EDE004-b

Emergency Radiology Case of the Day

Education Exhibits
Location: NA

Participants
Moderator
Guillermo P. Sangster MD: Nothing to Disclose
Alberto Leo Carbo MD: Nothing to Disclose
Simon Long MD: Nothing to Disclose
Husein Imtiaz Poonawala MD: Nothing to Disclose
Ana Andrade MD: Nothing to Disclose
Lucas Tomas Jensen MD: Nothing to Disclose
Javier Vallejos MD, MBA: Nothing to Disclose
Carlos Capunay MD: Nothing to Disclose
Peeyush Bhargava MD, MBA: Nothing to Disclose
Maureen Gail Heldmann MD: Nothing to Disclose
Gustavo A. Poggio MD: Nothing to Disclose
Javier Vallejo MD: Nothing to Disclose

ERE001-b

Code Blue: Imaging Features of Cardiac Arrest on CECT

Education Exhibits
Location: ER Community, Learning Center

Participants
Kelly A. Covey MD (Presenter): Nothing to Disclose
Sean Carlson DO: Nothing to Disclose
Michael Markovic MD: Nothing to Disclose
Thomas Bernard Poulton MD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review the imaging findings of cardiac arrest / impending cardiac arrest on CECT. 2. To present a typical case of cardiac arrest on CECT secondary to a ruptured abdominal aortic aneurysm. 3. To emphasize the importance of recognizing CECT signs of cardiac arrest / impending cardiac arrest.

TABLE OF CONTENTS/OUTLINE
Introduction Review imaging findings of cardiac arrest / impending cardiac arrest on CECT Case presentation of ruptured abdominal aortic aneurysm with classic findings of cardiac arrest on CECT Discussion Proposed pathophysiology of the imaging findings Clinical importance of recognizing cardiac arrest / impending cardiac arrest on CECT Summary

ERE003-b

Normal and Abnormal Imaging Findings after the Liposuction

Education Exhibits
Location: ER Community, Learning Center

Participants
Yong Eun Chung MD, PhD (Presenter): Nothing to Disclose
Hye-Jeong Lee MD: Nothing to Disclose
Je Sung You: Nothing to Disclose
Myeong-Jin Kim MD, PhD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: To review the definition, techniques and types of liposuction. To understand normal imaging findings after liposuction. To review imaging findings of complication due to liposuction. The major teaching points of this exhibit are Liposuction is less invasive procedure which can be performed in obese patients and there are several different techniques and types. Subcutaneous emphysema, fat infiltration and fluid collection are normal findings immediate after liposuction. Complications related to liposuction are vascular injury, abdominal wall defect, bowel wall injury, infection and pulmonary embolism.

TABLE OF CONTENTS/OUTLINE
1. Definition of liposuction
2. Image illustration of techniques of liposuction: SAL (suction-assisted liposuction), UAL (Ultrasound-), VAL (Vaser-), PAL (Power-), LAL (Laser-)
3. Image illustration of types of liposuction: Dry, Wet, Super wet, tumescent
4. Normal imaging findings after liposuction
5. Imaging findings of complications due to liposuction: active bleeding or hematoma, ventral herniation of bowel, perforation of Bowel, necrotizing fascitis, pulmonary embolism
ERE004-b

Bullet Characteristics in Forensic Radiology

Participants
- Dominic Gascho (Presenter): Nothing to Disclose
- Garyfalia Ampanozi MD: Nothing to Disclose
- Sebastian Eggert: Nothing to Disclose
- Sabine Franckenberg MD: Nothing to Disclose
- Stephan Bolliger: Nothing to Disclose
- Sebastian Winkhofer MD: Nothing to Disclose
- Steffen Ross MD: Nothing to Disclose
- Lukas Ebner MD: Nothing to Disclose
- Michael J. Thali MD: Nothing to Disclose
- Patricia Mildred Flach MD: Nothing to Disclose
- Sebastian Winklhofer MD: Nothing to Disclose
- Steffen Ross MD: Nothing to Disclose
- Lukas Ebner MD: Nothing to Disclose
- Michael J. Thali MD: Nothing to Disclose
- Sebastian Winklhofer MD: Nothing to Disclose
- Patricia Mildred Flach MD: Nothing to Disclose

TEACHING POINTS
• Vast artifacts on computed tomography (CT) may contrariwise not be present on magnetic resonance imaging (MR) - dependent on the bullets compounds • Ferromagnetic bullets present with extensive susceptibility on postmortem MR • Non-ferromagnetic bullets allow for radiological interpretation with scarce or no artifacts on postmortem MR • Projectile movement and migration may be caused by (postmortem) MR in ferromagnetic bullets • Projectile migration may occur along wound channel within a body cavity, e.g. in ricochet • Significant focal heating effects have not been detected during autopsy in forensic cases

TABLE OF CONTENTS/OUTLINE
• Introduction - Morgues and Forensic institutes worldwide increasingly use postmortem imaging for quality improvement or even as replacement for autopsy. Forensic caseload frequently presents with lodged projectiles and uncertainty remains whether to perform postmortem MR • Review of literature of (ante- and postmortem) CT and MR • Discussion of ballistic properties regarding artifacts • Discussion of ballistic properties regarding projectile migration, movement and dislocation • Discussion of ballistic properties regarding thermic effects • Potential implication for patient care • Case-based review of postmortem cases (scanned on a 3 T) displaying the above reviewed imaging features in correlation to autopsy

ERE005-b

Queer the Pitch: How to Detect Internal Drug Couriers—From Customs through Hospitals to Forensics

Participants
- Patricia Mildred Flach MD (Presenter): Nothing to Disclose
- Dominic Gascho: Nothing to Disclose
- Patrick Laberke: Nothing to Disclose
- Lukas Ebner MD: Nothing to Disclose
- Steffen Ross MD: Nothing to Disclose
- Garyfalia Ampanozi MD: Nothing to Disclose
- Wolf Schweitzer MD: Nothing to Disclose
- Thomas D. Ruder MD: Nothing to Disclose
- Andrew Thompson: Nothing to Disclose

TEACHING POINTS
• Learn about specific radiological signs on DR and CT and how to diagnose drug swallowers • The manufacture and density appearance on CT are elaborated • The diagnostic gap between the authorities procedures at airports to radiological imaging at hospitals and morgues are described • The problems of different jurisdictions and penalties (e.g. UK, US, Switzerland, Asia) are made aware • Pictorial review on clinical cases (Methamphetamine, Cocaine) and postmortem cases with focus on radiological detection and pitfalls is presented • The audience will learn about the pearls on DR and CT in drug couriers • A protocol regarding low dose DE-CT will be available for the reader

TABLE OF CONTENTS/OUTLINE
• Definition of body packers, pushers and stuffers • Customs procedures and body scans at the airport • Review of literature of different imaging modalities • Description of a drug loo • Radiological diagnostic signs on DR and CT • Pitfalls and complications in internal swallowers detection / liquid cocaine • Postmortem cases with autopsy and imaging • Density of the packs regarding the inside substance and why not to rely on density measurements • Outlook - low dose CT and micro-dose CT in suspects • Outlook - DE-CT / spectral CT

ERE006-b

Transitioning to Electronic Books: Designing Interactive Multimedia on the Ipad for the Medical Student Radiology Rotation Using a Competency-based Curriculum

Participants
- Amir Taherian BS (Presenter): Nothing to Disclose
- Paul S. Babyn MD: Nothing to Disclose

TEACHING POINTS
Standardize rotational assessment in Medical Imaging using pre and post-tests as measures of knowledge retention. Promote efficient imaging management skills and image ordering based on evidence-based medicine, using clinical vignettes.

### TABLE OF CONTENTS/OUTLINE

**Title:** Transitioning to Electronic Books: Designing Interactive Multimedia on the Ipad for the Medical Student Radiology Rotation using a Competency-Based Curriculum. Outline: with increased student enrollment, and often limited clinician access, students may not be exposed to a standardized experience in medical imaging. Our goal is to expose patients to the scope of radiology, clarify potential misconceptions about medical imaging that form the basis of clinician-radiologist interactions and describe risks and benefits of imaging, utilizing pre- and post-tests. Implementing a tablet-based radiology residency education curriculum will improve: Motivation to study (and total time spent studying); Preparation for the elective post-test; And active learning during the 2 week competency based elective. The free iBook has a visually rich layout with high resolution images, videos, multimedia, interactive quizzes, PACS scrolling, links to websites as well as other apps on the iPad, 3D models, and notes for radiology fact recalls.

**ERE007-b**

**Blast Injuries: From IED Blasts to Boston Marathon Bombing**

**Education Exhibits**

**Location: ER Community, Learning Center**

**Selected for RadioGraphics**

**Participants**

- **Ajay K. Singh MD (Presenter):** Nothing to Disclose
- **John D. York MD:** Nothing to Disclose
- **Laura Louise Avery MD:** Nothing to Disclose
- **Hani H. Abujudeh MD, MBA:** Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

**TEACHING POINTS**

This poster describes: 1. The imaging features of high intensity blast injuries from imbrovised explosive devices in Iraq and Afghanistan. 2. The imaging features of low intensity blast injuries from Boston marathon bombing 3. The physics of the various blast injuries (primary, secondary, tertiary and quaternary blast wave injuries)

**TABLE OF CONTENTS/OUTLINE**


**ERE009-b**

**MDCT Findings of Soft Tissue Barotrauma: Striking, Subtle, and Mimics**

**Education Exhibits**

**Location: ER Community, Learning Center**

**Participants**

- **Jonathan Holstad MD (Presenter):** Nothing to Disclose
- **Brett Douglas MacAdam MD, MS:** Nothing to Disclose
- **Dahua Zhou MD:** Nothing to Disclose

**TEACHING POINTS**

Purpose: 1. Review the classical physics of barotrauma and applied pathophysiology. 2. Discuss high-yield body MDCT findings in victims of soft tissue barotrauma. 3. Highlight the clinical prognostic importance of soft tissue barotrauma.

**TABLE OF CONTENTS/OUTLINE**

Physics/Pathophysiology of Barotrauma Classical physics: pressure = force/area. Pascal's Law states pressure applied to a closed body of fluid will be evenly distributed. While pressure is proportional to density it is independent of size and shape of the container. A force to the chest or abdomen acts as a shockwave. For example, if energy is transmitted throughout mesenteric fat a floating loop of bowel will experience an equal force on all sides. Clinical and Prognostic Importance of Soft Tissue Barotrauma. Clinical exam is surprisingly insensitive for pressure-related injuries. A "seatbelt sign" can be helpful on physical exam, however most attention is directed to fractures or solid organ injury. The radiologist plays a key role in completing the patient's clinical picture. Barotrauma victims frequently suffer from multiple solid organ injuries and risk a "satisfaction of search" error. Tracheal injury may complicate oxygenation. Traumatic flank hernias include a risk of bowel entrapment. Bowel contusions may progress to ischemia. Representative Cases and Mimics Conclusion

**ERE010-b**

**Will the Real SCIWORA Please Stand Up? Exploring the Lexicon of Clinicoradiologic Mismatch in Closed Spinal Cord Injuries**

**Education Exhibits**

**Location: ER Community, Learning Center**

**Participants**

- **Wendy Kim MD (Presenter):** Nothing to Disclose
- **David Dreizin MD:** Nothing to Disclose
- **Jane Kim MD:** Nothing to Disclose
- **Narendra S. Shet MD:** Nothing to Disclose
- **Alexis Rose Boscak MD:** Nothing to Disclose

**TEACHING POINTS**

- **Participants**
- **Wendy Kim MD (Presenter):** Nothing to Disclose
- **David Dreizin MD:** Nothing to Disclose
- **Jane Kim MD:** Nothing to Disclose
- **Narendra S. Shet MD:** Nothing to Disclose
- **Alexis Rose Boscak MD:** Nothing to Disclose
TEACHING POINTS

After viewing this exhibit, the learner should be able to: Understand the epidemiology, pathophysiology, and imaging characteristics of SCIWORA (spinal cord injury without radiographic abnormality) Explain the evolution of the different variations and sub-classifications of the term SCIWORA Describe key issues regarding prognostication, triage, and management as directed by MRI evaluation

TABLE OF CONTENTS/OUTLINE

Introduction Terminology and controversy: SCIWORA, SCIWORET, SCIWOCTET, SCIWOPRA, SCIWONA Prognostication and triage within the context of MRI Intrinsic cord pathology: Transient or recurrent SCIWORA Multilevel or tandem SCIWORA Cord edema Cord hemorrhage Extraneural pathology: Discoligamentous and capsular injury Epidural hematomas Follow up imaging Outcomes

ERE100

Acute Pancreatitis: Imaging Indications and Potential Complications

Education Exhibits
Location: ER Community, Learning Center

Participants
Jason DiPoe MD (Presenter): Nothing to Disclose
Yehuda Mihul: Nothing to Disclose
Nadia Caplan: Nothing to Disclose
Harold Jacob: Nothing to Disclose

TEACHING POINTS

1. Acute pancreatitis is a clinical diagnosis with diagnostic criteria that do not include imaging. Therefore, radiology examinations should be interpreted in the presence of these clinical data to avoid mistakes in misdiagnosing mimickers.
2. Indications for imaging of acute pancreatitis should focus on evaluation for etiology and potential complications.

TABLE OF CONTENTS/OUTLINE

Expected imaging findings in uncomplicated pancreatitis with focus on differential mimickers Indications for imaging - underlying mass, anatomic, autoimmune etiology, complication evaluation Complications a. Pseudocysts b. Abscess c. Necrosis d. Hemorrhage e. Splenic artery aneurysm f. Splenic vein thrombosis g. Fistula formation for example to kidney and pleura

ERE101

Beyond Simple Cholecystitis: Unusual Gallbladder and Gallstone Related Emergencies

Education Exhibits
Location: ER Community, Learning Center

Participants
Daniel Ariel Krieger MD: Nothing to Disclose
Meir Hillel Scheinfeld MD, PhD: Nothing to Disclose
Mike Spektor MD: Nothing to Disclose
Jeffrey Michael Levsky MD, PhD: Nothing to Disclose
Dameon R. Duncan MD, MBA: Nothing to Disclose
Robert Joshua Dym MD (Presenter): Nothing to Disclose

TEACHING POINTS

While cholecystitis is generally uncomplicated and straightforward, it may also present in advanced stages or other unusual forms. In addition to directly obstructing the cystic or common duct, gallstones may indirectly obstruct the common duct (Mirizzi syndrome), stomach (Bouveret syndrome) or small bowel (gallstone ileus). Postoperative complications after cholecystectomy include abscess and bile leak, and more rarely, cholecystitis of the cystic duct remnant and abscess due to dropped gallstones.

TABLE OF CONTENTS/OUTLINE

Introduction Advanced cholecystitis Emphysematous cholecystitis Gangrenous cholecystitis Hemorrhagic cholecystitis Gallbladder perforation Cholecystitis with fistula to colon Xanthogranulomatous cholecystitis Unusual presentations of cholecystitis Cholecystitis within a hernia Ischemic cholecystitis after TACE Gallbladder volvulus Gallbladder trauma Unusual gallstone obstructions Gallstone ileus Bouveret syndrome Mirizzi syndrome Post-operative complications Acute -Abscess -Bile leak Delayed -Dropped gallstones with abscess -Cholecystitis of cystic duct remnant Conclusion

ERE103

Cross-sectional Imaging of Traumatic and Non Traumatic Adrenal Emergencies

Education Exhibits
Location: ER Community, Learning Center

Participants
Michael Nathan Patlas MD, FRCP (Presenter): Nothing to Disclose
Christine G. Menias MD: Nothing to Disclose
Felipe Munera MD: Nothing to Disclose
Ania Zofia Kielar MD: Nothing to Disclose
Alla M. Rozenblit MD: Nothing to Disclose
Luigia Romano MD: Nothing to Disclose
Douglas S. Katz MD: Nothing to Disclose
Jorge A. Soto MD: Nothing to Disclose
TEACHING POINTS
To illustrate critical imaging findings in traumatic and nontraumatic adrenal emergencies. To discuss advantages of different cross-sectional modalities for diagnosis of acute adrenal abnormalities. To review management options with emphasis on interventional radiology.

TABLE OF CONTENTS/OUTLINE
Multiple traumatic and nontraumatic adrenal emergencies are encountered during imaging of critically ill patients. Traumatic adrenal hematomas are markers of severe polytrauma and can be easily overlooked due to multiple concomitant injuries. Acute nontraumatic abnormalities are usually detected during evaluation of nonspecific abdominal pain or presentations related to acute adrenal insufficiency or paroxysmal hypertension. A high index of suspicion is required for the establishment of timely diagnosis in cases of adrenal hemorrhage or infection. Cross-sectional imaging findings of the following traumatic and nontraumatic adrenal emergencies will be illustrated and reviewed: Traumatic adrenal hematoma; Spontaneous adrenal hemorrhage related to benign and malignant tumors and iatrogenic causes; Waterhouse-Friderichsen syndrome; Adrenal infections (Histoplasmosis, Candidiasis); Large symptomatic adrenal cysts; Symptomatic pheochromocytoma. Differential diagnosis and management options will be discussed.

ERE104
Cross-sectional Imaging, with Surgical Correlation, of Patients Presenting with Complications after Remote Bariatric Surgery without Bowel Obstruction

Education Exhibits
Location: ER Community, Learning Center

Participants
Ania Zofia Kielar MD (Presenter): Nothing to Disclose
Suzanne T. Chong MD: Nothing to Disclose
Christine O. Menias MD: Nothing to Disclose
Michele Riordon MD, FRCP: Nothing to Disclose
Michael Nathan Patlas MD, FRCP: Nothing to Disclose
Jean-Dennis Yelle MD, FRCP: Nothing to Disclose
Jason Robbins MD: Nothing to Disclose

TEACHING POINTS
Lack of bowel distension is not indicative of a normal study. Internal hernias can present with intermittent pain without overt obstruction. Key imaging findings on CT can allow early diagnosis of post bariatric complications before symptoms become life threatening.

TABLE OF CONTENTS/OUTLINE
Bariatric surgery is becoming a commonplace hospital procedure performed in North America. Patients may undergo a number of surgical intervention, including Roux-en-y gastric bypass, sleeve gastrectomy and gastric banding. If complications occur, they often present with bowel obstruction. However, patients can have important abnormalities in the absence of dilated loops. This educational poster will review non-obstructive complications of bariatric surgery which need to be identified early to alleviate symptoms, improve weight loss goals and prevent future ischemic or obstructive complications. This includes: 1. Dehiscence of Roux-en-y of sleeve gastrectomy staple lines 2. Internal hernia through Petersen’s defect without obstruction: Specific focus on a. SMV “beak sign” b. Perpendicular crossing of vessels with respect to bowel loops c. Location and aggregation of bowel loops in abnormal locations 3. Slipped band after restrictive-type banding surgery 4. Malabsorption syndromes.

ERE105
CT Imaging of Large Vessel Injury in Blunt Abdominal Trauma

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

Participants
Anthony Samuel Armetta MD (Presenter): Nothing to Disclose
Arthur Baghdanian MD: Nothing to Disclose
Armonde Baghdanian MD: Nothing to Disclose
Christina Alexandra Lebedis MD: Nothing to Disclose
Stephan W. Anderson MD: Nothing to Disclose
Jorge A. Soto MD: Nothing to Disclose
Faisal Khosa FFR(RCSI), FRCP: Nothing to Disclose
Waqas Shuaib MD: Nothing to Disclose

TEACHING POINTS
To review vascular injuries that are commonly overlooked in the interpretation of blunt abdominal trauma CT examinations. To understand the broad spectrum of vessel injury which may occur in the setting of blunt trauma. To explain pearls and pitfalls in CT diagnosis, which we will illustrate based on 10 years of combined experiences from two urban level-one trauma centers.

TABLE OF CONTENTS/OUTLINE
1. Case examples of large vessel injury in blunt abdominal trauma. For example: injuries to the abdominal aorta, portal vein, celiac axis, superior and inferior mesenteric vessels, renal vessels, etc.
2. Description of major and associated imaging findings of each case.
3. Discussion of pearls and pitfalls in the diagnosis of selected cases. For example: protocol variables that may add to or detract from the identification of a traumatic vascular injury.

ERE106
CT of Miscellaneous Regional and Diffuse Small Bowel Disorders in the Emergency Setting: Beyond Ischemia and Inflammatory Bowel Disease

Education Exhibits
Location: ER Community, Learning Center

Certificate of Merit

Participants
Douglas S. Katz MD (Presenter): Nothing to Disclose
Sushma Gaddam BS : Nothing to Disclose
Simon Onderi MD : Nothing to Disclose
Christopher D'Arcy Scheirey MD : Nothing to Disclose
Ritu Borda MBBS : Nothing to Disclose
John J. Hines MD : Nothing to Disclose
Bruce Richard Javors MD : Nothing to Disclose
Francis Joseph Scholz MD : Owner, FSpoon Company

TEACHING POINTS
The purpose of this exhibit is to review the CT findings of a variety of regional and diffuse small bowel disorders, ranging from relatively common to rare, which are above and beyond ischemia and inflammatory bowel disease. These disorders often have non-specific CT appearances, although there may be clues on the images to narrow the differential diagnosis. In selected cases, such as small bowel intramural hematoma and sclerosing peritonitis, the CT findings may be highly specific. Patients presenting with regional or diffuse acute as well as subacute small bowel disorders on CT may be particularly problematic in the emergency setting, and need to be placed in the specific clinical context. Correlation with the history, clinical findings, and laboratory findings in each specific case is critical.

TABLE OF CONTENTS/OUTLINE
Conditions to be discussed and demonstrated on CT will include: peritonitis; chemotherapy and radiation therapy enteritis; sclerosing peritonitis; infections (including C. difficile, TB, MAI, Whipple's disease); celiac disease; angioedema related to ACE inhibitors and other causes; intramural hematoma; eosiinophilic enteritis; lupus and other vasculitis; and amyloid. The imaging literature of these disorders will be briefly reviewed, and clues to narrowing the differential diagnosis will also be provided.

ERE107

CT of Small Bowel Diverticulosis and Diverticulitis: Findings, Complications, and Implications for the Emergency Radiologist

Education Exhibits
Location: ER Community, Learning Center

Participants
Douglas S. Katz MD (Presenter): Nothing to Disclose
John J. Hines MD : Nothing to Disclose
Mariam Moshiri MD : Consultant, Reed Elsevier Author, Reed Elsevier
Puneet Bhargava MD : Editor, Reed Elsevier
Ahmed Fadi MD : Nothing to Disclose
Christine O. Menias MD : Nothing to Disclose
James Burnett Gardner MD : Nothing to Disclose
David Jordan Maldow BA : Nothing to Disclose

TEACHING POINTS
Small bowel diverticulosis is frequently missed, particularly on CT examinations performed in the emergency setting, and although usually incidental, may have implications for patient management in the near future. Small bowel diverticulosis is an uncommon but not rare disorder which the emergency radiologist needs to recognize on CT. The diagnosis needs to be established prospectively, particularly on CT examinations performed for imaging of the acute abdomen and pelvis, as this is not a diagnosis which generally can be established clinically. A variety of manifestations and complications can be diagnosed utilizing CT, and the radiologist needs to be aware of this spectrum of findings.

TABLE OF CONTENTS/OUTLINE
A series of CT examinations from several institutions will be presented, demonstrating examples of small bowel diverticulosis and diverticulitis of the duodenum, jejunum, and ileum. Meckel's diverticulosis and diverticulitis as demonstrated on CT will be discussed and reviewed. The use of coronal reformations will be discussed. The CT findings of small bowel diverticulosis and diverticulitis range from obvious to subtle. Complications, including perforation, obstruction, abscess formation, lith formation, and 'enterolith ileus', will be demonstrated and discussed. The relevant clinical and imaging literature will be briefly reviewed.

ERE108

Diagnosis and Management for Acute Gastrointestinal Bleeding: Role of Radiologists

Education Exhibits
Location: ER Community, Learning Center

Participants
Akitoshi Inoue MD (Presenter): Research Grant, Bayer AG
Akira Furuwaka MD, PhD : Nothing to Disclose
Shinichi Ohta MD, PhD : Nothing to Disclose
Serenji Toleubay : Nothing to Disclose
Masashi Takahashi MD : Nothing to Disclose
Kiyoshi Murata MD : Nothing to Disclose
Shuzo Kanasaki MD : Nothing to Disclose
Michio Yamasaki MD : Nothing to Disclose

TEACHING POINTS
Acute gastrointestinal (GI) bleeding is a life-threatening condition and correct diagnosis of its site and cause is required for
Acute gastrointestinal (GI) bleeding is a life-threatening condition and correct diagnosis of its site and cause is required for immediate and timely management. The purposes of this presentation are:

1. To learn clinical manifestations of GI bleeding
2. To review diagnostic modalities for GI bleeding, including various types of endoscopies, angiography, scintigraphy, and CT, with the special emphasis on techniques, findings, and role and usage of CT in diagnostic algorithm.
3. To learn treatment approach for various types of GI bleeding and discuss the key for appropriate management decision

**TABLE OF CONTENTS/OUTLINE**

1. Clinical manifestations of GI bleeding
2. Diagnostic modalities for acute GI bleeding
3. CT protocol and timing of examination for positive results
4. CT findings of GI bleeding with correlating to management decision - Active bleeding: extravasation, pseudoaneurysm
   - Previous bleeding: clot, high density stool
5. IR procedure for GI bleeding; vasoconstriction, embolization with various materials, etc.
6. Case review - Acute upper GI bleeding: Ulcer, neoplasm, iatrogenic bleeding - Acute lower GI bleeding: Diverticular hemorrhage, acute hemorrhagic rectal ulcer
   - Others: hemobilia, aortoenteric fistula
7. Summary

**ERE109**

**Don't Have the Stomach For It: CT of Gastric Emergencies**

**Education Exhibits**

**Location:** ER Community, Learning Center

**Selected for RadioGraphics**

**Participants**

- Preeti Guniganti MD : Nothing to Disclose
- Courtney H. Bradenham MD : Nothing to Disclose
- Christine O. Menias MD : Nothing to Disclose
- Vincent M. Melnick MD (Presenter): Nothing to Disclose

**TEACHING POINTS**

1. The stomach is commonly a site of disease in the emergency department patient presenting with epigastric pain. Although traditionally evaluated with fluoroscopy, gastric emergencies are now more commonly seen on CT. 2. CT technique considerations when evaluating the stomach include the use of positive or neutral contrast as well as the use of arterial and portal venous phase imaging, such as when searching for a source of gastrointestinal bleeding. 3. The emergency radiologist must know the normal appearance of the stomach on CT, along with the typical appearance of infectious, inflammatory, and complications of surgery and/or malignant disease.

**TABLE OF CONTENTS/OUTLINE**

1. CT Protocol considerations
   a. Use of multiple contrast phases
   b. Oral contrast
2. Normal gastric anatomy on CT
3. Emergent conditions of the stomach on CT
   a. Inflammation/Infection
      i. Gastritis
      ii. Peptic ulcer disease
   b. Ischemia
   c. Obstruction
      i. Volvulus
      ii. Peptic ulcer disease
      iii. Malignancy
      iv. Foreign Bodies
   d. Perforation/Fistulae
      i. Benign ulcers
      ii. Malignant ulcers
      iii. Surgical complications
   e. Hemorrhage

**ERE110**

**Dual Energy/Spectral CT: Novel Applications in Emergency Abdominal Imaging**

**Education Exhibits**

**Location:** ER Community, Learning Center

**Selected for RadioGraphics**

**Participants**

- David M. Thomas BSc (Presenter): Nothing to Disclose
- Patrick McLaughlin FFR(RCSI) : Nothing to Disclose
- Tim O'Connell MD, Meng : President, Resolve Radiologic Ltd
- Luck Jan-Luck Louis MD : Nothing to Disclose
- Silvia D. Chang MD : Nothing to Disclose
- Rushaid Aljurayyan : Nothing to Disclose
- Tim O'Connell MD : Nothing to Disclose
- Ismail Tawakol Ali MBChB, MD : Nothing to Disclose
- Savvas Nicolaou MD : Nothing to Disclose

**TEACHING POINTS**

The purpose of this exhibit is: 1) To introduce Dual Energy/Spectral CT, and discuss it's benefits over single source CT. 2) To discuss the applications of DECT in emergency abdominal imaging. 3) To introduce future uses for DECT.

**TABLE OF CONTENTS/OUTLINE**

- What is Dual Energy /Spectral CT? How it works the physics behind it. Differences between Dual Energy and Spectral CT
- Benefits vs Single Source CT Color Iodine overlay maps, quantification of iodine Characterization and composition of tissue Bone Iodine subtraction for vascular analysis Virtual Non-Contrast imaging, and how it works Monoenergetic imaging
- Applications of DECT in emergency abdominal imaging (images and examples for each) Bone Iodine subtraction for vascular analysis in Aneurysms Contrast extravasation for non contained vascular injuries Characterization of renal calculi: Uric acid versus calcium Oxalate stones Bone Structure Trauma: Pancreatic Injuries Calculation of VNC for reduction of dose and clinical applications in vascular, renal, pancreatic, liver and bowel analysis. -Future applications of DECT/Spectral

**ERE111**

**Ectopic Pregnancy: Multimodality Imaging, Mimics & Complications**

**Education Exhibits**

**Location:** ER Community, Learning Center

**Selected for RadioGraphics**

**Participants**

- Ashley Elizabeth Prosper MD (Presenter): Nothing to Disclose
- Nicole French Darcy MD : Nothing to Disclose
**TEACHING POINTS**


**TABLE OF CONTENTS/OVERSEVIEW**

- Schematic review of the anatomy of the uterus, uterotubal junction and ovary
- US case review with typical findings across the spectrum of ectopics
- Review of US mimics: endometrioma, tuboovarian abscess, ruptured corpus luteum cyst and dermoid
- US pearls and pitfalls: interstitial line sign, hemoperitoneum, intradecidual sign, pseudosacs, tubal ring sign
- Case examples aided by cross-sectional imaging
- Imaging findings in cases complicated by early misdiagnosis, partial treatment and failed therapy
- Cases aided by image guided therapy

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**ERE112**

**Fallopian Tube Torsion: Turning our Attention to a Mimicker of Ovarian Pathology**

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

- Elizabeth Lee MD (Presenter): Nothing to Disclose
- Timothy J. Higgins MD: Nothing to Disclose
- Andrew Ross MD: Nothing to Disclose

**TEACHING POINTS**

Fallopian tube torsion is a rare (reported incidence of 1 in 1.5 million women) but possibly underreported cause of acute pelvic pain. Imaging findings suggesting this diagnosis include an elongated, tubular cystic mass, adjacent inflammatory changes, and normal appearing ovaries. Although typically absent, the presence of arterial and venous blood flow does not exclude this diagnosis due to the dual blood supply of the fallopian tubes.

**TABLE OF CONTENTS/OVERSEVIEW**

- A series of three cases of isolated fallopian tube torsion will be presented. Their pertinent imaging findings will be displayed. The pathophysiology, typical presentation and treatment of fallopian tube torsion will be discussed. Imaging characteristics which may suggest the diagnosis will be reviewed.

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**ERE113**

**Foreign Bodies from Mouth to Anus: Identification, Management, and Potential Complications**

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

- Amit Bipin Desai BA (Presenter): Nothing to Disclose
- Joel P. Thompson MD: Nothing to Disclose
- Akshya Gupta MD: Nothing to Disclose
- Rachel Shields MD: Nothing to Disclose
- Ravinder Sidhu MD: Nothing to Disclose
- Shweta Bhatt MD, MBBS: Nothing to Disclose

**TEACHING POINTS**

Teaching points:

1. Practice identification of common and uncommon foreign bodies in the chest, abdomen, and pelvis using a quiz format.
2. Highlight potential complications for each type of foreign body ingestion, inhalation, or insertion.
3. Provide an overview of management for commonly identified foreign bodies.
4. Review follow-up imaging options for identifying complications.

**TABLE OF CONTENTS/OVERSEVIEW**

- While foreign body inhalations and ingestions are relatively rare, familiarization with the symptoms and radiographic appearance of foreign bodies can be crucial in providing appropriate patient care. Common and uncommon foreign bodies will be reviewed in a fun quiz format, categorized by: • The call from the ED: acute presentations of foreign body insertion, ingestion, or inhalation. A subset of this category will highlight post-dental procedure foreign bodies. Complications arising from missed foreign bodies will also be presented. • The call from the OR: highlighting a systematic search routine for retained surgical foreign bodies and missing teeth/dental devices after intubation. • The call from the floor: reviewing appropriate indications, time periods, and imaging modalities for complication management, such as esophageal perforation, free intraperitoneal air, bowel obstruction, and infection.

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**ERE114**

**Foreign Body Induced Perforation of the Gastrointestinal Tract: Imaging Findings**

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

- Yun Mao MD (Presenter): Nothing to Disclose
- Duangkamon Prapruttam MD: Nothing to Disclose
- Sandeep Subhash Hedgire MD: Nothing to Disclose
- Jennifer W. Uyeda MD: Nothing to Disclose
- Mukesh Gobind Harisinghani MD: Nothing to Disclose

**TEACHING POINTS**

- While foreign body inhalations and ingestions are relatively rare, familiarization with the symptoms and radiographic appearance of foreign bodies can be crucial in providing appropriate patient care. Common and uncommon foreign bodies will be reviewed in a fun quiz format, categorized by: • The call from the ED: acute presentations of foreign body insertion, ingestion, or inhalation. A subset of this category will highlight post-dental procedure foreign bodies. Complications arising from missed foreign bodies will also be presented. • The call from the OR: highlighting a systematic search routine for retained surgical foreign bodies and missing teeth/dental devices after intubation. • The call from the floor: reviewing appropriate indications, time periods, and imaging modalities for complication management, such as esophageal perforation, free intraperitoneal air, bowel obstruction, and infection.
1. Ingested or inserted foreign bodies in children or adults can present to the emergency radiology for accurate location and to determine extent of damage induced by them. 2. Perforation occurs in < 1% of ingested foreign bodies and commonly misdiagnosed. 3. Sharp & blunt foreign bodies both can lead to perforation. 4. The perforation tends to occur in regions of acute angulation, such as ileocecal and rectosigmoid regions.

TABLE OF CONTENTS/OUTLINE

1. Ultrasound is sensitive in finding hyper-reflective foreign bodies but is of limited value in small/sonolucent foreign bodies. 2. X-ray can only detect metallic FB, but can give clues such as pneumoperitoneum is seldom to be observed because they may be covered and limited by fibrin and adjacent loops. 3. Direct and indirect signs of FB perforation on CT. 4. For detecting thin high-density FB and very small quantities of extraluminal gas, an unenhanced entire gut CT scan without oral contrast need be performed and its multiple plane reconstruction, especially coronal image should be evaluated scrupulously.

ERE115
Hepatobiliary and Gastrointestinal Oncologic Emergencies: Cross-Sectional Imaging Findings and Clinical Implications

Education Exhibits
Location: ER Community, Learning Center

Participants
Vijayanadh Ojili MD (Presenter): Nothing to Disclose
Arpit M. Nagar MBBS: Nothing to Disclose
Barjinder S. Sandhu MD: Nothing to Disclose
Venkata S. Katabathina MD: Nothing to Disclose
Abhijit Sunnapwar MD: Nothing to Disclose
Amol Suryakant Katkar MD: Nothing to Disclose
Hugh White MD: Nothing to Disclose
Kedar Nath Chintapalli MD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To describe the imaging manifestations of hepatobiliary and gastrointestinal oncologic emergencies and discuss the clinical implications of specific imaging findings. 2. To discuss the role of imaging and image-guided interventions in the management of these patients.

TABLE OF CONTENTS/OUTLINE

1. Introduction, etiopathogenesis and clinical presentation of hepatobiliary and gastrointestinal oncologic emergencies. 2. Role of cross-sectional imaging modalities (particularly CT). 3. Imaging spectrum of hepatobiliary and gastrointestinal oncologic emergencies (rupture, intra-tumoral haemorrhage, venous thrombosis, infection, intussusception and sequelae of mass effect including bowel and biliary obstruction etc).

ERE116
Jaundice in the Emergency Department: Fifty Shades of Yellow

Education Exhibits
Location: ER Community, Learning Center

Certificate of Merit

Participants
Refky Nicola DO, MS: Nothing to Disclose
Vincent M. Melnick MD: Nothing to Disclose
Christine Q. Menias MD: Nothing to Disclose
Daniel C. Oppenheimer MD (Presenter): Nothing to Disclose

TEACHING POINTS
1. Review the pathophysiology of jaundice. 2. Illustrate the role of Nuclear medicine, CT, US, and MRCP in identifying the cause of jaundice in the emergency patient. 3. Discuss the differential diagnosis and management of obstructive and non-obstructive jaundice in the acute setting.

TABLE OF CONTENTS/OUTLINE

1. Describe the normal physiology of bilirubin and pathophysiology of jaundice. 2. Discuss the appropriateness of various imaging modalities such as HIDA scan, CT, US, and MRCP in establishing the etiology of acute jaundice. 3. Present the differential diagnosis of jaundice with regards to the benign and malignant causes such as choledocholithiasis, ascending cholangitis, recurrent pyogenic cholangitis, post-operative biliary strictures, sclerosing cholangitis, pancreatic duct carcinoma, cholangiocarcinoma, hepatocellular carcinoma, and hepatic metastases. 4. Review the interventional techniques of managing acute jaundice and the limitations.

ERE117
Massive Nontraumatic Hemorrhage in the Abdomen and the Pelvis: What the Radiologists Need to Know

Education Exhibits
Location: ER Community, Learning Center

Participants
Takehiko Gokan MD (Presenter): Nothing to Disclose
Nobuyuki Takeyama MD: Nothing to Disclose
Noritaka Seino: Nothing to Disclose
Sinya Ikeda: Nothing to Disclose
Hirotos Sasamori: Nothing to Disclose
TEACHING POINTS
To understand clinical manifestations, causes, and MDCT features of massive nontraumatic hemorrhage in the abdomen and the pelvis. To understand MDCT anatomy of the peritoneum, retroperitoneum, and abdominal wall. To understand the role of interventional therapy for management of this condition.

TABLE OF CONTENTS/OUTLINE
The cases will be presented in a quiz format. Key differential diagnostic points, pitfalls, and therapeutic management will be highlighted in the discussion of each case. 1. To review the MDCT anatomy of peritoneum, retroperitoneum, and abdominal wall. 2. Cases of the hemorrhage Hemorrhagic diathesis or coagulopathy: administration of anticoagulants, disseminated intravascular coagulopathy (DIC), antiphospholipid syndrome, end-stage kidney disease etc. Vascular lesion: aneurysm, pseudoneuromus, segmental arterial mediolysis Tumor-associated hemorrhage: Tumor site in liver, spleen, kidney, adrenal gland, peritoneum etc. Gynecologic condition: ruptured ovarian cyst, ectopic pregnancy, HELLP syndrome etc. Iatrogenic injury: complication of surgery, interventional procedure etc. 3. Review and discussion for the management of the hemorrhage.

ERE118
More than Just Typical Acute Appendicitis on MDCT: Uncommon Conditions Related to Appendix
Education Exhibits
Location: ER Community, Learning Center

Participants
Kyung Jin Lee MD (Presenter): Nothing to Disclose
Hyun Cheol Kim: Nothing to Disclose
Seong Jong Yun: Nothing to Disclose
Sang Won Kim MD: Nothing to Disclose
Dai Mo Yang: Nothing to Disclose
Wook Jin: Nothing to Disclose
Seong Jin Park MD, PhD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To demonstrate uncommon clinical presentation of appendicitis 2. To discuss equivocal appendicitis and its solution 3. To illustrate uncommon complications related with acute appendicitis 4. To review several alternative diseases or conditions which mimic acute appendicitis

TABLE OF CONTENTS/OUTLINE
1. Uncommon clinical presentation of appendicitis (a) Appendicitis in unusual locations (b) Chronic appendicitis (c) Nonsurgical resolution of appendicitis 2. Equivocal appendicitis (a) What is the equivocal CT interpretation? (b) How can we clarify the equivocal CT interpretation? (c) Complementary role of ultrasound 3. Uncommon complications related with appendicitis (a) Gastrointestinal tract involvement (b) Genitourinary tract involvement (c) Other unusual complications 4. Tumors or inflammatory diseases affecting appendix

ERE119
Name That Nephrogram: Asymmetric Renal Enhancement in the Acute Care Setting
Education Exhibits
Location: ER Community, Learning Center
Certificate of Merit

Participants
Kristina Nowitzki MD, PhD (Presenter): Nothing to Disclose
Hao Steven Lo MD: Nothing to Disclose

TEACHING POINTS
While asymmetric renal enhancement is commonly encountered on contrast-enhanced CT in the emergency setting, it can represent a wide range of etiologies requiring divergent, and often urgent, clinical management. In a series of cases, this exhibit will familiarize radiologists with patterns of abnormal enhancement and associated findings, contributing to more confident, specific diagnosis.

TABLE OF CONTENTS/OUTLINE
1. Introduction highlighting normal renal enhancement physiology including normal CT nephrogram phases. 2. Cases organized in a quiz format, with etiologies including a) obstructive, b) vascular, c) traumatic, d) infectious/inflammatory, and e) neoplastic. Individual case discussions will encompass diagnostic imaging features, common clinical presentations and current management considerations.

ERE120
Ovarian Torsion: Clinical Indication, Diagnostic Features on CT and MRI, and Differential Diagnosis
Education Exhibits
Location: ER Community, Learning Center

Participants
Yoshifumi Noda MD (Presenter): Nothing to Disclose
Satoshi Goshima MD, PhD: Nothing to Disclose
Hiroshi Kondo MD: Nothing to Disclose
Hiroshi Kawada MD, PhD: Nothing to Disclose
Haruo Watanabe MD: Nothing to Disclose
1. For patients in whom there is significant clinical concern of ovarian torsion, transvaginal ultrasound remains an examination of choice though. However, CT and MRI are increasingly used as the initial diagnostic modalities, so radiologists should recognize the causes and imaging findings of ovarian torsion. 2. Radiologists play an important role in making an accurate diagnosis of ovarian torsion on CT and MRI. Understanding and recognizing characteristic features of ovarian torsion is crucial for the accurate diagnosis and description of adequate differential diagnosis for acute pelvic pain.

**TABLE OF CONTENTS/OUTLINE**

- Review the various clinical manifestations for ovarian torsion.
- Describe and illustrate the common CT and MR Imaging presentations of ovarian torsion based on the etiologies.
- Discuss the pathophysiology of ovarian torsion, characteristic imaging features, and the appropriate risk factors.

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**ERE121**

**Resident Primer in Acute Enterocolitis: Is It Ischemic, Infectious or Inflammatory?**

*Education Exhibits*

*Location: ER Community, Learning Center*

- Selected for RadioGraphics

**Participants**

- Sarah Wallace Cater MD : Nothing to Disclose
- Brandon Childers MD : Nothing to Disclose
- Pamela Tecce Johnson MD (Presenter): Research funded, Becton, Dickinson and Company

**TEACHING POINTS**

- Enteritis and colitis are common causes of acute abdominal pain.
- Their differential diagnosis is broad, including infectious, inflammatory and ischemic etiologies, each with different management strategies.
- The purpose of this exhibit is to review the multidetector computed tomography (MDCT) appearance of common infectious, inflammatory, and ischemic forms of acute enteritis and colitis with emphasis on distinguishing clinical and imaging features.

**TABLE OF CONTENTS/OUTLINE**

- Infectious enteritis and colitis
  - Risk factors
  - Clinical presentation
  - Causes (bacteria, virus, parasite)
- Distribution patterns according to cause (bowel and mesenteric findings)
- Inflammatory causes - Crohn’s disease and ulcerative colitis (UC)
- Demographics
- Clinical presentation
- Differences in distribution
- Gastrointestinal findings including features unique to each
- Mesenteric findings
- Extragastrointestinal manifestations
- Ischemic enterocolitis
- Risk factors
- Clinical presentation
- CT findings in bowel and mesentery (arterial vs venous compromise, time course)
- Vascular findings
- Prognosis

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**ERE122**

**Resident Primer in Acute Vascular Pathology: Distinguishing Abdominal Pseudoaneurysms from Aneurysms and Implications for Patient Management**

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

- Minghao Lu BA : Nothing to Disclose
- Pamela Tecce Johnson MD (Presenter): Research funded, Becton, Dickinson and Company
- Clifford Raabe Weiss MD : Research collaboration, Siemens AG
- Franco Verde MD : Nothing to Disclose

**TEACHING POINTS**

- Visceral pseudoaneurysms (PSAs) are important vascular lesions with high morbidity and mortality if complicated by rupture. These vascular lesions may form from numerous etiologies, which themselves are associated with considerable morbidity and mortality (e.g. penetrating trauma, pancreatitis). The purpose of this educational exhibit is to review visceral pseudoaneurysms and aneurysms, from the clinical presentation to CT imaging appearance, and discuss management algorithms.

**TABLE OF CONTENTS/OUTLINE**

- Pathophysiology of abdominal pseudoaneurysms vs true aneurysms
- CT technique and interpretative pearls
- Utility of dual phase imaging
- Importance of multiplanar review for detection and characterization
- Findings that aid in distinguishing pseudoaneurysm from true aneurysm
- MDCT case review
- Splenic artery pseudoaneurysm
- Superior mesenteric artery pseudoaneurysm
- Gastroduodenal pseudoaneurysm
- Renal pseudoaneurysm
- Aortic pseudoaneurysm
- Mycotic pseudoaneurysms
- Management visceral pseudoaneurysms require emergent repair, usually interventional

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**ERE123**

**Spectrum of MR Imaging findings of the Acute Abdomen in Pregnancy: Diagnostic Impact of Diffusion-weighted Image**

*Education Exhibits*

*Location: ER Community, Learning Center*
**Participants**

Yuka Okajima MD, MPH (Presenter): Nothing to Disclose
Ayako Tamura MD : Nothing to Disclose
Saya Horiuchi MD : Nothing to Disclose
Noriko Tanie MD : Nothing to Disclose
Takuya Ueda MD : Nothing to Disclose
Yasuyuki Kurihara MD : Nothing to Disclose
Gensuke Akaike MD : Nothing to Disclose
Takeshi Wada MD : Nothing to Disclose
Tsutomu Nihei : Nothing to Disclose

**TEACHING POINTS**

The purposes of this exhibit are: 1. To learn a spectrum of diseases and complications during pregnancy 2. To demonstrate MR imaging findings and diagnostic points in assessment of the acute abdomen in pregnancy 3. To discuss the value of diffusion-weighted images (DWI)

**TABLE OF CONTENTS/OUTLINE**


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**ERE124**

Take Me to Your Leader: What to Know About Adult Intussusception

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

Matthew Harlan Lee MD (Presenter): Nothing to Disclose
Meghan G. Lubner MD : Nothing to Disclose
Christine O. Menias MD : Nothing to Disclose
Sanjeev Bhalla MD : Nothing to Disclose
Douglas Robert Kitchin MD : Nothing to Disclose
Perry J. Pickhardt MD : Co-founder, VirtuoCTC, LLC Stockholder, Cellectar Biosciences, Inc

**TEACHING POINTS**

- Review causes of intussusception in adults. - Identify characteristic clinical and imaging features of enteroenteric, ileocolic, and colocolic intussusception. - Establish a differential diagnosis for pathologic lead points in adults based on patient history (i.e. cancer diagnosis), clinical presentation, and region of involvement.

**TABLE OF CONTENTS/OUTLINE**

- Introduction and overview of adult intussusception. - Illustrate causes of intussusception (e.g. malignant, benign neoplastic, congenital, acquired) in adults and describe typical US, fluoroscopic, and CT findings. Examples: • Enterointeric: Metastases (e.g. lung cancer, sarcoma), adenocarcinoma, GIST, PTLD, lipoma, Peutz-Jeghers polyp, gastric heterotopia, idiopathic. • Ileocolic: PTLD/Lymphoma, inflammatory polyp, Meckel diverticulum. • Colocolic: Primary colorectal cancer, metastases (melanoma), lipoma, villous adenoma. Summary: - Albeit a rare cause of obstruction, adult intussusception is usually associated with a pathologic lead point. - CT is the primary imaging modality to evaluate symptomatic intussusception. - Colocolic intussusception may be a harbinger of underlying malignancy - some series report malignant causes of intussusception greater in colonic than small bowel intussusception. - Patient history informs diagnosis in the setting of intussusception.

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**ERE125**

The Acute Abdomen in Recent Postpartum Females: An Imaging Solution to a Clinical Conundrum

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

Dinushi S. Perera MD (Presenter): Nothing to Disclose
Kheng L. Lim MD : Nothing to Disclose

**TEACHING POINTS**

1. To review the various causes of acute abdominopelvic symptoms in recent postpartum females presenting emergently.
2. To demonstrate the imaging features of these causes for abdominopelvic pain and other symptoms.
3. To discuss the clinical management of the imaging diagnosis.

**TABLE OF CONTENTS/OUTLINE**

ERE126

Updates and New Concepts of Imaging of Acute Intestinal Ischemia

Education Exhibits
Location: ER Community, Learning Center

Participants
Teresa I-Han Liang MD (Presenter): Nothing to Disclose
Jun Wang BSc: Nothing to Disclose
HeeJun Kang: Nothing to Disclose
William Chun Ki Lau MD: Nothing to Disclose
Savvas Nicolaou MD: Nothing to Disclose

TEACHING POINTS
1. Review the pathophysiology and clinical manifestations of acute intestinal ischemia (AI)
2. Discuss the imaging modalities used for diagnosis of AI
3. Describe the spectrum of imaging findings of AI

TABLE OF CONTENTS/OUTLINE
- Review the pathophysiology, anatomy, and clinical presentation of AI
- Review the utility and limitations of imaging modalities used for assessment of AI such as radiographs, ultrasound, angiography, MR angiography and with emphasis on MDCT as the main imaging modality
- Demonstrate the spectrum of imaging examples of AI including arterial embolic ischemia, arterial thrombus ischemia, venous ischemia and nonocclusive ischemia
- Discuss an imaging-based management algorithm
- Review imaging examples of pitfalls and mimics associated with AI
- Discuss new imaging techniques applicable for imaging of AI including use of new dose reduction techniques such as Iterative reconstruction, kVp modulation and dual-energy CT

ERE127

What's On Tap? A Urinary Tract On-Call Primer for Residents

Education Exhibits
Location: ER Community, Learning Center

Participants
Nicole Kurzbard MD (Presenter): Nothing to Disclose
Maitraya K. Patel MD: Nothing to Disclose
Michael John Nguyen MD: Nothing to Disclose
Anokh Pahwa MD: Nothing to Disclose
Daniel Jason Aaron Margolis MD: Research Grant, Siemens AG
Cecilia Matilda Jude MD: Author, UpToDate, Inc

TEACHING POINTS
Urinary tract symptoms and signs are common presenting complaints in the acute care setting. In these patients, significant urinary tract pathology may be first diagnosed by residents on call. After reviewing this presentation, participants will be able to:
- Identify common and uncommon non-traumatic acute urinary tract pathology on multi-modality imaging;
- Discuss imaging signs of urinary tract pathology;
- Recommend appropriate imaging modalities for evaluation of acute urinary symptoms;
- Recognize urinary pathology requiring immediate management.

TABLE OF CONTENTS/OUTLINE
- Disease categories include: Obstruction: nephroureterolithiasis, ureteropelvic junction obstruction; Infection: pyelonephritis, xanthogranulomatous pyelonephritis, granulomatous disease, urachal remnant infection, cystitis; Vascular: renal papillary necrosis, renal cortical necrosis, renal hemorrhage, renal artery occlusion, renal vein thrombosis, arteriovenous malformation; Neoplasm (presenting with hemorrhage/obstruction): angiomyolipoma, oncocytoma, transitional cell carcinoma, renal cell carcinoma. Variants and complications of disease entities are reviewed, such as emphysematous pyelonephritis/cystitis, renal abscess and pyonephrosis. Multimodality imaging and interventional radiology management are highlighted.

ERE128

Advanced Techniques and Updated Imaging of Non-Cardiac Chest Pain in the Emergency Department

Education Exhibits
Location: ER Community, Learning Center

Participants
HeeJun Kang: Nothing to Disclose
Teresa I-Han Liang MD (Presenter): Nothing to Disclose
William Chun Ki Lau MD: Nothing to Disclose
Savvas Nicolaou MD: Nothing to Disclose

TEACHING POINTS
1. Review the different causes, pathophysiology, and clinical manifestations of non-cardiac chest pain (NCCP)
2. Discuss the imaging modalities and spectrum of imaging findings for NCCP
3. Review new advances in imaging and dose reduction techniques
which can be applied to imaging of NCCP. Review role of Triple-Rule-out protocol as an "one-stop-shop" in evaluation of acute chest pain syndrome

TABLE OF CONTENTS/OUTLINE

- Review the different causes and pathophysiology, anatomy, and clinical presentations of NCCP
- Review the utility and limitations of imaging modalities used for assessment of NCCP, such as radiographs and angiography, with emphasis on MDCT as the main imaging modality
- Demonstrate the spectrum of imaging examples of NCCP including acute aortic syndrome, aortitis, and pulmonary embolism
- Review imaging examples of pitfalls and mimics associated with NCCP
- Discuss new imaging techniques applicable for imaging of NCCP such as Dual-energy CT, and review and demonstrate the utility of novel dose reduction techniques such as Ultra-High Pitch imaging, Iterative reconstruction, tube current and kVp modulation, and cardiac bowtie filters
- Discuss the literature evidence and demonstrate the effectiveness of "Triple-Rule-Out" protocol as a potential "one-stop-shop" method in evaluation of acute chest pain syndrome

ERE129

Emergency Thoracic Sonography: The Essentials

Education Exhibits
Location: ER Community, Learning Center

 выбранный для RadioGraphics

Participants

Sirote Wongwaisayawan MD : Nothing to Disclose
Rathachai Kaewlai MD (Presenter) : Nothing to Disclose
Ruedeekorn Suwannanon MD : Nothing to Disclose
Sorravit Sawatmongkornkul : Nothing to Disclose

TEACHING POINTS

The major teaching points of this exhibit are: 1. Sonographic artifacts arising from the pleural line and dynamic signs can be used to diagnose pneumothorax, pulmonary edema, pneumonia and other acute pathologies that abut pleural surface. 2. Sonographic signs of pneumothorax include loss of lung sliding, multiple A lines and lung point. 3. Sonographic B lines, when diffuse and bilateral, are likely caused by pulmonary edema in an acute setting. When they are focal, localized interstitial process is considered. 4. Acute rib, sternal and clavicular fractures are shown as a cortical step off with localized tenderness on sonography.

TABLE OF CONTENTS/OUTLINE

Utility of thoracic sonography in emergency setting.
Sonographic techniques.
Normal sonographic appearances: lung sliding and artifacts (A line, comet tails), bone surface Abnormal sonographic appearances: lung point and artifacts (B line, E line).
Review of imaging findings
- Thoracic wall (rib fracture, sternal fracture, clavicle fracture, chest wall hematoma).
- Pleura (pleural effusion, hemothorax, empyema, pneumothorax).
- Lungs (pulmonary infarction, pneumonia, atelectasis, pulmonary contusion).
- Heart and mediastinum (pericardial effusion, pulmonary edema).
Mimics and pitfalls Summary.

ERE130

Getting to the Heart of the Matter: Cardiac Findings on Non-Gated Chest CTA in the ED

Education Exhibits
Location: ER Community, Learning Center

Participants

Diamanto Rigas MD (Presenter) : Nothing to Disclose
Robin Beth Levenson MD : Nothing to Disclose
Karen Sisi Lee MD : Nothing to Disclose

TEACHING POINTS

1. To review various cardiac imaging findings that one may see on non-gated chest CTA in Emergency Department (ED) patients and demonstrate case examples. 2. To raise radiologist awareness and understanding about these findings to help expedite diagnosis.

TABLE OF CONTENTS/OUTLINE


ERE131

Seeing is Believing: Deadly Type A Aortic Dissection

Education Exhibits
Location: ER Community, Learning Center
Participants
Sergio Klimkowski MD: Nothing to Disclose
Sushilkumar K. Sonavane MD (Presenter): Nothing to Disclose
Travis S. Henry MD: Spouse, Employee, F. Hoffmann-La Roche Ltd
Jabal Robert Watts MD: Nothing to Disclose
Kaushik S. Shahir MD: Nothing to Disclose
Satinder Pal Singh MD: Nothing to Disclose

TEACHING POINTS
Accurate identification and fast communication is a key in saving lives in patients with type A dissection especially when accompanied with complications. CTA helps in emergent surgical planning. Prospective gating is helpful in easy detection of dissection and differentiation from motion related artifact.

TABLE OF CONTENTS/OUTLINE
1. Review pathophysiology and types of aortic intramural hematoma (IMH) and dissection
2. Optimization of CTA protocol
3. Imaging pitfalls and ways to avoid them
4. Demonstrate with examples various complications of Stanford Type A aortic dissection where emergent surgery saved life or patient could not survive such as
   • Aortic disruption
   • Pseudoaneurysm
   • Pericardial hematoma
   • Aortic insufficiency
   • Coronary artery occlusion- ostial narrowing, dissection
   • Pulmonary artery narrowing from shared sheath hematoma

ERE132
Thoracic CT Findings in Drowning Victims after Cardiopulmonary Resuscitation: Dead or Alive?

