Monday, May 16, 2016

9:40 AM - 11:40 AM  Scientific Session I-A: Gastrointestinal Radiology (concurrent)
Samuel Stafrace, MD, MRCP (UK), FRCR, FRCP Edin. (Qatar) and Andrew T. Trout, MD (USA), Moderators

9:40-9:50 a.m.  Ultrasound Imaging of the Spleen; Tips and Tricks to Aid Diagnosis - Samuel Stafrace, MD, MRCP (UK), FRCR, FRCP Edin. (Qatar)

9:50-11:40 a.m.  Scientific Papers – Gastrointestinal Radiology

<table>
<thead>
<tr>
<th>Paper #</th>
<th>Time</th>
<th>Author</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>9:50 AM</td>
<td>Trout</td>
<td>Interrater reproducibility of measured pancreatic secretory function on secretin-enhanced MRCP</td>
</tr>
<tr>
<td>002</td>
<td>9:58 AM</td>
<td>Alsabban</td>
<td>Clinical Relevance of Unsuspected MRE-detected PAD in Pediatric IBD</td>
</tr>
<tr>
<td>003</td>
<td>10:06 AM</td>
<td>Rosenbaum</td>
<td>US and MRI predictors of surgical bowel resection in pediatric Crohn’s disease</td>
</tr>
<tr>
<td>004</td>
<td>10:14 AM</td>
<td>Dillman</td>
<td>Prospective Cohort Study of Ultrasound-Ultrasound and Ultrasound-MRI Agreement in the Evaluation of Pediatric Small Bowel Crohn’s Disease</td>
</tr>
<tr>
<td>005</td>
<td>10:22 AM</td>
<td>Sasser</td>
<td>T2* MRI Assessment of Iron in Different Hepatic Segments in Pediatric Patients with Sickle Cell Hemoglobinopathies</td>
</tr>
<tr>
<td>006</td>
<td>10:30 AM</td>
<td>Tipirneni-Sajja</td>
<td>Assessment of Free-breathing R2*-UTE for Hepatic Iron Content Quantification in a Sedated Pediatric Cohort</td>
</tr>
<tr>
<td>007</td>
<td>10:38 AM</td>
<td>Khanna</td>
<td>MR based liver iron estimation in children: a comparison of signal intensity ratio method with T2* relaxometry</td>
</tr>
<tr>
<td>008</td>
<td>10:46 AM</td>
<td>Munden</td>
<td>Shear Wave Elastography of the Liver and Spleen, Comparison to Hemodynamics, Underlying Disease Process, and Isolating the Best Representative Segments</td>
</tr>
<tr>
<td>009</td>
<td>10:54 AM</td>
<td>Hartung</td>
<td>Ultrasound elastography with acoustic radiation force impulse (ARFI) to assess liver fibrosis and portal hypertension (HTN) in children with autosomal recessive polycystic kidney disease (ARPKD)</td>
</tr>
<tr>
<td>010</td>
<td>11:02 AM</td>
<td>Trout</td>
<td>Comparison of Gradient recalled echo (GRE) and Spin Echo-Echo planar imaging (SE-EPI) based MR Elastography of the liver in children with liver disease.</td>
</tr>
<tr>
<td>011</td>
<td>11:10 AM</td>
<td>Joshi</td>
<td>MR Elastography is a technically robust technique for assessment of hepatic stiffness in pediatric patients</td>
</tr>
<tr>
<td>012</td>
<td>11:18 AM</td>
<td>Joshi</td>
<td>Quantitative MR of the liver: Correlation between liver volume, stiffness, and fat fraction in a pediatric population</td>
</tr>
<tr>
<td>013</td>
<td>11:26 AM</td>
<td>Oudjhane</td>
<td>Doppler Parameters of Hepatic Artery as Predictors of Graft Status in Children with Liver Transplant</td>
</tr>
</tbody>
</table>

Keynote Speaker
Samuel Stafrace, MD, MRCP (UK), FRCR, FRCP Edin.
Attending physician - Radiology
Sidra Medical and Research Center
Assistant Professor in Clinical Radiology
Weill Cornell Medicine - Qatar
ABSTRACT FINAL ID: Paper #: 001
TITLE: Interrater reproducibility of measured pancreatic secretory function on secretin-enhanced MRCP
PRESENTER (FIRST NAME ONLY): Andrew
PRESENTER (LAST NAME ONLY): Trout
PRESENTER (INSTITUTION ONLY): Cincinnati Children’s Hospital Medical Center
PRESENTER (E-MAIL ONLY): andrew.trout@cchmc.org
SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 2
SESSION ABSTRACT START TIME: 9:50 AM
SESSION ABSTRACT END TIME: 9:58 AM
CURRENT CATEGORY: GI
SUPPLEMENTAL DATA: IPR Fig1.jpg|IPR Fig2.jpg|
AUTHORS (FIRST NAME, LAST NAME): Andrew Trout¹, Daniel B. Wallihan², Maisam Abu-El-Haija¹
AUTHORS/INSTITUTIONS: A. Trout, M. Abu-El-Haija, Radiology, Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio, UNITED STATES|D.B. Wallihan, Levine Children’s Hospital, Charlotte, North Carolina, UNITED STATES|

ABSTRACT BODY:
Purpose or Case Report: Exocrine secretory function is an important measure of pancreatic sufficiency in patients with chronic pancreatitis. Secretin-enhanced magnetic resonance cholangiopancreatography (MRCP) provides a non-invasive way to assess exocrine function. A study of adult patients previously defined normal secreted volume in response to secretin as 112±50 mL (Mensel B. AJR. 2014). While normative values are not yet known for children, if secretin-enhanced MRCP is to be a viable technique for assessment of exocrine function, there should be minimal interrater variability of measured secretory function. The purpose of this study was to assess interrater variability in measured exocrine pancreatic secretion by secretin-enhanced MRCP.

