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Primary omental torsion with massive necrosis: a case of uncommon surgical emergency

A 61-year-old male patient presented to our hospital's emergency department with a history of worsening abdominal pain. The symptoms began as epigastric pain and later localized to the right lower quadrant. On physical examination, there was rebound tenderness mainly in the right lower quadrant and in the right upper quadrant. The laboratory results showed leukocytosis. Abdominopelvic computed tomography scan revealed that a definite twisting on the long axis with three complete counter-clockwise turns was observed in the vascular structures of greater omentum. At operation, the greater omentum was found to be twisted and gangrenous. The infarcted omentum was ligated at the pedicle and excised. Primary torsion of the omentum is one of the uncommon causes of acute abdominal pain. Although rarely diagnosed, the entity is important to the surgeon because it mimics the common causes of the acute surgical abdomen. Omental torsion usually occurs on the right side. Abdominal pain starts suddenly after a heavy meal or hard exercise, and is not accompanied with nausea, vomiting and anorexia. Abdominal computed tomography may show peculiar features suggestive of omental torsion. Treatment consists of ligation and resection of the involved portion of the omentum and recovery is usually rapid, uneventful and complete.
Primary omental torsion should be considered in the differential diagnosis of acute abdomen. The surgeon must remain aware of the disease and search for it if, at laparotomy, other adequate cause is not found to explain the symptoms, especially if free sero-sanguineous fluid is found in the peritoneal cavity.

KEY WORDS: Acute abdomen, Greater omentum, Omental torsion, Omental infarction, Omental necrosis

Introduction

Omental infarction with or without gangrene due to torsion is an extremely rare cause of acute abdomen. Torsion is defined as twisting. Torsion as it is applied to abdominal organs or tumors implies the rotation of whole or part of the affected structure upon itself, with the formation of a narrowed neck or pedicle, where the circulation to the distal mass becomes constricted. In order to warrant clinical notice, such twisting must cause some degree of circulatory obstruction, since it is axiomatic that any process which produces neither subjective symptoms nor objective (circulatory) changes is purely physiologic and does not justify the category of a pathologic entity. Omental torsion is diagnosed usually on exploratory laparotomy for presumed acute appendicitis, acute cholecystitis, perforated peptic ulcer or similar abdominal emergencies. The increasing use of high-quality imaging modalities in the diagnosis of acute abdomen has allowed preoperative diagnosis to be made much more often.

Every classification recognized the premise that all cases of omental torsion may be divided into two main etiologic types. Anton *et al.* published an excellent review

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in which they discussed the embryology, anatomy, physiology and pathology of the omentum [1]. They proposed the following simple cIassification as sufficiently broad to embrace all the reported types: (1) those without apparent cause (idiopathic, cryptogenic, or primary abdominal); and (2) those associated with or complicated by any pathological condition (secondary) either within the abdominal cavity (*intrinsic*: cysts and tumors of the omentum, and *extrinsic*: pathology of the abdominal and pelvic organs, and peritoneum), or without (hernial, external).

We herein present a case of primary omental torsion with gangrene diagnosed and treated by surgery together with a brief review of the condition.

Case Presentation

A 61-year-old male patient presented to our hospital's emergency department with a 15-hour history of worsening abdominal pain. The symptoms began as epigastric pain and later localized to the right lower quadrant. The pain was sharp and constant in nature with nausea and vomiting. On physical examination, there was some abdominal distention. He was afebrile and normotensive with rebound tenderness mainly in the right lower quadrant and in the right upper quadrant. Peristalsis was normal. There was no evidence of hernia. His body mass index (BMI) was 24 kg/m^2. The laboratory results showed leukocytosis (14.4 10^3/μL) and no other abnormalities, including liver function tests, amylase, lipase, and urinalysis, which were within normal limits. A presumptive diagnosis of acute abdomen was made with acute appendicitis and acute cholecystitis in the differential diagnosis. An ultrasonography of the abdomen revealed that there were minimal free fluid and heterogeneity in fatty tissues in a fairly large area in the right lower quadrant. Then, a computed tomography (CT) scan was ordered for confirmation. Abdominopelvic CT scan revealed that a heterogeneity was observed in the omentum in an area of approximately 20x10 cm in the right middle and lower quadrants, and a definite twisting on its long axis with three complete counter-clockwise turns was observed in the vascular structures of this area (Fig. 1). This heterogeneity was thought to be secondary to comprimised mesenteric blood supply. This was reported as significant in terms of mesenteric volvulus. The decision was made to perform exploratory

