

Sunday

Opening Session

Sunday, Nov. 29 8:30AM - 10:15AM Location: Arie Crown Theater

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AMA PRA Category 1 Credits ™: 1.75 ARRT Category A+ Credits: 1.50

Participants

Ronald L. Arenson, MD, San Francisco, CA (Presenter) Nothing to Disclose John M. Boone, PhD, Sacramento, CA (Presenter) Research Grant, Siemens AG Research Grant, Hologic, Inc Consultant, Varian Medical Systems, Inc

Kenneth L. Pierce, MD, Oak Lawn, IL (Presenter) Nothing to Disclose

Sub-Events

PS10A **Presentation of the Outstanding Educator Award**

Participants

Kay H. Vydareny, MD, Tucson, AZ (Presenter) Nothing to Disclose

PS10B Presentation of the Outstanding Researcher Award

Participants

G. Scott Gazelle, MD, PhD, Boston, MA (Presenter) Consultant, General Electric Company Consultant, Marval Biosciences Inc

PS10C President's Address: Going Boldly into Radiology's Technological Future: Why Our Profession Must **Embrace Innovation**

Participants

Ronald L. Arenson, MD, San Francisco, CA (Presenter) Nothing to Disclose William P. Dillon, MD, San Francisco, CA (Presenter) Nothing to Disclose

Abstract

With growing populations of patients in need of care and rapid increases in recent years in the availability and utilization of imaging, health systems around the world are turning more and more to radiology as a key component of the services they deliver. Coupled with growth in demand is stunning technological innovation in radiology. With radiologists now busy as ever and working on the cusp of one of the most exciting eras ever in the development of information technology, we must ask ourselves: Are we harnessing our capacity for innovation and technology development in the right ways? As health systems look to us increasingly for answers, what will our profession deliver to them? From PACS to advanced image processing to reduce radiation dose, information technology (IT) has been critical to the advance of radiology. Now we are experiencing new developments in IT, including clinical decision support, computer aided radiology and advanced systems for improved workflow and efficiency. Soon, resources we once thought of as "futuristic" will appear, including expanded artificial intelligence, sophisticated extraction of information (data mining) from the medical record and dramatic improvements in image quality and usage. Exciting new concepts in radiology, such as hyperpolarized carbon 13, steerable catheters and the use of intraluminal filters, will radically change the way we view our work. All the promise of medicine as practiced in "Star Trek" seems headed our way. The potential positive impact of all of this on patients is immense, but achieving it means embracing innovation in new ways, and working as a profession to ensure that technological change is managed effectively.

PS10D Dedication of the Special Lecture to the Memory of Joseph N. Gitlin, DPH (1927-2014)

Participants

PS10E Special Lecture: Radiology, Medicine, and Healthcare: Will Inaction or Innovation Determine Our **Future?**

Participants Darrell G. Kirch, MD, Washington, DC (Presenter) Nothing to Disclose Ronald L. Arenson, MD, San Francisco, CA (Presenter) Nothing to Disclose

Abstract

Today's political, economic, and health realities present significant opportunity to shape the United States health care system so it achieves the triple aim-providing better care for individuals and populations at reasonable cost. The U.S. health care system has entered a period of massive transformation, and national approaches to patient care, education, and research will need to adapt to the changing health care landscape. This plenary session will highlight the political and economic realities facing U.S. health care, including shifts away from fee-for-service toward population-based payments in health care financing, reductions in clinical revenue, stagnant research funding, and a demand for new approaches in medical education. In a time of enormous change in health care, physicians are challenged to provide sufficient leadership to manage changing practices. Unfortunately, many physicians today are embedded in a traditional culture of medicine-one that is hierarchical, autonomous, competitive, individualistic, and expert-centric. Evidence is beginning to demonstrate that this culture, which conflicts directly with the health care desires of patients in the 21st century, can have negative outcomes for patient care. Unless a major cultural shift can occur, this traditional approach will have serious repercussions for the future of health care. Successful transformation will require both innovation and a new kind of leader. This plenary session will highlight the critical success factors for health care leaders in this transformative

period. Clinical care in the 21st century requires new leaders who will foster a culture that is collaborative, team-based, servicebased, mutually accountable, and patient-centered. Tomorrow's physicians will need to adapt to-and even create-disruptive innovations in operating models, clinical care, education, and technology. Whether in independent group practice or as part of a large health system, radiologists, other health care providers, and their institutions will need to develop innovative and forwardthinking operating models for cost and quality performance to ensure long-term sustainability. Physicians of tomorrow must accept that they are stewards and leaders of this transformation.

Breast Imaging (Contrast Mammo/CT)

Sunday, Nov. 29 10:45AM - 12:15PM Location: Arie Crown Theater



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

FDA Discussions may include off-label uses.

Participants

Maxine S. Jochelson, MD, New York, NY (Moderator) Nothing to Disclose

John M. Lewin, MD, Denver, CO (Moderator) Consultant, Hologic, Inc; Research Grant, Hologic, Inc; Consultant, Novian Health Inc

Sub-Events

SSA01-01 Contrast Enhanced Spectral Mammography: A University Educational Institute Experience in 3000 Patients

Sunday, Nov. 29 10:45AM - 10:55AM Location: Arie Crown Theater

Participants

Maha H. Helal IV, MD, Cairo, Egypt (*Presenter*) Nothing to Disclose Marwa A. Haggag, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Omnia Mokhtar, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Mahmoud M. Rezk, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Nelly Aliden, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Sahar Mansour, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Iman Godda, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Rasha M. Kamal, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Noha Abdel Shafey, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Contrast-enhanced spectral mammography (CESM) is an advanced application of digital mammography that uses contrast agent. But little is known about its efficacy in Egyptian patients. In this work; we aimed to share our experience in evaluating large sector of female patients with different breast diseases using CESM.

METHOD AND MATERIALS

CESM was carried for 3000 patients during their daily visit to our institute from 2012-2014. Examinations were performed for staging of proved malignancy in 27% cases and to clarify nature of indeterminate lesions in another 30%. Post operative cases and follow up cases post neoadjuvant chemotherapy were 23% and 20% respectively. Medio-lateral oblique and cranio-caudal views were taken in low (22-33 kVp) and high (44-49 kVp) energy exposures after IV injection of non-ionic iodinated contrast agent. The diagnostic performance of the contrast enhanced mammography was evaluated and pathology from surgical specimen or ultrasound guided core biopsy were the gold standard of reference in all cases.

RESULTS

CESM presented sensitivity of 88% and specificity of 86% to differentiate benign andmalignant masses. For post operative cases; sensitivity was 85% and specificity was 60%. In cases on chemotherapy; sensitivity was 87% and specificity was 77%. Contrast uptake was noted in 2040/3000 (68%) lesions. Intense uptake and heterogeneous enhancement were more frequent in malignant pathology (p value ≤ 0.001). Uniform ring enhancement noted in cavitory benign masses as abscess cavities and infected cysts noted in 664 cases (22.1%). Multicentric and multifocal carcinomas were detected in 42.2% (n=1266) of proved malignant masses. Statistical analysis yielded a sensitivity, specificity and accuracy of 71.4%, 37.5% and 53.3% for conventional mammograms compared to 87.5 %, 75% and 80% for contrast enhanced mammograms respectively

CONCLUSION

Contrast-enhanced spectral digital mammogram enhances the specificity of the standard mammogram. It presents an easy, simple and rapid contrast based method for discrimination between different breast pathologies and for follow up of chemotherapy and post operative cases

CLINICAL RELEVANCE/APPLICATION

CESM represents a new era of imaging. It provides better diagnostic performance than the standard mammogram, perform proper screening for high risk patients and follow up response to different lines of management

SSA01-02 Comparison of Background Parenchymal Enhancement on Contrast-Enhanced Spectral Mammography and Breast Magnetic Resonance Imaging

Sunday, Nov. 29 10:55AM - 11:05AM Location: Arie Crown Theater

Participants

Julie Sogani, MD, New York, NY (*Presenter*) Nothing to Disclose Elizabeth A. Morris, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Jennifer B. Kaplan, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Donna D. D'Alessio, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Debra A. Goldman, MS, New York, NY (*Abstract Co-Author*) Nothing to Disclose Chaya Moskowitz, New York, NY (*Abstract Co-Author*) Nothing to Disclose Maxine S. Jochelson, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purposes of this study were to examine the extent of background parenchymal enhancement (BPE) on contrast-enhanced spectral mammography (CESM) and to compare the level of BPE on CESM and breast magnetic resonance imaging (MRI).

METHOD AND MATERIALS

This is a retrospective, IRB-approved and HIPAA-compliant study performed on women with or at increased risk for breast cancer who underwent screening CESM and MRI at our institution between 2010 and 2014. Need for informed consent was waived. Three readers independently rated the BPE level on each imaging modality using a categorical scale: minimal, mild, moderate, or marked. To assess pairwise agreement between BPE levels on CESM and MRI as well as among readers, a weighted kappa (k) coefficient with quadratic weights was calculated. For overall agreement, the mean kappa and bootstrapped 95% confidence intervals (CI) were calculated with N=1000 bootstrap samples.

RESULTS

A total of 278 women underwent both CESM and MRI within a median time interval of 0 days (range: 0-28 days). Of these women, the BPE level determined by the three readers was minimal in 41-43%, mild in 24-34%, moderate in 17-20%, and marked in 4-16% on CESM compared to 36-46% minimal, 24-38% mild, 16-23% moderate, and 5-14% marked on MRI. The majority of women had minimal or mild BPE both on CESM (68-76%) and MRI (69-76%). Between CESM and MRI, the agreement ranged from moderate for reader 3 (k=0.55, 95% CI: 0.47-0.63) to substantial for reader 1(k=0.66, 95% CI: 0.57-0.75) and reader 2 (k=0.67, 95% CI: 0.60-0.75). Within CESM, the agreement for the readers was substantial at k=0.68 (95% CI: 0.62-0.73) with the pairwise agreement all being substantial (range: k=0.62-0.71). Within MRI, the agreement for the readers was substantial at k=0.75 (95% CI: 0.70-0.80) with the pairwise agreement all being substantial (range: k=0.66 (95% CI: 0.61-0.70). Overall agreement on BPE levels between CESM and MRI and among the readers was substantial at k=0.66 (95% CI: 0.61-0.70).

CONCLUSION

The level of BPE detected on CESM is in substantial agreement with that on MRI. While increased BPE on MRI has been demonstrated to be associated with increased odds of breast cancer, additional studies will be needed to evaluate the role of BPE on CESM as a predictor of breast cancer risk.

CLINICAL RELEVANCE/APPLICATION

The level of BPE detected on CESM is in substantial agreement with that on MRI and may serve as an additional marker of breast cancer risk.

SSA01-03 The Correlation between the Mammographic Breast Density and the Intensity of Background Parenchymal Enhancement in Contrast Enhanced Spectral Mammography

Sunday, Nov. 29 11:05AM - 11:15AM Location: Arie Crown Theater

Participants

Rasha M. Kamal, MD, Cairo, Egypt (*Presenter*) Nothing to Disclose Sahar Mansour, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Maha H. Helal IV, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Marwa A. Haggag, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Omniya Mokhtar, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Mohammed M. Gomaa, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to assess the correlation between the mammographic breast density and the intensity of background parenchymal enhancement (BPE) on Contrast Enhanced Spectral Mammography (CESM).

METHOD AND MATERIALS

The study is a retrospective study that included 410 patients who underwent CESM. The mammographic breast density was assessed on the low-energy images and was graded on the basis of the ACR BI-RADS breast density categories from a to d. These were further grouped into: group 1 which included the fatty (a) and the scattered fibroglandular tissue (b) breast densities and group 2 which included the heterogeneously dense (c) and the extremely dense (d) breast densities. The intensity of BPE was assessed on the subtraction high-energy images and was scored on a 4-point scale on the basis of the ACR MRI BI-RADS criteria, as minimal, mild, moderate, or marked. Statistical correlation was calculated using the Pearson correlation coefficient.

RESULTS

Group 1 (breast densities a and b) included 207/410 (50.5%) cases out of which 138/ 207 (66.6%) cases showed minimal and 66/207 (31.9%) cases showed mild BPE. Only 2/ 207 (1%) and 1/ 207 (0.5%) cases showed moderate and marked BPE respectively. Group 2 (breast densities c and d) included 203/410 (49.5%) cases out of which 91/ 203 (44.8%) cases showed minimal, 81/2013 (39.9%) cases showed mild, 24/203 (11.8%) cases showed moderate and only 7/ 203 (3.4%) cases showed marked BPE.The intensity of the BPE showed weak positive correlation with the corresponding breast density grade (r: 0.2824) were 376/410 (91.7%) of the cases showed minimal to mild BPE and only 34/410 (8.3%) showed moderate to marked BPE irrespective of the breast density group.

CONCLUSION

Mammographic breast density shows a weak positive correlation with the BPE in CESM, thus it does not hamper diagnosis even in the mammography dense breast parenchyma. Most of the cases show lower scores of BPE irrespective of the corresponding breast density grade.

CONCLUSION

Mammographic breast density shows weak positive correlation with the intensity of BPE in CESM.Most of the cases show lower scores of BPE, ranging from minimal to mild, irrespective of the corresponding breast density grade.

CLINICAL RELEVANCE/APPLICATION

Increased mammographic density and marked BPE can both decrease mammography and MRI sensitivity and specificity as they can obscure subtle and minimally enhancing malignant breast lesions. The weak positive correlation between mammographic breast density and BPE in CESM is a major advantage. CESM can thus be considered in the screening and diagnostic work-up of high risk patients and those with a heterogeneous dense breast parenchyma.

SSA01-04 Enhancement Patterns of Benign and Malignant Breast Lesions on Contrast-enhanced Breast Tomosynthesis

Sunday, Nov. 29 11:15AM - 11:25AM Location: Arie Crown Theater

Participants Chen-Pin Chou, MD, Kaohsiung, Taiwan (*Presenter*) Nothing to Disclose Tsung-Lung Yang, MD,MD, Kaohsiung, Taiwan (*Abstract Co-Author*) Nothing to Disclose Huay-Ben Pan, MD, Kaohsiung, Taiwan (*Abstract Co-Author*) Support, Hologic, Inc

PURPOSE

To assess the enhancement patterns of benign and malignant lesions on contrast-enhanced breast tomosynthesis (CEBT)

METHOD AND MATERIALS

Institutional review board approved the study. Written informed consent was obtained from all patients. A total of 140 consecutive women suspected of having architectural distortion on digital mammogram between March 2012 and April 2014 were reviewed. All women had both CEBT before biopsy. For the dual-energy CEBT, a modified Selenia Dimensions (Hologic, Inc.) machine was used. Simultaneously 2D mammogram and 3D tomosynthesis were taken after injection with iodine contrast agent. Post-contrast images were taken at 2 minutes (MLO view) and 4 minutes (CC view). The enhancement patterns were divided early enhancement in 2 minutes (type1), equal enhancement in 2 and 4 minutes (type2), late enhancement in 4 minutes (type3). The enhancement patterns were determined by consensus of two radiologists.

RESULTS

Total 151 histological results of breast lesions were available in 140 women (mean age 52 years, range 31-70 years). The pathology revealed 78 benign lesions and 73 breast malignancies (36 non-invasive and 37 invasive cacners). The enhancement patterns included 28 type 1, 65 type 2 and 58 type 3. Type 1 enhancement was found in 23 malignant lesions and 5 benign lesions, type 2 enhancement in 23 malignant lesions and 42 benign lesions, and type 3 enhancement in 27 malignant lesions and 31 benign lesions. Among 23 cancers with type 1 enhancement, 21 were invasive and 2 were non-invasive.Type 1 enhancement was highly associated with breast malignancy (p<0.01) and invasive breast cancer histology (p<0.01).

CONCLUSION

CEBT e nhancement pattens in 2 and 4 minutes may predict the nature of breast lesions.

CLINICAL RELEVANCE/APPLICATION

Enhancement pattern of CEBT may paly a role for differentiating breast lesions..

SSA01-05 Contrast-enhanced Spectral Mammography versus Breast Tomosynthesis in Further Evaluation of Recalled Cases after Screening Mammograms

Sunday, Nov. 29 11:25AM - 11:35AM Location: Arie Crown Theater

Participants Norran H. Said, MD, FRCR, Cairo, Egypt (*Presenter*) Nothing to Disclose Naglaa Abdel Razek, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Engy I. Ali, MSc, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Nivine A. Chalabi, MBBCh, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Ashraf Selim, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the added value of Contrast Enhanced Spectral Mammography (CESM) and Breast Tomosynthesis (BT) in the confirmation or exclusion of breast cancer after their referral from the national screening program

METHOD AND MATERIALS

After Ethics committee approval, and patients' consent, 75 women who underwent screening Digital Mammography, and were recalled by two independent breast radiologists were enrolled in the study. All patients underwent both BT and CESM, and an independent BIRADS score was given for each modality. Results were compared to pathology and follow up of negative/ typically benign findings.

RESULTS

Out of the 75 patients; 39 were recalled due to detection of a mass, 19 due to focal asymmetry, 11 due to microcalcifications, and 6 due to architectural distortion. Sensitivity, Specificity, PPV, NPV, LR positive, LR negative of CESM were 91.1, 96.7, 97.6, 87.8, 27.3, 0.09 respectively, and in BT were 86.6, 76.6, 84.7, 79.3, 3.71, 0.17. Agreement by Kappa was 0.104. CESM and BT both agreed on TP in 36 cases out of 45 proved cancers. With CESM there were 4 FN cases, from which BT could detect 3 cancers (micro calcifications). With BT there were 6 FN cases from which CESM could detect 5 cancers. There was 1 FP by CESM, and 7 by BT. Biopsy was avoided by CESM in 29 cases, and by BT in 23 cases.

CONCLUSION

CESM was able to avoid/ confirm biopsy with diagnostic certainty apart from cases with only microcalcifications as the dominant finding, where BT has shown better diagnostic capabilities.

CLINICAL RELEVANCE/APPLICATION

Both CESM and BT are now valuable tools in the recall unit of a national screening program and have proven good clinical

SSA01-06 Automatic Classification of Breast Lesions in Contrast Enhanced Spectral Mammography

Sunday, Nov. 29 11:35AM - 11:45AM Location: Arie Crown Theater

Participants

Miriam Sklair-Levy, MD, Tel -Hashomer, Israel (*Presenter*) Nothing to Disclose Yitzi Pfeffer, BS, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose Anat Shalmon, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose Yael Servadio, MD, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose Arie Rudnstein, MD, TelHashomer, Israel (*Abstract Co-Author*) Nothing to Disclose Michael Gotlieb, MD, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose Arnaldo Mayer, PhD, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess feasibility of automatic breast lesion classification algorithm in dual-energy contrast enhanced spectral mammography and evaluate its potential for biopsy sparing in benign breast lesions.

METHOD AND MATERIALS

A retrospective study, a set of 93 breast lesions in dual-energy contrast mammography, 41 benign,52 malignant lesions. Each lesion was manually contoured using standard PACS viewer drawing tools.Based on the data set a supervised learning algorithm was developed to tell benign and malignant lesions . The algorithm automatically extracts numerical descriptors from the pixels located inside and outside the lesion. The descriptors characterizes visual patterns that appear in benign and malignant lesion. The set of numerical descriptors is appended into a feature vector characterizing the lesion. In a training phase, a linear support vector machine classifier is trained to tell apart benign and malignant lesions using a subset of the lesions represented by their feature vectors and the corresponding label (benign/malignant) provided by pathology.In a testing phase, the remaining subset of lesions is fed to the trained classifier that returns a classification score. The higher the score, the higher the probability that the considered lesion is malignant. Eventually, the score is thresholded to provide the final classification with the desired balance between sensitivity and specificity. In the performed experiments, 92 lesions were used for training and 1 for testing phases. In this leave-one-out approach training and testing were repeated 93 times, each one for a different test lesion, so that each lesion was classified exactly 1 time without contributing to the training of its classifier.

RESULTS

Setting the classification score threshold (TH) to 0.5:sensitivity=0.90, specificity=0.76, NPV=0.86. Reducing TH to 0: sensitivity=0.98, specificity=0.54, NPV=0.96. Only 1 malignant lesion was classified as benign.Reducing TH to -0.5: sensitivity=1, specificity=0.37, NPV=1. it provides a reduction on 37% in biopsies without affecting sensitivity

CONCLUSION

This research showed the feasibility of automatic lesion classification in dual-energy CESM with a significant potential to reduce the number of benign breast biopsies.

CLINICAL RELEVANCE/APPLICATION

Automatic lesion classification in dual-energy CESM has the potential to reduce the number of benign breast biopsies, therefore to reduce the anxiety of patients. And reduce the cost

SSA01-07 Contrast-enhanced Breast Tomosynthesis and Dynamic Contrast-enhanced Breast MRI for Architectural Distortion Lesions on Mammograms

Sunday, Nov. 29 11:45AM - 11:55AM Location: Arie Crown Theater

Participants

Chen-Pin Chou, MD, Kaohsiung, Taiwan (*Presenter*) Nothing to Disclose Tsung-Lung Yang, MD, MD, Kaohsiung, Taiwan (*Abstract Co-Author*) Nothing to Disclose Huay-Ben Pan, MD, Kaohsiung, Taiwan (*Abstract Co-Author*) Support, Hologic, Inc

PURPOSE

To compare the diagnostic accuracy of contrast-enhanced breast tomosynthesis (CEBT) and dynamic contrast-enhanced breast MRI (DCE-MRI) for architectural distortion lesions detected on digital mammogram.

METHOD AND MATERIALS

Institutional review board approved the study. Written informed consent was obtained from all patients. A total of 32 consecutive women suspected of having architectural distortion on digital mammogram between March 2012 and April 2014 were reviewed. All women had both CEBT and DCE-MRI before biopsy. For the dual-energy CEBT, a modified Selenia Dimensions (Hologic, Inc.) machine was used. Simultaneously 2D mammogram and 3D tomosynthesis were taken after injection with iodine contrast agent and imaged between 2 and 4 minutes after injection. The BI-RADS classifications on CEBT were finally determined based on findings on combinations of 2D mammogram, 3D tomosynthesis and post-contrast subtraction 2D and 3D images. Women were also evaluated at 1.5T (GE) or 3T MRI (Siemens) with dedicated breast coil. Receiver operating characteristic (ROC) analysis was used to evaluate the performance of CEBT and DCE-MRI. Different radiologists interpreted CEBT and DCE-MRI.

RESULTS

Total 32 histological results of architectural distortion were available in 32 women (mean age 54 years, range 45-63 years). The pathology revealed 24 benign lesions and 8 breast malignancies. The sensitivity/specificity/accuracy between CEBT and DCE-MRI for diagnosing breast cancers were 100%/38%/53% and 100%/58%/68%, respectively (all p>0.05). For all readers, the areas under the ROC curve (AUCs) for diagnosis of malignancy were not significantly different between CEBT and DCE-MRI (all p >0.05).

CONCLUSION

CEBT and DCE-MRI showed similar diagnostic performance for architectural distortion lesions on screening mammogram.

CLINICAL RELEVANCE/APPLICATION

CEBT is a flexible imaging tool for differentiating architectural distortion lesions on screening mammogram.

SSA01-08 The Comparative Role of Contrast Enhanced Spectral Mammography versus Sono-Mammography in the Assessment of Patients Following Breast Surgery

Sunday, Nov. 29 11:55AM - 12:05PM Location: Arie Crown Theater

Participants Marwa M. El Sayad, MBBCh, Giza, Egypt (*Presenter*) Nothing to Disclose Rasha M. Kamal, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose Ayda A. Youssef, MD, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to evaluate the diagnostic accuracy of Contrast Enhanced Spectral Mammography as an adjunct to Sono-mammography versus Sono-mammography alone in the assessment of patients following breast surgery.

METHOD AND MATERIALS

The study is a prospective study that was approved by the research ethical committee of the Radiology Department. It included 38 patients (with 52 breast lesions) with history of breast surgery and indeterminate sono-mammographic findings. Patients with mastectomy bed lesions who could not perform mammography were excluded from the study. They were all scheduled for Contrast Enhanced Spectral Mammography (CESM). The identified lesions were classified into lesions at the site of the operative bed, lesions in the ipsilateral breast, yet, away from the operative bed and lesions in the contra-lateral breast. These lesions were further classified into benign or malignant by biopsy and histopathology. The sensitivity, specificity, positive and negative predictive values and likelihood ratios of sono-mammography and CESM were calculated and compared when using sono-mammography or CESM alone and when adding the three modalities together in diagnosis.

RESULTS

Out of the 52 identified breast lesions, 30/52, 57.7% were benign and 22/52, 42.3% were malignant. Eighteen out of 52 lesions, 34.6% were identified at the operative bed, 7/52, 13.5% in the ipsilateral breast, and 27/52, 51.9% in the contra-lateral breast. The calculated sensitivity, specificity, positive and negative predictive values and positive and negative likely-hood ratios of sono-mammography were 81.8%, 23.3%, 43.9%, 63.6%, 1.067 and 0.779 respectively as compared to 86.4%, 90%, 86.4%, 90%, 8.636 and 0.152 for CESM. When adding CESM to sono-mammography the calculated diagnostic indices were raised to 95.5%, 96.7%, 95.5%, 96.7%, 28.636 and 0.047 respectively.

CONCLUSION

Adding CESM in the post-operative breast assessment improved the diagnostic performance of sono-mammography.

CLINICAL RELEVANCE/APPLICATION

The follow up of patients who had undergone breast surgery, especially the interpretation of findings of the postsurgical breast, represents a diagnostic dilemma. Many findings can be mistaken for cancer. CESM is a promising time saving and lower cost technique than Magnetic Resonance Imaging (MRI). It has the potential to replace MRI as an adjunct to sono-mammography in this field.

SSA01-09 Clinical Performance of Dedicated Breast Computed Tomography in Comparison to Diagnostic Digital Mammography

Sunday, Nov. 29 12:05PM - 12:15PM Location: Arie Crown Theater

Participants

Elodia B. Cole, MS, Charleston, SC (*Presenter*) Consultant, FUJIFILM Holdings Corporation; Consultant, Koninklijke Philips NV; Consultant, Alan Penn & Associates, Inc

Amy S. Campbell, MD, Washington, DC (Abstract Co-Author) Nothing to Disclose

Srinivasan Vedantham, PhD, Worcester, MA (Abstract Co-Author) Research Grant, Koning Corporation

Etta D. Pisano, MD, Charleston, SC (*Abstract Co-Author*) Founder, NextRay, Inc CEO, NextRay, Inc Research Grant, Koning Corporation Research Grant, Koninklijke Philips NV Research Grant, Zumatek, Inc Research Grant, FUJIFILM Holdings Corporation Equipment support, Siemens AG Research Grant, Siemens AG Equipment support, Koninklijke Philips NV Research Grant, Koninklijke Philips NV

Andrew Karellas, PhD, Worcester, MA (Abstract Co-Author) Research collaboration, Koning Corporation

PURPOSE

To compare the clinical performance of a three-dimensional dedicated breast computed tomography system requiring no breast compression alone (dBCT), dBCT as adjunct to two-dimensional standard view screening mammography (SM), and two-dimensional diagnostic mammography (DxM).

METHOD AND MATERIALS

Eighteen radiologists interpreted 235 cases (52 negative, 104 benign, 79 cancer; 93/235 calcifications) that were randomly selected from 478 cases enrolled under 3 different clinical trial protocols, all in diagnostic population. Each case consisted of unilateral SM, DxM and dBCT images. Each case was randomized to 3 sessions and interpreted under 3 conditions: dBCT alone, dBCT plus SM, and DxM alone with at least a 4-week washout period. Each interpretation included an overall BIRADS score and continuous probability of malignancy (POM) score. For each case, any identified lesions assigned BIRADS category 3 or greater had its location, type, BIRADS and POM reported. Sensitivity, specificity and area under the ROC curve (AUC) were determined with either pathology or 1-year follow-up as truth.

RESULTS

All reported performance metrics were averaged across all readers. Results are reported from analysis using BIRADS score after

dichotomizing at BIRADS 4.The sensitivity for dBCT alone was 81.78%, 87.93% for dBCT plus SM, and 84.07% for DxM. dBCT plus SM had significantly higher sensitivity than DxM (p=0.0081), and dBCT alone (p<0.0001). DxM and dBCT alone did not differ in sensitivity (p=0.1753).The specificity for dBCT alone was 49.67%, 39.65% for dBCT plus SM, and 44.84% for DxM. Neither dBCT alone (p=0.1148) nor dBCT plus SM (p=0.0745) statistically differed from DxM. dBCT alone had a significantly higher specificity than dBCT plus SM (p<0.0001). The AUC based on BIRADS (POM) were 0.716 (0.770) for dBCT, 0.723 (0.791) for dBCT plus SM, and 0.724 (0.792) for DxM. There were no statistically significant differences between the modalities based on POM (p=0.3311) or BIRADS (p=0.8569) score analyses.

CONCLUSION

The most effective use of dBCT for diagnostic imaging is as adjunct to standard view mammography.

CLINICAL RELEVANCE/APPLICATION

Dedicated Breast Computed Tomography has potential for use as a diagnostic breast imaging tool.

Genitourinary (New Technologies for Imaging the Genitourinary Tract)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E351



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

FDA Discussions may include off-label uses.

Participants

Julia R. Fielding, MD, Chapel Hill, NC (*Moderator*) Nothing to Disclose Erick M. Remer, MD, Cleveland, OH (*Moderator*) Nothing to Disclose

Sub-Events

SSA09-01 Simultaneous Conventional Dynamic MR Urography and High Temporal Resolution Perfusion MRI of Bladder Tumors Using a Novel Free-Breathing Golden-Angle Radial Compressed-Sensing Sequence

Sunday, Nov. 29 10:45AM - 10:55AM Location: E351

Participants

Nainesh Parikh, MD, New York, NY (*Presenter*) Nothing to Disclose Justin M. Ream, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose Hoi Cheung Zhang, New York, NY (*Abstract Co-Author*) Nothing to Disclose Kai Tobias Block, PhD, New York, NY (*Abstract Co-Author*) Royalties, Siemens AG; Hersh Chandarana, MD, New York, NY (*Abstract Co-Author*) Equipment support, Siemens AG; Software support, Siemens AG; Consultant, Bayer, AG; Andrew B. Rosenkrantz, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the feasibility of simultaneous conventional dynamic MR urography (MRU) and high temporal resolution perfusion MRI of bladder tumors using a novel free-breathing golden-angle radial acquisition scheme with compressed sensing reconstruction

METHOD AND MATERIALS

22 patients with bladder lesions underwent MRU using the GRASP (Golden-angle RAdial Sparse Parallel) technique. Following contrast injection, GRASP was performed of the abdomen and pelvis during free breathing (voxel size 1.4x1.4x3.0 mm, 1,000 radial spokes, acquisition time 3:44 min). Two dynamic data-sets were retrospectively reconstructed from this single acquisition by combining a distinct number of spokes into each dynamic frame: 110 spokes per frame to provide a resolution of approximately 30 seconds, serving as conventional MRU for clinical interpretation, and 8 spokes per frame to provide 2 second resolution images for quantitative perfusion. Using the 2 second resolution images, ROIs were placed within the bladder lesion and normal bladder wall for all patients, an arterial input function was generated from the femoral artery, and the GKM perfusion model was applied.

RESULTS

Follow-up cystoscopy and biopsy demonstrated 16 bladder tumors (13 stage \geq T2, 3 stage \leq T1) and 6 benign lesions. All lesions were well visualized using the conventional 25 second clinical dynamic images. Based on the 2 second resolution images, Ktrans was significantly higher in bladder tumors (0.38±0.24) than in either normal bladder wall (0.12±8, p<0.001) or in benign bladder lesions (0.15±0.04, p=0.033). The ratio between Ktrans of the lesion and of normal bladder wall in each patient was nearly double in tumors than in benign lesions (4.3±3.4 vs. 2.2±1.6), and Ktrans was nearly double in stage \geq T2 tumors than in stage \leq T1 tumors (0.44±0.24 vs. 0.24±0.24), although these did not approach significance (p=0.180-0.209), likely related to small sample size.

CONCLUSION

GRASP DCE-MRI provides simultaneous conventional dynamic MRU and high temporal resolution perfusion MRI of bladder tumors. Quantitative evaluation of bladder lesions based on the 2 second temporal resolution reconstructions showed associations with pathologic findings in our preliminary cohort.

CLINICAL RELEVANCE/APPLICATION

The novel GRASP sequence allows quantitative perfusion evaluation of bladder lesions within the context of a clinical MRU examination using a single contrast injection and without additional scan time.

SSA09-02 Magnetic Resonance Fingerprinting in Diagnosis of Prostate Cancer: Initial Experience

Sunday, Nov. 29 10:55AM - 11:05AM Location: E351

Participants

Shivani Pahwa, MD, Clevelnad, OH (*Presenter*) Nothing to Disclose Chaitra A. Badve, MD, MBBS, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Yun Jiang, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Alice Yu, BS, MS, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Mark D. Schluchter, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Mark A. Griswold, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Electric Company Royalties, Bruker Corporation Contract, Siemens AG Lee E. Ponsky, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Vikas Gulani, MD, PhD, Ann Arbor, MI (*Abstract Co-Author*) Research support, Siemens AG

PURPOSE

 I o describe initial experience in detecting prostate cancer (PCa) using quantitative MRL parameters - 11 and 12 relaxation times derived from magnetic resonance fingerprinting (MRF-FISP), in combination with conventional ADC maps.

METHOD AND MATERIALS

63 patients with clinical suspicion of prostate cancer were imaged on 3T Siemens Skyra /Verio scanners. MRF has been shown to measure T1 and T2 relaxation times with high accuracy and precision2. In addition tothe standard multiparametric MRI exam, MRF-FISP was acquired (slice thickness: 6 mm, in-plane resolution:1×1 mm2,FOV:400 mm, TR:11-13 ms, flip angle:5-75 deg, duration:50s per slice).b-valuesfor DWI were0, 500, 1000 s/mm2.T1, T2 maps were generated from MRF-FISP dataand regions of interest (ROI)were drawn on T1, T2 and ADC maps in areas suspicious for cancer identified based on PIRADS score, and normal peripheral zone (NPZ). Matched pairs t-tests were used to compare T1, T2, ADC values in biopsy provenPCa and NPZ. Logistic regression model was applied to these parameters in differentiating PCa from NPZ. Receiver operating characteristic (ROC) analysis was performed for the parameters singly and in combination and area under the curve (AUC) was calculated

RESULTS

29 patients were diagnosed with cancer on transrectal biopsy. T1, T2, ADC values were significantly lower in cancer compared to NPZ (p<0.0001). Mean T1, T2, ADC for prostate cancer were 1413 ± 60 ms, 66 ± 3 ms, $745\pm54 \times 10-6$ mm2/s, respectively. For NPZ, these values were 2058 ± 77 ms, 165 ± 8 ms, $1736\pm37 \times 10-6$ mm2/s. The AUC for T1, T2, ADC values in separating PCa from NPZ was 0.978, 0.982, 0.801, respectively. The combination of T2 and ADC produced the most complete separation between cancer and normal tissues, resulting in AUC of 0.995.

CONCLUSION

MRF-FISP is a novel relaxometry sequence that allows quantitative examination of prostate in a clinical setting. The T1 and T2 relaxation times so obtained, in combination with ADC values show promising results in detecting prostate cancer.

CLINICAL RELEVANCE/APPLICATION

Quantitative MR parameters can help identify prostate cancer non-invasively. This could have broad applications in diagnosis, guiding biopsy, and following treatment

SSA09-03 Contrast-enhanced Ultrasound for Renal Mass Characterization: Comparison of Low MI Timeintensity Curves and Destruction Reperfusion Techniques

Sunday, Nov. 29 11:05AM - 11:15AM Location: E351

Participants

Wui K. Chong, MD, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Emily Chang, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Sandeep Kasoji, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Paul Dayton, PhD, Chapel Hill, NC (*Abstract Co-Author*) Co-founder, SonoVol LLC; Board Member, SonoVol LLC
Ersan Altun, MD, Istanbul, Turkey (*Abstract Co-Author*) Nothing to Disclose
Julia R. Fielding, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Kevin O. Herman, MD, Raleigh, NC (*Abstract Co-Author*) Nothing to Disclose
W K. Rathmell, Chapel Hill, NC (*Abstract Co-Author*) Research support, GlaxoSmithKline plc
Lee Mullin, PhD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate contrast enhanced US (CEUS) for renal mass characterization in chronic renal insufficiency (CRI), comparing nondestructive (low MI) and destruction-reperfusion techniques.

METHOD AND MATERIALS

Prospective study comparing 48 subjects: 24 with normal function and renal masses scheduled for excision; 24 with CRI and indeterminate renal lesions on non-contrast US/CT.CEUS was performed on an Acuson Sequoia with CPS software. Perflutren (Definity) 1.3ml was administered IV. Lesions were imaged at a low MI of 0.2. A 3 minute videoclip was recorded. Time Intensity curves (TICs) of the lesion and adjacent parenchyma were generated. After 30 minutes, a 2nd dose of Definity was given and a Destruction Reperfusion (DR) sequence performed on the same lesion. DR was performed under an IND exemption from the FDA. Bubble destruction was performed at an MI of 0.9. Reperfusion images were obtained using Motion Stabilized Persistence software (Siemens). A color-coded parametric map quantifying arrival time was generated in which Green=faster arrival, Red=slower, Black=no contrast. (Arrow=Bosniak IV mass).Reference standard was pathology, contrast CT/MR or absence of change on follow up imaging for benign lesions. Two blinded readers reviewed the low MI images and classified the lesions using Bosniak criteria.

RESULTS

Lesion size ranged from 1.7-7.6cm (mean 3.5cm). Histopathology of resected masses showed no cavitation or cellular injury from high MI of DR. DR arrival times correlated with low MI TIC parameters. Sensitivity for distinguishing Bosniak I/II/IIF from III and higher was: Reader 1-96%, Reader 2-100%. Specificity was 78% and 63%. Specificity is lower because CEUS detects smaller amounts of contrast than CT/MR, leading to 'overstaging' with standard Bosniak. Reduced time to peak and arrival time (p<0.05) was seen in the parenchyma of CRI subjects compared to parenchyma of those with normal renal function.

CONCLUSION

CEUS can characterize renal lesions, but Bosniak criteria must be modified because US is more sensitive to slight enhancement. DR does not cause tissue injury, correlates with low MI findings, and takes less time. The parenchyma in CRI showed reduced/ delayed contrast uptake, suggesting CEUS may also be useful for renal functional imaging.

CLINICAL RELEVANCE/APPLICATION

CEUS can evaluate indeterminate renal lesions and renal function in CRI, a population where CT and MR contrast are contraindicated.

SSA09-04 ARFI Evaluation of Small (<4 cm) Renal Masses. A Preliminary Study

Participants Costanza Bruno, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose Alessandra Bucci, MD, Verona, Italy (*Presenter*) Nothing to Disclose Matteo Brunelli, PhD, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose Salvatore Minniti, MD, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose Chiara Dalla Serra, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose Roberto Pozzi Mucelli, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate if ARFI can be a reliable technique in distinguish ccRCCS from other solid and fluid-containing small renal masses.

METHOD AND MATERIALS

31 small (<4 cm) renal masses (27 were solid - 17/27 ccRCCs, 3/27 papillary RCCs, 2/27 chromophobe RCCs, 4 oncocytomas and 1 angiomyolipoma - and 4 were cysts) were prospectively evaluated using US and ARFI. Each lesion was assigned an ARFI value obtained from the average of 12 measurements. All the solid masses underwent resection; all the cystic lesions were Bosniak 2, so were evaluated with follow up. The difference existing between the two groups was evaluated by means of Student's t test. A cut off value was determined to distinguish between ccRCCs and other lesions and sensibility, specificity, PPV, NPV and accuracy were determined.

RESULTS

ccRCCs are characterized by an higher ARFI value and - when compared with all the other lesions - the difference existing between the two groups was statistically significant (p<0.001). Considering a cut off value of 1.95 m/sec sensibility, specificity, PPV, NPV and accuracy were respectively 94.1%, 78.6%, 84.2%, 91.7% and 87.1%.

CONCLUSION

ccRCC is characterized by an higher ARFI value which can be used to distinguish it from other solid and fluid containing masses.

CLINICAL RELEVANCE/APPLICATION

ARFI can be an useful tool in the evaluation of small renal masses, helping distinguish cc RCCs from other lesions.

SSA09-05 Fusion Imaging of (Contrast-enhanced) Ultrasound with CT or MRI for Kidney Lesions

Sunday, Nov. 29 11:25AM - 11:35AM Location: E351

Participants

Thomas Auer, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose Tobias De Zordo, MD, Innsbruck, Austria (*Presenter*) Nothing to Disclose Daniel Junker, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose Isabel M. Heidegger, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose Werner R. Jaschke, MD, PhD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose Friedrich H. Aigner, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of the study was to evaluate the feasibility of fusion imaging (FI) of (contrast-enhanced) ultrasound (CEUS) with CT/MRI in localization of sonographically challenging kidney lesions and usefulness for assessment of indeterminate kidney lesions

METHOD AND MATERIALS

From March 2013 to January 2014, 30 consecutive patients were included in this retrospective studyAll patients presented with previously in CT/MRI detected indeterminate kidney lesions that were either not detectable or hard to distinguish in conventional gray-scale ultrasoundIn these patients additional FI was performed by fusion of ultrasound with CT/MRI datasets. In 26 (86.7%) of these patients FI and CEUS was simultaneously conducted

RESULTS

FI could be performed in all of the 30 patientsFI-indication: In 18 of 30 patients (60%) FI was performed because a lesion of interest could not clearly be allocated due to multiple and directly adjacent similar lesions within one kidney. In 12 of 30 patients (40%) the kidney lesions were solitary or at least isolated but could not be detected with gray-scale US alone.CEUS-indication: Insufficient CT protocol (without NECT) and a not-water-isodens lesion (>20 HU) in 8 (30.8%) patients borderline CE in CT (10HU-20HU) in 11 (42.3%) patients non-conclusive CT/MRI studies in 5 (19.2%) patients CEUS for follow-up in 2 (7.7%) patients.Combined FI-CEUS: FI-CEUS could clearly differentiate between a surgical and non-surgical finding in 24 (80%) of 30 patients In 2 (6.7%) of 30 patients with conducted FI-CEUS lesions remained indeterminateFinal dignosis: Histology revealed a surgical lesion in 6 (20%) patients, while in 18 (60%) patients a non-surgical lesion such as BII/BIIF cysts, abscess formations, cicatricial tissue and a pseudotumor could be found. FI-CEUS didn't determine a final diagnosis in 2 patients (6.7%) In one elderly patient (3.3%) FI was conducted without CEUS because only size control of was demanded In 3 (10%) patients kidney lesions were not confidently detected with FI due to general US limitations

CONCLUSION

Our data suggest that FI of the kidney is a feasible examination regarding the localization and further assessment of indeterminate kidney lesions.

CLINICAL RELEVANCE/APPLICATION

The combination of FI with a synchronous CEUS examination can clarify indeterminate renal CT or MRI findings, reduce radiation exposure and is cost effective.

SSA09-06 Optimal Energy for Kidney Parenchymal Visualization in Monoenergetic Images Generated from Dual Energy CT

Participants

Jason DiPoce, MD, Jerusalem, Israel (Presenter) Nothing to Disclose

Zimam Romman, Haifa, Israel (Abstract Co-Author) Employee, Koninklijke Philips NV

Jacob Sosna, MD, Jerusalem, Israel (Abstract Co-Author) Consultant, ActiViews Ltd Research Grant, Koninklijke Philips NV

PURPOSE

To evaluate image quality of kidney parenchyma in a spectrum of CT monoenergy levels and to select the optimal Monoenergy levels for visualization.

METHOD AND MATERIALS

IRB approval was obtained. 30-corticomedullary phase, IV contrast-enhanced CT abdomen scans (18 males, 12 females, mean age of 50 years) were evaluated. In each scan, kidney parenchyma (60 regions) was assessed. The scans were obtained from a 64-slice spectral detector CT prototype (Philips Healthcare, Cleveland, OH, USA) at 120 kVp with an average of 150 mAs. For each scan, simultaneous conventional polyenergetic and monoenergetic image datasets at 50, 60, 70, 100, and 140 keV were reconstructed. Two experienced radiologists analyzed subjectively in consensus visualization of the kidney parenchyma and selected the optimal visualization dataset based on the conspicuity of the cortex and medulla and compared to the conventional images. Objective kidney signal-to-noise ratio (SNR) in the optimal monoenergy images was measured and compared to data from the conventional CT images.

RESULTS

Optimal image quality for kidney visualization was subjectively selected with 60 - 70 keV monoenergy images and was judged to be better than the conventional dataset. The kidney SNR values in optimal monoenergy were highly significantly different (p<0.01) from conventional CT images. Average SNR was 10.9 and 16.3 in the conventional and optimal monoenergy respectively.

CONCLUSION

Optimal visualization of the kidney parenchyma on dual energy CT images is achieved with monoenergy image reconstruction at 60 - 70 keV based on both subjective and objective assessments and seems to improve image quality compared to conventional images.

CLINICAL RELEVANCE/APPLICATION

Optimal image quality in monoenergy images may be supplemental to conventional polyenergetic images and potentially increase the diagnostic yield.

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/

Jason DiPoce, MD - 2013 Honored Educator Jacob Sosna, MD - 2012 Honored Educator

SSA09-07 The Use of New Tissue Strain Analytics Measurement in Testicular Lesions

Sunday, Nov. 29 11:45AM - 11:55AM Location: E351

Participants

Dirk-Andre Clevert, MD, Munich, Germany (*Presenter*) Speaker, Siemens AG; Speaker, Koninklijke Philips NV; Speaker, Bracco Group; Matthias Trottmann, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose Julian Marcon, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose Melvin D'Anastasi, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Alexander Karl, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose Maximilian F. Reiser, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Virtual touch tissue imaging quantification (VTIQ) is a newly developed technique for the sonographic quantification of tissue elasticity. It has been used in the assessment of breast lesions. The purpose of this study was to determine the diagnostic performance of VTIQ in unclear testicular lesions.

METHOD AND MATERIALS

Twenty patients with known testicular pathology underwent conventional B-mode sonography with additional VTIQ of the testicular lesions using a Siemens Acuson S2000[™] and S3000[™] (Siemens Medical Solutions, Mountain View, CA, USA) system. Tissue mechanical properties were interpreted and compared in the VTIQ examination. The pathologic diagnosis was established after surgery or in the follow up examination in highly suspicious of benign lesions.

RESULTS

Over 36 months, 22 focal testicular lesions (median lesion size, 18 mm; range, 4-36 mm in 20 patients (median age, 43 years; range, 22-81 years) were examined. Lesions were hyperechoic (n = 1), hypoechoic (n = 14), isoechoic (n = 1), mixed echogenicity (n = 3) or anechoic (n = 3). Histological examination showed one benign lesion (6.25 %) with a mean size of 7 mm and 15 malignant lesions (93.75 %) with a mean size of 20 mm. The value of the shear wave velocity in normal testis tissue showed a mean shear wave velocity of 1.17 m/s. No value of the shear wave velocity could the measured in cystic lesions. The rest of the benign lesions showed a mean shear wave velocity of 1.94 m/s and for seminoma it showed a mean shear wave velocity of 2.42 m/s.

CONCLUSION

VTIQ is a reliable new method for measuring qualitative and quantitative stiffness of testis lesions and tissue. The qualitative shear-

wave elastography features were highly reproducible and showed good diagnostic performance in unclear testicular lesions. The VTIQ technique is a useful in assessing small testicular nodules and pseudo lesions.

CLINICAL RELEVANCE/APPLICATION

VTIQ is a reliable user independent new method for measuring qualitative and quantitative stiffness of different testis lesions and tissue. The VTIQ technique allows to distinguished different testis lesions and pseudo lesions.

SSA09-08 One-stop-shot MRI for Infertility Evaluation: Comparison with US and CT-HSG

Sunday, Nov. 29 11:55AM - 12:05PM Location: E351

Participants

Javier Vallejos, MD, MBA, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Jimena B. Carpio, MD, Buenos Aires, Argentina (*Presenter*) Nothing to Disclose Ezequiel Salas, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose Carlos Capunay, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose Mariano Baronio, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose Patricia M. Carrascosa, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose Lorena I. Sarati, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Demonstrate the utility of MRI-HSG in the diagnosis of infertility, can through this method show uterine, tubal, ovarian and pelvic causes.

METHOD AND MATERIALS

14 patients between 31 and 41 year-old diagnosed with infertility were studied. We performed a transvaginal ultrasound, virtual CT-HSG and MRI- HSG at the same day. MRI protocol include high-resolution T2 sequences, fat-suppressed T1, diffusion weighted imaging and contrast dynamic sequence (3D time-resolved imaging of contrast kinetics [TRICKS]). A contrast dilution of saline, iodine and gadolinium was instilled. Antral follicle counts, endometrial cavity findings, uterine wall pathology, tubal patency, and pelvic cavity findings were assessed with modalities.

RESULTS

In all cases it was observed more ovarian follicles on MRI-HSG than in US. In 65% of patients, Fallopian tubes were visualized completely with MRI-HSG, whereas in the remaining 35% only look at its distal portion. In all cases was demonstrated tubal patency with free peritoneal spillage. In 45% of patients, MRI-HSG showed endoluminal lesions, likes polyps and miomas, that were corroborated with CT-HSG. In 14% of patients, MRI-HSG detected endometrial implants in pelvic cavity that could not be corroborated by the other methods.

CONCLUSION

MRI-HSG allows a comprehensive evaluation for infertility diagnosis, with visualization and quantification of antral follicles, endometrial cavity, uterine wall and fallopian tubes as well as pelvic cavity findings such as endometrial implants.

CLINICAL RELEVANCE/APPLICATION

MRI techniques could be combined with HSG procedure in order to enables a one-step-shot imaging for evaluation of female infertility with the advantages of causing less pain and avoidance of exposure to ionizing radiation.

4D Ultrasound Cistoscopy with Fly through in the Evaluation of Urinary Bladder Tumors Preliminary Experience

Sunday, Nov. 29 12:05PM - 12:15PM Location: E351

Participants

Vito Cantisani, MD, Roma, Italy (*Abstract Co-Author*) Speaker, Toshiba Corporation; Speaker, Bracco Group; Speaker, Samsung Electronics Co, Ltd;

Nicola Di Leo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Valerio Forte, MD, Rome, Italy (*Presenter*) Nothing to Disclose Flavio Malpassini, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Mauro Ciccariello, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Francesco Flammia, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Francesco M. Drudi, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Federica Flammia, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose Giuseppe Schillizzi, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose Ferdinando D'Ambrosio, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the feasibility and diagnostic efficacy 4D Ultrasound cystoscopy with Fly through as compared with trasditional cystoscopy in evaluating Urinary Bladder tumors.

METHOD AND MATERIALS

30 consecutive patients with previous detected urinary bladder lesions at cystoscopy were prospectively evaluated with 2D baseline US, and 4D Ultrasound with fly through (US virtual navigation system) by an expert radiologist blinded to cystoscopy results. The two imaging modalities were compared with cystoscopy and surgical results (N=8 patients) in order to assess the sensitivity and specificity in tumor detection and characterization. The diagnostic performance of 2D features and 4D ultrasound were estimated and compared using ROC curve analysis.

RESULTS

24/33 and 31/33 urinary bladder lesions were detected by 2 D US and 4 D Ultrasound respectively. The latter was also able to

identify two additional lesions not previously detected at traditional cystoscopy. The US features of the lesions were consistent with the one provided at cystoscopy with not significant differences in term of characterization.Conclusion: Our preliminary results shows that 4 D ultrasound cystoscopy with fly through is more accurate than baseline 2D ultrasound to detect and characterize urinary bladder lesions with results comparable with traditional cystoscopy.

CONCLUSION

Our preliminary results shows that 4 D ultrasound cystoscopy with fly through is more accurate than baseline 2D ultrasound to detect and characterize urinary bladder lesions with results comparable with traditional cystoscopy.

CLINICAL RELEVANCE/APPLICATION

New ultrasound software such as 4 D ultrasound cystoscopy with fly through may help us to follow-up patients treated conservatively for urinary bladder lesions.

GI IR

Vascular/Interventional (Hepatobiliary Interventions)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E352

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

FDA Discussions may include off-label uses.

Participants

Wael E. Saad, MBBCh, Ann Arbor, MI (*Moderator*) Research Grant, Siemens AG; Consultant, Siemens AG; Consultant, Boston Scientific Corporation; Consultant, Medtronic, Inc; Consultant, Getinge AB; Consultant, Merit Medical Systems, Inc; Hyeon Yu, MD, Chapel Hill, NC (*Moderator*) Nothing to Disclose

Sub-Events

SSA24-01 Percutaneous Biliary Drainage Catheters Fluid Dynamics: In Vitro Flow Rates and Patterns

Sunday, Nov. 29 10:45AM - 10:55AM Location: E352

Participants

Anna Y. Li, BA, Shreveport, LA (*Presenter*) Nothing to Disclose David H. Ballard, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose Horacio R. D'Agostino, MD, FACR, Shreveport, LA (*Abstract Co-Author*) Inventor, Vibrynt, Inc Consultant, Boston Scientific Corporation Speaker, Cook Group Incorporated

PURPOSE

The purpose of our study was to evaluate the flow rates and patterns of simulated bile through drainage catheters in an in vitro biliary system model.

METHOD AND MATERIALS

The in vitro model consisted of a manometer-monitored constant pressure chamber containing simulated bile connected to a biliary tree made from airline and heat shrink cable tubing. Three types of 12-French drainage catheters (Cook Medical, Bloomington, IN) were inserted through a "T"-shaped sidearm in the biliary tree section of the model: biliary (32 sideholes along the shaft and locking pigtail), pigtail (6 sideholes within the pigtail), and a prototype pigtail catheter with a single sidehole in the catheter mid-shaft. Simulated bile at 4 different viscosities (guar gum solutions in water determined by a rotational viscometer to be in the range of human bile viscosity) flowed through the system under a constant pressure of 12 cm of water. A circumferential occlusion device was used to occlude distal flow. Flow volumes through each catheter were recorded over 1-minute intervals with the "common bile duct" unobstructed or obstructed. Ten trials were performed for each catheter and flow rates compared using Student's t-test.

RESULTS

Without obstruction, there was no significant difference in the flow rates between all catheters tested. With obstruction, there was no significant difference in the flow rates between the prototype and standard biliary catheters while no flow was observed with the pigtail catheter. Fluid was seen flowing along the external shaft of all unobstructed catheters. In the obstructed prototype and biliary catheters, fluid was seen to exit from the sidehole(s) proximal to the obstruction and out of the distal sideholes.

CONCLUSION

Our data suggest that biliary drainage may be achieved with fewer sideholes proximal to the obstruction. Similar flow rates were obtained with multiple sideholes as compared to one proximal sidehole.

CLINICAL RELEVANCE/APPLICATION

Biliary catheters with multiple sideholes do not improve flow rates and may facilitate encrustation with debris that could lead to catheter obstruction and sepsis. Catheters with one or fewer sideholes may achieve the same flow rate while reducing the likelihood of catheter obstruction.

SSA24-02 Benign Biliary Strictures Treated Using Biodegradable Biliary Stents: Multicentric Data Analysis on 99 Patients

Sunday, Nov. 29 10:55AM - 11:05AM Location: E352

Participants

Giovanni Mauri, MD, San Donato Milanese, Italy (*Presenter*) Consultant, Esaote SpA Caterina Michelozzi, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose Fabio Melchiorre, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Dario Poretti, MD, Rozzano, Italy (*Abstract Co-Author*) Nothing to Disclose Vittorio Pedicini, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose Monica Salvetti, MD, PhD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Eva Criado, MD, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose Joan Falco-Fages, MD, Sabadell, Spain (*Abstract Co-Author*) Nothing to Disclose Miguel Angel De Gregorio, PhD, Zaragoza, Spain (*Abstract Co-Author*) Nothing to Disclose Luca Maria Sconfienza, MD, PhD, San Donato Milanese, Italy (*Abstract Co-Author*) Nothing to Disclose Lorenzo Monfardini, Brescia, Italy (*Abstract Co-Author*) Nothing to Disclose Jiri Panek, Brno, Czech Republic (*Abstract Co-Author*) Nothing to Disclose Tomas Andrasina, MD, PhD, Brno, Czech Republic (*Abstract Co-Author*) Nothing to Disclose Mariano J. Gimenez Sr, MD, La Plata, Argentina (Abstract Co-Author) Nothing to Disclose

PURPOSE

to assess the mid-term outcome of biodegradable biliary stents (BBS) to treat benign biliary strictures.

METHOD AND MATERIALS

Institutional Review Board approval was obtained and patients' consent was waived. Between 2007 and 2014, ninety-nine patients (mean age 57±16 years [mean±standard deviation]), 57 males (61±15 years), 42 females (54±17 years), were treated. Technical feasibility, technical success, and immediate complications were recorded. In 89 patients (51 males, 38 females, aged 57±17 years) with at least 6 months follow-up (mean follow-up 20.2±19.9 months), late complications, episodes of cholangitis, episodes of altered hepatic functional tests without symptoms of cholangitis, episodes of biliary stones, and development of imaging demonstrated biliary stricture recurrence were recorded. Fisher's exact test, Mann-Whitney U test, and Cox regression model were used.

RESULTS

Stent implantation was feasible in 99/99 cases (100%). In 2/99 cases (2%), migration of the stent occurred immediately after deployment (technical success 98%). In 4/99 cases (4%), immediate mild haemobilia occurred. No major or late complications occurred. In 24/89 patients (26.9%) subsequent cholangitis occurred. 15/89 (16.8%) patients had episodes of altered hepatic functional tests without clinical symptoms of cholangitis. Six out of 89 patients (6.7%) developed biliary stones. In 19/89 patients (21.3%), stricture recurrence occurred. The estimated mean time to stricture recurrence was 32.9 months (95% C.I 29.6-36.2 months).

CONCLUSION

Percutaneous placement of BBS is a feasible, safe and effective strategy to treat benign biliary strictures and may represent a further option for treating patients in whom standard percutaneous therapy failed.

CLINICAL RELEVANCE/APPLICATION

Percutaneous placement of BBS is a feasible, safe and effective strategy to treat benign biliary strictures, potentially representing a further option for treating patients in whom standard percutaneous therapy failed.

SSA24-03 Interventional MRI-Guided Local Delivery of Agents into Swine Bile Duct Walls Using MR Compatible Needle-Integrated Balloon Catheter System

Sunday, Nov. 29 11:05AM - 11:15AM Location: E352

Participants

Feng Zhang, MD, Seattle, WA (*Presenter*) Nothing to Disclose Zhibin Bai, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Yaoping Shi, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Jianfeng Wang, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Yonggang Li, MD, Suzhou, China (*Abstract Co-Author*) Nothing to Disclose Xiaoming Yang, MD, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the feasibility of interventional magnetic resonance imaging (MRI)-guided local agent delivery into pig common bile duct (CBD) walls using a newly-designed MR-compatible, needle-integrated balloon catheter system.

METHOD AND MATERIALS

We first designed a needle-integrated balloon catheter system that is comprised of a 22-G MR-compatible Chiba biopsy needle and a conventional 12mm×2cm balloon catheter. Under fluoroscopy guidance, a custom needle/balloon system was positioned into the target CBD via a transcholecystic access. T1-weighted MR imaging was used to localize and reposition the needle/balloon system in the target. A 0.5-mL mixture of motexafin gadolinium (MGd) and trypan blue dye as well as 5-fluorouracil (5-Fu) was delivered into the CBD wall through the needle/balloon system. Post-infusion T1-weighted MR imaging was obtained and contrast-to-noise ratios (CNR) of CBD walls of pre- and post-MGd/blue infusions were compared by a paired t-test. In addition, post-infusion x-ray cholangiography was achieved to evaluate the potential injuries of CBDs by the needle/balloon system. High-pressure liquid chromatography was used to quantify 5-FU in the bile duct tissue. Subsequent histologic analysis was performed to correlate and confirm the imaging findings.

RESULTS

Post-infusion cholangiogram didn't show any extravasation of contrast agent, indicating no procedure-related damage to the CBDs. MR imaging demonstrated the clear enhancement of the target bile duct walls infused with MGd/trypan blue dye with average penetration depth of 4.7 ± 1.2 mm. The average CNR of the post-infusion bile ducts was significantly higher than that of the pre-infusion bile ducts (110.6 ± 22 vs 5.7 ± 2.8 , p<0.0001). Out of the total 5mg 5-FU injected into the bile duct tissue, 4.1 ± 0.12 mg 5-FU were retrieved, proving an approximately 80% drug delivery efficiency. Histology depicted the blue dye staining and red fluorescence of MGd through the target CBD walls, which was well correlated with the imaging findings.

CONCLUSION

It is feasible to use the new MR compatible, needle-integrated balloon catheter system for intrabiliary local agent delivery into CBD walls under MR imaging guidance.

CLINICAL RELEVANCE/APPLICATION

This study may open new avenues for efficient management of pancreatobiliary malignancies using MR-guided interventional oncology.

SSA24-04 Portal Vein Embolization via an Ipsilateral Approach is Safe and Effective

Participants Christina Loberg, MD, Aachen, Germany (*Presenter*) Nothing to Disclose Philipp Bruners, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose Maximilian Schmeding, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose Sebastian Keil, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose Fabian Goerg, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose Felix Schoth, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Portal Vein Embolization (PVE) is a well established technique in patients undergoing extended hemihepatectomy. To introduce hypertrophy of the future liver remnant embolization with Histoacryl as an inexpensive and reliable embolizing agent is usually performed. If Histoacryl is used, a contralateral approach is usually chosen to avoid non-target embolization. A puncuture route through the contralateral lobe i.e. the future liver remnant has its own downsides. We evaluated the safety of histoacryl based PVE fron an ipsilateral approach.

METHOD AND MATERIALS

A total of 107 PVE (male n = 68/ female n = 69), age 22 - 84 y (mean n = 60,37y) of the right portal system were performed via percutaneous transhepatic right-sided approach. Right portal brances (SV - VIII) were embolized with a Histoacryl/ Lipiodol mixture. Success rates and rates of complications were recorded.

RESULTS

PVE was technically successful performed in 106 patients. In one patient, no appropiate access to the right portal system could be established due to massive right-sided tumor load. In 2/ 106 patients (1,8 %) Histoacryl/ Lipiodol dislocated into the main portal trunk and caused non-target embolization requiring prolonged hospitalization for 72 hours with anticoagulation. Both patients underwent successful hemihepatectomy. A total of 103/ 106 (98,2%) PVE procedures by an ipsilateral right-sided transhepatic approach were completed successfully without non-target embolization. 3/ 106 patients (2.8 %) developed severe sepsis after the procedure. A total of 77 patients (73 %) finally underwent successful extended hemihepatectomy.17/ 106 patients (16 %) did not undergo hemihepatectomy because of tumor progress, in 12/ 106 cases (9 %) futrure liver remnant showed insufficient hypertrophy.

CONCLUSION

PVE with Histoacryl from an ipsilateral approach is a safe and effective tecnique to prepare liver surgery. In experienced hands non-target embolization is rare.

CLINICAL RELEVANCE/APPLICATION

PVE via transhepatic ipsilateral approach is a well established technique in patients undergoig extended hemihepatectomy.

SSA24-05 Different Strategies to Induce Hypertrophy of the Future Liver Remnant (FLR) in Case of Major Hepatic Resection: A Prospective Comparative Study in 118 Patients

Sunday, Nov. 29 11:25AM - 11:35AM Location: E352

Participants

Massimo Venturini, MD, Milano, Italy (*Presenter*) Nothing to Disclose Francesca Ratti, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Claudio Sallemi, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Francesco A. De Cobelli, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Luca Aldrighetti, MD, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose Alessandro Del Maschio, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Liver failure represents the most severe post-operative complication of major hepatic resection. Our aim was to prospectively compare percutaneous portal vein embolization (PVE), portal vein ligation (PVL), and associating liver partition and portal vein ligation for staged hepatectomy (ALPPS) in terms of FLR hypertrophy, complications and clinical outcome.

METHOD AND MATERIALS

From January 2004 to January 2015, 118 patients with an inadequate FLR underwent procedures to induce preoperative hypertrophy before major liver resection. 73 patients underwent PVE, 27 underwent PVL and 18 ALPPS. PVE was percutaneously performed under US and fluoroscopy, with a 4-F catheter, using PVA particles, coils and glue. Total liver volume (TLV), tumor volume and FLR were calculated before both the procedure and surgery. The following outcome measures were considered: operating time, intraoperative blood losses, hospital stay, morbidity and mortality rate. Plasma samples were collected preoperatively and in 1st, 2nd and 5th postoperative day to assess liver function. Morover, serum levels of white blood cells, C-reactive protein (CRP), Interleukin-6 (IL-6) and Endothelin-1 (ET-1) were determined as markers of inflammatory surgical stress response.

RESULTS

The three groups were homogeneous in terms of pre-procedural volumes, comorbidities and histopathological findings. In ALPPS group, FLR mean hypertrophy was higher than PVE and PVL groups ($PVE=5.45 \pm 3.17 \text{ cc/day}$, $PVL=5.59 \pm 2.19 \text{ cc/day}$, ALPPS =21.03 ± 11.09 cc/day, p<0.05). A higher grade of severe complications was recorded in ALPPS group compared to PVE and PVL groups. Postoperative plasma levels of AST, ALT, WBC, CRP, IL-6 and ET-1 showed a higher increase after the first surgical stage in the ALPPS series compared with the same stage of patients subjected to PVE/PVL.

CONCLUSION

PVE and PVL are comparable in inducing FLR hypertrophy. ALPPS assures the possibility to obtain a higher rate of hypertrophy in a shorter time even if with an higher rate of complications. PVE is preferable to PVL in all cases of unrequired two stage hepatectomy. ALPPS should not be considered a substitute for PVE or PVL but rather a technique to expand the pool of resectable

patients.

CLINICAL RELEVANCE/APPLICATION

Percutaneous PVE remains the first option to induce hypertrophy of the FLR in case of major hepatic resection. ALPPS should be proposed with caution in selected cases due to its high risk of complications.

SSA24-06 Root Cause Analysis of Rebleeding Events Following Transjugular Intrahepatic Portosystemic Shunt Creation for Variceal Hemorrhage

Sunday, Nov. 29 11:35AM - 11:45AM Location: E352

Participants

Janesh Lakhoo, BS, Chicago, IL (*Presenter*) Nothing to Disclose James T. Bui, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose Charles E. Ray JR, MD, PhD, Chicago, IL (*Abstract Co-Author*) Advisory Board, Novate Medical Ltd; Editor, Thieme Medical Publishers, Inc; ; ; ; ; Grace Knuttinen, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose Ryan P. Lokken, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Ron C. Gaba, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To identify fundamental causes underlying recurrent variceal hemorrhage (VH) following transjugular intrahepatic portosystemic shunt (TIPS) creation in order to ascertain opportunities for improvement of TIPS-based management of VH and rebleeding prevention.

METHOD AND MATERIALS

In this single-center retrospective study, 166 patients (M:F=101:65, median age 52 years, median MELD score 14) who underwent TIPS creation for VH between 1999-2014 were studied. Medical record review was used to detect patients who had recurrent VH events, and root cause analysis (RCA) allowed identification of most probable causal factors. A 5-person Interventional Radiology physician group then generated quality improvement (QI) recommendations for process changes to address causal factors, with consensus achieved using a modified Delphi method.

RESULTS

Twenty-five (15%) patients suffered variceal rebleeding post-TIPS. The 1-, 3-, and 5-year variceal rebleeding incidence was 17%, 21%, and 21%. Variceal rebleeding was associated with high 90-day all-cause mortality incidence (10/25, 40%). Male gender (P=0.018) and MELD score (P=0.009) were statistically associated with variceal rebleeding. The most common primary and secondary causes of recurrent VH were lack of or insufficient variceal embolization (48%, 12/25) and coagulopathy (44%, 11/25). Other causal factors included TIPS stenosis or occlusion (n=8) with recurrent portosystemic pressure gradient (PSG) elevation (n=5), inadequate PSG reduction (n=3), and TIPS under dilation (n=1). Fourteen preventative QI recommendations, spanning items related to TIPS portal venous puncture, venographic assessment, stent type and deployment technique, PSG reduction, embolotherapy methodology, and coagulopathy correction, were developed to potentially address variceal rebleeding.

CONCLUSION

While recurrent VH rates following TIPS are non-trivial, rebleeding may be related to addressable underlying causal factors. Further investigation may assess the efficacy of QI-based procedure methodological enhancements in reducing post-TIPS rebleeding incidence.

CLINICAL RELEVANCE/APPLICATION

Root cause analysis based identification of fundamental reasons underlying recurrent variceal hemorrhage after TIPS creation may help reduce the significant morbidity and mortality associated with this condition by targeting causal factors for correction through quality improvement measures.

SSA24-07 Hemodynamic Effects of a Combined Therapy Using Partial Splenic Embolization and Transjugular Intrahepatic Portosystemic Shunt in Patients with Portal Hypertension and Hypersplenism

Sunday, Nov. 29 11:45AM - 11:55AM Location: E352

Participants

Arnaud Geffray, Tours, France (*Presenter*) Nothing to Disclose Julien Pucheux, MD, La Riche, France (*Abstract Co-Author*) Nothing to Disclose Daniel Alison, MD, Tours, France (*Abstract Co-Author*) Nothing to Disclose Jean-Marc Perarnau, MD, Tours, France (*Abstract Co-Author*) Consultant, W. L. Gore & Associates, Inc

PURPOSE

Portal hypertension (PHT) is the result of increased hepatic resistance and portal blood flow. Transjugular Intrahepatic Portosystemic Shunt (TIPS) treats PHT by decreasing portal resistance but it increases the portal blood flow and promotes hepatic encephalopathy and right heart failure. Partial splenic embolization (PSE) treats hypersplenism and could decrease the splenic blood flow before the TIPS placement. The purpose of this study was to investigate the portal hemodynamic effects of a concomitant procedure using PSE before the TIPS placement in patients with PHT and hypersplenism.

METHOD AND MATERIALS

Thirteen patients with PHT and hypersplenism underwent PSE and TIPS in a concomitant procedure. PSE, performed just before the TIPS placement, consisted in injecting non-selectively 1 or 2 vials of microspheres (900-1200µm) in the splenic artery. The portal pressure gradient (PPG) was assessed before and after PSE. TIPS procedure consisted in a Viatorr® stent (Gore) placement calibrated from 6 to 10 mm, in order to obtain a PPG lower than 12 mmHg.

RESULTS

PSE was performed for an indication of surgery (n=3). HCV interferon therapy (n=1). chemotherapy (n=1). high risk of haemorrhage

because of severe thrombocytopenia, pancytopenia or recurrent bleeding from other sites than varices (n=5) and thrombocytopenia associated with hepatic encephalopathy (n=3). TIPS was carried out for the secondary prevention of variceal bleeding (n=6), refractory ascites (n=6) and portal venous thrombosis (n=1). The PPG decreased from $15,2 \pm 3,7$ mmHg before PSE to $11,8 \pm 4,0$ mm Hg after PSE. This allowed limiting the TIPS size to 6 mm in 7 patients. The PPG was $6,3 \pm 2,1$ mm Hg after the TIPS placement. The platelet count increased from 52 ± 27 G/L before PSE to 209 ± 109 G/L two months after the combined therapy. After the procedure, there was one splenic abscess leading to death, one splenic hematoma and one hepatic abscess and three cases of transient hepatic encephalopathy.

CONCLUSION

Our study evaluated the hemodynamic effects of this combined therapy. It showed that PSE decreases the PPG and can allow the creation of a smaller caliber TIPS.

CLINICAL RELEVANCE/APPLICATION

Randomized controlled studies are needed to evaluate the possible benefits of this combined therapy over encephalopathy and complications of splanchnic hemodynamic stress in patients with PHT and hypersplenism undergoing TIPS placement.

SSA24-08 The Effect of Locoregional Therapies and Transjugular Intrahepatic Portosystemic Shunting for Hepatocellular Carcinoma (HCC) Liver Transplant Patients: A UNOS Population Study

Sunday, Nov. 29 11:55AM - 12:05PM Location: E352

Participants

Minzhi[×]Xing, MD, New Haven, CT (*Presenter*) Nothing to Disclose Hyun S. Kim, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the utility of bridging locoregional therapies (LRT) and transjugular intrahepatic portosystemic shunts (TIPS) in HCC patients undergoing orthotopic liver transplant (OLT) and its effect on survival outcomes in a national population study.

METHOD AND MATERIALS

The United Network for Organ Sharing (UNOS) database was used to identify patients who were listed for OLT from 2002 to 2013 and followed through 2014. Patients within the Milan Criteria with approved HCC Model for End-Stage Liver Disease (MELD) exception and available pre-OLT TIPS placement data were included. Overall survival (OS) from OLT was stratified by TIPS status and bridging LRT (including transarterial chemoembolization (TACE), radiofrequency ablation (RFA) and cryoablation). Chi-squared tests were used to compare categorical variables and t-tests to compare continuous variables. Kaplan-Meier estimation and log-rank test were used for survival analysis.

RESULTS

Of 17,291 HCC patients who were listed for OLT during the study period, 14,511 patients received OLT, of whom 13,299 patients had adequate pre-OLT TIPS placement data, mean age 57.5 years, 77.1% male; 616 (4.6%) patients received pre-OLT TIPS, and 6,358 patients received at least one LRT. Comparison groups were similar for age at OLT, waitlist duration, gender, ethnicity, BMI, Child and MELD scores (p>0.05 for all). No significant differences in survival from OLT were observed between patients who received pre-OLT TIPS (mean 108.6 months) vs. those who did not (118.9 months), p=0.84. TIPS Patients who received at least one bridging LRT had significantly higher mean survival vs. those who received no bridging LRT (106.1 vs. 102.5 months, p=0.03).

CONCLUSION

In a national population study, OS from transplant in HCC patients was not significantly affected by pre-OLT TIPS placement status. TIPS Patients who received at least one bridging locoregional therapy had significantly improved post-OLT survival compared to those who did not.

CLINICAL RELEVANCE/APPLICATION

Pre-OLT TIPS for HCC patients may be safely performed without significant impact on post-OLT survival. Bridging LRT may improve post-OLT survival in HCC patients who require TIPS placement.

SSA24-09 Outcomes in Transjugular Intrahepatic Portosystemic Shunting for Liver Transplant Patients: A UNOS Population Study

Sunday, Nov. 29 12:05PM - 12:15PM Location: E352

Participants

Minzhi Xing, MD, New Haven, CT (*Presenter*) Nothing to Disclose Hyun S. Kim, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the utility of pre-transplant transjugular intrahepatic portosystemic shunts (TIPS) in patients undergoing orthotopic liver transplant (OLT) and its effect on survival outcomes in a national population study.

METHOD AND MATERIALS

The United Network for Organ Sharing (UNOS) database was used to identify patients who were listed for OLT from 2002 to 2013 and followed through 2014. Patients within the Milan Criteria for whom pre-OLT TIPS placement data was available were included. Overall survival (OS) from OLT was stratified by TIPS status, and differences in TIPS placement rates and survival between geographic regions were analyzed. Chi-squared tests were used to compare categorical variables and t-tests to compare continuous variables. Kaplan-Meier estimation and log-rank test were used for survival analysis; Pearson coefficient was used to calculate correlation between variables.

RESULTS

Of 154,626 patients who were listed for OLT during the study period, 71,733 patients received OLT, of whom 69,686 patients had

pre-OLT TIPS placement data, mean age 48.9 years, 67.4% male; 5,304 (7.6%) patients received pre-OLT TIPS. Comparison groups were similar for age at OLT, waitlist duration, gender, ethnicity, BMI, Child and MELD scores (p>0.05 for all). No significant differences in survival from OLT were observed between patients who received pre-OLT TIPS (mean 112.9 months) vs. those who did not (123.6 months), p=0.07. There were significant regional and geographic differences in TIPS placement rates (range 1.9-12.24%, p<0.001) and mean OS from OLT (range 36.3-101.9 months, p<0.001). Increasing longitudinal 12-month OS rates were observed in both TIPS and non-TIPS patients from 2002-2012.

CONCLUSION

In a national population study, OS from transplant was not significantly affected by pre-OLT TIPS placement status. Increasing longitudinal trends in 12-month post-OLT survival and significant geographic disparities in TIPS placement rates and survival from OLT were observed.

CLINICAL RELEVANCE/APPLICATION

Pre-OLT TIPS may be safely performed without significant impact on post-OLT survival.

Gastrointestinal (Pancreas Solid Masses)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E353A

GI CT MR

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

Participants

Michael A. Blake, MBBCh, Boston, MA (*Moderator*) Editor with royalties, Springer Science+Business Media Deutschland GmbH Desiree E. Morgan, MD, Birmingham, AL (*Moderator*) Research support, General Electric Company

Sub-Events

SSA06-01 Diagnostic Performance of 18F-FDG PET/MRI for the Preoperative Assessment of Resectability and Staging of Pancreatic Cancer: Comparison with 18F-FDG PET/CT Plus Contrast-enhanced MDCT - A Prospective Preliminary Study

Sunday, Nov. 29 10:45AM - 10:55AM Location: E353A

Participants

Ijin Joo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose Jeong Min Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Grant, Guerbet SA; Support, Siemens AG; Support, Koninklijke Philips NV; Grant, Bayer AG; Consultant, Bayer AG; Grant, General Electric Company; Support General Electric Company; Grant, STARmed Co, Ltd; Grant, RF Medical Co, Ltd; Grant, Toshiba Corporation; Grant, Dong-Seo Medical Industrial Col, Ltd Dong Ho Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Eun Sun Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Joon Koo Han, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic performance of 18F-FDG PET/MRI in the assessment of local resectability, N staging, and M staging in patients with pancreatic cancer compared with 18F-FDG PET/CT plus contrast-enhanced MDCT.

METHOD AND MATERIALS

In this prospective study, a total of 37 patients with 39 pancreatic cancers were enrolled and underwent 18F-FDG PET/MRI, 18F-FDG PET/CT, and contrast-enhanced MDCT within 2 weeks of each other. Mean and maximum standardized uptake values (SUVs) in PET/MRI and PET/CT of pancreatic cancers were measured. Two independent radiologists retrospectively reviewed two imaging sets (set 1: PET/MRI, set 2: PET/CT plus MDCT) to evaluate tumor conspicuity and local resectability using a 5-point scale, and to determine preoperative N staging (N- or N+) and M staging (M0 or M1). Diagnostic performances two imaging sets were compared using paired t-test, ROC analysis, and McNemar test.

RESULTS

Both mean and maximum SUVs of the pancreatic cancer showed strong correlations between PET/MRI and PET/CT (r=0.89 and 0.90, Ps<0.0001). Tumor conspicuity was slightly higher in PET/MRI set than PET/CT plus MDCT set (3.64 vs. 3.36, and 3.49 vs. 3.23 in reviewers 1 and 2, respectively; Ps>0.05). Diagnostic performance of PET/MRI in assessing local resectability was equivalent to PET/CT plus MDCT (Az values of 0.857 vs. 0.725, and 0.875 vs. 0.754 in reviewers 1 and 2, respectively; Ps>0.05). There were no statistically significant difference in the diagnostic accuracies for N- and M-staging between two imaging sets (N-staging: 52.6% vs. 42.1%, and 57.9% vs. 42.1%; M-staging: 75.0% vs. 79.2%, and 79.2% vs. 83.3%, in reviewers 1 and 2, respectively; Ps>0.05).

CONCLUSION

In this preliminary study in patients with pancreatic cancer, diagnostic performance of 18F-FDG PET/MRI is comparable to that of 18F-FDG PET/CT plus contrast-enhanced MDCT in the preoperative assessment of local resectability, N-staging, and M-staging .

CLINICAL RELEVANCE/APPLICATION

In the preoperative assessment of resectability and staging of pancreatic cancer, 18F-FDG PET/MRI, as an one-step whole-body imaging tool, may serve as a alternative to PET/CT plus MDCT.

SSA06-02 Prospective Histopathological Correlation of IVIM Derived Quantitative MR Parameters in Pancreatic Adenocarcinoma

Sunday, Nov. 29 10:55AM - 11:05AM Location: E353A

Participants

Elizabeth M. Hecht, MD, New York, NY (*Presenter*) Nothing to Disclose Michael Z. Liu, MS, New York, NY (*Abstract Co-Author*) Nothing to Disclose Sachin Jambawalikar, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Helen R. Remotti, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Stuart W. Weisberg, MD,PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Martin R. Prince, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Martin R. Prince, MD, PhD, New York, NY (*Abstract Co-Author*) Patent agreement, General Electric Company; Patent agreement, Hitachi, Ltd; Patent agreement, Siemens AG; Patent agreement, Toshiba Corporation; Patent agreement, Koninklijke Philips NV; Patent agreement, Nemoto Kyorindo Co, Ltd; Patent agreement, Bayer AG; Patent agreement, Lantheus Medical Imaging, Inc; Patent agreement, Bracco Group; Patent agreement, Medtronic, Inc; Patent agreement, Topspins, Inc; Stockholder, Topspins, Inc Donald Garmon, New York, NY (*Abstract Co-Author*) Nothing to Disclose Michael D. Kluger, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose John Chabot, MD, New York, NY (Abstract Co-Author) Nothing to Disclose

PURPOSE

To assess agreement between IVIM derived parameters and histopathology in participants with suspected pancreatic ductal adenocarcinoma (PDA) undergoing surgical resection.

METHOD AND MATERIALS

18 patients (9M:9F, mean 68y) were prospectively enrolled in this IRB approved, HIPAA compliant study with informed consent. All underwent respiratory-triggered axial EPI DWI with 11b values from 0 to 800 within 1 month of surgery (mean, 6d). Two experienced radiologists (>10y each) independently drew 2 ROIs over tumor and surrounding non-tumoral tissue when present and individual results were averaged. Mono (ADC0-800, ADCtotal) and bi-exponential (true diffusion (D), "pseudo"- diffusion (D*) and perfusion fraction (f) fitting were derived using open source MITK software (MITK.org). DWI metrics were compared with quantitative histopathology including % fibrosis, tumor cell density, and mean vascular density (MVD). Statistical analysis included intra-class correlation, Pearson correction and student t-test.

RESULTS

16 patients had PDA (Grade 2 (n=7), 2-3 (n=4), 3 (n=5),1 cholangiocarcinoma and 1 metastatic renal cell carcinoma (mRCC). Nontumoral pancreas tissue was available in 14/18 patients specimens. Mean reader ROI size for tumor and non-tumor tissue was not significantly different (p>0.05). Reader agreement was moderate-high (0.68-0.98) for ADC, f and D. Histopathology revealed that MVD was significantly lower in tumor as compared to non tumor (p=0.002) and % fibrosis was significantly higher in tumor (p=0.004). D, f and ADC0-800 were not significantly different between tumor and non-tumor tissue for either reader. There was moderate but significant correlation between D and % fibrosis in tumor tissue (excluding mRCC) for each reader (Reader 1, r=-0.48, p=0.04; Reader 2, r=-0.59, p=0.01. Including non-tumor and tumor tissues significance was maintained (Reader 1, r=-0.43, p=0.02; Reader 2, r=-0.47, p=0.007). D was lower for grades 3-4 vs. grades 1-2 fibrosis (1.11 μ m2/ms vs. 1.45 μ m2/ms, p=0.05). MVD did not significantly correlate with f or fD*. Cell density/tumor grade did not correlate with IVIM metrics.

CONCLUSION

D negatively correlates with % fibrosis in tumor and non-tumoral pancreatic tissue and may serve as a biomarker of treatment response.

CLINICAL RELEVANCE/APPLICATION

Development of imaging biomarkers that can monitor desmoplasia in pancreatic adenocarcinoma would be clinically useful.

SSA06-03 Pancreatic Neuroendocrine Neoplasms: Correlation of MR Imaging Appearance with Biological Behavior

Sunday, Nov. 29 11:05AM - 11:15AM Location: E353A

Participants Mingliang Wang, MD, Shanghai, China (*Presenter*) Nothing to Disclose Mengsu Zeng, MD, PhD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose Shengxiang Rao, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To describe MR imaging features of pancreatic neuroendocrine neoplasms (pNENs) and to identify MR imaging features in predicting biological behavior.

METHOD AND MATERIALS

MR imaging data from 35 patients (14 men and 21 women; age range 27-69 years) with pathologically proven pNENs was retrospectively reviewed. Of the pNENs, 14/35 (40.0 %) were G1, 19/35 (54.3 %) were G2 and 2/35 (5.7 %) were G3. Image analysis included tumor location, tumor diameter, signal intensity on precontrast images, enhancement pattern, pancreatic duct dilatation, vascular encasement, extrapancreatic spread, and presence of metastases.

RESULTS

2/35 (5.7 %) of lesions appeared as a cyst with thick wall. In other 33 cases, the median maximum diameter of pNENs was 2.67 cm (range 0.60-5.20 cm). 75.8 % of lesions appeared hyperintense on T2-weighted imaging. 36.4 % of lesions appeared inhomogeneity on T2-weighted imaging. On post-contrast images, 69.7% of lesions appeared early contrast enhancement on Arterial Phase images and continuous contrast-enhancement with its degrees higher than the pancreas on Delay Phase images Significant differences in gender, tumor diameter, signal intensity on precontrast images, and invasiveness were found between G1 group and G2 group (P <0.05). The lesions in G2 group had larger size than that in G1 group. The tumor size had good diagnostic performance, with area under ROC curve (AUC) of 0.944. When a cutoff value for tumor size was set as 1.95 cm, diagnostic sensitivity was 88.9% and specificity was 92.3% in differentiating G1 group from G2 group.

CONCLUSION

MR imaging features such as tumor diameter, signal intensity on precontrast images, and invasiveness may preoperatively suggest the biological behaviour of pNENs, assisting decisions about treatment. Lesions with a larger diameter, irregular margins, absence of a cleavage plane, inhomogeneity and invasiveness were significantly associated with malignant pNENs.

CLINICAL RELEVANCE/APPLICATION

MR imaging can display malignant signs of pancreatic neuroendocrine neoplasms, predict biological behavior of the neoplasms and help assisting decisions about treatment.

SSA06-04 Enhancement Pattern of Pancreatic Neuroendocrine Tumors on Dynamic Enhanced CT: A Comparison between Tumors with Different Degree of Fibrosis Component

Sunday, Nov. 29 11:15AM - 11:25AM Location: E353A

Participants

Cherry Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose Jae Ho Byun, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Seung-Mo Hong, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Jin Hee Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Seung Soo Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Hyoung Jung Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Moon-Gyu Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the enhancement pattern and other CT findings between pancreatic neuroendocrine tumor (NET) with different degree of fibrosis component.

METHOD AND MATERIALS

We retrospectively reviewed the CT images of 45 patients (17 males and 28 females) with surgically confirmed NET containing fibrotic component > 30% of the whole tumor (Group A). They were matched for age, gender, and tumor grade at a ratio of 1:1 to 45 NET patients with fibrotic component < 30% (Group B). Hounsfield unit (HU) of tumors in the precontrast (PC), arterial (AP), and portal (PP) phases, HU ratio (tumor to normal parenchyma) in each phase, HU enhancement pattern (progressive enhancement or wash-out pattern), and visible enhancement pattern change from AP to PP (peripheral to full, peripheral to peripheral, full to peripheral, or full to full) were compared between Group A and B. Other CT findings, including heterogeneity of enhancement, calcification, margin, perilesional infiltration, pancreatic duct dilation, direct invasion, lymph node and distant metastasis, were also compared between the two groups.

RESULTS

Group A showed progressive enhancement pattern and Group B showed wash-out pattern (P<0.05). HU of tumors and HU ratio in PC were higher in group A than in group B (42.5 ± 7.5 vs. 38.6 ± 8.2 ; 1.02 ± 0.28 vs. 0.88 ± 0.23 ; $P\leq.024$), whereas those in AP were lower in group A than in group B (146.2 ± 8.2 vs. 183.1 ± 49.7 ; 1.4 ± 0.52 vs. 1.61 ± 0.38 ; $P\leq.003$). Peripheral to full or peripheral enhancement change was more frequent in group A, while full to full enhancement change was more frequent in Group B (P<.05). Other CT findings were not significantly different between the two groups (P>.05).

