

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Primary omental torsion with clinical masquerading as acute appendicitis and radiological key for diagnosis ☆☆☆

Nguyen Xuan Khai, MD^a, Nguyen Viet Dung, MD^b, Truong Dinh Tien, MD^c,
Le Dang Thanh Cong, MD^d, Tran Van Giang, MD^d, Nguyen Thi Yen Nhi, MD^d,
Ngo Tuan Minh^{a,e,*}

^a Department of Interventional Radiology, Radiology Center, 103 Military Hospital, Vietnam Military Medical University, Hanoi, Vietnam

^b Department of Radiology, 108 Military Central Hospital, Hanoi, Vietnam

^c Department of Pathology, Vietnam Military Medical University, 103 Military Hospital, Hanoi, Vietnam

^d Department of Radiology and Endoscopy, Phu Quoc Medical Center, 30 Thang 4 Street, Duong Dong Town, Phu Quoc Island, Kiengiang, Vietnam

^e Department of Gastroenterology and Hepatology, 103 Military Hospital, Vietnam Military Medical University, Hanoi, Vietnam

ARTICLE INFO

Article history:

Received 8 August 2024

Accepted 16 August 2024

Keywords:

Primary omental torsion

Acute appendicitis

Greater omentum

Computed tomography

Omental whirl sign

laparotomy

ABSTRACT

Omental torsion is a medical condition characterized by the twisting of the omentum along its longitudinal axis, which leads to compromised blood flow. This condition is rarely diagnosed before surgery and can present symptoms similar to other causes of acute surgical abdomen. This report details a case of primary omental torsion initially suspected to be acute appendicitis. The patient was admitted to the hospital with symptoms of lower right quadrant abdominal pain and mild fever. Computed tomography imaging revealed a twisted mass of fatty tissue with surrounding fat stranding changes, but no signs of appendicitis were found, indicating omental torsion. The patient underwent surgery to remove the

Abbreviations: BMI, body mass index; CT, Computed tomography; POT, primary omental torsion; SMA, superior mesenteric artery; SMV, superior mesenteric vein; MIP, Maximum Intensity Projection.

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☆☆ Acknowledgments: First, we want to thank the patient for their cooperation and consent to share the medical information to advance medical knowledge. Secondly, we appreciate the contributions of all healthcare professionals involved in the patient's diagnosis, treatment, and management. Finally, we thank the team whose coordinated efforts made this case report possible. This case report proves the value of interdisciplinary collaboration in pursuing correct diagnosis and effective patient care. There was no source of funding for this article

* Corresponding author.

E-mail address: ngotuanminhbv103@vmmu.edu.vn (N.T. Minh).

<https://doi.org/10.1016/j.radcr.2024.08.090>

1930-0433/© 2024 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

twisted and necrotic omentum, leading to an improvement in symptoms. This case highlights the challenges in diagnosis and the crucial role of computed tomography imaging in managing this rare condition.

© 2024 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Acute abdominal pain is a leading cause of visits to the emergency department, accounting for 7%-10% [1]. Acute appendicitis is often considered due to its prevalence. However, primary omental torsion (POT), a rare condition, can present with similar symptoms, leading to potential diagnostic errors. Since Eitel first described it in 1899 [2], only a few hundred cases have been documented. POT has an incidence of 0.0016%-0.37% and accounts for 1.1% of cases presenting with abdominal pain [3]. POT involves twisting the greater omentum, resulting in tight vessels, ischemia, and necrosis [4]. The twisted portion of the omentum typically localizes to the right lower quadrant, leading to the sudden onset of peritoneal irritation on the right side of the abdomen. This condition causes abdominal pain, nausea, vomiting, or mild fever. These symptoms are often mistaken for acute appendicitis, acute cholecystitis, or sometimes twisted ovarian cysts. Therefore, establishing a preoperative diagnosis of omental torsion is challenging. The widespread use of CT in patients with acute abdomen has made it possible to diagnose this rare condition before surgery accurately. CT is the main diagnostic tool, revealing specific features, particularly streaks of whirling and concentric patterns (whirl signs). This case report aims to highlight the role of CT in accurately diagnosing POT that mimicked acute appendicitis.