Methods & Materials: Pediatric and young adult patients with suspected pancreatic disease underwent secretin-enhanced MRCP including coronal fat-saturated single shot fast spin echo sequences acquired before and after secretin administration. Secreted volume was calculated as the difference in enteric (gastric and small intestinal) fluid volume between the pre- and post-secretin images. Enteric fluid volume was calculated by summing the volume of fluid on each imaging slice which was in turn calculated by multiplying slice thickness by the area (cm²) of fluid signal. The area of fluid signal was measured by thresholding the images to include only pixels with fluid signal (ImageJ v1.48k 2013, National Institutes of Health) with the same threshold applied to both the pre- and post-secretin images. Secreted fluid volume was independently measured by two reviewers who each independently selected thresholds and drew regions of interest. Measured secreted volumes were compared using paired t-tests and Spearman’s correlation with bias between measurements determined by Bland-Altman analysis.

Results: 19 patients (mean age 13.2 y, range: 0.6-25.3y) were included in this study. Measured secreted fluid volumes were highly correlated between reviewers (r=0.93, Figure 1). Mean secreted volumes measured by reviewers 1 and 2 were 99.6 and 93.9 mL (p=0.23) with a bias between measurements of 5.7 mL (95%CI: -40-51.5 mL, Figure 2).

Conclusions: Measurement of secreted fluid volume on MRCP in response to secretin administration is highly reproducible with a bias of less than 10mL between reviewers. This difference is small in comparison to the range of secreted volumes in adult patients and suggests MRCP is a technically viable means to non-invasively assess pancreatic exocrine function.
ABSTRACT FINAL ID: Paper #: 002

TITLE: Clinical Relevance of Unsuspected MRE-detected PAD in Pediatric IBD

PRESENTER (FIRST NAME ONLY): Zehour
PRESENTER (LAST NAME ONLY): Alsabban
PRESENTER (INSTITUTION ONLY): The Hospital for Sick Children/University of Toronto
PRESENTER (E-MAIL ONLY): zehour.alsabban@sickkids.ca

SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT START TIME: 9:58 AM
SESSION ABSTRACT END TIME: 10:06 AM
CURRENT CATEGORY: GI
SUPPLEMENTAL DATA: Figure 1.pdf|Figure 2.pdf|TABLE 1.pdf|

AUTHORS (FIRST NAME, LAST NAME): Zehour Alsabban1, Nicholas Carman1, Sebastian King1, Rahim Moineddin2, Ryan Lo2, Jacob Langer1, Thomas D. Walters1, Anne Griffiths1, Peter Church1, Mary-Louise C. Greer1

AUTHORS/INSTITUTIONS: Z. Alsabban, N. Carman, S. King, J. Langer, T.D. Walters, A. Griffiths, P. Church, M.C. Greer, The Hospital for Sick Children/University of Toronto, Toronto, Ontario, CANADA|R. Moineddin, R. Lo, University of Toronto, Toronto, Ontario, CANADA|

ABSTRACT BODY:

Purpose or Case Report: Increasingly, perianal fistulae (PAF) and abscesses (PAA) are identified on Magnetic Resonance Enterography (MRE) in pediatric inflammatory bowel disease (PIBD). Not all perianal disease (PAD) is clinically suspected, creating a clinical dilemma regarding additional imaging and/or treatment. The purpose of this study was to assess clinical relevance of these findings, correlating PAD on MRE with clinical evidence of PAD.

Methods & Materials: This research ethics board approved retrospective study identified patients ≤ 18 years having MRE and pelvic magnetic resonance imaging (PMR) within a 6-month period over 2 years 2011-2013, for known or clinically suspected IBD. Exclusions were interval surgical intervention (except Seton), and non-standard/non-diagnostic MRI. Two pediatric radiology fellowship-trained readers experienced with MRI, blinded to clinical data, reviewed MRI for number, type and length of PAF and number and volume of PAA. Where discrepant, a consensus read was performed. MRE were paired with the gold standard PMR closest in ≤ 6 months and compared for PAD. MRE with PAD (MRE+) were classified as true or false positive (TP, FP).

Clinical data captured independently by gastroenterology and surgical fellowship-trained researchers experienced in PIBD, included presence of PAF, fissures, PAA, skin tags and PAD activity, with patients classified as clinically positive or negative for PAD if PAF and/or PAA were detected. Clinical outcomes were recorded.

Diagnostic statistics for sensitivity, specificity, positive and negative predictive values (PPV, NPV) were calculated using MRE+ consensus data.

Results: Ninety-four patients (male:female 61:33) had 108 MRE and 131 PMR, median age at initial MRI 14.1 years (5.3-18.6 years), a majority with Crohn’s disease. After excluding 16 MRE for lack of clinical data ≤ 6 months, 77 patients and 80 PMR/MRE pairs remained, with 62 MRE+ (58 TP and 4 FP) compared with clinical data.

Sensitivity was 41.4 %, specificity 100%, PPV 100%, and NPV 10.5.%. (Table 1) False negative (FN) PAA average volume was 0.85 ml vs. TP 3.5 ml, and PAF average lengths were similar, FN 2.9 cm vs. TP 2.8 cm. The 34 FN studies were in 31 patients, 9 later developing clinically evident PAD.

