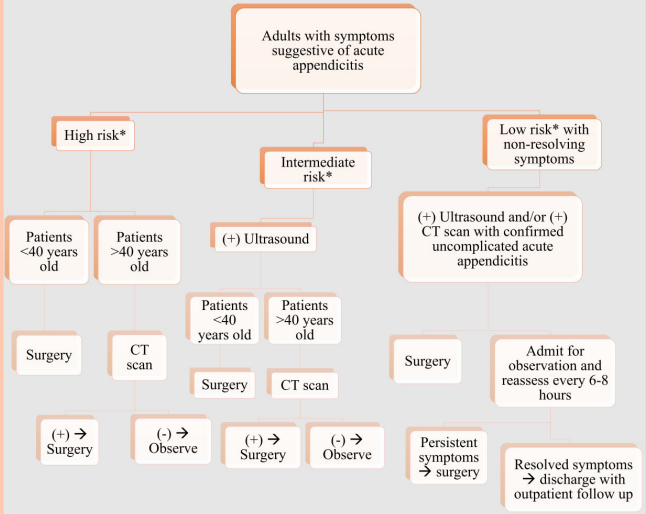
Retrocecal Appendicitis: Implications of a Rare Anatomical Variant

Stephanie Cook, PA-S RDN CSO LDN, Sheree Piperidis, MHS PA-C
Quinnipiac University Physician Assistant Program

Introduction

- Acute appendicitis has an estimated incidence of 7%, affecting approximately 500,000 people annually in the United States.[1]
- Appendicitis is one of the most common causes of surgical emergencies world-wide given the high complication and mortality rates associated if left untreated.[2-4]
- The proposed pathophysiology surrounding appendicitis includes luminal obstruction, most commonly from calcified fecalith leading to localized inflammation and increased intraluminal pressure.
- Other etiologies of appendiceal obstructions include lymphoid follicular hyperplasia or neoplasia.
- Once the appendiceal lumen is obstructed, thrombosis of the appendiceal vessels occurs leading to ischemia and polymicrobial bacterial overgrowth.[5]
- The most common clinical manifestations of appendicitis are periumbilical pain localizing to the right lower quadrant, nausea, anorexia, and low-grade fever.[5-8]
- Atypical presentations may ensue based on the patient's age, race, comorbidities, and anatomical variations of the vermiform appendix.
- Depending on the location of the appendix in relation to the cecum, uncharacteristic symptoms of right upper quadrant pain, right flank pain, constipation, dysuria, or dull abdominal pain may present.[2,6-8]
- Diagnostic workup of suspected acute appendicitis includes laboratory findings of leukocytosis and imaging modalities, typically computed tomography (CT) scan of the abdomen and pelvis using intravenous contrast, with visualization of appendiceal wall thickening, dilation, or appendicoliths.[7-9]
- Once a definitive diagnosis is established, immediate medical and surgical management is initiated to reduce potential complications such as perforation, gangrenous abscess, or peritonitis.[2-4,6,10,11]
- Currently, the recommended treatment for nonperforated or uncomplicated appendicitis is one dose of prophylactic intravenous antibiotics followed by either open or laparoscopic appendectomy within 12 hours of diagnosis.
- Perforated or complicated appendicitis typically requires emergent surgical intervention followed by three to five days of intravenous antibiotic therapy.[3,4,10,11]

Figure 1. Algorithm for Diagnosing and Managing Suspected Acute Appendicitis



*Risk levels based on the Alvarado scoring system, which accounts for presence of pain migration to right lower quadrant, anorexia, nausea/vomiting, right lower quadrant tenderness, rebound tenderness, temperature > 37.5°C, leukocytosis, and neutrophils >75%.

Adapted from World Journal of Emergency Surgery.[11]

Case Description

History

- 27-year-old Caucasian female presented to the Emergency Department with acute right flank pain, dysuria, urinary urgency, and nausea beginning eight hours prior.
- The pain was described as a constant stabbing feeling, 9/10 in severity, and without radiation.
- Stated symptoms began abruptly upon waking up in the morning without any symptoms the night prior.
- Last reported meal was at dinner the previous night, with lack of appetite and anorexia since onset of symptoms.
- Patient denied palliative or provocative therapies.
- Denied fever, chills, abdominal pain, constipation, diarrhea, blood in the stool, hematuria, chest pain, or shortness of breath.