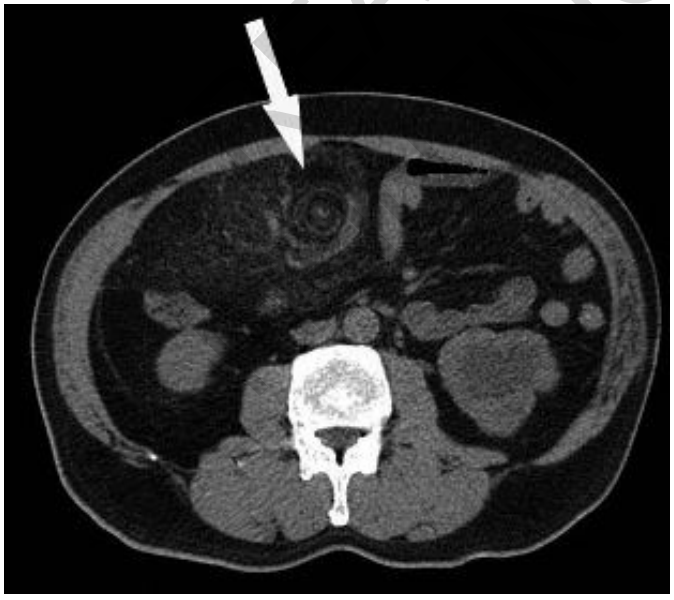

Fig. 1: Abdominal CT scan was remarkable for omental stranding with "curvilinear swirling" on the epigastric region, which is the so-called "whirl sign" (white arrow).

Fig. 2: Intraoperative view of the greater omentum delivered through the incision site prior to resection which twisted three times in a counter-clockwise direction, and the congested, necrotic distal part of the omentum.

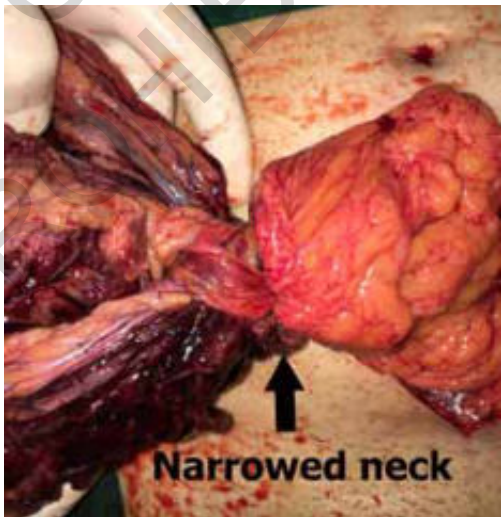

Fig. 3: Typical primary torsion. Note formation of a narrowed neck (black arrow) and intense congestion of infarcted portion.

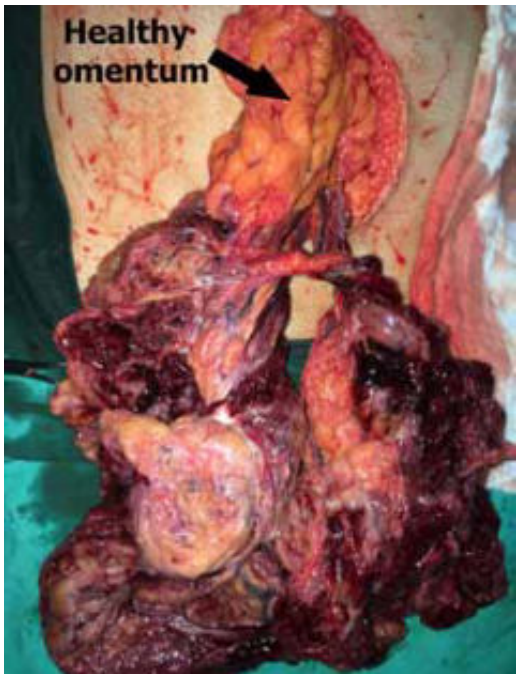

Fig. 4: Intraoperative view of ischemic and infarcted omentum distal to the healthy omentum.

