Gastrointestinal Case of the Day

Education Exhibits
Location: NA

Participants
Moderator
Vincent M. Mellnick MD: Nothing to Disclose
Amy Kiyo Hara MD: Nothing to Disclose
Christine Marie Peterson MD: Nothing to Disclose
Christine O. Menias MD: Nothing to Disclose
Dennis M. Balfe MD: Nothing to Disclose
Douglas Robert Kitchin MD: Nothing to Disclose
Meghan G. Lubner MD: Nothing to Disclose
Mittul Gulati MD: Nothing to Disclose
Perry J. Pickhardt MD: Co-founder, VirtuoCTC, LLC Stockholder, Cellectar Biosciences, Inc
Rex Albert Parker MD: Nothing to Disclose
Whitney A. Manlove MD: Nothing to Disclose
Michael Jyh-Gang Chiang MD: Nothing to Disclose
Jerry Tsu-Yuen Loo MD: Nothing to Disclose
Jennifer Lynn Kissane MD: Nothing to Disclose
Matthew Harlan Lee MD: Nothing to Disclose

TEACHING POINTS

1) Each GI case of the day will be taken from disorders of the luminal GI tract as well as the liver, spleen, pancreas, and biliary system. The findings may be uncommon manifestations of common diseases or common manifestations of uncommon diseases.

Image Interpretation Exhibit in Digital Format

Education Exhibits
Location: NA

Participants
Jeffrey C. Weinreb MD: Nothing to Disclose

TEACHING POINTS

This is the companion electronic exhibit to the Image Interpretation Session, scheduled for Sunday, November 30, 4:00 - 5:45 pm, in Arie Crown Theater. Several of the case histories to be discussed in the Sunday session will be on display electronically beginning Sunday at 8:00 am. After the session concludes, the accompanying discussion for each case will be revealed. The exhibit will remain on display for self-study until 12:30 pm, Friday, December 5.

The learning objectives for this presentation are: 1) Identify key abnormal findings on radiologic studies that are critical to making a specific diagnosis. 2) Construct a logical list of differential diagnoses based on the radiologic findings, focusing on the most probable differential diagnoses. 3) Determine which, if any, additional radiologic studies or procedures are needed in order to make a specific final diagnosis. 4) Choose the most likely diagnosis based on the clinical and the radiologic information.

Contrast Enhanced Ultrasound of the Spleen. How to do it. What to Expect of It

Education Exhibits
Location: GI Community, Learning Center

Participants
Demosthenes D. Cokkinos MD (Presenter): Nothing to Disclose
Eleni Antypa: Nothing to Disclose
Theodoros Kolios MD: Nothing to Disclose
Vasileios Moustakas MD: Nothing to Disclose
Dimitrios Exarchos MD: Nothing to Disclose
Ploutarhos A Piperopoulos MD, PhD: Nothing to Disclose

TEACHING POINTS

Basic steps for performing a Contrast Enhanced Ultrasound (CEUS) examination of the spleen. Explanation of normal haemodynamic behaviour post injection of the contrast agent. Description of underlying pathophysiology of the commonest pathologic entities of the spleen, with imaging examples on CEUS, compared to B-mode and Colour Doppler US, as well as CT or MR when available.

TABLE OF CONTENTS/OUTLINE

Different chapters of the presentation include review of splenic anatomy, contrast agents physics and description of technical
parameters in order to perform a successful CEUS examination, as well as analysis of contrast circulation through the spleen.
The commonest pathologic conditions of the spleen are reviewed with imaging examples on B mode, Colour Doppler and CEUS, correlated with CT or MR when these were performed. CEUS indications, contraindications, limitations and pitfalls are also mentioned.

GIE002-b
Sonography of the Gastrointestinal Tract Abnormalities

Education Exhibits
Location: GI Community, Learning Center

Participants
Dal Mo Yang : Nothing to Disclose  
Hyun Cheol Kim : Nothing to Disclose  
Sang Won Kim MD (Presenter): Nothing to Disclose  
Woo Jin Yang : Nothing to Disclose  
Kyung Jin Lee MD : Nothing to Disclose

TEACHING POINTS
1. An awareness of the sonographic appearance of diseases of the intestine is essential to achieve the proper diagnosis.
2. Familiarity with the sonographic appearances of diseases that affect the intestine may allow specific diagnosis based on the degree and distribution of bowel wall thickening and associated changes of perienteric tissues.

TABLE OF CONTENTS/OUTLINE
Normal anatomy of bowel wall  
Sonographic techniques  
Review of imaging findings  
Sample cases - infectious and inflammatory diseases (appendicitis, crohn's disease, ulcerative colitis, tuberculosis enterocolitis, diverticulitis, terminal ileitis, typhilitis, epiploic appendagitis, pseudomembranous colitis and syphilis) - ischemic disease, intussusception, - benign tumors - malignant tumors (malignant GIST, lymphoma, carcinoma, neuroendocrine tumors and metastases) - intramural hematoma.

GIE003-b
The Technology for Colon Distention in CT Colonography—Insufflation Method to Obtain Constantly a Good Distention of Colon

Education Exhibits
Location: GI Community, Learning Center

Participants
Masahiro Suzuki (Presenter): Nothing to Disclose  
Takashi Sakamoto MD : Nothing to Disclose  
Jun Torii RT : Nothing to Disclose  
Michihiro Yamasaki : Nothing to Disclose  
Yushi Hiran : Nothing to Disclose  
Tomohiko Aso RT : Nothing to Disclose  
Noriyuki Moriyama MD, PhD : Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1: To review the colon distention technology of CT Colonography (CTC). 2: To discuss the relationship between the conventional insufflation and the new “two steps insufflation”. 3: To explain the insufflation method of colon distention in order to achieve a high quality CT Colonography.

TABLE OF CONTENTS/OUTLINE
1: Relationship between the colon distention and the insufflation. 2: Anatomy of colon needed to distend the colon. 3: Steps necessary for re-positioning along the shape of the colon. 4: Visual assessment of the distention degree by means of a three-dimensional image. a: Conventional insufflation. b: 2 steps insufflation. 5: Benefits of the colon distention utilizing the new insufflation method.

GIE004-b
An MRCP-guided Trip through Pancreatobiliary Normal Anatomy and Anatomical Variants

Education Exhibits
Location: GI Community, Learning Center

Participants
Jose Tiago Soares MD (Presenter): Nothing to Disclose  
Joao Ressurreicao MD : Nothing to Disclose  
Diogo Ataide Santiago Castelo MD : Nothing to Disclose  
Tiago Pereira MD : Nothing to Disclose  
Pedro Portugal MD : Nothing to Disclose

TEACHING POINTS
To describe the MRCP (magnetic resonance cholangiopancreatography) technique used in our department. To review and illustrate the MR features of normal biliary and pancreatic ductal anatomy and the possible anatomical variants that may occur.

TABLE OF CONTENTS/OUTLINE
There are several anatomical variants of the biliary and pancreatic ducts. Though these are not usually relevant or pathological per se, they can be of ultimate importance hepatobiliary or gallbladder interventional procedures. MRCP, a non-invasive, and ionizing radiation-free technique, has replaced ERCP as the modality of choice to diagnose pancreatobiliary tract conditions as it allows ductal anatomy recognition as well as potential anomalies of the adjacent structures, without possible ERCP complications like pancreatitis, hemorrhage, bowel perforation or infection. In this paper, we provide a review of MRCP’s role on the identification of normal anatomy and anatomical variants of the biliary and pancreatic ducts.
GIE005-b

Iatrogenic Bile Duct Injuries: Diagnosis and Management

Education Exhibits
Location: GI Community, Learning Center

Participants
Dae Jung Kim MD (Presenter): Nothing to Disclose

TEACHING POINTS
(1) To review bile duct injury after surgery (2) To review bile duct injury after transarterial chemoembolization (3) To review management of bile duct injuries

TABLE OF CONTENTS/OUTLINE
1. Biliary injuries, related to the biliary tract surgery (a) Classification system for bile duct injuries Bismuth-Corlette classification, Strasberg classification, Stewart-Way classification (b) Diagnostic techniques (c) Complication of bile leakage - biliary fistula, biloma, bile ascites, bile peritonitis (d) Complication of bile stricture (e) Management 2. Biliary injuries, related to the biliary tract surgery (a) Mechanism and Patterns of bile duct injuries (b) Diagnostic techniques (c) Complication of bile leakage - biliary fistula, biloma, bile ascites, bile peritonitis (d) Complication of bile stricture (e) Management

GIE006-b

There's More than Stones. An Ultrasound Pictorial Review of Gallbladder and Bile Ducts Normal Variants and Pathology

Education Exhibits
Location: GI Community, Learning Center

Participants
Demosthenes D. Cokkinos MD (Presenter): Nothing to Disclose
Eleni Antypa: Nothing to Disclose
Konstantinos Iosifidis MD: Nothing to Disclose
Fani Dimitroyli MD: Nothing to Disclose
Aikaterini Pavlopoulou: Nothing to Disclose
Ploutarhos A Piperopoulos MD, PhD: Nothing to Disclose

TEACHING POINTS
To present an atlas of the diverse normal variants and abnormal findings related to the gallbladder and bile ducts imaged with ultrasound (US).

TABLE OF CONTENTS/OUTLINE
Different normal variants of the gallbladder and bile ducts on sonography: Heister spiral valves, septate gallbladder, Phrygian cap, duplication, gallbladder diverticulum etc. Common and uncommon pathological conditions, including gallstones, biliary sludge, hepatisation, haemobilia, acute, chronic and emphysematous cholecystitis, wall rupture, adenomyomatosis, wall oedema, polyps, mural tumours, porcelain gallbladder, cholangiocarcinoma, bile duct dilatation due to various reasons etc. Brief review of pathophysiology and sonographic appearance of all entities. Images on B-mode and Colour Doppler US, as well as Contrast Enhanced US and CT when available.

GIE007-b

Focused US of Gallblader: Technique, Differential Points and Pitfalls

Education Exhibits
Location: GI Community, Learning Center

Participants
Song-Ee Baek MD (Presenter): Nothing to Disclose
Yong Eun Chung MD, PhD: Nothing to Disclose
Jae Young Lee MD: Nothing to Disclose
Hye-Jeong Lee MD: Nothing to Disclose
Myeong-Jin Kim MD, PhD: Nothing to Disclose

TEACHING POINTS
1. To review techniques of focused US of gallblader (GB)
2. To explain differential US findings of GB wall thickening among adenomyomatosis, cholecystitis and cancer
3. To discuss differential points of benign and neoplastic GB polyp

TABLE OF CONTENTS/OUTLINE
Outline 1. Techniques of focused GB US: selecting probes and optimizing parameters 2. Differential US findings of GB wall thickening: Rokitansky-aschoff sinus (RAS), cholesterol crystal, comet tail artifact, twinkling artifact, preservation of GB wall layer 3. How can we diagnose neoplastic polyp: size, multiplicity, echogenecity, shape, growth rate 4. Strong point and weakness of trans-abdominal GB US, compared to endoscopic US 5. Typical cases and mimickers The major teaching points of this exhibit are: 1. US is a still powerful tool for diagnosis of GB disease 2. GB wall thickening with RAS, cholesterol crystal and preservation of GB wall layer suggest adenomyomatosis rather than GB cancer 3. A single polyp with hypochoegenecity, larger than 1cm and sessile shape may have higher chance to be confirmed as neoplastic polyp.

GIE008-b
What Radiologists Should Know about Colorectal Cancer Operation: High Tie versus Low Tie of the Inferior Mesenteric Artery and Inferior Mesenteric Vein

Education Exhibits
Location: GI Community, Learning Center

Participants
Seong Eun Ko (Presenter): Nothing to Disclose
Suk Keu Yeom MD : Nothing to Disclose
In Young Choi : Nothing to Disclose
Sang Hoon Cha MD : Nothing to Disclose
Seung Wha Lee : Nothing to Disclose
Hwan Hoon Chung : Nothing to Disclose
Ki Yeol Lee MD, PhD : Nothing to Disclose

TEACHING POINTS
1. To review the surgical options in colorectal cancer; High tie versus low tie vascular ligation of the inferior mesenteric artery and inferior mesenteric vein in relation to the surgical options.

TABLE OF CONTENTS/OUTLINE
1. Normal anatomy and its variant of inferior mesenteric artery and inferior mesenteric vein on 3D reconstructed CT scan 2. High tie versus low tie ligation of inferior mesenteric artery and inferior mesenteric vein in colorectal cancer surgery (1) According to vascular anatomy (2) Tumor location (3) Lymph node dissection level (4) Associated complication 3. What surgeons need to know before the colorectal cancer operation?

**GIE012-b**

**Multimodal Imaging Findings of Small-bowel Disorders**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**
- Javier Vallejos MD, MBA (Presenter): Nothing to Disclose
- Claudia Analia Alvarez MD: Nothing to Disclose
- Carlos Capunay MD: Nothing to Disclose
- Patricia M. Carrascosa MD: Research Consultant, General Electric Company

**TEACHING POINTS**

1. To determine the role of imaging modalities in evaluation of small bowel diseases. 2. To discuss various considerations in achieving small bowel distention and other technical issues. 3. To describe and illustrate imaging findings in the most common diseases, including Crohn disease, ulcerative colitis, celiac disease, small bowel tumors, and incidental findings.

**TABLE OF CONTENTS/OUTLINE**

- Imaging modalities: Small-bowel barium CT enterography MR enterography
- Technical considerations: With or without enteroclysis
- Achieving small bowel distention With or without intravenous contrast material
- Imaging findings: Crohn disease Ulcerative colitis Celiac disease Small bowel tumors Incidental findings
- Additional considerations: Pitfalls Potential clinical impact
- Future directions

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**GIE013-b**

**“Appendicitis! Are You Really Alone?”: A Case-based Review of Imaging Findings of Tumors Presenting as Acute or Chronic Appendicitis**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**
- Yedaun Lee MD (Presenter): Nothing to Disclose
- Hye Jin Baek: Nothing to Disclose
- Kwanghwi Lee: Nothing to Disclose
- Seon-Jeong Kim MD: Nothing to Disclose
- Seung Ho Kim MD: Nothing to Disclose
- Jeong Hee Yoon MD: Nothing to Disclose

**TEACHING POINTS**

1. A variety of different tumors may present as appendicitis or periappendiceal abscess. 2. Recognition of imaging findings of tumorous appendicitis would help to avoid unnecessary emergent appendectomy and provide appropriate treatment.

**TABLE OF CONTENTS/OUTLINE**

1. Tumors presenting as acute appendicitis. 1) Acute appendicitis mimicking cancer 2) Tumors presenting as acute appendicitis - Infected mucinous neoplasm of appendix, Neuroendocrine tumor, Non-mucinous appendiceal cancer 2. Tumors masquerading as periappendiceal abscess 1) Chronic inflammatory condition mimicking cancer. - Periappendiceal abscess mimicking cancer, Chronic xanthogranulomatous appendicitis, Endometriosis, Actinomycosis 2) Tumors masquerading as periappendiceal abscess - Colon cancer (cecum, appendix), Ovarian cancer, Gastrointestinal stromal tumors, Lymphoma 3. Differential diagnosis between non-tumorous and tumorous appendicitis

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**GIE014-b**

**Acute Right Lower Quadrant Pain: Differential Diagnoses on Ultrasonography**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**
- Min-Jeong Kim (Presenter): Nothing to Disclose
- Hong-II Ha MD: Nothing to Disclose
- Kwanseop Lee: Nothing to Disclose
- Seung-Gu Yeo MD: Nothing to Disclose

**TEACHING POINTS**

1. To discuss the various US techniques in the evaluation of patients with acute right lower quadrant pain. 2. To identify key sonographic findings of normal appendix and acute appendicitis. 3. To list the other causes of right lower quadrant pain beyond appendicitis and describe their US findings.

**TABLE OF CONTENTS/OUTLINE**

1. US Techniques
2. Normal appendix and Acute appendicitis
3) US anatomy of appendix
2) Appendicitis or Not: Key US findings
3) Pitfalls of acute appendicitis: appendiceal diverticulitis, early appendicitis, distal appendicitis, retrocecal appendicitis, perforated appendicitis, spontaneously resolving appendicitis
3. Other causes of RLQ pain
1) Right colonic diverticulitis
2) Ileal diverticulitis
3) Infectious enterocolitis
4) Inflammatory bowel disease
5) Primary epiploic appendagitis
6) Omental infarction
7) Mesenteric lymphadenitis
8) Malignancy
9) Miscellaneous: Urologic and gynecologic disease

GIE016-b

Preoperative High Resolution MRI Evaluation of Perianal Fistulas: Making the Difficult Easy by Combining Different Sequences and Image Processing

Education Exhibits
Location: GI Community, Learning Center

Participants
Miguel Eduardo Nazar MD (Presenter): Nothing to Disclose
Santiago Andres MD: Nothing to Disclose
Maria Florencia Grana MD: Nothing to Disclose
Ariel Oscar Vazquez MD: Nothing to Disclose
Lorena Alarcon MD: Nothing to Disclose
Eduardo Pablo Eyheremendy MD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: To review anorrectal anatomy. To review the types of perianal fistulas and their complications.
To describe high resolution MRI techniques for anorrectal evaluation using phased-array coil. To describe high resolution MRI findings of perianal fistulas. To show the accuracy of new MRI techniques for the identification and classification of anal and perianal fistulas and their complications. To show the usefulness of MRI to help surgical planning to minimize recurrence and detect clinically unapparent disease.

TABLE OF CONTENTS/OUTLINE
- High resolution MRI protocol of anorrectal anatomy.
- Anorrectal normal anatomy.
- Pathological MRI findings of perianal fistulas and their complications.
- New applications MRI techniques:
  1. Diffusion-weighted images
  2. Fusion T2-w - DWI-w images
  3. Scan dynamics T1-w gradient echo with fat suppression with color map graph and time-intensity curves.

GIE017-b

Restaging of Rectal Carcinoma after Chemoradiation Therapy: High Resolution MRI with Pathologic Correlation after Total Mesorectal Excision

Education Exhibits
Location: GI Community, Learning Center

Participants
Santiago Andres MD (Presenter): Nothing to Disclose
Maria Florencia Grana MD: Nothing to Disclose
Miguel Eduardo Nazar MD: Nothing to Disclose
Giselle Romero Caimi MD: Nothing to Disclose
Nicolas Rotholz: Nothing to Disclose
Eduardo Pablo Eyheremendy MD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: To review the normal rectal and mesorectal anatomy. To describe and compare the high-resolution MRI features of rectal carcinoma after chemoradiation treatment (CRT). To correlate MRI images with the histologic findings after total mesorectal excision (TME). To review TNM staging of rectal carcinoma. To review the high resolution MRI protocol for evaluation of rectal carcinoma using phased-array coil. To show the accuracy of MRI for assessment of rectal carcinoma staging after chemoradiation treatment.

TABLE OF CONTENTS/OUTLINE
- High resolution MRI protocol Rectal and mesorectal normal anatomy
- Anatomical, morphological and signal intensity changes after chemoradiation therapy
- Pathological MRI findings with histopathological correlation
- Usefulness of MRI to help surgical planning to minimize recurrence and complications after surgery
- Importance of the correlation between MRI findings and pathological features to predict the clinical outcomes

GIE018-b

What Radiologists Need to Know and What Radiation Oncologists Want to Know about Anorectal Cancers: Critical Anatomic and Staging Distinctions that Affect the Use of Radiation Therapy for Anorectal Malignancies

Education Exhibits
Location: GI Community, Learning Center

Selected for RadioGraphics
Participants

Shanna Matalon MD (Presenter): Nothing to Disclose
Sreeharsha Tirumani MBBS, MD: Nothing to Disclose
Harvey Mamon MD, PhD: Nothing to Disclose
Nikhil H. Ramaiya MD: Nothing to Disclose
Michael Hayden Rosenthal MD, PhD: Nothing to Disclose

TEACHING POINTS

1. Anatomic distinctions in the pelvis and perineum, such as the difference between mesorectal and internal iliac lymph nodes, can dramatically alter the staging and treatment of anorectal malignancies. 2. High rectal, low rectal, and anal cancers demonstrate different patterns of local, regional, and systemic dissemination. 3. Accurate reporting of the locations of suspicious lymph nodes is critical to the planning and delivery of radiation therapy.

TABLE OF CONTENTS/OUTLINE

- Anatomy of the anus, rectum, perineum, and pelvic nodal stations as seen on CT and MRI. - Key anatomic landmarks from the anal margin to the rectosigmoid junction. - Common histologic types of cancer that are found in each anatomic location with associated demographics and risk factors. - TNM staging for anal and rectal cancers, with emphasis on the key distinctions between these two sites (e.g., differing definitions of regional lymph nodes, most notably the internal iliac and inguinal nodal stations). - Roles of CT, MRI, and PET-CT in the initial staging of anorectal cancers and in radiation treatment planning.

GIE019-b

Abdominal and Pelvic Imaging of Complications to Systemic Cancer Therapy

Education Exhibits
Location: GI Community, Learning Center

Participants

Rahul Anil Sheth MD (Presenter): Nothing to Disclose
Debra Ann Gervais MD: Research Grant, Covidien AG

TEACHING POINTS

Imaging plays a pivotal role in the care of oncologic patients, not only for the monitoring of treatment response but also for the detection and management of treatment-related complications. Systemic chemotherapies result in a broad spectrum of complications, some of which are relatively unique to particular agents. In addition to assessing for treatment effects, radiologists should be attuned to these specific complication risks in cancer patients. In this exhibit, we will: 1. Review the common abdominal and pelvic imaging complications related to conventional systemic chemotherapy agents. 2. Highlight complications associated with newer molecularly targeted agents.

TABLE OF CONTENTS/OUTLINE

- Liver o Hepatic steatosis due to irinotecan o Hepatotoxicity due to oxaliplatin o "Pseudocirrhosis" due to treated hepatic breast cancer metastases - Spleen o Splenic rupture due to granulocyte colony stimulating factor - Pancreas o Pancreatitis due to L-asparaginase - Gastrointestinal tract o Colitis due to ipilimumab o Perforation due to bevacizumab o Enteritis due to 5-fluorouracil, capcitabine, and paclitaxel o Benign pneumatosis - Kidneys o Chronic renal failure/atrophy due to cisplatin and methotrexate o Bladder o Hemorrhagic cystitis due to cyclophosphamide o Neurogenic bladder due to vincristine

GIE020-b

Granulomatous Diseases in the Abdomen: A Pictorial Essay

Education Exhibits
Location: GI Community, Learning Center

Participants

Gustavo Andres Maldonado Ramirez MD (Presenter): Nothing to Disclose
Rocio Perez Johnston MD: Nothing to Disclose
Luis Antonio Sosa MD: Nothing to Disclose
Sergio A. Cnales Vera MD: Nothing to Disclose
Eric T. Kimura-Hayama MD: Nothing to Disclose

TEACHING POINTS

- A wide variety of granulomatous diseases can occur in the abdomen, involving multiple organs and systems. - Granulomatous diseases can be congenital, inflammatory and infectious. - This educational exhibit aims to highlight the different manifestations of granulomatous disease in the abdomen.

TABLE OF CONTENTS/OUTLINE

1. Review spectrum of pathology characteristics of granulomatous diseases. 2. Review different organs and systems affected by granulomatous diseases including gastrointestinal, hepatobiliary, urinary tract, mesentery and vascular. 3. Review pathology, clinical and imaging findings of chronic granulomatous disorders including: sarcoidosis, Crohn's disease, xanthogranulomatous pyelonephritis and cholecystitis, actinomycosis and tuberculosis. 4. Understand the role of different imaging modalities and their impact on treatment decision and follow-up.

GIE021-b

Disease Spectrum of Abdominal Wall; Radiological Findings and Clinical Significance

Education Exhibits
Location: GI Community, Learning Center

Participants

Seong Jin Park MD, PhD (Presenter): Nothing to Disclose
Hyun Cheol Kim: Nothing to Disclose
Sung Eun Ahn: Nothing to Disclose
TEACHING POINTS

1. To review the pathophysiology of abdominal wall diseases causing various clinical presentations. 2. To describe the radiological findings of abdominal wall diseases, including ultrasonography, CT, MR, PET-CT. 3. To discuss the diagnostic tips of abdominal wall diseases during radiological trials.

TABLE OF CONTENTS/OUTLINE

1. Anatomy of abdominal wall 2. Spectrum of abdominal wall diseases 1) Inflammation, including myositis, abscess, infected lymphangioma, 2) Abdominal wall hernia 3) Trauma, including hematoma, muscle tear 4) Vascular diseases 5) Tumors, including desmoid tumor, inflammatory myofibroblastic tumor, lymphoma, rhabdomyosarcoma, metastasis, and etc. 6) Miscellaneous 3. Radiological findings of abdominal wall diseases, including ultrasonography, CT, MR, PET-CT 4. Clinical significance 5. Discussion and summary

GIE023-b

Multimodality Imaging of Immunotherapy: What Every General Radiologist Should Know

Education Exhibits
Location: GI Community, Learning Center

Participants
Angela Patricia Moreno MD (Presenter): Nothing to Disclose
Jorge Andres Abreu MD : Nothing to Disclose
Carolina Rumie Valois: Nothing to Disclose
Andres Vasquez MD : Nothing to Disclose
Juliana Ocampo MD : Nothing to Disclose
Javier Andres Romero MD : Nothing to Disclose

TEACHING POINTS

1. Response Criteria in Solid Tumors or WHO criteria, designed to detect early effects of cytotoxic agents, may not provide a complete assessment of immunotherapeutic agents; 2. The appearance of measurable antitumor activity may take longer for immune therapies than for cytotoxic therapies; 3. Ipilimumab monotherapy has four distinct patterns of tumor response: a. shrinkage in baseline lesions, without new lesions; b. durable stable disease with no significant change in the size of the baseline lesions (in some patients followed by slow, steady decline in total tumor burden); c. Response after an increase in total tumor burden; and d. response in the presence of new lesions; 4. Ipilimumab produces a spectrum of immune-related adverse effects: enterocolitis, hypophysitis, hepatitis, dermatitis, myopathy, pancreatitis and nephritis; 6. Specific patterns of immune-related adverse events that are detectable radiologically should be recognized early and communicated to the clinician.

TABLE OF CONTENTS/OUTLINE

Introduction Why not RECIST or WHO criteria? New criteria in the assessment of Immune related tumor response Types of response. Main differences with RECIST. Are they related with favorable survival? Adverse effects related with therapy. They can be recognized radiologically? Importance in the treatment surveillance. Conclusions.

GIE024-b

Assessment of Locoregional Cancer Therapy in the Liver—Complications and Pitfalls

Education Exhibits
Location: GI Community, Learning Center

Participants
Dianna Yu Ning Yang DO (Presenter): Nothing to Disclose
Noushin Vahdat MD : Nothing to Disclose
Shetal N. Shah MD : Nothing to Disclose
Namita Sharma Gandhi MD : Nothing to Disclose

TEACHING POINTS

1. Familiarize with available locoregional cancer therapy for primary and metastatic liver tumors. 2. Recognize the expected imaging findings and potential pitfalls after locoregional cancer therapy. 3. Recognize the common and the rare (but clinically significant) complications associated with locoregional therapy.

TABLE OF CONTENTS/OUTLINE

Introduction to locoregional therapy for primary and metastatic liver tumors: Radiation therapy Thermal Ablation Transcatheter Therapy Expected post treatment imaging findings Potential imaging pitfalls Post treatment complications

GIE026-b

Correlation between Gadoxetic Acid Enhanced MR Imaging and Molecular/Genetic Background of Hepatocellular Carcinoma: Implication for Radiogenomics

Education Exhibits
Location: GI Community, Learning Center

Participants
Azusa Kitao (Presenter): Nothing to Disclose
Osamu Matsui MD : Research Consultant, Kowa Company, Ltd Research Consultant, Otsuka Holdings Co, Ltd Research Consultant, Eisai Co, Ltd Speakers Bureau, Bayer AG Speakers Bureau, Eisai Co, Ltd
TEACHING POINTS

The purpose of this presentation is 1. To review that the hepatobiliary phase of gadoxetic acid enhanced MR imaging is a sensitive (indirect) molecular imaging reflecting expression of uptake transporter organic anion transporting polypeptide 1B3 (OATP1B3) in hepatocellular carcinoma (HCC). 2. To demonstrate that the signal intensity on hepatobiliary phase reflects biological and molecular/genetic characteristics of HCC. 3. To discuss the possibility of gadoxetic acid enhanced MR imaging for personalized medicine in HCC as an imaging biomarker from "radiogenomics" point of view.

TABLE OF CONTENTS/OUTLINE

1. Enhancement mechanism of gadoxetic acid enhanced MR imaging in HCC - Correlation between OATP1B3 expression and signal intensity. Changes in enhancement rate and OATP1B3 expression in multistep hepatocarcinogenesis. Biological and molecular/genetic characteristics of hypointense (OATP1B3 under-expressed) HCC and hyperintense (OATP1B3 over-expressed) HCC. Clinical and pathological findings - Molecular and genetic analysis - Role of transcription factor hepatocyte nuclear factor (HNF) 4A in hepatocarcinogenesis. Usefulness of gadoxetic acid enhanced MR imaging for personalized medicine in HCC as an imaging biomarker expressing some specific molecular/genetic backgrounds (radiogenomics).

GIE027-b

US-guided Percutaneous Radiofrequency Ablation of Liver Tumors; Comparison Among Various Imaging Modalities for the Evaluation of Technical Success

Education Exhibits

Location: GI Community, Learning Center

Participants

Sang Soo Shin MD (Presenter): Nothing to Disclose
Jin Woong Kim MD: Nothing to Disclose
Suk Hee Heo MD: Nothing to Disclose
Hyo Soon Lim MD: Nothing to Disclose
Yong Yeon Jeong MD: Nothing to Disclose
Heo Young-Keun Kang MD: Nothing to Disclose

TEACHING POINTS

1. To overview the current status of imaging evaluation after US-guided radiofrequency ablation (RFA) of liver tumors. 2. To illustrate the role of CT, US, MR imaging in the assessment of results of RFA. 3. To suggest strengths and limitations of various imaging modalities in determining technical success of RFA.

TABLE OF CONTENTS/OUTLINE


GIE028-b

WHO, EASL, RECIST 1.1 and mRECIST Criteria: A Case-based Pictorial Illustration on Key Differences in Radiologic Assessment of Response after Emboloetherapy in Hepatocellular Carcinoma

Education Exhibits

Location: GI Community, Learning Center

Participants

Haq Wajid DO (Presenter): Nothing to Disclose
Ram Kishore Reddy Gurajala MBBS, FRCR: Nothing to Disclose
Dianna Yu Ning Yang DO: Nothing to Disclose
Shetal N. Shah MD: Nothing to Disclose
Amanjot Singh Gill MD: Nothing to Disclose
Karanakaravel Karuppasamy MBBS, FRCR: Nothing to Disclose

TEACHING POINTS

The goal is • To review multiple criteria that can be used to evaluate response to embolotherapy in hepatocellular carcinoma (HCC) • To highlight key differences between these criteria • To demonstrate varying impact these criteria can have

TABLE OF CONTENTS/OUTLINE

A. Background: An overview of tumor treatment response criteria by World Health Organization (WHO), the European Association for the Study of the Liver (EASL), and Response Evaluation Criteria in Solid Tumors - RECIST version 1.1 and modified RECIST (mRECIST) is presented. B. Highlight major differences: a. WHO and RECIST 1.0 and 1.1 are based on entire tumor size b. EASL and mRECIST are based only on viable residual tumor c. WHO and EASL are based on bi-dimensional measurements d. RECIST 1.1 and mRECIST are based on greatest uni-dimensional measurement. C. Brief review on prognostic correlation between these criteria and HCC. D. EASL and mRECIST a. Special significance in HCC b. Example cases: Like the one case shown in this criteria based on residual tumor size and description of treatment response can vary. E. SUMMARY: With the prediction of viability depending on imaging, a consistent methodology adopted throughout the follow-up period will aid in better management of HCC.
LI-RADS 2014 Technical Requirements for CT and MRI: A Primer for Radiologists

Education Exhibits
Location: GI Community, Learning Center

Participants
Avinash Ranesh Kambadakone MD, FRCR (Presenter): Nothing to Disclose
Dushyant V. Sahani MD: Research Grant, General Electric Company
An Tang MD: Speaker, Siemens AG Speaker, Boehringer Ingelheim GmbH
Amol Shah BS: Nothing to Disclose
Thomas Hope MD: Nothing to Disclose
Kathryn Jane Fowler MD: Research support, Bracco Group
Rajan T. Gupta MD: Consultant, Bayer AG Speakers Bureau, Bayer AG
Karthik Ganesan MBBS, MD: Nothing to Disclose
Hero Kamal Hussain MD: Consultant, Bayer AG
Claude B. Sirlin MD: Research Grant, General Electric Company Speakers Bureau, Bayer AG Consultant, Bayer AG

TEACHING POINTS

The purpose of this education exhibit on LI-RADS 2014 technical requirements for liver CT and MRI is: 1) to define and describe the recommended dynamic imaging phases, 2) to discuss the technical requirements and specifications for performance of CT/MRI of liver and review common technical challenges of optimal image acquisition, and 3) to compare and contrast the LI-RADS 2014 technical requirements with the recent OPTN imaging policy 3.6.4.4.

TABLE OF CONTENTS/OUTLINE

1. Brief overview of the new LI-RADS 2014 algorithm and content changes
2. Describe rationale for the LI-RADS technical requirements
3. Definitions and description of dynamic imaging phases for CT and MRI of liver in setting of HCC evaluation
4. Review technical requirements and specifications for optimal performance of CT and MRI
5. Compare the LI-RADS 2014 requirement with current OPTN policy
6. Illustrate the imaging technique in a pictorial review with review of common challenges, pitfalls and tips to optimize image quality
7. Discuss the technical parameters and challenges specific to gadoxetate-enhanced MR
8. Summary and conclusions

Postoperative Anatomic and Pathologic Findings at Multi-detector CT Following Pancreaticoduodenectomy

Education Exhibits
Location: GI Community, Learning Center

Participants
Jin Woong Kim MD: Nothing to Disclose
Sang Soo Shin MD: Nothing to Disclose
Suk Hee Heo MD: Nothing to Disclose
Sung Mo Kim (Presenter): Nothing to Disclose
Hyo Soon Lim MD: Nothing to Disclose
Yong-Yeon Jeong MD: Nothing to Disclose
Heoung-Keun Kang MD: Nothing to Disclose

TEACHING POINTS

1. To understand postoperative anatomy after pancreaticoduodenectomy with multi-detector CT (MDCT)
2. To review and illustrate the spectrum of postoperative complications after pancreaticoduodenectomy
3. To correlate MDCT findings with surgical grading of pancreatic fistula

TABLE OF CONTENTS/OUTLINE

1. Introduction
2. Surgical considerations
3. Postoperative anatomy following pancreaticoduodenectomy
4. Postoperative complications
   a) Pancreatic fistula
   b) Intrabdominal acute necrotic collection
   c) Biliary leak
   d) CBD obstruction
   e) Abscess
   f) Vascular complications
   (Pseudoaneurysm, active bleeding at gastroduodenal stump)
   g) Delayed gastric emptying
   h) Ileus
   i) Gastrointestinal bleeding
5. Correlation between MDCT findings and grading of postoperative pancreatic fistula based on International Study Group of Pancreatic Fistula (ISGPF) classification scheme
6. Conclusion

Beyond the Whipple Resection: What the Radiologist Needs to Know about the Multimodality Imaging of Borderline Resectable, Locally Advanced, and Metastatic Pancreatic Adenocarcinomas

Education Exhibits
Location: GI Community, Learning Center

Participants
John Webster Gilbert MD (Presenter): Nothing to Disclose
Atul Bhanudas Shinagare MD: Nothing to Disclose
Jyothi Priya Jagannathan MD: Nothing to Disclose
Brian M Wolpin MD: Nothing to Disclose
Nikhil H. Ramaiya MD: Nothing to Disclose
Michael Hayden Rosenthal MD, PhD: Nothing to Disclose

TEACHING POINTS

- About 70% of patients with pancreatic cancer present with locally advanced or metastatic disease, and another 5-10% have borderline resectable cancer.
- These three classes of pancreatic cancer undergo distinct treatments and demand different areas
of vigilance on the part of the radiologist. - Neoadjuvant therapy for borderline resectable tumors is performed with goal of resection and potential cure; locally advanced and metastatic tumors are treated for local control and palliation.

TABLE OF CONTENTS/OUTLINE
- Review of normal anatomy of the pancreas and nearby structures relevant to staging with correlation on CT and MRI, including discussion of optimum imaging technique
- Review of TNM staging system for pancreatic adenocarcinoma (AJCC 7th ed)
- Overview of classes of non-resectable pancreatic cancer (borderline resectable, locally advanced, metastatic) and current staging methods
- Illustration of common and uncommon pathways of tumor spread and sites of metastases with multimodality imaging
- Discussion of treatment options defined by extent of disease, including roles of chemotherapy, molecular targeted therapy, and radiotherapy
- Case-based review of side effects, complications, and treatment response:

GIE032-b
Postoperative CT Findings after Pancreatic Head Resection: Normal CT Anatomy and Complications

Education Exhibits
Location: GI Community, Learning Center

Participants
Ji Won Seo MD (Presenter): Nothing to Disclose
Minwook Lee MD : Nothing to Disclose
Ki Whang Kim MD : Nothing to Disclose
Yong Eun Chung MD, PhD: Nothing to Disclose
Myeong-Jin Kim MD, PhD : Nothing to Disclose
Hye-Jeong Lee MD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is:
To review the surgical technique of pancreatic head resection
To understand the postoperative CT anatomy according to surgical techniques
To review CT findings of postoperative complications
The major teaching points of this exhibit are:
Understand the postoperative CT anatomy to various surgical techniques
Linear fluid collection at the pancreaticojejunostomy site does not suggest pancreatic fistula or bile leak
Fistula formation between pancreaticojejunostomy site and adjacent fluid collection may suggest bile leak

TABLE OF CONTENTS/OUTLINE
1. Illustration of surgical techniques of pancreatic head resection
   A. Type of pancreatic head resection - Whipple's operation - Pylorus-preserving pancreaticojejunostomy
   B. Anastomosis methods of the remnant pancreas - Duct-to-mucosa pancreaticojejunostomy - End-to-side or end-to-end pancreaticojejunostomy
2. Normal postoperative findings according to the surgical techniques
3. Imaging findings of post-operative complications - Pancreatic fistula, fluid collection, acute pancreatitis, hemorrhage, delayed gastric emptying, enteric fistula

GIE033-b
Complications of Peritoneal Dialysis in Patients with Chronic Kidney Disease: Imaging Features

Education Exhibits
Location: GI Community, Learning Center

Participants
Jong-Young Oh (Presenter): Nothing to Disclose
Kyung Jin Nam MD : Nothing to Disclose
Jaehyung Park : Nothing to Disclose
Hee-Jin Kwon MD : Nothing to Disclose
Jin Han Cho : Nothing to Disclose
Dong Won Kim : Nothing to Disclose
Dong Ho Ha MD, PhD : Nothing to Disclose

TEACHING POINTS
1. Learning what kinds of complications can occur in patients with peritoneal dialysis
2. Recognition of the characteristic imaging findings of peritoneal dialysis related complications
3. Understanding of the pathophysiology of peritoneal dialysis related complications

TABLE OF CONTENTS/OUTLINE
Classification of peritoneal dialysis related complications
Pathophysiology and clinical features
Review of multimodality imaging findings
Sample cases and mimics
Summary

GIE034-b
Danger! Have You Missed a Desmoid Tumour? Pictorial Review of Cross-Sectional Imaging

Education Exhibits
Location: GI Community, Learning Center

Participants
Amanda Cheng MBBS : Nothing to Disclose
Sarah Eljamel MBChB (Presenter): Nothing to Disclose
Stephen John Glancy MBChB : Nothing to Disclose
Li Foong Wong BMedSc, MBBS : Nothing to Disclose
Malcolm Dunlop MBChB : Nothing to Disclose

TEACHING POINTS
• Pathogenesis and clinical features of abdominal desmoid tumours. • Emphasis on MRI in diagnosis, assessment of complications and disease follow-up. • Subtle imaging features raising suspicion of a DT. • Spectrum of imaging appearances.

TABLE OF CONTENTS/OUTLINE

Background: Abdominal desmoid tumours (DTs) are rare, benign fibromatous neoplasms occurring sporadically or in relation to familial syndromes. Despite lacking malignant potential, DTs cause significant morbidity and mortality via local invasion and compressive effects upon adjacent organs. DTs are notoriously challenging to diagnose and manage. Role of MRI: Non-ionising cross-sectional imaging has a particular role in assessing young patients that require long-term follow-up. MRI signal characteristics can provide additional information over CT and suggest potential behavioural and cellular properties. MRI Imaging Features: DTs occur in variable locations with a wide range of appearances. We aim to demonstrate common and rare locations within the abdomen, specific signal characteristics and enhancement patterns to look out for. Conclusion: MRI is a useful modality in the diagnosis of DTs, frequently in a young population. We provide examples of commonly overlooked imaging appearances.

GIE035-b

MDCT Imaging of Post-Surgical Abdominal Bleeding (PSAB)

Education Exhibits
Location: GI Community, Learning Center

Participants
Orlando Catalano MD : Nothing to Disclose
Antonio Nunziata MD (Presenter): Nothing to Disclose
G Carone MD : Nothing to Disclose
Paolo Delrio MD : Nothing to Disclose
Antonella Petrillo MD : Nothing to Disclose

TEACHING POINTS

PSAB is a relevant, potentially life-threatening occurrence. In the post-operative setting, haemorrhage may have a variety of clinical and imaging presentations. Rapid assessment and decision making is mandatory for proper patient management and avoidance of further complications. Knowledge of normal and near-normal findings after recent surgery is mandatory to achieve a prompt and effective diagnosis. Understanding impending bleeding is particularly relevant. The purpose of this exhibit is 1) To discuss the topic of abdominal haemorrhage developing after surgery, from a clinical and MDCT imaging point of view 2) To summarize the clues to MDCT diagnosis and potential pitfalls. 3) To highlight the optimal diagnostic work-up in cases suspected for PSAB, with special reference to the role of MDCT in selecting the most appropriate patient treatment.

TABLE OF CONTENTS/OUTLINE

The clinical and surgical aspects are first discussed, with special reference to risk factors, and main presentation scenarios. Various cases of intra-organ, intraperitoneal, and retroperitoneal PSAB are then illustrated, as shown by MDCT angiography. A correlation with presurgical findings is given, as well as, that with post-treatment findings. Interpretative pitfalls, leading to false positive or false negative diagnoses are considered.

GIE036-b

Functioning or Non-functioning? Pancreatic Neuroendocrine Tumors Sometimes Reveal Their Functional Status on Imaging

Education Exhibits
Location: GI Community, Learning Center

Participants
Colin J. McCarthy MD (Presenter): Nothing to Disclose
Shaunagh McDermott FFR(RCSI) : Nothing to Disclose
Patrick Joseph Burke MBBC : Nothing to Disclose
Peter F. Hahn MD, PhD : Stockholder, Abbott Laboratories Stockholder, Covidien AG Stockholder, CVS Caremark Corporation Stockholder, Kimberly-Clark Corporation Stockholder, Landauer, Inc
Joseph F. Simeone MD : Nothing to Disclose
Michael Austin Blake MBBC : Editor with royalties, Springer Science+Business Media Deutschland GmbH

TEACHING POINTS

Pancreatic neuroendocrine tumors (PNETs) are increasingly being detected neoplasms with variable hormone production and secretion. They represent 10% of pancreatic neoplasms and can present with unusual symptoms due to secretion of hormones. Their presentations can be initially clinically challenging including such symptoms as paresthesia and confusion related to hypoglycemia from an insulinoma. We emphasize the imaging features that can be helpful to differentiate PNETs from adenocarcinoma and demonstrate the differences between functioning and non-functioning pancreatic neuroendocrine tumors. We also highlight cases in which the functional status of the tumor can be deduced from imaging alone such as gastrinoma producing imaging features of Zollinger Ellison syndrome, ACTH secreting PNET producing increase in adrenal size and serotonin secreting PNET inducing fibrosis and a pancreatic ductal stricture.

TABLE OF CONTENTS/OUTLINE

1. Introduction - cellular origin, location of tumors, malignant potential. 2. Imaging features - differences between functioning and non-functioning PNETs and adenocarcinoma. 3. The use of US, CT, MRI and Molecular imaging. 4. PNETs and their imaging features - Insulinoma and gastrinoma, Somatostatinoma, VIPoma, glucagonoma, ACTH- and serotonin- producing tumors. 5. Syndromes associated with PNETs. 6. Summary.

GIE037-b

Customizing Dual Energy CT Post Processing to Your Abdominal Radiology Practice

Education Exhibits
Location: GI Community, Learning Center
Certificate of Merit

Participants
Sergio Klimkowski MD: Nothing to Disclose
Jessica Garrette Zarzour MD: Nothing to Disclose
Lincoln L. Berland MD: Consultant, Nuance Communications, Inc Stockholder, Nuance Communications, Inc
Desiree E. Morgan MD (Presenter): Nothing to Disclose

TEACHING POINTS
1. Review standard presentations of simulated monoenergetic and material density dual energy CT images
2. Understand choices for customizing and saving post processing steps to analyze specific abdominal conditions
3. Become familiar with incorporation of advanced dual energy post processing into daily clinical practice

TABLE OF CONTENTS/OUTLINE
Brief review of dual energy technology Basic types of images generated with dual energy image data Customizing dual energy post processing to address specific clinical abdominal imaging needs Virtual unenhanced image choices Adrenal adenoma Pancreatic lesions Liver nodules and steatosis Renal lesions and stones Research post processing examples Incorporation of dual energy images and post processing into clinical practice Summary

GIE038-b
Portal Complications after Liver Transplantation: When, What and How

Education Exhibits
Location: GI Community, Learning Center

Participants
Jesus Alejandro Gabutti MD (Presenter): Nothing to Disclose
Veronica Espinosa: Nothing to Disclose
Grisselda Teresa Romero Sanchez MD: Nothing to Disclose
Ignacio Munoz Lopez: Nothing to Disclose
Enrique Miguel Cruz MD: Nothing to Disclose
Jorge Vazquez Lamadrid MD: Nothing to Disclose

TEACHING POINTS
1. To describe the portal anastomosis technique, and main risk factors for developing complications.
2. To classify the temporality of portal complication in relation with the moment of surgery, acute, subacute and late.
3. To describe the normal imaging findings of the post-transplant portal vein.
4. To describe and how the different imaging techniques must be use to screen, document and follow up (before and after treatment) a portal complication.

TABLE OF CONTENTS/OUTLINE

GIE039-b
Not What You Expected? Typical and Atypical Appearances of Focal Liver Lesions on Contrast Enhanced Ultrasound

Education Exhibits
Location: GI Community, Learning Center

Participants
Demosthenes D. Cokkinos MD (Presenter): Nothing to Disclose
Eleni Antypa: Nothing to Disclose
Panagiotis Tserotas MD: Nothing to Disclose
Polychronis Liontos: Nothing to Disclose
Ekaterini Tavernarakis MD: Nothing to Disclose
Ploutarhos A Piperopoulos MD, PhD: Nothing to Disclose

TEACHING POINTS
Presentation of typical enhancement patterns of various histologic types of focal liver lesions (FLLs) on Contrast Enhanced Ultrasound (CEUS). Explanation of their haemodynamic behaviour post contrast injection based on their histology and recognition of atypical patterns of contrast enhancement.

TABLE OF CONTENTS/OUTLINE
Review of the status of CEUS as the first imaging method to be performed when a FLL is found on baseline US. Description of various types of lesions and their different patterns of US contrast agents' enhancement, depending on their blood flow from the hepatic artery and portal vein during the arterial, portal and late phase. Explanation of diagnosis based on these typical patterns and acknowledgement of enhancement in atypical ways. Presentation of cases of FLLs with typical and atypical behaviour on CEUS and explanation of the pathophysiological basis for these features based on their histology. Analysis of different behaviour of US, CT and MR contrast agents resulting in potential different behaviour of the same lesion in these modalities.

GIE040-b
Abnormalities in Intrahepatic Periportal Space: Multimodality Imaging Findings

Education Exhibits
Participants
Jong-Young Oh (Presenter): Nothing to Disclose
Kyung Jin Nam MD: Nothing to Disclose
Jin Hwa Lee MD: Nothing to Disclose
Kyungjae Lim: Nothing to Disclose
Hee Jin Kwon MD: Nothing to Disclose
Jin Han Cho: Nothing to Disclose
Seong Kuk Yoon MD: Nothing to Disclose

TEACHING POINTS
The major teaching points of this exhibit are: 1. Learning what kinds of disease can involve the intrahepatic periportal space. 2. Recognition of the characteristic imaging findings associated with each periportal abnormality. 3. Radiologic differentiation of various kinds of periportal abnormalities. 4. Understanding of the pathophysiology of periportal abnormalities.

TABLE OF CONTENTS/OUTLINE
- Anatomy of intrahepatic periportal space
- Classification of intrahepatic periportal pathologies according to different periportal structures
- Pathophysiology and clinical features
- Review of multimodality imaging findings
- Utility of each modality in the diagnosis of Sample cases and mimics

GIE041-b
Common and Uncommon Inflammatory Diseases of the Liver; Imaging Findings and Differential Diagnosis

Education Exhibits
Location: GI Community, Learning Center

Participants
Young Hwan Lee MD (Presenter): Nothing to Disclose
Han Ah Lee: Nothing to Disclose
Dong Ho Bang MD: Nothing to Disclose
You Ree Kim MD: Nothing to Disclose
Kwon Ha Yoon MD, PhD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To understand the radiologic findings of infectious or non-infectious inflammatory processes in the liver according to various causes. 2. To know the imaging features in differential diagnosis of hepatic inflammatory diseases.

TABLE OF CONTENTS/OUTLINE
- Pathogenic mechanism of hepatic infection
- Comparison of imaging modalities
- Imaging findings of hepatic inflammation according to various causes - Infectious diseases - Non-infectious diseases
- Differential diagnosis of various hepatic inflammatory diseases

GIE042-b
Neuroendocrine Tumor (NET) of Abdominal Organs: The WHO Update on Classification and Radiological Review

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Joonseok Hwang MD (Presenter): Nothing to Disclose
Hae Kyung Lee MD: Nothing to Disclose
Boem Ha Yi MD, PhD: Nothing to Disclose
Min Hee Lee MD: Nothing to Disclose
Seo Youn Choi MD: Nothing to Disclose

TEACHING POINTS
Teaching point 1. To review the pathologic assessment of NET according to new WHO classification and grading. 2. To illustrate the various imaging features of NET of abdominal organs and to present the differential point from mimics. 3. To review the contemporary treatment options.

TABLE OF CONTENTS/OUTLINE
- Update WHO classification and grading of NET
- Pathologic findings according to NET
- Review of imaging findings
- Sample cases and mimics
- Contemporary treatment options

GIE043-b
CT Findings of Intestinal Malrotation

Education Exhibits
Location: GI Community, Learning Center

Participants
Laura Marcela Ospina MD (Presenter): Nothing to Disclose
Carlos Alejandro Garcia MD: Nothing to Disclose
**TEACHING POINTS**

The purpose of this exhibit is:

1. To review the embryology and classification of malrotation
2. To define the CT signs of intestinal malrotation
3. To show fluoroscopic findings of Intestinal malrotation on CT
4. To describe the CT findings that are related to intestinal malrotation and propose a new one

**TABLE OF CONTENTS/OUTLINE**


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**GIE101**

**Bowel Obstruction through the Ages: A Tour**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

Michelle Diane Sakala MD (Presenter): Nothing to Disclose
Michael Oliphant MD: Nothing to Disclose
Evelyn Young Anthony MD: Nothing to Disclose

**TEACHING POINTS**

Review the common causes of bowel obstruction in the upper gastrointestinal tract, small bowel, and large bowel. Illustrate how obstruction at differing levels can appear similar across age groups when the etiologies are, in fact, different. Create a deliberate differential diagnosis based on patient age from neonate to older adult.

**TABLE OF CONTENTS/OUTLINE**


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**GIE102**

**CSF Shunt Complications; What the Abdominal Imager Needs to Know**

*Education Exhibits*

*Location: GI Community, Learning Center*

Certificate of Merit

**Participants**

Eric Rinker MD (Presenter): Nothing to Disclose
Daniel Thomas Myers MD: Nothing to Disclose
Todd Williams MD: Nothing to Disclose

**TEACHING POINTS**

1. Review the spectrum of abdominal complications of Ventriculoperitoneal (VP) and Lumboperitoneal (LP) shunts with emphasis on CT imaging and multimodality correlation including Nuclear Medicine and myelography.
2. Explore the different imaging options available in evaluation of CSF shunts.

**TABLE OF CONTENTS/OUTLINE**

1. Review imaging options for abdominal complications of CSF shunts (CT scan, Nuclear Medicine shunt studies, radiographs, CT myelography).
2. Background literature review of shunt complications.
3. Display examples of abdominal complications of CSF shunts at our institution, including: loculated CSF collections (subcutaneous, peritoneal, intramuscular), shunt infection including abscess, regional hematoma, mechanical failures (valve disconnect, tube shear, shunt retraction) and complications of abandoned shunt tubing (bowel perforation).

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**GIE103**

**CT Review of Internal Hernias**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

Shiv Bhanu MD: Nothing to Disclose
TEACHING POINTS

To learn pertinent anatomy as it relates to internal hernias. To learn imaging appearance and locations of more common internal hernias. To appreciate that internal hernias are diagnostically challenging given complex array of findings on sequential CT images. There is need for an electronic based resource for review of characteristic internal hernia CT findings.

TABLE OF CONTENTS/OUTLINE

- Purpose: Internal hernias continue to account for an increasing number of intestinal obstruction cases. Given the potential severity of internal hernias it is paramount that radiologists familiarize themselves with the assortment of internal hernias and their CT features. This suggestion, while easily offered is challenging as internal hernias are inherently complex in their imaging characteristics and do not lend themselves to diagnosis based on a single CT image as is often illustrated in the written literature. We present a series of fully scrollable internal hernia cases demonstrating classic signs best appreciated as a whole on multiple images. Content: Participants will become familiar with pertinent anatomy and characteristic CT findings of more common internal hernias. The importance of real-time scrolling ability for image interpretation is emphasized. Section headings will be Case # 1-13, discussion, IH vs simple SBO: hints for differentiation, summary.

GIE104

Difficult Diagnosis—A Pictorial Review of the CT Appearances of Uncommon Internal Hernias and Correlation with Surgical Findings

Education Exhibits

Location: GI Community, Learning Center

Participants

Anu Obaro MBBS (Presenter): Nothing to Disclose
Suzanne Ryan MD: Nothing to Disclose

TEACHING POINTS

To demonstrate the subtle signs sometimes overlooked in the acute and non-acute abdomen that can lead to missed diagnosis and litigation. To recognise the CT appearances of common and unusual internal hernias. To demonstrate correlation between CT appearances and surgical findings.

TABLE OF CONTENTS/OUTLINE

- Internal hernias are associated with high mortality and are a common missed diagnosis in patients who present with abdominal pain. The purpose of this presentation is to demonstrate predominantly unusual hernia appearances on CT, with surgical correlation. Types of internal hernia and epidemiology Anatomy of internal hernias High risk patients - particularly those with gastric bypass. Role of CT CT findings in both common and rare internal hernias - red flag signs that should not be missed, including mesenteric oedema, lymph node enlargement and free fluid. Case studies Static images and video examples of common and uncommon internal hernias including Petersen's, transmesenteric, retroperitoneal and broad ligament hernias. Surgical correlation and management.

GIE105

Internal and Abdominal Wall Hernias: Findings on CT, Frequency and Potential Complications

Education Exhibits

Location: GI Community, Learning Center

Participants

Temel Tirkes MD (Presenter): Nothing to Disclose
Chandana G. Lall MD: Nothing to Disclose
Fatih Akisik MD: Nothing to Disclose

TEACHING POINTS

1. Understand the anatomy of the peritoneal cavity and location.
2. Frequency and complication of each internal and abdominal wall hernias.
3. Demonstration by multi-planar CT images and illustrations.

TABLE OF CONTENTS/OUTLINE

- Multi-detector row CT with multi-planar reformations provides exquisite anatomic detail of the peritoneal cavity thereby allowing accurate identification of hernias and their contents, differentiation of hernias from other abdominal masses (tumors, hematomas, abscesses) and detection of pre- or postoperative complications. Knowledge of abdominal hernias and their complications is essential for making the correct diagnosis and may help guide clinical management. Internal Hernias Foramen of Winslow Paraduodenal Transmesenteric Transomental Pericecal Intersigmoid Supravesical and pelvic Abdominal Wall Hernias Groin Hernias (Inguinal and Femoral hernia) Ventral Hernias (umbilical, paraumbilical, epigastric, and hypogastric hernias) Lumbar Hernias Incisional Hernias

GIE106

Internal Hernias in the Era of MDCT: MDCT-surgical Findings Correlation

Education Exhibits

Location: GI Community, Learning Center

Selected for RadioGraphics

Participants

Satoshi Doishita (Presenter): Nothing to Disclose
Tohru Takeshita: Nothing to Disclose
Taro Tsukamoto: Nothing to Disclose
TEACHING POINTS

Internal hernias are challenging disorder for clinicians because of non-specific clinical signs and symptoms. Currently, multi-detector computed tomography (MDCT) is the first-line imaging technique for diagnosing various types of internal hernias. Supplementation of thin-slice axial CT with high-quality multiplanar reformation in the coronal and sagittal planes allows improved visualization of normal anatomical structures and pathological conditions and greater diagnostic accuracy in the diagnosis of internal hernias. Furthermore, the additional information provided by three-dimensional (3D) images allows a better understanding of pathological conditions of internal hernias and improves the ability to evaluate severity of a disease, thereby helping to optimize surgical planning. Radiologists should familiarize themselves with diagnostic MDCT findings of various types of internal hernias.

TABLE OF CONTENTS/OUTLINE

1. Definition, clinical issues and types of internal hernias 2. Features of CT images with pearls of interpretation 3. Reviewing the various types of internal hernias a. CT images b. Intraoperative pictures c. Related anatomy with emphasis on vessels

GIE107

Intestinal Anisakiasis: Could the Radiologist Give the First Clue?

Education Exhibits
Location: GI Community, Learning Center

Participants
GERARDO AYALA (Presenter): Nothing to Disclose
Elena Martinez Chamorro : Nothing to Disclose
Esteban Peghini MD : Nothing to Disclose
Virginia Navarro Cutillas : Nothing to Disclose
Alicia Merina MD : Nothing to Disclose
Susana Borruel MD : Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: 1. To illustrate CT findings of intestinal anisakiasis in patients attended in the emergency setting. 2. To emphasize those CT findings which allow the radiologist to suggest the diagnosis of intestinal anisakiasis, despite an alternative clinical suspicion.

TABLE OF CONTENTS/OUTLINE

Retrospective review of the emergency department clinical records of a tertiary hospital, finding 21 patients diagnosed with intestinal anisakiasis, who underwent CT examination, from January 2011 to December 2013. Diagnosis was made in patients with prior raw fish ingestion, based on positive results for Prick-test, total IgE and Anisakis-specific IgE levels and the presence of intestinal lesions on CT. CONTENTS: Patient demographic information and time of onset of symptoms Clinical presentation and initial diagnosis before CT examination: table 1 CT findings in intestinal anisakiasis: table 2 and figures 1-3 - Ascites, small bowel wall thickening, submucosal edema and luminal narrowing, proximal small bowel dilatation (14 patients [66.7 %] ) and occasional dilatation of distal bowel with fluid content, affected bowel segment length greater than 10 cm (14 patients [66.7 %] ) and mesenteric fat infiltration. 4. CONCLUSION: Radiologist could suggest intestinal anisakiasis based on MDCT findings.

GIE108

Luminal GI Injury: A Spectrum of Etiologies and Appearances

Education Exhibits
Location: GI Community, Learning Center

Participants
Lauren Moomjian MD (Presenter): Nothing to Disclose
Laura R. Carucci MD : Nothing to Disclose

TEACHING POINTS

1. It is important to be aware of exam techniques and subtle findings with bowel injury to make an accurate and timely diagnosis, as missed bowel injuries can be life threatening. 2. Radiologists must also recognize complications of bowel injury to facilitate timely treatment. Purpose: 1. To review etiologies of bowel injury including self-induced, iatrogenic, blunt or penetrating trauma 2. To describe the imaging evaluation of suspected injury to the luminal GI tract. 3. To discuss expected imaging findings of bowel injury and complications of injury and missed injury.

TABLE OF CONTENTS/OUTLINE

• Etiologies and Sites of Bowel injury • Techniques and Modalities for imaging suspected GI tract trauma • Self-induced: Boerhaave’s, impaction, foreign body ingestion or insertion, (esophageal, rectal, small and large bowel) • Iatrogenic- surgical or endoscopic injury, migrated medical device (i.e. biliary stent causing SBO), malpositioned devices, medication-induced injury • Blunt- perforation, duodenal injury, diffuse small bowel hyperenhancement from reperfusion injury, mesenteric injury with bowel devascularization • Penetrating- focal wall thickening, discontinuity or hematoma secondary to gunshot or stab wound, colorectal injury associated with pelvic fracture • Complications of injury and missed injury - stricture, abscess, infarction

GIE109

Mesenteric Ischemic Disease: Improving Early Detection Using Dual Energy Imaging

Education Exhibits
Location: GI Community, Learning Center

Participants
Patrik Rogalla MD (Presenter): Nothing to Disclose
Christin Farrell : Employee, Toshiba Corporation
TEACHING POINTS
To understand the principles, algorithms and different imaging techniques of Dual-energy CT. To learn how to apply Dual-Energy CT in patients with suspected mesenteric ischaemia to improve differentiation between healthy and diseased intestine.

TABLE OF CONTENTS/OUTLINE
To review 3 principles and algorithms of DE-CT 7 ways to obtain iodine maps in CT Myths versus reality in DE data acquisition Clinical cases

GIE110
Misleading Cases and Pitfalls in the Diagnosis of Small Bowel Obstruction on Plain Film with CT Correlation

Education Exhibits
Location: GI Community, Learning Center

Participants
Zina Joan Ricci MD : Nothing to Disclose
Fernanda Samara Mazzariol MD (Presenter) : Nothing to Disclose
Sarah Kyung Oh MD : Nothing to Disclose
Marjorie Werner Stein MD : Nothing to Disclose
Susan Judith Frank MD : Nothing to Disclose
Ellen Leslie Wolf MD : Nothing to Disclose
Shari Friedman MD : Nothing to Disclose
Malka B. Finkelstein MD : Nothing to Disclose
Milana Flusberg MD : Nothing to Disclose
Victoria Chernyak MD : Nothing to Disclose
Alla M. Rozenblit MD : Nothing to Disclose

TEACHING POINTS
1. A normal plain film does not always exclude SBO. 2. Plain films can be insensitive in the detection of SBO when the obstruction is in the proximal small bowel or the small bowel is fluid filled. If clinical suspicion exists, CT will be diagnostic. 3. Plain film is insensitive for the detection of strangulated obstruction and closed loop obstruction, both requiring CT for diagnosis. 4. The cause of SBO is generally not identified on plain film but easily determined on CT. 5. SBO may be erroneously diagnosed on plain film and CT can exclude obstruction and provide the correct diagnosis.

TABLE OF CONTENTS/OUTLINE

GIE111
Multimodality Evaluation of Large Bowel Obstruction: A Pictorial Review

Education Exhibits
Location: GI Community, Learning Center

Participants
Adam Noah Rucker MD (Presenter) : Nothing to Disclose
Patrick Kobes DO : Nothing to Disclose
John J. Hines MD : Nothing to Disclose
Barak Friedman MD : Nothing to Disclose

TEACHING POINTS
Large bowel obstruction is a potentially deadly disease requiring prompt diagnosis and rapid intervention. Patients presenting with large bowel obstruction can present with non-specific clinical symptoms making radiologic diagnosis a crucial component in patient care. The etiology of large bowel obstruction includes both neoplastic and non-neoplastic causes as well as entities which may mimic LBO. The purpose of this exhibit is to: 1. Review the spectrum of diseases which may cause LBO utilizing a variety of modalities. 2. Identify imaging patterns that will lead to rapid diagnosis of large bowel obstruction. 3. Discuss specific radiologic signs for each disease process to help in providing a succinct differential for referring clinicians.

TABLE OF CONTENTS/OUTLINE
Introduction Neoplastic Causes Non-neoplastic Causes Mimics of large bowel obstruction Management and consultative recommendations Summary

GIE112
Not all Right Flank Pain Is Appendicitis

Education Exhibits
Location: GI Community, Learning Center

Participants
Marcela De la Hoz Polo MD (Presenter) : Nothing to Disclose
Oscar Pozuelo Segura : Nothing to Disclose
Cristina Delgado MD : Nothing to Disclose
Stefano Pasetto MD : Nothing to Disclose
**TEACHING POINTS**

1. To review the anatomy of the right iliac fossa.
2. To review the pathological conditions, surgical and nonsurgical, that cause right flank pain.
3. To discuss the uses of CT scan in the diagnosis of abdominal pain. A series of challenging cases would be used to improve accuracy on the radiographic diagnostic of these pathologies.

**TABLE OF CONTENTS/OUTLINE**

1. Introduction: Right lower quadrant abdominal pain represents an everyday challenge for clinicians. The most common assumption is that this pain represents acute appendicitis, however, it is critical and imperative for physicians to keep the differential broad. The combination of patient symptoms and clinical findings will help direct the diagnosis and, in most cases, a suspected diagnosis will be confirmed or disproved by an imaging study.
3. Cases: are presented in a quiz format followed by review of the radiology findings and clinical manifestations. The list of cases includes: Acute appendicitis and its complications, appendiceal mucocele, mesenteric adenitis, cecal diverticulitis, epiploic appendagitis, omental infarct, Typhlitis, Crohn disease, foreign body (clam), gauzoma, intussusception, Meckel diverticulum, carcinoid tumor and some other tumoral lesions.
4. Summary

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**GIE113**

**Rapid Acquisition Axial and Coronal T2 HASTE MR Imaging in Diagnosis of Post-operative Collections**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

Sam Byott MBChB (Presenter): Nothing to Disclose
Ian Harris MBCh, FRACR: Nothing to Disclose

**TEACHING POINTS**

To understand the key features and imaging characteristics of various important post-operative findings on T2 HASTE MR abdominal imaging. To understand that rapid acquisition axial and coronal T2 HASTE MR imaging is a practical and effective tool to assess for post operative collections.

**TABLE OF CONTENTS/OUTLINE**

A. Imaging in the post-operative patient
B. Advantages/Disadvantages of MRI in this context
C. Rapid acquisition axial and coronal T2 HASTE MR abdomen
D. Concise review of single centre experience over 4 years and 147 cases
E. Case examples demonstrating important features on T2 HASTE MR
F. Discussion and future prospects

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**GIE114**

**Restricting Appetites: Common and Unusual Post-operative Complications for Gastric Bands**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

Sophia Tincey MBBS (Presenter): Nothing to Disclose
Anastasia Hadjivassiliou MBBS: Nothing to Disclose
Aniket N. Tavare MA, MBCh: Nothing to Disclose
Michael John Steward MBChB, MRCP: Nothing to Disclose

**TEACHING POINTS**

Understand the clinical indications for laparoscopic gastric banding. Description of surgical techniques currently used Discussion of imaging techniques used for band evaluation and normal post-procedural anatomy. Illustrated examples of common and unusual complications with clinico-radiological correlation.

**TABLE OF CONTENTS/OUTLINE**

Obesity is a growing global problem and a huge economic burden for healthcare providers. More frequently, laparoscopic gastric banding is being offered as a treatment and is one of the less invasive surgical options. It is important for radiologists to recognise normal post-operative anatomy which we will outline with imaging correlation. Illustrated multi-modality examples of potential post-operative complications including band slippage, band erosion with subsequent strictures, and infection will be reviewed. Additionally, more unusual complications including tube kinks and tubing erosion will be also discussed. Cases have been collected from a large regional centre for bariatrics where surgery is carried out for both the local population and referrals from other urban centres.

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**GIE115**

**Splenic Infarct: Pictorial Review**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

Moncef Allegue MD (Presenter): Nothing to Disclose
Riad Atallah MD: Nothing to Disclose
Faten Bouzaine MD: Nothing to Disclose
Omar Essid MD: Nothing to Disclose
Radhouane El Abed MD: Nothing to Disclose
Letaief Jemni MD: Nothing to Disclose
TEACHING POINTS
1. To review the imaging findings of acute and chronic splenic infarcts. 2. To explain the utility of MDCT to identify a potential cause of splenic infarcts.

TABLE OF CONTENTS/OUTLINE

Anatomy and congenital anomalies of the spleen
Different appearances of acute and chronic splenic infarcts (SI)
MDCT features of SI / causes:
- Thrombo-embolic origin
- Hematologic disorders
- Collagen vascular disease
- Miscellaneous disorders

Teaching points
Summary

GIE116
The Utility of MDCT on the Diagnosis of Acute Abdomen

Education Exhibits
Location: GI Community, Learning Center

Participants
Luz Elena Guerrero MD (Presenter): Nothing to Disclose
Patricia Herrera Quelez MEd : Nothing to Disclose
Lina K. Rojas MD : Nothing to Disclose
Ivan Carrion MD : Nothing to Disclose
Sandra Milena Cordoba Rovira MD : Nothing to Disclose
Tomas Sempere : Nothing to Disclose

TEACHING POINTS
1. Academic review of the different conditions that clinically are presented as acute abdomen, including postoperative complications. 2. Exposure of different clinical-radiological cases, diagnosed in our hospital during the last year and correlating them with surgical findings. 3. Recognize MDCT imaging appearance of various acute abdominal disease processes that are encountered in the emergency department. 4. To learn the usefulness of 2D MPR reconstructions and 3D volume rendering in the differential diagnosis of acute abdomen.

TABLE OF CONTENTS/OUTLINE
Reviewed retrospectively 80 cases of patients with acute abdomen, including those that come spontaneously to the emergency room, and patients admitted to our hospital for other reasons, during the last year. All of them required urgent surgical intervention with a prior execution of an abdominal MDCT. It was correlated the radiological findings with the surgical findings. Revising the clinical and radiological signs characteristics of each pathology: Mechanical bowel obstruction (incarceration, volvulus, intussusception, mesenteric vascular occlusion, adhesions, stenosis, bezoar, adhesive band), bowel perforation, postoperative common complications, acute cholecystitis, acute appendicitis, aortic aneurysm rupture and others. Summary and conclusions.

GIE117
Ticked Off: Complications of Colonic Diverticular Disease

Education Exhibits
Location: GI Community, Learning Center

Participants
Alexander Gavlin MD : Nothing to Disclose
Mike Spektor MD : Nothing to Disclose
Meir Hillel Scheinfeld MD, PhD : Nothing to Disclose
Dameon R. Duncan MD, MBA : Nothing to Disclose
Thomas McCann MD : Nothing to Disclose
Robert Joshua Dym MD (Presenter): Nothing to Disclose

TEACHING POINTS
Colonic diverticular disease is a very common condition which can lead to serious complications. The most frequent complications of colonic diverticulosis are gastrointestinal bleeding and diverticulitis. Acute diverticulitis varies in severity, with either localized effects or distant spread of infection. Long term sequelae of diverticulitis include fistulae and strictures, which may lead to bowel obstruction. Due to the high prevalence of diverticulosis, complications of diverticular disease and other serious conditions can often be confused.

TABLE OF CONTENTS/OUTLINE
Introduction Epidemiology Anotomy Etiology/pathophysiology Diverticular bleeding Acute diverticulitis- uncomplicated Local complications of diverticulitis Intramural abscess Pericolic phlegmon Pericolic abscess Diverticulitis involving other structures Free perforation and peritonitis Thrombophlebitis Liver abscess Fistulae to adjacent organs - urinary bladder - small bowel or colon - uterus - vagina - adenexa - abdominal wall Other post-diverticulitis morphologic changes Giant diverticulum Muscular hypertrophy Stricture, leading to obstruction Confusion with other conditions Colon cancer Appendicitis PID/TOA Conclusion
GIE118

X Marks the Spot: Use of Multi Detector CT Angiography in the Localization of Active Gastrointestinal Hemorrhage

Education Exhibits
Location: GI Community, Learning Center

Participants
Lee Lian Chew MBBS (Presenter): Nothing to Disclose

TEACHING POINTS
The aim of this educational exhibit is: 1. Discuss common causes of acute gastrointestinal (GI) hemorrhage 2. Review the current use of multi detector CT angiography in localization of source of gastrointestinal hemorrhage 5. Imaging technique 6. Findings of acute gastrointestinal hemorrhage - active bleed (blush) - recent bleed (clots) 7. Sample cases with angiographic correlation 8. Pitfalls

TABLE OF CONTENTS/OUTLINE
9. Conclusion

GIE119


Education Exhibits
Location: GI Community, Learning Center

Participants
Praveen Peddu MBBS, FRCP (Presenter): Nothing to Disclose
Rajeev Jain MBBS, MD : Nothing to Disclose
Ruchi Sharma : Nothing to Disclose
John Barr Karani MBBS, FRCP : Nothing to Disclose
Pauline Anne Kane MBBS, FRCP : Nothing to Disclose
Nigel Heaton : Nothing to Disclose

TEACHING POINTS
1. Abernethy malformations are extremely rare. Two major types are described. 2. Our experience of four patients - 3 with hepatocellular carcinoma and 1 with a large focal nodular hyperplasia (which regressed spontaneously after shunt occlusion) - Clinical presentation, Imaging studies and Interventional Radiological / Surgical Management. 3. The embryology, pathophysiology, imaging findings (CT, MR and Angiography) and Interventional Radiological / Surgical management . 4. Recognition of the Abernethy malformation and complications on Imaging studies, Management options and algorithms.

TABLE OF CONTENTS/OUTLINE
Embryology of the Abernethy Malformation Types of Porto-Systemic Shunts Imaging Diagnosis - CT, MRI and Angiography Oncological Complications Description of four patients with primary liver tumors - Imaging Diagnosis, Interventional Radiological / Surgical Management Discussion

GIE121

Evaluation of the Deep Inferior Epigastric Artery Perforator (DIEP) for Flap Repair after Mastectomy

Education Exhibits
Location: GI Community, Learning Center

Participants
Steven Lee MD (Presenter): Nothing to Disclose
John Ross McGrath MD : Nothing to Disclose
Ravinder Sidhu MD : Nothing to Disclose
Joel P. Thompson MD : Nothing to Disclose

TEACHING POINTS
1. Correct categorization of the branching pattern of Deep Inferior Epigastric Arteries (DIEA). 2. Identification of the different portions of the DIEA (i.e. intramuscular, subfascial, superficial). 3. Correctly describe the position of perforating branches with respect to the umbilicus. 4. Be familiar with entities that may jeopardize flap repair or render flap repair difficult. Be familiar with complications after flap repair.

TABLE OF CONTENTS/OUTLINE
Breast reconstruction after mastectomy may be performed with a DIEP flap as opposed to a Transverse rectus abdominis myocutaneous (TRAM) flap. This technique offers the advantage of sparing the rectus muscle and this decreasing postsurgical morbidity. Budorick N., et al . The donor site morbidity of free DIEP flaps and free TRAM flaps for breast reconstruction. This flap is comprised of the abdominal subcutaneous tissues and a portion of the DIEA. As such, surgeons rely on the radiologist to properly evaluate the DIEA for surgical planning. 1. DIEP flap repair vs TRAM flap repair. 2. Pictorial review of type I, II, and III DIEA’s. 3. Evaluation of the course and diameter of the different segments of the DIEA 4. Documenting the position of perforating branches in relation to the umbilicus. 5. Cases demonstrating pre- and post-surgical complications

GIE122
Hepatobiliary and Pancreatic Vascular Anatomy in the Era of Dual Energy CT (DECT)

Education Exhibits
Location: GI Community, Learning Center

Participants
Gaiane M. Rauch MD, PhD (Presenter): Nothing to Disclose
Priya Ranjit Bhosale MD: Nothing to Disclose
Eric P. Tamm MD: Nothing to Disclose
Catherine Ellen Devine MD: Nothing to Disclose
Brinda Rao MD: Nothing to Disclose
Janio Szklaruk MD, PhD: Nothing to Disclose

TEACHING POINTS
1. DECT improves vascular imaging in the abdomen by increasing contrast between vessels and background at low monochromatic energy images and on iodine material density images when compared to conventional CT imaging.
2. Knowledge of the common and variant vascular anatomy of the pancreas and liver are essential for the correct interpretation of DECT images, especially for surgical planning.
3. DECT may facilitate visualization of smaller vessels and therefore improve detection of second order vessels which may improve surgical planning.
4. DECT may facilitate visualization of vascular variants. Better visualization of such variants may improve surgical planning.

TABLE OF CONTENTS/OUTLINE
1. Brief review of dual energy CT, with description of specific postprocessing techniques to visualize and evaluate hepatobiliary and pancreatic vascular anatomy
2. To review the common and uncommon vascular anatomical variants in the liver and pancreas, including arterial, portal venous and systemic venous anatomy, using multiphasic DECT images
3. To compare various monochromatic energy images (keV) and with iodine-water images
4. To show improved detection of second order vascular supply on DECT
5. To discuss the benefits and pitfalls of the various energies and material specific images in the interpretation of vascular anatomy of the hepatobiliary organs

GIE123
Spectrum of Visceral Artery Pseudoaneurysms due to Various Etiologies Diagnosed on MDCT Abdominal Angiography

Education Exhibits
Location: GI Community, Learning Center
Cum Laude

Participants
Jigar Vasantlal Zota MBBS: Nothing to Disclose
Samarjit Singh Ghuman MBBS, MD (Presenter): Nothing to Disclose
Tarvinder Bir Singh Buxi MD: Nothing to Disclose
Kishen Singh Rawat MBBS, MD: Nothing to Disclose
Anurag Yadav MBBS: Nothing to Disclose

TEACHING POINTS
• Visceral artery pseudoaneurysms(VAPA) are a frequent cause of sudden onset intra-abdominal hemorrhage.
• A spectrum of various etiologies like iatrogenic, pancreatitis, trauma, tumors, vasculitis etc. can lead to VAPAs.
• MDCT Angiography is the modality of choice for the diagnosis of affected artery, assessing underlying etiology and planning further intervention.
• Varying etiologies can often lead to varying imaging parameters in VAPAs.

TABLE OF CONTENTS/OUTLINE
Firstly, we briefly discuss the epidemiology of visceral artery pseudoaneurysms(VAPA). Then, we discuss MDCT abdominal angiography protocol and imaging reconstruction manipulations. Further, a case based review of VAPA secondary to various etiologies are discussed, including LGA PA secondary to pancreatitis RHA PA at the margin of a hepatic abscess Splenic artery PA due to large pancreatic mass Post Whipples’ surgery GDA stump blow-out PA Post laparoscopic cholecystectomy cystic artery blow-out PA RHA PA secondary to acute cholecystitis Renal artery PA post PCNL Middle colic artery PA post pancreatitis Renal artery PA due to angiomyolipoma Post trauma RHA PA Post trauma splenic stump blow out PA RHA PA due to hepatoblastoma Ruptured GDA PA post pancreatitis We close with few take home messages.

GIE125
Biliary Pathology: A Pictorial Review

Education Exhibits
Location: GI Community, Learning Center
Selected for RadioGraphics

Participants
Joanna Kee-Sampson MD (Presenter): Nothing to Disclose
Jonathan Schiavi MD: Nothing to Disclose

TEACHING POINTS
At the end of this exhibit, the viewer should:
1. Be able to describe the anatomy of the biliary system
2. Have an understanding of multimodality imaging characteristics of various biliary pathologies

TABLE OF CONTENTS/OUTLINE
1. Developmental anomalies • Choledochal cysts • Pancreatic divisum • Biliary atresia
2. Neoplastic • Cholangiocarcinoma • Gallbladder carcinoma
3. Obstructive disease • Cholelithiasis •Colonic gallstone ileus •other gallstone ileus
**GIE126**

**Chronic Cholecystitis, "The Silent Time Bomb": US, CT and MR Imaging Findings of Associated Neoplastic and Non Neoplastic Complications**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Certificate of Merit**

**Participants**

- Matias Gustavo Vargas Araya MD (Presenter): Nothing to Disclose
- Eugenio Zalaquett MD: Nothing to Disclose
- Christine O. Menias MD: Nothing to Disclose
- Maria Jose Baladrón MD: Nothing to Disclose
- Álvaro Huete Garin MD: Nothing to Disclose
- Ignacio Beddings MD: Nothing to Disclose
- Pablo Bachler MD: Nothing to Disclose
- Sanjeev Bhalla MD: Nothing to Disclose

**TEACHING POINTS**

1. To understand the pathophysiology of chronic cholecystitis.
2. To review the imaging findings of non-complicated cholelithiasis.
3. To classify the different delayed complications of chronic cholecystitis: Inflammatory - Fistula - Neoplastic.
4. To illustrate the spectrum of US, CT and MR imaging findings of the complications of longstanding gallstone disease.

**TABLE OF CONTENTS/OUTLINE**

1. Demographics and clinical presentations.
2. Pathophysiology of chronic cholecystitis.
3. US, CT and MR imaging findings of non-complicated chronic cholecystitis.
5. Conclusion.

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**GIE128**

**Evaluation of Gallbladder Cancer: Ultrasonography, Computed Tomography, and Magnetic Resonance Imaging**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Certificate of Merit**

**Participants**

- Shinichi Morita (Presenter): Nothing to Disclose
- Hiroaki Onaya MD: Nothing to Disclose
- Yasuaki Arai: Nothing to Disclose
- Miyuki Sone MD: Nothing to Disclose
- Shunsuke Sugawara: Nothing to Disclose

**TEACHING POINTS**

The purpose of this exhibit is: 1. To understand the significant role of imaging in gallbladder cancer staging. 2. To discuss the findings and limitations of the images generated by ultrasonography (US), endoscopic ultrasoundscopy (EUS), computed tomography (CT), and magnetic resonance imaging (MRI) for evaluation of cancer invasion and spread. 3. To discuss the differences between benign and malignant tumors.

**TABLE OF CONTENTS/OUTLINE**

CONTENT ORGANIZATION

1. Study of gallbladder cancer T-staging using different modalities.
2. N-staging review and assessment of distant metastases and disseminations.
3. Discuss the differential diagnosis of benign tumors such as xanthogranulomatous cholecystitis, adenomyomatosis, Mirizzi's syndrome, and pericholecystic abscess.
4. Case-based illustration of gallbladder tumors with histopathological correlation.
5. SUMMARY Accurate evaluation of gallbladder wall invasion and extra-wall spread is essential to ascertain the appropriate therapeutic strategies for gallbladder cancer. In addition, it is essential to evaluate gallbladder wall invasion with a combination of various modalities, including transabdominal US, EUS, CT, and MRI and to ascertain the role of each modality in ensuring accurate diagnosis.

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**GIE129**

**Gallbladder Disease: Multi-modality Imaging and Radiologic–pathologic Correlation**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

- Hanan Sherif MD (Presenter): Nothing to Disclose
- Amal Alrashid MBBS: Nothing to Disclose
- Tahir Imaddudeen MBBS: Nothing to Disclose
- Issam Albozom MD: Nothing to Disclose
- Ahmed-Emad Mahfouz MD: Nothing to Disclose

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TEACHING POINTS

The spectrum of gallbladder disease includes cholecystitis (acute, chronic, calcular, noncalcular, gangrenous, and xanthogranulomatous), cholesterosis, adenomyomatosis, adenoma, neuroendocrine tumor, ganglioneuromatosis in multiple endocrine neoplasia MEN IIb, and carcinoma. The educational exhibit provides a full radiologic-pathologic correlation of these disease entities. Multi-modality imaging of the gall bladder includes ultrasonography, color Doppler, CT, MRI, HIDA scintigraphy, and PET/CT. The relative merits of each modality in a particular disease entity are illustrated. Examples are HIDA scintigraphy in acute cholecystitis, MRI in noncalcular cholecystitis, and Color Doppler and MRI in differentiating adherent sludge from gallbladder carcinoma.

TABLE OF CONTENTS/OUTLINE

The educational exhibit covers (in the Quiz format) the radiological features of a wide spectrum of gall bladder disease with full radiologic-pathologic correlation in all cases including: Cholecystitis: acute, chronic, calcular, noncalcular, gangrenous, and xanthogranulomatous. Cholesterosis. Adenomyomatosis. Gallbladder adenoma. Neuroendocrine tumor. Ganglioneuromatosis in multiple endocrine neoplasia MEN IIb. Carcinoma. The educational exhibit provides a full radiologic-pathologic correlation of these disease entities. Multi-modality imaging of the gall bladder includes ultrasonography, color Doppler, CT, MRI, HIDA scintigraphy, and PET/CT. The relative merits of each modality in a particular disease entity are illustrated. Examples are HIDA scintigraphy in acute cholecystitis, MRI in noncalcular cholecystitis, and Color Doppler and MRI in differentiating adherent sludge from gallbladder carcinoma.

GIE130

Imaging Cholangiocarcinoma: All Equal, Some Different?

Education Exhibits

Location: GI Community, Learning Center

Participants

- Luisa Costa Andrade (Presenter): Nothing to Disclose
- Daniel Andrade MD: Nothing to Disclose
- Luis Curvo-Semedo MD, Ph.D.: Nothing to Disclose
- Filipe Caseiro-Alves: Nothing to Disclose

TEACHING POINTS

- To review the histological classification of cholangiocarcinomas (CCK) focusing on the less typical forms of presentation and acknowledging their biologic behaviour.
- To determine the usefulness of MR in the differential diagnosis and patient management.

TABLE OF CONTENTS/OUTLINE

Cholangiocarcinoma is an adenocarcinoma that originates in the bile duct epithelium. Depending on the anatomical location they are divided in intra-hepatic, also called cholangiocellular carcinoma and extra-hepatic, the latter further sub-divided into peripheral or hilar (Klatskin tumor) taking into account the implications for patient management. According to their morphological features they are also classified as mass-forming, periductal infiltrative and intra-ductal. Despite a straighforward definition the histological classification is more complex since cases of mixed HCC-CCK tumors and intra-ductal papillary mucinous biliary neoplasms (IPMN) are being increasingly recognized in the literature. The purpose of this pictorial essay is to illustrate and describe the imaging features of the less well known forms of CCK addressing their biological behavior, mechanisms of spread, prognosis and major clues to the differential diagnosis.

GIE131

Imaging Diagnosis of Gallbladder

Education Exhibits

Location: GI Community, Learning Center

Participants

- Satoshi Goshima MD, PhD (Presenter): Nothing to Disclose
- Yoshifumi Noda MD: Nothing to Disclose
- Hiroshi Kondo MD: Nothing to Disclose
- Yukichi Tanahashi MD: Nothing to Disclose
- Nobuyuki Kawai MD: Nothing to Disclose
- Haruo Watanabe MD: Nothing to Disclose
- Masayuki Kanematsu MD: Nothing to Disclose

TEACHING POINTS

Understanding and recognizing various benign polypoid lesions of gallbladder mimicking gallbladder cancer is crucial for appropriate treatment and management. The assessment of mucosal and/or serosal surface irregularity is useful for the diagnosis of invasion depth of gallbladder cancer.

TABLE OF CONTENTS/OUTLINE

Review imaging findings of benign polypoid lesions of gallbladder, including cholesterol polyp, inflammatory polyp, gallbladder adenoma, adenomyomatosis of gallbladder, and xanthogranulomatous cholecystitis emphasis on differentiating gallbladder cancer. Discussion of associated deformity of gallbladder wall for the evaluation of gallbladder cancer invasion depth. Discussion of diagnostic problems and clinical implications.

GIE132

Imaging Spectrum of Biliary Tree Pathology: Not a Single Branch

Education Exhibits

Location: GI Community, Learning Center

Participants

- Tanzilah Afzal Barrow MBBS: Nothing to Disclose
- Ayesha Nasrullah MBBS (Presenter): Nothing to Disclose
- Victoria Barnes: Nothing to Disclose
- Rafik Ploboos: Nothing to Disclose
- Velaathan Rudralingam MBBS: Nothing to Disclose
TEACHING POINTS
1. Demonstrate the wide range of common and uncommon pathological abnormalities involving the biliary tree. 2. Illustrate how careful interpretation of the cross-sectional imaging findings together with clinical history can establish the correct diagnosis promptly and initiate treatment which may be potentially life saving. 3. Highlight interpretational pitfalls.

TABLE OF CONTENTS/OUTLINE
1. Etiology of common & common biliary tree pathology. 2. Review main learning points for the general radiologist. Case examples to include: • Congenital (Biliary atresia, Caroli’s disease, choledochal cyst) • Choledocholithiasis (calculi, Mirizzi’s syndrome- type 1/2) • Inflammatory (IgG4 related systemic disease, PSC) • Infectious (cholangitis, AIDS cholangiopathy, Oriental cholangiohepatitis, biliary parasites) • Neoplasia (cholangiocarcinoma, biliary cystadenoma, ampullary tumour) • Miscellaneous (haemobilia secondary to pseudoaneurysm, bile duct necrosis) SUMMARY • A sound knowledge of the spectrum of biliary tree pathology together with the clinical context is key in identifying the likely underlying condition. • Radiologists need to be aware of the spectrum of CT and MR appearances of bile duct disease & its possible causes in order to facilitate prompt appropriate management.

GIE133
Laparoscopic Cholecystectomy, a Low Risk Surgery? An Overview of Iatrogenic Bile Duct Injuries

Education Exhibits
Location: GI Community, Learning Center

Participants
Daniela Canaviri MD (Presenter): Nothing to Disclose
Fritz Hofmann MD: Nothing to Disclose
Oskar Giovanni Lopez Espinosa MD: Nothing to Disclose
Alejandro Gabutti: Nothing to Disclose
Montserrat Santoscoy MD: Nothing to Disclose

TEACHING POINTS
To show radiologic features of iatrogenic bile duct injuries To demonstrate imaging findings of iatrogenic bile duct injuries To review the underlying mechanism of different kinds of bile duct injuries. To check risk factors To know anatomic variations that can become a problem during surgery To discuss differentiation of iatrogenic bile duct injuries from other causes of bile duct lesions.

TABLE OF CONTENTS/OUTLINE
Epidemiology of bile duct injuries. Underlying mechanism of different kinds of bile duct injuries Risk factors. Anatomic variations Appearance of bile duct injuries • Fluoroscopy • CT • MRI Differentiation of iatrogenic bile duct injuries from other causes of bile duct lesions.

GIE134
Many Faces of Cholangiocarcinoma

Education Exhibits
Location: GI Community, Learning Center

Participants
Andrew Minsoo Shon MD (Presenter): Nothing to Disclose
Jonathan H. Yu DO: Nothing to Disclose
Senta Maria Berggruen MD: Nothing to Disclose
Grace Guzman: Nothing to Disclose
Winnie Anne Mar MD: Nothing to Disclose

TEACHING POINTS
1. To provide a comprehensive overview of the imaging features of intrahepatic and extrahepatic cholangiocarcinoma. 2. To review mimics of cholangiocarcinoma and potential pitfalls.

TABLE OF CONTENTS/OUTLINE

GIE135
Migration of Pancreaticojejunostomy Silastic Stents into the Bile Ducts after Pancreateoduodenectomy

Education Exhibits
Location: GI Community, Learning Center

Participants
So Hyun Park MD (Presenter): Nothing to Disclose
Jin Hee Kim MD: Nothing to Disclose

Certificate of Merit
TEACHING POINTS

1. To present various complications associated with migrated silastic stents from pancreaticojejunostomy into the bile ducts after pancreatoduodenectomy 2. To discuss pitfalls in CT and MR imaging interpretations in patients with migrated silastic stents in the bile ducts. 3. To emphasize the importance of making an effort to find silastic stents which can be easily overlooked on imaging examinations in patients who underwent pancreatoduodenectomy.

TABLE OF CONTENTS/OUTLINE

1. Demonstration of silastic stents on imaging examinations 2. Stent migration-associated complications (1) Bile duct stricture (2) Cholangitis (3) Abscess formation (4) Stent serving as a nidus for stone formation (5) Stent fracture 3. Long-term follow-up of the migrated stents at imaging studies 4. Pitfalls in CT and MR imaging interpretations in patients with migrated stents (1) Misinterpretation of stent-related complications: how and why? (2) Importance of precontrast CT scan Summary: Migrated pancreaticojejunostomy silastic stents can cause a variety of biliary complications which may be confused with other conditions, in particular, malignancies. Therefore, it would be important that radiologists be aware of these stent-related biliary complications to eliminate misdiagnosis and consequently to minimize unnecessary costly examinations or surgeries.

GIE136

Minimum Intensity Projection Imaging of the Biliary Tree: An Under-utilized Technique for Demonstrating Anatomy and Pathology

Education Exhibits
Location: GI Community, Learning Center

Participants
Jabi E. Shriki MD (Presenter): Nothing to Disclose

TEACHING POINTS

This exhibit has the following educational goals: 1. To demonstrate the basics of minimum intensity (MinIP) reformatting of imaging studies, including CT and MRI. 2. To review normal and variant anatomy of the biliary tree, and depict anatomic patterns using MinIP images. 3. To utilize MinIP images to show the range of pathology that may be seen in the biliary system. 4. To correlate MinIP images of the biliary tree with conventional imaging studies, including MRCP and ERCP.

TABLE OF CONTENTS/OUTLINE

The basic techniques of MinIP will be reviewed. The methods of reformatting volumes into MinIP images will be demonstrated. Normal and variant anatomy of the biliary tree will be discussed, with patterns of anatomy demonstrated using MinIP images. The spectrum of biliary pathology will be reviewed with depiction of disease states on MinIP images of studies, including CT and MRI. Correlation will be made with conventional imaging techniques, including MRCP and ERCP. Illustrative cases will be shown in order to demonstrate how MinIP images of the biliary tree can help guide patient care.

GIE137

MRI of Biliary Emergencies: Beyond Stones—Cases for Aces!

Education Exhibits
Location: GI Community, Learning Center

Participants
Chandana G. Lall MD (Presenter): Nothing to Disclose
Sadhana Verma MD: Nothing to Disclose
Priya Ranjit Bhosale MD: Nothing to Disclose
Roozbeh Houshyar MD: Nothing to Disclose
Madhavi Patana MD: Nothing to Disclose
Ramit Lamba MD: Nothing to Disclose
Martin Roberto Goyenechea MD: Nothing to Disclose
Andrew J. Del Gaizo MD: Nothing to Disclose

TEACHING POINTS

1. Review current role of magnetic resonance imaging in evaluation of acute biliary processes 2. Illustrate the MRI features of unusual biliary processes and acute complications of chronic processes presenting to the Emergency Department 3. Discuss details of each disease entity presented and differential diagnosis

TABLE OF CONTENTS/OUTLINE

Educational Goals/Teaching Points 1. Overview of unusual acute biliary disorders in the ED in QUIZ format 2. MR imaging of acute biliary processes and acute complications of chronic biliary processes 3. Role of MRI in management and disposition of ED patients and inpatients 4. Limitations and challenges of MRI is some lesions Conclusion After reviewing this exhibit, the radiologist will have a better understanding of MRI features of some unusual acute biliary disorders and the acute complications of chronic biliary disorders.

GIE138

MRI of Common and Uncommon Pathologies Involving the Periportal Space

Education Exhibits
Location: GI Community, Learning Center

Participants
TEACHING POINTS
(1) Review the anatomy and contents of the periportal space
(2) Recognize the MRI features of common and uncommon pathologies involving the periportal space

TABLE OF CONTENTS/OUTLINE
I. Review the anatomy of the periportal space
II. Describe the range of common and uncommon pathologies involving the periportal space
III. Illustrate MRI features of periportal pathologies and provide teaching comments

GIE139
MRI of Gallbladder Disease: The Spectrum from Acute to Chronic and Benign to Malignant Conditions, including Postcholecystectomy Complications

Education Exhibits
Location: GI Community, Learning Center

Participants
Matthew C. McDermott MD (Presenter): Nothing to Disclose
Courtney Ann Coursey Moreno MD: Nothing to Disclose
Juan Camilo Camacho: Nothing to Disclose
Kelly Lynn Cox DO: Nothing to Disclose
Pardeep Kumar Mittal MD: Nothing to Disclose

TEACHING POINTS
1. MRI provides superior soft tissue contrast facilitating accurate diagnosis of a multitude of gallbladder diseases including acute and chronic non-neoplastic diseases, and benign and malignant neoplasms
2. Indications for MRI of the gallbladder, general MRI protocol and special considerations (hepatobiliary agents)
3. Review postcholecystectomy complications

TABLE OF CONTENTS/OUTLINE
A. Indications for gallbladder MRI, general MRI protocol and special considerations
B. Gallbladder anatomy
C. Non-neoplastic acute and chronic diseases
   - Acute and chronic cholecystitis, including typical and variant/complicated forms
   - Cholelithiasis and Mirizzi syndrome
   - Gallstone ileus
   - Adenomyomatosis and cholesterosis
   - Iatrogenic gallbladder and bile duct injury
D. Benign and malignant neoplasms
   - Gallbladder polyps
   - Gallbladder adenocarcinoma
   - Involvement by cholangiocarcinoma and hepatic malignancies
   - Distant metastases to gallbladder
E. Summary: Due to its unique combination of excellent soft tissue contrast, multiplanar capabilities and lack of ionizing radiation, MRI plays an important role in the initial evaluation and follow-up of many gallbladder diseases. Optional use of a contrast agent with hepatobiliary excretion aids in evaluation of gallbladder and bile duct injuries.

GIE140
Non-lithiasic Gallbladder Diseases: Differential Diagnosis and Imaging Interpretation—What Should You Know?

Education Exhibits
Location: GI Community, Learning Center

Participants
Juan C. Spina MD (Presenter): Nothing to Disclose
Ramiro Orta MD: Nothing to Disclose
Jessica Lorena Savluk MD: Nothing to Disclose
Martin De Santibanez: Nothing to Disclose
Paula Difilippo: Nothing to Disclose
Ricardo Garcia Monaco MRCP: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1- To illustrate gallbladder normal anatomy and congenital abnormalities 2- To describe typical findings and differential diagnosis for most frequent benign and malignant gallbladder diseases

TABLE OF CONTENTS/OUTLINE
Introduction, normal anatomy and congenital abnormalities Description of benign entities: acute and chronic cholecystitis, xanthogranulomatous cholecystitis, adenomyomatosis Description of malignant entities: gallbladder carcinoma, metastases Imaging findings for differential diagnosis Example cases using MDCT and MRI with histologic correlation

GIE141
Role of Hepatobiliary Contrast Agents in MRI Evaluation of Challenging Cases, including Bile Duct Injuries
**Education Exhibits**

**Location:** GI Community, Learning Center

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**Participants**

- Neil Shah MD (Presenter): Nothing to Disclose
- Juan Camilo Camacho : Nothing to Disclose
- Courtney Ann Coursey Moreno MD : Nothing to Disclose
- Pardeep Kumar Mittal MD : Nothing to Disclose

**TEACHING POINTS**

1. To explain the difference between extracellular and hepatobiliary contrast
2. To demonstrate the role of different contrast agents in imaging bile duct injuries pre and post operatively
3. To provide examples of challenging cases, including hepatocellular carcinoma, focal nodular hyperplasia, adenoma, and hemangioma

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**TABLE OF CONTENTS/OUTLINE**

Hepatobiliary contrast agents are one of several types of contrast agents available for hepatic MRI. They can be used to detect and characterize focal lesions (especially challenging cases), evaluate diffuse hepatocellular disease, and evaluate biliary tree anatomy and function. Contrast Agents Mechanism of Action ---extracellular ---hepatobiliary Role of Different Contrast Agents in Bile Duct Injuries MRI with Hepatobiliary Contrast: Bile Duct Injuries ---bile duct leak ---stricture ---occlusion ---transection ---bilia MRI with Hepatobiliary Contrast: Other Challenging Cases ---hepatocellular carcinoma ---focal nodular hyperplasia ---adenoma ---hemangioma Summary: Hepatobiliary contrast agents play a key role in accurately recognizing and classifying bile duct injuries. Additionally, hepatobiliary contrast assists in evaluating challenging hepatic MRI cases.

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**GIE143**

**The Radiologist's Role in Biliary Duct Injury: Pre-Operative and Post-Operative Imaging and Assessment**

**Education Exhibits**

**Location:** GI Community, Learning Center

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**Participants**

- Jay A. Karajgikar MD (Presenter): Nothing to Disclose
- Barak Friedman MD : Nothing to Disclose
- John J. Hines MD : Nothing to Disclose

**TEACHING POINTS**

1. To learn the common etiologies of biliary tract injuries. 2. To describe our institutional protocol for the evaluation of biliary tract injury, including the utility of different imaging modalities (CT, MR, nuclear medicine). 3. To recognize the common imaging findings of bile duct injury in the pre-operative setting. 4. To recognize and describe the post-operative biliary tract complications (biliary leak, obstruction, stricture).

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**TABLE OF CONTENTS/OUTLINE**

Background and etiology of biliary injury. Types of biliary injury (Strasberg classification). Imaging workup of biliary tract injury (MRCP, CT, hepatobiliary scintigraphy). Description of salient pre-operative imaging findings when evaluating biliary tract injury (site of injury, length of involvement, presence of other biliary tract anomalies). Description of imaging findings of post-operative biliary complications with cases (biliary leak, obstruction, stricture). Summary and conclusions.

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**GIE145**

**3T MRI in Perianal Fistulas: Road Mapping the Tracks**

**Education Exhibits**

**Location:** GI Community, Learning Center

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**Participants**

- Kanchan Gupta MD (Presenter): Nothing to Disclose
- Rahul Bhushan Gujrathi MD : Nothing to Disclose
- Tanvi S. Jakhi MBBS : Nothing to Disclose
- Vivek Prakash Kotecha MBBS : Nothing to Disclose
- Bhujang Upendra Pai : Nothing to Disclose

**TEACHING POINTS**

1. To study perianal anatomy on 3T MRI 2. To outline MR classification of perianal fistulas 3. To illustrate spectrum of findings of perianal fistulas on 3T MRI

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**TABLE OF CONTENTS/OUTLINE**

Detailed assessment of perianal fistulae, their anatomical extent and associated complications play a crucial role in preoperative surgical planning and favourable outcome. Multisplanar imaging and excellent soft tissue resolution on 3T enables accurate delineation of primary and secondary tracks and associated complications. Retrospective review of 63 cases of perianal fistulas scanned between January 2010 to January 2014 on 3T MRI revealed a spectrum of findings. The findings encountered and illustrated in our exhibit include intersphincteric, transphincteric, extrasphincteric extent; secondary tracts in various planes; perianal abscesses; supraplevator extent, in isolation and / or variable combinations. Purpose of our exhibit is to understand the anatomy of perianal region and varied appearance of perianal fistulas, enabling radiologists to road map these primary and secondary tracks helping in favorable surgical outcome.

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**GIE146**

**A Review on the Role of Dynamic Rectal Examination (Defecography) to Assess the Abnormalities of Defecation Mechanics**
**Education Exhibits**

**Location:** GI Community, Learning Center

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**Participants**

- **Ahmad Yasin Ibrahim Taha MD, MBBS (Presenter):** Nothing to Disclose
- **Ahmed Monier Sherif MBCh, FRCR:** Nothing to Disclose
- **Ala Aisherbini MD:** Nothing to Disclose
- **Shaimaa Abdelhassib Fadi MD:** Nothing to Disclose
- **Ahmed Monier Sherif MBCh, FRCR:** Nothing to Disclose
- **Ala Aisherbini MD:** Nothing to Disclose
- **Amal Alrashid MBBS:** Nothing to Disclose
- **Shaimaa Abdelhassib Fadi MD:** Nothing to Disclose
- **Adham Darweesh:** Nothing to Disclose
- **Mostafa Ali MBCh, MD:** Nothing to Disclose

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**TEACHING POINTS**

1. To emphasize the diagnostic importance of defecography and to list the most encountered evacuatory disorders of the rectum and anal canal in our department.
2. To demonstrate the steps and the needed preparations for defecography procedure.
3. To explore the diagnostic yield and interpret the images findings.

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**TABLE OF CONTENTS/OUTLINE**

- What is defecography?
- Background
- Indications
- Procedure preparation and technique
- Diagnostic yield and images interpretation
- Cases and common outcomes
- References

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**GIE148**

**Beyond TME—Determining Surgical Planes for Locally Advanced Rectal Cancer Using MRI**

**Education Exhibits**

**Location:** GI Community, Learning Center

- **Magna Cum Laude**

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**Participants**

- **Venus Hedayati MRCP, FRCR (Presenter):** Nothing to Disclose
- **Svetlana Balyasnikova:** Nothing to Disclose
- **Paris Tekkis:** Nothing to Disclose
- **Gina Brown MD, MBBS:** Nothing to Disclose

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**TEACHING POINTS**

With the advent of extra-levator abdomino-perineal resections (ELAPE) and exenterative surgery there has been a paradigm shift in the management of locally advanced rectal cancer. The development and use of these surgical procedures has significantly increased accessibility to curative surgery, previously not performed on the basis of mesorectal margin involvement.

The radiologist is fundamental in determining appropriate radiological suitability for these procedures and in assessing the surgical planes required and likely to achieve curative (R0) resections. The key imaging factors in locally advanced rectal cancer with the use and importance of a descriptive compartmental anatomical classification system for determining sites of local spread will be discussed. The indispensable understanding of surgical planes in concluding potential surgical options will be drawn upon.

This exhibit will highlight recent advances in radiological-surgical assessment and focus on the surgical options beyond standard Total Mesorectal Excision (TME).

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**TABLE OF CONTENTS/OUTLINE**

- Background
- Summary of the current surgical options of TME and beyond
- Case examples from our institution using a compartmental-based pattern of reporting to ensure the radiologist can appropriately define the required surgical planes.

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**GIE150**

**MRI Defecography. Anatomical and Functional Cine-based Evaluation of the Pelvic Floor Dysfunction: When Everything Is Falling Down**

**Education Exhibits**

**Location:** GI Community, Learning Center

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**Participants**

- **Julieta Viridiana Galicia MD (Presenter):** Nothing to Disclose
- **Carmen Rocío Ramírez Carmona MD:** Nothing to Disclose
- **Cesar Nicolas Cristancho Rojas MD:** Nothing to Disclose
- **Eric T. Kimura-Hayama MD:** Nothing to Disclose

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**TEACHING POINTS**

1. The pelvic floor is a complex anatomical-functional system, which provides pelvic support, maintains continence, and coordinates relaxation during urination and defecation.
2. Pelvic floor dysfunction (PFD) involves a heterogeneous group of disorders affecting up to 50% of middle-aged and older patients, primarily women.
3. The knowledge of anatomy and physiology of the pelvic floor allows the classification of the female pelvis in 3 functional compartments: Anterior, middle and posterior.
4. Fluoroscopic studies have been used for the past 20 years for the diagnosis of pelvic floor dysfunction. However, MR defecography provides accurate real time (cine-based) images to survey the entire pelvic and to evaluate its dynamics. This method is useful in patients with moderate to severe symptoms to localize and classify pelvic floor dysfunction for surgical
TABLE OF CONTENTS/OUTLINE

1. Historical review. 2. MR and radiologic anatomy of the pelvic floor. 3. MR defecography protocol and interpretation with traditional (fluoroscopic) correlation based. 4. Pictorial review (static and cine images) of pelvic floor disorders. 5. Advantages of MR compared to other techniques.

GIE151
MRI Evaluation of Perianal Fistula: What the Radiologist Should Know

Education Exhibits
Location: GI Community, Learning Center

Participants
Omar Addou MD, MSc (Presenter): Nothing to Disclose
Badreddine Alami MD: Nothing to Disclose
Yousef Alaoui Lamrani MD: Nothing to Disclose
Maryem Boubbou: Nothing to Disclose
Siham Tizniti: Nothing to Disclose
Imane Kamaoui MD, PhD: Nothing to Disclose

TEACHING POINTS
• To illustrate the relevant pelvic normal anatomy and examples of various anoperineal fistula types. • To provide an overview of pelvic MRI for the evaluation of perianal fistulas and demonstrate MRI imaging features of those fistula types.

GIE152
MRI findings of Rectal Submucosal Lesions: Beyond the Optical Colonoscopy

Education Exhibits
Location: GI Community, Learning Center

Participants
Ana Alvarez Vazquez (Presenter): Nothing to Disclose
Chawar Hayoun: Nothing to Disclose
Luis Herraiz Hidalgo: Nothing to Disclose
Raquel Cano Alonso: Nothing to Disclose
Ana Fernandez Alfonso: Nothing to Disclose
Vicente Martinez de Vega: Nothing to Disclose

TEACHING POINTS
1. Lesions of intramural or extramural origin may give rise to a submucosal abnormality at colorectal evaluation. 2. MRI is the best diagnostic technique for the characterization of rectal submucosal lesions because it allows to arrive a reasonable differential diagnosis and to asses the degree of rectal wall involvement and the impairment of adjacent organs.

GIE153
MRI in Rectal Cancer: A 2014 Up-to-Date with Pathologic Correlation

Education Exhibits
Location: GI Community, Learning Center

Participants
Catia Esteves MD (Presenter): Nothing to Disclose
Francisco Costa: Nothing to Disclose
Andre Simoes MD: Nothing to Disclose
Joanne Maria Cruz David Lopes da Silva MD: Nothing to Disclose
Jose M. Pereira: Nothing to Disclose
Luis Salgueiro Guimaraes MD: Nothing to Disclose

TEACHING POINTS
The aim of the exhibit is to: • Illustrate the anatomical information provided by rectal magnetic resonance imaging (MRI). • Discuss the protocols and the technical requirements. • Understand the MRI findings used to stage rectal cancer based on the TNM classification and other relevant prognostic factors, before and after neoadjuvant radiochemotherapy (RCT), with pathologic correlation. • Aknowledge and illustrate the importance of MRI for surgical planning. • Discuss the current role of diffusion weighted imaging (DWI) in the restaging after neoadjuvant RCT. • Summarize essential findings that should be searched for and included in the radiologist report.

TABLE OF CONTENTS/OUTLINE
• Introduction Up-to-date on the current state-of-the-art treatment options. Discussion of the pivotal role of rectal MRI in the individualization of treatment by providing an accurate stratification of risk. • Normal anatomy and MRI technique/protocol Role of DWI and volumetry after RCT is discussed. • Illustration of the relevant imaging findings based on the TNM classification and
other important prognostic factors with pathologic correlation. • Discussion of the items that should be included in a structured report, with review of the literature. • Conclusion.

GIE154

Natural History of Colorectal Cancer: How CT Colonography Can Help to Predict Which Lesions Grow Slowly or Rapidly

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Yoshiaki Watanabe MD (Presenter): Nothing to Disclose
Mototaka Miyake MD: Nothing to Disclose
Mai Oda MD: Nothing to Disclose
Taku Sakamoto: Nothing to Disclose
Gen Inuma MD, PhD: Nothing to Disclose
Kazuro Sugimura MD, PhD: Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group
Yasuaki Arai: Nothing to Disclose

TEACHING POINTS
1. To show the sequential morphological changes of various colorectal neoplastic lesions, based on the imaging findings obtained from follow-up surveillance CT colonography, conventional abdominal CT, barium enema and colonoscopy.
2. To familiarize the audience with the developmental process and characteristics of the lesions showing progressive behavior.
3. To understand key imaging findings of the lesions which should be detected effectively to reduce mortality.

TABLE OF CONTENTS/OUTLINE
1. Review of the developmental process (natural history) of colorectal neoplastic lesions. 2. Introduction of typical shapes and characteristics of clinically indolent lesions and progressive life-threatening lesions. 3. Case series using 2D- and 3D- images in a quiz case-study format, including adenoma, serrated adenoma, adenocarcinoma with or without submucosal invasion and advanced adenocarcinoma. 4. Answer for all questions.

GIE155

Peri-anal Crohn's Disease: Spectrum of Imaging Findings

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Melanie Katherine Seale MBBS (Presenter): Nothing to Disclose
Tom Sutherland MBBS: Nothing to Disclose
Angela Galvin MBBS: Nothing to Disclose
Wai-Kit Lee: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is to: 1. Review the pathophysiology and manifestations of perianal Crohn's disease. 2. Review the role of imaging in perianal Crohn's, particularly of MRI for its ability to depict relationship of perianal fistulae to the anal sphincter complex, and to demonstrate entire extent of disease, including occult collections. 3. Describe the importance of multidisciplinary management in perianal Crohn's disease, and the role of the radiologist. 4. Show multiple imaging examples of perianal Crohn's disease, including imaging before and after various medical and surgical interventions.

TABLE OF CONTENTS/OUTLINE
Epidemiology of Perianal Crohn's Disease  Pathophysiology of Perianal Crohn's Disease  Role of imaging in Perianal Crohn's Disease - with emphasis on MRI Multidisciplinary Care in Perianal Crohn's Disease Case examples - range of manifestations - appearance of medical and surgical interventions

GIE156

Perianal Fistulas—MRI Evaluation

Education Exhibits
Location: GI Community, Learning Center

Participants
Ines Santiago Martins MD (Presenter): Nothing to Disclose
Hugo Pisco Pacheco MD: Nothing to Disclose
Madalena Pimenta MD: Nothing to Disclose

TEACHING POINTS
In this educational exhibit we propose to review: - The anatomy of the perianal region - The MRI technique in the evaluation of perianal fistulas - The St James' University Hospital classification of the various fistula types

TABLE OF CONTENTS/OUTLINE
- Anatomy of the perianal region - The St James' University Hospital classification of fistulas - The MRI technique in the
evaluation of perianal fistulas - Review of imaging findings on MRI o Classification of the fistula types (intersphincteric, transspincteric, supraplevator and translevator, submucosal fistulas and sinus tracts) o Identification of secondary tracts o Identification of abscesses o Relationships to pelvic structures - Summary

GIE157

Primer of Reading Defecography for Residents

Education Exhibits
Location: GI Community, Learning Center

Participants
Tina Islam MD (Presenter) : Nothing to Disclose
Anuradha Samir Shenoy-Bhangie MD : Nothing to Disclose
Joseph F. Simeone MD : Nothing to Disclose
Michael J. Shortsleeve MD : Nothing to Disclose
Mukesh Gobind Harisinghani MD : Nothing to Disclose

TEACHING POINTS
1. The reader will learn a systematic approach to interpreting defecography 2. The reader will understand normal and abnormal findings in defecography

TABLE OF CONTENTS/OUTLINE
1. Overview of a structured approach to interpreting defecography with illustrative normal and abnormal clinical cases 2. A structured dictation template is provided on how to report findings

GIE158

Pseudomyxoma Peritonei (PMP): Imaging Findings before and after the Combined Therapy Using Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy

Education Exhibits
Location: GI Community, Learning Center

Participants
Tsuyoshi Tajima MD, PhD (Presenter) : Nothing to Disclose
Ryuji Uehara MD : Nothing to Disclose
Hiroaki Wakiyama : Nothing to Disclose
Hideaki Yano : Nothing to Disclose

TEACHING POINTS
The purpose of this study is:
1. To understand the concepts of PMP
2. To recognize the up-to-date surgical procedures and postoperative complications of PMP
3. To review the common and uncommon imaging findings of PMP

TABLE OF CONTENTS/OUTLINE
1. PMP concepts
2. PMP treatment in our institute
3. Up-to-date PMP treatment
4. Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy
5. Primary and disseminated PMP: common and uncommon imaging findings
6. Differential diagnosis
7. Various imaging findings of post-operative complications

GIE159

Radiation Dose and Image Quality for Low Dose Fecal-tagging CT Colonography: A Comparison of Electronic Cleansing between Single-energy and Dual-energy CTC

Education Exhibits
Location: GI Community, Learning Center

Participants
Wenli Cai PhD (Presenter) : Nothing to Disclose
Da Zhang PhD : Nothing to Disclose
Bob Liu PhD : Nothing to Disclose
Michael Ethan Zalis MD : Co-founder, QPID Health Inc Chief Medical Officer, QPID Health Inc Stockholder, QPID Health Inc

TEACHING POINTS
The teaching points of this exhibits are:
1. Dual-energy CT colonography (DE-CTC) has different profiles of radiation dose compared to conventional single-energy CT colonography (SE-CTC).
2. Dual-energy electronic cleansing (DE-EC) improves the quality of electronic cleansing and the diagnostic performance in fecal-tagging DE-CTC images compared to SE-CTC.
3. DE-EC may achieve better EC performance compared to conventional single-energy EC with less radiation dose.
4. Low-dose DE-CTC assisted by DE-EC has the potential to become the next-generation colorectal screening modality.
TABLE OF CONTENTS/OUTLINE
The exhibit will be outlined as below: 1. Experiments of radiation dose: demonstrate the measurements of radiation dose in the colon scanned by DE-CTC and SE-CTC imaging protocols at the same scanner-reported doses. 2. Review of the DE-EC technique for low-dose DE-CTC, including reduction of image noise, material decomposition model, and virtual colon tagging. 3. Experiments of DE-EC: demonstrate the improvement of EC quality in the reduction of artifacts and pitfalls by using DE-EC vs. single-energy EC. 4. Discussion of the effectiveness and limitations of DE-EC techniques in visualization of low-dose DE-CTC images. 5. Future work and summary of DE-EC in low-dose DE-CTC images.

GIE160
Rectal Cancer MRI: How DWI Can Help Diagnosis in Local Recurrences

Education Exhibits
Location: GI Community, Learning Center

Participants
Maria Isabel Puig-Povendano (Presenter): Nothing to Disclose
Eva Maria Merino Serra MD: Nothing to Disclose
David Martinez De La Haza MD: Nothing to Disclose
Ana Sanchez Marquez MD: Nothing to Disclose
Eduardo Andia Navarro MD: Nothing to Disclose
Domenico Fraccalvieri: Nothing to Disclose

TEACHING POINTS
In spite of improvement in surgical techniques local rectal cancer recurrences are not rare. Usually the rectal cancer follow up is done with CT but, if suspicion of pelvic tumoral relapse exists and CT findings remain equivocal, patients can be tributaries of PET-CT. With this technique false positives (inflammatory diseases, previous surgery or radiotherapy, complications like fistulas or haematomas) and false negatives (necrotic or mucinous lesions or recent chemotherapy) can appear. MRI conventional images alone have high accuracy in detecting recurrences. DWI is able to help especially when they are small, anastomotic or multiples and improves confidence in rule out recurrence. Relapsing tumors restrict diffusion in b 1000 and are hypointenses in ADC maps, these features allow differential diagnosis with fibrotic or inflammatory changes. False positive are possible in mucinous tumor relapses. Surgical contraindications: proximal sacral invasion (above S2-S3), sciatic notch extension, involvement of nervous roots (S1, S2) or vascular encasement can be evaluated with conventional sequences.

TABLE OF CONTENTS/OUTLINE
- MRI rectal recurrence findings.
- DWI in detection and differential diagnosis of recurrences. Correlation with equivocal lesions at PET-CT.
- MRI planning surgery. Surgical contraindications.

GIE161
Rectal Cancer: How Local Staging with MR Imaging Influences Clinical Management

Education Exhibits
Location: GI Community, Learning Center

Participants
Supreeta Arya MD (Presenter): Nothing to Disclose
Deepak Das MBBS: Nothing to Disclose
Amar Ramesh Udare MBBS: Nothing to Disclose
avanish saklani: Nothing to Disclose
Kumaresan Sandrasegaran MD: Nothing to Disclose

TEACHING POINTS
1. To discuss the issues of clinical importance in the local staging of rectal cancers.
2. To discuss the optimal MRI technique for local staging as per ESGAR 2012 consensus meeting for MRI in clinical management of rectal cancers.
3. To bring awareness of how MR imaging findings assist in planning optimal therapy.

TABLE OF CONTENTS/OUTLINE
- Radiological anatomy of the rectum
- Brief outline of the major phase III trials in nonmetastatic rectal cancer that have influenced current evidence based optimal therapy.
- Issues of importance in the local staging of rectal cancer
- Highlights of ESGAR 2012 consensus meeting for MRI in clinical management of rectal cancers that will include optimal MRI technique
- Pictorial essay of various stages of rectal cancer with impact of various imaging findings on the therapy plan; how imaging assists surgical and radiation therapy planning
- Checklist for synoptic reporting

GIE162
Rectal, Peri-rectal and Perineal Diseases- a Multi-modality Pictorial Review with Histological, Endoscopic and Operative Correlation

Education Exhibits
Location: GI Community, Learning Center

Participants
Maureen Gail Heldmann MD (Presenter): Nothing to Disclose
Phillip Cole MD: Nothing to Disclose
Arielle Dubose MD: Nothing to Disclose
TEACHING POINTS

Review the anatomy of the supralevator and infralevator spaces of the pelvis and perineum. Illustrate a variety of neoplastic, infectious, inflammatory, traumatic, and congenital disease states affecting the rectum, anus, surrounding soft tissues, and perineum. Depict correlative imaging, endoscopic, and histological findings in rectal and perirectal pathology. Provide an overview of key findings that influence therapy selection and operative approaches to rectal, anal, and perineal therapies.

TABLE OF CONTENTS/OUTLINE

A gamut of pathology affects the rectum, anus, and perineum, and multiple imaging modalities offer information complimentary to the physical examination for optimal assessment and treatment planning. In an area easy to overlook on routine imaging, we offer correlative imaging, endoscopic, pathologic, and operative review of a range of rectal, perirectal, and perineal disease processes organized by the following topics: Neoplasm- benign and malignant Infectious and non-infectious inflammatory Traumatic Congenital / developmental Vascular Key surgical concepts are discussed, including radiological information required by the colorectal surgeon and current operative approaches to these anatomic spaces to assist the practicing radiologist in comprehensive reporting.

GIE163

The Post-Operative Colon: Imaging and Complications

Education Exhibits

Location: GI Community, Learning Center

Participants

Jay A. Karajgikar MD (Presenter): Nothing to Disclose
Barak Friedman MD: Nothing to Disclose
John J. Hines MD: Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to: 1. To understand and recognize the post-operative imaging appearance (CT and fluoroscopy) of commonly performed colon resections, with detailed emphasis on the Hartmann's Pouch, Ileoanal J-Pouch, and Lower Anterior Resection. 2. To understand and recognize the post-operative complications associated with the above mentioned procedures. 3. To learn the indications and contraindications for the Hartmann's Pouch, Ileoanal J-Pouch, and Lower Anterior Resection.

TABLE OF CONTENTS/OUTLINE

Background on colon resection (Indications, common terminology) Ileoanal J-Pouch: - Indications, contraindications, surgical technique. - Normal post-operative anatomy. Hartmann's Pouch: - Indications, contraindications, surgical technique. - Normal post-operative anatomy. Low Anterior Resection: - Indications, contraindications, surgical technique. - Normal post-operative anatomy. Complications, with examples from the above procedures (i.e. anastomotic leak and abscess, fistula, pouchitis, bowel obstruction, anastomotic stricture) Summary and Conclusions

GIE164

Tumor and Tumor-like Lesions of the Rectum: Uncommon Imaging Findings and Rare Pathological Entities

Education Exhibits

Location: GI Community, Learning Center

Participants

Luis Curvo-Semedo MD, PhD (Presenter): Nothing to Disclose
Daniel Andrade MD: Nothing to Disclose
Jorge Brito MD: Nothing to Disclose
Filipe Caseiro-Alves: Nothing to Disclose

TEACHING POINTS

The main purposes of this work are:

- To recognize uncommon imaging findings of tumor and tumor-like conditions of the rectum as seen on cross-sectional imaging studies, with emphasis on MRI (including DWI). These include both primary staging and restaging examinations.
- To review the clinical and imaging features of some rare neoplasms and neoplasm-like lesions occurring in the rectum.

TABLE OF CONTENTS/OUTLINE

1. Uncommon imaging findings of adenocarcinoma of the rectum - synchronous tumors - intussusceptions - invasion / fistulization to other organs - rare findings on restaging examinations after neoadjuvant chemo/radiation therapy. 2. Rare rectal tumors and tumor-like lesions - mucinous carcinoma - gastrointestinal stromal tumors - endocrine tumors - malignant melanoma - lymphoma - metastases - villous tumors - endometriosis - invasion from other neoplasms such as squamous cell carcinoma of the anal canal - other

GIE165

Unusual Masses of the Rectal, Perirectal and Presacral Regions

Education Exhibits

Location: GI Community, Learning Center

Participants

Andreu F. Costa MD, MSc (Presenter): Nothing to Disclose
Seng Thipphavong MD: Nothing to Disclose

Seng Thipphavong MD: Nothing to Disclose
A variety of interesting and unusual masses may arise in the rectal, perirectal and presacral regions. The precise location of the mass and its imaging manifestations can often yield a limited differential diagnosis. MRI is superior in delineating the origin and local extent of masses in this region of the pelvis.

### TABLE OF CONTENTS/OUTLINE

- **Learning Objectives**
- **Disclaimer**
- **Rectal and perirectal masses:** Interesting manifestations of adenocarcinoma; intussusception; mucinous adenocarcinoma; Rectal GIST; Rectal carcinoid; Perirectal sarcomas; Perirectal abscess
- **Presacral masses:** Nerve sheath tumor; Presacral extra-medullary hematopoiesis; Extra-adrenal myelolipoma
- **Summary**
- **References**
- **Contact Information**

### TEACHING POINTS

To learn about the benefits and pitfalls of virtual monochromatic spectral imaging in the interpretation of dual-energy CT colonography (CTC) examinations, in particular, ultra-low-dose CTC examinations.

### TABLE OF CONTENTS/OUTLINE

1. **Introduction and background:** Describe the role of virtual monochromatic imaging in dual-energy CTC.
2. **Principles of monochromatic CT imaging:** Review the principles of how virtual monochromatic images are generated from dual-energy CTC acquisitions using image-domain or projection-domain methods.
3. **Image quality improvement in virtual monochromatic images:** Provide an overview of the effect of virtual monochromatic imaging on image quality, including beam-hardening artifact reduction and noise reduction, in comparison with single-energy CTC imaging.
4. **Computer-assisted virtual monochromatic CTC:** Describe the principles and benefits of computer-assisted CTC techniques based on virtual monochromatic imaging, in particular, virtual bowel cleansing and computer-aided detection.
5. **Interpretation of virtual monochromatic CTC:** Provide an overview of the CTC reading based on virtual monochromatic images.
6. **Conclusions:** Virtual monochromatic spectral imaging has the potential to improve image quality in low-dose CTC and to improve readers’ diagnostic performance.

### TEACHING POINTS

To review the radiologic anatomy and imaging findings of abdominal wall hernias. Discuss the etiologies, imaging pitfalls, and complications.
**GIE170**

**Calcifications in Abdominal Radiography: A Pictorial Review**

_Education Exhibits_

_Location: GI Community, Learning Center_

**Participants**

- Alvaro Paniagua MD (Presenter): Nothing to Disclose
- Sara Moron Rodge MD, PhD: Nothing to Disclose
- Susana Hernandez Muniz MD: Nothing to Disclose
- Mercedes Ibanz Moya: Nothing to Disclose
- Jose Carmelo Albillos Merino MD: Nothing to Disclose

**TEACHING POINTS**

Understand how abdominal calcifications are originated and describe different causes that lead to detectable calcifications on plain abdominal radiographs. To establish a differential diagnosis based on location, characteristics and clinical features. To learn which calcifications have clinical significance and when additional imaging exploration may be required.

**GIE171**

**Don’t Get Thrown for a Loop (US)!: Imaging Findings, Atypical Presentations, Complications of Abdominal Systemic Lupus Erythematosus (SLE)**

_Education Exhibits_

_Location: GI Community, Learning Center_

- Certificate of Merit

**Participants**

- Gayatri Joshi MD: Nothing to Disclose
- Christine Q. Menias MD (Presenter): Nothing to Disclose
- Amy Kiyo Hara MD: Nothing to Disclose
- Kumaresan Sandrasegaran MD: Nothing to Disclose
- Mariam Moshiri MD: Consultant, Reed Elsevier Author, Reed Elsevier
- Douglas S. Katz MD: Nothing to Disclose
- Akram Mohamed Shaaban MBBCh: Contributor, Amirsys, Inc

**TEACHING POINTS**

Review classic SLE clinical presentations and abdominal imaging. Describe atypical abdominal SLE imaging findings. Improve diagnosis of SLE complications that can be diagnosed at imaging.

**GIE174**

**Imaging of Umbilicus in Adults**

_Education Exhibits_

_Location: GI Community, Learning Center_

**Participants**

- Jun Isogai MD (Presenter): Nothing to Disclose
- Jun Kaneko: Nothing to Disclose
- Mikio Tezuka: Nothing to Disclose
Yoshiaki Katada MD: Nothing to Disclose

TEACHING POINTS
To demonstrate normal variants and mimics of periumbilical structures To illustrate a wide variety of umbilical disorders

TABLE OF CONTENTS/OUTLINE
A. Review of embryologic and anatomical features of the umbilicus B. CT findings of normal variants of the periumbilicus. 1) Ligamentum teres, paraumbilical veins and hepatic falciform arteries in the falciform ligament, 2) Urachal remnants and obliterated umbilical arteries in the preperitoneal space. C. CT or MRI findings of a wide spectrum of umbilical diseases. 1) Urachal congenital anomalies 2) Infected urachal remnants 3) Omphalomesenteric duct anomalies attached to the umbilicus 4) Recanalized umbilical vein in Meckel's syndrome 5) Portosystemic collateral veins related with embryologic villointestinal vessels connecting the ileal branch to the umbilicus 6) Traumatic injury of the hepatic falciform artery 7) Malignant umbilical tumors

GIE175
Laparoscopic Adjustable Gastric Banding: What the Radiologist Needs to Know

Education Exhibits
Location: GI Community, Learning Center

Participants
David Borukhov MD (Presenter): Nothing to Disclose
Mustafa Al Roubaie MD: Nothing to Disclose
John J. Hines MD: Nothing to Disclose

TEACHING POINTS
1) Review the history, indications and weight loss outcomes of laparoscopic gastric banding. 2) Learn how to assess a lap band on multiple imaging modalities 3) Learn how to adjust a Lap Band. 4) Illustrate the spectrum of Lap Band post-surgical complications and review their treatment.

TABLE OF CONTENTS/OUTLINE

GIE176
Low kV CT Imaging of the Abdomen: Benefits, Pearls and Pitfalls

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit
Selected for RadioGraphics

Participants
Adeel Rahim Seyal MD: Grant, Siemens AG
Atilla Arslanoglu MD: Grant, Siemens AG
Azize Sahin MD: Nothing to Disclose
Samir Abboud MD: Nothing to Disclose
Jeanne Miriam Horowitz MD: Nothing to Disclose
Vahid Yaghmai MD (Presenter): Nothing to Disclose

TEACHING POINTS
Low kV is robust tool for reducing radiation dose from CT scans. There are significant clinical implications when lowering kV in abdominal imaging. Knowledge of these issues is essential for successful implementation of low kV CT imaging of the abdomen. The aim of this abstract is to provide a thorough review of the potential benefits that can be derived from low kV imaging of the abdomen including improved lesions conspicuity, improved contrast to noise ratio in CT angiography and lower dose of contrast material. We will also review the pitfalls associated with low kV imaging.

TABLE OF CONTENTS/OUTLINE
• Basic principles of low kV CT imaging • Effect of low kV on noise, image quality, CNR, radiation dose • Implementing reduced tube voltage in abdominal imaging • Clinical applications of low kV imaging in abdomen • Reducing intravenous contrast using low kV imaging. How? When? • Potential drawbacks of low kV imaging including photon starvation and image noise, potential missed vascular pathology and effect on lesion characterization based on density measurements

GIE177
Material Separation Using Dual-energy CT (DECT): Current and Emerging Applications

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit
Selected for RadioGraphics

Participants
Mukta Dilipkumar Agrawal MBBS, MD (Presenter): Nothing to Disclose
Jorge Mario Fuentes MD: Nothing to Disclose
Manuel Patino MD: Nothing to Disclose
TEACHING POINTS

DECT provides the capability to separate various materials by virtue of differences in their atomic numbers, and therefore attenuation profile, at different energies. This creates opportunities to generate material-specific images to derive clinically useful information as outlined below.

TABLE OF CONTENTS/OUTLINE

- Iodine images allow tissue characterization (iodine content), assess tissue viability, grade liver fibrosis (iodine retention on delayed images), and improve assessment of vascular patency. In cancer patients, improved assessment of local/distant metastasis and quantified iodine can serve as a biomarker of therapeutic response. • Fat images detect and grade hepatic steatosis and characterize fat containing lesions (adenomas, AML) and vascular plaque. • Calcium images quantify bone mineral density, detect intrallesion calcium, and characterize vascular plaque and renal stone composition. • Uric acid images diagnose UA stones for appropriate management and visualize urate crystals in the joint, differentiating primary gout vs. pseudo-gout. • Iron images detect and quantify tissue iron and monitor treatment. • Although not currently available, images specific to Gold (inflammation localization), Zinc (β cells in pancreas), Manganese (melanoma) and Copper (Wilson's) may be generated impacting diagnosis and treatment monitoring.

GIE178

The Ostensible Gallbladder: Ultrasound of RUQ Pain beyond Cholecystitis

Education Exhibits

Location: GI Community, Learning Center

Participants

Joel P. Thompson MD (Presenter): Nothing to Disclose
Omar Hasan MD: Nothing to Disclose
Deborah J. Rubens MD: Nothing to Disclose

TEACHING POINTS

1. Review etiologies of RUQ pain not caused by the gallbladder. 2. Highlight the ultrasound appearance of reviewed pathology. 3. Provide an overview of disease management including correlative Imaging with CT, MRI, and/or PET/CT.

TABLE OF CONTENTS/OUTLINE

While gallbladder pathology is the most common cause of right upper quadrant pain, numerous additional etiologies may cause a similar clinical picture. Ultrasound is frequently the triage examination, giving the radiologist an opportunity to discern the correct diagnosis or next management step. Using a quiz format, the differential diagnosis of RUQ pain will be reviewed, with emphasis placed on the ultrasound appearance of each disease process. Further characterization with CT, MR, and PET/CT imaging will be provided, followed by a brief discussion and synopsis of patient management. Cases will be presented by organ and disease process, including:
- Infectious and inflammatory: acute hepatitis (Hepatitis B, mononucleosis, and drug induced), hepatic abscess (bacterial and fungal), and cholangitis. Also pancreatic pseudocyst, pyelonephritis, and pyonephrosis.
- Vascular, including hepatic infarct, veno-occlusive disease, portal vein thrombosis, pseudoaneurysm formation.
- Neoplastic: Hepatic, biliary, and pancreatic tumors.
- Obstructive: Bowel, biliary, pancreatic and renal.

GIE180

The Tip of the Iceberg: The Clue to Suspect Syndromes with Abdominal Involvement

Education Exhibits

Location: GI Community, Learning Center

Participants

Yedaun Lee MD (Presenter): Nothing to Disclose
Hye Jin Baek: Nothing to Disclose
Kwanghwi Lee: Nothing to Disclose
Seon-Jeong Kim MD: Nothing to Disclose
Jeong Hee Yoon MD: Nothing to Disclose

TEACHING POINTS

A variety of syndromes involve abdominal organs. Sometimes abdominal manifestation could be an initial presentation of the syndrome. Radiologists have an important role in suspecting syndromes and suggesting diagnostic workup for patients. Therefore, this exhibit will present the key images of abdominal manifestation of syndromes and also will review these syndromes including diagnostic and treatment methods.

TABLE OF CONTENTS/OUTLINE

1. Quizzes of various syndromes with key images. 2. Review of syndromes with abdominal involvement. 1) Imaging findings of syndromes 2) Diagnosis and brief review of treatment

GIE181

Tuberculosis: A Radiologic Review of Extrapulmonary Manifestations

Education Exhibits

Location: GI Community, Learning Center
Selected for RadioGraphics

Participants

- Maria Jose Baladron MD (Presenter): Nothing to Disclose
- Eugenio Zalaquett MD: Nothing to Disclose
- Christine G. Menias MD: Nothing to Disclose
- Ignacio Beddings MD: Nothing to Disclose
- Pablo Bachler MD: Nothing to Disclose
- Matias Gustavo Vargas Araya MD: Nothing to Disclose
- Sanjeev Bhalla MD: Nothing to Disclose
- Alvaro Huete Garin MD: Nothing to Disclose

TEACHING POINTS

1. To recognize that tuberculous infections are not limited to the chest. 2. To learn the demographics, pathophysiology and clinical presentation of patients with extrapulmonary tuberculosis. 3. To review the spectrum of imaging findings of extrapulmonary tuberculosis through different imaging modalities.

TABLE OF CONTENTS/OUTLINE

1. Demographics and clinical presentation of extrapulmonary tuberculosis. 2. Radiologic review of the more common manifestations of extrapulmonary tuberculosis through different imaging modalities (CT, PET-CT and MRI), including involvement of: a) Central nervous system (meningitis, cerebritis, abscess, tuberculosis, miliary tuberculosis), b) Head and neck (tuberculous lymphadenitis), c) Pericardium. d) Abdomen and pelvis (solid organ involvement, gastrointestinal tract, peritoneal and tuberculous lymphadenitis). e) Male reproductive system (scrotum and testicular), f) Musculoskeletal (spondylodiscitis, osteomyelitis and arthritids). 3. Conclusions.

GIE182

Up Against the Wall: A Spectrum of Abdominal Wall Abnormalities

Education Exhibits

Location: GI Community, Learning Center

Participants

- Gabriela Gayer MD (Presenter): Nothing to Disclose
- Amsalu Dabela-Biketi MD: Nothing to Disclose

TEACHING POINTS

1. Review a spectrum of common and unusual findings in the abdominal wall, including examples of different routes of pathological spread. 2. Construct a diagnostic approach to abdominal wall lesions on CT using attenuation characteristics (i.e. solid, cystic, calcified, and combinations), with special attention to overlapping imaging appearances. 3. Emphasize the importance of relevant clinical data in establishing the correct diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Diagnostic approach based on CT imaging features and pertinent history 3. Imaging algorithm for further workup 4. Challenge cases: congenital, infectious/inflammatory, neoplasm, iatrogenic 5. Summary

GIE183

Usual and Unusual Contents of Inguinal Hernia Sac: A Spectrum of Radiologic Findings

Education Exhibits

Location: GI Community, Learning Center

Participants

- Hemang Kotecha DO: Nothing to Disclose
- Eduardo Scortegagna MD: Nothing to Disclose
- Heeseop Shin MD (Presenter): Nothing to Disclose
- Young Hwan Kim MD: Nothing to Disclose

TEACHING POINTS

Brief review of the radiologic anatomy of the inguinal canal and inguinal hernias. Discuss imaging findings, pitfalls, and differential diagnosis of usual and unusual contents of inguinal hernia sac.

TABLE OF CONTENTS/OUTLINE

Although inguinal hernia is usually a clinical diagnosis, ultrasound, CT, and MRI have been increasingly used for diagnosis in clinically uncertain cases, preoperative evaluation of incarcerated hernia, and evaluation of postoperative complications. The most common cause of inguinal hernia is herniation of bowel with or without obstruction. Unusual hernia contents such as metastasis, undescended testicle, bladder, ovary, normal appendix, acute appendicitis (Amyand’s hernia), lipoma and other tumors can pose a challenge for the surgeon if not properly diagnosed before surgery. Sometimes clinical diagnosis can be challenging, such as in obese patients and those with chronic pain of unknown etiology. Ultrasound can be valuable when performed by experienced operators, CT scan can easily diagnose strangulated hernias and related complications, and MRI can be problem solving without radiation. Therefore, it is crucial for the radiologist to be familiar with the usual and unusual imaging findings of inguinal hernias, as well as incidentally identified normal structures within the inguinal canal.

GIE184

Pre-Surgical CT-Guided Hookwire for the Correct Identification of Intraabdominal Masses at Surgery: Technique and Results from Our Experience

Education Exhibits

Location: GI Community, Learning Center
Participants
Jonathan Hernandez MD (Presenter): Nothing to Disclose
Juan Carlos Pernas: Nothing to Disclose
Diana Hernandez: Nothing to Disclose
Carmen M. Perez MD: Nothing to Disclose
Magui Menso: Nothing to Disclose
Jesus Bollo: Nothing to Disclose

TEACHING POINTS

To review the indications and technique for the use of pre-surgical CT-guided hookwires for the detection of intraabdominal masses. To report the results from our experience.

TABLE OF CONTENTS/OUTLINE

INTRODUCTION Image-guided hookwires were used initially for the pre-surgical localization of non-palpable breast masses, with good results. Eventually, it led to the use of image-guided hookwires to localize non-palpable pulmonary, osteomuscular and abdominal lesions. However, there are not many reports in the literature about the placement of intraabdominal hookwires.

INDICATIONS We will describe the indications for the procedure. TECHNIQUE We will also explain the different approaches for the placement of pre-surgical CT-guided intraabdominal hookwires.

RESULTS FROM OUR EXPERIENCE We will show results from our experience with 6 patients who in the follow-up showed signs of intraabdominal tumoral recurrence in the imaging studies. We also discuss the outcome of the patients and complications

CONCLUSIONS Percutaneous pre-surgical location with hookwires is an useful and safe method for localized resection, saving surgical time and improving the accuracy of the resected lesion with lower rate of complications.

GIE185

About Time to Pay Closer Attention to Nonalcoholic Fatty Liver Disease and the Role of Imaging

Education Exhibits
Location: GI Community, Learning Center

Participants
Samita Garg: Nothing to Disclose
Nizar Zein: Nothing to Disclose
Kavita Garg MD (Presenter): Nothing to Disclose

TEACHING POINTS

Nonalcoholic fatty liver disease (NAFLD) is an important public health concern and a risk factor for cardiac disease, diabetes and cancer. Though patients with hepatic steatosis can be asymptomatic for years, a subset will progress to nonalcoholic steatohepatitis (NASH), cirrhosis and hepatoma. NAFLD includes a spectrum of histopathological changes ranging from simple steatosis to NASH to cirrhosis. Liver biopsy is considered a gold standard, however, ultrasound, CT and MR can be used to diagnose NAFLD noninvasively. Other diffuse hepatocellular diseases such as Hepatitis C, hemochromatosis, A1-antitrypsin can confound imaging findings. Emerging quantitative assessment methods such as elastography and MR appear promising, however prospective studies are warranted for validation.

TABLE OF CONTENTS/OUTLINE

Prevalence and histopathologic activity scores of NAFLD Typical, atypical findings and differential diagnosis of NAFLD on ultrasound, CT and MR. Pros and cons of different imaging modalities in NAFLD screening. Clinical associations of NAFLD including for liver transplant, gastric bypass surgery, chemotherapy, pancreatic fat and body composition are briefly discussed. Emerging quantitative assessment methods such as MR and elastography.

GIE186

Congestive Hepatopathy: Imaging Findings

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit
Selected for RadioGraphics

Participants
Michael Leigh Wells MD (Presenter): Nothing to Disclose
Joseph Poterucha: Nothing to Disclose
Eric Fenstad: Nothing to Disclose
Sudhakar Kundapur Venkatesh MD, FRCR: Nothing to Disclose
Phillip Matthew Young MD: Nothing to Disclose
Philip A. Araoz MD: Nothing to Disclose
David Mailand Hough MD: Nothing to Disclose
Richard L. Ehman MD: CEO, Resoundant, Inc

TEACHING POINTS

Understand pathophysiology of congestive hepatopathy (CH). Imaging appearances of CH Role of MR Elastography

TABLE OF CONTENTS/OUTLINE

Background: CH refers to hepatic manifestations resulting from passive hepatic congestion due to cardiac causes. Prolonged CH may lead to liver fibrosis/cirrhosis. Significant liver fibrosis may develop before detection as liver dysfunction typically manifests late. Constrictive pericarditis in particular can result in rapid development of cirrhosis. Pathophysiology: CH results from increase in central venous pressure transmitted via inferior vena cava (IVC) and hepatic veins (HV) to sinusoids. Raised sinusoidal pressure, decreased hepatic venous blood flow and hypoxia results in degeneration of hepatocytes, particularly around central veins. Imaging findings: Dilated IVC and HVs; retrograde HV opacification at the early bolus phase; a diffusely mottled pattern of hepatic enhancement (nutmeg liver) and areas of patchy enhancement due to stagnant blood flow. Frequently extensive fibrosis with multiple regenerative nodules may be found. Magnetic resonance elastography (MRE) can demonstrate elevated liver stiffness secondary to liver fibrosis and may be useful in evaluation of fibrosis in CH. MRE can be easily performed after a cardiac MRI study. Preliminary experience with MRE in CH will be illustrated.
GIE188
Dual-energy CT: Applications in Liver Imaging

Education Exhibits
Location: GI Community, Learning Center

Participants
Javier Vallejos MD, MBA (Presenter): Nothing to Disclose
Carlos Capunay MD: Nothing to Disclose
Patricia M. Carrascosa MD: Research Consultant, General Electric Company

TEACHING POINTS
1- To describe the technique and principles of dual-energy CT (DECT). 2- To discuss the potential applications of DECT in liver imaging. 3- To be familiar with the capabilities, strengths and limitations of DECT.

TABLE OF CONTENTS/OUTLINE

GIE190
Hepatic Diseases Characterized by Perivascular Distribution: Imaging Features, Differential Diagnosis with Pathological Correlation

Education Exhibits
Location: GI Community, Learning Center

Participants
Akram Mohamed Shaaban MBCh (Presenter): Contributor, Amirsys, Inc
Christine O. Menias MD: Nothing to Disclose
Bryan Robert Foster MD: Nothing to Disclose
Khaled M. Elsayes MD: Nothing to Disclose
Maryam Rezvani MD: Nothing to Disclose

TEACHING POINTS
1. The learner should be able to list the different pathological entities characterized by periportal distribution. 2. The reader should be able to compile a short list of differential diagnosis based on the imaging features.

TABLE OF CONTENTS/OUTLINE
A. Perivascular fluid density
   1. Periportal edema and lymphedema
   2. Peribiliary cysts
   3. Caroli disease
   4. Biliary hamartomas
B. Perivascular enhancement
   1. Cavernous transformation of the portal vein
   2. Cholangitis (PSC, Pyogenic cholangitis, Viral cholangitis, AIDS-related cholangitis, Recurrent pyogenic cholangitis)
   3. Hepatitis
   4. Cholangiocarcinoma
   5. Metastases
   6. Periportal fibrosis (Congenital hepatic fibrosis, Schistosomiasis, Sarcoidosis)
C. Perivascular masses
   1. Lymphoma/PTLD
   2. Extramedullary hematopoiesis
   3. Neurofibromatosis
   4. Peliosis hepatitis
D. Perivascular parenchymal abnormalities
   1. Perivascular steatosis
   2. Perivascular iron deposition
   3. Primary biliary cirrhosis

GIE191
Hepatic Hemangioma.....or Not?

Education Exhibits
Location: GI Community, Learning Center

Participants
Aytekin Oto MD (Presenter): Research Grant, Koninklijke Philips NV Consultant, Guerbet SA
Richard L. Baron MD: Speakers Bureau, Bracco Group

TEACHING POINTS
Hemangiomas are the most common benign hepatic lesions and present in up to 30% of the population. In most cases, they have characteristic imaging findings allowing their reliable diagnosis, however, sometimes other benign and more importantly
malignant liver lesions can mimic hemangiomas or hemangiomas may have atypical imaging characteristics and be mistaken for malignancy. The purpose of this exhibit is to review the potential pitfalls that can lead to challenges in the diagnosis of hemangiomas by presenting different cases with teaching points in a quiz format.

**TABLE OF CONTENTS/OUTLINE**

1. Review of the typical imaging characteristics of hemangiomas on US, CT and MRI
2. Demonstration of imaging features of potential mimickers of hemangioma including malignant (HCC, cholangiocarcinoma, angiosarcoma, hypervascular and hypovascular metastasis) and benign (peliosis, vascular shunt, FNH, telangiectasia) focal liver lesions.
3. Demonstration of atypical imaging features of hemangioma such as initial central enhancement, central scar, hyalinized hemangioma, atypical peripheral enhancement, very slow filling, heterogenous T2 signal and diffuse hemangiomatosis.
4. Provision of practical clues to increase the confidence of radiologists when considering the diagnosis of hemangioma in different clinical and imaging scenarios and avoid the above pitfalls.

**GIE192**

**Imaging Characteristics of Infiltrative Liver Disease**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

Maryam Gul: Nothing to Disclose
Ammar Ahmed Chaudhry MD (Presenter): Nothing to Disclose
Abbas Ahmed Chaudhry BSc: Nothing to Disclose
Kevin S. Baker MD: Nothing to Disclose
Jawed Akhter Mallick MBBS: Nothing to Disclose
Almas Abbasi MBBS: Nothing to Disclose
Akhil Khan Pathan MS: Nothing to Disclose

**TEACHING POINTS**

1. Review clinical presentation and imaging findings of various infiltrative liver diseases including glycogen storage disease (e.g., Pompe's disease, von Gierke's disease, etc.), Mucopolysaccharidoses (e.g., Gaucher's disease, Niemann-Pick disease, etc.), metabolic (Wilson's disease, hemochromatosis), infectious hepatitis, leukemia, lymphoma and non-alcoholic steatohepatitis.
2. Discuss different treatment options and prognosis of the aforementioned entities.

**TABLE OF CONTENTS/OUTLINE**

1. Pictorial (cartoon and/or radiographic) depiction of anatomic areas of disease involvement.
2. Discussion of characteristic imaging findings (ultrasound, CT and MRI) of various infiltrative liver diseases processes.
3. Review primary treatment options (including surgical and interventional radiology guided), imaging follow-up and prognosis.
4. Flow chart highlighting key imaging features that can narrow the differential diagnosis.

**GIE193**

**Intra-operative Doppler Ultrasound in Liver Transplant: What the Surgeon Wants to Know**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

Harshad Wankhedkar DMRD: Nothing to Disclose
Sameer Ramchandra Kalgaonkar MD (Presenter): Nothing to Disclose
Barkha Keswani MD: Nothing to Disclose
Vinay Kumaran MChir: Nothing to Disclose
Ravi Ramakantan MD: Nothing to Disclose
Charul Goyal MBBS: Nothing to Disclose
Abhisht Aggarwal MBBS: Nothing to Disclose
Pravin Birangal MBBS: Nothing to Disclose

**TEACHING POINTS**

Doppler ultrasound aids in the diagnosis of vascular complications in the intra-operative setting, which permits immediate intervention and hence better surgical outcome. The reconstructed vessels are objectively assessed using following Doppler indices: Delayed Systolic Acceleration Time and tardus parvus hepatic artery waveform are strong predictors of hepatic artery stenosis. Hepatic artery Resistive Index of <0.6 is the most sensitive predictor of early hepatic artery thrombosis. Loss of triphasic hepatic venous waveform is indicative of venous outflow obstruction. Intra-operative portal vein flow of >1 liter/min is a predictor of allograft and patient survival. Intraoperative portal venous flow if >500ml/100g/min may require splenic artery ligation or creation of a shunt and if <100ml/100gm/min may require collateral ligation.

**TABLE OF CONTENTS/OUTLINE**

1. Indications II. Scanning technique - Sterile preparation for intraoperative scanning - Optimization of doppler parameters

**GIE194**

**Ischemic Injuries after Liver Transplantation: A Pictorial Essay based on MDCT, angioCT and MR Imaging**

*Education Exhibits*

*Location: GI Community, Learning Center*
Participants
Bernardo Canedo Bizzo MD (Presenter): Nothing to Disclose
Renata Rocha De Almeida : Nothing to Disclose
Alessandra Lopes Faria : Nothing to Disclose
Antonio Luis Eiras de Araujo : Nothing to Disclose
Leonardo Kayat Bittencourt MD, MSc : Nothing to Disclose
Emerson L. Gasparetto MD : Nothing to Disclose

TEACHING POINTS
The liver is subject to transplantation as part of the treatment for neoplastic lesions and liver failure. Patients may develop ischemic lesions following this surgical procedure, which should be differentiated from other categories of focal liver lesions, particularly tumor recurrence and infection. In this presentation, we aim to discuss the main imaging findings and the pathophysiology of each kind of hepatic ischemic injury, following liver transplantation.

TABLE OF CONTENTS/OUTLINE
- A quick review on the most common liver conditions that require transplantation (focus on cirrhosis and HCC).
- Anatomical description and schematic drawings of the most common surgical procedures of the liver transplantation.
- Imaging findings of the normal postoperative liver, based on MDCT, angioCT and MRI.
- Main imaging findings from hepatic ischemic injury liver transplantation procedure: Arterial (obstruction, stenosis, extrinsic compression, pseudoaneurysm and fistula); Portal (including portal vein, inferior vena cava and hepatic veins stenosis and thrombosis); secondary to hypovolemia; reperfusion lesions.

GIE195

LI-RADS v2014: Interpretation and Categorization of MRI Findings Using Hepatobiliary Agents

Education Exhibits
Location: GI Community, Learning Center
Certificate of Merit

Participants
Eduardo Almeida Cunha Costa MD (Presenter): Nothing to Disclose
Amol Shah BS : Nothing to Disclose
Masahiro Tanabe MD : Nothing to Disclose
Jay P. Heiken MD : Patent agreement, Covidien AG Patent agreement, Bayer AG
Kathryn Jane Fowler MD : Research support, Bracco Group
Thomas A. Hope MD : Speaker, Guerbet SA Research Grant, General Electric Company
Cynthia Sawhney Santillan MD : Consultant, Robarts Clinical Trials Research Group
Claude B. Sirlin MD : Research Grant, General Electric Company Speakers Bureau, Bayer AG Consultant, Bayer AG

TEACHING POINTS
LI-RADS v2014 has been expanded to include hepatobiliary contrast agents. The purpose of this exhibit is to review hepatobiliary contrast agents content in LI-RADS v2014. By viewing this exhibit viewers should be familiar with possible imaging appearances of hepatocellular carcinoma (HCC) at hepatobiliary agent-enhanced MRI as well as with the appearance of other malignant, pre-malignant and benign entities in patients with cirrhosis or other risk factors for HCC.

TABLE OF CONTENTS/OUTLINE

GIE196

Liver Dysfunction Imaging on MRI: Are You Working on Quantifying Fat, Fibrosis and Iron of the Liver?

Education Exhibits
Location: GI Community, Learning Center

Participants
Masahiro Okada MD (Presenter): Nothing to Disclose
Tetsuya Wakayama PhD : Employee, General Electric Company
Tomomi Koga : Nothing to Disclose
Nanae Tsuchiya : Nothing to Disclose
Takamichi Murakami MD, PhD : Nothing to Disclose
Sadayuki Murayama MD, PhD : Nothing to Disclose

TEACHING POINTS
1. To define advanced MR sequences in liver imaging for fat, fibrosis and iron. 2. To introduce new liver MR imaging for the analysis of liver dysfunction. 3. To recognize pitfalls of liver MR imaging.

TABLE OF CONTENTS/OUTLINE
1. Advanced liver imaging for liver parenchymal imaging a) MR spectroscopy of fat b) Fat fraction analysis and T2* relaxometry to investigate deposit of fat and iron c) Dixon technique for water and fat imaging d) Liver-specific contrast agent (Gd-EOB-DTPA) to estimate liver function e) Time intensity curve analysis after Gd-EOB-DTPA injection f) T1 relaxometry for diffuse liver disease g) T1 relaxometry versus US elastography for liver fibrosis h) MR elastography 2. Presentation of liver imaging a) Fatty liver, Non-alcoholic steatohepatitis (NASH) b) Chronic hepatitis c) Liver cirrhosis 3. Strategy of therapy in patients with hepatocellular carcinoma and liver dysfunction 4. Pitfalls of MR imaging to image liver function
GIE199

Liver Segmentation: A Primer for Radiologists

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Akshat Gotra MD (Presenter): Nothing to Disclose
Gabriel Chartrand BEng : Intern, Object Research Systems Inc
Kim-Nhien Vu MD : Nothing to Disclose
Franck Vandenbroucke-Menu MD : Nothing to Disclose
Claude Kauffmann PhD : Nothing to Disclose
Benoit Paul Gallix MD, PhD : Nothing to Disclose
Jacques A. De Guise : Research Grant, Emovi Inc Stockholder, Emovi Inc Spouse, CEO, Emovi Inc Research Grant, EOS imaging SA Royalties, EOS imaging SA Research Grant, OLEA Medical Research Grant, ORS Research Grant, Dassault Systemes Research Grant, Useful Progress
An Tang MD : Speaker, Siemens AG Speaker, Boehringer Ingelheim GmbH

TEACHING POINTS
(1) To review the clinical indications for performing liver segmentation, (2) to illustrate various segmentation methods, and (3) to discuss the pros and cons of CT and MRI for liver segmentation.