CONCLUSION

On dynamic enhanced CT, NET with rich fibrotic component tended to show progressive enhancement pattern and peripheral to peripheral or full enhancement change, while NET with poor fibrotic component tended to show wash-out pattern and full to full enhancement change.

CLINICAL RELEVANCE/APPLICATION

CT enhancement pattern has been suggested as a prognostic indicator of pancreatic NET. However, its degree of fibrotic component could be one of causes for its various enhancement patterns.

SSA06-05 Using Iodine Quantification from DECT Images to Differentiate Pancreatic Neuroendocrine Tumors from Splenules

Sunday, Nov. 29 11:25AM - 11:35AM Location: E353A

Participants

Andrea Prochowski Iamurri, MD, Boston, MA (*Presenter*) Nothing to Disclose Manuel Patino, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Diana Murcia, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Rodrigo Canellas, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Farhad Mehrkhani, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Yasir Andrabi, MD, MPH, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Avinash R. Kambadakone, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Dushyant V. Sahani, MD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

PURPOSE

Differentiating intrapancreatic splenule from other solid pancreatic masses and pancreatic neuroendocrine tumors (pNET) can be challenging on a single phase CT exam. We investigated the role of iodine quantification from DECT for characterizing splenules (SPL).

METHOD AND MATERIALS

In this retrospective study, 45 patients (16 with pNET and 29 with SPL) underwent to portal phase DECT (750HD GE) and material decomposed iodine images (MD-I) were used to quantify mean iodine concentrations (MIC) for pNET, SPL, spleen and aorta. Normalized iodine concentration (NIC) were calculated for pNET, SPL and spleen. MIC of pNET and of SPL were compared with spleen MIC. On the SECT images, mean HU (MHU) values were calculated for pNET, SPL and spleen. MHU and NIC values of lesions and spleen and their ratio were compared using a t-test. Lesion appearance was evaluated on MD-I with a scale from 1 to 3 (1 homogenous, 2 mild heterogeneity, 3 heterogeneous).

RESULTS

NIC values were: pNET 0.73 ± 0.2 , SPL 0.66 ± 0.1 and spleen 0.66 ± 0.1 . The MIC ratio between pNET and spleen was 1.14 ± 0.3 , and for SPL/spleen 1.01 ± 0.1 (p=0.047). The MHU ratios between pNET and spleen was 0.92 ± 0.2 and for SPL/spleen 0.86 ± 0.1 (p=0.174). SPL also demonstrated a homogenous appearance (29) vs the heterogeneous appearance of pNET (16, 4= mild heterogeneity, 12=obvious heterogeneous).

CONCLUSION

On the MD-I images from DECT, SPL's are homogenous and follow the iodine concentration of spleen whereas pNET are often heterogenous and show higher NIC values than spleen.

CLINICAL RELEVANCE/APPLICATION

Inaccurate diagnosis of intrapancreatic SPL and pNET on portal phase CT often leads to unnecessary interventions and surgeries and occasionally delay in much needed surgery in the cases of pNET. Reliable diagnosis of splenule on portal-venous phase DECT is feasible by subjective assessment and iodine quantification.

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Dushyant V. Sahani, MD - 2012 Honored Educator Dushyant V. Sahani, MD - 2015 Honored Educator

SSA06-06 Low Contrast Enhancement of Primary Pancreatic Ductal Adenocarcinoma is Associated with Early Development of Metastases Following Resection

Sunday, Nov. 29 11:35AM - 11:45AM Location: E353A

Participants

Aisha True-Yasaki, San Francisco, CA (*Presenter*) Nothing to Disclose Eric Collisson, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose Benjamin M. Yeh, MD, San Francisco, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc; Michael A. Ohliger, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose Judy Yee, MD, San Francisco, CA (*Abstract Co-Author*) Research Grant, EchoPixel, Inc Ronald J. Zagoria, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose Zhen J. Wang, MD, Hillsborough, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Previous studies suggest that enhancement patterns of pancreatic ductal adenocarcinoma (PDAC) reflect tumor angiogenesis and fibrosis, both of which are implicated in PDAC prognosis. The purpose of this study is to determine whether the degree of enhancement of resectable PDAC at pancreatic phase CT can predict subsequent early development of metastases.

METHOD AND MATERIALS

We retrospectively identified 38 patients with resectable PDAC who underwent multiphase pancreatic protocol CT prior to surgery (no neoadjuvant therapy), and who had >= 12 month follow up at our institution. Tumor enhancement was determined by measuring CT attenuation change (Δ Hounsfield unit (HU)) between the pancreatic phase and unenhanced images. Tumor grade, size, and AJCC stage at pathology were recorded. Follow up imaging studies were reviewed to determine any subsequent development of metastatic disease and its timing in these patients. Uni- and multi-variate analyses were used to determine predictors of the development of metastases within 12 month of surgery.

RESULTS

Fourteen of the 38 patients had developed metastases (liver, lung, peritoneum) by 12 months. The mean tumor enhancement in patients who had developed metastases by 12 months was significantly lower than that of patients who did not $(32.1\pm13.7HU vs. 55.9\pm18.9HU, p=0.0002)$. A threshold of 40HU identified patients with metastases by 12 months with 79% sensitivity and 92% specificity. Both tumor grades and size at pathology were significantly higher in patients with metastases by 12 months than those without (both p values < 0.05). There was a trend of higher tumor stages in patients with metastases by 12 months (p=0.06). 32/38 patients underwent gencitabine based adjuvant therapy post resection. The proportion of patients receiving adjuvant therapy was not significantly different between the two groups. Multivariate analysis showed that tumor enhancement < 40HU and tumor grade were independent predictors of development of metastases by 12 months (both p values <0.05).

CONCLUSION

Low contrast enhancement (<40HU) of primary PDAC is associated with development of metastases by 12 months following resection.

CLINICAL RELEVANCE/APPLICATION

Enhancement pattern of primary PDAC at CT may be a useful prognostic marker.

SSA06-07 Assessment of Iodine Uptake by Pancreatic Cancer Following Chemotherapy Using Dual Energy CT

Sunday, Nov. 29 11:45AM - 11:55AM Location: E353A

Participants

Satomi Kawamoto, MD, Baltimore, MD (*Presenter*) Research Grant, Siemens AG; ; Matthew K. Fuld, PhD, Iowa City, IA (*Abstract Co-Author*) Researcher, Siemens AG Gale Christensen, Baltimore, MD (*Abstract Co-Author*) Grant, Becton, Dickinson and Company Daniel Laheru, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Elliot K. Fishman, MD, Owings Mills, MD (*Abstract Co-Author*) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc

PURPOSE

To evaluate quantitative change of iodine uptake by pancreatic cancer using dual source dual energy CT before and after

METHOD AND MATERIALS

Twenty patients (13 males, 7 females, average age 67.8±11.8 years) with newly diagnosed pancreatic adenocarcinoma were scanned with dual source dual energy CT before and after (average interval: 71.9±42.8 days) chemotherapy. Dual phase CT protocol included arterial phase timed by bolus tracking, followed by a 60 second venous phase scanned with dual energy CT at 100 kV and 140 kV with tin filtration with reference dose of 250 and 193 mAs, respectively. Tumor segmentation was performed on a workstation using automated segmentation followed by manual editing. Iodine uptake by the tumor was obtained as an iodine concentration (mg/ml) and normalized by iodine uptake within the abdominal aorta ('normalized tumor iodine uptake'). Tumor iodine uptake was compared to change in tumor volume and tumor markers.

RESULTS

At baseline, average iodine uptake by tumor was 1.26 ± 0.37 mg/ml in arterial phase and 1.79 ± 0.50 mg/ml in venous phase, and average normalized tumor iodine uptake was 0.10 ± 0.05 in arterial phase and 0.38 ± 0.09 in venous phase. After chemotherapy, average normalized tumor iodine uptake was significantly decreased compared to the baseline in both arterial phase (0.08 ± 0.04 [p=0.016]) and venous phase (0.31 ± 0.09 [p=0.0007]). The tumor was decreased in volume in 17 patients (average volume change: $71\pm15\%$), and increased in 3 patients (average volume change: $154\pm22\%$). Average normalized iodine uptake in tumors that reduced volme greater than 20% after chemotherapy (n=9) was 72% and 77% of the baseline in arterial and venous phase respectively, lower than that of the other tumors (n=11) (88% of the baseline in both phase), but there was no statistically significantly difference. Average normalized tumor iodine uptake in patients with decreased tumor markers (n=8) were 74% and 80% of the baseline in arterial and venous phase, and in patients with increased tumor markers (n=3) were 116% and 96% of the baseline in arterial and venous phase, but the number of subjects were too small for statistical analysis.

CONCLUSION

Iodine uptake by pancreatic adenocarcinoma evaluated using dual energy CT may decrease after chemotherapy.

CLINICAL RELEVANCE/APPLICATION

Iodine uptake by pancreatic adenocarcinoma evaluated by dual energy CT may be potentially useful for assessment of treatment response.

Honored Educators

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Elliot K. Fishman, MD - 2012 Honored Educator Elliot K. Fishman, MD - 2014 Honored Educator

SSA06-08 Agreement of Results of CT-perfusion Measurements in Pancreatic Carcinoma: Comparison of Three Different Kinetic Calculation Models

Sunday, Nov. 29 11:55AM - 12:05PM Location: E353A

Participants

Gerd Grozinger, MD, Tubingen, Germany (Presenter) Nothing to Disclose

Sven Schneeweis, Tubingen, Germany (Abstract Co-Author) Nothing to Disclose

Konstantin Nikolaou, MD, Tuebingen, Germany (Abstract Co-Author) Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG

Marius Horger, MD, Tuebingen, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the interchangeability of perfusion parameters between three calculation methods for the post-processing of perfusion-CT images in pancreatic carcinoma.

METHOD AND MATERIALS

Perfusion-CT images was performed in 48 (32 male; mean age: 69±9 years) patients with adenocarcinoma of the pancreas. Images were post-processed using a software package based on the maximum-slope approach (blood flow-BF and blood volume-BV) and Patlak analysis (BV and k-trans), as well as a software package with deconvolution-based analysis (BF, BV and k-trans). Volume-of-interest (VOI) analysis of the tumor average perfusion was performed. Perfusion parameters were compared using the Wilcoxon matched-pairs test and Bland-Altman plots. Following CT-examinational protocol: 80kV, 100/120mAs, 64x0.6mm collimation, 26 consecutive scans, IV injection of 50 mL contrast at a flow rate of 5 mL/s, was used.

RESULTS

48 VOIs of tumors were analyzed. Moderate to good correlations were demonstrated between the various perfusion values (r = 0.42-0.90, P < .001). The Wilcoxon test revealed a significant difference between the methods (P < .001), with the BF and BV values obtained using the maximum-slope approach and Patlak analysis being lower than those obtained using deconvolution-based analysis. For analysis of k-trans deconvolution revealed significantly lower values (P < 0.001). The Bland-Altman plots for BF and BV values revealed a proportionality trend with outliers, which were strongly associated with the magnitudes of the parameters. Analysis of the k-trans values did not show any systematic bias. Comparison of the three different BV-calculations revealed an equal distribution.

CONCLUSION

There were significant differences in the perfusion parameters obtained using the three software packages, and therefore these parameters are not directly interchangeable. However, the magnitude of pairs of parametric values is in constant relation to each other enabling the use of any of these methods.

CLINICAL RELEVANCE/APPLICATION

Perfusion-based tumor characterization could emerge as a more sensitive treatment monitoring and therefore cognizance of perfusion parameter values obtained with existing software packages is mandatory.

SSA06-09 Role of Sarcopenia and Visceral Obesity, Assessed Using Preoperative CT-scan, as Predictors of Short-term Outcome Following Pancreaticoduodenectomy in Pancreatic Cancer Patients

Sunday, Nov. 29 12:05PM - 12:15PM Location: E353A

Participants Anna Damascelli, MD, Milan, Italy (*Presenter*) Nothing to Disclose Giulia Cristel, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Giulia Carrara, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Nicolo Pecorelli, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Alessandro Del Maschio, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose Francesco A. De Cobelli, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Recent reports showed that body composition parameters, assessed using computed tomography (CT) images, may improve preoperative risk stratification in oncologic Patients. The aim of this study is to evaluate how sarcopenia (depleted muscle mass) and visceral obesity impact on postoperative outcome in pancreatic cancer patients treated with pancreaticoduodenectomy (PD) in a high volume Institution, focusing on mortality and pancreatic fistula (PF) occurrence.

METHOD AND MATERIALS

Between 2010 and 2014, 284 consecutive patients underwent PD for pancreatic cancer; among them 202 patients underwent preoperative staging CT-scan imaging at our Institution within 30-days before PD, and were included in this study. Total abdominal muscle area (TAMA), visceral fat area (VFA) and subcutaneous fat area (SFA) were assessed using Slice-O-Matic 5.0 software (Tomovision, Montreal, Canada); TAMA and VFA were evaluated on two contiguous slices at the third lumbar vertebra, and then averaged, using Hounsfield unit threshold of -29 to +150 for skeletal muscle, -150 to -50 for visceral adipose tissue and -190 to -30 for subcutenous and intermuscular fat. Perioperative variables and postoperative outcomes were prospectively collected. Multivariate analysis was performed to identify independent predictors of 60-day mortality, and PF graded according to International Study Group of Pancreatic Fistula criteria. Sarcopenia was defined using predetermined sex-specific cut-off values (52.4 cm2/m2 for men and 38.5 cm2/m2 for women).

RESULTS

132 (65.4%) patients were classified as sarcopenic. Postoperative mortality occurred in 12 patients (5.9%), major complications in 40 (19.8%) and pancreatic fistula in 48 patients (23.8%). At multivariate analysis, VFA/TAMA and ASA score = 3 were the strongest predictors of mortality (p<0.001). Among patients who developed major complications, survivors had significantly lower VFA/TAMA ratio than non-survivors (p=0.017). VFA was an independent predictor of PF (p<0.001).

CONCLUSION

Preoperative analytic morphometric assessment, using CT images, is a useful tool for the prediction of mortality and pancreatic fistula occurrence, following PD for cancer.

CLINICAL RELEVANCE/APPLICATION

Preoperative CT assessment of sarcopenia and visceral adiposity improve risk stratification in patients undergoing pancreaticoduodenectomy for cancer, predicting mortality and pancreatic fistula occurrence.

Genitourinary (Adrenal and Renal Imaging)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E353B



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

FDA Discussions may include off-label uses.

Participants

Steven C. Eberhardt, MD, Albuquerque, NM (*Moderator*) Nothing to Disclose Claudia P. Huertas, MD, Medellin, Colombia (*Moderator*) Nothing to Disclose Seung Hyup Kim, MD, Seoul, Korea, Republic Of (*Moderator*) Nothing to Disclose

Sub-Events

SSA10-01 The Role of Peak Enhancement Values in Differentiating Pheochromocytomas from Adrenal Adenomas on CT

Sunday, Nov. 29 10:45AM - 10:55AM Location: E353B

Participants

Mohammed F. Mohammed, MBBS, Vancouver, BC (*Presenter*) Nothing to Disclose David Ferguson, MBBCh, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose Alison C. Harris, MBChB, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose William C. Yee, MD, FRCPC, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to establish the role of the peak enhancement Hounsfield Unit (HU) value of focal adrenal lesions in differentiating potential pheochromocytomas from adrenal adenomas.

METHOD AND MATERIALS

The peak enhancement HU values of histologically confirmed pheochromocytomas (n = 24) were retrospectively compared with those of histologically confirmed adrenal adenomas (n = 28) on the 60-second contrast enhanced venous phase and compared utilizing a chi-square test. The studies were performed over a period of 5 years (2009-2014) on multi-detector CT scanners (MDCT). HU values were also measured on unenhanced (n = 34) and 15-minute delayed contrast enhanced (n = 27) phases. Measurements were obtained by drawing a representative region of interest over the target lesion. Peak enhancement values were recorded and absolute washout, relative washout and absolute enhancement (60-second enhanced minus unenhanced) were also calculated when available. Mass size was also recorded. The Student t test was used for comparing absolute enhancement and mass size.

RESULTS

83.3% (n = 20) of pheochromocytomas demonstrated a peak enhancement value of 85 HU or greater, compared to 10.7% (n = 3) of adrenal adenomas (p < 0.001, PPV = 86.96%, NPV = 86.2%). Absolute enhancement of pheochromocytomas was also higher than that of adrenal adenomas (mean = 66.2 HU [range, 51-95 HU] vs. 48.1 HU [range, 18-74]; p < 0.005). Of the pheochromocytomas imaged with a triphasic protocol (n = 9), 77.8% (n = 7) met absolute and relative washout criteria for the diagnosis of a lipid-poor adenoma (>= 60% and >=40% respectively). Pheochromocytomas were significantly larger than adrenal adenomas (mean diameter, 4.5 cm [range, 1-8.3 cm] vs. 1 cm [range, 0.8-6.2 cm]; p < 0.0001).

CONCLUSION

Peak enhancement values of 85 HU or greater in an adrenal lesion on the 60-second post contrast phase strongly suggest a diagnosis of pheochromocytoma rather than adrenal adenoma, regardless of whether or not the lesion demonstrates absolute or relative washout characteristics compatible with a lipid poor adenoma.

CLINICAL RELEVANCE/APPLICATION

Peak enhancement values on the 60-second post contrast phase should be routinely assessed in the workup of an adrenal lesion to avoid missing a pheochromocytoma.

SSA10-02 Proton-Density Fat Fraction: A Viable Tool for Differentiating Adenomas from Nonadenomas in Adrenal Glands, Compared with In-phase and Out-of-phase MR Imaging

Sunday, Nov. 29 10:55AM - 11:05AM Location: E353B

Participants

Meng Xiaoyan, BMedSc, Wuhan, China (*Presenter*) Nothing to Disclose Hu Daoyu, PhD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose Chen Xiao, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose Zhen Li, MD, PhD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose Yanchun Wang, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the application of proton-density fat-fraction (PDFF) measurements for accurately quantifying the fat-content of adrenal nodules, differentiating adenomas from nonadenomas, and compare with in-phase (IP) and out-of-phase (OP) MR imaging.

This study was compliant with HIPAA and approved by the Institutional Review Board, with the waivers of informed consent. The consecutive research was performed between Aug 2013 to Aug 2014, 37 patients with 40 adrenal nodules (21 histopathologically proven adenomas, 13 proved pheochromocytomas and 6 clinically proven metastases) who underwent MRI scanning with T1 independent volumetric multi-echo gradient-echo imaging with T2*correction (IDEAL-IQ), following with an axial 3D dual-echo Dixon sequence (LAVA-FLEX) which performed IP and OP images. All MRI examinations were performed on a 3.0-T MR scanner. PDFF, SI index (SII), SI adrenal-to-liver ratio (ALR) and SI adrenal-to-spleen ratio (ASR) were calculated. All statistical analyses were performed by using statistical software SPSS 17.0.

RESULTS

PDFF of adenomas (21.39 \pm 10.09%)was significantly higher than of nonadenomas (2.25 \pm 2.73)(p=0.000, <0.05).PDFF was an effective tool for distinguishing adenomas from nonadenomas with an area under the curve (AUC) of 0.982, higher than 3.20 predicted adenomas with a sensitivity of 100% and a specificity of 89.5%.While,the sensitivities and specificities for adenomas were 90.0% and 100%, both for SII, ALR and ASR on IP/OP images, with AUC of 0.942, 0.937, 0.932, respectively.

CONCLUSION

PDFF measurements provided a more accurate estimation for fat content in adrenal nodules than with IP/OP images, and it could be a precisely parameter for differentiating adenomas from nonadenomas.

CLINICAL RELEVANCE/APPLICATION

In conclusion, IDEAL-IQ could be a valuable diagnostic tool for discriminating adenomas from nonadenomas with a high sensitivity and a relatively high specificity, avoiding radiation exposure, contrast media side-effect and complicated data calculation. IDEAL-IQ would be a prospective, reliable, and widely used method for diagnosing adrenal gland nodules in clinical study.

SSA10-03 Adrenal Calcifications on CT Associated with Familial Cerebral Cavernous Malformation Type I: An Imaging Biomarker for a Hereditary Cerebrovascular Condition

Sunday, Nov. 29 11:05AM - 11:15AM Location: E353B

Participants

Corinne D. Strickland, MD, MS, Boston, MA (*Presenter*) Shareholder, Thayer Medical Corporation Steven C. Eberhardt, MD, Albuquerque, NM (*Abstract Co-Author*) Nothing to Disclose Leslie Morrison, MD, Albuquerque, NM (*Abstract Co-Author*) Nothing to Disclose Li Luo, PhD, Albuquerque, NM (*Abstract Co-Author*) Nothing to Disclose Blaine L. Hart, MD, Albuquerque, NM (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Cerebral Cavernous Malformation Type I (CCM1) is an autosomal dominant disorder characterized by multiple cavernous malformations in the brain that may cause seizures, cerebral hemorrhage, or focal neurologic deficits. Abdominal manifestations are unproven and poorly described. Individuals of Hispanic descent in the Southwestern US are disproportionately affected by this condition due to a founder mutation in the CCM1/KRIT1 gene. Our aim was to investigate whether adrenal calcifications on CT are associated with CCM1 in carriers of the common Hispanic mutation (CHM).

METHOD AND MATERIALS

In an IRB-approved, HIPAA-compliant study, abdomen CT scans of 23 CCM1 subjects (10 F, 13 M, mean 48 yrs, range 24-73 yrs) were retrospectively reviewed. All subjects had multiple CCM lesions on brain MRI; 11 had confirmed CHM genotype. As controls, abdomen CTs from 38 unaffected matched subjects (18 F, 20 M, mean 48 yrs, range 23-73 years) and 13 subjects with sporadic (non-familial) CCM (6 F, 7 M, mean 51 yrs, range 26-72 yrs) were reviewed. Size, location, number, laterality of calcifications, and adrenal morphology were recorded. Brain lesion count was recorded for CCM1 subjects. Statistical comparisons between groups were calculated using Fisher exact test and two-sample t test.

RESULTS

15 of 23 CCM1 subjects (65%) had small (\leq 5mm), focal calcifications (SFC) in one or both adrenals, compared with 0 in unaffected and sporadic CCM subjects (p<0.001). SFC were either left-sided or bilateral. Glands with SFC had normal adrenal morphology. The presence of SFC correlated positively with number of CCM brain lesions (p=0.048); bilateral SFC correlated positively with patient age (p=0.030).

CONCLUSION

SFC are found in a majority (65%) of adults with CHM-related CCM1 and may be a clinically silent disease manifestation. SFC in this population are predominantly left-sided, more often bilateral with increasing age, and more common in patients with greater number of brain lesions. These findings add to existing evidence that CCM1 is a multi-system disorder with effects beyond the central nervous system. CCM1 should be considered in the differential diagnosis for focal adrenal calcifications encountered incidentally on CT.

CLINICAL RELEVANCE/APPLICATION

Incidental adrenal calcifications on CT may detect unrecognized CCM1 and improve diagnostic confidence in equivocal cases. Recognition of this entity is important for management of neurologic manifestations and genetic counseling.

SSA10-04 Clinical Value of Dual-Energy Virtual Non-Contrast of Dual-Source CT for Adrenal Adenoma

Sunday, Nov. 29 11:15AM - 11:25AM Location: E353B

Participants

Yang Shitong, Zhengzhou, China (Presenter) Nothing to Disclose

PURPOSE

To explore the feasibility of using virtual non-contrast (VNC) images in diagnosis of adrenal adenoma in dual-energy scans, and evaluate the sensitivity, specificity, and accuracy of VNC images for the lipid-poor adenoma.

METHOD AND MATERIALS

The clinical manifestations and CT images for 30 patients with 31 lesions confirmed by pathological results from surgery were reviewed retrospectively. All of the patients were examined by a pre-contrast scan (true non contrast; TNC) and then arterial and venous phase enhanced scan. Then enhanced examinations were performed with dual-energy scan mode (SOMATOM Flash, Siemens Healthcare, Forchheim, Germany). The dedicated post processing application Liver VNC was used to get VNC images at the arterial and venous phase respectively.Mean CT values, signal-to-noise ratio, subjective image quality, and radiation dose were compared between routine TNC and VNC.The correlation between TNC and VNC images of the adrenal adenoma was evaluated. Sensitivity, specificity and accuracy of VNC images for the characterization of lipid-poor adenoma were calculated from chi-square tables of contingency.

RESULTS

No significant differences were seen for mean CT values in normal adrenal tissue, adrenal adenoma and the muscles of posterior spine between TNC and VNC images (p>0.05), except the abdominal aortic and spleen which the mean CT values in VNC images was higher than TNC image and the differences were statistically significant (p<0.05).SNR of all tissues in VNC images were higher than that in TNC image, and the differences were statistically significant (p<0.05) expect the abdominal aortic(p>0.05).The subjective score of VNC images was lower than that of TNC image, but the difference was no statistically significant(p>0.05).The radiation dose of VNC images was lower than that of TNC(p<0.05).A positive correlation was found for CT values of adrenal adenoma between TNC and VNC images.Sensitivity,specificity, and accuracy from VNC images of arterial phase for the characterization of lipid-poor adenoma were 86.9%,100%,90.3% and from venous phase were 60.9%,87.5%,67.7%.

CONCLUSION

VNC images calculated from contrast-enhanced dual-energy CT have a potential to replace the TNC images to diagnose the adrenal adenoma and thus reduce the patient's radiation dose.

CLINICAL RELEVANCE/APPLICATION

Dual-energy VNC have a potential to replace the TNC images to diagnose the adrenal adenoma and thus reduce the patient's radiation dose.

SSA10-05 Characterization of Adrenal Lesions Using Rapid Kilovolt-Switching Dual Energy CT: Utility of Contrast-Enhanced Material Suppression Imaging

Sunday, Nov. 29 11:25AM - 11:35AM Location: E353B

Participants

Jason A. Pietryga, MD, Birmingham, AL (*Presenter*) Nothing to Disclose Mark E. Lockhart, MD, Birmingham, AL (*Abstract Co-Author*) Nothing to Disclose Therese M. Weber, MD, Birmingham, AL (*Abstract Co-Author*) Nothing to Disclose Lincoln L. Berland, MD, Birmingham, AL (*Abstract Co-Author*) Consultant, Nuance Communications, Inc; Stockholder, Nuance Communications, Inc; Bradford Jackson, Birmingham, AL (*Abstract Co-Author*) Nothing to Disclose Desiree E. Morgan, MD, Birmingham, AL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To characterize adrenal lesions as benign or malignant on contrast-enhanced dual energy CT using material suppression imaging (MSI) virtual unenhanced images and pseudo-unenhanced monoenergetic 140keV images.

METHOD AND MATERIALS

IRB-approved HIPAA-compliant study. A retrospective search identified consecutive adult outpatients who had undergone multiphasic dual energy CT(DECT) with an adrenal lesion (\geq 1cm) reported. Two patients weighing \geq 300 lbs were excluded. A single board-certified radiologist reviewed the CTs and placed ROIs on the adrenal lesions on the noncontrast (NC) series and simultaneously placed matching ROIs on MSI virtual unenhanced and virtual monoenergetic 140 keV images. The lesions were characterized by accepted clinical standards. Spearman rank correlation was performed to evaluate for associations between the virtual unenhanced, pseudo-unenhanced HU and NC HU and t tests to evaluate means. Regression analysis was performed to identify threshold values to characterize adrenal lesions as benign vs malignant. Myelolipomas were excluded from the regression analysis.

RESULTS

104 patients (52M,52F, mean age 62, weight 188 lb) with a total of 140 adrenal lesions were identified. 56%(78/140) of the lesions were lipid-rich adenomas, 6%(9/140) lipid-poor adenomas, 20%(28/140) malignancies, 8%(11/140) myelolipomas and 10%(14/140) indeterminate. The mean HUs for adenomas were -6.5 (NC), 11.3 (MSI), 12.5 (140 keV); mean HUs for malignant lesions were 34.2 (NC), 39.1 (MSI) 38.7 (140 keV), all p<0.0001. There were very strong Spearman correlations between NC and MSI HU (.83), NC and 140keV HU (.81) and MSI and 140keV HU (98). Excluding 1 obvious necrotic RCC metastasis, a threshold of 20 HU on MSI and 16 HU on 140keV images correctly characterizes lesions as adenomas with a sensitivity of 68%(59/87) and 53%(46/87), respectively, both with specificity of 100%.

CONCLUSION

MSI virtual unenhanced and virtual 140keV monoenergetic contrast-enhanced DECT images can be used to characterize adrenal adenomas with a sensitivity of 72% and 59%, respectively, when using new HU threshold values of 20 and 16, respectively. Excluding an obvious necrotic RCC metastasis, both threshold values are 100% specific.

CLINICAL RELEVANCE/APPLICATION

In this largest DECT series of adrenal lesions, new HU criteria are presented that can characterize lesions on contrast-enhanced DECT, potentially obviating the need for further imaging for most patients.

SSA10-07 MASS Criteria as a Predictor of Survival in Sunitinib Treated Metastatic RCC - A Secondary Post-hoc Analysis of a Multi-institutional Prospective Phase III Trial

Participants

Andrew D. Smith, MD, PhD, Jackson, MS (*Presenter*) Research Grant, Pfizer Inc; President, Radiostics LLC; President, Liver Nodularity LLC; President, Color Enhanced Detection LLC; Pending patent, Liver Nodularity LLC; Pending patent, Color Enhanced Detection LLC;

Frederico F. Souza, MD, Madison, MS (*Abstract Co-Author*) Nothing to Disclose Manohar Roda, MD, Jackson, MS (*Abstract Co-Author*) Nothing to Disclose Haowei Zhang, MD, PhD, Jackson, MS (*Abstract Co-Author*) Nothing to Disclose Xu Zhang, PhD, Jackson, MS (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To validate MASS Criteria as a predictive imaging biomarker in metastatic RCC treated with anti-angiogenic therapy.

METHOD AND MATERIALS

As part of a published multi-institutional prospective phase III trial, 375 adult patients with metastatic clear cell RCC were treated with sunitinib. In this secondary post-hoc retrospective analysis, initial post-therapy CT images were evaluated by RECIST, Choi Criteria, and MASS Criteria in patients with DICOM format images. Comparison of PFS and OS among MSKCC risk and imaging response groups was evaluated using log-rank test. Inter-observer agreement between 3 readers was assessed in 21 randomly selected cases using intra-class correlation coefficient (ICC).

RESULTS

Median PFS and OS of the full cohort (N=270) were 1.1 and 2.6 years, respectively. PFS and OS of all MASS Criteria objective response categories were significantly different from one another (p<0.0001 for each). By comparison, PFS of MSKCC low (N=186) and intermediate (N=84) risk groups, PFS of RECIST PR (N=33) and SD (N=228) groups, and OS of Choi Criteria SD (N=36) and PD (N=13) groups were not significantly different (p=0.225, 0.810 and 0.311, respectively). Median PFS for patients with baseline MSKCC Criteria low (N=186) and intermediate (N=84) risk were 1.2 and 0.9 years, respectively. By comparison, median PFS for patients with MASS criteria FR (N=177), IR (N=84), and UR (N=9) were 1.4, 0.5, and 0.1 years, respectively. Inter-observer agreement among 3 readers interpreting 21 randomly selected cases using MASS Criteria was substantial (ICC=0.70).

CONCLUSION

In patients with metastatic RCC treated with sunitinib, MASS Criteria response on the initial post-therapy CT is predictive of PFS and OS.

CLINICAL RELEVANCE/APPLICATION

MASS Criteria is currently the only quantitative biomarker for predicting response to anti-angiogenic therapy in metastatic RCC that has been validated in a multi-institutional study and it may potentially be useful in guiding therapy, reducing drug toxicities and costs, and planning adaptive design clinical trials.

SSA10-08 Prediction of Survival in Patients with Metastatic Clear Cell Carcinoma Treated with Targeted Antiangiogenic Agent Sunitinib via CT Texture Analysis

Sunday, Nov. 29 11:55AM - 12:05PM Location: E353B

Participants

Masoom A. Haider, MD, Toronto, ON (*Presenter*) Consultant, Bayer AG Alireza Vosough, MD, MRCP, Aberdeen, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Farzad Khalvati, PhD,MSc, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Alexander Kiss, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Balaji Ganeshan, PhD, London, United Kingdom (*Abstract Co-Author*) Scientific Director, TexRAD Limited Georg Bjarnason, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the role of CT Texture analysis in prediction of progression free and overall survival and assessment of response to treatment with Sunitinib in patients with metastatic clear renal cell carcinoma (RCC).

METHOD AND MATERIALS

Contrast enhanced CT texture parameters were assessed in 40 patients with metastatic clear RCC who were treated with Sunitinib. Appropriate measurable lesions were selected based on RECIST criteria before and about two months after treatment with Sunitinib. Texture and histogram analysis of the lesions were performed using TexRad software. Using a Cox regression model, correlation of texture parameters with measured time to progression and overall survival were assessed.

RESULTS

"Size normalized tumor Entropy" (NE) was found as an independent predictor of time to progression and overall survival and can add to Heng; a well-known prognostic model for metastatic RCC patients. Cox proportional hazards regression analysis (HR) showed that NE was an independent predictor of time to progression. (HR = 0.01 and 0.02; 95% confidence intervals (CI): 0.00 - 0.29 and 0.00 - 0.39; p=0.01 and p=0.01 for NE before and two months after treatment, respectively). NE was also shown to be an independent predictor of overall survival. (HR = 0.01 and 0.01; 95% CI: 0.00 - 0.31 and 0.001 - 0.22; p=0.01 and p=0.003 for NE before and two months after treatment, respectively).

CONCLUSION

Tumor heterogeneity is a well-known feature of malignancy reflecting areas of increased cellular density, hemorrhage and necrosis. CT texture analysis can quantify heterogeneity by using a range of parameters including size normalized Entropy (NE) as a measure of texture irregularity. Our study showed that NE is an independent predictor of the outcome of treatment with Sunitinib in patients with metastatic RCC and can be used for prediction of time to progression and overall survival in these patients. This can help identify non-responders from the outset with the potential to avoid unnecessary toxicity and to start alternative therapies earlier.

CLINICAL RELEVANCE/APPLICATION

The ability to identify poor responders early in the course of treatment or before starting the treatment can help patients be spared from toxicity usually associated with these treatments and could potentially receive alternative therapies earlier. Using the costly drugs of treatment only in patients who benefit from them will be a potential for cost-effectiveness improvement.

SSA10-09 Arterial Spin Labeling MR Imaging for Detecting Perfusion of Defect of Renal Cell Carcinoma Pseudocapsule and Predicting Renal Capsule Invasion: Initial Experience

Sunday, Nov. 29 12:05PM - 12:15PM Location: E353B

Participants

Hanmei Zhang, Chengdu, China (*Presenter*) Nothing to Disclose Yinghua Wu, MD,PhD, Chengdu, China (*Abstract Co-Author*) Nothing to Disclose Panli Zuo, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Niels Oesingmann, PhD, Erlangen, Germany (*Abstract Co-Author*) Employee, Siemens AG Bin Song, MD, Chengdu, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The defect of pseudo-capsule is tightly correlated with the invasiveness of tumors. This study aimed to prospectively evaluate the performance of combining morphological imaging and functional imaging for detecting the defects of pseudo-capsule in renal tumors, and to predict renal capsule invasion which were confirmed histopathologically.

METHOD AND MATERIALS

Twelve patients with suspicious renal tumors underwent T2-weighted imaging and contrast-free renal ASL imaging at a 3.0T MR scanner.Renal ASL was performed using a prototype flow-sensitive alternating inversion recovery trueFISP (FAIR-trueFISP) sequence with a TI of 1200 ms for perfusion images and without inversion for M0 images.A modified Look-Locker inversion-recovery (MOLLI) sequence was used for T1 mapping.Renal blood flow (RBF) was quantitatively measured on the perfusion images which were determined on a pixel by pixel basis.For T2-weighted images alone,the discontinuous hypo signal intensity rim was defined as the defect of tumors' pseudo-capsule,for combination of T2-weighted images and ASL,the hypo signals in T2-weighted images as well hyper signals in perfusion images was defined as the defect of tumors' pseudo-capsule.The diagnostic performance was assessed using diagnostic test's index.

RESULTS

Twelve renal lesions (11 clear cell RCCs and 1 chromophobe RCC) were evaluated in 12 patients.All ccRCCs showed defect of tumors' pseudo-capsule on T2-weighted images.Of the 11 ccRCCs cases,10 cases showed blood flow right on the defect area of tumors' pseudo-capsule on perfusion images and 1 case did not.All the defect areas of tumors' pseudo-capsule seen in the surgery operation had renal capsule invasion.For defecting of tumors' pseudo-capsule, i.e. predicting renal capsule invasion, sensitivity, specificity, positive predictive value and negative predictive value were 100%, 33.3%, 81.8%, 100% for T2-weighted images alone and 100%, 66.7%, 90%, 100% for combination of T2-weighted images and ASL images.

CONCLUSION

The combination of T2-weighted images and ASL images produced promising diagnostic accuracy for predicting renal capsule invasion, which could offer additional imaging information for clinical diagnosis of renal tumors.

CLINICAL RELEVANCE/APPLICATION

Noninvasively and prospectively evaluated the presence of the defect pseudo-capsule in renal tumors may help predict the invasiveness of tumor and influence clinical therapy strategy.

Vascular/Interventional (Venous Interventions)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E350

VA IR

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

Participants

Gretchen M. Foltz, MD, Saint Louis, MO (*Moderator*) Nothing to Disclose Thomas-Evangelos G. Vrachliotis, MD, PhD, Athens, Greece (*Moderator*) Nothing to Disclose

Sub-Events

SSA23-01 Prophylactic Antibiotics during Totally Implantable Venous Access Device Placement Does Not Decrease the Rate of Infection

Sunday, Nov. 29 10:45AM - 10:55AM Location: E350

Participants

Jonathan Jo, MD, New York, NY (*Presenter*) Nothing to Disclose Bradley B. Pua, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Hency Patel, New York, NY (*Abstract Co-Author*) Nothing to Disclose Peter Schaefer, New York, NY (*Abstract Co-Author*) Nothing to Disclose Ronald S. Winokur, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose David C. Madoff, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Controversy still exists regarding antibiotic use in totally implantable venous access device (TIVAD) placement. A recent study showed a <1% risk of catheter related bloodstream infection (CLABSI) without the use of antibiotic prophylaxis. The current study seeks to delineate the efficacy of prophylactic antibiotics in TIVAD placement and to identify parameters associated with infection risk in an institution where antibiotic prophylaxis was used in the majority of cases.

METHOD AND MATERIALS

Following IRB approval, retrospective review of consecutive patients receiving TIVADs from January 2008 - December 2012 were analyzed for port infections. Post-procedural infection was defined as port removal within 30 days of placement with clinical signs of infection. Demographic information, comorbidities, hospital admission status, port characteristics, as well as prophylactic and supplemental antibiotic use were documented. Preoperative laboratory results were reviewed for white blood cell count (WBC), platelet count, and coagulation studies. Chi-square tests were used to determine associations between patient characteristics and procedural infection.

RESULTS

Of 1438 patients, 1158 (80.5%) received antibiotics and 280 (19.5%) did not. Of the patients given antibiotics, 143 (12.3%) also received supplemental antibiotics within 30 days of port placement and were excluded from analysis. Among the remaining 1295 patients, 7 post-procedural infections were identified (0.5%), all occurring in the antibiotic group (p<0.0001). Post-procedural infection was also significantly associated with inpatient status versus outpatient (3.8% vs. 0.1%, p<0.0001) and double lumen ports versus single lumen (1.9% vs. 0.2%, p=0.002).

CONCLUSION

Prophylactic antibiotic therapy does not reduce the post-procedure infection rate. Infection rates are higher with inpatients and those receiving double lumen ports.

CLINICAL RELEVANCE/APPLICATION

With level 8 evidence in existence, the Society of Interventional Radiology guidelines suggests that prophylactic antibiotics are unnecessary for tunneled central lines. No consensus exists for totally implantable venous access devices. Despite mounting evidence of the limited utility of antibiotics, many interventional radiologists and the majority of fellows of the American College of Surgeons still use antibiotics. The study seeks to add to the evidence that prophylactic antibiotics may not add benefit in this setting.

SSA23-02 Developing a Method for Testing Mechanical Properties for Implantable Catheter Lines

Sunday, Nov. 29 10:55AM - 11:05AM Location: E350

Participants

Jasmin D. Busch, MD, Hamburg, Germany (*Presenter*) Nothing to Disclose Henning Schroder, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose Kay Sellenschloh, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose Gerd Huber, Hamburg, Germany (*Abstract Co-Author*) Speakers Bureau, Ulrich GmbH & Co KG; Gerhard B. Adam, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose Harald Ittrich, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To develop a reproducible and sensitive method for the quantification of parameters of mechanical properties of catheter lines as well as to investigate the influences of artificial aging.

Constructing an experimental setup and performing uniaxial tensile tests with 5F-silicone- and 6F-polyurethane catheter lines. Subgroups were each with unattended (n=6), chemically aged (n=7), and mechanically aged samples. Material behavior was analyzed by optical strain measurement (EOS 700D, Canon, Tokio/ Japan) and force measuring system (Xforce P, Zwick Roell AG, Ulm/ Germany). Maximum force (N), stress at break (Pa), strain at break (%), and Young's elastic modulus (Pa) were evaluated.

RESULTS

In the 5F-silicon catheter trial series ANOVA shows significant differences in subgroups with Young's elastic module (p<0.001); in the 6F-polyurethan catheters with Young's elastic module (p<0.001) maximum force (p<0.001), stress at break (p<0.001), as well as strain at break (p=0.001).

CONCLUSION

We successfully developed an experimental setup to quantify mechanical properties of various catheter lines and proofed reliability and sensitivity to determine artificial aging induced modification. The low range of variance promises to detect even minor deviations in material features.

CLINICAL RELEVANCE/APPLICATION

According to recurrent failures with catheter lines among the patient cohort with totally implanted port systems within our medical center it is necessary to gain knowledge about influences of long-term usage and to quantify aberrations to avoid risk owing to material fatigue or potentially faulty batches.

SSA23-03 Adrenal Venous Sampling in Primary Aldosteronism: Value of a Multinomial Regression Model to Detect Aldosterone Hypersecretion Lateralization When the Right Adrenal Vein Sampling is Missing

Sunday, Nov. 29 11:05AM - 11:15AM Location: E350

Participants

Remi Blanchette, MD, BEng, Montreal, QC (*Presenter*) Nothing to Disclose Jean-Philippe Mailhot, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Gilles P. Soulez, MD, Montreal, QC (*Abstract Co-Author*) Speaker, Bracco Group Speaker, Siemens AG Research Grant, Siemens AG Research Grant, Bracco Group Research Grant, Cook Group Incorporated Research Grant, Object Research Systems Inc Miguel Chagnon, MSc, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Patrick Gilbert, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Vincent L. Oliva, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Marie-France Giroux, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Andre-Lacroix, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Eric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Fric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Fric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Fric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Fric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Fric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Fric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose Fric Therasse, MD, Montreal, QC (*Abstract Co-Author*) Research support, Johnson & Johnson; Consultant, Cook Group Incorporated

To assess the value of a multinomial regression model to detect aldosterone hypersecretion lateralization (AHL) with adrenal venous sampling (AVS) when the right adrenal vein sampling is missing.

METHOD AND MATERIALS

All consecutive AVS from November 1990 to December 2014 were included. Non selective AVS, repeated AVS and AVS with missing data were excluded. Cortisol and aldosterone levels were measured simultaneously from the adrenal veins and left iliac vein before (basal) and after intravenous cosyntropin injection. Reference standard for AHL was a basal adrenal vein aldosterone /cortisol ratio (A/C) > 4 the opposite side. Two multinomials regressions models were built to predict AHL (right, left or no lateralization) using only the left adrenal and iliac veins hormone concentration, 1) before and 2) after cosyntropin injection. AHL detection accuracy was assessed with receiver operating characteristic (ROC) curves.

RESULTS

AVS of 171/186 (91.9%) patients (60 women; 126 men, mean age 53.5 years) met the inclusion/exclusion criteria. AHL was found in 106 (62%) patients. Areas under the ROC curves for AHL detection with the basal and the post-cosyntropin models were respectively 0.907 (95%CI; 0.862-0.952) and 0.928 (95%CI; 0.892-0.965) for the right side (p=0.11) and 0.915 (95%CI; 0.872-0.958) and 0.917 (95%CI; 0.875-0.959) for the left side (p=0.84). Sensitivities to detect AHL with a specificity of 95% with the basal and the post-cosyntropin models were respectively 52.7% (95%CI; 38.9%-66.1%) and 56.4% (95%CI; 42.4%-69.4%) for the right side and 52.9% (95%CI; 38.6%-66.8%) and 59.2% (95%CI; 44.2%-72.7%) for the left side. There were no contralateral AHL among false positives in both models.

CONCLUSION

Multinomial regression models of AVS can determine AHL in the majority of patients even when the right adrenal vein sampling is missing. Basal and post cosyntropin multinomial regression models had similar accuracy to detect AHL.

CLINICAL RELEVANCE/APPLICATION

Adrenal venous sampling is essential to assess aldosterone hypersecretion lateralization before adrenalectomy but is limited by a high right adrenal vein cannulation failure rate.

SSA23-04 Selective Arterial Calcium Stimulation (SACST) with Hepatic Venous Sampling Differentiates Occult Insulinoma from Nesidioblastosis in Patients with Endogenous Hyperinsulinemic Hypoglycemia and Negative or Inconclusive Noninvasive Imaging

Sunday, Nov. 29 11:15AM - 11:25AM Location: E350

Participants

Scott M. Thompson, MD, PhD, Rochester, MN (*Presenter*) Research collaboration, Synta Pharmaceuticals Corp Adrian Vella, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose F J. Service, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Clive Grant, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Geoffrey Thompson, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose James C. Andrews, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the diagnostic role of selective arterial calcium stimulation (SACST) with hepatic venous sampling in differentiating occult insulinoma from nesidioblastosis in patients with hyperinsulinemic hypoglycemia and negative or inconclusive noninvasive imaging.

METHOD AND MATERIALS

An IRB-approved retrospective review was undertaken of 116 patients with biochemical evidence of endogenous hyperinsulinemic hypoglycemia, negative or inconclusive noninvasive imaging and surgically and pathologically confirmed occult insulinoma (N=42) or nesidioblastosis (N=74) who underwent SACST with hepatic venous sampling from 1/1996 to 3/2014. Clinical, laboratory, radiologic and pathology data were reviewed. The maximum hepatic venous insulin concentration (mHVI; μ IU/ml) and relative-fold increase in hepatic venous insulin concentration over baseline (rHVI) following calcium injection from the dominant artery were compared between insulinoma and nesidioblastosis groups. ROC curves were generated to determine the specificity of mHVI and rHVI in differentiating insulinoma from nesidioblastosis.

RESULTS

The biochemical results of SACST were positive (>2.0-fold) in two or more arterial distributions in 26.2% of patients in the insulinoma group and 73.0% of patients in the nesidioblastosis group (p<0.0001). The mean (\pm SEM) mHVI post calcium injection was significantly higher in the insulinoma group compared to the nesidioblastosis group (778.6 \pm 189.6 µIU/ml v. 36.2 \pm 4.1 µIU/ml, respectively; p<0.001). The mean (\pm SEM) rHVI from baseline was significantly higher in the insulinoma compared to the nesidioblastosis group (25.1 \pm 4.4 v. 6.4 \pm 0.5, respectively; p<0.001). The area under the receiver operator curve (AUC) for mHVI and rHVI was excellent (0.94; p<0.0001) and good (0.83; p<0.0001), respectively. mHVI cutoffs of >91.5µIU/ml and >263.5µIU/ml were 95% and 100% specific for insulinoma, respectively. A 19.0-fold increase in rHVI over baseline was 99% specific for insulinoma.

CONCLUSION

These data suggest that the biochemical results of SACST can differentiate occult insulinoma from nesidioblastosis with high specificity in patients with hyperinsulinemic hypoglycemia and negative noninvasive imaging.

CLINICAL RELEVANCE/APPLICATION

SACST should be considered in patients with hyperinsulinemic hypoglycemia and negative noninvasive imaging to differentiate occult insulinoma from nesidioblastosis, thereby avoiding blind pancreatic exploration.

SSA23-05 Comparison of Inferior Vena Cava Filter Placement by Two Different Vascular Physician Specialties

Sunday, Nov. 29 11:25AM - 11:35AM Location: E350

Participants

Matthew Neill, New York, NY (*Presenter*) Nothing to Disclose Hearns W. Charles, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Eric T. Aaltonen, MD, MPH, New York, NY (*Abstract Co-Author*) Nothing to Disclose Amy R. Deipolyi, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare inferior vena cava filter (IVCF) placement procedures performed by vascular-interventional radiology (VIR) to those by vascular surgery (VS) with respect to radiation exposure, procedure time, anesthesia, and filter position.

METHOD AND MATERIALS

All IVCF placements using contrast venography by VIR or VS in 2014 in a single tertiary hospital center were identified by a PACS database search. The operator, filter type, angulation and distance from the lowest renal vein, radiation dose, fluoroscopy time, and anesthesia type were noted. Angulation was measured as the angle between the midline of the IVC and centerline of the filter.

RESULTS

Of 176 IVCF placements performed in VIR in 2014, carbon dioxide venography was used in 15 cases which were excluded. One case was a combined retrieval and placement and was also excluded, resulting in 160 cases for analysis. A total of 21 filters were placed by VS in 2014; 5 were placed as a part of another fluoroscopic procedure and were excluded from dose and fluoroscopy time analysis. Among the 160 cases performed by VIR, 152 were performed with topical access site anesthesia only; 2 with nursing-administered intravenous sedation; and 6 with anesthesia. By comparison, all 21 cases by VS were performed with anesthesia. Comparing cases performed by VS and VIR, mean radiation dose was higher (180 vs. 66 mGy; p=0.001), fluoroscopy time longer (4.6 vs. 2.5 minutes; p=0.0009), and filter angulation greater (3.8 vs. 2.5 degrees; p=0.006), respectively. There was no statiscally significant difference in distance of the filter tip from the most inferior renal vein (1.7 vs. 1.1 cm; p=0.19).

CONCLUSION

IVCF placement by VIR, compared to VS, entails less radiation exposure, less procedure time as indicated by lower fluoroscopy times, less need for anesthesia consultation, and more precise placement centered in the IVC.

CLINICAL RELEVANCE/APPLICATION

Demonstrating superior technique and lower procedure cost is essential in promoting VIR practice development. IVC filter placement performed by interventional radiologists is faster, involves less radiation exposure, and reduces need for anesthesiology consultation, compared to filter placement by vascular surgery.

SSA23-06 Up to 96% Dose Reduction in Pediatric and Young Adult Venous Interventions: Too Good to Be True?

Participants

Timothy Singewald, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose Rami Nachabe, PhD, Best, Netherlands (*Abstract Co-Author*) Employee, Koninklijke Philips NV Nicole Hilvert, Cincinnati, OH (*Abstract Co-Author*) Nothing to Disclose John M. Racadio, MD, Cincinnati, OH (*Abstract Co-Author*) Research Consultant, Koninklijke Philips NV; Travel support, Koninklijke Philips NV

Manish N. Patel, DO, Cincinnati, OH (Abstract Co-Author) Nothing to Disclose

PURPOSE

The purpose of this study is to evaluate dose reductions achieved during venous interventions such as IVC filter placement/retrieval and thrombolysis performed on an enhanced low-dose interventional radiology system.

METHOD AND MATERIALS

An IRB approved retrospective review of patients who underwent a relatively low-dose venous procedure (IVC filter placement/retrieval) or a relatively high-dose venous intervention (lower extremity thrombolysis) was performed. Radiation doses for cases performed on an enhanced low-dose interventional system (AlluraClarity, Philips Healthcare, Best, The Netherlands) were compared with cases from our former system used as a reference (AlluraXper, Philips Healthcare, Best, The Netherlands). Nineteen IVC filter placements or retrievals (5 male/7 female, 9-35 years, 37-84 kg) were performed on the low-dose system and were compared with 21 cases (4 male/10 female, 13-31 years, 49-112 kg) on the reference system. Twelve thrombolysis cases (3 male/4 female, 15-18 years, 51-77 kg) performed on the low-dose system were compared with 12 cases (0 male/5 female, 14-18 years, 53-146 kg) on the reference system.

RESULTS

Overall radiation doses were substantially reduced using the low-dose system compared to the reference system (the following doses are reported as low-dose vs reference system). For IVC filter placement/retrieval, median cumulative procedure dose-area product (DAP) was 3.5 vs 30.9 Gy.cm2 (89% dose reduction), fluoroscopy dose/minute was 1.06 vs 3.21 Gy.cm2/min (67% dose reduction), and the digital subtraction angiography (DSA) dose/frame was 0.03 vs 0.72 Gy.cm2/frame (96% dose reduction). For thrombolysis, median cumulative procedure DAP was 25 vs 409 Gy.cm2 (94% dose reduction), fluoroscopy dose/minute was 1.4 vs 5.2 Gy.cm2/min (73% dose reduction), and the DSA dose/frame was 0.06 vs 1.6 Gy.cm2/frame (96% dose reduction).

CONCLUSION

Significant radiation dose reduction is possible in pediatric and young adult patients undergoing venous interventions by using an enhanced low-dose interventional radiology system.

CLINICAL RELEVANCE/APPLICATION

Use of an enhanced low-dose interventional radiology system for venous interventions results in substantial dose reduction of up to 96% for pediatric and young adult patients.

SSA23-07 Balloon Pulmonary Angioplasty: Applicability of Fluoroscopy-based Registration of a Pre Acquired C-Arm CT for Procedure Guidance

Sunday, Nov. 29 11:45AM - 11:55AM Location: E350

Participants

Jan Hinrichs, MD, Hannover, Germany (Presenter) Nothing to Disclose

Christian Von Falck, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Pro Medicus Limited Research Grant, Siemens AG Marius Hoeper, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose

Julius Renne, MD, Hannover, Germany (Abstract Co-Author) Nothing to Disclose

Karen Olsson, Hannover, Germany (Abstract Co-Author) Nothing to Disclose

Frank K. Wacker, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Siemens AG Research Grant, Pro Medicus Limited Bernhard C. Meyer, Hannover, Germany (*Abstract Co-Author*) Research Consultant, Pro Medicus Limited

PURPOSE

To investigate the use of a fluoroscopy-based registration of a pre acquired C-Arm CT (CACT) for procedure guidance in patients suffering from chronic thromboembolic pulmonary hypertension (CTEPH) undergoing balloon pulmonary angioplasty (BPA).

METHOD AND MATERIALS

42 BPA procedures performed in 27 CTEPH patients (9m, 70±14y) were included in this study. Twenty-two BPAs were guided by selective CACT (syngo DynaCT, Artis Q®, Siemens Healthcare, Forchheim, Germany) acquired immediately before BPA (G3D). In another twenty BPAs (G2D), two orthogonal fluoroscopy images of the chest where acquired semi-automatically matched with a superimposed volume rendering (VRT) of a pre-acquired CACT (2D/3D registration, syngo Fusion®, Siemens), registration was computed and applied. In both cases CACT was post-processed to generate a volume rendering based graphic representation (VRT guidance) indicating the origin and course of the segmental pulmonary arteries (SPA). During the intervention, zoom level and orientation of VRT and C-Arm were linked online using intrinsic (G3D) or computed (G2D) registration. Based on VRT guidance, the interventional radiologist planned an apt working projection (WP-P). If necessary, the used WP (WP-U) was adapted. Agreement of WP-P and WP-U, duration of the procedure and radiation exposure data was documented and compared between the two groups (Wilcoxon-test).

RESULTS

Overall, 143 SPA were intended to undergo BPA. Agreement of WP-P and WP-U was obtained in G3D 82% and G2D 86%. The guide wire was successfully placed in G3D 93% and G2D 94% and subsequent BPA was successfully performed in G3D 91% and G2D 94%. CACT post-processing took a mean of 8min G3D and 7min G2D. Overall intervention time was 126min G3D and 117min G2D. No severe reperfusion edema occurred and no patient needed mechanical/assisted ventilation.Dose-area product (DAP) was significantly higher for G3D (G3D 9289±4221 vs. G2D 5448±2629 µGym2, p=0.002).

CONCLUSION
The use of fluoroscopy based 2D3D registration of CACT images for BPA guidance is feasible and accurate. 2D3D registration can be used to save radiation exposure if a pre-acquired CACT for guidance is available.

CLINICAL RELEVANCE/APPLICATION

CACT of the pulmonary arteries bares the opportunity to increase patient's safety during BPA, when used as guidance method. Additionally, 2D3D fusion of pre-acquired CACTs safes radiation dose in repeated BPAs.

SSA23-08 Added Value of Fluoroscopy/Venography during Endovenous Laser Therapy for Symptomatic Varicose Veins

Sunday, Nov. 29 11:55AM - 12:05PM Location: E350

Participants

Ricardo Yamada, MD, Charleston, SC (*Presenter*) Nothing to Disclose J. Bayne Selby JR, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Marcelo Guimaraes, Charleston, SC (*Abstract Co-Author*) Consultant, Cook Group Incorporated ; Consultant, Baylis Medical Company; Consultant, Terumo Corporation; Patent holder, Cook Group Incorporated John Selby III, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose James P. Gregg, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Procedural difficulties or unexpected findings may occur during endovenous laser therapy of varicose veins using ultrasound alone. Fluoroscopy/venography can be a useful adjunctive modality.

METHOD AND MATERIALS

After IRB approval, EVLT performed in the last 10 years were reviewed. Fluoroscopy/venography and ultrasound were used in all cases. Images, procedure report and patient's clinical condition were reviewed. Three graders evaluated whether this imaging method changed the treatment plan, aided completion of the procedure, displayed unexpected findings or clarified previous treatments results.

RESULTS

A total of 169 treatments were identified, in 142 patients. Fluoroscopy/venography had impact in 67 procedures (39%). In 25 cases it clarified multiple complex collateral veins. In 23 cases it helped navigate the guide-wire. In 16 cases it identified duplicated/accessory veins. In 3 cases it identified the need for second access. 23 patients had prior surgical ligation/stripping, sclerotherapy or endovenous thermal ablation. Among them fluoroscopy/venography contributed to procedure completion in 18 patients(78%).

CONCLUSION

Fluoroscopy/venography were helpful in patients previously treated, in whom passage of the guide wire was difficult and in those with bifurcated/accessory veins. Of these, patients with prior treatment benefited the most from fluoroscopy/venography.

CLINICAL RELEVANCE/APPLICATION

Fluoroscopy/venography during EVLT is particular helpful in patients with recurrent varicose veins after prior treatment. This additional imaging modality may be considered in all patients undergoing repeated treatment.

SSA23-09 Large Primary Varicose Veins: Combined Ultrasound Guided Endo-venous Laser Therapy and Selective Surgical Ligation at Sephano-Femoral Junction-A Mean 7 Years Follow-up with Review of Literature

Sunday, Nov. 29 12:05PM - 12:15PM Location: E350

Participants

Kiran C. Patil JR, MD, Jalgaon, India (*Presenter*) Nothing to Disclose Anurag Singh, MBBS, MD, Sharjah, United Arab Emirates (*Abstract Co-Author*) Nothing to Disclose Rajesh D. Jawale, MBBS, MD, Nasik, India (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

1) To evaluate our experience and curative effect of the combination of ultrasound guided endovenous Laser therapy (EVLT) and surgical detail separate ligation of each tributaries at S-F junction. 2) To review our experience with mean 7 years followup. 3) To compare our results with reviewed literature.

METHOD AND MATERIALS

Over the period from Jan 2005 to Dec 2013, 118 patients with 135 limbs were identified to have symptomatic primary large varicose veins (Criteria was SF junction diameter > 10 mm and saphenous vein > 8mm) were treated with this combined approach. Separate surgical ligation of each tributary at SF junction followed by ultrasound guided EVLT of rests of the lower limb large tributaries, duplicated veins and short saphenous vein (SSV) done by using 980-nm pulse wave Laser. Superficial subcutaneous tumescent injection of saline toprevent skin complications was used. Principal outcome measures were abolition of reflux, cosmetic improvement and improvement in Aberdeen Varicose Veins Symptome Score (AVVSS). Future followup on duplex ultrasound at week 1, months 1, 3, 6 then yearly for mean of 7 years.

RESULTS

The procedure was technically successful in all cases. Spot skin burns in 2, short term peri ankle parasthesia in 25, recurrent minor tributaries and spider veins in 12, 4 patients developed new parallel GSV. 2patient developed significant recurrence. All results were much better than only laser or only surgical or other combined methods reviewed in literature.

CONCLUSION

This combination therapy of intervention radiology and local surgery in treatment of large primary varicose veins appears to be very

effective and safe approach. The long term results are fairly better and more comparable. Its long term outcome is more superior and well accepted by patients than the other traditional methods compared from literature.

CLINICAL RELEVANCE/APPLICATION

Combined surgical and endovenous approach appears promising in good outcome in large primary varicose veins treatments. Large primary varicose veins of both lower limbs are aften associated with Sephano-femoral (S-F) junction diameter and saphenous vein diameter larger than 10 mm with multiple large varicose tributaries. These are notorious for recurrence even after intervention or surgical treatment. Hence combined intervention radiological and surgical approach was selected to obtain the best long term results.

Gastrointestinal (Rectal Cancer)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E450A

GI BQ CT MR

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

Participants

Marc J. Gollub, MD, New York, NY (*Moderator*) Nothing to Disclose Kedar Jambhekar, MD, Little Rock, AR (*Moderator*) Nothing to Disclose

Sub-Events

SSA07-01 Correlations of Extramural Vascular Invasion on Preoperative MRI with Local Lymph Node Metastasis in Rectal Cancer

Sunday, Nov. 29 10:45AM - 10:55AM Location: E450A

Participants

Liheng Liu, MD, Beijing, China (*Presenter*) Nothing to Disclose Erhu Jin, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Zhenghan Yang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Zhenchang Wang, MD, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the possibility of predicting local lymph node metastasis by extramural vascular invasion (EMVI) on preoperative MRI in patients with rectal cancer.

METHOD AND MATERIALS

MR images and clinical pathologic data of 183 consecutive patients with rectal cancer (between Dec. 2011 and Dec. 2014) were reviewed. MRI-detected extramural vascular invasion (mr-EMVI), with clinical pathologic factors (including age, gender, T stage, differentiation, size and pathological EMVI), were analyzed by chi-square crosstabs test (or t test) and multivariate logistic regression to determine risk factors for lymph node metastasis.

RESULTS

A total of 183 rectal cancer patients who underwent radical surgery were included in our study. Of them, 78 (42.6%) patients had lymph node metastasis according to pathology at the time of surgery. Among those clinical pathologic factors, T stage (odds ratio, 1.848), pathological EMVI (odds ratio, 4.878) and MRI-detected EMVI (odds ratio, 3.884) were independent risk factors for LNM. The incidence of LNM in the patients with pathological EMVI and MRI-detected EMVI was 78.7% and 75.4% respectively. By using pathological EMVI as a gold standard, sensitivity, specificity and agreement rate of MRI-detected EMVI were 61.7%, 82.3% and 77.0%.

CONCLUSION

MRI-detected EMVI could be used as a predictor for lymph node metastasis in patients with rectal cancer.

CLINICAL RELEVANCE/APPLICATION

This paper has shown that the lymph node status at the time of surgery in rectal cancer is related to preoperative MRI-detected extramural vascular invasion. The results may be useful for patients' selection for preoperative neoadjuvant therapy.

SSA07-02 Reproducibility of Evaluation of Invasion Depth of Rectal Cancer into the Mesorectal Fat: Can We Reliably Discern T3ab from T3cd Tumours?

Sunday, Nov. 29 10:55AM - 11:05AM Location: E450A

Participants

Monique Maas, MD, Maastricht, Netherlands (*Presenter*) Nothing to Disclose Jasenko Krdzalic, MD, MSc, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Doenja M. Lambregts, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Max Lahaye, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Janna B. Houwers, MD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Maria C. Ageitos Casais, MD, Santiago de Compostela, Spain (*Abstract Co-Author*) Nothing to Disclose Xubin Li, MD, PhD, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose Rianne Beckers, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Miriam van Heeswijk, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Geerard L. Beets, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Regina G. Beets-Tan, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

One of the important aspects of rectal cancer staging is the measurement of the invasion depth of a tumour into the mesorectal fat in millimetres. This determines whether there is a T3ab (<5mm) or T3cd (>5mm), which changes treatment for patients (CRT yes/no). Measurement of this factor is arbitrary. Aim was to evaluate reproducibility of the measurement of invasion depth into the mesorectal fat by different readers.

METHOD AND MATERIALS

Sixty-one patients with a pathologically proven T3 tumour were selected. Two readers with different experience in reading rectal

cancer MRI (2 years and 5 years) measured the maximal depth of invasion of tumour into mesorectal fat in the axial plane perpendicular to the tumour axis. Clock position of the measurement was registered. ICC and Bland-Altman plots were used for analyses.

RESULTS

Intraclass correlation coefficient was 0.61. The Bland-Altman plot showed a mean difference between measurements of 2.45 (SD 3.53) mm with limits of agreement of -4.45 to 9.39. Differences between measurements ranged from -9 to 15 mm. In 36% of patients the clock position of the measurements of both readers were was not in the same quadrant.

CONCLUSION

Reproducibility of measurement of invasion depth of tumour into the mesorectal fat is low, both with regard to the depth and to the location of the deepest invasion. Therefore, the distinction between T3ab and T3cd tumours is unreliable and should not be used for treatment decisions.

CLINICAL RELEVANCE/APPLICATION

The distinction between T3ab and T3cd tumours is deemed relevant to identify patients with a high risk tumor and administer neoadjuvant chemoradiation. Since measurement of invasion depth is only moderately reproducible, the use of this factor for risk and treatment stratification is questionable.

SSA07-03 Interobserver Variability in Interpretation of High Resolution MRI of Primary Rectal Cancer

Sunday, Nov. 29 11:05AM - 11:15AM Location: E450A

Participants

Ajaykumar C. Morani, MD, Houston, TX (*Presenter*) Nothing to Disclose Harmeet Kaur, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose Raghunandan Vikram, MBBS, FRCR, Houston, TX (*Abstract Co-Author*) Nothing to Disclose Y. N. You, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose Melissa W. Taggart, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose George J. Chang, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose Randy D. Ernst, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess interobserver variability in the interpretation of high resolution MRI scans for staging primary rectal cancer

METHOD AND MATERIALS

MRI of 22 randomly selected cases with known rectal cancer, were evaluated independently by 4 abdominal radiologists with approximately 2-4 years of experience in reading rectal MRI. Criteria evaluated included T stage and depth of tumor invasion separately assessed as measured in mm and < or > 5 mm, lymph node involvement and vascular invasion. The data was tabulated and interobserver agreement was calculated. For the small percentage of patients who went directly to surgery correlation with final pathology was performed.

RESULTS

There was wide range in interobserver agreement between 2 readers in different sets/combinations, ranging from 68-90% with overall complete agreement among all readers in only 68% of cases with respect to depth of tumor invasion which improved to 82%, if depth of tumor invasion was separated in <5 mm versus > 5 mm. 5 patients had undergone surgery immediately after MRI without preoperative chemoradiation. In these cases, individual reader accuracy for pT1/T2 versus T3 staging was 60-100% with overall mean accuracy of 80% among all readers. Agreement between 2 readers in different combinations, ranged from 68-81% with overall complete agreement among all readers in 54% of cases with respect to presence or absence of vascular invasion. Interobserver agreement was noted in 76-90% cases and complete agreement among all readers in 68% cases with respect to lymph node status.

CONCLUSION

High resolution MRI is now a widely accepted modality in the preoperative staging of primary rectal cancer. Inter-observer variability remains a significant limitation.

CLINICAL RELEVANCE/APPLICATION

High resolution MRI is now widely used for triaging patients directly to surgery or chemoradiation followed by surgery. However there is significant variation in the interpretation of key parameters. This should be recognized to avoid overtreatment or under-treatment of patients.

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/

Raghunandan Vikram, MBBS, FRCR - 2012 Honored Educator

SSA07-04 Value of MRI in Prediction of Metachronous Distant Metastasis after Curative Surgery in Patients with Rectal Cancer versus Clinical and Pathologic Outcomes

Sunday, Nov. 29 11:15AM - 11:25AM Location: E450A

Caiyuan Zhang, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose Dengbin Wang, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the risk factors for distant metastasis in patients with rectal cancer with MRI, clinical and pathologic outcomes.

METHOD AND MATERIALS

291 patients with surgico-pathologically confirmed rectal adenocarcinoma, who had undergone preoperative MRI before any treatment, were retrospectively collected. Preoperative MRI features (tumor location and size, MRI-TN stage, status of circumferential resection margin (CRM), lymphovascular invasion (LVI)), clinical characteristics (age, gender, preoperative CEA value), operation information (operation method, tumor location) and pathologic outcomes(pTN stage,status of pCRM, pLVI, nerve invasion(pNI), number of regional metastatic lymph nodes(pMLNNs), ratio of pMLN (pLNR),tumor grade) as well as immunohistochemical results were analyzed. Univariate and multivariate logistic regression models were performed to predict the risks of distant metastasis. The Kaplan-Meier method was used to analyze the disease-free survival (DFS) rate and 3-year overall survival (OS) rate.

RESULTS

Among 291 patients, 69 patients (23.7%) were confirmed to have distant metastasis. In univariate analysis, MRI-T stage (P=0.005), MRI-N stage (P<0.001), CEA value (P=0.007), pT stage (P<0.001), pN stage (P<0.001), pMLNNs (P<0.001), pLNR (P<0.001), tumor deposits (P=0.014), pLVI (P=0.005), pNI (P=0.003) correlated significantly with metachronous distant metastasis. In multivariate analysis, only preoperative CEA values (P=0.038, Exp(B)=2.102), pLNR(P<0.001, Exp(B)=23.780) and pT stage(P=0.005, Exp(B)=3.677) were independent risk factors for distant metastasis. The mean DFS period for both groups was significantly different (57.22±0.62 vs 18.88±1.98 months, P<0.001). The 3-year OS rate for patients with distant metastasis was 35.0% compared with 97.1% for those without distant metastasis (P<0.001).

CONCLUSION

Preoperative MRI provided limited value in prediction of metachronous distant metastasis in patients with rectal cancer as independent risk factor. Compared with MRI features, preoperative CEA values, pLNR and pT stage were independent risk factors. Patients with the risk factors should be closely followed up for monitoring the metachronous metastasis status in order to take measures for the hope of a good survival outcome.

CLINICAL RELEVANCE/APPLICATION

Compared with MRI features, CEA values, pLNR and pT stage were independent risk factors to predict metachronous distant metastasis in patients with rectal cancer.

SSA07-05 MRI Detected Tumor Response for Intermediate Stage Rectal Cancer(RC) Treated with Chemotherapy Predicts Disease Free Survival and Recurrence: A Collaborative Group Experience

Sunday, Nov. 29 11:25AM - 11:35AM Location: E450A

Participants

Uday B. Patel, MBBS, BSc, London, United Kingdom (Presenter) Nothing to Disclose Isidro Machado, Valencia, Spain (Abstract Co-Author) Nothing to Disclose Carlos Fernandez Martos, Valencia, Spain (*Abstract Co-Author*) Nothing to Disclose Rafael Estevan, Valencia, Spain (*Abstract Co-Author*) Nothing to Disclose Antonieta Salud, Lleida, Spain (Abstract Co-Author) Nothing to Disclose Maria Isabel Gil Garcia, Lleida, Spain (Abstract Co-Author) Nothing to Disclose Clara Montagut, Barcelona, Spain (Abstract Co-Author) Nothing to Disclose H Busto, Valencia, Spain (Abstract Co-Author) Nothing to Disclose Maria Rosa Safont, Sabadell, Spain (Abstract Co-Author) Nothing to Disclose Joan Maurel Santasusanaurel, Barcelona, Spain (Abstract Co-Author) Nothing to Disclose Juan R. Ayuso, MD, Barcelona, Spain (Abstract Co-Author) Nothing to Disclose J Aparicio, Madrid, Spain (Abstract Co-Author) Nothing to Disclose R Vera, Pamplona, Spain (Abstract Co-Author) Nothing to Disclose V Alonso, Zaragoza, Spain (Abstract Co-Author) Nothing to Disclose J Gallego, Elche, Spain (Abstract Co-Author) Nothing to Disclose M Martin, Barcelona, Spain (Abstract Co-Author) Nothing to Disclose C Pericay, Spain, Spain (Abstract Co-Author) Nothing to Disclose Eva Ballesteros JR, MD, Sabadell, Spain (Abstract Co-Author) Nothing to Disclose Jesus Santos Cores Santos Cores, Valencia, Spain (Abstract Co-Author) Nothing to Disclose Gina Brown, MD, MBBS, Sutton, United Kingdom (Abstract Co-Author) Nothing to Disclose

PURPOSE

'Intermediate risk' RC patients may benefit from neoadjuvant chemotherapy as staging MRI shows markers for distant disease but clear potential resection margins making local recurrence unlikely. This exhibit assesses MRI and pathological staging following neoadjuvant chemotherapy for intermediate risk RC in a prospectively enrolled multicenter phase II trial.

METHOD AND MATERIALS

The trial evaluated safety and efficacy of neoadjuvant Capecitabine, Oxliplatin and Bevacizumab(CAPOX-B). Forty-six patients were enrolled between 2009-11.Eligibility included baseline magnetic resonance(MR) showing a T3 tumour with mesorectal fascia (MRF) potentially clear.Baseline Nodal and Extra-mural venous invasion(EMVI) status was also recorded.Response was assessed by posttreatment MR and pathological T, N and EMVI status as well as Tumor regression grade(TRG).Additionally MR tumor length change,mrEMVI reversion and pathological T downstaging were recorded.Three-year disease free survival and recurrence were calculated using Kaplan-Meier.Cox proportional regression determined relationships between outcomes and all recorded imaging and pathology variables divided into good and poor responders.Three separate Cox-regression analyses were also performed for: baseline imaging, post-treatment imaging and pathology variables. Median follow-up was 36 months, fourteen patients experienced relapse. 3-year DFS was 69%. On Cox multivariate analysis including all factors mrEMVI(p=0.028) and T-downstaging(p=0.032) were independent prognostic factors for DFS. mrEMVI(p=0.040), T-downstaging(p=0.013) and ypN(p=0.041) were significant independent factors for recurrence.Significant univariate factors for DFS were: Baseline mrEMVI status(p=0.0001),mrEMVI reversion(p=0.003),post-treatment MR Tstaging(ymrT) (p=0.007),mrTRG(p=0.011),pathological nodal status(p=0.02) and Tdownstaging(p=0.0009).Significant univariate factors for recurrence were: mrEMVI(p=0.007),ymrT(p=0.008),mrTRG(p=0.019),Tdownstaging(p=<0.0001),ypN(p=0.002) and ypT(p=0.022).

CONCLUSION

Baseline MRI-EMVI is an independent prognostic factor for survival and recurrence in intermediate risk rectal cancer treated with neoadjuvant chemotherapy.

CLINICAL RELEVANCE/APPLICATION

Future randomised trials should evaluate primary chemotherapy verses standard treatment in patients with T3,MRF clear and mrEMVI positive disease.Moreover mrEMVI positive may be recommended as a stratification factor.

SSA07-06 Follow-up with MRI of Rectal Cancer Treated by TEM: Recurrence Detection and Inter-observer Reproducibility

Sunday, Nov. 29 11:35AM - 11:45AM Location: E450A

Participants

Monique Maas, MD, Maastricht, Netherlands (*Presenter*) Nothing to Disclose Britt Hupkens, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Milou Martens, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Jeroen Leijtens, Roermond, Netherlands (*Abstract Co-Author*) Nothing to Disclose Willem M. Deserno, MD,PhD, Almelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose Camille van Berlo, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Geerard L. Beets, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Regina G. Beets-Tan, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Small rectal cancers can be treated with transanal endoscopic microsurgery(TEM). Postoperative changes make follow-up with MRI challenging. Aim was to evaluate post-TEM-MRI at different time points for recurrence detection and assess interobserver-reproducibility.

METHOD AND MATERIALS

38 patients underwent TEM (8 after CRT). 122 MRIs were performed with a mean of 3 MRIs per patient. Seven patients had a recurrence. MRI was performed every 3-4 months during follow-up and consisted of T2W-MRI±DWI. MRIs were evaluated by readers with different experience by confidence level (CL) scoring for recurrence, reproducibility was evaluated with weighted kappa statistics.

RESULTS

For all MRIs AUC for recurrence detection was 0.79and0.73 for T2W-MRI and 0.69and0.76 for DWI. During follow-up AUC increased from 0.55-0.57 at the first MRI to 0.67-0.73 at subsequent MRIs for T2W-MRI. Interobserver-reproducibility was increased during FU for T2W-MRI from kappa 0.09 to 0.77. For DWI reproducibility was fair-good (kappa 0.49-0.61) which increased slightly during FU. Reproducibility also increased during FU from kappa 0.36 to 0.84. At the first MRI after TEM higher CL scores were given at DWI than at T2W-MRI, this difference disappeared as of the second MRI during FU. Number of equivocal scores decreased during FU. Iso-intensity in bowel wall and/or mesorectal fat were predictive for recurrence.

CONCLUSION

The first post-TEM MRI is difficult to assess. After the first MRI accuracy for recurrence detection increases dramatically, due to comparison with earlier studies. There is a learning curve during FU per patient leading to more certainty in readers. Reproducibility is fair-moderate, but increases during FU. Iso-intensity in bowel wall and/or mesorectal fat were predictive for recurrence.

CLINICAL RELEVANCE/APPLICATION

After TEM follow-up is crucial to detect recurrences. MRI is a feasible and reliable modality to perform follow-up after TEM to both detect luminal and nodal recurrences.

SSA07-07 Imaging Genomics of Colorectal Cancer: Patterns of Metastatic Disease at Time of Presentation Based on Mutational Status

Sunday, Nov. 29 11:45AM - 11:55AM Location: E450A

Participants

Cinthia Cruz, MD, Boston, MA (Presenter) Nothing to Disclose

James H. Thrall, MD, Boston, MA (*Abstract Co-Author*) Board Member, Mobile Aspects, Inc; Board Member, WorldCare International Inc; Consultant, WorldCare International Inc; Shareholder, Antares Pharma, Inc; Shareholder, iBio, Inc; Shareholder, Peregrine Pharmaceuticals, Inc

Debra A. Gervais, MD, Chestnut Hill, MA (Abstract Co-Author) Nothing to Disclose

PURPOSE

To identify the most frequent genetic traits associated with metastatic colorectal tumors at time of presentation and whether there is a correlation between the genotypes and the metastatic disease patterns.

METHOD AND MATERIALS

Retrospective review of 713 subjects with cross-sectional imaging at time of diagnosis with no previous treatment. All tumor samples were tested for Single Nucleotide Polymorphisms (SNP). Mutations can be present individually or coexisting. Z tests were

used to assess differences.

RESULTS

Three-hundred-ninety-seven males and 316 females. Metastatic disease in 547/713 (76), 385/487(79) mutants (M) and 162/226(72) wild types (WT) (p=0.02). Incidence of metastatic disease per genotype as follows: NRAS 31/35(89%), KRAS 213/244 (87%), APC 47/55(85%), TP53 142/170(84%), PIK3C 59/81 (73%), BRAF 56/79(71%) and WT (72%)162/226. Metastasis to the liver, lymphnodes (LN), peritoneum and lung were observed with all genotypes. Liver:LN proportion of involvement was seen as follows: KRAS 62:28 (p<0.001), BRAF 55:62, NRAS 71:58, TP53 63:59, PIK3C 69:49, APC 64:47 and WT 51:49. Metastatic site involvement exclusive to certain genotypes was observed: duodenum/kidneys/uterus/cervix/vagina: KRAS+TP53, Brain:TP53, Appendix: KRAS, Retroperitoneum:PIK3C/WT and Bladder/Pancreas/Prostate/Mediastinum: WT. All genotypes except for BRAF demonstrated bone metastasis.

CONCLUSION

Our study suggests there is an association between mutational status and patterns of metastatic disease in Colorectal Cancer. Metastatic disease to the bladder, pancreas, prostate and mediastinum in CRC suggests wild type tumors. A lower involvement of LN suggests the presence of KRAS mutation.

CLINICAL RELEVANCE/APPLICATION

Genetic profiling should guide the search for specific metastatic patterns allowing special consideration for unusual sites of involvement of metastatic disease to suggest the presence of a specific mutation.

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/

Debra A. Gervais, MD - 2012 Honored Educator

SSA07-08 The Application of 3.0T MR Intravoxel Incoherent Motion Imaging and Diffusion Weighed Imaging in Preoperative Diagnosis of Lymph Node Metastatic of Rectal Carcinoma

Sunday, Nov. 29 11:55AM - 12:05PM Location: E450A

Participants

Lin Qiu, Guangzhou, China (*Presenter*) Nothing to Disclose Xiang-Ran Cai, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose Sirun Liu, MSc, Guang-Zhou, China (*Abstract Co-Author*) Nothing to Disclose Meng Chen, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose You-Zhen Feng, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose Zhong-Ping Zhang, MMedSc, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the clinical value of Intravoxel Incoherent Motion imaging (IVIM) sequence in the diagnosis of lymph node metastatic of rectal carcinoma.

METHOD AND MATERIALS

87 lymph nodes from sixty-two rectal carcinoma patients with IVIM sequence

(b=0,25,50,75,100,150,200,400,600,800,1000,1200,1500 and 2000 s/mm2) at 3.0T MR scanner and pathology data were collected. The parameter of IVIM(standard ADC, D, D* and f values) and the DWI signal strength value with b=1000 s/mm2 (S1000) in non-metastatic lymph nodes and metastatic lymph nodes were measured and calculated. Pathology findings and MR sequence were compared. The difference of metastatic lymph nodes and non-metastatic lymph nodes were compared by paired-samples t test.

RESULTS

There were 25 metastatic lymph nodes was found in 62 patients. The standard-ADC= $(0.795 \pm 0.23) \times 10-3 \text{ s/mm2}, D= (0.649 \pm 0.11) \times 10-3 \text{ s/mm2}, D^* = (4.79\pm 2.38) \times 10-3 \text{ s/mm2}, f=(0.27\pm 0.09) \%$ and =348.25±26.74 in the metastatic lymph nodes ;the standard-ADC= $(0.995 \pm 0.34) \times 10-3 \text{ s/mm2}, D= (0.787 \pm 0.19) \times 10-3 \text{ s/mm2}, D^* = (4.86\pm 5.40) \times 10-3 \text{ s/mm2}, f=(0.33\pm 0.33) \%$ and S1000 =211.75±35.66 in non-metastatic lymph nodes. The difference of standard-ADC value(t=31.92,p<0.01), D(t=17.63,p=0.02) and S1000 (t=18.92,p<0.01) were statistically significant in the metastatic lymph nodes and non-metastatic lymph nodes;the standard-ADC value, D value and S1000 value of metastatic lymph nodes were higher than non-metastatic lymph nodes.

CONCLUSION

IVIM sequence can reveal standard ADC, D, D* , f and signal strength values ,they are helpful for diagnose metastatic lymph node.

CLINICAL RELEVANCE/APPLICATION

IVIM sequence is helpful for diagnose metastatic lymph node.

SSA07-09 CT Texture Analysis in Patients with Locally Advanced Rectal Cancer Treated with Neoadjuvant Chemoradiotherapy: A Potential Imaging Biomarker for Treatment Response and Prognosis

Sunday, Nov. 29 12:05PM - 12:15PM Location: E450A

Participants

Choong Guen Chee, MD, Seongnam, Korea, Republic Of (*Presenter*) Nothing to Disclose Young Hoon Kim, MD, PhD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Bohyoung Kim, PhD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Soyeon Ahn, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Kyoung Ho Lee, MD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Yoon Jin Lee, MD, Seongnam-si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Ji Hoon Park, MD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Research Grant, Bracco Group

PURPOSE

To evaluate the association of texture of locally advanced rectal cancer in computed tomography (CT) with neoadjuvant concurrent chemoradiotherapy treatment (CRT) response and 3-year disease-free survival (DFS).

METHOD AND MATERIALS

Institutional review board approved this retrospective study and waived the requirement of informed patient consent. 95 consecutive patients who had neoadjuvant CRT followed by surgery for locally advanced rectal cancer have been included. Texture features were assessed with pretreatment CT scans by using independently developed software. Entropy, uniformity, kurtosis, skewness, and standard deviation were obtained from the largest axial image of the tumor (its boundary being manually drawn), without filtration and with Laplacian of Gaussian spatial filter of various filter values for fine (1.0), medium (1.5 and 2.0), and coarse (2.5) textures. Dworak pathologic grading was used for treatment response. Mean value of each texture parameter was compared between treatment responder (grade 3 and 4) and non-responder (grades 1 and 2) groups via independent t-test. Kaplan-Meier analysis was used to find the relationship between CT texture and 3-year DFS. Receiver operating characteristic curve was performed to determine the optimal threshold values. Using Cox proportional hazards model, independence of texture parameters from patient's stage and age was assessed.

RESULTS

Treatment responder group (n = 32) showed fine-texture features (lower entropy, higher uniformity, and lower standard deviation) with statistical significance in no filtration, and fine (1.0) and medium (1.5) filter values. Without filtration, Kaplan-Meier survival plots for entropy, uniformity, and standard deviation were significantly different (P = .03, P = .016, and P = .033) and fine-texture features (≤ 6.7 for entropy, > 0.0100 for uniformity, and ≤ 28.06 for standard deviation) were associated with higher 3-year DFS. Entropy, uniformity, and standard deviation were independent factors from the cancer stage and age in 3-year DFS (P = .033, P = .011, and P = .04).

CONCLUSION

Fine-texture features are associated with better neoadjuvant CRT response and higher 3-year DFS in patients with locally advanced rectal cancer.

CLINICAL RELEVANCE/APPLICATION

Our study implies the possibility of texture analysis as an imaging biomarker for the treatment response of neoadjuvant CRT and 3year DFS in locally advanced rectal cancer.

ISP: Gastrointestinal (HCC)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E450B



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

Participants

Shahid M. Hussain, MD, PhD, Omaha, NE (*Moderator*) Nothing to Disclose Mustafa R. Bashir, MD, Cary, NC (*Moderator*) Research support, Siemens AG; Research support, Bayer AG; Research support,

Guerbet SA; Research support, General Electric Company; Consultant, Bristol-Myers Squibb Company

Sub-Events

SSA08-01 Gastrointestinal Keynote Speaker: Update on HCC Screening with Imaging

Sunday, Nov. 29 10:45AM - 10:55AM Location: E450B

Participants

Shahid M. Hussain, MD, PhD, Omaha, NE (Presenter) Nothing to Disclose

SSA08-02 Performances of Imaging for the Diagnosis of Small HCC Following the Recommendations of the European and American Association for the Study of the Liver

Sunday, Nov. 29 10:55AM - 11:05AM Location: E450B

Participants

Christophe Aube, MD, PhD, Angers, France (*Presenter*) Speaker, Bayer AG Support, General Electric Company Valerie Vilgrain, MD, Clichy, France (*Abstract Co-Author*) Nothing to Disclose Julie Lonjon, Montpellier, France (*Abstract Co-Author*) Nothing to Disclose Olivier Seror, Bondy, France (*Abstract Co-Author*) Consultant, Angiodynamics, Inc; Consultant, Olympus Corporation; Consultant, Bayer AG Ivan Bricault, PhD, Grenoble, France (*Abstract Co-Author*) Medical Advisory Board, IMACTIS Agnes Rode, MD, Lyon, France (*Abstract Co-Author*) Nothing to Disclose Christophe Cassinotto, MD, Pessac, France (*Abstract Co-Author*) Nothing to Disclose

Frederic Oberti, MD, PhD, Angers, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate, in a large population of patients with chronic liver disease, the performances of the different imaging techniques (contrast enhanced ultrasound (CEUS), CT scanner and MRI) alone and in combinations for the characterisation of hepatic nodules smaller than 3cm. This study was supported by a national institutional grant (PHRC 2008)

METHOD AND MATERIALS

From April 2010 to April 2013, 442 patients with a chronic liver disease have been prospectively included in 16 centres. They had 1 to 3 nodules 10 to 30 mm explored by CEUS, CT scanner and a MRI within a month. The examination was regarded as positive if the nodule displayed the typical landmark of HCC as defined by the European and American Association for the Study of the Liver (EASL and AASLD) recommendations. A composite gold standard was constructed with histology, imaging and follow up. We determined sensitivity and specificity for a given exam alone and for various combinations of exams as single tests. Results were given regarding the size of the nodules: 10-20mm and 20-30 mm.