Education Exhibits
Location: ER Community, Learning Center

Participants
Nanae Tsuchiya: Nothing to Disclose
Sadayuki Murayama MD, PhD (Presenter): Nothing to Disclose
Yoshiharu Ohno MD, PhD: Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, DAICHI SANKYO Group Research Grant, Eisai Co, Ltd Research Grant, Terumo Corporation Research Grant, Fuji Yakuhin Co, Ltd Research Grant, FUJIFILM Holdings Corporation Research Grant, Guerbet SA
Yasutaka Nakano MD, PhD: Nothing to Disclose
Masahiro Okada MD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review the thoracic CT findings in severe drowning 2. To review the postmortem CT findings in drowning victims 3. To correlate the imaging features with the clinical presentation

TABLE OF CONTENTS/OUTLINE
1. Definition and pathophysiology of drowning 2. Clinical evaluation of severity in drowning victims: a classification system of six grades 3. Thoracic CT findings after drowning - Lung opacities: reflect aspiration and pulmonary edema A. Diffuse ground-glass opacities (GGO) B. Air-space consolidation: seen in severe drowning C. Multiple lobular opacities: the most common pattern after drowning D. Interlobular septal thickening: reflects pulmonary edema - Pleural effusion: seen in severe drowning 4. Postmortem CT findings after drowning - Fluid collection in airways, pan-sinus fluid, mastoid cell fluid - Cardiopulmonary resuscitation (CPR) related findings (intravascular gas, rib fracture) - Postmortem changes (hypostasis, hyperattenuating aortic wall, and dilatation of the heart) 5. Pitfalls - Decompression disease - Immersion pulmonary edema (IPE) - Pulmonary edema due to airway obstruction

ERE133
CSI Radiology: A Précis of Radiologic Identification (RADid) for the Practicing Radiologist

Education Exhibits
Location: ER Community, Learning Center

Participants
Gary Martin Hatch MD (Presenter): Nothing to Disclose
Jamie Marie Elifritz MD: Nothing to Disclose
Sean Michael Biggs MD, MS: Nothing to Disclose
Thomas D. Ruder MD: Nothing to Disclose
Patricia Mildred Flach MD: Nothing to Disclose
Chandra Gerrard BS, RT: Nothing to Disclose
Kurt B. Nolte MD: Nothing to Disclose

TEACHING POINTS
Social, psychological and legal issues form the moral imperative to accurately identify the dead. Radiologists possess unique knowledge and skills which can improve the likelihood of identification (ID). A Radiologist’s understanding of the range of normal and abnormal findings and appreciation of the prevalence of both, may provide crucial evidence for the confirmation or exclusion of ID. A Radiologist’s mastery of image reformattting and rendering can enable comparative matching of exams and structures that is simply impossible in other’s hands. Even one identification made by a Radiologist, which otherwise could not have been made, provides service of incalculable value to the community and surviving relatives.

TABLE OF CONTENTS/OUTLINE
1. Methods of identification (ID)
2. ID - a multidisciplinary endeavor
3. Why identify the dead?
4. Scenarios requiring ID
5. Performing radiologic ID (RADid)
   - Guidelines
   - Biologic profiling
   - New considerations for the Radiologist
   - Lines of evidence
   - Advanced visualization and RADid.
6. Case examples
7. Value added by Radiologists
8. Making your expertise available
9. Further Reading
10. References

ERE134

An Approach to Imaging the Upper Airway in the Emergency Setting

Education Exhibits
Location: ER Community, Learning Center

Certificate of Merit

Participants
Kathryn Darras MD (Presenter): Nothing to Disclose
Gordon Ted Andrews MD: Nothing to Disclose
Tim O’Connell MD, Meng: President, Resolve Radiologic Ltd
Ana-Maria Bilawich MD: Nothing to Disclose
Patrick McLaughlin FFR(RCSI): Nothing to Disclose
Savvas Nicolaou MD: Nothing to Disclose

TEACHING POINTS
1. To review the anatomy of the upper airway.
2. To discuss the best protocols for imaging suspected airway pathology in the emergency setting.
3. To provide a rapid and thorough approach to evaluate the airway on MDCT, including potential pitfalls as well as pearls from our experience at a quaternary care trauma centre.
4. To review the pathogenesis, MDCT appearance, differential diagnosis, and management of traumatic and non-traumatic airway emergencies.
5. To highlight the ways in which the radiologist’s interpretation can maximally benefit the surgical team.

TABLE OF CONTENTS/OUTLINE
1. Review of upper airway anatomy
2. Protocol selection based on clinical context
   2.1. Penetrating trauma
   2.2. Blunt trauma
   2.3. Inflammatory / infectious etiologies
3. Approach to upper airway evaluation on MDCT
4. Differential diagnosis of acute upper airway obstruction
   4.1. Crush injuries
   4.2. Hyoid bone fracture
   4.3. Infection
      4.3.1. Immunocompetent
      4.3.2. Immunocompromised
   4.4. Foreign body
5. Review of key information to relay to clinical team

ERE135


Education Exhibits
Location: ER Community, Learning Center

Participants
David M. Thomas BSc (Presenter): Nothing to Disclose
Patrick McLaughlin FFR(RCSI): Nothing to Disclose
Luck Jan-Luck Louis MD: Nothing to Disclose
Tim O’Connell MD, Meng: President, Resolve Radiologic Ltd
Hossain Abu Alola: Nothing to Disclose
Rushaid Aljurayyan: Nothing to Disclose
Ismail Tawakol Ali MBChB, MD: Nothing to Disclose
Savvas Nicolaou MD: Nothing to Disclose

TEACHING POINTS
1) Review the pathophysiology and epidemiology of cervical spine fractures. 2) Define C-spine instability clinically and radiologically and define the role of MDCT and MRI and MRI prognostic indicators in recovery of neurological function. 3) Discuss how cervical spine fractures can lead to permanent neurological deficits. 4) Recognize the role of new CT measurements of the cervical spine in diagnosis of neck injuries 5) Review the Subaxial Injury Classification (SLIC) and Severity score, and discuss it’s utility in cervical trauma.

TABLE OF CONTENTS/OUTLINE
- Relevant C-spine anatomy
- Epidemiology and pathophysiology of cervical spine fractures. Types of c-spine fractures, and SLIC classification and severity score.
- Consequences of missed c-spine fracture diagnoses. -Review imaging modalities for the cervical spine Role of MDCT in clearing the c-spine in the obtunded patient MRI prognostic indicators in determining neurological recovery -Review new CT based measurements that aid in the detection of c-spine injuries in the acute setting. -Case studies several types of C-spine injuries -Summary, and discussion about future direction for detecting cervical spine fractures in the acute setting. -Provide a Clinical Protocol Guideline in the assesment of C-spine injuries and detection of instability.

ERE136

Don’t Traumatize Me! Non-Traumatic Causes of Intracranial Hemorrhage

Education Exhibits
Location: ER Community, Learning Center
TEACHING POINTS

1. Learn the imaging features that differentiate the etiologies of non-traumatic intracranial hemorrhage.
2. Review patient presentation and pathophysiology of non-traumatic causes of intracranial hemorrhage.
3. Demonstrate how recognizing different patterns of non-traumatic intracranial hemorrhage will affect patient management.

TABLE OF CONTENTS/OUTLINE

Information will be presented in quiz format utilizing cross-sectional and angiographic images. The following entities will be discussed:
1. Hypertensive Bleed
2. Aneurysm
3. Cerebral Amyloid Angiopathy
4. Vascular Malformations
5. Dural Sinus Thrombosis
6. Hemorrhagic Masses
7. Hemorrhagic Transformation of Infarct
8. Other rare causes of intracranial hemorrhage including PRES and reversible cerebral vasoconstriction syndrome

ERE137

Easily Missed Findings in the Emergency Department on Routine Non-contrast Head CTs with Potential for Significant Consequences

Education Exhibits
Location: ER Community, Learning Center

Selected for RadioGraphics

Participants
Mariya Kobi MD (Presenter): Nothing to Disclose
Neal Viradia MD : Nothing to Disclose
Alexander Benjamin Baxter MD : Nothing to Disclose
Mark Philip Bernstein MD : Nothing to Disclose
Aspan Singh Obson MD, MS : Nothing to Disclose
John Michael McMenamy MD : Nothing to Disclose

TEACHING POINTS

1. Review of easily missed findings on non-contrast CT head. 2. Present teaching points on how to avoid the errors.

TABLE OF CONTENTS/OUTLINE


ERE138

Emergency Room CT in Children with Seizure: Subtle CT Findings

Education Exhibits
Location: ER Community, Learning Center

Selected for RadioGraphics

Participants
Alex C. Wu MD : Nothing to Disclose
Milad Yazdani MD : Nothing to Disclose
Neil Vachhani MD : Nothing to Disclose
Unni K. Udayasankar MD, FRCR (Presenter): Nothing to Disclose

TEACHING POINTS

Non contrast head CT is often the initial modality of choice in children with new onsent seizure presenting to the Emergency Room. However, many structural intracranial pathologies have subtle imaging features and could be overlooked. The purpose of this exhibit is to present the emergency radiologist with a set of challenging cases to help them improve their diagnostic skills and accuracy.

TABLE OF CONTENTS/OUTLINE

The cases will be presented in a Quiz format starting with noncontrast head CT followed by MRI. The list of cases will include the following:
- Malformation of cortical development
**ERE139**

** Fluid Collection in the Retropharyngeal Space: A Wide Spectrum of Various Emergency Diseases in Children and Adults**

**Education Exhibits**

Location: ER Community, Learning Center

Certificate of Merit

**Participants**

- Hirotaka Ikeda MD (Presenter): Nothing to Disclose
- Tsuneo Yamashiro MD: Nothing to Disclose
- Atsuko Fujikawa MD: Nothing to Disclose
- Hayato Tomita: Nothing to Disclose
- Yoshio Yakushiji Kurihara MD: Nothing to Disclose
- Yasuo Nakajima MD: Nothing to Disclose

**TEACHING POINTS**

Fluid collection in the retropharyngeal space (RPS), including retropharyngeal abscess and several non-infectious diseases, appears in various diseases that should be treated in different clinical departments. Since emergency conditions causing neck pain can demonstrate this finding on CT or MRI, radiologists are required to differentiate these diseases to facilitate proper treatment.

The purpose of this exhibit is:

1. To review the normal anatomy of the RPS
2. To review diseases that demonstrate fluid collection in the RPS in children and adults

**TABLE OF CONTENTS/OUTLINE**

1. Normal anatomy of the RPS
2. Fluid collection in the RPS in children
   a) Infectious conditions; retropharyngeal abscess, cervical lymphadenitis, foreign body ingestion
   b) Malignancies; lymphoma, leukemia
   c) Kawasaki disease
   d) Congenital disease; pyriform sinus cyst
3. Fluid collection in the RPS in adults
   a) Infectious conditions (ENT); retropharyngeal abscess, cellulitis, foreign body ingestion
   b) Infectious conditions (orthopedics); osteomyelitis
   c) Non-infectious conditions (ENT); lymphangioma, laryngeal edema
   d) Non-infectious conditions (orthopedics); calcific tendinitis of the longus colli muscle, compression fracture
   e) Malignancies and tumor-related conditions
4. Indications for imaging modalities regarding treatment options

**ERE140**

**Harder to Breathe: Imaging of Acute and Subacute Laryngeal Conditions with Clinicoradiological Correlation**

**Education Exhibits**

Location: ER Community, Learning Center

**Participants**

- Marie Kim MD (Presenter): Nothing to Disclose
- Akifumi Fujita MD: Nothing to Disclose
- Joan M. Cheng MD: Nothing to Disclose
- Hiroshi Fujii MD: Nothing to Disclose
- Osamu Sakai MD, PhD: Speaker, Bracco Group Speaker, KYORIN Holdings, Inc Speaker, Eisai Co, Ltd

**TEACHING POINTS**

Acute and subacute causes of upper airway narrowing can have a nonspecific and varied presentation, ranging from vague neck pain and shortness of breath to more obvious signs such as stridor. Given the nonspecific clinical presentation, imaging studies may sometimes be obtained prior to endoscopic evaluation. Additionally, endoscopic examinations cannot assess submucosal or extra-laryngeal causes of upper airway narrowing, necessitating radiologic assessment.

The purpose of this exhibit is to:

1. Review various acute and subacute pathologies that cause laryngeal and airway compromise
2. Provide a clinicoradiological correlation of various disorders
3. Review of key imaging findings to narrow the differential diagnosis

**TABLE OF CONTENTS/OUTLINE**

1. Radiological anatomy of the larynx and trachea
2. Acute and subacute laryngeal abnormalities
   a. Infectious / inflammatory conditions
      - Epiglottitis
      - Croup
      - Retropharyngeal abscess
      - Hypopharyngeal abscess
      - Submandibular abscess
      - Odontogenic infection / oral floor abscess
      - Thrombophlebitis
   b. Angioedema
   c. Trauma
   d. Iatrogenic: post-extubation tracheal stenosis
   e. Tumors: advanced head and neck cancer

ER141

Imaging Features of Oral and Maxillofacial Conditions in the Emergent Setting: What the Radiologist Should Know

Education Exhibits
Location: ER Community, Learning Center

Participants
Ai Masukawa MD (Presenter): Nothing to Disclose
Takayuki Kurinobu MD : Nothing to Disclose
Hitoshi Takeuchi MD : Nothing to Disclose
Junko Araki : Nothing to Disclose
Shichiro Katase : Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review traumatic and nontraumatic oral and maxillofacial conditions on X-ray photography and computed tomography in the emergent setting To assess oral and maxillofacial disease in the acute setting, X-ray photography is the first-line modality, and computed tomography plays an important secondary role. 2. To understand important imaging findings for selection of treatment methods The radiologist needs to understand what the clinician wants to know and fulfills an important function in guiding appropriate patient management.

TABLE OF CONTENTS/OUTLINE
1. Traumatic
   - tooth fracture
   - tooth luxation
   - bleeding from the tongue
   - maxillofacial fracture
   - dislocation of temporomandibular joint

2. Nontraumatic
   - neck abscess caused by oral conditions
   - salivary stone and sialadenitis
   - odontogenic maxillary sinusitis
   - osteomyelitis/osteonecrosis of the mandible

3. Imaging information a surgeon wants to know

ER142

Multi-Detector Computed Tomography of Globe Injuries—Imaging Review, Pearls and Pitfalls

Education Exhibits
Location: ER Community, Learning Center

Participants
Scott David Steenburg MD (Presenter): Nothing to Disclose
Ryan Whitesell MD : Nothing to Disclose
Danny Lynn Leatherwood MD : Nothing to Disclose
E. Michael Harned MD : Nothing to Disclose
Stephen Francis Kralik MD : Nothing to Disclose
Darren P. O'Neill MD : Nothing to Disclose

TEACHING POINTS
- MDCT is the imaging modality of choice for imaging patients with acute polytrauma. - Though MDCT is often obtained to evaluate for facial fractures, injuries to the globe may also be detected and may not be clinically apparent. - MDCT signs of significant globe injuries may be subtle. - MDCT has only modest accuracy for open globe injuries compared to ultrasound and clinical exam.

TABLE OF CONTENTS/OUTLINE
- Review epidemiology of globe injuries.
- Review of normal globe anatomy.
- Review imaging modalities and strategies used for suspected globe trauma (ultrasound, MRI and CT).
- Imaging review of frequently encountered pathology using an interactive
quiz based format. - Subtle MDCT signs of significant globe injuries will be emphasized. - Pathology to be included: vitreous hemorrhage, corneal lacerations, open globe rupture, globe foreign bodies, penetrating globe injuries, ocular detachments (including retinal and choroidal detachment), lens injuries (including traumatic cataract, lens subluxation and dislocation). - Accompanying PDF slides demonstrate much of the pathology that will be reviewed and presented in the presentation.

ERE143

Pain in the Neck: What the ER Radiologist Needs to Know about Non-Traumatic Neck Emergencies

Education Exhibits
Location: ER Community, Learning Center

Certificate of Merit

Participants
Melissa Mei Chen MD (Presenter): Nothing to Disclose
Carlos S. Restrepo MD : Nothing to Disclose
Alejandro Lopez-Araujo MD : Nothing to Disclose
Bundhit Tantiwongkosi MD : Nothing to Disclose
Aimee Pamela Carswell MD : Nothing to Disclose
Julia L. Humphrey MD : Nothing to Disclose
Fang Yu MD : Nothing to Disclose
Daniel Verdini MD : Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review important anatomic landmarks in the neck crucial to the evaluation of neck emergencies. 2. To demonstrate multimodality imaging findings of non-traumatic common ER, critical and life threatening neck emergencies. 3. To briefly review pathophysiology and clinical management in some of the more critical emergencies.

TABLE OF CONTENTS/OUTLINE
1. Review of important anatomic landmarks in the neck 2. Infection -Epiglottitis -Peritonsillar abscess -Retropharyngeal space infection -Lemierre syndrome: Pharyngitis/peritonsillar abscess with secondary venous thrombosis -Discitis/osteomyelitis -Tuberculous lymphadenopathy: Scrofula 3. Tumor -Neck tumors causing airway compression -Post-radiation carotid vascular complications (Carotid blowout syndrome) 4. Other -Ingested foreign bodies -Tracheo-esophageal fistula secondary to lye ingestion 5. CONCLUSION: -Knowledge of the anatomic neck spaces is critical in evaluating life threatening neck emergencies, particularly with infection. -Understanding the pathophysiology of neck pathology is crucial in recognizing the pertinent imaging findings.

ERE144

Postoperative CT of the Mandible Following Trauma: Review of Normal Appearances and Common Complications

Education Exhibits
Location: ER Community, Learning Center

Participants
Michael Jason Reiter DO (Presenter): Nothing to Disclose
Ryan Becton Schwope MD : Nothing to Disclose
Paul Joseph Shogan MD : Nothing to Disclose
Jonathan Kini : Nothing to Disclose
Jared Theler : Nothing to Disclose

TEACHING POINTS
The major teaching points of this exhibit are:
1. Closed treatment of nondisplaced mandibular fractures is valid for patients who accept MMF. However, ORIF is preferred to avoid the drawbacks and inconveniences of MMF and is recommended for displaced fractures
2. Repair of condylar fractures is controversial without consensus amongst surgeons. However, fractures with severe condylar process displacement should undergo fixation
3. Two basic types of fracture fixation are load-bearing and load-sharing osteosynthesis which differ with regards to how much of the functional load the plate assumes
4. 1 or 2 plates may be used to fixate condylar fractures depending on the fracture morphology and amount of bone available to hold the screws
5. Nonunion, malocclusion, infection and fixation failure are potential complications

TABLE OF CONTENTS/OUTLINE
1. Indications for surgical intervention
   a. Symphysis
   b. Body
   c. Angle
   d. Ramus
   i. Condylar
      ii. Coronoid
2. Operative approaches
   a. Body/Symphysis
   b. Angle
   c. Ramus
3. Goals of surgical repair on CT
   a. Overview
   b. Body/Symphysis
   c. Angle
   d. Coronoid
   e. Condylar
      i. Intracapsular
      ii. Extracapsular
4. Commonly complications
ERE145

Spinning Out of Orbit! Traumatic and Non-Traumatic Orbital Emergencies

Education Exhibits

Location: ER Community, Learning Center

Participants

Elana Beth Smith MD (Presenter): Nothing to Disclose
Gunja Paresh Parikh MD : Nothing to Disclose
Adam Eugene Flanders MD : Nothing to Disclose
Neeta Rao MD : Nothing to Disclose
Neil B. Horner MD : Nothing to Disclose

TEACHING POINTS

1. Review the anatomy of the orbit
2. Learn to recognize the imaging features of entities with the potential to cause visual loss/disturbances, orbital pain/swelling, restricted ocular motility, and proptosis
3. Demonstrate complications that can result from orbital emergencies

TABLE OF CONTENTS/OUTLINE

Relevant anatomy will first be illustrated. Imaging findings of critical orbital emergencies will be shown on cross sectional imaging and digital subtraction angiogram (where appropriate). Diseases to be discussed will include the following:

I. Infection
   A. Cellulitis
   B. Dacryocystitis
   C. Parapharyngitis
   D. Vascular Lesions
      A. Superior Ophthalmic Vein Thrombosis
      B. Orbital Varix
      C. Venous Lymphatic Malformation
      D. Dural Arteriovenous Malformation
      E. Carotid-Cavernous Fistula
      F. Aneurysm
II. Vascular Lesions
    A. Superior Ophthalmic Vein Thrombosis
    B. Orbital Varix
    C. Venous Lymphatic Malformation
    D. Dural Arteriovenous Malformation
    E. Carotid-Cavernous Fistula
    F. Aneurysm
III. Trauma
    A. Foreign Body
    B. Orbital Hemorrhage
    C. Ruptured Globe
    D. Retrobulbar Hematoma
    E. Optic Nerve Injury
    F. Fractures
IV. Choroidal and Retinal Detachment
V. Inflammatory Orbital Disease
    A. Thyroid-related ophthalmopathy
    B. Idiopathic Orbital Inflammatory Syndrome
    C. Tolosa Hunt Syndrome
    D. Optic Neuritis

ERE146

Convergence of Radiology and Orthopedics: Understanding Pelvic Ring Fractures and How to Report Them on Trauma CT Examinations

Education Exhibits

Location: ER Community, Learning Center

Participants

Brian Scott Martell MD (Presenter): Nothing to Disclose
Scott David Wuertzer MD, MS : Nothing to Disclose
Leon Lenchik MD : Nothing to Disclose
Anna N Miller MD : Nothing to Disclose

TEACHING POINTS

1. Accurate reporting of pelvic ring fractures on trauma CTs is essential for optimal patient management.
2. Young and Burgess classification is based on direction of force while Tile classification is based on stability.
3. To provide value to orthopedic surgeons, radiologists should recognize important CT imaging findings for both systems.
4. Radiologist should have a basic knowledge of fracture management to help assess for complications on the postoperative CTs.

TABLE OF CONTENTS/OUTLINE

1. Introduction
2. Optimizing CT protocol
   a. 2 mm true axials
   b. 0.625mm reconstructions
   c. 3D renderings of inlet, outlet, and Judet views
3. CT reports
   a. What fracture direction and impaction tells you
   b. Direction of displacement matters
4. Tile classification
   a. A-stable
   b. B-partially stable
   c. C-unstable
5. Young/Burgess classification
   a. Anteroposterior Compression
   b. Lateral Compression
   c. Vertical Shear
   d. Mixed
6. Pitfalls in reporting
   a. Crescent fractures of the ilium-an important sign of instability
   b. Recognizing spino-pelvic dissociation-sacral U fractures
   c. Don’t forget the ischial spine, lateral sacrum, and LS transverse process
7. Fracture management
   a. Immediate patient management
   b. Nonoperative treatment
   c. Surgical fixation
8. Dysmorphic sacrum and its implications
9. Post-operative CTs
10. References

ERE147

'Embracing Dual Energy CT with Both Hands': Application of Dual Energy CT in Acute Hand Pathology

Education Exhibits

Location: ER Community, Learning Center

Participants

Brathaban Rajayogeswaran MBBCh (Presenter): Nothing to Disclose
Neal C. Chhaya MBBS, FRCR : Nothing to Disclose
Savvas Nicolaou MD : Nothing to Disclose
Hugue A. Ouellette MD : Nothing to Disclose

TEACHING POINTS

The use of Dual Energy CT in acute hand pathology in the Emergency Department. How to use the DE bone marrow oedema, tendon and gout application to problem solve. Limitations of Dual Energy CT and reduction of application artefacts.

TABLE OF CONTENTS/OUTLINE

1. Dual Energy CT in Acute Hand Pathology
2. Dual Energy Application
   a. Bone marrow oedema
   b. Tendon
   c. Gout
3. Limitations
4. Reduction of artefacts
5. References
Hand pathology counts for 10% of hospital Emergency Department (ED) visits. There are new and exciting Dual Energy CT (DECT) applications which can be utilised at initial presentation. DECT scan with DE bone marrow application, which has an estimated dose <0.05 mSv, can make a less convincing fracture easier to identify. Tendon injuries can also be interrogated, the tendon application allows them to be traced along their course through the hand. Diagnostic dilemma of acute joint pathology, infection or crystalline arthropathy can be addressed with the gout application identifying urate within a joint, reducing the need for an invasive procedure. The principles of Dual Energy CT. Dose of Dual Energy CT in the hand and estimated fatality risk of solid cancer. Exciting new DE bone marrow oedema with colour overlay maps and comparison with virtual non calcium subtraction technique. How the collagen application can be utilised to identify tendon injuries. Managing the diagnostic dilemma of acute joint pathology. Limitations of Dual Energy CT and reducing DECT application artefacts.

**ERE148**

**Proximal Humeral Fractures: What an Emergency Radiologist Needs to Know**

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

- Heeseop Shin MD (Presenter): Nothing to Disclose
- Arash Bedayat MD: Nothing to Disclose
- Christopher Alfred Cerniglia DO, MEng: Nothing to Disclose
- Hao Steven Lo MD: Nothing to Disclose

**TEACHING POINTS**

Review major classification systems of proximal humeral fractures, with major emphasis on the most commonly used Neer classification system. Review mechanisms of injury and characteristics of each fracture pattern on imaging. Learn to distinguish injuries that warrant additional imaging versus those that warrant surgical intervention.

**TABLE OF CONTENTS/OUTLINE**

1. Major classification systems of proximal humeral fractures.
   - Major emphasis on Neer classification system.
   - Mechanisms of injury for each fracture pattern.
2. Review imaging characteristics of each fracture pattern.
   - Key findings and recommendations to include in the report with emphasis on those that trigger additional evaluation with CT, MR, or angiography.
   - Important soft tissue injuries that require surgical intervention.
   - Associated injuries that raise suspicion for underlying proximal humeral fractures when the latter is not evident.
3. Review treatment of each fracture pattern.
   - Examples of surgical intervention.

**ERE149**

"Soft Calls": A Review of Non-osseous Radiographic Findings in Upper and Lower Extremity Trauma

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

- Jennifer Fay True MD (Presenter): Nothing to Disclose
- Gustav A. Blomquist MD: Nothing to Disclose
- Andres R. Ayoub MD: Nothing to Disclose
- David James Nickels MD: Nothing to Disclose
- James T. Lee MD: Nothing to Disclose
- Gary Louis Merhar MD: Nothing to Disclose
- Barbara Kenney Pawley MD: Nothing to Disclose

**TEACHING POINTS**

1) State the importance of soft tissue evaluation in the radiographic analysis of extremity trauma.
2) Recognize radiographic findings and explain the importance of joint effusion, lipohemarthrosis, focal soft tissue swelling, abnormal opacity within and displacement of fat pads, soft tissue gas and foreign bodies
3) Describe the pitfalls and limitations of soft tissue findings

**TABLE OF CONTENTS/OUTLINE**

Review multiple types of common soft tissue findings seen in the emergency radiology setting such as: joint effusion, lipohemarthrosis, focal soft tissue swelling and abnormal opacity within the fat pad, soft tissue gas, etc.

Review the importance of these findings. For example:

* Joint effusion: May indicate radiographically occult or subtle fracture or intra-articular soft tissue injury
* Lipohemarthrosis: Specific type of joint effusion indicating presence of an intra-articular fracture
* Focal soft tissue swelling and abnormal opacity within fat pad: May indicate adjacent fracture and/or tendon/ligament tear
* Soft tissue gas: Indicates presence of open fracture or penetrating injury

Show multiple examples of each finding utilizing mainly radiographs, CT, and ultrasound.

**ERE150**
"You're Pulling My Leg": A Resident's Guide to Avulsion Injuries in the Emergency Radiology Setting

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

**Participants**
- Jennifer Fay True MD (Presenter): Nothing to Disclose
- James T. Lee MD: Nothing to Disclose
- Sarah Milam Deraney MD: Nothing to Disclose
- Andres R. Ayoob MD: Nothing to Disclose
- Gustav A. Blomquist MD: Nothing to Disclose
- David James Nickels MD: Nothing to Disclose
- Gary Louis Merhar MD: Nothing to Disclose
- Barbara Kenney Pawley MD: Nothing to Disclose

**TEACHING POINTS**
- Give a brief overview of radiographic analysis of common avulsion injuries in the acute trauma setting
- Give a brief description of why these injuries are important to recognize early in extremity trauma such as associated soft tissue/ligamentous injuries.
- Describe the pitfalls and limitations of diagnosing avulsion injuries especially in the pediatric patient

**TABLE OF CONTENTS/OUTLINE**
- Review imaging findings of common avulsion injuries seen in the emergency radiology setting including those of the ankle, elbow, pelvis, etc.
- Review common ossification centers and the risk of false positive findings.
- Review the pitfalls and limitations of pediatric avulsion fracture imaging utilizing multiple imaging examples.

ERE151
Dual Energy CT Characterization of Incidental Findings in the Emergency Department: Initial Impressions and Correlation with Other Imaging Modalities

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

**Participants**
- Jeremy Robert Wortman MD (Presenter): Nothing to Disclose
- Urvi Pravin Fulwadhva MD: Nothing to Disclose
- Paul Michael Bunch MD: Nothing to Disclose
- Gregory Aaron Bonci MD: Nothing to Disclose
- Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG

**TEACHING POINTS**
1) Dual energy CT allows for the creation of virtual non-contrast (VNC) and iodine overlay images, which can quantify the enhancement of a lesion with a single acquisition. 2) Analysis of iodine overlay and VNC images can accurately characterize a variety of incidental lesions encountered with routine CT imaging in the Emergency Department, including adrenal, renal, splenic, and pancreatic lesions. 3) Routine dual energy CT imaging and post-processing can be performed in the Emergency Department setting, and has the potential to eliminate the need for follow-up imaging in many patients.

**TABLE OF CONTENTS/OUTLINE**
1) Dual energy CT technology
   - Illustrate the basic principles of material decomposition with dual energy CT.
2) Applications to incidental lesions in the Emergency Department
   - Review of common incidental lesions encountered with routine CT imaging in the Emergency Department, and potential applications of dual energy post-processing techniques.
   - Case based review correlating dual energy CT post-processing analysis of common incidental lesions encountered in the Emergency Department with other imaging modalities including multi-phase CT, MRI, and ultrasound.

ERE152
Dual Energy CT to Detect Active Extravasation in the Emergency Room Setting: Advantages over Conventional Contrast-Enhanced CT

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

**Participants**
- Gregory Aaron Bonci MD (Presenter): Nothing to Disclose
- Jeremy Robert Wortman MD: Nothing to Disclose
- Urvi Pravin Fulwadhva MD: Nothing to Disclose
- Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG

**TEACHING POINTS**
Dual energy (DE) imaging is based on the principle that different materials exhibit distinct absorption characteristics at different x-ray energies. DE three-material decomposition enables calculation of iodine content in tissues, which may be displayed as an iodine map or removed to display a virtual noncontrast (VNC) image. Areas of contrast extravasation questioned or not optimally visualized on conventional CT imaging can be reliably identified based on the presence of iodine content. This allows...
for confident diagnosis without the need for additional non-contrast or delayed post-contrast scans.

**TABLE OF CONTENTS/OUTLINE**

1. Dual Energy Physics Principles of DE CT and three-material decomposition. Generation of VNC imaging and determination of iodine content. 2. Applications in the ER Setting The identification of active extravasation is of particular importance in the emergency setting. Hyperdense foci on CT that represent active hemorrhage may be confused for enhancing tissue or pre-existing high density, especially when noncontrast phases are unavailable. Areas where dual energy imaging can be of most utility are solid organ bleeding, trauma, and vascular injury. We routinely employ DE post-processing for ER abdomen/pelvis CT to clarify iodine content and in turn better guide management.

**ERE153**

**Enhancing Your Practice with Dual Energy CT in the ER**

*Education Exhibits*  
*Location: ER Community, Learning Center*  
*Selected for RadioGraphics*

**Participants**

Urvi Pravin Fulwadhva MD (Presenter): Nothing to Disclose  
Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG

**TEACHING POINTS**

Dual energy (DE) CT can add value through:

A. Improved visualization of existing image content  
B. Creation of new image content not otherwise available  
C. Opportunities to reduce radiation exposure, IV contrast volume, or imaging utilization

**TABLE OF CONTENTS/OUTLINE**

1. Physics review of x-ray spectra and tissue absorption at different x-ray energies  
2. DE data acquisition and postprocessing including material characterization, 3 material decomposition, virtual monochromatic imaging.  
3. Demonstrate potentially game-changing applications (organized per teaching point category letters) via relevant clinical case examples:  
   A: Improved iodine visualization to improve detection and highlight subtle enhancement differences; bone removal in vascular imaging; virtual monochromatic imaging to maximize subtle attenuation differences  
   B: Virtual noncontrast (VNC) and iodine map images for definitive iodine characterization; renal stone characterization; gout identification; bone marrow edema detection; metal artifact suppression  
   C: Avoid further workup by definitive characterization of incidentals; VNC to eliminate noncontrast phases; reduce IV contrast or salvage poorly enhanced scans using low kVp/keV  
4. Workflow and post-processing considerations in building a DE program, and needs for successful integration into clinical routine

**ERE154**

**Muscle Edema: Fingerprints for the Emergency Radiology**

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

**Participants**

Joan C. Vilanova MD, PhD (Presenter): Nothing to Disclose  
Sandra Baleato Gonzalez MD: Nothing to Disclose  
Joaquim Barcelo MD: Nothing to Disclose  
Xavier Tomas-Batlle MD: Nothing to Disclose  
Miguel Villalon MD: Nothing to Disclose  
Maria Boada MD: Nothing to Disclose

**TEACHING POINTS**

- To understand the pathophysiology of muscle edema  
- To recognize additional radiographic clue findings within a muscle edema, in clinical correlation, for life-threatening conditions  
- To establish a differential diagnosis for certain emergency situations

**TABLE OF CONTENTS/OUTLINE**

- It will be shown the radiographic pattern (US, CT, MRI) of muscle edema, especially on MRI. A proper algorithm for potential critical conditions related to muscle edema will be provided. Additional functional imaging on MRI (DWI and contrast enhanced acquisition) are helpful to demonstrate certain etiology causes, which will be described. It will be demonstrated the potential causes of muscle edema: traumatic, infectious, autoimmune, inflammatory, neoplastic, neurologic or iatrogenic. It will be emphasized the conditions that could require prompt medical or surgical management. It is necessary to accurately diagnose and detect promptly these conditions to establish the correct diagnosis. Radiologists should be familiar with certain specific patterns of muscle edema to manage serious critical situations

**ERE155**

**Scan More and Save More: How to Finish the Trauma Panscan in a Shorter Time?**

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

**Participants**

Nagaharu Takakura: Nothing to Disclose  
Junichi Matsumoto MD (Presenter): Nothing to Disclose  
Brandon D. Lohman: Nothing to Disclose  
Masaru Satoh: Nothing to Disclose  
Yasushi Nakamori: Nothing to Disclose  
Yasuo Nakajima MD: Nothing to Disclose  
Yasuhiko Taira MD: Nothing to Disclose

**TEACHING POINTS**

- Trauma panscan is now essential screening method but to take time for scanning may be harmful for severely injured patients.
In this exhibit you will learn: How to decrease the time for trauma panscan; time for moving from emergency room to the CT, putting the patient on the scanner off the stretcher, scanning, taking the patient from the scanner onto the stretcher, and coming back to the ER. You can learn how to make them shorter for every step. How effective and how difficult those tricks are with grading systems for every step. Discussion will also include topics about trauma panscan for hemodynamically unstable patients and the panscan as a part of the primary survey.

TABLE OF CONTENTS/OUTLINE
Introduction: Significance of trauma panscan. How to reduce the time for panscan; hardware setting, special device for transfer, scanning protocols, and team approach. All tricks are shown with degrees of effectiveness and difficulty. Discussion Conclusion and future directions

ERE157
MR Imaging Diagnostic Pitfall for Acute Abdomen of Children and Pregnant Women

Education Exhibits
Location: ER Community, Learning Center

Participants
Yukichi Tanahashi MD : Nothing to Disclose
Satoshi Goshima MD, PhD : Nothing to Disclose
Yuki Yoshiyasu MD (Presenter): Nothing to Disclose
Hiroshi Kondo MD : Nothing to Disclose
Yoshifumi Noda MD : Nothing to Disclose
Nobuyuki Kawai MD : Nothing to Disclose
Hiroshi Kavada MD : Nothing to Disclose
Haruo Watanabe MD : Nothing to Disclose
Kota Sakurai : Nothing to Disclose
Masayuki Kanematsu MD : Nothing to Disclose

TEACHING POINTS
Various situations can cause acute abdomen in children and pregnant women. Understanding and recognizing the MR imaging features of acute abdomen is beneficial for an accurate diagnosis and determination of appropriate treatments without iohinated radiation exposure.

TABLE OF CONTENTS/OUTLINE
1. Review the various clinical manifestations of acute abdomen in children and pregnant women.
2. Illustrate key MRI findings of acute appendicitis, ovarian torsion, rupture of ovarian tumor, acute pancreatitis, acute cholangitis, and infectious uterine fibroid.
4. Review the clinical indications and treatment choices of major diseases and discuss the role of radiologists to choose appropriate treatment, especially for pregnant women.

ERE158
MRI Protocol and Typical Presentations of Appendicitis on MRI in Pregnant and Non-pregnant Women in the Acute Setting

Education Exhibits
Location: ER Community, Learning Center

Participants
Jennifer Wang BS (Presenter): Nothing to Disclose
Sarah Anne Barrett MBBCh : Nothing to Disclose
Ahmad M. Aljefri MBBS : Nothing to Disclose
Patrick McLaughlin FFR(RCSI) : Nothing to Disclose
David Tso MD : Nothing to Disclose
Silvia D. Chang MD : Nothing to Disclose
Savvas Nicolaou MD : Nothing to Disclose

TEACHING POINTS
1. Review the value of MRI in diagnosing appendicitis in pregnant and non-pregnant women.
2. Discuss MRI techniques/protocols, tips and tricks for visualization of the appendix in pregnant and non-pregnant women.
3. Use a case-based approach to illustrate the MRI techniques to evaluate appendicitis in a spectrum of pregnant and non-pregnant women, including some examples of alternative diagnosis.

TABLE OF CONTENTS/OUTLINE
1) Anatomy of the appendix. Pathophysiology of appendicitis. Value of each imaging modality (U/S, CT, MR). MRI indication/significance in pregnant and non-pregnant women. 2) Advantages and limitations of using MRI, and MRI interpretation of the appendix. 3) MRI protocol/techniques for visualizing appendix in pregnant women (time of acquisition, best sequence to visualize the appendix, cecal tilt angle, diffusion-weighted imaging.) 4) MRI utility in ruling in/out other medical conditions associated with acute RLQ abdominal pain (ectopic pregnancy, ovarian torsion, IBD, degenerating fibroids).

ERE159
The Unexpected When you are Expecting: MR Imaging Evaluation of Nonobstetric Abdominal Pain during Pregnancy

Education Exhibits
Location: ER Community, Learning Center
**TEACHING POINTS**

Abdominal pain is a common complaint during pregnancy and nonobstetric causes can require an urgent surgical approach. Normal pregnancy factors, such as dislocation of abdominal and pelvic structures by the uterus may delay a precise diagnosis, which can be harmful to both mother and fetus. The most frequent conditions are acute appendicitis, biliary disease, intestinal obstruction, pancreatitis, upper tract infection and abdominal trauma. Less common causes but also important include urinary lithiasis, ovarian torsion, epiploic appendagitis. US can be inconclusive in the evaluation of the pregnant woman; MR is a non-invasive and non-ionizing imaging modality, with excellent tissue contrast and no evidence of deleterious effects to the fetus.

**TABLE OF CONTENTS/OUTLINE**

1. Anatomic review of the pregnant pelvis; 2. Routine for the evaluation of the pregnant patient with abdominal pain; 3. Indications and contraindications of MRI during pregnancy; 4. MRI acquisition protocol for the pregnant patient; 5. The main imaging findings of abdominal pain during pregnancy: Inflammatory: acute appendicitis, diverticulitis, epiploic appendagitis, cholecystitis, pancreatitis, inflammatory bowel disease, hepatitis; Urinary: lithiasis, upper tract infection; Vascular: ovarian torsion, ovarian edema, pelvic congestion syndrome; Obstructive: bowel obstruction; Neoplastic.

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**ERE162**

**ED Breast Cases and Other Breast Emergencies**

*Education Exhibits*

*Location: ER Community, Learning Center*

*Certificate of Merit*

**Participants**

- Nasim R. Khadem MD (Presenter): Nothing to Disclose
- Sravanthi Reddy MD: Nothing to Disclose
- Sandy Chia-En Lee MD: Nothing to Disclose
- Linda Hovanessian-Larsen MD: Nothing to Disclose
- Daphne Kim Walker MD: Nothing to Disclose

**TEACHING POINTS**

1) Review the presentation, pathophysiology, imaging, and management of emergency breast cases and common breast pathology seen in the ED.
2) Understand the limitations of breast imaging in the acute setting, and know when to refer to a specialty breast center for further management.

**TABLE OF CONTENTS/OUTLINE**

1. Intro A. Breast development/anatomy B. Disease processes of the breast commonly present in the ED, and it is essential that the radiologist understand the imaging and management of the most common entities. An understanding of any limitations in the acute setting is especially important, as is knowing when referral to a specialty breast center is necessary. II. ED/emergency breast cases: will include discussion on pathophysiology/imaging of each case below, with particular focus on treatment and management. Will also include select case examples from our institution. A. Inflammatory/infectious: Mondor's disease, granulomatous mastitis, purperal/non-puerperal mastitis B. Blunt/penetrating trauma: contusions/hematomas, seatbelt injuries, stab wounds C. Implant complications: rupture, infection D. Post-procedural complications: pseudoaneurysm following stereotactic biopsy E. Mimics: granulomatous mastitis as mimic of cancer, gynecomastia (secondary to drugs, obesity), newborn breast masses (secondary to maternal hormones)

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**ERE163**

**Evaluating a Mouthful of Panorex Pathology and Associated Hardware**

*Education Exhibits*

*Location: ER Community, Learning Center*

**Participants**

- Evan Ross Finkelstein MD (Presenter): Nothing to Disclose
- Jeffrey A. Chuy BA, MD: Nothing to Disclose
- Ryan Melissa Finkelstein BS: Nothing to Disclose
- Nicole Eve Finkelstein MMedSc, MS: Nothing to Disclose
- Kim M. Caban MD: Nothing to Disclose

**TEACHING POINTS**

The purpose of this exhibit is: 1) To review anatomy and pathophysiology of the teeth. 2) To present cases with classic imaging findings for various pathologic processes on panorex. 3) To discuss the use and imaging appearance of current hardware within the mouth.

**TABLE OF CONTENTS/OUTLINE**

1) Teeth and panorex anatomy. 2) Clinical presentation of odontogenic disease. 3) Pathologic findings commonly encountered on panorex imaging. 4) Tooth trauma and associated hardware 5) Appearance of current dental restorations and orthodontic appliances 6) Panorex pitfalls 7) Summary
ERE164

Explosive Blast Injuries: A Review of Radiologic Findings

Education Exhibits
Location: ER Community, Learning Center

Participants
John Franklin Brunner MD (Presenter): Nothing to Disclose
Ajay K. Singh MD: Nothing to Disclose
Tatiana C. Rocha MD: Nothing to Disclose
Joaquim Michael Havens MD: Nothing to Disclose
Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG
Sravanthi Reddy MD: Nothing to Disclose
Robert Brunner BA: Nothing to Disclose

TEACHING POINTS
- Explosive blast injuries in the USA most commonly result from industrial accidents and rarely terrorist bombings.
- Four common patterns of blast injury are traditionally described: primary, secondary, tertiary, and quaternary, each with specific associated radiographic findings (Table 1).
- Radiologists should be familiar with all types of blast injury to ensure appropriate imaging strategies, accurate diagnosis, and rapid recognition of an explosive blast event.
- Radiologist recognition of the hallmark findings of intentional terrorist bombings may result in improved clinical response and forensic investigation by legal authorities.

TABLE OF CONTENTS/OUTLINE
I. Introduction II. Blast Injury Types (Table 1) a. Primary: Blast wave related barotrauma i. Mechanism ii. Injuries (Figure 1) b. Secondary: Blast related shrapnel injury i. Mechanism ii. Injuries (Figure 2 and 3) c. Tertiary: Blast wind displacement i. Mechanism ii. Injuries d. Quaternary: All other injuries i. Mechanism ii. Injuries III. Strategies for Imaging Blast injuries (Figure 5)

ERE165

Fixin' the Retroperitoneum—Trauma at Retroperitoneal Fixation Points

Education Exhibits
Location: ER Community, Learning Center

Participants
Jason F. Broomhall MD (Presenter): Nothing to Disclose
Matthew Smetts MD: Nothing to Disclose
Kyuran Ann Choe MD: Nothing to Disclose
Susan Elizabeth Braley MD: Nothing to Disclose

TEACHING POINTS
- To review the retroperitoneal structures with attention to points of fixation.
- To discuss retroperitoneal trauma in relation to shear injury and points of fixation, including within the genitourinary tract, gastrointestinal tract, musculoskeletal system, and vasculature. The physics of shear stress will also be discussed.
- To illustrate imaging findings of retroperitoneal shear trauma.

TABLE OF CONTENTS/OUTLINE
- Review of the relevant retroperitoneal structures/anatomy and points of fixation that can lead to shear injury.
- Discussion of the physics of shear injury and mechanisms in which retroperitoneal structures are involved.
- Imaging manifestations of retroperitoneal shear injury.

ERE166

Imaging Techniques in the Acute Assessment of Suspected Penetrating Diaphragmatic Injury: A Pictorial Review

Education Exhibits
Location: ER Community, Learning Center

Participants
Anushka Patchava MBChB, BSc (Presenter): Nothing to Disclose
Amanda Isaac MBChB, FRCR: Nothing to Disclose
Mohammad Daneshi MBBS: Nothing to Disclose
Duncan Bew: Nothing to Disclose
Lisa Marie Meacock MBBS: Nothing to Disclose

TEACHING POINTS
- The diagnosis of diaphragmatic injuries following penetrating thoraco-abdominal trauma can be challenging.
- Direct computed tomography (CT) signs of injury are infrequent and in small defects CT imaging may be non-diagnostic.
- Highlight diaphragmatic anatomy and areas susceptible to penetrating trauma.
- Illustrate and review the direct and non-direct signs of diaphragmatic injury, using cases of surgically confirmed diaphragmatic injury.
- Discuss how vectors of force and imaging clues facilitate a diagnosis of diaphragmatic injury.
- Consider the role of adjuncts in CT imaging, for example the use of intra-pleural contrast.

TABLE OF CONTENTS/OUTLINE
- Background/Context: Diaphragmatic anatomy and susceptibility to trauma.
- Patient group: Cases of surgically confirmed diaphragmatic injury from our level one trauma centre registry.
- Purpose: Pictorial review of the direct and indirect radiological signs of diaphragmatic injury.
- Discussion: Factors that help in the recognition of diaphragmatic injuries including vectors of...
Self-harm-Related Foreign Bodies in Adults: Diagnosis and Management in the Emergency Department

**Education Exhibits**

**Location:** ER Community, Learning Center

**Participants**

- John Franklin Brunner MD (Presenter): Nothing to Disclose
- Marie F. Russell: Nothing to Disclose
- Lee Alan Myers MD: Nothing to Disclose
- Keith David Herr MD: Nothing to Disclose
- Orest Bohdan Boyko MD, PhD: Nothing to Disclose
- Sravanthi Reddy MD: Nothing to Disclose
- Paul Michael Jaffray MD: Nothing to Disclose

**TEACHING POINTS**

- Self-harm-associated foreign bodies result in significant morbidity and mortality, resulting in 1500-1600 deaths per year in the USA.
- Amongst adults, the problem disproportionately affects individuals suffering from psychiatric conditions (85%), many of whom undergo repeat exposure to ionizing radiation in the form of CT and radiographs.
- Ingestion of foreign bodies is the most frequent manifestation of this behavior.
- Though the vast majority of ingested foreign bodies pass with only conservative management, 10-20% of patients require surgery or endoscopy for retrieval.
- Though less frequent, self-harm-related penetrating trauma results in higher morbidity and mortality.

**TABLE OF CONTENTS/OUTLINE**

1. Introduction
2. Self-Harm Behavior
   a. Per Os (Ingested foreign bodies)
      i. Common entities
      ii. Complications (Figure 1-2)
   b. Per Rectum
      i. Common entities (More often the result of sexual act or assault than self-harm)
      ii. Complications
   c. Per Urethra (Figure 3)
      i. Common entities
      ii. Complications
   d. Per Vagina (Figure 4)
      i. Common entities
      ii. Complications
   e. Self-inflicted penetrating trauma
      i. Common entities (e.g. stabbing, GSW, other)
      ii. Complications
3. Review of management strategies

Skin and Subcutaneous Emergencies: Multimodality Imaging with Ultrasound, CT, and Dual Energy CT

**Education Exhibits**

**Location:** ER Community, Learning Center

**Participants**

- Hansol Kim MD: Nothing to Disclose
- Sachin Shyamsunder Saboo FRCR, MD (Presenter): Nothing to Disclose
- Naman Sanjiv Desai MD: Nothing to Disclose
- Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG

**TEACHING POINTS**

- Awareness of characteristic Ultrasound and CT findings of various skin and subcutaneous emergencies is important for timely diagnosis and management.

**TABLE OF CONTENTS/OUTLINE**

1. Characteristic imaging findings and management of emergent skin and subcutaneous diseases:
   a. Inflammatory and infectious- cellulitis and abscesses of breast and other sites, Fournier's gangrene, necrotizing fasciitis, decubitus ulcers, thrombophlebitis
   b. Traumatic injuries and vascular pathology- subcutaneous emphysema, contusion, laceration, hematoma, pseudoaneurysm, electrical and burn injuries, compound fracture
   c. Iatrogenic- infections, fistula and hernia
   d. Fistula-enterocutaneous, pharygocutaneous
2. Imaging of incidentally encountered and non-emergent skin and subcutaneous conditions
   a. Benign- sebaceous cyst, calcifications, injection site and liposuction associated granulomas, neurofibromas, endometrioma, anasarca
   b. Malignant- primary and metastatic lesions
3. Role of Dual Energy CT in skin and subcutaneous diseases in the emergency room
4. Conclusion

When Leaving Your Seat Can Ruin A Call Shift: Indications, Technique Considerations, and Common Imaging Findings For ED Fluoroscopic Exams

**Education Exhibits**

**Location:** ER Community, Learning Center

**Participants**

- Peter M. Ghobrial MD (Presenter): Nothing to Disclose
- Sandeep Prakash Deshmukh MD: Nothing to Disclose

**TEACHING POINTS**

1. Review general considerations for radiation dose limitation during fluoroscopy examinations
2. Discuss appropriate clinical indications for use of fluoroscopy in patients presenting from the emergency department; some entities for which evaluation with fluoroscopy is no longer primarily indicated will also be described.
3. Pertinent history supporting suspected diagnoses will be highlighted.
4. Key aspects of successful exam technique will be reviewed.
5. Expected exam findings will be demonstrated for each entity.

**TABLE OF CONTENTS/OUTLINE**

1. Review general considerations for radiation dose limitation during fluoroscopy examinations
2. Discuss appropriate clinical indications for use of fluoroscopy in patients presenting from the emergency department; some entities for which evaluation with fluoroscopy is no longer primarily indicated will also be described.
3. Pertinent history supporting suspected diagnoses will be highlighted.
4. Key aspects of successful exam technique will be reviewed.
5. Expected exam findings will be demonstrated for each entity.
Introduction Objectives Strategies for Maximal Limitation of Fluoroscopic Radiation Dose Indications For Use of Fluoroscopy in ED Patient Evaluation (including: clinical presentation, expected effective radiation dose, imaging technique, and key findings--with imaging examples) Suspected Lower Urinary Tract Trauma: Male Urethra and Urinary Bladder Injury Esophageal Perforation Midgut Malrotation Reduction of Pediatric Intussusception Evaluation of ED Patients For Which Fluoroscopy Once Was, But Is No Longer Indicated (including: clinical presentation, expected effective radiation dose, imaging technique, and key findings--with imaging examples) Hypertrophic Pyloric Stenosis Small Bowel Obstruction

ERE171

Imaging of Ovarian Torsion: Spectrum of Findings and Multimodality Case Review

Education Exhibits

Location: ER Community, Learning Center

Selected for RadioGraphics

Participants

Shannon M. Navarro MPH, MD (Presenter): Nothing to Disclose
Ashley Elizabeth Prosper MD: Nothing to Disclose
Sravanthi Reddy MD: Nothing to Disclose
Daphne Kim Walker MD: Nothing to Disclose

TEACHING POINTS


TABLE OF CONTENTS/OUTLINE

1. Pathophysiology a. Pelvic anatomy/pathology b. Clinical presentation c. Risk factors 2. Spectrum of ultrasound findings a. Grey scale b. Color Doppler 3. Diagnosis of ovarian torsion on CT and MRI 4. Surgically proven cases: a. Spectrum of ovarian and vascular findings b. Intraovarian and extraovarian masses as lead points c. Mimics 5. Approach to imaging and pearls 6. Contrast enhanced ultrasound Summary Statement Evaluation of ovarian torsion is often a diagnostic dilemma for radiologists. Ultrasound is the imaging modality of choice, per the ACR Appropriateness Criteria; however, classic findings are not always present. CT and MRI may help with indeterminate cases, or may be the first study ordered, if other pathologies are expected. A multimodality approach is indicated for complicated cases, although the diagnosis of ovarian torsion can remain difficult to confirm. Contrast enhanced ultrasound may improve future diagnostic accuracy.

ERE172

Role of Ultrasound in Imaging of the Breast: Experience in An Inner City Emergency Room

Education Exhibits

Location: ER Community, Learning Center

Participants

Mark Guelfguat DO (Presenter): Nothing to Disclose
Arifa Faiz MBBS, MD: Nothing to Disclose
Joshua D. Gross MD: Nothing to Disclose
Shalom S. Buchbinder MD: Nothing to Disclose
Ralph Wm. Liebling MD: Nothing to Disclose

TEACHING POINTS

The major teaching points of the exhibit are: 1. Breast diseases can progress rapidly; therefore appropriate imaging should be performed expeditiously. 2. Ultrasound (US) is an effective breast imaging modality when utilized in the Emergency Room (ER) for preliminary diagnosis, especially in the evenings or weekends. 3. More advanced imaging modalities may follow the initial US exam to supplement the knowledge of the extent of the disease.

TABLE OF CONTENTS/OUTLINE

The purpose of this exhibit is to: 1. Review sonographic manifestations of breast diseases encountered in a setting on an inner city ER. 2. Discuss the diagnostic and prognostic role of US in evaluation of breast related diseases in an emergent setting. 3. Provide illustrative illustrations of differential diagnoses based on clinical presentations. Common and uncommon indications for ER breast US: -inflammation and mimickers: abscesses (typical and atypical pathogens; self-treated, medically treated and recurrent; adult and pediatric), inflammatory carcinoma, inflamed cyst, superficial thrombophlebitis -implant surgery complication (rupture, infection) -neoplasms (neglected and newly discovered, primary and secondary, benign and malignant, postoperative tumor recurrence) -gynecomastia (adult and pediatric)

ERE174

The Ring of Fire: A New Approach to Excluding Ectopic Pregnancy for Junior Residents Taking Call in the Emergency Department

Education Exhibits

Location: ER Community, Learning Center

Participants

Moreko Altoine Griggs MD (Presenter): Nothing to Disclose
Verghese George MBBS: Nothing to Disclose

TEACHING POINTS

The Ring of Fire algorithm is a visual and interactive mnemonic designed mainly for junior residents who take call in the emergency department. It provides a simple, innovative, and organized approach to the radiologic management of emergencies during early pregnancy. Emphasis is placed on how to exclude the diagnosis of ectopic pregnancy. As a play on words of the commonly described sonographic sign, the Ring of Fire algorithm is a set of six, sequential questions displayed along a ring that the user must address in order to exclude an ectopic pregnancy. The idea is to “escape” the Ring of Fire with answers that direct one away from the center of the ring where the diagnosis of ectopic pregnancy is located. However, if the answers continue to direct one along the ring of clinical and radiologic questions, concern for ectopic pregnancy should increase as the user
progresses further. Links to clinical pearls are included at their respective points along the ring in order to build on this foundation.

TABLE OF CONTENTS/OUTLINE

Ring of Fire Algorithm
The Importance of Excluding Ectopic in Early Pregnancy Emergencies
True Gestational Sac vs. Pseudosac
Adnexal Ring of Fire
Quantitative B-hCG and the Importance of Doubling Time
Ectopic Pregnancy
Non-ectopic early pregnancy emergencies
Conclusion

ERE175

Cardiopulmonary MDCT: Pearls and Pitfalls in Extracoronary Cardiac, Aortic and Pulmonary Artery Imaging

Education Exhibits
Location: ER Community, Learning Center

Participants
Davood Joseph Abdollahian MD: Nothing to Disclose
Linda Chi Hang Chu MD: Nothing to Disclose
Stefan L. Zimmerman MD: Nothing to Disclose
Elizabeth Kristine Weihe MD: Author, Amirsys, Inc
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
Pamela Tecce Johnson MD (Presenter): Research funded, Becton, Dickinson and Company

TEACHING POINTS

CT has become the imaging modality for emergency imaging of the heart, aorta and pulmonary arteries. The purpose of this exhibit is to: Discuss technical pitfalls that result in pseudopathology Demonstrate interpretative pearls that aid in making challenging diagnoses Illustrate post-operative findings that can be mistaken for pathology Review unusual pathology that may be encountered

TABLE OF CONTENTS/OUTLINE

Cardiac: LA appendage thrombus vs pseudothrombus RA thrombus vs crista semilunaris RA thrombus from RCC (keep on scanning!) Pacemaker lead through the wall of the RV Unusual pathology due to cardiac pulsation artifact Post operative material mimicking pseudoaneurysm or leak after aortic root repair Elephant trunk prosthesis (don’t mistake for dissection!) Pulmonary artery: Bolus tracking timing pearls and pitfalls Pseudothrombus due to mixing, motion artifact and saline flush Parenchymal infarct: range of CT appearances Incidental and subsegmental PE and the clinical conundrum they create Tumor thrombus Pulmonary embolism on non-contrast CT

ERE176

Intimal Problems: A Pictorial Review of Non-Traumatic Aortic Disease

Education Exhibits
Location: ER Community, Learning Center

Participants
Abigail Victoria Berniker MD (Presenter): Nothing to Disclose
Oleg Teytelboym MD: Nothing to Disclose
Justin Edward Mackey MD: Nothing to Disclose

TEACHING POINTS

Non-traumatic aortic diseases include a spectrum of conditions, many of which are associated with high morbidity and mortality. Radiologists should feel confident distinguishing non-traumatic aortic conditions and providing accurate interpretations to expedite appropriate patient management.

TABLE OF CONTENTS/OUTLINE

Goals -Review the spectrum of aortic disease encountered at imaging through a concise yet comprehensive case-based pictorial approach featuring common and uncommon entities -Help radiologists feel more confident characterizing non-traumatic aortic conditions and providing accurate interpretations to expedite timely treatment Background/Epidemiology Anatomy overview Schematics alongside imaging Case-Based Pictorial Review • Aortic aneurysm • Aortic pseudoaneurysm • Intramural hematoma • Penetrating ulcer • Aortic dissection • Acute aortic thrombus • Aortic occlusion • Aortitis • Mimics/pitfalls Mini Quiz: Test your knowledge with interactive cases Summary Non-traumatic aortic conditions are serious and often gone unrecognized until imaging studies are performed. Radiologists should be familiar with these entities and be able to provide accurate diagnoses to expedite patient care and prevent devastating, even fatal outcomes.

