




# Laparoscopic management of subhepatic appendicitis

 Burak Mahmut Kilci,  Nurullah Bilen,  Fatih Süslü

Department of General Surgery, Mardin Midyat State Hospital, Mardin, Türkiye

## ABSTRACT

Acute appendicitis is one of the most common causes of acute abdomen that requires an emergency surgical approach. Acute appendicitis usually presents with diffuse pain that starts from the periumbilical area and localizes to the right lower quadrant. However, the clinical features might differ if the locations of the appendix change in the abdomen.

A 25-year-old male patient presented to the emergency department with a complaint of right upper quadrant pain for two days and clinical signs similar to acute cholecystitis. On his first physical examination, there was tenderness in the right upper quadrant. White blood cell count levels and neutrophil levels were elevated on blood test results. He was considered for acute cholecystitis after the first evaluation, and hepatobiliary ultrasonography was performed. The liver parenchyma and the biliary tract structures were shown to be non-pathological on ultrasonography (USG). Thus, computed tomography (CT) of the whole abdomen was planned and performed. It demonstrated the upper location of the cecum and subhepatic appendix. Inflammatory signs were detected on the appendix wall and surrounding tissues on the CT scan. Thereupon, emergency surgery was planned, and a laparoscopic appendectomy was performed.

The subhepatic location of the appendix is reported as extremely rare, with a rate of approximately 0.08% of all appendicitis cases. This clinical presentation was first reported in 1955 by King. This rare anatomic variation may cause delayed diagnosis and treatment difficulties. Subhepatic appendicitis can mimic hepatobiliary, gastric, or renal disorders like acute cholecystitis, hepatic abscess, perforated duodenal ulcer, and right nephrolithiasis.

**Keywords:** Laparoscopic appendectomy, subhepatic appendicitis, variations of appendix

## Introduction

Acute appendicitis is one of the most common surgical emergencies. The appendix is generally located on the cecum at the junction point of three teniae coli in the right lower quadrant. Acute appendicitis generally presents with diffuse pain starting from the periumbilical area and localizes to the right lower quadrant, besides other intraabdominal infection signs like nausea, vomiting, and fever.<sup>[1]</sup> While the appendix generally presents in normal

anatomical regions, it can be located in other areas in some variations. Therefore, clinical symptoms of acute appendicitis might differ according to the intraabdominal location of the appendix. Subhepatic appendicitis is a very rare condition with a rate of 0.08% of all appendicitis cases.<sup>[2]</sup> The subhepatic location of the appendix can mimic the clinical signs of acute cholecystitis or may cause misdiagnosis and delayed diagnosis of acute appendicitis.



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Correspondence: Burak Mahmut Kilci, M.D., Department of General Surgery, Mardin Midyat State Hospital, Mardin, Türkiye

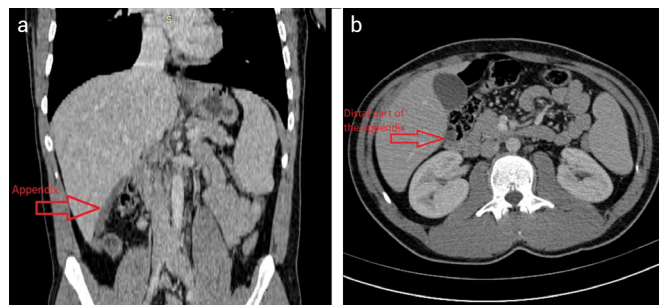
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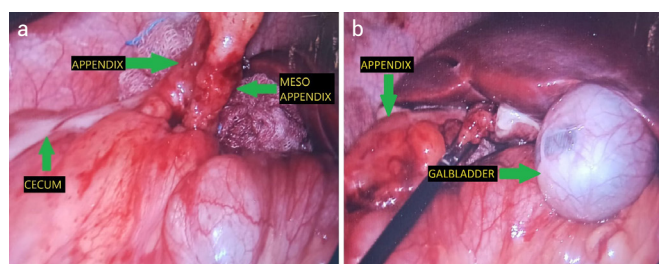
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## Case Report