TABLE OF CONTENTS/OUTLINE

GIE201

MR Findings of Budd-Chiari Syndrome

Education Exhibits
Location: GI Community, Learning Center

Participants
Patricia Borges Alla : Nothing to Disclose
Roberto Blasbalg MD (Presenter): Nothing to Disclose
Gabriel Bolsi : Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review the pathophysiology and magnetic resonance imaging aspects at different stages of Budd-Chiari Syndrome (BCS). 2. To describe the vascular findings in acute stage, characterized by patchy enhancement and venous collateral pathways and in subacute and chronic stages, characterized by the nodular pattern, which includes regenerative nodules until hepatocellular carcinoma (HCC). 3. To show how to the gadoxetic acid emerged as an important tool on differentiating these two entities.

TABLE OF CONTENTS/OUTLINE
1. Pathophysiology of Budd Chiari Syndrome (BCS) 2. MR imaging aspects of BCS 3. Acute stage: imaging findings (liver morphology and enhancement pattern) 4. Subacute and chronic stages: imaging findings (vascular and nodular changes) 5. BCS’s nodular pattern: how to the gadoxetic acid can help distinguishing HCC from non-malignant lesions 6. Summary

GIE202

MRI Evaluation of Diffuse Liver Disease—A Review

Education Exhibits
Location: GI Community, Learning Center

Participants
Neil Shah MD (Presenter): Nothing to Disclose
Kiran Kumar Maddu MBBS : Nothing to Disclose
Courtney Ann Coursey Moreno MD : Nothing to Disclose
Pardeep Kumar Mittal MD : Nothing to Disclose

TEACHING POINTS
1. Provide a brief, general overview of diffuse liver disease
2. Describe a standard MRI protocol for imaging diffuse liver disease
3. Show representative examples of and describe MRI findings for diffuse liver disease

TABLE OF CONTENTS/OUTLINE
Diffuse liver disease affects millions of people worldwide, with the radiologist's role becoming increasingly more important in diagnosis and guiding patient management and treatment. MRI is the modality that greatly aids in characterization of diffuse liver disease by allowing both morphologic and functional evaluation of hepatic tissue, with capabilities well beyond those of other noninvasive modalities. In this exhibit, we will review MRI diagnostic features of diffuse liver disease resulting from deposition and storage disease, abnormal perfusion, infectious and inflammatory processes, bile duct abnormalities, and
malignancy. MRI Imaging Features of Diffuse Liver Disease --Deposition and Storage: Steatosis, Hemochromatosis --Vascular: Congestive hepatopathy, Budd Chiari --Infectious/Inflammatory: Hepatitis, Sarcoidosis --Bile Ducts: Primary sclerosing cholangitis --Malignancy: Lymphoma, Leukemia Summary: MRI provides a comprehensive evaluation of diffuse liver diseases including pathologies affecting bile ducts, vascular structures, etc. due to its superior soft tissue contrast.

GIE203

Overlap Syndromes of Autoimmune Chronic Liver Disease: What the Radiologist Needs to Know

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Ashlesha Satish Udare MBBS, MD (Presenter): Nothing to Disclose
Rashmi Rakesh Badhe : Nothing to Disclose
Bhawan Krishna Paunipagar MD : Nothing to Disclose
Satish Satish Gaitonde : Nothing to Disclose
Namita Kamath MD, MBBS : Nothing to Disclose
Ritesh Dholu MD : Nothing to Disclose
Shrinivas Balaji Desai MD : Nothing to Disclose

TEACHING POINTS
1. To present the International Autoimmune Hepatitis Group (IAIHG) classification of the Overlap syndromes
2. To understand its clinical, serological findings, histopathology and management
3. To elucidate the role of imaging in diagnosis, classification, prognosis and post-treatment follow-up of overlap syndromes

TABLE OF CONTENTS/OUTLINE
Definition: Overlap syndromes are distinct entities on their own, with a variety of autoimmune manifestations presenting in a susceptible individual. Clinical manifestations and serological findings: Circulating auto-antibodies: ANA, SMA, anti-LKM-1, anti-LC1, and pANCA Histopathological features: Interface hepatitis, Portal inflammation, Biliary changes, Granulomas Imaging features: PSC-type overlap syndrome - Imaging features of PSC type: central macroregeneration, peripheral atrophy - US: Wall thickening, beading - MRCP features: biliary duct beading, biliary dilation, diverticula - Liver specific contrast excretion pattern PBC (Primary Biliary Cirrhosis) type - hypointensity surrounding the portal venous branches on T1-weighted and T2-weighted images in patients with PBC, termed the “periportal halo sign.” Evaluation of fibrosis with MR Elastography Screening for complications: IBD, cholangiocarcinoma and noncirrhotic portal hypertension Treatment and interventions

GIE204

Tips of Differentiation of Focal Hepatic Nodules in the Hepatobiliary Phase (HBP) of Gd-EOB-DTPA-enhanced MRI

Education Exhibits
Location: GI Community, Learning Center

Participants
Jeong Woo Kim MD : Nothing to Disclose
Chang Hee Lee MD (Presenter): Nothing to Disclose
Yang Shin Park MD : Nothing to Disclose
Jong Mee Lee : Nothing to Disclose
Jae Woong Choi MD : Nothing to Disclose
Kyeong Ah Kim MD : Nothing to Disclose
Cheol Min Park MD : Nothing to Disclose

TEACHING POINTS
1. To illustrate the pattern of various hepatic lesions with paradoxical uptake or unusual defect of the gadoxetic acid in HBP of liver MRI 2. To discuss how to use this knowledge of unusual pattern of Gd-EOB-DTPA for differential diagnosis of various hepatic lesions

TABLE OF CONTENTS/OUTLINE
1. Introduction 2. Typical and atypical imaging features of hepatic nodules in Gd-EOB-DTPA-enhanced MRI 1) Hepatocellular carcinoma 2) Metastasis from colon, breast, stomach, pancreas, etc 3) Cholangiocarcinoma 4) Focal nodular hyperplasia 5) Haptic adenoma 6) Abscess 7) Eosinophilic infiltrations 3. Pattern analysis according to Gd-EOB-DTPA uptake 4. Summary and benefit of these imaging features of various hepatic lesions for differential diagnosis in clinical practice. Summary 1. Paradoxical uptake within hepatic lesions is not unusual finding on HBP of gadoxetic acid enhanced 3T MRI 2. The malignant nodule may not show a total defect on HBPOgadoxetic acid enhanced 3T MRI 3. FNH may show defect on HBP 4. Haptic adenoma may also contrast uptake on HBP 5. The uptake pattern include total, peripheral, mixed, and target appearances 6. A pattern approach based image analysis may aid in making either a specific diagnosis or narrowing differential diagnosis of various hepatic lesions

GIE205

Trouble Shooting for Arterial Phase Images of Gd-EOB-DTPA Enhanced Liver MR

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Jimi Huh MD (Presenter): Nothing to Disclose
So Yeon Kim MD : Nothing to Disclose
Benjamin M. Yeh MD : Research Grant, General Electric Company Consultant, General Electric Company
Seung Soo Lee MD : Nothing to Disclose
**TEACHING POINTS**

1. To describe factors the quality of arterial phase MR imaging with Gd-EOB-DTPA. 2. To critically review the published literature, discuss the effects of various factors that influence Gd-EOB-DTPA arterial phase image quality. 3. To propose appropriate strategies that can help improve the arterial phase enhancement.

**TABLE OF CONTENTS/OUTLINE**

1. Challenges for arterial phase imaging (1) Temporal mismatch & weak arterial enhancement caused by the smaller administered volume and gadolinium content of Gd-EOB-DTPA than that of conventional extracellular gadolinium contrast agents (2) Acute transient dyspnea 2. Optimization strategies (1) Modify injection protocol • Slow injection rate • Increase in administered dose • Combined use of Gd-EOB-DTPA with conventional extracellular gadolinium contrast agents (2) Optimize image acquisition • Multiple arterial phase acquisitions • Accurate scan delay determination • 3T MR (3) Avoiding acute transient dyspnea • Risk factor identification and patient education (4) Improvement in image interpretation • Subtraction images • Awareness of characteristic Gd-EOB-DTPA enhancement patterns

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**GIE206**

**Vascular Disturbances of the Liver and FNH-like Lesions: What Are They?**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

- Luisa Costa Andrade (Presenter): Nothing to Disclose
- Daniel Andrade MD: Nothing to Disclose
- Maria Conceicao Sanches: Nothing to Disclose
- Luis Curvo-Senodo MD, PhD: Nothing to Disclose
- Filipe Caseiro-Alves: Nothing to Disclose

**TEACHING POINTS**

-To describe the imaging findings of focal liver lesions in the setting of vascular liver diseases, collected from our PACS from 2008 to 2013. -To explain the underlying pathophysiologic mechanism and rad-path correlation with cross-sectional imaging and hepatocyte-directed MR contrast agent. -To address the differential diagnosis and implications for patient management.

**TABLE OF CONTENTS/OUTLINE**

Benign focal liver lesions may be associated with congenital and acquired hepatic hemodynamic abnormalities. In this essay the authors will focus on the rad-path correlation of multiacinar nodular regenerative hyperplasia that develop in response to local or diffuse venous and/or arterial flow disturbances. These lesions may be associated with different types of vascular liver diseases such as Budd-Chiari syndrome, Rendu-Osler-Weber disease, congenital portosystemic shunts, congenital absence of the portal vein or sinusoidal obstructive syndrome. The chronic vascular injury causes progressive peri-venular and peri-portal fibrosis, ultimately leading to non-cirrhotic portal hypertension, a hallmark of the later stages of the vascular insult. A series of cases retrieved from the Hospital database will be presented, focusing on the imaging features that allow the differential diagnosis especially with HCC and metastases in the oncologic patient.

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**GIE207**

**WHY CLASSIFY!! The Clinical and Prognostic Implications of Classification Schemes Used in Hepato-biliary and Pancreatic Imaging: A Primer for Radiologists**

*Education Exhibits*

*Location: GI Community, Learning Center*  

Certificate of Merit

**Participants**

- Chandana G. Lall MD (Presenter): Nothing to Disclose
- Puneet Bhargava MD: Editor, Reed Elsevier
- Sadhna Verma MD: Nothing to Disclose
- Roozbeh Houshyar MD: Nothing to Disclose
- Mohammad Helmy MD: Nothing to Disclose
- Ali Shirkhoda MD: Book contract, Wolters Kluver nv
- Garrett Graham Ward MD: Nothing to Disclose
- Martin Roberto Goyenechea MD: Nothing to Disclose

**TEACHING POINTS**

Educational Goals/Teaching Points 1. Highlight essential classification systems used in hepato-biliary and pancreatic imaging; Practical utility and clinical importance of accurate classification by radiologists 2. Classification systems, organized by organ; Liver, Biliary System, Pancreas 3. Surgical and prognostic implications of lesions and processes in these organs with relevant imaging

**TABLE OF CONTENTS/OUTLINE**

Associating Liver Partition and Portal Vein Ligation for Staged Hepatectomy (ALPPS): Review, Indications and Variations of this Liver Resection Technique

**TEACHING POINTS**
- To present the ALPPS procedure and its variants.
- To recognise livers lesions amenable to ALPPS procedure.
- To discuss ALPPS controversials and alternatives.

**TABLE OF CONTENTS/OUTLINE**
1. Introduction: The history of the ALPPS procedure and its relevance on treatment of multiple lesion liver resections.
2. Technique and variations: It will be didactically explained the resections and the relations used in the ALPPS procedure.
3. Cases review: a series of cases from our service will be used to exemplify the procedure and try to predict successful outcomes.
4. Discussion of ALPPS controversial aspects and its alternatives.
5. Conclusion.

**GIE209**
Don’t Be Afraid of the Dark: A Practical Approach to T2- Hypointense Focal Liver Lesions

**TEACHING POINTS**
- Focal liver lesions are common findings in magnetic resonance imaging (MRI) and the vast majority of them manifest as hyperintense on T2-weighted images. However, hypointense T2 images, although less common, can be found in numerous pathologies, and this findings may help to narrow the list of differential diagnoses. Focal liver lesions (both benign and malignant) with low signal intensity on T2-WI include: iron deposition, calcifications, blood products, necrosis / necrotic nodules and lesions containing mucin.

**TABLE OF CONTENTS/OUTLINE**
Each topic will be discussed and illustrated below:
1. Review of protocols used in MRI for focal liver lesions
2. Main causes of lesions with low signal intensity on T2WI - Iron deposition - Calcifications (residual granuloma) - Degradation products of blood - Necrosis - Injuries containing mucin
3. Common lesions that may present with low signal intensity on T2WI - Focal nodular hyperplasia - Hepatocellular adenoma - Hepatocellular carcinoma - Cholangiocarcinoma - Metastases with and without mucin - Dysplastic / regenerative nodules - Hydatid cyst - Epithelioid hemangioendothelioma

**GIE212**
Focal Nodular Hyperplasia (FNH): Classification and Mimics, Findings at MR Imaging Correlating with Histopathology

**TEACHING POINTS**
- To demonstrate MRI characteristics of focal nodular hyperplasia and its classification (classic and non classic types).
- To educate participants regarding variety of lesions which mimic focal nodular hyperplasia along with histopathological correlation and ensure treatment and management of such lesions.

**TABLE OF CONTENTS/OUTLINE**
FNH is a hyperplastic process in which all normal constituents of liver are present but in an abnormally organized pattern.
presentation includes review of MR examination for characterization of liver lesions such as FNH and its mimics using dedicated MRI abdomen protocol. with and without contrast medium (Multihance) and hepatobiliary agents used for problem solving cases. Focal nodular hyperplasia is second most common benign liver tumor after hemangioma and is incidentally discovered during cross sectional imaging. FNH classification (Classic type 80% Non-classic type 20%) includes -Telangiectatic FNH -FNH with cytologic atypia -Mixed hyperplastic and adenomatous FNH IMICS HCC Fibrolamellar, Cholangiocarcinoma Hypervascular metastases. Hepatic adenoma Hemangioma Nodular regenerative hyperplasia. THID Conclusion: MRI is invaluable tool in diagnosing primary liver lesions such as FNH and its mimics due to its excellent soft tissue contrast and helpful in management of such conditions

GIE214

HCC- A to Z: A Comprehensive Review and Synopsis of Hepatocellular Carcinoma—A One Stop Shop!

Education Exhibits
Location: GI Community, Learning Center

Participants
Chandana G. Lall MD (Presenter): Nothing to Disclose
Puneet Bhargava MD : Editor, Reed Elsevier
Temel Tirkes MD : Nothing to Disclose
Priya Ranjit Bhosale MD : Nothing to Disclose
Sadna Verma MD : Nothing to Disclose
Joon-II Choi : Nothing to Disclose
Martin Roberto Goyenechea MD : Nothing to Disclose
Alampady Krishna Prasad Shanbhogue MD, MBBS : Nothing to Disclose

TEACHING POINTS
Pathophysiology, Genetic and phenotypic expression of HCC Classic Imaging parameters that aid in making the diagnosis of HCC Atypical Imaging features; A guide to making the correct diagnosis Imaging features and their prognostic implications Role of ultra high b value DWI if any Brief overview of current treatment options in non transplant candidates

TABLE OF CONTENTS/OUTLINE
CONTENT ORGANIZATION
Demographics of HCC Role of Imaging; Classic and Atypical Imaging features of HCC on MRI and CT
Genetics of HCC: Role for chemotherapy tailored to Genotype; Tumor markers in biphenootypic HCC; Progenitor cell markers including OATP, epCAM, K7, K19 etc Prediction of tumor prognosis by imaging parameters: size, presence of a capsule; Early rim enhancement, intralicesal fat, enhancement characteristics. TIWI characteristics, Eovist uptake, Halo or corona enhancement etc Treatment options: When, Why, How? TACE, TACE with drug eluting beads, Yttrium 90, Sorafenib

GIE215

Hepatic and Extrahepatic Metastatic Findings in Metastatic Uveal Melanoma: Making Sense of a Unique Malignancy

Education Exhibits
Location: GI Community, Learning Center

Participants
Amelia Wnorowski MD (Presenter): Nothing to Disclose
Flavius F. Guglielmo MD : Nothing to Disclose
Patrick L. O’Kane MD : Research Consultant, NPS Pharmaceuticals
Donald G. Mitchell MD : Consultant, CMC Contrast AB

TEACHING POINTS
1. The liver is usually the first metastatic site in uveal melanoma. There are common and uncommon appearances of liver metastases, some of which are almost unique to this disease.
2. There are common and uncommon locations of extrahepatic metastases. Many common locations of extrahepatic uveal melanoma metastases are infrequently seen with other malignancies.
3. Current therapies focus on controlling hepatic disease burden to improve survival. Imaging surveillance in these patients necessitates familiarity with the appearances of viable tumor and expected post-treatment change.
4. Abdominal MRI is particularly valuable in the diagnosis and follow-up of patients with metastatic uveal melanoma.
5. Awareness of the patterns of hepatic and extrahepatic uveal melanoma metastases can improve diagnostic accuracy.

TABLE OF CONTENTS/OUTLINE

GIE216

Hepatic Hemangiomas and Other Hemangiomatous Lesions: CT and MR Imaging Manifestations, Pitfalls and Problem-solving MR Techniques

Education Exhibits
Location: GI Community, Learning Center

Participants
Kenji Matsuzaki MD, PhD (Presenter): Nothing to Disclose
Mayumi Takeuchi MD, PhD : Nothing to Disclose
Masafumi Harada MD, PhD : Nothing to Disclose

TEACHING POINTS
1. Hepatic hemangiomas and other hemangiomatous tumors and tumor-like lesions may show characteristic clinical and imaging manifestations reflecting their pathologic features. Various degeneration in hemangiomas, and surrounding parenchymal changes may influence the imaging manifestations of hemangiomas.

2. Recognizing the various imaging manifestations of hemangiomas and other hemangiomatous lesions, and making an accurate diagnosis by using problem-solving MR techniques are important for appropriate management of patients.

**TABLE OF CONTENTS/OUTLINE**

Etiology, clinicopathologic features and imaging manifestations:
- Cavernous hemangioma (Typical, Small high-flow, Giant, Pedunculated)
- Sclerosed hemangioma and Solitary necrotic nodule as the end-stage of the disease
- Hemangiomatosis
- Angiomyolipoma / Epithelioid angiomyolipoma
- Angiosarcoma
- Peliosis hepatis

Degeneration of hemangiomas (Hyalinization, Cystic formation, Fibrosis, Calcification, Thrombosis)
Surrounding parenchymal changes (Co-existing fatty infiltration of the liver with peritumoral focal spared areas, peripheral parenchymal retraction, arterial-portal venous shunts)

Problem-solving MR techniques: Fat-saturation; Chemical shift imaging (CSI); DCE-MRI; DWI; SPIO-MRI; Gd-EOB-MRI

**GIE217**

**Hepatic Hemangiomas: Atypical Appearances and Imitators**

**Education Exhibits**
Location: GI Community, Learning Center

**Participants**

Kevin Firl (Presenter): Nothing to Disclose
Reena Chetna Jha MD: Consultant, CeloNova BioSciences, Inc

**TEACHING POINTS**

• Classic imaging features of hepatic hemangiomas
• Hepatic hemangiomas' atypical appearances on imaging
• Features of other uncommon hepatic lesions that simulate hemangiomas
• Importance of taking a history in indeterminate lesions

**TABLE OF CONTENTS/OUTLINE**

1. Classic imaging characteristics of hepatic hemangiomas a. unenhanced CT b. ultrasound c. Tc-99m labeled RBC Scan d. enhancement patterns i. interrupted/nodular ii. flash-filling iii. incomplete-filling iv. pathologic correlation 2. Atypical imaging appearances of hemangiomas a. the bright-dot sign b. intrahepatic arterio-portal shunting c. capsular retraction d. giant hemangiomas e. hyalinized hemangiomas f. hemangiomas in cirrhotic livers 3. Other uncommon hepatic lesions that may simulate hemangiomas a. hepatic sarcomas b. mucinous carcinoma metastasis c. epitheloid hemangioendothelioma d. peliosis hepatis 4. Importance of history taking a. adenoid cystic carcinoma metastasis case

**GIE219**

**Hepatocellular Carcinoma: The Evaluation after Therapy by Advanced Imaging Tools**

**Education Exhibits**
Location: GI Community, Learning Center

**Participants**

Masahiro Okada MD (Presenter): Nothing to Disclose
Yuko Iraha: Nothing to Disclose
KIMEI AZAMA: Nothing to Disclose
Kazushi Numata: Nothing to Disclose
Tomomi Koga: Nothing to Disclose
Sadayuki Murayama MD, PhD: Nothing to Disclose

**TEACHING POINTS**

1. To know the therapies for HCC, such as radio-frequency ablation (RFA), transcatheter arterial chemoembolization (TACE) and molecular targeted drug (Sorafenib).
2. To review typical and atypical findings of HCC on CT, US and MRI.
3. To know guidelines of response evaluation after HCC therapy.
4. To define diagnostic accuracy and difficulty for HCC recurrence after therapy on CT, US and MRI.
5. To know potential pitfalls and limitations of contrast enhanced CT, US and MRI in the diagnosis of HCC.

**TABLE OF CONTENTS/OUTLINE**

1. Morphology of HCC 2. Selection of HCC therapy • RFA • TACE • Molecular targeted drug (Sorafenib)

**GIE220**

**Imaging of Liver Tumors Treated with Thermoablation: Atypical is not Always Pathologic!**

**Education Exhibits**
Location: GI Community, Learning Center

**Participants**

Damien Bouda (Presenter): Nothing to Disclose
Maxime Ronot MD: Nothing to Disclose
Matthieu Lagadec MD: Nothing to Disclose
Blanche Bapst: Nothing to Disclose
Mohamed Abdel-Rehim MD: Nothing to Disclose
Gaspard D'Assignies MD: Nothing to Disclose
Vincent Barrau MD: Nothing to Disclose
**Valerie Vilgrain MD**: Nothing to Disclose

**TEACHING POINTS**

1. To review the spectrum of early and delayed normal imaging findings after thermoablation of hepatic tumors.
2. To know the main atypical presentations of ablation area, and to differentiate them from local tumoral progression or complications.
3. To know the schedule and imaging modalities of the patients’ follow-up.

**TABLE OF CONTENTS/OUTLINE**

1. Normal aspect of ablation area: - Differences between RFA and MWA - Imaging features (CT, MRI, US, CEUS, CBCT, and PET-CT) - Immediate, early, and delayed aspects - Identification of complete ablation / residual tumor - Interest of diffusion-weighted images - Imaging follow-up.
2. Atypical presentations: a - Ablation area: - Fatty tumors or scars - Presence of gas - Calcifications - Increase in size of the ablation area - Ghost lesion b - Adjacent liver modification: - Parenchymal retraction or atrophy - Infarction - Biliary and vascular modifications For each case, presentation of imaging features, clinical meaning, factors associated, and differentiation with main complications or local tumoral progression.

**GIE221**

**It’s all Relative! Vascular Invasion in Hepatocellular Carcinoma: Current Recommendations and Future Directions**

_Education Exhibits_

_Location: GI Community, Learning Center_

**Magna Cum Laude**

**Participants**

Gregor Martin Dunham MD (Presenter): Nothing to Disclose
Blake Carlson MD: Nothing to Disclose
Christopher Robert Ingraham MD: Nothing to Disclose
Mariam Moshiri MD: Consultant, Reed Elsevier Author, Reed Elsevier
Douglas S. Katz MD: Nothing to Disclose
Punet Bhargava MD: Editor, Reed Elsevier
Jabi E. Shriki MD: Nothing to Disclose
James Burnett Gardner MD: Nothing to Disclose

**TEACHING POINTS**

1. Malignant vascular invasion is a major prognostic factor and historically considered an absolute contraindication to hepatic resection.
2. Imaging signs such as “thread and streak sign” and “striated appearance” are key to the early detection in tumor thrombus.
3. New surgical techniques and multimodality treatments are increasingly being employed in the setting of vascular invasion.

**TABLE OF CONTENTS/OUTLINE**

1. Demonstrate vascular invasion appearance: US, MDCT, MRI, and angiography; with laparoscopic correlation.
2. Imaging helps to direct the most appropriate management strategy and surgical approach: hepatic vs. portal vein extension; assessing segmental involvement; vascular variants; and the future liver remnant.
3. Surgical options: right and left Hepatectomy; partial resection; two stage hepatectomy - portal vein embolization with delayed resection vs. associating liver partition and portal vein ligation for staged hepatectomy (ALPPS). Correlation with medical illustrations, gross pathology, and imaging will be provided.
4. Role of interventional radiology: palliative vs. adjunct to surgery. Newer studies indicate expanded role for catheter-directed therapy, Yttrium-90, cryoablation-assisted resection, portal vein embolization, and irreversible electroporation.

**GIE222**

**LI-RADS: An Essential Guide to the Radiologist**

_Education Exhibits_

_Location: GI Community, Learning Center_

**Participants**

Rita De Cassia Pereira MD: Nothing to Disclose
Antonio Eiras-Araujo MD: Nothing to Disclose
Jaime Araujo Oliveira Neto MD: Nothing to Disclose
Rosana Souza Rodrigues MD, PhD: Nothing to Disclose
Renata Mello Perez MD, PhD: Nothing to Disclose
Daniella Braz Parente MD (Presenter): Nothing to Disclose

**TEACHING POINTS**

1. Discuss the importance of LI-RADS implementation in cirrhotic liver MR exams as a tool for standardization of the reports.
2. Review the MR imaging criteria of LI-RADS 2013.1 version.
3. Illustrate the imaging feature observations according to each LI-RADS category.
4. Discuss the limitations and future perspectives of LI-RADS.

**TABLE OF CONTENTS/OUTLINE**

1. Introduction: importance of standardization.
2. LI-RADS 2013.1 version a. Review the important imaging features (mass-like configuration, arterial phase enhancement, “washout”, diameter, capsule, threshold growth, tumor in vein, treatment, non-HCC malignancy) b. Ancillary imaging features that favor HCC c. Ancillary imaging features that favor benignity d. Tie-breaking rules
3. Quiz

**GIE224**

**Liver Metastasis from Colorectal Cancer: What the Radiologists Must Know to Deliver the Best Treatment**

_Education Exhibits_

_Location: GI Community, Learning Center_
Participants
Yuko Nakamura MD (Presenter): Nothing to Disclose
Wataru Fukumoto: Nothing to Disclose
Yoko Kaichi: Nothing to Disclose
Yukiko Honda MD: Nothing to Disclose
Shuji Date: Nothing to Disclose
Kazuo Awai MD: Research Grant, Toshiba Corporation Research Grant, Hitachi Ltd Research Grant, Bayer AG Research Consultant, DAICHI SANKYO Group Research Grant, Eisai Co, Ltd

TEACHING POINTS

a. In patients with liver metastasis from colorectal cancer (LMCRC), surgical resection is the most effective, curative treatment. As both oncologic and functional outcomes are important, current treatment strategies must be understood.
b. Gadoxetate disodium (EOB)-enhanced MRI is the preferred modality for detecting LMCRC in untreated patients. PET-CT helps to identify distant metastases and local recurrence.
c. The prolonged administration of chemotherapy raises the risk for liver damage such as steatosis, sinusoidal injury, and steatohepatitis. Radiologists must be able to interpret imaging findings after treatments for LMCRC.

TABLE OF CONTENTS/OUTLINE

a. Overview of current strategies to treat LMCRC b. Characteristic CT-, MRI-, and PET/CT findings in patients with LMCRC c. Role of these imaging modalities in patients with LMCRC d. Evaluation of imaging findings to determine therapeutic effects

GIE226


Education Exhibits
Location: GI Community, Learning Center

Participants
Blake Carlson MD: Nothing to Disclose
Gregor Martin Dunham MD (Presenter): Nothing to Disclose
Christopher Robert Ingraham MD: Nothing to Disclose
Mariam Moshiri MD: Consultant, Reed Elsevier Author, Reed Elsevier
Douglas S. Katz MD: Nothing to Disclose
Puneet Bhargava MD: Editor, Reed Elsevier
Neeraj Lalwani MD: Nothing to Disclose
Chandana G. Lall MD: Nothing to Disclose

TEACHING POINTS

1. Five-year recurrence of hepatocellular carcinoma after resection is greater than 50%. 2. Understand the role of imaging in the work-up and management of recurrent HCC, including specific re-treatment considerations and the most current recommendations.

TABLE OF CONTENTS/OUTLINE

1. Brief review of surveillance recommendations and the role of imaging with laparoscopic correlation will be reviewed. 2. Recurrence patterns will be demonstrated on multi-modality imaging. 3. Post-treatment appearance: post resection and transplant anatomy; post transcatheater arterial chemoembolization (TACE); radiofrequency ablation (RFA); and Yttrium-90 (Y-90) changes will be reviewed with associated imaging, illustrations, videos and 3-D reconstructions. 4. Understand algorithmic management: location, extent, and size; anatomical variants - vascular and post-surgical; future liver remnant; and patient co-morbidities. 5. Current management, contraindications, and controversies: repeat liver resection, liver transplantation, TACE, RFA, Y-90, multikinase inhibitors (such as Sorafenib). Role of portal vein embolization and associating liver partition and portal vein ligation for staged hepatectomy (ALPPS). Gross pathology correlation will be provided and reviewed.

GIE227

Optimal Imaging Method of Preoperative 3DCT for Malignant Liver Tumors

Education Exhibits
Location: GI Community, Learning Center
Certificate of Merit

Participants
Kouhei Harada RT (Presenter): Research Consultant, Nemoto Kyorindo Co, Ltd
Syuichi Honma RT: Nothing to Disclose
Ayaka Chiba: Nothing to Disclose
Yoshiya Oohashi: Nothing to Disclose
Tatsuya Imai: Nothing to Disclose
Masanitsu Hatakena MD, PhD: Research Grant, Toshiba Corporation
Toru Mizuguchi: Nothing to Disclose
Koichi Hirata MD: Nothing to Disclose

TEACHING POINTS

1. Demonstrate the necessity of preoperative 3DCT simulation
2. Advantages/disadvantages of the scanning method
3. Description of methods using clinical data for creating 3D fusion images necessary for preoperative simulation

TABLE OF CONTENTS/OUTLINE

Necessity of 3DCT Providing required preoperative information for simulation Automatic liver area classification using workstations Liver volume analysis Optional Scan Conditions Determining optimal scan timing for hepatectomy Optimal contrast media volume Noise reduction using iterative reconstruction Benefits of 3D images for preoperative simulation Providing accurate tumors and vessel locations Liver resection line determination Remnant liver volume measurement Summary
Technical innovations in workstations have made it possible to generate important images before liver surgery. Workstations provide advance information including residual liver volume prediction, precise vascular anatomy, and depiction of accurate liver sections/segments to prevent postoperative liver failure and other surgical complications. The optimal conditions using contrast media and image capture timing are important for obtaining appropriate 2D images. All planned processes and conditions are necessary to create informative 3D images to simulate potential liver surgery approaches.

**GIE228**

**Peritumoral Enhancement of Hepatic Tumors and Tumorous Lesions: Analysis Based on the Hemodynamics Evaluated by Angiography-assisted CT and Histopathology**

*Education Exhibits*

*Location: GI Community, Learning Center*

*Certificate of Merit*

### Participants

- Kazuto Kozaka MD (Presenter): Nothing to Disclose
- Satoshi Kobayashi MD: Nothing to Disclose
- Junichiro Sanada: Nothing to Disclose
- Wataru Koda: Nothing to Disclose
- Tetsuya Minami MD: Nothing to Disclose
- Azusa Kitao: Nothing to Disclose
- Dai Inoue: Nothing to Disclose
- Norihide Yoneda: Nothing to Disclose
- Kotaro Yoshida MD: Nothing to Disclose
- Kazuhiko Ueda MD: Nothing to Disclose
- Toshifumi Gabata MD: Nothing to Disclose

### TEACHING POINTS

Understanding the features of peritumoral enhancement with underlying hemodynamic and pathologic changes in dynamic contrast enhanced imaging is essential for differential diagnosis and for realizing pathophysiology of hepatic tumor or tumorous lesions.

### TABLE OF CONTENTS/OUTLINE

- Outlines 1. Blood flow imaging techniques i. Dynamic CT/MRI, Contrast enhanced US ii. Angiography, Angiography assisted CT (CT during hepatic portoarteriography (CTAP), CT during hepatic arteriography (CTHA) and single level dynamic CTHA (SLD-CTHA)) 2. The classification of peritumoral hemodynamics based on angiography assisted CT i. Delayed ring/corona shaped peritumoral enhancement after the tumor enhancement ii. Early wedge or fan shaped peritumoral enhancement iii. Early ring shaped peritumoral enhancement iv. No or minimal peritumoral enhancement in a hypervascular tumor 3. The classification of tumor/surrounding hepatic parenchyma interface pathology i. Fibrous encapsulation pattern ii. Compressive pattern iii. Replacing infiltration pattern iv. Others 4. Correlation between peritumoral hemodynamics and interface pathology 5. Representative case review with special reference to conventional blood flow imaging

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**GIE230**

**Rare Primary Liver Tumors: Magnetic Resonance Imaging and Pathological Correlation**

*Education Exhibits*

*Location: GI Community, Learning Center*

### Participants

- Faramarz Edalat MD (Presenter): Nothing to Disclose
- Nima Kokabi MD: Nothing to Disclose
- Juan Camilo Camacho: Nothing to Disclose
- Courtney Ann Coursey Moreno MD: Nothing to Disclose
- Pardeep Kumar Mittal MD: Nothing to Disclose

### TEACHING POINTS

The purpose of this exhibit is to: • Explain the role of MRI as an invaluable tool in diagnosing rare liver tumors and its mimics due to its excellent soft tissue contrast • Review MR imaging characteristics of rare liver tumors • Understand the pathological correlation of rare liver tumors with their MR imaging findings • Discuss the role of MR imaging in supporting effective treatment decision making

### TABLE OF CONTENTS/OUTLINE

- Basic approaches to rare liver tumors • MRI protocol for evaluation of rare liver tumors • MR imaging features and pathological correlation of rare liver tumors including epithelioid hemangioendothelioma, hepatic angiosarcoma, biliary cystadenoma and cystadenocarcinoma, primary hepatic lymphoma and neuroendocrine tumors, and angiomyolipoma • Treatment approaches based on MRI findings • Conclusion

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**GIE231**

**Role of Imaging in Staging, Management and Follow-up of Patients with Hepatocellular Carcinoma (HCC) based on the Barcelona Clinic for Liver Cancer (BCLC) Staging System**

*Education Exhibits*

*Location: GI Community, Learning Center*

### Participants

- Asha Kandathil MD (Presenter): Nothing to Disclose
- Peter Shou-Cheng Liu MD: Nothing to Disclose
- William J. Weadock MD: Owner, Weadock Software, LLC
- Hero Kamal Hussain MD: Consultant, Bayer AG
TEACHING POINTS

1. BCLC staging system for hepatocellular carcinoma
2. Role of magnetic resonance imaging (MRI) in diagnosis and staging of HC
3. Treatment options available for various BCLC stages of HCC with focus on loco-regional therapeutic options such as percutaneous ablation, transarterial chemoembolization (TACE), radioembolization, stereotactic radiotherapy
4. Role of MRI in assessing therapeutic response in HCC

TABLE OF CONTENTS/OUTLINE

1. Overview of BCLC staging system for hepatocellular carcinoma
2. Case based presentation of various BCLC stages of HCC illustrating
   - MRI evaluation of tumor extent
   - appropriate loco-regional therapies
   - follow up MRI assessing post therapeutic response

GIE232

Spectrum of Hepatic Tumors with Delayed Extracellular Enhancement Effect on Hepatobiliary Phase of EOB-enhanced MRI: MR-pathologic Correlation

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Tatsuyuki Tonan MD (Presenter): Nothing to Disclose
Kiminori Fujimoto MD, PhD: Nothing to Disclose
Tatemoto Kumabe: Nothing to Disclose
Shuji Nagata MD: Nothing to Disclose
Aiko Sumi MD: Nothing to Disclose
Masafumi Uchida MD, PhD: Nothing to Disclose
Osamu Nakashima: Nothing to Disclose
Koji Okuda: Nothing to Disclose
Toshi Abe MD: Nothing to Disclose

TEACHING POINTS

1. To understand two enhancement patterns (types of gradual and persistent) of hepatic tumors on EOB-enhanced MRI for predicting pathologic characteristics (distribution and amount of intratumoral fibrous stroma, micro-vessels, and tumor cell).
2. To illustrate various tumors with each enhancement pattern.

TABLE OF CONTENTS/OUTLINE

Gd-EOB-DTPA combines the properties of a conventional non-specific extracellular and a hepatocyte-specific contrast agent. In this presentation, we evaluate the pathological characteristics of various hepatic tumors, which show extracellular enhancement effect on hepatobiliary phase, such as cholangiocellular carcinoma, cholangiolocellular carcinoma, sarcomatous/sclerosing hepatocellular carcinoma, neuroendocrine tumors including carcinoid tumor and carcinoma, and primary hepatic lymphoma. They have various dynamic enhancement pattern (i.e., gradual and persistent enhancement) and variable delayed extracellular enhancement pattern on hepatobiliary phase according to various distribution and amount of intratumoral fibrous stroma, micro-vessels and tumor cell. While these imaging findings are not specific finding, to understand these imaging findings are helpful in diagnosis of hepatic tumors. Furthermore, evaluation of the intratumoral fibrous stroma may aid prognostic prediction of hepatic malignant tumor.

GIE234

Texture Analysis of Solid Abdominal Neoplasms: A Primer

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Adeel Rahim Seyal MD (Presenter): Grant, Siemens AG
Atilla Arslanoglu MD: Grant, Siemens AG
Yuri Velitchko PhD: Nothing to Disclose
Samir Abboud MD: Nothing to Disclose
Thomas Patrick O’Donnell: Researcher, Siemens AG
Vahid Yaghmai MD: Nothing to Disclose

TEACHING POINTS

Texture analysis applies advanced mathematical models to characterize lesions, thus advancing image analysis to the level where the human eye cannot reach. This exhibit will review the concepts and applications of this promising tool. We will also discuss its role as an imaging biomarker in abdominal imaging, adding information not readily accessible by visual analysis alone.

TABLE OF CONTENTS/OUTLINE

• The pixel and its numerical information • The limits of human sight • The noise in imaging • Filters • Statistical models used to characterize abdominal tumor texture • Model based and transform-based methods • Illustration of the current application of
GIE235

The Liver in Oncology: Metastasis and Post-Treatment Changes

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Maria Isabel Puig-Povendano (Presenter): Nothing to Disclose
EDUARD ANDIA: Nothing to Disclose
Ana Sanchez Marquez MD: Nothing to Disclose
Eva Maria Merino Serra MD: Nothing to Disclose
David Martinez De La Haza MD: Nothing to Disclose
David Coca Castro RN, RT: Nothing to Disclose
Maria Gonzalez Alvarez: Nothing to Disclose

TEACHING POINTS
The increase in treatment possibilities and the survival improvement in metastatic disseminated diseases urges radiologists to a more accurate description in number, location and vascular relations of liver metastasis.

Familiarization with posttreatment changes relating to local therapy (surgery, radiofrequency, stereotactic body radiation therapy or transarterial chemoembolization) and after systemic treatment, (with typical conventional cytotoxic agents or molecular targeted therapy) is mandatory for the oncological radiologist.

Due to the increasing use of new molecular targeted therapy, features such as attenuation and contrast intake have to be taken into account when evaluating posttreatment response, besides morphologic parameters.

TABLE OF CONTENTS/OUTLINE
- Spectrum of findings in pretreatment metastatic lesions, focusing on MRI characteristics. - MRI as the most accurate imaging modality in the detection and characterization of small lesions: DWI and biliary elimination contrasts. - Posttreatment changes in liver parenchyma: steatosis, pseudocirrhosis, nodular regenerative hyperplasia. - Posttreatment changes in metastatic lesions: Conventional chemotherapy, cytotoxic effects, RECIST evaluation. Molecular targeted chemotherapy changes in attenuation and vascularity: CHOI, Bevacizumab, immunomodulatory therapy.

GIE236

To Resect or Not to Resect: The Role of Preoperative Imaging for Evaluation of Colorectal Hepatic Metastases

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Nathan P. Hannemann DO: Nothing to Disclose
Michael Jason Reiter DO (Presenter): Nothing to Disclose
Ryan Becton Schwope MD: Nothing to Disclose
Christopher Joseph Lisanti MD: Royalties, Wolters Kluwer nv
Peter A. Learn MD: Nothing to Disclose

TEACHING POINTS
1. Resection of liver-limited metastases from colorectal cancer is the current standard of care.
2. Selection criteria for hepatic resection of colorectal metastases include: attainability of complete removal of gross disease; adequate liver functional reserve following surgery (minimum of 25% of healthy liver in normal patients); and at least two contiguous hepatic sectors with sufficient vascular inflow and outflow.
3. More than 3 masses, masses 5 cm or greater, and bilobar disease are negative prognostic factors but not exclusion criteria for resection.
4. MRI is superior for the detection and characterization of liver metastases from colorectal cancer.

TABLE OF CONTENTS/OUTLINE
1. Rationale for surgical treatment of colorectal hepatic metastases
2. Criteria used to select patients that will benefit from resection
A. Historic criteria
B. Current criteria
3. Spectrum of imaging appearances of colorectal hepatic metastases
4. Review sensitivities of various modalities (CT, MRI, PET)
5. Critical radiologic features which impact the surgeon’s decision
A. Number and location of the metastatic lesions
B. Total volume of metastatic lesions and volume of expected normal remaining hepatic parenchyma following resection
C. Proximity to portal vein, hepatic artery, biliary tree

GIE237

Understanding Gd-EOB-DTPA-enhanced MR Imaging of the Liver: Practical Approaches and Pitfalls

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Tsutomu Tamada MD, PhD (Presenter): Nothing to Disclose
Katsuoshi Ito MD: Nothing to Disclose
TEACHING POINTS

To understand the pharmacologic characteristics of Gd-EOB-DTPA (EOB) To demonstrate the optimal protocol of EOB-enhanced MR imaging for the correct diagnosis of hepatocellular nodules in the chronic hepatitis or liver cirrhosis To illustrate the pitfalls of EOB-enhanced MR imaging for the detection of hepatocellular nodule in patients with chronic liver disease

TABLE OF CONTENTS/OUTLINE

Pharmacologic characteristics of EOB - Pharmacokinetics - Comparison with Gd-DTPA - EOB-related acute transient dyspnea - Low tissue deposition of gadolinium in EOB Optimization of EOB-enhanced MR imaging protocol - Vascular phase imaging: Arterial phase imaging; injection rate, imaging timing, multiphase acquisition Interpretation on equilibrium phase - Hepatobiliary phase (HP) imaging: timing of acquisition, optimal flip angle, effect of hepatic function - Idea for shorten examination time - Proper protocol for the detection of hepatocellular nodules Pitfalls - Typical EOB-enhanced MR imaging findings reflecting multi-step hepatocarcinogenesis - Early enhancing lesions showing hypointensity on HP mimicking hypervascular HCC - Nodules showing high signal intensity on HP - Peripheral low intensity sign (target sign) on HP - Periportal high intensity sign on HP

GIE238

Update on Hepatocellular Carcinoma (HCC): Categorization and Histopathologic Correlation

Education Exhibits
Location: GI Community, Learning Center

Participants

Eduardo Jose Matta MD (Presenter): Research Consultant, Pacific-Link Consulting
Venkateswar Rao Surabhi MD : Nothing to Disclose
Verghese George MBBS : Nothing to Disclose
Varaha Tammisetti MD : Nothing to Disclose

TEACHING POINTS

1. Review imaging characteristics of HCC on MDCT and DCE-MRI 2. Review HCC staging as it pertains to liver transplantation with attention 3. Categorize liver lesions according to OPTN/UNOS and LI-RADS criteria with special attention to new recommendations and policy changes 4. Correlate imaging characteristics to histopathologic samples 5. Describe imaging mimics and practical aids to accurately assessing for HCC

TABLE OF CONTENTS/OUTLINE


GIE240

What You Need to Know About the Alphabet Soup of Hepatocellular Carcinoma Imaging

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants

Atilla Arslanoglu MD (Presenter): Grant, Siemens AG
Adeel Rahim Seyal MD : Grant, Siemens AG
Azize Sahin MD : Nothing to Disclose
Fernanda Dias Gonzalez Guindalini MD : Nothing to Disclose
Frank H. Miller MD : Nothing to Disclose
Vahid Yaghmai MD : Nothing to Disclose

TEACHING POINTS

Hepatocellular carcinoma (HCC) is the most common primary liver tumor in adults. The American Association for the Study of Liver Diseases (AASLD), the European Association for the Study of the Liver (EASL), Liver Imaging Reporting and Data System (LI-RADS), Model for End Stage Liver Disease (MELD), Milan criteria, modified Response Evaluation Criteria in Solid Tumors (mRECIST), Organ Procurement and Transplant Network (OPTN) and United Network for Organ Sharing (UNOS) have laid down guidelines for HCC. Our exhibit will review how and what these guidelines/organizations mean to the practice of abdominal imaging. This exhibit will "unlock" the current complexities of this process and familiarize abdominal radiologists with nuances that affect management of patients with chronic liver disease at risk for HCC.

TABLE OF CONTENTS/OUTLINE

• Brief introduction of the guidelines • Diagnosis of HCC based on the available recommendations • Guidelines used to determine treatment and response assessment of HCC • Policies to decide liver transplant allocation in patients with HCC • Comparison between different practice guidelines • Role of these criteria in clinical radiology • Pitfalls of different guidelines

GIE241

A Lesson Well Remembered: Gastrointestinal Pathology Presenting to the Gynaecologist

Education Exhibits
Location: GI Community, Learning Center

Participants

Preeti Arora MBBS (Presenter): Nothing to Disclose
TEACHING POINTS

1. Illustrate the importance of peritoneal anatomy & pattern recognition. 2. Demonstrate the wide range of, common & uncommon, gastrointestinal pathologies presenting with gynaecological symptoms. 3. Illustrate how careful interpretation of the imaging findings with clinical history can aid timely correct diagnosis & appropriate therapy initiation. 4. Highlight potential pitfalls.

TABLE OF CONTENTS/OUTLINE

1. Etiology of common & uncommon gastrointestinal pathology which may present with gynaecological symptoms. 2. Review main learning points for gynaecological radiologists. Case examples to include MIMICS of: • Cervical Malignancy (appendicular mucinous tumour, rectosigmoid cancer perforating into the vagina) • Ovarian Mass (spigelian hernia, Krukenberg tumours from GI malignancy) • Ovarian Cyst (sigmoid mesenteric cyst, appendicular mucoele) • Peritoneal Ovarian Metastases (stomach, pancreas & lower GI cancers) • Vulval Malignancy (anal carcinoma) • Vaginal Discharge (colovaginal fistula & pyometra secondary to diverticular abscess/malignancy) At the end of this exhibit the viewer should understanding that locating the lesion epicentre & understanding the pattern of peritoneal spread aids identification of cases in which underlying GI pathology accounts for the presenting gynaecological symptoms.

GIE242

A Review of MR Defecography: A Case-based Discussion of How to Perform and Interpret

Education Exhibits
Location: GI Community, Learning Center

Participants
J. Daniel Giardina MD (Presenter): Nothing to Disclose

TEACHING POINTS
To review the indications, anatomy, protocol, diagnostic imaging, and common pathologies encountered.

TABLE OF CONTENTS/OUTLINE
A. Clinical Indications/Epidemiology B. Anatomy C. MR Protocols/Procedure D. How to Interpret E. Case Examples of Common Pathologies

GIE244

Advanced Iterative Model Reconstruction in Improving Image Quality of CT Abdomen

Education Exhibits
Location: GI Community, Learning Center

Participants
Kenneth K. Lau (Presenter): Nothing to Disclose
Eileen C. Ang MBBS, BMedSc : Nothing to Disclose
Nicholas David Ardley : Nothing to Disclose
Kevin Buchan : Employee, Koninklijke Philips NV

TEACHING POINTS
Multiple reconstructive techniques including different forms of iterative reconstructions (IR) improve image quality (IQ)/spatial resolution whilst reducing radiation dose in CT. The latest iterative model reconstruction (IMR) is a knowledge-based algorithm with improved low contrast resolution and produces relatively noise-free images. Improved IQ greatly aids solid organ lesion detection and hence improves patient outcome. The aim of this exhibit is to assess the diagnostic utility of IMR in CT of abdomen.

TABLE OF CONTENTS/OUTLINE
The CT data sets of 100 patients (mean age of 68) were reconstructed using IMR and iDose IRs. 1. The image noise using SD of attenuation values of liver was significantly improved by 41.3% from iDose to IMR and 39-71% in other organs. 2. The margins and internal architecture of lesions in liver, kidneys and other solid organs were better defined in IMR. There was significant improvement of IQ assessment of liver lesion with Mann-Whitney test. 3. The ureteric visualization and calculus detection, and blood vessel details were enhanced on IMR due to reduction of image noise in the adjacent fat. IMR is superior to conventional iterative reconstruction by producing relatively ‘noiseless’ CT images that enables better lesion detection.

GIE245


Education Exhibits
Location: GI Community, Learning Center

Participants
Rafael Morcillo Carratala MD (Presenter): Nothing to Disclose
Victor Rodriguez MD : Nothing to Disclose
Paula Maria Hernandez Guilabert MD : Nothing to Disclose
Lina Marcela Cruz Hernandez ARRT : Nothing to Disclose
Ximena Aragon Tejada MD : Nothing to Disclose
Luis Garcia Sanz : Nothing to Disclose

TEACHING POINTS
The aim of this exhibit is:
1. To illustrate the normal anatomy and most common anomalies and diseases of the esophagus obtained with barium esophagogram.
2. To demonstrate that barium studies are still the gold standard for the diagnosis of many esophageal pathologies.

**TABLE OF CONTENTS/OUTLINE**

- Anatomy and terminology of the esophagus with barium studies
- Imaging findings of esophageal anomalies and pathologies with barium studies
- Impressions: physiological (aortic arch, left main bronchus, heart), vascular (aberrant right subclavian artery, right aortic arch, double aortic arch, right aortic arch with aberrant left subclavian artery, uphill esophageal varices), extrinsic (cardiomediastinal with left atrial enlargement, multinodular goiter with intrathoracic extension).
- Indentations: esophageal web, cricopharyngeal achalasia, large anterior cervical osteophytes, Schatzki ring, muscular or contractile or A ring
- Diverticula: Zenker diverticulum, epiphrenic diverticulum, midesophageal diverticula
- Motility disorders: presbyesophagus, achalasia, diffuse esophageal spasm
- Strictures: peptic, neoplasm, corrosive ingestion, radiation esophagitis, idiopathic eosinophilic esophagitis
- Intramural benign tumors: leiomyoma and others

**GIE246**

**Calcified Abdominal Mesenteric Masses: A Differential Diagnosis**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

- Saro Manoukian MD (Presenter): Nothing to Disclose
- Nicholas H. Shaheen MD: Nothing to Disclose
- Daniel Kowal MD: Nothing to Disclose

**TEACHING POINTS**

The goals of this exhibit are as follows:
1. Explore the broad differential of calcified intra-abdominal mesenteric masses.
2. Review the characteristic CT imaging calcification patterns of these various masses including an emphasis on clinical history in order to improve diagnostic accuracy.

**TABLE OF CONTENTS/OUTLINE**

1. Review the broad differential diagnosis of calcified intra-abdominal masses.
   - Carcinoid
   - Treated lymphoma
   - Retractile mesenteritis
   - Metastatic disease
   - Ovarian serous cystadenocarcinoma
   - Osteosarcoma/chondrosarcoma
   - Pseudomyxoma peritonei
   - Granulomatous disease
     - Tuberculosis
     - Sarcoidosis
   - Desmoid
   - Mesenteric gastrointestinal stromal tumor/retroperitoneal leiomyomatosis
   - Cystic lymphangioma
2. Review the characteristic imaging findings of the aforementioned entities combined with relevant clinical history to help guide the radiologist in improving diagnostic accuracy, thereby guiding the clinician towards appropriate patient management and therapy.

**GIE247**

**Classical Gas: What Every Radiologists Needs to Know about Unusual Gas in the Abdomen**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

- Kathryn Darras MD (Presenter): Nothing to Disclose
- Tim O'Connell MD, Meng: President, Resolve Radiologic Ltd
- Silvia D. Chang MD: Nothing to Disclose
- Alison Clare Harris MBChB: Nothing to Disclose

**TEACHING POINTS**

1. To review the pathogenesis, MDCT appearance, pathogenesis, differential diagnosis, and management of abnormal gas encountered in the abdomen by organ system.

**TABLE OF CONTENTS/OUTLINE**

1. Pneumoperitoneum
   - Iatrogenic
   - Blunt
   - Penetrating
   - Pneumoretroperitoneum
   - Liver
   - Portal venous gas
   - Sphincter of Oddi incompetence
   - Gallstone ileus
2. Trauma
   - Gallbladder
   - Gallbladder injury
   - Empysematous cholecystitis
   - Perforated cholecystitis
   - Peritoneal fluid
   - Pancreatitis
   - Iatrogenic
   - Abcess
   - Duodenal diverticulum
   - Enteropancreatic fistula
   - Spleen
   - Enteric fistula
   - Macrocobalamin 2.6
   - Pneumatisis intestinalis 2.6.1
   - Bowel necrosis
   - Mucosal disruption
   - Increased mucosal permeability
   - Pulmonary disease
   - Kidneys
   - Peri-renal abscess
   - Perinephric emphysema
   - Pyelonephritis
   - Pyelitis
   - Carcinoma
   - Urinary Bladder
   - Iatrogenic
   - Trauma
   - Enteric fistula
   - Infection
   - "Edge of the film"
   - Soft tissues
   - Iatrogenic
   - Dissecting pneumomediastinum
   - Bones
   - Vertebral fracture
   - Abscess
   - Mimics
   - Chilaiditi syndrome
   - Hernias

**GIE248**

**Diffusion-weighted Imaging in the Gastrointestinal Tract and Peritoneum: How, When, and Why?**

**Education Exhibits**

**Location:** GI Community, Learning Center

Certificate of Merit

**Participants**
TEACHING POINTS

Diffusion-weighted imaging (DWI) is a magnetic resonance technique that gives us functional information about the analyzed tissues. Used in conjunction with other sequences available, it helps us to detect and characterize the lesions and even to predict a possible response to the specific treatments.

The aim of this exhibit is:
- To explain the principles of diffusion-weighted imaging in a friendly way.
- To know the limitations, the advantages and the tricks of this technique.
- To illustrate the specific findings of DWI in the gastrointestinal tract and peritoneum in a variety of conditions including malignant and benign processes.
- To discuss the specific clinical situations in which DWI is useful for pre- and post-treatment assessment.

TABLE OF CONTENTS/OUTLINE

1. Principles of DWI 2. When and why to use this technique 3. Important DWI findings by entities: a) Inflammatory conditions: inflammatory bowel disease, acute diverticulitis, appendicitis, colitis. b) Neoformative conditions: benign (poliposis) and malignant (gastric tumors, small bowel tumors, colorectal tumors, lymphoma) 4. Take home points

GIE249

Expecting the Unexpected: A Survey of Intraluminal Foreign Bodies in the Gastrointestinal Tract

Education Exhibits

Location: GI Community, Learning Center

Participants

Jay A. Karajgikar MD (Presenter): Nothing to Disclose
Sushma Gaddam BS: Nothing to Disclose
Barak Friedman MD: Nothing to Disclose
Douglas S. Katz MD: Nothing to Disclose
John J. Hines MD: Nothing to Disclose

TEACHING POINTS

1. To recognize and become familiar with various foreign objects in the gastrointestinal tract, including objects or devices that are purposefully placed through surgery or endoscopy as well as accidentally ingested foreign objects. 2. To become familiar with complications associated with foreign objects, including migration, intussusception, perforation, obstruction, hemorrhage and abscess formation, and implications for patient management.

TABLE OF CONTENTS/OUTLINE

1. Background and epidemiology of gastrointestinal foreign bodies (Incidence, race/gender predilection, affected populations, morbidity/mortality). 2. Discussion of intra-luminal foreign bodies in three separate sections (Pathologic, Iatrogenic, Ingested) with numerous examples of each detailing imaging findings, treatment implications, and potential complications. 3. Pathologic foreign bodies (e.g. bezoar, gallstone ileus). 4. Iatrogenic foreign bodies with normal imaging findings and complications. - Complications include malpositioning, stent migration and occlusion, intussusception, perforation, obstruction. 5. Ingested foreign bodies (accidental or purposeful) with complications. - Complications include abscess, perforation, bowel obstruction, vessel thrombosis. - Examples of pathology mimicking foreign bodies and vice versa. 6. Summary and conclusions.

GIE250

Extranodal Manifestations of Abdominal Lymphoma

Education Exhibits

Location: GI Community, Learning Center

Participants

Hannes Devos (Presenter): Nothing to Disclose
Frederik Vandenbroucke MD: Nothing to Disclose
Lode Ry Goethals MD: Nothing to Disclose
Yannick De Brucker: Nothing to Disclose
Bart Ilsen MD: Nothing to Disclose
Johan De Mey: Research Grant, General Electric Company

TEACHING POINTS

1. Differentiate between the different extranodal abdominal presentations of lymphoma.
2. Illustrate the imaging features of lymphoma in the liver, pancreas, spleen, kidney, adrenal, gastro-intestinal system and bladder.
3. Discuss the pitfalls and most common differential diagnoses.

TABLE OF CONTENTS/OUTLINE

1. Pathophysiology of different types of lymphoma, such as HL and NHL. 2. Review of the imaging features of lymphoma using CT and MRI, based on the organ in which the disease manifests itself. 3. Best diagnostic clues. 4. Summary.
Gastro Intestinal Stromal Tumours Reexplored—Many Orthodox and Unorthodox Avatars: A Pictorial Essay

Education Exhibits
Location: GI Community, Learning Center

Participants
Rammohan Vadapalli MD (Presenter): Nothing to Disclose
Abhijit Roychowdhury MD: Nothing to Disclose
Harshavardhan KR MD: Nothing to Disclose
Abhinav Sriram Sriram Vadapalli: Nothing to Disclose
Pramod Kumar Reddy Kaila MD: Nothing to Disclose

TEACHING POINTS
To high light the cardinal Imaging features of Gastro intestinal Stromal tumours with Pattern recognition approach on CT, MRI and PET-CT with Radio Pathological correlation. Familiarize the viewer with Spectrum of atypical Manifestations of GIST with Illustrative examples Pathophysiology and Concepts of GIST at a Glance Magnetic resonance imaging (MRI) Imaging Avatars of GISTs: The masses tend to be isointense relative to skeletal muscle on T1-weighted images and hyper intense on T2-weighted images. Signal-intensity voids if gas in the tumour MR findings vary, owing to the degree of necrosis and haemorrhage. The solid components of the tumour show Heterogeneous enhancement Post contrast T1 images.

TABLE OF CONTENTS/OUTLINE
- Cardinal CT and MRI findings of GIST are described with clinical Examples with a emphasis on Pattern Recognition-Endoluminal, Exophytic / ExoEnteric with homogenous CT attenuation - Atypical Features like large size, Heterogeneity, Enhancing borders, Multiloculated cystic Pattern Calcifications, necrosis, bubble-lucencies, matrix air, Fluid Fluid levels Adjacent visceral Invasion are Illustrated with a brief discussion on Differential Diagnosis - GISTs with Hepatic, peritoneal and Bone metastases are highlighted to familiarize the viewer with the malignant Variant.

GIE253
Getting at the Heart of the Matter: The Heart in Abdominal Disease

Education Exhibits
Location: GI Community, Learning Center

Participants
Joseph Mansour (Presenter): Nothing to Disclose
Sanjeev Bhalla MD: Nothing to Disclose
Kristopher W. Cummings MD: Research Consultant, Biomedical Systems Research Consultant, Medtronic, Inc
Fernando R. Gutierrez MD: Nothing to Disclose
Julie Tanios el-Ferzli MD: Nothing to Disclose
Christine O. Menias MD: Nothing to Disclose
Rita Chahinian MD: Nothing to Disclose

TEACHING POINTS
1. Review abdominal entities that may result in cardiac manifestations
2. Review cardiac entities that may result in abdominal manifestations

TABLE OF CONTENTS/OUTLINE
1. Introduction
2. Case-Based Review: Cases of Cardiac manifestations of abdominal entities

SUMMARY
The heart is included in every cross-sectional study of the abdomen. Radiologists must include it in their search pattern as it may be involved with abdominal diseases and in certain situations, a cardiac finding may explain the abdominal ones.

GIE255
How to Manage a Splenic Nodule?

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Catherine Ridereau-Zins MD (Presenter): Nothing to Disclose
Julien Hoareau MD: Nothing to Disclose
Patrick Tchouante: Nothing to Disclose
Cosmina Raluca Nedelcu MD: Nothing to Disclose
Christophe Aube MD, PhD: Speaker, Bayer AG Support, General Electric Company

TEACHING POINTS
1. to explain how to characterise a splenic nodule on different imaging techniques
2. to discuss how to integrate clinical and biological data and associated lesions to obtain the diagnosis
3. to explain how and when to perform US-guided splenic biopsy
4. to review the main etiologies

TABLE OF CONTENTS/OUTLINE

- How to manage a splenic nodule
- How to characterise on imaging cystic or solid lesions
- How far to go
- Conclusion: Diagnosis is not easy without clinical data. Some lesions can be identified easily: cysts, hemangioma. US-guided splenic biopsy can be performed in case of doubt. Rare etiologies can be suggested rarely.

GIE256

Imaging of Gastrointestinal Stromal Tumors (GIST) and Associated Syndromes

Education Exhibits
Location: GI Community, Learning Center

Participants
- Angela Hissae Motoyama Caiado MD: Nothing to Disclose
- Gisele Warmbrand MD: Nothing to Disclose
- Carlos Alberto Matsumoto MD: Nothing to Disclose
- Dario Ariel Tiferes MD (Presenter): Nothing to Disclose
- Gustavo S.P. Meirelles MD, PhD: Partner, DICOM Grid Stockholder, Fleury Group
- Rogerio Caldana MD, PhD: Nothing to Disclose

TEACHING POINTS

1. Identify the typical imaging findings of GIST at initial presentation and after treatment.
2. Recognize associated syndromes.
3. Discuss the differential diagnosis.

GIE259

Infectious Mimics of Abdominal Neoplasms: What to Look for

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
- Jessica J. Kraeft MD (Presenter): Nothing to Disclose
- Peter F. Hahn MD, PhD: Stockholder, Abbott Laboratories Stockholder, Covidien AG Stockholder, CVS Caremark Corporation Stockholder, Kimberly-Clark Corporation Stockholder, Landauer, Inc

TEACHING POINTS

1. Infection can present as mass-like lesions in the liver, spleen, gallbladder and gastrointestinal tract, mimicking neoplasm. 2. Imaging findings suggesting infection will be described.

GIE260

Infiltrative Disease of the Mesentery: Beyond the Misty Mesentery

Education Exhibits
Location: GI Community, Learning Center

Participants
- Michael Leigh Wells MD (Presenter): Nothing to Disclose
- Thomas Duncan Atwell MD: Nothing to Disclose
- Jeff L. Fidler MD: Nothing to Disclose
- John M. Barlow MD: Nothing to Disclose
- Sudhakar Kundapur Venkatesh MD, FRCR: Nothing to Disclose
- Patrick Wade Eiken MD: Nothing to Disclose

TEACHING POINTS

1) A "misty" or infiltrative appearance of the mesentery may be due to multiple etiologies with considerable variation in clinical management; categories include hemorrhage, edema, lymphatic fluid, protein, fibrosis, inflammation, and tumor ("HELPFIT").
2) Clinical history and additional findings such as lymphadenopathy, solid mass or abnormalities of the abdominal organs will help to narrow the differential diagnosis.

**TABLE OF CONTENTS/OUTLINE**

Intro - Definition of imaging findings and general categories of disease
Categories and case examples

- **Hemorrhage**: Trauma, aneurysm
- **Edema**: Anasarca, cirrhosis, nephropathy, hypalbuminemia
- **Local**: Bowel obstruction, venous thrombosis, arterial embolism/dissection, vasculitis, radiation
- **Lymphatic**: Lymphatic obstruction, lymphangiectasia, lymphangioma, lymphangiomatosis, Protein: Amyloidosis, Fibrosis
- **Fibrosis**: Fibromatoses
- **Inflammatory infiltration**: Pancreatitis, appendicitis, diverticulitis
- **Sclerosis**: Sclerosing mesenteritis, pseudotumor, IgG4, sarcoidosis, erdheim-chester
- **Tumor**: Lymphoma, metastatic disease, plexiform neurofibroma, mesothelioma, castlemans disease, lipoma, myolipoma, liposarcoma

Conclusion - An infiltrative or "misty" appearance of the mesentery has a differential diagnosis which can be sufficiently narrowed using additional pertinent imaging findings.

**GIE262**

**Jelly Belly: Imaging of Pseudomyxoma Peritonei (PMP)**

*Education Exhibits*

**Location:** GI Community, Learning Center

**Participants**

- Joseph Mansour (Presenter): Nothing to Disclose
- Christine O. Menias MD: Nothing to Disclose
- Julie Tanios el-Ferzli MD: Nothing to Disclose
- Wissam Mansour: Nothing to Disclose
- Raghid Nabih Kikano MD: Nothing to Disclose
- Sanjeev Bhalla MD: Nothing to Disclose

**TEACHING POINTS**

1. Review epidemiology, clinical presentation, and pathological features of PMP
2. Review tumor behavior including the pathophysiology of disease spread and treatment options.
3. Review the cross-sectional imaging findings in PMP.

**TABLE OF CONTENTS/OUTLINE**

1. Epidemiology, clinical presentation, and tumor pathological features of PMP
2. Tumor behavior, pathophysiology of disease spread and treatment options
   a. Distribution related to peritoneal fluid absorption and gravity
   b. Treatment of PMP and PMP-type conditions
3. Cross-sectional imaging findings of PMP with examples
   a. CT scan features of PMP
   b. Role of MRI
   c. Differentiation of PMP from disseminated mucinous carcinomatosis by imaging
4. Conclusion

**SUMMARY**

Pseudomyxoma peritonei (PMP) is a rare condition characterized by a productive mucinous ascites, filling the peritoneal cavity. PMP is a histologically benign peritoneal tumor and is not to be confused with disseminated mucinous carcinomatosis. PMP can originate from many organs, ruptured appendiceal mucinous adenoma and low grade ovarian neoplasms being the most common. Cross sectional imaging is crucial in assessing this condition and operability. The purpose of this exhibit is to illustrate the key imaging features, how they help differentiate PMP from peritoneal carcinomatosis and determine choice of treatment.

**GIE263**

**Let’s Cone It Down: CT Features of Diseases Involving the Ileocecal Area**

*Education Exhibits*

**Location:** GI Community, Learning Center

**Participants**

- Margaret Skaug: Nothing to Disclose
- Joseph McLaughlin: Nothing to Disclose
- Edward Chia-Hsing Chen MD: Nothing to Disclose
- Jennifer Flanagan: Nothing to Disclose
- Vasantha Vasan MD (Presenter): Nothing to Disclose

**TEACHING POINTS**

Acute abdominal pain is the second leading cause for an emergency room visit after chest pain in adults. A vast proportion of this is for right lower quadrant pain and CT is the modality of choice for evaluating this. Although appendicitis is the most common clinical concern there are several other diseases that involve the ileocecal area and present with RLQ pain. In this exhibit we will review the key CT features of inflammatory conditions (inflammatory bowel disease, appendicitis, epiploic appendagitis, typhlitis, mesenteric adenitis), infections (TB, amebiasis), neoplasms (adenocarcinoma, lymphoma, carcinoid) and other conditions including ischemia, cecal volvulus and intussusception which involve the ileocecal area. Emphasis will be on key features that help diagnose or narrow the differential diagnosis along with clinical history and lab work.

**TABLE OF CONTENTS/OUTLINE**

Overview
- Review the normal anatomy of the ileocecal area
- Factors to evaluate (i.e. bowel wall thickening, mesenteric stranding, lymphadenopathy, sinus/fistulous tracts, abscess, pneumatisos coli, free air)
- Key features of common infectious, inflammatory, neoplastic and other miscellaneous conditions affecting the ileocecal area

**GIE264**

**Liver Transplant Complications: Not Only a Transplantation Centers’ Issue**

*Education Exhibits*

**Location:** GI Community, Learning Center

**Participants**

- Ivo Ferreira (Presenter): Nothing to Disclose
- Joao Andre Oliveira: Nothing to Disclose
- Daniel Baby: Nothing to Disclose
- Manuela Certo MD: Nothing to Disclose
- Manuela Franca MD: Nothing to Disclose

**TEACHING POINTS**

- Overview of complications of liver transplant
- Review of common complications including patient factors, immunosuppressant medications
- Common complication (e.g. infection, rejection, vascular complications)
- Review of imaging findings and correlation with clinical presentation
- Discussion of management strategies and outcomes

**TABLE OF CONTENTS/OUTLINE**

Overview
- Review of liver transplantation and its complications
- Factors affecting outcomes
- Common complications and their imaging features
- Management strategies and outcomes

**SUMMARY**

Liver transplantation is a surgical procedure that involves the replacement of a diseased liver with a healthy organ from a donor. Common complications following liver transplantation include infections, rejection, vascular complications, and others. Imaging plays a crucial role in diagnosing and managing these complications, which can impact patient outcomes significantly.
TEACHING POINTS

Teaching Points:
- Comprehend the normal anatomy of the transplanted liver;
- Understand radiologic findings as an important tool to diagnosis liver transplant complications so as to define the best therapeutic approach.
- Recognize that nowadays, transplanted patients are evaluated in several medical services and therefore, all radiologists need to know their possible complications.
- Review common and uncommon imaging findings of liver transplant complications, namely those related to:
  - hepatic artery, portal vein, inferior vena cava and bile duct.

TABLE OF CONTENTS/OPTLINE

1 - Hepatic artery: stenosis; thrombosis; pseudoaneurysm and arteriovenous fistulas.
2 - Portal vein: stenosis; thrombosis.
3 - Inferior vena cava and hepatic veins: stenosis; thrombosis.
4 - Bile duct: stenosis; obstruction; leak.
5 - Others: hematoma; collections, hepatocellular carcinoma, intestinal occlusion.

GIE265
Non-Neoplastic Abdominopelvic Lymphadenopathy: A Comprehensive Review

Education Exhibits
Location: GI Community, Learning Center

Participants
- Elina Zaretsky MD, MA: Nothing to Disclose
- Alexander Caleb Kagen MD: Speakers Bureau, Bayer AG
- Neil Theise MD: Nothing to Disclose
- Galina Levin MD: Nothing to Disclose
- Christine Q. Menias MD: Nothing to Disclose
- Alampady Krishna Prasad Shanbhogue MD, MBBS: Nothing to Disclose
- Francesco Priamo MD (Presenter): Nothing to Disclose

TEACHING POINTS

Enlarged lymph nodes are common imaging findings on routine multi-detector computed tomography, ultrasound, and magnetic resonance examinations of the abdomen and pelvis. The purpose of this exhibit is: 1) To list the non-neoplastic causes of lymphadenopathy in the abdomen and pelvis. 2) To review the epidemiological, clinical and pathological features of non-neoplastic entities presenting with abdominopelvic lymphadenopathy. 3) To present the characteristic imaging features (MDCT, MRI, US) with emphasis on pattern approach to differential diagnosis.

TABLE OF CONTENTS/OPTLINE

1) Review of major nodal stations in the abdomen and pelvis. 2) Present clinical, pathological and imaging features of a wide array of non-neoplastic conditions resulting in abdominopelvic lymphadenopathy including, but not limited to: Nonspecific lymphoid hyperplasia, Viral infections (HIV, HBV, HCV Infectious mononucleosis), Whipple disease, Celiac disease, Autoimmune diseases (ex. SLE), Castlemans disease, Kikuchi lymphadenitis, Granulomatous lymphadenitis (ex. Sarcoidosis, Chron's, TB, Syphilis), Rosai-dorman disease (sinus histiocytosis), Storage disorders, and drugs. 3) Discuss a pattern approach based on clinical and imaging features.

GIE266
P.O.E.M. Procedure: What the Radiologist Needs to Know for This New Surgical Intervention for Achalasia

Education Exhibits
Location: GI Community, Learning Center

Participants
- Brian Williams MD (Presenter): Nothing to Disclose
- Rishi Kumar Maheshwary MD: Nothing to Disclose
- Matthew Scott Hartman MD: Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: 1. Review pathophysiological findings of achalasia. 2. Radiographic work-up of achalasia 3. Discuss POEM procedure 4. Radiographic findings status post POEM 5. Radiographic complications status post POEM

TABLE OF CONTENTS/OPTLINE

Table of Contents Pathophysiology of achalasia Review imaging of achalasia work up Discuss and illustrate POEM procedure Normal postoperative radiographic findings Complications associated with POEMs procedure.

GIE268
Spectral Detector Computed Tomography (Dual-layer CT): Initial Experience in Abdominal Imaging

Education Exhibits
Location: GI Community, Learning Center

Participants
- Luis Alberto Landeras MD (Presenter): Institutional Grant support, Koninklijke Philips NV
- Prabhakar Rajiah MD, FRCR: Institutional Research Grant, Koninklijke Philips NV

TEACHING POINTS

- To review the basic principles of spectral computed tomography imaging
- Understand the principles of spectral detector CT imaging compared to other available spectral CT alternatives
- Demonstrate different applications of spectral detector CT imaging in abdominal and pelvic imaging

GIE269
Swallowing Disorders due to Cervical Spinal Fixation: Diagnosis by Videofluoroscopy

Education Exhibits
Location: GI Community, Learning Center

Participants
Alberto Ivo Carbo MD (Presenter): Nothing to Disclose
Matthew Morgan: Nothing to Disclose
Anne Hollister MD: Nothing to Disclose
Peeyush Bhargava MD, MBA: Nothing to Disclose

TEACHING POINTS
• To describe the postsurgical techniques and complications of cervical spinal surgery like infection, hemorrhage and neurologic and muscular damage • To discuss the pathophysiology of the swallowing changes produced by the surgery • To review the radiological diagnosis and therapeutic consequences • To show sample cases of abnormal swallowing disorders due to surgery by fluoroscopy or rapid radiographic sequences

TABLE OF CONTENTS/OUTLINE
• Cervical spinal fixation: Surgical techniques • Post surgical complications that may affect the swallowing mechanism • Pathophysiology of swallowing disorders attributed to cervical fixation • Radiologic diagnosis and significance for treatment • Sample cases documented by videofluoroscopy, rapid radiographic sequences, plain film and MDCT.

GIE270
The Fluoroscopic Swallowing Examination: Imaging Findings Essential to Decide and Drive the Rehabilitative Process

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Alberto Ivo Carbo MD (Presenter): Nothing to Disclose
Matthew Morgan: Nothing to Disclose
Michael Colter Gates MD: Nothing to Disclose
Thomas Gates MD: Nothing to Disclose

TEACHING POINTS
• To describe the indications and technique of the fluoroscopic examination of abnormal swallowing personalized for a personalized ad tailored rehabilitation of swallowing disorders • To review the abnormal radiologic findings and underlying pathophysiology essential to deciding the swallowing rehabilitative process. Abnormal radiologic findings to be discussed in the exhibit include premature mouth leakage, nasopharyngeal regurgitation, delayed triggering of pharyngeal swallow, deficiency of bolus constrictor muscles, laryngeal penetration and aspiration, reduced hyolaryngeal elevation, residue in the vallecula and pyriform sinuses and diminished, delayed opening and early closing of the cricopharyngeus • To become familiar with indications and rationale of the compensatory strategies used by Speech-Language-Pathologists (SLP) to treat swallowing dysfunctions • To understand how the reported radiologic abnormalities will influence the patient’s management, especially in the instances where the SLP that will treat the patient is not present for the study

TABLE OF CONTENTS/OUTLINE
• Indications and technique of fluoroscopic swallowing examination • Abnormal radiologic findings and pathophysiology • Therapeutic maneuvers used by SLP to improve swallowing disorders • Sample cases documented by rapid digital sequences and videofluoroscopy

GIE272
The Not So Silver Lining: The Spectrum of Peritoneal Disease in the Adult

Education Exhibits
Location: GI Community, Learning Center

Certificate of Merit

Participants
Kathryn Darras MD (Presenter): Nothing to Disclose
Triona M. Walshe FFR(RCSI): Nothing to Disclose
Patrick McLaughlin FFR(RCSI): Nothing to Disclose
Silvia D. Chang MD: Nothing to Disclose
Alison Clare Harris MBChB: Nothing to Disclose

TEACHING POINTS
1. To review the anatomy and physiology of the peritoneum and the peritoneal spaces. 2. To provide an approach to evaluating images with suspected peritoneal disease. 3. To discuss the pathogenesis, MDCT appearance, differential diagnosis, and management of peritoneal pathology including latest recommendations for treating metastatic disease such as intraperitoneal chemotherapy. 4. To highlight new imaging techniques being used to evaluate the peritoneum, specifically DWI and Dual Energy
TABLE OF CONTENTS/OUTLINE


GIE273

The Peritoneal Metastasis of Gastric Cancer on Spectral CT: Uncommon Sites and Uncertain Signs

Education Exhibits
Location: GI Community, Learning Center

Participants
Lei Tang MD (Presenter): Nothing to Disclose
Ying-Shi Sun MD, PhD : Nothing to Disclose
Zi-Yu Li : Nothing to Disclose
Fei Shan : Nothing to Disclose
Xiaoting Li : Nothing to Disclose
Xiao-Peng Zhang MD : Nothing to Disclose
Jia-Fu Ji : Nothing to Disclose

TEACHING POINTS
1. To introduce how to improve the detection of unobvious peritoneal metastasis lesions. 2. To briefly review the common sites and signs of peritoneal metastasis of gastric cancer. 3. To illustrate the uncommon sites of peritoneal metastasis. 4. To introduce the uncertain signs of peritoneal metastasis.

TABLE OF CONTENTS/OUTLINE

1. How to improve the detection ability: 1) Multi-planar reconstruction and reasonable reading order to guarantee the full detection. 2) Wide window to demonstrate the fat tissue structures clearly. 3) Spectral CT to improve the resolution and facilitate quantitative evaluation. 2. Common sites and signs of peritoneal metastasis: 1) Omental cake. 2) Thickening or nodular of parietal peritoneal. 3. Uncommon sites of peritoneal metastasis 1) Transverse mesocolon 2) Hepatogastric ligament 3) Perihepatic peritoneum 4) Bilateral paracolic sulci 5) Small mesenteric. 4. Unobvious signs of peritoneal metastasis 1) Smudge sign: mild type, slightly and evenly increased fat density appeared as GGO; moderate type, unevenly increased fat density, with patchy-like or intensive GGO; severe type, unevenly and obviously increased fat density, with multiple strands, curls sign or blurred small nodules. 2) Small amount of ascites (>50ml): >90% probability of metastasis. 3) The opportunity to perform diagnostic laparoscopy.

GIE274

The Slowest Bowel Movement You've Ever Had—Bowel Motility and Our Experience with High Field Strength (3.0T) Dynamic MR Enterography

Education Exhibits
Location: GI Community, Learning Center

Participants
Takman E. Mack MD (Presenter): Nothing to Disclose
Jessica M. Miller MD : Nothing to Disclose
Robert Murray Marks MD : Nothing to Disclose

TEACHING POINTS
By acquiring real-time images from dynamic volumetric cine loops status post glucagon administration, evaluation of the bowel with MR Enterography is quickly becoming an invaluable tool for evaluation of various conditions (particularly for Inflammatory Bowel Disease management). Although this exam is typically performed at 1.5 T, we have experienced superior spatial/temporal resolution and SNR at 3.0 T MRI. 1. Review normal magnetic resonance imaging (MRI) anatomy and appearance of the abdominal contents at 3.0 T during MR Enterography. 2. Illustrate MRI findings in various gastrointestinal pathologic conditions. 3. Discuss the subtle nuances and techniques needed to optimize MR Enterography at 3.0 T.

TABLE OF CONTENTS/OUTLINE

1. Anatomic diagrams and review of abdominal anatomy, with pictorial review of small and large bowel motility during MR Enterography. 2. Imaging presentation of gastrointestinal pathologic conditions (imaging of routine and complicated Inflammatory Bowel Disease, potential mimickers, and a few other unusual conditions that can be encountered). 3. Discussion of 3.0 Tesla MRI Enterography techniques used at our institution that maximize our equipment as well as potential pitfalls. Use of negative oral contrast, glucagon, diffusion weighted imaging, and dynamic cine loops allows imaging the bowel to best advantage.

GIE275

The Wheel of the Mesentery: Imaging Spectrum of Primary and Secondary Mesenteric Neoplasms—How the Radiologist Can Help Plan the Treatment

Education Exhibits
Location: GI Community, Learning Center

Participants
Stephanie Nougaret MD (Presenter): Nothing to Disclose
TEACHING POINTS

Describe the normal anatomy of the mesentery and its relationships to the other peritoneal folds. Identify the CT and MRI appearances of common and rare primary mesenteric neoplasms using a dedicated algorithm. Describe the different patterns of spread of secondary mesenteric neoplasms. Recognize the common appearance on CT and MRI of secondary mesenteric neoplasms and their pitfalls. Propose a treatment algorithm and describe the sites of the mesentery in which surgical debulking or resection may be difficult.

TABLE OF CONTENTS/OUTLINE

1-Normal Anatomy of the Mesentery
2-CT and MRI appearances of common and rare primary mesenteric neoplasms
  2-1-Tumor types
  2-2-Algorithm for interpretation (Purely cystic masses, Solid masses, Mixed solid/cystic masses, Infiltrative masses, Stellate masses)
3-Routes of dissemination of secondary tumors of the mesentery
4-Appearances of secondary mesenteric neoplasms: Pearls and Pitfalls.
  4-1-Imaging pattern (Infiltrative: the misty mesentery, Clustered, Extensive)
  4-2-Early stage findings
  4-3- Complications
5-Treatment of primary and secondary mesentery neoplasms
  5-1-Treatment algorithm
5-2-Resectable and non resectable sites of the mesentery: How the radiologist can help plan the surgical approach.

GIE276

Transitions in GastroIntestinal Imaging: How Did We Get Here? From Barium Studies to CT Scans

Education Exhibits
Location: GI Community, Learning Center

Participants
Andrew Joseph Barrow MD (Presenter): Nothing to Disclose
Chitra Ambat Chandrasekhar MBBS : Nothing to Disclose
Agnes Maria Guthrie MD : Nothing to Disclose

TEACHING POINTS

1. Correlate cross sectional imaging findings in the usual and unusual presentations of disease entities of the esophagus stomach and small bowel with corresponding findings on conventional barium studies. 2. To help understand the “pros versus cons” of one modality over the other.

TABLE OF CONTENTS/OUTLINE

1. Exemplify the cross sectional imaging findings in common and seldom encountered upper gastrointestinal pathology as seen on CT scans and to demonstrate the corresponding findings on barium studies. 2. Discuss the single versus double contrast barium or water soluble contrast techniques and validate their usefulness and feasibility. With increasing use of cross sectional imaging, Computed Tomography (CT) scans have emerged as the mainstay for imaging of Gastrointestinal (GI) pathology. CTs have been touted as the “modality of choice” and useful for evaluating the entire GI tract, there is still a very strong role for imaging with conventional barium or water soluble contrast studies. The use of fluoroscopy and the live “hands on” approach to imaging with an Upper Gastrointestinal study is helpful in many instances where the CT scan is equivocal. Conventional contrast studies expedite patient triage and management. In many instances, a barium or water soluble contrast exam may corroborate or confirm the CT imaging findings and may “clinch” the diagnosis.

GIE277

Tumor and Tumor-like Conditions of the Anal and Perianal Canal Is

Education Exhibits
Location: GI Community, Learning Center
Certificate of Merit
Selected for RadioGraphics

Participants
Christine G. Menias MD (Presenter): Nothing to Disclose
Khaled M. Elsayes MD : Nothing to Disclose
Amy Kiyo Hara MD : Nothing to Disclose
Ania Zofia Kielar MD : Nothing to Disclose
Venkateswar Rao Surabhi MD : Nothing to Disclose
Kumaresan Sandrasegaran MD : Nothing to Disclose
William Christopher Baughman MD : Nothing to Disclose
Venkata S. Katabathina MD : Nothing to Disclose
Akram Mohamed Shaaban MBCh : Contributor, Amirsys, Inc
Rex Albert Parker MD : Nothing to Disclose
TEACHING POINTS
Review imaging features of tumors and tumor-like conditions of the anal and perianal region at CT and MR. Discuss the epidemiology, clinical presentation, and management of tumors and tumor-like conditions of the anal and perianal canal.

TABLE OF CONTENTS/OUTLINE
Tumors and tumor-like conditions of the anal and perianal canal including: Squamous cell/adenocarcinoma, GIST, Lymphoma, Angiomyxoma, Condyloma, Neurogenic tumors, Fournier gangrene, and other infections. Neuroendocrine tumors and metastases. Tumors that occur in the anal/perianal canal include melanoma, lymphoma, GIST, neuroendocrine tumors and metastases. Tumor-like conditions such as condyloma, and inflammatory and infection can also involve the anal and perianal canal. The purpose of this exhibit is to illustrate the common and uncommon tumors and tumor-like conditions of the anal and perianal canal.

GIE278
Understanding, Performing and Reading CT Scan in Parietal Abdominal Wall Repair Surgery

Education Exhibits
Location: GI Community, Learning Center

Participants
Catherine Ridereau-Zins MD (Presenter): Nothing to Disclose
Elodie Sibleau MD: Nothing to Disclose
Jerome Lebigot MD: Nothing to Disclose
Cosima Raluca Nedelcu MD: Nothing to Disclose
Aurelien VENARA MD: Nothing to Disclose
Christophe Aube MD, PhD: Speaker, Bayer AG Support, General Electric Company

TEACHING POINTS
- to expose main surgical procedures (indications and types of prosthetic meshes) to explain the CT scan technique to illustrate CT normal findings to review postoperative complications findings

TABLE OF CONTENTS/OUTLINE
- Background: Surgical procedures
- Imaging: how to perform a CT exam of the abdominal wall how to read it
- CT normal findings
- CT pathological findings
- Conclusion: Parietal postoperative complications are not common. CT scan allows a clear visualization of the prosthesis. The worse complication is infection of the prosthesis.

GIE279
You Ain’t Spleen Nothing Yet! Image Gallery of Unusual Splenic Pathology

Education Exhibits
Location: GI Community, Learning Center

Participants
Alexander Somwaru MD: Nothing to Disclose
Stanley S. Siegelman MD: Nothing to Disclose
Karen Margaret Horton MD: Nothing to Disclose
Pamela Tecce Johnson MD (Presenter): Research funded, Becton, Dickinson and Company

TEACHING POINTS
- Benign spleen lesions are common incidental findings on abdominal CT exams. Infrequently, primary and secondary malignancies and other unusual pathologies can be encountered in the spleen. The purpose of this exhibit is to ~
  1. Demonstrate the CT appearance of various unusual pathologic processes in the spleen
  2. Review the imaging features of primary and secondary splenic malignancies

TABLE OF CONTENTS/OUTLINE
- Technique limitations of arterial phase imaging
- Differential diagnosis based on enhancement characteristics
- Case Series
- Leukemia Non Hodgkin’s Lymphoma
- Hodgkin’s Lymphoma
- Metastatic disease (lung cancer, uterine cancer, ovarian cancer, renal cell carcinoma, melanoma)
- Primary tumors (epithelioid angiosarcoma, histiocytic angiosarcoma, pleomorphic angiosarcoma, hemangioendothelioma, small round blue cell tumor)

GIE280
A Clinical Review of Acute Pancreatitis, the Revised Atlanta Classification, Imaging, and Therapies

Education Exhibits
Location: GI Community, Learning Center

Participants
Mark Patrick Trahan MD (Presenter): Nothing to Disclose
Aalok Bipin Turakhia MD: Nothing to Disclose
Aarti Sekhar MD: Nothing to Disclose
Michael Terrence Osipow MD: Nothing to Disclose

TEACHING POINTS
Teaching Points: During the first week, clinical parameters guide treatment of pancreatitis. An awareness of the patient’s clinical history and onset of symptoms is critical for appropriate application of the terminology. Utilizing preferred terminology allows effective communication with referring clinicians and directs appropriate management. Treatment of fluid collections varies with collection type - for example, walled off necrosis usually requires more aggressive percutaneous drainage and/or minimally invasive surgical necrosectomy.

TABLE OF CONTENTS/OUTLINE
Background: Acute pancreatitis can present with a myriad of imaging findings. The Atlanta Classification of Acute Pancreatitis was devised in 1992 and revised in 2008 to address the inconsistent nomenclature used to describe pancreatitis. The goal of this educational exhibit is to provide radiologists with a review of the Revised Atlanta Classification, preferred terminology, and relevant imaging examples. Outline: Epidemiology of acute pancreatitis and a brief historical perspective Clinical diagnosis/risk stratification of patients including the appropriate role of imaging Review of Revised Atlanta Classification (see chart #1) including relevant terminology with examples Indications and special considerations for interventional versus surgical treatment

GIE281
Fat-Containing Lesions of the Pancreas
Education Exhibits
Location: GI Community, Learning Center

Participants
Chris Somerville MD (Presenter): Nothing to Disclose
Mitchell E. Tublin MD: Nothing to Disclose

TEACHING POINTS
- Only one fatty abnormality of the pancreas is common - fatty parenchymal replacement. Some of its many variations can mimic other fatty lesions. - All other fatty pancreatic lesions are rare. - Focal fatty replacement can mimic a lipoma.
- Near-complete fatty atrophy can be difficult to differentiate from lipomatous pseudohypertrophy. However, these distinctions are academic, as all are incidental findings. - Fat does not occur in adenocarcinoma, neuroendocrine tumors, or cystic neoplasms of the pancreas. - Liposarcoma is the only malignant fat-containing lesion of the pancreas. It is exceedingly rare. - Any fatty abnormality of the pancreas containing homogenous fat and no solid or enhancing components is an incidental finding.

TABLE OF CONTENTS/OUTLINE
- Intro o Fat on CT, MR, US o regional anatomy of pancreas - Fatty replacement o Partial - diffuse, focal o Complete - atrophy - enlargement - cystic fibrosis, lipomatous pseudohypertrophy, Swachman-Diamond Syndrome, duct obstruction - Masses o Hypoplasia o Lipoma o Liposarcoma o Teratoma o Angiomyolipoma/PEComa - Work-up and clinical significance

GIE282
Fat-Containing Lesions of the Pancreas: CT and MR Imaging Features with Pathological Correlation
Education Exhibits
Location: GI Community, Learning Center

Participants
Yoshihiko Fukukura MD, PhD (Presenter): Nothing to Disclose
Koji Takumi: Nothing to Disclose
Junichi Ideue: Nothing to Disclose
Tomokazu Umanodan: Nothing to Disclose
Tomohide Yoneyama: Nothing to Disclose
Hiroto Hakamada: Nothing to Disclose
Masanori Nakajo MD: Nothing to Disclose
Takashi Yoshiura MD, PhD: Nothing to Disclose

TEACHING POINTS
Fat-containing pancreatic lesion is unusual and cross-sectional imaging findings of fat-containing lesions can help in characterizing pancreatic lesions. The purposes of this exhibit are: 1. To illustrate CT and MR imaging findings of fat-containing pancreatic lesions with histopathologic correlation 2. To discuss the imaging differential diagnosis of fat-containing pancreatic lesions

TABLE OF CONTENTS/OUTLINE
- How to identify intralesion fat.
- Review of CT and MR imaging findings of fat-containing pancreatic lesions (fatty replacement, lipoma, liposarcoma, hamartoma, teratoma, lymphepithelial cyst, neuroendocrine tumor, and metastases from renal cell carcinoma and hepatocellular carcinoma), with histopathological correlation.
- Highlight key differential diagnostic points of fat-containing pancreatic lesions.
- Summary: The identification of fat within a pancreatic lesion can lead to the correct diagnosis along with other radiological findings and the clinical information.

GIE283
Heads or Tails: Case Based Review of Pancreatic Masses
Education Exhibits
Location: GI Community, Learning Center

Participants
Nina Woldenberg MD (Presenter): Nothing to Disclose
Cecilia Matilda Jude MD: Author, UpToDate, Inc
Jeffrey Petersen MD: Nothing to Disclose
TEACHING POINTS

Ductal adenocarcinoma is the most common pancreatic neoplasm. The spectrum of pancreatic tumors is broad however, and includes other exocrine and non exocrine cell types. The clinical features of the patient, including age and gender, in combination with the imaging appearance can frequently lead the radiologist to a specific pathologic diagnosis. The key radiologic findings on CT, US and MRI of the range of pancreatic tumors and tumor-like conditions, with clinical and selected pathologic correlation will be reviewed.

TABLE OF CONTENTS/OUTLINE

Comprehensive, multiple choice question case-based review of the spectrum of tumors and tumor-like conditions of the pancreas with special attention to key cross-sectional imaging features and clinical management. Pathologic correlation will be provided when appropriate. Spectrum of pancreatic neoplasms include adenocarcinoma, mucinous cystic neoplasm, serous cystadenoma, intraductal papillary mucinous neoplasm, solid pseudopapillary neoplasm, acinar cell cystadenocarcinoma, parangangioma, pancreatic neuroendocrine tumors, lymphoma, intraductal oncocytic papillary neoplasm, osteoclast giant cell tumor, as well as metastasis and the pancreatic tumors related to Von Hippel-Lindau syndrome. Tumor-like conditions including focal autoimmune pancreatitis and lipomatous pseudohypertrophy will be presented.

GIE284

High-quality 2D and 3D CT Imaging of Pancreato-Biliary Diseases with Small Focal Spot and Iterative Model Reconstruction Techniques

Education Exhibits

Location: GI Community, Learning Center

Participants

Masafumi Uchida MD, PhD (Presenter): Nothing to Disclose
Yukiko Kunou: Nothing to Disclose
Shinichi Tokuyasu RT: Employee, Koninklijke Philips NV
Akiko Sumi MD: Nothing to Disclose
Hidefumi Kuroki RT: Nothing to Disclose

TEACHING POINTS

Early detection and accurate diagnosis of pancreato-biliary tumors remain crucial to increase the rate of curative surgery. 1)To describe the basics of small focal spot and iterative model reconstruction techniques for pancreato-biliary diseases 2) To understand the clinical utility of the technique for high-quality 2D and 3D CT, illustrated through representative examples of clinical studies

TABLE OF CONTENTS/OUTLINE

1. The theoretical background of high-quality CT imaging with a small focal spot (focal spot size in the X-ray tube) and the iterative model reconstruction (full iterative reconstruction) technique 2. The protocol for CT imaging of the pancreato-biliary system using high image-quality techniques with contrast-enhanced CT 3. A review of the high-quality 3D CT findings - Fine vascular anatomy of the pancreato-biliary system 4. Comparison of the usual CT and high-quality CT images of the pancreato-biliary system with respect to their clinical utility

GIE285

Incidental Pancreatic Lesions: Imaging Diagnosis and Management Considerations

Education Exhibits

Location: GI Community, Learning Center

Participants

Jessica Lai MD (Presenter): Nothing to Disclose
Stephen Thomas MD: Nothing to Disclose
Aysegun Canu: Nothing to Disclose
Melvyn Sarah Mathew MD: Nothing to Disclose
Aytekin Oto MD: Research Grant, Koninklijke Philips NV Consultant, Guerbet SA

TEACHING POINTS

Review characteristic imaging findings of incidental pancreatic lesions. Discuss guidelines for the work-up and management options. Provide a suggested approach to evaluating incidental pancreatic lesions.

TABLE OF CONTENTS/OUTLINE

Problem of incidental pancreatic lesions Goals and work-up options Guidelines -International consensus -ACR Our suggested approach (reviewing imaging findings and recommended management of lesions) - Is a lesion cystic or a mimic? Duodenal diverticulum Solid lesions (adenocarcinoma, metastases, rare tumors) Vascular lesions (thrombosed pseudoaneurysm, varices) -Does the lesion communicate with the pancreatic duct? IPMN - Is the lesion microcystic? Serous cystadenoma IPMN - Is the lesion macrocystic? Mucinous cystadenoma(carcinoma) Macrocytic serous cystadenoma Cystic neuroendocrine tumor - Lymphoepithelial cyst Pseudocyst - Is there a solid component/thick septation/mural nodule? Mucinous cystadenoma(carcinoma) Solid and papillary neoplasm Cystic neuroendocrine tumor - Lymphoepithelial Cysts Pancreatic adenocarcinoma - Is the lesion solid? Focal fat Pancreatic adenocarcinoma Islet cell tumor Pancreatic duct stricture Intrapancreatic spleen

GIE287

Novel CT Imaging Techniques and Strategies for Diagnosing Pancreatic Neoplasms: What the Radiologist Should Know

Education Exhibits
Participants

Xiao Zhu Lin MD (Presenter): Nothing to Disclose
Kemin Chen MD, PhD : Nothing to Disclose
Fuhua Yan : Nothing to Disclose

TEACHING POINTS

1) To review conventional CT and its limitations for diagnosing pancreatic neoplasms
2) To illustrate novel CT imaging techniques for diagnosing pancreatic neoplasms
3) To demonstrate optimal strategies using these techniques by presenting experimental data and clinical images

TABLE OF CONTENTS/OUTLINE

1) Conventional CT and its limitations in diagnosing pancreatic neoplasms
   - limited density resolution/ indeterminate lesion
   - beam-hardening (BH) effect/ limited spatial resolution
2) Novel CT imaging techniques
   - monochromatic imaging/ optimal CNR technique and BH reduction
   - material density imaging
   - spectral HU curve
   - high definition CT (HDCT) and iterative reconstruction (IR)
3) Optimal strategies for pancreatic CT

GIE288

Pancreas Transplants: From Surgical Basics to Imaging Pearls

Education Exhibits

Location: GI Community, Learning Center

Cum Laude

Participants

Marc D. Kohli MD (Presenter): Research Grant, Koninklijke Philips NV Research Grant, Siemens AG
Angela K. Shah RT : Nothing to Disclose
Paul Haste MD : Nothing to Disclose
Kumaresan Sandrasegaran MD : Nothing to Disclose
Richard Mangus MD : Nothing to Disclose
Jonathan A. Fridell MD : Nothing to Disclose

TEACHING POINTS

Identifying the location and type of vascular and enteric anastomoses are critical to accurate imaging follow up. Pulse wave doppler findings of reversed diastolic arterial flow to the transplant pancreas suggests venous thrombosis Multiphase CT protocol with enteric contrast is important in detecting vascular and enteric complications.

TABLE OF CONTENTS/OUTLINE

Patient selection for pancreas transplant Surgical Techniques/Anatomy (Historical techniques, Current techniques, Vascular supply) Post operative complications (Early, Late) Ultrasound Imaging Considerations (Technique, Pitfalls, Goals of ultrasound evaluation, Case Examples). CT (Protocol and rationale, Case Examples) Image Guided Biopsy (Rationale, technique, complications) Summary

GIE289

The Revised Atlanta Classification for Acute Pancreatitis: Start Using It in Your Practice!

Education Exhibits

Location: GI Community, Learning Center

Selected for RadioGraphics

Participants

Bryan Robert Foster MD (Presenter): Nothing to Disclose
Kyle Jensen MD : Nothing to Disclose
Gene Bakis MD : Nothing to Disclose
Akram Mohamed Shaaban MBBCh : Contributor, Amirsys, Inc
Fergus V. Coakley MD : Nothing to Disclose

TEACHING POINTS

The revised Atlanta classification updates terminology used in the imaging evaluation of acute pancreatitis. Imaging is crucial in severe pancreatitis after the 1st week and directs treatment. Morphologic assessment of fluid collections is an important part of the revised Atlanta classification and is defined by the collection contents and by the time since the onset of symptoms. Use of the revised Atlanta classification in radiology reporting facilitates accurate communication amongst members of the care team and underscores the radiologist’s important role in the treatment of patients with acute pancreatitis.

TABLE OF CONTENTS/OUTLINE

1. Clinical diagnosis and overview of acute pancreatitis. 2. Presentation of the new revised Atlanta classification and comparison with the original Atlanta Classification. 3. Early vs. late phase. 4. Interstitial edematous pancreatitis vs. necrotizing pancreatitis. 5. Pancreatic vs. peripancreatic necrosis. 6. Multimodality imaging examples: acute peripancreatic fluid collection, acute necrotic collection, pseudocyst, walled off necrosis. 7. Disconnected duct syndrome. 8. Infected collections and pitfalls. 9. Illustrated surgical and interventional approaches used. 10. Suggestions for reporting the Revised Atlanta Criteria.

GIE290

The Ultimate Guide to the Journey of IPMNs: From Simple Cyst to Widespread Metastases

Education Exhibits

Location: GI Community, Learning Center
Participants
Anil Chauhan MD (Presenter): Nothing to Disclose
Aparna Balachandran MD: Nothing to Disclose
Catherine Ellen Devine MD: Nothing to Disclose
Eric P. Tamm MD: Nothing to Disclose
Priya Ranjit Bhosale MD: Nothing to Disclose

TEACHING POINTS
1. The Basics: Epidemiology, pathophysiology, natural history and treatment strategy of Intraductal Papillary Mucinous Neoplasms (IPMNs)
2. The Transformation: Discuss Radiology-Pathology correlation of IPMNs which are non-invasive with varying degree of dysplasia or are invasive with malignant transformation with varying degree of differentiation
3. The Finale: Metastatic spread pattern of IPMNs
4. Simple Cyst in Pancreas: Review the current management approach, based on literature evidence and anecdotal experience

TABLE OF CONTENTS/OUTLINE
1. Epidemiology, pathophysiology, and clinical presentation of IPMNs
2. Histopathological classification of IPMNs
3. CT and MRI Techniques in patients with pancreatic cystic lesions
4. Radiology-Pathology correlation of IPMNs
   a. Do imaging findings correlate with extent of dysplasia?
   b. Imaging Spectrum
5. Metastatic Spread Pattern: Common, Uncommon and Rare.
6. Simple Cyst in Pancreas: The evidence and experience based management strategy

GIE292-b
Beyond Gastric Adenocarcinoma: Multimodality Assessment of Common and Uncommon Gastric Neoplasms

Education Exhibits
Location: GI Community, Learning Center

Participants
Danielle Martin Richman MD, MS (Presenter): Nothing to Disclose
Sreeharsha Tirumani MBBS, MD: Nothing to Disclose
Stephanie A. Howard MD: Nothing to Disclose
Katherine Margaret Krajewski MD: Research Grant, General Electric Company
Nikhil H. Ramaiya MD: Nothing to Disclose
Michael Hayden Rosenthal MD, PhD: Nothing to Disclose

TEACHING POINTS
1. While adenocarcinoma is the most common type of gastric cancer, lymphoma, gastrointestinal stromal tumors, neuroendocrine tumors, and metastases should also be considered when evaluating an unknown gastric lesion. 2. Awareness of the distinctive CT, MR, and PET features of the less common tumors, such as the commonly large size, cystic contents, and intraluminal and extraluminal components of GISTs, can prompt the radiologist to raise them as differential diagnostic considerations. 3. Radiologists can adapt their imaging strategies to detect the differing patterns of regional and systemic spread among these entities.

TABLE OF CONTENTS/OUTLINE
1. Review of the most common types of malignancies involving the stomach, including adenocarcinoma, lymphoma, GIST, gastric neuroendocrine tumors, and metastases. Benign lesions such as leiomyomas and lipomas will also be discussed. 2. Multimodality review of the imaging features characteristic of these neoplasms. 3. Review of prognosis and local, regional and metastatic spread of these entities, with a focus on optimal imaging follow up. 4. Discuss the different treatment strategies for primary gastric malignancies. 5. Demonstrate important issues in the imaging of treatment response and treatment complications associated with these entities.

GIE293
Beyond the Left Lower Quadrant: Diverticula of the Gastrointestinal Tract

Education Exhibits
Location: GI Community, Learning Center

Participants
Seng Thipphavong MD (Presenter): Nothing to Disclose
Andreu F. Costa MD, MSc: Nothing to Disclose
Nasir M. Jaffer MD: Nothing to Disclose
Richard Seppala: Nothing to Disclose

TEACHING POINTS
1. A wide variety of GI tract diverticular disease extends beyond the left lower quadrant. Diverticula can occur anywhere along the GI tract and have the potential to be symptomatic. 2. Imaging studies, including barium examinations and cross-sectional imaging (CT), are essential in diagnosing symptomatic diverticular disease and identify complications.

TABLE OF CONTENTS/OUTLINE
The role of conventional GI studies and CT for the diagnosis of symptomatic diverticular disease will be highlighted. Acute and chronic complications associated with various common and uncommon diverticula will be outlined. Clinical and imaging features of the following GI tract diverticular diseases will be discussed: pharyngeal Zenker's diverticulum, Killian-Jamieson diverticulum mid-esophageal tuberculosis-related traction diverticulum, epiphrenic diverticulum, congenital gastric diverticulum, duodenal diverticulum and diverticulitis, small bowel diverticulitis, Meckel's diverticulum with intussusception, appendiceal diverticulum, right-sided diverticulitis, complicated sigmoid diverticulitis, colonic diverticulitis containing carcinoma, giant colonic diverticulum.
Congenital, Developmental, and Inherited Small Bowel Diseases in Adults: From Pathophysiology to Imaging and beyond!

Education Exhibits
Location: GI Community, Learning Center

Participants
Bo Li MD (Presenter): Nothing to Disclose
Alampady Krishna Prasad Shanbhogue MD, MBBS : Nothing to Disclose
Christine O. Menias MD : Nothing to Disclose
Ting Yin Tao MD, PhD : Nothing to Disclose
Elizabeth Fowler Sheybani MD : Nothing to Disclose
Sadhna Verma MD : Nothing to Disclose

TEACHING POINTS
*To illustrate the embryological developmental pathway of the small bowel (creation of the primitive gut tube, the midgut, and formation of the mesentery).
*To graphically illustrate the embryological defects associated with each congenital small bowel anomaly.
*To discuss the clinical and imaging characteristics of congenital, developmental, and inherited small bowel abnormalities presenting in adolescence and adulthood, with implications on management.

TABLE OF CONTENTS/OUTLINE
*Embryological developmental pathway of the small bowel with graphical illustration of defects which lead to the specific congenital anomaly. *Clinical and imaging manifestations of congenital small bowel anomalies presenting in adulthood, including Meckel's Diverticulum, Malrotation, Midgut Volvulus, Duodenal Web, Enteric Duplication Cyst, Meconium Ileus Syndrome, Neurofibromatosis and Hereditary Hemorrhagic Telangiectasia. Summary: A wide array of congenital, developmental, and inherited abnormalities of the small bowel present in adulthood with varied clinical and imaging manifestations. Diagnosis and treatment may be delayed due to nonspecific clinical presentation. Imaging plays a crucial role in the diagnosis and management.

GIE295
Crohn's Disease and Secondary Gastrointestinal Malignancy: Morphological Findings with MRI and CT and How Novel Functional MRI Sequences Can Improve Diagnostics

Education Exhibits
Location: GI Community, Learning Center

Participants
Anne Negard MD, PhD (Presenter): Nothing to Disclose
Kathrine Roe : Nothing to Disclose
Jorgen Jahnson MD, PhD : Nothing to Disclose
Bo Daniel Karlsson MD : Nothing to Disclose
Stein Harald Holmedal MD : Nothing to Disclose
Njal Bakka MD : Nothing to Disclose
Arne Faerden MD, PhD : Nothing to Disclose
Morten Vatn : Advisor, Genetic Analysis
Anne Hansen Ree MD, PhD : Nothing to Disclose

TEACHING POINTS
1. To present morphological findings of Crohn's disease (CD) and secondary malignancy with conventional Magnetic Resonance Imaging (MRI) and Computer tomography (CT) and to discuss the limitations of these techniques to distinguish inflammation from malignancy of the gastrointestinal (GI) tract 2. To describe novel functional MRI sequences as diffusion-weighted imaging (DWI), spectroscopy, magnetization transfer (MT) and dynamic contrast enhanced imaging (DCE) and to discuss how these techniques can improve the differentiation of inflammation and secondary malignancy in CD.

TABLE OF CONTENTS/OUTLINE
1. Introduction 2. CT technique 3. MRI technique with morphological sequences 4. CT and MRI findings in CD 5. CT and MRI findings of secondary GI malignancy 6. Novel functional MRI sequences The major teaching points of this exhibition are: 1. MRI and CT findings of CD are increased bowel wall thickness with skip lesions in between, combs sign and if the patient develops fistulas, the finding of extraintestinal tubular structures. 2. Secondary malignancy can be suspected if an expansive lesion of the bowel or the fistula develops. 3. Morphological image findings of CD and secondary malignancy overlap and the introduction of novel functional MRI sequences may improve this differentiation.

GIE296
Crohn's Disease Complications: A Radiologic-Pathologic Correlation

Education Exhibits
Location: GI Community, Learning Center

Participants
Manuel Betancourt Torres BS (Presenter): Nothing to Disclose
Laura Cristina Figueroa Diaz BS : Nothing to Disclose
Walter Johans Morales-Borrero BS : Nothing to Disclose
Guido E. Santacana-Laffitte MD : Nothing to Disclose
Miguel Gabriel Echevarria MD : Nothing to Disclose
Gory Ballester-Oritz MD : Nothing to Disclose

TEACHING POINTS
Discuss gastrointestinal anatomy. Give an overview of the disease clinical manifestations, progression and pathophysiology.
Review common characteristic pathologic bowel changes seen in different imaging modalities. Review imaging of common lesions and correlate with pathological findings. Acknowledge the importance of imaging in the assessment of extraluminal complications, disease distribution, and disease activity, as well as evaluation of unreachable bowel segments proximal to strictures encountered at colonoscopy. Discuss strengths and limitations of imaging in characterizing lesions and assessing bowel damage.

TABLE OF CONTENTS/OUTLINE
Crohn disease may involve any part of the digestive tract, although small bowel involvement occurs in almost 70% of the patients. It has a relapsing and remitting course, requiring frequent imaging studies to monitor disease activity and complications. We review the radiological features of Chron’s disease and its complications (including fistulae, abscesses, fibrotic strictures, adhesions and related neoplasia) with pathological correlation. Knowledge of the radiological features of Crohn disease and its complications is essential for adequate patient management.

GIE297
CT Imaging of Various Gastric Lesions: A Pictorial Review

Education Exhibits
Location: GI Community, Learning Center

Participants
Mitsuru Matsuki (Presenter): Nothing to Disclose
Tomoko Hyodo MD: Nothing to Disclose
Seishi Kuma MD: Nothing to Disclose
Masakazu Tsurusaki MD, PhD: Nothing to Disclose
Kazunari Ishii MD: Nothing to Disclose
Takamichi Murakami MD, PhD: Nothing to Disclose

TEACHING POINTS
1. To introduce clinical manifestations, etiology, pathology and CT images of various gastric lesions. 2. To discuss the diagnostic imaging and differential diagnosis of the various gastric lesions.

TABLE OF CONTENTS/OUTLINE
We present the following various gastric lesions and discuss the diagnostic imaging and differential diagnosis. 1. Benign tumors a. Neoplastic ·Gastrointestinal stromal tumor (GIST) ·Lipoma ·Leiomyoma ·Schwannoma, etc b. Non-Neoplastic ·Hammartomatous polyyp ·Lymphangioma, etc 2. Malignant tumors ·Adenocarcinoma ·Lymphoma ·Gastrointestinal stromal tumor (GIST) ·Metastatic tumor ·Carcinoid, etc 3. Others ·Peptic ulcers ·Acute gastric mucosal lesion (AGML) ·Eosinophilic gastroenteritis (EG) ·Hereditary angioedema (HAE) ·Anisakiasis ·Emphysema ·Diffuse cystic malformation ·Heterotopic pancreas, etc

GIE298
CT of Uncomplicated and Complicated Gastric Volvulus: Unraveling the Imaging Findings with Volumetric Date Set Interpretations

Education Exhibits
Location: GI Community, Learning Center

Participants
Hazem Hawasli MD (Presenter): Nothing to Disclose
Pamela Tecce Johnson MD: Research funded, Becton, Dickinson and Company
Karen Margaret Horton MD: Nothing to Disclose

TEACHING POINTS
1. Identify and classifying gastric volvulus. 2. Identify CT findings important to differentiate between uncomplicated and complicated gastric volvulus.

TABLE OF CONTENTS/OUTLINE
Introduction to Gastric Volvulus
- ·Etiology
- ·Incidence/Prevalence
Classification of two major types
- ·Organoaxial
- ·Mesenteroaxial
Management
Review of CT Findings for both Uncomplicated and Complicated Gastric Volvulus
Sample Cases

GIE299
CT-Enteroclysis and Enterography: How, When, Why and What

Education Exhibits
Location: GI Community, Learning Center

Participants
Catarina Afonso Silva MD (Presenter): Nothing to Disclose
Dean Daniel T. Maglinte MD: Consultant, Cook Group Incorporated
TEACHING POINTS
Review the technical aspects and clinical indications of each technique. Tips and tricks to avoid pitfalls. Discuss the pros and cons of each technique.

TABLE OF CONTENTS/OUTLINE
The diagnostic evaluation of small-bowel (SB) diseases has changed profoundly during the past few decades. The role of radiology in the investigation of SB diseases remains poorly understood by the referring physicians and radiologists who perform the examinations. Progress in imaging of the SB during the past few decades is due largely to refinements in the application of orally ingested conventional abdominal and pelvic CT or MR imaging with intravenous contrast. CT-enterography (Cte) and enteroclysis (CTe) improve visualization of the small bowel mucosa and wall in comparison with traditional CT and fluoroscopic studies. Evidence- and experience-based analyses have shown that examinations that distend the SB diagnose smaller, early lesions and allow confident exclusion of SB disease. Knowing the pros and cons of both tests is essential to avoid delays in the diagnosis which can influence prognosis. A pictorial review of SB pathology is presented for each method highlighting the pitfalls and shortcomings of each technique. How they performed, when and why they should be applied and what should we look for in each examination, to reach for the diagnosis is thoroughly reviewed.

GIE300
Demystifying Congenital Internal Hernias: Algorithmic Approach for Diagnosing and Classifying Internal Hernias with MDCT

Education Exhibits
Location: GI Community, Learning Center

Participants
Ameya Jagadish Baxi MBBS, DMRD (Presenter): Nothing to Disclose
Abhijit Sunnapwar MD: Nothing to Disclose
Arpith M. Nagar MBBS: Nothing to Disclose
Christine O. Menias MD: Nothing to Disclose
Kedar Nath Chintapalli MD: Nothing to Disclose
Vijayanadh Ojili MD: Nothing to Disclose

TEACHING POINTS
1. To illustrate embryology and anatomy of peritoneum with emphasis on foramina, recesses and fossae associated and responsible for development of congenital internal hernias. 2. To discuss salient imaging findings that can help in diagnosing and classifying internal hernias on multidetector computed tomography (MDCT). 3. To present an algorithmic approach for accurate preoperative diagnosis.

TABLE OF CONTENTS/OUTLINE
Congenital weakness in peritoneal orifices leads to abnormal protrusion of viscera and internal hernias. These patients can be asymptomatic or can present with epigastric discomfort, periumbilical pain and recurrent vomiting. Diagnosing it early is critical as internal hernia with small bowel obstruction (SBO) is at high risk for strangulation, ischemia and perforation. Accurate knowledge of anatomy of peritoneal cavity and potential hernia sites is very important. Each type of hernia has characteristic anatomic location and CT appearance. MDCT with multiplanar reconstruction (MPR) plays vital role in diagnosis and guiding surgical approach. In this educational exhibit, we discuss the types and important imaging findings of paraduodenal, pericecal, foramen of Winslow, transmesenteric, transmesocolic, pelvic and supravesical, sigmoid mesocolon, transomental hernias with emphasis on utility of MDCT and algorithmic approach for accurate preoperative diagnosis.

GIE302
Duodenal Imaging: An Alphabet of Pathology (Part I)

Education Exhibits
Location: GI Community, Learning Center

Participants
Daniel Andrade MD (Presenter): Nothing to Disclose
Luisa Costa Andrade: Nothing to Disclose
Jorge Brito MD: Nothing to Disclose
Luís Curvo-Semedo MD, PhD: Nothing to Disclose
Filipe Caseiro-Alves: Nothing to Disclose

TEACHING POINTS
To recognize the most important imaging findings of non-neoplastic conditions of the duodenum. To be aware of the most frequent imaging appearances of duodenal neoplasms.

TABLE OF CONTENTS/OUTLINE
The duodenum, being the first section of the small intestine, has some peculiarities that make it prone to a variety of conditions, either neoplastic or non-neoplastic. In this pictorial essay we will review the most frequent tumors of the duodenum (adenocarcinoma; lymphoma; GIST; lipoma; metastasis) and also some rare ones (Brunner’s gland hamartoma; juvenile polyposis). Focusing mainly on CT and upper gastrointestinal series findings. We will also discuss imaging findings of non-neoplastic conditions, such as congenital (situs inversus; malrotation; diverticula), traumatic (iatrogenic rupture; hematoma), inflammatory (groove pancreatitis; duodenitis; celiac disease; Crohn’s disease; fistulas) and other emergency situations (gallstone ileus; perforation; retroperitoneal; hernia; varices; superior mesenteric artery syndrome). We will review all these conditions in alphabetical order, with at least one condition for each letter of the alphabet, in a two-part educational exhibit (part I - from letter A to letter K and part II - from letter L to letter Z).

GIE303
Duodenal Imaging: An Alphabet of Pathology (Part II)

Education Exhibits
Participants
Daniel Andrade MD (Presenter): Nothing to Disclose
Luisa Costa Andrade: Nothing to Disclose
Jorge Brito MD: Nothing to Disclose
Luis Curvo-Semedo MD, PhD: Nothing to Disclose
Filipe Caseiro-Alves: Nothing to Disclose

TEACHING POINTS
To recognize the most important imaging findings of non-neoplastic conditions of the duodenum. To be aware of the most frequent imaging appearances of duodenal neoplasms.

TABLE OF CONTENTS/OUTLINE
The duodenum, being the first section of the small intestine, has some peculiarities that make it prone to a variety of conditions, either neoplastic or non-neoplastic. In this pictorial essay we will review the most frequent tumors of the duodenum (adenocarcinoma; lymphoma; GIST; lipoma; metastasis) and also some rare ones (Brunner’s gland hamartoma; juvenile polyposis), focusing mainly on CT and upper gastrointestinal series findings. We will also discuss imaging findings of non-neoplastic conditions, such as congenital (situs inversus; malrotation; diverticula), traumatic (iatrogenic rupture; hematoma), inflammatory (groove pancreatitis; duodenitis; celiac disease; Crohn’s disease; fistulas) and other emergency situations (gallstone ileus; afferent loop syndrome; internal hernia; varices; superior mesenteric artery syndrome). We will review all these conditions in alphabetical order, with at least one condition for each letter of the alphabet, in a two-part educational exhibit (part I - from letter A to letter K and part II - from letter L to letter Z).

GIE304
Gastric Cancer: MDCT Characterization and Pattern of Spread of Disease

Education Exhibits
Location: GI Community, Learning Center

Participants
Alejandro Perez Martinez: Nothing to Disclose
Pilar Sanchez Camacho (Presenter): Nothing to Disclose
Rafael Morcillo Carratala MD: Nothing to Disclose
Lina Marcela Cruz Hernandez ARRT: Nothing to Disclose
Ivan Mauricio Vargas Orozco MD: Nothing to Disclose
Andres Enriquez-Puga MBChB, MSc: Nothing to Disclose
Carmen Cereceda Perez MD: Nothing to Disclose

TEACHING POINTS
The propose of this exhibit is:
1.- To review the proper imaging technique needed to accomplish a correct MDCT gastric study
2.- To discuss the more relevant imaging findings of different kinds of gastric cancer, highlighting those key to differential diagnosis
3.- To explain the pattern of growth and spread of gastric cancers, which is essential to understand the pathology and the imaging findings.

TABLE OF CONTENTS/OUTLINE
- Imaging technique for MDCT gastric studies
  Patient preparation
  Contribution of reformatted images
- MDCT imaging findings of gastric cancer including:
  Premalignant lesions
  Early and advanced gastric carcinoma
  Early and advanced GIST
  Gastric lymphoma
  Gastric neuroendocrine Tumors
  Rare Tumors
  Mimics and pitfalls
- Patterns of growth and spread of the different tumors
- Summary and conclusions

GIE307
Imaging Clues to Duodenal Pathology: A Pictorial Review

Education Exhibits
Location: GI Community, Learning Center

Participants
Michael H. Raj MD (Presenter): Nothing to Disclose
Priya Kumar Shah MD: Nothing to Disclose

TEACHING POINTS
1. Perforation of the anterior wall of the duodenum will often present with free air and fluid in the peritoneal cavity, whereas perforation involving the posterior wall will often have walled-off fluid collections in the retroperitoneum. 2. Duodenal diverticula are important to identify prior to attempting endoscopic retrograde cholangiopancreatography and may have complications (inflammation, perforation, bezoar formation). 3. Like pancreatic injuries, duodenal injuries rarely occur in isolation and the presence of one injury should prompt a more thorough evaluation for coexisting injuries (solid organs, lumbar spine, and
vascular) as these coexisting injuries are associated with significantly increased morbidity and mortality.

**TABLE OF CONTENTS/OUTLINE**


**GIE308**

**Imaging Features of Gastrointestinal Stromal Tumors Pre- and Post- Treatment: Revisited**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

- Bethany Milliron MD (Presenter): Nothing to Disclose
- Juan Camilo Camacho: Nothing to Disclose
- Abhijit Datir MD: Nothing to Disclose
- Courtney Ann Coursey Moreno MD: Nothing to Disclose
- Pardeep Kumar Mittal MD: Nothing to Disclose

**TEACHING POINTS**

- Review pertinent pathophysiology of gastrointestinal stromal tumors
- Describe imaging findings of gastrointestinal stromal tumor at presentation with implications on treatment planning/options
- Discuss imaging findings following various treatment approaches

**TABLE OF CONTENTS/OUTLINE**

1. Review of gastrointestinal stromal tumors pathophysiology and clinical features a. Activating mutations (KIT and PDGFRA) b. Epidemiology c. Signs and symptoms at presentation 2. CT and MR findings at presentation a. Common sites - GI tract, mesentery and retroperitoneum b. Metastatic disease - hepatic and peritoneal disease c. What do clinicians want to know to plan treatment? i. Relationship between mass and gastrointestinal wall 3. Post-Treatment studies a. Normal post treatment change versus recurrence 4. Summary - Gastrointestinal stromal tumors are the most common mesenchymal tumors of the GI tract - CT and MRI are the imaging methods of choice for detection, staging, treatment (surgical) planning, and follow-up of gastrointestinal stromal tumors

**GIE309**

**Imaging Spectrum of Post-operative Complications of Bariatric Surgeries**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

- Malaz Musa: Nothing to Disclose
- ahmed derwish: Nothing to Disclose
- Adham Darweesh: Nothing to Disclose
- Shaimaa Abdelhassib Aabdelrafeh MBCh (Presenter): Nothing to Disclose
- Ahmed Monier Sherif MBBCh, FRCR: Nothing to Disclose
- Amal Airashid MBBS: Nothing to Disclose

**TEACHING POINTS**

1. This pictorial review describe the spectrum of imaging findings of the stomach and small bowel after Bariatric surgeries, thus help radiologists understand the variations in the anatomy and complications after different types of bariatric surgeries.
2. To familiarize the radiologists with the imaging findings of complications of the bariatric surgeries.

**TABLE OF CONTENTS/OUTLINE**

- Description of the different categories of bariatric surgeries and how it is performed.
- The Fluoroscopic and computed tomography findings of post bariatric surgeries illustrating different radiological pictures of the postoperative anatomical variations.
- Review how to approach fluoroscopic and CT evaluation of complications of bariatric surgeries in particular:
  1. Roux-en-Y gastric bypass (RYGB)
  2. Laparoscopic adjustable gastric banding (LAGB)
  3. Laparoscopic gastric sleeve (LGS)

**GIE310**

**Inflammatory Fibroid Polyps of the Gastrointestinal Tract: Imaging Spectrum with Pathologic Correlations and Mimickers**

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

- Ga Jin Han (Presenter): Nothing to Disclose
- Jin Hee Kim MD: Nothing to Disclose
- Seung Soo Lee MD: Nothing to Disclose
- Seong Ho Park MD: Research Grant, DONGKOOK Pharmaceutical Co, Ltd
- Jong Sook Lee: Nothing to Disclose
- Hyun Kwon Ha MD: Nothing to Disclose

**TEACHING POINTS**

1. This pictorial review describe the spectrum of imaging findings of the stomach and small bowel after Bariatric surgeries, thus help radiologists understand the variations in the anatomy and complications after different types of bariatric surgeries.
2. To familiarize the radiologists with the imaging findings of complications of the bariatric surgeries.

**TABLE OF CONTENTS/OUTLINE**

- Description of the different categories of bariatric surgeries and how it is performed.
- The Fluoroscopic and computed tomography findings of post bariatric surgeries illustrating different radiological pictures of the postoperative anatomical variations.
- Review how to approach fluoroscopic and CT evaluation of complications of bariatric surgeries in particular:
  1. Roux-en-Y gastric bypass (RYGB)
  2. Laparoscopic adjustable gastric banding (LAGB)
  3. Laparoscopic gastric sleeve (LGS)
1. To present the broad spectrum of imaging features of inflammatory fibroid polyps (IFPs) in the gastrointestinal tract, from the stomach to the colon, and their pathologic correlations on the basis of our experience with 122 pathology-proven cases during the past 13 years. 2. To point out characteristic imaging features of IFP which can be helpful to differentiate it from mimickers.

### TABLE OF CONTENTS/OUTLINE

Content Organization: 1. Imaging spectrum of IFPs and pathologic correlations
   (1) Stomach (2) Duodenum (3) Jejunum and ileum (4) Colon
   2. Characteristic imaging features of IFPs
   3. Mimickers of IFPs and differential diagnosis
   Summary: Imaging features of IFPs and their locations may be variable. It is important that radiologists be aware of these diverse imaging manifestations of IFPs as well as their characteristic imaging features to better differentiate this condition from its mimickers.

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### MDCT of Small Bowel Obstruction: Imaging Features, Pitfalls and Radiologic Techniques

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

- Hidenobu Takagi MD (Presenter): Nothing to Disclose
- Masashi Tsuda: Nothing to Disclose
- Kei Takase MD, PhD: Nothing to Disclose

**TEACHING POINTS**

The purpose of this exhibit is:

1. To review and describe the imaging findings in small bowel obstruction (SBO) on MDCT.
2. To learn what radiologists need to know about SBO for clinical management and treatment decisions.
3. To illustrate various challenging cases.

### TABLE OF CONTENTS/OUTLINE

1. Pathophysiology of SBO, with emphasis on closed loop obstruction
2. Review of imaging findings:
   - Localization of SBO (Ascites, mesenteric and bowel edema)
   - Severity of SBO (Bowel wall attenuation and enhancement)
   - Cause of SBO (Adhesion, band, foramen and congenital defect)
3. The radiologic approach to clinical decisions
4. Various demonstrable cases: analysing various internal hernias
5. Summary

---

### Monitoring Crohn’s Disease with Cross Sectional Imaging: Still A Lot of Room to Grow

**Education Exhibits**

**Location:** GI Community, Learning Center

**Certificate of Merit**

**Participants**

- Jordi Rimola MD (Presenter): Consultant, Robarts Clinical Trials Research Group
- Tomas Ripolles MD: Nothing to Disclose
- Sonia Rodriguez MD: Nothing to Disclose
- Miriam Cuatrecasas: Nothing to Disclose
- Ingrid Ordas: Nothing to Disclose
- Julian Panes: Nothing to Disclose

**TEACHING POINTS**

1. To discuss the relevance of monitoring Crohn’s disease by imaging modalities. 2. To become familiar with useful radiological signs after medical treatment of Crohn’s disease. 3. To understand the changes which occur after recurrence in Crohn’s disease.

### TABLE OF CONTENTS/OUTLINE

A) What techniques are available for monitoring Crohn’s disease (CD) and what are the pros and cons of each:
   - Clinical symptoms
   - Biomarkers (CRP, calprotectin, ...)
   - Endoscopy
   - Cross-sectional imaging
B) What are the gains and possibilities of monitoring CD by cross sectional imaging
C) What is known and what are the limitations of cross-sectional imaging for monitoring CD
D) Providing representative examples including US, CTE and MRE with correlation to endoscopic and/or pathological findings. Knowing the changes of the lesions after treatment could be used to confirm the disease activity state and to improve patient management
E) Future trends and directions

Preliminary evidence suggests that in CD a state of remission beyond the simple control of clinical symptoms, and including healing of lesions, may be associated with better disease outcome. Monitoring the disease through the use of cross-sectional imaging is gaining increased acceptance as it has advantages over endoscopy, but also limitations that should be made aware.

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### MR Enterographic Manifestations of Crohn’s Disease and Other's Conditions

**Education Exhibits**

**Location:** GI Community, Learning Center

**Participants**

- Javier Vallejos MD, MBA (Presenter): Nothing to Disclose
TEACHING POINTS

1. To describe technical considerations for achieving an optimal small-bowel MR study. 2. To discuss the advantages and limitations of MR imaging of the small bowel. 3. To determine the role of MR enterography in evaluation of Crohn disease and other small-bowel conditions.

TABLE OF CONTENTS/OUTLINE


GIE314

MR Enterography in the Assessment of Crohn’s Disease

Education Exhibits
Location: GI Community, Learning Center

Participants
Steven Peti MD (Presenter): Nothing to Disclose
Iakovos Koutras MD: Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: 1. To discuss the indications of MR Enterography in Crohn’s disease. 2. To review the imaging protocol and contrast agents used. 3. To illustrate the various MR findings of Crohn’s disease.

TABLE OF CONTENTS/OUTLINE

Introduction Indication of MR enterography in Crohn's disease MR Enterography technique Small Bowel findings Extraenteric findings Colonic findings Summary

GIE316

Occult Abdominal Hernias - How Critical Is Imaging?

Education Exhibits
Location: GI Community, Learning Center

Participants
Chinmay Bhimaji Kulkarni MBBS, MD (Presenter): Nothing to Disclose
Srikanth Moorthy MD: Nothing to Disclose
Sreekumar K P MBBS, MD: Nothing to Disclose
Nirmalkumar Prabhu: Nothing to Disclose
Rajesh Ramaiah Kannan MD: Nothing to Disclose

TEACHING POINTS

1. To understand the basic anatomical background of various internal hernias and other rare clinically occult hernias. 2. Role of imaging techniques in diagnosing clinically undetectable hernias with emphasis on Computed Tomography. 3. How imaging helps in appropriate management of these patients?

TABLE OF CONTENTS/OUTLINE

Anatomy and mechanism of hernia.
Imaging features.
Critical role of imaging in management of patients.

GIE317

Our Experience with the CT Enterography and the Inflammatory Bowel Disease

Education Exhibits
Location: GI Community, Learning Center

Participants
Ana Maria Vargas Diaz MD (Presenter): Nothing to Disclose
Jacinto Grasa: Nothing to Disclose
Marta Celia Lobo Garcia MD: Nothing to Disclose
Cristina Fernandez Rey: Nothing to Disclose
Francisco Javier Rodriguez Recio MD: Nothing to Disclose

TEACHING POINTS

To analyze the CT enterography radiological findings in patients with inflammatory bowel disease (activity and complications), as well as perform a diagnostic approach in patients with high suspicion.

To present the experience in our service since this technique was introduced in January 2011 to the present.

To review the current literature
The introduction of neutral oral contrast agent and the improvement of the luminal distention, have offer a new specific technique of the small intestine known as CT enterography. This technique can evaluate inflammatory bowel disease, vascular malformations and small intestine tumors. We have evaluated the signs of active inflammatory stenosis: mucosal hyperenhancement, wall thickening, mural stratification, increased attenuation of mesenteric fat and prominent vasa recta; as well as signs of complications such as abscesses, fistulas and obstruction. We evaluate the inactive disease with radiological findings of submucosal fat deposition, pseudosacculation, surrounding fibrofatty proliferation and fibrotic stenosis. The importance of being familiar with the radiological findings of active and non-active disease becomes important because the first one is susceptible to medical treatment while the second one may require surgical procedures such as resection of the affected segment.

**Performing Upper Gastrointestinal Examinations to Assess Gastric Bypass Surgeries: How We Do It, Tips, and Pitfalls**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

Ichiro Ikuta MD, MMedSc (Presenter): Nothing to Disclose  
Thomas Michael Cullen MD: Nothing to Disclose  
Taneya Lamb MD: Nothing to Disclose  
Henry Chow Chow DO: Nothing to Disclose  
Andrew Shih MD: Nothing to Disclose

**TEACHING POINTS**

- We review how to modify an upper gastrointestinal exam for post-surgical gastric bypass patients.  
- We will demonstrate the expected appearance for post-operative Roux-en-Y gastric bypass, gastric sleeve, and gastric band procedures.  
- We will then demonstrate complications that may arise.  
- Finally, we will review techniques to reduce radiation exposure to levels as low as reasonably achievable.

**Spread Patterns on MDCT in Gastric Carcinoma: Everything a Radiologist Needs to Know**

*Education Exhibits*

*Location: GI Community, Learning Center*

**Participants**

Mario Gerardo Santamarina MD (Presenter): Nothing to Disclose  
Ignacio Beddings MD: Nothing to Disclose  
Stefano Edoardo Rinaldi: Nothing to Disclose  
Hector Opazo Sanchez MD: Nothing to Disclose  
Mariano Volpacchio MD: Nothing to Disclose  
Christine O. Menias MD: Nothing to Disclose

**TEACHING POINTS**

1- To review the diagnosis of gastric carcinoma on MDCT  
2- To discuss a detailed knowledge of the different spread patterns of gastric carcinoma  
3- To illustrate and demonstrate gastric cancer spreads patterns on MDCT

**This May Be Hard to Swallow: A Pictorial Review of Esophageal Adenocarcinoma**

*Education Exhibits*
Participants
Jennifer Flanagan (Presenter): Nothing to Disclose
Shaun Michael Nordeck MS, RRA : Research Grant, Toshiba Corporation
Vasantha Vasan MD : Nothing to Disclose
Richard Charles Batz MD : Nothing to Disclose

TEACHING POINTS
Adenocarcinoma is the most common esophageal cancer in the U.S. and often in an advanced stage when diagnosed. The five year survival rate depends heavily on the stage at diagnosis; therefore early detection is of utmost importance. This educational exhibit will review esophageal adenocarcinoma and its presentation across the imaging spectrum (i.e. UGI, PET/CT, CT, EUS, EGD) and review the pitfalls/mimics that may present.

TABLE OF CONTENTS/OUTLINE
I. Anatomy review of GI tract with special emphasis of GE junction II. Brief overview of esophageal adenocarcinoma (incidence, risk factors, clinical presentation, work-up, treatment and prognosis) III. Pictorial review of esophageal adenocarcinoma and key imaging features across the imaging spectrum (i.e. UGI, PET/CT, CT, EUS, EGD) IV. Review pitfalls / mimics V. Summary of teaching points

MSE003-b

The Great Pretender—How Sarcoidosis Gained Its Reputation as the Mimic of Other Pathology

Education Exhibits
Location: MS Community, Learning Center

Participants
Thomas Robert Semple MBBS, BSC (Presenter): Nothing to Disclose
Susan Jane Buckingham MBChB : Nothing to Disclose

TEACHING POINTS
The aim of this exhibit is to
1. Review the pathophysiology of sarcoidosis
2. Demonstrate the typical radiological features of sarcoid within the chest, abdomen and central nervous system
3. Share some particularly good cases of sarcoid mimicking other conditions and the key features that suggest sarcoid could be the underlying cause

TABLE OF CONTENTS/OUTLINE
The Pathophysiology of Sarcoidosis
Typical Radiological Features (radiography, CT, MRI)
- Chest
- Abdomen
- Central Nervous System
Sarcoid as mimic of other pathology - illustrative cases and tell tale signs all is not what it seems (Including, amongst others, cases of sarcoid masquerading as metastatic bowel cancer (granulomatous colitis with necrotic lymphadenopathy and multiple pulmonary lesions) and mimicking high grade lymphoma with extensive bone marrow involvement (lymphadenopathy and diffuse bone FDG avidity on PET-CT). All cases presented were subsequently biopsy proven to represent sarcoidosis)
Summary

MSE006-b

Endoluminal Contrast for the Abdominal and Pelvic MRI: When, Where, and How?

Education Exhibits
Location: MS Community, Learning Center

Participants
Mohit Kumar Gupta MD (Presenter): Nothing to Disclose
Daniella Ferraro Fernandes Costa Pinho MD : Nothing to Disclose
April Alexander Bailey MD : Nothing to Disclose
Gaurav Khatri MD : Nothing to Disclose
Ivan Pedrosa MD : Shareholder, Humana Inc

TEACHING POINTS
1. To review the types of endoluminal contrast agents available for abdominal and pelvic MRI examinations.
2. To highlight specific clinical scenarios where endoluminal contrast agents help in the identification of abdominal and pelvic pathology.
3. To illustrate how to implement endoluminal contrast agents into clinical abdominal and pelvic MRI protocols.

TABLE OF CONTENTS/OUTLINE
Endoluminal contrast agents- Water, US gel, Diluted gadolinium, Barium, Iron-based Route of Administration- Endovaginal, endorectal, retrograde transurethral, oral, loopogram, fistulogram Applications of endoluminal contrast - Clarify conventional MRI findings, congenital anomalies, fistula formation, inflammatory bowel disease, extent of pelvic malignancies, endometriosis Use of endoluminal contrast agents in clinical practice - Indications, Selection of contrast agent, Preparation, and MRI Protocol
Conclusions - A variety of endoluminal contrast agents are available for clinical use in detecting specific abdominal and pelvic pathology. - Endoluminal contrast agents help identify or accentuate a wide variety of pathologic conditions in the abdomen and pelvis. - Use of endoluminal contrast agents in clinical practice requires understanding specific indications, preparation, and selection of a proper imaging protocol.

MSE012-b

DWI in Treatment Planning and Response Assessment of Abdomino-pelvic Malignancies: All you Need to Know

Education Exhibits
Location: MS Community, Learning Center

Participants
Leslie Ka-Hung Lee, MD (Presenter): Nothing to Disclose
Susanna I. Lee, MD, PhD: Nothing to Disclose
Onorio Antonio Catalano, MD: Nothing to Disclose
Debra Ann Gervais, MD: Research Grant, Covidien AG
Dushyant V. Sahani, MD: Research Grant, General Electric Company
Avinash Ranesh Kambadakone, MD, FRCR: Nothing to Disclose

TEACHING POINTS
The purpose of this educational exhibit is 1) to discuss the basic principles and technique of DWI at 1.5 T and 3T for oncological applications in the abdominal and pelvis, 2) to discuss the role of DWI in treatment planning and response assessment of abdomino-pelvic malignancies and 3) to review the potential pitfalls and challenges in interpretation of DWI

TABLE OF CONTENTS/OUTLINE

MSE101

Cardiopulmonary and Gastrointestinal Manifestations of Eosinophilic Diseases (ED) and Idiopathic Hypereosinophilic Syndromes: Radiological Spectrum with Emphasis on Cross Sectional Imaging

Education Exhibits
Location: MS Community, Learning Center

Participants
Rashmi S. Katre (Presenter): Nothing to Disclose
Carlos S. Restrepo, MD: Nothing to Disclose
Abhijit Sunnapwar, MD: Nothing to Disclose
Venkata S. Katabathina, MD: Nothing to Disclose
Sushilkumar K. Sonavane, MD: Nothing to Disclose
Ameya Jagadish Baxi, MBBS, DMRD: Nothing to Disclose

TEACHING POINTS
1. ED are a diverse group of disorders associated with peripheral or tissue eosinophilia. System involvement can be due to primary ED with no known cause or secondary due to underlying condition or known cause. Diagnosis of ED is established by clinical, laboratory and imaging findings 2. CT and MR play important role to assess the extent of disease and end organ damage. Delayed gadolinium enhancement on cardiac MRI is particularly helpful in confirming myocarditis or pericarditis

TABLE OF CONTENTS/OUTLINE
• Pulmonary manifestations of ED: simple eosinophilic pneumonia, chronic eosinophilic pneumonia, allergic bronchopulmonary aspergillosis, parasitic infections, drug reactions, Churg-Strauss syndrome and primary hypereosinophilic syndromes - radiographic and CT findings • Cardiac involvement: typically seen as endomyocarditis and rarely pericarditis - role of CT and post gadolinium MRI • Eosinophilic gastrointestinal disorders: esophagitis, gastritis, enteritis and colitis - conventional radiography and CT findings Chest radiograph may be the first screening tool to suggest ED along with patient symptoms. Correlation between CT/ MR findings and the results of careful clinical evaluation may be helpful in developing a differential diagnosis for eosinophilic disease. Radiologists should be aware of these entities and their imaging appearances

MSE105

Tumefactive Fibro-inflammatory Disorders of the Abdomen and Pelvis: 2014 Update

Education Exhibits
Location: MS Community, Learning Center

Participants
Venkata S. Katabathina, MD (Presenter): Nothing to Disclose
Suhare K. Khalil, MD: Nothing to Disclose
Venkateswar Rao Surabhi, MD: Nothing to Disclose
Raghunandan Vikram, MBBS, FRCR: Nothing to Disclose
Naoki Takahashi, MD: Nothing to Disclose
Srinivasa R. Prasad, MD: Nothing to Disclose

TEACHING POINTS
Review select fibro-inflammatory diseases presenting as masses that may masquerade as malignancies. Discuss recent advances regarding pathogenesis and clinico-pathological findings. Describe MDCT/MRI/PET-CT findings and the role of radiologist in diagnosis, management, and surveillance.

TABLE OF CONTENTS/OUTLINE
Introduction
Taxonomy: Inflammatory pseudotumors, IgG4 sclerosing disease, auto-immune pancreatitis, sclerosing mesenteritis, retroperitoneal fibrosis and auto-immune prostatitis
Recent advances in pathogenesis and molecular biology
MDCT, MRI and PET-CT findings
Natural history and prognosis
Conclusion
Select fibro-inflammatory diseases of the abdomen and pelvis present with masses that may be mistaken for more common neoplasms. IgG4 related disease has recently been described and current concepts of autoimmune pancreatitis continue to evolve. Biopsy is definitive; select masses show exquisite response to steroids or immunosuppressive drugs. Imaging findings allow initial detection, treatment follow-up and surveillance.

MSE106
A Wolf in Sheep’s Clothing: Tumor in the Abdomen Mimicking Benign Conditions

Education Exhibits
Location: MS Community, Learning Center
Certificate of Merit

Participants
Sarah Kyung Oh MD (Presenter): Nothing to Disclose
Zina Joan Ricci MD : Nothing to Disclose
Jeffrey Harmon Roberts MD : Nothing to Disclose
Victoria Chernyak MD : Nothing to Disclose
Alla M. Rozenblit MD : Nothing to Disclose
Fernanda Samara Mazzariol MD : Nothing to Disclose
Milana Piusberg MD : Nothing to Disclose
Marjorie Werner Stein MD : Nothing to Disclose
Ellen Leslie Wolf MD : Nothing to Disclose

TEACHING POINTS
Teaching points: Review multimodality (CT, Ultrasound, and MRI) imaging of malignant disease in the abdomen which simulates benign conditions, raising awareness of overlapping features and highlighting key imaging pearls for correct diagnosis. 1. Malignant disease can simulate benign conditions. 2. Superimposed infectious or inflammatory process may obscure the primary pathology. 3. Behavior on follow up exam can be helpful in distinguishing malignant disease from benign conditions.

TABLE OF CONTENTS/OUTLINE
A. Discuss differences between imaging modalities in the evaluation of tumor within the abdomen. B. Present cases where malignant disease simulates a benign condition. C. Present cases where a superimposed infectious or inflammatory process obscures the primary pathology. D. Highlight key features that may aid in correct diagnosis. E. Review imaging surveillance recommendations. Cases include but are not limited to the following: - Mucinous hepatic metastases as biliary hamartomas - HCC as FNH - Scirrhous colon carcinoma as diffuse colitis with toxic megacolon - Mucinous appendiceal neoplasm as acute appendicitis - TCC as normal renal sinus fat - Seminoma as orchitis - Psammomatous ovarian calcification as fibroids - Krukenberg tumors as tubo-ovarian abscesses - Buttock carcinoma as sacral decubitus ulcer

MSE107
Blast from the Past: Multimodality Imaging of Small Cell Carcinoma from Head to Toe

Education Exhibits
Location: MS Community, Learning Center

Participants
Tatiana Kelil MD (Presenter): Nothing to Disclose
Sreeharsha Tirumani MBBS, MD : Nothing to Disclose
Michael Hayden Rosenthal MD, PhD : Nothing to Disclose
Nikhil H. Ramaia MD : Nothing to Disclose
Monica J. Wood BS : Nothing to Disclose
Stephanie A. Howard MD : Nothing to Disclose

TEACHING POINTS
1. The revised 2010 WHO classification of neuroendocrine tumors (NET) classifies small cell carcinoma (SCC) as grade 3 neuroendocrine carcinoma based on mitotic count and proliferation index. 2. SCC most commonly occurs in the lung and uncommonly in extrapulmonary sites (2-5%). 3. Extrapulmonary SCC most commonly occurs in GI (particularly esophagus) and GU (particularly cervix and bladder) tracts. 4. SCC is characterized by mutations in p53, loss of retinoblastoma gene (RB1) and telomerase function and activation of c-KIT, MYC and PARP1. 5. SCC of the lung has striking early response to chemoradiation with high relapse rates and unusual metastasis. 6. Relapsed SCC is extremely difficult to treat, though some respond to temozolomide in particular in the setting of brain metastases. 7. Novel molecular targeted therapies (MTTs) in SCC include Aurora kinase (MYC) and PARP inhibitors.

TABLE OF CONTENTS/OUTLINE
1. Revised 2010 WHO classification of NET, focusing on pulmonary and extrapulmonary SCC. 2. Risk factors and epidemiology of SCC. 3. Role of multimodality imaging (CT, MRI, PET/CT) in disease staging, focusing on prognostic implications of disease site. 4. Illustrate typical and atypical metastases evaluating for recurrent disease. 5. Future directions of treatment, including role of temozolomide and novel MTTs.

MSE109
BRCA Associated Tumors—Not Just Breast and Ovarian Cancer

Education Exhibits
Location: MS Community, Learning Center
The proteins encoded by BRCA genes are tumor suppressors involved in DNA damage repair. With mutations of the BRCA gene, the ability to repair DNA damage is impaired, which can result in tumor development. Although breast and ovarian cancer are classically thought to be associated with BRCA mutations, other tumors may also contain such mutations like pancreatic, prostate and peritoneal cancer. Knowledge of BRCA mutations have started to affect approaches to treatment strategies.

In this exhibit, we will discuss and demonstrate:

1. BRCA genes and their function.
2. Epidemiology and the radiographic appearance of tumors such as breast, ovarian, prostate and pancreatic cancer, which can be seen in the setting of BRCA mutations.

TABLE OF CONTENTS/OUTLINE
1. BRCA gene product function and genetic testing
2. Epidemiology
3. Tumors associated with BRCA mutations
   a. Breast cancer
   b. Ovarian cancer
   c. Pancreatic cancer
   d. Fallopian tube cancer
   e. Peritoneal cancer
   f. Prostate cancer
4. Emerging therapy strategies in BRCA mutations
TABLE OF CONTENTS/OUTLINE

I. Introduction to DWI and ADC maps
II. Examples of pathology in the abdomen and pelvis well characterized using DWI, with emphasis in which DWI added information not available with standard MR imaging sequences. Case examples include:

- primary malignancy detection
- metastatic disease
- tumor recurrences
- inflammatory processes: autoimmune pancreatitis, hepatic abscesses, pyelonephritis, inflammatory and infectious bowel disease

Examples of the benefit of DWI in patients who are unable to receive contrast, including evaluation for appendicitis in pregnant patients and in characterization of renal masses in patients with severe renal insufficiency.

IV. Discussion of some of the limitations and potential pitfalls in interpretation of DWI.

MSE128

Aunt Minnie’s and Classic Signs in Adult Abdominopelvic Ultrasonography: A Primer for Radiology Residents

Education Exhibits
Location: MS Community, Learning Center

Participants
Nanda Venkatanarasimha MRCP, FRCR (Presenter): Nothing to Disclose

TEACHING POINTS
Familiarity afforded by recognition of a classic sign or Aunt Minnie on ultrasound allows for a more confident and accurate diagnosis. Identification and understanding the pathophysiologic characteristics associated with these signs can facilitate timely patient management.

TABLE OF CONTENTS/OUTLINE

- Systematic review of signs in Hepatobiliary:
  - Starry sky, halo, target, reverse target, short gun, double duct, central dot, double barrel, gamma-gandy bodies
  - WES, comet tail, Champagne, Murphy's Genitourinary.
- Renal sweat, dromedary hump, milk of calcium, mickey-mouse, Jack stone, cobra, ureteric jet
- Fibillary dance, onion skin

- Peritoneum & bowel:
  - Cake and Sandwich; pseudokidney
- Pelvis:
  - Picket fence, tip of iceberg, string of pearls, feeding artery, ring of fire, bridging vascular, plug and mesh Doppler
  - Spoke wheel, whirl pool, Ying-yang, String of beads, visible thrill, mosaic

- Reverse 'M', Parvus tardus, hepatofugal Correlative imaging

Summary

MSE130

Conquering the Calcifications of the Abdomen and Pelvis

Education Exhibits
Location: MS Community, Learning Center

Participants
Mahan Mathur MD (Presenter): Nothing to Disclose
Jonathan D. Kirsch MD : Nothing to Disclose
Mike Spektor MD : Nothing to Disclose
Kyle Elmer Pfeifer MD : Nothing to Disclose
Margarita V. Revzin MD : Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is to test the viewer on their knowledge of common and uncommon clinical entities that manifest primarily as calcifications within the abdomen and pelvis. The location and pattern of calcification will be emphasized thus allowing generation of a reasonable differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Cases will be presented in a quiz format. The majority of the initial imaging findings will be presented on conventional radiographs, from which a differential diagnosis can be generated. This will be followed by a discussion of the findings, highlighting key imaging features with CT. The following cases will be presented:

- Nephrolithiasis (including nephrocalcinosis)
- Staghorn calculus Poly cystic kidney disease (peripherally calcified cyst borders)
- Vas deferens calcifications
- Ureteral stent calcifications
- Gallstones
- Sclerosing encapsulating peritonitis
- Chronic pancreatitis
- Autoinfarcted spleen
- Fibroids
- Bladder stones (including stones in bladder diverticulum)
- Transitional cell carcinoma
- TB (putty kidney)
- Liver schistosomiasis
- Echinococcus
- Calcified lymph nodes
- Injection granulomas
- Transplanted kidney
- Peyronie’s disease
- Abdominal aortic aneurysm
- Calciphyaxis
- Twin gestation

MSE133

Ectopic Tissues in the Abdomen: Anatomical, Clinical, and Radiologic Features of the Rare Entities

Education Exhibits
Location: MS Community, Learning Center

Selected for RadioGraphics

Participants
Ryosuke Taiji (Presenter): Nothing to Disclose
Nagaaki Marugami : Nothing to Disclose
Junko Takahama MD : Nothing to Disclose
Masayo Ogawa : Nothing to Disclose
Aki Takahashi MD : Nothing to Disclose
Kimihiko Kichikawa MD : Nothing to Disclose

TEACHING POINTS
1. To understand anatomical common site, embryological etiology of ectopic tissues in the abdomen. 2. To demonstrate clinico-radiological features of ectopic tissues.
TABLE OF CONTENTS/OUTLINE

1. To review the abnormal development of ectopic tissues in the abdomen based on embryology. 2. To introduce the multimodality imaging using tissue-specific contrast media (contrast-enhanced US, SPIO-MRI, EOB-MRI and gastric mucosal membrane scintigraphy) for diagnosis of ectopic tissues in the abdomen. 3. To demonstrate clinico-radiological features of the ectopic tissues (1 Liver: ectopic liver and hepatocellular carcinoma from ectopic liver, 2 Gall bladder: double gall bladders, 3 Pancreas: ectopic pancreas in small intestine, 4 Spleen: intra-pancreatic spleen and splenosis, 5 Kidney: ectopic kidney in the pelvis, 6 Adrenal gland: adrenal rest tumor, 7 Gastric mucosa: Meckel diverticulum and gastric duplication, 8 Endometrium: endometriosis of the ureter, bladder and inguinal canal, 9 Ovarian stroma: mucinous cystic neoplasm of the pancreas).

MSE142

It’s Alive!!! How to Use a Simple Tissue Phantom to Teach Liver Biopsy, Abscess Drainage and Percutaneous Cholecystostomy Procedures

Education Exhibits
Location: MS Community, Learning Center

Magna Cum Laude

Participants
Maryellen Ruth Morris Sun MD (Presenter): Investigator, Bracco Group Investigator, Glaxo SmithKline plc
Bettina Siewert MD : Nothing to Disclose
Hannah Perry : Nothing to Disclose

TEACHING POINTS
- A simple and inexpensive tissue phantom is easily created for use in training residents and fellows to perform multiple procedures in the liver. -Enhancements including respiratory motion and simulation of target lesions, abscesses and infected gallbladders customize the teaching experience. -Method of phantom creation and application to teach targeted and nontargeted biopsies, percutaneous drainage of liver abscesses and percutaneous cholecystostomy are demonstrated.

TABLE OF CONTENTS/OUTLINE

MSE148

Non-conventional Uses of Diffusion-weighted MRI in Abdomen: Beyond Oncology

Education Exhibits
Location: MS Community, Learning Center

Participants
Bernardo Canedo Bizzo MD (Presenter): Nothing to Disclose
Romulo Varella MD : Nothing to Disclose
Eduardo Neumann Cupolillo MD : Nothing to Disclose
Carolina Canedo Bizzo : Nothing to Disclose
Leonardo Kayat Bittencourt MD, MSc : Nothing to Disclose
Emerson L. Gasparetto MD : Nothing to Disclose

TEACHING POINTS
Basic principles of abdominal diffusion-weighted MR imaging (DWI) that can aid radiologists in the qualitative and quantitative interpretation of DW images. Present the emerging applications of DWI for detection, characterization and distinguishing abdominal non-neoplastic pathologies. Discuss future perspectives of DWI role in abdominal MRI.

TABLE OF CONTENTS/OUTLINE
Diffusion-weighted MRI basic principles and protocols. Clinical applications of DWI on non-oncological abdominal conditions, including: 1. Acute and chronic inflammatory and infectious disorders, such as appendicitis, diverticulitis, nephritis, pancreatitis and tubovarian abscess; 2. Detection of infection or acute hemorrhage on cysts or fluid collections, such as autosomal dominant polycystic kidney disease, pancreatic pseudocyst, ovarian cyst, corpus luteum, urinoma, biloma, seroma and Cesarean section related complications; 3. Vascular thrombosis and ischemic conditions; 4. Inflammatory bowel disease; 5. Evaluation of hepatic fibrosis; 6. Assessment of renal function, including post-transplant evaluation. Possible applications of DWI on non-oncological abdominal conditions in the future.

MSE152

Pitfalls in Abdominal Duplex Sonography

Education Exhibits
Location: MS Community, Learning Center

Participants
David M. Paushter MD (Presenter): Advisory Panel, AIM Specialty Health

TEACHING POINTS
1. It is necessary to understand the basic principles of Doppler ultrasound that govern clinical applications to avoid errors and to recognize artifacts that suggest physiologic abnormalities and disease states 2. Doppler pitfalls arise from physical principles, technique including ultrasound unit operator selectable parameters, scanning errors and misinterpretation 3. Doppler ultrasound is a powerful tool for understanding the nature of blood flow, and therefore indirectly the health of organs within the abdomen
TABLE OF CONTENTS/OUTLINE

MSE153
Preoperative Computed Tomographic Angiography for Deep Inferior Epigastric Artery Perforator Flap: Review of the Abdominal Wall Anatomy and Novel Evaluation Methods

Education Exhibits
Location: MS Community, Learning Center

Participants
Kentaro Tamura MD (Presenter): Nothing to Disclose
Yoshitake Yamada MD : Nothing to Disclose
Noriko Aramaki-Hattori : Nothing to Disclose
Yusuke Shimizu : Nothing to Disclose
Kazuo Kishi : Nothing to Disclose
Masahiro Jinzaki MD : Nothing to Disclose

TEACHING POINTS
The purpose of the exhibit is to 1 Review the anatomy of the abdominal wall 2 Present the novel display method of CT angiography for preoperative planning for deep inferior epigastric artery perforator (DIEP) flap

TABLE OF CONTENTS/OUTLINE

SPSP01
Nuevos Horizontes en Diagnostico por Imagen Desde el CIR: Sesión del Colegio Interamericano de Radiología (CIR) en Español/New Horizons in Diagnostic Imaging from CIR: Session of the Interamerican College of Radiology (CIR) in Spanish

Special Courses

MA PR Category 1 Credits: 3.75
ARRT Category A+ Credits: 4.00
Sat, Nov 29 1:00 PM - 5:00 PM Location: E451A

LEARNING OBJECTIVES
1) To review advances or new horizons in imaging in major subspecialties from experts from different CIR (Interamerican College of Radiology) countries. 2) To use a practical approach including case-based learning. 3) To seek audience participation with presentation of unknown clinical examples related to the organ system presentations.

