

Appendiceal Diverticulitis Mimics Cecal Diverticulitis Diagnosed Preoperatively

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ABSTRACT: Appendiceal diverticulitis is an uncommon condition that clinically resembles acute appendicitis. However, it is an incidental finding in histopathological studies and is rarely diagnosed preoperatively by imaging studies. In this article, we present the clinical and imaging findings of a male patient presenting with right upper quadrant pain with a preoperative imaging diagnosis of appendiceal diverticulitis. He underwent laparoscopic appendectomy and confirmed the diagnosis of appendiceal diverticulitis. This is a rare preoperative diagnosis. The management is often like typical appendicitis which is appendectomy. It is important to differentiate it from diverticulitis of the small intestine or colon because these diseases usually require only conservative treatment.

KEYWORDS: Appendiceal diverticulitis, computed tomography, diverticular disease, laparoscopic appendectomy, pathology

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Introduction

Appendiceal diverticulitis was first described in 1893 by Kelynak.¹ The rate of diverticula found in appendix specimens ranges from 0.04% to 2.1%. Rates from conventional autopsies range from 0.2% to 0.6%.^{2,3} Appendiceal diverticula include congenital and acquired diverticula. Congenital appendiceal diverticulum is a true diverticulum, with an incidence of about 0.014%; whereas an acquired appendiceal diverticulum is a pseudodiverticulum at the mesenteric border of the appendix, with a more common rate of about 1.9%.⁴ The pathogenesis of acquired appendiceal diverticulosis is not completely understood, but it may be related to multiple diverticular diseases of other intestinal segments and various pathologies of the appendix. The average age of patients with appendicitis is about 38. This condition is more common in men and is often associated with cystic fibrosis. Acute diverticulitis of the appendix has been reported to have a 4-fold higher risk of perforation than acute appendicitis, with a 30-fold increased mortality compared with simple appendicitis.³⁻⁵ Appendiceal diverticulitis is a rare condition that can often be misdiagnosed as cecal diverticulitis due to its similar clinical presentation, making accurate preoperative identification a challenging endeavor.^{4,5} This case report highlights a rare instance of appendiceal diverticulitis that was correctly diagnosed before surgery, showcasing the importance of differential diagnosis in the gastrointestinal tract.

Case Presentation

A 55-year-old man was admitted to the hospital with symptoms of right iliac fossa abdominal pain from the previous day.

Clinical examination found that the patient had a fever of 38°C and abdominal pain in the right iliac fossa. Laboratory findings showed white cell count of 8270/mL (normal range 4000/mL to 11000/mL), standard C-reactive protein of 8.2 mg/L (normal value <5 mg/L), erythrocyte sedimentation rate of 18 mm/hour (normal value ≤20 mm/hour in men over 50 years old). White blood cell differential showed neutrophil 4970/mL (60%), lymphocyte 2430/mL (29.3%), monocyte 790/mL (9.5%), basophil 50/mL (0.60%), and eosinophil 30/mL (0.36%). Ultrasound images showed infiltrations in the right iliac fossa, suspicious for intestinal diverticulitis (Figure 1A). However, the evaluation of the appendix by ultrasound was limited due to the hard, thick abdominal wall. Computed tomography (CT) was performed for further evaluation and showed an appendix with a transverse diameter of about 6 to 9 mm, a lumen containing feces with fluid and air, and a thin wall (Figure 1B). The appendix had 3 diverticula, one with surrounding fat infiltration. The adjacent cecum also had many diverticula and mild fatty infiltration around it. Appendiceal diverticulitis was diagnosed. Immediately after that, another ultrasound was performed, confirming the diagnosis of appendiceal diverticulitis. After multidisciplinary consultation, the patient had laparoscopic appendectomy. During surgery, the appendix was found to be large, irregularly hyperemic surface, with several protruding diverticular-like areas, and among them was an inflamed diverticulum (Figure 1C). The appendix was removed without complications. The dissected appendix specimen showed multiple feces and 3 diverticula, one of which was inflamed (Figure 1D and F). The postoperative diagnosis was acute appendiceal