Case presentation

A 67-year-old female came to the emergency department with a 3-day history of right lower quadrant abdominal pain. The pain was sudden in onset and progressively worsening. The patient reported associated nausea and low-grade fever. She had no vomiting, previous similar pain, abdominal surgeries, or significant past medical history. At the time of admission, the patient presented with mild pain in the lower right quadrant and seemed in moderate distress during the physical examination due to pain, negative McBurney's sign, and negative right iliac fossa tenderness. Her vital signs were within normal limits except for a mildly elevated temperature of 37.8°C; her BMI was overweight at 28.2. The following day, an abdominal examination revealed localized tenderness, guarding, and rebound tenderness in the right lower quadrant, raising a high suspicion of acute appendicitis. The remainder of the physical examination was unremarkable. The laboratory tests revealed leukocytosis with a white blood cell count of 13.1 G/L and a neutrophil count of 7.8 G/L. Other laboratory parameters, such as liver and renal function tests, were within normal ranges.

Given the clinical presentation, an abdominal ultrasound was performed but was inconclusive due to the presence of bowel gas obscuring the appendix. An abdominal CT scan was required, but we only performed noncontrast-enhanced CT due to the hospital's availability conditions. The CT scan revealed a fat density lesion with surrounding fat stranding changes in the right lower quadrant, accompanied by streaks of whirling and concentric pattern (whirl sign) (Fig. 1). The appendix was visualized and appeared normal. These findings suggested the possibility of omental torsion.

A surgical procedure was planned after clinical and CT scan features. The facility's infrastructure did not allow for laparoscopic surgery, so the surgeon performed an open surgery. During surgery, the surgeon observed a twisted, necrotic segment of the greater omentum, confirming the diagnosis of omental torsion (Fig. 2). The patient was discharged in good general condition 3 days after the surgical procedure without any postsurgical complications. Subsequent outpatient follow-up was conducted for 1 month, revealing satisfactory progress and an absence of delayed complications, instilling optimism about the patient's future health.

Discussion

Etiology and pathophysiology

The first case of torsion of the greater omentum was described by Eitel in 1899, but Bush is credited with the first reported case in 1896. Since Bush's description, fewer than 300 cases have been reported in the literature, with fewer than 26 treated by laparoscopic surgery. Torsion of the greater omentum is a rare cause of acute abdominal pain, occurring in 0.0016% to 0.37% of cases, and is the cause of 1.1% of cases of abdominal pain [3]. Omental torsion can be classified into primary and secondary types [5]. Primary omental torsion occurs without predisposing factors, while secondary torsion is associated with conditions such as abdominal tumors, cysts, adhesions, or hernias. The exact cause of primary omental torsion is unclear, but several theories have been proposed, including anatomical variations, sudden body movements, or increased intra-abdominal pressure. These factors encourage rotation, and obesity influences abnormal fat distribution in the omentum, leading to increased weight and a higher risk of torsion. Our patient was overweight, with a BMI of 28.2. Therefore, in obese patients, omental torsion should be considered in the differential diagnosis of right lower quadrant abdominal pain.

The omentum, particularly the greater one, is a large apron-like fold of peritoneum draping over the intestines. It is rich in blood vessels, fat, and lymphatics, making it sus-



Fig. 1 – The CT images show a fatty mass in the right iliac fossa with ill-defined borders and surrounding fat-stranding (A). The mass is anterior to the bowel loops and is in the area of the omentum (B). On 10 mm MIP CT, the greater omentum has a hazy appearance with concentric hyperdensity and exhibits streaks of the whirling pattern (*omental whirl sign*) (C).

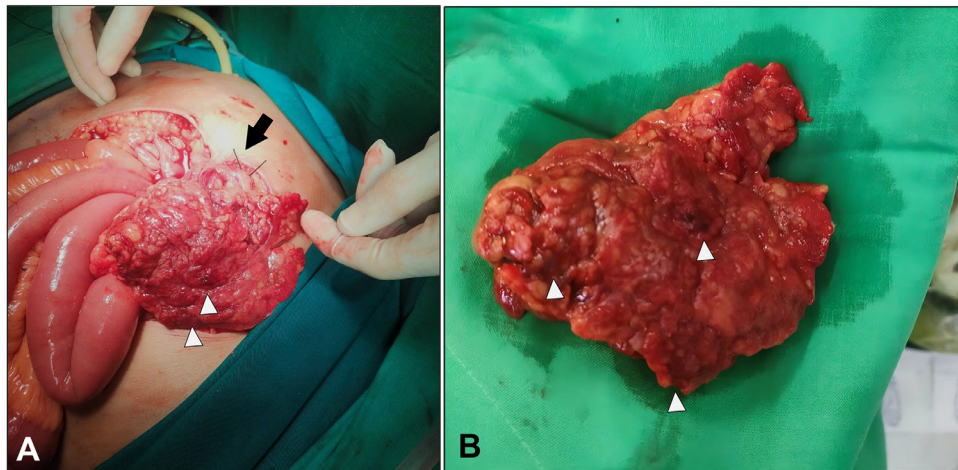


Fig. 2 – The torsed omentum separation from the parietal peritoneum is shown. (A) Prior to excision, a ligation was placed in the twisted site (black arrow). (A and B) The affected omentum exhibited congestion and redness (arrowhead) interspersed with areas of normal-appearing fat. These findings are consistent with omental hemorrhagic infarction.

ceptible to torsion. Torsion can lead to compromised blood flow, resulting in ischemia and necrosis of the affected segment. Thus, this can present clinically as acute abdominal pain, often mimicking more common conditions like appendicitis.

