ORIGINAL ARTICLE

Rare causes of acute abdomen and review of literature: Primary/secondary omental torsion, isolated segmental omental necrosis, and epiploic appendagitis

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ABSTRACT

BACKGROUND: Primary/secondary omental torsion (POT/SOT), isolated segmental omental necrosis (ISON), and primary epiploic appendagitis (PEA) are rare causes of acute abdominal pain that often lead to misdiagnosis. Although the differential diagnosis may vary according to the localization and severity of the pain, and associated symptoms such as nausea-vomiting and fever, depending on the disease and site of involvement, the character of the pain is generally similar and in a continuous form. Depending on pain localization, it can mimic different clinical pictures such as acute appendicitis, acute diverticulitis, ovarian pathologies, urinary tract stones and acute cholecystitis, and patients are often diagnosed after surgical exploration. With the increased availability of computed tomography and awareness of these diseases, more patients can be diagnosed in the preoperative process and unnecessary operations can be avoided. In particular, PEA is a self-limiting local inflammatory disease and can often be managed conservatively. For all diagnoses, the surgical treatment option is local excision of the relevant epiploic appendix or omental segment, preferably laparoscopically. The most common surgical indication is diagnostic confusion and the second is persistent pain.

METHODS: The data of patients followed up and treated for a diagnosis of POT, SOT, ISON or PEA between 2006 and 2021 were recorded in a specially prepared database. The demographic characteristics of the patients, and the data regarding the diagnosis and treatment process were evaluated retrospectively and discussed in the light of the relevant literature.

RESULTS: The reason for hospitalization and treatment in 12 of the 42 patients included in the study was necrosis of a part of the omentum. Of these patients, 4 were followed up and treated with a diagnosis of POT, 3 with SOT, 5 with ISON and 30 with a diagnosis of PEA. Thirty-three of the patients were diagnosed preoperatively, and 9 intraoperatively, 22 patients were operated on, and 20 patients with PEA were treated conservatively. After surgical or medical treatment, all the patients were discharged without complications. In the comparisons between the patients, no significant difference was observed in terms of clinical and laboratory findings.

CONCLUSION: POT, SOT, ISON and PEA should be considered in the differential diagnosis of patients with acute abdominal findings. In patients with PEA diagnosed in the preoperative period, a conservative approach should be considered first. In patients with a diagnosis of POT, SOT, and ISON, a surgical or conservative approach should be evaluated according to the patient's clinical condition.

Keywords: Acute abdomen; epiploic appendicitis; omental infarction; omental necrosis; omental torsion.

INTRODUCTION

Acute abdominal pain is the cause in 4–6% of all patients admitted to the emergency department. Of these patients, 10% have a pathology that may require surgery and one-third are non-specific. In the rest, the most common causes of acute abdomen are acute appendagitis (14%), intestinal obstruction

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(13%), urinary system diseases (9%), acute diverticulitis (8%), and acute cholecystitis (5%).[1,2] The aim of this study, was to present our 15-year clinical experience with primary omental torsion (POT), secondary omental torsion (SOT), isolated segmental omental necrosis (ISON), and primary epiploic appendagitis (PEA), which have a very low incidence among the causes of acute abdomen, in the light of the literature.

The greater omentum originates embryologically from the dorsal mesoderm and consists of four layers. It attaches to the greater curvature of the stomach, duodenum and transverse colon and covers the small intestines. It is continuous with the gastrosplenic ligament and the splenocolic ligament inferiorly on the left margin. The blood supply is provided by the right and left gastroepiploic arteries. Omental torsion is a rare clinical condition with hemorrhagic exudate and acute abdomen findings due to necrosis development in the distal of the torsion due to the deterioration of arterial supply and venous drainage due to the rotation of the omental structure and its appendages around its long axis. It is frequently seen between the ages of 30–50 years and the incidence in men is twice that of women.[3–6] Omental torsion was first described by Eitel in 1899 and POT has been reported to be found in 0.1% of children in laparotomy performed with the preliminary diagnosis of acute abdomen.[3] The most common cause of torsion is rotation around the right gastroepiploic artery, possibly due to the fact that the left vessels are more stable due to the gastrosplenic and splenocolic ligaments, the right distal epiploic artery has a longer course in this region, and the omentum is wider and more mobile.[3–5] Omental torsion is classified as primary or secondary according to its formation mechanism. In primary torsion, the distal end of the omentum is always free and therefore it is also called unipolar torsion.[5,7] Although the etiology of POT is still not fully understood, some anatomical conditions such as irregular omental lubrication, vascular malformations, accessory omentum or elongated omental tips, and factors such as obesity, trauma, sudden movements, peristaltic changes, and overeating are thought to be effective.[5] Secondary torsion may be unipolar or bipolar torsion in which both ends are fixed. The main difference of secondary torsion is that it occurs secondary to pathologies such as intra-abdominal tumor, cyst, inflammation, adhesion, and hernia or due to the previous abdominal surgery.[5–7] For whatever reason, a torsion that occurs in the proximal omentum first disrupts the venous return and causes congestion. The process leading to ischemia and necrosis begins due to edema caused by the triggering of inflammation. Information on omental torsion and the number of cases described in the literature are limited. Preoperative diagnosis of omental torsion is very difficult and it can usually be diagnosed intraoperatively. Studies have reported that 0.2–4.8% of all cases can be diagnosed correctly preoperatively.[8] The presenting complaint in patients is usually pain in the right quadrants. Nausea-vomiting, loss of appetite, and fever may occur. Differential diagnosis includes acute appendagitis, acute cholecystitis, acute pancreatitis, mesenteric lymphadenitis, gastrointestinal tract perforation, Meckel's diverticulum, urinary system pathologies, and gynecopathologies.[3–6] In blood tests, leukocytes and C-reactive protein (CRP) are usually detected as elevated. Ultrasonography (USG) and computed tomography (CT) are frequently used in imaging studies. The typical ultrasonographic appearance is of a moderately hyperechoic, non-compressible, oval mass lesion with peritoneal adhesions and peritoneal fluid can also be observed. CT findings are more significant, as the presence of an oval mass in the abdomen with a specific vortex finding suggests the diagnosis of omental torsion.[6,9,10] If surgery is postponed, and antibiotherapy/anti-inflammatory drugs are used in the treatment, the progression of the disease may be masked and abscess or adhesion may occur.[5,11] Although there are studies that have attempted conservative treatment for omental torsion, the recommended treatment in symptomatic patients is surgical excision.[6,12]

