Visualization of the appendix with MR enterography in children

Poster No.: C-0847
Congress: ECR 2012
Type: Scientific Paper
Authors: A. kovanlikaya, D. Rosenbaum, M. Mazumdar, A. Dunning, P. W. Brill; New York, NY/US
Keywords: Paediatric, Gastrointestinal tract, Radioprotection / Radiation dose, MR, Imaging sequences, Contrast agent-oral, Radiation safety
DOI: 10.1594/ecr2012/C-0847

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.
As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.
You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.
Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.
www.myESR.org
Purpose

To determine the detection rate of the normal appendix in children on oral and IV contrast-enhanced magnetic resonance (MR) imaging. MR imaging has been proposed as a radiation-sparing alternative modality to CT for cases of ultrasound-equivocal suspected appendicitis in children and adolescents. Establishing comparability to CT in the visualization of the normal pediatric appendix, as well as defining optimal MR protocol parameters may facilitate the exploration of MR imaging in the evaluation of appendiceal pathology.
Methods and Materials

40 patients (mean age 14.5 years ± 2.9, range 9-21) underwent abdominopelvic MR enterography for the evaluation of inflammatory bowel disease (IBD). No patients had acute abdominal symptoms to suggest appendicitis or IBD flare at the time of imaging. MR imaging was performed using a 1.5-T magnet and a surface phased-array coil. Forty-five minutes prior to imaging, VoLumen 15 mg/kg PO was administered. Axial and coronal T2 steady state (FIESTA), post-contrast axial and pre- and post-contrast coronal ultrafast spoiled gradient-echo (LAVA) sequences were obtained, as well as axial and coronal single-shot fast spin-echo (SSFSE) sequences in a subset of patients. Glucagon 0.5mg IV was given to inhibit peristalsis immediately preceding intravenous contrast administration, which consisted of 0.1 mmol/kg gadopentetate dimeglumine. No patients required sedation for the examination.

MR images were interpreted by two board-certified pediatric radiologists using consensus reading. The primary criterion on which appendiceal detection was based was the identification of a blind-ending tubular structure arising from the cecum. A positive identification of the appendix was defined as visualization on at least one MR sequence, with consensus between the two observers required. Presence of a detectable appendix was recorded for all sequences in both axial and coronal planes, and signal intensities of the appendiceal wall and lumen with respect to skeletal muscle were noted. Presence of oral contrast at the level of the cecum was also recorded. The rate of normal appendiceal detection was correlated with body mass index (BMI), gender, and age.
Results

MR imaging and medical records from 40 patients were reviewed. Two patients were excluded due to history of prior appendectomy. Of the remaining 38 cases, the normal appendix was detected in 18 (47%). The greatest detection rate was found on the axial FIESTA sequence (Table 1 on page 9). The overall detection rate of the normal appendix in our study (47%, 95% CI = 31%-63%) was not significantly different from the hypothesized rate (48%, P=.94) based on previous similar non-contrast MRI studies in children.

The appendix appeared as a blind-ending tubular structure with a mildly hyperintense wall surrounded by a markedly hypointense rim on the FIESTA sequence. Signal intensity of the appendiceal lumen appeared as low (Fig. 1 on page 5), intermediate (Fig. 2 on page 5), or high (Fig. 3 on page 6) depending upon the presence of air, fecal material, or oral contrast, respectively. On the LAVA sequence, the appendiceal wall was mildly hyperintense (Fig. 4 on page 7), and became moderately so following administration of intravenous contrast, with the lumen remaining hypointense (Fig. 5 on page 8). Enhancement of the appendiceal wall was less pronounced than that of inflamed bowel in patients with concurrent active IBD. On the SSFSE sequence, the appendiceal wall was isointense, with the lumen appearing either isointense if oral contrast was absent, or markedly hyperintense if oral contrast was present. In 8 cases, transit of oral contrast did not reach the level of the cecum; in 50% of these 8 cases, the appendix was nonetheless identified.

The mean transverse diameter of the visualized appendices was 5.2 mm (range, 3.5-7.0 mm). Patients in whom the appendix was seen on MRI had significantly higher BMI compared to patients in whom the appendix was not seen (P=.049, Table 1 on page 9). Neither age (P=.1183, Table 1 on page 9) nor gender (P=.2391, not shown) demonstrated a significant association with appendiceal detection rate. Presence of oral contrast at the level of the cecum was not significantly associated with appendiceal detection rate (P=1.0, not shown).
Images for this section:

**Fig. 1:** Axial FIESTA sequence; the appendix (arrow) in a 17 year-old female with Crohn disease appears as a tubular structure posterior to the cecum, with a mildly hyperintense wall and hypointense lumen due to lack of luminal filling by oral contrast, despite presence of contrast in the adjacent cecum (C). The hypointense ring separating the appendix from the surrounding peritoneal fat is due to opposed-phase phenomenon.

© Radiology, NewYork-Presbyteryian Hospital - New York/US
Fig. 2: Appendix (arrow) demonstrating a mildly hyperintense wall and fecal contents in a 15 year-old female with Crohn disease in whom oral contrast has not reached the cecum (C).

© Radiology, NewYork-Presbyterian Hospital - New York/US
Fig. 3: Appendix (arrow) in an 11 year-old female with Crohn disease demonstrating a hyperintense wall and a markedly hyperintense lumen, indicative of luminal filling by fluid. Oral contrast is present within the cecum (C).

© Radiology, NewYork-Presbyterian Hospital - New York/US
Fig. 4: Coronal pre-contrast LAVA image demonstrates the appendix (arrow) as a mildly hyperintense tubular structure with a hypointense lumen extending inferiorly from the cecum.

© Radiology, NewYork-Presbytarian Hospital - New York/US
**Fig. 5:** Following the administration of intravenous contrast, the appendix (arrow) demonstrates moderate enhancement, the degree of which is less than that of the adjacent inflamed terminal ileum (TI) in a 15 year-old female with Crohn disease.

© Radiology, NewYork-Presbytarian Hospital - New York/US
Table 1: Overall detection analysis of the normal appendix

© Radiology, NewYork-Presbytery Hospital - New York/US
Conclusion

Our results indicate that MR imaging detects the normal appendix at a rate comparable to CT, corroborating some prior investigations. Furthermore, the addition of oral and intravenous contrast did not increase detection rate of the normal appendix when compared to previously reported detection rates of MR imaging with neither oral nor IV contrast. This finding suggests that in MR protocols designed to evaluate the appendix, patients may be spared the delay and discomfort of oral contrast administration, increasing the feasibility of MR imaging in the emergent clinical setting. These findings should be taken into consideration as prospective studies are undertaken to evaluate a broader role for MR imaging in the assessment of appendiceal pathology.
References


Personal Information