Head And Neck
Neuroradiology/Head and Neck (Head and Neck Tumors)

Sunday, Nov. 27 10:45AM - 12:15PM Room: N227B

SSA18-01  Correlation Between Quantitative Perfusion/Diffusion MRI Parameters and Human Papillomavirus Status in Oropharyngeal Squamous Cell Carcinoma

Participants
Richard H. Wiggins III, MD, Salt Lake City, UT (Moderator) Nothing to Disclose
Dan T. Nguyen, MD, Hummelstown, PA (Moderator) Nothing to Disclose

PURPOSE
Patients with oropharyngeal squamous cell carcinoma (OPSCC) that are human papillomavirus (HPV)-positive show more favorable treatment response rates and prognosis as compared to patients with HPV-negative OPSCC. This study was designed to investigate the differences in perfusion parameters from dynamic contrast enhanced MR imaging (DCE-MRI) and ADC values from DWI according to the presence of biologically active HPV in OPSCC.

METHOD AND MATERIALS
46 patients (median age 62 years, IQR = 54-72) with pathologically confirmed OPSCC and underwent pretreatment DCE-MRI and DWI were enrolled and analyzed in this retrospective study. The DCE-MR and diffusion images were post-processed by using commercially available software (nordicICE, NordicNEuroLab). Quantitative parameters (\(K_{\text{trans}}\), \(K_{\text{ep}}\), \(V_{e}\), \(V_{p}\), AUC60-area under the signal intensity-time curve at initial 60s) from DCE-MRI and ADC value from DWI were calculated within the manually placed ROI plotted around the main tumor on every image slice. Histogram parameters consisting of mean, median, 25th, 75th percentile value, skewness and kurtosis of DCE-MRI parameters and ADC values were compared between the HPV-positive and HPV-negative groups using the Mann-Whitney U test.

RESULTS
16 patients were HPV-positive (34.8%). Patient's age (p=0.021) and T stage of OPSCC (p=0.012) are significantly different between HPV-positive and HPV-negative group. Among quantitative parameters from DCE-MRI and DWI, skewness of \(K_{\text{ep}}\) (p=0.016) and skewness (p=0.005), Kurtosis (p=0.015) of ADC show statistically significant difference between HPV-positive and HPV-negative OPSCC.

CONCLUSION
Tumor heterogeneity factor, skweness and kurtosis of ADC value show significant difference between HPV-positive and HPV negative group. Our preliminary evidence promise imaging parameters could reflect HPV status in OPSCC.

CLINICAL RELEVANCE/APPLICATION
Tumor heterogeneity factor from imaging parameters could reflect HPV status in oropharyngeal squamous cell carcinoma.

SSA18-02  The Use of Imaging, PET/CT and MRI, for Prognostication and Risk Stratification of Patients with Nasopharyngeal Carcinoma

Participants
Hui Yuan, MBBS, MMed, Hong Kong, Hong Kong (Presenter) Nothing to Disclose
Qi-Yong Ai, MBBS, Hong Kong, Hong Kong (Abstract Co-Author) Nothing to Disclose
Dora Kwong, MD, MBBS, Hong Kong, Hong Kong (Abstract Co-Author) Nothing to Disclose
Daniel Y. Fong, PhD, Hong Kong, Hong Kong (Abstract Co-Author) Nothing to Disclose
Ann D. King, MD, Shatin, Hong Kong (Abstract Co-Author) Nothing to Disclose
Victor H. Lee, MD, MBBS, Hong Kong, Hong Kong (Abstract Co-Author) Nothing to Disclose
Pek Lan Khong, MBBS, FRCSR, Hong Kong, Hong Kong (Abstract Co-Author) Nothing to Disclose

PURPOSE
To compare and evaluate the roles of metabolic and morphological parameters using PET/CT and MRI for prognostication and risk stratification of patients with nasopharyngeal carcinoma (NPC).

METHOD AND MATERIALS
Newly diagnosed non-metastatic NPC patients who underwent 18F-FDG PET/CT and contrast-enhanced MRI for staging were recruited. Primary tumor and nodal lesions were identified and segmented, using a threshold of SUV=2.5 on PET and standardized...
morphological criteria including size for nodes on MRI, by two independent teams. T stage was assessed based on MRI while N stage was based on both MRI and PET/CT (AJCC-TNM 7th edition). SUVmax, Metabolic Tumor Volume (MTV) and morphological tumor volume (VOL) of the lesions were computed. Cox-regression model (univariable followed by multivariable) was used for survival analysis with overall survival (OS) and recurrence-free survival (RFS) as end points. Classification And Regression Tree (CART) was adopted for risk-stratification, with risk-layers verified using Kaplan-Meier model. p-value <0.05 was considered statistically significant.

RESULTS

A total of 201 patients (148 male) aged 49.7±13.5 years old (mean ± SD) were included. Sixteen, 49, 81 and 55 patients were in stage I, II, III and IV respectively. T stage was assessed based on MRI while N stage was based on both MRI and PET/CT (AJCC-TNM 7th edition). SUVmax, Metabolic Tumor Volume (MTV) and morphological tumor volume (VOL) of the lesions were computed. Cox-regression model (univariable followed by multivariable) was used for survival analysis with overall survival (OS) and recurrence-free survival (RFS) as end points. Classification And Regression Tree (CART) was adopted for risk-stratification, with risk-layers verified using Kaplan-Meier model. p-value <0.05 was considered statistically significant.

CONCLUSION

Nodal volume is an important factor in prognostication and risk stratification of newly diagnosed NPC patients, and when exceeding 18cc over-rides TNM stage. This has potential implications on patient management.

CLINICAL RELEVANCE/APPLICATION

Nodal volume is an important factor in prognostication and risk stratification of newly diagnosed NPC patients, and when exceeding 18cc over-rides TNM stage. This has potential implications on patient management.

SSA18-03 Metastatic Nodes Injected with Talimogene Laherparepvec in Patients with Melanoma: Increased Size Does Not Necessarily Indicate Progression

Sunday, Nov. 27 11:05AM - 11:15AM Room: N227B

Participants
Carlos Zamora, MD, PhD, Chapel Hill, NC (Presenter) Nothing to Disclose
Edward M. Lopez, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Frances Collichio, MD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Mauricio Castillo, MD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the imaging response of metastatic nodes injected with talimogene laherparepvec in patients with melanoma.

METHOD AND MATERIALS

Twelve locally injected nodes in 7 patients were followed with serial contrast-enhanced CT and compared with baseline. Node size and margins (smooth vs. infiltrative) were recorded.

RESULTS

Median follow up was 277 days. Two major growth patterns were observed. Six of 12 nodes (50%, pattern 1, figure 1a) showed increase in size followed by decreased size, with size at final follow up smaller than baseline. Five of 12 nodes (42%, pattern 2, figure 1b) showed a downward trend in size. Two of these showed minor increases in size during follow up but never larger than baseline. Two of 5 were non-measurable at last follow up CT. Finally, 1 separate node showed an upward trend (marked with an asterisk, figure 1a) but could not be followed after 184 days as the patient was placed under hospice care due to disease progression. Six of 9 nodes eventually developed infiltrative margins at some point, including five nodes with final decreased size at follow up.

CONCLUSION

Nodes injected with talimogene laherparepvec can increase in size and develop infiltrative margins. Such changes can be seen even in lesions with ultimate treatment response.

CLINICAL RELEVANCE/APPLICATION

Increase in size of nodes injected with talimogene laherparepvec does not necessarily indicate progression. Infiltrative margins are also frequently seen and may be confused with extracapsular spread.

SSA18-04 Maxilla and Mandible Tumors: Combined Quantitative MRI Assessment and Conventional MRI for Differentiation of Tumors of Different Historical Types

Sunday, Nov. 27 11:15AM - 11:25AM Room: N227B

Participants
Yingwei Wu, MD, Shanghai, China (Presenter) Nothing to Disclose
Xiao-Feng Tao, MD, PhD, Shanghai, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the diagnostic value of quantitative parameters from diffusion-weighted MR imaging (DWI), dynamic contrast enhanced MR imaging (DCE-MRI), and MR spectrum (MRS) in patients with maxilla and mandible neoplasm.

METHOD AND MATERIALS

Materials and Methods: Total 524 patients (327 benign and 197 tumors) from 2002-2012 with maxilla and mandible neoplasm were recruited. All patients were underwent surgery and histology evaluation. Routine maxillafacial MRI was performed on all patients prior to surgery. Demographic information (age, sex) was searched in medical history. MR findings (size, margin, shape, envelope and signal of masses, bone destruction) were observed and recorded. DWI with b factor of 0 and 1000 s/mm², DCE-MRI and MRS was performed on 79 patients (49 benign and 30 malignant tumors). Quantitative parameters included ADC value, time-intensity
The purpose of this study was to investigate the accuracy of 3D double-echo steady-state with water excitation (3D-DESS-WE) curve (TIC) with parameters and Cho peak were obtained from the MR imaging. Single or combined parameters were fitted to single or multiple logistic regression models, respectively.

RESULTS
In the cohort of 524 patients, tumor size (malignant: 3.9cm vs benign: 2.6cm), unclear margin (malignant:87% vs benign:41%) and bone destruction (malignant:79% vs benign 34%) were found significantly different between benign and malignant group. For quantitative assessment in 79 patients, ADC value lower than cut-off point of 0.91×10-3mm2/s, TIC pattern with time to peak less than 120s and low washout ratio(<30%) and increased Cho peak were the valuable parameters for predicting malignancy. A combination of those parameters yielded a sensitivity, specificity and diagnostic accuracy and of 93.9%, 96.0% and 97.9%, respectively. Positive predictive value and negative predictive value for distinguishing benign and malignant tumors are 94.6% and 97% respectively.

CONCLUSION
Quantitative assessment was more valuable for predicting malignancy in maxilla and mandible neoplasm than routine MR findings. Using combination of quantitative parameters could greatly improve diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION
combined quantitative MRI assessment and conventional MRI may help preoperatively characterize maxilla and mandible tumors and help predict the benignity and malignancy of the tumors.

SSA18-05 MR Imaging of Parotid Gland Tumors: Added Value of Permeability MR Imaging

Sunday, Nov. 27 11:25AM - 11:35AM Room: N227B

Participants
Hidetake Yabuchi, MD, Fukuoka, Japan (Presenter) Nothing to Disclose
Satoshi Kawamani, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose
Takeshi Kamitani, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose
Koji Sagiyama, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose
Yuzo Yamasaki, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose
Hiroshi Honda, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose
Shunsuke Kamei, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose

PURPOSE
To determine added value of permeability MR imaging to T2-weighted images (T2WI), time intensity curve (TIC) analysis, and intra-voxel incoherent motion -diffusion-weighted imaging (IVIM-DWI) in characterization of parotid tumors.

METHOD AND MATERIALS
Sixty-one patients with pathologically proven parotid tumors who underwent T2WI, IVIM-DWI, and permeability MR imaging were enrolled. We measured signal intensities (SI) ratio of the lesion to the neighborhood muscle on T2WI. TIC patterns were categorized as follows: type A, persistent; type B, washout; and type C, plateau. Apparent diffusion coefficient (ADC), D and f were measured on IVIM-DWI. Ktrans, Kep, Ve, and Vp were measured from permeability MR imaging. We applied Kruskal-Wallis and Steel-Dwass tests to determine whether any differences among four histopathologic types (pleomorphic adenoma, Warthin's tumor, other benign tumors, and malignant tumors) could be seen. Diagnostic accuracy was compared before and after modification diagnosis referring to permeability MR imaging data.

RESULTS
The 49 benign tumors consisted of 23 pleomorphic adenomas, 16 Warthin's tumors, 10 various benign tumors, and 12 malignant tumors were enrolled. There was no significant difference in SI lesion/muscle, f, and Ktrans. ADC and D of malignant tumors were lower than those of pleomorphic adenomas (1.58±0.40, 1.45±0.41) and other benign tumors (1.25±0.29, 1.34±0.30), but higher than those of Warthin's tumors (0.90±0.21, 0.69±0.16). Kep and Vp of Warthin's tumors were lower than those of malignant tumors (0.45±0.084, 0.036±0.013). Ve of pleomorphic adenomas (0.57±0.50) was significantly higher than those of Warthin's tumors (0.14±0.093) and malignant tumors (0.26±0.11). In type B and C TIC patterns, positive predictive value improved in addition of Kep, Vp, and Ve compared with ADC and D alone.

CONCLUSION
There was added value of permeability MR imaging data including Kep, Vp, and Ve in the characterization of parotid gland tumors to conventional MR imaging.

CLINICAL RELEVANCE/APPLICATION
Combination of conventional and permeability MR imaging might help to characterize parotid gland tumors more accurately, and patients could avoid unnecessary surgery for benign tumors or the delay of treatment for malignant tumors.

SSA18-06 Localization of Parotid Gland Tumors in Relation to the Intraparotid Facial Nerve on 3D-Double-Echo Steady-State with Water Excitation Sequence

Sunday, Nov. 27 11:35AM - 11:45AM Room: N227B

Participants
Hiroyuki Fujii, MD, Shimotsuke, Japan (Abstract Co-Author) Nothing to Disclose
Akifumi Fujita, MD, Shimotsuke, Japan (Presenter) Nothing to Disclose
Hidenori Kanazawa, Shimotsuke, Japan (Abstract Co-Author) Nothing to Disclose
Edward K. Sung, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Osamu Sakai, MD, PhD, Boston, MA (Abstract Co-Author) Consultant, Guerbet SA
Hideharu Sugimoto, MD, Shimotsuke, Japan (Abstract Co-Author) Nothing to Disclose

PURPOSE
The purpose of this study was to investigate the accuracy of 3D double-echo steady-state with water excitation (3D-DESS-WE)
MR imaging sequence in localizing parotid gland (PG) tumors in relation to direct visualization of the intraparotid facial nerve (FN), in comparison to indirect method of localization.

METHOD AND MATERIALS
We retrospectively reviewed 57 consecutive patients with PG lesions. Two radiologists independently evaluated the detectability of the intraparotid FN on the 3D-DESS-WE sequence in preoperative MR imaging. The location of the PG lesions were categorized into the superficial or deep lobe based on two methods: 1) direct method with visualization of the intraparotid FN on 3D-DESS-WE, and 2) indirect method with approximation of the intraparotid FN using the FN line connecting the lateral surface of the posterosuperior border of the digastric muscle to the anterior surface of the ascending ramus of the mandible. Locations of PG lesions were confirmed by surgery. The diagnostic accuracy of PG lesion localization using the two methods was compared using the McNemar test.

RESULTS
Of the 114 PGs evaluated using the 3D-DESS-WE, the detectability of the intraparotid FN was 98.2% for the main trunk, 64.9% for the temporofacial branches, and 37.7% for the cervicofacial branches. The interobserver variability between the two radiologists was excellent (κ=0.89). A total of 58 PG lesions were evaluated for localization. Surgical findings confirmed 45 lesions localized to the superficial lobe, and 13 lesions localized to the deep lobe. The diagnostic accuracy of the 3D-DESS-WE method in lesion localization was 96.6% in total, with 100% accuracy for superficial lobe lesions, and 84.6% accuracy for deep lobe lesions. The diagnostic accuracy of the FN line method in lesion localization was 81.0% in total, with 93.3% accuracy for superficial lobe lesions, and 46.2% accuracy for deep lobe lesions. The difference in accuracy of PG lesion localization between the two methods was statistically significant (p=0.021).

CONCLUSION
We can achieve higher diagnostic accuracy in localizing PG tumors by directly visualizing the intraparotid FN using 3D-DESS-WE, compared to approximations using an indirect method.

CLINICAL RELEVANCE/APPLICATION
The spatial relationship of the intraparotid FN relative to a PG tumor is important for preoperative planning, and can optimize the surgical approach to prevent injury to the facial nerve.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Akihumi Fujita, MD - 2015 Honored Educator
Osamu Sakai, MD, PhD - 2013 Honored Educator
Osamu Sakai, MD, PhD - 2014 Honored Educator
Osamu Sakai, MD, PhD - 2015 Honored Educator

SSA18-07 An Active Surveillance Protocol for Low-risk Thyroid Cancer: How Many Patients Would Be Eligible?
Sunday, Nov. 27 11:45AM - 11:55AM Room: N227B

Awards
Student Travel Stipend Award

Participants
Andrew Griffin II, MD, Durham, NC (Presenter) Nothing to Disclose
Manisha Bahl, MD, MPH, Durham, NC (Abstract Co-Author) Nothing to Disclose
Juan Brito Campana, New York, NY (Abstract Co-Author) Nothing to Disclose
Jenny K. Hoang, MBBS, Durham, NC (Abstract Co-Author) Nothing to Disclose

PURPOSE
The 2015 American Thyroid Association thyroid cancer management guidelines state that an active surveillance management approach can be considered as an alternative to surgery in patients with low-risk thyroid tumors. Criteria for selection of patients for active surveillance is important and such a clinical decision making framework has been developed at Memorial Sloan Kettering Cancer Center. The aim of this study is to determine the proportion of thyroid cancers in a large cohort of patients that would meet criteria for active surveillance.

METHOD AND MATERIALS
We retrospectively reviewed 681 patients with thyroid cancer who underwent thyroid surgery between 2003 and 2012. The decision making framework for active surveillance was retrospectively applied to determine how many of these patients would have met criteria for surveillance. Patients with papillary microcarcinomas (≤1cm) were categorized as ideal, appropriate and inappropriate based on imaging findings and patient characteristics.

RESULTS
Of 681 patients with thyroid cancer, 419 (62%) were papillary carcinoma and 182 (27%) were papillary microcarcinomas at pathology. 163/182 (90%) were associated with nodules seen on preoperative imaging. The others were incidental papillary microcarcinomas in the pathology specimen. In the patients who had papillary microcarcinoma associated with a thyroid nodule, only 34/163 (21%) were located within nodules measuring ≤1cm on preoperative imaging. When the risk stratification clinical decision framework was applied, 15 patients were not low-risk and therefore not appropriate for surveillance: 2 had prior history of thyroid cancer and 13 had suspicious lymph nodes on imaging. For the remaining 19 low-risk cases, one was categorized as “ideal” and 18 were “appropriate” for active surveillance. This represents 3% of all patients with thyroid cancers and 5% of patients with papillary cancers.

CONCLUSION
Although almost one third of cancers in patients undergoing thyroid surgery were papillary microcarcinomas, only a small percentage...
Although almost one third of cancers in patients undergoing thyroid surgery were papillary microcarcinomas, only a small percentage of thyroid cancers meet criteria for active surveillance.

**CLINICAL RELEVANCE/APPLICATION**

A program of active surveillance of thyroid cancers would not place a large burden on endocrinology and radiology departments for imaging follow-up.

**SSA18-08 Differentiation of Benign and Malignant Lesions of the Tongue by Using High Resolution Diffusion-Weighted Magnetic Resonance Imaging with Readout-Segmented Echo-Planar Imaging at 3.0 T**

Sunday, Nov. 27 11:55AM - 12:05PM Room: N227B

Participants
- Shujian Li, Zhengzhou, China (Presenter) Nothing to Disclose
- Jingliang Cheng, MD,PhD, Zhengzhou, China (Abstract Co-Author) Nothing to Disclose
- Yong Zhang, DO, Zhengzhou, China (Abstract Co-Author) Nothing to Disclose
- Zanxia Zhang, Zhengzhou, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

Readout mosaic segmentation has been suggested as an alternative approach to echo-planar imaging (EPI) for high resolution diffusion-weighted imaging (DWI). The purpose of this study was to assess the role of readout-segmented EPI (RS-EPI) using parallel imaging and a two-dimensional navigator-based reacquisition (RESOLVE) for DWI in differentiating benign and malignant lesions of the tongue at 3.0 T field strength imaging.