ERE177

Show Me the Way to the Bleeder! A Pelvic Vascular Road Map to Help the On-Call Interventional Radiologist

Education Exhibits
Location: ER Community, Learning Center

Participants
TEACHING POINTS
- To show the potential of the computed tomography angiography (CTA) post-processing tools to achieve useful vascular reconstructions in the setting of acute pelvic bleeding. - To review pelvic vascular anatomy and draw a practical vascular road map to help the on-call interventional radiologist. - Use case examples to illustrate the correlation between CTA reconstructions and DSA (Digital Subtraction Angiography) and its therapeutic utility.

TABLE OF CONTENTS/OUTLINE
CT Angiography (CTA) in the acute pelvic bleeding CTA Protocol and post-processing tools Pelvic vascular anatomy: the road map for the interventional radiologist Show me the bleeder: Sample cases Summary

ERE178
Venous Injuries to the Thoracic Great Vessels

Education Exhibits
Location: ER Community, Learning Center

Selected for RadioGraphics

Participants
Carlos S. Restrepo MD : Nothing to Disclose
Daniel Lamus MD (Presenter) : Nothing to Disclose
Aftab Haq MD : Nothing to Disclose
Daniel Vargas MD : Nothing to Disclose
Rajeev Suri MD : Nothing to Disclose
Andres Garza : Nothing to Disclose
Ghazwan M. Faozi Kroma MD : Nothing to Disclose

TEACHING POINTS
Review the direct and indirect imaging findings of traumatic injuries to the central veins Illustrate with cases the imaging features utilizing MDCT and DSA images of patients at our institution with the corresponding clinical and imaging followup. Emphasize the value of a multiphase scanning protocol to facilitate the early detection of these lethal injuries.

TABLE OF CONTENTS/OUTLINE
The clinical presentation of the injuries to the central venous system may be indistinguishable from injury to the arterial great vessels and most often are the result of either trauma or iatrogenic causes. MDCT with multiphase protocol MDCT, has increased the detection rate for these lesions in patients that survive the initial injury and give valuable information about injuries to adjacent structures. The indirect imaging findings of venous injury can be equivocal (perivascular hematoma, fat stranding, and vessel wall irregularity) but may prompt an early repair of these highly lethal injuries. Injuries to the SVC and innominate veins carry a high mortality. Traumatic injuries to the intrathoracic portion of the IVC are always fatal and rarely imaged. The unusual injuries to the azygos venous system manifest with morbidity and mortality that is similar to that of other great vessel injuries.

ERE179
A Stab in the Dark: Tips and Tricks for Interpreting Acute CT in Penetrating Stabbing Injuries to the Torso

Education Exhibits
Location: ER Community, Learning Center

Participants
Joel Dunn FRCR, MBBS (Presenter): Nothing to Disclose
Yaron J. Berkowitz MBBSChir, MRCS : Nothing to Disclose
Derfel Ap Dafydd MRCP, FRCR : Nothing to Disclose
Anoma Lalani Carlton Jones MBBS, FRCP : Nothing to Disclose
Raghavendra Kamanahalli MD, FRCP : Nothing to Disclose
Elika Kashef FRCR : Consultant, W. L. Gore & Associates, Inc
Elizabeth Ann Dick MD, FRCR : Nothing to Disclose

TEACHING POINTS
Using case based examples, with surgical correlation where possible, we aim to shed light on the imaging pathway and interpretation in patients with traumatic penetrating stab injuries. Our aim is to clarify the following:
- When to scan/when not to scan
- What orifice should contrast be given and how many phases
- How to interpret CT findings
- Discuss review areas where findings are often overlooked, i.e. bowel and diaphragm
- Tips and tricks from our experience at our institution.

TABLE OF CONTENTS/OUTLINE
Introduction
Peritoneal anatomy
Imaging protocols and pathways at our institution
Case based examples with surgical correlation
Tips and tricks from our experience
Summary
ERE180
CT of the Acute Female Pelvis

Education Exhibits
Location: ER Community, Learning Center

Participants
Douglas S. Katz MD (Presenter): Nothing to Disclose
Esther Evette Coronel MD: Nothing to Disclose
Joseph Patrick Mazzie DO: Nothing to Disclose
Christine O. Menias MD: Nothing to Disclose
Mariam Moshiri MD: Consultant, Reed Elsevier Author, Reed Elsevier
Savvas Nicolaou MD: Nothing to Disclose
Kristen Fruauff MD: Nothing to Disclose
Corinne C. Liu MD: Nothing to Disclose

TEACHING POINTS
Sonography is the primary imaging modality for the evaluation of pelvic pain in female patients, especially if gynecologic pathology is suspected, and MRI is being increasingly used for problem solving and followup. However, in the emergency setting CT is frequently used in patients presenting with non-specific abdominal and pelvic pain, and CT may be the first imaging examination to demonstrate gynecologic abnormalities. The purpose of this exhibit is therefore to discuss and illustrate the spectrum of gynecologic findings of the acute female pelvis which may be identified on CT by the emergency and general radiologist, with a brief review of the imaging and clinical features of each diagnosis. Radiologists need to be familiar with all of these gynecologic disorders on CT.

TABLE OF CONTENTS/OUTLINE
The following topics will be covered, with brief reviews of the literature and CT case demonstrations, with selective ultrasound correlations: CT technique; ovarian torsion (with or without underlying cyst/mass); ovarian cysts (simple and hemorrhagic, with and without peritoneal fluid/hemorrhage); endometriosis; unanticipated intra-uterine and ectopic pregnancy; ovarian hyperstimulation; pelvic inflammatory disease; endometritis; ovarian vein thrombosis; uterine rupture; gynecologic neoplasms with acute presentations; and complicated uterine leiomyomas.

ERE181
Iatrogenic Complications Affecting the Abdominal Wall

Education Exhibits
Location: ER Community, Learning Center

Participants
Gabriela Gayer MD (Presenter): Nothing to Disclose

TEACHING POINTS
1. Review the pathophysiology of iatrogenic injuries affecting the abdominal wall. 2. Discuss the CT findings of a wide range of iatrogenic complications affecting the abdominal wall. 3. Emphasize the importance of integrating clinical data into the study's interpretation process in this setting.

TABLE OF CONTENTS/OUTLINE
1. Pathogenesis of iatrogenic injuries affecting the abdominal wall. 2. Clinical presentation 3. Imaging findings - CT, PET/CT and interventional radiological studies 4. Sample cases and mimics * Complications from medications: - Rectus sheath hematoma (anticoagulant treatment) * Complications from injections: - Injection-site lipohypertrophy (insulin injection) - Injection site granulomas (low-molecular-weight heparin) * Complications from drainage tract - Inferior epigastric artery pseudoaneurysm * Complications from surgery: - Hematoma/seroma/abcess - Incisional hernia - Heterotopic ossification in scar - Endometrioma 5. Summary 1. Familiarity and awareness of the broad spectrum of iatrogenic injuries is crucial. 2. Certain iatrogenic complications require prompt intervention. 3. Tailoring of CT study is important to confirm diagnosis.

ERE182
Multidetector Computed Tomography (MDCT) Imaging Grading and Pitfalls of Hepatic Injuries in Patients with Abdominal Blunt Trauma

Education Exhibits
Location: ER Community, Learning Center

Participants
Guillermo P. Sangster MD (Presenter): Nothing to Disclose
Maureen Gail Heldmann MD: Nothing to Disclose
Carolina Navarro MD: Nothing to Disclose
Maren Donato MD: Nothing to Disclose
Ana Andrade MD: Nothing to Disclose
Alejandro Tempra: Nothing to Disclose

TEACHING POINTS
1. Apply the American Association for the Surgery of Trauma-Organ Injury Scale (AAST) to grade hepatic injuries utilizing MDCT 2. Discuss the role of MDCT in the detection of hepatic injury and active bleeding 3. Distinguish false (+) MDCT findings from true hepatic injuries to avoid misdiagnosis

TABLE OF CONTENTS/OUTLINE
MDCT is the imaging modality of choice for evaluation of hemodynamically stable patients with abdominal blunt trauma. The liver is the second most common injured abdominal solid organ, and the most frequent abdominal injury resulting in death. A retrospective collection of patients with blunt abdominal trauma from our level I trauma center are included in this pictorial essay. Hepatic lesions are described and classified following the American Association for the Surgery of Trauma-Organ Injury
The following MDCT imaging findings are presented and discussed: a. Hematoma (subcapsular or intraparenchymal) b. Laceration c. Shattered liver d. Hilar vascular injury. The usefulness of arterial acquisition for detection of active bleeding. e. The delayed hepatic rupture process is reviewed. This exhibit reinforces the comprehensive value of MDCT in the diagnosis and grading of blunt hepatic trauma, and the impact of imaging on patient management. Mيمics should be recognized to avoid unnecessary invasive procedures.

ERE183

Severe Abdominal Trauma: Spectrum of Findings in Patients Who Undergo Diagnostic CT After Life-saving Laparotomy

Education Exhibits
Location: ER Community, Learning Center

Selected for RadioGraphics
Selected for RadioGraphics

Participants
Armonde Baghdanian MD (Presenter): Nothing to Disclose
Brian Michael Currie BS : Nothing to Disclose
Arthur Baghdanian MD : Nothing to Disclose
Christina Alexandra Lebedis MD : Nothing to Disclose
Stephan W. Anderson MD : Nothing to Disclose
Jorge A. Soto MD : Nothing to Disclose
Anthony Samuel Armetta MD : Nothing to Disclose

TEACHING POINTS
1. Review the most common indications for emergent exploratory laparotomy without pre-operative diagnostic CT, following blunt abdominal trauma. 2. Discuss the optimal trauma CT protocols in the setting of an open abdomen after trauma. 3. Illustrate the most significant injuries that are not detected or treated during an exploratory laparotomy performed without prior CT imaging. 4. Learn characteristic post-operative findings on CT performed after laparotomy for emergency hemostasis. 5. Describe findings of the open surgical abdomen. 6. Discuss the clinical implications of making the correct diagnoses.

TABLE OF CONTENTS/OUTLINE
1. Common indications for exploratory laparotomy immediately after arrival. 2. When to obtain an immediate post operative CT scan. 3. Typical findings of an open surgical abdomen on CT after emergent laparotomy. 4. Differentiating between expected post-operative findings and true injuries from initial trauma. 5. Potential dangerous pitfalls on post-operative emergent CT. 6. Sample case presentations.

ERE185

Traumatic Bladder Rupture: Utility of CT Cystogram and Clinical Implications

Education Exhibits
Location: ER Community, Learning Center

Certificate of Merit

Participants
Arthur Baghdanian MD (Presenter): Nothing to Disclose
Christina Alexandra Lebedis MD : Nothing to Disclose
Armonde Baghdanian MD : Nothing to Disclose
Anthony Samuel Armetta MD : Nothing to Disclose
Stephan W. Anderson MD : Nothing to Disclose
Jorge A. Soto MD : Nothing to Disclose

TEACHING POINTS
1. To review the imaging presentations and classification of bladder rupture in the trauma setting. 2. To explain the utility of CT Cystography to appropriately diagnose bladder trauma. 3. To discuss the clinical implications of making the correct diagnosis.

TABLE OF CONTENTS/OUTLINE
- When to obtain a CT Cystogram.
- Classification of bladder rupture based on Sandler et al. classification in Radiology 1986 (type 1-type 5).
- Association of pelvic fractures and bladder rupture.
- Sample cases with common imaging presentations that highlight the importance of CT Cystography for diagnosing bladder rupture.
- Clinical management implications of bladder rupture in extra vs intraperitoneal bladder rupture.

ERE186

Traumatic Injuries to the Pancreas: The Key Role of Imaging

Education Exhibits
Location: ER Community, Learning Center

Certificate of Merit

Participants
Jun Wang BSc (Presenter): Nothing to Disclose
HeeJun Kang : Nothing to Disclose
Patrick McLaughlin FFR(RCSI) : Nothing to Disclose
TEACHING POINTS

1. To review the epidemiology, pathophysiology and classification of traumatic injuries to the pancreas. 2. To review key radiological findings in traumatic injuries of the pancreas including findings on MDCT and MRCP. 3. To discuss the management of traumatic pancreas injuries, including algorithms based on imaging findings.

TABLE OF CONTENTS/OUTLINE

- Discuss the epidemiology and pathophysiology of traumatic pancreas injuries
- Review the imaging modalities available for imaging abdominal trauma, with emphasis on MDCT as the initial modality of choice
- Explain the AAST grading scheme of pancreatic injuries using MDCT
- Illustrate key findings of pancreatic trauma seen on MDCT and MRCP
- Discuss an imaging based algorithm for the management of traumatic injuries to the pancreas including the role of curved planar minimal intensity reconstructions as well as secretin and Eovist enhanced cholangiopancreatography.

ERE187

Costal Cartilage Injuries in Acute Trauma—An Overlooked Injury

Education Exhibits
Location: ER Community, Learning Center

Participants

Matthew Brennan OBrien MD (Presenter): Nothing to Disclose
Daniel Thomas Myers MD: Nothing to Disclose
David L. Spizarny MD: Nothing to Disclose

TEACHING POINTS

1. Costal cartilage injuries are uncommon injuries and may easily be overlooked
2. Costal trauma commonly occurs in three locations: costal cartilage attachment to the ossified rib end, costosternal/costomanubrial attachment and in the midportion of the cartilage
3. Greater awareness of spectrum of injuries and their appearances will lead to greater recognition of this uncommon traumatic injury

TABLE OF CONTENTS/OUTLINE

- Diagramatic anatomy of the costal cartilages
- Normal senescent change
- Classification scheme of injury
- Sites of injury (costal cartilage attachment, costosternal attachment, central cartilaginous injury)
- Types of injury (separation at cartilaginous attachment, complete fracture)
- Review of spectrum of costal cartilage injuries with emphasis on pictorial examples seen on CT for Trauma
- Relationship to American Association of Surgery for Trauma Chest Wall Trauma Score
- Complications including flail chest and lung herniation
- Mimics of injury / Pitfalls
- Summary

ERE188

Temporal Bone Trauma: Maneuvering through the Maze!

Education Exhibits
Location: ER Community, Learning Center

Participants

Anagha Rajeev Joshi MD, MBBS: Nothing to Disclose
Sneha Deshpande MBBS (Presenter): Nothing to Disclose
Ashwini Sankhe: Nothing to Disclose
Kishor L. Rajpal: Nothing to Disclose
Saurabh Anant Joshi MBBS: Nothing to Disclose

TEACHING POINTS

• Temporal bone flaunts a complex anatomy with multiple osseous components. It houses various important neural and vascular structures along with the auditory apparatus. Trauma to the temporal bone poses a risk to all these structures. • Temporal bone fractures may present with hearing loss, balance dysfunction, CSF leaks, nerve palsies, life threatening vascular injuries etc. • Evolution of Multi-detector CT has revamped the imaging of temporal bone with fast imaging speed, better resolution, multi-planar reformations and hence improved detection ability. • Thus, it has now become mandatory for a radiologist to be well acquainted with the anatomy and imaging of temporal bone.

TABLE OF CONTENTS/OUTLINE

• Anatomy of the temporal bone would be discussed in detail. • Imaging protocol with the normal CT anatomy would be illustrated with relevant images. • Various classification systems of the temporal bone fractures would be discussed with their clinical relevance. The types of fractures that would be discussed • Longitudinal, transverse and mixed type of fractures • Fractures violating or sparing the otic capsule • Petrous or non-petrous fractures • Fracture mimics in temporal bone would be illustrated, to acquaint the radiologists with the possible false positives; like the intrinsic fissures, extrinsic fissures and the intrinsic channels.

ERE189

Avoiding Fracture Overcalls: Tips for On-Call Residents

Education Exhibits
Location: ER Community, Learning Center
Participants
George Athanasatos MD (Presenter): Nothing to Disclose
Yousef Yasin MD: Nothing to Disclose
Bahram Kiani MD: Nothing to Disclose
Scott David Wuertzer MD, MS: Nothing to Disclose
Leon Lenchik MD: Nothing to Disclose

TEACHING POINTS
1. The goal of every on-call resident is to avoid missing fractures, but the importance of avoiding fracture overcalls should be equally emphasized. 2. Increased awareness of the types of overcalls and their common locations will help reduce their number. 3. Avoiding fracture overcalls may help reduce unnecessary cross-sectional imaging, relieve patient anxiety, and decrease unwarranted treatment.

TABLE OF CONTENTS/OUTLINE

ERE190
Imaging of Traumatic Peripheral Nerve Injuries
Education Exhibits
Location: ER Community, Learning Center

Participants
Yoshimi Endo MD (Presenter): Nothing to Disclose

TEACHING POINTS
1. To review the normal appearance of peripheral nerves on MRI and ultrasound. 2. To describe the imaging features of traumatically injured nerves on MRI and ultrasound. 3. To understand the strengths and limitations of each modality for evaluating peripheral nerves.

TABLE OF CONTENTS/OUTLINE
1. Normal appearance of peripheral nerves on MRI and ultrasound. 2. Introduction to major categories of nerve injuries: Neurapraxia, axonotmesis, neurotmesis 3. Imaging features of traumatically injured nerves, including appearance on dynamic ultrasound: - Nerve transections - End-bulb/stump neuromas - Post-traumatic neuritis 4. Nerve injuries in sports and non-penetrating trauma. 5. Predicting which nerve injury may benefit from surgical intervention and the need for clinical correlation.

ERE192
MDCT of Blunt Mandibular Trauma
Education Exhibits
Location: ER Community, Learning Center
Certificate of Merit
Selected for RadioGraphics

Participants
David Dreizin MD (Presenter): Nothing to Disclose
Krystal Archer-Arroyo MD: Nothing to Disclose
Nikki Tirada MD: Nothing to Disclose
Thorsten Roger Fleiter MD: Nothing to Disclose
Felipe Munera MD: Nothing to Disclose
Deborah Stein MD, PhD: Nothing to Disclose
Stuart E. Mirvis MD: Nothing to Disclose

TEACHING POINTS
After completing this exhibit, viewers will be able to... List the most common patterns of bilateral mandibular fractures in blunt trauma Explain the importance of basal triangles and alveolar fracture components in determining appropriate management. Describe findings that warrant tooth extraction in dentolavetalveolar trauma.

TABLE OF CONTENTS/OUTLINE

ERE193
Radiographic Assessment of Osseous Fixation Pathways in Pelvic and Acetabular Fractures
Education Exhibits
Location: ER Community, Learning Center

Participants
Nicholas Marc Beckmann MD (Presenter): Nothing to Disclose
Susanna Claire Spence MD: Nothing to Disclose
Manickam Kumaravel MD, FRCR: Nothing to Disclose

TEACHING POINTS
1) Describe the osseous fixation pathways (OFPs) used for percutaneous fixation of pelvic and acetabular fractures
2) Demonstrate the optimal radiographic views for assessing hardware placement in each OFP
3) Discuss general clinical indications for use of each OFP

TABLE OF CONTENTS/OUTLINE
Discussion of evolution of percutaneous pelvic fixation and osseous fixation pathways (OFPs) Discussion of osseous anatomy of the pelvis using 3D volume rendered and virtual radiograph CT images Discussion of indications for percutaneous pelvic fixation instead of traditional open fixation. Discussion of intra-operative fluoroscopic assessment of pelvic stability and percutaneous screw placement for the major pelvic OFPs: Anterior column Inferior pubic ramus AIIS to posterior ilium Gluteus medius pillar Iliac crest Posterior acetabular column Sacroiliac Sacral Discussion of radiograph and CT assessment of percutaneous pelvic fixation and examples of appropriately and malpositioned hardware in pelvic OFPs

ERE194
Radiographic Spectrum of Lisfranc Injuries of the Foot
Education Exhibits
Location: ER Community, Learning Center

Participants
Suresh Cheekatla MBBS (Presenter): Nothing to Disclose
Nagaramesh Chinapuvvula MBBS: Nothing to Disclose

TEACHING POINTS

TABLE OF CONTENTS/OUTLINE

ERE195
Traumatic Finger Injuries: What the Orthopedic Surgeon Wants to Know
Education Exhibits
Location: ER Community, Learning Center

Participants
Ged G. Wieschhoff MD: Nothing to Disclose
Scott Sheehan MD: Nothing to Disclose
Jeremy Robert Wortman MD (Presenter): Nothing to Disclose
George Dyer: Nothing to Disclose
Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG
Ketankumar I. Patel MBBS: Nothing to Disclose
Bharti Khurana MD: Nothing to Disclose

TEACHING POINTS
1) Knowledge of the biomechanics of the most common traumatic finger injuries. 2) Understanding of the classification and grading systems used by orthopedic surgeons for traumatic finger injuries. 3) What the orthopedic surgeons need in imaging interpretation to guide effective management.

TABLE OF CONTENTS/OUTLINE
1) Review the relevant anatomy of the fingers using multiple imaging modalities including radiographs, CT, MRI, and 3D modeling. 2) Illustrate the common mechanisms of traumatic finger injury, utilizing 3D modeling and animation. 3) Review the most commonly encountered osseous and soft tissue injury patterns seen in traumatic finger injuries. 4) Describe the classification systems of finger injuries most commonly used by orthopedic surgeons. 5) Case based review of common traumatic injuries in multiple imaging modalities.

ERE196
"A Stab in the Dark"—Review of Multidetector CT Imaging Findings in Penetrating Diaphragmatic Injury and Correlation with Clinical Outcome: A Level 1 Trauma Centre Perspective
**Education Exhibits**  
Location: ER Community, Learning Center

## Participants
- **Sadaf Javed MBBS (Presenter):** Nothing to Disclose
- **Mohammed Rashid Akhtar MBBS, BSc:** Nothing to Disclose
- **Susan Cross MBChB, FRCP:** Nothing to Disclose

### TEACHING POINTS
1. To illustrate the importance of multidetector CT in delineation of diaphragmatic rupture in Penetrating Trauma  
2. The CT signs in penetrating diaphragmatic injury can be subtle. We will demonstrate key findings along with potential pitfalls.

### TABLE OF CONTENTS/OUTLINE
1) PATHOPHYSIOLOGY OF INJURY  
2) CLINICAL SIGNS AND SYMPTOMS IN DIAPHRAGMATIC INJURY  
3) RADIOLOGICAL FINDINGS INDICATIVE OF INJURY TO DIAPHRAGM  
   - CXR  
   - US  
   - CT  
4) ACCURACY OF INDIVIDUAL CT SIGNS ACCORDING TO THE LITERATURE  
5) OUR EXPERIENCE  
6) METHODS - RETROSPECTIVE STUDY LOOKING AT SURGICALLY CONFIRMED CASES OF DIAPHRAGMATIC INJURY  
   - WAS DIAPHRAGMATIC INJURY PICKED UP ON CT (REPORTED INDEPENDENTLY BY 2 RADIOLOGISTS)  
   - WHICH SIGNS WERE MOST USEFUL  
7) RESULTS  
8) CONCLUSIONS INCLUDING SENSITIVITY AND SPECIFICITY

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**ERE197**

### Multisystemic Imaging Findings Associated with Near-fatal Drowning

*Education Exhibits*  
Location: ER Community, Learning Center

#### Participants
- **Daniel Ocasionez MD (Presenter):** Nothing to Disclose  
- **Carlos S. Restrepo MD:** Nothing to Disclose  
- **Achint K. Singh MD:** Nothing to Disclose  
- **Carolina Ortiz-Lopez MD:** Nothing to Disclose  
- **Gregory Kicska MD, PhD:** Nothing to Disclose  
- **J. David Godwin MD:** Shareholder, Cardiac Insight

#### TEACHING POINTS
1. Lower cervical spine injuries (involving C4 through C7) are particularly prevalent in near-fatal drowning victims when the predominant mechanism of injury was diving.  
2. The most common pulmonary CT findings in near-fatal drowning consist of diffuse, hazy groundglass and alveolar opacities throughout the bilateral lungs, with sparing of the most lateral, apical and basilar regions, coalescing in the perihilar and medial lung zones.  
3. The most common abdominal CT finding in near-fatal drowning is a distended stomach, with increased amount of gastric fluid which can have increased attenuation reflecting aspirated sand or sediment.

### TABLE OF CONTENTS/OUTLINE
1. Introduction  
2. Epidemiology  
3. Pathophysiology  
4. Imaging manifestations:  
   - Neurologic  
   - Cardiopulmonary  
   - Abdominal  
   - Musculoskeletal  
5. Conclusion

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**ERE198**

### Spectrum of Findings of Hypovolemic Shock Complex in Severe Blunt Trauma seen on Whole-Body MDCT

*Education Exhibits*  
Location: ER Community, Learning Center

#### Participants
- **Cathy Zhang (Presenter):** Nothing to Disclose  
- **David Tso MD:** Nothing to Disclose  
- **Patrick McLaughlin FFR(RCSI):** Nothing to Disclose  
- **Silvia D. Chang MD:** Nothing to Disclose  
- **Savvas Nicolaou MD:** Nothing to Disclose

#### TEACHING POINTS
1. Recognize MDCT signs of hypovolemic shock complex in the setting of blunt trauma.  
2. Highlight the importance of early detection and significance of the findings in the management of patients that present to the emergency department.  
3. Review of the literature of prevalence of radiological findings in shock.

### TABLE OF CONTENTS/OUTLINE
1. Review the pathophysiology of hypovolemic shock and its main etiology in trauma  
2. Discuss the findings on MDCT imaging:  
   - Bowel wall thickening and enhancement (i.e. shock bowel)  
   - Presence of intraperitoneal or retroperitoneal free fluid  
   - Abnormal enhancement of solid organs including pancreas, spleen, liver, kidneys, and adrenal glands  
   - Edema surrounding the peri-hepatic IVC (i.e. halo sign)  
   - Flattening of IVC and aorta  
   - Acute contrast extravasation  
3. Highlight the management of patient who present to the emergency department with positive findings to suggest hypovolemic shock

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**ERE199**

### Out of Radiologist’s Sight: Sacral Fractures and Lumbosacral Dissociation

*Education Exhibits*  
Location: ER Community, Learning Center
Participants

Yan Epelboym MD, MPH (Presenter): Nothing to Disclose
Scott Sheehan MD: Nothing to Disclose
Michael Weaver MD: Nothing to Disclose
Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG
Bharti Khurana MD: Nothing to Disclose

TEACHING POINTS

1. Understanding of the pathophysiology of sacral fractures
2. Understanding of the spectrum of sacral fractures and lumbosacral dissociation
3. Relevant imaging findings for the orthopedic surgeon to guide effective treatment

TABLE OF CONTENTS/OUTLINE

1. Review the relevant anatomy of the sacrum in multiple imaging modalities
2. Illustrate the common mechanism of sacral injury utilizing 3D modeling and animation
3. Illustrate the most commonly encountered sacral fractures
4. Describe the classification systems of lumbosacral junction injuries and sacral fractures
5. Case based review of sacral fractures and lumbosacral junction injuries.

ERE202

Updated and Novel Imaging of Blunt Vascular Neck Injuries (BVNI)

Education Exhibits

Location: ER Community, Learning Center

Participants

Teresa I-Han Liang MD (Presenter): Nothing to Disclose
Shamir Rai BSC: Nothing to Disclose
William Chun Ki Lau MD: Nothing to Disclose
Savvas Nicolaou MD: Nothing to Disclose

TEACHING POINTS

1. Discuss scope, clinical presentation and rationale for screening of Blunt vascular neck injuries (BVNI)
2. Discuss the imaging modalities and spectrum of imaging findings used for diagnosis of BVNI
3. Review novel imaging techniques which have been introduced for dose reduction imaging of BVNI

TABLE OF CONTENTS/OUTLINE

- Review the pathophysiology, epidemiology, anatomy, and clinical presentation of BVNI
- Review the utility and limitations of imaging modalities used for assessment of BVNI such as ultrasound, angiography, MRI and MR angiography, with emphasis on MDCT as the main imaging modality
- Demonstrate the spectrum of imaging examples of BVNI including minimal intimal injury, raised intimal flap, pseudoaneurysm, occlusion and transection with contrast extravasation
- Review the imaging classification system of BVNI with imaging examples
- Discuss an imaging-based management algorithm for evaluation, management and follow-up of BVNI
- Review imaging examples of pitfalls and mimics associated with BVNI such as streak artifacts and fibromuscular dysplasia
- Discuss new imaging techniques applicable for imaging of BVNI including use of new dose reduction techniques such as iterative reconstruction and dual-energy CT

SSA05

Emergency Radiology (Practice and Protocols)

Scientific Papers

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Sun, Nov 30 10:45 AM - 12:15 PM Location: N228

Participants

Moderator
Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG
Moderator
Ferco H. Berger MD: Nothing to Disclose

Sub-Events

SSA05-01

Emergency Department Imaging Utilization: What Factors are Associated with High Imaging Volume?

Meir Hillel Scheinfeld MD, PhD: Nothing to Disclose, Kevin Burns MD (Presenter): Nothing to Disclose, Victoria Chernyak MD: Nothing to Disclose

PURPOSE

Predicting ED imaging volume would be helpful in scheduling radiologists and technologists. Our goal was to determine the relationship of triage volume, season, weather and day of the week on imaging volume.

METHOD AND MATERIALS

IRB approval was obtained. The hospital database was queried for daily ED triage volume and imaging studies performed from 2011 through 2013 at a large tertiary care urban medical center. Daily weather conditions (temperature, amount and type of precipitation) were obtained from National Oceanic and Atmospheric
Administration records. 'Extreme weather' was defined as temperature <32ºF or >90ºF. Day of the week and season were recorded. Pearson correlations were first used to compare daily triage volume to imaging volume by modality. Logistic regression was used to arrive at parsimonious models with dichotomous outcomes of having high imaging volume, defined as days above the 90th percentile for a given modality. All models were adjusted for day of the week.

RESULTS

There were 485,295 ED triages and 305,493 imaging studies performed during the study period. Pearson correlations between triage volume and imaging modality yielded r=0.73 (p<0.0001) for XR, >37 US or >73 CT exams. For every additional 50 triaged patients, the odds of having high XR volume increased by 4.3 times (95% CI 2.9-6.3, p<0.0001).

CONCLUSION

Higher ED triage volume is strongly associated with high XR volume and, to a lesser extent, with high CT and US volume. Extreme weather is associated with increased odds of having high CT volume but not US or XR. Amount or type of precipitation were not associated with high imaging volume.

CLINICAL RELEVANCE/APPLICATION

ED triage volume is the primary association of imaging volume, most prominently for radiography; therefore, factors which influence ED triages should be considered when determining radiology and technologist staffing.

Imaging Utilization Trends in Emergency Departments in the Medicare Population

Santosh Kumar Selvarajan MD (Presenter): Nothing to Disclose, David C. Levin MD: Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, Laurence Parker PhD: Nothing to Disclose, Vijay Madan Rao MD: Nothing to Disclose

PURPOSE

Policymakers and payers have been concerned with the rapid growth in imaging utilization. But recent studies have shown that outpatient advanced imaging use has leveled off and begun to drop. Our purpose was to see if this trend has manifested itself in Emergency Departments (EDs).

METHOD AND MATERIALS

The nationwide Medicare Part B Physician/Supplier Procedure Summary Master Files for 2002-2012 were the data source. CPT codes for plain radiography (XR), noncardiac ultrasound (US), CT, MRI, and nuclear medicine (NM) were aggregated by modality. Medicare's place-of-service codes were used to identify those exams done during ED visits, and its specialty codes were used to determine which specialties did the interpretations. Utilization rates per 1000 Medicare beneficiaries were calculated. Trends from 2002 to 2012 were assessed.

RESULTS

Between 2002 and 2012, the ED utilization rate per 1000 of XR increased from 248.8 to 320.0 (+29%). Noncardiac US increased from 9.5 to 21.0 (+121%). CT increased from 57.2 to 147.9 (+159%). MRI increased from 1.4 to 5.1 (+264%). Only NM showed a slight numerical decline, from 2.8 to 2.1 (-25%). This was largely due to code bundling that occurred in myocardial perfusion imaging in 2010. In each of the first 4 modalities, growth was steady and progressive with no evidence of slowing. Raw numbers per 1000 Medicare beneficiaries of accrued new exams between 2002 and 2012 were: XR 71.3, US 11.5, CT 90.7, MRI 3.7, NM -0.7. Radiologists' share of the interpretations in 2012 were: XR 97%, US 89%, CT 99%, MRI 99%, NM 93%.

CONCLUSION

In contradistinction to the trends among outpatients, utilization rates of imaging in EDs grew continuously and substantially from 2002 to 2012. The largest numerical increases were seen in CT and XR. Radiologists strongly predominate in interpreting in all modalities. The degree of growth is of some concern and suggests that more attention needs to be directed to imaging appropriateness criteria in EDs.

CLINICAL RELEVANCE/APPLICATION

n/a

ED CT of the Abdomen and Pelvis Utilization has Continued to Increase, Despite what Appears to be a Reduction in Procedures caused by Code Bundling

Santosh Kumar Selvarajan MD (Presenter): Nothing to Disclose, David C. Levin MD: Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, Laurence Parker PhD: Nothing to Disclose, Vijay Madan Rao MD: Nothing to Disclose

PURPOSE

Previous studies have shown that the all imaging utilization rates have been stable since 2006 except CT which has continued to grow (overall annual growth of 3.4% from 2007-2009). From 2011, CPT codes for CT scans of the abdomen and pelvis were bundled into a single new code. Our purpose was to determine what effect this policy had on recent trends in CT utilization in ED.

METHOD AND MATERIALS

The nationwide Medicare Part B databases for 2000-2012 were used. The codes for CT of the abdomen and CT

n/a
of the pelvis were selected for all years of the study, and the bundled codes for CT abdomen/pelvis were selected for 2011 and 2012. Procedure volumes in ED and non-Ed (inpatient, office, and outpatient) settings were calculated. To understand the trends through the bundling years (2011 and 2012), we doubled the number of bundled codes, since these would have counted as 2 exams in 2010 and before.

RESULTS

The nationwide Medicare utilization rates of both CT abdomen and CT pelvis grew from 2000 to 2007 (4.8 M. to 9.7 M.) Thereafter, from 2008 to 2010, growth had stabilized except in ED (Non-ED, 8.1 M. to 7.7 M.; ED, 1.7 M. to 2.0 M).

There is a dramatic drop off in 2011 due to bundling: non-ED, 7.7 M. 4.2 M., Ed, 2.0 to 1.2 M When the bundled exams are doubled, 2011 non-Ed is stable at 7.8 M. exams; ED increases substantially from 2010, to 2.3 M. exams. In 2012, again counting the bundled code as 2 exams, non-ED volume is stable, at 7.8 M., while ED volume again increases substantially, to 2.6 M.

CONCLUSION

Medicare volumes of CT of the abdomen and CT pelvis show an apparent decline, but this is an artifact of code bundling. While procedure volume is stable in non-Ed settings, volume of CT of the abdomen and pelvis continue to grow strongly in the ED.

CLINICAL RELEVANCE/APPLICATION

New guidelines are probably required to reduce the CT utilization rates in Emergency.

SSA05-04

In-person Communication with a Radiologist in the Emergency Department Results in Improved Two-way Communication of Information, and May Improve Patient Care

Mariam Sofia Aboian MD, PhD (Presenter): Nothing to Disclose, Marcel Brus-Ramer MD, PhD : Nothing to Disclose, Allison Anne Tillack PhD : Nothing to Disclose, Mark Daniel Mamlouk MD : Nothing to Disclose, Peter Andrew Marcovici MD : Nothing to Disclose

PURPOSE

We hypothesized that the physical proximity of a radiologist to the treating providers in the ED would improve communication between radiologists and treating providers, and thus possibly improve care.

METHOD AND MATERIALS

The radiology resident on-call reading room at our university hospital was recently moved to the ED. Approximately 6 months later, the impact of this move was assessed via an IRB approved, HIPPA compliant survey [Figure 1] among ED faculty and residents (“providers”) after each in-person encounter with the on-call radiology resident.

RESULTS

27 surveys were completed during the study period. Direct in-person communication with radiology residents on-call was reported as "very important" (14/27) or "important" (11/27) for managing patients in the ED. 48% of providers stated they preferred to consult with a radiologist in-person for only their most difficult patients. In-person interaction was presumed to affect patient care, with 20/27 of the responders reporting that key information was communicated to the radiologist about the patient’s clinical history that would otherwise not have been communicated. In addition, 22/27 of the responders felt that they understood the imaging results better after the discussion as opposed to reading a "wet read" written report. Improved patient care due to direct communication was reported by 21/27 of the ED provider responders.

CONCLUSION

In-person communication between radiologists and ED providers was reported to be "important" or "very important" in 92% of cases, and was most often sought out by ED providers in perceived difficult cases. Critical history was provided to the radiologist that would not otherwise be communicated in 74% of surveyed encounters. Imaging findings were better understood by the ED providers in 81% of the encounters and there was improvement in patient care from the perspective of the majority of ED providers.

CLINICAL RELEVANCE/APPLICATION

In-person communication between ED providers and radiologists facilitates information sharing and thus may improve patient care in settings that require rapid communication.

SSA05-05

Effect of Patient Primary Spoken Language on CT Utilization in the Emergency Department

Bruce E. Lehnert MD (Presenter): Nothing to Disclose, Daniel S. Hippe MS : Research Grant, Koninklijke Philips NV Research Grant, General Electric Company, E. Sally Lee PhD : Nothing to Disclose, Lauren K. Whiteside MD : Nothing to Disclose, Ken Floris Linnau MD, MS : Speaker, Siemens AG Royalties, Cambridge University Press

PURPOSE

Effect of Patient Primary Spoken Language on CT Utilization in the Emergency Department
To determine if patient spoken language is associated with utilization of CT and time to CT imaging in the ED for patients who present without a trauma-related complaint.

METHOD AND MATERIALS

In this IRB approved, HIPAA compliant study, we retrospectively reviewed all adult ED visits from 10/1/2012 to 5/30/2013. Patient demographics, reported primary spoken language (PSL), Emergency Severity Index (ESI) score, time of ED admission and discharge, and CT (if performed) order time were recorded. Trauma and psychiatric patients, those with ESI scores 1 and 2, those with missing demographics, PSL or discharge time were excluded. The remaining patients were classified as moderate acuity (ESI=3) and low acuity (ESI=4, 5). Cox regression was used to evaluate the relationship between PSL and rate of CT while adjusting for other confounders. The association between PSL and time to CT order was assessed using generalized estimating equations (GEEs) while adjusting for other factors.

RESULTS

There were 17,651 ED visits by 12,124 patients which met the inclusion/exclusion criteria. 1,907 (16%) reported a non-English as their PSL. Before adjustments, a CT was ordered for 10.2% of patients with English PSL and 15.2% of patients with non-English PSL. In those for whom a CT was ordered, the average time to order was 124 +/- 93 min (English PSL) and 141 +/- 88 min (non-English PSL). After adjusting for sex, age, number of visits and time of admission, moderately acute patients with a non-English PSL had a 44% (CI: 23-68%; p<0.001) higher chance of getting a CT ordered when in the ED >1.5 hrs and had a 13.6 min longer mean time to CT order (CI: 3.0-24.3; p=0.01). Non acute patients with non-English PSL had an 88% (CI: 26-181%; p=0.002) higher chance of getting a CT ordered when in the ED >1.5 hrs and had a 41.6 min longer mean time to CT order (CI: 11.2-72.0; p=0.007). CT ordering rates were comparable when done < 1.5 hrs after admission.

CONCLUSION

Patients who report a non-English PSL have a significantly increased likelihood of undergoing CT in the ED and there is a significantly longer time to CT order placement.

CLINICAL RELEVANCE/APPLICATION

Patient primary spoken language association with CT use in the Emergency Departments represents a potential source for disparity in health care between English and non-English speaking patients.

SSA05-06

Dual Energy Post-processing of Incidental Renal Lesions Encountered in the Emergency Department: Reducing the Need for Follow-up Imaging

Jeremy Robert Wortman MD (Presenter): Nothing to Disclose, Urvi Pravin Fulwadhva MD: Nothing to Disclose, Jeffrey Y. Shyu MD: Nothing to Disclose, Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG

PURPOSE

To quantify the incidence of indeterminate renal lesions during routine dual energy CT (DECT) in an Emergency Department (ED) setting, and to assess the potential of DECT post-processing to characterize lesions and eliminate the need for further follow-up evaluation.

METHOD AND MATERIALS

1400 consecutive contrast enhanced abdominal CT scans were included in the study cohort, obtained in the ED using a DE CT protocol (Siemens SOMATOM Definition Flash). All scans were reviewed by a radiologist to assess for the presence of an indeterminate renal lesion defined for potentially solid lesions as size > 5 mm, attenuation > 20 HU, and lack of macroscopic fat, or for a cystic lesion as presence of thick septations or calcifications, thickened wall, or mural nodules. DE post-processing was performed on all lesions, which were considered enhancing if there was greater than 15 HU from iodine in contained DE regions of interest. All lesions were subsequently re-classified as benign or indeterminate.

RESULTS

At least one indeterminate renal lesion was identified in 57 (4.1%) patients, with mean lesion size of 1.7 cm. 36/57 (63%) were classified as benign (non-enhancing) after review of the iodine overlay images (36/36 Bosniak II cysts). The remaining 21 lesions (37%) could not be classified as benign (14 enhancing masses; 12/14 < 20 mm, 2/14 > 20 mm; 6 Bosniak IIF cysts, 1 Bosniak III cyst). Of the 57 indeterminate lesions, 9 had correlative imaging obtained with MR, CT, or US, with concordant results in all cases (1 enhancing mass, 8 Bosniak II/IIF cysts).

CONCLUSION

4.1% of ED patients undergoing abdominal CT had an incidentally detected indeterminate renal lesion. DE CT exonerated 63% of these lesions as benign, potentially averting the need for further workup in 2.6% of ER patients imaged by abdominal CT.

CLINICAL RELEVANCE/APPLICATION

If performed routinely, dual energy CT has the potential to substantially reduce the need for follow-up imaging to further characterize indeterminate renal lesions incidentally detected on Emergency Department abdominal CT scans.
SSA05-07 Non-trauma-associated Incidental Findings in Whole-body CT Examinations in Patients with Suspected Multiple Trauma

Martin Helmut Maurer MD (Presenter): Nothing to Disclose, Eduard Kroczek: Nothing to Disclose

PURPOSE

In patients with suspected multiple trauma whole-body computed tomography (wbCT) is the gold standard in the initial diagnostic work-up. As wbCT gives not only a rapid and precise overview on traumatic lesions it may also reveal associated non-traumatic findings of variable clinical importance. The aim of this study was to evaluate the number and quality of such incidental findings in patients that underwent whole-body CT examination due to suspected multiple trauma in a Level I trauma center.

METHOD AND MATERIALS

In a retrospective study between 2009 and 2013 a total of 2,909 patients (1,909 male, 800 female) with suspected multiple trauma were retrospectively analyzed with regard to non-trauma-associated incidental findings obtained in whole-body CT examination at initial admission. Findings were categorized by two readers in consensus according to the body region (head, neck, thorax, abdomen/pelvis, musculoskeletal system) and their clinical importance (category 1= further diagnostic work-up or therapeutic intervention urgently needed within initial hospitalization; 2= further work-up needed within less than 3 months; 3= findings that may result in health problems in the future; 4= benign incidental finding, no further work-up needed, variants).

RESULTS

Overall, 5,977 incidental findings were documented in 2,074 patients, thereof 1,135 in the head, 262 at the neck, 2,541 in the abdomen and 779 findings of the musculoskeletal system. There were 294 patients (9.9%) with a category 1 finding where further work-up or therapy was urgently needed, 673 patients (24.8%) with a category 2 finding, 775 patients (28.6%) with a category 3 finding and 332 patients (12.2%) with a category 4 finding.

CONCLUSION

Whole-body CT scans of patients with a suspected multiple trauma show a considerable number of non-trauma-associated incidental findings. There was at least one incidental finding in one out of two patients and a finding requiring urgent follow-up or therapy in one out of ten patients.

CLINICAL RELEVANCE/APPLICATION

In patients initially imaged with wbCT for suspected multiple trauma, radiologists and trauma surgeons must be aware of a high number of non-traumatic incidental findings with clinical relevance.

SSA05-08 Incidence of Acute Myocardial Infarction in Patients with Suspected Acute Pulmonary Embolism: Rationale for Low Dose Triple Rule out CT in the Acute Setting

Shamir Rai BSC: Nothing to Disclose, David Tso MD (Presenter): Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose

PURPOSE

The purpose of our study was to retrospectively determine the incidence of acute myocardial infarction (MI) in emergency patients with suspected pulmonary embolism (PE) who underwent chest computed tomography pulmonary angiography (CTPE). Given the advent of low dose Triple-Rule-Out (TRO) CT examination with advanced detector and reconstruction technology, reduced contrast medium volumes and improved image quality at low tube kilovoltage, and the continued morbidity, mortality, costs, and catastrophic consequences associated with missed acute MIs it would seem feasible to perform TRO CT examinations over CT chest (CTPE) when looking for a suspected PE in the acute setting in high-risk patient populations.

METHOD AND MATERIALS

The reports of 4596 consecutive patients who underwent CTPE between January 2011 and March 2014 at a single institution were retrospectively reviewed. The total number of patients that displayed CT signs of an acute MI were recorded and compared to the total number of CTPE that were conducted in the given time period.

RESULTS

Seventeen patients, of which 12 were male and 5 were female, ranging in age from 47 to 90, (mean age, 68.82 +/- 13.87 [SD] years) were identified as having an acute MI when being worked up for a PE via CTPE out of a total of 4596 chest CTs (PE protocol) conducted (0.37%). A total of 13 out of 17 patients (76%) were over the age of 60 with identified MI on the CTPE protocol.

CONCLUSION

This investigation establishes a baseline of 0.37% for the incidence of MI in patients being worked up for PE via chest CTPE protocol. Determination of the number of patients with aortic dissection, valvular, myocardial and other coronary artery disease (CAD) has not been explored in this study, but would further support a TRO CT over a chest CT (CTPE). As it stands TRO CT examination techniques, especially in patients over the age of 60, have the potential to reduce the number of hospitalized patients and reduce total health care costs.
**SSA05-09**

**Maximizing the Golden Hour: Assessing the Novel Prototype Polytrauma Viewer in the Setting of Unstable Acute Polytrauma Patients**

Shamir Rai BSC: Nothing to Disclose, David Tso MD (Presenter): Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Chesnal Dey Arepalli MD: Nothing to Disclose, Luck Jan-Luck Louis MD: Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose

**PURPOSE**

The purpose of this study is to evaluate the clinical utility of the novel prototype Polytrauma Viewer (Siemens Healthcare, Forchheim, Germany) in the setting of unstable acute polytrauma patients.

**METHOD AND MATERIALS**

32 unstable blunt acute trauma patients, between Nov. 2009 and Mar. 2014, meeting the criteria of SBP = 16, at a level 1 trauma center who underwent a whole-body CT (WBCT) scan were identified. Time to conduct the WBCT and time to final reconstruction was recorded. Two trauma radiologists (combined experience of 24 years) were blinded and interpreted the scans for life-threatening injuries [defined as non-contained vascular injury, unstable fractures, aortic dissection, tension pneumothorax, and intra/extra axial hemorrhage with significant mass effect] using the PACS workstation as the gold standard and the novel Polytrauma Viewer. Qualitative and quantitative measurements were used for image assessment. Time to load and process images, time to interpret and reach a final diagnosis, confidence of exclusion of life-threatening injuries (on a scale of 1-10, with 1 representing no confidence and 10 representing high confidence) and missed diagnosis were recorded when compared to the final report.

**RESULTS**

The mean total time to scan, perform the WBCT and complete the last reconstruction was 458s±258, 18.47s±11.89 and 3454s±1610 respectively. A significant reduction (p

**CONCLUSION**

The novel Polytrauma Viewer (Siemens Healthcare, Forchheim, Germany) is a promising prototype that can reduce the time to identification of life-threatening injuries in the acute traumatic setting through automatic reconstruction techniques and autosplitting the WBCT.

**CLINICAL RELEVANCE/APPLICATION**

The novel Polytrauma Viewer can reduce the time to identification of life-threatening injuries in the acute traumatic setting without diagnostic compromise, thereby potentially improving patient outcome and increasing the likelihood of patient survival.

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**ERS-SUA**

**Emergency Radiology Sunday Poster Discussions**

**Scientific Posters**

**ER**

AMA PRA Category 1 Credits™: .50

Sun, Nov 30 12:30 PM - 1:00 PM Location: ER Community, Learning Center

**Participants**

Moderator

Savvas Nicolaou MD: Nothing to Disclose

**Sub-Events**

**ERS203**

**Impact of CT on Geriatric Patients Presenting to the Emergency Department with Acute Abdominal Pain (Station #1)**


**PURPOSE**

To evaluate the diagnostic yield of abdominopelvic computed tomography (CT) in geriatric patients presenting to the Emergency Department (ED) with acute abdominal pain and effect on management.

**METHOD AND MATERIALS**

Medical records search from 1/2004-1/2013 identified 327 geriatric patients (> 80 yo; 248 women, 79 men) undergoing abdominopelvic CT in the ED for acute abdominal pain. Cases were reviewed for study indication and pre-CT vs. post-CT diagnoses. Report interpretations were categorized into with and without acute findings. Those with acute results were subdivided into medical and surgical diagnoses. Analysis of ED records was...
performed to determine whether results of the CT changed management, including medication treatment changes, referrals to a subspecialty, surgical operations and minimally invasive procedures. Anticipated admission status prior to imaging, actual disposition from the ED, and final disposition of those admitted were also recorded.

RESULTS

Of the 327 geriatric patients undergoing CT in the ED for acute abdominal pain, the most common indications for CT were small bowel obstruction (SBO) (66/327, 20%), abdominal aortic aneurysm rupture or dissection (40/327, 12%), diverticulitis (37/327, 9%), and bowel ischemia or perforation (30/327, 9%). Most common CT diagnoses were gastrointestinal ischemia (28/249, 11%), diverticulitis/colitis (23/249, 9%) and SBO (22/249, 9%). Of all patients, 214 (65%) required hospital admission, of which results of CT determined admission in 144 patients (67%). 249 of 327 patients (77%) had acute or treatable positive findings on CT (119 medical, 130 surgical). CT changed management in 92 patients (37%); 10 medically and 82 surgically. Patients with surgical issues (82/130, 62%) were treated operatively (41/82, 50%) or with minimally invasive operations/procedures (41/82, 50%).

CONCLUSION

Radiology interpretations from abdominopelvic CTs obtained in the ED have an impact on geriatric patient management, influencing primarily surgical rather than medical issues and subsequent treatment.

CLINICAL RELEVANCE/APPLICATION

The utilization of CT in the geriatric patient population will be an increasingly important issue for future health care management and cost.

ERS205

Decreased Birth Weight Associated with Administration of Intravenous Contrast for Computed Tomography during Pregnancy (Station #3)


PURPOSE

Standard guidelines recommend that iodinated contrast media be avoided during pregnancy based on in vitro and animal studies but few reports have assessed its use clinically. We examined the risk of pregnancy complications associated with the use of intravenous iodinated contrast for CT in pregnant women.

METHOD AND MATERIALS

We retrospectively reviewed charts of pregnant women undergoing CT with or without iodinated contrast at our institution between February 2005 and December 2013. We divided patients into a study group that received contrast with CT and a control group that underwent CT without contrast. Patients were only included if their CT was negative and they were followed until delivery. Demographic and clinical data was recorded and compared between the two groups using a two-tailed t-test.

RESULTS

336 pregnant women with CT during their pregnancy were recruited. 15 patients with positive CT results and 102 patients with poor follow-up were excluded. 128 patients received contrast with abdominal, pelvic, or chest CT and 91 underwent non-contrast head CT. Mean birth weight was significantly lower in the contrast administered group (2679 g) versus the control group (3055 g) (p<0.01). There were no statistically significant differences between groups regarding mean age of the mother at the time of delivery, mean gestational age at delivery, or APGAR scores at 1 and 5 minutes (p>0.05). Mean gestational age at time of CT was significantly later in the contrast group (25 weeks vs. 22 weeks; p<0.05).

CONCLUSION

Based on this preliminary retrospective study it appears that the administration of iodinated contrast for CT during pregnancy may be associated with lower birth weight. Further studies are indicated to validate and understand this association.

CLINICAL RELEVANCE/APPLICATION

Findings from this study may further substantiate the recommendations for limiting the use of iodinated contrast media for CT in pregnant women.

ERS206

When the Appendix is not Seen on Ultrasound for RLQ Pain: Does the Interpretation of Emergency Department Physicians Correlate with Diagnostic Performance? (Station #4)

Donald Le Ly MD, BEng (Presenter): Nothing to Disclose, Seng Thipphavong MD : Nothing to Disclose, ERS205

PURPOSE

To determine whether the interpretation of emergency department physicians correlates with diagnostic performance.”

METHOD AND MATERIALS

We retrospectively reviewed charts of pregnant women undergoing CT with or without iodinated contrast at our institution between February 2005 and December 2013. We divided patients into a study group that received contrast with CT and a control group that underwent CT without contrast. Patients were only included if their CT was negative and they were followed until delivery. Demographic and clinical data was recorded and compared between the two groups using a two-tailed t-test.

RESULTS

336 pregnant women with CT during their pregnancy were recruited. 15 patients with positive CT results and 102 patients with poor follow-up were excluded. 128 patients received contrast with abdominal, pelvic, or chest CT and 91 underwent non-contrast head CT. Mean birth weight was significantly lower in the contrast administered group (2679 g) versus the control group (3055 g) (p<0.01). There were no statistically significant differences between groups regarding mean age of the mother at the time of delivery, mean gestational age at delivery, or APGAR scores at 1 and 5 minutes (p>0.05). Mean gestational age at time of CT was significantly later in the contrast group (25 weeks vs. 22 weeks; p<0.05).

CONCLUSION

Based on this preliminary retrospective study it appears that the administration of iodinated contrast for CT during pregnancy may be associated with lower birth weight. Further studies are indicated to validate and understand this association.

CLINICAL RELEVANCE/APPLICATION

Findings from this study may further substantiate the recommendations for limiting the use of iodinated contrast media for CT in pregnant women.
PURPOSE

To determine the attitudes of emergency department (ED) physicians (MDs) towards non-visualization of the appendix (NVA) on ultrasound (US) scans for RLQ pain and to assess ultrasounds' diagnostic performance.

METHOD AND MATERIALS

A survey was administered to 166 ED MDs at several academic hospitals to determine their interpretation and practice after receiving an ultrasound report with NVA. Retrospective review of three large academic EDs revealed 1672 US scans performed for appendicitis in 2012. 291 (17.4%) explicitly indicated NVA and underwent a chart review of US findings, follow-up imaging, and surgical findings to determine the negative predictive value of NVA and utility of secondary findings. Univariate analysis was performed to determine which secondary signs of appendicitis were significant (P<0.05) predictors of a positive CT scan.

RESULTS

95/166 (57%) of ED MDs completed the survey; 53% had >10 years experience. After receiving an US report with NVA, 92% indicated re-examining the patient; 79% felt further imaging was required and 61% would proceed with CT. Only 18/95 (19%) of ED MD believed that follow up CT is positive for appendicitis in less than 30% of NVA; 71% agreed that a level of certainty scale would be helpful on radiology reports for appendicitis. Of 291 US scans with NVA, 246 (85%) were female (mean age 31y). In 229/291 (79%) patients with NVA and no alternate diagnosis; in 9/13 secondary signs of appendicitis were noted. Therefore negative predictive value (NPV) for NVA was 216/229 (94.3%). Inflammatory changes in RLQ (p=0.01) and focal tenderness (p=0.02) on US were significant predictors of a positive CT scan.

CONCLUSION

Current perceptions and practice of some ED physicians equate NVA on US as an inadequate study to exclude appendicitis. However, NVA is itself a highly predictive sign (94.3%) of absence of appendicitis when an alternate cause of pain is not seen.

CLINICAL RELEVANCE/APPLICATION

Dissemination of the high NPV of ultrasound in RLQ pain among ED MDs may lead to diminished resource utilization. Radiologists can add value to ED MDs by providing an evidence-based level of certainty scale for US findings when assessing for appendicitis.

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**ERE102**

Bowel Pathology in Color versus Shades of Gray: Understanding Bowel Diseases with Use of Dual Energy CT and Iodine Maps (Station #3)

Urvi Pravin Fulwadhva MD (Presenter): Nothing to Disclose, Jeremy Robert Wortman MD : Nothing to Disclose, Aaron D. Sodickson MD, PhD : Research Grant, Siemens AG

TEACHING POINTS

1. Dual energy CT can help to enhance subtle tissue characteristics in the bowel in both benign and malignant disease processes (infectious, inflammatory, GI bleed, small bowel obstruction and neoplasms) with use of iodine map and iodine overlay images. 2. Use of dual energy CT protocols and post processing can be integrated in daily clinical routine to add further insights in bowel imaging.

TABLE OF CONTENTS/OUTLINE

1. Brief primer of dual energy physics with attention to three-material decomposition and calculation of iodine content for display of iodine maps and virtual noncontrast images. 2. Case-based review of benign and malignant disorders of the bowel in both conventional gray-scale CT images and iodine maps. Emphasis on improved ability to detect and characterize bowel disease through use of dual-energy iodine content information, including the range of infectious, inflammatory, ischemic, and neoplastic bowel pathology. 3. Potential use of dual energy CT and iodine maps in monitoring response to treatment and modulating therapy in patients with benign and malignant bowel diseases.

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**ERS-SUB**

Emergency Radiology Sunday Poster Discussions

Scientific Posters

ERS207

High-Dose Radiographic Examinations in the ED: Can We Justify Exposures in the Era of Ultra-Low-Dose CT? (Station #1)

Elizabeth H. Y. Du BA, BSc : Nothing to Disclose, Amdad Mustafa Ahmed MBChB, FRCR : Nothing to Disclose, Patrick McLaughlin FFR(RCSI) (Presenter): Nothing to Disclose
PURPOSE

Ultra-low-dose CT protocols at the authors' institution result in a mean effective dose of 0.1 mSv, 0.2 mSv and 0.4 mSv in the chest, abdomen/thoracic spine and pelvis/lumbar spine, respectively. Similar exposure levels have been reported in the literature by McLaughlin et al. (Insights Imaging, Nov 2013) and Hanna et al. (J. Thorac. Cardiovasc. Surg., Jan 2014). We conducted a retrospective analysis of radiation exposure related to radiographic examinations of the chest, abdomen, thoracic spine, lumbar spine and pelvis in the ED of a level one trauma centre to determine the percentage of radiographs which exceeded mean exposure levels encountered at ultra-low-dose CT.

