Inguinal hernia leading to omental torsion: Role of CT in differentiating from other clinical mimics – a case report and literature review

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ABSTRACT

Omental torsion is a very rare cause of acute abdomen. Clinically, it mimics other common pathologies such as acute appendicitis, acute diverticulitis and acute cholecystitis. It is therefore no surprise, that it was rarely diagnosed pre operatively before the advent and easy availability of modern imaging techniques. CT scan, in particular, can diagnose omental torsion with confidence pre operatively. This can make conservative treatment possible in cases of primary omental torsion and guide regarding the appropriate treatment in cases of secondary torsion. We present a case of a young male patient who presented to Emergency department with symptoms of acute abdomen. Clinical and laboratory findings were non-specific for any specific cause of acute abdomen. CT scan, however, showed omental fat stranding with whirlpool sign representing omental torsion which was seen to be secondary to left inguinal hernia. Patient was operated in emergency and necrotic omentum was resected and hernia repaired. Post-operative recovery was uneventful.

CASE REPORT

CASE REPORT

A 32 years old male presented to Emergency department with severe abdominal pain and vomiting for last 6 hours. Pain was generalized but more on left side, continuous and non colicky. There was no history of constipation, diarrhea or fever. There was also complaint of on and off left scrotal swelling associated with dull pain for last 2 years. The patient had not sought any medical attention for this and had been ignoring this. There was no history of any previous surgery.

Physical examination revealed tenderness with guarding in left lumbar region. However no mass was palpable. There was a reducible left sided inguinal hernia having positive cough impulse. No overlying scrotal skin changes or signs of obstruction or strangulation of hernia was there. Patient had a normal BMI of 24.

Laboratory investigations revealed a mildly elevated total leukocyte count of 11,200 cells / mm^3 (normal 11,000 cells / mm^3) and mildly elevated ESR of 20mm/hour (normal 13mm/hour). Rest of the investigations including hemoglobin levels, differential leukocyte count and urine complete examination were within normal limits.

Ultrasound of the abdomen was unremarkable. No renal calculus or hydronephrosis was seen. No features of bowel obstruction could be demonstrated. Appendix could not be visualized due to bowel gas shadows.

The clinical and laboratory findings were nonspecific and a definitive diagnosis could not be reached. Therefore, A CT scan of abdomen and pelvis with I/V contrast was scheduled. CT scan done subsequently showed ill-defined area of mesenteric fat stranding in left hemi abdomen without any definable walls. This inflamed mesentery was also seen extending into the left sided inguinal hernia. In the center of this misty mesentery, there was twisting of mesenteric vessels in a characteristic whirlpool pattern. Mild amount of free fluid was also seen. There was no pneumoperitoneum. No bowel dilatation was seen. Bowel enhancement pattern was normal with no features to suggest ischemia.

Based on these findings, a diagnosis of secondary omental torsion due to left sided inguinal hernia was made. Since this was a case of secondary torsion, surgical intervention was planned instead of opting for conservative management. Emergency surgery was done which showed left sided inguinal hernia containing necrotic omentum along with necrotic omentum up to the transverse colon. Necrotic omentum was resected and open mesh hernioplasty was performed. Post-operative recovery was uneventful and patient was discharged on 3rd post-operative day.

DISCUSSION

Etiology and demographics

Omental torsion was first reported by Eitel in 1899 [1]. It remains a rare diagnosis having an incidence of 0.0016 % to 0.37% [2]. Less than 250 cases of omental torsion have been reported in literature [3]. A recent literature review has reported that only 0.2-4.8% of the cases of omental torsion are diagnosed preoperatively [4], highlighting how rarely its diagnosis is made using imaging modalities. A study done by Bason and Jones which analyzed 223 patients with omental torsion showed that only one patient out of these was diagnosed correctly before surgery [5]. Even after this study only a few of the 54 cases reported later were diagnosed correctly [6].