Sub-Events
SPSP01A  Introducción/Opening Remarks
Gloria Soto Giordani MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01B  Primera Parte/Part 1
Moderator Pablo Riera Ros MD, PhD : Medical Advisory Board, Koninklijke Philips NV Medical Advisory Board, KLAS Enterprises LLC Medical Advisory Committee, Oakstone Publishing Departmental Research Grant, Siemens AG Departmental Research Grant, Koninklijke Philips NV Departmental Research Grant, Sectra AB Departmental Research Grant, Toshiba Corporation

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01C  Sistema Nervioso Central: Correlación Entre Marcadores Genéticos e Imágenes en Astrocitomas/Central Nervous System: Imaging-Genetic Markers Correlation in Astrocytomas
LEARNING OBJECTIVES

1) To become familiar with the traditional biochemical/genetic markers of astrocytomas and how their presence or absence correlate with imaging findings. 2) To understand the biological changes, as reflected by MR advanced imaging techniques, that astrocytomas go through when malignant transformation occurs.

ABSTRACT

In this lecture we will use advanced MR imaging techniques, perfusion (both contrast enhanced and arterial spin labelled), permeability, diffusion, and spectroscopy to understand the biological behavior of astrocytomas. Low grade astrocytomas may not show high choline on MRS but show high myoinositol which correlates with low perfusion values. Anaplastic astrocytomas produce metalloproteases and thus VEGF and PDGF can stimulate angiogenesis resulting in high perfusion with gadolium and ASL. Lastly, hypoxia induces formation of permeability factors leading to edema and contrast enhancement in glioblastomas. Necrosis, seen as lipids on MRS is a marker of glioblastoma. Presence of MGMT promoter and alterations in the IDH1 gene (present in most secondary glioblastomas) confer a better survival pattern to glioblastoma patients and these findings are seen predominantly in temporal and deep tumors and in those with little contrast enhancement and high signal on T2 and DWI images. Thus, the initial transformation in all low grade astrocytomas is ischemia that can be seen as the presence of lactate on MRS, while markers of higher grades such as angiogenesis, permeability, and necrosis can be identified with perfusion, K-trans maps, and MR spectroscopy. Lack of myoinositol on MRS indicates its consumption for production of metalloproteases and thus it is also an early marker of angiogenesis. Many of these changes occur before anatomical images may suggest them.

URL

https://sites.google.com/site/castilloneuroradiology/

Active Handout

http://media.rsna.org/media/abstract/2014/14002958/SPSP01C sec.pdf

SPSP01D

Cardiovascular: Cambios Desde el TAC y RM Hacia la Imagen Funcional y Molecular/Cardiovascular: CT and MRI Changes towards Functional and Molecular Imaging

Antonio Luna MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review the current clinical indications of CT and MRI in cardiovascular diagnosis. 2) Highlight the new technical approaches in CT and MRI of the cardiovascular system. 3) Outline the potential role of functional and molecular imaging in the management of cardiovascular diseases.

SPSP01E

Mama: Integración de Medicina Nuclear en las Imágenes Diagnósticas de Mama/Breast: Nuclear Medicine Integration in Breast Imaging

Maria Victoria Velasquez MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Present the current indications for Molecular Breast Imaging and Positron Emission Mammography. 2) Describe imaging protocols, radiation exposure and benefits for both techniques. 3) Outline the most common findings of benign and malignant breast lesion on MBI and PEM with correlation with other breast imaging studies. 4) Navigate through the different steps of PEM guided biopsy. 5) Describe alternative management and follow up with these techniques.

ABSTRACT

Integration of Nuclear Medicine in Breast Imaging In the last decade the introduction of Nuclear medicine as Molecular imaging of the breast had a significant development in the diagnosis of breast abnormalities. Positron Emission Mammography (PEM) and Molecular Breast Imaging (MBI) have been successful in the detection of benign, atypical and malignant breast conditions. PEM have been proven to represent a very helpful staging tool in patients with contraindications to breast MRI. MBI is a valuable technique for screening of high risk patients and as for problem solving for patients with inconclusive clinical or imaging findings. This presentation will review the main indications of these Nuclear Medicine studies and will detail the findings and the correlation with conventional breast imaging. The breast imager will have a better understanding of the anatomic, functional and molecular breast imaging techniques.

SPSP01F

Tórax: Hallazgos de la Resonancia Magnética en Enfermedades del Parénquima/Chest: Magnetic Resonance Findings in Lung Parenchymal Disease

Arthur Soares Souza MD, PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To show the value of thoracic MRI for assessment of parenchymal lung disease. 2) To demonstrate the value
of diffusion weighted MRI (DWI) for differentiating benign from malignant lung neoplasms.

**ABSTRACT**

In this lecture we will show the clinical ability of thoracic MRI to depict the most common patterns of parenchymal lung diseases, and do the correlation with CT findings. MRI seems to be a valuable tool, without radiation exposure, for management of parenchymal lung disease. We will, also, address the importance of diffusion weighted MRI (DWI) for differentiating benign from malignant lung lesions.

**URL**

http://www.ultrax.com.br/chester

**SPSP01G**

Conferencia del Colegio Interamericano de Radiología/Interamerican College of Radiology Lecture

Dante R. Casale Menier MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPSP01H**

Segunda Parte/Part II

Moderator Miguel E. Stoopen MD: Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPSP01I**

Musculoesqueletico: Imágenes Avanzadas del Cartílago Articular y "Chemichal Shift" de Médula Ósea/Musculoskeletal: Advanced Imaging of the Articular Cartilage and Bone Marrow Chemical Shift Imaging

Gonzalo Javier Delgado MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPSP01J**

Abdomen e Hígado: Contrastes Hepatoespecíficos y Elastografía por Resonancia Magnética/Abdomen and Liver: Liver Specific Contrast Agents and Hepatic MR Elastography

Luis Antonio Sosa MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPSP01K**

Próstata: Resonancia Magnética de 3T y PET/CT con Colina/Prostate: 3T MRI and Choline PET/CT

Daniela Stoisa MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**Handout:** Daniela Stoisa

http://media.rsna.org/media/abstract/2014/14002966/cap chicago 2014.ppt

**SPSP01M**

Clausura/Closing Remarks
Dante R. Casale Menier MD (Presenter): Nothing to Disclose, Pablo Riera Ros MD, PhD (Presenter): Medical Advisory Board, Koninklijke Philips NV Medical Advisory Board, KLAS Enterprises LLC Medical Advisory Committee, Oakstone Publishing Departmental Research Grant, Siemens AG Departmental Research Grant, Koninklijke Philips NV Departmental Research Grant, Sectra AB Departmental Research Grant, Toshiba Corporation, Miguel E. Stoopen MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

- View learning objectives under main course title.

## SPMT11

### Mock Jury Trial

#### Special Courses

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>PR GI PR GI</td>
<td>5.00</td>
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<tr>
<td>ARRT A+</td>
<td>6.00</td>
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**AMA PRA Category 1 Credits ™:** 5.00  
**ARRT Category A+ Credits:** 6.00  
**Sun, Nov 30 10:30 AM - 3:30 PM  Location: S406A**

**Participants**

- **Moderator:** Leonard Berlin MD: Nothing to Disclose  
- **Attorney for Defense:** Timothy G. Nickels Nothing to Disclose  
- **Judge:** Clare Elizabeth McWilliams Nothing to Disclose  
- **Attorney for Plaintiff:** Keith A. Hebeisen Nothing to Disclose  
- **Defendant Radiologist:** Jonathan W. Berlin MD Stockholder, Nuance Communications, Inc Radiology Advisory Board, Nuance Communications, Inc  
- **Expert Witness:** Lincoln L. Berland MD Consultant, Nuance Communications, Inc Stockholder, Nuance Communications, Inc  
- **Expert Witness:** Mark E. Baker MD Research Consultant, Bracco Group Researcher, Siemens AG Research support, Siemens AG

**LEARNING OBJECTIVES**

1. Learn the various components of a medical malpractice lawsuit trial that is conducted in front of a jury in a courtroom.  
2. Understand the specific roles of the presiding judge, the attorney for the plaintiff, the attorney for the defendant, and the expert witnesses who testify that the defendant radiologist either complied with, or breached, the standard of medical care.  
3. Become apprised of how a jury of lay persons evaluate and judge the testimony of the witnesses, and the arguments of the opposing attorneys, by observing and listening to the jurors' deliberations.  
4. Appreciate the dilemma faced by radiologists when observing an incidental finding which is observed on a radiologic exam obtained for unrelated reasons.

**ABSTRACT**

A mock trial will be held that focuses on an allegation of negligence against a radiologist who observed an incidental finding on an abdominal CT scan that was obtained for reasons unrelated to the finding. The radiologist evaluated the finding, and determined that it was an insignificant and clinically unimportant finding, and thus reported that the finding can be ignored by the referring physician. The finding was forgotten until 18 months later when it was determined that the incidental finding had in fact been an early carcinoma. By that time the patient was inoperable, and despite treatment, died 8 months later. The deceased patient’s family filed a malpractice lawsuit against the defendant radiologist, alleging negligence because the radiologist had failed to raise the suspicion of malignancy and suggest additional studies. Attempts to settle the lawsuit out of court were unsuccessful, and thus the lawsuit was ready to be tried before a jury. Ordinarily such a trial would last one to two weeks, but because of time restraints, the trial will be conducted over a period of 3 hours. A real Judge who presides over malpractice trials in Chicago’s courtroom, and prominent plaintiff’s and defense attorneys, will conduct the trial, in an abbreviated fashion, as they would in a real trial. Two radiologist- expert witnesses will testify, one critical, and the other supportive, of the defendant radiologist. When the testimony is over, there will be a video and audio feed of the jury’s deliberations to the audience. Following the rendering of a verdict, an open discussion among the participants and the audience will be held.

## SSA06

### Gastrointestinal (Dual Energy CT)

#### Scientific Papers

<table>
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<th>Course Code</th>
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<tr>
<td>CT GI</td>
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**AMA PRA Category 1 Credits ™:** 1.50  
**ARRT Category A+ Credits:** 1.50  
**Sun, Nov 30 10:45 AM - 12:15 PM  Location: E353A**

**Participants**

- **Moderator:** Laura R. Carucci MD: Nothing to Disclose  
- **Moderator:** Dushyant V. Sahani MD: Research Grant, General Electric Company

**Sub-Events**

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<tr>
<td>SSA06-01</td>
<td>Impact of a Second-Generation Virtual Monochromatic Algorithm on the Conspicuity of Hypervascular Liver Tumors Using Dual-Source Dual-Energy MDCT</td>
</tr>
</tbody>
</table>
**PURPOSE**

To investigate the impact of a second-generation virtual monochromatic algorithm on the conspicuity of hypervascular liver tumors and image noise, using dual-source dual-energy MDCT.

**METHOD AND MATERIALS**

A custom anthropomorphic liver phantom simulating different levels of enhancement of hypervascular lesions in three adult body sizes was imaged with a second-generation dual-source MDCT using both dual-energy (100/80 kVp) and single-energy acquisitions, at various energy levels (80, 100, 120, 140 kVp). For each phantom size, the radiation output was kept constant for all scans. Virtual monochromatic images from the dual-energy dataset were reconstructed at energy levels ranging from 40 to 140 keV, using both first-generation (Syngo DE Monoenergetic) and second-generation (Syngo DE Monoenergetic PLUS) virtual monochromatic algorithms. Noise and tumor-to-liver contrast-to-noise ratio (CNR) were calculated and compared among different reconstructed datasets, for all phantom body sizes.

**RESULTS**

On single-energy imaging, the minimum noise level was observed at 120 kVp for the small and at 140 kVp for the medium and large phantom sizes; 80 kVp yielded the highest tumor-to-liver CNR for all phantom sizes. For the first-generation virtual monochromatic algorithm, noise was lowest at 70 keV in the small and medium phantom sizes, and 80 keV in the large phantom size; an energy level of 60 keV yielded the highest tumor-to-liver CNR for all phantom sizes. For the second-generation virtual monochromatic algorithm, noise was lowest at 80 keV for the small and the medium phantom sizes, and 90 keV for the large phantom size; an energy level of 40 keV yielded the highest tumor-to-liver CNR for all phantom sizes. In the large phantom, second-generation virtual monochromatic images at an optimal energy yielded significantly higher tumor-to-liver CNR, compared to either single-energy or first-generation virtual monochromatic images (P<0.01).

**CONCLUSION**

Second-generation virtual monochromatic algorithm may improve the conspicuity of hypervascular liver tumors compared to single-energy and first-generation virtual monochromatic images, in larger body sizes.

**CLINICAL RELEVANCE/APPLICATION**

Second-generation optimal energy virtual monochromatic images may substantially improve the conspicuity of hypervascular liver tumors in larger patients.

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**SSA06-02**

**Dual Energy MDCT in Hypervascular Liver Tumors: Effect of Patient Body Size on Selection of the Optimal Monochromatic Energy Level**

**PURPOSE**

To investigate the effect of body size on selection of the optimal monochromatic energy level for maximizing conspicuity of hypervascular liver tumors during late hepatic arterial phase with dual-energy MDCT.

**METHOD AND MATERIALS**

An anthropomorphic liver phantom having three different body sizes and iodine-containing inserts simulating low- and high-contrast hypervascular liver lesions was imaged with dual-energy MDCT and single-energy MDCT at various polychromatic energy levels (80, 100, 120 and 140 kVp). Dual energy MDCT was also performed in 48 patients with 114 hypervascular liver tumors; virtual monochromatic images were reconstructed at energy levels ranging from 40 to 140 keV at 10 keV increments. The effect of body size and lesion iodine concentration on image noise and tumor-to-liver contrast-to-noise ratio (CNR) was compared among the different datasets for both phantoms and patients.

**RESULTS**

The highest tumor-to-liver CNR was noted at 80 kVp for all phantom sizes. On virtual monochromatic images, the minimum noise was noted at 70 keV, for small and medium phantom sizes, and at 80 keV, for the large phantom. CNR was highest at 50 keV, for the small and medium phantoms, and at 60 keV, for the large phantom (P<0.0001). Compared with 80 kVp images, anatomic monochromatic images yielded significantly higher CNR for low-contrast lesions, in all phantom sizes (P<0.0001). The optimal monochromatic energy level for maximizing tumor-to-liver CNR in patients increased proportionally to body size (P<0.0001).

**CONCLUSION**

Selection of the optimal monochromatic energy level for maximizing the conspicuity of hypervascular liver tumors is significantly affected by patient's body size.
CLINICAL RELEVANCE/APPLICATION

Optimized monochromatic energy images may improve the conspicuity of hypervascular liver tumors in patients having a variety of sizes, which may be particularly beneficial for detecting subtle lesions in patients with cirrhosis.

Feasibility of Dual-energy CT for Iodine Contrast Media Reduction: An Animal Study

Yong Eun Chung MD, PhD (Presenter):  Nothing to Disclose, Hye-Jeong Lee MD :  Nothing to Disclose, Myeong-Jin Kim MD, PhD :  Nothing to Disclose

PURPOSE

To investigate the feasibility of dual energy CT (DECT) for iodine contrast media reduction in the diagnosis of hypervascular and hypovascular focal liver lesions.

METHOD AND MATERIALS

A VX2 tumor was implanted in two different segments of the liver in 13 rabbits. After 2-4 weeks, two phase contrast enhanced CT scans including the late arterial phase (LAP) and hepatic venous phase (HVP) were performed three times with 24 hour intervals. Contrast media of 1 ml/kg was injected via the ear vein during a 7 second period, with three different concentrations of iodine, i.e. 300 (I\textsubscript{300}), 150 (I\textsubscript{150}) and 75 mgI/mL (I\textsubscript{75}). The mean HU and standard deviation (SD) was measured in the liver, the hypervascular portion of the VX2 tumor which represented hypervascular tumors, and the central necrotic area of the VX2 tumor, which represented hypovascular tumors in 140 kVp images with I\textsubscript{300} as a reference standard. The mean HU and SD were also measured in monochromatic images (between 40keV and 140 keV with 10 keV intervals) at the same locations with I\textsubscript{150} and I\textsubscript{75}. Contrast-to-noise ratio (CNR) for hypervascular lesions in LAP and hypovascular lesions in HVP were calculated and the ratio of CNR (CNR\textsubscript{ratio}) between monochromatic image sets with I\textsubscript{150} and I\textsubscript{75} and the reference standard was calculated.

RESULTS

A total of 23 VX2 tumors in 25 rabbits were evaluated. For hypervascular lesions, CNR\textsubscript{ratio} was higher than 1 in 40 keV (1.23), 50 keV (1.28) and 60 keV (1.17) images with I\textsubscript{150}, whereas CNR\textsubscript{ratio} wasn’t higher than 1 in any keV images with I\textsubscript{75}. In terms of hypovascular lesions, CNR\textsubscript{ratio} was higher in 40 keV (2.19), 50 keV (1.55) and 60 keV (1.16) with I\textsubscript{150}, and 50 keV (1.12), 60 keV (1.24) and 70 keV (1.14) with I\textsubscript{75}.

CONCLUSION

With dual energy CT, the total amount of iodine contrast media might be halved in the diagnosis of hypervascular liver lesions and reduced to one fourth in the diagnosis of hypovascular liver lesions, while preserving CNRs of the focal liver lesion.

CLINICAL RELEVANCE/APPLICATION

In patients with impaired renal function, the total amount of iodine contrast media can be reduced by using DECT without deteriorating diagnostic performance for focal liver lesions.

Elucidation of the Perfusion Characteristics of Dual-energy Iodine-related Attenuation in Hepatocellular Carcinoma Using Volume Perfusion CT

Wolfgang M. Thaiss (Presenter):  Nothing to Disclose, Ulrike Haberland :  Employee, Siemens AG, Konstantin Nikolou MD :  Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG, Marius Horger MD :  Nothing to Disclose, Alexander Sauter :  Nothing to Disclose

PURPOSE

Iodine-related attenuation (IRA) acquired with dual energy CT is regarded as a perfusion surrogate marker. The purpose of the study was to compare this technique with Volume Perfusion CT (VPCT) in HCC patients.

METHOD AND MATERIALS

After approval, 20 patients (mean age 69.2) with untreated HCC were enrolled in a liver perfusion at 80 kV, using a Siemens Somatom Definition AS+. VPCT evaluation and ROI measurements - encompassing the maximum tumor outline - were carried out using a dedicated postprocessing software (syngo Volume Perfusion CT Body, Siemens). 20 lesion were evaluated. Next, the time-resolved perfusion scans were split in single time points. IRA maps were calculated for the time points in 3.5 sec steps starting at the peak enhancement of the abdominal aorta. Finally, the same VPCT-tumor-ROI was drawn and iodine concentration (IC) values were calculated for the 80 kV scans.

RESULTS

VPCT perfusion parameters were as follows: (tumor): blood flow (BF) 51.7 ± 17.0 (mL/100 mL/min), blood volume (BV) 12.6 ± 4.3 (mL/100 mL); (liver): arterial liver perfusion (ALP) 42.4 ± 15.0 (mL/100 mL/min), portal-venous perfusion (PVP) 10.3 ± 9.1 (mL/100 mL/min), hepatic arterial perfusion index (HPI) 84.4 ± 12.6. Peak enhancement in the lumen of the aorta was reached at 17.6 ± 4.4 sec. Tumor IC (mg/dL) for the different time points: 65.9 ± 41.2 (at peak enh. aorta), 110.6 ± 65.3 (p. enh. a. + 3.5 sec), 129.1 ± 61.7 (+ 7 sec),
Comparison of Image Quality and CT Numbers between True-noncontrast and Virtual Noncontrast Images of the Abdomen from Second-generation Dual-source CT Scanner


PURPOSE

To compare image quality and CT numbers between true-noncontrast (TNC) and virtual noncontrast (VNC) images of the abdomen from second-generation dual-source dual-energy CT (DSCT) scanner

METHOD AND MATERIALS

IRB-approved, HIPPA-compliant retrospective study of 42 subjects (mean age 59.7 yrs. [SD=9.1]) who underwent 3-phase CT of the liver on a DSCT scanner (Flash, Siemens Healthcare) using single energy (SE) (120kVp) and dual energy (DE) protocol (100/Sn140kVp), on different occasions. Four sets of images (TNC-SE, TNC-DE and VNC reconstructed from the arterial [VNCa] and portal-venous [VNCp] phases from DE exams) of the abdomen from each patient were randomly reviewed by 5 readers, who graded the image quality (1. Very good; 2. Good; 3. Fair; 4. Poor; 5. Very poor) and the presence of artifacts (1. None; 2. Do not affect interpretation; 3. Affect interpretation but diagnosis still possible; 4. Inadequate for use). Acceptable image quality was defined as a score ≤3, and acceptable artifact as a score ≤3. Regression analysis was used to assess differences in scores for image quality and artifacts, and differences in CT numbers obtained in the liver, kidneys, spleen, inferior vena cava, aorta and retroperitoneal (RP) fat.

RESULTS

Compared to TNC-DE, the mean proportion of acceptable image quality was 0.114 lower for VNCa (95% CI: 0.077, 0.152) and 0.119 lower for VNCp (95% CI: 0.073, 0.165). The difference between the VNCa and VNCp was small and not statistically significant (0.005, 95% CI: -0.031, 0.041). VNC sets had high frequencies of acceptable artifacts (VNCa: 0.995, VNCp: 0.986), and the differences among them were not statistically significant. For the liver, the mean difference in CT number between TNC-DE and VNCa was -0.7 (95% CI: -1.7, 0.3), and between TNC-DE and VNCp was -0.7 (95% CI: -1.7, -0.3). The largest differences in the mean CT numbers between VNCa and TNC-DE was in the aorta (50.2 vs. 40.8, 95% CI: 6.8, 11.9), and the largest difference between VNCp and TNC-DE was in the RP fat (-87.2 vs. -92.4, 95% CI: 4.0, 6.6). In the liver, spleen and RP fat both VNC sets showed a better agreement with TNC-DE than with TNC-SE.

CONCLUSION

VNC images had high frequency of acceptable image quality and artifacts, with small differences in CT numbers compared to TNC-DE.

CLINICAL RELEVANCE/APPLICATION

VNC is an alternative to TNC images of the abdomen, which helps decrease patients' exposure to radiation.
To compare image quality, attenuation and radiation dose between virtual unenhanced (VU) and conventional unenhanced (CU) datasets of the abdomen obtained with a 3rd generation dual-source dual-energy CT system (DECT). The impact of a 3rd generation iterative reconstruction algorithm (ADMIRE) was also assessed in comparison to filtered back projection (FBP).

METHOD AND MATERIALS

Eight patients underwent triphasic abdominal CT examinations including single-energy CU (120kV, 147 ref.mAs) and dual-energy arterial and portal venous phase acquisitions (100/Sn150kV, 180/90 ref.mAs). VU images were generated from arterial (AVU) and portal venous (PVU) phases. CU, AVU and PVU data-sets were reconstructed using FBP and ADMIRE (strength 3). Two abdominal radiologists analyzed the image quality using a five-point scale. Radiation dose, attenuation and noise of the abdominal organs and aortic calcifications were recorded for both FBP and ADMIRE in CU, AVU and PVU datasets.

RESULTS

Mean image quality scores of DECT VU images with ADMIRE was not significantly different than the mean image quality of CU images (4.83/12) for both AVU (4.79/9) and PVU (4.75/14). (p>.05). The mean attenuation values of liver, spleen, pancreas, renal cortex, aorta, and retroperitoneal fat did not differ significantly among CU, AVU, and PVU images (p>.05). There was however a significant difference in mean attenuation for small calcified aortic plaques. The reduction in the density of VU images (37939, 21756, 33478 HU for CU, AVU and PVU, respectively, p<.01) the radiation dose of the single-energy and dual-energy acquisitions did not differ significantly (3.22±1.25, 3.25±1.26, 3.23±1.27 mSv for CU, AVU and PVU, respectively, p>.05). The potential dose reduction that would have been achieved by omitting the unenhanced acquisition was 33.2% (p>.01).

CONCLUSION

3rd generation DECT VU images with the ADMIRE iterative reconstruction algorithm showed comparable image quality as single energy CU images with complete iodine subtraction, albeit with a reduction in the density of calcifications on VU images. There was no significant difference in radiation dose between dual-energy and single energy acquisitions.

CLINICAL RELEVANCE/APPLICATION

Despite an imperfect calcium subtraction, a 3rd generation DECT VU imaging technique using the ADMIRE algorithm has the potential to replace CU images in clinical practice.
These results are critical for implementation of DECT of the abdomen in clinical practice, as they show that this technique does not necessarily come at the expense of higher radiation doses.

**SSA06-08**

**Attenuation Based Automated Tube Voltage Selection in Computed Tomography of the Body with a Third Generation Dual Source Scanner at High Pitch**

Matthias Stefan May (Presenter): Speakers Bureau, Siemens AG, Markus Lurz: Nothing to Disclose, Wolfgang Wust MD: Nothing to Disclose, Achim Eller MD: Nothing to Disclose, Michael Uder MD: Speakers Bureau, Bracco Group Speakers Bureau, Siemens AG Research Grant, Siemens AG, Michael Marcus Lell MD: Research Grant, Siemens AG Speakers Bureau, Siemens AG Research Grant, Bayer AG Speakers Bureau, Bayer AG Research Consultant, Bracco Group

**PURPOSE**

To evaluate the potential for radiation dose reduction and increase in contrast to noise ratio by attenuation based automated tube voltage selection in a third generation dual source scanner at high pitch.

**METHOD AND MATERIALS**

Computed Tomography (CT) of the body was performed on a dual-source system with high tube output in 43 Patients (mean BMI = 26 kg/m2). Automatically calculated tube settings (70-120 kV), based on the ap-localizer, were recorded for all 12 gradual contrast weightings to analyze the kVp distributions in 25 patients. Spiral CT was performed for all patients with an intermediate weighting (grade 7) setting in a portal venous phase at 120 ref. kV, 180 ref. mAs, 2x192x0.6mm collimation, pitch 1.55. Objective image quality was assessed as contrast to noise ratio (CNR) and subjective image quality was evaluated on a 5 point Likert scale by 2 experienced radiologists. Effective dose was calculated based on the dose length product (DLP). Previous examinations on a 64 slice scanner served as reference.

**RESULTS**

All examinations were rated good or perfect for clinical diagnosis. Automated tube voltage selection (0% at 70kV, 1% at 80kV, 21% at 90kV, 33% at 100 kV, 22% at 110kV, 23% at 120 kV) resulted in statistically significant lower radiation dose (ED = 8.0 mSv) compared to the reference (ED = 11.2 mSv, p<0.05). CNR measurements in the liver and the spleen were not statistically significant different (p>0.05) from the previous examinations while CNR was significantly increased in the aortic root and the pulmonary trunk (p<0.01). Further radiation dose reduction would have been possible by prospectively increasing the contrast weighting while tube voltage setting would have further been decreased (8% at 70kV, 20% at 80kV, 44% at 90kV, 16% at 100 kV, 0% at 110kV, 12% at 120 kV).

**CONCLUSION**

Automated tube voltage adaptation allows for substantial radiation dose reduction (-29%) while maintaining soft tissue contrast and increasing vessel contrast. Latest scanner generations with high tube output allow for tube voltage reduction even at large volume exposition and high pitch.

**CLINICAL RELEVANCE/APPLICATION**

Radiation dose effectiveness is increased by latest technical x-ray tube developments and attenuation based automated tube voltage adaptation.

**SSA06-09**

**Impact of Nonlinear Image Blending Techniques for Contrast Medium Dose Reduction during Abdominal Dual Energy MDCT**

Achille Mileto MD (Presenter): Nothing to Disclose, Daniele Marin MD: Nothing to Disclose, Juan Carlos Ramirez Girardo PhD: Employee, Siemens AG, Christian Eusemann PhD: Employee, Siemens AG, Emanuele Scribano: Nothing to Disclose, Giorgio Ascenti MD: Nothing to Disclose

**PURPOSE**

To compare the image quality of a dual-energy nonlinear image blending technique, at reduced load of contrast medium, with a full-dose simulated 120 kVp linear blending technique during the portal venous phase of the abdomen.

**METHOD AND MATERIALS**

Forty-five patients (25 men, 20 women; mean age, 65.6±9.7 years; mean body weight, 74.9±12.4) underwent contrast-enhanced single-phase dual energy CT of the abdomen by a random assignment to one of three different contrast medium dose injection protocols using iomeprol 400 mgI/mL: (a) 1.3 mL of per kilogram of body weight (full dose, 100%), (b) 1.0 mL per kilogram of body weight (75%), and (c) 0.65 mL per kilogram of body weight (50%). Simulated 120 kVp linear blended images at full contrast dose, and nonlinear blended images at 75% and 50% contrast medium doses were reconstructed. Contrast-to-noise ratio and noise (at portal vein, liver, aorta, and kidney) were compared between the different datasets, using the analysis of variance. Three readers qualitatively assessed image quality for all data sets in a blinded and independent fashion.

**RESULTS**

Nonlinear blended images at 75% contrast medium dose allows for a significant improvement in contrast-to-noise ratio (P < .05 for all comparisons) compared with simulated 120 kVp linear blended images at full dose. No statistically significant difference existed in contrast-to-noise ratio and noise between nonlinear
blended images at 50% contrast medium dose and simulated 120 kVp linear blended images at full dose. Nonlinear blended images at 50% contrast medium dose were considered acceptable, by all readers.

CONCLUSION

Dual energy nonlinear image blending allows for reducing the dose of contrast medium up to 50% during portal venous phase, while preserving image quality.

CLINICAL RELEVANCE/APPLICATION

The possibility of obtaining clinically adequate image quality with a 50% reduction of the contrast medium dose may be clinically exploited to minimize patient risks while containing costs.
MDCT, producing higher resolution and multi-planar reformation of the images, should be considered as alternative technique in rectal cancer staging, especially in patient with MRI contraindications.

**MRI of Rectal Cancer: 3D Cube versus 2D T2-weighted Technique at 1.5 T - Initial Study**

**PURPOSE**

To compare reformatted images from three-dimensional (3D) CUBE T2-weighted fast spin-echo MR sequence with tri-planar images acquired two-dimensional (2D) T2-weighted fast spin-echo sequence in terms of image quality and accuracy of T staging of rectal cancer.

**METHOD AND MATERIALS**

58 patients (mean age, 58.4 years; range, 26-80 years) with rectal cancer conformed by colonoscopy and biopsy were enrolled in this study. All patients underwent pelvic MRI examination at 1.5 T. MRI sequences included a single coronal 3D CUBE T2-weighted fast spin-echo MR sequence with 1.4-mm-thinkness and a 2D T2-weighted fast spin-echo sequence in the sagittal, coronal, and axial planes with 5-mm-thickness. The other two planar images of 3D CUBE sequence were reconstructed at GE AW4.5 workstation with 5 mm thickness and no interslice gap. The total acquisition times of two sequences were calculated. Qualitative analyses of image quality and conspicuity between tumor and normal tissue were performed. Two radiologists experienced in colorectal cancer independently assessed the T-stage of local tumor in CUBE and T2-weighted image according to the depth of tumor invasion, circumference and length of intestine involved and the results were compared with histological results respectively. Quantitative values, qualitative scores were analyzed by using the paired t test, Wilcoxon signed rank test, respectively.

**RESULTS**

Mean acquisition time of 3D sequence (384s) was significantly shorter than the acquisition time of 2D sequences in three planes (718s) (p <0.05). Although both readers reached a consensus that 3D CUBE yielded significantly lower image quality than 2D MRI(p < 0.05), tumor conspicuity was superior with the 3D sequence (2.78±0.85 vs 2.21±0.73, t=8.24, P < 0.05), and 3D sequence offered similar accuracy in T stage of rectal cancer compared to 2D sequence(35/58 vs 33/58; t=1.76, P=0.08).

**CONCLUSION**

Despite a lower overall image quality, but because of time savings and the versatility of reconstructing images in any orientation without compromise of diagnostic accuracy in T stage of rectal cancer, the 3D CUBE T2-weighted fast spin-echo sequence showed certain advantages compared to 2D T2-weighted fast spin-echo sequences.

**CLINICAL RELEVANCE/APPLICATION**

Compared with 2D T2-weighted FSE sequence, 3D CUBE T2-weighted FSE sequence produces a great savings of time and offers a greater tumor conspicuity and the ability to perform multplanar reformation.

**Magnetic Resonance Imaging-detected Extramural Venous Invasion: Significant Prognostic Factor in Rectal Carcinoma**

**PURPOSE**

To compare the incidence of disease relapse between rectal cancer patients with positive MRI-detected extramural venous invasion (mrEMVI) and those with negative mrEMVI and evaluate the relapse-free survival rates between the two groups.

**METHOD AND MATERIALS**

A total of 263 patients (166 men, 97 women; mean age: 61 years, range: 20-85 years) with biopsy proven rectal carcinoma without metastasis at initial staging were enrolled in this study. All patients were staged using preoperative 3T rectal MRI, chest/abdomen CT and PET/CT scan and underwent follow-up imaging studies after operation at least for 3 years. Two radiologists reviewed all MR images and gave a consensus regarding MRI-EMVI score (five-point scale; 0-2: negative, 3-4: positive). All follow-up images were evaluated for local recurrence or metastasis. The incidences of disease relapse were compared between the two groups (mrEMVI-positive or negative) using Chi-square test. The relapse-free survival rate was analyzed using the Kaplan-Meier method and the differences between the groups were compared using the log rank test.

**RESULTS**

Of 263 patients, there were 69 (26.2%) patients with mrEMVI-positive rectal carcinoma. Of these patients, 42% (29/69) developed local recurrence or metastases during follow-up period, which were compared to 9.8% (19/194) of those with negative mrEMVI. There was significant difference in the incidence of relapse between two groups (p< .001). The patients were followed for a median of 52 (range, 3-76) months. The 5-year relapse-free survival rate was 89.4% in patients with mrEMVI-negative rectal cancer which was significantly higher than that of patients with mrEMVI-positive rectal cancer (75.6%).
higher than 56.4% in patients with mrEMVI-positive rectal cancer (p < .001).

CONCLUSION
The patients with mrEMVI-positive rectal cancer demonstrated higher disease-relapse rate and lower relapse-free survival rate than those with negative mrEMVI-negative rectal cancer.

CLINICAL RELEVANCE/APPLICATION
Preoperative evaluation of mrEMVI may predict the prognosis of patients with rectal carcinoma.

SSA07-04
MRI Tumor Heterogeneity as a Potential Prognostic Imaging Biomarker in Patients with Rectal Cancer Treated with Neoadjuvant Chemoradiotherapy

PURPOSE
To assess the prognostic significance of heterogeneity of rectal tumours on MRI, quantified by texture analysis in patients treated with neoadjuvant chemoradiation.

METHOD AND MATERIALS
Retrospective analysis of 29 consecutive patients with rectal cancer with 1.5T rectal MRI pretreatment and 6 weeks post neoadjuvant chemoradiation. Tumor heterogeneity was quantified on the T2 axial small field of view image with the largest tumour diameter, using TexRAD, a commercially available software. This used filtration-histogram based texture analysis technique to extract pixel size based (fine, medium, coarse) features and quantified histogram parameters including Kurtosis (K), skewness (S) and normalized standard-deviation (SDn). Kaplan-Meier analysis compared texture parameters with overall (OS) and disease-free survival (DFS). Mean follow-up was 39.4 months.

RESULTS
4 patients showed complete pathological response. Median OS and DFS was 52.3 (95% CI: 40.5-64.0) and 37.3 (95% CI: 15.3-59.2) months respectively. On pre-treatment MR, lower SDn and higher K/S were significantly associated with reduced OS for different texture scales (medium scale: SDn <0.52, p=0.0007; K>1.58, p=0.017; S>0.9, p=0.018) and lower SDn and K were significantly associated with reduced DFS for different texture scales (medium texture scale: SDn <0.52, p=0.0068; K<-0.27, p=0.0195). At 6 weeks post treatment, an increase in SDn and decrease in K/S were associated with poor prognosis (medium texture scale: SDn >8.1%, p=0.0431; K<-50.8%, p=0.018; S<-0.12, p=0.041). Pathological response, tumor stage, nodal stage and circumferential resection margin status were not significant predictors of OS and DFS.

CONCLUSION
Pre-treatment and 6 weeks post chemoradiation rectal tumor MRI texture parameters were associated with reduced OS and DFS. Changes in biological parameters such as tissue hypoxia may be reflected by changes in tumour heterogeneity.

CLINICAL RELEVANCE/APPLICATION
Tumour heterogeneity on pretreatment and 6 weeks post chemoradiation rectal MRI may be useful in predicting poorer clinical outcome and provide opportunity to target those patients suited for intensive management.

SSA07-05
Diagnostic Efficacy of Diffusion-weighted MR Imaging in the Evaluation of Tumor Response to Neoadjuvant Chemoradiation Therapy, in Patients with Locally Advanced Rectal Cancer, Correlated with Tumor Regression Grade at Histology
Maria Concetta Mumoli MD (Presenter): Nothing to Disclose, Davide Ippolito MD : Nothing to Disclose, Pietro Andrea Bonaffini MD : Nothing to Disclose, Orazio Minutolo MD : Nothing to Disclose, Camillo Roberto Giovanni Leopoldo Talei Franzesi : Nothing to Disclose, Sandro Sironi MD : Nothing to Disclose

PURPOSE
To assess the diagnostic value of quantitative apparent diffusion coefficient (ADC), as a predictor of tumor response to neoadjuvant chemo-radiation therapy (CRT) in patients with locally advanced rectal cancer (LARC), by analysing pre and post CRT values of ADC, correlated to tumor regression grade (TRG) obtained by histopathologic analysis.

METHOD AND MATERIALS
A total of 70 patients with locally advanced rectal cancer (≥T3 or lymphnode positive) were evaluated before and after CRT treatment. Each patient scan consists of multiplanar T2 and T1 combined with diffusion-weighted sequences using a 1.5T MRI system(Achieva,Phillips). For each patient dedicated workstation was used to evaluate the quantitative apparent diffusion coefficient (ADC) pre- and post-CRT MR images, by outlining freehand region of interest (ROIs) on the site of the lesion. Diagnostic accuracy of ADC values for predicting treatment response correlated with histopathologic tumor regression grade (TRG) was evaluated, according to Mandard’s classification [responders (TRG1-2) and non-responders (TRG 3-5)].
RESULTS

Patients were assigned to the tumor responders group (n = 48) or the tumor non-responders group (n = 22)
on the basis of histopathologic examination results following surgery. Before CRT, there wasn’t significant
difference in ADC value between responders vs non-responders: the mean tumor ADC values in the responders
group was minimally lower than those in non-responders group (862.67 × 10⁻³ mm²/sec ± 206.66 vs 877.46
mm²/sec ± 168.40). After CRT, the mean tumor ADC increased significantly in the responders group, 1444.46
× 10⁻³ mm²/sec ± 231.49 than in the nondownstaged group 1.267,47 × 10⁻³ mm²/sec. The post-CRT ADC
values were correlated to histopathologic tumor regression grade (TRG), and ROC analysis demonstrated the
best cut-off value of 1,298 x 10⁻³ mm²/sec, in determining responders patients yielding a sensitivity of 86% and
specificity of 72%.

CONCLUSION

The quantitative assessment of post-CRT in ADC map, represents a non-invasive feasible tool, useful in the
re-staging of patients with locally advanced rectal cancer (LARC), having good relationship with histology.

CLINICAL RELEVANCE/APPLICATION

The post-CRT ADC values showed comparable relative accuracy as a predictor of tumor response to
neoadjuvant chemo-radiation therapy (CRT) to tumor regression grade (TRG) obtained by histopathologic
analysis.

SSA07-06

Performance of Texture Analysis, Diffusion Weighted Imaging and Perfusion Imaging in Predicting
Tumoral Response to Neoadjuvant Chemoradiotherapy in Rectal Cancer Patients Studied with 3T MR

Carlo Nicola de Cecco MD (Presenter): Nothing to Disclose , Maria Ciolina MD : Nothing to Disclose ,
Balaji Ganesan PhD : Scientific Director, TexRAD Limited , Marco Rengo MD : Nothing to Disclose , Luca
Saba MD : Nothing to Disclose , Andrea Laghi MD : Speaker, Bracco Group Speaker, Bayer AG Speaker,
General Electric Company Speaker, Koninklijke Philips NV

PURPOSE

To determine the performance of texture analysis (TA), diffusion weighted imaging (DWI), and perfusion MR
(pMR) in predicting tumoral response in patients treated with neoadjuvant chemoradiotherapy (CRT).

METHOD AND MATERIALS

The patient population consisted of 12 patients with rectal cancer, who underwent pre-treatment 3T MRI.
Texture analysis (kurtosis), apparent diffusion coefficient (ADC) and pMR parameters (IAUGC, Ktrans, Ve, Kep)
were quantified using commercial research software algorithms. After CRT, all patients underwent complete
surgical resection and the surgical specimen served as the gold standard. Receiver operating characteristic
(ROC) curve analysis was performed to assess the discriminatory power of texture parameters to predict
complete response.

RESULTS

Pathological complete response (pCR), partial response (PR) and no response (NR) were found in 6, 3 and 3
patients, respectively. Baseline kurtosis was significantly lower in pCR in comparison with PR+NR (p=.01).
Among ADC and pMR parameters, only Ve was significantly lower in the pCR compared to PR/NR (p=.01). A
significant negative correlation between kurtosis and ADC (r=-0.650, p=0.022) was observed. The areas under
the curve (AUC) to discriminate patients with pCR from patients with PR/NR were 0.861 for kurtosis, 0.694 for
IAUGC, 0.569 for Ktrans, 0.861 for Ve, 0.668 for Kep and 0.556 for ADC. The discriminatory power was
significant for kurtosis (p=0.001) and Ve (p=0.003). The optimal cutoff for the identification of pCR was

CONCLUSION

Baseline TA and pMRI parameters have the potential to act as imaging biomarkers of tumoral response to
neoadjuvant chemoradiotherapy.

Clinical Impact of the Tumor Volume Reduction Ratio in the Rectal Cancer Patients Following
Preoperative Chemoradiation; A Comparison Study of Volumetric Measurement, Down-staging, and
Tumor Response Grade

Yoo bee Han MD (Presenter): Nothing to Disclose , Soon Nam Oh MD : Nothing to Disclose , Dong Myung
Yeo : Nothing to Disclose , Hong Seok Jang : Nothing to Disclose , Sung Eun Rha MD : Nothing to
Disclose , Seung Eun Jung MD : Nothing to Disclose , Moon Hyung Choi MD : Nothing to Disclose , Jae
Young Byun MD : Nothing to Disclose

PURPOSE

To evaluate whether MR volumetric analysis in rectal cancer can predict the clinical outcome, tumor recurrence
and disease-free survival (DFS), and to determine the most reliable method for predicting clinical outcome
among tumor volume reduction ratio (TVRR), tumor down-staging (TDS), and tumor response grade (TRG).

METHOD AND MATERIALS

Before starting chemotherapy patients underwent pre-treatment volumetric measurement (VCM), and follow-up

SSA07-07
Seventy four patients who underwent preoperative concurrent chemoradiation therapy (CCRT) and following curative rectal surgery, between January 2007 and December 2010, were included in this study. Two radiologists being blind to clinical outcome measured tumor volume in consensus before and after CCRT on MRI. Tumor volume was manually traced on each T2 weighted axial image and was calculated by multiplying cross-sectional areas by section thickness. TVRR, TDS of T stage were assessed on MRI. The pathologic TRG, recurrence and DFS were assessed with medical record. We divided patients into two groups according to episode of recurrence. Difference of TVRR between two groups were assessed with student t-test, and the cut-off value of TVRR for predicting recurrence were evaluated with maximal chi-square method. Difference of TDS and TRG between two groups were estimated with chi-square test. The most reliable predicting parameter among TVRR, TDS, and TRG was evaluated with Cox regression analysis.

RESULTS
TVRR(p=0.002) and TRG(p=0.006) was significantly different between recurrent and non-recurrent groups, whereas TDS of T stage (p=0.448) was not. Mean follow up time for DFS was 36.98 ± 18.51 months. The cut-off value of TVRR was estimated as 61.38%. Between higher TVRR (>61.38%) and lower TVRR groups, DFS (p=0.00) and TRG(p < 0.01) were significantly different. TVRR was the most reliable predicting parameter.

CONCLUSION
After CCRT, TVRR assessment on MRI can be a prognostic parameter for predicting tumor recurrence and DFS, as well as TRG. The cut-off value of TVRR was 61.38% in our study.

CLINICAL RELEVANCE/APPLICATION
MR volumetry of rectal cancer can be a helpful predicting factor for clinical outcome in patients with CCRT.

SSA07-08
The MRI Features of Rectal Cancer Which Achieved Pathological Complete Remission after Neoadjuvant Concurrent Chemoradiation Therapy
Honsoul Kim MD, PhD : Nothing to Disclose, Jeun Koh MD (Presenter): Nothing to Disclose, Hyuk Hur: Nothing to Disclose, Woong Sub Koom: Nothing to Disclose, Myeong-Jin Kim MD, PhD : Nothing to Disclose, Joonseok Lim MD : Nothing to Disclose

PURPOSE
To depict the MRI characteristics of rectal cancer of which pathological complete remission (PCR: Mandard grade 1) has been achieved by neoadjuvant concurrent chemoradiation therapy (CRT).

METHOD AND MATERIALS
We retrospectively analyzed 88 (Male/femal=55/33, age of 58.62±11.24 years) rectal cancer patients who underwent pre-/post-CRT MRI, CRT and surgery between January 1998 and December 2012 and were found to have achieved PCR. Post-CRT MR was obtained 8-54 (23.4±9.9) days before surgery. Tumor distal margin reached lower, middle and upper rectum (n=49/38/1, 6.0±2.3cm to anal verge). We analyzed pre-/post-CRT MRIs to assess tumor circumferential resection margin (CRM), MR T stage (gross perirectal infiltration), volume (volumetry), MR tumor regression grade (TRG), T2 signal intensity (SI) grade (comparing with muscle), residual morphology, diffusion restriction and nodal status. Paired t-test was used to compare pre-/post-CRT tumor volume.

RESULTS
Pre-CRT (24.3±44.3±3cm3) and post-CRT (7.6±9.9cm3) MR revealed a tendency of marked volume decrease (P<0.001, reduction rate: 70.6±19.3%). MR TRG G1(PCR)/G2/G3/G4/G5(marked progression) were 6/7/39/44/3 (pre-CRT) and 3/14/50/15/6 (post-CRT). SI grade (not visible/lower-than-muscle/iso-to-muscle/intermediate high/edema-SI) were 19/13/28/21/7 (post-CRT). CRM results (negative/threatening/invasion) were 37/34/17 (pre-CRT) and 3/23/61/1/0 (post-CRT). The cut-off value of TVRR was estimated as 61.38%. Between higher TVRR (>61.38%) and lower TVRR (p=0.00) and TRG(p < 0.01) were significantly different. TVRR was the most reliable predicting parameter.

CONCLUSION
MRI of rectal cancer which achieved PCR after CRT demonstrates highly variable and confusing imaging characteristics. A tendency of marked volume reduction and decreased T2 SI after CRT does exist, but remaining mass and/or enlarged LNs of soft tissue SI are not infrequently encountered.

CLINICAL RELEVANCE/APPLICATION
Post-CRT rectal cancer can show highly variable MRI features. Striking remnant mass and/or LNs with bulk showing soft tissue SI does not necessarily neglect the possibility of having achieved PCR.

SSA07-09
CT-quantified Obesity a Risk or Protective Factor for Complications after Rectal Cancer Surgery?
Johanna Nattenmueller MD (Presenter): Nothing to Disclose, Jurgen Staffa : Nothing to Disclose, Astrik Bagdassarian : Nothing to Disclose, Yakup Kulu : Nothing to Disclose, Biljana Gigic : Nothing to Disclose, Hans-Ulrich Kauczor MD : Research Grant, Boehringer Ingelheim GmbH, Research Grant, Siemens AG Research Grant, Bayer AG, Speakers Bureau, Boehringer Ingelheim GmbH, Speakers Bureau, Siemens AG

CLINICAL RELEVANCE/APPLICATION
CT quantified Obesity a Risk or Protective Factor for Complications after Rectal Cancer Surgery?
Johanna Nattenmueller MD (Presenter): Nothing to Disclose, Jurgen Staffa : Nothing to Disclose, Astrik Bagdassarian : Nothing to Disclose, Yakup Kulu : Nothing to Disclose, Biljana Gigic : Nothing to Disclose, Hans-Ulrich Kauczor MD : Research Grant, Boehringer Ingelheim GmbH, Research Grant, Siemens AG Research Grant, Bayer AG, Speakers Bureau, Boehringer Ingelheim GmbH, Speakers Bureau, Siemens AG
Obesity is associated with an increased incidence and mortality in rectal cancer (RC). However, an obesity paradox in the sense of a protective effect of adipose tissue is described in many chronic diseases. We evaluated whether there is an impact of total adipose tissue (TAT), visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT) and BMI on morbidity and surgical complications after RC surgery.

**METHOD AND MATERIALS**

In 329 patients with RC (98 female, 231 male; mean age 63.0 (SD 12), mean BMI 26.0 kg/m2 (SD 5) with 218 obese patients BMI >25 kg/m2) who underwent multi-detector-CT, area-based quantification of TAT, VAT, SAT and Ratio VAT/SAT was performed on levels L3/4 and L4/5, and volume-based quantification from T11/12 to LS/S1 (abd) and LS/S1 to symphysis (pelv), between -190 to -30 HU. Logistic regressions of TAT, VAT, SAT and Ratio VAT/SAT on surgical complications (total n=107, anastomotic leakage (AL, n=27), wound infection (WI, n=57), bleeding (n=12), abscess (n=26), bladder dysfunction (BD, n=25), burst abdomen (BA, n=9)) and medical complications [total n=47, cardiac (n=18), pulmonary (n=22)] were performed.

**RESULTS**

A significant increase was seen in overall medical complications for TAT (pabd=0.03; pelv=0.003) and SAT (pabd = 0.02; pelv = 0.002), in cardiac complications for TAT (pabd = 0.02, pelv = 0.01), VAT (pabd = 0.03) and SAT (pelv = 0.02); in AL for VAT (pelv = 0.02) and SAT (pelv = 0.04); in WI for TAT (pabd = 0.02, pelv = 0.02) and SAT (pelv = 0.01); in BD for TAT (pabd = 0.03) and VAT (pabd = 0.02, pl3/4 = 0.02); in BA for TAT (pabd = 0.003, pelv = 0.002, pl3/4 = 0.007, pl4/5 = 0.004), VAT (pabd = 0.005, pl3/4 = 0.01, pl4/5 = 0.03), SAT (pabd = 0.006, pelv = 0.002, pl3/4 = 0.03, pl4/5 = 0.007) and Ratio VAT/SAT (pl4/5 = 0.01). No association was seen with pulmonary or overall surgical complications, bleeding and abscess. BMI showed no association with any complication.

**CONCLUSION**

In contrast to BMI, an increase in adipose tissue compartments measured in CT is able to predict complications after RC surgery. No obesity paradox was observed in the sense of a protective effect of adipose tissue.

**CLINICAL RELEVANCE/APPLICATION**

Quantification of adipose tissue compartments, based on routine CT scans, could (in contrast to BMI) help identify patients at risk for complications following RC surgery, aiming to prevent these.
1. Precontrast CT value. 2. Enhancement ratio on arterial phase of dynamic CT. 3. Contrast noise ratio (CNR) on T1 weighted image. 4. CNR on T2 weighted image. 5. CNR and ADC value on diffusion weighted image (DWI). 6. CNR and enhancement ratio on hepatobiliary phase of gadoxetic acid enhanced MR imaging. 7. Pathological findings (macroscopic appearance, differentiation grade, proliferation pattern, vessel invasion and bile production). We also evaluated the correlations between immunohistochemical expression of B-catenin, GS and OATP1B3 (uptake transporter of gadoxetic acid).

RESULTS

HCC with B-catenin mutation (n=27) showed low CNR on DWI, high ADC value, high CNR and high enhancement ratio on gadoxetic acid enhanced MR imaging than those of intermediate type HCC (n=23) and HCC without B-catenin mutation (n=84) (P

CONCLUSION

HCCs with B-catenin mutation, which was supposed to be a biologically less aggressive subtype, showed high ADC value and high enhancement ratio on gadoxetic acid enhanced MR imaging.

CLINICAL RELEVANCE/APPLICATION

DWI and gadoxetic acid enhanced MR imaging are useful to diagnose HCCs with B-catenin mutation. Imaging diagnosis of this subtype of HCC will be important for future personalized medicine.

SSA08-02

Subcentimeter Hypervascular Nodule at High-risk for Hepatocellular Carcinoma in Patients with Chronic Liver Disease: Natural Course on Serial Gadoxetic Acid-enhanced MRI and Diffusion-weighted Imaging

Kyoung Doo Song MD : Nothing to Disclose, Seong Hyun Kim : Nothing to Disclose, Hyo Keun Lim MD : Nothing to Disclose, Jisun Lee (Presenter): Nothing to Disclose, Seong-Yoon Ryu MD : Nothing to Disclose

PURPOSE

To evaluate the natural course of subcentimeter hypervascular nodule at high-risk for developing to hepatocellular carcinoma (HCC) (SHNHR) by using a serial follow-up with gadoxetic acid-enhanced magnetic resonance imaging (MRI) and diffusion-weighted imaging (DWI) in patients with chronic liver disease.

METHOD AND MATERIALS

Institutional review board approval was obtained, and informed consent was waived. A SHNHR was defined as a subcentimeter hypervascular nodule having typical imaging findings of HCC on gadoxetic acid-enhanced MRI and DWI. We included 43 patients who had newly detected 50 SHNHRs. The progression rate to overt HCC was calculated by the Kaplan-Meier method. Cox proportional hazard model was used to evaluate the independent prognostic significance of baseline covariates for progression to overt HCC.

RESULTS

The median follow-up period was 139 days (range, 58 - 394 days). The cumulative progression rate to overt HCC at 3, 6, 9, and 12 months were 16.8%, 62.8%, 82.1%, and 88.1%. The initial size of SHNHR at baseline MRI was the significant predictor of increased risk of progression to overt HCC in univariate (hazard ratio [HR] = 1.399; 95% confidence interval [CI]: 1.132, 1.728; p = 0.002) and multivariate analysis (HR = 1.647; 95% CI: 1.229, 2.206; p = 0.001), and its optimal cut-off value was 5 mm based on the time-dependent receiver operating characteristic curve at 12 months.

CONCLUSION

The progression rate of SHNHR to overt HCC within 12 months was very high (88.1%). The initial size of SHNHR at baseline MRI was a significant risk factor for progression to overt HCC.

CLINICAL RELEVANCE/APPLICATION

1. Prompt treatment of SHNHRs may be justified, given the very high (88.1%) progression rate of SHNHR to overt HCC within 12 months. 2. If SHNHRs are followed up without any treatment, MRI follow-up at 3-month intervals seems to be reasonable. 3. If management strategy is determined by the risk for progression to overt HCC, 5 mm or less SHNHRs can be followed up without any treatment and prompt treatment may be considered for SHNHRs greater than 5 mm in the greatest dimension.

SSA08-03

Gadoxetic-acid MR Imaging in the Characterization of the "Grey Zone " of the Hepatocarcinogenesis

Michele Di Martino MD,PhD (Presenter): Nothing to Disclose, Michele Anzidei MD : Nothing to Disclose, Fulvio Zaccagna MD : Nothing to Disclose, Luca Saba MD : Nothing to Disclose, Carlo Catalano MD : Nothing to Disclose

PURPOSE

To evaluate radiological findings and diagnostic accuracy of gadoxetic acid magnetic resonance imaging (MRI) in the evaluation of small (≤2 cm) regenerative nodules (RN), dysplastic nodules (DN) and well-differentiated hepatocellular carcinomas (HCCs).

METHOD AND MATERIALS

Sixty-two cirrhotic patients, with 107 focal liver lesions were prospectively recruited. MR examinations were performed with a 3T magnet (Discovery MR750; General Electric Systems). The MRI study protocol included T1-weighted and T2-weighted pre-contrast sequences and 3D spoiled gradient-echo T1-weighted post-contrast
sequences Gd-EOB-DTPA-enhanced obtained during the arterial, portal-venous and equilibrium phases. All lesions (33 RN, 29 DN and 45 HCCs) were pathologically confirmed. One radiologist not involved in the datasets analysis reported the signal intensity characteristics of each lesion. Two radiologists blinded to clinical and pathological information evaluate radiological dataset images. Sensitivity, specificity and diagnostic accuracy were considered for statistical analysis.

**RESULTS**

Regenerative nodules usually show enhancement during the arterial phase without wash-out sign during portal-venous and delayed phase. Dysplastic nodules tend to do not show enhancement during the arterial phase and present wash-out on delayed phase. Well-differentiated HCCs very often show typical vascular pattern (wash-in and wash-out) and low signal intensity during the hepatobiliary phase. According to the AASLD radiological diagnosis the mean sensitivity, specificity and diagnostic accuracy in the diagnosis of HCC were, respectively (76.4%, 80%, 0.84).

**CONCLUSION**

Gadoxetic acid MR imaging is a reliable tool in the characterization of well-differentiated HCC from dysplastic and regenerative nodules.

**CLINICAL RELEVANCE/APPLICATION**

Characterization of small nodules in cirrhotic liver is still of challenge. Basically overlap between dysplastic nodules and hypovascular HCCs may be the most common cause of misinterpretation.

**SSA08-04 Imaging Diagnosis and Prognosis of Hepatocellular Carcinoma (HCC) in HIV-HCV Co-infected Cirrhotic Patients: Arguments for a New Screening Policy**

Maite Lewin MD, PhD (Presenter): Nothing to Disclose, Moana Gelu-Simeon: Nothing to Disclose, Marita Ostos: Nothing to Disclose, Faroudy Boufassa: Nothing to Disclose, Rodolphe Sobesky: Nothing to Disclose, Elina Teichner: Nothing to Disclose, Laurence Meyer: Nothing to Disclose, Helene Fontaine: Nothing to Disclose, Dominique Salmon: Nothing to Disclose, Didier Samuel: Nothing to Disclose, Olivier Seror: Nothing to Disclose, Jean-Claude Trinchet: Nothing to Disclose, Jean-Charles Duclos-Vallee: Nothing to Disclose

**PURPOSE**

To characterize the diagnosis and prognosis imaging features of HCC using computed tomography (CT) or magnetic resonance imaging (MRI) in cirrhotic patients co-infected with human immunodeficiency virus (HIV) and hepatitis C virus (HCV) compared to HCV mono-infected cirrhotic patients

**METHOD AND MATERIALS**

Thirty-five HCC cases from two multicenter prospective cohorts of HIV-HCV cirrhotic patients (32 males; median age: 50 years [40-65]), and 35 mono-infected HCV cirrhotic patients from a control group (29 males; median age: 56 years [41-83]) were included. The CT or MRI analysis of HCCs focused on: (a) the detection of infiltrative or nodular types, (b) the evaluation of nodule size, and (c) evidence for portal obstructing tumors. Survival analysis used the Kaplan-Meier and Cox models. Our institutional review board approved the study and subjects provided written informed consent.

**RESULTS**

An infiltrative type was found in 8/35 HIV-HCV patients (23%) but was never found in HCV patients (p=0.002). Other HCCs were of a nodular type. The largest nodules had a median diameter that did not differ significantly between HIV-HCV and HCV patients (24 mm [12-70] and 23 mm [13-90], respectively). A portal obstructing tumor was found in 10/35 HIV-HCV patients (28.5%) (including the 8 infiltrative types) but was never found in HCV patients (p=0.001). Survival was significantly shorter among HIV-HCV patients (p=0.004). The principal factors for a fatal outcome were an infiltrative type (adjusted HR:7.12 [2.59-19.60]) and portal obstructing tumor (aHR:4.82 [1.86-12.46]).

**CONCLUSION**

Compared to HCV mono-infected cirrhotic patients, HCCs in HIV-HCV co-infected cirrhotic patients were diagnosed at a more advanced stage, with a significantly higher rate of infiltrative types and of portal obstructing tumors, consistent with a shorter survival.

**CLINICAL RELEVANCE/APPLICATION**

An earlier HCC detection using MR imaging rather than ultrasound is required in order to improve the access to curative treatment of HIV-HCV co-infected cirrhotic patients.

**SSA08-05 Can We Differentiate Hepatocellular Carcinoma (HCC) with Paradoxical Uptake on Hepatobiliary Phase(HBP) from Focal Nodular Hyperplasia (FNH) or FNH-like Nodule in Gd-EOB-DTPA-enhanced MR Imaging?**

Jeong Woo Kim MD (Presenter): Nothing to Disclose, Chang Hee Lee MD: Nothing to Disclose, Yang Shin Park MD: Nothing to Disclose, Jong Mee Lee: Nothing to Disclose, Jae Woong Choi MD: Nothing to Disclose
PURPOSE
To identify imaging features that can reliably differentiate hepatocellular carcinoma (HCC) with paradoxical uptake on hepatobiliary phase (HBP) from focal nodular hyperplasia (FNH) or FNH-like nodule in Gd-EOB-DTPA-enhanced MR imaging

METHOD AND MATERIALS
This study was approved by our institutional review board and the requirement for informed consent was waived. 19 pathologically confirmed HCC with paradoxical uptake on HBP, 28 FNHs, and 21 FNH-like nodules from 61 patients who had undergone Gd-EOB-DTPA-enhanced liver MRI were included. Two radiologists reviewed independently and in consensus all MR images and evaluated following the image features: signal intensities on T1WI, T2WI, and DWI, appearances on T2WI (T2 scar) and HBP (EOB scar), arterial enhancement pattern, washout pattern (venous hypoenhancement) on venous phase (2 minutes), uptake pattern on HBP, and chemical shifting on in- and out-of-phases. ADC values were also measured. Image features that were statistically significant by univariate analysis were entered into multivariate logistic regression analysis.

RESULTS
Interobserver agreement was excellent (κ>0.85). Among imaging features analyzed, signal intensities on T1WI and DWI, appearances on T2WI and HBP, arterial enhancement pattern, washout pattern on venous phase, heterogeneous washout pattern on venous phase, heterogeneous uptake pattern on HBP, and heterogeneous arterial enhancement pattern were independent significant variables in the differentiation of HCC with paradoxical uptake from FNH or FNH-like nodule. (p = <0.001, <0.001, <0.001, <0.001, <0.001, <0.001, <0.001, respectively)

CONCLUSION
HCC showing paradoxical uptake on HBP in Gd-EOB-DTPA-enhanced liver MRI may be difficult to differentiate from FNH or FNH-like nodule. HCC with paradoxical uptake can be differentiated from FNH or FNH-like nodule on the basis of heterogeneous washout pattern on venous phase, heterogeneous uptake pattern on HBP, and heterogeneous arterial enhancement pattern in Gd-EOB-DTPA-enhanced MRI.

CLINICAL RELEVANCE/APPLICATION
Heterogeneous washout pattern on venous phase, heterogeneous uptake pattern on HBP, and heterogeneous arterial enhancement pattern in Gd-EOB-DTPA-enhanced liver MR imaging can be helpful in differentiating HCC with paradoxical uptake on HBP from FNH or FNH-like nodule.

SSA08-06
Prospective, Multicenter, Intra-individual Comparison of Multidetector CT and Contrast-enhanced MR Imaging in the Detection of Small Hepatocellular Carcinoma in Patients with Cirrhosis Induced by HBV Infection

Ke Wang MD (Presenter): Nothing to Disclose, Ze Peng: Nothing to Disclose, Xuedong Yang: Nothing to Disclose, Xiaoying Wang MD: Nothing to Disclose

PURPOSE
To prospectively compare the diagnostic performance of multidetector computed tomographic (MDCT) imaging, unenhanced MRI (MR-) and unenhanced combined contrast-enhanced MRI (MR±) in the detection of small hepatocellular carcinoma (SHCC) in patients with cirrhosis induced by HBV infection.

METHOD AND MATERIALS
A total of 150 patients (118M/32F; mean age, 54y; age range, 28-79y) confirmed with cirrhosis induced by HBV infection and suspected of SHCCs (≤3cm) underwent unenhanced combined contrast-enhanced MRI and multiphasic MDCT within 30 days. The images were qualitatively analyzed by 3 independent readers in three separate reading sessions (CT, MR-, MR±). Using strict diagnostic criteria for HCC, readers classified all detected lesions with use of a five-point confidence scale. The reference standard was a combination of pathologic proof, interventional therapy results and substantial tumor growth at follow-up CT or MRI. Interreader variability was assessed. The diagnostic performance of these techniques for the detection of SHCC was assessed by receiver operating characteristic (ROC) analysis, in addition to evaluating the sensitivity, specificity, positive predictive value (PPV) and negative predict value (NPV).

RESULTS
A total of 164 SHCCs (mean size± standard deviation, 1.8cm±0.6; range, 0.7-3.0cm) were detected. For all the lesions, the area under the ROC curve (Az) was significantly higher with MR± (0.947) than either with MR- (0.856) or with MDCT (0.897) (P CONCLUSION
Unenhanced combined contrast-enhanced MR imaging shows a better diagnostic performance for the detection of small HCCs (both for lesions ≤3cm and lesions ≤2cm) compared with either unenhanced MR or multiphasic MDCT in patients with cirrhosis induced by HBV infection.

CLINICAL RELEVANCE/APPLICATION
Unenhanced combined contrast-enhanced MR imaging is better than either unenhanced MR or multiphasic MDCT in detecting small HCCs, and is recommended in the evaluation of suspected HCC in patients with cirrhosis induced by HBV infection.

SSA08-07
Applicability of Gadoxetic Acid-enhanced MRI for Non-invasive Diagnosis of Hepatocellular Carcinoma (HCC) Using American Association for the Study of Liver Diseases (AASLD) and Liver Imaging Reporting and Data System (LI-RADS) Systems
Imaging Reporting and Data System (LI-RADS) Systems

Min Jung Park (Presenter): Nothing to Disclose, Myeong-Jin Kim MD, PhD: Nothing to Disclose, Yong Eun Chung MD, PhD: Nothing to Disclose, Chansik An MD: Nothing to Disclose, Hyungjin Rhee MD: Nothing to Disclose

PURPOSE
To retrospectively assess whether gadoxetic acid-enhanced MRI can be applicable to the non-invasive diagnosis of HCC using AASLD and LI-RADS systems

METHOD AND MATERIALS
A total of 124 hepatic nodules (≤ 5cm in diameter) in 109 patients at-risk for HCCs who had no history of liver tumor treatment were analyzed. Three observers independently assigned LI-RADS categories (1-5 and M) and AASLD scores (adapted from Bruix et al; 5 as definite HCC), and recorded major (assessment of washout in portal venous phase) and ancillary features (including hypointensity in hepatobiliary phase) of HCC for each lesion. Standard reference for diagnosis was histopathology other than 18 of 26 benign lesions diagnosed based on clinical and imaging features. Scores were compared by using McNemar test. Interobserver agreement was assessed by using multirater Fleiss κ statistics.

RESULTS
On surgery or biopsy, 94 of 124 (75.8%) nodules were confirmed as HCC. Sensitivity and specificity for LI-RADS in three observers were 55.3-67.0% and 83.3-90.0%, respectively, and those for AASLD were 67.0-76.6% and 83.3-86.7%, respectively. AASLD showed significantly higher sensitivity than LI-RADS in two observers (P ≤ 0.003), but no significant difference for specificity. When considering LR-4 and LR-5 as HCC, sensitivity and specificity for LI-RADS were 85.1-87.2% and 70.0-86.7%, respectively, and showed significantly higher sensitivity (P ≤ 0.035) than AASLD in all observers, but no significant difference for specificity. Lesions that were false positive for both systems (when LR-4 and LR-5 as HCC in LI-RADS) in all observers were cholangiocarcinoma (n=1), combined hepatocellular and cholangiocarcinoma (n=1) and dysplastic nodule (n=2). Interobserver agreement for categories consistent with HCC was moderate or good (LR-4 [κ=0.44], LR-5 [κ=0.68], AASLD-5 [κ=0.74]).

CONCLUSION
Gadoxetic acid-enhanced MRI can be applicable to the non-invasive diagnosis of HCC using AASLD and LI-RADS systems, yielding moderate sensitivity and specificity.

CLINICAL RELEVANCE/APPLICATION
Gadoxetic acid-enhanced MRI can be utilized for scoring LI-RADS and AASLD systems with acceptable diagnostic performances.

Comparison of HCC Conspicuity on Delayed MR Images with Extracellular versus Hepatobiliary Contrast Agent for Patients with Compromised Liver Function


PURPOSE
To compare the conspicuity of hepatocellular carcinoma (HCC) on the delayed phase images of extracellular contrast (gadodiamide) versus hepatobiliary contrast (gadoxetate disodium)-enhanced MR relative to liver function.

METHOD AND MATERIALS
We retrospectively identified 86 patients with newly diagnosed HCC on liver MR between 2010 and 2013 and recorded the severity of liver disease by Child-Pugh class (CPC). 38 patients had MR enhanced with gadodiamide and 48 with gadoxetate disodium on a 1.5T scanner. The conspicuity of 86 HCCs (mean size, 2.7cm; range, 1-9.1 cm) was visually graded on a 3-point scale (1=invisible, 2=fair, 3=clear cut) on the delayed phase images (5-minute delay for gadodiamide and 20-minute delay hepatobiliary phase for gadoxetate). Conspicuity was quantitatified by tumor-to-liver contrast ratios (TLC). The relative liver parenchymal enhancement (RPE) was measured on the delayed enhanced versus unenhanced images. For different CPCs, we compared the visual and quantitative conspicuity of and RPE between gadodiamide and gadoxetate.

RESULTS
For the 65 patients with mild liver disease (CPC A), the visual and quantitative conspicuity of the 27 HCCs imaged with gadodiamide was significantly worse than of the 38 HCCs with gadoxetate (P=.01,

CONCLUSION
In patients with moderate to severe liver disease, hypointensity of HCC is more conspicuous on the delayed phase with gadodiamide than with gadoxetate. This may reflect the high extracellular uptake of gadodiamide and poor hepatocyte uptake of gadoxetate in patients with compromised liver function.

CLINICAL RELEVANCE/APPLICATION
Liver function is critical to consider when selecting between an extracellular versus hepatobiliary contrast agent for optimal visualization of HCC at MR imaging.

Determining Optimal Iodine Dose with 80-kVp CT Imaging: Detection of Hypervascular...
Hepatocellular Carcinoma

Satoshi Goshima MD, PhD (Presenter): Nothing to Disclose, Yoshifumi Noda MD: Nothing to Disclose, Hiroshi Kondo MD: Nothing to Disclose, Haruo Watanabe MD: Nothing to Disclose, Masayuki Kanematsu MD: Nothing to Disclose.

PURPOSE

To determine the optimal iodine mass (IM) required for the detection of hypervascular hepatocellular carcinoma (HCC) based on total body weight (TBW) and body surface area (BSA) at 80kVp CT imaging of the liver.

METHOD AND MATERIALS

IRB approval and written informed consent was obtained. One hundred nine patients with chronic hepatitis (75 men, 34 women; mean age, 67.9 years; range, 41 - 85 years) underwent contrast enhanced CT for screening of HCC. The patients were randomized into three groups according to the following iodine-dose per body-weight protocols: 0.5 gI/kg (0.5 g of iodine per kilogram TBW), 0.4 gI/kg, and 0.3 gI/kg groups. All CT examination were performed with low tube voltage (80kVp), high tube current (with the use of automatic exposure control), and adaptive statistical iterative reconstruction. The three groups were compared in terms of hepatic parenchymal CT enhancement during the portal venous phase (ΔHU) and qualitative score (in a 5-point scale) for the visualization of HCC, if presence, at the hepatic arterial, portal venous, and equilibrium phases. Iodine dose per BSA (gI/m2) was also calculated and compared with ΔHU and visualization of HCC.

RESULTS

Thirty-three HCCs were identified in 30 patients (mean size, 15.2 mm; size range, 5-68 mm). The mean ΔHU for the 0.5 gI/kg group (83.3 HU) was higher than those of the 0.4 gI/kg (63.3 HU) and 0.3 gI/kg (50.0 HU) groups (P < 0.001). The relationship between the enhancement and iodine-dose according to a linear regression analysis was ΔHU = -6.3 + 178.0*IM/TBW (P < 0.001) and ΔHU = 7.4 + 4.1*IM/BSA (P < 0.001). The three groups were comparable in qualitative scores for the visualization of the detected HCCs in hepatic arterial and portal venous phase.

CONCLUSION

The iodine dose to achieve the hepatic parenchymal enhancement of 50 HU for the detection of hypervascular HCC was estimated to be 0.32 gI/kg of body weight or 10.5 gI/m2 of body surface area at 80-kVp CT imaging. This dose represents substantially less than the traditional dose of 500 mgI/kg used at higher kVp CT imaging.

CLINICAL RELEVANCE/APPLICATION

Our study estimated the optimal amount of iodine-dose for the detection of hypervascular HCC and confirmed that the iodine-dose could be required significantly less in 80-kVp than in higher kVp CT imaging. This information is useful for designing clinical protocols for hepatic CT imaging.

GIS-SUA

Gastrointestinal Sunday Poster Discussions

Scientific Posters

GI

AMA PRA Category 1 Credits ™: .50
Sun, Nov 30 12:30 PM - 1:00 PM   Location: GI Community, Learning Center

Participants

Moderator
Rajan T. Gupta MD : Consultant, Bayer AG Speakers Bureau, Bayer AG

Sub-Events

GIS325

Peritumoral Hyperintensity on Hepatobiliary Phase of Gd-EOB-DTPA Enhanced MRI in Hepatocellular Carcinomas: Correlation with Peritumoral Hyperplasia Showing Glutamine Synthetase Overexpression (Station #1)


PURPOSE

Peritumoral hyperintensity (PH) is occasionally seen in hepatocellular carcinoma (HCC) on the hepatobiliary phase (HB phase) of Gd-EOB-DTPA enhanced MRI (EOB-MRI). However, the mechanism of PH is still unknown. A recent study showed peritumoral hyperplasia (PTH) associated with over-expression of glutamine synthetase (GS) in HCC or metastatic carcinoma. The aim of this study was to analyze the correlation between PH on the
HB phase of EOB-MRI and GS expression indicating PTH.

METHOD AND MATERIALS

Seventy-seven surgically resected nodules (from 68 patients) were analyzed. Patients were grouped according to the degree of the peritumoral hyperintense signal on the HB phase: grade0 (no PH), grade1 (PH was seen on less than 50% of the tumor border), grade2 (50-80%), grade3 (80%-100%). Immunohistochemical staining for GS and organic anion transporter polypeptides (OATP)1B3 (uptake transporter of Gd-EOB-DTPA) was performed. In this study, PTH was defined as the peritumoral hepatocytes with high GS expression.

RESULTS

In the image evaluation of the HB phase of EOB-MRI, 39 nodules were classified as grade 0, 24 nodules as grade 1, 11 nodules as grade 2, and 3 nodules as grade 3. An increased expression of GS relative to the surrounding liver was observed in 3/39 grade 0 nodules (7.7%), 17/24 grade 1 nodules (70.8%), 9/11 grade 2 nodules (81.8%) and 3/3 grade 3 nodules (100%). There was significant in the incidence of PTH between grade0 and grade1-3 (P

CONCLUSION

Peritumoral hyperintensity on HB phase of EOB-MRI in HCC may indicate peritumoral hyperplasia with GS and OATP1B3 expression.

CLINICAL RELEVANCE/APPLICATION

Peritumoral hyperintensity on HB phase of EOB-MRI in HCC may indicate peritumoral hyperplasia. Understanding of this finding will be useful in the accurate diagnosis of liver tumors.

Noninvasive Assessment of Liver Fibrosis with Iodine Quantification Using Dual-energy CT in Chronic Liver Disease (Station #2)

Nobuyuki Asato MD (Presenter): Nothing to Disclose, Masakatsu Tsurusaki MD, PhD: Nothing to Disclose, Tomoko Hyodo MD: Nothing to Disclose, Mitsuru Matsuki: Nothing to Disclose, Kazunari Ishii MD: Nothing to Disclose, Takamichi Murakami MD, PhD: Nothing to Disclose

PURPOSE

To evaluate utility of iodine quantification using GSI (Gemstone Spectral Imaging by dual-energy CT) iodine map for staging liver fibrosis in the patients with chronic liver disease by using liver biopsy as the reference standard.

METHOD AND MATERIALS

This study was approved by the institutional review board. Forty-eight patients who underwent dynamic CT scanning using dual-energy CT within 2-months before or after liver biopsy for suspicion of chronic liver disease. The fibrosis stage was assessed according to METAVIR scores (fibrosis stage 0 [F0], 5 patients; F1, 8; F2, 9; F3, 16; and F4, 10). All patients underwent non-contrast and contrast-enhanced CT of the upper abdomen with a fast kV switching single-source dual-energy (80 kVp and 140 kVp) using 64-slice MDCT. Iodine density on each dynamic phase was quantitatively measured by the iodine map and was correlated with the fibrosis stage. We determined the optimal cutoff value and diagnostic ability for discriminating each stage of fibrosis using receiver operating characteristic (ROC) curve analysis of iodine density quantifications between portal phase and equilibrium phase. The percentage of iodine that remains from portal phase to equilibrium phase was defined as the residual ratio.

RESULTS

The residual ratio increased with the stage of fibrosis: F0, 66.6±3.6%; F1, 67.4±3.4%; F2, 72.9±5.6%; F3, 74.9±5.5%; and F4, 83.8±4.7%. There was a statistically significant correlation between the residual ratio and fibrosis stage (Spearman's Rho; r= 0.77, p < 0.001). The mean area under the ROC curve values for discriminating liver fibrosis stages were: 0.86 for stages of F1 or greater (Cutoff value=69.9%), 0.92 for stages of F2 or greater (72.2%), 0.86 for stages of F3 or greater (72.3%), and 0.94 for stage F4 (77.8%).

CONCLUSION

Iodine quantification using the GSI iodine map is a reliable technique for staging liver fibrosis and discriminating liver fibrosis stage in patients with chronic liver disease.

CLINICAL RELEVANCE/APPLICATION

Contrast enhanced dynamic CT is the most widely used modality for the patients with chronic liver disease. Iodine quantification using dual-energy CT (iodine map) could be one of the minimally-invasive options to assess fibrous stages as well as US elastography or MR elastography.

To Evaluate the Damage of Renal Function in CIAKI Rats by fMRI and Correlate with the Expression of AQP1 (Station #3)

Shui Xing Zhang MD (Presenter): Nothing to Disclose, Wen-Bo Chen BArch: Nothing to Disclose, Chang Hong Liang MD: Nothing to Disclose

PURPOSE

To investigate noninvasive blood oxygen level-dependent imaging (BOLD) sequences for measuring renal
function in contrast induced acute kidney injury (CIAKI) rats after the administration of iodinated contrast media (CM) and further correlate with the expression of AQP1.

METHOD AND MATERIALS

Thirteen male Sprague-Dawley (SD) rats with weight of 200-250 g were randomized grouped to a CIAKI group (injected with Meglumine Diatrizoate, 370mg/ml, 6 ml/kg body weight) and a control group (injected with same amount of 0.9% saline). All procedures were approved by the local Research Ethics Committee, and in accordance with the Guide of the Care and Use of Laboratory Animals published by the US National Institutes of Health (NIH Publication No. 85-23, revised 1996). BOLD sequences were performed at 24 h pre-injection and at intervals of 30 min, 12 h, 24 h, 48 h, 72 h and 96 h post-injection to assess renal relative spin-spin relaxation rate (R2*) respectively. At each time point, 3 rats were executed and the kidneys were performed immunohistochemistry (IHC) for measuring the expression of AQP1. Data were analyzed using SPSS 13.0 for Windows. One-way ANOVA test and Bivariate Correlations were used. P<0.05 was considered as statistical difference.

RESULTS

For the CIAKI group, the values of R2* in the outer medulla (OM) of kidneys were markedly increased at 30 min, 12 h, 24 h and 48 h (P<0.05 vs. baseline, n=6), respectively; whereas the changes at 72 h and 96 h in the OM and in the cortex and inner medulla (IM) were not statistically significant (P=NS vs. baseline). Besides, the expression of AQP1 at 30 min, 12 h, 24 h and 48 h (P<0.05 vs. baseline, n=3) were higher than control group. At 30 min to 48 h, the correlation coefficient r between R2* and AQP1 were 0.575 (P = 0.025, one-tailed).

CONCLUSION

The increase of oxygen level in OM were found at 30 min-48 h post-injection of iodinated CM. BOLD sequence provides means for noninvasive monitoring renal function during the first 2 days of CIAKI in clinical routine works. The AQP1 expression was positively correlated with R2 *. Therefore BOLD may be a objective mean for forecasting AQP1.

CLINICAL RELEVANCE/APPLICATION

BOLD may provides means for noninvasive monitoring renal function of CIAKI in clinical routine works and become a objective mean for forecasting AQP1.

GIS328

Impact of a Second-Generation Virtual Monochromatic Algorithm on the Conspicuity of Hypervascular Liver Tumors Using Dual-Source Dual-Energy MDCT (Station #4)

Daniele Marin MD (Presenter): Nothing to Disclose, Achille Mileto MD: Nothing to Disclose, Juan Carlos Ramirez Giraldo PhD: Employee, Siemens AG

PURPOSE

To investigate the impact of a second-generation virtual monochromatic algorithm on the conspicuity of hypervascular liver tumors and image noise, using dual-source dual-energy MDCT.

METHOD AND MATERIALS

A custom anthropomorphic liver phantom simulating different levels of enhancement of hypervascular lesions in three adult body sizes was imaged with a second-generation dual-source MDCT using both dual-energy (100/Sn140 kVp) and single-energy acquisitions, at various energy levels (80,100,120, 140 kVp). For each phantom size, the radiation output was kept constant for all scans. Virtual monochromatic images from the dual-energy dataset were reconstructed at energy levels ranging from 40 to 140 keV, using both first-generation (Syngo DE Monoenergetic) and second-generation (Syngo DE Monoenergetic PLUS) virtual monochromatic algorithms. Noise and tumor-to-liver contrast-to-noise ratio (CNR) were calculated and compared among different reconstructed datasets, for all phantom body sizes.

RESULTS

On single-energy imaging, the minimum noise level was observed at 120 kVp for the small and at 140 kVp for the medium and large phantom sizes; 80 kVp yielded the highest tumor-to-liver CNR for all phantom sizes. For the first-generation virtual monochromatic algorithm, noise was lowest at 70 keV in the small and medium phantom sizes, and 80 keV in the large phantom size; an energy level of 60 keV yielded the highest tumor-to-liver CNR for all phantom sizes. For the second-generation virtual monochromatic algorithm, noise was lowest at 80 keV for the small and medium phantom sizes, and 90 keV for the large phantom size; an energy level of 40 keV yielded the highest tumor-to-liver CNR for all phantom sizes. In the large phantom, second-generation virtual monochromatic images at an optimal energy yielded significantly higher tumor-to-liver CNR, compared to either single-energy or first-generation virtual monochromatic images (P<0.01).

CONCLUSION

Second-generation virtual monochromatic algorithm may improves the conspicuity of hypervascular liver tumors compared to single-energy and first-generation virtual monochromatic images, in larger body sizes.

CLINICAL RELEVANCE/APPLICATION

Based on the results obtained, a second-generation virtual monochromatic algorithm is recommended for use in clinical routine works.
Second-generation optimal energy virtual monochromatic images may substantially improve the conspicuity of hypervascular liver tumors in larger patients.

GIS329

Magnetic Resonance Imaging (MRI) in Locally Advanced Rectal Cancer (LARC): Tumor Volume Reduction Rate (TVRR) Assessed at Mid-term Chemoradiotherapy (CRT) Predicts the Histological Tumor Response Grade (TRG) (Station #5)

Marcello Alessandro Orsi MD (Presenter): Nothing to Disclose, Francesco Aldo De Cobelli MD: Nothing to Disclose, Giulia Agostini: Nothing to Disclose, Maria Alessia Zerella: Nothing to Disclose, Paolo Passoni: Nothing to Disclose, Najla Slim: Nothing to Disclose, Alessandro Del Maschio MD: Nothing to Disclose

PURPOSE

Neoadjuvant CRT is the standard therapeutic option in LARC. TRG is considered a trustable indicator of response and MRI is the reference technique for the evaluation of treatment response in vivo. In this study, we performed pelvic MRI before, during and after CRT to evaluate TVRR at mid-term CRT (mid-TVRR) and after CRT (late-TVRR) in correlation to histological TRG.

METHOD AND MATERIALS

32 patients affected by LARC, enrolled for preoperative CRT, underwent MRI before, during (at mid-term) and after CRT. On axial T2 images, using a dedicated software, the contour of the tumor was traced, then transformed into a 3-dimensional reconstruction, from which volumetric measurements were calculated. TRG was assessed by histopathology after surgery according to Dworak system (from 0 to 4). Patients with TRG=0-2 were considered as Non Responders (NR) and TRG=3-4 as Responders (R).

RESULTS

Based on histological TRG, 25 patients were classified R and 7 NR. Both Mid-TVRR and Late-TVRR were significantly higher in the R group than in the NR group, respectively 69±15% vs 19±16% (p<0.001; area under the ROC Curve (AUC) 0.98; cut-off value: 48%) and 86±7% vs 44±22% (p=0.002; AUC 0.99; cut-off value: 74%). In the R group, 8/25 were TRG=4 and 17/25 were TRG=3; Mid-TVRR was significantly higher in patients with TRG=4 than TRG=3 (84±7% vs 61±13%; p<0.001; AUC 0.95; cut-off value: 80); no significant difference in Late-TVRR between the two groups was found (89±5% vs 84±8%, p=n.s.).

CONCLUSION

In our study, TVRR in LARC during CRT presented a strong correlation with histological TRG. Volume reduction, both at half CRT (Mid-TVRR) and after CRT (Late-TVRR) can predict / differentiate R from NR. Moreover, Mid-TVRR was able to predict complete responders (TRG=4) from partial / nearly complete responders (TRG=3).

CLINICAL RELEVANCE/APPLICATION

MRI with volumetric evaluation, performed at half CRT, could early identify patients not responding to CRT, addressing them to alternative or more intense treatment. Moreover, Mid-TVRR, discriminating complete from partial responder patients, could be a powerful tool in addressing complete responders towards a conservative management.

GIS330

Dual-energy Spectral CT for Characterization of Hepatocellular Carcinoma: Initial Experience (Station #6)

Shalini Thapar Laroia MD (Presenter): Nothing to Disclose, Shiv Sarin: Nothing to Disclose

PURPOSE

To determine whether spectral CT can improve qualitative and quantitative accuracy in diagnosis of HCC in a cirrhotic liver using material iodine density.

METHOD AND MATERIALS

Routine and spectral CT (at 70-140kVp) was performed for 3600 patients with cirrhosis over a span of 3 years. The indeterminate mass lesions were identified, of which few were followed up and some lesions underwent biopsy/ surgical explantation. These were analyzed using gem stone imaging software at 55keV. The hepatic arterial phase (which showed maximum iodine enhancement) was used to quantify iodine concentrations from iodine-based material-decomposition images. The lesion iodine to aortic iodine concentration (normalized enhancement values- NEV) and lesion-to-normal parenchyma ratio (LNR) were obtained. Spectral HU curve, Scatter plot and the material density values of the indeterminate lesions were derived and statistically analyzed.

RESULTS

Total cirrhotic population screened = 3600 Number of patients with HCC =142 Number of indeterminate hypervascular lesions = 82 Number of indeterminate lesions on follow up =40 Number of indeterminate lesions underwent biopsy/ hepatectomy=42 All indeterminate lesions were studied with spectral imaging in HAP at 55keV: Number of patients with true positive HCC= 34, Number of patients with false positive HCC= 8

CONCLUSION

This study reveals that spectral imaging is an excellent add on qualitative and quantitative tool to routine CT for assessing hypervascular and indeterminate lesions in cirrhotic patients.
Abdominal Imaging Findings in Adult Patients on Extracorporeal Membrane Oxygenation (ECMO) (Station #7)

Laura Jane Steinberg MBBS (Presenter): Nothing to Disclose, Ashley Scrimshire MBBS: Nothing to Disclose, Lois Susan MacDonald MBBS, FRCP: Nothing to Disclose, Alan Ashworth MBChB: Nothing to Disclose, Velauthan Rudralingham MBBS: Nothing to Disclose, Sathi Anandan Sukumar MD: Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to: 1. Deliver an introduction to ECMO. 2. Present a pictorial review of the abdominal CT findings in adult patients on ECMO.

TABLE OF CONTENTS/OUTLINE

Introduction to ECMO Abdominal CT imaging techniques: Contrast injection and imaging protocol Pictorial Review: 1. Complications associated with ECMO; including procedural, renal and splenic infaracts, thromboses: including hepatic, renal and iliac veins and retroperitoneal haemorrhage. 2. Expected manifestations; including splenomegaly, periporal oedema, consolidation at the lung bases and ascites. 3. Primary abdominal pathologies leading to the requirement of ECMO; including pancreatitis and phaeochromocytoma. 4. Pitfalls; including dilution of contrast and changes in circulation dynamics leading to perfusional artefacts, with correlation to the operative or post mortem histology findings, where appropriate. This pictorial review will allow the Radiologist to discriminate between genuine pathology and artefact to ensure appropriate management of patients.

Practical LI-RADS Application to Focal Hepatic Lesions in Cirrhosis: Algorithmic Approach and Self-Assessment Cases (Station #10)


TEACHING POINTS

After viewing this exhibit, participants will be able to: 1. Review imaging features of suspicious focal liver lesions in the setting of cirrhosis. 2. Be familiar with the current LI-RADS classification of focal lesions. 3. Become familiar with a practical and stepwise algorithmic approach to using LI-RADS. 4. Test their level of understanding through case based self-assessment.

TABLE OF CONTENTS/OUTLINE


Beyond Uncomplicated Colon Diverticulitis: What the Radiologist Needs to Know (Station #11)

Ji Su Kim (Presenter): Nothing to Disclose, Hyun Cheol Kim: Nothing to Disclose, Sang Won Kim MD: Nothing to Disclose, Dal Mo Yang: Nothing to Disclose, Seong Jin Park MD, PhD: Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: 1. To review the diverticulitis other than colon diverticulitis. 2. To discuss the CT-based modified Hinchey classification which can provide the surgical indications of colonic diverticulitis. 3. To illustrate the various complications of diverticulitis 4. To demonstrate mimics of acute diverticulitis during CT interpretation

TABLE OF CONTENTS/OUTLINE

1. Colon diverticulitis - Pathophysiology - CT imaging findings 2. Diverticulitis other than colon - Small bowel diverticulitis - Meckel's diverticulitis - Appendiceal diverticulitis 3. The role of CT in predicting the need for surgery - Modified Hinchey classification with corresponding CT findings 4. Major complications of diverticulitis - Abscess - Fistula - Perforation - Hemorrhage - Bowel obstruction 5. Mimics of diverticulitis during CT interpretation - Colorectal cancer - Acute appendicitis - Stercoral colitis

CT 3D Volumetry, Vascular Anatomy and Virtual Resection in Live Related Liver Donor Evaluation: A Radiologist Primer (Station #12)

Sharad Maheshwari MD (Presenter): Nothing to Disclose, Abhijit A. Raut MD: Nothing to Disclose, Yogini Nikantha Sawant MBBS: Nothing to Disclose, Pankaj Chhatrala MBBS: Nothing to Disclose, Tejas Harish Kapadia MBBS: Nothing to Disclose, Abhisht Aggarwal MBBS: Nothing to Disclose, Jigar
TEACHING POINTS
This exhibit aims to introduce the concepts of "live related donor evaluation" to radiologist and its surgical significance. Optimal vascular anatomy and its challenges due to variation has been described. 3D Volumetry and concepts in virtual resection of liver according to the vascular anatomy and its surgical significance has been described.

TABLE OF CONTENTS/OUTLINE

Sub-Events

q-Space Diffusion-weighted MR Imaging of Gastric Carcinoma Ex Vivo: Correlation with Histopathologic Findings (Station #1)

Ichiro Yamada MD (Presenter): Nothing to Disclose, Keigo Hikishima PhD, MS: Nothing to Disclose, Naoyuki Miyasaka MD: Nothing to Disclose, Keiji Kato MD: Nothing to Disclose, Eisaku Ito MD: Nothing to Disclose, Kazuyuki Kojima MD, PhD: Nothing to Disclose, Tatsuyuki Kawano MD: Nothing to Disclose, Daisuke Kobayashi MD: Nothing to Disclose, Hideyuki Okano MD, PhD: Nothing to Disclose

PURPOSE
To determine the feasibility of non-Gaussian q-space diffusion-weighted MR imaging as means of evaluating mural invasion by gastric carcinomas and the histologic grades of gastric carcinomas.

METHOD AND MATERIALS
Twenty gastric specimens each containing a carcinoma were studied with a 7.0-T MR imaging system equipped with a four-channel phased-array surface coil. q-Space diffusion-weighted MR images were obtained with repetition time, 3000 msec; echo time, 29 msec; field of view, 50-60 mm x 25-30 mm; matrix, 256 x 128; section thickness, 2 mm without intersection gaps; ten b values ranging from 0 to 7163 sec/mm2; and motion-probing gradient in the y-direction. Three q-space imaging parameters (mean displacement, probability for zero displacement, and kurtosis) were calculated from the displacement distribution profiles, and standard apparent diffusion coefficient (ADC) was also calculated from two b values (b = 0 and 874 sec/mm2). The MR images were then compared with the histopathologic findings as the reference standard.

RESULTS
In all 20 specimens (100%), q-space imaging parameter maps were capable of depicting the individual layers of the normal gastric wall. The q-space imaging parameter maps in all 20 carcinomas (100%) made it possible to identify the same depth of tumor invasion of the gastric wall as observed during the histopathologic examination. The mean displacement (5.78 ± 0.36 μm), probability for zero displacement (52.6 ± 4.2 (arbitrary unit [a.u.]))), and kurtosis (55.1 ± 5.1 (a.u.)) of the carcinomas were statistically significantly different from the corresponding values of the layers of the gastric wall. The mean displacement (r = -0.841; P = 0.001), probability for zero displacement (r = 0.927; P < 0.001), and kurtosis (r = 0.927; P < 0.001) were statistically significantly correlated with the histologic grades of gastric carcinomas, while the ADC (r = -0.341; P = 0.255) showed no significant correlation with the histologic grades of gastric carcinomas.

CONCLUSION
q-Space diffusion-weighted MR imaging is feasible in gastric specimens and provides excellent diagnostic accuracy for evaluating mural invasion by gastric carcinomas and the histologic grades of gastric carcinomas.

CLINICAL RELEVANCE/APPLICATION
q-Space diffusion-weighted MR imaging may provide a diagnostic tool for noninvasive assessment of mural invasion by gastric carcinomas and the histologic grades of gastric carcinomas.

Characterization of Perfusion Parameters in Hepatocellular Carcinoma (HCC) with Aid of Volume Perfusion CT (VPCT): Correlation between Two Different Mathematical Models (Station #2)

Sascha Kaufmann : Nothing to Disclose, Maximilian Michael Walther Schulze MD : Nothing to Disclose, Daniel Spira MD : Nothing to Disclose, Alexander Sauter : Nothing to Disclose, Claus Detlef Claussen MD : Nothing to Disclose, Marius Horger MD (Presenter): Nothing to Disclose, Konstantin Nikolau MD : Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG
PURPOSE
To assess average perfusion values for blood flow (BF), blood volume (BV), k-trans, in hepatocellular carcinoma (HCC) measured with two different mathematical models as well as to determine the degree of arterial liver perfusion (ALP), portal venous perfusion (PVP-if any) and hepatic arterial index (HPI), the latter three being calculated by a special software which separates the contribution of the dual vascular (arterial/portal-venous) supply of the liver.

METHOD AND MATERIALS
Institutional review board approval was obtained for this prospective study. VPCT was performed in 81 patients covering the involved liver (80kV, 100/120mAs) using 64x0.6mm collimation, 26 consecutive volume measurements, IV injection of 50 mL of iodinated contrast at a flow rate of 5 mL/s). BF, BV and k-trans were measured using: maximum slope + Patlak analysis vs. deconvolution method.

RESULTS
For maximum slope + Patlak analysis BF/BV/k-trans yielded following avg. values values: 37.6/9.8/36.5 (SD: 14.7/7.1/16.5). For the deconvolution method mean BF/BV/k-trans were 67.7/12.5/24.2 (SD: 25.3/6.3/7.3), respectively. Separate calculation of ALP, PVP and HPI resulted in following values: 53.8/2.4/96.5 (SD: 15.0/5.4/7.2).

CONCLUSION
The deconvolution method results in more robust calculation of BV and k-trans whereas the max. slope + Patlak method yields higher variations of all calculated perfusion parameters. Moreover, the deconvolution method results in significantly higher BF, slightly higher BV and lower k-trans, but the relationship between results of both calculation models is congruent. The HPI was expectedly very high in all tumors.

CLINICAL RELEVANCE/APPLICATION
Perfusion imaging is an emerging technology which is beneficial both for tumor detection and characterisation as well as for therapy response monitoring. International guidelines for diagnosis of HCC allow for non-invasive diagnosis based on the presence of positive wash-in and wash-out tumor characteristics. However, not all HCC behave this way and perfusion quantification, particularly the HPI value may help for more accurate diagnosis and monitoring. Therefore orientation values are mandatory.

GIS333
Susceptibility-weighted Imaging of Multistep Hepatocarcinogenesis in Cirrhotic Livers: Correlation with Histopathology (Station #3)

Ruo Kun Li (Presenter): Nothing to Disclose, Mengsu Zeng MD, PhD: Nothing to Disclose, Jinwei Qiang: Nothing to Disclose, Shengxiang Rao MD: Nothing to Disclose, Lingli Chen: Nothing to Disclose, Yongming Dai: Nothing to Disclose

PURPOSE
To investigative imaging characteristics of multistep hepatocarcinogenesis in cirrhotic livers on susceptibility-weighted imaging (SWI) and correlate with histopathologic results.

METHOD AND MATERIALS
Seventy-three patients with 83 nodules in cirrhotic livers underwent hepatic MR imaging with SWI. Two radiologists reviewed MR images by consensus. Imaging characteristics of dysplastic nodules (DN), DN with malignant foci and hepatocellular carcinoma (HCC) were evaluated. Prussian blue staining was performed for semiquantification of hepatic iron content and above cirrhosis-associated nodules.

RESULTS
Positive iron staining of background liver parenchyma was found in 69 of 73 patients(94.5%) and 3 HCC patients were iron-negative staining of background liver parenchyma. Nine DN showed hypointensity or isointensity with pathologically confirmed similar (n=7) or slightly decreased (n=2) iron deposition compared with background liver parenchyma. SWI detected 14 of 15 DN with malignant foci. Seven cases appeared as homogeneous hyperintensity and 1 case appeared as heterogeneous hyperintensity due to intratumoral hemorrhages. The remaining 6 cases demonstrated as nodule-in-nodule appearance with iron deposition in all background nodules, iron deposition with grade 1 in one internal HCC foci, and iron-free in 5 internal HCC foci. The remaining 50 patients with hepatic iron deposition had 55 HCC lesions. Three HCC lesions had iron deposition with grade 1 to 2 and the remaining 52 HCC lesions were pathologically iron-resistant. HCC appeared as hyperintensity compared with siderotic surrounding liver parenchyma. However, HCCs with diameter larger than 3cm usually demonstrated heterogeneous hyperintensity due to intratumoral hemorrhage.

CONCLUSION
SWI could accurately visualize dynamic iron depletion on multistep hepatocarcinogenesis in cirrhotic livers. On SWI images, DN appear as hypointensity due to siderosis and malignant nodules appear as hyperintensity due to iron depletion.

CLINICAL RELEVANCE/APPLICATION
SWI could accurately visualize dynamic iron depletion on multistep hepatocarcinogenesis, which may be
Arterial Phase and Portal Venous Phase, Which Is Better for Material Suppressed Iodine (MSI) Images to Replace Conventional Non-enhanced (CN) Images in Liver CT? (Station #4)

Jing Zhao (Presenter): Nothing to Disclose, Xinming Zhao: Nothing to Disclose

PURPOSE

To evaluate whether Material Suppressed Iodine (MSI) images derived from CT spectral imaging can replace the conventional non-enhanced (CN) images in liver, and determine which phase is better between arterial phase (AP) and portal venous phase (PVP).

METHOD AND MATERIALS

A total of 25 patients underwent examinations of conventional non-enhanced CT and two phases (arterial phase, AP and portal venous phase, PVP) contrast enhanced CT scans. For both AP and PVP, monochromatic images were reconstructed and the MSI images were generated by suppressing iodine on 70keV monochromatic image with a dedicated software (GSI Volume Viewer, Advantage Workstation 4.6). The average CT value, image noise and in the liver, adipose tissue, vertebrae, muscle and pancreas were measured respectively. The subjective image quality score was assessed with 5-point scale. Variables were compared with paired student T-test and rank-sum test.

RESULTS

The average CT values of liver, portal venous, vertebrae, muscle and pancreas were slightly higher in MSI of dual-phase images than CN images. The difference was not statistically significant (p>0.05). However, adipose tissues in MSI images of dual-phase images were slightly lower than CN images (each p>0.05). MSI of arterial phase images showed remarkable lower average CT values than MSI of portal venous phase images (each p<0.05). Image noise in the liver, portal venous, adipose tissue, vertebrae, muscle and pancreas were significantly higher in MSI of dual-phase images (each p<0.05) than CN images. Image noise of such organs was slightly lower in MSI of arterial phase images than portal venous phase images (each p<0.05). The subjective image quality scores were higher in MSI of arterial phase images than portal venous phase images (p<0.05).

CONCLUSION

Material Suppressed Iodine (MSI) images are acceptable as replacements for the conventional non-enhanced (CN) images. MSI of arterial phase images show more advantages than MSI of portal venous phase images in replacements of the conventional non-enhanced (CN) images.

CLINICAL RELEVANCE/APPLICATION

Material Suppressed Iodine (MSI) images can replace the conventional non-enhanced (CN) images as an imaging protocol in liver dual-phase examination in clinic.

Impact of Interobserver Variability on dceMRI-derived Pharmacokinetic Parameters in Patients with Locally-advanced Rectal Cancer (Station #5)

James Franklin MA, MBBS (Presenter): Nothing to Disclose, Benjamin Irving PhD: Nothing to Disclose, Margaret Betts MBBS: Nothing to Disclose, Andre Hallack Miranda Pureza: Nothing to Disclose, Michael Brady: Shareholder, Matakania International Limited Shareholder, Mirada Medical Ltd Shareholder, Perspectum Diagnostics Ltd, Julia Schnabel MSc, PhD: Nothing to Disclose, Fergus Vincent Gleeson MBBS: Alliance Medical Ltd Consultant, Ewan Mark Anderson MBBCh: Nothing to Disclose

PURPOSE

Pharmacokinetic (PK) modeling of dynamic contrast-enhanced MRI (dceMRI) produces clinically relevant outputs. Accurate tumor delineation is necessary to generate tumor-specific outputs. This study evaluated the impact of interobserver variability in tumor delineation on dceMRI outputs in patients with locally-advanced rectal cancer (LARC).

METHOD AND MATERIALS

12 patients with LARC underwent dceMRI at 1.5T before treatment. Two observers delineated tumor volumes on Osirix Medical Imaging Software using the clinical axial small field of view (sFOV) T2W acquisition. Tumor volume delineations were coregistered to the axial T1W dceMRI acquisition using a combined rigid/non-rigid coregistration platform. PK-modeling of the tumor [contrast]-time curve was performed using the Tofts model to derive Ktrans and kep. The two tumor volume delineations were compared using differences in overall volumes and DICE similarity coefficient, which measures the proportion of spatial overlap between two delineations (identical segmentations = 1). Percentage differences in whole-tumor mean, median and variance of Ktrans and kep were calculated. The parameters derived for each observer were compared using paired t-tests and linear regression.

RESULTS

The mean percentage difference between volumes was 17% (range 1-65%) with mean DICE of 0.77 (range 0.5-0.89). In 9/12 patients DICE was >0.8. The mean percentage differences in mean, median and variance of Ktrans were 3.9% (range 0.5-10.1%), 5.4% (range 0.15-13.4%) and 6% (range 0.5-22%) and equivalent values for kep were 1.7% (range 0.1-5.1%), 2.1% (range 0.4-4.8%) and 4.9% (range 0.4-9.7%). No significant difference was found between the observers (p>0.5) for any of the pharmacokinetic parameters.
There was a significant negative correlation between DICE and percentage difference of median (p=0.02) and a similar trend for the percentage difference of mean Ktrans (p=0.17).

CONCLUSION

In most cases there is good interobserver agreement of rectal tumor delineation. Mean and median of tumour dceMRI pharmacokinetic parameters are relatively robust even for larger discrepancies in delineation, although interobserver variations in Ktrans increase with greater discrepancies in tumor delineation.

CLINICAL RELEVANCE/APPLICATION

There is typically good agreement of rectal tumour volume delineations by trained observers. Mean and median values of dceMRI-derived PK parameters are robust, even for greater disagreement.

GIS336

Application of Spectral CT Image Fusion Technology in Small HCC for Evaluating Diagnostic Accuracy and Image Quality (Station #6)

Jingjing Xing MD (Presenter): Nothing to Disclose, Jianbo Gao MD: Nothing to Disclose, Hangsha Hang Limbu MD: Nothing to Disclose, Pan Liang: Nothing to Disclose

PURPOSE

To evaluate image quality and diagnostic accuracy of CT single energy fusion image (optimal keV+70keV) for small HCC (<3cm) in patients with HBV or Cirrhosis.

METHOD AND MATERIALS

Twenty-eight patients with 32 small HCC(<3cm)who were HBV+ve and/or cirrhotic underwent spectral CT to generate conventional 140-kVp polychromatic images and monochromatic images with energy levels from 40 to 140 keV during the arterial phase. The image with highest lesion to liver contrast to noise ratio CNR (optimal keV) and lowest noise (70keV) were used to reconstruct a fusion image. One-way analysis of variance was used to compare the CNR and image noise of fusion image to that of conventional image (QC), optimal keV and 70kev. The lesion detection and the overall image quality were compared using 5 point method and nonparametric tests.

RESULTS

The optimal keV was determined to be 52±4 keV. The CNR of fusion group (5.62±1.54) were significantly higher than that of QC group (3.51 ± 1.21) (p<0.05) and 70keV Group (4.05±1.03) (p<0.05) and the image noise of fusion group (21.40±4.40) were significantly lower than that of QC group (17.69±.1.63) (p<0.01) and optimal keV group (34.00±4.25) (P<0.05). The lesion detection capacity score of fusion group (3.66 ± 0.51) were significantly higher than that of QC group (3.06 ± 0.43) (P<0.05) and 70keV group (2.89 ± 0.38) (P<0.05) with overall image quality score of the fusion group (3.61 ± 0.53) significantly higher than that of the other three groups (P<0.05).

CONCLUSION

Monochromatic images with energy level 52±4 keV had higher CNR values. Application of CT single energy image fusion technology (optimal keV + 70keV) has promising potential with overall better image quality and lesion detection capability in small HCCs with HBV or Cirrhosis.

CLINICAL RELEVANCE/APPLICATION

Cirrhosis and HBV infection has a high risk for developing HCC. Implementation of fused image in these high risk patients can detect HCC early on with better detection capacity and image quality than conventional CT.

GIE257

Imaging of Gastrointestinal Tract - Back to the Future (Station #7)

Chinmay Bhimaji Kulkarni MBBS, MD (Presenter): Nothing to Disclose, Srikanth Moorthy MD: Nothing to Disclose, Sreekumar K P MBBS, MD: Nothing to Disclose, Nirmalkumar Prabhu: Nothing to Disclose, Rajesh Ramaih Kannan MD: Nothing to Disclose

TEACHING POINTS

Evolution of imaging of gastrointestinal tract since the invention of roentgen rays to present day. Role of eminent personalities involved in this journey from past to present.

TABLE OF CONTENTS/OUTLINE

Early days of radiography. Bismuth to Barium studies. (Evolution of various barium techniques) Radiography versus Fluroscopy. Evolution of Computed tomography (CT) technology and its role in bowel imaging. Present days of bowel imaging.

GIE258

Imaging Spectrum of IgG4 Syndrome and Mimics: Radiology-Pathology Case-based Review (Station #8)

Maryam Gul (Presenter): Nothing to Disclose, Ammar Ahmed Chaudhry MD: Nothing to Disclose, Abbas Ahmed Chaudhry BSc: Nothing to Disclose, Mubashir Sheikh: Nothing to Disclose, Akhil Khan Pathan MS: Nothing to Disclose, Marlene Leslie Zawin MD: Nothing to Disclose

TEACHING POINTS
1- Review clinicopathologic spectrum of IgG4-related disease. 2- Discuss spectrum of imaging and pathologic findings in IgG4-related disease. 3- Review mimics with emphasis on key findings differentiating these entities.

TABLE OF CONTENTS/OUTLINE

Content Outline:
1- Review key clinical, pathological, imaging findings and treatments of IgG4-related disease including:
   - Autoimmune pancreatitis
   - Sclerosing Cholangitis
   - Sclerosing mesenteritis
   - Interstitial Nephritis
   - Retroperitoneal fibrosis
   - Coagulopathy
2- Review mimics of IgG4-related disease and highlight key imaging findings that aid in narrowing the differential:
   - Pancreatitis (alcohol, cholithiasis, groove pancreatitis, neoplasm)
   - PSC
   - Mesenteric and Retroperitoneal Neoplasms (Lymphoma/Leukemia/etc).
   - Nephritis (glomerulonephritis, ATN, pyelonephritis, neoplasms etc)
   - Vasculitis

Summary:
IgG4-syndrome involves multiple organs and can present in a variety of ways. Although the differential diagnosis is broad, it can be narrowed utilizing clinicopathologic features and imaging findings (e.g. Location, enhancement pattern, necrosis, MRI findings, etc). By the conclusion of this presentation, the viewer should be able to aid in patient work-up, recommend appropriate imaging follow-up and guide any potential biopsy.

GIE210
Evolving MR Imaging Appearance of Post-Radiation Liver Metastases and Parenchyma: A Pictorial Essay (Station #10)
Naama Lev-Cohain MD (Presenter): Nothing to Disclose, Takeshi Yokoo MD, PhD : Nothing to Disclose, Jeffrey Meyer : Research Grant, Peregrine Pharmaceuticals, Inc, Robert D. Timmerman MD : Research Grant, Varian Medical Systems, Inc, Iván Pedrosa MD : Shareholder, Humana Inc

TEACHING POINTS
We report on the characteristic evolution of the intra-lesional and peri-lesional MRI findings after SBRT and their impact on the clinical image interpretations. Teaching points: 1. Intra-lesional and peri-lesional features evolve over the acute, sub-acute and chronic phases after SBRT. These evolving features need to be incorporated in clinical image interpretation. 2. Treated lesions are best identified on the post-contrast T1-weighted images. 3. Intra-lesional restricted diffusion tends to resolve quickly after SBRT. Post-SBRT parenchyma does not demonstrate restricted diffusion. 4. Acute parenchymal changes appear around 3-6 months post-treatment and include peri-lesional and segmental hyper-enhancement and hyper-intensity on T2 weighted images. 5. Subacute parenchymal changes appear around 6 months post-treatment and include increased susceptibility effect due to chronic microhemorrhage. 6. Chronic parenchymal changes develop after 6 months and include biliary dilatation, capsular retraction, and radial stellate enhancement, due to parenchymal scarring.

TABLE OF CONTENTS/OUTLINE
1. Background
2. Evolving intra-lesional appearance
3. Evolving peri-lesional appearance
4. Impact on clinical image interpretation

GIE301
Dual Energy CT of the Intestines: Pearls and Pitfalls (Station #11)
Li Qin Zhao MD (Presenter): Nothing to Disclose, Zhen Jane Wang MD : Nothing to Disclose, So Yeon Kim MD : Nothing to Disclose, En-Haw Wu MD : Nothing to Disclose, Wei-Chou Chang MD : Nothing to Disclose, Jack Lambert PhD : Nothing to Disclose, Benjamin M. Yeh MD : Research Grant, General Electric Company Consultant, General Electric Company

TEACHING POINTS
To review basic principles of dual energy CT (DECT) for clinical application To learn how dual energy CT gives added value compared with conventional CT for bowel lumen evaluation To learn the benefits and different dual energy CT reformations for bowel evaluation To show critical pitfalls in dual energy CT for bowel evaluation To demonstrate the potential value of novel bowel CT contrast materials for use with dual energy CT

TABLE OF CONTENTS/OUTLINE
Basic principles of DECT - Relative X-ray attenuation of different materials - Material decomposition images for iodine and water separation - Effective Z - DECT abdominal protocol for rapid kV switching scanner Problem solving with DECT for challenging conventional CT bowel cases - Bowel masses - Gastrointestinal bleeding - Pills and over the counter abdominal pain medications - Peritoneal implants - Metal and beam hardening artifact Pitfalls of dual energy CT imaging of bowel - Artifacts of material decomposition that may mimic severe bowel disease - Pitfalls of effective Z analysis Future Directions - Potential benefits of novel bowel contrast agents

GIE200
MELD Allocation System for Liver Transplantation and OPTN Classification of Hepatocellular GIE210
GIE301
GIE200
Refresher/Informatics

RC104

Sports Injuries in the Chest and Abdominal Wall: A Core Curriculum of the Body's Core

Participants
- David Alan Rubin MD (Presenter): Nothing to Disclose
- Jonathan Craig Baker MD (Presenter): Research Consultant, Biomedical Systems
- William E. Palmer MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the relative strengths and weaknesses of radiographs, ultrasound, CT and MR in the evaluation of suspected injuries to the anterior chest wall structures, and use this information to logically direct an imaging evaluation.
2) Understand the anatomy of the anterior chest wall musculature and its relevance to the imaging patterns of injuries, together with how that information assists treatment planning.
3) Recognize and characterize the common and less common injuries in the abdominal and pelvic wall musculature and supporting pelvic ligaments.

ABSTRACT

The imaging of sports injuries to the extremities, joints, groin, spine, and head receive much attention. Nevertheless athletic injuries to the trunk also occur with some frequency. The thoracic, abdominal, and pelvic walls form the body’s central core. The thoracic wall includes the ossified and cartilaginous parts of the ribs together with the clavicles and sternum, which provide a protective cage for the vital chest organs, as well as a site of origin for the chest wall muscles. In turn, these powerful muscles are responsible for the large movements of the upper extremities and for stabilizing the upper body during twisting motions. Similarly, the abdominal and pelvic wall musculature and supporting ligaments form a protective ‘protective cage’ for the vital organs within the abdomen and pelvis, while stabilizing the body during locomotion and limb movements. Each of these bone and soft tissue structures are susceptible to direct blunt force trauma in contact and collision sports and to indirect stretching injuries during running, cutting, throwing, kicking, and related activities. There is growing understanding of the role of the thoracoabdominal musculoskeletal structures in sports, with training regimens now incorporating ‘core strengthening’ as an important pillar. The recognition, staging, therapy, and rehabilitation of these injuries are likewise becoming more sophisticated. This refresher course will review...
the role imaging plays for these injuries, emphasizing the added value of advanced imaging modalities for diagnosis, treatment planning, and prognostication.

**RC108**

**Contemporary Topics in Emergency Radiology: Update Your Knowledge (An Interactive Session)**

*Refresher/Informatics*

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<th>CT</th>
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AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Sun, Nov 30 2:00 PM - 3:30 PM   Location: E450A

**Sub-Events**

**RC108A**  
**Incidentalomas on Emergency CT: What to Do?**
Douglas S. Katz MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1. To overview the continuing problem of incidentalomas identified on abdominal and pelvic CT examinations.
2. To demonstrate examples of incidentalomas on abdominal and pelvic CT examinations from routine daily practice, and to discuss how they should be handled.
3. To briefly overview the growing literature on the identification and management of incidentalomas on abdominal and pelvic CT examinations.

**RC108B**  
**Imaging of Acute Pancreatitis: Updates You Should Know**
Jorge A. Soto MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1. Review the current nomenclature used in the 2012 Revision of the Atlanta classification for the diagnosis, staging and description of complications of acute pancreatitis.
2. Emphasize the importance of using proper terminology that should be used when describing fluid collection that occur in the setting of acute pancreatitis.
3. Suggest methods that can be used to decrease the total radiation dose delivered to patients with acute pancreatitis, especially by using MR in the follow-up of fluid collections and other complications.

**RC108C**  
**Dual Energy CT: Emergency Applications**
Aaron D. Sodickson MD, PhD (Presenter): Research Grant, Siemens AG

**LEARNING OBJECTIVES**

1. Summarize key concepts of Dual Energy / Spectral CT.
2. Highlight potential game-changing applications that can enhance information content, reduce radiation dose, or both.
3. Describe workflow and post-processing of dual-energy scanning.

**RC109**

**Gastrointestinal: Imaging the Obese Patient (An Interactive Session)**

*Refresher/Informatics*

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AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Sun, Nov 30 2:00 PM - 3:30 PM   Location: S103AB

**Sub-Events**

**RC109A**  
**Challenges and Solutions in Imaging the Obese Patient**
Rajan T. Gupta MD (Presenter): Consultant, Bayer AG Speakers Bureau, Bayer AG

**LEARNING OBJECTIVES**

1. Identify and understand the challenges in imaging the obese patient.
2. Determine how to alter CT parameters in order to optimize imaging in this patient population.
3. Explore the other imaging modalities that can be used to detect and characterize disease processes in the obese patient.
RC109B  
Bariatric Surgery I: Overview and Roux-En-Y Gastric Bypass  
Courtney Ann Coursey Moreno MD (Presenter): Nothing to Disclose  
LEARNING OBJECTIVES  

RC109C  
Bariatric Surgery II: Laparoscopic Gastric Banding  
Christine O. Menias MD (Presenter): Nothing to Disclose  
LEARNING OBJECTIVES  
1) Familiarize the Radiologist with the Laparoscopic Gastric Band Apparatus. 2) Understand normal post procedure imaging of Laparoscopic Gastric Band. 3) Recognize potential complications with imaging.

RC110  
Liver and Gallbladder Ultrasound including Elastography and Contrast  
Refresher/Informatics  
AMA PRA Category 1 Credits ™: 1.50  
ARRT Category A+ Credits: 1.50  
Sun, Nov 30 2:00 PM - 3:30 PM  Location: E451A

Sub-Events  
RC110A  
Contrast Ultrasound of the Liver and Gallbladder  
Hans-Peter Weskott MD (Presenter): Luminary, General Electric Company Speaker, Bracco Group  
LEARNING OBJECTIVES  
1) Understanding the indications of contrast enhanced ultrasound (CEUS) in focal liver and gallbladder diseases. 2) Learning about the importance of the three contrast phases and how CEUS performs in detecting and characterizing focal liver lesions and to characterize inflammatory and tumorous changes of the gallbladder wall. 3) Learning about the potential value as well as the limitations of CEUS in liver an gallbladder diseases. 4) Learning how CEUS performs when compared to B-mode and Color Doppler ultrasound, CT and MRI imaging.

ABSTRACT  
Liver: In patients with favorable scanning conditions CEUS is at least as sensitive as contrast enhanced CT (CECT) in detecting malignant liver lesions. Due to its high temporal resolution even a short hyperenhancement of a few seconds can reliably be detected this improving the characterization of focal liver lesions (FLL). A majority of FLL can therefore be characterized as iso- or hyperenhancing. During the arterial phase the tumor vessel supply and the tumor’s vessel architecture and direction of contrast filling is important in characterizing FLL. Due to a high spatial resolution novel contrast imaging techniques allow detection of washed out lesions down to 3mm in size. CEUS characterizes FLL with a much higher confidence than conventional US techniques and is comparable to CECT and CEMRI. CEUS also improves intraoperative tumor detection and characterization. Using time intensity analysis a change in contrast enhancement over time helps in estimating tumor response to chemotherapy. CEUS is also used to monitor local ablation therapy and is useful to early detect local tumor recurrence. Gallbladder: CEUS can be used to better visualize ulceration, perforation and tumors of its wall. It thus helps to improve the patient’s clinical management including timing for surgery. CEUS does not affect renal or thyroid function and is therefore helpful in older patients and should be the first line contrast imaging technique in patients with impaired renal function.

RC110B  
Liver Elastography  
Paul Singh Sidhu MRCP, FRCR (Presenter): Speaker, Bracco Group Speaker, Siemens AG Speaker, Hitachi, Ltd  
LEARNING OBJECTIVES  
1) Understand the concept of measuring liver stiffness with elastography, methods of elastography in clinical use. 2) Understand the need for the clinical application of liver stiffness measurements in disease management. 3) Review the different techniques available and review evidence of their accuracy. 4) Consolidate knowledge on application, accuracy and position in clinical practice of liver elastography.

ABSTRACT  
Chronic liver disease is a major health problem, representing the end stage of a number of pathological conditions. Measurement of liver stiffness is an important part of clinical assessment. This presentation will review the current techniques available for measuring liver stiffness. In particular Liver Elastography (LE) will be discussed with regard to its clinical application and recent advances in technology. The impact of LE in clinical practice and the latest evidence will be covered.
Chronic liver disease is a major health problem, representing the end stage of a number of pathological processes arising from a variety of causative factors. Alcohol misuse remains an important cause but the increasing prevalence of viral hepatitis (Hepatitis B and C) worldwide represents a healthcare issue. Early stages of chronic liver disease, fibrosis prior to the development of cirrhosis, is important to establish as this influences medical management, aimed at halting or slowing the progression to irreversible cirrhosis. Non-invasive markers are often used to predict the presence of liver fibrosis, but ultimately a liver biopsy is needed to stage the degree of fibrosis (usually the METAVIR or ISHAK scores). A liver biopsy is associated with morbidity and mortality, and samples a small volume of the liver, in a disease process that is often patchy. The need for an accurate non-invasive imaging method of assessing the degree of liver fibrosis, in essence the ‘stiffness’ of the liver, has encouraged the use of elastography to grade liver stiffness by either ‘compression’ assessment or using shear wave technology. The principles of the different types of elastography will be discussed, the application in assessing chronic liver disease, the evidence for accuracy and the future in clinical practice will be discussed.

Gallbladder and Biliary Disease

Anthony Edward Hanbidge MBBCh (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the value of ultrasound when assessing the gallbladder and bile ducts. 2) Identify the imaging features of acute conditions of these structures and complications. 3) Recognize common pitfalls to avoid misinterpretation. 4) Briefly describe other conditions of the gallbladder and bile ducts including sclerosing cholangitis, cholangiocarcinoma, IgG4 associated cholangitis, adenomyomatosis, gallbladder polyps and gallbladder cancer.

ABSTRACT

Acute cholecystitis is the most common cause of acute pain in the right upper quadrant (RUQ), and urgent surgical removal of the gallbladder is the treatment of choice for uncomplicated disease. However, cross-sectional imaging is essential because more than one-third of patients with acute RUQ pain do not have acute cholecystitis. In addition, patients with complications of acute cholecystitis, such as perforation, are often best treated with supportive measures initially and elective cholecystectomy at a later date. Ultrasound (US) is the primary imaging modality for assessment of the gallbladder and bile ducts; US is both sensitive and specific in demonstrating gallstones, biliary dilatation, and features that suggest acute inflammatory disease. It is sensitive at detecting abnormalities of the wall of the gallbladder and bile ducts. Often, additional imaging modalities are indicated. Computed tomography (CT) is valuable, especially for confirming the extent and nature of the complications of acute cholecystitis. Magnetic resonance (MR) cholangiopancreatography is helpful in complicated ductal disease (eg, recurrent pyogenic cholangiohepatitis) when more detailed diagnostic information is required for treatment planning, whereas endoscopic retrograde cholangiopancreatography is used when biliary intervention is required (eg, treatment of choledocholithiasis). Both CT and MR are accurate when staging malignancies of the gallbladder and bile ducts. Successful imaging with all modalities requires familiarity with both the characteristic and the unusual features of a wide variety of pathologic conditions. In addition, potential pitfalls must be recognized and avoided.

RC129

Abdominal MRI Technique Update (An Interactive Session)

Refresher/Informatics

MR GU GI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Sun, Nov 30 2:00 PM - 3:30 PM Location: E353C

Sub-Events

RC129A

Respiratory Artifacts in Abdominal MRI: Causes and Cures

Eduard E. De Lange MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand how the characteristics of commonly used abdominal-imaging pulse sequences influence their susceptibility to respiratory artifacts. 2) Explain differences between multi-slice and single-shot pulse sequences. 3) Describe various approaches for suppressing respiratory artifacts. 4) Optimize routine imaging protocols for abdominal MRI.

Active Handout
Choosing an MRI Contrast Agent

Jay Kumar Pahade MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Provide background of different available MRI contrast agents and their properties. 2) Discuss safety profiles and concepts related to minimizing risk of NSF. 3) Review common indications for different available MRI contrast agents and their relative strengths and weaknesses.

Optimizing Contrast Enhancement: 2014 and Beyond


LEARNING OBJECTIVES
1) Learn how to perform high temporal resolution dynamic MR Contrast enhanced imaging. 2) Learn post-processing strategies for high temporal resolution MR data. 3) Review applications of high temporal resolution imaging.

Modern Non-invasive Imaging of Cholestatic Liver Diseases (How-to Workshop)

Refresher/Informatics

RC151

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Sun, Nov 30 2:00 PM - 3:30 PM Location: E351

Participants
Ahmed Ba-Ssalamah MD (Presenter): Speaker, Bayer AG Speaker, Siemens AG
Aliya Qayyum MBBS (Presenter): Spouse, Employee, Imorgon Medical
Richard Michael Gore MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Describe MRI; MRCP techniques for evaluating biliary disease. 2) List applications in malignant biliary disease. 3) List applications in benign conditions of the biliary tract.

ABSTRACT
This workshop is designed to review the broad spectrum of morphologic and functional features encountered in patients with cholestatic liver diseases involving the intrahepatic and extrahepatic bile ducts and adjacent liver parenchyma, in correlation with the histopathologic hallmark of this group of diseases the so-called ‘vanishing duct sign. We will start by explaining the role of various different imaging modalities including invasive endoscopic retrograde cholangiopancreatography (ERCP) and non-invasive conventional T2 weighted magnetic resonance cholangiography (MRCP) as well as gadexetic acid-enhanced T1 MRCP and diffusion weighted images to expedite the evaluation of patients with known or suspected cholestatic liver diseases. Next, we will discuss the broad spectrum of biliary disorders that define cholestatic liver diseases including: primary sclerosing cholangitis (PSC), primary biliary cirrhosis (PBC), ischemic cholangiopathy, chronic rejection following liver transplant, drug-induced liver injury (DILI), infectious secondary cholangitis, cystic fibrosis (CF), etc.

Sunday Afternoon Plenary Session

Plenary Sessions

PS12

AMA PRA Category 1 Credits™: 1.75
ARRT Category A+ Credits: 1.50

Sun, Nov 30 4:00 PM - 5:45 PM Location: Arie Crown Theater

Participants
Presiding
N. Reed Dunnick MD Nothing to Disclose President, Radiological Society of North America

Sub-Events
PS12A Report of the RSNA Research and Education Foundation
James P. Borgstede MD (Presenter): Nothing to Disclose Chairman, Board of Trustees, RSNA Research and...
Abstract

The RandE Foundation - A Transformative Force in Radiology  The theme of the 2014 RSNA Scientific Assembly and Annual Meeting is “A Century of Transforming Medicine.” For 30 years of that century, the RandE Foundation has played a significant role in advancing the RSNA mission to promote excellence in patient care and health care delivery through education, research and technologic innovation. In celebration of 100 years, the Foundation is launching Inspire-Innovate-Invest, The Campaign for Funding Radiology’s Future. This bold campaign seeks to raise $17.5 million to fund grants in radiologic research and education, bridging the gaps in funding for promising investigators and educators. The need is great and the time is now, if the Foundation reaches its campaign goal of $17.5 million, it will keep pace with the growing demand and help ensure that critical discoveries by radiologic investigators come to fruition. Of these individuals, who will start their academic research career with an RandE grant, and what will grow from this initial funding? What advances will emanate from their research? And, how can radiologists support these investigators and educators as they pursue their chosen career paths in an effort to make the specialty even stronger? During the meeting week, please take time to visit the RandE Foundation Booth, located on Level 3 of Lakeside Center to learn more about how you can be a part of the campaign and support the RandE Foundation and the future of our specialty.

Image Interpretation Session


LEARNING OBJECTIVES

1) Identify key abnormal findings on radiologic studies that are critical to making a specific diagnosis. 2) Construct a logical list of differential diagnoses based on the radiologic findings, focusing on the most probable differential diagnoses. 3) Determine which, if any, additional radiologic studies or procedures are needed in order to make a specific final diagnosis. 4) Choose the most likely diagnosis based on the clinical and the radiologic information.

Case-based Review of Magnetic Resonance (An Interactive Session)

Multisession Courses

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Mon, Dec 1 8:30 AM - 10:00 AM  Location: S100AB

LEARNING OBJECTIVES

1) Understand the role of MRI for the evaluation of disorders of the upper and lower extremities, brain and neck, and abdomen and pelvis. 2) Apply helpful tips and tricks in MRI interpretation to avoid pitfalls and make accurate diagnoses. 3) Recognize frequently missed or misinterpreted findings on MRI of the head, neck, and body. 4) Understand the latest, clinically relevant MRI techniques and how they can be used in practice. 5) Develop a succinct MRI-based differential diagnosis for select disorders of the head, neck, body, and extremities.

ABSTRACT

MRI is a workhorse of imaging in most radiology practices, with applications in the brain, head and neck, abdomen and pelvis, and extremities. As the clinical utility of MRI has grown, so has its complexity. This series of talks aims to guide participants through the various anatomic regions of the body while highlighting the appropriate use of MRI through a series of interactive case presentations. Speakers will emphasize frequently missed diagnoses while providing tips for avoiding interpretive pitfalls and providing accurate diagnoses.

Sub-Events

MSCM21A  Lower Extremity  Donald Joel Flemming  MD (Presenter): Royalties, Reed Elsevier

LEARNING OBJECTIVES

View learning objectives under main course title.
LEARNING OBJECTIVES

View learning objectives under main course title.

1) Use illustrative cases to highlight common sources of error in the interpretation of MR imaging examinations of the upper abdomen (liver, pancreas, biliary tract, kidneys, adrenal glands). Issues related to poor imaging technique/protocol planning, errors in contrast administration, anatomic variants and pseudo-lesions will be demonstrated. 2) Review methods that can be used to decrease the likelihood or misinterpreting upper abdominal MR images related to these potential pitfalls.

LEARNING OBJECTIVES

1) Achieve a basic understanding of the hepatobiliary anatomy and imaging appearance of hepatic tumors 2) Understand strengths and limitations of imaging techniques, including MRI, PET-CT and CT, as they are used in delineating primary tumor and loco-regional staging 3) Identify common sites of recurrence for hepatic tumors and recognize the imaging appearances of these recurrences 4) Improve radiation therapy delivery through understanding the contouring recommendations for the gross tumor volume (GTV) and clinical target volumes (CTV) for hepatic tumors, both in the locally advanced and postoperative setting

ABSTRACT

In this course MRI will be used to contour normal hepatic anatomy as well as tumors involving this anatomical region. Also patterns of spread to adjacent lymph nodes will be shown, and cross sectional imaging will be used to contour the regional nodal lesions. Cases will be presented and the participants will be stimulated to do the contouring themselves, and will have feedback on their results

ABSTRACT

For this section of the presentation, a variety of topics regarding single source dual energy CT will be covered. This will include
applications of single source dual energy CT for abdominal imaging, and, particularly unique issues for single source CT in the development of imaging protocols, expediting workflow (such as for the generation of monochromatic energy images, and iodine/water material density images) at the scanner and approaches to image interpretation using these provided images. Strengths and limitations of singel source dual energy CT will also be discussed.

VSGI21
Gastrointestinal Series: Imaging of the Cirrhotic Patient

Series Courses

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AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 4.00

Mon, Dec 1 8:30 AM - 12:00 PM Location: E350

Participants
Moderator
Mark Elwood Lockhart MD : Nothing to Disclose
Moderator
Kathryn Jane Fowler MD : Research support, Bracco Group

Sub-Events

VSGI21-01 MRI and MR Elastography
Frank H. Miller MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the role of conventional MRI in the diagnosis of HCC and benign hepatic nodules. 2) Use of gadoxetate and diffusion weighted imaging in characterizing focal liver lesions in cirrhotic patients. 3) MR elastography in the assessment of fibrosis.

ABSTRACT

MR imaging plays in important role in the diagnosis of cirrhosis. The classic and atypical MR imaging features of hepatocellular carcinoma and the distinction from benign hepatic nodules will be discussed. The use of ancillary features of HCC will be discussed including the utility of gadoxetate and diffusion weighted imaging in characterizing focal hepatic lesions in cirrhotic patients. MR elastography, a relatively new technique will be emphasized for the staging of fibrosis and diagnosis of cirrhosis.

Active Handout

VSGI21-02 The Outcome of Hypovascular and Hypointense Nodules on Hepatocyte-phase Gadoxetic Acid-enhanced Magnetic Resonance Imaging; When Does It become a Conventional HCC?: 5 Years’ Experience

Katsuhiko Sano MD,PhD (Presenter): Nothing to Disclose, Utaro Motosugi MD : Nothing to Disclose, Tomoaki Ichikawa MD, PhD : Consultant, DAIICHI SANKYO Group, Shintaro Ichikawa MD : Nothing to Disclose, Hiroyuki Morisaka MD : Nothing to Disclose, Kojiro Onohara MD : Nothing to Disclose, Tomohiro Takamura : Nothing to Disclose, Hiroshi Onishi : Nothing to Disclose

PURPOSE

Nodules that appear hypointense on hepatocyte phase of gadoxetic acid-enhanced magnetic resonance imaging (EOB-MRI) and hypovascular on arterial-phase are often encountered in clinical practice. Such nodules cannot be diagnosed using routine imaging criteria. The pupose of this study was to elucidate the natural history over a long period of hypovascular nodules that appear hypointense on hepatocyte-phase EOB-MRI by focusing on hypervascularization.

METHOD AND MATERIALS

In this study, 235 such nodules in 84 patients were examined. Hypovascularity of the nodules was confirmed using dynamic CT. All nodules were retrospectively examined using serial follow-up CT and MRI examinations until hypervascularity was observed on arterial-phase dynamic CT or EOB-MRI, or CT during hepatic arteriography.

RESULTS

The mean follow-up duration was 702 days (range: 69 to 2085 days). Of the 235 nodules, 148 (63%) developed hypervascularization. The optimal cut off value of the size of hypervascularization was 10mm. Of the 102 nodules (=10mm or >10mm), 81 (79%) developed hypervascularization. The size of the nodules (=10mm or >10mm) and increase in size of the nodules were independent risk factors of hypervascularization by multivariate analysis. The 1-year cumulative risks of hypervascularization were 20% (=10mm or >10mm). These values were significantly differences.

CONCLUSION
About 80% of hypovascular and hypointense nodules on EOB-MRI (=10mm or >10mm) progressed to conventional hepatocellular carcinoma. Large nodular size (=10mm or >10mm) and increase in size of the nodules is the MR imaging findings that higher risk of hypervascularization.

**CLINICAL RELEVANCE/APPLICATION**

About 80% of hypovascular and hypointense nodules on EOB-MRI with the size equal to 10mm or larger 10mm. Large nodular size (=10mm or >10mm) and increase in size of the nodules are the MR imaging findings that indicate higher risk of hypervascularization.

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**VSGI21-03**

**Texture Analysis of Non-enhanced and Gadoxetate Disodium-enhanced MR Images of the Liver: A Comparison with Histological Grade of Liver Fibrosis**

Akira Yamada MD (Presenter): Nothing to Disclose, Kazuhiko Ueda MD: Nothing to Disclose, Yasunari Fujinaga MD: Nothing to Disclose, Masahiro Kurozumi MD: Nothing to Disclose, Shinichi Miyagawa: Nothing to Disclose, Masumi Kadoya MD: Nothing to Disclose

**PURPOSE**

To evaluate value of gadoxetate disodium on noninvasive diagnosis of liver fibrosis by texture analysis of MR images.

**METHOD AND MATERIALS**

Consecutive 46 patients who underwent preoperative gadoxetate disodium-enhanced MR imaging using 3 Tesla MR system were included in this retrospective study. The grade of liver fibrosis (the fibrosis score: F) was histologically diagnosed by surgical specimen in all patients. Pre-contrast respiratory-gated 2D fast spin echo T2-weighted images (voxel size = 0.7 x 0.7 x 5 mm), pre- and post-contrast (20 minutes after venous administration) breath-hold 3D gradient recalled echo T1-weighted images (voxel size = 0.7 x 0.7 x 3 mm) were used for evaluation. Fat-suppression was applied to all images. Region of interests sized 60 x 60 pixels were located in the liver avoiding major vessels and hepatic lesions in each MR image. Four feature values (‘contrast’, ‘correlation’, ‘energy’, and ‘heterogeneity’) of the liver were determined by texture analysis of region of interests. A stepwise liner regression analysis of the fibrosis score on the feature values obtained from texture analysis was performed using 3 different image sets (pre-contrast MR images, post-contrast MR images, and the both). ROC analysis of obtained 3 regression models in differentiation of liver fibrosis (F1-4) from normal liver (F0) was performed.

**RESULTS**

The area under ROC of obtained 3 regression models in differentiation of liver fibrosis from normal liver was 0.64 for pre-contrast MR images, 0.83 for post-contrast MR images, and 0.85 for the both. Two feature values (x1: ‘correlation’ in post-contrast T1-weighted images, P < 0.0001; x2: ‘energy’ in pre-contrast T2-weighted images, P = 0.017) were significant predictors for the fibrosis score in eventual regression model (y = -31.232x1 - 10.39x2 + 32.137, R = 0.63, P < 0.0001).

**CONCLUSION**

Gadoxetate disodium can add value on noninvasive diagnosis of liver fibrosis by texture analysis of MR images.

**CLINICAL RELEVANCE/APPLICATION**

The degree of liver fibrosis especially at its early stage can be predicted non-invasively by texture analysis of non-enhanced and gadoxetate disodium-enhanced MR images.

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**VSGI21-04**

**State-of-Art Sonography**

Stephanie R. Wilson MD (Presenter): Research Grant, AbbVie Inc Grant, Johnson & Johnson Consultant, Lantheus Medical Imaging, Inc Equipment support, Siemens AG Equipment support, Koninklijke Philips NV

**LEARNING OBJECTIVES**

1) The attendee will appreciate the unique contribution of contrast enhanced ultrasound (CEUS) to imaging of HCC in terms of its real time dynamic performance, superior spatial and temporal resolution, and incomparable vascular sensitivity. 2) The attendee will analyze the imaging performance of microbubble contrast agents for liver mass characterization with CEUS, which are purely intravascular, as compared to the interstitial agents commonly used for CT and MR scan.

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**VSGI21-05**

**Assessment of Hepatic Vascular Network Connectivity by Automated Graph Analysis of Dynamic Contrast Enhanced Ultrasound to Evaluate Portal Hypertension in Patients with Cirrhosis: A Pilot Study**

Ivan Amat-Roldan PhD (Presenter): Nothing to Disclose, Annalisa Berzigotti MD, PhD: Nothing to Disclose, Rosa Gilabert MD: Nothing to Disclose, Jaime Bosch MD: Nothing to Disclose

**PURPOSE**

The liver vascular network is characterized by a highly organized structure. This is progressively deranged due to fibrosis and hepatocyte drop-out in patients with chronic liver diseases, leading to portal hypertension. We hypothesised that graph analysis of vascular images obtained by dynamic contrast-enhanced ultrasound (DCE-US), would allow calculating the hepatic vascular network connectivity, which would predict the degree of organization of the liver circulation, and that this would mirror the severity of portal hypertension.

**METHOD AND MATERIALS**

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This pilot study includes 4 healthy subjects and 15 well characterized patients with liver cirrhosis who underwent DCE-US and hepatic venous pressure gradient measurement (HVPG; gold standard method to assess portal hypertension in cirrhosis). Individual graph models ('vascular connectomes') were computed based on time series analysis of video sequences of DCE-US examination (disruption-reperfusion technique). Graph analysis was carried out by calculation of clustering coefficient; according to graph theory a higher clustering coefficient indicates a more organized network. Based on clustering coefficient we calculated statistical models to predict HVPG from DCE-US video sequences.

RESULTS

Healthy subjects had a high clustering coefficient of vascular connectome suggesting a highly organized liver vascular network. Patients with cirrhosis showed a lower clustering coefficient indicating disruption of normal anatomy. Clustering coefficient decreased as HVPG increased. The correlation between the best model derived from distribution of clustering coefficient (10 bins) of vascular 4 connectome and HVPG had a Pearson's correlation of 0.977 and a root mean square error of 1.57 evaluated by leave one out cross-validation.

CONCLUSION

Computer based graph-analysis of video sequences generated by DCE-US permits to calculate a vascular connectome that reflects the degree of organization of hepatic microvascular network.

CLINICAL RELEVANCE/APPLICATION

This non-invasive method is able to quantify automatically the degree of liver vascular derangement and accurately mirrors the severity of portal hypertension in patients with cirrhosis.

VSGI21-07

LIRADS and UNOS Classifications of Liver Lesions

Cynthia Sawhney Santillan MD (Presenter): Consultant, Robarts Clinical Trials Research Group

LEARNING OBJECTIVES

1) To demonstrate the use of the LI-RADS and UNOS imaging categorization systems for observations seen in patients at risk for hepatocellular carcinoma with sample cases. 2) To highlight the different purposes of each categorization system. 3) To illustrate the differences and similarities in how observations are categorized with each system.

VSGI21-08

A Review of LI-RADS Categorization in 201 Pathology Proven Hepatocellular Carcinomas

Eric Christopher Ehman MD (Presenter): Nothing to Disclose, Spencer Caton Behr MD : Research Grant, General Electric Company, Rizwan Aslam MBBC : Research support, Bayer AG, Benjamin M. Yeh MD : Research Grant, General Electric Company Consultant, Linda Ferrell MD : Research support, Guerbet SA Research Grant, General Electric Company

PURPOSE

To explore the trends in imaging appearance and differences in findings by modality for the new LI-RADS v2014 definitions in a large group of pathology proven cases of hepatocellular carcinoma.

METHOD AND MATERIALS

Pathology reports from liver specimens (explants and partial hepatectomies) of 605 sequential patients with cirrhosis were reviewed to identify specimens with at least one focus of viable hepatocellular carcinoma, then cross-correlated with pre-operative CT and MR imaging. Patients with completely necrotic treated tumor, those without available prior pre-treatment multiphase imaging and tumors smaller than 1 cm were excluded. Each lesion was examined, the imaging features recorded, and the lesion retrospectively graded using the LI-RADS 2014 criteria.

RESULTS

147 patients with a total of 201 hepatocellular carcinomas diagnosed between 12/2008 and 10/2013 were analyzed. Average time between the most recent pre-treatment prior imaging study and surgery was 13 months. 150 (75%) lesions were imaged by multiphase CT, and 51 (25%) lesions by MRI. Overall, 64 (32%) lesions measured ≥1cm and <2cm, while 137 (68%) were ≥2cm. There were 21 (13%) LIRADS-3 lesions, 75 (37%) LIRADS-4 lesions and 102 (50%) LIRADS-5 lesions. 171 (85%) of lesions exhibited arterial hyperenhancement, 136 (68%) demonstrated washout and 29 (14%) showed evidence of capsule. At CT, the rate of LIRADS-3, -4 and -5 lesions was 13%, 37% and 50% respectively. At MR, these rates were 4%, 39% and 55%. At CT, 13% of 1-2 cm lesions were graded LIRADS-5, and at MR, 38% were graded LIRADS-5. Arterial phase hyperintensity and washout appearance rates were equivalent between MR and CT, but capsule appearance was more common on MR (29%) imaging than at CT (10%), with χ² = 10.7 (p<0.05).

CONCLUSION

The rate of arterial enhancement and portal venous or delayed washout are similar between lesions diagnosed via CT and those diagnosed with MR. Capsule appearance was seen significantly more frequently at MR, resulting in a higher rate of LIRADS-5 lesions measuring 1-2 cm at MR compared to CT.

CLINICAL RELEVANCE/APPLICATION

Differences in sensitivity for LI-RADS 5 lesions exist for MR and CT, which may support the use of MR imaging.
Performance of LI-RADS Criteria for Diagnosis of Pathologically Proven Hepatocellular Carcinoma Using Gd-EOB-DTPA, and Comparisons with the Japan Society of Hepatology 2010 Criteria

Stephanie Channual MD (Presenter): Nothing to Disclose, Anokh Pahwa MD: Nothing to Disclose, Katrina Richards Beckett MD: Nothing to Disclose, James Sayre PhD: Nothing to Disclose, David Shin-Kuo Lu MD: Consultant, Covidien AG Speaker, Covidien AG Consultant, Johnson & Johnson Research Grant, Johnson & Johnson Consultant, Bayer AG Research Grant, Bayer AG Speaker, Bayer AG, Steven Satish Raman MD: Consultant, Bayer AG Consultant, Covidien AG

PURPOSE

Only recently has LI-RADS (LR) expanded to apply to hepatobiliary (HB) contrast agents, with lesion appearance on the HB phase considered to be an ancillary feature that favors the diagnosis of hepatocellular carcinoma (HCC). In contrast, the Japan Society of Hepatology (JSH) includes lesion appearance on the HB phase as a major criteria that favors the diagnosis of HCC. The purpose of our study was to determine the performance of LI-RADS v2014 and Japan Society of Hepatology (JSH) 2010 criteria for the non-invasive diagnosis of HCC.

METHOD AND MATERIALS

This was an IRB approved, HIPAA compliant retrospective study with 131 consecutive suspected HCC nodules in 114 patients confirmed by percutaneous biopsy, resection, or explant within 90 days of Gd-EOB-DTPA MRI. Nodule size, presence of a capsule, and enhancement patterns were recorded. The nodules were then categorized as LR3, LR4, or LR5 based on the LI-RADS major criteria, and categorized as either meeting or not meeting the JSH criteria (defined as arterial enhancement and venous wash out, or arterial enhancement and lack of Gd-EOB-DTPA uptake on HB phase imaging).

RESULTS

Of the 131 nodules, 116 were pathologically confirmed HCC (88.5%). Of 131 nodules, 23 (18%), 41 (31%), and 67 (51%) were categorized as LR3, LR4, and LR5 respectively. Of these, 15/23, 37/41, and 64/67 LR3, LR4 and LR5 nodules were pathologically proven as HCC, respectively (sensitivities, 13%, 32%, and 55%, respectively; specificities, 47%, 73%, and 80%, respectively). The PPV of LR3, LR4, and LR5 were 65%, 90%, and 96%, respectively. The sensitivity, specificity, and PPV for the JSH criteria were 72.4%, 53.3%, and 92.3%, respectively. The accuracy of LR4 and LR5 combined was 83% (109/131), while the accuracy for the JSH criteria was 70.2% (92/131).

CONCLUSION

Although use of LI-RADS with Gd-EOB-DTPA yields a high PPV and accuracy for diagnosing HCC, moderate sensitivity and specificity suggest that further refinement of the criteria may be necessary and percutaneous nodule biopsy may be complementary for diagnosis. However, LR4 and LR5 combined was more sensitive and accurate for diagnosing HCC compared to the JSH criteria.

CLINICAL RELEVANCE/APPLICATION

The use of hepatobiliary specific MR contrast agents, such as Gd-EOB-DTPA, is becoming more prevalent, and understanding its applicability with LI-RADS is essential for the noninvasive evaluation of nodules in cirrhotic livers.

Ablation of Liver Lesions

Fred T. Lee MD (Presenter): Stockholder, NeuWave Medical, Inc Patent holder, NeuWave Medical, Inc Board of Directors, NeuWave Medical, Inc Patent holder, Covidien AG Inventor, Covidien AG Royalties, Covidien AG

LEARNING OBJECTIVES

1) Understand the basic rationale for ablation of liver lesions. 2) Understand the differences between ablation of liver tumors in cirrhotic and non-cirrhotic livers. 3) Understand the differences between the different ablation technologies.

Imaging Evaluation of Ablative Margin and Index Tumor Immediately after Radiofrequency Ablation for Hepatocellular Carcinoma: Comparison between Multi-detector CT and MR Imaging

Jin Woong Kim MD: Nothing to Disclose, Sang Soo Shin MD (Presenter): Nothing to Disclose, Suk Hee Heo MD: Nothing to Disclose, Hyo Soon Lim MD: Nothing to Disclose, Sung Mo Kim: Nothing to Disclose, Yong-Yeon Jeong MD: Nothing to Disclose, Heoung-Keun Kang MD: Nothing to Disclose

PURPOSE

To prospectively compare multi-detector CT and MR imaging in assessment of ablative margin (AM) and index tumor within ablation zones immediately after radiofrequency ablation (RFA) for hepatocellular carcinoma (HCC).
METHOD AND MATERIALS

Based on our preliminary data, the necessary number of patients was estimated to be at least 30 when an α error of 0.05 and a β error of 0.2 were applied. A total of 33 consecutive patients with 42 HCCs, all of whom had successfully undergone contrast-enhanced CT and MR imaging after RFA, were enrolled in this study. CT and MR imaging were performed within 3 and 7 hours after completion of RFA, respectively. Both CT and MR images were reviewed in consensus by two radiologists in two separate sessions regarding visual discrimination between AM and index tumor and status of AM within ablation zones. The status of AM was classified as AM plus (AM completely surrounded tumor), AM zero (AM was partly discontinuous, without protrusion of tumor beyond postulated border of ablated area) and AM minus (AM partly discontinuous, with protrusion of tumor). Any ablation zone with AM plus or AM zero was considered as imaging evidence to predict technical effectiveness, which was based on one-month follow-up CT, as well as to represent technical success.

RESULTS

With CT and MR imaging, visual discrimination between AM and index tumor was possible in 4 (9.5%) and 34 (81%) of 42 ablation zones, respectively (P< .001). Among 4 and 34 ablation zones in which status of AM could be evaluated on CT and MR imaging, respectively, all of 4 ablation zones were classified as AM plus on CT images, whereas 34 ablation zones were categorized into AM plus (n=28), AM zero (n=5) and AM minus (n=1) on MR images. Based on CT and MR imaging, technical success was determined to be achieved in 4 (9.5%) and 33 (78.6%), respectively (P< .001). The technical effectiveness was noted in all of ablation zones on one-month follow-up CT. CT and MR imaging predicted technical effectiveness in 4 (9.5%) and 33 (78.6%), respectively, (P< .001).

CONCLUSION

MR imaging was superior to multi-detector CT for assessment of ablative margin and index tumor within ablation zones immediately after RFA.

CLINICAL RELEVANCE/APPLICATION

MR imaging performed immediately after RF ablation can provide sufficient information regarding necessity of additional ablation after RF ablation with more confidence than contrast-enhanced CT.
Sub-Events

**MSRO25-01**

**Invited Speaker:**

Edward Y. Kim MD (Presenter): Nothing to Disclose

**Active Surveillance Following Neoadjuvant Chemoradiotherapy for Distal Rectal Tumors**

Paul Menzel : Nothing to Disclose, Justin Linam MA, MD (Presenter): Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):**

Neoadjuvant chemoradiotherapy (nCRT) and surgery is the standard of care for locally advanced rectal cancer (LARC), with pathologic complete response rates around 15%. Some patients with distal tumors and clinical complete response (cCR) after nCRT, however, refuse surgery, citing favorable disease attributes and a permanent stoma. We hypothesize that such patients will have an elevated locoregional recurrence (LRR) rate but that most can be successfully salvaged if followed closely. We present here our experience offering active surveillance (AS) for distal LARC.

**Materials/Methods:**

This is a multi-institutional review of two women and nine men at a median age of 61 years (range, 54-90) with T2-3N0-1M0 distal rectal adenocarcinoma who have been prospectively followed. All patients had cCR, including negative rectal biopsies, after 5-fluorouracil-based chemotherapy (5-FU CT) with 48.6-55.8 Gy (median, 50.4) concurrent radiotherapy (RT) and refused surgery. T3 and N1 patients also received adjuvant 5-FU CT.

Following extensive counseling that nCRT alone is non-standard treatment, AS was offered in lieu of surgery. AS consisted of imaging, CEA levels, endoscopies, and clinical exams every 1-12 months, at decreasing intervals over time. Follow-up was calculated from the start of nCRT. Our primary interests were the LRR rate and success of salvage therapy among these patients.

**Results:**

At a median follow-up of 42 months (range, 23-134), 2 of 11 (18%) patients developed LRR. There were no distant recurrences or deaths. One recurrent patient presented with T3N0 disease, had a local recurrence (LR) at 11 months, and underwent salvage abdominoperineal resection. He remains disease-free 60 months later. The second recurrent patient presented with T2N0 disease, had a LR with presacral extension at 23 months, and received salvage brachytherapy. She has slowly progressive disease seven months later and continues to refuse surgery.

**Conclusions:**

Patients with distal LARC who exhibit cCR after nCRT and forgo surgery have a LRR rate near 20%, or at least twice that of those proceeding with surgery. Close follow-up is therefore critical in these patients. Despite producing only two failures, our review adds to the limited existing literature that suggests at least half of carefully selected LARC patients undergoing AS can be salvaged successfully. Additional studies are needed to define an optimal subset of LARC patients for AS; to establish an appropriate surveillance protocol for such patients, particularly in the first two years; and to evaluate the role of dose-escalation in nCRT for LARC, as recent radiobiological data suggest a significant dose-response up to 70 Gy in LARC. In the interim, distal LARC patients with cCR after nCRT who undergo AS appear to have an encouraging prognosis, and AS is reasonable for those declining surgery.

**MSRO25-04**

**Is the Outcome Following Chemo-Radiation Equivalent to R1/R2 Resection Adjuvant Chemotherapy in Stage I-III Pancreatic Cancer?**

Myroslav Yuri Lutsyk MD (Presenter): Nothing to Disclose, Fadi Mezied MD : Nothing to Disclose, Ron Epelbaum MD : Nothing to Disclose, Rahamim Ben-Yosef : Nothing to Disclose

**ABSTRACT**

Purpose/Objective: The current treatment approach for exocrine pancreatic cancer is primary surgery followed by either gemcitabine based chemotherapy or chemo-radiotherapy. Patients who had questionable complete resection undergo a resection assuming that bulky removal of the tumor will probably prolong their survival. The purpose of this study was to evaluate retrospectively whether primary chemo-radiotherapy is equivalent to R1/R2 resection (followed by adjuvant chemotherapy) in pancreatic cancer.

Materials and Methods: 110 patients (74 male, 36 females, mean age of 62.8 yrs, range 38-84) with localized adenocarcinoma of pancreas, who were treated at Rambam Health Care Center in the last decade were enrolled to this study. Tumor location was in head of pancreas in 74 pts and in body/tail in the remaining 36 pts. Sixty nine pts were treated by surgery followed by gemcitabine based chemotherapy while 41 pts who their tumor found to be clinically non-resected, were treated with chemo-radiotherapy. The chemotherapy was based on combination of cisplatin and gemcitabine and only gemcitabine, in a reduced dose, during the radiation. The total dose of the radiation was 50.4 Gy, given in 1.8 Gy per fraction, 5 times a week. Overall survival were explored in dependence to treatment approach and surgical margins' status. Results: Thirty seven pts underwent complete resection of the
tumor (R0), 32 pts had R1/R2 and undetermined surgical margins and 43 pts had primary chemo-radiotherapy. No differences in overall survival were noted in terms of gender, tumor localization or involvement of nodes. Overall survival was higher for pts who underwent surgery, 2.132±0.25 years (CI 95%, 1.64-2.62) vs 1.2±3 0.09 years with primary chemo-radiotherapy (p<0.0001). The difference was noted after stratification of pts in accordance to margins status. Significant difference was note between R0 surgery vs primary chemo-radiotherapy and no difference between R1+R2 vs chemo-radiotherapy (p=0.15).Conclusions: The absence of significant difference in OS between R1/R2 resection vs primary chemo-radiotherapy suggests that performance a surgery without strong evidence of R0 margin is unnecessary.