- Past medical and surgical histories non-contributory.
- Medications only significant for monthly injection of medroxyprogesterone acetate for contraception.
- No food or drug related allergies.

- Family history non-contributory.

- Not sexually active, no history of sexually transmitted infections, not currently menstruating.
- No recent travel, illness, or sick exposures.
- No alcohol, tobacco, or recreational drug use.

- Review of systems otherwise unremarkable.

Physical Findings

Vital signs in Emergency Department:

- Temperature: 97.6°F.
- Pulse: 94 beats per minute.
- Respiratory rate: 16 breaths per minute.
- Blood pressure: 127/82 mmHg.
- Oxygen saturation: 99% on room air.

Physical examination:

- General: Alert and oriented to person, place, and time. Moderately uncomfortable. Non-toxic appearing.
- Head, eyes, ears, nose, throat: Head atraumatic. Pupils equal, round, and reactive to light and accommodation. Clear conjunctiva, moist mucous membranes. No lymphadenopathy.
- Heart: Regular rate and rhythm, normal S1 and S2 heart sounds, no murmurs. No jugular venous distension.
- Lungs: Normal breath sounds in all fields, no respiratory distress.
- Back: No flank ecchymosis, no costovertebral angle tenderness bilaterally, no paraspinal tenderness, full range of motion.
- Abdomen: Flat, non-distended, no apparent ecchymosis or surgical scars; normoactive bowel sounds; no masses or hernias, soft, no rigidity, no hepatosplenomegaly, McBurney's point negative for tenderness, Rovsing's sign negative, positive right suprapubic tenderness upon deep palpation.
- Extremities: Skin warm and dry, no pitting edema.

Diagnosis and Management

Diagnostic Results

Hematology:

- WBC 13.1, RBC 4.41, Hgb 13.6, Hct 41.4, Plt 201.

Chemistry:

- Na+ 138, K+ 3.6, Cl- 101, CO2 24, BUN 8.0, Cr 0.8, Ca++ 9.7, Glu 105.

Urinalysis:

- Trace RBC, pH 6.0, specific gravity 1.010.
- Negative for protein, glucose, ketones, nitrite, leukocyte esterase.

CT scan without contrast of the abdomen and pelvis:

- Appendiceal inflammation with multiple appendicoliths located posterior to the cecum.
- Small amount of free fluid in the pelvis.
- No evidence of hydronephrosis or renal/ureteral calculi.

Figure 2. Patient CT Scan in the Emergency Department

Differential Diagnosis

- Renal/ureteral calculi.
- Hydronephrosis.
- Pyelonephritis.
- Renal colic.
- Urinary tract infection.
- Muscular strain.
- Appendicitis.

Final Diagnosis

- CT scan of the abdomen and pelvis with findings consistent with nonperforated retrocecal appendicitis.

Hospital Course and Management

- Patient remained in the Emergency Department for four hours for diagnostic workup and observation.
- Following the results of the CT scan, the patient spiked a fever of 100.4°F and was provided oral acetaminophen in addition to oral ondansetron for nausea control.
- Once the general surgery team was consulted and patient deemed stable for admission to the surgical unit, intravenous ringer's lactate solution, heparin, morphine, and piperacillin/tazobactam were initiated.
- The patient underwent a laparoscopic appendectomy and was discharged to home the following day on oxycodone HCL/acetaminophen 5-325 mg tablet orally every six hours as needed for pain.

Case Outcome

- The patient underwent a successful laparoscopic appendectomy; however, was found to have gangrenous appendicitis intraoperatively.
- During the patient's clinical and diagnostic workup in the Emergency Department, timely and appropriate imaging were ordered despite the uncharacteristic presenting symptoms.
- The patient therefore received the definitive surgical and medical management recommended for acute appendicitis and did not suffer any significant complications.
- Had further diagnostic imaging not been ordered in the Emergency Department to rule out other etiologies of low suspicion, the patient likely would have been discharged home without the necessary surgical management.
- Given the patient's intraoperative findings of gangrenous appendicitis, the patient was at increased risk for significant complications and mortality if left untreated.

