

## CASE REPORT

# Diagnosis of Appendicitis with Left Lower Quadrant Pain

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Abdominal pain is one of the most common chief complaints of patients presenting to the emergency department and, among the diagnoses of abdominal pain, appendicitis is the most common surgical disorder. Traditionally, the diagnosis of appendicitis is based on well-established clinical criteria combined with physician experience. However, appendicitis presenting with rare and misleading left lower quadrant (LLQ) pain may result in an initial false-negative diagnosis by the physician and even result in failure to order the subsidiary examination of computed tomography (CT) or ultrasound, so increasing the risk of perforation/abscess formation and prolonged hospital stay. In this report, we present 2 cases of atypical appendicitis with LLQ pain where the correct diagnosis was not initially considered. One patient had right-sided appendicitis; the inflamed appendix was 12 cm in length and projected into the LLQ. Local peritonitis developed during observation. With the aid of CT, the diagnosis was established in time. The other patient had left-sided appendicitis with situs inversus totalis. Adverse outcomes with appendiceal rupture and abscess formation occurred due to inadvertent physical examinations and inadequate observation. Early clinical suspicion and adequate observation are indicated in patients with uncertain clinical features. However, in patients with unresolved clinical symptoms and/or local peritonitis that develop during observation, imaging studies play a significant role in preoperative diagnosis and determination of proper treatment. [*J Chin Med Assoc* 2005;68(12):599–603]

**Key Words:** abdominal pain, appendicitis, computed tomography, emergency department, situs inversus totalis

## Introduction

Appendicitis is the major surgical abdominal disease seen in emergency departments (EDs). It is also among the 5 leading causes of litigation against emergency physicians and accounts for 5% of the total dollar loss by insurers of emergency physicians in the United States.<sup>1</sup> The diagnosis is based on well-established clinical symptoms and physician experience. Adverse events (perforation and abscess formation) are correlated with initial false-negative decisions made by physicians.<sup>2</sup> Approximately 1-third of patients with appendicitis have localized pain outside of the right lower quadrant

because the position of the appendix can vary considerably.<sup>3</sup> However, left lower quadrant (LLQ) pain as the manifestation of appendicitis is relatively rare and misleading. The etiologies of LLQ pain are multiple and diverse. Only 1 case report of situs inversus totalis has been found in the emergency medicine literature.<sup>4</sup> Understanding this clinical presentation will help emergency physicians to have early clinical suspicion, implement sensitive imaging modalities early on, and correctly interpret the radiographic findings. We present 2 cases of appendicitis with the atypical presentation of LLQ pain only, and review the literature concerning this rare but important clinical finding.

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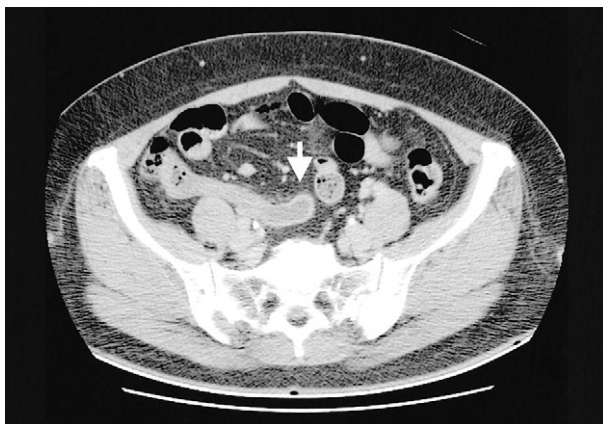
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## Case Reports

### Case 1

A 58-year-old woman was brought to our ED with the presentation of LLQ abdominal pain combined with nausea, vomiting and anorexia for 1 day. She had diabetes mellitus, hypertension and a history of duodenal ulcer. Her body temperature was 37.4°C, and blood pressure and heart rate were normal. Physical examination revealed abdominal tenderness over the LLQ without muscle guarding or rebound pain, and hypoactive bowel sounds. White blood cell count (WBC) was 12,700 /mm<sup>3</sup> with left shift (segment, 86.6%; lymphocyte, 10%). C-reactive protein (CRP) was 0.4 mg/dL. Routine urine, electrolytes, amylase, lipase and liver function tests were all within normal limits. A plain film of the abdomen (kidney, ureter, bladder, KUB) showed no stones or free air except some fecal material over the ascending and descending colon. A bedside ultrasound examination without particular emphasis on the appendix demonstrated normal findings regarding the liver, gallbladder, pancreas, bilateral kidneys and urinary bladder.