METHOD AND MATERIALS

Ethics approval was obtained. A total of 1261 radiographic examinations were included in this study (255 chest, 252 abdominal, 251 thoracic spine, 251 lumbar spine and 252 pelvic). Dose area product values (DAP, dGy cm²) for each image were obtained for all datasets, as was the examination indication and report findings. Individual DAPs were summed for multiple views to obtain a total DAP. Mean effective dose (MED, mSv) was calculated for each examination using published DAP-MED conversion factors (PA/lateral chest 0.012 mSv/dGy cm², AP chest 0.021 mSv/dGy cm², abdomen 0.026 mSv/dGy cm², thoracic spine 0.019 mSv/dGy cm², lumbar spine 0.021 mSv/dGy cm² and pelvis 0.029 mSv/dGy cm²).

RESULTS

Mean and SD for the studies were: chest (0.061 mSv, 0.107 mSv), abdomen (1.025 mSv, 1.152 mSv), thoracic spine (1.124 mSv, 1.045 mSv), lumbar spine (1.074 mSv, 1.087 mSv) and pelvis (1.313 mSv, 1.075 mSv). MEDs for radiographs exceeded those for ultra-low-dose CT in 11% of chest, 96% of abdominal, 91% of thoracic spine, 81% of lumbar spine and 80% of pelvic examinations. Significant radiographic findings contributing to patient care were found in 32% of chest, 24% of abdominal, 22% of thoracic spine, 22% of lumbar spine and 35% of pelvic examinations.

CONCLUSION

This study demonstrates that a significant percentage of plain radiographs are performed at a greater radiation exposure than encountered in novel ultra-low-dose CT protocols, often with relatively low diagnostic yield. The context of our findings will be illustrated with clinical examples of ultra-low-dose CT images obtained in the ED at our institution.

CLINICAL RELEVANCE/APPLICATION

We believe these findings will contribute to a paradigm shift as to how we best deliver ionizing radiation in the ED in future years.

ERS204

Identifying Emergency Room Patients’ Understanding of Health Care Personnel Responsible for Interpreting their Ultrasound Imaging (Station #2)

Samer Dabbo MD (Presenter): Nothing to Disclose

PURPOSE

To determine patients' understanding of the role and educational background of professionals performing emergency ultrasound (ERUS).

METHOD AND MATERIALS

This was a prospective IRB approved study where adult patients referred for ERUS to radiology department after-hours (5pm-8am and weekends) were approached to complete a one-page questionnaire following their ultrasound examination. Questionnaire focused on the professional responsible for interpreting examinations and their education. A non-random sampling approach was used in recruitment of patients based on patient's condition (i.e. only medically stable patients were approached). All examinations were performed by a sonographer and some patients were reexamined by a resident or staff radiologist. All accrued patients signed a consent.

RESULTS

271 surveys were completed with 68% of respondents being female. Patients' age ranged from 18-76 years old (median 34 y.o). 76% of patients had a college degree. Patients identified the following health care providers as responsible for interpreting the images of their scan: radiologists (51%), emergency doctor (40%), family doctor (7%) and nurse (2%). Patients identified the following health care providers as most qualified for interpreting the images of their scan: radiologists (39%), emergency doctor (33%), family doctor (24%) and nurse (4%). The majority of patients (76%) recognized radiologists as medical doctors. Patient understood the role of the radiologist as the following: interpret the scan (51%), perform the scan (40%), consultant to your doctor (36%) and organize the scan (22%). The majority of patients (72%) wanted to speak directly with the individual who interpreted the images of their scan. There was no statistically significant association between gender, age or education level with respect to willingness to speak directly with the individual who interpreted the images (p>0.05).

CONCLUSION

The majority of patients recognize radiologists as medical doctor who primarily responsible for interpretation of the examination. In addition, the majority would prefer to speak directly with the individual who interprets their scan.
CLINICAL RELEVANCE/APPLICATION

Emergency room patients prefer to speak directly with individuals who interpret their ultrasound exam. The implications of this study may be to shift the paradigm towards a more visible role for radiologists.

Role of Neuroimaging in Patients Presenting with Headache in the Emergency Room (Station #2)

Mahbubul Patwary MD (Presenter): Nothing to Disclose, Daniel Fung MD: Nothing to Disclose

PURPOSE

Each year as many as 3 million patients present to an emergency department (ED) for treatment of headache. With the rising use of imaging, neuroimaging has become an important financial and radiation safety issue. We investigated the diagnostic utility of computed tomography (CT) scans of the brain in patients with headache in order to propose a revised indication for neuroimaging in the community hospital emergency room setting.

METHOD AND MATERIALS

Electronic medical records from August 2013 to April 2014 were reviewed retrospectively from any patient who presented to the ED with a non-traumatic headache, as a primary or secondary diagnosis, who had a CT scan of the brain. Clinical stratification of headaches was not performed in order to exclude potential subjective data. Quantifiable measures including vital signs, lab values and physical exams were reviewed in order to identify potential risk factors. Outcome of this study was defined as any positive finding on neuroimaging requiring hospital admission.

RESULTS

179 patients met the inclusion criteria and only two patients (1.1%) had neuroimaging findings requiring admission. The positive cases presented with focal neurological symptoms, hypertension greater than 140/90 mmHg, and age > 60. Non-contributory variables included sex, general appearance, other vital signs, and acute phase laboratory values. Furthermore, 27 patients with a known history of migraines (15.1%) did not demonstrate any positive neuroimaging findings.

CONCLUSION

The overwhelming majority of patients who presented to the emergency department with a headache had a neuroimaging study not requiring admission. The data suggests most of these scans are unnecessary and lead to increased radiation exposure and healthcare costs. This preliminary data is part of a longitudinal study, which can potentially set guidelines for appropriate neuroimaging in the ED.

CLINICAL RELEVANCE/APPLICATION

The benefit of neuroimaging in the setting of headache may be not be justified by the radiation risk and associated healthcare cost.

Identifying Emergency Room Patients’ Understanding of Health Care Personnel Responsible for Interpreting their Ultrasound Imaging (Station #2)

Mostafa Atri MD: Nothing to Disclose

PURPOSE

To determine patients’ understanding of the role and educational background of professionals performing emergency ultrasound (ERUS).

METHOD AND MATERIALS

This was a prospective IRB approved study where adult patients referred for ERUS to radiology department after-hours (5pm-8am and weekends) were approached to complete a one-page questionnaire following their ultrasound examination. Questionnaire focused on the professional responsible for interpreting examinations and their education. A non-random sampling approach was used in recruitment of patients based on patient’s condition (i.e. only medically stable patients were approached). All examinations were performed by a sonographer and some patients were reexamined by a resident or staff radiologist. All accrued patients signed a consent.

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CONCLUSION

The majority of patients recognize radiologists as medical doctor who primarily responsible for interpretation of
the examination. In addition, the majority would prefer to speak directly with the individual who interprets their scan.

CLINICAL RELEVANCE/APPLICATION

Emergency room patients prefer to speak directly with individuals who interpret their ultrasound exam. The implications of this study may be to shift the paradigm towards a more visible role for radiologists.

ERS208

Role of Neuroimaging in Patients Presenting with Headache in the Emergency Room (Station #2)

Michael T. Mantello MD : Nothing to Disclose

PURPOSE

Each year as many as 3 million patients present to an emergency department (ED) for treatment of headache. With the rising use of imaging, neuroimaging has become an important financial and radiation safety issue. We investigated the diagnostic utility of computed tomography (CT) scans of the brain in patients with headache in order to propose a revised indication for neuroimaging in the community hospital emergency room setting.

METHOD AND MATERIALS

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CONCLUSION

The overwhelming majority of patients who presented to the emergency department with a headache had a neuroimaging study not requiring admission. The data suggests most of these scans are unnecessary and lead to increased radiation exposure and healthcare costs. This preliminary data is part of a longitudinal study, which can potentially set guidelines for appropriate neuroimaging in the ED.

CLINICAL RELEVANCE/APPLICATION

The benefit of neuroimaging in the setting of headache may be not be justified by the radiation risk and associated healthcare cost.

ERS209

CT Brain Perfusion (CTP): Do We Really is Useful in Ischemic Stroke? (Station #3)

Agustina Vicente Bartulos MD (Presenter): Nothing to Disclose, Michal Kawiorski ? : Nothing to Disclose, Daniel Lourido Garcia : Nothing to Disclose, Luis Gorospe Sarasua : Nothing to Disclose, Alfonso Muriel Garcia : Nothing to Disclose, María Alonso de Lecinana Cases : Nothing to Disclose

PURPOSE

The mismatch hypothesis has been used to identify recoverable tissue in acute stroke. However, its utility has been questioned. We performed a study to determine whether CT perfusion (CTP) accurately identify salvable tissue and if the findings have a translation into clinic.

METHOD AND MATERIALS

Prospective registry of patients with severe anterior circulation stroke subjected to reperfusion therapies. We recorded clinical characteristics, urgent neuroimaging data (baseline multimodal CT, non-contrast CT at 24 hours), occurrence of recanalization and outcomes at three months (NIHSS and mRS). Volumetric measurement of infarct core (reduced blood volume) and at risk tissue (reduced blood flow with normal volume) in CTP were performed. In 24-h-CT total volume of lesion (TVL) and partial volume (PVL) of lesion in the slices corresponding to the perfusion acquisition cage, were measured. Percentage of at risk tissue not incorporated to the final lesion was estimated and correlated with outcomes.

RESULTS

34 patients were included, median age 66.5 years (P25; P75: 60; 75). Baseline NIHSS 17 (14; 22). Location of the thrombus was: 21% Intracranial ICA, 62% M1 and 17% M2 segment of the MCA. Lesion volumes were: Core: 10.6 mL (4;18); at risk tissue: 74.3 mL (56; 91); mismatch 89% (79; 95), TVL: 12.4 mL (8;54); PVL: 10.7 mL (5; 33). Percentage of at risk tissue that did not incorporate into the final lesion was reduced when recanalization occurred: 89 % (76; 94) vs 46 % (23; 86), p =0.0044. For every 10 % of preserved tissue, NIHSS score improved by 3 points (95% CI: -4.9 - -0.8, p=0.007). Higher percentage of preserved tissue increased probability of independency (mRS 0-2) OR 1.15 (95% CI 1.04- 1.28).

CONCLUSION

CTP identify salvable tissue in acute stroke. Higher percentage of preserved at risk tissue is associated with
better clinical outcome. The futile recanalization is associated with lower percentage of penumbra saved.

**CLINICAL RELEVANCE/APPLICATION**

This study helps us to determine the value of CT-Perfusion. Other parameters that may have clinical relevance are also being assessed (collateral, thrombus location ...). We are trying to obtain a predictive clinico-radiological scale to select patients who will benefit from reperfusion therapies.

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**ERS210**

**ED CT of the Abdomen and Pelvis Utilization has Continued to Increase, Despite what Appears to be a Reduction in Procedures caused by Code Bundling (Station #4)**

Santosh Kumar Selvarajan MD (Presenter): Nothing to Disclose, David C. Levin MD : Consultant, HealthHelp, LLC Board of Directors, Outpatient Imaging Affiliates, LLC, Vijay Madan Rao MD : Nothing to Disclose, Laurence Parker PhD : Nothing to Disclose

**PURPOSE**

Previous studies have shown that the all imaging utilization rates have been stable since 2006 except CT which has continued to grow (overall annual growth of 3.4% from 2007-2009). From 2011, CPT codes for CT scans of the abdomen and pelvis were bundled into a single new code. Our purpose was to determine what effect this policy had on recent trends in CT utilization in ED.

**METHOD AND MATERIALS**

The nationwide Medicare Part B databases for 2000-2012 were used. The codes for CT of the abdomen and CT of the pelvis were selected for all years of the study, and the bundled codes for CT abdomen/pelvis were selected for 2011 and 2012. Procedure volumes in ED and non-Ed (inpatient, office, and outpatient) settings were calculated. To understand the trends through the bundling years (2011 and 2012), we doubled the number of bundled codes, since these would have counted as 2 exams in 2010 and before.

**RESULTS**

The nationwide Medicare utilization rates of both CT abdomen and CT pelvis grew from 2000 to 2007 (4.8 M to 9.7 M.) Thereafter, from 2008 to 2010, growth had stabilized except in ED (Non-ED, 8.1 M to 7.7 M.; ED, 1.7 M to 2.0 M).

There is a dramatic drop off in 2011 due to bundling: non-ED, 7.7 M, 4.2 M., Ed, 2.0 to 1.2 M When the bundled exams are doubled, 2011 non-ED is stable at 7.8 M. exams; ED increases substantially from 2010, to 2.3 M. exams. In 2012, again counting the bundled code as 2 exams, non-ED volume is stable, at 7.8 M., while ED volume again increases substantially, to 2.6 M.

**CONCLUSION**

Medicare volumes of CT of the abdomen and CT pelvis show an apparent decline, but this is an artifact of code bundling. While procedure volume is stable in non-ED settings, volume of CT of the abdomen and pelvis continue to grow strongly in the ED.

**CLINICAL RELEVANCE/APPLICATION**

New guidelines are probably required to reduce the CT utilization rates in Emergency.

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**ERE191**

**Imaging of Traumatic Preganglionic and Postganglionic Brachial Plexus Injuries (Station #5)**

Yoshimi Endo MD (Presenter): Nothing to Disclose

**TEACHING POINTS**

1. To review the normal appearance of conventional and CT myelograms of the cervical spine.
2. To review the imaging features of preganglionic brachial plexus injuries, including conventional and CT myelographic features of both complete and partial cervical nerve root avulsions.
3. To identify traumatic injuries to the postganglionic brachial plexus, focused on MRI

**TABLE OF CONTENTS/OUTLINE**

Preganglionic nerve roots - Normal anatomy of the preganglionic nerve roots/rootlets - Normal appearance of the nerve roots/rootlets on conventional and CT myelography - Myelographic features of complete and partial nerve root avulsions with MRI correlation Postganglionic brachial plexus - Anatomy of the components of the brachial plexus - Imaging techniques on MRI and ultrasound of the plexus - Normal appearance of the brachial plexus on MRI and ultrasound - Traumatic postganglionic brachial plexus injuries on MRI, including avulsions from high-energy trauma, traction from sports-related injuries and shoulder dislocations, and plexus injuries as a complication of fractures.
RC105

Brain Aneurysms

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: N230AB

Participants

Moderator
Jacqueline Anne Bello MD : Nothing to Disclose

Sub-Events

RC105A  Diagnostic Evaluation of Brain Aneurysms
Juan Pablo Villablanca MD (Presenter): Research collaboration, VasSol, Inc Research collaboration, Toshiba Corporation Research collaboration, Olea Medical

LEARNING OBJECTIVES

1) The course will review the relative strengths and limitations of current imaging techniques for the detection and follow-up of patients with symptomatic and asymptomatic cerebral aneurysms. 2) A practical strategy for image review and analysis will be provided that ensures complete lesion characterization and minimizes operator error. 3) A rubric for the analysis of the pre- and post-operative aneurysm patients will also be presented with an emphasis on a practical clinical approach. 4) A brief natural history and modality based literature review will also be provided.

RC105B  Intervention for Brain Aneurysms
Steven William Hetts MD (Presenter): Consultant, Silk Road Medical Inc Consultant, Medina Medical Inc Research Grant, Stryker Corporation Data Safety Monitoring Board, Stryker Corporation

LEARNING OBJECTIVES

1) Discuss the current endovascular interventional approaches to both ruptured and unruptured brain aneurysm treatment. 2) Critically evaluate recent clinical trial results regarding interventional brain aneurysm treatment. 3) Appreciate the limitations to endovascular brain aneurysm treatment using current technologies. 4) Understand that cerebral vasospasm is the leading cause of mortality and morbidity for hospitalized patients with aneurysmal subarachnoid hemorrhage, and appreciate current approaches to treating vasospasm.

Active Handout

RC105C  How Improvements in Imaging Can Improve Practice
Charles Milton Strother MD (Presenter): Research Consultant, Siemens AG Research support, Siemens AG License agreement, Siemens AG

LEARNING OBJECTIVES

1) To understand current thinking regarding factors which are predictive of the natural history of intracranial aneurysms. 2) To understand current capabilities of imaging modalities in identifying morphologic and hemodynamic characteristics of intracranial aneurysms. 3) To understand current abilities of assessing therapeutic results after endovascular treatment of intracranial aneurysms.

RC108

Contemporary Topics in Emergency Radiology: Update Your Knowledge (An Interactive Session)

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: E450A

Sub-Events
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.

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.

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.

Hot Topic Session: Meeting the Demand for 24/7 Coverage in Academic Medical Centers

Special Courses

ER
AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Mon, Dec 1 7:15 AM - 8:15 AM Location: E352

Participants
Moderator: Stephen Ledbetter MD: Nothing to Disclose

LEARNING OBJECTIVES

Many radiology departments are actively considering different methods to best expand to 24/7 attending coverage. In this session, three very different solutions will be explored, with particular attention to the issues relevant to academic medical centers, including: staffing, scheduling, and sustainability; expertise and scope of practice; the academic mission including academic productivity and implications to trainee education and autonomy; and financial considerations. Each model will be discussed, followed by a panel session for open discussion.

Sub-Events

SPSH20A Dedicated 24/7 ER Radiology Section Coverage Operating a Supporting Teleradiology Business
Aaron D. Sodickson MD, PhD (Presenter): Research Grant, Siemens AG

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSH20B Overnight Only ER Section in a Multi-hospital Health Care System
Lovleen Cavanagh DO (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.
Moving Toward around the Clock Subspeciality Coverage of ED Imaging - A Hybrid Model

Syed Ahmad Jamal Bokhari MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC250

Interventional Stroke Treatment: Practical Techniques and Protocols (How-to Workshop) (An Interactive Session)

Refresher/Informatics

![Image]

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Mon, Dec 1 8:30 AM - 10:00 AM Location: E353B

Participants

Gary Ross Duckwiler MD (Presenter): Scientific Advisor, Sequent Medical, Inc Scientific Advisor, Asahi Kasei Medical Co, Ltd
Stockholder, Sequent Medical, Inc Proctor, Covidien AG

Joshua A. Hirsch MD (Presenter): Shareholder, Intratech Medical Ltd

David John Fiorella MD, PhD (Presenter): Institutional research support, Siemens AG Institutional research support, Terumo Corporation Consultant, Covidien AG Consultant, Johnson & Johnson Consultant, NFocus Consulting Inc Owner, Vascular Simulations LLC Owner, TDC Technologies Owner, CVSL

LEARNING OBJECTIVES

1) Describe the diagnostic evaluation and decision making algorithms leading to urgent endovascular treatment of acute stroke.
2) Review endovascular techniques for the treatment of acute stroke from microcatheter set up to intraarterial thrombolysis to mechanical thrombectomy. 3) Discuss case examples of endovascular treatment including patient selection, technique, and pitfalls.

ABSTRACT

Rapid advances in the evaluation, selection, treatment and management of the acute stroke patient necessitates an ongoing educational event highlighting the newest information, techniques and strategies for obtaining the best outcomes for our patients. In this session, all of these topics will be covered in a practical ‘how to’ and case based approach which is designed to help the practitioner implement best practices. The course is useful for those performing imaging, treatment or both. Analysis of the latest ongoing trials, devices and techniques will be presented. Endovascular tips and tricks will be discussed, as well as pitfalls in the treatment of these patients.

Active Handout


VSER21


Series Courses

![Image]

AMA PRA Category 1 Credits ™: 3.50
ARRT Category A+ Credits: 4.00
Mon, Dec 1 8:30 AM - 12:00 PM Location: N230AB

Participants

Moderator
Michael Nathan Patlas MD, FRCPC : Nothing to Disclose
Moderator
Jamlik-Omari Johnson MD : Nothing to Disclose
Moderator
Aaron D. Sodickson MD, PhD : Research Grant, Siemens AG

Sub-Events

VSER21-01 Imaging of Pediatric Head Injury

L. Santiago Medina MD, MPH (Presenter): Editor, Springer Science+Business Media Deutschland GmbH

LEARNING OBJECTIVES

1) Have a clear understanding of the newer clinical criteria for imaging in pediatric head trauma based on the more recent large multicenter studies. 2) Optimization of the imaging protocols to enhancing the diagnostic performance. 3) The importance of integrating the pretest probability (clinical criteria) and the diagnostic test in order to have the highest posttest probability (probability after the imaging study).
**Fast Spin-Echo Inversion-Recovery (FSE-IR) Detects Cervical Ligamentous Injury in Non Accidental Trauma**

Karyn Alayne Ledbetter MD (Presenter): Nothing to Disclose, Michael Eric Stone MD: Nothing to Disclose, Sheena Saleem MD, MBBS: Nothing to Disclose, Deniz Altinok MD: Nothing to Disclose

**PURPOSE**

Although magnetic resonance imaging is routinely utilized in cases of suspected non accidental head trauma, little data exists regarding the use of imaging to evaluate for associated cervical spinal ligamentous injury. Furthermore, the association between ligamentous cervical injury and intracranial abnormalities on MRI has not been documented. Through retrospective review of MRI brain examinations, we aim to establish the value of fast spin-echo inversion-recovery (FSE-IR) in assessing for cervical spinal ligamentous injury in cases of suspected abusive head trauma.

**METHOD AND MATERIALS**

MRI brain examinations performed in all cases of suspected non accidental head trauma between 2010 and 2013 were retrospectively reviewed. First, the fast spin-echo inversion-recovery (FSE-IR) sequence was examined on each study to evaluate for hyperintense signal in the apical, anterior longitudinal, posterior longitudinal and interspinous ligaments. Subsequently, each positive study was evaluated for abnormal signal intensity on diffusion-weighted imaging, susceptibility-weighted imaging and on T2*.

**RESULTS**

A total of 60 patients with non accidental head trauma received MRI brain examinations in our institution between January 2010 and December 2013. Of these patients, 17 (29%) were found to have ligamentous injury on FSE-IR. Additional findings of severe trauma were also present on other MR sequences in all patients. Hypoxic ischemic injury, detected on diffusion-weighted imaging, was present in 10 patients (59%). Retinal hemorrhages, seen on the T2* sequence, were identified in 8 patients (47%) with concomitant ligamentous injury. Cortical venous thrombosis, detected on either susceptibility-weighted imaging or T2*, was present in 16 patients (94%).

**CONCLUSION**

The fast spin-echo inversion-recovery (FSE-IR) sequence detects cervical ligamentous injury in patients with non accidental head trauma and is associated with significant intracranial injuries including hypoxic-ischemic injury, thrombosed cortical veins and retinal hemorrhages. FSE-IR should be performed routinely in all cases of suspected abusive head trauma.

**CLINICAL RELEVANCE/APPLICATION**

Fast spin-echo inversion-recovery detects ligamentous cervical spinal injury and should be routinely used whenever non accidental trauma is suspected.

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**Facial Fracture in the Setting of Whole Body Computed Tomography for Trauma: Incidence and Clinical Predictors**

Ryan Whitesell MD (Presenter): Nothing to Disclose, Scott David Steenburg MD: Nothing to Disclose, Changyu Shen PhD: Nothing to Disclose, Hongbo Lin MS: Nothing to Disclose

**PURPOSE**

To identify the incidence and clinical predictors of facial fracture in the setting of whole-body multi-detector computed tomography (MDCT) for trauma.

**METHOD AND MATERIALS**

500 consecutive patients who received dedicated maxillofacial CT as part of whole-body MDCT for trauma were studied. Patients younger than 18 and those who received initial evaluation at an outside facility were excluded. Fracture incidence and clinical parameters were obtained from the electronic medical record. Clinical and demographic variables were compared between patients who had an acute fracture and those who did not. Two sample t-tests were used to compare continuous variables, and the Fisher’s exact tests were used to compare categorical variables.

**RESULTS**

A total of 221 (44.2%) patients had acute fracture demonstrated on the maxillofacial CT. In all, 470 (94.0%) patients had documented positive facial physical exam findings at presentation. Of the 30 patients without exam findings, 29 (negative predictive value = 96.7%) did not have a facial fracture. Orbital fractures were most common overall, seen in 52.5% of positive cases. Nasal fractures were the most common isolated fracture (18.6% of all fractures; 42.3% of isolated fractures). Statistically significant difference was found between positive and negative cases of facial fracture in GCS score ≤ 8 (p < 0.0001), intubated at presentation (p < 0.0001), Injury Severity Score (ISS) of ≥ 16 (p < 0.0001), positive facial physical exam (p < 0.0001), and loss of consciousness (p = 0.0299). By history, the highest fracture rates were seen in falls from elevation or standing height and open-vehicle accidents (80.0%, 58.9%, and 55.2%, respectively).
CONCLUSION

The absence of physical exam findings reliably excludes facial fractures. Clinical variables that positively associate with facial fracture include: GCS ≤ 8, ISS ≥ 16, intubated status, positive loss of consciousness, and presence of facial physical exam findings.

CLINICAL RELEVANCE/APPLICATION

These data can support clinical decision-making by identifying those at greatest risk for facial fracture and those who are less likely to have a fracture based on the initial clinical survey.

Imaging of Cervical Spine Injury


LEARNING OBJECTIVES

1) Understand the evidence for best practices in cervical spine imaging of trauma. 2) Develop an evidence based approach to selection of appropriate imaging in cervical spine trauma.

ABSTRACT

There is abundant evidence on when it is appropriate to image the cervical spine in trauma victims, and with which imaging modality. However, controversies persist. This session will focus on the evidence supporting the roles of CT, MRI, and radiography in cervical spine imaging. We will discuss special populations, including children, the elderly, obtunded patients, patients with neurological deficits, and patients with spinal fusion. Included will be a discussion of accuracy of imaging, cost effectiveness analysis, and use of clinical prediction rules to risk-stratify subjects.

Utility of CTA in Patients with Isolated Dens Fractures

Vicky Thi Nguyen MD (Presenter): Nothing to Disclose, Gabriel C. Fine MD: Nothing to Disclose, Kathleen R. Tozer Fink MD: Nothing to Disclose, Michael L. Richardson MD: Nothing to Disclose, Annemarie Relyea-Chew: Nothing to Disclose, Martin Lee David Gunn MBChB: Medical Advisor, TransformativeMed, Inc Spouse, Consultant, Wolters Kluwer nv Grant, Koninklijke Philips NV

PURPOSE

Blunt carotid and vertebral artery injuries (BCVI) can cause devastating ischemic neurologic events. The Denver criteria are often used to guide BCVI screening and include all patients with C2 fractures (fxs). We hypothesize that patients with ground level falls (GLF) and isolated dens fxs (IDF) have a very low risk of BCVI and do not require vascular imaging.

METHOD AND MATERIALS

All patients with C2 fxs in the hospital trauma registry from 2006-2012 were retrospectively reviewed. Age, sex, injury mechanism (GLF or non-GLF, a higher risk mechanism), C2 fracture type (IDF or other C2 fracture (OthC2F)), vascular imaging type, and Biffl injury grade were evaluated.

RESULTS

Of 789 subjects with C2 fxs, 176 (22%) had IDF and 613 (78%) had OthC2F. 538 of 789 (68%) subjects underwent vascular imaging, and 141 (26%) had BCVI. 76 of 176 (43%) patients with IDF underwent vascular imaging and 6 (8%) had BCVI. Of the 31 subjects with type 1 or 2 IDF and vascular imaging, 1 (3%) had BCVI compared to 5/45 (11%) with type 3 IDF. Of the 462 patients with OthC2F and vascular imaging, 135 (29%) had BCVI. There was a significantly decreased prevalence of BCVI in IDF compared to OthC2F (p<0.001). In 31 patients with IDF after GLF who had vascular imaging, only 1 (3%) patient with a type 3 IDF had a BCVI, compared to patients with OthC2F and non-GLF, there was an odds ratio of 0.11 for vascular injury in patients with IDF and GLF. There was a significantly decreased risk of BCVI in patients with IDF (p=0.0002) and GLF (p=0.02) compared to patients with OthC2F and non-GLF.

CONCLUSION

In patients with vascular imaging, only 8% with IDF had BCVI compared to 29% of those with OthC2F. The rate of BCVI in IDF sustained after GLF is low (1/31), and no patients with type 2 IDF after GLF had BCVI. Thus, these patients may not require routine screening, suggesting the need for further evaluation of the Denver criteria to decrease unnecessary imaging utilization. The rate of BCVI in OthC2F is higher (24-29%) and these patients should be screened regardless of injury mechanism.

CLINICAL RELEVANCE/APPLICATION

Patients with type 2 isolated dens fractures resulting from ground level falls may not require screening for BCVI. Patients with other C2 fractures regardless of mechanism should be screened.

Patients with Acute Pancreatitis and Suspected Pancreatic Necrosis: When to Perform Computed Tomography?

VSER21-04

VSER21-05

VSER21-06
PURPOSE

To assess the value of multidetector computed tomography (MDCT) in patients with acute pancreatitis and suspected pancreatic necrosis with regard to both lab tests (C-reactive protein, lipase, creatinine) and histopathology.

METHOD AND MATERIALS

102 consecutive patients with acute pancreatitis and suspected pancreatic necrosis underwent contrast-enhanced MDCT. Two blinded readers assigned patients into one of three groups (GR). Patients in GR1 showed edematous organ swelling, peripancreatic fluid collection, and pseudocysts; patients in GR2 showed necrotic collection and a lack of pancreatic parenchymal contrast-enhancement; and patients in GR3 had no evidence of pancreatitis. Findings were correlated with results from pancreatic surgery and guided fine-needle aspiration (FNA). Mann-Whitney’s U test was used to evaluate significant differences in lab findings between the groups. Cut-off values were calculated using ROC curve analysis.

RESULTS

Using MDCT, 54/102 patients (52.9%) were classified as GR1, 17/102 patients (16.7%) as GR2, and 31/102 patients (30.4%) as GR3. 13/17 patients (76.5%) in GR2 underwent either surgery (n=6, 46.2%) or FNA (n=7, 53.8%) and pancreatic necrosis was confirmed histopathologically in all of them. Statistical analysis showed significant CRP differences between GR2 vs. GR3 (p=0.001; cut-off point: 82mg/L; AUC 0.76) as well as between GR1 vs. GR3 (p<0.001; cut-off point: 98mg/L; AUC 0.84). The comparison between GR2 vs. GR3 and GR1 vs. GR3 revealed no significantly different lipase (p=0.35; AUC 0.58/p=0.85; AUC 0.52) or creatinine levels (p=0.96; AUC 0.5/p=0.24; AUC 0.6).

CONCLUSION

In patients with acute pancreatitis, MDCT may help when CRP values are highly elevated to rule out complications such as pancreatic necrosis. In contrast, lipase and creatinine are poor predictors.

CLINICAL RELEVANCE/APPLICATION

Patients with clinically suspected pancreatic necrosis and mild to moderate elevated lab parameters could be saved from unnecessary MDCT examinations.
CONCLUSION

Changing from a 16-row- to a 128-row MDCT-scanner will not increase the number of possibly clinically irrelevant SPE and, therefore no further increase in unnecessary thrombolytic therapies based on radiological diagnoses has to be expected.

CLINICAL RELEVANCE/APPLICATION

Although the detection rate of possibly clinically irrelevant SPE increased significantly after the introduction of MDCT compared to single-detector-CT, it seems that there is no further increase in the detection rate changing from an 16-row- to a 128-row scanner.

**Implications of Increasing the D-Dimer Threshold in Patients with a Lower Pretest Probability to Exclude Pulmonary Embolism prior to CT Pulmonary Angiography**

Daniel Matheson Adams MD (Presenter): Nothing to Disclose, Scott Stevens MD: Researcher, Iverson Genetic Diagnostics, Inc, Scott Woller MD: Nothing to Disclose, Joseph Bledsoe MD: Nothing to Disclose, Todd Delton Lovelace MD: Nothing to Disclose, Scott Evans PhD: Nothing to Disclose, Jim Lloyd BS: Nothing to Disclose, Valerie Aston RT: Nothing to Disclose, C. Gregory Elliott MD: Nothing to Disclose

PURPOSE

Compared to original trials which derived pre-test probability systems for suspected pulmonary embolism (PE), the prevalence of PE at each given level of pre-test probability has decreased. Consequently, higher values of d-dimer may safely exclude PE in suspected cases. We therefore examined the implications of increasing the d-dimer threshold for patients with decreasing clinical pretest probability.

METHOD AND MATERIALS

Consecutive CT pulmonary angiography (CTPA) exams performed for suspected PE over a 14 month period were retrospectively identified and final interpretations were recorded. Data to calculate the Revised Geneva Score (RGS) for each encounter were extracted from the electronic medical record by electronic means and manual review, and d-dimer values were collected. All patient encounters for which pretest probability was calculated as low (RGS 0-3) or intermediate (RGS 4-10) and for which d-dimer testing was performed were included in the study. The prevalence of PE for low and intermediate probability patients with d-dimer values below adjusted thresholds was then determined.

RESULTS

Of 3500 CTPA exams performed, 1745 involved encounters for patients with low or intermediate probability and d-dimer testing performed. Intermediate probability patients had a slightly higher mean age (53.2 vs. 50.1 years, p=0.001), but there was no significant difference in the prevalence of PE for low and intermediate probability patients at d-dimer levels below 1000 (3.7% vs. 2.5%, p=0.29). For both groups combined, prevalence of PE remained below 2% with a threshold of 700 (1.8%, 95% CI 1.1-3.1%), which accounted for 41% of the CTPA exams.

CONCLUSION

Prevalence of PE is not significantly different between patients with low and intermediate pretest probability at d-dimer levels below 1000. Prevalence of PE remains below 2% for all low and intermediate probability patients below 700, and 41% of the CTPA exams could be avoided if this level was used to exclude PE. Prospective management studies to select the optimal adjustment of d-dimer are necessary before clinical implementation may occur.

CLINICAL RELEVANCE/APPLICATION

CTPA utilization could be substantially reduced if d-dimer thresholds were increased for exclusion of PE for patients with both low and intermediate pretest probability.

**Is Oral Contrast Necessary for MDCT of Emergency Room Patients with Acute Abdominal Pain?**

Abdullah Alabousi MD (Presenter): Nothing to Disclose, Douglas S. Katz MD: Nothing to Disclose, Niv Sne MD: Nothing to Disclose, Michael Nathan Patlas MD, FRCPC: Nothing to Disclose

PURPOSE

The purpose of the study was to validate the hypothesis that discontinuing the use of oral contrast (OC) for MDCT will not affect the detection of acute abdominal abnormalities in emergency room (ER) patients.

METHOD AND MATERIALS
We conducted a retrospective study to assess the effect of eliminating OC use for 64MDCT scans of the abdomen and pelvis (AP) for patients presenting with acute abdominal pain to ER and BMI greater than 25. Patients with BMI less than 25 continued to receive OC. Only patients who underwent AP 64MDCT imaging in the portal venous phase without OC were included. The study was approved by the REB. Informed consent was waived. The electronic medical records were reviewed to determine the rate of repeat imaging within seven days from initial CT scan, as well as delayed or missed diagnoses related to the lack of OC.

RESULTS

1378 patients had an AP 64MDCT between November 1, 2012 and October 31, 2013. 375 patients met the inclusion criteria (174 males and 201 females, mean age 57, range 18-97). 7/375 (1.9%) patients had repeat CT examination with OC within 7 days. Of these 7 patients, none had a change in the course of their management due to the utilization of OC. No delayed or missed diagnoses related to the lack of OC were identified.

CONCLUSION

Omitting OC for imaging patients with BMI greater than 25 presenting with acute abdominal pain in an ER setting resulted in no delayed or missed diagnoses. The benefits of prompt imaging diagnosis outweighs the minimal potential need for repeat imaging.

CLINICAL RELEVANCE/APPLICATION

64MDCT evaluation of ER patients with acute abdominal pain can be safely performed without oral contrast.

VSER21-12  Imaging of Hip Fracture
Joseph Sekiguchi Yu MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review pertinent osseous landmarks of the hip joint. 2) Translate evidence based knowledge to the observed imaging findings. 3) Discuss important features that the surgeons needs to know. 4) Employ ACR appropriateness criteria for CT and MRI utilization.

VSER21-13  Comparison of Outcomes for Patients Evaluated with Magnetic Resonance Imaging vs CT for Suspected Occult Femoral Neck Fractures
Paul McAllister BS (Presenter): Nothing to Disclose, Timothy J. Mosher MD: Research Consultant, Medical Metrics, Inc Research Consultant, elImage, Inc Research Consultant, Johnson & Johnson Stockholder, Johnson & Johnson

PURPOSE

To determine if there is a difference in outcomes for patients with suspected fragility fractures at the femoral neck evaluated using CT in comparison to those evaluated with MRI.

METHOD AND MATERIALS

This study was an observational retrospective cohort design. Imaging studies ordered through the emergency department at Milton S. Hershey Medical Center were searched to identify participants. Due to higher prevalence of radiographic occult osteoporotic fractures of the hip, the study was limited to females over the age of 65 who had experienced a fall and were suspected of having a fracture. Patients were included if initial radiographic evaluation of the pelvis or hip was negative for fracture and followed by either a non-contrast CT or MRI of the hip or pelvis. Records were grouped based on whether evaluation for occult fracture was made with CT or MRI. Their electronic medical records were searched for hospitalizations in the year following their index evaluation in the emergency department. Our primary analysis was to compare outcomes thought to be directly related to delayed diagnosis or treatment of suspected fragility fractures. These outcomes include death, secondary displacement, avascular necrosis, rapid progression of osteoarthritis, delayed diagnosis, and malunion. These were determined based on a literature search conducted prior to the collection of data.

RESULTS

A database search from the dates of 1/1/05 to 12/31/12 yielded 926 records. After review, 119 of these records met the inclusion criteria; 21 were evaluated with MRI and 98 with CT. Statistical analysis showed no significant difference in clinical outcomes during the year following initial evaluation. 8.3% of patients evaluated with MRI experienced adverse outcomes directly related to hip fracture within one year in comparison to 10.6% of patients evaluated with CT (p=1.0). The most common of these adverse events in both groups was death within the following year.

CONCLUSION

In contrast to current guidelines that recommend MRI, our results indicate there is no significant difference in clinical outcomes between elderly female patients evaluated with CT or MRI for suspected fragility fractures of the hip following fall.
CLINICAL RELEVANCE/APPLICATION

Appropriateness criteria recommending MRI for suspected occult fragility fractures are based on studies of diagnostic accuracy; however, our results suggest no difference in patient centered outcome.

Lumbar MRI Imaging in the Emergency Room Setting in Patients with a prior Examination: A Pain in the Back?

Edwin Gulko MD : Nothing to Disclose, William Walter MD (Presenter): Nothing to Disclose, Judah Burns MD : Nothing to Disclose

PURPOSE
To determine factors that increase the likelihood of new or progressive lumbar MRI findings in patients with a prior MRI.

METHOD AND MATERIALS
Retrospective review was performed on ED patients with a lumbar MRI who had a prior MRI within 6 years. Demographics and "red flag" symptoms (malignancy, infection, fracture) were recorded. Lumbar MRIs were reviewed for acute findings (infection, new tumor, fracture, disc herniation, cord compression). Degenerative change was considered predominately facet joint arthropathy (FJA), degenerative disc disease (DDD), or both (BFD), and categorized as single or multi-level change. Images were compared with the prior MRI to assess change in canal stenosis. Odds Ratio analyses evaluated likelihood of worsening canal stenosis for single vs multi-level change, FJA vs DDD, and either FJA or DDD vs BFD.

RESULTS
285 lumbar MRIs were performed on patients with prior MRIs within 6 years. 7 cases were excluded. 136 patients (49%) had a 'red flag'. There were 66 cases with acute findings, 34 of which were patients with malignancy. Among 212 cases without an acute finding, 44 had more than 1 repeat exam and 16 had no degenerative change. As a result, 152 cases were evaluated for change in spinal canal stenosis. 42 (28%) had single level degenerative change and 110 (72%) had multilevel change. More patients with multilevel changes exhibited worsening spinal canal stenosis over time than patients with single level degeneration (OR 8.95, CI 2.0-39.2). There was no significant difference in the change in canal stenosis between patients with predominately FJA or DDD. More patients with BFD had worsening canal stenosis over time than patients with FJA or DDD (OR 2.9, CI 1.33-6.29).

CONCLUSION
ED lumbar spine MRIs are commonly performed when prior MRIs exist. Clinical "red flags" increase the likelihood of acute findings, consistent with previously published data. Patients with single level degeneration and no acute finding are less likely to have progressive spinal canal stenosis. Progression is more likely in patients with both FJA and DDD, than in those with one or the other.

CLINICAL RELEVANCE/APPLICATION
This research will help clarify the role of repeat lumbar MRIs in the ED for patients with various low back pain presentations and will allow for more prudent use of a limited imaging resource. Additionally we aim to explore which lumbar degenerative risk factors predispose to worsening spinal canal stenosis over time.

Musculoskeletal Series: Elbow, Hand and Wrist Imaging

Series Courses

Series Courses

VSMK21-01 Sports Related Injuries of the Elbow
Bruce B. Forster MD (Presenter): Investor, Doyen Medical Incorporated

LEARNING OBJECTIVES
The 'Elbow, Hand and Wrist' Series Course will review multimodality upper extremity imaging through 5 expert refresher course presentations interspersed among scientific presentations.

Series Courses

VSMK21-01 Sports Related Injuries of the Elbow
Bruce B. Forster MD (Presenter): Investor, Doyen Medical Incorporated

LEARNING OBJECTIVES
Correlation of Elbow MRI findings with Innings Pitched in Symptomatic and Asymptomatic Major League Baseball Pitchers

PURPOSE
To analyze the relationship between the total innings pitched and MRI findings of the elbow in asymptomatic and symptomatic professional pitchers, and to identify whether any asymptomatic MRI findings predicted a subsequent throwing related elbow injury that required a stay on the disabled list.

METHOD AND MATERIALS
Between 2001 to 2010, 25 asymptomatic Major League Baseball pitchers underwent MRI of their pitching arm at the time of a contract signing or a trade. Thirteen additional MRIs were performed on players as a result of new onset elbow symptoms during the course of the season. 2 MR arthrograms and 38 MRIs without intra-articular contrast were performed with a closed 1.5-T magnet at 1 of 4 different centers. The images were reviewed by a musculoskeletal radiologist who was blinded to the original MRI interpretations, the subjects’ injury status, and innings pitched. The total innings that the player pitched prior to the MRI was recorded in addition to elbow injuries requiring a stay on the disabled list following the MRI. Statistical analysis was performed to examine association between total career innings pitched and the presence of a particular MRI finding as well as between MRI findings and a subsequent disabled list stay.

RESULTS
When grouped as a whole and analyzed for MRI findings in relation to innings pitched several trends were observed that reached statistical significance. There was a greater number of innings pitched in players with degenerative findings of the UCL, cartilage lesions, olecranon osteophytes, flexor pronator mass tendinosis, and increased signal in the extensor wad.

CONCLUSION
The major league baseball pitcher’s elbow is subject to repetitive valgus torque over the course of their career, leading to adaptive and degenerative changes with the medial elbow and intra-articular structures. Though detected on MRI, these findings do not necessarily correlate with elbow pain or dysfunction. Analysis of a small but significant number of asymptomatic pitchers, who later sustained elbow injuries requiring a stay on the disabled list, revealed that all had degeneration of the UCL with olecranon osteophytes, and most had flexor pronator mass tendinosis.

CLINICAL RELEVANCE/APPLICATION
Degenerative findings along the medial elbow are commonly observed on MRI in professional pitchers. However, these findings are often clinically insignificant and do not correlate with time on the disabled list.

Quantitative MRI Analysis of the Relationship between the Anconeus Epitrochlearis Muscle and Ulnar Compression Neuropathy

PURPOSE
The anconeus epitrochlearis muscle (AEM) is an anomalous accessory muscle in the elbow, coursing from the medial olecranon to the medial epicondyle. Several cases in the literature have suggested the association of this muscle with ulnar compression neuropathy. The purpose of this study is to review the MRI findings of the AEM, assess the relationship between muscle size and ulnar nerve morphology, and investigate the muscle’s correlation with ulnar compression neuropathy.

METHOD AND MATERIALS
Thirty two cases of elbow MRI studies of patients with an AEM from July 2007 to March 2014 were reviewed retrospectively. All of these patients presented with elbow pain and/or numbness with mean age of 40 years (range 18 to 60 years). The following parameters were evaluated: ulnar nerve diameter proximal, within, and distal to the cubital tunnel (CT); AEM cross sectional area (MA) and volume (MV); and encroachment ratio of the muscle at the superior and inferior aspects of the CT. Changes in ulnar nerve caliber and signal were also assessed.

RESULTS
The mean ulnar nerve diameters proximal, within, and distal to the CT were 3.63, 3.97, and 3.39 mm respectively. The mean MA was 68.47 mm² and mean MV was 6300 mm³. The mean encroachment ratio of the AEM in the CT was 0.58 superiorly and 0.56 inferiorly. There was no statistically significant correlation between the ulnar nerve diameter within the CT and MA (r = 0.05) or MV (r = 0.06). There were positive correlations between the MA and both the superior (r = 0.66) and inferior (r = 0.64) encroachment ratios as well as between the MV and the superior (r = 0.65) and inferior (r = 0.57) encroachment ratios. The most common
CONCLUSION

Most findings of anconeus epitrochlearis muscle are incidental and asymptomatic without ulnar compression neuropathy. There is no significant correlation between anconeus epitrochlearis muscle size and ulnar nerve caliber in the cubital tunnel.

CLINICAL RELEVANCE/APPLICATION

Anconeus epitrochlearis muscle is usually incidentally found and not associated with symptoms or ulnar compression neuropathy. This knowledge can help the clinician in the management of elbow pain.

VSMK21-04  Entrapment Neuropathies of the Upper Extremity
Ali M. Naraghi MD, FRCR (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the normal peripheral nerve anatomy and muscle innervation in the upper extremity with an emphasis on sites of compression. 2) Identify the common sites of nerve entrapment in the upper extremity. 3) Recognize the imaging features of peripheral nerve entrapment in the upper extremity. 4) Recognize the limitations in imaging of upper limb entrapment neuropathies.

VSMK21-05  The Triangular Fibrocartilage Complex: High-Resolution Morphologic and Quantitative MR Evaluation
Monica Tafur MD (Presenter):  Nothing to Disclose, Mohammed Jamal Aakef:  Nothing to Disclose, Tania Kumar:  Nothing to Disclose, Jiang Du PhD:  Nothing to Disclose, Sheronda Statum:  Nothing to Disclose, Christine B. Chung MD:  Nothing to Disclose

PURPOSE

The objectives of this study are to implement high-resolution magnetic resonance imaging (MRI) using ultrashort time-to-echo (UTE) techniques to evaluate the triangular fibrocartilage complex (TFCC) and to quantify the MR properties of the TFCC.

METHOD AND MATERIALS

Institutional review board approval with exemption of informed consent was obtained. Wrists of subjects and human cadavers were imaged in a 3T Signa TwinSpeed scanner (GE Healthcare) with optimized coils (microscopy and dedicated wrist coils). Morphologic evaluation sequences included high-resolution proton density (PD), 3D spoiled gradient echo (SPGR) and 2D/3D UTE. Quantitative evaluation included conventional (T2 SE), T1rho sequences tailored for long T2 values (2D/3D T1rho) and UTE (UTE T2* and UTE T1rho) sequences and an in-house MatLab analysis algorithm fitting regions of interest (ROIs) to determine average values.

RESULTS

High-resolution MR images demonstrated the different structures of the TFCC as well as pathological findings including perforations, degeneration and calcifications of the fibrocartilage among others. UTE sequences allowed the visualization of structures with short T2 components and subtraction techniques facilitated the identification of these components, such as TFC calcifications, which were better demonstrated in UTE sequences as compared with conventional PD sequences. Quantitative MR analysis of the TFC showed a bi-component decay behavior in normal subjects (short T2* = 0.31 ms, long T2* = 9.68 ms). T2, UTE T2* and T1rho values were increased with degeneration of the TFC. In the presence of calcifications, UTE T2* values were decreased probably due to magnetic susceptibility effects. In some cases, certain areas of the TFC showed increased UTE T2* values despite a normal appearance on standard PD sequences, which may indicate early stages of degeneration.

CONCLUSION

UTE MRI allows the visualization of short T2 components of the TFCC and improved the demonstration of certain pathologies as compared with the standard clinical sequences. Quantitative MR analysis reflected changes in TFC composition in some pathological cases.

CLINICAL RELEVANCE/APPLICATION

Morphological and quantitative UTE sequences allow visualization of the short T2 components of the TFCC and demonstration of some pathological cases not provided by the standard clinical sequences.

VSMK21-06  Comparison of Wrist MR Arthrography Alone and Wrist MR Arthrography Plus Dynamic Cine-arthrography: The Usefulness in the Diagnosis of Triangular Fibrocartilage Complex and Intrinsic Ligament Tear

abnormalities involved the common extensor (n = 17) and biceps (n = 6) tendons. Four of the thirty two cases demonstrated focal T2 hyperintensity and/or thickening of the ulnar nerve consistent with ulnar neuritis, three within the CT and one just proximal to the CT.
PURPOSE

The purposes of this study were to introduce dynamic cine-arthrography (DCA) and compare the diagnostic performance between MR arthrography (MRA) alone and MRA with DCA for evaluating triangular fibrocartilage complex (TFCC) and intrinsic ligament tears.

METHOD AND MATERIALS

93 wrists of 88 patients underwent both DCA and MRA from May 2010 to February 2014. Among them, 44 wrists of 42 patients who had undergone arthroscopy were included in this study. DCA was performed during contrast injection for MRA. After puncture of the radio-carpal joint, DCA was taken while slowly injecting contrast under fluoroscopic guidance during passive wrist exercise. We obtained 3.0T MRA with fat-suppressed coronal, sagittal, and axial images. Two radiologist evaluated TFCC, scapho-lunate (S-L) ligament, and luno-triquetral (L-T) ligament tears on MRA and MRA with DCA, respectively. Based on the arthroscopic findings, we compared the diagnostic values between MRA and MRA with DCA by the McNemar test.

RESULTS

The overall sensitivity and specificity of the diagnosis of TFCC tear were the same between MRA and MRA with DCA (reader 1, sensitivity 96.4%/96.4% (MRA/MRA with DCA), specificity 68.8%/68.8%, accuracy 86.4%/86.4%, reader 2, sensitivity 96.4%/96.4%, specificity 93.8%/93.8%, accuracy 95.5%/95.5%). For intrinsic ligaments, all diagnostic values were increased on MRA with DCA as compared with MRA for both readers (S-L ligament: reader 1, sensitivity 77.8%/77.8% (MRA/MRA with DCA), specificity 92.3%/96.2%, accuracy 86.4%/86.6%, reader 2, sensitivity 61.1%/61.1%, specificity 76.9%/88.5%, accuracy 70.5%/77.3%, L-T ligament: reader 1, sensitivity 66.7%/100%, specificity 89.7%/89.7%, accuracy 81.8%/93.2%, reader 2, sensitivity 60.0%/86.7%, specificity 82.8%/86.2%, accuracy 75%/86.4%), without statistical significance (p>0.05). The inter-observer agreement was more increased on MRA with DCA than MRA alone.

CONCLUSION

Wrist MR arthrography with dynamic cine-arthrography resulted in a higher diagnostic value of intrinsic ligament tear and increased the inter-observer agreement of TFCC and intrinsic ligament tear as compared with wrist MR arthrography alone.

CLINICAL RELEVANCE/APPLICATION

The use of wrist MR arthrography plus dynamic cine-arthrography which was performed during contrast injection for MRA, may help increase diagnostic performance for TFCC and intrinsic ligament tear.
**VSMK21-09  Cost-effectiveness Analysis of Utilizing 3T MRI to Select Which Patients with Chronic Wrist Pain Should Undergo Arthroscopy**


**PURPOSE**

To evaluate the cost effectiveness of performing 3T MRI in patients with chronic wrist pain

**METHOD AND MATERIALS**

A decision analysis model was designed to compare the following diagnostic algorithms in the patients with chronic wrist pain (> 3 months): (1) 3T MRI followed by diagnostic arthroscopy for positive findings; and (2) Diagnostic arthroscopy. The assumption was the detected injuries were treatable by surgical repair or therapeutic arthroscopy. Short-term and long-term outcome were considered as unnecessary arthroscopy avoided and Quality-Adjusted-Life (QALY), respectively. Costs from societal perspective and incremental cost to effectiveness ratio were calculated. Accuracy of MRI in detection of wrist injuries, utility loss due to wrist pain and costs associated with each strategy were estimated from literature and Medicare reimbursement data for 2013. The willingness-to-pay threshold was considered to be $50000. Sensitivity analysis was conducted to examine the model's stability to variations in the clinically plausible range of the model's variables.

**RESULTS**

Sensitivity and specificity of MRI was considered as 74% and 84%, respectively. The prevalence of ligamentous injuries in the study population was considered as 25%. The analysis showed that using MRI as the primary indicator of necessity of performing arthroscopy cost average of $1425 per patient, while performing arthroscopy in all patients cost $2500 per patient. The incremental cost of using MRI to avoid one unnecessary arthroscopy was estimated as $793. The incremental costs of performing non-selective arthroscopy in all the patients in comparison to using MRI was $82692 per one QALY gained. Considering a subgroup of patients whose ligamentous injury is not amenable by arthroscopy, this amount decreased to $6035. The sensitivity analysis showed the model was stable to variation in clinically plausible ranges of 3T MRI sensitivity and specificity, providing prevalence of repairable wrist injury between the patients with chronic wrist pain did not exceed 34%.

**CONCLUSION**

Performing 3T MRI to determine the necessity of diagnostic arthroscopy in patients with chronic wrist pain may be cost-effective.

**CLINICAL RELEVANCE/APPLICATION**

In practices where most patients with wrist pain require no arthroscopic repair; MRI may be cost-effective both in avoiding unnecessary diagnostic arthroscopy and long-term societal perspective.

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**VSMK21-10  Imaging Techniques for Evaluating Elbow and Wrist Instability**

Miriam Antoinette Bredella MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Demonstrate understanding of the complex anatomy, kinematics and injury patterns of the wrist and elbow.
2) Become familiar with routine and novel static and dynamic imaging techniques to assess wrist and elbow instability.

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**VSMK21-11  Diagnosis of Scapholunate Dissociation: Cine-MR Imaging as a New Approach**

Soenke Langner MD, PhD: Nothing to Disclose, Inga Langner MD: Nothing to Disclose, Paul-Christian Krueger MD: Nothing to Disclose, Rebecca Kessler MD: Nothing to Disclose, Andreas Eisenschken MD, PhD: Nothing to Disclose, Per-Olaf Behrndt MD (Presenter): Nothing to Disclose

**PURPOSE**

Posttraumatic injuries of the scapholunate ligament (SLL) may cause scapholunate dissociation (SLD) which bears a high risk of osteoarthritis. Plain radiographs are used for initial diagnostic work up and MR imaging (MRI) is the preferred imaging modality for the assessment of ligamentous injuries. However, dynamic instability can only be assessed by cineradiography. The aim of the study was to evaluate diagnostic accuracy of cine-MRI for the assessment of SLD in comparison to arthroscopy.

**METHOD AND MATERIALS**

23 Patients with clinically suspected SLD were included. All patients underwent static MRI and cine-MRI of wrist at 3T. We acquired T2-weighted (T2w) images in axial and coronal planes and sagittal T1w images. Cine-MRI was performed from extreme radial to ulnar abduction and during clenching and unclenching of the fist with a temporal resolution of 5 images/s. Cineradiography was performed in all patients with a temporal resolution of 12.5 images/s. Afterwards all patients underwent arthroscopy. Images were evaluated by one hand surgeon and one experienced MSK radiologist blinded for intraoperative finding. Cineradiography and cine-MRI were evaluated for scapholunate (sl) distance, sl alignment, synchronous motion of carpal bones and continuity of Gilula lines. Sensitivity, specificity, positive (pLR) and negative (nLR) likelihood ratio for cine-MRI with respect to intraoperative findings were calculated. Differences between cineradiography and cine-MRI were evaluated using t-test. A p-value...
RESULTS
Cine-MRI was of diagnostic quality in all patients. There was no statistical significant difference between cineradiography and cine-MRI (p=0.081). SLD was correctly diagnosed in 5 patients and excluded in 16 patients. SLD was diagnosed false positive and negative in one case each. Sensitivity and specificity of cine-MRI for SLD was 83% and 94%, respectively. PLR and nLR was 13.83 and 0.18 respectively.

CONCLUSION
Cine-MRI has a high sensitivity and specificity for the diagnosis of SLD. It can be easily integrated in conventional MR imaging and may eliminate the need for cineradiography.

CLINICAL RELEVANCE/APPLICATION
CINE-MRI is a safe and feasible method to identify scapholunate dissociation and may prevent exposure of the patients to radiation.

Evaluating MRI-detected Tenosynovitis of the Hand and Wrist in Early Arthritis

VSMK21-12

Wouter Nieuwenhuis MD (Presenter): Nothing to Disclose, Annemarie Krabben: Employee, Johnson & Johnson, Wouter Stomp MD: Speaker, General Electric Company, Johan L. Bloem MD, PhD: Nothing to Disclose, Tom WJ Huizinga: Nothing to Disclose, Annette Van Der Helm-Van Mil: Nothing to Disclose, Monique Reijnierse MD: Nothing to Disclose

PURPOSE
This study aimed to identify the frequency of MRI-detected tenosynovitis at the metacarpophalangeal (MCP) and wrist joints in early arthritis, the diagnostic value for RA and the association with severity features within RA.

METHOD AND MATERIALS
178 early arthritis patients underwent unilateral 1.5T extremity-MRI at baseline. MRI-scans were made and scored using the RAMRIS-protocol. Tenosynovitis was scored at the wrist and MCP joints by two readers using the method as described by Haavardsholm et al. During the first year 69 patients fulfilled the 2010-classification criteria for RA; patients with and without RA were compared. Within RA-patients comparisons were made for anti-citrullinated-peptide-antibody (ACPA)-positivity and for radiographic progression (increase in Sharp van der Heijde score) during the first year.