A twenty-five-year-old male was admitted to the emergency department with post-prandial right upper quadrant and right lumbar pain, and nausea for two days. The patient's vital parameters were stable. Abdominal examination showed signs of abdominal defense and rebound on the right middle and upper side of the abdomen. The patient was considered for biliary colic preliminary diagnoses, and spasmolytic and anti-emetic symptomatic treatment and intravenous hydration were administered. However, the patient's complaint was not resolved. Thereupon, further investigations were performed. White blood cell levels and neutrophil levels were detected as elevated with results of  $21.22 \times 10^3/\mu\text{L}$  and  $19.37 \times 10^3/\mu\text{L}$ , respectively, in the laboratory blood test results. Liver function tests and bilirubin levels were normal. Following this, hepatobiliary USG was performed with a pre-diagnosis of acute cholecystitis. No significant pathology was observed on the gallbladder, biliary tract structures, and the liver parenchyma. Therefore, computed tomography (CT) was performed to figure out the exact pathology. However, the gallbladder and the intrahepatic and extrahepatic bile tracts were observed as normal. The cecum was observed localized at the right upper quadrant, and the appendix lying beneath under the liver. Appendix tissue was inflamed and wall-contracted, and the diameter of the appendix was increased (Fig. 1). The patient was diagnosed with acute subhepatic appendicitis and emergency surgery was planned. The patient was hospitalized and started on 1 g cefazolin and 500 mg metronidazole intravenously for antibiotic prophylaxis. Laparoscopic surgery was planned, and a 10 mm scope was inserted through the umbilicus. Laparoscopic exploration confirmed the subhepatic appendix and right upper located cecum (Fig. 2). The patient was positioned in a left-sided reverse Trendelenburg position. One other 10-mm trocar and two 5-mm trocars were inserted as in a laparoscopic cholecystectomy operation. The appendix was exposed after holding up the gallbladder and right lobe of the liver by grasping and retracting the gallbladder with a laparoscopic grasper. The appendix and the mesoappendix were hyperemic, erect, and surrounded with adhered tissues but not perforated. The surrounding tissues were dissected up to the radix of the appendix. Laparoscopic polymer clips were used for ligation and appendectomy was performed successfully. The procedure was completed without any complications. The patient started enteral feeding at the postoperative 8<sup>th</sup> hour and was discharged on the postoperative 1<sup>st</sup> day. The histopathological result confirmed suppurative appendicitis.



**Figure 1.** (a) View of the body of the appendix beneath the right lobe of the liver on the coronal section. (b) Distal part of the appendix on axial section



**Figure 2.** (a) View of appendix after dissection. (b) Subhepatic location of the appendix.

## Discussion

The appendix vermiformis is a worm-like structure of the digestive system, which is placed in the posteromedial wall of the cecum.<sup>[3]</sup> The most common anatomical variants of the appendix are commonly retrocecal (60%), pelvic (30%), and retroperitoneal (7-10%).<sup>[4]</sup> However, the subhepatic location of the cecum and the appendix is reported as extremely rare with a rate of approximately 0.08% of all appendicitis cases, which makes 0.09 per 100,000 population annually.<sup>[5]</sup> Incomplete rotation, fixation, or malrotation of the midgut during embryological development results in the subhepatic cecum and appendix.<sup>[6]</sup> These congenital anomalies generally remain asymptomatic, but in the case of appendicitis, they show up with inconsistent clinical signs and symptoms.<sup>[7]</sup> Almost 60% of acute appendicitis patients can be easily diagnosed by the symptoms, physical examination findings, and additional laboratory tests.<sup>[8]</sup> Subhepatic appendicitis can mimic hepatobiliary, gastric, or renal disorders like acute cholecystitis, hepatic abscess, perforated duodenal ulcer, and right nephrolithiasis.<sup>[9]</sup> This clinical presentation was first reported in 1955 by King.<sup>[10]</sup> Laboratory test results are generally similar to those in normal appendicitis clinics. An imaging method is required for the differential diagnosis. Abdominal ultrasound can be thought of as the first-line imaging method, but because of its low diagnostic value and individual differences, an abdominal

CT should be the first-line diagnostic imaging modality. It is significant to diagnose and make decisions for treatment as soon as possible in acute appendicitis, to prevent complications like perforation and intraabdominal sepsis, which may raise the rate of morbidity and mortality.<sup>[1]</sup> The surgical treatment method depends on the patient's clinical situation and the surgeon's experience. Open appendectomy is a choice, but laparoscopic treatment is the commonly preferred method for appendectomy for all appendicitis clinics, including those in different anatomical positions.<sup>[10]</sup> The laparoscopic approach is a less invasive technique that has more advantages in order to see the exact location of pathology, and explore additional intraabdominal pathologies if present. The placement of laparoscopic instruments in the laparoscopic approach can be modified according to the patient and the anatomical position of the appendix.<sup>[2]</sup>

## Conclusion

The location of the appendix may not be typical in all cases. Different variants of the appendix may mislead clinicians in making diagnoses due to differently presented clinical signs and symptoms. Thus, clinicians should be aware of such unusual variants of appendicitis. Abdominal CT seems like a better option to determine the exact pathology in order to avoid misdiagnosis. The laparoscopic approach should be the first treatment option if available.

## Disclosures

**Informed Consent:** Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

**Authorship Contributions:** Concept – M.B.K.; Design – B.M.K., N.B., F.S.; Supervision – N.B., F.S.; Materials – M.B.K.; Data collection and/or processing – N.B., F.S.; Analysis and/or interpretation – B.M.K., N.B., F.S.; Literature search – M.B.K.; Writing – M.B.K.; Critical review – B.M.K., N.B., F.S.

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