The patient was initially treated with intravenous fluids and antibiotics and placed under observation. As the LLQ pain with localized rebound and muscle guarding persisted after 4 hours of observation, abdominal computed tomography (CT) with the impression of sigmoid diverticulitis was arranged. The long swollen appendix with wall hyperemia, measuring about 12 cm in length with the tip pointing towards the presacral region, just across the midline of the lower abdomen, was accidentally found (Figure 1). Fortunately, no CT evidence of appendix perforation



**Figure 1.** Contrast enhanced computed tomography shows a long swollen appendix measuring about 12 cm in length with wall hyperemia, and with the tip (arrow) pointing towards the presacral region, just across the midline of the lower abdomen.

or abscess formation was identified. Emergency appendectomy was performed, and she was discharged 3 days later after an uneventful recovery.

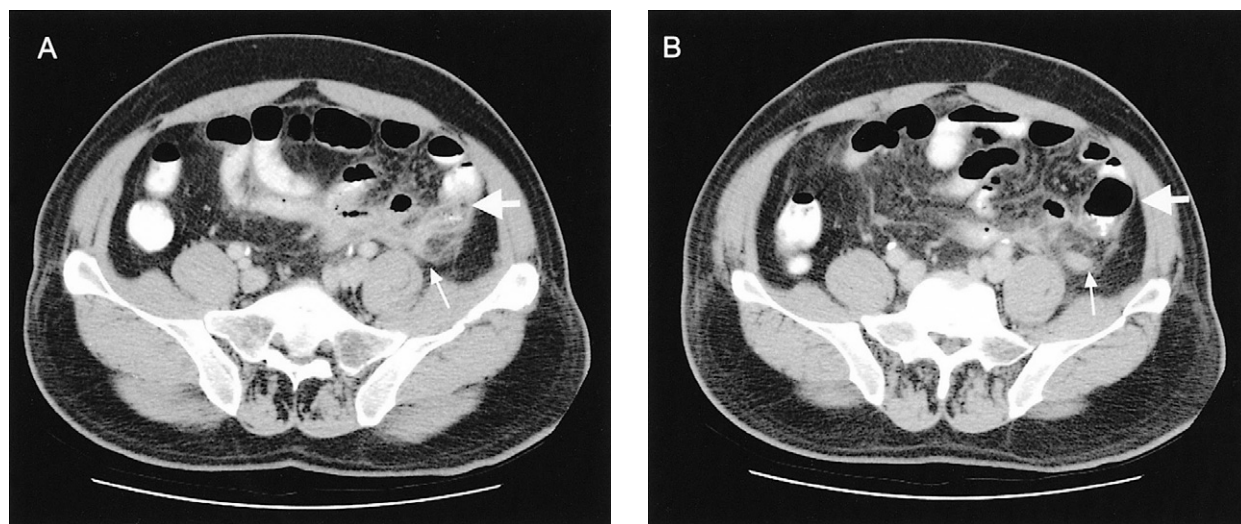
### Case 2

A 48-year-old man with hypertension presented to our ED with vague LLQ abdominal pain, loose stool passage and occasional vomiting for 1 day. His body temperature was 36.8°C, and blood pressure and heart rate were normal. Physical examination revealed LLQ abdominal tenderness without muscle guarding or rebound pain. Bowel sounds were hyperactive. The emergency physician on duty failed to identify right-side precordial myocardial impulse (PMI) and palpable liver edge on the left side during physical examination. The WBC was 11,500/mm<sup>3</sup> (segment, 78.6%; lymphocyte, 16%) and CRP was 3.0 mg/dL. The KUB showed a nonspecific bowel gas pattern. No chest X-ray, electrocardiography or ultrasound were performed.

