



MRI imaging in pediatric appendicitis

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ABSTRACT

An 8-year-old male presents with two days of abdominal pain and emesis. Computed tomography was concerning for obstruction or reactive ileus with an apparent transition point in the right lower quadrant, possibly due to Crohn's. Magnetic resonance imaging was concerning for perforated appendicitis. As demonstrated by this case MRI can be as sensitive as CT in detecting pediatric appendicitis [2]. We recommend using MRI instead of CT to diagnose appendicitis to avoid ionizing radiation and increased cancer risk in the pediatric population.

1. Introduction

Pediatric appendicitis is one of the most common causes of pediatric abdominal pain and at times is difficult to diagnose. Imaging protocols for these patients are varied. Studies have shown increased cancer risk in pediatric patient with each CT scan [5]. Ultrasound as a primary modality is optimal, but it is user dependent and less sensitive than CT or MRI [6]. MRI has been found to be equally as effective as CT scan and the majority of pediatric patients tolerate the increased time required [3]. Studies have found that using ultrasound as a primary modality, and MRI when necessary, is as sensitive and specific in diagnosing appendicitis as a CT scan [1].

2. Case report

Mr. N is an 8-year-old male with history of asthma and a prior episode of mesenteric adenitis presented with abdominal pain, nausea, and bilious emesis. An ultrasound was equivocal, CT abdomen and pelvis showed small bowel obstruction with a transition point in the right lower quadrant, inflamed bowel loops, and poor visualization of the appendix.



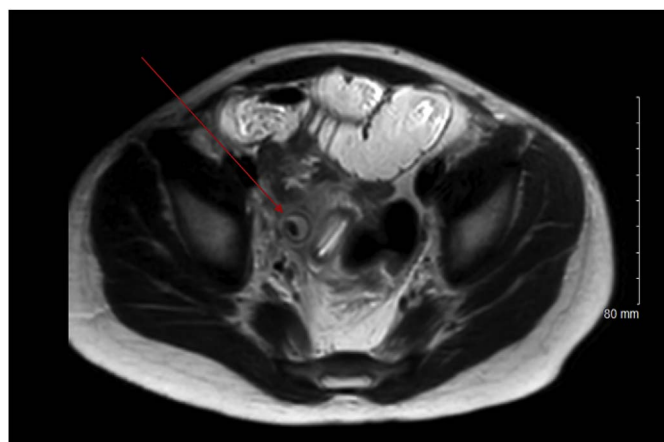
CT abdomen pelvis showing small bowel obstruction, no clear appendix.

CT abdomen pelvis showing small bowel obstruction, no clear appendix.

A nasogastric tube was placed for conservative management of his small bowel obstruction, but he deteriorated clinically throughout the day. He was increasingly tender and distended; an MRI was obtained and showed likely perforated appendicitis with a developing collection.

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MRI showing a dilated appendix with an appendicolith.

MRI showing a dilated appendix with an appendicolith.

There was concern for possible ischemic bowel in the setting of his clinical deterioration and the decision was made to perform an exploratory laparotomy through a lower midline incision. Intra-operatively he was found to have significant purulent fluid in the abdomen, the appendix was densely adherent to the sacral promontory and loops of terminal ileum, likely causing the small bowel obstruction, but no ischemia was present.

He recovered well post operatively, had return of bowel function by post-operative day two and was discharged home on oral antibiotics on post-operative day six.

3. Discussion

Initial diagnosis of appendicitis in pediatric patients is with physical exam and ultrasound. Sadly, the accuracy of ultrasound is operator dependent and can be between 71 and 97% accurate [6]. Diagnosis by ultrasound is more difficult in patients with an ileus, as the bowel gas can obstruct the window [6]. Meckel's diverticulum and inflammatory bowel disease can cause false positive ultrasound findings [6].

When ultrasound is unclear an alternative form of imaging may be helpful. Frequently CT is used over MRI because of the lower cost and faster evaluation, making it less likely to require patient sedation [2]. There is evidence that the risk of subsequent cancers increases with each CT scan performed on a pediatric patient [5]. Alternatively, MRIs have been found to be as accurate in diagnosing appendicitis as CT scan with no radiation exposure [5].

Studies have shown that MRI is 94% sensitive and 97% specific for appendicitis in the pediatric population [2]. This is comparable to CT scan 97% sensitive and 93% specific [3]. Aspelund G., et. Al looked into using Ultrasound and MRI as an alternative to CT for diagnosing pediatric appendicitis and found that they were equivalent [5].

One of the reasons MRI is often not utilized is due to the concern

that pediatric patients will require sedation to tolerate an MRI. Aspelund G., et. Al avoided sedating patients by only performing MRIs in patients over 5 years old [1]. Using this algorithm all patients that were planned to get an MRI tolerated the study without sedation [1]. Another study by Dillman J., et. Al demonstrated that 103 of 106 pediatric patients were able to tolerate an MRI to rule out appendicitis [4]. When ultrasound is equivocal MRI is a low risk alternative to CT scan that is tolerated by the majority of patients and avoids ionizing radiation.

4. Conclusion

Pediatric appendicitis can be a difficult diagnosis. Ultrasound, when performed by an experienced operation, can be sensitive and specific. When ultrasound is inconclusive MRI is an equally sensitive and specific test to CT. We recommend using MRI as a secondary test to diagnose appendicitis, to avoid radiation and increased cancer risk in pediatric patients.

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Declarations of interest

None.

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