It’s Not Appendicitis...?
Consideration of a Benign Mimicker

**Case:** A previously healthy 16-year-old boy with a normal BMI presented to the emergency department with a 4-day history of severe, colicky pain in his right lower abdomen and right lower back. Before admission, while working as a cook in a restaurant, the patient reported twisting his torso and experiencing a stabbing pain on the right side of his abdomen that wrapped around to his right flank. The pain was so severe that he was taken by ambulance to a regional hospital. At the hospital, appendicitis was suspected, so an abdominal computed tomography (CT) scan was performed. The normal scan ruled out appendicitis and the patient was discharged with ibuprofen. However, the pain continued to worsen. Four days later, the patient arrived at this institution’s pediatric emergency department and described his pain as intermittently stabbing with movement and dull and throbbing during rest. The patient reported persistent nausea and pain when bearing down but not during defecation. He had normal bowel movements with no constipation or blood, normal urine output without blood or dysuria, and reported tactile fevers. He reported no other illnesses or symptoms before or since the onset of the pain. After re-review of the original CT showing possible early changes consistent with appendicitis and persisting peritoneal signs on examination, the attending physician requested repeat abdominal CT.

**Question:** What is appropriate imaging for evaluation of appendicitis?

Per our institution’s radiology protocol, ultrasound is the preferred screen for appendicitis; however, if the referring physician has a high suspicion after an equivocal study, a follow-up CT may be performed. As promoted by the Image Gently Campaign, and supported by current literature, reducing the number of abdominal/pelvic CT scans by 33% can lead to a proportionate decrease in pediatric cancers.1 Thus, ideally, ultrasound should be the first imaging method used.2,3

**Case Continuation:** The repeat CT was read as normal by an on-call radiology fellow. The child’s laboratories revealed a normal white blood cell (WBC) count 9000/µL, hematocrit 46 000/µL, erythrocyte sedimentation rate 4 mm/h, C-reactive protein 0.2 mg/L, creatinine kinase 56 IU/L, and negative porphyrins. His complete metabolic panel was normal except for mildly elevated glucose of 120 mg/dL and total bilirubin level at 1.6 mg/dL. Urinalysis was normal. The patient had decreased appetite and fluid intake, so he was started on intravenous fluids. He was given intravenous morphine and ondansetron for pain control and worsening nausea. Physical examination of the patient’s abdomen was negative for Rovsing, Obturator, and Psoas signs positive for pain with movement, such as positional...
changes, and severe tenderness to palpation without rebound tenderness in the right lower quadrant (RLQ). His testicular examination was normal. He remained very still in the bed to avoid movement that exacerbated his pain. The patient’s cardiopulmonary examination was normal. Because of the focal and unremitting nature of his pain, surgery colleagues continued to feel that his presentation was consistent with evolving appendicitis and ultrasound examination of the RLQ was performed in the interest of reducing radiation exposure. Ultrasound reaffirmed a normal appendix and no fluid collections.

**Question:** What should be included in an initial differential diagnosis for a pediatric patient who presents with severe RLQ pain?

**Discussion:** Acute abdominal pain is a frequently observed reason for hospital admission in the pediatric population. Although appendicitis is one of the more common causes of abdominal pain requiring surgery, other less common, nonsurgical entities can mimic appendicitis, and may be elusive even to the most astute clinician. In a few cases, the clinical diagnosis can be challenging, and cross-sectional radiologic imaging studies might reveal an alternative diagnosis. This report focuses on a patient admitted with sudden onset of unexplained severe, RLQ pain. The colicky nature and location of pain suggested renal colic; however, renal colic was unlikely because of the absence of renal stones on abdominal CT and no blood was seen on urine analysis. Testicular torsion was considered unlikely, given the normal testicular examination, and constipation seemed unlikely, given his regular bowel movements. Iliopsoas injury also was considered, but was unlikely because the patient’s pain was not exacerbated by flexion at the hip. Peritonitis, myositis, and muscle strain also were considered, although the patient’s creatine phosphokinase and erythrocyte sedimentation rate were normal.

