Temporal Bone CT at 320-row CT: Effect of Axial Volume Scanning and the Iterative Reconstruction Algorithm on Image Quality and Radiation Exposure

Mika Kitajima MD (Presenter): Nothing to Disclose, Seitaro Oda MD: Nothing to Disclose, Yoshinori Shigematsu MD: Nothing to Disclose, Daisuke Utsunomiya MD: Nothing to Disclose, Toshinori Hirai MD: Nothing to Disclose, Yasuyuki Yamashita MD: Consultant, DAIICHI SANKYO Group

PURPOSE
To compare the image quality and radiation exposure on temporal bone CT acquired on a 320-row CT between axial-volume scan with iterative reconstruction (IR) and helical scan with filtered back projection (FBP).

METHOD AND MATERIALS
We randomized 50 patients into two groups and acquired axial scans with IR in group 1 (n=22) and helical scans with FBP in group 2 (n=28). The CTDI
\(^{\text{vol}}\), effective radiation dose, and imaging time in group 1 and 2 were 29.2 mGy, 0.37 mSv and 1.0 sec, and 48.6 mGy, 0.71 mSv, and 12.0 sec, respectively. Two neuroradiologists consensually recorded the overall image quality and visualization of 34 anatomic structures per ear (e.g., osseous spinal lamina, stapes crura, facial nerve canal) on a 4-point scale. We also compared the image noise and contrast-to-noise ratio (CNR) in the two groups. Mann-Whitney and unpaired t-tests were used for qualitative and quantitative assessments, respectively.

RESULTS
There was no significant difference in the overall image quality. At the comparison of individual anatomic structures, there was no significant difference in visualization of 35 structures except the osseous spinal lamina at the middle cochlear turn, round window membrane, and the vestibular aqueduct. There was no statistically significant difference in the mean image noise and CNR. An approximate reduction in the radiation dose and the imaging time of 48.1% and 92%, respectively, was obtained by axial volume scan with IR.

CONCLUSION
Temporal bone images acquired at 320-row CT using axial volume scanning and IR are of adequate diagnostic quality and allow for a substantial reduction in the radiation exposure and imaging time.

CLINICAL RELEVANCE/APPLICATION
Axial volume scanning with iterative reconstruction at 320-row CT allows for a substantial reduction in the radiation exposure and imaging time and maintains the image quality in temporal bone CT.

Comparative Cadaver Study of MDCT and C-Arm CT Imaging of the Temporal Bone before and after Cochlear Electrode Implantation: Image Quality and Dose Distribution

Tabassum A. Kennedy MD (Presenter): Nothing to Disclose, Timothy Peter Szczukutowicz PhD: Equipment support, General Electric Company Research Grant, Siemens AG, Sara Rademacher Nace MD: Nothing to Disclose, Kevin Royalty MS, MBA: Employee, Siemens AG, Sebastian Schafer: Consultant, Siemens AG, Samuel P. Gubbels MD: Nothing to Disclose, Brian Gartrell MD: Nothing to Disclose

PURPOSE
There have been substantial developments in C-Arm CT acquisitions (CACT), particularly in the setting of implantable devices and focusing on small volume, high contrast targets. The purpose of this study was to image the temporal bone and compare the image quality and relative radiation dose to the ocular lens between...
multidetector CT (MDCT) and CACT using a cadaveric model before and after cochlear electrode (CE) implantation.

**METHOD AND MATERIALS**

Four cadaveric heads were scanned on a C-Arm biplane system with CT capability, and on a clinical 64-slice MDCT. Each head was scanned with 2 different CACT modes: a small field of view (FOV) and full FOV mode. The small FOV mode utilized 6.5 cm x 11 cm coverage, 0.154 mm detector pitch and 0.2 mm slice thickness. The full FOV mode utilized 6.5 cm x 38 cm coverage, 0.308 mm detector pitch and 0.2 mm slice thickness. For MDCT scans, a clinical temporal bone protocol was used with a 0.531 pitch, noise index 6.7, acquisition slice thickness 2.5 mm, and axial bone reconstructions of 0.625 mm. Dose measurements were performed using thermoluminescent dosimeters (TLDs). The relative dose to the lens was measured with TLD chips placed under the eyelids of whole cadaver heads. Separate scans were acquired of each cadaver head both before and after CE implantation. Image quality was qualitatively evaluated by a panel of experienced neuroradiologists including the position of the implanted CE.

**RESULTS**

The image quality of MDCT and CACT temporal bone images was judged to be equivalent for clinical evaluation prior to CE implantation. CACT was superior to MDCT in localizing the intracochlear position of the CE. The radiation dose to the lens was 15 times lower in small FOV CACT compared to MDCT and 1.9 lower in full FOV CACT compared to MDCT. There was no significant difference in radiation dose between the pre and post implant acquisitions.

**CONCLUSION**

Due to the geometry of the scan range and collimation of the CACT system, a substantial dose reduction was observed for CACT over MDCT for the lens. Our data suggests equivalent spatial resolution for clinically relevant temporal bone structures prior to CE implantation and improved visibility of intracochlear position of the CE after implantation.

**CLINICAL RELEVANCE/APPLICATION**

Future applications of C-arm CT systems include intraoperative cochlear implant staging from delivery under fluoroscopic guidance to post-delivery assessment of surgical position.
**SSA16-04**

### Three Dimensional Reconstruction of the Inner Ear Using High Resolution MR-Imaging before Cochlear Implantation: Does the Volume of the Cochlea and Inner Ear Affect the Results of Speech Recognition Outcome after Implantation?

Nagy Naeem Naguib MD, MSc (Presenter): Nothing to Disclose, Ahmed Fathy Emam MBCh: Nothing to Disclose, Constanze Hey: Nothing to Disclose, Nour-Eldin Abdelrehim Nour-Eldin MD, MSc: Nothing to Disclose, Marc Harth: Nothing to Disclose, Iris Burck MD: Nothing to Disclose, Boris Bodelle MD: Nothing to Disclose, Thomas Lehnert MD: Nothing to Disclose, Thomas Josef Vogl MD, PhD: Nothing to Disclose

**PURPOSE**

To test whether the volume of the inner ear and cochlea measured using three dimensional (3D) reconstruction of the high resolution MRI sequence affect the speech recognition outcome following cochlear implantation.

**METHOD AND MATERIALS**

The study was retrospectively performed on 36 patients (17 males and 19 females) with a mean age of 53.58 years +/- 22.1. All patients suffered from longstanding sensorineural hearing loss and received unilateral cochlear implantation. High resolution MRI was performed using a T2-weighted SPACE sequence with 0.6 mm slice thickness. 3D reconstructions and pre-operative volume measurements were performed using an advantage workstation for diagnostic imaging. Speech recognition (SR) was tested using the Freiburger Monosyllabic Words (MSWT) and Numbers tests (NT) preoperatively, postoperatively, at 3, 6 and 12 month follow-up. Speech Recognition tests and Volume assessment were performed in a double blinded fashion. The correlation between the Speech Recognition test results and inner ear and cochlear volume measurements in 3D were tested for statistical significance using the Spearman's rank correlation test.

**RESULTS**

The mean 3D volume of the inner ear was 0.48 cm³ (Standard deviation: 0.08, Range: 0.31 - 0.7) and the mean 3D volume of the cochlea was 0.16 cm³ (Standard deviation: 0.03, Range: 0.1 - 0.22). The mean percentages of the SR-MSWT were 5.4, 25.19, 38.54, 46.04 and 53.85 in the preoperative, postoperative, 3, 6 and 12 month follow-up respectively. The mean percentages of the SR-NT were 30.4, 66.15, 81.6, 82.5 and 87.6 in the preoperative, postoperative, 3, 6 and 12 month follow-up respectively. There was no significant correlation (p > 0.05) between the preoperative volume of the inner ear and cochlea and the results of the SR assessment at any time point of the study.

**CONCLUSION**

The preoperative volume of the inner ear and the volume of the cochlea do not correlate significantly with the outcome of the speech recognition tests following cochlear implantation.

**CLINICAL RELEVANCE/APPLICATION**

The current study results showed that even patients with a small volume of the inner ear or small volume of the cochlea can benefit from cochlear implantation since the volume does not influence the speech recognition outcome.

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**SSA16-05**

### Cochlear Implants: Electrode Migration and its Implications

Mariano Sturla MD (Presenter): Nothing to Disclose, Alejandro Gomez RT: Nothing to Disclose, Eduardo Galli MD: Nothing to Disclose, Natalia A. Hiriart MD: Nothing to Disclose

**PURPOSE**

Show the usefulness and implications of electrode position detection in cochlear implant patients.

**METHOD AND MATERIALS**

68 patients with cochlear implants were studied with CT after surgery and in the followup (5 years period). In all of them electrodes were placed in the Scala Tympani at surgery. We used a 4 row scanner Philips MX8000Quad. Scan parameters were 0.5mm thickness, 0.5 reconstruction index and 0.5 pitch. To determine the exact position, we perform reconstructions(MPR, cMPR and 4D) and to determinate implant functionality we performed functional tests (voice perception, interpretation and discrimination) in all patients.

**RESULTS**

In 68 patients (75 implants) were imaged after surgery. 71 implants were followed up within a period of 5 years. Exact position of electrodes was identify in 97.1% (69/71). 2 implants (2.9%) were impossible to determinate due to strike artifact. We had two main types of migration: one occurs towards the tympanic box and the other inside the cochlea(scalar migration). 95.7% implants (66/69) were located at the Scala Tympani. All patients had normal functional tests for voice perception, interpretation and word discrimination. Only one showed a followup, abnormal tests and was proved to be a software calibration issue. In 4.3% (3 of 69) implants we discovered migration. In 2 of this 3 patients (2.8% of total) the electrode was identified at Scala Vestibuli beyond de basal turn of the cochlea, confirmed by CT. No one had impaired hearing functional tests. The other patient showed electrode migration within the middle ear towards the tympanic cavity (1.5% of total), presenting abnormal tests.

**CONCLUSION**

Computed Tomography is a reliable method to determinate the electrode position and migration. Electrodes localization is a relevant information to the surgeon and must always be reported. This preliminary results suggest that the existence of middle ear migration is more associated with hearing loss than the scalar migration. Scalar migration is more frequent beyond de basal turn of the cochlea. We believe that a larger series of patients is needed to confirm this preliminary results.

**CLINICAL RELEVANCE/APPLICATION**

Electrode position and location plays an important roll in the post-operative followup providing critical
**SSA16-06  Auditory Brainstem Implant: Computer Tomography Assessment of Electrodes Dislocation**

**Nicolo Cardobi (Presenter):  Nothing to Disclose , Roberto Cerini : Nothing to Disclose , Federica Spagnolli : Nothing to Disclose , Marco Barillari MD : Nothing to Disclose , Marco Carner : Nothing to Disclose , Vittorio Colletti MD : Nothing to Disclose**

**PURPOSE**

The main goal of our study was to evaluate the contribution of the Computed Tomography to demonstrate Auditory Brainstem Implant (ABI) electrodes dislocation.

**METHOD AND MATERIALS**

From 2008, out of 75 patients with ABI implant positioned in our Hospital, 7 patients with malfunctioning ABI were selected and retrospectively revised. CT examination was performed on our 64 slices CT scanner (Philips Brilliance 64, Philips Eindhoven, The Netherlands) at implant activation, usually 15 days after surgery and repeated later to verify any electrodes dislocations. Implant dislocation was defined as electrodes array rotation and/or translation. Rotation was defined as change in angulation, measured in degrees, of electrodes plate in each plane examined, between the CT examination performed at the ABI activation and subsequent follow-up CT. Translation was defined as displacement in millimetres of electrodes plate's iso-center, in each plane examined, between the CT examination performed at the ABI activation and subsequent follow-up CT. Electrodes translation and rotation were measured on fusion CT image in each plane and then compared to number of active electrodes of the array.

**RESULTS**

CT was able to identify electrodes plate rotation and/or dislocation in all patients. In 3/7 patients there were electrodes plate rotation and translation. In 2/7 patients there was only electrodes plate translation. Maximum rotation measured was 44.9°; maximum dislocation was 3.6 mm.

**CONCLUSION**

CT was able to identify electrodes plate rotation and/or dislocation in all patients.

**CLINICAL RELEVANCE/APPLICATION**

Computer tomography is a useful tool to detect ABI dislocation and should be used in case of decrease ABI performance over time.

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**SSA16-07  Volumetric Assessment of the Inner Ear in Patients Presenting with Meniere Disease**

**Ahmed Fathy Emam MBBCh (Presenter):  Nothing to Disclose , Nagy Naguib Naeem Naguib MD, MSc : Nothing to Disclose , Nour-Eldin Abdelrehim Nour-Eldin MD, MSc : Nothing to Disclose , Mohammed Ahmed Alsubhi BMBS : Nothing to Disclose , Katrin Eichler MD : Nothing to Disclose , Thomas Lehnert MD : Nothing to Disclose , Thomas Josef Vogl MD, PhD : Nothing to Disclose**

**PURPOSE**

To assess the volume of the Cochlea and Vestibular Labyrinth in patients presenting with Meniere Disease and to compare with the volume of normal inner ears using 3D reconstruction of MR-Imaging.

**METHOD AND MATERIALS**

A retrospective study was performed on 135 inner ears (79 females and 56 males) with a mean age of 48.9 year (standard deviation: 25.4, range: 5 month - 88 year). Of the 135 inner ears 75 inner ear (37 right and 38 left inner ears) presented with Meniere and 60 inner ears (32 right and 28 left inner ears) diagnosed as morphologically normal. High resolution MR-Imaging was performed using a T2-weighted SPACE sequence with 0.6 mm slice thickness. 3D reconstructions were performed using Advantage Workstation for diagnostic imaging. The difference between the volumes in patients with and without Meniere was tested using the Mann-Whitney test.

**RESULTS**

Right sided Meniere: semicircular canals mean volume was 0.290 mm$^3$ (SD: 0.06, Range: 0.190 - 0.430 mm$^3$), vestibule's mean volume was 0.086 mm$^3$ (SD: 0.02, Range: 0.060 - 0.160 mm$^3$) and Cochlea's mean volume was 0.180 mm$^3$ (SD: 0.02, Range: 0.130 - 0.240 mm$^3$). Normal right inner Ear: semicircular canals mean volume was 0.260 mm$^3$ (SD: 0.04, Range: 0.180 - 0.340 mm$^3$), Vestibule's mean volume was 0.070 mm$^3$ (SD: 0.01, Range: 0.050 - 0.110 mm$^3$) and Cochlea's mean volume was 0.170 mm$^3$ (SD: 0.02, Range: 0.120 - 0.200 mm$^3$). Left sided Meniere: semicircular canals mean volume was 0.290 mm$^3$ (SD: 0.05, Range: 0.200 - 0.410 mm$^3$), vestibule's mean volume was 0.080 mm$^3$ (SD: 0.02, Range: 0.060 - 0.150 mm$^3$) and Cochlea's mean volume was 0.180 mm$^3$ (SD: 0.027, Range: 0.140 - 0.260 mm$^3$). Left normal inner ears: semicircular canals mean volume was 0.260 mm$^3$ (SD: 0.04, Range: 0.200 - 0.340 mm$^3$), vestibule's mean volume was 0.070 mm$^3$ (SD: 0.01, Range: 0.040 - 0.090 mm$^3$) and Cochlea's mean volume was 0.160 mm$^3$ (SD: 0.02, Range: 0.120 - 0.210 mm$^3$). There was a statistically significant difference between the semicircular canal volume, vestibular volume and cochlear volume in inner ears affected with Meniere Disease in comparison with normal inner ears. (P value ranging between 0.002 and 0.045).
CONCLUSION

Patients presenting with Meniere Disease show a statistically significant larger volume of the semicircular canals, vestibule and cochlea compared to patients without Meniere disease.

CLINICAL RELEVANCE/APPLICATION

An increased volume of the inner ear might be responsible for Meniere disease.

SSA16-08  Reproducibility of Volumetric Assessment of the Inner Ear using Three Dimensional Reconstruction of the High Resolution MRI Sequence

Nagy Naguib Naeem Naguib MD, MSc (Presenter): Nothing to Disclose , Ahmed Fathy Emam MBBCh : Nothing to Disclose , Nour-Eldin Abdelrehim Nour-Eldin MD, MSc : Nothing to Disclose , Tatjana Gruber-Rouh : Nothing to Disclose , Boris Bodelle MD : Nothing to Disclose , Marc Harth : Nothing to Disclose , Thomas Lehnert MD : Nothing to Disclose , Thomas Josef Vogl MD, PhD : Nothing to Disclose

PURPOSE

To assess the reproducibility of the volumetric assessment of the inner ear using three dimensional (3D) reconstruction of the high resolution MR-Imaging (HR-MRI) sequences.

METHOD AND MATERIALS

The study was retrospectively performed on 50 patients (F=27, M=23) with a mean age of 53.3 years. Patients were referred for MRI due to different disorders of the inner ear. HR-MRI was performed using a T2-weighted SPACE sequence with 0.6 mm slice thickness. 3D reconstructions were performed using Advantage Workstation. Assessed were the volumes of both inner ears together, of each side alone, of the cochlea and of the vestibular system. All volume measurements were performed twice. To avoid possible Bias the time interval between both measurements was 1 year and the previous results were not accessible during the second evaluation (blinded). The agreement between both results was tested using intra-class correlation (ICC) test.

RESULTS

For the first assessment the mean volume of both inner ears together was 1.01 cm³ +/-0.13 (Range: 0.69-1.33), of each inner ear alone 0.5 cm³ +/-0.07 (Range: 0.32-0.71), of the cochlea 0.17 cm³ +/-0.024 (Range: 0.13-0.23) and of the vestibular system 0.33 cm³ +/-0.06 (Range: 0.19-0.49). For the second assessment the mean volume of both inner ears together was 0.99 cm³ +/-0.11 (Range: 0.79-1.27), of each inner ear alone 0.5 cm³ +/-0.06 (Range: 0.38-0.66), of the cochlea 0.17 cm³ +/-0.025 (Range: 0.13-0.26) and of the vestibular system 0.33 cm³ +/-0.05 (Range: 0.23-0.45). ICC analysis showed a statistically significant (p<0.0001) excellent agreement for volumetric assessment of both inner ears together (ICC-Coefficient=0.82, Confidence Interval (CI) 95%) and of the cochlea (ICC-Coefficient=0.88, CI 95%). A statistically significant (p<0.0001) substantial agreement for volumetric assessment of each side alone (ICC-Coefficient=0.79, CI 95%) and of the vestibular system (ICC-Coefficient=0.7, CI 95%) was noted.

CONCLUSION

Volumetric assessment of the inner ear using 3D reconstruction of HR-MRI is a reproducible method with statistically significant excellent agreement for volumetric assessment of both sides together and cochlea and substantial agreement for each side alone and vestibular system.

CLINICAL RELEVANCE/APPLICATION

The reproducibility of the volumetric assessment makes it possible to introduce 3D volume assessment of the inner ear as one of the MRI assessment parameters for patients presenting with inner ear disorders.

SSA17

Neuroradiology/Head and Neck (Vascular Disease of the Head & Neck)

Scientific Papers

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

Participants

Moderator
Pratik Mukherjee MD, PhD : Research Grant, General Electric Company Medical Advisory Board, General Electric Company

Moderator
E. Turgut Tall MD : Nothing to Disclose

Sub-Events

"Plaque Echolucency and Stroke Risk in Asymptomatic Carotid Stenosis: A Systematic Review and Meta-Analysis"
Plaque Echolucency and Stroke Risk in Asymptomatic Carotid Stenosis: A Systematic Review and Meta-Analysis

Hediyeh Baradaran MD (Presenter): Nothing to Disclose, Kartik Kesavabhotla: Nothing to Disclose, Edward E. Mtui MD: Nothing to Disclose, Diana Delgado MS: Nothing to Disclose, Ashley Giambrone PhD: Nothing to Disclose, Ajay Gupta MD: Nothing to Disclose

**PURPOSE**

Among methods to further risk-stratify patients with asymptomatic carotid stenosis, carotid artery plaque echolucency on ultrasound (US) has been identified as a noninvasive imaging marker for future stroke risk. We performed a systematic review and meta-analysis to evaluate the association between echoluent plaque identified on US and future ischemic events in asymptomatic patients with carotid atherosclerotic disease.

**METHOD AND MATERIALS**

We performed a comprehensive literature search evaluating the association of US-based characterization of carotid plaque with ischemic events. The included studies were prospective observational studies examining plaque echolucency on US in asymptomatic patients with mean follow-up of at least 1 year assessing for development of ipsilateral ischemic event. A meta-analysis with assessment of study heterogeneity and publication bias was performed. Results were summarized using a random or fixed-effects model.

**RESULTS**

Of the 5409 manuscripts screened, 7 met eligibility for systematic review and meta-analysis. A total of 7727 patients with a mean age of 72.1 were included. Because no significant heterogeneity was found between studies, a fixed effects model was used. The relative risk (RR) for ipsilateral stroke in patients with echoluent plaque was 3.00 (95% CI, 1.858-4.852; p = 0.00). In a subset analysis, the RR for ipsilateral stroke in patients with >50% carotid artery stenosis and echoluent plaque was 2.56 (95% CI, 1.275-5.137; p = 0.01). No statistically significant publication bias was found between studies.

**CONCLUSION**

In this meta-analysis of 7727 patients, we found that the presence of echoluent plaque on carotid artery US increases the risk of future ipsilateral stroke in asymptomatic patients with carotid atherosclerotic disease.

**CLINICAL RELEVANCE/APPLICATION**

US imaging routinely acquired for carotid artery stenosis screening can also be used to classify plaque echolucency and potentially offers a simple tool to further risk stratify asymptomatic patients with carotid atherosclerotic disease.

A Population-based Study on MRI-based Automated Segmentation of Carotid Atherosclerotic Plaque Burden

Mariana Selwaness MD (Presenter): Nothing to Disclose, Reinhard Hameeteman MSC: Nothing to Disclose, Oscar H. Franco: Nothing to Disclose, Aad Van Der Lugt MD, PhD: Nothing to Disclose, Jolanda J. Wentzel PhD: Nothing to Disclose, Meike Willemijn Vernooij MD: Nothing to Disclose

**PURPOSE**

The extent of carotid atherosclerosis is considered a potentially relevant risk marker for stroke. In a large stroke-free population, we identified cardiovascular risk factors and carotid plaque components associated with carotid plaque burden and lumen volume.

**METHOD AND MATERIALS**

Within The Rotterdam Study, we performed prescreening of carotid arteries with ultrasound to select participants with carotid plaques >=2.5 cm. On 1.5-Tesla carotid MRI scanning, plaque composition and luminal stenosis were visually assessed. Inner and outer wall of the carotid arteries were bilaterally segmented using a validated automated method in order to measure plaque burden. We analyzed sex-specific standardized relations of cardiovascular and imaging risk factors to plaque burden and lumen volumes using regression analysis.

**RESULTS**

In 1562 participants (mean age 72.7±9.2 years, 46% women), we automatically segmented 2821 carotid atherosclerotic plaques. Women had larger plaque burden (50.7±7.8% vs. 49.2±7.7%, p

**CONCLUSION**

Several cardiovascular risk factors as well as plaque composition, in particular IPH, are associated with plaque burden. Carotid IPH is a strong risk factor for luminal stenosis.

**CLINICAL RELEVANCE/APPLICATION**

Carotid plaque burden could play a role as a promising biomarker for cardiovascular disease. MRI-based automated segmentation is a user-friendly and non-invasive tool that may serve to identify risk factors of plaque burden in population studies.

Feasibility of High-resolution MR Imaging for the Diagnosis of Intracranial Vertebrobasilar Artery Dissection

Miran Han MD (Presenter): Nothing to Disclose, Jin Wook Choi MD: Nothing to Disclose, Young Keun Sur MD: Nothing to Disclose, Seon Young Park MD: Nothing to Disclose, Sun Yong Kim MD: Nothing to Disclose
PURPOSE

To evaluate the feasibility of HR-MR imaging to diagnose intracranial vertebrobasilar artery dissection (VBD) and to find most useful imaging findings suggesting dissection

METHOD AND MATERIALS

We retrospectively reviewed 55 patients suspected of having intracranial VBDs and underwent HR-MR imaging between March 2012 and October 2013. Two neuroradiologists independently reviewed the HR-MR images. The diagnosis based on only HR-MR imaging was compared with final diagnosis by the consensus among neuroradiologists, neurointerventionist and neurologist after reviewing all clinical and paraclinical investigations available at hospital discharge (initial CT, MR, DSA images and etiologic work-ups) and follow up. Two neuroradiologists also looked for indications of dissection (mural hematoma, dissection flap, outer diameter enlargement on T2WI of steno-occlusive lesion on angiography) on each sequence of HR-MRI. Interobserver agreement for diagnosing the VBD and inter- and intraobserver agreement for detecting evidence of dissection were estimated using the Cohen's kappa coefficient

RESULTS

5 patients were excluded because scanning range of HR-MR imaging did not fully cover the affected segment. Among the 50 study population, 33 patients were finally diagnosed with VBD by consensus of various specialists. Diagnosis based on HR-MR imaging corroborated the final diagnosis in 47 (94%, 31 VBD and 16 No VBD) patients. A mural hematoma was best detected on T1WI and CE-T1WI (54.3%). Dissection flaps were seen in almost all cases on CE-T1WI (91.4%) and secondly detected on T2WI (68.6%). Outer-diameter enlargement of the steno-occlusive lesions on angiography was detected in more than half of cases (62.86%). The two reviewers showed substantial to almost perfect agreement for diagnosis of VBD and detecting dissection signs on every sequence.

