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Transverse colon located appendix: A case of midgut malrotation

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Written informed consent was obtained from the patient for publication of this case report and all accompanying images.

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Abstract

Acute appendicitis is the most common cause of abdominal pain requiring general surgical intervention in emergency departments. Its pathogenesis typically involves obstruction of the appendiceal lumen, followed by inflammation, ischemia, and potentially perforation or diffuse peritonitis. The Alvarado score is practical for bedside assessment; however, it does not account for anatomical variations of the vermiform appendix, which may delay diagnosis and increase complication rates. Midgut malrotation results from abnormal or incomplete rotation of the midgut during embryogenesis and may cause an atypically high position of the cecum and appendix. Appendicitis outside the right lower quadrant is associated with higher morbidity and mortality because clinical manifestations are variable and imaging may be inconclusive. We present a 26-year-old male patient admitted with one day of epigastric abdominal pain, nausea, and loss of appetite. Physical examination showed tenderness confined to the epigastrium, and laboratory evaluation revealed leukocytosis. Contrast-enhanced computed tomography did not visualize the appendix in the right lower quadrant and did not report signs suggestive of intestinal malrotation. Because symptoms persisted and pain increased during follow-up, diagnostic laparoscopy was performed within 12 hours of admission. Laparoscopy demonstrated midgut malrotation and an inflamed appendix located adjacent to the transverse colon; laparoscopic appendectomy was completed in the same session. The patient recovered uneventfully and was discharged 24 hours postoperatively, and histopathology confirmed acute appendicitis with localized peritonitis. Diagnostic laparoscopy is a valuable tool in atypical cases when clinical and radiological findings are insufficient, as it enables comprehensive evaluation of the abdominal cavity and allows definitive treatment without delay. In patients with atypical abdominal pain who cannot be diagnosed using conventional pathways, early consideration of congenital anomalies such as midgut malrotation and timely diagnostic laparoscopy are critical to prevent complications.

Keywords: acute appendicitis, midgut malrotation, transverse colon, atypical appendicitis

Introduction

Acute appendicitis is the most common cause of abdominal pain requiring general surgical attention in emergency departments. Several scoring systems have been developed to support diagnosis and operative decision-making, and the Alvarado score is the most widely used. Although practical, these scoring systems do not account for anatomical variations of the vermiform appendix, which may lead to diagnostic difficulty and delayed treatment. The appendix demonstrates substantial anatomical variability, and the most common location, regardless of sex, is the retrocecal position. This rate has been reported as 25.4% to 71.0% in the literature [1, 2].

Midgut malrotation is a congenital anomaly caused by incomplete or abnormal rotation of the midgut around the superior mesenteric artery during embryogenesis [3, 4]. This condition may result in abnormal positioning of the cecum and appendix, producing atypical clinical manifestations of appendicitis outside the right lower quadrant.

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Acute appendicitis remains one of the leading causes of acute abdominal surgery. Although the classic clinical course is well described, variations in appendiceal anatomy can significantly alter pain localization and delay diagnosis. In atypically located appendicitis, classical findings may be absent and standard diagnostic pathways may be insufficient.

Imaging modalities such as ultrasonography and computed tomography have a central role in the diagnostic work-up, particularly in atypical presentations. Nevertheless, radiological assessment may be inconclusive when anatomical variations or congenital anomalies are present. Because delayed diagnosis in atypically located appendicitis is associated with increased morbidity, awareness of anatomical diversity is essential. In this context, we report a rare case of acute appendicitis located adjacent to the transverse colon due to midgut malrotation.

Case presentation

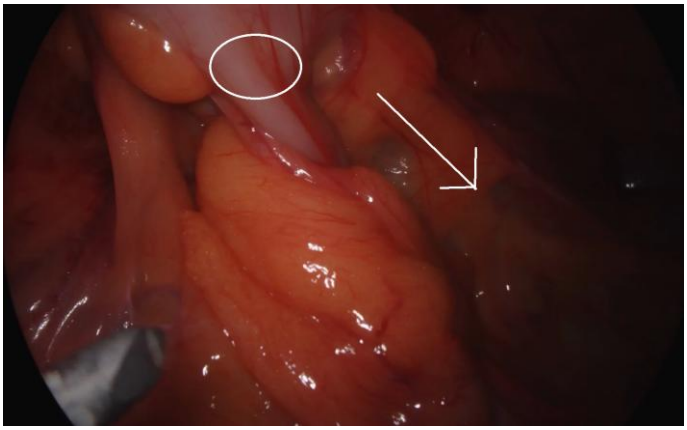
A 26-year-old male patient presented to the emergency department with one day of epigastric abdominal pain accompanied by nausea and loss of appetite. He had no known comorbidities. On physical examination, tenderness was limited to the epigastric region, without guarding or rebound. Examination of the remaining abdominal quadrants was unremarkable. Laboratory findings were as follows: C-reactive protein 1.6 mg/L (0–5), white blood cell count 15.36 K/µL (4–11), and neutrophils 74% (40–75).