RESULTS
65% of the 178 early arthritis patients had MRI-detected tenosynovitis at any of the studied locations. The flexor tendon at MCP-3 and the tendon of the extensor carpi ulnaris were most frequently affected (22% and 34%). Furthermore, tenosynovitis was more often present in RA than non-RA patients (75% versus 59% p 0.023). More commonly affected locations in RA than in non-RA were the tendons of the flexors at MCP-5 (odds ratio (OR) 2.8 95% CI 1.2-7.0), the extensors at MCP-2 (OR 9.1 95% CI 1.9-42.8) and MCP-4 (OR 14.2 95% CI 1.7-115.9) and extensor compartment I at the wrist 4.0 (95% CI 1.4-11.1). The specificity for these locations ranged 92-99% and the positive predictive value between 61-89%. The associations between tenosynovitis at these locations and RA were independent of the presence of local synovitis. Within RA-patients, the tenosynovitis scores were not associated with the presence of ACPA or radiographic progression during the first year.

CONCLUSION
MRI-detected tenosynovitis is common in early arthritis and is more common in RA patients than in early arthritis patients with other diagnoses. Locations with a high specificity for RA are the tendons of the flexor at MCP-5, the extensor at MCP-2 and MCP-4 and the first extensor compartment of the wrist.

CLINICAL RELEVANCE/APPLICATION
MRI is a sensitive method to detect tenosynovitis. However, the prevalence of MRI-detected tenosynovitis and its diagnostic and prognostic value in early arthritis patients are unclear.

Opposed-phase Gradient Echo MR Imaging Improves Image Quality and Visualization of Erosions in Arthritis

VSMK21-13

Wouter Stomp MD (Presenter): Speaker, General Electric Company, Johan L. Bloem MD, PhD: Nothing to Disclose, Tom WJ Huizinga: Nothing to Disclose, Annette Van Der Helm-Van Mil: Nothing to Disclose, Monique Reijnierse MD: Nothing to Disclose

PURPOSE
In rheumatoid arthritis, identifying the exact demarcation of erosions on MR images can be difficult because the cortical defect might be obliterated by either synovium or bone marrow edema. Opposed-phase MR imaging might enhance the visibility of this transition by visualizing it as a clear black line due to the presence of both water and fat protons within the same voxel. The purpose of this study was to determine whether opposed phase gradient-echo imaging improves visualization of erosions when compared to regular T1w TSE sequences.

METHOD AND MATERIALS
Unilateral wrist and MCP joints of 14 early arthritis patients were imaged on a 1.5T extremity MRI. T1w TSE and opposed phase T1w gradient-echo sequences were obtained in the coronal plane, both before and after gadolinium contrast administration. T2w TSE images were also obtained and were available to support scoring for both image sets. Images were assessed for image quality on a 0-5 scale and scored according to the OMERACT RAMRIS score for erosions in consensus by two observers blinded to clinical data. A reference score was established using all available images together.

RESULTS

Scanning time was 0:43 for the opposed phase sequence and 3:30 for the TSE sequence. Overall image quality, absence of movement artifacts and sharpness were significantly better using opposed phase images than T1w TSE images. Homogeneity, signal-to-noise ratio, RAMRIS erosion scores and rater confidence did not differ between sequences. There was a trend toward higher sensitivity of opposed phase images for detection of erosions (85.6%, 95% CI 76.6-91.6% vs 68.0%, 95% CI 57.7-76.9%). Specificity, positive predictive value and negative predictive value were similar between the sequences and all >85%.

CONCLUSION

Our results demonstrate the feasibility of using a fast out-of-phase T1w spoiled-gradient echo sequence to assess erosions according to OMERACT RAMRIS score. It decreases imaging time while providing better image quality and might increase sensitivity for small erosions.

CLINICAL RELEVANCE/APPLICATION

Shorter scanning time of the opposed phase sequence reduces movement artifacts and patient discomfort, and better delineation of the bone-tissue interface may improve reliability of erosion detection.

Arthritides—What’s Hot in the Rheumatology Literature

Eric Y. Chang MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the roles of the radiologist in diagnosis and management of arthropathies. 2) Describe the imaging findings of rheumatoid arthritis and spondyloarthritis based on current literature. 3) Identify the various categories of disease modifying therapies (DMOADs and DMARDs).

ABSTRACT

1) Discuss the roles of the radiologist in diagnosis and management of arthropathies. 2) Describe the imaging findings of rheumatoid arthritis and spondyloarthritis based on current literature. 3) Identify the various categories of disease modifying therapies (DMOADs and DMARDs).

ERS-MOA

Emergency Radiology Monday Poster Discussions

Scientific Posters

ERS211

Postmortem Adrenal Glands: CT Findings (Station #1)

Aley Talans MD (Presenter): Nothing to Disclose, Suely Fazio Ferracioli: Nothing to Disclose, Viviane Sayuri Yamachira: Nothing to Disclose, Natally de Souza Maciel Rocha Horvat MD: Nothing to Disclose, Hilton M. Leao Filho MD: Nothing to Disclose, Ronaldo Hueb Baroni MD: Nothing to Disclose

PURPOSE

To demonstrate the spectrum of adrenal CT findings commonly found postmortem, and to correlate imaging features and histological findings.

METHOD AND MATERIALS

We retrospectively evaluated 61 corpses who underwent postmortem CT scans, and compare them to
RESULTS

The average elapsed time between the CT scans and time of death was 11.3 hours. The mean attenuation was 27 HU (ranging from 4 HU to 48 HU), and 53% of the glands showed post contrast enhancement (considering the 50 corpses who were submitted to pre and post contrast phases). Gas within the gland was found in 12.3% of the cases. Calcification was found in 4.0% (5 / 122) of the CT scans. The histological findings were: no pathological finding in 67% (41/61), hemorrhage in 11.5% (7/61), ischemia and/or necrosis in 13% (8/61), nodules in 3.3% (4/122), microscopic metastatic lesions in 5% (3/61), macroscopic metastatic lesions in 1.6% (1/61). Histological correlation revealed that four of the 5 nodules seen on CT images had concordant pathological findings (2 metastasis of colonic adenocarcinoma and 2 metastasis of gastric adenocarcinoma). All these nodules had attenuation > 10 HU on CT (range 23-30). CT was not able to detect image alterations in glands with microscopic lesions. Despite the fact that we found 11.5% of adrenal glands with hemorrhage on autopsy, there was no significant difference in the mean attenuation of these glands when compared to the control group (31 HU and 27 HU, respectively). Considering the 28 corpses with post contrast enhancement, only 9 (32%) showed ischemia or hemorrhage on autopsy. Only 1 of the 15 corpses that presented gas on the CT had ischemia and/or necrosis on the autopsy.

CONCLUSION

Our study found some concordances and some differences between imaging and histological findings of postmortem adrenal glands. Further studies are being held to elucidate those questions since virtual autopsy is a potential alternative to conventional autopsy.

CLINICAL RELEVANCE/APPLICATION

To associate the adrenal gland alterations found on virtual autopsy with conventional autopsy, providing a radiological-pathological correlation.

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ERS212

Distribution and Patterns of Spinal Fractures Related to Different Traumatic Mechanisms in Post Mortem CTs (Station #2)

Yanik Buetikofer (Presenter): Nothing to Disclose, Wolf-Dieter Zech MD: Nothing to Disclose, Christian Jackowski MD: Nothing to Disclose, Daniel Ott MD: Nothing to Disclose, Levent Kara MD: Nothing to Disclose

PURPOSE

To gather epidemiological data regarding the cause of injury, and to evaluate the incidence of spinal fractures, in relation to different types of traumatic fatalities.

METHOD AND MATERIALS

This is a retrospective review of spinal fractures associated with different kinds of trauma over 9 years. 321 native postmortem CT scans of traumatic accidents between 2005 and 2013 have been evaluated regarding spine fractures. The types of traumatic accidents were assessed and divided into groups (n=321); a - Motor vehicle accidents (n=42), b - bicycle accidents (n=33), c - motorbike accidents (n=39), d - trauma involving pedestrians (n=47), e - Falls from great height (n=100), and f - all others (n=60). All fractures were divided; by fracture or dislocation of the atlanto-occipital joint (C0/C1), upper cervical spine fracture from C1 to C3 (upper CV), lower cervical spine fracture from C4 to C7 (lower CV), thoracic spine fracture (TV) and lumbar spine fracture (LV). All spine fractures were subsequently classified according to the AO Comprehensive Classification from June, 2013.

RESULTS

From a total of 359 fractures there were (21.75%) atlanto-occipital fractures, (12%) upper cervical fractures, (14.5%) lower cervical fractures, (31.75%) thoracic fractures and (20%) lumbar fractures. By the AO classification the upper cervical fractures comprise 51.75% Typ-A-, 31% Typ-B- and 17.25% Typ-C-fractures; The thoracic fractures comprise 41.75% Typ-A-, 33% Typ-B- and 25.25% Typ-C-fractures; The lumbar fractures comprise 32.5% Typ-A-, 30.5% Typ-B- and 37% Typ-C-fractures.

CONCLUSION

In all trauma types there is a higher incidence of upper cervical fractures compared to lower cervical fractures. Pedestrians are more likely to suffer a cervical fracture compared to the other accident types, especially compared to bicycle accidents, which are most likely to suffer a thoracic vertebral fracture.

CLINICAL RELEVANCE/APPLICATION

Knowledge of the distribution and patterns of spinal fractures with respect to the type of accident helps the radiologist to support the emergency physician in prioritizing trauma patients and their therapeutic needs.

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ERS213

Postmortem Computed Tomography Findings in the Thorax (Station #3)
Purpose

To investigate findings of postmortem imaging using objective data and to define the time-related course of lung changes using postmortem CT (PMCT).

Method and Materials

From April 2013 to October 2013, 199 bodies were examined on PMCT and 12 bodies (8 men, 4 women; age, 27-81 years [mean, 60.0 years]) were examined two times in a >4-hour interval (4-164 hours [mean, 30.8 hours; median, 17.5 hours]). We compared pleural space fluid volume, decreased aerated lung volume (DLV), and pulmonary volume between the two postmortem CT scans. To evaluate the volume change rate, we plotted the volume rate (ml/hour) against pleural space fluid volume and DLV according to the postmortem period.

Results

At the 2nd PMCT, the pleural space fluid (p = 0.0425) and DLV (p = 0.0186) increased and pulmonary volume (p = 0.0229) decreased. The pleural space fluid increase peaked at 30 hours and continued until 42 hours. The DLV rate consistently decreased throughout the postmortem period until the 30-hour mark.

Conclusion

The DLV rate consistently decreased throughout the postmortem period until the 30-hour mark. The pleural space fluid increase peaked at 30 hours and continued until 42 hours.

Clinical Relevance/Application

In early postmortem period (until 30 hours), the hypostasis of the lung is increased.

ERS214

Analysis of Causes of Death and Injury Patterns in Multiple Trauma: A Comparison of Post Mortem Computed Tomography (pmCT) to the Gold Standard Autopsy (Station #4)

Sonja Kirchhoff MD (Presenter): Nothing to Disclose, Oliver Peschel: Nothing to Disclose, Stefanie Kurz: Nothing to Disclose, Maximilian F. Reiser MD: Nothing to Disclose

Purpose

The aim was to analyze the conclusiveness of post mortem Computed Tomography (pmCT) regarding a reliable and adequate cause of death in trauma patients who died either in the trauma room or during emergency surgeries after the decision was made to terminate resuscitation procedures in comparison to the gold standard autopsy, and to help in matters of quality control, research and teaching.

Method and Materials

Data of trauma patients mostly due to traffic accidents admitted to the trauma room of our University Level I trauma center were enrolled and retrospectively analyzed. Subsequently pmCT followed by autopsy were performed. The cause of death, types and body region of injuries were analyzed and compared respectively. For the CT scans medical equipment placed in the patients such as intubation tubes, intravenous canules, etc. was not removed. PmCT was also searched for an explanation if an unsuccessful resuscitation took place.

Results

17 patients were enrolled. 8 patients sustained deadly injuries to the head (47.1%), 11 to the chest (64.7%), 0 to the abdomen (0%), 4 to the skeletal system (23.5%) and one patient drowned (5.8%). In 52.9% of the cases (group I) good agreement of autopsy and pmCT resulted. In 41.2% autopsy provided superior results compared to pmCT (group II) whereas in 5.8% pmCT found more information compared to autopsy (group III). PmCT was especially useful for the diagnosis of fractures, cerebral injuries and detecting gas formation of all kinds. Autopsy was superior in finding and interpreting injuries to parenchymal organs and vessels.

Conclusion

PmCT is useful in persons who died due to trauma providing quick results and a detailed overview of especially bony lesions, but also brain injuries and gas formations. It is advisable to conduct pmCT especially in cases without consent to autopsy to gain information about possible causes of death and to rule out the possibility of clinical mistakes, therefore to assure quality control.

Clinical Relevance/Application

PmCT can gain worthy information about injury patterns, especially of the skeletal system, head and brain after traumatic death. In cases when autopsy is declined, CT can outline a noninvasive alternative to evaluate diagnosis and therapy.

ERS215

Effect of Resident Training Level with Performance of Ultrasound for the Work-up of Acute Appendicitis (Station #5)

David Tso MD (Presenter): Nothing to Disclose, Jennifer Wang BS: Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Silvia D. Chang MD: Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose
PURPOSE
This study evaluated the role of operator experience with the use of ultrasound for the work-up of acute appendicitis in young adults. Specifically, we examine resident level of training and compare diagnostic performance with ultrasound technicians and radiology fellows.

METHOD AND MATERIALS
A retrospective study design was undertaken examining patients seen in the emergency department of an urban tertiary care teaching hospital between October 1 to December 31, 2013 with the chief complaint of right lower quadrant pain. Patients who were investigated with ultrasound as first-line imaging were identified. Scan time, findings on ultrasound, and need for further imaging was documented along with level of training of the operator performing the exam. Findings were correlated with CT findings and surgical diagnosis when available.

RESULTS
106 patients were identified (80.2% female, mean age 29.1). 39.6% of ultrasound exams were performed between the hours of 5PM and 8AM. Junior (R2 & R3) and senior (R4 & R5) radiology residents scanned 22.6% and 19.8% of the caseload respectively with no statistical difference in scan time (31.6 vs. 26.5 minutes, p=0.43), and did not differ from ultrasound technicians and fellows (28.1 minutes). Further imaging was required in 45.8% of cases performed by junior residents vs. 38.1% by senior residents, although no statistically significant difference was found. Residents as a whole did not differ with technicians/fellows with respects to the need for further imaging (44.4% vs. 31.1%, p=0.17). The appendix was visualized by ultrasound in 37.5% of cases scanned by junior residents, 40.0% of senior resident cases, and 34.0% of cases performed by technicians/fellows with no significant difference found. Sensitivity and specificity for residents as a whole was 50.0% and 90.0%, vs. 81.2% and 100% for technicians/fellows.

CONCLUSION
This study demonstrates no significant difference with respects to operator experience with the ability to visualize the appendix, scanning time, and requirement of further imaging for the diagnosis of acute appendicitis. There is an increase in sensitivity and specificity when comparing resident trainees and ultrasound technicians/radiology fellows.

CLINICAL RELEVANCE/APPLICATION
This study provides a snapshot of the diagnostic performance of ultrasound for the work-up of acute appendicitis in a tertiary care academic teaching hospital.

ERS216
Dead Bodies Have their Own Semiology: Normal Post-mortem CT Appearance in 80 Subjects (Station #1)
Estelle-Marie Kieffer (Presenter): Nothing to Disclose, Jeanne Charton MD: Nothing to Disclose, Guillaume Bierry MD, PhD: Nothing to Disclose, Audrey Farrugia: Nothing to Disclose, Francis P. Veillon MD: Nothing to Disclose, Catherine Roy MD: Nothing to Disclose

PURPOSE
To compare post-mortem CT and autopsy findings in a large series of subjects in order to determine the normal post-mortem appearance of several organs and structures.

METHOD AND MATERIALS
Eighty adult subjects (20 females, 60 males), with mean age 52 years, in whom autopsy was required, were included. All CT examinations were performed before autopsy without contrast administration, from head to toe, on a 128 slices unit. Mean time between death and CT was 2.7 days. CT data (multiplanar reformats in soft tissue, bone and lung windows settings) were reviewed in consensus by 2 radiologists. A total of 18 qualitative items were quoted as present or not. A senior forensic pathologist (aware of CT results) performed the autopsy (less than 12 hours after CT) and reported any macroscopic lesions. The "normal" post-mortem CT appearance (absence of underlying tissue injuries at autopsy) was afterwards determined for each item.

RESULTS
Significant postmortem CT findings observed without macroscopic underlying lesions at autopsy included: Bilateral hyperdensity of middle cerebral artery (38% of subjects); Tracheal and proximal bronchial filling (50%), diffuse bilateral pulmonary ground glass (71%) or alveolar fulfilling (58%), sphenoidal sinus filling (92%); Frequent pleural effusion (50%) but rarity of pericardial (9%) or peritoneal (20%) effusion.

CONCLUSION
Several CT changes, considered as abnormal and potentially lethal in living subjects, are within the range of normal post-mortem. Knowledge of those changes may help radiologists avoid misinterpretation and false
conclusions about causes of death.

**CLINICAL RELEVANCE/APPLICATION**

Knowledge of the changes induced by death on CT findings may help radiologists avoid misinterpretation and false conclusions about causes of death.

**ERS217**

**Military/law Enforcement Bullets and MRI: Magnetic Field Interactions at 1.5- and 3-Tesla (Station #2)**

Idris Diallo (Presenter): Grant, Guerbet SA, Mathieu Auffret: Nothing to Disclose, Julien Ognard MD, MSc: Nothing to Disclose, Lakdar Attar: Nothing to Disclose, Elise Bouvard: Nothing to Disclose, Jean Roussset: Nothing to Disclose, Douraied Ben Salem MD, PhD: Nothing to Disclose

**PURPOSE**

Gunshot injuries, resulting in retained bullets are frequent incidents. It is therefore crucial to evaluate the risks involved with performing magnetic resonance imaging (MRI), for patients with retained ferromagnetic objects. Furthermore, post-mortem MRI is now quite common and a retained ferromagnetic bullet can be problematic. In addition, most of the prior studies are focusing on civilian bullets and small caliber bullets. The objective of this study is to assess the magnetic field interactions at 1.5- and 3-Tesla (T) for a representative sample of military and law enforcement ballistic objects.

**METHOD AND MATERIALS**

Twenty-nine different bullets from different manufacturers underwent MRI evaluation regarding translational attraction and torque. The deflecting angle method and a qualitative torque scale were used in the 1.5- and 3-T magnetic resonance (MR) systems. The samples were representative of those commonly used in the North Atlantic Treaty Organization (NATO) military forces (e.g. 5.56mm NATO), law enforcement agencies (e.g. 9mm Parabellum) and encountered in war injuries and crime-related trauma (e.g. 7.62mm Kalashnikov).

**RESULTS**

At all static magnetic field strengths, all non-nickel- and non-steel-containing bullets exhibited no movement. Whereas eight bullets containing steel core, steel jacket or nickel jacket exhibited substantial magnetic field interactions in excess of what might be considered safe for patients. The deflection angle was equal to 90° and their torque superior to 4.

**CONCLUSION**

Military and law enforcement non-nickel- or non-steel-containing bullets appear to be safe for patients at 1.5- and 3-T whereas ballistics containing nickel and / or steel may be dangerous because of strong magnetic field interactions. If the exact bullets’ composition is known and does not contain a ferromagnetic metal, it is safe to perform the MRI examination.

**CLINICAL RELEVANCE/APPLICATION**

It is crucial to evaluate the risks involved with performing magnetic resonance imaging (MRI), for patients with retained ferromagnetic objects.

**ERS218**

**Drowning: Thoracic CT Findings for Predicting Clinical Severity (Station #3)**

Nanae Tsuchiya: Nothing to Disclose, Tsuneo Yamashiro MD: Nothing to Disclose, Sadayuki Murayama MD, PhD (Presenter): Nothing to Disclose, Hisashi Kamiya: Nothing to Disclose, Yasutaka Nakano MD, PhD: Nothing to Disclose, Yoshiharu Ohno MD, PhD: Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, DAIICHI SANKYO Group Research Grant, Eisai Co, Ltd Research Grant, Terumo Corporation Research Grant, Fuji Yakuhin Co, Ltd Research Grant, FUJIFILM Holdings Corporation Research Grant, Guerbet SA

**PURPOSE**

To determine if thoracic CT findings are related to clinical severity in drowning patients.

**METHOD AND MATERIALS**

The institutional review board approved this study and waived informed consent. Thoracic CT scans of drowning patients (n = 36) were reviewed retrospectively. The presence and severity of the following pulmonary CT findings were recorded: air-space consolidation, multiple lobular opacities, ground-glass opacity (GGO), and interlobular septal thickening. The severity was scored as mild (<25% of the whole lung area), moderate (25-50%), and severe (>50%). The presence of a pleural effusion was also assessed. Patients were categorized into 3 groups based on Szpilman’s grading, which is commonly used to stratify clinical risks and to determine further interventions: Group 1 (Grade 1-2), n=10; Group 2 (Grade 3-4), n=23; Group 3 (Grade 5-6), n=3.χ2 and the Kruskal-Wallis test were used to compare CT findings among the 3 groups.

**RESULTS**

The CT findings were as follows: air-space consolidation, n=20 (55.6%); GGO, n=16 (44.4%); multiple lobular opacities, n=32 (88.9%); interlobular septal thickening, n=3 (8.3%); and pleural effusion, n=4 (11.1%). The air-space consolidation score was significantly larger in the more severe groups (P < 0.01). Also, pleural effusions were more frequent in the more severe groups (P < 0.01).
CONCLUSION

On the chest CT of drowning patients, air-space consolidation and pleural effusion indicated higher severity and may suggest worse clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

This study is the first to demonstrate that chest CT would be useful in evaluating the clinical severity of drowning patients.

ERS219

Postmortem CT of Hip and Acetabular Fractures after Road Accidents in Relation to different Types of Impact and Involved Vehicles (Station #4)

Levent Kara MD (Presenter): Nothing to Disclose, Yanik Buetikofer: Nothing to Disclose, Christian Jackowski MD: Nothing to Disclose, Wolf-Dieter Zech MD: Nothing to Disclose

PURPOSE

To determine the different patterns of hip and acetabular fractures in postmortem CT in relation to different types of impact and involved vehicles including overrun of pedestrians.

METHOD AND MATERIALS

173 native postmortem CT scans of traffic accident victims between 2005 and 2013 have been retrospectively evaluated regarding hip and acetabular fractures. The types of traffic accidents were also assessed. Only direct human vs. vehicle types of accident with pelvic fractures were included to be divided into four groups (n=47): a - pedestrians overrun (n=10), b - pedestrians hit but not overrun (n=17), c - bicyclists vs. car (n=10) and d - motorcyclists vs. car (n=10). Hip and acetabular fractures were classified according to the AO comprehensive classification. Categories A and B (no indication for immediate treatment) were compared to category C (immediate treatment indicated).

RESULTS

According to the AO classification 24 of 47 victims presented category C fractures with indication for immediate treatment. Group a presented the highest rate of class C fractures (8 of 10). Decreasing rates of category C fractures could be observed in group b (10 of 17), group c (4 of 10) and group d (2 of 10).

CONCLUSION

Overrun victims have the highest risk of hip and acetabular injuries with indication of immediate treatment followed in a decreasing risk in the groups b, c and d.

CLINICAL RELEVANCE/APPLICATION

Knowledge of the distribution and patterns of hip and acetabular fractures with respect to the type of accident helps the radiologist to support the emergency physician in prioritizing trauma patients and their therapeutic needs.

ERS220

Small Intestinal Obstruction: Can CT Differentiate Who Needs Surgery at ED? (Station #5)

Jen-Dar Chen MD, MSc (Presenter): Nothing to Disclose, Chui-Mei Tiu MD: Nothing to Disclose

PURPOSE

To verify whether CT can differentiate the patients with small bowel obstruction (SBO) who need surgery from those who need not.

METHOD AND MATERIALS

We retrospectively reviewed CT features of all cases with final diagnosis of SBO at ED in the past one year. The patients who received surgery for SBO constituted the study group, and those who recovered from conservative treatment for SBO, the control group. CT were evaluated by two experienced abdominal radiologists blind to clinical management (surgery or conservative) for variable features: largest bowel diameter proximal to and smallest bowel diameter distal to transition zone, maximal proximal-to-distal diameter ratio, proximal bowel content, small bowel feces sign, bowel wall thickening, shape and enhancing pattern of transition zone, presence of closed loop, mesenteric fat stranding, mesenteric vascular engorgement, interloop/mesenteric fluid, ascites, etc. All CT features were compared between two groups with student t-test or Chi-square test accordingly for statistical analysis.

RESULTS

128 cases with final diagnosis of SBO were included in this study, including 84 males and 44 females with mean age 72 years. 64 cases received surgery for SBO (study group), and the others recovered from conservative treatment (control group). The study group more commonly presented cramping abdominal pain (n=57 [89.1%] vs. 47 [73.4%], p=0.04) and rebounding pain (n=8 [12.5%] vs. 1 [1.6%], p=0.03). Initial systolic blood pressure was significantly higher in study group (mean 146.4 ± 31.9 mmHg vs. 133.8 ± 27.8 mmHg, p=0.02). The maximal proximal-to-distal bowel diameter ratio was significantly larger in study group (mean 8.36 ± 3.05 vs. 7.03 ± 2.81, p=0.01). The following CT features were more significantly present in study group: mesenteric fat stranding (n=46 [71.9%] vs. 19 [29.7%], p<0.001), closed loop pattern (n=14 [21.9%] vs. 4 [6.3%], p=0.02), and interloop/mesenteric fluid (n=45 [70.3%] vs. 23 [35.9%], p<0.001).
CONCLUSION

CT can differentiate the cases with SBO necessitating surgery at ED, when presence of larger maximal proximal-to-distal diameter ratio, mesenteric fat stranding, closed loop pattern or interloop/mesenteric fluid.

CLINICAL RELEVANCE/APPLICATION

CT can detect small bowel obstruction with the necessity for surgery and is recommended in the initial evaluation at ED to facilitate clinical decision making to avoid unnecessary conservative management.

ERE002-b Imaging Spectrum of Oncologic Emergencies (hardcopy backboard)

Cecilia Carrera (Presenter): Nothing to Disclose, Silvina Edith De Luca MD: Nothing to Disclose, Emilia Casalini MD: Nothing to Disclose, Juan Codas Thompson MD: Nothing to Disclose, Melina Wirtz MD: Nothing to Disclose, Eduardo Pablo Eyheremendy MD: Nothing to Disclose

TEACHING POINTS

1. Recognition of key imaging findings of acute conditions in oncologic patients that allows prompt diagnosis and facilitates treatment, reducing morbidity and mortality with consequent better outcome in this group of patients. 2. Discuss the role of the radiologist in the diagnosis and management in emergent conditions in cancer patients.

TABLE OF CONTENTS/OUTLINE


SSE06 ISP: Emergency Radiology (Forensic Imaging)

Scientific Papers

AMAPRA Category 1 Credits™: 1.00
ARRT Category A+ Credit: 1.00
Mon, Dec 1 3:00 PM - 4:00 PM Location: N227AB

Participants

Moderator
Michael J. Thali MD: Nothing to Disclose
Moderator
Barry David Daly MD: Research Grant, Koninklijke Philips NV

Sub-Events

SSE06-01 Emergency Radiology Keynote Speaker: What’s Up in Forensic Radiology?

Michael J. Thali MD (Presenter): Nothing to Disclose

SSE06-02 Use of Computed Tomography in Abdomino-pelvic Gunshot Wounds. Is Bullet Trajectography Important?

Fatemeh Abdollahi Mofakham MD (Presenter): Nothing to Disclose, Nima Momenin MD: Nothing to Disclose, Karen Rosenspire MD: Nothing to Disclose

PURPOSE

We determined the sensitivity and specificity of Computed Tomography (CT) in detecting visceral organ injuries in gunshot wounds (GSW) to the abdomen and pelvis. We also evaluated use of reconstructions in the plane of the bullet (trajectography) to improve injury detection.

METHOD AND MATERIALS

The list of 621 patients who had presented to Emergency Department of a trauma center with GSW to the abdomen and pelvis and undergone laparotomy during the last 15 years was obtained from the trauma surgery database. Of those 53 had pre-operative CT abdomen/pelvis and were included in our study. We evaluated concordance of findings in operative report with CT report. Since pneumoperitoneum could not be confirmed by laparotomy, all the cases were reviewed for presence of free intraperitoneal air by a radiologist and second opinion was obtained in case of disagreement with the CT report. Usefulness of trajectography in identifying missed injuries by CT was also determined.

RESULTS
CT has high sensitivity in detecting free air, free fluid, stomach, and kidney injuries (85%, 94%, 86%, and 100% respectively). The sensitivities were lower for liver and spleen injuries (69% and 75%), and small and large bowel injuries (60% and 57%). Penetrating diaphragmatic injury (PDI) was missed in 10 of 12 cases, resulting in a sensitivity of only 17%. Trajectography was shown to be helpful in detecting small solid organ injuries. Review of the available CT images showed that, using trajectography and contiguous injury on sides of the diaphragm is improving sensitivity to 90% in PDI. These signs were previously shown to be highly accurate and sensitive, respectively.

CONCLUSION

CT sensitivity for visceral injuries can be improved using trajectography, with special attention to PDI. Bullet trajectography and presence of contiguous injuries on sides of the diaphragm are helpful in detecting PDI. As bowel can move with time, bullet trajectography should be used cautiously to identify the most likely sites of injury that require special attention. However, secondary signs of injury are required to suggest injury.

CLINICAL RELEVANCE/APPLICATION

We show methods to improve injury detection by CT in GSW to the torso, which may lead to improvement in mortality and morbidity.

SSE06-03

Mal-positioned Tracheal Tubes on Postmortem Computed Tomography in Forensic Cases

Patricia Mildred Flach MD : Nothing to Disclose, Anders Persson MD, PhD : Nothing to Disclose, Sabine Franckenberg MD : Nothing to Disclose, Michael J. Thali MD : Nothing to Disclose, Steffen Ross MD (Presenter): Nothing to Disclose

PURPOSE

Mal-positioning of a tracheal tube (TT) within the airways during intubation may lead to a serious cascade of complications, particularly in critically ill or trauma patients who require immediate emergency intubation. The purpose of this large-scale multi-center study was to identify the rate of TT-displacements of decedents on postmortem Computed Tomography (PMCT).

METHOD AND MATERIALS

A total of 2312 PMCT cases from three different European Institutes of Forensic Medicine (Switzerland and Sweden) were reviewed retrospectively (2003-2014). In 208 deceased cases a TT was inserted. The median age was 52.4 years (0.1-95 years). All corpses underwent whole body PMCT (Somatom 6, Somatom 16, Somatom Definition Flash; Siemens Medical, Germany) with slice thicknesses varying from 1 to 3mm. Image analysis was performed on a CT workstation (SynGo, Multi Modality Workplace, Siemens Medical, Germany).

RESULTS

Of all 208 deceased with a TT, less than a third (32%) presented with a mal-positioned TT (intraglottic 7%, tracheal bifurcation 18 % supracarinal, right main bronchus 43% bronchial, left main bronchus 14%, esophageal 11%, mediastinal after tracheal rupture 7%). Retrospective analysis of the treatment protocols showed that in 73 cases the medical personal removed the TT directly after the confirmation of death.

CONCLUSION

This multicentric study shows that PMCT is a valuable, non-invasive tool in depiction of displaced tracheal tubes in deceased. An insufficient tracheal intubation may cause hypoxia and generates a significant increase in morbidity. This fact becomes a forensic key-point in the evaluation of potential medical malpractice cases. The purpose of this large-scale multi-center study was to identify the rate of TT-displacements of decedents on postmortem Computed Tomography (PMCT).

CLINICAL RELEVANCE/APPLICATION

Non-invasive documentation of a misplaced tracheal tube on PMCT is a key-point in the evaluation of potential medical malpractice. This is hardly detectable during autopsy without potential dislocation of the TT due to preparation.

SSE06-04

Illegal Intracorporeal Cocaine Containers: Factors Influencing the Density at Low-dose CT Examination

Alexandra Platon MD (Presenter): Nothing to Disclose, Christoph D. Becker MD : Nothing to Disclose, Thomas Perneger : Nothing to Disclose, Pierre-Alexandre Alois Poletti MD : Nothing to Disclose

PURPOSE

Illegal intra-corporeal cocaine containers (packets) which appear isodense to the bowel content at low-dose CT may remain undetected at abdominal radiograph. The purpose of our study was to evaluate the parameters that may influence the density of intra-corporeal illegal cocaine containers at low-dose CT examination.

METHOD AND MATERIALS

All suspects of conveying intracorporeal illegal containers have been examined by low-dose CT. For each positive case, the weight (g), the percentage of cocaine (%), and the chemical content of the cutting agents of
the containers were obtained by chemical analysis; the mean radiologic density (HU) and the volume (cm$^3$) of containers were measured at low-dose CT. The bulk density (g/cm$^3$), used as an indicator of container compaction, was calculated. Univariate and multivariate analyses were performed to determine the parameters associated with the hyperdense aspect of packets, defined as a density higher than 40HU; this threshold corresponds to the mean density of the intestinal content.

RESULTS

Forty-six conveyors were included. Packets were isodense (< 40HU) in 13 (28%) conveyors, hyperdense (> 40HU) in 33 (72%). The radiologic density had a mean of 118.5 HU (range -85 to 327), bulk density had a mean of 1.00 g/cm$^3$ (range 0.51 to 1.77), and cocaine content had a mean of 44.2% (range 14.0 to 79.5). At univariate analysis, two parameters were associated with the hyperdense aspect of the packets: bulk density higher than 0.9 g/cm$^3$ (p<0.001) and cocaine content higher than 50% (p = 0.027). None of the cutting agent did influence the density. At multivariate analysis, only the bulk density remained discriminating (p=0.001).

CONCLUSION

A bulk density more than 0.9 g/cm$^3$ is the only parameter significantly associated with hyperdensity of the packets.

CLINICAL RELEVANCE/APPLICATION

Radiodensity of intracorporeal cocaine containers depends mainly on compaction and not on chemical content; this observation may explain containers' radiologic appearance.

**SSE06-05**

**The Neglected Space: Quantifying the Third Space Body Fluid with Whole Body CT and Autopsy**


**PURPOSE**

Fluid in the third space can accumulate in pleural, pericardial and peritoneal spaces in addition to the subcutaneous tissue planes (peripheral edema). We developed a qualitative method for grading fluid in the third space and correlated it with autopsy findings and CT quantitative fluid volume.

**METHOD AND MATERIALS**

Our IRB approved study included 41 human cadavers (mean age 63y, 24M; 17F) who had a whole body postmortem CT just prior to their autopsy. All bodies were preserved in the morgue in the time interval between death and autopsy at 4°C (mean time interval between CT and death = 23 hours). Two radiologists experienced in postmortem imaging reviewed the whole body CT examinations independently to grade the third space fluid in the pleura, pericardium (trace, small, moderate, large), the peritoneum (trace (thin sliver of fluid), small (pockets), large (diffuse fluid accumulation)) and subcutaneous space (minimal (fat stranding), mild (subcutaneous fluid in dependent portions), moderate (fluid accumulation extending into intermuscular planes to the non dependent portions), severe (diffuse circumferential fluid accumulation in subcutaneous and intermuscular planes)). Qualitative grading was correlated with autopsy findings.

**RESULTS**

No peripheral edema was seen in 9/41 cadavers. Moderate and severe peripheral edema was seen in 14/41 and 8/41 cadavers. It is not possible to quantify peripheral edema on autopsy. Only 26/41 (63%) cadavers had concordance between the results from radiologic grading of pleural effusion and the quantity of pleural fluid on autopsy. Only 20/41 and 16/41 of the cadavers (49% and 39%) had concordance between the results from radiologic grading and the quantity of peritoneal and pericardial fluid on autopsy. Degree of anasarca had significant correlation with the severity of ascites (Spearman r = 0.6, p

**CONCLUSION**

Postmortem CT can help in accurate detection and grading of third space fluid in pleural, peritoneal, pericardial and peripheral tissue planes. Severity of ascites on CT can predict the extent of peripheral fluid accumulation in the body.

**CLINICAL RELEVANCE/APPLICATION**

Third space fluid quantification is feasible on whole body postmortem CT, which is a limitation for autopsy examinations.

**SSE06-06**

**Left Ventricle Wall Thickness in Post Mortem CT: Does It Really Help to Determine LV Hypertrophy?**


**PURPOSE**

To assess the feasibility of postmortem CT in differentiating normal and hypertrophied left ventricle (LVH) in comparison to pathology as the gold standard.
METHOD AND MATERIALS
In an IRB approved, HIPAA compliant retrospective study, postmortem chest CT scan of 37 cadavers (59.9±14 years, body mass index 28.4±6 kg/m², F:M 9:28) were included for the study. Twenty one patients (57.2±14 years, body mass index 28.7±5.6 kg/m², F:M 18:3) had confirmed LVH on gross and histo-pathology examinations, whereas in remaining 16 patients (63.9±14 years, body mass index 28.1±7 kg/m², F:M 5:10), there was no LVH on pathology. Chest CT was performed at 120 kV, 300 mAs, 0.5:1 pitch, 1 second rotation time, 0.75 mm reconstructed section thickness with filtered back projection reconstruction technique. These images were exported to ViTREA® (VITAL Image, Toshiba Medical Systems) image processing workstation to generate short axis multiplanar images of the left ventricle in order to measure LV segmental thickness. LV wall thickness was measured at different locations in the left ventricle in all patients (Figure 1). Data were analyzed using student t-test.

RESULTS
It was possible to measure the LV wall thickness in all cadavers. BMIs in the LVH and non-LVH group were 28.7 ± 5.7 kg/m² and 28.1 ±7.2 kg/m² (p> 0.1). Average interval between death and postmortem CT was 22 ± 25 (range: 1- 114 hours). Septal wall thickness at mid-cavity had the lowest average (17.8 ±3.4) while lateral wall thickness at the base of the heart had the highest value (24.3 ±4.9) (p<0.000). Diameters at eight different locations were not significantly different between patients with and without LVH (p= 0.1 - 0.4). Also wall thickness was the same among patients with BMI higher (n=15, 19.6 ±5) and lower than 30 kg/m² (n=22, 19.9 ±5). Wall thickness in the female (n=9, 20.8 ±8.6) and male group (n=28, 20.3 ±5.8) was not significantly different (p> 0.1). Average wall thickness in patients scanned within 12 hours after their death and after 12 hours of their death were 20.8 ±2.7 and 21.2 ± 2.2 respectively (p> 0.1).

CONCLUSION
Postmortem CT shows increased left ventricle wall thickness in all human cadavers with or without pathology-confirmed LVH and regardless of patients' gender, size, and time of death.

CLINICAL RELEVANCE/APPLICATION
Left ventricle wall thickness should not be used to comment on presence or absence of left ventricle hypertrophy on post mortem CT.
endovascular therapy. Of 95 subjects, 85 (89.5%) had a concurrent baseline CTA; 59 (62.1%) had a conventional angiogram. Median age was 69 years, baseline NIHSS 17.0, and baseline ASPECTS 8.0. Of 85, 76 (89.4%) had baseline intracranial occlusions; 16 ICAT, 39 M1, 17 M2, and 4 other occlusions. The median (range) CTP core volume was 5.8 (0-81.6) ml and hypoperfused volume was 55.8 (0-383.4). Among 53 subjects, the CTA collateral grade was poor in 17 (32.1%), intermediate in 15 (28.3%) and good in 21 (39.6%). Among 41 subjects, the DSA collateral grade was 0 in 3 (7.3%), 1 in 8 (19.5%), 2 in 15 (36.6%), 3 in 12 (29.3%) and 4 in 3 (7.3%). Hypoperfused volumes correlated with baseline NIHSS (p = 0.0382) and core volumes correlated well with baseline ASPECTS (p

**CONCLUSION**

Higher CTP mismatch ratios and smaller cores were significantly associated with robust baseline collaterals in IMS III.

**CLINICAL RELEVANCE/APPLICATION**

CTP may be used as a non-invasive tool to predict collateral status, however warrants further investigation.

**SSE18-02**

Altered Functional Activation Maps in Healthy Aging and Stroke due to Neurovascular Uncoupling

*Ryan Raut (Presenter): Nothing to Disclose, Veena A. Nair PhD: Nothing to Disclose, Wolfgang Gaggl PhD: Researcher, Prism Clinical Imaging, Inc, Brittany Young: Nothing to Disclose, Christian La: Nothing to Disclose, Justin Sattin: Nothing to Disclose, Vivek Prabhakaran MD, PhD: Nothing to Disclose*

**PURPOSE**

A diminished relationship between neural and hemodynamic activity has been observed in various patient groups and has raised some concern regarding the validity of fMRI for these groups. To investigate the extent of neurovascular uncoupling (NVU) in aging and stroke, we compared fMRI activation maps of younger and older healthy subjects, as well as acute stroke patients during a breathhold task.

**METHOD AND MATERIALS**

Anatomical and functional images were collected on a GE 3T MR scanner for 73 subjects: 30 stroke patients (20 male, M = 59 years), 22 old healthy normals (10 male, M = 59 years), and 21 young normals (14 male, M = 22 years). Functional images were acquired during a breathhold task. Not all subjects did all tasks. Group-level analyses compared activation maps using AFNI.

**RESULTS**

Older normals differed from younger normals in cortical activation in multiple areas, suggesting an increase in the degree of neurovascular uncoupling with age. Stroke patients also differed from younger normals in cortical activation, suggesting that neurovascular uncoupling may indeed be occurring in this population as well. All maps were corrected for multiple comparisons, p < 0.05.

**CONCLUSION**

Our results suggest that some NVU may induce changes with age and stroke, though these disparities do not seem severe enough to invalidate fMRI for these groups. Further research is warranted to examine effect of stroke location and to improve understanding of fMRI signal in these groups.

**CLINICAL RELEVANCE/APPLICATION**

Breathhold mapping can be used to evaluate BOLD fMRI signal in stroke patients. Standard fMRI examinations may result in false negative mapping, leading to erroneous conclusions in this population.

**SSE18-03**

Decreased Cerebrovascular Reactivity is Associated with a Reduction in Cortical NAA/Cr: Loss of Neuronal Integrity in Areas of Limited Vascular Reserve


**PURPOSE**

We sought to determine whether limited cerebrovascular reactivity (vascular reserve) is associated with reduced neuronal density, or a loss of neuronal integrity, using NAA/Cr as a surrogate measure for neuronal health.

**METHOD AND MATERIALS**

Single voxel MR spectroscopy for NAA/Cr (N-acetylaspartate: creatine) ratio (TR 1500, TE 144 ms) was undertaken in 32 patients undergoing cerebrovascular reactivity (CVR) imaging. Cerebrovascular reactivity was measured using blood oxygen level dependent (BOLD) MR imaging with a carbon dioxide stimulus. Mirror image paired spectroscopy voxels, one voxel per hemisphere, were typically selected for each patient. Voxels were centered over normal appearing cortical parenchyma as seen on conventional imaging, in locations which maximized the CVR difference between voxels of a pair as seen on CVR maps. Mean CVR values within the volume of parenchyma corresponding to each spectroscopy voxel were measured. The correlation between NAA/Cr and CVR was assessed. The NAA/Cr in the voxels with limited CVR was compared to the NAA/Cr in the relatively spared voxels in the opposite hemisphere.
RESULTS
There was a weak but statistically significant correlation between CVR and NAA/Cr (n=32, r=0.322; P=0.010). In patients in whom there was visually obvious unilateral CVR reduction with contralateral sparing (n=13), the mean NAA/Cr ratio was lower in voxels with reduced CVR compared to the spared voxels in the opposite hemisphere (Mean NAA/Cr in voxels with reduced CVR = 1.849, SD 0.312; Mean NAA/Cr in voxels with spared CVR = 1.982, SD 0.282; P=0.027).

CONCLUSION
These results suggest that there may be reduced neuronal density or neuronal degradation in areas of reduced vascular reactivity. The weak correlation could relate to several factors including limited patient numbers, and the variable fraction of grey and white matter included within voxels.

CLINICAL RELEVANCE/APPLICATION
A reduced vascular response (CVR) may result in damaging effects on the health of grey matter, which is inconspicuous on conventional imaging. This may have clinical implications such as cognitive impairment and dementia.

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**SSE18-04**

Assessment of Brain-blood Barrier (BBB) Permeability after Local Brain Cooling with Dynamic Contrast Enhanced MRI in Transient Middle Cerebral Artery Occlusion (MCAO) Rat Model

Eun Soo Kim (Presenter): Nothing to Disclose, Seung-Koo Lee MD, PhD: Nothing to Disclose, Hye Jeong Kim MD: Nothing to Disclose, Kwanseop Lee: Nothing to Disclose

PURPOSE
To evaluate effect of local brain cooling by quantification of the permeability parameters (Ktrans, Kep, Ve, and Vp) presenting the microvascular BBB permeability using dynamic contrast enhanced MRI at a transient middle cerebral artery occlusion (MCAO) rat model

METHOD AND MATERIALS
31 Adult Sprague-Dawley rats (280-300 gram) were used in transient middle cerebral artery occlusion (MCAO) and underwent DCE-MRI on a 3T MRI scanner with 8-channel SENSE wrist coil. MCAO was induced by an intra-luminal filament. For one hour, middle cerebral artery was occluded at rat model. In the stroke control group without treatment, a 1-h MCA occlusion was induced and followed by 3 hour of reperfusion. Immediate MRI was performed and 24 hour of reperfusion was followed. The next day, the second MRI was done. In the local saline infusion group, after a 1-h MCA occlusion, 6ml of cold and warm saline (20°C or 37°C) through the hollow filament for about 10 minutes was infused before the onset of 3 hour of reperfusion. Immediate MRI was also performed and 24 hour of reperfusion was followed. The next day, following MRI was done. In all animals, the rotarod test was performed before MCAO and after MCAO for 1 to 9 days. The following day, all animals were euthanized and their brains were sectioned. To detect BBB breakdown after MCAO, we performed immunohistochemistry for myeloperoxidase (MPO) to identify infiltrating neutrophils associated with the inflammatory response. Data post-processing of permeability parameter was performed using Pride tools provided by Philips Medical system.

RESULTS
There was a statistically significant decrease of Ktrans and Kep at infarction area in cold saline (20°C) group compared with no treatment control group and a borderline decrease of Kep in cold saline (20°C) group, compared with warm saline (37°C) group. The behavior test was no statistically significance between three groups. Compared to total mixed inflammatory cells, the number of MPO-positive cells was significantly higher in control group than in cold and warm saline (20°C or 37°C) groups. In addition, the MPO-positive cells in cold saline (20°C) group are statistically lower than warm saline (37°C) group.

CONCLUSION
Local brain hypothermia induced by local saline infusion at stroke make a stable environment as decrease of BBB breakdown.

CLINICAL RELEVANCE/APPLICATION
DCE MRI can demonstrate the microvascular BBB permeability in stroke research.

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**SSE18-05**

The Temporal Evolution of Diffusion Kurtosis Imaging in Ischemic Stroke

Shun Zhang (Presenter): Nothing to Disclose, Jingjing Shi: Nothing to Disclose, Yihao Yao MD, PhD: Nothing to Disclose, Shuixia Zhang: Nothing to Disclose, Yan Zhang: Nothing to Disclose, Wenzhen Zhu MD, PhD: Nothing to Disclose

PURPOSE
Diffusion kurtosis imaging (DKI) is a quantitative measure of the non-Gaussianity of diffusion process in both white matter and gray matter; it has more advantages over DTI and can yield additional kurtosis information, so DKI may better characterize the complexity or heterogeneity of the tissue microenvironment. The purpose of this study is to investigate the temporal evolution of DKI-derived parameters and their application value in ischemic stroke

METHOD AND MATERIALS

114 patients with ischemic stroke were recruited in the study, including 8 cases of hyperacute infarction (<6hours), 14 acute infarction (7~24hours), 60 early subacute infarction (1~7days), 20 late subacute infarction (8~14days), and 12 chronic infarction (15days~2months). All the patients underwent DWI and DKI scan (b=0,1250,2500s/mm2). ADC and DKI-derived parameters were obtained within the lesions and contralateral mirror areas with ROI methods. The quantitative parameters included MK, Kx//, KD, MD, D//D, and D?

RESULTS
MK, Kx//, Kmap showed heterogeneous high signal in Infarcted area. MK, Kx//, Kmap showed elevated to a peak in acute, early subacute phase, then gradually reduced, and tends to normalize. MK value in infarcted area (1.445 ± 0.432) was higher than that in the contralateral mirror area (0.870 ± 0.174)(paired t-test), and so was Kx// and KD. Except for hyperacute phase, the percent change of Kx// was higher than KD and D// has a lower amplitude than D. In about each phase of ischemic stroke, the amplitude of percent change of MK, Kx// was over 50%, MK, Kx// exceeded 100% in acute phase, while the percent change of MD, D//, D? were all lower than 50%.

CONCLUSION
Based on the results above, it can be predicted that, it is more sensitive to identify ischemic lesions in hyperacute, acute phase with MK, Kx// than with ADC, MD, D//, D?. The diffusion change parallel to the axons is greater than that perpendicular to the axons (e.g. myelin). When infarction occurs, axonal injury was the primary cause of infarction, which can be expressed as axonal swelling, endoplasmic reticulum, and other intracellular fine structure. The decrease of ADC in infarcted area was mainly due to axonal damage.

CLINICAL RELEVANCE/APPLICATION
Diffusion kurtosis imaging can better reflect the microstructure changes in tissue, and is more sensitive in discovering diffusion restricted areas, and can be a complementary method in clinical diagnosis.

SSE18-06
CTA Recanalization Score – A Reliable Measure of Recanalization

PURPOSE
Recanalization is associated with a 4-fold increase in good outcomes in acute ischemic stroke. CTA has become the clinical and research standard of cerebrovascular assessment. Currently, there is no validated standardized CTA recanalization scoring system. We aimed to develop a CTA-based recanalization scale, and test the reliability of its components.

METHOD AND MATERIALS
Data is from INTERRSeCT, a multi-center prospective study, examining clot characteristics associated with early recanalization. Three raters assessed CTA of 30 randomly selected patients at baseline and 2-6h later. Baseline scans were scored for site of primary intracranial arterial occlusive lesion (PIAOL), residual flow through PIAOL and distal thrombus burden (DTB). Recanalization was assessed on follow-up CTA using PIAOL debulking, change in residual flow, and DTB. A CTA Recanalization Score (CTARS) consisting of 8 categories was used to summarize recanalization of PIAOL and its distal vasculature. Reliability was quantified using kappa (weighted when appropriate).

RESULTS
Agreement on PIAOL location varied from excellent proximally (ICA, M1, proximal M2) to poor for more distal sites. Agreement was moderate to substantial on residual flow (Kw=0.67, 0.49, 0.55), and fair to moderate on DTB (Kw=0.41, 0.17, 0.31) at baseline. Reliability was excellent for PIAOL debulking (Kw=0.87, 0.90, 0.92), residual flow change (Kw=0.91, 0.88, 0.86), and moderate to substantial for follow-up DTB (Kw=0.78, 0.43, 0.51). Near perfect agreement was obtained on final CTARS (Kw=0.90, 0.96, 0.88).

CONCLUSION
CTARS is a reliable method of assessing recanalization of PIAOL and its distal vasculature. Future studies should focus on prospective scale validation and performance with other imaging modalities.

CLINICAL RELEVANCE/APPLICATION
A reliable CTA recanalization assessment method will help in comparing novel thrombolytic agents vs. current standard of care in acute stroke management.

RC308
Emergency Imaging in Vulnerable Populations—Considerations and Calibrations
Refresher/Informatics
ER
AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Sub-Events

**The Obese Patient**

Martin Lee David Gunn MBChB (Presenter): Medical Advisor, TransformativeMed, Inc Spouse, Consultant, Wolters Kluwer nv Grant, Koninklijke Philips NV

**LEARNING OBJECTIVES**

1) Identify logistical and image quality challenges when obese patients are imaged in the Emergency Department. 2) Recognize common CT imaging artifacts in the obese patient. 3) Develop techniques to optimize image quality for obese ED patients when radiography, ultrasound and CT are used. 4) Understand current concepts about CT radiation dose in obese patients.

**URL’s**

http://depts.washington.edu/uwerad/education.html

**The Transferred Patient**

Joel A. Gross MD, MS (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the advantages of utilizing outside images for transferred patients. 2) Recognize the challenges in obtaining, processing, loading, and storing these images locally. 3) Recognize the challenges in managing the outside interpretations provided, and/or (re)interpreting the studies locally.

**ABSTRACT**

Over the past decade, the number of transferred patients arriving in emergency departments with outside imaging has increased tremendously, due to the relative ease and lowered costs of providing multiple images on small and inexpensive CD/DVDs, or via electronic transfers. This provides a tremendous opportunity to improve patient care, potentially allowing a trauma team to know what injuries the patient has suffered before they arrive, and reducing the added time, radiation, contrast and cost of of re-imaging a patient. Unfortunately, this opportunity also presents with numerous challenges, including: additional time to obtain and process outside images; complexity of reviewing images obtained with different protocols from those used at the reviewer’s institution, incomplete studies, lesser quality studies than those obtained locally. In addition, decisions have to made regarding the processing and interpretation (if any) of these studies.

**The Pediatric Patient**

Susan D. John MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Recognize the special challenges and risks of medical imaging in pediatric patients. 2) Evaluate the risks and benefits of various imaging modalities for specific pediatric diagnoses. 3) Design imaging procedures that are tailored to the special needs of the infant, young child, and adolescent patient.

**The Geriatric Patient**

Claudia Theresa Sadro MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Epidemiology of geriatric trauma. 2) Imaging protocols for the geriatric patient who sustains minor and major trauma including the value of CT, when to order MRI and thresholds for angiography. 3) Guidelines for measuring renal dysfunction and giving intravenous iodinated contrast in the setting of renal dysfunction in geriatric patients. 4) Unique patterns of injury encountered in geriatric patients will be shown with clinical examples including head trauma, spine trauma, rib fractures and chest trauma, abdominal trauma, pelvic fractures and extremity fractures. Special attention will be made to traumatic injury in patients on anticoagulants, steroids and bisphosphonates. 5) Pre-existing medical conditions and incidentalomas in geriatric patients. 6) Prevention of geriatric trauma.

**ABSTRACT**

The geriatric population is the most rapidly growing sector of the US population, and emergency departments are seeing an increasing number of geriatric trauma patients. Geriatric patients are at risk for serious injuries following relatively minor trauma. Underestimation of their injuries based on mechanism of action by caregivers and health care personnel is a significant cause of morbidity and mortality in this age group. Radiology plays an important role in the early work up of these patients. CT in the mainstay of imaging. There is less concern about the risk of cancer from ionizing radiation in this age group. Intravenous contrast may be administered in patients with normal renal function. In patients with impaired renal function, it is important to follow guidelines appropriate for age. Geriatric patients have different injury patterns than younger patients and are at increased risk of serious complications from minor injuries. They require early diagnosis and aggressive intervention to decrease mortality and to enable them to return to independent living. This review will discuss head injury,
spine injury, rib fractures, blunt abdominal trauma, pelvic fractures, extremity fractures and pre-existing illness as it pertains to radiology in the geriatric population

Active Handout

SSG03
Emergency Radiology (Abdominal Emergencies)

Scientific Papers

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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 MBChB, 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 concordant follow-up: 4 SBO, 11 diverticulitis, 6 Pelvic inflammatory disease, 7 Inflammatory bowel disease, 7 Colitis, 6 Pyelonephritis, 2 Cholecystitis, Renal abscess, Pseudomembranous colitis, Splenic hematoma, Mesenteric adenitis, 2 Pancreatitis, Lymphoma, Eipioic 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.

SSG03-02  Ureteral Stone Detection Using Virtual Nonenhanced Images in Enhanced Spectral CT Imaging: A Preliminary Study

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 females, 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

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 (0.794, 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 appendicitis 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 98.1% (265/270) for SD NECT, SD CECT1, LD NECT, and SD CECT2, respectively. Areas 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**

Kathryn Darras MD (Presenter): Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, David M. Thomas BSC: Nothing to Disclose, Shamir Rai BSC: Nothing to Disclose, Luck Jan-Luck Louis MD: 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, Savvas Nicolaou MD: Nothing to Disclose

**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?

Tarek Noel Hanna MD; Seyed Amirhossein Razavi MD; Drew Anthony Streicher MD, MBA (Presenter); Kimberly E. Applegate MD, MS

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 enteric 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; Abidin Kilincer MD (Presenter); Bulent Erbil MD; Volkan Kaynaroglu MD; Deniz Akata MD; Mustafa Nasuhi Ozmen MD

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 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.
235 No-UA on SS exams, 26 UA and 266 No-UA on DESCT exams), sensitivity and specificity were 93% and 96%. Image quality of the SS exam was similar to or slightly better than that of the DESCT exam.

CONCLUSION
Differentiation of UA and No-UA Kidney stones is feasible by using two consecutive scans. UA stones could be identified using a SS CT scanner with an accuracy of 96% for stone sizes >4mm.

CLINICAL RELEVANCE/APPLICATION
Knowledge of the composition of urinary tract stones is a fundamental part of the preoperative patient evaluation, and this information influences treatment plans and recurrence prevention. UA stones may be treated with urinary alkalization as a first-line treatment, with surgical treatment being reserved for stones that do not respond to medical therapy. Accurate differentiation of UA and No-UA using SS scanners may increase availability for this technique, which is clinically useful in identifying patients with medically treatable stones.

ERS222
Utility of iPAD as a Diagnostic Console for Detecting Acute Appendicitis on Focused Appendiceal Computed Tomography (Station #2)

Muhammad Awais MBBS (Presenter): Nothing to Disclose, Dawar Burhan Khan FRCR, MBBS: Nothing to Disclose, Danish Barakzai MBBS: Nothing to Disclose, Abdul Rehman MBBS: Nothing to Disclose, Naila Nadeem: Nothing to Disclose

PURPOSE
Acute appendicitis is a surgical emergency and accurate timely diagnosis is crucial for improving outcomes. Focused appendiceal computed tomography (FACT) has become one of the primary diagnostic modalities for acute appendicitis. Portable gadgets (like tablets, laptops and smart-phones) have the potential to greatly improve communication between radiologists and surgeons. iPAD, although being small, has sufficiently large display with a long battery life, enabling it to be used as a portable diagnostic imaging console. In the present study, we compared the accuracy of iPAD as a diagnostic console for diagnosing acute appendicitis on FACT using Picture Archival and Communication System (PACS) workstation as reference standard.