**MSRO25-05**  The Effect of MRI or PET Fusion in Radiotherapy Treatment Planning on the Pathological Complete Response Rate in Rectal Adenocarcinoma

Zaker  Rana  BS (Presenter):  Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):** A pathological complete response rate of 10 to 30% has been noted to occur following preoperative chemoradiation with CT-based treatment planning in patients with rectal cancer. Fusion of the treatment planning CT with other imaging modalities like MRI or PET may help identify tumor location and improve tumor coverage. The impact of MRI or PET fusion on pathological complete response rate has yet to be determined. This retrospective study sought to evaluate the effect of adding MRI or PET imaging to CT-based treatment planning and its impact on pathological complete response rates in patients with rectal cancer.

**Materials/Methods:** A retrospective analysis was performed on 39 patients, who received neoadjuvant chemoradiation for biopsy proven rectal adenocarcinoma from February, 2009 to September, 2013. Patients were divided into two groups. The first group was treated using CT-only based treatment planning (n=9) and the second was treated using either PET or MRI fusion with the simulation CT scan (n=30). There were a total of 19 cases of lower rectal cancer (0-7 cm from the anal verge), 12 cases of middle rectal cancer (7-11 cm from the anal verge), and 8 cases of upper rectal cancer (11-15 cm from the anal verge). Patients were treated to a total of 5,040 cGy in 28 fractions. Pathological complete response rates (ypT0N0M0) were assessed using postoperative pathologic reports following lower anterior resection or abdominoperineal resection.

**Results:** 39 patients with a median age of 62 received preoperative chemoradiation with an interval to surgery ranging from 34-162 days and a median of 70 days. Patients treated with PET or MRI fusion treatment planning showed a complete pathological response rate at the primary site of 60% and a complete lymph node pathological response rate of 70.83% (in patients who were clinically node positive) compared to 22.22% at the primary site and 66.66% at lymph node sites in patients with CT-only treatment planning. In patients treated using MRI or PET fusion, middle rectal cancer showed the best complete pathological response rate at 80%, followed by lower rectal cancer at 41.66%, and upper rectal cancer at 37.5%.

**Conclusions:** Utilization of MRI or PET fusion resulted in a higher pathological complete response rate when compared to CT-only based treatment planning, especially in middle rectal cancers. Further studies are needed to accurately identify those patients with a complete pathologic response after chemoradiation with the goal of potentially omitting the need for surgical resection.

**MSRO25-06**  Retrospective Analysis of Patients Suffering from GIST Liver Metastases Resistant to Tyrosine Kinase Inhibitors being Treated with SIRT

Nils  Rathmann  MD (Presenter):  Nothing to Disclose, Joachim  Schuette  MD :  Nothing to Disclose, Daniel  Pink  MD :  Nothing to Disclose, Stefan  Oswald  Schoenberg  MD, PhD :  Institutional research agreement, Siemens AG, Steffen J.  Diehl  MD :  Nothing to Disclose, Peter  Hohenberger :  Nothing to Disclose

**PURPOSE**

To our knowledge no data exists in concern of gastrointestinal stromal tumor (GIST) liver metastases being treated with selective internal radiation therapy (SIRT). Purpose of this study is to evaluate the therapy response and progression free interval (PFI) of GIST liver metastases after SIRT.

**METHOD AND MATERIALS**

From 2008 to 2013 nine patients with GIST liver metastases being progressive under tyrosine kinase inhibitors (TKI) treatment were referred. Five patients had liver metastases only, in another four patients extrahepatic disease was controlled by TKI. Depending on intrahepatic tumor distribution, either one or both liver lobes were treated intraarterially. Contrast enhanced (CE) MRI, CE CT and 18F-FDG PET-CT were used for follow-up. All patients resumed the TKI therapy after SIRT.

**RESULTS**

16 liver lobes of 9 patients were treated with a mean activity of 1.06GBq per lobe. No radiation induced liver disease (RILD) occurred, however one patient required surgery for persistent stomach ulcer. Three patients had a complete remission (CR), five patients partial response (PR) and one patient stable disease (SD). No patient showed progression after SIRT. Median PFI was 15.89 months (range 4-29). Median survival was 29.78 months (range 10-72).

**CONCLUSION**

SIRT offers a safe and effective treatment option in patients with liver metastases from GIST not or no longer responding to TKI treatment. In patients with mutational status known to be insensitive to available tyrosine kinase inhibitors SIRT could be an option for earlier phases of therapy. The results might also contribute to challenging the radiation resistance assumed for GIST.

**CLINICAL RELEVANCE/APPLICATION**

Our study presents distinct advantages of SIRT in terms of PFI and survival in patients with GIST suffering from progression of liver metastases.

**MSRO25-07**  The Impact of Radiation Therapy after Resection on Survival in Rectal Melanoma

May  Abdel-Wahab  MD, PhD :  Nothing to Disclose, Chandana A.  Reddy  MS :  Nothing to Disclose, Luca  Daniel  Hohenberger :  Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):** To determine the impact of adjuvant radiation therapy on survival in patients with rectal melanoma after resection. Our study presents distinct advantages of SIRT in terms of PFI and survival in patients with rectal melanoma after resection. Significant difference was note between R0 surgery vs primary chemo-radiotherapy and no difference between R1+R2 vs chemo-radiotherapy (p=0.15).Conclusions: The absence of significant difference in OS between R1/R2 resection vs primary chemo-radiotherapy suggests that performance a surgery without strong evidence of R0 margin is unnecessary.
**MSRO25-09 Temporal Radiographic Density Change in Multiphase Liver CT after Radiotherapy for Hepatobiliary Malignancy: Is It Predictable?**

**Jiho Nam MD (Presenter):** Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):** Irradiation of liver can cause time-dependent CT imaging changes. However, it is challenging to predict which patients will show the changes after radiotherapy or not. We compared patient characteristics to find predictable factors associated with radiotherapy induced multiphase liver CT density changes in the liver. **Materials/Methods:** We have retrospectively reviewed the medical records of total 154 patients who were treated with radiotherapy for the malignancy of hepatobiliary area or pancreas. Total radiotherapy dose to the liver was the range of 30-54 Gy using 1.8-3.0 Gy fraction with or without combined chemotherapy. Follow-up multiphase CT scans were serially performed after median 3 months after RT. Radiographic findings were thoroughly evaluated and then compared with radiotherapy plan data. Statistical analyses were performed to find any significant correlations between radiographic change and the patient characteristics. **Results:** Overall 67/154 patients showed significant radiographic changes (i.e., newly visible hypodense areas in the liver) in the multiphase liver CT scan during the follow-up periods. Liver cirrhosis, portal vein thrombosis, primary tumor site, and the use of chemotherapy appeared to be correlated with the radiographic changes. **Conclusions:** Density changes in multiphase liver CT images after liver radiotherapy can be occurred more frequently when the patient has liver cirrhosis. However, their clinical nature and the relevant pathophysiology have yet to be determined from further clinical research.
71 patients with suspected pancreatic carcinoma underwent second- or third-generation dual-source dual-energy CT with arterial phase. Images were reconstructed as virtual 120 kV series (M0.6) by linearly blending the spectral information of the high and low kV dataset and with the available standard mono-energetic application at a virtual mono-chromatic image impression at 40 keV and 55 keV. Additional image series were reconstructed with the novel "mono-energetic plus" application promising improved noise reduction (40+ and 55+). Image quality was compared between all series with respect to noise, signal of healthy pancreatic tissue and tumor tissue, SNR and pancreas-to-lesion contrast (CNR).

RESULTS
32 carcinomas were detected. Compared to the standard M0.6 series signal of healthy pancreas tissue was significantly higher for all mono-energetic reconstructed images (M0.6: 92 HU; 40: 280 HU; 40+: 290 HU; 55: 166 HU; 55+: 167 HU). With the standard mono-energetic algorithm, noise gradually increased with lower energies (55: 21 HU; 40: 37 HU), while the novel "mono-energetic plus" algorithm was able to keep the noise at a constantly low level similar to and not significantly different from the M0.6 series (8 HU for 55+ and 40+; 9 HU for M0.6). Consequently, SNR of the pancreas was significantly superior in the 40+ and 55+ than in the 40 and 55 standard series (40.1 and 23.1 vs. 10.1 and 8.8) and outperformed the M0.6 series (10.9). Likewise, pancreas-to-lesion contrast was highest in the 40+ series (16.4) followed by the 55+ series (7.1) and thus significantly higher than in any of the other series (M0.6: 4; 40: 3.3; 50: 2.5).

CONCLUSION
A novel noise-optimized algorithm for reconstruction of mono-energetic images from second- and third-generation dual-source dual-energy CT data can significantly improve image quality in the diagnosis of pancreatic carcinoma.

CLINICAL RELEVANCE/APPLICATION
The challenging diagnosis of small pancreatic adenocarcinoma with faint tumor-to-lesion contrast may be enhanced with this dedicated processing of dual-energy CT data, being vital for the patient.
**PURPOSE**

To measure the performance of Histogram-based Apparent Diffusion Coefficient (ADC) analysis in the evaluation of treatment response in pancreatic ductal adenocarcinomas (PDC).

**METHOD AND MATERIALS**

12 patients with PDC underwent T2-weighted and Diffusion-weighted MR (DW-MR) imaging acquired with nine b values (0,10,20,30,40,50,150,300,1000 s/mm^2), performed on 1.5T, before and after therapy (mean 6 weeks) with Gemcitabine alone (n=5) or combined Gemcitabine+nab-Paclitaxel (n=7). For each PDC, baseline and after-treatment: 1) tumour longest diameter on T2-weighted images (RECIST criteria); 2) tumour volume on DW-MR images and 3) histograms ADC (H-ADC) parameters (mean, median, 10th, 25th, 75th, and 90th centile) obtained from the entire tumour volume, were calculated. The therapeutic response was based on clinical and biological evaluation. Mann-Whitney test and Wilcoxon test were applied for comparison.

**RESULTS**

8/12 patients (66.6%) were responders. In the responder group, tumour diameter decreased more than 30% in only one patient (1/8), whereas DW-MR-based tumour volume reduction was greater than 30% in all responders (p

**CONCLUSION**

DWI-based tumour volume provides a significant marker of PDC response to chemotherapy and H-ADC parameters may be useful in evaluating and predicting tumour response.

**CLINICAL RELEVANCE/APPLICATION**

DWI-based tumour volume and Histogram-based ADC analysis may be useful in evaluating and predicting chemotherapy response in advanced pancreatic ductal adenocarcinomas.

**SSC04-04**

**Effects of Neoadjuvant Concurrent Chemoradiation Therapy in the Performance of MDCT in Determining Resectability of Borderline Resectable Pancreas Cancer: Preliminary Results of a Prospective Randomized Study**

Jin Joo MD (Presenter): Nothing to Disclose, Jeong Min Lee MD: Research Grant, Guerbet SA Equipment support, Siemens AG Research Grant, Bayer AG, Dong Ho Lee MD: Nothing to Disclose, Eun Sun Lee MD, PhD: Nothing to Disclose, Joon Koo Han MD: Nothing to Disclose, Byung Ihn Choi MD, PhD: Research Consultant, Samsung Electronics Co Ltd

**PURPOSE**

To prospectively evaluate the effects of neoadjuvant concurrent chemoradiation therapy (CCRT) in the preoperative assessment of resectability using MDCT in patients with borderline resectable pancreas cancer

**METHOD AND MATERIALS**

In this on-going prospective study, a total of 27 patients with borderline resectable pancreas cancer were enrolled and divided into two randomized groups: 15 patients to upfront surgery (group 1) and 12 patients to neoadjuvant CCRT followed by surgery (group 2). Contrast-enhanced MDCT images obtained immediately prior to surgery were retrospectively reviewed by two independent radiologists to determine the resectability of pancreas cancers. The diagnostic accuracies of MDCT in prediction of resectability between group 1 and group 2 were compared using the Fisher exact test.

**RESULTS**

Among 27 patients with borderline resectable pancreas cancers, 10 patients were confirmed as having resectable disease (R0 resection) and 17 patients were confirmed as having unresectable disease (R1 or R2 resection in 15 patients; inoperable due to distant metastases were found before surgery in 2 patients). The overall accuracies of the two reviewers in determining resectability of borderline resectable pancreas cancers were higher in patients who underwent upfront surgery (86.7% and 86.7% in reviewer 1 and 2, respectively) than in patients who had received neoadjuvant CCRT (66.7% and 66.7% in reviewer 1 and 2, respectively), however, the differences were not statistically significant (P>0.05).

**CONCLUSION**

Our preliminary data from a prospective randomized study show that neoadjuvant CCRT may reduce the diagnostic accuracy of MDCT in prediction of resectability in patients with borderline resectable pancreas cancers.

**CLINICAL RELEVANCE/APPLICATION**

In borderline resectable pancreas cancers, neoadjuvant concurrent chemoradiation therapy may reduce the diagnostic accuracy of MDCT in prediction of resectability.

**SSC04-05**

**Interpreting Baseline and Follow-up 18Fluoroxyglucose-PET Parameters in Patients with Locally Advanced and Borderline Resectable Pancreatic Cancer**

Shalini Moningi (Presenter): Nothing to Disclose, Avani Satish Dholakia BS: Nothing to Disclose, Jeffrey P. Leal BA: Nothing to Disclose, Lauren Rosati: Nothing to Disclose, Elliot K. Fishman MD: Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc, Siva P. Raman MD: Nothing to Disclose,
Pancreatic cancer (PCA) is the 4th leading cause of cancer death and patients with unresectable disease have a 5-year overall survival (OS) of <5%. The role of positron emission tomography/computed tomography (PET/CT) in PCA diagnosis, staging, and treatment response remains controversial due to limited data. We recently reported that baseline PET parameters predicted for OS following gemcitabine and stereotactic body radiation therapy (SBRT). Recent studies have also shown associations between maximum standardized uptake value and OS and progression-free survival; however, the role of post-treatment PET/CT parameters in the prognosis of PCA is unclear.

Patients with locally advanced (LA) or borderline resectable (BR) PCA who received radiation therapy (RT) with hypofractionated SBRT or intensity-modulated radiation therapy (IMRT) were retrospectively analyzed using baseline and follow-up PET/CT scans. Total lesion glycolysis (TLG) and maximum and peak SUV based on lean mass (SULmax and SULpeak) were calculated using in-house software. Changes in PET parameters were assessed for prognostic potential using Cox regression analyses.

Median OS of the 47 patients (44 LA, 3 BR) was 18.8 months. Forty patients received SBRT (n=32, 6.6 Gy x 5 fractions; n=8, 5 Gy x 5) and 7 patients received IMRT (total dose range, 30-50.4 Gy; fraction size, 2.5 Gy). Thirty-eight patients (35 LA, 3 BR) were analyzed pre- and post-RT. Median time from end of RT to follow-up scan was 3.67 months. Patients with a baseline SULmax of ≥3 cm had inferior OS compared to patients with a baseline SULmax < 3 g/ml (17.1 vs. 35.5 months; HR 5.6, 95% CI 1.3-24.4, p=0.02). Baseline TLG of ≥20 cm³ resulted in inferior OS compared to a TLG <20 cm³ (18.8 vs. 35.5 months; HR 5.7, 95% CI 1.3-25.9, p=0.02). However, a decrease in TLG on post-RT PET/CT scans was associated with worse OS in comparison with an increase in TLG (17.1 vs. 35.5 months; HR 0.3, 95% CI 0.1-0.8, p=0.02).

Our findings suggest that pre-RT PET/CT parameters may be predictive of OS in patients with LA and BR PCA. Lower baseline PET metabolic activity before RT may be a prognostic indicator for improved OS, whereas higher PET metabolic activity after RT may be due to local response from treatment as opposed to disease progression.

Our findings suggest that pre-RT PET/CT parameters may be predictive of OS in patients with LA and BR PCA. Lower baseline PET metabolic activity before RT may be a prognostic indicator for improved OS, whereas higher PET metabolic activity after RT may be due to local response from treatment as opposed to disease progression.

Pre-RT PET/CT parameters might be useful in predicting overall survival in pancreatic cancer patients.

Pancreatic ductal adenocarcinoma (PDAC) responds poorly to chemotherapy partly due to a collagen rich desmoplastic response that is a barrier to drug delivery. Angiotensin receptor blockade (ARB) with Losartan® has been shown to enhance the intratumoral penetration and efficacy of therapeutics in mice using in vitro techniques. Because of its steady state approach, we hypothesize that MRI using clinically available magnetic nanoparticles (MNP)(ferumoxytol - Feraheme®, AMAG Pharmaceuticals, Inc.), will be sensitive to changes in tumor microvasculature that result from ARB in PDAC. The purpose of this study was to test this hypothesis in an orthotopic mouse model of PDAC.

All experiments were approved by the local ethical review panel. Orthotopic tumors were generated by implanting 1mm³ chunks of AK4.4 spontaneously generated tumors (from a Ptfl-Cre/LSL-KrasG12D/p53Lox mouse model) into the pancreas of 6-8 week old FVB mice. Tumors were allowed to grow for 1 week prior to treatment. Animals were treated daily with an ip injection of 70mg/kg Losartan for 5 days. MRI was performed using a home built bird-cage coil at 4.7T and included multiecho gradient echo (TE 3.5, 8.5, 13.5, 18.5 msec; TR 750msec) and multiecho spin echo (TE 10, 20, 30, 40, 50, 60msec; TR 2000msec) pulse sequences and were performed prior to and following iv administration of 3 mg/kg iron ferumoxytol. Data analysis was performed by (ROI) analysis of 3 central slices within each tumor calculating ΔR² and ΔR²*. fBV (~ΔR²*) was normalized to an assumed fBV in muscle of 3%. Vessel size index (VSI) (~ΔR²*/ ΔR²) was also calculated comparing control and Losartan treated animals. Statistical analyses compared both cohorts using a two-tailed unpaired t-test.

Losartan treated animals (n=7) demonstrated a statistically significant difference in fBV (mean ± sem) (9.5 ± 1.3) as compared to the control population (n=5) (3.1 ± 2.2) (p

MRI using clinically available MNP provided a non-invasive assessment of tumor blood vessel changes following ARB in a PDAC model. The approximate 2.5 fold increase in mean VSI and fBV is in concert with recently published in vitro results.
**Functional Imaging of Interstitial Brachytherapy in Pancreatic Carcinoma Xenografts Using Spectral CT: How Does Iodine Concentration Correlate with Standardized Uptake Value of 18FDG-PET-CT?**

**PURPOSE**

To investigate the correlation between iodine concentration (IC) for quantitative of spectral CT and maximum standardized uptake value (SUVmax) of 18F-FDG-PET-CT to evaluate the therapeutic effect of interstitial brachytherapy on transplantation tumor of human pancreatic carcinoma in Balb/c- nu mice.

**METHOD AND MATERIALS**

Xenograft models were created by subcutaneous injection of Sw1990 human pancreatic cancer cell suspensions into the immunodeficient Balb/c- nu mice. Twenty mice bearing Sw1990 human pancreatic cancer cell xenografts were randomly separated into two groups: experimental (n = 10; 1.0 mCi) and control (n = 10; 0 mCi). After 2 weeks treatment, spectral CT and 18F-FDG microPET-CT scan were performed. The iodine concentration (IC) in the lesions were measured and normalized to the muscle tissue as nIC. The relationships between the nIC and SUVmax of the transplantation tumors were analyzed.

**RESULTS**

The nIC of the lesion was significantly lower than that in two groups during the multiphase scan. Our results showed that before treatment the SUVmax values among two groups had no significant statistical difference. Two weeks after treatment the SUVmax and 125I seed implant group were significantly lower than before, while for the empty seed group there were no significant difference compared with before treatment. The nIC values of the three-phase scans have certain positive correlation with the SUVmax values ($r = 0.64$, $p < 0.05$; $r = 0.51$, $p < 0.05$; $r = 0.71$, $p < 0.05$ in the 10,25 and 60 s phase respectively).

**CONCLUSION**

Spectral CT could serve as a valuable functional imaging modality as the nIC correlates with SUVmax of 18FDG PET-CT for evaluating the therapeutic effect of 125I interstitial brachytherapy in a pancreatic carcinoma xenograft.

**CLINICAL RELEVANCE/APPLICATION**

Spectral CT offers opportunities to assess the therapeutic response of pancreatic cancer.

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**Comparison of CT Appearance of Tubular and Colloid Pancreatic Adenocarcinoma Arising from Intraductal Papillary Mucinous Neoplasm**

**PURPOSE**

To compare the CT appearance of tubular (t) and colloid (c) type pancreatic ductal adenocarcinomas (PDAC) arising from intraductal papillary mucinous neoplasms (IPMN).

**METHOD AND MATERIALS**

An IRB approved retrospective study included patients who underwent resection of IPMN with either invasive tPDAC or cPDAC. Consecutive patients from 1996 to 2013 were included if they had preoperative CT imaging within 90 days of surgery. Two radiologists reviewed in consensus for the presence and size of solid enhancing component (SC), main pancreatic duct (MPD) size, presence of MPD cutoff, and largest cyst diameter (D). SC size on imaging was correlated with invasive tumor size as measured by pathology. Unpaired t-test, Fisher exact test, and Spearman correlation were used for statistical analyses.

**RESULTS**

48 pts (25:23 M:F, median age 72) were included, with CT performed a median of 19 (range 1-79) days before surgery. 27 pts had cPDAC (15:12 M:F, median age 73) and 21 pts had tPDAC (10:11 M:F, median age 71). No statistically significant difference was found between tPDAC and cPDAC for D (median 33 vs 23 mm, $p = 0.25$) or MPD size (median 10 vs 6 mm, $p = 0.46$). A SC was visible in 14 of 27 cPDAC and 16 of 21 tPDAC ($p = 0.13$). MPD cutoff was seen in 4 of 27 cPDAC and 8 of 21 tPDAC ($p = 0.21$). For the pathologic specimen, the median size of the invasive tumor for cPDAC was 24 mm and for tPDAC was 19 mm ($p=0.36$). The correlation between SC size measured on CT and pathologic tumor size was $R^2=0.50$ ($p<0.0001$) for cPDAC, and $R^2=0.08$ for tPDAC ($p=0.20$).

**CONCLUSION**

No significant difference was seen between the CT appearances of IPMN with either colloid or tubular PDAC. However, in contrast to tPDAC, the size of solid enhancing component for cPDAC measured on CT was associated with invasive tumor size on pathology. The abundant extracellular mucin present in cPDAC may explain the correlation between SC size measured on CT and pathology.
CLINICAL RELEVANCE/APPLICATION

Given the differences in prognosis between IPMN with either colloid and tubular pancreatic ductal adenocarcinomas, improved understanding of their CT appearance may prove useful.

Pancreatic Cysts and Pancreatic Ductal Adenocarcinoma: What Are the Odds?

Viktoriya Paroder MD (Presenter): Nothing to Disclose, Milana Flusberg MD : Nothing to Disclose, Alla M. Rozenblit MD : Nothing to Disclose, Victoria Chernyak MD : Nothing to Disclose

PURPOSE

To assess relationship between pancreatic cysts and pancreatic ductal adenocarcinoma (PDAC), and to compare imaging features of pancreatic cysts in subjects who subsequently develop PDAC and in those who do not.

METHOD AND MATERIALS

This case-control study was IRB-approved and HIPAA-compliant. Case group included adult subjects with a diagnosis of PDAC and control group included adult subjects with a diagnosis of lung cancer. Cancer diagnosis date was between 1/1/05-1/1/14 as recorded in Cancer Registry, and only subjects with at least one abdominal CT/MR >6 months before the cancer diagnosis date were included. The most recent abdominal CT/MR of each subject done >6 months prior to cancer diagnosis date was reviewed by a radiologist blinded to case/control status. The presence of pancreatic cyst(s), number, size of the largest cyst, and presence of main pancreatic duct (MPD) dilatation (defined as MPD ≥4mm) were recorded. A pancreatic cyst was considered simple when it lacked calcifications, septations and enhancement. Frequencies of pancreatic cysts, mean cyst sizes, frequencies of solitary cysts, simple cysts and MPD dilatation were compared between the groups. Logistic regression model with binary outcome of PDAC was constructed.

RESULTS

There were 162 subjects, 85 (52.5%) cases and 77 (47.5%) controls. Women comprised 62.4% (53 of 85) of cases and 58.4% (45 of 77) of controls (p=0.61). Mean ages were 69.2 years (±10.7) and 69.6 years (±12.9) in cases and controls, respectively (p=0.81). Pancreatic cysts were present in 23 (27.1%) of 85 cases and in 4 (5.2%) of 77 controls (p<0.001). The odds ratio of pancreatic cysts for development of PDAC was 7.0, adjusting for age and sex (p=0.001). Mean cyst size was 13.6 mm (±8.4) in cases and 6.5 mm (±3.3) in controls (p=0.01). Pancreatic cysts were solitary in 9 (40.9%) of 23 cases and 4 (100%) of 4 controls (p=0.04), and simple in 16 (69.6%) of 23 cases and 3 (75%) of 4 controls (p>0.99). MPD dilatation was present in 7 (30.4%) of 23 cases and 1 (25%) of 4 controls (p>0.99).

CONCLUSION

Pancreatic cysts are associated with 7.0 times higher odds of developing pancreatic ductal adenocarcinoma. Pancreatic cysts in subjects who develop pancreatic ductal adenocarcinoma tend to be larger and more commonly are multiple.

CLINICAL RELEVANCE/APPLICATION

Patients with pancreatic cysts are at higher risk of developing pancreatic ductal adenocarcinoma, particularly if the cysts are larger and multiple.
PURPOSE
The purpose of this study is early therapeutic response evaluation after cytotoxic chemotherapy using FOLFOX and FOLFIRI in patients with liver metastasis from colorectal cancer using IVIM DWI and DCE-MRI.

METHOD AND MATERIALS
This prospective study was approved by IRB and informed consent was obtained from the study patients. Nineteen patients with liver metastasis from colorectal cancer underwent DEC-MRI and IVIM DWI (b value=0, 25, 50, 75, 100, 200, 500, and 800 sec/mm2) using a 3-T MR scanner baseline and after 1st cycle of cytotoxic chemotherapy using FOLFOX and FOLFIRI. Following IVIM DWI parameters including ADC, true diffusion coefficient (D), pseudo-diffusion coefficient (D*), and perfusion fraction (f) and DCE-MR perfusion parameters including Ktrans, Kep, Ve, and iAUC were calculated. Response evaluation based on RECIST criteria. For statistical analysis, Spearman's rank correlation and Wilcoxon signed-rank was applied.

RESULTS
There were eight response and eleven non-response patients. In the comparison of IVIM DWI parameters, ADC (1.19±0.23 vs 1.26±0.26, 10-3/mm2/s, p=.012), D (1.08±0.23 vs. 1.17±0.24, 10-3/mm2/s, p=.012), f (17.3±0.03 vs. 13.3±0.02,%, p=.017) showed significant change between baseline and after 1st cycle chemotherapy in the response group. However, in the comparison of DCE-MR perfusion parameters including Ktrans, Kep, Ve, and iAUC, there were no statistically significant change in each DCE-MR perfusion parameters. The significant correlation was found between each of the perfusion-related IVIM parameters (D* and f) with DCE-MR parameters (Ktrans and iAUC) before chemotherapy (r=0.506 to 0.614, p<0.05), however there were no significant correlation after chemotherapy.

CONCLUSION
IVIM DWI is useful for early prediction of therapeutic response evaluation after cytotoxic chemotherapy in patients with liver metastasis from colorectal cancer.

CLINICAL RELEVANCE/APPLICATION
IVIM DWI of the liver metastasis from colorectal cancer can be used as early prediction of therapeutic response evaluation after cytotoxic chemotherapy.

SSC05-02
Tumor Margin Intensity Slope to Quantify Morphological Changes in Colorectal Liver Metastasis after Anti-angiogenic Therapy
Vahid Yaghmai MD (Presenter): Nothing to Disclose, Keyur Parekh MD : Grant, Siemens AG, Adeel Rahim Seyed MD : Grant, Siemens AG, Thomas Patrick O’Donnell : Researcher, Siemens AG

PURPOSE
Bevacizumab, an antiangiogenic agent, can lead to morphological changes in colorectal liver metastasis. Tumor margin intensity slope (TMIS) was used to objectively quantify morphological changes in liver metastasis after treatment.

METHOD AND MATERIALS
The HIPAA compliant retrospective study was approved by IRB. Seventy-two colorectal liver metastesis in 29 patients treated with bevacizumab with at least one pre- and one post-treatment MDCT scan were evaluated. Metastasis response was classified as optimal, incomplete or no response according to changes in tumor density, enhancement and margins (morphologic criteria). Tumor margin intensity slope, the first derivative of the plot of median intensities of concentric layers of voxels from outside the tumor towards its core, was calculated to compare different response categories. A greater negative value of TMIS corresponds to sharper tumor margins. Treatment response groups were compared using one-way analysis of variance (ANOVA). Student-Newman-Keuls test was applied for multiple comparisons.

RESULTS
Based on the morphological changes, 23/72 metastasis showed optimal response with remainder showing either incomplete (29/72) or no response (20/72). Mean TMIS values were -11.65 ± 3.5 HU/layer, -8.74 ± 5.2 HU/layer, and -7.58 ± 4.8 HU/layer (P=0.013) for lesions with optimal, incomplete and no response, respectively. On multiple comparisons, TMIS was significantly different for optimal response when compared with incomplete and no response. TMIS values between the latter two groups were comparable (P>0.05).

CONCLUSION
Tumor margin intensity slope provides objective quantification of morphological changes in colorectal liver metastasis and identifies lesions with optimal response to bevacizumab treatment.

CLINICAL RELEVANCE/APPLICATION
Tumor margin intensity slope is a promising imaging biomarker of response in colorectal liver metastases treated with antiangiogenics.

SSC05-03
Volumetric Assessment of Metastatic Colorectal Cancer: Reproducibility by Reader, Site, and Time Point
Meghan G. Lubner MD (Presenter): Nothing to Disclose, Nicholas Stabo : Nothing to Disclose, Sam Lubner : Nothing to Disclose, Alejandro Munoz Del Rio PhD : Research Consultant, Cellectar Biosciences, SSC05-02, SSC05-03
Purpose

To compare reproducibility of unidimensional and volumetric measures of metastatic colorectal cancer by reader, site of disease and time point in disease assessment.

Method and Materials

Analysis of CT images in 107 patients (mean age 58.7, range 25-81; 47 F, 60 M) undergoing systemic treatment for metastatic colorectal cancer was performed. Unidimensional (1D) and volumetric (3D) measures were retrospectively obtained on index lesions at three time points (mean interval 4.1 mos, median 3.7 mos) by three readers (abdominal imager, imaging core-lab manager, medical student) using a semi-automated technique. Measurements were summed and compared using best overall response and response at first post-treatment time point. Patient response was categorized based on RECIST 1.1 (CR, complete response; PR, partial response; SD, stable disease; PD, progressive disease). Intra and interobserver variability of 1D and 3D measures was assessed. Reproducibility of measurement by metastatic lesion site was evaluated. Kaplan-Meier models for each with categorical tumor response were constructed and compared. These models were created both for "best overall response" and for response at the first post treatment time point.

Results

Volumetric measures showed similar intra and interobserver variability to unidimensional measures. Metastatic site (lung, liver, node, other) did not significantly impact measurement reproducibility. Kaplan-Meier curves for unidimensional vs volumetric assessment were very similar in appearance. Both 1D and 3D measurements separated PD from the SD/PR group, but neither separated SD and PR well. Similar KM curves were seen using overall best response (across all time points) compared to response at the first post treatment time point.

Conclusion

Volumetric assessment of metastatic CRC is fairly reproducible, but does not show improved ability to predict survival over 1D measures and may not represent an improvement over less complex standard linear measures for this indication. Categorization of these variables either using best overall response or at the first post treatment time point also show similar survival models.

Clinical Relevance/Application

3D measures are reproducible, but do not improve correlation with survival over 1D measures. Assessment of disease at the first time point correlates well with overall best response in metastatic CRC, which may enable transition of therapy earlier.

Early Prediction of Response of Gastrointestinal Stromal Tumor to Sunitinib Therapy Using Non-Gaussian Diffusion MRI

Yi Sui MS (Presenter): Nothing to Disclose, Lei Tang MD: Nothing to Disclose, Frederick C. Damen PhD: Nothing to Disclose, Shun-Yu Gao MD: Nothing to Disclose, Kejia Cai PhD: Nothing to Disclose, Ying-Shi Sun MD, PhD: Nothing to Disclose, Xiaohong Joe Zhou PhD: Nothing to Disclose

Purpose

To evaluate the performance of a non-Gaussian diffusion model in early prediction of treatment response in recurrent gastrointestinal stromal tumor (GIST) under sunitinib therapy.

Method and Materials

With IRB approval, 10 patients (4 men, 6 women) with confirmed failure of previous imatinib therapy underwent sunitinib (50 mg/day, PO) single-drug targeted treatment. MRI scans were conducted on a 3T scanner before treatment, one week, three weeks and one month after treatment to monitor the tumor response. Diffusion MR images were acquired using 11 b-values up to 3000 sec/mm2. A set of diffusion parameters (apparent diffusion coefficient ADC, intravoxel heterogeneity index β, and mean free diffusion length μ) were fitted pixel by pixel using a fractional order calculus (FROC) model. The percentage change (%Δ) of ADC, β and μ after one week treatment were averaged over the whole tumor regions. The MRI parameters obtained after the first week of treatment were used to predict later treatment outcomes. All 36 tumors in 10 patients were divided into good response (n = 22) and poor response (n = 14) groups based on the Choi and EORTC-ISG-AGITG criteria. The parametric values were compared for each individual parameter using Mann-Whitney U test with a statistical significance set at p < 0.05. ROC analysis was performed to evaluate the performance of individual FROC parameters as well as the combination of all parameters (binary logistic regression) in predicting the therapeutic responses.

Results

Significant differences between good and poor response groups were found in the %Δ ADC (28% vs 8%, p = 0.032), %Δ β (20% vs 6%, p = 0.013), and %Δ μ (8% vs 2%, p = 0.004). The AUCs of %Δ μ (0.782) and %Δ β (0.747) were larger than %Δ ADC (0.714). When combining all parameters of the FROC model, the AUC was further increased to 0.893, suggesting that the FROC model improved the performance of prediction. The accuracy of prediction was increased to 83.3% using the FROC model, compared to using ADC alone (61.1%).

Conclusion

Our results demonstrate that the FROC diffusion model with high b-values can provide valuable information for early response prediction of sunitinib targeted therapy of GIST.
The FROC diffusion model may provide useful parameters for the prediction of GIST response to sunitinib therapy at early period.

**Comparison of MRI Parameters in the Early Response Prediction of Gastrointestinal Stromal Tumor to Targeted Therapy: A Patient-based Study**

Lei Tang MD (Presenter): Nothing to Disclose, Ying-Shi Sun MD, PhD: Nothing to Disclose, Zi-Yu Li: Nothing to Disclose, Xiao-Peng Zhang MD: Nothing to Disclose, Jia-Fu Ji: Nothing to Disclose, Xiaoting Li: Nothing to Disclose, Lin Shen: Nothing to Disclose

**PURPOSE**

To investigate the performance of quantitative parameters provided by MRI in the early prediction of the response of gastrointestinal stromal tumor (GIST) to targeted therapy.

**METHOD AND MATERIALS**

The institutional review board approved this prospective MRI study. All of the patients signed the written informed consent. MRI examinations were performed in 62 patients with GIST on 1.5T scanner before and at 2 and 12 weeks after treatment with targeted agents (Imatinib mesylate, 44 cases; Sunitinib malate, 18 cases). The longest diameter (LD) and contrast-to-noise ratio (CNR) of the tumors were measured on T2-weighted images (T2WI), and the apparent diffusion coefficient (ADC) was measured on diffusion-weighted images (DWI). A maximum of two lesions per organ/site and five lesions per patient were enrolled according to the regulation of RECIST 1.1. The early percentage changes (%Δ) of the above three parameters were compared for their performance in the differentiation of the good response (GoodR) and poor response (PoorR) groups using ROC curves.

**RESULTS**

Total of 141 GIST lesions in 62 patients enrolled in the study. There were 42 patients in GoodR group and 20 in PoorR group. After two weeks of therapy, the percentage changes of the ADC and LD were significantly different between the two groups (ADC: GoodR 30% vs. PoorR 1%, Z = -4.819, P < 0.001; LD: GoodR -7% vs. PoorR -2%, Z = -3.238, P = 0.001), but not of the T2WI-CNR (GoodR -3% vs. PoorR -9%, Z = -0.663, P = 0.508). Through ROC curves, the AUC for the percentage changes of LD, T2WI-CNR and ADC after two weeks of therapy were 0.756, 0.552 and 0.881, respectively, in the early prediction of the responses. Taking %ΔADC ≥ 15% to predict GoodR, the PPV was 87.5% (28/32). Taking %ΔADC

**CONCLUSION**

The percentage change of the ADC after two weeks of therapy outperforms T2WI-CNR and longest diameter in the early response prediction of GIST to targeted therapy.

**CLINICAL RELEVANCE/APPLICATION**

This patient-based study proved ADC has good performance in the early prediction of response of GIST to targeted therapy, which may provide surrogate biomarker for the personalized treatment of GIST.

**Whole-body Diffusion-weighted Imaging at 1.5T Compared with FDG-PET-CT for the Detection of Recurrence and Metastases in Patients with Gastrointestinal Tumors**

Zhiyang Zhou PhD: Nothing to Disclose, Jiaying Gong (Presenter): Nothing to Disclose, Wuteng CAO: Nothing to Disclose, Zhong-Ping Zhang MMedSc: Nothing to Disclose, Yanbang Lian: Nothing to Disclose

**PURPOSE**

To compare the diagnostic accuracy of using whole-body diffusion-weighted imaging (WB-DWI) at 1.5T and FDG-PET-CT in the detection of recurrence and metastases in gastrointestinal cancer patients and to assess the modification of ADC value between metastases and normal tissues.

**METHOD AND MATERIALS**

Twenty-eight consecutive patients diagnosed with gastrointestinal cancer and suspected tumor recurrence and 18 healthy controls were recruited and underwent both WB-DWI at 1.5T and PET-CT examinations for the staging of lymph node and distant metastases. PET-CT and histology and/or a clinical follow-up of 3-6 months served as a standard reference. Agreement between WB-DWI and FDG-PET-CT on detecting recurrence and distant metastases was compared using kappa statistics. Diagnostic accuracy, sensitivity, specificity, negative predictive value, and positive predictive value were calculated for each subject. Additionally, the difference of ADC values between normal tissues in controls and metastases were compared.

**RESULTS**

Tumor recurrence was observed in 5 of 28 patients. Lymph node involvement was determined in 20/28 cases as N-positive in PET-CT and in 18/28 in WB-DWI. M-stage was evaluated for liver metastases, lung, adrenal gland, peritoneal, and bone. One brain metastasis was observed in 1 patient using WB-DWI. No statistically significant difference (t=1.332, P=0.194) of overall diagnostic performances between PET-CT and WB-DWI was observed. WB-DWI demonstrated satisfying agreement with PET-CT (k=0.877) in the detection of recurrence and distant metastases. Applying WB-DWI imaging with b=600s/mm2, statistically significant differences of the ADC value were observed between metastatic lymph nodes and normal nodes, metastasis of liver and normal liver, and metastasis of bones and normal bones, respectively (P<0.05).

**CONCLUSION**
WB-DWI provides non-radiating imaging for staging of gastrointestinal tumors and offers consistent diagnostic performances with PET-CT. In addition, the ADC value can be applied in the determination of tumor metastasis.

**CLINICAL RELEVANCE/APPLICATION**

WB-DWI can be applied to stage gastrointestinal tumors and ADC is reliable in the identification of tumor metastasis.

**SSC05-07**

**Pattern of HCC Recurrence after Liver Transplantation: Time to Modify the Current Follow-up Imaging Modalities?**

Maxime Ronot MD (Presenter): Nothing to Disclose, Marco Dioguardi Burgio MD: Nothing to Disclose, David Fuks: Nothing to Disclose, Federica Dondero: Nothing to Disclose, Francois Cauchy: Nothing to Disclose, Valerie Paradis MD: Nothing to Disclose, Francois Durand: Nothing to Disclose, Jacques Belghiti MD: Nothing to Disclose, Valerie Vilgrain MD: Nothing to Disclose

**PURPOSE**

To analyze the imaging characteristics of hepatocellular carcinoma (HCC) recurrence following liver transplantation (LT) in order to optimize follow-up imaging in diagnosing recurrence.

**METHOD AND MATERIALS**

Between 2000 and 2011, all HCC patients who underwent LT were searched and only patients who had tumor recurrence were included. Pre-LT characteristics, and long-term outcome were retrospectively analyzed. Characteristics of recurrent HCC were analyzed at diagnosis on post-LT examinations as follows: 1/ site of recurrence defined as hepatic, extra-hepatic, or both, 2/ size of the largest lesions (mm on axial sections), and 3/ the time to recurrence, defined as the time between LT diagnosis of recurrence. The imaging modality of recurrence detection (ultrasound (US), CT or MRI) was noted.

**RESULTS**

Among 336 cirrhotic patients undergoing LT, 25 (7.4%) had HCC recurrence. All patients were males (median age 54 (41-64) years). Before LT, 13 (52%) patients had lesions outside the Milan criteria. Median time to HCC recurrence was 13.8 (1-75) months following LT and 8 (32%) patients experienced recurrence beyond 24 months after LT. Recurrences were detected using routine US follow-up in only 7 (28%) patients, and CT or MRI imaging in 18 (72%) of the patients including 5 (20%) who had marked increase of serum alpha-fetoprotein. The most frequently involved organs were the lungs in 13 (52%) patients, and the bones in 9 (36%) patients. Recurrent HCC involved more than one organ in 11 (44%) patients. Recurrences were limited to the liver in one (4%) patient, were exclusively extrahepatic in 18 (72%) patients and were both intrahepatic and extrahepatic in six (24%) patients. 1, 3- and 5-y OS of patients with HCC recurrence after LT were 84%, 39%, and 28%, respectively.

**CONCLUSION**

Routine US examination alone fails to detect most HCC recurrences. Because HCC recurrence is mainly extra-hepatic, may be delayed, and is rarely seen using US examination, we suggest performing regular whole-body imaging (CT or MRI) during follow-up visits 2 years or more after LT.

**CLINICAL RELEVANCE/APPLICATION**

Imaging follow-up of patients undergoing LT for HCC should include regular whole-body imaging during follow-up visits 2 years or more after LT.

**SSC05-08**

**Ultrasound Shearwave Elastography (SWE) Predicts Response in the Treatment of Patients with Liver Malignancies**


**PURPOSE**

To evaluate SWE in monitoring treatment response of patients with hepatic tumours.

**METHOD AND MATERIALS**

Forty-five patients undergoing non-surgical treatment for focal hepatic malignancies were studied using an ultrasound scanner with a curvilinear SC6-1 transducer (Aixplorer, SuperSonic Imagine, France) after 4 hours of fasting. The scans were performed at baseline, 2 weeks and 8 weeks post therapy under respiratory suspension. Three SWE scan planes of tumour and liver were acquired, analysed and averaged following placement of fixed regions of interest (10mm3) over the peripheral and central portion of the index tumours and adjacent hepatic parenchyma. Based on RECIST criteria, patients were classified as progressors (Pr) or non-progressors (NPr) at 8 weeks post therapy. SWE readings from baseline, 2 and 8 weeks (Wilcoxon test)
and between Pr and NPr (Mann-Whitney test) were compared. Area under receiver operating characteristics (AUROC) and Kaplan-Meier survival curves were plotted. The mean follow up was 233 days.

RESULTS
At baseline, liver SWE was significantly higher for Pr compared with NPr (13.4 ± 3.8kPa vs. 9.7 ±3.9kPa, p=0.01); a cut off value of ≤8.35kPa predicted non-progression following treatment [AUROC:0.77 (p=0.01), specificity:90.1%, sensitivity:58.3%, positive predictive value:93.3% and likelihood ratio of 6.4]. Compared with baseline, 2-week tumour SWE was significantly increased for both Pr (41.8 ± 10.6kPa vs. 50.7 ± 18.3, p=0.047) and NPr (51.2 ± 20.2kPa vs. 60.7 ± 22.0kPa, p=0.001). Compared with baseline, 8-week tumour SWE was significantly increased for both Pr (41.8 ± 10.6kPa vs. 61.9 ± 18.3kPa, p=0.02) and NPr (51.2 ± 20.2kPa vs. 74.3 ± 26.1kPa, p=0.002). At baseline, patients with liver SWE of ≥15kPa have a significantly shorter progression free survival (PFS) (Median 89 days vs 294 days, p=0.01). Compared with baseline, patients with an increase at 8-week liver SWE (of ≥40%) have a significantly shorter PFS (Median 85 days vs. 294 days, p=0.049).

CONCLUSION
Liver SWE at baseline predicts non-progressors following therapy. Patients with a baseline liver SWE of ≥15kPa or an increase of ≥40% at 8 weeks from baseline have shorter PFS. Tumour SWE is non prognostic.

CLINICAL RELEVANCE/APPLICATION
SWE is useful in predicting non-progressors and progression free survival following non-surgical therapy for hepatic malignancy.

SSC05-09 Effect of Treatment on Different CT Densities in Retroperitoneal Dedifferentiated Liposarcoma Treated with Chemotherapy or Radiotherapy prior to Surgical Resection

Sreeharsha Tirumani MBBS, MD (Presenter): Nothing to Disclose, Harika Tirumani MBBS : Nothing to Disclose, Jyothi Priya Jagannathan MD : Nothing to Disclose, Atul Bhanudas Shinagare MD : Nothing to Disclose, Nikhil H. Ramaiya MD : Nothing to Disclose

PURPOSE
Retroperitoneal Dedifferentiated liposarcoma (DDLPS) is a heterogeneous tumor on imaging with different densities on CT, and biologically varied with different growth rates. In this study, we retrospectively correlated effect of treatment on different densities in DDLPS.

METHOD AND MATERIALS
In this institutional review board-approved, retrospective study, out of 111 patients with primary or recurrent retroperitoneal/intra-abdominal DDLPS seen between January 1999 and December 2013, 25 patients (18 men, 7 women; mean age at diagnosis= 58 years, range, 35-72years) who received chemotherapy, radiotherapy or both before surgical resection were included. Imaging immediately prior to surgical resection (pre-surgery) and at baseline was reviewed by two radiologists to note the density of the nonlipomatous elements and the rate of growth during that period. Clinical and histopathological data was extracted from the electronic medical records.

RESULTS
There were 37 nonlipomatous lesions with three distinct densities: soft tissue density (SD) (>20HU), fluid density (FD) (0-20HU), and mixed density (MD) (combination of fluid and soft tissue). The distribution of the densities on the baseline scan and pre-surgery scans were SD=23; MD=9; FD=5 and SD=23; MD=11; FD=3 respectively. There was decrease in size of three lesions (>30%) while the rest 34 lesions were either unchanged in size or increased in size (26/34 lesions showed an increase in size by ≥20%). The respective median growth rate per month was 39% (SD), 63% (MD), and 35% (FD). There was a change in density in 2/23 SD lesions (to MD) and 2/5 FD lesions (to SD). Tumors were intermediate (10SD, 6MD, 4FD) or high (13SD, 3MD, 1FD) grade.

CONCLUSION
The nonlipomatous component of retroperitoneal DDLPS has three distinct densities on imaging which tend to grow at different rates despite treatment and can change their density in response to treatment. The densities do not correlate with the histological grade.

CLINICAL RELEVANCE/APPLICATION
Knowledge of the occurrence of different densities in the nonlipomatous component of retroperitoneal DDLPS can help radiologists to exert caution while interpreting images. Targeted biopsies in the future can help in understanding the histopathologic relevance of the different densities.
**SSC14-01**

**A Mechanism of Transcatheter Arterial Embolization-mediated Improvement of Drug Penetration in Liver Cancer**

Bin Liang (Presenter): Nothing to Disclose, Gan-Sheng Feng MD: Nothing to Disclose, Chuansheng Zheng: Nothing to Disclose

**PURPOSE**

Transcatheter intraarterial techniques can improve drug penetration in liver cancer and thus enhance the efficacy of chemotherapy, but its mechanism remains unclear. Intratumoral interstitial fluid pressure (IFP) has been found to be an important determinant of drug penetration in solid tumors. The present study is designed to determine whether transcatheter arterial embolization modifies IFP, and to evaluate whether the modified IFP is related to the improvement of drug penetration in liver cancer.

**METHOD AND MATERIALS**

VX2 tumors were implanted in the livers of 16 rabbits. The animals were divided into 4 groups of 4 animals each. Group 1 (doxo iv) animals received doxorubicin intravenous injection; group 2 (doxo ia) animals received doxorubicin hepatic intraarterial infusion; group 3 (doxo ia + E) received doxorubicin hepatic intraarterial infusion followed by embolization; group 4 (doxo + L ia + E) received hepatic intraarterial infusion of doxorubicin mixed with lipiodol followed by the embolization. After transcatheter treatment, wick-in-needle technique (Mikro-Tip pressure catheter) was used to measure IFP in tumor tissues, and immunofluorescence technique to evaluate the distance of doxorubicin fluorescence from the nearest blood vessel (recognized by CD31).

**RESULTS**

Tumors in the group 3 (doxo ia + E) and 4 (doxo + L ia + E) showed a significant decrease in IFP compared with the group 1 (doxo iv) and 2 (doxo ia) tumors (P < 0.05) within 1 hour after treatment. Embolization led to a decrease of IFP by 27.11% in group 3 and 31.81% in group 4 tumors, respectively. The change in IFP was significantly correlated with doxorubicin penetration distance (r = 0.671, P = 0.004).

**CONCLUSION**

Transcatheter arterial embolization reduce tumor IFP, which probably is responsible for the improvement of drug penetration in liver cancer.

**CLINICAL RELEVANCE/APPLICATION**

Our results reveal a novel mechanism of transcatheter arterial embolization-mediated improvement of drug penetration in liver cancer. The decrease in tumor IFP, generated by embolization, contributes to drug penetration in liver cancer. Thus, decreasing tumor IFP could represent a promising therapeutic strategy for improving the effectiveness rates of transcatheter therapies for liver cancer.

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**SSC14-02**

**Comparison of Drug Release between Conventional Chemoembolization and Drug Eluting Beads Chemoembolization**

Jae Hwan Lee MD (Presenter): Nothing to Disclose, Kyu Ri Son MD: Nothing to Disclose, Hyo-Cheol Kim MD: Nothing to Disclose

**PURPOSE**

The purpose of this study was to compare the in vitro drug release characteristics of DC bead and various kinds of Lipiodol emulsion, and to compare the tumor response in animal liver tumor model.

**METHOD AND MATERIALS**

We prepared 4 types of Lipiodol emulsion: A) 10mg of DOX in 0.5 ml of contrast media mixed with 2 ml of Lipiodol, B) 10 mg of DOX in 1.25 ml of contrast media mixed with 1.25 ml of Lipiodol, C) 10 mg of DOX in 0.5 ml of normal saline (NS) mixed with 2 ml of Lipiodol, D) 10 mg of DOX in 1.25 ml of NS mixed with 1.25 ml of Lipiodol. DC bead of 100-300 µm in diameter were loaded with DOX (37.5 mg/ml) according to the manufacturer’s instruction. Drug release from emulsions or DC bead was evaluated in in vitro model. Three weeks after implantation of VX2 carcinomas in the liver, TACE was performed using A) 4:1 volume ratio of Lipiodol and DOX solution, B) 1:1 volume ratio of Lipiodol and DOX solution, C) DC bead.

**RESULTS**
The released amounts (%) of DOX at 24 h are as follows: 20.64 ±0.20% for DC bead, 42.65 ±1.51% for Lipiodol:DOX in NS = 4:1, 45.74 ±2.14% for Lipiodol:DOX in Pamiray = 4:1, 60.92 ±1.45% for Lipiodol:DOX in NS = 1:1, and 56.91 ±2.31% for Lipiodol:DOX in Pamiray = 1:1. AUC value of group A was significantly lower than that of group B (p < 0.05), but there is no significant difference compared to that of group C. AUC value of group B was 3.43-fold higher than that of group C (p < 0.05). Cmax value of group A exhibited significant difference compared to those values of group B and C (p < 0.05). Particularly, Cmax value of group B was 12.12-fold higher than that of group C (p < 0.05).

CONCLUSION

stable Lipiodol emulsion can be created by excessive Lipiodol mixed with DOX dissolved in contrast media. DOX release from Lipiodol emulsion depends on volume ratio of Lipiodol and DOX solution. DC bead has more sustained DOX release than Lipiodol emulsion.

CLINICAL RELEVANCE/APPLICATION

(Dealing with making effective chemoembolic mixture in TACE) DOX -contrast media mixture with excessive lipiodol forms more stable emulsion, and DC bead has more sustained DOX releasing capacity than Lipiodol emulsion. These knowledge may be useful in achieving effective drug delivery to HCC in TACE.

SSC14-03

Conventional Transarterial Chemoembolization versus Drug Eluting Bead-Transarterial Chemoembolization for the Treatment of Hepatocellular Carcinoma

Roman Kloeckner MD (Presenter): Nothing to Disclose, Friederike Prinz: Nothing to Disclose, Christian Ruckes: Nothing to Disclose, Arndt Weinmann: Nothing to Disclose, Christoph Dueber MD: Nothing to Disclose, Michael Bernhard Pitton MD: Nothing to Disclose

PURPOSE

To compare the overall survival (OS) of patients suffering from hepatocellular carcinoma (HCC) treated with lipiodol - based conventional transarterial chemoembolization (cTACE) and drug eluting bead-transarterial chemoembolization (DEB-TACE).

METHOD AND MATERIALS

An electronic search of our radiology information system revealed a total of 674 patients receiving TACE between 11/2002 and 07/2013. 520 received cTACE, and 154 received DEB-TACE. In total, 424 patients were excluded due to a tumor entity different from HCC (n=91), liver transplantation following TACE (n=119), lack of histological grading (n=58), incomplete laboratory values (n=15) and other reasons (e.g. previous systemic chemotherapy, previous cisplatin-based TACE) (n=141). Therefore, 250 patients were included for comparative analysis (174 cTACE; 76 DEB-TACE).

RESULTS

Both groups were not significantly different in terms of sex, etiology of liver cirrhosis, overall status (BCLC), liver function (Child-Pugh), portal invasion, tumor load, and tumor grading (all p>0.05). Mean number of treatment sessions was 4±3.1 in the cTACE group versus 2.9±1.8 in the DEB-TACE group. The median survival in the cTACE group was 409 days (95% CI: 321-488 days) compared to 369 days (95% CI: 310-589 days) in the DEB-TACE group (p=0.76). In the subgroup of Child A patients, the median OS was 602 days (484-792 days) for cTACE versus 627 days (364-788 days) for DEB-TACE (p=0.39). In Child B and Child C patients the OS was considerably lower with 223 days (165-315 days) versus 226 days (114-335 days) (p=0.53).

CONCLUSION

The present study showed no significant difference in OS between cTACE and DEB-TACE in a large and well-selected cohort of HCC-patients.

CLINICAL RELEVANCE/APPLICATION

Currently, there is no firm evidence to prefer DEB-TACE to cTACE. Further prospective randomized trials with a hard endpoint are needed.

SSC14-04

Chemoembolization with Dc Beads Preloaded with Irinotecan (DEBIRI) vs. Doxorubicin (DEBDOX) as a Second Line Treatment for Liver Metastases from Cholangiocarcinoma: Technical Aspects, Complications, and Efficacy

Giulia Agostini (Presenter): Nothing to Disclose, Massimo Venturini MD: Nothing to Disclose, Stefano Cappio MD: Nothing to Disclose, Giulia Cammi: Nothing to Disclose, Francesco Aldo De Cobelli MD: Nothing to Disclose, Alessandro Del Maschio MD: Nothing to Disclose

PURPOSE

TACE with drug-eluting beads is routinely performed using Doxorubicin and Irinotecan in the treatment of HCC and hepatic metastases from colorectal cancer, respectively. Conversely, there is no specific drug indication in the treatment of other hypervascular liver metastases. Aim of our study was to compare the efficacy of DEBIRI vs. DEBDOX in the treatment of unresectable hepatic metastases from cholangiocarcinoma.

METHOD AND MATERIALS

In 2013, 10 patients affected by multiple cholangiocarcinoma hepatic metastases, resistant to the first line CT
regimen, were enrolled: 5 were submitted to lobar/segmental TACE with DEBIRI (100mg Irinotecan/1vial) and 5 with DEBDOX (50mg Doxorubicina/1vial), performed every 3 weeks. Patients treated with DEBIRI received ant-pain pre-medication consisting of a 30 mg of morphine and 3-4 ml of intra-arterial lidocaine. All the procedures were performed with a trans-femoral approach using a microcatheter. Complications and efficacy of the two different types of treatment were assessed with contrast-enhanced MDCT (RECIST and mRECIST criteria) performed at baseline and 72 hours after each procedure.

RESULTS

A total of 32 TACE were performed (mean: 3.2 TACE/patient). All the treatments were well tolerated, with one only case of asymptomatic cholecystitis spontaneously recovered. Response rates assessed at the end of the treatment cycle of patients treated with DEBDOX were 5/5 PD while the ones of the patients treated with DEBIRI were 2/5 PR, 2/5 SD and 1/5 PD, with the appearance of a variable necrosis percentage.

CONCLUSION

Anti-pain drug administration in patients treated with DEBIRI and the use of the microcatheter lead to a good treatment tolerability and a low complication rate. In our experience, DEBIRI was more effective than DEBDOX as a second line treatment of hepatic metastases from cholangiocarcinoma, an extremely aggressive malignancy.

CLINICAL RELEVANCE/APPLICATION

In our experience, DEBIRI was more effective than DEBDOX as a second line treatment of hepatic metastases from cholangiocarcinoma.

SSC14-05

The Effect of Age on Survival Outcomes in Unresectable Hepatocellular Carcinoma Treated with DEB-TACE: Surveillance, Epidemiology and End Results (SEER) Database vs. Tertiary Cancer Center

Minzhi Xing MD (Presenter):  Nothing to Disclose, Nima Kokabi MD :  Nothing to Disclose, Hyun Sik Kim MD :  Nothing to Disclose

PURPOSE

To evaluate the effects of age on survival outcomes in patients with advanced unresectable hepatocellular carcinoma (HCC) treated with Drug-Eluting Bead Chemoembolization (DEB-TACE) or best supportive care in a large-scale population study.

METHOD AND MATERIALS

Under IRB approval, our institute’s cancer registry was queried for patients with advanced unresectable HCC diagnosed from Sept 2005 to Dec 2010, treated with DEB-TACE. Eighteen registries of the U.S. Surveillance, Epidemiology and End Results (SEER) database were queried for patients with advanced HCC not amenable to surgery/radiation diagnosed in the same time period. Baseline characteristics, median overall survival (OS) from HCC diagnosis and median OS from first DEB-TACE were stratified by age at HCC diagnosis. Survival analysis and 95% confidence intervals (CI) were calculated using Kaplan-Meier estimation.

RESULTS

A total of 20,897 SEER patients with unresectable HCC who received neither radiation nor cancer-directed surgery and 231 patients who received DEB-TACE for advanced unresectable HCC were included. Of these, 11649 SEER patients and 155 DEB-TACE patients were <65 years of age at HCC diagnosis, compared with 9248 SEER and 76 DEB-TACE patients who were ≥65 years at diagnosis. All groups were similar for gender, race, bilobar disease, portal vein thrombosis, and mean largest tumor size (p>0.05). Median OS in patients <65 years was similar to patients ≥65 years at HCC diagnosis (4.1 vs. 4.0 months, p>0.05). Significant differences in median OS from HCC diagnosis between groups were observed in patients <65 years at diagnosis (SEER vs. DEB-TACE, 4.0 vs. 23.47 months, p<0.0001) and ≥65 years at diagnosis (SEER vs. DEB-TACE, 4.0 vs. 21.1 months, p<0.0001).

CONCLUSION

In a population-based study, DEB-TACE therapy in patients with advanced, unresectable HCC demonstrated significantly greater median OS compared to best supportive care regardless of age at diagnosis.

CLINICAL RELEVANCE/APPLICATION

Regardless of age at HCC diagnosis, DEB-TACE therapy in patients with advanced, unresectable HCC demonstrates significant survival benefit vs. best supportive care.
To investigate usefulness of diffusion-weighted magnetic resonance imaging (DWI) for early detection of the response after transcatheter arterial chemoembolization using degradable starch microsphere (DSM)-TACE for hepatocellular carcinoma (HCC) compared with contrast enhanced computed tomography (CECT) using the modified RECIST (mRECIST).

METHOD AND MATERIALS

Thirty patients with inoperable multifocal HCC underwent to DSM TACE. DSM TACE was performed every 4 to 6 weeks with a mixture of DSMs and Doxorubicin at a dose of 50 mg/m2 for three time. Magnetic resonance imaging (MRI) including breathhold echoplanar DWI sequences was performed prior to therapy (baseline MRI), 15 days after every DSM TACE (early MRI) as well as after 3 months (follow-up MRI). Intratumoral apparent diffusion coefficient (ADC) were measured independently by two radiologists. Relative change in ADC values (%ADC), α-fetoprotein level and tumor response on follow-up with contrast CECT after 3 months were determined. HCC lesions were divided into two groups, responder and non-responder. The correlation between %ADC and mRecist results was determined, and %ADC was compared between the two groups. Statistical analysis was performed using univariate comparison, and paired t test as well as Pearson's correlation.

RESULTS

Median progression-free survival (PFS) was 8 months, and overall survival was 21 months. Survival analyses showed significant effects of pretreatment α-fetoprotein level (P = .03) and ADC ratio (P < .005) on PFS and substantial effects of mRECIST (.05 < P < .1). After DSM TACE, the percent change in ADC (%ADC) from before to after therapy was significantly increased in non-responder lesions (79.2+/−11.4%) compared to responder lesions (7.0+/−49.7%, p=0.001). Positive correlations were observed for relative change between %mean ADC and complete or partial response (r = 0.536). Mean ADC were significantly greater in the responder group than in the non-responder group.

CONCLUSION

The ADC ratio 1 month after DSM TACE was an independent predictor of PFS, which showed stronger association with tumor response than mRECIST evaluated with CECT. In this study, therapeutic efficacy of DSM-TACE in HCC using DWI MRI analysis could be demonstrated.

CLINICAL RELEVANCE/APPLICATION

Diffusion-weighted magnetic resonance imaging (DWI) could be useful for early detection of response in patients with multifocal HCC treated with DSM TACE.

CRP as a Predictor of Response to TACE in HCC

PURPOSE

The prognostic value of C-reactive protein (CRP) in patients with hepatocellular carcinoma (HCC) is well established, but there exists relatively little data in its use in HCC patients undergoing transarterial chemoembolization (TACE). We sought to look at outcomes in our institutions in patients who underwent TACE for HCC. We further sought to evaluate the value of pre-embolization CRP levels in predicting clinical and radiological outcomes following TACE.

METHOD AND MATERIALS

This multi-center study involved a retrospective review of 34 patients (73±7.9 years, 29 male) who underwent a total of 100 TACE procedures over a six-year period. Pre-procedure CRP values were available in 90% of cases. Other factors evaluated included liver function tests and tumour markers (Bilirubin, Alkaline Phosphatase, transaminases (AST/ALT), gamma glutamyl transpeptidase (GGT), and alpha-fetoprotein). Following TACE, we evaluated both clinical factors (overall survival) and radiological response to TACE (as measured by modified RECIST criteria (mRECIST) on follow-up CT at 3 months). SPSS was used to analyze the results via T-Test, Mann-Whitney test, Pearson correlation, Spearman correlation and Kaplan-Meier analysis.

RESULTS

Follow-up imaging was available in 85% of patients. Median follow-up was 28 months (range 1-76). No association was found between CRP and liver function tests, tumour markers, patient age or other biochemical parameters (r<0.3 for all comparisons). An abnormal pre-procedure CRP was found to be independently and significantly associated with both disease response (on a per procedure basis on follow up imaging, p<0.001) and overall patient survival. A CRP >20mg/l before first TACE treatment carried the worst prognosis (mean survival 9.25 Vs 17.76 months, p=0.007).

CONCLUSION

Serum CRP measurement can be used to predict response to TACE in patients with HCC.

CLINICAL RELEVANCE/APPLICATION

CRP is a cheap and widely-available test which can be used as a pre-procedural predictor of response to TACE in patients which HCC. It can be used to help risk-stratify those patients who would benefit from TACE.
SSC14-08 Trans-Arterial EThanol Embolisation (TAETE) vs Conventional Chemoembolisation (cTACE) in the Treatment of BCLC Intermediate Stage HCC

Francesco Somma MD (Presenter): Nothing to Disclose, Roberto D'Angelo MD : Nothing to Disclose, Gianluca Gatta : Nothing to Disclose, Roberto Grassi : Nothing to Disclose, Francesco Fiore MD : Nothing to Disclose

PURPOSE

Hepatocellular carcinoma (HCC) is nowadays the third leading cause of cancer deaths worldwide. A variety of treatment modalities have been reported including resection, chemoembolisation, external irradiation, radiofrequency or percutaneous ethanol ablation. Our aim is to retrospectively evaluate the efficacy and safety of transarterial embolisation of intermediate HCC, using a mixture 1:1 of Ethanol and Lipiodol, that we named Trans-Arterial EThanol Embolisation (TAETE), compared with conventional Trans-Arterial Chemo-Embolisation (cTACE)

METHOD AND MATERIALS

87 patients (37.93% male; 62.07% female; range of age 36-86 years) with documented hepatic lesions of 1.4 to 5.4 cm in size were elected to TAETE (Ethanol and Lipiodol, 1:1) or cTACE (Epirubicin and Lipiodol), through a super-selective catheterization with direct injection in the tumor-feeding arteries. Both procedures were followed by the intrarterial administration of embolizing agents (70-150µ).

RESULTS

TAETE and cTACE therapies were performed in 45 and 42 patients, respectively. Thirty days after the procedure, a Multislice Computed Tomography (MSCT) showed in all patients at least partial response according to RECIST1.1 and EASL criteria, while in 51/87 (58.62%) patients a complete resolution was observed, with no statistically significant difference between the two groups. On the contrary, there was significant difference in the overall incidence of side-effects, such as in the occurrence of post-embolisation syndrome (p<0.001).

CONCLUSION

Compared to cTACE, TAETE showed to be more effective in the size-reduction of tumoral mass with similar anti-tumor effects at thirty-day MSCT control and better toxicity profile, which makes it extremely useful in patients with more than one lesion or in case of relapse.

CLINICAL RELEVANCE/APPLICATION

Considering the onset of adverse events according to CTCAE version 4.0 (2009), TAETE is less invasive than cTACE (p=0.019, chi2-test with Yates-correction), showing no significative difference in the radiological tumor response according to mRECIST and EASL (p=0.958, chi2 test). TAETE could be used in elderly HCC patients or in case of multiple treatments

SSC14-09 90Y Loaded Glass Microspheres versus Sorafenib for Hepatocellular Carcinoma with Portal Vein Thrombosis: A Retrospective Study

Yan Rolland MD, PhD (Presenter): Consultant, BTG International Ltd, Julien Edeline : Nothing to Disclose, Eveline Boucher : Nothing to Disclose, Etienne Garin MD : Consultant, BTG International Ltd

PURPOSE

PVT is a main negative prognostic factor for HCC patients. The goal of this study is to analyse retrospectively patients treated with ThereSphere (T) or sorafenib (S) or both TheraSphere plus sorafenib (T+S).

METHOD AND MATERIALS

61 consecutive PVT patients were retrospectively included. Patients treated with sorafenib received a standard dose. Patients treated with TheraSphere were treated using a personalized dosimetric approach. Median progression free survival (PFS) and overall survivals (OS) were estimated with the Kaplan-Meier methos and compared with a log-rank test.

RESULTS

18 patients received T only (30%), 29 S only (48%) and 14 received both T+S (23%). Main PVT was present in 38% of the patients treated by T and 52% for those treated by S only (ns). For patients treated with T the mean lobe dose was 146Gy and 13 patients (40%) received an intensification (mean lobe dose = 197Gy), PFS was 7.7 m (IC 95% : 6.5-8.9) in the group T vs 3.5 (IC 95% : 1.8-5.2) in the group S only (p = 0.026). OS was 23.4 months (IC 95% : 20.6-26.2) in the group T vs 5.1 (IC 95% : 2.3- 7.8) in the group S alone (p<0.001). In the group T, OS was not significantly different if the patients received T alone or both T+S, respectively 24.0months vs 21.5 months (p = 0.96). For patients with a maximum of 3 lesions OS was still significantly higher for patients treated by T (23.8 months) than for those treated by S only (5.1 months, p<0.001). For patients with unilateral PVT results were still significantly better for T : OS were 24.0 vs 6.5 months for patients treated respectively with T or S alone (p<0.001).

CONCLUSION

In this retrospective study TheraSphere, using a personalized dosimetric approach and intensification, significantly increases OS of PVT patients versus sorafenib.

CLINICAL RELEVANCE/APPLICATION

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glass microsphere radioembolization significantly increases overall survival for hepatocellular carcinoma with portal vein thrombosis

GIS-MOA

Gastrointestinal Monday Poster Discussions

Scientific Posters

GI

AMA PRA Category 1 Credits ™: .50

Mon, Dec 1 12:15 PM - 12:45 PM  Location: GI Community, Learning Center

Participants

Moderator
Rizwan Aslam MBBCh : Research support, Bayer AG

Sub-Events

GIS337

Reducing Beam Hardening Artifact by Monochromatic Images with CT Spectral Image—Quantitative Study in Phantom (Station #1)

chunwu zhou : Nothing to Disclose, Xinming Zhao MD : Nothing to Disclose, Liming Jiang MD : Nothing to Disclose, Ning Guo : Nothing to Disclose, Zheng Zhu : Nothing to Disclose, Jing Zhao (Presenter): Nothing to Disclose

PURPOSE

Use a quantitative phantom to evaluate the ability of beam hardening artifact (BHA) reduction by monochromatic images with CT spectral image by comparison with traditional polychromatic X-ray imaging (TPXI).

METHOD AND MATERIALS

A cyclical phantom with diameter of 25cm (Quantitative Standard Pulsating Phantom QSP-1, Fuyo Corporation) was used. Three fresh pig humerus bones and three 10mm-diameter tubes filled with iodine contrast were placed in the center of periphery of the phantom to mimic human’s bones and arteries. The phantom with bones and tubes was immersed in a water tank. Under the condition of helical scan with 120kVp, the CT value of three bones were 1025Hu, 905Hu and 770Hu respectively, the CT value of three tubes were 1200Hu, 1000Hu and 840Hu respectively. Both CT spectral imaging mode (protocol A) and routine CT mode (protocol B) with 120kV and 600mA were used. The other scan parameters were the same for two protocols, including FOV of 25.0cm, slice thickness of 5mm, rotation speed of 0.8s/r and pitch of 0.984. Both the monochromatic images (40-140keV, interval of 10keV) and 120kV TPIXI images were reconstructed. Beam hardening artifact index was calculated for each image, according the formula: BHA index=SQRT(ROIa^2-ROIb^2), where ROIa denotes to the SD value of water in the region adjacent to tubes with obvious BHA, ROIb denotes the SD value of water in the region far away from tubes and bones without obvious BHA. The area of ROIa and ROIb were both about 50mm2. Data was compared with rank sum test.

RESULTS

The BHA index of 120kV TPIXI image was 20.45±6.30. The BHA index of each monochromatic image set (ranging from 1.17±0.86 to 9.72±1.32) was lower than that of 120 TPIXI image (p<0.001). Monochromatic images at 80keV had the lowest BHA index (1.17±0.86). The variation of BHA index at 90keV to 140 keV(3.13±0.46 to 4.71±1.03) was smaller than that at 40keV to 70keV(9.72±1.32 to 3.28±0.26)(p<0.01).

CONCLUSION

Monochromatic images have less beam hardening artifact than TPIXI images, high keV images(80keV-140keV) are superior to low keV images(40keV-70keV).

CLINICAL RELEVANCE/APPLICATION

CT spectral image provides less beam hardening artifact and more accurate CT attenuation number, which may help clinical diagnosis.

GIS338

Imaging Outcomes of Liver Imaging Reporting and Data System (LI-RADS) 2, 3 and 4 Categories on CT and MR Examination (Station #2)


PURPOSE
The Liver Imaging Reporting and Data System (LI-RADS) released by the ACR is a comprehensive system for standardized interpretation and reporting of CT and MR examinations performed in patients at risk for hepatocellular carcinoma (HCC). The purpose of this study was to assess imaging outcomes of LR-2 (probably benign), LR-3 (intermediate probability for HCC) and LR-4 (probable HCC) observations. Specifically, we sought to determine the proportion of LR-2, LR-3, and LR-4 observations that, during clinical imaging follow-up and in the absence of treatment progress regress or remain stable in category code.

METHOD AND MATERIALS

This was a retrospective, observational, longitudinal, single-center study of patients who underwent clinical CT or MRI examinations for surveillance for or diagnosis of HCC.

RESULTS

The final study cohort had 158 patients (87 men, 71 women; mean age 59.0 years). All patients had chronic liver disease, and most had cirrhosis. The patients had a total of 284 observations (LR-4 [n = 53], LR-3 [n = 170], and LR-2 [n = 61]). Among the 53 LR-4 observations, 18 (34%) progressed to LR-5 during follow-up (15 within six months, one within 12 months, two at more than 12 months), 25 (47%) remained stable, and 9 (17%) regressed in category. Among 170 LR-3 observations, 7 (4%) progressed to LR-5 during follow up (0 within six months, two within 12 months, and five at more than 12 months), 10 (6%) progressed to LR-4, 47 (28%) remained stable, and 106 (62%) regressed to LR-1 or LR-2. All 61 LR-2 observations remained stable or regressed during follow-up.

CONCLUSION

LR-2, LR-3, and LR-4 observations have different imaging outcomes. One-third of LR-4 observations progressed to LR-5 within 6 months. Most LR-3 observations remained stable or regressed. All LR-2 observations remained stable or regressed.

CLINICAL RELEVANCE/APPLICATION

The LI-RADS categories were developed mainly by expert opinion. This study provides preliminary validation of the LR-2, LR-3, and LR-4 categories by showing that they have different imaging outcomes.

GIS339

Locally-advanced Pancreatic Adenocarcinoma: Reassessment of Response with CT Scan after Neoadjuvant Chemoradiotherapy (Station #3)

Christophe Cassinotto MD (Presenter): Nothing to Disclose, Jean-Pierre Lafourcade : Nothing to Disclose, Amaury Mouries : Nothing to Disclose, Bruno Lapuyade : Nothing to Disclose, Eric Terrebonne : Nothing to Disclose, Herve Trillaud MD : Nothing to Disclose, Genevieve Belleanné : Nothing to Disclose, Laurence Chiche MD : Nothing to Disclose, Christophe Laurent : Nothing to Disclose, Michel Montaudon MD : Nothing to Disclose

PURPOSE

To prospectively evaluate the ability of CT scan to determine tumor response and predict resectability after neo-adjuvant chemo-radiotherapy (CRT) in patients with non-metastatic locally-advanced pancreatic cancer (LAPC).

METHOD AND MATERIALS

This study received ethics approval, and all participants provided written informed consent. We prospectively enrolled consecutive patients with cephalic LAPC who underwent surgical exploration and/or resection following neoadjuvant CRT from June 2009 to May 2013. Two radiologists independently analyzed the baseline and post-CRT CT scans recording the size, attenuation, and circumferential vascular contacts of the tumor. Associations between the post-operative histological grade of tumor response (pTNM) and the clinical, biological and CT scan criteria were assessed using Spearman's correlation coefficients. CT scan criteria related with the presence of R0 resection were assessed using logistic regression.

RESULTS

Forty-seven patients were included, 33 with R0 resection, and 14 with R1 or no resection. Variables demonstrating a significant correlation with the histological tumor classification of tumor response were: post-CRT CA19-9 level (r=0.46), post-CRT tumor largest axis (r=0.44), post-CRT largest+small axis (r=0.46), change in largest axis (r=0.31), change in largest+small axis (r=0.39), change in SMV/Portal vein contact (r=-0.38), and post-CRT SMA contact (r=0.34). Partial regression of tumor contact with the SMV/Portal vein was associated in all cases with R0 resection (10/10 patients, PPV = 100%), and partial regression of tumor contact with any peripancreatic vascular axis was associated with R0 resection in 91% of cases (20/22 patients, PPV = 91%). Persistence of SMV/Portal vein stenosis after CRT was not predictive for R1 resection.

CONCLUSION

Partial regression of tumor-vessel contact indicates suitability for surgical exploration, irrespective of the degree of decrease in tumor size or the degree of residual vascular involvement.

CLINICAL RELEVANCE/APPLICATION

CT criteria based on the degree of tumor to vessel contact could provide valuable assistance in making decisions about therapy after completion of neo-adjuvant chemo-radiotherapy.
Evaluation of Tumor Recurrence after Whipple Surgery Using ssDECT (Station #4)

Manuel Patino MD (Presenter): Nothing to Disclose, Jorge Mario Fuentes MD: Nothing to Disclose, Pritesh Patel MD: Nothing to Disclose, Avinash Ranesh Kambadakone MD, FRCR: Nothing to Disclose, Dushyant V. Sahani MD: Research Grant, General Electric Company

PURPOSE
To evaluate performance of Single source Dual-energy CT (ssDECT) in detection of local recurrence on post Whipple patients compared to conventional single-energy CT scans.

METHOD AND MATERIALS
Thirty-five patients (17 males; 18 females) with history of pancreatic adenocarcinoma and Whipple procedure (0.1 to 5 years after the procedure) underwent a follow up ssDECT (GE-CT750 HD, 140/80 kV). Two blinded radiologists independently reviewed the 140 kVp and DECT processed iodine and monochromatic images in a separate session for the presence of local recurrence, liver metastasis, and surgical complications and provided recommendations. Multiple follow up studies, tumor markers (CA-19.9) and histology served as standard reference. Quantitative analysis of the iodine concentration in the surgical bed was performed, and subsequently compared for post-operative changes and recurrence using t-test.

RESULTS
15 patients had local recurrence and 20 showed expected post-operative changes. The sensitivity and specificity for SECT for local recurrence was 75% and 65% for R1, and 70% and 65% for R2 and for DECT it was 86% and 75% for R1, and 83% and 70% for R2. Interobserver agreement for DECT was good with a kappa value of 0.7. Iodine concentration was different in patients with local recurrence vs. those with expected changes (p

CONCLUSION
ssDECT shows higher sensitivity and specificity for diagnosing local recurrence detection after Whipple surgery compared to SECT. Tumor recurrence can be differentiated from normal post operatory changes based on iodine quantification.

CLINICAL RELEVANCE/APPLICATION
Distinction between normal postoperative changes vs. tumor recurrence after Whipple procedure impacts patient management, and can be challenging on conventional CT. DECT have potential to overcome these limitations by mapping the iodine distribution within tumor and normal tissue.

Spectral CT in Rabbit VX2 Liver Tumors: Image Fusion Technology Associated with Monochromatic Image (Station #6)

Wang Mingyue (Presenter): Nothing to Disclose, Jianbo Gao MD: Nothing to Disclose, Zhou Yue: Nothing to Disclose

PURPOSE
To evaluate the value of image fusion technology associated with monochromatic image of spectral CT

METHOD AND MATERIALS
Twenty-four rabbits with VX2 liver tumors underwent spectral CT, On the 8th day after implantation. The conventional 140kVp polychromatic images (QC) and monochromatic images with energy level from 40 to 140 keV were generated. In the arterial phase the optimal CNR keV (OP) and 70keV were choosen and the fusion image (OP+70)keV was generated from OP plus 70keV. The tumor-to-liver contrast-to-noise ratio (CNR) and image noise 0f the four groups were calculated. The lesion conspicuity scores(LCS) and overall image quality scores(OQS) in the four groups were recorded.

RESULTS
The CNR of the group (OP+70) had no significant differences from that of the group OP, but the image noise of group (OP+70) was significantly lower than that of group OP (2.63±2.59vs2.81±2.74,p=0.288;9.12±1.28 vs7.89±1.35,p=0.002),the CNR of the OP and (OP+70) were significantly higher than that of group 70(1.92±2.39,p

CONCLUSION
Image fusion technology associated with monochromatic image of spectral CT which combine the advantage of high CNR and the advantage of low noise, improve the lesion detection and image quality.

CLINICAL RELEVANCE/APPLICATION
improve the lesion detection and image quality

Hepatic Steatosis after Percutaneous Intraportal Pancreatic Islet Transplantation (PIPET) in 108 Allo-and Auto-Transplanted Patients: Can Ultrasound Predict the Clinical Outcome? (Station #8)

Giulia Agostini (Presenter): Nothing to Disclose, Massimo Venturini MD: Nothing to Disclose, Giulia Querques: Nothing to Disclose, Paola Maffi: Nothing to Disclose, Antonio Secchi: Nothing to Disclose, Alessandro Del Maschio MD: Nothing to Disclose

PURPOSE
GIS341
GIS343
GIS345
PIPIPIT is a less invasive, repeatable therapeutic option in brittle type 1 diabetes, compared to surgical pancreas transplantation: it can be performed after kidney-transplantation (IAK), alone (ITA) in type-1 diabetic pts without chronic renal insufficiency, or as an autotransplantation (IAT) after pancreatectomy (immunosuppression unnecessary). Steatosis is a consequence of the islets’ engraftment: its meaning is controversial. Our retrospective longitudinal study aimed to assess hepatic steatosis incidence at ultrasound (US) after islet auto- and allotransplantation, and to identify any relationship with graft function.

METHOD AND MATERIALS
From 1989 to 2012, 108 pts (33 IAK, 50 ITA, 25 IAT) underwent PIPIT, which is performed under a combined US and fluoroscopic guidance. US was performed at baseline/6/12/24 months. Steatosis first detection/prevalence/duration/distribution were recorded. Steatotic (S) and non-steatotic patients (NS) were compared for the following parameters at baseline/6/12/24 months: insulin-independence-rate, β-score, C-peptide, glycated-hemoglobin, exogenous-insulin-requirement, fasting-plasma-glucose, infused-islet-mass. C-peptide is the traditional marker of islet function, but β-score is a more comprehensive parameter, including all the previously mentioned ones.

RESULTS
Steatosis was found in 21/108 pts, 24% (20/83) allotransplanted, 4% (1/25) autotransplanted (better outcome), with first detection at 6 months, highest prevalence at 1 year (18 cases). Infused-islet-mass was significantly higher in S than NS patients (IE/kg: S=10.822; NS=6.138). Metabolically, S pts had worse basal conditions (β score: S=1.7 ± 1.6; NS=2.8 ± 2.8), but better islet function at the time of steatosis first detection (β score: S=3.9 ± 2.0; NS=2.9 ± 2.3), after which a progressive islet exhaustion, along with steatosis disappearance, was observed. Conversely, in NS pts these parameters remained more stable in time.

CONCLUSION
Steatosis at US seems to be related to islet mass and overworking activity. Presence of steatosis precedes metabolic alterations, can predict graft dysfunction addressing therapeutic decisions before islet exhaustion. Absence of steatosis doesn’t allow any conclusion.

CLINICAL RELEVANCE/APPLICATION
Steatosis at US precedes metabolic alterations and can predict graft’s dysfunction addressing to therapeutic decisions before islet exhaustion. If steatosis doesn’t appear, no conclusion can be drawn.

GIE179
Liver Imaging: Review of Commonly Used and Developing MRI Techniques (Station #9)

The Powerful Role of of Barium Esophagorgraphy in Detection of Important Thoracic Esophageal Pathologies (Station #10)
Radiology for Dysphagia: When the Endoscopy Cannot Help (Station #11)

Alberto Ivo Carbo MD (Presenter): Nothing to Disclose, Sana Naeem MD: Nothing to Disclose, Meghna Chadha MD, MBBS: Nothing to Disclose

TEACHING POINTS

- To discuss causes and pathophysiology of dysphagia that can be diagnosed by radiology. Pharynx: motility disorders. Upper esophageal sphincter: diminished opening, delay opening, early closing. Esophagus: webs, motility disorders, severe strictures, perforations, extrinsic compressions
- To analyze the contribution of radiology in the diagnosis of causes of dysphagia that cannot be solved by endoscopy

TABLE OF CONTENTS/OUTLINE

- The symptom of dysphagia
- Anatomy and pathophysiology of dysphagia
- Imaging techniques
- Pharyngeal swallowing abnormalities
- Cricopharyngeal dysmotilities
- Pharyngoesophageal webs
- Esophageal motility disorders
- Pharyngoesophageal tears and perforations
- Severe pharyngeal and esophageal strictures
- Extrinsic compressions
- Conclusions

Three-Dimensional Ultrasonography of Biliary Tract Disorders (Station #12)

Jessica Kurian MD (Presenter): Nothing to Disclose, Susan Judith Frank MD: Nothing to Disclose, Benjamin Taragin MD: Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is to describe the use of three-dimensional ultrasonography (3DUS) in diagnosis of congenital and acquired biliary tract disorders. Teaching points include:

1. Review the current literature pertaining to 3DUS and the biliary tract
2. Review the basic technical aspects of 3DUS
3. Understand the normal appearance of the biliary tract on 3DUS
4. Illustrate the 3DUS features of various biliary tract disorders
5. Using examples, discuss the role of 3DUS in biliary tract imaging, including advantages and disadvantages, comparison to CT, MRCP and ERCP, and potential future directions

TABLE OF CONTENTS/OUTLINE

1. 3DUS technique
2. 3DUS of the normal biliary tract
3. Case examples of biliary pathology illustrated by 3DUS. The entities presented will include but are not limited to: Cholelithiasis and choledocholithiasis, cholangiocarcinoma and gallbladder carcinoma, adenomyomatosis, gallbladder polyps, choldeochal cyst
4. Future directions and summary

Use of a Staged US and CT Protocol to Diagnose Acute Appendicitis in Adults (hardcopy backboard)

Menaka Nadar MD (Presenter): Nothing to Disclose, Arun Krishnaraj MD, MPH: Nothing to Disclose

TEACHING POINTS

1. To review the current ACR guidelines for imaging in patients with suspected acute appendicitis.
2. To review the US findings of acute appendicitis.
3. To explain the role of US in diagnosing acute appendicitis in appropriately selected adults.

TABLE OF CONTENTS/OUTLINE

1. Presentation/workup of acute appendicitis
2. ACR guidelines for imaging patients with suspected acute appendicitis
3. US findings in acute appendicitis
4. Staged US and CT protocol for imaging appropriately selected adults with suspected appendicitis
5. US evaluation of the appendix can be effective at diagnosing appendicitis in a variety of patients -US first can avoid unnecessary radiation and is lower cost than CT
6. In cases of a nonvisualized appendix, but inflammatory changes in the right lower quadrant (i.e. free fluid or increased echogenicity within the surrounding fat), CT is recommended for further evaluation.
7. In cases of equivocal ultrasound, further evaluation with CT or other imaging can be performed as clinically indicated.
8. Limitations of ultrasound in imaging adults with suspected appendicitis

GIS-MOB

Gastrointestinal Monday Poster Discussions

Scientific Posters

GIS340

Study of Quantitative Dynamic Contrast-enhanced Magnetic Resonance Imaging (DCE-MRI) with Liver-specific Contrast Agent—Gd-EOB-DTPA in a VX2 Rabbit Liver Tumor Model (Station #1)

Chuanmiao Xie MD, PhD: Nothing to Disclose, Zhijun Geng MD, PhD (Presenter): Nothing to Disclose, Kangqiang Peng: Nothing to Disclose, Zhimin Jiang: Nothing to Disclose
PURPOSE

Quantitative dynamic contrast enhanced MRI (DCE-MRI) can offer information related to tumor perfusion and permeability (Ktrans), rate constant (Kep), extravascular extracellular volume fraction (Ve), and distribution volume (DV). The purpose of this article is to explore the feasibility and diagnostic value of quantitative DCE-MRI with liver-specific contrast agent_ Gd-EOB-DTPA in VX2 rabbit liver tumor model.

METHOD AND MATERIALS

Sixteen rabbits (Body weight=3Kg, random gender) were transplanted the VX2 tumor cell. Fourteen days after tumor transplantation, all the rabbits underwent a liver DCE-MR scan in a 3.0 T MAGNETOM Verio MR scanner (Siemens Healthcare, AD, Germany) with the administration of Gadoxetic acid, disodium at the flow rate of 1mL/s, every rabbit received 0.6 mL GBCA (0.1mmol/Kg) in the DCE-MR procedure. Ktrans, Kep, Ve and DV were measured in the tumor lesion and the normal liver tissue in the same slice. A pathologic examination was also done.

RESULTS

Hepatocellular carcinoma was diagnosed in sixteen rabbits by pathologic examination. The Ktrans ,Kep, Ve and DV of liver tumor lesion are 0.119±0.011, 5.670±0.036, 0.101±0.033, 0.389±0.043. And the results of normal area is 0.022±0.006, 2.827±0.235, 0.045±0.007, 0.932±0.168. The Ktrans and Kep of liver tumor lesion were significant higher than the normal area (p<0.001). And the DV of liver tumor lesion was lower than the normal area (p<0.005).

CONCLUSION

In VX2 rabbit liver tumor model, quantitative DCE-MRI imaging with Gadoxetic acid, disodium can develop precise quantitative result (Ktrans, Kep, Ve and Vd) for diagnosis. There is important clinical value of quantitative DCE-MRI imaging in liver disease diagnosis and differential diagnosis.

CLINICAL RELEVANCE/APPLICATION

Gadoxetic acid, disodium is a liver-specific gadolinium based contrast agent can be uptaken by hepatocytes and excreted by bile duct. The Kep and Ve are different from the non-specific gadolinium based contrast agent due to the difference of excretion pathway between the two kinds of contrast agent. Hence, we must be careful when we analyze the quantitative DCE-MR data.

GIS346

A Preliminary Study of CT Angiography on Small Tumor Blood Supply Arteries of Gastrointestinal Tract Malignant Tumors with Low Concentration Contrast Medium Optimizing Gemstone Spectral Imaging Technique Using Single Source Dual-energy CT (Station #2)

Shifeng Tian (Presenter): Nothing to Disclose, Ailian Liu MD : Nothing to Disclose, Jinghong Liu : Nothing to Disclose, Chen Anliang : Nothing to Disclose, Yijun Liu : Nothing to Disclose, Renwang Pu MBBCh, FRCP : Nothing to Disclose

PURPOSE

To investigate the low concentration contrast medium combined with optimal monochromatic parameters of CT angiography (CTA)on small tumor blood supply arteries of gastrointestinal tract malignant tumors using single source dual-energy CT spectral imaging(GSI)technique.

METHOD AND MATERIALS

This study was approved by the ethics committee of our hospital. 71 patients with gastrointestinal tract malignant tumors were analyzed prospectively. All the cases were randomly divided into two groups termed A and B. Group A contained 33 cases using high concentration of contrast medium in routine scan, lines of conventional 120 kVp polychromatic energy full abdominal scan and tri-phase dynamic enhanced scan, concentration of 350 mg I/ml contrast medium was injected; group B contained 38 cases using low concentration of contrast medium in optimal monochromatic parameters scan group, followed by routine tri-phase total abdominal scan using spectral CT imaging injected concentration of 270 mg I/ml contrast medium. The images of two groups were reconstructed and evaluated by two radiologists using 5-scale score. The inter observer agreement was evaluated by Kappa and subjective rating were compared by Mann – Whitney U. CT HU value, image noise , contrast- to- noise ratio (CNR) and CT dose index(CTD Ivol)were compared by independent sample t test.

RESULTS

The inter observer agreement for subjective scores is very good (Kappa value > 0.80); ICC (ICC value > 0.75). Subjective image quality scores, CT HU values, image noise, CNR and CTDIvol of high concentration group and low concentration group were 2.64±0.86 points and 3.53±0.69 points, 242.80±41.44HU and 408.41±50.72HU, 21.02±2.66HU and 18.67±2.18HU, 8.95±2.51 and 18.60±2.17. The differences were statistically significant (P < 0.05). The CTDIvol of two groups were 17.84±4.68mGy and 16.87±0.00mGy respectively, the differences was no statistically significant (P =0.205).

CONCLUSION

The low concentration contrast medium optimal monochromatic mode can improve CTA quality of small tumor blood supply arteries of gastrointestinal tract malignant tumors with GSI technique using single source dual-energy CT, and the radiation dose not increase.

CLINICAL RELEVANCE/APPLICATION
The low concentration contrast medium optimal monochromatic mode can reduce the concentration of contrast medium, reduce the incidence of contrast medium side effects.

**GIS347**

**Semi-automatic Imaging Feature Analysis for Assessment of Vascular Invasion in Hepatocellular Carcinoma (HCC): A Radiogenomic Pilot Study (Station #3)**

Thorsten Persigehl MD (Presenter): Nothing to Disclose, Xiaotao Guo PHD: Nothing to Disclose, Elizabeth Verna: Nothing to Disclose, Jean Emond: Nothing to Disclose, Lawrence H. Schwartz MD: Nothing to Disclose, Binheng Zhao DSc: License agreement, Varian Medical Systems, Inc License agreement, Keosys License agreement, Hinacom Software and Technology, Ltd License agreement, AG Mednet, Inc

**PURPOSE**

Liver transplantation (LT) represents the only curative treatment of HCC in liver cirrhosis. Commonly used morphologic selection criteria, such as Milan criteria, are mainly based on tumor size and number of lesions, but do not take into account microvascular invasion as a major risk factor for tumor recurrence after LT. The purpose of this pilot study was to evaluate semi-automatic imaging feature analysis for assessment of vascular invasion at first staging MRI of HCC patients who underwent LT.

**METHOD AND MATERIALS**

In this IRB-approved, retrospective pilot study, baseline MRIs (from 2003-2009) of 88 HCC patients with a total of 144 suspicious lesions were included. Lesions were semi-automatically delineated at arterial DCE-MRI. The imaging features of 2D roundness factor (RF: defined as a function of tumor perimeter and area) and 3D compactness factor (CF: defined as a function of tumor surface and volume), as well as the maximum tumor diameter (Dia) and volume (Vol) were calculated. Computer-derived results were correlated (A) for all HCC lesions and (B) for the worst index lesion per patient (e.g. lowest RF) with the pathologically reported micro- and/or macrovascular invasion at the explanted liver after LT (from 2004-2010). Chi-square (p-value) and AIC-based statistics were calculated.

**RESULTS**

Despite general limitations (e.g. various bridging times and different treatments before LT), we found a positive association between all imaging findings at staging MRI (RF, CF, Dia, and Vol) and any vascular HCC invasion at explant pathology after LT (p=.001/.009/.003/.019). However, the combined RF/Dia performed best (RF/Dia=88.9; RF=89.9, and Dia=93.7). Moreover, RF and CF correlated strongly with the microvascular invasion on lesion (p=.002/.009) and patient basis (p=.003/.045).

**CONCLUSION**

In our pilot HCC study, the semi-automatic calculated roundness factor (RF) seemed to allow a non-invasive prediction of vascular invasion at the staging MRI, and performed better than simple size or volume measurements.

**CLINICAL RELEVANCE/APPLICATION**

Non-invasive semi-automatic imaging feature analysis might provide an independent staging biomarker for new advanced selection criteria in HCC before liver transplantation.

**GIS348**

**Perfusion Computed Tomography for Pancreas Cancer Imaging Using a 320 Channel Wide Detector (Station #4)**

Jeong Hee Yoon MD (Presenter): Nothing to Disclose, Jeong Min Lee MD: Research Grant, Guerbet SA Equipment support, Siemens AG Research Grant, Bayer AG, Hackjoon Shim: Employee, Toshiba Corporation, Joon Koo Han MD: Nothing to Disclose, Byung Ihn Choi MD, PhD: Research Consultant, Samsung Electronics Co Ltd

**PURPOSE**

To establish the protocol of perfusion computed tomography (CT) using a 320-detector CT for pancreas tumor evaluation.

**METHOD AND MATERIALS**

This prospective study was approved by our institutional review board and informed consent was obtained from all patients. A total of 27 patients (M:F=22:5, mean age 52 years) with pancreas tumors were enrolled. Among them, 18 patients underwent pancreas resection (group 1: pancreas adenocarcinoma [PAC], n=14; neuroendocrine tumor [NET], n=3; and undifferentiated carcinoma n=1) and the remaining 9 patients received chemotherapy for PAC (group 2, Gemcitabine-based [n=4], and FOLFIRINOX [n=5]). All patients underwent perfusion CT before treatment, and group 2 underwent follow-up perfusion CT after finishing 2nd cycles of chemotherapy. Perfusion CT scan was performed with 100kVp, volumetric scan, and followed by routine abdominopelvic CT for extrapancreatic imaging. The perfusion parameters obtained by maximal slope (arterial flow, [AF]) and Patlak models (Flow, blood volume [BV]) were compared between tumors and pre- and post-chemotherapy CT. Parameters were also compared between non-responder (PD, SD) and responder (PR, CR).
RESULTS

PAC showed significantly lower AF, BV than normal parenchyma (P<0.001), and NET (P<0.001). However, there was no significant differences of flow among PAC, NET and normal pancreas (P>0.05). Between responder (n=3) and non-responder (n=6), there were no significant differences of initial perfusion CT parameters between two groups (P>0.05). However, responders showed early rise of BV, compared to non-responders (BV: 142.0±30.9, 23.2±56.9%, respectively). In nine patients who received chemotherapy, there was no significant difference of perfusion parameters between different chemotherapy regimen groups.

CONCLUSION

Perfusion CT might provide additional information for pancreas tumor characterization and response evaluation. In addition, combining abdominopelvic CT with perfusion CT provided all-in-one protocol for patients with pancreas tumor.

CLINICAL RELEVANCE/APPLICATION

Perfusion CT may serve additional role for pancreas tumor imaging, and may predict pathophysiologic changes of tumors non-invasively.

GIS349

Prevalence of Reticular Hypointensity on T1-weighted Gadoxetate Enhanced MRI in Patients Receiving Chemotherapy for Colorectal Cancer (Station #5)

Henry Ho Ching Tam MBBS (Presenter): Nothing to Disclose, Angela Mary Riddell MBBS: Nothing to Disclose, Gina Brown MD, MBBS: Nothing to Disclose, Toni Wallace BSc: Nothing to Disclose, David John Collins BSc, BA: Nothing to Disclose, Ian Chau: Nothing to Disclose, Dow-Mu Koh MD, FRCR: Nothing to Disclose

PURPOSE

Reticular hypointensity on T1-weighted gadoxetate-enhanced MRI (EOB MRI) is a feature of sinusoidal obstruction syndrome (SOS) reported with oxaliplatin chemotherapy. However, the prevalence of this appearance is not known. We evaluated the prevalence of SOS on hepatocellular phase EOB MRI in colorectal cancer (CLC) patient treated with chemotherapy, and correlated this pattern with liver dysfunction on serum biochemistry.

METHOD AND MATERIALS

IRB approved retrospective review of CLC patients from 2007 to 2011 who received neoadjuvant chemotherapy and EOB MRI after treatment. MR imaging included in-and-oppose phase T1-weighted, T2-weighted, T1-weighted EOB-MRI (arterial, portovenous, interstitial and 10 minutes delayed) on a 1.5T MR scanner. Images were reviewed blinded to type of chemotherapy for hepatic steatosis, number and location of metastases, presence and extent of reticular hypointensity. Imaging findings were compared with the type of chemotherapy and serum liver function tests (LFTs) using the Chi-square test.

RESULTS

100 patients were reviewed, of which 74 received oxaliplatin-based chemotherapy and 26 other treatment. Prevalence of reticular T1 hypointensity was 25.6% (19/74) in patients treated with oxaliplatin-based chemotherapy while none of the other patients showed this pattern (chi-square, p=0.004). Reticular T1 hypointensity was diffuse in 11 and segmental in 8. Available histology in 3 patients of this MRI pattern confirmed sinusoidal obstruction. Available histology in 10 patients without this MRI pattern did not show sinusoidal obstruction. None of the patients with reticular T1 hypointensity show hepatic steatosis. LFTs were abnormal in 16 patients with reticular T1 hypointensity compared with 49 in other patients (chi-square, p=0.05).

CONCLUSION

Diffuse or segmental reticular T1 hypointensity is frequently observed on EOB-MRI in patients receiving oxaliplatin-based chemotherapy and is associated with liver dysfunction but not liver steatosis.

CLINICAL RELEVANCE/APPLICATION

Recognition of reticular hypoenhancement may allow radiologists and clinicians to identify patients at risk of oxaliplatin-related toxicity and may help to inform decision treatment alteration/termination.

GIS350

Comparison of Iodine Suppressing Efficiency for Different Abdominal Organs of Material-suppressed Iodine Images (MSI) Generated from CT Spectral Imaging (Station #6)

Jing Wang: Nothing to Disclose, Wenya Liu: Nothing to Disclose, Yi Jiagn MD, PhD (Presenter): Nothing to Disclose, Jing Wang: Nothing to Disclose, tingting LI MD: Nothing to Disclose

PURPOSE

Material suppressed iodine images (MSI) is a new technique provide by CT spectral imaging, which remove
iodine contribution on 70keV monochromatic image. This study aims to evaluate the iodine suppressing efficiency for different abdomen organs of material suppressed iodine images (MSI).

METHOD AND MATERIALS
Totally 40 patients (mean age 49.6±12.2 years) received abdominal CT, including non-enhanced and contrast-enhanced images during the artery phase (AP) and portal phase (PVP). The mean CT number (CT) of abdominal organs including liver, kidney, pancreas, and abdominal aorta were measured in 70keV monochromatic images, MSI and true non-enhanced images (TNI). The iodine-suppressed radio (ISR) was calculated from the formula as follow: ISR = (CT70keV− CT MSI)/(CT70keV− CTTNI).

RESULTS
There were significant differences in the ISR of liver and kidney between AP and PVP (AP: liver, 0.49±0.23 vs kidney, 0.88±0.050 vs PVP: liver, 0.80±0.09 vs kidney, 0.91±0.04; both p<0.05). There were no significant differences in theISR of pancreatic and abdominal aorta between AP and PVP (AP: pancreatic, 0.75±0.12 vs abdominal aorta, 0.90±0.04 vs PVP: pancreatic, 0.79±0.13 vs abdominal aorta, 0.88±0.07; both p>0.05). ISR of kidney in PVP was superior over other organs.

CONCLUSION
The iodine suppressing efficiency of MSI varies for different abdomen organs and scan phases. Hypervascular organs seem to get more ISR.

CLINICAL RELEVANCE/APPLICATION
Although the MSI is supposed to be a potential replacement for TNI. To some extent, the efficiency of MSI is influenced by the characteristic of organ and scan phase.

GIS351

MRI Based Liver Iron Content Determination Using Signal Intensity Ratio Analysis: RF Spoiled vs. Not RF Spoiled Gradient Echo (Station #7)
Arthur Peter Wunderlich PhD (Presenter): Consultant, Siemens AG, Stefan Andreas Schmidt: Nothing to Disclose, Meinrad Johannes Beer MD: Research Consultant, Shire plc, Holger Cario: Nothing to Disclose, Volker Rasche MD, PhD: Nothing to Disclose

PURPOSE
Annihilation of remaining magnetization by radio frequency (RF) spoiling alters image contrast compared to solely gradient spoiling. We studied influence of RF-spoiling (RFS) on liver iron content (LIC) results of gradient echo (GRE) MRI utilizing signal intensity ratio (SIR), i.e. ratio of liver to muscle signal.

METHOD AND MATERIALS
In liver iron overloaded patients, a spin-echo based MRI method yielded LIC reference values. Under approval of our local ethics committee, GRE data was also acquired with TE 4.76 and 9.53 ms, TR 120 ms, and FA 20° and 90°. RF spoiling was randomly switched on (50:50). Axial slices were obtained with 5 mm thickness, FoV of 380 mm and 2x2 mm resolution. 12 patients suitable for SIR analysis, i.e. with reference LIC below 350 mmol/kg liver dry weight, were randomized for each group. Additionally, 3 patients with LIC < 350 mmol/kg scanned with both +/- RFS were selected, summing up to a total of 27 patients and 30 investigations. ROIs were drawn in liver and paraspinal muscles, and analyzed using a method proposed by Gandon. Results were correlated to LIC reference by linear regression analysis separately for +/- RFS.

RESULTS
LIC determined by SIR correlated well with reference LIC for both + and - RFS; R² was larger without RFS (0.85 vs. 0.71 +RFS). Differences depend on LIC: for LIC below 150 mmol/kg, data +RFS show higher values compared to data -RFS, and vice versa in patients with LIC above 150 mmol/kg.

CONCLUSION
The popular GRE based method for LIC quantification proposed by Gandon et al. relies on liver to muscle SIR. Contrast changes depending on the spoiling scheme have to be considered, since differences in correlation to reference LIC value were observed when comparing RF-spoiled vs. non-RF-spoiled GRE. This is important in case MRI for LIC determination is performed on systems from different vendors since similar acronyms are often used for different GE techniques. We observed a difference in linearity between data acquired with and without RF spoiling. Further studies are needed since differences are most prominent at LIC values occurring only rarely in our patient cohort. The superior linearity of reference LIC and results of non-RF-spoiled GRE suggests avoiding RF-spoiling for public available SIR based LIC determination.

CLINICAL RELEVANCE/APPLICATION
Choice of different spoiling schemes in SIR/GRE-based LIC determination may impact results of LIC quantification.
**GIE173**

**Hot Spleen: Hypervascular Lesions of the Spleen (Station #8)**

Michyla L. Bowerson MD (Presenter): Nothing to Disclose, Christine O. Menias MD: Nothing to Disclose, Kristen Alexa Lee MD: Nothing to Disclose, Kathryn Jane Fowler MD: Research support, Bracco Group, Motoyo Yano MD, PhD: Nothing to Disclose, Kathryn Jane Fowler MD: Nothing to Disclose, Khaled M. Elsayes MD: Nothing to Disclose

**TEACHING POINTS**

The aim of this study is to review the clinical presentation, imaging features, and management of hypervascular splenic lesions.

**TABLE OF CONTENTS/OUTLINE**

- Introduction.
- Clinical presentation and epidemiology of hypervascular lesions of the spleen, including hemangioma, lymphangioma, vascular metastasis, Littoral cell angioma, Sclerosing angiomatoid nodular transformation, Hamartoma, and angiosarcoma.
- Pictorial review of the hypervascular splenic lesions with different imaging modalities, such as CT and MR.
- Management of these lesions.

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**GIE306**

**Ileo-anal Pouch Reconstruction: Surgical Approach and Imaging for Complications (Station #9)**

Emily Boulos MD: Nothing to Disclose, Jonathan Hong (Presenter): Nothing to Disclose, Robin McLeod MD: Nothing to Disclose, Helen MacRae: Nothing to Disclose, Nasir M. Jaffer MD: Nothing to Disclose

**TEACHING POINTS**

1. Describe the open and laparoscopic techniques of ileo-anal pouch reconstruction. 2. Review imaging techniques used for assessing the ileo-anal pouch for complications. 3. Illustrate selected complications of ileo-anal pouch reconstruction and their imaging findings.

**TABLE OF CONTENTS/OUTLINE**

Ileo-anal pouch reconstruction can be performed utilizing open or newer laparoscopic techniques. This presentation will describe the surgical technique for ileo-anal pouch reconstruction, and review imaging studies used to evaluate ileo-anal pouches for post-operative and long term complications. Examples of the more commonly described complications such as pouch leak and fistula will be discussed, as well as some more unusual complications such as volvulus. The importance and limitations of fluoroscopic-guided and CT contrast pouchograms in correctly identifying complications will be illustrated.

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**GIE213**

**Functional MRI of Liver Tumors (Station #10)**

Antonio Luna MD (Presenter): Nothing to Disclose, Alvin C. Silva MD: Nothing to Disclose, Lidia Alcala Mata MD: Nothing to Disclose, Roberto Garcia Figueiras MD: Nothing to Disclose, Mariano Volpacchio MD: Nothing to Disclose, Enrique Ramon MD: Nothing to Disclose

**TEACHING POINTS**

Review the different functional MRI techniques that can be used in the assessment of liver tumors, including their derived biomarkers

Highlight the current and potential clinical applications of these techniques

**TABLE OF CONTENTS/OUTLINE**


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**GIE261**

**Inflammatory Bowel Disease: MR Enterography in Initial Diagnosis and Evaluating Extraluminal Complications (Station #11)**

Faramarz Edalat MD (Presenter): Nothing to Disclose, Nima Kokabi MD: Nothing to Disclose, Juan Camilo Camacho: Nothing to Disclose, Courtney Ann Coursey Moreno MD: Nothing to Disclose, Pardeep Kumar Mittal MD: Nothing to Disclose

**TEACHING POINTS**

The purpose of this exhibit is to: 1. Explain the role of MRI as an invaluable tool in IBD due to its excellent soft tissue contrast and absence of ionizing radiation in mostly patients of young age requiring repeated radiological examinations 2. Review pathophysiology of IBD 3. Discuss use of MR enterography in initial diagnosis of IBD and its extraluminal complications 4. Explain the potential use of MR enterography for surveillance in IBD patients

**TABLE OF CONTENTS/OUTLINE**

- Pathophysiology of IBD
- MR enterography protocol for IBD
- Approach for initial IBD diagnosis: MR imaging features of ulcerative colitis versus Crohn’s disease and acute versus chronic IBD
- MR imaging characteristic of IBD complications
- MR imaging as surveillance tool for IBD patients
- Conclusion
Liv-er Dye: A Radiology-Pathology Correlation of Treated and Recurrent Liver Lesions (Station #12)

Eric Christopher Ehman MD (Presenter): Nothing to Disclose , Sarah Umetsu MD, PhD : Nothing to Disclose , Benjamin M. Yeh MD : Research Grant, General Electric Company Consultant, General Electric Company , Nicholas Fidelman MD : Nothing to Disclose , Linda Ferrell MD : Nothing to Disclose , Thomas A. Hope MD : Speaker, Guerbet SA Research Grant, General Electric Company

TEACHING POINTS
To briefly review the most commonly used non-surgical treatments of hepatocellular carcinoma To show the varying appearance of both recently and remotely treated lesions To illustrate imaging features suggestive of recurrent tumor versus post-treatment change

TABLE OF CONTENTS/OUTLINE
Review of commonly performed treatments for primary liver malignancies Transarterial interventions: chemoembolization (TACE), bland embolization Thermal treatment: radiofrequency ablation, cryoablation, microwave ablation Case based Radiology-Pathology correlation of treated hepatic lesions TACE Imaging appearance of embolic material at treatment site Appearance of fibrous capsule surrounding treatment site Post-treatment vascular shunts and venous thrombosis that mimic recurrence Thermal ablation Hypodensity and surrounding contrast enhancement patterns at CT T1 and T2 signal characteristics and enhancement characteristics at dynamic MR Case based Radiology-Pathology correlation of residual and recurrent disease TACE Disappearance of embolic material over time, as related to revascularization and recurrence Nodular enhancement at CT/MR consistent with recurrence Thermal ablation Examples of nodular enhancement around treatment site that suggest recurrence

Interventional Oncology Series: Hepatocellular Carcinoma

Series Courses

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Mon, Dec 1 1:30 PM - 6:00 PM Location: S406B

Participants
Moderator
Riad Salem MD, MBA : Consultant, Bayer AG Consultant, Nordion, Inc Consultant, BioSphere Medical, Inc Advisory Board, Sirtex Medical Ltd Consultant, Merit Medical Systems, Inc

LEARNING OBJECTIVES
1) To learn the indications for transcatheter-based therapies for patients with HCC. 2) To understand the potential limitations, pitfalls, side effects and toxicities associated with transcatheter therapies for patients with HCC. 3) To know the results, imaging responses and survival benefit of various transcatheter therapies. 4) To know the future transcatheter therapies and understand their potential. 5) To learn the various combination therapies available and undergoing clinical evaluation for HCC.

ABSTRACT
01) Staging Systems, Epidemiology, and Medical -1) Identify state-of-the art surgical treatment, non-surgical treatment, and transplantation treatment for patients with HCC. 2) Identify the most appropriate treatment for early and advanced stage of HCC. 3) Describe and discuss indications for resection in chronic liver disease. 4) Integrate interventional radiological procedures in the treatment of HCC. 02) HCC mgmt in Europe -1) To understand how HCC patients are being managed in Europe. 2) To learn the decision making processes driving treatment selection for patients. 3) To review the data from the European point of view. 03) HCC mgmt in Korea -1) To understand how HCC patients are being managed in Korea. 2) To learn the decision making processes driving treatment selection for patients. 3) To review the data from the Korean point of view. 04) HCC mgmt in HK/China -1) To understand how HCC patients are being managed in China. 2) To learn the decision making processes driving treatment selection for patients. 3) To review the data from the Chinese point of view. 05) HCC mgmt in Japan -1) To understand how HCC patients are being managed in Japan. 2) To learn the decision making processes driving treatment selection for patients. 3) To review the data from the Japanese point of view. 06) Panel Discussion:

Sub-Events

VSIO21-01  Staging Systems, Epidemiology, and Medical Therapy
Richard S. Finn MD (Presenter): Consultant, Bayer AG Consultant, Novartis AG Consultant, Amgen Inc

LEARNING OBJECTIVES
1) Identify state-of-the art surgical treatment, non-surgical treatment, and transplantation treatment for patients with Hepatocellular Carcinoma. 2) Identify the most appropriate treatment for early and advanced stage of Hepatocellular Carcinoma. 3) Describe and discuss indications for resection in chronic liver disease. 4) Integrate interventional radiological procedures in the treatment of Hepatocellular Carcinoma.

VSIO21-02  Identifying New Staging Markers for HCC before TACE: Which Lesion Parameter on Baseline MR Imaging Is the Ideal Prognostic Marker?
Julius Chapiro MD (Presenter): Nothing to Disclose , Rafael Duran MD : Nothing to Disclose , MingDe Lin PhD : Employee, Koninklijke Philips NV , Ruediger Egbert Scherthaner MD : Nothing to Disclose , Carol Thompson : Nothing to Disclose , Jean-Francois H. Geschwind MD : Consultant, BTG International Ltd Consultant, Bayer AG Consultant, Guerbet SA Consultant, Nordion, Inc Grant, BTG International Ltd Grant, F.
PURPOSE

The most commonly used staging systems for hepatocellular carcinoma (HCC) (e.g. BCLC, CLIP) use the largest lesion diameter as the leading imaging biomarker for tumor status. This study tested and compared the prognostic value of lesion diameter, volume and enhancement on baseline MR imaging to predict overall survival (OS) in patients with unresectable HCC treated with transarterial chemoembolization (TACE).

METHOD AND MATERIALS

This retrospective analysis included 79 patients with unresectable HCC who were to receive their first TACE. Baseline arterial-phase contrast enhanced MRI (ceMRI) was used to measure the overall and enhancing tumor diameters. In addition, a segmentation-based 3D quantification of the overall and enhancing tumor volumes was performed in each patient (see Figure 1). Numeric cutoff values (5cm for diameters and 65cm3 for volumes) were used to stratify the patient cohort in two groups for each method. Survival was evaluated using Kaplan-Meier analysis and compared using Cox proportional hazard ratios (HR) after uni- and multivariate analysis.

RESULTS

Median OS of the entire population was 16.4 months (95% CI, 11.4-21.5). The stratification according to overall or enhancing tumor diameters did not result in a statistically significant separation of the survival curves (HR 1.4 [95% CI, 0.7-2.5]; P=0.234 and HR 1.6 [95% CI, 0.9-2.8]; P=0.080, respectively). The stratification according to overall or enhancing tumor volume achieved statistical significance (HR, 1.8 [95% CI, 0.9-3.4]; P=0.022 and HR, 1.8 [1.1-3.1]; P=0.017, respectively). Patients with enhancing tumor volumes <65cm3 survived significantly longer than patients with larger enhancing tumor volumes (P=0.013; 29.7 months [95% CI, 14.5-44.9] vs. 15.0 months [95% CI, 10.4-19.6], respectively).

CONCLUSION

As opposed to tumor diameter which currently is the most commonly used staging marker, volumetric assessment of lesion size and enhancement on baseline ceMRI is strongly associated with patient survival after TACE.

CLINICAL RELEVANCE/APPLICATION

The use of volumetry-based thresholds as staging biomarkers might lead to more accurate prognostic discriminators in future staging systems.

HCC Management in Europe

Riccardo Antonio Lencioni MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Hepatocellular Carcinoma Treated by Transarterial Chemoembolization: Prediction of Treatment Failure Using Tumoral Morpho-phenotypic Features on Pre-treatment Biopsy

Maxime Ronot MD (Presenter): Nothing to Disclose, Amedeo Sciarra: Nothing to Disclose, Luca Di Tommaso: Nothing to Disclose, Carlotta Raschioni: Nothing to Disclose, Pierre Bedossa: Nothing to Disclose, Massimo Roncalli: Nothing to Disclose, Valerie Vilgrain MD: Nothing to Disclose, Valerie Paradis MD: Nothing to Disclose

PURPOSE

1) To identify tumoral tissue markers as potential predictors of resistance to transarterial chemoembolization (TACE) in hepatocellular carcinoma (HCC), 2) to provide a simple scoring system to be applied on pre-TACE HCC biopsy, and 3) to validate the score.

METHOD AND MATERIALS

Inclusion criteria were patients with HCC who received TACE and who had pre-TACE biopsy of the tumor from 2005 to 2010. Two groups of patients were analyzed: 1) a study group composed of resected patients used to build the scoring system, and 2) a validation group of non-resected patients whom tumor response was evaluated at imaging. Resistance to TACE was defined as residual tumor >50% on resected specimen in the former and as non-complete tumor response according to mRECIST in the latter. In the study group, tumor size, the immunohistochemical expression of markers related to hypoxia and angiogenesis (HIF1-a, VEGF and CD34), apoptosis (CA9), stemness phenotype (Nestin), and epithelial-mesenchymal transition (Vimentin, E-Cadherin, Twist) were analyzed. Variables associated with TACE resistance were entered as candidate variables into a stepwise logistic regression model in order to build a TACE-resistance prediction score. This score was then validated on the validation group.

RESULTS

The study study was composed of 108 lesions from 41 cirrhotic patients (39 males (95%), mean age 58.5±8). Overall 45/108 (44%) HCC were classified as TACE-resistant. Of these, 33 (73%) had a diameter ≤ 3 cm, 28 (62%) showed a high microvessel density (CD34 staining) and 40 (89%) low VEGF expression (p<0.05). The association of these three parameters (small size, ?CD34 and ?VEGF) in a weighted score was able to predict TACE-resistance with 87% accuracy, 87% sensitivity and 88% specificity. The validation set was composed of
CONCLUSION

Combination of VEGF and CD34 staining performed on pre-TACE biopsy together with the tumor size may be useful for the prediction of TACE-resistance in HCC.

CLINICAL RELEVANCE/APPLICATION

Patients with HCC treated with TACE may benefit from a tumoral morpho-phenotypic analysis performed on pre-treatment biopsy.

VSIO21-06

Vascular Redistribution Following Partial Hepatic Artery Embolisation for SIRT—Efficacy of Delivery of Y90 Microspheres to Embolised Liver Segments

Philip Borg MD, FRCR (Presenter): Nothing to Disclose, Jon Kingsley Bell MBChB, FRCR: Nothing to Disclose, Steve Philip Jeans: Nothing to Disclose, Jill Philip Tipping: Nothing to Disclose, Amarjot Chander: Nothing to Disclose, Damian P. G. Mullan FFR(RCSI), FRCR: Nothing to Disclose, Prakash Manoharan MRCP, FRCR: Nothing to Disclose, Jeremy Andrew Liste Lawrance MBChB: Nothing to Disclose

PURPOSE

To evaluate the efficacy of delivery of microsphere delivery during Selective Internal Radiation Therapy (SIRT) using SIR-Spheres® to segments of the liver that have been coil embolised. Embolisation of the left hepatic artery and or its branches to prevent extra-hepatic distribution of Yttrium90 (Y90) microspheres is often performed in selective internal radiation therapy (SIRT). This has a potential to under treat portions of the liver.

METHOD AND MATERIALS

158 SIRT cases over an 8 year period were reviewed. Cases with unfavorable anatomy underwent coil occlusion of part or all of the left or right hepatic arteries to ensure safe whole liver therapy. Using Xeleris® imaging software analysis was made on the planar gamma and bremsstrahlung imaging. Regions of interest (ROI) for the right and left lobes of the liver were drawn and a geometric mean ratio of right:left (R:L) post administration of Tc99mMAA and post Y90 microspheres. ROIs were adjusted for background scatter. R:L liver lobe ratios in patients who had partial embolisation of the hepatic artery compared to R:L liver lobe with no embolisation.

RESULTS

Post Tc99mMAA Non embolised patients R:L ratio mean = 8.8 Embolised patients R:L ratio mean = 20.5 Post Y90 microspheres Non embolised patients R:L ratio mean = 5.6 Embolised patients R:L ratio mean = 8.9

CONCLUSION

After injection of Y90 patients with partial hepatic artery embolisation had a larger R:L lobe ratio when compared to those not embolised. The same was true after injection of Tc99mMAA but to a greater extent. This difference in ratios, with better uptake in the left lobe after injection of Y90 can be explained by the development of intrahepatic collateral flow channels in the 2-3 week period between the Tc99mMAA scan immediately post coil embolisation and the Y90 scan. Laminar flow also affects distribution of Y90 and Tc99mMAA. These preliminary results from analysing planar imaging of 23 patients will be correlated with SPECT CT on a larger number of patients.

CLINICAL RELEVANCE/APPLICATION

Although there is a significant decrease in treatment to the embolised segments, there is likely development of intracollateral flow channels to embolised segments, increasing delivery of radiospheres after partial coil embolisation hepatic arteries. This is an acceptable compromise to ensure safe delivery of Y90 microspheres without extrahepatic distribution.
**Efficacy and Safety of 70-150 μm Compared with 100-300 μm Drug Eluting Beads in Transarterial Chemoembolization for Unresectable Hepatocellular Carcinoma: Does Size Matter?**

Amy Robin Deipolyi MD, PhD (Presenter): Nothing to Disclose, Shehab A. Alansari MD: Nothing to Disclose, Rahmi Oklu MD, PhD: Nothing to Disclose, Zubin Irani MD: Nothing to Disclose, Raymond W. Liu MD: Nothing to Disclose, George Rachid De Oliveira MD: Nothing to Disclose, Andrew X. Zhu MD, PhD: Nothing to Disclose, Suvranu Ganguli MD: Research Grant, Merit Medical Systems, Inc Consultant, Boston Scientific Corporation

**PURPOSE**

Prior work suggests that 100-300 μm drug-eluting beads (DEB) for transarterial chemoembolization (TACE) compared with 300-500 μm DEB are safer and more effective for hepatocellular carcinoma (HCC). We compared safety and efficacy of 70-150 μm to 100-300 μm DEB in TACE for HCC.

**METHOD AND MATERIALS**

In 12/2012 our DEB-TACE protocol was changed from 2 vials of 100-300 μm to 1 vial of 70-150 μm and 1 vial of 100-300 μm DEB, which generated two groups of HCC patients for comparison selected under similar eligibility criteria. We reviewed laboratory and clinical data, post-TACE course, and response on 1-2 month imaging based on modified RECIST criteria. Fisher's exact, χ2 and student's t tests analyzed group differences.

**RESULTS**

Of 65 cases (54 patients) performed with 70-150 μm DEB (Group 1) and 67 cases (53 patients) with 100-300 μm DEB (Group 2), treatment was lobar in 60 and selective in 11 (Group 1) and lobar in 42 and selective in 7 cases (Group 2). There was no difference in pre-procedure age, stage, or liver function tests. There was a trend for greater decrease in index lesion size in Group 1 (-8 v +2%; p=0.4). Treatment response for Group 1 and 2 was similar irates of complete response (16 v 23%, partial response (9 v 5%), stable disease (70 v 61%) and progressive disease (5 v 11%) (p=0.4). Group 1 patients were significantly more likely to be readmitted within 1 month or have prolonged hospital stay for complications related to liver dysfunction with more patients requiring treatment for ascites, symptoms of portal hypertension, and biliary disease (12 v 3; p<0.01). Two patients in Group 1 developed cholecystitis and 2 patients died within 2 months, compared to none in Group 2. Group 1 patients tended to have increased bilirubin post-procedure (+19 v -12%; p=0.07), more complications from any cause (24 v 16; p>0.05), longer hospital stay (1.5 v 1.1 days; p=0.07), and to visit doctors more frequently within 1 month (13 v 8; p>0.05).

**CONCLUSION**

Our results suggest that despite similar efficacy by imaging, TACE with smaller, 70-150 μm DEB leads to more liver-related complications, and possibly more adverse events from all causes and longer post-TACE hospitalization.

**CLINICAL RELEVANCE/APPLICATION**

Transarterial chemoembolization with 70-150 μm compared with 100-300 μm drug eluting beads for hepatocellular carcinoma may cause more complications and longer hospitalization, despite similar efficacy. Findings suggest 100-300 μm beads may be optimal.

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**HCC Management in Japan**

Yasuaki Arai (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To understand how HCC patients are being managed in Japan. 2) To learn the decision making processes driving treatment selection for patients. 3) To review the data from the Japanese point of view.

**Intraarterial Therapies in the US: Where Are We?**

Jean-Francois H. Geschwind MD (Presenter): Consultant, BTG International Ltd Consultant, Bayer AG Consultant, Guerbet SA Consultant, Nordion, Inc Grant, BTG International Ltd Grant, F. Hoffmann-La Roche Ltd Grant, Bayer AG Grant, Koninklijke Philips NV Grant, Nordion, Inc Grant, ContextVision AB Grant, CeloNova BioSciences, Inc Founder, PreScience Labs, LLC CEO, PreScience Labs, LLC

**LEARNING OBJECTIVES**

1) Understand patient selection process. 2) Understand the patient indications and complications. 3) Understand the rationale for combining anti-angiogenic agent with loco-regional therapies. 4) Understand the results of various catheter based intra-arterial therapies for Liver Cancer.

**Survival Outcomes in Patients with Advanced-stage HCC and Portal Vein Thrombosis: Comparison between Conventional and Drug-eluting Beads TACE**

Boris Gorodetski (Presenter): Nothing to Disclose, Julius Chapiro MD : Nothing to Disclose, Bareng Nonyane : Nothing to Disclose, Rafael Duran MD : Nothing to Disclose, MingDe Lin PhD : Employee, Koninklijke Philips NV, Jean-Francois H. Geschwind MD : Consultant, BTG International Ltd Consultant, Bayer AG Consultant, Guerbet SA Consultant, Nordion, Inc Grant, BTG International Ltd Grant, F. Hoffmann-La Roche Ltd Grant, Bayer AG Grant, Koninklijke Philips NV Grant, Nordion, Inc Grant, ContextVision AB Grant, CeloNova BioSciences, Inc Founder, PreScience Labs, LLC CEO, PreScience Labs, LLC

**PURPOSE**

Our study sought to compare the overall survival (OS) in patients with hepatocellular carcinoma (HCC) and...
portal vein thrombosis (PVT), treated with conventional (c) or drug-eluting beads (DEB) transarterial chemoembolization (TACE).

**METHOD AND MATERIALS**

This retrospective analysis included a total of 133 HCC patients with PVT that were treated with cTACE (N=95) or DEB-TACE (N=38) without crossover of therapy. The extent of PVT (peripheral [p] vs. main [m] PVT) was diagnosed on contrast-enhanced MR or CT imaging. Prognostic parameters from the Barcelona Clinic Liver Cancer staging system (Child-Pugh [CP] stage, Performance Status [PS], Lesion diameter and multiplicity, PVT localization, lymph nodes, metastases) and other clinically relevant covariates (tumor type and burden, cirrhosis, sex, age) were included into the nearest-neighbor propensity score 2:1 matching, to achieve balance in treatment allocation. We then fitted a Cox proportional hazard regression model for time to death and treatment, adjusting for other covariates as potential confounders.

**RESULTS**

A total of 102 patients were successfully matched (31 were excluded). A total of 34 patients were treated with DEB-TACE and 68 were treated with cTACE. The distribution of parameters was almost equal between the groups, for DEB-TACE and cTACE, respectively: N= 23 (67.6%) and N= 45 (66.2%) had mPVT, N=22 (64.7%) and N=41 (60.3%) had CP >A, N=28 (82.4%) and N=52 (76.5%) had PS > 0, N= 30 (88.2%) and N=60 (88.2%) had multiple lesions, N=32 (94.1%) and N=66 (97.1%) had a tumor diameter > 3cm. The median OS of the matched cohort (N=102) was 4.5 months (95% CI, 3.1-6.0). As for the treatment groups, median OS was 5.0 months (95% CI, 3.5-6.5) for cTACE and 3.3 months (95% CI, 2.5-4.2) for DEB-TACE (log-rank test, P=0.394). The adjusted hazard ratio from the Cox regression was 1.23 (95% CI, 0.71-2.11, P=0.46).

**CONCLUSION**

Both cTACE and DEB-TACE achieved similar survival outcomes in patients with advanced-stage HCC and PVT. A trend towards better median OS in patients treated with cTACE was observed.

**CLINICAL RELEVANCE/APPLICATION**

DEB-TACE did not provide significant survival benefits in the treatment of patients with advance-stage HCC and PVT when compared to cTACE.

### VSIO21-13

**Assessment of Tumor Response**

Riad Salem MD, MBA (Presenter): Consultant, Bayer AG Consultant, Nordion, Inc Consultant, BioSphere Medical, Inc Advisory Board, Sirtex Medical Ltd Consultant, Merit Medical Systems, Inc

**LEARNING OBJECTIVES**

1) Review methods of response assessment. 2) Discuss limitations of current methods. 3) Describe future imaging concepts in development.

### VSIO21-14

**Prospective Longitudinal Quality of Life Assessment in Patients with Unresectable Infiltrative Hepatocellular Carcinoma and Portal Vein Thrombosis after Yttrium-90 Radioembolization and Outcome Correlations**

Nima Kokabi MD (Presenter): Nothing to Disclose, Minzhi Xing MD: Nothing to Disclose, Juan Camilo Camacho: Nothing to Disclose, Faramarz Edalat MD: Nothing to Disclose, Hyun Sik Kim MD: Nothing to Disclose

**PURPOSE**

To investigate the effects of Y90 radioembolization on health-related quality of life (HRQL) in patients with infiltrative hepatocellular carcinoma (HCC) and portal vein thrombosis (PVT) and to correlate baseline and early QOL trends to disease progression and survival.

**METHOD AND MATERIALS**

HRQL trends using Short-Form 36 (SF-36) questionnaire in patients with infiltrative HCC and PVT treated with glass-based Y90 were investigated in a correlative study related to a prospective phase II trial. Patients underwent baseline assessment within 1 mo prior to Y90 and follow-up assessments were performed at 1, 3 and 6 mo post-therapy. Tumor progression was determined by 3 monthly MRI’s. Overall survival (OS) and time to progression (TTP) were measured using Kaplan-Meier estimation from the day of first Y90. Baseline and follow-up SF-36 scores were compared using paired t-test. Log-rank test was used to determine the effects of favorable scores at baseline and early follow-ups on TTP and OS.

**RESULTS**

Thirsty patients (n=30) were treated and followed for a median of 19 mo. Decreased pre-treatment baseline scores within all domains of SF-36 were observed in patients vs. age-adjusted US controls. The physical component scores were more significantly decreased than mental components. Overall, at 1, 3 and 6 mo, scores for individual SF-36 domains, physical and mental component summaries (PCS and MCS) remained unchanged. While there was no difference in baseline SF-36 scores for patients with prolonged TTP (≥4 mo) and OS (≥6 mo), corresponding physical component scores at 1 mo were significantly higher than those with TTP <4 mo and OS <6 mo. Specifically at 1 mo, patients with normalized Physical Function, Role Physical and PCS within 2 standard deviation (SD) of US normalized score, had a significantly prolonged median OS (15.7 mo vs. 3.7 mo; p<0.001) and TTP (12.4 mo vs. 1.8 mo; p<0.001) compared those with physical component scores >2SD below normalized US population values.
CONCLUSION

HRQOL in patients treated with infiltrative HCC and PVT treated with Y90 does not significantly change within 6 months post therapy. Early (1month) favorable trends in the physical components of SF-36 may be a predictor of prolonged OS and TTP.

CLINICAL RELEVANCE/APPLICATION

The effect of Y90 radioembolization on HRQOL in patients with infiltrative HCC and PVT and the utility of SF-36 assessment tool as a predictor of clinical outcome are currently unknown.

MSRO26

BOOST: Gastrointestinal—Case-based Review (An Interactive Session)

Multisession Courses

RO OI GI RO OI GI
AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50
Mon, Dec 1 3:00 PM - 4:15 PM Location: S103CD

Participants

Theodore Sunki Hong MD (Presenter): Nothing to Disclose
Suvranu Ganguli MD (Presenter): Research Grant, Merit Medical Systems, Inc Consultant, Boston Scientific Corporation
Mukesh Gobind Harisinghani MD (Presenter): Nothing to Disclose
Lawrence Blaszkowsky MD (Presenter): Data Safety Monitoring Board, GlaxoSmithKline plc

LEARNING OBJECTIVES

- Review focal threapeutic options for hepatobiliary diseases usign a case based approach
- What imaging attributes dictate and affect management
- Discuss how imaging correlates to tumor response

ABSTRACT

Using case based apporach; key imaging pointers for accurate diagnosis and staging of hepatobiliary disease will be discussed. In addition decision pointer for focal therapy will be discussed

SSE07

Gastrointestinal (CT Technique and Contrast)

Scientific Papers

CT GI
AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Mon, Dec 1 3:00 PM - 4:00 PM Location: E353A

Participants

Moderator
Rizwan Aslam MBBCh : Research support, Bayer AG
Moderator
Ihab R. Kamel MD, PhD : Nothing to Disclose

Sub-Events

SSE07-01 The Clinical Application of Optimization Contrast Medium Infusion Protocol Tailored to Body Weight in Abdominal Dual-phase CT Scan

Yi Jiang (Presenter): Nothing to Disclose , Wenya Liu : Nothing to Disclose , Jingjing Wan MD : Nothing to Disclose

PURPOSE

The aim of this study is to discuss whether the weight tailored contrast media injection plan could result in same or better image quality in abdominal dual-phase CT scan compare with conventional injection plan with constant infusion parameters.

METHOD AND MATERIALS

Abdominal dual-phase CT was performed on 90 patients(48 female and 42 male; average age, 47±12 years) which were prospectively randomized into two groups according to the rate and dose of contrast media injection: weight-adjusted iodine-dose protocol and constant iodine-dose protocol(3.5mL/s and 80mL). Both two groups adopt same concentration of contrast media(320 mgI/mL).Moreover,3 subgroups were divided in each group in accordance with the weight grade(under 55, 55~70, Over 70). Quantitative analysis: the CT values of
liver, kidney, celiac trunk and portal vein were measured during the artery phase (AP) and portal vein phase (PVP) in each group. Qualitative analysis: Image quality was evaluated by two experienced doctors. And the results included good, common and bad.

RESULTS
Although all target tissues with sufficient attenuation measured in group weight-adjusted iodine-dose was lower than that of group constant iodine-dose, there were no significant difference among the measured attenuation of liver, kidney, celiac trunk and portal vein between weight-adjusted iodine-dose protocol and protocol during the AP and PVP (all \( p > 0.05 \)), while those in subgroups were approximate (all \( P > 0.05 \)). Image quality of group weight-adjusted iodine-dose wasn’t fundamentally different from group constant iodine-dose. Image quality of subgroup with weight under 55 was better than that of other subgroups under the weight-adjusted iodine-dose protocol, either large or small vessels were manifested clearly without artifact.

CONCLUSION
Based on weight-tailored, infusion protocols using concentrations of 320, mgI/mL can achieve approximate attenuation levels compare with constant iodine-dose protocol.

CLINICAL RELEVANCE/APPLICATION
Abdominal dual-phase CT scan based on weight tailored contrast media injection plan can reduce the dose and rate of contrast medium without affecting the quality of imaging, further reducing the risk of side effect of contrast medium for patient.

SSE07-02
Image Quality in the Low Dose CT of the Liver: Contrast Study between 270mgI/ml and 370mgI/ml
Liu Xiaoyu MD (Presenter): Nothing to Disclose

PURPOSE
To assess the image quality of low-dose CT of the liver obtained with 80kVp and low contrast dose (200mgI/kg) between low (270mgI/mL) and high (370 mgI/mL) concentration agent when BMI is lower than 23.

METHOD AND MATERIALS
40 patients (average age 52ys, BMI<23) underwent unenhanced and enhanced liver CT were divided into 2 groups randomly: group 1 (n=20) with 80kVp and contrast dose of 200mgI/kg (270mgI/ml); group 2 (n=20) 80kVp and 200mgI/kg (370mgI/ml). Another group of 20 (group 3) with no BMI restriction used 120kVp and 1ml/kg (370mgI/ml) as the conventional group. The injection time is fixed at 20 seconds, leading to an adjustable injection speed. The CT values were measured on liver, aorta, portal vein and muscle as background to calculate the CNR and SNR. Two senior radiologists evaluated the axial image quality with scores 1-5.

RESULTS
The CT value of the aorta during arteral phase (AP) were 296.44±37.68, 305.32±76.11, 262.99±41.62; and of the portal vein in portal phase (PP) were 156.04±26.02, 160.19±22.76, 147.76±24.61, respectively. The CT value of aorta in group 2 was significantly (\( p < 0.05 \)) higher than that in group 1 and 3. There was no diference in the CT value of portal vein in 3 groups (\( p > 0.05 \)). The CNR and SNR in the 3 groups in AP were (0.79±0.66, 5.83±0.94); (0.75±0.96, 5.75±1.33) and (0.96±1.14, 6.95±0.73), and in PP (2.21±1.02, 7.34±1.02), (2.29±1.37, 7.41±1.72) and (3.32±1.07, 9.20±1.07), respectively. There were no significant differences among the 3 groups in AP and VP (\( p > 0.05 \)). The image quality scores were 4.78±0.42, 4.55±0.51 and 4.73±0.46 for group 1, 2 and 3, respectively. There was no different between them (\( P > 0.05 \)). Volume CT dose index (CTDivol) were 36.62±0.24mGy, 33.58±4.47mGy and 98.89±7.04 mGy for groups 1, 2 and 3, respetively.

CONCLUSION
Use low contrast medium (200mgI/kg) can provide similar image quality as the conventional protocol (370mgI/ml, 1ml/kg). And higher aorta enhancement achieved with 370 mgI/ml at the same amount of iodine dose(200mgI/kg) in this experiment while CNR and SNR show no significantly differences.

CLINICAL RELEVANCE/APPLICATION
Low contrast medium (200mgI/kg) protocol can provide similar image quality as the conventional protocol (370mgI/ml, 1ml/kg) in patients with BMI< 23 no matter which concentration of contrast medium (270mgI/ml or 370mgI/ml) is used.

SSE07-03
Balancing Radiation and Contrast Media Dose in Multi-detector CT (MDCT): Prospective Evaluation of Image Quality
Luigi Camera MD (Presenter): Nothing to Disclose, FEDERICA IMMACOLATA LICCARDO MD : Nothing to Disclose, RAFFAELE LIuzzi : Nothing to Disclose, Pier Paolo Mainenti MD : Nothing to Disclose, Massimo Imbriaco MD : Nothing to Disclose, Laura Pizzuti : Nothing to Disclose, sabrina segreto MD : Nothing to Disclose, Marco Salvatore MD : Nothing to Disclose

PURPOSE
To obtain a constant image quality in abdominal MDCT balancing radiation and contrast media dose administered to patients of different age.

METHOD AND MATERIALS
52 (32 M; 22 F; aged 20-83 yrs) patients underwent a single-pass contrast-enhanced MDCT of abdomen and pelvis (coll. 1x32 mm; tube speed 36 mm/s; rotation time 0.75 s; helical pitch=27; rec. thickness = 5mm; 120 kVp; AEC) with scan delays of 70-90 seconds. Patients were divided into three different age-groups: A (20-45 yrs); B (46-65 yrs); C (>65 yrs). For each group, a different Noise Index and contrast medium dose (Iopamiro 370 mgl/ml; Bracco Imaging) were selected as follows: A (NI=15; 2.5 cc/kg); B (NI =12.5; 2cc/kg); C (NI=7.5; 1.5cc/kg). Radiation exposure was reported as Dose Length Product (DLP; mGy/cm). Image quantitative analysis was performed by placing four circular regions of interest (ROIs) in different sections of liver parenchyma, aorta and sub-cutaneous fat tissue to calculate Signal to Noise (SNR) and Contrast to Noise ratios (CNR) for the liver (L) and aorta (A). Images were randomly evaluated by two radiologists that graded the image quality using standard criteria with a 5 point scale. analysis. Statistical analysis was performed by one-way ANOVA and by weighted Cohen kappa test to determine inter-observer agreement.

RESULTS

No significant difference was observed in the SNR and CNR of both the liver (9.2±1.4, 9.2±1.1, 9.2±3 and 17±2, 19±3, 22±4) and aorta (12±2, 14±3, 17±5 and 21±2, 26±5, 32±6) for group A, B and C, respectively, whereas a statistically significant difference was observed between the radiation (mGy/cm) and the contrast media dose (ml) administered to group A (542±274 and 160±35), B (962 ±359 and 134±19;) and C (2134±583 and 110±19, p < 0.001), respectively. None of the studies was graded as poor or inadequate and inter-observer agreement for qualitative analysis was fair to moderate with weighted Cohen kappa values ranging from 0.37 to 0.63.

CONCLUSION

A constant image quality in contrast-enhanced MDCT can be obtained balancing radiation and contrast media dose administered to patients of different ages.

CLINICAL RELEVANCE/APPLICATION

Age-specific risks of radiation-induced cancer and contrast-induced nephropathy can be reduced preserving the image quality in contrast enhanced abdominal MDCT.

Spectral CT with Low-osmolar Contrast in VX2 Liver Tumor: Investigation of Image Quality and Detection

Wang Mingyue (Presenter): Nothing to Disclose , Jianbo Gao MD : Nothing to Disclose , Zhou Yue : Nothing to Disclose

PURPOSE

To assess the image quality and detection between Spectral CT with low-osmolar contrast and conventional CT with conventional contrast.

METHOD AND MATERIALS

Forty-eight rabbits with VX2 liver tumors were randomly divided into A group and B group. On the 7th day after implantation, the rabbits in group A underwent conventional CT enhancement scan with conventional contrast (Ioversol 320mgI/ml) and the rabbits in group B underwent spectral CT with low-osmolar contrast (Iopromide 270mgI/ml). The tumor-to-liver contrast-to-noise ratio (CNR) were calculated in group A in arterial phase, while The CNR were calculated at the optimal CNR keV in group B in arterial phase. The lesion conspicuity scores (LCS) and overall image quality scores (OQS) in the two groups were recorded.

RESULTS

The CNR of the group B had no significant difference from that of the group A (1.73±2.52 vs.1.99±1.73, p=0.092). The LCS and OQS of the group B had no significant difference from that of group A (3.50±0.608 vs 3.604±0.675 p= 0.577; 3.563±0.496 vs 3.354±0.561 p= 0.179)

CONCLUSION

Spectral CT associated with low-osmolar contrast can greatly reduce contrast media dose without compromising image quality and detection.

CLINICAL RELEVANCE/APPLICATION

reduce contrast media dose without compromising image quality and detection

Spectral CT in Rabbit VX2 Liver Tumors: Image Fusion Technology Associated with Monochromatic Image

Wang  Mingyue (Presenter):  Nothing to Disclose , Jianbo  Gao  MD :  Nothing to Disclose

PURPOSE

To evaluate the value of image fusion technology associated with monochromatic image of spectral CT

METHOD AND MATERIALS
Twenty-four rabbits with VX2 liver tumors underwent spectral CT, on the 8th day after implantation. The conventional 140kVp polychromatic images (QC) and monochromatic images with energy level from 40 to 140 keV were generated. In the arterial phase the optimal CNR keV (OP) and 70keV were chosen and the fusion image (OP+70)keV was generated from OP plus 70keV. The tumor-to-liver contrast-to-noise ratio (CNR) and image noise of the four groups were calculated. The lesion conspicuity scores (LCS) and overall image quality scores (OQS) in the four groups were recorded.

RESULTS

The CNR of the group (OP+70) had no significant differences from that of the group OP, but the image noise of group (OP+70) was significantly lower than that of group OP (2.63±2.59 vs 2.81±2.74, p=0.288; 9.12±1.28 vs 7.89±1.35, p=0.002), the CNR of the OP and (OP+70) were significantly higher than that of group 70 (1.92±2.39, p

CONCLUSION

Image fusion technology associated with monochromatic image of spectral CT which combine the advantage of high CNR and the advantage of low noise, improve the lesion detection and image quality.

CLINICAL RELEVANCE/APPLICATION

The Effect of Adaptive Statistical Iterative Reconstruction (ASIR) on Image Quality and CT Perfusion Parameters in Primary Colorectal Cancer

Serena Virdi : Nothing to Disclose, Davide Prezzi FRCR (Presenter): Nothing to Disclose, Maria Lewis MS : Nothing to Disclose, Catherine Grierson MD, FRCR : Nothing to Disclose, David John Breen MD : Nothing to Disclose, Vicky Joo-Lin Goh MBCh : Research Grant, Siemens AG

PURPOSE

To prospectively assess the effect of adaptive statistical iterative reconstruction (ASIR) on image quality and quantified CT perfusion parameters in primary colorectal cancer.

METHOD AND MATERIALS

Institutional review board approval and informed consent was obtained for this prospective study. To date 20 consecutive patients (17 male, 3 female, mean age 69.6 years) with a primary colorectal adenocarcinoma have undergone CT perfusion (Discovery 750HD, GE Healthcare: 100kV, 150mA, axial mode, 0.5s rotation time, 64×0.625mm detectors, 1s interscan delay, reconstructed slice thickness 5mm, z-axis coverage 40mm). Tumor regional blood flow, blood volume, mean transit time, and permeability surface area product (Distributed parameter analysis, Perfusion 4.0, GE Healthcare) were assessed by the same observer using identical regions of interests for the following ASIR percentages: 0%, 20%, 40%, 60%, 80% and 100%, and compared using analysis of variance with statistical significance at 5%. Tumor contrast-to-noise ratios (CNRs) were also measured at the different ASIR percentages.

RESULTS

Tumors were located within the rectum (10), sigmoid colon (2), descending colon (1), splenic flexure (1), ascending colon (3) and cecum (3). Mean (SD) tumor size was 4.31 (1.79) cm. Mean (SD) of BF, BV, MTT and PS was 70.72 (16.87) mL/min/100g tissue, 7.57 (2.17) mL/min, 7.68 (1.94) seconds and 32.7 (7.60) mL/min/100g tissue respectively. Mean tumor BF, BV, MTT and PS varied by less than 3%, 7%, 6% and 2% respectively. Tumor CNR increased with increasing ASIR, with values of 2.47 and 3.74 at 0% and 100% ASIR respectively, an increase of 51%.

CONCLUSION

ASIR does not alter quantified tumor CT perfusion values significantly yet improves the contrast to noise ratio. ASIR enables lower dose CT perfusion techniques to be applied with adequate image quality and no significant changes to quantification.

CLINICAL RELEVANCE/APPLICATION

Iterative reconstruction techniques such as ASIR enable lower dose CT perfusion techniques to be applied in clinical practice, maintaining adequate image quality with no significant changes in quantification of CT perfusion parameters.
Correlation between Morphological Extent of Inflammatory Small Bowel Lesions in Patients with Crohn’s Disease Compared to Intra- and Prelesionary Motility, Assessed with MRI

Sebastian Bickelhaupt (Presenter): Nothing to Disclose, Moritz Wurnig: Nothing to Disclose, Andreas Boss MD: Nothing to Disclose, Michael A. Patak MD: Nothing to Disclose

PURPOSE

The aim of this study is to investigate if alterations of intra- and prelesionary motility in inflamed small-bowel segments correlate with length, wall-thickness and prelesionary dilatation of small bowel lesions in patients suffering from Crohn’s disease assessed with MRI.

METHOD AND MATERIALS

This retrospective IRB approved study included 25 patients (12 males, 13 females, 18-77y) with inflammatory lesions examined with magnetic resonance enterography (MRE). Cine MRE was performed using a coronal 2D steady-state free precession sequence (TR 2.9, TE 1.25) on a 1.5 T MRI scanner (GE Signa, GE Medical Systems, USA). Small bowel motility was examined using a dedicated MR-motility assessment software (Motasso, Vers. 1.0, Sohard AG, Bern, Switzerland). Motility patterns (contraction frequency, relative occlusion rate and mean diameter) were assessed in correlation to wall thickness, length and prelesionary dilatation of the lesions. Statistical analysis was performed by calculation of the Pearson’s-Correlation coefficient.

RESULTS

Small bowel motility showed a significant correlation between the contraction frequency within the inflammatory lesions and the non-affected pre-lesionary segments ($r=0.734$, $p=0.046$). Further a significant inverse correlation between the prelesionary diameter quantification and the motility measured in the prelesionary, non-affected segments was found ($r=-0.821$, $p=0.015$). The length of the inflammatory segments, the wall thickening and prelesionary dilatation did not correlate with the frequency of the contractions within the lesion ($r=0.17$, $p=0.477$; $r=0.316$, $p=0.123$; $r=0.161$, $p=0.441$) or the impairment of luminal occlusion ($r=0.274$, $p=0.184$; $r=0.199$, $p=0.033$; $r=0.015$, $p=0.945$) and only the prelesionary dilatation ($r=0.410$, $p=0.042$) correlated to the mean luminal diameter of the inflamed segment.

CONCLUSION

The degree of motility impairment within inflammatory small bowel lesions does not significantly correlate with the extent of the lesion but with the motility measured in prelesionary, non-affected segments, suggesting an interdependent functional aspect of inflammation even in morphologically non-affected small bowel segments.

CLINICAL RELEVANCE/APPLICATION

Patients with inflammatory bowel diseases often show severe abdominal complaints though presenting limited inflammation, we revealed interdependent functional bowel impairment in non-affected segments as a possible explanation.

Monitoring Response to Infliximab Induction Therapy in Crohn Disease with Interval Ultrasound: A Safe and Effective Option

Prasan Patel BSC (Presenter): Nothing to Disclose, Aman Wadhwani BSC: Nothing to Disclose, Alexandra Wilson BSC: Nothing to Disclose, Kerri Novak MD: Research Grant, Abbott Laboratories Consultant, Abbott Laboratories Speakers Bureau, Merck KgaA, Stephanie R. Wilson MD: Research Grant, AbbVie Inc Grant, Johnson & Johnson Consultant, Lantheus Medical Imaging, Inc Equipment support, Siemens AG Equipment support, Koninklijke Philips NV

PURPOSE

To assess the utility of ultrasound (US) in determining therapeutic response to Infliximab induction therapy in Crohn disease (CD) patients.

METHOD AND MATERIALS

This retrospective, single-centre review comprises 55 patients with established CD given infliximab as induction therapy and then monitored sonographically and clinically. All patients had baseline US scans with colour Doppler (CD) prior to Infliximab initiation, with subsequent interval US scans between 3 and 48 months (range of 3-5 scans). All US scans were classified as showing mild/moderate/severe inflammation or remission, on the basis of wall thickness, hyperemia, and mesenteric inflammatory fat. Complications were documented. Sonographic responsiveness following infliximab induction was defined as a decrease in wall thickness (to <4mm), inflammatory fat and CD signal. In this retrospective review, gold standard gross pathology was available in 10 patients. Multiple endoscopic evaluations were not consistently timed in this retrospective review.

RESULTS

Ultrasound showed an excellent ability to detect response to infliximab, favourable at 3 months in 40/55 (78%) patients, increasing to 45/55 (82%) by 24 months. Two patients showed partial sonographic responsiveness, with a minimal decrease in wall thickness, inflammatory fat and CD signal, and 8 patients showed severe
Conclusions

US performed with CD allows for non-invasive and accurate prediction of responsiveness to infliximab, evident as early as 3 months following induction.

Clinical Relevance/Application

Infliximab induction therapy for CD can be monitored safely and accurately using US, potentially allowing us to predict those requiring dose escalation, additional therapy or surgical intervention.

SSE08-03

Predictors of Response to Pharmacologic Therapy in Patients with Crohn's Disease Derived from Quantitative Analysis of Time-intensity Curves Obtained after Microbubble Contrast Agent Injection

Emilio Quaia MD (Presenter): Nothing to Disclose, Michele Pontello: Nothing to Disclose, Gabriele Poillucci: Nothing to Disclose, Antonio Giulio Gennari: Nothing to Disclose, Maria Assunta Cova MD: Nothing to Disclose

Purpose

To assess the value of time-intensity curves obtained after sulphur hexafluoride-filled microbubble contrast agent injection to identify predictors of response to pharmacologic treatment in patients with Crohn's disease.

Method and Materials

Twenty patients (12 male and 8 female; mean age ± SD, 45 years ± 6) with a biopsy-proven diagnosis of Crohn's disease involving the terminal ileal loop were included in this prospective study. In each patient the terminal ileal loop was scanned by contrast-enhanced ultrasound 1-15 days before and 6 weeks after the beginning of specific pharmacologic treatment (azathioprine, infliximab, corticosteroids, or mesalazine). The quantitative analysis of echo-power after videointensity conversion in linear arbitrary units was performed by a proprietary software package. In each patient the percent variation (Post-Pre x 100/Pre) of different semiquantitative parameters - peak enhancement, area under the time-intensity curve (AUC), AUC during washin (AUCWI), AUC during washout (AUCWO), rise time, mean transit time, and time to peak enhancement - were related to the therapeutic outcome assessed after 18 weeks from the beginning of pharmacologic treatment by CDAI and/or endoscopy (Crohn's Disease Endoscopic Index of Severity).

Results

Responders (n=11 patients) vs non-responders (n=9) differed in the percent variation of AUC (-56.9±15.45 vs 6.5±4.12,33, P<.05), AUCWI (-51.3±12.34 vs 10.33±7.55; P<.05), AUCWO (-72.21±55.05 vs -11.45±12.33, P<.05), and peak enhancement (-80.57±44.41 vs -5.43±12.22; P<.05) while did not differ in the percent variation of rise time, mean transit time, and time to peak enhancement. The AUC, AUCWI, AUCWO and peak enhancement are also independent predictors of response after multivariate logistic regression analysis.

Conclusion

The percent variation of the AUC, AUCWI, AUCWO and the peak enhancement after microbubble contrast agent injection are semiquantitative parameters which are different between responders and non-responders and are also predictors of response to pharmacologic treatment in patients with Crohn's disease.

Clinical Relevance/Application

Contrast-enhanced ultrasound is a simple, portable, and repeatable technique. The time-intensity curve obtained after microbubble contrast agent injection during patients' follow-up, may assess the effectiveness of the pharmacologic treatment in patients with Crohn's disease without the need to employ CT or MR enterography.

SSE08-04

Findings and Roles of CT Enterography in Patients with Crohn's Disease Showing Complete Remission at Colonoscopy after Treatment with Anti-TNF-α

Cherry Kim MD (Presenter): Nothing to Disclose, Seong Ho Park MD: Research Grant, DONGKOOK Pharmaceutical Co, Ltd Research Grant, General Electric Company, Suk-Kyun Yang MD: Nothing to Disclose, Sang Hyoung Park: Nothing to Disclose, Hyun Kwon Ha MD: Nothing to Disclose

Purpose

Complete remission (CR) of inflammation, i.e. mucosal healing, using anti-TNF-α has become a treatment goal for Crohn's disease (CD). This study was to investigate the findings and roles of CT enterography (CTE) in CD showing CR at colonoscopy after anti-TNF-α therapy.

Method and Materials

34 consecutive CD patients, who had shown colonoscopic CR after anti-TNF-α therapy and had undergone CTE within 1 month of the CR, were included. CTE of 32 colons and 24 terminal ilea found to have endoscopic CR were analyzed regarding CTE findings of bowel inflammation (wall thickening, mural hyperenhancement, perienteric edema/infiltration, comb sign, and findings of penetrating disease) and other abnormalities. CTE findings at the time of CR were compared with pre-treatment CTE findings if available (in 26 patients). The incidence of various CTE findings at the time of endoscopic CR and their association with treatment length,
demographic and pre-treatment disease characteristics, and patient course/outcome after the achievement of 
CR (median follow up, 17 months) was analyzed.

RESULTS

25 (45%) of 56 bowels in 21 (62%) patients showed one or more findings of inflammation on CTE at CR, 
although remarkably decreased compared with pre-treatment state: mural hyperenhancement \( (n=19) \), mural 
thickening \( (n=14) \), and comb sign \( (n=4) \). Bowel deformities (contraction, pseudosacculation, and loss of 
haustration) \( (n=15) \) mostly persisted with occasional reversal of loss of haustration. There was no significant 
difference in treatment length between patients who showed residual inflammation on CTE (6-49 months; 
median, 14) and those who did not (10-58 months; median 13) \( (P=0.944) \). Also, the residual bowel 
inflammation as seen on CTE at the time of CR was not significantly associated with demographic or 
pre-treatment disease characteristics or the post-CR patient course/outcome.