Discussion

- Atypical presentations of acute appendicitis resultant from anatomical variants, such as a retrocecal appendix, are increasing in prevalence and are common causes of misdiagnoses in the Emergency Department.[2,6-8]
- Approximately 6% of adults with acute appendicitis are misdiagnosed annually upon initial presentation. Of those, the initial symptoms either lack the presence of abdominal pain or include a chief complaint of constipation without associated symptoms.[8]
- Amongst the imaging modalities available, CT provides the greatest specificity for detection and exclusion of appendicitis, including in those with anatomical variants and atypical symptoms.[2,6-9]

Figure 3. Anatomical Variants of the Appendix

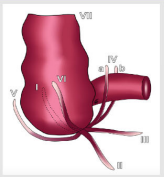


Table 1. Prevalence of Appendix Locations

Location	Prevalence (%)
I: Retrocecal	32.1
II: Pelvic	28.5
III: Subcecal	13.2
IV: Ileal	14.5
V: Paracecal	7.5
VI: Anterocecal	4.0
VII: Hepatic	2.4

Image and data adapted from Clinical Anatomy.[6]

Conclusion

- The current guidelines for diagnosis and management of suspected appendicitis focus solely on common signs and symptoms and do not account for atypical presentations.
- Diagnostic workup of atypical symptoms is therefore guided primarily by clinical judgement or accidental findings on imaging, leading to increased risk of misdiagnosis.
- Without accurate diagnosis and timely medical and surgical interventions, risk of perforation and mortality is significantly increased.
- Additional research surrounding uncharacteristic presentations in those ultimately found to have acute appendicitis is necessary to raise clinical awareness and enhance clinical decision-making in those with inconclusive diagnoses.

References

1. Ferris M, Quan S, Kaplan BS, et al. The global incidence of appendicitis: a systematic review of population-based studies. *Ann Surg.* 2017;266(2):237-241. doi:10.1097/SLA.0000000000002188
2. Mahajan P, Basu T, Pai CW, et al. Factors associated with potentially missed diagnosis of appendicitis in the emergency department. *JAMA Netw Open.* 2020;3(5):e200612. doi:10.1001/jamanetworkopen.2020.0612
3. Doklestić SK, Bajec DD, Djukić RV, et al. Secondary peritonitis: evaluation of 204 cases and literature review. *J Med Life.* 2014;7(2):132-8.
4. Papandria D, Goldstein SD, Rhee D, et al. Risk of perforation increases with delay in recognition and surgery for acute appendicitis. *J Surg Res.* 2013;184(2):723-9. doi:10.1016/j.jss.2012.12.008
5. Vanhatalo S, Munukka E, Sippola S, et al. Prospective multicentre cohort trial on acute appendicitis and microbiota, aetiology and effects of antimicrobial treatment: study protocol for the MAPPAC (Microbiology Appendicitis Acuta) trial. *BMJ Open.* 2019;9(9):e031137. doi:10.1136/bmjopen-2019-031137
6. Kacprzyk A, Drosh J, Stefura T, et al. Variations and morphometric features of the vermiform appendix: a systematic review and meta-analysis of 114,080 subjects with clinical implications. *Clin Anat.* 2020;33(1):85-98. doi:10.1002/ca.23474
7. Vriesman AC, Puylaert JB. Mimics of appendicitis: alternative nonsurgical diagnoses with sonography and CT. *AJR.* 2006;186(4):1103-1112. doi:10.2214/AJR.05.0085
8. Kim S, Lim HK, Lee JY, Lee J, Kim MJ, Lee AS. Ascending retrocecal appendicitis: clinical and computed tomographic findings. *JCAT.* 2006;30(5):772-6. doi:10.1097/01.rct.0000228151.73528.8f
9. Gamanagatti S, Vashisht S, Kapoor A, Chumber S, Bal S. Comparison of graded compression ultrasonography and unenhanced spiral computed tomography in the diagnosis of acute appendicitis. *SMJ.* 2007;48(1):90-7.
10. Podda M, Cillara N, Di Saverio S, et al. Antibiotics - first strategy for uncomplicated acute appendicitis in adults is associated with increased rates of peritonitis at surgery: a systematic review with meta-analysis of randomized controlled trials comparing appendectomy and non-operative management with antibiotics. *Surgeon.* 2017;15(5):303-314. doi:10.1016/j.surge.2017.02.001
11. Di Saverio S, Podda M, De Simone B, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *World J Emerg Surg.* 2020;15(1):27. doi:10.1186/s13017-020-00306-3