Omental torsion is defined as twisting of omentum around its long axis. It can be primary or secondary. Primary torsion occurs in the absence of any pathology. It is typically seen in pediatric population and is due to congenital variations such as bifid omentum, accessory omental tissue or variant blood supply [7]. On the other hand, secondary omental torsion, the more common type, is usually seen in adults with a male predilection [8]. Males are usually affected twice as commonly as females and usually in the fourth to fifth decades of life [9]. The underlying causes of secondary torsion include omental mass, hernia, omental adhesions due to previous surgery and trauma [10]. Obesity has been implicated as a predisposing condition both in children and adults [11].

While the etiologies are different, the precipitating factors for both primary and secondary omental torsion are same – a sudden increase in intra-abdominal pressure leading to sudden shift of omentum. This may be due to coughing, sneezing, exertion or occupational use of vibrating tools [12]. Omental torsion is more common on right side than left presumably because of greater length and mobility of right sided omentum along with less vascularity with poor collateralization [13].

Our patient although much younger than the usual age of presentation, had one of the predisposing conditions – inguinal hernia – which had been left untreated and neglected for some time.

CLINICAL AND IMAGING FINDINGS

The twisting of the omentum leads to venous obstruction which causes omental congestion. This may lead to arterial compromise by edema or elicit an inflammatory response resulting in adhesion formation which then leads to arterial obstruction and ultimately necrosis.

A review of the literature shows that most common symptomatology of omental torsion is pain. Infact, 80 % of patients usually present with right lower abdominal pain [14]. However given its rarity, it accounts for only 1.1 % of cases of acute abdomen [15]. This localization of pain makes it mimic more common entities like acute appendicitis, acute cholecystitis, caecal volvulus, Meckel's diverticulitis and epiploic appendagitis. When pain is on left side, diverticulitis is an important differential in clinical diagnosis as well as ovarian torsion and ectopic pregnancy in female patients. Other symptoms include nausea, vomiting, anorexia, diarrhea and fever [16]. On examination, there may be tenderness and rebound tenderness, adding to the diagnostic confusion especially in cases with right sided torsion. Occasionally, a mass may be palpable depending on the size of segment involved [17]. Although total leukocyte count and inflammatory markers may be elevated, laboratory tests are usually nonspecific in this condition and may only delay the diagnosis and management [9].

Ultrasound or CT scan are considered mandatory pre-operative diagnostic tools [18]. Although its exact sensitivity has not been reported in literature, ultrasound is usually of limited value in its diagnosis due to obscuration of area of interest by bowel shadows and operator dependency [12]. However, it helps to exclude other more common causes of acute abdomen. When seen, the usual appearance is of a solid hyperechoic lesion [19]. CT scan is considered the gold standard [20] and is considered very sensitive in diagnosing the condition [18]. The characteristic finding on CT is 'mass-like' fat density in the mesentery with internal hyperattenuating streaks arranged in concentric pattern giving whirlpool appearance. This sign is characteristic as its represents the torsed vascular pedicle and is not seen in other diseases of omentum [19]. Other findings include hyperattenuating streaks of fat beneath the parietal peritoneum in the affected segment [20]. Free fluid may also be seen in some cases. Most of the patients in larger studies on omental torsion were managed conservatively as it became clearer that it was a benign and self limiting condition. Therefore, diagnosis was often made on basis of clinical and imaging findings. Due to these limitations, it has not been possible to assess the specificity or predictive values of CT or ultrasound for diagnosing omental infarction [21].

Treatment and prognosis

Treatment of omental torsion remains controversial. Omentectomy has been the treatment of choice traditionally [22]. This may be because pre-operative diagnosis was a rarity. It has been estimated to be established in less than 5% of cases [23]. It is not surprising therefore that a literature review revealed only 20 reported cases of successful non operative management of omental torsion between 1990 and 2020 [9]. When treated surgically, laparoscopic management is preferred over open laparotomy to achieve this. Its benefits include less pain, shorter hospital stay and reduced incidence of wound complications [24].