CONCLUSION

HR-MR imaging could be a useful and non-invasive diagnostic tool for intracranial VBDs and dissection flap on CE-T1WI is most confident sign for suggesting dissection

CLINICAL RELEVANCE/APPLICATION

HR-MR imaging can demonstrate direct findings of dissection and be non-invasive useful diagnostic tool for the diagnosis of intracranial vertebrobasilar artery dissection

Haptoglobin 2-2 Genotype is Associated with Presence and Progression of MRI Depicted Carotid Intraplaque Hemorrhage

Tina Binesh Marvasti (Presenter): Nothing to Disclose, Navneet Singh MD: Nothing to Disclose, Mariam Afshin: Nothing to Disclose, Tishan Maraj: Nothing to Disclose, Pascal N. Tyrrell PhD: Nothing to Disclose, Alan Rowland Moody MD: Nothing to Disclose

PURPOSE

Intraplaque hemorrhage (IPH) - a component of late-stage atherosclerotic plaque- is a source of free hemoglobin (Hb) that binds the haptoglobin (Hp) protein and forms a complex cleared by tissue macrophages. There are three Hp genotypes: Hp1-1, Hp2-2 and Hp1-2. The Hb-Hp2-2 complex has a lower binding affinity for macrophages, resulting in retention of vascular Hb and oxidative burden. Studies have shown a higher risk of CV events in Hp2-2 individuals. We hypothesized that Hp2-2 patients' failure to clear Hb results in a greater prevalence and progression of MRI depicted IPH (MRIPH). We aimed to identify a biomarker (Hp) for routine testing of individuals at risk of IPH.

METHOD AND MATERIALS

Patients with non-surgical carotid artery disease (30-95% stenosis) underwent 3T carotid MRI (Philips Achieva) of both carotids annually from 2010 to 2014. MRIPH uses a T1weighted inversion recovery fat suppressed 3D Fast Field Echo sequence in the coronal plane to detect IPH which appears of high signal due to methemoglobin. IPH was defined as a signal intensity 1.5x the adjacent sternocleidomastoid muscle. IPH volume was quantified using VesselMass software. Hp genotypes were identified using an established PCR protocol. Descriptive statistics and mixed effects model longitudinal regression analyses were performed.

RESULTS

The study cohort consisted of 80 patients (mean age, 72.8 years; range 52-100) with 160 carotid images. Patients homozygote for the Hp2 allele had a significantly higher prevalence of IPH at baseline (BL) compared to those carrying an Hp1 allele (57% vs. 34%, OR=2.52, 95%CI=1.23-5.144, p=0.01). IPH volume at BL did not differ significantly between the two groups (0.27 vs. 0.23 mL respectively, p=0.836). Longitudinal analysis of 18 IPH positive carotids with two years follow up data indicated a significant progression of IPH volume over time in Hp2 homozygote patients (β=0.12, SE=0.04, p<0.01) and regression of IPH volume in patients carrying an Hp1 allele (β=-0.09, SE=0.03, p=0.01).

CONCLUSION

Patients homozygote for the Hp2 allele had a significantly higher prevalence of carotid BL-IPH at which worsened over a two year follow up period.

CLINICAL RELEVANCE/APPLICATION

Detection of pre-symptomatic vascular disease allows for prevention of CV events. Hp genotype is a biomarker of high risk vascular disease (IPH) that when detected using simple genotyping methods can identify at-risk populations for more targeted imaging investigations.
**SSA17-05**

The Carotid Plaque Imaging in Acute Stroke (Capias) Study: Baseline and 3-month Follow-up Data

Tobias Saam MD (Presenter): Research Grant, Diamed Medizintechnik GmbH Research Grant, Bayer AG, Anna Bayer-Karpinska: Nothing to Disclose, Tobias Boeckh-Behrens: Nothing to Disclose, Andreas Schindler MD: Nothing to Disclose, Andreas Dietrich Helck MD: Nothing to Disclose, Holger Poppert: Nothing to Disclose, Florian Schwarz MD: Nothing to Disclose, Dirk-Andre Clevert MD: Speaker, Siemens AG Speaker, Bayer AG Speaker, Konstantin Nikolaou MD: Speakers Bureau, Siemens AG Speakers Bureau, Koninklijke Philips NV Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG, Frank Wollenweber: Nothing to Disclose, Martin Dichgans MD: Nothing to Disclose

**PURPOSE**

In up to 40% of patients with ischemic stroke no definite etiology can be established. A significant proportion of these cryptogenic stroke cases may be due to non-stenosing atherosclerotic plaques or low grade cervical artery stenosis not fulfilling common criteria for atherothrombotic stroke. The purpose of the Capias trial is to determine the frequency, characteristics and clinical long-term consequences of ipsilateral complicated American Heart Association lesion type VI (AHA-LT6) carotid artery plaques in patients with cryptogenic stroke compared to patients with defined stroke etiology.

**METHOD AND MATERIALS**

300 patients (age >49 years) with unilateral DWI-positive lesions in the anterior circulation and non- or moderately stenosing (< 70% NASCET) internal carotid artery plaques will be enrolled in the prospective multicenter study Capias. Carotid plaque characteristics will be determined by high-resolution black-blood carotid MRI at baseline and 12 month follow up.

**RESULTS**

The study started on February 15th 2011. So far, clinical and radiological baseline data of 115 patients have been analyzed. Table 1 demonstrates the baseline characteristics and the prevalence of AHA-LT6 in each stroke subtyping using the TOAST criteria. An initial analysis of primary endpoint data showed a significantly higher prevalence of complicated AHA-LT6 plaques in cryptogenic stroke patients ipsilateral (32%) than contralateral (5%) to the ischemic stroke (p < 0.001, McNemar). 3-month follow-up data was available in 101 patients and 5 cerebrovascular events (1 TIA, 4 strokes) occurred. 4 out of 5 events (80%) occurred in patients with AHA-LT6 plaques.

**CONCLUSION**

Baseline data of the Capias trial suggests that arterio-arterial embolism from non-stenotic carotid atherosclerotic plaques play a role in the pathogenesis in a subset of subjects previously diagnosed with a cryptogenic stroke. The majority of recurrent strokes occurred in patients with AHA-LT6, suggesting that AHA-LT6 could be an important imaging biomarker to assess risk of stroke recurrence.

**CLINICAL RELEVANCE/APPLICATION**

Depending on the results of CAPIAS, this study may have important implications for diagnostic decision making and provide the basis for the planning of targeted interventional studies.

**SSA17-07**

Artery of Superior Orbital Fissure: An Undescribed Branch from the Pterygopalatine Segment of the Internal Maxillary Artery to the Cavernous Sinus through the Superior Orbital Fissure

Hiro Kiyosue MD (Presenter): Nothing to Disclose, Shuichi Tanoue MD: Nothing to Disclose, Ryuichi Shimada MD: Nothing to Disclose, Hiromu Mori MD: Nothing to Disclose

**PURPOSE**

Artery of foramen rotundum is thought to be a sole arterial branch of the pterigopalatine segment of the internal maxillary artery to the cavernous sinus. However, we found another undescribed branch, provisionally-named artery of SOF, from pterigopalatine segment of the internal maxillary to the cavernous sinus via the SOF in some cases of parasellar hypervascular lesions. In this paper, we investigated the frequency and course of the artery of SOF in cases with parasellar hypervascular lesions.

**METHOD AND MATERIALS**

We retrospectively reviewed biplane and 3D angiography of external carotid artery undergone from June 2010 to December 2013 in 17 patients with parasellar hypervascular lesions, including 13 cases of cavernous sinus dural arteriovenous fistulas and 4 cases of parasellar meningiomas. 3D angiographic images were reviewed by 2 experienced neuroradiologists with particular interest to the artery of SOF.

**RESULTS**

The artery of SOF was identified in 7 of 13 cases of cavernous sinus dural arteriovenous fistulas and 2 of 4 cases of parasellar meningioma. It arose at the pterygopalatine segment of the internal maxillary artery, either singly or by a common trunk with the artery of foramen rotundum, and run upward to reach the SOF, and then turned posteriorly to the cavernous sinus with acute angle and fed the AVFs or tumors. In one case, the artery of SOF communicated with lachrymal branch of the ophthalmic artery at the orbital apex.

**CONCLUSION**

Although it has not been described before, the existence of SOF with lachrymal anastomosis fulfills the criteria of an arteriovenous anastomosis.
Although it has not been described in anatomic paper, the artery of SOF could be observed approximately half of the cases of parasellar hypervascular lesions.

**CLINICAL RELEVANCE/APPLICATION**

This study demonstrates an arterial branch of the external carotid artery, artery of superior orbital fissure (SOF), which has not been recognized. The artery of SOF can feed the cavernous sinus dural AVFs and hypervascular tumor. Special attention should be paid for embolization of the artery of SOF because it potentially anastomose with ophthalmic artery and anterior branch of the inferolateral trunk of the internal carotid artery.

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**SSA17-08**

**Finding the Optimal Parameter for the DSA Time Density Curve When Evaluating Flow Changes in Patients with Carotid Stenosis**

Chung-Jung Lin MD, PhD : Research Grant, Siemens AG , Wan-Yue Guo MD, PhD (Presenter): Research Grant, Siemens AG , Yi-Yang Lin MD : Nothing to Disclose , Feng-Chi Chang : Nothing to Disclose , Sheng-Che Hung MD : Nothing to Disclose , Markus Kowarschik PhD : Employee, Siemens AG , Janina Beilner MD : Employee, Siemens AG , Cheng-Yen Chang MD : Nothing to Disclose

**PURPOSE**

Cerebral circulation time provides instantaneous intravascular flow measurement from the time density curve (TDC) in digital subtraction angiography (DSA) series and accurately predicts flow changes in stenotic vessels. The purpose of our study was to compare the effectiveness of three major TDC variables for detecting flow changes in stenotic patients: relative time to maximum concentration (rTmax), maximum slope (MS), and area under curve (AUC).

**METHOD AND MATERIALS**

Seventy cases of unilateral carotid stenosis (group A) and 56 normal controls (group B) were retrospectively enrolled. Fixed contrast injection protocols and acquisition parameters were used in all angiographic series. The middle cerebral artery (M1), sigmoid sinus (SS), and internal jugular vein (JV) in the AP (anterior-posterior) view, and second branch of the middle cerebral artery (M2), parietal vein, and superior sagittal sinus (SSS) in the lateral view were chosen. rTmax, MS, and AUC of the TDC in individual ROIs were compared between the two groups using a DSA analyzer prototype.

**RESULTS**

rTmax in M1, SS, JV, M2, PV and SSS were significantly prolonged in group A compared to group B. Among all AUCs, only the AUC in SSS was significantly larger in group A than in group B. For the MSs, M1, M2, and SS showed significant decreases in group A compared to group B. The AUC for the SSS demonstrated the best single diagnostic performance at the optimal cutoff value of 536 with sensitivity 71% and specificity 64.5%.

**CONCLUSION**

Only the MSs for M1, M2, and the AUC for the SSS showed equivalent diagnostic performance with rTmax in differentiating carotid stenosis. rTmax thus remains the preferred measurement for all ROIs in routine DSAs.

**CLINICAL RELEVANCE/APPLICATION**

Using rTmax alone in different ROIs provides sufficient, rapid in-room assessment of intravascular hemodynamic and thus improves patient safety in endovascular treatments.

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**SSA17-09**

**Extracranial Carotid Artery Stenting Followed by Intracranial Stent-based Thrombectomy for Acute Tandem Occlusive Disease**

John Moshe Gomori MD (Presenter): Consultant, Mednymatch Technology Ltd , Ronen Leker MD : Consultant, Medymatch Technology Ltd , Roni Peter Eichel MD : Nothing to Disclose , Jose Enrique Cohen MD : Nothing to Disclose

**PURPOSE**

Acute tandem occlusions of the extracranial internal carotid artery (ICA) and a major intracranial artery respond poorly to intravenous tissue plasminogen activator (IV-tPA) and present an endovascular challenge. We describe our experience with emergent stent-assisted ICA angioplasty and intracranial stent-based thrombectomy of tandem occlusions.

**METHOD AND MATERIALS**

Procedures were performed from 3/2010-12/2013. National Institutes of Health Stroke Score (NIHSS) and Alberta Stroke Program Early CT Score (ASPECTS), occlusion sites, collateral supply, procedural details, and outcomes were retrospectively reviewed with IRB waiver of informed consent.

**RESULTS**

24 patients, mean age 66 years, mean admission NIHSS score 20.4, and mean ASPECTS 9 were included. Occlusion sites were proximal ICA-MCA trunk in 17 patients, proximal ICA-ICA terminus in six, ICA-MCA-anterior cerebral artery (ACA) in one, Stent-assisted cervical ICA recanalization was achieved in all patients, with unprotected pre-angioplasty in 24/24, unprotected stenting in 16/24 (67%), and protected stenting in 8/24 (33%), followed by stent-thrombectomy in 25 intracranial occlusions. There was complete
recanalization/complete perfusion in 19/24 (79%), complete recanalization/partial perfusion in 2/14 (13%), and partial recanalization/partial perfusion in 2/24 (8%) with no procedural morbidity/mortality. Mean time to therapy was 3.8 hours (range 2-5.5). Mean time to recanalization was 51 minutes (range 38-69). At 3-month follow-up, among 17/22 surviving patients (77%), 13/17 (76%) presented mRS 0-2 and 3/17(18%) were mRS 3.

CONCLUSION
In acute tandem ICA-MCA/distal ICA occlusions, extracranial stenting followed by intracranial stent-based thrombectomy appears feasible, effective, and safe. Further evaluation of this treatment strategy is warranted.

CLINICAL RELEVANCE/APPLICATION
With newer techniques, acute tandem carotid - intracranial occlusive disease is now amenable to treatment with high success and low complication rates.

RC106
Head and Neck Top Five: Important Anatomy, Missed Diagnoses and Imaging Pearls

LEARNING OBJECTIVES
1) The participant will be able to identify the key 'fat pads' at the exit points of those cranial nerves most often affected by perineural spread. 2) The participant will be able to describe the fascial organization of the parapharyngeal region. 3) The participant will be able to locate the laryngeal ventricle using axial and coronal imaging.

ABSTRACT
Important Anatomy Head and neck imaging relies heavily on an understanding of the intricate and often difficult anatomy. The session will focus on identification of anatomy that is crucial in a defining the margins and patterns of spread of pathology. Other landmarks that are key to description of the location of lesions are also covered. For instance, there is a small amount of fat located just external to each neural foramen through which perineural spread of carcinoma may pass. The most important of these primary 'fat pads' are located in the pterygopalatine fossa (external to foramen rotundum), just inferior to foramen ovale (trigeminal fat pad), and the stylomastoid foramen (facial nerve) fat pad. These fat pads should be examined for potential obliteration as tumor approaches the foramen. The laryngeal ventricle is key to the organization of the larynx and reports should localize lesions related to this important structure. The ventricle may not be directly visible depending on the phase of respiration of an imaging scan. However the lateral wall of the larynx transitions from fat to muscle at the level of the ventricle. The ventricle is located at the upper margin of the thyroarytenoid muscle that makes up the bulk of the true vocal cord. The parapharyngeal spaces are crossed by several substantial fascial layers. The fascia organize the region into compartments that help the radiologist predict the identity of tumors in that location. Specifically, the anatomy makes it possible to separate tumors that are almost certainly of salivary origin from those that are not. Other specific anatomic points useful in interpretation or characterization will also be discussed.

Missed Diagnoses in the Head and Neck

LEARNING OBJECTIVES
1) Identify some of the most common mistakes radiologists make when evaluating MRI or CT scans of the neck and skull base. 2) Identify different patterns of perineural tumor spread (PNTS) and understand the subtle CT and MRI changes that indicate early PNTS. 3) Recognize atypical patterns of metastatic nodal disease and how it can be missed on routine CT scans. 4) Identify changes in the nasopharynx and skull base that indicate invasive infectious or neoplastic process. 5) Learn to distinguish recurrent tumor in the setting of complex post-treatment changes.

ABSTRACT
This presentation will highlight some of the most common mistakes and misdiagnoses that radiologists make when interpreting head and neck studies, including MRI and CT examinations. Many 'misses' are difficult, and rely on identifying subtle changes in small structures in the complex landscape of the neck and skull base. Other misses are difficult because they are relatively rare and may not be on the radar of most radiologists. Some misdiagnoses are the result of satisfaction of search, and are observed in complex cases, especially complex head and neck cancer. Post treatment changes in the neck impose additional limitations on imaging of the head and neck. This lecture will identify some common mistakes that are made in both private and
academic practices. Cases will be presented using a case-based approach. They keys to identifying the pertinent findings and making each diagnosis will be highlighted.

**Head and Neck Imaging Pearls**

Richard Henry Wiggins MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To identify imaging findings in some Imaging pearls in the Head and Neck, including those within the neck, temporal bone, paranasal sinuses, skull base, and orbits. 2) To review the most radiologic and clinical features of some common diagnoses, as well as the most important differential considerations. 3) To suggest scan techniques that will help the radiologist consistently make these diagnoses.

**ABSTRACT**

This session will review some important pearls in head and neck imaging. These tips and tricks will review some important aspects of imaging in the head and neck to help with protocoling studies, as well as techniques for imaging and interpretation. Important imaging differentials will also be reviewed and discussed.

**Skull Base and Nerves**

Refresher/Informatics

**LEARNING OBJECTIVES**

1) To review the anatomy of the Central Skull Base. 2) To present common and uncommon pathologies that affect the Central Skull Base. 3) To remind the audience of imaging pitfalls of the Central Skull Base. 4) To discuss the complementary roles of CT and MR in imaging the Central Skull Base.

**ABSTRACT**

Imaging of the skull base presents many challenges due to its anatomical complexity, numerous normal variants, and lack of familiarity to many radiologists. As the skull base is a region which is not amenable to physical exam, and as lesions of the skull base are generally difficult to biopsy and even more difficult to operate on, the radiologist plays a major role in directing patient management via accurate image interpretation. Knowledge of the skull base should not be limited to neuroradiologists and head and neck radiologists, however, as the central skull base in particular is routinely included in the field of view when cross-sectionally imaging the brain, cervical spine, or head and neck with CT or MRI, and hence its nuances should be familiar to general radiologists as well. We review the basic anatomy of the central skull base, including bony anatomy as well as the anatomy of adjacent soft tissue structures. We will also present imaging findings of common and uncommon pathologies of the central skull base, including primary tumors such as chordoma and chondrosarcoma, metastases and plasmacytoma, and non-neoplastic lesions of the central skull base. We will review some imaging pitfalls and "don't touch" lesions of the central skull base, and will emphasize the complementary roles of CT and MR in solving difficult cases.

**Cranial Nerves I-VI**

Wendy R. K. Smoker MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the anatomy of the upper six cranial nerves. 2) Learn the functions of these cranial nerves. 3) Be able to identify common pathologies affecting these nerves.

**ABSTRACT**

Cranial nerve dysfunction is a common presenting symptom in many patients. In order to evaluate for a causative lesion, one must have a thorough knowledge of the anatomy of each nerve. The anatomy of cranial nerves I-VI is presented along with a review of the function(s) of each nerve. For cranial nerves III-VI, the entire course of each nerve from brainstem exit to innervated muscles (for III, IV, V1, and VI) is reviewed. Pathology affecting these nerves is divided into brainstem, cisternal, base of skull (Meckle cave/cavernous sinus), and distal lesions. Common pathologies that affect each nerve along the various segments are presented.
Cranial Nerves VII-XII
Deborah L. Reede MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review the anatomy of cranial nerves VII - XII. 2) Learn clinical findings associated with nerve involvement that can help in the localization of a lesions. 3) Demonstrate lesions at various points along the nerve pathway.

MSCM22
Case-based Review of Magnetic Resonance (An Interactive Session)

Multisession Courses

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

Mon, Dec 1 10:30 AM - 12:00 PM  Location: S100AB

Sub-Events

MSCM22A  Female Pelvis
Antonio Luna MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review the use of MRI in gynecological disorders in a case-based format. 2) Highlight common pearls and pitfalls in MRI of the female pelvis. 3) Enhance findings that should not be overlooked in MRI of gynecological disorders.

MSCM22B  Head and Neck
Christine M. Glastonbury MBBS (Presenter): Investor, Amirsys, Inc

LEARNING OBJECTIVES

1) To learn the key points that create a succinct imaging differential diagnosis while appreciating the ‘big picture’ in HandN imaging. 2) To recognize the imaging findings of critical disease and what to do or recommend next with your patient.

Active Handout

MSCM22C  Brain
Jonathan H. Burdette MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the latest brain imaging techniques and how they can be used in routine clinical practice. 2) Recognize commonly missed or misinterpreted findings/abnormalities. 3) Recognize imaging features of various brain pathologic entities, such as neoplastic, infectious, inflammatory, and vascular diseases.

ABSTRACT

Magnetic Resonance Imaging continues to be the workhorse technique in brain imaging. The brain imaging capabilities of MRI continue to make MRI a more sensitive and specific diagnostic tool compared with CT for most clinical entities. The past 15 years has ushered in the era of Physiologic MRI techniques, such as diffusion-weighted imaging, diffusion tensor imaging, gadolinium-based and arterial spin labeled perfusion imaging, spectroscopy, functional MRI (fMRI), and, most recently, connectivity/network-based imaging. This presentation will cover the MR imaging features of several brain pathologic entities, and some of the latest brain MR imaging techniques will be introduced.

SSE24
Radiation Oncology (Head and Neck)

Scientific Papers

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AMA PRA Category 1 Credits ™: 1.00
DKI in Early Predicting the Response to Neoadjuvant Chemotherapy of Nasopharyngeal Carcinoma

Chen Yunbin MD : Nothing to Disclose, Wang Ren (Presenter): Nothing to Disclose, Dechun Zheng MS : Nothing to Disclose, Welbo Chen PhD : Nothing to Disclose, Xiang Zheng MS : Nothing to Disclose, youping xiao : Nothing to Disclose, Xiangyi Liu BS : Nothing to Disclose, Jianji Pan : Nothing to Disclose

PURPOSE

The aim of this prospective study was to explore the clinical value of diffusion kurtosis imaging (DKI) in early predicting the response to neoadjuvant chemotherapy (NAC) of nasopharyngeal carcinoma at 3.0T MR.

METHOD AND MATERIALS

A total of 44 patients with locally advanced NPC underwent MRI scan prior to and on the 4th, 21th (after the first cycle of chemotherapy completed), 42th (after the second cycle of chemotherapy completed) day after NAC initiation. Both the DKI parameters (corrected diffusion coefficient, D and excess diffusion kurtosis coefficient, K) and DWI parameters (apparent diffusion coefficient, ADC) were derived at each time point. The target lesions were divided into two groups (responders group, RG and non-responders group, NRG) according to lesion regression on 42th day based on RECIST 1.1. D values, K values, ADC values and its changes compared to baseline were compared between the two groups by SPSS 18.0 version software.

RESULTS

There is no significant difference(P=0.511) of D pre between RG (1.0087±0.0238×10^-3 mm²/s) and NRG (1.0490±0.046×10^-3 mm²/s). And likewise, there shows no significant difference(P=0.084) of ADC pre between RG (0.888±0.358×10^-3 mm²/s) and NRG (0.8138±0.030×10^-3 mm²/s). However, ΔD4th day were significantly greater (P=0.004) in RG (0.3771±0.041×10^-3 mm²/s) compared to NRG (0.1979±0.046×10^-3 mm²/s). ADC21th day were significantly greater (P=0.011) in RG (0.8886±0.0247×10^-3 mm²/s) compared to NRG (0.7999±0.0229×10^-3 mm²/s). There is no significant difference of K values or its changes between the two groups.

CONCLUSION

DKI could be a potential and more sensitive tool for early predicting response to neoadjuvant chemotherapy of nasopharyngeal carcinoma non-invasively.

CLINICAL RELEVANCE/APPLICATION
DKI can early predict the treatment response of nasopharyngeal carcinoma to NAC non-invasively and this exam recommended when underlying individual chemotherapy.

**SSE24-03**

**Definitive Radiotherapy for Base of Tongue Squamous Cell Carcinoma**

Kaitlin Christopherson (Presenter): Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):** To evaluate the long-term efficacy of primary radiation therapy in the management of base-of-tongue squamous cell carcinoma. **Materials/Methods:** We retrospectively reviewed the medical records of 468 patients treated curatively with definitive radiation therapy between 1964 and 2011 for base-of-tongue squamous cell carcinoma. Inclusion criteria included curative intent with definitive radiation, a completed course of radiation, a minimum of 2 years of potential follow up, and no distant metastasis at presentation. Median follow up for the cohort was 5.5 years (range, 0.1-26.3 years) for all patients and 8.7 years (range, 1.6 to 29.3) for living patients. Median total dose to the primary site was 74.4 Gy (range, 56.6 to 81.6). Various treatment strategies were used including once-daily standard fractionation in 87 patients (18%), concomitant boost technique in 99 patients (21%), twice-daily fractionation in 268 patients (57%), and simultaneous boost technique in 14 patients (3%). Intensity-modulated radiotherapy was used in 128 patients (27%). Overall, 87% (409) of patients presented with positive cervical lymph node involvement and 227 (48.5%) patients underwent planned neck dissections in addition to radiotherapy. Adjuvant chemotherapy was administered to 171 (37%) patients. Data regarding p16 pathway activation was only available for 5% of patients (25) in the current series. Toxicity was graded according to the Common Terminology Criteria for Adverse Events, v4.0. Results: The local control rate at 5 years for the entire cohort was 85%; when separated by T stage the local control rates at 5 years were as follows: T1, 97%; T2, 94%; T3, 86%; and T4, 65% (p<0.0001). Local regional control rates based on overall stage at 5 years were as follows: I-II, 96%; III, 83%; IVA, 88%; and IVB, 52% (p=0.0001). Overall survival rates at 5 years were as follows: 1-11, 66%; III, 69%; IVA, 71%; and IVB, 36% (p<0.0001). Cause-specific survival rates at 5 years were as follows: I-II, 89%; III, 78%; IVA, 83%; and IVB, 48% (p<0.0001). The 5-year local-regional control rate for patients treated with IMRT vs. no IMRT were 88% and 77%, respectively (p=0.0120). Severe late radiation-related complications occurred in 68 (14.5%) patients. Conclusions: Our data reveal that the local and regional control rates and survival rates after definitive radiotherapy are acceptable. As our median follow up time increases, it is evident that late effects of radiation continue to burden patients even decades after treatment. As we begin to see an increasing number of patients with favorable tumor markers, we advocate for research into possible de-intensification of treatment for suitable patients to minimize serious late radiation effects.