CONCLUSION

CTE showed incomplete resolution of inflammatory findings in 45% of the bowels (62% of the patients) despite 
endoscopic CR state after anti-TNF-α therapy. The residual CTE abnormalities appear not to have clinical 
relevance or prognostic implications and, thus, should not indicate insufficient treatment as long as there is a 
remarkable decrease in the inflammatory findings on CTE.

CLINICAL RELEVANCE/APPLICATION

CTE can be used more accurately and effectively to monitor the treatment response to anti-TNF-α in CD 
patients by understanding the CTE findings of endoscopic CR.

SSE08-05

Diagnostic Accuracy of Sinogram Affirmed Iterative Reconstruction and Filtered Back Projection in 
CTE at Half Dose for Active Inflammatory Terminal Ileal Crohn’s Disease: A Multireader Study

Namita Sharma Gandhi MD (Presenter): Nothing to Disclose, Brian Robert Herts MD: Research Grant, 
Siemens AG, Andrei S. Purysko MD: Nothing to Disclose, Erick Marc Remer MD: Nothing to Disclose, 
David Marc Einstein MD: Nothing to Disclose, Noushin Vahdat MD: Nothing to Disclose, Devaraju 
Kanmaniraja MD: Nothing to Disclose, Myra Kay Feldman MD: Nothing to Disclose, Christopher Peter 
Coppa MD: Nothing to Disclose, Nancy A. Obuchowski PhD: Research Consultant, Siemens AG Research 
Consultant, Hologic, Inc Research Consultant, CVUS Research Consultant, Elucid Bioimaging Inc., 
Ajit Harishkumar Goenka MD: Nothing to Disclose, Mark E. Baker MD: Research Consultant, Bracco Group 
Researcher, Siemens AG Research support, Siemens AG

PURPOSE

To compare diagnostic accuracy and image quality between sinogram affirmed iterative reconstruction (SAFIRE) 
and filtered back projection (FBP) at half and full dose for diagnosis of active inflammatory terminal ileal (TI) 
Crohn’s disease on CT Enterography (CTE).

METHOD AND MATERIALS

IRB approved, HIPAA compliant, Retrospective, Single center study. Study cohort of 90 patients: active TI 
Crohn’s disease \( (n=45) \) and Normal \( (N=45) \). All patients had a CTE on a dual-source CT (100% dose) with FBP 
reconstruction. Single source (50% dose) data was extracted and reconstructed with FBP and SAFIRE version 3 
(strength 3 and 4). CTDIvol full dose mean=13.1 mGy, median=7.36 mGy, range- 3.62-44.5 mGy; CTDIvol ½ 
dose mean=6.55 mGy, median=3.68 mGy, range- 1.81-22.25 mGy. Using a 5-point scale, 8 readers evaluated 
the studies, randomized and blinded to the clinical history, dose and reconstruction method, separately for 
subjective image quality and presence or absence of active TI Crohn’s disease. Statistical evaluation included 
multifile reader multi-comparison ROC analysis, with nonparametric methods and non-inferiority analysis at a 
marginal of 0.05.

RESULTS

Each half-dose reconstruction had a significantly higher proportion of non-diagnostic or suboptimal images 
compared to full dose FBP (mean frequency of such images at ½ dose FBP: 0.117; ½ dose SAFIRE strength 3: 
0.054 and ½ dose SAFIRE strength 4: 0.054; full-dose FBP: 0.017) with all p values <0.001 (adjusted for 
difference test) (95% CI -0.131, -0.016). The readers’ mean accuracies with ½ dose were significantly 
non-inferior to full dose FBP (i.e. no more than 0.05 less than) (½ dose FBP: 0.908; ½ dose SAFIRE strength 3: 
0.935; ½ dose SAFIRE strength 4: 0.924; full-dose FBP: 0.908) with p-values of 0.935; ½ dose SAFIRE strength 3: 
0.031, 0.031) for ½ dose FBP, <0.001 (CI -0.041, 0.013) for ½ dose SAFire strength 3 and <0.001 (CI-0.039, 0.007) for ½ dose 
Safire strength 4.

CONCLUSION

The diagnostic accuracies of half dose CTE with FBP, SAFIRE version 4 (strength 3 and 4) are statistically 
non-inferior to full dose CTE for diagnosing active inflammatory terminal ileal Crohn’s disease despite an inferior 
subjective image quality.

CLINICAL RELEVANCE/APPLICATION

Radiation dose reduction can be achieved in patients with Crohn’s disease who often undergo multiple CT 
Enterography studies to assess for active inflammation.

SSE08-06

Role of Model Based Iterative Reconstruction in CT Enterography

Kevin Murphy MBCh, MRCS: Nothing to Disclose, Lee Crush MBCh, FFR(RCSI): Nothing to Disclose, 
Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Maria Twomey MBChB, FFR(RCSI) (Presenter): 
Nothing to Disclose, Christopher Page: Nothing to Disclose, Iris Mildenberger: Nothing to Disclose, 
Niamh Moore: Nothing to Disclose, Jackie Bye BA: Employee, General Electric Company, Owen J.
PURPOSE

We analyse the performance of pure model based iterative reconstruction (MBIR) in the setting of low dose CT Enterography (CTE).

METHOD AND MATERIALS

44 Crohn's patients (27 female) (38.5±12.98 years) referred for CTE were included. Low dose modified-protocol (MP) and conventional-protocol (CP) CT datasets were contemporaneously acquired. CP-ASiR image formation used 40% adaptive statistical iterative reconstruction. MP data was reconstructed with 100%MBIR (MP-MBIR) and 40%ASiR (MP-ASiR). Image quality was assessed subjectively and objectively and at 6 levels. Clinical interpretation was undertaken independently by 2 blinded radiologists along with 2 non-blinded readers in consensus ('gold-standard').

RESULTS

A 74.7% average radiation dose reduction was seen - MP effective-dose (ED) 1.61±1.18 mSv (size-specific-dose-estimate (SSDE) 2.47±1.21 mGy); CP ED 6.05±2.84 mSv (SSDE 9.25±2.9 mGy).

CONCLUSION

Low dose CTE with MBIR reconstruction, at a mean dose of 1.61 mSv, yields images that are superior or comparable to conventional images acquired at 3 times the radiation.

CLINICAL RELEVANCE/APPLICATION

Pure iterative reconstruction is a valuable technology at improving low dose CT image quality, allowing considerable dose reductions at CT.
There was excellent correlation and agreement between MRS-PDFF vs MRI-PDFF (r²=0.88-0.97, p<0.05, slope -0.01±0.02, intercept 1.66±0.174).

CONCLUSION
In this comparative effectiveness study of three advanced non-invasive biomarkers of hepatic steatosis, quantitative chemical shift encoded MRI and CT attenuation showed excellent correlation to MRS and can serve as accurate biomarkers for steatosis. Material decomposition with DECT (CT-FD) did not improve the accuracy of fat quantification over conventional attenuation. US is accepted as a biomarker for quantifying liver fibrosis but had poor accuracy for liver-fat quantification. A major benefit of MRI and CT is the evaluation of the entire liver tissue instead of only small samples like in biopsy and MRS.

CLINICAL RELEVANCE/APPLICATION
Because fatty liver disease affects an increasing number of patients there is a need for accurate quantitative biomarkers to access this disease.

SSE09-02
Quantification of Liver Steatosis and Iron Overload in Diffuse Liver Disorders: Histological Validation of a 3.0 T MRI Multi-Echo Chemical Shift Gradient Echo (ME-CSh-GRE) Single Breath-hold Sequence

Manuela Franca MD (Presenter): Nothing to Disclose, Angel Alberich Bayarri: Nothing to Disclose, Luis Martin-Bonmati MD, PhD: Nothing to Disclose, Joao Andre Oliveira: Nothing to Disclose, Francisa Emanuel Costa MD: Nothing to Disclose, Eduardo Ribeiro: Nothing to Disclose, Jose Ramon Vizcaino Vazquez: Nothing to Disclose, Graca Porto: Nothing to Disclose, Helena Pessegueiro Miranda: Nothing to Disclose

PURPOSE
Liver biopsy is the standard technique to evaluate diffuse liver disorders. However, it is invasive, may have complications and has sampling bias. The purpose of this study is to validate an MR protocol that allows simultaneous measurement of fat and iron within the liver in a single breath-hold.

METHOD AND MATERIALS
In this prospective study, consecutive patients with diverse diffuse liver disorders and clinically indicated liver biopsy were recruited. To estimate proton-density fat fraction (PDFF) and iron R²*, a 3.0T MR examination using a single breath-hold ME-CSh-GRE sequence (TR/TE=10/0.99, 1.69, 2.39, 3.09, 3.79, 4.49, 5.19, 5.89, 6.59, 7.29, 7.99, 8.69ms) was used. Quantification was performed with dedicated software (with magnitude and phase reconstruction, T1 bias and T2* correction, and multiphase fat spectral modeling) selecting a ROI within the biopsied liver segment. Liver biopsy was used as gold standard for steatosis (0-3) and iron deposits (0-4) grading. Relationship between MR measurements and pathological grading was statistically assessed by non-parametric Kendall’s tau-b. Differences of the calculated parameters between histopathological grades were assessed by ANOVA tests.

RESULTS
A total of 104 patients were enrolled. Regarding histological steatosis grading, patients distribution was (grade/n) 0/78; 1/14; 2/ 6; 3/6. Analogously, histological iron grading distribution was 0/54; 1/28; 2/12; 3/5; 4/5. There were 14 patients with both iron and fat deposits. PDFF mean, median, 25 and 75-percentile showed significant differences between steatosis grade (p

CONCLUSION
Our results demonstrate an excellent relationship between ME-CSh-GRE MR derived PDFF and iron R²* quantifications against liver biopsy. This sequence allows to accurately measuring fat and iron in different diffuse liver disorders, even if they coexist.

CLINICAL RELEVANCE/APPLICATION
This ME-CSh-GRE MR sequence can be used to estimate fat and iron as a fast, non-invasive and quantitative liver imaging biomarkers.

SSE09-03
Intra- and Inter-examination Precision, and Accuracy of Magnitude-based and Complex-based MRI for Estimation of Hepatic Proton Density Fat Fraction (PDFF) in a Population of Obese Adults and Children

Omid Yeganeh MD: Nothing to Disclose, Yakir S. Levin MD, PhD: Nothing to Disclose, Kevin Amir Zand MD: Nothing to Disclose, Elhamy Rafat Heba MBCh, MD: Nothing to Disclose, Gavin Hamilton PhD: Nothing to Disclose, Rohit Loomba MD, MSc: Nothing to Disclose, Jeffrey B. Schwimmer MD: Nothing to Disclose, Claude B. Sirlin MD: Research Grant, General Electric Company Speakers Bureau, Bayer AG Consultant, Bayer AG, Michael Simca Middleton MD, PhD (Presenter): Consultant, Allergan, Inc Institutional research contract, Bayer Inst: institutional research contract, Isis Pharmaceuticals, Inc Institutional research contract, Johnson & Johnson Institutional research contract, Synageva BioPharma Corporation Institutional research contract, Takeda Pharmaceutical Company Limited Stockholder, General Electric Company Stockholder, Pfizer Inc Institutional research contract, Pfizer Inc

PURPOSE
To measure intra- and inter-examination precision, and accuracy using magnetic resonance spectroscopy (MRS) as reference, of magnitude- and complex-based multi-echo gradient-echo MRI (mMRI and cMRI, respectively) for estimation of hepatic proton density fat fraction (PDFF) in obese adults and children.

METHOD AND MATERIALS
In this prospective, IRB-approved, HIPAA-compliant study, obese adults and children were enrolled after obtaining written informed consent. Three 3T MRI examinations were performed, with subjects being taken off and placed back on the scanner table between examinations. Each MRI examination consisted of three MRI
acquisitions, each including mMRI, cMRI, and a magnetic resonance spectroscopy (MRS) acquisition from a voxel location in the right lobe. Hence, each subject had nine data points for each method (mMRI and cMRI). Two intra- and inter-examination precision metrics were computed: standard deviation (SD), and range. Accuracy of mMRI PDFF and cMRI PDFF, using MRS as a reference, was measured using Bland-Altman plots and linear regression.

RESULTS

Twenty-nine subjects were enrolled (23 male, 6 female; mean age 23.7 ± 14.02 years; age range 12 to 59 years; body mass index (BMI) 37 ± 5.6 kg/m², BMI range 28.1 to 51.1 kg/m²). PDFF standard deviations for intra- and inter-examination precision were 0.12% and 0.36% for mMRI, and 0.29% and 0.38% for cMRI, respectively. Ranges of PDFF standard deviation were 0.53% to 1.71% for mMRI, and 1.17% to 1.56% for cMRI, respectively. Regression intercepts were 1.70% and 0.82%, and regression slopes were 0.99 and 0.94, for mMRI and cMRI respectively, using MRS as a reference standard.

CONCLUSION

Both mMRI and cMRI demonstrated excellent intra- and inter-examination repeatability. mMRI and cMRI showed similar accuracy in hepatic PDFF estimation using MRS as a reference standard.

CLINICAL RELEVANCE/APPLICATION

Both mMRI and cMRI are likely to sufficiently precise to be useful in hepatic PDFF longitudinal monitoring studies.

SSE09-04

An Efficient and Sensitive 1H-MR Spectroscopy Method for Quantifying and Monitoring Hepatic Steatosis with T1 and T2 Corrected Fat Fractions

Ronald Ouwerkerk PhD (Presenter): Nothing to Disclose, Ranganath Muniyappa MD : Nothing to Disclose, Christopher E. Ramsden MD : Nothing to Disclose, Monica C. Skarulis MD : Nothing to Disclose, Ahmed Medhat Gharib MBChB : Nothing to Disclose

PURPOSE

To test and validate a new 1H-MRS method to quickly and accurately measure hepatic lipid content, capable of measuring with low fat signals or small changes in fat content.

METHOD AND MATERIALS

Localized MRS (8ml volume) was optimized for signal-to-noise efficiency of fat to obtain T1, T2 and spin density for water and lipids in human livers within one breath-hold. After recording an initial fully relaxed scan, spectra were acquired at a short repetition time (TR) in steady state with varying TE values and 4-fold signal averaging. Water and lipid T1 were estimated from the fully relaxed and steady state signal ratios and used to correct T2 measurements. T2 and spin density were obtained from linearized regression fits of exponential decay with TE. T1 and T2 corrected spin densities of water and fat (CH2+CH3) were used to calculate fat fractions (ff) as fat/(fat+water). Thirteen healthy subjects were assessed with this fast TR method (FTR) and with HISTO, an established method for single breath-hold T2 corrected ff measurement at 3s TR. Longer TR avoids T1 correction but only one scan per TE value can be recorded. Both methods were compared with ff determined by much lengthier respiratory navigator-gated scans (nav-MRS).

RESULTS

The figure A) shows spectra recorded with HISTO, last spectrum (TE 72 ms) shown with scale x50 and B) spectra recorded with FTR from the same volume. The fully relaxed spectrum shown at 1/2 scale (dashed) and lipid signal at TE 144 ms at 50x scale. The new method measurably improved sensitivity and accuracy of the liver fat measurement; the liver ff determined with FTR show a better correlation with nav-MRS results (with ff ranging from 0.2% to 7.8%) than HISTO (correlation coefficient R2=0.996 vs. 0.896 with HISTO, N=13). Also, the quality of the T2 regression fit was much better for FTR than HISTO as evidenced by much better linearized regression fit coefficient R2 for fat signals: FTR R2 = 0.951± 0.053 vs. HISTO 0.760±0.271, N=13.

CONCLUSION

Signal averaging and more sampled TE values result in more sensitive and accurate estimates of T2 corrected fat fractions, particularly in livers with low lipid content.

CLINICAL RELEVANCE/APPLICATION

This MRS method for measuring the liver fat content has the ability to detect lower ff and smaller changes in ff than current water-fat imaging methods which makes it a particularly useful tool for monitoring disease progression or the effects of therapy.

SSE09-05

A Multi-material Decomposition Algorithm for Liver Fat Quantification in Dual-energy CT: Reproducibility of the Method, and Comparison with MR Spectroscopy

Tomoko Hyodo MD (Presenter): Nothing to Disclose, Norihisa Yada : Nothing to Disclose, Osamu Maenishi MD : Nothing to Disclose, Peter Lamb : Employee, General Electric Company, , Kosuke Sasaki MS : Employee, General Electric Company, , Takamichi Murakami MD, PhD : Nothing to Disclose, Masakatsu Tsurusaki MD, PhD : Nothing to Disclose, Kazunari Ishii MD : Nothing to Disclose, Mitsuru Matsuki : Nothing to Disclose, Seishi Kumano MD : Nothing to Disclose, Teruhito Mochizuki MD : Nothing to Disclose

PURPOSE

SSE09-04 An Efficient and Sensitive 1H-MR Spectroscopy Method for Quantifying and Monitoring Hepatic Steatosis with T1 and T2 Corrected Fat Fractions

Ronald Ouwerkerk PhD (Presenter): Nothing to Disclose, Ranganath Muniyappa MD : Nothing to Disclose, Christopher E. Ramsden MD : Nothing to Disclose, Monica C. Skarulis MD : Nothing to Disclose, Ahmed Medhat Gharib MBChB : Nothing to Disclose

PURPOSE

To test and validate a new 1H-MRS method to quickly and accurately measure hepatic lipid content, capable of measuring with low fat signals or small changes in fat content.

METHOD AND MATERIALS

Localized MRS (8ml volume) was optimized for signal-to-noise efficiency of fat to obtain T1, T2 and spin density for water and lipids in human livers within one breath-hold. After recording an initial fully relaxed scan, spectra were acquired at a short repetition time (TR) in steady state with varying TE values and 4-fold signal averaging. Water and lipid T1 were estimated from the fully relaxed and steady state signal ratios and used to correct T2 measurements. T2 and spin density were obtained from linearized regression fits of exponential decay with TE. T1 and T2 corrected spin densities of water and fat (CH2+CH3) were used to calculate fat fractions (ff) as fat/(fat+water). Thirteen healthy subjects were assessed with this fast TR method (FTR) and with HISTO, an established method for single breath-hold T2 corrected ff measurement at 3s TR. Longer TR avoids T1 correction but only one scan per TE value can be recorded. Both methods were compared with ff determined by much lengthier respiratory navigator-gated scans (nav-MRS).

RESULTS

The figure A) shows spectra recorded with HISTO, last spectrum (TE 72 ms) shown with scale x50 and B) spectra recorded with FTR from the same volume. The fully relaxed spectrum shown at 1/2 scale (dashed) and lipid signal at TE 144 ms at 50x scale. The new method measurably improved sensitivity and accuracy of the liver fat measurement; the liver ff determined with FTR show a better correlation with nav-MRS results (with ff ranging from 0.2% to 7.8%) than HISTO (correlation coefficient R2=0.996 vs. 0.896 with HISTO, N=13). Also, the quality of the T2 regression fit was much better for FTR than HISTO as evidenced by much better linearized regression fit coefficient R2 for fat signals: FTR R2 = 0.951± 0.053 vs. HISTO 0.760±0.271, N=13.

CONCLUSION

Signal averaging and more sampled TE values result in more sensitive and accurate estimates of T2 corrected fat fractions, particularly in livers with low lipid content.

CLINICAL RELEVANCE/APPLICATION

This MRS method for measuring the liver fat content has the ability to detect lower ff and smaller changes in ff than current water-fat imaging methods which makes it a particularly useful tool for monitoring disease progression or the effects of therapy.

SSE09-05 A Multi-material Decomposition Algorithm for Liver Fat Quantification in Dual-energy CT: Reproducibility of the Method, and Comparison with MR Spectroscopy

Tomoko Hyodo MD (Presenter): Nothing to Disclose, Norihisa Yada : Nothing to Disclose, Osamu Maenishi MD : Nothing to Disclose, Peter Lamb : Employee, General Electric Company, , Kosuke Sasaki MS : Employee, General Electric Company, , Takamichi Murakami MD, PhD : Nothing to Disclose, Masakatsu Tsurusaki MD, PhD : Nothing to Disclose, Kazunari Ishii MD : Nothing to Disclose, Mitsuru Matsuki : Nothing to Disclose, Seishi Kumano MD : Nothing to Disclose, Teruhito Mochizuki MD : Nothing to Disclose
To assess the clinical accuracy and reproducibility of a new multi-material decomposition (MMD) algorithm developed for the quantification of hepatic fat content in fast kVp-switching dual-energy CT (DECT).

METHOD AND MATERIALS
Our institutional review board approved this prospective study. Thirty-three patients with suspected hepatic steatosis (BMI, 19-34) underwent unenhanced DECT scans and single-voxel 1H-MR spectroscopy (MRS) within 4 weeks prior to liver biopsy. Histologically, steatosis was graded as 0 (<5% of hepatocytes), 1 (5-33%), 2 (33-66%) and 3 (>66%) by the nonalcoholic fatty liver disease activity score (NAS). Hepatic fat volume fraction (FVF_{DECT}, %) images of 5 mm thickness were generated from DECT data using MMD. FVF_{DECT} was measured in the region-of-interest (ROI; size, 300 mm²) corresponding to the biopsy site. The ROI analysis was repeated by two observers. Inter- and intra-observer agreements of FVF_{DECT} were evaluated and agreement between FVF_{DECT} and MRS-determined fat volume fractions (FVF_{MRS}, %; voxel size, 25 x 25 x 25 mm) was assessed using Bland-Altman analysis. FVF_{DECT} and FVF_{MRS} were compared regarding histological grade of steatosis using one-way analysis of variance with Tukey-Kramer and Spearman correlations.

RESULTS
NAS steatosis scores were score 0 in 5 patients; 1 in 14; 2 in 11; and 3 in 3. Intra- and interobserver agreement of the FVF_{DECT} were very good (mean differences < 0.1%). There were good correlations between NAS steatosis score and both FVF_{DECT} (r = 0.72; P < .0001) and FVF_{MRS} (r = 0.78; P < .0001). In pairwise comparisons, no statistical significant difference was found between the scores 0 and 1 for both FVF_{DECT} and FVF_{MRS}. Significant differences were found between NAS steatosis scores 2 and 3 only for FVF_{MRS} (P = .019) and between the other pairwise comparisons for both FVF_{DECT} and FVF_{MRS}. Bland-Altman analysis of FVF_{DECT} and FVF_{MRS} showed significant proportional bias (r = 0.66; P < .001).

CONCLUSION
MMD algorithm for DECT is feasible for the quantification of hepatic fat content with comparable accuracy to MRS, and with excellent reproducibility.

CLINICAL RELEVANCE/APPLICATION
Low Liver Choline Content in Non Alcoholic Hepatosteatosis Measured with Localized 1H-MRS

SSE09-06
Ronald Ouwerkerk PhD (Presenter): Nothing to Disclose, Yaron Rotman MD: Nothing to Disclose, Ranganath Muniyappa MD: Nothing to Disclose, Christopher E. Ramsden MD: Nothing to Disclose, Monica C. Skarulis MD: Nothing to Disclose, Ahmed Medhat Gharib MBChB: Nothing to Disclose

PURPOSE
To test the hypothesis that low choline is linked with hepatosteatosis in humans. Choline deficient diets can be used to create animal models of non-alcoholic hepatosteatosis (NASH). Choline is an essential factor in creating very low-density lipoproteins (VLDL) and this is the main vehicle for clearing lipids from the liver. It is therefore conceivable that at least in some humans with elevated liver fat content the cause is also linked to an abnormal choline supply in the liver.

METHOD AND MATERIALS
Thirteen healthy controls and ten patients with NASH were recruited for studies to measure liver fat with MRS. All were scanned in a 3T MR scanner with a comprehensive liver exam including localized MRS. Both T1 weighted expiration breath-hold and T2 weighted navigator gated scouts were scanned in transverse and coronal orientations. Single volume localized MR spectra were acquired in the liver in single breath-hold and with navigator gating. Volumes (8ml) were carefully placed in the right posterior lobe of the liver, avoiding blood vessels and fatty structures. Single breath-hold scans were used to collect spectra with a series of TE to determine the T2 of water and fat. Navigator-gated MRS was used for measurement of the fat fraction ff=fat/(fat+water), and choline content, both corrected for T2 relaxation of water and fat.

RESULTS
The liver ff in the controls was predictably lower than in NASH patients: 0.90 ± 0.63, in controls (N=13) vs. 9.9 ± 3.7 in NASH (N=10). The liver choline content was higher in controls (5.7±1.3, range 4.5-8.2 mmol/kg ww, N=13) than in NASH (2.6 ± 1.6 range 0.3-5.6 mmol/kg ww, N=10). The difference was significant with p < 0.0001 in an unpaired heteroscedactic t-test. A figure with choline as a function of ff shows the difference in both ff and choline content between controls (black squares) and NASH (open circles). There was no strong linear correlation between choline and ff (shown for NASH only).

CONCLUSION
There is a clear reduction in choline-containing compounds detectable by MRS in most subjects with NASH. Even though the individual causes of NASH may vary, the data support the hypothesis that there is a link between liver choline content and elevated haptic lipid content.

CLINICAL RELEVANCE/APPLICATION
Relating liver choline content with liver fat content could reveal information about the cause of the fat accumulation in the liver in NASH.
LEARNING OBJECTIVES

1) Achieve a basic understanding of the anatomy of hepato bilary region and appearance of hepatic and biliary tumors as seen on imaging studies. 2) Appreciate the differences between imaging techniques, including MRI and CT, as they are used in delineating primary tumor and involved regional nodes. 3) Identify common sites of recurrence for hepatic and biliary cancer and recognize the imaging appearances of these recurrences. 4) Improve radiation therapy delivery through understanding the contouring recommendations for the gross tumor volume (GTV) and clinical target volumes (CTV) for hepato bilary cancer, both in the locally advanced and post-operative setting. 5) Understand the use of imaging, treatment planning, and treatment delivery techniques to account for respiratory motion.

ABSTRACT

Achieve a basic understanding of the anatomy of hepato bilary region and appearance of hepatic and biliary tumors as seen on imaging studies. 2) Appreciate the differences between imaging techniques, including MRI and CT, as they are used in delineating primary tumor and involved regional nodes. 3) Identify common sites of recurrence for hepatic and biliary cancer and recognize the imaging appearances of these recurrences. 4) Improve radiation therapy delivery through understanding the contouring recommendations for the gross tumor volume (GTV) and clinical target volumes (CTV) for hepato bilary cancer, both in the locally advanced and post-operative setting. 5) Understand the use of imaging, treatment planning, and treatment delivery techniques to account for respiratory motion.
ABSTRACT

Given the ubiquitousness of liver lesions on imaging studies, it is incumbent upon radiologists to accurately characterize these lesions and differentiate benign from malignant. While the vast majority of liver lesions are benign incurring no further treatment or management and their features need to be recognized, the management of indeterminate and malignant lesions ranges from percutaneous biopsy to surgery to chemotherapy and a confident diagnosis or differential diagnosis should be pursued before these invasive measures are undertaken. While many lesions are adequately characterized on other imaging modalities, many require further analysis with MRI and some may initially present at MR imaging. Given the wide array of pulse sequences and protocols and proliferation of MR contrast agents, assimilating all of the necessary imaging information to generate an accurate diagnosis or differential diagnosis can be challenging. MRI is considered the most comprehensive and accurate modality for noninvasive assessment of liver lesions and in the majority of cases, a confident lesion diagnosis is possible based on the composite information from multiple pulse sequences. While many lesions exhibit classic features rendering diagnosis straightforward, lesions occasionally demonstrate unusual or atypical features that may complicate accurate diagnosis and familiarity with these infrequent appearances is important for accurate characterization and discrimination between benign and malignant etiology. The utility of the various MRI pulse sequences and contrast agents will be discussed and a diagnostic algorithm will be presented to help classify and accurately diagnose liver lesions.

LEARNING OBJECTIVES

1) To appreciate and understand the typical imaging appearances of common liver lesions. 2) To understand the algorithmic approach to liver lesion differential diagnosis. 3) To understand how information from the various pulse sequences and contrast agents contribute to liver lesion assessment.

RC329B

Pancreatic Cysts—Achieving Consistency and Common Sense

Masoom A. Haider MD (Presenter): Consultant, Bayer AG

LEARNING OBJECTIVES

1) To recognize the classic MRI findings for cystic pathologies of the pancreas. 2) To have a pragmatic approach to management recommendations of cystic lesions of the pancreas based on current guidelines.

ABSTRACT

With the widespread use of cross sectional imaging cystic pancreatic lesions are being detected with increasing frequency. The dominance of pseudocyst as the commonest type of pancreatic cyst may no longer hold. Radiologists must be familiar with the features of cystic neoplasms. MRI offers excellent tissue contrast for characterization of pancreatic cysts as well as for assessment of relationship to the pancreatic duct which can be helpful for differential diagnosis. A number of MRI features can be used to help guide management and offer likely differential diagnosis and will be presented. At the same time MRI has resulted in increased detection of tiny incidental simple pancreatic cysts for which limited or no followup may be necessary. It is important to recognize that in some cases MRI and other non-invasive imaging methods cannot provide reliable diagnosis as there is substantial overlap in imaging findings between some benign and pre-malignant or malignant cystic neoplasm. These scenarios will be reviewed in the context of current published guidelines to enable a pragmatic approach to pancreatic cyst evaluation.

URL's


RC329C

Cholangiocarcinoma—Addressing a Difficult Challenge

Kartik Sudhir Jhaveri MD (Presenter): Research Grant, Bayer AG Speaker, Bayer AG

LEARNING OBJECTIVES

1) To emphasize an optimal MR imaging protocol. 2) To highlight role of MRI in the diagnosis and classification. 3) To demonstrate the role of MRI in staging. 4) To understand limitations of MRI and review "mimics" of cholangiocarcinoma.

ABSTRACT

Although Cholangiocarcinoma is a rare tumour (<2% of all cancer), it is the second most common primary Hepatobiliary malignant tumour after hepatocellular carcinoma (HCC). This tumour actually encompasses a diverse group of tumours varying greatly in location, growth pattern and histology resulting in a gamut of imaging manifestations. It is important to be familiar with those diverse manifestations to provide accurate detection and characterization. Since only surgery can provide curative therapy, accurate resectability assessment is critical. Defining an optimal MRI protocol which includes precontrast MR imaging along with high resolution MRCP sequences and Dynamic contrast acquisitions/MR angiography is necessary to ensure accurate results MRI offers unique advantages via its ability to provide information noninvasively in a single test regards tumour size, extent, vascular involvement, nodes and extrahepatic spread. MRCP can superbly display bile ducts upstream to an obstruction. MRI is not without limitations. In some cases other disease process may mimic cholangiocarcinoma and these will be discussed. At times MRI may not be able to confidently detect or stage the tumour and correlative imaging with Ultrasonography, CT and PET needs to be considered.

References:

Pitfalls in Liver Imaging (How-to Workshop)

**Participants**
- Khaled M. Elsayes, MD (Presenter): Nothing to Disclose
- Richard L. Baron, MD (Presenter): Speakers Bureau, Bracco Group
- Janio Szklaruk, MD, PhD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**
1. Describe most commonly encountered imaging pitfalls of the liver.
2. Describe relevant technical background, pathophysiology and hemodynamics of these pitfalls.
3. List tips to avoid erroneous diagnosis and clues to reach correct diagnosis.

**ABSTRACT**
There is a wide range of common pitfalls in liver imaging, which can lead to frequent incorrect diagnoses mainly because many radiologists are not completely familiar with anatomical, morphological, physiological, hemodynamic and biological principles as well as deficiency of modern clinical and radiological knowledge. This leads to common misinterpretations which would further result in wrong management with potentially negative outcome. In this course, we discuss a spectrum of these pitfalls according to the following organization: In this course, we discuss a spectrum of these pitfalls which can be classified to: 1. Diagnostic pitfalls a. Mistaking benign lesions for malignant lesions b. Mistaking malignant lesions for benign lesions 2. Technical pitfalls a. CT, US, MR specific issues that create difficulties in diagnosis b. Technique pitfalls 3. Organizing pitfalls by liver status a. Pitfalls in imaging chronic liver disease (cirrhosis) b. Pitfalls in noncirrhotic liver 4. Atypical presentations of common benign lesions 5. Atypical presentations of common malignant lesions 6. Organization according to imaging findings

**URL's**
https://www.radiology.uchicago.edu/page/faculty-lectures

Doppler US: Abdominal and Visceral Applications (Hands-on Workshop)

**Participants**
- Shweta Bhatt, MD, MBBS (Presenter): Nothing to Disclose
- Wui Kheong Chong, MD (Presenter): Nothing to Disclose
- M. Robert Dejong (Presenter): Advisory Board, Koninklijke Philips NV Speakers Bureau, Koninklijke Philips NV
- Vikram Singh Dogra, MD (Presenter): Editor, Reed Elsevier
- Corinne Deurdulian, MD (Presenter): Nothing to Disclose
- Edward G. Grant, MD (Presenter): Research Grant, Bracco Group Research Grant, General Electric Company Medical Advisory Board, Nuance Communications, Inc
- Gowthaman Gunabushanam, MD (Presenter): Editor, WebMD Health Corp
- Mark Elwood Lockhart, MD (Presenter): Nothing to Disclose
- Michelle Lavonne Robbin, MD (Presenter): Consultant, Koninklijke Philips NV
- Leslie M. Scoutt, MD (Presenter): Consultant, Koninklijke Philips NV
- Sadhna Verma, MD (Presenter): Nothing to Disclose
- Ravinder Sidhu, MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**
1. Understand basic concepts associated with abdominal and visceral Doppler.
2. Describe ultrasound techniques, protocols, and diagnostic criteria for evaluation of abdominal and visceral arteries.
3. Gain experience in Doppler techniques through personalized hands-on scanning of models with a variety of ultrasound machines.
4. Describe common pitfalls in Doppler examinations.

**ABSTRACT**
This hands-on course will focus on the details that constitute good Doppler technique in the evaluation of vascular flow within the abdomen and pelvis. Technical considerations for optimization of Doppler images will be discussed and the concepts will be applied to abnormalities commonly encountered in patients. Initial two brief lectures will begin by discussing important aspects of abdominal and visceral Doppler. The majority of the session will give participants an opportunity to scan live models to improve technical skills in color and spectral Doppler. Faculty will be available at multiple stations using a variety of ultrasound machines. Participants will be encouraged to inquire about specific arterial territories of interest in the abdomen and pelvis during the hands-on component of the course.
Gastrointestinal Series: State-of-Art CT and MR in Luminal GI Diseases

**Series Courses**

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**Participants**

**Moderator**
- John Richard Leyendecker MD : Nothing to Disclose
- Joel Garland Fletcher MD : Grant, Siemens AG

**Sub-Events**

**VSGI31-01**  
**Crohn’s Disease**

Amy Kiyo Hara MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) CT Enterography technique (Oral contrast and low radiation dose issues). 2) CT signs of active inflammatory disease vs fibrostenosing or mixed. 3) Proposed Crohns disease report terminology. 4) Discuss what the gastroenterologist wants to know.

**ABSTRACT**

CT enterography can provide a comprehensive evaluation of the small bowel in patients with Crohns disease. This presentation will discuss technical tips for optimizing bowel distention and reducing radiation dose. Imaging findings of Crohn’s disease, differentiating active inflammatory vs fibrostenosing disease and the proposed terminology for describing these findings will also be demonstrated and discussed. Important findings to detect and describe for gastroenterologists will be demonstrated.

**VSGI31-02**  
**Grading of Crohn’s Disease Activity Using CT, MRI, US and Scintigraphy: A Meta-analysis**

Carl Alejandro Julien Pylaert MSc (Presenter): Nothing to Disclose, Jeroen Tielbeek MD : Nothing to Disclose, Shandra Bipat MS : Nothing to Disclose, Jaap Stoker MD, PhD : Research Consultant, Robarts Clinical Trials

**PURPOSE**

To assess the role of computed tomography (CT), magnetic resonance imaging (MRI), ultrasonography (US) and scintigraphy in grading Crohn’s disease (CD) activity.

**METHOD AND MATERIALS**

MEDLINE, EMBASE and Cochrane databases were searched for studies evaluating CT, MRI, US and scintigraphy in grading CD activity as compared to (ileo-)colonoscopy, biopsies or intraoperative findings as the reference test. Two independent reviewers assessed the data. Three by three tables (none, mild, frank disease) were constructed for all studies and overall grading accuracy, overgrading and undergrading were calculated/summarized by fixed or random effects models.

**RESULTS**

Our search yielded 9356 articles, from which 19 articles were determined eligible for inclusion. A total of 549 patients were included. Per-patient data showed overall grading accuracy values for CT, MRI, US and scintigraphy of 86% (95%CI: 75-93%), 84% (95%CI: 67-93%), 44% (95%CI: 28-61%) and 40% (95%CI: 16-70%), respectively. CT and MRI data were pooled and showed similar overall grading accuracy estimates (P=0.8). CT and MRI showed similar overgrading (P=0.8) and undergrading (P=0.5). Per-segment data showed overall grading accuracy values for CT, MRI, US and scintigraphy of 87% (95%CI: 77-93%), 78% (95%CI: 72-82%), 66% (95%CI: 52-78%) and 86% (95%CI: 80-91%), respectively. CT showed similar grading accuracy to MRI (P=0.08) and scintigraphy (P=0.8). Both CT and scintigraphy showed higher grading accuracy than US (P=0.001 and P=0.003, respectively). Similar overgrading was seen between CT and MRI (P=0.7), CT and scintigraphy (P=0.2) and MRI and scintigraphy (P=0.09). MRI undergraded more than scintigraphy (P=0.004), while comparisons between CT and MRI and between CT and scintigraphy showed similar undergrading (P=0.1 and P=0.5, respectively).

**CONCLUSION**

CT and MRI showed similar high accuracy values and similar over- and undergrading both in the per-patient and per-segment analyses. Results for US and scintigraphy were inconsistent and limited data was available.

**CLINICAL RELEVANCE/APPLICATION**

Both CT and MRI can be used for grading of Crohn’s disease activity, with MRI being preferable as it lacks ionizing radiation exposure.

**VSGI31-03**  
**MR Enterography with Diffusion-weighted Imaging to Substitute Intravenous Contrast for**
Evaluating Crohn’s Disease: A Noninferiority Study


PURPOSE
To prospectively determine whether MR enterography (MRE) performed with diffusion-weighted imaging (DWI) and without intravenous contrast is diagnostically noninferior to conventional contrast-enhanced (CE) MRE for evaluating Crohn’s disease (CD).

METHOD AND MATERIALS
Fifty adults suspicious of CD prospectively underwent clinical assessment, MRE, and ileocolonoscopy within 1 week and 44 patients finally diagnosed with CD (M:F, 34:10; 26.9±6.1 years) were analyzed. Conventional CE-MRE and DWI at \( b = 900 \text{ s/mm}^2 \) were performed. Unenhanced DWI-MRE (i.e. T2-weighted sequences + DWI) and CE-MRE (i.e. T2-weighted sequences + dynamic CE T1-weighted sequences) were reviewed in separate sessions with proper blinding, a washout period, and randomization. A total of 172 small bowel segments representing the entire spectrum from normalcy to severe inflammation in CD as seen on CE-MRE were chosen for the review. The primary endpoint was the proportional agreement between two MRE methods in diagnosing active bowel inflammation, with the noninferiority margin of 85% of agreement. Secondary analyses were performed in the agreement in interpreting penetrating diseases and regarding the MRE accuracy in the terminal ileum for diagnosing all severities of inflammation and for deep ulcers using the endoscopic findings as the reference standard.

RESULTS
The agreement between unenhanced DWI-MRE and CE-MRE in interpreting active bowel inflammation was 92.4% (159/172; one-sided 95% CI, >88.4%). Therefore, the noninferiority of DWI-MRE to CE-MRE was established. Of 8 segments with penetrating diseases shown on CE-MRE, DWI-MRE interpreted 6 segments concordantly, characterized 1 abscess discordantly as phlegmon, and neglected 1 sinus tract. In the 41 terminal ilea with endoscopic reference standard, unenhanced DWI-MRE and CE-MRE did not reveal significant differences in the sensitivity for diagnosing all severities of inflammation (94% [32/34] vs. 97% [33/34]; \( P = 1 \)) or for diagnosing deep ulcers (95% [20/21] for both; \( P = 1 \)).

CONCLUSION
DWI-MRE was noninferior to CE-MRE in diagnosing bowel inflammation but showed more considerable discordance with CE-MRE in diagnosing penetrating diseases.

CLINICAL RELEVANCE/APPLICATION
DWI-MRE may substitute CE-MRE for evaluating bowel inflammation in CD patients who are contraindicated for the use of intravenous contrast and are not suspicious of having penetrating diseases.

VSGI31-04 Small Bowel Imaging in Occult GI Bleed
David J. Grand MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Understand the role of CT for occult GI bleeding. 2) Understand and implement specific CT protocol optimized to detect source of occult GI bleed. 3) Detect and diagnose the various causes of occult GI bleed.

VSGI31-05 In the Work-up of Patients with Obscure Gastrointestinal Bleed, Does 64-slice MDCT Angiography Have a Role?
Chinmay Bhimaji Kulkarni MBBS, MD (Presenter): Nothing to Disclose, Srikanth Moorthy MD: Nothing to Disclose, Sreekumar KP MBBS, MD: Nothing to Disclose, Rajesh Ramaih Kannan MD: Nothing to Disclose

PURPOSE
To prospectively determine the sensitivity of 64-slice MDCT angiography in detecting and diagnosing the cause of obscure gastrointestinal bleed (OGIB).

METHOD AND MATERIALS
The study included 132 patients (male 93, female 39) in the age range of 3 -87 years (average age 55.13 years) who were referred to radiology department as part of workup for clinically evident gastrointestinal bleed or as part of workup for anemia (with and without positive fecal occult blood test) between 2007-2013. MDCT angiography was performed only after conventional upper endoscopy and colonoscopy were negative. Following a non-contrast scan, all patients underwent triple-phase contrast CT scan using a 64-slice CT scan system. The diagnostic performance of MDCT angiography was compared to the results of capsule endoscopy, 99mTc-red blood cell scintigraphy (99mTc-RBC scintigraphy), digital subtraction angiography, and surgery whenever available.

RESULTS
CT scan showed positive findings in 80 of 132 patients. The sensitivity, specificity, positive predictive value, and negative predictive values of MDCT angiography for detection of bleed were 74.7%, 66.7%, 81.2%, and 57.7%, respectively. Capsule endoscopy was performed in 36 patients and was positive in 21 patients.
sensitivity 78.2%). 99mTc-RBC scintigraphy was performed in 16 patients and was positive in 10 patients (sensitivity 71.4%). Digital subtraction angiography was performed in 34 patients and was positive in 28 patients (sensitivity 90.3%).

CONCLUSION

MDCT angiography is a sensitive and noninvasive tool that allows rapid detection and localization of OGIB. It can be used as the first-line investigation in patients with negative endoscopy and colonoscopy studies. MDCT and capsule endoscopy have complementary roles in the evaluation of OGIB.

CLINICAL RELEVANCE/APPLICATION

MDCT angiography is a sensitive and noninvasive tool that allows rapid detection and localization of obscure gastrointestinal bleed and can be used as the first-line investigation in patients with negative endoscopic studies.

VSGI31-06  MR of Fistula-in-ano  Tracy Anne Jaffe MD (Presenter): Nothing to Disclose  
LEARNING OBJECTIVES

1) To review the MRI techniques for evaluating fistula-en-ano. 2) To review the MR findings of fistula-en-ano.

VSGI31-07  MR of Rectal Cancer  Mukesh Gobind Harisinghani MD (Presenter): Nothing to Disclose  
LEARNING OBJECTIVES

1) Understand the role of MR in accurate staging of rectal cancer. 2) Review MR technique, anatomy pertinent to rectal cancer staging.

ABSTRACT

The presentation will provide a comprehensive overview of the role of MR in staging rectal cancer

VSGI31-08  Patient Selection for Local Excision: Preoperative MRI to Predict Negative Lymph Node Metastasis in Patients with Clinical T1 and T2 Stage Rectal Cancer  Beomseok Sohn MD (Presenter): Nothing to Disclose, Chansik An MD: Nothing to Disclose, Joonseok Lim MD: Nothing to Disclose, Myeong-Jin Kim MD, PhD: Nothing to Disclose  
PURPOSE

To minimize the false-negative rate (FNR) of preoperative MRI in the diagnosis of lymph node (LN) metastasis in patients with clinical T1 or T2 rectal cancer. Local excision can reduce the morbidities from radical surgery, but has shown high local recurrence rates due mainly to undetected LN metastasis. Ideally, minimized FNR for detecting LN metastasis would maximize the identification of patients suitable for local excision.

METHOD AND MATERIALS

A total of 246 patients with clinical T1/T2 rectal cancer who underwent MRI within one month before surgery were included in this study. The tumor location, morphology, tumor diameter/volume, and depth of tumor invasion were evaluated using MRI. Patients were categorized into three groups according to the LN size and morphology: Group 1, no discernible regional LN or all visible LNs <3 mm; Group 2, not belonging to either Group 1 or 3; and Group 3, at least one LN >5 mm or showing irregular margins or internal heterogeneity.

RESULTS

Lower LN group and partial tumor invasion of the muscular layer were significantly associated with lower risks of LN metastasis. When it was considered negative for LN metastasis if the patient belonged to LN Group 1 or 2 regardless of the depth of tumor invasion, the FNR were 13.6%. When only LN Group 1 was considered negative for LN metastasis, the FNR was still 9.7%. Addition of invasion depth to the diagnostic criteria decreased the FNR from 13.6% to 5.8% (LN Group 1/2 with partial tumor invasion) and from 9.7% to 3.2% (LN Group 1 with partial tumor invasion).

CONCLUSION

Inclusion of tumor invasion depth in LN evaluation using preoperative MRI can reduce the FNR for LN metastasis in patients with clinical T1 or T2 rectal cancer.

CLINICAL RELEVANCE/APPLICATION

We can better identify a low risk group for regional LN metastasis among patients with early-stage rectal cancer.
We can better identify a low risk group for regional LN metastasis among patients with early-stage rectal cancer by assessing the depth of tumor invasion and regional LNs using preoperative MRI. Application of these criteria may help minimize the likelihood of offering local excision to a patient who might have LN metastasis.

**VSGI31-09**

**Combined Predictive Value of Functional Imaging Markers Derived from Correlations of PET/CT and Diffusion Weighted MRI in Response Assessment of Rectal Cancer Treatment after Neoadjuvant Radiochemotherapy**

Davide Ippolito MD (Presenter): Nothing to Disclose, Pietro Andrea Bonaffini MD: Nothing to Disclose, Davide Fior MD: Nothing to Disclose, Silvia Girolama Drago: Nothing to Disclose, Giulia Querques MD: Nothing to Disclose, Sandro Sironi MD: Nothing to Disclose

**PURPOSE**

To assess the clinical diagnostic value of functional imaging, combining quantitative parameters of ADC and SUV max, before and after chemo-radiation therapy, in prediction of tumor response of patients with rectal cancer, related to tumor regression grade at histology.

**METHOD AND MATERIALS**

A total of 51 patients with biopsy proven diagnosis of rectal carcinoma were enrolled in our study. All patients underwent a whole body 18 FDG PET/CT scan and a pelvic MR examination including DW imaging for staging (PET 1, RM1) and after completion (6.6.weeks) of neoadjuvant chemoradiation treatment (PET 2, RM 2). Subsequently all patients underwent total mesorectal excision and the histological results were compared with imaging findings. The MR scanning, performed on 1,5 T magnet (Philips,Achieva), included T2-weighted multiplanar imaging and in addition DW images with b-value of 0 and 1000 mm²/sec. On PET/CT the SUV max of the rectal lesion were calculated in PET1 and PET2. The percentage decrease of SUVmax(ΔSUV) and ADC (ΔADC) values from baseline to presurgical scan were assessed and correlated with pathologic response classified as tumor regression grade (Mandard’s criteria;TRG 1= complete regression,TRG 5= no regression).

**RESULTS**

At histology, according to Mandard’s criteria, 33 tumors(68%) showed complete or subtotal regression(TRG1-2) and were classified as responders; 18 tumors(32%) were classified as non-responders(TRG3-5). Considering all patients, the mean values of SUVmax in PET 1 was higher than mean value of SUVmax in PET2 (p=0.001), whereas mean ADC values was lower in MR 1 than MR 2 (p<0.001). The best predictors for TRG response were SUV2(threshold of 4.4) and ADC2(1.28x10^-3mm2/s); combining in a single analysis median quantitative value, the PPV in predicting different group category response, related to TRG system, presented an overall AUC of 96%, higher than DWI(88.2%) or SUVmax(93.3%).

**CONCLUSION**

In era of PET/MRI the combination of functional data derived from DWI and PET/CT represents the most accurate method to evaluate the response to treatment in LARC patients, with repeatable accuracy values higher than those reported for other conventional imaging techniques.

**CLINICAL RELEVANCE/APPLICATION**

The functional imaging combining ADC and SUVmax permits to detect changes in cellular tissue structures useful for the assessment of tumour response after the neoadjuvant therapy in rectal cancer patients.

**VSGI31-10**

**CT Colonography and Colorectal Cancer Screening**

Perry J. Pickhardt MD (Presenter): Co-founder, VirtuoCTC, LLC Stockholder, Cellearc Biosciences, Inc

**LEARNING OBJECTIVES**

1) Understand the recent developments in CTC screening, including guideline updates and coverage determinations. 2) Appreciate the potential added value of extracolonic data for wellness and screening. 3) Become aware of emerging data with regard to other competing CRC screening tools.

**ABSTRACT**

The presentation will provide an update on the current status of guidelines and coverage issues for CTC screening. Recent clinical data for CTC will be reviewed, including the potential value-added assessment from extracolonic findings.

**VSGI31-11**

**Missed Colorectal Polyps at Optical Colonoscopy Despite Prospectively Known Positive CT Colonography Findings**


**PURPOSE**

The diagnostic performance of optical colonoscopy (OC) for colorectal polyp detection has been estimated in previous CT colonography (CTC) trials using segmental unblinding of CTC findings. However, these estimates do
METHOD AND MATERIALS

During a 113 month period, 9,336 patients (mean age 57.1±8.0 years, M:F 4,210:5,126) underwent CTC at a single center, yielding 2,606 non-diminutive polyps. Of 1,731/2,606 polyps that underwent follow-up OC, 1,550 (90%) were concordant and 181 (10%) were discordant. CTC results (size, location, morphology) were revealed to colonoscopists prior to OC. After independent consensus review by at least two radiologists, 115 discordant findings were felt to be possible OC false negatives, and were further evaluated at repeat CTC and/or OC.

RESULTS

Of the 115 possible OC false negatives, 37 were either lost to follow-up or still awaiting follow-up at the time of study. Of the remaining 78 polyps 31 (40%) were confirmed to be OC false negatives at follow-up evaluation (26 by OC, 5 by CTC), and 47 (60%) were again not found, and remain CTC false positives. Compared with CTC false positives, OC false negatives were more likely to be larger (10.6 ± 5.3 mm vs 8.5 ± 3.3 mm, \(p=0.034\)) and to have higher diagnostic reader confidence at initial CTC (mean 2.8/3 vs 2.3/3, \(p=0.001\)). OC false negatives were more likely than OC/CTC concordant polyps to be located in the right colon (71% vs 47%, \(p=0.010\)). Of OC false negatives confirmed at subsequent OC, 17/26 (65%) had adenomatous histology (1 tubulovillous adenoma, 11 tubular adenoma, 5 serrated adenoma), of which 6 were advanced lesions.

CONCLUSION

Among discordant polyps at OC following positive CTC, OC false negatives are a common occurrence even when CTC findings are known prior to colonoscopy. Proven OC false negatives were ≥10 mm on average, more likely to be located in the right colon, and called with higher diagnostic confidence on CTC. Most ultimately resected OC false negatives proved to be adenomatous histology, including a substantial fraction of advanced lesions.

CLINICAL RELEVANCE/APPLICATION

An understanding of missed polyps at colon cancer screening is vital to improving detection and patient care.

SSG03

Emergency Radiology (Abdominal Emergencies)

Scientific Papers

ER CT GU GI
AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Tue, Dec 2 10:30 AM - 12:00 PM  Location: E352

Participants

Moderator
Michael Nathan Patlas MD, FRCPC : Nothing to Disclose
Moderator
Mariano Scaglione MD : Nothing to Disclose

Sub-Events

SSG03-01

Rapid Acquisition Axial and Coronal T2 HASTE MR in the Evaluation of Acute Abdominal Pain

Sam Byott MBChB (Presenter) : Nothing to Disclose, Ian Harris MBCh, FRCR : Nothing to Disclose

PURPOSE

To assess MR in acute abdominal imaging and ascertain if it is a reliable alternative to CT in patients under 60

METHOD AND MATERIALS

Four year prospective analysis from January 2009 - December 2013. In patients under 60 presenting with acute abdominal pain, MR was used either as a primary investigation, or following ultrasound when there was ongoing clinical concern. Rapid acquisition HASTE (Half Fourier Acquisition Single Shot Turbo Spin Echo) coronal and axial sequences without intravenous contrast. Patients were followed up for minimum of 3 months.

RESULTS

468 cases included in the study. 349 negative for acute abdominal pathology 116 positive for acute abdominal pathology 3 indeterminate MR Negative: 324 had uneventful follow up 22 had negative laparoscopies 3 had subsequent appendectomies, appendicitis on histology (3 days, 10 days and 2 months post scan) MR Positive: 64 had surgery confirming MR findings: 34 appendicitis, 14 SBO, 3 Ovarian torsion, 3 LBO, Intussusception, Ovarian carcinoma, Ovarian dermoid, 2 Pelvic inflammatory disease, Diverticular abscess, Crohns, 4 Endoscopy for acute bowel pathology 1 had surgery for MR diagnosis of appendicitis, sigmoid diverticular perforation identified at surgery 51 were treated conservatively with concurrent follow-up: 4 SBO, 11 diverticulitis, 6 Pelvic inflammatory disease, 7 Inflammatory bowel disease, 7 Collitis, 6 Pyelonephritis, 2 Cholecystitis, Renal abscess, Pseudomembranous colitis, Splenic hematoma, Mesenteric adenitis, 2 Pancreatitis, Lymphoma, Epiploic appendagitis MR indeterminate: 1 treated conservatively, 1 had laparoscopic appendectomy, normal appendix on histology, 1 had laparoscopic appendectomy with acute appendicitis on histology Overall
diagnostic accuracy of 99% (463/468), with respect to correlation between MR diagnosis and clinical/surgical follow up. Negative laparoscopy rate: 4.9%

CONCLUSION
This study demonstrates that rapid acquisition axial and coronal T2 HASTE MR is a practical, safe and effective method in the diagnosis of acute abdominal pain. MR is the preferred option to CT in patients of an age prone to radiation with a potential surgical diagnosis.

CLINICAL RELEVANCE/APPLICATION
MRI in acute abdominal imaging is both effective and practical and is the preferred imaging option in patients of an age prone to radiation with a potential surgical diagnosis.

URETERAL STONE DETECTION USING VIRTUAL NONENHANCED IMAGES IN ENHANCED SPECTRAL CT IMAGING: A PRELIMINARY STUDY
Duan Haifeng MMed (Presenter); He Taiping MMed; Yang Chuangbo MMed; Ma Guangming MMed; Guo Youmin MD; Lei Yuxin MMed; Yu Yong MMed

PURPOSE
To evaluate the clinical value of detecting ureteral stones with the virtual nonenhanced (VNE) images generated in the enhanced spectral CT imaging.

METHOD AND MATERIALS
38 adults (21 males and 17 female, ages: 24-76 years) with positive calculi in the urinary system found during abdominal CT for lesion diagnosis or clinical emergency were retrospectively analyzed. True nonenhanced (TNE) CT was performed with 120kVp with noise index of 12 at 5mm slice thickness. Contrast-enhanced scans in the venous phase (VP) and delayed phase (DP) were performed with spectral CT mode. VNE images were generated from the 2 enhanced phases. 2 board-certified radiologists reviewed both TNE and VNE images for image quality and stone detection rate. Mean CT number, size and contrast-noise-ratio (CNR) of stones were measured.

RESULTS
52 stones were detected from TNE images, including 11 in the renal parenchyma, 25 in the renal pelvises, 4 in the ureters of abdominal segments, 7 in the ureters of pelvis segments and 5 in the bladder; 51 and 52 stones were detected with VNE images at VP and DP, respectively. The missed stone at VP located in renal parenchyma with diameter less than 0.8mm and low CT number of 86HU, similar to that of renal parenchyma. The mean CT number (in HU) for the stones from TNE was 310.15±154.85, higher than the 244.33±153.20 from VNE at VP and 251.78±155.73 at DP (p<0.05). The maximum stone areas (in mm2) determined from VNE images were 39.0±32.7 and 38.8±33.4, within 83% of the 47.0±36.8 determined by TNE images. The 3 sets images produced similar image quality scores and CNR values at 22.51±12.99, 19.25±15.69 and 20.91±17.71, respectively with no difference. The dose reduction achieved by omitting TNE scan was 21.4%.

CONCLUSION
The use of VNE images generated from the enhanced spectral CT provides very high sensitivity in detecting ureteral stones with good image quality and 21% dose reduction compared with the TNE images. There is good correlation in stone CT number and size measurement between TNE and VNE images.

CLINICAL RELEVANCE/APPLICATION
VNE images from enhance spectral CT may be used to replace TNE for ureteral stone detection with excellent sensitivity and dose reduction.

DIRECT COMPARISON OF CONTRAST-ENHANCED MRI WITH CONTRAST-ENHANCED CT TO DIAGNOSE APPENDICITIS
Michael D. Repplinger MD (Presenter); Perry J. Pickhardt MD; Douglas Robert Kitchin MD; Jessica B. Robbins MD; Timothy J. Ziemlewicz MD

PURPOSE
To determine the accuracy of an MRI protocol (with and without contrast plus DWI) when compared with a CE-CT protocol for the detection of acute appendicitis.

METHOD AND MATERIALS
This is a HIPAA-compliant, IRB-approved prospective study of patients presenting to the emergency department with abdominal pain. Patients were eligible for enrollment if they were over 11 years old and had a CT ordered to evaluate for appendicitis. After consent was obtained, patients underwent CT and MR imaging in tandem. Three attending radiologists interpreted all MR and CT images independently. Image sets were de-identified. Multiple parameters were documented for each image set including characteristics of the appendix (size, location, etc), the likelihood of appendicitis, possible alternative diagnoses, and the time required to interpret
the images. Follow-up consisted of a chart review for pathological/surgical findings or follow-up phone interview/chart review. Continuous variables were summarized with descriptive statistics using means and 95% confidence intervals. Receiver operating characteristic (ROC) curves for the likelihood of appendicitis were drawn. Pair-wise comparisons of AUCs were obtained. Cohen's kappa with quadratic weights was used to assess inter-reader agreement.

RESULTS

We enrolled 93 patients from 2/2012-7/2013, including 60 women (64.5%), with a mean age of 33.3 years (30.5, 36.2). The incidence of appendicitis was 37.6%. Sensitivity and specificity were 0.94 (0.79, 0.99) and 1 (0.91, 1) for unenhanced MRI/DWI, 0.94 (0.79, 0.99) and 0.92 (0.91, 0.98) for CE-MRI, and 1 (0.88, 1) and 0.98 (0.89, 1) for CT. The ROC curves had AUCs of 0.868 (0.784, 0.953), 0.885 (0.814, 0.956), and 0.903 (0.832, 0.973) for unenhanced MRI/DWI; 0.864 (0.782, 0.947), 0.867 (0.795, 0.938) and 0.9 (0.823, 0.976) for CE-MRI; and 0.947 (0.899, 0.996), 0.959 (0.915, 1), and 0.961 (0.915, 1) for CT. The mean time to read the MR images was 4.45 minutes (4.23, 4.67) compared with 2.04 minutes (1.91, 2.17) for CT. Kappa values were 0.643-0.805 for unenhanced MRI/DWI, 0.722-0.778 for CE-MRI, and 0.769-0.976 for CT.

CONCLUSION

The accuracy of this MRI protocol approached that of CT for the diagnosis of appendicitis, with substantial inter-rater agreement.

CLINICAL RELEVANCE/APPLICATION

MRI may be a suitable first-line imaging test to diagnose appendix in the general population.

SSG03-04

Usefulness of Low-Dose Non-enhanced CT with Coronal Reformations in Patients with Suspected Acute Appendicitis: Comparison with Standard-Dose Non-enhanced CT


PURPOSE

To evaluate usefulness of low-dose (LD) non-enhanced CT (NECT) with coronal reformation to diagnose acute appendicitis in comparison with standard-dose (SD) NECT and SD contrast-enhanced CT (CECT).

METHOD AND MATERIALS

The institutional review board approved this retrospective study and waived the informed consent. This study population included 452 adult patients (age range, 18-89 years) who underwent CT performed by using a SD (SD NECT and SD CECT1, n = 182) or a LD protocols (LD NECT and SD CECT2, n = 270) for suspected acute appendicitis. Two reviewers independently interpreted the axial and the coronal reformatted images of NECT and CECT scans during separate sessions. They assessed appendix visualization and proposed a diagnosis of appendicitis using a 4-point scale. Diagnostic performance and interobserver agreement for diagnosing acute appendicitis were compared between SD NECT and SD CECT1, LD NECT and SD CECT2, and LD NECT and SD NECT, respectively.

RESULTS

The frequencies of appendix visualization of reviewers 1 and 2 were 95.6% (174/182) and 94.5% (172/182), 98.4% (179/182) and 98.9% (180/182), 90.7% (245/270) and 90% (243/270), and 98.9% (267/270) and 98.9% (267/270) for SD NECT, SD CECT1, LD NECT, and SD CECT2, respectively. Under the curves (AUCs) of reviewers 1 and 2 for SD NECT (0.97 and 0.96, respectively) were not significantly lower than those of SD CECT1 (0.99 and 0.97) (P = 0.19 and 0.64, respectively). AUCs of reviewers 1 and 2 for LD NECT (0.95 and 0.95) were significantly lower than those of SD CECT2 (0.99 and 0.98) (P = 0.002 and 0.02, respectively). However, AUCs of reviewers 1 and 2 for LD NECT (0.95 and 0.95) were not significantly lower than those of SD NECT (0.97 and 0.96) (P = 0.18 and 0.92, respectively). All of the values for interobserver agreement of SD NECT, SD CECT1, LD NECT, and SD CECT2 were excellent (k = 0.84, 0.84, 0.85, and 0.86, respectively).

CONCLUSION

LD NECT with coronal reformation was not inferior to SD NECT for the initial evaluation of acute appendicitis.

CLINICAL RELEVANCE/APPLICATION

LD NECT can be used as the first-line imaging tool in the workup of patients with suspected acute appendicitis.

SSG03-05

CT Features of Small Bowel Closed Loop Obstruction in Emergency Room: Comparison between Patients Groups according to Treatment Strategies

Cherry Kim MD (Presenter): Nothing to Disclose, Choong Wook Lee MD: Nothing to Disclose, Mi-Hyun Kim: Nothing to Disclose, Gil-Sun Hong MD: Nothing to Disclose

PURPOSE
To assess CT features of small bowel closed loop obstruction (CLO) in patients who need emergency operation within 24 hours, and to compare CT features between patients who need delayed operation and who were recovered by conservative treatment.

METHOD AND MATERIALS

From 2009 to 2013, 187 patients were diagnosed as having CLO based on CT results in the emergency room (ER). Among them, 135 patients were enrolled using the exclusion criteria as follows; (a) CLO by peritoneal seeding, (b) CT images without coronal images, and (c) patients who were immediately transferred to other hospital. Clinical decision for treatment strategy was made based on both clinical and CT findings: 51 patients (Group A) were treated surgically within 24 hours and the remaining 84 patients (Group B) were initially decided to be conservatively treated. Among the 84 patients, 27 patients (Subgroup B1) underwent operation after 24 hours due to aggravation of clinical signs, and 57 patients (Subgroup B2) were recovered with conservative treatment only. CT images were analyzed regarding CT features as follows; pre-contrast bowel wall (BW) attenuation, BW enhancement, BW thickening, mesenteric edema, whirling sign, shape of entrapped mesenteric vessels, distance between beaked bowel loops, mesenteric vascular collapseness, and vascular enhancement of mesenteric arteries and veins. CT features were compared between group A and B, and between subgroup B1 and B2 using Fishers exact test and Student t-test.

RESULTS

CT features of group A showed significantly increased pre-contrast BW attenuation, decreased BW enhancement, decreased vascular enhancement of mesenteric arteries and veins, increased BW thickening, severe mesenteric edema and severe mesenteric vascular collapseness than those of group B (all, p<0.001). In subgroup analysis between B1 and B2, all CT features didn't show any significant differences (all, p>0.05).

CONCLUSION

In patients who admitted ER with CLO, CT features were quite different between the groups who need emergency operation or not. However, there were no significant CT findings to differentiate the patients who need delayed operation from the patients who were completely recovered with conservative treatment.

CLINICAL RELEVANCE/APPLICATION

In patients with small bowel closed loop obstruction, some CT features could be important factors for clinical decision about emergency operation or initial conservative treatment.

SSG03-06 Virtual Monochromatic Reconstruction of Contrast-enhanced Dual-energy CT at 70 keV Maximizes the Conspicuity of Mucosal Enhancement in Acute Small Intestinal Obstruction


PURPOSE

To evaluate the role of virtual monochromatic imaging (VMI) to maximize the conspicuity of mucosal enhancement in computed tomography (CT) of the abdomen and pelvis for acute small intestinal obstruction and to compare this technique to conventional polychromatic imaging (PCI).

METHOD AND MATERIALS

Institutional review board approval was obtained, with no informed consent required, for this retrospective analysis. 20 consecutive patients with acute small intestinal obstruction were scanned using a 128-section dual source, dual energy CT system using a standardized protocol (100-140 kV, ref mAs of 115-89, 32x0.6mm). Scans were retrospectively reconstructed at VMI energy levels from 40 - 150 keV in 10 keV increments and were analyzed both quantitatively and qualitatively. SNR and CNR values for mucosal enhancement in collapsed segments were recorded using region of interest (ROI) analysis at each energy level for all VMI datasets and compared to PCI. Subjective analysis of mucosal enhancement was performed by two independent, blinded readers.

RESULTS

The SNR and CNR for mucosal enhancement at the different VMI levels were compared using ANOVA with posthoc analysis with Newman-Keuls Multiple Comparison Test, demonstrating statistical significance (p < 0.05). Optimal SNR and CNR for small intestinal mucosal enhancement was observed at 80 keV and 70 keV, respectively. Qualitatively, both readers reported increased conspicuity of mucosal enhancement at the 70keV level.

CONCLUSION

VMI reconstruction of contrast enhanced dual energy CT scans of the abdomen and pelvis at 70 keV maximizes the conspicuity of mucosal enhancement in computed tomography (CT) of the abdomen and pelvis for acute small intestinal obstruction. At this level, conspicuity was improved for all readers.

CLINICAL RELEVANCE/APPLICATION
VMI reconstruction of contrast enhanced dual energy CT scans of the abdomen and pelvis at 70 keV maximizes the conspicuity of mucosal enhancement in acute small intestinal obstruction.

**SSG03-07**

**Usability of Ultrasound for the Diagnosis of Acute Appendicitis Correlated to Patients BMI and the Severity of Inflammation**

Sebastian Bickelhaupt (Presenter): Nothing to Disclose, Sandra Tschirky: Nothing to Disclose, Michael A. Patak MD: Nothing to Disclose

**PURPOSE**

The clinical diagnosis of acute appendicitis in emergency departments is often backed by ultrasound (US) or and computed tomography (CT). US is commonly the initial modality as an inexpensive and fast tool avoiding ionizing radiation. The increasing number of patients with a high body mass index (BMI) might limit the use of US. Our study investigated the accuracy of US for the diagnosis of appendicitis correlated to the patients BMI, the severity of inflammation and the need for additional CT-examinations.

**METHOD AND MATERIALS**

716 patients with suspected acute appendicitis (mean age 40.33, 309 female, 408 male) were included in this IRB-approved, retrospective study between 2005-2011. Inclusion criteria: clinically suspected acute appendicitis, data of body mass index (BMI), leukocytes, c-reactive protein and a consecutive surgical intervention with histopathologically proven appendicitis. Patients grouping followed WHO definitions (BMI < 18.5; 18.5-24.9; 25.0-29.9; >30). Correlations between the BMI, ultrasound-ability in detecting acute appendicitis, the necessity for CT examinations (Siemens Somatom 64, Erlangen, Germany) and the level of inflammation were calculated using Spearman’s rank-correlation.

**RESULTS**

Ultrasound-usage decreased with increasing BMI from 65.5% (BMI < 18.5) and 67.1% (18.5-24.9) to 54.6% (25.0-29.9) and 45.6% (>30) in a significant negative correlation (r=-0.1, p=0.006). Vice versa initial CT usage increased from 7.8% to 18.5% (r=0.2, p<0.05). The need for additional CT after US significantly correlated with the BMI (r=0.1, p=0.005) (3.4%; 10.7%; 11.6%; 26.5%). The diagnostic certainty of ultrasound significantly decreased with increasing BMI from 48.2% and 45.8% to 38% and 30.8% (r=-0.097, p=0.006), that did not correlate with levels of inflammatory markers (p>0.05) which did not differ between the groups.

**CONCLUSION**

The diagnostic certainty for the diagnosis of acute appendicitis significantly correlates with the BMI of the patients, leading to an increasing need for additional CT in obese patients. This finding was independent of the severity of inflammation with no correlation between the level of inflammatory markers and the diagnostic certainty of the ultrasound examination.

**CLINICAL RELEVANCE/APPLICATION**

Our study revealed a significant and robust negative correlation between the diagnostic certainty and an increasing BMI in the patients which helps to assess the appropriateness of initial ultrasound in patients depending on the BMI.

**SSG03-08**

**Evaluation of the Distribution of Enteral Contrast in ED Patients Undergoing Abdominal-Pelvic CT: Does It Get Where It Is Supposed to Go and What Is the Added Value?**


**PURPOSE**

Current oral prep for adult abdominal-pelvic CT (AP CT) has shortened to one hour to facilitate faster Emergency Department (ED) patient care. How often does oral contrast optimally opacify the gastrointestinal tract? Does this contrast reach the site of pathology or assist in diagnosis?

**METHOD AND MATERIALS**

All adults undergoing AP CT exams in the ED at two university-affiliated urban hospitals were identified via the healthcare database over a 3-month period in 2012. Two raters reviewed CTs for the proximal and distal location of enteral contrast. Presence, site, and type of bowel pathology as well as prior gastrointestinal surgery were documented. When applicable, the site of bowel pathology was evaluated for the presence or absence of enteric contrast.

**RESULTS**

Of 1349 patients, 530 (39%; 61% female, mean age 50 +/- 19 years) were administered oral contrast. In 321/530 (61%), oral contrast reached the terminal ileum (TI). Bowel pathology was present in 31% of these cases (165/530). When small or large bowel pathology was present, 47% (77/165) of cases had oral contrast present at the bowel pathology site. When the bowel was categorized into 4 anatomic segments, there was a significant difference (p<0.001) in oral contrast reaching the site of bowel pathology based on location: stomach and duodenum (84%), jejunum to TI (35%), proximal colon (57%), and distal colon (28%). In 8% of
cases (41/530), the original interpretation was equivocal for bowel pathology. 59% (24/41) of these equivocal cases had oral contrast present at the site of pathology. Of all 530 oral contrast cases, in only 84 cases (16%) did contrast extend from the stomach to the distal colon.

**CONCLUSION**

Only 61% of adults in the ED that undergo CT achieve oral contrast passage to the TI. 16% had complete stomach to distal colon contrast distribution. Oral contrast was present at the possible pathology site in equivocal reports (59%) in a similar frequency to positive cases (47%). These results raise questions about the use of oral contrast to facilitate identification and characterization of bowel pathology, unless prep time is lengthened.

**CLINICAL RELEVANCE/APPLICATION**

ED length of stay time pressures continue to intensify, leading to shorter prep times for oral contrast administration. As a result, optimal CT bowel prep is not achieved in many patients.

### SSG03-09

**A New Technique for the Diagnosis of Acute Appendicitis: Abdominal CT with Compression to the Right Lower Quadrant**

Erhan Akpinar MD : Nothing to Disclose, Abidin Kilincer MD (Presenter): Nothing to Disclose, Bulent Erbil : Nothing to Disclose, Volkan Kaynaroglu : Nothing to Disclose, Deniz Akaa MD : Nothing to Disclose, Mustafa Nasuh Ozmen MD : Nothing to Disclose

**PURPOSE**

To determine the diagnostic accuracy of abdominal CT with compression to right lower quadrant in adults with acute appendicitis.

**METHOD AND MATERIALS**

Institutional review board approved this prospective study, and compression group patients gave written informed consent. The study included 168 patients (age range, 18-78 years) who underwent contrast enhanced CT for suspected appendicitis performed either by using compression to the RLQ (n = 71) or by standard protocol (n = 97). Compression was applied to RLQ with 1000cc saline bag and an elastic belt. All compression group patients had abdominal US examination before CT to exclude conditions like abdominal aortic aneurysm, etc. Two radiologists reviewed in consensus CT images; receiver operating characteristic (ROC) analysis, Fisher exact tests, and Mann-Whitney U tests were used to compare diagnostic accuracy between the two groups.

**RESULTS**

Fifty-nine patients (23 in compression group and 36 in standard protocol) had pathologically proven acute appendicitis. Median (min-max) outer diameter of appendix was 10 mm (7-15 mm), 10.5 mm (7.1-17.6 mm), 5 mm (4-7.5 mm) and 6.3 mm (4.8-10.3 mm) among patients with appendicitis in compression in compression and standard-CT, and without appendicitis in compression and standard-CT, respectively. While appendix diameter was not significantly different among patients with appendicitis undergoing CT with or without compression, there was a significant difference across other groups in pairwise comparisons (p<0.01). In patients without appendicitis, filling of contrast material to the appendiceal lumen was statistically higher in compression group when compared to standard protocol (p<0.01). Area under the ROC curve of compression and standard CT were 0.997 and 0.979, respectively. Using a cut-off value of 6.75 mm for outer appendiceal diameter, the sensitivity and specificity for diagnosing appendicitis was 100% and 67.3% with standard CT, while the specificity increased to 94.9% with preservation of sensitivity at 100% with compression CT.

**CONCLUSION**

Normal appendix diameter was significantly smaller in compression-CT group when compared to standard-CT group, increasing the diagnostic accuracy of CT performed by abdominal compression.

**CLINICAL RELEVANCE/APPLICATION**

Abdominal CT with compression to right lower quadrant, which can be considered as a CT counterpart of graded compression US, has a high diagnostic accuracy in the setting of acute appendicitis.
Sub-Events

SSG04-01

Achieving Sub-milliSievert Radiation Dose: Prospective Randomized Clinical Study to Assess Ultra-low Dose Abdominal MDCT with a Three Dimensional Adaptive Iterative Reconstruction (AIDR) and Image-based Iterative Reconstruction (SafeCT)


PURPOSE

To assess ultra-low dose (ULD) abdominal MDCT using a three-dimensional adaptive iterative reconstruction (AIDR-3D) and SafeCT, an image-based vendor-neutral iterative reconstruction (IR) compared with standard-dose imaging.

METHOD AND MATERIALS

A total of 36 patients (mean age 66±12 years; M:F 19:17; mean weight 71±15 kg) gave informed consent for this prospective clinical study and underwent abdominal CT on 320 MDCT (AquilionONE, Toshiba Healthcare). Two consecutive image series were acquired in each patient: (i) standard-of-care (SD) CT [6mSv, mean CTDIvol 8 mGy] and (ii) ULD-CT (0.9mSv, 2.5 mGy). Scan length of ULD-CT was half that of SD-CT (lung bases to mid-abdomen). SD-CT and ULD data were reconstructed with FBP, SafeCT (MedicVision Israel) and AIDR-3D resulting in 360 image series. Two radiologists independently assessed subjective quality using a task-based evaluation to assess organ-based focal lesions and normal anatomical structures (when no lesions were present). Image noise was measured at homogenous liver parenchyma. Noise-spectral density plots were obtained. Student’s t-test and ANOVA were used on SPSS v 22.0.

RESULTS

Mean dose reduction relative to SD CT was 75%. Radiologists identified 173 focal lesions with SD-FBP. Lesion detection for ULD-CT images was 79% (139/176; most lesion being missed in patients weighing ≥75kg 37% missed 50/79). ULD-FBP images were clinically inadequate for all abdominal structures. Mean subjective image quality score for ULD-IR images was significantly higher in patients weighing <75kg (p<.01). For liver margins and parenchyma, ULD-AIDR3D and ULD-SafeCT images were significantly better than ULD-FBP images (p<0.01). Visualization of low-contrast hepatic and renal lesions was clinically adequate on both ULD-AIDR3D and ULD-SafeCT images compared to ULD-FBP (p<0.01). Mean liver image noise for ULD-AIDR3D was 17HU, significantly lower than SD-FBP (22, p=.009), ULD-FBP (60HU, p<.001) and ULD-SafeCT (26HU, p=.003). Although image quality of SD images were significantly better than ULD, lesion detection was deemed acceptable on ULD scans reconstructed with IR techniques (p<.01).

CONCLUSION

Iterative reconstruction techniques (such as 3-dimensional AIDR and SafeCT) show great potential for substantially reducing radiation dose of abdominal MDCT.

CLINICAL RELEVANCE/APPLICATION

Abdominal MDCT is achievable at 2.5 mGy (≈0.9mSv) using 3D-AIDR and image-based SafeCT without significant compromise in image quality at 75% dose reduction.

SSG04-02

Comparison of Image Based, Adaptive Statistical, and Model Based Iterative Reconstruction Techniques for Substantial Dose Reduction for Abdominal CT


PURPOSE

To evaluate low dose abdominal CT images reconstructed with imaged based (SafeCT), adaptive statistical (ASIR), and model based (MBIR) iterative reconstruction techniques to the standard dose abdomen CT.

METHOD AND MATERIALS

In an IRB approved, prospective clinical study included 21 patients (mean age 68 ± 7 years, mean weight 82±15 kg, M:F 14:7, undergoing routine abdomen CT on a 64 channel MDCT (Discovery CT750 HD). After standard of care abdominal CT, low dose images were acquired at 120 kV and reduced mAs (CTDIvol of 2.5 mGy). Sinogram data of low dose series were reconstructed with SafeCT (AP0, AP1), ASIR (SS70, SS90 GE Healthcare) and MBIR (GE Healthcare) and standard dose abdomen CT reconstructed with ASIR (SSS0) (n=6*21=210 series). Two radiologists performed independent and blinded comparison for lesion detection, lesion conspicuity, and visibility of small structures, first for all patients with low dose images and subsequently for standard dose images.

RESULTS
Mean CTDIvol were 13 ± 1.7 and 2.5 ± 0.1 mGy for standard and low dose abdominal CT, respectively. There were two missed lesions (small liver cyst and kidney cyst) on low dose images. Pancreatic ducts could be seen in only 5/10 patients at low dose regardless of iterative reconstruction techniques. The lesion conspicuity (23/25 lesions) was sufficient for clinical diagnostic performance for low dose SafeCT, ASIR and MBIR images. Low dose MBIR had limited diagnostic performance for evaluation of liver and kidney parenchyma in 18/21 patients compared to 8/21 for SafeCT and 7/21 for ASIR images. The liver margin, adrenal glands, pancreatic contour, gall bladder, peritoneum, retroperitoneum, and bowels were sufficient and equally seen on all low dose images regardless of iterative reconstruction techniques.

CONCLUSION

Low dose abdominal CT at 2.5 mGy is sufficient for most clinically significant lesions with SafeCT, ASIR, and MBIR. However, evaluation of pancreas requires higher dose than 2.5 mGy. Visibility of normal liver parenchyma is limited on low dose MBIR images.

CLINICAL RELEVANCE/APPLICATION

Iterative reconstruction techniques can allow sufficient clinical diagnostic performance for routine abdominal CT image at CTDIvol of 2.5 mGy.

SSG04-03

CT Imaging of the Liver: Comparison of Sinogram-affirmed with Advanced Modeled Iterative Reconstructions

Fabian Morsbach (Presenter): Nothing to Disclose, Lotus May Desbiolles MD: Nothing to Disclose, Sebastian Leschka MD: Nothing to Disclose, Hatem Alkadhi MD: Nothing to Disclose

PURPOSE

To investigate image quality and conspicuity of liver lesions on abdominal computed tomography (CT) images, reconstructed with advanced modeled iterative reconstruction (ADMIRE), sinogram-affirmed IR (SAFIRE) and filtered back projection (FBP).

METHOD AND MATERIALS

Forty patients (19 female, mean age 63±14 years) with focal liver lesions (cysts, n=16; hemangiomas, n=6; metastases, n=18) undergoing standard portalvenous phase abdominal CT were included. Images were reconstructed with ADMIRE (strength levels 1-5), SAFIRE (strength levels 1-5), and FBP at a slice thicknesses of 2 mm. Two readers evaluated subjective image quality focusing on image appearance (score 1: no artifacts, 2: minor artifacts, blotchy, plastic-like appearance, 3: major artifacts, blotchy, plastic-like appearance, 4: artifacts making a diagnosis impossible), and visibility of small structures (score 1: excellent visibility, 2: above average, 3: average, 4: poor). Readers also rated the conspicuity of lesions (score 1: well-seen lesion, well delineated margin, score 2: well-seen lesion, poorly delineated margin, score 3: subtle lesions, score 4: probably an artifact mimicking a lesion). Attenuation (in HU) of the liver and subcutaneous fat and the standard deviation of attenuation indicating noise was measured. Friedman test and analysis of variance (ANOVA) were conducted.

RESULTS

Readers found a significantly improved image appearance for all strength levels of ADMIRE compared to the respective SAFIRE levels (P<0.001), as well as superior visibility of small structures (P<0.001). Lesion conspicuity was rated similarly with ADMIRE and SAFIRE (P>0.05) and superior to FBP at strength levels 3-5 (all P<0.05). HU-values of the liver and fat did not vary with reconstruction algorithms (P>0.05). Noise decreased with increasing strength levels compared to FBP (P<0.05), with no differences among corresponding strength levels (P>0.05).

CONCLUSION

As compared to SAFIRE, ADMIRE improves image quality and reduces artificial image appearance at a similar noise reduction level without impairing lesion conspicuity.

CLINICAL RELEVANCE/APPLICATION

Iterative reconstructions with a less artificial image appearance can be used for CT imaging at low radiation doses with a broader acceptance by radiologists in daily clinical routine.

SSG04-04

Differences of Radiation Dose Estimates Compared with Direct Measurements in Morbidly Obese Patients undergoing Abdominal Computed Tomography: An Experimental Ex-Vivo and Patient-based Study

Roy Marcus MD (Presenter): Nothing to Disclose, Fabian Bamberg MD, MPH: Speakers Bureau, Bayer AG Speakers Bureau, Siemens AG Research Grant, Bayer AG Research Grant, Siemens AG, Klement Neumaier: Nothing to Disclose, Maximilian F. Reiser MD: Nothing to Disclose, Konstantin Nikolaou MD: Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG, Thorsten R. C. Johnson MD: Nothing to Disclose

PURPOSE

Proper CT imaging of morbidly obese patients remains an imaging challenge. The necessary increase in tube voltage and current results in dose length products (DLP) with high extrapolated effective dose estimates. However, actual equivalent dose exposition is presumably lower as an effect of the shielding of the adipose tissue layer. Thus, the aim of this study was to assess the association between conventionally estimated and
measured radiation dose in morbidly obese patients.

**METHOD AND MATERIALS**

The study consisted of an ex- and an in-vivo part. In the ex-vivo experiment, an Alderson Phantom was equipped with 108 thermo-luminescent detectors (TLD) throughout the lower chest, the abdomen and pelvis and scanned on a Dual Source CT (DSCT): (I) Slim phantom with automatic potential and current modulation and (II) Obese phantom embedded in a circumferential 30 cm layer of pork fat, simulating a patient with a BMI>35, with 2x140kVp and current modulation. In the in-vivo study, 7 patients (BMI > 35) referred for abdominal imaging were scanned on a DSCT with 2x120kVp and automatic current modulation. Effective dose was derived according to IRCP-103 (TLD ex-vivo), based on DLP with standard conversion factor k (DLP-based; ex and in-vivo), and using a Monte-Carlo-Simulation (MCS; ex- and in-vivo).

**RESULTS**

TLD, MCS and DLP based dose values did not show any differences in the ex-vivo setting simulating lean body habitus (I: 3 vs. 3.2 vs. 3 mSv). In the ex-vivo setting simulating obese body habitus (II), TLD and MCS based values did not show a significant difference; however, both were significantly lower than DLP-based value (9.52 vs. 11.6 vs. 34.2 mSv, p

**CONCLUSION**

Our results indicate that estimated and measured radiation dose in obese patients undergoing CT differs significantly with falsely documented high dose estimates in this population (up to 4-fold). Thus, a weight adapted k value of 0.0055-0.0075 for such patients may provide more accurate effective dose estimates.

**CLINICAL RELEVANCE/APPLICATION**

Currently reported dose values in obese patients undergoing CT do not provide adequate estimates of radiation dose and should be evaluated carefully.

**SSG04-05**

**Risk of Cancer Associated with Radiation in Torso CT Scan: A Hospital-based Comparative Study across Different Types of Scanners**

Omid Khalilzadeh MD, MPH (Presenter): Nothing to Disclose, Irene Si Ming Wang MD : Nothing to Disclose, Emad Ahmadi MD : Nothing to Disclose, Sarabjeet Singh MD : Research Grant, Siemen AG Research Grant, Toshiba Corporation Research Grant, General Electric Company Research Grant, Koninklijke Philips NV, Rajiv Gupta PhD, MD : Nothing to Disclose, Mannudeep K. S. Kalra MD : Nothing to Disclose, Synho Do PhD : Research Grant, Koninklijke Philips NVC

**PURPOSE**

Radiation exposure from CT can be reduced by use of advanced CT scanners (for example, devices with advanced reconstruction algorithms (ARA), compared with conventional filtered pack projection). Radiation exposure is associated with increased lifetime attributable risk (LAR) of cancer incidence in the sensitive organs. The aim of this study was to evaluate the organ-specific risk of cancer associated with Torso CT scan in patients referred to our institution and compare these across different scanners, and protocols.

**METHOD AND MATERIALS**

Data from 7345 adult patients who underwent chest CT scan, and 8283 patients who underwent abdomen/pelvic CT scan, over a period of 4 months, were retrospectively analyzed. Radiation exposure data was obtained from a radiation-dose analytic software that calculates organ-specific effective doses for each patient. The Biological Effects of Ionizing Radiation (BEIRVII) models were used to extrapolate the LAR of cancer incidence associated with CT radiation. Data was stratified by the anatomic area imaged, machine make (General Electric, Philips, and Siemens), model, reconstruction algorithms and the technologies used in the device. The overall and organ-specific LAR of cancer associated with CT radiation was compared between different groups.

**RESULTS**

For an abdomen/pelvic CT, the LAR of cancer incidence associated with radiation was, on average, highest for kidneys (38.20±0.62, per 100,000) and gall bladder (33.10±0.55 per 100,000). About 30% of patients with abdomen/pelvic CT, and 36% of patients with chest CT, were scanned with more advanced devices (i.e. devices with ARA). For a routine chest CT, lungs (26.10±0.42, per 100,000), kidneys (18.49±0.38, per 100,000) and the liver had the maximum LAR of cancer incidence. For a routine non-contrast abdomen-pelvic CT scan, the LAR of cancer incidence in stomach, kidneys, gall bladder, pancreas and colon were significantly lower (20-30%) in more advanced devices (with ARA vs. those without). Analysis across different vendors, protocols, age groups and genders was also performed.

**CONCLUSION**

The advanced CT devices (with ARA vs. those without) are associated with 20-30% lower overall and organ-specific extrapolated risk of cancer incidence attributed to CT radiation.

**CLINICAL RELEVANCE/APPLICATION**

The overall and organ-specific extrapolated LAR of cancer associated with CT radiation can be reduced by use of more dose-efficient scanners.

**SSG04-06**

**Dose Estimate Considerations in SECT and DECT of the Abdomen - Perceptions and Reality**

Manuel Patino MD (Presenter): Nothing to Disclose, Jorge Mario Fuentes MD : Nothing to Disclose, Yasar Andrabi MD, MPH : Nothing to Disclose, Koichi Hayano MD : Nothing to Disclose, Mukta Dilipkumar Agrawal MBBS, MD : Nothing to Disclose, Dushyant V. Sahani MD : Research Grant, General Electric Company

**PURPOSE**

The advanced CT devices (with ARA vs. those without) are associated with 20-30% lower overall and organ-specific extrapolated risk of cancer incidence attributed to CT radiation.
Radiation dose remains a critical concern with the use of new CT techniques in the clinical practice. Therefore, the purpose of the study is to compare Size Specific Dose Estimate (SSDE) between Single source Dual-energy (ssDECT) and Single-energy abdominal CT scans using current ACR-Dose Index Registry as reference standard.

**METHOD AND MATERIALS**

A total of 150 patients with cancer history (61 Males, 89 Females) underwent a follow up CE-ssDECT (GE-CT750 HD, 140/80 kV; 375-630 mA) of the abdomen-pelvis. Their recent prior CE-SECT (16-64 MDCT, 120 kV; 41-531 mA) reconstructed using FBP in 84 patients and Iterative techniques in 65, served for dose estimate comparison. Size Specific Dose Estimate (SSDE) was calculated and compared between DECT and SECT using t-test. Dose Index Registry data was used as reference.

**RESULTS**

The mean SSDE on ssDECT, SECT-FBP and SECT-IRT were 15.6 mGy, 14.9 mGy and 12.1 mGy respectively. There was no significant difference in SSDE between DECT and SECT-FBP ($p>0.05$). A difference was found in SSDE between ssDECT and SECT-IRT ($p<0.05$).

**CONCLUSION**

For cancer follow-up abdomen studies, the dose estimates from ssDECT are comparable to SECT-FBP and slightly higher than SECT-IRT but remain substantially lower than ACR-DIR data.

**CLINICAL RELEVANCE/APPLICATION**

Dual energy CT has demonstrated added value in clinical diagnosis. However, radiation dose is still a critical concern that limits its wide implementation. This study shows comparable dose estimates between SECT and ssDECT, with minimally high SSDE in DECT, decreasing perceived radiation concerns.

### SSG04-07 Effective Dose in CT Examinations: How Much Is the Effective Dose Varying between Follow-up Examinations Performed on the Same CT Scanner?

**PURPOSE**

To investigate, how much the effective dose (ED) varies between follow-up examinations performed on the same CT scanner.

**METHOD AND MATERIALS**

The effective dose (ED) was estimated retrospectively for 50 patients suffering from cancer at three different times of CT examination. At each time, a CT scan of the chest (CH), of the liver without contrast enhancing (LI) and of the entire abdomen after contrast media application (AB) was performed using the same predefined CT protocol and the same CT scanner (Siemens Definition FLASH). For automated radiation dose reduction Care Dose 4D and Care KV (Siemens) were used. Data were assessed following recommendations of ICRP 103 using Radimetrics’ dose-monitoring-software Exposure™.

**RESULTS**

The mean ED for CH was $5.0 \pm 1.9$ mSv, for LI $4.9 \pm 2.0$ mSv, and for AB $7.6 \pm 3.3$ mSv. The mean differences of ED between follow-up examinations were $0.8 \pm 1.1$ mSv for CH, $0.6 \pm 0.7$ mSv for LI, and $1.2 \pm 1.6$ mSv for AB. The differences between ED of follow-up examinations showed a strong correlation to the differences in the tube current (CH: $12.5 \pm 10.8$ mAs, $r = 0.85$; LI: $10.4 \pm 10.2$ mAs, $r = 0.78$; AB $14.8 \pm 18.2$ mAs, $r = 0.70$). The differences between the ED of follow-up examinations showed only a weak correlation to the differences in the scan length (CH: $22.0 \pm 20.4$ mm, $r = 0.03$; LI: $14.2 \pm 12.7$ mm, $r = 0.11$; AB $21.4 \pm 20.9$ mm, $r = 0.35$). Even though in the vast majority of CT examination the tube voltages had not been changed between follow-up examinations, changes in the tube voltage in individual cases had major effect on ED.

**CONCLUSION**

A high variance of the effective dose exists between follow-up CT examinations, when using the same CT scanner and scan protocol. This variance is predominantly caused by differences in the tube current, which had been automatically determined by the dose reduction algorithm.

**CLINICAL RELEVANCE/APPLICATION**

Improvements in the automated tube current modulation algorithm are necessary to reduce radiation dose in CT.

### SSG04-08 Feasibility of Low-tube-current Gemstone Spectral Imaging (GSI) Associated with Adaptive Statistical Iterative Reconstruction (ASiR) in Upper Abdominal CT Angiography (CTA)

**PURPOSE**

To evaluate the impact of low-tube-current GSI associated with ASiR on radiation dose and image quality in upper abdominal CTA.
METHOD AND MATERIALS

Twenty-six patients who underwent GSI for upper abdominal CTA using a 64-row CT scanner (GE Discovery CT750 HD) were enrolled. Before confirming GSI scan, GSI assist software allowed optimal mA selected automatically based on the scout view and noise index at 12. Patients were retrospectively divided into two groups. Group A (n=14) and group B (n=12) underwent CT scan with high tube current (≥560mA) and low tube current (≤250mA).

RESULTS

The mean CTDIvol and effective radiation dose in group B (11.55 ±2.94mGy, 4.48 ±1.34mSv) were significantly lower than group A (18.13±3.64mGy, 7.56 ±2.68mSv) (p<0.01). There were not significantly different mean CT values of AR and SMA (239.86±36.15, 239.66±59.25) between group B and group A (p>0.05). The SD values of subcutaneous fat in group A (51.67±17.99, 48.17±16.66) was lower than group B (61.66±14.71, 57.21±14.87) (p<0.05).

CONCLUSION

Compared with high tube current GSI, approximate 41% radiation dose reduction can be acquired by low-tube-current GSI associated with ASIR without degradation of image quality and noise in abdominal CTA.

CLINICAL RELEVANCE/APPLICATION

Low-tube-current GSI combined with ASIR has the ability to reduce radiation dose without image quality loss.

A Quantitative Comparison of Noise Reduction across Five Commercial (Hybrid and Model Based) Iterative Reconstruction Techniques: An Anthropomorphic Phantom Study

Manuel Patino MD (Presenter): Nothing to Disclose, Jorge Mario Fuentes MD: Nothing to Disclose, Koichi Hayano MD: Nothing to Disclose, Avinash Ranesh Kambadakone MD, FRCR: Nothing to Disclose, Jennifer W. Uyeda MD: Nothing to Disclose, Dushyant V. Sahani MD: Research Grant, General Electric Company

PURPOSE

To compare the performance of three Hybrid Iterative Reconstruction Techniques (h-IRTs) (ASIR, iDose4, SAFIRE) with their respective strengths on image noise reduction on low-dose Computed Tomography (CT) exams using Filtered Back Projection (FBP) as standard reference. Also, to compare image noise reduction between h-IRTs and Model Based IRTs (MB-IRTs) (MBIR/Veo and IMR) on low dose exams.

METHOD AND MATERIALS

An anthropomorphic abdomen phantom was scanned at 100 - 120 kVp and different mAs (25-100) on three CT systems (GE Discovery CT750-HD, ASIR, MBIR/Veo; Philips iCT, iDose4, IMR; and Siemens Somatom, SAFIRE). Images were reconstructed using FBP and various strengths of IRTs. Nine noise measurements (ROI mean size 423 mm2) on extra-colonic fat for the strengths of IRTs were recorded and compared to FBP using ANOVA. Radiation dose in CTDIvol and DLP was also compared.

RESULTS

There was no significant difference on radiation dose and image noise on FBP between the scanners (p>0.05). Gradual image noise reduction was observed with each increment of h-IRT’s strength with maximum noise suppression around 50% (48.2-53.9%). Similar noise reduction was achieved on the scanners by applying specific h-IRT strengths. Maximum noise reduction on MB-IRTs was higher (68.3-81.1%) than that on h-IRTs (p<0.05).

CONCLUSION

By using constant scan parameters, radiation dose and image noise on FBP are similar for different scanner manufacturers. Significant image noise reduction is achieved on low-dose CT images rendered with IRTs. The image noise on various scanners can be matched by applying specific h-IRTs strengths. MB-IRTs attain substantially higher noise reduction over h-IRTs irrespective of the radiation dose.

CLINICAL RELEVANCE/APPLICATION

This study lends the opportunity to understand the impact of various IRTs and influence of their strengths on the image noise. Since implementation of these techniques in clinical practice can be complex, this experience can assist in optimizing abdomen CT protocols with standard and modified dose scan parameters.
GIS352
CT Perfusion Based Visualization and Quantification of Pancreatic Carcinoma Using 256 Slice CT -Feasibility on Predicting the Response in Combined Chemoradiotherapy or Chemotherapy (Station #1)

Yukiko Kunou (Presenter): Nothing to Disclose, Masafumi Uchida MD, PhD : Nothing to Disclose, Yasumitsu Hirose : Nothing to Disclose, Hidehiro Etou : Nothing to Disclose, Yoshinobu Okabe : Nothing to Disclose, Yoshi Abe MD : Nothing to Disclose

PURPOSE

to evaluate the utility of pancreatic perfusion CT for predicting the response of pancreatic carcinoma to combined chemotherapy and radiotherapy or chemotherapy.

METHOD AND MATERIALS

From July 2009 to November 2012, we enrolled 43 patients (26 men, 17 women: mean age 67 years, range 37-81 years) with unresectable pancreatic carcinoma who underwent PPCT before receiving CCRT or chemotherapy. Four perfusion parameters (perfusion, peak enhancement intensity, time to peak, and blood volume) of pancreatic tumor were calculated and we divided each perfusion parameter into two groups: high value group and low value group. The CCRT response was evaluated morphologically on 3-month follow-up CT based on the Response Evaluation Criteria in Solid Tumors. Pretreatment CT perfusion parameters were compared between responders and nonresponders by the Fisher exact test. Overall survival of the two groups was estimated by using the Kaplan-Meier method and compared by using the log-rank test.

RESULTS

Based on RECIST criteria, 13 of the total 43 patients had partial response (PR) at 3 months post-initiation of therapy, 24 had stable disease (SD) and six had progressive disease (PD). There was a statistically significant difference in all perfusion parameters when patients with PR at three months were compared with patients with SD or PD: perfusion: P < .01, peak enhancement intensity: P < .05, time to peak: P < .01, and blood volume: P < .01. Of the 43 patients, four were lost to follow-up and were excluded from survival analysis. Of the remaining 39 patients, 13 were alive at a mean of 19 months after beginning therapy and 26 had died. Six of the 36 patients underwent surgical resection after neoadjuvant therapy, five of whom received CCRT and one received only chemotherapy. Of the four perfusion parameters measured, only the high value group of the peak enhancement intensity was significantly correlated with a higher likelihood of survival at 15 months post-initiation of therapy (p = 0.01).

CONCLUSION

Prediction of therapeutic effects is useful in management of patients with pancreatic carcinoma. Although conventional CT relies on many morphological findings, evaluation of pancreatic tumor perfusion with CT can provide radiologists and clinicians with very useful information that can be applied directly to patient care.

CLINICAL RELEVANCE/APPLICATION

Pancreatic perfusion CT

GIS353
The Relationships between Signal Changes with Time in the Hepatobiliary Phase of Gd-EOB-DTPA Enhanced MR Imaging and the Degree of Histopathologic Grades in Hepatocellular Carcinomas (Station #2)

Atsushi Higaki MD (Presenter): Nothing to Disclose, Tsutomu Tamada MD, PhD : Nothing to Disclose, Teruki Sone MD, PhD : Nothing to Disclose, Akira Yamamoto MD : Nothing to Disclose, Yasufumi Noda : Nothing to Disclose, Kazuya Yasokawa : Nothing to Disclose, Katsuyoshi Ito MD : Nothing to Disclose

PURPOSE

The purpose of this study was to evaluate the relationships between signal intensity in the three hepatobiliary phases (10, 15, 20 minutes) of Gd-EOB-DTPA enhanced MR imaging and the degree of histopathologic grades in hepatocellular carcinoma (HCC).

METHOD AND MATERIALS

A retrospective analysis of 64 HCCs (well-differentiated, n = 15; moderately, n = 36; poorly, n = 13) in 60 patients who underwent preoperative Gd-EOB-DTPA-enhanced MRI was performed. Hepatobiliary phase (HP) images were obtained at 3 times (10, 15, 20 minutes) after Gd-EOB-DTPA administration. Signal intensity of the lesion in all phases was measured using region-of-interest for the calculation of contrast enhancement ratio (CER). A two-factor repeated-measures analysis of variance (ANOVA) model was used for statistical analysis.

RESULTS

The mean CER was 36.8 (range, 17.1 to 68.9) at 10 minutes, 42.8 (range, 20 to 88.5) at 15 minutes and 48.1 (range, 21.6 to 95.8) at 20 minutes in the well-differentiated HCC (w-HCC), 36.7 (range, 15.7 to 68.2), 32.04 (range, 9.3 to 47.3) and 29.49 (range, 7.6 to 44.8), respectively, in the moderately differentiated HCC (m-HCC), and 30.4 (range, 10.8 to 53.8), 25.89 (range, 8.7 to 44.8) and 19.93 (range, 5.3 to 37.2), respectively, in the poorly differentiated HCC (p-HCC). The results of a multiple comparison assuming time as a factor show that the CER of m-HCCs (P < 0.02-0.001) and p-HCCs (P < 0.01-0.001) showed significant decreases with time until 20-min HP, whereas the CER of w-HCCs (P < 0.01) increased significantly with time until 20-min HP. When degree of differentiation was assumed as a factor, the multiple comparison results showed that there were no significant differences among the 3 groups at 10 minutes, whereas there were significant differences between w-HCCs and m-HCCs at 15 minutes (P = 0.011), and between w-HCCs and m-HCCs, and w-HCCs and p-HCCs at 20 minutes (P < 0.001, P < 0.001, respectively).
CONCLUSION
In the hepatobiliary phase of Gd-EOB-DTPA enhanced MR imaging, the CER increased with time in w-HCCs, but decreased with time in both m-HCCs and p-HCCs, probably reflecting the difference in contrast enhancement behavior of the lesion.

CLINICAL RELEVANCE/APPLICATION
W-HCCs may be distinguished from m-HCCs/p-HCCs based on CER changes during the hepatobiliary phase.

Computer-aided Assessment of Hepatic Contour Abnormalities as an Imaging Biomarker for the Prediction of Hepatocellular Carcinoma Development in Patients with Chronic Hepatitis C (Station #3)

Satoshi Goshima MD, PhD (Presenter): Nothing to Disclose, Yoshifumi Noda MD: Nothing to Disclose, Hiroshi Kondo MD: Nothing to Disclose, Yukichi Tanahashi MD: Nothing to Disclose, Nobuyuki Kawai MD: Nothing to Disclose, Haruo Watanabe MD: Nothing to Disclose, Masayuki Kanematsu MD: Nothing to Disclose, Kyongtae Tyler Bae MD, PhD: Patent agreement, Covidien AG Consultant, Otsuka Holdings Co, Ltd

PURPOSE
To evaluate whether hepatic fibrosis index (HFI) quantified on the basis of hepatic contour abnormality is a risk factor for the development of hepatocellular carcinoma (HCC) in patients with chronic hepatitis C.

METHOD AND MATERIALS
During a 14-month period, we prospectively evaluated 98 patients with chronic hepatitis C who had no medical history of HCC treatment (56 men and 42 women; mean age, 70.7 years; range, 48-91 years). Gadoxetic acid enhanced hepatocyte phase was used to detect and analyze hepatic contour abnormality. Hepatic contour abnormality was quantified and converted to HFI using in-house proto-type software. HFI was computed and compared between patients with (n = 54) and without HCC (n = 44), and tested as a risk factor for the development of HCC determined by the odds ratio with binominal logistic analysis.

RESULTS
HFI was significantly higher in patients with HCC (0.58+/-0.86) than without HCC (0.36+/-0.11) (P < 0.001). Logistic analysis revealed that HFI was a significant risk factor for HCC with an odds ratio (95% confidence interval) of 26.4 (9.0-77.8) with a cutoff value of 0.395.

CONCLUSION
Hepatic fibrosis index, generated using a computer-aided assessment of hepatic contour abnormality, may be a significant imaging biomarker for the development of HCC in patients with chronic hepatitis C.

CLINICAL RELEVANCE/APPLICATION
A computer-generated, hepatic morphological index is highly predictive for the development of HCC in patients with chronic hepatitis C. This index may be an important imaging biomarker for clinical management of these patients.

Virtual Unenhanced CT Imaging with the Conventional Unenhanced CT Imaging in Liver: A Comparative Study (Station #5)

junjie mao (Presenter): Nothing to Disclose, Junlin Zhou: Nothing to Disclose

PURPOSE
To assess the advantages and disadvantages of virtual unenhanced (VU) CT imaging obtained by gemstone spectral imaging (GSI) to explore the feasibility of omitting the conventional unenhanced (CU) CT imaging in the dual phase enhanced CT in liver.

METHOD AND MATERIALS
23 patients underwent routine liver scan (120kVp, 300mAs, 64×0.625mm) and dual-phase enhanced scan with GSI mode on a 64-row dual energy CT (Discovery CT 750HD, GE healthcare). Virtual unenhanced images were generated by suppressing iodine on 70keV monochromatic image with a dedicated software (GSI Volume Viewer, Advantage Workstation 4.6). The CT value, SNR were measured and calculated. Referencing the clinical pathology and enhanced CT and ultrasound results, the lesion detection rate was got by two experienced radiologists independently. Dose-length product (DLP) was recorded and effective dose (ED) was calculated with a conversion factor 0.015mSv/mGy×cm. The CT value, SNR and ED were compared with paired student T-test, the lesion detection rate was compared with chi-square test.

RESULTS
The average CT value of VU images was slightly lower than that of CU images (54.54±7.71 vs 56.78±7.86, t=2.99, P=0.008). The SNR of VU images for was higher than that of CU images (5.38±0.75 vs 3.51±0.34, t=10.79, P<0.01). The lesion detection rates of VU images and CU images had no significant difference (66.59% vs 68.32%, X2=0.25, P>0.05). The ED for dual enhanced phases was (12.43±7.47) mSv, lower than that of true three phases (18.45±3.76mSv, t=4.37, P<0.01).
In live, virtual unenhanced (VU) CT imaging derived from gemstone spectral imaging (GSI) provides compatible image quality and tumor detection rate, compared with conventional unenhanced (CU) CT imaging.

**CLINICAL RELEVANCE/APPLICATION**

In live, virtual unenhanced (VU) CT imaging derived from gemstone spectral imaging (GSI) provides has potential to substitute of conventional unenhanced (CU) CT imaging.

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### GIS357

**Texture Analysis for the Classification of Focal Liver Lesions on Both Non-contrast Enhanced and Contrast-enhanced Triple-phase CT Images (Station #6)**

**Zaiyi Liu MD (Presenter): Nothing to Disclose, Yanqi Huang: Nothing to Disclose, Xin Chen MD: Nothing to Disclose, Dan Pan: Nothing to Disclose**

**PURPOSE**

To investigate the ability of texture analysis (TA) for classification of focal liver lesions including pure cysts, hemangiomas (HEM), focal nodular hyperplasia (FNH), metastatic carcinoma (MET), hepatocellular carcinoma (HCC) and intra-hepatic cholangiocarcinoma (ICC) on both non-contrast enhanced CT (NECT) and contrast-enhanced triple-phase CT (CECT).

**METHOD AND MATERIALS**

CT images of 318 patients (138 women and 180 men; mean age, 42yrs) with diagnosis of FNH (n=34), HCC (n=60), ICC (n=44), hemangioma (n=60) and pure cyst (n=60) were retrospectively analyzed. All patients underwent NECT and CECT scan on the same CT unit with one standard protocol. A complete list of texture features derived from gray-level histogram, co-occurrence and run-length matrix, gradient, autoregressive model, and wavelet transform were calculated using a TA software (MaZda) with region of interest manually placed on targeted lesion. Feature selection was performed using methods of Fisher score, probability of classification error and average correlation (POE+ACC, PA), mutual information coefficients (MI) and combination of (F+PA+MI). Linear discriminant analysis (LDA) in combination with k nearest neighbor (k-NN) classification was used for lesion classification.

**RESULTS**

For all groups, TA gave lower misclassification rates (MCR) on CECT compared to NECT. Pure cyst could be easily discriminated from other focal liver lesions with the minimum MCR of 0% on both arterial and portal venous phase. For discrimination of benign from malignant solid lesions, TA achieved the lowest MCR of 13.57% on portal venous phase, while the highest MCR of 37.60% on NECT. High classification accuracy of 95.74% was observed for discrimination between FNH and HEM on both arterial and portal venous phase. In malignant group, with the feature sets selected by either Fisher score or POE+ACC, or F+PA+MI, MCR lower than 41% were achieved on arterial phase, while NECT yielded a surprisingly low MCR of 39.02% with MI method.

**CONCLUSION**

TA provided excellent accuracy for discrimination between cyst and other focal liver lesions, between benign and malignant lesions, and between benign lesions. Contrast-enhanced CT images contained the most relevant discrimination textural information compared to NECT.

**CLINICAL RELEVANCE/APPLICATION**

Based on contrast-enhanced CT images, texture analysis can be able to differentiate between benign and malignant focal liver lesions and aid in clinical practice.

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### GIS358

**Intraductal Papillary Mucinous Neoplasm of Pancreas: Diagnostic Performance of CT and MR According to International Consensus Guidelines 2012 (Station #7)**

**Jae Ho Byun MD: Nothing to Disclose, Nieun Seo MD (Presenter): Nothing to Disclose, Jin Hee Kim MD: Nothing to Disclose, Seung Soo Lee MD: Nothing to Disclose, Hyoung Jung Kim MD: Nothing to Disclose, Moon-Gyu Lee MD: Nothing to Disclose**

**PURPOSE**

To investigate the diagnostic performance of CT and MR in patients with intraductal papillary mucinous neoplasm (IPMN) of pancreas according to international consensus guidelines 2012.

**METHOD AND MATERIALS**

158 patients with surgically confirmed IPMN of pancreas who underwent preoperative both CT and MR imaging were included in this retrospective study. According to pathologic results, IPMN was categorized into branch-duct (BD) IPMN and main duct (MD) IPMN including combined IPMN. Two abdominal radiologists evaluated the “high-risk stigmata” and “worrisome features” according to international consensus guidelines 2012 on CT and MR imaging in consensus. Univariate and multivariate analyses were used to identify significant predictors of malignancy in pancreas IPMN, including invasive carcinoma and high-grade dysplasia. Sensitivity and specificity of each significant finding for diagnosing malignant IPMN were also calculated. McNemar test was used to compare diagnostic accuracy of CT and MR.
RESULTS

60 patients had BD IPMN and 98 patients had MD IPMN. In 60 patients with BD IPMN, diameter of main pancreatic duct, presence of mural nodule, mural nodule size, enhancement of mural nodule, and thick septa were significant on univariate analysis (P<.05), with sensitivity of 62.5-84.6% and specificity of 50-84.6% on CT and of 62.5-84.6% and 50-82.7% on MR. In 98 patients with MD IPMN, presence of mural nodule, mural nodule size, enhancement of mural nodule, and lymphadenopathy were significant on univariate analysis (P<.05), with sensitivity of 34.1-68.2% and specificity of 81.5-92.6% on CT and of 29.6-72.7% and 83.3-96.3% on MR. On multivariate analysis, presence of mural nodule was the most important predictor in both types of IPMN (P<.05), whereas mural nodule size and lymphadenopathy were significant in only MD IPMN (P<.05). Diagnostic performance of CT and MR for each significant finding was not statistically different in both types of IPMN (P>.05).

CONCLUSION

According to international consensus guidelines 2012, presence of mural nodule was the most important predictor of malignancy in both types of IPMN. CT and MR showed no significant difference in differentiating malignant from benign IPMN.

CLINICAL RELEVANCE/APPLICATION

This study provided predictors of malignancy and their diagnostic performance in BD IPMN and MD IPMN according to the international consensus guidelines 2012 on CT and MR imaging.
To review the newer functional approaches with CT and MRI that can be used to assess focal and diffuse pancreatic diseases, including the derived biomarkers

To highlight the current and potential clinical applications of these imaging techniques

**TABLE OF CONTENTS/OUTLINE**


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**GIE254**

**GI Upset: Drug-induced Injury in the Abdomen (Station #11)**


**TEACHING POINTS**

Toxic gastrointestinal side effects of numerous prescribed medications are frequently discussed in clinical and pathology literature. Radiologic manifestations of drug-induced injury have also been described but are less frequently addressed, which may be due in part to a lack of knowledge of the patient’s medications and in part to the often subtle or nonspecific imaging findings. It is therefore important for radiologists in training and practicing radiologists to be familiar with complications in the gastrointestinal tract related to common medical therapies and how they may present on various imaging modalities. Incidence and mechanism of several common medication-induced injuries, as well as their imaging findings and disease processes that can have a similar imaging appearance, will be reviewed in the esophagus, stomach, small bowel, colon, liver and pancreas.

**TABLE OF CONTENTS/OUTLINE**

Cases will include, but are not limited to: Pill induced esophagitis NSAID related gastric ulcers and intestinal webs Bowel wall hematoma related to anticoagulation Chemotherapy related bowel pneumatosis and perforation Antibiotic related colitis Hepatic steatosis related to chemotherapy Sinusoidal obstructive syndrome related to antimitabolites Hepatic adenomas related to oral contraceptive pills Pancreatitis related to chemotherapy

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**GIE147**

**Beyond Adenocarcinoma—An MR Imaging Approach to Uncommon Neoplasms of the Ischiorectal Fossa (Station #12)**

Kristy Lee MD (Presenter): Nothing to Disclose, Shamir Rai BSC: Nothing to Disclose, Kathryn Derras MD: Nothing to Disclose, Charlotte Jane Yong-Hing MD, FRCP: Nothing to Disclose, Patrick Martin Vos MD: Nothing to Disclose, Cameron John Hague MD: Nothing to Disclose, Alison Clare Harris MBChB: Nothing to Disclose, Silvia D. Chang MD: Nothing to Disclose, Karen Sisi Lee MD: Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose

**TEACHING POINTS**

1. Review the normal anatomy and important landmarks of the ischiorectal fossa on MRI
2. Review the MR imaging features of uncommon masses in the ischiorectal fossa and the best sequences to evaluate these masses
3. Develop a basic imaging approach that will help narrow the differential diagnosis

**TABLE OF CONTENTS/OUTLINE**

- Historical imaging approach and misconceptions of the ischiorectal fossa (IRF)
- Normal anatomy and important landmarks of the IRF and anorectum
- Utility and limitations of MR sequences for characterizing neoplasms
- Dx based on location: arising from the anorectum (intraluminal, intra-luminal and extra-luminal, intramural or extra-luminal), IRF, or rectal extra-peritoneal space extending into the IRF and intimately or not related to the sacrococcygeal - Narrow the dx based on tissue type and tumor composition - Review what surgeons and oncologists want to know - Discuss an imaging-based algorithm for evaluation and management with cases including rectal carcinoid, leiomyosarcoma, leiomyoma, primary rectal lymphoma, metastases, GIST, lipomas, liposarcoma, myxoid liposarcoma, aggressive angiomyxoma, mucinous adenocarcinoma (and arising from perianal fistulae), plexiform neurofibromas, schwannoma, malignant nerve sheath tumor, teratoma and chordoma, mimics such as pilonidal cyst disease, cystic lymphangioma, etc.

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**GIS-TUB**

**Gastrointestinal Tuesday Poster Discussions**

**Scientific Posters**

*AMA PRA Category 1 Credits™: .50*

**Tue, Dec 2 12:45 PM - 1:15 PM Location: GI Community, Learning Center**

**Sub-Events**
Effect of MRI Intensity Standardization on Liver Tissue Characterization: A Comparison between Normal and Cirrhotic Livers (Station #1)

Shobhit Sharma MBBS (Presenter): Nothing to Disclose, Jayaram K. Udupa PhD: Nothing to Disclose, Yubing Tong PhD: Nothing to Disclose, Drew Avedis Torigian MD, MA: Nothing to Disclose, James Eric Schmitt MD, PhD: Nothing to Disclose

PURPOSE
MR images present significant intensity variation across patients and scanners irrespective of imaging sequence used. The presence of thermal noise, image inhomogeneity and non-standardness of the MR image intensity gray scale poses challenges to MR image analysis. The purpose of this study is to demonstrate how a pattern classification strategy may be effective in liver MRI once the images are first "cleaned" as optimally as possible by correcting for intensity inhomogeneity and by accounting for non-standardness, so that image intensities are made to have consistent tissue specific meanings.

METHOD AND MATERIALS
20 normal subjects and 30 cirrhosis patients who underwent T1-weighted (T1W) and T2-weighted (T2W) MRI of the abdomen were retrospectively studied. Image correction was performed for radiofrequency field inhomogeneities, and the live wire method was used to segment the liver and generate a liver mask. The liver mask was overlaid upon the corrected image and the resultant image was standardized for intensity. The standardized MRI intensity statistics were calculated within the liver mask.

RESULTS
The cumulative histogram for each imaging sequence for each group appeared chaotic before standardization but well-behaved after standardization. Mean intensity, standard deviation, and %coefficient of variation from these distributions without vs. with standardization, respectively, were as follows. Normal: In-phase T1W (301, 219, 73% vs. 2707, 479, 18%); Opposed-phase T1W (270, 190, 70% vs. 2665, 700, 26%); Fat-suppressed opposed-phase 3D T1W (259, 266, 90% vs. 2798, 475, 17%); T2W (166, 116, 70% vs. 979, 560, 57%); T2W-FS (165, 137, 83% vs. 1081, 512, 47%).

Cirrhosis: In-phase T1W (196, 100, 51% vs. 2667, 553, 21%); Opposed-phase T1W (183, 100, 55% vs. 2773, 546, 20%); Fat-suppressed opposed-phase 3D T1W (183, 100, 55% vs. 2773, 546, 20%); T2W (215, 170, 79% vs. 1019, 570, 56%); T2W-FS (163, 161, 99% vs. 1064, 552, 52%).

CONCLUSION
Intensity inhomogeneity correction and intensity standardization may be useful to make MR image intensities have a tissue-specific numeric meaning. This novel approach may be useful to improve the detection and characterization of cirrhosis on MRI.

CLINICAL RELEVANCE/APPLICATION
MR intensity standardization may help to detect and quantify differences between normal and cirrhotic livers compared to non-standardized MRI.

Comparison of the Accuracy between Liver and Spleen Elastography Using Acoustic Radiation Force Impulse and Other Noninvasive Tests in Predicting the Presence of Esophageal Varices (Station #2)

Jaehyung Park (Presenter): Nothing to Disclose, Kwon Hee-jin: Nothing to Disclose, Kyungjae Lim: Nothing to Disclose, Jinhan Cho: Nothing to Disclose, Jong-Young Oh: Nothing to Disclose, Kyung Jin Nam MD: Nothing to Disclose

PURPOSE
Purpose: This study aimed to evaluate the accuracy of liver elastography, spleen elastography, and other noninvasive tests (aspartate aminotransferase-alanine aminotransferase ratio, APRI (AST platelet ratio) score, platelet count, and platelet/spleen ratio) in predicting the presence of esophageal varices in liver cirrhosis.

METHOD AND MATERIALS
We studied 197 consecutive patients with hepatitis B virus (HBV) (n = 97), hepatitis C virus (HCV) (n = 59), or alcohol-induced liver cirrhosis (n = 41) who underwent biochemical tests, gastrointestinal endoscopy, and liver and spleen elastography by acoustic radiation force impulse (ARFI). The median liver and spleen stiffness values from 5 successful measurements per participant were obtained.

RESULTS
Result: Among the patients with a valid measurement, 43 % had no esophageal varices, whereas the others had esophageal varices. On univariate analysis, the platelet count, platelet/spleen ratio, and spleen elastography were independently associated with esophageal varices. However, in cases of alcohol-induced liver cirrhosis, spleen stiffness was not reliable for prediction of esophageal varices and also spleen stiffness measurement are less reproducible than liver stiffness measurement.

CONCLUSION
Conclusion: The liver and spleen stiffness values measured by ARFI elastography are well correlated, and spleen stiffness measured by ARFI can potentially be used as a non-invasive method for determining the presence of esophageal varices. However, the evidence supporting a similar role for replacing endoscopy is lacking because spleen stiffness is less reproducible compared to liver stiffness and, further, it is not an appropriate predictor for esophageal varices in alcoholic cirrhosis.
GIS363

**Efficacy of Interferon-a in the Prevention of Colorectal Cancer Metastases: Assessment by 7 Tesla Liver Magnetic Resonance (MR) in a Mouse Model of Disease (Station #5)**

Paolo Marra (Presenter): Nothing to Disclose, Antonio Esposito MD: Nothing to Disclose, Tamara Canu RT: Nothing to Disclose, Giovanni Sita: Nothing to Disclose, Francesco Aldo De Cobelli MD: Nothing to Disclose, Alessandro Del Maschio MD: Nothing to Disclose

**PURPOSE**

In primary and metastatic liver tumors characterized by neovascularization the accumulation of Tie2-expressing monocytes (TEMs) is common. They are tumor-associated macrophages derived from the hematopoietic system, with pro-angiogenic activity. Our purpose was to genetically modify these cells to express and selectively deliver interferon-a to liver metastases. Antitumor efficacy was assessed by volumetric analyses at MRI in a mouse model of liver CRC metastases.

**METHOD AND MATERIALS**

Liver metastases were induced injecting 5x10^3 CT26-GFP cells through the splenic vein in 30 CB6F1 mice: 14/26 were previously transplanted with TEMs engineered to express IFNα under the Tie2 promoter (IFN-group); 12/26 were transplanted with TEMs engineered to express green-fluorescent-protein under the Tie2 promoter (Placebo-group); 4/26 control mice were un-manipulated before metastases induction (Control-group). In other 6 of 11 mice injected with metastatic cells, IFNα was administered systemically at a dose of 25µg day. Starting from day 14 after metastases induction serial in vivo liver EOB-DTPA-enhanced MRI analyses with a 7-Tesla scanner were carried out for the detection and the volumetric assessment of metastases.

**RESULTS**

The incidence of liver metastases was lower in IFN-group than in Placebo and Control groups both at 14 (0% vs 57% vs 50%; p<0,05) and at 34 days (11% vs 100% vs 100%; p=0,002) from CT26-GFP cells injection. 3 IFN-mice that developed metastases at day 21 presented disease remission with no metastases at day 54. Average tumor volume was significantly lower in IFN-group than in Placebo and Control groups with a mean value between time points respectively of 1,53 vs 128,86 vs 38,92 mm³ (p<0,01). At day 54 Placebo and Control mice were dead vs only 11% of IFN-mice (p=0,001). Also the systemic administration of IFNα reduced liver metastases incidence in treated mice (IFN vs Placebo: 0% vs 60% at 14 and 21 days; p<0,05).

**CONCLUSION**

Selective hepatic or systemic deliver of IFNα seems to prevent CRC metastases in a mouse model of disease: incidence and volume reduction at MRI should be considered a reliable and easy detectable marker of biological efficacy as it correlates with survival rates.

**CLINICAL RELEVANCE/APPLICATION**

MR is a reliable and practical tool for the evaluation of efficacy of new therapies in mouse models of disease: with it, a potential reduction of the time required for the preclinical experimental phase may be achieved.

GIS364

**Diagnostic Value of CT- localizer and Axial Low-dose Computed Tomography for the Detection of Drug Body Packing (Station #6)**

Joel Aissa (Presenter): Nothing to Disclose, Christian Rubbert MD: Fellowship funded, Koninklijke Philips NV, Patrick Kroepil MD: Nothing to Disclose, Christoph Schleich: Nothing to Disclose, Gerald Antoch MD: Speaker, Siemens Medical AG Speaker, Bayer AG Speaker, BTG International Ltd, Falk Roland Miese MD: Nothing to Disclose

**PURPOSE**

Body packing is an increasingly upcoming form of contraband worldwide. Due to the limitations of conventional radiography low dose computed tomography (CT) has been established as method of choice for detecting illicit drugs. Omission of abdominal CT in cases with positive CT- localizer leads to a further reduction of radiation dose. The purpose of this study was to assess the diagnostic performance of CT- localizers in the detection of illegal body packets.

**METHOD AND MATERIALS**

108 patients (86 men, 19 women; mean age, 34.3 ± 8.7 years (range, 18-56 years) were included into this study. All suspects were referred to our institute between March 2012 to March 2013. Presence of body packs was assessed in consensus by two radiologists with two and seven years of professional experience. The blinded observers compared the CT- localizer and the axial low dose CT images. Positive predictive value and negative predictive value, sensitivity and specificity of the CT- localizer were calculated.

**RESULTS**

The sensitivity of CT- localizer for detection of packs was 0.68 (19 of 28), and specificity was 1.00. In 28 (26%) of 108 cases packs were detected in axial CT images. Packets were discovered in the CT- localizer of 19 (18%) suspects. There were no cases assessed as false positive. The omission of the axial low dose CT-images would have led to a mean radiation dose reduction of 2.0 ± 0.5 mSv in this study. The positive predictive value was...
1.0 and the negative predictive value was 0.89.

CONCLUSION

The value of CT-localizers lies in their high PPV. They are limited by low sensitivity, compared to axial CT images in detection of potential body packers.

CLINICAL RELEVANCE/APPLICATION

In positive cases the high PPV of CT-localizer may possibly allow to omit the full axial low dose abdominal CT to get even lower radiation exposure.

The Natural History of Incidental Cystic Pancreatic Lesions Less than 3cm: Results of Mid-term Follow-up and Clinical Significance (Station #7)

PURPOSE

To retrospectively determine natural history of incidentally detected focal cystic pancreatic lesions (CPLs) less than 3cm with an average imaging follow-up (F/U) of 34 months.

METHOD AND MATERIALS

Throughout a 60-month period, a cohort of patients with incidental CPLs were identified using a computerized search. Patients, who fulfilled all of following criteria, were enrolled in this study; 1) available CT or MR images with F/U interval more than 6 months, 2) CPLs that were unilocular, 3) CPLs less than 3cm in size, 4) CPLs that were not given any specific diagnosis on initial CT or MR images, 5) no symptoms referable to pancreas, 6) no history of pancreatitis. CT and MR images were analyzed regarding location and size of CPLs. According to interval size change, CPLs were divided into three groups (increase, no change, decrease).

RESULTS

Among 1514 patients with incidental CPLs, 565 patients were confirmed to meet inclusion criteria. While 495 patients had one CPL, 70 patients had more than two CPLs. The mean size of 661 CPLs in 565 patients was 11.7 mm on initial CT or MR images. Regarding location, 661 CPLs were located in head (n=241), neck (n=52), body (n=200) and tail (n=168). During F/U, 14 CPLs were confirmed as benign (n=11) and malignant (n=3). Fourteen CPLs with pathological diagnosis were classified into interval increase (n=5), no change (n=5), and interval decrease (n=4) group, respectively. Per-lesion-based analysis showed that 661 CPLs increased in 23% (152 CPLs), did not change in 69.9% (462 CPLs) and decreased in 7.1% (47 CPLs) during F/U. The mean size of 152 CPLs that showed interval increase was 12.1 mm and 19.8 mm on initial and final F/U images, respectively, among which 85.5% (130 CPLs) were still less than 3cm on final F/U images. While two (1.5%) of enlarged 130 CPLs less than 3cm were pathologically confirmed as benign (n=2), three (13.6%) of enlarged 22 CPLs greater than 3cm were confirmed as malignant (n=3).

CONCLUSION

Our data suggest that 152 CPLs (23%) of incidental CPLs of 3cm or smaller showed interval increase during a mean F/U of 34.2 months, among which 130 CPLs (85.5%) were still negative for malignancy in the last F/U imaging.

CLINICAL RELEVANCE/APPLICATION

Although incidental cystic pancreatic lesions of 3cm or smaller could increase in size, most of asymptomatic CPLs can be observed safely, at least for a mean period of 3 years.

Sclerosing Cholangitis: Guide to Navigate through Winding and Bumpy Bile Ducts (Station #8)

TEACHING POINTS

1. To outline the current concept in sclerosing cholangitis
2. To present an imaging atlas of sclerosing cholangitis with relevant clinical features and pathogenesis
3. To discuss the risks and imaging characteristics of cholangiocarcinoma in patients with sclerosing cholangitis
4. To establish a systematic approach to the differential diagnosis of sclerosing cholangitis

TABLE OF CONTENTS/OUTLINE

1. Introduction of the current concept in sclerosing cholangitis
2. Disease spectrum, clinical significance, and imaging findings

(1) Primary sclerosing cholangitis
i. Definition
ii. Clinical significance
iii. Imaging features

(2) Secondary sclerosing cholangitis
i. Etiology: IgG4-related sclerosing cholangitis, recurrent pyogenic cholangitis, ischemic cholangiopathy, AIDS cholangiopathy, Eosinophilic cholangitis, Portal biliopathy
ii. Clinical significance
iii. Imaging features characteristic to different etiologies

(3) Risk of cholangiocarcinoma: Associated etiology and image features

3. Systematic approach to differential diagnosis of sclerosing cholangitis
To review the different functional MRI techniques that can be used for evaluation of diffuse liver disease, including the derived biomarkers. To highlight the current and potential applications of these techniques.

TABLE OF CONTENTS/OUTLINE
1. DIFFUSION-WEIGHTED IMAGING 2. IVIM ANALYSIS OF DWI 3. PERFUSION MRI 4. CONTRAST-ENHANCED MRI 5. MR ELASTOGRAPHY 6. MULTIPARAMETRIC ANALYSIS 7. APPLICATIONS IN CIRRHOSIS, FIBROSIS AND OTHER DIFFUSE LIVER DISEASES

GIE149 Imaging of Rectal Pathology by MRI with Aqueous Jelly: The Magical Key! (Station #12)
Dharmesh Prabhakar Vasavada MS (Presenter): Nothing to Disclose, Nandini Bahri MD: Nothing to Disclose

TEACHING POINTS
After reviewing of this article, readers will: To differentiate the early stages of carcinoma like T1 and T2 from mucosal thickening, collapsed rectum, and polyp. To plan the coronal images perpendicular to axial images in distended rectum to avoid partial volume effect and to accurately evaluate the depth of tumor and length of tumor for surgery. To see the distensibility and delineate the intact mucosa in case of lesions like lymphoma and GIST of recto-sigmoid junction.

TABLE OF CONTENTS/OUTLINE
Introduce nearly 100 ml sterile aqueous jelly in the rectal lumen and use surface array coils to do MRI for rectal pathologies. The advantage of jelly: Water based contrast with or without gadolinium requires pressure effect like foley’s bulb to be retained in the rectum up to the completion of MR examination and that causes impact on the ability of MRI to detect the exact distance between tumor and potential resection margin. And patients with abdominal discomfort shows very low compliance to this technique. While jelly distends the rectum optimum enough to visualize the lumen and help to differentiate the above mentioned rectal pathology without giving false impression of potential resection margin as there is no pressure effect required and patient compliance is high as there is no need to distend entire large colon.

GIE022-b Gastrointestinal Fluoroscopic Techniques with Cross-sectional and Pathologic Correlation: What the Resident Must Know to Deliver a Quality Examination (hardcopy backboard)
Leonardo Ivan Valentin MD (Presenter): Nothing to Disclose, Erik Soloff MD: Nothing to Disclose, Rafael Andres Vicens-Rodriguez MD: Nothing to Disclose, Crystal Trujillo MD: Nothing to Disclose

TEACHING POINTS
1. To define expectations and milestones when performing fluoroscopy in residency. 2. Knowledge of the normal and abnormal imaging appearances of the gastrointestinal tract is essential in order to maximize the quality, sensitivity, and appropriate interpretation when performing fluoroscopy studies. 3. Correlate abnormalities initially detected on fluoroscopy with its appearance in computed tomography, magnetic resonance imaging, and positron emission tomography; in addition to endoscopic and pathologic appearance.

TABLE OF CONTENTS/OUTLINE
Introduction Gastroesophageal Anatomy Normal appearance of the gastrointestinal tract in Fluoroscopy Overview of pathology identified by Fluoroscopy (Clinical Cases with cross-sectional and pathologic correlation) Technical Details at Our Institution Conclusion

MSAS33 Management of Portal Hypertension (Sponsored by the Associated Sciences Consortium) (An Interactive Session)

Multisession Courses

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*Tue, Dec 2 1:30 PM - 3:00 PM*  *Location: S105AB*

Participants
Moderator
David Brent Nicholson: Nothing to Disclose
Moderator
Steven P DeColle: Nothing to Disclose

Sub-Events
MSAS33A TIPS (Tranjugular Intrahepatic Portal Systemic Shunts)
Harneil Singh Sidhu MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) When are indications for a TIPS procedure? 2) Pre-procedure workup for a TIPS procedure? 3) How is a TIPS
1) When are indications for a TIPS procedure? 2) Pre-procedure workup for a TIPS procedure? 3) How is a TIPS performed. 4) What are some post procedure issues that occur.

LEARNING OBJECTIVES

1) Summarize the pathologic anatomy and hemodynamics associated with gastric and ectopic varices. 2) Describe the varying techniques of portosystemic collateral embolization, and balloon occluded transvenous obliteration (BRTO and BATO) for the management of gastric varices. 3) Identify the skillset and tactics for practice building and clinical patient selection. 4) Describe the techniques for transvenous sclerosis of ectopic varices will be described.

ABSTRACT

This session will describe the pathologic anatomy and hemodynamics associated with gastric and ectopic varices. The varying techniques of portosystemic collateral embolization and balloon occluded transvenous obliteration (BRTO and BATO) for the management of gastric varices are also reviewed. Practice building and clinical patient selection will also be addressed. Advanced techniques for transvenous sclerosis of ectopic varices will be described.

LEARNING OBJECTIVES

1) The attendees will know the various types of percutaneous portal procedures performed. 2) The attendees will understand the hemodynamic definitions and concepts of inflow and outflow. 3) The attendees will understand that increasing antegrade portal venous does not necessarily increase the functional inline portal venous flow to the liver hepatocytes. 4) The attendees will understand what procedures are categorized as procedures that would increase or decrease inline portal venous inflow. 5) The attendees will understand the correlations between nominal portal pressures, pressure gradients and portal flow (velocity, volume and direction).

ABSTRACT

Abstract: Portal interventions include: Transjugular Intra hepatic PortoSystemic Shunts (TIPS), portal vein angioplasty / Stenting, Balloon-occluded retrograde Transvenous obliteration (BRTO), hepatic venous interventions for Budd-Chiari, para umbilical vein occlusion and extrahepatic PortoSystemic shunt occlusion. The lecture will discuss the effects of these procedures on nominal portal pressures, pressure gradients and portal flow (velocity, volume and direction) and inline portal blood flow to the functional liver (hepatocytes).

LEARNING OBJECTIVES

1) Discuss the role of PET/CT in the staging and follow up of common gastrointestinal tumors like colon adenocarcinoma. 2) Evaluate the role of PET/CT in gynecologic malignancies. 3) Discuss the importance of PET/CT in determination of early response in gastrointestinal stromal tumors. 4) Discuss the role of PET/CT in evaluation of select renal and prostate malignancies. 5) Be familiar with limitations of PET imaging in evaluating certain conditions like malignant ascites, peritoneal and omental metastasis and the importance of careful evaluation of CT findings in addition to the FDG PET image.
ABSTRACT

PET/CT has increasingly become the modality of choice for initial evaluation and follow up of patients with many gastrointestinal cancers including colorectal, esophageal and gastric cancer, pancreatic adenocarcinoma and hepatobiliary malignancies. Unlike the conventional radiologic modalities, change in FDG uptake can help identify responders even 4 to 5 weeks after chemotherapy for most cancers and much earlier for the gastrointestinal stromal tumors. PET/CT can also aid in the evaluation of indeterminate lesions like lung nodules, hepatic masses and lymph nodes. While the role of FDG PET in renal, prostate and bladder cancer is still being defined, it has a high positive predictive value and can be used for evaluation of lesions seen on other conventional imaging. In gynecological cancers PET/CT is predominantly used for patients with locally advanced disease or suspected recurrence. PET is also being increasingly incorporated into radiotherapy planning for dose delineation and modification according to metabolic activity.

Interventional Oncology Series: Liver Metastases

Series Courses

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Participants

Moderator
Michael Christopher Soulen MD:
Royalties, Cambridge University Press Consultant, Guerbet SA Research support, Guerbet SA Consultant, BTG International Ltd Research support, BTG International Ltd Consultant, Merit Medical Systems, Inc Speaker, Sirtex Medical Ltd

LEARNING OBJECTIVES

This session will review the multidisciplinary management of liver metastases from colorectal cancer and neuroendocrine tumors, the unique feature affecting assessment and triage of each tumor type, and integration of image-guided therapy with systemic therapies. Didactic material will be reinforced by tumor board style review of clinical cases.

ABSTRACT

see individual lecture abstracts

Sub-Events

VSIO31-01 Setting the Stage: NCCN/ESMO Guidelines for mCRC
Mary F. Mulcahy MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

VSIO31-02 Going for Cure: Multidisciplinary Conversion to Resectability
Robert E. Roses MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the contemporary paradigm for the management of hepatic metastases (with an emphasis on colorectal cancer liver metastases).
2) Describe criteria for resectability.
3) Discuss the interplay between systemic chemotherapy and surgical approaches.
4) Discuss the interplay between interventional radiology techniques and surgical approaches.
5) Discuss alternative treatment sequences for patients with synchronous liver metastases.

ABSTRACT

The last decade has witnessed an expanding role for resection in the management of metastatic colorectal cancer. Traditional exclusion criteria for liver resection have largely been abandoned. The contemporary paradigm for the management of liver metastases emphasizes the preservation of a sufficient liver remnant. Assessment of resectability depends on careful review of preoperative imaging and is facilitated by volumetric measurement. In addition, because of the greater efficacy of chemotherapy, a subset of patients who are initially unresectable are downstaged to resectability. Systemic therapy may also allow for the more rational application of aggressive surgical approaches. Intervventional approaches, in particular portal vein embolization may further expand the number of resection candidates or allow for safer application of extended hepatectomy. In patients with synchronous metastases reverse sequencing, and combined resections are increasingly utilized. Finally, two-stage hepatectomy may allow for complete resection of bilobar metastatic disease.

VSIO31-03 DW-MRI vs. PET/CT for Assessment of Early Treatment Response of Liver Metastases to Y90-Radioembolisation: First Results
Alexandra Barabasch MD (Presenter): Nothing to Disclose, Nils Andreas Kraemer: Nothing to Disclose, Alexander Ciritsis: Nothing to Disclose, Nienke Lynn Hansen MD: Nothing to Disclose, Philipp Bruners MD: Nothing to Disclose, Christiane Katharina Kuhl MD: Nothing to Disclose

PURPOSE

View learning objectives under main course title.
We report on the first results of an ongoing study that aims at comparing the accuracy of liver DW-MRI to PET/CT for early response-assessment after trans-arterial Y90-radioembolisation (Y90-RE).

METHOD AND MATERIALS

Between June-2010 and December-2013, 145 Y90-RE in 85 patients were performed. Patients who (1) had liver-metastases from solid cancers, and (2) had at least 3 measurable target-lesions in the right liver lobe were included. 25 patients (16 colorectal, 8 breast and 1 CUP) met the inclusion criteria and underwent PET/CT and DW-MRI of the liver within 6 weeks before and within 4-8 weeks after Y90-RE. An increase in minimal ADC (ADCmin) and a decrease in maximal SUV (SUVmax), respectively, of at least 30% after Y90-RE was regarded as positive response. In diverging response classifications, the final outcome of the patient was used to distinguish true from false response-classifications.

RESULTS

Two patients (2/25, 8 %) were FDG-negative on pre-therapeutic PET, leaving 23 for DWI/PET-correlation. After Y90-RE, overall SUVmax decreased from 7.90 ± 2.75 to 5.47 ± 2.06 (p<0.0001). Minimal ADC (ADCmin) increased from 0.53 ± 0.14 *10-3 mm2/s to 0.73 ± 0.29 *10-3 mm2/s (p=0.0035). A strong inverse correlation was observed for post-therapeutic ADCmin and SUVmax (r=-0.73). Concordant response-classification was observed in 19/23 patients (83 %), discordant in 4/23 (17 %). In 3/4, response based on DWI was confirmed by follow-up. PPV to predict presence of response was 14/15 (93 %) for MRI and 11/10 (91 %) for PET. NPV to predict absence was 10/10 (100 %) for MRI and 10/14 (71 %) for PET. The sensitivity for detecting response was significantly higher for MRI (100 %; 14/14) than for PET (71%; 10/14) (p<0.004).

CONCLUSION

DW-MRI appears to be significantly more sensitive than PET/CT for demonstrating early response after Y90-RE in patients with secondary liver tumors.

CLINICAL RELEVANCE/APPLICATION

DW-MRI should be preferred for early response assessment after Y90-RE, since it appears to be significantly more sensitive compared to PET/CT.

VSIO31-04  Going It Alone: Ablation for Cure
Luigi Solbiati MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

For hepatic metastases from colorectal cancer ablation is generally used in small volume liver disease in inoperable patients. For many years survival data following ablation (median survival of 3 years and 5-year survival approaching 30 %) have been better than any published chemotherapy alone data and slightly worse than those achieved after liver resection. More recently, thanks to further improvements of ablation technologies and techniques, it has been demonstrated that local control of colorectal metastases within the 2-cm and the 2-3 cm size ranges approaches respectively 100 % and 85-90 %, thus being comparable with most surgical series. In addition, in recent reports, long-term follow-up results up to 10 years in patients with appropriately selected hepatic metastases from colorectal cancer were essentially equivalent to those from surgical resection, even preserving the traditional advantages of ablation vs surgery (less invasiveness, repeatability, lower complication rates, etc ..). These findings highlight the viability of ablation as an alternative treatment not only in the large number of patients who are ineligible for surgical resection, but also for patients who could undergo surgery, provided that accurate selection of cases is applied and the most advanced technologies and techniques to guide and perform ablations are employed. Of course, combinations of ablations and chemotherapy are by far preferable to ablation alone, but ablation should still be offered to patients who cannot receive chemotherapy.

VSIO31-05  Palliative Embolotherapy: New Technology, New Promises?
Tobias Franz Jakobs MD (Presenter):  Speaker, Sirtex Medical Ltd Research Consultant, Sirtex Medical Ltd Speaker, Siemens AG Speaker, Terumo Corporation Speaker, Surefire Medical, Inc

LEARNING OBJECTIVES

1) Palliative embolization for different tumor entities. 2) Indications for palliative embolotherapy. 3) Products and devices for embolotherapy.

ABSTRACT

Embolisation has become an accepted modality of cancer treatment in patients with a variety of clinical scenarios. It is commonly used in clinical practice in the treatment of hepatocellular carcinoma, hepatic metastases from colorectal and breast cancer and neuroendocrine tumors. This review summarizes the current evidence for the efficacy of embolotherapy in these clinical settings, together with the associated complications and future options.

VSIO31-06  Transarterial Chemoembolization in Soft-Tissue Sarcoma Metastases to the Liver – The Use of
Purpose

To evaluate the role of imaging biomarkers of tumor response in soft-tissue sarcoma (STS) metastases to the liver treated with conventional transarterial chemoembolization (cTACE).

Method and Materials

This study was a retrospective analysis of 25 patients with STS metastases to the liver treated with cTACE. Each patient underwent contrast-enhanced MRI (ceMRI) within 6 weeks before and after therapy. Tumor response of the largest target lesion was assessed on arterial-phase MRI in each patient using RECIST, modified RECIST and EASL guidelines. In addition, a segmentation-based 3D quantification of the enhancing tumor volume (quantitative [q] EASL) was performed. For each method, patients were classified as responders (R) and non-responders (NR) and evaluated using Kaplan-Meier analysis. Overall survival (OS) and progression-free survival (PFS) of the entire cohort were calculated. Clinical parameters (performance, tumor status, treatment history) were included into a multivariate analysis of Cox proportional hazard ratios (HR).

Results

A total of 65 procedures (mean, 2.6/patient) were performed. Median OS of the entire cohort was 21.2 months (95% CI, 13.4-28.9) and PFS was 6.3 months (95% CI, 4.45-8.2). No patient was classified as R according to RECIST, while 11 (44%), 12 (48%) and 12 (48%) patients were R according to EASL, mRECIST and qEASL, respectively. Multivariate analysis identified tumor response according to mRECIST and qEASL as reliable predictors of improved patient survival (P=0.019; HR 0.3 [0.1-0.8] and P=0.006; HR 0.2 [0.1-0.6], respectively).

Conclusion

This study demonstrated the advantages of enhancement-based tumor response assessment over size-based RECIST analysis of STS metastases to the liver and validated qEASL as the most predictive assessment method after cTACE.

Clinical Relevance/Application

The validation of mRECIST and qEASL as prognostically relevant imaging biomarkers of tumor response might help to identify non-responders sooner for potential re-treatment in this rare disease.
Once considered rare, the incidence and prevalence of neuroendocrine tumors (NET) have increased rapidly, with a more than five-fold increase in incidence in the United States from 1973 to 2004 and an prevalence that is two- to five-times that of esophageal cancer, gastric cancer, pancreatic cancer, and hepatobiliary cancer. The typically long delay in diagnosis of NETs and their propensity for hepatic metastases create an important role for liver-directed therapies. Challenged by the shortage of physicians experienced in the diagnosis and management of this disease, these long-lived patients often access strong advocacy groups and web-based support sites which direct them to centers of excellence with physician teams that offer a complete understanding of the spectrum of their disease. It is essential that interventional oncologists develop an intimate knowledge of the characteristics and management of neuroendocrine tumors in order to know how and when best to apply the armamentarium of image-guided therapies, and guide patients in integrating these with surgical, systemic and supportive therapies.

**VSIO31-09**

**Role of Aggressive Surgery in mNET**

Robert E. Roses MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Discuss the role of resection of a primary NET in the setting of metastatic disease. 2) Discuss the evidence for for resection of metastatic NET 3) Discuss the management of complex patients with multiple sites of disease or bilobar liver metastases.

**ABSTRACT**

Neuroendocrine tumors include a diverse group of clinical and pathologic entities. Treatment priorities much be personalized and reflect spectrum of disease, symptoms and tumor biology. Notwithstanding, a convincing role for aggressive surgical management has emerged and can benefit patients with early and disseminated disease. Resection of the primer tumor is often indicated, even in the presence of metastases. Aggressive liver resection appears to be of benefit; particularly if all visible disease can be removed. For patients with disseminated disease a multidisciplinary approach and judicious application of interventional approaches is essential in achieving favorable outcomes.

**VSIO31-10**

**Cone-Beam Computed Tomography Angiography for Depiction of Tumor-feeding Vessels during Chemoembolization of Malignant Liver Tumors: Comparison of Conventional and Dedicated-software Analysis**

Maxime Ronot MD (Presenter): Nothing to Disclose, Mohamed Abdel-Rehim MD: Nothing to Disclose, Viseth Kuoch MD: Nothing to Disclose, Antoine Hakime MD: Nothing to Disclose, Marion Roux: Nothing to Disclose, Melanie Chiaradia MD: Nothing to Disclose, Valerie Vilgrain MD: Nothing to Disclose, Thierry J. De Baere MD: Consultant, Terumo Corporation Speaker, Coviden AG Speaker, Terumo Corporation Speaker, General Electric Company Consultant, General Electric Company Consultant, Guerbet SA Speaker, Guerbet SA, Frederic Deschamps: Nothing to Disclose

**PURPOSE**

To compare the ability of a dedicated software and conventional cone beam computed tomography (CBCT) analysis to identify tumoral feeders in a series of malignant liver tumors treated with transarterial chemoembolization (TACE).

**METHOD AND MATERIALS**

Between January 2011 and January 2012, 66 hypervascular malignant liver tumors from patients who underwent TACE with contrast-enhanced CBCT at the arterial phase were included (51 HCC, 13 NET and 2 adrenal cancer metastases). Data were analyzed by 6 interventional radiologists blinded to each other analyses (2 junior and 4 experienced readers). Readers were asked to identify tumor feeders by performing 1) a conventional analysis using post-processing tools such as maximum intensity projection, multiplanar reconstruction, volume rendering, 2/ a computer-aided analysis using FlightPlan for liver (referred to as raw-FPFL), and 3) a review of this computer aided analysis for which reader were asked to validate or invalidate each feeder detected by the software (referred to as reviewed-FPFL). Analyses were compared to a “Reference Reading” established by two study supervisors in consensus. Sensitivities, positive predictive values (PPV), and false positive ratios (FPR) were compared using Mac-Nemar, Chi-square and exact Fisher tests. Analysis durations were compared using a Mann-Whitney U test. Inter-readers agreements were assessed by mean of percentage of agreement.

**RESULTS**

A total of 179 feeding vessels were identified in the 'Reference Reading'. The sensitivity of raw-FPFL was significantly higher than that of both reviewed-FPFL and conventional analyses (90.9% vs. 83.2% and 82.1%, p<0.0001), with lower PPV (82.9% vs. 91.2% and 90.6%, respectively (p<0.0001), higher FPR (17.1% vs. 9.4% and 8.8%, respectively (p<0.0001), and higher inter-reader agreement (92% vs. 80 and 79%, respectively, p<0.0001). The conventional analysis was significantly longer than that of both raw- and reviewed-FPFL (<0.0001).

**CONCLUSION**

Contrast-enhanced CBCT with software analysis enabled accurate and sensitive detection of tumor feeders of malignant liver tumors before TACE. The review of the software analysis was responsible for a significant decrease in the number of identified feeders.

**CLINICAL RELEVANCE/APPLICATION**

Dedicated software analysis of contrast-enhanced CBCT images should be used when performing transarterial chemoembolization of liver tumors.
Embolotherapy for mNET: When and How?
Sarah Beth White MD (Presenter): Consultant, Guerbet SA Consultant, Vascular Solutions, Inc Research support, Siemens AG

LEARNING OBJECTIVES
1) Assessment and triage of metastatic NETs. 2) Review of image guided therapies for mNETs. 3) Integration of systemic therapy with image guided therapies for mNETs.

ABSTRACT
Neuroendocrine tumors (NETs) describe a family of tumors that mainly arise from the gastrointestinal tract. The incidence is estimated to be between 2.5-5 per 100,000, two thirds of which are small intestine carcinoids. NETs can be clinically silent (unless hormone producing) and are often found incidentally. However, once they metastasize to the liver, the vasoactive substances they release can enter the systemic circulation and cause carcinoid syndrome, which clinically manifests as flushing and diarrhea. Treatment for metastatic NET (mNET) includes systemic therapies that range from monthly octreotide injections (a well-tolerated somatostatin analog) in mild cases to cytotoxic chemotherapies such as 5-FU and doxorubicin in aggressive cases. Embolotherapy has also started to play a role in the treatment of mNET; however, controversy still remains about which type of therapy is the most efficacious, bland embolization vs. conventional chemoembolization vs. drug eluting bead chemoembolization vs γ-90 radioembolization. The objective of this session is to discuss the role of embolotherapy for the treatment of mNET and how to integrate it with systemic therapies.

Coming to America: PRRT
Daniel Pryma MD (Presenter): Research Grant, Siemens AG Research Grant, Molecular Insight Pharmaceuticals, Inc Speaker, IBA Molecular Advisory Board, Bayer AG

LEARNING OBJECTIVES
1) To understand the various available permutations of PRRT and their relative risks and benefits. 2) To appreciate the current research availability and potential for future availability of PRRT.

ABSTRACT
PRRT is a mainstay in the treatment of GEPNETS worldwide, but has very limited availability as an investigational therapeutic in the United States. The various permutations of radioisotopes and somatostatin analogs used for PRRT will be reviewed along with an understanding of their potential risks and benefits. The process of PRRT will be discussed including expectations for outcomes and toxicity. Finally, the availability of PRRT for American patients will be discussed.

Liver-Directed Therapy for Metastases from Breast Cancer: Outcomes Analysis
Amy Marie Fowler MD, PhD (Presenter): Nothing to Disclose, Stephanie Markovina MD, PhD: Nothing to Disclose, Angela Hirbe: Nothing to Disclose, Christina Koo Speirs MD, PhD: Nothing to Disclose, Alejandro Munoz Del Rio PhD: Research Consultant, Cellectar Biosciences, Inc Reviewer, Wolters Kluwer nv, Todd DeWees: Nothing to Disclose, Cynthia Ma: Nothing to Disclose, Jeffrey R. Olsen MD: Consultant, DFINE, Inc Travel support, DFINE, Inc Speaker, ViewRay, Inc, Nael El Said Saad MBBC: Research Consultant, Veran Medical Technologies, Inc Proctor, Sirtex Medical Ltd

PURPOSE
To determine the clinical outcomes for breast cancer patients with chemorefractory liver metastases treated with locoregional therapy.

METHOD AND MATERIALS
This HIPAA-compliant, IRB-approved study is a single-institution, retrospective chart review. Twenty-nine consecutive female breast cancer patients (mean age 55 years; 35-77) with unresectable liver metastases progressing despite systemic chemotherapy were included who were treated with radiofrequency (RF) ablation (n=17), chemoembolization (n=6), or 90Y radioembolization (n=6) from January 1999 to March 2013. Follow-up data was obtained through June 2013. Treatment response was evaluated on follow-up imaging which consisted of CT, MRI, and/or PET/CT. Overall survival (OS) time and time to progression (TTP) of disease was measured from the time of first liver-directed therapy. OS and TTP curves were generated using the Kaplan-Meier method and compared with the log rank test.

RESULTS
Median OS was 21 months (1-81 months) for all patients and was 34, 15.5, and 16 months for patients treated with RF ablation, chemoembolization, and radioembolization, respectively. Longer OS was measured for those treated with RF ablation compared to chemoembolization (p=0.04) or radioembolization (p=0.03). Median follow-up was 16 months (1-81 months) with one death from liver failure prior to follow-up imaging. Median TTP was 4 months (1-26 months) for all patients and was 2, 1, and 6 months for patients treated with RF ablation, chemoembolization, and radioembolization, respectively. Longer TTP was measured for patients treated with radioembolization compared to RF ablation (p=0.04).

CONCLUSION
Survival was comparable for patients treated with chemo- and radioembolization, but was prolonged for those treated with RF ablation, presumably from reduced pre-therapy disease burden.

**CLINICAL RELEVANCE/APPLICATION**

While this study is small with a heterogeneous retrospective cohort, the results support a palliative indication for radio- and chemoembolization with potential prolonged survival provided by RF ablation. Identification of patient and tumor biomarker criteria that best predict survival and consideration of earlier utilization of embolization at lower amounts of disease burden may improve outcomes. A matched-pair analysis with patients treated with systemic chemotherapy alone is in progress.

**LEARNING OBJECTIVES**

1) To present a variety of clinical scenarios highlighting the multidisciplinary options for management of liver metastases from neuroendocrine tumors through a 'tumor board' of experts representing each of the major oncologic disciplines.

**SSJ07**

**Gastrointestinal (Liver Masses)**

**Scientific Papers**

AMa PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00

Tue, Dec 2 3:00 PM - 4:00 PM  Location: E353A

**Participants**

**Moderator**
Michael Austin Blake MBBCh: Editor with royalties, Springer Science+Business Media Deutschland GmbH

**Moderator**
Vamsi Rao Narra MD, FRCR: Consultant, Biomedical System Medical Advisory Board, Guerbet SA

**Sub-Events**

**SSJ07-01**

**Biphenotypic Intrahepatic Cholangiocarcinoma and Hepatocellular Carcinoma: Imaging Features on MRI, CT, Ultrasound and PET**

Michael Leigh Wells MD (Presenter): Nothing to Disclose, Sudhakar Kundapur Venkatesh MD, FRCR: Nothing to Disclose, Geoffrey Bates Johnson MD, PhD: Nothing to Disclose, Jeff L. Fidler MD: Nothing to Disclose, David Maitland Hough MD: Nothing to Disclose, Joel Garland Fletcher MD: Grant, Siemens AG, Vishal Chandan MBBS: Nothing to Disclose

**PURPOSE**

Biphenotypic primary hepatic neoplasms characterized by both hepatocellular carcinoma (HCC) and cholangiocellular carcinoma (CCA) differentiation are rare. We performed a retrospective study to review the imaging and laboratory findings in 47 patients.