After simple management, the patient was discharged with his symptoms partially relieved. However, gradual aggravation of the LLQ pain prompted him to visit our ED again 3 days later. CRP had elevated to 20.2 mg/dL. Low grade fever and peritoneal signs with muscle guarding over the LLQ were also noted. Abdominal CT demonstrated situs inversus totalis and swelling of the left-sided appendix with marked surrounding mesenteric infiltrates. A small abscess was found over the periappendiceal region (Figure 2). A delayed diagnosis of acute left-sided appendicitis with rupture and localized abscess formation over the LLQ was established. Treatment with empiric antibiotics was initiated, but the patient was subjected to a prolonged hospital stay.

## Discussion

Abdominal pain is one of the most common chief complaints seen in the ED, and among the diagnoses of abdominal pain, appendicitis is the most common surgical disorder.<sup>5</sup> Although many patients have a characteristic history and physical examination, the condition may sometimes mimic other physical problems and delay the diagnosis. Approximately 1-third of patients with appendicitis have localized pain outside of the right lower quadrant because the position of the appendix can vary considerably.<sup>3</sup> However, LLQ pain as the manifestation of appendicitis is relatively rare and patients are easily misdiagnosed as having other common conditions such as sigmoid diverticulitis, regional enteritis, ischemic colitis,



**Figure 2.** (A) Contrast enhanced computed tomography shows a left-sided cecum (large arrow) and swelling of the proximal portion of the appendix with hyperemic wall thickening (small arrow) over the left lower quadrant of the abdomen and marked surrounding mesenteric infiltration. (B) At a lower level, swelling of the distal portion of the appendix is well defined (small arrow).

intestinal obstruction, urolithiasis, epididymitis or pelvic inflammatory disease which usually do not require surgery. In general practice, observation and/or antibiotic treatment, assistance with “priority” modalities of intravenous urography, colonoscopy or gynecologic sonography if appropriate, are usually performed initially. CT is frequently considered when rebounding pain or local peritoneal signs develop or the clinical symptoms and signs are unresolved during observation. In Case 1, local peritonitis developed during observation and supportive treatment, and early abdominal CT was performed. Fortunately, the non-perforated long appendix projecting into the LLQ was accidentally discovered in time. In Case 2, failure to detect the anomaly of situs inversus during physical examination and lack of awareness resulted in delayed diagnosis and the adverse outcome of ruptured appendicitis with abscess formation. For patients with LLQ pain, appendicitis should be included in the differential diagnosis. Early clinical suspicion, adequate observation and early implementation of CT examination are mandatory, especially when there are unresolved clinical symptoms and local peritonitis.

Appendicitis typically includes a predictable set of clinical symptoms and laboratory abnormalities. The surgical diagnosis of acute appendicitis is customarily made on clinical grounds alone, using history, physical examination and WBC. The MANTRELS score, including migration of pain, anorexia, nausea and vomiting, tenderness in the right lower quadrant, rebound pain, fever, leukocytosis and left shift, has been used as a clinical assessment to diagnose appen-

ditis.<sup>6</sup> However, it has long been recognized that the classically described signs and symptoms are frequently unreliable indicators, and up to 33% of patients with appendicitis will present with atypical findings.<sup>7</sup> Graff et al<sup>2</sup> demonstrated that physician errors (failure to diagnose appendicitis at initial evaluation) correlated with adverse outcome (perforation, abscess formation). The diagnosis of acute appendicitis remains clinically challenging because many nonsurgical disorders have similar clinical presentations, and appendicitis itself can mimic many other conditions. The value of CT in the diagnosis of acute appendicitis has been well documented, with a reported accuracy of 93–98%.<sup>8</sup> Selective use of abdominal CT in patients suspected of having acute appendicitis but with equivocal clinical findings and/or physical exams may result in a lower negative appendectomy rate and fewer patient admissions for observation.<sup>9,10</sup> Most reports emphasized the favorable clinical impact of CT in the population of patients with right lower quadrant pain or suspected appendicitis.<sup>7–11</sup> However, appendicitis patients presenting with LLQ pain may lead the physician to make a false-negative decision and not to order the subsidiary CT examination in time, so increasing the risk of perforation/abscess formation and prolonged hospital stay.