**SSE24-04**

**Carotid Parangangiomas and Glomus Jugulare Tumors Managed with Definitive or Adjuvant Radiation**

Rebekah Maymani (Presenter): Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):** Parangangiomas of the head and neck are generally benign and well controlled with definitive radiotherapy or surgery. We reviewed our institutional experience with these tumors managed with radiation therapy (RT) at initial presentation or recurrence. **Materials/Methods:** A retrospective review was performed of all patients treated definitively or adjuvantly for parangangiomas at the carotid body or jugular foramen from January 2006 to February 2013. Twenty-one parangangioma patients were identified and 33 tumors treated. 10 clinical presentations were evaluated: 3 were glomus jugulare, 2 carotid parangangiomas, 1 malignant carotid body tumor, and 17 as paragangliomas. Median patient age at diagnosis was 49 (range 23-77) and at RT was 53 (range 23-77). Genders were equally distributed at 50%. All patients had imaging prior to therapy including MRI (25 tumors), CT (22), and PET/CT (6). Mean tumor volume was 42.1 cc (range 2.8-314.6 cc). Sixteen patients (67%) had unilateral disease, 3 had glomus tumors at more than 2 sites. Six (25%) underwent resection at diagnosis, with 1 undergoing postoperative RT and 5 receiving treatment at recurrence for a median time to RT of 10.7 years. Biopsy was attempted in 5 patients (inconclusive in 2), and the remaining individuals were treated based on imaging alone. One patient was treated with 3D-CRT, and the remainder with IMRT to a median dose of 50 Gy (range 45-54 Gy). Results: All patients completed therapy as planned. Surveillance imaging was available in 20 (83%) patients. Median follow up was 16.5 months (range 0.5 to 98 months). Stable disease without progression was found in 95% of patients with follow-up imaging. Disease stability was also clinically observed in 75% of patients without follow-up imaging. The one lesion with progression on imaging was treated to 50 Gy with IMRT and to this date has received no further therapy. This patient had a history of prior contralateral and ipsilateral glomus tumors, a pulmonary glomus lesion, and a malignant carotid body tumor. RT was well tolerated with 18 patients (75%) reporting grade 1-2 acute effects during treatment. Two patients (8%) experienced grade 3 mucositis. Two patients (8%) reported long-term effects including hearing loss, facial pain, xerostomia, and dysgeusia attributable to RT vs radiation therapy are acceptable. As our median follow up time increases, it is evident that late effects of radiation continue to burden patients even decades after treatment. As we begin to see an increasing number of patients with favorable tumor markers, we advocate for research into possible de-intensification of treatment for suitable patients to minimize serious late radiation effects.

**SSE24-05**

**Positional and Volumetric Changes of Salivary Glands in Head and Neck Cancer Patients Treated with IMRT Utilizing Daily KV IGRT**

Maikel Botros MD (Presenter): Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):** To evaluate volumetric changes and positional changes of parotid and submandibular glands in patients treated for head and neck cancers with IMRT within our institution (n=16). **Materials/Methods:** We carried out a retrospective review of patients treated for squamous cell carcinoma of the head and neck from January 2008 until August 2012. All patients must have been treated utilizing IMRT with KV IGRT (n=16). KV CT scans from daily IGRT were retrieved on all patients for fractions 1, 11, 21, and 31 (with minor deviations of fraction number used in a few patients). The parotid glands and submandibular glands were contoured by a single radiation oncologist. In order to decrease intra-observer variations, contours were compared slice by slice on each gland to ensure that arterial structures within the gland were contoured in or out of the gland in a similar fashion. Volumetric measurements were measured and center of mass (COM) of each gland was obtained. The positional changes of the glands were measured by inter-parotid and
SSE24-06

**Recurrent Head and Neck Cancers Treated in the Primary Site with Hypofractionated Stereotactic Radiosurgery**

**Ariel Joseph Lederman (Presenter): Nothing to Disclose, Mordechai Loksen : Nothing to Disclose , Thomas Lowinger : Nothing to Disclose, Alexandra Khaleel : Nothing to Disclose, Daniel Izon : Nothing to Disclose , Gilbert S. Lederman MD : Nothing to Disclose**

**ABSTRACT**

**Purpose/Objective(s):** Hypofractionated Stereotactic Body Radiosurgery (HFSR) is a non-invasive focused beam technique delivering high dose radiation to extracranial cancers. We analyzed HFSR as treatment for recurrent head and neck cancers that were re-treated in the primary site. **Materials/Methods:** 19 recurrent head and neck tumors were re-treated in 18 patients during a 55 month interval. All the patients were evaluated before and after treatment. Age ranged from 29 to 85 (mean 63) with 9 females and 10 males. Tumor volumes ranged from 7.8 cc to 1297.9 cc (mean 158.4 cc). Patients received 200-800 cGy (median 600 cGy) with 42% receiving 4 fractions and 58% receiving 5 fractions for a total dose of 1000-4000 cGy (median 2500 cGy). Cancers were radiographically evaluated with contrast CT and/or MRI studies and reviewed by independent radiologists. Control of the treated cancer is defined as cessation of growth, shrinkage or disappearance of the cancer after treatment. Results: Follow up ranged from 2 to 49 months (mean 12). Overall control rate was 84.2%. For tumors >158.4 cc, there was an 87.5% control rate. Control rate for tumors >=158.4 cc was 67%. For tumors that received a dose <2600 cGy, there was an 80% control rate compared to 100% control rate for tumors receiving a dose >=2600 cGy. For tumors <158.4 cc that received <2600 cGy, there was an 83% control rate versus 100% control rate for tumors 2600 cGy. No tumors >=158.4 cc received >=2600 cGy. Conclusions: HFSR for recurrent head and neck cancers re-treated in the primary site when prior treatment did not succeed offers a usually well-tolerated, non-invasive method with a high degree of tumor control. A larger cohort may show a dose response analysis, as is suggested in this study. Patients will continue to be evaluated to provide longer follow up, possible benefits of local control and potential survival advantage. HFSR for recurrent primary head and neck cancers remains an option for those whom standard approaches have not produced desired results or in patients seeking a non-surgical, non-chemotherapeutic treatment.

**LEARNING OBJECTIVES**

1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content.
2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time.
3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

**SPLDL31**

**RSNA Diagnosis Live™: Body, Cardiac, MSK, Neuro, ENT Potpourri**

**Special Courses**

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AMA PRA Category 1 Credits ™: 1.00

ARRT Category A+ Credit: 0

**Participants**

Adam Eugene Flanders MD (Presenter): Nothing to Disclose
Sandeep Prakash Deshmukh MD (Presenter): Nothing to Disclose
Christopher Gerodie Roth MD (Presenter): Author, Reed Elsevier

**LEARNING OBJECTIVES**

1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

**SPSC30**

**Controversy Session: Head and Neck Modality Roulette: What's the Best Imaging Option?**

**Special Courses**

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AMA PRA Category 1 Credits ™: 1.00

ARRT Category A+ Credit: 1.00

**Tue, Dec 2 7:15 AM - 8:15 AM Location: E451A**
Participants
Moderator
Deborah Rachelle Shatzkes MD: Nothing to Disclose

Sub-Events

SPSC30A  4DCT in Parathyroid Adenoma Search: Is It Worth the Dose?
C. Douglas Phillips MD (Presenter): Stockholder, MedSolutions, Inc Consultant, Guerbet SA, Laurie A. Loevner MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
We will discuss the contribution of 4D-CT to imaging parathyroid adenomas and parathyroid hyperplasia and whether or not the technique is of value in the current radiation-conscious era.

ABSTRACT
A physician wishing to accurately diagnose and localize parathyroid tissue for minimally invasive parathyroid surgery (MIPS) has a number of potential choices. They may choose to not image the patient. They may utilize Tc-99m SESTAMIBI imaging with or without SPECT or CT fusion, they may order US, MRI, or CT studies. 4D-CT has gained attention as an accurate and reliable test to localize parathyroid tissue for MIPS. The questions regarding this technique are 1) does it answer the question reliably? and 2) is it worth the dose to an individual patient?

SPSC30B  Surveillance Imaging in Head and Neck Cancer: Should PET/CT be the First-line Modality?
Barton F. Branstetter MD (Presenter): Nothing to Disclose, Hugh D. Curtin MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) List 3 advantages to using PET/CT for surveillance of treated Head and Neck Squamous Cell Carcinoma. 2) List 3 disadvantages to using PET/CT for surveillance of treated Head and Neck Squamous Cell Carcinoma. 3) Describe the optimal frequency and duration of PET/CT for surveillance of treated Head and Neck Squamous Cell Carcinoma.

ABSTRACT
In patients with head and neck squamous cell carcinomas, PET/CT has proved useful at several different stages of patient care. PET/CT is used for staging a newly-discovered malignancy (or re-staging of recurrence); it is used to monitor response to therapy; it is used to assess suspicious signs and symptoms in treated patients; and it is used for surveillance of treated patients who have no evidence of residual disease. The appropriate application of PET/CT in these clinical scenarios is controversial. Some of the advantages and disadvantages of PET/CT for surveillance are undisputed, but the details of how to apply the technique have not been fully optimized in the current radiology literature. In this presentation, advantages and disadvantages of surveillance PET/CT (relative to CT) are described, and areas of controversy and ongoing research are delineated.

SPSC30C  MRI of the IAC: Do We Need Gadolinium?
William P. Dillon MD (Presenter): Nothing to Disclose, Franz J. Wippold MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) the various MR high resolution techniques for imaging the internal auditory canal. 2) the evidence supporting the use of contrast material with MR imaging in the evaluation of hearing loss. 3) the evidence supporting the use of non contrast MR imaging in the evaluation of hearing loss.

ABSTRACT
This presentation will highlight the evidence in favor and opposed to the use of gadolinium contrast administration in the setting of hearing loss from suspected vestibular schwannoma. Authors will demonstrate the use of high resolution non contrast MRI techniques tailored to the IAC, and show case examples where the use of gadolinium is useful in detecting diseases other than schwannoma.

MSCC31  Case-based Review of Nuclear Medicine: PET/CT Workshop—Head and Neck Cancers (In Conjunction with SNMMI) (An Interactive Session)

Multisession Courses

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

Tue, Dec 2 8:30 AM - 10:00 AM Location: S406A
LEARNING OBJECTIVES
1) To understand the value of PET/CT in the care process of managing head and neck cancer. 2) To review illustrative cases and pitfalls of interpretation.

BOOST: Head and Neck—Oncology Anatomy (An Interactive Session)
Multisession Courses

Sub-Events

MSRO31A  Imaging of Nasopharynx Cancer
Suresh K. Mukherji MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Review the normal anatomy of the nasopharynx. 2) Discuss the relationship between staging and imaging. 3) Describe common spread patterns of nasopharyngeal carcinoma.

ABSTRACT
This session will review the normal anatomy of the nasopharynx. We will also the common spread patterns of nasopharyngeal carcinoma and discuss the important relationship between imaging and staging.

MSRO31B  Contouring based on Patterns of Spread for Nasopharynx Cancer
Sung Kim MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Learn the patterns of spread of nasopharyngeal cancer, and how to contour accordingly

MSRO31C  Common Pathways of Perineural Spread
Suresh K. Mukherji MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Describe common pathways of perineural spread. 2) Review the imaging findings of perineural spread. 3) Describe the proper imaging technique for being able to detect perineural spread.

ABSTRACT
This session will be a detailed review normal anatomy of the of the pathways of perineural spread. This will focus on the normal anatomy, imaging appearance of perineural spread and techniques for optimal imaging.

MSRO31D  Perineural Spread and Implications for Radiation Oncology
Sung Kim MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Learn about indications and contouring for perineural invasion.
Sub-Events

RC306A  Sinonasal Inflammatory Disease
Christine M. Glastonbury MBBS (Presenter): Investor, Amirsys, Inc

LEARNING OBJECTIVES
1) Review the imaging features of sinonasal (SN) inflammatory disease starting with acute and chronic rhinosinusitis. 2) Understand the pathogenesis and imaging manifestations of critical complications of these processes. 3) Learn the key distinguishing features that indicate more aggressive SN processes such as invasive fungal sinusitis, granulomatous disease and SN malignancy.

RC306B  Sinonasal Tumors
Hilda Elie Stambuk MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Review the imaging features of benign and malignant sinonasal tumors. 2) Understand the role and specific utility of imaging modalities in the diagnosis of sinonasal tumors. 3) Learn the imaging characteristics of pathways of spread of malignant sinonasal tumors. 4) Understand important imaging features relevant to treatment and post-treatment surveillance of sinonasal tumors.

ABSTRACT
Tumors of the paranasal sinuses and nasal cavity are rare, constituting only about 3% of all upper respiratory tract tumors. The majority of patients present with non-specific symptoms and radiologists are often challenged to make the clinician aware of the potential for an ominous disease process such as a malignant tumor. It is therefore crucial to understand the role of imaging modalities such as CT, MRI and PET scan in order to optimize the benefits of imaging against the risks of misdiagnosis. Contrast-enhanced CT in axial and coronal planes is an excellent initial study for evaluation of sinus neoplasms because bone destruction is more easily seen on CT. Early stage tumors present as unilateral masses that generally do not densely enhance on CT. Bony destruction is a common feature of squamous cell carcinoma (SCC), whereas regressive remodeling of adjacent bone occurs more frequently in benign and less aggressive lesions. Most tumors have low to intermediate signals on T1W MRI. Because they generally are highly cellular with little water content, they have intermediate signal on T2W images and are therefore easy to differentiate from postobstructive sinus secretions, which are hyperintense on T2W MRI. Some minor salivary gland tumors, schwannomas, and inverted papillomas have sufficient water content and can be bright on T2W MRI. Postcontrast T1W MRI is particularly important in identifying dural/intracranial extension of tumors. PET scan is the first-line modality in monitoring patients after therapy because of very high negative predictive value. False-positive results can however occur because of infection, inflammation, and early treatment-related changes that take up to 3 months to resolve. This lecture will discuss the salient features of common benign sinonasal tumors and illustrate the anatomic patterns of spread for malignant tumors including perineural spread.

RC306C  Orbital Differential Diagnosis
Jenny K. Hoang MBBS (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) To apply a systematic approach to orbital masses. 2) Provide differentials for orbital masses based on location. 3) Appreciate overlapping imaging findings of orbital pathologies. 4) Recognize characteristic clinical and imaging features of orbital pathologies.

MSRO32
BOOST: Head and Neck—Integrated Science and Practice (ISP) Session

Multisession Courses

Participants
Moderator
Clifton David Fuller MD, PhD: In-kind support, General Electric Company Research Grant, Elekta AB
Sub-Events

MSRO32-01 Invited Speaker:


MSRO32-02 Radiotherapy-Treated Early Glottic Cancers: 15-Year Regional Cancer Center Experience

Jennifer Kwan BS (Presenter): Nothing to Disclose, Wilma M Hopman MA : Nothing to Disclose, Steve Hall MD, MSc: Nothing to Disclose, Timothy E Owen MD,FRCPC : Nothing to Disclose, Khaled Osman Zaza MD, FRCP : Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Accurate staging is the most important factor guiding the management of patients with localized glottic cancers. To date, CT has served as the primary imaging modality used for staging of laryngeal cancers, but it is known that MRI has a higher sensitivity to detect cartilage invasion. It is hypothesized that use of MRI provides improved staging accuracy and better outcomes for early glottic cancers. This study reports our 15-year regional cancer center outcomes of treatment for T1-2N0 glottic cancers. Findings reflect our unique experience with early adoption of MRI for tumor staging, which began in the 1990s. In addition, based on the poorer outcomes of patients of low-socioeconomic status described in literature, it was hypothesized that these patients may have a different set of prognostic factors than the general population. Our cancer center serves a large proportion of rural and low-income residents; this allowed for the identification of relevant prognostic factors for this population.

Materials/Methods: Medical records of 64 patients with T1-2N0 glottic cancers, treated from 1997-2012 at our institution, were retrospectively reviewed for patient, tumor, and treatment characteristics. Univariate analyses were performed and Kaplan-Meier curves were generated for 5-year disease-free (DFS), laryngectomy-free (LFS), disease-specific (DSS), cancer-specific (CSS), and overall (OS) survivals. National Cancer Institute definitions of survival outcomes were used.

Results: 59 patients received radiation and 5 received surgery as definitive treatment for T1-2N0 glottic cancers. Of the 59 patients who received radiation, 13 (22.0%) had a local recurrence of cancer, which was retreated in 9 cases with total laryngectomy, 2 with hemilaryngectomy, 1 with hemicordectomy, and 1 case was not operated on. The median time to recurrence was 12.3 months. 5-year DFS, LFS, DSS, CSS, and OS were 79.7%, 84.7%, 94.9%, 84.7%, and 79.7% respectively for radiation-treated cancers. Patients treated with upfront surgery had comparable outcomes with 5-year DFS, DSS, CSS, and OS of 75.0%, 100.0%, 100.0%, and 75.0% respectively. On univariate analysis, top factors relating to poor overall survival from radiation included supraglottic extension (p=0.01), use of feeding tube (p=0.02), and higher T stage (p=0.05).

Conclusion: This study describes optimal survival outcomes for patients with T1-2N0 glottic cancers that parallel or surpass CT-staged outcomes described in literature, despite the rural and low-income backgrounds of the study population. Results suggest that use of MR imaging to stage laryngeal cancers may be beneficial for achieving accurate staging and improved survival outcomes. Prognostic factors have also been identified for this unique patient population.

MSRO32-03 A Randomized Phase III Study of Adverse Events between Sequential (SEQ) versus Simultaneous Integrated Boost (SIB) Intensity Modulated Radiation Therapy (IMRT) in Nasopharyngeal Carcinoma; Preliminary Result

Anussara Songthong MD (Presenter): Nothing to Disclose, Danita Kannarunimit MD : Nothing to Disclose, Chakkapong Chakkabat MD : Nothing to Disclose, Chawalit Lertbutsayanukul MD : Nothing to Disclose

PURPOSE

Simultaneous integrated boost intensity modulated radiation therapy (SIB-IMRT) is widely used in treatment of nasopharyngeal carcinoma (NPC). Higher dose per fraction leads to increased tumor control probability despite higher risk of normal tissue complications. The purpose of this study is to investigate acute and late toxicities comparing SEQ-IMRT versus SIB-IMRT in patient with NPC.

METHOD AND MATERIALS

Newly diagnosed stage I-IVB NPC patients were stratified and randomized to receive SEQ-IMRT or SIB-IMRT. SEQ-IMRT consisted of two sequential radiation treatment plans; 2Gy x 25 fractions to low-risk planning target volume (PTV-LR) followed by 2Gy x 10 fractions to high-risk planning target volume (PTV-HR). In contrast, SIB-IMRT consisted of only one treatment plan; 2.12Gy x 33 fractions to PTV-LR and 1.7Gy x 33 fractions to PTV-HR, respectively. All patients received concurrent weekly cisplatin followed by three cycles of adjuvant cisplatin and SFU. Dosimetric data was compared between two IMRT plans. Toxicities were evaluated according to CTCAE version 4.03.

RESULTS

Between October 2010 and November 2013, 130 eligible patients were randomized between SEQ-IMRT (59 patients) and SIB-IMRT (71 patients). Dosimetric data showed significant difference in PTV-LR dose as well as median one parotid gland dose. With median follow-up time of 460 days (17-1211 days), there was no significant difference in toxicities between both IMRT techniques. During chemoradiation, the most common grade 3-5 acute toxicities were mucositis (14% vs 13.2%, SEQ vs SIB, p=0.897) followed by dysphagia (8.8% vs 10.3%, p=0.774) and xerostomia (8.8% vs 7.4%, p=0.512). During adjuvant chemotherapy period, 23.8% and 34.6% experienced grade 3 weight loss in SEQ-IMRT and SIB-IMRT (p=0.295). At 1 year, grade 3 weight

ABSTRACT

Purpose/Objective(s): Accurate staging is the most important factor guiding the management of patients with localized glottic cancers. To date, CT has served as the primary imaging modality used for staging of laryngeal cancers, but it is known that MRI has a higher sensitivity to detect cartilage invasion. It is hypothesized that use of MRI provides improved staging accuracy and better outcomes for early glottic cancers. This study reports our 15-year regional cancer center outcomes of treatment for T1-2N0 glottic cancers. Findings reflect our unique experience with early adoption of MRI for tumor staging, which began in the 1990s. In addition, based on the poorer outcomes of patients of low-socioeconomic status described in literature, it was hypothesized that these patients may have a different set of prognostic factors than the general population. Our cancer center serves a large proportion of rural and low-income residents; this allowed for the identification of relevant prognostic factors for this population.

Materials/Methods: Medical records of 64 patients with T1-2N0 glottic cancers, treated from 1997-2012 at our institution, were retrospectively reviewed for patient, tumor, and treatment characteristics. Univariate analyses were performed and Kaplan-Meier curves were generated for 5-year disease-free (DFS), laryngectomy-free (LFS), disease-specific (DSS), cancer-specific (CSS), and overall (OS) survivals. National Cancer Institute definitions of survival outcomes were used.

Results: 59 patients received radiation and 5 received surgery as definitive treatment for T1-2N0 glottic cancers. Of the 59 patients who received radiation, 13 (22.0%) had a local recurrence of cancer, which was retreated in 9 cases with total laryngectomy, 2 with hemilaryngectomy, 1 with hemicordectomy, and 1 case was not operated on. The median time to recurrence was 12.3 months. 5-year DFS, LFS, DSS, CSS, and OS were 79.7%, 84.7%, 94.9%, 84.7%, and 79.7% respectively for radiation-treated cancers. Patients treated with upfront surgery had comparable outcomes with 5-year DFS, DSS, CSS, and OS of 75.0%, 100.0%, 100.0%, and 75.0% respectively. On univariate analysis, top factors relating to poor overall survival from radiation included supraglottic extension (p=0.01), use of feeding tube (p=0.02), and higher T stage (p=0.05).

Conclusion: This study describes optimal survival outcomes for patients with T1-2N0 glottic cancers that parallel or surpass CT-staged outcomes described in literature, despite the rural and low-income backgrounds of the study population. Results suggest that use of MR imaging to stage laryngeal cancers may be beneficial for achieving accurate staging and improved survival outcomes. Prognostic factors have also been identified for this unique patient population.
loss was not significantly different between two arms. One-year overall survival (OS) and progression-free survival (PFS) were 93.9% and 96% in SEQ-IMRT and 98% and 88.8% in SIB-IMRT, respectively (p =0.406 for OS and 0.053 for PFS).

CONCLUSION

This randomized phase III trial comparing SIB-IMRT versus SEQ-IMRT in NPC showed no statistically significant difference between both IMRT techniques in terms of acute and late adverse events. Short-term tumor control and survival outcome were promising.

CLINICAL RELEVANCE/APPLICATION

SIB-IMRT (dose painting technique) resulted in similar adverse events compared with SEQ-IMRT (shrinking field technique) in NPC.

MSRO32-04 Post-Operative Simultaneous Integrated Boost-Intensity Modulated Radiation Therapy in Head and Neck Cancer: Outcomes From a Single Institution Series

Bhavana Vangara Chapman BS (Presenter): Nothing to Disclose, Peyman Kabolizadeh MD, PhD : Nothing to Disclose, Hebist Berhane MD : Nothing to Disclose, Ryan P. Smith MD : Nothing to Disclose, David Clump : Nothing to Disclose, Dwight E. Heron MD : Nothing to Disclose

ABSTRACT

Purpose/Objectives:

Despite aggressive post-operative radiotherapy with or without chemotherapy for advanced head and neck cancer, locoregional recurrence rates remain suboptimal. With respect to radiation treatment, patients are generally treated with sequential planning radiation treatment in which the same dose is delivered to shrinking tumor volumes. Accelerated hypofractionated schedules with the simultaneously integrated boost-intensity modulated radiation therapy (SIB-IMRT) technique have gained increased interest in hopes of obviating tumor repopulation. This study aimed to assess toxicities and outcomes in patients with head and neck cancer treated with SIB-IMRT post-operatively at a single institution.

Materials/Methods:

Between 2003 and 2012, 25 patients (21 males, mean age 57) with head and neck cancer were treated with post-operative SIB-IMRT at a single institution. Seventeen patients (68%) received chemotherapy. The median KPS at the time of treatment was 80 (80-100). Toxicities were recorded according to the Common Terminology Criteria for Adverse Events Version 4.0. Kaplan-Meier survival analyses were used to estimate local control (LC) and overall survival (OS) rates. The multivariate Cox regression method was used to model predictors of outcome.

Results:

The median follow-up after SIB-IMRT was 36 months (7-112 months). Four percent of patients had stage II disease while 20% and 76% of patients had stage III and IV disease, respectively. The majority of patients had laryngeal (40%) and oropharyngeal (20%) cancer, while remaining patients had oral cavity, hypopharynx, paranasal sinus, salivary, and unknown primary cancers. The median prescription dose was 66.0 Gy (60.0-70.4 Gy) delivered in 30 fractions (30-35 fractions). High-risk tumor volumes received a median dose of 2.12 Gy (2.00-2.25 Gy) per fraction while the low-risk volumes received a median dose of 1.80 Gy (1.64-2.00 Gy) per fraction. The 1/2/4-year LC, OS, and distant metastasis-free survival rates were 95.8/85.1/71.4%, 91.0/81.3/75.1%, and 95.0/95.0/88.0%, respectively. Five patients (20%) experienced acute grade 3 toxicity and one patient (4%) had late grade 3 toxicities. No acute or late grade 4 toxicity was reported. On univariate analysis, no risk factors were identified as significant predictors of local failure or OS.