The increasing use of imaging to diagnose the cause of acute abdomen has made pre-operative diagnosis and thus conservative management possible. An argument in favor of this choice is the natural history of the disease process as a self-limited benign condition [23]. However, complications can occur in the form of abscess formation and adhesions due to persistence of necrotic tissue [25]. Adhesions could have potential for greater long term morbidity with potential for intestinal obstruction as well. Conservative treatment can however occasionally fail to relieve the symptoms with a failure rate of 15.9 % reported in literature [20]. Also if conservative treatment fails, patient is more likely to need open surgery than laparoscopic approach [26]. Provided that other alternative diagnosis are excluded using imaging modalities interpreted by expert radiologists and sound clinical acumen is used to keep low threshold for surgery in those who fail to respond to medical management treatment or develop complications, conservative treatment can be considered appropriate management strategy in primary omental torsion. Secondary cases will require surgery in any case for the underlying cause.

Untreated inguinal hernias, such as the one in this case, can develop serious complications such as bowel obstruction and strangulation, referred to as 'hernia accidents ' [27]. Therefore, early repair is advocated to prevent these since there is large difference in mortality and morbidity rates between emergent versus elective inguinal hernia repairs. A meta-analysis showed mean mortality of 4.0 % for hernia accident as compared to 0.2% for elective hernia repair [28].

Differential diagnosis

1. Mesenteric panniculitis

The entity which most closely mimics omental torsion radiologically is mesenteric panniculitis. This is characterized by chronic nonspecific inflammation of mesenteric adipose tissue. It typically results is a mass-like area of heterogeneously increased fat attenuation on CT that displaces adjacent bowel loops but does not displace surrounding vascular structures [29]. Preservation of a halo of normal fat density around the mesenteric vessels is a useful sign which discriminates this condition from omental torsion in which the fat stranding is centered on the vessel around which the omentum has torsed. Presence of peripheral rim of soft tissue attenuation separating the misty mesentery from normal fat, named the tumoral pseudo capsule, has also been reported in cases of mesenteric panniculitis.

2. Epiploic appendagitis

This condition is characterized by self-limited inflammation or ischemia of epiploic appendages of the large bowel. Imaging usually reveals a fat-density ovoid lesion abutting the bowel wall with a peripheral high attenuation rim representing inflamed visceral peritoneum covering the appendage and a central dot sign representing thrombosis of vascular pedicle [30]. The latter is almost considered pathognomic of this entity. However the presence of a central thrombosed vascular pedicle is also seen in omental torsion, albeit unsurprisingly, since both are forms of torsion. The size of the 'inflammatory lesion' (smaller in cases of epiploic appendagitis), location (epiploic appendagitis abuts colonic wall) and the peripheral high attenuation rim (not seen in omental torsion) help differentiate the two entities, although both usually have similar clinical course and management.

3. Acute diverticulitis

This is one of the most common causes of left sided abdominal pain caused by inflammation of colonic diverticula [31]. Imaging reveals an outpouching from colonic wall with thickening of the involved gut wall along with surrounding fat stranding. However when wall thickening is not seen in mild cases and the striking finding is mesenteric fat stranding, differentiation from primary mesenteric processes such as omental torsion and mesenteric panniculitis may be difficult. In such cases however, the absence of signs specific for these alterative diagnosis might provide a clue.

LIMITATIONS

This is a single case report narrating the findings in a single case. Larger studies with adequate sample size would be needed to calculate exact diagnostic accuracy of CT for this entity. Another limitation of this study is the potential for selection bias as a symptomatic patient having underlying pathology was included only and not compared with primary omental torsion.

TEACHING POINT

Omental torsion is a rare cause of acute abdomen albeit one, whose conservative management is possible, provided reliable pre-operative diagnosis is made using imaging. CT scan makes this possible with the appearance of hyperattenuating streaks arranged in concentric pattern giving whirlpool appearance in mesenteric fat aiding in the diagnosis in such cases.

QUESTIONS

Question 1: Which of the following is not a risk factor for developing omental torsion?