METHOD AND MATERIALS
Two hundred and twenty five (225) patient underwent FACT at our institution from January, 2012 to June, 2013. All these CT scans were blindly re-interpreted by an independent consultant radiologist first on iPAD version 2.0 and two weeks later, on PACS diagnostic workstation. CT scans were interpreted for the presence of acute appendicitis, location of appendix, phlegmon formation, perforation, appendicolith, free fluid and maximal appendiceal transverse diameter (outer wall to outer wall). Statistical analysis was performed on SPSS version 20. Paired student t-test and kappa statistics were used for comparison. A p-value of less than 0.05 was considered statistically significant.

RESULTS
Ninety nine (99) out of 225 patients had radiological evidence of acute appendicitis on PACS workstation. iPAD was 100% accurate in diagnosing acute appendicitis using PACS workstation as the reference standard. Appendicoliths were identified on PACS workstation in 43, phlegmon in 10, free fluid in 39 and perforation in 12 of the CT scans. Kappa (κ) statistics showed excellent agreement between iPAD and PACS workstation for the detection of appendicolith (κ =0.945), phlegmon (κ=0.817), free fluid (κ=0.793) and perforation (κ=0.904). Student’s t-test failed to reveal any significant difference (p=0.222) between the mean appendiceal transverse diameter as measured on iPAD (11.511 mm) versus PACS workstation (11.288 mm).

CONCLUSION
iPAD, as a diagnostic console, was as accurate as PACS workstation for the diagnosis of acute appendicitis on FACT.

CLINICAL RELEVANCE/APPLICATION
iPAD may be used as an efficient portable imaging console for diagnosing acute appendicitis on FACT.

ERS243
First-line Ultrasound in the Work-up of Acute Appendicitis at an Academic Teaching Hospital with 24/7 Radiology (Station #3)

David Tso MD (Presenter): Nothing to Disclose, Jennifer Wang BS: Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Douglas S. Katz MD: Nothing to Disclose, Silvia D. Chang MD: Nothing to Disclose, Savvas Nicolau MD: Nothing to Disclose

PURPOSE
This study evaluated the role of ultrasound as a first-line imaging modality for the work-up of acute appendicitis in young adults at an academic teaching hospital with 24/7 staff radiologist on site. This study attempted to determine the specificity and sensitivity of ultrasound in diagnosing appendicitis and the need for further imaging.

METHOD AND MATERIALS
A retrospective study design was undertaken examining patients seen in the emergency department of an urban tertiary care teaching hospital between October 1 to December 31, 2013 with the chief complaint of right lower
quadrant pain. Patients investigated with ultrasound as first-line imaging were identified. Scan time, findings on ultrasound, and the need for further imaging was documented. Findings were correlated with CT findings and surgical diagnosis when available.

RESULTS

106 patients were identified (80.2% female, mean age 29.1). 39.6% of ultrasound exams were performed between the hours of 5PM and 8AM. Average time for a scan was 28.6 minutes. The appendix was visualized in 28.3% on ultrasound and was equivocal on 11.3%. Of the 30 cases where the appendix was visualized, 76.7% were sonographically diagnostic for acute appendicitis and had an average appendiceal diameter of 10mm. An alternative diagnosis was found in 16% of all cases, with ovarian pathologies being most common. Of the 23 confirmed cases of appendicitis on ultrasound, only 2 patients required further imaging. 18 patients went to the operating room where appendicitis was confirmed on all but one case. Perforation rate was 35.3%. Of the 83 patients with negative or equivocal ultrasound scans, 47.0% required further imaging (64.1% CT, 35.9% MRI). The appendix was seen on all CT scans, but on only 78.7% of all MRI scans. 12 patients went to the operating room where all cases were diagnosed with appendicitis with a perforation rate of 41.7%. The sensitivity and specificity of ultrasound was 70.8% and 92.9% respectively.

CONCLUSION

First-line ultrasound is utilized in young patients to avoid exposure to radiation. The appendix is not visualized a majority of the time on ultrasound, necessitating further imaging. When the appendix is visualized, ultrasound demonstrates high specificity for the diagnosis of acute appendicitis.

CLINICAL RELEVANCE/APPLICATION

Ultrasound is a useful first-line imaging modality for the diagnosis of appendicitis when the appendix can be visualized.

ERS241

Fluoroscopy-Guided Treatment of Acute Esophageal Food Impactions in the Emergent Setting (Station #5)

Wenjia Wang MD (Presenter): Nothing to Disclose, Michael J. Shortsleeve MD: Nothing to Disclose

PURPOSE

Our department utilizes a combination therapy of intravenous glucagon, effervescent crystals, and water to treat acute esophageal food impactions in the emergent setting. We present our results from 109 consecutive completed procedures performed from 2002 to 2013.

METHOD AND MATERIALS

Patients with acute food impactions (less than 24 hours duration) in the esophagus were selected. Single contrast esophagrams were performed with 5 ml of undiluted non-ionic water-soluble contrast to confirm the presence and location of food impactions. Patients were then administered 1 ml of IV glucagon, one packet of E-Z Gas, and 240 ml of water. A second single-contrast esophagram was obtained to evaluate food bolus clearance and to exclude perforation. From 2002 to 2013, we performed 130 consecutive procedures, of which 21 were excluded for premature abortion due to patient vomiting.

RESULTS

The therapy resulted in 57 successful (excluding 3 which resolved within 30 minutes later in the emergency room and 9 which resolved following the initial contrast bolus alone) and 36 unsuccessful procedures with a success rate of 61%. In addition, 3 showed partial food clearance and 1 showed food bolus movement without clearance. The majority of impactions were ingested meat (94%, n=87). The most common underlying abnormality found was a lower esophageal ring, measuring 12.3 cm in the successful group and 11.4 cm in the unsuccessful group (n=19, excludes 19 with a documented ring but no measurement). Other causes included dysmotility, reflex esophagitis, Candida esophagitis, stricture, and esophageal adenocarcinoma. Combined with our previous data from 1987 to 1993 of 33 successful and 15 unsuccessful consecutive completed procedures, our total success rate is 64%. One complication of mucosal laceration occurred after two consecutive treatments in the same patient from the previous data.

CONCLUSION

The combination therapy is both successful and safe in treating acute esophageal food impactions in the emergent setting with minimal complications and radiation.

CLINICAL RELEVANCE/APPLICATION

The above described combination therapy is unique to our department and demonstrates the highest success rate to our knowledge in published literature for the fluoroscopic treatment of acute esophageal food impactions. Our study subject number is also the largest of its kind.
TEACHING POINTS

1. Illustrate Multidetector Computed Tomography (MDCT) findings of diaphragmatic injury (DI) after blunt thoraco-abdominal trauma. 2. Depict direct and indirect signs of DI. 3. Discuss false positive findings that may be misinterpreted as DI at MDCT.

TABLE OF CONTENTS/OUTLINE

MDCT is the imaging modality of choice for evaluation of hemodynamically stable patients with blunt trauma. DI is an uncommon but serious condition and often unrecognized. A collective of patients with diaphragmatic rupture or detachment after blunt trauma encountered in clinical practice trauma center form the basis of this pictorial essay. Direct and indirect signs of DI are discussed: 1. Diaphragm discontinuity. 2. Intrathoracic herniation of abdominal contents. 3. Constriction of the herniated abdominal viscera: "collar sign". 4. Visualization of the herniated viscera against the posterior chest wall: "dependent viscera sign". 5. The delayed diaphragmatic rupture process is reviewed. 6. Mimics of DI: congenital diaphragmatic defects (Bochdalek and Morgagni), eventration, and hiatal hernias. This educational exhibit substantiates the benefits of multiplanar MDCT in the detection and pre-operative planning in trauma pts sustaining DI. Subtle signs should be recognized for timely diagnosis, and familiarity with potential mimics is key to avoid unnecessary procedures.

Imaging of Craniocervical Junction Traumatic Injuries: What the Clinician Needs to Know (Station #6)

Roy Riascos MD (Presenter): Nothing to Disclose, Eliana E. Bonfante MD: Nothing to Disclose, Claudia Cotes MD: Nothing to Disclose, Reza Hakimelahi MD: Nothing to Disclose

TEACHING POINTS

Review the anatomy and different structures that stabilize the craniocervical junction. Analyze the different types of traumatic injuries that occur in the craniocervical junction. Understand the mechanical forces involved in craniocervical stability. Review the current classifications of craniocervical trauma and their imaging findings. Identify how imaging plays a role in the prognosis and treatment of craniocervical junction injuries.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Indications of Imaging • Plain films • CT • MRI 3. Craniocervical Junction Anatomy • Bony Anatomy • Ligamentous Anatomy • Craniometry 4. Traumatic Injuries of the Craniocervical Junction • Atlanto-Occipital Dissociation • Occipital Condyle Fractures • Fractures of the Atlas and Transverse Ligament Rupture • Atlanto-Axial Rotatory Deformity • Odontoid Fractures • Traumatic Spondylolisthesis of the Axis 5. Conclusion/Summary • What the clinician needs to know

Broken Bones, Bleeding Vessels, and Leaking Bladders: A Comprehensive Review of Acute Pelvic Trauma (hardcopy backboard)


TEACHING POINTS

Review osseous, vascular, and genitourinary (bladder and urethral) injuries that occur in acute pelvic trauma. Describe imaging tests such as MDCT, CT cystogram, and retrograde urethrogram used in the evaluation of pelvic traumatic injuries. Review classification of pelvic fractures and bladder and urethral injuries and implications for clinical management. Discuss the critical role of interventional radiology.

TABLE OF CONTENTS/OUTLINE

Acute pelvic trauma can result in pelvic fractures and soft tissue injuries due to high-energy mechanisms. Imaging plays an important role in identifying injuries that can be life-threatening and may need to be managed by a multidisciplinary team. A 10-year search of the radiology information system for pelvic trauma yielded 900 cases that were reviewed for this exhibit. In this exhibit, pelvic ring fractures, vascular injuries, and bladder and urethral injuries are reviewed including mechanism of injury, imaging appearance and implications for management. The most appropriate imaging tests are discussed including CT cystogram and retrograde urethrogram. The role of interventional radiology in the management of acute pelvic trauma is discussed. After reviewing this exhibit, a radiologist will have a global and in-depth understanding of acute pelvic trauma and the myriad of injuries that can be sustained.
PURPOSE

Acute adrenal ischemia represents a rare clinical event which should be promptly diagnosed in order to preserve the adrenal vitality and function. This study aims to evaluate the diagnostic accuracy of a new CT sign in order to define or exclude an initial phase of adrenal ischemia.

METHOD AND MATERIALS

69 patients suspected of having adrenal ischemia underwent 320-row CT examination. CT multi-planar images were evaluated searching for the patency of adrenal arterial and venous vessels, adrenal gland volume and the presence of the "capsular sign" represented by the evidence of a peripheral subtle hyper-dense line around an hypo-dense enlarged adrenal gland. All CT findings were then compared with the surgical findings (n=5), follow-up examinations (n=20) or autopsy (n=4). Sensitivity, specificity, diagnostic accuracy (DA), positive predictive value (PPV) and negative (NPV) were calculated for the "capsular sign" and represented by ROC analysis.

RESULTS

Acute adrenal ischemia occurred in 29/69 patients (42%), unilateral in 20 and bilateral in 9. Venous thrombosis was found in 20/29 (69%) and arterial hypo-perfusion in 9/29 (31%). The sign was found in 24/29 patients (83%). Sensitivity, specificity, DA, PPV and NPV values of 83%, 100%, 93%, 100% and 89%, respectively, were obtained.

CONCLUSION

The "capsular sign" represents a CT finding to be searched when an acute adrenal pathological condition is suspected. Its evidence correlates to acute ischemia with a 100% probability and when it is not found, the probability of a non-ischemic condition is 89%.

CLINICAL RELEVANCE/APPLICATION

The proposed CT "capsular sign" could represent a specific finding of acute adrenal ischemia providing a prompt diagnosis in the early phase of the disease.

ERS224

Frequency of IV Contrast CT Findings and Most Frequent Sites of Involvement in Pathologically Proven Cases of Ischemic Colitis (Station #2)

Cynthia Cruz MD (Presenter), Hani H. Abujudeh MD, MBA

PURPOSE

Determine the most frequent findings on IV contrast CT examinations of pathologically proven cases of ischemic colitis and define the most frequent sites of colonic involvement.

METHOD AND MATERIALS

IRB compliant retrospective review of CT examinations done with intravenous contrast of pathologically proven cases of ischemic colitis, from 2007 to 2010 in our institution. Patients with a history of recent abdominal surgery or trauma, and those without a concurrent IV contrast enhanced CT at time of diagnosis were excluded. 102 scans were analyzed for the presence of the following criteria involving the colon: abnormal wall enhancement, bowel wall thickening, dilatation, mesenteric fat stranding, venous engorgement, presence of fluid or ascites, pneumatosis-portomesenteric gas, infarcts of other organs and vasculature occlusion. Affected segments of the colon were noted.

RESULTS

Colonic wall thickening and mesenteric fat stranding were the most frequently seen findings, each was present in 90 of 102 cases (88%). Altered wall enhancement was detected in 84 of 102 cases (82%), increased enhancement was the most common pattern. Venous engorgement, was seen in 52 of 102 patients (51%). 36 of 102 cases (35%) in our series showed pericolonic fluid or ascites, in 27 of 36 cases (75%) fluid was present in small or trace amounts. Only 20 of 102 (20%) patients were found to have colonic dilatation. Pneumatosis was observed in 10 of 102 (9.8%) exams, with the presence of portomesenteric gas in 2 of those 10 cases (20%). Mesenteric arterial occlusion was observed in only 1 case of 102 (0.9%). No Infarcts of other organs were observed. Segmental distribution of ischemia was described in 96/102 (92%) cases whereas the involvement of the entire colon was seen only in 6/102 (5.9%) of the scans. Descending colon and sigmoid were the most frequently involved segments at 64 of 102 (62.7%) and 58 of 102 (56.9%) cases, and with fewer cases: transverse 23 of 102 (22.5%) and caecum 21 of 102 (21%).

CONCLUSION

The most frequent IV contrast CT findings in patients diagnosed with ischemic colitis are: Bowel wall thickening, fat stranding, abnormal wall enhancement and venous engorgement. The descending and sigmoid colon are the most frequently involved segments in ischemic colitis, and with lower incidences transverse and caecum.

CLINICAL RELEVANCE/APPLICATION

IV contrast CT is critical to demonstrate the findings in the early onset of ischemic colitis and its possible causes.
Adults with Acute Appendicitis: Comparison between Computed Tomography, Histopathological Findings and C-reactive Protein (Station #4)

PURPOSE
To compare findings on computed tomography (CT) with both histopathology and C-reactive protein (CRP) in patients with acute appendicitis (AA).

METHOD AND MATERIALS
76 consecutive patients (age 56±17.9y; range 23-97y) were categorized into one of three groups (GR) based on the histopathologic evaluation: ulcero-phlegmonous AA (GR1), gangrenous AA (GR2), and perforation (GR3). All patients underwent preoperative contrast-enhanced low-dose CT. Two blinded readers reviewed images in consensus and patients were assigned into one of three GR using following criteria: Patients in GR1/GR2 showed wall thickness (2-3mm/>3mm) with ring-like contrast enhancement, a cross-sectional diameter (6-10mm/>10mm), and moderate/high grade of periappendiceal fat attenuation, respectively, and patients in GR3 showed an abscess formation in the RLQ. CRP levels were correlated using p-values from Mann-Whitney's U test and receiver operating characteristic (ROC) curve analysis was performed for identification of cutoff-point for perforation.

RESULTS
According to histopathological evaluation, 49/76 patients (64.5%) were assigned into GR1, 5/76 patients (6.6%) into GR2, and 22/76 patients (28.9%) into GR3. Using MDCT, 42/49 patients (85.7%) were correctly identified as GR1, however, 7/49 patients (14.3%) were falsely classified as GR2. 2/5 patients (40%) were correctly identified as GR2, and 3/5 patients (60%) were falsely classified as GR1. 19/22 patients (86.4%) were correctly identified as GR3, and 3/22 patients (13.6%) were falsely classified as GR2. Mean CRP was 56mg/l ± 99 (range 0-359mg/l) in GR1, 117mg/l ± 64 (range 32-208mg/l) in GR2, and 139mg/l ± 84 (range 59-353mg/l) in GR3. CRP was significantly different between GR1 and GR3 (p<0.03). ROC analysis revealed an optimal cut-off point of >72mg/l for identification of perforation (AUC=0.725), resulting in a sensitivity of 86.4% and a specificity of 55.1%. CRP was neither significantly different between GR1 and GR2 (p=0.206) nor between GR2 and GR3 (p=0.786).

CONCLUSION
In patients with suspected AA and highly elevated CRP levels, CT is able to rule out perforation.

CLINICAL RELEVANCE/APPLICATION
CT may help to predict the relevant differences in histopathological grading. The differentiation between patients in GR1 and GR3 could lead to a different surgical approach (open vs. laparoscopic).

Automated Curved versus Standard Axial Reconstruction CT Images of the Rib Cage—Comparison of Diagnostic Performance and Time Requirement for the Detection of Rib Fractures (Station #5)

PURPOSE
The evaluation of computed tomography (CT) images for the presence of rib fractures can be time-consuming. The automated creation of unfolded, straight, two-dimensional CT maps of the rib cage with a commercially available curved planar reconstruction algorithm (syngo.CT Bone Reading, Siemens Healthcare, Erlangen, Germany) can potentially shorten interpretation time. Therefore, we compared the diagnostic performance and reading time of automated curved reconstruction CT maps and standard axial CT images for the detection of rib fractures.

METHOD AND MATERIALS
Isotropic chest CT data sets of 41 trauma patients were used. 21 of 41 (51%) datasets contained 137 of 984 (14%) rib fractures, which were established through independent image interpretation of two experienced readers with subsequent consensus interpretation. For comparison of the two visualization techniques, three readers independently evaluated the data sets, which were randomly presented and blinded to time, date and patient information. Data evaluation was performed in two sessions, which were two weeks apart. In the first session, curved reconstruction CT maps were given for interpretation and axial CT images in the second session. Diagnostic performance statistics included sensitivity, specificity, and overall reliability. A general multilevel linear modelling framework was used to revise the data clustering and dependency. Non-parametric tests were used to assess differences. A p-value ≤ 0.05 was considered significant.

RESULTS
Using automated curved reconstruction CT maps, the sensitivity was 81-86%, specificity was 96-98%, and reliability was 94-96%. The mean reading time was 48-73 sec. Using axial CT images, the sensitivity was 85-90%, specificity was 97- 98% and reliability was 95-97%. The mean reading time was 91-112 sec. Comparison of the two different techniques on a reader-by-reader basis computed no statistical difference of the overall reliability (p = 0.7-0.063), whereas the mean reading times were statistically different for all readers.
CONCLUSION
Automated curved reconstruction CT maps of ribs can shorten interpretation time needed for the detection of rib fractures with similar diagnostic performance of axial CT image interpretation.

CLINICAL RELEVANCE/APPLICATION
Automated curved reconstruction CT maps of the ribs can shorten interpretation time needed for the detection of rib fracture and can increase efficiency of trauma CT interpretation.

ERE167

MDCT of High Energy Pelvic Ring Disruptions in Blunt Trauma (Station #3)

David Dreizin MD (Presenter): Nothing to Disclose, Haoxing Chen BS: Nothing to Disclose, Felipe Munera MD: Nothing to Disclose, Krystal Archer-Arroyo MD: Nothing to Disclose, Daniel Christopher Mascarenhas BS: Nothing to Disclose, Deborah Stein MD, PhD: Nothing to Disclose, Thomas M. Scalea MD: Nothing to Disclose, Uttam Bodanapally MD: Nothing to Disclose, Stuart E. Mirvis MD: Nothing to Disclose

TEACHING POINTS
After completing this exhibit, viewers will be able to... Describe the basic patterns of injury of the Young-Burgess and Tile classification systems of pelvic ring disruption. Explain the anatomic and mechanistic basis of traumatic pelvic ring instability. Describe management of instability and associated vascular and soft tissue injuries

TABLE OF CONTENTS/OUTLINE
1. Introduction Blunt pelvic trauma epidemiology Anatomy and biomechanics Posterior sacroiliac ligament complex and sagittal stabilizers Anterior pelvic ring: pubic symphysis and rami Vector forces, internal and external rotation/torque 2. Classification systems of pelvic ring disruption Defining instability Young-Burgess classification Tile classification Strengths and limitations of each system 3. Management of bony and ligamentous instability in the acute setting. Pelvic binders Angloembolization External fixation and percutaneous screw placement 4. Associated soft tissue injuries Pelvic extraperitoneal hematomas (arterial, venous, and bony bleeds) Open and occult contaminated injuries Genitourinary trauma Rectus sheath avulsion Degloving injuries (e.g. Morell-lavallee) 5. Conclusion

ERE160

What’s New in Thoracolumbar Spine Trauma? The Latest Thoracolumbar Injury Classification and Severity Score (TLICS) and MRI as the Game-Changer (Station #6)

Jiamin Juliana Zheng MD (Presenter): Nothing to Disclose, Nima Razaghi Kashani MD: Nothing to Disclose

TEACHING POINTS
1) To present the new thoracolumbar injury classification and severity score (TLICS) as the increasingly adopted classification system by spine surgeons. 2) To understand the differences and advantages of TLICS compared to traditional classification systems such as the 3-columns of Denis by offering prognostic information and aiding in management decisions. 3) To recognize the importance of the posterior ligamentous complex as the most important component in stability of the spine in this new paradigm and the role of MRI. 4) To learn how to accurately score and report each component of TLICS. 5) To recognize common imaging pitfalls in the evaluation of spine trauma.

TABLE OF CONTENTS/OUTLINE
1) Mechanisms of spinal trauma and patterns of injuries 2) What is TLICS and why is it eclipsing other classification systems? 3) Illustration through cases of how to score TLICS based on its 3 components a. Morphology of the fracture b. Integrity of the posterior ligamentous complex c. Neurological status assessed clinically 4) How good are we at evaluating each component? a. Review of 12 cases shown to 3 independent MSK radiologists and 3 independent spine surgeons, inter-observer reliability will be presented along with data from literature review. b. Pitfalls leading to error in scoring will be depicted through cases.
**SSJ06-01**

**Dual-source CT of Chest in Blunt Thoracic Trauma: Reduced Aortic Motion Using a Novel Iterative Temporal Resolution Optimization Algorithm**

Teresa I-Han Liang MD (Presenter): Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Shamim Rai BSc: Nothing to Disclose, Darra Murphy MD, FRCP: Nothing to Disclose, Luck Jan-Luck Louis MD: Nothing to Disclose, Tim O’Connell MD, Meng: President, Resolve Radiologic Ltd, Ana-Maria Bilawich MD: Nothing to Disclose, John R. Mayo MD: Speaker, Siemens AG, Savvas Nicolaou MD: Nothing to Disclose

**PURPOSE**

Motion artifacts commonly reduce diagnostic confidence in patients with suspected blunt aortic injury. In this study we evaluate a novel iterative temporal resolution optimization (TRO) algorithm in patients with blunt chest trauma undergoing contrast enhanced ultra high pitch dual source CT.

**METHOD AND MATERIALS**

Twenty-two patients who presented to a level one trauma centre between February 18 to March 25, 2014 with blunt thoracic trauma were included. All patients were scanned using a standardized ultra high pitch dual source CT protocol (UHP) using a single CT system. Aortic Motion artifact was scored using a five-point Likert scale modified from CCTA literature at multiple locations of the heart and aorta by two readers (Score of 1 = absence of motion artifacts or noise-related blurring in any vessels; score of 5 = severe or circumferential motion artifact, prominent mural discontinuity). Mean and standard deviation of CT values within aorta, muscle and air were recorded and signal to noise (SNR) and contrast to noise (CNR) ratios were generated as a quantitative index of image quality. Student t-test and Wilcoxon rank sum test were used for statistical analysis and p<0.05 was considered significant.

**RESULTS**

Aortic motion scores were significantly lower on UHP-TRO as compared with UHP images for both readers (Aortic valve 3.5±3 vs 5±2; Aortic sinus 1±1 vs 4±3; Sinotubular junction 1±1 vs 4±2; Ascending aorta 1±1 vs 3±2; p<0.0001). Motion scores were not significantly different at the aortic arch, isthmus and descending aorta on UHP-TRO as compared with UHP images (Arch 1±0 vs 1±0.75; Isthmus 1±0 vs 1±0.75; Descending aorta 1±0 vs 1±0.75). Mean SNR was 19.5% higher on UHP as compared with UHP-TRO (26.42 vs 21.27, p=0.01) and mean CNR scores were 27.7% higher on UHP images (13.4 vs 9.65, p=0.002).

**CONCLUSION**

Temporal Resolution optimized reconstruction of ultra high pitch dual-Source CT of the chest significantly improves motion artifact of the aorta in blunt thoracic trauma at the sacrifice of a mild reduction in SNR and CNR.

**CLINICAL RELEVANCE/APPLICATION**

Iterative temporal resolution optimized reconstruction of ultra high pitch Dual-Source CT images of the chest qualitatively improves motion artifact in blunt thoracic trauma patients facilitating more accurate assessment of the aorta.

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**SSJ06-02**

**Motion Artifact Reduction from High-pitch Dual-source CT Pulmonary Angiography**

Paul Michael Bunch MD (Presenter): Nothing to Disclose, Urvi Pravin Fulwadhva MD: Nothing to Disclose, Jeremy Robert Wortman MD: Nothing to Disclose, Andrew Primak PhD: Employee, Siemens AG, Aaron D. Sodickson MD, PhD: Research Grant, Siemens AG

**PURPOSE**

To compare quantitative measures of cardiac pulsation and respiratory motion artifact in CT pulmonary angiograms (CTPA) performed using a high-pitch dual-source protocol and a single-source protocol.

**METHOD AND MATERIALS**

In this retrospective, IRB-approved, HIPAA-compliant study, 50 CTPA exams were included using each of two protocols: 1) a high-pitch dual-source (DS) protocol and 2) a routine single-source (SS) protocol. Neither protocol used ECG gating. Inclusion criteria were age >18 years, both arms elevated above the scan region, and no prior lobectomy or pneumonectomy. All scans were performed in the Emergency Department on a Siemens Definition Flash scanner. Each scan was evaluated for motion artifact producing a “double image” appearance, and when present, the greatest anatomic overlap interval was measured perpendicular to the axis of the ascending aorta, left ventricular lateral wall, and diaphragm. Measurements were performed on axial images for aortic and cardiac motion and on coronal reformatted images for diaphragmatic motion. Statistical analysis was performed using one way ANOVA.

**RESULTS**

There was no statistically significant difference in patient gender, age, or effective diameter between the two cohorts. High-pitch DS CTPA scans used a mean pitch of 2.9 (range 1.6-3.0), resulting in a mean scan duration of 0.8 seconds (range 0.6-1.7). Routine SS technique used pitch 0.75 for a mean scan duration of 4.6 seconds (range 3.6-5.8). DS outperformed SS technique with respect to quantitative measures of ascending aortic, cardiac, and diaphragmatic motion. Mean distances between motion-artifact double images were reduced at the ascending aorta from 4.1 mm with SS to 0.3 mm with DS, at the left ventricular lateral wall from 5.3 mm with SS to 1.2 mm with DS, and at the diaphragm from 2.2 mm with SS to 0.1 mm with DS, all with p<0.001.
CONCLUSION

High-pitch dual-source CTPA is an effective means to significantly reduce artifacts resulting from ascending aortic, cardiac, and diaphragmatic motion.

CLINICAL RELEVANCE/APPLICATION

High-pitch dual-source CTPA significantly reduces cardiac and respiratory motion artifact without the need for ECG synchronization, which may result in increased diagnostic confidence during evaluation for pulmonary embolus as well as cardiac and aortic causes of chest pain.

Dual Source, Ultra High Pitch CT Pulmonary Angiography (CTPA) Reduces Motion and Allows for Accurate Evaluation of the Proximal Coronary Arteries in Approximately 50% of Patients Imaged for Suspected Pulmonary Embolism


PURPOSE

As rotation time, coverage and pitch increase, modern CT systems are more likely able to produce motion free images of the coronary arteries during CTPA scans. The purpose of this study was to compare coronary artery motion and diagnostic acceptability between dual source ultra high pitch (UHP), single source (SS) and dual source dual energy (DE) CTPA studies.

METHOD AND MATERIALS

362 consecutive patients underwent CTPA scans for suspected pulmonary embolism between Sept 1, 2013 and Jan 31, 2014. 238 UHP, including 194 at 100kV (UHP-100kV) and 44 at 120kV (UHP-120kV), 57 SS scans, and 37 DE scans were analyzed. Coronary arteries were separated into nine segments, and coronary artery motion was qualitatively scored using a scale from 1-4 (non-interpretable to diagnostic with no motion artifacts) to assess the quality of each protocol for visualization of the coronary arteries. CTDI and DLP values were collected for each scan to determine the effective radiation dose. Signal intensity, noise, and signal to noise ratio (SNR) of the aorta, main pulmonary artery, and paraspinal muscles were also assessed.

RESULTS

The UHP-120kV and UHP-100kV scans had the lowest amount of motion, with 38.8% and 30.1% of coronary segments being evaluable compared to 4.2% of SS segments. Proximal coronaries were more diagnostic than distal coronaries UHP-120kV (53.5% vs 24%, median score 2 vs 1, p < 0.05), and both were higher than the UHP-100kV group (20.04 vs 15.80, p < 0.0001).

CONCLUSION

UHP-120kV CTPA significantly reduced coronary artery motion and allows for accurate evaluation of the proximal coronary arteries compared to SS CTPA, without a statistically significant impact on SNR. UHP-100kV resulted in 77.2% less radiation exposure than SS although it came at the expense of an 18.8% reduction in average SNR.

CLINICAL RELEVANCE/APPLICATION

UHP CTPA protocols can be used to assess the proximal coronary arteries while maintaining the ability to rule in or out pulmonary embolism in patients with chest pain.

CTA in the ED: Impact of Contrast Timing Technique on Scan Duration

Martin Lee David Gunn MBChB (Presenter): Medical Advisor, TransformativeMed, Inc Spouse, Consultant, Wolters Kluwer nv Grant, Koninklijke Philips NV, Bruce E. Lehner MD : Nothing to Disclose, Anda Maria Cornea MD, PhD : Nothing to Disclose, Christopher Allen Potter MD : Nothing to Disclose

PURPOSE

To compare the impact of contrast timing technique on scan duration and arterial enhancement for thoracic CT angiography.

METHOD AND MATERIALS

Retrospective, single center, IRB approved study that evaluated consecutive patients who had undergone single pass CT angiography of the thorax on a GE LightSpeed 16 CT scanner using 3 contrast timing techniques. Group A consisted of 86 patients who underwent CT pulmonary angiography (CTPA) using a timing bolus. Group B consisted of 74 patients who underwent a fixed-delay biphasic non-gated 'double rule out' CTPA and aortic CTA protocol. Group C consisted of 58 patients who underwent thoracic aortic CTA using a bolus triggering (tracking) technique. The primary endpoint was comparing the duration (in seconds) between the acquisition time of the last scout image and the first axial post-contrast image in all three groups. The secondary endpoint was vascular enhancement (HU) of the main pulmonary artery (MPA) and thoracic aorta. Statistical techniques included a 3-way ANOVA for three group analysis and t-tests to compare specific protocols. p < 0.05 was considered statistically significant.

RESULTS

There was a statistically significant (p<0.0001) difference in the average delay between the last scout image...
and axial acquisition in the three groups: group A (timing) 330 seconds (CI 302-358), group B (triggering) 250 seconds (CI 221-279), and group C (fixed delay) 160 seconds (CI 136-184); group A vs B (p=0.002), B vs C (p<0.0001), and A vs C (p<0.0001). Comparing MPA enhancement between group A (416HU, CI 388-444) and group C (442HU, CI 411-473) yielded no statistically significant difference (p=0.207). Comparing aortic enhancement between group B (363HU, CI 338-389) and group C (425HU, CI 399-451) yielded a significant difference (p=0.001), with greater enhancement in group C. Similar volumes of contrast were used in the three groups.

CONCLUSION

CTA using a fixed delay contrast enhancement technique is almost 3 minutes faster to perform than a timing bolus, with no impairment in vascular enhancement. This appears to be due to time taken by the technologists to perform the necessary steps. Three minutes is about 10% of the average CT scan slot duration.

CLINICAL RELEVANCE/APPLICATION

Choosing a bolus triggering or a fixed delay could shorten the scan duration for urgent ED CTAs and allow for more patients, and potentially less stable patients, to get scanned.

SSJ06-05

Exponentially Decelerated Contrast Media Injection Rate Combined with A Novel Patient-specific Contrast Formula Reduces Contrast Volume Administration During Computed Tomography Pulmonary Angiography

Charbel Saade MS (Presenter): Nothing to Disclose, Hussain Al-Mohiy : Nothing to Disclose, Mukbil H. Hourani MD : Nothing to Disclose

PURPOSE

To investigate opacification of the pulmonary vasculature during CTPA using a patient-specific contrast formula and exponentially decelerated contrast media injection rate.

METHOD AND MATERIALS

CTPA was performed on 150 patients with suspected PE using a 256 channel computed tomography scanner and a dual barrel contrast injector. Patients were randomly assigned to two equal protocol groups: protocol A, the department’s conventional protocol, employed a patient-specific contrast formula based on measured patient cardiovascular dynamics. Protocol B involved the use of a patient-specific contrast formula combined with exponentially decelerated contrast media injection rate. Both protocols used a 50 mL saline flush at 4.5 mL/s and a craniocaudal scan direction. Patient age and gender were equally distributed across both groups. The mean cross-sectional opacification profile of eight central and eleven peripheral pulmonary arteries and veins were measured for each patient and arteriovenous contrast ratio (AVCR) calculated for each lung segment. Protocols were compared using Mann-Whitney U non-parametric statistics. Jackknife alternative free-response receiver operating characteristic (JAFROC) analyses were used to assess diagnostic efficacy. Inter-observer variations were investigated using Kappa methods

RESULTS

A number of pulmonary arteries demonstrated increases in opacification (p<0.02) for protocol B compared with A whilst opacification in the heart and all veins was reduced in protocol B (p<0.03). Subsequently, increased AVCR in protocol B compared with A was observed at all anatomic locations (p<0.0002) where this ratio could be calculated. An increase in JAFROC figure of merit (p<0.0002) and inter-observer variation was observed with protocol B compared with A with the latter metric increasing from (k = 0.3) to (k = 0.73) respectively. Mean contrast volume was reduced in protocol B (29±4 mL) compared to A (33±9 mL).

CONCLUSION

Significant improvements in visualisation of the pulmonary vasculature can be achieved with a low contrast volume CT acquisition using an exponentially decelerated contrast media injection rate and a patient-specific contrast formula

CLINICAL RELEVANCE/APPLICATION

Matching contrast injection timing with vessel dynamics significantly improves vessel opacification and reduces contrast dose in the assessment of pulmonary embolism during computed tomography pulmonary angiography.

SSJ06-06


Alexi Otrakji MD (Presenter): Nothing to Disclose, Efren Jesus Flores MD : Nothing to Disclose, Roberto Lo Gullo MD : Nothing to Disclose, Jo-Anne O. Shepard MD : Consultant, Agfa-Gevaert Group, Mannudeep K. S. Kalra MD : Nothing to Disclose, Subba Rao Digumarthy MD : Nothing to Disclose, Margaret Kave BS, RT : Nothing to Disclose

PURPOSE

To assess if “contrast enhanced routine chest dual energy CT protocol” (DECT-RC) can provide acceptable vascular enhancement and additional parenchymal information compared to “single energy CT pulmonary angiography” protocol (SECT-PA).

METHOD AND MATERIALS
Our IRB approved retrospective study included 200 adult patients who underwent either DECT-RC (n= 100 patients, M: F 47:53, mean age 62±15 years, mean weight 76±19kg) or SECT-PA (n=100 patients, M:F 43:57, mean age 59±17 years, mean weight 84±24kg). All CT examinations were performed on dual source MDCT (Siemens Definition Flash) or single source 64-row MDCT (GE 750HD Discovery). For DECT-RC, we generated images 60kev, pulmonary blood volume images (PBV) and virtual non-contrast images (VNC) images in transverse plane at 2.5mm thickness. Transverse SECT-PA images were reconstructed at both 1.25 and 2.5mm thicknesses. Two thoracic radiologists assessed main, lobar, segmental and subsegmental pulmonary arterial enhancement and filling defects in addition to diagnostic confidence, pulmonary and mediastinal abnormalities on 60 kev, PBV and VNC images. CTDI vol, and DLP were recorded for each patient.

RESULTS
Radiation dose for DECT-RC (7.2 ± 2.1mGy, 260.4 ± 83.2 mGy.cm, 3.6 ± 1.2 mSv) was significantly lower than SECT-PA protocol (15 ± 7.9 mGy, 499.3±276.4 mGy.cm, 7 ± 3.9 mSv) (p=0.0040). Optimal to excellent enhancement in pulmonary arteries was noted with DECT-PA (85%, 85/100 patients) and in 82% of SECT-PA (82/100 patients) (p>0.05). Limited to unacceptable pulmonary arterial enhancement was noted in % (15/100 patients) with DECT-RC and % (18/100 patients) with SECT-PA protocols. PBV images were deemed to provide helpful incremental value in making the diagnosis in 72% of patients (72/100) mostly in patients with perfusion defects from air trapping (better seen on PBV), consolidation, atelectasis, and pulmonary embolism. The incremental value of VNC images were helpful in 4/100 patients only with high attenuation lung nodules (n=1) and mediastinal lymph nodes (n=3).

CONCLUSION
Contrast enhanced routine chest protocol with DECT has the potential to replace SECT pulmonary angiography protocol for providing required pulmonary arterial enhancement as well as helpful additional information for evaluation of lung lesions.

CLINICAL RELEVANCE/APPLICATION
Routine chest CT with DECT can provide similar or better information compared to single energy CT pulmonary angiography without incurring any radiation penalty.
identifying sequelae, determining prognosis, and guiding rehabilitation. In conclusion, recent technological advances in CT and MRI have greatly improved our understanding of the pathophysiology of craniocerebral trauma and allow us to detect abnormalities, even in patients with mild head trauma, when routine imaging studies appear normal.

**RC405B**  
The Changing Context of Imaging After Head Injury  
Michael N. Brant-Zawadzki MD (Presenter): Nothing to Disclose  

**LEARNING OBJECTIVES**  
1) The audience will understand the challenges in understanding the concept of minimally traumatic brain injury.

**RC405C**  
Advanced Imaging Techniques in Traumatic Brain Injury  
Pratik Mukherjee MD, PhD (Presenter): Research Grant, General Electric Company Medical Advisory Board, General Electric Company

**LEARNING OBJECTIVES**  
1) To understand the potential of advanced MRI techniques such as diffusion tensor imaging (DTI) and resting state functional MRI (rs-fMRI) and of magnetoencephalography (MEG) for better diagnosis of mild traumatic brain injury (TBI). 2) To review the current best practices for imaging of concussions and the findings of recent imaging research studies. 3) To provide an overview of ongoing multicenter research studies for validation of advanced MRI and MEG for TBI.

**RC408**  
Blood on the Brain: Intracranial Hemorrhage in the Emergency Setting (An Interactive Session)  

**Refresher/Informatics**

**AMA PRA Category 1 Credits ™**: 1.50  
**ARRT Category A+ Credits**: 1.50  
**Tue, Dec 2 4:30 PM - 6:00 PM**  
**Location: E353C**

**Sub-Events**

**RC408A**  
Traumatic Intracranial Hemorrhage  
Wayne Scott Kubal MD (Presenter): Stockholder, Stryker Corporation Research Grant, Guerbet SA

**LEARNING OBJECTIVES**  
1) Understand how pathophysiology and anatomy determine the imaging appearance of traumatic intracranial hemorrhage. 2) Critically assess which imaging options offer the greatest sensitivity for diagnosing traumatic intracranial hemorrhage. 3) Be conversant with some of the new techniques for studying traumatic intracranial hemorrhage.

**RC408B**  
Non-traumatic Subarachnoid Hemorrhage  
Diego B. Nunez MD, MPH (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**  
1) Analyze the various causes, patterns of distribution and imaging features of non-traumatic subarachnoid hemorrhage. 2) Identify common and not so common diagnostic pitfalls encountered in the initial CT assessment of the patient with suspected subarachnoid hemorrhage. 3) Recognize the contribution of additional imaging (CT angiography, MR, DSA) as integral part of the admitting evaluation of patients with subarachnoid hemorrhage.

**RC408C**  
Non-traumatic Intraparenchymal Hemorrhage  
Peter George Kranz MD (Presenter): Research Consultant, Cephalogics, LLC Research Consultant, Biogen Idec Inc

**LEARNING OBJECTIVES**  
1) Identify the major causes for non-traumatic (spontaneous) brain parenchymal hemorrhage. 2) Understand
the role of the primary survey in identifying the most important imaging features needed for the acute management of hemorrhages. 3) Understand the contribution on non-contrast CT, CTA, and MRI in the management of spontaneous hemorrhage, including the contribution these modalities make to defining the etiology of hemorrhages.

**SPSC41**

**Controversy Session: DTI in Head Injury: Crossing Borders, Clinical Applications, and Legal Ramifications**

**Special Courses**

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AMA PRA Category 1 Credits™: 1.00
ARRT Category A+ Credit: 1.00
Wed, Dec 3 7:15 AM - 8:15 AM Location: N228

**Participants**

**Moderator**
Gordon K. Sze MD: Investigator, Remedy Pharmaceuticals, Inc

**Sub-Events**

**SPSC41A DTI in the Courtroom: Pro**
Michael L. Lipton MD, PhD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

This presentation will discuss dMRI assessment the legal context, to illustrate the potential and limitations of dMRI, as well as other imaging approaches. The basis and limitation of dMRI will be discussed in the context of the legal standard of evidence.

**SPSC41B DTI in the Courtroom: Con**
Pratik Mukherjee MD, PhD (Presenter): Research Grant, General Electric Company Medical Advisory Board, General Electric Company

**LEARNING OBJECTIVES**

1) Identify the diffusion tensor imaging (DTI) correlates of traumatic brain injury (TBI). 2) Explain the challenges of applying DTI to the diagnosis of TBI. 3) Summarize the current state of clinical research in DTI of TBI, including the advent of large multi-center trials.

**MSES41**

**Essentials of Ultrasound**

**Multisession Courses**

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AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 8:30 AM - 10:00 AM Location: S100AB

**Sub-Events**

**MSES41A Arterial Doppler Waveforms around the Body**
Mindy Meislich Horrow MD (Presenter): Spouse, Director, Merck & Co, Inc

**LEARNING OBJECTIVES**

1) Analyze the difference between high resistance and low resistance arterial waveforms and where they normally occur. 2) Demonstrate an understanding of the parvus tardus waveform and the situations in which it occurs. 3) Demonstrate an understanding of Doppler waveforms related to stenosis, pseudoaneurysm and arterio-venous fistula.

**ABSTRACT**

This lecture will review the basic types of normal arterial waveforms throughout the body including carotid, vertebral, visceral organ and peripheral vessels. Further discussion will include general and specific changes related to stenosis, occlusion, pseudoaneurysms and arterial venous fistulas with some cases related to pitfalls and quality assurance.
MSES41B  First Trimester US  
John Stephen  Pellerito  MD (Presenter):  Nothing to Disclose

**LEARNING OBJECTIVES**

1) Recognize sonographic features and landmarks of a normal first trimester pregnancy. 2) Interpret sonographic findings and hCG measurements to determine a normal or abnormal gestation. 3) Analyze diagnostic criteria for nonviable first trimester pregnancy. 4) Apply sonographic findings to clarify a pregnancy of uncertain viability or unknown location.

**ABSTRACT**

First Trimester US  John S  Pellerito,  MD  FACR  
This presentation highlights the sonographic presentations of normal and abnormal first trimester pregnancy. We will discuss the normal landmarks that are visualized during the first weeks of life. Expected hCG titers are reviewed for each landmark and discrepancies between sonographic findings and hCG levels will be discussed. The diagnostic criteria for normal and nonviable early pregnancy will be established. There will be case discussions to evaluate the findings associated with an intrauterine pregnancy of uncertain viability as well as how to assess a pregnancy of unknown location.

MSES41C  US of OB Emergencies  
Oksana Helena  Baltarowich  MD (Presenter):  Nothing to Disclose

**LEARNING OBJECTIVES**

1) List the main placental causes of significant bleeding in the third trimester of pregnancy. 2) Explain the causes of false sonographic diagnosis of placenta previa. 3) Explain the differences among placenta accreta, increta, and percreta. 4) List the complications of cervical incompetence.

**ABSTRACT**

This lecture will review the sonographic findings seen in obstetrical emergencies in the second and third trimesters of pregnancy. The diagnosis of placenta previa will be discussed along with the pitfalls in the sonographic diagnosis. Differences between placenta accreta, increta and percreta will be highlighted. Examples of placental abruption will be shown. Cervical incompetence and its complications will be discussed along with several other abnormalities that constitute emergent situations.

**Active Handout**


MSSR41

RSNA/ESR Emergency Symposium: General Principles, Pediatric and ENT Emergencies (An Interactive Session)

**Multisession Courses**

 PD  ER  NR  HN  GI  MD  V

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 8:30 AM - 10:00 AM  Location: S402AB

**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 ethiology, 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.

**RC504**

**Bone and Cartilage Injury: Traumatic and Stress-related Chondral, Osteochondral and Subchondral Failure with Emphasis on Pathophysiology and Routine and Advanced MR Imaging**

**Refresher/Informatics**

MR MK ER MR MK ER

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 8:30 AM - 10:00 AM  Location: S406B

**Participants**

Donald L. Resnick MD (Presenter): Nothing to Disclose
Yolanda Y. P. Lee MBChb (Presenter): Author, Amirsys, Inc
Christine B. Chung MD (Presenter): Nothing to Disclose
Mini Nutan Pathria MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Discuss the structural anatomy of a. articular cartilage with emphasis on its collagen framework and b. the trabecular architecture in the subchondral bone. 2) Emphasize the manner in which the collagen and trabeculae respond to compressive, shear, and tensile forces applied to the joint surface and the resultant injuries as they are displayed in MR images. 3) Emphasize the anatomy and biomechanical implications of the osteochondral unit through novel MRI applications. 4) Discuss structure and biomechanics of bone tissue with regard to the pathogenesis of fatigue and insufficiency forms of stress injury. 5) Use case-based teaching methods to illustrate the imaging spectrum of traumatic and stress-related chondral, osteochondral, and subchondral injuries.

**RC508**

**Multimodality Imaging of the Acute Female Pelvis: US, CT and MRI (An Interactive Session)**

**Refresher/Informatics**

ER US MR CT OB GU MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 8:30 AM - 10:00 AM  Location: E450B

**Sub-Events**

**RC508A**

**US of Obstetrical Emergencies**

Ana P. Lourenco MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Recognize the sonographic appearance of common and uncommon obstetric emergencies. 2) Demonstrate understanding of management for emergent obstetric diagnoses. 3) Identify those cases requiring additional imaging, beyond US, for definitive diagnosis.

**ABSTRACT**

In this refresher course focused on US of Obstetrical Emergencies, we will review the key imaging findings and management of both common and uncommon obstetrical emergencies. As many hospitals and radiology practices may not routinely evaluate pregnant patients, these are particularly important topics to review. Timely and accurate diagnosis is critical to improved outcomes for both the mother and fetus. The range of topics to be reviewed will cover the first, second, and third trimester, as well as the immediate post-partum period. Diagnoses will include ectopic pregnancy, with a focus on the less commonly encountered types of ectopics - cervical, C-section scar, interstitial, and ovarian ectopics. We will also review the imaging findings of ovarian...
hyperstimulation as well as associated complications, which can be potentially life-threatening. Ovarian torsion in pregnancy will be discussed, as the hormonal changes of pregnancy and mass effect from corpus luteal cysts of pregnancy or other masses may predispose patients to torsion. Furthermore, the non-specific clinical presentation often makes the diagnosis challenging. Similarly, the presentation of acute appendicitis in pregnancy may be non-specific. Imaging findings of acute appendicitis in pregnancy will be reviewed, as accurate diagnosis prior to appendiceal rupture can markedly improve outcomes for both mother and fetus. Placental abnormalities will be reviewed, including placenta previa, placental abruption, and abnormal placentation (accreta, increta, percreta). Imaging findings of cervical incompetence will be reviewed, as well as important next steps in clinical management once this diagnosis is discovered. We will also review the sonographic findings of uterine dehiscence, which although rare, is potentially catastrophic to both mother and fetus. Lastly, we will review the imaging findings of retained products of conception, most commonly presenting in the immediate post-partum period.

Active Handout

**RC508B**

US of Gynecological Emergencies
Robin Beth Levenson MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Discuss gynecologic causes of acute female pelvis and the role of ultrasound in evaluation. 2) Identify important gynecologic ultrasound findings in the acute setting and recognize pearls and pitfalls in diagnosis. 3) Illustrate examples demonstrating range of imaging findings. 4) Recognize the key ultrasound features in gynecologic emergencies.

Active Handout

**RC508C**

CT of the Acute Female Pelvis
Anjali Agrawal MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Highlight the importance of recognition of acute gynecologic conditions on CT. 2) Outline the physiologic processes that may present as acute pelvic pain and their CT findings. 3) Describe the CT features of various pathologic causes of the acute female pelvis. 4) Illustrative case examples with correlative imaging findings on sonography or MRI to improve the understanding of the anatomy and pathology on CT.

**RC508D**

MRI of the Acute Female Pelvis
Stephan W. Anderson MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) The participant will review the etiologies of acute pelvic pain for which MRI may be effectively employed in the diagnostic evaluation. 2) The participant will be able to apply an MRI-based approach to certain etiologies of acute abdominal pain at their own institution. 3) The participant will review the current pertinent literature in the application of MRI in acute pelvic pain.

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**VSNR41**

Neuroradiology Series: Stroke

**Series Courses**

AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 3.75

**Wed, Dec 3 8:30 AM - 12:00 PM ** Location: E451B

**Participants**

Moderator
Erin Simon Schwartz MD : Nothing to Disclose

Moderator
Vincent Paul Mathews MD : Speakers Bureau, Eli Lilly and Company

**Sub-Events**

VSNR41-01 Non-atherosclerotic CNS Vasculopathies
Pina Christine Sanelli MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

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1) Provide a brief review of CNS vasculopathies highlighting the key diagnostic features. 2) Review pertinent differential diagnoses of neuroimaging cases. 3) Provide important imaging pearls for differentiating CNS vasculopathies.

ABSTRACT
A review of CNS vasculopathies highlighting the key diagnostic features will be provided. The pertinent differential diagnoses of neuroimaging cases will be reviewed. Important imaging pearls for differentiating CNS vasculopathies will be provided.

VSNR41-02 The Value of High-Resolution T2-Weighted Vessel Wall MR Imaging for the Differentiation of Intracranial Vasculopathies
Mahmud Mossa-Basha MD (Presenter): Nothing to Disclose, William D. Hwang MD: Nothing to Disclose, Tom Hatsukami: Research Grant, Koninklijke Philips NV, Adam de Havenon MD: Nothing to Disclose, David Tirschwell MD, MSc: Nothing to Disclose, Yoshihiko Anzai MD: Nothing to Disclose, Niranjan Balu PhD: Nothing to Disclose, Daniel S. Hippe MS: Research Grant, Koninklijke Philips NV Research Grant, General Electric Company, Chun Yuan PhD: Research Grant, Koninklijke Philips NV Consultant, Bristol-Myers Squibb Company Consultant, Koninklijke Philips NV

PURPOSE
To assess the contribution of high-resolution T2-weighted vessel wall MR (VWI) sequences for differential diagnosis of intracranial vasculopathies.

METHOD AND MATERIALS
Consecutive patients with intracranial arterial stenosis who had undergone 3T high-resolution MR VWI were retrospectively selected. 2D T2-weighted sequences (.4 x .4 mm in-plane resolution, 1 mm thick slices) were scanned and assessed in both axial plane and a plane perpendicular to the artery lumen. Relative vessel wall thickness, eccentricity of disease and signal characteristics were assessed in areas of arterial stenosis or irregularity as seen on luminal imaging by a double blinded rater. Classification of patients was based on the following clinical and imaging criteria: atherosclerosis (2 atherosclerosis risk factors without evidence of systemic or CSF inflammation or clinical evidence of vasospastic process/reversibility), vasculitis (clinical evidence of CSF infection/inflammation and/or systemic inflammatory disease without atherosclerosis risk factors or clinical evidence of vasospastic process) and reversible cerebral vasoconstriction syndrome (RCVS) (classic clinical presentation, with reversibility of the imaging findings and no evidence of systemic or CNS inflammatory disease).

RESULTS
There were 21 atherosclerosis cases with 45 plaques, 4 vasculitis cases (VZV, PACNS, TB and Behcet vasculitis) with 14 stenoses and 4 RCVS cases with 19 stenoses that could adequately be assessed on T2-weighted VWI. A linear T2 hyperintense band along the intimal surface (presumed to represent fibrous cap) was seen in 36/45 atherosclerotic, 0/14 vasculitic and 0/19 RCVS lesions. All of the atherosclerotic lesions showed appreciable wall thickening, as compared to 11/14 vasculitis and 4/19 RCVS lesions. 42/45 atherosclerotic plaques, 2/14 vasculitis and 2/19 RCVS lesions showed eccentric wall thickening.

CONCLUSION
High resolution T2-weighted VWI can complement T1 and PD pre and post-contrast VWI for the differentiation of intracranial stenosing vasculopathy, based on disease eccentricity, presence of a T2 hyperintense intimal band and appreciable wall thickening.

CLINICAL RELEVANCE/APPLICATION
High-resolution T2 VWI should be incorporated into intracranial VWI protocols, as this technique can provide complementary information to T1 and PD-weighted techniques.

VSNR41-03 Whole Brain 3D-T1w-Black-Blood 3T-MRI for the Diagnosis of Intracranial CNS Vasculitis and Horton’s Disease: A Pilot Study
Nora Navina Kammer MD (Presenter): Nothing to Disclose, Eva Maria Coppenrath MD: Nothing to Disclose, Karla Maria Treitl MD: Nothing to Disclose, Hendrik Kooijman: Employee, Koninklijke Philips NV, Maximilian F. Reiser MD: Nothing to Disclose, Tobias Saam MD: Research Grant, Diamed Medizintechnik GmbH Research Grant, Bayer AG

PURPOSE
2D-T1w black-blood sequences are used in atherosclerotic plaque imaging and for the assessment of inflammatory changes of intracranial vessels. However, sequences are limited due to long acquisition times which limits the number of acquired slices and thus the coverage (coverage often 3 cm or less). Aim of the study was to evaluate a commercially not available gadolinium-enhanced isotropic 3D-whole-brain-black-blood T1w-TSE sequence with variable flip angles (T1w-VISTA) for the diagnosis of intra- and extracranial vasculitis.

METHOD AND MATERIALS
We prospectively included 26 patients with suspected vasculitis, 3 patients with Sickle-cell disease and 15 tumor patients without any evidence of vascular disease. All patients received a standardized protocol (T1w pre- and post contrast, TOF, DIFF, T2, FLAIR) and a T1w 3D-BB-VISTA sequence pre- and post contrast (resolution=0.8 mm3 isotropic, scan time 4:43 minutes). Left and right arteries of the anterior and posterior circulation (176 segments) and right/left temporal artery (88 segments) were evaluated for the presence of stenosis, wall thickening (eccentric/concentric) and contrast enhancement of the vessel wall (3-point Likert scale).
RESULTS
6 out of 104 arterial segments in patients with suspected intracranial vasculitis (3x right/1x left middle cerebral artery, 1x right and left vertebral artery) and 6 out of 88 temporal arteries showed focal circumferential, concentric wall thickening, luminal narrowing and strong contrast enhancement. These findings were found in 8 distinct patients in which vasculitis was clinically confirmed. One patient with sickle-cell disease presented with a stenosis and concentric wall thickening without contrast enhancement. None of the 60 arterial segments of the tumor patients showed vasculitis like lesions but 6 segments (distal vertebral artery) showed an eccentric wall thickening and none to moderate contrast enhancement due to atherosclerotic plaques.

CONCLUSION
Whole-brain-black-blood MRI is feasible in less than 5 minutes scan time and allows to accurately diagnosing CNS vasculitis and Horton's disease. Future studies will be necessary to evaluate the utility of this sequence for other vascular pathologies, such as arterial dissection and atherosclerosis.

CLINICAL RELEVANCE/APPLICATION
Whole-brain-black-blood MRI is a relevant additional tool for diagnosing and monitoring cranial vasculitis.

Identification of an Impaired Cerebrovascular Reactivity by Use of Arterial Spin Labeling in Patients with Moyamoya Disease

VSNR41-04

Tae Jin Yun MD (Presenter): Nothing to Disclose, Jin Chul Paeng: Nothing to Disclose, Chul-Ho Sohn MD: Nothing to Disclose, Beom Su Kim MD: Nothing to Disclose, Seung Hong Choi MD, PhD: Nothing to Disclose, Ji-hoon Kim MD: Nothing to Disclose

PURPOSE
We aimed to assess the ability of arterial spin labeling (ASL) to identify an impaired cerebrovascular reactivity (CVR) relative to single photon emission computed tomography (SPECT) in patients with moyamoya disease (MMD).

METHOD AND MATERIALS
The institutional review board of our hospital approved this prospective study and written informed consent was obtained from all patients. We conducted a prospective study to determine the ability of ASL to identify CVR relative to SPECT in 78 subjects with MMD. Among these patients, 31 patients performed unilateral direct arterial anastomosis, and in these patients, follow up ASL perfusion MR and SPECT were performed additionally (for ASL, 1 weeks, 3 months, and 6 months after operation; for SPECT, 6 months after operation). Volumes of interests based on internal carotid artery territories were applied to the cerebral blood flow maps from the basal stress ASL and SPECT. And, the concordance between the CVR indexes (CVRIs) from ASL and SPECT was assessed using Bland-Altman analysis, and the area under the receiver-operating characteristic curve (AUC) was used to evaluate diagnostic accuracy of ASL relative to that of SPECT using various CVRI cutoff points.