Conclusion:

Post-operative SIB-IMRT is an effective and safe technique in the treatment of patients with head and neck cancer with or without concurrent chemotherapy. Our results with respect to outcome and toxicity are comparable to those obtained with conventional radiotherapy. For select patients, SIB-IMRT is a reasonable alternative strategy with potential clinical and operational advantages.

MSRO32-05 The Role of PET/CT in the Nodal Management of Squamous Cell Carcinoma of the Oral Cavity

Jennifer Lobo Shah MD (Presenter): Nothing to Disclose, Wendy Hara MD : Nothing to Disclose

PURPOSE

Standard treatment for oral cavity squamous cell carcinoma (OCSCC) is surgical resection followed by adjuvant therapy based on pathologic analysis. Pre-operative imaging has been used to determine nodal involvement and has guided determination of the need for a neck dissection (ND). We sought to evaluate the patterns of failure when a ND was omitted due to pre-operative PET/CT showing no nodal involvement.

METHOD AND MATERIALS

From 2003-2013, we treated 761 patients with OCSCC. A pre-operative PET/CT was performed for 333 patients, of which 260 were retrospectively reviewed. ND was omitted in 41 of these patients, which comprised the cohort for this analysis. Factors analyzed included demographics, imaging and pathologic data, treatment with adjuvant radiotherapy (RT), and patterns of failure. The Kaplan-Meier rates of local recurrence (LR), regional recurrence (RR), and overall survival (OS) were calculated.

RESULTS

Median follow-up was 37 months. Subsites included: 59% oral tongue, 22% alveolar ridge, 15% floor of mouth, 2% lip, 2% buccal mucosa, 2% retromolar trigone, and 0% hard palate. 41% were T1, 39% were T2, 12% were T3, and 7% were T4. ND was omitted due to a node-negative (NN) PET/CT in 44% or due to perineural invasion (PNI) seen at biopsy indicating a need for adjuvant RT in 29%. Other reasons included co-morbidities and the potential for complications. 46% of patients received adjuvant RT. At median follow-up, OS was 80%, LR was 20%, and RR was 22%. LR was associated with tumor size >2.5 cm (p=0.02) and close margins (p=0.06). Decreased OS was associated with tumor size >2.5 cm (p=0.01), close margins (p=0.06), and node-positive (NP) PET/CT (p=0.01). Of the 12 patients who had a NP PET/CT, the reason for ND omission was
PNI in 6 patients, early stage disease in 1 patient, potential complications in 3 patients, and unclear reasons in 2 patients. 33% of the RRs occurred in patients with a NP PET/CT.

CONCLUSION
This data shows a significant risk of RR in patients with OCSCC with ND omission on the basis of a NN PET/CT. Furthermore, decreased OS was seen in patients with a NP PET/CT with ND omission on the basis of meeting pathologic indications for adjuvant RT. This suggests that ND may play an important therapeutic role in the management of patients with OCSCC irrespective of PET/CT findings.

CLINICAL RELEVANCE/APPLICATION
PET/CT should be used with caution when determining the need for neck dissection in OCSCC.

Prediction Response to Intensity-Modulated Radiotherapy of Nasopharyngeal Carcinoma: A Dynamic Contrast-Enhanced MR Imaging Study at 3T

Dechun Zheng MS (Presenter): Nothing to Disclose, Chen Yunbin MD: Nothing to Disclose, Xiangyi Liu BS: Nothing to Disclose, Weibo Chen PhD: Nothing to Disclose, Queenie Chan PhD: Nothing to Disclose, Chaobin Huang: Nothing to Disclose, Youping Xiao: Nothing to Disclose, Wang Ren: Nothing to Disclose, Jianji Pan: Nothing to Disclose

PURPOSE
To prospectively evaluate dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) as a tool for assessing short-term control of chemoradiotherapy (CRT) in nasopharyngeal carcinoma (NPC).

METHOD AND MATERIALS
Fifty patients with local advanced NPC scheduled for neoadjuvant chemotherapy (NAC) following intensity-modulated radiation therapy (IMRT) were studied. DCE-MRI was performed within one week before NAC and repeated one week after IMRT treatment using a 3T clinical scanner system (Achieva TX, Philips Healthcare). Clinical response was evaluated after completed CRT according to the RECIST criteria. Four kinetic parameters ($K_{trans}$, $K_{ep}$, $v_p$ and $v_e$) were measured based on extended Tofts’ Model and compared to different clinical response groups using student T or Mann-Whitney U test.

RESULTS
$K_{trans}$ and $K_{ep}$ values were reduced after one week IMRT in patients with clinical treatment response after NAC and CRT treatment. The pretreatment $K_{trans}$ value, percentage change and difference values of $K_{trans}$ and $K_{ep}$ ($K_{trans(Perc)}$ and $K_{ep(Perc)}$), $\Delta K_{trans}$ and $\Delta K_{ep}$ between pretreatment and after one week IMRT, and tumor regression after one week IMRT were all significantly larger in complete response (CR) patients than those with residual disease (partial response, PR) after radical CRT ($P < 0.05$). We found out in boxplot analysis that $\Delta K_{trans}$, $K_{trans(Perc)}$ and $K_{ep(Perc)}$ metrics were predictive imaging markers for response assessment of NPC subjects who treated with CRT, which demonstrated that patients who were CR after CRT clustered in separate regions from those were PR (Figure 1). The receiver operating characteristic (ROC, Figure 2) analyses proved that diagnosis efficacies of single $K_{trans}$, $\Delta K_{trans}$, $\Delta K_{ep}$, $K_{trans(Perc)}$ and $K_{ep(Perc)}$ values ranging from 71.8 - 87.0%. And combined with tumor shrink ratio with above parameters yielded the highest diagnosis efficacy (90.2%) as well as the highest sensitivity (92.3%) and specificity (81.1%), respectively.

CONCLUSION
DCE-MRI has the potential to predict short-term control of locally advanced NPC by mean of earlier evaluating changes of tumor vascularization and volume during treatment. The $K_{trans}$ may be potential markers for predicting the response to CRT of NPC.

CLINICAL RELEVANCE/APPLICATION
DCE-MRI study prior and during IMRT process is available to early predict clinical response of local advanced NPC treated with CRT. $K_{trans}$ might become non-invasive prognostic markers of NPC.

Prognostic Interplay of Positron Emission Tomography (PET)-based Metrics and Human Papillomavirus (HPV) Status in Oropharyngeal Squamous Cell Carcinoma (OP-SCC)

John Martin Floberg MD, PhD (Presenter): Nothing to Disclose, Pranshu Mohindra MD, MBBS: Nothing to Disclose, Nevein F. Ibrahim MD: Nothing to Disclose, Samuel Barash MD: Nothing to Disclose, Heather M Geye: Nothing to Disclose, David T. Yang MD: Nothing to Disclose, Scott B. Perlman MD: Nothing to Disclose, Timothy M McCulloch MD: Nothing to Disclose, Greg Hartig MD: Nothing to Disclose, Paul M. Harari MD: Nothing to Disclose, Randall J. Kimple MD, PhD: Nothing to Disclose

PURPOSE
To investigate the prognostic interplay of HPV status and PET-based metrics including maximum standardized uptake value ($SUV_{max}$), peak SUV ($SUV_{peak}$), metabolic tumor volume (MTV), and tumor glycolytic activity (TGA) in OP-SCC.

METHOD AND MATERIALS
With IRB approval, we identified 352 patients with OP-SCC treated with radiotherapy from 1990-2010. Patients
with pre-treatment PET scans and known HPV status were identified. SUV$_{\text{max}}$, SUV$_{\text{peak}}$, MTV (all tumor above 50% of SUV$_{\text{max}}$), and TGA (MTV*SUV$_{\text{mean}}$) were obtained for both primary tumor (P) and lymph nodes (N). Means were compared using the t-test. Kaplan-Meier log-rank test and Cox regression analysis were performed for freedom from recurrence (FFR) and overall survival (OS); patients distributed across median values.

RESULTS

125 patients had PET scans available for analysis (mean follow-up 2.8 years), of which HPV status was available for 72 patients (60 positive, 12 negative). The mean P- and N- SUV$_{\text{max}}$, SUV$_{\text{peak}}$, MTV, and TGA values were not significantly different between the HPV positive and negative groups. Measures predictive of 3-year OS included low P-TGA (92 v. 76%, p=0.02) and low P-MTV (90 v. 85%, p=0.05). Low P-TGA was also predictive of improved FFR (94 v. 77%, p=0.01). Non-significant but distinct separation of FFR survival curves was seen with P-SUV$_{\text{max}}$, SUV$_{\text{peak}}$, and MTV. Similar separation was noted in P-FFR and distant-FFR by using primary tumor metrics, while nodal-metrics did not appear to display any trends. On Cox regression analysis for FFR, HPV status was the dominant factor when compared to each of the PET-metrics individually, except P-TGA which was also independently significant (HR: 0.19, p=0.01) and P-SUV$_{\text{max}}$ (HR: 0.3, p=0.09). In addition to HPV status, both P-TGA and P-SUV$_{\text{max}}$ provided additional stratification of patients into four separate cohorts based on FFR, with significant stratification effect in the HPV positive population.

CONCLUSION

While the dominant prognostic impact of HPV status is clearly noted, PET-metrics, particularly P-TGA and P-SUV$_{\text{max}}$ may provide additional prognostic information in OP-SCC. The interplay of these important prognostic factors will be further defined using large prospective databases.

CLINICAL RELEVANCE/APPLICATION

PET imaging metrics provide additional stratification of patient cohorts beyond HPV status. This prognostication, if validated prospectively, could help further individualize treatment recommendations.

Low Baseline Lymphocyte Count and Lymphocyte to Neutrophil Ratio May Predict Poorer Overall Survival in Patients with Head and Neck Cancer Treated with Radiation Therapy: Role of Immunofunction?

Junjian Huang BS (Presenter): Nothing to Disclose, Joseph Kaminski MD: Nothing to Disclose, Jeff Campbell: Nothing to Disclose, Jing Zhao: Nothing to Disclose, Paul Stanton: Nothing to Disclose, Ahmad Al-Basheer PhD: Nothing to Disclose, Byron Grady Dasher MD: Nothing to Disclose, Jerry W. Howington MD: Nothing to Disclose, Jed Weems Howington MD: Nothing to Disclose, John Stewart: Nothing to Disclose, William Dean Martin MD: Nothing to Disclose, Chris Sheils MD: Nothing to Disclose, Feng-Ming Kong MD, PhD: Nothing to Disclose

PURPOSE

Low total lymphocyte count and lymphocyte to neutrophil ratio are directly related to immunofunction and have been reported as poor prognostic indicators for multiple cancers at various stages after anticancer treatment. We hypothesized that baseline lymphocyte count and lymphocyte to neutrophil count correlate with overall survival in patients with head and neck cancer treated with radiation based therapy.

METHOD AND MATERIALS

This is a retrospective analysis of consecutive patients with non-metastatic Stage I-IV head and neck cancer who were treated with radiation therapy from January of 2003 to October of 2013. Pre-treatment complete white blood count, demographic, and clinical variables were extracted from medical records and vital status was obtained by using the Social Security Death Index. Variables and outcomes were analyzed using tests of R.

RESULTS

Of the 348 patients reviewed, 254 had baseline complete blood counts (Median age 57, Male 178, Female 76, 201 received chemotherapy). The median follow-up duration is 22 months. Higher baseline lymphocyte count and lymphocyte to neutrophil ratio were significantly associated with lower mortality (HR: 0.34, 95% CI 0.23-0.53, p=0.000001 and HR: 0.91, 95% CI 0.84-0.97 p=0.005). The 2 year survival rates for patients with normal lymphocyte counts versus patients with abnormal counts were 65% (CI: 0.724-0.865, 0.567-0.745) and 61% (CI: 0.714-0.941, 0.476-0.783), respectively. Furthermore, higher neutrophils (HR: 1.07 95% CI 1.001-1.141, p=0.047) and seg counts (HR: 1.04, p=0.0007) were correlated with increased mortality. Stage IV cancer patients had worsened overall survival compared to Stage I-III (HR 2.2, CI: 1.3-3.6, P=0.0026). Other variables such as chemotherapy(HR: 0.7, P=0.174), age, and gender were not significantly associated with overall survival.

CONCLUSION

This study demonstrates that baseline lymphocyte count and lymphocyte to neutrophil ratio is directly correlated with overall survival in patients with head and neck cancers treated with radiation therapy. This result suggests immune function may play an important role in overall survival of head and neck patients. Prospective studies are needed to validate this interesting funding.

CLINICAL RELEVANCE/APPLICATION

To advocate the property of pre-treatment baseline lymphocyte count and lymphocyte to neutrophil ratio as
prognostic indicators for overall survival in HEENT cancer patients treated with radiation therapy.

**MSRO32-09 Criteria for a Prophylactic Gastrostomy in Head and Neck Cancer Patients Receiving Concurrent Radiochemotherapy**

Edwin Boelke (Presenter): Nothing to Disclose

**ABSTRACT**

**Purpose/Objective(s):** Concurrent chemoradiation for head-and-neck cancer (HNC) may lead to increased rates of long term dysphagia as a severe side effect. Percutaneous endoscopic gastrostomy (PEG) may be indicated in numerous situations in HNC patients undergoing chemotherapy when normal nutrition becomes impossible. It is still under debate, which predictive factors for prophylactic PEG tube insertion are useful.

**Materials/Methods:** From an institutional database, 101 patients (72 male, 29 female, mean age 59.5 years) with concurrent radiochemotherapy for HNC were included in this study. Clinical factors (ECOG performance status, age, TNM stage), administration of chemotherapy and several organ-at-risk dosimetric parameters (oropharynx + 1 cm margin, superficial pharyngeal constrictor muscle, larynx, oral cavity) were correlated with the need for tube feeding or parenteral nutrition for more than 4 days using a multiple logistic regression model.

**Results:** Whereas several dosimetric and clinical factors were significant predictors for the need of artificial nutrition on univariate analysis, on multivariate analysis only three factors remained independently significant: Mean dose to the oropharynx + 1 cm circumferential margin, ECOG performance state and the use of chemotherapy.

**Conclusions:** Using a multiple logistic regression model we could distinguish HNC-patients with different risk factors for the need of additional feeding during radiochemotherapy.

**SSG10**

**Neuroradiology/Head and Neck (Thyroid & Parathyroid Imaging)**

**Scientific Papers**

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**Participants**

Moderator
Jenny K. Hoang MBBS : Nothing to Disclose
Moderator
Ashok Srinivasan MD : Author, Amirsys, Inc

**Sub-Events**

SSG10-01

**Lifetime Attributable Risk of Cancer from Radiation Exposure during Parathyroid Imaging: Comparison of 4DCT and Sestamibi Scintigraphy**

Jenny K. Hoang MBBS (Presenter): Nothing to Disclose, Robert E. Reiman MD : Nothing to Disclose, Giang Huong Nguyen MD, PhD : Nothing to Disclose, Natalie Januzis : Nothing to Disclose, Carolyn R. Lowry BS : Nothing to Disclose, Bennett B. Chin MD : Nothing to Disclose, Terry T. Yoshizumi PhD : Nothing to Disclose

**PURPOSE**

The aim of this study was to measure the effective dose and organ doses for parathyroid 4DCT and sestamibi scintigraphy, and to estimate the lifetime attributable risk (LAR) of cancer incidence based on the measured radiation doses.

**METHOD AND MATERIALS**

We measured the organ radiation doses for 4DCT and sestamibi scintigraphy (with SPECT-CT) based on scanning with our institution's protocols. An anthropomorphic phantom with MOSFET detectors was scanned to measure radiation dose from CT. Organ doses from the radionuclide for scintigraphy were based on NUREG/CR-6345. Effective dose was calculated for 4DCT and scintigraphy, and used to estimate the LAR of cancer incidence for patients differing in age and gender with the approach established by the Biologic Effects of Ionizing Radiation VII report. A 55-year-old female was selected as the standard patient based on demographics of patients with primary hyperparathyroidism.

**RESULTS**

The organs that received the highest radiation dose for 4DCT were the thyroid (150 mGy), salivary glands (137 mGy) and the esophagus (87 mGy). For sestamibi scintigraphy, the highest organ doses were to the colon (42 mGy), gall bladder (35 mGy) and the kidneys (32 mGy). The effective dose was 26 mSv for 4DCT compared to 12 mSv for sestamibi scintigraphy. The baseline lifetime incidence of any cancer in the unexposed standard patient was 45438/100,000. In the exposed patient, the LAR for cancer incidence was 172/100,000 for 4DCT and 66/100,000 for sestamibi scintigraphy. This resulted in an increase in lifetime incidence of cancer over baseline risk of 0.46% for 4DCT and 0.18% for sestamibi scintigraphy. In a 25-year-old female (nonstandard) the increase in the lifetime incidence of cancer over baseline risk was higher at 0.94% for 4DCT and 0.36% for sestamibi scintigraphy.
CONCLUSION

Effective dose from 4DCT is double that of sestamibi scintigraphy, but both studies cause negligible increases in lifetime risk of cancer. Clinicians should not allow concern for radiation-induced cancer influence decisions regarding workup in older patients with primary hyperparathyroidism. In younger women, 4DCT should not be the first-line imaging modality given a substantially higher LAR from 4DCT compared to scintigraphy.

CLINICAL RELEVANCE/APPLICATION

Clinicians should not allow concern for radiation-induced cancer influence decisions regarding workup in older patients (≥ 55 years) with primary hyperparathyroidism.

SSG10-03

TIRADS and Ultrasound Elastography: Useful Tools in Recommending Repeat FNA for Solid Thyroid Nodules with Nondiagnostic Fine Needle Aspiration Cytology

Vivian Youngjean Park MD (Presenter): Nothing to Disclose, Eun-Kyung Kim: Nothing to Disclose, Jin Young Kwak MD: Nothing to Disclose, Jung Hyun Yoon MD: Nothing to Disclose, Hee Jung Moon MD: Nothing to Disclose

PURPOSE

We aimed to evaluate the role of the thyroid imaging reporting and data system (TIRADS) and elastography in recommending repeat fine-needle-aspiration (FNA) for solid thyroid nodules with nondiagnostic FNA cytology.

METHOD AND MATERIALS

A total of 143 solid thyroid nodules in 141 patients were included. Each was classified according to the TIRADS; solid component, hypoechoogenicity or marked hypoechoegenicity, microlobulated or irregular margins, microcalcifications, and taller-than-wide shape were considered suspicious US features. Nodules with one, two, three or four, or five suspicious US features were classified as category 4a, 4b, 4c or 5 respectively. Elastography scores were classified according to the Rago and Asteria criteria. We investigated the malignancy risk for each TIRADS category and the corresponding sensitivity, specificity, negative predictive value, positive predictive value and accuracy of elastography.

RESULTS

Of 141 nodules, 25 were malignant, 79 were benign, and 39 were not confirmed. None of the US features, frequencies of TIRADS categories or classification according to the Rago and Asteria criteria significantly differed between benign and malignant nodules. The malignancy risk for TIRADS category 4a, 4b, 4c and 5 were 6.7% (1/15), 15.8% (6/38), 20.7% (17/82) and 12.5% (1/8) respectively, when including nonconfirmed nodules in the denominator. When analyzing confirmed nodules, elastography showed the highest negative predictive value for TIRADS category 4a; sensitivity, specificity, negative predictive value, positive predictive value and accuracy were 0% (0/1), 85.7% (6/7), 85.7% (6/7), 0% (0/1), 75% (6/8) for the Rago criteria and 100% (1/1), 85.7% (6/7), 100% (6/6), 50% (1/2) and 87.5% (7/8) for the Asteria criteria. The Asteria criteria accurately classified the 1 malignant nodule in the TIRADS category 4a as malignant.

CONCLUSION

Observation may be considered for solid thyroid nodules with nondiagnostic cytology that are classified as TIRADS category 4a and benign based on Asteria criteria, due to their low malignancy risk and high negative predictive value of elastography. Repeat FNA is warranted for TIRADS category 4b, 4c or 5, regardless of elastography features.

CLINICAL RELEVANCE/APPLICATION

Elastography is a useful tool in recommending repeat FNA for solid thyroid nodules with initial nondiagnostic cytology, when no other suspicious US features are present.

SSG10-04

Ultrasound Elastography Using Carotid Artery Pulsation in Differential Diagnosis of Sonographically Indeterminate Thyroid Nodules

Bongguk Yim (Presenter): Nothing to Disclose, Woo Jung Choi MD: Nothing to Disclose, Jeong Seon Park MD: Nothing to Disclose, Hye Ryoung Koo MD: Nothing to Disclose, Soo-Yeon Kim: Nothing to Disclose

PURPOSE

The purpose of this study was to evaluate the diagnostic performance of gray-scale ultrasound (US) and a new method of thyroid US elastography using carotid artery pulsation in the differential diagnosis of sonographically indeterminate thyroid nodules.

METHOD AND MATERIALS

A total of 102 thyroid nodules with indeterminate gray-scale US features from 102 patients (20 men and 82 women; age range, 16-74 years, mean age: 51 years) were included. Gray-scale US images were reviewed and scored from 1 (low) to 5 (high) according to the possibility of malignancy. US elastography was performed using carotid pulsation as a compression source. The elasticity contrast index (ECI), which quantifies local strain...
contrast within a nodule, was automatically calculated. The radiologist reassessed scores after concurrently reviewing gray-scale US and elastography. Receiver operating characteristic curve analysis was used to evaluate the diagnostic performances of each data set and to compare the Az values of gray-scale scoring, ECI, and combined assessment scoring.

RESULTS

Malignant thyroid nodules were more hypoechoic than benign nodules. The ECI was significantly higher in malignant nodules than in benign thyroid nodules. The Az values of each data set were 0.755 (95% CI, 0.660-0.832) for gray-scale, 0.835 (95% CI, 0.748-0.901) for ECI, and 0.853 (95% CI, 0.769-0.915) for combined assessment. The Az value for the combined assessment of gray-scale and ECI was significantly higher than for gray-scale alone (p = 0.022).

CONCLUSION

Combined assessment with gray-scale US and elastography using carotid artery pulsation is helpful for differentiating sonographically indeterminate thyroid nodules.

CLINICAL RELEVANCE/APPLICATION

Thyroid US elastography using carotid artery pulsation may be a useful adjunctive parameter for the differential diagnosis of sonographically indeterminate thyroid nodules.

Parathyroid Adenomas and Hyperplasia on 4DCT: Grading System for Degree of Confidence

Manisha Bahl MD, MPH (Presenter): Nothing to Disclose, Ali R. Sepahdari MD: Nothing to Disclose, Julie A. Sosa MD: Nothing to Disclose, Jenny K. Hoang MBBS: Nothing to Disclose

PURPOSE

Prior to performing minimally-invasive parathyroidectomy, preoperative imaging is required to localize parathyroid adenomas with a high degree of confidence. Several signs on 4DCT can be used to determine degree of confidence. The purpose of this study is to evaluate the performance of a confidence grading system for parathyroid lesions on 4DCT.

METHOD AND MATERIALS

We retrospectively reviewed preoperative 4DCT scans in 63 consecutive patients from November 2012 to December 2013 with pathologically-proven parathyroid adenomas or hyperplasia. Two radiologists reviewed the CT images to localize parathyroid lesions. Lesions detected on imaging and confirmed by surgery were categorized by a three-category confidence grading system based on four enhancement patterns (Types A-D) and three secondary signs. "Consistent with" was defined as Type A/B enhancement with >/=1 secondary findings. "Suspicious" was Type A/B enhancement without secondary findings or Type C/D enhancement with >/=1 secondary findings. "Possible" was Type C/D enhancement without secondary findings. The enhancement patterns required the lesion to be lower in attenuation than the thyroid gland on the noncontrast phase but differed on the arterial and delayed phases. Secondary findings were size >/=1 cm, a cystic component, and the polar vessel sign. We calculated and compared the prevalence and positive predictive values (PPV) of each grading system category.

RESULTS

63 patients had 75 lesions. 54 patients had single adenomas and nine patients had multigland disease with 21 lesions. The sensitivities for single gland and multigland disease were 94% and 52%, respectively. 74 lesions (including four false positives) could be categorized by the grading system. "Consistent with" was seen in 51% of lesions and had 100% PPV. "Suspicious" represented 37% of lesions and had 96% PPV. Finally, "possible" represented 11% of lesions and had the lowest PPV (73%).

CONCLUSION

A grading system allows radiologists to communicate the degree of confidence when a lesion is detected on 4DCT, which is valuable for preoperative planning. The proposed system performs as intended in that the highest confidence grade has the highest PPV and the lowest grade has the lowest PPV.

CLINICAL RELEVANCE/APPLICATION

A 4DCT grading system can communicate degree of confidence for parathyroid adenomas, and detection of a lesion with the highest confidence grade may reduce the need for further imaging.

Intra-reader Agreement for Color Based Elastograms in Thyroid Elastography

Manjiri K. Dighe MD (Presenter): Research Grant, General Electric Company, Jeff Thiel : Nothing to Disclose, Theodore J. Dubinsky MD : Nothing to Disclose

PURPOSE

To assess intra-reader agreement in evaluation of the color elastograms in thyroid elastography using...
METHOD AND MATERIALS

After IRB approval, elastograms were obtained by Shear-wave elastography from 77 individuals, with a total of 96 thyroid nodules. Elastography data was acquired without any external compression using the Supersonics Aixplorer machine. Each nodule had multiple color elastograms saved per nodule. 1 reader blinded to the final cytopathology results was asked to score the elastogram images based on a standard 5-point scale. The reader was then asked to rescore the elastograms after a period of 15 days and was also blinded to the prior results. Results were also compared to the cytopathology diagnosis based on Bethesda classification. In addition, since each nodule had multiple images, variability of scoring within a single nodule was also evaluated.