RESULTS

382/442 patients with 551 nodules have been finally kept for the statistical analysis. They were 315 (82.46%) males; the mean age was 62.06 +/- 9.73 years. The causes of the chronic liver disease were mainly alcohol (58.12%), C virus (31.41%) and metabolic syndrome (19.11%). The mean size of the nodules was 18.15 +/- 5.74mm.For the 10 - 20mm nodules (n=347) sensibility for the diagnosis of HCC was 70.2% for MR, 67.6% for CT scanner and 39.9% for the CEUS; and the specificity was respectively 83.1%, 76.6% and 93.5%. For the 20 - 30mm nodules (n=204) sensibility for the diagnosis of HCC was 70.5% for MR, 67.5% for CT scanner and 52.4% for the CEUS; and the specificity was respectively 97.3%, 97.3% and 100%.For the 10 - 20mm nodules the sensibility and specificity were respectively 54.8% and 100% for the association of CT + MR; 27.7% and 100% for CT + CEUS; and 28.7% and 99.4% for MR and CEUS

CONCLUSION

This study validates the use of sequencial application of CT and MRI as recommended in the recent update of EASL and AASLD guidelines, in case of small HCC and in a large population. It shows the potential interest of CEUS for its high specificity. This study is part of the CHIC group.

CLINICAL RELEVANCE/APPLICATION

Recent updates of EASL and AASLD recommendations for the non invasive diagnosis of HCC are validated for the small HCC in a large population.

SSA08-03 Non-invasive Diagnostic Criteria of Hepatocellular Carcinoma: Comparison of Diagnostic Accuracy of Updated LI-RADS with Clinical Practice Guidelines of OPTN-UNOS, AASLD, NCCN, EASL-EORTC, and KLCSG-NCC

Sunday, Nov. 29 11:05AM - 11:15AM Location: E450B

Participants Burcu Akpinar, MD, Aurora, CO (*Presenter*) Nothing to Disclose Samuel Chang, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose Jeffrey Kaplan, MD, Aurora, CO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively compare the diagnostic accuracy of different noninvasive diagnostic criteria of hepatocellular carcinoma (HCC) by LI-RADS, OPTN-UNOS, AASLD, NCCN, EASL-EORTC, KLCSG-NCC

METHOD AND MATERIALS

We reviewed the medical records of 2,210 patients who had undergone biopsy, resection, or explantation of liver from January 2011 to November 2013 in our institution. Ninety three patients (M:F=69:24; mean age: 54.8, range 30-77) with chronic hepatitis B and/or cirrhosis for any etiology who had focal hepatic lesions \geq 5 mm reported on dynamic contrast enhanced CT or MR were included. The focal hepatic lesions treated prior to imaging were excluded. A total of 144 lesions were finally included in our study with 73 lesions \geq 2 cm, 55 lesions between 1-2 cm, and 16 lesions < 1 cm. The focal hepatic lesions were retrospectively evaluated on CT or MR by use of different noninvasive diagnostic criteria of HCC including LI-RADS (2014), OPTN-UNOS, AASLD, NCCN, EASL-EORTC, and KLCSG-NCC. Using the pathology reports as a gold standard, sensitivity, specificity, and accuracy of the diagnostic criteria were analyzed.

RESULTS

The sensitivity was highest and equal with AASLD, NCCN, EASL-EORTC and KLCSG-NCC criteria (84.4%), followed by LI-RADS (77.9%) and OPTN-UNOS criteria (75.3%). The specificity was highest with OPTN-UNOS criteria (92.5%), followed by LI-RADS (90.0%), AASLD, NCCN, EASL-EORTC and KLCSG-NCC (82.1%). The accuracies were 83.3%, equal for all noninvasive diagnostic criteria.

CONCLUSION

AASLD, NCCN, EASL-EORTC and KLCSG-NCC had the highest sensitivity whereas OPTN-UNOS had the highest specificity among all six guidelines. LI-RADS could not provide higher specificity than OPTN-UNOS criteria or high sensitivity than AASLD or EASL criteria.

CLINICAL RELEVANCE/APPLICATION

Though LI-RADS 2014 is widely used by radiologists, it provides lower specificity than OPTN-UNOS criteria as well as lower sensitivity than AASLD or EASL criteria for noninvasive diagnosis of HCC.

SSA08-04 Prognostic Stratification of Patients with Hepatocellular Carcinoma Undergoing Curative Resection: Comparison of Preoperative MRI Staging and Postoperative American Joint Committee on Cancer Staging Systems

Sunday, Nov. 29 11:15AM - 11:25AM Location: E450B

Participants

Chae Jung Park, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose Chansik An, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Yeun Yoon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Yong Eun Chung, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Jin-Young Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Myeong-Jin Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To devise a preoperative staging system for hepatocellular carcinoma (HCC) undergoing resection using magnetic resonance imaging (MRI) findings, and to compare its prognostic ability with that of the American Joint Committee on Cancer (AJCC) staging.

METHOD AND MATERIALS

A total of 175 consecutive patients with HCC who underwent curative hepatic resection after preoperative MRI between January 2000 and December 2007 were analyzed. We devised an MRI staging system based on the number of nodules, a size criterion of 2 cm, gross vascular invasion, and two MRI features (rim enhancement and peritumoral parenchymal enhancement in the arterial phase) which were reported to be associated with worse prognosis after curative resection of HCC. In the devised MRI staging, instead of microvascular invasion which is used by the AJCC staging system, a size criterion of 2 cm was used to differentiate tumor stages 1 and 2. Each tumor stage was further divided into two substages; if both of the MRI features were absent, a patient was staged as T1a, 2a, or 3a, but staged as T1b, 2b, or 3b if any of these were present. Disease-free survival of both staging systems was analyzed using the Kaplan-Meier method with log-rank testing.

RESULTS

Both MRI and AJCC staging systems were excellent for predicting disease-free survival across different tumor stages 1, 2 and 3. Of 175 patients, 29 (16.6%), 6 (3.4%), 77 (44%), 51(29%), 6 (3.5%), and 6 (3.5%) were staged as T1a, T1b, T2a, T2b, T3a, and T3b by the preoperative MRI staging system, respectively. Disease-free survival was significantly different between T1 and T2a (median, 1925 days vs. 1668 days; P=0.048), between T2a and T2b (median, 1668 days vs. 799 days; P=0.0021), and between T2b and T3 (median survival, 799 days vs. 141 days; P=0.0015). However, no significant difference was found in disease-free survival between T1a and T1b, and between T3a and T3b.

CONCLUSION

Preoperative MRI staging system may be comparable to the postoperative AJCC staging system in predicting prognosis following

curative resection of HCC. Furthermore, tumor stage 2 of the MRI staging system may be further divided into T2a and T2b.

CLINICAL RELEVANCE/APPLICATION

These advantages (preoperative staging and further stratification of T2 into T2a/b) can make the devised MRI staging useful in deciding on treatment plans of patients with HCC.

SSA08-05 Utilising the Full Potential of MRI in the Diagnosis of HCC - Time for a Game Changer?

Sunday, Nov. 29 11:25AM - 11:35AM Location: E450B

Participants

Kelvin Cortis, MD, FRCR, Msida, Malta (*Presenter*) Nothing to Disclose Rosa Liotta, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose Roberto Miraglia, MD, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose Settimo Caruso, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose Fabio Tuzzolino, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose Angelo Luca, MD, Palermo, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The current cornerstone of HCC diagnosis is the wash-in/wash-out enhancement pattern. It is known that HCC might exhibit other MRI findings. Our aim was to retrospectively review the MRIs of histologically proven HCCs on liver explants, and to identify the best combination of sequences useful in HCC diagnosis.

METHOD AND MATERIALS

97 consecutive patients who underwent liver transplantation between 2004 and 2012 and Gd-BOPTA-MRI within 3 months of surgery were enrolled. A hepatobiliary histopathologist and two radiologists blinded to the radiological/histopathological findings performed a nodule by nodule analysis. The signal intensity of all nodules was assessed on the following axial sequences: T1 in/opposed phase, 3D fat suppressed (FS) T1 (pre-contrast, arterial, portal, equilibrium, and hepatobiliary phases), T2, T2 FS, and diffusion (B=800). Arterial enhancement was graded as none, mild, moderate, or intense. A multiple logistic regression analysis was performed following pathological/radiological correlation, and the Odds Ratio (OR) was calculated for every parameter analysed and adjusted for nodule size.

RESULTS

Imaging was performed 41.7±25.4 days pre-transplantation. 291 lesions were identified on histopathology, of which 193 were HCCs, 68 regenerative nodules, 8 low-grade dysplastic nodules (DN), 19 high-grade DNs, 2 cholangiocarcinomas, and 1 necrotic nodule. 48 HCCs (24.9%) were not detectable on imaging (24.9%), leaving a total of 145 HCCs (\leq 10 mm n=25;11-19 mm n=58; \geq 20 mm n=62).As expected, intense (OR 10.9, p<0.000) or moderate (OR 2.2, p=0.003) arterial enhancement and hypointensity on the portal venous (OR 14.3, p<0.000) or equilibrium (OR 15.9, p<0.000) phases were found to predict HCC.In addition, nodules showing hypointensity on the hepatobiliary phase and T2 hyperintensity were also highly likely to represent HCC. In the former, an OR of 10.2 was observed (p<0.000). The OR was 14.3 in non-FS T2 weighted sequences, and 10.2 in FS T2 weighted sequences (p<0.000).

CONCLUSION

In patients with a high risk of HCC, nodules lacking the typical hemodynamic findings are most likely HCC if they exhibit T2 hyperintensity and/or hypointensity on the hepatobiliary phase with an OR of 14.3 and 10.2, respectively (p<0.000).

CLINICAL RELEVANCE/APPLICATION

MRIs targeted at diagnosing HCC should include T2 weighted sequences with and without FS and Gd-BOPTA/Gd-EOB-enhanced hepatobiliary phases alongside standard sequences.

SSA08-06 A Tumor Suppression Factor HNF4a (Hepatocyte Nuclear Factor) Expression Correlates with Gadoxetic Acid Enhanced MRI Fndings in Hepatocellular Carcinoma

Sunday, Nov. 29 11:35AM - 11:45AM Location: E450B

Participants

Azusa Kitao, Kanazawa, Japan (*Presenter*) Nothing to Disclose Osamu Matsui, MD, Kanazawa, Japan (*Abstract Co-Author*) Research Consultant, Kowa Company, Ltd Research Consultant, Otsuka Holdings Co, Ltd Research Consultant, Eisai Co, Ltd Speakers Bureau, Bayer AG Speakers Bureau, Eisai Co, Ltd Norihide Yoneda, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Kazuto Kozaka, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Satoshi Kobayashi, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Toshifumi Gabata, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Kotaro Yoshida, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Dai Inoue, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Testuya Minami, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Wataru Koda, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose Junichiro Sanada, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Hepatocyte nuclear factor (HNF) 4A is one of transcription factors with tumor suppression effect, and besides, regulates expression of many molecules including organic anion transporting polypeptide (OATP) 1B3 (uptake transporter of gadoxetic acid) in hepatocellular carcinoma (HCC) (Yamashita T, Hepatology 2014). The purpose of this study is to clarify the correlation between HNF4A expression, pathological findings and imaging findings on gadoxetic acid enhanced MRI.

METHOD AND MATERIALS

The subjects are 138 surgically resected HCCs. We semiquantitatively evaluated the immunohistochemical HNF4A and OATP1B3 expression of HCC into four grades: grade 0: no expression, grade 1: weak expression, grade 2: moderate expression and grade 3:

intensive expression. We compared HNF4A grade of HCCs with OATP1B3 grade, enhancement ratio on the hepatobiliary phase of gadoxetic acid enhanced MRI and histological tumor differentiation grade (well, moderately and poorly differentiated HCC).

RESULTS

HNF4A grade in HCC showed a significant positive correlation with OATP1B3 grade (P=0.003, r=0.46). There was also a significant positive correlation between HNF4A grade and enhancement ratio on the hepatobiliary phase of gadoxetic acid enhanced MRI (P<0.0001, r=0.49). Especially, intensive HNF4A expression was observed in atypical HCC showing high enhancement ratio and increased OATP1B3 expression. HNF4A grade was decreased according to the decline of differentiation grade of HCC (P=0.0007, r=0.29).

CONCLUSION

The expression of HNF4A in HCC correlated with both of OATP1B3 expression and enhancement ratio on the hepatobiliary phase of gadoxetic acid enhanced MRI. In addition, HNF4A expression was decreased during multistep hepatocarcinogenesis. Gadoxetic acid enhanced MRI is useful to evaluate the expression of HNF4A in HCC.

CLINICAL RELEVANCE/APPLICATION

Gadoxetic acid enhanced MRI has a potential to reflect the expression of many genes and molecules regulated by HNF4A as imaging biomarkers (radiogenomics), which will be important for future personalized medicine.

SSA08-07 Presence of Hypovascular and Hypointense Nodules on Preoperative Gadoxetic Acid-enhanced MR Imaging: An Important Risk Factor for Recurrence after Liver Resection for Hypervascular Hepatocellular Carcinoma

Sunday, Nov. 29 11:45AM - 11:55AM Location: E450B

Participants

Katsuhiro Sano, MD, PhD, Chuo, Japan (*Presenter*) Nothing to Disclose Tomoaki Ichikawa, MD, PhD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose Tatsuya Shimizu, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose Utaroh Motosugi, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose Hiroyuki Morisaka, MD, Kofu, Japan (*Abstract Co-Author*) Nothing to Disclose Shintaro Ichikawa, MD, Chuo-Shi, Japan (*Abstract Co-Author*) Nothing to Disclose Hiroshi Onishi, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose Masanori Matsuda, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose Hideki Fujii, MD, Tamaho, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The hepatocyte phase (HP) of gadoxetic acid-enhanced magnetic resonance imaging (EOB-MRI) can reveal numerous hypovascular and hypointense nodules with malignant potential, which may progress to conventional hypervascular hepatocellular carcinoma (HCC). We retrospectively evaluated the prognostic factors for patients with hypervascular HCC after liver resection, including the presence of hypovascular hypointense nodules on HP of EOB-MRI (hypo-nodule).

METHOD AND MATERIALS

In total, 114 consecutive patients who had undergone surgical resection and were pathologically diagnosed with moderately differentiated HCC were included. For the analysis of risk factors for recurrence and a poor survival rate after liver resection, univariate and multivariate Cox regression analyses were performed for the following factors: age, tumor size, tumor number, vascular invasion, TNM stage, albumin level, prothrombin ratio, Child-Pugh class, alpha-fetoprotein level, protein induced by vitamin K absence/antagonist-II (PIVKA-II), liver cirrhosis, past history of HCC, and presence of hypo-nodules on HP of preoperative EOB-MRI. We compared the 5-year recurrence-free and overall survival rates between patients with and without hypo-nodules on HP of EOB-MRI.

RESULTS

Univariate and multivariate analyses revealed the presence of hypo-nodules as the only significant risk factor for recurrence after liver resection (risk ratio, 2.1 and 2.1; p-value, 0.014 and 0.020) and albumin level as the only significant risk factor for a poor survival rate (risk ratio, 10.3 and 6.1; p-value, <0.001 and 0.019). The 5-year recurrence-free rate was significantly lower for patients with hypo-nodules (13.1%) than for those without (48.8%; p = 0.008); similar results were observed for the 5-year survival rate (66.1% vs. 83.4%), although the difference was not significant (p = 0.222).

CONCLUSION

The presence of hypo-nodules on HP of preoperative EOB-MRI is an important risk factor for recurrence after liver resection for hypervascular HCC.

CLINICAL RELEVANCE/APPLICATION

The presence of hypovascular and hypointense nodules on hepatocyte phase of preoperative gadoxetic acid-enhanced MR imaging is an important risk factor for recurrence after liver resection for hypervascular hepatocellular carcinoma.

SSA08-08 Hepatocellular Carcinoma without Gadoxetic Acid Uptake on Preoperative MR Imaging: An Important Prognostic Risk Factor after Liver Resection

Sunday, Nov. 29 11:55AM - 12:05PM Location: E450B

Participants

Tatsuya Shimizu, MD, Yamanashi, Japan (*Presenter*) Nothing to Disclose Katsuhiro Sano, MD, PhD, Chuo, Japan (*Abstract Co-Author*) Nothing to Disclose Tomoaki Ichikawa, MD, PhD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose Utaroh Motosugi, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose Hiroyuki Morisaka, MD, Kofu, Japan (*Abstract Co-Author*) Nothing to Disclose Shintaro Ichikawa, MD, Chuo-Shi, Japan (*Abstract Co-Author*) Nothing to Disclose

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Hiroshi Onishi, MD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
Masanori Matsuda, MD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
Hideki Fujii, MD, Tamaho, Japan (Abstract Co-Author) Nothing to Disclose
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PURPOSE

Hepatocellular carcinomas (HCCs) commonly demonstrate hypointensity compared with the surrounding liver parenchyma on the hepatocyte phase (HP) of gadoxetic acid-enhanced MR imaging (EOB-MRI). However, some hypervascular HCCs with gadoxetic acid (EOB) uptake demonstrate iso- or hyperintensity on HP. Such lesions are known to be biologically less aggressive. A previous study showed a lower recurrence rate for hyperintense HCC than for hypointense HCC. In this study, we retrospectively evaluated the overall survival rate for patients with hyperintense and hypointense HCC on EOB-MRI.

METHOD AND MATERIALS

In total, 114 consecutive patients with moderately differentiated HCC that was surgically resected from January 2008 to December 2013 were included in this study. According to their signal intensity on HP of EOB-MRI, the 114 patients were classified as EOB uptake (+) HCC (n = 23) and EOB uptake (-) HCC (n = 91). Risk factors for recurrence and a poor survival rate after liver resection were analyzed by univariate and multivariate Cox regression analyses of the following factors: age, tumor size, tumor number, vascular invasion, TNM stage, albumin level, prothrombin ratio, Child-Pugh class, alpha-fetoprotein level, protein induced by vitamin K absence/antagonist-II (PIVKA-II), liver cirrhosis, past history of HCC, and EOB uptake on HP of preoperative EOB-MRI. Then, we calculated the overall survival and recurrence-free rates for both groups using Kaplan-Meier survival curves. The log-rank and Wilcoxon tests were used to analyze significant differences.

RESULTS

The absence of EOB uptake was found to be a significant risk factor for a poor survival rate after liver resection (risk ratio, 5.4; p < 0.05). The EOB uptake (+) group showed a higher overall survival rate compared with the EOB uptake (-) group (5-year survival rate, 100% and 73.3%; p < 0.05). However, the recurrence-free rate was not significantly different (p = 0.70).

CONCLUSION

The absence of EOB uptake was a significant risk factor for a poor survival rate after liver resection. The overall survival rate was higher for patients with EOB uptake than for those without.

CLINICAL RELEVANCE/APPLICATION

In patients with moderately-differentiated hepatocellular carcinoma, the absence of gadoxetic acid uptake is a significant risk factor for a poor survival rate after liver resection. The overall survival rate is higher for patients with gadoxetic acid uptake than for those without.

SSA08-09 Dual Energy Spectral CT Imaging for the Evaluation of Small Hepatocellular Carcinoma Microvascular Invasion

Sunday, Nov. 29 12:05PM - 12:15PM Location: E450B

Participants

Yang Chuangbo, MMed, Xianyang City, China (*Presenter*) Nothing to Disclose Chenglong Ren, Shanxi, China (*Abstract Co-Author*) Nothing to Disclose Xirong Zhang, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose Haifeng Duan, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose Lei Yuxin, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose Ma Chunling, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose Taiping He, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose Tian Xin, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate small hepatocellular carcinoma microvascular invasion using dual energy spectral CT imaging.

METHOD AND MATERIALS

This study was approved by our ethics committee. We retrospectively analyzed the images of 50 patients with 56 small hepatocellular carcinoma who underwent preoperative contrast enhanced dual-phase spectral CT scans before surgical resection. Tumors were divided into two groups based on the pathological findings for analysis: with (n=37) and without (n=19) microvascular invasion. Iodine concentration (IC) for tumors was measured in arterial phase (AP) and venous phase (VP) on the iodine-based material decomposition images to calculate IC reduction rate (ICrr) between AP and VP. IC values were further normalized to that of aorta to obtain normalized IC (NIC). Tumor CT attenuation number was measured on the monochromatic image sets to generate spectral HU curve and to calculate a slope (k) for the curve: (CT(40keV)-CT(90keV))/50. Values of the 2 pathological groups were compared and ROC study was performed to assess the differential diagnosis performance.

RESULTS

The IC, NIC, ICrr and slope (k) values in AP for tumors with microvascular invasion(Fig 2A-2C) were significantly higher than those without microvascular invasion(Fig 1A-1C) (2.40 ± 0.80 mg/ml vs. 1.68 ± 0.47 mg/ml for IC; 0.22 ± 0.06 vs. 0.16 ± 0.05 for NIC; 0.27 ± 0.16 vs. 0.01 ± 0.25 for ICrr; and 3.28 ± 1.08 vs. 2.27 ± 0.63 for slope, all p<0.05)(Table 1). Using the normalized iodine concentration value of 0.18 in AP as a threshold, one could obtain an area-under-curve of 0.82 for ROC study with sensitivity of 82.4% and specificity of 70.0% for differentiating small hepatocellular carcinoma with and without microvascular invasion. These values were significantly higher than the sensitivity of 64.7% and specificity of 69.2% with conventional CT numbers at 70keV(Table 2).

CONCLUSION

Using quantitative parameters obtained in spectral CT in the arterial phase provides new method with high accuracy to evaluate small hepatocellular carcinoma microvascular invasion.

CLINICAL RELEVANCE/APPLICATION

Quantitative iodine concentration measurement in spectral CT may be used to provide a new method to evaluate small

hepatocellular carcinoma microvascular invasion.

Oncodiagnosis Panel: Hodgkin Lymphoma: Current Controversies

Sunday, Nov. 29 10:45AM - 12:15PM Location: E353C

ΟΙ

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

Participants

Stephanie A. Terezakis, MD, Baltimore, MD (*Moderator*) Speaker, Elekta AB Karen M. Winkfield, MD, PhD, Boston, MA, (kwinkfield@partners.org) (*Presenter*) Consultant, Novartis AG Satish P. Shanbhag, MBBS, MPH, Baltimore, MD (*Presenter*) Nothing to Disclose Steve Cho, MD, Madison, WI, (scho@uwhealth.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the role of computed tomography (CT) and positron emission tomography (PET)/CT in the management of patients with Hodgkin and non-Hodgkin lymphoma. 2) To review the new Lugano Classification:Recommendations for Initial Evaluation, Staging, and Response Assessment of Hodgkin and Non-Hodgkin Lymphoma. 3) To assess the limitations and potential of PET/CT and PET/MR in assessing lymphoma evaluation and treatment response.

ABSTRACT

FDG PET/CT and contrast-enhanced CT both play an important role in lymphoma, for initial evaluation, staging and assessing response to therapy. In this session we will review the current and evolving role of imaging in lymphoma and demonstrate how it guides therapy in this patient population. The limitations and future developments of PET imaging in the context of PET/CT and PET/MRI will be addressed and discussed.

URL

Musculoskeletal (Interventional)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E451B



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

FDA Discussions may include off-label uses.

Participants

Michael G. Fox, MD, Charlottesville, VA (*Moderator*) Stockholder, Pfizer Inc; Mary Kristen Jesse, MD, Denver, CO (*Moderator*) Nothing to Disclose

Sub-Events

SSA13-01 Fluoroscopic Guided Sacroiliac Joint Injections - Comparison of Intra-articular and Peri-articular Injections on Immediate and Short-term Pain Relief

Sunday, Nov. 29 10:45AM - 10:55AM Location: E451B

Participants

Nicholas C. Nacey, MD, Charlottesville, VA (*Presenter*) Nothing to Disclose James Patrie, MS, Charlottesville, VA (*Abstract Co-Author*) Nothing to Disclose Michael G. Fox, MD, Charlottesville, VA (*Abstract Co-Author*) Stockholder, Pfizer Inc;

PURPOSE

To determine if intra-articular sacroiliac (SI) joint injections provide greater immediate and short-term pain relief compared to periarticular SI joint injections.

METHOD AND MATERIALS

All fluoroscopic guided SI joint injections targeting the inferior 1 cm of the SI joint, performed over a 4-year period, were identified. All patients were injected with 2.5 mL of Bupivacaine and 20 mg (0.5 mL) of triamcinalone. Patients were excluded if another triamcinalone dose or a different steroid/anesthetic combination was used, or if either the pre-injection, immediate (5-10 minute) post-injection, or 1-week post-injection pain score was not recorded. Two MSK radiologists with 2 and 13 years post-fellowship experience independently retrospectively reviewed the fluoroscopic images to determine intra-articular or peri-articular placement. Univariate and multivariate statistical analysis was performed.

RESULTS

169 patients (114F:55M; mean age 60.9 years) met the inclusion criteria with 88 intra-articular and 81 periarticular injections. Pre, immediate and 1-week post-injection pain scores for the intra-articular and periarticular injections were 6.2/2.0/4.1 and 6.0/2.3/4.2, respectively. Immediate and 1-week post-injection pain reduction was statistically significant in both groups (p= <0.001). After adjusting for age, gender, pre-pain level, time of year, and reason for exam there was no significant difference in the pre-injection to immediate post-injection change in pain between intra-articular and periarticular injections (mean change 0.35, p=0.30) or in the pre-injection to 1-week postinjection change in pain (mean change 0.03, p=0.92). Geometric mean fluoro time was 27 sec for intra-articular injections and 42 sec for periarticular injections (p<0.001).

CONCLUSION

Both intra-articular and periarticular SI joint injections provide statistically significant immediate and 1-week post-injection pain relief. However, there was no significant difference in the degree of pain relief provided by intra-articular and peri-articular injections.

CLINICAL RELEVANCE/APPLICATION

Since similar pain relief was provided with intra-articular and periarticular SI joint injections, fluoroscopy is an adequate method for performing most SI joint injections.

SSA13-02 Ten Years' Experience in Combined Intradiscal and Periradicular Injection of Medical Ozone and Periradicular Administration of Steroids and Anesthetic for the Treatment of Lumbar Disk Herniation: Effects on Disk Size and Lumbar Radiculopathy in 437 Patients

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Sunday, Nov. 29 10:55AM - 11:05AM Location: E451B
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Participants

Thomas Lehnert, MD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose Nagy N. Naguib, MD, MSc, Frankfurt Am Main, Germany (*Presenter*) Nothing to Disclose Julian L. Wichmann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Josef Matthias Kerl, MD, Frankfurt, Germany (*Abstract Co-Author*) Research Consultant, Siemens AG Speakers Bureau, Siemens AG Ralf W. Bauer, MD, Frankfurt, Germany (*Abstract Co-Author*) Research Consultant, Siemens AG Speakers Bureau, Siemens AG Martin Beeres, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the therapeutic benefit and morphologic changes in herniated lumbar disk after CT-guided intradiscal and periradicular ozone-oxygen injection combined with a periradicular administration of steroids and anesthetic.

437 patients with lumbar radiculopathy received an intradiscal (3 mL) and periradicular (7 mL) injection of an ozone-oxygen mixture (ratio 3:97), followed by a periradicular injection of corticosteroid (1 mL of Celestan®Depot) and anesthetic (2 mL of Carbostesin® 0.25%) in the same session. Under CT guidance, intradiscal and periradicular injection was administered by means of an extraspinal lateral approach, using a 22-gauge 17.8-cm spinal needle. 6 months after treatment, clinical outcome was assessed by applying the modified MacNab method. The effects on disk matrix and disk volume were evaluated by MRI.

RESULTS

Treatment was successful in 316 patients (72.3%). In the remaining 121 patients (27.7%), treatment was considered to have failed. Among the patients whose treatment was a success, outcome was excellent in 153 patients (48.4%) and good in 163 patients (51.6%). Among the patients whose treatment was a failure, this was poor in 87 patients (71.9%) and poor with recourse to surgery in 34 patients (28.1%). Initial disk volume was 8.06-29.15 cm³ (mean, 18.29 cm³). 6 months after treatment, in patients with excellent outcome disk volume reduction was 5.67-22.11% (mean, 12.11%), in patients with good outcome 2.61-16.11% (mean, 7.29%) and in patients with poor outcome 0.33-8.21% (mean, 2.46%).

CONCLUSION

Our study shows that the combined intradiscal and periradicular injection of medical ozone and periradicular injection of steroids affects both the mechanical and the inflammatory components of pain caused by disk herniation. For this reason, this is a therapy option for treating lumbar disk herniation that has failed to respond to conservative management, before recourse to surgery or when surgery is not possible.

CLINICAL RELEVANCE/APPLICATION

CT-guided combined intradiscal and periradicular injection of ozone-ozygen represents a therapeutic alternative for lumbar radiculopathy with promising results. The ease of execution and non-invasiveness of this therapy permit the successful outpatient treatment of lumbar sciatic pain.

SSA13-03 Computed Tomography (CT) Guided O2-O3 Discolysis: Critical Review of Indications According to Our Experience

Sunday, Nov. 29 11:05AM - 11:15AM Location: E451B

Participants

Marco Perri, MD, L'Aquila, Italy (*Presenter*) Nothing to Disclose Marco Varrassi, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose Claudia Marsecano, MD, Fiuggi, Italy (*Abstract Co-Author*) Nothing to Disclose Alessandra Splendiani, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose Carlo Masciocchi, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose Massimo Gallucci, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to clarify the O2-O3 discolysis indications and outcomes depending on the type of disc disease.

METHOD AND MATERIALS

Medical Ethical Committee approval was obtained for prospective double-blind trial. A total of 517 patients gave informed consent and were randomly assigned to two groups. Control group of 159 men and 101 women with age range 25-89 years, underwent percutaneous steroid treatment while Study Group of 163 men and 94 women with age range 22-92 years underwent the same treatment with the addiction of oxygen-ozone discolysis. Procedures were performed under computed tomographic guidance. Visual Analog Scale Questionnaire was administered before treatment and at intervals, the last at 6-month follow-up. Results were compared with the X2 and t-test.

RESULTS

After 6 months, O2-O3 discolysis was successful in 106 Study Group patients (41.24% with extrusions) compared with 9 Control Group patients (3.5%) with the same disco vertebral pathology (P <.001). Moreover in 89 (34.6%) Study Group patients with protrusions success rate was statistically significant(P<.001) compared with 5 Control Group patients(1.9%) with the same pathology. Furthermore statistically significant difference (P<.001) was detected in the presence of Grade I, II, III of Degenerated Disc in 185 of Study Group patients (68.4%) compared with 4 Control Group patients (1.5%).

CONCLUSION

O2-O3 discolysis is more effective at 6 months than steroid and anesthetic injection near intraforaminal sites especially in cases of sciatica due to herniated or protruded disc and with a Grade of Disc Degeneration from mild to moderate range.

CLINICAL RELEVANCE/APPLICATION

Our approach leads to relief in sciatica symptoms and obtains the best results in case of extrusions, protrusions and in presence of discal degenerative aspects from mild to moderate grade.

SSA13-06 Magnetic Resonance Guided Focused Ultrasound Surgery (MRgFUS) for Totally Non-Invasive Treatment of Osteoid Osteoma: A Prospective Development Study

Sunday, Nov. 29 11:35AM - 11:45AM Location: E451B

Participants

Maurizio Del Monte, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Gaia Cartocci, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Alessandro Napoli, MD, Rome, Italy (*Presenter*) Nothing to Disclose Valeria De Soccio, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Fabrizio Boni, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose To investigate mid-to long-term efficacy of MRgFUS in the treatment of symptomatic osteoid osteomas

METHOD AND MATERIALS

This prospective study involved 29 consecutive patients with clinical and imaging diagnosis of Osteoid Osteoma; all patients underwent MRgFUS ablation (ExAblate, InSightec; 3T MR).Lesions located in vertebral body were excluded; prior RFA or surgery was not considered an exclusion criteria.Patients received therapy using MRgFUS, delivered toward the nidus, identified on MRI and/or CT. Primary endpoints were adverse events (serious and otherwise) and pain relief assessed using Quality of Life questionnaires in patients with bone pain (FACT-BP), Visual Analog Pain Score (VAS) and daily intake of Non-steroidal drugs (NSAIDs). Patient's follow-up, including clinical and imaging examinations, was established at 1, 12 and 24 months.As secondary endpoint, imaging examinations (CT and dynamic CE-MRI, Gd-BOPTA, Bracco) were used to evaluate inflammatory status after treatment and bone remodeling.

RESULTS

29 patients (4 female; 25 male; mean age 23,4 yo) were recruited for totally non-invasive MRgFUS treatment. The treatment was well tolerated by all patients and no adverse events were recorded. A mean number of 5.6 sonications with mean energy of 894 ± 209 J was necessary to complete the treatment. Complete clinical response was found in 27/29 patients. There was a significant (p=0.001) improvement in quality of life, according to FACT-BMP (mean values: 33.7 at baseline and 54.7 at follow-up;). A statistically significant difference (p=0.001) was noted between pre-and post-treatment VAS scores (8.4vs0.6,respectively). Imaging evaluation with CE-MRI demonstrated edema and hyperemia decrease in lesions associated with complete response. At CT, bone remodeling was evident in all complete responders (27/29 patients, 93%); in 15/29 (51%), nidus fading was demonstrated and in 10/29 (34%) restitutio-ad-integrum of bone abnormality was depicted

CONCLUSION

MRgFUS can be safely and effectively adopted for the treatment of Osteoid Osteoma. This application is totally non-invasive, carried out in a single session and with pain relief attainable since the very following day after treatment. Our results also indicated a positive trend to bone restoration especially in younger patients

CLINICAL RELEVANCE/APPLICATION

MRgFUS allows single session, totally non-invasive treatment of osteoid osteoma

SSA13-07 Minimally Invasive Screw Fixation of Fractures in the Cervical and Thoracic Spine: CT-controlled Presurgical Guidewire Implantation in Clinical Routine

Sunday, Nov. 29 11:45AM - 11:55AM Location: E451B

Participants

Sebastian Fischer, MD, Frankfurt, Germany (*Presenter*) Nothing to Disclose Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose Maximilian Kresing, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose Ingo Marzi, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose Stefan Zangos, MD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose Martin G. Mack, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose Katrin Eichler, MD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Purpose of our retrospective study is to evaluate the feasibility and accuracy of minimally invasive, transpedicular screw placement in cervicothoracic fractures with the help of CT-controlled guidewires.

METHOD AND MATERIALS

293 guidewires were inserted in 35 patients (42.9 ± 21.2 years) under CT fluoroscopy (286 thoracic, 7 cervical). There were 28 traumatic cases, 3 pathologic fractures, 3 fractures due to infectious infiltrations and 1 osteoporotic fracture. In 151 pedicles the screwing was directly performed and controlled in the CT-room. CT-images were reviewed regarding accuracy and cortical violations using the popular 2 mm increment deviation classification by Gertzbein and Robbins.

RESULTS

The guidewire implantation resulted in 28 cortical contacts. Minor affections of the pedicle wall by the inserted screws occurred in 39.1% (59 of 151), respectively 23.8% if taking unavoidable encroachments into account (30 of 59). The width of the pedicular isthmus correlated to the number of cortical guidewire-contacts (r=-0.449; p=0.077) and pedicle violations (all graded "A") by the inserted screws (r=-0.581; p=0.049).Total procedural duration was 138.6 ± 44.2 min, representing 14.5 ± 11.6 min for each pedicle, while showing a significant negative correlation against the vertebral level [r=-0.849; p=0.0002] and the occurrence of pedicle violations (r=-0.641; p=0.027).

CONCLUSION

The treatment of vertebral fractures with a guidewire-based insertion technique for pedicle screws results in a very high accuracy and a low complication rate if performed under CT-imaging.

CLINICAL RELEVANCE/APPLICATION

Guidewires help in precise placement of cervical and thoracic screws for vertebral osteosynthesis. Special attention should be taken in the mid-thoracic levels due to a smaller width of the pedicle isthmus.

SSA13-08 Feasibility of CT Guided Needle Biopsy in Harvesting Chondrocytes for Autologous Chondroctye Implantation: An Initial Experience on Human Cadavers

Sunday, Nov. 29 11:55AM - 12:05PM Location: E451B

Shadpour Demehri, MD, Baltimore, MD (*Abstract Co-Author*) Research support, General Electric Company; Researcher, Carestream Health, Inc; Consultant, Toshiba Corporation Bashir Zikria, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the timing, accuracy and technical feasibility of CT guided chondrocyte retrieval from superior medial and lateral non weight-bearing margins of the trochlea.

METHOD AND MATERIALS

As an initial experience, 10 human knee cadavers were selected as samples. Osteosite bone biopsy needle (G13761 - Murphy M1M - 11G/10cm) was used for the purpose of chondrocyte retrieval. Two operators, one musculoskeletal radiologist and one orthopedic surgeon performed the chondrocyte retrieval procedures. Each performed one sampling from the medial and one sampling from the lateral margins of trochlea. In the first planning phase, operators selected the proper target for chondrocyte retrieval, in the CT examination. Time (seconds), accuracy (mm distance from the target) and needle readjustment attempts were recorded during chondrocyte retrieval.

RESULTS

All samplings resulted in eventual tissue retrieval. Samplings from the lateral margin were performed faster (Operator 1: 74 \pm 34 sec vs. 106 \pm 36 sec; P value: 0.056 - Operator 2: 72 \pm 30 sec vs. 111 \pm 35 sec; P value: 0.014) and more accurate (Target error: Operator 1: 1.32 \pm 1.01 mm vs. 3.23 \pm 1.72 mm; P value: 0.007 - Operator 2: 1.17 \pm 0.57 mm vs. 2.81 \pm 1.36 mm; P value: 0.040) than samplings from the medial margin. There was no significant difference in the mean number of needle adjustment rates (ranging from 1.50 \pm 0.71 to 1.10 \pm 0.74 readjustment attempts); neither between the operators, nor between lateral and medial margins.

CONCLUSION

This preliminary results supports the hypothesis that CT guided needle biopsy may be a feasible and accurate method for chondrocyte retrieval from non weight-bearing margins of the trochlea. Sampling from the lateral margin may be relatively advantageous in terms of procedure time and accuracy.

CLINICAL RELEVANCE/APPLICATION

Feasibility of CT-guided chondrocyte retrieval for autologous chondrocyte implantation may obviate one arthroscopic surgery; and therefore, reduce the cost, morbidity and complication.

SSA13-09 US and MRI Follow-up after Treatment of Supraspinatus Tendon Tendinopathy: PRP vs Needling

Sunday, Nov. 29 12:05PM - 12:15PM Location: E451B

Participants

Alice La Marra, MD, L'Aquila, Italy (*Presenter*) Nothing to Disclose Francesco Arrigoni, Coppito, Italy (*Abstract Co-Author*) Nothing to Disclose Silvia Mariani, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose Simone Quarchioni, Laquila, Italy (*Abstract Co-Author*) Nothing to Disclose Luigi Zugaro, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose Antonio Barile, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose Carlo Masciocchi, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the efficacy of infiltrative treatment with PRP versus needling, in patients with tendinosis of the supraspinatus tendon at level of its crescent area.

METHOD AND MATERIALS

We enrolled 40 patients (aged 40-60), with tendinosis of the supraspinatus tendon at its crescent area, evaluated through ultrasound-US and MRI exams; we excluded patients with partial lesions.Twenty patients were submitted to PRP treatment (group 1); 20 patients were submitted to needling treatment (group 2).All patients, 6 months after treatment (T1) underwent US examinations and 1 year after treatment (T2) underwent US and MRI examinations.We considered some fundamental parameters: morphology of the tendon, echogenicity or signal intensity of its structures, presence or not of bursitis, evolution in partial or full tear. All patients were evaluated through VAS (Visual Analogic Scale) for pain and Constant scale for functionality

RESULTS

In group 1, at T1 the ultrasound exams showed disappearance of bursitis and recovery of tendon echogenicity in 15/20 patients; 5 patients had no changes . At T2, in 17/20 patients MRI and US showed morphological recovery; we observed non-substantive modifications in 2 patients and a worsening in 1 patient.85 % of the patients showed improvement in VAS and 77% in Constant values already at T1; the mean values were 70% at T2.In group 2, at T1, US showed disappearance of bursitis and recovery of tendon echogenicity in 8/20 patients; , 12 patients showed no changes.At T2 in 6/20 patients , MRI and US showed morphological recovery; 8 patients had no significant variations; 4 patients had worsening of tendinosis; 2 patients showed partial tears of the tendon.65 % of the patients showed improvement in VAS and 62% in Constant values at T1; the mean values were only 33% at T2.

CONCLUSION

Compared to needling, the PRP infiltrative treatment of tendinosis of the supraspinatus tendon showed major possibilities of recovery, with a slower evolution of tendinosis or tendon's tear.

CLINICAL RELEVANCE/APPLICATION

Both PRP and needling are effective minimally invasive treatments suitable for large range of patients.PRP resulted to be more effective with a lower rate of progression of the tendinosis or tendon tear

Neuroradiology/Head and Neck (Temporal Bones)

Sunday, Nov. 29 10:45AM - 12:15PM Location: N226

HN NR MR

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

Participants

Richard H. Wiggins III, MD, Salt Lake City, UT (*Moderator*) Nothing to Disclose Amanda S. Corey, MD, Atlanta, GA (*Moderator*) Consultant, RadMD

Sub-Events

SSA16-01 Is Magnetic Resonance Tractography of Intraparotid Facial Nerve Useful in Patients with Malignant Tumors?

Sunday, Nov. 29 10:45AM - 10:55AM Location: N226

Participants

Rene-Charles Rouchy, Grenoble, France (*Presenter*) Nothing to Disclose Arnaud Attye, MEd, Grenoble, France (*Abstract Co-Author*) Research Grant, Guerbet SA Felix Renard, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Irene Tropres, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Laurent Lamalle, Grenoble Cedex, France (*Abstract Co-Author*) Nothing to Disclose Sylvie D. Grand, MD, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Adrian I. Kastler, MD, MSc, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Christian Righini, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Alexandre Krainik, MD, PhD, Grenoble CEDEX, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Parotidectomy with facial nerve (VIIn) sacrifice is often necessary in patients with malignant tumor. In all parotid masses, diagnosis of perineural spread is important as a prognosis biomarker since patients may have asymptomatic nerve invasion. Recently, the feasibility of intraparotid VIIn tractography was assessed to identify nerve contact with parotid tumors. The aim of this study was to determine if VIIn fractional anisotropy (FA) was linked to histologic grade in patients undergoing surgery for parotid tumors.

METHOD AND MATERIALS

Study ethics approval was obtained from our institutional review board (IRB 5891). Patients aged 18 or over, were including in this prospective study if they had:(a) A history of parotid tumors, requiring surgical management between December 2013 and April 2015(b) Undergone MR scans with diffusion acquisition and post-processing tractography(c) Surgical intraoperative checking of the intraparotid facial nervePatients underwent MR scans with VIIn tractography calculated with the constrained spherical deconvolution model. We performed scans on a 3T MRI Philips ACHIEVA® 3.0T TX with a 32 channel head coil. The post-processing steps were performed using MRtrix package software. The parameters of the diffusion sequence were: b-value of 1000 s/mm2, 32 directions, voxel size: 2 mm isotropic, scan time: 9'31".

RESULTS

Twenty patients (mean age: 53 years, 5 women) were enrolling in this study. The first group (n=10) referred with a benign tumor without facial nerve compression or invasion as checked by surgical team. The second group (n=10) referred with a malignant tumor and included three patients with clinical facial nerve palsy. The VIIn mean FA value was estimated as being 0.53±0.06 in patients with benign tumors and 0.37±0.08 in malignant tumor group. Mean FA value was significantly lower in the second group (t-test, p≤0.05) and was also reduced in patients free from clinical facial palsy with surgically evidence of VIIn perineural spread (n=3).

CONCLUSION

In these preliminary results, MRI using diffusion tractography was a promising procedure to assess parotid tumor histologic grade and potential perineural spread.

CLINICAL RELEVANCE/APPLICATION

A reliable imaging biomarker of histologic grade and perineural spread in cases with parotid tumors may help to better inform and manage patients.

SSA16-03 Additive Value of "Otosclerosis Weighted" Images for the Diagnosis of Fenestral Otosclerosis

Sunday, Nov. 29 11:05AM - 11:15AM Location: N226

Participants

Koji Yamashita, MD, PhD, Fukuoka, Japan (*Presenter*) Nothing to Disclose Akio Hiwatashi, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Osamu Togao, MD, PhD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Kazufumi Kikuchi, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Masatoshi Kondo, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Takashi Inoguchi, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Hiroshi Honda, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT is one of the main diagnostic tool for the detection of otosclerotic foci which are often identified as low density lesions in the

ante fenestral region. Bone densities can be measured in Hounsfield units by the accurate regions of interest (ROIs) setting. However, small ROI settings by less-experienced radiologists may result in false negative findings. Our purpose was to evaluate the diagnostic ability of our proposed method (otosclerosis weighted image) compared with conventional CT images alone.

METHOD AND MATERIALS

Temporal bone CT of consecutive patients with otosclerosis were retrospectively analyzed. The diagnosis of otosclerosis was confirmed during surgery in all cases. All CT images were obtained using a sixty-four-detector-row CT scanner with 0.5-mm collimation, 80 mm FOV, and a 512 \times 512 matrix. "Otosclerosis weighted" images were obtained by extracting temporal bone region with threshold technique and reversing the density gradients (black to white). Two independent radiologists took part in two reading sessions. In the first session, the observers read only conventional CT images. In the second session they read "otosclerosis weighted" images along with the conventional CT images. Accuracy was assessed for the two readers (Chi-square test).

RESULTS

Thirty temporal bones of 25 patients with otosclerosis (M:F = 3:22, mean age: 53.9 ± 9.0 years old) were included. For both observers, reading with "otosclerosis weighted" image was associated with higher sensitivity (66.7-76.7%) than with the conventional CT images alone (50-56.7%; p<0.005, each).

CONCLUSION

Application of our proposed method based on threshold value may help reduce misdiagnosis of fenestral otosclerosis.

CLINICAL RELEVANCE/APPLICATION

CT is one of the main diagnostic tool for the detection of otosclerotic foci which are often identified as low density lesions. Application of our method based on threshold value helps reduce misdiagnosis of fenestral otosclerosis.

SSA16-04 Preserved Cochlear T2 Signal is an Important Predictor for Hearing Preservation in Patients Treated for Vestibular Schwannoma

Sunday, Nov. 29 11:15AM - 11:25AM Location: N226

Participants

Vinay Prabhu, MD, New York, NY (*Presenter*) Nothing to Disclose Travis Hill, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Matthew Shinseki, New York, NY (*Abstract Co-Author*) Nothing to Disclose David R. Friedmann, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose J. Thomas Roland JR, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose John Golfinos, New York, NY (*Abstract Co-Author*) Nothing to Disclose Douglas Kondziolka, MD,MSc, New York, NY (*Abstract Co-Author*) Nothing to Disclose Girish M. Fatterpekar, MBBS, New York, NY (*Abstract Co-Author*) Editor, Reed Elsevier

PURPOSE

Hearing preservation is a therapeutic goal for many patients with vestibular schwannoma (VS). We examined the relationship between pre-treatment MRI and post-treatment hearing status in an effort to define factors that may influence management.

METHOD AND MATERIALS

From September 2010 through January 2014, consecutive cases of VS treated with stereotactic radiosurgery (SRS) or microsurgery were reviewed. Preoperative MRIs were analyzed by two readers with respect to three dimensional tumor size, shape (round vs. oval), cochlear T2 signal, relationship of tumor to internal auditory canal (IAC), and presence of necrosis. Patients were excluded if they had prior treatment or no pre-treatment MRI within one year. "Serviceable" hearing was defined as speech discrimination score (SDS) \geq 70% or AAO-HNS class A/B. Post-treatment hearing "preservation" was defined as maintenance or development of serviceable hearing after SRS or microsurgery using non-translabyrinthine approach. Bivariate statistics were calculated.

RESULTS

191 cases were reviewed; 68 patients met criteria for inclusion. A majority underwent SRS (69%), had tumors in the distal IAC (52%), oval shape (56%), without confluent necrosis (68%), and median volume of 0.95 mL. Of these patients, 55 and 30 had preand post-treatment audiometry, respectively; 56% and 67% had "serviceable" pretreatment hearing on SDS and AAO-HNS, respectively. People without serviceable pre-treatment hearing on SDS had significantly larger (p=0.05) and round (p=0.02) tumors. Reduced cochlear T2 signal trended towards worse hearing on AAO-HNS (p=0.12). Preserved cochlear T2 signal was the only variable significantly associated with post-treatment hearing preservation as measured by SDS or AAO-HNS in all tumors (p<.001 and p=.01, respectively) or SDS for those in the distal IAC (p=02). Interobserver agreement measuring cochlear T2 signal was 92%.

CONCLUSION

Preoperative MRI identified patients more likely to have better hearing outcomes, thus aiding clinicians in pretreatment counseling. Decreased cochlear T2 signal may indicate close association with the cochlear neurovascular bundle, influencing endolymph protein concentration and negatively influencing hearing outcome.

CLINICAL RELEVANCE/APPLICATION

Pre-treatment cochlear T2 signal is associated with hearing outcomes after treatment for vestibular schwannoma. Use of thin section MRI has the potential to better inform treatment decisions.

SSA16-05 Slip Interface Imaging: A Novel MR Elastography-Based Method to Predict Tumor-Brain Adhesion in Vestibular Schwannoma

Sunday, Nov. 29 11:25AM - 11:35AM Location: N226

Kevin J. Glaser, Rochester, MN (*Abstract Co-Author*) Intellectual property, Magnetic Resonance Innovations, Inc; Stockholder, Resoundant, Inc
Armando Manduca, PhD, Rochester, MN (*Abstract Co-Author*) Royalties, General Electric Company
Jamie J. Van Gompel, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Michael J. Link, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Joshua D. Hughes, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Anthony J. Romano, PhD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Richard L. Ehman, MD, Rochester, MN (*Abstract Co-Author*) CEO, Resoundant, Inc; Stockholder, Resoundant, Inc; Research Grant,

Resoundant, Inc John Huston III, MD, Rochester, MN (*Abstract Co-Author*) Stockholder, Resoundant, Inc

PURPOSE

To assess the clinical feasibility of MR slip interface imaging (SII) for predicting the degree of tumor-brain adhesion in vestibular schwannomas.

METHOD AND MATERIALS

With IRB approval and informed consent, nine patients with pathologically suspected and subsequently confirmed vestibular schwannomas were recruited. The SII acquisition is similar to MR elastography (MRE) in which low-amplitude mechanical vibration is applied to the head with a pillow-like device placed in the head coil and the resulting shear waves are imaged using a phase-contrast pulse sequence with motion encoding gradients synchronized with the applied vibration. Imaging was performed on a 3T MR system with an 8-channel head coil in a scan time of less than 7 minutes. The acquired shear motion data were processed with two different algorithms (shear line analysis and calculation of octahedral shear strain (OSS)) to identify the degree of tumor-brain adhesion. Blinded to the SII results, neurosurgeons qualitatively assessed tumor adhesion at the time of tumor resection as one of three patterns: no adhesion, partial adhesion, and complete adhesion. Correlations between SII and surgical findings were determined, and the ability to use OSS to quantify the tumor adhesion was tested using a Mann-Whitney U test with a statistical significance set at p < 0.05.

RESULTS

In SII, the presence of a non-adhesive tumor-brain interface appears as a dark line in the shear line images and exhibits higher OSS values than an adhesive interface. The absence of shear lines corresponded to complete tumor adhesion. Surgical results for the nine patients included 2 cases with complete adhesion, 3 with partial adhesion, and 4 with no adhesion. SII results were concordant with the intraoperative assessment of tumor adhesion in 8 cases (88.9%). One case was identified as having no adhesion with SII, but adhesions were found at surgery. The OSS values for the non-adhesive interfaces were significantly larger (p=0.012) than the adhesive interfaces.

CONCLUSION

Our results demonstrate that SII is a clinically feasible method to preoperatively predict the degree of tumor-brain adhesion in patients with vestibular schwannomas.

CLINICAL RELEVANCE/APPLICATION

The SII technique shows promise for allowing radiologists and neurosurgeons to preoperatively quantify the degree of intracranial tumor adhesion and predict potential complications of tumor resection.

SSA16-06 Endolymphatic Hydrops as an Imaging Biomarker: A Chronic Disease with Various Clinical Presentations

Sunday, Nov. 29 11:35AM - 11:45AM Location: N226

Participants

Arnaud Attye, MEd, Grenoble, France (*Presenter*) Research Grant, Guerbet SA Georges Dumas, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Irene Tropres, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Matthieu Roustit, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Eldda Banciu, MD, La Tronche, France (*Abstract Co-Author*) Nothing to Disclose Johan Pietras, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Laurent Lamalle, Grenoble Cedex, France (*Abstract Co-Author*) Nothing to Disclose Sebastien Schmerber, Grenoble, France (*Abstract Co-Author*) Nothing to Disclose Alexandre Krainik, MD, PhD, Grenoble CEDEX, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

MRI seeking for endolymphatic hydrops (EH) was recently found as closely reflecting histopathologic findings in patients with Meniere's disease (MD). However, the lack of healthy subject data was problematic to precisely define the pathological condition. The aim of this study was to assess EH prevalence in a large cohort of patients with four clinical presentations: MD, sensorineural hearing loss (SHL), recurrent peripheral vestibulopathy (RPV) and recurrent benign paroxysmal positional vertigo (rBPPV) in comparison with healthy subjects. We also evaluated EH localization (i.e cochlear or vestibular) in each group.

METHOD AND MATERIALS

300 patients and 25 healthy subjects were recruited between January 2013 and May 2015. Patients were consecutively included in this study if they had: (a) A history of clinically define MD (n=100), RPV (n=100), SHL (n=50) or rBPPV (n=50)(b) Have undergone an MRI scan 4 hours after intravenous gadoteric acid injection using FLAIR imaging (TR: 8000 ms, TE: 316 ms, TI: 2400 ms) with subtraction process. Control subjects inclusion was approved by our institutional review board (IRB 6705/15-CHUG-02). Two radiologists performed blind, semi-quantitative evaluations of MRI scan. Cochlear EH have been noted as present if nodular or irregular dilatation of endolymphatic canal and VH recorded as present when more than 50% of the vestibule have been occupied by endolymphatic space. Patients were graded based on the number and localization of hydrops and results were analyzed using the Student's t-test.

RESULTS

In the control group, 3 healthy subjects were found with EH in either cochlea or vestibule with these criteria.EH prevalence was

approximately estimated as being 85%, 50%, 40% and 40% in MD, SHL, RPV and rBPPV groups respectively. The results showed a significantly higher average number of hydrops localizations in the MD group when compared to other groups (t-test, p<0.01). Cochlear EH was found in 36% and 38% of RPV and rBPPV patients. Vestibular EH was displayed in 20% of SHL patients.

CONCLUSION

MRI criteria for EH allowed to distinguish pathology from healthy condition. However, EH appeared as a chronic disease rather than directly responsible of patient symptoms.

CLINICAL RELEVANCE/APPLICATION

We aimed to better explain pathophysiology of inner ear disorders, allowing better patient information and adapted therapeutic strategies in patients with endolymphatic hydrops.

SSA16-07 Superiority of Heavily T2-weighted 3D-FLAIR Over Regular 3D-FLAIR for the Detection of Cochlear Lymph Fluid Signal Abnormality in Patients with Sudden Sensorineural Hearing Loss

Sunday, Nov. 29 11:45AM - 11:55AM Location: N226

Participants

Shinji Naganawa, MD, Nagoya, Japan (*Presenter*) Nothing to Disclose Toshiaki Taoka, MD, PhD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose Shingo Iwano, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose Hisashi Kawai, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose Michihiko Sone, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose Mitsuru Ikeda, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the signal increase of cochlear lymph fluid on 3D-FLAIR in patients with sudden sensorineural hearing loss (SNHL) between the regular contrast 3D-FLAIR (FL) and heavily T2-weighted 3D-FLAIR (HF).

METHOD AND MATERIALS

25 patients with unilateral sudden SNHL and 8 healthy volunteers were included. Patients were divided into mild group of 9 patients, average hearing level of 60 dB or less; and severe group of 16 patients, hearing level of more than 60dB. All patients and healthy volunteers underwent a MR cisternography (MRC) for anatomical reference of the fluid space, FL and HF at 3T. Region of interest (ROI) was manually drawn on mid-modiolar section of MRC around cochlea. ROI for noise was drawn in the air area. ROIs were copied onto FL and HF. Contrast-to-noise ratio (CNR) between affected and non-affected ear was measured in patients' group and CNR between right and left ear was measured in control group. Differences in CNR on FL and HF among 3 groups were tested by one-way analysis of variance (ANOVA).

RESULTS

There was a statistically significant difference in the mean of CNR on HF among the three groups (p < 0.001). Further, from the pairwise comparisons among them, there was a statistically significant difference with each other in the mean of CNR on HF (p < 0.05). There was no statistically significant difference in the mean of CNR on FL among the three groups (p = 0.074).

CONCLUSION

HF is more sensitive to signal alteration of cochlea with sudden SNHL than FL.

CLINICAL RELEVANCE/APPLICATION

Heavily T2-weighted 3D-FLAIR (HF) is more sensitive to high signal of cochlea in the ears with sudden sensorineural hearing loss (SNHL) than regular contrast 3D-FLAIR (FL) .

SSA16-08 Three-Dimensional Fluid-Attenuated Inversion Recovery Signal Changes as a Prognosis Predictor in Idiopathic Sudden Sensorineural Hearing Loss

Sunday, Nov. 29 11:55AM - 12:05PM Location: N226

Participants

Sheng-Che Hung, MD, Taipei, Taiwan (*Presenter*) Nothing to Disclose Wen-Huei Liao, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose Hsiu-Mei Wu, MD, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose Jiing-Feng Lirng, MD, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the relationship of 3D FLAIR findings and outcome in patients with idiopathic sudden sensorineural hearing loss (ISSNHL).

METHOD AND MATERIALS

We retrospectively reviewed consecutive 66 patients presenting with unilateral ISSNHL from June 2013 to September 2014. Before treatment, all patients underwent MRI exams, including 3D-FIESTA, and 3D-FLAIR without gadolinium enhancement. One blind observer registered 3D-FIESTA and 3D-FLAIR on a dedicated workstation and drew ROIs to measure the signal intensity of cochlea in both affected and unaffected ears on 3D-FLAIR.

RESULTS

The ratio of the cochlear signals between the affected and unaffected ears showed significant correlation with the severity of pretreatment hearing loss and the clinical outcome (Siegel criteria) after treatment. The increased FLAIR signal intensity is a specific prognostic predictor of poorer outcome (Siegel grade III/IV) after treatment. (sens./spec: 32%/86% (cutoff value: 1.2) and 5%/91% (cutoff value, 1.4)).

CONCLUSION

This study demonstrated a correlation between cochlear FLAIR signal and pre-treatment hearing level, and post-treatment outcome. Increased FLAIR signal is a specific prognostic predictor of poorer outcome after treatment.

CLINICAL RELEVANCE/APPLICATION

The causes of sudden deafness now are still idiopathic. In general, labyrinthitis caused by viral infection, blood circulation disorders, or ruptures of the inner ear membrane are believed to cause sudden deafness. The unpredictability of idiopathic sudden sensorineural hearing loss (ISSNHL) presents a challenge to preventive care. Prognosis can be predicted that the patients poor post-treatment outcome from the high intensity signal inner ear of 3D FLAIR sequence on MRI.

SSA16-09 Flat Panel CT in Diagnosis of Superior Canal Dehiscence. A Really New Diagnostic Approach?

Sunday, Nov. 29 12:05PM - 12:15PM Location: N226

Participants

Christina Loberg, MD, Aachen, Germany (*Presenter*) Nothing to Disclose Christiane K. Kuhl, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose Philipp Bruners, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose Justus Ilgner, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose Martin Westhofen, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Superior canal dehiscence (SCDS) is a rare defect, caused by a thinning or complete absence of temporal bone overlying superior semicircular canal of vestibular system. Treatment of choice is covering the defect with ceramic implant. Flat panel CT is an innovative tecnique that permits visualization of the complex anatomy of temporal bone with high spatial resolution. The utility of flat panel CT has been demonstrated in multiple disease states including neurovascular disease, peripheral vascular disorders and oncology. We therefore evaluated flat panel CT in diagnosis of SCDS.

METHOD AND MATERIALS

30 patients (m = 18/f = 12) age 36 - 63 (m= 48,2) with symptoms of SCDS underwent flat panel CT examination between January 2013 and January 2015. 13 patient underwent MSCT imaging before, these images were assessed as normal. Flat panel CT was performed by Siemens Axion Artis, rotation 220°. Postprocessing was done at Siemens leonardo workstation with reconstructions in bone window in 3D projection and adapted to superior semicircular canal. Applied Radiation dose inbetween flat panel CT and MSCT was compared.

RESULTS

In 5/ 17(29%) patients who underwent flat panel CT imaging SCDS was confirmed. In 6/ 13 (46%) patients who underwent MSCT and flat panel CT defect of temporal bone overlying superior semicircular canal was found and SCDS was intraoperatively confirmed. Applied radiation dose was nearly equal (flat panel CT 276, 5mGy/ cm / MSCT 277,4mGy/ cm).

CONCLUSION

Flat panel CT should be performed in cases with symptoms SCDS when MSCT is assessed normal. It is a reliable diagnostic tool and a new diagnostic approach in diagnosis of SCDS.

CLINICAL RELEVANCE/APPLICATION

Flat panel imaging is a reliable tool in imaging temporal bone and inner ear structures and can improve preoperative virtual planning.

SSA17

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

Sunday, Nov. 29 10:45AM - 12:15PM Location: N227



Mahmud Mossa-Basha, MD, Seattle, WA (Moderator) Research support, General Electric Company

Sub-Events

SSA17-01 The CTA Rim Sign: Calcification Pattern Predicts Carotid Intraplaque Hemorrhage

Sunday, Nov. 29 10:45AM - 10:55AM Location: N227

Participants

Laura B. Eisenmenger, MD, Salt Lake City, UT (*Presenter*) Nothing to Disclose Joseph S. McNally, MD, PhD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Carotid intraplaque hemorrhage (IPH) is associated with a high risk of future stroke. The gold standard for IPH detection is MRI with heavily T1-weighted sequences. This study was undertaken to determine essential CTA imaging predictors of carotid IPH.

METHOD AND MATERIALS

In this IRB-approved retrospective cross sectional study, 172 patients (244 carotid arteries) were studied having undergone carotid disease workup with both MRA and CTA from 2009-present. IPH was detected with the Magnetization Prepared Rapid Acquisition Gradient-recalled Echo (MPRAGE) sequence. CTA predictors included the presence or absence of calcification, type of calcification (rim, adventitial or bulky), percent diameter stenosis, mm stenosis, maximum plaque thickness, ulceration, and intraluminal thrombus. Clinical covariates included age, male sex, diabetes, hypertension, hyperlipidemia and body mass index. Cardiovascular medication confounders included antihypertension, antiplatelet, anticoagulation and statin medication classes. A mixed effects multivariable Poisson regression model was used accounting for 2 vessels per patient. A backwards-elimination method was used to determine the final model, in which prevalence ratios were reported and all remaining predictors had a p<.10. ROC analysis was used to determine discriminatory power measured by area under the curve (AUC).

RESULTS

The final model for carotid IPH prediction included the rim sign (prevalence ratio, PR=8.6, p<.001, 95%CI: 4.0,18.5) and maximum plaque thickness (PR=1.2, p=.001, 95%CI: 1.1,1.4). In the final model, no other imaging criteria were significant predictors of IPH. The discriminatory value of the final model was extremely high (AUC=93.9%), significantly higher than the rim sign alone (86.1%, p<.001), thickness alone (85.2%, p<.001), NASCET stenosis (78.4%, p<.001), mm stenosis (77.7%, p<.001) or ulceration (71.0%, p<.001).

CONCLUSION

The carotid CTA rim sign is highly predictive of carotid IPH.

CLINICAL RELEVANCE/APPLICATION

Because most patients undergoing acute stroke workup receive lumen imaging with CTA, MRI is often not performed and IPH is ignored. The CTA rim sign and maximum plaque thickness allow high discrimination of carotid IPH. Future prospective studies may be envisioned to determine if the rim sign indicates a higher future stroke risk.

SSA17-02 Clinical Risk Prediction Models for the Identification of Patients with High-Risk Carotid Plaque

Sunday, Nov. 29 10:55AM - 11:05AM Location: N227

Participants Navneet Singh, MD, Toronto, ON (*Presenter*) Nothing to Disclose Alan R. Moody, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

Kush Kapur, PhD, MENG, Boston, MA (Abstract Co-Author) Nothing to Disclose

PURPOSE

High-risk carotid plaque containing intraplaque hemorrhage predicts stroke, however, it is not yet routinely screened for in practice. We aimed to develop cross-validated clinical models to identify patients at risk of high-risk carotid plaque.

METHOD AND MATERIALS

Between 2003 and 2014, 1862 suspected neurovascular disease patients had MRI. High-risk carotid plaque was defined by presence of intraplaque hemorrhage on 3D T1w GRE black-blood MRI, a sequence routinely included in our institutional neurovascular MRI protocol. Using derivation and validation cohorts with 931 patients each, two risk-prediction logistic regression models considering 11 risk factors, with and without inclusion of stenosis grade, were developed. Receiver-operator characteristic curves were used to compare discriminatory ability of these two models.

RESULTS

The overall prevalence of high-risk carotid plaque was 19.3% (359/1862). Patients with high-risk carotid plaque could be identified

using age, sex, hypercholesterolemia, and peripheral vascular disease (AUC 0.781, 95% CI 0.747 to 0.815). Optimal threshold sensitivity and specificity was 81.8% and 62.4%, respectively. The addition of carotid stenosis grade improved discrimination of patients (AUC 0.826, 95% CI 0.795 to 0.856), and improved optimal threshold specificity to 72.8% without a significant change in sensitivity.

CONCLUSION

Patients prone to high-risk carotid plaque, containing intraplaque hemorrhage, may be identified using a simple clinical risk prediction model of cardiovasacular risk-factors and carotid stenosis grade.

CLINICAL RELEVANCE/APPLICATION

The model provides an opportunity for targeted carotid MRI screening in patients not already undergoing neurovascular MRI, but external validation studies are required.

SSA17-03 Identification of the Vulnerable Carotid Plaque Using Dynamic Contrast Enhanced Ultrasound

Sunday, Nov. 29 11:05AM - 11:15AM Location: N227

Participants

Brahman Dharmarajah, MBBS, MRCS, London, United Kingdom (Presenter) Nothing to Disclose

Michalakis A. Averkiou, PhD, Seattle, WA (Abstract Co-Author) Nothing to Disclose

Damianos Christofides, MSc, Nicosia, Cyprus (Abstract Co-Author) Nothing to Disclose

Ankur Thapar, MBBS, MRCS, London, United Kingdom (Abstract Co-Author) Nothing to Disclose

Alun Davies, FRCR, London, United Kingdom (Abstract Co-Author) Nothing to Disclose

Edward Leen, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Equipment support, Koninklijke Philips NV Equipment support, General Electric Company Equipment support, SuperSonic Imagine Research Consultant, General Electric Company Speakers Bureau, Bracco Group Speakers Bureau, Koninklijke Philips NV Speakers Bureau, AngioDynamics, Inc Speakers Bureau, General Electric Company

PURPOSE

Carotid atherosclerosis is implicated in 15-20% of all strokes. Dynamic contrast enhanced ultrasound (DCEUS) is a simple adjunct to color Doppler ultrasound for the assessment of carotid atherosclerosis. It has been identified that DCEUS can demonstrate perfusion within carotid plaques of greater than 50% stenosis with some differentiation observed between symptomatic and asymptomatic patients. In this study the perfusion of carotid plaques is evaluated both qualitatively and quantitatively to evaluate carotid perfusion of symptomatic and asymptomatic.

METHOD AND MATERIALS

After ethical approval, the carotid arteries of 24 patients were imaged using the L9-3 probe of the Philips iU22 ultrasound platform. Patients were injected with a bolus of 2ml of Sonovue with subsequent dynamic phase imaging acquisitionOffline blinded analysis was performed using DICOM data transferred to QLAB commercial analysis software. Qualitative perfusion assessment used binary grading: 0 represented less than 50% of carotid plaque area contained moving microbubbles and 1 represented more than 50% of carotid plaque area contained moving microbubbles are a valid microbubble signal.For quantitative DCEUS analysis, a region-of-interest (ROI) was drawn around the plaque. Plaques were delineated from the lumen signal to remove potentially large amplitude differences between the plaque and lumen signal intensity. A time intentisity curve (TIC) was derived from the dynamic phase ROI signal with mean plaque intensity signal calculated from the TIC.

RESULTS

The qualitative analysis results showed that 75% (9/12) of asymptomatic patients had >50% carotid plaque perfusion in comparison to only 33% (4/12) of symptomatic patients. After quantitative image analysis, the mean DCEUS intensity signal from the TIC of the carotid plaques was again significantly higher for asymptomatic patients than symptomatic patients (P<0.05).

CONCLUSION

Contrary to previous studies, this study suggests that patients with greater carotid plaque perfusion are more likely to have an asymptomatic carotid symptom status where as those with reduced perfusion are more likely to be symptomatic from their carotid disease.

CLINICAL RELEVANCE/APPLICATION

In patients with greater than 50% carotid stenosis, reduced plaque perfusion on DCEUS may represent vulnerable, symptomatic carotid atherosclerosis.

SSA17-05 Advanced Atherosclerotic Disease with Intraplaque Hemorrhage is Present in Non-Stenotic Carotid Arteries of Diabetic Patients

Sunday, Nov. 29 11:25AM - 11:35AM Location: N227

Participants

Tishan Maraj, Toronto, ON (*Presenter*) Nothing to Disclose Alan R. Moody, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Navneet Singh, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Tina Binesh Marvasti, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Mariam Afshin, PhD, MENG, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Pascal N. Tyrrell, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose David Jenkins, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Diabetic patients have an increased risk of ischemic cerebrovascular events with worse outcomes than the non-diabetic population. Carotid artery stenosis currently stratifies patient risk but, even without significant stenosis, intraplaque hemorrhage (IPH) may predict cerebrovascular events. We report the prevalence of IPH in an asymptomatic diabetic population without carotid artery stenosis, using 3-dimensional (3D) magnetic resonance imaging (MRI) and investigate its association with carotid artery wall volume.

METHOD AND MATERIALS

Patients were recruited from a prospective dietary trial between 2010 and 2013, with a carotid intima-media thickness (IMT) > 1.2mm and non-stenotic carotid arteries on ultrasound. All were asymptomatic type 2 diabetic patients who underwent baseline 3D T1-weighted black blood imaging for visualization of intraplaque hemorrhage (3D-MRIPH) and 3D- time of flight imaging. Carotid artery vessel wall (VW) volumes and IPH volumes were determined bilaterally for a standard 32 mm segment centered at each carotid bifurcation, using a validated approach with the software, VesselMASS (Medis, Netherlands). Descriptive statistics as well as repeated measures linear regression analyses were performed.

RESULTS

159 patients were included with mean age 63.1 + 7.9 years, 62.3% male, 17.9% with a smoking history and 69.2% on hypertensive medication. The prevalence of IPH was 23.3% (n=37) with five patients exhibiting IPH in both carotid arteries. VW volume of the IPH positive carotid arteries was found to be significantly different from IPH negative arteries (β =0.15mm3 SE=0.03, p<0.01) and independent from other factors that affected VW volume - age (β =0.01yrs SE=0.002, p<0.01), sex (β =0.21 SE=0.04, p<0.01), BMI (β =0.22 SE=0.10, p=0.03) - when adjusted (none significant) for disease duration, smoking, blood pressure, and medications (statins, anti-hypertensive, anti-platelet).

CONCLUSION

IPH can be found in the absence of carotid artery stenosis in asymptomatic diabetic patients and is associated with an increased carotid artery wall volume as measured by 3D-MRI. It represents a biomarker of advanced atherosclerotic disease and may identify individuals at higher risk of cardiovascular disease.

CLINICAL RELEVANCE/APPLICATION

3D MRI can identify high risk cardiovascular biomarkers, such as intraplaque hemorrhage, in diabetic patients before onset of stenosis.

SSA17-06 Feasibility of High-resolution MR Imaging for the Diagnosis of Posterior Inferior Cerebellar Artery Dissection

Sunday, Nov. 29 11:35AM - 11:45AM Location: N227

Participants

Miran Han, MD, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Jin Wook Choi, MD, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Sun Yong Kim, MD, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Jin Soo Lee, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Yoolim Baek, MD, Suwon, Korea, Republic Of (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate the feasibility of HR-MR imaging diagnosing posterior inferior cerebellar artery (PICA) dissection and to find most useful imaging findings suggesting dissection

METHOD AND MATERIALS

We retrospectively reviewed 104 patients suspected of having arterial dissection involving posterior cerebral circulation and underwent HR-MR imaging between March 2012 and March 2015. 66 patients were diagnosed with arterial dissection involving posterior cerebral circulation and 16 patients among them (24.2%) were diagnosed with isolated PICA dissection by the consensus among neuroradiologists, neurointerventionist and neurologist after reviewing all clinical and paraclinical investigations available at hospital discharge (initial CT, MR, DSA images and etiologic work-ups) and follow up. Two neuroradiologists independently reviewed the HR-MR images of patients finally diagnosed as PICA dissection and looked for evidence of dissection (mural hematoma, dissection flap, outer diameter enlargement on T2WI) on each sequence of HR-MRI (PDWI, T2WI, T1WI and CE-T1WI). Inter- and intraobserver agreement for detecting evidence of dissection was estimated using the Cohen's kappa coefficient.

RESULTS

Dissection flaps were seen in all cases on T2WI (100%) and secondly detected on CE-T1WI (81.3%). Outer-diameter enlargement of the steno-occlusive lesions on angiography was detected in most of cases (81.3%). A mural hematoma was best detected on CE-T1WI (50.0%). The two reviewers showed substantial to almost perfect agreement for detecting dissection signs on every sequence (Cohen's kappa coefficient: $0.63 \sim 0.94$)

CONCLUSION

HR-MR imaging could be a useful and non-invasive diagnostic tool for PICA dissection and dissection flap with outer wall enlargement on T2WI is most confident sign for suggesting dissection.

CLINICAL RELEVANCE/APPLICATION

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

SSA17-07 Corrrelation of Carotid Plaque Features with Acute Cerebral Infarction in Type 2 Diabetic Patients - A Magnetic Resonance Imaging Study

Sunday, Nov. 29 11:45AM - 11:55AM Location: N227

Participants Beibei Sun, Shanghai, China (*Presenter*) Nothing to Disclose Huilin Zhao, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose Xiaosheng Liu, PhD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose Ye Cao, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose Jianrong Xu, Shanghai, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

The aim of this study was to investigate the association between carotid atherosclerotic plaque characteristics and the severity of acute cerebral infarct (ACI) in symptomatic patients with T2DM.

METHOD AND MATERIALS

We studied 204 arteries in 102 stoke patients by carotid and brain MRI. ACI volume was determined from symptomatic internal carotid artery territory on diffusion-weighted imaging (DWI). The symptomatic carotid plaque burden and compositional characteristics between stroke patients with T2DM and without T2DM were compared by using independents sample t-test and nonparametric Wilcoxon signed rank test after analyzed with MR vessel imaging. Pearson correlation test was applied to determine the correlations between volume of ACIs and carotid features in T2DM patients, then univatiate and multivariate linear regressions were applied to assess the independent associations of carotid characteristics with severity of ACIs.

RESULTS

Out of 104 enrolled stroke patients, 44(42%) had T2DM. They were distinguished as atherosclerotic plaque based on carotid artery with presence of any plaque component on MRI, such as calcification, LRNC, or IPH. The occurrence rate of carotid artery plaque was higher in diabetics vs non-diabetics (76.1% vs 52.6%, p=0.001). Compared with patients without T2DM, the T2DM subjects showed significantly higher prevalence of LRNC (70.5% vs 48.3%, P=0.038) as well as a larger volume of LRNC (76.82±114.31 mm3 vs 35.91 ± 73.79 mm3, P=0.042). Among these stroke patients, ACIs size of T2DM subjects in internal carotid artery (ICA) territory (7.75±11.49mm3 vs 3.77 ± 6.33 mm3, P=0.042) are greater than that of non-T2DM subjects. In addition, The LRNC volume had superior correlation (r=0.77, p<0.001) with the infarction volume of ipsilateral ICA territory, outperforming the other parameters in T2DM patients. Univariate and multivariate linear regression analysis showed close correlation of LRNC volume and MWT with the severity of ACI (B= 0.15, P<0.01 and B=4.99, P<0.05, respectively).

CONCLUSION

LRNC prevalence and volume of carotid plaques are significantly different between stroke patients with T2DM and without T2DM. In addition, LRNC volume and MWT are independently associated with cerebral infarction as measured by DWI.

CLINICAL RELEVANCE/APPLICATION

Our findings indicate that characterizing atherosclerotic plaque by MR vessel wall imaging might be useful for stratification of plaque risk and infarction severity in T2DM patients.

SSA17-08 Early Atherosclerotic Disease Detected by MRI and CT in the Carotid and Coronary Arteries in Lowmoderate Risk Individuals

Sunday, Nov. 29 11:55AM - 12:05PM Location: N227

Participants

Mariana Selwaness, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose Veit Sandfort, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose Robyn McClelland, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Karen Rodriguez, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose Evrim B. Turkbey, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose Anna E. Zavodni, MD, MPH, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose Puskar Pattanayak, MBBS, FRCR, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose Marissa Mallek, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose Mark A. Ahlman, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose Christopher Sibley, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose David A. Bluemke, MD, PhD, Bethesda, MD (*Presenter*) Research support, Siemens AG

PURPOSE

We examined the relationship between positive remodeling in the carotid and coronary arteries and investigated determinants of remodeling in a population with low-moderate risk of cardiovascular disease.

METHOD AND MATERIALS

Study subjects >55 years old with history of hypercholesterolemia underwent high resolution black blood carotid MRI using dedicated surface coils at 3T. In addition, CT angiography was performed using 320 slice scanning. Arterial wall area (outer vessel area-lumen) and the remodelling index (RI) (wall area/outer vessel area) were measured by observers blinded to clinical status. Data were analyzed using Spearman's correlation coefficient and multivariate linear regression analysis adjusted for sex, age, height and weight.

RESULTS

In 201 individuals (mean age 65.3 ± 6.5 , 64% men) with a low-moderate risk (Framingham Risk Score $7.8\pm7.6\%$), we found a strong association between wall area and outer vessel area in both the carotid (r=0.80;p<0.001, adjusted beta 1.67 [95%CI 1.43-1.92]) as well as the coronary arteries (r=0.82;p<0.001, adjusted beta 1.48 [95%CI 1.24-1.72]). This association was stronger when we compared the third tertile of lumen area to the first tertile, indicating more outward remodeling. The RI of the right and left carotid artery in a study subject was strongly correlated (r=0.75, p<0.001), whereas intra-individual RI between carotid and coronary disease was weak (r=0.20, p<0.001). In multivariate analysis, hypercholesterolemia, height and CAC score were associated with the RI of the coronary arteries.

CONCLUSION

This study is the first to combine MRI and CT imaging to investigate positive remodeling in the carotid and coronary arteries of lowmoderate risk individuals from the general population. Early atherosclerosis was associated with positive remodeling with larger diameter in the coronary and carotid arteries. Positive remodeling was not the same for different vascular beds.

CLINICAL RELEVANCE/APPLICATION

Detection of positive remodeling and understanding its role in early atherosclerotic disease could improve prevention strategies and management of stroke and coronary heart disease.

SSA17-09 Characterization of Restenosis after Carotid Endarterectomy Using Contrast-Enhanced Black Blood MRI

Sunday, Nov. 29 12:05PM - 12:15PM Location: N227

Participants Huan Yang, Baltimore, MD (*Presenter*) Nothing to Disclose Ye Qiao, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Li Liu, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Gunes Orman, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Zeeshan Anwar, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Jarunee Intrapiromkul, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Hugh Trout III, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose Bruce A. Wasserman, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To characterize restenosis after carotid endarterectomy (CEA) using high-resolution contrast-enhanced black blood MRI (CEMRI) and compare with primary atherosclerotic lesions.

METHOD AND MATERIALS

17 consecutive patients (10 male; mean age 73.4±11.9 years) with carotid restenosis (13 unilateral; 4 bilateral) after CEA underwent CEMRI at 3T. The median interval between surgery and CEMRI was 16.5 months (IQR, 9.3-95.5 months). Patients were matched with 20 asymptomatic patients with primary carotid atherosclerosis (19 unilateral; 1 bilateral) by age and luminal stenosis. All MRI images were de-identified and interpreted by two readers who were blinded to the history of CEA. The presence of plaque and plaque components was recorded for each lesion based on previous criteria on CEMRI. The lesions were classified as plaques or intimal hyperplasia based on the presence/absence of plaque features on CEMRI. The MRI morphological measurements included wall thickness (WT), area, normalized wall index and eccentricity (maximum WT- minimum WT)/maximum WT), and the signal measurements included heterogeneity (defined by coefficient of variation of signal intensity) and contrast-enhancement (%CE, the percent change in signal intensity from the pre- to post-contrast images).

RESULTS

A total of 42 carotid lesions from 37 patients were analyzed, and classified as primary plaques (n=21), recurrent plaques (n=13) and intimal hyperplasia lesions (n=8). Compared with plaques (both primary and recurrent), lesions with intimal hyperplasia exhibited smaller eccentricity (0.48 vs. 0.74, p<0.001), lower signal heterogeneity (20.0% vs. 27.2%, p=0.004) and higher % CE (88.4% vs 43.9%, p=0.002). Recurrent plaques had similar MRI characteristics when compared with primary plaques. However, recurrent lesions demonstrated higher CE (57.5% vs 35.4%, p=0.046) and more frequently involved in the medial wall of the internal carotid artery, an uncommon location for a plaque formation (recurrent vs. primary; 38.5% vs 4.8%, p<0.001).

CONCLUSION

Carotid restenosis from intimal hyperplasia demonstrated distinct imaging characteristics on CEMRI compared with atherosclerotic lesions.

CLINICAL RELEVANCE/APPLICATION

The phenotype of the restenotic lesions after CEA imposes different stroke risks. CEMRI imaging allows for the differentiation of these lesions and may provide insight into the treatment of restenosis.

ISP: Emergency Radiology (Utilization and Practice)

Sunday, Nov. 29 10:45AM - 12:15PM Location: N228

ER

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

Participants

Jamlik-Omari Johnson, MD, Atlanta, GA (*Moderator*) Nothing to Disclose Aaron D. Sodickson, MD, PhD, Wayland, MA (*Moderator*) Research Grant, Siemens AG; Consultant, Bracco Group

Sub-Events

SSA05-01 Emergency Radiology Keynote Speaker: Importance of Studying Utilization Trends in Imaging: How We Do It?

Sunday, Nov. 29 10:45AM - 10:55AM Location: N228

Participants

Vijay M. Rao, MD, Philadelphia, PA (Presenter) Nothing to Disclose

SSA05-02 The Surprising Continued Growth of Imaging Utilization in Emergency Departments

Sunday, Nov. 29 10:55AM - 11:05AM Location: N228

Participants

Manisha C. Patel, MD, Philadelphia, PA (Presenter) Nothing to Disclose

David C. Levin, MD, Philadelphia, PA (Abstract Co-Author) Consultant, HealthHelp, LLC; Board of Directors, Outpatient Imaging Affiliates, LLC

Laurence Parker, PhD, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose

Vijay M. Rao, MD, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose

PURPOSE

A recent study from a single large teaching hospital in 2014 suggested that the use of imaging in the emergency department (ED) may be decreasing. Our purpose was to study this issue on a nationwide basis.

METHOD AND MATERIALS

The national Medicare Part B Physician/Supplier Procedure Summary Master Files from 2001-2013 were evaluated. These files cover all patients in traditional Medicare fee-for-service (37.3 million in 2013). Volumes of radiography, CT, and noncardiac ultrasound (US) - the 3 major types of ED imaging - were determined by aggregating all CPT codes within each modality. Exams performed in EDs were determined by using Medicare's place-of-service codes. Utilization rates per 1000 Medicare beneficiaries were calculated. Medicare specialty codes were used to determine the specialty of the interpreting physicians.

RESULTS

The ED utilization rate per 1000 of radiography increased every year from 238 in 2001 to 323 in 2013 (+36%). In ED CT, the rate increased every year from 48 in 2001 to 158 in 2013 (+229%). The CT increase would have been even greater except for code bundling of CT scans of the abdomen and pelvis in 2011. In ED noncardiac US, the rate also increased every year from 8.6 in 2001 to 22.2 in 2013 (+158%). In 2013, radiologists interpreted 98% of ED radiographs and 99% of CT scans. They interpreted 88% of noncardiac US studies. The remaining US exams were interpreted by vascular surgeons (5%), ED physicians (3%), general surgeons (2%), or cardiologists (1%).

CONCLUSION

There has been a steady increase in the utilization rates of the 3 major types of imaging that are performed in ED patients. The increase has been quite sharp in CT and noncardiac US. Despite the recent report, there is no evidence that ED imaging use is declining. Radiologists strongly predominate in interpretation of all types of imaging in EDs, despite persistent efforts by some other specialties to gain a foothold.

CLINICAL RELEVANCE/APPLICATION

NA

SSA05-03 Diagnostic Yield and Clinical Utility of Abdominopelvic Computed Tomography Following Emergent Laparotomy for Trauma

Sunday, Nov. 29 11:05AM - 11:15AM Location: N228

Participants

Adam K. Haste, MD, Indianapolis, IN (*Presenter*) Nothing to Disclose Scott D. Steenburg, MD, Zionsville, IN (*Abstract Co-Author*) Nothing to Disclose Brian L. Brewer, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Utility of Computed Tomography (CT) imaging has been well validated in the initial assessment of trauma patients. However, there are some patients who are deemed too unstable to undergo CT scan and initially require exploratory laparotomy. Occasionally additional injuries are identified on CT if performed after surgery; however, to our knowledge, there have been no studies investigating types and severity of such injuries. The purpose of this study was to determine the diagnostic yield and clinical utility

of CT following emergent laparotomy in the setting of trauma.

METHOD AND MATERIALS

The trauma databases of two urban level 1 trauma centers were queried over a 5 year 8 month period for patients who underwent abdominopelvic CT imaging within 48 hours of emergent exploratory laparotomy. CT reports and images were retrospectively reviewed to identify all injuries diagnosed by post-laparotomy CT. All injuries diagnosed at laparotomy were identified by reviewing the operative records. Comparisons were made between operative and CT findings.

RESULTS

92 patients met inclusion criteria. 64 patients (69.6%) had additional injuries not identified during laparotomy. There were 20 unidentified solid organ injuries, including 4 splenic, 4 hepatic, and 7 renal injuries. CT upgraded severity of 4 liver injuries that were diagnosed at initial surgery. Of 16 patients with suspected renal injury at surgery, there were 12 renal injuries confirmed by CT. 11 patients (12.0%) had CT injuries severe enough to prompt further intervention, including 5 angiography/embolizations and 6 re-operations. Fractures were found in 59 (64%) patients.

CONCLUSION

Overall there was high concordance between injuries identified on CT and those which could reasonably be expected to be identified at surgery. In total, 70% of patients had undiagnosed injuries; however, some of these injuries, such as fractures, would not be expected to be diagnosed at surgery. 12% of patients had injuries on CT severe enough to require further intervention. Post laparotomy CT adds value in trauma patients who initially require emergent exploratory laparotomy.

