AMSER Case of the Month October 2025

5 year old male with left-sided abdominal pain

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Patient Presentation

- **HPI:** A 5 year old male presents to the emergency department with 3 days of left-sided abdominal pain associated with nausea and vomiting
- **Medical Hx:** None
- **Past Surgical History:** None
- **Family History:** No known history
- Vitals:

Temperature (°C)	Heart Rate (BPM)	Respiratory Rate	Blood pressure
37.6	114	24	108/67

- **Physical exam:** Abdomen was soft, nondistended without tenderness to palpation with distraction using stethoscope; however, after removing the stethoscope and palpating patient has significant tenderness to palpation in the LUQ and LLQ, no rebound or guarding

Pertinent Labs

- Urinalysis: Negative for nitrites/leukocyte esterase
- WBC: 23.0 10^9/L
- Lipase: normal
- C-reactive protein: 13.4 mg/dL

What Imaging Should We Order?

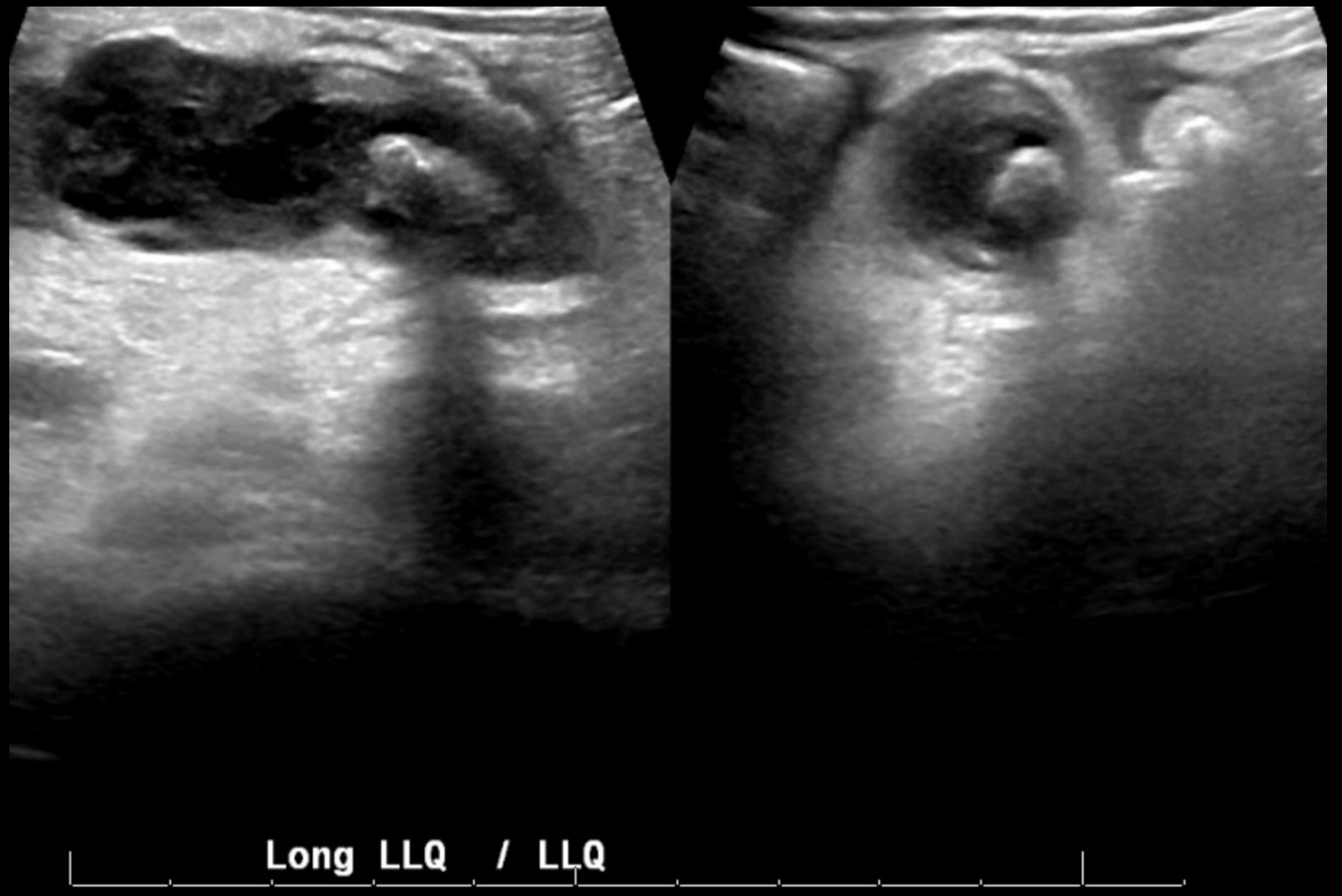
ACR Appropriateness Criteria

Variant 2: **Child. Suspected acute appendicitis, intermediate clinical risk. Initial imaging.**

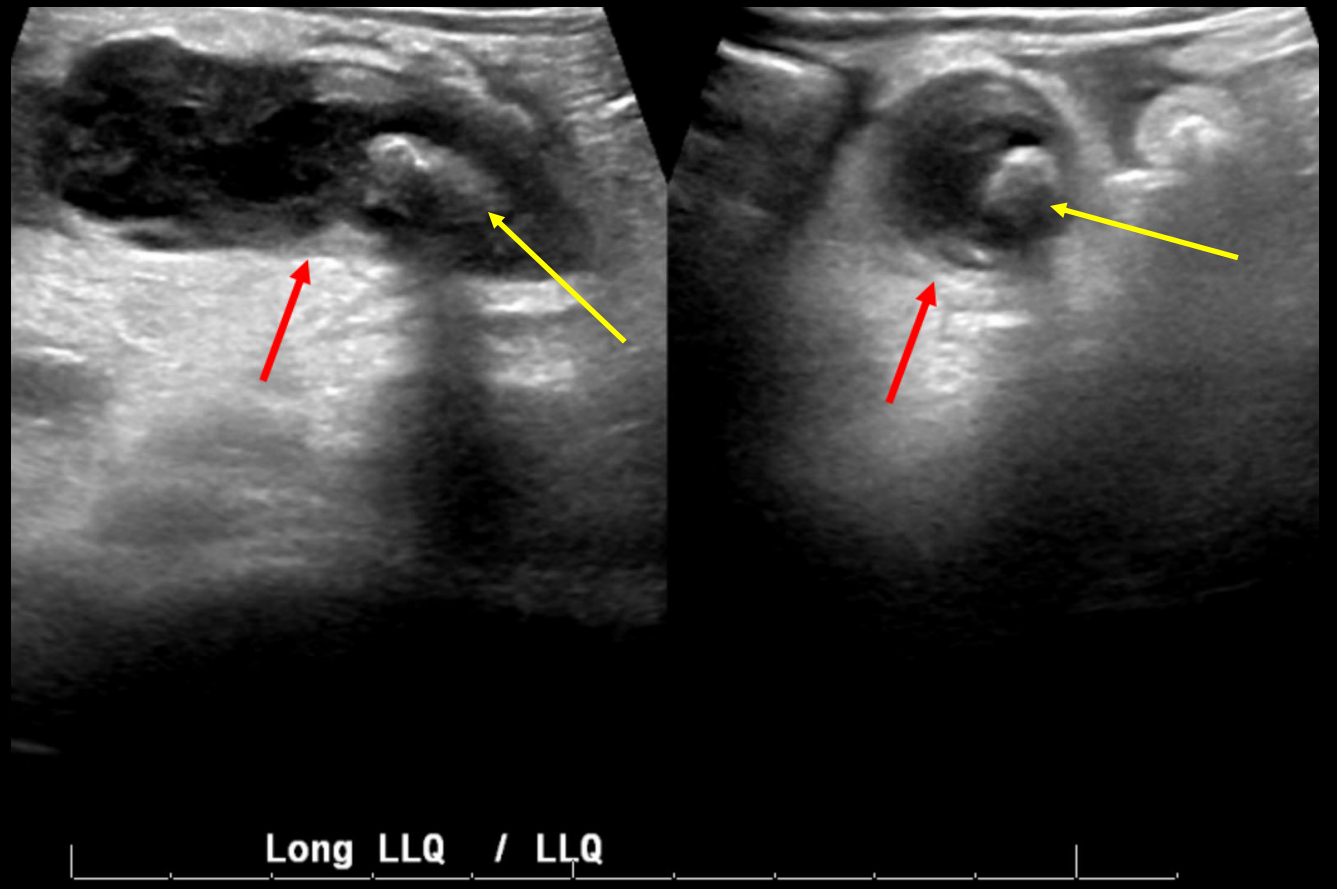
Procedure	Appropriateness Category	Relative Radiation Level
US abdomen RLQ	Usually Appropriate	O
US abdomen	Usually Appropriate	O
CT abdomen and pelvis with IV contrast	May Be Appropriate (Disagreement)	☢☢☢☢
CT abdomen and pelvis without IV contrast	May Be Appropriate (Disagreement)	☢☢☢☢
MRI abdomen and pelvis without and with IV contrast	May Be Appropriate (Disagreement)	O
MRI abdomen and pelvis without IV contrast	May Be Appropriate (Disagreement)	O
Radiography abdomen	May Be Appropriate (Disagreement)	☢☢
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢☢
US pelvis	Usually Not Appropriate	O

