

Acute Appendicitis

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RAD 4001

Clinical History

- 11 y/o female with no significant PMH presents to ER w/ worsening RLQ abdominal pain for the past day
 - ROS notable for loss of appetite, diarrhea, nausea within past 6 hours
 - Vitals: HR 113, RR 20, BP 129/79, Temp 99.6F
 - Physical exam reveals tenderness to palpation in RLQ, no rebound, no guarding
 - Beta-hCG negative
 - CBC shows WBC 21.5 w/ left shift
 - Ultrasound- no visualization of the appendix
 - CT Abdomen/Pelvis w/ contrast ordered

Key H/P Findings (Peds)

- Samuel's Pediatric Appendicitis Score (PAS): 6/10 intermediate risk
 - RLQ pain with cough, percussion, or hopping (+2)
 - RLQ tenderness on light palpation (+2)
 - Anorexia (+1)
 - Fever >38C/100.4F (+1)
 - Nausea/Vomiting (+1)
 - Leukocytosis (>10,000) (+1)
 - Left Shift (>75% Neutrophilia) (+1)
 - Migration of pain to RLQ (+1)

Key H/P Findings (Adult)

Modified Alvarado score for diagnosis of appendicitis

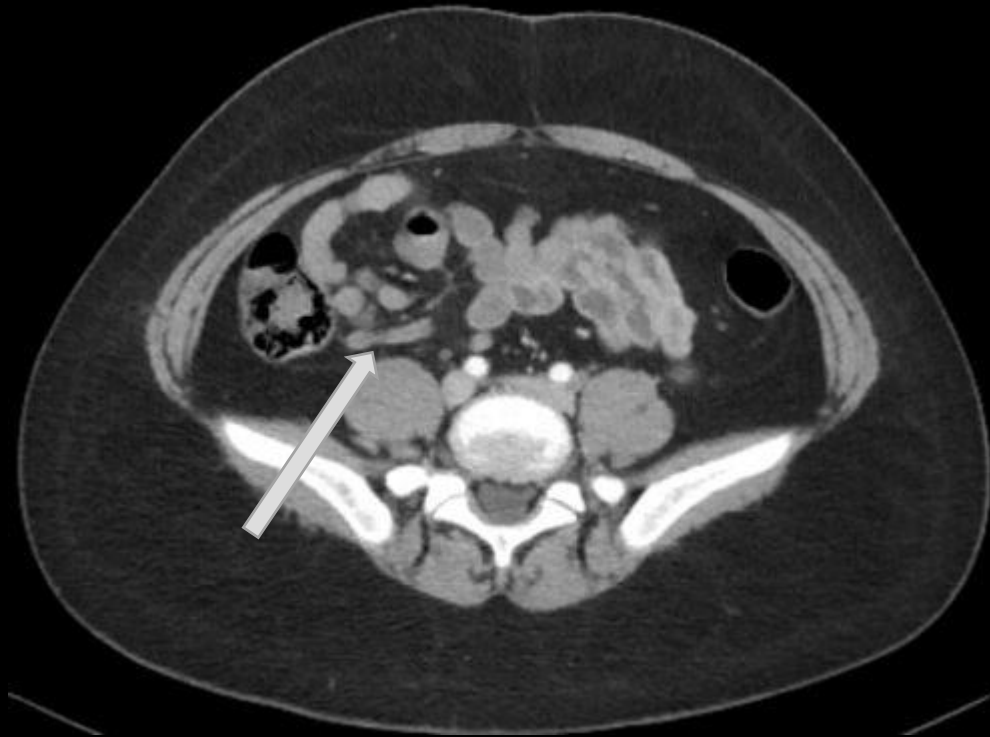
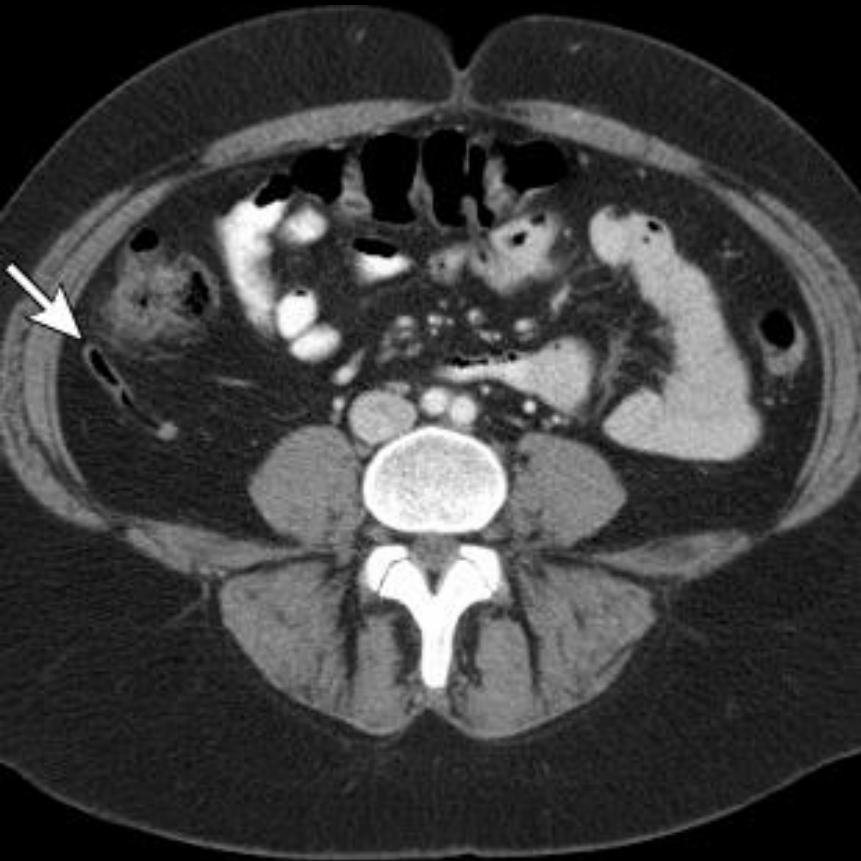
Feature	Point
Migratory right lower quadrant pain	1
Anorexia	1
Nausea or vomiting	1
Tenderness in the right lower quadrant	2
Rebound tenderness in the right lower quadrant	1
Fever $>37.5^{\circ}\text{C}$ ($>99.5^{\circ}\text{F}$)	1
Leukocytosis of white blood cell count $>10 \times 10^9/\text{liter}$	2
Total	9