CLINICAL RELEVANCE/APPLICATION

Post laparotomy CT identifies clinically important injuries in a small but significant percentage of trauma patients who require initial emergent exploratory laparotomy and is recommended for complete evaluation of traumatic injuries.

SSA05-04 Duplicate Cardiothoracic Imaging in the ED: Is there Room for Improvement?

Sunday, Nov. 29 11:15AM - 11:25AM Location: N228

Participants

Tarek N. Hanna, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Waqas Shuaib, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose James Matthew Kerchberger, BS, Atlanta, GA (*Presenter*) Nothing to Disclose Jamlik-Omari Johnson, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Faisal Khosa, FFR(RCSI), FRCPC, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Examine Emergency Department (ED) ordering practices in patients receiving both chest radiography (CXR) and chest computed tomography (CCT).

METHOD AND MATERIALS

Consecutive ED patients receiving both CXR and CCT in a single ED visit from 6/2009-3/2013 were included. For each exam, time of order entry (TOE), time of study completion (TSC), and time of final interpretation (TOI) was recorded and analyzed. TOE was the time of electronic order entry by the ED provider. TSC was when images were uploaded to PACS. TOI was the time of final radiology report availability. Cases with incomplete data were excluded.

RESULTS

3627 patients (66.5% male, average age 49.2 \pm 36 years) met inclusion criteria. In 3437 (94.8%) patients the CXR was ordered first, in 43 (1.2%) the CCT was ordered first, and in 91 (2.5%) the CCT and the CXR were ordered simultaneously. Of the 91 patients with simultaneous CCT and CXR orders, the CXR was completed first in 78 cases (85.7%); none of the 91 patients had chart documentation to explain the simultaneous orders. In only 50.6% (1740/3437) of exams where CXR was ordered first, was the final CXR report available prior to CCT order placement. Of the 43 patients in whom CCT was ordered first, only 2 (4.6%) had the final CCT report available prior to the CXR order. In 47.8% (1735/3627) of all cases, the second imaging modality (whether CT or CXR) was ordered prior to final report availability of the first exam. In 7.3% (n=263/3627) of all cases, the second imaging modality (whether CT or CXR) was ordered prior to the image availability of the first exam.

CONCLUSION

Making secondary cardiothoracic imaging decisions without having the final radiology report for the primary exam (47.8% of all cases) or ordering a secondary cardiothoracic imaging study prior to image availability for the first exam (7.3%) may be appropriate in certain situations, but further investigation of these trends is needed to identify possible inappropriate resource utilization. In 2.5% of cases, CCT and CXR were ordered simultaneously, which may occur secondary to perceived wait times for CCT. Targeted technology solutions may alleviate some of this redundancy.

CLINICAL RELEVANCE/APPLICATION

Primary imaging results should influence secondary imaging decisions. Efficient imaging in the ED helps arrive at an accurate diagnosis while minimizing cost, radiation, and patient turn around time.

SSA05-05 Radiological Workflow in Mass Casualty Incidents: Evaluation of Two Level 1 Trauma Sites in a Largescale Exercise

Sunday, Nov. 29 11:25AM - 11:35AM Location: N228

Participants Fabian Mueck, Munich, Germany (*Presenter*) Nothing to Disclose Maximilian Muggenthaler, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose Lucas L. Geyer, MD, Charleston, SC (*Abstract Co-Author*) Speaker, General Electric Company Kathrin Weber, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose Maximilian F. Reiser, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose Stefan Wirth, MD, MSc, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Aim of study was to compare the in-house workflow of two level 1 trauma sites in the case of a mass casualty incident (MCI) with a particular focus on CT management.

METHOD AND MATERIALS

A MCI of 70 patients was simulated by actors. According to a local MCI patient distribution matrix, the on-site triage assigned 7 cases to trauma site A (long in-house distances) and 5 patients to the completely independent second trauma site B (short in-house distances) of the same hospital. Within a most realistic simulation of in-house treatment several time points were measured and compared (e. g. with respect to arrival: time to triage, time to trauma room, time to CT and time to one of the two possible ending points which were arrival at the intensive care unit or at the operating theatre).

RESULTS

Site A needed more time (minutes) from arrival to ending point (A:31.84; B:21.60; P=0.059). According to the distances the times were longer to both trauma room (A:8.46; B:2.73, P = 0.008), and CT room (A:1.81; B:0.06, P=0.008). The observed shorter stay on the CT table did not compensate these effects. (A:6.42; B:7.31, P=0.705).

CONCLUSION

Facility design has a major influence on the time needed for in-house treatment. Short distances allow reaching end-points within 22 min. Considering CT it is possible to serve up to 6 patients per scanner-hour by using a standard protocol and up to a theoretical maximum of 13 patients by using a CT triage procedure.

CLINICAL RELEVANCE/APPLICATION

Considering polytrauma patients in CT, optimized facility design with short distances allows to serve up to 6 patients/h using a standard protocol, and up to a theoretical maximum of 13 patients/h by using a more simple triage procedure.

SSA05-06 Time to Write an Obituary? Sacrum and Coccyx Radiographs have Limited Clinical Impact in the Emergency Department

Sunday, Nov. 29 11:35AM - 11:45AM Location: N228

Participants

Mahniya Sadiq, BS, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Tarek N. Hanna, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Noah G. Ditkofsky, MD, Saint Johns, NL (*Presenter*) Nothing to Disclose Abhijit Datir, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Saurabh Rohatgi, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Faisal Khosa, FFR(RCSI), FRCPC, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Marc D. Benayoun, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Determine the yield and clinical impact of sacrum and coccyx radiographs (SC-XR) in the Emergency Department (ED).

METHOD AND MATERIALS

Consecutive SC-XR obtained in the EDs of 4 hospitals over a 5 year period were categorized as positive for acute fracture or dislocation, negative, or other. Other documented incidental findings that may have clinical relevance. Five follow-up metrics were analyzed: follow-up imaging in the same ED visit, follow-up imaging within 30 days, new pain medication prescriptions at discharge, clinic follow-up recommended at discharge, and surgical intervention within 60 days.

RESULTS

687 patients met inclusion criteria (48.1 years, 61.6% female). 91.3% were negative, 8.4% (n=58/687) were positive, and 0.3% (n=2/687) had other findings (lytic metastatic disease, Pagets). Regarding follow-up: 5.7% (n=39) had CT or MRI in the same ED visit, 4.3% (n=29) had advanced imaging within 30 days, 65.8% of patients received recommendations for clinical follow-up, and 47.9% of patients were prescribed new pain medications. Due to inherent practice differences, the level 1 trauma center was analyzed separately. At the level 1 trauma center (n=335, 44.8 years, 53.4% female), when comparing positive and negative SCXRs, there was no significant difference in follow-up ED imaging (p=0.19), 30 day imaging follow-up (p=0.77), medication administration (0.06), or clinical follow-up (p=0.14). At the level 2 trauma centers (n=352, 51.3 years, 69.4% female) there was a significant difference in same day (p=0.04) and 30-day follow-up imaging (p=0.001), but no difference in pain medication (p=0.94) or clinic follow-up (p=0.78) of the positive cases had surgical intervention. At our institution, the average global charge for SC-XRs over the study period was \$230 (\$201-263), \$24 professional and \$206 technical, for a total cost over the study period of \$158,010.

CONCLUSION

ED SC-XRs have costs and ionizing radiation, and in some EDs result in more advanced imaging. However, the results of SC-XR did not affect pain medication administration or clinic follow-up. No positive SC-XRs resulted in surgical intervention.

CLINICAL RELEVANCE/APPLICATION

As ED SC-XRs do not affect clinical management, their use can be curtailed, and patients treated conservatively. This will result in radiation and cost savings, and may decrease ED length of stay.

SSA05-07 Incidental Findings in Patients with Multiple Injuries: How to Proceed?

Sunday, Nov. 29 11:45AM - 11:55AM Location: N228

Thomas Lehnert, MD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose Moritz H. Albrecht, MD, Frankfurt am Main, Germany (*Presenter*) Nothing to Disclose Julian L. Wichmann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Nour-Eldin A. Nour-Eldin, MD,PhD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose Moritz Kaup, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose Jan-Erik Scholtz, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Multislice computed tomography (MSCT) is the diagnostic criterion standard for the initial evaluation of patients with suspected multiple injuries. Besides scanning for injuries directly related to the initial trauma, MSCT scans can reveal pathologies unrelated to the trauma of clinical relevance. The aim of the present study was to determine the frequency and follow-up course of incidental findings in patients with multiple injuries.

METHOD AND MATERIALS

This is a retrospective analysis of prospectively collected data on 2,242 patients with suspected multiple injuries at a Level I trauma center from 2006 to 2010. The MSCT reports were retrospectively reviewed regarding abnormal findings not related to trauma. These incidental findings were classified on a four-point level scoring system with respect to clinical importance and urgency for further diagnostic and therapeutic procedures.

RESULTS

During initial trauma center evaluation in the emergency department, 2,246 patients met our inclusion criteria. A total of 2,036 patients (90.7%) underwent MSCT; 1,142 (50.9%) of the patients had one or more incidental findings. A total of 2,844 incidental findings were detected. Overall, 349 tumor findings were noted (12.3% of all incidental findings); 113 findings were suspicious for malignant processes or metastasis. According to our classification, 168 (5.9%) of the incidental findings required urgent follow-up (Level 4), and 527 (18.5%) of the incidental findings required a follow-up before discharge (Level 3).

CONCLUSION

MSCT in patients with multiple injuries reveals one or more incidental findings in more than one of two patients. A scoring system classifying for relevance of incidental findings was introduced and could be applied in routine trauma care in the future.

CLINICAL RELEVANCE/APPLICATION

The consequent handling of incidental findings may add an extra burden for trauma surgeons and emergency physicians but should lead to improvements in health care for the patients. Especially in trauma patients, the reviewing radiologist should pay attention to both the presence of traumatic injuries and the incidental findings and communicate both to the ordering physician.

SSA05-08 Completion CT Chest Abdomen Pelvis after Acute Head and Neck Trauma: Incidence of Acute Traumatic Pathology

Sunday, Nov. 29 11:55AM - 12:05PM Location: N228

Participants

Michael S. Kelleher JR, MD, New Haven, CT (*Presenter*) Nothing to Disclose Guangzu Gao, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose Michael F. Rolen, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose Syed A. Bokhari, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

At our institution, patients found to have acute head or neck trauma will receive a CT chest abdomen pelvis (CT CAP) even in the absence of signs or symptoms to suggest bodily trauma. The purpose of our study was to determine the incidence of acute traumatic pathology on these CT CAP exams.

METHOD AND MATERIALS

After receiving IRB approval, a retrospective chart review was performed. Patients who presented to our institution's emergency department over a one year period (8/1/2013-7/31/2014) with findings of acute head and neck trauma who subsequently went on to have a CT CAP were identified. Exclusion criteria were as follows: proximal extremity/rib fractures identified on plain film prior to CT CAP, chest pain, abdominal pain, CPR after the traumatic event, soft tissue hematomas identified on physical exam and hypotension. We then analzyed the clinical course and imaging results of each patient meeting study criteria. Specifically, for the head/neck CTs, type of injury was divided into 5 broad categories: intra-axial bleed, extra-axial bleed, facial bone fracture, skull fracture, and cervical spine fracture. Mechanism of injury was categorized as follows: fall from standing, fall from height (greater than 6 feet), motor vehicle collision, and assault. The frequency and percentage of each of these categories were calculated. For the CT CAP exams, acute traumatic injuries were recorded, and the incidence of acute traumatic injury was calculated.

RESULTS

101 (8.6%) CT CAP studies performed in our ED during the one year period met study criteria. The most frequent mechanism of injury in this group was a fall from standing (76.2%). The most common traumatic head/neck injury in this group was an extra-axial hemorrhage (49.5%). Of all CT CAP studies, only one study demonstrated an acute traumatic injury (non-displaced 5th and 6th rib fractures). This finding was of no significant clinical consequence.

CONCLUSION

In the setting of low-velocity trauma, patients with acute head/neck inury without signs or symptoms of bodily injury should not receive a CT CAP. This data can be used to restructure trauma algorithms, which will reduce financial costs and better utilize radiological resources in the emergency department setting.

CLINICAL RELEVANCE/APPLICATION

CT CAP is an unecessary exam for low-velocity trauma patients with acute head/neck injury in the absence of signs or symptoms to suggest bodily injury.

SSA05-09 Effect of Timing of Request on Imaging Approach to the Diagnosis of Acute Appendicitis in a Group of Teaching Hospitals with 24/7 Availability of Ultrasound Technologist

Sunday, Nov. 29 12:05PM - 12:15PM Location: N228

Participants

Mostafa Atri, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Hassan A. Alzahrani JR, MD, Dammam, Saudi Arabia (*Presenter*) Nothing to Disclose Ravi Menezes, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine if time of the day and day of the week influence the type of imaging request to evaluate for acute appendicitis and the performance of different modalities during and after regular hours.

METHOD AND MATERIALS

This is an REB approved retrospective study of consecutive patients operated with pre-operative diagnosis of acute appendicitis between Feb 2013 and August 2014 in three teaching hospitals with 24/7 US technologist coverage. Acquisition of consent was waived. Data collected included: a) the rate of US only, CT only and US followed by CT performed between 8AM and 5PM during the regular hours and after this period during the week, and weekend and holidays, and b) performance of each imaging approach. US examinations were all initiated by a technologist and reviewed by a staff/fellow during regular hours and by a resident/fellow after hour.

RESULTS

Three hundred and thirty seven patients were operated during this period. They included 152 women and 185 men, ranging in age from 18 to 85 (mean 36 ± 15) years old. One hundred thirteen (33.5%) of patients were imaged before and 224 (66.5%) after regular hour (p=0.001). Eigtheen (5.3%) had negative appendectomy, 5 (4.4%) during regular hour and 13 (5.8%) after hour (p>0.05), and 319 patients had appendicitis or a condition of appendix requiring surgery. Regular hour imaging included 59 (52%) US only, 32 (28%) CT only, and 22 (20%) US followed by CT. The corresponding numbers for after-hour examinations were 109 (48%), 98 (44%), 17 (8%) (p =0.006). Sensitivity of US during regular hour was 72% (56/78), and CT was 76% (40/53). The corresponding sensitivities for after hour examinations were 86% (101/118) (p=0.018) and 95% (106/111) (p<0.001).

CONCLUSION

In spite of comparable sensitivity of US to CT, significantly higher number of CTs was requested after regular hour to evaluate for acute appendicitis.

CLINICAL RELEVANCE/APPLICATION

There are more CTs performed after regular hour to evaluate for acute appendicitis because of the wrong perception of lower accuracy of US being performed after regular hour.

ISP: Musculoskeletal (Bone Tumor)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E451A

MK MR

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

Participants

Craig W. Walker, MD, Omaha, NE (*Moderator*) Nothing to Disclose Corrie M. Yablon, MD, Ann Arbor, MI (*Moderator*) Nothing to Disclose

Sub-Events

SSA14-01 Musculoskeletal Keynote Speaker: Bone Tumor

Sunday, Nov. 29 10:45AM - 11:05AM Location: E451A

Participants Mark J. Kransdorf, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose

SSA14-03 Distinguishing Untreated Osteoblastic Metastases from Enostoses Using CT Density Measurements

Sunday, Nov. 29 11:05AM - 11:15AM Location: E451A

Participants

Adam C. Ulano, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Miriam A. Bredella, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Patrick J. Burke, MBBCh, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Ivan Chebib, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Frank J. Simeone, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Ambrose J. Huang, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Martin Torriani, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Connie Y. Chang, MD, Boston, MA (*Presenter*) Nothing to Disclose

PURPOSE

Differentiating osteoblastic metastases from benign enostoses on CT can be challenging. The purpose of our study was to determine if CT density thresholds of osteoblastic bone lesions can be used to distinguish untreated osteoblastic metastases from benign enostoses.

METHOD AND MATERIALS

Our study was IRB approved and complied with HIPAA guidelines. The study group comprised 62 patients (mean age 62 ± 20 y, 35 f, 27m) with sclerotic bone lesions found on CT. Etiology of sclerotic lesions was assessed by biopsy (n=17) or clinical and imaging follow-up (n=45). None of the patients had prior treatment for metastases. CT density of all lesions was measured by a MSK and an abdominal imaging fellow. If multiple lesions were present, the largest lesion was evaluated. The average and maximum densities in Hounsfield Units (HU) were measured. ROC analysis was performed to determine sensitivity and specificity, area under the ROC (AUC), and confidence intervals (CI), as well as cutoff values of CT densities to differentiate metastases from enostoses. Interreader reproducibility was assessed using intraclass correlation coefficient (ICC) with 95% CI.

RESULTS

A total of 37 enostoses and 25 untreated osteoblastic metastases were evaluated (primary tumors: breast cancer n=12, prostate cancer n=11, ovarian cancer n=1, transitional cell carcinoma n=1). Mean and maximum CT densities of enostoses were 1190 HU and 1323 HU, respectively and of osteoblastic metastases were 654 HU and 787 HU, respectively. Using a cut-off of 885 HU for average density, the AUC was 0.982, sensitivity was 94.6%, and specificity was 96%. Using a cut-off of 1058 HU for maximum CT density, the AUC was 0.976, the sensitivity was 94.6%, and specificity was 96%. ICC for mean density was 0.987 for enostoses and metastases. ICC for maximum density was 0.814 for enostoses and 0.980 for metastases.

CONCLUSION

Density measurements using CT can be used to distinguish untreated osteoblastic metastases from enostoses.

CLINICAL RELEVANCE/APPLICATION

An average density of 885 HU and a maximum density of 1058 HU provide reliable thresholds below which a metastatic lesion is the favored diagnosis.

SSA14-04 Multiparametric Approach with Diffusion Weighted Imaging (DWI) and Dynamic Contrast Enhanced (DCE) Magnetric Resonance Imaging (MRI): A Comparison Study in Differentiation between Benign and Malignant Bone Lesions

Sunday, Nov. 29 11:15AM - 11:25AM Location: E451A

Participants

Young Cheol Yoon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Eunsun Oh, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate and compare the diagnostic performance of quantitative parameters derived from DWI and DCE-MRI in differentiating

METHOD AND MATERIALS

This study obtained IRB approved . Fifty five patients (23 men, 32 women; 21-82 years; mean age of 55 years) underwent MRI prior to treatment. ADC values were calculated by using three DW images (b = 0, 400, and 1400). DCE-MRI data were analyzed yielding estimates of Ktrans (volume transfer constant), Ve (extravascular extracellular volume fraction) and Kep (rate constant) with population based arterial input function. Additionally, a ratio of Ktrans and ADC was calculated. Difference of each parameter between benign and malignant bone tumors were evaluated after adjusting age and sex. ROC curve analysis was done to calculate and compare sensitivity, specificity, accuracy, positive predictive value, negative predictive value, and AUC after determining the optimal cut-off value for each parameter. Odds ratio (ORs) with 95% confidence intervals of each parameter in diagnosing malignant bone tumor was calculated with logistic regression.

RESULTS

Fifty five lesions were pathologically proven benign (n =19), and malignant (n=36) bone tumor. All parameters except Ve were significantly different between benign and malignant bone tumors. The highest of AUC was seen in Ktrans, followed by Ktrans/ADC. With comparison of AUC of each parameter, Ktrans, Kep, and Ktrans/ADC showed significantly higher AUC than that of ADC. However, there were no significant difference among these three parameters. The parameters with best sensitivity and specificity were Ktrans/ADC, and Kep, respectively. The best parameters with positive predictive value and negative predictive value were Kep and Ktrans/ADC, presenting 17.38 (P = .0013).

CONCLUSION

Quantitative parameters, Ktrans, Kep, ADC, and Ktrans/ADC, are good to differentiate benign and malignant bone tumor. Ktrans/ADC shows superior performance in differentiation of malignant and benign bone tumors, suggesting that the combination of parameters derived from perfusion and diffusion MRI may be much useful for differentiating benign and malignant bone tumor.

CLINICAL RELEVANCE/APPLICATION

Multiparametric approach for the differentiation of benign and malignant bone is feasible with DWI and DCE-MRI. A parameter combining both DWI and DCE-MRI may be much useful.

SSA14-05 Whole Body MRI Assessment of Bone Involvement in Prostate Cancer and Multiple Myeloma: Diagnostic Accuracy of Different Sequences

Sunday, Nov. 29 11:25AM - 11:35AM Location: E451A

Participants

Ahmed Larbi, MD, Nimes, France (*Presenter*) Nothing to Disclose Patrick Omoumi, MD, Lausanne, Switzerland (*Abstract Co-Author*) Nothing to Disclose Vasiliki Pasoglou, MD, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose Bertrand Tombal, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose Catherine Cyteval, MD, Montpellier, France (*Abstract Co-Author*) Nothing to Disclose Frederic E. Lecouvet, MD, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the diagnostic accuracy of the different sequences obtained in whole-body MRI (WB-MRI/DWI) in detecting bone involvement in patients with prostate cancer (PCa) and multiple myeloma (MM).

METHOD AND MATERIALS

Two musculoskeletal radiologists reviewed WB-MRI studies in 50 patients with PCa at high risk for metastasis and in 47 patients with suspicion of MM. WB-MRI examinations included anatomical coronal T1- and STIR-weighted sequences, and functional diffusion-weighted (DWI) sequences. The readers successively assessed individual sequences (T1, STIR, DWIBS), then pairs of sequences (T1/DWIBS, T1/STIR, STIR/DWIBS), and finally all sequences together (T1 / STIR / DWIBS) to detect bone involvement. The gold standard was established on the basis of a panel review of all sequences.

RESULTS

Inter-observer agreement was good to excellent with similar kappa in both groups (.71 to .96). In the 'PCa' group, the study demonstrated the superiority of T1-weighted (Se 100%, Sp 92%) and DWI (Se 97%, Sp 92%) sequences, and of the pair T1 / DWIBS (Se 100%, Sp 100%) for the detection of patients with bone involvement. Isolated reading of STIR sequences lacked accuracy (Se 91%, Sp 92%) for detecting bone metastases. In the "MM" group, the study demonstrated the insufficiency of individual sequences (Se 83-93%, Sp 70%) to detect bone involvement. The best diagnostic accuracy was achieved by the combined reading of all sequences T1 / STIR / DWIBS (Se 93%, Sp 88%).

CONCLUSION

To detect bone involvement, the combined reading of T1- and DWI-weighted sequences appears sufficient in PCa, whereas the combined reading of all sequences is necessary in MM.

CLINICAL RELEVANCE/APPLICATION

Diagnostic accuracy of the different sequences obtained in whole-body MRI (WB-MRI/DWI) are unknown. The combined reading of T1- and DWI-weighted sequences appears sufficient in PCa, whereas the combined reading of all sequences is necessary in MM.

SSA14-06 Correlation between Intravoxel Incoherent Motion Diffusion-weighted MR Imaging Parameters and Dynamic Contrast-enhanced MR Perfusion Parameters in Patients with Bone Metastasis from Nonsmall Cell Lung Cancer at 3.0 T

Sunday, Nov. 29 11:35AM - 11:45AM Location: E451A
Won-Hee Jee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Investigator, Bayer AG; Research support, Bayer AG; So-Yeon Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Joon-Yong Jung, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Yohan Son, Seoul, Korea, Republic Of (*Abstract Co-Author*) Employee of Siemens Healthcare Korea Mun-Young Paek, Seoul, Korea, Republic Of (*Abstract Co-Author*) Employee, Siemens AG Jin Hyoung Kang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospective investigate whether intravoxel incoherent motion (IVIM) diffusion-weighted imaging (DWI) parameters correlate with dynamic contrast-enhanced (DCE) magnetic resonance imaging (MRI) perfusion parameters in patients with bone metastasis from non-small cell lung cancer (NSCLC) at 3.0 T.

METHOD AND MATERIALS

The institutional review board approved this retrospective study and informed consent was waived. Thirty-two patients (16 men, 16 women, mean age 61 years, range 46-89) with 37 treatment naive bone metastases from NSCLC underwent 3T MRI including IVIM DWI with nine b values (0-800 sec/mm2) and DCE-MRI. Following IVIM parameters including apparent diffusion coefficient (ADC), true diffusion coefficient (Dslow), peudodiffusion coefficient (Dfast), and perfusion fraction (f), DCE MRI perfusion parameters including volume transfer constant (Ktrans), rate constant (Kep), extravascular extracellular volume fraction (Ve), and initial area under the time-signal intensity curve at 60 seconds (iAUC) were calculated. The Spearman rank correlation was performed for statistical analysis.

RESULTS

Median Ktrans, Kep, Ve, and iAUC were 138 (107-213) 10-3/min, 506 (319-647) 10-3/min, 334 (236-513) 10-3, and 16 (11-27), respectively. Median ADC, Dslow, Dfast, and f were 973 (849-1198) μ m2/sec, 898 (786-1128) μ m2/sec, 274 (224-311) μ m2/sec, and 98 (59-118), respectively. Ktrans demonstrated a significant inverse correlation with Dslow (r = - 0.405, P=.013). Kep revealed a significant inverse correlation with ADC and Dslow (r = - 0.370, P = .024; r = - 0.352, P = .033, respectively). There was a significant inverse correlation of iAUC with ADC and Dslow (r = - 0.434, P = .007; r = - 0.486, P = .002, respectively). However, there was no significant correlation between Ve and IVIM parameters.

CONCLUSION

Ktrans inversely correlates with Dslow, while Kep and iAUC inversely correlate with ADC and Dslow in patients with bone metastasis from NSCLC at 3.0 T.

CLINICAL RELEVANCE/APPLICATION

IVIM DWI could help assume tumor perfusion in bone metastasis from NSCLC, particularly when DCE MRI cannot be performed.

SSA14-07 Body Composition Predictors of Progression from MGUS to Multiple Myeloma

Sunday, Nov. 29 11:45AM - 11:55AM Location: E451A

Participants

Joyce Veld, BSc, Boston, MA (*Presenter*) Nothing to Disclose Elizabeth K. O'Donnell, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Andrew J. Yee, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Martin Torriani, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Miriam A. Bredella, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Recent studies have suggested that abdominal adiposity may be risk factor of progression from monoclonal gammopathy of undetermined significance (MGUS) to multiple myeloma (MM). The purpose of our study was to determine abdominal body composition parameters on PET/CT that may serve as predictors of progression of MGUS to MM. We hypothesized that patients with MM had higher abdominal adiposity and higher fat metabolic activity compared to subjects with MGUS.

METHOD AND MATERIALS

Our study was IRB approved and complied with HIPAA guidelines. The study group comprised 38 patients (mean age 63±12 y, 20 m, 18 f) with MGUS and 31 patients (mean age 61±11 y, 14 m,17 f) with recently diagnosed MM (mean time from diagnosis to PET/CT: 4.7±6.7 mo). All patients underwent whole body PET/CT. Total abdominal adipose tissue (TAT), abdominal subcutaneous adipose tissue (SAT) and visceral adipose tissue (VAT) cross sectional areas (CSA) (cm2) and metabolic activity (SUV) were assessed at the level of L4 on the unenhanced PET/CT. Date and type of therapy were recorded. None of the patients had active malignancy other than MM at the time of PET/CT. Variables were tested for normality of distribution using the Shapiro-Wilk test. Variables that were not normally distributed were log transformed. Groups were compared by ANOVA.

RESULTS

Results: Patients with recently diagnosed MM had higher TAT and SAT CSA (p=0.03 and p=0.04) and higher TAT and VAT metabolic activity (p<0.0001). Seventeen patients with MM had not undergone MM therapy prior to PET/CT. There were no differences in body composition between MM patients with or without treatment at time of PET/CT (p > 0.5).

CONCLUSION

Patients who were recently diagnosed with MM had higher TAT and SAT CSA and higher fat metabolic activity compared to patients with MGUS, suggesting that these parameters may be serve as novel biomarkers of disease progression in MM. Larger longitudinal studies are necessary to test this hypothesis.

CLINICAL RELEVANCE/APPLICATION

Abdominal adiposity and fat metabolic activity may serve as novel biomarkers for disease progression from MGUS to MM.

SSA14-08 Whole-Body MRI: Value in Chronic Recurrent Multifocal Osteomyelitis (CRMO) and Synovitis, Acne, Pustulosis, Hyperostosis, and Osteitis (SAPHO)

Participants

Roxanne Giggens, MBBS, Oxford, United Kingdom (Presenter) Nothing to Disclose

Karen J. Partington, MBChB, MRCS, Oxford, United Kingdom (Abstract Co-Author) Nothing to Disclose

PURPOSE

CRMO and SAPHO are characterised by multifocal non-infective osteomyelitis. Lesions are often asymptomatic and therefore, if suspected, whole-body screening is useful to determine multifocality. We aim to evaluate the role of whole-body MRI in the diagnosis, exclusion, and follow-up of CRMO and SAPHO.

METHOD AND MATERIALS

We retrospectively reviewed 22 whole-body MRI examinations performed in 19 patients (12 females, 7 males; age range 10-54 years) for suspected, or known CRMO or SAPHO between May 2012 and February 2015. The protocol consisted of coronal T1-weighted and STIR sequences. The number and location of osseous lesions were evaluated and compared with previous radiological examinations.

RESULTS

14 scans were performed for suspected diagnosis of CRMO or SAPHO; 5/14 (36%) showed a single site of disease and 9/14 (64%) showed multifocal disease. In the multifocal group, 19 previously undetected lesions were visualised in 6/9 (67%) patients. MR findings were used to guide biopsy location in 5 patients.8 scans were performed to assess disease severity in patients with known multi-focal CRMO or SAPHO; 6/8 (75%) showed a change in disease burden compared to previous imaging, with 4 new or worsening lesions, and 12 lesions showing improvement or resolution.

CONCLUSION

Whole-body MRI can demonstrate multifocal disease, including asymptomatic lesions, in CRMO and SAPHO without exposure to ionising radiation. In our series we have shown that whole-body MRI is useful for establishing a diagnosis, visualising occult lesions, providing a baseline of disease distribution, guiding treatment and allowing follow-up to evaluate progression and resolution.

CLINICAL RELEVANCE/APPLICATION

In patients with suspected or confirmed CRMO or SAPHO, whole-body MRI is an ideal initial, and follow-up, diagnostic tool that does not involve ionising radiation.

SSA14-09 Assessment of Therapeutic Response in Ewing's Sarcoma Based on One-, Two-, and Threedimensional Tumor Size Measurements

Sunday, Nov. 29 12:05PM - 12:15PM Location: E451A

Participants

Maryam Aghighi, MD, Menlo Park, CA (*Presenter*) Nothing to Disclose Joshua T. Lee, BS, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose Justin Boe, MD, Edmond, OK (*Abstract Co-Author*) Nothing to Disclose Rie von Eyben, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose Rakhee S. Gawande, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose Philippe Petit, MD, Marseille, France (*Abstract Co-Author*) Nothing to Disclose Tarsheen Sethi, MBBS, Daly City, CA (*Abstract Co-Author*) Nothing to Disclose Solomon Messing, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose Jeremy Sharib, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose Steven G. DuBois, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose Heike E. Daldrup-Link, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The Children's Oncology Group (COG) established criteria to assess therapeutic response in Ewing sarcoma based on threedimensional tumor size measurements. The purpose of our study was to compare COG criteria with one-dimensional Response Evaluation Criteria in Solid Tumors (RECIST) and two-dimensional tumor measurements defined by the World Health Organization (WHO) and to determine which method correlates best with clinical outcomes.

METHOD AND MATERIALS

Seventy-four patients (mean age of 14.5±6.5 years) with newly diagnosed Ewing sarcoma treated at three medical centers were evaluated. Primary tumor size was assessed on pre- and post-treatment Magnetic Resonance (MR) scans according to COG, RECIST, and WHO criteria. Effective tumor volume (Using OSIRIX software) served as the standard of reference. The agreement of each criterion with the standard of reference was assessed using Cohen kappa coefficient analysis. Tumor therapy responses based on changes in tumor length, area or volume, were compared with patient survival using the Log-rank test and Kaplan-Meier plots.

RESULTS

Based on Cohen's kappa coefficient, the agreement with the standard of reference was very good for COG (κ =0.89) while it was fair for RECIST (κ =0.39) and moderate for WHO (κ =0.55). COG criteria had significantly greater sensitivity to predict responders (92%) compared to RECIST (54%) and WHO (66%). Only COG demonstrated a significant difference in survival between responders and non-responders (p=0.003) compared to RECIST (p=0.41) and WHO (p=0.48).

CONCLUSION

Three-dimensional tumor measurements according to COG criteria are better predictors of therapeutic response of Ewing sarcoma than RECIST or WHO. These results could motivate more aggressive treatment for patients identified as non-responders by COG criteria.

CLINICAL RELEVANCE/APPLICATION

In clinical practice, a high sensitivity of response assessments is warranted in order to avoid ineffective therapies and stratify nonresponders to other therapies at a time point when interventions can still impact prognosis. Our data in EFST showed that volumetric tumor measurements are substantially more sensitive for detection of tumor non-response than unidimensional measurements. NR

MR

Neuroradiology (New Techniques in Brain Tumor Imaging)

Sunday, Nov. 29 10:45AM - 12:15PM Location: N229

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

FDA Discussions may include off-label uses.

Participants

Eu-Meng Law, MBBS, Los Angeles, CA (*Moderator*) Speakers Bureau, Toshiba Corporation; Medical Advisory Board, Bayer AG; Medical Advisory Board, Bracco Group; Medical Advisory Board, FUJIFILM Holdings Corporation; Rivka R. Colen, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SSA18-01 Electrical Conductivity Characteristics of Glioma and Potential Usefulness of Noninvasive Electrical Conductivity Measurement in Evaluation of Glioma

Sunday, Nov. 29 10:45AM - 10:55AM Location: N229

Participants

Khin K. Tha, MBBS,PhD, Sapporo, Japan (*Presenter*) Nothing to Disclose Ulrich Katscher, Hamburg, Germany (*Abstract Co-Author*) Employee, Koninklijke Philips NV Christian Stehning, Hamburg, Germany (*Abstract Co-Author*) Employee, Koninklijke Philips NV Shigeru Yamaguchi, MD,PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose Shunsuke Terasaka, MD,PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose Hiroki Shirato, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Direct electrical conductivity measurements to identify tumor location, before the era of CT and MRI, had documented difference in electrical conductivity values of tumors from normal brain parenchyma and among tumor types. Recent advances in MRI have allowed noninvasive measurement of electrical conductivity values. This study aimed to noninvasively determine the electrical conductivity characteristics of glioma and evaluate potential usefulness of noninvasive electrical conductivity measurement in glioma evaluation.

RESULTS

The contrast-enhanced tumor component of grade III gliomas had higher mean and mode of electrical conductivity histograms than the non-contrast-enhanced tumor component and normal-appearing brain parenchyma (P<0.017). The non-contrast-enhanced tumor component of grade II gliomas had higher mean electrical conductivity than the normal brain parenchyma (P=0.012). Mode of electrical conductivity histograms for both components of grade IV tumors were higher than grade III tumors (P<0.017).

CONCLUSION

The electrical conductivity characteristics of glioma were determined noninvasively by MRI. Electrical conductivity difference of gliomas from the normal brain parenchyma and between tumor grades suggests potential usefulness of noninvasive electrical conductivity measurements.

CLINICAL RELEVANCE/APPLICATION

Information about tissue electrical conductivity can be obtained noninvasively by MRI; and this information can be beneficial in distinguishing gliomas.

SSA18-02 Symptomatic Seizures in Primary Glioblastoma: A Radiogenomic Approach towards a Possible Prognostic Factor

Sunday, Nov. 29 10:55AM - 11:05AM Location: N229

Participants

Vera Ć. Keil, MD, Bonn, Germany (*Presenter*) Nothing to Disclose Tunc F. Ersoy, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose Dariusch R. Hadizadeh Kharrazi, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose Hans H. Schild, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose Matthias Simon, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In patients with primary glioblastoma (pGB), tumor-induced seizures (TIS) are a common symptom and are possibly a positive prognostic factor for progression free and overall survival (PFS, OS). Explanations of the pathogenesis of TIS range from tumor location and pressure effects to neurochemical particularities based on the genetic profile of the tumor. This study evaluates if TIS in pGB can be correlated with imaging or genetic aspects of the lesion.

METHOD AND MATERIALS

Retrospective analysis of pre-operative 3 T MRI brain scans (Achieva TX; Philips Healthcare) of 64 pGB patients (29 with TIS; 35 without seizures). Analysis criteria: gender, age, PFS and OS, genetic profile (TERT mutation/rs2853669 polymorphism, MGMT promotor status), midline shift, subventricular pGB growth, bilaterality, multifocality as well as multiple volume ratios. Volumetry of contrast-enhancing (vital) tumor (CER), central necrosis (CN) and peri-focal FLAIR hyperintensities was based on 3D contrast-enhanced T1w, T2w and FLAIRw maps. MRI were analyzed with post-processing software (Philips Intellispace) by three readers

independently. Statistic analyses were performed with SPSS 22.0 with TIS as the independent variable.

RESULTS

OS was significantly longer in pGB patients with TIS (p=0.004). There was a tendency for longer PFS in this group (p=0.08; mean 13.3 vs. 8.3 months). In pGB patients with TIS, total tumor volume was significantly smaller (p=0.017; 50.3 v. 29.4 cm³) and the tumor was significantly more often found in the subventricular zone, yet surprisingly not in the hippocampal area. TIS was not associated with any of the tested genetic markers known to be associated with longer OS and PS.

CONCLUSION

TIS in pGB patients could significantly be correlated with distinct imaging aspects of the tumor (size and location) as well as with longer OS and PFS. Commonly analyzed genetic markers for OS and PFS (MGMT, hTERT) were yet not associated with TIS.

CLINICAL RELEVANCE/APPLICATION

While TIS proved a prognostic factor for OS and PFS, this is not correlated with MGMT and hTERT status in pGB, but TIS does correlate with distinct imaging aspects on MRI. Whether TIS lead to earlier diagnoses of pGB and hence longer OS/PFS due to smaller tumor volume remains an intricate question to solve.

SSA18-03 Investigation into the Effect of Diagnostic Ultrasound and Microbubble on the Blood-Brain Tumor Barrier Permeability of C6 Glioma

Sunday, Nov. 29 11:05AM - 11:15AM Location: N229

Participants

Jinlong Zhang, PhD, Chongqing, China (*Presenter*) Nothing to Disclose Weiguo Zhang, Chongqing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the effect of microbubble-enhanced diagnostic ultrasound (MEUS) on the blood-brain tumor barrier permeability and the possible mechanism.

METHOD AND MATERIALS

C6 Glioma-bearing Sprague-Dawley rats were assigned to 3 separate groups; the microbubble-enhanced continued diagnostic ultrasound group (CMEUS), the microbubble-enhanced intermittent diagnostic ultrasound group (IMEUS) and the control group. Rats were insonicated through skull with low-frequency diagnostic ultrasound and injected with Evans Blue (EB) dye and microbubbles through their tail veins to test changes in capillary permeability. Confocal laser scanning microscopy was used to observe the deposition of red fluorescence-dyed EB in tumor tissues. HE staining and MRI SWI were used to evaluate whether MEUS can damage normal brain tissue. The distribution and expressing levels of JAM-1 and calcium-activated potassium channels (Kca channels) was detected by western blot and immunohistochemical.

RESULTS

In the MEUS groups, EB exudation exhibited a significant increase in the tumor tissue compared with the control group. While the IMEUS group had more EB exudation than the CMEUS group. LSCM showed that a bright red fluorescence of EB was extensively distributed in the tumor interstitium. Western blot and immunohistochemical recealed MEUS significantly increased Kca channel protein expression and reduced JAM-1 expression in glioma tissue. And this changes were more obvious in the IMEUS group than the CMEUS group.

CONCLUSION

MEUS could effectively increase blood-brain tumor barrier permeability without causing damage to normal nerve tissue. The mechanism might be up-regulation of KCa channels expression in glioma tissue and affecting the formation of tight junction in bloodbrain tumor barrier by reduction of JAM-1 expression. These findings might provide some new guidance to find a therapeutic option to site-specific open the BTB and deliver anti-cancer agents to glioma.

CLINICAL RELEVANCE/APPLICATION

These findings might provide some new guidance to find a therapeutic option to site-specific open the BTB and deliver anti-cancer agents to glioma.

SSA18-04 Improved Clinical DCE-MRI Pipeline for High Resolution, Whole Brain Imaging: Application to Brain Tumor Patients

Sunday, Nov. 29 11:15AM - 11:25AM Location: N229

Participants

Krishna S. Nayak, PhD, Los Angeles, CA (*Presenter*) Nothing to Disclose Yi Guo, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Yinghua Zhu, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Sajan Goud Lingala, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose R. Marc Lebel, Calgary, AB (*Abstract Co-Author*) Employee, General Electric Company Naren Nallapareddy, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Mark S. Shiroishi, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Mark S. Shiroishi, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Mark S. Shiroishi, MD, Los Angeles, CA (*Abstract Co-Author*) Speakers Bureau, Toshiba Corporation; Medical Advisory Board, Bayer AG; Medical Advisory Board, Bracco Group; Medical Advisory Board, FUJIFILM Holdings Corporation;

PURPOSE

To develop novel DCE-MRI acquisition, reconstruction, and processing approaches that are targeted towards providing complete clinical assessment of brain tumors

METHOD AND MATERIALS

 A clinical prospective evaluation of a novel sparse sampling and constrained reconstruction scheme to enable whole brain DCE-MRI imaging (22x22x20 cm3 coverage at spatial resolution of 0.9x0.9x1.9mm3) is demonstrated. Our approach uses multiple sparsity constraints in the spatial and temporal domain, which are spatial wavelet, spatial total variation and temporal finite difference, all with low weights, to mitigate potential bias from any one constraint. We compare with a current clinical scan (Rate 2 SENSE: 22x22x4.2cm3 at spatial resolution of 0.9x1.3x7mm3) on 15 brain tumor (BT) patients. PK parameters (Ktrans, vp) were derived, and image quality scores (4 point Likert scale) from two experienced neuroradiologists were used to evaluate the anatomic images and PK maps. We also propose two novel constraints that leverage knowledge from the PK model, to improve the above constraints, and obtain reduced dependence on free parameters; these are evaluated in a retrospective undersampling study of 10 BT patients.

RESULTS

We obtained higher image quality scores with our experimental scan compared to the clinical scan. The combined radiologists scores for each of the time-resolved, post-contrast, Ktrans images, respectively for the accelerated and clinical scans were 1.2+0.6 v/s 2.2+0.7 (p<0.001). Fig1 demonstrates two examples of improved volume coverage in imaging a patient with a 6cm glioblastoma multiforme tumor, and a patient with 14 metastatic lesions spread throughout the brain. In the retrospective study, the novel PK derived constraints achieved improved PK parameter map depiction at acceleration rates greater than 20; (not shown)

CONCLUSION

A novel high resolution whole brain DCE-MRI method using constrained reconstruction that is clinically feasible is demonstrated; which constituted a substantial 36 fold improvement in resolution and coverage compared to current clinical scans

CLINICAL RELEVANCE/APPLICATION

The combined use of modern sparse sampling, and constrained reconstruction techniques enables whole brain isotropic resolution DCE-MRI which greatly improves the clinical value of DCE-MRI in characterizing brain tumors (eg. guaranteed imaging of large tumors, multiple small lesions, assessment of anti-angiogenic therapies for brain tumors).

SSA18-05 Two-dimensional Localized Correlated Spectroscopy (2D L-COSY) at 7T for Detection of 2hydroxyglutarate in Gliomas with IDH Mutations

Sunday, Nov. 29 11:25AM - 11:35AM Location: N229

Participants

Gaurav Verma, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose Suyash Mohan, MD, Philadelphia, PA (*Abstract Co-Author*) Consultant, ACR Image Metrix; Investigator, Rad Dx Steven Brem, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose MacLean Nasrallah, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Michael A. Thomas, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Arati Desai, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Lisa M. Desiderio, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Harish Poptani, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Rajakumar Nagarajan, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Mutations in the isocitrate dehydrogenase (IDH) 1 and 2 genes in oligodendroglioma, astrocytoma and secondary glioblastoma are associated with better prognosis. Previous magentic resonance spectroscopy (MRS) studies have suggested the oncometabolite 2-hydroxyglutarate (2HG) as a potential biomarker for these mutant gliomas. Two-dimensional localized correlated spectroscopy (2D L-COSY) has demonstrated unambiguous and reliable measurement of several brain metabolites, including 2HG. Spectroscopy at ultra-high fields affords proportionally higher signal quality and spectral separation resulting in improved sensitivity and specificity. In this study we demonstrate the utility of 2D L-COSY for detection of 2HG in human gliomas.

METHOD AND MATERIALS

Seven brain tumor patients with prior magnetic resonance imaging/spectroscopy (MRI/MRS) scans at 3T were studied using 2D L-COSY on a 7T whole-body scanner with a 32-channel transmit/receive head coil. Scan parameters were as follows: TE = 20 ms, TR = 2 s, 8 averages, $64 \Delta t1$ increments of 0.4 ms, 2048 t2 points with F2 bandwidth = 4000 Hz and F1 bandwidth = 2500 Hz, scan time 17 min. Voxels were localized using T2-weighted fluid-attenuated inversion recovery (FLAIR) imaging and ranged from 11-15 ml. L-COSY data were reconstructed offline using a custom MATLAB-based post-processing algorithm and quantified through peak volume integration. IDH1/2 mutation status was subsequently determined with pathology.

RESULTS

2D L-COSY detected 2HG peaks in two of the seven patients. A third patient was prospectively declared inconclusive due to artifact ridging in the region where 2HG would be expected. Pathology results confirmed IDH1 mutation in these three patients and the absence of mutation in the remaining four. 2D L-COSY further demonstrated the unambiguous separation of other metabolites including choline-containing metabolites like phosphocholine (PC) and glycerophosphocholine (GPC) and separation of lactate (Lac) from background lipid signal.

CONCLUSION

This study using 2D L-COSY represents the unambiguous detection of 2HG in vivo at 7T, which could serve as an biomarker for malignant progression in brain tumors.

CLINICAL RELEVANCE/APPLICATION

Pre-surgical detection of 2HG could alter treatment strategies as both an early marker for malignant progression and as an endpoint for targeted therapy (AGIOS 121 drug) against IDH1 mutation.

SSA18-06 Amide Proton Transfer and Magnetization Transfer Imaging of Primary CNS Lymphomas and Highgrade Gliomas: Differential Diagnostic Performance and Comparison with Nuclear-Cytoplasm Ratios

Sunday, Nov. 29 11:35AM - 11:45AM Location: N229

Participants

Shanshan Jiang, MSc, Guang Zhou, China (*Presenter*) Nothing to Disclose Jinyuan Zhou, PhD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Xianlong Wang, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose Hao Yu, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose Yufa Li, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose Zhibo Wen, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To show the ability of using the novel amide proton transfer-weighted (APTW, sensitive to mobile proteins, such as those in the cytoplasm), as well as conventional magnetization transfer (MT, sensitive to semi-solid macromolecules) MRI signals as imaging biomarkers to differentiate primary CNS lymphomas (PCNSLs) from high grade gliomas (HGGs), and evaluate the correlations between APTW and MT imaging signals and nuclear-cytoplasm (N/C) ratios.

METHOD AND MATERIALS

Eleven patients with lymphomas and 21 patients with HGGs were studied. MT spectra over an offset range of ± 6 ppm (eight acquisitions at ± 3.5 ppm to increase the signal-to-noise ratio) and the conventional MT ratio (MTR) at 15.6 ppm (2 kHz) were acquired. The multiple APTW signals and MTR signal were obtained and compared between PCNSLs and HGGs. The diagnostic performance was assessed with the receiver-operating-characteristic (ROC) analysis. Image analysis software (Image-Pro Plus) was applied to calculating N/C ratios on HandE sections.

RESULTS

The PCNSLs usually showed more homogeneous APTW hyperintensity (spatially compared to the normal brain tissue) than the HGGs. The maximum APTW signal (APTWmax) and APTW signal inhomogeneity (APTWmax-min = APTWmax - APTWmin) within a lesion were significantly lower (P < 0.05 and 0.001, resp.), while the MTR signal was significantly higher (P < 0.01) in PCNSL lesions than in HGG lesions. APTWmax-min had the highest area under the ROC (0.963) and accuracy (94.1%) in differentiating PCNSLs from HGGs. There were significantly larger N/C ratios in PCNSLs (1.69 ± 0.72) than in HGGs (0.55 ± 0.21 ; P < 0.01), consistent with the APTW and MTR measurements. There was a strong, significantly negative correlation between APTWmax and N/C ratio (R = 0.576, P < 0.01), and there was a moderate positive correlation between MTR and N/C ratio (R = 0.326, P < 0.084).

CONCLUSION

The endogenous protein-based APTW signal would be a valuable MRI biomarker that can to provide an additional value to identify PCNSLs and HGGs presurgically.

CLINICAL RELEVANCE/APPLICATION

The addition of APT imaging to the currently used MRI protocol (including the conventional and advanced MRI sequences) would enhance the differential diagnostic accuracy of MRI between PCNSLs and HGGs ultimately.

SSA18-07 Computer Extracted Texture Descriptors from Different Tissue Compartments within the Tumor Habitat on Treatment-naïve MRI Predict Clinical Survival in Glioblastoma Patients

Sunday, Nov. 29 11:45AM - 11:55AM Location: N229

Participants

Pallavi Tiwari, PhD, Cleveland, OH (*Presenter*) Nothing to Disclose Jay B. Patel, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Sasan Partovi, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Prateek Prasanna, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Anant Madabhushi, MS, Piscataway, NJ (*Abstract Co-Author*) Research partner, Siemens AG Research partner, General Electric Company Research partner, F. Hoffmann-La Roche Ltd Founder and President, IbRiS, Inc

PURPOSE

Glioblastoma Multiforme (GBM) is a highly aggressive and heterogeneous brain tumor. Currently all GBM patients are given "onedose-fit-all" treatment. Identification of prognostic markers can allow for personalized therapy options for GBM. The underlying hypothesis of this study is that the heterogeneity in GBM (due to subtle variations in tumor enhancement, cellular density, fibrosis, necrosis that are not visually appreciable on volumetric analysis of MRI) is prognostic and can be captured using computerized texture descriptors extracted from within different tumor compartments (enhancing tumor, necrotic core, edema). These compartments together define tumor "habitat", and computerized texture features from within the habitat can be predictive of short-term (STS) (overall survival (OS) <6-months) from long-term survival (LTS) (OS>24-months).

METHOD AND MATERIALS

A total of 62 3 Tesla MRI studies (27 STS, 35 LTS) with Gd-T1C, FLAIR, and T2w protocols were obtained from the TCIA repository. Enhancing tumor, and necrotic regions on Gd-T1 and edematous region jointly on T2-w and FLAIR, were manually segmented by an expert using Slicer 3D. 135 2-D texture descriptors on a per-voxel basis (e.g. co-occurrence matrices, gray-level dependence matrices, Gabor), and volumetric measurements were extracted from each oftumor, necrosis, edema compartments on every MRI protocol. Feature selection was used to identify most discriminative features with a random forest classifier trained via 3-fold cross validation. Kaplan-Meier (KM) curves were used for survival analysis, with correction for multiple hypothesis testing to identify features that were significantly (p<0.05) correlated with survival.

RESULTS

Contributions from top 18 texture features within the tumor habitat, (from edema, necrotic core, enhanced tumor), when analyzed together, were most significantly associated with survival, across Gd-T1-C (p=0.003), FLAIR (p=0.006), and T2-w (p=0.02) as compared to individual features, and volumetric measurements from the tumor habitat.

CONCLUSION

Computerized texture features when jointly interrogated across compartments within the tumor habitat appear more prognostic of clinical survival in GBM than features from enhancing tumor and tumor volume alone.

CLINICAL RELEVANCE/APPLICATION

Identifying MRI differences in survival characteristics for patients with long term and short-term survival can allow for designing personalized therapeutic decisions for GBM.

SSA18-08 Using Pre-Operative Dynamic Contrast-Enhanced MRI to Evaluate Tissue Factor Expression: A Potential Role in Prediction of Glioma Malignancy

Sunday, Nov. 29 11:55AM - 12:05PM Location: N229

Participants

Tian Xie, Chongqing, China (*Presenter*) Nothing to Disclose Xiao Chen, Chongqing, China (*Abstract Co-Author*) Nothing to Disclose Wei Xue, Chongqing, China (*Abstract Co-Author*) Nothing to Disclose Weiguo Zhang, Chongqing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To correlate dynamic contrast-enhanced MRI (DCE-MRI) parameters with tissue factor (TF) expression for assessing glioma malignancy

METHOD AND MATERIALS

Thirty-two patients with histopathologically diagnosed supratentorial glioma received DCE-MRI. Extended Tofts linear model based parameters(Ktrans, Kep, Ve, Vp) were obtained, which were analyzed by hot-spot and whole tumor cross-sectional method, as well as histogram. Four serial paraffin sections were stained with TF, CD105, CD34 and a-SMA, respectively. Percentage area of TF was calculated at 200 × magnification. Microvascular parameters were caldulated at 100 × mgnification, including microvascular density (MVD), microvascular area (MVA), proliferating capillary index (PCI), and microvessel pericyte coverage index (MCI), Pearson correlation was performed between TF and multiple microvascular indexes, DCE-MRI parameters.

RESULTS

TF was associated with glioma grade and significantly correlated with proliferating capillary index (PCI), microvascular pericyte coverage index (MPI) (r=0.798, p<.001; r=0.835, p<.001) and also showed moderate correlation with microvascular area (MVA) and microvessels density (MVD). volume transfer constant from plasma to tissue (Ktrans) hot-spot value best correlated with TF (r=0.886, p<.001), followed by 90th percentile Ktrans value (r=0.801, p<.001). Moreover, histogram analysis of Ktrans value demonstrated that weak TF expression was associated with less heterogeneous and positively skewed distribution.

CONCLUSION

Correlation of TF with microvascular indexes indicated that TF tightly linked with glioma malignancy. And Ktrans parameters provided reliable estimation of TF expression in glioma patients.

CLINICAL RELEVANCE/APPLICATION

DCE-MRI could pre-operatively evalute tissue factor expression, thus it can be utilized for assessing glioma malignancy, particularly on neovascularization, like vascular endothrlium proliferation and pericytes coverage

SSA18-09 Chemical Shift Imaging (CSI) for Detection of 2-Hydroxyglutarate (2HG) in Human Gliomas at 3T

Sunday, Nov. 29 12:05PM - 12:15PM Location: N229

Participants

Gaurav Verma, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose Harish Poptani, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose MacLean Nasrallah, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Michael A. Thomas, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Arati Desai, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Steven Brem, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Suyash Mohan, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The "oncometabolite" 2-hydroxyglutarate (2HG) has been shown to be an ideal biomarker for detection of isocitrate dehydrogenase (IDH) mutated gliomas. The presence of IDH mutation may be an early genetic marker of malignant transformation in gliomas and non-invasive detection of 2HG may aid in better treatment planning of these tumors. Chemical Shift Imaging (CSI) at 3T has been proposed for detection of 2HG and this study was performed to prospectively detect 2HG in tumors suspected of gliomas on imaging.

METHOD AND MATERIALS

Five patients were studied on a 3T scanner with a 12-channel receive head coil. Scan parameters were: TE=97 ms, TR=1.7s, NEX=3 with weighted phase-encoding, 1024 complex points, bandwidth=2000 Hz, 16x16 matrix, scan time 7 min. Voxels were localized using FLAIR or contrast enhanced images and were each $1 \times 1 \times 3$ cm3. CSI data were reconstructed offline and quantified using the LCModel prior-knowledge based fitting program. A Cramer-Rao lower bound (CRLB) of 40% was used along with the criteria that multiple neighboring voxels show presence of 2HG. IDH1/2 mutation status was subsequently determined on pathology.

RESULTS

2HG resonance was detected in three patients who were later found to be: low grade (WHO Grade II, n=2) and high grade (WHO Grade III, n=1). The remaining two patients did not show a 2HG peak and were found to be: WHO grade IV, n=1; metastases, n=1. Presence of mutant IDH mutation was subsequently confirmed on pathology in all three patients where 2HG was detected while the

remaining two patients were IDH mutation negative.

CONCLUSION

LCModel fitting of CSI data successfully detected 2HG, confirming previous studies. This study further confirms the role of 2HG as a marker for malignant transformation indicating that IDH positive low grade gliomas where 2HG is detected should be treated more aggressively and can be ideal candidates for IDH targeted therapies.

CLINICAL RELEVANCE/APPLICATION

In vivo 2HG detection has significant translational implications: Early biomarker of malignant progression, treatment response and recurrence Endpoint for therapy (AGIOS 121 drug) targeted against IDH1

СТ

PH

Physics (CT I - Dual Energy/Spectral)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S403B

AMA PRA Category 1 Credits ™: 1.50 ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Norbert J. Pelc, ScD, Stanford, CA (*Moderator*) Research support, General Electric Company; Research support, Koninklijke Philips NV; Consultant, Varian Medical Systems, Inc; Consultant, NanoX; Scientific Advisory Board, RefleXion Medical Inc; Scientific Advisory Board, Prismatic Sensors AB; Medical Advisory Board, OurCrowd, LP;

Mats Danielsson, PhD, Stockholm, Sweden (*Moderator*) Stockholder, Prismatic Sensors AB; President, Prismatic Sensors AB; Stockholder, Innovicum AB; President, Innovicum AB; Research Grant, Koninklijke Philips NV; Stockholder, Biovica International AB; Board Member, Biovica International AB;

Sub-Events

SSA19-01 Preclinical CT Angiography Imaging in a Large Animal Model Using a Whole-body Photon Counting CT Scanner Prototype

Sunday, Nov. 29 10:45AM - 10:55AM Location: S403B

Participants

Ahmed Halaweish, PhD, Rochester, MN (*Presenter*) Employee, Siemens AG Shuai Leng, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Zhicong Yu, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Zhoubo Li, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Jill M. Anderson, RT, ARRT, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Steven M. Jorgensen, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Erik L. Ritman, MD, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

To investigate CT Angiographic (CTA) imaging capabilities of a whole-body prototype photon counting CT scanner in a large animal model, in comparison to 2nd generation dual-source dual energy CTA imaging.

METHOD AND MATERIALS

The prototype, whole-body photon counting CT (PCCT) scanner (Siemens Healthcare, Forchheim, Germany) is built on a Definition Flash dual-source platform, where the "A" detector/source sub-system uses a conventional energy-integrating detector (EID) and the "B" detector/source sub-system uses a photon-counting detector (PCD). Six pigs were imaged at clinically equivalent doses on the PCCT scanner (140 kV, 140 mAs, 15.51 mGy, 0.5 second rotation, 0.6 pitch, 32x0.5 collimation) and a commercial dual-source CT system (Definition Flash, Siemens Healthcare) (80/Sn140kV, 406/157 mAs, 15.4 CTDIvol, 0.5 second rotation, 0.5 pitch, 32x0.6 collimation). Energy spectrum thresholding on the PCCT scanner was set for 25 keV and 65 keV, resulting in two threshold (25-140 keV and 65-140keV) and two bin (25-65keV and 65-140keV) image datasets. CT angiograms of the head and neck, thorax, and abdomen/pelvis were obtained on both systems (100 ml Iohexol 350 Injection + 35 ml saline chaser). Images were reconstructed using the same clinical parameters (3.0 mm slices / 2.0 mm increment, D30f kernel) and qualitatively evaluated for general image quality and the presence of artifacts. Material decomposition was performed using an in-house developed material decomposition algorithm.

RESULTS

PCD images demonstrated decreased beam hardening relative to EID images and minimal ring, cupping or streaking artifacts. Qualitatively, CTA results were judged to be equivalent. Initial material decomposition results demonstrated good sensitivity to iodine and calcium separation.

CONCLUSION

The evaluated prototype whole-body PCD CT system was capable of producing clinical image quality CT angiographic exams with reduced artifacts and improved beam hardening.

CLINICAL RELEVANCE/APPLICATION

Whole-body CTA can be obtained with a whole-body photon counting CT scanner, using a single x-ray source while retaining the energy separation of a dual-source CT system with optimized filtration.

SSA19-02 Dose Efficiency of a Prototype, Whole-body, Photon-counting CT System versus a Conventional CT System for Imaging of Iodinated Contrast Media

Sunday, Nov. 29 10:55AM - 11:05AM Location: S403B

Participants

Ralf Gutjahr, Munich, Germany (*Presenter*) Grant, Siemens AG Ahmed Halaweish, PhD, Rochester, MN (*Abstract Co-Author*) Employee, Siemens AG Katharine Grant, PhD, Rochester, MN (*Abstract Co-Author*) Employee, Siemens AG Steffen Kappler, Dipl Phys, Forchheim, Germany (*Abstract Co-Author*) Researcher, Siemens AG Zhicong Yu, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Shuai Leng, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Lifeng Yu, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Zhoubo Li, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Steven M. Jorgensen, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Erik L. Ritman, MD, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

The purpose of this study was to investigate, for the task of iodine imaging, the dose efficiency of a whole-body photon counting CT scanner relative to a commercially available energy-integrating CT system.

METHOD AND MATERIALS

Photon Counting CT (PCCT) imaging was performed on a whole-body prototype system (Siemens Healthcare, Forchheim, Germany), while conventional CT imaging was performed on a commercially available energy-integrating CT system (SOMATOM Definition Flash). The PCCT prototype system is built on a dual-source platform, where the "A" tube/detector uses a conventional energy integrating detector and the "B" tube/detector uses a photon-counting detector. Imaging was performed with similar geometries, identical beam filtration and equivalent tube and detector parameters. Three anthropomorphic phantoms (CIRS, Inc., Norfolk, VA, USA), mimicking a: 10 year old, small adult, and large adult were scanned. Each phantom contained Lucite vials of four different iodine concentrations: 5, 10, 15 and 20 mg/mL. Images were acquired on each system with four different tube voltages (80, 100, 120, 140 kV) and ten different tube currents (50, 100, 150, 200, 250, 300, 350, 400, 500, 550 mA). CT numbers and noise were measured in both tissue-equivalent and iodine regions of interest (ROIs) and averaged over 10 neighboring slices. The calculated CNR values were plotted against CTDIvol(32 cm) for each ROI, tube voltage and phantom size and fitted with a square root-function.

RESULTS

At 140 kV, the PCCT system provided increased CNR values (for a given dose) in the 10 year old (+10.7%), small adult (+13.2%), and large adult phantoms (+16.2%). An increase in CNR values (at a given dose) was also observed at 120 kV (10 year old: +10.7%, small adult: +12.9%, large adult: +18.7%) and at 100 kV (10 year old: +9.9%, small adult: +10.9%, large adult: +21.8%).

CONCLUSION

Relative to conventional CT, PCCT provided increased dose efficiency for iodine imaging for all presented phantom sizes. This is a result of the heavier weighting of the lower energy photons, apparent with PCCT technology.

CLINICAL RELEVANCE/APPLICATION

PCCT provides greater dose efficiency for iodine imaging relative to conventional energy integrating CT systems.

SSA19-03 Spectral Imaging on a 160 mm Clinical CT System with Fast kVp Switching: Evaluation of Image Quality

Sunday, Nov. 29 11:05AM - 11:15AM Location: S403B

Participants

Debashish Pal, PhD, Waukesha, WI (*Presenter*) Employee, General Electric Company Kevin Mulligan, BEng, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Roman Melnyk, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Yasuhiro Imai, MS, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Jean-Baptiste Thibault, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Jiahua Fan, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company

PURPOSE

Purpose:Wide-cone CT systems with 160 mm aperture or more has several clinical benefits such as single shot cardiac imaging and helical scans with faster acquisition. Spectral imaging using fast kV switching on such a system can additionally enable quantitative imaging and access to CT images at lower energies. The purpose of this work is to evaluate the new prototype image generation chain of a 160 mm spectral imager using fast kVp switching (Revolution CT, GE Healthcare, Waukesha, WI).

METHOD AND MATERIALS

The new spectral image generation chain incorporates an advanced model of the acquisition physics and measurement noise. It also builds upon the hardware advancements made in the wide-cone CT system and an advanced spectral modeling and projection-domain material decomposition (MD). A 33 cm GAMMEX phantom is scanned at three different dose level (20.1, 11.9, 23.1 mGy) with known density of iodine. A 20 cm GAMMEX phantom is also scanned under 20.1 mGy. The MD (Water-Iodine) images are reconstructed using a slice thickness of 0.625 mm. The monochromatic images are generated from 40 - 140 keV. First noise in the monochromatic images at 0.625 mm slice thickness is measured by averaging across 3 different ROIs. Contrast to noise ratio (CNR) is also measured across all keVs at 0.625 mm slice thickness by placing a ROI on the 20 mg/cc iodine rod. Circular ROIs of radius 10 mm are placed on 5 mm averaged slices for measuring the mean density in the 5, 10, and 20 mg/cc iodine rods.

RESULTS

The image chain is evaluated on GAMMEX phantoms with different size and dose level. The CNR monotonically increases from 140 to 40 keV for both 20 and 33 cm GAMMEX. The density accuracy of Iodine is within 5% of the known density for all rods. The noise reduction at 40 and 140 keV for the 33 cm GAMMEX is measured to be 59% and 63% relative to MD images with no noise reduction. The noise reduction for the 20 cm GAMMEX at 40 and 140 keV is 58% and 61%.

CONCLUSION

The phantom study demonstrates superior image on both material and monochromatic images with the new image chain. Significant improvement in CNR is achieved at lower energies without compromising on the density accuracy.

CLINICAL RELEVANCE/APPLICATION

The quantitative aspect of spectral imaging using the new imaging chain and improved contrast-to-noise at lower energies is

SSA19-04 Segmentation-Assisted Material Decomposition in Dual Energy Computed Tomography (DECT)

Sunday, Nov. 29 11:15AM - 11:25AM Location: S403B

Participants

Stefan Kuchenbecker, MENG, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose Sebastian Faby, DIPLPHYS, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose David Simons, MD, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose Michael Knaup, PhD, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose Heinz-Peter Schlemmer, MD, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose Michael M. Lell, MD, Erlangen, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Speakers Bureau, Siemens AG; Research Grant, Bayer AG ; Speakers Bureau, Bayer AG; Research Consultant, Bracco Group; ; Marc Kachelriess, PhD, Heidelberg, Germany (*Presenter*) Nothing to Disclose

PURPOSE

Prior knowledge is required to decompose DECT data into more than two basis materials. Published methods show limitations regarding the assumptions made: The basis materials chosen often do not correspond to the anatomical structures (e.g. contrast agent represents bone, adipose tissue contains air, ...). Our purpose is to improve the prior knowledge to avoid misclassifications. In cases where ambiguities cannot be avoided we want to present them to the reader of the decomposed images.

METHOD AND MATERIALS

A common approach of DE-based three material decomposition can be visualized by a triangle in a DECT-diagram. The number of basis materials can be increased by using many triangles to tesselate the DECT-diagram into a mix of basis materials like air, blood, bone, contrast agent, fat, liver, etc. In contrast to other methods attempting such multi material decompositions we first segment and classify the anatomical structures shown in the DECT data set into the region types air, fatty tissue, soft tissue, (dense and) enhanced tissue, bone, dense bone. Heuristics then choose the basis material triple (triangle vertices) that should be used for each region type among the set of the following basis materials: air, adipose tissue, liver tissue, contrast agent (CA), and calcium hydroxyapatite (CaHA). ROIs can be placed to quantify the contents. If an ROI contains no bone type region the decomposition into CaHA is omitted. In bone regions CA is not quantified. ROIs containing bone together with tissue the tissue evaluation is ambiguous-it may represent organs, connective tissue or bone marrow. Therefore CaHA and CA are quantified simultaneously. Our approach was tested on simulations and on patient data acquired with a dual source CT system.

RESULTS

Due to segmentation of a patient data set the CaHA content inside a rib is determined (c \sim 106 mg/mL) independently of the iodine content in neighboring fatty tissue of CA (c = 0.8 mg/mL). Segmented tissue is ambiguous-iodine c = 0.4 mg/mL and CaHA c = 17 mg/mL are evaluated. Representative adipose and liver tissue content are always assessed.

CONCLUSION

Our approach quantifies multiple materials according to the anatomical regions they belong to. No manual segmentation is required at improved accuracy to previous methods.

CLINICAL RELEVANCE/APPLICATION

The improved material quantification is important for diagnostics, e.g. to evaluate the vascularization of tumors or for CT-based bone mineral density analysis.

SSA19-05 Volumetric Fast kV Switching Development on Wider Cone Geometry System

Sunday, Nov. 29 11:25AM - 11:35AM Location: S403B

Participants

Priti Madhav, PhD, Waukesh, WI (*Presenter*) Employee, General Electric Company Hewei Gao, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electrical Company Vijay Subramanian, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Eric Biehr, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Adam Cohen, Milwaukee, WI (*Abstract Co-Author*) Employee, General Electric Company Spencer Cutler, Pewaukee, WI (*Abstract Co-Author*) Employee, General Electric Company Jiahua Fan, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Scott Slavic, Sussex, WI (*Abstract Co-Author*) Employee, General Electric Company

PURPOSE

The purpose of this work is to evaluate the clinical feasibility of using a wider cone beam geometry system for volumetric fast kV switching imaging. With a detector width of 160-mm and fast helical pitch capability, spectral (dual-energy) scanning of larger volume coverages can be acquired faster with reduced motion artifacts but no increase in overall dose.

METHOD AND MATERIALS

Spectral imaging evaluation was done on a 160-mm wide cone clinical CT system with Fast kVp switching (Revolution CT, GE Healthcare, Waukesha, WI). Generator improvements allow for 3x faster switching performance between low and high kV. The 3D collimator and advanced detector design help reduce X-ray scatter and electronic noise, respectively, in the dual-energy images. Advanced spectral modeling, projection-based material decomposition, and advanced noise modeling have also been developed for spectral imaging. System evaluation was done by acquiring dual-energy scans across different dose levels at 40, 80, and 160-mm scan coverages. Phantoms used include: 20-cm and 33-cm dual-energy phantom with varying Iodine densities from 2.5mg/cc to 20mg/cc (Gammex, Inc., Middleton, WI), 20-cm water-filled phantom and custom-made 24.5-cm water-filled phantom with three 5-cm liquid iodine rods submerged. CT Hounsfield Unit (HU) and Material Density (MD) Mean, standard deviation, and uniformity were measured across different monochromatic keV and MD volume images.

160-mm scans were acquired using 80/140 protocols as low as 3mGy. The 3x faster switching performance between kVps increased energy separation by 20%. With hardware improvements, measured CT HU and MD values for different Iodine concentrations in the monochromatic keV and MD images were within 2% across all dose levels. MD values in the Iodine and Water material images were accurate within 6% and 2%, respectively. Due to modeling of the Heel Effect in the Advanced Spectral algorithm, increased uniformity was observed at wider scan coverages.

CONCLUSION

With advanced hardware and image processing improvements, system and phantom evaluation has shown that dual-energy imaging can be achieved on a wide coverage CT system using fast kV switching technology.

CLINICAL RELEVANCE/APPLICATION

Benefits of spectral imaging (i.e. reduced beam hardening artifacts, improved CNR over single kVp, material information) can be achieved for wider coverage scanning with minimal impact to overall image quality and dose.

SSA19-06 Reliability of the Iodine Signal in Dual-energy CT on Two Scanner Types: A Phantom Study Featuring Beam Hardening

Sunday, Nov. 29 11:35AM - 11:45AM Location: S403B

Participants

Gordon Craggs, PhD,MSc, Brussels, Belgium (*Presenter*) Nothing to Disclose Gert Van Gompel, PhD, Brussel, Belgium (*Abstract Co-Author*) Speaker, General Electric Company Maarten Peleman, MSc, Gent, Belgium (*Abstract Co-Author*) Nothing to Disclose Peter V. Smeets, MD, Gent, Belgium (*Abstract Co-Author*) Nothing to Disclose Johan De Mey, Jette, Belgium (*Abstract Co-Author*) Nothing to Disclose Nico Buls, DSc, PhD, Jette, Belgium (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

A dual-energy (DE) phantom study was performed on two scanner types in order to evaluate (1) the stability and accuracy of CT numbers and iodine concentrations in function of object size; (2) the effect of beam hardening.

METHOD AND MATERIALS

Iodine concentrations of 3 and 6 mgI/ml were poured into two respective rows of cylindrical cavities with diameters ranging from 3 to 25.5 mm in an AAPM CT performance phantom. Besides this, a 16 mm diameter tube filled with 6 mgI/ml was placed in the main water-filled compartment, partly covered by a Teflon beam hardening ring. The phantom was scanned in standard 120 kVp and DE mode on a GE Healthcare Discovery HD750 and Siemens SOMATOM Definition Flash scanner at 3 CTDIvol's (9, 19 and 29 mGy). Iodine concentrations were determined for all cavities using the scanner's DE mode, and compared to their true concentrations. CT number stability was determined accordingly and a comparison was made between the DE acquisition and standard 120 kV scanning.

RESULTS

(1) Relatively constant (max VAR 14%) HU values for both scanners as a function of the object diameters were observed. The Siemens scanner showed a consistent overestimate of approximately 0.5 mgI/ml for both contrast concentrations. A significant decrease in concentration accuracy for object diameters smaller than 6 mm was present for both scanners. (2) A step-like increase of 10 HU upon transitioning out of the Teflon part was observed for both scanners at single energy 120 kV and the Siemens blended DE image, less for the GE DE image (AV 148 HU, max VAR 5 HU).

CONCLUSION

(1) Measured and true iodine concentrations were consistent down to 6 mm object size, notwithstanding an observed offset with one scanner type. (2) A step-like increase in HU highlights the effect of beam hardening, and is more prominent for classical scans compared to DE.

CLINICAL RELEVANCE/APPLICATION

DE CT techniques are being increasingly used in tumor imaging. Since iodine is a contrast agent commonly used in CT imaging, determining its detectable lower limit is a crucial factor. Iodine concentration estimations should be made with appropriate consideration.

SSA19-07 Comparison of the Accuracy of Iodine Quantification with a Novel Split Filter Single-source Dualenergy CT Technique and a Second Generation Dual-source Dual-energy CT

Sunday, Nov. 29 11:45AM - 11:55AM Location: S403B

Participants

Andre Euler, MD, Basel, Switzerland (*Presenter*) Nothing to Disclose Anushri Parakh, MBBS,MD, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose Caroline Zahringer, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose Bernhard Krauss, PhD, Forchheim, Germany (*Abstract Co-Author*) Employee, Siemens AG; ; Zsolt Szucs-Farkas, MD, PhD, Berne, Switzerland (*Abstract Co-Author*) Nothing to Disclose Sebastian T. Schindera, MD, Basel, Switzerland (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Ulrich GmbH & Co KG; Research Grant, Bayer AG

PURPOSE

To evaluate the accuracy of iodine quantification with a novel dual-energy technique on a single-source CT scanner using a split filter (TwinBeam Dual-Energy, Siemens) compared with dual-source dual-energy and single-source dual-spiral mode in a phantom.

RESULTS

The error of measurement for the iodine quantification ranged for the simulated intermediate-sized patient from 0.1 - 2.5 mgI/ml for

protocol A, from 0 to 6.9 mgI/ml for protocol B and from 0.1 - 2 mgI/ml for protocol C. For the simulated large patient, the error ranged from 0.6 - 7.1 mgI/ml for protocol A, from 0.2 - 7.4 mgI/ml for protocol B and from 0.3 - 3.3 mgI/ml for protocol C.

CONCLUSION

The novel single-source dual-energy CT technique with a split filter offers comparable accuracy for iodine quantification to a second generation dual-source CT scanner in a simulated intermediate-sized patient. However in simulated large patients, greater measurement errors have to be expected with the single-source dual-energy technique.

CLINICAL RELEVANCE/APPLICATION

Accurate iodine quantification with the novel split filter dual-energy CT technique offers the possibility to eliminate additional CT examination or phases (e.g. assessment of iodine uptake of a renal lesion).

SSA19-08 Feasibility of a Basis Material Decomposition Using a Prototype Whole-Body Photon-Counting-based CT System and a Living Swine Model

Sunday, Nov. 29 11:55AM - 12:05PM Location: S403B

Participants

Zhoubo Li, Rochester, MN (*Presenter*) Nothing to Disclose Shuai Leng, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Ahmed Halaweish, PhD, Rochester, MN (*Abstract Co-Author*) Employee, Siemens AG Zhicong Yu, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Jill M. Anderson, RT, ARRT, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Steven M. Jorgensen, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Erik L. Ritman, MD, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

The aim of this study was to evaluate the feasibility of performing in-vivo basis material decomposition at clinical dose levels using a prototype, whole-body photon counting CT scanner.

METHOD AND MATERIALS

A prototype, whole-body photon-counting CT (PCCT) scanner (Siemens Healthcare, Forchheim, Germany) was used in this study. After institutional animal care and use committee approval, six 3-month-old female swine were imaged at clinical doses (140 kV, 140/270 mAs, 0.5-1 second rotation time, 0.6 pitch, 32x0.5 collimation, and CTDIvol of 15.51/29.69 mGy) and full dose (440mAs, CTDIvol 68.44 mGy). The data were acquired using the "chess mode", with energy thresholds of 25, 45, 65, and 85 keV, where data from all 16 sub-pixels of the detector were combined to simultaneously generate 7 measurements at different X-ray energies. CT angiograms were obtained and images were reconstructed using clinical parameters (3.0 mm slices / 2.0 mm increment, D30f kernel). Phantom experiments were performed separately to evaluate the accuracy of our in-house developed material decomposition technique and generate the calibration data for the material decomposition of the in-vivo swine images. Noise reduction was applied on all 7 sets of PCCT images, prior to the implementation of the material decomposition algorithm, which resulted in 3 material specific images.

RESULTS

Phantom experiments showed good estimation of basis material densities with RMSE of 5.1, 0.9, 5.4 mg/ml (percent error: 3.8%, 6.6% and 0.3%) for calcium, iodine, and water, respectively at full dose. At the clinical dose level, the RSME values were 7.6, 1.2, and 9.0 mg/ml (percent error: 7.0%, 6.7% and 0.4%), respectively. Initial material decomposition results in living swine images demonstrated good separation and quantification of iodine, calcium, and water. The material decomposition performed robustly at clinical relevant dose levels when effective noise reduction was applied.

CONCLUSION

The evaluated prototype whole-body PCCT system demonstrated the potential for performing accurate basis material decomposition in-vivo at clinically relevant dose levels.

CLINICAL RELEVANCE/APPLICATION

Reliable material decomposition by the whole-body PCCT system under clinical dose level may be translated to clinical applications such as iodine quantification and stone characterization.

SSA19-09 Evaluation of Three-Stage Metal Artifact Reduction Software for 256-slice Fast-kV Switching Spectral CT

Sunday, Nov. 29 12:05PM - 12:15PM Location: S403B

Participants

Kriti Sen Sharma, PhD,BEng, Woburn, MA (*Abstract Co-Author*) Employee, General Electric Company Debashish Pal, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Taisuke Takemasa, Hino-Shi, Japan (*Abstract Co-Author*) Employee, General Electric Company Roy A. Nilsen, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Jiang Hsieh, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company Elizabeth Nett, Waukesha, WI (*Presenter*) Employee, General Electric Company

PURPOSE

The purpose of this work is to evaluate the image quality of a prototype metal artifact reduction (MAR) algorithm for severe metal cases on a prototype fast-kV switching spectral CT scanner with wide-cone capability (Revolution CT, GE Healthcare, Waukesha, WI).

METHOD AND MATERIALS

A three-stage projection based metal artifact reduction algorithm (SmartMAR. GE Healthcare) originally designed for single energy

CT is extended to spectral CT. The algorithm is developed to further improve the quantitative aspect of spectral imaging in the presence of dense metal objects such as hip implants, dental fillings. Two phantoms with metal inserts of various sizes were constructed: (1.) Titanium and Stainless Steel rods in water cylinders (Fig. A), (2.) torso phantom fitted with metal implants at extremities (Fig. C, D). The phantoms were scanned on a prototype fast-kV switching spectral CT scanner under the following protocol (80/140 kVp, 400 to 500 mAs). Scan-data was reconstructed without (baseline-recon) and with the new MAR algorithm. Three ROIs were placed at different locations in the phantoms as shown in Figs. A, D (two in area of high metal streak, and one away from metal). Noise performance was quantified for the two phantoms by calculating the average standard deviation s1, s2, and s3 in selected ROI-s across all the slices affected by metal.

RESULTS

Images reconstructed with MAR (Figs. B, E) showed reduced beam hardening and streaks compared to baseline-recons (Figs. A, C, D). In area of metal streaks, the noise performance was improved for MAR recon (s1: 15.25, s2: 25.28) compared to baseline recon (s1: 42.05, s2: 97.99), i.e. a reduction of 63%, and 74% respectively). In areas away from metal, the standard deviation s3 was reduced from 29.84 (baseline) to 17.54 (MAR), i.e. an improvement of 41%.

CONCLUSION

For severe metal cases, a prototype three-stage MAR algorithm for projection-based spectral CT showed improvements over baseline-recon in terms of image quality and noise performance.

CLINICAL RELEVANCE/APPLICATION

Projection based spectral CT allows native reduction of beam hardening artifacts arising from metallic objects; MAR processing further improves the quantitation by reducing residual artifacts caused due to factors such as photon starvation and partial volume.

Physics (Mammography/Ultrasound)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S404AB



AMA PRA Category 1 Credits ™: 1.50 ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Andrew Karellas, PhD, Worcester, MA (*Moderator*) Research collaboration, Koning Corporation Ernest J. Feleppa, PhD, New York, NY (*Moderator*) Research collaboration, General Electric Company; Research collaboration, SonaCare Medical, LLC

Sub-Events

SSA20-01 Realistic Simulation of X-ray Phase-contrast Imaging at a Human Scale

Sunday, Nov. 29 10:45AM - 10:55AM Location: S404AB

Participants

Yongjin Sung, Boston, MA (*Presenter*) Nothing to Disclose William P. Segars, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose Adam Pan, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose Rajiv Gupta, PhD, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

X-ray phase-contrast imaging (XPCI) can dramatically improve soft tissue contrast in medical imaging. Despite worldwide efforts to develop novel XPCI systems, a numerical framework to rigorously predict the performance of a clinical XPCI system at a human scale is not yet available.

METHOD AND MATERIALS

We have developed a novel method of propagating the X-rays through a human-scale 3-D object [1]. Specifically, we have adopted the wave equation simplified with the first-order Rytov approximation, which allows us to quickly and accurately generate simulated amplitude and phase images that an XPCI detector would see. For our numerical phantom, we have adopted the XCAT model as defined with non-uniform rational B-splines (NURBS) [2]. Existing methods using the XCAT rely on ray tracing or Monte-Carlo simulation, which produce inaccurate XPCI simulations. Using our wave-based approach, we can accurately simulate the phase-contrast signal from the NURBS phantom.

RESULTS

Using the developed method, we have generated a projection image of a human chest for the grating-based method, the most popular XPCI method (Figure 1b). Compared to the attenuation image (Figure 1a), there is higher contrast between soft-tissue structures on the phase-contrast image. For example, all the structures obscured by the diaphragmatic silhouette are much better appreciated in the phase image. Similarly, the intra-vertebral disks are seen with greater clarity in phase-contrast than in attenuation. The phase-contrast image also demonstrates the bronchial tree (including the primary, secondary, and tertiary branches) better than the attenuation image.

CONCLUSION

Combining the NURBS-based XCAT phantom and our wave propagation simulator, we could simulate various XPCI methods at a full adult human scale, for the first time with the best of our knowledge.

CLINICAL RELEVANCE/APPLICATION

There is currently no XPCI system that can image a human torso. Our numerical tool can be used to predict and compare the performance of new XPCI systems on various disease entities in a clinical scenario.

SSA20-03 Comparison of Detection Performance between 2D Digital Mammography and Breast Tomosynthesis Using a Structured Physical Phantom

Sunday, Nov. 29 11:05AM - 11:15AM Location: S404AB

Participants

Lesley Cockmartin, Leuven, Belgium (*Presenter*) Nothing to Disclose Nicholas Marshall, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Guozhi Zhang, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Kim Lemmens, MSc, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Eman Shaheen, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Hilde Bosmans, PhD, Leuven, Belgium (*Abstract Co-Author*) Co-founder, Qaelum NV Research Grant, Siemens AG

PURPOSE

To propose and apply a phantom for performance comparison between digital mammography (DM) and breast tomosynthesis (BT).

METHOD AND MATERIALS

The phantom consists of a 48 mm thick breast-shaped acrylic container, filled with water and acrylic spheres of different diameters. Three-dimensionally printed spiculated (diameter range: 3.8-9.7 mm) and non-spiculated (1.6-6.2 mm) masses as well as

microcalcifications (90-250 µm) were inserted as targets. The phantom was imaged ten times in both DM and BT mode on four systems: Siemens Inspiration, Hologic Selenia Dimensions, GE SenoClaire 3D and Fuji Amulet Innovality under automatic exposure control. Five readers evaluated target detectability in a four-alternative forced-choice study. The percentage of correct responses (PC) was assessed based on 10 trials of each reader for each object type, size and imaging modality. Additionally, detection threshold diameters at 62.5% PC were assessed via fitting of the psychometric curve.

RESULTS

For microcalcifications, average PC was comparable for the four systems in DM and BT mode, ranging from 78% to 84% for DM and from 64% to 82% for BT. Threshold diameters for microcalcification detection for the four systems ranged between 111 and 118 µm in DM and between 113 and 158 µm in BT. For masses, PC values were higher in BT compared to DM. In DM, they ranged from 60% to 75% for spiculated and from 31% to 45% for non-spiculated masses. For BT, detection of spiculated masses was the highest (94% to 99%) and remained high for non-spiculated masses (65% to 85%). For spiculated masses threshold diameters were between 4.6 and 6.3 mm for DM and between 1.7 and 2.6 mm for BT. Threshold diameters for non-spiculated masses lay outside the range available in the phantom in DM mode while for BT threshold diameters were found between 1.8 and 3.1 mm.

CONCLUSION

The phantom was able to show detectability differences between DM and BT for four commercial systems. These results are comparable to published clinical findings: BT performed better for the detection of masses, while both modalities were equivalent for the detection of microcalcifications.

CLINICAL RELEVANCE/APPLICATION

The proposed phantom enables the detection performance evaluation of BT against DM during acceptance testing, routine quality control or image quality benchmarking of BT systems.

SSA20-04 VHF-Induced Thermoacoustic Imaging Using a Clinical Ultrasound Transducer Array

Sunday, Nov. 29 11:15AM - 11:25AM Location: S404AB

Participants

Sarah K. Patch, PhD, Milwaukee, WI (*Presenter*) Nothing to Disclose William See, MD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To demonstrate that a clinical ultrasound transducer array can detect VHF-induced thermoacoustic pulses with sufficient bandwidth for quantitative whole organ imaging. This is an important step because thermoacoustic signal strength is directly proportional to SAR, which is lower in the VHF regime than in microwave or optical regimes.

METHOD AND MATERIALS

A 96-channel transducer array (P4-1) providing 3 cm coverage was incorporated into a benchtop thermoacoustic imaging system for imaging fresh surgical specimens. Thermoacoustic signal was generated by 700 ns irradiation pulses with 11 kV/m electric field strength. Data was acquired simultaneously in step-and-shoot mode by the array and a 2.25 MHz focused single-element transducer. In-plane resolution and contrast were measured by imaging an 80-micron wire and a homogeneous cylindrical phantom.Several fresh human prostates were imaged immediately after surgery. Two sets of sinograms were acquired, separated by a 2 cm translation along the tomographic axis. The P4-1 data was reconstructed over a 6 x 6 x 5 cm^3 volume. Rudimentary comparison to histology was performed.

RESULTS

As expected, the larger single element transducer was more sensitive and required 8-fold less signal averaging than the P4-1 array. Although nominal bandwidths of the P4-1 array and 2.25 MHz transducer are comparable, the single element transducer was more sensitive to low frequencies and provided better contrast, whereas the higher frequency P4-1 array provided better resolution. Full width at half maximum in the P4-1 and single element images of the 80-micron wire at isocenter were smaller and greater than 1 mm, respectively. CNR in the single element and P4-1 images of the cylindrical phantom were greater than 5 and less than 1/5, respectively. A weighted average of the two images provides better image quality than either individually.Volumetric reconstruction of the multi-channel P4-1 data visualizes anatomic features that are rarely seen in ultrasound, CT, or MRI.