RESULTS

There was overall good intra-reader agreement in scoring the elastograms with a concordance correlation coefficient of 0.83, a weighted kappa of 0.71 with a 95% confidence interval of 0.66 to 0.76 and a mean Intraclass correlation coefficient (ICC) of 0.83 and 0.90. The Area under the curve for accurate diagnosis of the nodule as being benign of malignant was 0.82. The variability in the scoring between the benign nodules was less than that in the malignant nodules with a variance of 0.64 and 1.38 respectively.

CONCLUSION

Our study indicates that there was good overall intra-reader agreement for qualitative scoring of the elastograms. The overall variance in the scoring of benign nodules was less than that in the malignant nodules. There could be bias in this since the number of malignant nodules in our study was smaller than benign nodules. Since Shearwave elastography provides quantitative values for the stiffness in the nodule, there would be less of a discordance and less variance compared to scoring color elastograms for thyroid nodule elastography.

CLINICAL RELEVANCE/APPLICATION

Decreasing the intra-reader variability in thyroid elastography is important. We also evaluated the variance in scoring each individual nodule since in every exam multiple images are acquired per nodule and it is important to know which particular score should be assigned to a nodule to be able to provide accurate diagnosis.

SSG10-07

Preoperative Differentiation of Thyroid Adenomas and Thyroid Carcinomas Using High Resolution Contrast-enhanced Ultrasound (CEUS)

Ernst Michael Jung MD (Presenter): Nothing to Disclose, Stefan Schleder MD: Nothing to Disclose, Lena Dendl: Nothing to Disclose, Christian Roland Stroszczynski MD: Nothing to Disclose

PURPOSE

To evaluate the impact of high-resolution contrast-enhanced ultrasound (CEUS) in combination with Color Coded and Power Doppler Sonography (CCDS/PD) in the preoperative differentiation of thyroid adenomas and thyroid carcinomas.

METHOD AND MATERIALS

A total of 111 patients (60 female, median age 54 years) underwent surgery for thyroid adenoma and thyroid carcinoma. CCDS/PD and CEUS were performed in all patients by an experienced examiner using a multifenque frequency linear transducer (6-9 MHz) and were digitally stored. Reading of the ultrasound images was performed by two experienced radiologists in consensus for CEUS a bolus injection of 1 ml Sulfurhexaflouride-Microbubbles (Sonovue®) was used. A histopathological evaluation was obtained as standard of reference in all patients.

RESULTS

80 thyroid adenomas and 31 thyroid carcinomas were detected. Mean diameter of thyroid adenomas and thyroid carcinomas was 27 mm and 25 mm, respectively. The differences in microcirculation of thyroid adenomas and thyroid carcinomas were statistically highly significant (p < 0.01). Representative features for thyroid adenomas were either no wash-out or wash-out with persisting edge in late phase, for thyroid carcinomas a complete wash-out in late phase. Thus, calculation of the sensitivity, specificity, positive and negative predictive value of 82%, 91%, 96% and 63%, respectively, for the differentiation of benignity and malignancy was possible.

CONCLUSION

Dynamic evaluation of microcirculation using CEUS and CCDS/PD enables a more reliable preoperative discrimination between thyroid adenomas and thyroid carcinomas.

CLINICAL RELEVANCE/APPLICATION

CEUS enables a more reliable preoperative discrimination between thyroid adenomas and thyroid carcinomas.

SSG10-08

Dual-energy Multiphasic CT Scan for Localization of Discrepant or Unlocalized Parathyroid Adenomas
Adenomas

Reza Forghani MD, PhD (Presenter): Nothing to Disclose, Michael Roskies MD: Nothing to Disclose, Michael Hier MD: Nothing to Disclose, Alex Mlynarek: Nothing to Disclose, Mark Levental MD: Nothing to Disclose

PURPOSE

Accurate pre-operative localization of parathyroid adenomas (PAs) is essential for successful minimally invasive surgery, and is typically based on two concordant studies. 4-dimensional MDCT is increasingly used for localization of PAs. There are also isolated reports of dual-energy CT (DECT) for localization of PAs but no systematic evaluation of this technique. DECT has the potential to increase accuracy of PTA detection by enabling more accurate iodine content evaluation and to eliminate the need for an unenhanced scan, reducing radiation exposure. In this study, we evaluated the utility of multiphasic DECT for PA localization in a group of patients having discrepant or unidentified PAs.

METHOD AND MATERIALS

20 patients with primary hyperparathyroidism having either discrepant or unlocalized PAs underwent a multiphasic DECT in a 64-slice scanner (GE Discovery CT750HD). Scans were obtained at 25, 55, and 85 sec after injection of 80 mL of iopamidol at 3.5 mL/sec. DECT scans were reconstructed as 70 keV monochromatic images and source images transferred to a dedicated workstation for reconstruction of virtual monochromatic images. The scans were prospectively reviewed by 2 attending head and neck radiologists. The final results were compared with localization during minimally invasive surgery and histopathologic confirmation.

RESULTS

Out of 20 patients, 11 had negative and 9 discordant standard imaging. DECT identified PAs in 8 of 11 and 7 of 9 patients, respectively. Of the 15 PAs, 7 were prospectively identified as PA candidates but characterized as atypical, based on absence of rapid arterial phase enhancement and early washout and/or presence of internal low attenuation areas. 7 patients have so far undergone surgery, and DECT correctly localized the PA in 6 of 7 patients, for a total of 7 PAs (one patient had bilateral PAs).

CONCLUSION

3-phase DECT without an unenhanced scan can accurately localize PAs in a significant proportion of unlocalized or discrepant cases. Although perfusion characteristics are important, a high proportion of PAs lacked typical perfusion characteristics in this patient population but were identifiable based on other features.

CLINICAL RELEVANCE/APPLICATION

Multiphasic DECT without an unenhanced scan can accurately localize a significant number of PAs not localized by conventional imaging enabling successful minimally invasive surgery with reduced surgical exploration and associated patient morbidity.

SSG10-09

4DCT in the Evaluation of Hyperparathyroidism: Predictors of Parathyroid Single Gland and Multigland Disease

Ali R. Sepahdari MD (Presenter): Nothing to Disclose, Manisha Bahl MD, MPH: Nothing to Disclose, Jenny K. Hoang MBBS: Nothing to Disclose

PURPOSE

Parathyroid multigland disease (MGD) is a challenging problem for radiologists. Other lesions in the patient may be missed after the first lesion is detected because they are small or not suspected. We aim to compare 4DCT findings of single gland (SG) and MGD to identify findings that may predict MGD.

METHOD AND MATERIALS

We retrospectively reviewed 35 patients with MGD and 129 patients with SG lesions who had preoperative 4DCT scans at two institutions between September 2011 and December 2013. The following data were recorded: presurgical calcium and PTH levels, number of candidate lesions identified with 4DCT, and longest measurement of abnormal glands seen on CT. Parametric and non-parametric statistical tests were applied in order to determine features or combinations of features that could predict MGD.

RESULTS

Mean size of MGD was 8.8 mm and significantly smaller than mean size 11.8 mm for SG lesions (p = .001). MGD also had lower serum PTH (p = .03). Fisher’s exact test showed that identification of only 1 abnormal gland, versus no abnormal glands or multiple abnormal glands, was strongly predictive of single gland disease (p = .0001, likelihood ratio [LR] = 5). The finding of only 1 abnormal gland was 86% specific for single gland disease (14% missed MGD). Adding the requirement that the abnormal gland measure at least 10 mm in maximal dimension resulted in 94% specificity for SG disease (6% missed) (p = .0001, LR 8.5).

CONCLUSION

Identification of a single abnormal gland measuring at least 10 mm on 4DCT is highly specific for single gland
disease. Conversely, when the candidate lesion is less than 1cm, the radiologists should be more suspicious for MGD and review the scan closely for another lesion. This information can help radiologists to improve the sensitivity of future 4DCT interpretations for MGD.

**CLINICAL RELEVANCE/APPLICATION**

Improving the detection of MGD or raising suspicion for MGD to the surgeons allows for a more informed clinical management plan and appropriate selection of patients for minimally invasive surgery.

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**MSRO33**

**BOOST: Head and Neck—Case-based Review (An Interactive Session)**

**Multisession Courses**

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AMA PRA Category 1 Credits™: 1.25  
ARRT Category A+ Credits: 1.50  
Tue, Dec 2 3:00 PM - 4:15 PM  
Location: S103AB

**Participants**

Suresh K. Mukherji MD (Presenter): Nothing to Disclose  
Sung Kim MD (Presenter): Nothing to Disclose  
Carol R. Bradford MD (Presenter): Nothing to Disclose  
Francis Paul Worden MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review common tumors of the head and neck. 2) Review imaging findings in head and neck malignancies that specifically change staging. 3) Review the value of imaging in directly affecting management and treatment.

**ABSTRACT**

This session will be tumor board that includes a head and neck radiologist, head and neck surgeon, medical oncologist and radiation oncologist. We will discuss a variety of head and neck cancer cases and illustrate the value-added benefits and highlight of imaging affects staging, treatment and management.

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**SSJ17**

**Neuroradiology/Head and Neck (ENT Oncology)**

**Scientific Papers**

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AMA PRA Category 1 Credits™: 1.00  
ARRT Category A+ Credit: 1.00  
Tue, Dec 2 3:00 PM - 4:00 PM  
Location: N227AB

**Participants**

Moderator  
Ashley Hawk Aiken MD: Nothing to Disclose  
Moderator  
Barton F. Branstetter MD: Nothing to Disclose

**Sub-Events**

**SSJ17-01**

Proposal of a Sequential Clinico-Radiological Protocol for Aetiological Characterisation of Cervical Lymphadenopathy by Comparing the Accuracies of Ultrasonography (USG), Elastography and MDCT

Sravanthi Mantripragada MBBS (Presenter): Nothing to Disclose  
Raja Sekaran Kattumannarkudi Ramalingam MBBS: Nothing to Disclose  
Meera Krishnakumar DMRD, MD: Nothing to Disclose

**PURPOSE**

To determine the **most accurate modality** and propose a sequential protocol for cause identification of cervical lymphadenopathy.

**METHOD AND MATERIALS**

The study population consisted of 121 nodes and a control of 11 reactive nodes. USG and Strain elastography were performed with an Acuson S2000 unit. ImageJ software was used to analyse Elastographic images. MDCT was performed using a Toshiba 64 slice scanner. Based on characteristics like size, shape, reticulation, type of vascularity, hilar echogenicity, necrosis, matting, percentage of elastographic stiffness, nodes were diagnosed and compared with the final HPE diagnosis. Accuracy of each modality (USG, combination of USG and Elastography and MDCT) was estimated by calculating the sensitivity, specificity, PPV and NPV for each aetiology (Lymphoma, TB, Metastasis and Reactive). The modalities were compared in pairs to determine the most accurate modality for cause characterization. P-values, PPV, NPV and PLR for certain characteristics of
USG and MDCT which favoured some aetiologies were calculated. The data was analysed using Fisher's exact test and Pearson's Chi-squared test. A p value <0.05 was considered significant.

RESULTS

USG was the most accurate modality, followed by MDCT and combination of USG and Elastography, in that order. On USG: -Intranodal reticulation with posterior acoustic enhancement implies Lymphoma -Displaced vascularity or necrosis and matting implies TB -Hilar vascularity implies Reactive -Peripheral or mixed vascularity imply Metastasis On MDCT: -Heterogeneous enhancement and low attenuation centres (not necrosis) implies Metastasis -Thick nodular capsular enhancement with internal septae or matting or peripheral/multilocular enhancement or necrosis implies TB

CONCLUSION

USG is the preferred modality for cause characterization of cervical lymphadenopathy. Elastography significantly reduces the accuracy of USG, when used in tandem, especially in cases of TB. This implies that Elastography has very limited application in the cause characterization of cervical lymphadenopathy. TB significantly reduces the accuracy of ultrasound modalities in cause determination.

CLINICAL RELEVANCE/APPLICATION

This study proposes a low-cost, low-radiation standard clinico-radiological step-by-step protocol (in fig) for approach to cervical lymphadenopathy, which is of practical application.

SSJ17-02

Comparison of Accuracies between US-guided Fine Needle Aspiration and US-guided Core Needle Biopsy to Detect Malignancy and to Make Tissue-specific Diagnosis of Salivary Gland Tumors

Seung-Won Jang MD (Presenter): Nothing to Disclose, Hye Joung Eom MD: Nothing to Disclose, Myung-Su Ko MD: Nothing to Disclose, Jeong Hyun Lee MD, PhD: Nothing to Disclose, Young Jun Choi MD: Nothing to Disclose, Rangyoung Yoon MD: Nothing to Disclose, Jung Hwan Baek: Nothing to Disclose

PURPOSE

To compare the diagnostic accuracies of ultrasonography-guided fine needle aspiration (USFNA) and core needle biopsy (USCNB) for detecting malignant tumors of the salivary gland and for tissue-specific diagnosis of benign and malignant tumors in a tertiary hospital

METHOD AND MATERIALS

This retrospective study was approved by our institutional review board and informed consents were waived. From 2003 to 2012, 354 consecutive patients underwent USFNA (n = 121) or USCNB (n = 233) for a salivary gland mass. Among them we included 320 patients confirmed either by surgery (n = 248) or clinical follow-up > 1-year (n = 72) after exclusion of non-diagnostic results (n = 13) or follow-up loss (n = 21). We compared the diagnostic accuracies between USFNA and USCNB for discriminating malignant salivary gland tumors and for correct tissue-specific diagnosis of benign and malignant tumors. We also tested any difference between the procedures according to the operator's experience level.

RESULTS

Non-diagnostic rates were significantly higher in USFNA with 6.7 % (7/104) than USCNB with 2.6 % (6/229), respectively. The overall accuracy of USCNB for diagnosing malignant tumors was significantly higher than that of USFNA (p = 0.026). Correct tissue-specific diagnosis for benign and malignant tumors was in 97 % and 53 % with USFNA and 96 % and 92 % with USCNB. The accuracy for diagnosing malignant tumors was significantly higher with USCNB than USFNA among the results by trainees, but there was no difference among the results by faculty. There was no significant complication needed intervention or hospitalization in our cohort.

CONCLUSION

USCNB should be the choice for diagnosis of a salivary gland mass because it is better in discriminating malignant tumors from benign and in tissue-specific diagnosis of benign and malignant tumors.

CLINICAL RELEVANCE/APPLICATION

Ultrasonography-guided core needle biopsy is superior to fine needle aspiration in diagnosis of malignant tumors of the salivary gland

SSJ17-03

The Incremental Value of Diffusion Weighted Imaging over Conventional MRI for Detection of Metastatic Nodes in Squamous Carcinoma of the Oral Tongue: Do We See the Glass Half Full or Half Empty?

Supreeta Arya MD (Presenter): Nothing to Disclose, Sonal Mahalwar MBBS: Nothing to Disclose, Nilesh Sable: Nothing to Disclose

PURPOSE

To determine the incremental value of diffusion-weighted MR imaging over conventional MRI in the detection of metastatic lymph nodes in oral tongue squamous cell carcinoma (SCC).

METHOD AND MATERIALS
A prospective study was undertaken in 30 patients of stage T2 - T4 oral tongue SCC at a tertiary referral oncology centre. Cases receiving neoadjuvant therapy were excluded. All cases underwent MRI on a 1.5T magnet. Multiplanar spin echo sequences (T1W, T2W, STIR and postgadolinium T1W) were obtained for conventional MRI. DWIMRI was performed using b0 and b1000 values. ADC maps were used for calculating ADC values for nodes at each nodal station (IA, IB, II-V). All cases underwent elective neck dissection, either unilateral (n=16) or bilateral (n=14). In all 44 necks were operated; modified radical neck dissection (MRND) in unilateral dissections and MRND supra-omohyoid neck dissection on the contralateral side. The imaging findings were correlated with histopathology, both on a per neck basis and per nodal station level basis. Institutional review board clearance was obtained before recruiting patients for the study.

RESULTS
Conventional MR imaging using all criteria revealed a sensitivity of 66.6%, specificity of 90%, PPV of 88.8%, NPV 69.2%, and accuracy of 77.2%, on a per neck basis. On a per nodal station basis, a sensitivity of 63.8%, specificity of 90.9%, positive predictive value (PPV) of 69.6%, negative predictive value (NPV) of 88.5% and accuracy of 84.2% were obtained. There was significant overlap in the range of ADC values of benign and metastatic nodes. The cut off ADC value obtained from the ROC curve was 0.95x10^-3mm2. Using this ADC value the incremental value of DWI-MRI over conventional MRI yielded a sensitivity of 77.5%, specificity of 77.2%, positive predictive value of 50.8%, negative predictive value of 92% and accuracy of 77.3%.

CONCLUSION
DWI MRI added to conventional MRI increased sensitivity and NPV, but due to overlap in ADC values of metastatic and reactive nodes, the PPV reduced significantly. DWI of lymph nodes may not be as accurate as initially reported in literature.

CLINICAL RELEVANCE/APPLICATION
The debate between elective neck dissection and watchful waiting for the clinically negative neck is not yet settled. DWI MRI cannot improve surgical staging; but if watchful waiting is the decided policy, adding DWI-MRI to conventional MRI could contribute by an increase in NPV.

SSJ17-04

Could Contrast-enhanced CT Examination Add Diagnostic Value over US-based Detection of Metastatic Neck Lymph Nodes in Patients with Thyroid Cancer?: A Prospective, Multicenter Study.

Korean Society of Thyroid Radiology (KSThr) Study Group

Younghen Lee MD (Presenter): Nothing to Disclose, Ji-hoon Kim MD : Nothing to Disclose, Dong Gyu Na MD : Nothing to Disclose, Jung Hwan Baek : Nothing to Disclose, Sun Won Park : Nothing to Disclose, So Lyung Jung : Nothing to Disclose, Eun Ju Ha : Nothing to Disclose, Jinna Kim MD : Nothing to Disclose, Tae Jin Yoon MD : Nothing to Disclose

PURPOSE
To determine an additional diagnostic role of combined US/CT over the US evaluation for detection of metastatic LNs in patients with thyroid cancers.

METHOD AND MATERIALS
During the recent 1 year, 9 experienced head and neck radiologists in seven institutions prospectively evaluated the both I-VI neck LN levels of patients with thyroid cancers prior to operation using both ultrasound (US) and contrast-enhanced neck CT. Imaging criteria of probably metastatic LN were as followed [US: calcification, cystic change, hyperechoic, abnormal vascular pattern; [CT]: calcification, cystic change, strong enhancement without hilar vessel, heterogeneous enhancement. If at least one of above mentioned criteria to suggest probably metastatic were found, we considered the corresponding LN level as probably metastatic. Finally, we compared the both I-VI neck LN levels of patients with thyroid cancers prior to operation using both ultrasound (US) and contrast-enhanced neck CT. Imaging criteria of probably metastatic LN were as followed [US: calcification, cystic change, hyperechoic, abnormal vascular pattern; [CT]: calcification, cystic change, strong enhancement without hilar vessel, heterogeneous enhancement. If at least one of above mentioned criteria to suggest probably metastatic were found, we considered the corresponding LN level as probably metastatic. Finally, we considered the corresponding LN level as probably metastatic. We considered the corresponding LN level as probably metastatic. Finally, we considered the corresponding LN level as probably metastatic.

RESULTS
On a per neck basis, the level by level and patient-based analysis revealed that combined US/CT imaging criteria significantly improved the sensitivities (p<0.01), and decreased the specificities (p<0.01), while not affected the diagnostic accuracies (p>0.05) in the overall, central and lateral neck levels, compared to US-only, except the more higher diagnostic accuracies achieved only in lateral neck by combined US/CT criteria (p=0.011). Moreover, the sensitivities of CT criteria to detect additional metastatic LNs in lateral neck were 54.8% (23/42 levels) and 65.5% (19/29 persons) in cases of LNs which were not considered as probably metastatic by US criteria.

CONCLUSION
For preoperative neck LN evaluation, US/CT combined evaluation could play additional diagnostic roles in patients with thyroid cancers, especially in lateral neck, compared to US-based evaluation.

SSJ17-05

Head and Neck Neoplasms: Correlation of CT Perfusion Imaging with Microvessel Density and Cascular Endothelial Growth Factor

Zuohua Tang MS, MD (Presenter): Nothing to Disclose, Jie Wang : Nothing to Disclose, Lingjie Wu MD : Nothing to Disclose, Sun Won Park : Nothing to Disclose, Ji-hoon Kim MD : Nothing to Disclose, Dong Gyu Na MD : Nothing to Disclose, Eun Ju Ha : Nothing to Disclose
PURPOSE

To evaluate the value of perfusion CT (CTP), microvessel density (MVD), and vascular endothelial growth factor (VEGF) in the differentiation of malignant from benign head and neck neoplasms (HNNs).

METHOD AND MATERIALS

Forty-one HNNs proven by pathology underwent CTP, MVD, and VEGF analysis. All lesions were divided into three groups: Group A, benign hypovascular lesions; Group B, benign hypervascular lesions; and Group C, malignant lesions. A time density curve (TDC) and CTP parameters (MIP, BV, BF, MTT, CP) were analysed. The relationship between the perfusion measurements and MVD/VEGF was assessed by Pearson correlation.

RESULTS

The TDCs could be classified into three types. TDC of type I was mainly found in Group A, and type II was found in Groups B and C. MIP, BF, and BV were all significantly higher in Groups B and C compared to Group A (all P < 0.01). Pearson correlation showed a positive correlation between the MVD and MIP, BV, and VEGF, respectively (all P<0.05). The VEGF expression in Group C was significantly higher than that in Groups A and B (all P<0.05).

CONCLUSION

The MIP and BV of CTP correlate positively with MVD and may reflect angiogenesis of HNNs. CTP combined with VEGF could be beneficial by allowing differentiation of malignant from benign HNNs.

CLINICAL RELEVANCE/APPLICATION

CTP may reflect angiogenesis of head and neck neoplasms (HNNs) and is helpful in the differentiation of malignant from benign HNNs and is recommended in the initial evaluation of HNNs.

SSJ17-06

Negative High-resolution Salivary Gland Ultrasound: Highly Predictive of Negative Labial Gland Biopsy in Patients with Sicca Symptoms

Juveria Siddiqui MBBS, MRCS (Presenter): Nothing to Disclose, Elisa Astorri: Nothing to Disclose, Anwar Tappuni: Nothing to Disclose, Nurhan Sutcliffe MBBS: Nothing to Disclose, Michele Bombardieri: Nothing to Disclose, Polly Richards MD: Nothing to Disclose

PURPOSE

Sjogren's syndrome (SS) is a chronic autoimmune condition affecting both the salivary and lacrimal glands, with resultant xerostomia and keratoconjunctivitis sicca. American-European Consensus Group (AECG) criteria mandates a positive labial salivary gland biopsy (LSGB) for diagnosis, if anti-Ro/La antibody (ENA) tests are negative, in order to distinguish SS from alternative causes of sicca. Due to the high specificity and poor sensitivity of invasive LSGB, it is often reserved for symptomatic ENA positive patients. This study investigates the value of high resolution salivary gland ultrasound (US) in predicting positive LSGB in patients with sicca symptoms.

METHOD AND MATERIALS

The US and LSGB reports of 85 consecutive patients attending the SS clinic were compared. All patients had clinical sicca. Major salivary gland US was performed by experienced sonographers and assessed using the modified Salaffi score (>1 is abnormal). Experienced histopathologists utilised the Chisholm and Mason focus score confirmed by immunohistology for CD3/CD20/CD138/CD21 in LSGB evaluation. Both reports were assessed blindly, independent of clinical data.

RESULTS

Out of the 85 patients, 20 were ENA positive (23.5%). 31 patients had a positive LSGB, 15 of whom were ENA positive and 16 of whom were ENA negative. Thus 36 patients met diagnostic criteria for SS, with the remaining 49 classified as sicca only. Abnormal US findings were seen in 34 patients (40%); notably 29 of these patients diagnosed as LSGB positive, giving a significant concordance between the two techniques of 91.76% (Kappa 0.826). Irrespective of diagnosis and ENA status, a negative US gave a negative LSGB predictive value of 96.08% while the positive predictive value of a positive LSGB with abnormal US findings was 85.29%.

CONCLUSION

This data suggests that a negative US is highly predictive of negative LSGB, in patients with clinical sicca. This is important in ENA negative patients, where LSGB results are most relevant. We propose the incorporation of ultrasound into the SS diagnostic algorithm for risk stratification, with a view to avoiding invasive biopsy in low risk patients.

CLINICAL RELEVANCE/APPLICATION

Negative ultrasound is highly predictive of negative labial salivary gland biopsy in our patient group. Incorporation of this investigation into a diagnostic algorithm for patients with sicca could prevent invasive biopsy in low risk patients.
Temporal Bone Imaging

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: S406B

ABSTRACT

The temporal bone is a small but anatomically complex region for which the acquisition of a basic knowledge of anatomy represents a significant achievement. Review of temporal bone imaging studies requires a highly structured and systematic approach, in order to prevent missing important but often subtle imaging findings. Additionally, good imaging technique is critical, and time spent optimizing protocols will yield substantial dividends. Currently, one should interpret studies with submillimeter acquisition and reconstruction thicknesses, with the right and left sides reconstructed separately at small field of views. A minimum of axial and coronal planes should be reviewed; many additionally interpret sagittal images, with oblique planes available to aid in specific diagnostic issues, such as superior semicircular canal dehiscence. Inflammatory disease of the temporal bone can be broadly divided into acute and chronic processes; these differ not only in duration of disease, but most importantly, in etiology. Acute otitis media represents an infection that typically ascends from the upper respiratory tract and is most common in children. Chronic otomastoiditis is a result of Eustachian tube dysfunction and is typically not associated with infection. Both are imaged primarily to look for complications, as the primary diagnosis is made clinically. A wide variety of tumors affect the temporal bone, including those found elsewhere intracranially and at the skull base, including meningioma, schwannoma and paraganglioma. The skin of the external auditory canal is susceptible to those lesions that may affect skin anywhere, including squamous and basal cell carcinomas, as well as melanoma. Other tumors, such as metastases, myeloma and lymphoma, are primary to the osseous components of the temporal bone and are most commonly found at the petrous apex.