RESULTS
The CVRI from ASL had a negative bias as compared to the CVRI from SPECT (systemic bias, -3.5%). In addition, the differences between the CVRI from ASL and SPECT tended to be larger when the CVRI is more impaired. The analysis of the diagnostic accuracy of ASL for detecting the impaired CVR revealed an AUC of 0.81 with a sensitivity of 81%, a specificity of 100%, a positive predictive value of 100%, and a negative predictive value of 12%. ASL performed in 6 months after anastomosis showed significant increase in CVRI than that performed preoperatively as well as SPECT (for ASL, -2.7 ± 7.3 and -11.2 ± 9.3, P < 0.001; for SPECT, -3.7 ± 2.9 and -6.2 ± 5.2, P = 0.013, respectively).

CONCLUSION
ASL can identify impaired CVR with excellent performance in patients with MMD and has the potential to serve as a non-invasive imaging tool for determining CVR in patients with cerebrovascular disease.

CLINICAL RELEVANCE/APPLICATION
1. ASL can identify impaired CVR with excellent performance in patients with MMD
2. ASL has the potential to serve as a non-invasive imaging tool for determining CVR in patients with cerebrovascular disease.

Assessing the Hemodynamic Insufficiency Model of Stroke Risk in Children with Sickle Cell Disease Using MR-based Measures of Cerebrovascular Reactivity

VSNR41-05

Przemyslaw Kosinski BS (Presenter): Nothing to Disclose, Jackie Leung: Nothing to Disclose, Manohar Meghraj Shroff MD: Nothing to Disclose, Suzan Williams: Nothing to Disclose, Gabrielle deVeber: Nothing to Disclose, Andrea Kassner PhD: Nothing to Disclose

PURPOSE
The most devastating complication of sickle cell disease (SCD) is overt stroke, which occurs in more than 10% of children. Patients with cerebral blood flow velocities (CBFv) >200cm/s on Transcranial Doppler (TCD) are at highest risk of stroke. There are two models that explain how increased CBFv in SCD increases risk of stroke: the vasculopathy-stenosis and the hemodynamic insufficiency (HI) models. The stenosis model was originally used to attribute stroke onset to high CBFv. However, in the STOP trial, 79% of children with SCD had minor/no
stenosis. This favours the HI model, which postulates that cerebral vessels have only a finite capacity to dilate, which is compromised in SCD due to chronic anemia. As a result it poises the cerebral vasculature for ischemia and subsequent stroke. The aim of the study was to investigate the HI model in children with SCD by quantifying the capacity of vasodilation using an MR- based cerebrovascular reactivity (CVR) defined as a change in cerebral blood flow (CBF) in response to a vasoactive stimulus. We hypothesize that CVR is reduced and correlates with the degree of anemia.

METHOD AND MATERIALS

30 SCD patients (10-18 years) were imaged on a clinical MRI system. A hypercapnic challenge (CO2) was administered in synchrony with a blood-oxygen-level dependent (BOLD) MRI to measure relative CBF changes. Anatomical images were also acquired and reviewed by a radiologist to exclude with significant stenosis, large white matter lesions or vascular abnormalities. CVR maps were generated by correlating the BOLD MRI signal change with the corresponding CO2 values. Mean CVR values were then calculated based on gray and white matter segmentation. Hct values were obtained from hematology records. Pearson correlation coefficients were calculated for CVR and hct as well as CVR and CBF.

RESULTS

CVR demonstrated a moderately strong correlation with hct, \( r=0.68 \) (\( p=0.01 \)). The correlation between CVR and gray matter CBF was moderately strong, \( r=-0.63 \) (\( p=0.021 \)).

CONCLUSION

Our results show that CVR is associated with the degree of anemia in children with SCD who do not have a stenosis. This seems to support the HI model of stroke risk in this population.

CLINICAL RELEVANCE/APPLICATION

The degree of anemia needs to be considered when assessing stroke risk in SCD. CVR seems to be superior to TCD measures of high CBFv, as CVR can fully describe the status of the cerebral vasculature.

VSNR41-06 New Insights in Pediatric Stroke

A. James Barkovich MD (Presenter): Research Consultant, General Electric Company

LEARNING OBJECTIVES

1) Understand how to protocol imaging studies for a child with new onset of localized neurologic impairment and, in particular, when ultrasound or CT may be useful as opposed to performing MRI as the initial procedure. 2) Recognize which studies and, in particular, what sequences should be performed on MRI and in what order. 3) Understand the causes of pediatric stroke, which are different from those in adult stroke. 4) The stroke is easy to identify; to find the cause of the stroke is not easy in children, but will be easier after attending this session.

ABSTRACT

Localized stroke is an important cause of morbidity and mortality in childhood and one of the top ten causes of childhood death. Approximately 25% of all pediatric strokes occur in neonates and approximately 50% occur in children less than 1 year of age. Despite these numbers, the misconception remains that stroke is a rare and relatively unimportant illness in childhood. Fortunately, the medical community has recently become more aware of this entity and its importance in pediatric health. Presenting signs and symptoms depend upon the region of brain affected and the age of the patient at the time of the infarct. Perinatal/prenatal stroke is much more common than generally recognized, with a prevalence of 1 in 2300-5000 live births. Patients may present with neonatal encephalopathy or seizures or may remain undetected until early hand preference is manifested. In older children, presentation is one of abrupt onset of seizure or neurological deficit. Once a stroke is suspected, clinically or by imaging, it is imperative to determine whether hemorrhage is present in order to determine whether anticoagulation is in order. Vascular imaging is essential and in either case should be obtained with high resolution, as dissections and post-infectious vasculopathy can be extremely subtle and both require anticoagulation. If the stroke is hemorrhagic and if there are regions of increased diffusivity, venography should be obtained. If vasculopathy is suspected because of location of the infarct or history of recent illness, we obtain vascular wall imaging with 1mm partition size after administration of contrast to look for irregularity or enhancement of the arterial wall; the latter seems to be associated with inflammation. If dissection is identified in the vertebral artery at the upper cervical level, careful attention should be paid to anomalies of the upper cervical vertebrae that may stretch or damage the vessel with abrupt head motion, usually secondary to trauma.

VSNR41-07 Emergency Stroke Triage

Greg Zaharchuk MD, PhD (Presenter): Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Understand the concept of the diffusion-perfusion (DWI-PWI) mismatch concept in acute stroke. 2) Review the recent results of stroke trials using the DWI-PWI concept. 3) Appreciate the potential role of other markers, such as collateral flow, oxygenation, pH, and resting-state fMRI for assessing the ischemic brain.

VSNR41-08 Clot Characteristics on Baseline Imaging Predicts Recanalization with IV tPA in the IMS III Trial

Bijoy Menon MBBS, MD (Presenter): Nothing to Disclose , Sharon Yeatts PhD : Consultant, F. Hoffmann-La VSNR41-06
PURPOSE
In IMS-III trial patients, we evaluate if clot characteristics on baseline non-contrast CT (NCCT) or CT-angio (CTA) determine recanalization with IV-tPA using classification and regression tree analysis (CART).

METHOD AND MATERIALS
IMS-III protocol is published. Two readers assessed clot characteristics on NCCT [hyperdense(HD) sign location, length, ratio of maximal Hounsfield Unit (HU) HDS/contralateral MCA (rHU)] and CTA [Clot burden score, length, residual flow through clot, ratio of contrast HU at proximal/distal clot interface (cirHU)] by consensus. Very early arterial weighted CTAs were excluded; appropriate imputation techniques used whenever distal clot interface was not measured. Early recanalization with IV-tPA was assessed on first angio (only in the endovascular arm) while 24-hour recanalization with IV-tPA was assessed on follow-up CTA (only in the IV-tPA alone arm).

RESULTS
Of 263 patients with anterior circulation clots on baseline CTA, after excluding patients with missing data, 64 in the IV-tPA and 175 in the endovascular arm were analyzed. CART models for early and 24-hr recanalization with IV-tPA are shown in Figures 1 and 2 respectively.

CONCLUSION
Clot characteristics on NCCT and CTA can help physicians estimate a range of early and late recanalization rates with IV-tPA.

CLINICAL RELEVANCE/APPLICATION
Clot characteristics on both NCCT and CTA can help determine the efficacy of tPA and should be considered when deciding to treat patients with tPA over endovascular.

Predictors of Reperfusion in Acute Ischemic Stroke Patients
Alexander D. Horsch MD, MRCS (Presenter): Nothing to Disclose, Jan Willem Dankbaar MD, PhD: Nothing to Disclose, Yolanda Van Der Graaf: Nothing to Disclose, Willem P. Mali MD, PhD: Nothing to Disclose, Birgitta Katinka Velthuis MD: Research Consultant, Koninklijke Philips NV Speakers Bureau, Koninklijke Philips NV

PURPOSE
Acute ischemic stroke studies emphasize a difference between reperfusion and recanalization but predictors of reperfusion have not been elucidated. This study aims to identify predictors of reperfusion and to investigate the relation between recanalization and reperfusion.

METHOD AND MATERIALS
From the XXX trial 178 patients were selected with a middle cerebral artery territory perfusion deficit on admission CT perfusion (CTP) and complete day 3 follow-up CTP and CT-angiography (CTA). Reperfusion and recanalization were evaluated on the follow-up imaging. The association between reperfusion and recanalization was calculated using absolute and relative risks. Patient admission and treatment characteristics as well as admission CT imaging parameters regarding occlusion site and stroke severity were collected. Their association with complete reperfusion was analyzed using logistic regression.

RESULTS
Absolute risk for complete reperfusion was 0.60 in the complete recanalization group and 0.23 in the incomplete recanalization group, with a relative risk of 2.60 (CI 1.63-4.13), but around 40% showed a discrepancy between recanalization and reperfusion status. Lower clot burden (OR 1.35, CI 1.14-1.58), more distal thrombus location (OR 2.28, CI 1.18-4.39) and good collateral score (OR 2.84, CI 1.34-6.02) increased the odds of complete reperfusion whilst higher NIHSS score (OR 0.95, CI 0.90-1.00), larger infarct core size (OR 0.32, CI 0.15-0.69) and larger total ischemic area (OR 0.31, CI 0.15-0.67 for 2001-5000 mm² and OR 0.16, CI 0.07-0.37 for >5000 mm²) decreased the odds of complete reperfusion. None of the patients with ipsilateral intracranial ICA occlusion showed complete reperfusion.

CONCLUSION
Reperfusion and recanalization are strongly related but not always equivalent in acute ischemic stroke. Lower clot burden, distal thrombus location, collateral score, NIHSS score, infarct core size and total ischemic area are predictors of reperfusion.
How Can We Make Stroke Imaging Better around the World? :Global Survey of Radiologists in 18 Countries

Bhavya Rehani MD (Presenter): Nothing to Disclose

PURPOSE
Stroke poses a major health challenge in today's world. "Time is Brain" in stroke and every minute counts in stroke management. To what extent are we able to provide timely imaging to these patients globally and if not what can be done? Our aim was to survey radiologists across developing countries in Asia, Europe and South America to assess the stroke care and find out what in their opinion are the most effective ways to improve imaging and management.

METHOD AND MATERIALS
A standardized questionnaire containing 18 questions was sent to radiologists in 20 developing countries across the world. Radiologists from 18 countries responded (response rate=90%). These include Kenya, Algeria, Rwanda, Sri Lanka, Malaysia, Costa Rica, Macedonia, Bulgaria, Mexico, China, India, Uruguay, Burma and Venezuela among others.

RESULTS
Survey results indicated that most of the countries (72%), lack access to CT scanners. Intravenous tissue plasminogen activator (t PA) is the standard of care of ischemic stroke and cannot be given unless hemorrhage is excluded on CT. Also, this can only be administered for a specific time window after symptom onset. To maximize patients who can benefit from thrombolysis, the key is to have a short Emergency Room Door to CT scan time. Unfortunately, Door to CT scanner time is more than 30 minutes in 83% (95% CI being 80.5-85.4%). Moreover, 77% of the countries had shortage of the drug tPA. Overall, radiologists rated their knowledge as "average" in reading stroke imaging and 77% (95% CI being 74.5-79%) believed that further training would be helpful. Minority had access to Neurointerventionalist (33%) and Telestroke services (27%). When questioned about the three most powerful ways to improvise stroke imaging in their respective countries, the highest rated choices were: training programs on stroke imaging to improvise knowledge among radiologists, campaigns to increase awareness in the community and improvising access to CT.

CONCLUSION
This survey helps radiologists around the world communicate the imaging needs in stroke in their respective countries and how can they be met. This can help radiologists who want to reach out in their humanitarian efforts to improve imaging around the world.

CLINICAL RELEVANCE/APPLICATION
Global outreach programs can use this survey to determine more effective ways of improving stroke imaging and care in developing countries.

The Prediction of Prognosis Using ADC Volume in Endovascular Revascularization Therapy for Acute Ischemic Stroke

Miran Han MD (Presenter): Nothing to Disclose, Jin Wook Choi MD : Nothing to Disclose, Sun Yong Kim MD : Nothing to Disclose, Jin Soo Lee : Nothing to Disclose, Young Keun Suh MD : Nothing to Disclose, Seon Young Park MD : Nothing to Disclose

PURPOSE
The recent shift of endovascular treatment (ET) methods for acute ischemic stroke towards better outcome. We hypothesized that bigger core volume may be tolerable to further ET. This study was retrospectively designed to predict the prognosis using ADC volume in endovascular revascularization therapy for acute ischemic stroke.

METHOD AND MATERIALS
Patients with acute ischemic stroke in anterior circulation territory and intra-arterial (IA) revascularization therapy were retrieved. ADC volume taken before the IA therapy was calculated quantitatively with the margin thresholds of ADC value as 700x10^-5 mm²/s. Futile prognosis was defined as modified Rankin Scale 5-6 at 3 months. We divided patients into 3 groups. Group 1 represented with ADC volume less than 50 cm³, group 2 with 50 to 100 cm³ and group 3 with more than 100 cm³. Baseline characteristics (age, initial NIHSS score), imaging data (successful revascularization, TICI 2a-3) and clinical outcomes (good outcome, mRS 0-2 at 3months; poor outcome, mRS 5-6) were compared among groups. Logistic regression and Receiver Operating Characteristic (ROC) curve analyses were done.

RESULTS
Finally, 76 patients were enrolled in this study. There is no difference of age and successful revascularization among the groups. Larger volume group show significantly high initial NIHSS score (p=0.027) and poor outcome (p < 0.001). ADC volume more than 100 cm³ was significantly associated with futile prognosis (p=0.001, Odds ratio, 25.4 [95%CI, 3.874-166.673]). The area under the ROC curve for ADC volumes was 0.675 (p=0.009). For predicting futile prognosis, sensitivity and specificity were 57.6% and 69.8% at ADC volume 50 cm³, 48.5% and 95.3% at 100 cm³ and 33.3% and 97.7% at 150 cm³, respectively.
CONCLUSION

A huge DWI volume was associated with the futile prognosis. This imaging marker, however, could not be a single sign for stopping further aggressive IA treatment for acute ischemic stroke because the area under the ROC curve was relatively small. When IA therapy is considered, well known harmful factors including old age, high NIHSS score and huge ADC volume should be combined altogether for 'no more to go'.

CLINICAL RELEVANCE/APPLICATION

Recent progress of ET methods might be attributed to a tolerance of bigger ADC volume than previously recommended.

VSNR41-12 Endovascular Treatment for Stroke: What do we do Now?

M. Imran Chaudry MD (Presenter): Stockholder, Medina Medical Stockholder, Blockade Medical, Inc Proctor, Covidien AG Consultant, Penumbra, Inc Consultant, Johnson & Johnson Fellowship Funding, MicroVention Inc Fellowship Funding, Stryker Corporation

LEARNING OBJECTIVES

1) Assess the impact of recent stroke clinical trials. 2) Compare the outcomes with various thrombectomy devices. 3) Develop a simple systematic approach to thrombectomy.

MSES42 Essentials of Pediatric Imaging

Multisession Courses

PD ER

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Wed, Dec 3 10:30 AM - 12:00 PM  Location: S100AB

Sub-Events

MSES42A Pediatric Ingested Foreign Objects: Recognition and Triage

Katharine Lee Hopkins MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To differentiate the radiographic appearances of commonly ingested foreign objects. 2) To recognize the potential of such objects to do harm. 3) To understand typical patterns of injury associated with pediatric foreign object ingestions. 4) To follow management pathways and timelines that minimize patient injury.

Active Handout


MSES42B Imaging Abnormalities in Down Syndrome

Alex Towbin MD (Presenter): Author, Amirsys Inc Shareholder, Merge Healthcare Incorporated Consultant, Guerbet SA

LEARNING OBJECTIVES

1) Understand the common manifestations of Down syndrome throughout the body. 2) Describe the most common causes of morbidity and mortality in patients with Down syndrome.

MSES42C Acute Pediatric Abdomen

Timothy M. Cain MBBS, FRANZCR (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review important acute pediatric abdomen presentations to ensure that appropriate etiologies are considered when a pediatric patient is imaged for an acute abdomen. 2) Understand the role of different imaging modalities in the assessment of an acute pediatric abdomen so that the right test may be performed in an appropriate time frame. 3) Understand the importance of critical pediatric imaging findings so that the important information is conveyed to the surgeon/clinician.
ABSTRACT

Children are not little adults and imaging of the acute pediatric abdomen requires a different approach than for adults. The history accompanying the clinical presentation may be vague or absent, the clinical symptoms are often nonspecific and the presentation often occurs after the condition is well established. Consequently, diagnostic imaging often plays an important role in the identification of the etiology and correct interpretation of the images is essential for an optimum outcome. Congenital abnormalities may be identified before birth and may not require post natal imaging prior to surgery, but other conditions will present in the neonatal period and require upper and/or lower GIT contrast studies. Hypertrophic pyloric stenosis is not the only cause of projectile vomiting in infants but the ultrasound findings can be diagnostic when recognized. Malrotation of the bowel giving rise to midgut volvulus is a surgical emergency that will result in bowel infarction if not relieved. Intermittent volvulus due to duodenal malrotation is more difficult to recognize when there is no bowel obstruction. The key landmark being the position of the D-J flexure; however, the D-J flexure can be falsely low when there is over distension of the stomach or the patient is imaged in an oblique position. It can also be in the correct position by chance due to increased mobility of the bowel and a repeat study should be considered if strong clinical suspicion remains. Intussusception (especially ileocolic) may lead to bowel perforation and/or infarction and peritonitis but can be safely treated if recognized and treated early. Appropriate use of medical imaging in the identification of patients with appendicitis can improve the management of these patients but it may provide false reassurance if the limitations of the study are not recognized. The role of imaging in these and other abdominal emergencies will be discussed.

MSSR42

RSNA/ESR Emergency Symposium: CNS Emergencies (An Interactive Session)

Multisession Courses

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Wed, Dec 3 10:30 AM - 12:00 PM Location: S402AB

Sub-Events

MSSR42A

CNS Trauma and Neurovascular Injury


LEARNING OBJECTIVES

1) To be familiar with traumatic brain injury demographics and classification schemes. 2) Be able to apply appropriateness criteria for head trauma imaging in children and adults. 3) Identify key imaging patterns and pitfalls in the evaluation of brain and neurovascular trauma.

ABSTRACT

This lecture on Acute Head Trauma is divided into 4 parts: Part 1 will briefly review TBI demographics. Part 2 will discuss the current imaging approach to acute TBI in today's clinical practice. Part 3 will briefly describe the most common TBI classification schemes. Part 4 will illustrate the imaging manifestations of the different injuries located in the extra-axial space (e.g., scalp and skull injury; epidural, subdural, subarachnoid and intraventricular collections), and the intra-axial space (e.g., dysautoregulation, contusion, hematoma, penetrating TBI, axonal injury, fat emboli). Note that a common theme throughout the lecture will be “Lessons I've Learned Since Neuroradiology Fellowship” ;-)
syndrome (PRES), reversible cerebral vasoconstriction syndrome, Susac's syndrome, and status epilepticus. Furthermore, initial findings of (impending) complications of brain disease, such as hydrocephalus and herniation of brain structures, may be subtle, while early recognition allows for prompt and adequate intervention. Finally, diagnostic and therapeutic interventions performed in an emergency setting may interfere with the diagnosis and interpretation of clinical and imaging findings. Associated limitations and pitfalls therefore need to be recognised to avoid false negative or false positive diagnosis respectively.

**Interactive Case Discussion**


**LEARNING OBJECTIVES**

1) To review traumatic brain injury (TBI) and non-traumatic neurological emergencies. 2) To describe imaging manifestations of TBI and non-traumatic neurological emergencies. 3) To understand the clinical implications of radiological imaging findings in TBI and non-traumatic neurological emergencies. 4) To know the state-of-the-art radiological imaging options for the assessment of acute TBI and non-traumatic neurological emergencies.

**ABSTRACT**

This interactive case discussion builds on the two previous lectures in this session, on traumatic and non-traumatic neurological emergencies respectively. Both lecturers will take the audience through several clinical cases, highlighting and emphasizing important issues from their lectures, such that the previously presented theory is placed in a clinical context. Preferably, the participants will have attended the two prior lectures, to optimally benefit from and participate in this interactive case discussion.

**ERS-WEA**

**Emergency Radiology Wednesday Poster Discussions**

**Scientific Posters**

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**Participants**

Moderator
Michael Nathan Patlas MD, FRCP:
Nothing to Disclose

**Sub-Events**

**ERS225**

**Assessment of Pulmonary Arterial Enhancement According to the Venous Access Route: Upper Extremity Access Versus Lower Extremity Access (Station #1)**

Cherry Kim MD (Presenter): Nothing to Disclose, Choong Wook Lee MD: Nothing to Disclose, Gil-Sun Hong MD: Nothing to Disclose, Mi-Hyun Kim: Nothing to Disclose

**PURPOSE**

The aim of this study is to compare the degree of pulmonary arterial enhancement according to the venous access route of contrast administration (upper vs. lower extremities) in patients who have undergone pulmonary embolism CT (PECT) in the emergency room (ER).

**METHOD AND MATERIALS**

1,521 patients underwent PECT in the ER from 2012 to 2013. Among them, intravenous (IV) contrast materials (CM) were administered via venous route of lower extremity in 24 patients (Group L), because of various reasons of unavailability of vein in upper extremities. This group was compared with control group (Group U, 72 patients whose IV route in upper extremity). Clinical and CT image parameters were retrospectively evaluated by two radiologists in consensus. The parameters include age, gender, body weight, mean pulmonary artery attenuation, mean aorta attenuation, presence of pulmonary embolism and suggestive findings of right pulmonary arterial hypertension. The PECT showing a mean pulmonary artery enhancement lower than 250 HU, was assumed as a non-diagnostic PECT. Group L was subdivided into two subgroups (14 patients with diagnostic PECT and 10 with non-diagnostic PECT), and compared to each other. Comparisons were performed with Fisher's Exact Test, student t-test and the Mann-Whitney test.

**RESULTS**

Non-diagnostic PECT were found in 58.3% (14/24) in Group L and 19.4% (14/72) in Group U (p<0.001). Mean pulmonary artery attenuation and mean aorta attenuation (Group L vs. Group U) were 266±116 HU vs. 321±86 HU (p<0.05) and 236±61 HU vs. 293±59 HU (p<0.001), respectively. In the subgroup analysis of Group L, the non-diagnostic subgroup showed a younger age (55±16 vs. 68±10, p<0.05) and a lower detection rate of pulmonary embolism (70% vs. 14.3%, p<0.05) than the diagnostic subgroup. However, the rate of suggestive findings of right pulmonary artery hypertension wasn't significantly different between the two subgroups (40% vs. 21.4%, p=0.39).

**CONCLUSION**
CONCLUSION

This study demonstrated that the rate of non-diagnostic PECT was increased when CM was administered through lower extremity, leading to a lower detection rate of pulmonary embolism.

CLINICAL RELEVANCE/APPLICATION

The rate of inadequate PECT is higher with venous route through lower extremity, leading to high false negative results in detection of pulmonary embolism.

ERS226

Automatic Assessment of Cardiac Function from Triple-Rule-Out-CT Data in Patients with Chest Pain: Is there Additional Information for the Emergency Physician?—Preliminary Results (Station #2)

Frederick Schuster (Presenter): Nothing to Disclose, Carmen Andrea Pfortmueller: Nothing to Disclose, Thorsten Klink MD: Nothing to Disclose, Aristomenis Konstantinos Exadaktylos: Nothing to Disclose, Johannes T. Heverhagen MD, PhD: Speaker, Bracco Group, Stefan Puig MD, MSc: Nothing to Disclose

PURPOSE

To evaluate the feasibility of automatic cardiac function assessment and whether the assessment of cardiac function provides additional information in patients with chest pain, who were referred for Triple-Rule-Out-CT (TRO-CT) to exclude coronary stenosis, pulmonary embolism and/or aortic dissection in the emergency department.

METHOD AND MATERIALS

Until now, we have included consecutive 91 patients (52 females, 39 males; mean age: 61 years, range: 17 - 85) in this retrospective study. TRO-CT-Data were analyzed using the syngo.ct-cardiac-function client (syngo.via VA 20; Siemens, Germany). After loading the data, the client automatically segmented right and left ventricle and calculated the global parameters 'ejection fraction (EF), myocardial mass (MM), stroke volume (SV), end-systolic and end-diastolic volumes (ESV and EDV)'. All patients were scanned with the same ECG-triggered CT-protocol using a 128-slice scanner (Somatom Edge, Siemens, Erlangen, Germany) without any premedication.

RESULTS

In 78/91 (86%) examinations the client automatically segmented the right and left ventricle and calculated cardiac function parameters. The mean heart rate was 77.7 bpm (range: 47 - 125 bpm). The EF of the left and/or the right ventricle was pathologic in 61/78 (78%) patients, as was the MM of the left ventricle in 10/78 (13%), the SV of the left ventricle in 13/78 (17%), and the ESV and/or the EDV of the left ventricle in 28/78 patients (36%).

CONCLUSION

Automatic assessment of cardiac function calculated from TRO-CT data is feasible and can add medical information in patients with chest pain, which is usually obtained from additional examinations, such as echocardiography. Further studies are needed to evaluate the clinical and economic significance of this technical possibility.

CLINICAL RELEVANCE/APPLICATION

Automatic cardiac function assessment provides additional information in patients who are referred for TRO-CT in emergency settings, which usually can only be obtained from additional, time consuming examinations such as echocardiography.

ERS227

The Role of MD-CECT in the Diagnosis of Necrotizing Fasciitis and Correlation with the LRINEC Score (Station #3)

Francesco Carbonetti MD (Presenter): Nothing to Disclose, Antonio Cremona: Nothing to Disclose, Daniela Sergi: Nothing to Disclose, Marco Guidi: Nothing to Disclose, Valentina Carusi: Nothing to Disclose, Marco Di Girolamo MD: Nothing to Disclose, Dañilo Guida: Nothing to Disclose, Vincenzo David MD: Nothing to Disclose

PURPOSE

To evaluate the diagnostic efficacy of the CT findings in predicting the diagnosis of Necrotizing Fasciitis (NF).

METHOD AND MATERIALS

In a period of a year 36 pts with a clinical suspicion of NF underwent to CE-MDCT .CT findings studied were : involvement and thickening of the muscular fascia, fluid collections along the deep fascial sheaths, extension of oedema into the intramuscular septa and the muscles, low attenuation areas in the deeper fascial planes suggestive for colliquiative necrosis, a non enhancement of the muscular fascia and vascular thrombosis Radiological findings were compared with the LRINEC score and with the surgical data.

RESULTS

CT findings were suggestive for NF in 10 pts, for non-NF in 2 pts and for gas-gangrene in 2 pts .The rest of the pts showed CT finding suggestive for cellulitis (10 pts), myositis (5 pts), soft tissue abscess (7 pts). Among
the patients with CT findings suggestive for NF, non-NF and gas gangrene, 9 pts showed a non enhancing fascia, subcutaneous gas was present in 12 pts, involvement of the fascia in 12 pts, fluid collections along the deep fascial sheaths in 7 pts, low attenuation areas in the deeper fascial planes in 3 pts. Surgical examination confirmed the diagnosis of NF in 12 pts who showed at the CE-MDCT a non enhancement of the fascia (9/12), low areas of attenuation (3/12), fluid collections (4/12), presence of subcutaneous gas (10/12). The LRINEC score in pts with NF was equal or superior to 6 points: 6 pts had a score of 6/8, 4 pts a score of 7/8, 2 pts a score of 8/8. The diagnoses of the other pts (cellulitis 10 pts, myositis 5 pts, musculoskeletal abscess 7 pts) were confirmed.

CONCLUSION
The presence of a non-enhancing fascia after contrast medium administration, the involvement of the fascia and the presence of subcutaneous gas are the radiological findings mostly related to NF, and could strongly suggest to the radiologist the presence of NF; these findings with an intermediate-high LRINEC should address to a surgical evaluation. CT could discriminate NF from the most common musculoskeletal infections.

CLINICAL RELEVANCE/APPLICATION
NF is a fatal disease if it is not treated, in order to permit a prompt surgical intervention radiological findings correlated with the LRINEC score permit a better evaluation of the pts disease and a prompt surgical intervention in order to avoid the complication of NF.

ERS228
Interpretation of Diffusion-weighted MR Imaging in Patients with Acute Neurologic Deficits in Emergency Department by Radiology Residents: Comparison of Diagnostic Accuracy Among Residents and Analyses of Interobserver Reliability (Station #4)
SungJae Lee MD (Presenter): Nothing to Disclose, Hye Jin Baek: Nothing to Disclose, Kwanghwi Lee: Nothing to Disclose, Yedaun Lee MD: Nothing to Disclose, Hyun Kyung Jung: Nothing to Disclose, Seon-Jeong Kim MD: Nothing to Disclose, Seung Ho Kim MD: Nothing to Disclose

PURPOSE
To compare the diagnostic accuracy among radiology residents for the interpretation of diffusion-weighted MR imaging (DWI) in patients with acute neurologic deficits in emergency department (ER) and to evaluate the interobserver reliability

METHOD AND MATERIALS
A total of 80 patients who underwent DWI to evaluate acute neurologic deficits were included in this retrospective study. Four radiology residents in the third and fourth years assessed the results of the imaging independently, and their interpretation compared with the consensus opinion of two staff neuroradiologists. The McNemar test and kappa statistics were used to compare the results among four readers.

RESULTS
Of the 80 patients, the presence of acute infarction was confirmed in 48 (60%) patients, negative findings were in 32 patients (40%). The most frequent site of acute infarction was pons. For the interpretation of DWI abnormality among four readers, all diagnostic indices of senior residents were similar to or higher than those of junior residents. There was no statistical difference in the assessment of DWI between readers with same grade (McNemar test, P = 0.146, juniors, and P = 0.180, seniors). However, the results of senior residents were significantly superior to junior residents (McNemar test, P = 0.022). Kappa statistics showed good agreement among the residents, and also showed good agreement between residents and staffs.

CONCLUSION
Although senior residents showed better values in the interpretation of emergency DWI than junior residents, there was a good interobserver agreement among their results. Therefore, on-call radiology residents could safely make the initial interpretation of DWI which underwent in ER, and formal reporting may wait until a suitable experienced radiologist is available.

CLINICAL RELEVANCE/APPLICATION
On-call radiology residents can make the initial interpretation of DWI which underwent in ER, and formal reporting may wait until a suitable experienced radiologist is available.

ERE00
Multi-Detector CT Angiography of Peripheral Vascular Injuries—Imaging Pearls and Pitfalls (Station #5)
Scott David Steenburg MD (Presenter): Nothing to Disclose, Ryan Whitesell MD: Nothing to Disclose, Jared L. Gayken MD: Nothing to Disclose, Clint W. Sliker MD: Nothing to Disclose, Douglas S. Katz MD: Nothing to Disclose

TEACHING POINTS
- Suspected blunt and penetrating peripheral vascular injuries can be quickly and accurately diagnosed with multi-detector CT angiography. - A variety of arterial injury morphologies can be diagnosed with MDCT angiography. - MDCT angiography diagnostic pitfalls and limitations, including metal artifact from gunshot wounds, may require further investigation with conventional catheter angiography.

TABLE OF CONTENTS/OUTLINE
The strengths and weaknesses of the various imaging modalities for the diagnosis of suspected peripheral vascular injuries will be reviewed. Optimal MDCT angiography techniques and protocols will be presented. Various arterial injuries diagnosed with MDCT angiography will be presented using a case-based approach. Vascular injuries to be presented include: wall injury with intimal flap, pseudoaneurysm, dissection with luminal narrowing, dissection with occlusion, transection with occlusion, transection with active bleeding, and traumatic arterio-venous fistula. Imaging pitfalls for diagnosing peripheral vascular injuries following gunshot wounds will be presented.

ERS-WEB

Emergency Radiology Wednesday Poster Discussions

Scientific Posters

ERS229 MRI Offers Advantages Over Ultrasound for the Evaluation of Suspected Appendicitis in Emergency Room Patients (Station #1)

Geoffrey Merritt Rutledge MD (Presenter): Nothing to Disclose, Efren Jesus Flores MD: Nothing to Disclose, Sanjay Saini MD: Nothing to Disclose, Anjaneya Singh Kathait MBBS: Nothing to Disclose, Anand M. Prabhakar MD: Nothing to Disclose

PURPOSE

To compare the outcomes of magnetic resonance imaging (MRI) with ultrasound (US) in the evaluation of patients with suspected acute appendicitis (AA) in the emergency room.

METHOD AND MATERIALS

In this IRB approved, retrospective study, we reviewed all MRI reports performed in the emergency room for suspected AA, between May, 2010 and March, 2014. Demographic and clinical data were extracted via chart review. Pathology reports were used as the reference standard for disease confirmation. Completion times of MRI and US were calculated from the start and stop times on the images.

RESULTS

74 patients underwent MRI (71 female, 64 pregnant; mean age 29 years, range 17-51 years; mean gestational age 15.6 weeks, range 3-37 weeks). Ten patients had AA on surgical pathology. MRI correctly diagnosed AA in 10/10 cases (sensitivity 100%), was falsely positive in 2/64 cases (specificity 97%), and had no false negative diagnoses (positive predictive value of 83%, negative predictive value of 100%). The two patients who were misdiagnosed with AA on MRI underwent appendectomy and pathology demonstrated a hyperplastic polyp in one case and serosal congestion in the other case. US was performed concurrently in 56/74 patients, and correctly diagnosed AA in two cases and was falsely negative in six cases. MRI made six alternative diagnoses that were not described on US (two cases of colitis and one case each of cirrhosis with splenomegaly, polycystic ovarian syndrome, ruptured ovarian cyst, and hydronephrosis). No diagnoses made on US were missed on MRI. US was completed in significantly less time on average than was MRI (mean 17.6 min +/- 14.2 vs. 38.8 min +/- 14.6, p<0.01).

CONCLUSION

MRI demonstrates excellent sensitivity and specificity for AA and can also make alternative diagnoses. MRI took longer than US to complete, but future studies could focus on decreasing MRI scan times.

CLINICAL RELEVANCE/APPLICATION

MRI is sensitive and specific for acute appendicitis and can make alternative diagnoses, and is recommended as an alternative to US for the evaluation of emergency room patients with suspected acute appendicitis.

ERS230 MR Appendicitis Protocol using Rectal Infusion of Saline (Station #2)

Ajay K. Singh MD (Presenter): Nothing to Disclose

PURPOSE

The aim of the study was to evaluate the feasibility of MR imaging for appendicitis using rectal saline infusion.

METHOD AND MATERIALS

A total of 14 patients (14 to 47 years; mean age 31.5 years) presenting to the emergency department with right lower quadrant pain and clinical suspicion of acute appendicitis were included in the study. The MR protocol involved the initial use of 3 plane single shot fast spin-echo sequence, followed by rectal infusion of 1 L of saline. Following this 3 plane single shot fast spin-echo sequences were obtained followed by axial T2 FSE...
RESULTS

The rectal infusion of saline was able to improve the visualization of the cecal wall in 11 out of 14 patients. In 4 out of the 14 patients the saline did not reach the cecum, although into two of these patients the visualization of cecum was improved by air distention of the bowel lumen. The appendix was visualized in 12 out of 14 patients. In two patients, the appendix was seen to fill up with saline, thereby ruling out the possibility of acute appendicitis. Three patients were positive for acute appendicitis while one patient had changes of degenerating fibroids on MR.

CONCLUSION

MRI study of the appendix with rectal saline infusion is a feasible technique in the evaluation of acute appendicitis. The saline infusion significantly improves the visualization of the cecum compared to MR imaging without rectal saline infusion. The presence of saline in the lumen of the appendix can be used as criteria in calling an appendix as normal.

CLINICAL RELEVANCE/APPLICATION

With the nonavailability of Gastromark, the techniques of rectal infusion can help in optimal visualization of the cecum and appendix in patients with suspected appendicitis. The presence of saline in the appendiceal lumen can be used as a reliable criterion in calling an appendix as normal.

ERS231
Acute Gastrointestinal Bleeding (AGIB)—Can we Predict Bleeding on MDCT Angiography? (Station #3)

Maria Vega Garcia Blazquez (Presenter): Nothing to Disclose, Agustina Vicente Bartulos MD: Nothing to Disclose, Luis Gorospe Sarasua: Nothing to Disclose, Rut Romera Sanchez RT: Nothing to Disclose, Javier Zamora Romero: Nothing to Disclose

PURPOSE

To assess factors that might be related with presence of active bleeding on CT-angiography performed in patients with acute episode of lower gastrointestinal bleeding.

METHOD AND MATERIALS

Prospective study (2 years) over 105 patients with AGIB and CT-angiography is performed according to agreed protocol (baseline, arterial and venous phases). Positivity in CT angiography is assessed by the presence of contrast extravasation active arterial and/or venous phases. The following variables were collected: age, sex, history of prior episodes of AIB, anticoagulant/anti-platelet treatment; non steroidal anti-inflammatory drugs; severity of AIB (severe / moderate / mild); hemodynamic instability; need for transfusion; location and cause of the bleeding. An endoscopy or/and arteriography or/and surgery were used as gold standard/benchmarks. Data analysis was performed using Chi-square, Fisher and U Mann-Whitney test. SPSS 15 software was used.

RESULTS

105 patients (49 males / 56 females) with average age of 73 were recruited. The CT-angiography was positive in 28%. There is no statistically significant difference between age, sex or previous history of gastrointestinal bleeding. There is a higher risk of active bleeding on CT angiography although a statistically significant relationship was not reachet in patients taking anticoagulant/anti-platelet therapy (36.7% in positive CTs versus in 21.4% negatives); non steroidal anti-inflammatory drugs (35.7 vs. 27.5%); hemodynamic instability (risk different between the two categories,15%); need for transfusion (39% vs 23.5%); the localization in the colon (71.4 vs 28%). There is a statistically significant association (p <0.001) between serious-massive hemorrhage and the likelihood of gastrointestinal bleeding.

CONCLUSION

Severe gastrointestinal bleeding could be a predictor of active bleeding on CT-angiography. It is likely that positivity CT factors as anti-platelet therapy, non steroidal anti-inflammatory drugs, transfusion requirements, and localization in the colon...could reach statistical significance with an increased sample size.

CLINICAL RELEVANCE/APPLICATION

The multidetector CT-angiography appears to be a promising diagnostic tool in emergency AGIB. Sould be the first test to be performed thanks to its characteristics availability, speed, does not require preparation. Certain patient characteristics may help predict the positive test.

ERS232
Low Back Pain in the ER—Imaging and Outcomes (Station #4)


PURPOSE

Americans spend $50 billion yearly on low back pain (LBP). Acute LBP is often self-limited, without the need for imaging. Imaging plays an important role for patients with progressive neurologic deficits and refractory pain for greater than six weeks. The ACR Appropriateness Criteria is an important tool in the clinician’s arsenal to
provide appropriate, cost conscious medical care. We aimed to assess the prevalence of appropriate imaging among patients who presented with LBP to a level 1 ER.

**METHOD AND MATERIALS**

We retrospectively searched our ER records for patients who presented with a CC of "Back Pain" from Jan-Feb 2013. Of 368 total patients, 59 were randomly selected and analyzed for their age, gender, presentation, imaging, follow-up, treatment, and outcomes. Among imaged patients, the study indication was compared to the ACR Appropriateness Criteria with the indication deemed appropriate based on a rating of 5 or higher.

**RESULTS**

Of the 59 patient subgroup, the average age was 49 years (51% F, 49% M). The majority presented with acute or acute on chronic LBP (54 patients, 92%) and had a precipitating event (30 patients, 51%), 18 (31%) underwent imaging in the ED (11 with MRI, 2 CT, 3 plain films, 1 MRI and plain film, and 1 CT and plain film), and 11 (19%) had outpatient imaging (5 with MRI, 3 CT, and 3 plain films). 34/59 patients (58%) had neither ED nor outpatient imaging. The majority were appropriately imaged based on the ACR Appropriateness Criteria, 17/18, 93% for pts imaged in the ED and 11/11, 100% imaged as outpatients. Of the ED patients, imaging variants included 5/17 trauma and/or osteoporosis, 4/17 for neuro deficit, 4/17 for prior spinal pathology, 4/17 infection or cancer. 44 patients (76%) had outpatient or ER follow-up after discharge: of these, 23 (52%) had resolution or return of pain to baseline with pain medication and PT, 7 (16%) had improvement with intervention (ESI or kyphoplasty), 7 (16%) improved with surgery, and 5 patients had persistent pain (11%). Of the 7 patients who ultimately had surgery, 4 had prior ED or outpatient imaging, and 2 had imaging prior to the initial ED visit.

**CONCLUSION**

The majority of our ED subgroup with LBP did not undergo imaging. Those who did so were imaged based on appropriate ACR guidelines and most had improvement or resolution of their LBP with conservative management.

**CLINICAL RELEVANCE/APPLICATION**

Adequate imaging utilization for LBP is a key cost effectiveness tool.
LEARNING OBJECTIVES

1) The learner will be able to differentiate traumatic aortic injuries from congenital variants that mimic injury, to distinguish minor from major aortic injuries and to understand how injury classification can influence management. 2) The participant will recognize the various CT appearances suggesting and verifying major airway injury. 3) The participant will understand the various CT appearances of blood/bleeding in the chest and how the location, quantity of blood/bleeding and patient clinical status determine initial treatment. 4) The learner will appreciate the spectrum of cardiac injuries that can be diagnosed on admission contrast-enhanced CT and those that require urgent intervention.

MSSR43B  
Non-Traumatic Thoracic Emergencies

Cornelia Maria Schaefer-Prokop MD (Presenter): Advisory Board, Riverain Technologies, LLC

LEARNING OBJECTIVES

1) To get familiar with protocols and diagnostic performance of comprehensive cardiothoracic CT examinations to determine the presence of vascular life threatening events such as aortic dissection, acute coronary disease and pulmonary embolism. 2) To illustrate typical but also less classic CXR and CT findings of patients with pulmonary or mediastinal diseases causing acute dyspnea and / or requiring immediate treatment and to learn about key imaging findings in these patients allowing for a fast differential diagnosis. 3) To learn how to adapt CT protocols to CXR findings and to integrate imaging findings with lab findings, patient history and clinical information for making the diagnosis.

ABSTRACT

Pulmonary symptoms such as chest pain, shortness of breath or wheezing are common non-traumatic symptoms prompting ER visits. Because clinical symptoms are very non-specific, imaging plays a major role in differentiating life threatening from less severe diseases and forming a diagnosis. The chest radiograph remains the first imaging despite its limited sensitivity for certain diseases and being prone to inter-observer variability. Comprehensive cardiothoracic CT examinations using most modern CT equipment are well evaluated in their diagnostic accuracy to determine the presence of vascular life threatening events such as aortic dissection, acute coronary disease and pulmonary embolism. Protocols, literature evidence and appropriate examples will be discussed. In addition the course will highlight nonvascular emergencies such as mediastinal diseases (e.g., esophageal perforation, mediastinitis or pericarditis) and pulmonary emergencies (e.g., pneumonia, edema, pneumothorax, exacerbation of diffuse lung diseases) for which a more comprehensive consideration of imaging findings, lab findings, patient history and clinical information is needed for making the diagnosis.

MSSR43C  
Interactive Case Discussion

Cornelia Maria Schaefer-Prokop MD (Presenter): Advisory Board, Riverain Technologies, LLC, Stuart E. Mirvis MD (Presenter): Nothing to Disclose

SSM07  
ISP: Emergency Radiology (Neurologic Emergencies)

Scientific Papers

AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Wed, Dec 3 3:00 PM - 4:00 PM Location: S403B

Participants
Moderator  
Wayne Scott Kubal MD : Stockholder, Stryker Corporation Research Grant, Guerbet SA  
Savvas Nicolaou MD : Nothing to Disclose

Sub-Events

SSM07-01  
Emergency Radiology Keynote Speaker: Update on the MR Imaging of Acute Stroke  
Wayne Scott Kubal MD (Presenter): Stockholder, Stryker Corporation Research Grant, Guerbet SA

SSM07-02  
Pattern Analysis and Correction of Artifacts in the Brain Stem with DWI Using Two Different Phase Encoding Direction  
Gil-Sun Hong MD (Presenter): Nothing to Disclose, Choong Wook Lee MD : Nothing to Disclose, Mi-Hyun Kim : Nothing to Disclose, Cherry Kim MD : Nothing to Disclose

PURPOSE

To assess the pattern of artifacts with high signal intensity in the brain stem on Diffusion Weighted Image (DWI) and determine if the artifacts in the brain stem could be corrected by DWI using two different phase
METHOD AND MATERIALS

This retrospective study included 726 patients who visited emergency department (ED) with minor neurologic symptoms and performed DWI to exclude central brain lesions. DWI protocol in ED included MRI scan with posteroanterior phase encoding direction (PA-PED) for whole brain and reversed phase encoding direction (anteroposterior direction, AP-PED) for brain stem. We defined the brain stem lesion showing high signal intensity on DWI as “artifact” if the corresponding lesion on follow up MRI disappeared or the patient’s symptom was improved on clinical follow up. Finally, we included 106 patients with 126 lesions in this study. Two emergency radiologists assessed the pattern of location, size and shape of artifacts in brain stem on DWI with PA-PED compared with those with AP-PED by consensus. Locations of artifacts were classified according to anatomy of brain stem and vascular territory: 7 levels of brain stem and 4 vascular territories (anteromedial, anterolateral, lateral and posterior group). Shapes of artifacts were classified into linear, dot and V-shape. It was assessed whether the artifacts in brain stem could be corrected by changing the phase encoding direction.

RESULTS

The artifacts in the brain stem on DWI with PA-PED significantly presented in the posterolateral territory and level 3-5, compared with those with AP-PED which significantly presented in the anterior portion and level 6 and 7 (P<.001). The shapes of artifact between two groups were significantly different: linear or dot shape (PA-PED) vs. V shape (AP-PED) (P<.001). All artifacts with high signal intensity in the brain stem on DWI with PA-PED or AP-PED were completely corrected on DWI with reversed phase encoding direction (n= 126/126, 100%).

CONCLUSION

The artifacts in the brain stem on DWI manifest different location pattern and shape. All artifacts with high signal intensity in the brain stem can be corrected by DWI with reversed phase encoding direction.

CLINICAL RELEVANCE/APPLICATION

DWI with reversed phase encoding direction is recommended in the initial evaluation of suspected artifact mimicking infarction based on the knowledge of the characteristic pattern of artifacts in the brain stem on DWI.

SSM07-03

Is It Possible to Accurately Diagnose Cerebral Venous Sinus Thrombosis on Noncontrast CT?

Jian Guan MD (Presenter): Nothing to Disclose, Ling Lin: Nothing to Disclose, Ling Zhang MD: Nothing to Disclose, Guangqi Yang: Nothing to Disclose, Zhiyun Yang: Nothing to Disclose

PURPOSE

With its highly variable clinical presentation, the diagnosis of cerebral venous sinus thrombosis (CVST) challenging. Noncontrast CT is still the preferred imaging exam in most emergency departments. The aim is to investigate the possibility of accurate diagnosis for CVST on noncontrast CT.

METHOD AND MATERIALS

There were 35 cases with CVST (case group) and 40 cases without CVST (control group). All cases received noncontrast CT scan. The two groups were matched by age and gender. Two radiologist blindly reviewed all CT examinations and made decision together. Another experienced radiologist measure CT value of cerebral venous sinus and summary clinical history and symptoms. Independent samples t test was performed between two groups, and receiver operating curve was performed to get critical value of venous sinus for diagnosis. Attenuation of venous sinus (critical value) (A), relative history (SLE, nephropathy, pregnancy etc)(B), symptoms (headache and/or spasm) (C),hemorrhagic infarct and/or epicranium swelling on CT (D) were taken as four variables. We calculated sensitivity, specificity and reliability of each variable for diagnosis of CVST. The impression were compared via grading of the mentioned variables (1-3 points) and the sum of each case in both groups were analyzed (Chi-square test / Fisher exact test).

RESULTS

Attenuation of venous sinus in case group was significantly higher than control group (P<0.001). The best critical value for diagnosis was 68HU (Youden index = 0.886). The best single indicator was variable A (specificity 93%), followed by variable D (specificity 77%), while the other two indicators were of no statistical significance in two groups, According to the results, variable A was considered as 3 points, variable D as 2, both variable B and C as 1. The score of B,C or D variable can be accumulated repeatly. The case with total score no less than 5 points is highly correlated with clinical diagnosis as CVST in following up. The sensitivity, specificity and reliability were 83%, 100% and 94%, respectively ( P<0.01).

CONCLUSION

Combined with relative history, symptoms and noncontrast CT findings, we can make an accurate diagnosis for CVST.

CLINICAL RELEVANCE/APPLICATION

For the patients who have relative history, especially with headache and/or spasm, noncontrast CT is a valuable exam to exclude CVST and make a decision for further imaging.

SSM07-04

Improvements in Subjective and Objective Image Quality in Emergency Non-contrast CT of the Head, Reconstructed with a Novel Third-generation Modelled Iterative Reconstruction Algorithm
PURPOSE

Accurate interpretation of Head CT demands high image contrast and spatial resolution from a CT system. This study aims to assess the image quality effects of a novel third generation modelled iterative reconstruction algorithm (SAFIRE+, Siemens Healthcare, Forcheim, Germany) compared to the prior generation of SAFIRE in helical non contrast CT of the head.

METHOD AND MATERIALS

50 consecutive patients underwent helical unenhanced head CT over a 5 day period using a dual source 128-slice CT system. Images were reconstructed with standard FBP, SAFIRE (strength 1, 3, 5) and SAFIRE+ (strength 1, 3, 5). Objective and subjective image quality were compared between images reconstructed with SAFIRE and SAFIRE+ at corresponding strength levels. Objective measures of image quality include image noise, signal-to-noise ratio, and contrast-to-noise ratio. Subjective rating of grey-white differentiation, coarse noise, posterior fossa streak artifact, and overall diagnostic acceptability were scored out of 10 by two reviewers in consensus. Statistical analysis was performed with paired student’s t-test and Wilcoxon signed rank test.

RESULTS

SAFIRE+ demonstrated statistically significant reduction in objective noise and improvement in signal-to-noise ratio at all reconstruction strengths (p<0.01 for all comparisons). SAFIRE+5 showed significant improvement in contrast-to-noise ratio as compared with SAFIRE5 (2.0±0.6 vs 1.8±0.5, p<0.01). There was a statistically significant improvement in grey-white differentiation, diagnostic acceptability, streak artifact, and subjective noise when SAFIRE+5 images were subjectively compared with SAFIRE5.

CONCLUSION

Third generation modelled iterative reconstruction offers improvement in both objective and subjective image quality of head CT. Subjective and objective benefits over SAFIRE were better appreciated at higher reconstruction strengths.

CLINICAL RELEVANCE/APPLICATION

SAFIRE+ is an easy software upgrade that offers evolutionary improvements in image quality which may enhance diagnostic accuracy and better guide clinical decisions.

PURPOSE

To investigate the image quality of cerebral dual energy CT angiography (DECTA) using a non-linear image blending technique as compared with the conventional linear blending method in patients with spontaneous subarachnoid hemorrhage (SAH).

METHOD AND MATERIALS

Thirty consecutive spontaneous SAH patients undergone a dual-source, dual energy (80kV and Sn140kV mode) cerebral CTA were retrospectively reviewed with ethical committee permission. Optimized images using non-linear blending method were generated and compared with the 0.6 linear blending images by evaluating cerebral artery enhancement, attenuation of SAH, image noise, signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) respectively using paired Student t test. Two radiologists independently assessed subjective vessel visualization per-segment on maximum intensity projection (MIP) images using a 5-point scale (5 = excellent, 1 = un-diagnosable). The inter-observer agreement was calculated by kappa test; and the segmental scorings of the two image sequences were estimated by Wilcoxon-Mann-Whitney (WMW) tests.

RESULTS

The non-linear blending images obtained higher cerebral artery enhancement (307.24±58.04HU) but lower attenuation of SAH (67.07±6.79HU) and image noise (8.39±8.43 for SNR and 20.37±7.74 for CNR) (all p<0.01). The segmental scorings of the two image sequences were estimated by Wilcoxon-Mann-Whitney (WMW) tests.

CONCLUSION

The non-linear image blending technique improved vessel visualization of cerebral DECTA by optimizing contrast enhancement in spontaneous SAH patients.
CLINICAL RELEVANCE/APPLICATION

Use of non-linear blending technique with DECT optimizes vessel visualization of cerebral CTA for patients with spontaneous SAH.

Derivation of Virtual Non-contrast CT Head Images from Dual Energy Head CT Angiography Studies: Potential Feasibility of Replacing Routine Non-contrast Head CT with Virtual Non-contrast CT

Shamir Rai BSC (Presenter): Nothing to Disclose, Chesnal Dey Arepalli MD: Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Rita Chiu MD: Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose

PURPOSE

Virtual non-contrast (VNC) images are derived from dual energy (DE) contrast enhanced CT scans. The purpose of this study is to evaluate the whether the VNC images derived from DE head CT angiography (CTA) are of diagnostic quality in patients presenting with acute stroke symptoms.

METHOD AND MATERIALS

A total of 50 consecutive patients with acute stroke symptoms were retrospectively identified between Dec. 1, 2013 and Feb. 5, 2014 from a single institution’s emergency department. All the patients underwent both a non-contrast CT (NCCT) and DE head CTA at 100 kv and 140 kv. Quantitative analysis of the NCCT and the generated VNC Head images were performed using circular region of interests (ROIs) with an area of 22.8mm² centered on both caudate heads (grey matter), internal capsules, corona radiata and centrum semiovale. The SNR and CNR were calculated. The CTDvol (mGy), DLP (mGycm) were recorded. The effective dose was calculated using the established ratio of 0.0021. Two radiologists, with combined 20 years of experience were blinded and retrospectively interpreted the VNC CT images in comparison to the routine NCCT, assessing for pathology and diagnostic acceptability. The VNC CT scans were graded 1 (non-diagnostic), 2 (decreased image quality, unlikely to be diagnostic), 3 (decreased image quality with potential to be diagnostic), 4 (decreased image quality but diagnostic), 5 (diagnostic study).

RESULTS

The median subjective score for assessment of the virtual non-contrast study for reader 1 and reader 2 were 4±1 and 4±0.75. The effective dose in the DE CTA scans was significantly lower than in the non-contrast CT heads (1.652 msv±0.1986 and 1.955 msv ±0.4843 respectively, (p

CONCLUSION

VNC CT scans were determined to be diagnostic with reduced image quality. This has the potential to replace routine non-contrast studies.

CLINICAL RELEVANCE/APPLICATION

Optimized head VNC CT protocols are currently in development. With enhancement in VNC CT algorithms, stroke assessment could be limited to a single DE CTA thereby reducing radiation exposure to the patient.

MSCU42

Case-based Review of US (An Interactive Session)

Multisession Courses

ER US GU

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Wed, Dec 3 3:30 PM - 5:00 PM Location: S406A

Sub-Events

MSCU42A GYN Challenging Cases

Oksana Helena Baltarowich MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the sonographic features of various manifestations of gynecological pathologies. 2) Discuss the differential diagnosis for each entity.

ABSTRACT

A variety of sonographic images of gynecological pathologies will be shown as unknowns. Differential diagnoses will be discussed for each entity. The most likely diagnosis will be revealed in the context of the clinical setting in which it was presented.

MSCU42B Acute Abdomen: Diagnosis and Intervention
LEARNING OBJECTIVES

1) Recognize when ultrasound is an appropriate first line imaging modality for the patient presenting with acute abdominal pain. 2) Be able to recognize the pertinent positive and negative findings on ultrasound when evaluating common and occasionally uncommon causes of acute abdominal pain. 3) Learn when to consider ultrasound as a modality for performing interventions to treat the patient presenting with acute abdominal pain.

ABSTRACT

Ultrasound is often the first line imaging modality for the patient presenting with acute abdominal pain. This is particularly true when there is a high clinical suspicion of biliary or renal etiologies. Through multiple case presentations, this session will review the ultrasound findings one may encounter when working up acute abdominal pain. In addition, cases where ultrasound guided interventions may be appropriate in patients present with abdominal pain will be shown. Audience involvement will be encouraged through the use of audience response.

MSCU42C

Head to Toe: Small Parts Matter!

Deborah J. Rubens MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review some of the common pathologic entities involving superficial glands and structures. 2) Emphasize the unique technical parameters which are critical to optimize imaging of small parts. 3) Test the attendant's knowledge of some critical decision pathways in superficial pathology.

ABSTRACT

High frequency ultrasound is a powerful tool to assess superficial structures including the neck (thyroid, parathyroid, other neck masses) chest and abdominal wall, extremities and the scrotum. Accurate performance requires optimizing scanning frequency for adequate tissue penetration as well as Doppler sensitivity to differentiate fluid collections from tumors, to assess organs for blood flow and to diagnose inflammatory conditions. Cases will be selected to emphasize thyroid, neck, testicular and extra-testicular pathology, particularly those cases which require urgent surgical or medical intervention such as incomplete or partial torsion, hernias and testicular ischemia. Additional cases will include symptomatic lumps and bumps as well as the incidentalomas one commonly encounters in superficial scanning.

Active Handout


MSSR44

RSNA/ESR Emergency Symposium: Abdominal Emergencies (An Interactive Session)

Multisession Courses

ER CT GI

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.

MSSR44C

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 abdominalk 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.

MSES51

Essentials of Genitourinary Imaging

Multisession Courses

ER OB GU

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 8:30 AM - 10:00 AM Location: S406B

Sub-Events

MSES51A

Urinary Stone Disease

Parvati Ramchandani MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Familiarize attendee with the radiologic features of the spectrum of urinary stone disease. 2) Familiarize attendees with the role of imaging in the management of patients with stone disease. 3) Familiarize attendees with the role of the different imaging modalities in diagnosis of urinary stone disease.