CONCLUSION

VHF-induced thermoacoustic pulses can be detected by clinical ultrasound arrays. Quantitative imaging can be achieved using transducers and electronics with sensitivity to kHz frequencies.

CLINICAL RELEVANCE/APPLICATION

VHF-induced thermoacoustics requires propagating powerful EM pulses, similar to B1 excitation pulses used in MRI, but without the need for a costly superconducting magnet.

SSA20-05 Intra-Operative Cerebral Angio-Sonography with Ultrasound Contrast Agents

Sunday, Nov. 29 11:25AM - 11:35AM Location: S404AB

Participants

Francesco Prada, MD, Milan, Italy (*Presenter*) Nothing to Disclose Massimiliano Del Bene, Legnano, Italy (*Abstract Co-Author*) Nothing to Disclose Luigi Solbiati, MD, Busto Arsizio, Italy (*Abstract Co-Author*) Nothing to Disclose Giovanni Mauri, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Consultant, Esaote SpA Luca Maria Sconfienza, MD, PhD, San Donato Milanese, Italy (*Abstract Co-Author*) Nothing to Disclose Francesco DiMeco, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose

Background

Intra-operative vessels visualization is highly desirable in neurosurgery, especially when the target is related or close to main

vessels, such as in skull base and vascular surgery. Contrast enhanced ultrasound (CEUS) is an imaging technique that allows visualization of tissue perfusion and vascularization, through the infusion of purely intravascular ultrasound contrast agents (UCA).

Evaluation

After cerebral scanning with B-mode ultrasound (US) CEUS is performed: UCA are injected and insonated with low mechanical index US. UCA specific harmonic signal is transduced using contrast specific algorithm, to obtain real-time angio-sonography (ASG).

Discussion

UCA depicts flow entity and direction in the target vessels, through the visual qualitative detection of movement, velocity and number of MB. Through the UCA dynamics it is possible to study all the vascular districts simultaneously, both arterial and venous, without the necessity to set gain or pulse repetition frequency as in Doppler imaging that however permits to quantify the flow; 3 phases of enhancement are notable: arterial, parenchymal and venous. ASG, being an echotomographic examination, provides a representation of the vessels within the surgical fields, not only on the surface, as showed by microscopic fluorescence, but also of those deeply seated and still embedded within the surgical field, allowing to visualize them in depth and follow their entire course simply tilting the probe.

Conclusion

Real time intra-operative ASG is a rapid, reliable, repeatable method for vessels visualization and evaluation of tissue perfusion.

SSA20-06 A New AEC Set-up Achieves Constant Lesion Detectability for Different Breast Thicknesses in Digital Mammography

Sunday, Nov. 29 11:35AM - 11:45AM Location: S404AB

Participants

Elena Salvagnini, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Chantal Van Ongeval, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Nicholas Marshall, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Lesley Cockmartin, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Koen Michielsen, MSc, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Andre Van Steen, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose Lara Struelens, Mol, Belgium (*Abstract Co-Author*) Nothing to Disclose Hilde Bosmans, PhD, Leuven, Belgium (*Presenter*) Co-founder, Qaelum NV Research Grant, Siemens AG

PURPOSE

To investigate detectability of simulated lesions in real mammograms for different breast thicknesses and 2 set-ups for automatic exposure control (AEC).

METHOD AND MATERIALS

520 screening mammograms, acquired under standard AEC mode, were selected and divided into 4 thickness groups(T-groups), T1 \leq 29mm, T2=30-49mm, T3=50-69mm, T4 \geq 70mm. Each group contained 130 cranio-caudal lesion-free images. BIRADS density scores and Volpara density maps were available for each image. Simulated lesions of microcalcification clusters and masses were inserted into half of the images. A specific lesion template was inserted into one image of each T-group having the same BIRADS score and local Volpara value in order to separate the influence of thickness from the background. A new AEC set-up, designed to give constant theoretical object detectability as a function of thickness rather than constant detector pixel value. Modified AEC was then implemented for breast thicknesses above 30 mm resulting in an average dose increase of 60%. New patient data were collected and lesion insertion was repeated for the new dataset. Four radiologists performed a free search study on both datasets. JAFROC analysis was then applied. The alternative free-response receiver operating characteristic (AFROC) areas were calculated for each T-group.

RESULTS

For standard AEC mode: AFROC area decreases from 0.802 to 0.553 with increasing thickness for groups T1 to T3 while the area for T4 (0.565) was found almost equal to T3 (0.553). All p-values were smaller than 0.05 except for the T3-T4 pair. Detection differences between T3 and T4 were not significantly different, while the decreasing trend from T1 to T3 is significant. For the modified AEC mode: the AFROC area for T1 was equal to 0.802, while for T2, T3 and T4 it was equal to respectively 0.650, 0.652 and 0.652. No significant differences were found for these T-groups (p-values>0.05) while T1 remained significantly different from all others T-groups.

CONCLUSION

A significant decrease in lesion detection for increasing breast thickness is seen when the standard AEC mode is used. The modified AEC mode instead provided constant lesion detection for breast thicknesses above 30mm.

CLINICAL RELEVANCE/APPLICATION

This study quantifies the influence of breast thickness on lesion detectability and proposes a new AEC set-up with improved detectability for digital mammographic systems.

SSA20-07 X-ray Attenuation of Normal and Cancerous Breast Tissue Measured with Photon-counting Spectral Imaging

Sunday, Nov. 29 11:45AM - 11:55AM Location: S404AB

Participants

Erik Fredenberg, MSc, PhD, Stockholm, Sweden (*Presenter*) Employee, Koninklijke Philips NV David R. Dance, PhD, Guildford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Kenneth C. Young, PhD, Guildford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Paula Willsher, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Fleur Kilburn-Toppin, MBBCHIR, MA, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Matthew G. Wallis, MD, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Elin Moa, MS, Solna, Sweden (Abstract Co-Author) Employee, Koninklijke Philips NV

PURPOSE

Spectral imaging is emerging as a promising method to extract quantitative information from x-ray images, applied in mammography to improve lesion visibility, discriminate between lesion types, and measure breast density. Common for the development of these applications is that prior knowledge of tissue x-ray attenuation is required, but the sources of such information are sparse. Moreover, attenuation is often measured on formalin-fixed tissue specimens, but the effect of such fixation on the obtained attenuation values is largely unknown. The purpose of this study is to measure the attenuation of fresh and fixed samples of normal and cancerous breast tissue.

METHOD AND MATERIALS

7 samples of adipose breast tissue, 3 samples of glandular tissue and 8 samples of tumor tissue in the thickness range 3-12mm were imaged on a photon-counting spectral mammography system before and after formalin fixation. The energy dependent x-ray attenuation was measured in terms of equivalent thicknesses of aluminum (AI) and poly-methyl methacrylate (PMMA) for 10mm of tissue.

RESULTS

Figure 1 shows the equivalent AI and PMMA thicknesses (mean +1 standard deviation of individual samples): -0.110+-0.022mm AI, 8.60+0.13mm PMMA for fresh adipose tissue, 0.268+-0.040mm AI, 8.44+-0.26mm PMMA for glandular tissue, 0.312+-0.024mm AI, 8.55+-0.17mm PMMA for tumor tissue. The difference between fixed and fresh tissue were -0.007mm AI, 0.01mm PMMA for adipose tissue, -0.041mm AI, 0.22mm PMMA for glandular tissue, and -0.039mm AI, 0.07mm PMMA for tumor tissue.

CONCLUSION

There was a measurable difference in attenuation between fresh and fixed tissue that was consistent for all investigated tissue types. There was a relatively large difference between glandular and tumor tissue, but the number of samples is still too limited to show significance. The equivalent PMMA thicknesses were slightly higher than values derived from published data (Hammerstein 1979, Johns and Yaffe 1987), but the Al thicknesses agreed well values derived from Johns and Yaffe.

CLINICAL RELEVANCE/APPLICATION

Accurate data on tissue attenuation is crucial for the development and implementation of spectral imaging techniques, which can potentially improve sensitivity and specificity of mammography.

SSA20-08 Dedicated High-Resolution Breast CT Allows Imaging Micro-Calcifications down to 130 µm at Screening Mammography Dose Levels

Sunday, Nov. 29 11:55AM - 12:05PM Location: S404AB

Participants

Willi A. Kalender, PhD, Erlangen, Germany (*Presenter*) Consultant, Siemens AG Consultant, Bayer AG Founder, CT Imaging GmbH
Scientific Advisor, CT Imaging GmbH CEO, CT Imaging GmbH
Daniel Kolditz, PhD, Erlangen, Germany (*Abstract Co-Author*) Employee, CT Imaging GmbH
Ann-Christin Roessler, MSc, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Evelyn Wenkel, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Ruediger Schultz-Wendtland, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Fasching, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Computed tomography of the breast (BCT) has been a topic of interest for about two decades. It was proposed and evaluated in different designs by a number of groups as a potential alternative method for breast imaging. So far efforts have shown success with respect to soft tissue imaging but suffer from limited spatial resolution. We designed and evaluated a BCT scanner aiming for three-dimensional (3D) spatial resolution of better that 100 μ m to provide means for improved assessment of 3D micro-calcification clusters.

METHOD AND MATERIALS

The concept of the scanner is built on fast spiral CT using directly converting cadmium telluride detector technology with 100 μ m pixel pitch; it was evaluated and confirmed previously by simulations. Here we assessed spatial resolution on a prototype setup by measuring the modulation transfer function (MTF) using a 10 μ m diameter tungsten wire. High precision Ruby beads immersed in a plastic breast-mimicking setup and 10 surgically resected breast specimens were measured in direct comparison to full field digital mammography (FFDM). The same 60 kV scan protocol was used for all BCT measurements; standard clinical settings were used for FFDM imaging. Micro-CT at 30 μ m resolution was employed as reference standard for judging the specimen results.

RESULTS

BCT exposures were kept at a level corresponding to below 6 mGy average glandular dose related to exposure of a tissueequivalent cylinder of 14 cm diameter. Spatial resolution characterized by the MTF's 10% value was measured as 64 lp/cm. Ruby beads were clearly visible in BCT exams down to 130 μ m, the smallest size available; FFDM revealed beads down to 160 μ m. Specimen examinations confirmed these results qualitatively. For specimens, BCT showed micro-calcifications down to 100 μ m; it was vastly superior in separating structures in different layers by virtue of its slice imaging nature.

CONCLUSION

High-resolution BCT allows improving the assessment of 3D micro-calcification clusters and avoids erroneous superimposition effects, which may pretend fictitious lesions in projection imaging.

CLINICAL RELEVANCE/APPLICATION

Breast CT offering high resolution in all three dimensions shall enable improved analysis and diagnostics of micro-calcifications.

SSA20-09 Performance Evaluation of Microcalcification Detection in a Multi-contrast Breast X-ray Imaging System

Participants

John W. Garrett, MS, Madison, WI (*Presenter*) Nothing to Disclose Yongshuai Ge, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Ke Li, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Ran Zhang, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Guang-Hong Chen, PhD, Madison, WI (*Abstract Co-Author*) Research funded, General Electric Company; Research funded, Siemens AG

PURPOSE

The breast anatomical background noise power spectrum (NPS) and quantum NPS jointly impact the final detection performance of an x-ray breast imaging system. For a grating-based multi-contrast breast imaging system, it has recently been discovered that differential phase contrast (DPC) and dark-field (DF) contrast images have fundamentally different anatomical background NPS and quantum NPS. These dramatic differences should result in fundamentally different imaging performance, particularly in the context of microcalcification detection. The purpose of this study was to evaluate the diagnostic performance of the three-contrast mechanisms for the breast microcalcification detection task.

METHOD AND MATERIALS

To evaluate imaging performance, a quantitative model observer performance analysis framework was used in this study. To model the microcalcification detection task for each contrast mechanism, a microcalcification signal was segmented from absorption, DPC, and DF images of a cadaver breast specimen. Two-component (quantum + anatomical) NPS were directly measured from multi-contrast images of cadaver breasts. A generalized model observer was used to combine the task functions and NPS to quantify the microcalcification detectability indices for a range of radiation exposure levels (5-100%) and calcification sizes (diameter = 0.25-2.5 mm).

RESULTS

For the 1 mm calcification, the highest diagnostic performance corresponded to DPC imaging (7.4), with DF the next highest (3.8), and absorption the lowest (3.2). However, absorption imaging also showed the most relaxed dependence on radiation exposure level among the three modalities due to the larger portion of low frequency content in its anatomical noise. Among the calcifications with different sizes, DPC showed a peak in detectability at 1.25 mm and DF showed a peak at 0.75 mm, while absorption imaging had no such peak in the range explored.

CONCLUSION

The microcalcification detection performance in multi-contrast breast imaging is strongly influenced by both anatomical noise and radiation dose level. The results presented here offer new insight into how each individual modality can be optimized to maximize the likelihood of detecting early breast cancers.

CLINICAL RELEVANCE/APPLICATION

Understanding how additional information from DPC and DF imaging may aid in breast cancer is a crucial step in designing next generation multi-contrast breast imaging systems.

Chest (Lung Cancer Screening)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S404CD

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

FDA Discussions may include off-label uses.

Participants

Mark L. Schiebler, MD, Madison, WI (Moderator) Nothing to Disclose

Brett W. Carter, MD, Houston, TX (Moderator) Author, Reed Elsevier; Consultant, St. Jude Medical, Inc; ;

Sub-Events

SSA04-01 Association of COPD and COPD Phenotypes with Malignancy in the National Lung Screening Trial

Sunday, Nov. 29 10:45AM - 10:55AM Location: S404CD

Participants

Caroline Chiles, MD, Winston-Salem, NC (*Presenter*) Nothing to Disclose Ilana F. Gareen, PhD, Cranston, RI (*Abstract Co-Author*) Nothing to Disclose Kathleen Brown, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose David S. Gierada, MD, Saint Louis, MO (*Abstract Co-Author*) Contract, VuCOMP, Inc Jorean Sicks, MS, Providence, RI (*Abstract Co-Author*) Nothing to Disclose Ella A. Kazerooni, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose Hrudaya P. Nath, MD, Birmingham, AL (*Abstract Co-Author*) Research Grant, General Electric Company; Stockholder, General Electric Company Stavroula Chysanthopoulou, Providence, RI (*Abstract Co-Author*) Nothing to Disclose James G. Ravenel, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Surya P. Bhatt, Birmingham, AL (*Abstract Co-Author*) Nothing to Disclose Reginald F. Munden, MD, DMD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the association of COPD and COPD phenotypes (emphysema, airway and mixed) with lung cancer (LC) in participants with indeterminate lung nodules in the National Lung Screening Trial (NLST).

METHOD AND MATERIALS

We conducted a retrospective, case-control study of 817 participants (200 LC, 617 controls) in the CT-trial arm with 6-19 mm indeterminate lung nodules. 8 readers performed a visual analysis for centrilobular emphysema (CLE), bronchial wall thickening, centrilobular nodularity and interstitial fibrosis. Readers were asked to classify each scan as normal, emphysema-predominant COPD, airway-predominant COPD or mixed pattern COPD. Spirometry results (FEV1/FVC, FEV1) were used to classify each participant as normal or mild, moderate, severe or very severe COPD.

RESULTS

In a univariate analysis for LC diagnosis, emphysema-predominant COPD phenotype had an odds ratio (OR) of 1.530 (95% confidence interval (CI): 0.994, 2.354), airway-predominant COPD an OR of 1.004 (95% CI: 0.619, 1.629) and the mixed pattern an OR of 0.764 (95% CI: 0.427, 1.367) (reference = normal). Increasing CLE severity was associated with LC diagnosis for trace (OR 1.378, 95% CI: 0.879, 2.160), mild (OR 1.704, 95% CI: 1.073, 2.706) and moderate (OR 2.133, 95% CI: 1.326, 3.431). The number of patients with severe CLE was small with inconclusive results (; OR 1.105, 95% CI: 0.580, 2.103). Increasing airflow limitation was not strongly associated with increasing odds ratios for LC [mild OR 0.917 (95% CI: 0.533, 1.577), moderate OR 1.278 (95% CI: 0.865, 1.889), severe OR 0.939 (95% CI: 0.525, 1.681), very severe OR 2.040 (95% CI: 0.653, 6.374), reference normal].

CONCLUSION

Both an emphysema-predominant COPD phenotype by CT and increasing severity of CLE were associated with an increased LC risk in patients with indeterminate lung nodules on CT screening, while airflow limitation had a less strong relationship. The latter may be due to the lack of specificity of COPD phenotype available from spirometry. The NLST received funding from the National Cancer Institute through the grants U01 CA079778 and U01CA 080098

CLINICAL RELEVANCE/APPLICATION

Risk calculation for indeterminate nodules incorporates COPD history. CT information on both emphysema-predominant COPD phenotype and severity may perform better in risk prediction than spirometry.

Honored Educators

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Ella A. Kazerooni, MD - 2014 Honored Educator

SSA04-02 Lung Nodule Consistency and Relative Risk of Future Lung Cancer Diagnosis: Does Sex Matter?

Sunday, Nov. 29 10:55AM - 11:05AM Location: S404CD

Participants Phillip M. Boiselle, MD, Boston, MA (*Presenter*) Nothing to Disclose Fenghai Duan, PhD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose Stavroula Chysanthopoulou, Providence, RI (*Abstract Co-Author*) Nothing to Disclose Sarah DeMello, Providence, RI (*Abstract Co-Author*) Nothing to Disclose Denise R. Aberle, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose Caroline Chiles, MD, Winston-Salem, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare differences in the relative risk (RR) of lung cancer (LC) by nodule consistency and sex in the CT arm of the NLST.

METHOD AND MATERIALS

By study design, all CT-detected nodules measuring 4-30 mm were characterized by consistency (solid=SN, nonsolid/ground glass=GGN, and part-solid=PSN). For each nodule consistency, the following were calculated: sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for LC for both men (M) and women (W). For each nodule consistency, RR was calculated as the ratio of the probability of LC given a reported nodule consistency to the probability of LC given no nodule of the same consistency.

RESULTS

Of 26,455 participants in the CT arm of the NLST, 9994 (37.8%) had a positive screen at ≥ 1 time point. 8062 (81%) had 1 nodule consistency and 1932 (19%) had >1 nodule consistency. The RR of LC was significantly higher for women than men for GGNs (2.68 W vs.1.68 M, p=0.0026), and a similar trend was observed for PSNs (4.45 W vs. 3.19 M, p=0.0556). In contrast, SNs were associated with a comparable RR for both sexes (4.48 vs. 3.77, p =0.1970), along with nearly equivalent sensitivity and specificity for LC (sensitivity = 69.6% W, 68.5%M; specificity = 69.6% W, 68.5% M). Women demonstrated a higher sensitivity than men for subsolid nodules, including GGNs (26.7% W, 12.6% M) and PSNs (16.2% W, 10.2% M). PSNs had the highest PPV in both sexes (15.3% W, 12.3%, M), whereas SNs had the lowest PPV in women (7.9%) and GGNs had the lowest PPV in men (6.6%).

CONCLUSION

Rates of lung cancer are influenced by both nodule consistency and sex. Subsolid nodules are associated with a higher risk of lung cancer for women than men.

CLINICAL RELEVANCE/APPLICATION

Radiologists should be aware of sex-related differences in risk of lung cancer for subsolid nodules when interpreting CT screening studies.

Honored Educators

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Phillip M. Boiselle, MD - 2012 Honored Educator

SSA04-03 Comparing Lung-RADS and the McWilliams Nodule Malignancy Score: Which Approach Works Best to Select Screen Detected Pulmonary Nodules for More Aggressive Follow-up?

Sunday, Nov. 29 11:05AM - 11:15AM Location: S404CD

Participants

Sarah J. Van Riel, MD, Nijmegen, Netherlands (*Presenter*) Research Grant, MeVis Medical Solutions AG Francesco Ciompi, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Mathilde Winkler Wille, Hellerup, Copenhagen, Denmark (*Abstract Co-Author*) Nothing to Disclose Ernst T. Scholten, MD, Haarlemmerliede, Netherlands (*Abstract Co-Author*) Nothing to Disclose Asger Dirksen, Hellerup, Denmark (*Abstract Co-Author*) Nothing to Disclose Kaman Chung, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Mathias Prokop, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Mathias Prokop, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Speakers Bureau, Bayer AG Speakers Bureau, Bracco Group Speakers Bureau, Toshiba Corporation Speakers Bureau, Koninklijke Philips NV Research Grant, Toshiba Corporation Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Stockholder, Thirona BV Co-founder, Thirona BV Research Grant, MeVis Medical Solutions AG Research Grant, Canon Inc Research Grant, Toshiba Corporation Research Grant, Riverain Technologies, LLC

PURPOSE

In 2014 Lung-RADS was published to standardize CT lung screening reporting and management, based on nodule type, size, and growth. In 2013 the McWilliams model was published providing a nodule malignancy probability based on nodule size, type, morphology and subject characteristics. Threshold of the McWilliams score provides an alternative over Lung-RADS categories to determine work-up for screen-detected nodules. We compare both approaches on an independent data set.

METHOD AND MATERIALS

All 60 cancers were selected from the Danish Lung Cancer Screening Trial, in the first scan where they were visible, and 120 randomly selected benign nodules from baseline scans were added, all from different participants. Data had been acquired using a low-dose (16x0.75mm, 120kVp, 40mAs) protocol, and 1mm section thickness reconstruction. For each nodule, the malignancy probability was calculated using McWilliams model 2b. Parameters were available from the screening database or scored by an

expert radiologist. Completely calcified nodules and perifissural nodules were given a score of 0, in accordance with the McWilliams model. All nodules were categorized into their Lung-RADS category based on nodule type and diameter. Perifissural nodules were treated as regular solid nodules, in accordance with Lung-RADS guidelines. Sensitivity and specificity were calculated, for each Lung-RADS category cut-off. For each specificity level, corresponding sensitivity of the McWilliams model was determined.

RESULTS

McWilliams performed substantially better than Lung-RADS in selecting malignant nodules for more aggressive follow-up. Defining Lung-RADS category 2/3/4A/4B and up as a positive screening result, nodule malignancy specificity was 21%/65%/86%/99% and sensitivity was 100%/85%/58%/32%. At the same specificities, McWilliams's sensitivity was higher with 100%/96%/86%/45%.

CONCLUSION

For every cut-off level in Lung-RADS, the McWilliams model operating at the same specificity has superior sensitivity to differentiate malignant from benign nodules .

CLINICAL RELEVANCE/APPLICATION

The McWilliams model seems to be a better tool than Lung-RADS to provide a malignancy risk and help radiologists determine which subgroup of nodules detected in a screening setting need more invasive work-up.

SSA04-04 Sex- and Gender-linked Differences in Baseline Characteristics of the National Lung Screening Trial

Sunday, Nov. 29 11:15AM - 11:25AM Location: S404CD

Participants

Caroline Chiles, MD, Winston-Salem, NC (*Presenter*) Nothing to Disclose Fenghai Duan, PhD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose Judith K. Amorosa, MD, Somerville, NJ (*Abstract Co-Author*) Nothing to Disclose Stavroula Chysanthopoulou, Providence, RI (*Abstract Co-Author*) Nothing to Disclose Sarah DeMello, Providence, RI (*Abstract Co-Author*) Nothing to Disclose Martin Tammemagi, PhD, St Catherines, ON (*Abstract Co-Author*) Nothing to Disclose Phillip M. Boiselle, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Evaluate baseline characteristics of male and female participants in the National Lung Screening Trial (NLST) to determine sex- and gender-linked differences at enrollment that could influence trial results in terms of lung cancer (LC) risk.

METHOD AND MATERIALS

The NLST enrolled men (M) and women (W) aged 55 -74, current or former smokers with > 30 pack-year smoking history. At registration, all participants completed questionnaires regarding demographics, personal/family history of cancer, and smoking history. Demographic characteristics of these participants were stratified by sex and compared with LC risk as determined by the Prostate Lung Colon Ovarian (PLCO) screening trial logistic-regression model for lung cancer prediction (PLCOM2012). Using this model, the mean 6-yr risk of LC was calculated for M and W participants.

RESULTS

Baseline characteristics that increase LC risk in female NLST participants included their lower educational level [13.62 years \pm 2.28 (W), 14.05 years \pm 2.49 (M)], lower BMI [28 (W), 29 (M)], higher self-reported history of COPD [6.44% (W), 4.08% (M)], and higher family history of LC [23.78% (W), 20.32% (M)], p<0.001 for all comparisons. Baseline characteristics that decrease their LC risk included younger age [61.2 (W), 61.6 years (M)], decreased smoking intensity [26.64 cigarettes per day (W), 29.69 (M), p<0.001], and shorter smoking duration [39.24 yrs (W), 40.27 (M)], p<0.001 for all comparisons. Based on the PLCOM2012 model for lung cancer prediction, the mean calculated 6-yr LC risks were similar for both sexes [0.0319 \pm 0.0274 (W), 0.0323 \pm 0.0283 (M), p=0.07].

CONCLUSION

Despite significant differences in a variety of individual LC predictors between men and women, the mean calculated 6-yr risk of LC was similar for male and female NLST participants. These findings are consistent with reported similar lung cancer incidence rates between men and women within each trial arm of the NLST.

CLINICAL RELEVANCE/APPLICATION

Risk factors for LC may vary according to sex characteristics. Including these in risk modeling may improve selection of individual patients for screening.

Honored Educators

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Phillip M. Boiselle, MD - 2012 Honored Educator

SSA04-05 Radiologic Findings In Patients with a Previous History Of Malignancy Undergoing Lung Cancer Screening

Sunday, Nov. 29 11:25AM - 11:35AM Location: S404CD

Participants

Darragh Halpenny, MBBCh, MRCPI, New York, NY (*Presenter*) Nothing to Disclose Jane D. Cunningham, FFRRCSI, New York, NY (*Abstract Co-Author*) Nothing to Disclose

Niamh M. Long, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Ramon E. Sosa, BA, New York, NY (*Abstract Co-Author*) Nothing to Disclose Michelle S. Ginsberg, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Lung cancer screening with computed tomography (CT) reduces mortality in high-risk patients with a smoking history. The rate of lung cancers detected based on positive screening CT in the National Lung Screening Trial (NLST) was 2.4%. The aim of this study was to assess the radiological findings in a cohort of patients with a previous history of malignancy, who underwent CT screening for lung cancer.

METHOD AND MATERIALS

The IRB approved this study. Patients with a previous history of a malignancy, either cured from that disease or with a life expectancy of at least 5 years, were referred for low dose CT lung cancer screening between 5/2/2011 and 9/24/2014. Initial CTs and all available follow up CTs were retrospectively reviewed by 2 radiologists in consensus. CT features assessed included nodule size, morphology and number. Clinical features recorded included pack year smoking history, type of previous cancer and previous cancer therapy. The Lung-RADS[™] scoring system was retrospectively applied to all studies.

RESULTS

140 patients were studied. 61 (43%) male, 79 (56%) female, mean age 66 (40-80). 139 patients (99%) had a smoking history [mean pack years 57 (0-120)]. All had a previous history of cancer: 58 (41%) breast, 21 (15%) head and neck and 17(12%) lung. All patients had at least 1 chest CT, 42 had 2 CTs, 30 had 3 CTs and 9 had at least 4 CTs.8 (6%) patients were diagnosed with cancer on screening CT (7 lung carcinoma, 1 chest wall sarcoma). 2 (1%) patients had a biopsy or surgery for lesions identified on screening CT (1 atypical pneumocyte hyperplasia, 1 nodular scar). 49 (35%) patients were considered to have a positive screening CT (recalled for repeat chest CT earlier than 330 days), 33 (23%) after the 1st screen, 16 (20%) after the 2nd screen, and 6 (15%) after the 3rd screen. After the 1st screen, the Lung- RADS™ categories were: 4 - 6%, 3 - 9% and < 2- 84%. The most common incidental findings were emphysema 26%, post-surgical change 8% and post-radiation change 16%.

CONCLUSION

Patients with a previous history of a malignancy undergoing screening chest CT have a higher rate of screen detected neoplasm as compared to the incidence reported in a non oncologic group such as the NLST.

CLINICAL RELEVANCE/APPLICATION

Patients with a prior cancer history have a higher rate of screen detected lung cancer than reported in the NLST. Larger studies are needed in this group who may benefit from lung cancer screening.

SSA04-06 CT Screening for Lung Cancer: Frequency of Adrenal Enlargement Identified in Baseline and Annual Repeat Rounds and Results of Follow-up Imaging

Sunday, Nov. 29 11:35AM - 11:45AM Location: S404CD

Participants

Minxia Hu, New York, NY (*Presenter*) Nothing to Disclose Rowena Yip, MPH, New York, NY (*Abstract Co-Author*) Nothing to Disclose David F. Yankelevitz, MD, New York, NY (*Abstract Co-Author*); Royalties, General Electric Company Claudia I. Henschke, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the frequency of adrenal enlargement by age, gender, smoking status, family history of lung cancer and other comorbidities in low-dose CT screening for lung cancer as well as the progression at first annual and longer follow-up.

METHOD AND MATERIALS

HIPAA-compliant Informed consent was obtained on 4,776 participants in screening between 1992 to 2014. At enrollment, all were asymptomatic for lung cancer, 40 years of age or older, current, former, and never smokers and completed a background questionnaire. Adrenal gland was considered as enlarged if the longest diameter measured 6 mm or more. Univariate and multivariate analysis using logistic regression analysis was performed to identify significant characteristics of those with and without adrenal enlargement.

RESULTS

On the baseline CT scan, 202 (4%) of 4,776 participants had at least one adrenal enlarged gland. Among the 11,591 annual repeat CT scans, 5 (0.04%) participants had a newly enlarged adrenal gland. Multivariate analysis showed that the frequency significantly increased with increasing decades of age (OR = 1.4, 95% CI: 1.2-1.7) and for those smoking at baseline enrollment (OR = 1.7, 95% CI: 0.9-3.5). Of the 202 with adrenal enlargement, the diameter was 6-9 mm for 40 (20%), 10-19 mm for 93 (46%), 20-29 mm for 55 (27%), 30-39 for 12 (6%) and 40 mm or more for 2 (1%); only currently smoking was a significant predictor of size (P = 0.04). Focusing on the 200 whose adrenal gland was less than 40 mm, first annual repeat CT scans were available for 133 and the adrenal size decreased in 3 (2%), was unchanged in 82 (62%), and increased by less than 10 mm in remaining 48 (36%). Upon further follow-up (median follow-up time of 80 months, IQR: 49-107), none increased by more than 10 mm and none had documented adrenal metastases.

CONCLUSION

Adrenal enlargement is a frequent finding on baseline scans. They tend to be slow growing and their frequency is related to both age and smoking status.

CLINICAL RELEVANCE/APPLICATION

Adrenal enlargement on baseline scanning is a frequent finding, and for those without lung cancer annual surveillance as follow up appears sufficient.

Participants

Robin Peters, MD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Marjolein A. Heuvelmans, BSc, Groningen, Netherlands (*Presenter*) Nothing to Disclose Rozemarijn Vliegenthart, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Peter M. Van Ooijen, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Geertruida H. De Bock, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Matthijs Oudkerk, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the association of pulmonary multi-nodularity with lung cancer probability in baseline computed tomography (CT) lung cancer screening.

METHOD AND MATERIALS

In a low-dose CT lung cancer screening trial, participants were selected with at least one non-calcified nodule at baseline. The trial was approved by the Ministry of Health. All participants gave informed consent. The per-participant number of baseline nodules was determined. The probability of lung cancer was compared for categories based on number of baseline nodules using chi-square testing. Lung cancer diagnosis was confirmed by histology. Nodules were classified as benign if they did not show significant growth for up to six years after baseline.

RESULTS

3,392 participants with 7,258 nodules were included. 1,746/3392 participants (51.5%) had one nodule, 800/3392 (23.6%) had two nodules, 354/3392 (10.4%) had three nodules, 191/3392 (5.6%) had four nodules, and 301/3392 (8.9%) had over four nodules at baseline. Lung cancer was diagnosed in these nodules during baseline in 62 participants, and during later rounds in another 75 participants (cancer rate 4.0%). Mean nodule count in subjects with only benign nodules was 2.1 ± 1.8 , compared to 2.3 ± 2.2 (p=NS) in screenees with lung cancer. The probability of lung cancer was 61/1746 (3.5%) in case a participant had one nodule, 37/800 (4.6%) for two nodules, 17/354 (4.8%) for three nodules, 12/191 (6.3%) for four nodules and 10/301 (3.3%) when a participant had over four nodules (p=NS). Lung cancer diagnosis during baseline screening was made in the largest nodule in 60/62 (96.8%) cases.

CONCLUSION

Multi-nodularity is common in baseline CT lung cancer screening. The relationship between nodule count and lung cancer probability is complex, with a possible peak in probability of malignancy in subjects with four nodules. Lung cancer was detected most frequently in the nodule with the largest volume.

CLINICAL RELEVANCE/APPLICATION

Malignancy probability does not change with the increase of the number of lung nodules in a patient. Each nodule found in lung cancer screening subjects should be assessed separately, with recommendation for nodule management based on the nodule with the largest volume.

SSA04-08 Occurrence and Lung Cancer Probability of Newly Detected Solid Nodules at Incidence CT Lung Cancer Screening

Sunday, Nov. 29 11:55AM - 12:05PM Location: S404CD

Participants

Joan E. Walter, BSc, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Marjolein A. Heuvelmans, BSc, Groningen, Netherlands (*Presenter*) Nothing to Disclose Geertruida H. De Bock, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Rozemarijn Vliegenthart, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Matthijs Oudkerk, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the occurrence of new solid nodules and their respective lung cancer rate at the incidence screening rounds of a large randomized low-dose computed tomography (LDCT) lung screening trial.

METHOD AND MATERIALS

This trial was approved by the Ministry of Health. All participants gave informed consent. In total, 7,557 individuals underwent baseline LDCT screening. Following baseline, incidence-screenings took place after 1, 3 and 5.5 years. For this study, participants were selected with solid non-calcified nodules, newly detected after baseline and also in retrospect not present on any previous screen. Lung cancer diagnosis was based on histology, and benignity was based on either histology or a stable volume for at least two years.

RESULTS

At incidence screenings, in total 1,484 new solid nodules were identified in 949 participants. The median age of participants with new solid nodules was 59 years (interquartile-range 55-63 years), and 77% (735/949) were male. After one year, at least one new solid nodule was present in 4.7% (344/7295) of participants, and after two more years additional new nodules were found in 7.1% (491/6922) of participants. Eventually, in 7.9% (75/949) of participants with new solid nodules, a new solid nodule was proven to be lung cancer (in total 77 cancers). Most of the detected lung cancers were adenocarcinoma (30/77 [39.0%]), squamous cell carcinoma (20/77 [26.0%]) or small cell lung cancer (9/77 [11.7%]), and a majority (48/77 [62.3%]) was diagnosed at stage I.

CONCLUSION

New solid nodules are common findings in CT lung cancer screening and carry a substantial risk of malignancy. More research concerning new nodules is necessary to determine a sufficient follow-up strategy and evaluate distinguishing nodule features of

benign and malignant new nodules.

CLINICAL RELEVANCE/APPLICATION

During LDCT lung cancer screening, in almost 8% of participants with new solid nodules, one of these nodules is malignant and guidelines may need to consider a more stringent follow-up for new nodules.

SSA04-09 Comparing Inter-reader Variability of Manual Diameter and Semi-automated Volumetric Measurements for Pulmonary Nodules in Lung Cancer Screening

Sunday, Nov. 29 12:05PM - 12:15PM Location: S404CD

Participants

Arjun Nair, MD,FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose Sze Mun Mak, MBBS,FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Nicholas J. Screaton, BMBCh, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose John A. Holemans, MBBS, Liverpool, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Stephen W. Duffy, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose John K. Field, PhD, Liverpool, United Kingdom (*Abstract Co-Author*) Nothing to Disclose David R. Baldwin, MD, Nottingham, United Kingdom (*Abstract Co-Author*) Nothing to Disclose David M. Hansell, MD, London, England, United Kingdom (*Abstract Co-Author*) Nothing to Disclose David M. Hansell, MD, London, England, United Kingdom (*Abstract Co-Author*) Research Consultant, AstraZeneca PLC Research Consultant, Boehringer Ingelheim GmbH Research Consultant, InterMune, Inc Research Consultant, F. Hoffmann-La Roche Ltd Anand Devaraj, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Guidelines propose that solid nodules with baseline diameter<6mm return to annual lung cancer screening. However, the accepted range of inter-reader variability (IRV) in manual diameter measurements derives from a single study. We aimed to (1) quantify IRV for both manual diameter and semi-automated volumetric measurements (Vol), and (2) assess inter-reader agreement for diameter-based categorisation, for solid nodules that may potentially require CT follow-up based on their volumes.

METHOD AND MATERIALS

Solid nodules between 50-300mm3 that had been measured by two trial radiologists at baseline CT in a national lung screening trial were reviewed. Two radiologists also independently measured diameters using electronic callipers. Diameter measurements were used to categorise nodules according to Lung-RADS for each reader. IRV was calculated using Bland-Altman analysis for diameter and volume measurements in all nodules, and for nodules ≥6mm. Inter-reader agreement for Lung-RADS categorisation was compared using the weighted kappa statistic (multirater K). The percentage of nodules where readers would have disagreed on the need for CT follow-up, using diameters according to Lung-RADS, was calculated.

RESULTS

286 nodules (mean diameter 5.0 ± 1.2 mm, mean volume 99.5 ± 51.8 mm3) in 200 subjects were studied. Absolute and percentage mean (and 95% confidence intervals, CIs) difference between readers were 0.2 (-1.2, 1.6) mm and 4.5% (-22.7%, 31.6%) respectively for diameter, and 4.6(-101.6, 110.8) mm3 and 1.3% (-19.9%, 22.6%) respectively for volume. Percentage mean (and 95% CIs) differences between readers for diameter and volume in the 54/286 nodules measuring ≥ 6 mm were 3.0% (-27.2%, 33.3%) and 0.1% (-1.1%, 1.4%). Multirater K for Lung-RADS categorisation was 0.67. Radiologists would have disagreed on the need for CT follow-up using diameter in Lung-RADS in 18/286 nodules (10.9\%).

CONCLUSION

IRV in diameter is slightly higher than in semi-automated volumetry, for solid nodules with volumes 50-300mm3, but substantially lower using volumetry for nodules measuring \geq 6mm in this volume range. However, inter-reader agreement for categorisation according to diameter remains good.

CLINICAL RELEVANCE/APPLICATION

Diameter measurement provides good overall agreement for nodule categorisation, but size reproducibility could substantially be improved using semi-automated volumetry for nodules deemed positive.

Physics (Image Processing/Analysis I)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S405AB



AMA PRA Category 1 Credits ™: 1.50 ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Kenneth R. Hoffmann, PhD, Buffalo, NY (*Moderator*) Vice President, Imagination Software Corporation; Stockholder, Imagination Software Corporation; Officer, Imagination Software Corporation; Rebet M. Nichikawa, PhD, Pitteburgh, PA (*Moderator*) Pavaltics, Hologic, Inc.

Robert M. Nishikawa, PhD, Pittsburgh, PA (Moderator) Royalties, Hologic, Inc;

Sub-Events

SSA21-01 Mapping the Brain by a New Multiparametric Quantitative MRI Method

Sunday, Nov. 29 10:45AM - 10:55AM Location: S405AB

Participants

Giuseppe Palma, PhD, Naples, Italy (*Presenter*) Nothing to Disclose Enrico Tedeschi, MD, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose Pasquale Borrelli, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose Sirio Cocozza, MD, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose Carmela Russo, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose Antonietta Canna, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose Marco Comerci, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose Bruno Alfano, PhD, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose Marcello Mancini, MD, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose

Background

Multi-parametric quantitative MRI (qMRI) has long been an active field of research, with several approaches aiming to estimate a subset of R1, R2, R2*, proton density (PD) and magnetic susceptibility (QSM) maps of the tissues. We used a set of Steady-State sequences, acquired with variable flip angles (FAs) and different phase coherence, to derive, in a fully analytical way, quantitative volumetric R1, R2, R2*, PD and QSM maps.

Evaluation

Two dual-echo fully flow-compensated (FC) FLASH and one phase-cycled balanced Steady-State Free-Precession (bSSFP) sequences were acquired at different FAs with very low sensitivity to blood or Cerebrospinal Fluid (CSF) flow. The full brain of each volunteer was scanned in a total acquisition time of 14 minutes with a voxel size of 0.6 mm3. The datasets were processed to remove banding artifacts and used to invert voxelwise the relaxometry equations in the FOV.

Discussion

Unlike most existing approaches, the maps obtained by our method entirely rely on widely available 3D sequences, thus overcoming usual 2D resolution constraints, and are not affected by intra-voxel biases arising from imperfect 2D radio frequency-pulse profiles, which in turn cause different isochromat evolutions in response to different effective FAs. Moreover, unlike other 3D schemes based on unbalanced SSFP, our method does not suffer from high sensitivity to flow of relatively long T2 fluids (as CSF), thus being apt to image other body districts. Also, several issues of the DESPO methods are solved. In particular, the B1± inhomogeneity dependence can be either removed by providing a measured B1 field map, if an ad hoc protocol is available on the scanner, or largely compensated for by the proposed information theory approach. Furthermore, a judicious use of the Bloch equations for the acquired MR signals proved useful to skip the acquisition of the high-FA bSSFPs required by DESPOT2, thus limiting the acquisition time and avoiding at once SAR issues and CSF pulsation artifacts.

Conclusion

Our method allows for the quantitation of 5 independent parameters and gets rid of the sensitivity to B0 inhomogeneity by means of a fully analytical solution, thus also speeding up the computation step.

SSA21-02 Hybrid Exact Maximum Likelihood Estimation (HE-ML) Algorithm for Accurate qMRI Over the Full T2 Biological Spectrum with Only Two Echoes

Sunday, Nov. 29 10:55AM - 11:05AM Location: S405AB

Participants

Hernan Jara, PhD, Belmont, MA (*Presenter*) Patent holder, qMRI algorithms Research Grant, General Electric Company Royalties, World Scientific Publishing Co

Stephan W. Anderson, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

Osamu Sakai, MD, PhD, Boston, MA (Abstract Co-Author) Speaker, Bracco Group; Speaker, Eisai Co, Ltd; Consultant, Guerbet SA

Background

To develop a T2 qMRI mapping algorithm for the DE-TSE pulse sequence that is accurate over the full T2 biological range. To create a T2 mapping program that combines the exact dual echo T2 formula and the methods of maximum likelihood (ML) estimation for estimating long T2 values. The dual echo turbo spin echo (DE-TSE) pulse sequence is consistently being adopted for routine clinical use and for research protocols: it is fast, efficient, highly resilient to susceptibility artifacts, and diffusion insensitive. It also has qMRI applications for mapping T2 and the proton density (PD). The main limitation in terms of qMRI is that only two echoes are

available for T2 mapping, thus limiting the accuracy range of T2 estimation. The purpose of this work was to develop a T2 qMRI mapping algorithm for the DE-TSE pulse sequence that is accurate over the full T2 biological range, from soft tissues to pure cerebrospinal fluid (CSF). Specifically, to create a T2 mapping program that combines the exact dual echo T2 formula as well as the methods of maximum likelihood (ML) estimation for estimating long T2 values. ML estimators are optimal in the sense that the variance of the estimates reaches asymptotically the greatest lower bound of the variance.

Evaluation

HE-MLE algorithm was programed in Mathcad using the formulation of Bonny el al. (MRM 1996; 36(2):287-293.) and used to process the images of a phantom and the head images of a volunteer. The T2 values were compared to those obtained with a single slice multi spin echo (mSE) sequence. The phantom T2 obtained with both techniques are graphed in Fig. 1a: linear correlation analysis reveals strong linear relationship (R2=0.9988) with a slope of 0.975.

Discussion

DE-TSE is available from all major MRI manufacturers and efficiently produces excellent PD- and T2-weighted images with high anatomic coverage in less than four minutes.

Conclusion

The developed hybrid exact maximum likelihood T2 qMRI algorithm produces accurate measurements over the full T2 biological spectrum and could extend the usefulness of the DE-TSE pulse sequence in clinical and research applications.

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/

Hernan Jara, PhD - 2014 Honored Educator Osamu Sakai, MD, PhD - 2013 Honored Educator Osamu Sakai, MD, PhD - 2014 Honored Educator Osamu Sakai, MD, PhD - 2015 Honored Educator

SSA21-03 Prognostic Value of Quantitative MRI Biomarkers for Treatment Response Assessment of Multiple Myeloma

Sunday, Nov. 29 11:05AM - 11:15AM Location: S405AB

Participants

Chuan Zhou, PhD, Ann Arbor, MI (*Presenter*) Nothing to Disclose Qian Dong, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose Heang-Ping Chan, PhD, Ann Arbor, MI (*Abstract Co-Author*) Institutional research collaboration, General Electric Company Daniel R. Couriel, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose Attaphol Pawarode, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose Jun Wei, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose Lubomir M. Hadjiiski, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We are investigating a radiomics approach to treatment response assessment of multiple myeloma (MM) using MRI. This study assessed the value of our developed MRI biomarkers as prognostic factors in patients with MM after autologous bone marrow transplant (BMT).

METHOD AND MATERIALS

With IRB approval, 63 pairs of spine MRI scans performed pre- and post-BMT (3-6 months) and clinical tests ($< \pm 7$ days of post-MRI) were collected retrospectively from 63 MM patients. A 3D dynamic intensity entropy transformation (DIET) method was developed to transform MR T1-weighted signal voxel by voxel to a quantitative entropy enhancement value (qEEV), from which two MR image biomarkers, the mean difference in qEEV between the pre- and post-BMT MR scans over the vertebras (m-qEEV) and the percentage of vertebras with an increased qEEV in the post-BMT scan (p-qEEV), were derived for each patient to estimate progression-free survival. The values of age, gender, and the clinical test outcomes including M-protein in serum and urine, ratio of free light chain (FLC), % plasma cell (PC), beta-2-microglobulin and immunoglobulin levels were also assessed. Univariate analysis was performed with the Kaplan-Meier method and log-rank test, and multivariate analysis was performed with the Cox proportional hazards regress model, with respect to the time to progression (TTP) censored at 3 years.

RESULTS

The univariate analysis showed that the patients with optimal cutoff points of m-qEEV < - 0.1 and p-qEEV < 10% determined by the maximally selected rank statistics had significantly shorter TTP (P = 0.047 and P < 0.001, respectively). The age (<60), gender and all individual clinical tests in their normal ranges did not significantly predict longer TTP, except normal FLC (P = 0.040) and PC (P = 0.022). The multivariate analysis showed that the best predictive factor for TTP was p-qEEV (P < 0.018; hazard ratio (HR) 31.2). Other factors such as m-qEEV (P = 0.276; HR=5.6), FLC(P = 0.510; HR = 1.4) and PC (P < 0.217; HR = 1.2) did not provide significant predictive value for TTP.

CONCLUSION

The study demonstrated the feasibility of using the quantitative MRI biomarker (p-qEEV) as prognostic predictor for patients with MM after BMT.

CLINICAL RELEVANCE/APPLICATION

MR-based radiomic biomarker with prognostic significance may improve the accuracy for staging and assessing treatment response for MM, allowing clinicians to optimize therapy for individual patients.

SSA21-04 Validation of a Quantitative Masking Index for Digital Mammography

Sunday, Nov. 29 11:15AM - 11:25AM Location: S405AB

Participants

James G. Mainprize, PhD, Toronto, ON (*Presenter*) Institutional research agreement, General Electric Company Olivier Alonzo-Proulx, Toronto, ON (*Abstract Co-Author*) Institutional research agreement, General Electric Company Martin J. Yaffe, PhD, Toronto, ON (*Abstract Co-Author*) Research collaboration, General Electric Company Founder, Matakina International Ltd Shareholder, Matakina International Ltd Co-founder, Mammographic Physics Inc

PURPOSE

Mammography has reduced sensitivity for detecting cancer in dense breasts, for which superposition of shadows of normal structures can "mask" the presence of cancer either by a loss of contrast or by the distracting complexity of the surrounding parenchymal structures. We have developed a quantitative measure of masking by evaluating the signal-to-noise ratio (SNR) of a localized model observer.

METHOD AND MATERIALS

On a grid of sub-regions (ROIs), the parenchymal texture was quantified by extracting the inverse power-law exponent, β , from the noise power spectrum (NPS). The localized detection task SNR, d_L, for a simulated 5 mm diameter lesion was estimated using a non-prewhitening observer and measurements of the system MTF, and NPS from each ROI. The resulting map of d_L is analyzed to extract the masking potential of each mammogram. The d_L maps were validated with a 4 alternative forced choice (4AFC) of a simulated lesion (diameter 5 mm) inserted into ROIs randomly selected from a single mammogram, across 7 β categories (0.5 intervals from 1.5-5.0). A second reader study compared a radiologist's perception and accuracy to the d_L maps generated for a set of 78 screening cases.

RESULTS

The 4AFC study was performed on 20 mammograms and over 5000 ROIs. Preliminary results on one reader showed that mean d_L was highly correlated with inverse threshold lesion thickness (r=0.897, p<1e-10). In the second study, a radiologist estimated the probability of malignancy, BIRADS density and assessed the difficulty level of each case. Initial results showed a 36% difference (p<1e-6) in mean d_L between non-dense and dense mammograms and a 28% difference (p<1e-3) in mean d_L between "easy" and "hard" images.

CONCLUSION

A quantitative measure of masking by background parenchyma has been developed. Strong correlation is seen with both breast density and texture. Two preliminary reader studies confirm that local task SNR tracks with reader performance, in both simulated conditions and clinical evaluations of mammograms.

CLINICAL RELEVANCE/APPLICATION

A measure of masking by mammographic density can have a number of applications, e.g., to conform to recent changes to BIRADS density assessment, to categorize mammograms that require more careful assessment, or as a selection tool to identify those women who should be invited to be screened with alternative technologies.

SSA21-05 Virtual Monochromatic CT Numbers from a Dual-Energy MDCT Acquisition: Comparison between Single-Source Projection-Based and Dual-Source Image-Based Platforms in a Phantom Environment

Sunday, Nov. 29 11:25AM - 11:35AM Location: S405AB

Participants

Achille Mileto, MD, Durham, NC (*Presenter*) Nothing to Disclose Andrew R. Barina, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose Daniele Marin, MD, Cary, NC (*Abstract Co-Author*) Nothing to Disclose Sandra Stinnett, MS, MPH, Durham, NC (*Abstract Co-Author*) Nothing to Disclose Kingshuk Choudhury, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose Rendon C. Nelson, MD, Durham, NC (*Abstract Co-Author*) Consultant, General Electric Company Consultant, Nemoto Kyorindo Co, Ltd Consultant, VoxelMetrix, LLC Research support, Bracco Group Research support, Becton, Dickinson and Company Speakers Bureau, Siemens AG Royalties, Wolters Kluwer nv

PURPOSE

To investigate in a phantom experiment whether there is any variability in virtual monochromatic CT numbers from a dual energy MDCT acquisition, across single- and dual-source hardware implementations.

METHOD AND MATERIALS

A polyethylene terephthalate torso phantom, filled with water, was employed to simulate the human abdominal environment. This contained a cylindrical polypropylene bottle, filled with 12 mg/mL of iopamidol 300, with serially suspended polyethylene terephthalate spheres (15 and 18 mm) filled with two iodine-to saline iodine dilutions (0.8 mgI/mL and 1.2 mgI/mL). Dual energy (80/140 kVp) and single energy (100 and 120 kVp) scans were performed using single-source (HD750 GSI, GE Healthcare) and dual-source (SOMATOM Definition Flash, Siemens Healthcare) MDCT systems. Virtual monochromatic images were reconstructed at energy levels ranging from 40 to 140 keV (at 10 keV increments), in either the projection- or the image-space domains.

RESULTS

There were significant differences between the single-source projection-based platform and the dual-source image-based platform in the measured attenuation values of the simulated lesions tested (P < 0.001, for all comparisons). The magnitude of these differences was greatest at lower monochromatic energy levels and at lower iodine concentrations. The dual energy hardware platform, the virtual monochromatic energy level, and the lesion iodine concentration had a highly statistically significant effect on the difference in the measured attenuation values between the two platforms, indicating that the platforms respond differently to changes in these variables (P < 0.001, for all comparisons).

CONCLUSION

A significant variability in CT numbers exists between single-source projection-based and dual-source image-based virtual monochromatic datasets, as a function of the selected energy level and the lesion iodine content.

CLINICAL RELEVANCE/APPLICATION

The variability in monochromatic CT numbers between the two clinically available dual energy platforms may impact clinical decisions that depend on subtle differences in measured attenuation values. For example, when minimally-vascularized abdominal neoplasms are repeatedly imaged with different dual energy platforms, differences in measured attenuation values between the imaging studies due to variability between scanners might be erroneously attributed to changes in tumor vascularity.

SSA21-06 Accuracy Enhancement with Deep Convolutional Neural Networks for Classifying Regional Texture Patterns of Diffuse Lung Disease in HRCT

Sunday, Nov. 29 11:35AM - 11:45AM Location: S405AB

Participants

Guk-Bae Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose Yeha Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) CEO, VUNO Korea Inc Hyun-Jun Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Founder, VUNO Korea Inc Kyu-Hwan Jung, Seoul, Korea, Republic Of (*Abstract Co-Author*) Employee, VUNO Korea Inc Namkug Kim, PhD, Seoul, Korea, Republic Of (*Presenter*) Stockholder, Coreline Soft, Inc Joon Beom Seo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose June-Goo Lee, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To introduce deep learning-based feature extraction method which adaptively learns the most significant features for the given task using deep structure to classify six kinds of regional patterns in diffuse lung disease.

METHOD AND MATERIALS

HRCT images were selected from images of 106 patients having diffuse lung disease from a Siemens CT scanner (Sensation 16, Siemens, Forchheim, Germany) and 212 patients from a GE CT scanner (Lightspeed 16, GE, Milwaukee, WI, USA). Two experienced radiologists marked sets of 600 rectangular regions of interest (ROIs) with 20×20 pixels on HRCT images obtained from GE and Siemens scanners, respectively. These were consisted of a hundred of ROIs for each of six local patterns including normal, consolidation, emphysema, ground-glass opacity, honeycombing, and reticular opacity (Fig. 1(a)). Performance of convolution neural network (CNN) classifier having a deep architecture (Fig. 1(b)) was compared with that of support vector machine (SVM) having a shallow architecture. In the SVM classifier, 22 features including histogram, gradient, run-length, gray level co-occurrence matrix, low-attenuation area cluster, and top-hat transform were extracted. In the CNN classifier, a hundred features in the last layer (FC #1), however, were extracted automatically with deep learning classifier manner. All experiments were performed based on forward feature selection and five fold cross-validation with 20 repetitions.

RESULTS

The accuracies of the SVM classifier were achieved 92.34 ± 2.26 % at 600 ROI images acquired in a single scanner (GE) and 91.18 ± 1.91 % at 1200 ROI images of the integrated data set (GE and Siemens). The accuracies of the CNN classifier showed a higher performance of 93.72 ± 1.95 % and 94.47 ± 1.19 % in a single and the integrated HRCT, respectively (Fig. 1(c)).

CONCLUSION

The SVM accuracy in the integrated data showed not inferior to that in a single vender data, due to the effect of different scanners. In the CNN classifier, however, the CNN performance in the integrated data might be better, due to more robustness to image noise and higher performance in larger data set. In addition, the CNN shows higher performance than the SVM in both of data types.

CLINICAL RELEVANCE/APPLICATION

Deep learning based automated quantification system of regional disease patterns at HRCT of interstitial lung diseases can be more useful in the diagnosis, severity assessment, and monitoring of treatment effects.

SSA21-07 Predicting Radiologists' Diagnostic Performances Using Quantitative Image Features: Preliminary Analysis

Sunday, Nov. 29 11:45AM - 11:55AM Location: S405AB

Participants

Juhun Lee, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose Robert M. Nishikawa, PhD, Pittsburgh, PA (*Presenter*) Royalties, Hologic, Inc; Ingrid Reiser, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose John M. Boone, PhD, Sacramento, CA (*Abstract Co-Author*) Research Grant, Siemens AG Research Grant, Hologic, Inc Consultant, Varian Medical Systems, Inc

PURPOSE

The endpoint for assessing image quality should be related to radiologists' diagnostic performances, instead of imaging statistics, such as contrast to noise ratio. The purpose of this preliminary study is to evaluate breast computed tomography (CT) image quality using quantitative image features that are correlated with radiologists' diagnostic performances.

METHOD AND MATERIALS

A total of 102 pathology proven breast lesions in 92 dedicated breast CT images were used. An iterative image reconstruction (IIR) algorithm was used to obtain CT images with different image qualities (28 different qualities). Through image feature analysis from breast lesions (developing classifiers on image features from the lesion), two reconstruction options (i.e., 2 out of 28 different qualities) and one clinical reconstruction with area under the ROC curve (AUC) values of 0.67, 0.75, and 0.86 were selected for a reader study. A subset of breast lesions (N = 50, half malignant) were selected for the reader study. One experienced MQSA

radiologist read 150 cases (50 lesions x 3 image qualities) and reported each lesion's probability of malignancy following BI-RADS. The radiologist's performance was evaluated by measuring the AUC. Under leave-one-out-cross-validation, a logistic regression classifier was trained and tested over the image features (via a feature selection technique) and the probability of malignancy from the radiologist. The classifier's AUC was measured and compared with that of the radiologist.

RESULTS

The radiologist's AUCs for each quality were 0.74, 0.79, and 0.81. The trained classifier achieved averaged AUCs of 0.72, 0.76, and 0.77. The linear correlation coefficients between the classifier's probability and the radiologist's probability on the test set were 0.51, 0.6, and 0.54 (all p-values < 0.001).

CONCLUSION

The classifier was able to learn the radiologist's estimation of lesion malignancy. More readers are required to generalize our results.

CLINICAL RELEVANCE/APPLICATION

Quantitative image features were used to correlate radiologists' diagnostic performances. These features may be useful for optimizing reconstruction algorithms and evaluating dose reduction techniques.

SSA21-08 Multivariate Modeling for Prediction of Cervical Cancer Treatment Outcomes

Sunday, Nov. 29 11:55AM - 12:05PM Location: S405AB

Participants

Baderaldeen A. Altazi, MS, Tampa, FL (*Presenter*) Nothing to Disclose Daniel Fernandez, MD, PhD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose Geoffery Zhang, PhD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose Eduardo G. Moros, PhD, MS, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose

Background

Several studies reported univariate correlation analysis of radiomics as predictive factors for treatment clinical outcomes. This study investigated building a multivariate linear regression model that combines several predictive metrics in correlation with treatment outcomes.

Evaluation

Our dataset consisted of the pretreatment PET/CT scans from a cohort of 74 patients diagnosed with cervical cancer, FIGO stage IB-IVA, age range 31-76 years, treated with external beam radiation therapy to a dose range between 45-50.4 Gy (median dose: 45 Gy), concurrent cisplatin chemotherapy and MRI-based Brachytherapy to a dose of 20-30 Gy (median total dose: 28 Gy). Pearson's correlation (PC) and Area under (AUC) the receiver operator curve (ROC) were used to assess the correlation with treatment outcomes. Radiomics features were extracted; Co-occurrence (COM), Gray Level Size Zone (GLSM) and Run Length (RLM) and Intensity Based (IBM) Matrices algorithms. Afterwards, they were selected using sequential backward selection to predict for distant metastases (DM), Locoregional recurrence (LRR) and last follow-up status (LFS).

Discussion

The models consisted of linear combination of 2 to 3 radiomics features for each outcome. LRR model consisted of (Intensity contrast and Low Gray-Level Run Emphasis). LFS model consisted of (Different Entropy, Intensity contrast and Low-Intensity small-area emphasis). DM models consisted of (size zone variability and small-area emphasis) and (surface/Area and Volume). Models showed PC scores range (0.3-0.5) and AUC range (0.75-0.9) with 95% CI (0.6-1.0). All models scored low Variance Inflation Factor (VIF < 5) based on multicolinearity diagnostics test. All tests were statistically significant (p<0.05).

Conclusion

Multivariate linear regression models of radiomics features improved prediction power of treatment outcomes in comparison to univariate analysis. Morever, all models passed multicolinearity diagnostics test. LRR model scored highest improved predictive power followed by LFU then DM models respectively. This approach may contribute to incorporate PET radiomics in patient's response analysis in clinic.

SSA21-09 Increasing the Interscan Reproducibility of Coronary Calcium Scoring by Partial Volume Correction in Low-Dose non-ECG Synchronized CT: Phantom Study

Sunday, Nov. 29 12:05PM - 12:15PM Location: S405AB

Participants

Jurica Sprem, MSc, Urecht, Netherlands (*Presenter*) Nothing to Disclose Bob De Vos, MSc, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Rozemarijn Vliegenthart, MD, PhD, Groningen, Netherlands (*Abstract Co-Author*) Nothing to Disclose Max A. Viergever, Utrecht, Netherlands (*Abstract Co-Author*) Research Grant, Pie Medical Imaging BV; Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Ivana Isgum, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Research Grant, Pie Medical Imaging BV; Research Grant, 3mensio Medical Imaging BV;

PURPOSE

Coronary calcium (CAC) scores obtained in low-dose chest CT without ECG-synchronization, as acquired in lung cancer screenings, are strong and independent predictors of cardiovascular events (CVE). However, due to acquisition, interscan CAC score reproducibility is moderate. This may result in incorrect CVE risk prediction. To increase the interscan reproducibility of CAC scores, we have developed a method to quantify CAC using partial volume correction (PVC).

METHOD AND MATERIALS

Three phantoms were scanned (Philips Brilliance 64, 120 kVp, 20 mAs, 3.0 mm slice thickness, 3.0 mm increment), each containing 3 inserts differing in size (9.1, 24.6 and 62.8 mm³) and calcium density (0.197, 0.401 and 0.796 mg/mm³). Total CAC volume per scan

was 96.5 mm³. Each phantom was scanned 3 times with slight rotation and translation between acquisitions, and in 3 different scenarios: 1 stationary and 2 moving with speed of 10 mm/s and 30 mm/s without ECG-synchronization, resulting in total of 27 scans. CAC was scored by clinically used thresholding at 130 HU. Thereafter, PVC employing Expectation-maximization algorithm for learning a multi-dimensional Gaussian mixture was used to determine partial content of calcium in the voxels of each identified calcification and its vicinity. The total CAC volumes per scan were computed by thresholding and using the proposed PVC method.

RESULTS

For the stationary phantom with low, medium and high density inserts, thresholding resulted in CAC volumes of 60.9, 142.9 and 213.2 mm³, while PVC determined 70.4, 88.9 and 92.9 mm³, respectively. For the phantom moving at 10 mm/s, thresholding resulted in CAC volumes of 50.3, 149.8 and 224.6 mm³, while PVC gave 58.2, 91.2 and 96.7 mm³, respectively. For the phantom moving at 30 mm/s, thresholding resulted in CAC volumes of 15.1, 147.2, and 306.3 mm³ and PVC determined 51.8, 78.8 and 106.5 mm³, respectively.

CONCLUSION

Thresholding underestimates volume of low density and overestimates volume of high density calcifications. The effect is emphasized with increasing motion artefacts. PVC provides better estimates of true calcium volume and it is less affected by motion.

CLINICAL RELEVANCE/APPLICATION

CAC quantification using PVC may increase interscan reproducibility of the CAC volume score.

CA

СТ

Cardiac (Dual-energy Cardiac CT)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S502AB

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

FDA Discussions may include off-label uses.

Participants

Gautham P. Reddy, MD, Seattle, WA (*Moderator*) Nothing to Disclose Harold I. Litt, MD, PhD, Philadelphia, PA (*Moderator*) Research Grant, Siemens AG ; Research Grant, Heartflow, Inc; Johan H. Reiber, PhD, Leiden, Netherlands (*Moderator*) Stockholder, Medis Medical Imaging Systems bv

Sub-Events

SSA02-01 One-Stop-Shop Cardiac Dual-Energy CT: A Gatekeeper for Invasive Coronary Angiography Early after Acute Myocardial Infarction?

Sunday, Nov. 29 10:45AM - 10:55AM Location: S502AB

Participants

Wenhuan Li, MD, Beijing, China (*Presenter*) Nothing to Disclose Kuncheng Li, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Xiaolian Zhu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Nan Chen, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Qi Yang, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the gatekeeper function of one-stop-shop cardiac dual-energy CT (DECT) in acute myocardial infarction (AMI) patients to avoid unnecessary invasive coronary angiography (ICA), by evaluating its diagnostic performance to detect coronary stenoses, myocardial perfusion defects, and myocardial infarction, using ICA plus 13N-ammonia/18F-deoxyglucose (FDG) PET as the gold standard.

METHOD AND MATERIALS

Consecutive AMI patients scheduled for ICA who have not undergone primary or rescue angioplasty were prospectively recruited. One-stop-shop DECT and 13N-ammonia/18F-FDG PET were underwent before ICA. The one-stop-shop DECT needed a dual-phase scan. First phase was scanned in arterial phase, used to reconstruct images of DECT angiography (DE-CTA) and DECT myocardial perfusion (DE-CTP). Second phase was delayed phase DECT which was scanned 10 seconds after first phase scan, used to detect myocardial infarction. Image analysis was as follow: firstly, identify the area of myocardial perfusion defects and myocardial infarction by DE-CTP and delayed phase DECT using 13N-ammonia/18F-FDG PET as the gold standard. A concordant reduction in 13N-ammonia perfusion PET and 18F-FDG metabolic PET (matching defects) indicates myocardial infarction. Then assess the presence or severity of stenoses on coronary artery supplying area of myocardial perfusion defects or myocardial infarction by DE-CTA, using ICA as the gold standard. If there were multiple plaques in coronary, the lesion with larger plaque area was considered as the culprit lesion. Significant stenosis was defined as a luminal diameter reduction of ≥50% on coronary artery.

RESULTS

A total of 25 patients were successfully completed one-stop-shop DECT, 13N-ammonia/18F-FDG PET and ICA. Intervals between examinations were no more than 1 week. ICA plus 13N-ammonia/18F-FDG PET showed 20 AMI patients with significant stenoses on infarct-related artery (IRA) and 5 AMI patients without significant stenoses on IRA. One-stop-shop DECT correctly identified 20 AMI patients with significant stenoses on IRA (sensitivity 100%) and correctly ruled out 5 patients AMI (specificity 100%).

CONCLUSION

One-stop-shop cardiac DECT has a gatekeeper function to avoid unnecessary ICA in patients early after AMI without significant stenosis.

CLINICAL RELEVANCE/APPLICATION

One-stop-shop cardiac DECT has a gatekeeper function to avoid unnecessary ICA in patients early after AMI without significant stenosis.

SSA02-02 Extracellular Volume Fraction from Iodine Density Image Using Single Source Dual-energy CT: Comparison with Manual Measurement and Non-rigid Registration Approach

Sunday, Nov. 29 10:55AM - 11:05AM Location: S502AB

Participants

Yasutoshi Ohta, MD, Yonago, Japan (*Presenter*) Nothing to Disclose Shinichiro Kitao, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Junichi Kishimoto, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Tomomi Watanabe, MD, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Natsuko Mukai, MD, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Kazuhiro Yamamoto, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Toshihide Ogawa, MD, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

I he purpose of this study was to evaluate the usefulness of myocardial extracellular volume fraction (ECV) from iodine density image using ssDECT by comparison with subtraction derived ECV.

METHOD AND MATERIALS

SsDECT image was collected from patients suspected of coronary artery disease or further evaluation of reducing ejection fraction. All subjects were performed non-contrast and equilibrium contrast-enhanced CT using ssDECT. Manually-measured ECV (mECV), automatically-subtracted ECV using non-rigid deformation (nECV) and equilibrium-iodine density derived ECV (iECV) using iodine density image without subtraction were calculated on the mid-left ventricular level. mECV, nECV and iECV were compared by using Pearson correlation. Agreements among three methods were assessed by using Bland-Altman comparison.

RESULTS

Twenty-two patients were evaluated. iECV was calculated without plain CT. The correlations of each ECV measurement approach were as follows: (mECV and iECV; r=0.754, p<0.001), (mECV and nECV; r=0.623, p=0.002). ECV was higher in patients with heart failure than healthy control subjects for mECV (30.73 vs. 24.45, p=0.012), nECV (30.60 vs. 24.95, p=0.027) and iECV (29.79 vs. 24.68, p=0.007). Mean radiation dose was $3.5\pm0.2mSv$ for each CT acquisition.

CONCLUSION

ECV using iodine density image correlates with ECV calculated by subtraction, which allows for the noninvasive technique quantification of the diffuse fibrosis burden in myocardial diseases with less radiation dose and without plain CT.

CLINICAL RELEVANCE/APPLICATION

ECV derived from Iodine density image using ssDECT enables measurement of ECV without non-enhanced CT and discriminate patient increased ECV as well as subtraction derived ECV. This approach leads to reduction of X-ray exposure.

SSA02-03 Underestimation of Atherosclerotic Burden by Invasive Coronary Angiography Compared to Dual Energy Computed Tomography

Sunday, Nov. 29 11:05AM - 11:15AM Location: S502AB

Participants

Gaston Rodriguez Granillo, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Patricia M. Carrascosa, MD, Buenos Aires, Argentina (*Presenter*) Research Consultant, General Electric Company Alejandro Deviggiano, MD, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Carlos Capunay, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose Macarena De Zan, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Alejandro Goldsmit, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Dual energy (DE) CTCA has emerged as a novel approach that aims to convey a more accurate assessment of atherosclerotic coronary plaques since it attenuates some of the limitations related to the polychromatic nature of x-rays, by means of synthesized monochromatic evaluation. We sought to explore the differences between atherosclerotic burden with invasive coronary angiography (ICA) and DE-CTCA in symptomatic patients.

METHOD AND MATERIALS

The present prospective study involved patients with suspected coronary artery disease (CAD) referred for invasive coronary angiography (ICA). Patients were categorized according to the atherosclerotic burden extent using the modified Duke prognostic CAD index, the CAD extension score, and the segment stenosis score (SSS), which reflect the extension and severity of the atherosclerotic burden; and the segment involvement score (SIS), which only reflects the extent of the atherosclerotic burden.

RESULTS

Eighty patients were prospectively included in the study protocol. The mean age was 62.0 ± 10.9 years, and 59 (74 %) patients were male. The mean SIS (8.2 ± 3.9 vs. 6.0 ± 3.7 , p<0.0001), modified Duke index (4.33 ± 1.6 vs. 4.0 ± 1.7 , p= 0.003), the CAD extension score (4.84 ± 1.8 vs. 4.43 ± 2.1 , p= 0.005), and the median SSS (13.5 (9.0-18.0) vs. 9.5 (5.0-15.0), p<0.0001) were significantly higher at DE-CTCA compared to ICA. DE-CTCA showed a significantly higher number of patients with any left main coronary artery lesion (46 (58 %) vs. 18 (23 %), p<0.0001) and with severe proximal lesions (0.28 ± 0.03 vs. 0.26 ± 0.03 , p<0.0001) than ICA. Overall, DE-CTCA identified a larger extent of disease at proximal and mid coronary segments compared to ICA, particularly higher at the left main coronary artery (DE-CTCA 0.69 ± 0.7 vs. ICA 0.29 ± 0.6 , p <0.0001).

CONCLUSION

In this study, CTCA using dual energy imaging identified a significantly larger atherosclerotic burden compared to ICA, particularly involving the proximal segments. Our findings provide further insights into the limitations of ICA and the concept of normal or near normal coronary arteries, although the potential clinical implications should be explored in further prospective natural history studies.

CLINICAL RELEVANCE/APPLICATION

Dual energy (DE) CTCA has emerged as a novel approach that aims to convey a more accurate assessment of atherosclerotic coronary plaques since it attenuates some of the limitations related to the polychromatic nature of x-rays.

SSA02-04 Dual Energy Computed Tomography Coronary Angiography. Diagnostic Performance in Patients with Intermediate to High Likelihood of Coronary Artery Disease

Sunday, Nov. 29 11:15AM - 11:25AM Location: S502AB

Participants

Patricia M. Carrascosa, MD, Buenos Aires, Argentina (*Presenter*) Research Consultant, General Electric Company Alejandro Deviggiano, MD, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Carlos Capunay, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose Javier Vallejos, MD, MBA, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Macarena De Zan, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Gaston Rodriguez Granillo, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Alejandro Goldsmit, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Dual energy (DE) CTCA has emerged as a novel approach that shows promise to attenuate some of the limitations related to the polychromatic nature of x-rays. We sought to explore the diagnostic performance of DE-CTCA in patients with intermediate to high likelihood of CAD referred to ICA, and the influence of different energy levels and the extent of coronary calcification.

METHOD AND MATERIALS

Between May 2014 and January 2015, consecutive symptomatic patients with suspected CAD referred for ICA who accepted to undergo DE-CTCA and a coronary artery calcium (CAC) scoring. 45, 65 and 85 keV datasets were randomly assigned for analysis by consensus of two observers blinded to the clinical data and to energy level applied. Quantitative image quality assessment and luminal attenuation and signal noise was evaluated at the aortic root. Coronary artery calcium (CAC) scores were calculated by a forth independent observer. Each coronary segment was assigned a vessel territory and categorized into tertiles according to the individual vessel CAC score.

RESULTS

Sixty-seven patients were prospectively included. The mean effective radiation dose of DECT was $4.1\pm1.0 \text{ mSv}$ and of CAC $0.9\pm0.3 \text{ mSv}$. The median CAC scoring was 597 (interquartile range 184-1095). Ten segments (1.0 %) were deemed non-assessable among 45 keV reconstructions, compared to 5 (0.5 %) among both 65 keV and 85 keV reconstructions (p= 0.07, Friedman test). Image quality was significantly lower at 45 keV reconstructions. No significant differences were observed between groups regarding the diagnostic performance either on a per patient or per segment basis. Patients with moderate calcification showed a modest increase in the positive predictive value among mid and high energy levels compared to reconstructions at 45 keV, modest improvement in likelihood ratios, and a trend towards a significant improvement in diagnostic performance with 65 keV versus 45 keV reconstructions [(45 keV, AUC 0.92 vs. 65 keV, AUC 0.96, p= 0.06]. The diagnostic performance of DE-CTCA was significantly lower in segments with severe calcification, independently of the energy level applied.

CONCLUSION

DE-CTCA had a good diagnostic performance, with a high specificity even in patients with diffuse calcification.

CLINICAL RELEVANCE/APPLICATION

Dual energy (DE) CTCA has emerged as a novel approach that shows promise to attenuate some of the limitations related to the polychromatic nature of x-rays.

SSA02-05 Quantitative Evaluation of Beam-Hardening Artefact Correction at Dual-Energy CT Myocardial Perfusion Imaging

Sunday, Nov. 29 11:25AM - 11:35AM Location: S502AB

Participants

Andreas Bucher, MD, Frankfurt, Germany (*Presenter*) Nothing to Disclose Lucas L. Geyer, MD, Charleston, SC (*Abstract Co-Author*) Speaker, General Electric Company Julian L. Wichmann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Carlo N. De Cecco, MD,PhD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Felix G. Meinel, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose U. Joseph Schoepf, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Grant, General Electric Company; Research Grant, Siemens AG; Research support, Bayer AG; ; ; Andrew D. McQuiston, BS, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Christopher Wolla, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose Moritz H. Albrecht, MD, Frankfurt am Main, Germany (*Abstract Co-Author*) Nothing to Disclose Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To quantitatively assess the impact of a novel reconstruction algorithm ("kernel D33f") with beam-hardening correction (BHC) on beam-hardening artefacts of the myocardium at dual-energy computed tomography myocardial perfusion imaging (DE-CTMPI).

METHOD AND MATERIALS

Rest-series of DE-CTMPI studies from 14 patients were retrospectively analyzed. Six image series were reconstructed for each patient using 3.0 mm section thickness: a) 100kV, b) 140kV, and c) linearly-blended MIX0.5, each with BHC (D33f kernel) and without (D30f). A total of 756 myocardial regions were analyzed. Seven regions of interest (ROI) equally subdivided the myocardium in the axial section. Three subdivisions were made within areas prone to BHA. Reports of SPECT studies within 30 days of CT examination were used to confirm presence and location of true perfusion defects. The relative difference of ROI attenuation from average myocardial attenuation (RDTM) was determined as an indicator for homogeneity of myocardial attenuation. Paired student t-test was used for statistical evaluation.

RESULTS

Overall mean myocardial attenuation was lower on corrected reconstructions (D30f, 87.3 ± 24.1 HU; D33f, 85.5 ± 21.5 HU, p=0.009). Overall RDTM was more homogeneous using BHC (D30f, $-0.3\pm11.4\%$; D33f, $0.1\%\pm10.1\%$ p<0.001). Changes in RDTM were greatest in the postero-basal myocardium (D30f, $-16.2\pm10.0\%$; D33f, $3.4\pm10.7\%$; p<0.001).

CONCLUSION

A dedicated reconstruction algorithm with BHC can significantly reduce beam-hardening artefacts at DE-CTMPI to improve the specificity of myocardial perfusion defect assessment.

CLINICAL RELEVANCE/APPLICATION

DE-CTMPI datasets may be routinely reconstructed with a BHC algorithm to decrease beam-hardening artefacts and improve assessment of the myocardium.

SSA02-06 Diagnostic Value of Spectral CT Combined with Serum Biomarkers in Determining Coronary Artery Plaque Characteristics-A Preliminary Study

Sunday, Nov. 29 11:35AM - 11:45AM Location: S502AB

Participants Huang Renjun, Suzhou, China (*Presenter*) Nothing to Disclose Dai Hui, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose Li Yonggang, Suzhou, China (*Abstract Co-Author*) Nothing to Disclose Guo Liang, Suzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of the present study was to evaluate the value of spectral computed tomography (CT) in determining coronary plaque composition and in reflecting coronary plaque vulnerability which were compared with CT values and the findings of serum biomarkers as the reference standard.

METHOD AND MATERIALS

107 consecutive patients(65 males and 42 females)underwent coronary CTA on a GSI capable 64-slice CT scanner.Plaques were divided into 5 groups according to MSCT criteria(plaque density expressed by Hounsfield units[HU])and the size of calcification in mixed plaques.Spectral curve and effective atomic number and two-material decomposition(FAT and HAP)technique were used to analyze coronary plaques.The vulnerability of plaques was determined by serum biomarkers including soluble OX40 ligand(sOX40L)and matrix metalloproteinases(MMP-9)and lipoprotein associated phospholipase A2(Lp-PLA2).The concentration of serum biomarkers were measured by ELISA.

RESULTS

159 coronary artery plaques were analyzed.90 cases of blood samples were obtained, and 42 cases were negative on CT.By measuring CT values, the plaques were classified as fibrous(group1,n=29), which had a density of 61-129HU(75±20 HU), soft(group2,n=35), which had a density of ≤ 60 HU(36±30HU), and calcified(group3,n=24), which had a density of ≥ 130 HU(774±234 HU). Mixed plaques with larger(group4,n=40,465±196HU) or spotty(group5,n=31,53±32HU) calcification were also analyzed. Except the value of FAT between group1 and group5 and between group2 and group5, there were statistically significant differences of four spectral results among the 4 groups(p<0.05). Levels of three serum biomarkers were significantly higer in positive patients(p<0.05). There were significant differences of MMP-9 levels between group2 and group3(p<0.05). Negative correlations was found between serum MMP-9 levels and CT density(r=-0.501,p<0.05) and effective atomic number(r=-0.372,p<0.05) and slope of spectral curves(r=-0.378,p<0.05) and value of HAP(r=-0.411,p<0.05).

CONCLUSION

Our results indicate that spectral CT might be used to differentiate atherosclerotic plaques. Serum levels of sOX40L and MMP-9 and Lp-PLA2 correlate with the coronary atherosclerosis, and the elevated levels of MMP-9 might be associated with coronary plaque vulnerability.

CLINICAL RELEVANCE/APPLICATION

spectral CT might be used to differentiate atherosclerotic plaques and indicate coronary plaque vulnerability.

SSA02-07 Interobserver Agreement of Stress Rest Dual Energy CT Myocardial Perfusion

Sunday, Nov. 29 11:45AM - 11:55AM Location: S502AB

Participants

Patricia M. Carrascosa, MD, Buenos Aires, Argentina (*Presenter*) Research Consultant, General Electric Company Carlos Capunay, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose Alejandro Deviggiano, MD, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Roxana Campisi, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Javier Vallejos, MD, MBA, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Maria Munain, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose Gaston Rodriguez Granillo, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The objectives of this paper are to determine the interobserver variability in the evaluation of myocardial perfusion defects by Stress-Rest DECT myocardical perfusion and to assess the Sensitivity (S), Specificity (Sp), Positive predictive value (PPV) and Negative predictive value (NPV) of two observers in correlation with SPECT findings.

METHOD AND MATERIALS

We evaluated 20 patients with known or suspected coronary disease who had a positive exercise test for ischemia or had an indication of SPECT.Prospective ECG-triggered cardiac DECT was performed with a 128 slice CT scanner (Discovery CT750 HD; GE Medical Systems).First a stress CT scan was carried out and 30 minutes later a rest CT scan was complemented. Dipyridamole drug was used for stress myocardial perfusion imaging in both CT and SPECT studies.The protocol was approved by an Institutional Ethics Committee and all patients signed a informed consent.A 17 segmental model analysis was done using the DECT monochromatic data at 70 kev by two independent observers.SPECT analysis was done and compared with DECT.Statistical analysis:The 95% confidence interval of the proportions was calculated by the exact binomial method to determine the presence of myocardial perfusion defects for both observers (O1; O2).Interobserver agreement between both observers was measured by the kappa coefficient.

RESULTS

There were 680 myocardial segments for analysis. For the detection of myocardial perfusion defects for O1 and O2: S, Sp, PPV and
NPV were 82,1%, 96.74%, 85.48%, 96.04% and 83.3%, 96.2%, 83.3%, 96.2%, respectively. The correlation between O1 and O2 was k= 0.79 (0.71 to 0.86). The mean radiation dose for each patient was 7.1 +/- 1.2 mSv.

CONCLUSION

There was good interobserver agreement of Stress-Rest DECT for the detection of myocardial perfusion defects as well as adecuate sensitivity and specificity with SPECT findings, with similar radiation dose than single energy CT scans.

CLINICAL RELEVANCE/APPLICATION

Stress-Rest DECT for the detection of myocardial perfusion defects is feasible and shows a good performance compared to SPECT scans.

SSA02-08 Improvement of Image Quality Using Adaptive Statistical Iterative Reconstruction in the Evaluation of Chronic Myocardial Infarction Using Iodine Density Image with Spectral CT

Sunday, Nov. 29 11:55AM - 12:05PM Location: S502AB

Participants

Junichⁱ Kishimoto, Yonago, Japan (*Presenter*) Nothing to Disclose Yasutoshi Ohta, MD, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Shinichiro Kitao, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Tomomi Watanabe, MD, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose Toshihide Ogawa, MD, Yonago, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to evaluate the effect and determine the optimal blend percentages of adaptive statistical iterative reconstruction (ASiR) for iodine density imaging (IDI) of myocardial late iodine enhancement (LIE) in the evaluation of chronic myocardial infarction (CMI) with spectral CT.

METHOD AND MATERIALS

A total of 28 patients underwent cardiac LIE using single source dual-energy CT scanner (DiscoveryCT 750HD, Freedom Edition: GE). IDI between 0% and 100% of contributions of ASiR in 10% increments were reconstructed. The signal-to-noise ratio (SNR) of remote myocardium and the contrast-to-noise ratio (CNR) of infarcted myocardium were measured. Transmural extent of infarction was graded by using a 5-point scale (0= no late enhancement, 1= late enhancement with 1-24% of transmural extent, 2= 25-49%, 3= 50-74%, 4= 75-100%). The SNR, CNR, and transmural extent were assessed in a contribution ratio of each ASiR. The transmural extents were compared with MRI as a reference standard.

RESULTS

In comparison with 0% ASiR, the use of 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, and 100% ASiR resulted in reduction of image noise between groups (-5.4%, -12.9%, -20.3%, -26.9%, -34.0%, -41.3%, -47.6%, -54.0%, -60.1% and -64.8%, respectively; p<0.01) without difference in signal (p=NS). Compared with 0% ASiR images, reconstruction with 100% ASiR image demonstrated the highest improvement in SNR (229%; p<0.001) and CNR (199%; p<0.001). 80%-100% ASiR demonstrated the highest ratio (73.7%) of accurate transmural extent classification in comparison to MRI.

CONCLUSION

ASiR intensity of 80% to 100% improves image quality without changes in signal and maximizes the accuracy of transmural extent in infarcted myocardium.

CLINICAL RELEVANCE/APPLICATION

Use of ASiR improves the image quality of LIE on iodine density image and leads to accurate diagnosis of transmural extent.

SSA02-09 Reduction of Coronary Motion Artifact in Monochromatic Imaging at Various Energy Levels Using a Motion Correction Algorithm in ECG-gated Single-source Dual-Energy Coronary CT Angiography with Rapid Switching of the Tube Voltage: Clinical Impact

Sunday, Nov. 29 12:05PM - 12:15PM Location: S502AB

Participants

Rika Fukui, Tokyo, Japan (*Presenter*) Nothing to Disclose Jianbo Gao, MD, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose Haruhiko Machida, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Kazuyo Kita, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Yun Shen, PhD, Beijing, China (*Abstract Co-Author*) Employee, General Electric Company Researcher, General Electric Company Eiko Ueno, MD, Chiyoda-Ku, Japan (*Abstract Co-Author*) Nothing to Disclose Isao Tanaka, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Takuya Ishikawa, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the clinical impact of reduction of coronary motion artifact in monochromatic imaging (MI) at various energy levels obtained using a motion correction algorithm (MCA) in electrocardiography-gated single-source dual-energy coronary computed tomography angiography with rapid switching of the tube voltage (DECCTA)

METHOD AND MATERIALS

We retrospectively assessed 134 consecutive patients (73 men; mean age 68 ± 11 years; mean heart rate 53.7 ± 5.0 bpm) who underwent DECCTA. On 65-keV MI reconstructed at the optimal cardiac phase without the MCA using the detail kernel, adaptive statistical iterative reconstruction algorithm (50% blending ratio), and 20-cm field of view, 3 readers independently graded pervessel coronary motion artifact from one (poor) to 5 (excellent) (3 to 5, interpretable) for the right (#one to 3) and left coronary arteries (#5 to 8) and left circumflex artery (#11, 13). For 30 uninterpretable vessels in 24 of 134 patients, MI was reconstructed at 45 to 105 keV at 20-keV intervals with the MCA; the readers regraded per-vessel coronary motion artifact on the MI; and the percentage of interpretable vessels achieved with the MCA was calculated at each energy level. We compared grades between images obtained with and without the MCA using Wilcoxon signed-rank test and for each energy level with the MCA using Kruskal-Wallis test.

RESULTS

For the 30 vessels in 24 patients that were uninterpretable without the MCA, 26 (87%) at 45 and 65 keV, 21 (70%) at 85 keV; and 16 (53%) at 105 keV were interpretable with the MCA. Grades of coronary motion artifact were 1.6 \pm 0.5 at 65 keV without the MCA and 3.7 \pm 1.0 at 45 keV, 3.6 \pm 1.0 at 65 keV, 3.1 \pm 1.1 at 85 keV, and 2.8 \pm 1.2 at 105 keV with the MCA. Grades were significantly better with the MCA than without at any energy level (P < 0.01 for all), and the grade with the MCA between any 2 energy levels (P > 0.05) differed significantly only between 45 and 105 keV.

CONCLUSION

Use of the MCA on MI at 45 to 65 keV is clinically useful for reducing coronary motion artifact in DECCTA.

CLINICAL RELEVANCE/APPLICATION

Use of the MCA for MI at a lower keV is clinically useful to reduce coronary motion artifact and improve image interpretability and diagnostic accuracy in DECCTA.