Conclusions: MRE increasingly detects PAD not always clinically evident. Recognizing the natural history of PIBD, continued monitoring for PAD requiring intervention is warranted when detecting PAD on MRE. The high FN vs. low FP also suggests a low threshold for imaging if PAD is clinically suspected.
ABSTRACT FINAL ID: Paper #: 003
TITLE: US and MRI predictors of surgical bowel resection in pediatric Crohn’s disease
PRESENTER (FIRST NAME ONLY): Daniel
PRESENTER (LAST NAME ONLY): Rosenbaum
PRESENTER (INSTITUTION ONLY): NewYork-Presbyterian Hospital/Weill Cornell Medical Center
PRESENTER (E-MAIL ONLY): dgr2001@med.cornell.edu
SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 4
SESSION ABSTRACT START TIME: 10:06 AM
SESSION ABSTRACT END TIME: 10:14 AM
CURRENT CATEGORY: GI
SUPPLEMENTAL DATA: none
AUTHORS (FIRST NAME, LAST NAME): Daniel Rosenbaum¹, David M. Biko², Sudha A. Anupindi²
AUTHORS/INSTITUTIONS: D. Rosenbaum, Radiology, NewYork-Presbyterian Hospital/Weill Cornell Medical Center, New York, New York, UNITED STATES|D.M. Biko, S.A. Anupindi, The Children’s Hospital of Philadelphia, Philadelphia, Pennsylvania, UNITED STATES|

ABSTRACT BODY:
Purpose or Case Report: To identify imaging features of the terminal ileum (TI) on short-interval bowel ultrasound (US) and MR enterography (MRE) in children with Crohn’s disease (CD) requiring subsequent surgical bowel resection compared with those managed by medical therapy alone, and to correlate imaging features with histopathology.

Methods & Materials: This retrospective study evaluated patients with CD undergoing short-interval bowel US and MRE (within 2 months of one another), as well as subsequent ileocecectomy or endoscopy within 3 months of imaging. Imaging appearance of the TI on both modalities was compared between surgical patients and those managed with medical therapy, with the following parameters assessed: bowel wall thickness (BWT), mural stratification, vascularity, fibrofatty proliferation, abscess, fistula, and stricture on bowel US; BWT, T2 ratio, enhancement pattern, mesenteric edema, fibrofatty proliferation, abscess, fistula, and stricture on MRE. Imaging findings in surgical patients were correlated with location-matched histopathologic scores of inflammation and fibrosis using a scoring system adapted from the Simple Endoscopic Score for Crohn’s Disease.

Results: Twenty-two surgical patients (mean age 16.5 years; M/F: 13/9) and 20 non-surgical patients (mean age 14.8; M/F: 8/12) were included in final analysis. Surgical patients demonstrated significantly increased bowel wall thickness (p = 0.01), loss of mural stratification (p = 0.02), and increased fibrofatty proliferation (p = 0.04) on bowel US, as well as increased bowel wall thickness (p = 0.02), increased T2 ratio (p = 0.03), increased mesenteric edema (p = 0.001), and stricture (p = 0.005) on MRE. Nineteen of 22 ileocecectomy specimens showed severe inflammation and 21/22 showed severe fibrosis, with specimen homogeneity limiting meaningful correlation with imaging findings.

Conclusions: Children with CD requiring surgical bowel resection demonstrate multiple imaging features on US and MRE traditionally associated with both active inflammation and chronic fibrosis, findings corroborated by histopathology. These features may potentially serve as imaging biomarkers of medical therapy refractoriness in determining which patients will progress to surgery.
ABSTRACT FINAL ID: Paper #: 004
TITLE: Prospective Cohort Study of Ultrasound-Ultrasound and Ultrasound-MRI Agreement in the Evaluation of Pediatric Small Bowel Crohn’s Disease
PRESENTER (FIRST NAME ONLY): Jonathan
PRESENTER (LAST NAME ONLY): Dillman
PRESENTER (INSTITUTION ONLY): Cincinnati Children’s Hospital Medical Center
PRESENTER (E-MAIL ONLY): jonathan.dillman@cchmc.org
SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 5
SESSION ABSTRACT START TIME: 10:14 AM
SESSION ABSTRACT END TIME: 10:22 AM
CURRENT CATEGORY: GI
SUPPLEMENTAL DATA: Figure 1a upload.tif|Figure 1b upload.tif
AUTHORS (FIRST NAME, LAST NAME): Jonathan R. Dillman2, Ethan A. Smith1, Ramon Sanchez1, Michael DiPietro1, Soudabeh Fazeli1, Matthew Davenport3
AUTHORS/INSTITUTIONS: E.A. Smith, R. Sanchez, M. DiPietro, S. Fazeli, Department of Radiology, Section of Pediatric Radiology, University of Michigan C.S. Mott Children, Ann Arbor, Michigan, UNITED STATES|J.R. Dillman, Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio, UNITED STATES|M. Davenport, University of Michigan Hospitals, Ann Arbor, Michigan, UNITED STATES

ABSTRACT BODY:
Methods & Materials: IRB approval and informed consent/assent were obtained for this HIPAA-compliant prospective cohort study of children with newly diagnosed distal small bowel Crohn’s disease (July 2012 to December 2014). Enrolled subjects (N=29) underwent two small bowel US examinations performed by blinded independent radiologists both before and at multiple time points after initiation of medical therapy (231 unique ultrasound examinations, in total); 134 US examinations were associated with concurrent MRE. The MRE examination was interpreted by a third blinded radiologist. The following was documented on each examination: involved length of ileum (cm); maximum bowel wall thickness (mm); amount of bowel wall and mesenteric Doppler signal; presence of stricture, penetrating disease, and/or abscess. Inter-radiologist agreement was assessed with single-measure three-way mixed model intra-class correlation coefficients (ICC) and prevalence-adjusted, bias-adjusted kappa statistics (κ). Numbers in brackets are 95% confidence intervals.
Results: US-US agreement was moderate for involved length (ICC: 0.41 [0.35-0.49]) (Figure 1a); substantial for maximum bowel wall thickness (ICC: 0.67 [0.64-0.70]) (Figure 1b); moderate for bowel wall Doppler signal (ICC: 0.53 [0.48-0.59]); slight for mesenteric Doppler signal (ICC: 0.25 [0.18-0.42]); and moderate to almost perfect for stricture (κ: 0.54), penetrating disease (κ: 0.80), and abscess (κ: 0.96). US-MRE agreement was moderate for involved length (ICC: 0.42 [0.37-0.49]); substantial for maximum bowel wall thickness (ICC: 0.66 [0.65-0.69]); and substantial to almost perfect for stricture (κ: 0.61), penetrating disease (κ: 0.72), and abscess (κ: 0.88).
ABSTRACT FINAL ID: Paper #: 005