**METHOD AND MATERIALS**

66 patients with 66 solid lingual tumors and tumorlike lesions underwent conventional MRI and RESOLVE DWI with b-values of 0 and 1000 s/mm² before therapy. The apparent diffusion coefficient (ADC) values and the relative apparent diffusion coefficients (rADC) values of the lingual lesions were calculated and compared between benign and malignant lesions of the tongue. The diagnostic performance of the ADC values and the rADC values was calculated using receiver operating characteristic (ROC) curve analysis.

**RESULTS**

The mean ADC values and rADC values of malignant tumors was significantly lower than that of benign solid lesions ($p<0.001$, $p<0.001$). The mean ADC values and rADC values of squamous cell carcinomas were significantly lower than that of adenoid cystic carcinomas ($p=0.001$, $p=0.002$), vascular malformation ($p<0.001$, $p>0.001$) and inflammatory lesions ($p=0.001$, $p=0.002$). The mean ADC values and rADC values of adenoid cystic carcinomas and inflammatory lesions were significantly lower than that of vascular malformation ($p=0.021$, $p=0.006$), ($p=0.021$, $p=0.026$). No significant differences were seen in the mean ADC values and rADC values of adenoid cystic carcinomas and inflammatory lesions ($p=0.715$, $p=0.855$). Receiver operating characteristic analysis showed that when an ADC value $<1.37 \times 10^{-3}$ mm²/s was used for predicting malignancy, the highest sensitivity of 93.02%, specificity of 86.96% and accuracy of 90.91% were obtained. The optimum threshold for the rADC value was 0.74, resulting in a sensitivity of 90.70%, a specificity of 86.96% and an accuracy of 89.39%.

**CONCLUSION**

RESOLVE can potentially offer high quality of lingual diffusion-weighted Images. ADC mapping may be an effective MR imaging tool for the differentiation of benign and malignant lesions of the tongue.

**SSA18-09 To Evaluate the Differential Role of PET-CT and Post Contrast MRI in Head and Neck Tumours with Local Metastases**

Sunday, Nov. 27 12:05PM - 12:15PM Room: N227B

Participants
- Sikandar M. Shaikh, DMRD, Hyderabad, India (Presenter) Nothing to Disclose

**PURPOSE**

To evaluate significant differences between the results of 18F-FDG-PET/CT and MRI in their ability to detect primary head-and-neck cancer and local metastatic spread.

**METHOD AND MATERIALS**

The test results of 21 patients with suspected primary head-and-neck cancer which were examined with dedicated examination of the neck at simultaneous 18-F-FDG-PET/CT and immediately there after a simultaneous post contrast MRI were analysed. A nuclear medicine physician and a radiologist evaluated the data of both examinations in consensus in a blinded manner with a 6-week gap between evaluation of the two examinations. Thereafter the results were compared with the gold standard of histopathological report, follow-up imaging or a consensus interpretation of all available data. Sensitivity, specificity, positive (PPV) and negative predictive value (NPV) were calculated for both methods.

**RESULTS**

Altogether 45 lesions were detected in PET/CT and 63 lesions in MRI. By use of gold standard 25 malignant lesions were found, 8 primary tumours and 30 lymph node metastases. PET/CT presented a sensitivity of 69.6%, a specificity of 97.4%, a PPV of 92.9% and a NPV of 87.0%. PET/MRI presented a sensitivity of 80.4%, a specificity of 90.8%, a PPV of 78.3% and a NPV of 91.8%.

**CONCLUSION**
MRI shows a higher sensitivity but a lower specificity in detection of primary head-and-neck cancer and local metastases in comparison to 18F-FDG-PET/CT.

CLINICAL RELEVANCE/APPLICATION

MR is superior as it has very good soft tissue sensitivity compared with PET-CT.
Contemporary Thyroid and Parathyroid Imaging: The Incidental Thyroid Nodule Through 4DCT

Sunday, Nov. 27 2:00PM - 3:30PM Room: E353B

Participants
Ilona M. Schmalfuss, MD, Gainesville, FL, (schmai@radiology.ufl.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Discuss ACR guidelines on managing incidental thyroid nodules. 2) Review imaging features distinguishing between benign and malignant thyroid nodules. 3) Apply ACR guidelines on managing incidental thyroid nodules to different case examples.

ABSTRACT

Managing the Incidental Thyroid Nodule

Participants
Laurie A. Loevner, MD, Gladwyne, PA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Identify the relevant anatomy for localization of the parathyroid glands, including in the normal, ectopic and disease states. 2) Describe the current surgical approaches to parathyroid disease and implications for preoperative parathyroid imaging. 3) Compare and contrast the available imaging modalities for preoperative localization of parathyroid lesions, and their advantages and disadvantages.

Active Handout: Hillary Rolls Kelly
Participants
- Adam E. Flanders, MD, Narberth, PA, (adam.flanders@jefferson.edu) (Presenter) Nothing to Disclose
- Sandeep P. Deshmukh, MD, Philadelphia, PA, (sandeep.deshmukh@jefferson.edu) (Presenter) Nothing to Disclose
- Christopher G. Roth, MD, Philadelphia, PA (Presenter) Nothing to Disclose

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.

ABSTRACT
URL
LEARNING OBJECTIVES

1) To describe the Zika epidemic spread. 2) To illustrate the appearance of congenital Zika both prenatal and postnatal using ultrasound, MRI, and CT. 3) To discuss developments from the infectious disease perspectives, including vaccine development.

URL
http://pubs.rsna.org/doi/full/10.1148/radiol.2016161584

Sub-Events

SPSH21A Introduction: Why is Zika from an Imaging Perspective So Different from other Congenital Infections

Participants
Richard L. Robertson, MD, Boston, MA (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

SPSH21B Facing the Zika Epidemic in Brazil: The Epidemiology and the Role of the Radiologist

Participants
Jacob Szejnfeld, MD, Sao Paulo, Brazil, (jacob.cura@gmail.com) (Presenter) Nothing to Disclose

Handout: Jacob Szejnfeld

SPSH21C Multidomality Prenatal Imaging Findings of Congenital Zika Infection

Participants
Patricia Oliveira-Szejnfeld, MD, Sao Paulo, Brazil, (patricia.fetal@gmail.com) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

SPSH21D New Insights on Imaging and Pathological Correlations on Zika Infection

Participants
Fernanda Tovar-Moll, MD, PhD, Rio de Janeiro, Brazil (Presenter) Nothing to Disclose

SPSH21E Controlling Zika Virus: Update on Prevention Strategies and Vaccination

Participants
Andrew Hale, MD, Boston, MA (Presenter) Nothing to Disclose

SPSH21F Panel Discussion

Participants
**Pharynx, Larynx, and Oral Cavity**

Monday, Nov. 28 8:30AM - 10:00AM Room: E450B

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

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**Participants**

**Sub-Events**

**RC206A  Imaging the Nasopharynx**

Participants  
Nancy J. Fischbein, MD, Stanford, CA *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the normal anatomy of the nasopharynx. 2) Illustrate the appearance and patterns of spread of nasopharyngeal carcinoma. 3) Describe additional pathologies of the nasopharynx, along with imaging pearls and pitfalls.

**ABSTRACT**

The focus of this presentation is to highlight the anatomy of the nasopharynx with particular emphasis on the sinusosal anatomy and patterns of spread. Understanding the pathways of tumor spread allows the radiologist to influence treatment decisions especially in regards to the extent of surgery and also in post treatment monitoring for recurrent disease.

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**RC206B  Imaging of the Oropharynx and Oral Cavity**

Participants  
Lawrence E. Ginsberg, MD, Houston, TX *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the anatomic subsites of the oral cavity and oropharynx, and the common tumor histologies arising there. 2) Present the imaging appearance, spread patterns, and imaging strategies in terms of modality. 3) Review the role of radiology in staging malignancy of the oropharynx and oral cavity.

**ABSTRACT**

The focus of this presentation is to highlight the anatomy of the oropharynx with particular emphasis on the anatomy of the oral cavity and oropharynx. Understanding the pathways of tumor spread allows the radiologist to influence treatment decisions especially in regards to the extent of surgery and also in post treatment monitoring for recurrent disease.

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**RC206C  Imaging the Larynx and Hypopharynx**

Participants  
Kristine M. Mosier, DMD, PhD, Indianapolis, IN *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Define key anatomy of the larynx and hypopharynx. 2) Understand the influence of anatomy on pathways of tumor spread. 3) Identify radiographic features of the patterns of tumor involvement of the larynx and hypopharynx.

**ABSTRACT**

The focus of this presentation is to highlight the anatomy of the larynx and pharynx with particular emphasis on the anatomy of the laryngeal cartilage framework, membranes and laryngeal spaces. A clear knowledge of these anatomic relationships is essential to understanding the pathways of tumor spread within the laryngopharynx. Recognizing patterns of spread allows the radiologist to influence treatment decisions especially in regards to the extent of surgery and also in post treatment monitoring for recurrent disease. Certain benign conditions that affect the larynx will also be discussed.
Lunch & Learn: Transitioning to DR, Clinical and Financial Benefits Beyond Preventing Reimbursement Penalties: Supported by Fujifilm (invite-only)

Monday, Nov. 28 12:30PM - 1:30PM Room: S403B

Participants

PARTICIPANTS

Jerry Thomas, MS, FAAPM, DABR, CHP, DABSNM Wichita, KS
William Tobin BS, Tyler, TX

PROGRAM INFORMATION

This course does not offer CME credit.
RSNA Diagnosis Live™: Imaging in the Cobra Kai Dojo

Tuesday, Nov. 29 7:15AM - 8:15AM Room: E451B

Participants
Adam E. Flanders, MD, Narberth, PA, (adam.flanders@jefferson.edu) (Presenter) Nothing to Disclose
Sandeep P. Deshmukh, MD, Philadelphia, PA, (sandeep.deshmukh@jefferson.edu) (Presenter) Nothing to Disclose
Christopher G. Roth, MD, Philadelphia, PA (Presenter) Nothing to Disclose

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.
Participants
Janis P. O'Malley, MD, Birmingham, AL, (jomalley@uabmc.edu) (Moderator) Nothing to Disclose
Jonathan E. McConathy, MD, PhD, Birmingham, AL (Presenter) Research Consultant, Eli Lilly and Company; Research Consultant, Blue Earth Diagnostics Ltd; Research Consultant, Siemens AG; Research Consultant, General Electric Company;

LEARNING OBJECTIVES
1) Participants will use FDG-PET/CT and FDG-PET/MRI more effectively in their clinical practice through better understanding of the anatomy, clinical scenarios, and differential diagnoses relevant to the diagnostic imaging of head and neck cancers.

ABSTRACT
RSNA Diagnosis Live™: Do You Know Your Head and Neck Anatomy? (An Interactive Session)
Tuesday, Nov. 29 8:30AM - 10:00AM Room: E451B

RC306A  
Temporal Bone Anatomy

Participants
Richard H. Wiggins III, MD, Salt Lake City, UT (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Review important temporal bone anatomy. 2) Understand complex imaging anatomy of the temporal bone. 3) Describe imaging techniques of the temporal bone.

ABSTRACT
The temporal bone has some of the most intricate anatomy of the human body. This refresher course will review the complex anatomy of the temporal bone, including the external auditory canal, middle ear, inner ear, and petrous apex, as well as the imaging techniques to best evaluate this region. The anatomy and normal imaging appearances will be described and reviewed.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Richard H. Wiggins III, MD - 2012 Honored Educator

RC306B  
Skull Base Anatomy

Participants
C. Douglas Phillips, MD, New York, NY, (dphillips@med.cornell.edu) (Presenter) Stockholder, MedSolutions, Inc Consultant, Guerbet SA

LEARNING OBJECTIVES
1) Understand the embryologic development of the skull base. 2) Identify a number of developmental anomalies of the skull base and describe their imaging findings. 3) Compare developmental lesions from inflammatory/infectious or neoplastic lesions.

RC306C  
Larynx and Hypopharynx

Participants
Hugh D. Curtin, MD, Boston, MA, (Hugh_Curtin@meei.harvard.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Review the major anatomic structures of the larynx. 2) Specifically identify the laryngeal ventricle and its bordering tissues. 3) Describe the contents of the paraglottic space and describe its importance in tumor growth.

ABSTRACT
The larynx is a complex system of cartilage, muscle and ligaments that work together to produce speech and to facilitate breathing. Imaging can identify many of the different structures of the larynx. Particularly important are the laryngeal ventricle and the paraglottic space. These structures will be emphasized along with other anatomy that is of key importance in imaging evaluation.
PURPOSE

CT Angiography (CTA) is a commonly acquired imaging modality which provides a detailed examination of the carotid plaque, but has been limited in its use for risk stratification because of the lack of prospective studies to support the link between cerebrovascular ischemia and certain plaque features. We performed this systematic review and meta-analysis to assess the association between carotid plaque features on CTA and cerebrovascular ischemia.

METHOD AND MATERIALS

A medical librarian performed a literature search to identify published English-language studies that evaluated the link between carotid plaque features and ischemic events. The selection criteria included studies that: (1) evaluated internal carotid artery (ICA) plaque features on CTA of the extracranial carotid arteries, (2) involved patients with symptomatic correlation (transient ischemic attack/stroke) with plaque features, and (3) included asymptomatic controls, either the contralateral carotid artery, asymptomatic subjects or both. Four meta-analyses were performed and the combined Odds Ratios (ORs) were obtained using a random-effects model (Figure 1).

RESULTS

The literature search yielded 12,557 articles from which 14 studies, with a total of 2028 patients and 3194 arteries, were included for review. We found significant associations between both soft plaque and increased carotid artery wall thickness (CAWT) and higher occurrence of ipsilateral ischemic events with ORs of 3.633 (95% CI 1.087-12.142, p=0.036) and 6.204 (95% CI 2.485-15.493, p<0.001), respectively. In addition, we found a significant relationship between calcified plaque and decreased likelihood of ipsilateral ischemic events (OR 0.544; 95% CI 0.320-0.923, p=0.024). There was no statistically significant relationship between plaque ulceration and ipsilateral symptoms (OR 1.898; 95% CI 0.914-3.942, p=0.086).

CONCLUSION

Our meta-analysis demonstrates that soft plaques and increased CAWT measurements are highly associated with ipsilateral ischemic events, while calcified plaques are linked to lower occurrence of ipsilateral ischemia. These results warrant future prospective studies to validate the use of these plaque features in stroke risk stratification.

CLINICAL RELEVANCE/APPLICATION

CTA may be used to detect high-risk plaques that could aid in identifying patients at an increased risk of stroke who may be potential candidates for surgical revascularization.

Participants

Yoshimi Anzai, MD, Salt Lake Cty, UT (Moderator) Nothing to Disclose
Ronald L. Wolf, MD, PhD, Philadelphia, PA (Moderator) Nothing to Disclose

Tomasz Czernuszewicz, PhD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Jonathan Homeister, MD, PhD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Benjamin Y. Huang, MD, MPH, Chapel Hill, NC (Abstract Co-Author) Consultant, LQ3 Pharmaceuticals, Inc
Ellie R. Lee, MD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Carlos Zamora, MD, PhD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Mark Farber, MD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Joseph Fulton, MD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Peter Farooq, MD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Raghu Vallabhaneni, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Timothy C. Nichols, MD, Chapel Hill, NC (Abstract Co-Author) Nothing to Disclose
Stroke is commonly caused by thromboembolic events originating from vulnerable atherosclerotic plaques in the carotid vasculature. To improve carotid plaque characterization with ultrasound, we have been investigating ARFI imaging, a novel elasticity imaging technique, that has shown promise for discriminating soft from stiff plaque. In this study, in vivo carotid ARFI imaging is implemented in patients undergoing carotid endarterectomy (CEA) and compared against matched histology with blinded reader assessment to validate performance.

METHOD AND MATERIALS
Patients (N = 25) undergoing CEA were recruited and imaged transcutaneously with ARFI. After surgery, the extracted specimens were sectioned and aligned to the ultrasound plane. 2D ARFI images of peak displacement were rendered and evaluated by 3 radiologists blinded to histology. Receiver operating characteristic (ROC) curve analysis was performed and area under the curve (AUC) was taken as a metric of performance for detecting features such as necrotic core (NC), intraplaque hemorrhage (IPH), collagen (COL), and calcium (CAL). Also, readers were asked to measure fibrous cap thickness (FCT) from ARFI images, and their results were compared against FCT from histology by Spearman correlation (ρ), regression (R²), and Bland-Altman (BA) analysis.

RESULTS
Median AUC performance for plaque features were as follows: NC, 0.809; COL, 0.696; IPH, 0.639; CAL, 0.612. Grouping the stiff (COL/CAL) and soft (NC/IPH) features together resulted in marked improvement in performance, with median AUCs of 0.859 for COL/CAL and 0.887 for NC/IPH (Fig. 1). For FCT measurements, two of the three radiologists achieved good agreement with histologic measurements. The first reader identified 11 FCs (out of 16) with moderately high agreement with histology (R² = 0.64, ρ = 0.81). The second reader identified 7 FCs with high agreement with histology (R² = 0.89, ρ = 0.75). The third reader identified 11 FCs, but had weak agreement to histology (R² = 0.27, ρ = 0.56).

CONCLUSION
This study suggests that ARFI may be capable of distinguishing soft from stiff features of atherosclerotic plaques and that ARFI may also be relevant to measuring FCT, an important indicator of plaque vulnerability.

POSSIBLE CLINICAL RELEVANCE
ARFI ultrasound imaging is capable of discriminating between soft from stiff carotid plaque, representing a novel approach to detecting vulnerable lesions, which may help predict stroke risk.

POSSIBLE FUTURE DIRECTIONS
To improve carotid plaque characterization with ultrasound, we have been investigating ARFI imaging, a novel elasticity imaging technique, that has shown promise for discriminating soft from stiff plaque. In this study, in vivo carotid ARFI imaging is implemented in patients undergoing carotid endarterectomy (CEA) and compared against matched histology with blinded reader assessment to validate performance.
Participants: Yanni Du, MMed, MMed, Beijing, China (Presenter) Nothing to Disclose
Wei Yu, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Zhaoyang Fan, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Zhanhong Wang, Beijing, China (Abstract Co-Author) Nothing to Disclose
Xiaoming Bi, PhD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Jing An, Beijing, China (Abstract Co-Author) Research collaboration, Siemens AG
Tianjing Zhang, Beijing, China (Abstract Co-Author) Employee, Siemens AG
Debiao Li, PhD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Lixin Yang, MMed, MMed, Beijing, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

3D magnetization-prepared rapid acquisition gradient-echo (MPRAGE) sequence has been validated to detect IPH with high sensitivity and specificity. Recently, a new 3D plaque imaging sequence, Multicontrast Atherosclerosis Characterization (MATCH) developed for the characterization of carotid plaque IPH, calcification and overall plaque morphology can be depicted in three interleaved image sets of a single scan, allowing complete image registration. The purpose of the work is to compare the diagnostic performance of MATCH and MPRAGE for the detection of IPH, with histologic analysis as the reference standard.

METHOD AND MATERIALS

Thirty-five individuals scheduled for carotid endarterectomy underwent 3 T carotid MR imaging using MPRAGE and MATCH. Imaging parameters for MATCH and MPRAGE are listed in Table 1. All image data sets were processed on commercial plaque analysis software (MRI-Plaque View, VPDiagnostics, US). Two reviewers blinded to the histologic results assessed the presence and signal intensity of IPH for each sequence. Images were matched to histology results using morphological features of the lumen, vessel wall and the distance from the carotid bifurcation. Sensitivity, specificity and Cohen kappa (K) were computed to quantify the agreement in the detection of IPH among the two MRI protocols with reference to the pathology results.