ISON has similar incidence, and clinical and laboratory features as omental torsion.[3,13] Although the formation mechanisms are different in both cases, the main pathology is necrosis of a part of the omentum. USG and CT findings are also similar to those of omental torsion. Naming the phenomenon as "necrosis of a part of the omentum without torsion or any other cause" is still a controversial issue in the literature. The term omental infarction, which was defined by Bush et al.[14] in 1896, has expanded over time to encompass all the causes that impair the blood supply to the omentum. In 1959, Halligan et al.[15] revised the definitions and introduced the definition of "primary idiopathic segmental infarction" and included all the remaining causes in the secondary omental infarction group. This definition was also used in later studies as "primary idiopathic segmental infarction of the omentum" or "ISON".[16,17]

Epiploic appendages are small fat-filled projections or globules attached to the external surface of the colon through a vascular stalk. They are seen in the entire colon, being more intense in the rectosigmoid region; their size varies between 0.5 and 5 cm and numbers vary between 50 and 100.[18] An epiploic appendage usually has one or two arteries and a vein. Although their function is not fully understood, there are theories that they form a mechanical barrier, serve as fat accumulation points for periods of hunger and function as blood reservoirs during peristalsis.[19] PEA is an acute condition caused by ischemic necrosis and subsequent inflammation triggered by torsion of the epiploic appendix or thrombosis of the draining vein. This pathology should be distinguished from secondary epiploic appendagitis due to inflammation in an adjacent structure. PEA is a rare cause of acute abdominal pain, mostly seen in men, occurring between the second and fifth decades of life, with an incidence of approximately 8/million. Obesity, intense physical exercise and the presence of hernia are considered as risk factors. The differential diagnosis includes acute diverticulitis, acute appendagitis, acute cholecystitis, pelvic inflammatory disease (PID), ovarian torsion, ectopic pregnancy, renal colic, mesenteric lymphadeni-

tis, acute omental torsion, and mesenteric panniculitis.[19,20] The patient's presenting complaint is usually sudden onset and persistent abdominal pain. Although it can be seen in all quadrants, it mostly affects the left lower quadrant. Other complaints such as nausea-vomiting, fever, constipation, and diarrhea are either indistinct or absent. In the physical examination, the patient has deep palpation tenderness and rebound positivity, and increased leukocytes and CRP secondary to inflammation are observed in laboratory tests.[19–21] The appearance of a hyperechoic oval mass associated with the colon surface, unresponsive to compression, may be detected with ultrasonugraphy and no central blood flow can be seen with Doppler USG.[22] Another imaging option, CT, gives more effective results; an oval mass surrounded by a hyperdense ring, the association of this oval mass with the colon wall, the appearance pattern called "central dot" and suggestive of venous thrombus, the thickening of the colon wall and adjacent parietal peritoneum is in favor of epiploic appendagitis. Although magnetic resonance imaging is not used very often, it is valuable because of superiority in the visualization of soft tissues. In addition to the oval mass appearance, a ring frame can also be observed in T1-weighted sequences.[22–24] The algorithm in the treatment of epiploic appendagitis has also changed over time. While surgical treatment was used in the past due to the limited use of imaging studies and the inability to exclude other pathologies in the differential diagnosis, today follow-up with anti-inflammatory drugs is at the forefront, but the benefit of antibiotics has not yet been demonstrated. With nonsteroidal anti-inflammatory drugs (NSAID), the clinical picture of the patients usually regresses in 1 week, but the recurrence rate is high. Surgical treatment is required in patients who do not respond to medical treatment or who develop recurrence.[19,21,25]

MATERIALS AND METHODS

This study included 42 patients who were followed up and treated with the diagnosis of POT/SOT, ISON or PEA between 2006 and 2021. The data of the patients were recorded in a specially prepared database. The demographic data of these patients, data on diagnosis, follow-up, and treatment process were evaluated and analyzed in the light of the literature.

Statistical Analysis

The data obtained were analyzed statistically using SPSS software (IBM SPSS Statistics for Windows, version 25.0, IBM Corp., Armonk, NY, USA). Conformity to normal distribution of continuous variables was tested with the Shapiro–Wilk test. Continuous variables with normal distribution were presented as mean±standard deviation (SD) values, and continuous variables not conforming to normal distribution were presented as median (interquartile range 25–75) values. Categorical variables were presented as number (n) and percentage (%). Laboratory data were compared using the paired samples t-test and the Wilcoxon Signed Ranks test. The Mann–Whitney U-test was used for the comparison of continuous variables between paired groups, and Fisher's exact test or Pearson Chi-square tests were used for intergroup comparisons of discrete variables. A value of $P < 0.05$ was considered statistically significant. This research was approved by SBU Gulhane Training and Research Hospital Clinical Research Ethics Committee (date: 29 December 2021, no: 2021/112).