TITLE: T2* MRI Assessment of Iron in Different Hepatic Segments in Pediatric Patients with Sickle Cell Hemoglobinopathies

PRESENTER (FIRST NAME ONLY): Hampton
PRESENTER (LAST NAME ONLY): Sasser
PRESENTER (INSTITUTION ONLY): Medical University of South Carolina
PRESENTER (E-MAIL ONLY): sasserh@musc.edu

SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 6
SESSION ABSTRACT START TIME: 10:22 AM
SESSION ABSTRACT END TIME: 10:30 AM
CURRENT CATEGORY: GI

SUPPLEMENTAL DATA: Representative graph.tif|Table_Mean and SD HIC.docx|Table_Ferritin vs HIC.docx|

AUTHORS (FIRST NAME, LAST NAME): Hampton Sasser¹, Heather Collins¹, Anil G. Rao¹
AUTHORS/INSTITUTIONS: H. Sasser, H. Collins, A.G. Rao, Radiology and Radiological Science, Medical University of South Carolina, Charleston, South Carolina, UNITED STATES

ABSTRACT BODY:

Purpose or Case Report: To evaluate if there is a variation in hepatic iron concentration (HIC) between liver segments when assessing iron overload in pediatric patients with sickle cell hemoglobinopathies.

Methods & Materials: This is a retrospective analysis of abdomen MRI studies following IRB approval. T2* weighted gradient recalled echo (GRE) serial axial images of the liver were acquired with same time of repetitions (TR) and increasing echo times (TE). Same sized region of interest (ROI) circles were placed on all Couinaud liver segments. T2* was calculated as the negative inverse value of the slope got by plotting natural logarithmic ROI values with TE values. HIC was calculated for each of the Couinaud segments using R2* (R2*=1000/T2*) and an equation formulated by Wood et al (2005) as follows: HIC = (R2* x 0.0254) + 0.202 (Sample Figure). The mean HIC values of all patients for each of liver segments (Table 1) were compared and analyzed statistically for variance using a two tailed ANOVA test with Sidak correction. A Pearson correlation was conducted to identify associations between ferritin levels and HIC for each segment and a mean of all segments combined. All analyses were considered significant at p<0.05 values.

Results: There were 47 abdomen MRI studies done in 26 patients (11 female, 15 males; age range 5 – 19 years; mean age 14 years). Overall, there was no significant main effect of liver segment on hepatic iron content, F(152.39, 65.23) = 2.34, p = .10, ηp² = 0.05. Ferritin levels positively correlated (Table 2) with HIC in all the liver segments and also with the overall mean value of all segments combined, r (45) = .545, p < .001.

Conclusions: No significant differences in HIC between liver segments were found indicating that ROI estimation of HIC in a single liver segment is sufficient to assess hepatic iron burden. HIC positively correlates with serum ferritin levels.
ABSTRACT FINAL ID: Paper #: 006
TITLE: Assessment of Free-breathing R2*-UTE for Hepatic Iron Content Quantification in a Sedated Pediatric Cohort
PRESENTER (FIRST NAME ONLY): Aaryani
PRESENTER (LAST NAME ONLY): Tipirneni-Sajja
PRESENTER (INSTITUTION ONLY): Diagnostic Imaging, St. Jude Children's Research Hospital
PRESENTER (E-MAIL ONLY): aaryani.sajja@stjude.org
SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 7
SESSION ABSTRACT START TIME: 10:30 AM
SESSION ABSTRACT END TIME: 10:38 AM
CURRENT CATEGORY: Other
SUPPLEMENTAL DATA: Figure1.png|Figure2.png|Figure3.png
AUTHORS (FIRST NAME, LAST NAME): Aaryani Tipirneni-Sajja1, Beth McCarville1, Axel J. Krafft1, Ralf B. Loeffler1, Ruitian Song1, Chris Goode1, Gail Fortner2, Jane S. Hankins2, Claudia M. Hillenbrand1
AUTHORS/INSTITUTIONS: A. Tipirneni-Sajja, B. McCarville, A.J. Krafft, R.B. Loeffler, R. Song, C. Goode, C.M. Hillenbrand, Diagnostic Imaging, St. Jude Children's Research Hospital, Memphis, Tennessee, UNITED STATES|G. Fortner, J.S. Hankins, Hematology, St. Jude Children's Research Hospital, Memphis, Tennessee, UNITED STATES
ABSTRACT BODY:
Purpose or Case Report: Quantification of hepatic iron content (HIC) using R2*-MRI is an alternative to liver biopsy. R2* is usually obtained from breath-hold multi-gradient-echo images (BH-GRE); HIC is calculated from R2* using liver biopsy calibrations. However, in children who require sedation or cannot hold their breath, GRE images contain degrading respiratory motion artifacts that introduce errors in HIC estimation. Here, we propose a free-breathing (FB) ultra-short echo time (UTE) R2* acquisition that reduces erroneous R2*-based HIC assessment introduced by physiological motion.
Methods & Materials: 27 sedated patients (age, 6.7±3.8yrs) with iron overload (IO) were scanned at 1.5T using both FB-GRE and FB-UTE sequences. Further, FB exams were compared to standard BH-GRE in a non-sedated IO patient to test for potential R2* deviation in FB scans. R2* maps were obtained for all sequences by fitting a monoexponential decay to the signal. To calculate mean liver R2*, whole liver ROIs were drawn and blood vessels were excluded via histogram analysis. The mean and standard deviation (SD) of R2* values extracted from FB-GRE and FB-UTE were analyzed using linear regression and Bland-Altman plots.
Results: All FB-GRE images of sedated children had motion artifacts and inferior image quality compared to FB-UTE images; the artifacts appeared more pronounced with increasing HIC. As an example, Fig. 1 shows FB-GRE and FB-UTE images and respective R2* maps of a sedated child. Barely any artifacts are visible in FB-UTE images. The non-sedated patient (Fig. 2) also displayed motion artifacts for FB-GRE images and a lower mean liver R2* and higher SD than the standard BH-GRE and FB-UTE suggesting that artifacts are the main cause for this observed R2* underestimation. Overall, we consistently found lower mean R2* values for FB-GRE, with a 2-fold higher SD compared to FB-UTE (Fig. 3).
Conclusions: R2* is underestimated for FB-GRE most likely due to motion artifacts which primarily arise from bright subcutaneous fat signal. Artifacts become more visible with increasing HIC as the contrast between artifacts and dark liver tissue increases. Furthermore, R2* underestimation and SD become greater towards high IO which introduces a strong bias in high HIC estimates. In contrast, FB-UTE had barely any motion artifacts as radial sampling is intrinsically insensitive to motion. We conclude that FB-UTE with its excellent image quality is a viable method for accurate R2*–HIC assessment in sedated children and patients who cannot breath-hold.
ABSTRACT FINAL ID: Paper #: 007
TITLE: MR based liver iron estimation in children: a comparison of signal intensity ratio method with T2* relaxometry
PRESENTER (FIRST NAME ONLY): Geetika
PRESENTER (LAST NAME ONLY): Khanna
PRESENTER (INSTITUTION ONLY): Mallinckrodt Institute of Radiology
PRESENTER (E-MAIL ONLY): khannag@mir.wustl.edu
SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 8
SESSION ABSTRACT START TIME: 10:38 AM
SESSION ABSTRACT END TIME: 10:46 AM
CURRENT CATEGORY: GI
SUPPLEMENTAL DATA: Figure_1.tif|Figure_2.tif|
AUTHORS (FIRST NAME, LAST NAME): Swapnil Bagade2, Geetika Khanna1
AUTHORS/INSTITUTIONS: G. Khanna, Washington University, Mallinckrodt Institute of Radiology, St Louis, Missouri, UNITED STATES|S. Bagade, Radiology Associates, St. Francis hospital, Hartford, Connecticut, UNITED STATES|