This imaging modality was ordered by the emergency medicine physician

Findings (unlabeled)



Findings: (labeled)



Grayscale ultrasound images of the LLQ in the long and transverse planes demonstrate a blind ending tubular structure with gut signature demonstrating wall thickening (red) and adjacent echogenic fat, suggesting inflammation. Echogenic structure within the lumen with posterior acoustic shadowing corresponding to an appendicolith (yellow)

What Imaging Should We Order?

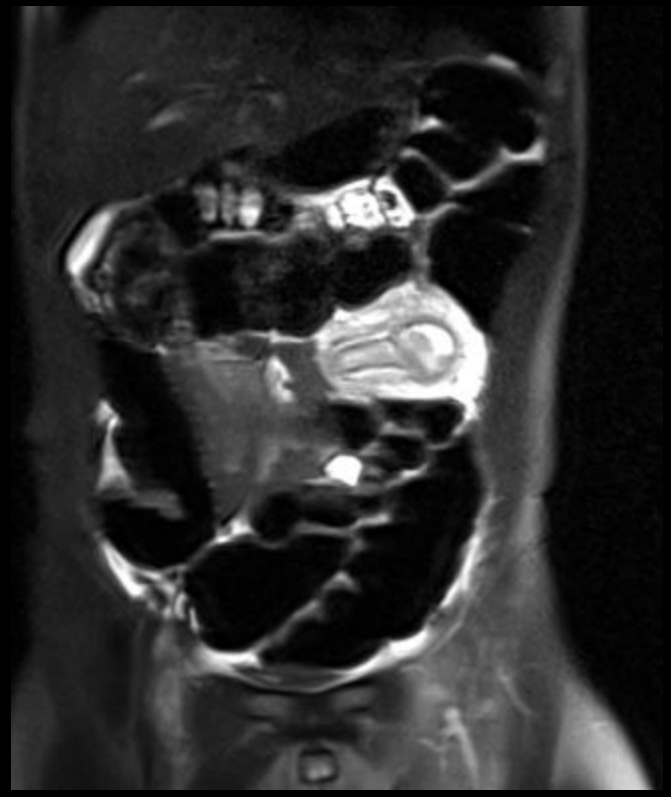
ACR Appropriateness Criteria

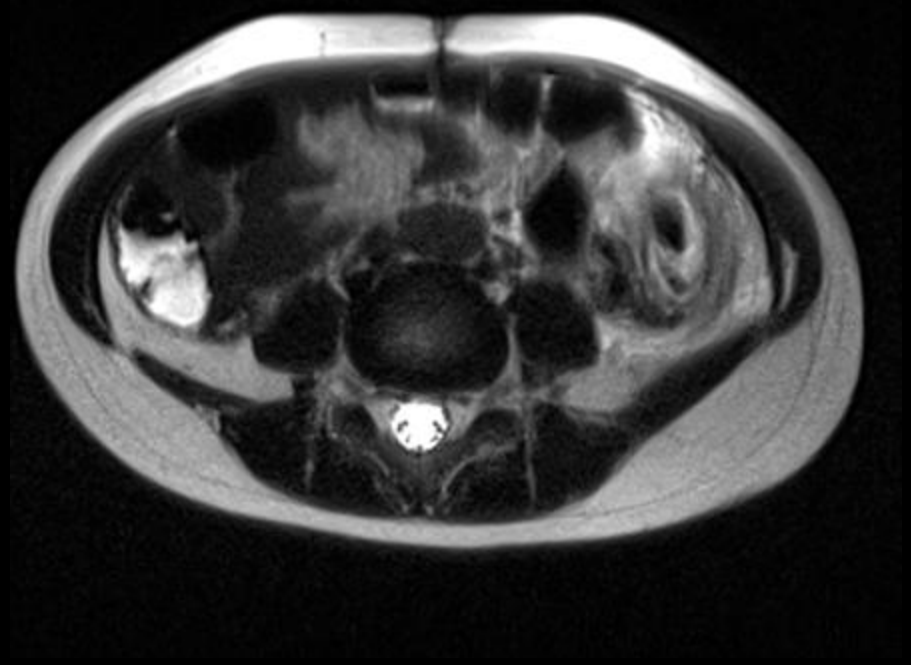
Variant 4: **Child. Suspected acute appendicitis, equivocal or nondiagnostic right lower quadrant ultrasound. Next imaging study.**