RESULTS

The reason for hospitalization and treatment in 12 of 42 patients included in the study was necrosis of a part of the omentum. Of these patients, 4 were followed up and treated with the diagnosis of POT, 3 with SOT, and 5 with ISON (primary idiopathic segmental infarction of the omentum).

The mean age of 4 male patients with a diagnosis of POT was 34.8±12.5 years (22–52) and the reason for admission was vague abdominal pain ranging from 1 to 5 days in all four. Nausea and vomiting were also present in one of the patients. Physical examination revealed right lower quadrant tenderness in three patients and epigastric tenderness in one patient. In patients with mean WBC values of 14.8±0.7 $\times 10^3$ cells/uL (14.0–15.7) in blood tests, neutrophil dominance was present and mean CRP values were 32.8±17.6 mg/L (7–45). Although three of the 4 patients were diagnosed preoperatively with CT, the diagnosis of plastron appendagitis could not be excluded in one patient. The diagnosis was made after exploration. Due to the persistence of acute abdomen findings, segmental omentectomy was performed with laparotomy in the patient with a prediagnosis of plastron appendagitis, and laparoscopically in the others. None of the four patients developed postoperative complications and all were discharged in 3 days postoperatively.

Two of the three patients diagnosed with SOT were admitted because of sudden onset right lower quadrant pain and the other patient had no gas-stool discharge for 3 days. One of the patients was hospitalized with a prediagnosis of ovarian torsion/acute abdomen, the other with a prediagnosis of acute appendagitis and the other with a prediagnosis of ileus. All three of the patients with a mean age of 26.0±6.0 years (20–32) had acute abdominal findings. The patient with a prediagnosis of ileus also had severe distension. In patients with mean WBC values of 15.2±2.6 $\times 10^3$ cells/uL (12.6–17.8) in blood tests, neutrophil dominance was present and mean CRP values were 67.7±12.3 mg/L (54–78). Although all three patients had preoperative cross-sectional imaging, omental torsion secondary to primary pathology was detected intraoperatively. The patients underwent oophorectomy, appendectomy, and partial omentectomy with mass excision, respectively. All three patients were discharged without postoperative complications in 4–7 days. Macroscopic and histopathological images of the patients operated on for POT/SOT are given in Figures 1 and 2.

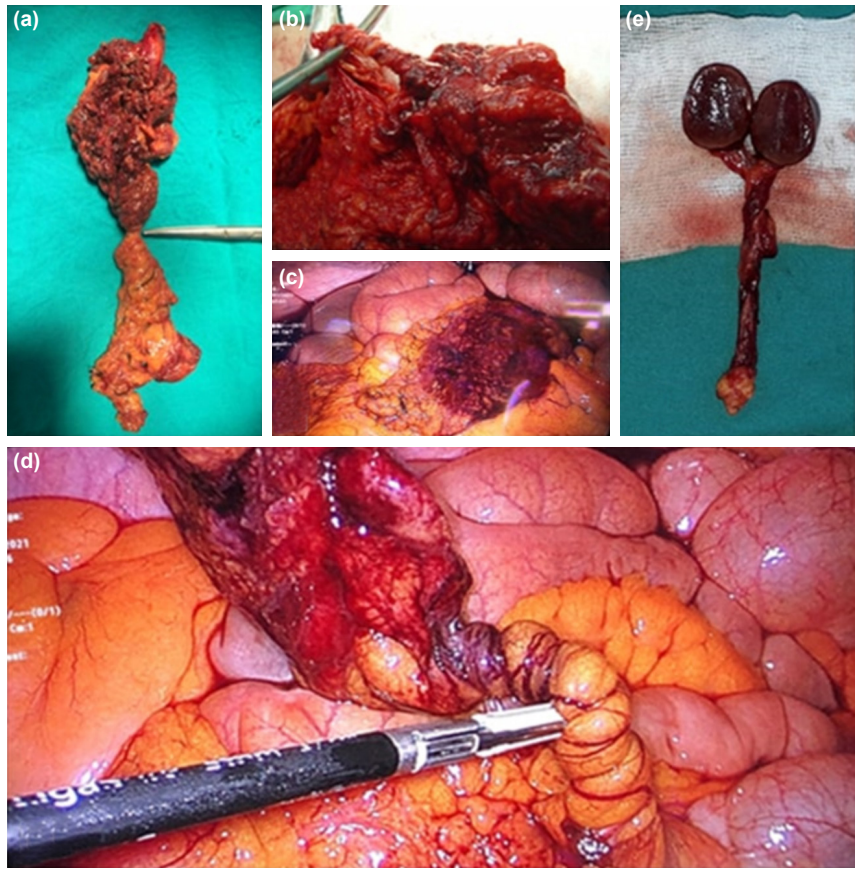

Figure 1. Intraoperative and piece images of primary/secondary omental torsion. **(a-d)** Primary omental torsion, **(e)** secondary omental torsion due to intra-abdominal mass lesion.