Score of 0 to 3 indicates appendicitis is unlikely and other diagnoses should be pursued. Score of ≥ 4 indicates that the patient should be further evaluated for appendicitis.

Relevant Imaging

CT with intravenous and oral contrast shows a normal appendix that is air-filled with diameter of <6 mm.

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CT with contrast shows 6-7mm appendix- equivocal



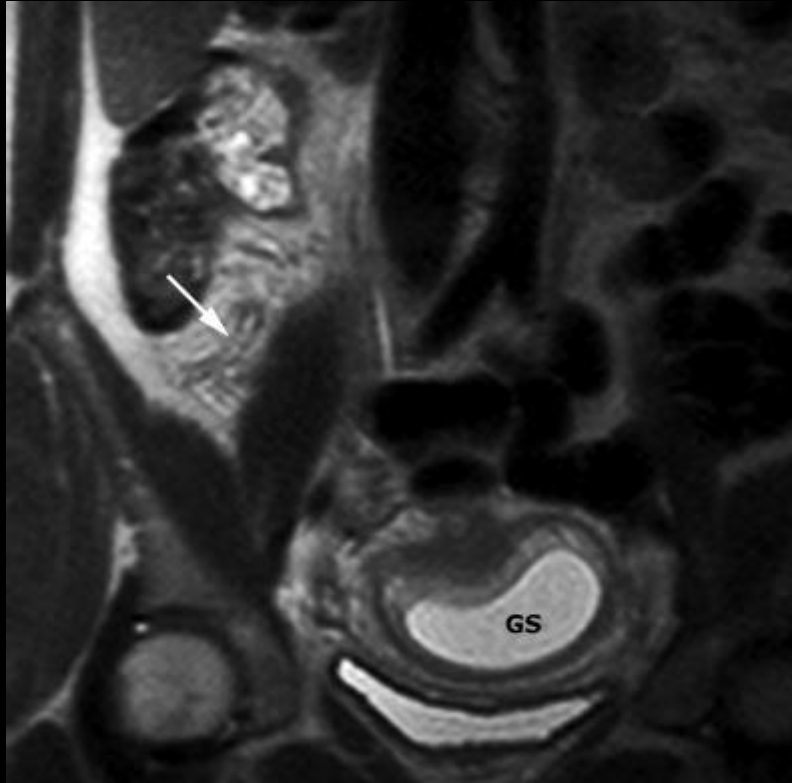
Mesenteric Lymph Nodes



Key CT Findings in Appendicitis

- Enlarged appendiceal diameter >6 mm with an occluded lumen
- Appendiceal wall thickening (>2 mm)
- Appendiceal wall enhancement
- Appendicolith (seen in approximately 25 percent of patients)
- Periappendiceal fat stranding

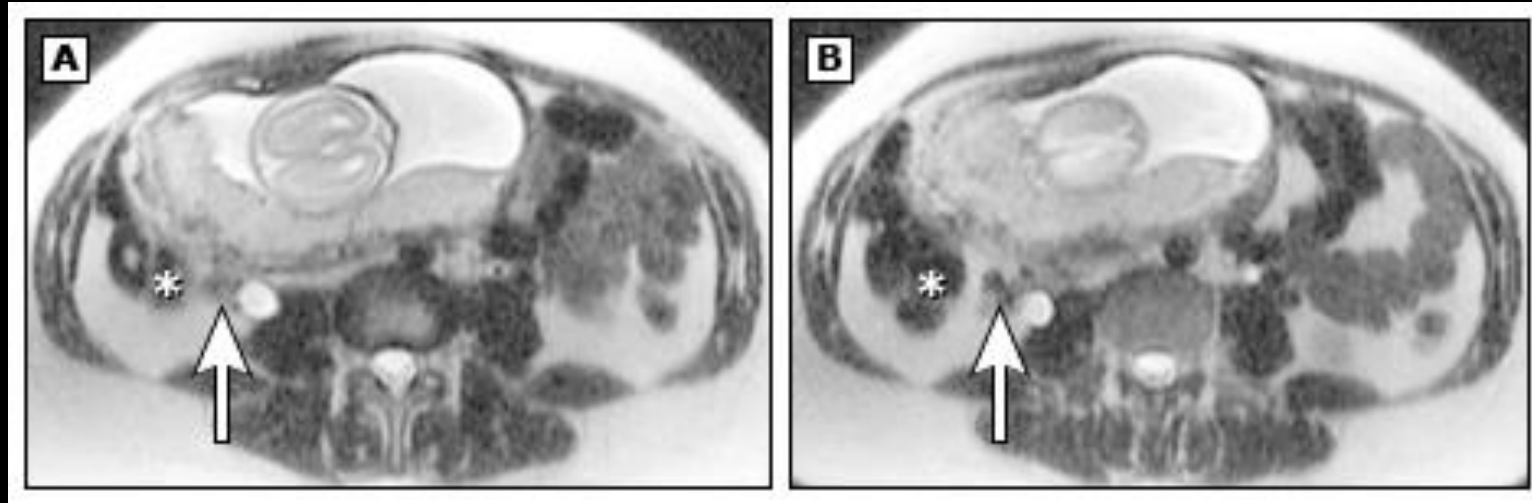
Imaging in Children/Pregnancy- MRI



Example: T2-weighted MRI of a woman at 9 wks gestation. The appendix is fluid-filled w/ diameter of 7 mm. The gestational sac is seen lower in the pelvis.