ABSTRACT

Imaging is crucial in the diagnosis and management of urinary stone disease. Abdominal radiography, ultrasound and CT all continue to be important modalities in detecting urinary stone disease, determining stone composition, determining the best management strategy, and in detecting complications due to stone disease. In this presentation, the role, advantages and pitfalls of the different imaging modalities available to evaluate stone disease will be discussed.

MSES51B

Endometriosis Imaging

Andrea Grace Rockall MRCP, FRCR (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) To be familiar with the typical clinical presentations of endometriosis. 2) To know the imaging features of endometriosis on ultrasound. 3) To know the imaging features of endometriosis on MRI. 4) To be aware of the potential serious complications of endometriosis and the accompanying imaging findings.

**Ectopic Pregnancy: Challenges and Pitfalls**

Genevieve Louise Bennett MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the role of imaging in evaluation and management of the patient with suspected ectopic pregnancy. 2) Recognize the imaging findings in both common and uncommon manifestations of ectopic pregnancy, including unusual sites of pregnancy implantation. 3) Avoid common pitfalls in diagnosis of ectopic pregnancy.

**ABSTRACT**

Ectopic pregnancy is the leading cause of first trimester maternal morbidity and mortality, and the diagnosis may often be challenging. In this course, the role of imaging in evaluation and management of patients with suspected ectopic pregnancy will be reviewed. Both common and uncommon manifestations of ectopic pregnancy will be discussed, including unusual sites of pregnancy implantation. Diagnosis of C-section scar implantation and early detection of placental implantation disorders will be reviewed. Throughout the course, common diagnostic pitfalls and strategies to avoid these pitfalls will be emphasized.

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**Emergency Radiology Series: Contemporary and (Sometimes) Controversial Topics in Imaging of Trauma**

**Series Courses**

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**Thu, Dec 4 8:30 AM - 12:00 PM   Location: S405AB**

**Participants**

Moderator
Clint W. Sliker MD : Nothing to Disclose
Moderator
Mariano Scaglione MD : Nothing to Disclose
Moderator
Ferco H. Berger MD : Nothing to Disclose

**Sub-Events**

**VSER51-01**

Imaging of the Polytrauma Patient: Role of Whole-Body CT

Savvas Nicolaou MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Appreciate the rationale for Whole Body Imaging in assessing the polytrauma patient. 2) Compare advantages of whole body versus segmental MDCT protocol. 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) Understand and review strategies for reducing radiation exposure. 5) Discuss strategies and techniques for optimization of whole body imaging protocols in the trauma setting. 6) Discuss Future Directions to allow bridging of anatomy and function.

**VSER51-02**

Are We Missing Traumatic Bowel and Mesenteric Injuries?

Bret Allan Landry MD (Presenter): Nothing to Disclose, Samir Faidi MD, FRCPC : Nothing to Disclose, Angela Coates MEd : Nothing to Disclose, Michael Nathan Patlas MD, FRCPC : Nothing to Disclose

**PURPOSE**

Traumatic bowel and mesenteric injury (TBMI) is an uncommon entity that can be lethal if not detected and treated in a timely manner. The purpose of our study was to evaluate the diagnostic accuracy of 64MDCT for the detection of TBMI in patients at our level 1 trauma centre.

**METHOD AND MATERIALS**

We used our hospital’s trauma registry to identify patients with a diagnosis of TBMI from January 1, 2006 to June 30, 2013. Only patients who had a 64MDCT scan at presentation and subsequently underwent laparotomy/laparoscopy were included in the study cohort. Using the surgical findings as the gold standard, the accuracy of prospective radiology reports was analyzed.
RESULTS

Of the 4781 trauma patients who presented to our institution, 44 (0.9%) had surgically proven TBMI. 22/44 were excluded as they did not have MDCT before surgery. The study cohort consisted of 14 males and 8 females with a median age of 41.5 years and a median Injury Severity Score of 27. 17/22 had blunt trauma and 5/22 had penetrating injury. A correct preoperative imaging diagnosis of TBMI was made in 14/22 of patients. The overall sensitivity of the radiology reports was 63.6% (95% CI: 41-82%), specificity was 79.6% (95% CI: 67-89%), PPV was 53.9% (95% CI: 33-73%) and NPV was 85.5% (95% CI: 73-94%). The accuracy was 90.5%. However, only 59% (10/17) of patients with blunt injury had a correct preoperative diagnosis. Review of the findings demonstrated that majority of patients with missed blunt TBMI (5/7) demonstrated only indirect signs of injury.

CONCLUSION

The detection of TBMI in trauma patients on 64MDCT can be improved, especially in patients presenting with blunt injury. Missed cases in this population occurred because the possibility of TBMI was not considered despite the presence of indirect imaging signs.

CLINICAL RELEVANCE/APPLICATION

The prospective diagnosis of TBMI remains challenging despite advances in CT technology and widespread use of 64MDCT.

VSER51-03

Trauma Imaging: An Institutional Triaging Algorithm and Its Impact on MDCT Use over an 8 Year Period

Arthur Baghdanian MD (Presenter): Nothing to Disclose, Christina Alexandra Lebedis MD: Nothing to Disclose, Armonde Baghdanian MD: Nothing to Disclose, Anthony Samuel Armetta MD: Nothing to Disclose, Stephan W. Anderson MD: Nothing to Disclose, Jorge A. Soto MD: Nothing to Disclose, Milo Krastev: Nothing to Disclose, Peter A. Burke MD: Nothing to Disclose, Tracey Dechert MD: Nothing to Disclose

PURPOSE

To evaluate how the implementation of an institutional triaging algorithm impacted the utilization of MDCT imaging of the abdomen and pelvis at a level one trauma center.

METHOD AND MATERIALS

This retrospective HIPAA compliant study was IRB approved. Informed consent was waived. All adult patients admitted for abdominal trauma from 1/1/06-12/31/13 were included in this study. The total number of abdomino-pelvic CT scans acquired, mean injury severity score (ISS) and percentage of trauma scans with positive findings per year were recorded. We then determined the impact that a triaging clinical algorithm, introduced in January 2009, had on these parameters. Patients were divided into two groups: before the implementation of this triaging algorithm (2006-2009) and after (2010-2013). The unpaired t-test and Fisher’s exact test were used to compare the two groups for significant differences in the ISS and percentage of positive CT scans, respectively.

RESULTS

The number of annual trauma admissions and the percentage of these patients who received abdomino-pelvic CT scans were: 2006 (2122/71%), 2007 (2234/74%), 2008 (2231/71%), 2009 (2033/60%), 2010 (2167/44%), 2011 (1929/43%), 2012 (1923/36%), and 2013 (1729/39%). The mean ISS and percentage of positive scans for the same time period were: 2006 (9/18%), 2007 (9/19%), 2008 (8/19%), 2009 (9/17%), 2010 (10/20%), 2011 (10/24%), 2012 (11/22%) and 2013 (9/20%). Patients admitted after the implementation of the clinical trauma algorithms had a significantly higher mean ISS and a significantly higher percentage of positive CT scans (p<0.0001; p<0.0002, respectively).

CONCLUSION

The implementation of a clinical algorithm at our level one trauma center resulted in decreased utilization of trauma CT scanning. Our analysis suggests that this clinical algorithm can be used successfully to select patients who require CT imaging in the trauma setting.

CLINICAL RELEVANCE/APPLICATION

In the trauma setting, institutional algorithms can be implemented to prevent unnecessary imaging of patients in a nationwide effort to reduce radiation exposure and hospital costs.

VSER51-04

A Risk-Benefit Analysis of Adding an Arterial-Phase CT Abdomen When Evaluating for Splenic Trauma

Joel P. Thompson MD (Presenter): Nothing to Disclose, Steven Lee MD: Nothing to Disclose, Akshya Gupta MD: Nothing to Disclose, Susan K. Hobbs MD, PhD: Nothing to Disclose, John Gilbert Strang MD: Nothing to Disclose, Thomas H. Foster PhD: Nothing to Disclose

PURPOSE
To quantify the risks and benefits of changing CT protocol in the ED/trauma setting to include an arterial phase CT of the abdomen.

**METHOD AND MATERIALS**

Several recent studies have demonstrated increased sensitivity for identifying contained splenic vascular injury (i.e. pseudoaneurysm and arteriovenous fistula formation) in trauma patients by the addition of arterial-phase CT abdominal imaging. However, the overall risk-benefit ratio is not known. Using published data, we quantified the number of previously undiagnosed cases of contained splenic vascular injury in trauma patients age 15 and older, as well as the number of patients for whom management would change and the number of new cancer cases induced by the increased radiation dose. During sensitivity analysis, supplemental data from a level 1 trauma center was used to help identify patient subgroups with a more favorable risk-benefit ratio.

**RESULTS**

The number needed to scan to identify one new case of contained vascular injury was 182, to change management in one patient was 255, and to induce one new cancer was 3,584. Increased dose length product (DLP) resulted in higher cancer induction risk, but this risk was relatively small and did not result in more cancer cases caused than new vascular injury cases detected over a range of normal DLP values. Analysis using the age distribution of trauma patients at our institution and an age-dependent cancer induction rate did not significantly change results. Pending results include additional analysis utilizing data from a level 1 trauma center, including stratification by gender, mechanism of injury (blunt versus penetrating) and severity of injury (level 1 trauma, level 2 trauma, or overall population).

**CONCLUSION**

The addition of an arterial phase CT abdomen to a trauma protocol for the assessment of contained splenic vascular injury has a favorable risk-benefit ratio across a range of typical DLP values.

**CLINICAL RELEVANCE/APPLICATION**

The addition of an arterial phase CT abdomen to a trauma protocol for the assessment of contained splenic vascular injury has a favorable risk-benefit ratio across a range of typical DLP values.

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**Blunt Aortic Injury: Still an Enigma**

Kathirkamanathan Shanmuganathan MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Demonstrate the spectrum of traumatic aortic injury: typical, atypical and minimal injury.
2) Discuss the role of imaging and treatment of traumatic aortic injury.

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**Utility of the CT Severity Index for Determining the Outcome of Embolization as Primary Therapy for Severe Blunt Splenic Trauma with Splenic Injury**

Armonde Baghdanian MD (Presenter): Nothing to Disclose, Brian Michael Currie BS: Nothing to Disclose, Arthur Baghdanian MD: Nothing to Disclose, Christina Alexandra Lebedis MD: Nothing to Disclose, Stephan W. Anderson MD: Nothing to Disclose, Jorge A. Soto MD: Nothing to Disclose, Anthony Samuel Armetta MD: Nothing to Disclose

**PURPOSE**

To determine if the CT Severity Index predicts the need for subsequent splenectomy in patients who undergo splenic artery embolization as the primary therapy of severe blunt splenic injuries.

**METHOD AND MATERIALS**

This retrospective study was HIPAA compliant and IRB approved with waiver of informed consent. Twenty-five adult patients with blunt splenic trauma evaluated with abdominal CT between 1/1/2006 and 1/31/2013 who subsequently underwent and survived splenic artery embolization were included. The study population included 19 male and 6 female patients. Two radiologists retrospectively and independently reviewed the CT images and classified splenic injuries using the CT Severity Index: intraperitoneal active extravasation (grade 4b), intrasplenic vascular injury (grade 4a) and no vascular injury (grades 2 or 3). Another investigator reviewed the electronic medical records and documented whether or not each patient required splenectomy for definitive therapy. Two-tailed Fisher's exact test was used to evaluate the association between the admission CT severity index and the success rate of splenic embolization as primary therapy (defined by stable patient discharge without the need for surgical splenectomy).

**RESULTS**

CT severity Indices: grade 4b (n=13), grade 4a (n=9), grade 3 (n=2) and grade 2 (n=1). Of the 25 patients, 21 recovered with no additional intervention and were determined to have a successful outcome: Ten with grade 4b, eight with grade 4a and three with grades 2 or 3. Four patients required splenectomy and the embolization procedure was deemed a failure: three with grade 4b and one with grade 4a. Thus, 10/13 (77%) patients with grade 4b and 11/12 (92%) patients with grade 2 to 4a injuries had successful embolization procedures as primary therapy. This difference was not statistically significant (p > .05).

**CONCLUSION**

The majority of patients with blunt splenic injury can be treated with arterial embolization and will not require a splenectomy. This includes patients with intraperitoneal active extravasation (CT severity index grade 4b).
CLINICAL RELEVANCE/APPLICATION

Embolization can be used to successfully treat all types of vascular injuries in the spleen caused by blunt trauma, including free extravasation of contrast-enhanced blood into the peritoneal cavity.

VSER51-08

MDCT of Blunt and Penetrating Diaphragmatic Injuries
Felipe Munera MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To discuss the role of MDCT in patients with blunt and penetrating diaphragmatic injuries. 2) Review the MDCT findings of diaphragmatic injuries. 3) Describe potential pitfalls.

ABSTRACT

Diaphragmatic Injuries remain a challenging diagnosis with potential catastrophic delayed complications. A high degree of suspicion in every case of severe blunt thoracoabdominal trauma or penetrating thoracoabdominal injury is essential. This presentation will provide a practical tutorial for radiologists hoping to improve their interpretive accuracy for both blunt and penetrating DIs. The CT signs of diaphragmatic injuries will be explained. A number of instructive cases will be presented, including frequent diagnostic pitfalls.

VSER51-09

Analysis of Diaphragmatic Motion Artifacts in Ultra High-Pitch Dual Source Computed Tomography of the Thorax in Trauma Patients
Teresa I-Han Liang MD (Presenter): Nothing to Disclose, Patrick McLaughlin FFR(RCSI) : Nothing to Disclose, Chesnal Dey Arepalli MD : Nothing to Disclose, Luck Jan-Luck Louis MD : Nothing to Disclose, Ana-Maria Bilawich MD : Nothing to Disclose, John R. Mayo MD : Speaker, Siemens AG, Savvas Nicolaou MD : Nothing to Disclose

PURPOSE

Diaphragmatic injuries have a marked impact on the management and prognosis of trauma patients. Motion artifacts may obscure diaphragm injuries during CT of trauma patients with low Glasgow Coma Scale (GCS) scores or those who are intubated and ventilated. CT acquisition times are dramatically reduced by using dual source ultra-high pitch (DS-UHP) as compared with conventional single source (SS) protocols. The purpose of this study was to evaluate diaphragmatic motion on simultaneously acquired DS-UHP and SS CT scans in trauma patients.

METHOD AND MATERIALS

Seventy-five consecutive trauma patients who presented to a level one trauma centre over a 6 month period scanned with a standardized trauma protocol including both DS-UHP chest (pitch = 1.7-3.2) and SS abdominal CT scans (pitch =0.6) were reviewed retrospectively. Subjective analysis of diaphragmatic motion was performed in consensus by two readers using a 4 point likert scale in 7 regions of the diaphragm on coronal 3mm and axial 1mm-3mm slices. An overall confidence score to exclude a diaphragmatic tear based on all coronal and axial images available was also determined (1 to 10, 10 being completely confident and 1 being impossible to exclude). Wilcoxon Rank Sum tests were used for statistical analysis and p < 0.05 was considered significant.

RESULTS

The mean overall confidence score for the DS-UHP was 9.85, which was significantly better than the mean score of 7.66 for SS images (p < 0.0001). The scores for diaphragmatic motion on coronal and axial images were significantly better for DS-UHP images in all areas when compared individually (p < 0.0001). Additionally, utilizing the overall coronal image scores, the subjective diaphragmatic motion was significantly less in the DS-UHP images than the SS images (p < 0.0001).

CONCLUSION

Ultra high-pitch is advantageous as it allows for better evaluation of diaphragmatic structures by minimizing motion artifacts on images of freely breathing trauma patients.

CLINICAL RELEVANCE/APPLICATION

An ultra high-pitch dual source mode is valuable in trauma patients who are unable to breath-hold as it allows minimization of motion artifacts of the diaphragm as compared with conventional single source reconstructions.

VSER51-10

Are We Missing Traumatic Diaphragmatic Rupture?
Vincent Andrew Leung MD (Presenter): Nothing to Disclose, Susan Reid MD, FRCPC : Nothing to Disclose, Angela Coates MEd : Nothing to Disclose, Michael Nathan Patlas MD, FRCPC : Nothing to Disclose

PURPOSE

Traumatic diaphragmatic rupture (DR) is an uncommon injury that can be lethal if not detected and treated in a timely manner. The purpose of our study was to evaluate the diagnostic accuracy of 64MDCT for the detection of DR in patients at our level 1 trauma centre.
METHOD AND MATERIALS

We used our hospital’s trauma registry to identify patients with a diagnosis of DR from January 1, 2008 to December 31, 2012. Only patients who had a 64MDCT scan at presentation and subsequently underwent laparotomy/laparoscopy were included in the study cohort. Using the surgical findings as the gold standard, the accuracy of prospective radiology reports was analyzed.

RESULTS

Of the 3225 trauma patients presented to our institution, 38 (1.2%) had a DR. Fourteen of the 38 were excluded as they did not have MDCT pre-surgery. The cohort consisted of 20 males and 4 females with a median age of 34.5 years and a median Injury Severity Score of 26. Fifteen had a blunt trauma while 9 had a penetrating injury (PI). The overall accuracy of the radiology reports was 66.7% (95% CI: 44.7-84.3%), specificity was 100% (95% CI: 94-100%), PPV was 100% (95% CI: 79.2-100%) and NPV was 88.4 (95% CI: 78.4-94.8%). The accuracy was 91%. However, only 3/9 with PI (33%) had a correct preoperative diagnosis. Most of the missed cases (4/6) had only indirect signs of injury.

CONCLUSION

The detection of DR in trauma patients on 64MDCT can be improved, especially in patients presenting with PI. Most missed cases occurred because the possibility of DR was not raised despite the presence of indirect evidence.

CLINICAL RELEVANCE/APPLICATION

The prospective diagnosis of DR remains challenging despite advances in CT technology and widespread use of 64MDCT.

VSER51-11  CTA of Blunt and Penetrating Peripheral Vascular Injuries

Scott David Steenburg MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the optimal CTA imaging protocol for the evaluation of suspected peripheral vascular injuries. 2) Identify the various imaging manifestations of peripheral vascular injuries. 3) Recognize CTA limitations and pitfalls in the diagnosis of peripheral vascular injuries. 4) Recognize when further evaluation with catheter angiography or surgical exploration are required.

Active Handout


VSER51-12  Predicting Mortality from Hypovolemic Shock Complex in the Polytrauma Setting

David Tso MD (Presenter): Nothing to Disclose, Jennifer Wang BS: Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose

PURPOSE

This study examined how the constellation of radiological findings seen in hypovolemic shock complex on a Multi-Detector Computed Tomography (MDCT) scan correlate with survival of polytrauma patients.

METHOD AND MATERIALS

A retrospective study design was undertaken examining patients involved in severe blunt trauma with an Injury Severity Score (ISS) >= 16 who were admitted to the emergency department (ED) at a Level I Trauma Center between July 2011 and June 2013. Patients underwent a standardized multi-phasic whole body MDCT protocol obtained from a single CT scanner located within the ED. Radiological findings of hypovolemic shock were identified from the scan including vascular and non-vascular findings. Radiological variables were correlated with clinical and 30-day mortality data.

RESULTS

50 patients were identified, of which 17 died and 33 survived their injuries. The mortality cohort had lower Glasgow Coma Score (GCS) (6.0 vs. 11.9, p

CONCLUSION

Small caliber of the great vessels and decrease perfusion of the spleen and renal medulla were seen in the mortality group. Contrast enhancement of the left ventricular chamber was greater in the mortality cohort which may be a novel indicator of low cardiac output or increase in systemic vascular resistance in the context of hypovolemic shock.

CLINICAL RELEVANCE/APPLICATION

Quantitative analysis of left ventricular chamber enhancement, diameter of the great vessels, and spleen and renal medulla enhancement on multi-phasic whole body MDCT scans may identify polytrauma patients at risk of death.
**VSER51-13**

The Effect of Soft Tissue Damage Volume on Systemic Inflammation and Organ Failure in Multiple Injury Patients

Scott David Steenburg MD (Presenter): Nothing to Disclose, Travis Frantz: Nothing to Disclose, Todd McKinley MD: Nothing to Disclose, Greg Gaski MD: Nothing to Disclose

**PURPOSE**

The Systemic Inflammatory Response Syndrome (SIRS) can lead to organ failure and death in multiply injured patients (MIPs). SIRS results primarily from an immune response to endogenous molecules thought to be liberated from damaged tissue. However, it is not known how the magnitude of tissue injury affects systemic inflammation and organ dysfunction. It is plausible that certain tissues are more prone to release of inflammatory mediators leading to SIRS, and that the magnitude of soft tissue injury may correspond with the degree of systemic inflammation and subsequent organ dysfunction. The purpose of this study was to determine how the total volume of soft tissue damage, as quantified on admission whole body CT scan, correlated with the magnitude of inflammation and organ dysfunction in MIPs.

**METHOD AND MATERIALS**

Clinical data from 51 MIPs (ISS ≥ 18, age 18-65), admitted to the ICU for a minimum of 6 days, were used to calculate daily SIRS scores (0 to 4) and daily Sequential Organ Functional Assessment scores (SOFA; 0 - 24). The Soft Tissue Damage Volume Score (STDVS) was calculated by combining the volumetric measurements of all soft tissue injuries (extravascular blood products) in each patient as measured on admission whole body CT scans. Regression analyses evaluated correlations between STDVS and both SIRS and SOFA scores.

**RESULTS**

The results demonstrate two distinct patient populations; those at High Risk and those at Low Risk for subsequent inflammation and organ dysfunction. The average SIRS score vs STDVS slope was 10.5x higher in high risk patients (Fig 1, p<0.01) and average SOFA scores vs STDVS slope was 6.14X higher in high risk patients (, p<0.01). There is a linear relationship between the STDVS and the SIRS and SOFA scores for these two patient populations.

**CONCLUSION**

The magnitude of systemic inflammation and organ dysfunction is a function of STDVS. These results demonstrate a dichotomous response of how MIPs tolerate soft tissue damage, suggesting that some patients are at higher risk of systemic inflammation than others.

**CLINICAL RELEVANCE/APPLICATION**

STDVS as calculated on admission CT may serve as a potential clinical tool for predicting systemic inflammation and organ dysfunction during the recovery process. Further investigations are required to elucidate the underlying pathophysiologic pathways for how soft tissue damage causes inflammation and organ dysfunction in MIPs.

**VSER51-14**

Streamlining Emergent Hand and Wrist Radiography

Henry Chou MD (Presenter): Nothing to Disclose, Scott David Steenburg MD: Nothing to Disclose, Jeffrey William Dunkle MD: Nothing to Disclose, Sean D. Gussick MD: Nothing to Disclose, Matthew James Petersen MD: Nothing to Disclose, Marc D. Kohli MD: Research Grant, Koninklijke Philips NV Research Grant, Siemens AG, Changyu Shen PhD: Nothing to Disclose, Hongbo Lin MS: Nothing to Disclose

**PURPOSE**

Physicians often order both a three-view study of the hand and four-view study of the ipsilateral wrist following hand and/or wrist injury. Because hand radiographs include visualization of the carpus, we set out to determine whether a modified study using fewer wrist radiographs performs comparably to the traditional hand and wrist series in the evaluation of acute hand and wrist abnormalities.

**METHOD AND MATERIALS**

This retrospective study was approved by the institutional review board, and the need to obtain informed consent was waived. Two hundred forty patients (50% male; age range 18-92y) with unilateral three-view hand (posteroanterior, oblique, and lateral) and four-view wrist (posteroanterior, oblique, lateral, and ulnar deviation) radiographs obtained concurrently in the emergency setting were included in this study. Four experienced emergency radiologists, blinded to the original report and clinical records, interpreted the original seven images. The patients’ radiographs were then recombined to include only the three hand images and a single ulnar deviated wrist view. These were interpreted by the same radiologists following an eight week delay and in random sequence to reduce memory bias. Two radiologists independently evaluated each patient’s studies. Data analysis was performed using kappa statistics to measure agreement between the seven- and four-view image interpretations.

**RESULTS**

A total of 479 reports were generated in each of the seven- and four-view image sets, with 142 (29.6%) of the seven-view and 125 (26.1%) of the four-view reports conveying certain or suspected acute osseous findings. Statistical analysis yielded an average inter-method kappa coefficient of 0.818 for the four radiologists, which represents strong agreement between the seven- and four-view interpretations.
CONCLUSION

The modified four-view hand and wrist radiographic series produces diagnostic results comparable to the traditional hand and wrist series in the acute clinical setting.

CLINICAL RELEVANCE/APPLICATION

A modified four-view hand and wrist radiographic study is effective for assessing acute hand and wrist injury while reducing cost, time, and radiation dose.

ERS-THA

Emergency Radiology Thursday Poster Discussions

Scientific Posters

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Participants

Moderator
Clint W. Sliker MD : Nothing to Disclose

Sub-Events

ERS233

Revised Criteria for Ultrasound Diagnosis of Appendicitis: Importance of Hyperechoic Fat in Adult and Pediatric Patients with Appendices Measuring 6-8 mm in Diameter (Station #1)

Stephanie T. Chang MD (Presenter): Nothing to Disclose, R. Brooke Jeffrey MD : Research Consultant, InnerVision Ultrasound, Jarrett Rosenberg PhD : Nothing to Disclose, Eric West Olcott MD : Nothing to Disclose

PURPOSE

To determine whether the ultrasound (US) presence of hyperechoic fat, hyperemia or an abnormal submucosal layer (SML) may be additionally predictive with appendiceal diameter in diagnosing acute appendicitis among pediatric and adult patients.

METHOD AND MATERIALS

A total of 381 patients (292 pediatric patients and 89 adults defined as greater than 18 years in age) between the ages of 2-40 years undergoing US evaluation for appendicitis between December 2011-January 2013 with visualized appendices were included. US cases were retrospectively reviewed by two independent readers for the presence of hyperechoic fat (absent, unilateral, or circumferential), loss of the SML, or increased Doppler flow. Acute appendicitis was ascertained by surgery or clinical follow-up.

RESULTS

In a multivariate model including sex, age, maximum anterior-posterior diameter, fat, SML loss, and Doppler flow, only appendiceal diameter (OR 2.7, p<0.001), unilateral fat (OR 4.1, p=0.039), and circumferential fat (OR 7.7, p<0.001) demonstrated significant independent predictive value for diagnosing acute appendicitis in a population of adult and pediatric patients. Specifically, for borderline appendices measuring between 6-8 mm in diameter, the presence of circumferential fat significantly increased the likelihood of appendicitis (OR 9.0, p=0.006).

CONCLUSION

The US presence of hyperechoic fat, particularly circumferential fat, is the most important secondary finding to appendiceal diameter for diagnosing appendicitis among both pediatric and adult patients.

CLINICAL RELEVANCE/APPLICATION

The presence or absence of hyperechoic fat on US evaluation for appendicitis is the most important finding for improving sensitivity and specificity in appendices between 6-8 mm in diameter.

ERS234

Imaging of Postcoital Pelvic Pain and/or Vaginal Bleeding (Station #2)


PURPOSE

The aim of the study was to study the evaluate features of female patient’s presenting with postcoital acute or
subacute pelvic pain and/or bleeding

METHOD AND MATERIALS

248 patients (17-74 years; Avg 35.2 years) with history of pelvic pain and/or bleeding after coitus were included in this study. There were 246 ultrasound, eight CT and one MR studies were performed in the 247 patients. There were 80 patients with vaginal bleeding (40 with pelvic pain and 40 without pelvic pain). Rest of the patient’s (n = 167) presented with pelvic pain without bleeding. 32 patient had history of intrauterine device insertion in the past.

RESULTS

Out of the 168 patients who were imaged for postcoital pain, 80 (47.6%) patients had a positive imaging study. In this group 24 had uterine fibroids, and 32 had an ovarian cyst measuring at least 2.5 cm in diameter. The other findings in the patients included 1 hydronephrosis, 1 hematometra, 1 malpositioned IUD, 7 adenomyosis (one with fibroid), 4 hemoperitoneum, 1 pelvic inflammation, 3 polycystic ovarian disease, 2 polyps, and 4 suspected adenomyosis. In the 40 patients with pain and vaginal bleeding 40% of the patients had a positive imaging finding, while in patients with vaginal bleeding only 47.5% (19/40) patients had a positive imaging finding. Amongst the 247 patients, there were 4 patients with significant hemoperitoneum, 1 patient with vaginal perforation and 2 patients with ovarian neoplasm.

CONCLUSION

Pelvic imaging for postcoital pain and/or bleeding has a high rate of positive results which justify its use in patient management. Although the most common findings of postcoital pain and/or vaginal bleeding are uterine fibroids and functional ovarian cysts, the most clinically significant result which can potentially require emergent intervention is intraperitoneal bleeding and vaginal vault perforation.

CLINICAL RELEVANCE/APPLICATION

The study justifies the use of pelvic imaging for postcoital pain and/or bleeding based on high positivity rate. The study concludes that the most common findings of postcoital pain and/or vaginal bleeding are uterine fibroids and functional ovarian cysts, which do not require emergency surgery. It enumerates the serious causes which need urgent management.

ERS235

Performance of Automated 3D-rendering of Ribs in Polytrauma Patients: Clinical Experience in 110 Patients (Station #3)

Suonita Khung : Nothing to Disclose, Pauline Masset : Nothing to Disclose, Jean-Baptiste Faivre MD : Nothing to Disclose, Nunzia Tacelli MD : Nothing to Disclose, Jacques Remy MD : Research Consultant, Siemens AG, Martine J. Remy-Jardin MD, PhD (Presenter): Research Grant, Siemens AG

PURPOSE

To evaluate the diagnostic performance of virtually-rendered unfolded views of the ribs.

METHOD AND MATERIALS

110 consecutive adult patients referred for polytrauma underwent a chest CT examination, retrospectively reviewed for specific detection of rib fractures according to two independent approaches: (a) analysis of transverse CT sections, completed with multiplanar reformats whenever deemed necessary by the reader (Group 1); (b) analysis of unfolded ribs as proposed by the software “CT Bone Reading” that generated a virtually-rendered unfolded view of the ribs and spine, with the possibility of rib analysis along their long axis and creation of standard orthogonal views in different orientations of any area suspected of fracture (Group 2). The gold standard for the diagnosis of rib fractures was established by the combined analysis of Group 1 and Group 2 images. Image analysis was obtained as follows: (a) separate reading of Group 1 and Group 2 images by two independent readers (a junior reader and a senior reader); (b) consensus analysis of Group 1 and Group 2 images by the two readers to establish the final diagnosis of rib fractures.

RESULTS

From the gold standard analysis, 44 patients had rib fractures (mean number of fractures per patient: 2.85) with a total of 266 ribs fractured and a total of 314 fractures (222 undisplaced; 92 displaced). The “CT bone reading” provided a complete reconstruction of the whole ribcage in 94 patients (85.5%) and partially incomplete reconstructions (1-5 ribs inadequately reconstructed) in 16 patients (14.5%). The software performance was established as follows: (a) diagnosis of rib fracture (sensitivity: 0.84; specificity: 1); (b) number of ribs fractured (sensitivity: 0.77; specificity: 0.99); (c) number of displaced fractures (sensitivity: 0.92; specificity: 1). Group 2 analysis allowed detection of 38.6% of rib fractures missed in Group 1 and significantly reduced the junior reader's reading time (p<0.0001).

CONCLUSION

This software has the potential to help detect rib fractures in polytrauma patients.

CLINICAL RELEVANCE/APPLICATION

The detection of rib fractures in a polytrauma patient, often difficult and time consuming, can be helped by the evaluated system.
**ERS236**

**Does Distance Matter? Effect of Having a Dedicated CT Scanner in the Emergency Department on Completion of CT Imaging and Final Patient Disposition Times (Station #4)**

Wilfred Dang BS (Presenter): Nothing to Disclose, Ania Zofia Kielar MD: Nothing to Disclose, Angel Yi Nam Fu BSC: Nothing to Disclose, Suzanne T. Chong MD: Nothing to Disclose, Matthew Donald Fernandes McInnes MD, FRCPC: Nothing to Disclose

**PURPOSE**

To evaluate whether the presence of a CT scanner in the emergency department (ED) improves ED workflow by decreasing the time between imaging requisition and completion, as well as potentially impacting patient outcomes by shortening time to final disposition.

**METHOD AND MATERIALS**

IRB approval was obtained for this retrospective study conducted on 2,142 consecutive, acute thoracic, abdominal and pelvic imaging requests from two affiliated academic EDs from August 1 to October 31, 2012. At one institution, the CT scanner is in the ED; in the other it is located in the radiology department 300m away from the ED. Patients were stratified based on acuity of CT indication, interpreting radiologist training level, and the time of day of scanning. Three time points were compared between hospitals: 1) The time the CT requisition was received to the time the CT scan was initiated (ΔTime 1), 2) the time from CT scan initiation to the time the CT was reported preliminarily by a resident/fellow, or verbally reported by staff to the ED (ΔTime 2), and 3) the time the CT requisition was received to the time of final patient disposition (ΔTime 3).

**RESULTS**

Decreases in time, favouring the institution with the ED CT scanner, are 16 (P<0.0001), 15 (P<0.0001), and 19 minutes (P=0.04). Significant differences were also seen in morning and overnight shifts (P<0.0001, P<0.0001, P=0.002, and P<0.0001, P<0.04, P=0.001) and for CT reporting times in higher radiology levels of training (P=0.04 and 0.0001 for Staff and PGY 5, respectively). No significant differences were seen for hyperacute patients.

**CONCLUSION**

The presence of an ED CT scanner is associated with decreases time to CT scan completion, radiological interpretation and patient disposition.

**CLINICAL RELEVANCE/APPLICATION**

A CT scanner in the Emergency department reduces: time from request to scan initiation, time from CT request reception to interpretation, and time of patient disposition for acute-care patients.

**ERE201**

**Spectrum of CT Appearance of Traumatic Venous Injuries (Station #5)**

Suresh Cheekatla MBBS (Presenter): Nothing to Disclose, Nagaramesh Chinapuvvula MBBS: Nothing to Disclose, Susanna Claire Spence MD: Nothing to Disclose

**TEACHING POINTS**

1. To know the spectrum of traumatic venous injuries. 2. To know how to recognize these injuries on CT.

**TABLE OF CONTENTS/OUTLINE**

1. CT signs that are definitive for venous injury: a) Intraluminal filling defect or thrombus seen on venous and delayed phases. b) Venous pseudoaneurysm seen on venous and delayed phases. c) Venovenous fistula seen on venous and delayed phases. d) Arteriovenous fistula seen on arterial phase. e) Active contrast extravasation seen on venous and/or delayed phases. 2. CT signs that are suggestive but not definitive for venous injury: a) Hematoma, stranding, or fluid around the vein. b) Contour irregularity. c) Luminal narrowing.
We evaluated the records of 190 adult ER trauma patients who received a spinal MRI examination within 2 weeks of a spinal CT from 2010-2013. We reviewed the radiographic reports and findings for this cohort of patient on CT and MRI, the extent of cross-modality agreement, the post-imaging management, and length of hospital stay (LOS). The patients were analyzed regarding the concordance of CT and subsequent MRI findings; when the MRI results were discordant we investigated whether or not these findings altered subsequent care.

RESULTS

Of the 190 patients included within the study, 102 (54%) underwent a CT examination with any positive finding. 76 of these patients received a concordant MRI examination; 26 patients had a discordant MRI examination demonstrating either an acute compression fracture or a non-compression fracture/ligamentous injury. 88 patients (46%) initially received a negative CT examination. 77 of those patients had a concordant MRI examination; 11 patients underwent a discordant MRI examination. These 11 examinations showed either chronic disc disease or spinal stenosis; none demonstrated an acute traumatic injury or changed patient management. 5 patients (2%) required surgical intervention and all had diagnostic findings by CT scan. The LOS for patients with discordant MRI examinations ranged from 0 to 38 days with a mean and median of 5 and 2 days respectively.

CONCLUSION

MRI examination of the spine in the setting of trauma has a role in clarifying the acuity and extent of CT findings but is not necessary in cases where the initial CT exam is negative for traumatic injury. Further, the CT findings alone were diagnostic in those few patients requiring surgical intervention (2% of our study group).

CLINICAL RELEVANCE/APPLICATION

For trauma patients, the routine acquisition of an MRI after a normal spine CT is unnecessary. MRI can clarify positive findings on CT but may not alter subsequent patient management in regards to surgical intervention.

ERS238

'A touch of colour': DE Bone Marrow v Virtual Non-Calcium Application for the Assessment of Bone Marrow Oedema in Acute Hand Fractures (Station #2)

Brathaban Rajayogeswaran MBCh (Presenter): Nothing to Disclose, Neal C. Chhaya MBBS, FRCR: Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclsoe, Savvas Nicolaou MD: Nothing to Disclose, Hugue A. Ouellette MD: Nothing to Disclose

PURPOSE

The phalanges and metacarpals are the most common fractures of the skeletal system accounting for 10% of all bony injuries. Despite the use of computed tomography, fractures can sometimes be hard to identify particularly in the presence of osteopenia. Evaluation of bone marrow oedema following hand trauma can increase confidence in fracture identification as it is felt to reflect oedema/haemorrhage. The purpose of this study was to assess bone marrow oedema associated with proven hand fractures on Dual-energy CT using the new colour Siemens DE Bone marrow application against the current virtual non calcium marrow oedema application.

METHOD AND MATERIALS

40 consecutive patients underwent dual-energy wrist computed tomography (DECT) studies in the emergency department in 2013. Retrospective evaluation for bone marrow oedema was performed on the Siemens virtual non calcium (VNC) and new DE bone marrow (DE BM) applications by two experienced MSK radiologists. Their confidence on identifying oedema at the known fracture site was documented.

RESULTS

57 fractures were identified with the majority of fractures present within the carpus: 12 scaphoid, 15 triquetral, 2 capitate, 2 hamate, 2 trapezium. There were 6 distal radial and 2 ulnar styloid fractures, with the remaining fractures identified at the base of the metacarpals. Reader 1 using VNC had a Sensitivity 79% (CI 0.66 - 0.89, PPV 97% CI 0.85 - 0.99), Reader 2 VNC - Sensitivity 62% (CI 0.48 - 0.75, PPV 97% CI 0.85 - 0.99). Reader 1 using the DE BM Sensitivity 58% (CI 0.44 - 0.71, PPV 97% CI 0.85 - 0.99), Reader 2 DE BM - Sensitivity 62% (CI 0.48 - 0.75, PPV 97% CI 0.85 - 0.99). The kappa inter-rater reliability between the readers using VNC - 0.277 p=0.021 and DE BM 0.496 p

CONCLUSION

The present of bone marrow oedema can increase the confidence of identifying hand fractures in the acute trauma setting. The DE Bone Marrow application with colour overlay is a valuable imaging tool when MRI is not available.

CLINICAL RELEVANCE/APPLICATION

The presence of bone marrow oedema identified on Dual energy CT can increase the confidence in identifying acute hand fractures in the Emergency Department.

ERS239

The Ribs Unfolded—A CT Visualization Algorithm for Fast Detection of Rib Fractures: Effect on Sensitivity and Specificity in Trauma Patients (Station #3)


PURPOSE

To assess the radiologist’s detection rate of rib fractures in trauma CT when reading curved planar reformats (CPR) of the ribs compared to reading standard MPRs.
METHOD AND MATERIALS

Written, informed consent was waived for this institutional review board-approved study. There were 220 consecutive trauma CTs (146 male and 74 female patients; mean age ± standard deviation, 42.6 years±21.4; range, 0-94 years) retrospectively subjected to a software algorithm (Syngo.Via CT Bone Reading, Siemens AG) for automatic generation of CPRs of the ribs. Patients were split into two equal groups. After primary analysis, 16 patients were excluded due to insufficient segmentation, leaving 107 patients in group A and 97 patients in group B. Two radiologists independently evaluated group A using CPRs and group B using standard MPRs. The other two radiologists reviewed both groups with the inverse methods setting. The detection rate results for each reader were compared with a standard of reference that was created by two senior radiologists using all available MPRs and CPRs and the findings of all readers. General estimation equations were used for statistical analysis.

RESULTS

The reference standard identified 361 rib fractures in 61 patients. Reading CPRs showed a significantly higher mean sensitivity (P=<.001) for fracture detection than reading standard MPRs, with 80.9%(584/722) and 71.5%(516/722), respectively. Mean reading time was significantly shorter for CPRs, with 31.3 seconds, compared to standard MPRs, with 60.7 seconds (P<.001).

CONCLUSION

Using CPRs for the detection of rib fractures allows for accelerating the reading process in chest CTs of trauma patients, while offering an increased mean sensitivity compared to reading conventional standard MPRs.

CLINICAL RELEVANCE/APPLICATION

1. Curved planar reformats (CPRs) can help radiologists to significantly decrease the reading time needed for analysis of the ribs in chest CT. This might accelerate the report and leave more time to assess other organs in polytrauma CT. 2. The accurate detection of rib fractures is clinically relevant to allow for sufficient treatment and for a focused search for associated complications.

ERS240

Major Incidental Findings on Trauma CT: Rate and Impact of Patient Age (Station #4)


PURPOSE

The proportion of the US population that is 65 years and older is growing rapidly. In 2012, 25% of injuries in the National Trauma Databank occurred in patients aged 65+ years, and by 2030 20% of the US population will be ≥65 years old. Imaging "incidentalomas" have been shown to be common and important CT findings. The purpose of this study was to evaluate the relationship between patient age and the incidence of major incidental findings on trauma CT scans.

METHOD AND MATERIALS

Retrospective, IRB approved and HIPAA compliant single-center study of all adult (18yrs+) patients who presented to an urban level 1 trauma center and underwent single phase CT of the chest-abdomen-and pelvis from Jan 1, 2013 to Dec 31, 2013 to evaluate for trauma. The definition of a major incidental finding (MIF) requiring communication was reached by consensus of two radiologists and three clinicians. All radiology reports were reviewed for major and minor incidental findings. Statistical analysis included a Mann-Whitney U and Fisher-exact tests to compare the patient ages in the major incidental and non-incidental groups.

RESULTS

In the 533 CT scans reviewed, 148 major incidental findings were identified in 132 patients (25%). The average age of patients without MIFs was 43 (sd=17.8) years, compared to 56 (sd=18.4) years in patients with incidental findings (p<0.0001). There was a steady increase in the major incidental rate each decade, peaking at age 80-90 years (r² = 0.86). 42/95 (44.2%) of patients 65+ years had MIFs compared to 90/438 (20.6%) patients < 65 years (p<0.0001). MIFs were located in the chest: 80(54%), abdomen: 51(34.5%), pelvis: 14 (9.5%), and other: 1(0.7%). Pulmonary nodules were the most common incidental finding, being present in 38/533 (7.1%) of patients (average 57yrs; sd=14.4 yrs), and representing 25% of incidental findings.

CONCLUSION

There is a strong correlation between patient age and the presence of major incidental findings on trauma torso CT.

CLINICAL RELEVANCE/APPLICATION

Due to the progressively rising average population age, our findings of a higher rate of major incidental findings on CT in the elderly suggests the rate of incidental findings is likely to increase in coming years. Systems should to be developed to ensure adequate communication and follow-up of these findings.

ERE184

Spleenic Trauma, Emergencies, and Incidentalomas (Station #5)

Mariya Kobi MD (Presenter): Nothing to Disclose , Niveditha Pinnamaneni MD : Nothing to Disclose , Alexander Benjamin Baxter MD : Nothing to Disclose , Aspan Singh Ohson MD, MS : Nothing to Disclose
Alexander Benjamin Baxter MD: Nothing to Disclose, Aspan Singh Ohson MD, MS: Nothing to Disclose, Mark Philip Bernstein MD: Nothing to Disclose, John Michael McMenamy MD: Nothing to Disclose

**TEACHING POINTS**

1. Recognize traumatic and non-traumatic splenic emergencies, classifications and urgent management. 2. Understand splenic manifestations of serious systemic illnesses. 3. Recognize incidental and developmental splenic lesions that require no further evaluation.

**TABLE OF CONTENTS/OUTLINE**

1. Normal patterns of splenic enhancement
2. Splenic Trauma and Classifications • Blunt • Penetrating • Associated injuries
3. Acute abdomen related splenic disease • Splenic torsion • Splenic infarct • Conditions predisposing to splenic rupture
4. Splenic involvement in systemic disease for example: • Lymphoma • Mononucleosis • Splenic abscess (bacterial and fungal) • Sarcoïd • TB • Sickle cell disease • Hypersplenism and consumptive coagulopathy • Splenomegaly in portal hypertension (splenic and portal vein thrombosis) • Metastatic disease
5. Incidentalomas • Hemangiomas • Lymphangiomas • Cysts

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**MSCA51**

**Case-based Review of the Abdomen (An Interactive Session)**

*Multisession Courses*

*ER OB GU GI*

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 the 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**


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**RC705**

**Non-Traumatic Neuro Emergencies**

*Refresher/Informatics*
LEARNING OBJECTIVES

1) At the end of this lecture the participant should be able to recognize the variable appearance of parenchymal and subarachnoid hemorrhage on CT/CTA and MRI/MRA exams. 2) In addition, the learner should be able to provide a differential diagnosis based on clinical presentation, imaging characteristics and location. 3) The clinical examples will also include cases that allow the learner to become familiar with the complications of non-traumatic intracranial hemorrhage.

ABSTRACT

The presentation begins with an overview of the common causes of non-traumatic intracranial hemorrhage. The pathophysiology of hypertensive hemorrhage is discussed followed by a series of examples demonstrating the classic locations and appearance on CT and MR imaging. The clinical and radiological features of aneurysmal and non-aneurysmal subarachnoid hemorrhage will be reviewed including examples of vasospasm. Morphological and flow features that contribute to aneurysm rupture will be presented. Vascular malformations are discussed using clinical cases that demonstrate the risk factors associated with AVM hemorrhage which include aneurysms on the feeding arteries, intra-nidal aneurysms, supply from perforating arteries, exclusively deep venous drainage and venous outflow obstruction/thrombosis. Advanced accelerated high resolution 4D MRA techniques are introduced that use radial imaging and constrained reconstruction to provide contrast enhanced time resolved whole brain MRA images which facilitate the diagnosis and characterization of intracranial hemorrhage. To complete the review, additional examples of hemorrhage from vasculitis, amyloid angiopathy and neoplastic diseases are presented.

LEARNING OBJECTIVES

1) Recognize various orbital pathologies that acutely compromise vision. 2) Identify various neck infections that may compromise the airway and their extensions. 3) Understand the patterns of extension of odontogenic infections. 4) List the various intracranial complications of acute sinusitis and be able to identify.

ABSTRACT

The category of ENT emergencies encompasses a variety of pathologies, only a few of which can be addressed in the time allotted. This discussion will focus on: 1) Pathology (potentially) affecting vision acutely and including orbital infections, pseudotumor, and carotid cavernous fistulas 2) Infections that may compromise the airway including, peritonsillar, retropharyngeal, epiglottic, and parapharyngeal abscesses, Ludwig angina, Lemierre syndrome, and necrotizing fasciitis. 3) The impotrance of the mylohyoid line in determining whether a tooth infection will spread to the sublingual or submandibular space 4) Common complications of acute sinusitis

LEARNING OBJECTIVES

1) Identify the basic anatomic, pathologic, and physiologic principles to non-traumatic spinal emergencies, and diagnostic and therapeutic procedures. 2) Improve basic knowledge and skills relevant to clinical practice. 3) Analyze imaging and therapeutic techniques and apply this knowledge to protocol development, patient management/safety, and cost. 4) Demonstrate understanding of the influence of socioeconomic issues on current and future practice patterns.

ABSTRACT

Nontraumatic spinal emergencies may result from a variety of causes from congenital/developmental anomalies-abnormalities, degenerative diseases, inflammation, infection, vascular, hematologic and metabolic diseases to neoplasms. Clinical findings and symptoms may be nonspecific. An optimized imaging strategy is necessary for the accurate diagnosis and treatment planning. Congenital/developmental abnormalities are not generally to present emergently. They may be unknown until an unrelated acute event occurs. Degenerative diseases and artropathies may also cause nontraumatic emergencies, spinal cord compression can result from pannus and chronic instability of the rheumatoid arthritits. Ossification of the posterior longitudinal ligament, ossification of ligamentum flavum, synovial cysts, and epidural lipomatosis, acute disc extrusion may result in an acute neurologic deficit. Inflammations as multiple sclerosis, Guillain-Barre, infections are the main causes of
the nontraumatic spinal injuries may have an indolent, latent phase prior to objective emergency findings. Vascular and hematologic disorders are present a susceptible group with respect to nontraumatic spinal emergencies. Development of symptoms of the neoplasms is usually slowly progressive, but acute presentations are not uncommon.

**RC708**

**Interactive Game: Extreme Imaging of the Extremities—Significant, Subtle, and Soft Tissue Injuries**

*Refresher/Informatics*

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AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 4:30 PM - 6:00 PM Location: E350

**LEARNING OBJECTIVES**

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

**Sub-Events**

**RC708A Soft Tissue Injuries of the Ankle: Emphasis on CT and MRI**

Manickam Kumaravel MD, FRCR (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand in depth the normal anatomy of the ankle on CT and MRI. 2) Appreciate subtle and catastrophic soft tissue injury patterns of the ankle. 3) Evaluate post-operative imaging. 4) Effectively utilize CT and MRI in management of patients with ankle injuries.

**ABSTRACT**

Ankle injuries are common presentations in all emergency departments. A wide spectrum of injuries present from subtle to catastrophic in nature. Identification of these injuries makes significant impact on treatment of such injuries. Detail is much better appreciated in cross-sectional imaging such as CT and MRI. Knowledge of injury patterns help in identification of associated injuries. CT and MRI will be used to illustrate a wide gamut of presentation of soft tissue injuries. Emphasis will be placed on clinical significance of these injuries and also on treatment options and postoperative imaging of such injuries. Examples will be inclusive of injuries of the retinaculum, tendon, ligament, subtle bony avulsion injuries and other soft tissues. Other modalities of plain radiography and ultrasound will also be used to explain the injuries. At the end of the course learners will have a comprehensive understanding of ankle soft tissue injuries patterns and their treatment methodology.

**RC708B Knee Injuries: When Radiographs Are Not Enough**

Ken Floris Linnau MD, MS (Presenter): Speaker, Siemens AG Royalties, Cambridge University Press

**LEARNING OBJECTIVES**

1) Identify clinical scenarios requiring advanced knee imaging in the emergency department setting. 2) Select appropriate imaging modality and exam parameters for advanced knee imaging. 3) Summarize radiology findings of selected knee injuries, which warrant advanced imaging in order to aide in efficient clinical decision making and treatment planning.

**ABSTRACT**

The knee is very commonly injured in blunt and penetrating extremity trauma. Knee radiographs are the most common initial imaging study for evaluation of knee injuries. Unfortunately, radiography can be of limited utility for complete assessment of the bones and soft tissues of the knee. As a result advanced imaging (including CT, MRI or sonography) may be required to fully characterize knee injury. Sometimes the immediate full evaluation of the knee is warranted. The purpose of this presentation is to explore clinical settings which may require advanced imaging of knee injuries in addition to radiography while the patient is still in the emergency room.

**RC708C Wrist Injuries**

Claire Kalsch Sandstrom MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the normal anatomy of the wrist on CT and MRI. 2) Appreciate subtle and catastrophic soft tissue injury patterns of the wrist. 3) Effectively utilize CT and MRI in management of patients with wrist injuries.
ABSTRACT

Wrist injuries are common presentations in all emergency departments. A wide spectrum of injuries present from subtle to catastrophic in nature. Identification of these injuries makes significant impact on treatment of such injuries. While most injuries can be identified or inferred from radiographs, diagnoses can be confirmed and refined on cross-sectional imaging such as CT and MRI. Knowledge of injury patterns helps in identification of associated injuries.

CT and MRI will be used to illustrate a wide gamut of presentations of soft tissue and subtle osseous injuries. Emphasis will be placed on clinical significance of these injuries and also on treatment options and postoperative imaging of such injuries. Examples will be inclusive of injuries of tendon, ligament, subtle bony avulsion injuries and other soft tissues.

At the end of the course learners will have a comprehensive understanding of wrist soft tissue injury patterns and their treatment methodology.

Finger and Thumb Injuries

Bharti Khurana MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the relevant anatomy of finger and thumb. 2) Review the most commonly encountered osseous and soft tissue injury patterns seen in traumatic finger injuries.

ABSTRACT

Hand injuries are common presentations in all emergency departments. Knowledge of injury patterns helps in identification of associated subtle and soft tissue injuries. Emphasis will be placed on clinical significance and treatment options.

At the end of the course learners will have a comprehensive understanding of soft tissue and osseous injuries of hand.

Pediatric: Neuro II

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: S102AB

Sub-Events

RC713A Fetal Neuro

Beth M. Kline-Fath MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) The participant will briefly review basic prenatal neurosonology and fetal MR imaging sequence important to identify normal and abnormal cerebral pathology. 2) Common fetal central nervous system abnormalities will be reviewed and compared to the normal fetal developmental landmarks. 3) The learner at the end of the session will be able to utilize the germinal matrix, brain parenchymal signal, sulcation and myelination to verify pathologies in the fetal brain.

RC713B Hypoxic Ischemic Injury/Perinatal Stroke

Ellen Grant MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Learn the imaging patterns of hypoxic ischemic encephalopathy and perinatal stroke. 2) Learn the differential diagnosis for imaging patterns similar to hypoxic ischemic encephalopathy and perinatal stroke. 3) Understand the role of imaging in treatment and prognosis.

RC713C Perinatal Brain Trauma
LEARNING OBJECTIVES

1) To become more familiar with mechanisms of injury related to parturition. 2) To better recognize birth trauma-induced imaging abnormalities of the scalp, skull, and brain in newborns. 3) To have an increased awareness of birth-related traumatic neurosurgical emergencies.

ABSTRACT

The incidence of birth-related neurotrauma has declined with modern advances in prenatal care and improved obstetrical techniques. Nevertheless, head injury still occurs during labor and delivery. The different types of parturitional head injury cover a wide spectrum and range from minor self-limited scalp injuries such as a caput succedaneum to life threatening intracranial posterior fossa hemorrhages requiring prompt neurosurgical intervention. Head injuries including scalp hematomas, skull fractures and types of intracranial hemorrhage will be discussed in this session as well as risk factors that predispose the neonate to birth-related trauma.

RC806

Head and Neck Emergency!

Refresher/Informatics

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Fri, Dec 5 8:30 AM - 10:00 AM  Location: S406B

Sub-Events

RC806A  Adult Non-Traumatic Emergencies
Claudia Francoise-Eve Kirsch MD (Presenter): Consultant, Informa plc

LEARNING OBJECTIVES

1) Review and understand the etiology of adult non-traumatic emergencies in the head and neck. 2) Review and understand the critical radiographic manifestations of adult non-traumatic emergencies, emphasizing the critical radiographic anatomical findings seen with emergent findings in the head and neck arising from either vascular, infectious, neoplastic, degenerative, inflammatory, congenital, allergic, and toxic etiologies (VINDICATE). 3) Review the radiographic features and the critical clinical implications of non-traumatic head and neck emergencies, so the radiologist is vindicated in conveying these findings to the referring clinicians leading to improved diagnostic outcomes and treatment.

ABSTRACT

This RSNA refresher course focuses on the adult non-traumatic emergencies in the head and neck arising from vascular, infectious, neoplastic, degenerative, inflammatory, congenital, allergic and toxic etiologies. This lecture will also focus on understanding the critical radiographic anatomical findings and clinical manifestations, allowing the radiologist to be vindicated when conveying the imaging findings to the referring clinicians.

RC806B  Pediatric Non-Traumatic Emergencies
Bernadette L. Koch MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the most common non-traumatic emergencies in imaging the pediatric head and neck. 2) Describe and understand the orbital and intracranial complications of pediatric sinusitis. 3) Identify the most common complications of middle ear and mastoid inflammatory disease. 4) Recognize the most common complications of deep neck infections in children.

RC806C  Traumatic Head and Neck Emergencies
Amy F Juliano MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the major types of orbital and facial injuries and recognize their imaging appearance. 2) Describe fractures that occur in the temporal bone and important structures that may be compromised, and correlate imaging findings with clinical presentation and symptoms. 3) Analyze laryngeal anatomy in the setting of trauma so as to be able to describe soft tissue and cartilaginous injuries.
The Usual and Unusual Abdominal Emergencies

**Sub-Events**

**RC808A**

**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.

**RC808B**

**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.

**RC808C**

**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**

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).

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.

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 iliowemoropopliteal artery 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) Discuss the various categories of mesenteric ischemia (arterial occlusive, embolic, venous thrombotic, and nonocclusive), and the pathophysiologic basis behind the imaging findings in each case. 2) Understand the basis behind modern CT protocols for mesenteric ischemia, particularly the biphasic examination with CT mesenteric angiography. 3) Demonstrate techniques to rapidly analyze a mesenteric CT angiographic dataset. 4) Review the CT signs of mesenteric ischemia and their sensitivity and specificity. 5) Evaluate the current literature on mesenteric ischemia and discuss optimal diagnostic criteria.

ABSTRACT

Literature on mesenteric ischemia and discuss optimal diagnostic criteria.
Acute mesenteric ischemia (AMI) is a life-threatening condition said to affect up to 1% of patients presenting with an acute abdomen, and it carries a mortality rate ranging between 59-93% in the published literature. Time to diagnosis and surgical treatment are the only factors which have been shown to improve mortality, and evidence shows that the clear test of choice for AMI is now biphasic CT. Water is preferably administered as a negative contrast agent, followed by CT mesenteric angiography and then a portal venous phase exam. Diagnostic accuracy is significantly improved by analysis of the CT angiogram for arterial stenoses or occlusions, evidence of emboli, or angiographic criteria of nonocclusive ischemia. It is the use of CT angiography in addition to routine portal phase imaging which has pushed the sensitivity and specificity of the test to >90% in recent published articles. Other nonangiographic CT findings that are relatively specific for AMI in the appropriate clinical setting include pneumatosis intestinalis, portal or mesenteric venous gas or thrombosis, and decreased bowel wall enhancement. Bowel wall thickening, mesenteric stranding, ascites, and mucosal hyperenhancement are more nonspecific findings which may also be seen. Nonocclusive schema may be the most difficult form to diagnose, and findings of shock abdomen can aid in identification. Knowledge of the patient's clinical history is critical not only for the selection of an appropriate study protocol but also for interpretation of the imaging findings in context.

CTA of Gastrointestinal Bleeding

Jorge A. Soto MD (Presenter): Nothing to Disclose

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 a 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.