RESULTS

Among 35 patients, a total of 664 available sections and 71 matching histology specimens were included for the analysis. MATCH yielded good agreement with MPRAGE (k=0.702) on detecting the presence of IPH for 664 available sections. With pathological specimens as the gold standard, moderate to good agreement was shown between MATCH and MPRAGE (k=0.785 vs. 0.637). Sensitivity for the detection of IPH was 92.5% vs. 83.0%, respectively, for MATCH and MPRAGE. Specificity was 88.9% for both protocols.

CONCLUSION

MATCH is a promising CMR imaging method for assessing the vulnerable plaque in a clinical workup.

CLINICAL RELEVANCE/APPLICATION

MATCH is a promising CMR technique for assessing the vulnerable plaque in a clinical workup.

SSJ18-05 Evaluating the Impact of Ice Collar on the Blood Flow of the Internal and External Carotid Arteries

Tuesday, Nov. 29 3:40PM - 3:50PM Room: N226

Awards

Student Travel Stipend Award

Participants

Maryam Mohammad Zadeh, MD, Laguna Niguel, CA (Presenter) Nothing to Disclose
Ali Mohammadzadeh Kouparaei, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Vahid Mohammadzadeh, Tehran, Iran (Abstract Co-Author) Nothing to Disclose
Reza Erfanian, Tehran, Iran (Abstract Co-Author) Nothing to Disclose
Abolfazli K. Shiravi, MD, Tehran, Iran (Abstract Co-Author) Nothing to Disclose
Pouya Entezar, Tehran, Iran (Abstract Co-Author) Nothing to Disclose
Ali Borhani, MD, Tehran, Iran (Abstract Co-Author) Nothing to Disclose
Mohammad Reza Mohammadi Andehali, Tehran, Iran (Abstract Co-Author) Nothing to Disclose
Mahtab Rabbani Anari, Tehran, Iran (Abstract Co-Author) Nothing to Disclose
Sakineh Kadivar, Tehran, Iran (Abstract Co-Author) Nothing to Disclose

PURPOSE

To assess the impact of ice collar on the blood flow (BF) of the internal (ICA) and external carotid (ECA), facial (FA) and temporalis (TA) arteries.

METHOD AND MATERIALS

The study consists of three separate phases conducted on 10 men and 2 women (mean age of 29.8±3 yrs). (1) Cervical and tympanic temperatures, systolic (SBP), diastolic blood pressure (DBP) and heart rate (HR) were measured at the baseline and every 5 minutes for 25 minutes once with ice collar (-6°C) in place and then after it was removed. (2) Blood flow of ICA, ECA, FA and TA were assessed before applying regular collar (25°C), promptly after removing it and 10 minutes after collar removal using Doppler US. Facial and temporal BF was measured 5 and 15 minutes after applying regular collar as well. (3) Second phase was repeated this time using an ice collar.

RESULTS
Applying ice collar was significantly associated with tympanic and cervical temperatures (P=0.002 and <0.0001, respectively) while it had no significant impact on the HR (P=0.1), SBP (P=0.5) and DBP (P=0.3). Applying regular collar did not significantly affect BF of the internal and external carotid, facial and temporalis arteries (P=0.9, 0.1, 0.5 and 0.06 respectively). Pearson’s correlation coefficients for flow assessment of ICA, ECA, FA and TA by Doppler US before collar use and after collar removal were 0.73, 0.96, 0.76 and 0.90 respectively (P= 0.01, <0.001, 0.02, <0.0001 respectively). Ice collar use did not alter BF to ICA (P=0.1) but significantly decreased BF to ECA, FA and TA (P=0.0002, <0.0001 and <0.0001; respectively)

CONCLUSION

Obtained test-retest-reliability coefficient indicated that Doppler US is a reliable method for BF assessment of the ICA, ECA, facial and temporalis arteries. Cold application on neck can decrease the BF of the ECA, FA and TA while BF to ICA remains unchanged. This method can potentially be used to control ECA bleeding without compromising brain’s blood supply.

CLINICAL RELEVANCE/APPLICATION

We proved the positive impact of ice collar on decreasing BF to cervical arteries, which can serve as an effective, non-invasive method to control the head and neck bleeding.

SSJ18-06  Simultaneous Measurement of in-vivo ADC and T2* in Atherosclerotic Plaque using a 3D Multiple Echo Diffusion Weighted Driven Equilibrium Stack of Stars (3D ME-DW-DE SOS) Sequence

Tuesday, Nov. 29 3:50PM - 4:00PM Room: N226

Participants
Seong-Eun Kim, PhD, Salt Lake City, UT (Presenter) Nothing to Disclose
Bradley D. Bolster Jr, PhD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Dennis L. Parker, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Gerald S. Treiman, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Scott McNally, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose

PURPOSE

The purpose of this work was to develop and evaluate the 3D carotid wall imaging technique for simultaneous measurement of in-vivo ADC and T2* in Atherosclerotic plaque to increase the quantification of high risk plaque components.

METHOD AND MATERIALS

We have developed a motion insensitive high resolution 3D multiple echo diffusion weighted driven equilibrium Stack of Stars (3D ME-DW-DE SOS) sequence that can simultaneously measure ADC and T2* of water proton in a single scan. To test technique feasibility, MRI studies of twelve symptomatic and eight asymptomatic patients with atherosclerosis were performed on a 3T MRI scanner with a home built phased array coils. The parameters were: FOV=152x152 mm2, 2 mm slice thickness, TE/TR = 2.05/8.0ms, 32 slices/slab, b =20, 450 s/mm2. The resultant in-plane spatial resolution was 0.6x0.6 mm2. The total imaging time was 3 min 20 sec. Mean and standard deviation values were computed using all pixels identified by ROI for T2* and ADC. Quantitative statistical comparison of ADC values from symptomatic and asymptomatic groups was conducted using ANOVA.

RESULTS

Symptomatic plaque had significantly lower both of T2* and ADC than asymptomatic plaque (25±7.5 vs. 45±9.8ms, or 0.74±0.23 vs. 1.29±0.51x10-3mm2/sec, respectively, p<0.002). This value is close to the values reported previously.

CONCLUSION

The 3D ME-DW-DE SOS can provide high resolution T2* and ADC values simultaneously, which may provide important clinical information to detect plaque progression.

CLINICAL RELEVANCE/APPLICATION

DWI has the potential to provide information that will allow better discrimination of plaque components such as lipid core. Iron has consistently been found in higher concentrations in plaque compared to vessel tissue. In previous studies, intraplaque T2* distinguished symptomatic from asymptomatic plaques in patients with carotid atherosclerosis. This technique can provide high resolution T2* and ADC values simultaneously, which may provide important clinical information to detect plaque progression.
**RC406A  Cervical Lymphadenopathy**

Participants
Peter M. Som, MD, New York, NY, (peter.som@mssm.edu)  *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand the anatomy of the cervical lymph nodes and why these nodes are so important as predictors of survival. 2) Learn the criteria utilized to assess pathologic lymph nodes.

**ABSTRACT**

The cervical lymph nodes are the best predictors of the development of distant metastases from a head and neck cancer. As such, they are predictors of survival. Further, if metastatic tumor has spread outside of the node, the survival is reduced by half and the incidence of distant metastases is tripled. Because of these facts, knowledge of how to evaluate these nodes is critical to someone interpreting head and neck imaging studies. This course will review how to classify and stage these cervical nodes and discuss criteria to assess when a metastatic node is present. It will also discuss how these metastatic nodes should be described in reports of these imaging studies.

**RC406B  Non-nodal Neck Masses**

Participants
David R. De Lone, MD, Rochester, MN  *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Have an organized approach to the imaging evaluation of a palpable neck mass. 2) Palpable pseudomasses will be discussed. 3) Construct a logical differential diagnosis based on the location, enhancement characteristics, and cystic/solid nature of the mass, considering neoplastic, inflammatory, and congenital etiologies.

**RC406C  Hemangiomas and Other Vascular Lesions**

Participants
Deborah R. Shatzkes, MD, New York, NY, (shatzkes@hotmail.com)  *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand what clinical and imaging features of a neck “lump” should suggest the possibility of a hemangioma or other vascular lesion. 2) Review current classification of vascular anomalies, and the biologic basis for this classification. 3) Describe the imaging features of common vascular tumors and malformations, specifically hemangiomas, venous and lymphatic malformations, and arteriovenous malformations.

**ABSTRACT**

Our understanding of vascular lesions has been hampered by loose and inconsistent terminology and by the lack of a coherent classification system. Following Mulliken's description of the biologic basis of disease in 1982 (PRS 69: 412-422), the International Society for the Study of Vascular Anomalies (ISSVA) was formed with the goal of classifying this diverse group of entities, and of defining nomenclature that would facilitate both clinical management and research in this area. The most important feature of this classification system is the division into vascular tumors and vascular malformations. The common hemangioma is by far the most important vascular tumor, while frequently encountered malformations include venous, lymphatic and arteriovenous lesions. Hemangiomas are proliferating endothelial neoplasms, while malformations are considered localized defects in angiogenesis and have quiescent epitheliums. It is important to reserve the term “hemangioma” for these vascular tumors only. This distinction drives the imaging appearance of these entities, with hemangiomas demonstrating signal characteristics compatible with cellular neoplasms, namely enhancement with only moderate T2 hyperintensity. Venous and lymphatic malformations, like all vascular malformations, are named by their vessels of origin. Lymphatic malformations image like sacs of lymph, with marked T2 hyper intensity but without enhancement. Venous malformations, however, enhance avidly, and demonstrate very high T2 signal given their relatively low cellularity. AVM’s typically do not appear as discrete masses, but rather infiltrate tissues, causing hypervascularity and edema. The presence of vascular flow voids and mild T2 hyper intensity reflecting tissue edema are the hallmarks of AVM's.
Thyroid and Neck Ultrasound (An Interactive Session)

Tuesday, Nov. 29 4:30PM - 6:00PM Room: E451A

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

Participants

Mary C. Frates, MD, Sharon, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the sonographic characteristics that are associated with a high probability that a thyroid nodule is likely malignant or likely benign. 2) Gain an understanding of the rationale of the current guidelines for recommending thyroid fine needle aspiration.

ABSTRACT

This presentation will review the epidemiology of thyroid nodules and thyroid cancer and correlate the sonographic findings of thyroid nodules with the risk of malignancy. 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 sonographic features have shown a high specificity for the diagnosis of thyroid cancer and include marked hypoechoigenicity, the presence of microcalcifications, infiltrating or micro-lobulated borders, and a taller-wide shape. Sonographic patterns can also identify those nodules with a very low risk of malignancy, making biopsy unnecessary in low risk adults. The current guidelines for recommending thyroid fine needle aspiration and the timing of sonographic follow-up imaging will also be discussed.

RC410B Thyroid Elastography

Participants

Richard G. Barr, MD, PhD, Youngstown, OH (Presenter) Consultant, Siemens AG; Consultant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, SuperSonic Imagine; Speakers Bureau, Koninklijke Philips NV; Research Grant, Bracco Group; Speakers Bureau, Siemens AG; Consultant, Toshiba Corporation; Research Grant, Esaote SpA; Research Grant, B and K Ultrasound; Research Grant, Hitachi Aloka Ultrasound

LEARNING OBJECTIVES

1) Explain the difference between strain and shear wave elastography. 2) Understand the techniques to be able to perform thyroid ultrasound elastography. 3) Apply ultrasound elastography into routine clinical practice of thyroid nodules.

ABSTRACT

1) Explain the difference between strain and shear wave elastography. 2) Understand the techniques to be able to perform thyroid ultrasound elastography. 3) Apply ultrasound elastography into routine clinical practice of thyroid nodules.

RC410C Parathyroid and Other Neck Masses including Lymph Nodes Post-Thyroidectomy

Participants

Michael D. Beland, MD, Providence, RI, (mbeland@lifespan.org ) (Presenter) Consultant, Hitachi, Ltd

LEARNING OBJECTIVES

1) Identify abnormal parathyroid glands based on sonographic characteristics. 2) Develop an accurate differential for cystic lesions in the neck based on sonographic characteristics, lesion location and clinical circumstances. 3) List the most common etiologies of other solid and cystic lesions located in the neck. 4) Recognize the sonographic characteristics that suggest metastatic disease in cervical lymph nodes.

ABSTRACT
**RC420**

**Imaging Evaluation of Post-Radiation Therapy Normal Tissue Effects**

Tuesday, Nov. 29 4:30PM - 6:00PM Room: S104A

**RC420A  Post-radiation Therapy CNS Imaging**

Participants
Christina I. Tsien, MD, Saint Louis, MO (*Moderator*) Speaker, Merck & Co, Inc

**Sub-Events**

**RC420B  Post-radiation Therapy Head and Neck Imaging**

Participants
Michael D. Chan, MD, Winston-Salem, NC (*Presenter*) Advisory Board, NovoCure Ltd
Tammie S. Benzinger, MD, PhD, Saint Louis, MO, (benzingert@wustl.edu) (*Presenter*) Research Grant, Eli Lilly and Company Investigator, Eli Lilly and Company Investigator, F. Hoffmann-La Roche Ltd

**RC420C  Post-radiation Therapy Gynecologic Imaging**

Participants
Akila N. Viswanathan, MD, Baltimore, MD (*Presenter*) Nothing to Disclose
Kathryn J. Fowler, MD, Chesterfield, MO (*Presenter*) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Discuss the role of surveillance imaging in identification of radiation induced changes in normal tissue, so that these changes are not misinterpreted as evidence of persistent or recurrent tumor. 2) Describe imaging characteristics of radiation injury to various tissues including visceral mucosal space, salivary glands, bones and vascular structures in the neck as well as surrounding organs such as brain, skull base and lungs. 3) Discuss the advantage of early identification of these using case-based approach.

**ABSTRACT**

Radiation therapy for head and neck cancers can cause adverse effects and toxicity to the normal tissues in the irradiated regions. This does not only lead to a variety of comorbidities, but also present a challenging and complex appearance on surveillance imaging studies. Timely identification of some of these adverse effects can improve patient survival and quality of life.

**LEARNING OBJECTIVES**

1) Review and demonstrate the imaging findings of gynecologic malignancies following radiation therapy. 2) Review the imaging modalities used to assess response.

**ABSTRACT**
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 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.
Case-Based Review of Pediatric Radiology (An Interactive Session)

Wednesday, Nov. 30 8:30AM - 10:00AM Room: S406A

GU HN NR PD

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

FDA Discussions may include off-label uses.

Participants
Ricardo Restrepo, MD, Miami, FL (Director) Nothing to Disclose

Sub-Events

MSCP41A Pediatric Brain and Spine Disorders

Participants
Thierry Huisman, MD, Baltimore, MD, (thuisma1@jhu.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Correlate imaging findings with clinical symptoms and age/gender demographics to narrow down differential diagnosis of pediatric neurological diseases. 2) Use a pattern recognition approach for identifying various metabolic disorders and its differentials. 3) Apply conventional and advanced neuroimaging for differentiation between tumors and tumor mimickers.

ABSTRACT
Based on a series of common and rare pediatric neurological cases various tools will be discussed how to narrow down differential diagnosis in children with neurological diseases. By combining the clinical symptoms as well as the age and gender of a patient many diseases can be excluded. Furthermore a detailed analysis of the distribution and quality of imaging findings as noted on conventional and advanced neuroimaging may further facilitate final diagnosis. In the current session various illustrative cases will be shown.

MSCP41B Pediatric Head and Neck Disorders

Participants
Amy F. Juliano, MD, Boston, MA, (amy_juliano@meei.harvard.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Identify the major types of congenital lesions, inflammatory and infectious processes, and tumors in the head and neck region in the pediatric population. 2) Recognize the clinical presentations and imaging features of these lesions. 3) Provide differential diagnoses based on imaging appearance and location.

ABSTRACT

MSCP41C Pediatric Genitourinary Disorders

Participants
Harriet J. Paltiel, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Identify the most appropriate radiological examinations to evaluate children with a variety of genitourinary symptoms. 2) Describe the diagnostic imaging features of important pediatric genitourinary abnormalities. 3) Discuss the application of new techniques of potential benefit in pediatric genitourinary imaging, including ultrasound contrast and dual source CT.

ABSTRACT
Participants

**MSRO41A Imaging of the Lymph Nodes of the Head & Neck: Applied Anatomy**

Participants
Suresh K. Mukherji, MD, Northville, MI *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the normal anatomy of the lymph nodes of the head and neck. 2) Define the size criteria used to identify metastatic lymph nodes. 3) Review the classification of the cervical lymph nodes.

**ABSTRACT**

This lecture will review the normal anatomy of the lymph nodes of the head and neck. The talk will also define the size criteria used to identify metastatic lymph nodes and review the classification of the cervical lymph nodes.

**MSRO41B Current Concepts and Controversies in Radiation Planning of the Head & Neck Lymph Nodes**

Participants
Sung Kim, MD, New Brunswick, NJ, (sk1375@cinj.rutgers.edu) *(Presenter)* Nothing to Disclose

**MSRO41C Question & Answer**

Participants
Suresh K. Mukherji, MD, Northville, MI *(Presenter)* Nothing to Disclose

**MSRO41D Imaging of the Brachial Plexus: Applied Anatomy**

Participants
Sung Kim, MD, New Brunswick, NJ *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the normal anatomy of the brachial plexus. 2) Describe common tumors that involve the brachial plexus. 3) Review the post-radiation therapy appearance of the brachial plexus.

**ABSTRACT**

This lecture will review the normal anatomy of the brachial plexus. The lectures will also describe common tumors that involve the brachial plexus and review the post-radiation therapy appearance of the brachial plexus.

**MSRO41E Current Concepts and Controversies in Contouring and Treatment of the Brachial Plexus and Surrounding Structures**

Participants
Sung Kim, MD, New Brunswick, NJ *(Presenter)* Nothing to Disclose

**MSRO41F Question & Answer**

Participants
Participants
Michelle A. Michel, MD, Milwaukee, WI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Discuss the anatomy of the paranasal sinus drainage pathways using multiplanar imaging. 2) Recognize patterns of inflammatory disease based upon the anatomy of the sinus drainage pathways. 3) Identify important anatomic variations in the sinusosal cavities that may predispose a patient to recurrent inflammatory disease or complications during endoscopic surgery. 4) Recognize imaging findings in acute & chronic rhinosinusitis. 5) Recognize orbital & intracranial complications of rhinosinusitis. 6) Recognize the imaging appearance of early acute fulminant invasive fungal sinusitis on CT and MRI. 7) Recognize the intraorbital and intracranial complications of IFS and bacterial rhinosinusitis. 8) Recognize imaging features which suggest neoplasm rather than inflammatory sinus disease.