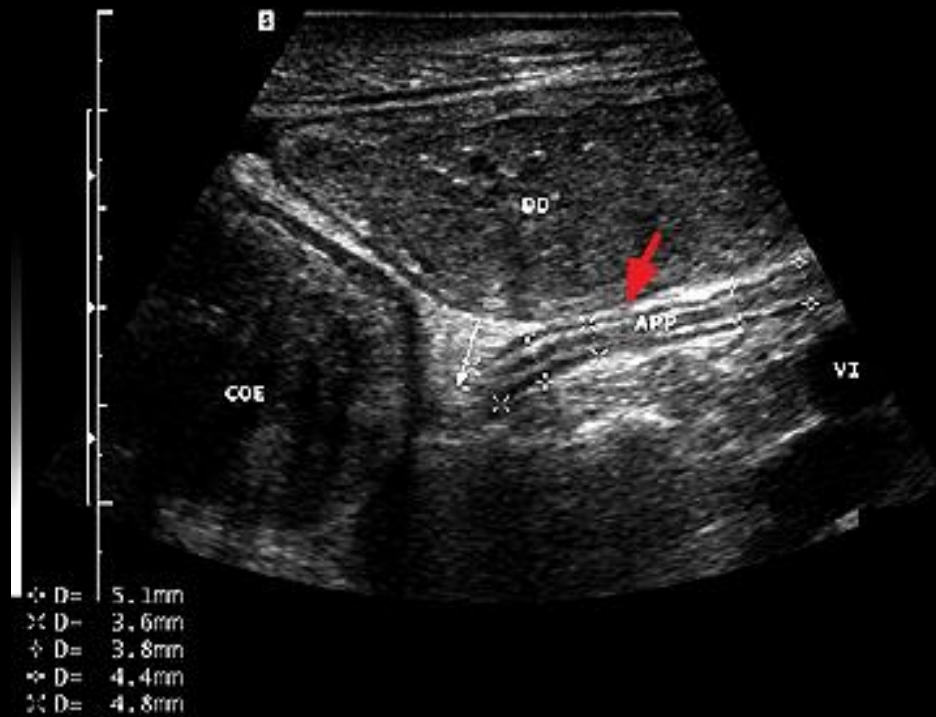
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MRI normal appendix

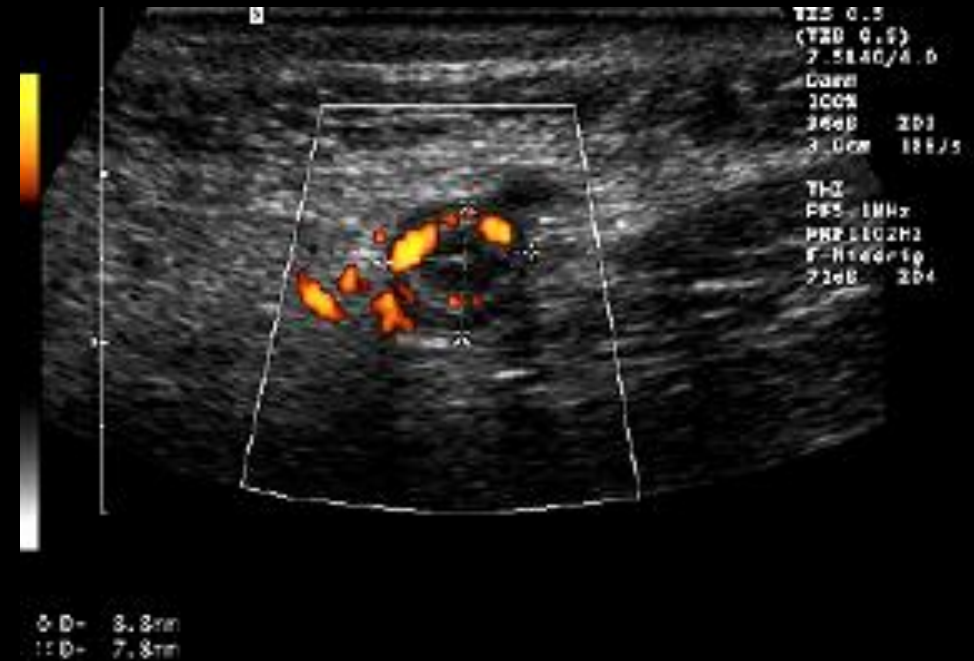


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Imaging in Children/Pregnancy- US