Contrast-enhanced computed tomography was performed for differential diagnosis. The radiology report stated that the appendix was not visualized in the right lower quadrant, and no radiological findings suggestive of intestinal malrotation, including an abnormal superior mesenteric artery–vein relationship, were reported (Figure 1).

Figure 1: Contrast-enhanced computed tomography image in the coronal plane demonstrating the right lower quadrant (RLQ), where the appendix could not be visualized. The left side of the patient is indicated (L). No radiological findings suggestive of intestinal malrotation were identified.

During follow-up after admission to the ward, symptoms persisted and the visual analog scale pain score increased. Diagnostic laparoscopy was performed within 12 hours of admission. Laparoscopic evaluation demonstrated midgut malrotation, with the appendix located adjacent to the transverse colon (Figure 2). Laparoscopic appendectomy was performed. The postoperative course was uncomplicated; the patient tolerated oral intake, mobilized without difficulty, and was discharged after 24 hours of observation. Histopathological examination confirmed acute appendicitis with localized peritonitis. Written informed consent was obtained from the patient for publication of this case and the accompanying images.

Figure 2: Laparoscopic view demonstrating the inflamed appendix (encircled) located adjacent to the transverse colon (arrow) in a patient with midgut malrotation.



Discussion

In patients presenting with non-localized or atypical abdominal pain, the underlying pathology may be an atypically located vermiform appendix rather than classic right lower quadrant appendicitis. Delayed diagnosis in such cases increases the risk of complications, including perforation and diffuse peritonitis [5, 6]. In the present case, early clinical reassessment and diagnostic laparoscopy within 12 hours of ward admission likely contributed to the favorable outcome by limiting disease progression.

Morbidity and mortality increase when acute appendicitis occurs outside the right lower quadrant [7]. Atypical presentations and diagnostic uncertainty can delay appropriate management. In our patient, the initial evaluation favored gastritis; however, persistent symptoms and abnormal laboratory findings prompted further assessment. Because contrast-enhanced computed tomography did not establish a definitive diagnosis and did not identify alternative common causes of acute abdomen, diagnostic laparoscopy was performed.

During normal embryologic development, the cecum and appendix settle in the right lower quadrant. In midgut malrotation, abnormal positioning of the cecum can relocate the appendix, resulting in non-classical symptoms. Acute appendicitis associated with malrotation has been reported with left lower quadrant or right upper quadrant pain, including presentations extending toward the hepatic flexure [8, 9]. Epigastric tenderness may also occur in conditions such as mobile cecum syndrome or in patients with a long appendix crossing the midline [7, 10].

In our case, intraoperative findings were most consistent with an incomplete rotation pattern rather than complete non-rotation. The cecum was positioned abnormally high, and the inflamed appendix was located adjacent to the transverse colon. No Ladd's bands or midgut volvulus were identified. Although transverse colon diverticulitis mimicking acute appendicitis has been reported, to our knowledge, acute appendicitis adjacent to the transverse colon associated with midgut malrotation, as observed here, has not been previously described [11].

Diagnostic laparoscopy is particularly valuable when clinical and radiological findings do not clarify the diagnosis. Di Buono et al. [12] emphasized the importance of a laparoscopic approach in anatomically atypical presentations such as situs inversus. Laparoscopy enables evaluation of the entire abdominal cavity and is associated with lower rates of incisional hernia and wound infection compared with laparotomy [13]. In this case, the primary rationale for laparoscopy was comprehensive intra-abdominal evaluation, which allowed diagnosis and treatment to be achieved in the same session.

The Alvarado score in our patient was 4, based on nausea (1 point), leukocytosis (2 points), and neutrophil shift (1 point). Although alternative scoring systems such as the Appendicitis Inflammatory Response score and the Raja Isteri Pengiran Anak Saleha Appendicitis score have been developed, these tools similarly do not evaluate congenital or positional anomalies that may underlie atypically located appendicitis [14].

In patients with atypical abdominal pain who cannot be diagnosed using conventional investigations, congenital anomalies such as midgut malrotation should be considered, and diagnostic laparoscopy should be considered early to prevent complications and establish the correct diagnosis.

Anatomical diversity is an essential consideration for surgeons. Atypical presentations, such as acute appendicitis located adjacent to the transverse colon due to midgut malrotation, can increase diagnostic uncertainty and delay treatment. In such situations, diagnostic laparoscopy can be highly useful when clinical and radiological evaluation is inconclusive, as it allows direct visualization of anomalies and enables definitive treatment without delay. This case highlights the importance of considering rare anatomical variations in the differential diagnosis of patients presenting with unusual abdominal pain in order to prevent complications.

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