1. Obesity
2. Previous surgery
3. Hernia
4. Trauma
5. Inflammatory bowel disease (applies)

Explanation for question 1

1. Obesity [Obesity has been implicated as a predisposing condition both in children and adults]
2. Previous surgery [The underlying causes of secondary torsion include omental mass, hernia, omental adhesions due to previous surgery and trauma]
3. Hernia [The underlying causes of secondary torsion include omental mass, hernia, omental adhesions due to previous surgery and trauma]
4. Trauma [The underlying causes of secondary torsion include omental mass, hernia, omental adhesions due to previous surgery and trauma]
5. Inflammatory bowel disease [The underlying causes of secondary torsion include omental mass, hernia, omental adhesions due to previous surgery and trauma]

Question 2: Which of the following statements is true regarding predilection of omental torsion?

1. Omental torsion is more common in males than females (applies)
2. Omental torsion is more common on left side than right

3. Primary omental torsion is more common in pediatric patients than secondary omental torsion (applies)
4. It is more common in thin lean children than obese adults
5. Secondary omental torsion is more common than primary omental torsion (applies)

Explanation for question 2

1. Omental torsion is more common in males than females [Males are usually affected twice as commonly as females and usually in the fourth to fifth decades of life]
2. Omental torsion is more common on left side than right [Omental torsion is more common on right side than left presumably because of greater length and mobility of right sided omentum along with less vascularity with poor collateralization]
3. Primary omental torsion is more common in pediatric patients than secondary omental torsion [Primary omental torsion is typically seen in pediatric population and is due to congenital variations such as bifid omentum, accessory omental tissue or variant blood supply]
4. It is more common in thin lean children than obese adults [Obesity has been implicated as a predisposing condition both in children and adults]
5. Secondary omental torsion is more common than primary omental torsion [On the other hand, secondary omental torsion, the more common type, is usually seen in adults with a male predilection]

Question 3: What is the most common presentation of omental torsion?

1. Nausea and vomiting
2. Diarrhea
3. Abdominal Pain (applies)
4. Fever
5. Tachypnea

Explanation for question 3

1. Nausea and vomiting [Most common symptomatology of omental torsion is pain. Infact, 80 % of patients usually present with right lower abdominal pain]
2. Diarrhea [Most common symptomatology of omental torsion is pain. Infact, 80 % of patients usually present with right lower abdominal pain]
3. Abdominal Pain [Most common symptomatology of omental torsion is pain. Infact, 80 % of patients usually present with right lower abdominal pain]
4. Fever [Most common symptomatology of omental torsion is pain. Infact, 80 % of patients usually present with right lower abdominal pain]
5. Tachypnea [Most common symptomatology of omental torsion is pain. Infact, 80 % of patients usually present with right lower abdominal pain]

Question 4: Which of the following statements correctly describes imaging findings of omental torsion?

1. Hypoechoic mass on ultrasound
2. Fat density mass-like lesion in the mesentery on CT (applies)
3. Hyperattenuating streaks arranged in concentric pattern in mesentery giving whirlpool appearance on CT (applies)
4. Hyperattenuating streaks of fat beneath the parietal peritoneum in the affected segment on CT (applies)
5. Fat attenuation mass with preservation of a halo of normal fat density around the mesenteric vessels on CT

Explanation for question 4

1. Hypoechoic mass on ultrasound [When seen, the usual appearance is of a solid hyperechoic lesion]
2. Fat density mass-like lesion in the mesentery on CT [The characteristic finding on CT is 'mass-like' fat density in the mesentery with internal hyperattenuating streaks arranged in concentric pattern giving whirlpool appearance.]
3. Hyperattenuating streaks arranged in concentric pattern in mesentery giving whirlpool appearance on CT [The characteristic finding on CT is 'mass-like' fat density in the mesentery with internal hyperattenuating streaks arranged in concentric pattern giving whirlpool appearance.]
4. Hyperattenuating streaks of fat beneath the parietal peritoneum in the affected segment on CT [Other findings include hyperattenuating streaks of fat beneath the parietal peritoneum in the affected segment]
5. Fat attenuation mass with preservation of a halo of normal fat density around the mesenteric vessels on CT [Preservation of a halo of normal fat density around the mesenteric vessels is a useful sign which discriminates this condition from omental torsion in which the fat stranding is centered around the vessel around which the omentum has torsed]

Question 5: Which statement is correct regarding the management of omental torsion?