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☢☢☢☢
MRI abdomen and pelvis without and with IV contrast	Usually Appropriate	O
MRI abdomen and pelvis without IV contrast	Usually Appropriate	O
CT abdomen and pelvis without IV contrast	May Be Appropriate (Disagreement)	☢☢☢☢
US abdomen	May Be Appropriate (Disagreement)	O
US abdomen RLQ	May Be Appropriate	O
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	☢☢☢☢☢
US pelvis	Usually Not Appropriate	O
Radiography abdomen	Usually Not Appropriate	☢☢

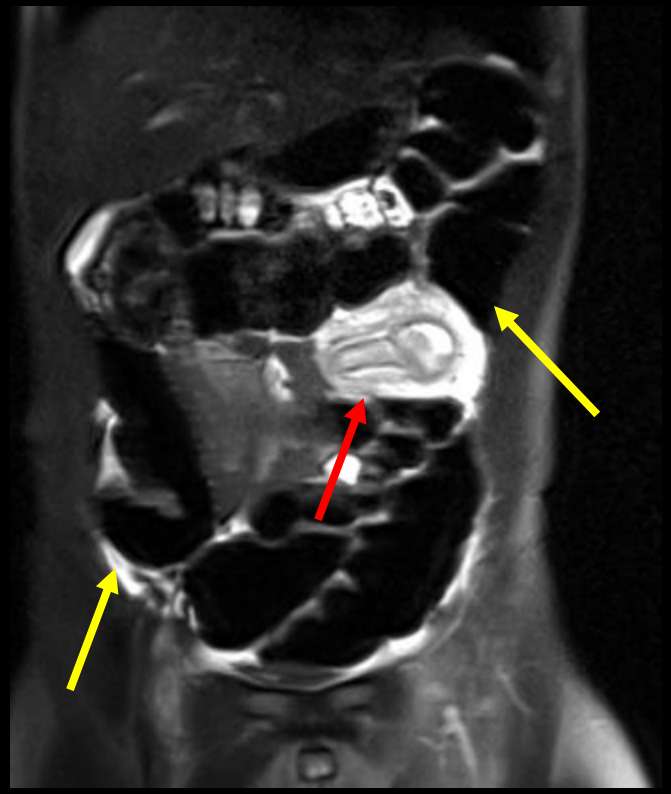
This imaging modality was ordered by the emergency medicine physician