In 5 of the patients, the diagnosis was ischemia and necrosis of a part of the omentum, regardless of torsion or any known cause. Among these patients, defined as the ISON group, 4 were male and the mean age was 35.6±13.7 years (22–55). The reason for admission in all these patients was abdominal pain ongoing for 1 or 2 days, which was localized in the right lower quadrant in three cases. On physical examination, three patients had tenderness in the right lower quadrant and two had tenderness in the periumbilical region. The mean WBC value was 13.5±3.5 $\times 10^3$ cells/uL (9–18.2), neutrophil dominance was present and mean CRP values were 22.4±8.8 mg/L (12–35). In two of the 5 patients, contamination in the right lower quadrant of the abdomen was detected on USG, and CT was performed in four patients because the USG findings were non-specific. Surgery was performed in all of these patients, with a pre-operative diagnosis made in two patients

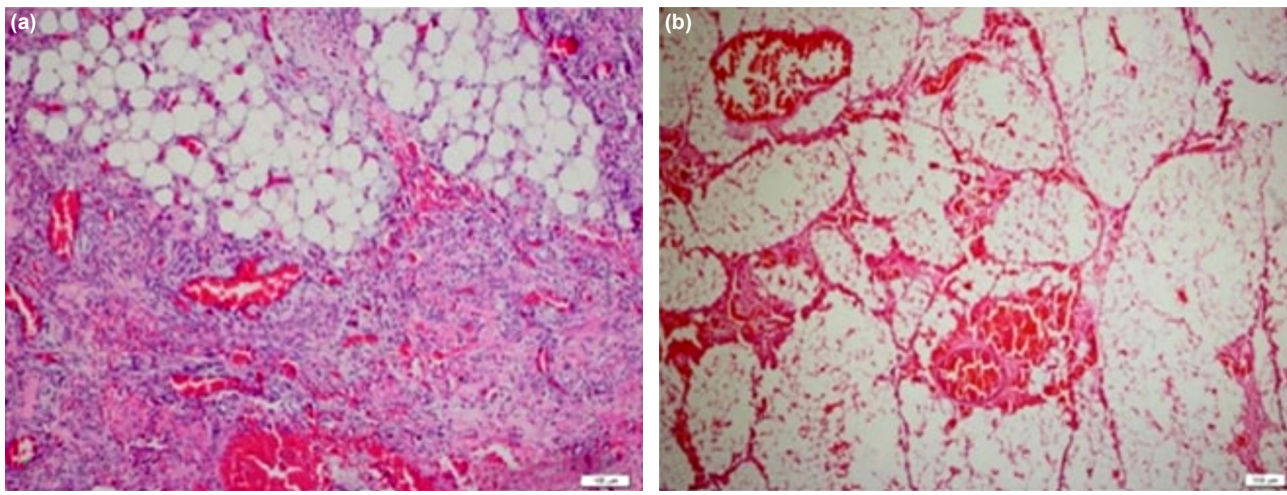

Figure 2. Omental necrosis histopathological examination. Inflammation **(a)** and bleeding areas **(b)** can be observed in the omentum (hematoxylin and eosin, ×40).

and intraoperative diagnosis in three. Both of the patients who were diagnosed preoperatively had CT scans and both had midline segmental omental necrosis. Two of the patients were operated on with a McBurney incision, while three patients underwent laparoscopic surgery. None of the patients developed postoperative complications and all were discharged between 2 and 4 days postoperatively. The macroscopic images of the patients operated on for ISON are shown in Figure 3.

A total of 30 patients were followed up and treated with the diagnosis of epiploic appendagitis. The female/male ratio was 9/21, the mean age was 36.6±9 years (20–54), and the mean BMI was 26.5±4.2 (21–35). Comorbidities were determined in 5 patients; 4 with hypertension and one with type 2 diabetes. The reason for admission in all patients was abdominal pain, and the duration of the pain varied between 1 and 5 days. In addition, 20 patients had nausea and/or vomiting and 10 patients had fever. In the physical examination of the patients, there was tenderness in the epigastric region in one patient and in the right lower quadrant in two patients. All other patients had tenderness in the left lower quadrant and/or subrapubic region. In laboratory tests, mean WBC values were 13.7±3.0 $\times 10^3$ cells/uL (7.8–19.8), neutrophil dominance was present and mean CRP values were 31.0±24.2 mg/L (3–98). Although standing abdomen X-ray findings were non-specific in the imaging examinations of the patients, on USG, findings suggestive of inflammation were observed in the left lower quadrant in 14 patients and in the right lower quadrant in 1 patient. Epiploic appendagitis was diagnosed in 20 of 28 patients on CT, and from "pericolonic local inflammation" findings suggestive of epiploic appendagitis in the remaining 8. Of these patients, 20 were treated conservatively, followed by bowel rest, analgesics, anti-inflammatory drugs, and antibiotherapy. The remaining 10 patients were operated on. The reasons for surgery were increased pain in 8 patients despite conservative treatment, septic laboratory and clinical findings in one patient, and because of limited imaging possibilities in one patient it was not possible to make a definitive diagnosis and exclude acute abdomen. Intraoperative low amounts of serous fluid were observed in 8 of the operated patients. No post-operative complications developed in any of the patients and all were discharged between 3 and 7 days. There was no significant difference in terms of hospitalization time between the operated and non-operated patients. Macroscopic and CT images and histopathological examinations of the patients operated on with the diagnosis of epiploic appendagitis are shown in Figures 4 and 5.