**Case Continuation:** Ketorolac and cyclobenzaprine were added to the patient’s pain medication regimen because of continued pain. In discussion with the pediatric neurology service, it was determined that the pain was not consistent with a neurologic cause because the patient had normal strength, tone, no loss of continence, and no sensation abnormalities. Psychiatric diagnoses were considered; however, the patient’s physical examination consistently demonstrated tenderness with palpation that would wake the patient from sleep, limitation of the patient’s movement due to pain, and tenderness to light pressure, suggesting muscle involvement. The pediatric gastroenterology service did not think the pain typical of an ulcer or intestinal problem. Given the sudden onset of severe pain with movement, they suggested the diagnosis of omental infarction.

**Question:** What is omental infarction?

**Discussion:** Omental infarction is a rare cause of acute abdomen resulting from vascular compromise of the greater omentum. Typical presentation includes sudden onset of RLQ pain and tenderness. The process occurs at the right-sided margin of the omentum where the arterial blood supply is tenuous. If the omentum twists on itself, omental torsion can lead to omental infarction, due to both arterial and venous insufficiency. **Case Continuation:** The patient failed to demonstrate improvement in his pain or ability to move 5 days after admission. After review of the clinical course, an abdominal MRI was performed. The MRI demonstrated extensive edema of the subcutaneous fat of the trunk. Mild enlargement of the right rectus abdominus muscle was noted, without well-defined hemorrhage formation. Increased signal intensity was identified within the right paracolic fat, as well as abnormal enhancement after contrast administration, which suggested omental infarction or epiploic appendagitis (Fig 1). The abdominal CT was then reevaluated by a senior pediatric radiologist, and an oval-shaped focus of fat density with a thin peripheral hyperattenuating rim and central dot, surrounded by inflammatory change, adjacent to and abutting the ascending colon, was retrospectively identified (Fig 2). Epiploic appendagitis was then the diagnosis, primarily because of the typical imaging appearance and anatomic correlation with the site of the patient’s pain.

**FIGURE 1** Axial T1 fat-suppressed MRI of the lower abdomen obtained after the administration of intravenous gadolinium contrast reveals bright areas of inflammatory enhancement of the RLQ paracolic fat (red arrow). Note high signal intensity in the surrounding subcutaneous fat of the abdominal wall, consistent with edema.
cases have been reported. This condition is uncommon in the pediatric population and few cases have been reported. This condition most commonly occurs in the fourth and fifth decades of life, equally in men and women, with a reported age range of 12 to 82. One study has identified obesity as a risk factor in children.

The epiploic appendages are round, fat-filled, serosa-covered, pedunculated structures located on the antmesenteric side of the colon along the taenia coli. The appendages are present along the entire length of the colon, covered by peritoneum and increasing in number up until the rectum, where they are absent. The greatest concentration is in the cecum and sigmoid colon. Epiploic appendages, which measure 0.5 to 5.0 cm long, are larger on the left side of the colon than the right. Because they are larger and more numerous on the left, the most common site of epiploic appendagitis is in the left lower quadrant. Less frequently, the right colon is affected, and the condition mimics acute appendicitis. The function of the appendages is not exactly known but is proposed to be similar to the greater omentum as a form of protection; they also may act as cushioning during peristalsis. Each epiploic appendage encloses a small end artery branching from the vasa recta of the colon, and a draining vein that passes through its narrow pedicle. Its limited blood supply, pedunculated shape, and excessive mobility make it prone to torsion, ischemia, or hemorrhagic infarction. Gradual torsion of the appendage results in chronic inflammation with minimal to no symptoms. However, acute torsion with spontaneous thrombosis of the draining vein will be symptomatic, typically with abrupt onset of acute abdominal pain, localized to the right or left lower quadrant. Secondary epiploic appendagitis occurs as a result of another, nearby inflammatory process, such as appendicitis, diverticulitis, or cholelithiasis.

**Question:** What is epiploic appendagitis and its pathophysiology in the pediatric population?

**Discussion:** Epiploic appendagitis is an ischemic and inflammatory condition resulting from torsion or ischemia of the epiploic appendages. It is an uncommon cause of abdominal pain in the pediatric population and few cases have been reported. This condition most commonly occurs in the fourth and fifth decades of life, equally in men and women, with a reported age range of 12 to 82. One study has identified obesity as a risk factor in children.