ABSTRACT
Knowledge of multiplanar CT anatomy of the sinonasal cavities is of utmost importance to the imager given advances in endoscopic sinus surgery (ESS). It is the role of the radiologist to provide an accurate surgical roadmap for our surgical colleagues. Knowledge of normal anatomy, sinus drainage pathways, and anatomic variants allows one to recognize patterns of inflammatory disease, to assess potential causes of recurrent inflammatory disease, and to identify variants that may make a patient more prone to a complication during ESS. Normal and variant anatomy of the nasal cavity and paranasal sinuses will be discussed, with an emphasis on drainage pathways and variants of particular clinical relevance. Rhinosinusitis is a common clinical problem which affects > 16% of the US population annually and results in significant expenditure of health care dollars. I will review the epidemiology and imaging findings of acute & chronic rhinosinusitis, including silent sinus syndrome. CT and MRI findings of orbital and intracranial complications of bacterial sinusitis will be presented. I will also cover the imaging findings in polyposis, allergic fungal sinusitis, non-invasive fungal disease and mucoceles. A specific search pattern and certain red flags will help the audience to suspect more aggressive infection, inflammation or tumor rather than routine sinusitis on the initial workhorse non-contrast sinus CT. Both CT and MR imaging play an important role in the timely diagnosis of aggressive sinonasal processes, especially invasive fungal sinusitis (IFS). Early CT imaging findings will be reviewed, along with the clinical presentation and population at risk, in order to emphasize the importance of high clinical suspicion and early diagnosis. The complimentary role of MRI to characterize late complications of bacterial and fungal infection and also to distinguish tumor from inflammatory sinus disease will also be covered.

Active Handout: Michelle Anne Michel

Participants
Deborah R. Shatzkes, MD, New York, NY (Presenter) Nothing to Disclose

Active Handout: Rebecca Sue Cornelius

Participants
Ashley H. Aiken, MD, Atlanta, GA, (ashley.aiken@emoryhealthcare.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Recognize the imaging appearance of early acute fulminant invasive fungal sinusitis on CT and MRI. 2) Recognize the intraorbital and intracranial complications of IFS and bacterial rhinosinusitis. 3) Recognize imaging features which suggest neoplasm rather than inflammatory sinus disease.

ABSTRACT
Presentation Summary: A specific search pattern and certain red flags will help the audience to suspect more aggressive infection, inflammation or tumor rather than routine sinusitis on the initial workhorse non-contrast sinus CT. Both CT and MR imaging play an important role in the timely diagnosis of aggressive sinonasal processes, especially invasive fungal sinusitis (IFS). Early CT imaging findings will be reviewed, along with the clinical presentation and population at risk, in order to emphasize the importance of high clinical suspicion and early diagnosis. The complimentary role of MRI to characterize late complications of bacterial and fungal infection and also to distinguish tumor from inflammatory sinus disease will also be covered. References: 1. Epstein VA and Kern RC. Invasive Fungal Sinusitis and Complications of Rhinosinusitis. Otolaryngol Clin North Am. 2008 Jun; 41(3): 497-5242. Aribandi M, McCoy V, Bazan C. Imaging Features of Invasive and Noninvasive Fungal Sinusitis: A Review. Radiographics. 2007 Sep-Oct; 27 (5):


Participants
Robert Jeraj, Madison, WI (Moderator) Founder, AIQ Services

LEARNING OBJECTIVES

1) Describe the evolution of adaptive radiotherapy and relevant technological advances as they pertain to head and neck radiotherapy. 2) Understand the clinical rationale for plan adaptation in head and neck patient population. 3) Describe possible routes to clinical implementation. 4) Discuss risks associated with adaptive planning workflows and appropriate quality assurance.

ABSTRACT

This session will focus on the practical implementation of adaptive radiotherapy for head and neck cancer. Although the concept of adaptive radiation therapy (ART) has been around for more than two decades, routine plan adaptation has not become standard practice in the management of head and neck cancer despite huge technological advances in imaging, image registration software, and dose calculation speed. The remaining challenges in implementing ART for head and neck cancer in 2016 as well as an update of the demonstrated clinical need will be discussed. Features of successful adaptive radiotherapy implementations will be highlighted as well as a summary of useful clinical tools and required quality assurance.

Participants
Marija Popovic, PhD, Montreal, QC, (marija.popovic@mcgill.ca) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn about appropriate anatomical and imaging modalities for selection and delineation of target volumes in HN. 2) To learn about biologically conformal approaches (dose painting) in HN. 3) To learn about quantitative imaging requirements for RT in HN.

ABSTRACT

Anatomical and molecular imaging is used to tailor radiation treatment by enabling proper selection and delineation of target volumes and organs, which in turn lead to dose prescriptions that take into account the underlying tumor biology. Dose modulation to different parts of target volume may also be used to match variable tumor radiosensitivity (so-called biologically conformal radiotherapy or dose-painting). For accurate implementation of targeted and adaptive IMRT, tools and procedures, such as accurate image acquisition and reconstruction, automatic segmentation of target volumes and organs at risk, non-rigid image and dose registration, and dose summation methods, need to be developed and properly validated.
Participants
Sung Kim, MD, New Brunswick, NJ (Moderator) Nothing to Disclose
Timothy J. Kruser, MD, Chicago, IL (Moderator) Nothing to Disclose

Sub-Events

**MSRO42-01 Invited Speaker:**

Participants
Minh T. Truong, MD, Boston, MA (Presenter) Nothing to Disclose

**MSRO42-03 Intravoxel Incoherent Motion Diffusion Weighted Imaging (IVIM-DWI) in Evaluating the Hypoxia and Radiosensitivity of Nasopharyngeal Carcinoma Xenografts**

Wednesday, Nov. 30 10:50AM - 11:00AM Room: S103CD

Participants
Youping Xiao, Fuzhou, China (Presenter) Nothing to Disclose
Yumin Chen, MD, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Ying N. Chen, PhD, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Dechun Zheng, MS, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Xiangyi Liu, BS, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Jianji Pan, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Zhuangzhen He, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Jing Zhong, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Wang Ren, Fuzhou, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To preliminary investigate intravoxel incoherent motion diffusion weighted imaging (IVIM-DWI) in assessing the hypoxia and radiosensitivity of nasopharyngeal carcinoma (NPC) xenografts.

**METHOD AND MATERIALS**

Two different radiosensitive NPC cell lines (CNE-1 and CNE-2) were transplanted on sixty nude mice (30 of each group) to raise xenografts, which received the fractional radiations (30Gy, each fraction of 10Gy) at the alternative days. Each group was then subcategorized into the following five groups: non-radiation group (G0), radiation group of 10Gy (G1), 20Gy (G2), 30Gy (G3), and 3 days after 30Gy radiation (G4). On a 3.0T MR system, IVIM-DWI with 14 b-factors (0-1000 s/mm²) were performed on G0 xenografts directly and G1~G4 xenografts after irradiations. IVIM-parameters of xenografts were calculated with IDL6.3 software. The cell density, necrosis proportion and HIF-1α of xenografts were analyzed histopathologically. The general changes of IVIM-parameters and pathological features after irradiations were tested with One-way ANOVA, their difference were compared by Student t test and/or Mann-Whitney U test. The correlations between different variables were analyzed with Spearman test.

**RESULTS**

After fractional radiations, the general changes of D, f and D* values in CNE-2 xenografts were statistically significant than those of CNE-1 xenografts (P<0.01). D increased while D* and f decreased more significantly in CNE-2 xenografts (P<0.01). D and necrosis proportion of G3 and G4 in CNE-2 xenografts were higher than those of CNE-1 xenografts (P<0.05). However, the general change of HIF-1α expression in CNE-1 xenografts was more significant than that of CNE-2 xenografts (P<0.005). On the other hand, D correlated negatively with cell density (rs=-0.861, P<0.001) and HIF-1α expression (rs=-0.814, P<0.001), while it behaved a positive correlation with necrosis proportion (rs=0.952, P<0.001). Furthermore, f correlated positively with cell density (rs=0.627, P<0.001) but negatively with necrosis proportion (rs=-0.649, P<0.001).

**CONCLUSION**

High-radiosensitive CNE-2 xenografts behaved more significant changes in IVIM-parameters than low-radiosensitive CNE-1 xenografts after fractional radiations, which correlated significantly with microstructure features and hypoxia of xenografts. Thus, IVIM-DWI can be potentially valuable in predicting the radio-sensitivity of NPC xenografts.

**CLINICAL RELEVANCE/APPLICATION**

Animal studies of IVIM-DWI can help demonstrate the mechanism on hypoxia and radiosensitivity of NPC.

**MSRO42-04 A Phase I Trial of Ketogenic Diet with Concurrent Chemoradiation (ChemoRT) in Head and Neck Squamous Cell Carcinoma (HNSCC)**

Wednesday, Nov. 30 11:00AM - 11:10AM Room: S103CD
Participants
Caryn Anderson, MD, Iowa City, IA (Presenter) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Ketogenic diet (KD) combined with chemorRT reduced tumor growth and improved survival in pre-clinical models. We hypothesized stage III-IVB HNSCC patients would be able to remain compliant with KD because of PEG tube requirement during chemorRT. Research supported by NIH U54TR001356 and KetoCal® 4:1 provided by Nutricia Pharmaceuticals.

Materials/Methods: This phase I clinical trial enrolled stage III-IVb definitive and post-op HNSCC patients receiving concurrent platinum-based chemorRT. PEG placement was required, but subjects were encouraged to continue KD by mouth. KD recipes and KetoCal® shakes were provided for daily consumption for 5 weeks starting 2 days prior to chemorRT. Fingerstick ketones (FK) were checked Mon-Fri, and serum beta-hydroxybutyrate (BHB), glucose, and uric acid were checked weekly. Lipid panel was checked at week 3. Serum oxidative stress parameters were assessed prior to, during, and after completing KD. Adverse events were graded utilizing CTCAE version 4.0:

Results: Median follow-up for all enrolled subjects (n=12) from completion of RT was 4.9 mo (range: 0-16.6). 4/12 subjects successfully completed 5 weeks of KD as prescribed. Successful subjects used scheduled anti-emetics, consumed shakes via PEG tube as opposed to orally and had strong social support. Median days on KD for those who discontinued was 5.5 (range: 2-8). Of the first 4 subjects treated, 2 completed, 1 withdrew due to fatigue (gr. 3), and 1 had a dose limiting toxicity (DLT) (hyperuricemia, grade 4; 12.7 nd/dL; nl ref 2.4-7.0). The protocol was amended to address diet-related hyperuricemia and allow for increased protein intake. Subsequently, 8 eligible subjects enrolled with 2 completing therapy and 2 experiencing DLTs (acute pancreatitis grade 3; hyperuricemia with complicating nausea and vomiting, grade 3). The remaining 4 subjects withdrew due to diet intolerance prior to beginning chemorRT (n=1), and nausea with vomiting (n=1, vomiting grade 1, n=3). Serious adverse events included hospitalizations for parotitis (n=1), acute pancreatitis (n=1), neutropenic fever (n=1), and nausea with vomiting (n=1). Both the acute pancreatitis and nausea with vomiting SAEs were considered related to study diet and were deemed DLTs. In those who completed KD, the median days FK were elevated and weeks the BHB levels were above baseline were 24.5 days (range: 19-25) and 5 weeks (range: 4-6), respectively. Median uric acid levels were 4.9 nd/dL (range: 3.4-5.4). Lipids remained normal. Serum oxidative stress markers, as assessed by protein carbonyls, increased linearly with increasing days on KD. Conclusion: While challenging despite PEG availability, KD compliance is possible when combined with concurrent chemorRT for HNSCC. Enrollment continues.

RESULTS

Unilateral versus Bilateral Intensity Modulated Radiation for Surgically-treated Squamous Cell Carcinoma of the Palatine Tonsil Staged with FDG-PET/CT

Wednesday, Nov. 30 11:10AM - 11:20AM Room: S103CD

MSR042-05

Awards
Student Travel Stipend Award

Participants
Re-I Chin, BA, Saint Louis, MO (Presenter) Nothing to Disclose
Yuan J. Rao, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Michael Y. Hwang, Newark, NJ (Abstract Co-Author) Nothing to Disclose
Christopher R. Spencer, MD, MS, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Todd DeWees, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Parul Nussenbaum, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Douglas Adkins, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
James S. Lewis Jr, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Wade L. Thorstad, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Michael Pierro, BS, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose

PURPOSE

We report long-term outcomes of unilateral (UL) vs. bilateral (BL) radiation therapy (RT) for tonsil cancer in the era of FDG-PET/CT (PET). We hypothesize that staging with PET aids in patient selection for ULRT, especially in patients with multiple ipsilateral lymph nodes (stage N2b), for which there is controversy on whether ULRT is appropriate.

METHOD AND MATERIALS

The population included 159 patients treated with IMRT for tonsil cancer from 1997-2013. The primary tumor was treated to a median dose of RT was 66 Gy. PET was used in 113 (71%) patients. Fifty-two patients received ULRT for lateralized (>1cm from midline) tonsil cancer. Twenty-nine patients with N2b disease received ULRT and 56 received BLRT. All patients received surgery to the tonsil primary and 154 (97%) received neck dissection. We evaluated acute toxicity and patient-reported quality of life (PROQOL). We also reviewed cases of contralateral failures (CLF) in N2b patients receiving ULRT on PubMed, and correlated these outcomes to utilization of PET staging.

CONCLUSION

Unilateral neck radiation reduces acute toxicity and improves quality of life compared to bilateral radiation, and results in high LRC. For properly selected patients with well lateralized tumors (>1cm from midline), there was no difference in LRC between unilateral and bilateral radiation. In this study with high utilization of PET, we observed no CLF. FDG-PET staging may be useful when considering unilateral radiation in patients with stage N2b disease.

CLINICAL RELEVANCE/APPLICATION
This study highlights the importance of staging FDG-PET in contributing to proper patient selection when considering unilateral radiation in patients with stage N2b tonsil cancer.

**MSRO42-06 Patterns of Loco-Regional Failure Following Post-Operative IMRT to Oral Cavity Cancer: Quantitative Dose-Volume Analysis Using a Standardized Pattern-of-Failure Typology**

**Wednesday, Nov. 30 11:20AM - 11:30AM Room: S103CD**

**Participants**
Andrew Wong, BS, Houston, TX (Presenter) Nothing to Disclose  
Abdallah S. Mohamed, MD, MSc, Houston, TX (Abstract Co-Author) Nothing to Disclose  
Clifton D. Fuller, MD, PhD, Houston, TX (Abstract Co-Author) Nothing to Disclose  
David I. Rosenthal, Houston, TX (Abstract Co-Author) Advisory Board, Bristol-Myers Squibb Company Advisory Board, Merck KGaA  
Research support, Merck KGaA  
Brandon Gunn, MD, Galveston, TX (Abstract Co-Author) Nothing to Disclose  
Adam S. Garden, MD, Houston, TX (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

Loco-regional failure is traditionally coded as a binary variable. For oral cavity cancer patients receiving post-operative intensity modulated radiotherapy (PO-IMRT), we seek to localize and identify volumetric/dosimetric patterns of failure with quantitative dose maps, using a standardized typology.

**METHOD AND MATERIALS**

Oral cavity cancer patients receiving PO-IMRT at our institution between 2001-2011 were identified. Diagnostic CT documenting recurrence (rCT) was co-registered with the original planning CT (pCT) with previously validated deformable image registration method. Manually segmented recurrent gross disease (rGTV) on the rCT was deformed to co-registered pCTs. Dose to 95% failure volume (fD95%) was compared to 95% dose to target volume the failure centroid originated from (pD95). Failures were classified into five types: A (fD95 higher than pD95, centroid within CTV1), B (fD95 higher, centroid in CTV2 or CTV3), C (fD95 lower, in CTV1), D (fD95 lower, in CTV2 or CTV3), E (centroid outside all target volumes), and F (centroid from matching low-neck superclavicular field).

**RESULTS**

289 patients were reviewed. Local and loco-regional control at 5-years was 83% and 76%, respectively. Of 62 patients with documented local/regional failure, 51 had available rCT and pCT for analysis. 1-, 2- and 4-year overall survival was 74%, 30%, and 4%, respectively. Mean time to recurrence diagnosis post-radiation treatment was 6.4 months. Primary tumor sites were: 22 oral tongue, 10 alveolar ridge, 6 buccal mucosa, 6 retromolar trigone, 4 hard palate, and 3 floor of mouth. 83 rGTVs were identified, with 31 (37%) type B, 10 (12%) type C, 6 (7%) type D, 3 (4%) type E, and 3 (4%) type F.

**CONCLUSION**

Over half of failures following PO-IMRT in oral cavity cancer were not those that had originated from high-dose target volumes and that had received adequate dosimetric coverage. A standardized typology incorporating volumetric and dosimetric metrics adds value to failure characterization over simplistic binary “loco-regional failure” categories.

**CLINICAL RELEVANCE/APPLICATION**

A standardized typology for failure classification incorporating volumetric and dosimetric metrics can be utilized to infer mechanisms of failure and to identify interventions to reduce failure rates.

**MSRO42-07 PET/CT in CT Simulation: Significance of a Standardized Positioning Protocol for Head and Neck Radiotherapy Planning**

**Wednesday, Nov. 30 11:30AM - 11:40AM Room: S103CD**

**Participants**
George Tolekdis, Chicago, IL (Presenter) Nothing to Disclose  
Miranda L. Thoma, ARRT, BS, Chicago, IL (Abstract Co-Author) Nothing to Disclose  
Mehee Miranda L. Thoma, ARRT, BS, Chicago, IL (Abstract Co-Author) Nothing to Disclose  
Aidnag Z. Diaz, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

Diagnostic imaging scans are a valuable tool for head and neck (H&N) cancer radiotherapy treatment planning (RTP). Information from diagnostic scans can be incorporated into the RTP process by performing a dedicated diagnostic scan in the treatment position or by co-registering an existing scan with the simulation scan. The purpose of this study was to use the clival incline to quantify differences in H&N positioning between patients undergoing diagnostic PET/CTs positioned with vs. without the RTP immobilization mask.

**METHOD AND MATERIALS**

Twenty patients receiving radiotherapy for H&N cancer from 2011-2015 at our institution were selected for this retrospective review. Ten patients underwent diagnostic PET/CT using the mask created during simulation (Group A) while ten patients underwent PET/CT without the mask (Group B). Clival incline was measured three times for each simulation and PET/CT group and used to obtain a mean clival incline value.

**RESULTS**

Mean clival incline measured on the CT from the PET/CT images in Group B was 61.44° (standard deviation (SD), 8.30°; standard error mean (SEM), 2.62°), while clival incline for Group A was 72.25° (SD, 7.78°; SEM, 2.46°). Comparing the simulation CT to the PET/CT, mean clival incline difference was 12.61° in Group B (SD, 5.62°; SEM, 1.78°), and 1.48° (SD, 1.03°; SEM, 0.32°) in Group A. These differences between the groups were statistically significant, p = .008 and p = .001, respectively, using T-test analysis for the equality of means.
CONCLUSION

Based on these results we reach two conclusions. 1) When no mask is used for PET/CT, there is a different approach to positioning: PET/CT technologists favor a neutral to flexion position, while we favor a neutral to extended position. 2) Using the simulation mask for PET/CT greatly reduces the difference in head position when compared to its respective simulation scan. This allows for more robust registration. When possible, patients should have PET/CT performed using the immobilization mask created for simulation. However, as this is not always feasible, a standardized neck positioning protocol for both H&N simulation and PET/CT scans should be explored.

CLINICAL RELEVANCE/APPLICATION

We hypothesize that simulating patients with their RTP mask will 1) increase patient comfort 2) allow for a superior registration and 3) not significantly affect plan quality.

MSRO42-09 Inter-Scan Positional Variability of Head and Neck Soft Tissue on a Dedicated 1.5T MR Simulator with Open-Face Immobilization

CONCLUSION

Based on these results we reach two conclusions. 1) When no mask is used for PET/CT, there is a different approach to positioning: PET/CT technologists favor a neutral to flexion position, while we favor a neutral to extended position. 2) Using the simulation mask for PET/CT greatly reduces the difference in head position when compared to its respective simulation scan. This allows for more robust registration. When possible, patients should have PET/CT performed using the immobilization mask created for simulation. However, as this is not always feasible, a standardized neck positioning protocol for both H&N simulation and PET/CT scans should be explored.