ABSTRACT BODY:
Purpose or Case Report: MR evaluation of liver iron concentration is standard of care in children with predisposition to iron overload. T2* relaxometry is the standard of care for MR based liver iron estimation. However, this technique is not available in all institutions. The signal intensity ratio (SIR) method developed by Gandon, et al. is easy to implement and has a web-based formula for liver iron estimation. The purpose of our study was to:
1. Determine correlation between liver iron concentration (LIC) estimated by SIR and T2* methods
2. To assess the accuracy of LIC quantification by SIR method using T2* as the reference standard.

Methods & Materials: This is a retrospective, IRB approved, HIPAA compliant study. Radiology information system was queried to identify subjects <25 years of age who had MRI for LIC between December 2011- October 2014. All subjects underwent LIC estimation using the SIR and T2* methods in the same visit. The SIR method measures the ratio of liver to muscle signal intensity in 5 gradient echo (GRE) sequences. The T2* method uses a multiecho T2 GRE sequence. LIC was estimated by SIR method by reader 1 and T2* method by reader 2. The readers were blinded to all clinical information and other sequences. Spearman’s rank correlation coefficient was used to assess the association between the two methods. The accuracy of LIC estimated by the SIR method was determined using T2* as reference standard.

Results: 51 MRIs were performed on 37 children (21F), age 3-22 years with following disorders: sickle cell 30, Blackfan Diamond 3, bone marrow transplant 2, and thalassemia major 2. T2* based LIC was 1.4-23 (median 4.5) mg/g dry weight of liver.

The Spearman’s rank correlation coefficient between the two methods was 0.83 (P<0.01) (Fig 1). 5/5 subjects with LIC <2mg/g were accurately classified as mild iron overload, and 2/2 with LIC >15mg/g were accurately classified as major iron overload by the SIR method. 9/14 (64%) subjects with LIC in 2-7mg/g range were accurately classified as intermediate iron overload by SIR method, while 5 (36%) were underestimated by the SIR method. 18 subjects had LIC in 7-15mg/g range, and all were accurately classified as either intermediate (10) or major (8) iron overload by SIR method (Fig 2).

Conclusions: There is good correlation between the SIR method and T2* relaxometry for LIC estimation. While severity of LIC is accurately determined in patients with <2mg/g or >7mg/g of liver iron, the classification is less accurate in the intermediate range.
ABSTRACT FINAL ID: Paper #: 008

TITLE: Shear Wave Elastography of the Liver and Spleen, Comparison to Hemodynamics, Underlying Disease Process, and Isolating the Best Representative Segments

PRESENTER (FIRST NAME ONLY): Martha
PRESENTER (LAST NAME ONLY): Munden
PRESENTER (INSTITUTION ONLY): Texas Children's Hospital
PRESENTER (E-MAIL ONLY): mmmunden@texaschildrens.org

SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 9
SESSION ABSTRACT START TIME: 10:46 AM
SESSION ABSTRACT END TIME: 10:54 AM
CURRENT CATEGORY: GI
SUPPLEMENTAL DATA: none

AUTHORS (FIRST NAME, LAST NAME): Martha M. Munden1, Alexander Dodd1, Wei Zhang1, Daniel H. Leung1
AUTHORS/INSTITUTIONS: M.M. Munden, A. Dodd, W. Zhang, D.H. Leung, Pediatric Radiology, Texas Children's Hospital, Houston, Texas, UNITED STATES

ABSTRACT BODY:

Purpose or Case Report: The purpose of the study is to determine the utility of shear wave elastography (SWE) of the liver and spleen compared to sonographic characteristics, hemodynamic parameters, disease entity and to assess the most representative liver segment for shear wave sampling in the pediatric patient.

Methods & Materials: The study was approved by institutional IRB and informed consent was obtained. A prospective cohort of healthy patients (n=24) and those with known liver disease (n=23) were analyzed. Results of SWE values of the liver (segments 5-8), SWE of the spleen were compared and correlated with ultrasound morphology (UM), underlying disease entity and hemodynamic parameters [Congestion Index of the portal vein (CI), portal hypertension index (PHI)].