No statistically significant difference was found between the groups in the comparative analyses performed in terms of

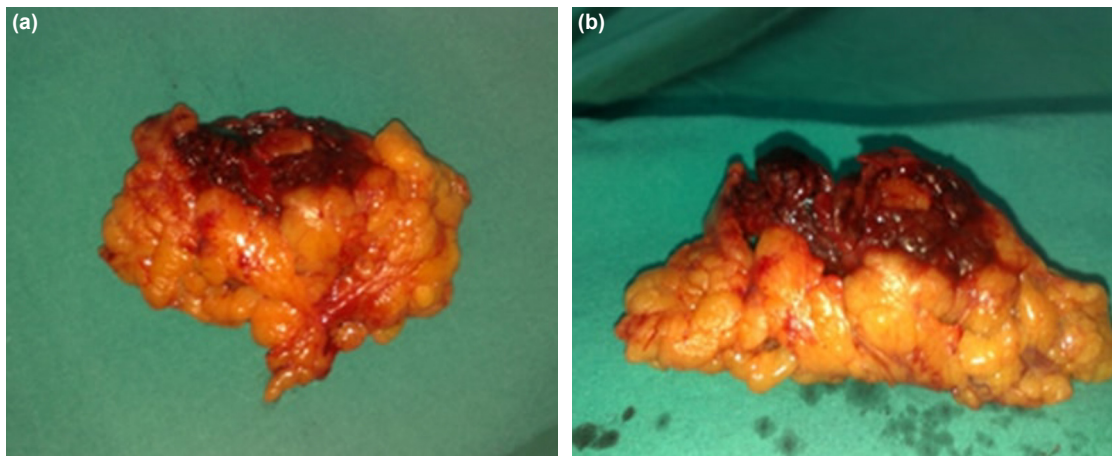

Figure 3. (a, b) Macroscopic view of isolated segmental omental necrosis.

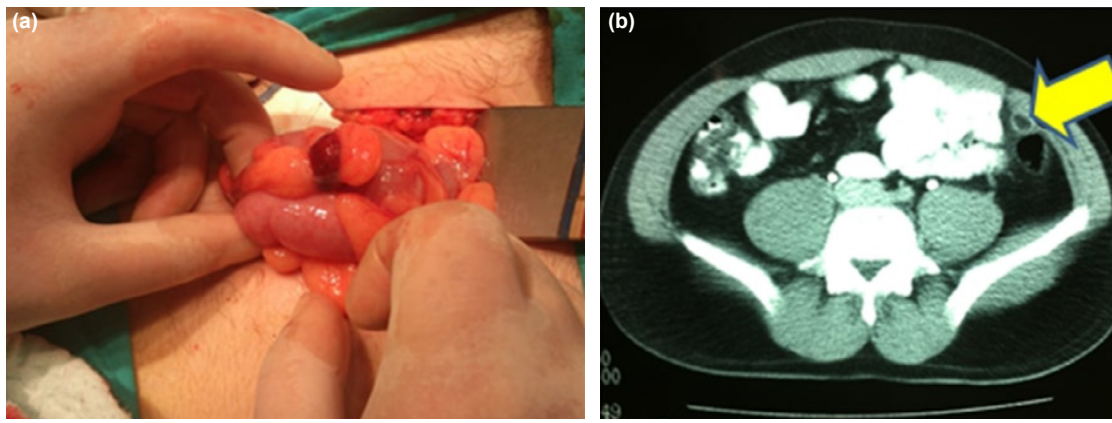

Figure 4. (a, b) Intraoperative and computed tomography images of primary epiploic appendagitis.

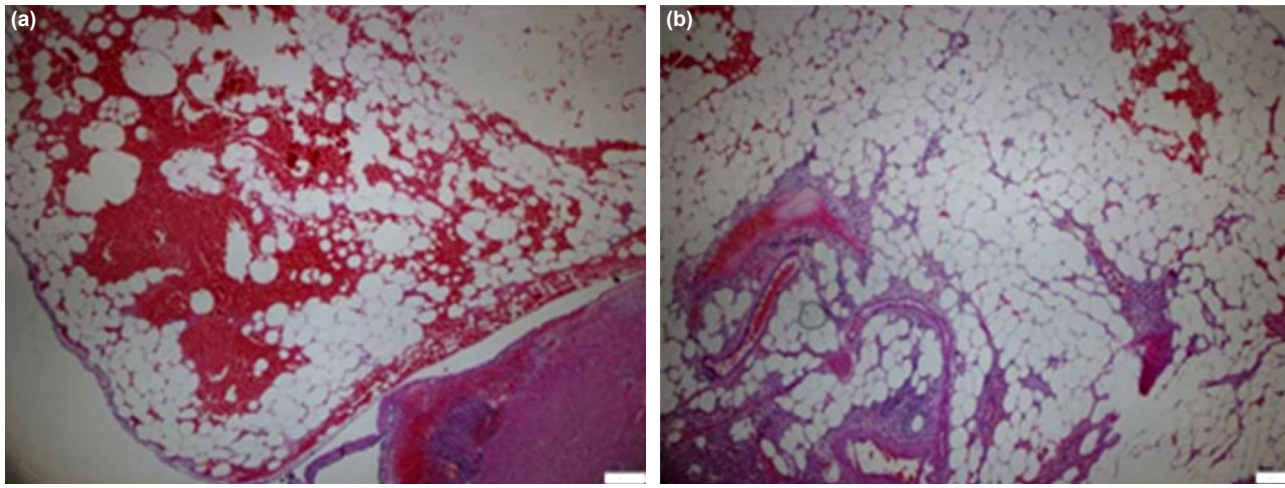

Figure 5. Histopathological examination of primary epiploic appendagitis. Congestion **(a)** and acute inflammation findings **(b)** in the epiploic appendages in the colon wall (hematoxylin and eosin, ×40).

gender distribution, age, BMI, duration of complaints, WBC, neutrophil percentage, and CRP values. There was a statistically significant difference only in terms of length of stay in hospital (p=0.001). However, these comparative evaluations should be interpreted with caution as the number of patients in the first three patient groups was very low and patient numbers were not homogeneously distributed. The demographic data of all the patients and data regarding the diagnosis/treatment process are shown in Table 1.