CLINICAL RELEVANCE/APPLICATION

We hypothesize that simulating patients with their RTP mask will 1) increase patient comfort 2) allow for a superior registration and 3) not significantly affect plan quality.

PURPOSE

With the advancement in radiotherapy treatment delivery techniques, quality of soft-tissue delineation for RT planning becomes increasingly important. Owing to the superior soft tissue contrast in MR images, MR-sim is superior to CT-sim. In this study, the inter-scan positional repeatability on MR-sim is quantitatively evaluated based on the concordance index (CI) and centroid position.

METHOD AND MATERIALS

Four healthy volunteers were scanned (4 scans for each on different days) using a T2w CUBE sequence with identical coverage, voxel-size(0.8x0.8x1.0mm³) and receiver-bandwidth(62.5kHz) on a 1.5T MR-sim with open-face thermoplastic cast for immobilization. Image distortion was minimized using the system provided geometric correction function. VOIs of the parotid gland(PGs), intervertebral discs(C23,C67), brainstem(BS), pituitary gland(PIT) and eyeballs(EBs) were carefully drawn. For each volunteer, volume and centroid position of each VOI were calculated. CI and centroid shift of the delineated VOIs, all referencing to the first scan, were subsequently calculated.

RESULTS

The calculated CI (mean±SD) of C23, C67, PIT, EBL, EBR, PGL, PGR and BS were 0.13±0.04, 0.10±0.07, 0.25±0.13, 0.66±0.04, 0.68±0.03, 0.62±0.07, 0.66±0.06 and 0.72±0.08, respectively. For PGs, our CI was similar to the published CI for an interobserver study using CT-sim. The observed low CI in C23, C67 and PIT corresponded to the small intersection between the delineated VOI of different scan sessions. The mean 3D shift of C23, C67, PIT, EBL, EBR, PGL, PGR and BS were 3.73±1.41, 9.11±10.45, 3.20±1.17, 3.69±0.71, 3.46±0.65, 3.55±1.11, 3.50±2.61, 4.30±4.18mm. Small CI and large 3D shift indicated a large positional variability in C67 since C67 was located at the posterior end of the cast. For BS, the large CI and large 3D shift were noted. Large CI corresponded to a large VOI intersection, which was affected by multiple factors such as positional variability, shape and size of the delineated VOI.

CONCLUSION

Except for C67, acceptable 3D shift was obtained for all VOIs (3.2-4.3mm) using MR-sim.

CLINICAL RELEVANCE/APPLICATION

Measurement of the inter-scan positional variability of MR-sim is important as it is related to the normal tissue sparing and hence the treatment outcome.
Nuclear Medicine (Central Nervous System and Head and Neck Imaging)

Wednesday, Nov. 30 10:30AM - 12:00PM Room: S505AB

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

FDA

Discussions may include off-label uses.

SSK13-01 Improved Detection of Transosseous Meningiomas Using 68Ga-Dotatate PET-CT Compared to MRI

**Participants**
Gary A. Ulaner, MD, PhD, New York, NY (Moderator) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd
Frederik L. Giesel, MD, MBA, Heidelberg, Germany (Moderator) Patent application for F18-PSMA-1007

**METHOD AND MATERIALS**
In this retrospective study, subjects were selected from a cohort of 325 consecutive patients who underwent 68Ga-DOTATATE PET-CT of the head for evaluation of confirmed or suspected intracranial meningioma. Inclusion criteria were (1) MRI imaging within 1 month of either pre- or postoperative matching PET-CT imaging, and (2) as standard of reference pathology-confirmed meningioma diagnosis with inclusion or exclusion of transosseous extension. Imaging was independently analyzed by two readers with respect to osseous involvement, absolute tracer uptake measured as SUVmax, volume of meningioma and surrounding edema. Chi square, Mann-Whitney U or exact McNemar's tests as well as receiver operating characteristics (ROC) analyses were performed to compare variables and diagnostic test performance.

**RESULTS**
Eighty-two patients (mean age 56±13 years) fulfilled the inclusion criteria. Patients with transosseous extension of meningioma (n=67) showed significantly larger lesions (median 10 ml vs. 3 ml, p=0.002) and significantly higher SUVmax (median 14 vs. 8, p=0.032) compared to extraosseous meningiomas. 68Ga-DOTATATE PET-CT in comparison to contrast-enhanced MRI performed at a considerably higher sensitivity (98.5% vs. 55.2%) while maintaining high specificity (86.7% vs. 100.0%) in the pre- as well as postoperative setting; statistically significant differences between the tests were observed (p<0.001). In ROC analysis, PET-CT assessment performed best (AUC: 0.933), followed by MRI assessment (0.866), meningioma volume (0.765) and SUVmax (0.680) while surrounding edema added no valuable information (0.483).

**CONCLUSION**
68Ga-DOTATATE PET-CT enables improved detection of the transosseous extension of intracranial meningiomas compared to MRI in pre- and postoperative settings.

**CLINICAL RELEVANCE/APPLICATION**
Transosseous extension of meningiomas affects growth and recurrence and is important for surgical management. Improved detection using 68Ga-DOTATATE PET-CT has the potential to impact decision making.

SSK13-02 Pittsburgh Compound B (PiB) PET Imaging of Meningioma and Other Intracranial Tumors

**Awards**
Student Travel Stipend Award

**Participants**
Derek R. Johnson, MD, Rochester, MN (Presenter) Consultant, F. Hoffmann-La Roche Ltd
Christopher H. Hunt, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Mark A. Nathan, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Val J. Lowe, MD, Rochester, MN (Abstract Co-Author) Research Grant, General Electric Company Research Grant, Siemens AG Research Grant, Eli Lilly and Company Advisory Board, Bayer AG
Joseph E. Parisi, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Meningioma is by far the most common intracranial tumor, with a prevalence of up to 3% in autopsy studies. While diagnosis by MRI is generally straightforward, lack of specificity may raise a diagnostic dilemma in patients with a history of cancer. We and others have reported cases of focal Pittsburgh compound B (PiB) PET activity within meningiomas; herein we report our institutional experience with this technique.

METHOD AND MATERIALS

Records of all patients who underwent PiB PET/CT at our institution from 2006 through 2015 were reviewed to identify those with intracranial tumors. Inclusion criteria included at least one MRI with contrast demonstrating enhancement of the suspected tumors, a minimum dimension of at least 0.5 cm, and either pathological confirmation of tumor or greater than 6 months of radiographic follow-up for patients in whom observation was recommended.

RESULTS

2472 patient records were reviewed; 45 patients (1.8%) met inclusion criteria for probable or definite intracranial tumor. Tumor types were meningioma (29/45, 64%), vestibular schwannoma (7/45, 16%), pituitary macroadenoma (4/45, 9%), metastatic disease (2/45, 4%), and others (3/45, 7%).

A ROC curve was created for the lesion:cerebellum SUVmax ratio, with an AUC of 0.91 for the ratio value of 1.65. At or above this ratio, specificity for meningioma was 100% (95% CI 79.4-100%) and sensitivity was 75.9% (95% CI 56.5-89.7%). The positive predictive value was 100% (95% CI 84.6-100%).

CONCLUSION

A tumor:cerebellum uptake ratio of 1.65 or greater on PiB PET is a highly specific and reasonably sensitive marker of intracranial meningioma. Further prospective evaluation is warranted to validate this result as well as to fully define the performance of this technique with emerging technologies such as PET/MRI and commercially available amyloid radiotracers.

CLINICAL RELEVANCE/APPLICATION

Pittsburgh compound B PET imaging may distinguish meningioma from other intracranial tumors with a high level of specificity, allowing for appropriate patient triage and treatment without the need for invasive testing and associated potential morbidity.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Geoffrey B. Johnson, MD, PhD - 2015 Honored Educator

SSK13-03  A Meta-analysis of Test-retest Repeatability of Amyloid PET Imaging with 11C-PIB and 18F-labeled Amyloid Radiotracers in Alzheimer’s Disease Patients and Healthy Controls

Wednesday, Nov. 30 10:50AM - 11:00AM Room: S505AB

Participants

Sara Sheikhbahaei, MD, MPH, Baltimore, MD (Presenter) Nothing to Disclose
Nancy A. Obuchowski, PhD, Cleveland, OH (Abstract Co-Author) Research Consultant, Siemens AG; Research Consultant, QT Ultrasound Labs; Research Consultant, Elucid Bioimaging Inc
Vctor L. Villemagne, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Rathan M. Subramaniam, MD, PhD, Dallas, TX (Abstract Co-Author) Nothing to Disclose

PURPOSE

In this meta-analysis we aim to determine the repeatability of amyloid PET imaging with 11C-Pittsburgh compound-B (11C-PIB) and 18F-fluorine (18F) labeled radiotracers using the available literature.

METHOD AND MATERIALS

Systematic electronic search were performed in PubMed and EMBASE (last updated in Jan 2016) to identify studies addressing the test-retest repeatability of amyloid PET imaging with 11C-PIB and 18F labeled radiotracers in patients with Alzheimer’s disease (AD) or healthy controls (HCs). The individual patient data or the mean test-retest variability (TRV%) and the standard deviation of two PET tracer retention measurements were extracted from the eligible studies. The study authors were contacted seeking for more information. The average neocortical SUVr were considered as a measure of amyloid load and the cerebellar cortex as the reference region. The percent repeatability coefficient (RC%) was calculated as an index of absolute reliability. The pooled estimates of mean TRV% with SE and the RC% with bootstrapped 95%CI were generated for summary effect.

RESULTS

A total of 7 studies were included in this individual patient data meta-analysis. Four studies evaluated the test-retest variability of 18F labeled amyloid tracers (Florbetapir, AZD4694, Flutemetamol, Florbetaben). The test-retest amyloid PET studies were performed between 1 to 4 weeks apart. The pooled mean TRV% for average cortical SUVr was 2.77(SE=0.75) in patients with AD (n=26) with a RC% of 10.36% (4.76-14.92). The pooled mean TRV% for average cortical SUVr was 3.12 (SE=1.39) in HCs (n=22) with a RC% of 10.41 (3.33-20.3). Three studies evaluated the test-retest variability of 11C-PIB amyloid imaging. The test-retest amyloid PET studies were performed on same day and up to 60 days apart. The pooled mean TRV% for average cortical SUVr was 4.33 (SE=0.25) for AD (n=12) with a RC% of 15.4% (8.49-20.05). The pooled mean TRV% for average cortical SUVr was 3.61 (SE=0.59) in HCs (n=16) with a RC% of 9.38% (7.55-10.92).

CONCLUSION

Our results showed no significant differences in RC% of 18F labeled and 11C-PIB amyloid tracers for neocortical SUVr.
CLINICAL RELEVANCE/APPLICATION

The repeatability coefficient of 18F amyloid radiotracers is about 10% for neocortical SUVr in both Alzehimers Disease patients and healthy controls. This effect should be considered when using neocortical SUVr as an outcome measure for assessing anti-amyloid therapy.

SSK13-04 Applying Amide Proton Transfer MR Imaging to Hybrid Brain PET/MR: Concordance to Gadolinium Enhancement and a Complementary Value to 18F-FDG PET

Wednesday, Nov. 30 11:00AM - 11:10AM Room: S505AB

Participants
Hongzan Sun, Shenyang, China (Presenter) Nothing to Disclose
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Jinyuan Zhou, PhD, Baltimore, MD (Abstract Co-Author) License agreement, Koninklijke Philips NV

PURPOSE

To evaluate the diagnostic concordance and metric correlations of amide proton transfer (APT) imaging with Gd-enhanced MRI and 18F-FDG PET using hybrid brain PET/MR.

METHOD AND MATERIALS

Twenty-one subjects with suspected brain lesions on prior CT or MRI were prospectively enrolled. Brain 18F-FDG PET/MR with gadolinium (Gd) enhancement (plus whole-body 18F-FDG PET/MR) was performed. Six diagnostic criteria based on brain lesion morphology and final diagnosis were used to compare the accuracy of unenhanced MRI (T1WI, T2WI, FLAIR plus DWI), enhanced MRI (T1WI), APT imaging and 18F-FDG PET. In cases of tumors, we further evaluated the concordance between Gd enhancement, APT-weighted (APTW) signal intensity and 18F-FDG avidity by the McNemar test, and also the associations between metrics from APT imaging and PET by Pearson correlation analysis.

RESULTS

There were totally 23 lesions (from 21 subjects), including 13 metastases, 3 gliomas (2 WHO grade IV and 1 WHO grade II), 3 meningiomas (WHO grade I), and 4 chronic infarctions. Enhanced MRI and APT imaging showed superior and similar diagnostic accuracy, compared to unenhanced MRI and 18F-FDG PET in tumor detection and final diagnosis. APTW signal intensity and Gd enhancement were concordant in all the 19 tumors (100%), while high 18F-FDG avidity was shown in only 12 (63.2%) with statistical difference (P < 0.05). There was no significant association between APTWmax and SUVmax, or APTWmean and SUVmean in all the brain tumors (P > 0.05). However, significant correlations were identified between APTWmax and SUVmax (r = 0.609, P = 0.027), as well as APTWmean and SUVmean (r = 0.599, P = 0.030) for 13 FDG hypermetabolic brain tumors (11 metastases and two meningiomas).

CONCLUSION

APT imaging using endogenous proteins and peptides can be used as to increase diagnostic accuracy with unnecessary administration of exogenous gadolinium chelate. APT imaging may play a complementary role to FDG metabolic activity during brain PET/MR study.

CLINICAL RELEVANCE/APPLICATION

APT imaging might be applied as a routine imaging sequence to streamline the scan protocol and extend clinical indications for brain 18F-FDG PET/MR.

SSK13-05 Anti-3-[18F]FACBC (Fluciclovine) Dynamic PET Differentiates Low-Grade and High Grade Gliomas in Patients with Minimal Prior Intervention

Wednesday, Nov. 30 11:10AM - 11:20AM Room: S505AB

Awards

Student Travel Stipend Award

Participants
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David M. Schuster, MD, Atlanta, GA (Abstract Co-Author) Institutional Research Grant, Nihon Medi-Physics Co, Ltd; Institutional Research Grant, Blue Earth Diagnostics Ltd; Consultant, WellPoint, Inc; 
Mark M. Goodman, PhD, Atlanta, GA (Abstract Co-Author) Royalties, Nihon Medi-Physics Co, Ltd

PURPOSE

Fluciclovine is an amino acid analogue PET radiotracer which is transported into tumor cells mainly via ASCT-2 and LAT-1 amino acid transport systems. The purpose of this study was to examine the role of fluciclovine dynamic PET in differentiating low-grade gliomas (LGGs) and high grade gliomas (HGGs) in systemic therapy naive patients.

METHOD AND MATERIALS

Biopsy proven LGGs (WHO grade II; N=5) and HGGs (WHO grades III and IV; N=11) from 14 patients post stereotactic biopsy or partial resection and therapy naive, underwent dynamic fluciclovine PET imaging on a High-Resolution Research Tomograph (Siemens Medical Solutions). Two HG glioma patients exhibited bifocal disease. The protocol was approved by IRB and supported by an NIH RO1 grant (5RO1CA121320). Using ROIs determined by the PET Edge tumor margin detection tool and manually selected ROIs of the contralateral normal brain, time activity curves were obtained for standardized uptake values (SUVmax and SUVmean)
RESULTS

Fluciclovine dynamic PET reveals predominant rapid increase followed by plateau kinetics in radiotracer uptake in LGGs, HGGs, and normal brain parenchyma. Significant increase was observed in HGGs relative to LGGs and normal background parenchyma. Equilibrium is reached within 20 minutes and may be an optimal time for static fluciclovine PET imaging.

CLINICAL RELEVANCE/APPLICATION

Fluciclovine PET is helpful in differentiating between low grade and high grade gliomas showing rapid increase then plateauing, reaching equilibrium approximately 20 minutes following injection.

SSK13-06 Incidental Brain Pathology on Whole Body FDG PET-MRI

Wednesday, Nov. 30 11:30AM - 11:40AM Room: S505AB

Awards

Student Travel Stipend Award

Participants

Ana M. Franceschi, MD, New York, NY (Presenter) Nothing to Disclose
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Nard K. Relan, PhD, Stony Brook, NY (Abstract Co-Author) Nothing to Disclose
Dinko Franceschi, MD, Stony Brook, NY (Abstract Co-Author) Nothing to Disclose

PURPOSE

Routine FDG PET-CT imaging for oncology is performed from the base of the skull to the mid thighs. Both benign and malignant brain findings can occur in the oncology patient that would be missed on the typical PET scan. In our institution, when performing whole body PET-MRI for cancer patients, we routinely include the entire head. The aim of our study was to characterize both PET and MRI brain findings incidentally detected on the included head portion of the study.

METHOD AND MATERIALS

234 FDG PET-MRI body scans that included the head were retrospectively reviewed. Images were obtained on hybrid PET-MRI with simultaneous acquisition using body coil and dedicated body sequences without IV contrast. Of the 234 studies, 204 individual patients were scanned (125 female, 79 male). Only the patient’s first PET-MRI was reviewed. Mean age was 55 y (range 7-89). 191 studies were for cancer assessment (72 staging, 119 restaging). Other 14 indications were for 5 paraneoplastic syndrome, 3 adenopathy, 3 lung nodule, 1 vasculitis, and 2 monoclonal gammopathy. Of these 4 were later diagnosed with cancer. Images of studies were for cancer assessment (72 staging, 119 restaging). Other 14 indications were for 5 paraneoplastic syndrome, 3 adenopathy, 3 lung nodule, 1 vasculitis, and 2 monoclonal gammopathy. Of these 4 were later diagnosed with cancer. Images of

RESULTS

Of the 204 patients, 30 patients (14.7 %) had positive brain findings on PET-MRI body sequences. 11 (5.4 %) had vascular disease (avg age 72 y) with 7 chronic microvascular ischemic changes and 4 had brain infarcts. One infarct was a subacute stroke in a paraneoplastic patient and another newly discovered infarct was in a 38 y female. Detection rate for microvascular ischemic changes was likely lower due to the body MRI sequences. 9 patients (8.7 %) had post-therapy changes in the brain due to either radiation (n=2), surgery (n=3), or chemotherapy (n=4). Three others had benign cystic lesions. 8 patients (9.4 %) had serious brain pathologies including 4 paraneoplastic patients (leptomeningeal metastases, metabolic encephalopathy, Creutzfeld-Jakob disease, and lymphoma), 1 metastases, 2 pituitary tumors, and 1 chronic subdural collection with mean age 63 y.

CONCLUSION

FDG PET-MRI imaging is a rapidly evolving modality that is commonly employed for cancer evaluation. The standardized base of skull to mid thigh imaging may miss many important brain pathologies that are discovered even using MRI body sequences.
Neurologic PET has traditionally required long acquisition times with a dedicated, smaller field of view (FOV) protocol than whole body imaging. With the introduction of next generation solid state, digital photon counting PET technology (dPET) we explored the potential to achieve excellent neuro image quality using ultra high definition (UHD, 1 mm³ voxel volume) reconstruction from acquisitions using the large FOV. We performed phantom and intra-individual comparisons using both whole body and dedicated brain acquisition and UHD reconstruction to assess the image quality and quantitative accuracy.