Sub-Events

RC406A
Temporal Bone Imaging: Anatomy
Tabassum A. Kennedy MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Analyze the temporal bone using a systematic approach. 2) Identify the main structures of the temporal bone based on anatomic location within the external ear, middle ear and inner ear.

RC406B
Temporal Bone Imaging: Inflammation
Deborah Rachelle Shatzkes MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize CT and MRI imaging anatomy of the temporal bone most salient to temporal bone disease. 2) To apply an understanding of the etiologic differences between acute and chronic inflammatory disease of the temporal bone to the interpretation of relevant imaging studies. 3) To analyze CT and MRI imaging features and construct a limited and clinically relevant differential diagnosis for temporal bone masses.

Active Handout

RC406C
Temporal Bone Imaging: Tumor
Karen Lisa Salzman MD (Presenter): Consultant, Amirsys, Inc Stockholder, Amirsys, Inc

LEARNING OBJECTIVES

1) Review the benign and malignant tumors of the temporal bone. 2) Understand the key imaging features of each tumor in order to differentiate the lesions in clinical practice.

SPDL41

RSNA Diagnosis Live™: Body, Cardiac, MSK, Neuro, ENT Potpourri

Special Courses

AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 0

Wed, Dec 3 7:15 AM - 8:15 AM Location: E451B

Participants
LEARNING OBJECTIVES

1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

MSSR41

RSNA/ESR Emergency Symposium: General Principles, Pediatric and ENT Emergencies (An Interactive Session)

Multi-session 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: 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.

RC506

SCC of the Upper ADT: A Primer

Refresher/Informatics

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 8:30 AM - 10:00 AM   Location: S102D

Sub-Events

RC506A  The ADT Primaries
Suresh K. Mukherji MD (Presenter): Nothing to Disclose
LEARNING OBJECTIVES

1) Review the anatomy and imaging findings of the various subsites of the upper aerodigestive tract. 2) Describe the spread patterns of squamous cell carcinoma of the upper aerodigestive tract. 3) Review the important information that should be included in the radiology reports that affect treatment and staging.

ABSTRACT

The presentation will be focused on squamous cell carcinoma of the upper aerodigestive tract. The lecture will review the anatomy and imaging findings of the various subsites of the upper aerodigestive tract and describe the spread patterns of squamous cell carcinoma and how this affects staging. The lectures will also review the important information that should be included in the radiology reports that affect treatment and management.

RC506B

The Cervical Lymph Nodes

Peter M. Som MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) The difference between nodal staging and nodal classification in the neck. 2) The criteria for assessing a pathologic neck lymph node. 3) The impact on survival of metastatic nodes and what they mean to treatment plans. 4) The varied appearances of metastatic papillary thyroid cancer nodes.

ABSTRACT

This course will discuss why cervical metastatic nodes are so important in determining treatments for head and neck cancer patients. The course will also discuss the anatomic locations of the cervical lymph nodes and the differences between nodal staging and nodal classification and when each of these systems should be used. Criteria for assessing when a node is metastatic will also be presented. The use of PET/CT will be discussed as it pertains to metastatic cervical adenopathy.

RC506C

Post-treatment Imaging

Lawrence E. Ginsberg MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the techniques, timing and strategies for imaging the patient who has been treated for upper aerodigestive tract malignancy. 2) To explore the imaging findings that would be expected after successful therapy, and to differentiate these from tumor recurrence. 3) To review the typical complications of radiation therapy in the head and neck, and their imaging findings.

SSK17

Neuroradiology/Head and Neck (Head & Neck Tumors)

Scientific Papers

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 10:30 AM - 12:00 PM Location: N229

Participants

Moderator
Suresh K. Mukherji MD: Nothing to Disclose
Moderator
Ashley Hawk Aiken MD: Nothing to Disclose

Sub-Events

SSK17-01

Arterial Spin Labeling Perfusion MR Imaging of Head and Neck Tumors: A Pilot Study

Ahmed Abdel Razek MD (Presenter): Nothing to Disclose, Nadia Nada: Nothing to Disclose

PURPOSE

To evaluate the utility of arterial spin labeling perfusion weighted MR imaging in differentiating malignant from benign tumors of head and neck.

METHOD AND MATERIALS

Prospective study was done upon 37 patients (23M, 14F aged 28-72 ys: mean 49ys) with head and neck solid masses at 1.5 Tesla scanner (Ingenia Philips Nederland). Routine pre and post contrast and diffusion weighted MR imaging of head and neck region were done for all patients. Multi-phases arterial spin labeling with FEEPI
sequence was applied. The applied scanning parameters: TR = 2500 ms, TE = 20 ms, flip angle = 35 degrees, slice thickness = 6 mm, interslice gap = 1 mm, NEX = 1, FOV = 25 cm x 20 cm, SENSE factor = 2.5 and scanning time = 4 minutes. There was reconstruction of 1200 source images. The tumor blood volume (TBV) parametric perfusion maps were reconstructed from source images. The regional tumor blood volume (rTBV) were calculated and correlated with pathological findings.

RESULTS

There was a statistically significant difference in (rTBV) between malignant tumors and benign lesions of head and neck (P=0.001). Also, there was significant difference (P=0.001) in rTBV between well and moderately differentiated malignancy versus poorly and undifferentiated head and neck malignancy. The rTBV was correlated with ADC value (r=0.879). Selection a threshold of rTBV for differentiating malignant from benign tumors results in area under the curve of 0.863, accuracy of 87%, sensitivity of 82%, specificity of 78%, positive predictive value of 83% and negative predictive value of 86%.

CONCLUSION

We concluded that arterial spin labeling perfusion weighted MR imaging is a non-invasive imaging technique that can play a role in differentiation malignant from benign tumors of head and neck.

CLINICAL RELEVANCE/APPLICATION

Arterial spin labeling MR imaging is a non-invasive imaging technique may differentiate malignant tumors of head and neck from benign lesions. So, it can be added into routine MR imaging of head and neck.
To evaluate the association of the BRAFV600E mutation with sonographic features and clinicopathologic parameters in a large-scale study population with conventional papillary thyroid carcinoma (PTC).

METHOD AND MATERIALS

This was an institutional review board-approved retrospective study with waiver of informed consent. Between January and July 2010, 688 patients who underwent thyroidectomy for conventional PTC were enrolled. The sonographic features, clinicopathologic parameters and the presence of BRAFV600E mutation were retrospectively reviewed. The rate of BRAFV600E mutation was calculated. The sonographic features and clinicopathologic parameters were compared between the BRAF-positive PTC and BRAF-negative PTC. The association of sonographic features with BRAFV600E mutation was evaluated in papillary thyroid microcarcinoma (PTMC group) and PTC larger than 10mm (PTC>10mm group), respectively.

RESULTS

The BRAFV600E mutation was detected in 69.2% (476 of 688). The sonographic features were not significantly different between the BRAF-positive and negative PTC, also in both PTMC and PTC>10mm groups, respectively. The BRAFV600E mutation was associated with male gender, large tumor size, extrathyroidal extension, central and lateral lymph node metastasis, and advanced tumor stage (P=.028 for the patients' sex, P<.0001 for tumor size, extrathyroidal extension, lymph node metastasis and tumor stage).

CONCLUSION

The BRAFV600E mutation was not associated with sonographic features, regardless of tumor size in PTC patients, but was associated with poor clinicopathologic parameters.

CLINICAL RELEVANCE/APPLICATION

Therefore, preoperative BRAFV600E mutation analysis for thyroid nodule with suspicious sonographic features could be recommendable for risk stratification and initial surgical approach of PTC.

SSK17-04 Dynamic contrast-enhanced MRI in the Differentiation of Posttreatment Changes from Tumor of the Head and Neck

Young Jun Choi MD (Presenter): Nothing to Disclose, Jung Hwan Baek: Nothing to Disclose, Yu Sub Sung: Nothing to Disclose, Jeong Hyun Lee MD, PhD: Nothing to Disclose

PURPOSE

The aim of this study was to investigate the value of dynamic contrast-enhanced MRI (DCE-MRI) with model-free analysis in differentiation of viable tumor from posttreatment changes.

METHOD AND MATERIALS

We enrolled twenty-two patients with malignant tumors of the head and neck after definitive treatment, who underwent DCE-MRI during follow-up. Patients were divided into viable tumor (n=11) or post-treatment (n=11) groups according to the results of biopsy or clinical and radiologic follow-up. Patterns of time-signal-intensity (TSI) curves were classified including "progressive increment" as type I, "plateau" as type II and "washout" as type III. Patterns of TSI curves and DCE-MRI parameters including whole area-under-the-curve (AUC) and rAUC were compared between two groups (rAUC = [AUC of the initial 90 seconds]/[AUC of the final 90 seconds]). Inter-reader agreement was also tested by two independent readers for TSI curve pattern analysis.

RESULTS

TSI curve patterns for viable tumor vs. posttreatment changes were 13.6% vs. 86.7% for type I, 50% vs. 13.6% for type II, and 36.4% vs. 0% for type III, which was significantly different by statistical test (P< .05). Whole AUC and rAUC were also significantly different between two groups (P< .05, each). ROC curve analyses showed TSI curve pattern as the best single predictor of the presence of viable tumor with sensitivity of 86.4% and specificity of 86.4% (P<.0001; optimum cutoff with type II). The inter-reader agreement was excellent with κ-value of 0.887.

CONCLUSION

TSI curve pattern derived from DCE-MRI is a potential noninvasive imaging biomarker for differentiation of viable tumor from posttreatment changes in patients with head and neck malignancy.

CLINICAL RELEVANCE/APPLICATION

TSI curve pattern derived from DCE-MRI is a potential noninvasive imaging biomarker for differentiation of viable tumor from post-treatment changes in patients with head and neck malignancy.

SSK17-05 The Prognostic Value of First FDG PET Response Following Re-irradiation with Stereotactic Body Radiotherapy Plus Cetuximab in Patients with Recurrent Previously-Irradiated Squamous Cell Carcinoma of the Head and Neck: Results from a Phase II Trial

John A. Vargo MD (Presenter): Nothing to Disclose, Robert L. Ferris MD, PhD: Nothing to Disclose, David Clump: Nothing to Disclose, Barton F. Branstetter MD: Nothing to Disclose, Carl Seynnaeve MD: Nothing to Disclose, James Ohr DO: Nothing to Disclose, Michael Gibson MD: Nothing to Disclose,
PURPOSE
Locally-recurrent previously-irradiated head-and-neck cancer (rHNC) remains a significant clinical challenge, with limited options for unresectable disease. Recently, SBRT ± cetuximab has emerged as a viable regimen with reduced toxicity and shorter treatment time compared to conventional options. Response evaluation in patients with recurrent disease is challenged by anatomical distortion from prior treatment and recurrent tumor. As a part of a Phase II trial examining SBRT + cetuximab in rHNC, assessment by PET/CT at 2-months was included as a secondary metric to better define the role of PET/CT as an early & more sensitive biomarker of response compared to CT alone.

METHOD AND MATERIALS
From July 2007 to March 2013, patients >18 with inoperable locoregionally-confined rHNC within a previously-irradiated field receiving >= 60Gy, ECOG 0-1, & normal hepatic/renal function were enrolled. Patients received concurrent cetuximab (400mg/m2 on day -7 then 250mg/m2 on days 0 and +8) plus SBRT (40-44Gy in 5 fractions over 1-2 week). The primary endpoints: loco regional progression-free survival (PFS) & treatment-related toxicity (not reported here) Secondary end-points: response rates and changes in tumor glucose metabolism post-therapy as assessed by subjective interpretation of the FDG PET/CT.

RESULTS
Fifty patients were enrolled, of which 48 were eligible. Median follow-up for surviving patients was 18 months (range: 10 -70). Per protocol first FDG PET/CT was performed 8 week post-treatment in 44 patients (92%). Response as assessed by first PET/CT was as follows: progression 36%, stable disease 14%, partial response 30%, and complete response 21%, respectively. Complete metabolic response by first FDG PET/CT was a significant predictor of progression free survival (1-year 71% vs. 25%, p = 0.040) and overall survival (1-year 67% vs. 35%, p = 0.047).

CONCLUSION
Complete metabolic response by FDG PET/CT appears to be an early predictor of overall outcome following SBRT + cetuximab. Further ongoing analysis within this recently complete phase II trial will help to better clarify the prognostic significance of FDG-PET/CT in comparison to traditional anatomical CT-based response metrics.

CLINICAL RELEVANCE/APPLICATION
In a phase II protocol examining SBRT + cetuximab for patients with rHNC, we show potential efficacy with good response rates & complete response by 2-month PET/CT may guide further management.

SSK17-06 Prediction of Therapeutic Effect of Concurrent Chemoradiation in Nasopharyngeal Carcinoma Based on Pretreatment Quantitative Diffusion-weighted Imaging
Meng Lin (Presenter): Nothing to Disclose, Xiaoduo Yu: Nothing to Disclose, Dehong Luo MD: Nothing to Disclose, Han Ouyang MD: Nothing to Disclose, Chun-Wu Zhou MD: Nothing to Disclose, ZHENYU ZHOU: Nothing to Disclose

PURPOSE
To investigate the use of pre-treatment diffusion-weighted imaging(DWI) in predicting therapeutic effect of concurrent chemoradiation in nasopharyngeal carcinoma.

METHOD AND MATERIALS
65 patients with nasopharyngeal carcinoma confirmed by nasopharyngoscope and biopsy pathology (from October 2009 to December 2012) underwent DWI (b value=0, 800 s/mm2) before concurrent chemoradiation, during treatment (with dose of 50Gy) and after treatment (at the end of conventional treatment) using a 3.0T MR. The mean, maximum and minimum ADC value of tumor as well as the delineation of maximum area of tumor in pretreatment, during and after treatment were recorded to estimate the tumor regression rate. The subjects were put into two categories according to the tumor regression rate after treatment: group of complete response (CR) and group of non-CR including partial response (PR) and stable disease (SD). Spearman’s correlation analysis was applied between the ADC values and tumor regression rates. Independent T-test was also used to compare the ADC values of group CR and group non-CR. Moreover, ROC analysis was applied for the evaluation of ADC values in predicting group CR.

RESULTS
The mean and maximum ADC were found to have negative correlation with tumor regression rate during and after treatment (r = -0.463 - -0.552, PP value less than 0.001. ROC curve indicated that using a threshold of mean ADC value lower than 1.09×10-3mm2/s on predicting group CR led to specificity, sensitivity, and accuracy of 82.5%, 76.0% and 80.0% respectively, with area under curve of 0.816 (P

CONCLUSION
Quantitative DWI measurement (ADC) was shown to be capable of predicting therapeutic effect of concurrent chemoradiation in nasopharyngeal carcinoma.

CLINICAL RELEVANCE/APPLICATION
Pretreatment DWI possessed potential to be applied in individualized therapy, according to its capability of predicting therapeutic effect of concurrent chemoradiation in nasopharyngeal carcinoma.

SSK17-07 Use of Pretreatment Semiquantitative and Quantitative Dynamic Contrast-enhanced Magnetic Resonance Imaging in Predicting Sensitivity of Concurrent Chemoradiation in Nasopharyngeal Carcinoma

PURPOSE
To investigate the use of pretreatment semiquantitative and quantitative dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) in predicting sensitivity of concurrent chemoradiation in nasopharyngeal carcinoma.

METHOD AND MATERIALS
65 patients with nasopharyngeal carcinoma were included in this study. Pretreatment contrast-enhanced dynamic MRI was performed at 0.3T using a 3D spoiled gradient echo sequence before concurrent chemoradiation. The maximum area of tumor was manually delineated on pretreatment T1-weighted contrast-enhanced MRI. The ADC and MTR values of the maximum area of tumor were calculated and recorded. Tumors were segmented into three groups: group of complete response (CR), group of partial response (PR), and group of stable disease (SD). Spearman’s correlation analysis was applied between the ADC and MTR values and tumor regression rate. Independent T-test was used to compare the ADC and MTR values of group CR and group non-CR. Moreover, ROC analysis was applied to evaluate the ROC curve of ADC and MTR in predicting group CR.

RESULTS
The mean ADC and MTR of the maximum area of tumor were found to have a significant correlation with tumor regression rate (r = 0.73, PP value less than 0.001). The ROC curve indicated that using a threshold of mean ADC value lower than 1.09×10-3mm2/s on predicting group CR led to specificity, sensitivity, and accuracy of 82.5%, 76.0% and 80.0% respectively, with area under curve of 0.816 (P

CONCLUSION
Pretreatment semiquantitative and quantitative DCE-MRI was shown to be capable of predicting sensitivity of concurrent chemoradiation in nasopharyngeal carcinoma.

CLINICAL RELEVANCE/APPLICATION
Pretreatment DCE-MRI possessed potential to be applied in individualized therapy, according to its capability of predicting therapeutic effect of concurrent chemoradiation in nasopharyngeal carcinoma.
Carcinoma

Meng Lin (Presenter): Nothing to Disclose, Xiaoduo Yu: Nothing to Disclose, Lin Li MD: Nothing to Disclose, Dehong Luo MD: Nothing to Disclose, Chun-Wu Zhou MD: Nothing to Disclose, ZHENYU ZHOU: Nothing to Disclose

PURPOSE

To evaluate the use of pretreatment semi-quantitative and quantitative dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) in predicting sensitivity of concurrent chemoradiation in nasopharyngeal carcinoma.

METHOD AND MATERIALS

36 patients with nasopharyngeal carcinoma proved by nasopharyngoscope and biopsy pathology (from January to December 2013) underwent DCE-MRI exams before concurrent chemoradiation. Semi-quantitative and quantitative parameters of the mean (delineation of maximum area of tumor) and hot area (depicted on Ktrans map) were processed by GenIQ software (GE) including MaxSlop, CER, IAUGC, Ktrans, Kep and Ve. The patients were re-examined MRIs during treatment (with dose of 50Gy) and after treatment (at the end of conventional treatment). According to the tumor regression rate after treatment, the patients were classified into group complete response (CR) and group non-CR including partial response (PR) and stable disease (SD). The correlations between pretreatment parameters and tumor regression rate were analyzed. Parameters between group CR and non-CR were compared by independent T-test. The value of parameters on predicting CR were assessed by ROC.

RESULTS

Tumor regression rate during and after treatment showed positive correlation with tumor mean and hot area IAUGC, Ktrans, Kep, mean MaxSlop and hot area CER (r: 0.341 ~ 0.608, P:

CONCLUSION

Pretreatment semiquantitative and quantitative DCE-MRI were capable of predicting sensitivity of concurrent chemoradiation in nasopharyngeal carcinoma.

CLINICAL RELEVANCE/APPLICATION

Pretreatment semi-quantitative and quantitative parameters of DCE-MRI has potential to be helpful in individualized therapy.

SSK17-08

Correlations between Perfusion and Intravoxel Incoherent Motion (IVIM) Diffusion in Nasopharyngeal Carcinoma

yu xiao ping MD (Presenter): Nothing to Disclose, Li Fei Ping: Nothing to Disclose, Lu Qiang: Nothing to Disclose

PURPOSE

To study the potential correlations between MR perfusion parameters and intravoxel incoherent motion (IVIM) parameters in nasopharyngeal carcinoma (NPC), and hence investigate the underlying clinical significance

METHOD AND MATERIALS

A total of 30 patients detected with NPC (21 men, 9 women) were enrolled in this study. Content forms were obtained from all patients prior to the study. All patients underwent dynamic contrast-enhanced T1-weighted MR perfusion and multi-b value based IVIM diffusion exams (b=0, 50, 80, 100,150,200,400,600,800, 1000 s/mm2) on a 1.5T scanner. For each primary tumor, MR perfusion parameters including Ktrans (volume transfer constant), Ve (volume fraction), FPV (fractional plasma volume) and kep were obtained and recorded from the perfusion data. Additionally, IVIM parameters (ADCstandard, ADCslow, ADCfast, Fraction of ADCfast) were obtained from the IVIM diffusion MR maps. Pearson correlation coefficients between the two groups were obtained to evaluate the potential correlations between MR perfusion parameters and IVIM diffusion parameters.

RESULTS

The Ktrans, kep, Ve and FPV values of NPC were 0.336±0.094/min, 1.502±0.420/min, 0.234±0.053 and 0.008 ±0.009 respectively; whereas the standardADC, slowADC,fastADC, fraction of fastADC of the corresponding NPC were (0.950±0.175)×10^-3 mm²/s, (0.685 ±0.113)×10^-3 mm²/s, (0.020 ± 0.018 )×10^-3 mm²/s and (0.315±0.102)×10^-3 mm²/s respectively. Ve value revealed a significant correlation with fastADC values(r=0.450, p=0.013). Ktrans value showed a positive correlation with fastADC values(r=0.378, p=0.039). However kep and FPV values did not show significant statistical correlation with the IVIM parameters in NPC(table 1).

CONCLUSION

Ktrans and FPV values of the perfusion imaging showed significant correlation with the IVIM parameters, such correlation was not seen in between other perfusion parameters and IVIM parameters. The underlying physiological mechanism is to be studied.

CLINICAL RELEVANCE/APPLICATION

The correlations between MR perfusion parameters and intravoxel incoherent motion diffusion parameters is helpful in understanding the relation between the two MR exams on nasopharyngeal carcinoma.
SSK17-09

Head and Neck Low-tube-Voltage 80-kVp CT of Primary and Recurrent Squamous Cell Carcinoma: Evaluation of Objective and Subjective Image Quality

Jan-Erik Scholtz (Presenter): Nothing to Disclose, Johannes Kraft: Nothing to Disclose, Eva-Maria Noske: Nothing to Disclose, Boris Schulz MD: Nothing to Disclose, Moritz Kaup: Nothing to Disclose, Claudia Freileisen: Nothing to Disclose, Boris Bodell MD: Nothing to Disclose, Iris Burck MD: Nothing to Disclose, Jens Wagenblast MD: Nothing to Disclose, Josef Matthias Kerl MD: Research Consultant, Siemens AG Speakers Bureau, Siemens AG, Ralf W. Bauer MD: Research Consultant, Siemens AG Speakers Bureau, Siemens AG, Thomas Lehnert MD: Nothing to Disclose, Thomas Josef Vogl MD, PhD: Nothing to Disclose, Julian Lukas Wichmann MD: Nothing to Disclose

PURPOSE

To investigate a low-tube-voltage 80-kVp acquisition technique for computed tomography (CT) of head and neck primary and recurrent squamous cell carcinoma (SCC) with regard to objective and subjective image quality.

METHOD AND MATERIALS

This retrospective study was approved by the institutional review board, and written informed consent was waived. We retrospectively evaluated 65 patients (47 male, 18 female; mean age: 62.1 years) who underwent head and neck dual-energy CT due to biopsy-proven primary (n = 50) or recurrent (n = 15) SCC. 80-kVp and standard blended 120-kVp image series were compared. Image noise and signal attenuation of detected malignancy, cervical vessels and various soft tissue structures were measured, tumor signal-to-noise (SNR) and contrast-to-noise ratio (CNR) were calculated. Subjective image quality was rated by two independent reviewers using a 5-point grading scale regarding overall image quality, lesion delineation, image sharpness, and image noise. Interobserver agreement was calculated using intraclass correlation coefficient (ICC).

RESULTS

Mean tumor attenuation (153.8±41.2 vs. 97.1±29.2 HU), SNR (10.7±6.9 vs. 8.3±4.9), CNR (8.1±5.4 vs. 4.8±4.9), and subjective tumor delineation (score, 4.65 vs. 4.07) were significantly increased (all P<0.001) with 80-kVp acquisition compared to standard blended 120-kVp images. Interobserver agreement was substantial (ICC, 0.74; 95% confidence intervals: 0.58-0.83). The calculated average dose-length-product was reduced by 48.7% with 80-kVp acquisition compared to the standard dual-energy CT examination (135.9±16.1 vs. 279.0±32.1 mGy•cm, P<0.001).

CONCLUSION

Head and neck CT with low-tube-voltage 80-kVp acquisition provides increased tumor delineation, SNR, and CNR for CT imaging of primary and recurrent SCC compared to standard 120-kVp acquisition with an accompanying significant reduction of radiation exposure.

CLINICAL RELEVANCE/APPLICATION

Head and neck CT with low-tube-voltage 80-kVp acquisition may improve delineation of squamous cell carcinoma with a simultaneous reduction of radiation dose.
The use of multiphase 4DCT in the preoperative detection of parathyroid adenomas has been on the rise recently. On the other hand, with the recent advent of high quality SPECT-CT gamma cameras with better CT capabilities, the localization accuracy of sestamibi SPECT-CT has vastly improved. At our institution, we have introduced a novel hybrid technique by incorporating two of the four phases (the arterial and non-contrast) of the 4DCT with concomitant sestamibi SPECT. We evaluated the value of this dual-phase 2D SPECT-CT technique in comparison with the conventional SPECT-CT in preoperative localization of parathyroid adenomas.