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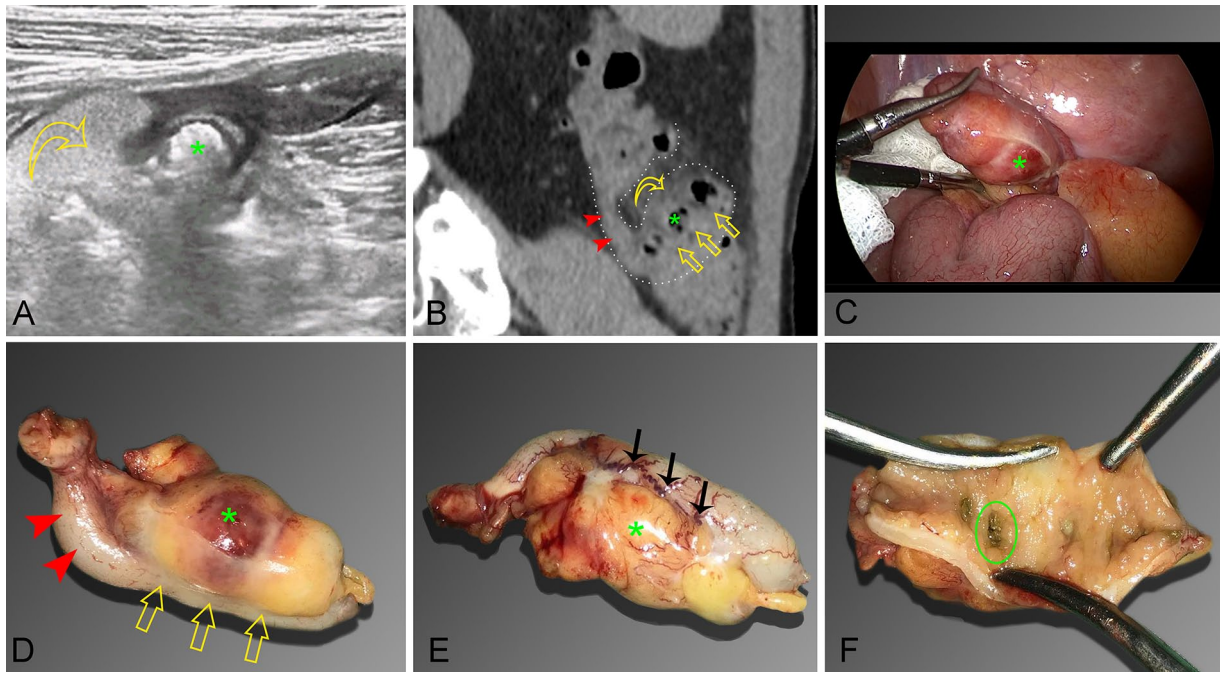


Figure 1. (A) Gray-scale ultrasound image showed an inflamed appendiceal diverticulum containing feces (asterisk), with surrounding fatty infiltration (curved arrow). (B) Oblique sagittal plane CT image shows an enlarged appendix (dashed line) with several fecal-containing diverticula (asterisk) and surrounding fatty infiltration (curved arrow). Note that the root (red arrowheads), and the body and tip of the appendix (straight arrows) were normal size. (C) Image taken during laparoscopic appendectomy showed an enlarged appendix with a red inflamed diverticular surface (asterisk). (D-F) Surgical specimen showed normal appendicular root (red arrowheads) and body (yellow open arrows), appendiceal diverticulitis (asterisks), congested superficial blood vessels (black solid arrows), and appendiceal diverticulum hole (circle).

diverticulitis. Microscopic images of the specimen showed the appendix mucosa was edematous, congested, and infiltrated with many acute inflammatory cells. Diverticulum tissue specimen showed acute inflammatory cell infiltration into the mucosal layer, fibrous hyperplasia, and vascularity. No presence of suspicious malignancy was seen in the appendix specimen. Histopathology confirmed acute appendiceal diverticulitis and congestive appendicitis (Figure 2). The patient fully recovered after 3 days and was discharged. The patient's examination 6 months after surgery showed that his health was unremarkable, including normal abdominal ultrasound and colonoscopy results. The patient has been followed up until now (March 2024) and his health is within normal limits.