ISP: Informatics (Education and Research)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S403A

ED RS

AMA PRA Category 1 Credits ™: 1.50 ARRT Category A+ Credit: 1.00

Participants

George L. Shih, MD, MS, New York, NY (*Moderator*) Consultant, Image Safely, Inc; Stockholder, Image Safely, Inc; Consultant, Angular Health, Inc; Stockholder, Angular Health, Inc; Peter R. Bream JR, MD, Nashville, TN (*Moderator*) Consultant, Coeur, Inc; Advisory Panel, CryoLife, Inc Luciano M. Prevedello, MD, MPH, Columbus, OH (*Moderator*) Nothing to Disclose

Sub-Events

SSA11-01 Informatics Keynote Speaker: Role of NLP and Machine Learning in Radiology

Sunday, Nov. 29 10:45AM - 10:55AM Location: S403A

Participants

George L. Shih, MD, MS, New York, NY (*Presenter*) Consultant, Image Safely, Inc; Stockholder, Image Safely, Inc; Consultant, Angular Health, Inc; Stockholder, Angular Health, Inc;

SSA11-02 Virtual Reality Training Modules Hold Potential for IR Education

Sunday, Nov. 29 10:55AM - 11:05AM Location: S403A

Awards

Trainee Research Prize - Fellow

Participants Colin J. McCarthy, MD, Boston, MA (*Presenter*) Nothing to Disclose Alvin Y. Yu, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Stephen R. Lee, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Synho Do, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Steven L. Dawson, MD, Cambridge, MA (*Abstract Co-Author*) Consultant, Cook Group Incorporated Royalties, CAE Healthcare, Inc Raul N. Uppot, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Background

The challenge for all types of interventional radiology (IR) training is hands-on experience. Currently, IR trainees learn procedures by watching and assisting in cases. We set out to develop and evaluate an immersive virtual reality (VR) simulator, the aim of which was to provide trainees with an introduction to IR procedures. These modules differ from traditional textbooks or online learning sites, since they immerse the participant in the center of activity. Advances in the VR field have allowed for not only realistic display of stereoscopic and 360-degree images, but also the recording of such immersive content.

Evaluation

An introductory IR tutorial was recorded using a dual camera system (GoPro, Inc.) and post-processed to generate a stereoscopic 3D tutorial. The content was displayed using a head-mounted VR headset, featuring low-latency gyroscope paired with two low persistence OLED displays located immediately in front of the viewer's eyes, blocking out all external visual stimuli (Oculus VR, LLC). Additional tutorials were also constructed from a 7 camera rig (360Heros, Inc.) that captured 360-degree environmental images, allowing full immersion in the IR suite. Footage from 7 individual cameras was fused and synchronized using software (Autopano Video, Kolor SARL). Participants were asked to complete a survey after the tutorial, with questions designed around a Likert scale.

Discussion

12 participants agreed to partake in the study, 6 Attending Radiologists, 5 Fellows and 1 Resident. 75% (n = 9) of those surveyed felt that the immersive VR training module was "good" or "excellent". All participants felt that the VR headset had potential to improve IR training in the future. Feedback included some reports of initial motion sickness, potential to interact with the 3D environment and the need to incorporate radiology images into the interactive content.

Conclusion

Immersive VR platforms hold potential to enhance education in Interventional Radiology. The technology is its early stages, but may serve as an adjunct to existing methods of training. In addition to stereoscopic 3D tutorials, interactive 360-degree video content may prove valuable to those unfamiliar with an interventional suite.

SSA11-03 Teaching File 2.0: The Next Generation of Radiology Education with Open Web Technologies

Sunday, Nov. 29 11:05AM - 11:15AM Location: S403A

Participants

Jason M. Hostetter, MD, Baltimore, MD (*Presenter*) Nothing to Disclose Christopher Trimble, MD, MBA, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Michael A. Morris, MD, MS, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Jean Jeudy JR, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

Background

Radiology education has long consisted of static images displayed alongside text, often in powerpoint slides or textbooks. This

presentation style is incongruent with the modern radiologist's digital, interactive workflow. Our project aims to allow radiologists to easily create interactive, anonymized, standards compliant teaching files, available anywhere, on any device.

Evaluation

Using standard web technologies of HTML5 and JavaScript, we created a cloud-based application to create and store radiology cases. Integrated with our enterprise PACS via DICOM standards, studies are fully anonymized with one click, creating a web-based teaching case that is always-on, shareable, and available to desktop PCs, tablet devices, and modern smartphones without installing third party software. Similar to normal web pages, cases can be manipulated with hyperlinks in case descriptions or in other web pages in which the case is displayed. Cases are viewed in a web browser with full DICOM support allowing a true PACS environment. The application has been used at our institution over the past year to create educational modules for medical students as well as to create interactive educational e-books about radiology and pathology topics. Residents and faculty also utilize the system to maintain personal case logs and share interesting cases via email or text within HIPAA compliance.

Discussion

Our implementation brings full PACS functionality to a portable and extensible educational platform. By utilizing existing web and DICOM standards, any device with a modern web browser is a fully enabled DICOM viewer, and any standards compliant PACS can be easily integrated to generate anonymized cases in a single click. A cloud based solution also allows easy sharing and collaboration, by simply sending a link via email, text, or social media, in same way one may share an interesting article. Our architecture eliminates the need for local archival storage, ensuring cases are always instantly available.

Conclusion

We created a cloud based radiology educational resource using standard web technologies, with full PACS functionality, and automated anonymization to bring radiology educational materials to the modern web.

SSA11-04 Simultaneous Human-Readable and Structured Data Encoding from PDF Forms

Sunday, Nov. 29 11:15AM - 11:25AM Location: S403A

Participants Zachary S. Delproposto, MD, Detroit, MI (*Presenter*) Nothing to Disclose Matthew C. Rheinboldt, MD, New Orleans, LA (*Abstract Co-Author*) Nothing to Disclose

Background

Clinical and research needs often demand the need to store metadata which is not integral to the EHR (e.g., RECIST data). While PDF files can be saved as DICOM images, structure is lost and maintained only by entry into a separate system which requires maintenance and dissociates captured information from the study data. We have created a system to extract data from PDF Forms and simultaneously embed the form itself as a human-readable DICOM image, and the structured form data as an embedded QR code within a DICOM image.

Evaluation

Using PDF forms eliminates the need for custom local or web applications to edit structured data. Storing the PDF data as an image allows for facile retrieval of human-readable information sans additional software. QR-encoded structured data is stored as DICOM image data, not using private/non-standard fields, maintaining superb vendor neutrality and compatibility. QR-codes also permit structured data capture directly into mobile applications. Leveraging existing PACS infrastructure obviates the need for an external database. Extraction of structured data and PDF form re-creation occurs as needed; the presence of image-embedded structured data does not diminish the performance of the PACS or impede interpretation of diagnostic data.

Discussion

Built using open-source components and leveraging the existing PACS infrastructure, we find that our system allows easy, reliable metadata entry and recall (Figure 1). Since forms are stored both as a PDF image and as QR-encoded structured data image, workstations without the need for structured metadata entry or recall function normally without workflow impact. Most users are familiar with PDF forms, which are in common use and routinely used at both public and private institutions. PDF forms can be constructed to constrain input fields to appropriate types (e.g., numeric fields), enforcing data consistency. Ease of use is a key factor in this system. Additional data storage requirements are minimal, adding only a few images to each study.

Conclusion

We show a robust, efficient, cost-effective method to encode metadata from PDF forms simultaneously in a human-readable image and machine readable structured image formats.

SSA11-05 Call Cases Dashboard: What a First-Year Radiology Resident Knows before Call

Sunday, Nov. 29 11:25AM - 11:35AM Location: S403A

Participants

Linda Kelahan, MD, Washington, DC (*Presenter*) Nothing to Disclose Allan Fong, BS,MS, Washington, DC (*Abstract Co-Author*) Nothing to Disclose Raj Ratwani, Washington, DC (*Abstract Co-Author*) Nothing to Disclose Ross W. Filice, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose

Background

Current ACGME guidelines do not help first-year radiology residents prepare for the daunting task of taking call. Tracking exposure to high-acuity cases that are likely to be encountered while taking call can provide a framework for focused study and reflection. Furthermore, these cases can subsequently be utilized for educational or research purposes.

Evaluation

We focused on cases most likely to be encountered in a resident call setting. First, we limited evaluation to relevant procedures (i.e. CT abdomen/pelvis for appendicitis). We then applied natural language processing (NLP) techniques (specifically sentence

parsing) to identify both positive and negative cases where the diagnosis should have been considered and excluded irrelevant cases. Each night we apply these algorithms to and update our resident dashboard to reflect our findings. Residents can view this data in a custom date range with access to specific accession numbers for further review.

Discussion

Current methods of assessing resident progress, such as ACGME case log minimums, do not elucidate the types of pathology the resident sees nor the decisions the resident should make. Our model attempts to both highlight cases that have important call-relevant pathology but also negative cases where that pathology should be considered (i.e. CT for right lower quadrant pain). By making this data available to our residents, we believe they will better understand how prepared they are for call, will have opportunity to further educate themselves if needed, and will hopefully improve their receiver operating characteristic (ROC) on call, which would positively impact clinical care. Furthermore, we are developing a repository of important call cases that any resident could review for educational or research purposes.

Conclusion

Our "call cases" dashboard has multiple advantages to traditional CPT-code driven analysis of radiology resident education. We can identify positive high acuity call-relevant studies viewed prior to beginning call, but also negative cases where there was high clinical suspicion. Furthermore, this repository allows residents to review call-relevant cases for educational or research purposes.

SSA11-06 Resident Performance Analytics Using Structured Attending Feedback and #Hashtag Sharing Features

Sunday, Nov. 29 11:35AM - 11:45AM Location: S403A

Participants

Po-Hao Chen, MD, MBA, Philadelphia, PA (*Presenter*) Nothing to Disclose Yin J. Chen, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Mary H. Scanlon, MD, FACR, Haverford, PA (*Abstract Co-Author*) Nothing to Disclose Tessa S. Cook, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

Background

The qualitative evaluation of a trainee's a radiology interpretation is an important dimension of training that is difficult to meaningfully analyze and quantify. We previously presented an open-source web-based platform that provided volume-related analytics for residents. Working from the existing code, we added visualization of attending feedback on resident reports, analytics of qualitative grading of on-call studies, and social media features allowing annotation and sharing of interesting cases.

Evaluation

Building upon our open-source software, we implemented new functionality for analyzing attending modifications on both daytime and off-hour preliminary interpretations. At our institution, attending radiologists grade independently-interpreted, on-call exams using a 5-point scale: 'Great Call,' 'Agree,' 'Addition,' 'Minor Change,' and 'Major Change.' After loggin in, the software analyzes the trainee user's attending grades and offers birds' eye view of discrepancy rates, turnaround times, and volume of call studies. The data can be organized by modality and anatomy. For each study, the software offers a 'Show Changes' view to highlight attending edits on preliminary reports. An administrators' view is available for residency and fellowship directors. The trainee and administrators may annotate each examination using free text, or apply social media-like #hashtags for sharing. We tracked trainees' usage of the software before and after new feature implementation.

Discussion

Analysis of usage patterns during the three months post-implementation (9/1/2014-11/30/2014) showed 484 distinct user logins per month, compared to 142 per month in the preceding three months (5/1/2014-7/31/2014) when these new features were not available. Additionally, 86 unique tags have been created by users with 962 total applications as of 2/28/2015. Some uses for hashtags include teaching ('#RareDx'), follow-up ('#FollowUp'), and documenting interpretive errors ('#SatOfSearch').

Conclusion

Implementation of new qualitative analytic and sharing features have led to substantial increases in usage of our resident analytics platform, suggesting that these features fulfill previously unmet educational needs.

SSA11-07 Electronic Education Exhibit 'Likes' at the 2014 RSNA Annual Meeting

Sunday, Nov. 29 11:45AM - 11:55AM Location: S403A

Participants

Paul M. Bunch, MD, Boston, MA (*Presenter*) Nothing to Disclose Jeremy R. Wortman, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Katherine P. Andriole, PhD, Dedham, MA (Abstract Co-Author) Advisory Board, McKinsey & Company, Inc;

PURPOSE

For the second consecutive year, the 2014 RSNA DPS offered electronic education exhibit (EEE) viewers the opportunity to "like" an EEE. We sought to 1) evaluate any relationship between an EEE's popularity and its chance of winning an award or being selected for RadioGraphics, 2) evaluate any relationship between an EEE's recognition and its subsequent popularity, and 3) assess overall audience "like" participation at the 2014 meeting as compared to 2013.

METHOD AND MATERIALS

The number of likes each EEE received was recorded from DPS on 1) Wednesday morning before award selections and RadioGraphics invitations had been announced and 2) Saturday morning after the meeting had concluded. Data analysis was performed by means of one-way ANOVA.

RESULTS

At the 2014 RSNA meeting, there were 1793 EEEs, which received 11074 likes (Mean 6.2, Min 0 [n=124], Max 109 [n=1]). Awards were given to 404 EEEs (22.5%), which received 3452 likes (31.2%, Mean 8.5, Min 0 [n=13], Max 109 [n=1]). RadioGraphics

invitations were given to 169 EEEs (9.4%), which received 1525 likes (13.8%, Mean 9.0, Min 0 [n=2], Max 54 [n=1]). EEEs receiving awards had significantly more likes prior to award selection (Mean 4.4 vs 3.5, p=0.0035) and at the end of the meeting (Mean 8.5 vs 5.5, p<0.0001) than non-awarded EEEs. EEEs receiving RadioGraphics invitations had significantly more likes prior to invitation announcement (Mean 4.6 vs 3.6, p=0.0272) and at the end of the meeting (Mean 9.0 vs 5.9, p<0.0001) than non-invited EEEs. Recognized EEEs received significantly more likes over the second half of the meeting than non-recognized EEEs (Mean 4.2 vs 1.9 for awarded vs non-awarded, Mean 4.5 vs 2.2 for invited vs. non-invited, p<0.0001 for both). There was a 152% increase in total EEE likes recorded at the 2014 RSNA meeting as compared to 2013 (11074 vs 4391).

CONCLUSION

The DPS "like" feature at the 2014 RSNA meeting allowed for substantial audience feedback on EEEs, with over 11000 distinct entries made. There was an association between EEE likes and EEE recognition, and EEE recognition was also associated with a subsequent increase in EEE likes. As compared to 2013, EEE viewers at the 2014 meeting recorded 2.5 times more likes.

CLINICAL RELEVANCE/APPLICATION

EEE likes gauge radiologists' opinions of EEEs and may predict awards and RadioGraphics invitations. The DPS like feature was more utilized at the 2014 RSNA meeting as compared to the previous year.

SSA11-08 Structured Reporting of Focal Lesions in the Abdomen to Assess Radiology Trainees' Performance Demonstrates Decreased Detection Errors for Suspicious Lesions with Increased Training

Sunday, Nov. 29 11:55AM - 12:05PM Location: S403A

Participants

Joe C. Wildenberg, MD, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose Po-Hao Chen, MD, MBA, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Charles E. Kahn JR, MD, MS, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Hanna M. Zafar, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose Tessa S. Cook, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Structured reporting (SR) of focal masses in the solid abdominal organs can be used, in the context of education, to assess the ability of of radiology trainees to detect and characterize these lesions. Using an existing SR initiative at our institution, we investigated if there was a difference in detection of focal abdominal mass lesions by trainee level.

METHOD AND MATERIALS

All CT and US studies of the abdomen performed between 7/1/2013 and 12/15/2014 in a call setting, without immediate attending input, were reviewed. Trainees evaluated the liver, pancreas, kidneys, and adrenal glands within the SR framework. Numeric codes were analogous to BI-RADS, and corresponded to both the presence of focal masses and the likelihood of malignancy. All preliminary interpretations were subsequently reviewed by attending radiologists, and differences in the numerical categories noted. Non-visualization was representative of a change from an assignment of "no mass" to any benign, indeterminate or suspicious lesion. Data was analyzed by level of training.

RESULTS

Among 12081 studies that met inclusion criteria, residents failed to visualize focal abdominal masses more often than fellows (80/3699, 2.2% versus 128/8382, 1.5%, respectively) (p<0.02). Sub-analysis revealed no difference in detection when the lesion was classified as benign; however, fellows demonstrated a lower miss rate for suspicious lesions (p<0.05). Furthermore, although direct year-to-year comparisons were not significant, there was a near-linear decrease in non-visualization rate with increased trainee year (r=-0.96; p<0.05).

CONCLUSION

SR can be leveraged to assess radiology trainees' performance and guide education in call situations. We found that increased training was associated with a lower proportion of missed focal masses. Additionally, we found that inexperienced trainees made more errors when the lesion was eventually classified as suspicious, whereas there was no difference for benign lesions.

CLINICAL RELEVANCE/APPLICATION

Trainee education in the clinical setting is often subjective, with incomplete metrics to assess trainee performance. Structured reporting of focal abdominal masses is an objective metric to understand the progression of trainees' proficiency and provide targeted feedback for studies read in a call setting. The effect of alternative methods of targeted educational outreach to residents on non-visualized abdominal masses can be explored.

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/

Charles E. Kahn JR, MD, MS - 2012 Honored Educator

SSA11-09 TROVE: Open Source Resident Dashboard with Disease Classification Using Natural Language Processing (NLP) and Machine Learning (ML)

Sunday, Nov. 29 12:05PM - 12:15PM Location: S403A

Participants

Kurt T. Teichman, BSc, MEng, New York, NY (*Abstract Co-Author*) Nothing to Disclose Shlomo Minkowitz, BA, MD, New York, NY (*Presenter*) Nothing to Disclose Charles Herrmann, MS, New York, NY (*Abstract Co-Author*) Nothing to Disclose George L. Shih, MD, MS, New York, NY (*Abstract Co-Author*) Consultant, Image Safely, Inc; Stockholder, Image Safely, Inc; Consultant, Angular Health, Inc; Stockholder, Angular Health, Inc;

Background

Determining if a radiology resident has met the goals of the residency curriculum, which outlines different pathologies and conditions for imaging, is challenging. Our TROVE dashboard (DEMO: http://demo.trovedashboard.com / SOURCE: http://src.trovedashboard.com) displays the volume of exams and now classifies the radiology reports to determine which diseases a resident has seen during clinical rotations.

Evaluation

Machine learning algorithms are applied using a training dataset from our billing company which provides ICD9 codes for all radiology reports. The disease view of the TROVE dashboard utilizes 174 support vector machine (SVM) classifiers to associate radiology free text reports with 174 specific disease labels, which correspond to diseases that were determined to be important for resident training by the different departmental division chiefs. Resident reports are processed using Natural Language Processing techniques by finding both positive and negative labels for a particular disease and then compiling a MESH concept list of the most common concepts associated with that particular disease to determine features to be used in SVM training. Utilizing solely the impression text of a report, the average F1-score across all 174 svm classifiers is 0.801894 (best = 1.0). Some diseases scored higher such as Carotid Stenosis (0.883001144096) and Wrist Fracture (0.886353355114). Other diseases had lower scores such as Testicular Torsion (0.676691729323). A single report may include multiple diseases and will be classified as such by the SVMs.

Discussion

With an average F1-measure of 0.801894 we can conclude that the methodology outlined above provides fairly robust predictions associated with the SVM classifiers, giving a reasonable estimate of resident experience. Lower scores are generally associated with either improper feature selection and/or shortage of training data which may improve over time with more data. Future work on these SVM classifiers should include the use of MetaMap for better feature selection.

Conclusion

TROVE dashboard, using NLP and ML, provides classification of radiology reports to determine the diseases residents have seen during their clinical rotations.

Cardiac (Anatomy and Function)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S504AB



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

FDA Discussions may include off-label uses.

Participants

Gregory W. Gladish, MD, Houston, TX (Moderator) Nothing to Disclose

Prabhakar Rajiah, MD, FRCR, Cleveland, OH (Moderator) Institutional Research Grant, Koninklijke Philips NV

Sub-Events

SSA03-01 Utility of Ungated Free-breathing Through-time Radial GRAPPA in Pediatric Cardiac MRI- Preliminary Results

Sunday, Nov. 29 10:45AM - 10:55AM Location: S504AB

Participants

Prabhakar Rajiah, MD, FRCR, Cleveland, OH (*Abstract Co-Author*) Institutional Research Grant, Koninklijke Philips NV Deepa Prasad, MBBS, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Lydia Everhart, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Vikas Gulani, MD, PhD, Ann Arbor, MI (*Abstract Co-Author*) Research support, Siemens AG Nicole Seiberlich, PhD, Cleveland, OH (*Abstract Co-Author*) Research Grant, Siemens AG Ravi Ashwath, MD, Cleveland, OH (*Presenter*) Nothing to Disclose Robert C. Gilkeson, MD, Cleveland, OH (*Abstract Co-Author*) Research Consultant, Riverain Technologies, LLC Research support, Koninklijke Philips NV Research support, Siemens AG

PURPOSE

Cardiac MRI (CMR) sequences require ECG gating and multiple breath holds, which may be difficult in children and often require general anesthesia. We sought to compare the image quality and quantitative ventricular parameters with ungated free breathing through-time radial GRAPPA to gold-standard breath-hold cine sequences.

METHOD AND MATERIALS

The study included 9 patients, 7 on 1.5 T and 2 on 3 T scanners. Both gold-standard breathheld SSFP scans with ECG gating and free breathing ungated highly under sampled radial bSSFP scans were acquired. Radial data was reconstructed using through-time radial GRAPPA. ESV, EDV, EF and mass were assessed for both scans and compared using two-sided t-tests. Images were evaluated by two independent cardiac imagers for several features including endocardial border detection, blood pool, myocardium, mitral and tricuspid valve, global and regional cardiac wall motion abnormalities on a 5 point scale (1- worst, 5- best). Artifacts were graded on a 5 point scale (1- no artifacts, 5- extensive artifacts).

RESULTS

There was excellent correlation of quantitative measurements between the two MRI techniques (EF R=0.89, EDV R=0.99, ESV R=0.93, mass R=0.98). The differences in EF, EDV, ESV and mass between gold-standard and real-time methods were not statistically significant. For the Bland-Altman plot, the mean difference of the measurements between the gold-standard and real-time methods was -0.35% (1.57% and -2.27%) and 95% limits of agreement contained 100% of the difference scores. On qualitative assessment, mitral valve was seen well (p=0.01) in SSFP but all the other features were comparable in both sequences. The mean artifact score was significantly lower in the real- time images (1.1 vs 2.8, p < 0.005). The mean scan time was also shorter with real time real time method (4.1 mins vs 6.5 mins, p < 0.001)

CONCLUSION

Real-time functional CMR with through-time radial GRAPPA performed without ECG-gating under free-breathing can be considered as an alternative to gold-standard breath hold cine imaging for the evaluation of quantitative and qualitative parameters in pediatric patients with comparable results, fewer artifacts and shorter scan times.

CLINICAL RELEVANCE/APPLICATION

This novel sequence is useful in cardiac MRI of children, who often are not compliant with breath holding instructions and may thus obviate the need for general anesthesia in these children.

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/

Prabhakar Rajiah, MD, FRCR - 2014 Honored Educator

SSA03-02 Accuracy, Precision, and Inter-Observer Variability of Left Ventricular Mass Quantification with 4D Flow MRI

Sunday, Nov. 29 10:55AM - 11:05AM Location: S504AB

Trainee Research Prize - Fellow

Participants

Kate Hanneman, MD, Toronto, ON (*Presenter*) Nothing to Disclose Aya Kino, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose Joseph Y. Cheng, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose Marcus T. Alley, PhD, Stanford, CA (*Abstract Co-Author*) Research Funding, General Electric Company; Research Consultant, Arterys; Shreyas S. Vasanawala, MD, PhD, Palo Alto, CA (*Abstract Co-Author*) Research collaboration, General Electric Company; Consultant, Arterys; Research Grant, Bayer AG;

PURPOSE

4D flow MRI has been shown to comprehensively evaluate flow, ventricular function, and anatomy in congenital heart disease. Here, we aim to compare the accuracy, precision, and inter-observer variation of left ventricular (LV) mass quantification by 4D flow MRI versus the gold standard cardiac-gated cine steady-state free precession (SSFP).

METHOD AND MATERIALS

With IRB approval, informed consent, and HIPAA compliance, 22 consecutive patients with suspected or known congenital heart disease (10 males, 6.4±4.8 years) referred for 3T ferumoxytol-enhanced cardiac MRI were prospectively recruited. Complete ventricular coverage was obtained with both axial 4D flow and standard two-dimensional short-axis multi-slice SSFP sequences. Two blinded cardiovascular imagers independently segmented the images for LV myocardium on end systolic (ES) and end diastolic (ED) images, thus yielding four blinded measurements of LV mass by each imager in each subject. Linear regression, ANOVA, Bland-Altman analysis, and intra-class correlation (ICC) were used to assess the hypothesis that the accuracy, precision and inter-observer variability of LV mass measurements are not significantly difference between 4D flow and cine SSFP acquisitions.

RESULTS

Significant positive correlations were found for LV mass between 4D flow and SSFP at ED ($32.8\pm14.2g$ vs. $33.3\pm14.4g$, r=0.989, p<0.001) and ES ($33.2\pm14.4g$ vs. $31.8\pm13.6g$, r=0.988, p<0.001). Mean bias between ED and ES LV mass measurements as a percentage of the mean were $-2.1\pm10.3\%$ for 4D flow and $4.2\pm4.7\%$ for SSFP, respectively. There was no significant difference between 4D flow and SSFP with respect to mean square difference of ED-ES LV mass (F=2.05, p=0.159). High levels of inter-observer agreement were achieved for LV mass with 4D flow (ED ICC 0.948 (95%CI 0.880, 0.978); ES ICC 0.936 (95%CI 0.851, 0.973)) and SSFP (ED ICC 0.960 (95%CI 0.906, 0.983); ES ICC 0.953 (95%CI 0.890, 0.980)), with overlapping confidence intervals.

CONCLUSION

Ferumoxytol-enhanced 4D flow MRI determines LV mass with comparable precision, accuracy and inter-observer agreement relative to cine SSFP.

CLINICAL RELEVANCE/APPLICATION

4D flow imaging allows for accurate and reliable assessment of LV mass, potentially reducing costs and increasing patient comfort due to shortened data acquisition times.

SSA03-03 Deformable Registration Based Analysis of Cine MR for Quantification of Regional Myocardial Function: Comparison to MR Feature Tracking and Speckle-Tracking Echocardiography

Sunday, Nov. 29 11:05AM - 11:15AM Location: S504AB

Participants

Mariana M. Lamacie, MD, Toronto, ON (*Presenter*) Nothing to Disclose Dinesh Thavendiranathan, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Kate Hanneman, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Marie-Pierre Jolly, Princeton, NJ (*Abstract Co-Author*) Employee, Siemens AG Andreas Greiser, PhD, Erlangen, Germany (*Abstract Co-Author*) Employee, Siemens AG Elsie Nguyen, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose Richard Ward, MSc, MRCP, Toronto, ON (*Abstract Co-Author*) Grant, Novartis AG Grant, Apotex, Inc Bernd J. Wintersperger, MD, Toronto, ON (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Research support, Siemens AG

PURPOSE

The aim of this study is to assess deformable registration algorithms using cine SSFP data for analysis of myocardial strain in comparison to cine SSFP feature tracking (FT) and speckle-tracking echocardiography (STE)

METHOD AND MATERIALS

In this prospective study, 28 patients with thalassemia major and 10 healthy volunteers underwent cardiac MRI at 1.5T (Avanto fit, Siemens, Germany). LV peak systolic global longitudinal (GLS) based on 3 long axis SSFP cine images was measured using MR feature tracking (2D Cardiac Performance Analysis MR, Tomtec, Germany) and a prototype automatic contouring tool with integrated inverse deformable registration analysis (DRA) (TrufiStrain, Siemens CT, Princeton, US) based on material coordinates assessment (Lagrangian strain). Repeated analysis was performed for both MR approaches to assess for measurement variability. 2D speckle-tracking echocardiography (STE) (EchoPAC, GE, UK) was performed within 2h of the MR examination.

RESULTS

STE based longitudinal strain analysis was feasible in 89% of subjects while both MR approaches successfully analyzed all data sets (100%). GLS measured by FT (-23.2 \pm 3.9%; P<0.0001) and DRA (-16.0 \pm 1.7%; P<0.0001) was significantly different from STE (-19.9 \pm 1.6%). While GLS data based on FT analysis did not significantly correlate to STE (r=0.09; P=0.61) DRA derived GLS showed significant correlation (r=0.34; P=0.049). DRA demonstrated significantly lower intra-observer variability in comparison to FT analysis (COV (%): 1.63 vs. 6.22, F=14.43, p<0.001) with also low inter-observer variability (COV 3.179%). Assessment of ICC also demonstrates superiority in repeated measurements (intra-observer agreement) for DRA (0.9903; 95% CI: 0.9815 to 0.9950) as compared to FT analysis 0.9659 (95% CI: 0.8479 to 0.9874).

CONCLUSION

Deformable registration based analysis of cine SSFP data is a novel semi-automated method that allows assessment of longitudinal deformation with superior reproducibility in comparison to MR feature tracking approach. Although DRA derived GLS values differed from those obtained by STE and FT MR methods, the values were still within the published normal values.

CLINICAL RELEVANCE/APPLICATION

Strain analysis is an important measure of regional ventricular function and subclinical myocardial dysfunction. Automated, accurate and reproducible assessment of strain using standard Cine SSFP data can promote routine use in clinical practice.

SSA03-04 Feature Tracking Cardiac MRI Reveals Abnormalities in Ventricular Function in Patients with Bicuspid Aortic Valve and Normal Ejection Fraction

Sunday, Nov. 29 11:15AM - 11:25AM Location: S504AB

Participants

Nicholas S. Burris, MD, San Francisco, CA (*Presenter*) Nothing to Disclose Karen G. Ordovas, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose Michael D. Hope, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Prior echocardiographic studies of congenital bicuspid aortic valve (BAV) have found evidence of subclinical systolic and diastolic dysfunction. Patients with BAV commonly undergo cardiac magnetic resonance imaging (CMR) for evaluation of valvular function and aortic dimensions. Feature tracking CMR (FT-CMR) is a technique that allows for assessment of myocardial strain using standard 2D cine sequences. The purpose of this study was to investigate differences in myocardial strain between BAV patients with preserved ejection fraction and healthy controls using FT-CMR.

METHOD AND MATERIALS

Patients with isolated BAV and normal ejection fraction (EF), who had previously undergone CMR (n=36), were compared to an ageand sex-matched sample of healthy control subjects (n=10). FT-CMR strain analysis software (Circle Cardiovascular Imaging, Inc.) was used to measure LV mass, EF and 2D ventricular strain parameters. Comparison of means was performed with student's t-test assuming unequal variance.

RESULTS

Average age was 30.4 ± 10.7 for the BAV group and 29.4 ± 8.7 for healthy controls (p=0.8). Gender distribution was similar between groups (BAV: 47% F, Control: 50% F). The majority of BAV patients had mild or no valve dysfunction by echocardiography (stenosis: 64%, insufficiency: 72%). There was a trend towards higher global peak circumferential and radial strain in BAV patients compared to controls [(-19.8 ± 1.8 vs. -18.8 ± 1.2%, p=0.07) and (40.3 ± 6.4% vs. 36.8 ± 4.3, p=0.08) respectively], but these differences did not reach statistical significance. Compared to controls, myocardial mass index was higher in BAV patients (61.3 ± 13.5 vs. 46.1 ± 8.7 g/m2, p<0.001). Peak diastolic circumferential and radial strain rates were lower in BAV patients compared to controls [(0.83 ± 0.21 vs. 1.1 ± .21 s^-1, p=0.01) and (-2.0 ± 0.66 vs. -2.8 ± 0.50 s^-1, p=0.02) respectively]. Longitudinal strain and strain rate were not different between groups.

CONCLUSION

Feature-tracking CMR can identify abnormalities of left ventricular strain in a clinical cohort of BAV patients with normal EF. Differences in diastolic strain rate between BAV and control groups may indicate evidence of early diastolic dysfunction.

CLINICAL RELEVANCE/APPLICATION

Feature tracking cardiac MRI strain analysis may aid in identifying early diastolic dysfunction in congenital BAV patients undergoing cardiac MR evaluation.

SSA03-05 Is CMR Reproducible Enough for the Follow-up of RVEF? Comparison with Gated Blood Pool SPECT in Various Subgroups of Heart Disease

Sunday, Nov. 29 11:25AM - 11:35AM Location: S504AB

Participants

Laurent Dercle, MD, Villejuif, France (*Presenter*) Nothing to Disclose Thomas Giraudmaillet, MD, Toulouse, France (*Abstract Co-Author*) Nothing to Disclose Fatima-Zohra Mokrane, MD, Toulouse, France (*Abstract Co-Author*) Nothing to Disclose Charline Zadro, Toulouse, France (*Abstract Co-Author*) Nothing to Disclose Marie Agnes Marachet, Toulouse, France (*Abstract Co-Author*) Nothing to Disclose Herve P. Rousseau, MD, Toulouse, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The estimation of right ventricular ejection fraction (RVEF) is crucial in order to establish the diagnosis, the risk stratification, the prognosis, and the response to treatment in a wide range of heart disease. Cardiac Magnetic Resonance Imaging (CMR) is the reference-standard for the evaluation of RV volumes but the manual delineation of endocardial border leads to a significant operator-dependency. This report investigates if new MRI techniques are reproducible enough to be considered as the reference-standard for the follow-up of RVEF (in 12 subgroups of heart disease), in comparison with the most reproducible technique: gated blood pool single photon emission computed tomography (GBPS).

METHOD AND MATERIALS

94 CMR and 99 GBPS were measured by two physicians. GBPS was performed using 2 automatic algorithms: BP-SPECT and QBS and a semi-automatic algorithm: TOMPOOL. Relative Inter-Observer Variability (IOV) was defined as the absolute difference between the two calculated measurements normalized to their average and expressed as a percentage.

RESULTS

The overall IOV (%) was greater using semi-automatic GBPS procedure (TOMPOOL: 16±20%) than CMR (12±14%) or automatic

GBPS algorithm (QBS: $8\pm12\%$, BP-SPECT: $6\pm6\%$). The IOV of CMR challenged GBPS in 2 subgroups of heart disease treated arrhythmia ($6\pm5\%$) and hyperdynamic cardiomyopathy / cirrhosis ($4\pm3\%$). Overall, the factors that most influenced the IOV were right valve regurgitation ($20\pm18\%$; n=27), dilated cardiomyopathy ($20\pm20\%$; n=24), RVEF<45% ($20\pm18\%$; n=32), end-systolic diameter of the left ventricle>41mm ($17\pm19\%$; n=30) and left valve regurgitation ($17\pm20\%$; n=27).

CONCLUSION

The most reproducible procedure is automatic GBPS. Changes occurring during the follow-up should be interpreted cautiously on CMR (IOV: 12%) or semi-automatic GBPS (IOV: 16%). The parameters responsible for increased IOV on CMR are: valve regurgitation, altered ejection fraction and enlargement of the left ventricle. The reproducibility of CMR challenged GBPS in treated arrhythmia and hyperdynamic heart disease.

CLINICAL RELEVANCE/APPLICATION

The estimation of RVEF is crucial in a wide range of heart disease. A reproducible technique is necessary for an optimal follow-up of RV dysfunction.

SSA03-06 Left Ventricular Function Can Be Adequately Assessed Using Compressed Sensing Cine Imaging with High Spatial and Temporal Resolution

Sunday, Nov. 29 11:35AM - 11:45AM Location: S504AB

Participants

Juliane Schelhorn, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose Felix Nensa, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose Haemi P. Schemuth, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose Stefan Maderwald, PhD, MSc, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose Marcel Gratz, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose Kai Nassenstein, Essen, Germany (*Presenter*) Nothing to Disclose Michael Zenge, PhD, Erlangen, Germany (*Abstract Co-Author*) Employee, Siemens AG Harald H. Quick, PhD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose Thomas W. Schlosser, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Cardiac magnetic resonance cine imaging currently bases on time consuming cine SSFP sequences with limited spatial and temporal resolution. Here we assessed whether two compressed sensing cine sequences with high spatial or high temporal resolution can reliably quantify left ventricular volumes and mass.

RESULTS

Small differences were observed between standard SSFP and sparse 1 for end-diastolic volume (EDV, median difference 4ml, p=0.044), stroke volume (SV, mean difference, 7±10ml, p=0.013), ejection fraction (EF, 1%, p=0.029), and myocardial mass (-8±7g, p<0.001), but no significant difference was found for end-systolic volume (ESV, p=0.135). No significant differences were observed between standard SSFP and sparse 2 regarding EDV (-1±5ml, p= 0.528), ESV (-3±5ml, p=0.058), SV (2±5ml, p=0.139), and EF (1±3%, p=0.105), except for myocardial mass (-6±8g, p=0.017). Intraclass correlation coefficients comparing standard SSFP with both sparse sequences were at least 0.95. Bland-Altman analysis and Passing-Bablock regression showed good agreement between all sequences. Intraobserver agreement was good to excellent (kappa: 0.76-0.90).

CONCLUSION

Compressed sensing cine sequences with improved spatial or temporal resolution enable reliable assessment of LV volumes and mass.

CLINICAL RELEVANCE/APPLICATION

Compressed sensing cine imaging allows an adequate assessment of the left ventricular function and an improved spatial and temporal resolution.

SSA03-07 CMR-derived TAPSE Is a Useful Marker for Detection of RV Function Changes in Patients with Chronic Thromboembolic Pulmonary Hypertension

Sunday, Nov. 29 11:45AM - 11:55AM Location: S504AB

Participants

Xiaojuan Guo, PhD, Beijing, China (*Presenter*) Nothing to Disclose Min Liu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Zhanhong Ma, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Tao Jiang, Bei Jing, China (*Abstract Co-Author*) Nothing to Disclose Shuang Wang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose Tianjing Zhang, Beijing, China (*Abstract Co-Author*) Employee, Siemens AG

PURPOSE

The aim of this study is to determine whether CMR-derived right ventricular fractional shortening (RVFS), tricuspid annular plane systolic excursion with a reference point within the right ventricular apex (TAPSEin) and with one outside the ventricle (TAPSEout) : (1) can predict pulmonary hypertension ,(2)correlates with pulmonary vascular resistance index (PVR) and main pulmonary artery flow in patients with CTEPH.

METHOD AND MATERIALS

37 patients (age, 50.1 ± 11.7 years; male,22) with chronic thromboembolic pulmonary hypertension (CTEPH) and 15 healthy subjects (age,47.4 \pm 13.6 years; male, 9) underwent CMR imaging at 3T. The four-chamber Cine images were acquired to get the distance between the cutting edge of the tricuspid annulus with the RV free wall and the RV apex or a reference point outside the RV apex in end-diastole (end-diastolic length (EDL)in or EDLout) and end-systole (end systolic length (ESL)in or ESLout). All patients underwent right heart catheterization to get PVR.The parameters between different group were compared by an

independent t- test. The ROC curve analysis was used to evaluate the diagnosis value of TAPSE derived by CMRI. TAPSE obtained by CMRI were correlated with PVR and MPA mean velocity by Spearman or Pearson correlation analysis.

RESULTS

TAPSEout (t=5.69, p<0.001), TAPSEin (t=5.83, p<0.001) and RVFS (t=6.05, p<0.001) revealed a significant difference between patients with CTEPH and the healthy group .ROC curve analysis showed that TAPSEout had a high predictive value for CTEPH (Auc=0.92 for TAPSEout, 0.89 for TAPSEin ,0.88 for RVFS, p<0.01). The diagnostic threshold for TAPSEout was15.7mm for CTEPH patients. In patients with CTEPH, PVR showed a significant but weak correlation with TAPSEout (r=-0.31, p=0.04) and no correlation with TAPSEin (r=- 0.09, p=0.61) and RVFS (r=-0.08, p=0.64). There was a moderate correlation between MPA mean velocity and TAPSEout (r=-0.54, p<0.03) and no correlation with TAPSEin (r=-0.13, p=0.62) and RVFS (r=0.-0.06, p=0.83).

CONCLUSION

CMR-derived TAPSEout is a useful marker to predict CTEPH. TAPSEout shows a good correlation with PVR and MPA mean velocity in CTEPH patients. TAPSEout might be a potential indicator for detection of RV function changes.

CLINICAL RELEVANCE/APPLICATION

CMR -determined TAPSE measurement is a quick screening method to identify patients with potential RV dysfunction and to select patients in whom a more detailed analysis would be used.

SSA03-08 Body Mass Index-Based Reduction of Radiation Exposure in Coronary CT Angiography Using a 3rd Generation Dual-Source CT Scanner

Sunday, Nov. 29 11:55AM - 12:05PM Location: S504AB

Participants

Stefanie Mangold, MD, Charleston, SC (*Presenter*) Nothing to Disclose
Carlo N. De Cecco, MD, PhD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Julian L. Wichmann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Maxwell Stroebel, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Christian Canstein, Charleston, SC (*Abstract Co-Author*) Employee, Siemens AG
U. Joseph Schoepf, MD, Charleston, SC (*Abstract Co-Author*) Research Grant, Bracco Group; Research Grant, Bayer AG; Research Grant, General Electric Company; Research Grant, Siemens AG; Research support, Bayer AG; ;
Giuseppe Muscogiuri, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group
Speakers Bureau, Bayer AG
Akos Varga-Szemes, MD, PhD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively investigate the potential of further dose reduction at coronary computed tomography angiography (CCTA) based on body mass index (BMI) using a 3rd generation dual-source CT (DSCT) scanner and automated tube voltage selection.

METHOD AND MATERIALS

We evaluated 231 patients who underwent CCTA with a 3rd-generation DSCT. Prospectively ECG-triggered adaptive sequential acquisition at 70, 80, 90, 100 and 120kV (pulsing window 30-90%, full dose at 70% of the cardiac cycle) was performed with automated attenuation-based selection of tube current and voltage and advanced modeled iterative reconstruction. Patients were divided in three classes: 1, 70-80kV (n=44); 2, 90-100kV (n=59) and 3, 120kV (n=118). BMI and effective dose (ED) was recorded. Vascular attenuation in proximal and distal coronary arteries was measured. Contrast-to-noise ratio (CNR) was calculated. To subjectively evaluate vessel enhancement and image noise five-point scales were used.

RESULTS

Image quality was diagnostic in 98.7% of the examinations. BMI between the groups was significantly different with 24.2kg/m2 in group 1, 27.5kg/m2 in group 2 and 34.3kg/m2 in group 3 (p=.0006 and p<.0001, respectively). Proximal and distal CNR was significantly lower in group 1 compared to group 2 (14.5vs16.8 and 11.4vs14.0,p=.049 and .007) and in group 3 compared to group 2 (13.6 and 10.9;p=.002 and .0001). However, no significant differences between the groups were shown by subjective image quality analysis (p>.05). Intragroup comparison in group 1 and 2 revealed no significant differences regarding the BMI and objective image quality parameters between 70 and 80kV (mean BMI: 24.0±3.0vs25.1±3.4kg/m2,p=.370; mean proximal CNR: 15.0vs14.1,p=.492) and between 90 and 100kV (mean BMI: 27.7±4.6vs27.2±4.3kg/m2,p=.717; mean proximal CNR: 16.1vs17.5,p=.429). However, ED was significantly lower for 70kV in comparison to 80kV (1.7±1.4vs2.7±1.5mSv,p=.001) as well as for 90kV compared to 100kV (5.0±3.4vs6.5±3.3mSv,p=.011). Mean ED at 120kV was 11.2±4.4mSv.

CONCLUSION

For CCTA with 3rd generation DSCT automated tube voltage selection is effective in reducing the ED according to patient size.

CLINICAL RELEVANCE/APPLICATION

Automated tube voltage selection can be used to achieve significant reduction of radiation dose in CCTA in patients with a wide range of body types.

SSA03-09 The Impact of Dipper Status in Hypertension on Cardiac Structure, Global Function and Regional Myocardial Strain: Insights from Cardiac Magnetic Resonance (CMR)

Sunday, Nov. 29 12:05PM - 12:15PM Location: S504AB

Participants

Jonathan C. Rodrigues, MRCP, FRCR, Bristol, United Kingdom (*Presenter*) Nothing to Disclose Antonio M. Amadu, MD, Sassari, Italy (*Abstract Co-Author*) Nothing to Disclose Amardeep Ghosh Dastidar, MBChB, MRCP, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Stephen M. Lyen, FRCR, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Amy Burchell, MBBCh, MRCP, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Laura Ratcliffe, MBBS, MRCP, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Emma Hart, BSC, PhD, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Mark Hamilton, MRCP, FRCR, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Chiara Bucciarelli Ducci, MD, PhD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Julian Paton, BSC, PhD, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Angus Nightingale, MBBCHIR, MD, Bristol, United Kingdom (*Abstract Co-Author*) Nothing to Disclose Nathan Manghat, FRCR, MD, Plymouth, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The loss of normal nocturnal dip in blood pressure in hypertension has adverse prognostic implications. We investigated the impact of dipper status on cardiac structure and function using cardiac magnetic resonance (CMR).

METHOD AND MATERIALS

24 hour ambulatory blood pressure monitoring (ABPM) and comprehensive CMR including late gadolinium enhancement (LGE) for myocardial scar assessment (1.5T Avanto, Siemens) were performed in 72 hypertensive patients referred from our tertiary hypertension clinic. Dipper status (n=33) was defined as >10% drop and non-dipper (n=39) as 0-10% drop in nocturnal systolic BP (SBP) versus diurnal SBP. Left ventricular mass (LVM) and volumes indexed to body surface area. Regional myocardial strain was estimated from the global mid LV from a 3D model generated from 4-chamber, 2-chamber and short axis cines (cvi42, Circle Cardiovascular Solutions Inc.). Fishers exact or unpaired student T tests were used as appropriate.

RESULTS

The results are show in Table 1. Non-dippers were significantly older than dippers ($54\pm14 \text{ vs } 46\pm15 \text{ years } p<0.05$). There was no difference in overall SBP and DBP between dippers and non-dippers but the latter had significantly higher nocturnal SBP ($152\pm23 \text{ vs } 129\pm13 \text{ mmHg } p<0.001$) and DBP ($82\pm14 \text{ vs } 76\pm12 \text{ mmHg } p<0.05$). There were non-significant trends towards higher indexed LVM ($90\pm25 \text{ vs } 84\pm18g/m2$) and prevalence of subendocardial LGE suggesting previous subclinical myocardial infarction (11% vs 3%) in non-dippers compared to dippers. Time to peak longitudinal strain was significantly higher in non-dippers compared to dippers ($346\pm68 \text{ vs } 316\pm54\text{ ms } p<0.05$) despite no significant difference in BP. A similar trend was observed for time to peak radial strain ($332\pm68 \text{ vs } 306\pm68\text{ ms } p=0.07$).

CONCLUSION

Significantly higher nocturnal SBP and DBP occur in non-dippers versus dippers. Trends towards increased indexed LVM, prevalence of subendocardial MI and prolonged time to peak strain. The latter suggests increased peripheral vascular resistance in non-dippers. These findings may help explain the adverse cardiovascular risk conferred by non-dipper status.

CLINICAL RELEVANCE/APPLICATION

CMR provides insights into different structural and function differences in non-dippers versus dippers and has potential to aid risk stratification in patients with hypertension.

СТ

NM

ISP: Nuclear Medicine (PET/CT for Oncology)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S505AB

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

FDA Discussions may include off-label uses.

Participants

Andrew Quon, MD, Los Angeles, CA (*Moderator*) Nothing to Disclose Johannes Czernin, MD, Los Angeles, CA (*Moderator*) Stockholder, Sofie Biosciences; Founder, Sofie Biosciences; Stockholder, Momentum Biosciences LLC; Founder, Momentum Biosciences LLC; Stockholder, Triangle Pharmaceutics; Founder, Triangle Pharmaceutics; ;

Sub-Events

SSA15-01 Nuclear Medicine Keynote Speaker: Targeting PSMA for Imaging Cancer

Sunday, Nov. 29 10:45AM - 11:05AM Location: S505AB

Participants

Martin G. Pomper, MD, PhD, Baltimore, MD (*Presenter*) Shareholder, CTS, Inc; Board Member, CTS, Inc; Research Grant, CTS, Inc; Advisor, CTS, Inc; Institutional license agreement, Progenics Pharmaceuticals, Inc

SSA15-03 Next Generation Digital PET/CT: A Phase I Intra-Individual Comparison with Current Photomultiplier TOF PET/CT

Sunday, Nov. 29 11:05AM - 11:15AM Location: S505AB

Participants

Michael V. Knopp, MD, PhD, Columbus, OH (*Presenter*) Nothing to Disclose Katherine Binzel, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose Philip Bardos, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose Michelle I. Knopp, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose Chadwick L. Wright, MD, PhD, Lewis Center, OH (*Abstract Co-Author*) Nothing to Disclose Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose Veena A. Nagar, MD, Dublin, OH (*Abstract Co-Author*) Nothing to Disclose Nathan C. Hall, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose Piotr J. Maniawski, MSc, Cleveland, OH (*Abstract Co-Author*) Employee, Koninklijke Philips NV

PURPOSE

To objectively assess the oncologic imaging characteristics of a next generation solid state digital PET detector system compared to current state of the art photomultiplier based time of flight PET/CT imaging.

METHOD AND MATERIALS

A next generation, solid state, digital PET/CT system (Vereos 64 TF, Philips Healthcare) operated in pre-factory release was used to compare image characteristics in 25 clinical care patients to current photomultiplier detector based time of flight PET/CT. The order of imaging (placement on the system) was randomized with the SOC imaging at 75 min and investigational at 55 and 95 min p.i. Image characteristics were assessed by blinded readers (3) using a scoring system and blinded quantitative ROI analysis

RESULTS

All matched exams were rated evaluable with decay corrected higher count intensity on all digital PET images. Image quality and detection ability was consistently rated significantly higher (p<.01) on the digital PET images. Comparing different reconstruction approaches, 2mm whole body, PSF with Gaussian filtering achieved the highest image quality score. Confidence of lesion detectability was rated significantly higher on the digital PET when evaluating lesions of <15 mm. While larger lesions and soft tissue presented equivalent SUV readouts at ROI analysis, smaller (<15 mm) and metabolic active lesions revealed substantially higher SUV values suggestive that also in vivo the improved recovery coefficent will lead to more correct, precise metabolic activity readouts. Tracer dose simulations indicate that no impact on quality and detectability was found while reducing the count equivalency from 13 mCi FDG to 6mCi.

CONCLUSION

The digital PET system demonstrated higher count sensitivity, improved spatial and contrast resolution that led to better lesion detection and improved quantification especially of small, metabolic active lesions. This Phase I trial suggests, that the next generation PET detection technology has the opportunity to substantially advance the visual and quantitative quality, accuracy and measurement reproduciblity for clinical PET imaging. Furthermore, substantially reduced tracer dose appear feasible in clinical PET.

CLINICAL RELEVANCE/APPLICATION

This presentation introduces the clinical capabilities of the next generation digital detector PET/CT technology for oncologic PET imaging and present initial clinical findings on improved lesion visualization, detection and quantification.

SSA15-04 Staging of Patients with Advanced Melanoma - CT or PET/CT? Impact of Imaging on Decision Making and Survival Analysis of Patients with Stage III and IV Melanoma

Participants Christina Pfannenberg, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose Susann-Cathrin Schuele, Tuebingen, Germany (*Abstract Co-Author*) Research Grant, Siemens AG Thomas Eigentler, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose Christian la Fougere, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG Claus Garbe, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the therapy management based on CT alone vs. 18F-FDG-PET/CT in patients with metastatic stage III/IV melanoma and to evaluate the 5-year long term survival

METHOD AND MATERIALS

Patient-related re-assessment of CT and 18F-FDG-PET/CT scans of 64 patients with advanced melanoma, primarily evaluated by a lesion-based analysis at our institution. The study cohort included 52 primary and 12 restaging examinations. For each patient it was defined if PET/CT caused a change in therapy in comparison to the decisions based on CT alone. Therapy modifications ranged from "major" (e.g. surgery instead of systemic therapy) to "minor" (e.g. change in systemic therapy). Patient outcome was evaluated by calculation of the 5-year survival rates according to Kaplan-Meier.

RESULTS

PET/CT resulted in a change of therapy in 54% of patients of the entire group including "major" changes in 45%. The highest number of PET/CT-induced therapy shifts occurred in the primary staging group with 52% major changes. The corresponding data for the restaging group were 33% therapy changes (4/12 patients), thereof 2 patients with a major shift. In 16 patients already planned for metastasectomy based on CT alone PET/CT CT excluded metastases in 13 patients and revealed further metastases in 3 patients making an operation futile. The 5-year survival rate of the entire cohort was 30%, with an increase to 34% in the primary staging and a decline to 17% in the surveillance group. Comparing overall survival of patients in which metastases could be excluded by PET/CT or in which metastases could be completely removed (n=43) with those patients not eligible for surgery (n=21), a significant overall survival benefit for the first group could be revealed (40.5 % vs. 10.0; p=0.000185).

CONCLUSION

FDG-PET/CT affects surgical decision making in patients with metastatic melanoma mainly by the proper selection of patients for a complete metastasectomy, which is associated with increased long time survival.

CLINICAL RELEVANCE/APPLICATION

FDG-PET/CT significantly influences therapeutic management in patients with advanced melanoma, thereby increasing the long-time survival of this patient group.

SSA15-05 Comparison of Pulmonary Nodule Detection in Lung Cancer Patients Using Whole Body FDG PET/CT, High Resolution Lung Reformat of FDG PET/CT, or Diagnostic Breath Hold Chest CT

Sunday, Nov. 29 11:25AM - 11:35AM Location: S505AB

Participants

Robert R. Flavell, MD, PhD, San Francisco, CA (Presenter) Nothing to Disclose

Spencer C. Behr, MD, Burlingame, CA (Abstract Co-Author) Research Grant, General Electric Company; Consultant, General Electric Company

Marc C. Mabray, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose

Miguel Hernandez Pampaloni, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose

David M. Naeger, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose

PURPOSE

Previous reports have documented that pulmonary nodules can be missed on the non-breath hold CT portion of FDG PET/CTs. We evaluated the image quality and rate of pulmonary nodule detection of whole body PET/CT (WB PET/CT), high-resolution sharp lung reconstruction of PET/CT (HR PET/CT), and diagnostic breath hold chest CT (BH CT).

METHOD AND MATERIALS

A cohort of 25 patients was identified who had a history of lung cancer as well as a PET/CT staging or re-staging scan and a diagnostic chest CT within 15 days of each other. Per our standard protocol, all PET/CTs included a high resolution lung reformat with sharp reconstruction filter and 2 mm slice thickness. WB PET/CT, HR PET/CT, and BH CT were reviewed by 3 radiologists, and the number and size of pulmonary nodules detected were recorded, as was a subjective assessment of image quality. Statistical significance of differences between reader and modality groups was analyzed by two-way repeated measures ANOVA.

RESULTS

On average, 2.84 nodules were found per patient with WB PET/CT, 3.93 nodules with HR PET/CT, and 3.91 nodules with BH CT. When only nodules less than or equal to 8 mm in size were considered, BH CT (2.86) and HR PET/CT (2.95) revealed more nodules per patient than WB PET/CT (1.99). While statistically significantly more nodules and nodules less than 8 mm were detected by HR PET/CT and BH CT than WB PET/CT (p<0.001) no difference was noted between the two higher resolution modalities. Comparisons of image quality revealed reader preference for BH CT over HR PET/CT (p = 0.01), and HR PET/CT over WB PET/CT (p<0.001).

CONCLUSION

More pulmonary nodules are detected using HR PET/CT reformats than the standard WB PET/CT images, and overall image quality was rated as higher. The ability to detect nodules was indistinguishable from dedicated BH CTs. These data suggest that use of high-resolution reformats of PET/CT images of the lungs increases sensitivity for pulmonary nodule detection, approaching that of dedicated Chest CT.

CLINICAL RELEVANCE/APPLICATION

Routine application of a high-resolution lung reformat to PET/CT images may increase the rate of pulmonary nodule detection to rates comparable to routine chest CT.

SSA15-06 Value of FDG PET/CT for Systemic Staging of Newly Diagnosed Invasive Lobular Breast Cancer (ILC) as Compared with Invasive Ductal Breast Cancer (IDC)

Sunday, Nov. 29 11:35AM - 11:45AM Location: S505AB

Participants

Molly P. Hogan, MD, New York, NY (*Presenter*) Nothing to Disclose Brittany Dashevsky, MD, DPhil, New York, NY (*Abstract Co-Author*) Nothing to Disclose Maxine S. Jochelson, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Monica Morrow, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Debra A. Goldman, MS, New York, NY (*Abstract Co-Author*) Nothing to Disclose Mithat Gonen, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Clifford Hudis, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose Gary A. Ulaner, MD, PhD, New York, NY (*Abstract Co-Author*) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd

PURPOSE

While NCCN guidelines consider FDG PET/CT for systemic staging of newly diagnosed stage III breast cancer patients, factors in addition to stage may influence PET/CT utility. For example, primary ILC demonstrates lower conspicuity on FDG PET than the more common IDC. We evaluated utility of PET/CT systemic staging of newly diagnosed patients with ILC as compared to IDC.

METHOD AND MATERIALS

A retrospective study was performed under IRB waiver. Our Hospital Information System was screened for ILC patients who underwent PET/CT 2006-2013 prior to systemic or radiation therapy. Initial stage was determined from records of physical exam, mammography, ultrasound, MRI and/or surgery. PET/CT was evaluated to identify unsuspected distant metastases. A cohort of patients with stage III IDC was evaluated for comparison. Upstaging rates were compared using chi square test and the relative risk with 95% CI was calculated.

RESULTS

146 ILC patients fulfilled inclusion criteria. PET/CT revealed unsuspected distant metastases in 12 patients (8%): 0 of 8 initial stage I, 2 of 50 (4%) stage II, and 10 of 88 (11%) stage III. All patients upstaged to IV were confirmed by pathology. 3 of the 12 upstaged patients were upstaged only by the CT component of the PET/CT, as metastases were non-FDG-avid. In the comparison stage III IDC cohort, 22% (20 of 89) of patients were upstaged to IV by PET/CT. All 20 demonstrated FDG avid metastases. The relative risk of PET/CT revealing unsuspected distant metastases in stage III IDC patients (p=.049). For FDG-avid metastases, the relative risk of PET/CT revealing unsuspected FDG-avid distant metastases in stage III IDC patients (p=.007).

CONCLUSION

FDG PET/CT is more likely to reveal unsuspected distant metastases in stage III IDC patients than in stage III ILC patients. In addition, some ILC patients were upstaged only by the CT component of PET/CT, as the metastases detected on CT were not FDG-avid. As PET/CT may have lower impact on systemic staging of ILC patients, ILC patients should not be pooled with IDC patients when exploring the utility of PET/CT.

CLINICAL RELEVANCE/APPLICATION

NCCN guidelines and planned studies may need to consider histologic subtype of breast cancer. FDG PET/CT may have less impact on systemic staging of newly diagnosed ILC than IDC.

SSA15-07 FDG PET/CT and Recurrent Colorectal Cancer Patient Survival: FDG Avidity and Tumor Burden

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Sunday, Nov. 29 11:45AM - 11:55AM Location: S505AB
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Participants

Wael M. Marashdeh, MBBS, MD, Baltimore, MD (*Presenter*) Nothing to Disclose Charles Marcus, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Mehdi Taghipour, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Se Jin Ahn, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose Rathan M. Subramaniam, MD, PhD, Baltimore, MD (*Abstract Co-Author*) Travel support, Koninklijke Philips NV

PURPOSE

The aim of the study was to assess the value of quantitative PET parameters in the prediction of survival in recurrent colorectal cancer patients.

METHOD AND MATERIALS

This was a retrospective study of 126 patients with biopsy proven colorectal cancer recurrence from 2000 to 2012. Maximum and peak standardized uptake values (SUVmax, SUVpeak), metabolic tumor volume (MTV) and total lesion glycolysis (TLG) were measured for each biopsy confirmed recurrent lesion using gradient segmentation method. The median follow up period was 32.1 months. The primary outcome was overall survival (OS). Kaplan-Meier survival plots and Cox regression analyses were performed.

RESULTS

The mean \pm SD SUVmax, SUVpeak, total TLG and total MTV of the study population were 7.1 \pm 4.3, 5.3 \pm 3.2, 378.3 \pm 917.1g and 234.2 \pm 420.8mL, respectively. Multivariate cox regression analysis showed total TLG (p=0.001) and total MTV (p=0.001) were associated with OS. Kaplan-Meier survival analysis was performed and SUVmax (threshold=5.9, HR=2.5; 95%CI:1.4-4.2; p<0.0001), SUVpeak (threshold=4.31, HR=2.1; 95%CI:1.2-3.5; p=0.005), total TLG (threshold=137.1g, HR=2.9; 95%CI:1.7-4.8; p<0.0001) and

total MTV(threshold=32.17mL, HR=2.5; 95%CI:1.5-4.2; p<0.0001) were significant predictors of survival during follow-up. An integrated risk stratification model using SUVmax and total MTV to stratify patients into three subgroups predicted patient survival outcomes (HR=2.1, 95% CI:1.5-2.9; log-rank p<0.0001).

CONCLUSION

FDG PET SUVmax, SUVpeak, TLGtotal, MTVtotal and an integrated risk stratification with FDG avidity and tumor burden provide significant prognostic information in patients with biopsy proven recurrent colorectal cancer.

CLINICAL RELEVANCE/APPLICATION

FDG PET/CT in recurrent colorectal cancer can help stratify patients in different groups for which different treatment stratigies can be applied.

SSA15-08 Association between Prognosis and FDG-PET Parameters, ADC of MRI and Oncogene Expression in Pancreas Cancer

Sunday, Nov. 29 11:55AM - 12:05PM Location: S505AB

Participants

Shigeki Nagamachi, MD, PhD, Miyazaki, Japan (*Presenter*) Nothing to Disclose Ryuichi Nishii, MD, PhD, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose Youichi Mizutani, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose Nobuhiro Shibata, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose Jiro Ohuchida, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose Kazuhiro Kondo, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose Toshinori Hirai, MD, PhD, Miyazaki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The study was done to determine the significant prognostic factor among FDG-PET parameters, apparent diffusion coefficients (ADC) of MRI and various oncogenes expression in pancreas cancer.

METHOD AND MATERIALS

Sixty-five pancreas invasive ductal cancer patients those underwent F-18 FDG PET/CT and subsequent surgical resection were evaluated. The maximum standardized uptake value (SUVmax), the peak of standardized uptake value (SUVpeak), metabolic tumor volume (MTV), and total lesion glycolysis (TLG) were calculated on 18F-FDG PET/CT in both early (1hr) and delayed (2hr) examinations. The threshold value for calculating MTV was 40% of SUVmax. In addition, apparent diffusion coefficient (ADCmean and ADCmin) of MRI, various oncogenes expressions including EGFR, VEGFA, Ki-67, HIF-1, KRAS, BRAF, CDH13 were evaluated. Among various clinical parameters including imaging parameters, independent significant prognostic factors for overall survival (OS) were determined by multivariate analysis with Cox proportional hazards model. Among various significant prognostic parameters, univariate analysis with mantel-cox test was done for comparing OS.

RESULTS

The pathologic T (pT) stage, TLG on early PET image, SUV max on delayed images and ADCmean was significant prognostic factor for OS (<0.05). Regarding gene expressions, only KRAS was significant predictive factors (P <0.05). In univariate analysis, patients of larger TLG (>=55) showed higher cumulative survival rate compared with that of smaller TLG group (<55). Similarly, lower ADCmean (<1300) showed shorter OS than that of higher ADCmean (>=1300).

CONCLUSION

Both FDG parameters (TLG on early PET image, SUV max on delayed images) and ADCmean were significant parameters for predicting OS, in addition to pT stage and KRAS expression. Thus, both 18F-FDG PET/CT and MRI diffusion images can provide useful prognostic information for patients undergoing resection of pancreatic cancer.

CLINICAL RELEVANCE/APPLICATION

In the prediction of prognosis of invasive ductal pancreas cancer after surgical operation, TLG of FDG-PET and ADCmean of MRI were useful imaging parameters.

SSA15-09 Body Weight-based Protocols during Whole Body FDG PET/CT Significantly Reduces Radiation Dose without Compromising Image Quality

Sunday, Nov. 29 12:05PM - 12:15PM Location: S505AB

Participants

Charbel Saade, PhD, Beirut, Lebanon (*Presenter*) Nothing to Disclose Mohamad B. Haidar, MD, Beirut, Lebanon (*Abstract Co-Author*) Nothing to Disclose Ahmad Ammous, Beirut, Lebanon (*Abstract Co-Author*) Nothing to Disclose Mukbil H. Hourani, MD, Beirut, Lebanon (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate radiation dose reduction during head to mid thigh fluorodeoxyglucose (FDG) positron emission tomographic (PET)/computed tomography by employing weight based protocols.

METHOD AND MATERIALS

520 consecutive patients were referred for FDG PET/CT study using a 16-detector PET/CT. Patients were allocated to one of two scanning protocols: Group A, the conventional protocol; 120 kVp, 120 mAs, 0.5 sec rotation time, pitch 0.8mm/rot across all body weights; Group B, employed a 4 tier body weight protocol: protocol A: \leq 60 kg: 140 kVp, 35 mAs, 0.75 sec rotation time, pitch 0.8mm/rot; group B: 60 - 80 kg: 140 kVp, 50 mAs, 0.75 sec rotation time, pitch 0.8mm/rot; group C: 80 - 100 kg: 140 kVp, 65 mAs, 0.75 sec rotation time, pitch 0.8mm/rot; group D: > 100 kg: 140 kVp, 100 mAs, 0.75 sec rotation time, pitch 0.8mm/rot all protocols employed tube current modulation. Patient demographics were measured. Age and sex-specific lifetime attributable risk

(LAR) of individual cancers were estimated using the approach of BEIR VII and summed to obtain whole body LAR.

RESULTS

mean patient demographics demonstrated no significant difference. Mean effective dose CTDIvol and DLP significantly reduced in protocol B (CTDIvol; 4.60 ± 1.49 , DLP; 823.35 ± 280.70 mSv) compared to A (CTDIvol; 7.36 ± 1.79 , DLP; 1260.96 ± 304.7 mSv) (p<0.0001). Mean FDG administration demonstrated no significant differences in each protocol (p=0.873). Contrast to noise ratio demonstrated no differences between each group (p<0.21). Mean LAR cancer risk was significantly reduced for females by 35% and males 125% in protocol B compared to A (p<0.04).

CONCLUSION

Significant reduction in radiation dose can be achieved using patient-specific body weight based protocols during whole-body FDG PET/CT without compromising image quality.

CLINICAL RELEVANCE/APPLICATION

FDG and PET/CT have revolutionized the practice of medicine. With the expanding use of PET/CT, ionizing radiation may eventually result in an increased incidence of cancer in the exposed population. This problem can be minimized by optimizing the CT protocol to achieve optimal image quality with the lowest possible radiation dose

Pediatric Series: Neuro

Sunday, Nov. 29 10:45AM - 12:15PM Location: S100AB

NR MR PD

AMA PRA Category 1 Credits ™: 3.25 ARRT Category A+ Credits: 4.00

Participants

Robert C. McKinstry III, MD, PhD, Saint Louis, MO (*Moderator*) Travel support, Siemens AG Speaker, Siemens AG Thierry Huisman, MD, Baltimore, MD (*Moderator*) Nothing to Disclose

Sub-Events

VSPD11-01 Malformations of Cortical Development

Sunday, Nov. 29 10:45AM - 11:05AM Location: S100AB

Participants

Robert C. McKinstry III, MD, PhD, Saint Louis, MO, (mckinstryb@mir.wustl.edu) (*Presenter*) Travel support, Siemens AG Speaker, Siemens AG

LEARNING OBJECTIVES

A radiologist attending this session will learn 1) The stages of cortical development. 2) The malformations associated with abnormal neuronal proliferation and/or apoptosis. 3) The malformations associated with abnormal neuronal migration. 4) Learn the malformations associated with abnormal postmigrational development

ABSTRACT

This presentation will review the stages of normal cerebral cortical development. Malformations of cortical development will be organized according to abnormal development at each stage: proliferation/apoptosis, migration, and postmigrational organization. Tubulinopathies (e.g., polymicrogyria) and defects in the mTOR pathway (e.g., Tuberous Sclerosis) will illustrate emerging knowledge tying genotype to endophenotype.

Active Handout:Robert C. McKinstry

http://abstract.rsna.org/uploads/2015/15002018/VSPD11-01.pdf

VSPD11-02 Comparison of Three Diffusion Models for Differentiating Low- and High-Grade Pediatric Brain Tumors

Sunday, Nov. 29 11:05AM - 11:15AM Location: S100AB

Participants

Muge Karaman, PhD, Chicago, IL (*Presenter*) Nothing to Disclose Yi Sui, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose He Wang, PhD, Shangai, China (*Abstract Co-Author*) Nothing to Disclose Frederick C. Damen, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose Yu Hua Li, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose Xiaohong J. Zhou, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the performance of monoexponential, biexponential, and continuous time random walk (CTRW) diffusion models for differentiating low-grade (LG) and high-grade (HG) pediatric brain tumors.

METHOD AND MATERIALS

With IRB approval, 54 children (4 months to 13 years old) with brain tumors were enrolled in the study and underwent MRI scans at 3T. The imaging protocol included pre-/post-contrast T1, T2, FLAIR, and diffusion-weighted imaging with 12 b -values (0 to 4000 s/mm2). The parameters of the mono-exponential (apparent diffusion coefficient, D), biexponential (fast and slow diffusion coefficients, Df and Ds ; fast diffusion fraction, f) and CTRW (diffusion coefficient, Dm; fractional powers of the waiting time and jump length, a and β) models were estimated from the diffusion data. Surgical biopsy or surgery was performed to determine the tumor grade histopathologically according to the WHO guidelines, resulting in 24 patients with LG and 30 with HG tumors. The mean values of all parameters over the tumor ROIs were compared between the two groups using a Mann-Whitney-Wilcoxon U-test. A k - means clustering algorithm was employed to differentiate LG and HG tumors based on the biexponential or CTRW parameters, followed by a comparison using histopathology as a reference.

RESULTS

Significant differences between the two tumor groups (LG vs. HG) were observed in the parameters of any of the three models with p-values < 0.001 (D : 0.90 ± 0.34 vs. 0.56 ± 0.17 in monoexponential; Df: 2.6 ± 1.1 vs. 1.8 ± 0.5 , Ds : 0.58 ± 0.1 vs. 0.31 ± 0.1 , f : 0.73 ± 0.11 vs. 0.59 ± 0.09 in biexponential; Dm : 1.5 ± 0.5 vs. 0.75 ± 0.2 , $a:0.95\pm0.04$ vs. 0.90 ± 0.03 , $\beta:0.92\pm0.07$ vs. 0.81 ± 0.06 in CTRW, with D 's in units of μ m2/ms). The combination of CTRW parameters produced better accuracy (85% vs. 79%), sensitivity (87% vs. 83%), and specificity (83% vs. 75%) than the combination of biexponential parameters for identifying tumor grades. Both models outperformed the monoexponential model in accuracy (75%) and specificity (54%).

CONCLUSION

The CTRW diffusion model performed the best in determining pediatric brain tumor malignancy when compared with the monoexponential and biexponential models.

The CTRW diffusion model can provide quantitative imaging markers to improve diagnosis of pediatric brain tumors.

VSPD11-03 Evaluation of Pediatric Intracranial Tumors with Intravoxel Incoherent Motion MR Imaging

Sunday, Nov. 29 11:15AM - 11:25AM Location: S100AB

Participants Kazufumi Kikuchi, MD, Fukuoka, Japan (*Presenter*) Nothing to Disclose Akio Hiwatashi, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Osamu Togao, MD, PhD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Koji Yamashita, MD, PhD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose Tomoyuki Okuaki, RT, Chuo-Ku, Japan (*Abstract Co-Author*) Employee, Koninklijke Philips NV Hiroshi Honda, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Intravoxel incoherent motion (IVIM) is a non-invasive MR imaging technique to measure microcirculation and diffusivity simultaneously. The purpose of this study was to evaluate the utility of perfusion fraction (f) and diffusion coefficient (D) derived from IVIM to characterize pediatric intracranial tumors.

METHOD AND MATERIALS

This retrospective study included 16 children (M: F = 9: 7; age range 2 month-19 year-old, median 5 year). There were 6 highgrade tumors (HGTs; 3 anaplastic ependymoma, 1 glioblastoma, 1 medulloblastoma, and 1 atypical teratoid/rhabdoid tumor), 9 lowgrade tumors (LGTs; 4 pilocytic astrocytoma, 2 craniopharyngioma, 1 diffuse astrocytoma, 1 choroid plexus papilloma, and 1 subependymoma) and 1 germinoma. IVIM imaging was obtained using single-shot SE-EPI sequence with 13 b-factors (0, 10, 20, 30, 50, 80, 100, 200, 300, 400, 600, 800, 1000 s/mm²). Other parameters of IVIM were as follows: TR/TE = 2500/70 ms, FA = 90, FOV = 230 x 230 mm², matrix = 128 x 126, slice thickness = 5 mm, slices = 11, average = 1. The signal equation: S = S0·[(1-f) exp(bD)+f exp(-BD*)] was fitted to obtain f pixel-by-pixel. The f and D were measured in the three hot spot regions-of-interest in a tumor in each map. Histopathologic vascular density was measured in three microscopic fields (x200) of the most intense vascularization on CD-31-immunostainted histopathologic specimens. Statistical analysis was performed with the Pearson correlation coefficient and receiver operating characteristic (ROC). A p value less than .05 was considered significant.

RESULTS

The f-value (4.2-27.1%) significantly correlated (r = 0.72, P = 0.0018) with vascular density (0.60-13.4%). The f of HGTs (19.1±4.6%) was significantly higher than LGTs (7.7±4.0%; P = 0.0047). The D of HGTs (0.93±0.34 x 10^-3/mm²) was significantly lower than LGTs (1.70±0.34 x 10^-3/mm²; P = 0.0032). ROC analysis showed high Az values with f (0.94) and D (0.96) without a statistically significant difference (P = 0.74).

CONCLUSION

The f-value derived from IVIM significantly correlated with vascular density of pediatric brain tumors. Both f and D parameters could discriminate HGTs from LGTs.

CLINICAL RELEVANCE/APPLICATION

Using IVIM, we could simultaneously evaluate flow and diffusivity in pediatric brain tumors. The f-value derived from IVIM significantly correlated with vascular density. Both f and D could discriminate HGTs from LGTs.

VSPD11-04 rADC and Location Differ between Posterior Fossa Pilocytic Astrocytomas with and without Gangliocytic Differentiation

Sunday, Nov. 29 11:25AM - 11:35AM Location: S100AB

Participants

Julie Harreld, MD, Memphis, TN (*Presenter*) Nothing to Disclose Scott N. Hwang, MD, PhD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose Ibrahim Qaddoumi, MD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose David W. Ellison, MD, PhD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Pediatric gangiogliomas (GG) are rare (\leq 4% of pediatric brain tumors), and only ~5% of gangliogliomas occur in the posterior fossa. A recently defined GG variant, histopathologically resembling pilocytic astrocytoma but with focal gangliocytic differentiation (PA-GG) that can be overlooked, can be mistaken for the common pilocytic astrocytoma (PA). We investigated whether MRI features could differentiate posterior fossa PA-G from PA.

METHOD AND MATERIALS

Pre-operative MRIs (and CTs where available) of 42 children (3mo-15 years, mean 7.11±3.8 years; 57% male; 8 PA-GG, 34 PA) were evaluated by two neuroradiologists blinded to pathologic diagnosis for tumor location and gross morphology; presence of hemorrhage or calcification; circumscription; degree of enhancement, edema, and %cyst/necrosis; and minimum rADC (compared to thalamus). Data for PA-GG and PA were compared.

RESULTS

Location differed significantly between PAs and PA-Gs (Pearson ChiSquare, p=0.0194); 16/34 PAs, but no PA-GGs, were centered in the cerebellar hemisphere. All PA-GGs predominantly involved midline structures (vermis, medulla, midbrain), compared to 13 of 34 PAs. Minimum rADC was significantly lower in PA-GGs (mean 0.95±0.21; 95%CI 0.73, 1.17) than in PAs (mean 2.01±0.38; 95%CI 1.86,2.16) (p<.0001). 24/34 PAs and 1/8 PA-GGs had "cyst+nodule" morphology, 7/34 PAs and 4/8 PA-GGs had evidence of hemorrhage, with no statistically significant difference between these or the remaining evaluated features.

CONCLUSION

Minimum rADC and location appear to differ significantly between posterior fossa PAs with or without gangliocytic differentiation.

CLINICAL RELEVANCE/APPLICATION

For differentiation between posterior fossa PAs with and without gangliocytic differentiation, location and minimum rADC may be a useful adjunct to histopathologic diagnosis, which is subject to sampling error.

VSPD11-05 Systematic Comparison of MR Imaging Findings in Pediatric Ependymoblastoma with Ependymoma and CNS-PNET NOS

Sunday, Nov. 29 11:35AM - 11:45AM Location: S100AB

Participants

Johannes Nowak, MD, Wurzburg, Germany (*Presenter*) Nothing to Disclose Carolin Seidel, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose Torsten Pietsch, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose Balint Alkonyi, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose Taylor Laura Fuss, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose Carsten Friedrich, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose Katja von Hoff, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose Stefan Rutkowski, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose Monika Warmuth-Metz, Wurzburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Ependymoblastoma (EBL), ependymoma (EP), and primitive neuroectodermal tumors of the central nervous system (CNS-PNET NOS = not otherwise specified) are pediatric brain tumors that can be differentiated by histopathology in the clinical setting. Recently, we first described specific MRI features of EBL. In this study, we compare standardized MRI characteristics of EBL with EP and CNS-PNET NOS in a series comprising of 22 patients in each group.

METHOD AND MATERIALS

We systematically analyzed the initial cranial MRI scans at diagnosis according to 25 standardized criteria, and paired comparison was performed for EBL and EP, as well as for EBL and CNS-PNET NOS. All 66 cases of this multi-center study were centrally reviewed regarding histopathology, MR imaging and multimodal therapy.

RESULTS

We found differences between EBL and EP regarding age at diagnosis, MR signal intensity, tumor margin and surrounding edema, presence and size of cysts, and contrast enhancement pattern. Although MRI appearance of EBL shares many features with CNS-PNET NOS, we revealed significant differences in terms of age at diagnosis, tumor volume and localization, tumor margins, edema, and contrast enhancement.

CONCLUSION

We systematically analyze and compare MRI characteristics of pediatric EBL with EP and CNS-PNET NOS in a series of 22 centrally reviewed cases of each group. A definite differentiation of these entities with MRI seems to be difficult; however, we identify particular imaging features that might help distinguishing these histologically distinct tumor types.

CLINICAL RELEVANCE/APPLICATION

This is the first study that systematically compares multiple parameters of MR imaging in pediatric EBL with findings in EP and CNS-PNET NOS. Since EBL is very rare, our data provides important information that might help differentiating EBL from other pediatric brain tumor entities in the clinical setting.

VSPD11-06 Quantitative Approach to the Posterior Cranial Fossa and Cranio-cervical Junction in Asymptomatic Children with Achondroplasia

Sunday, Nov. 29 11:45AM - 11:55AM Location: S100AB

Participants

Rosalinda Calandrelli, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Marco Panfili, MD, Rome, Italy (*Presenter*) Nothing to Disclose Gabriella D'Apolito, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Giuseppe M. Di Lella, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Cesare Colosimo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Achondroplasia, the best-known form of congenital dwarfism, is caused by a disturbance of endochondral bone formation. We proposed a MRI-based quantitative morpho-volumetric approach to the posterior cranial fossa and cranio-cervical junction to understand posterior cranial fossa changes responsible of ventriculomegaly and life-threatening medullary compression.

METHOD AND MATERIALS

We analyzed brain MRI of 12 children with a diagnosis of achondroplasia (mean age 39 + 16 months) and no surgical treatment. 3DFSPGR T1weighted images were used for1)evaluation of the posterior fossa synchondroses;2)volumetric analysis of the posterior fossa (posterior cranial fossa volume=PCFV, posterior cranial fossa brain volume=PCFBV, PCFV/PCFBV ratio, hemispheres'cerebellar volume=Ce.V, cerebellar vermis volume=Ve.V, brainstem volume, CSF spaces volume, IV ventricle volume);3)morphometric analysis of the posterior fossa (clivus, supraocciput, exocciput lengths, tonsillar hemiation, tentorial angle) and cranio-cervical junction (A-P and LL diameters of the foramen magnum);4)measurements of foramen magnum and jugular foramina areas;5) volumetric analysis of supratentorial ventricles.These patients were compared with age-matched control group.

RESULTS

All patients showed synostosis of spheno-occipital synchondroses while six patients showed synostosis of anterior and posterior

intra-occipital synchondroses, cervical myelopathy without swelling cord.Compared to control group, clivus and exocciput lengths, L-L and A-P diameters of the foramen magnum, foramen magnum area and jugular foramina area were significantly reduced; supraocciput length, tentorial angle, PCFV, PCFBV, CeV, Ve, brainstem volume and supratentorial ventricular system volume were significantly increased(p<0.05) while PCFV/PCFBV ratio, the subarachnoid spaces volume of the PCF and IV ventricle volume were not significant (p>0.05).

CONCLUSION

The quantitative approach to the posterior fossa and cranio-cervical junction modifications shows a complex relationship among the maldevelopment of the posterior cranial fossa, the foramen magnum stenosis, the development of ventriculomegaly and medullary compression.

CLINICAL RELEVANCE/APPLICATION

Posterior cranial fossa changes and foramen magnum stenosis should be evaluated together to the status of synchondroses in order to plan the prophylactic cervicomedullary decompression.

VSPD11-07 Congenital Spine Anomalies: Diagnosis and Classification

Sunday, Nov. 29 11:55AM - 12:15PM Location: S100AB

Participants

Erin S. Schwartz, MD, Philadelphia, PA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

Understand the embryologic derangements behind the more common congenital spinal anomalies encountered in clinical practice.
 Be able to apply a clinical-radiological classification to facilitate the interpretation of imaging studies of patients with spinal dysraphism.

ABSTRACT

Encouraging imaging studies on patients with congenital spinal anomalies can be intimidating for radiologists, particularly when pediatric imaging and/or neuroimaging are not a large part of your practice. A clinical-radiological classification system developed by Tortori-Donoti, et al (Neuroradiology, 2000), remains a valuable approach to correctly diagnosing these children, largely dividing entities into open or closed spinal dysraphism based on the absence or presence of overlying skin, respectively. Closed spinal dysraphism is further subdivided into those lesions that present with a subcutaneous mass versus does that do not. Lesions without a subcutaneous mass can be further subdivided into simple and complex, and may be associated with other cutaneous stigmata such as hemangioma, skin dimple, and/or focal hairy patch.

ISP: Radiation Oncology (Lung Cancer)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S104A

CH RO

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

Participants

Beatriz E. Amendola, MD, Coral Gables, FL (*Moderator*) Speakers Bureau, Varian Medical Systems, Inc Matthew M. Harkenrider, MD, Maywood, IL (*Moderator*) Nothing to Disclose

Sub-Events

SSA22-01 Radiation Oncology Keynote Speaker: Perspectives in Lung Cancer

Sunday, Nov. 29 10:45AM - 10:55AM Location: S104A

Participants

James S. Welsh, MD, MS, Batavia, IL (Presenter) Nothing to Disclose

SSA22-02 Squamous Cell Carcinoma (SCC) Increases the Risk for Local Recurrence in Non-Small Cell Lung Cancer (NSCLC) Treated with Stereotactic Body Radiation Therapy (SBRT)

Sunday, Nov. 29 10:55AM - 11:05AM Location: S104A

Participants

Rashmi K. Benda, MD, Boca Raton, FL (*Abstract Co-Author*) Nothing to Disclose Charles Shang, Boca Raton, FL (*Presenter*) Nothing to Disclose Shawna Watson, BS, Boca Raton, FL (*Abstract Co-Author*) Nothing to Disclose Timothy R. Williams, MD, Boca Raton, FL (*Abstract Co-Author*) Nothing to Disclose Michael E. Kasper, MD, Boca Raton, FL (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): SBRT has become one of the standard treatment modalities for early stage NSCLC. To reduce local recurrence, higher radiation doses have been proposed. These higher doses may result in potential increased toxicity. This study was designed to isolate possible risk factors predicting an increased risk of recurrence. Materials/Methods: From 184 primary lung SBRT cases treated between 2010 and 2012 at one institution, 6 known locally recurrent cases were identified positively with FDG-PET scans and/or pathology. 30 patients with a PET scan at least 24 months post SBRT were selected as the control group. All patients were planned using BrainlabTMand treatment delivered using five to seven 6MV photon beams delivering 50 Gy in 5 consecutive fractions on a Novalis Tx machine assisted with CBCT, 6D robotic alignment, and respiratory gating. Collected parameters included age, gender, histopathology, and biomarkers. Results: In the locally recurrent group, 5 of 6 cases were diagnosed as squamous cell carcinoma with none TTF-1 positive, while 25 of 30 locally controlled cases were identified as adenocarcinoma (ACA), as shown in the following table.Group:Local RecurrentLocally Controlledp-value*Cases630n/aGender (M:F)4:28:220.057Age (mean)78.878.1n/aSCC52ACA125TTF-1 (+)023*Note: Z test for two population proportions, twotailed.Conclusion: SCC appears to have a strong correlation to local recurrence in this our study using 50Gy in 5 fractions. The following factors predicted local recurrence in our study: 1. Squamous cell histology: 1/6 of recurrences vs 1/30 of locally controlled 2. TTF-1 negative: all recurrences were TTF-1 negative vs 23.3% of the locally controlled. This is a pilot study looking at our confirmed local recurrences. We plan to expand our analysis to include tumor size and other histologic factors, location (motion), image acquisition and other dosimetric factors.

SSA22-03 Squamous versus Non Squamous Cell Lung Cancer: Survival Difference in 1116 Patients From a Single-Institution

Sunday, Nov. 29 11:05AM - 11:15AM Location: S104A

Participants

Jing Zhao, Augusta, GA (*Abstract Co-Author*) Nothing to Disclose Feng-Ming Kong, MD, PhD, Augusta, GA (*Presenter*) Research Grant, Varian Medical Systems, Inc

ABSTRACT

Purpose/Objective(s): In this study, our purpose was to compare the difference of overall survival (OS) between squamous (SCC) and non-squamous cell (non-SCC) non-small cell lung cancer patients, with consideration of other clinical factors.Materials/Methods: Study population included patients treated from 2002 to 2014 in our center and with data recorded in the Tumor Registry. Age, gender, race, marital status, insurance status, tumor location, clinical stage, pathology, alcohol and smoking history, and treatments were tested for their significances. All alive patients had to be followed for at least 12 months to enter this study. Kaplan-Meier analysis and Cox proportional hazards model were used to determine differences in overall survival (OS). All tests were two-sided and p = 0.05 was considered to be significant. Results: A total of 1116 consecutive patients were eligible in which SCC and non-SCC patients accounted for 31.7% and 68.3%. Patients with stage I, II, III and IV for SCC and non-SCC were 20.3%, 8.6%, 33.1%, 38.0% and 16.9%, 6.0%, 23.9%, 53.2%, respectively. In multivariate analysis, age, gender, stage, chemotherapy and surgery were significantly correlated with OS. Median OS was not significantly different between SCC and non-SCC (9.6 vs 8.5 months, HR = 0.99, 95% CI: 0.87-1.15, p = 0.992). There was no significant difference in OS between SCC and non-SCC patients stratified by age, gender and race. For stage I patients, non-SCC had longer OS than SCC patients (49.5 vs 38.1 months, p = 0.013), while no significant difference was observed in patients with stage II, III and IV. Patients treated with chemotherapy had significantly better median OS than those who didn't receive chemotherapy: SCC (15.9 vs 6.9 months, HR = 0.63, 95% CI: 0.48-0.81, p Conclusion: No significant difference of OS were found between SCC and non-SCC patients in this study. While surgery and chemotherapy improve OS in both SCC and non-SCC groups, radiotherapy extended OS only significantly for advanced stage non-SCC patients.