1. Open omentectomy is preferred over laparoscopic omentectomy
2. Conservative treatment should not be done in primary omental torsion even if pre-operative diagnosis has been established with imaging techniques
3. Conservative management of omental torsion has negligible failure rate
4. Conservative management of omental torsion has been made possible partly due to modern imaging techniques (applies)
5. Complications of failed conservative management of omental torsion include intestinal perforation

Explanation for question 5

1. Open omentectomy is preferred over laparoscopic omentectomy [When treated surgically, laparoscopic management is preferred over open laparotomy to achieve this]
2. Conservative treatment should not be done in primary omental torsion even if pre-operative diagnosis has been established with imaging techniques [Provided that other alternative diagnosis are excluded using imaging modalities interpreted by expert radiologists and sound clinical acumen is used to keep low threshold for surgery in those who fail to respond to medical management treatment or develop complications, conservative treatment can be considered appropriate management strategy in primary omental torsion].
3. Conservative management of omental torsion has negligible failure rate [This can however occasionally fail to

relive the symptoms with a failure rate of 15.9 % reported in literature]

4. Conservative management of omental torsion has been made possible partly due to modern imaging techniques [The increasing use of imaging to diagnose the cause of acute abdomen has made pre-operative diagnosis and thus conservative management possible.]

5. Complications of failed conservative management of omental torsion include intestinal perforation [However, complications can occur in the form of abscess formation and adhesions]

AUTHORS' CONTRIBUTIONS

Ali Mansoor: Acquisition, analysis and interpretation of data for the work, Drafting the work, final approval of the version to be published, agreement to be accountable for all aspects of the work

Rabia Shaukat: Drafting the work, final approval of the version to be published, and agreement to be accountable for all aspects of the work