Clinical presentation

Patients with primary omental torsion typically present with acute onset abdominal pain, which is most commonly localized to the right lower quadrant. The increased length and mobility on the right side of the greater omentum may explain the predominant clinical presentation of right-sided abdominal pain [6], as demonstrated in our reported patient. This presentation makes clinical differentiation challenging. Associated symptoms may include nausea, vomiting, and low-grade fever, further complicating the diagnosis. However, according to Luis et al. [7], gastrointestinal symptoms are absent in more than 50% of patients because intestinal peristalsis is unaffected. Because symptoms are nonspecific and it is a rare condition, it can be misdiagnosed as acute appendicitis, acute cholecystitis, torsion of an ovarian cyst, and salpingitis in women of reproductive age. According to Goti et al. [8], 66% of the patients presented symptoms resembling acute appendicitis, while 22% exhibited symptoms similar to acute cholecystitis.

Diagnostic imaging

Because the clinical presentation of omental torsion is nonspecific, imaging studies are crucial for an accurate diagnosis. Ultrasound is often the initial imaging modality used. The ultrasound scan can reveal an oval-shaped mass attached to the anterior abdominal wall. This mass appears as a hyperechoic lesion and may resemble fat stranding. Besides, the narrow field of view on ultrasound focuses on looking for acute appendicitis so that these omental masses can be missed.

CT imaging is the main diagnostic tool due to its high sensitivity in detecting omental masses and the characteristic features of torsion. On CT imaging, omental torsion often appears as a whorled mass of fatty tissue with surrounding fat stranding and, in some cases, free fluid in the abdomen. The presence of twisted blood vessels within the greater omentum, known as the “whirl sign,” is a key diagnostic feature.

A “whirlpool” is a large mass of swirling water and has the potential to pull in even large surrounding objects. The “abdominal whirlpool” sign commonly describes the twisting of the mesenteric vessels and the small bowel loops [9]. The twisting of the superior mesenteric vein (SMV) and its tributaries around the superior mesenteric artery (SMA) produces a characteristic whirl-like appearance. However, we find that there needs to be more literature discussing the “omental whirlpool” sign. Differentiating between mesenteric and omental torsion is based on specific signs:

1. Omental torsion is located in front of the bowel loops, whereas mesenteric torsion is located among them.
2. The blood vessels of the omentum branch out from the right and left gastroepiploic arteries, whereas the

mesentery branches out from the superior mesenteric artery.

On CT, the omentum consists of fat and blood vessels. Due to the contrast between these 2 structures, twisted blood vessels in omental torsion can be easily observed without needing contrast agent injection.

Besides, CT is highly effective in distinguishing POT from other causes of right lower quadrant abdominal pain. In our case, although on noncontrast-enhanced CT, the findings of an omental mass with an “omental whirl sign” and the normal appearance of the appendix were key to suspecting omental torsion. Although CT is especially valuable, careful attention is needed to differentiate POT from similar conditions, such as an omental hernia, epiploic appendagitis, and lipoma.

Management

There are 2 primary approaches for treating omental torsion: conservative and surgical. This approach includes oral analgesics, anti-inflammatory medications, and prophylactic antibiotics. However, conservative treatment may sometimes fail, potentially leading to complications such as abscess formation and intra-abdominal adhesions, which can pose significant risks. Therefore, laparoscopic intervention is advised in cases with unclear diagnosis or failure of conservative measures [10,11].

With the advent and widespread use of laparoscopy, omental torsion can be easily visualized, significantly reducing the likelihood of missed pathology during surgery. Surgical treatment typically involves resecting the affected portion of the omentum, especially if necrotic tissue is present. Laparoscopy allows for a definitive diagnosis, assessment of the severity of distal ischemia due to torsion, and either resection or detorsion of the greater omentum. Conversion to open surgery is unnecessary, as the resected specimen can be removed through the trocar sites in most cases [12,13]. In contrast, open surgery may have limitations, such as the difficulty in exploration through a McBurney-type or infra umbilical incision used in standard appendectomies, which could result in missed diagnosis. Postresection, clinical symptoms typically resolve immediately, making laparoscopic omentectomy the preferred treatment option.