The Spearman correlation coefficients were calculated of each of the 5 (4 liver segments, 1 spleen) regions to CI, PHI, and UM, and as normal vs known liver disease. The means and standard deviations of the shear wave values were summarized and compared using UM, disease vs no disease groupings, using the Wilcoxon Rank test. P value <0.05 was considered significantly different. For the correlation of shear wave values of liver to spleen, the Spearman and Pearson correlation coefficients were calculated.

Results: Segment 5 had the highest correlation coefficient with the ultrasound morphology grading system (Spearman: 0.64, p value<0.0001), segment 8 was next (Spearman: 0.46, p value : 0.0027). When all normal livers were grouped against known liver disease, segments 5 (1.1 m/s +/-0.2 vs 1.4 m/s +/-0.4) again showed the most significant difference with segment 8 (1.2 m/s +/-0.2 vs 1.7 m/s +/-0.7) next with P values of <0.0001 for segment 5 and 0.0032 for segment 8.

The Pearson Correlation Coefficient for comparing shear wave of liver and spleen showed a linear but negative correlation.

Shear wave measurements of segments 5 - 8 of the liver did not correlate well with CI or PHI. Of disease entities, those who had undergone a Fontan procedure with single ventricle physiology had the highest overall stiffness with cystic fibrosis the second highest.

Conclusions: SW elastography does correlate liver elasticity with known underlying liver disease and with abnormal sonographic characteristics. Segments 5 and 8 provided the highest correlation. No correlation was found with hemodynamic parameters.

Of the various underlying disease states, those having undergone a prior Fontan procedure with single ventricle physiology had the highest stiffness.
ABSTRACT FINAL ID: Paper #: 009
TITLE: Ultrasound elastography with acoustic radiation force impulse (ARFI) to assess liver fibrosis and portal hypothenstion (HTN) in children with autosomal recessive polycystic kidney disease (ARPKD)
PRESENTER (FIRST NAME ONLY): Erum
PRESENTER (LAST NAME ONLY): Hartung
PRESENTER (INSTITUTION ONLY): Children’s Hospital of Philadelphia
PRESENTER (E-MAIL ONLY): hartunge@email.chop.edu
SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 10
SESSION ABSTRACT START TIME: 10:54 AM
SESSION ABSTRACT END TIME: 11:02 AM
CURRENT CATEGORY: GU
SUPPLEMENTAL DATA: Figure1.tif|Figure2.tif|Figure3.tif
AUTHORS (FIRST NAME, LAST NAME): Erum A. Hartung¹, Kassa Darge¹
ABSTRACT BODY:
Purpose or Case Report: To evaluate if liver and spleen stiffness measured by ARFI can distinguish (1) ARPKD children from healthy controls, and (2) ARPKD children with and without clinical signs of portal HTN (presence/absence of splenomegaly or thrombocytopenia).
Methods & Materials: Children ≤21 y/o with ARPKD (n=11) and controls (n=11) were compared cross-sectionally. Stiffness of the right and left liver lobes and spleen were evaluated using a Siemens Acuson S3000 ultrasound scanner to measure shear wave velocity (SWV) in m/s (mean of 10 measurements per site). Splenomegaly was defined as sagittal spleen length >90th %ile for height based on published norms. Thrombocytopenia was defined as platelets <150K/uL. Liver and spleen SWV were compared in (1) ARPKD vs. controls; and (2) ARPKD children with vs. without signs of portal HTN, using Wilcoxon rank sum test. Receiver operating characteristic (ROC) analysis was used to determine if liver and spleen SWV can distinguish between these groups.
Results: SWV in the right and left liver lobes (RLL and LLL) and spleen were significantly higher in ARPKD vs. controls [RLL 1.70 m/s (IQR 1.57, 2.67) vs. 1.29 m/s (IQR 1.02, 1.40)(P=0.0007); LLL 2.32 m/s (IQR 1.77, 3.23) vs. 1.06 m/s (IQR 0.96, 1.27)(P=0.0001); spleen 3.27 m/s (IQR 2.83, 3.74) vs. 2.66 m/s (IQR 2.36, 2.88)(P=0.03)](Figure 1). Liver and spleen SWV were higher in ARPKD children with splenomegaly vs. those without [RLL 2.49 m/s (IQR 1.95, 3.04) vs. 1.57 m/s (IQR 1.49,1.58)(P=0.01); LLL 3.01 m/s (IQR 2.37, 3.29) vs. 1.77 m/s (IQR 1.64, 1.83)(P=0.006); spleen 3.67 m/s (IQR 3.32, 3.85) vs. 2.83 m/s (IQR 2.17, 2.88)(P=0.006)]. Liver and spleen SWV were also higher in ARPKD children with thrombocytopenia vs. those without [RLL 2.67 m/s (IQR 2.25, 3.04) vs. 1.58 m/s (IQR 1.49, 1.69)(P=0.006); LLL 3.23 m/s [IQR 2.80, 3.29] vs. 1.80 m/s (IQR 1.64, 1.83)(P=0.006); spleen 3.74 m/s [IQR 3.60, 3.85] vs. 2.86 m/s (IQR 2.17, 3.02)(P=0.006)](Figure 2). ROC analysis showed high AUC for RLL, LLL, and spleen SWV to differentiate ARPKD vs. controls [AUC (95%CI): 0.92 (0.80-1.00), 1.00 (1.00-1.00), and 0.76 (0.53-1.00) respectively]; ARPKD children with vs. without splenomegaly [AUC (95%CI): 0.92 (0.77,1.00), 0.91 (0.72-1.00), and 0.94 (0.81-1.00)]; and ARPKD children with vs. without low platelets [AUC (95%CI) 1.00 (1.00-1.00) for all 3 sites](Figure 3).
Conclusions: Liver and spleen stiffness measured by ARFI can distinguish children with ARPKD from healthy controls, and can detect presence of portal hypertension in children with ARPKD.
ABSTRACT FINAL ID: Paper #: 010

TITLE: Comparison of Gradient recalled echo (GRE) and Spin Echo-Echo planar imaging (SE-EPI) based MR Elastography of the liver in children with liver disease.