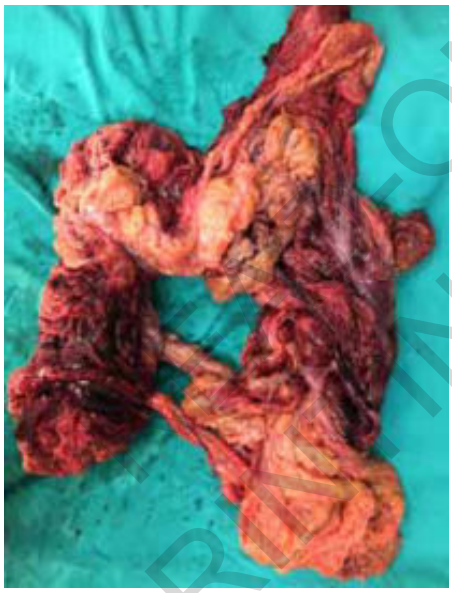

Fig. 5: Surgical specimen of primary torsion of omentum showing hemorrhagic congestion and necrosis of dependent segment below a pivotal point where it has twisted several times.

laparotomy to confirm the diagnosis and to treat the patient.

At operation some sero-sanguineous free fluid was found in the peritoneal cavity. During exploration an indurated omentum was felt. This was found to be twisted (Fig. 2) and gangrenous, blue-black and hemorrhagic, measuring about 35 cm in length and 25 cm in width, which confirmed the diagnosis of omental torsion with infarction (Fig. 3). The whole infarcted omentum was ligated at the pedicle and excised, and infracolic omentectomy was completed (Fig. 4). The appendix and gallbladder were visualized and were normal. No other pathologic changes were noted in the abdomen. The operation was concluded and a liquid diet commenced on the first postoperative day.

The specimen consisted of a mass of indurated, hemorrhagic and necrotic fibro-fatty tissue, which was fan-shaped when spread out and measured 32x23x4 cm (Fig. 5). At the upper end there was a pedicle 5 cm in length which exhibited a definite twisting on the long axis with three complete counter-clockwise turns. The distal portion was deep red and purple in color and congested, and showed tensely distended veins. Microscopic examination showed extensive hemorrhage, areas of fat necrosis. extravasation of red cells into the fat and thrombi in all the veins. There was no evidence of vascular inflammatory disease. Diagnosis was infarction of the omentum due to primary torsion.

Discussion

Omental infarction, with or without torsion, is a rare cause of acute abdominal pain, which makes it a difficult and unusual diagnosis to make. Omental torsion has an incidence of 0.0016% to 0.37%, which is a ratio of less than 4 cases per 1000 cases of appendicitis [2,3]. This incidence has made it difficult to make the diagnosis, and historically it has only been diagnosed during open surgery for a presumptive diagnosis of acute abdomen. There has been reported that preoperative diagnosis is only made in 0.6% to 4.8% of cases of omental infarction [4]. Patients typically present within the third to fifth decades, with a slightly higher prevalence in males [5], and the majority of patients are overweight [6]. Obesity is a well-documented risk linked to primary torsion, with one study reporting that almost 70% of patients with omental infarction were obese [7]. It is speculated that excess fat unevenly distributed in the omentum acts as a lead point for torsion. Our patient was a 61-year-old nonobese male with a BMI of normal weight.