DISCUSSION

Omental torsion or infarction can be primary or secondary. One-third of cases are primary and there is no underlying pathology. In primary torsion cases, the torsioned segment is mostly the right distal part of the omentum, which can be explained by the longer course of the right distal epiploic artery in this region and the wider and more mobile omentum.[3,13] Another reason why the cases are mostly right-sided and the left-sided torsion is seen less may be due to the fact that patients have been misdiagnosed as diverticulitis and treated conservatively. Regardless of the cause, omental necrosis due to POT, SOT or ISON is an extremely rare cause of acute abdomen. Furthermore, from our clinical experience it has been seen that especially in patients with relaparotomy and diffuse intra-abdominal disease (such as peritoneal carcinomatosis), locally torsioned omental areas are frequently observed, but clinically ignored and neglected compared to primary pathology, so it can be concluded that SOTs are encountered much more frequently than the rates reported in the literature. Omental torsion can be confused with acute appendagitis, cholecystitis, incarcerated hernia, diverticulitis, and ovarian torsion, sepending on the localization and the rate of pre-operative correct diagnosis of patients is very low.[1–3] The patients are mostly diagnosed intraoperatively, and studies have reported that 0.2–4.8% of all cases can be diagnosed correctly preoperatively.[3,8,13] Omental pathologies are frequently observed in the 3rd and 5th decades and are more common in men than in women.[3,6] Most of the patients in the current study were aged 20–40 years and there was male gender predominance. POT was mostly right-sided, consistent with the literature. In our clinic, only 12 patients with the diagnosis of omental necrosis were treated during the 15-year period. Of these patients, 4 were treated for POT, 3 for SOT, and 5 for ISON. A correct diagnosis was made preoperatively in 3/4 of the patients with POT, but 3/5 of patients with ISON and all three patients with SOT were diagnosed intraoperatively. When the omental pathologies were examined chronologically, there was seen to be greater diagnostic accuracy in more recent cases of POT. This was attributed to greater clinical experience and the more frequent use of cross-sectional imaging methods. Especially in SOT, the diagnosis can be made more difficult by the primary pathology causing the torsion to be more prominent clinically and radiologically. Torsion could not be diagnosed preoperatively in any of the 3 patients with SOT and torsion secondary to the primary pathology was detected after exploration. Predisposing factors are omental malformation, obesity, trauma, exercise, overeating, coughing, and hyperperistalsis in primary torsion.[13] In this retrospective study, there were insufficient data to be able to analyze predisposing factors. In some cases, there may be an infarction without torsion in the omentum (ISON).[3]

It has been reported in the literature that the pain in omental torsion and infarction is of sudden onset, is continuous, and the severity increases with time and movement. In physical examination, tenderness and rebound in the right lower quadrant of the abdomen are frequently found, and there may be nausea and vomiting.[3,13] In the current study cases, the pain was sudden and continuous, and on physical examination there was tenderness and rebound in the right lower quadrant or epigastric region depending on the localization of the omental pathology. One patient with POT, one patient with SOT (the main reason was mechanical bowel obstruction), and one patient with ISOT had complaints of

Table 1. Demographic data of the patients and data on the diagnosis/treatment process

	Primary OT (n=4)	Secondary OT (n=3)	ISON (n=5)	PEA (n=30)
Male gender, n (%)	4 (100)	2 (66.6)	4 (80)	21 (70)
Age (year)	34.8±12.5	26.0±6.0	35.6±13.7	36.6±9.0
	(22–52)	(20–32)	(22–55)	(20–54)
Body mass index (kg/m2)	27.3±3.0	25.3±4.2	29.2±2.4	26.5±4.2
	(24–31)	(22–30)	(26–32)	(21–35)
Clinical presentation				
Abdominal pain	4/4	3/3	5/5	30/30
Pain (day)	1–5	1–3	1–2	1–5
Vomiting and nausea	1/4	1/3	1/5	20/30
Fever	0/4	0/3	1/5	10/30
Peritonitis	4/4	3/3	5/5	2/30
Laboratory and Imaging				
Leukocyte (x103cells/uL)	14.8±0.7	15.2±2.6	13.5 ±3.5	13.7 ±3.0
	(14.0–15.7)	(12.6–17.8)	(9.0–18.2)	(7.8–19.8)
C-reactive protein (mg/L)	32.8±17.6	67.7±12.3	22.4±8.8	31.0±24.2
	(7–45)	(54–78)	(12–35)	(3–98)
Preoperative CT, n (%)	1 (25)	3 (100)	4 (80)	28 (93.3)
Operative management				
Laparoscopic, n (%)	3 (75)	0	3 (60)	4 (40)
Open, n (%)	1 (25)	3 (100)	2 (40)	6 (60)
Nonoperative	–	–	–	20/30
Time of diagnosis, n (%)				
Preoperative	3 (75)	0	2 (40)	28 (93.3)
Intraoperative	1 (25)	3 (100)	3 (60)	2 (6.7)
Length of stay (day)	3±0	5.3±1.5	2.8±0.8	4.7±1.1
	(3–3)	(4–7)	(2–4)	(3–7)
30-day complication	–	–	–	–