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FIGURES

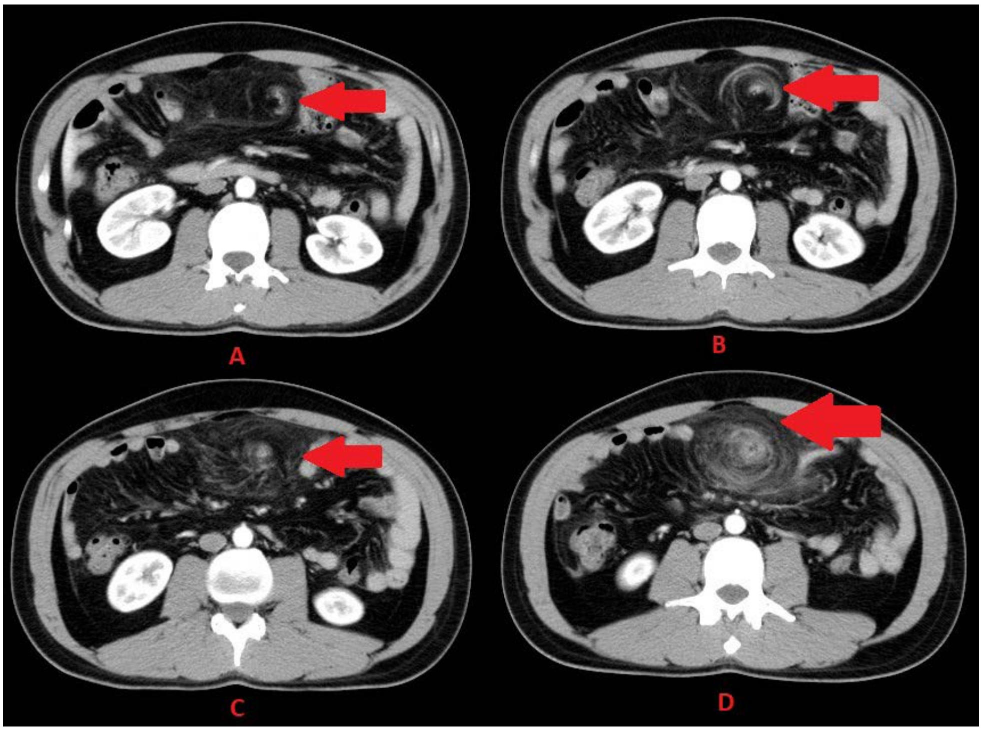

Figure 1: 32 year old male with omental torsion secondary to left sided inguinal hernia
FINDINGS: Axial contrast enhanced CT abdomen in the portovenous phase shows central hyperattenuating vessel (A) around which other vessels are arranged concentrically giving whirlpool appearance (B) with surrounding fat stranding (C). Concentric rings are further seen clearly (D).
TECHNIQUE: Axial CT portovenous phase obtained on 16 slice scanner at 75 sec after injection of 100 ml Omnipaque; 275 mA; 120 kV; 1.3 mm slice thickness

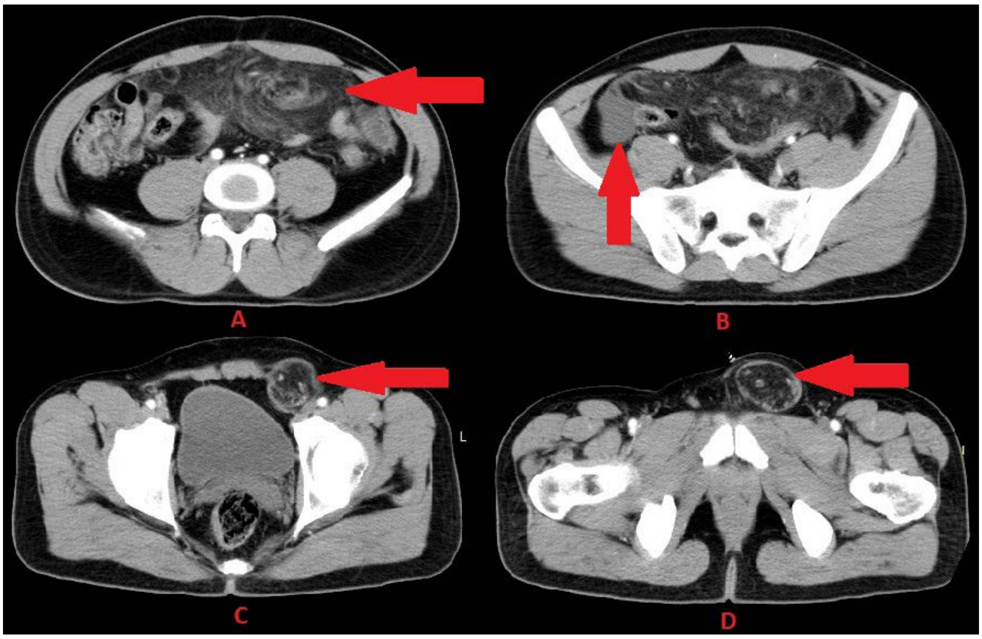

Figure 2: 32 year old male with omental torsion secondary to left sided inguinal hernia
FINDINGS: Axial contrast enhanced CT abdomen in the portovenous phase shows hyperattenuating concentric streaks in fat beneath parietal peritoneum (A) mild amount of free fluid in right paracolic gutter (B) and left sided inguinal hernia (C) and (D).
TECHNIQUE: Axial CT portovenous phase obtained on 16 slice scanner at 75 sec after injection of 100 ml Omnipaque; 275 mA; 120 kV; 1.3 mm slice thickness