Omental torsion was first decribed in the literature by Pierre de Marchette in 1851, and primary torsion of the omentum by Eitel in 1899 [8]. Vascular disturbances of the omentum, particularly of the greater omentum, occasionally cause acute abdominal distress, diagnosed variously as due to acute appendicitis, acute cholecystitis, perforated peptic ulcer, etc. Fortunately, most cases present such persisting symptoms that laparotomy is performed and the correct diagnosis is usually reached. However, the surgeon must recognize the possible occurrence of this lesion and look for it if the cause of the symptoms is not found in the organ or organs preoperatively suspected of producing the clinical symptoms.

These cases are reported in the literature under several descriptive titles including primary omental torsion, omental volvulus, acute epiploitis, idiopathic segmental infarction, omental thrombosis and similar headings; and usually the cases caused by torsion are segregated from those produced by spontaneous thrombosis as separate and distinct entities. Since the basic disturbance is vascular regardless of etiology, and since the symptomatology is essentially alike in all cases, an inclusive classification or grouping has been proposed as follows: (A) omental infarction (with or without gangrene) due to torsion (primary/idiopathic and secondary); and (B) omental infarction (with or without gangrene) due to thrombosis (idiopathic/spontaneous infarction; associated with vascular disease; and due to external trauma) [9].

The etiology of primary torsion is not immediately apparent. The omentum does not have inherent powers of motion so that its displacements are determined by outside forces; e.g., intestinal peristalsis, intra-abdominal tension, intestinal distention, traction by adhesions. Leitner *et al*. grouped the possible etiologic causes into predisposing factors and precipitating factors [9]. Predisposing factors include: (a) *Anatomical variations* - tongue-like projections, longer right half, bifid structure. (b) *Obesity* - causing irregularly distributed accumulations of excess fat. (c) *Epiploitis* (*omentitis*) - thought by some authors always to occur, possibly fugitive in nature and not evident on examination, but sufficient to initiate the torsion. This change may be inflammatory, posttraumatic or postoperative. (d) *Arrangement of blood vessels* - the omental veins are longer than the arteries and are thin-walled. Kinking of the veins may cause dilatation and twisting around the shorter tense artery, initiating a self-perpetuating torsion. (e) *Tumors or cysts*. Precipitating factors are those which cause displacement of the omentum: (a) *Trauma* – including blunt trauma to the abdomen, violent exercise, coughing, straining, acute changes in body position producing sudden displacement of the omentum. (b) *Hyperperistalsis* - as with overeating causing an increase in passive movements of the omentum. (c) *Vascular changes* - areas of infarction caused by thrombosis or embolism initiate a twisting due to the increased weight of the infarcted area. Our patient seems to have had none of these predisposing or precipitating conditions mentioned.

Secondary torsion is much more common than the primary type and is associated with adhesions of the free end of the omentum to the peritoneum. This occurs especially to the neck of hernial sacs, although it may occur in many types of intra-peritoneal lesions, or following laparotomy. The secondary torsion is usually bipolar; that is, a torsion of the central portion between two fixed points, but it may be unipolar, with torsion of the free end. The latter type occurs most frequently within hernial sacs into which the omentum has prolapsed or into which it has become incarcerated. The twisted omentum may be entirely within the hernial sac or may be partly intra-abdominal. No anatomic cause or pathology, such as obesity, adhesion, or hernia, could be determined in the present patient.