PRESENTER (FIRST NAME ONLY): Andrew
PRESENTER (LAST NAME ONLY): Trout
PRESENTER (INSTITUTION ONLY): Cincinnati Children's Hospital
PRESENTER (E-MAIL ONLY): andrew.trout@cchmc.org

SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 11
SESSION ABSTRACT START TIME: 11:02 AM
SESSION ABSTRACT END TIME: 11:10 AM
CURRENT CATEGORY: GI

SUPPLEMENTAL DATA: Figure1.jpg Figure2.jpg Figure3.jpg

AUTHORS (FIRST NAME, LAST NAME): Suraj D. Serai1, Andrew Trout1, Jonathan R. Dillman1, Kevin J. Glaser2, Richard L. Ehman2

AUTHORS/INSTITUTIONS: S.D. Serai, A. Trout, J.R. Dillman, Radiology, Cincinnati Children's Hospital, Cincinnati, Ohio, UNITED STATES|K.J. Glaser, R.L. Ehman, Mayo Clinic, Rochester, Minnesota, UNITED STATES|

ABSTRACT BODY:

Purpose or Case Report: Magnetic Resonance Elastography (MRE) primarily has been performed using a gradient echo sequence (GRE). GRE MRE, however, has two main limitations in a pediatric population where non-alcoholic fatty liver disease is a major cause of liver fibrosis: 1) Breath holds can be inconsistent, resulting in poor image quality, and 2) Signal loss in the deep liver in obese patients can result in under-sampling possibly leading to erroneous stiffness values. Spin-echo echo planar imaging (SE-EPI) is an alternative means of performing MRE that has higher SNR and is faster (Figure 1). The aim of this study was to compare GRE and SE-EPI MRE in a pediatric population.

Methods & Materials: 26 patients referred for clinical liver MRE were imaged using both GRE and SE-EPI MRE on a 1.5T MR scanner (HDx, GE Healthcare, Waukesha, USA) using an 8-channel torso coil and identical active driver amplitudes. GRE MRE was acquired in 4 breath holds of 15 seconds each and SE-EPI MRE was acquired in a single breath hold of 15 seconds. Four axial slices through the liver were obtained in each subject. MR elastogram maps were generated using a multimodal direct inversion (MMDI) algorithm (Mayo Clinic; Rochester, MN) with liver stiffness calculated as a mean of the means for stiffness measured on each slice (kPa). Pearson correlation and Bland-Altman difference plots were generated to assess agreement between techniques. Area of the sampled regions of interest was also recorded and compared with a 2-sample paired t-test (two-tailed).

Results: Mean patient age was 13.8 years (range: 0.7-19.8 years), and 57% were boys. Mean liver stiffness was 3.2±0.9 kPa by GRE MRE and 3.1±1.0 kPa by SE-EPI MRE. Sampled areas were 9,445±5,177 cm² for GRE MRE and 1,1973±4,533 cm² for SE-EPI MRE (p=0.001). When compared, all stiffness values but one fell within 95% agreement with the line of equality with an ICC value of 0.99 (95% CI: 0.976-0.995, p<0.001)(Figure 2). Bland-Altman analysis demonstrates a bias of -0.16 kPa between techniques with all but one value falling within 95% prediction limits (Figure 3). The outlier reflected an obese patient (BMI=35) in whom GRE MRE under-sampled the liver giving a stiffness value of 3.1±1.0 kPa versus 2.2±0.8 kPa for SE-EPI MRE.

Conclusions: There is strong agreement in measured hepatic stiffness between GRE and SE-EPI MRE with a bias of less than 0.2 kPa between techniques. SE-EPI MRE has the advantage of sampling a larger area of the liver and can be performed in a single breath hold.
ABSTRACT FINAL ID: Paper #: 011

TITLE: MR Elastography is a technically robust technique for assessment of hepatic stiffness in pediatric patients

PRESENTER (FIRST NAME ONLY): Madalsa

PRESENTER (LAST NAME ONLY): Joshi

PRESENTER (INSTITUTION ONLY): Cincinnati Children’s Hospital Medical Center

PRESENTER (E-MAIL ONLY): madalsa.joshi@cchmc.org

SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology

SESSION DAY & DATE: Monday, May 16, 2016

SESSION ABSTRACT SORT ORDER: 12

SESSION ABSTRACT START TIME: 11:10 AM

SESSION ABSTRACT END TIME: 11:18 AM

CURRENT CATEGORY: GI

SUPPLEMENTAL DATA: none

AUTHORS (FIRST NAME, LAST NAME): Madalsa Joshi1, Alexander J. Towbin1, Daniel J. Podberesky2, Suraj D. Serai1, Jonathan R. Dillman1, Stavra Xanthakos1, Rohit Kohli1, Andrew Trout1

AUTHORS/INSTITUTIONS: M. Joshi, A.J. Towbin, S.D. Serai, J.R. Dillman, S. Xanthakos, R. Kohli, A. Trout, Radiology, Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio, UNITED STATES|D.J. Podberesky, Nemours Children’s Hospital, Orlando, Florida, UNITED STATES|

ABSTRACT BODY:

Purpose or Case Report: To determine the rate of success of MR elastography of the liver in a pediatric population and identify the reasons for unsuccessful examinations.

Methods & Materials: Imaging records were searched for patients 18 years of age and younger, who underwent MR elastography of the liver between January 1, 2011 and August 5, 2015. MR elastography examinations were performed on one of two scanner platforms (different vendors, both 1.5T) using gradient recalled echo pulse sequences. Imaging reports were reviewed for the frequency of failed MR elastography acquisitions. Unsuccessful examinations were investigated further to determine the causative factor(s) resulting in failure, and to determine if a subsequent successful examination had been performed.