**METHOD AND MATERIALS**

In this institutional review board approved study, we retrospectively searched our institutional electronic medical records for patients with pathologically confirmed biphenotypic tumors. Clinical data and serum tumor markers were recorded. Two reader consensus of imaging features obtained for computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET) and ultrasound.

**RESULTS**

Chronic liver disease (CLD) was present in 36% of subjects; cirrhosis in 28%. Serum AFP was elevated in 29/42 (69%), CA 19.9 in 21/35 (60%) and both AFP and CA 19.9 were elevated in 16/34 (47%). On MRI, tumors were T2 hyperintense in 18/19 (95%) and T1 hypointense in 19/19 (100%). Only 1/27 (4%) exhibited classic HCC feature of arterial hyperenhancement followed by washout. On CT and MRI, nearly three quarters (20/27, 74%) had peripheral hyperenhancement followed by peripheral washout or fade coupled with gradual central enhancement. Other patterns included persistent peripheral enhancement on all phases (n =3), separate foci of arterial and delayed enhancement (n=2), and hypoenhancement (n=1). Pseudocapsule was present in 6; biliary obstruction in 3 and liver capsule retraction in 8. Peripheral hypoechoogenicity and central
hyperechogenicity was the most common ultrasound feature, 5/12 (43%). PET demonstrated hypermetabolism in 9/11 (82%).

CONCLUSION

Biphenotypic tumors do not show strong association with CLD and serum tumor markers are inconsistently elevated. They exhibit variable imaging characteristics on CT and MRI, but classic features of HCC are usually not seen. Most have enhancement patterns which may suggest alternative diagnoses such as biphenotypic tumor, CCA or metastasis. Two distinct tumor components are rarely seen. Discordance between imaging findings and laboratory tumor markers should raise suspicion of biphenotypic tumor. Mixed tumors tend to be very metabolically active at FDG PET. Ultrasound is not specific.

CLINICAL RELEVANCE/APPLICATION

Suggesting an etiology other than HCC may be an important role of imaging in these patients given the significant differences in management of HCC compared with biphenotypic tumors, CCA or metastases.

SSJ07-02

Evaluation of a New Manganese-based Orally-Administered Hepatobiliary MR Contrast Agent


PURPOSE

To determine the qualitative and quantitative efficacy of orally-administered manganese chloride tetrahydrate (CMC-001) for the evaluation of focal liver lesions (FLL) by MRI.

METHOD AND MATERIALS

Unenhanced alone and combined unenhanced and CMC-001 enhanced T1- and T2-weighted images at 1.5T of 30 healthy volunteers and 134 patients included in five Phase I and II trials or for compassionate use were evaluated separately by one independent reader who was blinded to patient information, contrast agent dose and clinical diagnosis. Region-of-interest signal intensity (SI) measurements were acquired from the non-tumorous liver parenchyma, common bile duct (CBD), portal vein (PV), paraspinous muscle and FLL, when present. FLL were also scored for visualization, delineation, detection confidence and characterization. Mean signal intensity measurements and lesion contrast-to-noise ratios (CNR) were compared between pre- and post-contrast images. The detection of benign and malignant-appearing lesions were compared between unenhanced alone and combined unenhanced and CMC-001 enhanced images.

RESULTS

178 unenhanced and CMC-001 enhanced image pairs were available for evaluation (some patients were imaged more than once). Comparing T1-weighted unenhanced to enhanced images, there was a significant increase in the SI of both liver parenchyma and CBD (37% and 412%, respectively; p<.0004). There was also a statistically significant improvement in the lesion-to-liver CNR after CMC-001 administration (median: pre: 4.22, post: 12.12; p<.0001). Compared to unenhanced images alone, the combination of unenhanced and CMC-001enhanced images demonstrated 13% more malignant-appearing lesions. Also for malignant-appearing lesions, confidence in lesion localization in the 'high' category increased from 41% to 56% (p<.0001), while confidence in lesion visualization and delineation in the 'excellent' category increased from 32% to 44% (p<.0001) and from 18% to 36% (p<.0001), respectively.

CONCLUSION

This initial analysis shows that orally-administered manganese chloride tetrahydrate provides qualitative and quantitative improvement over unenhanced MRI for visualization and detection of focal liver lesions.

CLINICAL RELEVANCE/APPLICATION

Manganese chloride tetrahydrate could be an alternative contrast agent for patients with known or suspected focal liver lesions in whom gadolinium-based contrast agents are contraindicated, particularly in patients with renal insufficiency.

SSJ07-03

Diagnostic Management of Benign Hepatocellular Lesions Imaged atMR - Hepatobiliary Phase versus CEUS

Lambros Charles Tsikikas MD (Presenter): Nothing to Disclose, Frederic Pigneur MD: Nothing to Disclose, Marion Roux: Nothing to Disclose, Vincent Roche: Nothing to Disclose, Laurence Baranes MD: Nothing to Disclose, Julien Calderaro: Nothing to Disclose, Charlotte Costentin: Nothing to Disclose, Damien Medico: Nothing to Disclose, Marjan Djabbari: Nothing to Disclose, Alexis Laurent: Nothing to Disclose, Ariane Mallat: Nothing to Disclose, Alain Rahmouni MD: Nothing to Disclose, Alain Luciani MD, PhD: Nothing to Disclose

PURPOSE

To compare the added value of contrast-enhanced ultrasound (CEUS) and delayed hepatobiliary phase (HBP) imaging using Gd-BOPTA enhanced MRI in patients with atypical benign hepatocellular lesions (BLT).
METHOD AND MATERIALS
Sixty-four BLT-37 focal nodular hyperplasia (FNH) and 27 hepatocellular adenomas (HCA) with atypical presentation on liver MR using extracellular Gd chelates (EC-MRI) in 41 patients were retrospectively included in this IRB approved study. All patients underwent HBP MRI and CEUS. Two radiologists independently reviewed 2 sets of images: set 1 EC-MRI and HBP MRI; set 2 EC-MRI and CEUS. All HCA and 38% of all FNH were documented on pathology, the remaining FNH being diagnosed in board decisions and a median 18 months follow-up. Sensitivity (Se) specificity (Spe) were compared between the two sets, and subgroup analysis according to lesion’s size were performed.

RESULTS
Regardless of lesion size, the respective Se and Spe of both data sets were not statistically different (94 and 100% vs. 78 and 92% respectively; p=0.11 and p=0.48). For lesions larger than 35mm, although both sets had similar excellent specificity (100%, p = 1) the sensitivity was higher for EC- MRI+HBP set (100% vs. 33%; p=0.04).

CONCLUSION
Although the overall performances of EC-MRI + CEUS and EC-MRI + HBP MRI are similar, the use of HBP should be advocated over CEUS in larger than 35mm large benign hepatocellular lesions.

CLINICAL RELEVANCE/APPLICATION
Size influences HBP and CEUS diagnostic performances. The use of HBP should be advocated over CEUS in larger than 35mm large benign hepatocellular lesions.
In a 7-year period we identified 48 patients with 50 "dirty" cysts (hypoechoic content in 24 lesions, lack of posterior enhancement in 10 lesions, both findings in 16 lesions) at US. These subjects were imaged for cancer staging/follow-up and had no previous study for comparison. They prospective underwent sulphur hexafluoride-based contrast medium injection. Diagnosis was confirmed by further imaging in 30 lesions, follow-up in 18, and biopsy in 2.

RESULTS

US was indeterminate, by definition, in all lesions (9-39 mm, mean 20). The liver echotexture was fatty in 37 patients and normal in the others. An inhomogeneous content was more predictive for solid nature than lack of dorsal enhancement did. CEUS correctly diagnosed all 24 true cysts (100%) in 24 patients and 25/26 solid lesions (96%, 18 metastases and 7 hemangiomas) in the remaining 24. One deeply located metastasis was incorrectly diagnosed as cyst by CEUS.

CONCLUSION

CEUS allows achieving a definitive diagnosis in patients with US findings of "dirty" liver cyst. CEUS allows ruling out a solid FLL and characterizing truly solid FLLs. This is of special value in countries where US is regarded as the first modality for liver survey.

CLINICAL RELEVANCE/APPLICATION

It is not uncommon that liver cysts show an atypical appearance at US. In these cases CEUS allows to solve the diagnostic pitfall avoiding further imaging with more expensive and invasive modalities.

Contrast-enhanced Hepatic Angiography: A Novel CEUS Technique to Image Intrahepatic Arteries

Hans-Peter Weskott MD (Presenter): Luminary, General Electric Company Speaker, Bracco Group, Shanshan Yin MD: Nothing to Disclose

PURPOSE

To evaluate the arterial hepatic architecture including diameter, course and branching by using a pulse inversion technique in patients with either diffuse and/or focal liver disease.

METHOD AND MATERIALS

For detection or characterization of focal liver lesions (FLL) in normal/or diffuse liver disease 137 patients underwent CEUS. With arrival of the first bubbles (contrast agent Sonovue, Bracco Company, Milan,Italy) a sweep of the right or left liver lobe was performed using a low MI harmonic imaging technique (pulse inversion, Logiq E9, C1-5, GE Healthcare, Milwaukee, USA). Cine capture was started to visualize the vascular continuity of intrahepatic arteries. Average accumulation time for a cine capture sequence was 6.5s ±1.8s. A successful examination was defined when at least three main branches of the right or left hepatic artery were imaged. Loops were reviewed to compare course and size of intrahepatic arteries, including 44 patients with liver metastases, 28 within liver cirrhosis and 65 patients without cirrhosis and malignant FLL among them 18 patients with benign FLL.

RESULTS

The success rate was 88%. In cirrhotic patients 78% had a tortuous course and dilated arteries including at least three main arterial branches. The mean diameter of the right or left main tortuous artery was 3.36±0.92mm. The smallest arterial branches measured 0.4mm. Compared to patients without collateral circulation (n=24), diameters were thinner in patients with collateral circulation (n=4) (3.39±0.96mm vs. 2.58±1.15mm, p=0.138). In non-cirrhotic patients, 54% showed corkscrew arteries involving no more than two main arterial branches, mostly seen in patients under chemotherapy. In comparison the mean diameter of the non-cirrhotic liver was thinner (2.32±0.89mm, p=0.000). Curly arteries were seen more often in the elderly (r=0.285). In metastatic disease, 45.4% patients had curly arteries. Tortuous feeding arteries were seen in all FNH and HCC. Arterial stenosis was seen in a patient with lung cancer without liver metastasis.

CONCLUSION

CEHA is capable to image changes of the intrahepatic arterial architecture and thus contributes to characterize the vascular status in patients with diffuse or focal liver diseases.

CLINICAL RELEVANCE/APPLICATION

CEHA shows differences in in the arterial architecture of patients with diffuse liver disease, especially in patients under or after chemotherapy, it helps to image tumor supplying arteries in benign FLL and HCC.
SSJ08-01  CT Detection of Complicated or Uncomplicated Meckel's Diverticulum


PURPOSE

To determine how often complicated and uncomplicated Meckel's diverticulum is detected on CT in pediatric and adult population.

METHOD AND MATERIALS

Forty (8 pediatric and 32 adult) patients (29 males and 11 females; average age: 46.2±23.7) with pathologic diagnosis of Meckel's diverticulum who had CT exam before surgical resection were evaluated. These included 26 asymptomatic adult patients with incidentally found Meckel's diverticulum during unrelated abdominal surgery, and 14 (8 pediatric and 6 adult) patients with complicated Meckel's diverticulum (4 bleeding, 6 small bowel obstruction [SBO], 2 acute diverticulitis, 1 incisional hernia, and 1 inverted Meckel's diverticulum). A total of 85 CT exams (23 CT exams for 14 patients with complicated Meckel's diverticulum, and 62 CT exams for 26 asymptomatic patients) obtained with multiple different scanners and techniques were evaluated for detection of Meckel's diverticulum and its complications. Technical factors for CT including IV and positive oral contrast material and subjective CT quality (excellent, good, fair, poor), and patient's factors including amount of peritoneal fat and ascites (none, minimum, moderate, large) were compared to detection of Meckel's diverticulum using mixed-effect logistic regression models.

RESULTS

Meckel's diverticulum was detected in 19 of 40 (47.5%) patients (average diameter: 17.1±7.7mm, length 42.6±14.7mm). Complicated Meckel's diverticulum was detected in 8 of 14 (57.1%) patients (2 bleeding, 2 SBO, 2 diverticulitis, 1 hernia, and 1 inverted Meckel's) on at least one CT exam, and 13 of 23 (56.5%) total CT exams. Uncomplicated Meckel's diverticulum was detected in 11 of 26 (42.3%) patients on at least one CT exam, and 16 of 62 (25.8%) total CT exams. Amount of peritoneal fat (p=0.02) was related to detection of Meckel's diverticulum. Amount of ascites (p=0.06) and subjective quality of axial CT (p=0.05) were not statistically significant, but tended to be related to its detection, whereas IV (p=0.59) or oral contrast (p=0.41) were unrelated to its detection.

CONCLUSION

Complicated Meckel's diverticulum was detected in 56.5% of CT exams, and uncomplicated Meckel's diverticulum was detected in 25.8% of CT exams.

CLINICAL RELEVANCE/APPLICATION

Complicated Meckel's diverticulum should be considered in patients with abdominal/gastrointestinal symptoms, and its possible CT findings should be sought.

SSJ08-02  What Is the Predictive Factors of Bowel Viability and Prognosis in Bowel Ischemia? Retrospective Review of Image Findings of Abdomen Computed Tomography (CT)

Hyun Soo Kim (Presenter): Nothing to Disclose, Sung Eun Ahn: Nothing to Disclose, Dong Ho Lee MD: Nothing to Disclose, Seong Jin Park MD, PhD: Nothing to Disclose, Joo Won Lim: Nothing to Disclose, Han Na Lee MD: Nothing to Disclose, Sung Kyung Moon: Nothing to Disclose, Yunkyung Shin: Nothing to Disclose

PURPOSE

To evaluate the imaging predictive factors and clinical factors of bowel viability and prognosis in abdomen CT of the patients with bowel ischemia.

METHOD AND MATERIALS

This retrospective study enrolled 72 patients (M:F ratio = 35:37, mean age = 63.2 years) who underwent abdomen CT due to bowel ischemia or infarction. Two radiologists reviewed two phase abdomen CT images without information of their recovery status in consensus. The following imaging features were assessed; involving bowel location, involving pattern (multifocal, continuous), involving length (<25cm, 25~50cm, 50~75cm, >75cm), thickness of the most thickened bowel, mucosal and mural enhancement degrees (absence, decreased, similar to the adjacent viable bowel, increased), mucosa and serosa disruption, delayed enhancement of mucosa and serosa, ancillary findings (mesentery vessel thrombosis, other organ infarction, portal vein gas, and pneumatosis). Statistical analyses were performed for the comparison between good and poor prognosis patients by using Chi-square, Fisher's exact and paired-T tests.

RESULTS

According to the clinical data, patients were divided into two groups - group 1 who underwent the bowel resection, or were expired (12), and group 2 who recovered bowel viability with conservative manage (60). In comparison between 2 groups, small bowel involvement, longer segment involvement, decreased mucosal and mural enhancement degrees, and the presence of mucosal disruption, mesenteric vessel thrombosis, and other
abdominal organs infarction were statistically related to the poor clinical results (p <0.05). Of the 23 patients who showed lack or decreased mucosal enhancement of involved bowel, small bowel involvement (p<0.001) and involved length (p= 0.013) were statistically associated with the prognosis.

**CONCLUSION**

Significant CT findings related to the prognosis in bowel ischemia are small bowel involvement, longer segment involvement, decreased mucosal and mural enhancement, mucosal layer disruption, mesenteric vessel thrombosis, other abdominal organs infarction.

**CLINICAL RELEVANCE/APPLICATION**

When the ischemic bowel showed absent or decreased mucosal enhancement in abdomen CT, small bowel and long length involvement is the bed prognostic factor requiring the prompt and active treatment.

**SSJ08-03**

**Comparison of Radiological and Clinical Differential Points of Small Bowel Obstruction between Surgically and Non-surgically Managed Groups**

Seungmin Lee (Presenter):  Nothing to Disclose, Wooyul Paik MD :  Nothing to Disclose, Mi-Hyun Park MD :  Nothing to Disclose, Keum-Nahn Jee MD, PhD :  Nothing to Disclose

**PURPOSE**

To analyze and compare the radiological and clinical differential points between surgically and non-surgically managed groups in patients with small bowel obstruction (SBO).

**METHOD AND MATERIALS**

To evaluate and compare the imaging findings of contrast enhanced abdominal 3D CT between surgically and conservatively managed groups of patients with SBO in 252 cases of 227 patients (mean age of 57 year-old, male to female ratio 118 : 109) from Jan 2009 to March 2013. To analyze the CT findings of proximal bowel dilatation, obstruction site with definite transition zone, small bowel feces sign, mesenteric whorl or crowding around obstruction site, strangulation, closed loop obstruction, and combined peritoneal changes such as ascites, mesenteric haziness, seeding nodules, etc. retrospectively by consensus of two abdominal radiologists. To review their past medical history including previous operation history of abdomen or pelvis, peritoneal inflammation with or without enterocolitis and trauma. To perform statistical analyses using Chi-square test and student t-test between the two groups.

**RESULTS**

No significant statistical deference between the two groups about past medial history of surgery, trauma or peritonitis (P>0.05). In surgically managed groups, significantly increased incidence of small bowel feces sign (p=0.007), strangulation or closed loop obstruction (p<0.0001), and peritoneal changes such as ascites, mesenteric haziness, seeding nodules, etc. (p=0.0001) in 3D CT findings.

**CONCLUSION**

Contrast enhanced 3D CT findings of small bowel feces sign, strangulation or closed loop obstruction and combined peritoneal changes of ascites, nodules or haziness are statistically significantly increased in surgically managed group of patients with SBO than in non-surgically managed one.

**CLINICAL RELEVANCE/APPLICATION**

In the evaluation of CT findings with SBO, our results could be considered in decision making of patient's management.

**SSJ08-04**

**Determining the Need for Surgical Intervention for Small Bowel Obstruction Based on MDCT Findings: Multi-reader Study Comparing Experienced Radiologists with Newly Board-certified Radiologists**


**PURPOSE**

Small bowel obstruction (SBO) is an important diagnosis and Multi-detector CT (MDCT) plays a critical role in the evaluation of suspected SBO. The purpose of this study is to determine how good MDCT is in predicting the need for surgical intervention (within 72 hours), bowel resection and bowel ischemia. Additionally, to compare the differences between experienced radiologists and newly board-certified radiologists in identifying SBOs that required surgical intervention.

**METHOD AND MATERIALS**

MDCT studies performed at the time of admission for suspected SBO in 85 consecutive adults were systematically reviewed by 12 board-certified radiologists. Six of the radiologists were newly board-certified radiologists. The other six radiologists were experienced radiologists. The examinations were scored for the presence or absence of findings relevant to SBO and associated bowel ischemia. Each reader rated the likelihood: 1) of the need for surgical exploration, 2) that bowel ischemia would be found at surgery, and 3) that bowel resection would be required. A 5-point scale was utilized for each question (1=definitely not;
RESULTS
The pooled (all 12 radiologists) ROC area-under-the-curve (AUC) for surgical need was 0.802. Pooled ROC AUC for the presence of ischemia and need for bowel resection was 0.795 and 0.783, respectively. Considering a score of 3-5 as positive, pooled sensitivity and specificity for predicting the need for surgery was 86.1% and 65.5%, respectively. AUC for surgical need between the junior and senior radiologists was the same (0.802). The AUC for bowel ischemia between the junior and senior groups was 0.734 and 0.856, respectively. The AUC for bowel resection was 0.808 (junior) and 0.758 (senior).

CONCLUSION
Radiologists are moderately successful in evaluating the need for patients with suspected SBO to go to surgery based on MDCT findings. There are no significant differences in the abilities of newly board-certified radiologists and experienced radiologists in identifying SBOs that require imminent surgical intervention.

CLINICAL RELEVANCE/APPLICATION
SBO is an important diagnosis and we have shown that radiologists using MDCT findings can be helpful in guiding clinicians to the appropriate diagnosis and treatment.

SSJ08-05
Dynamic Contrast-Enhanced Magnetic Resonance Imaging of Small Bowel and Magnetic Resonance Flow Analysis of Mesenteric Vessels in Patients with Paroxysmal Nocturnal Hemoglobinuria with and without Abdominal Pain

Sergio Margari MD (Presenter): Nothing to Disclose , Francesco Aldo De Cobelli MD : Nothing to Disclose , Giulio Pezzetti MD : Nothing to Disclose , Antonio Esposito MD : Nothing to Disclose , Alessandro Del Maschio MD : Nothing to Disclose

PURPOSE
The exact pathogenesis of abdominal pain in patients with Paroxysmal Nocturnal Hemoglobinuria (PNH) has never been investigated by in-vivo imaging studies. We aimed to use Magnetic Resonance Imaging (MRI) for an accurate assessment of mesenteric vessels flow and small bowel microvascular perfusion, in order to identify early pathophysiological phenomena associated with abdominal pain in PNH patients.

METHOD AND MATERIALS
Twelve PNH patients, six with abdominal pain (AP) and six without abdominal pain (NOP), underwent MRI in fasting conditions. Mean flow (MF) and stroke volume (SV) of Superior Mesenteric Vein (SMV) and Artery (SMA) were measured with ECG-gated phase-contrast flow-mapping sequences; mean areas under the curve at 60 (AUC60) and 90 seconds (AUC90) and Ktrans of the small intestine wall were assessed using Dynamic Contrast Enhanced MRI (DCE-MRI). Statistics were performed with Mann-Whitney test, Spearman’s correlation and linear regression model.

RESULTS
All MRI parameters were lower in AP than in NOP. Total AUC60: 84.81 ± 11.75 vs. 131.73 ± 18.89 (P < 0.001); total AUC90: 102.33 ± 14.16 vs. 152.58 ± 22.70 (P < 0.001); total Ktrans: 0.0346 ± 0.0019 min⁻¹ vs. 0.0521 ± 0.0015 (P = 0.0015; P = 0.003 duodenum, 0.009 jejunum, 0.009 ileum); SMV: MF 4.67 ± 0.85 ml/s vs. 8.32 ± 2.14 (P = 0.002); SV 3.85 ± 0.76 ml vs. 6.55 ± 1.57 (P = 0.02). MF in SMV showed a positive correlation with total AUC60 (Spearman ρ = 0.882, P < 0.001), total AUC90 (ρ = 0.855, P = 0.001) and total Ktrans (ρ = 0.764, P = 0.093 duodenum, 0.009 jejunum, 0.009 ileum). Mean flow in SMV was able to explain about 60-70% of MRI perfusion variability in the whole small intestine (R² = 0.607, P = 0.005 total AUC60; R² = 0.668, P = 0.002 total AUC90; R² = 0.731, P = 0.011 total Ktrans). SMA: MF 6.95 ± 2.61 ml/s vs. 11.2 ± 2.32; SV 6.52 ± 2.19 ml vs. 8.78 ± 1.63 (P = 0.07).

CONCLUSION
Combined MR based assessment of blood flow in the mesenteric vessels and small intestine wall perfusion suggests that an impairment of small bowel blood supply is associated with the presence of abdominal pain in PNH patients. Comparing flow and perfusion parameters, MF in SMV resulted the most powerful small bowel wall perfusion independent predictor.

CLINICAL RELEVANCE/APPLICATION
Small intestine blood flow and perfusion impairment, especially in the venous compartment and in jejunum and ileum, seems to be an early/reliable MRI marker of mesenteric ischemia in untreated PNH patients with abdominal pain.

SSJ08-06
Frequency and Appearance of Small Bowel Image Artifacts in the Iodine Map Images of Rapid kVp Switching Dual-energy CT

En-Haw Wu MD (Presenter): Nothing to Disclose , So Yeon Kim MD : Nothing to Disclose , Zhen Jane Wang MD : Nothing to Disclose , Wei-Chou Chang MD : Nothing to Disclose , Liqin Zhao MD : Nothing to Disclose , Benjamin M. Yeh MD : Research Grant, General Electric Company Consultant, General Electric Company

PURPOSE
To describe the appearance and incidence of gas interface artifacts in the small bowel that may mimic bowel
method and materials

We retrospectively identified 99 consecutive patients (M:F = 51: 48, age 59.3 ± 14.4 years) who underwent abdominal rsDECT scans obtained with oral water and IV contrast. At an AW workstation up to three representative jejunal segments in a patient were chosen to include segments with full gas-distension, partial gas-distension, or absent gas. For each jejunal segment, readers recorded the presence of image artifacts seen in the iodine maps that were not seen on the corresponding 140 kVp or 65 keV images. Iodine map artifacts were classified as: 1) Pseudo-stratified bowel wall artifact, defined as three or more thin alternating parallel bands of bright and dark signal; 2) Pseudo-pneumatosis, defined as irregular small beaded signal voids adjacent to bowel mucosa; and 3) Pseudo-hyperenhancement, defined as intense high signal of the bowel folds brighter than that of blood vessels.

results

Iodine map bowel artifacts appeared in 82 of 99 patients (83%). Of a total of 242 representative jejunal segments evaluated (full gas-distension: 54, partial gas-distension: 89, absent gas: 99), the artifacts were observed in 134 (55.4%) jejunal segments. Bowel image artifacts were more frequently seen in fully gas-distended 54 of 54 (100%) and partially gas-distended 80 of 89 (90%) jejunum than in and absent gas segments 0 of 99 (0%), p<0.001 for both. For all cases, the artifacts were seen only along the air-bowel interface. In full and partial gas-distended segments (n=143), 114 segments had two or more artifacts (totally, 105 pseudo-stratified bowel wall, 21 pseudo-pneumatosis, and 125 pseudo-hyperenhancement). The presence of pseudo-stratified bowel wall and pseudo-hyperenhancement were significantly associated (r=0.697, p = 0.02).

Conclusion

Image artifacts on iodine map of rsDECT are common at gas interfaces in the bowel. Knowledge of these artifacts is helpful to accurately interpret DECT scans with possible bowel disease.

clinical relevance/application

When evaluating dual energy CT iodine map images, one should recognize that gas interface artifact is common and has characteristic image appearances.
RESULTS
Analysis of the current guidelines showed a diagnostic improvement with the addition of cholestasis to the "Sendai criteria" on determining malignancy of IPMNs (sensitivity 81.2% vs. 86.9% with no change in specificity of 59.6%). The largest single predictors of malignancy were solid components (OR 7.7) and cholestasis (OR 45.6). Over 95% of all cases with cholestasis had malignant IPMNs (PPV 96.4%; NPV 63.1%).
The cause of cholestasis was not solely a result of direct compression of the bile duct by the lesions. Subanalysis of branch duct IPMNs (BD-IPMNs) also resulted in a diagnostic improvement with the addition of cholestasis (sensitivity 48.8% vs. 62.8% with no change in specificity of 76.4%). The largest single predictors of malignancy for BD-IPMNs were main pancreatic duct dilation (OR 8.1) and cholestasis (OR 72.2). Frequency analysis revealed that even small BD-IPMNs had already undergone malignant transformation (≤1cm: 15%; 1-2cm: 26%; 2-3cm 20%) with about 10% of those having a dilated bile duct.

CONCLUSION
A dilated bile duct is a significant positive predictor of malignancy regardless of the size of the lesion. The addition of cholestasis to current guidelines is a superior tool for preoperative stratification of IPMNs.

CLINICAL RELEVANCE/APPLICATION
Improved radiological predictors of malignancy may offer better detection rates and in turn improved patient care.

SSJ09-02

Risk Stratification of Side Branch Intraductal Papillary Mucinous Neoplasm of the Pancreas, Based on Long-term Follow Up Results

Ybao Liu MD, PhD (Presenter): Nothing to Disclose, Fatih Akisik MD : Nothing to Disclose, Kumaresan Sandrasegaran MD : Nothing to Disclose, Temel Tirkes MD : Nothing to Disclose, Mark Tann MD : Nothing to Disclose, Jordan K. Swensson MD : Nothing to Disclose, Chang Hong Liang MD : Nothing to Disclose, Chen Lin PhD : Research Grant, Siemens AG

PURPOSE
We wanted to evaluate if there is clinical value in serial imaging exams for side branch intraductal papillary mucinous neoplasm (SB-IPMN), by observing the natural history of these lesions using CT/MR imaging and ERCP/EUS data.

METHOD AND MATERIALS
This retrospective HIPAA-compliant study was approved by the authors' institutional review board, with waiver of informed consent. 327 patients (113 male, 214 female, mean age at time of first diagnosis, 65.95 years; range, 25-90 years) with SB-IPMN were followed up to 98 months with cross-sectional exams (CT, MRI or both) were enrolled in the study. All imaging exams, along with patients' EUS and ERCP data, were evaluated by analysis of cystic lesions including initial and final absolute sizes, absolute cyst growth rates, percentage size differences, and growth rate percentages. The differences in septation and the presence or absence of a mural nodule between CT, MRI and EUS were compared. Statistical analysis included the t test, analysis of variance (ANOVA), and McNemar test.

RESULTS
The mean follow up time was 40.5 months, ranging between 12 and 98 months. In the absence of a mural nodule or thick septa, no malignant tranformation was noted independent of size. Initial cyst sizes averaged 12 ± 8.0 mm with a range between 0 - 60 mm. At the end of follow up, cyst sizes averaged 14 ±10 mm. Average cyst growth was 2 ± 7 mm. Smaller cysts, <10mm, showed greater mean cyst growth rate (30%) (P

CONCLUSION
In side branch IPMNs smaller than 30 mm , without mural nodules or septations, we did not observe malignant tranformation on long-term follow up. Additionally, increase of cyst size did not predict malignancy. Therefore, there may be no need to perform serial evaluation of this group.

CLINICAL RELEVANCE/APPLICATION
If a SB-IPMN shows no mural nodule or septa , perhaps no further imaging followup is indicated, as interval change in size without these features did not predict malignancy.

SSJ09-03

Incremental Value of Secretin-Enhanced Magnetic Resonance Cholangiopancreatography in the Screening of Asymptomatic Individuals with High Risk of Pancreatic Cancer


PURPOSE
Intraductal Papillary Mucinous Neoplasm (IPMN) is a precursor of invasive pancreatic cancer (PC) distinguished from other pancreatic cystic neoplasms by its communication with the pancreatic duct. Secretin-enhanced magnetic resonance choangiopancreatography (S-MRCP) has the potential to enhance the detection of ductal communication of pancreatic cysts. We investigated the incremental diagnostic yield of S-MRCP in a population with a high prevalence of small pancreatic cysts.

METHOD AND MATERIALS

Standard MRCP protocol was performed with and without secretin using 1.5 T magnets in subjects undergoing pancreatic screening because of a strong family history of pancreatic cancer as part of the multicenter trial. All studies were reviewed prospectively by two independent readers who recorded the presence and number of pancreatic cysts, the presence of visualized ductal communication before and after secretin, and the degree of confidence in the diagnoses.

RESULTS

Of 202 individuals enrolled (mean age 56 years, 46% males), 93 (46%) had pancreatic cysts detected by MRCP, and 64 of the 93 had pre-and post-secretin MRCP images available for comparison. Data from the 128 readings show that 6 (6/128 = 4.7%) had ductal communication visualized only on the secretin studies compared to pre-secretin studies (odds ratio 1.28, p = 0.04). In addition, there was a statistically significant increase in confidence in reporting ductal communication after secretin compared to before secretin (p <0.0005).

CONCLUSION

At 1.5 T MRI, the use of secretin can improve the visualization of ductal communication of cystic pancreatic lesions. This incremental increase in visualizing ductal communication was also associated with increasing the reader's confidence in making a diagnosis of IPMN.

CLINICAL RELEVANCE/APPLICATION

With 1.5 T MRI, the use of secretin improved visualization of ductal communication of a cystic pancreatic lesion in 4.6% of patients with cysts. The incremental value of secretin in screening subjects for IPMN could potentially offset the added cost and time for additional sequences. Radiologists should decide on the cost/benefit ratio of using secretin in such cases.

SSJ09-04

Natural History of Incidental Unilocular Cystic Pancreatic Lesions with >4 Year MRI Follow Up

Lyndon Luk MD (Presenter): Nothing to Disclose, Tamas Gonda : Nothing to Disclose, Maia Kayal : Nothing to Disclose, Elizabeth M. Hecht MD : Nothing to Disclose

PURPOSE

Current literature provides limited information on the growth rate of asymptomatic cystic pancreatic lesions in patients that have had multiple abdominal MR studies over a period of at least four years. Demonstrating stability in these lesions over an extended period of time may further establish follow-up imaging guidelines.

METHOD AND MATERIALS

Keyword search of radiology reports from 2009-2013 was used to identify patients with cystic pancreatic lesions. Of the 803 patients identified, 58 had cystic lesions identifiable on MRI and >4 year imaging follow up. Two radiologists in consensus reviewed axial and coronal T2W images (5-8 mm slice thickness) and measured the single largest dimension of the largest pancreatic cystic lesion in each study. Mean interval and overall growth rate of these lesions were calculated and compared using t test (p< 0.05, significant).

RESULTS

58 (38F: 20M, mean age 62 y) patients with 58 target unilocular cystic lesions without wall thickening or internal nodularity ranging in size from 3-53 mm (mean 12.7 mm) underwent 370 abdominal MRI studies over a mean follow up of 79 months (range 48-160 mo, mean 6.4 MRI studies/patient). Of the 58 lesions, 7 had cytologic evidence of IPMN and 49 had no pathologic diagnosis. Only one patient proceeded to surgery after 8 year follow up because of developing main duct dilation and lesion growth from 17 mm to 30 mm. Pathology revealed partly high grade neoplasm without an invasive component. Mean overall growth of all lesions was 2.1 mm (16.5%). 27 patients had overall diameter growth of ≥ 3 mm. Among the lesions with ≥ 3 mm growth (range of growth 3-13 mm), there was no significant difference in baseline size compared to lesions that had no growth or < 3 mm growth (12.3 versus 13.4 mm). There was no interval development of wall thickening or internal nodularity within the target lesions in either group.

CONCLUSION

58 asymptomatic unilocular cystic pancreatic lesions in this study followed for greater than 4 years up to 13 years demonstrated only 16.5% growth and only 1 lesion (1.7%) which demonstrated 76.5% growth combined with main duct dilation proceeded to surgery.

CLINICAL RELEVANCE/APPLICATION

58 asymptomatic unilocular cystic pancreatic lesions in this study followed for greater than 4 years up to 13 years demonstrated only 16.5% growth and only 1 lesion (1.7%) which demonstrated 76.5% growth combined with main duct dilation proceeded to surgery.

SSJ09-05

MR Imaging Features of Solid Pseudopapillary Tumors of Pancreas in Male Patients: Comparison with Imaging Features in Female Patients

Jei Hee Lee MD (Presenter): Nothing to Disclose, Young Keun Sur MD : Nothing to Disclose, Seon Young Park MD : Nothing to Disclose, Jai Keun Kim MD : Nothing to Disclose

PURPOSE

To evaluate and describe the imaging features of solid pseudopapillary tumors (SPT) in male patients and to
compare with the imaging features of SPTs in female patients.

**METHOD AND MATERIALS**

This retrospective study was approved by the institutional review board. We included 50 patients (M:F=8:42, mean age=36.4 years) who had undergone preoperative MR evaluation and were histologically confirmed as SPT. The following MR imaging features of SPT in each patient were reviewed: size, location, shape, margin, encapsulation, hemorrhage, calcification, solid-cystic ratio, P-duct dilatation, parenchymal atrophy, T1 signal intensity, T2 signal intensity, and enhancement pattern. Statistical differences of MR imaging features between male and female SPT patients were analyzed.

**RESULTS**

The average age of male patients (50.75 ± 4.13 years) was significantly higher (p=0.0013) than female patients (33.67 ± 2.03 years). The shape of SPTs in male patients was predominantly lobulated (n=6/8, 75.0%) compared to female patients in whom oval shaped SPTs were most prevalent (n=26/42, 61.91%) (p=0.0224). SPTs in male patients were predominantly solid (solid, n=4/8, 50.0%; mainly solid, n=4/8, 50.0%) whereas cystic (n=5/42, 11.90%) or mainly cystic (n=13/42, 30.95%) lesions were significantly more prevalent in female patients (p=0.0309). Progressive heterogeneous enhancement was the most prevalent enhancement pattern of SPTs in both male (n=7/7, 100.0%) and female (n= 32/37, 86.49%) patients. Other MR imaging features showed no significant difference between male and female patients.

**CONCLUSION**

In conclusion, SPTs in male patients appeared as mainly solid mass with lobulating contour and heterogeneous progressive enhancement occurring at an older age than female patients. Recognition of such different imaging features of SPTs in male patients may help to differentiate from other pancreatic tumors for proper management.

**CLINICAL RELEVANCE/APPLICATION**

SPT in male patients occurred at an older age and appeared as solid mass with lobulating contour compared to female patients.

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**SSJ09-06**

**Comparison of Diagnostic Feasibility between Ultrasound-guided Percutaneous Core Needle Biopsy and Endoscopic Ultrasound-guided Fine Needle Aspiration for Solid Pancreatic Lesions**

Young Keun Sur MD (Presenter): Nothing to Disclose, Young Chul Kim MD : Nothing to Disclose, Eun Ju Ha : Nothing to Disclose, Seon Young Park MD : Nothing to Disclose, Jei Hee Lee MD : Nothing to Disclose, Jai Keun Kim MD : Nothing to Disclose

**PURPOSE**

To compare diagnostic feasibility between endoscopic ultrasound-guided fine needle aspiration (EUS-FNA) using 25-gauge (G) needle and ultrasound-guided percutaneous core needle biopsy (USG-CNB) using 18 G core needle for the diagnosis of solid pancreatic lesion.

**METHOD AND MATERIALS**

This retrospective study was approved by our institutional review board and the requirement for informed consent was waived. Patients who underwent either EUS-FNA or USG-CNB for solid pancreatic lesion from January 2008 to December 2012 were included and reviewed. EUS-FNAs and USG-CNBs were performed by experienced endoscopists or radiologists. Technical failure rate, diagnostic accuracy, sensitivity, and specificity for malignancy were calculated and compared.

**RESULTS**

One hundred seven biopsy attempts were undertaken in 89 patients (EUS-FNA, n=71; USG-CNB, n=36). Biopsy specimens were successfully obtained in 99 biopsy attempts (EUS-FNA, n=64; USG-CNB, n=35). The technical failure rate of EUS-FNA and USG-CNB was 9.86% and 2.78%, respectively (p=0.3541). Sensitivity and specificity of EUS-FNA for malignancy was 76.36% and 88.89%, respectively, which was not significantly different (p=0.3588 and 0.6645, respectively) from sensitivity and specificity of USG-CNB (87.09% and 100%, respectively). Diagnostic accuracy was 78.13% in EUS-FNA and 88.57% in USG-CNB, which was also not significantly different (p=0.3101). Diagnostic accuracy did not differ between the two modalities according to the location of the lesion in pancreas.

**CONCLUSION**

The similar diagnostic performance of EUS-FNA and USG-CNB supports the use of the two modalities as a complementary utility for the accurate diagnosis of solid pancreatic lesions.

**CLINICAL RELEVANCE/APPLICATION**

Accurate diagnosis of lesions as benign or malignant should help clinicians establish proper treatment plans and avoid unnecessary surgery.
Sub-Events

SSJ14-01

Angiotensin Receptor Blockade Causes Measurable Increases in Drug Delivery in Pancreatic Cancer Model as Measured by 18F-5fluorouracil and PET

Alexander Ramos Guimaraes MD, PhD (Presenter): Speakers Bureau, Siemens AG Expert Witness, Rice, Dolan, Kershaw, Vidhya Kumar: Nothing to Disclose, Rakesh K. Jain PhD: Board of Directors, XTuit Pharmaceuticals Stockholder, XTuit Pharmaceuticals, Ciprian Catana MD, PhD: Nothing to Disclose, Hong Ren PhD: Nothing to Disclose, Yves Boucher PhD: Nothing to Disclose, Jacob M. Hooker PhD: Nothing to Disclose, Andrew Hoover PhD: Nothing to Disclose, Diego Santos Ferreira PhD: Nothing to Disclose

PURPOSE

Pancreatic ductal adenocarcinoma (PDAC) responds poorly to chemotherapy partly due to a collagen rich desmoplastic response that is a barrier to drug delivery. Recent studies, however, have demonstrated increased survival with FOLFIRINOX, a component of which is 5-fluorouracil. In addition, angiotensin receptor blockade (ARB) with Losartan® has been shown to enhance the intratumoral penetration and efficacy of therapeutics in mice using in vitro techniques. The purpose of this study was to test the hypothesis that ARB leads to measurable increased drug delivery as evidenced by labeled 18F-5fluorouracil (5FU) using microPET in a mouse model of PDAC.

METHOD AND MATERIALS

All experiments were approved by the local ethical review panel. Orthotopic tumors were generated by implanting 1mm3 chunks of AK4.4 spontaneously generated tumors (from a Ptfi-Cre/LSL-KrasG12D/p53Lox mouse model) into the pancreas of 6-8 week old FVB mice. Tumors were allowed to grow for 1 week prior to treatment. Animals were treated daily with an ip injection of 70mg/kg Losartan for 5 days. 18F-5FU was synthesized using novel, recently published approaches that produce increased yield. MicroPET studies were performed on a Triumph PET/CT Scanner. Orthotopic pancreatic tumor model mice were anesthetized using isoflurane and imaged in Treated-Control pairs. Dynamic PET images were acquired for 60 minutes, using a 18F-5FU tracer dose of 200 uCi per animal. CT scans for attenuation and anatomic coregistration were performed immediately following PET acquisition. ROI analysis was performed on dynamic co-registered images using Osirix® with tumor time activity curves normalized to muscle. Statistical analyses compared both cohorts using a paired two tailed t-test.

RESULTS

N=6 animals (3 pairs) were studied. Losartan treated animals demonstrated a mean % increase of 148% in drug delivery as measured by 18F-5FU PET that was statistically significant (p

CONCLUSION

ARB in a PDAC orthotopic model demonstrates reproducible, increased drug delivery using PET and labeled 18F-5FU. This method is easily translatable to humans suffering from PDAC.

CLINICAL RELEVANCE/APPLICATION

With the improved survival in patients with pancreatic cancer following FOLFIRINOX, this technique could be translated to study novel targeted modulation of the tumor microenvironment concomitant with 5FU based therapies.

SSJ14-02

Estimation of Liver Function on Gd-EOB-DTPA-Enhanced Magnetic Resonance Imaging: Compare with T1 Mapping and the Quantitative Liver–Muscle Contrast Ratio

Zhenpeng Peng (Presenter): Nothing to Disclose, Shiting Feng MD: Nothing to Disclose, Ziping Li MD, PhD: Nothing to Disclose

PURPOSE

To estimate the ability of T1 mapping of liver and the quantitative liver-muscle contrast ratio (Q-LMC) on gadolinium ethoxybenzyl diethylenetriamine pentaacetic acid (Gd-EOB-DTPA)-enhanced magnetic resonance imaging for the estimation of liver function.

METHOD AND MATERIALS

Institutional Review Board approval and written informed consent were obtained.94 patients underwent MRI
with a 3.0T system before and at 20 minutes after Gd-EOB-DTPA administration. 73 were Child-Pugh class A (CPA), 14 were B (CPB) and 7 were C (CPC). T1 maps were acquired using three dimensional spoiled gradient echo sequences with two different flip angles (2 and 11°) and a fixed TR/TE (4.4ms/1.2ms). Liver T1 values were obtained using a T1 processing tool (MapIT software). T1 relaxation time of liver and reduction rate of T1 relaxation time between pre- and post-contrast enhancement were measured. The quantitative liver-muscle contrast ratio (Q-LMC) was calculated using the signal intensities of the liver and erector spinae with fat-suppressed FLASH T1-weighted sequence images. The one-way anova and pearson correlation were used for comparisons between the 2 methods.

RESULTS
Post-contrast T1 relaxation times of liver were significantly reduced. The reduction rate of T1 relaxation time in CPA/CPB/CPC were 77.6±8.4%, 62.6±8.5%, 50.7±12.5%. The difference between each group were significant (P<0.05). The increase Q-LMC in CPA/CPB/CPC were 59.4±8.5%, 48.5±6.3%, 46.2±6.2%. The difference between CPA/CPB and CPA/CPC were significant (P<0.05), but the difference between CPB/CPC was not significant (P>0.05). The pearson correlation coefficient of the reduction rate of T1 relaxation time and the Q-LMC were -0.648 and -0.526.

CONCLUSION
Both the T1 mapping of liver and the Q-LMC before and after Gd-EOB-DTPA administration can help estimate liver function. The reduction rate of T1 relaxation time was the better index of liver function than the Q-LMC.

CLINICAL RELEVANCE/APPLICATION
The reduction rate of T1 relaxation time was the better index of liver function than the Q-LMC.

SSJ14-03
Assessment of Aquaporins Function of Early-stage Liver Fibrosis Using Multi-B Diffusion-weighted MRI
Qiu-Ju LI MD (Presenter): Nothing to Disclose, Jiahui LI MD: Nothing to Disclose, Bing Yu MD: Nothing to Disclose, Yu Shi PhD: Nothing to Disclose, Zhou-She ZHAO: Nothing to Disclose, Zi-Heng ZHANG: Nothing to Disclose, Qiyong Guo MD: Nothing to Disclose

PURPOSE
To investigate the relationship between the ADC values and AQP expression, using a multiple b-value(multi-b) diffusion weighted magnetic resonance imaging(DW MRI), with the histopathological and immunohistochemical tests as gold standard.

METHOD AND MATERIALS
24 rodent liver fibrosis models at different fibrotic stages were prepared in male Wistar rat for the experiment through thioacetamide injection thrice a week with another 6 intact as the control group. Both groups were performed MR measurements, on a 3. T scanner, before and after the injection of acetazolamide solution, a typical AQP inhibitor, used to inhibit the AQP1, AQP3 and AQP4 on hepatic tissue. For the MR protocol, besides the conventional T1WI and T2WI, a multi-b DWI was carried out with 18 b values selected from 0 to 4500 s/mm2(low-b: <200 s/mm2, mid-b: 300-1500s/mm2 and high-b: 1700-4500 s/mm2). The obtained multi-b DW images were post-processed through a newly developed tri-exponential model with low-b, mid-b, and high-b ADCs achieved. The output parametric maps were reviewed and analyzed blindly by two experienced observers with no histologic detail informed. The same layer of the harvested lobe were chosen for the routine HE staining, Sirius red staining of collagen, and AQP1 molecular pathology staining to determine the stage of liver fibrosis and the AQP1 expression level. Liver fibrosis was evaluated according to the Metavir scoring system.

RESULTS
The AQP1 expression in the liver endothelial cells significantly increased with aggravation of liver fibrosis from normal to early stage fibrosis. The mean high-b ADC value of S2 was significantly higher than S1, both higher than S0 (P<0.05), which was in accordance with the result of immunohistochemical tests. At S1, the high-b value post inhibitors injection had a significant decrease (>30%), and 20% higher than S2. However, the inhibition tests were negative at S0.

CONCLUSION
It was demonstrated in this study that the severity of liver fibrosis is positively correlated with the AQP1 expression and the multi-b DW MRI technique was capable to detect the S1 stage liver fibrosis.

CLINICAL RELEVANCE/APPLICATION
AQP multi-b DWI molecular imaging is a promising tool for early diagnosis of liver fibrosis.

SSJ14-04
Prognostic Value of Simplified Dual-timepoint FDG-PET/CT in Pancreatic Cancer: Comparison to Routine SUV Measurements
Freimut Juengling MD, PhD (Presenter): Nothing to Disclose, Christian Bieg MD: Nothing to Disclose, Ralph Peterli MD: Nothing to Disclose, Ines Valenta: Nothing to Disclose, Markus Von Flue MD: Nothing to Disclose, Markus Gass MD: Nothing to Disclose

PURPOSE
To evaluate the prognostic value of early dual-timepoint kinetics in pancreatic malignancies as compared to routine single SUV measurements alone.

**METHOD AND MATERIALS**

In a prospective analysis of 55 consecutive patients with histological or cytological diagnosis of pancreatic cancer, scheduled for FDG-PET/CT, dual-timepoint PET/CT was performed at 60 min. and 90 min. after application of FDG. Images were fused with routine MRI and accordingly, lesional SUV min, SUVavg and SUVmax were respectively measured for each timepoint. Regional changes in SUVs were calculated as previously described. Patients were followed-up for 12-70 months, with death or survival as primary endpoint. For analysis of prognostic significance on survival, patients were assigned to two pairs of groups, according to regional changes in SUV exceeding a cut-off of 3.5 in SUVmax or of 11% change in SUV measurements and Kaplan-Meier survival curves were plotted using MedCalc software. Survival curves were compared using the logrank test.

**RESULTS**

Comparison of survival rates between groups based on SUVmax $\geq$ 3.5 vs. SUVmax < 3.5 (a cutoff proposed by several groups, eg. Hu et al. 2013) did not result in a significant difference between groups (logrank test, P=0.9298), while a regional SUV increase of more than 11% differentiated between a high-mortality group (36% survival probability at 24 months; 22% at 36 months) and a low-mortality group (86% survival probability at 24 months; 68% at 36 months, P=0.0041, logrank test))

**CONCLUSION**

Dual timepoint FDG-PET/CT performed as early as 30 minutes after the initial study adds significant prognostic information to standard PET evaluation based on single SUV measurements and differentiates between a high-mortality group and a low-mortality group at 24 and 36 months after initial diagnosis.

**CLINICAL RELEVANCE/APPLICATION**

The proposed dual-timepoint PET/CT imaging protocol adds significant, prognostic information on survival probability, as compared to standard imaging and SUV measurements. The additional time and effort, consisting in 5 minutes of additional scanning immediately after completion of routine protocols, is minimal and fits perfectly into the existing, clinical workflow.

Transcriptomic and Immunohistochemical Profiling of Pancreatic Ductal Adenocarcinoma: Search for Functional Imaging Biomarkers

**PURPOSE**

Imaging plays an important role in the management of patients with pancreatic ductal adenocarcinoma (PDAC); however, the ability to reliably detect early stage tumors and accurately identify the true extent of disease preoperatively is severely limited with current anatomical diagnostic imaging techniques (computed tomography, magnetic resonance imaging, endoscopic ultrasound). We employed a target-centric strategy to identify transporter proteins upregulated in PDAC versus normal pancreas as potential targets for a new functional imaging probe to complement existing anatomical imaging approaches.

**METHODOLOGY AND MATERIALS**

We have performed transcriptomic (gene expression) profiling using laser capture microdissection, microarray and RNAseq on histologically-confirmed primary PDAC tumors and normal pancreas tissue from 33 patients, including five patients whose tumors were isoattenuating to normal pancreas and not visible on CT. RNAseq data were analyzed as gene normalized counts using the mapped reads per kilobase per million mapped reads (RPKM) method. Target expression at the protein level was confirmed with immunohistochemistry on tissue microarrays from 94 PDAC patients. All studies on human specimens were approved by our Institutional Review Board.

**RESULTS**

Our search has identified at least 10 candidate transporter proteins upregulated in PDAC versus normal pancreas. Thus far, the best potential imaging target identified was SLC6A14, a neutral and basic amino acid transporter. SLC6A14 was overexpressed at the transcriptional level in all patients and expressed at the protein level in 95% of PDAC tumors.

**CONCLUSION**

SLC6A14 merits further investigation as a candidate transporter for functional imaging of PDAC.

**CLINICAL RELEVANCE/APPLICATION**

SSJ14-05
A new functional imaging probe that selectively targets PDAC with high sensitivity could transform patient management by allowing earlier detection and surgical intervention, and improving preoperative staging of disease.

**Pre-treatment FDG-PET/CT Predicts Distant Relapse Following Percutaneous Ablation for Colorectal Liver Metastases**

James Franklin MA, MBBS (Presenter): Nothing to Disclose, Jean SZ Lee MRCP, MBChir: Nothing to Disclose, Charles Dearman BA: Nothing to Disclose, Daniel Yiu Fai Chung MBBS, FRCP: Nothing to Disclose, Ewan Mark Anderson MBCh: Nothing to Disclose, Fergus Vincent Gleeson MBBS: Alliance Medical Ltd Consultant

**PURPOSE**

Percutaneous ablation has a role in the local treatment of colorectal liver metastases. Patients are typically selected for therapy based on technical, rather than biological, considerations. Pre-treatment techniques to allow improved patient selection for local therapy would be of clinical value. The aim of this study was to assess whether quantitative [18F]-FDG-PET/CT (PET/CT) was associated with patterns of disease relapse at 1 year.

**METHOD AND MATERIALS**

This was a retrospective cohort study of 24 patients with solitary colorectal liver metastases, who underwent percutaneous ablation. All patients had a PET/CT scan prior to treatment. The presence of intra- or extrahepatic distant metastatic relapse at 1 year was determined by contrast-enhanced CT, and MRI or PET/CT where available. Patients with metastatic relapse were classified into oligometastatic or polymetastatic patterns of relapse; oligometastatic disease was defined as limited relapse (≤3 metastases), which remained amenable to local treatment. The PET/CT parameters SUVmax, SUVpeak, metabolic tumour volume (MTV) and tumour glycolytic volume (TGV) were derived using commercially available software (Hermes Medical Solutions, AB, Stockholm). The association of these parameters with patterns of subsequent metastatic relapse was tested using standard statistical techniques.

**RESULTS**

The 24 patients were categorized as follows: 9 polymetastatic relapse, 4 oligometastatic relapse, 11 no relapse. All patients with an SUVmax > 13 had polymetastatic relapse within one year. There was a significant difference of SUVmax (7.47 vs 14.15, p=0.002) and TGV (79.5 vs 664.0, p=0.016) between those with polymetastatic relapse compared with oligometastatic or no relapse. The AUC for the ROC curve for SUVmax to predict polymetastatic compared with oligometastatic or no relapse at 12 months was 0.875 (Figure 1).

**CONCLUSION**

Baseline PET/CT can provide prognostic information for patients undergoing percutaneous ablation for solitary colorectal liver metastases, which may allow improved patient selection for local therapy. This may be because FDG-uptake reflects underlying differences in tumour biology.

**CLINICAL RELEVANCE/APPLICATION**

Selection for percutaneous ablation of colorectal liver metastases is based largely on technical, rather than biological, considerations. PET/CT can provide prognostic information, which may allow improved patient selection for local therapy.
emphasizes of the talk will be on MRI techniques like Diffusion weighted imaging, MR spectroscopy and MR elastography in diffuse hepatic pathology. The three F’s of fat, fibrosis and iron (Fe) will be tackled in terms of diagnosis, and quantification. These will be reviewed via case examples. Also, a thorough review of the existing literature will be presented during the course of the talk.

ABSTRACT

Diffuse liver pathology in children has traditionally been evaluated using ultrasound (US) and CT scan. US is easier way to evaluate fatty liver even in children. However, the normal range of hepatic fat fraction on these sequences in children is not known yet. The purpose of this study was to evaluate normal range of hepatic fat fraction on these sequences in healthy children.

METHOD AND MATERIALS

We retrospectively reviewed children who visited our medical check-up clinic for last two years. Age, sex, height, weight, body mass index, and laboratory findings including liver function tests, cholesterol, and triglyceride level were reviewed. Hepatic fat fraction (%) was measured on the dual- and triple-echo gradient-recalled-echo sequences of our routine check-up MR protocol performed at 3T. We excluded children with abnormal laboratory finding or overweight (body mass index more than 25 kg/m2). Paired t-test was used to compare dual and triple fat fraction. Pearson’s chi-squared test was used to evaluate the correlation between fat fraction and clinical or laboratory findings.

RESULTS

Among the total 72 children visited our clinic during the study period, 18 were excluded due to the abnormal laboratory findings or overweight. The enrolled 54 children (M:F = 26:28) were 5-15 years old with a mean of 9 years. Dual fat fraction (range 0.1-8.0%, mean 2.3 ± 2.0 %) was lower than triple fat fraction (range 0.4-6.5%, mean 2.9 ± 1.4 %) (p=0.006). Eight children (8/54, 15%) on dual and six children (6/54, 11%) on triple-echo sequences showed more than 5% fat fraction. In the correlation analysis, only dual fat fraction and triglyceride level was correlated significantly (Pearson's correlation coefficient 0.314, p=0.021).

CONCLUSION

The upper limit of normal hepatic fat fraction was 8% on dual- and 6.5% on triple-echo sequences. Dual fat fraction was lower than triple fat fraction and correlated with triglyceride level in healthy children.

CLINICAL RELEVANCE/APPLICATION

Knowing normal range of hepatic fat fraction using dual- and triple-echo gradient-recalled-echo sequences is an easy way to evaluate fatty liver even in children. However, the normal range of hepatic fat fraction on these sequences in children is not known yet. The purpose of this study was to evaluate normal range of hepatic fat fraction on these sequences in healthy children.

Preliminary Assessment of a Hi SNR mMRI Sequence for Use in Determination of Low Hepatic Proton Density Fat Fraction (PDDF) in Children


PURPOSE

Low signal-to-noise (SNR) could interfere with hepatic fat assessment by magnitude-based MRI (mMRI). The purpose of this study was to assess in children the accuracy of a high-SNR (Hi-SNR) mMRI sequence to determine hepatic proton density fat fraction (PDDF), at PDDF values less than ten percent.

METHOD AND MATERIALS

In this prospective, single-site, IRB approved, HIPAA compliant study, a Hi-SNR variant of an mMRI sequence was developed by increasing slice thickness from 8 to 10 mm, and decreasing matrix from 224x128 to 128x92. Pediatric subjects with known or suspected non-alcoholic fatty liver disease (NAFLD) were recruited, provided
written informed consent, and underwent 3T MR examinations including mMRI and an advanced multi-TR-TE magnetic resonance spectroscopy (MRS) sequence capable of measuring T1 of water and fat as well as PDFF. The mMRI PDFF values used in this study are the means of three circular 1-cm radius regions of interest (ROIs) placed on source mMRIs co-localized to the MRS voxel location, one slice above that location, and one slice below that location. Linear regression models were used to assess accuracy of MRI-estimated PDFF for the three ROI locations, using multi TR-TE MRS PDFF as reference.

RESULTS

Standard and Hi-SNR mMRI, and multi-TR-TE MRS (to measure PDFF and T1) were obtained for 19 children (13 male, 6 female, age 11.8 ± 2.5 years). Regression analysis of Hi SNR mMRI using multi-TR-TE MRS had a slope, y-intercept and R2 value, respectively, of 0.960, 1.216% and 0.993 for all 19 subjects; and 1.185, 0.602% and 0.822 for the 13 subjects with PDFF less than ten percent. Those values for standard mMRI were 0.987, 0.738% and 0.990 for all 19 subjects; and 1.139, 0.240% and 0.691 for the 13 subjects with PDFF less than ten percent.

CONCLUSION

In children with known or suspected NAFLD, correlation of Hi-SNR MRI PDFF with MRS was similar, or slightly improved compared to that for mMRI, for PDFF values less than ten percent.

CLINICAL RELEVANCE/APPLICATION

PDFF estimation using a high SNR mMRI variant sequence in children is feasible, and may be helpful if future research suggests that low SNR affects accuracy.

VSPD32-04

Diagnosis of Liver Rejection by Acoustic Radiation Force Impulse in Pediatric Liver Transplant Patients

Lidia Monti: Nothing to Disclose, Marco Salsano (Presenter): Nothing to Disclose, Manila Candusso: Nothing to Disclose, Giuliano Torre: Nothing to Disclose, Chiara Grimaldi: Nothing to Disclose, Paola Francalanci: Nothing to Disclose, Francesco Callea: Nothing to Disclose, Giovanna Soglia MD: Nothing to Disclose, Alfonso Avolio: Nothing to Disclose, Lorenzo Bonomo MD: Nothing to Disclose, Jean De Ville De Goyet: Nothing to Disclose, Paolo Toma: Nothing to Disclose

PURPOSE

Acoustic radiation force impulse (ARFI) imaging has been developed as a new non-invasive ultrasound-based elastography modality to investigate liver stiffness using shear wave velocity (SWV). The aim of this study was to evaluate the role of ARFI imaging for assessing episodes of liver dysfunction (rejection, hepatitis, cholangitis and fibrosis) during the post-operative course after pediatric LT.

METHOD AND MATERIALS

ARFI was performed using an US device (Acuson S2000, Siemens Medical Solutions) equipped with a 4-MHz transducer. SWV by ARFI imaging was performed in 59 pediatric LT recipients (median 6 month after transplantation). Liver transplantation was performed with a full liver graft in 15 cases (25%) and with a split liver (segments II-III) in 44 (75%). SWV was measured ten times to quantify hepatic stiffness. Liver biopsy and laboratory analysis (including aminotransferases, alkaline phosphatases, albumin and bilirubin) were performed in a range of time from one day to one month from the ARFI imaging. SWV was compared to biochemical parameters using liver biopsy as reference standard. Data were evaluated retrospectively.

RESULTS

During the study period ARFI was performed 138 times. According to histopathology there were 15 rejections, 29 hepatitis episodes, 12 cholangitis episodes. Median SWV (m/s; IQR) was higher in patients with diagnosis of graft rejection than in patients without liver disease [2.03, 1.67-2.44, vs 1.22, 1.09-1.31, p < 0.01]. Median SWVs in patients with hepatitis and cholangitis were respectively 1.80, (IQR = 1.49-2.06) and 2.07 (IQR = 1.91-2.48). A few patients had fibrosis with a median SWV of 1.67 m/s. At ROC curve analysis ARFI resulted able to predict rejection (AUC = 0.932), hepatitis (AUC = 0.916) and cholangitis (AUC = 0.949). Statistical analysis wasn't reliable for fibrosis (n = 4).

CONCLUSION

SWV obtained by ARFI predicts the diagnosis of rejection, hepatitis and cholangitis in pediatric liver transplantation independently to biochemical markers. ARFI could be useful to reduce the number of liver biopsy in order to guide the immunosuppressive therapy.

CLINICAL RELEVANCE/APPLICATION

ARFI, together with serological markers, is an efficient modality for the diagnosis of graft dysfunction allowing the reduction in the number of liver biopsies in pediatric patients after LT.

VSPD32-05

Acoustic Radiation Force Impulse (ARFI) Quantification for Assessing the Severity of Liver Fibrosis in Patients with Biliary Atresia before Kasai Surgery: Comparison with Liver Fibrosis Biopsy Pathology
PRIORITY

To assess liver fibrosis severity with acoustic radiation force impulse (ARFI) quantification in biliary atresia (BA) patients before Kasai surgery.

METHOD AND MATERIALS

Patients with conjugated hyperbilirubinemia of unknown causes were prospectively evaluated. BA was diagnosed with laparotomy and cholangiography, liver biopsy was performed in the process of operation. Subjects without hepatobiliary diseases were recruited at the same period as controls. The pSWE with ARFI (Acuson S2000, Virtual Touch Tissue Quantification mode) was performed on all subjects before surgery and ARFI values were calculated in BA patients and control group. The difference between the two groups was statistical analyzed.

RESULTS

There were 27 BA patients and 20 controls in total. The ARFI values in patients were significantly faster than controls ($P<0.001$). Median and mean values of ARFI according to liver fibrosis stages in BA patients were 1.16, 1.16m/s (F0), 1.70, 1.69m/s (F1), 1.67, 1.78m/s (F2), 2.21, 2.14m/s (F3) and 2.71, 2.65m/s (F4), respectively. In control group, median and mean values of ARFI were 1.11 and 1.13m/s, respectively. The correlation between ARFI and fibrosis stages was analyzed with spearman correlation coefficient, and $r=0.757(P<0.001)$.

CONCLUSION

ARFI could reflect the liver fibrosis, and had good correlation with liver fibrosis stages in BA patients. It may become noninvasive method to predict the prognosis and determine the treatment in the future.

CLINICAL RELEVANCE/APPLICATION

ARFI is a reliable noninvasive method in evaluating the severity of liver fibrosis in BA patients before Kasai surgery.
We evaluated qualitative and quantitative magnetic resonance enterography (MRE) findings which best correlate with mucosal healing assessed by ileocolonoscopy as a reference standard.

METHOD AND MATERIALS

In this IRB-approved, HIPAA-compliant retrospective study, patients 18 years of age or below with Crohn’s disease were identified who underwent two ileocolonoscopy exams to assess disease activity with an MRE closely timed with the second endoscopy. Two pediatric gastroenterologists reviewed the paired endoscopic exams by consensus to assess inflammatory activity as reference. All bowel segments with macroscopic evidence of inflammation on the first endoscopy were included in the study, and were then categorized for the presence or absence of mucosal healing (MH) based on whether macroscopic inflammation was observed on the second endoscopy. An experienced pediatric abdominal radiologist evaluated the corresponding MRE exams of these patients, blinded to the endoscopic results, for multiple imaging features associated with active inflammation. Imaging-endoscopic correlation was then performed.

RESULTS

25 patients were included in the study (mean age 17.6 + 2.8 years) with a mean time between MRE and endoscopy of 12.4 + 7.3 days. On endoscopy, 38 bowel segments demonstrated MH and 22 segments demonstrated persistent inflammation. Among imaging features, MRI Index of Activity (MaRIA) score < 8 (accuracy 85%, sensitivity 89%, specificity 77%) and bowel wall thickness (WT) < 4 mm (82%, 87%, 73%) were most strongly associated with MH (P < 0.0001, Fisher’s Exact Test). The average WT in healing segments was 2.7 ± 0.9 mm compared with 5.2 ± 2.2 mm in segments with persistent inflammation (P < 0.0001, Student’s t test). Other MRE features significantly (P < 0.005) associated with MH included mesenteric hypervascularity (78%, 97%, 45%), and bowel wall T2 hyperintensity (78%, 92%, 55%).

CONCLUSION

MRE is an accurate noninvasive technique for assessing mucosal healing in pediatric patients with Crohn’s disease. The MRE features most strongly associated with MH include MaRIA score < 8 and WT < 4 mm.

CLINICAL RELEVANCE/APPLICATION

MRE assessment of mucosal healing has great potential in pediatric Crohn’s disease as a noninvasive imaging biomarker of disease activity and a therapeutic endpoint of clinical trials.

Performance of Diffusion Weighted Sequences in Pediatric Patients with Inflammatory Bowel Diseases (IBD) Evaluated by MR-enterography

Celine Dubron (Presenter): Nothing to Disclose, Elisa Amzallag-Bellenger MD: Nothing to Disclose, Alain Duhamel: Nothing to Disclose, DOMINIQUE TURCK: Nothing to Disclose, Nathalie Boulry: Nothing to Disclose, Fred E. Avni MD, PhD: Nothing to Disclose

PURPOSE

Prospective evaluation of the performances of DWI for the detection of active lesions on MR-enterography in children with IBD.

METHOD AND MATERIALS

Sixty five children (mean age 12.9 years (3-18 years), median age 14 years) with suspected or known IBD were examined by MR-enterography (1.5 Tesla magnets Philips - Eindhoven and GE - Milwaukee). Preparation included pre-examination ingestion of a mixture of Mannitol and water. T2 weighted, T1 after Gadolinium injection and diffusion weighted sequences were obtained. All images were reviewed on a PACS system by two radiologists, each blinded to the clinical data and to the conclusion of the second reviewer. The digestive tract was divided into 7 segments. The 2 radiologists were asked to analyze the images obtained and to report on the presence of active lesions defined as bowel thickening observed on T2 sequences associated with contrast enhancement. The radiologists analyzed successively and independently the images obtained by combining T2 and DWI on one site, T2 and T1 + Gadolinium on the other. The latter was considered as the gold-standard. Whenever no agreement was observed, analysis with consensus was obtained. Inter-observers agreement and sensitivity, specificity, PPV and NPV were calculated.

RESULTS

The couple “T2 + diffusion” detected 64 lesions in 42 patients whereas the couple “T2 + T1 with Gadolinium” detected 58 lesions in 36 patients. The inter-observer agreement was excellent with a Kappa coefficient of 0.84. Sensitivity, specificity, PPV and NPV for the couple “T2 + DWI” for the detection of active lesions of IBD were respectively 100 %, 96 %, 79 % and 100 %. The accuracy between the two techniques reached 97%, with Kappa coefficient of 0.86. Seven supplementary lesions were detected by DWI and not by T1+gadolinium. 5/7 had an endoscopic or histologic study confirming active lesions.

CONCLUSION

Associated with T2 weighted sequence, DWI have equivalent or probably better performances than T1+gadolinium.

CLINICAL RELEVANCE/APPLICATION

Its use would allow to perform shorter examination and obviate the need for gadolinium injection.
MR Enterography (MRE) Findings in Pediatric Ulcerative Colitis (PUC) vs Controls: The Added Value of DWI

Simone Chaudhary BSc, MSc (Presenter): Nothing to Disclose, Jorge Humberto Davila Acosta MD: Nothing to Disclose, David Mack MD: Nothing to Disclose, Ericc Benchimol MD: Nothing to Disclose, Elka Miller MD: Nothing to Disclose

PURPOSE
To compare DWI, post-gadolinium enhanced MRI (PGE) and bowel wall thickness (BWT) in active PUC with a group of normal controls on endoscopy.

METHOD AND MATERIALS
This is a retrospective study that included newly diagnosed patients with PUC who underwent MRE within 7 days after endoscopy and a group of controls with normal endoscopy findings. Bowel was divided in Cecum (Ce); ascending colon (AC); transverse colon (TC); descending colon (DC); sigmoid colon (SC); and rectum (Re). Terminal ileum was not affected. MRE was performed in a 1.5 T Magnet. Protocol included coronal and axial DWI, b=1000; pre- and post- gadolinium coronal dynamic multiphase and axial LAVA fat saturation. DWI was restricted (DR) if there was high signal intensity on b1000 and corresponding low signal intensity on the ADC map. PGE was positive if there was avid mucosal enhancement in comparison with the small bowel. Endoscopy was positive if ulceration, inflammation or edema were documented. Two readers were blinded to diagnosis and assessed BWT, DR and PGE in each segment. Interclass correlation (ICC) and Linear Mixed Effects Models with Random Intercept (LMEMRI) were calculated for BWT. Inter-rater reliability (kappa), sensitivity (Se) and specificity (Sp) for DWI and PGE were calculated.

RESULTS
Data from 15 patients with PUC and 15 normal controls was analyzed. Kappa values for DWI/PGE were: Ce 0.64/0.76, AC 0.62/0.67, TC 0.71/0.64, DC 0.81/0.49, SC 0.87/0.78 and Re 0.86/0.55. ICC for BWT were Ce 0.22, AC 0.63, TC 0.65; DC 0.40, SC 0.41 and Re 0.59. For reader 1/reader 2: Se of DWI: Ce 91/73%; AC 69/62%; TC 77/69%; DC 100/93%; SC and Re100%. Sp of DWI: Ce 94%; AC 100%; TC 94/100%; DC 87/100%; SC 93%; and Re 87%. Se of PGE: Ce 36/55%; AC 31/46%; TC 38/62%; DC and SC 60/73%; and Re 47/67%. Sp of PGE: Ce and AC 100%; TC 94/100%; DC and SC 93/100%; and Re 87/93%. LMEMRI for BWT showed statistical difference in all segments (p<0.01) with exception of AC (p=0.11). The median difference was 0.5-1.5mm

CONCLUSION
PGE and DWI show high inter-rater reliability. Se of DWI detecting active PUC is superior to PGE; whereas specificity is comparable. BWT showed significant difference between active PUC versus controls, but these differences were only 0.5-1.5mm

CLINICAL RELEVANCE/APPLICATION
Routine MRE should include DWI sequences which increase the degree of detection of active PUC within 7 days of diagnostic endoscopy with high sp values when compared with controls

Development and Validation of an Ultrasound Scoring System for Children with Suspected Acute Appendicitis

Robert Orth MD, PhD (Presenter): Grant, Toshiba Corporation Research support, General Electric Company, Sara Fallon: Nothing to Disclose, R. Paul Guillerman MD: Nothing to Disclose, Martha Mappus Munden MD: Nothing to Disclose, Wei Zhang PhD: Nothing to Disclose, George S. Bisset MD: Nothing to Disclose, Monica Lopez MD: Nothing to Disclose, Mary Brandt MD: Nothing to Disclose

PURPOSE
To facilitate consistent, reliable communication among providers, we developed a novel scoring system for reporting limited right lower quadrant ultrasound (US) exams obtained for suspected pediatric appendicitis. The purpose of this study was to evaluate implementation of this scoring system and its ability to risk-stratify children with suspected appendicitis.

METHOD AND MATERIALS
We developed a risk-stratification scale (Appy-Score) and structured reporting template for limited abdominal US exams obtained for suspected pediatric appendicitis. Appy-Score strata were: 1=normal completely visualized appendix; 2=normal partially visualized appendix; 3=non-visualized appendix, 4=equivocal; 5a=non-perforated appendicitis; 5b=perforated appendicitis. The Appy-Score was applied retrospectively to all limited right lower quadrant US exams ordered through our Emergency Department during a 5-month pre-implementation period (1/1/2013-5/31/2013), and Appy-Score use was tracked prospectively post-implementation (7/1/2013-9/30/2013). Diagnostic performance measures of US exams were computed post-implementation. Secondary outcomes included CT imaging following US exams and negative appendectomy rates.

RESULTS
We identified 1,235 patients in the pre- and 687 patients in the post-implementation groups. Appy-Score use increased from 24% in July to 89% in September (p=0.0001). The likelihood of appendicitis progressively increased with each score stratum. Sensitivity, specificity, positive predictive value and negative predictive value post-implementation were 93.8%, 92%, 83.8%, and 97.1%, respectively. The rate of CT imaging after US decreased from 8.6% pre-implementation to 5.9% post-implementation (p=0.048). Negative appendectomy rates did not significantly change (4.4% vs. 4.1%, p=0.88).

**CONCLUSION**

The use of a risk-stratified scoring system and standardized template for reporting the results of US exams for suspected pediatric appendicitis clearly communicated the likelihood of appendicitis to the treating physician and decreased the need for CT imaging. Future studies should assess whether this streamlines care in the emergency room setting and whether the risk strata are generalizable to other institutions with varying expertise in US imaging.

**CLINICAL RELEVANCE/APPLICATION**

A scoring system for reporting limited US exams performed for suspected pediatric appendicitis can risk-stratify patients and decrease the rate of follow-up CT imaging.

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**Definition of Normal Newborn Anorectal Anatomy by Ultrasound Using a Novel Posterior Approach**

Ellen Christine Wallace MD (Presenter): Nothing to Disclose, Jean-Marc Gauguet MD, PhD: Nothing to Disclose, Jeremy Aidlen MD: Nothing to Disclose

**PURPOSE**

Describe the normal anatomy and characteristics of the anus, rectum, levator ani, puborectalis, ischiorectal fossa, sacrum and coccyx using a novel, posterior, trans-sacrococcygeal, high resolution ultrasound imaging approach. Illustrate how to perform the technique and validate the information obtained by comparison with anatomic drawings and selected CT and MR images, which are more commonly used to evaluate this area.

**METHOD AND MATERIALS**

Retrospective review of images obtained as part of routine spinal ultrasound evaluations in newborns between 2005 and 2014. High resolution linear ultrasound probes were used via a trans-sacrococcygeal approach, in the posterior sagittal and axial planes with the infant prone. A series of images demonstrate rectum, anus, presacral space, levator ani, puborectalis, sacrum, coccyx and ischiorectal fossa. Review of CT and MR imaging data, obtained for unrelated reasons, has been used to corroborate, compare and contrast with the ultrasound imaging data.

**RESULTS**

The anal canal is particularly well seen by high frequency, linear, ultrasound probes, when evaluated from a posterior trans-sacrococcygeal approach in newborns. It has a characteristic cylindrical appearance quite distinct from the rectum. The length, muscle thickness, anorectal ring, anal verge, and anorectal angle, are nicely depicted on sagittal images. The mucosa, internal and external anal sphincteric layers, and anorectal course through the levator ani muscles are well seen on axial images. The anal canal orientation with respect to rectum, sacrum, vagina and urethra can also be defined on the sagittal images. The integrity of the posterior sacrococcygeal elements is clearly seen. The images compare favorably with MR and CT of the same area without need for sedation or ionizing radiation in this young population.

**CONCLUSION**

Posterior, midline, trans-sacrococcygeal, high resolution, ultrasound imaging is a reproducible technique, which demonstrates normal anorectal and pelvic floor anatomy exquisitely well. Facility with this technique provides useful supplementary data to that obtained by transabdominal and transperineal ultrasound techniques.

**CLINICAL RELEVANCE/APPLICATION**

Confident demonstration and knowledge of normal ultrasound anorectal complex anatomy from a posterior approach provides a foundation to evaluate anorectal malformations, anterior ectopic anus and cloaca.

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**MRU: What Is Current Clinical Practice?**

J. Damien Grattan-Smith MBBS (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To discuss key protocol aspects for MR urography in children to reproducibly generate high quality studies and show how MR urography is has widespread application in the evaluation of children with urinary tract disease.
Participants
Jay P. Heiken MD (Presenter): Patent agreement, Covidien AG Patent agreement, Bayer AG
Erik K. Paulson MD (Presenter): Nothing to Disclose
Zhen Jane Wang MD (Presenter): Nothing to Disclose
David Joseph Disantis MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Learn the characteristic features of some common and atypical abdominal masses. 2) Understand how newer techniques, such as gadoxetate-enhanced MRI and diffusion-weighted imaging, help to identify and characterize abdominal masses. 3) Identify the key imaging findings that assist surgeons or oncologists treating specific abdominal masses. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

RC451
Imaging in Practice: MRI of the GIT (How-to Workshop)

LEARNING OBJECTIVES
1) To review the clinical indications for MR Enterography (MRE). 2) To learn an optimized MRE protocol. 3) To understand the clinical utility, advantages, and disadvantages of each MRE pulse sequence. 4) To discuss an imaging-based classification system for small bowel Crohn's disease. 5) To review the imaging findings for the different Crohn's disease subtypes.

Perianal Fistulizing Disease
Joel Garland Fletcher MD (Presenter): Grant, Siemens AG

LEARNING OBJECTIVES
1) To review the anatomy of the anal sphincter complex and pelvic floor. 2) To discuss standard MR perianal imaging for fistulas, and adaptations for ileal pouch, rectovaginal fistulas, and concurrent MR enterography. 3) To review the justification and rationale for MR anal imaging in patients with perianal Crohn's disease. 4) To describe time-efficient detection and classification of perianal fistulas. 5) To show how the appearance of perianal fistulas changes with treatment.

How to Use MRI for Rectal Cancer Staging
Gina Brown MD, MBBS (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) To appreciate optimal MRI techniques for accurate staging of Rectal Cancer. 2) To understand the implications for patient care from optimised staging. 3) To follow minimum reporting standards for reporting Rectal Cancers at baseline and after preoperative therapy.
Sub-Events

MSSR41A  General Principles
Ulrich Linsenmaler MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate general principles of diagnostic imaging in Emergency Radiology in traumatic and non-traumatic emergencies. 2) Analyze etiology, background and management of common radiological emergencies. 3) Identify the role, indications and protocols for US, CR, MDCT in modern emergency radiology.

MSSR41B  Challenges of Imaging Pediatric Abdominal Emergencies
Susan D. John MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the variations of pathology that cause abdominal pain and vomiting in infants and children. 2) Plan safe and effective imaging protocols using US, CT, and MRI. 3) Recognize pitfalls in the diagnosis of pediatric abdominal emergencies with imaging.

MSSR41C  Imaging in ENT Emergencies
Diego B. Nunez MD, MPH (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Analyze imaging findings in patients presenting with acute head and neck conditions using a systematic spatial approach. 2) Demonstrate understanding of the role and indications of CT and MR in acute non-traumatic ENT case management. 3) Identify the extent of disease and recognize specific complications of cervicofacial infections.

RC509

Gastrointestinal: Tumor Response Assessment (An Interactive Session)

Refresher/Informatics

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Wed, Dec 3 8:30 AM - 10:00 AM   Location: E353C

Sub-Events

RC509A  RECIST and Other Criteria
Vahid Yaghmai MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To review the concepts behind development of anatomic imaging biomarkers. 2) To learn the strengths and weaknesses of RECIST and other anatomic imaging biomarkers. 3) New criteria for evaluation of gastrointestinal tumor response assessment.

ABSTRACT

Improvements in imaging technology and therapeutic options for the management of gastrointestinal tumors have revolutionized the way tumor response to therapy is assessed. Cytotoxic therapies result in tumor shrinkage and their efficacy is commonly assessed by evaluating tumor size based on strict guidelines such as the Response Evaluation Criteria in Solid Tumors (RECIST). This review will familiarize radiologists with the steps that have led to the development and modifications of the RECIST. New cytostatic and locoregional therapies may not change tumor size and have exposed many weaknesses of the RECIST. As a result, tumor and therapy specific response assessment criteria have been developed. These new criteria, including Choi, EASL, mRECIST and irRC will also be discussed.

RC509B  CT and MR Perfusion Imaging
Dushyant V. Sahani MD (Presenter): Research Grant, General Electric Company
LEARNING OBJECTIVES

1) Understand newer concepts in oncology including tumor angiogenesis and the evolving role of imaging biomarkers in drug trials. 2) Discuss the basic principles of CT-MR perfusion and limitations of each method. 3) Develop basic knowledge and skills for acquisition and interpretation of perfusion imaging in the abdomen and pelvis. 4) Assess the potential of perfusion imaging in the oncology trials and in non-oncologic clinical settings.

**RC509C**

**Diffusion-Weighted Imaging**

Ihab R. Kamel MD, PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the basic concepts for DWI in body applications. 2) Describe the emerging role of DWI in assessing response in cancer. 3) Discuss the application of DWI in whole body imaging.

ABSTRACT

Diffusion-weighted magnetic resonance imaging (DWI) can provide functional information at a cellular level by measuring water diffusion values. DWI is sensitive to changes in the micro diffusion of water and the apparent diffusion coefficient (ADC) is an indicator of the movement of water within the tissue. In abdominal oncology, DWI imaging has been successfully used in assessing treatment response of liver tumors. In addition, ADC values have been shown to predict tumor response to treatment. In some instances low tumor ADC before treatment can be predictive of better outcome. Assessing response of in the entire tumor volume may be more valuable than a single ROI measurement. Moreover, multiparametric response maps that include changes in both ADC and enhancement after therapy are more predictive of response and patient survival compared to ADC or enhancement alone. We will review the different response criteria for various liver tumors treated with intrarterial therapy. New application of DWI including whole body applications will also be discussed.

**RC509D**

**PET-MR—What Do We Know in 2014**

Raj Mohan Paspulati MD (Presenter): Research grant from Philips Healthcare

LEARNING OBJECTIVES

1) To understand the PET-MR technology and challenges. 2) To understand clinical application of PET-MR and comparison with PET-CT. 3) To understand the pitfalls, artifacts and future of PET-MR.

ABSTRACT

Introduction of PET-CT had substantial influence on cancer staging and has become a standard practice of care in certain types of cancer staging, restaging and document tumor response to treatment. The low soft tissue contrast of the CT, especially the low dose non contrast CT is the main limitation of hybrid PET-CT imaging. MR imaging proved to be superior to even contrast enhanced CT in certain anatomical regions such as pelvis, head and neck due to its excellent soft tissue contrast resolution. There has been a quest for combined PET-MRI system to provide anatomical, physiological and molecular information with single integrated imaging. The main hurdle has been the sensitivity of PET photomultiplier tubes to magnetic field. This is overcome and integrated PET-MR systems are now available for clinical practice. There are currently two types of integrated PET-MR systems available from two different vendors. In the sequential type the photomultiplier tubes of PET are shielded from magnetic field by separating the PET and MR gantries. In the simultaneous type Photomultiplier tubes and MR coils are integrated in one system by using magnetically insensitive avalanche photo diodes. Both these systems have some advantages and disadvantages, but have common challenges. MR attenuation correction is the major challenge faced by both type of systems. World wide, there is limited literature available on the utility and clinical application of the PET-MR system. There has been lot of enthusiasm as well as anxiety in incorporating this integrated system into clinical practice by radiologists as well as physicians involved in managing cancer patients. This refresher course addresses these issues of clinical PET-MR system, key areas where they have impact on patient care and management. At the end of the course the attendees of the course will be familiar with PET-MR system, clinical applications in oncology, advantages, limitations, pitfalls and challenges.
LEARNING OBJECTIVES

1) Discuss the role of the interventional radiologist in the treatment and management of patients with primary and metastatic liver cancer as part of the multidisciplinary team. 2) Learn best practice techniques in the treatment of liver cancers, with emphasis on both locoregional and focal therapeutic approaches, and indications for treatment. 3) Explore various tips and tricks for each treatment modality and learn how to avoid complications through good patient selection, choosing the appropriate techniques, and knowing what common mistakes to avoid. 4) Learn about newer and developing techniques and devices, their potential roles and indications, and potential pitfalls. 5) Explore advanced imaging modalities in the detection of tumors and for monitoring treatment response.

Imaging in Practice: DWI in the Abdomen and Pelvis (How-to Workshop)

Refresher/Informatics
MR GU GI
AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 8:30 AM - 10:00 AM  Location: N228

Sub-Events

How to Perform DWI - Principles and Protocol
Shreyas Shreenivas Vasanawala MD, PhD (Presenter): Research collaboration, General Electric Company Stockholder, Morpheus Imaging, Inc

LEARNING OBJECTIVES

1) Understand basic principles of contrast formation in diffusion weighted MRI. 2) Understand sources of artifacts in diffusion weighted MRI. 3) Know techniques to reduce artifacts to produce diagnostic quality diffusion weighted images.

ABSTRACT

Diffusion-weighted imaging is being used with increasing frequency in body MRI. The basic mechanism of contrast generation is the use of large motion-sensitizing gradients such that water molecules undergoing random motion are dephased, resulting in signal loss. Tissues and lesions with high cellularity have reduced diffusive motion of water, which results in relatively high signal. However, a number of issues make diffusion-weighted imaging in the body challenging relative to neurological applications. First, the vast majority of clinical DWI is performed with an echo-planar technique, which suffers from image distortions due to field inhomogeneity. These become problematic particularly where there are gas-tissue interfaces, such as at the dome of the liver and near gas-filled bowel. The presentation will discuss methods to minimize these distortions. Second, the T2 relaxation rates of abdominal tissues are less than that of pelvic viscera and much less than that of the brain, whereas normal water diffusivity is higher; as the choice of diffusion sensitivity (b value) heavily influences the echo time, lower b values must be used. Third, motion from cardiac pulsations, respiration, and peristalsis produce artifacts, some of which are easily recognizable, and others which can subtly hide pathology. Techniques to minimize these pitfalls will be presented. Finally, issues of reproducibility that affect the practical clinical use of DWI for lesion characterization in body MRI will be discussed, along with approaches to improve reliability.

Interpretation of DWI - How to Create and Use ADC Maps in Your Practice
Thomas A. Hope MD (Presenter): Speaker, Guerbet SA Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Understand the principles of calculating ADC. 2) Understand the effect of b-value selection and weighting on diffusion calculations. 3) Explore the value of IVIM and other parameters.

ABSTRACT

In order to incorporate diffusion weighted imaging into clinical practices, it is important to understand how diffusion data is evaluated. Qualitatively, one can simply say that lesions are “bright” on diffusion, but intensity on high b-value imaging is not always equal to a lesion that has reduced diffusion. The understanding and implementation of quantitative analysis is therefore critical for both research and everyday clinical practice. The first step is the calculation of the apparent diffusion coefficient (ADC) map, which is used to help tease out the differences in intrinsic T2 hyperintensity and diffusivity. The calculation of the ADC map is greatly affected by the methodology used as well as the selection of b-values acquired. The ADC of a tissue describes how quickly signal decreases as the b-value is increased. Those lesions with high diffusivity will have high ADC values, while those lesions with reduced diffusion will have lower ADC values. In addition to ADC, other parameters have been described that affect the measured diffusivity. The most commonly discussed is intravoxel incoherent motion (IVIM) that is thought to represent the random movement of blood within the capillary system, often called pseudodiffusion. This parameter has its greatest effect on diffusion weighted images at low b-values.

URL's

http://www.radiology.ucsf.edu/research/meetings/rsna
Applications of DWI in Clinical Practice – When It Does and Doesn’t Help
Frank H. Miller MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate the utility of diffusion weighted imaging in the abdomen. 2) Show advantages and limitations of diffusion weighted imaging in the abdomen.

ABSTRACT

Diffusion weighted imaging (DWI) has been used in neuroimaging for many years. It has only more recently become feasible in the abdomen. The objective of this talk is to emphasize the important role that diffusion-weighted imaging can have in your practice and that it can be used routinely without difficulty in the abdomen and pelvis. DWI potentially can detect additional lesions and direct the radiologist to lesions that are not as well seen on conventional imaging. DWI helps in characterization of lesions but does have limitations in specificity which will be discussed. Qualitative and quantitative evaluation can be performed and the applications of these techniques clinically will be described. The strengths and limitations of DWI in multiple organs including the liver, pancreas, adrenal gland, kidney, and evaluation for metastases and infections will be discussed. DWI is especially helpful for identify lymph node and peritoneal metastases. Emerging techniques include the use of diffusion weighted imaging to assess response to therapy following liver-directed therapy will also be discussed. In summary, DWI should be used routinely if not being used at your institution. This talk will show benefits and limitations of DWI in a number of organs in the body.

Active Handout


SSK06

Gastrointestinal (Pancreas Benign Disease)

Scientific Papers

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 10:30 AM - 12:00 PM Location: E353B

Pancreas Signal Intensity in Patients with Type 2 Diabetes Mellitus: Correlation with Pathological Features

Yoshifumi Noda MD (Presenter): Nothing to Disclose, Satoshi Goshima MD, PhD : Nothing to Disclose, Hiroshi Kondo MD : Nothing to Disclose, Haruo Watanabe MD : Nothing to Disclose, Hiroshi Kawada MD : Nothing to Disclose, Nobuyuki Kawai MD : Nothing to Disclose, Yukichi Tanahashi MD : Nothing to Disclose, Masayuki Kanematsu MD : Nothing to Disclose, Kyongtae Tyler Bae MD, PhD : Patent agreement, Covidien AG Consultant, Otsuka Holdings Co, Ltd

PURPOSE

To assess the potential value of magnetic resonance (MR) imaging in evaluating the progression of type 2 diabetes mellitus (T2DM) and correlation with pathological features.

METHOD AND MATERIALS

This retrospective study was approved by our institutional review board and written informed consent was waived. MR imaging obtained in 29 consecutive patients (15 men, 14 women; mean age, 67.5 ± 11.8 years; range, 22-80 years) who underwent pancreatectomy were evaluated. Patients were classified into three groups according to the following HbA1c value: HbA1c ≥ 6.5 (T2DM), 5.7 ≤ HbA1c < 6.5 (pre-T2DM), HbA1c < 5.7 (non-T2DM). The pancreas-to-muscle signal intensity ratio (SIR) on in- and opposed-phase images, T2- and diffusion-weighted images, and the apparent diffusion coefficient (ADC) of the pancreas were measured. MR imaging parameters were correlated with the degree of islet amyloid polypeptide (IAPP) deposition and pancreatic fibrosis using multiple regression analysis. The relationships between the severity of T2DM and the MR imaging measurements were examined by using multiple regression analysis and the one-way analysis of variance.

RESULTS
Multiple regression analysis demonstrated that SIRs on opposed- and in-phase images were independently associated with IAPP deposition ($P = .0044$) and with pancreatic fibrosis ($P = .0002$), and SIR on opposed-phase images was associated with the severity of T2DM ($P = .0001$). Compared with the patients with pre- or non-T2DM, those with T2DM demonstrated significantly lower SIR on in- and opposed-phase images ($P < .05$), and the odds ratio for the presence of T2DM was 52.0 in patients with the cutoff SIR value of 1.08.

**CONCLUSION**

The SIR on in- and opposed-phase images of the pancreas can be a potential biomarker for assessment of IAPP deposition, pancreatic fibrosis, and the severity of T2DM.

**CLINICAL RELEVANCE/APPLICATION**

Our study demonstrated the SIR on opposed-phase images of the pancreas possibly represent the IAPP deposition and severity of T2DM. This index may be an important quantitative biomarker for the screening of patients with impaired glucose tolerance.

**SSK06-02**

**Age Has an Additive Effect on Diabetes Related Pancreatic Atrophy**

*Anish Kirpalani MD (Presenter): Nothing to Disclose, Nishigandha Prabhakar Burute MBBS, MD: Nothing to Disclose, Errol Colak MD: Nothing to Disclose, Rosane Nisenbaum: Nothing to Disclose, Shalini Anthwal: Nothing to Disclose, Arash Mirrahimi: Nothing to Disclose, David Jenkins: Nothing to Disclose*

**PURPOSE**

Pancreas volume (PV) is reduced in Type I and Type II diabetes. It is also known to reduce gradually with increasing age. We aimed to assess the effect of age on Type II diabetes (T2DM) related pancreatic atrophy, using MRI-based planimetry.

**METHOD AND MATERIALS**

Our institutional review board granted approval of this retrospective study with a waiver for informed consent. Pancreas contours were traced in consecutive MRIs for 32 patients with Type II DM and 50 normoglycemic patients using manual MRI based planimetry on non-gadolinium T1W 3D fat suppressed gradient echo images. Volumes were calculated using standard post-processing software.

The effect of age on pancreas volume was assessed separately for the Type II DM and normoglycemic cohorts. Patients were further divided into younger (55 years and younger) and older (greater than 55 years) cohorts and pancreas volumes between Type II diabetics and normoglycemics were compared separately for both cohorts.

**RESULTS**

In the Type II DM cohort, pancreas volume significantly decreased with age ($p=0.004$), while in the normoglycemic cohort, volume was not significantly associated with age ($p=0.23$). Pancreas volume in diabetic and normoglycemic patients was significantly different for patients age>55 years (mean 65.38 vs. 96.39 respectively, $p<0.001$) but was not significantly different for patients 55 years or younger (mean 81.04 vs. 86.85, $p=0.352$).

**CONCLUSION**

Type II diabetes related pancreatic atrophy is more pronounced in older age groups. Age has a significant additive effect on diabetes related pancreatic atrophy.

**CLINICAL RELEVANCE/APPLICATION**

Age has an additive effect on diabetes related pancreatic atrophy, older diabetics may thus be at an increased risk of pancreatic insufficiency from diabetes. Quantifying the extent of pancreatic atrophy by pancreas volume measurements in this subset may help titrate pharmacological interventions in these patients.

**SSK06-03**

**19F MRI of Fluorocapsules Predicts Failure of Islet Cell Therapy**

*Dian Arifin PhD: Nothing to Disclose, Mangesh Kulkarni: Nothing to Disclose, Jeff W.M. Bulte PhD (Presenter): Research Grant, Koninklijke Philips NV Founder and co-owner, SenCEST, LLC*

**PURPOSE**

To immuno-isolate transplanted human islet cells by encapsulation and to apply fluorne as 19F MRI tracer for predicting islet cell survival with and without co-transplantation of immunomodulating mesenchymal stem cells (MSCs).

**METHOD AND MATERIALS**

Fluorocapsules were synthesized by adding 6% v/v PFPE into semi-permeable alginate microcapsules and used to encapsulate luciferase-transfected fresh cadaveric human islets or mouse insulinoma cells. Human MSCs were encapsulated separately in non-modified capsules. 5000 encapsulated islets without (n=6) or with 50,000 encapsulated MSCs (n=6 each) were engrafted s.c. into diabetic NOD/ShiLtj mice. For 19F MRI of capsule rupture, fluorocapsules degradable by alginate lyase were used. Controls were mice receiving no alginate lyase...
RESULTS

BLI signals in islet+MSC group were higher (p<0.05) compared to islets alone group (Fig.1A), with a transient improvement in glycemic control up to day 7 post-transplantation (Fig.1B). While 50% of mice transplanted with islets alone survived at 4 weeks, islet+MSC mice had 100% survival rate. Fluorocapsules appeared as hot spots on 1H/19F MRI (Fig.1C). 19F MRI signal from ruptured fluorocapsules correlated to graft failure (Fig.1D, p<0.05). Fluorine and BLI signals of intact fluorocapsules were stable, while naked cells were rejected within the same time as lysed capsules (Fig.1E,F).

CONCLUSION

MSCs rescued islets from early loss and transiently improved their function in a stringent s.c. transplantation environment. The decrease in 19F MRI signal upon capsule rupture proceeds concurrently with graft rejection and can be used to predict islet therapy failure.

CLINICAL RELEVANCE/APPLICATION

19F MRI combined with MSCs can monitor and prevent islet cell graft failure for treatment of type I diabetes.

SSK06-04

Prediction of Exocrine Dysfunction in Early Chronic Pancreatitis by T1-weighted Gradient Echo (GRE) Signal Intensity

Temel Tirkes MD (Presenter): Nothing to Disclose, Alex M. Aisen MD: Consultant, Repligen Corporation Research Grant, Repligen Corporation Consultant, Carestream Health, Inc, Fatih Akisik MD: Nothing to Disclose

PURPOSE

Determine if pancreatic signal on T1-weighted fat-suppressed pre-contrast GRE image can be indicator of decreased exocrine function.

METHOD AND MATERIALS

A retrospective analysis was performed on 42 suspected chronic pancreatitis (CP) patients who had both intraductal secretin stimulation test (IDST) and MRCP. IDST involves collection of fluid from the pancreatic duct after stimulation with intravenous secretin at the time of Endoscopic Retrograde Cholangiopancreatography (ERCP). Fluid is assessed for bicarbonate concentration (HCO3) as a measure of exocrine pancreatic function (HCO3 >105 is considered normal). There were 29 patients with normal and 13 patients with decreased exocrine function. By ERCP, 40 patients were categorized as normal and 2 patients as mild CP based on the Cambridge classification. MRCP was performed on 1.5T (n=34) or 3T (n=8) scanners. A volume interpolated 3D GRE sequence was used to acquire T1-weighted pre-contrast images using minimal TE, mean TR and flip angle of 5.01±0.32 ms and 12 for 1.5T and 4.33±0.32 ms and 9 for 3T scanners. Two reviewers independently performed region of interest (ROI) measurements (~1cm²) from the head, body and tail of the pancreas as well as the spleen. Signal intensity ratio (SIR) was calculated by dividing the average pancreas signal by the spleen. Pearson's correlation coefficient was calculated to assess the correlation between HC03 concentration and SIR. Analyses of covariance (ANCOVA) models were used to determine the differences in SIR between normal and decreased group as well as the variability of measurements between 1.5T and 3T scanners.

RESULTS

There was significant difference (p<0.0001) in the SIR of the pancreas between the normal (mean 1.41, SD: 0.27) and decreased exocrine function group (mean 1.05, SD: 0.21). A significant positive correlation (p <0.0001) was found between pancreatic fluid HCO3 level and SIR. Inter-observer correlation was excellent (kappa=0.90, p <0.0001). Similar results were found on both the 1.5T and 3T scanners (p=0.62).

CONCLUSION

There was significant correlation between the decreased exocrine function (measured by the IDST) and lower T1-weighted signal on fat-suppressed pre-contrast GRE images.

CLINICAL RELEVANCE/APPLICATION

Ratio of T1-weighted signal of the pancreas over spleen can be used as an indicator of decreased exocrine function in patients with suspected early chronic pancreatitis.

SSK06-05

Wirsungocele and Santorinicele: MRCP Findings and Clinical Outcomes

Ybao Liu MD, PhD (Presenter): Nothing to Disclose, Fatih Akisik MD: Nothing to Disclose, Kumaresan Sandrasegaran MD: Nothing to Disclose, Temel Tirkes MD: Nothing to Disclose, Mark Tann MD: Nothing to Disclose, Chang Hong Liang MD: Nothing to Disclose, Chen Lin PhD: Research Grant, Siemens AG

PURPOSE
To retrospectively investigate the value of MRCP in detecting wirsungocele and santorinicele, correlation with chronic or acute pancreatitis, as well as comparison with ERCP and EUS results.

**METHOD AND MATERIALS**

This retrospective HIPAA-compliant and IRP proven study, with waiver of informed consent, included 80 patients (61 santoriniceles, 18 wirsungoceles and 1 both santorinicele and wirsungocele). 14 of 80 patients underwent only MRCP exams while 66 of 80 patients underwent S-MRCP exams. Analyzing the sizes of santorinicele and wirsungocele, comparing the sensitivity and specificity of MRCP and S-MRCP in detecting santorinicele and wirsungocele, analyzing whether santorinicele and wirsungocele are correlated with pancreas divisum, chronic or acute pancreatitis, and compared the results with ERCP and EUS findings. Statistical analysis included χ² test, Fisher’s exact probability procedures. A value of p<.05 was considered significant.

**RESULTS**

The study subjects consisted of 80 patients (21 male and 59 female; mean age at time of diagnosis, 55 years; range, 11-82 years). Size of wirsungocele (N=18) 4.5 ± 1.7 mm and santorinicele (N=62) 3.6 ± 0.8 mm. There was significant difference between MRCP and S-MRCP in detecting santorinicele, 68 % and 92 % (p

**CONCLUSION**

MRCP is useful in identifying wirsungocele and santorinicele. Secretin increases the sensitivity of the exam. Chronic or acute pancreatitis are more common in the patient with a santorinicele than in a patient with a wirsungocele.

**CLINICAL RELEVANCE/APPLICATION**

The diagnosis of santorinicele is important as there is a correlation with acute and chronic pancreatitis as opposed to a wirsungocele.
SSK06-08

Low-Tube-Voltage 100-kVp Single-Portal-Phase Abdominal CT for Short-Term Follow-up of Acute Pancreatitis: Evaluation of CT Severity Index, Interobserver Agreement and Radiation Dose

Julian Lukas Wichmann MD (Presenter): Nothing to Disclose, Pawel Majenka: Nothing to Disclose, Martin Beeres MD: Nothing to Disclose, Wolfgang Kromen: Nothing to Disclose, Boris Schulz MD: Nothing to Disclose, Stefan Wesarg MS: Nothing to Disclose, Ralf W. Bauer MD: Research Consultant, Siemens AG Speakers Bureau, Siemens AG, Josef Matthias Kerl MD: Research Consultant, Siemens AG Speakers Bureau, Siemens AG, Tatjana Gruber-Rouh: Nothing to Disclose, Renate Maria Hammerstingl MD: Nothing to Disclose, Thomas Josef Vogl MD, PhD: Nothing to Disclose, Thomas Lehnert MD: Nothing to Disclose

PURPOSE

To intra-individually compare a single-portal-phase low-tube-voltage 100-kVp abdominal computed tomography (CT) technique with standard 120-kVp acquisition for short-term follow-up assessment of acute pancreatitis regarding CT severity index (CTSI), interobserver agreement and radiation dose.

METHOD AND MATERIALS

We retrospectively analyzed 66 patients with diagnosed acute pancreatitis who underwent initial dual-phase abdominal CT (unenhanced, arterial, portal phase) at hospital admission and short-term (mean interval, 11.4 days) follow-up dual-phase dual-energy abdominal CT. All dual-phase 100-kVp and standard blended 120-kVp (M 0.6) short-term follow-up CT image series were independently evaluated by three radiologists using a modified CTSI system assessing pancreatic inflammation, necrosis, and extrapancreatic complications. Scores from the various image series were compared with paired t-test, interobserver agreement was evaluated using intraclass correlation coefficients (ICC).

RESULTS

Mean scores of CTSI for unenhanced, portal- and dual-phase follow-up scans were 4.9, 6.1, 6.2 (120-kVp) and 5.0, 6.0, 6.1 (100-kVp), respectively. Contrast-enhanced series consistently showed a higher CTSI compared to unenhanced scans (P<0.05) but differences between single- and dual-phase series did not reach statistical significance (P>0.7). CTSI scores for corresponding 100-kVp and 120-kVp image series were alike without significant differences (P>0.05). Interobserver agreement was substantial to almost perfect for all evaluated image series and subcategories (ICC: 0.67-0.93). The average dose-length-product of the single-portal-phase scans was reduced by 41% with 100-kVp acquisition compared to 120-kVp imaging (363.8 vs. 615.9 mGy•cm, P<0.001).

CONCLUSION

Low-tube-voltage 100-kVp single-portal-phase abdominal CT provides sufficient information and image quality
for short-term follow-up evaluation of acute pancreatitis and detection of extrapancreatic complications while simultaneously allowing for a significant reduction of radiation exposure.

**CLINICAL RELEVANCE/APPLICATION**

Low-tube-voltage single-portal-phase CT is sufficient for short-term follow-up of acute pancreatitis and is recommended to reduce cumulative radiation exposure during hospitalization.

**SSK06-09 Dynamic Non Invasive ASL Perfusion Imaging of the Pancreas to Investigate the Effect of Secretin**

Khosch Khosch MD (Presenter): Nothing to Disclose, Michael Ith : Nothing to Disclose, Wolfgang Kuhn MD : Nothing to Disclose, Lauren Bains PhD : Nothing to Disclose, Yojena Chittazhathu Kuruvilla : Nothing to Disclose, Johannes T. Heverhagen MD, PhD : Speaker, Bracco Group

**PURPOSE**

To prospectively investigate the reproducibility of perfusion measurement of the pancreas using arterial spin labeling (ASL) as well as to quantify effect size and variability during secretin stimulation in healthy volunteers.

**METHOD AND MATERIALS**

Ten healthy volunteers (four men, six women: mean age 28.5±4.6; 25 - 40 years) were investigated with an adapted respiratory-gated flow-sensitive alternating inversion recovery (FAIR)-TrueFISP ASL sequence to determine pancreatic perfusion (3T Verio; Siemens Erlangen, Germany) after fasting for 6h. 80 consecutive ASL data sets were measured for dynamic tracking of the secretin effect in the pancreas. Perfusion was quantitated by averaging 20 sets. The first of the resulting four stacks represented the baseline value (BL) whereas the other 3 stacks (P1 - P3) were measured immediately after secretin injection (1E/kg body weight). To investigate repeatability of pancreatic perfusion each volunteer was studied twice with an interval of 1 week between measurements.

**RESULTS**

Mean BL perfusion was 285±96 ml/100g/min with an intraindividual variability of 14.4% for repeated measurements. After secretin stimulation (P1) pancreas perfusion significantly (p<0.05) increased by 81% to 486±156 ml/100g/min. This effect showed an intraindividual variability of 63%.

**CONCLUSION**

Dynamic non-invasive ASL imaging of the pancreas permits to quantify pancreas perfusion in a clinically applicable setting with good reproducibility for BL measurements. After secretin stimulation healthy volunteers showed a significant increase of pancreas perfusion with reasonable reproducibility. Whether this effect can be clinically used for diagnostic purposes remains a goal for future studies.

**CLINICAL RELEVANCE/APPLICATION**

Perfusion measurements with ASL sequences renders a promising method to differentiate pancreatic disorders especially in elderly patients without the risk associated with the invasive alternatives.

**SSK07 Gastrointestinal (Liver Fibrosis and Chronic Liver Disease)**

**Scientific Papers**

*MR CT GI*

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Wed, Dec 3 10:30 AM - 12:00 PM   Location: E350

**Participants**

Moderator
Elmar M. Merkle MD : Advisor, Siemens AG Advisor, Bayer AG Speakers Bureau, Bayer AG Reserach Support, Bayer AG Reserach Support, Bracco Group Reserach Support, Guerbet SA

Moderator
Shahid Mahmood Hussain MD : Research support, Koninklijke Philips NV Research support, Bracco Group

Moderator
Daniele Marin MD : Nothing to Disclose

**Sub-Events**

**SSK07-01 Multiparametric Magnetic Resonance Imaging for Assessing Pathophysiologic Changes in Hepatic Fibrosis**

Jeong Hee Yoon MD (Presenter): Nothing to Disclose, Jeong Min Lee MD : Research Grant, Guerbet SA Equipment support, Siemens AG Research Grant, Bayer AG, Joon Koo Han MD : Nothing to Disclose, Byung Ihn Choi MD, PhD : Research Consultant, Samsung Electronics Co Ltd
**PURPOSE**

To explore changes of liver parenchyma by using dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) with dual-input, dual-compartment model and diffusion-weighted imaging with intravoxel incoherent motion (DWI-IVIM) in histologically diagnosed hepatic fibrosis (HF).

**METHOD AND MATERIALS**

This prospective study was approved by our institutional review board and informed consent was obtained from all patients. A total of 34 patients (M:F=17:17, mean age 45.6 years) who were diagnosed with HF were enrolled (F0 [n=15]; F1 [n=2]; F2 [n=9]; F3 [n=4]; and F4 [n=4]). All patients underwent DCE-MRI and DWI using ten b-values (0~1000sec/mm²) at 1.5T scanner before histological examination. Parameters of DCE-MRI (arterial flow, portal flow [ml/min/100g], MTT (sec), Kep [1/min/100]) and those of DWI (ADCtotal, Dt, D* [x10-3mm²/sec] and f [%]) were compared between no or early HF (F0-1) and significant HF (≥F2). The diagnostic performances for assessing advanced HF were evaluated for each parameter using multiple logistic regression and receiver operating characteristic analyses.

**RESULTS**

Compared to F0-1, advanced HF showed significantly lower ADCtotal (1.32±0.19 vs. 1.14±0.13, respectively, P<0.005), Dt (1.10±0.18, 0.98±0.14, respectively) and D* (82.2±20.1 vs. 44.3±23.2, respectively, P<0.001). However, f were not significantly different between two groups (P>0.05). Advanced HF showed lower portal flow (P<0.05) and prolonged MTT, compared to F0-1 (P<0.005), whereas arterial flow was significantly higher in advanced HF than F0-1 (P<0.05). Kep was significantly lower in advanced HF than F0-1 (419.6±66.7 vs. 552.0±226.8, P<0.05). To detect advanced HF, D* (AUC 0.88, Az value of ≤54.74 [x10-3mm²/sec]) and Kep (AUC 0.82, Az value of ≤503.97[1/min/100]) were the most significant parameters (P<0.001).

**CONCLUSION**

DCE-MRI using dual-input model and IVIM-DWI non-invasively detected perfusion and diffusion changes of advanced HF and identified portal and arterial flow contribution to the liver.

**CLINICAL RELEVANCE/APPLICATION**

HF causes diffusion and perfusion changes in the liver. Pathophysiologic changes of HF could be non-invasively monitored by using multiparametric MRI.

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**SSK07-02 T1 Mapping of Liver Parenchyma Compared to Relative Enhancement Measurement to Determine the Grade of Liver Cirrhosis at 3T**

Michael Haimerl (Presenter): Nothing to Disclose, Niklas Verloh: Nothing to Disclose, Claudia Fellner MD, PhD: Nothing to Disclose, Christian Roland Stroszcynski MD: Nothing to Disclose, Philipp Wiggermann: Nothing to Disclose

**PURPOSE**

The purpose of this study was to assess diagnostic accuracy of T1 mapping of liver parenchyma compared to relative enhancement (RE) measurement of gadolinium ethoxybenzyl diethylenetriamine pentaacetic acid (Gd-EOB-DTPA) enhanced MRI in differentiating grade of liver cirrhosis.

**METHOD AND MATERIALS**

235 patients (164 men, 71 women; mean age: 59.4 years) underwent MRI on a clinical whole body 3T system (Magnetom Skyra, Siemens Healthcare). Two TurboFLASH sequences (TI = 400ms; 1000ms) were acquired before and 20 minutes (hepatobiliary phase) after Gd-EOB-DTPA administration to obtain T1 maps. T1 maps were used to determine changes in T1 relaxation time between plain and enhanced images. RE was calculated based on changes in SI between plain and enhanced volume interpolated breath hold examination (VIBE) during hepatobiliary phase. T1 relaxation time changes and RE were correlated to the Child Pugh score.

**RESULTS**

Reduction of T1 relaxation times as well as RE of liver parenchyma are both significant in differentiation of patients with different Child Pugh Scores (RE, p≤0.024; T1, p≤0.001). Reduction of T1 relaxation times and RE showed both a constant significant decrease from Child-Pugh class A up to class C. However, evaluation of T1 relaxation time changes showed lower variants (RE, σ² ≤0.064; T1, σ² ≤0.013) between patient groups than RE.

**CONCLUSION**

Patients with advanced liver disease showed significantly lower changes in T1 mapping and RE. The use of T1 mapping to determine the grade of liver cirrhosis is superior to classification based on RE.

**CLINICAL RELEVANCE/APPLICATION**

T1 mapping and evaluation of RE by means of non-enhanced and Gd-EOB-DTPA-enhanced MRI may provide suitable and robust parameters for detecting and characterizing liver cirrhosis. Whereas RE uses relative values of signal intensity, T1 mapping is based on absolute values and is not dependent on variable factors of image processing.

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**SSK07-03 Cross-vendor Validation of Liver MR Elastography**

**PURPOSE**

To our knowledge, a direct comparison between MR Elastography (MRE) derived liver stiffness on the same subject performed back-to-back between two different vendor platforms has not been reported. The purpose of this study was to evaluate and validate reproducibility of MRE on two vendor platforms.

**METHOD AND MATERIALS**

8 healthy volunteers with no prior history of liver disease and 3 clinical patients with chronic liver disease were recruited for the study. MRE exams were performed twice on two different 1.5T MR scanners - once on a Philips MR scanner (Ingenia, Philips Healthcare) and immediately afterward on a GE MR scanner (HDx, GE Healthcare). All scan parameters were kept identical on the two platforms to the best extent possible. After the MRE method, magnitude and phase images were obtained, the data was converted into quantitative images displaying the stiffness of the liver parenchyma. Liver stiffness values between the two platforms were compared using interclass correlation with a p value < 0.05 considered statistically significant.

**RESULTS**

Mean liver stiffness values for the 8 volunteers ranged from 1.96 - 2.65 kPa on the GE platform, and from 1.90 - 2.46 kPa on the Philips platform. Mean liver stiffness values for the 3 clinical patients ranged from 2.1 - 4.04 kPa on the GE platform, and from 2.08-4.05 kPa on the Philips platform. Liver stiffness differences ranged from 0.04 - 0.23 (1.8% - 9.6%) for the volunteer subjects and from 0.01 - 0.36 (0.25% - 9.6%) for the clinical patients. Interclass correlation coefficient, r=0.98 with 95% confidence interval obtained as 0.8264-0.9974 implying high correlation. The p-value for this coefficient is 0.005, which is significant. Figure shows a set of magnitude images, wave images and stiffness maps in the same subject.

**CONCLUSION**

As MRE becomes more widespread in its usage, and as more vendor platforms become approved by the FDA, it is imperative that cross vendor validation studies be performed to ensure that liver stiffness values are consistent across different platforms. In this study, we have demonstrated that on two specific vendor platforms, there was no statistically significant difference in MRE derived liver stiffness on the same subject.

**CLINICAL RELEVANCE/APPLICATION**

MRE is a promising non-invasive quantitative imaging tool to determine liver stiffness in the assessment of patients with chronic liver disease, and in this study shows excellent consistency across two vendor platforms.

**Detection and Stratification of Liver Fibrosis Using Dual Energy CT (DECT)**

**METHOD AND MATERIALS**

In this retrospective, IRB approved and HIPPA compliant study, 18 patients underwent dual phase (arterial and delayed phase) DECT scans for either chronic liver disease evaluation or liver lesion characterization. All patients had histopathological confirmation. Ten patients with chronic liver disease comprised the case group; whereas the remaining eight subjects comprised the control group. The normalized Iodine concentrations in the liver (NIL, mg/ml) parenchyma between both groups were compared using t test for both phase acquisitions and for the concentration difference (NIL delayed-arterial) respectively. Additionally, the t-test was also used to compare NIL values between various fibrosis subgroups. The correlation between NIL values and histologic fibrosis scores was evaluated using Spearman’s test. The receiver operating curve (ROC) analysis was applied to evaluate the diagnostic accuracy of the mean NIL to stratify liver fibrosis.

**RESULTS**

NIL values from the delayed phase were higher in the fibrosis group over the control group (Fibrosis: 0.56 ± 0.04 vs. control: 0.35 ± 0.05 mg/ml, p<0.05). NIL values increased along with the Ishak scores, demonstrating a positive and strong correlation (r=0.772, p=0.0001). Mean NIL values from the control, moderate and severe fibrosis groups were statistically different (moderate: 0.55 ± 0.06 mg/ml, severe: 0.71 ± 0.13 mg/ml, p<0.05). NIL values increased along with the Ishak scores, demonstrating a positive and strong correlation (r=0.772, p=0.0001). Mean NIL values from the control, moderate and severe fibrosis groups were statistically different (moderate: 0.55 ± 0.06 mg/ml, severe: 0.71 ± 0.13 mg/ml, p<0.05). NIL values increased along with the Ishak scores, demonstrating a positive and strong correlation (r=0.772, p=0.0001). Mean NIL values from the control, moderate and severe fibrosis groups were statistically different (moderate: 0.55 ± 0.06 mg/ml, severe: 0.71 ± 0.13 mg/ml, p<0.05). NIL values increased along with the Ishak scores, demonstrating a positive and strong correlation (r=0.772, p=0.0001). Mean NIL values from the control, moderate and severe fibrosis groups were statistically different (moderate: 0.55 ± 0.06 mg/ml, severe: 0.71 ± 0.13 mg/ml, p<0.05).

**CONCLUSION**

DECT by quantification of NIL values during the delayed phase enables detection and stratification of liver fibrosis.

**CLINICAL RELEVANCE/APPLICATION**

DECT shows potential to perform liver fibrosis stratification in patients with chronic liver disease, enabling a more robust evaluation of liver disease.
Purposes

The gold standard for diagnosing hepatic fibrosis is percutaneous biopsy; an invasive procedure with limitations and complications including sampling error, morbidity and mortality. Developing noninvasive approaches to diagnose fibrosis using imaging is therefore clinically important. Non-contrast CT (NCCT) is an imaging modality with several advantages when compared to some other imaging options as it has no contraindications and thus can be performed on nearly any patient regardless of their renal function, allergies, or internal ferromagnetic materials. The purpose of this study was to evaluate the ability of a texture analysis program to grade hepatic fibrosis on NCCT.

Method and Materials

Following IRB approval, 59 patients with a random liver biopsy within 6 months of having a NCCT were included. Hepatic segmentation of 5 slices through the porta hepatis on each patient’s NCCT was performed, and an in-house developed MATLAB texture analysis program was used to extract 42 texture features. Ishak Fibrosis Scale (scores 0-6) was used to determine the biopsy specimens’ histopathologic fibrosis scores. A classification and regression tree (CART) analysis was performed to find texture features that most correlated with the hepatic fibrosis scores. Patients were separated into 2 groups: low level fibrosis 0-2 versus higher levels of fibrosis 3-6, and low-moderate levels 0-3 versus high levels of fibrosis 4-6.

Results

Included patients’ fibrosis scores ranged from 0-6. CART analysis found short run emphasis (SRE), long run high gray-level emphasis (LRHGE), mean CT number, and 9 neighborhood standard deviation (Std9) to be the main texture features used to distinguish patients with low fibrosis scores 0-2 from higher fibrosis scores 3-6 with a sensitivity of 100%, specificity of 97% and PPV of 96%. CART analysis found Std5, LRHGE and Law’s feature 5 (L5) to be the main texture features used to distinguish low-moderate fibrosis scores 0-3 from high fibrosis scores 4-6 with a sensitivity of 88%, specificity of 98%, and PPV of 93%.

Conclusion

This study shows that texture analysis of NCCT images can accurately distinguish low levels from higher levels of hepatic fibrosis.

Clinical Relevance/Application

Texture analysis of NCCT images is a potential alternative to liver biopsy for evaluating hepatic fibrosis because it is noninvasive, has no contraindications, and can accurately distinguish low levels from higher levels of hepatic fibrosis.
PURPOSE

To determine the feasibility of multiphasic dynamic CT including multiple arterial phases for evaluation of liver tissue perfusion characteristics using the dual maximum slope model in patients with chronic liver disease compared with perfusion CT (PCT) as the standard of reference.

METHOD AND MATERIALS

PCT was performed in 23 patients with chronic liver diseases using Xenetix 370. Ten of these 23 patients were classified as the validation group in order to verify the method of obtaining the perfusion parameters using multiphasic dynamic CT, and the remaining 13 patients were classified as the evaluation group. Five-phase, dynamic CT including unenhanced, triple-arterial phases including information regarding the peak aortic and splenic enhancement and the portal phase, were selected in order to obtain perfusion parameters of liver parenchyma using the dual maximum slope method. Those selected CT datasets and the whole PCT data sets were analyzed using the dedicated perfusion software (VPCT body; Siemens Healthcare) for estimating the perfusion parameters. Comparison between the perfusion parameters calculated from the multiphasic dynamic CT datasets and those of PCT was made using the intraclass correlation coefficient.

RESULTS

All of the perfusion parameters of patient liver parenchyma obtained by five-phase images in the 23 patients, did not differ significantly compared with those of PCT. They showed very high agreement with PCT (ICCs > 0.80, P-value < 0.01) in both the validation and the evaluation groups.

CONCLUSION

It was feasible to obtain perfusion parameters of the liver using multiphasic dynamic CT scans, and the perfusion parameters using the dynamic CT scans and the dual maximal slope model were comparable to those of perfusion CT.

CLINICAL RELEVANCE/APPLICATION

Dynamic CT scans including multiple arterial phase imaging using the dual maximal slope model is able to provide not only morphologic information but also perfusion parameters of the liver which were comparable to those of perfusion CT. Therefore, it can be feasible to use this approach using dynamic CT and the dual maximum slope model for evaluation of liver fibrosis, liver cirrhosis and portal hypertension.

Evaluation of Liver Fibrosis in Liver Transplant by Shear Wave Elastography - A Pilot Study


PURPOSE

Shear Wave Elastography (SWE) has emerged as a non-invasive technique to grade early fibrosis in patients with chronic viral hepatitis and non-alcoholic liver diseases. Recent studies showed good correlation between grading of fibrosis by SWE and histopathology in chronic liver disease. Liver transplant patients have not been studied. The purpose of our study was to evaluate the feasibility of SWE as a screening test in diagnosing clinically significant fibrosis (F2-F4) in patients with liver transplant.

METHOD AND MATERIALS

This study was HIPAA compliant and IRB approved. Shear wave ultrasound was performed in 25 recipients of whole liver transplant (age range 42-67 years; M/F 17/8) on the day of liver biopsy. 12 measurements were obtained from the same segment of the right lobe from which biopsy was planned. Highest and lowest measurements were discarded for calculation of the average liver stiffness. The average liver stiffness was expressed in m/sec. Metavir scoring system was used to grade the fibrosis. The stage of fibrosis derived from the velocity measurements were compared with the histopathological staging of fibrosis.

RESULTS

Eight of 25 biopsies had F2 fibrosis by histopathology (7 were classified as F2 fibrosis and 1 case was classified as F0-F1 by SWE). 1 case of F4 fibrosis by histopathology was classified as F3 by SWE. The remaining 16 cases showed no significant fibrosis (F0, F1) by histopathology (14 cases were classified as without significant fibrosis and 2 were classified as F2 by SWE). The sensitivity for identifying clinically significant fibrosis was 88.9% with NPV of 93.3%. The specificity was 87.5% and PPV was 80%.

CONCLUSION

Results from this pilot study shows that SWE can be used to diagnose early stage fibrosis and replace liver biopsy.

CLINICAL RELEVANCE/APPLICATION

SWE can be used as non-invasive technique to assess early fibrosis in transplant patients, thereby reducing the morbidity associated with routine protocol biopsy.
Comparison of Partial and Whole Adult Liver Transplants: A Need for New Interpretive Guidelines?

Helena Gabriel MD: Nothing to Disclose, Michael Luo (Presenter): Nothing to Disclose, Alexander James Kieger MD: Nothing to Disclose, Robert McCarthy MD: Nothing to Disclose, David Donald Casalino MD: Nothing to Disclose, Nancy A. Hammond MD: Nothing to Disclose, Paul Nikolaidis MD: Nothing to Disclose, Jeanne Miriam Horowitz MD: Nothing to Disclose, Juan Caicedo: Nothing to Disclose

PURPOSE

To compare and contrast complications and sonographic findings between partial and whole liver transplants to determine if previously held interpretation guidelines should be altered for partial transplants.

METHOD AND MATERIALS

In this retrospective, IRB-approved study, we evaluated partial liver transplants and chose a MELD score-matched cohort of whole liver transplants to compare. Each patient had a baseline ultrasound at 24 hours and most had additional exams at 1, 2, and 4 weeks, as well as preceding a complication. Numerous sonographic parameters were noted and statistically compared between the two groups.

RESULTS

104 partial transplants were compared to 104 whole transplants resulting in a review of 577 ultrasound exams. Partial liver transplants experienced a significantly higher overall number of complications than whole (66 vs. 44, p<0.02) with biliary complications predominating (39% vs. 23%, p<0.05). Vascular complication rates were similar between the two groups. Of ultrasound parameters, partial transplants demonstrated significantly increased portal vein velocities throughout the portal venous system (avg 91 cm/s vs 65 cm/s, p<0.05) and significantly lower hepatic arterial RIs at the anastomosis and distally (.66 vs .77, p<0.05). Partial transplants were slightly more likely to have monophasic hepatic venous flow than whole. When following these patients over time, these differences in parameters normalized at the one month period. Of patients with biliary complications, vascular RI differences on the US preceding detection of the complication approached significance.

CONCLUSION

Partial liver transplants experience higher rates of overall complications dominated by biliary complications. Also, differences in sonographic parameters occur in partial liver transplants relative to whole early on but tend to normalize on follow up at one month. These differences can be erroneously misinterpreted as representing vascular emergencies necessitating further work up. An awareness these these sonographic parameter variations in partial liver transplants may be in the realm of normal may avoid unnecessary procedures.

CLINICAL RELEVANCE/APPLICATION

An awareness that sonographic parameter variations can occur early on with partial liver transplants but tend to normalize at one month may suggest follow up rather than more aggressive procedures in these patients.
METHOD AND MATERIALS

A sample of 58 years olds in the general population living in Turin, Italy were randomly allocated (1:1) to be invited by mail for primary screening with FS or CTC. Those with a history of CRC, adenomas, inflammatory bowel disease, recent colonoscopy, or two first-degree relatives with CRC were ineligible. Non-responders to invitation for FS screening were re-invited to attend for screening with CTC or immunological Fecal Occult Blood Test (FOBT). The primary outcome was screening participation rate, defined as numbers of invitees undergoing to the screening relative to the total number of invitees. Participation rates were also compared in a multivariate model to assess the effect of covariates (sex, screening arm). Data on reasons for non-participation were collected.

RESULTS

Of the 1984 eligible subjects included in the study, 995 and 989 were randomly assigned to CTC and FS arm, respectively. After excluding 27 people who could not be traced (1.4% across intervention groups), the participation rate following the first invitation and mail reminder was 27.1% (265/977) for FS and 30.5% (299/980) for CTC (P=0.09). Participation in screening with CTC was significantly better than with FS (34%, 95% CI: 30-39% vs. 26%, 95% CI: 22-31; OR, 1.6; 95% CI: 1.1-2.3; P=0.01) among men, while no difference between CTC and FS screening was observed among women (27%, 95% CI: 23-31% vs. 28%; 95% CI: 24-32; OR, 0.91; 95% CI: 0.7-1.2; P=0.53). Invitation for FS non-responders to undergo screening with CTC or FOBT increased participation (80-100 days after invitation) by 5% (18 of 330 invitees) and 4.8% (16 of 330 invitees), respectively.

CONCLUSION

A numerical trend of increased participation in CTC vs. FS screening was seen. Moreover, men were significantly more likely than women to adhere to screening with CTC than with FS.

CLINICAL RELEVANCE/APPLICATION

Our study showed a higher participation of men in CTC screening (vs. FS screening). Additional effort may be needed to improve participation of women in CRC screening regardless of screening strategy.

METHOD AND MATERIALS

A web-based Survey on CT Colonography

Nicola Flor (Presenter): Nothing to Disclose, Mauro Peri: Nothing to Disclose, Andrea Laghi MD: Speaker, Bracco Group Speaker, Bayer AG Speaker, General Electric Company Speaker, Koninklijke Philips NV, Francesco Sardanelli MD: Speakers Bureau, Bracco Group Research Grant, Bracco Group Speakers Bureau, Bayer AG Research Grant, Bayer AG Research Grant, IMS International Medical Scientific, Gianpaolo Cornalba MD: Nothing to Disclose

PURPOSE

To verify the knowledge and the interest on CT Colonography of the General Practitioners of a big city.

METHOD AND MATERIALS

On February 2014 a web-based Survey on CT Colonography was administered to all the 1,050 General Practitioners of our town. The initial survey was written and reviewed by the co-investigators and consisted of the 10 following multiple choice questions. 1. CTC is a CT of the abdomen aimed at the study of the colon, properly distended with air or carbon dioxide insufflated through a rectal catheter. Information already known? 2. CTC is a low radiation dose examination, comparable to that absorbed from the environment in a year. Information already known? 3. The most recent data indicate that the accuracy of CTC in the diagnosis of polyps and carcinomas is similar to that of the traditional OC. Information already known? 4. The most recent data indicate that the accuracy of CTC in the diagnosis of polyps and carcinomas is higher than that of the traditional DCBE. Information already known? 5. Do you think that CTC may represent an effective technique for CRC screening? 6. In a patient with incomplete OC or who refuse OC, which of the following options would you choose? Video capsule or CTC or DCBE? 7. In a patient with FOBT positive, with OC is incomplete or refuse OC, which of the following options would you choose? Video capsule or CTC or DCBE? 8. In the case of a patient diagnosed with CTC a polyp 10 mm, what would be your advice? 9. On behalf of your patients are required prescription of virtual colonoscopy? 10. Are you interested in attending a formative event on this topic?

RESULTS

Finally 231/1050 (22%) completed the Survey. 95% of responders are interested in attending a formative event on CTC. Only 57% of responders is aware that CTC is a low dose technique. Only 48% is aware that CTC and OC accuracies in diagnosing colonic polyps and CRC are almost the same, and 30% of responders don’t know that CTC accuracy is highly superior versus double contrast barium enema accuracy. 93% of responders advises immediate OC in patients diagnosed with a 10 mm polyp.

CONCLUSION

About 95% of our Physicians demonstrated interest in CT colonography asking for a one-day event on this topic. Some important CTC aspects are not well known yet.

CLINICAL RELEVANCE/APPLICATION

This survey has highlighted the need for education of General Practitioners on the latest capabilities and limitations of CTC.
Officer, QPID Health Inc Stockholder, QPID Health Inc

**PURPOSE**

The purpose of this study was to evaluate a novel dual-energy electronic cleansing (DE-EC) method: virtual-colon-tagging EC (VCT-EC), in cleansing fecal-tagging CT colonography (CTC). We assessed the performance of polyp detection and the conspicuity of polyps after the application of VCT-EC.

**METHOD AND MATERIALS**

Twenty-one patients underwent a bowel preparation with a low-fiber, low-residue diet, and oral administration of iodine contrast agents. Dual-energy CT scanning (SOMATOM Definition Flash) was performed at two photon voltages of 140 kVp and 80 kVp with the automatic dose exposure control module (CARE Dose 4D) in both supine and prone positions. Resulting DE-CTC data were subjected to VCT-EC scheme. Each subject had video-assisted optical colonoscopy as reference standard. The performance of polyp detection in VCT-EC was assessed by two experienced radiologists, who were blind to the pathology reports and the original fecal-tagging CTC images. They read the 21 cleansed DE-CTC cases by the proposed VCT-EC scheme to find the polyps by recording the size and location of each finding, as well as the confidence score regarding whether each finding is a polyp ≥6 mm (range: 1 [definitely no polyp] - 10 [definitely a polyp]); a score of ≥5 indicates a polyp finding).

**RESULTS**

The per-patient analysis revealed that VEC-EC yielded an average sensitivity of 90.6%, 93.3% and 95.0% for polyps ≥6mm, ≥8mm, and ≥10mm respectively. The per-polyp analysis indicated that for 6 missed polyps ≥8mm (false-negative) (5 from reader 1 and 1 from reader 2), only 1 of them was submerged in tagged materials at prone position and thus was a cleansed polyp by VCT-EC. Five (5) of 6 false-negative findings were sessile-flat morphology. The t-test of confidence scores between “Cleansed Polyps” and “Air-Exposed” non-submerged polyps showed no statistically significant difference for all 33 polyps (p=0.73) and 13 polyps submerged in one position and air-exposed in another position (p=0.60).

**CONCLUSION**

Our VCT-EC scheme provides an effective solution for the artifacts-free visualization of fecal-tagging CTC images.

**CLINICAL RELEVANCE/APPLICATION**

New dual-energy EC method can substantially reduce EC artifacts and it may lead to artifact-free visualization of the colon.

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Simethicone Used to Prevent Colonic Bubbles on CT Colonography Performed with Iohexol for Fecal/fluid Tagging: A Randomized Controlled Trial

Gil-Sun Hong MD (Presenter): Nothing to Disclose, Seong Ho Park MD : Research Grant, DONGKOOK Pharmaceutical Co, Ltd Research Grant, General Electric Company , Bohyun Kim MD : Nothing to Disclose, Ju Hee Lee MD : Nothing to Disclose, Jin Cheon Kim : Nothing to Disclose, Chang Sik Yu : Nothing to Disclose

**PURPOSE**

To determine if the colonic bubbles observed on CT colonography (CTC) performed with cathartic preparation and oral iohexol for fecal/fluid tagging, could be prevented by simethicone.

**METHOD AND MATERIALS**

IRB approval was obtained. This prospective, randomized, controlled trial compared 80 adults suspected of having colonic neoplasia who had been randomly assigned in a 1:1 ratio to the control (M:F, 23:17; 63 years±11.6) and intervention (M:F, 22:18; 60 years±11.8) groups. Patients underwent CTC after cleansing with 4 L of polyethylene glycol, tagging with 50 mL of 350 mgI/mL oral iohexol, and without (control) or with (intervention) oral administration of 200 mg of simethicone. Thirty-eight control and 37 intervention patients subsequently underwent colonoscopy and/or surgery which served as the reference standards for the CTC accuracy. The primary endpoint was a per-patient score intended to measure the amount of colonic bubbles, ranging 0 (no bubbles) to 5 (the largest amount). The secondary endpoints included the per-lesion sensitivity, accounted for clustered data and lesion diameter, and per-patient specificity of CTC for adenomas and carcinomas 6 mm or greater.

**RESULTS**

Randomization was effective and the patient and lesion characteristics were comparable between the two groups except for the presence of six flat colonic lesions only in the control group. The per-patient score of the amount of colonic bubbles was significantly smaller in the intervention, i.e. with simethicone, group than in the control group: mean score±SD of 0.0±0.1 versus 1.2±0.8, respectively (P<.001). The CTC sensitivity and specificity did not differ significantly between the control and the intervention groups (78% [126/162] or 88% [126/144] when flat lesions were excluded versus 91% [131/144], P=.247 or .325; and 96% [26/27] versus 89% [24/27], P=.795, respectively).

**CONCLUSION**

Colonic bubbles noted on CTC after cathartic preparation and fecal/fluid tagging using iohexol, can be successfully prevented by adding simethicone to the preparation.
**CLINICAL RELEVANCE/APPLICATION**

CTC can be performed successfully and more conveniently for patients using iohexol for fecal/fluid tagging and by adding simethicone (which is a highly economical, safety-proven, easy-to-take, anti-foaming medicine) to the preparation in order to prevent colonic bubbles associated with iohexol.

**Intra-individual Comparison of Magnesium Citrate and Sodium Phosphate for Bowel Preparation at CT Colonography: Automated Volumetric Analysis of Residual Fluid for Quality Assessment**

**PURPOSE**

To perform an objective, intra-individual comparison of residual colonic fluid volume and attenuation associated with magnesium citrate versus sodium phosphate catharsis at CT colonography (CTC).

**METHOD AND MATERIALS**

This retrospective HIPAA-compliant study had institutional review board approval; informed consent was waived. The study cohort included 250 asymptomatic adults (mean age at index, 56.1 years; 124M/126F) who underwent CTC screening twice over a 5-year interval. Colon catharsis at initial and follow-up screening employed single-dose sodium phosphate (NaP) and double-dose magnesium citrate (MgC), respectively, allowing for intra-patient comparison. Automated volumetric analysis of residual colonic fluid volume and attenuation was performed on all 500 CTC studies. Colon fluid volume < 200 ml and mean attenuation between 300-900 HU were considered optimal. Paired t-test and McNemar’s test were used to compare differences.

**RESULTS**

Residual fluid volumes < 200 ml were recorded in 192 examinations (76.8%) following MgC and in 204 examinations (81.6%) following NaP (p=0.23). The mean total residual fluid volume was 155±114 ml for MgC and 143±100 ml for NaP (p=0.01). The attenuation range of 300-900 HU was significantly more frequent for MgC (n=220, 88.0%) than for NaP (n=127, 50.8%) (p < 0.001). Mean fluid attenuation was significantly lower for MgC (700±165 HU) than for NaP (878±155 HU) (p < 0.001). Concomitant presence of both optimal fluid volume and attenuation was significantly more frequent for MgC 65.2% than for NaP (38.0%) (p < 0.001).

**CONCLUSION**

Objective intra-individual automated comparison of residual fluid volume and attenuation shows that magnesium citrate catharsis improves overall CTC examination quality over sodium phosphate.

**Effect of Computer-aided Detection on Reader Performance in Laxative-free CT Colonography: Observer Performance Study**

**PURPOSE**

Computer-aided detection (CADe) could be useful for effective laxative-free CT colonography (lFCTC) examination; however, its effect on reader performance has not been evaluated on asymptomatic patients. Our purpose was to evaluate the effect of a CADe scheme optimized for lFCTC on human readers’ detection performance for adenomas and carcinomas in a screening population.

**METHOD AND MATERIALS**

A total of 300 cases were randomly sampled from a multi-center lFCTC trial for asymptomatic patients, in which 605 participants had lFCTC examination at 4 medical centers with dietary fecal tagging by non-ionic iodine. The precise spatial locations of lesions confirmed by segmentally unblinded colonoscopy were identified prospectively and retrospectively on the lFCTC images. A fully automated CADe scheme, which had been trained to detect polyps using an independent set of 204 CTC cases with 263 lesions, reviewed the 605 lFCTC cases for significant lesions. The 300 sampled lFCTC cases were subjected to electronic cleansing and used for the observer study, in which the case reading order was designed to distribute the positive cases evenly between quartiles. An expert reader (≥600 cases reading experience) reviewed these cases and recorded all detected lesions ≥6 mm using primary 3D interpretation without and with optimized CADe assistance. Per-patient sensitivities and the areas under the receiver operating curve (AUC) in the detection of adenomas and carcinomas were compared between the two reading modes.

**RESULTS**

There were 24, 18, and 11 patients with adenomas or carcinomas ≥6 mm, ≥8 mm, and ≥10 mm, respectively. In these size ranges, per-patient sensitivities for unassisted readings were 38%, 44%, and 64%, respectively, whereas those of CADe-assisted readings were 63% (P < 0.05), 72% (P < 0.05), and 91%, respectively. The corresponding AUCs for unassisted readings were 0.63, 0.70, and 0.80, respectively, whereas those of CADe-assisted readings were 0.76 (P < 0.01), 0.84 (P < 0.01), and 0.90 (P < 0.05), respectively.
CONCLUSION

The use of CADe optimized for lfCTC substantially increased the performance of human readers in the detection of adenomas and carcinomas in a screening population.

CLINICAL RELEVANCE/APPLICATION

The use of CADe can substantially increase the performance of human readers in the detection of adenomas and carcinomas on asymptomatic patients, thus the use of CADe is recommended for colon cancer screening with lfCTC.

Virtual Colonoscopy under 2 mSv with Iterative Reconstruction, Are We Ready?

Riccardo Ferrari MD (Presenter): Nothing to Disclose, Marco Rengo MD: Nothing to Disclose, Luca Bertana MD: Nothing to Disclose, Davide Bellini MD: Nothing to Disclose, Tommaso Biondi: Nothing to Disclose, Andrea Laghi MD: Speaker, Bracco Group Speaker, Bayer AG Speaker, General Electric Company Speaker, Koninklijke Philips NV

PURPOSE

The aim of our study was to compare the use of very low dose protocol in virtual colonoscopy (VC) with the use of iterative reconstruction protocols, with normal dose protocol.

METHOD AND MATERIALS

55 patients underwent VC after incomplete colonoscopy. We performed two randomized different protocols in prone and supine scan: a very low radiation dose protocol (100 Kv, 50 mA, 0.5 s rotation time) with ASIR recon 50%; normal protocol without ASIR recon (120 Kv, 100 mA, 0.5 s rotation time). Preparation of patients was performed using a same day fluid tagging by mean of 60 ml of gastrografin administered 3 h before the exam. Two different expert radiologists read one series per time at one month apart. Diagnostic accuracy was compared with weighted-K test. Cad software as a second reader was used, we evaluated false positive numbers in both scans.

RESULTS

Diagnostic accuracy of the same reader was comparable between prone and supine scan (k=0.98); inter-readers agreement was comparable (k=0.91). 15 polyps, 3 cancer, 7 diverticulosis disease were found. 17 extracolonic findings were found. Mean mSv of low dose (LD) scans was 0.7; normal dose (ND) scans was 2.2 mSv. Mean false positive with CAD were comparable (5.6 LD; 5: ND scans).

CONCLUSION

The correct selection of low dose protocol with iterative reconstruction can decrease the patient radiation exposition with a comparable diagnostic performance. The necessity of limited spatial resolution (polyp>6 mm) and the high difference in attenuation value between fluid marked residual, air and colon mucosa could justify the use of a very low dose protocol. Limited evaluation of abdominal organs' parenchyma, especially the liver, has to be taken into consideration, while other extracolonic findings (i.e. aortic aneurysm, rena stones) can be well evaluated.

CLINICAL RELEVANCE/APPLICATION

To compare the performances of reading normal virtual colonoscopy protocols comparing them with a very low dose protocols with iterative reconstruction.
Hepatocellular Carcinoma (HCC) Invading Portal Venous System in Cirrhosis: 7 Years Results of Percutaneous Radiofrequency Ablation of HCC and Main Portal Vein Tumor Thrombus (MPVTT)

Antonio Giorgio (Presenter): Nothing to Disclose, Giorgio Calisti: Nothing to Disclose, Carmine Coppola: Nothing to Disclose, Ferdinando Scarano: Nothing to Disclose, Umberto Scognamiglio: Nothing to Disclose, Luca Montesarchio: Nothing to Disclose, Piero Gatti: Nothing to Disclose, Paolo Matteucci: Nothing to Disclose, Valentina Giorgio: Nothing to Disclose

PURPOSE

To report 7 years results on radiofrequency ablation (RFA) of single hepatocellular carcinoma (HCC) and the accompanying main portal vein tumor thrombus (MPVTT) in patients with compensated liver cirrhosis.

METHOD AND MATERIALS

From January 2005 to January 2012, among 3144 consecutive cirrhosis patients, 772 had HCC and MPVTT; of these, 70 had a single HCC with MPVTT. 48 patients (38 men; mean age 69 years) with 48 HCC nodules -3.7-5 cm in diameter- invading main portal trunk (MPT) underwent RFA. 22 matched patients (18 men; mean age 69 years) with 22 HCC nodules -3.6-4.8 cm in diameter- extending into the MPT, refused RFA and composed the control group. Efficacy of RFA was defined complete when both complete necrosis of HCC and complete re-canalization of the MPT and its branches were achieved.

RESULTS

1, 3, 5 and 7-year cumulative survival rates of treated patients were 62, 29, 18 and 5%, respectively. The 12-months cumulative survival rate of un-treated patients was 0%. The difference was statistically significant (p < 0.001; hazard ratio 2.88; 95% CI 1.57- 5.39). The disease-free survival rates in treated group were 52, 38, 35 and 23% at 1, 3, 5 and 7 year, respectively. No death occurred.

CONCLUSION

RFA of HCC and the accompanying MPVTT significantly prolongs long-term survival compared with no treatment. The procedure is safe and should be considered as a new and effective tool in the treatment of advanced HCC.

CLINICAL RELEVANCE/APPLICATION

RFA of HCC and the accompanying MPVTT in patients with compensated liver cirrhosis significantly prolongs long-term survival compared with no treatment.

Radiofrequency Ablation versus Non-anatomical Resection: Propensity Score Analyses of Long-term Outcome in 580 patients

Tae Wook Kang: Nothing to Disclose, Hyunchul Rhim MD, PhD: Nothing to Disclose, Seong-Yoon Ryu MD (Presenter): Nothing to Disclose, Min Woo Lee: Nothing to Disclose, Hyo Keun Lim MD: Nothing to Disclose, Young-Sun Kim: Nothing to Disclose

PURPOSE

To compare the long-term therapeutic outcomes of radiofrequency ablation (RFA) with non-anatomical resection (NAR) in patients with a small hepatocellular carcinoma (HCC) ≤ 3cm as a first-line treatment.

METHOD AND MATERIALS

The data of 580 patients with a small HCC (≤ 3cm) underwent ultrasonography-guided percutaneous RFA (n=438) or NAR (n=142) as a first-line treatment, were reviewed. For comparison of therapeutic efficacy between RFA and NAR groups, local tumor progression (LTP), intrahepatic distant recurrence (IDR), disease-free survival (DFS) and overall survival (OS) rates were analyzed using a 1-to-1 propensity score match. In addition, major complications and post-operative hospital stay were compared.

RESULTS

Before propensity score matching (n=580), 5-year cumulative LTP (20.9% vs. 12.7%, p = 0.093) and OS rates (85.5% vs. 90.9%, p = 0.194) were comparable between two groups while 5-year cumulative IDR (62.7% vs. 36.6%, p < 0.001) and DFS rates (31.7% vs. 61.1%, p < 0.001) in NAR group were significantly better than that in RFA group. After the matching (n=198), there were no significant differences in terms of all therapeutic outcomes including 5-year cumulative IDR (47.0% vs. 40.2%, p = 0.240) and DFS rates (48.9% vs. 54.4%, p = 0.201) in both groups. RFA was superior to NAR in terms of major complication rate (5.6% vs. 2.1%, p = 0.016) and post-operative hospital stay (p < 0.001).

CONCLUSION

In patient with a small HCC (≤3cm) as a first-line treatment, there was no significant difference in LTP, IDR, DFSs and OS between RFA and NAR. However, RFA yielded less invasiveness than NAR.

CLINICAL RELEVANCE/APPLICATION

There was no significant difference between RFA and NAR in terms of long-term therapeutic outcomes including Local Tumor Progression, Intrahepatic Distant Recurrence, Disease Free Survival, and Overall Survival in patients with a small HCC ≤3cm (BCLC very early/early-stage HCC) as a first-line treatment.
Microwave Thermoablation of Hepatic Tumors Using a Semi-automatic Robotic Guidance Approach

Jijo Paul MSc, PhD (Presenter): Nothing to Disclose, Emmanuel Chukwudum Mbalisike MD: Nothing to Disclose, Martin Beeres MD: Nothing to Disclose, Katrin Eichler MD: Nothing to Disclose, Thomas Josef Vogl MD, PhD: Nothing to Disclose, Stefan Zangos MD: Nothing to Disclose

PURPOSE

To evaluate robotic guidance and manual approaches during microwave thermal ablation based on real-time planning, intra-procedural guidance, procedural accuracy as well as patient dose.

METHOD AND MATERIALS

The study was prospectively performed between June 2013 and February 2014 using 70 patients. 40 patients were treated with manual approach and the remaining 30 were treated with a semi-automatic robotic guided approach. Parameters evaluated were accuracy (number of readjustment, applicator active point deviation, applicator active point final position after readjustment), total procedural time (planning time, insertion time, ablation time), quantitative/qualitative image quality and patient dose. Wilcoxon’s matched paired test and two sided student’s t-test were used to test the significance of the data and p-values < 0.05 was considered to be of statistical significance.

RESULTS

Accuracy parameters was significantly higher in group 2 (all p<0.05) than group 1. Total procedural time showed mean time difference of 3 mins (group 2> group 1). Volume CT dose-index, and dose-length-product were significantly lower for group 2 compared to group 1 (all p<0.05) for CT fluoroscopy imaging. Total procedural performance score was higher for group 2 compared to group 1 (p=0.0001). Image quality parameters were insignificant between examined groups.

CONCLUSION

Using the semi-automatic robotic guided approach improved accuracy of targeting the target tumor, reduce patient dose and increase procedural performance (which influences the procedural safety) is achieved during ablation.

CLINICAL RELEVANCE/APPLICATION

The robotic guided approach improved accuracy of targeting the target tumor

Radiofrequency Ablation for the Treatment of Hepatocellular Carcinoma in Patients with Transjugular Intrahepatic Portosystemic Shunts

Shota Yamamoto MD (Presenter): Nothing to Disclose, Jonathan Keon Park MD: Nothing to Disclose, Quazi Al-Tariq MD: Nothing to Disclose, Taryar Min Zaw MD: Nothing to Disclose, Steven Satish Raman MD: Consultant, Bayer AG Consultant, Covidien AG, David Shin-Kuo Lu MD: Consultant, Covidien AG Speaker, Covidien AG Consultant, Johnson & Johnson Consultant, Bayer AG Research Grant, Bayer AG Speaker, Bayer AG

PURPOSE

To assess radiofrequency (RF) ablation efficacy, as well as the patency of transjugular intrahepatic portosystemic shunts (TIPS), in patients undergoing RF ablation for hepatocellular carcinoma (HCC)

METHOD AND MATERIALS

Retrospective database review of patients with pre-existing TIPS undergoing RF ablation for HCC was conducted over a 147-month period. TIPS patency before and after RF ablation was assessed by US, angiography and/or contrast-enhanced CT or MRI. CT and/or MRI were performed within 1 day of RF ablation. Assessment of ablation efficacy was performed according to an updated image-guided tumor ablation consensus statement.

RESULTS

19 patients with 21 lesions undergoing 25 RF ablation sessions were included. Child-Pugh class A, B, and C scores were seen in 1, 13, and 5 patients. 11 patients ultimately underwent liver transplantation. All lesions (100%) demonstrated imaging evidence of HCC. All ablation sessions showed immediate technical success without residual tumor enhancement (100%). No patients (0%) suffered liver failure within 1 month of ablation. For 21 total ablated lesions, primary technical efficacy rate was 15/21 (71.4%). Local progression was seen in the 6 other lesions (28.6%); however, only 3/21 (14.6%) lesions demonstrated local progression without successful retreatment and/or transplant. Furthermore, only 2/6 of lesions demonstrating local progression (33%) were located within 1 cm of TIPS stent-graft. 1, 2, and 3-year survival for patients not undergoing transplantation (8/19, 42%) was 100%, 80%, and 67%. Pre-ablation TIPS patency was demonstrated in 22/25 sessions (88%). In 7 cases, lesions ablated were within 1 cm of the TIPS. Of 22 cases with patent TIPS prior to ablation, post-ablation patency was demonstrated in 22/22 (100%) on immediate post-ablation imaging and in 21/22 (95%) at last follow-up. No immediate complications following RF ablation were observed.

CONCLUSION

Ablation efficacy did not differ significantly from cited literature values for patients without TIPS. Furthermore, TIPS patency was preserved in the majority of cases. Patients with both portal hypertension and HCC are not uncommonly encountered, and a pre-existing TIPS does not appear to be a definite contraindication for RF ablation.
RF ablation for HCC in patients with TIPS can be performed with similar efficacy to standard patients while preserving TIPS patency.

Microwave versus Radiofrequency Ablation for the Treatment of HCC: A Comparison of Efficacy and Safety at a Single Center


PURPOSE

To compare the safety and efficacy of radiofrequency (RF) ablation to high-powered gas-cooled microwave (MW) ablation for the treatment of hepatocellular carcinoma (HCC) at a single center.

METHOD AND MATERIALS

This IRB-approved retrospective review included 68 tumors in 53 patients treated by RF (12/2001-11/2011) and 135 tumors in 90 patients treated by MW (12/2010-3/2014). Treatments occurred at a single institution and were performed by the same group of operators. Patient demographics, tumor size, rate of local tumor progression (LTP), and procedure-related complications were compared between groups. Complications were recorded according to the Clavien-Dindo classification. Comparisons of proportions between groups were done using a Fischer's Exact Test with p<0.05 considered statistically significant.

RESULTS

There was no significant difference in patient demographics or size of treated tumors. Mean tumor size was 2.2 cm in the RF group (0.6-4.5) and 2.1 cm in the MW group (0.5-4.2). The majority of treated tumors in both groups were < 3 cm (76.5% in RF group and 86.7% of MW group). Median follow up period was longer for the RF patients (31 months versus 13 months for the MW group). The overall rate of local tumor progression was statistically significantly higher for RF than for MW (17.6% versus 5.9%, p=0.012). The rate of LTP for tumors < 3 cm was greater for RF than MW (13.5 vs. 6% respectively) but this difference was not statistically significant (p=0.13). The rate of LTP for tumors ≥ 3 cm was also greater for RF than MW (31.3 vs. 5.6% respectively), but the difference was not statistically significant due to the small sample size (p=0.08). There were few serious (≥ grade III) complications in either group (2 RF - symptomatic small hemothorax requiring thoracentesis, intraperitoneal bleed requiring exploratory laparotomy; 1 MW - intra-procedural pneumothorax treated with pleural blood patch) (p=0.28).

CONCLUSION

MW ablation of HCC offers a safe alternative to RF ablation with improved local tumor control at short term follow up.

Microwave ablation has theoretical heating profile advantages over RF ablation and this study demonstrates this may lead to improved local tumor control with treatment of hepatocellular carcinoma.

PURPOSE

Cryoablation may be used as a means of local tumor control in the liver. Little data is available on hepatic cryoablation. The purpose of our study was to evaluate the safety and outcomes of cryoablation for both primary and metastatic liver tumors in a high volume tertiary care center.

METHOD AND MATERIALS

Retrospective review of all hepatic cryoablation procedures from 10/2006-7/2013. Laboratory data, follow-up imaging, and clinical information were used to determine complications (SIR standards) and outcomes (RECIST). Percutaneous CT guided hepatic cryoablation was performed (1-8 probes based on tumor size and location). Two freeze cycles were performed in 62 of 66 procedures, remainder used three cycles. All patients were admitted overnight for monitoring.

RESULTS

54 patients underwent 66 ablations (4 cholangiocarcinoma, 1 sarcoma, 1 hemangioendothelioma (HEH), 14 HCC, 32 metastases). Average (range) tumor size was 2.3(0.5-4.5) cm. Follow up ranged (average) 0-45 (17) months. Local tumor progression was seen in 29 patients, the remainder had complete response. The average (median) time to local progression was 207 (148) days. Two patients were lost to follow up. The OS and DFS were not significantly different based on tumor type. 21 complications: 6 major (2 subcapsular hematoma requiring transfusion, 2 pseudoaneurysm requiring embolization, subcutaneous necrosis requiring surgical
debridement, hypotension and bradycardia requiring atropine) and 15 minor were identified. Higher number of probes and increased probe:tumor size ratio were associated with cases of bleeding, however, the trend did not reach statistical significance (p 0.61 and p 0.78).

CONCLUSION
Hepatic cryoablation can be achieve local tumor control and durable complete response in up to 43% of patients. Complications were seen in approximately 30% of cases with major complications in 9%. Further research is needed to determine the comparative efficacy and ideal role of hepatic cryoablation in the setting of different tumor types.

CLINICAL RELEVANCE/APPLICATION
Our study evaluates the safety and efficacy experience of hepatic cryoablation for liver tumors in a tertiary care center.

Liver Cryoablation: Safe Outcomes when Limiting Ablation Size per Session

Peter John Littrup MD : Founder, CryoMedix, LLC Research Grant, Galil Medical Ltd Research Grant, Endo Health Solutions Inc Officer, Delphinus Medical Technologies, Inc , Hussein D. Aoun MD : Nothing to Disclose, Barbara A. Adam MSN : Nothing to Disclose, Evan N. Fletcher MS, BA : Nothing to Disclose, Brian Faustino Baigorri MD : Nothing to Disclose, Mohamed M. Jaber MD : Nothing to Disclose, Mark J. Krycia BS : Nothing to Disclose, Matthew Prus BS : Nothing to Disclose, Fatima Memon MD (Presenter): Nothing to Disclose

PURPOSE
To assess complication factors for liver cryoablation in relation to tumor/ablation volume and vessel proximity, in primary hepatocellular carcinoma (HCC) and metastatic tumors. Focus upon hematologic complications was also assessed for single vs. multiple tumors per procedure.

METHOD AND MATERIALS
CT and/or CT-US fluoroscopic-guided percutaneous cryoablations were performed in 292 procedures on 393 tumors (66 HCC and 327 metastatic carcinomas) in 186 patients. Tumor ablation zones were measured in 3 planes and location noted according to vessel proximity. There were 179 tumors that were targeted in the same procedure and outcomes noted separately. Complications were graded by the National Institutes of Health, Common Terminology of Complications and Adverse Events (CTCAE). Patients received CT or MRI at 1, 3, 6, 12, 18, 24 months and yearly thereafter.

