



Essential Learning

Appendicitis

- **What are the classic physical exam findings of appendicitis?**
 - McBurney's point tenderness to palpation (located $\frac{2}{3}$ distance of umbilicus to right anterior superior iliac spine)
 - Rovsing's sign (pain over McBurney's point with LLQ palpation)
 - Psoas sign (pain with extension of right leg at the hip in left lateral decubitus position)
 - Obturator test (pain with internal and external rotation of the flexed right thigh at the hip)
- **What scoring systems are used for appendicitis? How useful are they?**
 - Scoring systems such as the Alvarado score and Pediatric Appendicitis Risk Calculator (pARC) have limited sensitivity and therefore, limited clinical utility.
- **Does treating pain appropriately affect the surgeon's abdominal exam?**
 - No, it is unlikely that pain medications will mask abdominal findings. Patients' pain should always be treated.
- **How do laboratory tests help in the evaluation of appendicitis?**
 - WBC can be elevated in acute appendicitis, but a normal WBC is not uncommon.
 - Normal WBC + normal CRP together may sufficiently rule out appendicitis (negative likelihood ratio of 0.09). In the pediatric population, a combination of normal WBC + neutrophilia <75% + normal CRP was shown to have a sensitivity of 99.2%.
 - Procalcitonin may play an additional role in evaluating appendicitis, but has low sensitivity when used alone.
- **How does initial imaging differ in different patient populations?**
 - CT abdomen/pelvis should be done in males and women of non-childbearing age with equivocal signs. The use of contrast is controversial and institution-specific, but may not be necessary unless you need to rule out other intra-abdominal findings (e.g., abscess). CT sensitivity is >96% with enteral contrast (PO or PR), 95% with only IV contrast, 90-95% without contrast. Non-contrasted studies are more likely to have false-negative results in early appendicitis or very thin patients.
 - Ultrasound can be used as a first choice option in children and pregnant women.
 - Starting with US in the pediatric population can eliminate ~50% of CTs in this population.
 - Pelvic US should be performed in women of childbearing age with high suspicion for pelvic etiology.
 - Barriers to US in the ED tend to occur when ultrasound techs are not available (i.e., weekends/nights).

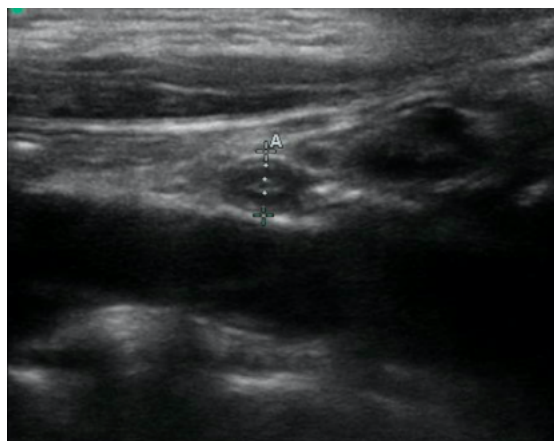
- US is also operator-dependent (for instance, consider the difference between US technicians at low-volume community hospitals who perform fewer US scans compared to technicians at high-volume, academic hospitals who perform frequent US scans)
 - CT is slightly more sensitive and specific than US in appendicitis. Ultrasound can aid in determining alternative diagnoses, but CT is better.
 - MRI can be considered in the pregnant population and has no difference in accuracy when compared to CT.
- **What are the antibiotic choices for acute appendicitis?**
 - Antibiotics should broadly cover aerobic and anaerobic gram-neg organisms.
 - Cefoxitin or cefotetan is preferred in uncomplicated cases. Can also consider ceftriaxone + metronidazole, ampicillin-sulbactam or metronidazole plus ciprofloxacin.
 - Piperacillin/tazobactam or ertapenem is preferred in complicated cases (perforation, abscess and/or phlegmon).
 - Of note, antibiotic choices for the treatment of acute appendicitis is very institution specific.
- **Surgery vs antibiotics for appendicitis?**
 - This is still a topic of medical research. Surgery is the definitive treatment for appendicitis; however, medical therapy with antibiotics is an option. Approximately 25% of medically managed patients will eventually need an appendectomy.
- **POCUS Pearls**
 - In a 2017 systematic review and meta-analysis by Matthew Fields J et al., the sensitivity and specificity of emergency physician-performed POCUS in diagnosing appendicitis was 80% and 92%, respectively.
 - This suggests that while POCUS should not be used as a standalone test, it may be useful as an initial imaging modality in the hands of an experienced operator.
 - Using the technique of graded compression, investigation of the appendix may begin either at the point of maximal tenderness, or by starting in the RUQ and sliding down to the RLQ and cecum/terminal ileum. There the appendix can be visualized anterior to the psoas muscle and iliac vessels.
 - Appendicitis is diagnosed on ultrasound when a blind-ending tubular structure is seen that is > 6 mm in diameter with no peristalsis. The appendix should be imaged in two planes. ([Figures 37.3 \(A&B\)](#))
 - Other signs of appendicitis included the presence of an appendicolith, or a “ring of fire” appearance when the hyperemic appendiceal wall is seen in short axis under color flow doppler. In the case of perforation, there may be an anechoic periappendiceal fluid collection. ([Figures 37.3 \(C-E\)](#))
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- **References:**
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- Image References
 - US FAST Image from Wikimedia commons:
<https://commons.wikimedia.org/wiki/File:MorisonNoText.png>
 - CT Images from “Radiopaedia”: <https://radiopaedia.org/cases/39799>
 - POCUS images courtesy of: Emory Emergency Medicine POCUS Archive

Figure 37.3 (A-E) – POCUS for Appy (reference for POCUS Pearls)

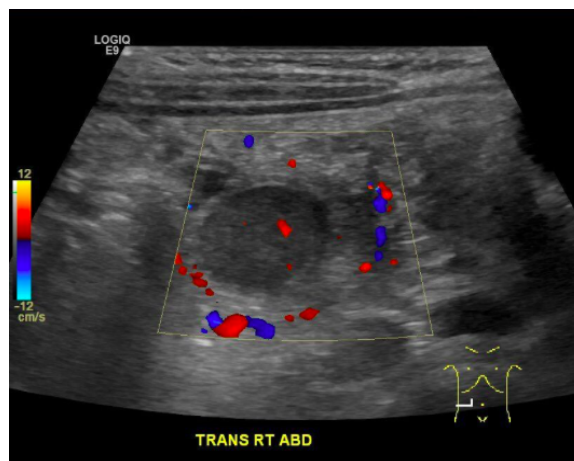
A) Appendicitis Short Axis



B) Appendicitis Long Axis



C - E) Ruptured Appendix and Ring of Fire



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