Normal Appendix <6mm



Acute Appendicitis- thickened and hyper-vascular wall

Differential Diagnosis

- Acute Appendicitis (perf vs. non-perf)
- Viral GI
- Ectopic Pregnancy
- IBD
- Pelvic Inflammatory Disease
- Ovarian Torsion

Discussion

- Pathogenesis of acute appendicitis believed to be a result of obstruction by fecalith, calculi, lymphoid hyperplasia, tumors, etc.
- In young patients, lymphoid follicular hyperplasia due to infection may be the primary cause
- In older patients, obstruction due to fibrosis, fecalith, or tumor is common
- Initial inflammation is followed by ischemia, perforation, and development of an abscess or peritonitis
- Most patients do not perforate within the first 24 hours

Treatment

- Laparoscopic Appendectomy with prophylactic antibiotics was performed and the patient was discharged within 24 hours
- Her uncomplicated acute appendicitis was confirmed by surgical pathology
- Non-Operative management with antibiotics only could be considered in this case, but may result in complicated appendicitis, perforation, abscess, or simply delaying inevitable surgery
- No post-op imaging is required unless there is suspicion of an abscess or neoplasm later on

Final Diagnosis

- Uncomplicated Acute Appendicitis

ACR appropriateness Criteria

Variant 1: Right lower quadrant pain, fever, leukocytosis. Suspected appendicitis. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	⊕⊕⊕
CT abdomen and pelvis without IV contrast	May Be Appropriate	⊕⊕⊕
US abdomen	May Be Appropriate	○
MRI abdomen and pelvis without and with IV contrast	May Be Appropriate	○
US pelvis	May Be Appropriate	○
MRI abdomen and pelvis without IV contrast	May Be Appropriate	○
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	⊕⊕⊕⊕
Radiography abdomen	Usually Not Appropriate	⊕⊕
Fluoroscopy contrast enema	Usually Not Appropriate	⊕⊕⊕
WBC scan abdomen and pelvis	Usually Not Appropriate	⊕⊕⊕⊕


CT Abdomen/Pelvis w/ IV contrast was the correct imaging modality for this uncomplicated acute appendicitis in a NON-pregnant woman

ACR appropriateness Criteria

Variant 3: Pregnant woman. Right lower quadrant pain, fever, leukocytosis. Suspected appendicitis. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
US abdomen	Usually Appropriate	○
MRI abdomen and pelvis without IV contrast	Usually Appropriate	○
US pelvis	May Be Appropriate	○
CT abdomen and pelvis with IV contrast	May Be Appropriate	⊗⊗⊗
CT abdomen and pelvis without IV contrast	May Be Appropriate	⊗⊗⊗
CT abdomen and pelvis without and with IV contrast	Usually Not Appropriate	⊗⊗⊗⊗
MRI abdomen and pelvis without and with IV contrast	Usually Not Appropriate	○
WBC scan abdomen and pelvis	Usually Not Appropriate	⊗⊗⊗⊗
Radiography abdomen	Usually Not Appropriate	⊗⊗
Fluoroscopy contrast enema	Usually Not Appropriate	⊗⊗⊗

If this patient had been pregnant, then US or MRI would be an appropriate imaging choice

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Your estimate range for CAT Scan (CT) Abdomen
and Pelvis with Contrast is

\$2,470.90 - \$3,706.34

Your reference number is I7GGA6T7FP

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<https://onlinepatientestimation.com/PatientPortal/site/MHHSPatientAccessServices>

Take Home Points / Teaching points

- Rule out pregnancy in the female patient! It will have an effect on imaging modality choice due to radiation exposure
- Multiple imaging modalities may be appropriate depending on the patient's needs and financial constraints
- There is more than one reasonable treatment option to consider between surgery and antibiotics alone

References

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- <https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria>



Questions?