The twist of the omentum occurs in the long axis, producing a neck of varying length in which a variable number of turns occur around the pivotal point. The pedicle may become considerably attenuated and in a few instances there has occurred auto-amputation [10]. It is interesting to note that the direction of rotation is usually clockwise. The torsion is usually complete and permanent. In our patient, a definite twisting on the long axis with three complete counter-clockwise turns was observed. Unlike the literature, the turns of greater omentum were in the counter-clockwise direction in our case. However, incomplete torsion and self-restitution apparently occurs, or there may be recurring partial torsion, as shown by old irregular areas of scarring and fibrosis in the omentum. In fact, the acute episode at times may be the end result of previous partial or incomplete twisting, with final venous thrombosis initiating a permanent torsion. The basic changes subsequent to the torsion are essentially the same as those due to infarction. The distal or free end of the omentum becomes congested and edematous, hemorrhagic extravasation takes place into the interstitial tissue, and thrombi form in the omental veins. There is inflammatory cell infiltration of varying degrees and if the process is of sufficient duration, gangrene may occur. Aseptic peritonitis usually is present, with varying amounts of free sero-sanguineous fluid in the peritoneal cavity. This latter finding is so characteristic that it should lead to the immediate suspicion of an omental infarction if other obvious pathology does not exist. At surgery, we also found some free sero-sanguineous fluid in the peritoneal cavity of our patient. However, Patriti *et al*. reported that benign solitary fibrous tumor of the greater omentum can present itself with spontaneous hemoperitoneum [11]. Therefore, when investigating the source of free sero-sanguineous fluid in the peritoneal cavity, one should always be aware that the cause can originate from tumors or cysts of the greater omentum. Eventually, there is thrombosis of omental veins, and if the process is of sufficient duration, arterial occlusion supervenes, leading to acute hemorrhagic infarction and necrosis. If the mass is not excised, it becomes atrophic and fibrotic and on rare occasion the pedicle may be autoamputated. Sometimes omental torsion derotates spontaneously. Nihei *et al*. reported a spontaneously derotated omental torsion with only hemorrhage but no infarct or necrosis [12]. In a large majority of reported cases, omental torsion with infarction was segmental, involving the right side of the omentum, as it is longer, heavier, and more mobile than the left side [13-15].

There are no significant clinical features to distinguish one type of lesion from the other. This is understandable, since the basic alteration is the same; namely, infarction with or without subsequent necrosis. The pre-

operative diagnosis is rarely made, the usual clinical impression being, in order of frequency, acute appendicitis, acute cholecystitis, perforated peptic ulcer and acute pancreatitis. Actually, preoperative diagnosis is more or less of academic interest only, since the symptoms and physical findings inevitably warrant a laparotomy even in the absence of a definitive diagnosis. It is here that the surgeon must be aware of the possible occurrence of this condition, since inadequate exploration through a small McBurney type of incision might permit him to overlook the actual disease. The finding of free sero-sanguineous fluid in the peritoneal cavity and the failure to explain the symptoms by obvious pathologic changes in the appendix, gallbladder, pelvic organs, gastro-intestinal or genito-urinary tract should cause him to suspect the presence of some omental lesion.

The leading complaint is abdominal pain. This frequently is present in the right lower quadrant of the abdomen, although it is often described as peri- or para-umbilical. It may occur in the right upper quadrant, the right loin, less commonly in the same locations on the left side, and occasionally as generalized pain. In our patient, the symptoms began as epigastric pain and later localized to the right lower quadrant. The onset is usually sudden, and the pain may be persistent or remitting, and frequently may subside or diminish when the patient lies down. The pain was sharp and constant in nature with nausea and vomiting in our case. Tenderness is almost invariably present, most commonly in the right side, especially the lower quadrant. Rebound tenderness occurs often and moderate rigidity may be present. On physical examination, the patient had rebound tenderness mainly in the right lower quadrant and in the right upper quadrant. However, the rigidity is usually voluntary rather than the involuntary muscle spasticity of intraperitoneal infection. Special emphasis is laid on marked hyperesthesia of the skin [16] with little muscle guarding, in contrast to the intense pain elicited on touching the abdominal surface. Of some significance is the fact that despite fairly intense pain and tenderness at the onset, the rapid progression that one would expect to find in acute appendicitis is not observed in the same period of time. Occasionally, if the involved portion of omentum is sufficiently large, a mass may be felt, most often under these circumstances in the right lower or upper quadrants. This has several times led to the diagnosis of localized abscess of the appendix or empyema of the gallbladder. Fever and leukocytosis occur with about the same frequency as one would anticipate in the usual case of appendicitis. Our patient was not febrile, and laboratory tests revealed a moderate leukocytosis. Nausea and vomiting are frequently observed, and diarrhea or constipation may occasionally develop.