Findings (unlabeled)





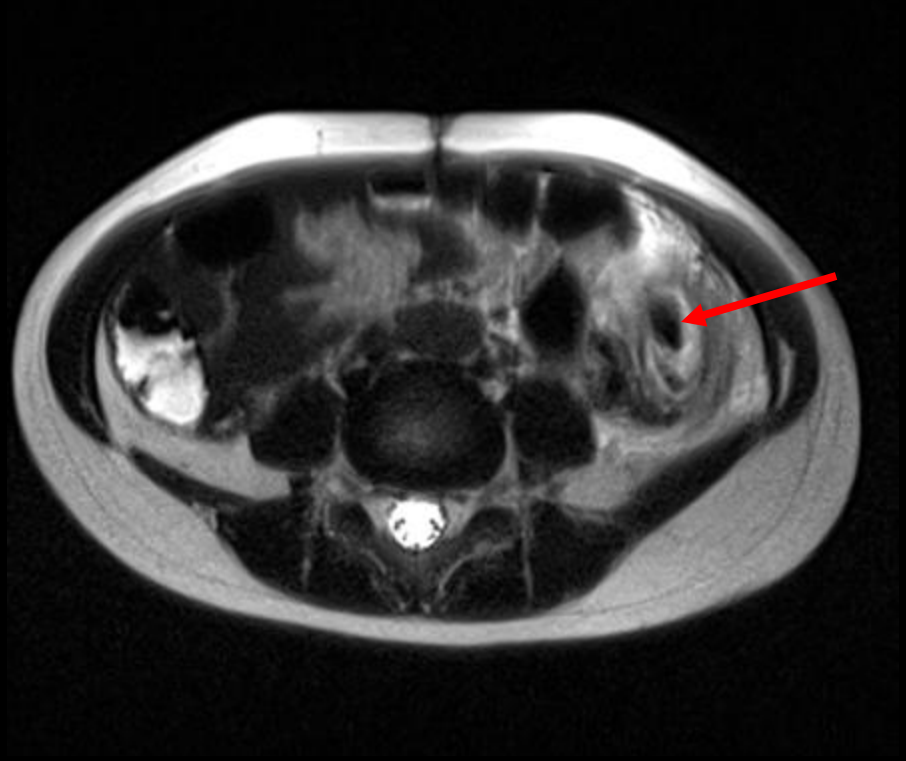
Findings (labeled)



Coronal T2 Haste
with Fat Saturation

Bowel malrotation with the small bowel in the right hemiabdomen and colon and cecum almost entirely within the left hemiabdomen (yellow). Dilated blind-ending tubular structure arising from the cecum in the left mid-abdomen with wall edema and surrounding T2 hyperintense signal, consistent with inflammation (red).

Findings (labeled)



Axial T2 Haste

Rounded T2 hypointense structure in the appendix (red), consistent with an appendicolith.

Interval History

- Diagnosis of acute appendicitis was established based on clinical and imaging findings
- Laparoscopic appendectomy was performed without correction of the midgut malrotation
- Surgical pathology confirmed the preoperative diagnosis of acute appendicitis

Final Dx:
Left-sided appendicitis in intestinal malrotation

Case Discussion: Epidemiology and Etiology of Appendicitis/Intestinal malrotation

- Acute appendicitis (AA) is one of the most common conditions requiring emergency abdominal surgery.