Appendicitis with the atypical presentation of LLQ pain may result from right-sided appendicitis with abnormal length projecting into the LLQ or left-sided appendicitis.<sup>4</sup> The normal appendix is usually 6–9 cm in length, but can be twice as long.<sup>4</sup> In Case 1, the

appendix was more than 12 cm in length, with tip wall hyperemia and projection into the LLQ of the abdomen. Situs inversus totalis, with an incidence of 1 in 6,000–35,000 live births, and the less common midgut malrotation are 2 rare congenital anomalies that result in a left-sided appendix.<sup>4</sup> Most case reports have emphasized its rare occurrence associated with left-sided appendicitis.<sup>4,12,13</sup> Collins,<sup>14</sup> in a study of 71,000 patients with appendicitis, reported that the overall incidence of left-sided appendicitis was 0.04%, which included 0.024% with midgut malrotation and 0.016% with situs inversus totalis. However, the incidence of appendicitis presenting with LLQ pain may be underestimated because previous literature took no account of right-sided appendicitis with abnormal length projecting into the LLQ region.

It is a challenge for emergency physicians to timely differentiate atypical appendicitis from other more common nonsurgical conditions when managing patients with LLQ pain. Situs inversus totalis can be detected easily by careful physical examination and simple radiographic studies such as right side PMI, palpable liver edge on the left side, chest radiography with dextrocardia, and special electrocardiography with right axis deviation of both P-wave and QRS complex and low voltage in the precordial leads.<sup>4</sup> Ultrasound and CT can also help in the detection of situs inversus totalis. For midgut malrotation with the heart and liver on the correct sides, CT is useful in demonstrating this anomaly. The presence of CT superior mesenteric vein (SMV) rotation sign, with the SMV located anterior and to the left of the superior mesenteric artery, is helpful to ascertain the presence of midgut malrotation.<sup>12,13,15</sup> The CT findings of left-sided and right-sided appendicitis are similar in appearance except for their opposite location. For right-sided appendicitis with abnormal length projecting into the LLQ of the abdomen, it is important to identify the cecum on CT so that an abnormal appendiceal location can be recognized. The relationship of the base of the appendix to the cecum is essentially constant, but the free end of the appendix can occupy any position: directed medially, caudally, laterally or rectoceally.<sup>16</sup>

The typical clinical features of appendicitis include the gradual onset of vague periumbilical abdominal pain shifting to the right lower quadrant over approximately 24 hours, associated with nausea, vomiting and anorexia. The site of maximum pain and tenderness will vary depending on the stage at which the patient presents. Epigastralgia, nonspecific abdominal pain, LLQ pain or pain in other locations may be the initial presentation of appendicitis due to

different evolving stage or abnormal appendiceal position. Graff et al<sup>17</sup> reviewed 252 patients with abdominal pain and found that short-term observation (mean, 10.4 hours) improved the ability to distinguish between patients with and without appendicitis. In Case 1, adequate observation played an important part in early diagnosis to prevent an adverse outcome. In Liu et al's report,<sup>18</sup> close observation of equivocal cases in the ED did not necessarily increase the perforation rate. For patients presenting atypically with suspicion for appendicitis, clinical observation in the ED with serial abdominal examination is essential.

In conclusion, appendicitis in an unusual position may lead to LLQ pain only. High suspicion and adequate observation are indicated in patients with uncertain clinical features. However, in patients with unresolved clinical symptoms and/or local peritonitis, imaging studies play a significant role in preoperative diagnosis and determination of proper treatment.

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