Discussion

Appendiceal diverticular disease is usually divided into 4 subtypes. Type 1 occurs when a normal appendix is found along with acute appendiceal diverticulitis. Type 2 involves acutely appendiceal diverticulitis with surrounding appendicitis. Type 3 is conventional appendicitis with incidental uninvolved diverticulum. Type 4 is an appendiceal diverticulum found incidentally without evidence of appendicitis or diverticulitis.⁶ Our patient was classified as type 1. In addition, Phillips and Perry⁷ also classified appendiceal diverticular disease into 5 types. Type 1 includes primary acute diverticulitis, with or without acute peridiverticulitis. Type 2 includes acute diverticulitis secondary to acute appendicitis.

Type 3 includes the presence of diverticulum without inflammation. Type 4 includes the presence of diverticulum with acute appendicitis. Type 5 includes chronic peridiverticulitis with acute appendicitis.^{7,8} According to this classification, our case belongs to type 1.

Diverticulitis is a rare condition that causes appendicitis, which can mimic acute appendicitis. Diagnosis may be delayed, and its presence increases the risk of significant complications, including increased risk of perforation and death.^{2,5,6} Progression of diverticulosis to diverticulitis may occur after partial or complete obstruction of the appendix lumen or by sharp foreign bodies. This obstruction may be due to mucosal swelling, inflammation, torsion, fecaliths, or fibrous strictures, etc. Perforation may be due to some sharp objects (such as fish-bone, toothpicks, etc.) entering the lumen of the appendix, causing perforation of the appendix and diverticula, which can progress to abscess or peritonitis.^{3,4,6,9}

In the literature, most patients were diagnosed with acute appendicitis on clinical and imaging basis, then underwent appendectomy, but the final histopathology showed that appendiceal diverticulitis rather than appendicitis or concomitant appendicitis.^{1-4,9} It should be noted that both inflammatory processes can occur simultaneously according to the classification proposed by Lipton et al.⁶ The rate of diagnosis of appendicitis diverticulitis before surgery on imaging is very rare. In our case, ultrasound initially could not confirm the exact diagnosis. However, on CT images, we suspected