SSA22-04 Evaluation of Tumor Volume and Target Volume Definition Based on Diffusion-weighted MRI in Radiotherapy of Non-small Cell Lung Cancer

Sunday, Nov. 29 11:15AM - 11:25AM Location: S104A

Participants

Jonas Stroeder, MD, Homburg, Germany (*Presenter*) Nothing to Disclose Philippe Jagoda, MD, Homburg/saar, Germany (*Abstract Co-Author*) Nothing to Disclose Jochen Fleckenstein, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose Arno Buecker, MD, Homburg, Germany (*Abstract Co-Author*) Consultant, Medtronic, Inc Speaker, Medtronic, Inc Co-founder, Aachen Resonance GmbH Research Grant, Siemens AG Guenther K. Schneider, MD, PhD, Homburg, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Speakers Bureau, Bracco Group; Research Grant, Bracco Group;

PURPOSE

The purpose of this study was to evaluate DWI of the thorax in determination of tumor volume and assessment of target volume for radiation therapy planning of non-small cell lung cancer (NSCLC) in comparison to a FDG-PET-CT based approach.

METHOD AND MATERIALS

13 pts with NSCLC and indication for primary radio(-chemo)therapy were prospectively evaluated with both MRI and PET-CT. 13 primary tumors with UICC stages I (4 pts.), II (1 pt.), IIIA (3 pts.) and IIIB (5 pts.) were evaluated. For MRI a respiratory gated T2-weighted sequence in axial orientation and non-gated DWI (b= 0, 800, 1400 and ADC map) were acquired on a 1.5 T scanner (Siemens, Magnetom® Aera). FDG PET-CT was performed as part of the routine staging. Both MR and PET-CT images were coregistered on a radiation treatment planning system (Philips, Pinnacle3®). For the FDG-PET-CT data a semiautomatic contouring of the gross tumor volume (GTV) of the primary tumor based on a "source-to-background"-Algorithm was applied. For DWI and the T2w sequences a visual definition of the GTV was performed. Beside a statistical comparison of the GTV an evaluation of the target volume based on the "Hausdorff-Distance" (HD) and the "Dice Simillarity Coefficient" was performed.

RESULTS

The median values (+ range) of the GTV for PET-CT and MRI (DWI and T2w imaging) did not differ significantly (PET-CT 69 ml (3 - 229 ml), DWI 71 ml (4 - 361 ml), T2w 65 ml (5 - 350 ml). The measured tumor volumes with all three techniques showed a highly significant correlation (PET/CT vs. DWI: r=0.97; PET/CT vs. T2w imaging: r=0.89; DWI vs. T2 imaging: r=0.92; p <0.0001). However in 9 out of 13 cases DWI showed a larger volume as compared with the FDG-PET data (mean difference 29.8% \pm 19,5%). Comparing PET-CT and DWI a good agreement regarding the spatial target volume was found (HD: 2.5 \pm 1.1 mm; DC 0,65 \pm 0.08), which showed a tendency of decreased agreement with increasing tumor volumes.

CONCLUSION

FDG-PET-CT and MR based GTV definition overall shows a good agreement, especially regarding the spatial-topographic tumor localization. Tumor volumes may differ considerable in a particular case and further studies have to evaluate the added value of DWI in radiotherapy planning.

CLINICAL RELEVANCE/APPLICATION

Based on our initial findings DWI in radiation therapy planning can give important additional information and should be evaluated in larger scale studies.

SSA22-05 The Impact of Respiratory Movement on Local Recurrence in Patients with Stage I Non-Small Cell Lung Cancer in the Treatment of Intensity Modulated SBRT

Sunday, Nov. 29 11:25AM - 11:35AM Location: S104A

Participants

Tomohiro Itonaga, Tokyo, Japan (*Presenter*) Nothing to Disclose Hidetsugu Nakayama, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Yu Tajima, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Sachika Shiraishi, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Mitsuru Okubo, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Ryuji Mikami, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Kouichi Tokuuye, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Phase II study of intensity-modulated stereotactic body radiotherapy (SBRT) using compensated filter for patients with stage I NSCLC was conducted. In this study, an internal target volume (ITV) was set to compensate for respiratory uncertainty under restriction of respiratory movement. The purpose of this study was to evaluate outcomes and prognostic factors when patients with stage I NSCLC were treated using this method.Materials/Methods: This study was approved by our facility's ethical board. All patients provided written informed consent. Eligible criteria included the following: 1. patients who were unsuitable for surgery, 2. cytologically or histologically proven NSCLC, a tumor highly suspected of having NSCLC due to high accumulation in positron emission tomography or tumor growth rates of 25% compared to a previous image, 3. a clinical stage of T1-2N0M0 according to the 7th UICC TNM classification. To restrict the respiratory movement, the abdomen was pressed by a custom-made plastic immobilization belt. While wearing this device, a planning CT was taken during the inspiratory and expiratory phases, and the ITV was determined as the volume which covered the CTV in both phases. A compensator-based intensity modulated SBRT dose of 75 Gy given in 30 fractions was prescribed to PTV.Results: Forty-three patients with a total of 45 tumors at stage I NSCLC who underwent SBRT were entered into this study at Tokyo Medical University between March 2012 and March 2014. The median age of patients was 80 years (range, 49-90), and the male/female ratio was 28/15. Of the 45 tumors, 29 were T1, 16 were T2. Eighteen tumors were located in the upper lobe, 6 in the middle lobe and lingual segment, and 21 in the lower lobe. Regarding histological type, 12 tumors was identified as adenocarcinoma, 9 as squamous cell carcinoma, 8 as non-small-cell carcinoma and 16 were unidentified. During follow-up (median 15 months), actuarial local progression-free rates at 1-year and 2-years were 92.3% (95% confidence interval [CI] 78.0 to 97.5%) and 87.2 % (95% CI, 67.5 to 95.3%), respectively. The actuarial local progression-free survival rate in patients with an ITV 30 ml larger than their GTV was significantly lower than those with a difference of 30 ml or less (p=0.029). Tumor histology, tumor location and minimum dose of ITV had no significant effect on local progression-free survival

rates by univariate analysis. By multivariate analysis, an ITV minus GTV volume larger than 30 ml (hazard ratio = 11.2, p = 0.04) was a statistically significant indicator of poor local progression-free survival rates. Minimum dose of ITV and tumor location were not significant.Conclusion: A large volume of ITV minus GTV was a negative prognostic factor for local progression in SBRT, which suggested that in instance of high respiratory movement, special technique of respiratory gaiting or tumor-tracking may be necessary.

SSA22-06 Comparison of Dose Distributions Calculated with Different Dose Calculation Algorithms in Pulmonary Lung Lesions in Order to Analyze the Influence of Different Algorithms on the Dose Prescription

Sunday, Nov. 29 11:35AM - 11:45AM Location: S104A

Participants

D Correia, Bern, Switzerland (*Presenter*) Nothing to Disclose D Henzen, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose B K. Shrestha, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose Daniel Schmidhalter, PhD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose Natalie D. Klass, MD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose Marco Malthaner, PhD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose Bernd Klaeser, MD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose Nando Mertineit, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose Kathrin Zaugg, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose Michael W. Schmuecking, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To introduce more accurate algorithms like Monte Carlo (MC) into the clinical routine, an adjustment of the currently used EPL or PB dose prescription is required. The goal of this study was to find the dose prescription adjustment when switching from PB to MC in iPlan and from EPL to MC in MultiPlan, respectively. For that reason dose distributions calculated with the different algorithms were analyzed for patients with malignant pulmonary lung lesions with different tumor size and location.

METHOD AND MATERIALS

For 124 lung lesions, treated between 2010 and 2014 at the Novalis TX (Varian Medical Systems) and at the CyberKnife (Accuray), dose distributions were initially calculated with PB and retrospectively re-calculated with MC in iPlan. In the same way, dose distributions were initially calculated with EPL and retrospectively re-calculated with MC in Multiplan. We compared the PB with the MC dose distribution within iPlan as well as the EPL with the MC dose distribution within MultiPlan. The following parameter were compared: minimum dose to 99% (D99), 95% (D95) and Dmean of the different target volumes (GTV, CTV, ITV, PTV), prescription isodose volume (PIV), the heterogeneity index (HI) and Dmean as well as Dmax to the organs at risk (OARs). Based on changes in D99, D95 and mean PTV dose, the prescription dose was converted from PB to MC and from EPL to MC, respectively.

RESULTS

So far, 64/124 lesions were evaluated (PB n=52, EPL n=12). The D99 and D95 to the PTVs were reduced when using MC in comparison to PB and EPL. Reduction was larger for peripheral tumors than for central tumors (up to 25% vs. 5%). Maximum in reduction was seen in small peripheral lesions, i.e. the PIV can be reduced up to 95% (PB volume 8.36ccm vs. MC volume 0.37ccm). Based on D95, for small peripheral lesions the PB prescription of 5x12Gy has to be reduced to 5x9.5Gy for MC. The mean and maximum dose to OARs decreased when using MC in comparison to EPL or PB.

CONCLUSION

Our preliminary results confirm that the dose prescription has to be adjusted when switching from PB or EPL to MC. Furthermore we found, that the adjustment is different when switching from PB to MC in iPlan in comparison to switching from EPL to MC in MultiPlan.

CLINICAL RELEVANCE/APPLICATION

Future trials will show, if the more accurate dose calculation by MC might increase the probability of tumor control and/or might lower the toxicity.

SSA22-07 Dynamic Contrast-enhanced Perfusion Area-Detector CT Assessed by different Mathematical Models vs. FDG-PET/CT: Capability for Therapeutic Outcome Prediction in Non-Small Cell Lung Cancer Patients with Chemoradiotherapy

Sunday, Nov. 29 11:45AM - 11:55AM Location: S104A

Participants

Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Presenter*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Terumo Corporation; Research Grant, Fuji Yakuhin Co, Ltd; Research Grant, FUJIFILM Holdings Corporation; Research Grant, Guerbet SA; Shinichiro Seki, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose Hisanobu Koyama, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose Yasuko Fujisawa, MS, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation Naoki Sugihara, MENG, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation Takeshi Yoshikawa, MD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Sumiaki Matsumoto, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Sumiaki Matsumoto, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Sumiaki Matsumoto, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Sumiaki Matsumoto, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Sumiaki Matsumoto, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation; Noriyuki Negi, RT, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose Tohru Murakami, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose Kazuro Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

To directly compare the capability for therapeutic outcome prediction between dynamic first-pass contrast-enhanced (CE-) perfusion area-detector CT (ADCT) assessed by different mathematical methods and FDG-PET/CT in non-small cell lung cancer (NSCLC) patients treated with chemoradiotherapy.

METHOD AND MATERIALS

53 consecutive Stage IIIB NSCLC patients underwent PET/CT, dynamic CE-perfusion ADCT, chemoradiotherapy, and follow-up examination. In each patient, therapeutic outcomes were assessed as therapeutic effect based on RECIST guideline, disease free interval and overall survival. Then, all patients were divided into two groups as follows: 1) complete or partial response (CR+PR) and 2) stable and progressive diseases (SD+PD) groups. In this study, total tumor perfusion (TTPDMS) and tumor perfusions from pulmonary (TPPDMS) and systemic (TPSDMS) circulations by dual-input maximum slope method, extraction fraction (EF) and distribution volume (DV) by Patlak plot method, tumor perfusion (TPSMS) by single-input maximum slope method, and SUVmax were assessed at each targeted lesion, and averaged to determine final values in each patient. To compare the capability for distinguishing CR+PR from SD+PD groups, ROC analyses were performed. Finally, disease free interval and overall survival between responders and non-responders assessed by all indexes as having no significant differences for differentiation capability on ROC analyses were compared by Kaplan-Meier method followed by log-rank test.

RESULTS

Area under the curves (Azs) of TTPDMS (Az=0.81), TPSDMS (Az=0.85) and SUVmax (Az=0.84) had significantly larger than that of TPPDMS (Az=0.69, p<0.05). On disease free interval and overall survival assessments, responders had significantly longer disease free interval and overall survival than non-responders on TPSDMS (disease free: p=0.002, overall: p=0.001), TPSMS (disease free: p=0.004, overall: p=0.03) and DV (disease free: p=0.03, overall: p=0.04).

CONCLUSION

Dynamic first-pass CE-perfusion ADCT provide a few good predictors, and have better potential than PET/CT for therapeutic outcome prediction in NSCLC patients treated with chemoradiotherapy.

CLINICAL RELEVANCE/APPLICATION

Dynamic first-pass CE-perfusion ADCT provide a few good predictors, and have better potential than PET/CT for therapeutic outcome prediction in NSCLC patients treated with chemoradiotherapy.

SSA22-08 Impact of Thoracic Radiation (TRT) on Survival of Extensive-Stage Small Cell Lung Cancer (ES-SCLC): A Singapore Population-Based Outcome Study

Sunday, Nov. 29 11:55AM - 12:05PM Location: S104A

Participants

Yu Yang Soon, Singapore, Singapore (*Presenter*) Nothing to Disclose Huili Zheng, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Shaun Z. Ho, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Wee Yao Koh, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Cheng Nang Leong, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose En Yun Loy, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Jeremy C. Tey, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Balamurugan Vellayappan, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Swee Peng Yap, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Kam Weng Fong, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose Ivan W. Tham, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Randomized studies have shown that TRT improved survival outcomes in patients with ES-SCLC responding to first line chemotherapy. This retrospective cohort study aims to evaluate the use of TRT and its impact on survival.Materials/Methods: All patients diagnosed with ES-SCLC without brain metastases in the only two Singapore national cancer centers from 2003 to 2010 were identified using the institutions' pathology registries. We linked the treatment records to the national death registry. Demographic and clinical factors associated with the use of TRT were identified. Propensity score analysis was used to analyze the impact of TRT on survival.Results: 59 of 224 patients were identified to receive TRT. The proportion of patients treated with TRT increased from 27% in 2003 to 38% in 2005 and decreased to 21% in 2010. Using an a/b ratio of 10 for tumor control, the median equivalent dose in 2 Grays (Gy) per fraction is 32.5Gy (range 4.7Gy to 60Gy). Patients treated with prophylactic cranial irradiation (adjusted odds ratio [OR] 4.85; 95% Confidence Interval [CI] 1.33 to 17.69, P = 0.017) or who had progressive disease after first line chemotherapy (adjusted OR 5.25; 95% CI 1.13 to 24.38, P = 0.034) were more likely to receive TRT. Controlling for demographic and clinical characteristics, TRT was associated with lower risk of death (Hazard ratio 0.48; 95% CI 0.34 to 0.67, P Conclusion: TRT has been not widely adopted in the treatment of ES-SCLC in Singapore and may be associated with improved survival. A larger population based outcome study to validate the survival benefit of thoracic radiation is warranted.

SSA22-09 A Retrospective Evaluation of Stereotactic Body Radiation Therapy for Pulmonary Oligometastases in a Multicenter Study

Sunday, Nov. 29 12:05PM - 12:15PM Location: S104A

Participants

Kuniaki Katsui, Okayama, Japan (*Presenter*) Nothing to Disclose Yuzuru Niibe, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Hideomi Yamashita, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Takaya Yamamoto, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose Wataru Takahashi, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Jiro Kawamori, Chuo, Japan (*Abstract Co-Author*) Nothing to Disclose Keiichi Jingu, MD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose Keiichi Nakagawa, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Atsuro Terahara, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose Susumu Kanazawa, MD, Okayama, Japan (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Oligometastases was divided into sync-oligometastases and oligo-recurrence, the difference being that the

primary site of oligometastases was uncontrolled (sync-oligometastases) or controlled (oligo-recurrence). The purpose of this study was to evaluate treatment outcomes after stereotactic body radiotherapy (SBRT) for pulmonary oligometastases.Materials/Methods: A total of 96 patients (65 males and 31 females) who received SBRT for pulmonary oligometastases between January 2004 and April 2014 at 4 high-volume institutions in Japan were enrolled in this retrospective study. The primary sites were the colorectum (n=25), lung (n=24), head and neck (n=8), and others (n=39). Ten cases were syncoligometastases, 79 cases were oligo-recurrences and 7 cases were unclassified oligometastases. The median disease-free interval (DFI) between initial therapy and SBRT was 24 months (range, 0-246 months). The median prescribed BED was 105.6 Gy (range, 75-134.4 Gy). Overall survival (OS), local control rate (LCR) and relapse-free survival rate (RFS) were calculated using Kaplan-Meier curves, and the log-rank test was used to compare the curves. Multivariate analysis for RFS was performed using a Cox proportional hazards model. Statistical significance was set at p Results: The median follow-up periods were 21 months (range, 1-119 months) for all patients. The 3-year OS, LCR and RFS rates were 52%, 75% and 25%, respectively. Radiation pneumonitis of grade 3 was found in 2 patients and gastrointestinal toxicity of grade 4 was found in 1 patient. No grade 5 toxicity occurred. The 3-year RFS for sync-oligometastases was 0% and that for oligo-recurrence was 28% (Figure, p Conclusion: In SBRT for pulumoary oligometastases, control of the primary site is a significant prognostic factor for RFS.

Molecular Imaging (Neuroimaging)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S504CD

NR MI MR AMA PRA Category 1 Credits ™: 1.50 ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Alexander Drzezga, MD, Cologne, Germany (*Moderator*) Research Grant, Eli Lilly and Company; Speakers Bureau, Siemens AG; Speakers Bureau, General Electric Company; Speakers Bureau, Piramal Enterprises Limited; Research Consultant, Eli Lilly and Company; Research Consultant, Piramal Enterprises Limited; ; ; ; ; ;

Satoshi Minoshima, MD, PhD, Salt Lake City, UT (*Moderator*) Royalties, General Electric Company; Consultant, Hamamatsu Photonics KK; Research Grant, Hitachi, Ltd; Research Grant, Nihon Medi-Physics Co, Ltd; Research Grant, Astellas Group; Research Grant, Seattle Genetics, Inc;

Sub-Events

SSA12-01 Molecular Imaging Profiling of Treatment Effects in Experimental Multiple Sclerosis

Sunday, Nov. 29 10:45AM - 10:55AM Location: S504CD

Awards

Molecular Imaging Travel Award

Participants

Benjamin Pulli, MD, Boston, MA (*Presenter*) Nothing to Disclose Reza Forghani, MD, PhD, Montreal, QC (*Abstract Co-Author*) Shareholder, Real-Time Medical, Inc; Committee member, Real Time Medical, Inc Gregory R. Wojtkiewicz, MSc, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Cuihua Wang, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose Matthias Zeller, MD, 02114, MA (*Abstract Co-Author*) Nothing to Disclose Neng Dai, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose John W. Chen, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, Pfizer Inc

PURPOSE

Treatment effects of interferon beta (IFN) and glatiramer acetate (GA), two first-line agents used in multiple sclerosis (MS), are similar as evaluated by conventional MRI. We imaged these two drugs with MPO-Gd, an activatable molecular MR probe specific to myeloperoxidase (MPO), an enzyme secreted by pro-inflammatory myeloid cells, to better profile and study their effects on the innate immune response in vivo.

METHOD AND MATERIALS

Thirty-five female SJL mice were injected with proteolipid protein to induce experimental autoimmune encephalomyelitis, a mouse model of MS, and treated with IFN (1 μ g/day), GA (150 μ g/day), MPO inhibitor ABAH (0.8 mg/day), or saline. Mice underwent MRI at 4.7T with MPO-Gd at disease peak (day 12). Lesion volume, number, contrast-to-noise ratio (CNR), and total MPO-Gd enhancement were quantified on delayed images. Mechanistic in vitro experiments were performed.

RESULTS

CNR (MPO activity in vivo) was decreased with ABAH and IFN, but not with GA. Lesion volume, lesion number, and total MPO-Gd enhancement was decreased with all three agents (Fig., A-B). These findings suggest that IFN may have the imaging signature of an MPO inhibitor. However, direct enzymatic inhibition was only found with ABAH, and not with IFN or GA (C). When primary neutrophils were stimulated to secrete MPO, IFN decreased activity of the MPO enzyme, similar to ABAH (D), while GA did not have a similar effect (D). When neutrophils were incubated with IFN, increased superoxide anion production (as measured by dihydroethidium [DHE] fluorescence) was detected (E). Inhibition of superoxide anion production by apocynin resulted in the restoration of MPO activity from stimulated neutrophils (F). Spectrophotometry revealed that IFN-mediated superoxide anion production abolished absorbance of MPO at 430 nm, consistent with irreversible destruction of the iron-containing prosthetic group (G).

CONCLUSION

Molecular imaging profiling with MPO-Gd reveals differential treatment effects of the two first-line drugs used in the treatment of MS (H), and led to the discovery of a novel mechanism of action of IFN: IFN triggers superoxide anion production in myeloid cells to irreversibly inactivate MPO.

CLINICAL RELEVANCE/APPLICATION

Molecular imaging profiling with imaging agents that probe the immune response could open up a new avenue to study the effects of current and future novel therapeutic drugs for MS.

SSA12-02 Microtubule Stabilization Therapeutic Improves Cognition and Acutely Increases Axonal Transport on Manganese-enhanced MRI in Aged Mice with AD Pathology

Sunday, Nov. 29 10:55AM - 11:05AM Location: S504CD

Greg Garwin, Seattle, WA (Abstract Co-Author) Nothing to Disclose

Satoshi Minoshima, MD, PhD, Salt Lake City, UT (*Abstract Co-Author*) Royalties, General Electric Company; Consultant, Hamamatsu Photonics KK; Research Grant, Hitachi, Ltd; Research Grant, Nihon Medi-Physics Co, Ltd; Research Grant, Astellas Group; Research Grant, Seattle Genetics, Inc;

Donna J. Cross, PhD, Seattle, WA (Abstract Co-Author) Nothing to Disclose

PURPOSE

Previously we reported increased axonal transport in young mice transgenic (Tg) for Alzheimer's disease (AD) after intranasal administration of a microtubule-stabilizing therapeutic, paclitaxel using MRI with manganese (MEMRI). In this study we administered paclitaxel to AGED 3xTg-AD mice with established pathology from 10-18 mos and hypothesized that cognition would improve and be associated with increased axonal transport.

METHOD AND MATERIALS

Mice, (3xTg-AD n=10, age=44wks) were treated by intranasal lavage with paclitaxel (TAX: 0.6 mg/kg) or 0.9% saline (SAL) in 5 µl per nostril at intervals of 2wks. MEMRI was obtained after first treatment to assess acute effect on transport. Scanning (14T Bruker MR: MDEFT, TR/TE: 5000ms/1.9ms, 0.140x0.140x0.25mm3) pre and immediately after treatment occurred at 100 min. and from 370-400 min after delivery of 5 µL of 1M MnCl2 intranasally. Images were coregistered stereotactically aligned and normalized to a mouse atlas. Tracer kinetic analysis based on dispersion model was used to estimate transport. At 56 wks after 5 treatments, mice were tested in radial water tread maze for memory deficits and compared to age-matched WT (n=5) and at 75 wks after 11 treatments, anxiety was assessed by elevated plus maze.

RESULTS

At 10 mos, 3xTg-AD have amyloid and neurofibrillary tangles. There was a significant acute effect of TAX on transport in the olfactory tract. Transport rates decreased slightly in SAL (-13%) in the 3wk interval between MEMRI scans however TAX increased (>100%) transport at 24hrs after administration (p=0.05). Cognition was tested in the water tread maze (memory) and elevated plus maze (anxiety). TAX had improved memory as compared to SAL and not significantly different from WT (Day 5, 36% dec, 143.8±43 vs 91.5±77s and Day 12, 22% dec, 138.3±52 vs 107.7±75s for SAL vs. TAX, p<0.05). 3xTg-AD mice exhibit anxiety. TAX spent more time exploring open arms than SAL (Open arm 84% inc, 129.1±80 vs 20.9±31s for TAX vs SAL, p≤0.05). There were no differences in Mn2+ uptake indicating delivery thru activity-dependent Ca2+ channels was not affected by treatment.

CONCLUSION

MEMRI indicated that paclitaxel has an acute effect on axonal transport processes in AD mice. Paclitaxel also improved cognition and anxiety in AD mice when administered after pathology was well-established.

CLINICAL RELEVANCE/APPLICATION

Microtubule-stabilizing drugs present an exciting new therapeutic option for Alzheimer's disease.

SSA12-03 Whole-Brain, Volumetric MR Spectroscopic Profiles Identify Infiltrating Glioblastoma Margin for Fluorescence-Guided Surgery

Sunday, Nov. 29 11:05AM - 11:15AM Location: S504CD

Participants

James S. Cordova, BS, Atlanta, GA (*Presenter*) Nothing to Disclose Constantinos G. Hadjipanayis, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Zhongxing Liang, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Lee Cooper, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Saumya Gurbani, MS, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Stewart Neill, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Eduard Schreibmann, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Hui-Kuo G. Shu, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose ELectric Company; Stockholder, Medtronics, Inc; Stockholder, Mylan NV; Stockholder, Apple Inc Jeffrey Olson, PHD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Hyunsuk Shim, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Glioblastoma (GBM) resection based on T1W-contrast enhanced MRI (T1W-CE) results in high rates of local recurrence due to tumor infiltration beyond contrast enhancing margins. MR spectroscopic imaging (MRSI) maps are thought to identify tumor infiltration outside of T1W-CE regions more specifically than T2-FLAIR. Thus, coupling preoperative MRSI with real-time fluorescence-guided surgery (FGS) using 5-aminolevulinic acid (5-ALA) may allow the maximal removal of tumor beyond the enhancing margin.

METHOD AND MATERIALS

In a trial for new and recurrent GBM (n=20 patients), 3D whole-brain MRSI volumes, including choline (Cho), creatine (Cr), and Nacetylaspartate (NAA) maps, were acquired and used for surgical planning in patients receiving FGS. Biopsies were collected from regions with elevated Cho/NAA before bulk resection using 5-ALA fluorescence. Fluorescence of resected tissue was quantified ex vivo with a hand-held spectrometer, and metabolic data was sampled from MRSI volumes using an 8 mm³ region-of-interest centered at the point of tissue extraction. Samples were stained for SOX2, a tumor-specific marker, and analyzed to quantify tumor infiltration using an automated histology image analysis tool. Semi-automated tumor segmentation was used to evaluate extent-oftumor resection (EOR) (Cordova et al. 2014).

RESULTS

One-hundred percent of tissue samples from metabolically abnormal regions, even those devoid of T2 abnormality, contained SOX2 positive cells (range: 3 - 96% of cells). Cho/NAA, Cho/Cr, and Cho showed strong, statistically significant correlations with the proportion of SOX2-positive cells ($\rho = 0.70$, 0.66, and 0.60, respectively; p < 0.05). Ex vivo tissue fluorescence showed a weaker yet significant correlation with Cho/NAA and Cho ($\rho = 0.365$ and 0.404; p < 0.05). Median EOR in MRSI/5-ALA cases was 97.5% whereas that in a concurrent study using FGS alone was 94.2%.

CONCLUSION

This is the first time that 5-ALA-induced fluorescence has been shown to correlate with MRSI-derived metabolic markers in brain tumors. The correlation of MRSI abnormality with histopathology and quantitative intraoperative fluorescence supports the use of MRSI for identifying regions of tumor infiltration outside of T1W-CE.

CLINICAL RELEVANCE/APPLICATION

As MRSI is independent of contrast diffusion, it defines tumor infiltration more precisely than T1W-CE; and when combined with FGS, results in more complete resections that may extend patient survival.

SSA12-04 Motexafin Gadolinium (MGd) - Enhanced MR and Optical Imaging of Rat Gliomas for Potential Intraoperative Determination of Tumor Margins

Sunday, Nov. 29 11:15AM - 11:25AM Location: S504CD

Participants

Longhua Qiu, Seattle, WA (*Presenter*) Nothing to Disclose Feng Zhang, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Yaoping Shi, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Zhibin Bai, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Jianfeng Wang, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Donghoon Lee, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose Xiaoyuan Feng, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose Xiaoming Yang, MD, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the possibility of using motexafin gadolinium (MGd)-enhanced molecular MR imaging and optical imaging to identify the genuine margins of rat gliomas. To investigate the possibility of using motexafin gadolinium (MGd)-enhanced molecular MR imaging and optical imaging to identify the genuine margins of rat gliomas.

METHOD AND MATERIALS

Rat glioma model was created by inoculating C6 glioma cells in right caudate nucleuses of male Sprague-Dawley rats (160g ± 20g). Thirty six rats with tumors were randomized into six groups (n=6/group). Five groups were euthanized at different time points of 15, 30, 60, 120 and 240 minutes after intravenous administration of 6-mg/kg MGd respectively, while one group received saline as a control. After a craniotomy, ex vivo optical imaging was performed to identify the tumors featuring as MGd-emitting red fluorescence. Then, the whole brains were harvested for ex-vivo T1-weighted MRI (T1WI). Optical photon intensities and MRI signal-to-noise ratio (SNR) were quantified for plotting the times to photon/SNR curves. Tumor extent was demarcated on both optical and MR imaging. Subsequently, confocal microscopy of brain tissues was performed to confirm the intracellular uptake of MGd by tumor cells and correlate the tumor margins determined on both optical and MR images.

RESULTS

Fluorescent optical imaging could sensitively detect the deep-seated tumors with red fluorescence in rat brains and clearly outlined the tumor margins. T1WI showed the tumors heterogeneous enhancement. Both the photon intensity and the maximal enhancement on T1WI reached the peak at 15 minutes after MGd administration, with a continuing tumor visibility lasting for 2-4 hours. Confocal microscopy confirmed the exclusive accumulation of MGd in tumor cells which was well correlated with imaging findings.

CONCLUSION

Both MGd-enhanced optical imaging and molecular MR imaging can sensitively determine rat glioma tumor margin within the optimal time window of 15~30 minutes post-MGd administration, which pose the potential clinical application for aiding the complete removal of gliomas at a hybrid surgical setting with intraoperative optical and MR imaging capabilities.

CLINICAL RELEVANCE/APPLICATION

MGd-enhanced imaging poses a potential clinical application for aiding the complete removal of gliomas at a hybrid surgical setting with intraoperative optical and MR imaging capabilities.

SSA12-05 Generation of a Bispecific Antibody for Combined EGFR/CD105 Targeting of High-Grade Gliomas

Sunday, Nov. 29 11:25AM - 11:35AM Location: S504CD

Awards

Molecular Imaging Travel Award

Participants

Reinier Hernandez, MSc, Madison, WI (*Presenter*) Nothing to Disclose Haiming Luo, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Hao Hong, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Stephen Graves, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Robert J. Nickles, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Our aim was to design and generate a heterodimer [Bs-F(ab')2] using two mAb Fab fragments for dual-targeting of epidermal growth factor receptor (EGFR) and CD105. The synergistic targeting properties of Bs-F(ab')2 were investigated in vitro/in vivo.

METHOD AND MATERIALS

Bs-Fab'2 was synthesized by reacting two mAb fragments (Cetuximab Fab and TRC105 Fab) derivatized with the "Click' chemistry pair tetrazine/trans-cyclooctene. Bs-Fab'2 was purified by size exclusion chromatography, conjugated to NOTA, and labeled with 64Cu for positron emission tomography (PET). In vitro and in vivo dual-receptor binding studies were performed in a U87MG human

glioblastoma cancer model (EGFR/ CD105 +/+). Blocking, biodistribution, and ex vivo histological examination were performed to validate the in vivo data.

RESULTS

Purified Bs-F(ab')2 was confirmed by SDS-PAGE (~100 kDa, >90% pure), whereas the two Fab fragments were each at ~50 kDa. Flow cytometry showed an enhanced fluorescence signal for the heterodimer compared with either Fab. PET of U87MG tumor bearing mice with 64Cu-NOTA-Bs-F(ab')2 revealed a strikingly higher tumor uptake (32.0 ± 6.9 , 47.5 ± 6.7 , 46.0 ± 3.3 and 44.1 ± 9.4 %ID/g at 3, 15, 24, and 36 h postinjection, respectively; n=3) compared to those observed with 64Cu-NOTA-Cet-Fab and 64Cu-NOTA-TRC105-Fab (both <15%ID/g). Injection of a blocking dose (100mg/kg) of Cetuximab or TRC105 prior to the administration of the tracer resulted in a significantly reduced tumor uptake of 64Cu-NOTA-Bs-F(ab')2, which confirmed that Bs-F(ab')2 tumoruptake was mediated by both EGFR and CD105 expression. Owing to the low tracer uptake in non-target organs (e.g. liver and kidney), we attained excellent tumor-to-normal tissue contrasts.

CONCLUSION

We report the first successful dual-targeting of EGFR and CD105, with a "click" heterodimer featuring two mAb Fab fragments, which led to synergistic enhancement of tumor uptake over either Fab alone. These results may improve future cancer diagnosis and therapeutic efficacy.

CLINICAL RELEVANCE/APPLICATION

Combined EGFR/CD105-targeting provides increased tumor-targeting efficacy and specificity, which may ultimately lead to better diagnostic sensitivity and increased tumor cytotoxicity.

SSA12-07 MRI Contrasts Induced by Direct Saturation: Demonstration in the Central Nerve System

Sunday, Nov. 29 11:45AM - 11:55AM Location: S504CD

Participants

Rongwen Tain, PhD, Chicago, IL (*Presenter*) Nothing to Disclose Feliks Kogan, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose Xiaohong J. Zhou, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose Kejia Cai, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

A frequency selective saturation RF pulse across a broad frequency range produces a Z-spectrum. This Z-sprectrum receives contributions from components mainly including direct saturation (DS) of bulk water, magnetization transfer, chemical exchange saturation transfer, and Nuclear Overhauser Enhancement. When a weak saturation regime is applied, such as B1rms< 50 Hz and duration < 500 ms, the Z-spectrum is mainly attributed to the DS spectrum, characterized by a Lorentzian-shape. The DS magnitude at a given frequency offset has been used to measure iron content in brain. Additionally, the position of maximum DS has been exploited to map B0 field variations (Δ B0). In this study, we investigate additional contrasts revealed by analyzing DS spectrum.

METHOD AND MATERIALS

This study was performed under an approved IRB protocol. DS spectra within ± 1 ppm were acquired from the brain and cervical spinal cord of healthy subjects at 3T scanner with a 32 channel head-coil and a 16 channel head and neck spine coil, respectively. The pulse sequence consists of a pre-saturation pulse (B1rms = 12.2 Hz for brain, 24.4 Hz for spinal cord, 200 ms) followed by a 2D single-shot SPGR readout. The DS data was fitted pixel by pixel with a Lorentzian function to produce B0 field, DS line-width, and DS magnitude maps. In addition, simulations with Bloch equations were performed to correlate with experimental data.

RESULTS

Beside the Δ BO map, the Lorentzian fitting of data obtained from both brain and spinal cord was used to produce new maps based on the DS line-width and magnitude. In the brain and spinal cord respectively, the DS line-width of gray matter is slightly narrower than that of the white matter. As expected, CSF gave the narrowest line-widths. DS amplitude was reversed. Simulation further showed that DS line-width is positively proportional to 1/T2 and inversely proportional to 1/T1. DS magnitude was found to be proportional to proton density.

CONCLUSION

Two quantitative contrasts (DS line-width and magnitude) that reflect tissue relaxation rates and proton density have been demonstrated in the human CNS tissues.

CLINICAL RELEVANCE/APPLICATION

The discovered contrasts induced by DS MRI have the clinically potential for characterization of normal and pathological tissues.

SSA12-08 CD146-based Noninvasive ImmunoPET Imaging of High-grade Gliomas

Sunday, Nov. 29 11:55AM - 12:05PM Location: S504CD

Participants

Reinier Hernandez, MSc, Madison, WI (*Presenter*) Nothing to Disclose Yunan Yang, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Stephen Graves, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Robert J. Nickles, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The goal of this study is to establish CD146 as a novel target for in vivo immunoPET imaging of mice bearing orthotopic high-grade gliomas (HGG).

METHOD AND MATERIALS

An improved immunization approach was used to generate YY146, a murine anti-CD146 monoclonal antibody. RT-PCR, western blot, flow cytometry, and immunofluorescence staining studies were conducted to determine in vitro CD146 expression. Subcutaneous (s.c.) U87MG human glioblastoma (CD146+) and PC3 human prostate cancer (CD146-) tumors were induced in athymic nude mice. Additionally, orthotopic U87MG tumors were generated in nude mice and its progression monitored by T2-weighted MRI. YY146 was conjugated to p-SCN-Bn-NOTA and radiolabeled with 64Cu. Sequential PET scans, blocking, histological, and biodistribution studies were carried out to determine in vivo CD146 specificity of 64Cu-NOTA-YY146.

RESULTS

Flow cytometry demonstrated that chelator conjugation to YY146 did not compromise its CD146-binding affinity/specificity. 64Cu-NOTA-YY146 was obtained with high radiochemical purity (>95%) and specific activity, in yields surpassing 90%. MicroPET imaging studies revealed an elevated and persistent uptake of 64Cu-NOTA-YY146 in U87MG (CD146+) s.c. xenografts which peaked at 13.7±0.7 %ID/g, 48h post-injection (n=3). In contrast, significantly lower accumulation was observed in PC3 (CD146-) tumors (<5 %ID/g). Excellent tumor homing was observed from PET/CT imaging of orthotopic U87MG tumors, where 64Cu-NOTA-YY146 was able to infiltrate the brain and accumulate in tumorous tissue (21.5±3.5 %ID/g at 48h post-injection; n=5). The attained exquisite tumor-to-normal brain contrast allowed for the sensitive detection of small malignancies (~2 mm). Biodistribution, blocking experiments, as well as histological examination validated PET data, and confirmed the CD146 specificity of 64Cu-NOTA-YY146.

CONCLUSION

We successfully implemented noninvasive immunoPET imaging of in vivo CD146 expression in an orthotopic human glioblastoma cancer model. The high affinity and specificity of 64Cu-NOTA-YY146 envisages the potential of this novel mAb for targeted HGG diagnosis and therapy.

CLINICAL RELEVANCE/APPLICATION

Herein, we show for the first time that CD146 is a promising tumor-specific target for noninvasive in vivo imaging and targeted therapy of high-grade gliomas.

SSA12-09 The Expression of P2X7 Receptors in EPCs and Their Potential Role in the Targeting of EPCs to Brain Gliomas

Sunday, Nov. 29 12:05PM - 12:15PM Location: S504CD

Participants

Xiao Chen, Chongqing, China (*Presenter*) Nothing to Disclose Weiguo Zhang, Chongqing, China (*Abstract Co-Author*) Nothing to Disclose Jingqin Fang, Chongqing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the functional expression of P2X7 receptors in EPCs, role of P2X7 receptors in proliferation and homing to glioma of EPCs.

RESULTS

We confirmed, for the first time, the expression of P2X7 receptors in rat spleen-derived EPCs. Activation of P2X7 receptors in EPCs by BzATP promoted cells proliferation and migration, rather than apoptosis. Compared to the group without BBG treatment, less transplanted EPCs homed to gliomas in the group with BBG treatment, especially integrated into the vessels containing tumor-derived endothelial cells in gliomas. Moreover, western blot showed that CXCL1 expression was downregulated in gliomas with BBG treatment, which meant P2X7 receptors suppression inhibited the homing of EPCs to gliomas through down-regulation of CXCLI expression. Additionally, MTT assay and MRI revealed that P2X7 receptors exerted no significant promoting effect on C6 glioma cells proliferation, glioma growth and angiogenesis.

CONCLUSION

Taken together, our findings imply the possibility of promoting proliferation and targeting ability of transplanted EPCs to brain gliomas in vivo through P2X7 receptors, which may provide new perspectives on application of EPCs as a therapeutic and imaging probe to overcome antiangiogenic resistance for gliomas.

CLINICAL RELEVANCE/APPLICATION

Apply EPCs as a therapeutic and imaging probe to overcome antiangiogenic resistance for gliomas.

IN

Principles and Practice of 3D Printing

Sunday, Nov. 29 11:00AM - 12:30PM Location: S501ABC

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

FDA Discussions may include off-label uses.

Participants

Frank J. Rybicki III, MD, PhD, Ottawa, ON (*Moderator*) Research Grant, Toshiba Corporation; Jonathan M. Morris, MD, Rochester, MN (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn the basics of 3D printing technologies. 2) Discuss how these can be used clinically. 3) Discuss the current limitations of this technology as it relates to health care. 4) Use case examples to define current uses of this technology in surgical and medical specialties.

ABSTRACT

3D printing/additive manufacturing is a growing industry. Within the medical field there is growing interest in this technology and its impact on patients lives. In this talk we will discuss the basics of 3D printing and how they can be incorporated into medical uses from surgical design of implants to anatomic modeling of complex surgery.

Sub-Events

RCC11A 3D Printing for the Radiologist: A Primer and Introduction to Sessions

Participants

Frank J. Rybicki III, MD, PhD, Ottawa, ON (Presenter) Research Grant, Toshiba Corporation;

LEARNING OBJECTIVES

1) To become familiar with 3D printing technologies. 2) To have an introduction of materials used to create 3D-printed anatomical models and how they can be used in medical applications. 3) To be exposed to the process of 3D printing and those realized and potential clinical benefits in radiology, stratified by organ section.

ABSTRACT

While advanced visualization in radiology is instrumental for diagnoses and communication with referring clinicians, there is an unmet need to render DICOM images as three-dimensional (3D) printed models capable of providing both tactile feedback and tangible depth information of both anatomic and pathologic states. 3D printed models, already entrenched in the non-medical sciences, are being rapidly embraced in medicine as well as in the lay community. Incorporating 3D printing from images generated and interpreted by radiologists presents particular challenges including training, materials and equipment, and guidelines. The overall costs of a 3D printing lab must be balanced by clinical benefits. The RSNA 2015 program includes 6 hours of didactic lectures that review and summarize numerous studies that support such benefits from 3D printing, as it is expected that the number of 3D printed models generated from DICOM images for planning intervention and fabricating implants will grow exponentially. The program also includes multiple hands-on courses that will enable radiologists, at a minimum, to become familiar with 3D printing software and hardware as it relates to our field.

RCC11B 3D Printing Technologies

Participants

Peter C. Liacouras, PhD, Bethesda, MD (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the basic principle of Additive Manufacturing (3D Printing) and how it differs from subtractive technology. 2) Understand the principles of the software needed to convert Medical Images into three-dimensional printed models and what factors contribute to the quality of each model. 3) Become familiar with the different types of Additive Manufacturing (3D Printing) technologies.

ABSTRACT

This presentation will provide a novice to Additive Manufacturing the general knowledge applicable to the medical field. The basic principles of Additive manufacturing (3D Printing) will be discussed along with the different technologies which encompass the field. The steps of converting radiographic images into three-dimensional printable files and the differences between the multitude of additive manufacturing techniques will be the primary focuses.

RCC11C Techniques for Current 3D Printing

Participants Gerald T. Grant, MD, MS, Louisville, KY (*Presenter*) Nothing to Disclose

RCC11D 3D Printing Software

Participants

Andreas Giannopoulos, MD, Boston, MA, (agiannopoulos1@partners.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To become familiar with common 3D printing software terminology and software capabilities. 2) To be acquainted with the line of software needed in transforming medical images to 3D printable files. 3) To appreciate the implementation of 3D printing software in everyday clinical practice.

ABSTRACT

3D printers cannot recognize DICOM images and further steps are necessary to make DICOMs readable by 3D printers. While adequately trained personnel can perform many of those steps, the role of the radiologist is essential to ensure that the model will be clinically useful. A variety of software packages for STL generation from medical imaging as well as software for 3D part manipulation, known as Computer-Aided Design (CAD), will be discussed. Basic technical terminology and commonly used techniques will be presented. Real life paradigms from own medical 3D printing experience will be provided.

RCC11E 3D Printing with Open Source Freeware

Participants

Michael W. Itagaki, MD, MBA, Seattle, WA (Presenter) Owner, Embodi3D, LLC

LEARNING OBJECTIVES

1) To become familiar with the steps of converting a medical imaging scan in standard Digital Imaging and Communications in Medicine (DICOM) format into a 3D printable medical model. 2) To become familiar with the free, open-source software packages that can perform each step.

ABSTRACT

This presentation will provide an overview of the basic steps of converting a medical scan into a 3D printed medical model, using free, open-source software for each required step. Conversion of computed tomography image data in Digital Imaging and Communications in Medicine (DICOM) format to stereolithography (STL) file format using the open-source software package 3D Slicer will be reviewed. Further manipulation of the STL file in preparation for 3D printing using the open-source software package Blender will also be discussed.

Active Handout: Michael Ward Itagaki

http://abstract.rsna.org/uploads/2015/15002970/RCC11E.pdf

RCC11F Implementing 3D Printing into a Clinical Practice

Participants

Jonathan M. Morris, MD, Rochester, MN (Presenter) Nothing to Disclose

ABSTRACT

3D printing/additive manufacturing is a growing industry. Within the medical field there is growing interest in this technology and its impact on patients lives. In this talk we will discuss how we incorporated this technology into a quaternary referral center as a real time clinical service. We will specifically discuss the advantages as well as limitations of this technology as it relates to the medical/surgical field. We will discuss "How we do it" and what resources are needed to develop a service. As the impact of this technology is growing we will also discuss what evidence will we need to have global acceptance as a clinical service and why it should be housed in radiology.

Basic DICOM with Horos/Osirix and dcm4che (Hands-on)

Sunday, Nov. 29 11:00AM - 12:30PM Location: S401CD

IN

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

Participants

Marc D. Kohli, MD, San Francisco, CA (*Presenter*) Research Grant, Siemens AG Simon Rascovsky, MD, MSc, Bogota, Colombia (*Presenter*) Officer, eDx Tecnologia en Salud SAS

LEARNING OBJECTIVES

1) Describe basic DICOM object metadata structure. 2) Demonstrate familiarity with Osirix/Horos DICOM viewer functions including image display, and measurements. 3) Use Osirix/Horos to send/receive DICOM objects. 4) Name several common dcm4che toolkit tools, and describe their purpose.

Data Collection, Organization and Analysis with Excel - A Hands-On Tutorial (Hands-on)

Sunday, Nov. 29 11:00AM - 12:30PM Location: S401AB

IN

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

Participants

Jaydev K. Dave, PhD, MS, Philadelphia, PA, (jaydev.dave@jefferson.edu) (*Presenter*) Nothing to Disclose Raja Gali, MS, Philadelphia, PA (*Presenter*) Nothing to Disclose Manish Dhyani, MBBS, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe techniques for creating a spreadsheet to allow trouble-free data analysis. 2) Demonstrate key data management skills. 3) Describe tools for performing basic descriptive statistics. 4) Identify how to perform simple statistical tests and perform these tests with a sample dataset. 5) Understand how bad data (or bad data acquisition techniques) may corrupt subsequent data analyses. 6) Practice data plotting/representation techniques. 7) Identify differences between a spreadsheet and a database. 8) Identify statistical tasks that require more sophisticated software. Pre-requisites: Familiarity with Microsoft Windows and Microsoft Excel environment will be assumed

ABSTRACT

A spreadsheet program is commonly employed to collect and organize data for practicing quality improvement, for research, and for other purposes. In this refresher course, we will demonstrate to a user, familiar with Microsoft Excel environment, how this spreadsheet program may be used for such purposes. The course will begin with describing efficient approach for data acquisition and highlight key data management skills; and with reviewing commons errors that may be avoided during data logging. Then we will provide a brief introduction on basic descriptive tests before proceeding with a hands-on tutorial using a sample dataset to calculate basic descriptive statistics, and to perform basic statistical tests like t-test, chi-square test, correlation analysis, etc. Effect of corrupted data on such analysis will also be demonstrated. The final hands-on component for this course will include data plotting and representation including the use of pivot tables. The course will conclude with a discussion on identifying differences between a spreadsheet and a database, limitations of a spreadsheet program and avenues where a dedicated statistical software program would be more beneficial. A list of some of these dedicated statistical software programs for analyses will also be provided.Pre-requisites:Familiarity with Microsoft Windows and Microsoft Excel environment will be assumed
VSIO11

Interventional Oncology Series: Percutaneous Management of Renal Tumors: Updates and Ongoing Controversies in 2015

Sunday, Nov. 29 1:30PM - 6:00PM Location: S405AB

GU IR OI RO

AMA PRA Category 1 Credits ™: 4.25 ARRT Category A+ Credits: 5.00

FDA Discussions may include off-label uses.

Participants

Debra A. Gervais, MD, Chestnut Hill, MA (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

1) To review management options for small renal masses as well as indications for each. 2) To review the data supporting the energy based thermal ablation modalities for ablation of renal masses. 3) To describe the role and limitations of biopsy of renal masses. 4) To review the management of benign solid renal masses. 5) To describe the evidence for ablation of T1b renal masses.

Sub-Events

VSI011-01 Updates in the Management of Small (T1a) Renal Masses: Resect, Ablate, or Follow?

Participants

LEARNING OBJECTIVES

View learning objectives under main course title.

VSI011-02 Small Renal Mass (T1a): The Case for Ablation in 2015

Sunday, Nov. 29 1:30PM - 1:50PM Location: S405AB

Participants

Jeremy C. Durack, MD, New York, NY (Presenter) Scientific Advisory Board, Adient Medical Inc Investor, Adient Medical Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

VSI011-03 Small Renal Mass (T1a): The Case for Resection in 2015

Sunday, Nov. 29 1:50PM - 2:10PM Location: S405AB

Participants

Adam S. Feldman, MD, Boston, MA (Presenter) Consultant, Olympus Corporation

LEARNING OBJECTIVES

View learning objectives under main course title.

VSIO11-04 Small Renal Mass (T1a): Both Cases for Intervention are Weak. Active Surveillance Will Do Just as Well

Sunday, Nov. 29 2:10PM - 2:30PM Location: S405AB

Participants

Stuart G. Silverman, MD, Brookline, MA, (sgsilverman@partners.org) (Presenter) Author, Wolters Kluwer nv

LEARNING OBJECTIVES

View learning objectives under main course title.

VSIO11-05 Age Impacts Choice of Partial Nephrectomy vs. Percutaneous Ablation for Stage T1a Renal Cell Carcinoma: a Surveillance, Epidemiology and End Results (SEER)-Medicare Population Study

Sunday, Nov. 29 2:30PM - 2:40PM Location: S405AB

Participants

Minzhi Xing, MD, New Haven, CT (*Presenter*) Nothing to Disclose Nima Kokabi, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose Di Zhang, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose Hyun S. Kim, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate survival outcomes in patients with stage 1a renal cell carcinoma (RCC) undergoing open or laparoscopic partial nephrectomy (PN) vs. percutaneous cryoablation (CRA) or radiofrequency ablation (RFA) in a large-scale population study.

METHOD AND MATERIALS

The most recently undeted SEED-Medicare linked detence was queried for nationals with T12NOMO DCC (</ cm ICD-0.3 C64 0)

diagnosed between 2000 and 2011 and followed to 2012. Patients who underwent therapy were selected from Medicare via CPT carrier claim codes (percutaneous RFA 50592; percutaneous CRA 50593; open PN 50240; laparoscopic PN 50543). Mean overall survival (OS) from therapy was compared between patients who underwent percutaneous ablation vs. partial nephrectomy, with subgroup survival analysis of individual therapies. Kaplan-Meier estimation and Cox proportional hazard models were used for survival analyses and to assess independent prognostic factors for OS.

RESULTS

A total of 5,983 T1a RCC patients underwent percutaneous ablation or PN within the study period, median age 72.0 yrs, 61.0% male. Of these, 3150 received open PN, 1785 received laparoscopic PN, 419 received CRA and 629 received RFA. Of these, 47.9% of patients undergoing PN were >72 yrs, vs. 67.1% of patients in the ablation group. Mean age of patients receiving ablation was significantly higher than that of the PN group, 80.1 vs. 70.6 yrs, p<0.001. Other factors including gender, ethnicity, mean index tumor size and tumor grade were not significantly different between comparison groups. Patients who underwent PN had significantly higher mean OS compared to the ablation group, 128.7 vs. 75.5 months, p<.001. On Cox regression analysis, younger age was the only independent prognostic factor for survival, HR 0.91 (0.87-0.93, p<0.001).

CONCLUSION

In T1aN0M0 RCC, patients undergoing ablation were significantly older compared to PN patients. Age was found to be an independent prognostic factor for survival from treatment.

CLINICAL RELEVANCE/APPLICATION

In T1aN0M0 RCC, age was found to be an independent prognostic factor for survival from treatment and may impact choice of therapy.

VSI011-06 Ablation for Renal Cell Carcinoma: Radiofrequency, Cryoblation, or Microwave?

Participants

LEARNING OBJECTIVES

View learning objectives under main course title.

VSI011-07 Small Renal Mass (T1a): The Case for RFA in 2015

Sunday, Nov. 29 2:40PM - 3:00PM Location: S405AB

Participants

Debra A. Gervais, MD, Chestnut Hill, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

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/

Debra A. Gervais, MD - 2012 Honored Educator

VSI011-08 US-guided Percutaneus Radiofrequency Ablation of Renal Cell Carcinoma: Experience from Treating 120 Renal Masses Over 7 Years

Sunday, Nov. 29 3:00PM - 3:10PM Location: S405AB

Participants

Adriana C. Montealegre Angarita, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose Xavier Serres Creixams, PhD, Barcelona, Spain (*Presenter*) Nothing to Disclose Enrique Trilla, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose Milton R. Villa III, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose Juan Halaburda Berni, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose Esteban Ramirez Pinto, MD, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose Xavier G. Azogue JR, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Evaluate the efficacy and safet of ultrasound (US) guided percutaneous radiofrequency ablation (RFA) for small renal masses. Describe the complications of RFA guided by US. Evaluate the technique in their initial ablative capacity and rate of tumor recurrence at one year minimum follow up. Illustrate postablation findings of residual or recurrent renal tumor by using Contrast-enhanced US (CEUS) Evaluate the effect of renal function in patients undergoing RFA guided by US

METHOD AND MATERIALS

Over a 7 year 105 patients with 120 renal masses (tumor size averaged 2.7 cm) were reviewed treated with US-guided percutaneous RFA. Biopsy was performed at the same moment of the procedure from 2009. Cool-tip RFA system was percutaneously inserted under ultrasound guidance. RF was emitted at 100-120 W for 12 minutes to attain temperatures sufficient to ensure tumor kill. The treatment response and technical success were defined by absence of contrast enhancement within the tumor on contrast enhanced CT and CEUS. The patients were followed up with CEUS and computed tomography at 3.6 months and every 6 months thereafter. Multivariate analysis was performed to determine variables associated with procedural outcome.

Follow-up ranged from 24 months to 84 months. The initial treatment success rate was 95.8%. Five of the remaining tumors were successfully re-treated. Four tumors had recurrence (defined as the occurrence of contrast enhancing tumor 12 months after complete ablation) three of whom required a second ablation and one nephrectomy. The overall technical success rate was 99%. Complications were seven self-limited included hematomas subcapsular or perirenal. In all 104 (99%) patients have preservation of renal function, only one patient developed significant renal function deterioration associated with perirenal hematoma. There were no bowel complications despite the fact that 6 of the tumors were within 1 cm of bowel. Protective strategies progressed from reliance on electrode positioning to hydro dissection.

CONCLUSION

Our experience to date suggests that US-guided RFA of small renal tumors is a safe and effective, minimally invasive technique in selected patients.

CLINICAL RELEVANCE/APPLICATION

US-guided RFA of renal tumors can provide benefits compared to other techniques: Intraprocedural monitoring affords visualization of the forming hot ball, helps detect proximity to surrounding structures and does not use ionizing radiation.

VSI011-09 Small Renal Mass (T1a): The Case for Cryoblation

Sunday, Nov. 29 3:10PM - 3:30PM Location: S405AB

Participants

Peter J. Littrup, MD, Providence, RI (*Presenter*) Founder, CryoMedix, LLC; Research Grant, Galil Medical Ltd; Research Grant, Endo Health Solutions Inc; Consultant, Delphinus Medical Technologies, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

Cryoablation of smaller renal cancers (i.e., T1a, or <4 cm) is an out-patient treatment that is safe, effective and flexibility for nearly any renal location. Major cryoablation benefits include its excellent visualization of ablation zone extent, low procedure pain and flexible protection of tumor ablation sites near calyces, bowel and ureter. CT-guidance is the cryoablation guidance modality of choice due to circumferential visualization of low density ice and ready availability. US-guidance can augment renal cryoablation, especially for smaller visible masses and/or placement of interstitial metallic markers during biopsy for selected cases requiring better eventual CT localization. MR-guidance has little clinical benefit or cost-efficacy. For safety, cases will be considered for avoidance of direct calyceal puncture, selection of hydrodissection or balloon interposition for bowel protection, and protection of the uretero-pelvic junction by stent placement. Imaging outcomes of complications and their avoidance will be shown. For optimal efficacy, tumor size in relation to number and size of cryoprobes emphasize the "1-2 Rule" of at least 1 cryoprobe per cm of tumor diameter and no further than 1 cm from tumor margin, as well as cryoprobe spacing of <2cm. Thorough extent of visible cryoablation margins beyond all apparent tumor margins produces very low local recurrence rates for tumors in nearly any renal location, resulting in excellent cost-efficacy by minimizing the need for re-treatments.

VSI011-10 Adjunctive Techniques to Improve Image-Guided Percutaneous Cyroablation of Renal Masses in Difficult Anatomic Locations: Quantifying Procedural Success and Long-term Outcomes

Sunday, Nov. 29 3:30PM - 3:40PM Location: S405AB

Participants

Ahmed Fadl, MD, Mineola, NY (*Presenter*) Nothing to Disclose Andrew Ho, Bayside, NY (*Abstract Co-Author*) Nothing to Disclose Samia Sayegh, DO, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose April Griffith, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose Siavash Behbahani, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose Jason C. Hoffmann, MD, Mineola, NY (*Abstract Co-Author*) Consultant, Merit Medical Systems, Inc; Speakers Bureau, Merit Medical Systems, Inc

PURPOSE

When performing renal mass cryoablation in difficult anatomic locations, adjunctive techniques such as retrograde pyeloperfusion, hydrodissection, and angioplasty balloon interposition can improve safety and technical success rates. Prior studies have reported the technical success of these techniques, but correlation with longer-term outcomes has not been reported in this specific patient population. This study quantifies the success of these techniques, and correlates with long-term cross-sectional imaging outcomes.

METHOD AND MATERIALS

Retrospective analysis of percutaneous renal mass cryoablation was performed from September 2011 through October 2014 at a single, tertiary care institution. Cases using adjunctive techniques were analyzed. The diagnostic cross sectional imaging, procedural images and report, and follow-up multi-phasic cross-sectional imaging were reviewed by one radiology resident and one interventional radiology attending. The type of adjunctive technique used, reason for such utilization, and procedural outcome of the technique were recorded. Specifically, in cases of hydrodissection or balloon angioplasty interposition, measurements of the displacement distance were made. Minor and major complications were recorded, per Society of Interventional Radiology criteria. Longer-term outcomes were evaluated by review of follow-up cross-sectional imaging.

RESULTS

Out of 53 cryoablations during the study period, 9 utilized adjunctive techniques, including hydrodissection (n=8), retrograde pyeloperfusion (n=1), and angioplasty balloon interposition (n=1). Median greatest tumor dimension was 1.9cm (range 1.3-3.5cm). Prior to adjunctive technique, median tumor proximity to closest organ was 0.4cm (range 0.1-1.3cm). After technique was used, median distance to closest organ was 2.8cm (range 0.3-3.3cm). One hydrodissection was unsuccessful, thus angioplasty balloon interposition was then performed. All cases had appropriate ablation zones and protection of adjacent critical structures. No minor or major complications were reported. No patients had evidence of residual or recurrent tumor on follow-up imaging, ranging from 3 to 30 months.

CONCLUSION

Adjunctive techniques to allow cryoablation of renal masses in difficult anatomic locations have excellent technical success rates and long-term outcomes.

CLINICAL RELEVANCE/APPLICATION

Improving outcomes of difficult renal mass cryoablations.

VSI011-11 Small Renal Mass (T1a): The Case for Microwave

Sunday, Nov. 29 3:40PM - 4:00PM Location: S405AB

Participants

Fred T. Lee JR, MD, Madison, WI (*Presenter*) Stockholder, NeuWave Medical, Inc; Patent holder, NeuWave Medical, Inc; Board of Directors, NeuWave Medical, Inc; Patent holder, Medtronic, Inc; Inventor, Medtronic, Inc; Royalties, Medtronic, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

VSI011-12 Long-term Clinical Outcomes Following Radiofrequency and Microwave Ablation of Renal Cell Carcinoma at a Single Large VA Medical Center

Sunday, Nov. 29 4:00PM - 4:10PM Location: S405AB

Participants

Salim E. Abboud, MD, Cleveland, OH (*Presenter*) Nothing to Disclose Tanay Y. Patel, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Stephanie Soriano, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Nannette Alvarado, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose Preet S. Kang, MD, Pepper Pike, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Earlier detection and a desire to preserve renal function and decrease surgical morbidity in the treatment renal cell carcinoma (RCC) has prompted increased use of percutaneous thermal ablation treatments such as radiofrequency ablation (RFA) and more recently microwave ablation (MWA). MWA has the potential to provide more complete ablation compared to RFA in part due to more uniform and higher intra-tumoral temperatures, but only a few small studies have examined the short-and long-term outcomes of MWA for RCC. This retrospective review assesses the experience and technical short- and long-term success rates of using RFA and MWA for RCC at a large VA medical center.

METHOD AND MATERIALS

Patient and tumor characteristics (tumor size, nearness to collecting system, anterior/posterior location, location relative to polar line, and endophytic/exophytic predominance) were tabulated using descriptive statistics. Group comparisons were performed by using univariate logistic regression analysis to determine factors impacting primary efficacy, secondary efficacy, and technique effectiveness. Kaplan-Meier local tumor progression-free survival following ablation was calculated.

RESULTS

71 patients with 78 renal lesions underwent ablation. Mean, primary, and secondary mean follow-up were 35.1, 33.5, and 31.3 months. Total, primary, and secondary technique effectiveness rates were 86%, 82%, and 4%, respectively. Primary efficacy and total technique effectiveness were associated with size, with p values of 0.02 and 0.001. There was no significant difference in survival curves between MWA and RFA treated patients. MWA and RFA groups were not significantly different in terms of age, BMI, or tumor size. Complications occurred in 11.5% of patients, none resulting in death. More than 90% patients were done as outpatients (sent home day of procedure) with moderate sedation. No cases used intubations or general anesthesia.

CONCLUSION

RFA and MWA both represent effective treatment modalities for RCC. Longer follow-up time and larger tumor size may be associated with the somewhat lower effectiveness rates; the comparable efficacy/complication rates compared to prior ablation studies demonstrate the feasibility of performing ablations on an outpatient basis.

CLINICAL RELEVANCE/APPLICATION

Image guided percutaneous ablation is an effective and cost-effective treatment modality for RCC in patients that are not surgical candidates.

VSI011-13 To Biopsy or Not Biopsy the Small Renal Mass before Ablation? That Is the Question

Participants

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

Characterization of small renal masses has proven challenging. However, with appropriate CT and MR protocols, the majority of these lesions can now be characterized pre procedurally, enabling a confident diagnosis. In this lecture, we will describe renal mass characterization protocols and describe the common imaging signatures of RCC subtypes and their common mimics including lipid poor AML and oncocytoma. This may eliminate need for preprocedural biopsy.

VSIO11-14 Biopsy or No Biopsy Before Ablation? Biopsy Every Renal Mass before Percutaneous Ablation

Participants

William W. Mayo-Smith, MD, Boston, MA (*Presenter*) Author with royalties, Reed Elsevier; Author with royalties, Cambridge University Press

LEARNING OBJECTIVES

View learning objectives under main course title.

VSIO11-15 Biopsy or No Biopsy before Ablation? Don't Trouble Yourself or the Patient with the Renal Mass Biopsy - Imaging Diagnosis Will Do Just as Well in 2015

Sunday, Nov. 29 4:50PM - 5:10PM Location: S405AB

Participants

Steven S. Raman, MD, Santa Monica, CA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

VSIO11-16 Thermal Ablation of a Confluent Lesion in the Porcine Kidney with Magnetic Resonance Guided High Intensity Focused Ultrasound (MR-HIFU)

Sunday, Nov. 29 5:10PM - 5:20PM Location: S405AB

Participants

Johanna M. van Breugel, MSc, Utrecht, Netherlands (*Presenter*) Nothing to Disclose Martijn de Greef, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Joost W Wijlemans, MD,PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Gerald Schubert, PhD, Vantaa, Finland (*Abstract Co-Author*) Employee, Koninklijke Philips NV Chrit T. Moonen, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Maurice V. Bosch, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose Mario G Ries, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate if MR-HIFU can provide for a reliable confluent volumetric lesion in the renal cortex in a clinically relevant time-frame in a porcine study.

METHOD AND MATERIALS

Nine anesthetized pigs were placed on a clinical Philips Sonalleve MR-HIFU therapy system integrated with a 1.5T Achieva MRI. Both acoustic energy delivery and MR-thermometry were respiratory gated and active surface cooling was employed to prevent near-field damage. A honeycomb pattern of at least seven ablation cells (9-25s, 450W acoustic power, 4x4x10 mm3 per cell) were positioned in the cortex of the kidney. The therapeutic endpoint was evaluated by a non-perfused volume (NPV) measurement using DCE-MRI. Subsequently, the animal was euthanized and the extent of induced necrosis was examined using a cellular viability staining (NADH).

RESULTS

Confluent volumes on NPV-imaging (up \sim 3 mL) and NADH staining (up to \sim 4mL) were obtained and temperatures exceeding 60°C were reached in 6 pigs. I.e. heating of the false rib, poor respiratory correction, and a large incidence angle caused poor kidney heating in 3 pigs.

CONCLUSION

These first results indicate that current clinical MR-HIFU equipment might be suitable for non-invasive therapy of renal masses. Positioning of the sonications and the subject based on anatomical scans is very important, as well as adequate motion compensation. Future work will include a first clinical study on renal cell carcinomas.

CLINICAL RELEVANCE/APPLICATION

There is an increasing interest in non-invasive kidney sparing therapy for renal cancer, since ~1.6% of men and women will be diagnosed with kidney and renal pelvis cancer during their lifetime, in 25% of all abdominal imaging sessions a renal lesion is found, partial nephrectomy - standard care for tumors <4cm - has a 15% complication rate, and the population is aging and known with comorbidities and poor physical condition. Therefore, several patient studies investigated the feasibility of HIFU for the thermal ablation of renal masses. Mainly a hand-held extracorporeal ultrasound device with US B-mode imaging for guidance or a laparoscopic approach was used. Disadvantages are i.e. the lack of respiratory motion compensation, no real-time visualization of energy deposition, and the complexity of the probe positioning. Alternatively, feasibility of MR-HIFU interventions on the kidney with respect to motion compensated real-time thermometry and acoustic energy delivery was established, recently.

VSI011-17 Outside the Box: Is Ablation Effective for Masses other than T1a RCC

Participants

LEARNING OBJECTIVES

VSI011-18 Percutantous Ablation for T1b Tumors

Sunday, Nov. 29 5:20PM - 5:40PM Location: S405AB

Participants Thomas D. Atwell, MD, Rochester, MN ($\ensuremath{\textit{Presenter}}\xspace$) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

VSI011-19 Percutantous Ablation for Angiomyolipomas

Sunday, Nov. 29 5:40PM - 6:00PM Location: S405AB

Participants

Fred T. Lee JR, MD, Madison, WI (*Presenter*) Stockholder, NeuWave Medical, Inc; Patent holder, NeuWave Medical, Inc; Board of Directors, NeuWave Medical, Inc; Patent holder, Medtronic, Inc; Inventor, Medtronic, Inc; Royalties, Medtronic, Inc

LEARNING OBJECTIVES

RCB12

Creating and Delivering Online and Mobile Education Content: From Online Courses to Interactive iBooks (Hands-on)

Sunday, Nov. 29 2:00PM - 3:30PM Location: S401CD



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

Participants

George L. Shih, MD, MS, New York, NY, (george@cornellradiology.org) (*Moderator*) Consultant, Image Safely, Inc; Stockholder, Image Safely, Inc; Consultant, Angular Health, Inc; Stockholder, Angular Health, Inc;

LEARNING OBJECTIVES

1) Assess the potential of online and mobile e-learning innovations to augment your residents', medical students', and staff's educational curricula. 2) Acquire the domain knowledge to use already available content (eg, PowerPoint presentations) to both create video content and deploy e-learning courses on modern web-based and mobile platforms. 3) Acquire the domain knowledge to create an interactive Apple iBook (electronic books) with text, images, video, and interactive questions.

ABSTRACT

1. From OpenCourseWare to the Khan Academy, and now to Coursera and edX, e-learning has been dramatically improved over the last decade, changing education from the normal classroom into learning done at convenience, and also allows for more creative and engaging content during the typical lecture. Stanford Med published positive initial findings in utilizing video-based lectures in an interactive class setting. Leveraging this new way of learning, requires knowledge about the types of technology and platforms for these courses.2. The workflow required to host an e-learning course can be summarized in 3 steps: (a) creating the educational content, (b) hosting the materials, and (c) making the materials available to the intended audience. E-content today typically consists of lecture slides along with video recordings captured by technology like TechSmith Camtasia (non-free) and Apple Quicktime (free). Once the materials are created and edited, one must choose a suitable hosting platform realistic to the skills and goals of the instructor with options that include coursesites.com, iTunes U, and YouTube / Google Hangouts. Students can then be invited to view the material or the content can be made available to the public.3. Creating and publishing e-books is a great way to share your teaching material as an engaging interactive tool. Publishing in e-book format solves many logistical problems of conventional publishing and the e-book format has interactive features that paper books can't match. We will review the process of creating your own e-book from assembling material to layout design to submitting for e-publication. Specifically Apple iBooks Author software will be used to demonstrate converting an existing Powerpoint presentation or journal publication into an e-book. In addition, the course will go over how to publish with or without DRM (copy-protection) and ways to obtain an ISBN for publishing for sale. Online resources will also be reviewed.

Sub-Events

RCB12A Screencasting Basics on the Desktop and on the iPad

Participants Ian R. Drexler, MD, MBA, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RCB12B Massive Open Online Course (MOOC) Creation and Hosting

Participants Kurt T. Teichman, BSc, MEng, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RCB12C Interactive iBooks to Supplement your Online Course

Participants Alan C. Legasto, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

Modern Non-invasive Imaging of Cholestatic Liver Diseases

Sunday, Nov. 29 2:00PM - 3:30PM Location: S404AB



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

Participants

Ahmed Ba-Ssalamah, MD, Vienna, Austria (*Presenter*) Nothing to Disclose Aliya Qayyum, MBBS, Houston, TX (*Presenter*) Nothing to Disclose Richard M. Gore, MD, Evanston, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe MRI ; MRCP techniques for evaluating biliary disease. 2) List applications in malignant biliary disease. 3) List applications in benign conditions of the biliary tract.

ABSTRACT

This workshop is designed to review the broad spectrum of morphologic and functional features encountered in patients with cholestatic liver diseases involving the intrahepatic and extrahepatic bile ducts and adjacent liver parenchyma, in correlation with the histopathologic hallmark of this group of diseases the so-called "vanishing duct sign. We will start by explaining the role of various different imaging modalities including invasive endoscopic retrograde cholangiopancreatography (ERCP) and non-invasive conventional T2 weighted magnetic resonance cholangiography (MRCP) as well as gadoxetic acid-enhanced T1 MRCP and diffusion weighted images to expedite the evaluation of patients with known or suspected cholestatic liver diseases. Next, we will discuss the broad spectrum of biliary disorders that define cholestatic liver diseases including: primary sclerosing cholangitis (PSC), primary biliary cirrhosis (PBC), ischemic cholangiopathy, chronic rejection following liver transplant, drug-induced liver injury (DILI), infectious secondary cholangitis, cystic fibrosis (CF), etc.

Informatics-enabled Peer Review - Lessons from Large Scale Implementations

Sunday, Nov. 29 2:00PM - 3:30PM Location: S404CD

IN LM

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

Participants

Jonathan B. Kruskal, MD, PhD, Boston, MA, (jkruskal@bidmc.harvard.edu) (Moderator) Author, UpToDate, Inc

LEARNING OBJECTIVES

Sub-Events

RC153A ACR RadPeer Experiences

Participants Hani H. Abujudeh, MD, MBA, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the components of the ACR RADPEER system. 2) List the strengths and weakness of RADPEER.

ABSTRACT

RADPEER is the ACR peer review system, used by over 17,000 radiologists. It is the largest radiology peer review system in the world. RADPEER has undergone many improvements since first released, and more improvements are coming in the future. RADPEER design includes an interesting case section. Future improvements may be in ways to use RADPEER data for Performance Improvement activities.

RC153B Focus on Workflow Integration

Participants

Tarik K. Alkasab, MD, PhD, Boston, MA, (talkasab@mgh.harvard.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe how RADPEER-based systems are typically integrated into radiology workflows. 2) Describe how alternative, groupbased peer review systems can be integrated into radiology workflows. 3) Discuss emerging methods of integrating radiology peer review with the radiologist workday.

RC153C Peer Review Analytics

Participants

V. Anik Sahni, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the importance of analytics in the peer review process. 2) Explore the IT solutions available to develop an analytics tool. 3) Discuss data presentation and important key metrics.

RC153D Impact of Peer Review on the Quality of Interpretation

Participants

Jonathan B. Kruskal, MD, PhD, Boston, MA, (jkruskal@bidmc.harvard.edu) (Presenter) Author, UpToDate, Inc

LEARNING OBJECTIVES

Discuss emerging options for effective peer review. 2) Describe ways in which peer review can result in improved perfromancve.
 Descibe methods for improving the utility and effectiveness of the peer review process.

ABSTRACT

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/

Jonathan B. Kruskal, MD, PhD - 2012 Honored Educator

Breast Imaging: Fundamentals of Interpretation

Sunday, Nov. 29 2:00PM - 3:30PM Location: S406A

BR DM US

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

Participants

Sub-Events

RC115A ACR Accreditation

Participants

Brett T. Parkinson, MD, Salt Lake Cty, UT (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the history and current relevance of Breast Imaging Accreditation. 2) Be familiar with the scoring standards for breast imaging accreditation, including reasons for failure. 3) Learn about electronic submission of mammography images for accreditation. 4) Appreciate the importance of attaining Breast Imaging Centers of Excellence status.

RC115B Mammography: A Practical Approach to Breast Lesions

Participants

Gilda Cardenosa, MD, Richmond, VA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) The participants should be able to develop a practical common sense approach to the detection and subsequent evaluation of breast lesions. The participant should be able develop an approach focused on the use of prior films, additional spot compression views and ultrasound in establishing the significance of screen detected lesions and the evaluation of patients presenting with clinical signs and symptoms.

ABSTRACT

A basic, practical and common sense approach in the detection and evaluation of potential breast lessons is presented. As a starting point the need to sit back and review the images globally for potential technical issues that may limit or preclude interpretation, breast size asymmetry, parenchymal asymmetry (focal, global or developing) and the presence of diffuse changes will be discussed. After the images are accessed globally, the active search for the presence of potential masses, calcifications and distortion will be discussed. The importance of using prior films, additional spot compression views, physical examination and ultrasound before making management decisions will be emphasized all towards the goal of minimizing potential delays in the diagnosis of early breast cancers.

RC115C Breast Ultrasound

Participants

Paula B. Gordon, MD, Vancouver, BC (*Presenter*) Stockholder, OncoGenex Pharmaceuticals, Inc ; Scientific Advisory Board, Hologic, Inc; Scientific Advisory Board, RealImaging

LEARNING OBJECTIVES

1) Participants should have greater confidence in performing and interpreting breast ultrasound exams, with an understanding of knobology and post-processing to produce optimal images, and to make use of Doppler to assess breast masses. A brief explanation of elastography will be included. 2) Participants will also gain understanding of the challenges of mammographic-sonographic correlation, and an approach for when correlation is uncertain.

ABSTRACT

Breast ultrasound is an indispensable adjunct to mammography. Using BIRADS criteria, ultrasound can provide critical information that can lead to the earlier diagnosis of cancer, but also allow a definitive benign diagnosis and eliminate the need for invasive procedures. This requires optimal imaging. This course will cover the fundamentals of breast ultrasound including: Equipment selection, set-up and optimization, including the proper use of focal zones, compounding and harmonics, Doppler and elastography. Lesion characterization using BIRADS descriptors will be discussed for simple and complicated cysts, and criteria for distinguishing benign from malignant solid masses. Mamographic/sonographic correlation is key, when the indication for the examination is investigation of a mass seen at screening mammography. This is fairly straightforward when the mass is large and solitary, but more challenging when it is small and/or there are multiple masses. The ultrasound finding has to correspond to the location of the mammographic mass as well as the character of the mass.

Pain and Sedation in 2015: Improving Quality and Patient Outcomes

Sunday, Nov. 29 2:00PM - 3:30PM Location: S504AB

IR

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

Participants

Fred E. Shapiro, DO, Boston, MA (*Presenter*) Nothing to Disclose Richard D. Urman, MD, MBA, Boston, MA (*Presenter*) Nothing to Disclose Hesham H. Malik, MD, Worcester, MA, (Hesham.Malik@umassmemorial.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) An evidenced-based review of the current literature and how to measure quality and safety related to procedural sedation. 2) Understand the necessity and the role that team training contributes to a safe procedural environment. 3) Review appropriate patient selection for interventional procedures. 4) Review procedural sedation policies, accreditation, pharmacology and patient monitoring. 5) Challenging cases presentation and discussion.

ABSTRACT

The safe and effective sedation of patients during interventional Radiology procedures requires an in depth knowledge of how to administer conscious sedation. Even more important, however, is the skill set to be able to accurately assess each patient's clinical status prior to the procedure, be able to formulate a comprehensive sedation plan, and recognize which patients would be better served by involvement of an Anesthesiologist. This course will review the institutional requirements for providing minimal, moderate or deep sedation. We will also outline how to develop a procedural sedation (PS) policy, including recognition of the role that team training contributes to a safe environment. We will review the use of the Institute for Safety in Office Based Surgery (ISOBS) safety checklist as well as its customization to the IR settingWe will provide an evidenced-based review of the current literature re: QA, risk management, and process improvement using the ISOBS checklist as well as a review of drugs commonly used for procedural sedation.

RC111

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

Sunday, Nov. 29 2:00PM - 3:30PM Location: S505AB

HN NR CT NM OI

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

Participants

LEARNING OBJECTIVES

Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC111A Practical Approach for Interpreting Head and Neck PET/CT

Participants

Rathan M. Subramaniam, MD, PhD, Baltimore, MD, (rsubram4@jhmi.edu) (*Presenter*) Travel support, Koninklijke Philips NV

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

RC111B PET/CT for Head and Neck Cancer: Clinical Applications and Case Studies

Participants

Eric M. Rohren, MD, PhD, Houston, TX (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.

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/

Eric M. Rohren, MD, PhD - 2015 Honored Educator

RC111C The Head and Neck Surgeon's Perspective: What I Need to Know

Participants Nishant Agrawal, MD, Baltimore, MD (*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.

Precision Medicine through Image Phenotyping

Sunday, Nov. 29 2:00PM - 3:30PM Location: S403A

CA CH VA BQ IN

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

Participants

Ella A. Kazerooni, MD, Ann Arbor, MI (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn what the term precision medicine means. 2) To understand how informatics intersects with clinical radiology to enable precision medicine in practice. 3) To learn through concrete examples how informatics based radiology precision medicine impacts health

ABSTRACT

Biomarkers have been emrabced by both the scientific and regulatory communities as surrogates end points for clinical trials, paving the way for their widespread use in medicine. The field of imaging biomarkers has exploded, and the their integration into clinical practice relies heaving on and intersects with the field of bioinformatics.. Once specific biomakers are show to have value, easily integrating them into the digital environment of the radiologist and communcating them to the health care providers and or directly to patients effeiciently and seamlessly is important for their value and impact on health to be realized. Culturally, it is taking radiologists from the era of description and largely qualitative reporting, into a quantitative future state, and leveraging informatics to extract information from imaging alone ot together with data available in the electronic medical record is essential for future sucess in this new world. To get there, understanding the impact of this approach as a value of our services, and standardization of imaging technques along the lines of what the RSNA QIBA initiative is designing, are essential, so that imaging biomarkers are robust, accurate and reprodicbile. Embraching this approach enables and facilitates new appracohes, relationships of imaging and IT researchers, vendors and consumers, to fully realize the possibilities. This course will discuss and describe the overall constructs, and use tangible exams of using this in practice today and for the future.

Sub-Events

RC154A Lung Nodules: Combining Population and Patient Specific Data to Inform Personalized Decision Making

Participants

Eliot L. Siegel, MD, Severna Park, MD (*Presenter*) Research Grant, General Electric Company; Speakers Bureau, Siemens AG; Board of Directors, Carestream Health, Inc; Research Grant, XYBIX Systems, Inc; Research Grant, Steelcase, Inc; Research Grant, Anthro Corp; Research Grant, RedRick Technologies Inc; Research Grant, Evolved Technologies Corporation; Research Grant, Barco nv; Research Grant, Intel Corporation; Research Grant, Dell Inc; Research Grant, Herman Miller, Inc; Research Grant, Virtual Radiology; Research Grant, Anatomical Travelogue, Inc; Medical Advisory Board, Fovia, Inc; Medical Advisory Board, Toshiba Corporation; Medical Advisory Board, McKesson Corporation; Medical Advisory Board, Carestream Health, Inc; Medical Advisory Board, Bayer AG; Research, TeraRecon, Inc; Medical Advisory Board, Bracco Group; Researcher, Bracco Group; Medical Advisory Board, Merge Healthcare Incorporated; Medical Advisory Board, Microsoft Corporation; Researcher, Microsoft Corporation

LEARNING OBJECTIVES

1) Describe how data from a clinical trial can be repurposed as a decision support tool. 2) List some of the potential techniques that can be utilized to predict likelihood of a malignant nodule from the NLST database. 3) Explain how the Fleischner Guidelines can be personalized utilizing data from NLST and PLCO. 4) Detail the implications for lung screening trials of having access to NLST and PLCO data. 5) Demonstrate how a healthcare enterprise can create their own local reference database using information from their own patient population.

ABSTRACT

The era of personalized/precision medicine offers the potential to utilize patient and lesion specific data to personalize screening and diagnostic work-up, diagnosis, and treatment selection to a particular patient to optimize effectiveness. Although recently, the emphasis has been on utilization of genomic data in personalized medicine, there is a 'gold mine' of useful data in previously conducted clinical trials as well as patient medical electronic records that has, until now, gone largely untapped. The purpose of this presentation is to describe how the screening, diagnosis, and treatment of lung nodules can be personalized utilizing data from the NLST and PLCO clinical trials and how the Fleischner Guidelines and screening criteria for lung cancer can be modified according to the characteristics of an individual patient and individual nodule. The presentation will also include ways in which a facility can collect local data on their own patients to supplement these reference databases with experience from their own patient population.

RC154B Managing Cardiovascular Care through Image Phenotyping Combined with Patient Level Data

Participants John J. Carr, MD, MS, Nashville, TN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

Cardiovascular diseases(CVD) develop over an individual's lifetime. CVD is the number one cause of death and morbidity worldwide. Integrated application of genomics, quantitative imaging and "big data" has the potential to positively transform cardiovascular

prevention and care and reduce the health and economic consequence of CVD. In this talk we will review how easily obtainable imaging biomarkers, already available, can power this change. Measures of cardiac and vascular structure and function as well as body composition provide great insight into and individual's risk of CVD, level of physical activity, diet, vascular health and general well-being. NR

Difficult Diagnoses in Neuroradiology

Sunday, Nov. 29 2:00PM - 3:30PM Location: S406B

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

FDA Discussions may include off-label uses.

Participants

Christopher P. Hess, MD, PhD, Mill Valley, CA, (christopher.hess@ucsf.edu) (*Moderator*) Research Grant, General Electric Company; Research Grant, Quest Diagnostics Incorporated; Research Grant, Cerebrotech Medical Systems, Inc; Vincent P. Mathews, MD, Milwaukee, WI (*Moderator*) Nothing to Disclose

Sub-Events

RC105A Pituitary Lesions: Not as Easy as They Seem

Participants

Michael N. Brant-Zawadzki, MD, Newport Beach, CA, (mbrant@hoag.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Appreciate the prevalence of "incidental" lesions within the pituitary gland, and their origin. 2) Differentiate intrinsic pituitary gland lesions from non-pituitary lesions simulating intrinsic disease. 3) Utilize common MRI parameter choices to help specify pathology in the pituitary region.

ABSTRACT

The pituitary gland's size, important function, and detailed surrounding anatomy of disparate structures makes it an "acid test" for the accuracy and specificity of any imaging modality. The multiplicity of intrinsic lesions, as well as the plethora of surrounding structural histology produces a wide bandwidth of abnormalities in the pituitary fossa and its environs. A systematic approach to analyzing lesions of the pituitary region will be presented, common pitfalls explored, and atypical examples utilized to review the approach to a targeted differential diagnosis for lesions of this region.

RC105B Is it Vasculitis?

Participants

Daniel M. Mandell, MD, Toronto, ON, (danny.mandell@uhn.ca) (Presenter) Research funded, General Electric Company;

LEARNING OBJECTIVES

1) Appreciate the spectrum of imaging findings in CNS vasculitis. 2) Appreciate findings that help differentiate among related conditions. 3) Understand the role of imaging relative to other tests (CSF sampling, biopsy etc...).

ABSTRACT

Abstract:Central nervous system (CNS) vasculitis is relatively uncommon. However, multifocal abnormalities on CT/MRI and/or intracranial arterial narrowing on CTA/MRA often leads to consideration of this diagnosis. I will discuss the spectrum of imaging findings in CNS vasculitis, including brain parenchymal and meningeal findings, angiographic findings, and the emerging role of vessel wall MRI. I will then focus on the differential diagnosis, and findings that can help differentiate among conditions that mimic vasculitis. Finally, we will consider how imaging fits into the broader clinical work-up which may include cerebrospinal fluid sampling and biopsy.

RC105C Spontaneous Intracranial Hypotension

Participants

William P. Dillon, MD, San Francisco, CA, (william.dillon@ucsf.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the clinical presentation, variations thereof, and MR and CT features of SIH. 2) Understand the approach to treatment of SIH with autologous blood patch. 3) Understand the potential complications of SIH, and blood patch.

ABSTRACT

Spontaneous intracranial hypotension (SIH) is a syndrome of low cerebrospinal fluid volume and or pressure that typically results from either a spinal dural defect at a perineural cyst or from an osteophyte/ disc penetrating through the ventral dura. Postural headache is the most common symptom. Other reported symptoms include nausea, vertigo, cranial nerve palsies, visual impairment, quadriplegia, and coma. Because of the nonspecific nature of symptoms, the diagnosis may be missed or mistaken for other disease entities. These patients may be surgically treated for subdural fluid collections or 'Chiari 1 malformations' instead of the underlying spinal cause of intracranial hypotension. Patients with connective tissue disorders - such as Marfan syndrome, Ehlers-Danlos syndrome, and autosomal dominant polycystic kidney disease - are at increased risk of SIH. The most appropriate therapy for SIH is an epidural blood patch, which ideally should be directed to the location of the leak, if it is known. If the location of the leak is unknown, then the epidural blood patch can be placed in a nonselective fashion. Described imaging findings of SIH include diffuse pachymeningeal enhancement, subdural fluid collections, cerebellar tonsillar herniation, distention of the dural venous sinuses, enlargement of the pituitary gland and downsloping of the floor of the third ventricle. Ct guided epidural blood patch following detection of the CSF fistula is the most efficient and appropriate first line of therapy. The diagnostic findings, complications of

untreated SIH, and the approach to the patient with suspected CSF fistula of the spine will be discussed.

Quantitative Imaging Mini-Course: Promise and Challenges

Sunday, Nov. 29 2:00PM - 3:30PM Location: S502AB

BQ

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

Participants

Michael F. McNitt-Gray, PhD, Los Angeles, CA (*Director*) Institutional research agreement, Siemens AG; Research support, Siemens AG; ; ; ; ;

Sub-Events

RC125A The Perspective of the RSNA Quantitative Imaging Biomarker Alliance (QIBA)

Participants

Edward F. Jackson, PhD, Madison, WI, (efjackson@wisc.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the need for and benefits of implementing quantitative image analyses in clinical trials and clinical radiology practice. 2) Understand the activities that RSNA supports to help move the profession of radiology from a primarily qualitative interpretation paradigm to a more quantitative-based interpretation model. 3) Describe the challenges of extracting uniform, standardized quantitative measures from clinical imaging scans. 4) Provide examples of approaches to resolving some of these challenges.