Abdominal ultrasound is important in the exclusion of other acute conditions, and sonography findings that suggest omental infarction include a hyperechoic, noncompressible, and ovoid mass [17]. In our case, an ultrasonography of the abdomen revealed that there were minimal free fluid and heterogeneity in fatty tissues in a fairly large area in the right lower quadrant. Then, a CT scan was ordered for confirmation. CT scan can easily differentiate omental torsion from acute appendicitis and acute cholecystitis. Classic signs of omental torsion on CT scan include the whirl sign of a fatty mass with concentric linear strands in the greater omentum [7], with an accumulation of serosanguinous fluid within the peritoneum [18]. Abdominal CT scan was remarkable for omental stranding with "curvilinear swirling" on the epigastric region in our patient, which is the so-called "whirl sign". Balthazar *et al*. showed that magnetic resonance imaging (MRI) was effective, even when omental torsion was complicated by bleeding or development of abscess [19]. However, because CT scan is the gold standard diagnostic modality in patients presenting with acute abdomen [20], the need for MRI to establish a diagnosis of omental torsion is very rare.

A preoperative diagnosis of omental torsion is not of much interest since the clinical manifestations inevitably warrant surgical intervention. It is seen that neither the symptoms nor the physical findings present any characteristic pattern to suggest the diagnosis, since any or all of the features are common to several other acute abdominal diseases. The treatment is simply laparotomy with ligation and excision of the involved area of omentum, or, if necessary, of the entire omentum. We performed total omentectomy due to massive necrosis resulting from primary torsion of the greater omentum in our patient. When a torsioned omentum is observed at laparotomy, it must not be derotated manually because of the risk of thrombosis and the subsequent necrosis of vessels [12]. The prognosis is excellent and only rarely have any untoward sequelae or postoperative complications been reported.

Conclusion

Primary omental torsion is a rare surgical pathology, presenting as acute abdomen and mimicking acute appendicitis in a majority of cases. Preoperative diagnosis may be difficult, but can be achieved using diagnostic imaging, particularly CT scan. The surgeon must remain aware of the disease and search for it if, at laparotomy, other adequate cause is not found to explain the symptoms, especially if free sero-sanguineous fluid is found in the peritoneal cavity. Treatment consists of ligation and resection of the involved portion of the omentum and recovery is usually rapid, uneventful and complete.

Riassunto

L'infarto del fegato è una rara causa di addome acuto e viene diagnosticato solo con la chirurgia esplorativa.

Un paziente maschio di 61 anni si è presentato al pronto soccorso del nostro ospedale con una storia di peggioramento del dolore addominale. I sintomi sono iniziati come dolore epigastrico e successivamente localizzati nel quadrante inferiore destro. All'esame fisico, vi era una tenerezza di rimbalzo principalmente nel quadrante inferiore destro e nel quadrante superiore destro. I risultati di laboratorio hanno mostrato leucocitosi. La tomografia computerizzata addominopelvica ha rivelato che nelle strutture vascolari di maggiore omento è stata osservata una torsione definita sull'asse lungo con tre giri completi in senso antiorario. All'operazione, il maggiore omento è risultato essere contorto e cancrenoso. L'omento infarto fu legato al peduncolo e fu rimosso.
La torsione primaria dell'omento è una delle cause non comuni di dolore addominale acuto. Sebbene diagnosticata raramente, l'entità è importante per il chirurgo perché imita le cause comuni dell'addome chirurgico acuto. La torsione ossea di solito si verifica sul lato destro. Il dolore addominale inizia improvvisamente dopo un pasto pesante o un intenso esercizio fisico e non è accompagnato da nausea, vomito e anoressia. La tomografia computerizzata addominale può mostrare caratteristiche peculiari che suggeriscono la torsione omentale. Il trattamento consiste nella legatura e nella resezione della parte interessata dell'omento e il recupero è generalmente rapido, senza incidenti e completo.
La torsione omentale primaria dovrebbe essere presa in considerazione nella diagnosi differenziale dell'addome acuto. Il chirurgo deve rimanere a conoscenza della malattia e cercarla se, alla laparotomia, non viene trovata un'altra causa adeguata per spiegare i sintomi, specialmente se nella cavità peritoneale si trova un liquido siero-sanguigno libero.

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