METHOD AND MATERIALS

20 patients were imaged on a pre-commercial release dPET (Vereos, Philips) (50 or 110 min post-injection, dose 13 mCi FDG). A single bed position was centered on the brain and a 90s acquisition was performed using the brain FOV 256 mm. Immediately following, standard whole body acquisition including the brain was performed using 90s per bed and the whole body FOV 576 mm. Both data sets were then reconstructed with a 1 mm³ voxel volume. An atlas based analysis was performed measuring SUVmax and z-score. A phantom comparison was completed, using a Hoffman brain phantom with three acquisitions each with the brain and whole body FOVs. A blinded reader analysis performed for image quality.

RESULTS

The intra-individual comparison between 256 FOV and 576 FOV revealed no significant differences in SUVmax, z-score measures or image quality reads. The phantom data showed similar results, with no significant differences in quantitative readouts between the two FOV.

CONCLUSION

This feasibility studies indicates that next generation digital detector PET may not require smaller, dedicated acquisition FOV and can acquire neurological PET using the full, standard whole body FOV. Equivalent quantitative and visual quality was achieved. This may facilitate improved workflow, particularly when larger anatomic or even whole body acquisitions are combined with neuro-imaging. While longer acquisition times over the brain may still be desirable, incorporation of variable bed times into whole body acquisitions can easily accommodate such needs.

CLINICAL RELEVANCE/APPLICATION

Next generation digital PET/CT systems can perform accurate and equivalent quality brain PET metabolic imaging using the standard full field of view acquisition reducing the necessity for small FOV.

SSK13-08  Added Diagnostic Value of Complementary Gadoxetic Acid-enhanced MRI to 18F-DOPA-PET/CT for Liver Staging in Medullary Thyroid Carcinoma

Participants

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PURPOSE

To investigate the added diagnostic value of complementary gadoxetic acid-enhanced MRI to 18F-DOPA-PET/CT for liver staging in medullary thyroid carcinoma (MTC).

METHOD AND MATERIALS

Twenty-nine consecutive Patients (n=17 f, n=12 m, median age 58 years) with histologically confirmed MTC undergoing gadoxetic acid-enhanced liver MRI within one month of matching contrast-enhanced 18F-DOPA-PET/CT between 2010 and 2015 were included for retrospective analysis. 18F-DOPA-PET/CT and multiparametric MRI (T2w; DWI; unenhanced, arterial, portal venous, delayed, and hepatobiliary phase T1w GRE fs) data sets were read consecutively and liver lesions were categorized on a 5-point scale analogously to the LI-RADS criteria (1–definitely benign; 2–probably benign; 3–intermediate risk for metastasis; 4–probably metastasis; 5–definitely metastasis). It was noted if gadoxetic acid-enhanced MRI detected additional, 18F-DOPA-PET/CT-occult metastases (category 5) or if gadoxetic acid-enhanced MRI allowed for a definite classification (categories 1 and 5) of lesions for which the 18F-DOPA-PET/CT scan remained inconclusive (categories 2-4).

RESULTS

A total of n=141 liver lesions (18F-DOPA-PET/CT n=107, MRI n=141; n=99 metastases, n=27 benign cysts, n=15 hemangiomas) were analyzed. N=34 additional lesions were detected by MRI, of which n=30 were additional metastases (median diameter 0.5 cm [0.4 – 1.9 cm]) occult on 18F-DOPA-PET/CT. MRI allowed for a definite lesion classification (categories 1 and 5) in 89 % (125/141) (18F-DOPA-PET/CT 69 %, n=74/107). MRI lead to a change in lesion categorization in 17 cases (from category 2 to 1: n=10; from category 3 to 1: n=3; from category 4 to 5: n=4).

CONCLUSION

Gadoxetic acid-enhanced MRI allows for a more accurate liver staging in MTC patients compared to 18F-DOPA-PET/CT alone, particularly for 18F-DOPA-negative metastases and lesions <1 cm.

CLINICAL RELEVANCE/APPLICATION
Differentiation of Incidental Tracer Uptake in the Head and Neck Area: A Comparison Between PET/CT and PET/MR

Wednesday, Nov. 30 11:50AM - 12:00PM Room: S505AB

Gadoxetic acid-enhanced MRI optimizes the detection of liver metastases with potential direct impact on clinical patient management and may be included as standard imaging in MTC staging protocols.

Participants
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PURPOSE
To compare the diagnostic accuracy of 18F-fluorodeoxyglucose positron emission tomography/magnetic resonance (18F-FDG PET/MR) imaging to 18F-FDG PET/computed tomography (18F-FDG PET/CT) concerning incidental tracer uptake in a dedicated head and neck protocol.

METHOD AND MATERIALS
A retrospective analysis of 81 patients that underwent contrast-enhanced 18F-FDG PET/CT and 18F-FDG PET/MR on the same day for oncological indications was performed. Fused PET/CT and PET/MR datasets were analyzed by two independent readers in random order in two separate sessions for PET/CT and PET/MR under consideration of the clinical indication. Incidental tracer uptake was classified in the three following groups: most likely benign, indeterminate and most likely malignant. Potential discrepancies were resolved in a separate consensus reading. Then, the reference standard was defined for all lesions by an expert reader using clinical reports, cross sectional imaging and histopathological reports. Differences between the total number of accurately and inaccurately classified lesions were investigated using McNemar's test between both modalities. A p<0.05 indicated statistical significance.

RESULTS
A total of 46 lesions were available for further analysis. Twenty-seven and 31 lesions were classified as most likely benign, 18 and 14 as indeterminate and one as most likely malignant in PET/CT and PET/MR respectively. According to the reference standard, 43 lesions were benign, one was malignant and in two lesions, a definite diagnosis was not possible. PET/MR was not superior to PET/CT concerning the correct diagnosis of an incidental 18F-FDG uptake (p=0.125). While the correct classification of an incidental uptake was possible in 28 findings on PET/CT and PET/MR, 14 findings were misclassified by either modality and four findings that were misclassified on PET/CT could be classified correctly on PET/MR.

CONCLUSION
PET/MR is not superior to PET/CT in the classification of incidental tracer uptake in the head and neck area.

CLINICAL RELEVANCE/APPLICATION
Incidental tracer uptake of the head and neck is a diagnostic dilemma in hybrid imaging. Our data indicate, that PET/MR does not increase the diagnostic accuracy of PET/CT in this specific problem.
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.
Neuroradiology/Head and Neck (Thyroid and Parathyroid)

Wednesday, Nov. 30 3:00PM - 4:00PM Room: N227B

SSM17-01 Patients’ Pain and Satisfaction after Thyroid Core-needle Biopsy

Wednesday, Nov. 30 3:00PM - 3:10PM Room: N227B

Participants
Reza Forghani, MD, PhD, Cote-saint-Luc, QC (Moderator) Consultant, Real Time Medical, Inc; Shareholder, Real Time Medical, Inc; Committee member, Real Time Medical, Inc; Consultant, General Electric Company; 
David R. De Lone, MD, Rochester, MN (Moderator) Nothing to Disclose

PURPOSE
The core needle biopsy (CNB) has been proposed as a complementary tool for thyroid nodules with inconclusive cytopathology by fine-needle aspiration (FNA). The purpose of this study was to compare the patients’ pain and satisfaction between the two procedures.

METHOD AND MATERIALS
The patients who had underwent thyroid FNA (n=90, 13 males, age 52.9±13.4) or CNB (n=80, 18 males, age 51.4±11.2) were consecutively included. The degree of pain was surveyed using 0 to 10 scales in both groups at three time points (during procedure, after procedure, and 20 minutes after procedure). The telephone surveys were made after 2 weeks after procedures for the remaining pain and overall satisfaction. The rate of inconclusive diagnosis (insufficient specimen[IS] and atypia of undetermined significance[AUS]) in cytopathology were recorded. Student’s t test was used for the comparative analysis.

RESULTS
The pain scores were not significantly different between the two groups (mean scores±standard deviation, FNA vs. CNB; during procedure, 2.88±1.46 vs. 2.54±1.79; after procedure, 1.41±1.54 vs. 1.49±1.79; 20 minutes after procedure, 0.74±0.82 vs. 0.90±1.13, all p>0.05). There was no case of acute complication in both groups. After 2 weeks after procedure, the remaining pain was reported in 6 patients (score 3 and 4) in FNA group, and 4 patients (score 3 and 4) in CNB group. Overall satisfaction scores after 2 weeks were also not different between the two groups (FNA 8.00±1.92, CNB 8.25±1.69, p=0.41). The rate of inconclusive diagnosis were 36.6% in FNA group (15 IS and 18 AUS) and 1.2% in CNB group (no IS, 1 AUS) (p<0.001).

CONCLUSION
CNB showed comparable patients’ pain and overall satisfaction to FNA, and significantly lower rates of inconclusive pathologic diagnosis. This finding suggests that CNB may replace the role of FNA as first approach to obtain pathologic diagnosis of thyroid nodules.

CLINICAL RELEVANCE/APPLICATION
Considering the comparable level of patients’ pain and satisfaction and lower rate of inconclusive pathologic results of CNB, CNB may have a potential to be the first approach to obtain pathologic diagnosis of thyroid nodules.

SSM17-02 Diagnostic Value of Shear Wave Elastography (SWE) Technique as Non-Invasive Tool in Diagnostic Assessment Between Benign and Malignant Thyroid Nodules

Wednesday, Nov. 30 3:10PM - 3:20PM Room: N227B

Participants
Davide Ippolito, MD, Monza, Italy (Presenter) Nothing to Disclose
Maria V. Schiavone, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose
Carmillo R. Talei Franzesi, Milan, Italy (Abstract Co-Author) Nothing to Disclose
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Davide Leni, Monza, Italy (Abstract Co-Author) Nothing to Disclose
Sandro Sironi, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the diagnostic performance of shear-wave ultrasound elastography (SWE) in the assessment of thyroid nodules, to differentiate malignant from benign nodules, being the fine-needle aspiration biopsy (FNAB) the standard of reference.

METHOD AND MATERIALS
A total of 161 patients (59.79±13.14 y, 119 females, 42 males), referring to our centre for thyroid nodules evaluation, underwent
ultrasound examination combined with Shear Wave Elastography before US-guided fine-needle aspiration of thyroid nodules. The investigation was performed (TOSHIBA Apio 500) by using a linear high-resolution 15-4 MHz transducer. Mean SWE elasticity index (EI mean) of nodules was measured and obtained data were expressed in kPa and m/s. Results of SWE examination were compared to cytological analysis or post-surgical histopathology.

RESULTS

A total of 169 nodules from 161 patients were analyzed. Eight nodules (4%) were malignant and 161 (96%) were benign. The obtained data showed a mean value of elasticity index of 29.7 kPa in malignant nodules and 30.4 kPa in benign nodules. SWE absolute values were not significantly different between benign and malignant nodules. While the evaluation of the ratio between nodule stiffness and thyroid parenchyma stiffness, in each of the patients, demonstrated that the strain ratio cut-off value of 1.57 offers high values of specificity (100%) and sensitivity (50%) (P<0.05), in prediction of malignant thyroid nodules.

CONCLUSION

Our results showed that strain ratio is more specific than conventional elastography score system to differentiate malignant from benign thyroid nodules; while absolute value of quantitative elasticity index measured by shear wave elastography was not significantly different from malignant and benign nodules.

CLINICAL RELEVANCE/APPLICATION

Strain ratio represents a good index in assessment of malignant thyroid nodules; it can be used routinely combined with US examination to increase the diagnostic efficacy in thyroid nodules assessment.

SSM17-03 Management for Small Thyroid Nodules: A Comparative Study Applying Six Guidelines for Thyroid Nodules

Wednesday, Nov. 30 3:20PM - 3:30PM Room: N227B

PURPOSE

To evaluate and compare the diagnostic performances of six guidelines for thyroid nodules in predicting the outcomes of small thyroid cancer and in differential diagnosis of small thyroid nodules.

METHOD AND MATERIALS

From March 2007 to February 2010, 4,696 thyroid nodules in 4,585 patients measuring 1-2cm that were diagnosed as benign or malignancy based on surgery or US-FNA were included. US examinations of the thyroid nodules were retrospectively reviewed, and categorized according to the categories of six guidelines for thyroid nodules reported in literature. Medical records of the patients were reviewed for cytopathology results and patient outcome during follow-up. Multivariate regression analysis was used to analyze predictors for distant metastasis and recurrence/persistence in patients with small thyroid cancer. Diagnostic performances of each guideline were calculated and compared.

RESULTS

Of the 4,696 thyroid nodules, 3,652 (77.8%) were benign and 1,044 (22.2%) were malignancy. Eight-hundred seventy-three patients diagnosed as small thyroid cancer were followed, of which 12 had distant metastasis and 66 had recurrences/persistence of disease. Positive findings of the guidelines did not show significant association to distant metastasis or recurrence/persistence of disease (all P>0.05). Sensitivity and NPV was highest in TIRADS-Kwak, 98.8% and 98.6%, respectively, while specificity, PPV, and accuracy was highest in Kim criteria, 83.1%, 59.6%, and 84.0%, respectively (P<0.001).

CONCLUSION

Positive features of the six guidelines for thyroid nodules were not associated with patient outcomes in small thyroid cancer. With its high specificity and accuracy, the Kim criteria may be an effective guideline to use in management of small thyroid nodules.

CLINICAL RELEVANCE/APPLICATION

Positive features of the six guidelines for thyroid nodules were not associated with patient outcomes in small thyroid cancer. With its high specificity and accuracy, the Kim criteria may be an effective guideline to use in management of small thyroid nodules.

SSM17-04 Role of Core-needle Biopsy as a Gatekeeper in Patients with Initially Detected Thyroid Nodules

Wednesday, Nov. 30 3:30PM - 3:40PM Room: N227B

PURPOSE

We evaluated the diagnostic yield and diagnostic accuracy of CNB and FNA in a large population of patients with initially detected thyroid nodules.

METHOD AND MATERIALS

This observational study was approved by our institutional review board, and all patients provided written informed consent. The
RESULTS
The non-diagnostic result rate and higher malignancy rate in CNB group than in FNA group were observed consistently in propensity score analysis and subgroup analysis. CNB seems to be a promising diagnostic tool for patients with initially detected thyroid nodules.

CONCLUSION
The significantly lower non-diagnostic result rate and higher malignancy rate in CNB group than in FNA group were observed consistently in propensity score analysis and subgroup analysis. CNB could be a promising diagnostic tool for patients with initially detected thyroid nodules.

METHOD AND MATERIALS

PURPOSE
The purpose of this study was to evaluate the ability of multiparametric MRI (mpMRI) to predict aggressive histological features in papillary thyroid carcinoma (PTC).

METHOD AND MATERIALS
We evaluated a cohort of 68 patients with pathologically confirmed PTC who underwent mpMRI including T2 weighted imaging (T2WI), diffusion weighted imaging (DWI-MRI), and dynamic contrast material enhanced (DCE-MRI) before thyroidectomy. Tumor aggressiveness was defined by the histopathological phenotype. The T1 and T2 signal intensity ratio (SIR) of each thyroid nodule was calculated by measuring the mean signal intensity divided by that of paraspinal muscle. DCE-MRI parameters (ktrans and Ve) and apparent diffusion coefficient (ADC) values were calculated. The SIRs, ADCs, Vp, Ve and volume transfer coefficient (Ktrans) were then compared between PTCs with and without features of tumor aggressiveness. The diagnostic accuracy of the ADCs value and pharmacokinetic parameters were estimated using receiver operating characteristic curve (ROC) between the 2 groups.

RESULTS
The ADC value (p < 0.0001) and Vp (p < 0.0001) were significantly lower for PTCs with than PTCs without features of tumor aggressiveness, but no significant difference was found in the T2 SIR (p = 0.54) and Ktrans (p = 0.86). The cutoff value of ADC to discriminate PTCs with and PTCs without tumor aggressiveness was determined at 1.20×10⁻³ mm²/s with a sensitivity of 86%, specificity of 100%, area under curve (AUC) of 0.85. The Vp cutoff value that provided the best combination of high sensitivity of 86% and specificity of 100% to distinguish between patients with and patients without features of tumor aggressiveness.

CONCLUSION
The ADC value and DCE-MRI parameter Vp before surgery have good potential to assess aggressiveness histological features in PTC.

CLINICAL RELEVANCE/APPLICATION
Multiparametric MR parameters (the ADCs value and Vp) accurately predict the aggressiveness of PTC.
have published algorithms regarding thyroid nodule management, in particular whether biopsy should be performed. There exist limited data on these algorithms’ diagnostic performance. Using a published risk estimation model we tested the performance of these algorithms in differentiating benign and malignant nodules.

**METHOD AND MATERIALS**

1,000,000 thyroid nodules were modeled in MATLAB. Size, composition, echogenicity, margins, calcifications, and presence of taller-than-wide morphology were modeled after published data. First, malignancy risk was estimated per Kwak’s model and assigned as a binary variable: calculated risk of $N (N \in [0,1])$ indicates malignancy if $M \in [0,1])$. Second, all nodules were assessed using SRU 2005, ATA 2009, and ATA 2015 algorithms. With the binary malignancy variable as condition positivity and recommendation for FNA from each algorithms as test positivity, sensitivity, specificity, PPV and NPV were calculated for each algorithm.

**RESULTS**

1,000,000 thyroid nodules were modeled, mean size 16.6 mm, median 14.6 mm. Nodule characteristics mimic those described by Kwak et al. Risk of nodules’ malignancy ranges from 2.0-98% (mean 12.8%, median 6.8%). 12.8% nodules were assigned as malignant. FNA was recommended for 41% of nodules by SRU 2005, 66% of nodules by ATA 2009, and 82% by ATA 2015. Sensitivity and specificity of the algorithms is significantly different ($\chi^2 < 0.0001$): 49% and 60% for SRU; 81% and 36% for ATA 2009; and 95% and 20% for ATA 2015. The figure shows true/false positivity/negativity, positive/negative predictive value, sensitivity, and specificity for each algorithm.

**CONCLUSION**

SRU 2005, ATA 2009 and ATA 2015 algorithms are used routinely in clinical practice to determine need for thyroid nodule biopsy. We demonstrate significant differences in these algorithms’ diagnostic performance. The current iterations of each algorithm result in a compromise between sensitivity or specificity.

**CLINICAL RELEVANCE/APPLICATION**

Society of Radiologists in Ultrasound and American Thyroid Association nodule management algorithms demonstrate significant differences in diagnostic performance, with all resulting in a compromise between sensitivity or specificity.
Participants
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Deborah R. Shatzkes, MD, New York, NY, (shatzkes@hotmail.com ) (Moderator) Nothing to Disclose

LEARNING OBJECTIVES
1) To understand the goals of imaging in the work-up of primary hyperparathyroidism, and the pros and cons of the available modalities. 2) To appreciate both the contributions and limitations of the radiologist in staging head and neck cancer. 3) To assess suitability of ultrasound as an imaging modality in various sites of the head and neck.

Sub-Events

SPSC45A  What Should Be the Initial Imaging Modality in the Work-up of Primary Hyperparathyroidism?: 4D CT

Participants
Jenny K. Hoang, MBBS, Durham, NC (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Review the rationale for precisely localizing parathyroid lesions prior to surgery. 2) Describe the imaging findings of parathyroid adenoma on 4D-CT. 3) Describe the advantages of 4D-CT.

ABSTRACT
Preoperative parathyroid imaging in patients with primary hyperparathyroidism is routine, and for many years ultrasound and scintigraphy has been a common combination. However in recent years, there have been notable changes in surgery and imaging. In the early 2000s, the direction of surgery changed from four-gland cervical exploration to focused surgery. Focused surgery involves resecting a single parathyroid adenoma through a small unilateral incision on one side of the neck in one quadrant and requires precise imaging localization for operative planning. 4D-CT, which is a CT of the neck and upper chest with at least two contrast phases. 4D-CT was first reported in the surgical literature in 2006 and offers several advantages, including shorter scan time, detailed anatomical localization, and improved ability to detect multiglandular disease. Multiple studies show 4D-CT to be more sensitive than scintigraphy and ultrasound for preoperative localization. It is also possible to grade degree of confidence on 4D-CT.