ABSTRACT

The RSNA Strategic Plan strives to advance the radiological sciences and foster the development of new technologies in part by promoting the quantification of imaging results. The added value of quantification in both research and clinical environments is likely to increase as health care initiatives place increased pressure on radiologists to provide decision support for evidence-based care. There remain substantial barriers to the widespread use of quantitative measures in clinical radiology, including an inherently large number of variables that impede validation of specific metrics, diversity of proprietary industry platforms, and lack of acceptance by radiologists. A critical barrier to the implementation of quantitative imaging in radiology is the lack of standardization among vendor platforms. Collaboration in the pre-competitive space is challenging yet crucial to address standardization, and integrating quantitative measurement into workflow will be necessary for wide adoption. The Quantitative Imaging Biomarkers Alliance (QIBA) was officially launched in 2007 as a means to unite researchers, healthcare professionals, and industry stakeholders in the advancement of quantitative imaging. QIBA's mission is to improve the value and practicality of quantitative biomarkers by reducing variability across devices, patients, and time. The four QIBA modality-driven Coordinating Committees (CT, MR, Nuclear Medicine, US) currently oversee nine Biomarker Committees, and associated task forces, that develop QIBA Profiles (i.e., documents) of standardized technical performance specifications for image acquisition, data processing and analysis, and compliance.

RC125B NCI's Quantitative Imaging Network (QIN) Perspective

Participants

Robert J. Nordstrom, PhD, Rockville, MD (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Gain an overview of the NCI Quantitative Imaging Network (QIN). 2) Identify conditions for application submission and review. 3) Identify the needs and benefits for implementing quantitative imaging principles aimed at measurement or prediction of response to therapy in clinical trials. 4) Understand the need for network involvement in these activities.

ABSTRACT

The NCI Quantitative Imaging Network (QIN) is an international association of research teams with the mission to improve the role of quantitative imaging for clinical decision making in oncology by the development and validation of data acquisition, analysis methods, and tools to tailor treatment to individual patients and to predict or monitor the response to drug or radiation therapy. To that end, the teams are moving from the activities of developing and optimizing decision support tools to validating them in clinical environments. This lecture will chart the history of the QIN, show examples of the research results from several teams, and review results of the recent annual meeting.

RC125C Clinical Trial Perspective

Participants

Lawrence H. Schwartz, MD, New York, NY (*Presenter*) Committee member, Celgene Corporation; Committee member, Novartis AG; Committee member, ICON plc; Committee member, BioClinica, Inc

LEARNING OBJECTIVES

1) Gain an overview of the NCI's National Clinical Trials Network (NCTN). 2) Identify the need for Quantitative Imaging within the trial network and in specific trials. 3) Review examples of trial design incorporating Quantitative Imaging. 4) Review recent initiatives in Precision Medicine and the potential role for Quantitative Imaging.

ABSTRACT

Advances in the understanding of the cancer genome has supported the development of targeted therapeutics such as imatinib, erlotinib, crizotinib, and vemurafenib that have changed the approach to cancer treatment, allowing for individualized therapy. In order to study these targeted therapies in an individual manner, cancer clinical trials will need to screen large numbers of patients

in order to identify the subset with the molecular targets that are appropriate to study. In addition, improved efficiencies have been implemented to streamline important central functions related to tissue banks, regulatory approvals and imaging transfer and archiving. The role of imaging both within the NCTN and in precision medicine is undergoing change as well. This will be explored and discussed to understand how we can optimize the role of Quantitative Imaging. Accountable Care Organizations: Real World Experience for Radiologists

Sunday, Nov. 29 2:00PM - 3:30PM Location: S105AB

HP

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

Participants

Clifford J. Belden, MD, Lebanon, NH, (cliffbelden@gmail.com) (*Coordinator*) Nothing to Disclose Clifford J. Belden, MD, Lebanon, NH, (cliffbelden@gmail.com) (*Moderator*) Nothing to Disclose John H. Lohnes, MD, Wichita, KS (*Presenter*) Nothing to Disclose Jonathan Breslau, MD, Sacramento, CA (*Presenter*) Investor, BioIncept, LLC

LEARNING OBJECTIVES

1) Contrast the potential risks and benefits of new payment models vs. traditional fee for service from the patient and radiologist perspective. 2) Explain the impact that new payment models might have on the practice of radiology. 3) Identify the opportunities that new are emerging as payment transitions away from traditional fee for service. 4) Explain how imaging impacts cost risk within health care organizations to support value-based payments. 5) Describe the effect of an increasingly price-conscious consumer on radiology business models.

ABSTRACT

IHE Workflow Efficiency from Acquisition to the Report

Sunday, Nov. 29 2:00PM - 3:30PM Location: S501ABC

IN

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

Participants

Bradley J. Erickson, MD, PhD, Rochester, MN (*Moderator*) Stockholder, Evidentia Health, Inc; Stockholder, OneMedNet Corporation; Stockholder, VoiceIt Technologies, LLC

Bradley J. Erickson, MD, PhD, Rochester, MN (*Presenter*) Stockholder, Evidentia Health, Inc; Stockholder, OneMedNet Corporation; Stockholder, VoiceIt Technologies, LLC

Harry Solomon, Barrington, IL (Presenter) Employee, General Electric Company

Brad Genereaux, Waterloo, ON, (brad.genereaux@agfa.com) (Presenter) Employee, Agfa-Gevaert Group

LEARNING OBJECTIVES

1) Understand the IHE profile for managing radiology report templates (MRRT). 2) Learn about the RSNA template library and how it works together with the MRRT profile so you can easily download and use RSNA templates. 3) Discover how the MRRT profile allows you to take your templates with you when you change systems or change jobs. 4) Review the enhanced features available in MRRT templates.

ABSTRACT

The purpose of this session is to demonstrate how existing and planned IHE profiles can help improve the workflow in a medical imaging department, and help those responsible for its operation, monitor what is happening. Prior IHE profiles focused heavily on traditional RIS and PACS. Newer projects are focused on departmental workflow management and monitoring, as well as exchange of images and reports between medical facilities. We will also describe future possible profiles for utilizing RadLex to improve radiologist efficiency and improve departmental workflow.

Pediatric Series: Fetal/Neonatal

Sunday, Nov. 29 2:00PM - 3:30PM Location: S102AB



AMA PRA Category 1 Credits ™: 3.25 ARRT Category A+ Credits: 4.00

Participants

Daniela Prayer, MD, Vienna, Austria (*Moderator*) Nothing to Disclose Amy R. Mehollin-Ray, MD, Houston, TX, (armeholl@texaschildrens.org) (*Moderator*) Nothing to Disclose

Sub-Events

RC113-01 Fetal MRI of Genitourinary Tract Abnormalities

Sunday, Nov. 29 2:00PM - 2:20PM Location: S102AB

Participants

Ann M. Johnson, MD, Philadelphia, PA, (johnsona@email.chop.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn basic fetal MRI techniques and relevent embryology. 2) Understand what fetal MRI can add in evaluation of genitourinary (GU) abnormalities. 3) Become familiar with patterns of fetal GU abnormalities with an emphasis on complex lesions affecting multiple organ systems, such as cloacal malformation spectrum and exstrophy. 4) The purpose of the course is to understand the potential role of fetal MRI in the evaluation of fetal genitourinary tract abnormalities. There will be an emphasis on complex lesions affecting multiple organ systems, such as cloacal malformation spectrum and exstrophy.

RC113-02 Novel Nanoparticle Gd Contrast Agent Does Not Penetrate the Placental Barrier

Sunday, Nov. 29 2:20PM - 2:30PM Location: S102AB

Participants

Anil N. Shetty, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Ketan B. Ghaghada, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Robia Pautler, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Wesley Lee, MD, Houston, TX (*Abstract Co-Author*) Research support, General Electric Company Research support, Koninklijke
Philips NV Research support, Siemens AG Research support, Samsung Electronics Co Ltd
Haijun Gao, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Chandra Yallampalli, DVM,PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
David Rendon, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Ananth Annapragada, PhD, Houston, TX (*Abstract Co-Author*) Stockholder, Marval Pharma Ltd Stockholder, Alzeca Biosciences LLC
Stockholder, Sensulin LLC Stockholder, Abbott Laboratories Stockholder, Johnson

PURPOSE

Gd contrast agent usage in placental imaging is generally contraindicated, for concerns related to fetal contrast agent exposure. We therefore developed a A novel liposomal Gd nanoparticle contrast agent for T1-MRI, retaining the Gd on the maternal side, thus shielding the fetus from potential toxicities. In this study, we tested this agent in placental imaging in a mouse model, and measured its transplacental permeability.

METHOD AND MATERIALS

Female C57BL/6 mice, pregnant at gestational age E16.5±1 days, were imaged by T1-MRI on a 9.4T small animal MRI (Bruker Instruments) using a conventional contrast agent (Multihance, a meglumine salt of Gd-BOPTA chelate) (13 mice) and using the novel nanoparticle Gd agent (9 mice). DCE-MRI was conducted using consecutive 3D-SPGRE sequences at a constant flip angle of 16°, TE/TR=1.93ms/6ms, FOV = 3x3x2.5cm, matrix = 128x128x16. Each image was converted to a T1 map, and the contrast agent concentration on a pixel-by-pixel basis, estimated from the known relaxivity. After imaging, the mice were sacrificed and the Gd content of the placenta and fetus measured using ICP-AES.

RESULTS

Image and data shown below are representative of each cohort. The placentae are rather small (2mmx3mm) but are still clearly defined, and obviously not invasive into the uterine wall. Signal intensities in the placental and fetal ROI's, indicative of Gd concentration in each compartment, clearly show that the conventional Gd chelate agent penetrates the placental barrier and enters the fetus. The nanoparticle agent however, does not do so, indicated by zero signal in the fetal compartment throughout the duration of this experiment. The ICP-AES study confirmed the imaging study results, with no detectable Gd in the fetal compartment. A separate study in human placentae using an ex vivo perfused placenta preparation, also confirmed these results.

CONCLUSION

The nanoparticle contrast agent does not penetrate the placental barrier in a mouse model. The data are consistent with separate tests on a perfused human placenta model.

CLINICAL RELEVANCE/APPLICATION

The incidence of placenta accreta has increased 8-fold in the last 30 years, and improved methods for placental imaging are sorely needed. Nanoparticle Gd contrast agents described in this work could be useful for placental imaging, while maintaining fetal safety.

RC113-03 Normal and Abnormal Development of the Cerebellar Vermis - A Quantitative Fetal MRI Study

Participants

Gregor Kasprian, MD, Vienna, Austria (*Presenter*) Nothing to Disclose Gregor Dovjak, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose Peter C. Brugger, MD, PhD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose Georg Langs, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose Georg Langs, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose Michael Weber, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose Ernst Schwartz, MSc, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose Dieter Bettelheim, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose Daniela Prayer, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Postnatal neurodevelopmental outcome of fetuses with hindbrain malformations is dependent on normal growth and development of the cerebellar vermis. This comparative in vivo and post mortem fetal MRI study aims to quantitatively assess the relative dimensions of respective vermian lobules between 18 to 32 gestational weeks (GW) in normal and pathological conditions.

METHOD AND MATERIALS

75 fetuses (18-32 GW, mean 25.7GW) with normal brain development and 20 fetuses with different types of hindbrain malformations were scanned prenatally (1.5T, T2-TSE, voxel size 0.72/0.72/4.4mm - 1.0/1.0/4.4mm) and seven fetuses (16-30GW, mean 21.9GW, 3T, CISS sequence, resolution: 0.33/0.33/0.33mm) scanned within 24 hours postmortem were selected for postprocessing. A T2-weighted midline sagittal slice was identified and 2D vermian segmentation was performed using ITK snap (Figure).

RESULTS

The mean proportional size of 7/9 discriminable vermian lobules did not differ between in vivo and post mortem measurements. The relative size of the following lobules increased during gestation (Pearson, p<0.05): Culmen ($r^2=.460$) and Declive/Folium/Tuber ($r^2=.453$). The proportions of Lingula ($r^2=-.439$), Centrum ($r^2=-.554$), Pyramis ($r^2=-.303$) and Nodulus ($r^2=-.491$) decreased with gestational age. The relative size of the Uvula did not show age specific changes (p=.201). Certain types of hindbrain malformations showed common patterns of cerebellar lobular hypoplasia.

CONCLUSION

Fetal vermian lobulation can be accurately assessed by MRI between 18 and 32GW in normal and pathological conditions in vivo . Growth of specific vermian lobules is nonuniform during the second and third trimester. Distinct patterns of vermian lobular hypoplasia can be described antenatally.

CLINICAL RELEVANCE/APPLICATION

Knowledge about the distinct growth patterns of specific vermian lobules is helpful in the prognostic classification of fetal hindbrain malformations.

RC113-04 MRI-US Fusion Imaging in Real-Time Virtual Sonography for the Evaluation of Fetal Anomalies: Preliminary Stud

Sunday, Nov. 29 2:40PM - 2:50PM Location: S102AB

Participants

Silvia Bernardo, MD, Rome, Italy (*Presenter*) Nothing to Disclose Valeria Vinci, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Matteo Saldari, MD, PhD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Antonella Giancotti, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Lucia Manganaro, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Camilla Aliberti, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Magnetic resonance imaging (MRI) and ultrasound (US) scanning complement each other in the screening and diagnosis of fetal anomalies. Real-time virtual sonography (RVS) is a new technique that uses magnetic navigation and computer software for the synchronized display of real-time US and multiplanar reconstruction MRI images. The purpose of this study was to evaluate the feasibility and ability of RVS to assess the main pathologies in fetuses with suspected US anomalies.

METHOD AND MATERIALS

This study was conducted over a two-month period march-april 2015 in 30 patients referred for a morphological fetal US-based evaluation. Patients undergone Fetal MRI at 1.5 T for fetal anomalies were offered fusion imaging (Hitachi HI Vision Ascendus).The MRI image dataset acquired at the time of the examination was loaded into the fusion system and displayed together with the US image on the same monitor. Both sets of images were then manually synchronized and image were registered using multiple planes MR imaging.The ability of this combined image (RVS imaging) to assess the main anatomical sites and fetal anomalies was evaluated and compared with standard B-Mode US and MRI images previously acquired.

RESULTS

In all cases RVS was technically possible, with a 100% match between MR images and US images. Data registration, matching and fusion imaging were performed in less than 15-20 minutes. On a total of 30 fetuses, 20 were for the encephalic district and 10 for the body (8 thoraco- abdominal; 2 heart). In all cases RVS was technically possible, with a 100% match between MR images and US images. In 10 cases of body abnormalities, fusion imaging helped the diagnosis in 20%. In the 10/20 cases of encephalic pathology, fusion imaging improved the diagnosis; in the other 10 cases MRI was superior to US even using the RVS.

CONCLUSION

The present work is a preliminary study on the feasibility and practical use of a Fetal MRI-US real-time fusion imaging. Thanks to

informations from both US and MRI, fusion imaging allows better identification of the different fetal pathologies and could improve the performance of ultrasound examination.

CLINICAL RELEVANCE/APPLICATION

Fusion imaging is feasible for the assessment of fetal abnormalities. Because it combines information from both US and MRI techniques, fusion imaging allows better identification of the different fetal pathologies.

RC113-05 Predictive Value of the MRI-based Ratio of Fetal Lung Volume to Fetal Body Volume in Congenital Diaphragmatic Hernia in Comparison to the MR Fetal Lung Volume and the Sonographic Lung-to-Head Ratio

Sunday, Nov. 29 2:50PM - 3:00PM Location: S102AB

Participants

Claudia Hagelstein, MD, Mannheim, Germany (*Presenter*) Nothing to Disclose Silke von Mittelstaedt, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose Meike Weidner, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose Christel Weiss, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose Regine Schaffelder, MD, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose Thomas Schaible, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose Stefan O. Schoenberg, MD, PhD, Mannheim , Germany (*Abstract Co-Author*) Institutional research agreement, Siemens AG Wolfgang Neff, MD, PhD, Alzey, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate prognostic accuracy of the MRI-based ratio of fetal lung volume to fetal body volume (MR-FLV/FBV) in fetuses with congenital diaphragmatic hernia (CDH) and to compare it to established prognostic parameters (the observed-to-expected MR fetal lung volume [o/e-MR-FLV] and the US-based observed-to-expected lung-to-head ratio [o/e-LHR]) with regard to survival, extracorporeal membrane oxygenation (ECMO) requirement and development of a chronic lung disease (CLD).

METHOD AND MATERIALS

Fetal MRI was performed in 132 patients with isolated CDH (mean gestational age 32.8±3.8 weeks) to measure FLV and FLV/FBV. Sonographic assessment of the LHR was performed within three days before or after fetal MRI. To obtain parameters that were independent from gestational age, the o/e-MR-FLV and the o/e-LHR were calculated based on normal controls, whereas calculation of the MR-FLV/FBV is independent from normal controls.

RESULTS

91% of the neonates survived, 37% needed ECMO therapy and 45% developed a CLD. All prenatal parameters revealed an excellent correlation with patients ´ clinical outcome. MR-FLV/FBV, o/e-MR-FLV and o/e-LHR were significantly higher in survivors (p always <0.0001). Patients with ECMO requirement and patients with CLD showed a significantly lower MR-FLV/FBV, o/e-MR-FLV or o/e-LHR (p always <0.0001). Prognostic accuracy regarding survival was quite similar for the three parameters (AUC MR-FLV/FBV : 0.830, AUC o/e-MR-FLV : 0.868, AUC o/e-LHR : 0.845). Regarding ECMO requirement (AUC MR-FLV/FBV : 0.844, AUC o/e-MR-FLV : 0.843, AUC o/e-LHR : 0.736) and development of CLD (AUC MR-FLV/FBV : 0.778, AUC o/e-MR-FLV : 0.795, AUC o/e-LHR : 0.738) the MR-FLV/FBV and o/e-MR-FLV showed a slightly better prognostic accuracy compared to the o/e-LHR.

CONCLUSION

In CDH, assessment of pulmonary hypoplasia based on the MR-FLV/FBV, the o/e-MR-FLV or the o/e-LHR is quite similar in predicting survival. Regarding ECMO requirement and development of CLD, the o/e MR-FLV and the MR-FLV/FBV showed a slightly better prognostic accuracy compared to the US-based o/e-LHR. Compared to other prognostic parameters, MR-FLV/FBV has the advantage of being independent from the reference to a normal control group.

CLINICAL RELEVANCE/APPLICATION

In CDH, MRI-based MR-FLV/FBV and o/e-MR-FLV as well as US-based o/e-LHR are excellent and almost equivalent parameters to predict survival, ECMO-requirement and development of CLD.

RC113-06 Correlation between Fetal and Postmortem Magnetic Resonance Imaging and Conventional Autopsy in the Detection of Fetal Abnormalities

Sunday, Nov. 29 3:00PM - 3:10PM Location: S102AB

Participants

Matteo Saldari, MD, PhD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Silvia Bernardo, MD, Rome, Italy (*Presenter*) Nothing to Disclose Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Valeria Vinci, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose Lucia Manganaro, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare Fetal and postmortem MRI and conventional autoptic findings in cases of major pathological abnormalities.

METHOD AND MATERIALS

In this prospective study we enrolled 128 fetuses with identified US findings of severe fetal malformations, with local research ethics committee approval. Among these, we performed 94 whole body Fetal MRI on 94 fetuses using a 1.5 T MR scanner and of these, only 89 women undewent termination of pregnancy because of the fetal abnormalities. Of the 89 patients, 80 (90%) consented to postmortem MRI alone; 59 (66%) women consented to both postmortem MRI and conventional autopsy and formed our study group. Following delivery, fetuses were stored in refrigerated compartments prior to MR imaging and autopsy. Also for the post-mortem imaging evaluation we acquired whole body MR imaging using a 1.5 T MR scanner. MR images were reviewed by a team of two radiologists blinded to the autoptic data. Pathologists who performed conventional autopsy were blinded to the MR data; autoptic data were considered the gold standard.

RESULTS

Final autoptic diagnoses were: polycystic kidney disease (n=15), diaphragmatic hernia (n=10), lissencephaly (n=4), type-2 Arnold-Chiari malformation (n=6), Dandy-Walker syndrome (n=13), cloacal malformation (n=1), anencephaly (n=1), holoprosencephaly (n=4), rhombencephalosynapsis (n=2), Walker-Warburg syndrome (n=2), schizencephaly (n=1).MRI-autopsy provided additional information in 10/59 (17%) compared to fetal MRI.In 6 cases (10%) conventional autopsy provided superior diagnostic information compared to MRI-autopsy. On the other hand, in 7 cases (12%) the disruption of the anatomy during autoptic dissection of the fetal body couldn't allow a correct identification of the pathology.

CONCLUSION

MR autopsy is accepted by nearly all mothers while conventional autopsy is accepted by about two-thirds of mothers, it provides similar information compared to conventional autopsy in case of fetal malformations and it allows the evaluation of the pathology in case of tissue disruption during the autoptic evaluation.

CLINICAL RELEVANCE/APPLICATION

Fetal MRI can add significant additional information and may be use to guide conventional autopsy

RC113-07 Imaging of Ambiguous Genitalia

Sunday, Nov. 29 3:10PM - 3:30PM Location: S102AB

Participants

Jeanne S. Chow, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) The purpose of this course is to understand the important role of the radiologists in infants with ambiguous genitalia. Imaging techniques as well as important imaging findings will be detailed.

ABSTRACT

Imaging and Endografts (An Interactive Session)

Sunday, Nov. 29 2:00PM - 3:30PM Location: S103AB

VA IR

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

Participants

Sub-Events

RC112A TEVAR Indications and Outcomes

Participants

Michael D. Dake, MD, Stanford, CA (*Presenter*) Scientific Advisory Board, W. L. Gore & Associates; Scientific Advisory Board, Abbott Laboratories; Research Consultant, Cook Group Incorporated; Research Consultant, TriVascular, Inc; Research Consultant, Medtronic, Inc; Research Consultant, Intact Vascular, Inc; Research Consultant, Novate Medical; Research support, Cook Group Incorporated; Research support, W. L. Gore & Associates, Inc; ;

LEARNING OBJECTIVES

1) Understand the current applications of thoracic endografts for management of thoracic aortic pathologies. 2) Recognize the benefits and existing limitations of current endograft technologies for treatment of different aortic lesions. 3) Identify the complications and failure modes of TEVAR. 4) Know the current outcome metrics typically evaluated after TEVAR treatment of thoracic aneurysms and aortic dissections. 5) List the important imaging findings and criteria currently used to assess the suitability of aortic anatomy for TEVAR.

RC112B New Endografts for Complex AAA

Participants

Constantino S. Pena, MD, Miami, FL (*Presenter*) Speakers Bureau, Cook Group Incorporated; Advisory Board, C. R. Bard, Inc; Advisory Board, Boston Scientific Corporation; Advisory Board, General Electric Company;

LEARNING OBJECTIVES

1) Discuss the status of established AAA endografts. 2) Discuss new endografts for the treatment of AAA. Particularly discuss areas of improvement over established endografts. 3) Present data on novel endografts being developed.

RC112C Old Endografts with New Complications

Participants

Elliot K. Fishman, MD, Owings Mills, MD (*Presenter*) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc

LEARNING OBJECTIVES

1) Understand the spectrum of complications which may be seen in patients with endografts that have been in place for several years and the significance of these complications. 2) Develop a strategy for the evaluation of endovascular stents with specific scanning protocols and the role of post processing of the data into 3D. 3) understand the complexities of complications including involvement of bowel and adjacent organs and the CT findings that can suggest these complications.

ABSTRACT

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/

Elliot K. Fishman, MD - 2012 Honored Educator Elliot K. Fishman, MD - 2014 Honored Educator

Fundamentals of Imaging for the Radiation Oncologist

Sunday, Nov. 29 2:00PM - 3:30PM Location: S102C

CH HN NR RO

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

Participants

Simon S. Lo, MD, Cleveland, OH (Moderator) Research support, Elekta AB;

Sub-Events

RC120A Fundamentals in Radiation Oncology Imaging of Head and Neck Cancer

Participants Hilda E. Stambuk, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define key anatomy and understand pathways of tumor spread for head and neck cancers. 2) Identify radiographic features of the patterns of tumor involvement. 3) Understand the implications of radiographic imaging in treatment planning.

ABSTRACT

Radiographic imaging is integral to diagnosis, extent of disease assessment, treatment planning and post-treatment surveillance in patients with head and neck cancer. Since the overwhelming majority of cancers of the head and neck are squamous cell carcinoma, these tumors will be the primary focus of the lecture. In addition, choosing the appropriate imaging modality is of vital importance in effective evaluation and therefore the pros and cons of imaging modalities in particular subsites will be presented. The patterns of tumor spread depend on the site of origin of the tumor and will be discussed in detail for some of the common sites such as nasopharynx and oropharynx that are treated primarily with radiation. The implications of pathways of tumor involvement including perineural spread on treatment planning will be emphasized. This lecture will provide radiation oncologists a basic understanding of the role of imaging and will highlight pearls and pitfalls that can influence management.

RC120B Fundamentals in Radiation Oncology Imaging of Thoracic Malignancies

Participants

Matthew M. Harkenrider, MD, Maywood, IL (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To review the normal imaging changes after precision radiotherapy for lung cancer. 2) To discuss methods of distinguishing recurrence vs. fibrosis after stereotactic radiotherapy. 3) To highlight difficult imaging cases in assessing response after radiotherapy.

ABSTRACT

RC120C Fundamentals in Radiation Oncology Imaging of Skull Base Tumors

Participants

Jason Rockhill, MD, Seattle, WA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Identifying imaging techniques to help delineate target volumes for skull based tumors. 2) Discuss the challenges of determining target volumes for skull based tumors in the resected and non-resected patient. 3) Review key features to follow by imaging of skull based tumors after radiation therapy.

RC120D Imaging and RT QA in Cancer Clinical Trials: The Advanced Technology Consortium (ATC), the Quality Assurance Review Center (QARC), and the Imaging and Radiation Oncology Core (IROC)

Participants

Thomas J. Fitzgerald, MD, Worcester, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe diagnostic imaging and radiation therapy utilization in clinical trials. 2) Describe the role of quality assurance in imaging and radiation therapy in clinical trials. 3) Describe future QA strategies in the National Clinical Trials Network (NCTN).

MR-Guided High Intensity Focused Ultrasound (HIFU)

Sunday, Nov. 29 2:00PM - 3:30PM Location: S504CD



FDA Discussions may include off-label uses.

Participants

Pejman Ghanouni, MD, PhD, Stanford, CA, (ghanouni@stanford.edu) (Moderator) Nothing to Disclose

Sub-Events

RC117A Neurologic Applications of MR-guided HIFU

Participants

Max Wintermark, MD, Lausanne, Switzerland, (max.wintermark@gmail.com) (Presenter) Advisory Board, General Electric Company;

LEARNING OBJECTIVES

1) To understand the neuro applications of HIFU. 2) To understand the challenges of applying HIFU for neuro applications. 3) To review the ongoing trials of neuro applications of HIFU.

ABSTRACT

MR guided focused ultrasound is a new, minimally invasive method of targeted tissue thermal ablation that may be of use to treat central neuropathic pain, essential tremor, Parkinson tremor, and brain tumors. The system has also been used to temporarily disrupt the blood-brain barrier to allow targeted drug delivery to brain tumors. We will discuss current and potential neuro applications of this exciting technology.

RC117B Gynecologic Applications of MR-guided HIFU

Participants

Young-Sun Kim, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain pros and cons of MR-guided HIFU in the treatment of uterine fibroids and adenomyosis as compared to other therapeutic modalities 2) Assess important factors in screening MR exams of MR-guided HIFU therapy of uterine fibroids 3) Explain treatment strategy of MR-guided HIFU therapy of uterine fibroids to improve therapeutic outcomes 4) Describe the current limitations of MR-guided HIFU of uterine fibroids and explain how to overcome limitations

ABSTRACT

Uterine fibroid and adenomyosis are the most popular clinical applications of MR-guided HIFU (high-intensity focused ultrasound) therapy. As a totally non-invasive interventional therapeutic modality using small foci of hyperthermia, MR-guided HIFU has pros and cons as compared to other therapeutic modalities. However, owing to its greatest merit of complete non-invasiveness, its clinical adoptions are increasing worldwide.MR-guided HIFU therapy has certain inborn limitations, therefore, appropriate screening in MR-guided HIFU of uterine fibroids is extremely important to improve overall therapeutic outcomes. In order to do so, properties of the target fibroids, safe pathway of sonications, complication-related factors should be well analyzed in screening MR exams. Furthermore, the symptom-relevant fibroid or the portion of fibroid should be recognized and completely ablated.As accumulations of clinical experiences of MR-guided HIFU therapy, there have been several techniques or strategies developed to overcome such limitation or to improve therapeutic efficacy, which will be covered in this presentation.

Handout:Young-Sun Kim

http://abstract.rsna.org/uploads/2015/13012024/RSNA2015_KimYS - handout.pptx

RC117C Body Applications of MR-guided HIFU

Participants

Alessandro Napoli, MD, Rome, Italy (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To become familiar with the basic physical principles of HIFU and the potential of MR guidance. 2) To approach selection criteria in MRI screening examinations for accurate indications and identify contraindications and non-suitable patients. 3) To appreciate current results and potential therapy regimens. 4) To understand recent technical developments and their potential.

ABSTRACT

The concept of ideal tumor surgery is to remove the neoplastic tissue without damaging adjacent normal structures. High-intensity focused ultrasound (HIFU) was developed in the 1940s as a viable thermaltissue ablation approach. In clinical practice, HIFU has been applied to treat a variety of solid benign and malignant lesions, including pancreas, liver, prostate, and breast carcinomas, soft tissue sarcomas, and uterine fibroids. More recently, magnetic resonance guidance has been applied for treatment monitoring during focused ultrasound procedures (magnetic resonance-guided focused ultrasound, MRgFUS). Intraoperative magnetic resonance imaging provides the best possible tumor extension and dynamic control of energy deposition using real-time magnetic

resonance imaging thermometry. The fundamental principles and clinical indications of the MRgFUS technique will be introduced; different treatmentoptions and personal outcomes will be discussed.

RC117D Palliation of Painful Metastases to Bone

Participants

Pejman Ghanouni, MD, PhD, Stanford, CA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Therapeutic options for palliation of painful metastases to bone. 2) Patient selection for MR guided focused ultrasound palliation of painful bone metastases. 3) Results of Phase III pivotal study of ExAblate MR guided focused ultrasound for palliation of painful bone metastases. 4) Technical aspects of successful patient treatment. 5) Immediate post-treatment imaging-based assessment of results. 6) Future applications of MR guided focused ultrasound for the management of osseous metastatic disease.

ABSTRACT

Cancer patients commonly have metastases to bone; as the survival of cancer patients is prolonged by more effective therapies, the prevalence of patients with metastases to bone is also increasing. Bone metastases are often painful, and often diminish the quality of life. Radiation therapy (RT) is the standard of care for the treatment of bone metastases, but a significant subset of patients do not respond to RT. MR guided focused ultrasound non-invasively achieves localized tissue ablation and provides a proven method of pain relief in patients who do not respond to radiation therapy. MR imaging provides a combination of tumor targeting, real-time monitoring during treatment, and immediate verification of successful treatment. The results of the pivotal Phase III trial that led to FDA approval of the ExAblate MR guided focused ultrasound device for the palliation of painful metastases to bone will be reviewed. In particular, patient selection, the technical aspects of successful patient treatment, and post-treatment assessment of results will be described. Concepts for future development of this technology with regard to the management of osseous metastatic disease will also be presented.

MR Imaging-guided Breast Biopsy (Hands-on)

Sunday, Nov. 29 2:00PM - 3:30PM Location: E260



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

Participants

Amy D. Argus, MD, Cincinnati, OH (Presenter) Advisory Board, Devicor Medical Products, Inc Christopher P. Ho, MD, Atlanta, GA, (christopher.ho@emory.edu) (Presenter) Nothing to Disclose Su-Ju Lee, MD, Cincinnati, OH, (su-ju-lee@uchealth.com) (Presenter) Spouse, Stockholder, General Electric Company. Michelle V. Lee, MD, Saint Louis, MO, (leem@mir.wustl.edu) (Presenter) Nothing to Disclose Mitva J. Patel, MD, Columbus, OH (Presenter) Nothing to Disclose Stamatia V. Destounis, MD, Scottsville, NY (Presenter) Research Grant, FUJIFILM Holdings Corporation; Research Grant, Hologic, Inc; Research Grant, QT Ultrasound LLC Wade C. Hedegard, MD, Rochester, NY (Presenter) Nothing to Disclose Carol H. Lee, MD, New York, NY (Presenter) Nothing to Disclose Colleen H. Neal, MD, Ann Arbor, MI (Presenter) Nothing to Disclose Carol M. Dell, MD, Lexington, KY (Presenter) Nothing to Disclose Roberta A. Jong, MD, Toronto, ON (*Presenter*) Nothing to Disclose Gary J. Whitman, MD, Houston, TX (*Presenter*) Book contract, Cambridge University Press Christiane K. Kuhl, MD, Bonn, Germany (Presenter) Nothing to Disclose Hiroyuki Abe, MD, Chicago, IL, (habe@radiology.bsd.uchicago.edu) (Presenter) Consultant, Seno Medical Instruments, Inc Karla A. Sepulveda, MD, Houston, TX (Presenter) Nothing to Disclose Amy L. Kerger, DO, Columbus , OH, (amy.kerger@osumc.edu) (Presenter) Nothing to Disclose Jill J. Schieda, MD, Cleveland, OH, (jschieda@metrohealth.org) (Presenter) Nothing to Disclose Mai A. Elezaby, MD, Madison, WI (Presenter) Nothing to Disclose Amado B. del Rosario, DO, Chicago, IL (Presenter) Nothing to Disclose Andrew Bowman, MD, PhD, Jacksonville, FL (Presenter) Nothing to Disclose Elizabeth R. Deperi, MD, Jacksonville, FL (Presenter) Nothing to Disclose Candice W. Bolan, MD, Jacksonville, FL, (bolan.candice@mayo.edu) (Presenter) Nothing to Disclose Jiyon Lee, MD, New York, NY, (jiyon.lee@nyumc.org) (Presenter) Nothing to Disclose Kirti M. Kulkarni, MD, Chicago, IL (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Establish criteria for MR Image-guided breast biopsy patient selection. 2) Cultivate a working understanding of MR Image-guided biopsy and needle localization instrumentation and implementation. 3) Basic MR Image-guided biopsy and needle localization parameters and requirements for appropriate coil, needle and approach selection. 4) Discuss practice integration issues. 5) Discuss pearls and pitfalls associated with successful MR Image-guided biopsy.

ABSTRACT

This course is intended to provide both basic didactic instruction and hands-on experience in the application of MRI guided breast biopsy. MRI provides greater sensitivity for detecting breast cancer compared with mammography and ultrasound, although with imperfect specificity. MRI guided biopsy is required to confirm or exclude maligancy for MRI only findings. This course will be devoted to the understanding and identification of the following pertaining to MRI guided biopsy: 1) appropriate patient selection 2) optimal positioning for biopsy 3) target selection and confirmation 4) various biopsy technologies and techniques 5) potential problems and pitfalls. Techniques for Interventional Sonography and Thermal Ablation (Hands-on)

Sunday, Nov. 29 2:00PM - 3:30PM Location: E264



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

Participants

Stephen C. O'Connor, MD, Springfield, MA (Moderator) Nothing to Disclose Alda F. Cossi, MD, Boston, MA (Presenter) Nothing to Disclose Neil T. Specht, MD, Trumbull, CT (Presenter) Nothing to Disclose Mark L. Lukens, MD, Greensboro, NC (Presenter) Nothing to Disclose Michael A. Mahlon, DO, Tacoma, WA (Presenter) Nothing to Disclose Manish N. Patel, DO, Cincinnati, OH, (manish.patel@cchmc.org) (Presenter) Nothing to Disclose Hollins P. Clark, MD, MS, Winston Salem, NC (Presenter) Nothing to Disclose Mark J. Hogan, MD, Columbus, OH (Presenter) Nothing to Disclose Carmen Gallego, MD, Madrid, Spain, (cgallego@salud.madrid.org) (Presenter) Nothing to Disclose Mabel Garcia-Hidalgo Alonso, MD, Madrid, Spain (Presenter) Nothing to Disclose John D. Lane, MD, Bayside, WI (Presenter) Nothing to Disclose William W. Mayo-Smith, MD, Boston, MA (Presenter) Author with royalties, Reed Elsevier; Author with royalties, Cambridge University Press Humberto G. Rosas, MD, Madison, WI (Presenter) Nothing to Disclose Kristin M. Dittmar, MD, Columbus, OH (Presenter) Nothing to Disclose Nicholas A. Zumberge, MD, Columbus, OH (Presenter) Stockholder, Abbvie Inc; Stockholder, Cerner Corporation; Stockholder, Dexcom, Inc; Stockholder, Exact Sciences Corporation; Stockholder, Gilead Sciences, Inc; Stockholder, Merck & Co, Inc; Stockholder, Northwest Biotherapeutics Inc Veronica J. Rooks, MD, Honolulu, HI (Presenter) Nothing to Disclose James W. Murakami, MD, Columbus, OH (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify basic skills, techniques, and pitfalls of freehand invasive sonography. 2) Discuss and perform basic skills involved in thermal tumor ablation in a live learning model. 3) Perform specific US-guided procedures to include core biopsy, abscess drainage, vascular access, cyst aspiration, soft tissue foreign body removal, and radiofrequency tumor ablation. 4) Incorporate these component skill sets into further life-long learning for expansion of competency and preparation for more advanced interventional sonographic learning opportunities.

ABSTRACT

RC102

What's New from the Radiology Residency Review Committee

Sunday, Nov. 29 2:00PM - 3:30PM Location: S403B

ED

AMA PRA Category 1 Credits ™: 1.50 ARRT Category A+ Credit: 0

Participants

James C. Anderson, MD, Portland, OR (*Presenter*) Nothing to Disclose Felicia Davis, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To provide updates from the Review Committee for Diagnostic Radiology. 2) To provide updates from ACGME. 3) To provide updates on ACGME's Next Accreditation System.

National Library of Medicine: Find Articles You Need: Searching PubMed/MEDLINE Efficiently (Hands-on)

Sunday, Nov. 29 2:00PM - 3:30PM Location: S401AB

IN

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

Participants

Tony Nguyen, MLIS, Baltimore, MD, (tnguyen@hshsl.umaryland.edu) (*Presenter*) Nothing to Disclose Holly Ann Burt, MLIS, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand how PubMed constructs a query and how to develop and refine effective search strategies in radiology. 2) Use PubMed tools including Clinical Queries, Related Articles, Single Citation Matcher and Loansome Doc. 3) Build focused searches using the Medical Subject Headings (MeSH) vocabulary for radiology and limit searches to radiology-oriented journals. 4) Understand how to save and download citations.

ABSTRACT

This hands-on workshop covers key searching techniques, changes to PubMed, and how to develop effective search strategies for PubMed and MEDLINE. Topics covered include: why keywords don't always give the results you expect, how to limit to specific journals, quick searches to find evidence-based citations, how to access full-text articles, and downloading citations to reference manger programs. The National Library of Medicine (NLM) provides free web access to nearly 24 million citations for biomedical and clinical medical articles through PubMed (available online at PubMed.gov). MEDLINE is a subset of PubMed which includes links to sites providing full text articles and to other related databases and resources.

URL

Handout: Holly Ann Burt

http://abstract.rsna.org/uploads/2015/13013403/2015pubmedRSNA.pdf

Combat and Forensic Radiology

Sunday, Nov. 29 2:00PM - 3:30PM Location: N230

ER

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

Participants

Sub-Events

RC108A Imaging of Drug Smuggling

Participants

Ferco H. Berger, MD, Amsterdam, Netherlands, (f.berger@vumc.nl) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Comprehend the socio-economic background of drugs and the different ways of intra-corporeal transportation and packing materials used. 2) Analyze the different imaging techniques for detection of illicit drugs trafficking, detect the findings and know the potential lack thereof. 3) Comprehend with the complications that can occur and the imaging findings thereof.

ABSTRACT

The drugs industry is reported to make up to almost 1% of global GDP and 1/3 of the population has tried illicit drugs in their life. Overdosing causes a staggering estimated 1 death per hour in Europe alone. Trafficking of drugs occurs by ingestion (body packers) or vaginal/rectal insertion (body pushers). As can be imagined, ingestion / insertion of packets of drugs can cause different kinds of clinical problems, depending on packaging material and type of drug. Detection of packets by screening methods as well as acute and subacute clinical conditions and the depiction thereof by different imaging modalities will be discussed. The participants of this RC will get to know the current developments in both the packets as well as the imaging of their features and complications.

RC108B The Virtual Autopsy-Bridging Radiology and Forensics

Participants

Michael J. Thali, MD, Zurich, Switzerland, (thali@irm.uzh.ch) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To Improve basic knowledge and skills of forensic imaging for radiologists. 2) To give an update of the historical and current development and techniques in forensic imaging in the world. 3) To present the newest research areas in forensic imaging and radiology. 4) To discuss workflow and present possibilities and options. 5) To show how to get involved in forensic imaging / radiology.

ABSTRACT

The modern virtual autopsy approach (called Virtopsy) began at the turn of the millennium as multi-disciplinary applied research project to implement imaging modalities from diagnostic radiology and surveying technology in forensic sciences. Since then, the Virtopsy approach has become a standard procedure in forensic investigations. Today, computed tomography, magnetic resonance imaging, optical 3D surface scanning, and 3D photogrammetry are routinely used to detect and document forensic evidence in a minimally-invasive and observer-independent manner in both the living and the deceased.Virtopsy can enhance traditional autopsy or even replace it in selected cases. One of the main benefits of imaging lies in the observer-independent documentation of forensically relevant findings. In addition, digital imaging data can be stored permanently and may be re-examined at any time if a second opinion is required.In living patients, Virtopsy permits the documentation of patterned injuries such as bite marks, bruises, lacerations, and abrasions. Documentation is made in three dimensions, true to scale, and enables comparison of injuries to potential injury causing instruments.Virtopsy provides in the court excellent tools for crime and accident reconstruction, including 3D depictions of internal injuries, 3D true color representations of surface injuries and even 3D scaled models of entire crime scenes and events. The Virtopsy approach reproduces critical forensic evidence in an unbiased and comprehensible fashion, suitable for presentation as evidence to laypersons and legal professionals.

RC108C Medical Effects of Nuclear Weapons

Participants

Bruce R. Javors, MD, New York, NY, (bjxraydoc@gmail.com) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare conventional and nuclear weapons and explain their fundamental differences. 2)Comprehend the various short term effects including thermal, blast and radiation injuries. 3) Identify and understand the long term consequences of nuclear blasts especially those from radiation exposure. 4) Understand the societal disruption that may follow the use of nuclear weapons.

ABSTRACT

Since 1945 society has been faced with both the possible and real aftermaths of nuclear weapons and their use.Nuclear weapons are both quantitatively and qualitatively different from chemical explosives. Those differences will be briefly presented.Immediately after detonation, most of the energy released by a weapon is in the form of blast and heat with only a small amount of radiation produced. The formers' effects on most organ systems will be reviewed along with acute radiation sickness and the resultant difficulties of shielding oneself from those effects.The delayed results of radiation exposure will also be discussed. Included are carcinogenesis and mutagenesis. Possible ecologic and social disruption will be presented. Focus will also be placed on infectious

diseases especially in light of both the diminished host and organized medical responsiveness. The myths and realities of terrorist devices, so-called suitcase bombs, will be reviewed. Appropriate video and still photographs will accompany many of the above items.

RC116

The Aging Radiologist: How to Cope, When to Quit (Sponsored by the RSNA Professionalism Committee) (An Interactive Session)

Sunday, Nov. 29 2:00PM - 3:30PM Location: S402AB

LM PR

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

Participants

Donald M. Bachman, MD, Framingham, MA (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify physiological and psychological manifestation of aging specific to performance as a radiologist. 2) Institute nonprejudicial evaluation of function and performance of radiologists in their department as they age. 3) Understand economic, health, emotional and professional factors that stimulate radiologists to either continue working or retire. 4) Identify strategies for instituting meaningful and satisfying activities after retirement from active radiology practice.

ABSTRACT

Active Handout:Donald M. Bachman

http://abstract.rsna.org/uploads/2015/12022172/RC116.pdf

Sub-Events

RC116A Coping with the Physical and Mental Changes of Aging

Participants Donald M. Bachman, MD, Framingham, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC116B Economics of Retirement Finance: Concepts and Misconceptions

Participants Stephen Chan, MD, Closter, NJ (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC116C Professional and Organizational Issues for Senior Radiologists in the Radiology Practice

Participants Bruce J. Barron, MD, Dunwoody, GA (*Presenter*) Stockholder, Immunomedics, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

Active Handout:Bruce Jonathan Barron

http://abstract.rsna.org/uploads/2015/15003264/RC116C.pdf

RC116D The Radiologist in Retirement: The Importance of Health Insurance, and of New Personal and Professional Endeavors

Participants

Robert A. Schmidt, MD, Chicago, IL (*Presenter*) Medical Advisory Board, Three Palm Software LLC Stockholder, Three Palm Software LLC Spouse, Advisory Board, Three Palm Software LLC Spouse, Stockholder, Three Palm Software LLC Spouse, Medical Advisory Board, Bayer AG Consultant, VuComp, Inc Spouse, Consultant, VuComp, Inc

LEARNING OBJECTIVES

RC123

Molecular Imaging Mini-Course: Basics of Molecular Imaging

Sunday, Nov. 29 2:00PM - 3:30PM Location: E451A

CT MI NM PH

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC123A Developing Molecular Imaging Agents

Participants

Julie L. Sutcliffe, PhD, Sacramento, CA, (jlsutcliffe@ucdavis.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the ideal properties of a molecular imaging agent. 2) Describe the in vitro validation of the molecular imaging agent. 3) Describe specific examples of successful molecular imaging agents.

RC123B Instrumentation (PET and CT) and Image Reconstruction

Participants

John Sunderland, PhD, Iowa City, IA, (john-sunderland@uiowa.edu) (Presenter) Research Grant, Siemens AG

LEARNING OBJECTIVES

1) Identify the primary design components of a modern PET/CT system. 2)Design and implement a PET/CT quality control program to assure high quality and quantitatively accurate clinical imaging. 3) Describe commonly used PET reconstruction algorithms and the practical impact of reconstruction parameters upon image quality and quantitation.

ABSTRACT

Handout:John Sunderland

http://abstract.rsna.org/uploads/2015/15002826/RSNA Physics Recon Talk.pdf

RC123C Basic Clinical Applications

Participants Hubert J. Vesselle, MD, PhD, Seattle, WA (*Presenter*) Consultant, MIM Software Inc

ABSTRACT
Imaging of Pulmonary Fibrosis

Sunday, Nov. 29 2:00PM - 3:30PM Location: E451B



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

Participants

David A. Lynch, MBBCh, Denver, CO (*Moderator*) Research support, Siemens AG; Scientific Advisor, PAREXEL International Corporation; Consultant, Boehringer Ingelheim GmbH; Consultant, Gilead Sciences, Inc; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Veracyte, Inc;

LEARNING OBJECTIVES

1) Understand the current clinical approach to diagnosis and management of pulmonary fibrosis. 2) Identify the major CT imaging features of the idiopathic intersitial pneumonias based on the revised ATS/ERS diagnostic criteria for IPF. 3) Differentiate idiopathic pulmonary fibrosis from nonspecific interstitial pneumonia and chronic hypersensitivity pneumonitis. 4) Identify important complications of IPF. 5) Understand evolving role of quantitative CT in assessment of lung fibrosis.

ABSTRACT

Recent clinical trials in idiopathic pulmonary fibrosis (IPF) have resulted in approval of two new treatments for this condition. Given the central role of the radiologist in making the CT diagnosis of IPF, it is critical to understand the diagnostic criteria for this condition as recently revised by the ATS/ERS, and to distinguish it from other fibrosing interstitial pneumonias including nonspecific interstitial pneumonia (NSIP), connective tissue disease related lung fibrosis (CVD-ILD), and chronic hypersensitivity pneumonitis (HP). The radiologist also has an important role in identifying complications of lung fibrosis including acute exacerbations and lung cancer. Substantial advances have been made in developing CT techniques for quantification of lung fibrosis, which correlate with clinical severity and with mortality.

Sub-Events

RC101A Advances in Management of Pulmonary Fibrosis

Participants

Imre Noth, MD, Chicago, IL (*Presenter*) Speakers Bureau, Sumitomo Dainippon Pharma Co, Ltd; Speakers Bureau, F. Hoffmann-La Roche Ltd; Speakers Bureau, Boehringer Ingelheim GmbH; Consultant, ImmuneWorks, Inc; Consultant, Gilead Sciences, Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Boehringer Ingelheim GmbH

LEARNING OBJECTIVES

View learning objectives under main course title.

RC101B Fibrosing Interstitial Pneumonia: How to Sort Out the IP's

Participants Justus E. Roos, MD, Durham, NC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC101C Critical Issues in Imaging of Idiopathic Pulmonary Fibrosis

Participants

David A. Lynch, MBBCh, Denver, CO (*Presenter*) Research support, Siemens AG; Scientific Advisor, PAREXEL International Corporation; Consultant, Boehringer Ingelheim GmbH; Consultant, Gilead Sciences, Inc; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Veracyte, Inc;

LEARNING OBJECTIVES

View learning objectives under main course title.

RC101D Quantification of Pulmonary Fibrosis

Participants

Brian J. Bartholmai, MD, Rochester, MN (*Presenter*) License agreement, ImBio, LLC; Scientific Advisor, ImBio, LLC; Scientific Advisor, Bristol-Myers Squibb Company

LEARNING OBJECTIVES

View learning objectives under main course title.

Pediatric MR: Normal or Not?

Sunday, Nov. 29 2:00PM - 3:30PM Location: N228



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

Participants

Geetika Khanna, MD, MS, Iowa City, IA (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

1) Differentiate normal and abnormal signal intensity patterns of abdominal structures in children. 2) Recognize normal developmental variants that can simulate abdominal pathology.

ABSTRACT

Sub-Events

RC124A Musculoskeletal MR

Participants

Nancy A. Chauvin, MD, Philadelphia, PA, (chauvinn@email.chop.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the MR appearance of normal marrow conversion in the developing skeleton. 2) Identify common pediatric marrow pitfalls that might be mistaken for pathology. 3) Describe the MR appearance of common bone marrow abnormalities in children.

RC124B Brain and Spine

Participants

Tina Y. Poussaint, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Assess MR features associated with normal brain and spine development and maturation. 2) Identify abnormal MR imaging features associated with specific brain diseases and disorders of development in childhood.

ABSTRACT

In pediatric neuroradiology, magnetic resonance imaging is used to assess central nervous system (CNS) disease in the infant, child, and teenager. This requires 1) an understanding of normal brain development and maturation from gestation through adolescence; 2) a technical mastery of the neuroimaging techniques that are used in evaluating brain diseases of childhood; and 3) an overall grasp of the imaging features of numerous brain pathologies, both acquired and congenital. This lecture will focus on the common MR imaging features of the normal pediatric brain and spine and will compare and contrast with MR imaging features in specific brain diseases and disorders of development.

RC124C Abdominal MR

Participants Geetika Khanna, MD, MS, Iowa City, IA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Differentiate normal and abnormal signal intensity patterns of abdominal structures in children. 2) Recognize normal developmental variants that can simulate abdominal pathology.

Imaging Cancer Treatment Complications

Sunday, Nov. 29 2:00PM - 3:30PM Location: N229

CT NM OI

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

Participants Sub-Events

RC118A Identifying and Distinguishing Treatment Complications on FDG PET/CT

Participants

Gary A. Ulaner, MD, PhD, New York, NY, (ulanerg@mskcc.org) (*Presenter*) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd

LEARNING OBJECTIVES

1) Identify iatrogenic causes of FDG-avidity on FDG PET/CT and distinguish them from FDG-avid malignancy. Iatrogenic causes of FDG-avidity include changes caused by surgery (inflammation at sites of incision, pleurodesis inflammation, transposition of ovaries/testes), radiation (pneumonitis, esophagitis, hepatitis), and drugs (bleomycin pneumonitis, bisphosphonate osteonecrosis, ipilimumab enterocolitis). Familiarity with usual and unusual causes of iatrogenic FDG-avidity will improve accuracy of FDG PET/CT reporting.

ABSTRACT

Fluorine 18 fluorodeoxyglucose (FDG) positron emission tomography / computed tomography (PET/CT) is increasingly used in the initial staging, evaluation of treatment response and surveillance of many malignancies. Uptake of FDG is substantially increased in most malignancies compared with its uptake in normal tissues, and FDG-avidity often leads to cancer detection earlier than abnormalities on anatomic imaging. However, FDG is not a cancer-specific agent, and FDG-avidity can be seen in many benign processes. It can be particularly challenging to discriminate malignancy from benign FDG-avid changes caused by surgery and procedures, radiation, and chemotherapy. FDG-avid lesions caused by surgery and procedures includes inflammation at sites of incision or dissection, inflammation from vascular compromise or surgical retraction, surgical transposition of structures with physiologic FDG-avidity (such as ovaries or testes), and pleurodesis inflammation. Radiation may induce FDG-avid pneumonitis, esophagitis, or hepatitis, as well as osteoradionecrosis or fractures. FDG-avid chemotherapy complications include pneumonitis, osteonecrosis, enterocolitis, and pancreatitis. Granulocyte Colony Stimulating Factor for treatment of bone marrow suppression after chemotherapy induces temporary increases of FDG-avidity in the bone marrow and spleen. In this review we illustrate common and unusual iatrogenic causes of FDG-avidity that can confound FDG PET/CT interpretation. Familiarity with these cases will improve accuracy of FDG PET/CT interpretation.

RC118B Imaging Musculoskeletal Complications

Participants

Brooke R. Beckett, MD, Portland, OR (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize the osseous and soft tissue complications of tumor treatment, specifically those caused by radiation, chemotherapy, and surgery. These include radiation osteitis, osteonecrosis, insufficiency fractures, secondary malignancy, myositis and myonecrosis, and muscle denervation changes.

ABSTRACT

Musculoskeletal complications of tumor treatment are relatively common, often symptomatic, and therefore, an important cause of morbidity in the posttreatment cancer patient. Radiation causes local marrow changes such as osteitis, osteonecrosis and osteopenia, predisposing to insufficiency fractures. It may also cause local muscle damage, most commonly myositis, but occasionally myonecrosis. A rare but especially dreaded complication of radiation is secondary bone or soft tissue sarcoma, which will also be described. Chemotherapy, particularly protocols that include high doses of steroids, predisposes to osteonecrosis. And finally, surgical resection of extremity tumors, either primary or metastatic, may lead to muscle denervation changes. The bones and soft tissues should be carefully reviewed on all surveillance imaging, be it radiographs, CT or MRI, to exclude the presence of these often treatable complications.

RC118C GI Complications

Participants Priya R. Bhosale, MD, Houston, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize the complications caused by chemotherapy and radiation specifically those that occur in the GI tract including the liver and the pancreas. These include perforations, abscess formation, radiation enteritis, insufficiency fractures and secondary malignancy.

ABSTRACT

Several complications can occur in the GI tract following surgery. Similarly chemotherapy can cause a myriad of complications such as perforation, abscesses and enteritis. Radiation therapy can result in radiation enteritis and occurrence of radiation induced

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Priya R. Bhosale, MD - 2012 Honored Educator

RC118D Pulmonary Complications

Participants

Michelle S. Ginsberg, MD, New York, NY (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize complications in the postoperative thoracic patient in both immediate and late periods. In the immediate period this will include lobar collapse, hemorrhage, pulmonary edema, pneumonia, as well as rarer complications such as bronchopleural fistula, chylothorax and lung torsion. In the later period it is important to follow these patients and to recognize and distinguishing recurrent tumor from treatment changes and new primary tumors.

ABSTRACT



CA

Read with the Experts (Cardiac Radiology) (An Interactive Session)

Sunday, Nov. 29 2:00PM - 3:30PM Location: N226

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

FDA Discussions may include off-label uses.

Participants

Frank J. Rybicki III, MD, PhD, Ottawa, ON (*Moderator*) Research Grant, Toshiba Corporation; Frank J. Rybicki III, MD, PhD, Ottawa, ON (*Presenter*) Research Grant, Toshiba Corporation; Satinder P. Singh, MD, Birmingham, AL, (ssingh@uabmc.edu) (*Presenter*) Nothing to Disclose Sanjeev Bhalla, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose Jacobo Kirsch, MD, Weston, FL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To illustrate common cardiac pathologies encountered in noninvasive imaging. 2) To review imaging protocols designed to best depict cardiac pathology. 3) To review image post-processing tools to render cardiac imaging findings for interpretation and communication with referring clinicians. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT

This session will include live reads with experts in cardiac radiology to meet the learning objectives. Specific cases and clinical scenatios will be presented to best demonstrate the pathology and the strategies for imaging and image interpretation.

URL

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Sanjeev Bhalla, MD - 2014 Honored Educator Jacobo Kirsch, MD - 2013 Honored Educator Renal Cell Carcinoma: How Imaging Can Be Used to Select among Treatment Options and Monitor Response

Sunday, Nov. 29 2:00PM - 3:30PM Location: N227

GU

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

Participants

Erick M. Remer, MD, Cleveland, OH, (remere1@ccf.org) (*Coordinator*) Nothing to Disclose Steven S. Raman, MD, Santa Monica, CA (*Presenter*) Nothing to Disclose Raghunandan Vikram, MBBS, FRCR, Houston, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The attendee will learn how imaging can be used to predict renal tumor subtype and grade. 2) Imaging findings that guide renal tumor management toward percutaneous tumor ablation, partial, and radical nephrectomy will be described. 3) The use of imaging to evaluate patients after tumor ablation and nephrectomy will be reviewed. Assessment methods will be compared and complications will be illustrated. 4) Methods for assessing tumor response after chemotherapy such as RECIST, WHO, Choi / Modified Choi, SACT, and MASS criteria will be discussed with illustrative examples. Imaging appearances of post therapy complications will be reviewed.

ABSTRACT

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Raghunandan Vikram, MBBS, FRCR - 2012 Honored Educator

RC129

Should I Scan That Patient? A Very Interactive Session on MR Safety and Regulations (An Interactive Session)

Sunday, Nov. 29 2:00PM - 3:30PM Location: E353C



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

Participants

Jeffrey C. Weinreb, MD, New Haven, CT (*Presenter*) Nothing to Disclose Emanuel Kanal, MD, Pittsburgh, PA (*Presenter*) Consultant, Boston Scientific Corporation; Consultant, Medtronic, Inc; Consultant,

St. Jude Medical, Inc; Consultant, Bayer AG; Investigator, Bracco Group; Royalties, Guerbet SA;

LEARNING OBJECTIVES

1) Analyze the cause and avoidance of a spectrum of common MR safety issues, including burns. 2) List the factors (including regulation and guidelines) which should be evaluated in order to determine the safety of MRI in patients with implants, devices, or foreign objects. 3) Answer questions from the audience concerning MRI safety issues

ABSTRACT

The major potential safety considerations in magnetic resonance imaging relate to those stemming from the static magnetic field, the time varying radiofrequency oscillating magnetic fields, the time varying switched gradient magnetic fields, the contrast agents often utilized in the MR imaging process, sedation/anesthesia and monitoring-related issues unique to the MR imaging environment, and cryogen related potential safety concerns. These can present confounding situations for MR practitioners faced with questions relating to the safety of exposing particular patients and devices, implants, or foreign bodies to MR imaging examinations. This session will introduce and briefly explain the above safety considerations, and highlight specific issues likely to confront MR practitioners in their daily practice by utilizing real-life examples. The methodology and reasoning process used to approach these clinical examples in determining risk-benefit ratios for accepting or rejecting such patients from MR exposure will be stressed. The emphasis will be on not so much the particular examples used, but rather having the attendee feeling more comfortable with the approach to such clinical and research situations in order to better enable them to appropriately address such questions in their own daily practice routines. Audience polling and interaction will be actively utilized throughout this session. This will help enable the attendee to not only hear the opinions of the presenters on the cases being discussed, but also to assess their own responses to the questions being posed relative to that of the other attendees of this session.

Contemporary Problems in Arthritis Evaluation (An Interactive Session)

Sunday, Nov. 29 2:00PM - 3:30PM Location: E450B

мк

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

Participants

Donald J. Flemming, MD, Hershey, PA (Director) Royalties, Reed Elsevier

LEARNING OBJECTIVES

1) Describe the multimodality imaging features of common arthropathies. 2) Describe key imaging features that help distinguish one arthritis from another commonly confused entity. 3) Describe important clinical features that help establish the correct diagnosis of an arthropathy. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT

The purpose of this presentation is to discuss how to differentiate commonly confused athropathies using a case based interactive format. The utility of multiple modalities and incorporation of clinical data in establishing a correct diagnosis will be reviewed.

Sub-Events

RC104A Differentiating Rheumatoid Arthritis from Crystal Deposition Diseases

Participants

Donald J. Flemming, MD, Hershey, PA (Presenter) Royalties, Reed Elsevier

LEARNING OBJECTIVES

1) Describe the imaging features that differentiate rheumatoid arthritis and gout. 2) Describe the imaging features that differentiate rheumatoid arthritis and calcium pyrophosphate deposition disease.

ABSTRACT

Radiologists can have a tremendous impact on care of a patient suffering from an arthritis by confirming or establishing the correct diagnosis. Prevention of joint damage hinged on the correct diagnosis and therapeutic regimen. The purpose of this presentation is to review the imaging features that assist in differentiating rheumatoid from crystal deposition disease (gout and calcium pyrophosphate and hydroxyapatite deposition disease). A case based format will be used to demonstrate the critical radiographic, MRI, CT and ultrasound features that help establish the correct diagnosis.

RC104B Differentiating Appendicular Inflammatory from Degenerative Arthritis

Participants

Thomas M. Link, MD, PhD, San Francisco, CA, (thomas.link@ucsf.edu) (*Presenter*) Research funded, General Electric Company; Research funded, InSightec Ltd; Royalties, Springer Science+Business Media Deutschland GmbH; Research Consultant, Pfizer Inc;

LEARNING OBJECTIVES

1) To classify imaging studies of patients with arthropathies as inflammatory or degenerative. 2) To differentiate specific radiographic criteria of inflammatory arthropathies from those of degenerative osteoarthritis of the appendicular skeleton. 3) To identify findings that are found in both inflammatory and degenerative arthropathies, in particular in erosive osteoarthritis.

ABSTRACT

In general appendicular inflammatory arthropathies are characterized by loss of bone with juxta-articular osteopenia and erosive changes while degenerative arthritis shows increased bone formation with subchondral sclerosis and osteophytes. However, there is overlap as inflammatory arthropathies will eventually develop secondary degenerative changes and there is an erosive form of osteoarthritis (OA), which is typically found in older women. There are a number of criteria to differentiate OA and inflammatory arthropathies. These include location of abnormalities in the appendicular skeleton, which greatly helps to differentiate rheumatoid arthritis from OA (metacarpo-phalangeal/metatarsophalangeal joints in rheumatoid arthritis versus distal and proximal interphalangeal joints in OA) but not psoriatic arthritis and OA (distal and proximal interphalangeal joints in OA). Also inflammatory arthropathies and OA are both found at the radiocarpal, intercarpal and carpo-metacarpal joint 1. Differentiating erosive OA and psoriatic arthritis is a particular challenge as they both are erosive and may be found in the same locations. This lecture will present typical and more problematic cases of inflammatory and degenerative arthropathies, identify typical and overlapping findings and provide the attendees with a diagnostic approach to these entities.

RC104C Differentiating Sacroillitis from Its Mimickers

Participants

David C. Salonen, MD, Toronto, ON (Presenter) Consultant, AbbVie Inc; Consultant, Johnson & Johnson;

LEARNING OBJECTIVES

1) Discuss radiographic and MR criteria 'necessary' for the diagnosis of sarcoiliitis. 2) Describe the imaging features that differentiate inflammatory sarcoiliitis from its mimickers.

RC104D Differentiating Ankylosing Spondylitis from Spinal Degenerative Disease

Participants

Robert G. Lambert, MBBCh, Edmonton, AB (Presenter) Research Consultant, Abbott Laboratories

LEARNING OBJECTIVES

1) Differentiate specific patterns of bone marrow abnormality on spine MRI from non-specific changes. 2) Describe the patterns of bone formation on spine radiography in middle-aged patients that distinguish between degenerative causes and spondyloarthritis. 3) Recommend which patients with spinal ossification need further imaging to distinguish between spondyloarthritis and DISH.

ABSTRACT

Diffuse idiopathic skeletal hyperostosis (DISH) is a degenerative disorder characterized by flowing ossification in the spine occurring primarily in the anterior longitudinal ligament, and to a lesser extent, in paravertebral tissues and the peripheral part of the annulus fibrosus. The ossification is usually most prominent along the anterior and right anterolateral aspects of thoracic vertebral bodies and, on lateral x-ray, radiolucency may be noted between new bone and the vertebral body. Current classification criteria for DISH require spinal ankylosis across 3 consecutive intervertebral discs and less extensive ankylosis may present a diagnostic challenge when criteria are not met. Concomitant disc degeneration is frequent but is less prevalent at fused levels. DISH may involve the sacroiliac (SI) joints but with relative preservation of articular cartilage. Spondyloarthritis (SpA) is a group of inflammatory disorders that involve the joints and entheses of the axial and peripheral skeleton and is typified by ankylosing spondylitis (AS). Spinal involvement is characterized by inflammation at the attachment of the annulus fibrosus. Osteitis may be seen in the form of erosion and/or sclerosis of the vertebral corner and "squaring" of the vertebral bodies on lateral views of the spine is caused by adjacent periosteal reaction. In the periphery of the annulus fibrosus, formation of syndesmophytes are seen as vertical bony spurring that may extend to bridge the disc causing ankylosis. The inflammatory process may result in ankylosis of the costotransverse, costovertebral, and facet joints and interspinous ligaments. These two conditions are easily distinguished when seen in their common presentation. However, patients with an older than usual onset of SpA over the age of 40 may be hard to distinguish from early DISH and disc degeneration is common at all ages regardless of both DISH and SpA. In many cases when the diagnosis is uncertain, further imaging, especially with MRI, may be useful to distinguish between these two entities. However while some patterns of MRI involvement are highly specific for one condition or another, often bone marrow abnormalities in the spine are nonspecific and being able to distinguish between these patterns is of considerable diagnostic importance.

RC104E Monitoring Response to Disease Modifying Therapy

Participants

Eric Y. Chang, MD, San Diego, CA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the role of the radiologist in the management of arthropathies. 2) Compare the ability of different imaging modalities to detect inflammation and structural alteration. 3) Assess the response after disease modifying therapy according to established criteria.

ABSTRACT

How to Avoid Failure: Qualities of a Successful Leader

Sunday, Nov. 29 2:00PM - 3:30PM Location: E350

LM

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

Participants

LEARNING OBJECTIVES

1) Develop an understanding of the essential traits and skills required for a leader to be successful, ie traits and states. 2) Develop an understanding of the common errors made by leaders in academic and private practices enabling the attendee to obtain the ? learnings' without the 'lumps. 3) Acquire the skills of succession planning needed to ensure that the success of your organization is sustainable over time and leadership transitions. (This course is part of the Leadership Track)

Sub-Events

RC132A How Leaders Succeed and Fail

Participants

James A. Brink, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title. (This course is part of the Leadership Track)

RC132B Keys to Avoid Failure: Key Qualities of a Successful Leader

Participants Jonathan S. Lewin, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title. (This course is part of the Leadership Track)

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Jonathan S. Lewin, MD - 2012 Honored Educator

RC132C Leadership

Participants N. Reed Dunnick, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize historical examples of leaders, in addition to how you can recognize and emulate their favorable characteristics that draw you to their leadership attributes. 2) Understand an overview of leadership references, where and how to access the same, how the related body of knowledge has evolved, and current perspectives concerning leaders and leadership. (This course is part of the Leadership Track)

Anatomy and Pathology of the Pharynx and Larynx

Sunday, Nov. 29 2:00PM - 3:30PM Location: E450A

HN NR

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

Participants Sub-Events

RC106A Imaging the Nasopharynx

Participants

Nancy J. Fischbein, MD, Stanford, CA, (fischbein@stanford.edu) (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 nasopharynx is the uppermost portion of the upper aerodigestive tract, and it is located posterior to the nasal cavity, inferior to the sphenoid sinus, and anterior to the clivus and craniovertebral junction, above the level of the soft palate. Given its intimate relationship with the central skull base, detailed knowledge of the anatomy of the central skull base, including its canals and foramina, is critical to understanding the spread of disease in this region. Though CT is helpul in imaging diseases of this region, a good knowledge of MR anatomy, and an understanding of optimal MR imaging protocols, is essential to proper imaging and imaging interpretation of diseases of the nasopharynx. We will spend some of our time discussing nasopharyngeal carcinoma, including its demographics, staging, and imaging appearance, but we will also review benign pathologies of the nasopharynx, and other malignant entities. We will also review some imaging pearls for each entity, and also imaging pitfalls, as there are many ways in which the unwary radiologist can overlook or misinterpret significant pathology in the nasopharynx.

RC106B Imaging the Oropharynx

Participants

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

LEARNING OBJECTIVES

1) Review the normal anatomy of the oropharynx. 2) Illustrate the normal spread patterns of tumors involving various subsites of the oropharynx. 3) Describe the appearance of various infectious and inflammatory processes involving the oropharynx.

ABSTRACT

Imaging plays a crucial role in evaluating the evaluating the oropharynx. This talk will review the normal anatomy and malignancies involving the oropharynx. The presentation will also review various inflammatory and infectious processes that involve different parts of the oropharynx.

RC106C Imaging the Larynx and Hypopharynx

Participants Peter M. Som, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The registrants will learn the intimate relationship between the larynx and hypophartnx. 2) The antomy of the larynx and hypopharynx will be reviewed. 3) The major pathology of these structures will be reviewed.

ABSTRACT

The larynx is situated wiithin the hypopharynx and thus their intimate relationship. The anatomy of the larynx and the hypopharynx will be reviewed, especially as it pertains to neoplasms. The scope of inflammatory and neoplastic diseases that affect these structures will be reviewed with particular attention to what should be included in the radiologist's report to create a pertainent and meaning report.

MRI: Imaging for Treatment Planning

Sunday, Nov. 29 2:00PM - 3:30PM Location: E353A

MR RO PH

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

Participants

Eric Paulson, Milwaukee, WI (Moderator) Nothing to Disclose

ABSTRACT

Sub-Events

RC122A MRI for Anatomical Definition

Participants

Eric Paulson, Milwaukee, WI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the advantages of MRI simulation for anatomical delineation in both external beam radiation therapy and brachytherapy. 2) Understand the differences between images obtained during MRI simulation versus diagnostic MRI. 3) Understand the current solutions to address technical challenges of using MRI for anatomical delineation in Radiation Oncology.

ABSTRACT

MRI is rapidly emerging as a primary imaging modality in Radiation Oncology, fueled by innovations in MRI-guided treatment delivery, MRI simulation systems, and the role of MRI in individualizing and adapting radiation therapy. This course will discuss the advantages and technical challenges of using MRI for anatomical definition in radiation treatment planning. Current solutions to tailor MRI to the unique demands of Radiation Oncology will be explored. Clinical examples illustrating the use of MRI for anatomical delineation in both external beam radiation therapy and brachytherapy will be presented.

RC122B MRI for Functional Definition

Participants

Uulke A. van der Heide, PhD, Amsterdam, Netherlands (Presenter) Speaker, Koninklijke Philips NV

LEARNING OBJECTIVES

1) Get an overview of the most relevant functional MRI modalities are available. 2) Understand how they can be used to improve target definition. 3) Understand their limitations and specific concerns for use in radiation oncology.

ABSTRACT

In addition to anatomical imaging, MRI affords a range of functional techniques. Diffusion-weighted MRI images the restriction of water mobility in tissue, thus probing microanatomy. This is used to identify tumors and monitor response to treatment. Dynamic contrast-enhanced MRI shows the tracer kinetics of contrast agents and reflects the characteristics of the microvasculature, such as flow and permeability. These and other techniques can be used to improve target definition, and to characterize tumor tissue for radiotherapy dose painting.

Gynecologic Ultrasound (An Interactive Session)

Sunday, Nov. 29 2:00PM - 3:30PM Location: E353B

GU OB US

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

Participants Sub-Events

RC110A Uterus and Endometrium

Participants Ruth B. Goldstein, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be able to state the acceptable standards for endometrial assessment in women with abnormal vaginal bleeding. 2) Be able to recognize a uterine abnormality in a postmenopausal woman that warrants further evaluation including tissue sampling or MRI. 3) Be able to recognize and diagnose adenomyosis.

Active Handout: Ruth Beth Goldstein

http://abstract.rsna.org/uploads/2015/15001988/RC110A.pdf

RC110B Ovarian Masses

Participants Phyllis Glanc, MD, Toronto, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Evaluate critical ultrasound features of adnexal masses that permit stratification into benign, indeterminate or suspicious for malignancy. 2) Incorporate the role of guidelines, consensus statements, risk prediction algorithms and serum biomarkers. 3) Consider the role of alternate imaging modalities such as MRI, CT, PET-CT. 4) Utilize appropriate management strategies.

ABSTRACT

There remains a gap between the state of the knowledge and translation into practice for the diagnosis and management of adnexal masses. Pelvic ultrasound remains the primary imaging modality in the greater majority of cases. Most ovarian masses can be correctly classified on the basis of their ultrasound characteristics, nonetheless many masses that are 'almost certainly benign' or even 'indeterminate' come to prompt surgical exploration, which is not always apprpriate or without its potential risks.. This session will explore further these characteristic findings but also will evaluate the role of serial ultrasound, additional modalities such as MR or CT, serum biomarkers, strategies such as IOTA simple rules and optimization of referral patterns.

Active Handout: Phyllis Glanc

http://abstract.rsna.org/uploads/2015/15001989/RC110B.pdf

RC110C Endometriosis

Participants

Luciana P. Chamie, MD, PhD, Sao Paulo, Brazil (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Define clinical and epidemiological aspects of endometriosis. 2) Define the importance of imaging mapping for endometriosis before clinical counseling. 3) Apply the most appropriate technique to investigate endometriosis. 4) Define the bowel preparation required for the transvaginal ultrasound to investigate endometriosis. 5) Apply the imaging algorithm to map deeply infiltrative endometriosis. 6) Assess the ultrasonographic findings of deeply infiltrative endometriosis in the most common sites such as bladder, vesicouterine pouch, retrocervical space, vagina, ureters, appendix and rectosigmoid colon. 7) Assess the ultrasonographic findings of ovarian endometriomas and differentiate them from functional cysts.

ABSTRACT

Endometriosis is a very common gynecological disease affecting millions of women in their reproductive life, often causing pelvic pain and infertility. Clinical history and physical examination may suggest endometriosis, but imaging mapping is necessary to identify the disease and mandatory for clinical couseling and surgical planning. Transvaginal ultrasound after bowel preparation is the best imaging modality as the first-line technique to evaluate patients suspected of endometriosis. The bowel preparation is relatively simple and include the day before and the day of the examination. This method is highly accurate to identify intestinal endometriosis and to determine which layers of the bowel wall are affected. In addition, it provides better assessment of small peritoneal lesions of the retrocervical space, vagina and bladder. Pelvic adhesions can also be evaluated during the exam.

URL

http://chamie.com.br/download

Active Handout:Luciana Pardini Chamie

http://abstract.rsna.org/uploads/2015/15001990/Active RC110C.pdf

Medical Physics 2.0: Nuclear Imaging

Sunday, Nov. 29 2:00PM - 3:30PM Location: E351

NM PH

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

Participants

Ehsan Samei, PhD, Durham, NC (*Director*) Nothing to Disclose Douglas E. Pfeiffer, MS, Boulder, CO (*Director*) Nothing to Disclose

Sub-Events

RC121A Nuclear Imaging Perspective

Participants

Douglas E. Pfeiffer, MS, Boulder, CO (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the history and development of nuclear imaging. 2) Become introduced to the advances of hybrid imaging. 3) Understand the impact of equipment development on medical physics support.

ABSTRACT

Nuclear imaging has not received the attention or development enjoyed by other imaging modalities. Nevertheless, our understanding of nuclear imaging and development of protocols and hybrid systems has led to new requirements for testing and other medical physics support. This presentation will discuss these developments and the impact they have had on the medical physics support needed by nuclear imaging departments.

RC121B Nuclear Imaging 1.0

Participants

Osama R. Mawlawi, PhD, Houston, TX (*Presenter*) Research Grant, Siemens AG; Research Grant, General Electric Company; Research Grant, RadioMedix, Inc

LEARNING OBJECTIVES

1) Learn acceptance testing and commissioning of gamma cameras/SPECT / and PET-CT systems. 2) Describe routine quality control procedures and their frequencies. 3) Become familiar with ACR accreditation of planar, SPECT, and PET systems. 4) Learn about various potential image artifacts of gamma camera, SPECT and PET systems.

ABSTRACT

The aim of this lecture is to provide the audience with an overview of the current medical physics testing procedures that are performed on gamma cameras, SPECT and PET systems. The lecture will be divided into 3 main parts; the first part will describe the tests performed for acceptance testing of these systems while the second part will describe the routine quality control and assurance tests and their frequencies. The last part of the lecture will focus on the ACR accreditation process and the necessary phantom imaging for gamma cameras, SPECT and PET systems. Throughout the lecture, examples of potential image artifacts will be presented.

RC121C Nuclear Imaging 2.0

Participants

Jeffrey Nelson, Durham, NC (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Become familiar with new physics metric and analytics in nuclear imaging. 2) Determine testing implication of emerging technologies in nuclear imaging. 3) Envision the clinical implementation of new physics metrics and analytics.

ABSTRACT

Although the basic science of nuclear imaging has remained relatively unchanged since its inception, advances in instrumentation continue to advance the field into new territories. With a great number of these advances occurring over the past decade, the role and testing strategies of clinical nuclear medicine physicists must evolve in parallel. This presentation is designed to highlight some of the recent advances from a clinical medical physicist perspective and provide ideas and motivation for designing better evaluation strategies. Topics include improvement of traditional physics metrics and analytics, testing implications of hybrid imaging and advanced detector technologies, and strategies for effective implementation into the clinic.

MR Techniques in GI Cancers

Sunday, Nov. 29 2:00PM - 3:30PM Location: E352

GI MR

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC109A Liver Specific Contrast Agents

Participants

Giuseppe Brancatelli, MD, Palermo, Italy, (gbranca@yahoo.com) (Presenter) Speaker, Bayer AG

LEARNING OBJECTIVES

1) Describe the mechanism of action of liver specific contrast agents. 2) Understand the added value of liver-specific contrast agents in the characterization of focal liver lesions. 3) Identify the most common pitfalls and limitations of liver specific contrast agents.

ABSTRACT

RC109B Diffusion-weighted Imaging

Participants Ihab R. Kamel, MD, PhD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

Discuss the basic concepts for DWI in body applications.
Describe the emerging role of DWI in assessing response in cancer.
Discuss the application of DWI in whole body imaging.

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/

Ihab R. Kamel, MD, PhD - 2015 Honored Educator

RC109C MR Perfusion

Participants

Hersh Chandarana, MD, New York, NY (*Presenter*) Equipment support, Siemens AG; Software support, Siemens AG; Consultant, Bayer, AG;

LEARNING OBJECTIVES

1) Understand basic principles of Perfusion Weighted Imaging (PWI) 2) Understand steps involved in performing PWI 3) Clinical applications and limitations will be highlighted.

ABSTRACT

ABSTRACT:DCE-MRI refers to the high temporal resolution imaging performed before and after administration of gadolinium contrast. This dynamic contrast-enhanced (DCE)-MRI can be used to assess organ and/or tumor perfusion (PWI). PWI can provide insight into tumor vascularity and possibly early treatment response to antiangiogenic therapies. Basic concept of perfusion weighted imaging as well as acquisition and image analysis schemes will be briefly discussed. Potential clinical applications and challenges to clinical implementation will be highlighted.

RC109D PET MR

Participants

Alexander R. Guimaraes, MD, PhD, Portland, OR (Presenter) Speakers Bureau, Siemens AG; Expert Witness, Rice, Dolan, Kershaw

LEARNING OBJECTIVES

1) Understand the unique challenges in the physics underlying PET/MRI. 2) Understand the unique role of PET/MRI in diagnosing and staging GI Malignancies. 3) Understand the potential future role of PET/MRI in both diagnosing GI malignancies and in assessing novel therapeutic response.

ABSTRACT

3D Printing (Hands-on)

Sunday, Nov. 29 4:00PM - 5:30PM Location: S401AB

IN

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

Participants

Frank J. Rybicki III, MD, PhD, Ottawa, ON (Moderator) Research Grant, Toshiba Corporation; Frank J. Rybicki III, MD, PhD, Ottawa, ON (Presenter) Research Grant, Toshiba Corporation; Jane S. Matsumoto, MD, Rochester, MN (Presenter) Nothing to Disclose Jonathan M. Morris, MD, Rochester, MN (Presenter) Nothing to Disclose Dimitris Mitsouras, PhD, Boston, MA (Presenter) Research Grant, Toshiba Corporation; Speakers Bureau, Toshiba Corporation Andreas Giannopoulos, MD, Boston, MA, (agiannopoulos1@partners.org) (Presenter) Nothing to Disclose Nicole Wake, MS, New York, NY (Presenter) Nothing to Disclose Peter C. Liacouras, PhD, Bethesda, MD (Presenter) Nothing to Disclose Thomas A. Foley, MD, Rochester, MN (Presenter) Nothing to Disclose Kiaran P. McGee, PhD, Rochester, MN (Presenter) Nothing to Disclose Michael W. Itagaki, MD, MBA, Seattle, WA (Presenter) Owner, Embodi3D, LLC Shannon N. Zingula, MD, Rochester, MN (Presenter) Nothing to Disclose Leonid Chepelev, MD, PhD, Ottawa, ON (Presenter) Nothing to Disclose Adnan M. Sheikh, MD, Ottawa, ON (Presenter) Nothing to Disclose AiLi Wang, Ottawa, ON (Presenter) Nothing to Disclose Wilfred Dang, BS, Ottawa, ON (Presenter) Nothing to Disclose Ekin P. Akyuz, BSc, Ottawa, ON (Presenter) Nothing to Disclose Taryn Hodgdon, MD, Ottawa, ON (Presenter) Nothing to Disclose Carlos H. Torres, MD, Ottawa, ON (Presenter) Nothing to Disclose Anji Tang, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn the Standard Tessellation Language (STL) file format that is used in 3D priting. 2) Be exposed to a software package to enable segmentation of DICOM images using semi-automated and manual segmentation algorithms, allowing the user to demarcate desired parts. The most commonly used tools are thresholding, region growing, and manual sculpting. 3) Learn refinement of an output STL output so that it can be optimized for accurate printing of the desired anatomy and pathology. This step uses Computer Aided Design (CAD) software is used to perform steps such as "wrapping" and "smoothing" to make the model more homogeneous.

ABSTRACT

"3D printing" refers to fabrication of a tangible object from a digital file by a 3D printer. Materials are deposited layer-by-layer and then fused to form the final object. There are several 3D printing technologies that share similarities but differ in speed, cost, and resolution of the product. Digital Imaging and Communications in Medicine (DICOM) image files cannot be used directly for 3D printing; further steps are necessary to make them readable by 3D printers. The purpose of this hands-on course is to convert a set of DICOM files into a 3D printed model through a series of simple steps. Some of the initial post-processing steps may be familiar to the radiologist, as they share common features with 3D visualization tools that are used for image post-processing tasks such as 3D volume rendering. However, some are relatively or completely new to radiologists, including the manipulation of files in Standard Tessellation Language (STL). It is the STL format that is read by the 3D printer and used to output the hand held part of the patient's anatomy. This 90 minute session will begin with a DICOM file and will proceed through the steps to create a printable STL file. An extensive training manual will be provided before the meeting. It is highly recommended that participants review the training manual to optimize the experience at the workstation.

URL

Active Handout:Frank John Rybicki

http://abstract.rsna.org/uploads/2015/14003455/Active RCA13.pdf

Optimizing PowerPoint Slides

Sunday, Nov. 29 4:00PM - 5:30PM Location: S501ABC

ED IN

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

Participants

William J. Weadock, MD, Ann Arbor, MI (*Presenter*) Owner, Weadock Software, LLC Sarah C. Abate, BS, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the components of an optimal slide presentation. 2) Learn about common errors made in slide preparation and how they can be avoided. 3) Learn about how to improve the quality of a presentation by using optimal different slide backgrounds, font size and color, and image sizes. 4) Learn tips to ensure a smooth presentation.

ABSTRACT

Electronic presentations are very common in radiology practice. This hands-on demonstration and questions and answer session will show attendees how to optimize their presentations. The focus will be on the use of slide templates, color selection (font and background), font and image size, and animations. Additional review of image and video display and management will be covered. Demonstrations will include tips to decrease time creating and modifying presentations. Bring your questions!

Sunday Afternoon Plenary Session

Sunday, Nov. 29 4:00PM - 5:45PM Location: Arie Crown Theater



AMA PRA Category 1 Credits ™: 1.75 ARRT Category A+ Credits: 1.50

Participants

Ronald L. Arenson, MD, San Francisco, CA (Presenter) Nothing to Disclose

Sub-Events

PS12A Report of the RSNA Research and Education Foundation

Participants

Burton P. Drayer, MD, New York, NY (Presenter) Advisor, Hologic, Inc

Abstract

The RandE Foundation - Our Future is Now This year marks the 100th anniversary of the RSNA's founding. As radiology looks toward the future, one wonders what the next 100 years will look like for our specialty and whether the central role of radiologists in healthcare will be sustained. Analogous to our clinical radiology mantra, if we are not at the radiology research table we will be on the menu. As a leading global force in radiology, the RSNA is poised to lead the specialty into the next century and exceed the incredible success of the past 100 years. The RandE Foundation will play a key role in radiology's future by continuing its support of inspiring investigators and those pursuing innovative approaches to education. To meet these research and education needs headon, the Foundation launched Inspire-Innovate-Invest, The Campaign for Funding Radiology's Future® at last year's annual meeting. This bold campaign seeks to raise \$17.5 million to fund grants in radiologic research and education, bridging the gaps in funding for promising investigators and educators. To date our campaign has been a success with individuals, private practice and corporate donors generously pushing us to the mid-way point in our goal. There is still a long way to go. The future of our specialty depends on the commitment and generosity of each of us, the members of the imaging community. This year, the Foundation will fund 92 grants totaling \$3.6 million. The RandE is funding 25% of our ever increasing number of excellent grant applications. While pleased with these achievements, imagine what the RandE Foundation could fund with additional support from all of us as radiology colleagues? During the meeting week, please take time to visit the RandE Foundation Booth, located on Level 3 of Lakeside Center to learn more about how you can be a part of the campaign and support the RandE Foundation and the future robustness of our specialty.

PS12B Image Interpretation Session

Participants

Jonathan B. Kruskal, MD, PhD, Boston, MA (*Presenter*) Author, UpToDate, Inc Donald P. Frush, MD, Durham, NC (*Presenter*) Nothing to Disclose Bruce B. Forster, MD, Vancouver, BC (*Presenter*) Travel support, Siemens AG; Travel support, Toshiba Corporation; Christine M. Glastonbury, MBBS, San Francisco, CA (*Presenter*) Author with royalties, Reed Elsevier Michelle M. McNicholas, MD, Dublin, Ireland (*Presenter*) Nothing to Disclose Melissa L. Rosado De Christenson, MD, Kansas City, MO (*Presenter*) Author, Thieme Medical Publishers, Inc; Author, Reed Elsevier; Author, American Registry of Pathology; Author, Oxford University Press; ; ; ; Jorge A. Soto, MD, Boston, MA (*Presenter*) Nothing to Disclose

Honored Educators

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Melissa L. Rosado De Christenson, MD - 2012 Honored Educator Jorge A. Soto, MD - 2013 Honored Educator Jorge A. Soto, MD - 2014 Honored Educator Jorge A. Soto, MD - 2015 Honored Educator Jonathan B. Kruskal, MD, PhD - 2012 Honored Educator