METHOD AND MATERIALS
A total of 58 patients who underwent sestamibi SPECT-CT imaging on the Siemens SymbiaT6™ slice SPECT-CT scanner in the past two years at our institution were retrospectively analyzed. 32 of these had the conventional early/delayed SPECT-CT protocol with CT for localization and attenuation correction purposes only. 26 had dual phase (arterial and noncontrast) CT during the concomitant early/delayed SPECT respectively. The images were interpreted on a diagnostic confidence scale of 0 to 3 (0= negative, 1= possible, 2= probable and 3= definite evidence of parathyroid lesion). The size and number of the lesions were also analyzed and correlated with final pathology results for concordance.

RESULTS
The conventional SPECT-CT identified a total of 35 lesions in 32 patients. 34 of these were true parathyroid lesions and only 1 was false positive. 23 of 35 lesions were categorized as definite(score 3) and all of them were >1 cm on imaging. On the dual phase 2D SPECT-CT, a total of 27 lesions in 26 patients were identified. 4 patients had false-negative results. It correctly identified 3 multiglandular and 19 single lesions. 20 lesions were identified with the highest diagnostic confidence (score 3).17 of these were >1 cm. Overall, there was no statistically significant difference in the concordance rate between the two techniques (p=0.65).

CONCLUSION
Dual phase contrast Sestamibi SPECT-CT did not increase the sensitivity of lesional detection in hyperparathyroid patients for preoperative disease localization, when compared with the conventional noncontrast SPECT-CT.

CLINICAL RELEVANCE/APPLICATION
Dual-phase Sestamibi 2DSPECT-CT technique does not warrant routine adoption in parathyroid imaging. However, it could benefit those with extensive thyroid nodules, prior negative imaging and/or failed exploration.

SSM19-02
“Sequential Multiphase and Dual Tracer” (SMADT) Imaging of the Neck for Detection and Localisation of Parathyroid Disease and Comparison with Ultrasound

Alison May  Berner  BA, MBBS (Presenter):  Nothing to Disclose , Ewa   Nowosinska  MBBS, MRCP :  Nothing to Disclose , Athar   Haroon  MBBS :  Nothing to Disclose , Mo   Luqman :  Nothing to Disclose , Margaret W.   Newell  PhD :  Nothing to Disclose , Hikmat   Jan  MD, MBChB :  Nothing to Disclose

PURPOSE
To evaluate the sensitivity and specificity of SMADT (sequential multiphase and dual tracer) technique utilising 99mTcO₄⁻ and Dynamic 99mTc MIBI with SPECT/CT for detection and localisation of hyper-functioning parathyroid tissue and to compare with ultrasound (US).

METHOD AND MATERIALS
64 patients (16 male, 48 female, mean age 55 years) with hyperparathyroidism were scanned over 4 years. For SMADT technique, 80 MBq 99mTcO₄⁻ was injected with dynamic thyroid image acquisition started at 20 minutes, 900 MBq 99mTc MIBI injection at 30 minutes and dynamic imaging continued until 50 minutes. SPECT was acquired at 60 minutes with further SPECT/CT of the neck at 3 hours. Subsequent subtraction and statistical difference analyses were performed following processing of dynamic data. Neck US was carried out within 3 months. Findings for each parathyroid gland and the thyroid were classified as positive or negative. Patients underwent surgical resection of parathyroid tissue according to imaging results. Histology for each sample was classified as normal, indeterminate, hyperplasia, adenoma or carcinoma. SMADT findings were correlated with histology.

RESULTS
86 histological samples were resected (18 normal, 6 indeterminate, 9 hyperplasia, 50 adenoma, 3 carcinoma). The sensitivity of both SMADT and neck US for detecting parathyroid hyperplasia, adenoma, carcinoma or indeterminate lesions was 82.3% (95% CI = 70.1-90.4). Sensitivity for localisation to individual glands for SMADT was 70.6% (95% CI = 58.1-80.7) and for neck US was 60.3% (95% CI = 47.7-71.8). Specificity for localisation was 94.4% (95% CI = 70.6-99.7) for SMADT and 72.2% (95% CI = 46.4-89.2) for neck US. SMADT imaging detected two intrathyroidal lesions not seen on neck US.

CONCLUSION
SMADT and neck US are equally sensitive for detection of hyper-functioning parathyroid tissue in hyperparathyroid patients. The use of sequential multiphase and dual tracer imaging better facilitates lesion localisation for varying parathyroid pathologies.

CLINICAL RELEVANCE/APPLICATION
Sequential multiphase and dual tracer technique complements the role of previously available imaging modalities for detection and localisation of hyper-functioning parathyroid tissue prior to surgery.
**SSM19-03**  
**Association between the Presence of Genetic BRAF Mutation and Clinicopathological Characteristics in the Papillary Thyroid Cancer Patients**  
Sung M. Kim MD (Presenter): Nothing to Disclose, Charles M. Intenzo MD: Nothing to Disclose

**PURPOSE**

It has been reported that BRAF mutation is the most common in papillary thyroid cancer (PTC). It correlates strongly with high-risk clinicopathological characteristics, tumor recurrence and reduced sensitivity of radioiodine therapy, due to reduced expression of sodiumiodine symporter and lost capacity of iodine uptake. The study evaluates the association between the presence of BRAF mutation in the PTC, high-risk clinical parameters, and the presence of stunned thyroid.

**METHOD AND MATERIALS**

A total of 30 thyroid cancer patients who had a radioiodine treatment for PTC were retrospectively reviewed to see if the presence of BRAF gene mutation in the PTC patients and to see correlation between BRAF gene mutation and clinical parameters of high-risks clinicopathological parameters in PTC such as age, sex, tumor size, extrathyroidal invasion, nodal and distant metastases (TNM staging).

**RESULTS**

Twenty-one patients had a positive BRAF gene mutation (group= A) and 9 patients had a negative gene mutation (group= B). Age and sex distributions between the two groups are similar, with no statistical significance. However, group A has a higher frequency of T3a, T4a, N1b, M1 and extranodal spread. There are 4 (19%) stunned thyroid in group A and 1 (11%) in group B; no statistically significance.

**CONCLUSION**

PTC patients with BRAF gene mutation positive has a higher grade of PTC than those patients without a gene mutation. There is no association between presence of BRAF gene positive and presence of stunned thyroid. The presence of gene mutation would be important parameter for management of PTC patients.

**CLINICAL RELEVANCE/APPLICATION**

Presence of BRAF gene mutation is one of important clinicopathological parameters for management of papillary thyroid cancer patients in the future. Its presence indicates a higher grade of PTC that will behave aggressively.

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**SSM19-04**  
**The Effects of Age and Routine Dietary Iodine Consumption on Performance of Low Iodine Diet for rhTSH-aided Radioiodine Ablation for Papillary Thyroid Cancer**  
Kunihiro Nakada (Presenter): Nothing to Disclose, Mika Tamura BS: Nothing to Disclose, Masayuki Sakurai: Nothing to Disclose, Yushi Furuta MD, PhD: Nothing to Disclose

**PURPOSE**

Low iodine diet (LID) is an important preparation to enhance efficacy of radioiodine therapy for thyroid cancer. However, practice of stringent LID for longer duration could be complicated and boring. The aim of this study was to determine individual characteristics that are linked with failure of LID.

**METHOD AND MATERIALS**

We studied 38 patients with postsurgical papillary thyroid carcinoma who were to undergo rh-TSH aided remnant tissue ablation using 30mCi of I-131. Pathologic finding was either pT3/pT4 or pN1a/N1b in all. After counseling by a dietitian, LID was done from 8 days before to 2 days after administration of I-131. As a parameter of total body iodine, urinary iodine concentration normalized by urinary creatinin (UIC: μg/gCRE) was measured before start of LID (UICb) and on the day of I-131 ablation (UICp). Based on UICp, performance of LID was defined as successful (< 150) or unsuccessful (>= 150). As possible factors for unsuccessful LID, we focused on age, gender, BMI, estimated GFR, residence, frequency of pinning out during LID period, given dose of l-T4, daily iodine consumption estimated by food frequency questionnaire, and UICb. Radioiodine uptake in the remnant tissue (RIU) was semi-quantitatively assessed using a gamma camera at 3 days after ingestion of I-131.

**RESULTS**

UICb and UICp ranged from 25 to 7840 and 19 to 1850 (average: 723 and 181, respectively. 30 out of 38 (79%) patients were assigned to successful LID while the remaining 8 (21%) was assigned to unsuccessful LID. There was a significant inverse correlation between UICp and RIU (r=-0.641). Also, there were significant differences in the RIU between patients with successful LID and those with unsuccessful LID(9.2 vs.5.8, <60 yrs.) and UICb (>400) were the significant factors associated with unsuccessful LID results.

**CONCLUSION**

Unsuccessful performance of LID was seen in about 20% of the patients. The older patients or patients with high UIC under routine diet have higher risk for unsuccessful LID performance. Those patients may require special consideration regarding LID protocol in depleting total body iodine for rh-TSH aided radioiodine ablation for thyroid cancer.

**CLINICAL RELEVANCE/APPLICATION**
For successful depletion of total body iodine for radioiodine ablation of remnant thyroid tissue, duration of stringent of LID may be adjusted for each patient according to age and UIC levels at routine dietary condition.

**SSM19-05**

**Survival of Pheochromocytoma, Paraganglioma, and Carcinoid Patients Treated with I-131 MIBG**


**PURPOSE**

The purpose of this study is to determine whether I-131 MIBG has any benefit for survival of patients with pheochromocytoma, paraganglioma, and carcinoid.

**METHOD AND MATERIALS**

We retrospectively reviewed 128 patients with paraganglioma/pheochromocytoma and 215 patients with carcinoid treated with I-131 MIBG over the 24 years of practice at Duke University Hospital with I-131 MIBG therapy. We reviewed medical records, the National Death Registry, and publicly available death records to determine whether patients showed any increase in survival over historical data on patients with carcinoid and pheochromocytoma/paraganglioma, both from treatment and from the date of diagnosis with metastatic disease.

**RESULTS**

Using NDI data, and assuming any patient not shown as being dead in the NDI, medical record, or publicly available death records to be alive at least until December 31, 2011 (the last date for which NDI death data was available), median survival times for carcinoid were 1720 days (58 months) from diagnosis of metastatic disease and 877 (29 months) days from treatment. Comparable survival data for metastatic carcinoid after Yao (2008) is 33 months. Median survival times for pheochromocytoma/paraganglioma were 2110 days (70 months) from diagnosis of metastatic disease and 1513 days (50 months) from treatment. This is slightly improved over the average 50% five-year survival rate for metastatic pheochromocytoma and paraganglioma.

**CONCLUSION**

Patients treated with MIBG have higher survival times than average, particularly for carcinoid, suggesting some therapeutic benefit in terms of prolonging survival.

**CLINICAL RELEVANCE/APPLICATION**

Some prolongation of survival is likely with I-131 MIBG.

**SSM19-06**

**Semi-automatic 3D-Volumetric Lesion Quantification in Liver Metastasized Neuroendocrine Tumors for Improved Therapy Stratification prior to PRRT**

Matthaus Cieciera : Nothing to Disclose , Clemens Kratchwili MD : Nothing to Disclose , Jan Moltz : Nothing to Disclose , Hans-Ulrich Kauczor MD : Research Grant, Boehringer Ingelheim GmbH Research Grant, Siemens AG Research Grant, Bayer AG Speakers Bureau, Boehringer Ingelheim GmbH Speakers Bureau, Siemens AG Speakers Bureau, Novartis AG , Uwe Haberkorn MD : Nothing to Disclose , Frederik Lars Giesel MD, MBA (Presenter): Nothing to Disclose

**PURPOSE**

Patients with liver metastases of gastroenteropancreatic neuroendocrine tumors (GEP-NETs) are usually treated with Lutetium- DOTA(0)-Phe(1)-Tyr(3)octreotid (Lu-DOTATOC) or Yttrium- DOTA(0)-Phe(1)-Tyr(3)octreotid (Y-DOTATOC) PRRT depending on initial tumor load, especially focusing on lesion diameter. Since patients with GEP-NETs usually present with disseminated liver lesions, semi-automatic lesion detection might be more objective in clinical work flow. This study’s objective is to evaluate semi-automated measurement of total lesion distribution for therapy stratification in patients with GEP-NETs.

**METHOD AND MATERIALS**

All liver lesions (n =1537) in 19 patients with histological diagnosis of GEP-NETs who underwent contrast enhanced MR scans on a 1.5 T whole body system using Gd-EOB-DTPA, a hepatocyte-specific contrast agent, before peptide receptor radionuclide therapy (PRRT) treatment were acquired using MEVIS Software for 3D segmentation of liver lesions in this cross-sectional study. The distribution of tumor load into two sections greater respectively smaller 20mm in longest 3D diameter was calculated and used for objective therapy stratification.

**RESULTS**

Lesion distribution was successfully quantified in all 19 Patients. The mean count of lesions smaller 20mm was 67.5, the count greater 20mm was 13.4. However, the mean contribution to tumor load of lesions smaller 20mm was 23.76%, the contribution of lesions greater 20mm was 76.30%, on average, respectively.
CONCLUSION
Semi-automatic lesion acquisition for tumor-load detection provides essential information for therapy stratification prior to PRRT. As lesion assessment in standard quantification can be challenging, our study presents a new approach for operator-independent lesion analysis for improved diagnostic surrogates. Though, the segmentation process has yet to be optimized in order to provide for a faster lesion mapping.

CLINICAL RELEVANCE/APPLICATION
Objective lesion quantification in patients with GEP-NETs enables precise and individual patient therapy regimens.

MSCN51
Case-based Review of Neuroradiology (An Interactive Session)

Multisession Courses

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<th>Adult Brain</th>
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<td>Pamela Whitney  Schaefer  MD (Presenter):  Nothing to Disclose</td>
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LEARNING OBJECTIVES

1) Recognize the key neuroimaging characteristics of various adult cerebral disease entities. 2) Use pertinent imaging features and key clinical factors to formulate a pertinent differential diagnosis for various adult cerebral pathologies. 3) Discuss the utility of various imaging techniques for evaluating various adult cerebral disorders. 4) Review pertinent anatomy as it pertains to common adult cerebral pathologies.

MSCN51B | Adult Spine |
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<td>Gordon K.  Sze  MD (Presenter):  Investigator, Remedy Pharmaceuticals, Inc</td>
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LEARNING OBJECTIVES

1) To analyze findings on imaging examinations of the spine. 2) To characterize unusual findings and provide a differential diagnosis.

MSCN51C | Adult Head and Neck |
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<td>Hugh D.  Curtin  MD (Presenter):  Nothing to Disclose</td>
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LEARNING OBJECTIVES

1) To use imaging findings to differentiate head and neck lesions that can occur in similar locations. 2) To identify and evaluate imaging landmarks that determine changes in treatment.

RC606
Glands of the Head and Neck

Refresher/Informatics

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<td>Hugh D.  Curtin  MD (Presenter):  Nothing to Disclose</td>
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RC606A

Salivary Imaging
Ilona Maria Schmalfuss MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand advantages and disadvantages of salivary gland imaging. 2) Discuss application of diffusion weighted imaging in work-up of salivary gland abnormalities. 3) Generate differential diagnostic considerations based on acuity of symptom onset, distribution of lesion(s) and imaging appearance. 4) Outline potential difficulties in the work-up of salivary gland abnormalities.

RC606B

Thyroid Imaging
Ashley Hawk Aiken MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the incidence, significance and natural history of incidental thyroid nodules and differentiated thyroid cancer respectively. 2) Know the current literature and best practice recommendations for further imaging evaluation (US) and FNA of the incidental thyroid nodule. 3) Recognize the indications for cross-sectional imaging in the pre-operative evaluation of thyroid cancer.

ABSTRACT

The evaluation of thyroid nodules and masses is a broad, complex and controversial topic. This presentation aims to look at the current evidence for three of the most common clinical scenarios: 1. Incidental thyroid nodule on CT or MRI: When to recommend ultrasound or biopsy? 2. Palpable thyroid mass: What is the best test? 3. Preoperative evaluation of a thyroid mass with cancer diagnosis: What is the best test? Thyroid nodules are extremely common, with approximately 50% at autopsy. Most of these nodules are less than a centimeter. Thyroid cancer is also common, but not nearly as common as thyroid nodules, with approximately 2-5% at autopsy. Thyroid cancer incidence is on the rise without a significant change in mortality rate. There is some evidence that a rising incidence of subcentimeter papillary thyroid cancer results from increased detection on CT. There are no current guidelines for the management of these extremely common incidental thyroid nodules. This presentation will review the current literature and suggest some practical guidelines to help radiologists decide how to report these nodules. The combination of size criteria and clinical risk factors such as age is the best approach to date. The common practice of using a 10 mm size threshold alone to recommend US is arbitrary and results in excessive work-up of these incidental nodules, cost and patient anxiety. Current evidence suggests that a stratification approach, incorporating aggressive imaging findings, age younger than 35-40 years, and a 15-mm cutoff for triaging work-up, may reduce this excess work-up of benign ITNs while capturing the same proportion of thyroid malignancies. Ultrasound is the study of choice for the evaluation of an intrathyroidal mass or nodule. CT has no signs that help to differentiate malignant from benign thyroid nodules and is therefore not the study of choice. The Society of Radiologists in Ultrasound (SRU) has developed ultrasound criteria to determine high-risk nodules and prompt fine needle aspiration (FNA) for diagnosis. The SRU recommends FNA for the following US characteristics: 1. 1 cm & microcalcification 2. > 1.5 cm solid or coarse calcifications 3. > 2 cm mixed solid & cystic components 4. Nodule w/ substantial growth 5. Nodule w/ abnormal cervical lymph nodes The American Thyroid association (ATA) guidelines also currently recommend ultrasound as the preoperative study of choice for evaluation of uncomplicated thyroid cancer. However, cross-sectional imaging should be recommended for cases with: 1. Aggressive pathology 2. Clinical signs of extra-thyroidal extension: vocal cord palsy, fixed mass, dysphagia, respiratory symptoms, etc. 3. Lateral compartment lymphadenopathy by palpation or ultrasound Many thyroid cancer experts would also consider cross sectional imaging for ultrasound or palpable central compartment lymphadenopathy.

active handout


RC606C

Parathyroid Imaging
C. Douglas Phillips MD (Presenter): Stockholder, MedSolutions, Inc Consultant, Guerbet SA

LEARNING OBJECTIVES

1) Discuss the history of parathyroid imaging. 2) Understand current imaging modalities and their strengths and weaknesses. 3) Know the current surgical approach to parathyroid disease. 4) Understand the contribution of physiologic imaging of parathyroid disease.

ABSTRACT

Parathyroid imaging for patients with primary hyperparathyroidism (PHT) has gone through a series of changes that have been brought about because of the necessity of very precise localization of the abnormal parathyroid gland or glands. In the current surgical paradigm, minimally invasive parathyroid surgery (MIPS) is the sought after technique, demanded by patients and offering the lowest cost and most efficacious method to address an abnormal gland. Radiologists offer much to this patient population. Cross-sectional imaging is very often offered to this patient group and precise localization of parathyroid tissue is the goal. Surgeons do not want to operate on normal glands, and they do not want to explore necks. They must be directed to tissue that is parathyroid tissue, and not lymph nodes, and not other potential visceral space masses. Ectopic parathyroid tissue is also a vexing problem. In the setting of ectopic parathyroid tissue, the classic localizing techniques may fail, and a gland that is not evident on the oft-performed and often first line imaging modality (Tc-99m SESTAMIBI) may be problematic. We will discuss the contribution of CT, MR, US and nuclear medicine to visualize parathyroid tissue.
Sub-Events

**RC610A**  
**Thyroid Nodules: When and What to Biopsy**  
**Presenter:** Jill Eve Langer MD  
**Consultant, BioClinica, Inc**

**LEARNING OBJECTIVES**

1) Discuss the sonographic characteristics that are associated with a high probability that a thyroid nodule is likely malignant or likely benign.  
3) Gain an understanding of the rationale of the current guidelines for recommending thyroid fine needle aspiration.

**ABSTRACT**

As an overview, this presentation will review the epidemiology of thyroid nodules and correlate the sonographic findings with the risk of malignancy or the likelihood that the appearance represents a benign hyperplastic thyroid nodule rather than a true neoplasm. Additionally, the rationale for current guidelines for recommending thyroid fine needle aspiration will be discussed. The prevalence of palpable thyroid nodules is estimated to be 6.4% in women and 1.5% in men between 30 to 60 years of age, living in iodine-sufficient regions. However, high resolution sonography of the neck has been shown to be a much more sensitive technique than palpation, detecting nodules in 19 to 67% of randomly selected adults, with detection rates greater in women and increasing with age for both genders. Fortunately the vast majority of sonographically detected thyroid nodules are benign, hyperplastic regions of the thyroid. Fine-needle aspiration biopsy (FNA) is still considered the most reliable diagnostic test to determine if a thyroid nodule is malignant. Malignant nodules account for approximately 5% of all nodules that undergo palpation-guided FNA and approximately 10 to 15% of nodules that undergo sonography-guided FNA procedures. Analysis of the sonographic features of thyroid nodules has become the preeminent non-invasive tool for analyzing the risk of malignancy of thyroid nodules and aids in selecting which nodules should undergo fine needle aspiration (FNA). A number of recently published guidelines and consensus statements emphasize that the sonographic appearance of a nodule is a superior predictor of malignancy compared with nodule size or palpability and that when sonographic features of malignancy are noted, the nodule should undergo FNA. A number of sonographic features have shown a high specificity for the diagnosis of thyroid cancer and include marked hypochoegenicity, the presence of microcalcifications, infiltrating or micro-lobulated borders, and a taller-

**RC610B**  
**Post-Thyroidectomy Neck**  
**Presenter:** Carl C. Reading MD  
**Nothing to Disclose**

**LEARNING OBJECTIVES**

1) Recognize the sonographic appearance of recurrent and metastatic disease, and other abnormalities, in the post-operative neck.

**ABSTRACT**

In the post-thyroidectomy neck, ultrasound surveillance is a highly effective method to evaluate for residual and recurrent disease. Recurrence can occur anywhere within the neck, but typically is located in the mid and low internal jugular chains and thyroid bed region. Abnormal cervical lymph nodes can be recognized with a high degree of accuracy due to abnormal size, shape, internal architecture, and color Doppler appearance. In patients with suspected metastatic papillary cancer, the presence of internal fluid or calcifications is highly predictive of malignancy. Abnormal nodal color Doppler flow including peripheral (non-hilar), increased, and irregular flow is highly predictive of malignancy. Within the post-operative thyroid bed, itself, residual thyroid tissue, tumor recurrence, and suture granulomas can occur. FNA for cytologic analysis of suspected abnormalities can be performed, and the addition of thyroglobulin and calcitonin assay of the specimen, for papillary and medullary cancer, respectively, adds a high degree of accuracy to this procedure.

**RC610C**  
**Parathyroid and Other Neck Masses**  
**Presenter:** Mary Catherine Frates MD  
**Nothing to Disclose**

**LEARNING OBJECTIVES**

1) Understand the best method to detect abnormalities of the parathyroid gland.  
2) Gain understanding of the wide variety of lesions that can be found in the neck outside of the thyroid gland.  
3) How to differentiate between these lesions based on their sonographic characteristics.
Case-based Review of Neuroradiology (An Interactive Session)

Multisession Courses

PD | NR | HN | CR

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 10:30 AM - 12:00 PM   Location: S100AB

Participants

Director
Pina Christine Sanelli  MD Nothing to Disclose

Sub-Events

MSCN52A  Pediatric Brain
Tina Young  Poussaint  MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) To select the appropriate modality or modalities in evaluating a suspected or diagnosed case of pediatric CNS disease with focus on MR imaging. 2) To review key MR imaging features of pediatric brain diseases. 3) To evaluate neuroimaging of pediatric CNS disease as it relates to understanding the developing brain in childhood.

MSCN52B  Pediatric Spine
Nafi Aygun  MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric spine. 2) Identify the key imaging features of various common pediatric spine diseases. 3) Recognize common patterns for spine and spinal cord pathology and organize these patterns into categories of diseases processes.

ABSTRACT

Common pediatric spine and spinal cord diseases will be discussed in a case-based format.

MSCN52C  Pediatric Head and Neck
Laurie A. Loevner  MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the salient imaging features of common pathologies of the pediatric head and neck. 2) Identify pertinent anatomy in the neck and skull base through the illustration of head and neck pathology. 3) Recognize patterns for disease that allow a succinct differential diagnosis. 4) Apply radiologic findings to identify next appropriate steps in patient work-up.

RC706  How to Say it: Generating High Impact H&N Reports

Refresher/Informatics

NR | HN

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 4:30 PM - 6:00 PM   Location: N226

Sub-Events

RC706A  Reporting Sinus Studies
Michelle A. Michel  MD (Presenter):  Author, Amirsys, Inc Co-editor, Amirsys, Inc Consultant, Amirsys, Inc
LEARNING OBJECTIVES

1) Understand relevant normal and variant sinonasal anatomy, patterns of inflammatory disease, and complications of acute rhinosinusitis. 2) Recognize lesions that mimic inflammatory disease and identify additional findings outside of the sinonasal cavities that may be present on imaging studies. 3) Improve your basic knowledge and skills relevant to assessing the pediatric temporal bone. 4) Apply principles of critical thinking to provide temporal bone reports that are clinically relevant and of use for parental counseling and surgical planning. 5) Understand the importance of accurately localizing the tumor to a subsite in the head and neck. 6) Apply staging details from the AJCC 7th edition to tumors that have been identified.

