Omental infarction in children misdiagnosed as acute appendicitis

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Omental infarction (OI) is a rare cause of acute abdomen in children. It is found in 0.1–0.5% of pediatric patients undergoing abdominal exploration for the suspect of acute appendicitis. OI is considered a self-limited entity, and conservative management should be considered. This approach implicates computer tomography scan radiation exposure, prolonged hospitalization, and prolonged analgesic and anti-inflammatory therapy. In contrast, surgery allows immediate pain resolution with low complication rate. We present our experience with two cases of pediatric acute abdomen due to OI, misdiagnosed as acute appendicitis, which were successfully treated surgically. *Ann Pediatr Surg* **11:200–202 © 2015 Annals of Pediatric Surgery.**

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Introduction

Omental infarction (OI) is a rare cause of acute abdomen in children. OI in the pediatric population accounts for ~30% of all cases reported and is found in 0.1–0.5% of children undergoing abdominal exploration for acute appendicitis [1–4]. A distinction between torsion of omentum and infarction has been made in the past. This distinction is not clinically relevant as both entities present in the same manner. The symptoms of OI are similar to those of acute appendicitis, and more than 90% of cases present with right-sided abdominal pain [5,6]. Ischemic lesion of the great omentum can be visualized using imaging techniques, including both abdominal ultrasonography (US) and computer tomographic (CT) scan [7]. Even with the use of these methodologies it is not always possible to establish an accurate diagnosis [8,9]. OI is considered a self-limited benign condition in children, which may resolve spontaneously. Conservative management has been proposed as the treatment of choice [8,9]. However, conservative treatment might be appropriate only when a correct diagnosis is made. To accomplish this a CT scan is often required. Prolonged hospitalization and prolonged analgesic and anti-inflammatory therapy are needed in this approach. In contrast, surgery is usually indicated in case of uncertain diagnosis, persistent peritoneal findings, and potential complications such as adhesions forming about the infarct [9]. The persistence of necrotic tissue in the abdomen may induce the local development of abscess and adhesions [4]. Surgery allows immediate pain resolution with prompt hospital discharge and low rate of complications, especially when laparoscopy is adopted. We present two cases of OI in children who had a preoperative diagnosis of acute appendicitis and were successfully treated with surgery.

Case report

Case 1

An 8-year-old boy presented with acute onset of right lower quadrant abdominal pain that persisted for 24–48 h. There was no history of fever, vomiting, diarrhea, or constipation. His past medical history was unremarkable. His BMI was 30. The physical examination revealed distended abdomen and mild tenderness localized to the lower abdominal quadrants. Laboratory examinations revealed a white blood cell (WBC) count of 10770/mm^3 with 68.9% neutrophilia and C-reactive protein of 2.98 mg/dl. US revealed unremarkable findings, except for free peritoneal fluid in Douglas's space and diffuse distended bowel loops. The pain and peritoneal signs increased during observation. The child was treated with laparoscopy with the preoperative diagnosis of acute appendicitis. At operation, the appendix was uninflamed. A complete examination of the bowel found no pathological findings. A small amount of bloody fluid was found in Douglas's space. A $9 \times 4 \times 3$ cm solid, hemorrhagic, and necrotic omental mass was found due to OI. Partial right omentectomy was performed. Histological examination confirmed OI with fat necrosis infiltration by lymphocytes and some inflammatory cells. The postoperative course was uneventful and he was discharged on day 2.

Case 2

A 5-year-old boy was admitted to our department with acute abdominal pain, localized in the right iliac fossa, of 12 h duration without nausea and vomiting. His BMI was 24. Past medical history was unremarkable. Physical examination revealed mild degree of tenderness and muscular rigidity in right lower quadrate. Laboratory investigations revealed a WBC count of 9700/mm^3 with neutrophilia of 75% and elevated C-reactive protein (5 mg/dl). Abdominal US did not reveal signs of appendicitis [10], but showed a marked and inhomogeneous hyperechogenicity of the abdominal fat tissue (Fig. 1a) and free peritoneal fluid in Douglas's space (Fig. 1b), among bowel loops and in Morrison's space. These findings were interpreted as secondary to appendicitis. The abdominal pain persisted and was poor-responder to standard analgesic therapy (paracetamol).