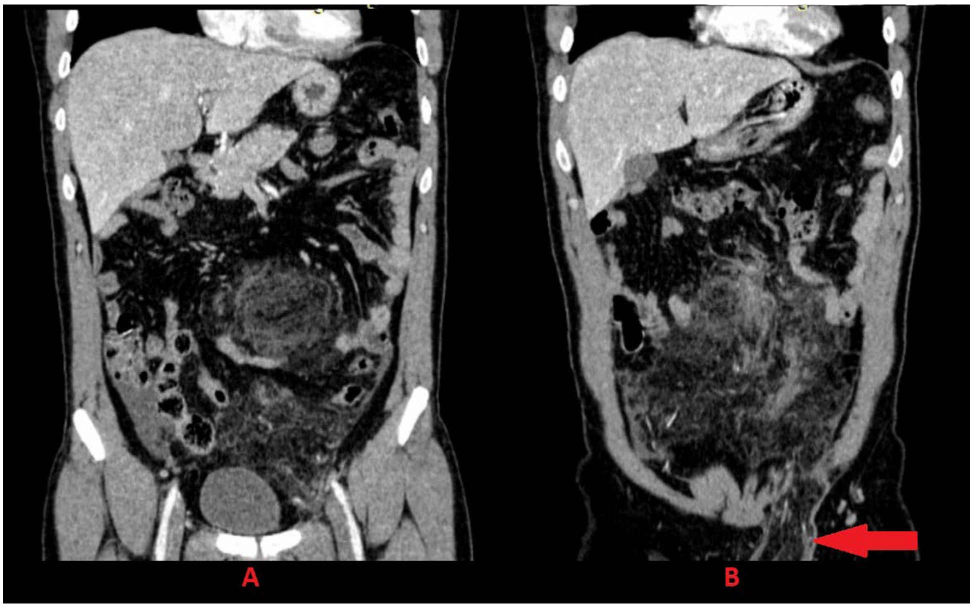

Figure 3: 32 year old male with omental torsion secondary to left sided inguinal hernia
FINDINGS: Coronal reformat of contrast enhanced CT abdomen in the portovenous phase shows area of fat stranding in the left hemi abdomen with the stranding extending into left hemi pelvis (A) and the misty omental fat extending into left sided inguinal hernia (B).
TECHNIQUE: Coronal reformat CT portovenous phase obtained on 16 slice scanner at 75 sec after injection of 100 ml Omnipaque; 275 mA; 120 kV; 0.8 mm slice thickness