RESULTS
Results: All patients required only conscious sedation. Ablation zones and tumors averaged 5.2 and 2.9 cm, respectively. Grade >3 complications were associated with larger tumor size, for 21.5% (15/70) >4cm vs. 5% (11/222) ≤4cm for (p<.00001). Major types of complications included 12 hemoglobin (CTCAE 3), 13 platelet (2 grade 3, 8 grade 4, 3 grade 5), 1 ARDS (CTCAE 5), 4 pleural effusion (CTCAE 3), and 1 hematoma and 1 pneumothorax (CTCAE 3). In HCC patients with a pre-procedure platelet count <75,000/uL or Hb <10g/dL, major complications were significantly greater at 33% (4/12) vs. 2.4%(1/42) in patients with starting hematologic values above these levels (p<0.005). No significant difference in major complications was noted between single tumor ablation (9.0%, 20/221) compared to the multiple tumor ablation group (8.5%, 6/71; p>0.05) when controlling for total ablation volume. Re-grading according to Clavien-Dindo system lowered rate of major complications.

CONCLUSION
Major complication rate was significantly higher for larger tumors, but there was no significant difference based on location or treatment of multiple tumors when controlling for total ablation volume. HCC patients with low platelets and anemia should be avoided.

CLINICAL RELEVANCE/APPLICATION
Major complication rate was significantly higher for larger tumors, but there was no significant difference based on location or treatment of multiple tumors when controlling for total ablation volume.

Irreversible Electroporation (IRE) of Malignant Liver Tumors Close to Major Portal or Hepatic Veins: Is It Safe and Effective?

Martina Distelmaier (Presenter): Nothing to Disclose, Alexandra Barabasch MD : Nothing to Disclose, Nils Andreas Kraemer : Nothing to Disclose, Christiane Katharina Kuhl MD : Nothing to Disclose, Philipp Bruners MD : Nothing to Disclose

PURPOSE
IRE has been proposed as a non-thermal ablation procedure that offers specific advantages over thermal methods, notably absence of heat sink effect, and to help avoid thermal damage to vessels or bile ducts. Our aim was to verify this concept by investigating the local efficacy and complications of CT-guided percutaneous IRE for hepatic malignancies located immediately adjacent to major portal and hepatic veins and bile ducts.

METHOD AND MATERIALS
24 metastes in 19 patients (mean age 62 ± 12 y) suffering from liver tumors (9 colorectal, 4 breast, 1...
hepatocellular, 1 renal cell, 1 GIST, 1 mesothelioma, 1 oesophageal) with a mean size 17 ± 10.5 mm, range 7 - 44 mm, underwent percutaneous hepatic IRE. All lesions were located immediately adjacent to major hepatic veins (n = 12), portal vein branches (n = 6) or both (n = 6) and therefore not suitable for RF ablation. Between 3 and 5 IRE probes with an active tip length of 1.5 - 2.5 cm were placed strictly parallel under CT-guidance. IRE was performed with 70 pulses per probe pair, a pulse length of 75 µs and a maximum voltage of 3000 V. All patients undergo systematic follow-up CT and MR imaging; follow-up so far is up to 24 months.

RESULTS

Complete ablation of the target lesion was achieved in 22/24 (92%) cases with a safety margin of 5-10 mm as confirmed by CT and MRI. In 24/24 cases, the adjacent major portal or hepatic vein branches remained perfused at long term follow up. No major procedure-related complications were observed. In 4/22 cases (18%), local recurrence adjacent to the ablation zone was observed between 1 and 12 months after treatment. In one patient, a small, clinically asymptomatic arterio-portal fistula developed on f/u that did not require treatment. One patient, with a metastasis located on the portal bifurcation developed mild left-sided cholestasis, not requiring treatment.

CONCLUSION

In this small series, IRE for primary and secondary hepatic malignancies located adjacent to large portal or hepatic veins proved to be both, safe as well as efficient with regards to local control.

CLINICAL RELEVANCE/APPLICATION

CT-guided IRE appears to be a useful for percutaneous ablation of primary and secondary liver tumors that are not amenable to RFA.

SSK24-09


Thomas Josef Vogl MD, PhD (Presenter): Nothing to Disclose, Alena Dommermuth BS: Nothing to Disclose, Britta Heinle: Nothing to Disclose, Nour-Eldin Abdelrehim Nour-Eldin MD, MSc: Nothing to Disclose, Thomas Lehner MD: Nothing to Disclose, Stefan Zangos MD: Nothing to Disclose, Wolf-Otto Bechstein: Nothing to Disclose, Nagy Naguib Naeem Naguib MD, MSc: Nothing to Disclose

PURPOSE

To evaluate the prognostic factors for long-term survival and progression-free survival (PFS) after treatment of colorectal cancer (CRC) liver metastases with MR-guided laser-induced thermotherapy (LITT).

METHOD AND MATERIALS

We included 594 patients (mean age, 61.2 years) with CRC liver metastases who were treated with LITT. The statistical analysis of long-term survival and PFS were based on the Kaplan-Meier method. The Cox regression model tested different parameters that could be of prognostic value. The tested prognostic factors were the following: sex, age, location of primary tumor, number of metastases, maximum diameter and total volume of metastases and necroses, quotient of total volumes of metastases and necroses, time of appearance of liver metastases and location in the liver, TNM classification of CRC, extrahepatic metastases, and neoadjuvant treatment.

RESULTS

Median survival was 25 months starting from the date of the first LITT. The 1-, 2-, 3-, 4-, and 5-year PFS rates were 51.3%, 35.4%, 30.7%, 25.4%, and 22.3%, respectively. The number of metastases and their maximum diameter were the most important prognostic factors for both long-term survival and PFS. Long-term survival was also highly influenced by the initial involvement of the lymph nodes.

CONCLUSION

For patients treated with LITT for CRC liver metastases, the number and size of metastases, together with the initial lymph node status, are significant prognostic factors for long-term survival.

CLINICAL RELEVANCE/APPLICATION

MR-guided LITT allows an excellent local control of liver metastases in colorectal cancer
Feasibility of Using MR Elastography to Differentiate Benign and Malignant Masses in Pancreas

He An (Presenter): Nothing to Disclose, Yu Shi PhD: Nothing to Disclose, Qiyong Guo MD: Nothing to Disclose

PURPOSE

Differential diagnosis of pancreatic masses remains as an important clinical challenge nowadays. Recently, we conducted a prospective study to assess the ability of MR Elastography (MRE) to evaluate the shear stiffness in patients with pancreatic benign and malignant masses. Hence, the purpose of this study was to evaluate the potential value of MRE in the characterization of pancreatic tumors.

METHOD AND MATERIALS

22 patients with pancreatic tumors and 10 healthy volunteers underwent 3.0T MRE exam using echo planar imaging (EPI) pulse sequence with low-frequency vibrations (40Hz) between December 2013 and March 2014. The patients included 9 cases with pancreatic benign masses and 13 cases with pancreatic cancer (PC). Cyst with pure liquid and lesion with diameter less than 1.5cm were excluded due to fail for algorithm or detection on elastogram. Except for 5 cases with PC proven by extra-pancreatic metastasis, all the other cases were proven by surgery and pathology. Of the 9 benign cases, 5 were diagnosed with mass-forming pancreatitis (MFP), 2 with cystadenoma, 1 with islet cell adenoma and 1 with pancreatic lipoma. Of the 13 malignant cases, all were diagnosed with Pancreatic Ductal Adenocarcinoma (PDAC). Stiffness was calculated with a 3D direct inversion algorithm. Statistical analysis was performed on the stiffness values for differentiation of normal pancreas, benign tumors and malignant tumors.

RESULTS

Malignant liver tumors had significantly greater mean shear stiffness than both benign tumors (2.04±0.52kPa vs 1.19±0.24kPa, p=0.038) and normal pancreas (2.04±0.52kPa vs 1.21±0.8kPa, p=0.001). Benign tumors had similar stiffness values to normal pancreas (1.19±0.24kPa vs 1.21±0.8kPa, p=0.7). Within the benign lesions, the MFP had a little greater stiffness than other types of tumors (1.22~1.47kPa vs. 0.67~1.14kPa, p=0.025).

CONCLUSION

MR Elastography has the unique ability to define benign/healthy pancreas and malignant masses. A hallmark of PDAC is the presence of ‘desmoplasia’, a process in which massive fibrous tissue infiltrates and envelops neoplasm, which might contribute the tumor much harder than the healthy pancreatic tissues. Different types of benign tumors might have varied stiffness due to their diverse mechanical properties.

CLINICAL RELEVANCE/APPLICATION

MR Elastography has the unique ability to define benign/healthy pancreas and malignant tumors and is recommended for the diagnosis of pancreatic masses in clinic.


Jung Hoon Kim MD (Presenter): Nothing to Disclose, Jeehyun Kim: Nothing to Disclose, Hyo Won Eun MD, PhD: Nothing to Disclose, Joon Koo Han MD: Nothing to Disclose, Byung Ihn Choi MD, PhD: Research Consultant, Samsung Electronics Co Ltd

PURPOSE

Tumor size and vascularity are most important parameters for therapeutic response evaluation. This study is to assess the feasibility of tumor volume measurement and volumetric contrast-enhanced US using 3D transducer in therapeutic response evaluation after treatment in VX2 rabbit hepatic tumor comparison with 2D-CEUS.

METHOD AND MATERIALS

Rabbit hepatic VX2 carcinoma with targeted therapy (n=22, 30mg/kg/day of Sorafenib for 7-day) and control group (n=13) were performed CEUS using 2D(12MHz, PLT-1204MV) and 3D transducer(12MHz, PLT-1204BT) baseline and one day after first treatment. Three different tumor volumes(calculated volume from 2D US; 2D-Vol, 3D volume identified on non-contrast US; 3D-Vol, 3D volume identified on CEUS; e3D-Vol) and seven US perfusion parameters were obtained. Tumor volume using MDCT as a reference standard, we compared the change of each different tumor volumes. Therapeutic efficacy was estimated using necrotic fraction, MVD, and apoptosis of tumor after treatment. Correlation between tumor volume and US perfusion parameters was analyzed.

RESULTS
According to pathology, there were significant differences between baseline and after treatment. Tumor volume showed no statistical difference between baseline and one day after treatment (299.9 ±140.6 vs 283.7 ±118.1, mm3, p=.108), however, in treatment group, both 3D and 2D US perfusion parameters, including peak intensity (33.2±19.9 vs 16.6±10.7, 63.7±20.0 vs 30.1±19.8), slope (15.3±12.4 vs 5.7±4.5, 37.3±20.4 vs 15.4±13.0), AUC (1004.1±560.3 vs 611.4±421.1, 1332.2±708.3 vs 670.4±388.3), had significantly decreased one day following first treatment (p=.00). e3D-Vol showed no statistical difference comparison with tumor volume using MDCT (299.9± 140.6mm3 vs 283.7±118.1, p= .108), however 2D-Vol (1933.7±1250.4, p= .00) and 3D-Vol (236.8±118.0, p=.00) had significant difference comparison with tumor volume using MDCT.

CONCLUSION

CEUS using 3D transducer was useful for predicting early therapeutic response one day after targeted therapy using US perfusion parameters. In addition to, CEUS using 3D transducer is accurately measure the tumor volume.

CLINICAL RELEVANCE/APPLICATION

CEUS using 3D transducer is feasible to predict therapeutic response evaluation after targeted therapy because it is not only useful for perfusion evaluation but also accurate tumor volume measurement.

The Application Value of the CT Perfusion Imaging in the Diagnosis of Autoimmune Pancreatitis (Station #4)

Huiying Shi MD (Presenter):  Nothing to Disclose, Xiaoxuan Ma :  Nothing to Disclose, Minxia Qiao :  Nothing to Disclose, Fan Yang :  Nothing to Disclose, Shibo Dong :  Nothing to Disclose

PURPOSE

To investigate the application value of the whole pancreas CT perfusion imaging in the diagnosis of autoimmune pancreatitis (AIP) and the differential diagnosis between the AIP and pancreatic carcinoma.

METHOD AND MATERIALS

Seven cases of autoimmune pancreatitis and 8 pancreatic carcinoma underwent the whole pancreas perfusion CT imaging. The 18-gauge intravenous needle was placed into right antecubital vein and contrast medium Ultravist 40 ml(370 mg iodine/ml,6ml/s) was injected following normal saline 30 ml at the same speed. Perfusion scan and injection started at the same time. Total acquisition time lasted for 60s with 19 times volume CT scan and 6080 pictures. The CT findings and perfusion parameters of all cases were analysed and compared, such as, diffuse enlargement/focal lesion of pancreas, pancreatic duct changes such as its' stricture, expansion or truncation, adjacent blood vessels involvement, the features of the time-density curve, characteristics of the perfusion pseudo-color pictures and perfusion parameters, other autoimmune diseases manifestation.

RESULTS

In 7 AIP cases, the lesions in 5 located at the head of the pancreas, 2 body and tail, and 5 accompanied with pancreatic duct dilatation, 4 extrahepatic bile duct dilatation, one ulcerative colitis. No blood vessels invasion was found in all cases. In 8 cases of pancreatic carcinoma, 3 located at the pancreatic head, 5 the body and tail, and 4 accompanied with dilatation of pancreatic duct, 6 adjacent vascular invasion, and 2 extrahepatic bile duct dilatation. Time-density curve analysis showed the enhancement pattern of AIP was similar to that of the normal pancreatic tissue, but the degree of the enhancement was significantly reduced. The shape of the time-density curve had a significantly difference between pancreatic carcinoma and the normal pancreatic tissue in which the former demonstrated a much lower enhancement pattern than the latter. The mean AF value had a statistically significant difference (p<0.05) between AIP and pancreatic carcinoma (82.6 vs 69.7ml/min/100ml) in statistical analysis of Variance.

CONCLUSION

As a supplement method of routine CT examination, CT perfusion imaging could demonstrate characteristics of AIP, and would play an important role in the diagnosis and differential diagnosis of AIP.

CLINICAL RELEVANCE/APPLICATION

CT perfusion can demonstrate the blood supply features of the pancreas disease and helpful for the diagnosis of autoimmune pancreatitis.

Pre-operative Staging of the CT Colonography for Patients with Colorectal Cancer: Effect of Low Tube Voltage and Iterative Reconstruction (Station #6)

Sadahiro Yamamura (Presenter):  Nothing to Disclose, Masanori Imuta MD :  Nothing to Disclose, Seitaro Oda MD :  Nothing to Disclose, Daisuke Utsunomiya MD :  Nothing to Disclose, Yasuyuki Yamashita MD :  Consultant, DAIICHI SANKYO Group

PURPOSE

The purpose of our study was to assess the accuracy of the pre-operative staging of the CT colonography (CTC) in patients with colorectal cancer with decreasing in tube voltage from 120- to 100-kVp with iterative reconstruction (IR).
METHOD AND MATERIALS

Scanning was performed with 24 consecutive patients who had a diagnosis of colorectal carcinoma in the supine (120-kVp with FBP) and prone (100-kVp with IR) positions, with other parameters unchanged. Two readers visually assessed image quality and the k coefficients were calculated for interobserver agreement. The average image quality ratings were compared using the Wilcoxon signed rank test. We also evaluated the accuracy of the CTC for staging colorectal cancer in both 120-kVp with FBP and 100-kVp with IR.

RESULTS

No significant differences were found in the visual score for the image quality between 120-kVp with FBP and 100-kVp with IR. The interobserver agreement was substantial. CTC with a 100-kVp with IR algorithm identified all the carcinomas and had an overall accuracy of 85%, 64% and 100% for the evaluation of tumor depth, lymph nodes and metastases respectively, and CTC with a 100-kVp with FBP algorithm had an overall accuracy of 81%, 62% and 100%. No significant differences were found in the accuracy of the staging between 120-kVp with FBP and 100-kVp with IR.

CONCLUSION

CTC with a 100-kVp with IR algorithm proved useful for the pre-operative evaluation of patients with a diagnosis of colorectal carcinoma with substantial radiation dose reduction.

CLINICAL RELEVANCE/APPLICATION

CTC with a 100-kVp with IR algorithm proved useful for the pre-operative evaluation of patients with a diagnosis of colorectal carcinoma with substantial radiation dose reduction.

GIS372

Radio-pathological Correlation in HCC Treated by Transarterial Chemoembolisation: Comparison between RECIST, mRECIST and EASL Criteria (Station #7)

Maxime Ronot MD (Presenter): Nothing to Disclose, Marco Dioguardi Burgio MD: Nothing to Disclose, Onorina Bruno MD: Nothing to Disclose, Claire Francoz: Nothing to Disclose, Valerie Paradis MD: Nothing to Disclose, Francois Durand: Nothing to Disclose, Laurent Castera: Nothing to Disclose, Valerie Vilgrain MD: Nothing to Disclose

PURPOSE

To compare the diagnostic performance of RECIST1.1, mRECIST, and EASL criteria for assessing tumor necrosis in a consecutive series of patients treated with transarterial chemoembolisation (TACE) before liver transplantation (LT) for hepatocellular carcinoma (HCC).

METHOD AND MATERIALS

Between 2006 and 2012, all patients treated with at least one session of TACE before LT for HCC were included. Response to treatment was evaluated by two independent readers on the last MDCT before LT according to RECIST1.1, mRECIST, and EASL criteria. Tumor response on imaging was compared to the tumor necrosis assessed on pathologic examination of the liver explant. Major necrosis was defined as the presence of more than 90% of necrosis. Necrosis between 50-90% and < 50% were defined as intermediate and minor necrosis, respectively. Inter-reader agreement for the tumor response was evaluated by the kappa statistic. Factors associated with a major (>90%) necrosis were tested by multivariate analysis.

RESULTS

58 patients with 88 HCC treated with 94 TACE sessions (53 male (91%) were included. Before TACE, patients had a mean 1.6 (range 1-4) of HCC with a mean 25mm diameter (range 10-80 mm). HCC was unique in 30 patients (52%). All HCCs were hypervascular on arterial phase MDCT acquisition. 51 nodules (58%) showed major necrosis. Among them, lesions were classified as complete response according to RECIST1.1, mRECIST and EASL in 2 (4%), 47 (92%) and 47(92%) for reader 1, respectively, and 1 (2%), 45 (88%) and 45 (88%) for reader 2, respectively. Despite similar performances with mRECIST and EASL, only mRECIST was correlated with major necrosis on multivariate analysis for both readers (p<0.0001). Inter-observer agreement was substantial for RECIST1.1 (k=0.65 +/- 0.08), mRECIST (k=0.78+/-.07), and EASL (k=0.75+/-0.07).

CONCLUSION

mRECIST and EASL criteria showed better correlation with major tumor necrosis than RECIST1.1. mRECIST showed better correlation with tumoral major necrosis and should be used to evaluate response to TACE.

CLINICAL RELEVANCE/APPLICATION

Patients with HCC treated by TACE should be evaluated with mRECIST criteria.

GIS373

Barium Swallow Is Insensitive in Diagnosing Clinically Significant Anastomotic Leaks Following Esophagectomy (Station #8)

Simon Roh MD (Presenter): Nothing to Disclose, Mark Jannettoni MD: Nothing to Disclose, John Keech MD: Nothing to Disclose, Peter Gruber MD, PhD: Nothing to Disclose, Kalpaj Parekh MBBS: Nothing to Disclose

PURPOSE
The standard of practice following esophagectomy is to evaluate the anastomosis by a barium swallow for detection of leaks. The aim of this study was to evaluate the reliability of the barium swallow study compared to clinical evaluation in diagnosing anastomotic leaks following esophagectomy.

METHOD AND MATERIALS

We studied all consecutive patients with either transhiatal or transthoracic esophagectomy between January 2000 and December 2013 at our institution. Patients were evaluated for anastomotic leak by routine barium swallow study on post-op day 5. These results were compared to clinically determined leaks (defined by neck wound infection requiring jejunal feeds and or parenteral nutrition) during the postoperative period. The sensitivity and specificity of barium swallow in diagnosing clinically significant anastomotic leaks was determined.

RESULTS

A total of 382 esophagectomies were performed [mean age 62.1 (21-88) years], [malignancy (n=313), high grade dysplasia (n=15), benign stricture/perforation (n=35), and other (n=19)]. A variety of techniques were used including transhiatal (n=341), McKeown (n=34), and Ivor Lewis (n=7) esophagectomies. Operative mortality was 2.9% (n=11). 356 patients (93%) underwent barium swallow study after esophagectomy [mean postoperative day 6.4 (3-75)]. Clinically significant anastomotic leak was identified in 32 (9.0%) patients [malignancy 84% (n=27), high grade dysplasia 13% (n=4), benign stricture/perforation 3% (n=1)]. The sensitivity of the swallow in diagnosing a leak was 35% and specificity was 98%. The positive and negative predictive values of barium swallow study in detecting leaks were 58% and 94%, respectively.

CONCLUSION

Barium swallow is an insensitive but specific test for detecting leaks at the cervical anastomotic site after esophagectomy.

CLINICAL RELEVANCE/APPLICATION

Our practice has evolved to resume oral intake two weeks after the surgery even in the case barium swallow is negative for a leak.

GIE251

**Fluoroscoping Esophageal Trauma (Station #10)**

Merav Galper BA, MD (Presenter): Nothing to Disclose, Christopher D’Arcy Scheirey MD: Nothing to Disclose, Francis Joseph Scholz MD: Owner, FSpoon Company

**TEACHING POINTS**

1) Prompt recognition of esophageal injury is critical for clinical management
2) Suspected esophageal trauma producing dysphagia warrants urgent fluoroscopic examination
3) Special techniques must be employed for optimal visualization of injuries
4) Fluoroscopic staging of esophageal trauma differs from the AAST and other esophageal injury scales and is based on degree of mural damage

**TABLE OF CONTENTS/OUTLINE**

1) Background of esophageal trauma
2) Perforation etiologies a. Instrumentation b. Ingestion/vomiting c. Fragile mucosa (e.g. bullous dermatoses, eosinophilic esophagitis) d. Radiation stricture e. Caustic agents

GIE124

"Biliary Diseases with Pancreatic Counterparts”: Evolving Concepts in Pathogenesis and Cross-sectional Imaging Findings (Station #11)

Venkata S. Katabathina MD (Presenter): Nothing to Disclose, Erin Flaherty MD: Nothing to Disclose, Nicole Riddle MD: Nothing to Disclose, Anil Kumar Dasyam MD: Nothing to Disclose, Narayan Lath: Nothing to Disclose, Srinivasa R. Prasad MD: Nothing to Disclose

**TEACHING POINTS**

Review anatomy and embryology of biliary tract with emphasis on peribiliary glands List select inflammatory and neoplastic diseases of biliary tract that have pancreatic counterparts Discuss evolving concepts regarding pathogenesis along with molecular and cytogenetic abnormalities Describe CT/MRI findings and role of imaging in diagnosis and management

**TABLE OF CONTENTS/OUTLINE**

Introduction Anatomy and development of biliary tract Inflammatory diseases: IgG4 sclerosing cholangitis-autoimmune pancreatitis; primary sclerosing cholangitis-idiopathic duct centric chronic pancreatitis Neoplasms: Cholangiocarcinoma-pancreatic adenocarcinoma; Intraductal papillary mucinous neoplasm of bile duct (IPMN-B); IPMN of pancreas (IPMN-P); Biliary mucinous cystic neoplasm (MCN) and IPMN-B with cystic change-pancreatic MCN and IPMN-P with cystic changes Recent advances in pathogenesis, molecular biology and cytogenetics Conclusion Biliary tract and pancreas develop from endoderm, peribiliary glands demonstrate
remnants of pancreatic tissue. Select biliary pathologies show similar pathogenesis and imaging findings to their pancreatic counterparts; this has lead to proposal of a new disease concept 'biliary diseases with pancreatic counterparts'. This unified concept will assist in understanding pathogenesis of pancreatico-biliary diseases and developing novel therapeutic strategies.

**GIE315**

**MR Enterography: Application in Non-Inflammatory Diseases of the Gastrointestinal Tract (Station #12)**

Stephanie Soriano MD (Presenter): Nothing to Disclose, Raj Mohan Paspulati MD: Research grant from Philips Healthcare

**TEACHING POINTS**

• With the greater demand, the radiologist should be familiar with the proper technique, applications, and imaging features of MR enterography.
• MR provides improved tissue contrast, greater tranmural and extramural detail, and function information, facilitating diagnosis of non-inflammatory small bowel disease.

**TABLE OF CONTENTS/OUTLINE**

Imaging modalities available for the evaluation of small bowel disease
Rationale for the use of MR enterography for evaluation of noninflammatory bowel disease
Lack of ionizing radiation
Improved tissue contrast
Visualization of the entire bowel
Greater endoluminal, mural, and extramural enteric detail
Functional information

**GIE025-b**

**The POEM Procedure (Peroral Endoscopic Myotomy): Current Role and Experience, Imaging Findings, and Potential Complications (hardcopy backboard)**


**TEACHING POINTS**

First described in Japan in 2008, and then first performed in the United States in 2009, the POEM procedure (peroral endoscopic myotomy) is a 'minimally invasive' approach to replace the Heller myotomy for achalasia and other related disorders, where conservative management has failed or is not indicated. A form of NOTES, the POEM is performed via endoscopic access to the gastroesophageal junction, via a submucosal tunnel approach, which allows rapid secure closure with clips placed at the mucosotomy site. POEM is now used at multiple centers with similar outcomes to date as with surgical myotomy. The purpose of this exhibit is therefore to review the world-wide experience, as well as our extensive institutional experience; to demonstrate the expected and unexpected imaging findings following POEM; to explain the procedure and its indications and contra-indications; and to review the relevant current clinical and limited imaging literature.

**TABLE OF CONTENTS/OUTLINE**

- Indications, contra-indications, and current status/role of POEM
- What the endoscopist needs to know from the radiologist before and after the POEM procedure
- Expected and unexpected imaging findings before and after the procedure (radiography, fluoroscopy, and CT)
- Outcomes/review of the literature
- Early and late potential adverse events: recognition and management

**GIS-WEB**

**Gastrointestinal Wednesday Poster Discussions**

**Scientific Posters**

**GIS315**

**Effect of Body Habitus on Image Quality of Low Tube Voltage CT during Hepatic Arterial Phase: Is BMI Still Most Influential Factor? (Station #1)**

Yang Shin Park MD (Presenter): Nothing to Disclose, Chang Hee Lee MD: Nothing to Disclose, Jong Mee Lee: Nothing to Disclose, Jae Woong Choi MD: Nothing to Disclose, Kyeong Ah Kim MD: Nothing to Disclose, Cheol Min Park MD: Nothing to Disclose

**PURPOSE**

Low tube voltage CT is useful in the evaluation of hypervascular hepatocellular carcinoma. However, image quality of hepatic arterial phase can vary depending on patient body habitus. Therefore, the purpose of our study was to evaluate which of patient body habitus factors have more impact on image quality of low tube voltage CT performed during the hepatic arterial phase.

**METHOD AND MATERIALS**

Ninety-seven patients (66 men, 31 women; age range, 26-78 years) who underwent clinically indicated liver dynamic CT examination were enrolled in this study. Low tube voltage (80 kVp), low tube current (277-337
mAs) CT was performed in the late hepatic arterial phase using a 320-detector row scanner with adaptive iterative dose reduction (AIDR) 3D reconstruction. Patient body habitus was measured by using weight, body mass index (BMI), muscle volume (MV) of the abdominal wall, and longest lateral width (LW) of the abdomen. On hepatic arterial phase, the mean image noise and contrast-to-noise ratios (CNR) for the aorta and liver were assessed. Correlation between body habitus factors and image quality parameters was evaluated.

RESULTS
In all patients, the image noise and CNRs for the aorta and liver had strongest correlation with MV \((r = 0.68, -0.59, -0.28)\). In subgroup analysis, image noise was significantly correlated with weight, BMI, MV, and LW in men \((r = 0.50, 0.40, 0.59, 0.49)\), whereas image noise was significantly correlated with only MV in women \((r = 0.73)\). In addition, the significant correlation was noted only between the image noise and MV \((r = 0.45, 0.77)\) in larger men (BMI > 25) and smaller women (BMI < 25), while image noise was correlated with weight and MV \((r = 0.52, 0.45)\) in smaller men and no relationships in larger women.

CONCLUSION
Contrary to the prevailing thought about BMI as determinant for patient stratification, MV shows strongest correlation with image noise and CNR in the hepatic arterial phase using low tube voltage CT.

CLINICAL RELEVANCE/APPLICATION
With the use of MV as a determinant in individualized protocol or patient selection to perform low tube voltage CT during hepatic arterial phase, acceptable image quality can be achieved with diagnostic improvement for hypervascular hepatic tumor and radiation dose reduction.
GIS377

The Prevalence and the Natural Course of Pancreatic Cysts in ADPKD (Station #4)


PURPOSE

To evaluate the prevalence and natural course of pancreatic cysts in ADPKD subject

METHOD AND MATERIALS

ADPKD patients enrolled in the Rogosin Institute ADPKD Data Repository (n=178; male 46%), who underwent MRI scans between November, 2006 and November, 2013 (age 18 to 84 years; mean = 47.5 years) were evaluated for pancreatic cysts on axial and coronal single-shot fast spin-echo (SSFSE) images obtained at 1.5T (TE=183.0, matrix = 256 x 256 or 512 x 256 [high resolution], slice thickness =8.0). Pancreatic cyst diameters were measured with electronic calipers; cysts measuring >2 mm were counted. Estimated GFR (eGFR), using AG Patent agreement, Topspins, Inc Stockholder, Topspins, Inc

RESULTS

At least one pancreatic cyst was found in 61 (34%) ADPKD patients (male 44%, eGFR 65-121 ml/min/1.73m2). One pancreatic cyst, more than one cyst, and more than 10 cysts were found in 41%, 54%, and 5% patients, respectively. Cyst size ranged from 2 mm to 57 mm (median = 4 mm). Of the 28 ADPKD patients with follow-up MRI, 39% showed changes during the follow-up period: cyst number increased in 17.9%, cyst size increased in 32.1%. Of 71 ADPKD cases with a matched control, 31% had pancreatic cysts compared to 17(24%) in the control population (p=0.11).

CONCLUSION

Prevalence of pancreatic cysts was similar in the ADPKD and non-ADPKD control population. However, the reported prevalence of pancreatic cysts was lower by SSFSE than previously reported by thin slice 3D MRCP 44.7%. Changes in pancreatic cyst number and size occur commonly in ADPKD. The clinical significance of these
changes has not been established.

**CLINICAL RELEVANCE/APPLICATION**

Although pancreatic cysts have been observed in ADPKD, their prevalence and natural history have not been established especially using MRI, which is modality of choice in detecting pancreatic cysts as well as evaluating ADPKD.

**GIS378**

Evaluation of the Performance and Conspicuity of Polyps Detection by Virtual Colon Tagging Method in Dual-energy Fecal-tagging CT Colonography (Station #5)

Wenli Cai PhD (Presenter): Nothing to Disclose, Se Hyung Kim : Research Grant, Mallinckrodt plc Research Grant, Samsung Electronics Co Ltd, Michael Ethan Zalis MD : Co-founder, QPID Health Inc Chief Medical Officer, QPID Health Inc Stockholder, QPID Health Inc

**PURPOSE**

The purpose of this study was to evaluate a novel dual-energy electronic cleansing (DE-EC) method: virtual-colon-tagging EC (VCT-EC), in cleansing fecal-tagging CT colonography (CTC). We assessed the performance of polyp detection and the conspicuity of polyps after the application of VCT-EC.

**METHOD AND MATERIALS**

Twenty-one patients underwent a bowel preparation with a low-fiber, low-residue diet, and oral administration of iodine contrast agents. Dual-energy CT scanning (SOMATOM Definition Flash) was performed at two photon voltages of 140 kVp and 80 kVp with the automatic dose exposure control module (CARE Dose 4D) in both supine and prone positions. Resulting DE-CTC data were subjected to VCT-EC scheme. Each subject had video-assisted optical colonoscopy as reference standard. The performance of polyp detection in VCT-EC was assessed by two experienced radiologists, who were blind to the pathology reports and the original fecal-tagging CTC images. They read the 21 cleansed DE-CTC cases by the proposed VCT-EC scheme to find the polyps by recording the size and location of each finding, as well as the confidence score regarding whether each finding is a polyp ≥6 mm (range: 1 [definitely no polyp] - 10 [definitely a polyp]); a score of ≥5 indicates a polyp finding).

**RESULTS**

The per-patient analysis revealed that VEC-EC yielded an average sensitivity of 90.6%, 93.3% and 95.0% for polyps ≥6mm, ≥8mm, and ≥10mm respectively. The per-polyp analysis indicated that for 6 missed polyps ≥8mm (false-negative) (5 from reader 1 and 1 from reader 2), only 1 of them was submerged in tagged materials at prone position and thus was a cleansed polyp by VCT-EC. Five (5) of 6 false-negative findings were sessile-flat morphology. The t-test of confidence scores between "Cleansed Polyps" and "Air-Exposed" non-submerged polyps showed no statistically significant difference for all 33 polyps (p=0.73) and 13 polyps submerged in one position and air-exposed in another position (p=0.60).

**CONCLUSION**

Our VCT-EC scheme provides an effective solution for the artifacts-free visualization of fecal-tagging CTC images.

**CLINICAL RELEVANCE/APPLICATION**

New dual-energy EC method can substantially reduce EC artifacts and it may lead to artifact-free visualization of the colon.

**GIS379**

Assessment of Tumor Response Following Loco-regional Therapies in Patients of Hepatocellular Carcinoma using Contrast-enhanced Ultrasound and Compare Its Diagnostic Accuracy with Multiphasic CT (Station #6)

Shashibala Paul MBBS, PhD : Nothing to Disclose, Vishnubhatla Sreenivas : Nothing to Disclose, Ekta Dhamija MD (Presenter): Nothing to Disclose, Hanish Sharma : Nothing to Disclose, Shivanand Ramachandra Gamanagatti MBBS, MD : Nothing to Disclose, Subrat K. Acharya MD : Nothing to Disclose

**PURPOSE**

To evaluate the tumor response following locoregional therapies in patients with Hepatocellular carcinoma(HCC) by contrast- enhanced ultrasound (CEUS) and compare the diagnostic accuracy of response detection of CEUS with multiphasic CT(MPCT).

**METHOD AND MATERIALS**

HCC patients treated with locoregional therapies [Trans-arterial chemoembolization(TACE) / Radiofrequency ablation (RFA) /acetic acid ablation (PAI) or any combination], were enrolled. At 4 weeks post-treatment, CEUS of the liver was done using SonoVue contrast media.Contrast enhanced multiphasic CT (MPCT) and Magnetic resonance imaging (MRI) liver were also done.All three modalities of CEUS, MPCT and MRI were done not more than 2 weeks apart. Tumor response of the largest mass per patient was assessed on all the three imaging modalities. Enhancing tissue in the treated tumor area on CEUS/MPCT/MRI was termed as residual disease. Types of residual disease was labelled as peripheral nodular, homogenous, heterogenous. Central or rim enhancement depending upon the location. Sensitivity, specificity, positive and negative predictive values of
CEUS in detecting residual was estimated and compared with that of MPCT, taking MRI as the gold standard

RESULTS

Ninety six patients (mean age 53.5 years, males 81, females 15), with 102 HCC, treated with TACE(61), RFA(11), PAI(18) and TACE plus PAI(6), were included. Mean mass size was 4.6 ± 2.5 cm (range 0.8-15.6 cm). Residual disease was seen in 65/102 (63.7%) masses on CEUS. Different patterns were - peripheral nodular 43.1%, heterogeneous 35.4%, homogenous 16.9%, central 3.1% and rim enhancement in 1.5%. Seventy two masses could be evaluated on all three modalities. Sensitivity, specificity, PPV and NPV of CEUS was 85.7%, 76.7%, 83.7% and 79.3% compared with 40.5%, 90%, 85% and 51.9% respectively on MPCT.

CONCLUSION

CEUS has a higher diagnostic accuracy compared with MPCT in detection of residual disease in HCC patients treated with locoregional therapies and peripheral nodular is the commonest pattern seen.

CLINICAL RELEVANCE/APPLICATION

Evaluation of the diagnostic accuracy of CEUS in assessment of tumor response following locoregional therapies is important because if CEUS results are encouraging, use of MPCT could be circumvented.

GIS381

Application of kv Assist Associated with Adaptive Statistical Iterative Reconstruction (ASiR) in Upper Abdominal CT Angiography (Station #8)

Qingguo Wang (Presenter): Nothing to Disclose

PURPOSE

To evaluate the impact of kv assist associated with adaptive statistical iterative reconstruction based on body mass index (BMI) on dose and image quality of CT angiography (CTA) for upper abdomen.

METHOD AND MATERIALS

This study included 46 patients who underwent CT angiography for upper abdomen using a 64-row CT scanner (GE Discovery CT750 HD). Patients were divided into two groups using and not using kv assist technique. Group A (n=23, BMI: 20.72±2.37) and group B (n=23, BMI: 22.31±1.82) underwent CT scan with standard tube kVp (120kVp) and low tube kVp (≤100kVp) recommended by kv assist. Data of Group B were reprocessed with a fixed blending level (50% and 0% respectively) of adaptive statistical iterative reconstruction (ASiR) for each image set. The baseline was 120 kVp, noise index (NI) =12.0 (5mm). The CT value of abdominal fat layer, aorta (AR), superior mesenteric artery (SMA) were measured. The contrast noise ratio (CNR) and signal noise ratio(SNR) of AR and SMA were calculated respectively. The CT dose index volume (CTDIvol) of each patient were recorded. The dose length produce (DLP) was recorded and effective radiation dose was calculated.

RESULTS

The mean CTDIvol and effective radiation dose in group B (6.06 ±2.80mGy, 2.31 ±1.06mSv) were significantly lower than group A (9.26±4.69mGy, 3.81 ±2.31mSv) (p

CONCLUSION

KV assist can recommend optimal scan protocol and approximate 39% radiation dose reduction can be reached without degradation of image quality.

CLINICAL RELEVANCE/APPLICATION

KV assist helps to improve patient care through personalized protocols and simplify scan technique optimization. There is a potential to use significantly less radiation dose without image quality loss.

GIE225

Multimodality Pictorial Review of Organ Procurement and Transplantation Network (OPTN) and Liver Imaging-Reporting and Data System (LI-RADS) Classification of Liver Lesions (Station #10)

David Christopher Irwin MD : Nothing to Disclose, Sean D. Raj MD : Nothing to Disclose, Muzammil Hanif MD : Nothing to Disclose, Khozema Hussain MD : Nothing to Disclose, Daniel Anaya MD : Nothing to Disclose, Mark Alfred Sultenfuss MD (Presenter): Nothing to Disclose, David Sada MD : Nothing to Disclose

TEACHING POINTS

The Purpose of this exhibit is to: 1. Understand the Organ Procurement and Transplantation Network (OPTN) and Liver Imaging-Reporting and Data System (LI-RADS) classification systems. 2. Review the CT and MRI imaging characteristics of liver lesions classified by both the OPTN and LI-RADS classification systems. 3. Correlate the CT and MRI features of OPTN and LI-RADS category 3, 4, and 5 lesions with their transcatheter angiographic and contrast-enhanced cone-beam CT appearance.

TABLE OF CONTENTS/OUTLINE

Why use LIRADS and OPTN for liver lesion interpretation. United Network for Organ Sharing (UNOS) requirements for image acquisition. Applying the LIRADS and OPTN categories to liver lesions. Common features of both LIRADS and OPTN categories, with examples. Distinguishing features between LIRADS and OPTN categories, with examples. Examples of LIRADS and OPTN category 0-5 lesions based on CT, MRI, transcatheter angiography, and contrast-enhanced cone-beam CT.
**TEACHING POINTS**

Colic vasculature has a wide spectrum of variants in branching and in relationship between vessels and abdominal structures. To add an arterial phase scan to CT Colonography protocol allows processing of a vascular map, helpful in pre-operative planning of laparoscopic surgery for colo-rectal cancer, diverticular disease and other colonic diseases.

**TABLE OF CONTENTS/OUTLINE**

Contrast enhanced CT Colonography protocol CE-CTC for colorectal cancer staging and diagnosis of non-neoplastic colonic diseases Colonic vasculature anatomy and variants Role of laparoscopic colonic surgery (advantages and disadvantages) Usefulness of colonic vascular map in preoperative laparoscopic planning Sample cases with 3D rendered CTC - Vascular hybrid images

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**GIE271**

**The Hepatoduodenal Ligament Revealed: Cross-Sectional Imaging Spectrum of Anatomical Variants, Diseases and Neoplasms (Station #12)**

Daniel A.T. Souza MD (Presenter): Nothing to Disclose, Amin Souleiman Chaoui MD : Nothing to Disclose, Mark Knox MBChc : Nothing to Disclose, Deirdre E. Moran MBCh : Nothing to Disclose, Aleksandar Ivanovic : Nothing to Disclose, Koenraad J. Mortele MD : Nothing to Disclose

**TEACHING POINTS**

The hepatoduodenal ligament is a part of the lesser omentum that extends from the porta hepatis to the superior duodenum. It contains the hepatic artery, portal vein, common bile duct, and hepatic lymph nodes. We will review the anatomy, as well as cross-sectional imaging findings of a wide spectrum of anatomical variants, diseases, and neoplasms that can occur within its boundaries.

**TABLE OF CONTENTS/OUTLINE**

1. Overview of the anatomy of the hepatoduodenal ligament, with diagrams, reformatted CT and MR images, 3D reconstructions, and endoscopic/surgical correlation; 2. Case-based review of cross-sectional findings in congenital (eg, type I choledochal cyst), infectious (eg, portal thrombophlebitis), inflammatory (eg, pancreatic pseudocyst), vascular (eg, hepatic artery pseudoaneurysm), and neoplastic processes (eg, ganglioneuroma) that can occur within this unique anatomic space.

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**MSE123**

**Abdominal Manifestations of Systemic Autoimmune Diseases and Vasculitis (Station #1)**

Kiyoyuki Minamiguchi (Presenter): Nothing to Disclose, Aki Takahashi MD : Nothing to Disclose, Nagaaki Marugami : Nothing to Disclose, Ryosuke Taiji : Nothing to Disclose, Junko Takahama MD : Nothing to Disclose, Kimihiko Kichikawa MD : Nothing to Disclose

**TEACHING POINTS**

1. To present an overview of systemic autoimmune diseases and vasculitis that can involve abdomen. 2. To describe imaging findings and clinical presentation those are helpful in diagnosing with illustrations.

**TABLE OF CONTENTS/OUTLINE**

1. The pathophysiology of abdominal involvement by autoimmune diseases and vasculitis will be discussed. 2. The imaging spectrum of the abdominal manifestations of systemic autoimmune diseases and vasculitis such as systemic lupus erythematosis, scleroderma, polymyositis/dermatomyositis, Behcet's disease, IgA vasculitis and polyarteritis nodosa will be reviewed with the clinical findings and a discussion of the differential diagnosis. 3. The imaging findings of treatment complications (drug toxicity, opportunistic Infection) will be reviewed.

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**SSM08**

**Gastrointestinal (Loco-regional Therapy Liver Imaging)**
DWI Can Predict Early Therapy Response in Patients with Hepatocellular Carcinoma after Selective Internal Radiation Therapy (SIRT)

Juliane Schelhorn MD (Presenter): Nothing to Disclose, Marcus Paul Reinboldt: Nothing to Disclose, Guido Gerken: Nothing to Disclose, Thomas C. Lauenstein MD: Nothing to Disclose, Sonja Kinner MD: Nothing to Disclose

PURPOSE

Selective internal radiation therapy (SIRT) with Yttrium-90 (Y90) microspheres is a promising therapy option in patients with advanced hepatocellular carcinoma (HCC). Early detection of therapy response is warranted to ensure adequate ongoing treatment, but size measurements and contrast enhancement are often not conclusive. We aimed to evaluate diffusion weighted imaging (DWI) for early prediction of tumor response in patients with HCC following SIRT.

METHOD AND MATERIALS

42 patients (33 male, 9 female, mean age 61.2 years) with histopathologically proven HCC underwent magnetic resonance imaging (MRI) including DWI before and 30 days (early) and 180 days (late) after Y90 therapy. Morphologic HCC size and apparent diffusion coefficients (ADC) were compared for at all three time points and were correlated with clinical and laboratory parameters to assess response.

RESULTS

SIRT could be successfully performed in all 42 patients (one injection n=25, two injections n=17). Mean tumor size at baseline amounted to 6.7cm; mean baseline ADC amounted to 1.55 x 10^{-3} mm²/s. After 30 days tumor size did not show any difference (mean tumor size d30= 6.5cm) in responders and non-responders while ADC values increased to 1.64 x 10^{-3} mm²/s (p=0.34) in responders and stayed constant in non-responders. After 180 days, tumor size showed a slight decrease (mean tumor size d180= 6.1cm) in responders and a slight increase in non-responders while ADC values turned out to be significantly higher compared to pretherapeutic imaging (1.82 x 10^{-3} mm²/s; p<0.01) in the responder group.

CONCLUSION

Response to SIRT can be documented by DWI in most patients after 30 days and more pronounced after 180 days. However, vital tumor size changed only little in early and late control MRI. Tumor size therefore cannot be used as response indicator.

CLINICAL RELEVANCE/APPLICATION

DWI is an important tool to assess response or non-response to SIRT in patients with HCC and should be used as imaging modality of choice to evaluate therapy response.
vein. DCE-MRI acquisitions of 5 images over 30 seconds in each phase were taken pre-contrast, at the hepatic arterial-dominant phase and at 60, 120, 180, 240, 330, 420 510 and 600 seconds post-contrast. Regions of interest were semi-automatically selected for lesions and abdominal aorta. Distribution volume of contrast agent (DV) and transfer constant Ktrans were calculated. The modified response evaluation criterion in solid tumors (mRECIST) one month after TACE was used to group patients into responders (complete response and partial response) and non-responders (stable disease and progressive disease); recovery of parameter values after sorafenib was compared between the two groups. Angiogenesis factor angiopoietin (ang2) was measured pre-, 3 and 10 days post-TACE.

RESULTS

DV pre-treatment was 30.8ml/100ml, and was decreased at 3 (20.6ml/100ml, p<0.001) and 10 days (20.0ml/100ml, p=0.002). Ktrans was not significantly changed. DV at 10 days was 8.6ml/100ml and 27.0ml/100ml for responders and non-responders respectively (p=0.02). Following sorafenib therapy DV fell by 5.6ml/100ml in responders, but increased by 2.5ml/100ml in non-responders (p=0.026). Ang2 decreased by 705ng/l in responders and 331ng/l in non-responders (p=0.037). A significant correlation (r=0.621, p=0.03) between DV and ang2 was observed.

CONCLUSION

DV 10 days post-TACE is useful in early prediction of therapeutic outcome in HCC. Changes in ang2 suggest this may be due to reduced vascular remodeling in non-responding lesions.

CLINICAL RELEVANCE/APPLICATION

The DCE-MRI parameter DV may offer early prediction of patients unlikely to benefit from sorafenib. Early changes in therapy regime may increase survival in HCC and avoid unnecessary side effects.

SSM08-03

Contrast-enhanced Sonography (CEUS) in the Follow-up of Patients with Percutaneously-ablated Hepatocellular Carcinoma (HCC)

Orlando Catalano MD : Nothing to Disclose , Pietro Paolo Saturnino MD (Presenter): Nothing to Disclose , Paolo Vallone MD : Nothing to Disclose , Francesco Izzo MD : Nothing to Disclose , Vittoria Nunziata : Nothing to Disclose , Antonella Petrillo MD : Nothing to Disclose

PURPOSE

HCC patients treated with percutaneous ablation require close follow-up for detecting tumour recurrence. We illustrate our single-centre experience on using CEUS as a follow-up tool alternated with CT.

METHOD AND MATERIALS

In a 7-year period there were 588 patients with 1-3 HCCs treated with radiofrequency ablation (alone or combined with ethanol injection). Patients with completely ablated tumours at 1-mo. CT were followed-up serially, using alternated CEUS (one sulphur hexafluoride-based microbubbles injection per lobe) and CT every 3 months. The following patterns of recurrence were considered: A, enhancing tissue within the lesion; B, enhancing tissue adherent to the lesion; C, enhancing tissue within the same liver segment of the treated nodule; D, enhancing tissue within a different segment (progression). Patients with positive CEUS underwent confirmatory CT (standard reference).

RESULTS

Median follow-up was 29 months. There were 221 recurrences. Three pattern A recurrences (2 detected by CEUS and 1 by CT), 86 pattern B recurrences (44 detected by CEUS and 42 by CT), 70 pattern C recurrences (32 detected by CEUS and 38 by CT), and 62 pattern D recurrences (23 detected by CEUS and 39 by CT). CT detected additional nodules in 16/101 patients with positive CEUS.

CONCLUSION

CEUS is more sensitive than US in detecting HCC recurrence after percutaneous ablation and is as effective as CT in detecting HCC relapse within the same segment of the ablated nodule. Since 72% recurrences develop in the same segment of the necrotic nodule, CEUS proves to be effective despite the less comprehensive liver survey compared to CT.

CLINICAL RELEVANCE/APPLICATION

Patients with ablated HCC nodule are at high risk of recurrence and require a close, long-term monitorization. Including CEUS in patient follow-up may allow decreasing the number of CT examinations.

SSM08-04

Determining Correlation between Post-radioembolization Y-90 PET/CT Scan, Estimated Lesion Dosimetry, and Radiographic Response of Transcatheter Treated Unresectable Hepatocellular Carcinoma

Shetal N. Shah MD : Nothing to Disclose , Gordon McLennan MD (Presenter): Data Safety Monitoring Board, B. Braun Melsungen AG Research Grant, C. R. Bard, Inc Consultant, C. R. Bard, Inc Consultant,
PURPOSE

Radioembolization using Yttrium-90 (Y-90) microspheres is a treatment for unresectable hepatocellular carcinoma (HCC). A post-treatment Y-90 PET/CT scan can help determine microsphere distribution.

We studied the correlation of post treatment Y-90 PET/CT hepatic distribution, with calculated radiation dose delivered to tumor and normal liver, and therapy response assessment on subsequent CT and MRI in transcatheter treated HCC patients.

METHOD AND MATERIALS

HIPAA compliant, retrospective chart and imaging review of 57 treated patients (101 hepatic tumors) were completed. Specific activities (Bq/mL) for treated tumor and normal liver tissue were calculated from the Y-90 PET/CT scans based on overlay tumor contouring from pre-procedure triphasic liver CT and MRI. Tumor response on subsequent imaging was assessed using mRECIST.

RESULTS

The mean dose per tumor was 166.45 Gy (mode 90-120 Gy; treatment dose range 0-570 Gy). Tumor response by mRECIST correlated with dose delivered, with complete response (CR) significantly higher in lesions receiving >300 Gy, and stable disease (SD) being higher in lesions receiving <60 Gy. Normal liver tissue received a mean dose of 66.25 Gy. 8/15 (53%) pts who received a dose of radiation greater than 80 Gy to normal liver displayed signs of hepatotoxicity.

CONCLUSION

Radiation dose HCC after Y-90 dose radioembolization is similar to the brachytherapy dose used to treat other cancers. Lesion dose estimated at >300 Gy resulted in CR, while lesions receiving mean dose <60 Gy had SD by mRECIST.

CLINICAL RELEVANCE/APPLICATION

To date, few study have reported the correlation between dose injected, microsphere distribution, dose quantification, and radiographic response after Y-90 treatment in unresectable transcatheter treated HCC. This knowledge may help optimize outcomes and reduce adverse events.

SSM08-05

Computer Aided Response Prediction Based on Pre-therapy FDG PET/CT Imaging Biomarkers of Y90-SIRT Therapy in Patients with Primary and Metastatic Liver Cancers

Rahul Mehta (Presenter): Nothing to Disclose, Nishant Kumar MD: Nothing to Disclose, Hui Lu: Nothing to Disclose, Aladin Mariano MD: Nothing to Disclose, Grace Knuttilen: Nothing to Disclose, Thomas M. Anderson MD: Nothing to Disclose, Yang Lu MD, PhD: Nothing to Disclose

PURPOSE

To develop a prediction algorithm capable of determining the effectiveness of Y90-SIRT treatment in patients with primary and metastatic liver cancers through the use of imaging biomarkers extracted from PET/CT scans.

METHOD AND MATERIALS

We designed a strategy of associating changes in imaging features of tumors after treatment through the use of pattern recognition and machine learning. We modified a fuzzy clustering algorithm to automatically detect and segment liver tumors to calculate individual tumor features such as SUV, morphology, texture, and gray-level statistics. Next, we built a support vector machine (SVM) and a Bayesian model to identify critical imaging markers relevant to improvement in Y90-SIRT therapy. Finally, we evaluated the prognostic significance of the model on patients to determine whether Y90-SIRT is an effective treatment in the current state of cancer. The strategy was applied on a set of 15 pretherapy FDG PET/CT scans in patients with Cholangiocarcinoma (n=6), or liver metastases from colon cancer (n=8) and ovarian cancer (n=1). Each patient had at least a 6 month follow-up with PET/CT. Additionally, some had contrast CT or MRI studies. Y90-SIRT therapy responses were analyzed with PET/CT based PERCIST criteria.

RESULTS

The model was able to predict the effectiveness of treatment with an accuracy of 85%-95% in determining if a patient would improve based on PET/CT scan. The sensitivity was found to be 90%, while the specificity was 100%. We found the Bayesian model to have a higher accuracy rate, most likely because our cohort of data is relatively small. Furthermore, we found tumor volume, number of curves of a tumor, and edge shape had greatest prognostic significance.

CONCLUSION

The model is self-learning. As further data is accumulated, the prediction accuracy will improve. Furthermore, we can add additional imaging biomarkers to increase the sensitivity rate. The ability to predict the outcome of a treatment based on imaging biomarkers may reduce or prevent unnecessary, expensive, and invasive procedures, along with the potential to provide personalized treatments.

CLINICAL RELEVANCE/APPLICATION

The computer aided pre therapy PET/CT based prediction algorithm can predict responsiveness of liver directed Y90-SIRT therapy, thus avoiding ineffective treatment and unnecessary costly procedures.
Pretreatment Evaluation of Future Remnant Liver Function Using Gd-EOB-DTPA enhanced Magnetic Resonance Imaging in Patients Undergoing Hepatic Resection or Radiofrequency Ablation for Hepatocellular Carcinoma

Jeong Hee  Yoon  MD (Presenter):  Nothing to Disclose  , Jeong Min   Lee  MD :  Research Grant, Guerbet SA Equipment support, Siemens AG Research Grant, Bayer AG  , So Yeon   Kim  MD :  Nothing to Disclose  , Joon Il  Choi  MD, PhD :  Nothing to Disclose  , Yong-Yeon  Jeong  MD :  Nothing to Disclose  , Andrea  Schenk  PhD :  Nothing to Disclose  , Longquan  Chen  MSc :  Nothing to Disclose  , Hendrik Oliver Arp  Laue  PhD :  Nothing to Disclose

PURPOSE
To determine whether predicted remnant liver function (RLF) on dynamic hepatocyte-specific contrast-enhanced (DHCE)-MRI using Gd-EOB-DTPA correlates with standard liver function(LF) test results (ICG R15) after resection or radiofrequency ablation (RFA).

METHOD AND MATERIALS
This prospective study approved by IRB and informed consent was obtained in all patients. Fifty-five patients with hepatocellular carcinomas who underwent resection (n=50), RFA (n=2), or liver transplantation (n=3), and nine living liver donors were enrolled. All underwent DHCE-MRI and ICG R15 tests within 7 days ahead of treatment. Fifty-one patients underwent follow-up either DHCE- (n=36) or noncontrast (n=15) MRI on post-treatment day 3. Hepatic extraction fraction [HEF] and HEF multiplied by liver volume [HEFmL] were calculated using deconvolution analysis. The predicted HEF and HEFmL were compared with post-treatment ICG R15 to predict RLF. In addition, pre- and post-treatment HEF and HEFmL were compared to pre-and post-treatment ICG R15. Furthermore, critical LF was calculated using HEFmL to predict ICG R15≥20%. Last, intra-individual heterogeneity of HEF was assessed using coefficients of variation (CV) among the hepatic segments.

RESULTS
Predicted HEF and HEFmL obtained from pre-treatment MR imaging showed a statistically significant correlation with post-treatment ICG R15 (r=-0.37, -0.31, respectively, P <0.05). HEF and HEFmL calculated from pre- and post-treatment MR imaging also showed significant correlations with pre- and post-treatment ICG R15 (r=-0.39 to -0.59, respectively, P<0.05). In predicting ICG R15≥20%, HEFmL showed 73.7% sensitivity and 87.2% specificity with a cut-off value of 118.1mL (AUC: 0.78, P<0.001). In addition, 56.1% (55/98) of DHCE-MRI showed CVs of segmental HEF higher than 10% (10~40%). Figure 1 (top row). Semiautomatic volumetry (a) followed by automatic vascular segmentation (b) and identification of vascular territories (c). Figure 2. HEF maps of liver donor(a), Child A5 (b), and Child B7 (c). Note the heterogeneous distribution of HEF in each case.

CONCLUSION
DHCE-MRI provided information of global and segmental LF. In addition, RLF could be predicted using HEFmL which showed a negative correlation with post-treatment ICG R15.

CLINICAL RELEVANCE/APPLICATION
DHCE-MRI may be able to provide global and regional LF, which could be helpful for clinicians in choosing therapeutic strategy for HCC and in planning liver surgery.

Gastrointestinal (Esophagus Imaging)

SSM09-06

Value of Oral Effervescent Powder Administration for Multidetector CT Evaluation of Esophageal Cancer


PURPOSE
To assess the added value of oral effervescent powder (EP) administration for detection and T-staging of esophageal cancer at contrast-enhanced CT, as compared to studies without EP.
METHOD AND MATERIALS

84 patients without esophageal pathology and 52 patients with histological confirmed diagnosis of esophageal cancer referred for CT were included in this prospective IRB-approved study (99m/37f, mean age 61y). Half of the patients of each group were orally administered 3g effervescent powder (EP) prior to image acquisition. Esophageal distension was assessed (proximal/middle/distal/tumor level) by measurement of the inner (IA) and outer area (OA). Two blinded readers separately evaluated all datasets regarding diagnosis of esophageal cancer (yes/no) and T-staging (T0-T4), if applicable. Distension results were compared (t-Test). In patients with cancer sensitivity, specificity, negative (NPV) and positive (PPV) predictive values were calculated. CT staging results were evaluated (Cohen-k) and compared with histopathology as reference standard, which was obtained within four weeks of imaging.

RESULTS

IA and quotient IA/OA were significantly larger at all levels after EP as compared to the control (p<0.05; mean IA: 1.1 vs. 0.42, mean IA/OA: 0.34 vs. 0.13). For both readers sensitivity, specificity, NPV and PPV for detection of cancer were as follows: 78%/78%, 98%/98%, 95%/95%, 87%/87% after EP; 60%/68%, 98%/98%, 94%/94%, 80%/83% without EP. T-Staging after EP was good (k=0.838/0.674) and moderate without EP (k=0.576/0.592). Interobserver agreement for detection and staging of tumor was very good (k=0.830) and good (k=0.741) after EP, and good (k=0.774) and moderate (k=0.591) without EP, respectively.

CONCLUSION

Oral administration of effervescent powder at CT results in good distension of the esophagus, and improves detection and T-staging of esophageal cancer, as compared to control studies without effervescent powder.

CLINICAL RELEVANCE/APPLICATION

Oral administration of effervescent powder at CT improves detection and T-staging especially of subtle lesions (T1 and T2 tumors) in patients with esophageal cancer.

Incidental Extraesophago-gastric Findings at Pneumo-MDCT

Marina Ulla MD (Presenter): Nothing to Disclose, Ernestina Gentile DMD: Nothing to Disclose, Ezequiel Levy Yeyati MD: Nothing to Disclose, Gabriel Cook: Nothing to Disclose, Sofia Bakken: Nothing to Disclose, Laura Frank: Nothing to Disclose, Ricardo D. Garcia-Monaco MD, PhD: Research Consultant, Siemens AG Research Consultant, BTG International Ltd

PURPOSE

Pneumo-MDCT is a new technique being offered to patients for the presurgical assessment and characterization of esophageal and GE junction neoplasms (E-GEN). The aims of this study were to prospectively determine the frequency of extraesophago-gastric findings at Pneumo-MDCT, to classify them according to the clinical importance, relationship to E-GEN and to evaluate the consequences of these findings.

METHOD AND MATERIALS

300 consecutive patients undergoing study for E-GEN were examined with Pneumo-MDCT. Two independent radiologists reviewed the CT-images for extraesophago-gastric pathology, findings were classified as either clinically important or unimportant and related or not with E-GEN. Clinically important findings were defined as those that necessitated further diagnostic studies, medical or surgical follow-up. Electronic medical records were reviewed to determine the consequences of the workup derived from Pneumo-MDCT.

RESULTS

In the 300 patients studied: 287 patients (95%) had a total of 780 extraesophago-gastric findings, 73 (9.3%) were clinically important findings and 707 (90.7%) were unimportant. In the clinically important findings group 38/73 (52%) were lesions not related with E-GEN and 35/73 (48%) were related with E-GEN. In the clinically unimportant findings group 707/707 (100%) were not related with E-GEN. None of the patients with clinically unimportant findings underwent further testing while all important findings required follow-up.

CONCLUSION

Pneumo-MDCT identifies a large number of extraesophago-gastric findings. Extraesophago-gastric findings are common, mostly those not related with E-GEN. Only patients with highly clinical significant findings required further diagnostic testing. Additional studies to determine cost-effectiveness and legal implications of detecting extraesophago-gastric findings are warranted.

CLINICAL RELEVANCE/APPLICATION

Beyond assessment and characterization of esophageal and GE junction neoplasms, Pneumo-MDCT identifies a large number of extraesophago-gastric findings.
Squamous Cell Carcinoma and Tumor Regression after Chemoradiotherapy.

Maiko Kozumi (Presenter): Nothing to Disclose, Hideki Ota MD, PhD: Nothing to Disclose, Tomonori Matsuura: Nothing to Disclose, Kei Takase MD, PhD: Nothing to Disclose, Shoki Takahashi MD: Nothing to Disclose, Keiichi Jingu MD: Nothing to Disclose

PURPOSE

To evaluate correlation between tumor response to chemoradiotherapy (CRT) in esophageal carcinoma and histogram-derived apparent diffusion coefficient (ADC) parameters obtained from volumetric assessment of the primary lesion on diffusion-weighted MR imaging.

METHOD AND MATERIALS

Consecutive 22 patients (20 men; mean age 70.0 years, range 51-88 years) with esophageal squamous cell carcinoma (clinical T3, 17, T4, 5) were included in this prospective study. All the patients underwent radiotherapy with a total dose of 59.6-62.4 Gy and concurrent chemotherapy (cisplatin and 5-fluorouracil [5-FU], 14, nedaplatin and 5-FU, 6, docetaxel, cisplatin and 5-FU, 2). MR examination at 3 Tesla was performed 1-3 days prior to CRT. Readout-segmented echo-planar diffusion imaging (RESOLVE, b=50, 800 s/mm²) was used to acquire ADC maps. Two radiologists evaluated MR images by consensus reading. Regions of interests were placed on all slices of the ADC maps where the tumor was visualized. Histogram parameters (the mean, 10th, 25th, 50th, 75th, 90th percentiles, skewness and kurtosis) of ADCs were compared with post-treatment disease status based on Response Evaluation Criteria in Solid Tumors criteria (complete response [CR], partial response [PR] or stable disease [SD]) and tumor regression ratio in diameter on pre- and post-treatment CT scans.

RESULTS

The mean of the largest tumor diameter on pretreatment CT was 33.5 ± 9.1 mm. Post-treatment status were CR in one, PR in nine and SD in 12, respectively. Mean tumor regression ratio was 33.1 ± 22.4%. The mean 50th percentile ADC values were (1.39 ± 0.27) ×10⁻³ mm²/s in patients with CR or PR and (1.35 ± 0.18) ×10⁻³ mm²/s in those with SD (P = 0.61). None of the ADC parameters was significantly correlated with post-treatment status (Spearman’s ρ = 0.09 - 0.26, P = 0.29 - 0.79) or tumor regression ratio (Pearson’s r = -0.13 - 0.26, P = 0.25 - 0.99).

CONCLUSION

Histogram-derived pretreatment ADC parameter was not a predictive imaging biomarker for tumor response by CRT in esophageal squamous cell carcinoma. Further investigation that includes long-term follow-up is warranted to evaluate association between tumor characteristics determined by ADC and patients’ prognoses.

CLINICAL RELEVANCE/APPLICATION

ADC parameters obtained from readout-segmented echo-planar diffusion imaging are not correlated with tumor response to CRT in esophageal squamous cell carcinoma and are not recommended for its prediction.

Prognostic Utility of Pre-treatment Apparent Diffusion Coefficient in Esophageal Cancer: A Pilot Study

Francesco Giganti MD (Presenter): Nothing to Disclose, Annalaura Salerno MD: Nothing to Disclose, Elena Orsenigo: Nothing to Disclose, Damiano Chiari: Nothing to Disclose, Alessandro Del Maschio MD: Nothing to Disclose, Francesco Aldo De Cobelli MD: Nothing to Disclose

PURPOSE

Treatment options for esophageal cancer (EC) vary from endoscopic to surgical resection, with or without neo-adjuvant therapy (NT), but prognosis still remains poor. This pilot study was designated to evaluate the role of apparent diffusion coefficient (ADC) as a potential prognostic biomarker in the management of EC.

METHOD AND MATERIALS

Ethics approval was obtained from our research committee and informed, written consent was obtained from each patient. Over a period of 4 years, 23 Patients (18 men, 5 women; mean age 64 ± 11 years) with biopsy-confirmed esophageal tumor (16 esophageal and 7 Siewert I) prospectively underwent 1.5T MR system including T1, T2 and DWI (b values: 0-600 s/mm²) sequences and ADC measurements were calculated. Specifically, 14/23 patients (61%) were directly treated with radical surgery whereas 9/23 patients (39%) were submitted to NT before undergoing surgical resection, with histopathological evaluation. All participants were followed up for a median of 19 months. Pathological ADC, tumor location, pT (T1-2 vs T3-4), pN and histotype were investigated by univariate and multivariate analysis using Cox regression and Kaplan-Meier curves.

RESULTS

At the end of the follow up, 19 (83%) patients were alive and 4 (17%) had died. Median overall survival was superior to 24 months. In the univariate analysis, assuming an ADC cut off of 1.4 × 10⁻³ mm²/s, our results showed significant results in detecting patients with a better (>1.4) or worse (<1.4).

CONCLUSION

This preliminary study suggests the innovative role of ADC as a diagnostic tool able to predict the aggressiveness of EC. DW-MRI might be added in the staging of EC and, although further studies are needed, ADC could be considered a non-invasive prognostic parameter capable of distinguishing between patients with better or worse prognosis with important implications in therapeutic regimens.

CLINICAL RELEVANCE/APPLICATION

ADC could be considered a non-invasive prognostic parameter able to distinguish between patients with better or worse prognosis in esophageal cancer, with important implications in therapeutic regimens.
Markers of Sarcopenia Predict Adverse Long-term Outcome in Patients Undergoing Resection of Esophageal or Gastro-esophageal Junction Cancer

Dietmar Tamandl MD (Presenter): Nothing to Disclose, Matthias Paireder: Nothing to Disclose, Reza Asari: Nothing to Disclose, Sebastian Schoppmann MD: Nothing to Disclose, Ahmed Ba-Ssalamah MD: Speaker, Bayer AG Speaker, Siemens AG

PURPOSE
To evaluate the predictive value of sarcopenia as a potential biomarker for survival in patients undergoing potentially curative resection of esophageal or esophagogastric cancer.

METHOD AND MATERIALS
After IRB approval, 202 patients (49F/153M) were selected from the institutional database who underwent resection for esophageal cancer (EC) or cancer of the gastroesophageal junction (GEJ) between 2006 and 2013. Besides demographic and tumor-specific parameters, preoperative CT scans were used to assess established markers of sarcopenia and body composition (psoas muscle area, PMA; [lean] psoas muscle density, [L]PMD; lumbar skeletal muscle index, LSMI; intraabdominal fat, IAF; subcutaneous fat, SCF and retrorenal fat, RRF). Cox regression along with Kaplan Meier analysis was performed to assess the primary outcome parameter overall (OS) and recurrence free survival (RFS) after surgery. Median and interquartile range (IQR) was used for continuous variables.

RESULTS
202 patients underwent surgery in the observed time period, 28 had transhiatal extended gastrectomy and 174 had Ivor Lewis esophagectomy. The time period between preoperative CT scan and surgery was 15 days (7-34). Median age was 63.9 years (IQR, 56.4-70.0). 5-year OS and median OS was 39.8% and 41.4 months (95% confidence interval [CI] 21.4-61.4). Patients who were sarcopenic based on PMD

CONCLUSION
Patients who show signs of sarcopenia on preoperative CT images have impaired long-term outcome after surgery for esophageal or GEJ cancer.

CLINICAL RELEVANCE/APPLICATION
Based on CT data, this readily available information can help to identify patients who might benefit from intense nutritional support before and probably after surgery for esophageal or GE-junction cancer.

Perforated Intrathoracic Viscus: Are Two Tests Better than One?

Martha Terrazas MD (Presenter): Nothing to Disclose, Ane Lauren McCullough MD: Nothing to Disclose, William Moreau Thompson MD: Nothing To Disclose, Jess Schwartz MD: Nothing to Disclose, Loren Howard Ketai MD: Nothing to Disclose

PURPOSE
Determine the relative accuracy of Fluoroscopic Esophagography (FE) and CT in the detection of perforation of intrathoracic viscus (esophagus or neo-esophagus).

METHOD AND MATERIALS
A university hospital Radiology Information System was searched for patients who had undergone both FE and CT within three days. Those patients who had received both exams to evaluate suspected perforation of an intrathoracic viscus were included for study. FEs and CTs were evaluated by independent readers, each blinded to the results of the other exam and to the clinical outcome.FE and CT were scored separately using a 1-5 Likert scale, a score>3 designated positive. A composite score (CS) was also created, designating cases as positive if Likert score was> 3 on FE or CT. Cases were considered true positive if 1) free perforation was surgically repaired 2) contained perforation was confirmed by evolution on subsequent diagnostic imaging or 3) by post image evaluation consensus of both readers and an attending thoracic surgeon. Accuracy of FE, CT and CS were compared using McNemar’s test

RESULTS
Seventy-nine patients met the inclusion criteria, 19 of whom had free (12) or contained (7) viscus perforations. Perforations were postsurgical (6), or related to endoscopy (5), penetrating trauma (4), Boerhaave’s(3) or blunt trauma (1).CT was 69% sensitive and 88% specific, with 5 of the 6 false negatives (FNs) occurring in CTs performed without positive GI contrast.Two FNs involved penetrating trauma and two were related to endoscopy. FE was 42% sensitive and 98% specific for perforation, 5 of the FNs occurring in postsurgical perforations. Sensitivity of the composite score was 95% and specificity was 88%. Both CT and CS were significantly better than FE alone (P <.05).

CONCLUSION
CT is superior to FE in the detection of perforated intrathoracic viscus, particularly in the post-surgical setting but is not sufficiently sensitive to stand alone in all settings. Diagnostic accuracy may be improved by combining CT with FE, particularly in the diagnosis of perforations caused by penetrating or endoscopic trauma or if CT is performed without administration of positive GI contrast

CLINICAL RELEVANCE/APPLICATION
In a large cohort of patients undergoing evaluation for perforated intrathoracic viscus the relative efficacy of FE and CT was dependent upon the clinical setting. Results suggest that combination of both tests is often warranted.
Feasibility of Abdominal CT Scan at Sub Milli-Sievert Doses with Two Iterative Reconstruction Techniques: A Prospective Study


PURPOSE
To assess feasibility of abdominal CT scan acquired at CTDIvol of 1.4mGy (less than 1mSv) and reconstructed with filtered back projection (FBP) and two iterative reconstruction (IR) techniques.

METHOD AND MATERIALS
In an IRB approved prospective study, 25 patients (58.8 ±12.5years, M:F 15:10) undergoing standard of care (SOC) abdominal CT on 128-MDC (Definition FLASH, Siemens) gave written informed consent for acquisition of an extra series low dose CT scan (LD, lower reference mAs). The LD images were reconstructed with SafeCT (A1,A2,A3 settings; MedicVision) and SAFIRE (S3, S4, S5). Two radiologists evaluated LD images for lesion detection and contour delineation including liver (parenchyma, margins), adrenal (nodule detection), pancreas (duct), kidney (parenchyma and stones), bowel (wall, abnormalities) and lymph nodes. All structures were evaluated on a 5-point scale in comparison to SOC-FBP (1=supra-clinical diagnostic performance, 5= unacceptable clinical diagnostic performance). Objective noise was measured in liver and spleen. Modal scores and inter-observer agreement (kappa) were calculated for subjective quality.

RESULTS
Average CTDIvol for SOC-FBP and LD were 9±5mGy (6±4mSv) and 1.4±0.2mGy (0.9±0.05mSv), respectively. Inter-observer agreement was good (κ= 0.65). LD-FBP were suboptima (14/25) or unacceptable (11/25). SafeCT showed improvement in diagnostic performance as acceptable (7/25), limited (11/25) and suboptimal (7/25) with A2 setting. Evaluation of the SAFIRE also showed improvement in diagnostic performance, as acceptable (9/25), limited (9/25) and suboptimal (7/25) with S5. Patients with limited and suboptimal diagnostic performance had significantly higher BMI (S5: 34.0 ±7.5 kg/m2 and A2: 32 ± 9.2 kg/m2) as compared to acceptable performance (S5: 22.2 ± 6 kg/m2 and A2: 23.4 ± 5.4 kg/m2), (p =0.000). In patients with BMI<23, liver parenchyma and liver margin on LD images were not significantly different from SOC-FBP(p = 0.17-0.3). A2 (28 ± 14) and S5 (23 ± 11) settings showed similar objective noise as for the SOC-FBP abdominal CT (23 ± 7).

CONCLUSION
Both of the iterative reconstruction techniques (SafeCT and SAFIRE) improve diagnostic performance of low dose abdominal CT as opposed to FBP. However, it is crucial to select the optimal settings of the IR techniques to achieve a desirable image quality.

CLINICAL RELEVANCE/APPLICATION
It is feasible to lower the radiation dose of abdominal CT in small patients (BMI<23 kg/m2) by use of iterative reconstruction techniques.

Knowledge-based Iterative Model Reconstruction Technique for Substantial Dose Reduction in Abdominal MDCT: Comparison with Hybrid and Traditional Filtered Back Projection in a Prospective Clinical Study

PURPOSE

To assess substantial dose reduction in abdominal MDCT using a knowledge-based Iterative Model Reconstruction (IMR) technique compared with hybrid-based iDose and traditional filtered back projection (FBP) technique.

METHOD AND MATERIALS

This IRB-approved prospective study included 41 patients (62 ± 12 years; BMI 28 ± 5 kg/m2) who underwent ultra-low dose (ULD) CT immediately after their standard-of-care (SD) CT on 256 MDCT (iCT, Philips Healthcare). Size-specific dose estimates for SD and SubmSv CT were 10 ±3 mGy (~6 mSv) and 1.5 ±0.4 mGy (~0.9 mSv), respectively. SD CT were reconstructed using filtered back projection (FBP), whereas ULD CT were with FBP, IMR and iDose. Four radiologists assessed subjective image quality independently, using 5-point scale (1=supraclinical;5=unacceptable). Lesions (true, pseudo or missed) were detected on ULD-FBP and compared to SD-FBP 'reference-standard'. Objective noise and CT numbers of soft tissue structures were measured. Noise spectral density (NSD) curves to assess noise in frequency domain were obtained. Friedman’s test, ANOVA and intraclass correlation coefficient were used for data analysis.

RESULTS

All true lesions (n=52) on SD-FBP were detected on ULD images. There were no missed or pseudo-lesions on ULD images. Mean intraclass correlation was 0.7. ULD-FBP was deemed unacceptable for subjective quality. Subjective ratings showed higher image quality for IMR for liver margins, soft-tissue structures, and retroperitoneal lymphadenopathy, compared to iDose in patients with a BMI ≤25 kg/m2. For patients with BMI >26 kg/m2, ULD IMR outperformed FBP and iDose for subjective ratings. Irrespective of patient BMI, subjective ratings for hepatic lesions, renal cysts, and colonic diverticula were significantly better with ULD IMR images. Objective noise for ULD-FBP and iDose was 57-66% and 10-23% higher compared to SD-FBP, but 8-56% lower with ULD-IMR. NSD showed significantly lower noise in the frequency domain with IMR technique in all patients irrespective of BMI.

CONCLUSION

Lesion detection is similar in standard-dose and ultra-low dose abdominal MDCT (~1.5 mGy). IMR considerably improved image quality compared to iDose and FBP with mean 85% dose reduction.

CLINICAL RELEVANCE/APPLICATION

Knowledge-based Iterative Model Reconstruction technique enables substantial dose reduction in abdominal MDCT with uncompromised lesion detection compared to standard-of-care abdominal CT.
Dose Optimization of a Dual-source, Dual-energy Abdominal CT Protocol in Comparison to a Single-source CT Protocol: Assessment of Radiation Dose, Quantitative and Qualitative Image Analysis

Matthias Benz MD (Presenter): Nothing to Disclose, Caroline Zahringer: Nothing to Disclose, Achim Kircher: Nothing to Disclose, Luigia D’Errico: Nothing to Disclose, Fides Schwartz: Nothing to Disclose, Maka N. Kekelidze MD, PhD: Nothing to Disclose, Sebastian Tobias Schindera MD: Research Grant, Siemens AG Research Grant, Ulrich GmbH & Co KG

PURPOSE
To compare the radiation dose and image quality of two dual-energy abdominal CT protocols compared with a single-energy protocol.

METHOD AND MATERIALS
75 routine abdomino-pelvic CT examinations were performed on a dual-source CT scanner (Somatom Definition Flash, Siemens). 25 CT scans were performed using the dual-energy protocol recommended by the vendor (tube A, 100 kVp, 230 ref. mAs; tube B, 140 kVp, 178 ref. mAs) (protocol A), 25 CT scans were performed using a dose-optimized dual-energy protocol which was evaluated in a previous phantom study (tube A, 100 kVp, 150 ref. mAs; tube B, 140 kVp, 116 ref. mAs) (protocol B), and 25 CT scans were performed using a single-energy CT protocol (120 ref. kVp, 150 ref. mAs) (protocol C). The radiation dose was assessed with the size-specific dose estimates (SSDE) (Radimetrics, Bayer Healthcare). Objective noise measurements were calculated. Five readers scored each scan according to six subjective image quality parameters: noise, contrast, artifacts, visibility of small structures, sharpness, and overall diagnostic confidence.

RESULTS
The body mass index was not significantly different between group A, B, and C (25.7±4.9, 24.9±3.7, and 27.4±4.9 kg/m2, respectively; p=0.12). The SSDE of protocol A, B, and C measured 14.6, 8.1, and 8.0 mGy, respectively (p<0.001). The objective image noise measured 4.2±0.8, 5.6±0.8, and 5.6±1.0 for protocol A, B, and C, respectively (p<0.001). The five readers ranked protocol A best in all six subjective image quality parameters (p<0.05). Except for the subjective image noise (2.6±0.4 vs. 2.9±0.5; p=0.009), no significant difference in the other five subjective image quality parameters was observed between the dose-optimized dual-energy protocol (protocol B) and the standard single energy protocol (protocol C).

CONCLUSION
The default dual-energy abdominal CT protocol can be optimized to achieve a dose-neutral scan in comparison to a single-energy CT scan. The dose neutral dual-energy CT scan results in a similar quantitative and qualitative image quality compared to a standard single-energy CT scan.

**CLINICAL RELEVANCE/APPLICATION**

By optimizing the default abdominal dual-source protocol, dual-energy CT can be acquired at no extra radiation dose compared with single-energy CT, yielding potential clinical benefits from the dual-energy data set.

**Spectral CT Imaging in Abdominal Patients: Evaluation of Whether the Virtual Nonenhanced Images from Contrast-enhanced Spectral CT Could Replace Plain Scan for Radiation Dose Reduction**

Duan Haifeng MMed (Presenter): Nothing to Disclose, Ma Guangming MMed: Nothing to Disclose, Zhang Xirong MMed: Nothing to Disclose, Yang Chuangbo MMed: Nothing to Disclose, Guo Youmin MD: Nothing to Disclose, Tian Qian MMed: Nothing to Disclose, Jia Yongjun MMed: Nothing to Disclose

**PURPOSE**

To evaluate if the virtual nonenhanced (VNE) images generated from the contrast-enhanced spectral CT images could replace the true nonenhanced (TNE) for radiation dose reduction.

**METHOD AND MATERIALS**

40 adults (28 males and 12 females, ages: 23-76 years) underwent 3-phase abdominal CT were retrospectively analyzed. Plain CT was performed with conventional 120kVp. The contrast-enhanced scans in the arterial phase (AP) and portal venous phase (VP) were performed with spectral CT imaging mode. VNE images were generated from the AP and VP spectral CT images. 2 board-certified radiologists reviewed both TNE and VNE images for image quality and lesion detection. Mean CT value, signal-noise-ratio (SNR) and contrast-noise-ratio (CNR) for liver, spleen, kidney, pancreas and muscle were measured. Lesion detection rate, subjective image rating and radiation dose were also assessed and compared.

**RESULTS**

Both the TNE and VNE images satisfied clinical needs for lesion detection and image quality. The image quality scores were 4.73±0.55, 4.25±0.90 and 4.55±0.64 for TNE, VNE at AP and VNE at PP, respectively, and there was no difference in terms of number of lesions detected (108, 100 and 104, respectively) (p>0.05). The mean and standard deviation values (in HU) of the CT number in liver, spleen, kidney, pancreas and muscle were, respectively, (53.16±6.11, 48.40±6.06, 36.84±9.41, 32.00±3.34 and 46.00±5.62) on TNE, (54.12±6.39, 50.79±5.06, 41.99±7.65, 34.34±4.62 and 48.22±5.90) on VNE at AP and (57.09±5.91, 53.80±3.98, 43.30±6.87, 34.08±3.68, and 49.16±6.19) on VNE at VP. There was slight bias for CT numbers on VNE. However, the absolute difference in CT number between VNE and TNE was less than 10HU, with the largest at VP for the pancreas. VNE at AP had better CT number fidelity with the smallest difference for the liver. CNR values in 3 groups were similar. VNE images provided statistically higher SNR. The potential dose reduction for replacing TNE with VNE was 21.4%.

**CONCLUSION**

VNE image generated from the contrast-enhanced abdominal spectral CT provides adequate image quality for lesion depiction, high CT number fidelity and 20% dose reduction compares with TNE.

**CLINICAL RELEVANCE/APPLICATION**

VNE images generated from the contrast-enhanced abdominal spectral CT may be used to replace TNE images to provide adequate image quality for lesion depiction and 20% dose reduction.
SSM19-01  Value of Novel Contrast-enhanced Dual-phase (Arterial and Noncontrast) Sestamibi 2D SPECT-CT Technique in Preoperative Localization of Parathyroid Disease

Jacob William Sechrest MD (Presenter): Nothing to Disclose, Seyed Mohammad MD: Nothing to Disclose, Rajarsi Mandal MD: Nothing to Disclose, Umamaheswar Duvvuri MD: Nothing to Disclose, Robert L. Ferris MD, PhD: Nothing to Disclose, Ashok Muthukrishnan MD: Nothing to Disclose

PURPOSE

The use of multiphase 4DCT in the preoperative detection of parathyroid adenomas has been on the rise recently. On the other hand, with the recent advent of high quality SPECT-CT gamma cameras with better CT capabilities, the localization accuracy of sestamibi SPECT-CT has vastly improved. At our institution, we have introduced a novel hybrid technique by incorporating two of the four phases (the arterial and non-contrast) of the 4DCT with concomitant sestamibi SPECT. We evaluated the value of this dual-phase 2D SPECT-CT technique in comparison with the conventional SPECT-CT in preoperative localization of parathyroid adenomas.

METHOD AND MATERIALS

A total of 58 patients who underwent sestamibi SPECT-CT imaging on the Siemens SymbiaT6™ slice SPECT-CT scanner in the past two years at our institution were retrospectively analyzed. 32 of these had the conventional early/delayed SPECT-CT protocol with CT for localization and attenuation correction purposes only. 26 had dual phase (arterial and noncontrast) CT during the concomitant early/delayed SPECT respectively. The images were interpreted on a diagnostic confidence scale of 0 to 3 (0 negative, 1=possible, 2=probable and 3=definite evidence of parathyroid lesion). The size and number of the lesions were also analyzed and correlated with final pathology results for concordance.

RESULTS

The conventional SPECT-CT identified a total of 35 lesions in 32 patients. 34 of these were true parathyroid lesions and only 1 was false positive. 23 of 35 lesions were categorized as definite(score 3) and all of them were > 1 cm on imaging. On the dual phase 2D SPECT-CT, a total of 27 lesions in 26 patients were identified. 4 patients had false-negative results. It correctly identified 3 multiglandular and 19 single lesions. 20 lesions were identified with the highest diagnostic confidence (score 3).17 of these were >1cm. Overall, there was no statistically significant difference in the concordance rate between the two techniques (p=0.65).

CONCLUSION

Dual phase contrast Sestamibi SPECT-CT did not increase the sensitivity of lesional detection in hyperparathyroid patients for preoperative disease localization, when compared with the conventional noncontrast SPECT-CT.

CLINICAL RELEVANCE/APPLICATION

Dual-phase Sestamibi 2D SPECT-CT technique does not warrant routine adoption in parathyroid imaging. However, it could benefit those with extensive thyroid nodules, prior negative imaging and/or failed exploration.

SSM19-02 Sequential Multiphase and Dual Tracer” (SMADT) Imaging of the Neck for Detection and Localisation of Parathyroid Disease and Comparison with Ultrasound

Alison May Berner BA, MBBS (Presenter): Nothing to Disclose, Ewa Nowosinska MBBS, MRCP: Nothing to Disclose, Athar Haroon MBBS: Nothing to Disclose, Mo Luqman: Nothing to Disclose, Margaret W. Newell PhD: Nothing to Disclose, Hikmat Jan MD, MBChB: Nothing to Disclose

PURPOSE

To evaluate the sensitivity and specificity of SMADT (sequential multiphase and dual tracer) technique utilising 99mTcO4 and Dynamic 99mTc MIBI with SPECT/CT for detection and localisation of hyper-functioning parathyroid tissue and to compare with ultrasound (US).

METHOD AND MATERIALS

64 patients (16 male, 48 female, mean age 55 years) with hyperparathyroidism were scanned over 4 years. For SMADT technique, 80 MBq 99mTcO4 was injected with dynamic thyroid image acquisition started at 20 minutes, 900 MBq 99mTc MIBI injection at 30 minutes and dynamic imaging continued until 50 minutes. SPECT was acquired at 60 minutes with further SPECT/CT of the neck at 3 hours. Subsequent subtraction and statistical difference analyses were performed following processing of dynamic data. Neck US was carried out within 3 months. Findings for each parathyroid gland and the thyroid were classified as positive or negative. Patients underwent surgical resection of parathyroid tissue according to imaging results. Histology for each sample was classified as normal, indeterminate, hyperplasia, adenoma or carcinoma. SMADT findings were correlated with histology.

RESULTS

86 histological samples were resected (18 normal, 6 indeterminate, 9 hyperplasia, 50 adenoma, 3 carcinoma). The sensitivity of both SMADT and neck US for detecting parathyroid hyperplasia, adenoma, carcinoma or indeterminate lesions was 82.3% (95% CI = 70.1-94.4). Sensitivity for localisation to individual glands for SMADT was 70.6% (95% CI = 58.1-80.7) and for neck US was 60.3% (95% CI = 47.7-71.8). Specificity for localisation was 94.4% (95% CI = 70.6-99.7) for SMADT and 72.2% (95% CI = 46.4-89.2) for neck US. SMADT imaging detected two intrathyroidal lesions not seen on neck US.

CONCLUSION

SMADT and neck US are equally sensitive for detection of hyper-functioning parathyroid tissue in
hyperparathyroid patients. The use of sequential multiphase and dual tracer imaging better facilitates lesion localisation for varying parathyroid pathologies.

**CLINICAL RELEVANCE/APPLICATION**

Sequential multiphase and dual tracer technique complements the role of previously available imaging modalities for detection and localisation of hyper-functioning parathyroid tissue prior to surgery.

**SSM19-03**

**Association between the Presence of Genetic BRAF Mutation and Clinicopathological Characteristics in the Papillary Thyroid Cancer Patients**

Sung M. Kim MD (Presenter): Nothing to Disclose, Charles M. Intenzo MD: Nothing to Disclose

**PURPOSE**

It has been reported that BRAF mutation is the most common in papillary thyroid cancer (PTC). It correlates strongly with high-risk clinicopathological characteristics, tumor recurrence and reduced sensitivity of radiiodine therapy, due to reduced expression of sodiumiodine symporter and lost capacity of iodine uptake. The study evaluates the association between the presence of BRAF mutation in the PTC, high-risk clinical parameters, and the presence of stunned thyroid.

**METHOD AND MATERIALS**

A total of 30 thyroid cancer patients who had a radioiodine treatment for PTC were retrospectively reviewed to see if the presence of BRAF gene mutation in the PTC patients and to see correlation between BRAF gene mutation and clinic parameters of high-risks clinicopathological parameters in PTC such as age, sex, tumor size, extrathyroidal invasion, nodal and distant metastases (TNM staging).

**RESULTS**

Twenty-one patients had a positive BRAF gene mutation (group = A) and 9 patients had a negative gene mutation (group = B). Age and sex distributions between the two groups are similar, with no statistical significance. However, group A has a higher frequency of T3a, T4a, N1b, M1 and extranodal spread. There are 4 (19%) stunned thyroid in group A and 1 (11%) in group B; no statistically significance.

**CONCLUSION**

PTC patients with BRAF gene mutation positive has a higher grade of PTC than those patients without a gene mutation. There is no association between presence of BRAF gene positive and presence of stunned thyroid. The presence of gene mutation would be important parameter for management of PTC patients.

**CLINICAL RELEVANCE/APPLICATION**

Presence of BRAF gene mutaion is one of important clinicopathological parameters for management of papillary thyroid cancer patients in the future. Its presence indicates a higher grade of PTC that will behave aggressively.

**SSM19-04**

**The Effects of Age and Routine Dietary Iodine Consumption on Performance of Low Iodine Diet for rhTSH-aided Radioiodine Ablation for Papillary Thyroid Cancer**

Kunihiro Nakada (Presenter): Nothing to Disclose, Mika Tamura BS: Nothing to Disclose, Masayuki Sakurai: Nothing to Disclose, Ysushi Furuta MD, PhD: Nothing to Disclose

**PURPOSE**

Low iodine diet (LID) is an important preparation to enhance efficacy of radioiodine therapy for thyroid cancer. However, practice of stringent LID for longer duration could be complicated and boring. The aim of this study was to determine individual characteristics that are linked with failure of LID.

**METHOD AND MATERIALS**

We studied 38 patients with postsurgical papillary thyroid carcinoma who were to undergo rh-TSH aided remnant tissue ablation using 30mCi of I-131. Pathologic finding was either pT3/pT4 or pN1a/N1b in all. After counseling by a dietitian, LID was done from 8 days before to 2 days after administration of I-131. As a parameter of total body iodine, urinary iodine concentration normalized by urinary creatinin (UIC: μg/gCRE) was measured before start of LID (UICb) and on the day of I-131 ablation (UICp). Based on UICp, performance of LID was defined as successful (<150) or unsuccessful (>=150). As possible factors for unsuccessful LID, we focused on age, gender, BMI, estimated GFR, residence, frequency of dinning out during LID period, given dose of I-T4, daily iodine consumption estimated by food frequency questionnaire, and UICb. Radioiodine uptake in the remnant tissue (RIU) was semi-quantitatively assessed using a gamma camera at 3 days after ingestion of I-131.

**RESULTS**

UICb and UICp ranged from 25 to 7840 and 19 to 1850 (average: 723 and 181, respectively. 30 out of 38(79%) patients were assigned to successful LID while the remaining 8(21%) was assigned to unsuccessful LID. There was a significant inverse correlation between UICb and RIU (r=-0.641). Also, there were significant difference in the RIU between patients with successful LID and those with unsuccessful LID(9.2 vs.5.8, p60 yrs.) and UICb (>400) were the significant factors associated with unsuccessful LID results.
CONCLUSION
Unsuccessful performance of LID was seen in about 20% of the patients. The older patients or patients with high UIC under routine diet have higher risk for unsuccessful LID performance. Those patients may require special consideration regarding LID protocol in depleting total body iodine for rh-TSH aided radioiodine ablation for thyroid cancer.

CLINICAL RELEVANCE/APPLICATION
For successful depletion of total body iodine for radioiodine ablation of remnant thyroid tissue, duration of stringency of LID may be adjusted for each patient according to age and UIC levels at routine dietary condition.

SSM19-05
Survival of Pheochromocytoma, Paraganglioma, and Carcinoid Patients Treated with I-131 MIBG

PURPOSE
The purpose of this study is to determine whether I-131 MIBG has any benefit for survival of patients with pheochromocytoma, paraganglioma, and carcinoid.

METHOD AND MATERIALS
We retrospectively reviewed 128 patients with paraganglioma/pheochromocytoma and 215 patients with carcinoid treated with I-131 MIBG over the 24 years of practice at Duke University Hospital with I-131 MIBG therapy. We reviewed medical records, the National Death Registry, and publicly available death records to determine whether patients showed any increase in survival over historical data on patients with carcinoid and pheochromocytoma/paraganglioma, both from treatment and from the date of diagnosis with metastatic disease.

RESULTS
Using NDI data, and assuming any patient not shown as being dead in the NDI, medical record, or publicly available death records to be alive at least until December 31, 2011 (the last date for which NDI death data was available), median survival times for carcinoid were 1720 days (58 months) from diagnosis of metastatic disease and 877 (29 months) days from treatment. Comparable survival data for metastatic carcinoid after Yao (2008) is 33 months. Median survival times for pheochromocytoma/paraganglioma were 2110 days (70 months) from diagnosis of metastatic disease and 1513 days (50 months) from treatment. This is slightly improved over the average 50% five-year survival rate for metastatic pheochromocytoma and paraganglioma.

CONCLUSION
Patients treated with MIBG have higher survival times than average, particularly for carcinoid, suggesting some therapeutic benefit in terms of prolonging survival.

CLINICAL RELEVANCE/APPLICATION
Some prolongation of survival is likely with I-131 MIBG.

SSM19-06
Semi-automatic 3D-Volumetric Lesion Quantification in Liver Metastasized Neuroendocrine Tumors for Improved Therapy Stratification prior to PRRT

PURPOSE
Patients with liver metastases of gastroenteropancreatic neuroendocrine tumors (GEP-NETs) are usually treated with Lutetium- DOTA(0)-Phe(1)-Tyr(3)octreotid (Lu-DOTATOC) or Yttrium- DOTA(0)-Phe(1)-Tyr(3)octreotid (Y-DOTATOC) PRRT depending on initial tumor load, especially focusing on lesion diameter. Since patients with GEP-NETs usually present with disseminated liver lesions, semi-automatic lesion detection might be more objective in clinical work flow. This study’s objective is to evaluate semi-automated measurement of total lesion distribution for therapy stratification in patients with GEP-NETs.

METHOD AND MATERIALS
All liver lesions (n =1537) in 19 patients with histological diagnosis of GEP-NETs who underwent contrast enhanced MRI scans on a 1.5 T whole body system using Gd-EOB-DTPA, a hepatocyte-specific contrast agent, before peptide receptor radionuclide therapy (PRRT) treatment were acquired using MEVIS Software for 3D segmentation of liver lesions in this cross-sectional study. The distribution of tumor load into two sections greater respectively smaller 20mm in longest 3D diameter was calculated and used for objective therapy
stratification.

RESULTS

Lesion distribution was successfully quantified in all 19 Patients. The mean count of lesions smaller 20mm was 67.5, the count greater 20mm was 13.4. However, the mean contribution to tumor load of lesions smaller 20mm was 23.70%, the contribution of lesions greater 20mm was 76.30%, on average, respectively.

CONCLUSION

Semi-automatic lesion acquisition for tumor-load detection provides essential information for therapy stratification prior to PRRT. As lesion assessment in standard quantification can be challenging, our study presents a new approach for operator-independent lesion analysis for improved diagnostic surrogates. Though, the segmentation process has yet to be optimized in order to provide for a faster lesion mapping.

CLINICAL RELEVANCE/APPLICATION

Objective lesion quantification in patients with GEP-NETs enables precise and individual patient therapy regimens.

MSSR44

RSNA/ESR Emergency Symposium: Abdominal Emergencies (An Interactive Session)

Multisession Courses

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<th>ER</th>
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AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Wed, Dec 3 3:30 PM - 5:00 PM  Location: S402AB

Sub-Events

MSSR44A  Abdominal Injuries

Andras Palko MD, PhD (Presenter): Medical Advisory Board, Euromedic International NV

LEARNING OBJECTIVES

1) To explain the significance of injury mechanism and its role in the formation of consequent abdominal lesions and their complications. 2) To outline the role of proper imaging technique and diagnostic algorithm in the sufficiently fast diagnosis of abdominal injuries. 3) To learn more about the typical and unusual findings of various abdominal traumatic conditions.

ABSTRACT

Abdominal injuries require a timely and reliable diagnosis in order to prevent the potentially lethal outcome. The armory of clinical tools (physical examination, lab tests) does not fulfill these criteria, since they are either not fast, or not reliable. Imaging diagnostic modalities help the clinician to acquire the necessary amount of information to initiate focused and effective treatment. However, the selection of the appropriate imaging algorithm, modality and technique, as well as the precise detection and interpretation of essential imaging findings are frequently challenging, especially because the circumstances, under which these examinations are performed (open wounds, bandages, non-removable life-supporting equipment, lack of patient cooperation, etc.), are frequently less than optimal. Knowledge of critical imaging signs, symptoms and the role they play in the evaluation of the patient's condition, but also fast decision-making and ability to closely cooperate with the clinicians are skills of key importance for radiologist members of the trauma team.

MSSR44B  The Enemy Within, Non-Traumatic Abdominal Emergencies

Ronald Jay Zagoria MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia. 3) Attendees will learn the CT findings of common causes of an 'acute' abdomen. 4) Attendees will learn the imaging findings of acute, nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

This segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain. CT findings will be emphasized. Key imaging findings of nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.
Interactive Case Discussion

Ronald Jay Zagoria MD (Presenter): Nothing to Disclose, Andras Palko MD, PhD (Presenter): Medical Advisory Board, Euromedic International NV

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for traumatic and non-traumatic causes of abdominal pain.
2) Attendees will learn the CT signs and causes of bowel ischemia and injuries.
3) Attendees will learn the CT findings of common causes of a traumatic and non-traumatic 'acute' abdomen.
4) Attendees will learn the imaging findings of acute, traumatic and nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

Using cases and an audience response system, this segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain and abdominal injuries. CT findings will be emphasized. Key imaging findings of traumatic and nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of blunt an penetrating abdominal injuries, urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

Case-based Review of Pediatric Radiology (An Interactive Session)

Multisession Courses

PD | IR | MK | GI | CR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 8:30 AM - 10:00 AM Location: S406A

Participants

Director
Sudha Ayyala Anupindi MD Nothing to Disclose

LEARNING OBJECTIVES

1) Access the results of new research and assess their potential applications to clinical practice.
2) Improve basic knowledge and skills relevant to clinical practice.
3) Practice new techniques.
4) Assess the potential of technological innovations and advances to enhance clinical practice and problem-solving.
5) Apply principles of critical thinking to ideas from experts and peers in the radiologic sciences.

Sub-Events

Abdominal Masses in Children
Sudha Ayyala Anupindi MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the common types of abdominal tumors in children and the practical pathway of imaging.
2) Analyze the common features of these abdominal tumors in a case based format.
3) Discuss the differential diagnosis and therapeutic options for each case.

ABSTRACT

During this session we will be presenting cases of common pediatric abdominal tumors. The following are the learning objectives: At the end of the session the participant will be able to: 1) Identify the common types of abdominal tumors in children and the practical pathway of imaging 2) Analyze the common features of these abdominal tumors in a case based format 3) Discuss the differential diagnosis and therapeutic options for each case.

Interventional Procedures in Infants and Children
Ricardo Restrepo MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Pediatric Bone Marrow Imaging
Kirsten Ecklund MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Apply conventional and advanced MR techniques to design adequate protocols for assessment of pediatric bone marrow disorders. 2) Recognize normal age related variations in bone marrow signal intensity throughout the skeleton. 3) Identify primary and secondary marrow abnormalities that accompany focal and systemic disorders of the musculoskeleton.

**RC609**

**Gastrointestinal: CT Colonography Update (An Interactive Session)**

*Refresher/Informatics*

**Sub-Events**

**RC609A**

**Current Approaches and Controversies in Patient Preparation**

Kevin J. Chang MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) List various options for bowel catharsis and their relative advantages and disadvantages. 2) List various options and the timing of fecal and fluid tagging agents. 3) Evaluate potential indications for noncathartic or minimal cathartic preparations and their disadvantages.

**RC609B**

**Interpretation Principles and the Difficult Lesion**

David H. Kim MD (Presenter): Consultant, Viatronix, Inc Co-founder, VirtuoCTC, LLC Medical Advisory Board, Digital ArtForms, Inc

**LEARNING OBJECTIVES**

1) List the two tasks undertaken during CTC interpretation. 2) Identify the reasons underlying the difficulty in flat polyp detection and characterization. 3) State the importance of serrated polyps related to cancer development.

**RC609C**

**Pitfalls at CT Colonography**

Seong Ho Park MD (Presenter): Research Grant, DONGKOOK Pharmaceutical Co, Ltd Research Grant, General Electric Company

**LEARNING OBJECTIVES**

1) To understand the pitfalls related to CT colonography techniques and how to avoid them. 2) To understand the pitfalls in interpreting CT colonography and how to avoid them.

**RC609D**

**Current Status of CT Colonography and Reimbursement**

Judy Yee MD (Presenter): Research Grant, EchoPixel, Inc

**LEARNING OBJECTIVES**

1) To learn some of the latest advances in performance of CTC. 2) To understand the current challenges to national reimbursement for screening CTC. 3) To review methods for local dissemination of CTC.

**RC629**

**HCC Diagnosis Using LI-RADS (An Interactive Session)**

*Refresher/Informatics*
**LEARNING OBJECTIVES**

1) Review underlying clinical scenarios that predispose patients to develop hepatocellular carcinoma. 2) Understand typical imaging appearances at MR imaging such that when characteristic imaging features are seen in the correct clinical setting, we can be certain that the diagnosis is hepatocellular carcinoma. 3) Describe variant features and secondary signs that are either suggestive of, or argue against, the diagnosis of hepatocellular carcinoma.

**URL’s**

http://www.acr.org/Quality-Safety/Resources/LIRADS

**LEARNING OBJECTIVES**

1) To familiarize radiologists with the current version of the Liver Imaging Reporting and Data System (LI-RADS) and its associated lexicon, atlas, and reporting recommendations. 2) To review the categories for liver observations in LI-RADS. 3) To demonstrate how to access and use the algorithm for determining the category of a liver observation.

**REPORTING LI-RADS RESULTS**

1) To discuss standards for liver lesion reporting, using the Liver Imaging Reporting and Data System (LI-RADS).

**ABSTRACT**

The Liver Imaging Reporting and Data System (LI-RADS) includes a reporting template for contrast-enhanced CT and MRI, and minimum reporting standards. This talk will discuss those reporting standards and provide tips for clear and concise reporting.

**LEARNING OBJECTIVES**

1) Gain knowledge as to how to approach tumor ablation in extrahepatic sites. 2) How to avoid and manage organ specific complications. 3) Review results of tumor ablation in the lung, kidney, and bone.
complications. 3) Review results of tumor ablation in the lung, kidney, and bone.

ABSTRACT
Pulmonary malignancies, and specifically lung cancer, are a leading cause of death worldwide. Utilization of best current therapies results in an overall five-year relative survival rate for all stages combined to be only 15%, necessitating the use of alternative therapies. Image-guided ablation of lung malignancies is a revolutionary concept whose clinical applications are just beginning to be developed. It has some advantages over traditional radiotherapy and chemotherapy. Its safety profile is similar to percutaneous image-guided lung biopsy. Almost all image-guided ablative procedures can be performed in an outpatient setting, mostly with conscious sedation. Multiple applications can be performed without any additional risks. Contraindications are few and include uncontrollable diathesis and recent use of anticoagulants. Image-guided ablation of lung malignancies is performed with two basic rationales. In the first group it is used with an intention of achieving definitive therapy. These are patients who are not candidates for surgery because of co-morbid medical contraindications to surgery, like poor cardiopulmonary reserve or patients refusing to undergo operation. This cohort could potentially derive significant benefit form a minimally invasive alternative therapy. In the second group it is used as a palliative measure as follows: (a) to achieve tumor reduction before chemotherapy (b) to palliate local symptoms related to aggressive tumor growth, such as chest pain, chest wall pain or dyspnea (c) hematogenous painful bony metastatic disease (d) tumor recurrence in patients who are not suitable for repeat radiation therapy or surgery Image-guided ablation is expanding treatment options for the local control of non-small cell lung cancer and metastatic disease.

MSRT52

ASRT@RSNA 2014: Stomach Esophageal Pathology

Multisession Courses

AMa PRA Category 1 Credits™: 1.00
ARRT Category A+ Credit: 1.00
Thu, Dec 4 9:15 AM - 10:15 AM  Location: N230AB

Participants
Jeffrey Crowley BS, RRA (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) The attendee will gain an understanding of the structure and function of the esophagus 2) The attendee will have an overview of radiographic pathology of many disease processes of the esophagus. 3) The attendee will gain an understanding of the structure an function of the stomach. 4) The attendee will be given an overview of the radiographic pathology of many disease processes of the stomach. 5) The attendee will participate in case studies involving disease processes of the esophagus and stomach.

ABSTRACT
In this course a overview of the structure and function of the stomach and esophagus will be given. Several common disease processes will be discussed using radiographic findings. The final portion will be case studies of some of the disease processes discussed in the lecture.

MSCP52

Case-based Review of Pediatric Radiology (An Interactive Session)

Multisession Courses

AMa PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 10:30 AM - 12:00 PM  Location: S406A

Participants
Director
Sudha Ayyala Anupindi MD Nothing to Disclose

LEARNING OBJECTIVES
1) Access the results of new research and assess their potential applications to clinical practice. 2) Improve basic knowledge and skills relevant to clinical practice. 3) Practice new techniques. 4) Assess the potential of technological innovations and advances to enhance clinical practice and problem-solving. 5) Apply principles of critical thinking to ideas from experts and peers in the radiologic sciences.

Sub-Events

MSCP52A  Congenital and Acquired Thoracic Vascular Disorders in Children
Edward Yungjae Lee MD, MPH (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Discuss practical imaging techniques for evaluating congenital and acquired thoracic vascular disorders in children. 2) Review helpful clinical aspects and imaging findings of pediatric thoracic vascular diseases. 3) Learn characteristic imaging findings to narrow the differential diagnoses of various pediatric thoracic vascular disorders.
MSCP52B  Pediatric Abdominal Infectious and Inflammatory Disorders  Thaddeus W. Herliczek MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the imaging appearance of conditions causing pediatric right lower quadrant pain. 2) Recognize the characteristic magnetic resonance imaging features of pediatric appendicitis. 3) Understand the imaging appearance, complications and etiologies of pediatric pancreatitis. 4) Describe the imaging features of pediatric infectious hepatobiliary disease.

MSCP52C  Pediatric Musculoskeletal Neoplasms  Jung-Eun Cheon MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the imaging approach to pediatric musculoskeletal neoplasms. 2) Discuss the role of different imaging modalities in the evaluation of pediatric musculoskeletal neoplasms. 3) Identify the common location and characteristic imaging findings of pediatric musculoskeletal neoplasms.

ABSTRACT

Frequency, location, and imaging characteristics are important diagnostic clues in pediatric bone and soft-tissue tumors, either benign or malignant. MR imaging has evolved as the most important diagnostic tool for local staging of primary bone and soft tissue tumors, for monitoring response to chemotherapy, and for detecting postoperative tumor recurrence. A detailed discussion of all bone and soft tissue tumors is well beyond the scope of this review; instead, we highlight the initial evaluation and staging of primary pediatric musculoskeletal neoplasms.

MSES52  Essentials of Postoperative Gastrointestinal Imaging  Multisession Courses

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 10:30 AM - 12:00 PM  Location: S406B

Sub-Events

MSES52A  Postoperative Upper GI  Cheri Lee Canon MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To identify normal postoperative anatomy of the upper GI track. 2) To diagnose complications of upper GI surgeries.

MSES52B  Imaging of the Post-operative Pancreas  Erik K. Paulson MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Identify expected cross-sectional imaging findings in patients who have undergone pancreatic surgery. 2) Identify complications in patients who have undergone pancreatic surgery.

MSES52C  Postoperative Liver  Philippe Alain Soyer MD, PhD (Presenter): Research Consultant, Guerbet SA Research Consultant, Ipsen SA

LEARNING OBJECTIVES

1) To become familiar with the expected appearances of the liver following surgery. 2) To highlight the complementary role of the various imaging techniques in the diagnosis of postoperative complications. 3) To become familiar with the imaging features of early and late complications including recurrence of the initial disease. 4) To understand how CT and MR imaging can help with management decision.
**LEARNING OBJECTIVES**

1) To review common colon surgical procedures. 2) To review the routine radiographic findings after colorectal surgery. 3) To review the radiographic findings of complications after colorectal surgery.

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**PARTICIPANTS**

**Moderator**

J. Louis Hinshaw MD: Stockholder, NeuWave Medical Inc Medical Advisory Board, NeuWave Medical Inc Stockholder, Cellebarity Biosciences, Inc

**Moderator**

Andrew Dennis Smith MD, PhD: Research Grant, Pfizer Inc President, Radiostics LLC President, Liver Nodularity LLC President, Color Enhanced Detection LLC Pending Patent, Radiostics LLC Pending Patent, Liver Nodularity LLC Pending Patent, Color Enhanced Detection LLC

**Moderator**

Keyanoosh Hosseinzadeh MD: Consultant, Bayer AG

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**Sub-Events**

**SSQ06-01**

Different Approaches and Methodological Principles of Reporting in Chest/Abdominal CT with Oncologic Questioning by Residents and Radiology Specialists with Regard to Professional Experience: Results of a Clinical Investigation Using Eye-Tracking

Sara Kammerer (Presenter): Nothing to Disclose, Anna Knauer: Nothing to Disclose, Christoph Schuelke: Nothing to Disclose, Walter Leonhard Heindel MD: Nothing to Disclose, Boris Buerke MD: Nothing to Disclose

**PURPOSE**

Contrast-enhanced thoracoabdominal CT is an established method in cancer staging. However, higher rates of missed pathologies in case of little work experience suggest that a methodical approach of detection of pathologies can be learned. Thus, aim of this study is to investigate differences in focusing of radiologic residents or specialists when screening CT for oncological findings to evaluate the efficiency of different methodological principles in analysis of CTs according to the professional experience.

**METHOD AND MATERIALS**

Thoracoabdominal MSCTs of 20 patients with the clinical indication of staging owing to known underlying oncological disease were included. CTs were presented to 4 radiologists with varying years of working experience and evaluated independently of one another. Meanwhile, ocular fixation positions are recorded using an eye-tracking software tool (Tobi X2-60 EyeTracker), a commercially available software tool that is already perfectly established. CTs were retrospectively analysed with the issue of successful detection of all pathologies. Based on the eye-fixation patterns, heat maps were created. Visual attention, dwell time of ocular fixation on clinically important or areas with pathologic findings, general search patterns and time efficiency was assessed. Statistical analysis was performed taking account to the individual stage of professional experience.

**RESULTS**

The analysis revealed that observer sensitivity depends on work experience due to a systematic order of inspection and a good known course of disease, i.e. of metastatic spread. Missed pathologies mostly included secondary findings or a lack of methodical approach of inspection. The dwell time of ocular fixation of unexperienced readers was significantly higher in salient findings whereas experienced readers more frequently fixated areas with less salient, but clinically important findings or clinically important regions.

**CONCLUSION**

Preliminary results suggest that experienced radiologic physicians reduce missed findings through looking more systematically upon CTs and a focus on clinically important regions regarding the individual primary disease. Visual attention was more targeted in the practiced physicians and less time was needed, however all experience stages seem to be able to improve their performance by analyzing CT images in systematic patterns.

**CLINICAL RELEVANCE/APPLICATION**

Improvement of CT screening by evaluating the most effective search method.
Performance in Experienced and Inexperienced Readers
Giuliano Scattolin MD (Presenter): Nothing to Disclose, Dow-Mu Koh MD, FRCR: Nothing to Disclose, Giovanni Morana MD: Nothing to Disclose, David Watkins MBBS, MRCP: Nothing to Disclose, Angela Mary Riddell MBBS: Nothing to Disclose

PURPOSE

Peritoneal disease contraindicates surgery in patients with gastroesophageal, gastric and pancreatic cancers, but the diagnostic performance of CT in this context is unknown. We compare the CT diagnostic performance between experienced and inexperienced radiologists for peritoneal disease detection in primary upper abdominal malignancies.

METHOD AND MATERIALS

In this IRB approved study, the pre-operative CT images of 110 patients with gastroesophageal (n=41), gastric (n=49) and pancreatic (n=10) cancers who underwent laparoscopy were retrospectively reviewed. Portovenous phase CT was performed within 3 weeks prior to laparoscopy using multichannel CT and 1-3 mm multiplanar image reconstruction. Images were reviewed by an expert (>10 years experience) and inexperienced radiologist for presence, size and location of peritoneal nodules; peritoneal stranding, peritoneal thickening, cystic disease and ascites. CT images were scored using set criteria on a 4-point scale for likelihood of peritoneal disease. Reader diagnostic performance was compared by ROC analysis and observer agreement by kappa statistics. CT features were compared between patients with and without peritoneal disease using Fisher’s exact test.

RESULTS

97 were laparoscopically negative for peritoneal disease and 13 positive. For experienced radiologist, CT score >2 showed 77% (95%CI: 46-95%) sensitivity and 58% (47-68%) specificity for detecting peritoneal disease. For inexperience radiologist, there was 71% (42-92%) sensitivity and 52% (42-62%) specificity. By ROC analysis, there was no difference in diagnostic performance between readers (Az 0.69 vs 0.61, p=0.23) with moderate interobserver agreement (kappa = 0.47). For experienced reader, peritoneal nodules > 5 mm in gastrohepatic ligament were more frequently observed in patients with peritoneal disease (Fisher’s exact test p=0.005), but other CT features were non-discriminatory in both readers.

CONCLUSION

In patients with primary upper abdominal malignancies, reader experience shows little advantage for detecting peritoneal disease. The diagnostic performance of CT is modest in both experienced and inexperienced readers.

CLINICAL RELEVANCE/APPLICATION

Peritoneal disease detection in upper abdominal cancers is limited using CT and appears uninfluenced by reader experience. Other imaging techniques (e.g. DWI) should be investigated to improve diagnostic performance.

Use of Liver MRI Following Standard Staging Abdominopelvic CT to Evaluate Newly-diagnosed Colorectal Cancer Patients
Kichang Han MD (Presenter): Nothing to Disclose, Seong Ho Park MD: Research Grant, DONGKOOK Pharmaceutical Co, Ltd Research Grant, General Electric Company, Hyoung Jung Kim MD: Nothing to Disclose, Seung Soo Lee MD: Nothing to Disclose, Ah Young Kim MD: Nothing to Disclose, Hyun Kwon Ha MD: Nothing to Disclose

PURPOSE

No clear guidelines yet exist regarding how to use liver MRI in evaluating patients with newly-diagnosed colorectal cancer. This study was to investigate the clinical impact of liver MRI in staging evaluation of newly-diagnosed colorectal cancer patients, primarily focusing on those who demonstrate diminutive indeterminate hypodense lesions (‘too-small-to-characterize’ [TSTC]) focal hepatic lesions or metastasis-negative hepatic findings on standard staging CT.

METHOD AND MATERIALS

We included 863 consecutive adults who had newly-diagnosed colorectal cancer without concomitant malignancies and received portal-phase contrast-enhanced abdominopelvic CT. Patients who had TSTC hepatic lesions without other suspicious/indeterminate hepatic findings (TSTC-liver-on-CT), metastasis-negative hepatic findings (negative-liver-on-CT), and hepatic lesions suspicious or indeterminate for metastasis excluding TSTC lesions as seen on CT were identified. Per-patient rate of hepatic metastasis unsuspected by CT for the entire cohort and the diagnostic yield of liver MRI for such lesions for those who had undergone liver MRI were assessed.

RESULTS

There were 261 TSTC-liver-on-CT patients, 464 negative-liver-on-CT patients, and 138 patients with suspicious hepatic findings on CT. Among TSTC-liver-on-CT patients, the rate of hepatic metastasis was 2.2% (5/230, excluding patients without follow-up) and the yield of liver MRI was 3% (3/96). Negative-liver-on-CT patients gave the MRI yield of 0% (0/94). Among negative-liver-on-CT patients, the rate of hepatic metastasis discovered within 6 months of curative surgery was 1.1% (4/350, excluding patients without follow-up) when the liver was cleared by negative CT alone and 2% (2/88, excluding patients without follow-up) when cleared also by negative MRI (P=0.347). Among the patients who had suspicious hepatic findings on CT, the MRI yield was 25% (19/77).
CONCLUSION
The diagnostic yield of liver MRI for hepatic metastasis was very low in newly-diagnosed colorectal cancer patients who showed TSTC hepatic lesions or metastasis-negative hepatic findings on CT. Staging liver MRI is likely unnecessary for them.

CLINICAL RELEVANCE/APPLICATION
Staging liver MRI may not be effective or justified in patients with newly-diagnosed colorectal cancer who show TSTC hepatic lesions or metastasis-negative hepatic findings on CT, while it should be recommended for those who have hepatic findings suspicious of metastasis on CT.

SSQ06-04
Does the Gadoxetic Acid-enhanced Liver MRI Impact on the Treatment of Patients with Colorectal Cancer? Comparison Study with FDG-PET and Gadoxetic Acid-enhanced MRI

Ji Won Oh MD (Presenter): Nothing to Disclose, Seung Beak Lee: Nothing to Disclose, Soon Nam Oh MD: Nothing to Disclose, Sung Eun Reu MD: Nothing to Disclose, Joon Il Choi MD, PhD: Nothing to Disclose, Je Ryung Yoo: Nothing to Disclose, Jae Young Byun MD: Nothing to Disclose

PURPOSE
To evaluate the added value of Gadoxetic acid-enhanced liver MRI in preoperative staging of colorectal cancer, and to estimate the clinical impact of the liver MRI in management planning of liver metastasis.

METHOD AND MATERIALS
Among 140 Patients who underwent CT, FDG-PET, and consecutive Gadoxetic acid-enhanced liver MRI for preoperative evaluation of colorectal cancer, between January 2011 and December 2013, 41 patients with confirmed liver metastasis by subsequent surgery or follow-up imaging were included. Per patient sensitivity and specificity, and per-nodule sensitivity of FDG-PET and liver MRI at detecting metastatic nodules were evaluated according to the reading papers. The sensitivity for liver metastasis of FDG-PET and MRI were calculated in groups of tiny (< 1 cm), small (<2 cm) and large (≥2 cm) metastatic nodules. The newly detected metastatic nodules on liver MRI were analyzed, to assess the treatment change after performing liver MRI.

RESULTS
A total of 131 metastatic nodules (size 1.6 cm; range 0.4-8.2) were detected in 41 patients (mean age 65 years; range 37-81). The sensitivity and the specificity of FDG-PET and liver MRI did not differ significantly on per patient base. The per-nodule sensitivity of FDG-PET (68.7%) and liver MRI (96.2%) were significantly different (P = 0.0001), especially for small (<2 cm) nodules. The sensitivity of FDG-PET and liver MRI were 59.8%, 95.1%, for small nodules and 27.1%, 91.7% for tiny nodule, respectively. The mean diameter of metastatic nodules was significantly different between FDG-PET negative (0.75 cm) and FDG-PET positive (1.98 cm) nodules (P = 0.0001). At least one more metastatic nodule was newly detected on MRI in 16 (39%) patients. Among these, 6 (15%) patients showed significant change of the management plan after performing liver MRI.

CONCLUSION
Gadoxetic acid-enhanced liver MRI detected more metastatic nodules compared with FDG-PET, especially for small (< 2 cm) nodules. Excellent small nodule detection of Gadoxetic acid-enhanced liver MRI is helpful for treatment planning of liver metastasis in colorectal cancer.

CLINICAL RELEVANCE/APPLICATION
FDG-PET or Gadoxetic acid-enhanced MRI are used for evaluation of suspicious metastatic lesion in patients with colorectal cancer. For hepatic metastases, Gadoxetic acid-enhanced MRI shows excellent detection of liver metastasis regardless of size and may be a helpful decision maker for treatment planning.

SSQ06-05
PETCT Derived Tumoural Heterogeneity and Glucose Uptake Predicts Survival in Primary Colorectal Cancer Patients


PURPOSE
We investigated the prognostic value of FDG PET and CT texture analysis for survival of colorectal cancer patients grouped by stage as a) stage I-III rectal cancer, b) stage I-III colonic cancer and c)metastatic stage IV.

METHOD AND MATERIALS
126 patients (79-males; 47-females; mean-age 66.2±10.6y) with primary colorectal cancer prospectively underwent FDG-PET/CT. Primary tumour heterogeneity was assessed on CT images using image filtration-histogram technique. FDG uptake (SUVmax) on PET was measured. Clinical stage was determined using surgical histology and clinical imaging data. Univariate Kaplan-Meier analysis assessed the ability of each imaging and clinical markers to predict survival. Cross-validation assessed the prognostic model via hazard ratio. Multivariate Cox’s regression was used to test the independence of significant model input factors. Institutional Review Board approval was obtained.

RESULTS

Median follow up for surviving patients was 47.9 months (minimum 12 months). For patients with stage I-III rectal cancer (n=42), CTTA (coarse skewness, p=0.011), SUVmax (p=0.012) and clinical stage (p=0.006) were the best survival predictors. A significant interaction between skewness and clinical stage was the only independent predictor (p=0.003). For patients with stage I-II (n=28) and stage III (n=28) colon cancer, CTTA (unfiltered kurtosis, p=0.001) and T-stage respectively were the only significant survival predictors. CTTA (fine kurtosis) was the only significant survival predictor in stage IVb disease (n=11).

CONCLUSION

Tumour heterogeneity measured as CTTA and glucose uptake on PET were found to be survival predictors for colorectal cancer patients divided in a number of clinically relevant sub-populations.

CLINICAL RELEVANCE/APPLICATION

CT textural features and FDG signal has potential to predict survival and help refine management decision in colorectal cancer patients at staging, in a number of clinically relevant settings.

SSQ06-06 The Inferior Mesenteric Vein Sign: A New Sign for Diagnosis of Rectosigmoid Carcinoma on Contrast-enhanced CT
Ahmed-Emad Mahfouz MD (Presenter): Nothing to Disclose, Hanan Sherif MD: Nothing to Disclose, Ahmed El Sayed Sayedin MBCh: Nothing to Disclose, Moamena Ahmed El-Matbouly MBCh: Nothing to Disclose, Rashad Alfkey MD: Nothing to Disclose

PURPOSE

Diagnosis of rectosigmoid carcinoma on contrast-enhanced CT relies on demonstration of thickening and enhancement of the rectosigmoid wall and enlarged lymph nodes. Rectal wall thickening may be the only sign seen in early carcinoma and may be mimicked by spasm or adherent fecal matter. Angiogenesis and arteriovenous shunting within the carcinoma may result in earlier venous return in the draining inferior mesenteric vein (IMV) compared to the superior mesenteric vein (SMV). The purpose of this study is to evaluate fast venous return of intravenous contrast agent in IMV compared to SMV (the IMV sign) as a diagnostic sign for rectosigmoid carcinoma.

METHOD AND MATERIALS

Contrast-enhanced CT of the abdomen and pelvis of 35 patients with rectosigmoid carcinoma and 50 patients free of colorectal disease as a control group have been randomized and reviewed in consensus by two experienced radiologists, blinded to the diagnosis. In the first session transverse CT sections of the pelvis were reviewed for rectosigmoid wall thickening and lymph nodes. In the second session, only 3-D reconstructions of the arterial and venous-phase CT were reviewed to note whether contrast agent appeared earlier in IMV compared to SMV (positive IMV sign). The diameter of IMV and the IMV/SMV enhancement ratio have been measured and compared in the two groups by the Student’s T-test.

RESULTS

Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of IMV sign for diagnosis of carcinoma have been 83, 100, 100, 89, and 93% as compared to 100, 84, 81, 100, and 91% for wall thickening and 40, 98, 93, 70, and 74 % for nodal enlargement respectively. IMV/SMV enhancement ratio on arterial phase has been significantly higher in the carcinoma group (1.38±0.42) compared to control group (0.68±0.25) (p<0.05), denoting faster venous return in IMV, while the difference was not statistically significant in the venous phase. There has been no statistically significant difference of IMV diameter between the carcinoma (5.8±1.1 mm) and the control group (4.3±1.2 mm).

CONCLUSION

The IMV sign is a useful sign for the diagnosis of rectosigmoid carcinoma on contrast-enhanced CT

CLINICAL RELEVANCE/APPLICATION

IMV sign is specific for rectosigmoid carcinoma. Rectosigmoid wall thickening should not be interpreted as a spasm if associated with the positive IMV sign.

SSQ06-07 The Prognostic Significance of Macroscopic Extramural Vascular Invasion on MRI in Patients with Locally-advanced Rectal Cancer
PANCREATIC CANCER STAGING: COMPARISON OF WHOLE-BODY HYBRID PET/MR AND PET/CT IMAGING


PURPOSE

To compare the staging performance of whole-body PET/MR with PET/CT in patients with pancreatic cancer.

METHOD AND MATERIALS

In this retrospective IRB approved study, 24 consecutive patients affected by pancreatic cancer underwent whole-body hybrid FDG-PET/CT (Gemini TF, Philips) and same day FDG-PET/MR (Biograph mMR, Siemens). PET/CT and PET/MR studies were independently evaluated by two readers. TNM staging according to PET/MR and PET/CT was compared.

RESULTS

PET/MR imaging quality was deemed adequate for diagnostic purposes in all. 14/24 pancreatic cancer patients showed avid FDG lesions. In 15/24 staging between PET/MR and PET/CT was concordant. In the remaining 9/24, PET/MR up-staged 5: In 1 PET negative lymph nodes were DWI positive and had supportive MR morphologic criteria, In 1 PET negative liver metastasis demonstrated pathologic enhancement on MR, In 2 negative PET/CT, PET/MR demonstrated locally resectable cancer. In 1 a questionable pancreatic lesion on PET/CT was definitively diagnosed as resectable pancreatic cancer on PET/MR. PET/MR down-staged 3 positive PET/CT demonstrating: In 1 focal pancreatitis, In 1 post-electroporation inflammatory changes In 1 benign post surgical bowel loop changes. Moreover it demonstrated focal pancreatitis in 1 negative case on PET/CT, referred to us for a suspicious pancreatic cancer on ultrasound.

CONCLUSION

PET/MR imaging provides all the diagnostic benefits of PET/CT in the assessment of pancreatic cancer patients, with the benefits of superior local, hepatic and nodal staging and accuracy in comparison to PET/CT.

CLINICAL RELEVANCE/APPLICATION

PET/MR might represent a very promising and innovative technique for accurate staging and follow up of
pancreatic cancer patients.

**Desmoplastic Small Round Cell Tumor: A Comprehensive, Single-institution Study of 94 Cases**

**Purpose**
To evaluate clinico-pathological and multi-modality, cross-sectional imaging features of a cohort of 94 cases of desmoplastic small round cell tumor (DSRCT).

**Method and Materials**
An IRB-approved, HIPAA-compliant, retrospective study of patients with DSRCT treated at a tertiary cancer center between 2001 and 2013 yielded 94 cases. Epidemiological, clinical and pathological data as well as imaging findings were recorded. Tumor size, location, morphology, and distribution pattern of metastases at the time of presentation, were analyzed.

**Results**
DSRCT occurred in young patients with a median age of 21.5 years (age range 5-53 years) and a marked male predilection (M:F=86:8). 89 were white (Caucasian or Hispanic), 4 were African-American, and 1 of Asian descent. Most patients were symptomatic with abdominal pain being the most common symptom. At initial presentation, 85 patients showed multifocal, nodular and/or diffuse omental and peritoneal disease. 38 patients had diaphragmatic involvement. In addition, 32 patients had liver metastases, 2 cases had pancreatic involvement, and 1 had renal involvement. 49 patients had retroperitoneal involvement in the form of implants, tumor extension or nodal involvement. In the thorax, 33 had nodal disease, 17 had pleural effusion, and only 2 cases had lung metastases at presentation. 1 patient had intracranial metastasis and 2 had bony metastases at presentation. 12 patients showed calcific lesions.

**Conclusion**
DSRCT is a rare, multifocal peritoneal malignancy with frequently disseminated abdominal disease at presentation. In the abdomen, the disease most commonly involves the omentum and peritoneum, followed by the retroperitoneum. Liver is the most common solid visceral metastatic site. A substantial number of patients have diaphragmatic involvement. In the thorax, nodal and pleural involvement is more common than lung parenchymal involvement. About 13% of cases showed calcifications.

**Clinical Relevance/Application**
Desmoplastic small round cell tumor (DSRCT) is a rare, biologically aggressive, multifocal primary peritoneal sarcoma that should be considered in the differential diagnosis of solitary or multiple peritoneal masses in a young white male. The characteristic t(11;22)(p13;q12) translocation involving fusion of EWS and WT1 genes and unique pathological findings are important diagnostic features of this tumor.
METHOD AND MATERIALS

Preoperative CT findings of 91 patients (43 men and 48 women; median age 60.4 years) who underwent resection for sigmoid diverticulitis from August 2008 to May 2010 were compared to histological reports applying the Hansen and Stock classification (HS). All CT scans were evaluated in a dedicated study reading by two experienced radiologists. The interobserver agreement was determined by using the kappa index.

RESULTS

Nine patients were staged type I in the preoperative CT scan (sensitivity: 33%, specificity: 100%). Sensitivity and specificity for detecting a phlegmonous diverticulitis (HS IIA; n=6) was 83.3% and 83.5%, for detecting a covered perforation (HS IIB; n=49) 71.4% and 81.0% and for revealing a free perforation (HS IIC; n=5) 100% and 100%, respectively. Sensitivity and specificity for detecting a recurrent diverticulitis (HS III; n=22) was 72.7% and 92.7%. Kappa statistics revealed a moderate interobserver agreement (kappa=0.6), especially in cases of phlegmonous and covered perforation diverticulitis. In 10 patients (24%) CT did not reveal covered perforation which was histopathologically verified.

CONCLUSION

CT is an appropriate tool for diagnosing sigmoid diverticulitis. However, moderate inter-observer agreement reveals potential inaccuracies in the correct staging of sigmoid diverticulitis as compared to histopathology. A tendency to under-stage covered perforations (HS IIb) was found.

CLINICAL RELEVANCE/APPLICATION

Since covered perforation may be not adequately revealed by CT in all cases, phlegmonous diverticulitis may also be regarded as complicated and consequently treated similar to covered perforation.

SSQ07-02

Clinical and Radiological Features of Portal Hypertensive Colopathy: Common but Little-known Entity

Gensuke Akaike MD (Presenter): Nothing to Disclose, Takuya Ueda MD: Nothing to Disclose, Yoshiyuki Fujita: Nothing to Disclose, Kevin Urayama: Nothing to Disclose, Yasuyuki Kurihara MD: Nothing to Disclose, Masaki Matsusako MD, PhD: Nothing to Disclose, Yuka Morita MD: Nothing to Disclose, Takeshi Wada MD: Nothing to Disclose, Tomoya Nishiyama MD: Nothing to Disclose, Mariko Okura: Nothing to Disclose, Yuka Okajima MD, MPH: Nothing to Disclose, Kazuhiro Hosoya: Nothing to Disclose, Takeshi Wada MD: Nothing to Disclose, Tomoya Nishiyama MD: Nothing to Disclose, Mariko Okura: Nothing to Disclose

PURPOSE

The purpose of this study was to evaluate the computed tomography (CT) findings of portal hypertensive colopathy (PHC) and its relation with various clinical features.

METHOD AND MATERIALS

We retrospectively reviewed 163 consecutive patients with clinical diagnosis of liver cirrhosis who underwent contrast enhanced CT and blood examination within a 24 hour interval between January 2012 to January 2013 (median age: 69.0 years, range: 41-89, male103, female 60). Two board-certified radiologists with 22 and 6 years of experience in abdominal imaging reviewed the CT images. The presence and location of PHC, which was defined as submucosal thickening greater than 10 mm, was assessed. Associate CT findings including the followings were also evaluated; Gastroesophageal varices, gall bladder wall edema, splenomegaly, ascites, the diameter of main portal vein, and modified caudate-right lobe ratio (C/RL-m). The relationship between presence of PHC, clinical findings including Child-Pugh score and the associate CT findings was statistically assessed. Univariate statistics including chi-squared test, Student’s t-test, and Mann-Whitney U test were used as appropriate.

RESULTS

PHC was found in 39 out of 163 patients (29.3%). The location of PHC was the ascending colon in 34/39 patients (87.2%), the transverse colon in 18/39 patients (46.2 %), the descending colon in 11/39 patients (28.2%), the sigmoid colon in 9/39 patients (23.1%) and the rectum in 9/39 patients (23.1%). The presence of edema was significantly associated with higher Child-Pugh score (10.3%, 41.0% and 48.7% for Child-Pugh score A, B and C, respectively, p

CONCLUSION

The presence of PHC is significantly associated with cirrhosis severity and is more frequently observed in the ascending colon and the transverse colon. It is important to recognize PHC as it is sometimes mistaken for colitis.

CLINICAL RELEVANCE/APPLICATION

Portal hypertensive colopathy (PHC) is a colonoscopic finding and the radiological feature is not fully understood. We found the characteristic distribution and relation with the clinical condition.

SSQ07-03

Value of CT Enterography in the Diagnosis of Phlebosclerotic Colitis

Xue Song Zhao MD (Presenter): Nothing to Disclose, fei miao : Nothing to Disclose, Fuhua Yan : Nothing to Disclose, Xianfu Luo : Nothing to Disclose, Xiao Zhu Lin MD : Nothing to Disclose

PURPOSE

To investigate the value of CT enterography in the diagnosis of phlebosclerotic colitis with endoscopic and
**METHOD AND MATERIALS**

The institutional review board approved the study protocol and informed consent was obtained from all patients. Features from CT enterography in 6 patients with endoscopically and histopathologically confirmed phlebosclerotic colitis were retrospectively reviewed. CT enterography was performed on the Discovery CT750 HD scanner (GE Healthcare, Waukesha, Wisconsin, USA).

**RESULTS**

Phlebosclerotic colitis at CT enterography showed the same features: multiple tortuous threadlike calcifications along the course of the colon perpendicular to the colonic wall. Coronary reconstructed CT enterographic images in portal venous phase clearly disclosed patchy or threadlike calcifications corresponding to the calcified walls of the branches of right and middle colic veins and their intramural tributaries. The thickened colon wall manifested stratified pattern (the trilaminar appearance). There were no skip lesions. Swelling of the ileocecal valve, disappearance of semi-lunar folds, luminal irregularities, rigidity of the colon and increased adjacent hazy density in the surrounding fatty tissue were also observed. Endoscopic images showed that the mucosa lost its normal vascular network and had a dark-purple, hyperemic and edematous appearance with multiple superficial ulcers and erosions. Blue-black vessels were visible and the wall of the ascending colon was particularly friable.

**CONCLUSION**

Phlebosclerotic colitis had its unique CT enterographic and endoscopic features. CT enterography with multiplanar reformatting of axial image data provides better visualization of the entire small bowel wall and allows detection of extra-luminal as well as the mesenteric vessel diseases.

**CLINICAL RELEVANCE/APPLICATION**

Phlebosclerotic colitis has its specific CT enterographic features, radiologists should be familiar with this rare type of ischemic colitis caused by obstruction of the veins in the intestinal wall and adjacent mesentery, and is most commonly seen in the ascending colon.

**Comparison of Diagnostic Performance of 99mTc-Labeled RBC Scintigraphy and CT with GI Bleed Protocol in Detecting and Localizing Source of Acute Lower Gastrointestinal Bleeding Using Conventional Angiography as Gold Standard**

**PURPOSE**

Acute lower gastrointestinal bleeding (LGIB) is a medical and surgical emergency, which despite recent advances in diagnosis and treatment, still remains a diagnostic and therapeutic challenge causing significant morbidity and mortality. In this study, we assessed the diagnostic performance of RBC scintigraphy and CT with GI bleed protocol for the detection and localization of the LGIB.

**METHOD AND MATERIALS**

Seventy six patients had undergone either RBC scintigraphy, CT with GI bleed protocol or both, followed within 24 hours by conventional angiography for the evaluation of LGIB between Jan 2010 and Feb 2014. All scintigraphic and CT examinations were performed according to standard departmental protocol. CT with GI protocol comprised of an initial unenhanced CT, followed by arterial, portovenous and delayed phases at 15, 60 and 180 seconds post intravenous contrast administration, respectively. Data was retrospectively reviewed for evaluating sensitivity, specificity and accuracy of these two modalities for the detection and localization of LGIB using conventional angiography as gold standard. Statistical analysis was performed on Statistical Analysis Software (SAS) version 9.1.3 and Fisher exact test was used to compare the sensitivity, specificity and overall accuracy of the two modalities. A p-value of less than 0.05 was considered statistically significant.

**RESULTS**

Fifty one (51) patients had undergone RBC Scintigraphy alone, 20 had CT with GI bleed protocol alone and 5 had undergone both the modalities. Fourteen (14) out of 25 patients in CT with GI bleed group had angiographic evidence of active bleed compared to 32 out of 56 patients in the RBC scintigraphy group. CT with GI bleed protocol had significantly higher specificity (90.9%) as compared to 33.3% for RBC scintigraphy. (p=0.0027) CT with GI Bleed also had a higher sensitivity (100%) as compared RBC scintigraphy (81.25%). However, this difference did not reach statistical significance. (p=0.09) Overall accuracy of CT with GI bleed protocol (90.5%) was significantly higher as compared to 60.7% for RBC scintigraphy. (p=0.0006)

**CONCLUSION**

CT with GI bleed protocol was significantly more accurate in detecting and localizing lower GI bleed in comparison to RBC scintigraphy.

**CLINICAL RELEVANCE/APPLICATION**

Patients with LGIB should undergo CT with GI bleed rather than RBC scintigraphy for detecting and localizing source of LGIB as it is more accurate and less time consuming.
Comparison between MR Defecography and X-ray Defecography in Patients with Obstructed Defecation Syndrome

Zhiyang Zhou PhD, Yanbang Lian (Presenter), Zhicheng He, Zhong-Ping Zhang MMEdSc, Wuteng CAO, Jiaying Gong

PURPOSE
To compare the diagnostic capability of magnetic resonance defecography with conventional X-ray defecography in obstructed defecation syndrome (ODS).

METHOD AND MATERIALS
Thirty-two consecutive patients diagnosed as ODS were enrolled and underwent both MR defecography and conventional X-ray defecography of the ano-rectal region (ARA) within 10 days. T2-weighted fast spin-echo sequences in sagittal, coronal and axial slices and a single sagittal dynamic sequence of fast imaging employing steady state acquisition (FIESTA) for rest, and defecation phase were acquired on MR system, respectively. The antero-posterior position for rest and post-defecation phase, lateral position for rest, lift and defecation phase were acquired using X-ray defecography. The obtained data sets from both methods regarding to the condition of ODS and its complication were evaluated using the pubococcygeal line (PCL) as the reference line, and the results were compared using a two-tailed McNemar’s test with p<0.05.

RESULTS
No significant difference was observed regarding to the evacuation phase between MR defecography and X-ray defecography (p>0.05) in the presence of rectocele (13 vs 15), puborectalis dyssynergia (5 vs 6), enterocele (1 vs 3), sigmoidocele (2 vs 4). Although MR defecography was inferior (p < 0.05) to X-ray defecography in the assessment of rectal mucosal prolapse (12 vs 22), intrarectal invagination (3 vs 18) and descending perineum (8 vs 21), it demonstrated more complications of the anterior and middle compartment of the pelvic cavity such as cystoptosis and hysteroptosis, and other lesions of the pelvic cavity or pelvic floor. Meanwhile, MR defecography demonstrated better superiority in demonstrating the detailed pelvic anatomy.

CONCLUSION
MR defecography and X-ray defecography exhibit different advantages in evaluating ODS. MR defecography provides both morphological and functional information for the pelvic floor and plays a significant role in a better evaluation of the entire pelvic anatomy and pelvic organ interaction.

Temporal Variations in Presentation for MDCT for Suspected Acute Appendicitis in Adults

Bryan Dustin Pooler MD (Presenter), Joshua Suhonen, Edward Malnor Lawrence BS, Perry J. Pickhardt MD

PURPOSE
To evaluate temporal (hourly, daily, monthly, seasonal) variations in presentation for MDCT for the evaluation of suspected acute appendicitis in adults.

METHOD AND MATERIALS
Over a ten year period, 2,844 consecutive adults (mean age 38.8 years) underwent MDCT for suspected appendicitis. 669 individuals (23.5%) ultimately proved to have appendicitis, which was perforated in 123 cases (18.4%). Temporal variation in presentation for MDCT according to the time of day, day of the week, month, and season was assessed, and positive versus negative cases and perforated versus non-perforated cases were compared.

RESULTS
Significant hourly variation was present for total MDCT's performed, with the peak hour from 1500-1600 (n=223) and the nadir from 0500-0600 (n=44) (p<0.001), but there was no significant hourly variation in positive rate. Significantly more MDCT's were performed from 1600-midnight (n=1190) compared with 0800-1600 (n=993) and midnight-0800 (n=661) (p<0.001), and the positive rate was higher from midnight-0800 (30%) compared with 0800-1600 (20%) and 1600-midnight (23%) (p<0.001). Day of the week varied significantly for total MDCT's performed (high of 458 on Friday, low of 267 on Saturday, p<0.001) and positive rate (low of 19% on Friday, high of 29% on Saturday, p=0.050), but not for perforation rate (high of 26% Friday, low of 12% Wednesday, p=0.109). Variation in MDCT usage by month (high of 265 MDCT's in September, low of 204 MDCT's in February, p=0.167) and season (high of 27% in fall, low of 23% in winter, p=0.059) was observed but was not statistically significant.

CONCLUSION
In this large cohort of adults undergoing MDCT for suspected appendicitis, a number of significant temporal variations in usage and outcome were observed.
Diagnosis of Acute Appendicitis on CT - Is there a Role for Contrast Enhanced Abdominal CT

**PURPOSE**

The purpose of this study was to evaluate whether non-contrast enhanced abdominal CT scans obtained through virtual non-contrast (VNC) CT scans, were equally sensitive and specific in diagnosing acute appendicitis as contrast-enhanced abdominal CT studies.

**METHOD AND MATERIALS**

A total of 23 consecutive patients who underwent a dual energy (DE) CT for suspected appendicitis were identified retrospectively, between the dates of Dec 28, 2013 to March 2, 2014 at a single institution's emergency department. Of these cases, 13 were surgically and pathologically confirmed to be appendicitis, the other 10 cases were determined to be clinically negative for appendicitis. VNC CT studies were constructed from the contrast-enhanced DE abdominal CT scans for all cases. Two radiologists, one an abdominal radiologist, the other a MSK radiologist, were blinded and retrospectively interpreted the VNC CT images, assessing for pathology and diagnostic confidence. Readers were asked to record whether the appendix was seen, the size of the appendix and whether they suspected the patient had appendicitis and their confidence level (on a scale of 1-10, with 1 representing no confidence and 10 representing high confidence) on evaluation of both the VNC CT and contrast-enhanced CT.

**RESULTS**

The abdominal radiologist (AR) was not able to identify the appendix in only 1 VNC case. No cases of appendicitis were missed, however. The AR had a calculated 100% accuracy for the diagnosis of appendicitis. The median confidence scores between VNC and contrast enhanced CT's were equal (9 and 9 respectively; p=0.026). MSK radiologist (MSKR) was unable to identify the appendix in 9 cases and subsequently missed 4 cases of appendicitis. MSKR median confidence scores were significantly decreased for the VNC study versus the contrast enhanced study (9 and 10 respectively; p=0.027). The calculated sensitivity was 66% (0.34-0.9) and specificity of 100% (0.54-1.00) for the MSK radiologist.

**CONCLUSION**

Non-contrast enhanced CT has the potential to be diagnostic with a high accuracy in the hands of experienced abdominal radiologists. However, contrast enhanced abdominal CT studies still have a role in diagnosing acute appendicitis in not so experienced radiologists.

**CLINICAL RELEVANCE/APPLICATION**

Contrast enhanced CT abdominal studies facilitate relatively easy diagnosis of acute appendicitis in not so experienced radiologists.
alternative finding (n = 22). No cases of appendicitis or alternative diagnoses would have been missed using the limited scan.

CONCLUSION
A limited range CT from the bottom of T10 to the top of the pubic symphysis is as accurate as full abdominopelvic CT in evaluating patients with suspected acute appendicitis and results in approximately 20% dose reduction.

CLINICAL RELEVANCE/APPLICATION
A limited range CT is an effective technique to reduce radiation dose in patients undergoing MDCT for suspected acute appendicitis.

SSQ07-09
CT Following US for Possible Appendicitis: Anatomic Coverage

Martin E. O’Malley MD (Presenter): Nothing to Disclose, Fawaz Saud Alharbi MBBS, MD: Nothing to Disclose, Tanya Punita Chawla MBBS: Nothing to Disclose, Hadas Moshonov PhD: Nothing to Disclose

PURPOSE
To determine appropriate anatomic coverage for CT following inconclusive or nondiagnostic US for possible appendicitis.

METHOD AND MATERIALS
This retrospective study included 99 patients with possible appendicitis with inconclusive or nondiagnostic US followed by CT. Two radiologists reviewed the CT scans and determined superior and inferior anatomic coverage required to diagnose or exclude appendicitis and diagnose alternative causes. This "targeted" coverage was used to estimate potential reduction in anatomic coverage compared to standard abdominal/pelvic CT.

RESULTS
Study group included 99 patients; 83 women, 16 men; mean age 32 (median, 29; range 18-73) years. On CT, each reviewer identified normal appendix, no alternative diagnosis in 47 (48%) and 45 (45%); appendix not seen, no alternative diagnosis in 7 (7%) and 5 (5%); equivocal appendicitis in 5 (5%) and 2 (2%); appendicitis in 19 (19%) and 22 (22%); and alternative diagnosis in 21 (21%) and 25 (25%) patients, respectively (Kappa coefficient 0.675, substantial agreement). To confidently diagnose or exclude appendicitis or identify an alternative diagnosis, anatomic coverage would be from superior border of L2 to superior border of pubic symphysis for both reviewers. If this targeted rather than standard coverage was used, the anatomic coverage would be reduced by 30-55% (mean 39%, median 40%) with a similar reduction in dose.

CONCLUSION
When CT is performed for appendicitis following inconclusive or nondiagnostic US, targeted anatomic coverage should be from superior border of L2 to superior border of pubic symphysis. Targeted anatomic coverage would result in a significant reduction in exposure to ionizing radiation compared to standard CT.

CLINICAL RELEVANCE/APPLICATION
When CT is performed for appendicitis following inconclusive or nondiagnostic US, targeted anatomic coverage rather than standard anatomic coverage can be used resulting in a significant reduction in exposure to ionizing radiation.
Standard 10° Flip Angle
Seungbo Lee (Presenter): Nothing to Disclose, Eun-Suk Cho: Nothing to Disclose, Dahye Lee: Nothing to Disclose, Jeong-Sik Yu MD: Nothing to Disclose, Joo Hye Kim: Nothing to Disclose, Jae-Joon Chung MD: Nothing to Disclose

PURPOSE
10-min delayed hepatocyte phase imaging (HPI) provided satisfactory information for detection of focal hepatic lesion (FHL) in Gd-EOB-DTPA-enhanced liver MRI. However, lesion-to-liver contrast-to-noise ratio (CNR) was significantly lower than 20-min delayed HPI. Increasing the flip angle (FA) from 10° to 30° in HPI improves lesion-to-liver CNR since the higher FA increases T1-weighting. The purpose of the study was to compare the lesion-to-liver CNR and FHL detection sensitivity between 10-min delayed HPI with a 30° FA (10min-FA30) and 20-min delayed HPI with a 10° FA (20min-FA10) in patients with liver metastases. In addition, to determine whether 10min-FA30 could replace 20min-FA10, thus saving time of 10 minutes in acquiring HPI.

METHOD AND MATERIALS
51 patients with 197 liver metastases underwent Gd-EOB-DTPA-enhanced MRI with 10min-FA30 and 20min-FA10 using 3D T1-weighted gradient echo sequence. Lesion-to-liver CNRs on both two HPI sets were calculated. Two radiologists assessed independently the presence of FHLs using a four-point scale. The values were compared with paired t-test and Wilcoxon signed-rank test.

RESULTS
The mean CNR for metastases on 10min-FA30 (268.5 ± 91.9) was significantly higher than that of 20min-FA10 (202.1 ± 71.3). There was no significant difference on detection sensitivity for liver metastases between the two HPI sets for both readers (98.1% sensitivity at 10min-FA30 and 97.8% at 20min-FA10).

CONCLUSION
10min-FA30 in Gd-EOB-DTPA-enhanced MRI had higher lesion-to-liver CNR with no difference in lesion detection sensitivity, compared to the 20min-FA10. This result indicates that 10min-FA30 could replace 20min-FA10 with a better diagnostic performance for detection of liver metastases and also allows 10 minutes of time-saving.

CLINICAL RELEVANCE/APPLICATION
Using a 30° flip angle, 10-min delayed hepatocyte phase imaging in gadoxetic acid-enhanced MRI can replace 20-min delayed imaging with 10° flip angle with a better diagnostic performance for detection of liver metastases and also allows 10 min of time-saving.

Feasibility of Arterial Spin Label to Differentiate Solid and Cystic Focal Liver Lesions
Antonio Luna MD (Presenter): Nothing to Disclose, Teodoro Martin MD: Nothing to Disclose, Lidia Alcala Mata MD: Nothing to Disclose, Jordi Broncano MD: Nothing to Disclose, Javier Sanchez MD, PhD: Research Consultant, Koninklijke Philips NV, Jorge A. Soto MD: Nothing to Disclose

PURPOSE
Analyze if FAIR-ASL is feasible in the liver
Check if FAIR-ASL is able to differentiate cystic and solid liver lesions in comparison to DCE-MRI

METHOD AND MATERIALS
20 patients with 28 focal liver lesions (n=18 solid and n=10 of cystic nature) were submitted to our 3T magnet for further characterization. Solid lesions included 6 metastasis, 4 hepatocellular carcinoma, 6 hemangioma, 1 dysplastic nodule and 1 FNH and cystic lesions correspond to 7 simple cysts, 1 hydatid cyst, 1 postsurgical collection and 1 treated HCC. ASL-FAIR sequence was performed as part of the MRI protocol, which also include chemical-shift imaging, axial TSE T2-weighted sequence and DCE-MRI. Two radiologist independently reviewed all MRI studies in 2 different session blinded to any clinical information. In the first session, they read all the unenhanced series and the ASL sequence. In the second session, they read all MR sequences including the DCE-MRI, except the ASL. They classified all focal liver lesion over 8 mm as solid or cystic. Criteria for solid lesions were presence of internal flow in ASL sequence or enhancement in the DCE-MRI sequence. DCE-MRI was considered as the gold-standard. The ASL-FAIR is a breath-hold balanced TFE sequence: flip angle: 35, TR: 3,6 ms, TE: 1,7 ms, SENSE factor: 2, Tag delay: 1500 ms, image resolution: 4x4x10 mm3, acquisition time: 14s.

RESULTS
Interreader agreement for both ASL and DCE-MRI was excellent (κ=1; p<0,001). A statistically significant correlation was demonstrated between DCE-MRI and ASL (r=0.85; p<0,001). Sensitivity, specificity, and positive and negative predictive values were of 100%. 80%, 90% and 100%, respectively for both readers. The two false positive in ASL reading corresponded to a postsurgical collection and a simple cyst.

CONCLUSION
FAIR-ASL was feasible in all patients, and as part of a liver MRI protocol. ASL can show accurately the presence or absence of flow in solid and cystic liver lesions, respectively.

CLINICAL RELEVANCE/APPLICATION
ASL is feasible in the liver. ASL can be used as an alternative non-contrast technique to DCE-MRI in the differentiation between benign and malignant focal liver lesion.
Surrogate Arterial Phase Imaging Using Long-duration Free-breathing Fat-suppressed Radial 3D Gradient-Recalled Echo Sequence: An Alternative Approach in Patients Unable to Breath-hold

Mamdoh AlObaidy MD (Presenter): Nothing to Disclose, Miguel Ramalho MD: Nothing to Disclose, Kiran Kumar Reddy Busireddy MD: Nothing to Disclose, Brian M. Dale PhD: Employee, Siemens AG, Ersan Altun MD: Nothing to Disclose, Lauren Marie Brubaker Burke MD: Consultant, Amgen Inc, Richard Charles Semelka MD: Research support, Siemens AG Consultant, Guerbet SA

PURPOSE
To assess the feasibility and enhancement quality of acquiring early-phase imaging utilizing long-duration radial 3D-GRE imaging by initiating the sequence prior to starting contrast injection.

METHOD AND MATERIALS
This HIPAA compliant study was performed with signature waiver in accordance with institutional IRB. Thirty-three consecutive patients (10 males, 23 females; 50.7±25.5 years) underwent free-breathing gadolinium-enhanced radial 3D-GRE, with sequence initiation 30s prior to contrast injection. Comparison was made to a control group of 33 consecutive cooperative patients (21 males and 12 females; 60.9±12.6 years), who underwent breath-hold dynamic Cartesian 3D-GRE imaging. The late hepatic arterial (LHA) phase was selected for comparison. Images were evaluated for quality of enhancement and overall image quality. Quantitative organ enhancement was calculated. Sub-group analysis was performed within the radial 3D-GRE group.

RESULTS
Twenty-two and 23 examinations of radial and Cartesian 3D-GRE sequences, respectively, were acquired during the LHA phase. Specific organ enhancement scores were of satisfactory-to-good diagnostic quality (3.34-3.80) for the radial 3D-GRE group; however, lower than those of Cartesian 3D-GRE (p≤0.0001). There was a significant trend of higher overall quality of enhancement scores in pediatric patients and examinations performed at 3T (p<0.0001). Specific organ percent enhancement was significantly lower for all organs in the radial 3D-GRE group, except for the liver.

CONCLUSION
Arterial phase imaging for abdominal MRI is feasible using conventional radial 3D-GRE by adopting a simplistic approach utilizing a fixed time of 30 s of sequence initiation prior to gadolinium injection, which may allow arterial-phase imaging in patients unable to suspend respiration.

CLINICAL RELEVANCE/APPLICATION
Pediatrics and adults unable to suspend respiration are normally lacking dynamic, specifically arterial, imaging in their routine MRI examinations. The preliminary results of our study suggest that our approach may allow adequate arterial phase imaging using free-breathing three-dimensional gradient-recalled echo with radial k-space sampling.

Effect of Intravenous Gadoxetic Acid and Flip Angle on Hepatic Proton Density Fat Fraction (PDFF) Estimation with Magnitude Multi-echo Gradient-echo MR Imaging at 3T


PURPOSE
To compare hepatic proton density fat fraction (PDFF) accuracy using low- and high-flip angle (FA) 6-echo magnitude-based magnetic resonance imaging (MRI), before and after administration of gadoxetic acid (Gx), using pre-contrast magnetic resonance spectroscopy (MRS) as reference.

METHOD AND MATERIALS
This prospective, cross-sectional, observational single-center study was IRB approved and HIPAA complaint. Adults with known or suspected non-alcoholic fatty liver disease (NAFLD) undergoing 3T clinical Gx-enhanced liver MRI were enrolled. Magnitude-based MRI at low-FA (10°) and high-FA (50°) was obtained pre-Gx and during the hepatobiliary phase to estimate PDFF, with FAs in random order to eliminate time-point bias. Pre- and post-Gx advanced MRS (using multiple TRs and TEs, to measure T1) was obtained from a voxel in the right hepatic lobe. Accuracy of MRI PDFF, co-localized to the MRS voxel location, was assessed by regression analysis using pre-Gx MRS as reference. Pre- and post-Gx hepatic water and fat T1 values were estimated from MRS.