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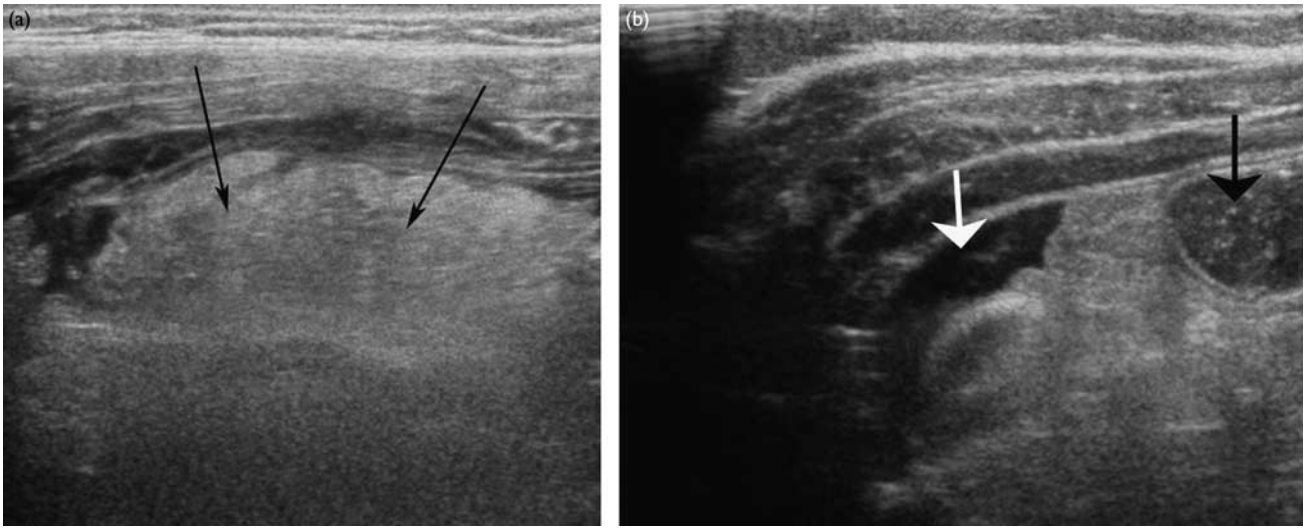
Fig. 1



Case 2: The abdominal ultrasound showed hyperechoic intra-abdominal fat (black arrows in a) associated with the presence of intraperitoneal fluid (white arrow in b) and dilated bowel loops (black arrow in b). The appendix could not be visualized.

The child was thus operated upon; the right iliac fossa was explored through a standard McBurney's incision and the appendix had normal macroscopic appearance but a small amount of bloody fluid was found. No biochemical, cytological, or microbiologic profile examination was conducted on this. A grossly inflamed and infarcted segment of the greater omentum of $7 \times 5 \times 2$ cm in size was seen and removed. The definitive histological examination confirmed diagnosis of OI with diffuse ischemic lesions, fat necrosis, vascular congestion and infiltration by inflammatory cells, and edema. The postoperative course was uneventful and he was discharged on day 3.

Discussion

Vascular disturbance of the omentum, described variously as acute epiploitis, primary omental torsion, or idiopathic segmental infarction, is an infrequent cause of acute abdomen, often mimicking acute appendicitis, cholecystitis, or pancreatitis [10]. Park *et al.* [1] reported a male-to-female ratio of 2.58:1 and mean age of 31.7 years in their series, and they reported that 32.6% of the cases occurred in children under 15 years of age. The augmented prevalence of obesity in children, seen in recent years, might justify the increasing incidence of OI [2,11]. The greater omentum is divided anatomically into left (gastrophrenic and gastrosplenic) and right (gastrocolic) ligaments. The epiploic branches of the right and left gastroepiploic arteries supply the right one. Initially it is flimsy and transparent, and progressive perivascular fat deposition occurs throughout childhood [2,11]. OI, generally, occurs on the right ligament because the omentum is longer and more mobile on its right side [5,11,12]. The right-sided predilection is usually attributed, also, to anomalous vascular development with resultant predisposition to infarction [6,13]. A different embryonic origin for the right side of the greater omentum is suggested by a more fragile blood supply of this area compared with the remaining of the omentum. The blood vessels of the right lower portion of the greater omentum are more susceptible to elongation and secondary occlusions. Such evidences further explain the high incidence (90%) of this disease in the right side of the greater omentum [14].