ABSTRACT

In order to create an accurate and clinically helpful sinonasal CT report, the radiologist must have knowledge of sinonasal anatomy and correct terminology of surgical procedures. Reports for sinus CT in the setting of inflammatory disease should include an objective description of the amount of mucosal disease in the sinuses. The drainage pathways of the sinuses should be evaluated keeping in mind patterns of inflammatory disease. The radiologist should be familiar with the variety of orbital, bone/soft tissue, and intracranial complications of sinusitis. Whenever there is clinical suspicion of an intracranial complication of sinusitis, gadolinium-enhanced MRI of the brain is indicated. CT is often performed for the evaluation of the patient after ESS. The examination may be performed to evaluate for improvement in sinus ventilation, causes of ESS failure, or complications of surgery. Sinus CT "red flags" include odontogenic maxillary disease, isolated sphenoid sinus and olfactory recess inflammatory opacification. It is also important to review the compartments adjacent to the sinonasal cavities in search of additional findings.

Reporting Temporal Bone Studies

Caroline Diana Robson MBChB (Presenter): Editor with royalties, Amirsys, Inc Author with royalties, Amirsys, Inc

LEARNING OBJECTIVES

1) Improve your basic knowledge and skills relevant to assessing the pediatric temporal bone. 2) Apply principles of critical thinking to provide temporal bone reports that are clinically relevant and of use for parental counseling and surgical planning.

ABSTRACT

Reporting Temporal Bone Studies Recognize normal variants in pediatric temporal bone: Cartilaginous cochlear cleft, enlarged vestibular aqueduct mimics, SCC dehiscence mimics, foramen tympanicum, petrous apex marrow variants Congenital External and Middle Ear Problems 1. External auditory canal (EAC): Normal, stenotic (tympanic plate present/hypoplastic) or atretic (tympanic plate absent). If atretic describe atresia plate: bony (thick or thin) vs bony and membranous. Stenosis + opacification and bony erosion = keratosis obturans or cholesteatoma. 2. Mastoid pneumatization: Pneumatization (development) and aeration 3. Middle ear space size (MES): Normal, hypoplastic or absent; assess morphology; look for opacity in MES 4. Ossicles and tegmen: Normal or abnormal size, shape, orientation or ossicular fusion/fixation. Tegmen integrity 5. Oval and round windows: Normal, atretic or stenotic 6. Facial nerve (CN7) canal size and course: Normal or anomalous course, normal or dehiscent, small or normal size 7. Inner ear anomalies: Inner ear + EAC/middle ear anomalies = syndrome/teratogenic insult 8. Mandibular condyle size/position: Micrognathia = syndromic etiology 9. Vessels: ICA, IJV, emissary veins, MMA ID. Head and neck and brain: Incidental or related findings Congenital Inner Ear Problems 1. Vestibular aqueduct/endolymphatic sac and duct: LVA = midpoint measurement > 0.9 mm and ependural measurement > 1.9 mm. Flared LVA associated with incomplete partition (IP-II) cochlea and/or deficient modiolus. 2. Cochlea: Shape and size of turns, interscalar septum (ISS) and/or modiolus. 3. Cochlear nerve canal (CNC) and cochlear nerve: Atresia, stenotic or normal CNC. Absent, hypoplastic or normal nerve. 4. IAC and cranial nerves: Normal, wide or stenotic IAC, symmetric or asymmetric. Absent, hypoplastic or normal CNV and 8 5. Vestibule: Normal, hypoplastic or globular 6. SCC: Absent, hypoplastic, malformed or normal 7. Assess EAC, MES, vessels, HN and brain

Active Handout

Reporting Head and Neck Cancer Studies

Patricia A. Hudgins MD (Presenter): Stockholder, Amirsys, Inc

LEARNING OBJECTIVES

1) The significance of AJCC seventh edition and how it helps outline and direct your formal neck CT or MRI interpretation. 2) The importance of identifying the subsite of the malignancy, prior to describing the findings. 3) How to generate a value-added interpretation, so that the Tumor Board members or clinicians can triage the patient to appropriate therapy for the malignancy.

Head and Neck Cancer PET Interpretation with Case Examples (An Interactive Session)

Refresher/Informatics
Sub-Events

RC711A Practical Approach for Interpreting Head and Neck PET/CT
Rathan M. Subramaniam MD, PhD (Presenter): Speakers Bureau, Eli Lilly and Company

LEARNING OBJECTIVES
1) To understand the value of PET/CT in the care process of managing head and neck cancer. 2) To learn common pathways of tumor spread in head and neck. 3) To review illustrative cases and pitfalls of interpretation.

RC711B PET/CT for Head and Neck Cancer: Clinical Applications and Case Studies
Eric Michael Rohren MD, PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Review head and neck anatomy and physiologic sites of FDG uptake. 2) Discuss the role of FDG-PET/CT in the evaluation of patients with head and neck malignancies.

ABSTRACT
FDG-PET/CT provides valuable information in the assessment of the patient with cancers of the head and neck. The metabolic information determined by FDG is complimentary and additive to the anatomic information from CT, and can be used to direct surgery, plan radiation therapy, and evaluate response to systemic or localized treatment. In this presentation, the role of FDG-PET/CT in the management of head and neck cancer will be presented, using case examples to illustrate the utility of PET as well as common pitfalls.

RC731 US for Thyroid Cancer: Diagnosis, Surveillance, and Treatment (How-to Workshop)

Participants
Jill Eve Langer MD (Presenter): Consultant, BioClinica, Inc
Kathryn Ann Robinson MD (Presenter): Nothing to Disclose
Sheila Sheth MD (Presenter): Consultant, Star Scientific, Inc

LEARNING OBJECTIVES
1) Describe the sonographic characteristics of thyroid nodules that are suspicious for malignancy. 2) a. Discuss the Bethesda Cytology Classification of Thyroid FNA results and the risk of malignancy associated with each category. b. Describe the indications for two new genetic tests that may be performed on FNAs obtained from thyroid nodules with indeterminate cytology. 3) a. Describe the technique of US-guided biopsy of thyroid nodules and cervical lymph nodes in patients who have undergone thyroidectomy for thyroid cancer. b. Discuss the rationale and method of performance of US-guided ethanol ablation of malignant cervical adenopathy in post thyroidectomy patients.

ABSTRACT
This presentation will consist of a three individual presentations. The first will review the sonographic characteristics of thyroid nodules that are suggestive of malignancy. Recommendations for selecting which thyroid nodules require ultrasound-guided biopsies which have been provided by both Radiology consensus conferences and published Endocrinology guidelines will be discussed. The second presentation will review with the Bethesda Cytology Classification of Thyroid FNA results and the risk of malignancy associated with each category. Additionally this presentation describes the indications for two new genetic tests that may be performed on FNAs obtained from thyroid nodules with indeterminate cytology. The last presentation will provide a detailed description of the technique for performing ultrasound guided biopsy of thyroid nodules and cervical lymph nodes. Various methods will be discussed and required equipment outlined. Possible complications, though rare, will be described. A comparison of the typical sonographic features of normal versus abnormal lymph nodes will be presented in an effort to identify those patients in whom sonographic follow up can be used instead of biopsy. A discussion of the possible advantages of adding thyroglobulin assay to cytologic evaluation will be provided. The rationale for and technique of performing ultrasound guided ethanol ablation of malignant cervical lymph nodes in patients with thyroid cancer will be undertaken.
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.

SST08
Neuroradiology/Head and Neck (New Techniques in Head & Neck Imaging)

Scientific Papers

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Fri, Dec 5 10:30 AM - 12:00 PM Location: N230AB

Participants
Moderator
Pratik Mukherjee MD, PhD: Research Grant, General Electric Company Medical Advisory Board, General Electric Company
Gaurang V. Shah MD: Nothing to Disclose

Sub-Events

SST08-01 Novel Binomial Off-Resonant Rectangular (BORR) Pulse for MRI Retrobulbar Vessel Imaging
Yongquan Ye (Presenter): Nothing to Disclose, Zhen Wu PhD: Nothing to Disclose, E. Mark Haacke PhD
The Usefulness of Acoustic Structure Quantification Values in the Evaluation of Diffuse Thyroid Disease

**PURPOSE**

Retrobulbar vessels, such as ophthalmic artery (OA) and vein (OV), central retinal artery (CRA), posterior ciliary arteries (PCA) and lacrimal artery (LA), are critical to maintain the eye's normal function. Disrupted blood flow in these vessels can lead to severe vision loss. However, these vessels are difficult to image with MRI. Here we demonstrate a novel water selective excitation method, namely Binomial Off-Resonant Rectangular (BORR) pulse, for obtaining high resolution retrobulbar vascular maps.

**METHOD AND MATERIALS**

Nine healthy volunteers (5 males, 31±3 y/o) were enrolled in the study with written consents. All data were collected on a Siemens 3T Verio scanner with product 32ch head coil. The BORR GRE sequence was scanned sagittally with TR/TE = 11/3ms, 0.5mm isotropic voxels; BORR pulse duration τ= 1.6ms, flip angle = 12°, and frequency offset Δf = 140Hz. This configuration gives whole brain coverage and excellent fat suppression. For comparison, 3D TOF MRA (with and without fat saturation [FS], or water excitation [WE]), 2D TOF, Linear Subtraction (LS) MRA and CE MRA were also performed. All scans were configured to have similar parameters (e.g. voxel size, bandwidth, etc.). All final results were reoriented to axial plane and processed with Maximal Intensity Projection (MIP) over a 4mm thickness.

**RESULTS**

As shown in the figure, the BORR pulse reliably suppresses all orbital fats, while preserving high vessel signal with sharp edges. In contrast, none of other MRA methods, including CE-MRA and LS MRA which have proven to work well for cerebral vessels, achieved similar performance in showing the vessels.

**CONCLUSION**

With our new BORR method, we have shown for the first time the high resolution MR images of the retrobulbar vessels, which has not been revealed by any existing MRA methods. This is because these vessels are buried in fatty tissues that show high signal in most MRA methods, and routine fat suppression or water excitation approaches also affect blood signal. The BORR method, on the other hand, has very robust and thorough fat suppression while preserving high blood signal. Therefore we have demonstrated the promising capacity for imaging retrobulbar vessels of the BORR method.

**CLINICAL RELEVANCE/APPLICATION**

We demonstrate a novel MRA method to reveal retrobulbar orbital vessels with high resolution, clearly revealing major vessels such as OA, OV, PCA and CRA to enable direct evaluation of the blood supply to the eyes.
**SST08-03**

**Impact of Image Orientation on Measurements of Thyroid Nodule Stiffness Using Shear Wave Elastography**

Manjiri K. Dighe MD (Presenter): Research Grant, General Electric Company, Jeff Thiel: Nothing to Disclose, Daniel S. Hippe MS: Research Grant, Koninklijke Philips NV Research Grant, General Electric Company

**PURPOSE**

To compare stiffness measurement within a thyroid nodule using Shear wave elastography (SWE) on transverse (T) and longitudinal (L) images.

**METHOD AND MATERIALS**

After IRB approval, elastograms were obtained by (SWE) from 77 individuals, with a total of 96 thyroid nodules. SWE data was acquired without any external compression using the Supersonics Aixplorer machine. Elastograms were acquired in the transverse (T) and longitudinal (L) orientation. 1 reader blinded to pathology results drew regions of interest (ROIs) covering the entire nodule within each image. The mean stiffness value (SV) was recorded from each ROI and averaged across each nodule for each orientation separately. Nodule SVs were compared between orientations using the Wilcoxon signed-rank test for bias and the concordance correlation coefficient (CCC) for agreement. In those with final histopathology results available, receiver operating characteristic (ROC) curve analysis and the area under the ROC curve (AUC) were used to evaluate how well SVs from each orientation could discriminate malignant and benign lesions.

**RESULTS**

Mean nodule SVs were 19.3 ± 15.5 kPa on T images and 22.1 ± 20.8 kPa on L images. There was a statistically significant but small bias in measurements between orientations of 2.8 kPa (p=0.003). The SD of differences was 13 kPa and CCC=0.74. After removing two large values, these dropped to 9.9 kPa and CCC=0.52. In the subset of 41 nodules with histopathology available, the AUC for discriminating malignant and benign lesions was 0.76 (p=0.002) using T images and 0.70 (p=0.01) using L images (p=0.28 for the difference).

**CONCLUSION**

There was moderate agreement in mean stiffness values measured using transverse and longitudinal orientation but only a small bias. Measurements from both orientations had similar performance in discriminating malignant and benign lesions. Using either orientation for characterizing thyroid nodules is feasible.

**CLINICAL RELEVANCE/APPLICATION**

Similar diagnostic performance using Shearwave elastography was achievable using transverse and longitudinal orientations, which provides flexibility in imaging patients with short necks or difficulty in laying on the examination bed with an extended neck.

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**SST08-04**

**Iterative Model Reconstruction Algorithm in Low kVp (80) Parotid CT Scan for Visualization of Adipose Tissue Deposition in Sjögren’s Syndrome**

Changwei Ding (Presenter): Nothing to Disclose, Xiao Mei Lu MMed: Employee, Koninklijke Philips NV, Ping Wang MD, MS: Nothing to Disclose, Qiyong Guo MD: Nothing to Disclose

**PURPOSE**

To investigate the ability of low dose parotid CT scan using an iterative model reconstruction (IMR) algorithm to detect the distinctive adipose tissue deposition in Sjögren’s syndrome.

**METHOD AND MATERIALS**

Eighteen patients with confirmed Sjögren’s syndrome were scanned using a 256-slice CT for visualization of the parotid gland. This protocol was approved by hospital ethics committee and written informed consent was obtained from each patient. Among these patients, five underwent routine dose scan (120 kV and 200 mAs) and filtered back projection algorithm was used for image reconstruction (RD-FBP group), and thirteen patients under low dose scan (80 kV, 200 mAs, 71% dose reduction), and iDose4 (level 5) and IMR (level 1) algorithm was used respectively for image reconstruction (LD-iDose4 group and LD-IMR group, respectively). The image noise (measured in semispinalis capitis) was compared between RD-FBP group and LD-iDose4 and LD-IMR group. The images of LD-iDose4 group and LD-IMR group were read blinded by two experienced radiologists in consent for evaluation of the adipose tissue deposition in the parotid gland according to these features: detectability, interface contrast to parotid parenchyma, and density contrast to parotid parenchyma [1 (poor) to 5 (excellent)].

**RESULTS**

The image noise in the LD-IMR group was significantly lower than in the LD-iDose4 and RD-FBP groups (4.36±0.96, 6.92±1.11, and 5.77±1.44, respectively, P<0.05). There was no significant difference in the detectability of adipose tissue between LD-IMR and LD-iDose4 groups (P>0.05). The LD-IMR group displayed clearer boundary between adipose tissue and parotid parenchyma and offers higher density contrast than the LD-iDose4 group (P < 0.05).

**CONCLUSION**

IMR algorithm reduced the noise of low dose parotid CT scan, even lower than RD-FBP, increased the interface and density contrast of adipose tissue and parotid parenchyma, so offered stronger ability to detect adipose tissue deposition in the parotid gland of patients with Sjögren’s syndrome.

**CLINICAL RELEVANCE/APPLICATION**

...
IMR can improve the image quality of low dose CT scan, increase the contrast resolution between different tissues, and thereby enhance the ability to detect lesions.

**SST08-05**

**Single Contrast Bolus vs Radiation Dose: Can Combined Chest & Neck CT Examinations Use One Topogram?**

**Jie Zhang PhD (Presenter): Nothing to Disclose, Jessica L. Cornett: Nothing to Disclose, Karsten D. Colwell: Nothing to Disclose, Edward Joel Escott MD: Royalties, Thieme Medical Publishers, Inc Researcher, Athersys, Inc Grant, Athersys, Inc Inc**

**PURPOSE**

Currently we treat Computed Tomography (CT) chest and neck examinations as separate scans, using two separate topograms and dividing the contrast 60/40. Depending upon the patient’s body habitus this amount of contrast for each scan may not be sufficient to opacity the vessels properly. Acquiring one topogram with the arms up then having the patient move their arms up/down during the chest/neck scan allows one bolus of contrast to be administered, but has the potential to increase radiation. The purpose of this study is to investigate the difference in patient radiation dose for combined chest and neck CT examinations when one topogram with the arms up is used, compared with two separate topograms with the arms up and down respectively.

**METHOD AND MATERIALS**

Between 2/1/2014 and 4/5/2014, patients who received a CT chest and neck examination in the same session and same CT scanner were randomly separated into two groups. One group followed the conventional two topogram scenario with proper arm positioning while the other group kept the arms up for the combined topogram. The first group received the divided 60/40 bolus contrast while the second group received only one contrast bolus. During scan acquisition for the second group the arms were positioned out of the scan field-of-view (FOV). Automatic Exposure Control (e.g., CareDose4D) remained on for CT scanning. Volume CT Dose Index (CTDIvol) for the chest and neck CT scans was recorded, respectively. Patient Body Mass Index (BMI) was also recorded.

**RESULTS**

The CTDIvol and BMI of 23 patients were collected, 11 with two separate topograms and 12 with one topogram. Our preliminary comparison shows there is no significant difference in either CTDIvol of the neck (p=0.24) or BMI (p=0.51) with either topogram technique. This may be mainly due to the use of AEC (CareDose4D) which adjusts tube current in real time. CTDIvol of the chest was not compared since in either situation the arms are not included within the chest on the topogram.

**CONCLUSION**

One topogram with the arms up can be used for combined CT chest and neck examinations to allow the use of a single contrast bolus. With the appropriate use of AEC, there is no significant increase in the radiation dose to patient.

**CLINICAL RELEVANCE/APPLICATION**

One topogram can be used for combined chest and neck CT examinations to enable the use of a single contrast bolus without a significantly increased patient dose.

**SST08-06**

**Application of the Dual Energy CT Scan for Differentiation of Parathyroid Gland from Thyroid Gland Based on Enhancement Characteristics**

**Laleh Daftaribesheli MD (Presenter): Nothing to Disclose, Emad Ahmadi MD: Nothing to Disclose, Omid Khalilzadeh MD, MPH: Nothing to Disclose, Rajiv Gupta PhD, MD: Nothing to Disclose**

**PURPOSE**

Compared to thyroid, parathyroid is hypothesized to uptake more amounts of iodine after iodine contrast injection, and to have more rapid iodine washout in delayed images. The aim of this study was to ease the distinction of parathyroid from thyroid gland in CT images by comparing the changes of iodine content in these two glands over time after iodine contrast injection. Using dual-energy CT, we also aimed to minimize radiation exposure by eliminating the pre-contrast phase.

**METHOD AND MATERIALS**

We retrospectively studied seven CT angiograms of head and neck that had been performed for vascular assessment of patients. The imaging protocol included iodine contrast injection followed by one post-contrast dual-energy CT image and one delayed image after injection. We defined regions of interest over parathyroid and thyroid gland, computed the iodine content in these regions using dual-energy CT post-processing software, and subtracted the iodine content in delayed image from that of the post-contrast image. This iodine content change was then compared between thyroid and parathyroid glands.

**RESULTS**

Our study includes 5 males and 2 females with the mean age of 67. Our analysis showed that the iodine content decrease from post-injection to delayed image was 6.2 ± 1.8 for parathyroid gland, and it was 2.1 ± 2.1 for the thyroid gland. The figure shows the changes of iodine content over time in both parathyroid and thyroid glands, as well as the defined regions of interest for two representative cases.
Using a two-phase dual energy CT scan (post-contrast and delayed phase), parathyroid tissue can be distinguished from thyroid gland based on the pattern of iodine content changes between the phases.

**CLINICAL RELEVANCE/APPLICATION**

Difference between iodine content of post-contrast image and delayed post-contrast image in the parathyroid and thyroid tissue might enable clinicians to differentiate the two tissues reliably. Distinction of parathyroid from thyroid tissues in dual-energy CT images might be facilitated by superimposing computed images on the CT image that are encoded based on changes of iodine content from post-injection to delayed-phase images.

**Establishing Normative Values of Dual-energy CT Parameters in Head and Neck Tissues and Comparison to Benign and Malignant Tumors**

**METHOD AND MATERIALS**

Institutional review board approval was obtained. All adult CT neck scans performed on a 64 slice GE CT (HD750, Milwaukee, WI) with dual energy CT (Gemstone spectral imaging, GSI) from November 2009 to February 2014 were included. Scans with significant artifact or poor contrast bolus were excluded. Post-processing was performed by an experienced neuroradiologist on a GE-AW workstation by placing multiple ROIs in normal tissues including the parotids, submandibular glands, floor of mouth, tongue base, lymph nodes, paraspinal muscle and in known tumor tissue (either benign or malignant). The parameters measured included HU at 70keV, effective Z and iodine-water concentrations. Mean, S.D. and range were calculated for each of these parameters within normal tissues and were then compared to the parameters measured in benign and malignant tumors using independent samples t-test. Scatterplots of effective Z against each of the other parameters were also created to analyze if benign and malignant tissues could be reliably separated using these parameters.

**RESULTS**

Patients with 17 benign and 24 malignant tumors were included. The mean and SD of effective Z and iodine-water concentration (in mg/cc) in normal tissues, benign and malignant tumors are listed in Table 1. Significant differences in effective Z and iodine-water concentrations was noted between benign and malignant neoplasms (p=0.001, 0.001 respectively) and between malignant neoplasms and all normal tissues but not between benign tumors and normal tissues. The scatterplots of effective Z versus HU at 70 keV showed good separation of benign and malignant tumors.

**CONCLUSION**

Our study reveals that dual energy CT may help in distinguishing both benign and malignant tumors from each other, and differentiating malignant tumors from normal tissue in the head and neck.

**Thyroid Evaluation with a Novel Microvascular Flow Technique**

To evaluate the flow imaging capabilities of a new prototype ultrasound (US) image processing technique (SMI; Toshiba Medical Systems, Tokyo, Japan) for depiction of microvascular flow in normal thyroid tissue and thyroid nodules compared to standard color and Power Doppler imaging (CDI and PDI).

**METHOD AND MATERIALS**

SMI is a novel, microvascular flow imaging mode implemented on the Apio 500 US system (Toshiba). SMI utilizes advanced clutter suppression to extract flow signals from large to small vessels and depicts this information as a color overlay image or as a monochrome map of flow. Ten (10) healthy volunteers and 22 patients, with 25 thyroid nodules, scheduled for US guided fine needle aspiration were enrolled in this prospective study. Subjects underwent US examination consisting of grayscale US, CDI and PDI followed by color and monochrome SMI and pulsed Doppler. In the volunteers, pulsed Doppler guided by the 4 flow modes determined the lowest velocity measurable within the normal thyroid microvasculature and results were
compared using a one-way ANOVA. Two radiologists independently analyzed still images and digital clips scoring overall flow detection, vessel branching details and noise on a subjective scale of 1 (worst) to 10 (best). Scores were compared (on a per nodule basis) using a non-parametric Wilcoxon signed rank test.

RESULTS

For the volunteers SMI captured microvasculature with lower velocity than CDI and PDI (2.2 ± 0.35 and 2.1 ± 0.32 cm/s vs. 2.6 ± 0.44 and 2.8 ± 0.77 cm/s; p < 0.012). In all cases SMI showed microvascular flow with significantly higher image scores and provided better depiction of the vessel branching details compared to CDI and PDI (SMI scores > 5.4 and CDI/PDI scores < 4.9; p < 0.0001). Clutter noise was significantly higher in monochrome SMI mode than in the other modes, including color SMI (monochrome SMI scores < 4.5 while others were > 6.4; p < 0.001).

CONCLUSION

The novel SMI mode consistently showed more detailed thyroid flow with smaller branches and lower velocities than CDI and PDI.

CLINICAL RELEVANCE/APPLICATION

This new flow mode may be useful for providing a better understanding of the vascularity of thyroid nodules.

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**SPFR61**

**Friday Imaging Symposium: A Guided Tour for Managing Incidental Findings: Adnexal, Thyroid, Pediatric, Adrenal and Chest**

**Special Courses**

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AMA PRA Category 1 Credits™: 2.50
ARRT Category A+ Credits: 3.00
Fri, Dec 5 12:30 PM - 3:00 PM  Location: E253CD

**Participants**

**Moderator**
Lincoln L. Berland  MD  Consultant, Nuance Communications, Inc  Stockholder, Nuance Communications, Inc

**LEARNING OBJECTIVES**

1) Appreciate the scope, variety and nature of the problem of incidental findings on imaging studies in multiple contexts and the special challenges each present. 2) Better apply a system for managing incidental adnexal lesions, including when to follow or further evaluate lesions based on their features, size and on patient factors. 3) Apply criteria for diagnosing and following incidental adrenal lesions, including when and how to reference information from an ACR White Paper addressing this topic. 4) Assess how new knowledge and techniques developed since publication of the Fleischner criteria in 2005 will lead to changes for managing incidental pulmonary lesions.

**Sub-Events**

**SPFR61A**  
**Chest**
Reginald F. Munden  MD, DMD (Presenter):  Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPFR61B**  
**Adnexal**
Susan M. Ascher  MD (Presenter):  Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPFR61C**  
**Adrenal**
William W. Mayo-Smith  MD (Presenter):  Author with royalties, Reed Elsevier  Author with royalties, Cambridge University Press

**LEARNING OBJECTIVES**

View learning objectives under main course title.
**Thyroid Nodules**
Edward G. Grant MD (Presenter): Research Grant, Bracco Group Research Grant, General Electric Company Medical Advisory Board, Nuance Communications, Inc

**LEARNING OBJECTIVES**

View learning objectives under main course title.

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**Pediatrics**
R. Paul Guillerman MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Recognize common or vexing incidental findings encountered in pediatric body imaging, such as lymphoid hyperplasia, brown fat, ectopic thymus, pulmonary nodules, small bowel intussusceptions, duodenal inversum, intraperitoneal free fluid, infantile ovarian cysts, urachal remnants, renal cysts, renal collecting system ectasia, neonatal adrenal masses, testicular microlithiasis, osteochondral irregularities, and hypercellular marrow. 2) Understand the clinical implications of these incidental findings to distinguish which of them can be dismissed and which of them warrant additional investigation or follow-up