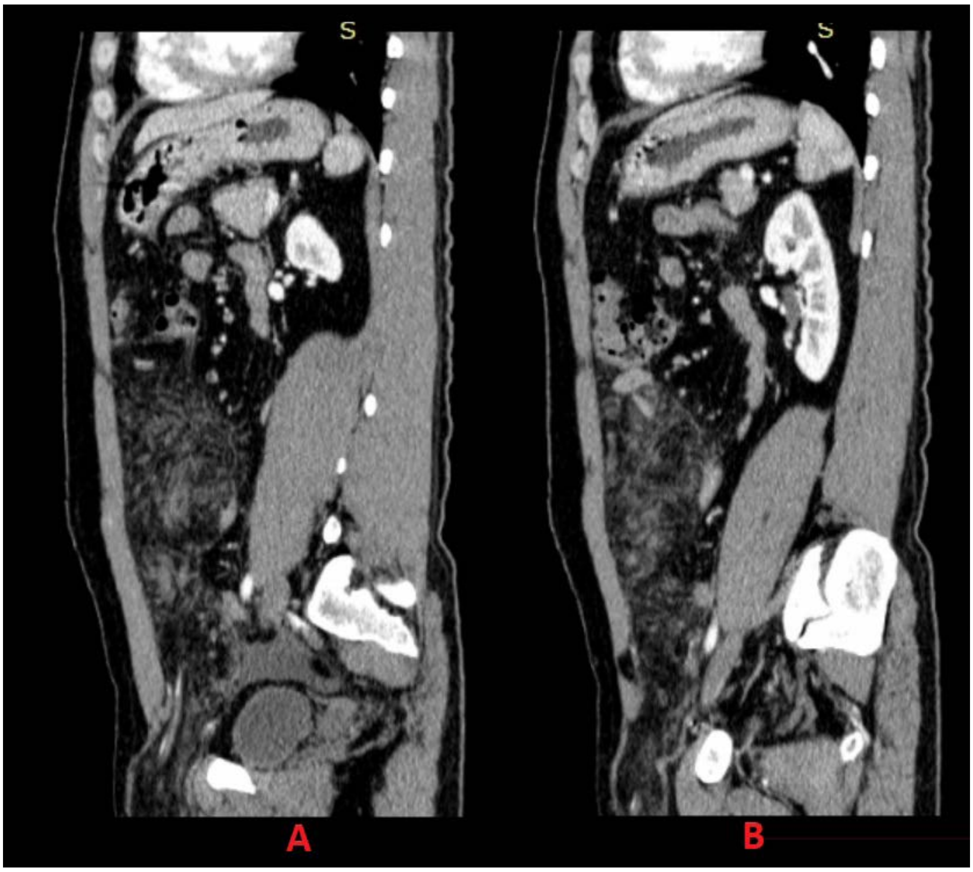

Figure 4: 32 year old male with omental torsion secondary to left sided inguinal hernia
FINDINGS: Sagittal reformat of contrast enhanced CT abdomen in the portovenous phase shows area of fat stranding in the left hemi abdomen with the stranding extending into left hemi pelvis and into the fat in left sided inguinal hernia (A and B).
TECHNIQUE: Sagittal reformat CT portovenous phase obtained on 16 slice scanner at 75 sec after injection of 100 ml Omnipaque; 275 mA; 120 kV; 0.8 mm slice thickness

SUMMARY TABLE

Etiology	Primary due to congenital variations such as bifid omentum, accessory omental tissue or variant blood supply. Secondary due to omental mass, hernia, omental adhesions due to previous surgery and trauma.
Incidence	0.0016 – 0.37%
Gender ratio	Male : female 2:1
Age predilection	Fourth to fifth decade
Risk factors	Obesity
Treatment	Conservative for primary, surgical for secondary
Prognosis	Good specially if surgically treated
Findings on imaging	Ultrasound: Solid hyperechoic ‘lesion’ CT: ‘mass-like’ fat density in the mesentery with internal hyperattenuating streaks arranged in concentric pattern giving whirlpool appearance. Hyperattenuating streaks of fat beneath the parietal peritoneum in the affected segment. Free fluid may also be seen in some cases.

DIFFERENTIAL TABLE:

Differential Diagnosis	Ultrasound	CT scan
Omental torsion	Solid hyperechoic lesion	Mass-like’ fat density in the mesentery with internal hyperattenuating streaks arranged in concentric pattern giving whirlpool appearance. Hyperattenuating streaks of fat beneath the parietal peritoneum in the affected segment.
Mesenteric panniculitis	Distortion and thickening of mesentery with increased echogenicity. A halo of sparing around vessels may be also seen as a region of hypoechoic fat	Mass-like area of heterogeneously increased fat attenuation that displaces adjacent bowel loops but does not displace vessels. Preservation of a halo of normal fat density around the mesenteric vessels. Presence of peripheral rim of soft tissue attenuation separating the misty mesentery from normal fat - tumoral pseudocapsule.
Epiploic appendagitis	Rounded, non-compressible, hyperechoic mass, without internal vascularity, and surrounded by a subtle hypoechoic line.	Fat-density ovoid lesion abutting the bowel wall with a peripheral high attenuation rim with central dot sign.
Acute diverticulitis	Hyperechoic bowel outpouching showing some degree of acoustic shadowing associated with thickened bowel wall and echogenic non-compressible fat in surroundings.	Outpouching from colonic wall with thickening of the involved gut wall along with surrounding fat stranding

ABBREVIATIONS

CT: Computerized Tomography; ESR: Erythrocyte Sedimentation Rate; I/V: Intravenous

KEYWORDS

Omental torsion; omental inflammation; acute abdomen; inguinal hernia; CT scan