Some mechanisms such as abdominal trauma, hyperperistalsis following enteritis, and increased abdominal pressure have been proposed as possible trigger for omental torsion, accentuating the physiological movements of the omentum [13]. OI without torsion has to be regarded as more rare; it could be due to hypercoagulable states, venous thrombosis, vasculitis, and pancreatitis [11]. However, the distinction between different etiologies of OI and their pathogenesis has been abandoned due to a lack of clinical variance in presentation, management, or outcome [15].

Finally, OI has been classified by Leitner into two categories: primary (idiopathic) or secondary. The possible etiologies of primary cases are congenital venous anomalies, obesity, sudden change of position, and substantial meal. When the cause is secondary, it occurs with intra-abdominal pathologies such as internal or external hernia, tumor, cyst, or adhesions [16].

Our cases did not show any evidence of abnormal omental attachment, acquired abdominal pathology, or previous abdominal surgery, and so they can be classified as primary (idiopathic).

Varjavandi *et al.* [11] and Loh *et al.* [17] recently suggested that obesity is a risk factor for OI. They postulated that increased fat perivascular deposition in the omentum compromises the blood supply to the developing omentum, causing relative ischemia. Furthermore, the increased omental weight may lead to torsion, or traction to the most distal parts of the omentum. The obesity of one of our patients seems to support this suggestion.

Symptoms of OI may consist of sudden onset of acute abdominal pain, more often in the right iliac fossa. Yang *et al.* [18] reported that diagnosis of OI should be considered in patients presenting with right lower quadrant abdominal pain without nausea and fever and with a neutrophil percentage that is below 77%. OI rarely causes intestinal irritation or systemic inflammatory response, which could account for the rare occurrence of nausea and vomiting. Physical examination usually elicits localized tenderness with or without palpable mass [5,17,18]. Clinical presentation of OI could be variable, and differential diagnosis with acute appendicitis or other pathologies is often challenging for the surgeon. As regards the WBC value, another study reported the mean in 19 patients to be 12.633 mm^3. In contrast, both of our patients showed WBC within normal limits. This aspect should be taken into account in the differential diagnosis of appendicitis, because the condition is usually associated with elevated WBC [14].

It is estimated that 0.1–0.5% of children undergoing laparotomy or laparoscopy for suspected appendicitis were finally diagnosed with OI [2,4]. Abdominal US and CT scan are advocated as extremely helpful in differential diagnosis. The typical ultrasound appearance of the infarcted omentum is a hyperechoic, no-compressible, ovoid intra-abdominal mass adherent to the anterior abdominal wall [19]. CT scan, usually, reveals an ill-defined mass located between the abdominal wall and the transverse and the ascending colon and may demonstrate fat interspersed with hyperattenuating streaks [8]. CT multiplanar reconstruction preoperatively can be a useful imaging tool in making a diagnosis [20,21]. The diagnostic accuracy of US and CT scan has increased in the last years [8,9], but despite their advances it is still not possible to formulate an accurate preoperative diagnosis of OI in all cases. CT is considered as the diagnostic modality of choice, but it implicates significant radiation exposure. In our experience, preoperative abdominal US failed to make a correct diagnosis. In both cases clinical evaluation and physical examination suggested a diagnosis of acute appendicitis, and surgical exploration was performed.

The management of OI is still controversial, because it is considered a self-limiting benign condition that may resolve spontaneously. Conservative management is considered safe and effective by some authors. To accomplish this, an accurate diagnosis is crucial [7,8,12]. In a previous study, where the two approaches were compared, a longer hospital stay and an increased analgesic need were the main disadvantages of conservative management [9]. Moreover, complications after conservative management include both abscesses and adhesions induced by the persistence of necrotic tissue in the abdomen [4]. Therefore, some authors advocate surgical resection [5,6,9,11,13,15]. Surgical procedure results in immediate resolution of pain with no morbidity and an uneventful and short postoperative course [9,10,17]. Nubi *et al.* [9] concluded that a short trial period of conservative management is warranted, but when no prompt response is observed surgical intervention is recommended.

Conclusion

OI often mimics acute appendicitis preoperatively, although US and CT may be diagnostic. Even if rare, OI should be considered as a differential diagnosis by pediatric surgeon and radiologist for acute persisting abdominal pain, especially in the absence of fever or gastrointestinal symptoms, elevated WBC count, and particularly in obese children. Inspection of the omentum should be a routine part of exploration on abdominal US or CT scan. Some cases require surgical intervention; nevertheless, surgical treatment of OI seems to be limited to those with complications, such as failure of conservative management, omental abscess, bowel obstruction, and in cases of uncertain diagnosis.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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