CT: Computed tomography; ISON: Isolated segmental omental necrosis; OT: Omental torsion; PEA: Primary epiploic appendagitis.

nausea and vomiting. Subfebrile fever and moderate leukocytosis can be seen in the clinical picture of 50% of patients.[3] In the evaluations of the patients POT, SOT and ISON were followed up, and only one patient, who was diagnosed with ISON, had fever. Therefore, it can be considered that fever is not an obvious symptom, especially in the early period and in patients without complications. No patient remained under conservative treatment and all patients underwent surgery. The typical ultrasonographic appearance is a moderately hyperechogenic, non-compressible, oval, mass lesion with peritoneal adhesions, and peritoneal fluid may also be observed. CT is accepted as the gold standard in diagnosis. CT findings are more significant; the presence of an oval mass in the abdomen with a specific vortex finding suggests the diagnosis of omental torsion.[6,9,10] Through this CT finding, three patients with POT were identified in the current study.

Treatment of omental necrosis or torsion is still controversial. When the case reports in the literature are examined, a conservative approach and laparoscopy can be seen to come to the fore after the diagnosis is confirmed.[25] A conservative approach to the treatment of omental torsion was reported Van Breda Vriesman[26] in 11 cases, by Bachar et al.[27] in 5 cases, and by Nagar et al.[28] in 2 cases, and all the patients recovered without complications. Nubi et al.[16] treated 4 of 10 cases with a conservative approach, and while the first 3 of the other 6 cases were explored immediately, the other 3 were explored laparoscopically due to an increase in pain during conservative follow-up, and omentectomy and appendectomy were performed. Recently, laparoscopic exploration has been recommended primarily in omental torsion and infarction. During exploration, the appendix, gallbladder, bladder, and pelvic cavity are evaluated. Monitoring of serohemorrhagic fluid in the abdomen is quite specific for omental torsion and infarction.

[3] The laparoscopic approach is recommended because the patient needs to stay in the hospital longer, needs more analgesic agents, and complications that may develop during conservative follow-up due to analgesia may be hidden, whereas laparoscopy for both diagnostic and therapeutic purposes is more advantageous and causes fewer complications.[13,29] Breunung et al.[3] detected intra-abdominal serohemorrhagic fluid in a case of laparoscopic exploration with the preliminary diagnosis of acute appendagitis and evaluated the appendix vermiformis as normal and ended the operation with omentectomy. Another striking finding from the current series exploration findings was that a significant but not massive amount of free serohemorrhagic fluid was detected in the abdomen of patients with omental necrosis. In untreated cases, short-term and long-term complications such as necrosis, progressive fibrosis, intra-abdominal abscess, sepsis, and bowel obstruction due to adhesions may occur.[30] No early complications were observed in the current patients treated conservatively or surgically.

Although PEA is one of the rare causes of acute abdomen in general, it is a condition which is encountered more frequently than the other three diagnoses (POT, SOT, and ISON), probably because clinicians and radiologists are more aware of this and have clearer information about management. PEA should be distinguished from secondary epiploic appendagitis due to inflammation in an adjacent structure. PEA is more common in men and in the 2nd–5th decades of life. It is a rare cause of acute abdominal pain with an incidence of approximately 8 per million. PEA is often localized in the sigmoid colon because it is long, relatively more mobile than other colon segments, and more epiploic appendages are concentrated here.[23–25] Obesity, intense physical exercise and the presence of hernia are considered to be risk factors. The differential diagnosis includes acute diverticulitis, left-sided urinary system pathologies, ovarian pathologies, PID, ectopic pregnancy, acute appendagitis, acute cholecystitis, mesenteric lymphadenitis, acute omental torsion, and mesenteric panniculitis.[19,20] It may also be confused with diverticulitis, especially in cases with intense sigmoid colon localization and it is thought that some patients may have been diagnosed with diverticulitis and treated conservatively. This may be expected to be more frequent, especially in patients with previously known colon diverticulum. It should also be kept in mind that the opposite situation may have occurred, namely a patient with diverticulitis may have been treated conservatively with the diagnosis of PEA, albeit less frequently. The majority of the patients in the current series were aged 20–40 years and there was male gender predominance. This distribution of age and gender was consistent with the literature. PEA was localized in the sigmoid colon in 27 of 30 patients, and the patient complaints were usually of sudden onset and non-displaced abdominal pain. Although it can be seen in all quadrants, it mostly affects the left lower quadrant. Other complaints such as nausea-vomiting, fever, constipation-diarrhea are either indistinct or absent. In the physical examination, the patient is usually seen to have deep palpation tenderness and rebound positivity, and in the laboratory tests, increased leukocytes and CRP secondary to inflammation.[19–21] In the current series patients followed up for PEA, one-third of the patients had fever at the time of diagnosis, all patients had pain and 20/30 patients had nausea and/or vomiting.