Conclusion

Omental torsion, while rare, should be considered in the differential diagnosis of acute abdominal pain, particularly in obese patients. CT scans play a crucial role in diagnosing omental torsion and ruling out other causes of abdominal pain, only on noncontrast CT. Early recognition and surgical intervention are essential in preventing complications and ensuring a good outcome. This case highlights the importance of considering omental torsion in patients with symptoms suggestive of acute appendicitis and the role of CT scans in avoiding misdiagnosis and providing appropriate management, especially the “omental whirl” sign.

Author contributions

Conceptualization, Nguyen Xuan Khai, Nguyen Viet Dung, Le Dang Thanh Cong, and Ngo Tuan Minh; Writing - original draft, Nguyen Xuan Khai, Nguyen Viet Dung, and Ngo Tuan Minh. Undergoing the diagnostic procedure, collecting, and interpreting the imaging and pathology, Nguyen Xuan Khai, Nguyen Viet Dung, Le Dang Thanh Cong, Tran Van Giang, Nguyen Thi Yen Nhi, Truong Dinh Tien, and Ngo Tuan Minh. Writing, review & editing, Nguyen Xuan Khai, Nguyen Viet Dung, Truong Dinh Tien, and Ngo Tuan Minh. All authors have read, revised, and agreed to the final published version of the manuscript.

Data availability

The data supporting this article are available from the authors upon reasonable request.

Patient consent

We have obtained written informed consent from the patient to publish this case report. The patient consented to de-identified clinical information and images being used for this report. The authors of the manuscript retain this informed consent and can provide it to the journal upon request.

REFERENCES

- [1] Cervellin G, Mora R, Ticinesi A, Meschi T, Comelli I, Catena F, et al. Epidemiology and outcomes of acute abdominal pain in a large urban Emergency Department: retrospective analysis of 5,340 cases. *Ann Transl Med* 2016;4(19):362.
 - [2] GG E. Rare omental torsion. *NY Med Rec* 1899;55:715–16.
 - [3] Moreno FM, Gago MdRD, García DMC, Muñoz AP, Alonso MD, Fraguas FN, et al. Primary omental torsion as presentation of acute abdomen. *Case report. Rev Esp Enferm Dig* 2016;108(2):105–6.
 - [4] Madha ES, Kane TD, Manole MD. Primary omental torsion in a pediatric patient: case report and review of the literature. *Pediatr Emerg Care* 2018;34(2):e32–4.
 - [5] Occhionorelli S, Zese M, Cappellari L, Stano R, Vasquez G. Acute abdomen due to primary omental torsion and infarction. *Case Rep Surg* 2014;2014:208382.
 - [6] Saad E, Awadelkarim A, Agab M, Babkir A, Yeddi A. Omental fat torsion: a rare mimicker of a common condition. *J Investigat Med High Impact Case Rep* 2022;10:23247096221076271.
 - [7] Carrillo LM, de Jesús Marín-López J, Díaz-Barrera O, Olvera-Rodríguez JA, Gutiérrez-Gutiérrez LY, Herrera-Gutiérrez J. Omental torsion: an unusual case of acute abdomen. *Case report. Int J Surg case Rep* 2023;103:107901.
 - [8] Goti F, Hollmann R, Stieger R, Lange J. Idiopathic segmental infarction of the greater omentum successfully treated by laparoscopy: report of case. *Surg Today* 2000;30:451–3.
 - [9] Singh D, Chawla A. The “abdominal whirlpool” sign. *Abdom Radiol* 2016;41(7):1437–8.
 - [10] Athamnah N, Al Azzam HS, Maayah RF, Maqableh LM, Malkawi AH, Rabai NA, et al. Omental torsion presenting as acute abdominal pain, pre-operative diagnosis: a case report. *Glob Surg* 2020;6:1–3.
 - [11] Yagnik VD. Primary omental torsion. *ANZ J Surg* 2019;89(11):1515–16.
 - [12] Miheşiu A, Sandu A, Bratu D, Miheşiu C. Laparoscopic management of primary omental torsion. *Case Rep Surg* 2021;2021(1):5536178.
 - [13] Le Roux F, Gennuso F, Lipsker A, Mauvais F. Omental torsion, a rare cause of acute surgical abdomen. *J Visceral Surg* 2013;150(6):421–2.
-
- [1] Cervellin G, Mora R, Ticinesi A, Meschi T, Comelli I, Catena F, et al. Epidemiology and outcomes of acute abdominal pain