- Intestinal malrotation is a rare condition, occurring in about 1 in 6,000 live births.
  - It results from incomplete counterclockwise rotation of the midgut around the superior mesenteric vessels during embryonic development, causing abnormal positioning of the small and large intestines.

- In pediatric patients, left lower quadrant abdominal pain has several possible differential diagnoses, including colitis, intussusception, ovarian torsion, and constipation.

Case Discussion: Presentation and Diagnosis of Appendicitis

- History and Physical exam
  - Acute appendicitis classically presents with initial vague periumbilical pain that later localizes to the right lower quadrant, often accompanied by fever, nausea, and vomiting.
  - Key physical findings include right lower quadrant tenderness, rebound tenderness, guarding, and positive signs such as McBurney's point tenderness, Rovsing's sign, Psoas sign, and Obturator sign.
  - Presentation in children can be variable, with delayed diagnosis occurring in up to 63% of cases.
  - Diagnosis relies on clinical evaluation, scoring systems such as the Alvarado score, and ultrasonography. However, atypical presentations (e.g., left-sided pain) can make diagnosis more difficult.
  - In atypical cases, maintaining a high index of suspicion and using advanced cross-sectional imaging are essential to avoid diagnostic delays and complications.
- Imaging (Appendicitis)
  - Ultrasound is the first-line diagnostic tool in young children because it avoids ionizing radiation. Key findings include:
    - Target (bull's-eye) sign: bowel wall thickening on transverse view, consistent with acute inflammation.
    - A non-compressible, fluid-filled, blind-ending tubular structure > 6 mm in diameter +/- appendicolith
    - Appendiceal wall thickening ≥ 3 mm.
  - Appendicitis should not be diagnosed based on luminal diameter alone, as size can vary.
  - If ultrasound results are inconclusive, MRI may be preferred over CT in pediatric patients due to the absence of ionizing radiation.
    - Key MRI findings include: dilated appendix, wall thickening, peri-appendiceal free fluid, and fat stranding.
  - Identification of an appendicolith is important due to its association with failed conservative management and higher risk of complications

Case Discussion: Treatment and Prognosis of Appendicitis with Malrotation

- Laparoscopic appendectomy is the gold standard for surgical management of acute appendicitis, regardless of whether the appendix is right- or left-sided.
- Intestinal malrotation is typically treated with the Ladd's procedure, which involves:
  - Dividing fibrotic bands between the cecum and lateral abdominal wall, and between the duodenum and terminal ileum
  - Repositioning the bowel, with the small intestine placed on the right and colon on the left.
  - This procedure does not restore normal rotation but creates a nonrotation state, reducing the risk of volvulus.
- In patients with both appendicitis and malrotation, two surgical strategies are considered: (1) Standard appendectomy alone, or (2) Appendectomy combined with Ladd's procedure
- While appendectomy alone may be adequate, the lifelong risk of volvulus persists, leading some surgeons to favor performing a Ladd's procedure concurrently.

References:

1) Birnbaum DJ, Geffroy Y, Goin G, Balandraud P. Left side appendicitis with midgut malrotation in an adult. *J Surg Tech Case Rep*. 2013;5(1):38-40. doi:10.4103/2006-8808.118627

2) Holt AC, Anand S, Nada H, Ahmad H. Midgut Volvulus. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; September 12, 2022.

3) Michelson KA, Reeves SD, Grubenhoff JA, et al. Clinical Features and Preventability of Delayed Diagnosis of Pediatric Appendicitis. JAMA Netw Open. 2021;4(8):e2122248. doi:10.1001/jamanetworkopen.2021.22248

4) Yousef A, Gerrie S, Hurteau-Miller J. Imaging Review of Intestinal Malrotation and Midgut Volvulus. *Radiographics*. 2025;45(4):e240177. doi:10.1148/rg.240177