Results: A total of 449 examinations were performed on 356 unique patients during the study period. The mean age of the patient population was 12.6 ±3.6 years (range 0.1-18 years). The success rate for MRI elastography was 96% (431/449) with 18 failed examinations (4%, mean age = 11.4 years, range = 2.3-17.3 years). The reasons for examination failure included in order of decreasing frequency: large body habitus causing difficulties in paddle positioning (n=6), hepatic iron overload (n=4), patient inability to tolerate the MRI (n=3), patient motion/inability to follow breathing instructions (n=3), artifact from implanted hardware (n=1), and technical (hardware/software) malfunction (n=1). Eight of the 18 patients underwent repeat examinations, 6 (75%) of which were successful. Changes which yielded successful studies on repeat imaging included improved paddle positioning in patients with large body habitus (n=2), slice selection away from the hardware causing artifact (n=1), scanning the patient with sedation (n=1), proper functioning of hardware/software (n=1), and improved breath holding (n=1).

Conclusions: MR elastography of the liver is a technically robust, non-invasive method for evaluating liver stiffness in pediatric patients. Failure of MR elastography examinations is infrequent and largely reflects patient specific factors, some of which can be mitigated with careful technique.
Purpose or Case Report: MRI allows the assessment of liver stiffness (elastography), hepatic fat fraction, and liver volume in a single test. The purpose of this study was to determine the relationship between liver volume, stiffness, and fat fraction in a pediatric population. Specifically, we hypothesized that measured liver volume would increase with increasing fat content and decrease with increasing stiffness.

Methods & Materials: The reports for all quantitative MR examinations of the liver performed over 3 years, 8 months in patients less than 18 years of age were reviewed and liver stiffness (mean of means for four adjacent axial slices in kPa), liver volume, and hepatic fat fraction were extracted. Limited MR examinations had been performed at 1.5T, and included an MR elastography sequence, in and opposed phase imaging for calculation of hepatic fat fraction, and an axial fat-suppressed T2 weighted sequence for determination of liver volume based on manual segmentation. The electronic medical record was reviewed for clinical information including age, sex, weight, and underlying diagnosis. Unadjusted and adjusted relationships between variables were assessed using Pearson correlation and multiple linear regression.

Results: A total of 449 MR elastography examinations were performed in 356 unique patients (mean age = 12.7 ±3.6 years) during the study period. Based on univariate analysis, there was a significant positive correlation between liver volume and both patient age (r=0.52, p<0.0001) and hepatic fat fraction (r=0.57, p<0.0001). There were significant negative correlations between liver volume and mean liver stiffness (r=-0.10, p=0.03) and between hepatic fat fraction and liver stiffness (r=-0.26, p<0.0001). When adjusted for age, gender, and other variables, a 1% increase in hepatic fat fraction was associated with a 62mL increase in liver volume (p<0.0001); and a 1 year increase in age was associated with a 111mL increase in liver volume (p<0.0001). On average, female gender was associated with a 144mL decrease in liver volume compared to males (p=0.02). In the adjusted analysis, the relationship between liver stiffness and volume reversed suggesting an interplay between variables with a 1kPa increase in mean liver stiffness associated with a 59 mL increase in liver volume (p=0.04).

Conclusions: Liver volume is significantly associated with hepatic fat fraction and liver stiffness, with increases in each accounting for measurable increases in liver volume.
ABSTRACT FINAL ID: Paper #: 013
TITLE: Doppler Parameters of Hepatic Artery as Predictors of Graft Status in Children with Liver Transplant
PRESENTER (FIRST NAME ONLY): Tahani
PRESENTER (LAST NAME ONLY): Ahmad
PRESENTER (INSTITUTION ONLY): IWK Health center
PRESENTER (E-MAIL ONLY): tahani1523@yahoo.com
SESSION TITLE: Scientific Session I-A: Gastrointestinal Radiology
SESSION DAY & DATE: Monday, May 16, 2016
SESSION ABSTRACT SORT ORDER: 14
SESSION ABSTRACT START TIME: 11:26 AM
SESSION ABSTRACT END TIME: 11:34 AM
CURRENT CATEGORY: GI
SUPPLEMENTAL DATA: none
AUTHORS (FIRST NAME, LAST NAME): Tahani Ahmad2, Govind Chavhan1, Yaron Avitzur1, Rahim Moineddin1, Kamaldine Oudjhane1

ABSTRACT BODY:
Purpose or Case Report: To assess the clinical utility of hepatic artery Doppler parameters in evaluating graft status in children with liver transplant and to determine pediatric-specific ranges/cut off values of hepatic artery flow velocity (HAV) that portends complications

Methods & Materials: A retrospective review of the transplant database at tertiary pediatric hospital was performed for all children (289) who underwent liver transplantation between February 1998- September 2014. The operative reports, clinical notes, laboratory results, pathological findings and ultrasound records were reviewed at three time points (day 3, month 3 and one year post-operative). Basic descriptive data and statistical analysis including T test, ROC, Chi-squared test and Fisher exact test were performed as appropriate to assess the correlation between hepatic artery velocity and intrahepatic resistive index (RI) on one hand with liver function tests (LFT) and graft status (rejection, biliary or vascular complications) on the other hand.

Results: Of 120 children (54 girls and 66 boys; mean age of 3 years and 2 months) enrolled, 70/120 had satisfactory graft status at the one-year follow-up. Clear cut off value for HAV that can predict graft status was not identified. However, velocities between 50-200 cm/sec were associated with normal graft status (p=0.0658). Vascular and biliary complications in the immediate post-operative period were more frequent at velocities 200-300 cm/sec (p-value 0.0024). There was positive association between RI and graft status (p=0.0308) and values below 0.5 were associated with vascular complications (p=0.0116). There is no significant association between the liver function test and the Doppler parameters apart from a positive correlation between HA velocity at month-3 and the GGT (p-value 0.0410).

Conclusions: HAV between 50-200 cm/sec and RI (0.5- 0.8) are likely associated with normal graft status in children. These values should be used as an assist to the constellation of the ultrasonic findings and the clinical picture in pursuing a timely appropriate clinical decision