RESULTS
Twenty-eight adult subjects were enrolled after obtaining written informed consent. Linear regression slope, intercept, and R2 of MRI-PDFF as a function of MRS-PDFF were, respectively: 1.06, 0.90%, and 0.98 pre-Gx at FA 10°; 1.05, 0.92%, and 0.99 post-Gx at FA 10°; 0.73, 0.06%, and 0.98 pre-Gx at FA 50°; and 1.04, 0.37%,
and 0.99 post-Gx at FA 50°. Mean hepatic water and fat T1 values by MRS were 927 and 356 msec pre-Gx, and 361 and 347 msec post-Gx, respectively.

**CONCLUSION**

Low-FA magnitude multi-gradient-echo MRI estimates hepatic PDFF pre- and post-Gx accurately. High-FA magnitude MRI overestimates PDFF pre-Gx due to T1 bias from fat protons having shorter T1 values than water protons, but accurately estimates PDFF post-Gx because Gx preferentially relaxes water protons, causing T1 values of both water and fat to be similar, thus reducing T1 bias.

**CLINICAL RELEVANCE/APPLICATION**

Post-Gx MRI at high FA allows accurate PDFF estimation with improved signal-to-noise, and higher resolution which may enable detection and characterization of fatty or fat-sparing focal liver lesions.

**SSQ08-05**

**Combined Multiple Short Echo of Gradient Echo (CMGRE) Imaging for Accurate Measurement of Severe Iron Accumulation in the Liver**

Xianfu Luo (Presenter): Nothing to Disclose, Fuhua Yan: Nothing to Disclose, Wei-Min Chai: Nothing to Disclose, Huan Zhang: Nothing to Disclose, Huanhuan Liu: Nothing to Disclose, Xiao Zhu Lin MD: Nothing to Disclose

**PURPOSE**

To assess the accuracy of combined multiple short echo of gradient echo (CMGRE) imaging for noninvasive quantification severe iron accumulation in the liver.

**METHOD AND MATERIALS**

Forty-two patients with elevated ferritin and suspected of iron overload were included in our study. MR was then performed for liver iron quantification on 1.5T GE Healthcare Signa Twin speed systems. First, a routine multiple gradient echo (RMGRE) imaging was acquired 10 echoes in a sequence with first echo time (TE) of 1.5ms and an echo spacing of 1.2ms. And then a group of combined multiple short echo of gradient echo (CMGRE) technique was used in 10 separately sequence with the first TE of 1ms and an echo spacing of 0.2ms. The gradient echo MRI sequences were run all with repetition time (TR) of 50ms, a flip angle of 20°and a readout bandwidth of 83.3 kHz. Frequency fat suppression was used for each single sequence. R2* of the liver was calculated with the functool of R2* on ADW4.3 workstation. 3 parameter fitting model was used to calculate R2*. Two radiologists measured R2* with three region of interest (ROI) for each patient. The accuracy of two group for R2* quantification was judged by curve fitting analysis. R Square and residual sum of squares for CMSGRE and RGRE was 0.98 and 0.39 respectively. And the residual sum of squares for CMSGRE and RGRE was 0.04 and 71.39, respectively. CMSGRE was more accurate than SMGRE in quantification of severe iron accumulation in the liver.

**RESULTS**

For all 42 patients the R2* was 335.47± 58.34Hz and ranged from 34.13Hz to 1503.10Hz. 11 of 42 patients with chronic liver disease had normal R2* liver.10 patients were with severe iron accumulation (R2*>585Hz). The R2* of sever iron accumulation patients was 1035.36±101.99 Hz ranged from 665.91Hz to 1721.87Hz determined by CMSGRE. The R Square of CMSGRE and RMGRE was 0.98 and 0.39 respectively. And the residual sum of squares for CMSGRE and RGRE was 0.04 and 71.39, respectively. CMSGRE was more accurate than SMGRE in quantification of severe iron accumulation in the liver.

**CONCLUSION**

Combined multiple short echo of gradient echo imaging will give more accuracy for quantification of liver iron concentrate in severe iron accumulation patients.

**CLINICAL RELEVANCE/APPLICATION**

With combined multiple short echo of gradient echo imaging for quantification graveness iron accumulation, MRI might provide more accuracy information for chelation therapy in the clinical practice in the future.

**SSQ08-06**

**DWI of Liver Lesions: IVIM Model with Different Combination of 11 b Values**

Giovanni Morana MD (Presenter): Nothing to Disclose, Giuliano Scattolin MD: Nothing to Disclose, Riccardo Zanato: Nothing to Disclose, Federica De Leo: Nothing to Disclose, Alex Faccineto: Nothing to Disclose, Michele Fusaro: Nothing to Disclose, Dow-Mu Koh MD, FRCR: Nothing to Disclose

**PURPOSE**

We investigate diffusion coefficients, evaluated with intravoxel incoherent motion (IVIM) model, in both hypervascular and hypovascular liver lesions (HCC, FNH and colorectal metastases), in their different parameters: apparent diffusion coefficient (ADC); perfusion fraction (f); diffusion and pseudodiffusion coefficient (D and D*). We evaluated how IVIM parameters change according to the number of b values utilized in their analysis.

**METHOD AND MATERIALS**

Retrospective study of 96 patients with differences diagnosis: HCC (n=28; path proof) FNH (n=44; Liver specific CM uptake and follow-up) CCM (colorectal carcinoma metastasis: n=24; path proof). MR: Siemens Avanto, 1.5 T with quantum gradients. DWI sequence: EPI (WIP511c; TR/TE=4361/54ms) with 11 b-values (0, 10, 20, 30, 50, 70, 100, 150, 200, 400, 800 sec / mm2). Using MatLab, the estimations of D, D* and f were carried out for different combination of b-values: C1 (11 values: 0, 10, 20, 30, 40, 80, 200, 400, 800 sec / mm2), C2
RESULTS

With 11 b values: - ADC and D were not significantly different between lesions. - HCC vs FNH: D* and f were not significantly different between HCC and FNH; both were significantly higher than in CCM. - Perfusion fraction (%f) was significantly higher in HCC and FNH versus CCM. With lesser b values (C2,C3): - D* shows a significant (p< 0.05) decrease in HCC, not significantly decrease in FNH and in CCM. Not statistically difference between lesions - D does not change - %f does not show a significantly decrease in the above groups, thus maintaining the statistical difference (HCC/FNH >> CCM).

CONCLUSION

DWI and IVIM parameters are dependent on number of b values, with the exception of %f and D. Higher b values are more helpful for dd. Quantitative analysis is highly dependent on the sequence. There is a need for standardization of sequences.

CLINICAL RELEVANCE/APPLICATION

Perfusion fraction is independent from the number of b values and is a useful indicator for differential diagnosis.

SSQ08-07

Novel Dynamic Hepatic MR Imaging Strategy Using Advanced Parallel Acquisition, Rhythmic Breathholder Technique, and Gadoxetate Disodium Enhancement

Ute L. Fahlenkamp MD (Presenter): Nothing to Disclose, Moritz Wagner MD : Nothing to Disclose, Matthias Taupitz MD, PhD : Nothing to Disclose, Bernd K. Hamm MD : Research Consultant, Bayer AG Research Consultant, Toshiba Corporation Stockholder, Siemens AG Stockholder, General Electric Company Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Siemens AG Research Grant, General Electric Company Research Grant, Elbit Medical Imaging Ltd Research Grant, Bayer AG Research Grant, Guerbet AG Research Grant, Bracco Group Research Grant, B. Braun Melsungen AG Research Grant, KRAUTH medical KG Research Grant, Boston Scientific Corporation Equipment support, Elbit Medical Imaging Ltd Investigator, CMC Contrast AB, Alexander Huppertz MD : Employee, Siemens AG

PURPOSE

To evaluate image quality of gadoxetate disodium-enhanced dynamic hepatic MR imaging strategy based on advanced parallel acquisition combined with rhythmic breathholding.

METHOD AND MATERIALS

With institutional-review-board approval and consent, twenty-seven patients (21 males, mean age 57.3 years) underwent 3D gradient-echo imaging at 3 Tesla using controlled-aliasing-for-image-reconstruction (CAIPIRINHA, spatial resolution 1.2×1.2×3.0mm, acquisition time 10.4 seconds) for preoperative imaging. Sequence was repeated over three minutes at eight fixed timepoints after contrast injection. Image quality was evaluated on a five-point scale (1=excellent; 5=non-diagnostic). Dynamic sequences were classified according to perfusion phases. Contrast characteristics and artifacts were analyzed. The liver position in z-axis was evaluated to monitor breathhold robustness.

RESULTS

Overall image quality was scored 1.44 (95%CI: 1.18-1.71). Contrast in central and peripheral vessels was excellent in 25/27 and 22/27 patients, respectively. Adequate arterial phase was acquired in 21/27 patients, classification was "early arterial" in 3/21 and "late arterial" in 18/21 patients. In two patients, 1st dynamic acquisition was classified "too early" and 2nd acquisition "portal", and in four patients timing was too late (1st dynamic classified "portal"). Artifacts were observed in 21/27 patients, rated as mild in 19/21. Compromised quality was due to receiver-coil-related artifacts (17/29), parallel-imaging-related artifacts (6/29), breathing artifacts (3/29), and other (3/29). The position of the liver throughout the dynamic phases was highly constant with maximal mean shifting of +2.2mm and -2.1mm during 1st and 2nd dynamic acquisitions.

CONCLUSION

Advanced parallel acquisition with rhythmic breathholding leads to very high and robust image quality without individual timing in preoperative gadoxetate disodium-enhanced liver MR imaging.

CLINICAL RELEVANCE/APPLICATION

Acquisition time of about 10 seconds combined with a rhythmic breathholding strategy guarantees for high quality of gadoxetate disodium-enhanced hepatic MR imaging and avoids non-diagnostic dynamic phases caused by breathing artifacts.

SSQ08-08

CAIPIRINHA-Dixon-TWIST (CDT) - volume-Interpolated Breath-hold Examination (VIBE) for Abdominal Imaging: Comparison of Gadoterate Meglumine, Gadobutrol and Gadoxetic Acid

Johannes Budjan MD (Presenter): Nothing to Disclose, Melissa Ong MD : Nothing to Disclose, Philipp Riffel MD : Nothing to Disclose, John Nicholas Morelli MD : Nothing to Disclose, Henrik J. Michaely MD : Speakers Bureau, Siemens AG Speakers Bureau, Bayer AG Speakers Bureau, Guerbet SA, Stefan Oswald Schoenberg MD, PhD : Institutional research agreement, Siemens AG, Stefan Haneder MD : Nothing to
CAIPRINHA-Dixon-TWIST (CDT)-VIBE is a robust method for abdominal magnetic resonance imaging providing both high spatial and high temporal resolution. The purpose of this study was to examine the influence of different gadolinium based contrast agents (GBCA) on image quality (IQ) with CDT-VIBE.

METHOD AND MATERIALS

In this IRB-approved, retrospective, inter-individual comparison study, 86 patients scanned at 3T were included. Within 28 seconds, 14 high-resolution 3D datasets were acquired using CDT-VIBE. 37 patients received 0.1 mmol/kg gadoterate meglumine, 28 patients 0.1 mmol/kg gadobutrol, and 19 patients 0.1ml/kg gadoxetic acid. Two blinded, board-certified radiologists assessed the image quality on a 5 point scale (1, nondiagnostic; 5, excellent image quality), as well as the number of hepatic arterial dominant (HAD) phases.

RESULTS

Regardless of the used GBCA, CDT-VIBE provided good results in terms of best IQ achieved among all 14 datasets (gadobutrol 4.3, gadoterate meglumine 3.9, gadoxetic acid 3.7). With respect to worst IQ, the three groups showed statistically significant differences with gadobutrol receiving the highest (3.6), gadoxetic acid the lowest (2.4) rating. No statistically significant differences were found regarding the number of HAD phases.

CONCLUSION

Applying a CDT-VIBE technique, different classes of gadolinium-based contrast agents can be utilized for dynamic liver imaging with good image quality.

CLINICAL RELEVANCE/APPLICATION

As CDT-VIBE provides good image quality regardless of the applied contrast agent, it can be beneficial in various imaging settings, e.g. by combining its high spatial and temporal resolution with advantages of hepatocyte specific contrast agents.

Hepatocellular Carcinoma Perfusion Quantification with Tofts vs. Two-Compartment Shutter-speed Models. Initial Experience

Guido Hugo Jajamovich PhD : Nothing to Disclose , Wei Huang : Nothing to Disclose , Cecilia Besa MD : Nothing to Disclose , Xin Li : Nothing to Disclose , Aneela Afzal : Nothing to Disclose , Bachir Taouli MD (Presenter): Research Grant, General Electric Company Consultant, Bayer AG

METHOD AND MATERIALS

In this prospective IRB approved study, 9 cirrhotic patients with 12 HCC lesions (mean size 6.4 cm, range 1-13 cm) underwent DCE-MRI. 5 patients were scanned twice for test-retest evaluation. Data was acquired using axial 3D-FLASH sequence covering the whole liver (temporal resolution 1.9-2.5s, 100 volumes acquired) before and after injection of 0.05 mmol/kg of Gd-BOPTA. Liver, portal vein, abdominal aorta and HCCs mean concentrations time-courses were obtained by placing ROIs. Liver and HCC parameters Ktrans, ve and kep for TM and SSM and ti for SSM were compared using Wilcoxon test. Reproducibility was assessed by computing the coefficient of variation (CV).

RESULTS

ve and kep for TM and Ktrans and ti for SSM showed significant differences between liver and HCC (p <0.03). Ktrans, ve and kep for TM were significantly different when compared with their SSM counterparts (p <0.005). Parameter reproducibilities were better in liver parenchyma (CV range 17.4-32.3) compared to HCC (range 37.7-62.6) for both models, while TM demonstrated generally better reproducibility than SSM.

CONCLUSION

Initial data shows different perfusion parameters when computed with the TM and SSM, with differences observed for Ktrans and ti between liver and HCC for the SSM. The SSM showed worse reproducibility than TM.

CLINICAL RELEVANCE/APPLICATION

Substantial differences in ti (mean intracellular water molecule lifetime) were observed between liver parenchyma and HCC which may reflect differences in metabolic activities, suggesting potential utility for HCC characterization.
**GIS382**

**DCE-MRI-based Pharmacokinetic Biomarker for Predicting Survival of Patients with Advanced Hepatocellular Carcinoma Treated by Sunitinib: Fast-Water-Exchange-Limit-Constrained Analysis (Station #1)**


**PURPOSE**

To compare five different standard dual-input pharmacokinetic models (PKMs) with the fast water exchange regime for the analysis of baseline DCE-MRI data in the prediction of 1-year survival (1YS) and its association with overall survival (OS) in advanced hepatocellular carcinoma (HCC) treated by sunitinib.

**METHOD AND MATERIALS**

Twenty patients with advanced HCC underwent DCE-MRI at baseline, and received sunitinib daily by mouth for 28 days followed by 14 days of rest in 6-week cycles. The baseline DCE-MRI data were analyzed retrospectively by using five different standard dual-input PKMs: the Tofts-Kety (TK), extended TK, two compartment exchange, adiabatic approximation to the tissue homogeneity (AATH), and distributed parameter (DP) models. Kinetic parameters consisted of total hepatic blood flow (BF), arterial flow fraction (γ), arterial BF (BF_A), portal BF, blood volume, mean transit time, capillary permeability-surface area product (PS), fractional interstitial volume (v_I), and extraction fraction (E). Following receiver operating characteristic analysis with additional leave-one-out cross-validation, parameters of the different kinetic models were compared in terms of 1YS discrimination using cross-validated Kaplan-Meier analysis, and association with OS using a univariate Cox-proportional hazard model, with additional permutation testing.

**RESULTS**

For 1YS prediction, the TK-model-derived v_I (P=0.037), the AATH-model-derived BF_A (P=0.019), PS (P=0.027), and E (P=0.033), and the DP-model-derived γ (P=0.012) and BF_A (P=0.041) had statistically significant predictability after cross-validation and permutation testing, all of which were lower in the high-risk group. For OS, the increase of the AATH-model-derived PS and the DP-model-derived BF_A were statistically significantly associated with the increase of OS with hazard ratios of 0.766 (P=0.023) and 0.809 (P=0.025) after permutation testing, respectively.

**CONCLUSION**

The AATH-model-derived PS and the DP-model-derived BF_A were effective biomarkers for both the prediction of 1YS and the association with OS. Among the standard models, the AATH and DP were favorable models in survival analysis.

**CLINICAL RELEVANCE/APPLICATION**

Kinetic parameters derived from dual-input PKMs with the fast water exchange regime based on baseline DCE-MRI data can provide effective prognostic imaging biomarker.

**GIS383**

**Is Iodine Quantification Able to Reflect Early Chemotherapy Response of Liver Metastases Origination from Rectal Cancer?—Preliminary Results (Station #2)**

Rui Qi (Presenter): Nothing to Disclose, Zhenlin Li MD: Nothing to Disclose, Xiaohui Zhang: Employee, Siemens AG

**PURPOSE**

To evaluate the value of iodine quantification by dual-source dual-energy computed tomography (DSDECT) in appraising chemotherapy effect of liver metastases of rectal cancer.

**METHOD AND MATERIALS**

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A total of 7 patients (2 female, 5 male, mean age 52y) with liver metastases from unresectable rectal cancer were retrospectively analyzed. 37 lesions were evaluated, range 4-7 lesions each. In all cases, a first line therapy with oxaliplatin was stopped and second line therapy with Zaltrap+FOLFIRI was initiated. Time interval between first cycle of second line and stop of last cycle of primary therapy was minimum 1 month each. DSDECT scans were performed (SOMATOM Definition Flash, Siemens) before application of second line therapy as base line and directly after end of each cycle according to clinical standards. Iodine quantification was based on portal venous phase (PVP, standardized iodine load and injection rate). According to RECIST criteria, number of patients classified as partial response / progressive disease (PR/PD) were 4/3 (total number of metastases per group 23/14). Iodine quantification was performed on the manufactures workstation (MMWP, Siemens) and region of interest to evaluate the iodine concentration (standardized iodine value used, SIV, normalization by iodine uptake of surrounding liver parenchyma) were placed in areas with maximal enhancement within solid tumor tissue. A two sample t-test was used for statistical analysis.

RESULTS

SIV for PR (0.46±0.24) and PD(0.71±0.28) group in DSDECT before chemotherapy were significantly different in the PVP scan(P=0.011). The change of SIV between pre-chemotherapy and first cycle of the chemotherapy for PR group (0.13±0.20) were significantly different with that in PD group (-0.12±0.14)(P=0.00). The change of SIV between pre-chemotherapy and second cycle of the chemotherapy for PR group (0.19±0.28)(P=0.00) was also significantly higher than that in PD group (-0.19±0.19). For PR group the SIV increased in most target lesions after chemotherapy, while for PD group the SIV decreased.

CONCLUSION

SIV provided information in the base line scanning and reflected the early response on second line chemotherapy in liver metastases of advanced rectal cancer. This preliminary study may be a robust and simple parameter for therapy assessment.

CLINICAL RELEVANCE/APPLICATION

SIV may be a easy obtained parameter to therapy follow-up and predication for second line chemotherapy of liver metastases.

GIS384

A Preliminary Study on Multislice-Based CECT Texture Analysis in Differential Diagnosis of Pyogenic Hepatic Abscess and Malignant Mimickers (Station #3)

Shiteng Suo (Presenter): Nothing to Disclose, Zhi Guo Zhuang : Nothing to Disclose, Mengqiu Cao : Nothing to Disclose, Jianrong Xu : Nothing to Disclose

PURPOSE

To establish the utility of multislice-based texture analysis on contrast-enhanced computed tomography (CECT) in discrimination of pyogenic hepatic abscess and malignant mimickers.

METHOD AND MATERIALS

This retrospective study included 25 abscesses in 20 patients and 33 tumors in 26 patients who underwent CECT, and for further comparison, 19 hepatic simple cysts in 19 patients were also reviewed. Multislice-based texture analysis was assessed for CECT images using a Laplacian of Gaussian band-pass filter (5 filter levels with sigma weighting ranging from 1.0 to 2.5), with quantification of uniformity, entropy, kurtosis and skewness. Statistical significance for these parameters was tested by one-way ANOVA followed by Tukey honestly significant difference (HSD) test. Diagnostic performance was evaluated using the receiver operating characteristics (ROC) curve analysis.

RESULTS

There were significant differences in entropy and uniformity at all sigma weightings (P < 0.001), and in kurtosis and skewness only at sigma 1.8 and 2.0 weightings (P = 0.002-0.006) when hepatic abscess, malignant mimickers and simple cysts were compared. Tukey HSD tests showed that abscess had a significantly higher entropy and a significantly lower uniformity than malignant mimickers (P = 0.000-0.004). Entropy (at a sigma 2.0 weighting) had the largest area under the ROC curve of 0.888 in distinguishing abscess from malignant mimickers, with a sensitivity of 81.8% and a specificity of 88.0% using a threshold of 3.64.

CONCLUSION

Multislice-based texture analysis may be useful for differentiating pyogenic hepatic abscess and malignant mimickers. Entropy and uniformity are helpful to distinguish the two entities. Larger prospective studies with histopathological results are needed to further confirm the relationship between CECT texture features and disease microenvironment characteristics.

CLINICAL RELEVANCE/APPLICATION

Multislice-based texture analysis quantifies the routinely acquired CECT data in clinical practice without additional imaging and may provide a potential tool to bridge radiologic data with intrinsic tissue characteristics.

GIS385

The Usefulness of Gadoxetic Acid-Enhanced Dynamic Magnetic Resonance Imaging in Hepatocellular Carcinoma: Toward Improved Staging (Station #4)

Sang Hyun Choi (Presenter): Nothing to Disclose, Jae Ho Byun MD : Nothing to Disclose, Heon-Ju Kwon MD : Nothing to Disclose, Hong-Il Ha MD : Nothing to Disclose, So Jung Lee : Nothing to Disclose, Hyung Jin Won MD : Nothing to Disclose, Pyo Nyun Kim MD : Nothing to Disclose

PURPOSE
To evaluate the usefulness of gadoxetic acid-enhanced dynamic magnetic resonance imaging (MRI) in staging hepatocellular carcinoma (HCC).

**METHOD AND MATERIALS**

Two investigators independently and retrospectively reviewed dynamic computed tomography (CT) and gadoxetic acid-enhanced dynamic MRI obtained from July to September 2011 in 195 patients with HCC (158 men, 37 women; mean age, 57.1 years). The diagnostic performances of dynamic CT and MRI were evaluated. Barcelona Clinic Liver Cancer (BCLC) stages were determined before and after gadoxetic acid-enhanced dynamic MRI and according to final diagnosis. Change in BCLC stage was evaluated after adding gadoxetic acid-enhanced dynamic MRI to dynamic CT. The consistency between final BCLC stage and each of these two modalities was compared. Diagnostic performance and BCLC staging between gadoxetic acid-enhanced dynamic MRI and dynamic CT was compared using the McNemar test.

**RESULTS**

Final BCLC stage was classified as stage 0 (12.8%), A (60.5%), B (16.9%), C (8.7%), and D (1.0%), respectively. Gadolinium-enhanced dynamic MRI showed significantly higher diagnostic performance than dynamic CT for HCC, including significantly greater sensitivity (observer 1, 90.6% [203/224] versus 79.5% [178/224]; observer 2, 88.4% [198/224] versus 63.8% [143/224]; \(P<.05\), and significantly more accurate BCLC staging (observer 1, 92.8% [181/195] versus 80.5% [157/195]; observer 2, 89.2% [174/195] versus 68.2% [133/195]; \(P<.05\)). Gadolinium-enhanced dynamic MRI showed higher interobserver agreement for the diagnosis (k = 0.630 versus 0.485) and staging (k = 0.851 versus 0.601) than dynamic CT. BCLC stage was changed correctly after gadolinium-enhanced dynamic MRI in the patients showing differences between CT and final BCLC stages (observer 1, 71.1%; observer 2, 71.0%).

**CONCLUSION**

Gadoxetic acid-enhanced dynamic MRI provided important additional information compared with dynamic CT during initial staging HCC. Gadolinium-enhanced dynamic MRI showed higher diagnostic performance and more accurate BCLC staging than dynamic CT.

**CLINICAL RELEVANCE/APPLICATION**

Gadoxetic acid-enhanced dynamic MRI is important during initial staging HCC as it shows significantly more accurate BCLC staging and is more consistent with final BCLC stage than dynamic CT.

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**GIS386**

Radiation Reduction in Reproductive-Aged Women for Suspected Acute Appendicitis: A Look at Ultrasound versus Computed Tomography (Station #5)

Darren Lu MD (Presenter): Nothing to Disclose, Hisham A. Tchelepi MD: Nothing to Disclose

**PURPOSE**

To recognize ultrasound (US) as the first step in evaluating reproductive-aged women with suspected acute appendicitis and to stress its role in eliminating the need for unnecessary radiation exposure.

**METHOD AND MATERIALS**

A retrospective review was conducted of women ages 14 to 45 (mean of 28.4) presenting with right lower quadrant pain suspicious for acute appendicitis. All cases had an initial right lower quadrant ultrasound. Subsequent CT scans were performed as clinically indicated by the ordering physicians. All cases that proceeded to surgery had pathologic confirmation.

**RESULTS**

158 cases were reviewed. In 23 cases (14.6%), a normal appendix was identified on US. 2 of those cases had a follow up CT performed, both showing a normal appendix. 27 cases (17.1%) demonstrated a dilated, noncompressible appendix consistent with acute appendicitis on US. 8/27 (29.6%) had follow up CT, 7 of which confirmed acute appendicitis. One case proved to be cecal diverticulitis with a normal appendix. All cases of acute appendicitis were confirmed on pathology except one, which was perforated and managed medically. 108 cases (68.3%) were non-diagnostic in which the appendix was not identified. 34 of those had a CT demonstrating a normal appendix. 17/34 (50%) had alternative diagnoses including pyelonephritis, hemorrhagic/ruptured ovarian cysts, teratoma, fibroids, and hydrosalpinx. Our results demonstrate that US has a positive predictive value of 95.8% and a negative predictive value of 100% when an appendix was identified, which are similar to the previously reported data for CT. None of the patients with a non-diagnostic US were subsequently diagnosed with acute appendicitis on CT or clinically. Using the calculator from www.xrayrisk.com, for a female with an average age of 28.4 and DLP of 790 mGy-cm (values from our study population), the total effective dose of a CT abdomen and pelvis is 14.22mSv causing a 1/499 additional risk of cancer.

**CONCLUSION**

This study demonstrates that US plays a significant role in the reduction of radiation dose to our study population of reproductive-aged women. Additionally, US of the appendix in patient presenting with acute right lower quadrant pain can be dependable and reliable for diagnosis.

**CLINICAL RELEVANCE/APPLICATION**

Ultrasound should be considered for the initial evaluation of suspected acute appendicitis, especially in reproductive-age women to decrease radiation exposure.
**GIS387**

**Parallel-transmit-accelerated Spatially-selective Excitation MRI for Reduced-FOV Diffusion-weighted Imaging of the Pancreas (Station #6)**

Kolja Thierfelder MD, MSc (Presenter): Nothing to Disclose, Wieland H. Sommer MD: Nothing to Disclose, Olaf Dietrich PhD: Nothing to Disclose, Felix G. Meinel MD: Nothing to Disclose, Maximilian F. Reiser MD: Nothing to Disclose, Konstantin Nikolau MD: Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG

**PURPOSE**

Diffusion-weighted imaging (DWI) of the pancreas often suffers from susceptibility and distortion artifacts. Our aim was to evaluate the use of 2D-selective parallel-transmit accelerated excitation MRI for diffusion-weighted EPI (pTX-EPI) of the pancreas and to compare it to conventional single-shot EPI (c-EPI).

**METHOD AND MATERIALS**

The MRI examinations of 32 consecutive patients were evaluated in this prospective and IRB-approved study. All examinations were performed on a 3-T MRI system equipped with two independent transmit channels. PTX-EPI was performed with a (zoomed) Field-of-View (FOV) of 230 × 118mm², whereas c-EPI used a full-FOV of 380 × 285mm². The 2D-RF pulse of pTX-EPI was shortened by a factor of 1.7 (TX-acceleration factor). In a qualitative analysis, two blinded and experienced readers evaluated 3 different aspects of image quality on 3- to 5-point Likert scales. Additionally, apparent diffusion coefficients (ADCs) were determined in both c-EPI and pTX-EPI in normal-appearing pancreatic tissue using regions of interests (ROIs). Mean ADC values and standard deviations were compared between the two techniques.

**RESULTS**

The zoomed pTX-EPI was superior to c-EPI with respect to overall image quality (3.10 ± 0.65 vs. 2.45 ± 0.77, p < 0.0001) and identifiability of the pancreatic ducts (1.03 ± 0.81 vs. 0.45 ± 0.69, p < 0.01). Artifacts were significantly less severe in pTX-EPI than in c-EPI (1.06 ± 0.77 vs 1.61 ± 0.84, p < 0.01). The mean ADC values of c-EPI (1.29 ± 0.19 × 10^{-3} mm²/s) and pTX-EPI (1.27 ± 0.17 × 10^{-3} mm²/s) did not differ significantly (p = 0.44). The variation within the ROIs as measured by the standard deviation was significantly lower in pTX-EPI (0.095 ± 0.035 × 10^{-3} mm²/s) than in c-EPI (0.135 ± 0.075 × 10^{-3} mm²/s), p < 0.05.

**CONCLUSION**

TX-accelerated spatially-selective EPI leads to substantial improvements in DWI of the pancreas with respect to different aspects of image quality without significantly influencing the ADC values.

**CLINICAL RELEVANCE/APPLICATION**

PTX-accelerated EPI has the potential to overcome some of the limitations of conventional DWI techniques in MRI of the pancreas. Further studies might show whether the use of parallel-transmit enables a more accurate differentiation of pancreatic lesions.

**GIS388**

**Added Value of Diffusion-weighted MR Imaging to T2-weighted and Dynamic Contrast-enhanced MR Imaging in T Staging of Gastric Cancer (Station #7)**

Song Liu (Presenter): Nothing to Disclose, Jian He MD, PhD: Nothing to Disclose, Wenxian Guan: Nothing to Disclose, Qiang Li: Nothing to Disclose, Haiping Yu: Nothing to Disclose, Zhuping Zhou: Nothing to Disclose, Shanhua Bao: Nothing to Disclose, Zhengyang Zhou: Nothing to Disclose

**PURPOSE**

The objective of this study was to confirm whether diffusion-weighted (DW) magnetic resonance (MR) imaging has some added value to T2-weighted (T2W) and dynamic contrast-enhanced (CE) MR imaging in T staging of gastric cancer on 3 T MR scanners.

**METHOD AND MATERIALS**

Fifty-one patients (age range, 28-82 years; mean, 62 years; 33 men and 18 women) with a total of 51 gastric cancers underwent axial T2W, dynamic CE and DW (b, 0 and 1000 s/mm²) MR imaging. Two radiologists independently interpreted the images for T staging of the tumors. The tumors were staged based on the histopathological findings that assign the tumor stage according to TNM classification of American Joint Committee on Cancer (AJCC, 7th edition). McNemar test was used to check the differences among three MR image sets (T2W+CE, T2W+DW, T2W+CE+DW) in the diagnostic accuracy with the reference of post-operative histopathological results. Inter-observer agreement was calculated by using kappa statistics.

**RESULTS**

The overall accuracy of T staging in pT1-4 gastric cancers by T2W+CE+DW (88.2%) was significantly higher than that by T2W+CE and T2W+DW (both 76.3%, P=0.031). For advanced lesions (pT2-4), T staging accuracy by T2W+CE+DW (92.3%) was significantly higher than that by T2W+CE (76.9%, P=0.031). There were no significant differences of T staging accuracy in pT1-4 and pT2-4 gastric cancers between T2W+CE and T2W+DW (P=1.000, 0.125). Kappa values in inter-observer agreement test were 0.855, 0.826 and 0.578 in T2W+DW, T2W+CE+DW and T2W+CE.

**CONCLUSION**

DW adds useful information to T2W and CE MR imaging in T staging of gastric cancer, especially in advanced...
Role of Initial Imaging in Risk Stratification for Suspected Choledocholithiasis in Hospitalized Patients (Station #8)

Stella Kang MD : Nothing to Disclose , Laura Heacock MS, MD (Presenter): Nothing to Disclose

PURPOSE

The American Society of Gastroenterology (ASGE) guidelines on evaluation of suspected choledocholithiasis generally support MRCP for intermediate risk patients, and direct evaluation with ERCP for high-risk patients. However, frail patients at high risk of choledocholithiasis but also procedural complications may benefit from MRCP, with the tradeoff of possible delay in necessary stone extraction. We evaluated the predictive utility of ASGE guideline variables and imaging parameters in risk stratification as a potential decision aid for choosing MRCP or ERCP.

METHOD AND MATERIALS

We retrospectively reviewed inpatient cases at our institution with clinically suspected choledocholithiasis. Included patients had US or CT of the abdomen followed by MRCP within 48 hours. Reference standard included ERCP, endoscopic ultrasound, intraoperative cholangiogram, or documented clinical resolution. We used binary logistic regression to test 5 variables in ASGE risk assessment (total bilirubin, age, common duct (CD) dilatation, pancreatitis, liver function test (LFT) abnormality) according to published guidelines, as well as CD size at US/CT, for prediction of choledocholithiasis.

RESULTS

78 cases were included in regression analysis with 25 cases of CD stones. Among ASGE variables for risk assessment, abnormal LFT and CD dilatation were significant predictors of choledocholithiasis (p = 0.031, 0.017). Inclusion of all ASGE variables was slightly more accurate than the two-variable model (77 vs 75% accuracy). Within the ASGE high risk group, CD dilatation was a significant predictor of choledocholithiasis. In the ASGE high risk class, CD stone prevalence was 53%, and CD dilatation had positive predictive value (PPV) of 75%; meanwhile, ASGE intermediate risk patients had 22% CD stone prevalence, and CD dilatation had a PPV of only 26%.

CONCLUSION

For acutely ill patients, CD dilatation is the strongest predictor of choledocholithiasis and may aid the decision for MRCP versus ERCP. Patients classified as ASGE high risk for choledocholithiasis with CBD dilatation on initial imaging have high pretest probability not warranting MRCP. ASGE intermediate risk patients cannot be reclassified to high risk using CD dilatation.

CLINICAL RELEVANCE/APPLICATION

CD dilatation at initial imaging is the strongest predictor of choledocholithiasis in hospitalized patients and use with established clinical guidelines aids the decision for MRCP versus ERCP.
Modern hernia repair involves placement of mesh within the inguinal canal. Mesh repairs are associated with more complications than primary tissue repairs and can often lead to a chronic pain syndrome known as inguinodynia. Diagnosis benefits considerably from cross-sectional imaging, however our internal data show that radiologists perform this task poorly. We conducted a retrospective review of 322 patients presenting to a specialty hernia surgeon from 2008-2013. Of the 56 patients with history of inguinal mesh, we identified 19 patients operated on for mesh-related complication with pre-operative cross-sectional imaging available. Radiologists only correctly reported mesh-related abnormalities in 32% of cases (compared to 79% success rate by a blinded expert reader, p = 0.0081).

Evaluation of the post-operative groin is difficult. In addition to reviewing the CT and MRI findings of these surgically-confirmed complications, we intend to highlight the frequent causes of misdiagnosis found in our series. Relying on intraoperative correlation, we hope to illustrate the relevant devices and techniques involved in modern herniorrhaphy.

**TABLE OF CONTENTS/OUTLINE**

- Techniques - Anterior repair - Pre-peritoneal repair
- Devices - Flat Mesh - Sandwich - Plugs
- Complications - Malpositioning - Migration - Meshoma - Infection - Neuroma

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**GIE319**

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**Pull Me Up: A Review of Esophagectomy and Gastric Pull-through Procedures, Their Radiographic Features and Complications (Station #11)**

Jennifer Flanagan (Presenter): Nothing to Disclose, Shaun Michael Nordeck MS, RRA: Research Grant, Toshiba Corporation, Vasantha Vasan MD: Nothing to Disclose, Richard Charles Batz MD: Nothing to Disclose

**TEACHING POINTS**

With the incidence of esophageal carcinoma continuing to increase, esophagectomy and gastric pull-through surgeries for these patients are also on the rise. It is important for radiologists to be able to recognize the different surgical techniques and their radiographic presentations as well as potential complications. This education exhibit will discuss the different surgical techniques (i.e. Ivor Lewis, modified Ivor Lewis, modified McKeown approach, vagal-sparing esophagectomy, transthoracic esophagectomy, transhiatal esophagectomy, bloc esophagectomy, endoesophageal pull through, gastric pull-up and bowel interposition), their radiographic presentation and associated complications.

**TABLE OF CONTENTS/OUTLINE**

I. Introduction II. Review of normal anatomy of GI tract with special emphasis on esophagus and stomach. III. Review of esophagectomy and gastric pull-through procedures including different surgical techniques IV. Review post-op radiographic features and associated complications V. Summary of teaching points

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**GIE321**

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**Small Bowel Tumors: Multi-technical Radiological Approach with Emphasis on CT and MRI and with Endoscopic and Pathologic Correlation (Station #12)**

Jose Gutierrez Chacoff MD (Presenter): Nothing to Disclose, Juan Ramon Ayuso MD: Nothing to Disclose, Giancarlo Schiappacasse MD: Nothing to Disclose, Mario Pages MD: Nothing to Disclose, Daniel Barnes MD: Nothing to Disclose

**TEACHING POINTS**

Small bowel tumors are uncommon lesions whose the incidence have increased, so its diagnostic imaging is of paramount importance to accelerate the therapeutic process. The presence of a stenotic lesion in the duodenum or in the jejunum is highly suggestive of adenocarcinoma. The presence of an intestinal mass associated with the affected loop aneurysmal dilation, suggest lymphoma or GIST. Lymphoma present an homogeneous low contrast enhancement, while the GIST is hypervascular with areas of necrosis.

**TABLE OF CONTENTS/OUTLINE**

- Introduction Study Techniques - Double contrast radiology - Ultrasound and endosonography - MDCT and MDCT-enterography - MRI-enterography - PET-CT - Endoscopy and Endoscopic capsule
- Benign tumors - Radiologic Semiology - Lypoma - Hemangioma - Adenomatous polyp - Hamartomatous polyp - Leiomyoma
- Malignancies - Radiologic Semiology - Adenocarcinoma - Carcinoid - Lymphoma - GIST - Sarcoma - Metastasis
- Diseases associated with intestinal tumors - Peutz-Jegers - Gardner Syndrome - Blue nevus syndrome - Lynch Syndrome - Crohn's Disease - Celiac Disease
- Diagnostic Approach
GIS390

US Characteristics to Predict Neoplasm in Gallbladder Polyps 10 mm or Larger (Station #1)

Bo Bae Lee (Presenter): Nothing to Disclose, Jeong Kyong Lee MD: Nothing to Disclose, Jieun Byun MD: Nothing to Disclose

PURPOSE

To evaluate the characteristics of gallbladder (GB) polyps 10 mm or larger to predict a neoplasm in routine ultrasound (US) examinations.

METHOD AND MATERIALS

A database was reviewed to search for 'GB polyp' in all US examinations of abdomen for five years at a single institution. Fifty-three patients having GB polyps 10 mm or larger with follow-up images (n = 18) or pathologic diagnosis from surgery (n = 35) were included in the retrospective study. The mean duration of imaging follow-up was 46.4 months (range, 12-116 months). All US images and reports were reviewed by two readers in consensus to determine the imaging characteristics of GB polyps including the qualitative and quantitative assessment of the echogenicity, size, shape, surface, multiplicity, the presence of hyperechoic foci in the polyp, GB wall thickening adjacent to the polyps, and visibility on CT. Univariate and multivariate analysis was used to evaluate the predictors for a neoplastic polyp. Receiver operating characteristic (ROC) curve was used to determine the optimal cut-off point for size and age.

RESULTS

A neoplastic polyp was verified pathologically in 12 (22.6%) of 53 patients and the mean size was 23 mm (range, 10-37 mm). Remaining 41 polyps (77.4%) were verified as nonneoplastic by the stability in size on follow-up images (n = 18) or pathologic examinations (n = 23). A univariate analysis of all variables revealed that the presence of adjacent GB wall thickening (P < 0.001), larger size (≥ 17 mm, P < 0.001), older age (> 57 years, P = 0.002), the absence of hyperechoic foci in the polyp (P = 0.003), CT visibility (P = 0.014), sessile shape (P = 0.017), solitary polyp (P = 0.025), and irregular surface (P = 0.048) were significant predictors for a neoplastic polyp. In a multivariate analysis, larger size (≥ 17 mm) was a significant and independent predictor for a neoplastic polyp (P = 0.008).

CONCLUSION

The rate of malignancy is low in GB polyps even 10mm or larger (15.1%). Polyp size 17 mm or larger was the strongest predictor for a neoplastic polyp. CT visibility was a predictor for a neoplastic polyp, in addition to the established predictors. Also, polyps with inner hyperechoic foci preferred to be a nonneoplastic polyp.

CLINICAL RELEVANCE/APPLICATION

Follow-up US examinations are recommended for GB polyps less than 17 mm. Cholecystectomy would be reserved for polyps 17 mm or larger.

GIS391

Pancreatic Neuroendocrine Neoplasms—Imaging features for Distinguishing the Histological Malignancy Defined by World Health Organization 2010 Classification (Station #2)


PURPOSE

To retrospectively determine the CT and MR imaging findings, distinguishing the histological malignancies of pancreatic neuroendocrine neoplasms (PNEs) defined by World Health Organization (WHO) 2010 classification.

METHOD AND MATERIALS

Institutional ethics committee approval and informed consent were obtained. 118 lesions in 109 patients (60 men and 49 women; mean age, 60 years) were histopathologically diagnosed as PNEs in our institutions and 89 resected lesions in 80 patients were included in this study. All lesions were classified into two groups based on the tumor grade, G1 group (including G1 lesions, n=55) and G2 + G3 group (including G2 lesions, n=32 and G3 lesions, n=2), respectively. Various imaging findings such as lesion location, diameter, shape, border, attenuation at non-enhanced CT, homogeneity, enhancement pattern on dynamic multiphase CT, presence of calcification, cystic portion, hemorrhagic change, vascular invasion, and main pancreatic duct (MPD) dilatation, signal intensity of MR images (T1, T2, and diffusion weighted images) and ADC values were evaluated. All imaging findings were compared for each group. Moreover, sensitivity, specificity, PPVs and NPVs in the prediction of G2 + G3 group were also calculated. Mann-Whitney or X2-test was used adequately for evaluating these correlations and a value of p < 0.05 was considered as significant.

RESULTS

Diameter, homogeneity, enhancement pattern, vascular invasion and ADC value were significant differences between G1 group and G2 + G3 group. The rate of lesions with calcification, cystic portion and MPD dilatation tended to be greater in G2 + G3 group than G1 group, however there was no significant difference. All lesions appeared as round or lobulated masses and 84 lesions were well-defined regardless of the tumor grade. Hemorrhagic changes were not found in any lesions. PPVs and NPVs for each imaging findings were 46.9-80.0% and 61.4-90.9%, respectively. Highly PPV and NPV for combined diameter, enhancement pattern and ADC value were observed.

CONCLUSION

Diameter, homogeneity, enhancement pattern, vascular invasion and ADC value were significant differences between G1 group and G2 + G3 group. The rate of lesions with calcification, cystic portion and MPD dilatation tended to be greater in G2 + G3 group than G1 group, however there was no significant difference. All lesions appeared as round or lobulated masses and 84 lesions were well-defined regardless of the tumor grade. Hemorrhagic changes were not found in any lesions. PPVs and NPVs for each imaging findings were 46.9-80.0% and 61.4-90.9%, respectively. Highly PPV and NPV for combined diameter, enhancement pattern and ADC value were observed.
Several imaging findings of CT and MRI are correlated with the tumor grade defined by WHO classification and considered as useful modalities for evaluating histological malignancy.

**CLINICAL RELEVANCE/APPLICATION**

Several imaging findings of non-invasive modalities such as CT and MR are useful for evaluating histological malignancy defined by WHO 2010 classification and determining the treatment strategy.

### GIS392

**Predictive Value of Apparent Diffusion Coefficient Histogram, Alpha-fetoprotein and Transferrin in Evaluation of Hepatocellular Carcinoma' Response to Radiofrequency Ablation (Station #3)**

Xiaohong Ma (Presenter): Nothing to Disclose, Xinming Zhao: Nothing to Disclose, Han Ouyang MD: Nothing to Disclose, Feng Ye: Nothing to Disclose, Chunwu Zhou: Nothing to Disclose

**PURPOSE**

To evaluate the value of apparent diffusion coefficient (ADC) histogram analysis, alpha-fetoprotein (AFP) and transferrin (TFN) for predicting tumor progressive in patients with hepatocellular carcinoma (HCC) treated with radiofrequency ablation (RFA)

**METHOD AND MATERIALS**

In a retrospective study, both 33 progressive patients and 31 stable patients with biopsy-proven HCC underwent breath-hold diffusion-weighted imaging (DWI) (b=800 sec/mm²) on a 3.0T MR scanner before RFA treatment. The pre-treatment ADC value was averaged from the lowest to 10th, 30th, 50th, and 100th percentile of histogram respectively, called ADC10, ADC30, ADC50 and ADC100. The ratio of ADC10, ADC30, ADC50 and ADC100 to mean ADC of non-lesion area were calculated, named RADC10, RADC30, RADC50 and RADC100. All the ADC and RADC values, AFP, TFN, sex, age and maximal tumor diameter (MTD) were statistically analyzed.

**RESULTS**

The ADC30, ADC50ADC100RADC30, RADC50RADC100 values of tumors in the progressive group were significantly higher than those of the stable group (P < 0.05, respectively). Univariate Cox regression analysis indicated that RADC10, RADC30, RADC50 values of the tumor were significantly associated with disease progressive survival (DPS) (RR = 31.02, 43.84 and 44.29, P < 0.05, respectively). In multivariate analysis, the RADC50 value of tumors was a significant predictor for tumor progressive (P = 0.04, χ² = 4.12). When the cut-off value of RADC50 (0.71) was used, the DPS of above the cut-off value group was significantly lower than that of below the cut-off value group (χ² = 5.12P = 0.02).

**CONCLUSION**

Pre-RFA RADC values especially RADC50 value by the ADC histogram analysis may be a predictor for tumor progressive in patients with HCC treated with RFA. Pre-treatment level of AFP and TFN could not predict the prognosis of HCC before RFA treatment.

**CLINICAL RELEVANCE/APPLICATION**

Pre-RFA ADC histogram analysis may serve as a biomarker for predicting tumor progressive in patients with HCC treated with RFA.

### GIS393

**Improved Assessment of Mediastinal and Pulmonary Pathologies in Oncological Staging CT Examinations of the Chest and the Abdomen Using High Pitch Acquisition (Station #4)**

Franziska Maria Braun MD (Presenter): Nothing to Disclose, Martina Karpitschka MD: Nothing to Disclose, Maximilian F. Reiser MD: Nothing to Disclose, Birgit Betina Ertl-Wagner MD: Nothing to Disclose, Anno Graser MD: Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Pfizer Inc Consultant, Bayer AG Grant, Bayer AG, Wieland H. Sommer MD: Nothing to Disclose

**PURPOSE**

To determine radiation dose and image quality of staging CT examinations of the chest and the abdomen performed on a third generation dual-source CT (DSCT) system that allows for high pitch acquisition.

**METHOD AND MATERIALS**

45 patients with known malignancies were analyzed in this study. The collective consisted of 28 men and 17 women with a mean age of 64 years (median 64, range 45 - 80 years). All patients were imaged with standard pitch acquired on a second generation DSCT system (fixed pitch 0.6) as well as with a high pitch protocol from a third-generation DSCT scanner (fixed pitch 1.55). The average time interval between the paired CT examinations was 245 days (median 175, range 11 - 979 days). Both scanners used attenuation-based tube current modulation and tube potential selection. Only follow-up examinations with ± 10 kV difference in tube potential were included. Effective doses were calculated and noise measurements in defined thoracic and abdominal regions were performed. Motion artifacts as well as diagnostic confidence were rated by two experienced radiologists in consensus reading.

**RESULTS**

Median effective doses were 8.5 mSv for standard pitch examinations and 8.7 mSv for high pitch CT scans (p =
Median image noise measured within the trachea and the aortic arch was significantly lower for high pitch examinations (9.0 and 6.5 HU vs. 11.0 and 9.0 HU for standard pitch) (p = 0.0001 and p < 0.001), whereas image noise within the liver, the retroperitoneal fat and the paraspinal muscles was statistically comparable (all p > 0.05). The percentage of datasets with major mediastinal and pulmonary motion artifacts was significantly lower for the high pitch than for the standard pitch protocol (p < 0.0001 and p < 0.0173). These findings are congruent with the observation of a better diagnostic confidence in the assessment of mediastinal abnormalities (p < 0.0001) as well as pulmonary pathologies (p = 0.0047) in high pitch CT.

CONCLUSION

High pitch acquisition of staging CT examinations of the chest and the abdomen facilitates the assessment of mediastinal abnormalities (e.g. lymphadenopathy) and the basal lungs while providing a constantly high abdominal image quality when compared to conventional oncological CT protocols.

CLINICAL RELEVANCE/APPLICATION

High pitch CT acquisition of the chest and abdomen in oncologic patients improves image quality of the mediastinum and the lower lungs without additional radiation dose.

Dynamic MRI Defecography: Observation in Young Female Volunteers (Station #5)

Yanbang Lian (Presenter): Nothing to Disclose, Zhiyang Zhou PhD: Nothing to Disclose, Zhengjun Liu MD: Nothing to Disclose, Jianping Qiu: Nothing to Disclose, Pan Zhu: Nothing to Disclose, Wuteng CAO: Nothing to Disclose

PURPOSE

To study the anatomical and functional changes of normal female pelvic floors with high resolution dynamic MR defecography at rest, lift and defecation phases to establish an initial normal criteria for the diagnosis of pelvic floor dysfunction.

METHOD AND MATERIALS

Ninety six young female volunteers, aged 20-30 years with a mean of 23.8±2.0 underwent the high resolution dynamic MRI defecography. Dynamic fast imaging employing steady-state acquisition sequence was performed in mid-sagittal plane at rest, lift and defecation phases. The distance between bladder neck, cervix, peritoneum, anal-rectal junction, sigmoid colon, small intestine to pubococcygeal line (PCL) were measured. Paired samples t test was carried out to compare the quantitative data.

RESULTS

The distance of anal-rectal junction, bladder neck, cervix, peritoneum, sigmoid colon, small intestine to PCL at rest phase were: (0.05±7.51)mm, (-23.80±3.34)mm, (-35.15±6.27)mm, (-40.07±6.53)mm, (-60.59±18.14)mm and (-67.65±13.48)mm, respectively. The measurements at lift phase were: (-9.11±4.77)mm, (-25.55±3.72)mm, (-35.74±6.06)mm, (-39.40±5.98)mm, (-63.76±10.29)mm and (-66.60±13.97)mm, respectively. The measurements at defecation phase were: (17.47±11.09)mm, (-7.01±10.52)mm, (-14.91±13.29)mm, (-20.05±14.18)mm, (-47.51±13.80)mm and (-46.87±14.90)mm, respectively. There is no statistically significant difference in distance of cervix, peritoneum, sigmoid colon, small intestine to PCL between rest and lift phase (t=1.32, 1.71, 1.70, 1.20, and P=0.19, 0.09, 0.09, 0.24, respectively). However, there are statistically significant difference in cervix, peritoneum, sigmoid colon, small intestine to PCL between rest and defecation (P<0.05) and between lift and defecation (P<0.05). The distance of anal-rectal junction, bladder neck to PCL showed statistically significant difference in rest, lift and defecation phases.

CONCLUSION

Distance of Cervix, peritoneum, sigmoid colon and small intestine to PCL shows no difference in rest and lift phases. Bladder neck, cervix, peritoneum, sigmoid colon and small intestine are above PCL in all three phases. Anal-rectal junction is below PCL no more than 2cm in defecation. This study can serve as normal reference for evaluation of pelvic organ prolapse.

CLINICAL RELEVANCE/APPLICATION

Dynamic MRI defecography in normal female young volunteers can provide us with a diagnostic criteria to better understand and more appropriately treat for pelvic floor dysfunction.

Feasibility and Reproducibility of R2* Measurements under Oxygen and Carbogen Challenge in Healthy Volunteers and Patients with Hepatocellular Carcinoma at 1.5 T and 3T (Station #6)

Octavia Bane PhD (Presenter): Nothing to Disclose, Cecilia Besa MD : Nothing to Disclose, Niels Oesingmann PhD : Employee, Siemens AG, Hadrien Dyvorne PhD : Nothing to Disclose, Guido Hugo Jajamovich PhD : Nothing to Disclose, Bachir Taouli MD : Research Grant, General Electric Company Consultant, Bayer AG

PURPOSE

Blood oxygen level dependent (BOLD) MRI measures R2* (1/T2*) of tissues, which depends on blood flow, hematocrit, and oxygen saturation of hemoglobin. This initial study quantifies baseline R2* and changes after oxygen (O2) and carbogen (CB) respiratory challenges in patients with hepatocellular carcinoma (HCC) at 1.5T and 3T.
METHOD AND MATERIALS

Fat-suppressed 2D multiecho GRE sequence was acquired on the upper abdomen (at 1.5T using 5 or 12 TE’s, and 7 TE’s at 3T) in 8 healthy volunteers and 22 patients with HCC, in multiple breath-holds room air and after 10 min. of respiratory challenge. 8 subjects underwent test-retest exams. Mean R2* values at baseline, after challenges, as well as ΔR2* (%)=100x(R2*baseline-R2*gas)/R2*baseline were calculated for HCCs, liver parenchyma and muscle. A paired t-test was used to compare baseline to gas challenges R2*.

RESULTS

The intrasubject test-retest mean coefficients of variation for R2* measurements for air, O2 and CB for liver, HCC and muscle was

CONCLUSION

As shown previously, we did not observe significant change in R2* of the liver or muscle with hyperoxic challenge. HCCs demonstrated variable response to O2 and CB, which may be secondary to vascularity and hypoxia, and should be correlated to pathologic findings in this ongoing study.

CLINICAL RELEVANCE/APPLICATION

R2* is a potential non-invasive biomarker of tumor hypoxia and vascularity, which has been shown to correlate with tumor invasiveness, progression and radioresistance in carcinomas.

GIS396

Evaluation of Chemotherapy Response of Gastric Cancer in a Mouse Model Using the Intravoxel Incoherent Diffusion-weighted MRI (Station #7)

Jin Cheng MD (Presenter): Nothing to Disclose, Jie Deng PhD: Nothing to Disclose, Yi Wang MD: Nothing to Disclose, He Wang PhD: Nothing to Disclose, Feng Pan: Nothing to Disclose, Weizhen Wu MD: Nothing to Disclose, Nan Hong MD: Nothing to Disclose

PURPOSE

to determine the capability of intravoxel incoherent motion (IVIM) diffusion-weighted (DW) MRI in evaluating therapeutic response in a mouse gastric cancer model.

METHOD AND MATERIALS

The xenografts bearing MKN-45 human gastric adenocarcinoma were randomly separated in a control group and a group receiving chemotherapy. Fluorouracil and Calcium Folinate were administrated in xenografts for 5 consecutive days starting on day 0. DWMRI with 14 b-values (0-1500 s/mm²) was performed before (day -1) and after treatment (day 3 and day 7). Pure diffusion coefficient (D), perfusion fraction (f) and perfusion coefficient (D*) were calculated by the bi-exponential model S/S₀=(1-f)e^(-bD)+fe^(-b(D+D*)). Apparent diffusion coefficient (ADC) was also calculated. Median changes of ΔADC%, ΔD%, ΔD*% and Δf% from baseline (day -1) measurements were calculated, and analyzed by Mann-Whitney test.

RESULTS

The increase in f of the treated group was significantly higher than the control group, at day 3 (Δf %treated=83.7% and Δf %control=14.3%, P=0.0248) and day 7 (Δf %treated=63.7% and Δf %control=-2.6%, P=0.0192). D* of the treated group decreased at both day 3 (ΔD*%=-21.1%) and day 7 (ΔD*%=-5.5%), whereas D* of the control group increased at day 3 (ΔD*%=14.3%) but decreased at day 7 (ΔD*%=-5.5%). ADC increase of the treated group (ΔADC%=15.8%) was higher than that of control group (ΔADC%=10.7%) at day 3. However, the significant differences in ΔD*% and ΔADC% were not reached.

CONCLUSION

The perfusion fraction f that may associate with tumor tissue microvascular volume may serve as a valuable imaging biomarker of response to chemotherapy in gastric adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION

IVIM-derived perfusion fraction f involving diffusion weighted MRI with multiple b values would serve as greater imaging biomarker to monitor chemotherapeutic response in gastric cancer compared with ADC values, pure diffusion coefficient D, and perfusion coefficient D*.

GIS397

Cholangiolocellular Carcinoma vs. Conventional Mass-Forming Intrahepatic Cholangiocarcinoma: Comparison of Prognosis and Multiphasic CT Finding (Station #8)

Jong Hyouk Yun MD (Presenter): Nothing to Disclose, Jung Gu Park: Nothing to Disclose, Hee Kang MD: Nothing to Disclose

PURPOSE

The aim of this study is to evaluate the prognosis of nonresectable cholangiolocellular carcinoma compared with conventional mass-forming intrahepatic cholangiocarcinoma and associated multiphasic CT findings.

METHOD AND MATERIALS

From January, 2007 to December, 2013, we retrospectively studied 82 patients with pathologically confirmed nonresectable MF type ICC. Prognosis was compared between 14 patients with cholangiolocellular carcinoma and 68 patients with conventional intrahepatic MF cholangiocarcinoma. Multiphasic liver CT images were evaluated for tumor morphology and enhancement features. Survival rates of two groups were calculated by using the Kaplan-meier method, and the differences in survival were compared by using the log-rank test. A Cox proportional hazard model was used for multivariate survival analysis.
RESULTS

Hypervascular masses were shown in twelve (85%) of 14 cholangiolocellular carcinoma and twelve (17%) of 68 conventional MF type ICCs. The mean diameter of cholangiolocellular carcinoma was significantly smaller than that of conventional MF type ICCs (P=0.025). The median patient survival period of cholangiolocellular carcinoma was significantly longer than conventional MF type ICCs (P= 0.04). Results of multivariable Cox regression analyses confirmed that tumor size (hazard ratio [HR], 1.08; P=0.02), hypovascular tumor (HR, 2.01; P=0.001), and metastatic lymphadenopathy (HR, 2.90; P=0.01) were the independent factors associated with patient survival duration.

CONCLUSION

The cholangiolocellular carcinoma seems to be better prognosis compared with conventional MF type ICCs. The patient survival of MF type ICCs is significantly dependent on tumor size, tumor vascularity and metastatic lymphadenopathy.

CLINICAL RELEVANCE/APPLICATION

The cholangiolocellular carcinoma seems to be better prognosis compared with conventional MF type ICCs.

GIE233

Subtype Classification of Hepatocellular Adenomas and Their Distinguishing, Imaging Characteristics on MRI (Station #9)

Christy Blaire Pomeranz MD (Presenter): Nothing to Disclose, Sharon Meei Ay Ngu MBChB : Nothing to Disclose, Richard Kinh Gian Do MD, PhD : Nothing to Disclose

TEACHING POINTS

1. Review the new pathologic subtypes of hepatocellular adenomas and their genotypic and phenotypic differences.
2. Review distinguishing features and imaging characteristics of different adenoma subtypes on contrast enhanced MRI.

TABLE OF CONTENTS/OUTLINE

Hepatocellular adenomas (HCA) are benign liver tumors, which may display a host of clinical consequences including malignant transformation and bleeding. The Bordeaux group has recently shown that they are pathologically, a heterogeneous group of tumors which can be sub-classified into four different subtypes: HNF1α mutation HCA (35-40%), β-catenin positive HCA (10-15%), inflammatory HCA (40-50%), and unclassified HCA (5-10%). There are increasing reports of differences in imaging characteristics of HCA by subtype on contrast enhanced MRI. Radiologists will play an important role in clinical management if they are able to differentiate between different HCA subtypes on imaging since the subset of β-catenin positive HCA have an increased risk of malignant transformation and inflammatory HCA have an increased risk of bleeding. The emerging MR imaging characteristics of HCA will be illustrated and compared to other hypervascular liver tumors.

GIE239

Updates to the Liver Imaging Reporting and Data System (LI-RADS) v2014: The Latest and Greatest (Station #10)

Cynthia Sawhney Santillan MD (Presenter): Consultant, Robarts Clinical Trials Research Group, Claude B. Sirlin MD : Research Grant, General Electric Company Speakers Bureau, Bayer AG Consultant, Bayer AG

TEACHING POINTS

1. To review LI-RADS v2014 with an emphasis on changes from the previous version.
2. To discuss the changes in LI-RADS v2014 that bring it closer in alignment with criteria for HCC used by OPTN and AASLD.
3. To demonstrate the use of LI-RADS v2014 using sample CT and MR cases in a quiz format.

TABLE OF CONTENTS/OUTLINE

Background and Significance: Importance of accurate HCC staging Discussion of differences in target population and purpose for other systems for diagnosis of HCC, including AASLD and OPTN. LI-RADSv2014 Highlight changes in the diagnostic algorithm Review new content on hepatobiliary contrast agents and their role in LI-RADS Discuss changes in ancillary features that favor malignancy Quiz Radiologists will be presented with cases and asked to categorize them using LI-RADS. There will be an emphasis on cases that use information that is new or changed in LI-RADS v2014.

GIE172

Dual Energy MDCT Quantitative Imaging in the Abdomen: What Can It Do to Improve Your Practice? (Station #11)


TEACHING POINTS

1. Conventional CT numbers represent the normalization of the linear attenuation coefficient to air and water.
2. By a near-simultaneous illumination of materials at two different kilovoltage levels, dual energy MDCT can enhance variances in slope of characteristic x-ray attenuation curves of materials.
3. Dual energy MDCT
provides more accurate quantitative data compared to conventional CT numbers].

TABLE OF CONTENTS/OUTLINE

Introduction: This education exhibit illustrates the basic concepts underlying dual energy MDCT quantitative imaging and its applications in abdominal imaging. Theoretic Concept: Back to the Future. From Polychromatic to Monochromatic Imaging: Dual energy MDCT data can be utilized to obtain virtual monochromatic data which have the potential for mitigating beam-hardening and energy shifting phenomena, therefore providing more accurate quantitative data. Dual Energy MDCT Quantitative Imaging Applications in the Abdomen Virtual Monochromatic Data Display: a) Liver; b) Pancreas; c) Kidney (Figure 1); d) Adrenal Glands; e) Vascular Material Density Analysis: a) Liver (Figure 2); b) Pancreas; c) Kidney (Figure 3); d) Adrenal Glands (Figures 4,5); e) Vascular Conclusion: Dual energy MDCT quantitative imaging may represent a paradigm shift for the abdominal imaging practice.

MSCA51
Case-based Review of the Abdomen (An Interactive Session)

Multisession Courses

AMa PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 1:30 PM - 3:00 PM Location: S406A

Sub-Events

MSCA51A Imaging of Acute Abdomen
Stephan W. Anderson MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1. The participant will be exposed to the current literature related to imaging of acute abdominal pain using CT. 2. The participant will be able to apply an evidence-based approach to CT protocol development in the imaging of acute abdominal pain. 3. The participant will be able to independently evaluate the published literature in this area in a critical fashion and continue to apply recent developments to their own practice.

MSCA51B Imaging of Abdominal Trauma
Savvas Nicolaou MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review the technique and protocols, with an emphasis on MDCT, for imaging of blunt and penetrating abdominal trauma. 2) Demonstrate examples of the spectrum of injuries associated with abdominal trauma, including splenic, hepatic, kidney, pancreatic and bowel injuries. 3) Demonstrate significance of arterial and portal venous phase imaging in the setting blunt abdominal trauma (BAT), and the role of whole body imaging in the setting of BAT. 4) Review the new imaging applications and techniques such as iterative reconstruction and dual-energy CT which can help better image abdominal injuries post-trauma.

MSCA51C Imaging of the Acute Abdomen and Pelvis in Pregnancy
Puneet Bhargava MD (Presenter): Editor, Reed Elsevier

LEARNING OBJECTIVES

1) To understand imaging related radiation risk to the fetus. 2) Exam appropriateness in right upper quadrant, mid-abdominal and flank pain. 3) Role of CT contrast media and its associated risk in pregnancy.

Active Handout

SPSH53
Hot Topic Session: Imaging of Oncologic Surveillance in the Era of Local Targeted Therapies

Special Courses

AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
**Participants**

**Moderator**

David H. Kim MD: Consultant, Viatronix, Inc Co-founder, VirtuoCTC, LLC Medical Advisory Board, Digital ArtForms, Inc

**Sub-Events**

**SPSH53A**

Surveillance Imaging Following Focal Ablative Therapies (Microwave, Radio-frequency Ablation, Cryoablation)

J. Louis Hinshaw MD (Presenter): Stockholder, NeuWave Medical Inc Medical Advisory Board, NeuWave Medical Inc Stockholder, Cellectar Biosciences, Inc

**LEARNING OBJECTIVES**

1) Understand the expected imaging findings after image-guided tumor ablation. 2) Understand the typical findings of complications, local tumor progression, and disease progression. 3) Learn about newer imaging modalities/methods for identifying local tumor progression.

**ABSTRACT**

Image-guided tumor ablation is a rapidly advancing minimally invasive targeted therapy for the treatment of both malignant and benign tumors. Even if you are not actively involved in performing this procedure, you will almost certainly see follow-up imaging performed to evaluate for both local tumor progression and metastatic disease. Following this discussion, you should have a basic understanding of the typical indications for image-guided tumor ablation and the imaging findings associated with normal evolution of the ablation zone as well as findings suspicious for recurrent disease. Of course, this varies depending on the target organ/disease, as well as the underlying malignancy. For example, colorectal carcinoma metastatic to the liver tends to be relatively hypovascular and similar in attenuation to the avascular ablation zone on portal venous phase imaging. Therefore, the primary indicator of recurrence in this clinical setting is asymmetric change/growth one or more of the ablative margins. In contrast, hepatocellular carcinoma is most frequently hypervascular. Since the ablation zone should be avascular, any evidence of vascular enhancement within/around the ablation zone on follow up imaging can be suspicious for residual or recurrent disease. The imaging findings also vary depending upon the ablation modality utilized, particularly when MRI is used for the imaging follow up and we will go through the signal changes that occur over time following an ablation. In addition, we will discuss standardized nomenclature to describe the follow up imaging for tumor ablation. Although the nomenclature is descriptive and extremely helpful, particularly to ensure consistency and improve reporting for research purposes, the terms are not always intuitive.

**SPSH53B**

Surveillance Imaging Following Arterial-directed Regional Therapies for the Treatment of Liver Tumors (Yttrium and Embolization)

Anne Mara Covey MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the different criteria to measure radiographic response, including WHO, EASL, RECIST, mRECIST, and understand the appropriate application for each. 2) Understand which imaging modalities are useful to assess treatment response following different arterially directed therapies. 3) Recognize imaging features of treatment effect and be able to differentiate treatment effect from tumor recurrence and other complications related to treatment.

**MSCA52**

Case-based Review of the Abdomen (An Interactive Session)

**Multisession Courses**

**LEARNING OBJECTIVES**

Several speakers will be presenting case-based reviews of topics of relevance for imaging of the abdomen and pelvis. Brief discussions with focused reviews of the literature will follow for each case.

**Sub-Events**

**MSCA52A**

Pitfalls and Pearls in Abdominal Sonography

Terry S. Desser MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Correctly identify common and uncommon sonographic pathology in the abdomen. 2) Use your understanding of basic sonographic and physiologic principles to infer the correct diagnosis in unusual ultrasound cases.
**LEARNING OBJECTIVES**

1) Apply practical approach to diagnose common and uncommon pathology of genitourinary tract. 2) Learn to avoid pitfalls and misdiagnosis of genitourinary tract pathology.

**LEARNING OBJECTIVES**

1) Summarize imaging findings of complications of abdominal malignancies due to direct tumor effects and treatment effects. 2) Discuss the role imaging in determining treatment regimens.

**ABSTRACT**

Imaging plays a central role in the detection, diagnosis and treatment planning of abdominal malignancies. Proper imaging begins with protocol selection. Knowledge of imaging pitfalls helps the radiologist avoid diagnostic errors. Recognition of complications due to tumor effects and treatment effects is important to minimize morbidity and mortality in patients undergoing treatment for abdominal malignancies. Through case-based discussion, we will review tactics to optimize imaging and management for patients with abdominal malignancies.

**Active Handout**


**RC709**

**Imaging Pancreaticobiliary Diseases (An Interactive Session)**

**Refresher/Informatics**

**AMA PRA Category 1 Credits™: 1.50**

**ARRT Category A+ Credits: 1.50**

**Thu, Dec 4 4:30 PM - 6:00 PM Location: E353B**

**Sub-Events**

**RC709A**

**Cholangiocarcinoma**

**Alison Clare Harris MBChB (Presenter): Nothing to Disclose**

**LEARNING OBJECTIVES**

1) Review the risk factors, diagnostic features and anatomical/morphological classification of cholangiocarcinoma (CC). 2) Describe the typical imaging appearances for intra and extrahepatic cholangiocarcinoma using a multi-modality approach recognizing the distinction between perihilar and distal CC. 3) List findings that are key in determining surgical resectability.

**ABSTRACT**

Abstract Cholangiocarcinoma (CC) is the second most common primary liver tumor worldwide after hepatocellular carcinoma. Incidence and mortality rates for intrahepatic CC are rising. Established risk factors have been determined, but more than 70% of cases are sporadic. The identification of key characteristic features on CT and MRI/MRCP allow for accurate diagnosis and staging. Tumors are classified based on anatomical location into intra and extrahepatic (perihilar and distal) subtypes. This standardizes reporting and helps determine management and planning for either laparoscopy or biopsy. The criteria for surgical resection will be discussed together with options for progressed disease.

**RC709B**

**Pancreas Cancer**

**Eric P. Tamm MD (Presenter): Nothing to Disclose**

**LEARNING OBJECTIVES**

1) Understand the current status of staging pancreatic cancer, the impact of cross-sectional imaging on staging,
and understand the category of 'borderline resectable pancreatic cancer.' 2) Appreciate the impact of advances in vascular reconstruction surgery on staging and surgical planning. 3) Have a basic understanding of neoadjuvant therapy, and its impact on staging.

**ABSTRACT**

The evolution of approaches to pancreatic cancer therapy have had several ramifications for imaging and particularly staging. This evolution has included the development of venous and, to a lesser degree, common hepatic arterial, vascular bypass grafts, and neoadjuvant therapy. These changes led to the changes in the AJCC staging guidelines to de-emphasize venous involvement, and the development of the category of borderline resectable pancreatic cancer. One of the challenges in the environment of preoperative therapy is what are the typical patterns of treatment response. These changes all emphasize the importance of detailed accurate radiology reporting, which has led to the RSNA and American Pancreatic Association templates for radiology reporting. This exhibit will review these topics, with appropriate illustrative radiologic cases.

**Acute Pancreatitis**

Kumaresan Sandrasegaran MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the working party classification of acute pancreatitis. 2) Appreciate the difference between peripancreatic and pancreatic necrosis. 3) Have an understanding of how imaging findings affect endoscopic and surgical management of severe acute pancreatitis.

**ABSTRACT**

In the last 10 years, there have been many new developments in the diagnosis and treatment of severe acute pancreatitis. The concept of peripancreatic necrosis is one. Imaging findings that differentiate peripancreatic necrosis from acute inflammatory collections have been described. Correct image interpretation is important since the former is usually treated more aggressively than the latter. Disconnection of the main pancreatic duct is another finding that may be identified by imaging. This has implications in the subacute stages of severe acute pancreatitis, usually requiring extensive endoscopic or operative intervention in the months after the initial episode. This presentation will review these topics, with appropriate illustrative radiologic cases.

**Autoimmune Pancreatitis**

Joel Garland Fletcher MD (Presenter): Grant, Siemens AG

**LEARNING OBJECTIVES**

1) To review the diagnostic criteria for autoimmune pancreatitis. 2) To discuss the differences between Type 1 and Type 2 autoimmune pancreatitis. 3) To emphasize the need to maximize visualization of pancreatic and intrahepatic ducts and understand temporal changes in contrast enhancement in autoimmune pancreatitis. 4) To describe imaging features of the pancreatic duct and periductal parenchyma in autoimmune pancreatitis that may distinguish it from cancer or chronic pancreatitis. 5) To describe the diagnostic and other frequently seen imaging findings of autoimmune pancreatitis. 6) To illustrate imaging findings showing response to treatment and recurrence of autoimmune pancreatitis after remission. 7) To describe useful imaging features in the differential diagnosis of pancreatitis versus neoplasms and other inflammatory conditions.

**Quantitative CT and MR Perfusion Imaging**

**RC717**

**Refresher/Informatics**

**Learning Objectives**

1) To understand the principles of CT perfusion analysis for tumor assessment. 2) To understand the pathophysiological basis of CT perfusion parameters for tumors. 3) To understand unique CT perfusion analysis of the liver due to its characteristic dual blood supply. 4) To describe the potential clinical applications, with a focus on hepatic and extrahepatic applications and clinical trials. 5) To discuss several recent challenging issues regarding CT perfusion. 6) To discuss areas for further development including assessment of tumor heterogeneity.

**Abstract**

With the emergence of novel targeted therapies for cancer, imaging techniques that assess tumor vascular support have gained credence for response assessment alongside standard response criteria. CT perfusion techniques that quantify regional tumour blood flow, blood volume, flow-extraction product, and permeability-surface area product through standard kinetic models, are
attractive in this scenario by providing evidence of a vascular response or non-response. Additionally, these techniques may provide prognostic and predictive information to the clinician. Their increasing acceptance in oncological practice in recent years has been related to the combination of clinical need and technological improvements in CT, including faster tube rotation speeds, higher temporal sampling rates, the development of dynamic 3D acquisitions and development of commercial software programmes embedded within the clinical workflow. Recently published consensus guidelines provide a way forward to performing studies in a more standardized manner. To date single centre studies have provided evidence of clinical utility. Future studies that include good quality prospective validation correlating perfusion CT to outcome endpoints in the trial setting are now needed to take CT perfusion forward as a biomarker in oncology. These presentations will cover the principles of CT perfusion analysis for tumor assessment and its pathophysiological basis. Clinical applications will be discussed focusing on hepatic and extrahepatic applications and clinical trials. Areas for further development including assessment of tumor heterogeneity will also be discussed.

Sub-Events

RC717A

**CT Perfusion in Oncology: Hepatic Imaging**

Se Hyung Kim (Presenter): Research Grant, Mallinckrodt plc Research Grant, Samsung Electronics Co Ltd

**LEARNING OBJECTIVES**

1) To understand basic principles, acquisition protocol, and pharmacokinetic models of CT perfusion. 2) To learn unique CT perfusion analysis of the liver due to its characteristic dual blood supply. 3) To describe the potential clinical applications, with a focus on hepatic applications. 4) To discuss several recent challenging issues regarding CT perfusion.

RC717B

**CT Perfusion in Oncology: Extrahepatic Imaging**

Vicky Joo-Lin Goh MBCh (Presenter): Research Grant, Siemens AG

**LEARNING OBJECTIVES**

1) To understand the principles of CT perfusion analysis for tumor assessment. 2) To understand the pathophysiological basis of CT perfusion parameters for tumors. 3) To describe the potential clinical applications, with a focus on extrahepatic applications and clinical trials. 4) To discuss areas for further development including assessment of tumor heterogeneity.

**ABSTRACT**

With the emergence of novel targeted therapies for cancer, imaging techniques that assess tumor vascular support have gained credence for response assessment alongside standard response criteria. CT perfusion techniques that quantify regional tumour blood flow, blood volume, flow-extraction product, and permeability-surface area product through standard kinetic models, are attractive in this scenario by providing evidence of a vascular response or non-response. Additionally, these techniques may provide prognostic and predictive information to the clinician. Their increasing acceptance in oncological practice in recent years has been related to the combination of clinical need and technological improvements in CT, including faster tube rotation speeds, higher temporal sampling rates, the development of dynamic 3D acquisitions and development of commercial software programmes embedded within the clinical workflow. Recently published consensus guidelines provide a way forward to performing studies in a more standardized manner. To date single centre studies have provided evidence of clinical utility. Future studies that include good quality prospective validation correlating perfusion CT to outcome endpoints in the trial setting are now needed to take CT perfusion forward as a biomarker in oncology. Clinical applications will be discussed focusing on extrahepatic applications and clinical trials. Areas for further development including assessment of tumor heterogeneity will also be discussed.

RC717C

**Quantitative MR Perfusion Imaging of the Brain**

Max Wintermark MD (Presenter): Research Grant, General Electric Company Research Grant, Koninklijke Philips NV

**LEARNING OBJECTIVES**

1) Understand the difference between quantitative and qualitative perfusion measurements. 2) Distinguish several approaches for obtaining quantitative perfusion maps in the brain. 3) Appreciate the strengths and weaknesses between the two major techniques, arterial spin labeling and bolus contrast dynamic susceptibility imaging.

**RC729**

**Abdominal MRA Update (An Interactive Session)**

*Refresher/Informatics*

**AMA PRA Category 1 Credits ™**: 1.50

**ARRT Category A+ Credits**: 1.50

*Thu, Dec 4 4:30 PM - 6:00 PM   Location: S402AB*
**Non-contrast MRA of the Abdomen**

Scott Brian Reeder MD, PhD (Presenter): Institutional research support, General Electric Company
Institutional research support, Bracco Group

**LEARNING OBJECTIVES**

1) Understand the underlying principles of non-contrast MRA. 2) Be familiar with the currently available methods for non-contrast MRA. 3) Be familiar with important applications and examples of non-contrast MRA. 4) Understand current limitations and pitfalls associated with non-contrast MRA.

**ABSTRACT**

1. Understand the underlying principles of non-contrast MRA. 2. Be familiar with the currently available methods for non-contrast MRA. 3. Be familiar with important applications and examples of non-contrast MRA. 4. Understand current limitations and pitfalls associated with non-contrast MRA.

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**Blood Pool MR Contrast Agents: Clinical Applications and Caveats**

Mellena Davis Bridges MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Describe the differences between the in vivo behavior of blood pool and conventional MRI contrast agents. 2) Match the clinical indication with the appropriate contrast agent. 3) Determine the best imaging protocol. 4) Describe potential pitfalls and methods for dealing with them.

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**Deep Inferior Epigastric Perforator MRA for Planning Breast Reconstruction**

Nanda Deepa Thimmappa MD, MBBS (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Learn how to image perforator vessels for autologous breast reconstruction. 2) Understand anatomic and surgical considerations for determining the optimum vessel/donor sites for microsurgical breast reconstruction. 3) Review the perforator findings from a spectrum of cases. 4) See a systematic approach to post-processing and reporting perforator studies.

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**The Usual and Unusual Abdominal Emergencies**

Refresher/Informatics

**Sub-Events**

**Challenge Cases: Uncommon Causes of Acute Abdominal Pain**

Clint W. Sliker MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Uncommon diseases that may mimic common causes of acute abdominal pain. 2) Atypical manifestations of or complicated common causes of acute abdominal pain.

**Imaging of Drug Smuggling**

Ferco H. Berger MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To discuss the socio-economic background of drugs and the different ways of intra-corporeal transportation and packing materials used. 2) To elaborate on the different imaging techniques for detection of illicit drugs trafficking and the findings and the potential lack thereof with different types of imaging modalities. 3) To get familiarized with the complications that can occur and the imaging findings thereof.

**ABSTRACT**
The drugs industry is reported to make up to almost 1% of global GDP and 1/3 of the population has tried illicit drugs in their life, causing a staggering estimated 1 death per hour in Europe alone. Trafficking of drugs occurs by ingestion (body packers) or vaginal/rectal insertion (body pushers). As can be imagined, ingestion / insertion of packets of drugs can cause different kinds of clinical problems, depending on packaging material and type of drug. Detection of packets by screening methods as well as acute and subacute clinical conditions and the depiction thereof by different imaging modalities will be discussed. The participants of this RC will get to know the current developments in both the packets as well as the imaging of their features.

**Non-traumatic Splenic Emergencies**

Michael Nathan Patlas MD, FRCPC (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To discuss the use of different cross-sectional imaging modalities for detection of splenic emergencies. 2) To illustrate applications of multi-phasic MDCT in emergency evaluation of patients with acute left upper quadrant pain. 3) To demonstrate the value of specific imaging findings for identifying and characterizing non traumatic splenic emergencies.

**ABSTRACT**

Non-traumatic splenic emergencies are uncommon entities. Patients can present to the emergency room with a sharp left upper quadrant (LUQ) pain related to splenic infarct, ruptured splenic artery aneurysm, splenic torsion or rupture. Alternatively, splenic emergencies are detected during evaluation of patients with fever of unknown origin (splenic abscess, tuberculosis) or non-specific abdominal pain (splenic vein thrombosis). This presentation will discuss the cross-sectional imaging approach to the patient with LUQ pain, differential diagnosis and management options with an emphasis on the interventional radiology techniques.

active handout


**Pitfalls in Abdominal Imaging**

**Sub-Events**

**RC809A** Pitfalls in Bowel Imaging

Douglas S. Katz MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To briefly overview the problem of correct interpretation of the bowel on ‘routine’ abdominal and pelvic CT. 2) To demonstrate cases of pitfalls and pearls of interpretation of bowel findings on abdominal and pelvic CT. 3) To briefly review the limited literature on this topic.

**RC809B** Atypical Liver Lesions


**LEARNING OBJECTIVES**

1) To understand the typical imaging appearance of various focal liver lesions on CT and MR and how they can present in an atypical fashion (i.e. the imaging spectrum).

**RC809C** Pitfalls in Hepatic Doppler Sonography

Jonathan B. Kruskal MD, PhD (Presenter): Author, UpToDate, Inc

**LEARNING OBJECTIVES**

1) Discuss the common technical pitfalls that occur when performing the liver Doppler examination, and how these can be mitigated. 2) Discuss the perceptual and interpretive errors that occur when performing the liver Doppler examination, and how these can be minimized. 3) Describe the clinical impact of technical and interpretive errors.
**RC809D**

*Pearls and Pitfalls in Pancreatic Diseases*

**Benjamin M. Yeh MD (Presenter):** Research Grant, General Electric Company Consultant, General Electric Company

**LEARNING OBJECTIVES**

1) Understand critical ductal and parenchymal anatomic variants that affect the appearance of the pancreas affected by cancer. 2) Describe the appearance of pancreatic adenocarcinomas and how to report critical structures for local staging of malignancy. 3) Review mimics of pancreatic adenocarcinoma and how to distinguish between benign and malignant disease.

**ABSTRACT**

Pancreatic cancer remains a devastating disease with a poor general prognosis. Understanding of the typical radiological features of pancreatic cancer helps in the detection of early disease that may be curable. While surgical resection carries the hope of cure in patients with resectable disease, accurate radiological interpretation and staging is critical for the appropriate triage of patients with suspected adenocarcinoma and provides the roadmap for surgical intervention. Imaging interpretation also guides palliative therapy that may improve the quality of life. In this course we will cover important anatomic considerations at CT and MRI that allow for rapid accurate interpretation of images in patients with suspected adenocarcinomas. We will review important mimics of malignancy that may require different treatment and improved prognosis. The staging of adenocarcinoma, including structural landmarks important for pre surgical planning will be discussed.

**RC812**

*Acute Abdominal Vascular Diseases*

**Refresher/Informatics**

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**Sub-Events**

**RC812A**

*Aortic Branch Dissections*

**Dominik Fleischmann MD (Presenter):** Research support, Siemens AG

**LEARNING OBJECTIVES**

1) Review the epidemiology of aortic side-branch dissections, which can occur as a complication of aortic dissection, or as isolated spontaneous dissections of the visceral or renal arteries. 2) Explain the pathophysiology of side branch malperfusion syndromes. 3) Present the key imaging features which distinguish between the two main mechanisms of side branch malperfusion: local obstruction versus inflow obstruction.

**ABSTRACT**

Dissections of aortic side branches is a common complication of Type A and Type B acute aortic dissection which substantially increases mortality. It is important to understand the pathophysiology and the two principle mechanisms of side branch malperfusion in aortic dissection: flow obstruction can be due to (A) local abnormalities, such as occlusive dissection flaps, blind ending false lumen with true lumen occlusion (‘windsock’), or frank thrombosis. Side-branch malperfusion may also occur due to (B) limited inflow: The classic situation is complete true lumen collapse in the upstream aorta, resulting in underperfusion of all downstream branches supplied by the true lumen. Wile local obstructions are most commonly treated by stent placement into the diseased side branch, inflow-lesions typically require surgical or endovascular repair of the upstream aorta. Spontaneous dissections of the celiac, mesenteric, or renal arteries are relatively rare events, and typically present with acute abdominal or flank pain. Dissections of side branch arteries can lead to ischemic complications or to frank rupture. Patients presenting with mesenteric or renal artery dissection require a thorough workup to identify genetic disorders (notably Ehlers Danlos IV), inflammatory conditions (vasculitis), and other entities such as fibromuscular dysplasia and segmental arterial mediolysis (SAM).

**RC812B**

*Symptomatic Aneurysms*

**W. Dennis Foley MD (Presenter):** Research Consultant, General Electric Company

**LEARNING OBJECTIVES**

1) To detail the anatomic location and clinical presentation of symptomatic aneurysms. 2) To review appropriate imaging strategies using CT angiography. 3) To emphasize physiologic support and patient monitoring while in the imaging environment. 4) To utilize appropriate anatomic coverage in CT angiography procedures for both the diagnosis of symptomatic aneurysms and surgical and endovascular planning. 5) To detail the role of 2D and 3D image processing in the emergency situation for anatomic diagnosis and treatment planning.
ACUTE GASTROINTESTINAL BLEEDING: ROLE OF CT ANGIOGRAPHY

Abstract

Symptomatic aneurysms cover the spectrum of arterial aneurysms presenting with a) localized symptoms secondary to aneurysm expansion and possible rupture b) regional symptoms secondary to dissection and embolism and c) systemic cardiovascular dysfunction related to hypotension and organ dysfunction. Common clinical scenarios include aneurysm rupture - most commonly abdominal aortic, popliteal and abdominal visceral aneurysms as well as thoracoabdominal aortic dissection. Symptomatic aneurysms may also occur in patients with known arterial pathology including connective tissue disorders such as Marfan’s and Ehlers-Danlos syndrome and Takayasu aortitis/arteritis. Patients with suspected rupture of abdominal aortic or iliofemoropopliteal arterial aneurysms may initially be evaluated by sonography. However, in all circumstances, CT angiography due to its robust implementation and high-resolution imaging of the vasculature and regional anatomy that allows for planning of endovascular and surgical intervention is the preferred technique. CT Angiographic protocols appropriate to the suspected anatomic location of the aneurysm that provide an adequate roadmap for endovascular or surgical intervention are employed. Extended coverage is particularly important in patients with suspected thoracoabdominal aortic dissection or aneurysms associated with peripheral embolism. Cardiac gating should be utilized in any patient with a suspected type A aortic dissection or rupture of an ascending aortic aneurysm. Aortic, cardiac and coronary artery imaging are integral to the evaluation and management of these patients. A particular subset of the “symptomatic aneurysm” is post-trauma aortic disruption, usually thoracic in which diagnosis of traumatic aneurysm is critical and the aneurysm is associated with additional sites of soft tissue and skeletal trauma. Guidelines for endovascular or surgical intervention or non-invasive management with serial CT Angiographic imaging will be discussed.

LEARNING OBJECTIVES

1) To review the appropriate implementation of CT angiography in the evaluation of patients presenting with acute lower intestinal bleeding. 2) To describe the technical details that are necessary for acquiring good quality CT angiography examinations. 3) Illustrate the characteristic CT angiographic findings of active or recent bleeding with specific examples of multiple etiologies.

ABSTRACT

Acute gastrointestinal bleeding is a serious condition that may threaten a patient's life depending on the severity and duration of the event. Precise identification of the location, source and cause of bleeding are the primary objective of the diagnostic evaluation. Implementation of colonoscopy in the emergency setting poses multiple challenges, especially the inability to adequately cleanse the colon and poor visualization owing to the presence of intraluminal blood clots. Scintigraphy with technetium 99m-labeled red blood cells is highly sensitive but also has some limitations, such as the inability to precisely localize the source of bleeding and determine its cause. Properly performed and interpreted CT angiography examinations offer logistical and diagnostic advantages in the detection of active hemorrhage. A three-phase examination (non-contrast, arterial and portal venous) is typically performed. Potential technical and interpretation pitfalls should be considered and will be explained. The information derived from CT angiography helps direct therapy and select the most appropriate hemostatic intervention (when necessary): endoscopic, angiographic, or surgical. Precise anatomic localization of the bleeding point also allows targeted endovascular embolization. The high diagnostic performance of CT angiography makes this test a good alternative for the initial emergent evaluation of patients with acute lower intestinal bleeding.

ACUTE GASTROINTESTINAL BLEEDING: ROLE OF CT ANGIOGRAPHY

Abstract

Symptomatic aneurysms cover the spectrum of arterial aneurysms presenting with a) localized symptoms secondary to aneurysm expansion and possible rupture b) regional symptoms secondary to dissection and embolism and c) systemic cardiovascular dysfunction related to hypotension and organ dysfunction. Common clinical scenarios include aneurysm rupture - most commonly abdominal aortic, popliteal and abdominal visceral aneurysms as well as thoracoabdominal aortic dissection. Symptomatic aneurysms may also occur in patients with known arterial pathology including connective tissue disorders such as Marfan’s and Ehlers-Danlos syndrome and Takayasu aortitis/arteritis. Patients with suspected rupture of abdominal aortic or iliofemoropopliteal arterial aneurysms may initially be evaluated by sonography. However, in all circumstances, CT angiography due to its robust implementation and high-resolution imaging of the vasculature and regional anatomy that allows for planning of endovascular and surgical intervention is the preferred technique. CT Angiographic protocols appropriate to the suspected anatomic location of the aneurysm that provide an adequate roadmap for endovascular or surgical intervention are employed. Extended coverage is particularly important in patients with suspected thoracoabdominal aortic dissection or aneurysms associated with peripheral embolism. Cardiac gating should be utilized in any patient with a suspected type A aortic dissection or rupture of an ascending aortic aneurysm. Aortic, cardiac and coronary artery imaging are integral to the evaluation and management of these patients. A particular subset of the “symptomatic aneurysm” is post-trauma aortic disruption, usually thoracic in which diagnosis of traumatic aneurysm is critical and the aneurysm is associated with additional sites of soft tissue and skeletal trauma. Guidelines for endovascular or surgical intervention or non-invasive management with serial CT Angiographic imaging will be discussed.

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CT/PET in the Abdomen and Pelvis: How and When (How-to Workshop) (An Interactive Session)

Refresher/Informatics

Sub-Events

RC851A  CT/PET: Metabolic Assessment in Reporting
Eric Michael Rohren MD, PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the role of metabolic parameters in response assessment using FDG-PET/CT. 2) Compare the use of anatomic and metabolic response evaluation systems in the evaluation of patients with malignancy.

RC851B  Artifacts/Pitfalls/Incidentals
Terence Zekon Wong MD, PhD (Presenter): Advisory Board, Eli Lilly and Company Consultant, Koninklijke Philips NV Advisory Board, Bayer AG

LEARNING OBJECTIVES

1) Recognize and address common benign findings on FDG-PET / CT scans that can simulate malignancy. 2) Understand technical factors that can influence interpretation and quantification of FDG-PET studies.

ABSTRACT

Diagnostic accuracy of FDG-PET/CT scans can be degraded by potential technical artifacts during imaging acquisition as well as interpretive pitfalls encountered when evaluating regions of tracer accumulation. Technical artifacts occur relatively frequently due to the complexity of the PET and CT image acquisition and reconstruction; examples of important artifacts will be presented, along with potential solutions. Thoughtful design of PET/CT imaging protocols and attention to detail during image acquisition can reduce the incidence of artifacts. In addition, interpretive pitfalls due to false positive and false negative FDG accumulation is a major source of angst in interpreting oncologic PET/CT studies. Examples of common interpretive pitfalls will be presented along with approaches to distinguish malignant from benign FDG accumulation.

RC851C  Select Issues in Abdominal and Pelvic CT/PET
Andrea Grace Rockall MRCP, FRCR (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To know the indications for PET/CT in pelvic malignancy. 2) To recognize the typical findings on FDG-PET/CT in pelvic malignancies, including gynaecologic and urologic cancers. 3) To be aware of some new tracers that are being used in pelvic malignancy.

SST05

Gastrointestinal (Stomach Cancer and Masses)

Scientific Papers

Sub-Events

Participants

Moderator
Michelle Mae McNamara MD : Nothing to Disclose
Moderator
Peter Shou-Cheng Liu MD : Nothing to Disclose
SST05-01  Spectral CT Single Energy Imaging in Intramucosal Gastric Carcinoma: Evaluation of Diagnostic Accuracy and Image Quality

Jingjing Xing MD (Presenter): Nothing to Disclose, Jianbo Gao MD: Nothing to Disclose, Hangsha Limbu MD: Nothing to Disclose, Yonggao Zhang: Nothing to Disclose, Pan Liang: Nothing to Disclose

**PURPOSE**

To test the application of spectral CT generated monochromatic images at different energy levels concerning its diagnostic accuracy and image quality compared to the conventional CT in pathologically proven intramucosal gastric carcinoma.

**METHOD AND MATERIALS**

Twenty-two pathologically proven intramucosal gastric carcinoma patients who had undergone spectral CT imaging were reviewed retrospectively to generate conventional 140-kVp polychromatic images (group A) and monochromatic images with energy levels from 40 to 140 keV (group B) during the arterial phase (AP) and the venous phase (VP). The tumor to gastric wall contrast to noise ratio (CNR) and mean image noise were calculated and compared using two-sample t test between group A and group B. The lesion detection rate, reader’s confidence and reader’s subjective evaluation of image quality were recorded.

**RESULTS**

Monochromatic images at energy level of 53 ± 3 keV had highest CNR and the lowest mean noise was found to be at energy level of 70 ± 3 keV. Compared to group A, group B monochromatic images with energy level of 40 to 70 keV had significantly higher CNR (p<0.05) and significantly lower image noise (p<0.05) during both AP and VP. The lesion detection rate, reader’s confidence and reader’s subjective evaluation of image quality were significantly higher for group B at monochromatic energy levels of 40 to 70 keV.

**CONCLUSION**

Monochromatic images at energy levels of 40 to 70 keV can increase detection of intramucosal gastric carcinoma with no degradation in image quality.

**CLINICAL RELEVANCE/APPLICATION**

Monochromatic images at energy level of 40 to 70 keV increases the conspicuity of early gastric carcinoma decreasing the rate of false negative CT findings.

SST05-02  Application of CT Spectral Imaging in Preoperative T Staging of Gastric Cancer

Song Liu (Presenter): Nothing to Disclose, Liang Pan: Nothing to Disclose, Jian He MD, PhD: Nothing to Disclose, Ping Cao: Nothing to Disclose, Zhengyang Zhou: Nothing to Disclose

**PURPOSE**

The objective of this study was to evaluate the application of CT spectral imaging in preoperative T staging of gastric cancer.

**METHOD AND MATERIALS**

Fifty-two patients with gastroscopically confirmed gastric cancer were included prospectively and underwent preoperative multiphase-enhanced CT scans. Spectral imaging was performed in the arterial phase, automatic tube current modulation was adopted in the portal venous and delayed phases. Regions of interest (ROIs) were placed within the tumor, stomach wall, peripheral and distant fat to determine the optimal monochromatic image with the highest contrast-noise-ratio (CNR) between the cancer and surrounding tissues. Spectral curves of those ROIs were obtained. Two radiologists interpreted polychromatic and optimal monochromatic images of 52 patients and assessed T staging independently. With the reference of postoperative histopathological findings, T staging accuracy were compared between poly- and monochromatic images. Inter-observer agreement was calculated by kappa statistics.

**RESULTS**

Preoperative T staging accuracy of gastric cancer by spectral imaging (82.69%, 43/52) was significantly higher than that of polychromatic CT images (71.15%, 37/52)(P =0.031). In terms of each T stage, diagnostic accuracy of spectral imaging was slightly better in T1/3 stages and identical in T2/4 stages compared with that of polychromatic images. Inter-observer agreement (Kappa value) was improved from 0.562 (polychromatic images) to 0.768 (spectral imaging).

**CONCLUSION**

CT spectral imaging generating optimal monochromatic images with highest CNR and spectral curves of the tissues, can improve preoperative T staging accuracy of gastric cancer.

**CLINICAL RELEVANCE/APPLICATION**

CT spectral imaging can replace traditional CT scan in preoperative T staging of gastric cancer with higher diagnostic accuracy without more radiation dose.
Iodine Concentration in Perigastric Fat Tissue Adjacent to the Tumor and its Correlation to T Staging of Gastric Carcinoma

PURPOSE
To analyze the iodine concentration (IC), normalized iodine concentration (nIC) and water concentration (WC) of the perigastric fat tissue adjacent to the tumor lesion and correlate their value for differentiating between T3 and T4 staged gastric carcinoma.

METHOD AND MATERIALS
Fifty-four patients with pathologically proven T4 (group A) and T3 (group B) staged gastric carcinoma who had undergone spectral CT imaging (Discovery CT750 HD) were retrospectively selected. Material Decomposition (MD) image of these cases were reconstructed for measuring IC, nIC and WC of perigastric fat tissue adjacent to the lesion during Arterial phase (AP) and Venous phase (VP). Two-sample t tests were used to compare the three parameters between group A and group B during AP and VP. Receiver operating characteristic (ROC) was used to determine the threshold of nIC for differentiating T3 and T4 staged gastric carcinoma.

RESULTS
Significantly higher IC and nIC values were obtained in group A than in group B (IC -0.72±2.01 vs. -7.00±0.31 µg/cm³ in AP; 0.15±2.18 vs. -5.00±2.21µg/cm³ in VP; nIC 0.03±0.22 vs. -0.07±0.31 in AP; 0.22±0.42 vs. -0.10±0.65 in VP) (P<0.05). There was no significant difference in water concentration during both AP and VP (p>0.05). Setting the threshold of nIC at -0.048 during AP and -0.015 during VP, the sensitivity of serosal invasion was 85.2% and 82.3% respectively and specificity of serosal invasion was 87.6% and 82.3% respectively.

CONCLUSION
The iodine concentration of perigastric fat adjacent to the tumor is significantly higher in cases of T4 staged gastric carcinoma to that of T3 staged gastric carcinoma and can be regarded as a definitive sign of serosal invasion.

CLINICAL RELEVANCE/APPLICATION
Iodine concentration of perigastric fat tissue adjacent to tumor accurately detects serosal invasion and can be implemented in CT staging of gastric carcinoma preoperatively.

The Analysis of CT Missed Peritoneal Metastasis in Gastric Cancer: A Region-by-Region Comparison with Diagnostic Laparoscopy

PURPOSE
To explore the characteristics of the CT missed peritoneal metastasis (PM) of gastric cancer through the region-by-region comparison with diagnostic laparoscopy findings.

METHOD AND MATERIALS
Total of 251 consecutive patients with advanced gastric cancer and diagnosed as free of PM by spectral CT enrolled in the study. All of the patients were performed diagnostic laparoscopy to verify the findings on CT. If PM detected during laparoscopic exploration, the exact metastasis location would be recorded and compared with CT findings. The target observation regions included the omentum, diaphragm, transverse mesocolon, parietal peritoneum and hepatogastric ligament. The concerning signs included smudge sign, uncertain small nodules and thickening of the parietal peritoneum. The smudge sign was further divided into (1) mild type: slightly and evenly increased fat density appeared as ground glass opacity (GGO), (2) moderate type: unevenly increased fat density, with patchy-like or intensive GGO, (3) severe type: unevenly and obviously increased fat density, with multiple strands, curls sign or blurred small nodules. The demonstration rates of the above signs on spectral CT would be compared and analyzed between PM positive and negative patients.

RESULTS
Forty-six patients were confirmed as PM positive through laparoscopic exploration. Through the region-by-region comparison, there was still no any suspected CT sign in 16 patients. Total of 43 abnormal regions in 30 patients with PM positive signs on retrospective spectral CT were detected. There were 30 PM regions in 24 patients displayed as smudge sign (mild type, 7 regions; moderate type, 11 regions; severe type, 12 regions), ten regions as thickening of the parietal peritoneum, and three regions of undetermined small nodules. The demonstration rate of the smudge sign on spectral CT in PM positive patients was significantly higher than that of the PM negative ones (24/46, 52.2% vs. 31/205, 15.1%, p

CONCLUSION
Smudge sign is the most common finding in CT missed PM patients with gastric cancer, paying attention to this sign will contribute to the early detection of peritoneal metastasis.
CLINICAL RELEVANCE/APPLICATION

The study retrospectively analyzed the suspect sign of CT missed peritoneal metastasis in gastric cancer, which may contribute to the early detection of peritoneal metastasis.

SST05-05

New Insights in the Management and Prognosis of Gastric Cancer: The Innovative Role of Pre-treatment Apparent Diffusion Coefficient

Francesco Giganti MD (Presenter): Nothing to Disclose, Luca Albarello: Nothing to Disclose, Alessandro Ambrosio: Nothing to Disclose, Carlo Staudacher MD: Nothing to Disclose, Alessandro Del Maschio MD: Nothing to Disclose, Francesco Aldo De Cobelli MD: Nothing to Disclose

PURPOSE

Treatment options for gastric cancer (GC) range from endoscopic mucosal resection to radical surgery at its most invasive. These are used alone or in combination with neo-adjuvant therapy (NT). Despite multiple strategies, prognosis still remains poor regardless. The aim of our study was to investigate the role of apparent diffusion coefficient (ADC) as a potential biomarker in the evaluation of the aggressiveness of GC.

METHOD AND MATERIALS

Approval for this study was obtained from our Institutional Ethics Committee and written informed consent was obtained from each Patient. From October 2009 to December 2013, 99 Patients (66 men - 33 women; mean age 67.45 ± 11.41 years) with biopsy-proven disease (24 Siewert II-III and 75 gastric cancers) were examined with a 1.5T MR system including T1, T2 and DWI (b values 0-600 s/mm2) sequences. ADC measurements were obtained from regions of interest traced on T2 and DW images and automatically copied on the ADC map. 70/99 Patients (70.7%) were directly treated with surgery while 29/99 Patients (29.3%) were submitted to NT beforehand. All participants were followed up for a median of 18 months. Pathological ADC, tumor location, pT, pN, surgical approach and histotype were investigated by univariate and multivariate analysis using Cox regression model and Kaplan-Meier curves.

RESULTS

At the end of the follow up, 66 (66.6%) patients were alive and 33 (33.4%) had died. Median overall survival was 36 ± 4 months. Considering all the variables, we observed that ADC values below 1.5 x 10-3 mm2/s could predict a negative prognosis both in the total population (n=99, p

CONCLUSION

Our preliminary study suggests the potential role of ADC as a quantitative biomarker reflecting the aggressiveness of GC. ADC may provide useful information on life expectancy and might be added to the current validated prognostic parameters for pre-operative risk stratification.

CLINICAL RELEVANCE/APPLICATION

ADC may provide useful information on life expectancy and might be added to the current validated prognostic parameters for pre-operative risk stratification.

SST05-06

Dynamic Contrast-enhanced MRI in Gastric Cancer: Correlation of Perfusion Parameters with Pathological Prognostic Factors

Ijin Joo MD (Presenter): Nothing to Disclose, Jeong Min Lee MD: Research Grant, Guerbet SA Equipment support, Siemens AG Research Grant, Bayer AG, Joon Koo Han MD, PhD: Research Consultant, Samsung Electronics Co Ltd

PURPOSE

To investigate the feasibility of dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) for perfusion quantification of gastric cancers, and to correlate DCE-MRI parameters with pathological prognostic factors.

METHOD AND MATERIALS

This prospective study was approved by our institutional review board, and informed consent was obtained from each patient. Twenty-seven patients with gastric cancers underwent free-breathing radial DCE-MRI at 3T scanner followed by surgery. Quantitative DCE-MRI parameters (Ktrans, Kep, Ve, and iAUC) of gastric cancer and normal wall were measured. DCE-MRI parameters of gastric cancer were compared with those of normal gastric wall by using paired t-test. The relationship between DCE-MRI parameters and pathological prognostic factors of gastric cancers including T- and N-staging, histological grades, and grades of epidermal growth factor receptor (EGFR) expression were evaluated by using the Student t-test or the Spearman rank correlation test.

RESULTS

DCE-MRIs were of diagnostic quality in 22 patients (22/27, 81.5%), and failed in 5 patients due to bowel peristalsis. Ve and iAUC were significantly higher in gastric cancer than normal gastric wall (P<.05). Ve was significantly correlated with T-staging (r=0.49, P=.02), and was significantly higher in poorly-differentiated carcinoma than well- or moderately-differentiated carcinoma (P<.05). Ktrans was significantly correlated with grades of EGFR expression (r=0.466, P=.03). None of DCE-MRI parameters of gastric cancer showed significant difference according to N-staging.

CONCLUSION

DCE-MRI is technically feasible for quantification of perfusion dynamics of gastric cancers, and DCE-MRI parameters of gastric cancers may be valuable prognostic indicators correlated with pathological features.

CLINICAL RELEVANCE/APPLICATION
The Correlation of Iodine Concentration in Spectral CT and Pathological Regression in Gastric Cancer to Neoadjuvant Chemotherapy: A Pilot Study

Lei Tang MD (Presenter); Nothing to Disclose, Ziyu Li; Nothing to Disclose, Ying-Shi Sun MD, PhD; Nothing to Disclose, Jiafu Ji; Nothing to Disclose, Xiaoting Li; Nothing to Disclose, Zhong-Wu Li; Nothing to Disclose, Xiaopeng Zhang MD; Nothing to Disclose

Purpose

To investigate the potential of iodine concentration (IC) determined by spectral CT in the response prediction of gastric cancer to preoperative neoadjuvant chemotherapy (NC).

Method and Materials

The institutional review board approved this prospective study. All patients signed the written informed consent. Twenty enrolled patients with advanced gastric cancer underwent spectral CT examination twice (1 week before NC and after 2 cycles of NC), with anisodamine and effervescent granules administered to guarantee the shape consistency and stability of gastric wall. Spectral CT imaging was performed with fast tube voltage switching between 80 and 140kVp during a single rotation. The percentage changes of the tumor size (%ΔCWT) and the IC values on arterial phase (%ΔIC-a) after NC were calculated on the 70keV monochromatic and iodine-based material decomposition images, respectively and compared among different response groups. The pathological regression grades 1-3 were defined as 50% residual tumor per tumor bed, respectively. Grade 1 was defined as good response (GoodR) and Grades 2-3 as poor response (PoorR). The diagnostic efficacies of the two parameters were evaluated using ROC curves.

Results

The decrease rate of %ΔIC-a in the GoodR group was higher than that of the PoorR group (-0.59 [-0.76, -0.20] vs. -0.11 [-0.75, 0.92], P=0.012). No significant difference was observed between GoodR and PoorR with regard to %ΔCWT (-0.16 [-0.65, 0.20] vs. -0.04 [-0.40, 0.13], P=0.779). The AUCs of ROC were 0.857 and 0.542 for %ΔIC-a and %ΔCWT respectively, in the response prediction of gastric cancer to NC. Taking the decrease rate of %ΔIC-a > 52.9% as the cutoff value to identify good responders, the sensitivity was 0.857 and specificity was 0.831. Taking the decrease rate of %ΔCWT > 17.4% as the cutoff value to judge good responders, the sensitivity and specificity values were 0.643 and 0.500, respectively.

Conclusion

The change of the tumor IC after neoadjuvant chemotherapy measured by spectral CT has good correlation with pathological regression of gastric cancer, which has better prediction efficacy than tumor size.

Clinical Relevance/Application

The iodine concentration in spectral CT has potential in the response prediction of gastric cancer to neoadjuvant chemotherapy, which may provide personalized information for treatment.

Comparative Imaging Analysis of Epstein-Barr Virus-associated Gastric Lymphoepithelioma-like Carcinoma versus Conventional Gastric Adenocarcinoma

Seon Young Park MD (Presenter); Nothing to Disclose, Young Chul Kim MD; Nothing to Disclose, Tae Sun Han; Nothing to Disclose, Young Keun Sur MD; Nothing to Disclose, Jei Hee Lee MD; Nothing to Disclose, Jia Keun Kim MD; Nothing to Disclose

Purpose

Primary gastric lymphoepithelioma-like carcinoma (LELC) is a rare type of undifferentiated gastric adenocarcinoma with better prognosis than the conventional gastric adenocarcinoma. We analyzed the clinical and radiologic features of Epstein-Barr virus (EBV)-associated LELC to determine the computed tomography (CT) features that differentiate it from conventional gastric adenocarcinoma.

Method and Materials

Between January 2004 and December 2012, clinical and radiologic features of 39 EBV-associated LELCs were compared with that of 36 conventional gastric adenocarcinomas. Independent t-test was used to evaluate the difference in patient age between EBV-associated LELC and conventional gastric adenocarcinoma. Sexual distribution, lesion detectability, multiplicity, presence of lymph node metastasis, location, gross appearance, lesion thickness and margin, presence of round edge, contrast enhancement pattern, and degree of contrast enhancement were compared using Chi-square test.

Results

Male predominance (male to female ratio=31:8) was seen in patients with EBV-associated LELC with statistical significance (P < 0.001). The most common location of EBV-associated LELC was the upper third of the stomach with statistical significance (P=0.0001). There was a statistically significant difference in the presence of uniform peripheral thickness between both groups; 30 patients (88.24%) with EBV-associated LELCs and 13 (40.63%) with conventional gastric adenocarcinomas (P=0.001). EBV-associated LELCs demonstrated well-defined margins (n=29; 85.29%) more often than conventional gastric adenocarcinomas (n=19, 59.37%; P=0.0369). There was a statistically significant difference in the presence of a round edge between both groups; 25 patients (73.53%) with EBV-associated LELCs and 15(48.87%) with conventional gastric adenocarcinomas (P=0.0497).

Conclusion

Perfusion characteristics of gastric cancers can be quantitatively measured by free-breathing DCE-MRI, and DCE-MRI parameters may provide prognostic information in patients with gastric cancers.
The radiologic features including tumor location in the upper third of the stomach and, presence of uniform peripheral thickness with round edge ("pizza crust sign") can be helpful in differentiating EBV-associated LELC from conventional gastric carcinoma on CT scans.

**CLINICAL RELEVANCE/APPLICATION**

Clinical and radiologic features of EBV-associated LELC in our study can be helpful in differentiating EBV-associated LELC from conventional gastric carcinoma on CT scans.

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**Leiomyoma of the Gastric Cardia: Differentiation from Gastrointestinal Stromal Tumor on CT**

Hyun Kyung Yang MD (Presenter): Nothing to Disclose, Young Hoon Kim MD, PhD: Nothing to Disclose, Yoon Jin Lee MD: Nothing to Disclose, Ji Hoon Park MD: Nothing to Disclose, Ji Young Kim MD: Nothing to Disclose, Kyoung Ho Lee MD: Nothing to Disclose, Hye Seung Lee MD: Nothing to Disclose

**PURPOSE**

To describe the computed tomographic (CT) findings of leiomyoma and gastrointestinal stromal tumor (GIST) originated from the gastric cardia and to identify the features that differentiate each other.

**METHOD AND MATERIALS**

The institutional review board of our institution approved this retrospective study and waived the requirement for patient informed consent. CT images of pathologically proved leiomyomas (n = 26) and GISTs (n = 19) in the gastric cardia were retrospectively reviewed. Analysis of the CT findings included evaluation of whether the tumor involved the esophagogastric junction (EGJ), contour, surface, border, growth pattern, enhancement pattern, and enhancement grade of the tumor, as well as the presence of low intralesional attenuation area, presence of calcification or hemorrhage and presence of surface dimple or ulcer. The attenuation of each lesion, the long diameter (LD), the short diameter (SD), and the LD/SD ratio were measured. Among these findings, statistically significant variables were determined by using the χ² test (to compare the categorical variables), the Student t test (for quantitative analysis), and the receiver operating characteristic (ROC) curve (to determine the optimal cutoff of the LD/SD ratio and attenuation value).

**RESULTS**

EGJ involvement, homogeneous enhancement pattern, intermediate or low enhancement degree, absence of intralesional low attenuation and absence of surface dimple or ulcer were found significant for differentiating leiomyoma from GIST of the gastric cardia (P < .05 for each finding). LD/SD ratio >1.2 and attenuation value ≤71.2 HU yielded sensitivities of 84.6% and 61.5%, and specificities of 52.6% and 84.2%, respectively at ROC curve analysis. When at least three of these seven criteria were used in combination, the sensitivity and specificity were 8% (2 of 26) and 100% (19 of 19).

**CONCLUSION**

By using specific CT criteria, leiomyoma and GIST in the gastric cardia can be differentiated with a high degree of accuracy.

**CLINICAL RELEVANCE/APPLICATION**

Knowledge of differentiating CT characters between the two submucosal tumors help avoiding unnecessary surgery or determining the appropriate surgical procedure.

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**SST06**

**Gastrointestinal (Gallbladder and Biliary Imaging)**

**Scientific Papers**

- **MR**
- **CT**
- **GI**

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Fri, Dec 5 10:30 AM - 12:00 PM Location: E353C

**Participants**

**Moderator**
Jessica B. Robbins MD : Nothing to Disclose


**Sub-Events**

**SST06-01** **The Incremental Value of 3T Diffusion-weighted MRI in Diagnosing Extrahepatic Cholangiocarcinoma**
PURPOSE

To evaluate the incremental value of diffusion-weighted imaging (DWI) in addition to magnetic resonance cholangiopancreatography (MRCP) in diagnosing extrahepatic cholangiocarcinoma (EHCC); to determine the most appropriate b value for DWI on 3.0T MRI.

METHOD AND MATERIALS

Preoperative MRI examinations were performed for 63 patients with suspected EHCC. The examinations included T2-weighted imaging, coronal fast imaging employing steady-state acquisition (FIESTA), MRCP and DWI sequence with different b values (500, 1000 and 1200s/mm²). All cases were confirmed by histopathological diagnosis. Two radiologists in consensus reviewed MRCP imaging and combined MRCP and DWI imaging with ADC maps, and apparent diffusion coefficient (ADC) value, signal-noise ratio (SNR), contrast-to-noise ratio (CNR) and signal-intensity ratio (SIR) under various b values were calculated.

RESULTS

There were significant differences in sensitivity (74.4% vs 94.9%), specificity (75% vs 100%) and accuracy (74.6% vs 96.8%) between MRCP alone and combined MRCP and DWI with a b value of 1000 s/mm² (P<0.05). There was also a significant difference in ADC, SNR, CNR and SIR under various b values (P<0.05).

CONCLUSION

For diagnosing EHCC, the use of combined MRCP and DWI shows a better diagnostic performance; the b value of 1000 s/mm² is the most appropriate for DWI on 3.0T MRI.

CLINICAL RELEVANCE/APPLICATION

The use of combined MRCP and DWI can improve diagnostic performance for extrahepatic cholangiocarcinoma (EHCC). DWI can also provide additional clinically important information and is recommended to patients presenting with an EHCC or suspected EHCC.

SST06-02

Usefulness of Imaging Criteria for Distinguishing Autoimmune Cholangiopathy from Primary Sclerosing Cholangitis or Bile Duct Malignancy


PURPOSE

A recent study (AJR 2014 Mar;202(3):536-43) proposed specific imaging criteria for differentiating autoimmune cholangiopathy (IAC) from primary sclerosing cholangitis (PSC) or other biliary diseases. The purpose of this study was to determine the diagnostic performance of these imaging criteria for diagnosis of autoimmune cholangiopathy.

METHOD AND MATERIALS

Medical records search between 10/2008-10/2013 identified 10 patients (8M, 2W, mean age 61, range 34-82) with clinically and biopsy proven IAC. Ten cases of PSC (5M, 5W, mean age 51, range 22-65) and 4 cases of primary biliary cancer (1M, 3W, mean age 63, range 56-69) were randomly selected for comparative analysis. Three blinded and fellowship-trained abdominal radiologists, (experience 7-25 years), reviewed either MRI with MRCP (n=17) or CT and ERCP (n=7) for the following imaging predictors of IAC: single wall bile duct thickness > 2.5 mm; continuous biliary involvement, gallbladder involvement, absence of liver disease, peribiliary mass, pancreatic and renal abnormalities. Each radiologist provided imaging-based diagnosis of IAC, PSC, or biliary malignancy and sensitivities and specificities were recorded. Association of each imaging predictor for IAC compared with non-IAC (PSC or primary biliary malignancy) was determined by using Fisher's exact test, P < 0.05 to indicate a significant association.

RESULTS

For diagnosis of IAC, mean (range) sensitivity and specificity was 79% (70-90%) and 83% (78-86%), respectively. The strongest imaging predictors for distinguishing IAC vs. non-IAC were: pancreatic abnormalities: 73% vs. 9% (P, 0.001-0.01); continuous biliary involvement: 80% vs. 43% (P, 0.01-0.20); single wall bile duct thickness > 2.5 mm: 73% vs. 40% (P= 0.01-0.41); and absence of liver disease: 80% vs. 57% (P=0.17-1).

CONCLUSION

Imaging predictors of IAC demonstrate moderately high sensitivity and specificity for distinguishing IAC from PSC or biliary malignancy. Pancreatic abnormality demonstrated the most significant association with IAC. Single wall bile duct thickness, continuous biliary involvement, and absence of liver disease demonstrate trends towards association with IAC.

CLINICAL RELEVANCE/APPLICATION
Pancreatic abnormalities, thickened bile duct wall, continuous biliary stricturing, and absence of liver disease favor a diagnosis of IAC. However, it remains difficult to distinguish IAC from PSC or biliary malignancy based on imaging features alone.

**Value of Gadoxetate Disodium Enhanced MRI in Patients with Primary Sclerosing Cholangitis (PSC) for Assessment of Hepatic Function**

Jan Hinrichs MD, Nothing to Disclose, Henrike Lenzlen, Nothing to Disclose, Frank K. Wacker MD, Research Grant, Siemens AG Research Grant, Pro Medicus Limited, Kristina Imeen Ringe MD (Presenter): Nothing to Disclose

**PURPOSE**

To assess the value of gadoxetate disodium enhanced hepatic MRI in patients with PSC for evaluation of liver function and to determine a possible correlation with severity of disease.

**METHOD AND MATERIALS**

46 patients (31 males, 15 females; mean age 44 years) with confirmed diagnosis of PSC who underwent gadoxetate disodium enhanced hepatic MRI on a 1.5T system were included in this IRB-approved study. The protocol included T1w VIBE sequences acquired prior to (TP1), and 19 (TP2) and 150 (TP3) minutes after i.v. contrast injection. SNR measurements were performed by placing ROIs in each liver segment on identical positions of the corresponding datasets and compared (t-Test). Mean SNR changes (TP1-TP2; TP1-TP3) were calculated and correlated with liver functions tests (Spearman), which were obtained within 24 hours of the MRI scan, as well as with the MELD, AMSTERDAM and MAYO Score, respectively.

**RESULTS**

Significant changes of hepatic SNR between non-enhanced and gadoxetate disodium enhanced MRI could be observed in all liver segments (p<0.0001). Mean SNR prior to contrast injection was 79 (range 34-131), 19 min after contrast injection 166 (27-539) and 150 minutes p.i. 147 (43-296), respectively, corresponding with a mean SNR increase of 111% (TP2) and 93% (TP3). A significant correlation with serum bilirubin (p=0.0289), GOT (p=0.0178) and alkaline phosphatase (p=0.0004) could be appreciated (r=-0.322, -0.348 and -0.503, respectively). Significant correlations with the MELD (p=0.041; r=-0.303) and AMSTERDAM Score (p=0.013; r=-0.449) were observed.

**CONCLUSION**

On a segmental level, hepatic SNR significantly increased on gadoxetate disodium enhanced MRI in patients with PSC. Regarding the whole liver, the increase of SNR significantly correlated with clinical scores and liver functions tests. As fluctuations of these liver function tests are common during the course of the disease, SNR changes might probably reflect severity of the disease.

**CLINICAL RELEVANCE/APPLICATION**

Hepatic SNR measurements in patients with PSC may serve as a useful method to assess liver function, on both a global and a segmental level. The segmental information might be useful to plan and guide endoscopic procedures.

**Growth Rate of Biliary Cystadenomas: Value of Short Term Follow-up Imaging**

Adeel Rahim Seyal MD, Grant, Siemens AG, Keyur Parekh MD, Grant, Siemens AG, Vahid Yaghmai MD (Presenter): Nothing to Disclose

**PURPOSE**

To determine growth rate of biliary cystadenoma to estimate suitable follow-up imaging interval.

**METHOD AND MATERIALS**

The HIPAA compliant retrospective study was IRB approved. Patients with histopathologically proven primary or recurrent biliary cystadenoma with at least two cross-sectional imaging studies (CT and/or MR scans) performed were included. Comparison was done with simple liver cysts. Volume of biliary cystadenomas and liver cysts was calculated and growth kinetic parameters were analyzed using doubling time (DT) and reciprocal of doubling time (RDT) where DT=(T2 -T1)xlog2/(logV2-logV1) and RDT=1/DT. Positive RDT indicates growth while negative RDT indicates regression.

**RESULTS**

Eleven pathologically proven biliary cystadenoma were evaluated in 9 adult patients (all females). Eleven hepatic cysts in another 9 adult patients were also evaluated. Median [interquartile range (IQR)] baseline volume for cystadenoma and liver cysts was 20.1 ml (8.7, 190.3) and 2.1 ml (1.0, 3.3) respectively. Mean interscan interval for cystadenoma and liver cysts was 319.9 days (range 25 - 787) and 543 days (range 13 - 1812) respectively. All cystadenomas (100%) showed increase in size with mean RDT of 0.87 ± 0.7. Median (IQR) DT was 581.5 days (319.2, 1661). Liver cysts had mean RDT of 0.45 ± 1.1 and median (IQR) DT of 4223 days (1425, 16152). RDT was significantly different between two groups (P = 0.0081).

**CONCLUSION**

Slow growth of biliary cystadenoma suggests that short frequency follow-up imaging of less than one year to
Slow growth of biliary cystadenomas suggests that short frequency follow-up imaging of less than one year to monitor change in size of these lesions may not be indicated.

**CLINICAL RELEVANCE/APPLICATION**

Biliary cystadenomas grow very slowly and may be followed on imaging.

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**SST06-05**

**Comparative Performance of MRCP with and without Contrast for Suspected Choledocholithiasis in Hospitalized Patients**

Laura Heacock MS, MD (Presenter): Nothing to Disclose, Ankur Doshi MD: Nothing to Disclose, Justin Michael Ream MD: Nothing to Disclose, Danny C. Kim MD: Nothing to Disclose, James S. Babb PhD: Nothing to Disclose, Stella Kang MD: Nothing to Disclose

**PURPOSE**

Magnetic resonance cholangiopancreatography (MRCP) is widely used as a noninvasive, accurate test for suspected choledocholithiasis. Current ACR guidelines recommend contrast-enhanced MRCP, but in hospitalized patients the full protocol may increase costs, scan time, and patient discomfort with questionable benefits. We compared performance of a potential short protocol with non-contrast MRI/ HASTE MRCP to contrast-enhanced MRI/3D MRCP.

**METHOD AND MATERIALS**

We retrospectively evaluated 69 standard contrast-enhanced abdominal MRI/MRCP for suspected bile duct stones in inpatients. Two radiologists first used only non-contrast sequences including 2D coronal/axial HASTE, followed by the entire exam with post-contrast sequences and 3D MRCP. Readers noted perceived need for contrast, presence of common bile duct (CBD) stone, CBD dilatation, cholangitis, or other causes of acute biliary obstruction. Reader agreement and confidence were assessed. We also tested clinical factors predicting need for contrast in biliary assessment. ERCP, intraoperative cholangiogram or documented clinical resolution served as reference standard.

**RESULTS**

In 69 patients, 21 had confirmed choledocholithiasis, 4 had acute hepatitis, and 2 had clinical cholangitis. Both noncontrast and contrast-enhanced image sets resulted in high accuracy for bile duct stone (88-91% vs 87-90%); there was no significant difference in accuracy, sensitivity, specificity, NPV, PPV for either reader for any feature assessed with or without contrast (p > 0.6). Reader agreement was excellent for non-contrast and contrast-enhanced detection of CBD stones (k = 0.84, 0.77) and CBD dilatation (k = 0.71, 0.61). 1 reader reported increased confidence (p

**CONCLUSION**

For hospitalized patients with suspected choledocholithiasis, performance of noncontrast MRI with HASTE MRCP may be equal to contrast-enhanced MRI/3D MRCP; a shorter test would offer potentially increased patient tolerability and reduced hospital costs.

**CLINICAL RELEVANCE/APPLICATION**

For inpatients with suspected choledocholithiasis, an abbreviated non-contrast MRI with HASTE MRCP may offer a faster exam with no compromise in diagnostic test performance.

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**SST06-06**

**Cystic Duct Enhancement: A Useful CT Finding in the Diagnosis of Acute Cholecystitis without Visible Impacted Gallstones**

Kyung Jin Lee MD (Presenter): Nothing to Disclose, Sang Won Kim MD: Nothing to Disclose, Hyun Cheol Kim: Nothing to Disclose, Dal Mo Yang: Nothing to Disclose

**PURPOSE**

To evaluate the incidence of cystic duct enhancement on CT in acute cholecystitis, and to determine the usefulness of this finding for diagnosing acute cholecystitis in cases without visible impacted gallstones.

**METHOD AND MATERIALS**

The institutional review board approved this study, and informed consent was waived. CT scans of 63 patients with surgically proven acute cholecystitis and 63 age- and sex-matched control subjects were retrospectively reviewed independently by two radiologists to determine the presence of the cystic duct enhancement or impacted stones in the gallbladder neck or cystic duct. Then, two additional radiologists were asked to evaluate independently all CT images using a 5-point scoring system for diagnosing acute cholecystitis, both before and after being informed of cystic duct enhancement in substitution for impacted gallstones. Pathologic correlation was performed in cases with acute cholecystitis in which two reviewers agreed on the presence of cystic duct enhancement.

**RESULTS**

Incidences of cystic duct enhancement and stone impaction were observed to be significantly more common in the patient group (86-91%) than in the control group (6-14%) (P < 0.001) with good interobserver agreement (κ = 0.79). Using the criterion in which acute cholecystitis is diagnosed when confidence score is four or five, diagnostic sensitivities increased significantly from 60.3% to 85.7% for reviewer 1 (p = 0.001) and from 71.4% to 87.3% for reviewer 2 (p = 0.028) after the reviewers were informed of cystic duct enhancement in substitution for impacted gallstones. Also, diagnostic accuracy increased significantly for the lesser experienced radiologist (from 75.4% to 87.3%, p = 0.015). Pathologically, cystic duct enhancement is correlated with either preserved mucosa of the cystic duct, in cases where the mucosal layer of the gallbladder is necrotized, or inflammation of the cystic duct similarly to that of the gallbladder.
CONCLUSION

Accuracy and sensitivity for diagnosing acute cholecystitis by CT were significantly improved when cystic duct enhancement was used as a complement to impacted gallstones.

CLINICAL RELEVANCE/APPLICATION

When cystic duct enhancement and impacted gallstones are used complementarily as major CT findings, the diagnostic sensitivities of CT increased significantly from 60-71% to 86-87%, which are comparable with those of US (81%) and MR (85%).

SST06-07

Gallstone Characterization Using Dual Energy Computed Tomography and Correlation with in-vitro Phantom Study

Young Hwan Lee MD : Nothing to Disclose, Youe Ree Kim MD (Presenter): Nothing to Disclose, Seong Hyun Wee MD : Nothing to Disclose, Dong-Ho Bang MD : Nothing to Disclose, Kwon-Ha Yoon MD, PhD : Nothing to Disclose

PURPOSE

The aim of this study was to differentiate cholesterol gallstone from calcium gallstone using dual energy CT(DECT) and to correlate with in-vitro phantom study.

METHOD AND MATERIALS

We retrospectively analysed 95 gallstones in 48 patients with in-vitro and clinical DECT. Semi-quantitative infrared spectroscopy (FTIR) was performed to confirm the chemical composition of the stones. According to the FTIR results, gallstones were divided into calcium and cholesterol stones, we measured Hounsfield units (HU) of the gallstones at 80, 100, 140kVp image sets of in-vitro DECT and calculated sensitivity for stone detection. We also measured HU values of the 60 stones (25 cholesterol stones, 35 calcium stones) at 100, 140, Mixed kVp sets and virtual non-enhanced (VNE) images of clinical DECT and calculated sensitivity for stone detection. Finally we compared the HU values of stones on each image sets.

RESULTS

Gallstones were confirmed as 45 cholesterol stones in 23 patients and 50 calcium bilirubinate stones in 25 patients on FTIR. On in-vitro DECT analysis, cholesterol stones were identified with 100%, 84%, 96% sensitivities and calcium stones were identified with 98%, 98%, 98% sensitivities at 80, 100, 140kVp image sets. Cholesterol stones showed hypotenuation at 80kVp (76%), hyperattenuation at 140kVp (51%). Calcium stones showed hyperattenuation at all of image sets (98%). There were statistically significant at all of the comparative quantitative analyses of 80/100kVp, 80/140kVp and 100/140kVp sets (for cholesterol stones, P<.001; for calcium stones, P<.001). On clinical DECT image analysis, detection sensitivities of cholesterol stones were 62%, 77%, 60%, 93% and sensitivities of calcium stones were 97%, 97%, 97% at 100, 140, mixed kVp, VNE image sets, respectively. There were also statistically significant at comparative quantitative analyses of 100/140kVp set for cholesterol stone (P=.049), of 100/140kVp and 100/mixed kVp sets for calcium stones (P<.001, P=.001)

CONCLUSION

Cholesterol stones usually showed iso- or hyperattenuation at high kVp images than low kVp images and calcium stones showed hyperattenuation at all kVp images of DECT. VNE images of clinical DECT were useful to detect cholesterol gallstones.

CLINICAL RELEVANCE/APPLICATION

Dual energy CT can be used to differentiate gallstone components with different kVp setting and detection of cholesterol gallstones can be improved on virtual non-enhanced images of DECT.

SST06-08

A Comparative Study of Conventional Ultrasonography (USG) and Contrast-enhanced Ultrasonography (CEUS) in the Diagnosis of Gallbladder Diseases- A Study from Northern India

Mohd Khalid MBBS, MD (Presenter): Nothing to Disclose

PURPOSE

To compare the diagnostic performance of conventional and contrast-enhanced ultrasonography in characterizing gallbladder lesions.

METHOD AND MATERIALS

40 patients with gallbladder disease were examined using conventional ultrasonography (USG) followed by contrast-specific harmonic imaging mode (CEUS) after injection of Perflutren-lipid microsphere suspension. Lesions were characterized based on their echogenicity, enhancement pattern in the early and late vascular phases (heterogeneous or homogeneous enhancement and hyper, iso, hypo or non-enhancing in relation to adjacent normal liver), intrallesional vascularity (branched, linear, dotted or none) and intactness of underlying gallbladder wall. Final diagnosis was established by histopathology and the results were analyzed statistically.
RESULTS

There was an obvious female preponderance (67.5%) among the patients examined. Gallbladder malignancy (adenocarcinoma) was diagnosed in 12 patients (30%), all of whom were above the age of 40 years. USG detected 18 patients with chronic cholecystitis, 2 with inflammatory polyps and 10 cases of malignancy with sensitivity, specificity, accuracy, negative predictive value (NPV) and positive predictive value (PPV) of 83.33%, 82.14%, 92% and 66.67%, respectively with regards to diagnosis of malignancy. Based on CEUS findings, a diagnosis of chronic cholecystitis was made in 24 patients, inflammatory polyp in 4, adenomyomatosis in 1 and malignant lesion in 11 with sensitivity, specificity, accuracy, NPV and PPV of 91.67%, 100%, 97.5%, 96.55% and 100%. Heterogeneous enhancement was observed in a majority of the malignant lesions (91.67%) in comparison to 39.28% among benign lesions. Malignant lesions had a predominant branched intralvesional vascular pattern (58.23%) as opposed to a predominant dotted pattern in benign lesions (87.5%). Gallbladder wall disruption was seen in all the patients with malignant lesions (100%), while only one patient (3.57%) with benign disease (chronic cholecystitis) demonstrated the same.

CONCLUSION

Contrast-enhanced ultrasound may be a useful tool in the evaluation of gallbladder disease, particularly of malignant lesions.

CLINICAL RELEVANCE/APPLICATION

This study emphasizes the superiority of CEUS in the evaluation of gallbladder lesions in a population which shows a high incidence of malignancy using Perflutren-lipid microsphere suspension.

Gangrenous Cholecystitis versus Uncomplicated Acute Cholecystitis: Which CT Findings Differentiate between the Two?

Wei-Chou Chang MD (Presenter): Nothing to Disclose, Yuxin Sun : Nothing to Disclose, En-Haw Wu MD : Nothing to Disclose, So Yeon Kim MD : Nothing to Disclose, Liqin Zhao MD : Nothing to Disclose, Benjamin M. Yeh MD : Research Grant, General Electric Company Consultant, General Electric Company

PURPOSE

To evaluate the diagnostic accuracy of CT findings for differentiating gangrenous cholecystitis from uncomplicated acute cholecystitis, with histopathological findings as reference standard.

METHOD AND MATERIALS

Our Institutional Review Board approved this retrospective study. We retrospectively reviewed 141 consecutive patients over a 4-year period with histologically proven gangrenous cholecystitis or uncomplicated acute cholecystitis. Of the 141 patients, those who received percutaneous drainage before CT scan were excluded, (n=15). We reviewed the CT scans to record the transverse gallbladder diameter, the presence of intraluminal membranes, or mural striation. We recorded the presence of gallbladder-wall enhancement (on contrast enhanced CT) and hyperdense wall (on unenhanced CT) on a 3-point scale (1, definitely absent; 2, probably present, 3, definitely present). Univariate and multivariate logistic regression was used to correlate with histopathology.

RESULTS

Of the total 126 patients, 28 cases (22.2%) had gangrenous and 98 had uncomplicated acute cholecystitis at histopathology. CT findings of gallbladder distension (n= 26 of 28 versus 38 of 98, p< .001), intraluminal membranes (n = 9 of 28 versus 8 of 98, p = .001), mural striation (n = 14 of 28 versus 12 of 98, p < .001), probability of decreased gallbladder-wall enhancement (absent, probably, and present, n = 2, 4, 14 of 28 versus 53, 24, 5 of 98, p < .001), probability of hyperdense wall on non-contrast images (absent, probably, and present, n = 2, 4, 3 of 28 versus 27, 9, 2 of 98, p = .01), and fluid accumulation (n= 6 of 28 versus 7 of 98, p = .03) were more often seen in gangrenous cholecystitis than in uncomplicated acute cholecystitis. At multivariate analysis, gallbladder distension (odds ratio, OR, 31.4, p< 0.01), mural striation (OR, 9.5, p< 0.02) and decreased gallbladder-wall enhancement (OR, 10.6, p< 0.02) independently predicted gangrenous cholecystitis.

CONCLUSION

A markedly distended gallbladder with mural striation and decreased wall enhancement is highly specific for gangrenous cholecystitis at CT.

CLINICAL RELEVANCE/APPLICATION

Pre-operative CT findings of marked gallbladder distension and decreased wall enhancement are highly predictive of gangrenous cholecystitis.
**Participants**

Moderator
Albert A. Nemcek MD : Consultant, B. Braun Melsungen AG

Moderator
Wael E. A. Saad MBCh : Research Grant, Siemens AG Research Consultant, Siemens AG Consultant, Boston Scientific Consultant, Getinge AB Consultant, Merit Medical Systems, Inc

**Sub-Events**

**SST16-01 When to Stent? Colonic Stenting – A Six Year Retrospective Review**

Sarah Eljamel MBChB (Presenter): Nothing to Disclose, Derek AJ Smith MBChB : Nothing to Disclose, Domenyk Brown MBChB : Nothing to Disclose, Hugh M. Paterson : Nothing to Disclose

**PURPOSE**

- To determine the success rate of colonic stenting (CS) and describe positive/negative factors predictive of successful deployment.
- To determine the complication rate of colonic stenting and describe these encountered in the early and late phase.
- To define the average survival and stent patency/intervention free period in patients with inoperable metastatic disease (M1) and determine when palliative surgery may be preferable to CS.

**METHOD AND MATERIALS**

All patients undergoing CS between November 2007 and October 2013 were identified from the departmental radiology electronic database. Clinical data was obtained from retrospective casenote review.

**RESULTS**

178 colonic stents were deployed in 165 patients. 143 patients had primary colonic malignancy, 102 of these had M1 disease at presentation. 41 patients were considered unfit for surgery or refused surgical intervention. Technical success rate was 81.6%. Univariate factors predictive of success were: position of obstruction (left/right) (p-value <0.01), degree of obstruction (complete obstruction/stricture) (p-value 0.09) and presentation type (elective/emergency) (p-value 0.49). Early complications (within 7 days): perforation (1.8%), stent migration (1.2%) and technical failure (1.8%). Late complications (within follow-up period): perforation (5.6%) and stent migration (3.6%) 17 patients represented with obstruction secondary to tumour ingrowth (10.3%). 8 were managed by further stenting (100% technical success). 2 had laser therapy to unblock stent. 7 underwent surgery. Median primary stent patency (to first intervention) is 558 days by Kaplan-Meier survival analysis. In M1 and M1 chemotherapy, estimated median primary stent patency is 555 days and 315 days respectively with a median patient survival of 139 days and 224 days.

**CONCLUSION**

CS is proven to be a viable option in the relief of colorectal obstruction. Ideal candidates have metastatic colorectal disease with a left colonic stricture. In patients with inoperable metastatic colorectal cancer; stenting provides effective, minimally invasive, long-term management in the palliation of colonic obstruction, with stent patency rates often exceeding patient survival.

**CLINICAL RELEVANCE/APPLICATION**

CS is a viable management option in metastatic colorectal obstruction, but in patients fit enough to undergo chemotherapy and thus palliative surgery, when should surgery be offered over CS?

**SST16-02 Technical and Clinical Outcomes of Colorectal Stenting in Large Bowel Obstruction**

James Henry Briggs MBChB, FRCR : Nothing to Disclose, Thomas Oakley MBBS, MA (Presenter) : Nothing to Disclose, Mark William Little MBBS, MSC : Nothing to Disclose, Joe Benson Woodhouse MBBS : Nothing to Disclose, Shaheen Dixon MBBS, FRCR : Nothing to Disclose, Charlie Ross Tapping MBCh, FRCR : Nothing to Disclose, Raman Uberoi MBChB, FRCR : Nothing to Disclose

**PURPOSE**

The aims of this study are to determine anatomical and clinical factors which affect outcome following stenting for large bowel obstruction, allowing improved treatment selection for patients.

**METHOD AND MATERIALS**

Retrospective review of all colonic stents placed in our institution between February 2006 and December 2013 was undertaken. This yielded 271 stents placed in 249 patients. Radiological and medical records were examined and a wide range of data collected, including patient demographics, nature, location and length of stricture, duration of symptoms, technical and clinical success, complication and 30 day mortality.

**RESULTS**

Technical and clinical success were 80.1% and 68.3% respectively. Clinical success was significantly lower in strictures longer than 5cm (53.4% vs 71.3%, p=0.0216). Clinical success was also lower in lesions at anatomical flexures (59.6% vs 76.6%, p=0.0096). A longer duration of symptoms (more than one week) was associated with lower technical success (69.2% vs 85.4%, p=0.0086). Overall complication rate was 27.1% (17.2% perforations, 6.6% stent migration and re-occlusion in 3.3%) and in line with other series. Analysis of the cases with perforation showed that only half of the perforations were related to stent placement. There was
a non statistically significant trend toward increased perforation rate in benign strictures over malignant (2.8% vs 11.1%, p=0.0602). No significant trends relating to patient age or 30 day mortality were shown. The length and site of stricture were not shown to be related to complication rate.

CONCLUSION

This study represents the largest published series of colonic stents to date. It has identified statistically significant trends in clinical success and lesion length and location, with lower technical success in patients with symptoms for longer than one week. These findings should be taken into account when choosing a treatment strategy for patients presenting with large bowel obstruction to optimise technical and clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

Limited quality evidence exists around colonic stenting for bowel obstruction. The current study represents that largest single cohort of patients undergoing stenting for large bowel obstruction to date. We have identified patient, clinical and anatomical factors to stratify risk and predict outcomes. We present new evidence to refine decision making in relation to the management of colonic obstruction.

SST16-03

A Percutaneous Transhepatic Cholangiography Needle Prototype That Utilizes the Unique Electrical Conductivity of Bile to Alert the Operator That the Needle Tip Has Entered a Bile Duct

Hersh Desai: Nothing to Disclose, ravi mahadevan: Nothing to Disclose, Jackson Bruce Morton BS: Nothing to Disclose, Matt Nagle: Nothing to Disclose, Mark Palmeri MD, PhD: Nothing to Disclose, Paul Vincent Suhocki MD (Presenter): Nothing to Disclose

PURPOSE

Percutaneous cholangiography technique has changed little over the decades and is associated with prolonged fluoroscopy times. The purpose of this research was to develop a needle prototype that would reduce procedure time and, therefore, radiation exposure to the patient and operator.

METHOD AND MATERIALS

The needle prototype was created from an 18 gauge needle shaft and a 20 gauge stylet, separated by an insulating layer of non-conductive polyurethane and glue. Current travels from the tip of the 18 gauge needle shaft, across surrounding fluid and into the stylet tip. The needle functions as a leg of a Wheatstone Bridge, with the fluid at the needle tip acting as a variable resistor. It utilizes a BeagleBone Black microprocessor for its software computational needs. The BeagleBone Black stores a Python based code. Battery, circuit and microprocessor are housed inside a box equipped with USB and HDMI outputs for data display. The output is compatible with most medical display monitors and continuously updates output voltage values. The needle was tested in-vitro, using salt and deionized water solutions of differing electrical conductivities matching those of blood, bile and liver.

RESULTS

This needle prototype successfully transduced changes in relative electrical conductivity in fluids surrounding the needle tip. It accurately detected entry of the needle tip into a salt solution that has the same conductive properties as bile. In the range of biologically relevant conductivities, generally below 2 S/m, the response of the system allowed for differentiation between the electrical conductivities of bile, blood and liver tissue.

CONCLUSION

This percutaneous cholangiography needle prototype utilizes the unique electrical conductivity properties of bile to alert the operator that the needle tip has entered a bile duct. Further testing in animal models will be necessary before determining its clinical utility for this and other applications.

CLINICAL RELEVANCE/APPLICATION

This needle prototype can reduce radiation exposure associated with percutaneous transhepatic cholangiography by eliminating the need for fluoroscopy during much of the procedure. This technology shows potential for use in other medical procedures as well, utilizing the unique electrical conductivities of body fluids not discussed here.

SST16-04

Primary Hepatic Arterial Stenting in Patients after Liver Transplantation: 1 Year Patency Rates and Long Term Clinical Outcomes

Ammar Sarwar MD (Presenter): Nothing to Disclose, Jan Martin Brennan MBChB, BMEdSc: Nothing to Disclose, Olga Rachel Brook MD: Research Grant, Guerbet SA, Felipe Birchal Collares MD: Nothing to Disclose, Salomao Faintuch MD: Nothing to Disclose, Barry A. Sacks MD: Nothing to Disclose, Muneeb Ahmed MD: Nothing to Disclose

PURPOSE

To determine clinical outcome in patients who underwent primary stent placement for hepatic artery (HA) stenosis after liver transplantation.

METHOD AND MATERIALS

A retrospective review of all adult liver transplant patients needing HA stent (2003-2013) was performed. All imaging studies and clinical outcomes were recorded. Primary clinical outcomes (mortality, graft dysfunction) were assessed. As a secondary endpoint, primary patency was assessed using available imaging at 1 month and 1 year.

RESULTS
Survival Benefit of TIPS in Patients with Refractory Ascites: A Single Institution Case-Control Analysis

Ahmad Parvinian MD (Presenter): Nothing to Disclose, Leigh Casadaban BS: Research Grant, Guerbet SA, Jeet Minocha MD: Nothing to Disclose, Martha-Gracia Knuttinen MD, PhD: Nothing to Disclose, James Thuan Bui MD: Nothing to Disclose, Charles E. Ray MD, PhD: Nothing to Disclose, Ron Charles Gaba MD: Nothing to Disclose

PURPOSE
Ascites is a leading cause of morbidity and mortality among cirrhotic patients: it occurs in 50% within 10 years of diagnosis and becomes medically refractory in 5-10%, which entails a 1-year mortality rate of up to 50%. Transjugular intrahepatic portosystemic shunt (TIPS) is a safe and effective treatment for ascites secondary to portal hypertension. While the benefits of this procedure are well documented, data regarding the effect of TIPS on survival remain unproven. To that end, this study aims to quantify the impact of TIPS creation on survival in the setting of ascites.

METHOD AND MATERIALS
In this single-institution retrospective study, 79 patients who underwent TIPS for refractory ascites from 2001-2014 were compared with a cohort of 80 patients with refractory or recidivant ascites due to decompensated liver disease who underwent serial paracentesis procedures during the same time period. Data pertaining to demographic and liver disease characteristics, Model for End Stage Liver Disease (MELD) scores, and survival outcomes were obtained from electronic medical record review and the social security death index. Survival outcomes were analyzed using Kaplan-Meier statistics with log-rank comparison.

RESULTS
The TIPS cohort comprised 56 men and 23 women (mean age 54 years, mean MELD 15); the no-TIPS cohort comprised 46 men and 34 women (mean age 54 years, mean MELD 22.5). Survival was enhanced with TIPS: median survival was 1100±371 days in the TIPS cohort and 262±121 days in the no-TIPS cohort (P=0.021). Median survival among patients with MELD scores ≤18 was 1219±436 days versus 262±77 days (P=0.01) in the TIPS versus no-TIPS cohorts, respectively. Survival was similar in patients with MELD >18 (130± 602 versus 322± 220 days, P=.829). There was no significant difference in mortality between the TIPS and no-TIPS groups at 30 days (13.2% versus 12.5%, P=1.0) or 90 days (21.1% versus 28.8% P=0.58), indicating short-term procedure safety.

CONCLUSION
TIPS creation enhances long-term survival without significantly impacting short-term mortality in patients with ascites.

CLINICAL RELEVANCE/APPLICATION
TIPS imparts a quantifiable survival benefit on patients with ascites. A precise understanding of this benefit may aid in temporal optimization of TIPS allocation as a bridge to definitive therapy.

Migration of Retrievable, Expandable Metallic Stents Inserted for Malignant Esophageal Strictures: Incidence, Management, and Prognostic Factors in 332 Patients

Wei-Zhong Zhou (Presenter): Nothing to Disclose, Ho-Young Song MD: Nothing to Disclose, Jung-Hoon Park MS, RT: Nothing to Disclose, Ji Hoon Shin MD: Nothing to Disclose, Jin Hyoung Kim MD: Nothing to Disclose, Young Chul Cho BS: Nothing to Disclose, Jong Kun Jang: Nothing to Disclose, Eun Jung Jun PhD: Nothing to Disclose

PURPOSE
Focused on evaluating the factors that influence stent migration following placement of single design stent was not previously reported. The purpose of this study was to evaluate the incidence, prognostic factors, and secondary management of stent migration in patients with malignant esophageal strictures.
METHOD AND MATERIALS
A retrospective cohort study was performed in a single, tertiary-referral, university hospital to identify the incidence, management, and prognostic factors for stent migration in 332 consecutive patients with placement of a retrievable, expandable, metallic stent for malignant esophageal strictures. Stent migration was classified into four patterns as locations of a migrated stent when migrated stents were detected. A multivariate logistic regression model was used to identify the independent predictive factors associated with stent migration.

RESULTS
Stent migration occurred in 42 (12.6%) of 332 patients. Migration was partial (n=21) or complete (n=21), and nine, 12, 11, and 10 patients had patterns I, II, III, and IV, respectively. Multivariate analysis identified the following prognostic factors: esophagogastic junction strictures caused by cancer of the gastric cardia (OR, 3.330; 95% CI, 0.156-9.698; p = 0.004), patients who underwent anti-cancer treatment after stent placement (OR, 17.514; 95% CI, 7.094-43.235; p < 0.001), and patients with a longer survival time (OR, 2.994; 95% CI, 0.991-7.996; p < 0.001). Secondary management was needed for 33/42 (79%) patients. The strictures in the remaining nine patients improved throughout the follow-up.

CONCLUSION
Stent migration occurs most commonly in patients with cancer of the gastric cardia, longer survival time and who underwent anti-cancer treatment following stent placement. Stent migration is successfully managed by further intervention.

CLINICAL RELEVANCE/APPLICATION
Accurate knowledge of the pattern of stent migration is important for its successful management.

**SST16-07**
Approach of Image-Fusion from Pre-procedural Computed Tomography Angiography in an Interventional Vascular Procedure: The Portal Vein Puncture during Transjugular Intrahepatic Portosystemic Shunt (TIPS)

Karim Rouabah (Presenter): Nothing to Disclose, Jean-Marie Caporossi: Nothing to Disclose, Guillaume Louis MD: Nothing to Disclose, Alexis Jacquier MD: Research Grant, Groupe DANONE SA Research Grant, Merck & Co, Inc Consultant; General Electric Company Travel support, Siemens AG Travel support, Boston Scientific Corporation, Jean-Michel Bartoli MD: Nothing to Disclose, Vincent Vidal MD: Nothing to Disclose

PURPOSE
Evaluate the feasibility, accuracy and safety of Image-Fusion using 3D portography from pre-procedural Computed Tomography Angiography (CTA) with the fluoroscopy in portal vein puncture during TIPS.

METHOD AND MATERIALS
Eighteen patients underwent TIPS with Image-Fusion from pre-procedural CTA. The wedged iodinated sus hepatic vein portography was the conventional method used to visualize the portal vein. The study was performed by two groups of operators: one composed of radiologist with less than 3 years experience in TIPS procedure and the other more experienced. A direct portography was performed after successful portal vein puncture to analyze the accuracy of the Image-Fusion. The subjective utility of the image fusion for the portal puncture and the pre-procedural CTA post-processing time were analyzed. We also studied the total number of puncture attempts, the global radiation exposure as well as the specific radiation exposure correlated to the wedged sus-hepatic portography.

RESULTS
The TIPS procedure was succesful in 17 patients (94.4 %). The image fusion was useful in 13 patients (72.2%). The average post-processing time was 16.4 minutes. Image fusion was strictly superimposed with the direct portography in 10 patients (55.6%). The average gap was 0.69 cm in height and 0.28 cm laterally. The mean number of puncture was 4.6. Eight patients needed less than 3 portal vein puncture attempts. The wedged sus hepatic portography was interpretable in 8 patients (44.4 %), its mean radiation exposure was 421.2 dGy.cm² corresponding to an average surexposure of 19%. No complication was noticed.

CONCLUSION
Image fusion from pre-procedural CTA whit fluoroscopy in portal vein puncture during TIPS is a promising, feasible, safe and accurate technique.

CLINICAL RELEVANCE/APPLICATION
Long-term survival and post-procedures complications of TIPS are related to good initial positioning of the stent, depending on the precision of the portal puncture.

**SST16-08**
Early, Unexpected, Liver Failure after TIPS Placement in Cirrhotic Patients with Relatively Preserved Liver Function (MELD ≤12): Incidence, Outcome and Prognostic Factors

Angelo Luca MD: Nothing to Disclose, Roberto Miraglia MD: Nothing to Disclose, Luigi Maruzzelli MD (Presenter): Nothing to Disclose, Giovanni Vizzini: Nothing to Disclose, Mario D'Amico MS: Nothing to Disclose, Fabio Tuzzolino: Nothing to Disclose

PURPOSE

To evaluate incidence, outcome and prognostic factors of early liver failure (LF) after TIPS in cirrhotic patients with relatively preserved liver function.

**METHOD AND MATERIALS**

We retrospectively reviewed 217 consecutive cirrhotic patients with baseline MELD ≤12 who underwent TIPS for portal hypertensive complications. TIPS indications were recurrent variceal bleeding (47.9%), refractory/recurrent ascites (41.5%), other (10.6%). Early LF defined as presence of death, liver transplantation (LT) or MELD >18 within 3-months after TIPS was assessed. The Kaplan-Meier method and the Log-rank test were used to look for predictors of early LF. Independent predictors were assessed using a multivariate Cox proportional hazards model.

**RESULTS**

Twenty (9.2%) out of 217 patients developed early LF after TIPS (10 patients died, 1 patient required LT and 9 patients increased the MELD to more than 18). In the latter group, two patients died at 6 and 9.8 months, two underwent LT at 7.8 and 11.9 months, 4 patients decreased the MELD≤12 from 4.3 to 12 months after TIPS and one patient maintained a stable MELD. One patient had bi-segmental hepatic necrosis on computed tomography; no other procedure-related technical complications were associated with early LF. Early LF was associated with significantly lower transplant free survival 97% vs. 40% at 6-months (p< 0.05) and 88% vs. 24% at 12-months (p< 0.0001) compared with patients without LF. Multivariate analysis revealed that refractory ascites (OR 4.6; CI 1.37-15.5; p=0.01) and pre-TIPS MELD ≥11 (OR 3.2; CI 1.07-9.5; p=0.01) were independently associated with the risk of early LF. In the subgroup of 95 patients with refractory ascites early LF occurred in 15 patients (16%), multivariate analysis disclosed that platelets level (OR 0.9; CI 0.99-0.99; p=0.01) was an additional independent predictors of early LF.

**CONCLUSION**

Early LF is not uncommon in cirrhotic patients with MELD≤12 undergoing TIPS especially in patients with refractory ascites and those with MELD ≥11. In the subgroup of patients with refractory ascites, platelet count was identified as additional prognostic factor. In more than two third of cases early LF causes death or requires LT.

**CLINICAL RELEVANCE/APPLICATION**

Early LF is not uncommon in cirrhotic patients with MELD≤12 undergoing TIPS especially in patients with refractory ascites and those with MELD ≥11.

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**Outcome Following a Negative CT Angiogram for Gastrointestinal Haemorrhage**

Victoria Chan MBChB (Presenter): Nothing to Disclose, Donald Man Lap Tse MRCP, FRCR : Nothing to Disclose, Shaheen Dixon MBBS, FRCR : Nothing to Disclose, Vivek Shrivastava MBBS : Nothing to Disclose, Charles Ross Tapping MBChB, FRCR : Nothing to Disclose, Rafiuddin Patel MBChB, FRCR : Nothing to Disclose, Mark Bratby MRCP, FRCR : Nothing to Disclose, Suzie Anthony FRCR : Nothing to Disclose, Raman Uberoi MBChB, FRCR : Nothing to Disclose

**PURPOSE**

To evaluate the role of a negative computed tomography angiogram (CTA) in patients who present with gastrointestinal (GI) haemorrhage.

**METHOD AND MATERIALS**

A review of all patients who had CTAs for GI hemorrhage over an eight-year period from January 2005 to December 2012 was performed. Data on patient demographics, location of hemorrhage, hemodynamic stability and details of angiograms and/or the embolization procedure were obtained from the CRIS/PACS database, interventional radiology database, secure electronic medical records and patient’s clinical notes.

**RESULTS**

202 CTAs were performed in 180 patients over the eight-year period. 87 CTAs were performed for upper GI hemorrhage (18 positive for active bleeding, 69 negative) and 115 for lower GI hemorrhage (37 positive for active bleeding, 78 negative). 58.7% (37/63) of patients with upper GI bleed and 77.4% (48/62) of patients with lower GI bleed who had an initial negative CTA did not rebleed without the need for radiological or surgical intervention. This difference was statistically significant (p = 0.04). The relative risk of rebleeding, following a negative CTA, in lower GI bleeding vs upper GI bleeding patients is 0.55 (95% confidence interval 0.32 - 0.95).

**CONCLUSION**

Patients with upper GI bleed who had negative CTAs usually require further intervention to stop the bleeding. In contrast, most patients presenting with lower GI hemorrhage who had a negative first CTA were less likely to rebleed.

**CLINICAL RELEVANCE/APPLICATION**

Negative CTA is a good indicator that patients with lower GI hemorrhage with a negative first CTA are much more likely to settle spontaneously without the need for intervention, compared with patients with upper GI hemorrhage.