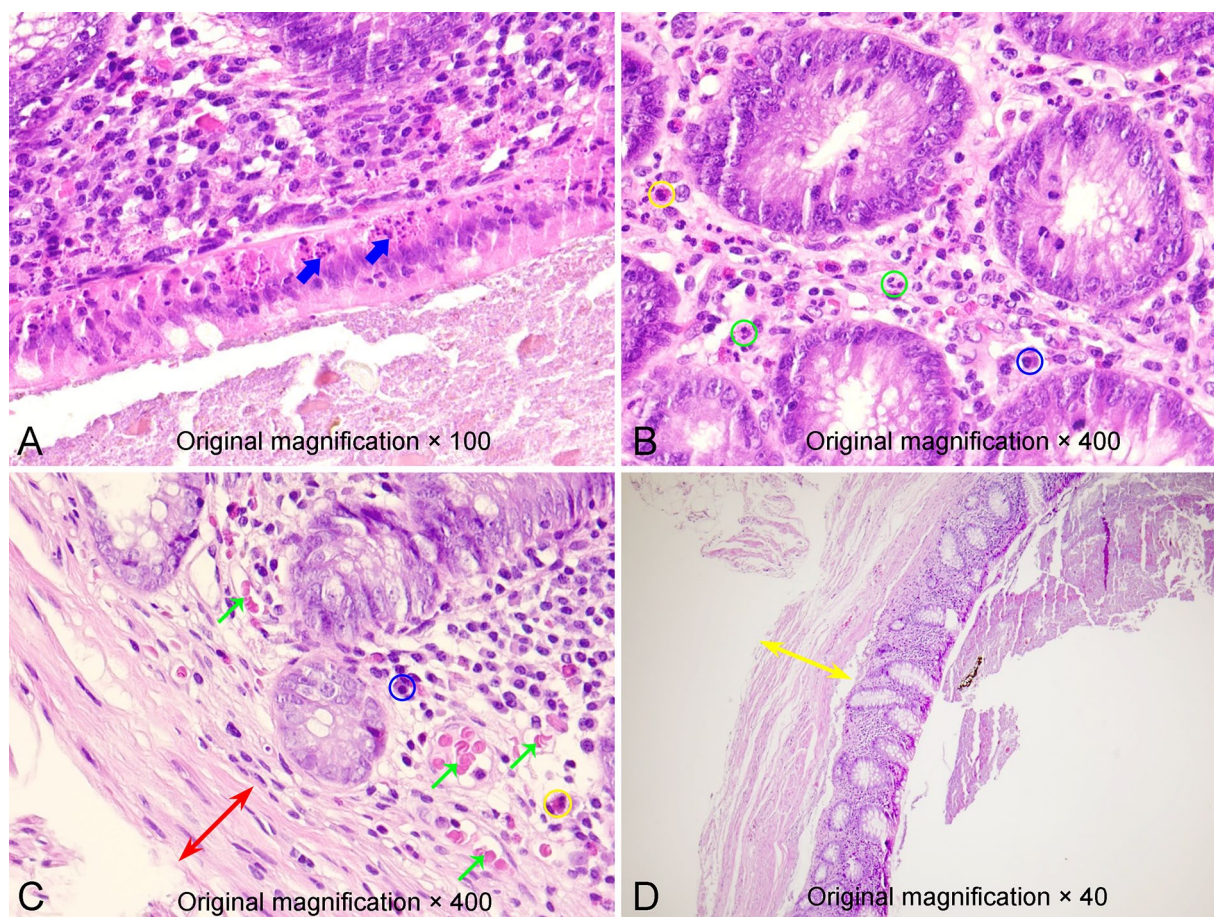


Figure 2. Microscopic images of the appendix specimen with diverticula (hematoxylin-eosin stain). (A) There was infiltration of acute inflammatory cells into the diverticular mucosa (arrows). (B) Appendiceal mucosa was infiltrated with plasma cells (blue circle), polymorphonuclear leukocytes (green circles), and eosinophils (yellow circle). (C) Diverticulum mucosa was infiltrated with plasma cells (blue circle), eosinophils (yellow circle), neovascularization (green arrows), and fibrous hyperplasia (red double-headed arrow). (D) Appendiceal diverticula had thin muscle layer (yellow double-headed arrow).

appendicitis, so we had to do a second ultrasound to confirm the diagnosis. In the context of diverticulitis, accurate differentiation between colonic diverticulitis and appendiceal diverticulitis is important for deciding on treatment. If the patient has colonic diverticulitis then conservative treatment is recommended, if the patient has appendiceal diverticulitis then appendectomy is required. An accurate preoperative diagnosis allows surgeons to plan the most appropriate surgical strategy tailored to the patient's specific condition. The surgical approach can be adjusted based on the preoperative findings. In cases where appendiceal diverticulitis is diagnosed preoperatively, careful attention to the mesentery of the appendix is important to ensure complete removal of affected tissue and minimize the risk of postoperative complications, because appendiceal diverticula have an increased risk of malignancy of the appendix.²⁻⁵ Simple appendiceal diverticulitis is often seen in uncomplicated cases; however, it can be difficult to recognize when there are complications of abscess or peritonitis. Differential diagnosis of appendicitis and diverticulitis of the colon is difficult in cases where these intestines contain multiple diverticula. The image suggests fatty infiltration around inflamed diverticula.^{2,4,6,9}

Appendectomy is recommended when inflamed appendiceal diverticula are detected on imaging. Additionally, if an incidental appendiceal diverticulum is discovered during surgery, some authors recommend prophylactic appendectomy, as up to 66% of patients will develop acute inflammation. Appendiceal diverticula are also associated with an increased risk of appendiceal cancers including adenocarcinoma, carcinoid tumors, and mucinous adenomas, this strengthens the argument for appendectomy.^{4,5,9} Moreover, because of the increased risk of perforation and increased mortality, appendectomy is recommended.¹⁰ Unlike colon or small intestine diverticulitis, which can often be cured with medical treatments, there have been no studies demonstrating the success of non-surgical treatment of appendiceal diverticulitis. This is most likely since appendicitis and appendiceal diverticulitis are difficult to distinguish on imaging.¹⁰⁻¹³

Conclusion

In summary, acute appendicitis due to appendiceal diverticulitis is a rare disease, often diagnosed based on pathology, and rarely diagnosed preoperatively. Appendiceal diverticulitis may be associated with significant complications. Currently,

laparoscopic appendectomy is the preferred method for acute appendiceal diverticulitis.

Author's Note

The authors obtained informed consent from the patient for publication of the case report and related images and signed a written informed consent form.

Author Contributions

All authors contributed equally to this manuscript.

Ethical Approval

Ethics Committee approval was not required for this case report. The surgical procedure was conducted in accordance with the principles of the Declaration of Helsinki.

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