SPSC45B  What Should Be the Initial Imaging Modality in the Work-up of Primary Hyperparathyroidism?: Technetium-99m Sestamibi

Participants
Bennett S. Greenspan, MD, MS, Augusta, GA, (bengreenspan0708@gmail.com ) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Attendees will be able to define the high degree of sensitivity and specificity and localizing ability that can be achieved with Tc-99m Sestamibi, particularly utilizing SPECT/CT. 2) Attendees will be able to explain why Tc-99m Sestamibi SPECT/CT is valuable in detecting and localizing ectopic parathyroid adenomas. 3) At the conclusion of the presentation, attendees will be able to explain why functional imaging with Tc-99m Sestamibi is the standard of practice for localizing parathyroid adenomas prior to surgery, especially in recurrent or residual disease.

ABSTRACT
Primary hyperparathyroidism is often discovered by routine screening that identifies the presence of hypercalcemia, and parathyroid immunoassay can identify elevated parathyroid hormone. The only curative treatment is surgery. Preoperative parathyroid scintigraphy, including with SPECT/CT, can assist in planning surgical strategy, to determine limited exploration vs. bilateral surgery, and identification of ectopic parathyroid glands. Ectopic glands, which occur approx. 5-15% of the time, can be seen in the mediastinum, occasionally below the level of the thymus. Technetium-99m Sestamibi is an excellent technique to detect and localize enlarged parathyroid glands. For parathyroid adenomas, sensitivity, accuracy and positive predictive value can be as high as 96%, 96% and 100%. For hyperplasia 86%, 86% and 100%. Localizing adenomas or hyperplasia to the correct side and upper or lower pole or ectopia, especially with SPECT/CT, can reduce surgical time. Imaging is particularly helpful in residual or recurrent disease, where previous surgery has produced altered anatomy. Tc-99m Sestamibi with SPECT/CT is the standard of practice, and provides high sensitivity, specificity, accuracy and localization.

SPSC45C  When Interpreting Cancer Staging Imaging Studies, Should the Radiologist Put a Stage in Their Report?: Yes

Participants
Lawrence E. Ginsberg, MD, Houston, TX (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) To understand my opinion on the role of the radiologist in formal staging of head and neck cancer.
ABSTRACT

This presentation is entirely subjective, but everyone is entitled to my opinion. The radiologist has a critical role in head and neck cancer staging when upstaging features are detected at imaging. The clinician may not know about the nodal metastasis (clinically N0), an occult primary malignancy (clinically T0), or the perineural spread, bone destruction, or other relevant finding that indicates a higher stage tumor than is known clinically. In such circumstances, I feel strongly that it is the role of the diagnostic imaging oncologist (what I see in the mirror), to convey that formally within our report because accurate staging is critical to prognosis, staging, and assignment to treatment protocols. I routinely do this in my busy head and neck oncology practice, and have never once received negative feedback. On the other hand, I try to avoid understaging by tumor measurement, acknowledging that a mucosal lesion may be larger on clinical exam than I can see radiographically.

LEARNING OBJECTIVES

1) Discuss the advantages and limitations of including a radiologic stage when interpreting staging examinations for head and neck squamous cell carcinoma.

ABSTRACT

Radiologists must have a comprehensive understanding of how head and neck squamous cell carcinoma is staged. That's the only way to ensure that our reports include all of the radiologic elements that contribute to staging. But there are also critical features of these cancers that might be unavailable to us when we are reading out, possibly because of incomplete documentation, or possibly because the information hasn't been gathered yet. A radiologic stage that is rendered without all the clinical data might be misleading, and could get propagated on later documents, leading to improper care. A multidisciplinary tumor board is the optimal place for consensus staging of head and neck tumors.

SPSC45D Is Ultrasound Under-Utilized in Head and Neck Imaging?: No

Participants
Barton F. Branstetter IV, MD, Pittsburgh, PA, (bfb1@pitt.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Review factors that influence first-line imaging of neck processes
2) Discuss impact of access to imaging modalities and referral patterns on ultrasound utilization in the neck

ABSTRACT

Appropriate imaging of a neck mass or fullness is influenced by whether the patient is an adult or child, the location of any palpable finding, risk factors for cancer, or symptoms of infection. While ultrasound is a powerful tool to clarify if lesions are solid, cystic, or vascular, and guide sampling, it does not provide a comprehensive evaluation of multifocal, trans-spatial or non-palpable processes, or assist in identification of aerodigestive tract primary tumors. Factors such as access to cross-sectional imaging, radiation exposure, sonographer time and skill, and referral patterns for evaluation and sampling also influence utilization.

SPSC45F Is Ultrasound Under-Utilized in Head and Neck Imaging?: Yes

Participants
Kim Learned, MD, Philadelphia, PA, (kim.learned@uphs.upenn.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES


ABSTRACT

The trend of utilization of Advanced Imaging continued to rise for all imaging modalities Ultrasound, CT, MR, PET/CT. Ultrasound is gold standard for evaluation of thyroid mass. However, CT and MR are initial imaging choice for evaluation of non-thyroidal neck mass in adults by ACR appropriateness criteria as well as common clinical practice. The barriers for utilization of Ultrasound in Neck Imaging include the perceived lack of training, time and financial incentive as well as shortcoming of ultrasound in evaluation of the deeper neck and easy accessibility of CT and MR in United States. Ultrasound is valuable tool for evaluation of major salivary gland. Ultrasound-guidance biopsy has greatest potential in providing high level of diagnostic efficacy as part of comprehensive clinical practice guidelines. Point-of-care Ultrasound & Ultrasound-guidance Procedure for palpable neck mass are in line with the Institute of Medicines six dimensions of high quality care: safe, timely, effective, efficient, equitable, and patient-centered. The ultimate goal for utilization of Ultrasound in Neck Imaging is to improve the patient's outcome and to optimize the imaging strategy, combining the highest diagnostic yield with the lowest cost.

Handout: Kim Learned


SPSC45F Is Ultrasound Under-Utilized in Head and Neck Imaging?: Yes

Participants
Julie Bykowski, MD, La Jolla, CA, (jbykowski@ucsd.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the advantages and limitations of including a radiologic stage when interpreting staging examinations for head and neck squamous cell carcinoma.

ABSTRACT

Radiologists must have a comprehensive understanding of how head and neck squamous cell carcinoma is staged. That's the only way to ensure that our reports include all of the radiologic elements that contribute to staging. But there are also critical features of these cancers that might be unavailable to us when we are reading out, possibly because of incomplete documentation, or possibly because the information hasn't been gathered yet. A radiologic stage that is rendered without all the clinical data might be misleading, and could get propagated on later documents, leading to improper care. A multidisciplinary tumor board is the optimal place for consensus staging of head and neck tumors.
Participants
Suresh K. Mukherji, MD, Northville, MI (Presenter) Nothing to Disclose
Sung Kim, MD, New Brunswick, NJ (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Review the pertinent anatomy of the upper aerodigestive tract. 2) Discuss the spread patterns of various head and neck tumors. 3) Illustrate the important of multimodality imaging for tumor contouring.

ABSTRACT
This e-contouring session will be given by a head and neck radiologist and radiation oncologist. This session will review the pertinent anatomy of the upper aerodigestive tract, discuss the spread patterns of various head and neck tumor and Illustrate the importance of multimodality imaging for tumor contouring.
Case-based Review of Neuroradiology (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: S100AB

LEARNING OBJECTIVES

1) Provide a brief review of CNS pathology highlighting the key diagnostic features. 2) Review pertinent differential diagnoses of neuroimaging cases. 3) Provide important imaging pearls for differentiating CNS pathology.

ABSTRACT

Learning Objectives:
1. Provide a brief review of CNS pathology highlighting the key diagnostic features.
2. Review pertinent differential diagnoses of neuroimaging cases.
3. Provide important imaging pearls for differentiating CNS pathology.

Sub-Events

**MSCN51A  Adult Brain**

Participants
Pina C. Sanelli, MD, Manhasset, NY (Director) Nothing to Disclose

LEARNING OBJECTIVES

1) Better analyze the relevant features of each case. 2) Be able to characterize findings into general diagnostic categories and apply knowledge of specific patterns to narrow down the differential diagnoses.

ABSTRACT

Participants
Gordon K. Sze, MD, New Haven, CT (Presenter) Investigator, Remedy Pharmaceuticals, Inc

**MSCN51B  Adult Spine**

Participants
Pamela W. Schaefer, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

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

ABSTRACT

Numerous spinal cord and spine pathologies will be presented, key features of specific pathologies will be reviewed and pertinent differential diagnoses will be discussed in a case based review format.

**MSCN51C  Adult Head & Neck**

Participants
Laurie A. Loevner, MD, Gladwyne, PA (Presenter) Nothing to Disclose
The Temporal Bone: Trauma, Tumors, and Inflammation

Thursday, Dec. 1 8:30AM - 10:00AM Room: E451A

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

Participants

Sub-Events

RC606A  Temporal Bone Trauma

Participants
Tabassum A. Kennedy, MD, Madison, WI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Recognize patterns of temporal bone trauma. 2) Categorize fractures based on anatomy, fracture direction and otic capsule involvement. 3) Anticipate predictable complications of temporal bone trauma.

ABSTRACT

RC606B  Temporal Bone Tumors

Participants
Amy F. Juliano, MD, Boston, MA, (amy_juliano@meei.harvard.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Identify the location of a tumor within the temporal bone and generate a differential diagnosis based on the location. 2) Recognize imaging features of some temporal bone tumors that have distinct appearances on CT or MR. 3) Identify pertinent positives and negatives.

ABSTRACT

RC606C  Temporal Bone Inflammation

Participants
Joel D. Swartz, MD, Gladwyne, PA, (swartzjd@aol.com) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) The learner will be able to understand and analyze the most common varieties of inflammation involving the external auditory canal, middle ear, mastoid and inner ear. 2) The learner will understand the appropriate use of computed tomography and MRI. 3) The learner will be able to differentiate cholesteatoma from other middle ear maladies and understand the pathophysiology of the entities discussed in the presentation. 4) The learner will understand the imaging approach to inner ear inflammation.

ABSTRACT

This presentation will follow an anatomically organized template. The external ear entities emphasize will include necrotizing external otitis, keratosis obturans, granulation tissue and EAC cholesteatoma. There will be special attention to middle ear cholesteatoma with a discussion of diffusion weighted imaging and differentiation of this lesion of granulation tissue and cholesterol granuloma. The pathophysiology of labyrinthitis will also be emphasized.
**Learning Objectives**

1) Provide a brief review of CNS pathology highlighting the key diagnostic features. 2) Review pertinent differential diagnoses of neuroimaging cases. 3) Provide important imaging pearls for differentiating CNS pathology.

**Abstract**

Learning Objectives:
1. Provide a brief review of CNS pathology highlighting the key diagnostic features.
2. Review pertinent differential diagnoses of neuroimaging cases.
3. Provide important imaging pearls for differentiating CNS pathology.

**Sub-Events**

**MSCN52A  Pediatric Brain**

Participants
Pina C. Sanelli, MD, Manhasset, NY (Director) Nothing to Disclose

**Learning Objectives**

1) Identify the key imaging features of various common pediatric brain diseases. 2) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric brain. 3) Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

**Abstract**

Learning Objectives: 1. Identify the key imaging features of various common pediatric brain diseases. 2. Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric brain. 3. Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

Active Handout: Pia C. Maly Sundgren

**MSCN52B  Pediatric Spine**

Participants
Tina Y. Poussaint, MD, Boston, MA, (tinayoung.poussaint@childrens.harvard.edu) (Presenter) Nothing to Disclose

**Learning Objectives**

1) Identify the key imaging features of various common pediatric spine diseases. 2) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric spine. 3) Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

**Abstract**

1) Identify the key imaging features of various common pediatric spine diseases. 2) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric spine. 3) Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

**MSCN52C  Pediatric Head & Neck**

Participants
Korgun Koral, MD, MBA, Dallas, TX, (korgun.koral@utsouthwestern.edu) (Presenter) Nothing to Disclose

**Learning Objectives**

1) Classify common vascular lesions of pediatric neck. 2) Detect normal variations of pediatric skull base. 3) Recommend appropriate imaging tests for common pediatric neck masses. 4) List clinically relevant observations on emergent pediatric neck CT.

**Abstract**

n/a
Neuroradiology/Head and Neck (Advanced Imaging of the Head and Neck)

Thursday, Dec. 1 10:30AM - 12:00PM Room: N229

SSQ15-01 Shear Wave Elastography in Lymph Nodes: A Feasibility and Diagnostic Study

Participants
Christine M. Glastonbury, MBBS, San Francisco, CA (Moderator) Author with royalties, Reed Elsevier
Ashley H. Aiken, MD, Atlanta, GA (Moderator) Nothing to Disclose

Method and Materials
260 patients referred for needle core biopsy of superficial LN's under ultrasound guidance were prospectively included (with IRB approval). Bmode US and SWE examinations were performed using an Aixplorer® ultrasound machine (SuperSonic Imagine Ltd). Quantitative SWE parameters were registered (mean stiffness values (E_mean), standard deviation (SD), maximum stiffness values (E_max)) and qualitative patterns of the SWE elasticity color map were evaluated in consensus by two readers (nodular pattern, blue pattern, rim of higher stiffness). SWE measurements were performed both in the long and short axis planes in a subgroup of 152 patients. A subgroup of 42 LN's were prospectively scanned twice by two operators in order to assess inter-observer agreement (intraclass coefficient) on quantitative SWE parameters. Finally, these results were compared to histological findings.

Results
Final diagnosis was benign LN's in 27.6% (n=72), lymphomas in 42.7% (n=111), carcinomas in 17% (n=44) and other disease in 12.7% (n=33). E_mean values were significantly higher for carcinomas and lymphomas than for benign LN's (22.9 [16.2-29.6] kPa ; 16 [12.2] kPa; 11.4 [6.8-16] kPa respectively p < 0.05). E_max values and SD were significantly lower for benign than for other LN's (E_max values: 17.45 [7.7-27] kPa for benign and 32.6 [18.3-46.9] kPa, 47.7 [33.6-2] kPa, 29.2 [21.3-7] kPa for other LN's, carcinomas, lymphomas respectively; p<0.01) both in the long and short axis. Interestingly, E_mean values were consistently higher by about 25% than short axis values (mean discrepancy : 4.11 kPa ; p<10-3). For SWE qualitative parameters, the presence of a rim of higher stiffness was significantly correlated with carcinomas, blue pattern with benign LN's and nodular pattern with carcinomas and other disease (p<10-4). E_mean values for observer 1 and 2 and intraclass coefficient assessed twice were 16.04, 14.68 kPa (NS) and 0.764 respectively.

Conclusion
Quantitative and qualitative SWE provided accurate informations to differentiate LN's according to histology. E_mean values were consistently higher when measured from the long axis plane than the short axis one.

Clinical Relevance/Application
To improve accuracy of ultrasound imaging for differentiating benign from other superficial LN's

SSQ15-02 Differentiation of Malignant Cervical Lymphadenopathy by Dual-energy CT: An Initial Experience

Participants
Liang Yang, Beijing, China (Presenter) Nothing to Disclose
Dehong Luo, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Lin Li, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Yanfeng Zhao, Beijing, China (Abstract Co-Author) Nothing to Disclose
Meng Lin, Beijing, China (Abstract Co-Author) Nothing to Disclose
Wei Guo, Beijing, China (Abstract Co-Author) Nothing to Disclose

Purpose
To evaluate the diagnosis value of the quantitative parameters derived from dual-energy CT (DECT) in differentiating malignant cervical lymphadenopathy caused by thyroid carcinoma (TC), salivary gland carcinoma (SC), squamous cell carcinoma (SCC) and
The Value of Diffusion-Weighted Imaging Using Readout-Segmented Echo-Planar Imaging, Parallel Imaging, and Two-Dimensional Navigator-Based Reacquisition in the Evaluation of Parotid Gland Tumors

METHOD AND MATERIALS

From January 2014 to December 2015, 92 patients with pathologically confirmed cervical lymphadenectomy of TC, SC, SCC and lymphoma were retrospective analyzed. All patients underwent DECT with gemstone spectral imaging mode before therapy. The quantitative parameters included IC-L (iodine concentration of lesion), WC-L (water concentration of lesion) and λHU (slope of spectral HU curve), which were obtained by analyzing monochromatic images. Parameters of different type lesions were compared.

RESULTS

65 male, 27 female; mean age, 48 years. IC-L for TC (n=18), SC (n=9), SCC (n=36), lymphoma (n=29) were (39.85±14.57)·100μg/cm3, (23.01±3.15)·100μg/cm3, (16.00±4.31)·100μg/cm3 and (14.66±4.17)·100μg/cm3 respectively. λHU for TC, SC, SCC, lymphoma were 5.45±1.95, 3.12±0.41, 2.16±0.75, 1.95±0.64 respectively. The difference of IC-L, λHU were significant among different groups (F=48.31, 49.16 respectively, P<0.05). Post hoc pairwise comparisons of IC-L and λHU demonstrated significant difference between TC and SC or SCC or lymphoma (P<0.05) and between SC and SCC or lymphoma (P<0.05). The median of WC-L in TC, SC, SCC, Lymphoma group was [1036.22(1026.298~1042.14) mg/cm3], [1032.25(1025.03.31~1036.17) mg/cm3], [1034.63(1027.68~1038.61) mg/cm3], [1034.08(1031.21~1041.26) mg/cm3], respectively. There was no significant difference of WC-L between different groups (H=0.39, P>0.05).

CONCLUSION

Quantitative parameters derived from DECT showed significant differences among malignant cervical lymphadenopathy of TC, SC, SCC, lymphoma. DECT can help distinguish different malignant cervical lymphadenopathy.

CLINICAL RELEVANCE/APPLICATION

Quantitative parameters derived from DECT were useful supplements to conventional CT images, and were helpful for distinguishing different malignant cervical lymphadenopathy. Using these quantitative parameters in preoperative evaluation of cervical malignant lymphadenopathy might help radiologists avoid subjective bias related to experience and raise diagnostic confidence. These studies thus offered an important adjunct to diagnose the different cervical malignant lymphadenopathy.

Participants

Zanxia Zhang, Zhengzhou, China (Presenter) Nothing to Disclose
Jingliang Cheng, MD,PhD, Zhengzhou, China (Abstract Co-Author) Nothing to Disclose
Yong Zhang, DO, Zhengzhou, China (Abstract Co-Author) Nothing to Disclose
Shujian Li, Zhengzhou, China (Abstract Co-Author) Nothing to Disclose

The Value of Diffusion-Weighted Imaging Using Readout-Segmented Echo-Planar Imaging, Parallel Imaging, and Two-Dimensional Navigator-Based Reacquisition in the Evaluation of Parotid Gland Tumors

METHOD AND MATERIALS

Sixty-five patients with parotid gland tumors confirmed by pathology were retrospectively reviewed. All the patients received preoperative conventional MRI and RESOLVE DWI (b-values of 0 and 1000 s/mm2). The apparent diffusion coefficient (ADC) maps were reconstructed, and the ADC values of the solid parts of the lesions were calculated and the receiver operating characteristic curves (ROC) was drawn to obtain the cut-off value for differentiating benign and malignant parotid gland tumors.