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**Question:** How does epiploic appendagitis typically present, how is it diagnosed, and how is it radiographically evaluated?

**Discussion:** The typical presentation is acute left lower quadrant pain. The pain is typically nonmigratory, and worse with coughing and abdominal stretching. Heavy exercise also has been reported as a predisposing factor. On physical examination, there may be localized tenderness to the right or left lower quadrant, without guarding or rigidity. Low-grade fever may be present, and nausea and vomiting are uncommon. WBC count may be normal or slightly elevated.

For diagnosis of epiploic appendagitis, there are no pathognomonic laboratory tests; however, laboratory evaluation is often useful in excluding other etiologies. Specifically, studies have shown that only 5% of patients with appendicitis will have a WBC count <8000/µL. For epiploic appendagitis diagnosis, abdominal sonography should first be used; the inflamed appendage resembles a noncompressible hyperechoic mass with a hypoechoic rim. Ultrasound is the preferred diagnostic tool because it does not impart ionizing radiation. Abdominal CT confirms the fatty nature of the lesion, usually consisting of a 1- to 5-cm oval-shaped, paracolic focus of fat density surrounded by inflammatory change. It typically features a 2- to 3-mm, hyperattenuating rim, reflecting the inflamed visceral peritoneal covering, which is considered diagnostic. In addition, a central round area of increased attenuation "central dot sign" or a longitudinal area of increased density is seen, representing thrombosed central vessels or areas of hemorrhage or fibrosis (Fig 3). Adjacent fat stranding and asymmetric colonic wall thickening are also typically seen (Fig 2). Rao and colleagues reported that a pericolonic, oval-shaped lesion with fat attenuation, thickened visceral peritoneal lining, and periappendageal fat stranding is virtually pathognomonic. MRI is not a well-studied imaging modality for the diagnosis of epiploic appendagitis; however, findings are typically similar to CT scan (Fig 1).
This condition rarely makes the top of most pediatricians’ differential diagnosis because of more common conditions, such as appendicitis, testicular torsion, inflammatory bowel disease, or constipation. However, considering epiploic appendagitis in the differential has the potential to decrease the number of CTs and laboratory tests performed because of the benign nature of the disease. At this institution over the past year, we have had at least 3 cases of epiploic appendagitis confirmed by radiologic findings and clinical course. The first case was presented in this report. The second case was a 15-year-old girl who was admitted for presumed appendicitis due to intense RLQ pain. Abdominal ultrasound failed to demonstrate appendicitis but did reveal inflamed right paracolic fat consistent with epiploic appendagitis. Her pain resolved 2 days after admission and she was discharged. These 3 cases reinforce the need for increased awareness of epiploic appendagitis in the differential diagnosis of RLQ pain, as it often mimics appendicitis and is not limited to the adult population.

Differential diagnostic considerations in the pediatric population include acute appendicitis and omental infarction. On imaging, omental infarction is typically larger in size (3.5–7.0 cm), triangular or oval-shaped, and without a thin, hyperattenuating rim or central dot sign. The process is characteristically found between the anterior abdominal wall and transverse or ascending colon, corresponding in location to the greater omentum. Epiploic appendagitis can be difficult to distinguish from omental infarction; however, differentiation is not critical, as conservative management is the treatment of both conditions. Differentiation from acute appendicitis should be straightforward in the absence of an identifiable, inflamed appendix.

**Case Resolution:** Cross-sectional radiologic imaging (CT, MRI) was key to the diagnosis of epiploic appendagitis in our patient, although ultrasound, with subsequent MRI in some cases, should be the first-line imaging modality in most patients. This patient was transitioned from opioids to acetaminophen and naproxen for pain control, and over the course of 8 days after his injury, his symptoms significantly improved.

**Conclusions:** Our patient’s history of acute twisting at his waist followed by the immediate onset of pain was puzzling. Reassuring laboratory studies failed to elucidate the etiology, but abdominal MRI and reevaluation of his abdominal CT by an experienced radiologist revealed the typical features of epiploic appendagitis in his RLQ. Epiploic appendagitis should be considered in the differential diagnosis of unexplained right or left lower quadrant abdominal pain in children to avoid unnecessary testing.

**REFERENCES**


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