No significant difference was determined in the laboratory findings between the four different clinical diagnoses and there was moderate elevation in all parameters. Radiological imaging tests such as USG and CT provide the most diagnostic benefit. However, the sensitivity of USG may vary depending on intestinal gas and the experience of the operator. The sensitivity of USG is higher for PEA than for other omental pathologies. Although USG as an imaging test gives variable results, the appearance of a hyperechoic oval mass associated with the colon surface, unresponsive to compression, may be detected, and on Doppler USG no central blood flow can be seen.[22] Another imaging option is CT, which provides more effective results. Epiploic appendagitis is suggested by an oval mass surrounded by a hyperdense ring, the association of this oval mass with the colon wall, the so-called "central dot" and suggestive venous thrombus pattern, and thickening of the colon wall and adjacent parietal peritoneum.[22–24] Pre-operative diagnosis rates have been increased with the use of CT, and thus the number of patients who have been treated conservatively and recovered without complications has also increased.[13,31]

The algorithm in the treatment of epiploic appendagitis has also changed over time. While surgical treatment was used in the past, due to the limited use of imaging studies and the inability to exclude other pathologies in the differential diagnosis, today follow-up with anti-inflammatory drugs is at the forefront, but the benefit of antibiotics has not yet been demonstrated. With NSAID, the clinical process of the patient usually regresses in 1 week, but the recurrence rate is high. Surgical treatment, primarily laparoscopic, should be considered for patients who do not respond to drug therapy or who develop recurrence.[19,21,25]

Conclusion

From the evaluation of the 42 cases presented here and the information in literature, POT, SOT, ISON, and PEA should be considered in the differential diagnosis of patients with acute abdominal findings. Surgery should be considered more prominently especially in patients with omental necrosis, depending on the patient's clinical status and the size of the omental segment, and a conservative approach should be selected first for patients diagnosed with PEA. In diagnostic dilemmas, diagnostic laparoscopy should definitely be kept in mind.

Ethics Committee Approval: This study was approved by the Gülhane Training and Research Hospital Clinical Research Ethics Committee (Date: 29.12.2021, Decision No: 2021/112).

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ORİJİNAL ÇALIŞMA - *ÖZ*

Akut karının nadir nedenleri ve literatür incelemesi: Primer/sekonder omental torsiyon, izole segmental omental nekroz ve epiploik apandisit

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AMAÇ: Primer/sekonder omental torsiyon (POT/SOT), izole segmental omental nekroz (İSON) ve primer epiploik apandisit (PEA), sıklıkla tanısal yanılgılara neden olan nadir akut karın ağrısı nedenleridir. Bu patolojilerde tutulum yerine ve hastalığın şiddetine bağlı olarak ağrı lokalizasyonu, şiddeti, bulantı-kusma, ateş gibi eşik eden semptomlar ve bunlara bağlı olarak da ayırıcı tanıları değişiklik göstermekle birlikte ağrı karakteri genellikle benzer ve devamlı tarzdadır. Lokalizasyonlarına bağlı olarak akut apandisit, akut divertikülit, ovaryan patolojiler, üriner sistem taşları ve akut kolesistit gibi farklı klinik tabloları taklit edebilir ve sıklıkla cerrahi eksplorasyon sonrası tanı alırlar. Gelişen teknoloji, bu hastalıklara dair farkındalığın artmış olması ve belirgin olarak artan bilgisayarlı tomografi kullanımı ile artık daha fazla hastada preoperatif süreçte tanı konulabilmekte ve gereksiz operasyonlardan kaçınılabilmektedir. Özellikle PEA kendi kendini sınırlayan lokal enflamatuvar bir hastalık olup sıklıkla konservatif olarak yönetilebilir. Cerrahi tedavi seçeneği ise tüm tanılar için ilgili epiploik appendiks veya omental segmentin, tercihen laparoskopik olarak lokal eksizyonudur. En sık cerrahi endikasyon tanısal karışıklık, ikinci en sık neden ise persistan ağrı yakınmasıdır.

GEREÇ VE YÖNTEM: 2006–2021 yılları arasında kliniğimizde, primer/sekonder omental torsiyon, izole segmental omental nekroz veya primer epiploik apandisit tanısı ile takip ve tedavi ettiğimiz hastaların verileri geriye dönük olarak toplandı. Hastaların demografik verileri, tanı ve tedavileri, hastanede yatış süreleri değerlendirilerek literatür eşliğinde sunuldu.

BULGULAR: Çalışmaya alınan 42 hastanın 12'sinin yatış ve tedavi nedeni omentumun bir bölümünün nekrozu idi. Bu hastalardan 4'ü POT, 3'ü SOT, 5'i İSON ve 30'u PEA tanısı ile takip ve tedavi edildi. Hastaların 33'ü preoperatif, 9'u intraoperatif tanı aldı. 22 hasta opere edildi ve PEA'lı 20 hasta konservatif olarak tedavi edildi. Cerrahi veya tıbbi tedavi sonrasında tüm hastalar komplikasyonsuz olarak taburcu edildi. Hastalar arasında yapılan karşılaştırmada klinik ve laboratuvar bulguları açısından anlamlı farklılık gözlenmedi.

TARTIŞMA: Akut karın bulguları olan hastaların ayırıcı tanısında POT, SOT, ISON ve PEA düşünülmelidir. Preoperatif dönemde PEA tanısı konan hastalarda öncelikle konservatif yaklaşım düşünülmelidir. POT, SOT ve İSON tanısı alan hastalarda hastanın kliniğine göre cerrahi veya konservatif yaklaşım değerlendirilmelidir.

Anahtar sözcükler: Akut karın; epiploik apandisit; omental infarkt; omental nekroz; omental torsiyon.

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