RESULTS

59 patients with parotid gland tumor were included in the study. The mean ADC value of pleomorphic adenomas were significantly higher than that of all other examined subtypes. ADC values of warthin tumors were significantly lower than pleomorphic adenoma (p=0.000), basal cell adenoma (p=0.000) and malignant tumors (p=0.001). No significant difference was found between basal cell adenoma and malignant tumors (p=0.067). ADC cut-off values were 1.22×10⁻³ to 3.10×10⁻³ mm²/s between pleomorphic adenomas and malignant tumors and 0.99×10⁻³ to 3.00×10⁻³ mm²/s between adenomas and malignant tumors; using 0.99×10⁻³ mm²/s≤ADC values to make a diagnosis of malignant tumors, the sensitivity, specificity, accuracy, and positive and negative predictive values were 93.8%, 81.4%, 84.7%, respectively.

CONCLUSION

RESOLVE can be applied as a complementary tool in the detection of benign and malignant lesions of the parotid gland for producing high-resolution DWI.

CLINICAL RELEVANCE/APPLICATION

RESOLVE can be applied as a complementary tool in the detection of benign and malignant lesions of the parotid gland for producing high-resolution DWI.

Pleomorphic Adenoma and Malignant Tumor of Parotid Gland: Diagnostic Value of Single-Source Dual-Energy Spectral Computed Tomography

METHOD AND MATERIALS

PURPOSE

To quantitatively evaluate the diagnostic value of single-source dual-energy spectral Computed Tomography between pleomorphic adenoma and malignant tumor of parotid gland.

RESULTS

59 patients with parotid gland tumor were included in the study. The mean ADC value of pleomorphic adenomas were significantly higher than that of all other examined subtypes. ADC values of warthin tumors were significantly lower than pleomorphic adenoma (p=0.000), basal cell adenoma (p=0.000) and malignant tumors (p=0.001). No significant difference was found between basal cell adenoma and malignant tumors (p=0.067). ADC cut-off values were 1.22×10⁻³ to 3.10×10⁻³ mm²/s between pleomorphic adenomas and malignant tumors and 0.99×10⁻³ to 3.00×10⁻³ mm²/s between adenomas and malignant tumors; using 0.99×10⁻³ mm²/s≤ADC values to make a diagnosis of malignant tumors, the sensitivity, specificity, accuracy, and positive and negative predictive values were 93.8%, 81.4%, 84.7%, respectively.

CONCLUSION

RESOLVE can be applied as a complementary tool in the detection of benign and malignant lesions of the parotid gland for producing high-resolution DWI.

CLINICAL RELEVANCE/APPLICATION

RESOLVE can be applied as a complementary tool in the detection of benign and malignant lesions of the parotid gland for producing high-resolution DWI.

Participants

Lin Li, MD, Beijing, China (Presenter) Nothing to Disclose
adenoma and malignant tumor of parotid gland.

METHOD AND MATERIALS

From January to December in 2015, 17 cases with parotid tumor underwent enhanced neck CT using a single-source dual-energy spectral CT mode before operation. The scanning parameters included tube voltage rapid-switching between 80kV/140kV, tube current of 260mA; helical pitch of 0.984 and rotation speed of 0.7s/r. Spectral analysis was performed using the Gemstone Spectral Imaging (GSI) Viewer software on the AW4.6 workstation (GE healthcare). GSI Viewer automatically calculate the optimal energy level for getting the highest CNR. The slope value (K) of spectral HU curve was calculated by using the following equation: K = (HU40keV-HU100keV)/(100-40). The iodine concentration (IC), water concentration (WC), normalized IC artery (NICA), normalized IC muscle (NICM) and K were compared between pleomorphic adenoma and malignant tumors. The statistical analysis was performed with SPSS 19.0 software. ROC analysis was performed to evaluate the efficiency of the multiple variables for detecting malignant tumors.

RESULTS

Seven pleomorphic adenoma and ten malignant tumors were confirmed by pathology. The optimal contrast-noise-ratio (CNR) was achieved at 66.16±4.17 keV. The IC, NICA, NICM and K of malignant tumors were significantly higher than pleomorphic adenoma (P<0.05). The optimal IC, NICA, NICM and K threshold was 0.935mg/mL, 0.14, 2.00 and 1.11, achieving 100%, 80%, 70% and 100% sensitivity, 71.4%, 71.4%, 85.7% and 71.4% specificity, respectively. The accuracy was 88.2%, 82.4%, 76.5% and 88.2%, respectively.

CONCLUSION

The single-source dual-energy spectral Computed Tomography can help differentiating malignant from pleomorphic adenoma.

CLINICAL RELEVANCE/APPLICATION

Spectral imaging can reflect the iodine concentration of pleomorphic adenoma and malignant tumors and it is useful in differential diagnosis.

SSQ15-06 Initial Clinical Experience using Ultra-High Definition Digital PET/CT in Head and Neck Oncology

Thursday, Dec. 1 11:20AM - 11:30AM Room: N229

Participants

Chadwick L. Wright, MD, PhD, Lewis Center, OH (Presenter) Nothing to Disclose
Aashish D. Bhatt, MD, Louisville, KY (Abstract Co-Author) Nothing to Disclose
Frayna Bhatia, BS, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Preethi Subramanian, MS, BEng, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Katherine Binzel, PhD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Piotr J. Maniawski, MSc, Cleveland, OH (Abstract Co-Author) Employee, Koninklijke Philips NV
Jun Zhang, PhD, Columbus, OH (Abstract Co-Author) Nothing to Disclose

PURPOSE

The purpose of this study is to assess the clinical potential of next generation digital photon counting PET (dPET) detector technology to enable ultra-high definition imaging in patients with head and neck cancer and compare its imaging characteristics to conventional photomultiplier tube detector (cPET) PET/CT.

METHOD AND MATERIALS

Fifteen head and neck cancer patients in this ongoing study agreed to participate to an intra-individual comparison of FDG PET imaging using pre-commercial release dPET/CT (Vereos) and cPET/CT (Gemini TF 64) imaging systems. Standard of care cPET imaging was performed at ~75 min p.i. of 481 MBq FDG, investigational dPET imaging either at ~55 min or ~95 min p.i. All other aspects of image acquisition were kept identical. Digital PET images were reconstructed using Time-of-Flight with 4 mm3 (standard definition), 2 mm3 (high definition), and 1 mm3 (ultra-high definition) voxel volumes and compared with standard definition cPET imaging by a three reader panel.

RESULTS

All 30 data sets were evaluable. Ultra-high definition dPET imaging was consistently rated best in terms of image quality with significantly (p < 0.01) higher readers scores. Improved lesion detectability with sharper delineation was consistently described by the blinded readers compatible with substantially reduced partial volume. Lesion detectability was found to be especially improved in smaller (<15 mm) lesions and better characterization of larger heterogeneous lesions was also noted. While large, homogenous lesions had comparable SUV values on both cPET and dPET, smaller lesions demonstrated higher SUV as did heterogeneous lesions.

CONCLUSION

Ultra-high definition dPET in head and neck cancer patients was enabled by dPET with significantly improved image quality, lesion detectability and confidence in lesion classification compared to cPET. Digital PET benefits from the faster Time-of-Flight timing resolution (~325 ps) compared with cPET (~550 ps). While FDG PET imaging in head and neck cancer is already of proven clinical value, ultra-high definition dPET appears to be a further leap for disease staging and therapy planning.

CLINICAL RELEVANCE/APPLICATION

Ultra-high definition digital PET improves image quality, lesion detectability and confidence in classification especially for small, metabolic active lesions in head and neck cancer.

SSQ15-07 Diffusion Kurtosis Imaging for Differentiating Parotid Tumors

Thursday, Dec. 1 11:30AM - 11:40AM Room: N229

Participants

Chuanting Li, MD, PhD, Jinan, China (Presenter) Nothing to Disclose
To explore the values of diffusion kurtosis imaging (DKI) in differential diagnosis benign and malignant parotid tumors.

METHOD AND MATERIALS

32 patients with parotid tumor were examined with conventional MRI and DKI on a MAGNETOM Skyra 3.0 T MRI scanner. The DKI parameters were as follows: TR=3700ms, TE=95ms, FOV=210mmx210mm, slice thickness=3 mm with 0 mm gap, b-values= 0, 1000 and 2000mm2/s, 20 orthogonal directions. The data of DKI was analyzed with Diffusion Kurtosis Estimator to calculate mean kurtosis (MK), mean diffusivity (MD) and fractional anisotropy (FA). The diagnostic accuracy of MK, MD and FA values was evaluated with sensitivity, specificity, and area under receiver operating characteristic (ROC) curve (AUC).

RESULTS

There was a significant difference benign and malignant parotid tumors in the values of MK, FA and MD (p= 0.003, 0.019 and 0.047). The mean MK value of benign parotid tumors was lower than malignant parotid tumors, and it was 0.73±0.27 and 1.09±0.25 respectively. The mean FA value of benign parotid tumors was lower than malignant parotid tumors, and the mean MD value of benign tumors was higher than malignant tumors. The diagnosis of cut-off point between benign and malignant parotid tumors for MK was 1.0526. The sensitivity, specificity and AUC for MK were 75.00%, 91.30% and 0.853. The AUC for FA and MD in differential benign and malignant parotid tumor was 0.783 and 0.739.

CONCLUSION

Parameters of DKI may depict microstructure changes of parotid tumors and could provide quantitative information for the parotid tumors. DKI could be used in clinical for differentiating parotid tumors and planning operation.

SSQ15-08 Pre-Treatment Intra-voxel Incoherent Motion Diffusion-weighted Imaging (IVIM-DWI) in Predicting Induction Chemotherapy Response in Locally Advanced Hypopharyngeal Carcinoma

Thursday, Dec. 1 11:40AM - 11:50AM Room: N229

Participants

Wei Guo, Beijing, China (Presenter) Nothing to Disclose
Dehong Luo, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Meng Lin, Beijing, China (Abstract Co-Author) Nothing to Disclose
Lin Li, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Yanfeng Zhao, Beijing, China (Abstract Co-Author) Nothing to Disclose
Liang Yang, Beijing, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

The aim of this study was to predict response to induction chemotherapy in patients with locally advanced hypopharyngeal carcinoma by IVIM values.

METHOD AND MATERIALS

Twenty eight patients with locally advanced hypopharyngeal carcinoma underwent IVIM studies using twelve different b values (b=0, 10, 20,30,50,70 100,150,200,400,800 and 1000 s/mm2). All patients underwent two MRI studies: a baseline exam before any treatment and a mid-treatment exam 3 weeks after induction chemotherapy. In IVIM approach, D*, f and D were extracted from a bi-exponential fit. For comparison, ADC map were extracted from a mono-exponential fit. At the end of induction chemotherapy, patients were classified as responders or non-responders group according to the Response Evaluation Criteria in Solid Tumors criteria (RECIST). The patients were classified into high grade group (G1), moderate grade group (G2) and low grade group (G3) according to the tumor pathological grading. The predictive value of IVIM parameters were examined with Student's t-test, analysis of variance (ANOVA) and receiver operating characteristic (ROC) curves.

RESULTS

Compared with the pretreatment value, the posttreatment ADC value and D value was significantly higher and the posttreatment D* value was significantly lower (all P<0.05). In contrast, posttreatment f parameter only changed slightly (P>0.05). Compared with non-responders, a notably lower pretreatment ADC value, D value, posttreatment D* value, and higher posttreatment ADC value, D value, ∆ADC, ∆D, and ∆D* were observed in responders (all P<0.05), but no significant change in ∆f among the two group (P> 0.05). The ROC curve analysis indicated that, the cutoff of posttreatment D value in best predicting tumor's chemotherapeutic response was 0.847×10−3 mm2/s, and the corresponding AUC, sensitivity, and specificity were 0.806, 75.0% and 88.9%, respectively. Although pretreatment IVIM-derived parameters had no significant differences between high grade, moderate grade and low grade group, a trend towards lower D* was observed with increasing tumor grading from G3 to G1.

CONCLUSION

IVIM-DWI can potentially predict the treatment response to induction chemotherapy for hypopharyngeal carcinoma.

CLINICAL RELEVANCE/APPLICATION

IVIM-DWI can predict the treatment response to induction chemotherapy for hypopharyngeal carcinoma.
Head and Neck Top Five: Important Anatomy, Missed Diagnoses and Imaging Pearls

Thursday, Dec. 1 4:30PM - 6:00PM Room: E451B

Participants
Suresh K. Mukherji, MD, Northville, MI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Review the anatomy of five important areas of the extracranial head and neck. 2) Discuss their radiologic landmarks. 3) Explain their clinical importance.

ABSTRACT
This presentation will discuss some of the complex anatomy of the head and neck. Specifically, this presentation will review the anatomy of five important areas of the extracranial head and neck, discuss their radiologic landmarks and explain their clinical importance. The attendee will gain a better understanding of these areas and will be able to provide more value in their reports.

Missed Diagnoses in the Head and Neck

Participants
Patricia A. Hudgins, MD, Atlanta, GA, (phudgin@emory.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Common diagnoses that are missed when interpreting CECT and MRI of the Head and Neck will be reviewed. 2) Why some lesions are often not detected by experienced radiologists will be discussed. 3) The need for clinical history is critical in Head and Neck Imaging, and incomplete knowledge of signs, symptoms, and physical exam findings greatly contribute to "missed" diagnoses. Examples will be presented.

ABSTRACT
It is widely acknowledge that Head and Neck Imaging is difficult. Even experienced radiologists may struggle with CT or MRI of H & N lesions. There are some tips that can help detect a subtle or even occult lesion, and these will be presented in this Course. There are some settings when the radiologist should clearly state, in the dictation, whether they did or did not have access to the clinical status of the patient. These too will be presented.

Head and Neck Imaging Pearls

Participants
Christine M. Glastonbury, MBBS, San Francisco, CA, (christine.glastonbury@ucsf.edu) (Presenter) Author with royalties, Reed Elsevier

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

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.
Participants

**RC711A**  
Practical Approach for Interpreting Head and Neck PET/CT

Participants  
Rathan M. Subramaniam, MD, PhD, Dallas, TX (Presenter) Nothing to Disclose

**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.

**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.

Honored Educators

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**RC711B**  
PET/CT for Head and Neck Cancer: Clinical Applications and Case Studies

Participants  
Eric M. Rohren, MD, PhD, Houston, TX, (Eric.Rohren@bcm.edu) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review head and neck anatomy and physiologic sites of FDG uptake. 2) Review the impact of FDG-PET/CT on the management 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.

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**RC711C**  
The Head and Neck Surgeon’s Perspective: What I Need to Know

Participants  
Nishant Agrawal, MD, Chicago, IL, (nishant.agrawal@uchicago.edu) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the indications of PET/CT in head and neck cancer. 2) Review the impact of PET/CT on staging in head and neck cancer. 3) Review the role of PET/CT in the evaluation of the unknown primary. 4) Review the role of post-treatment PET/CT.

**ABSTRACT**
Friday Imaging Symposium: Common Symptoms for Head and Neck Imaging: What the Clinician Is Asking and How You Should Answer

Friday, Dec. 2 12:30PM - 3:00PM Room: E353C

AMA PRA Category 1 Credits ™: 2.50
ARRT Category A+ Credits: 3.00

Participants
Deborah R. Shatzkes, MD, New York, NY, (shatzkes@hotmail.com) (Moderator) Nothing to Disclose

LEARNING OBJECTIVES
1) To review the differential diagnosis for frequently encountered symptomatology in the head and neck. 2) To understand the information that referring physicians hope to obtain from imaging studies ordered for these presenting symptoms. 3) To describe the imaging findings of the most important entities resulting in these symptoms.

ABSTRACT

URL

LEARNING OBJECTIVES
1) To discuss the role of imaging in the diagnosis and management of hoarseness.

ABSTRACT

The diagnosis of hoarseness is based on clinical criteria with evaluation needed in patients with significant voice change, or limited voice change but significant other symptoms. Since hoarseness is often self-limited and has an etiology that can be detected with laryngoscopy, imaging should be reserved for the assessment of specific pathology after the larynx has been visualized. In this presentation, the role of imaging in the diagnosis and management of hoarseness will be discussed.

URL

Active Handout: Ashok Srinivasan

LEARNING OBJECTIVES
1) Review and understand the practical anatomy of the facial nerve. 2) Identify the most common pathologies that affect the various anatomic subsets of the facial nerve and cause facial nerve paralysis. 3) Use CT and MRI to identify the abnormality and establish a differential diagnosis for lesions causing facial nerve paralysis.

ABSTRACT

The Facial Nerve has some unique characteristics in terms of both form and function. The functions are diverse. Most of the time radiologists are asked to evaluate the facial nerve because of facial nerve paralysis. The nerve provides innervation to the muscles of facial expression. But there are other functions that we need to remember. Anatomy: The facial nerve is composed of motor, sensory, and parasympathetic fibers. The motor fibers originate from cell bodies in the motor cortex of the frontal lobe. Fibers descend in a unique way to the lower pons where separate motor nuclei operate the lower and upper facial muscles. Injury to the cortex or descending fibers above the pontine nuclei result in central facial nerve paralysis. Peripheral facial nerve paralysis occurs when the the pontine nuclei or distal motor branches are affected. The facial nerve takes a very unique and complicated course through the CPA, internal auditory canal, temporal bone, and parotid gland to reach the end organ musculature of the face. Understanding the anatomic subsites is critical to CT and MRI evaluation of facial nerve paralysis. During this talk, the relevant anatomy of the facial nerve will be discussed. Etiology: There are variety of etiologies that can cause facial nerve dysfunction and paralysis. Disorders can be infectious, traumatic, post-surgical, neoplastic, congenital, vascular and idiopathic. The most common cause of facial paralysis is Bell's palsy, characterized by the acute onset of unilateral facial weakness. It is likely related to reactivation of herpes simplex virus, leading to inflammation of the facial nerve. CT or MRI studies are not typically indicated in the evaluation for Bell's palsy. However, MRI may demonstrate abnormal enhancement of the intracanalicular, labyrinthine, tympanic and mastoid segments of the nerve. This lecture will review a number of etiologies that affect the facial nerve and their imaging correlates. Imaging: MRI with gadolinium contrast enhancement is the preferred technique for evaluation of facial nerve paralysis in most cases, but CT also plays a significant role. In fact, many experts believe that MRI and CT can be complimentary in evaluation of difficult cases.

Active Handout: Phillip Randall Chapman
**SPFR61C**  Facial Pain

Participants
Deborah L. Reede, MD, Brooklyn, NY (*Presenter*) Nothing to Disclose

**LEARNING OBJECTIVES**

1. Review the sensory innervation of the face
2. Learn common causes of facial pain
3. Understand the role of imaging in the diagnosis and management of patients with facial pain

**ABSTRACT**

Imaging can play a pivotal role in identifying the source of facial pain especially when clinical findings are ambiguous due to the overlap of symptoms from different pathologies or the inability to perform a proper clinical exam in patients with trismus and/or significant soft tissue swelling. After a review of the nerves that supply sensory innervation to the face, common neurologic and non-neurologic causes of facial pain are discussed. The role of imaging in the management and treatment of these conditions will be emphasized.

**SPFR61D**  Diplopia

Participants
Asim F. Choudhri, MD, Memphis, TN (*Presenter*) Nothing to Disclose

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Asim F. Choudhri, MD - 2016 Honored Educator

**SPFR61E**  Hearing Loss

Participants
Gul Moonis, MD, Boston, MA (*Presenter*) Nothing to Disclose

**SPFR61F**  Tinnitus

Participants
John L. Go, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose