

CASE REPORT

Primary Epiploic Appendagitis Mimicking Acute Appendicitis: A Case Report and Narrative Review of the Literature

Maria Alexandra Kefala, Kostas Tepelenis¹, Christos K. Stefanou², Stefanos K. Stefanou³, Georgios Papathanakos⁴, Aikaterini Kitsouli⁵, Nikolaos Tepelenis⁶ and Panagiotis Kitsoulis^{5,7}

Department of Pediatrics, General Hospital of Ioannina "G. Xatzikosta", Ioannina; Department of Surgery, University Hospital of Ioannina¹, Ioannina; Department of Surgery, General Hospital "G. Xatzikosta"², Ioannina; Department of Surgery, General Hospital of Filiates³, Thesprotia; Intensive Care Unit, University Hospital of Ioannina⁴, Ioannina; Anatomy-Histology-Embryology, University of Ioannina⁵, Ioannina; Department of Pathology, Agia Sofia Children's Hospital⁶, Athens; Department of Orthopaedics, University Hospital of Ioannina⁷, Ioannina, Greece

Primary epiploic appendagitis is uncommon and is estimated to induce 1.1–1.3% of all abdominal pain. We report a 42-year-old male who appeared in the morning in the emergency department with abdominal pain localized in the right lower abdomen and associated with anorexia and nausea. Clinical examination, laboratory tests, and abdominal ultrasound revealed deep tenderness at Mc Burney point and a mild elevation of CRP (0.7 mg/dL). In the evening, the symptoms were exacerbated, and a diagnostic laparoscopy was performed. Intra-operatively, the appendix was normal and a twisted, necrotic epiploic appendage originating from the antimesenteric border of the mid ascending colon was found. Laparoscopic resection of the necrotic epiploic appendage and prophylactic appendectomy was carried out. Histology indicated the diagnosis of the necrotic epiploic appendage. Postoperatively, the patient recovered without complications. Although the preoperative diagnosis of primary epiploic appendagitis has improved due to abdominal ultrasound and mainly CT, there are still cases which are diagnosed during laparoscopy. The treatment of choice is conservative management, while the use of antibiotics remains controversial. The relapse and complication rates are rare. Surgical excision, particularly laparoscopic, should be considered in cases of uncertain diagnosis, persistent symptoms, or recurrence. (*Korean J Gastroenterol* 2020;76:88-93)

Key Words: Epiploic appendagitis; Torsion of epiploic appendage; Necrosis of epiploic appendage; Infarct of epiploic appendage

INTRODUCTION

Epiploic appendages are small fatty pouches covered by visceral peritoneum and situated along the large intestine, particularly at the sigmoid colon. They are vulnerable to torsion, which leads to ischemic necrosis and subsequent inflammation. This entity is called primary epiploic appendagitis and can be misdiagnosed easily due to the lack of characteristic clinical and laboratory findings.¹ Traditionally, they are diagnosed during exploratory laparotomy or diagnostic lapar-

scopy performed for other causes of right lower quadrant pain.^{2,3} In recent years, the diagnostic accuracy of abdominal ultrasound and CT has improved, and an increasing number of cases are diagnosed preoperatively.

On the other hand, there are still cases that are diagnosed during laparoscopy. The treatment of choice is conservative with or without the use of NSAIDs, while the use of antibiotics remains controversial.^{4,5} Laparoscopic excision should be considered in cases of an uncertain diagnosis, persistent symptoms, or recurrence.

Received May 8, 2020. Revised June 27, 2020. Accepted July 2, 2020.

© This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.
Copyright © 2020. Korean Society of Gastroenterology.

Correspondence to: Kostas Tepelenis, Department of Surgery, University Hospital of Ioannina, Vellas 30, Kardamitsia, Ioannina 45500, Greece. Tel: +30-2651038047, Fax: +30-2651077630. E-mail: kostastepelenis@gmail.com, ORCID: <https://orcid.org/0000-0002-9088-4959>

Financial support: None. Conflict of interest: None.

This paper reports the case of a 42-year-old male who was misdiagnosed with acute appendicitis. A definite diagnosis was made by laparoscopy. The purpose of this review is to summarize all the existing data regarding primary epiploic appendagitis mimicking acute appendicitis and highlight the most important points for the differential diagnoses of epiploic appendagitis from acute appendicitis. Medline was investigated from 1960 to March 1, 2020. The keywords, epiploic appendagitis, torsion of an epiploic appendage, necrosis of an epiploic appendage, and infarct of an epiploic appendage, were selected to identify all reports possibly related to primary epiploic appendagitis. The reference lists of all relevant studies and reviews were scanned for additional studies.

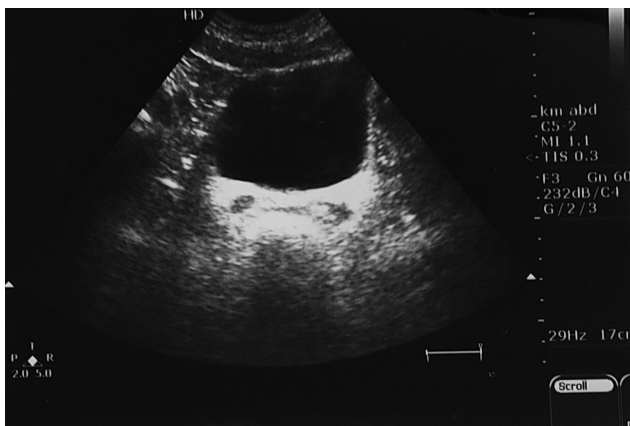


Fig. 1. Abdominal ultrasound: The vermiform appendix is not visualized, and no free fluid is found. The only finding was probe tenderness in the right iliac fossa.

CASE REPORT

A 42-year-old male visited the emergency department with a history of abdominal pain localized in the right lower abdomen in the previous eight hours. The pain was described as dull and constant, and it was associated with anorexia and nausea. No history of fever, vomiting, diarrhea, constipation, or urinary complaints was noted. The patient reported no prior medical or surgical history. An abdominal examination disclosed a soft, non-distended abdomen, with normal bowel sounds and deep tenderness at the Mc Burney point. Rebound tenderness in the right iliac fossa, Rovsing's sign, psoas sign, and obturator sign were all negative.

Laboratory studies revealed mild elevation of CRP (0.7 mg/dL) without any other inflammatory markers (white blood cell count 7.4 K/UL, neutrophils 53.5%, and erythrocyte sedimentation rate 8 mm/hour). Abdominal ultrasound showed no free fluid, while the abdominal organs were normal (Fig. 1). The appendix, however, was not visualized. The only finding was probe tenderness in the right iliac fossa.

The patient was admitted to the surgical department for observation, and antibiotics were commenced, but the pain did not settle. In the afternoon, the pain became intense, and rebound tenderness was found in the right iliac fossa on palpation. In the authors' department, abdominal CT was not performed routinely for further evaluation of lower quadrant pain except for particular cases. Therefore, a decision was made to carry out diagnostic laparoscopy instead of an abdominal CT due to the high clinical suspicion of acute appendicitis.

Nevertheless, the appendix was identified, exposed, and



Fig. 2. Surgical specimens: (A) the vermiform appendix appears normal, while (B) a twisted, necrotic epiploic appendage originating from the antimesenteric border of the mid ascending colon is identified. (C) The two surgical specimens are placed alongside.

found to be normal. A twisted, necrotic epiploic appendage originating from the antimesenteric border of the mid ascending colon was noted (Fig. 2). There was no mesenteric lymphadenopathy or Meckel's diverticulum. Laparoscopic appendectomy and resection of the necrotic epiploic appendix were performed using a harmonic scalpel (Ethicon Endo-Surgery, Johnson & Johnson, Cincinnati, USA). No antibiotics were administered postoperatively. The patient recovered uneventfully, and he was discharged after two days. Histology indicated an infarct of the epiploic appendage, hemorrhagic and necrotic adipose tissue, and infiltration by foamy macrophages, while the vermiform appendix was normal.

DISCUSSION

The most common cause of acute right lower quadrant pain is acute appendicitis. Epiploic appendagitis is a frequent mimic of appendicitis clinically, which can be either primary or secondary. The primary form is caused by the torsion of an epiploic appendage or the spontaneous thrombosis of the central vein, which leads to ischemic or hemorrhagic infarction and subsequent inflammation. In contrast, secondary epiploic appendagitis is the inflammation of epiploic appendages due to the extension from adjacent inflamed organs, particularly in cases of diverticulitis, appendicitis, cholecystitis, or pancreatitis.⁶

The estimated frequency of primary epiploic appendagitis in patients with abdominal pain is 1.1-1.3%, and its incidence

Table 1. Demographics and Clinical Presentation of Patients with Primary Epiploic Appendagitis

Author	Patients/sex ratio (M/F)	Mean age (years)	Right side epiploic appendagitis	Symptoms except for pain	Clinical findings
Van Breda Vriesman et al. (1999) ⁷	40 (28/12)	42	6 (15)	Nausea 5% Vomiting 5%	Focal tenderness 100% Rebound 25% Mass 10%
Zissin et al. (2002) ⁹	33 (24/9)	44.6	9 (27.3)	None	Focal tenderness 84.9%
Son et al. (2002) ³	8 (8/0)	34.9	1 (12.5)	Fever 12.5%	Focal tenderness 100% Rebound 25% Mass 25%
Legome et al. (2002) ¹²	19 (10/9)	37.8	5 (26)	Anorexia 32% Nausea 36% Vomiting 21% Constipation/diarrhea 10% Fever >38°C 15%	Focal tenderness 100% Guarding 47%
Sand et al. (2007) ¹	10 (7/3)	44.6	2 (20) LLQ 80% RLQ 20%	Nausea 4.7% Vomiting 4.7% Diarrhea 14.2%	Focal tenderness 100% Rebound 10%
Ozdemir et al. (2010) ¹³	12 (9/3)	40	4 (33)	Nausea 16.6% Vomiting 16.6% Urinary tract symptoms 8.3%	Focal tenderness 100% Rebound 24.9% Rigidity 16.6%
Chen et al. (2011) ¹¹	21 (15/6)	40	2 (9.5)	Nausea 4.7% Vomiting 4.7% Diarrhea 14.2%	
Choi et al. (2011) ²	31 (22/9)	40	13 (41.9)		Focal tenderness 100% Rebound 25.8%
Nadida et al. (2016) ⁴	12 (4/8)	51.7	6 (50)	Nausea 25% Vomiting 8.3%	
Ergelen et al. (2017) ¹⁴	45 (23/22)	42.3	16 (35)	Fever 6.6%	Focal tenderness 100% Rebound 13.3%

Values are presented as n (%).

Demographics and clinical features are referred to patients with primary epiploic appendagitis, not only in patients with epiploic appendagitis situated in the right colon.

M, male; F, female; LLQ, left lower quadrant; RLQ, right lower quadrant.

is 8.8 cases/million/year. Approximately 1% of patients with an initial diagnosis of acute appendicitis might have epiploic appendagitis.^{7,8} The condition usually affects adults in their fourth and fifth decades of life, and there is a male predominance. The commonest site is the sigmoid colon (50%) followed by the descending (26%), ascending colon and cecum (22%), while it is rarely encountered in the transverse colon (2%).^{1,4,7,9-14}

Epiploic appendages, also known as epiploic appendices or appendices epiploicae, are small fatty pouches covered by visceral peritoneum. They are attached to the antimesenteric border of the colon via a stalk and protrude into the peritoneal cavity. Each is supplied by one or two end arteries originating from the vasa recta longa of the colon and drained by a single tortuous vein. Vesalius was the first to describe them in 1543, while Virchow suggested that loose intraperitoneal bodies could be detached epiploic appendages. Approximately 50-100 epiploic appendages measuring 2-5 cm in length and 1-2 cm in thickness can be found all over the colon.¹ They are arranged in two rows: anteriorly along the taenia libera and posterolaterally along the taenia omentalis, except for the transverse colon, which contains only one row as the greater omentum attaches to the taenia omentalis. Occasionally they might be larger and reach up to 15 cm, particularly in obese people and in those who lose weight.^{1,2} Their function remains unclear. They might act as a protective cushion during peristalsis, fat

storage, or contribute to intestinal immunity.¹

The initial manifestation of primary epiploic appendagitis mimicking acute appendicitis is variable. The most frequent appearance is acute pain in the right iliac fossa. The pain is described as dull, constant, and non-exacerbating with physical movements. Other symptoms include postprandial fullness and early satiety, but fever, nausea, vomiting, diarrhea, and constipation are rarely present. A clinical examination reveals localized tenderness and occasionally rebound tenderness.^{1-4,7,9-14} In most cases, all routine laboratory parameters, such as inflammatory markers, liver transaminases, pancreatic amylase, lipase, and urinalysis, are within the normal limits. Occasionally, a mild leukocytosis and a mild elevation of CRP are observed.^{2,13} Table 1 lists the demographics and clinical presentations of patients with primary epiploic appendagitis.

Distinguishing primary epiploic appendagitis from acute appendicitis preoperatively is very challenging. In contrast, primary epiploic appendagitis needs to be distinguished preoperatively from acute appendicitis because it is managed conservatively without surgical operation. One clinical attribute of primary epiploic appendagitis is focal, non-migratory pain situated in the right iliac fossa, which is accompanied by an absence of inflammatory markers. On abdominal ultrasonography, it is depicted as a hyperechoic ovoid non-compressible mass surrounded by a subtle hypoechoic rim. The

Table 2. Computed Tomography Findings of Patients with Primary Epiploic Appendagitis

Author	Ovoid mass of fat density	Hyperdense ring sign	Central dot sign	Fat stranding sign	Parietal peritoneal thickening
Rioux et al. (1994) ⁵	100	100	28.5		93
Mollà et al. (1998) ⁸	100	100	57	100	57
Van Breda Vriesman et al. (1999) ⁷	100	59	41		38
Zissin et al. (2002) ⁹	100				84.8
Ng et al. (2006) ¹⁶	100	100	42.8	100	
Jalaguier et al. (2009) ⁶	100	100	77	100	93
Chen et al. (2011) ¹¹	100	100	33.3	100	
Hasbahceci et al. (2012) ¹⁵	100	100	75	100	60
Hwang et al. (2013) ¹⁰	100	89.3	17.9	14.3	
Saad et al. (2014) ²⁰	100	100	61		
Nadida et al. (2016) ⁴	100	100	16.7		
Nugent et al. (2017) ¹⁷	100	100	79		74
Ergelen et al. (2017) ¹⁴	100	100	26.6	100	
Almeida et al. (2018) ¹⁸	100	100	51	100	81

Values are presented as %.

mass is situated adjacent to the colonic wall, while the adjacent fat is hyperechoic due to inflammation.^{4,5,8,13,15} Ultrasound can reveal the inflamed epiploic appendage to the anterior abdominal wall.^{5,8} On Doppler images, a specific feature is the absence of blood flow in the mass, while there might be increased blood flow in the adjacent inflamed fat.^{4,8,15} On the other hand, abdominal ultrasound is an operator-dependent examination, and primary epiploic appendagitis is not always visible.

Currently, abdominal CT is the gold standard for a diagnosis of primary epiploic appendagitis. Despite the location of primary epiploic appendagitis, the imaging criteria encompass the following five special features: an ovoid mass with fat attenuation measuring 1-3.5 cm in the greatest diameter; hyperdense ring sign, which is a hyperdense ring that encircles the ovoid mass and corresponds to the inflammatory visceral peritoneum; central dot sign, which is the presence of a hyperdense dot centrally that illustrates the thrombosed vein; fat stranding sign, which is the severe mesentery inflammation compared to minimal asymmetric thickening of the adjacent bowel wall; thickening of the parietal peritoneum due to the attachment of the inflamed epiploic appendage. The fat stranding sign indicates that the primary site of the inflammation is the epiploic appendage rather than the bowel wall. All the CT findings are summarized in Table 2.^{4-11,14-18} Abdominal MRI can be an alternative to abdominal CT, particularly in children and pregnancies. The imaging findings include an ovoid mass with high signal in T1 and T2 images, while rim enhancement can be observed in contrast agent (gadolinium) enhanced T1 images.¹⁹

In the authors' hospital as well as in others all over the world, the initial assessment of right lower quadrant pain included an abdominal ultrasound. CT of the abdomen is obtained only in special circumstances. Sharp, non-migratory pain in the right iliac fossa accompanied by the absence of inflammatory markers and a normal abdominal ultrasound might be an indication for CT to avoid unnecessary laparoscopy or laparotomy.

The treatment of choice for primary epiploic appendagitis is conservative with or without the use of NSAIDs because it is considered a self-limiting disease.^{4,20} The symptoms are usually resolved within two weeks, while the CT findings require more time to subside.¹⁰ Antibiotics are administered widely,^{1,3,10,11,16,18} even though their therapeutic benefit is not well-documented.⁵⁻⁷ Most studies report a low rate of recurrence

with conservative treatment.^{1,3,5,7,8,10,13,14} Nevertheless, a few studies revealed a recurrence rate of 5-17%.^{12,15,18} Sand et al.¹ reported that there is a tendency of recurrence in conservatively treated patients. Four out of ten patients in this study (40%) had the same pain at the same locality, for two days, on average, four weeks before their appearance to the emergency department. The indications of surgery include an uncertain diagnosis, no improvement in symptoms despite conservative management, and relapse. Many authors recommend a laparoscopic resection of the affected epiploic appendages coupled with prophylactic appendectomy in such cases.¹ In the authors' hospital as well as in other institutions around the world, prophylactic appendectomy is carried out in cases of diagnostic laparoscopy or exploratory laparotomy for right lower quadrant pain, even if the appendix is normal.

REFERENCES

1. Sand M, Gelos M, Bechara FG, et al. Epiploic appendagitis—clinical characteristics of an uncommon surgical diagnosis. *BMC Surg* 2007;7:11.
2. Choi YU, Choi PW, Park YH, et al. Clinical characteristics of primary epiploic appendagitis. *J Korean Soc Coloproctol* 2011;27:114-121.
3. Son HJ, Lee SJ, Lee JH, et al. Clinical diagnosis of primary epiploic appendagitis: differentiation from acute diverticulitis. *J Clin Gastroenterol* 2002;34:435-438.
4. Nadida D, Amal A, Ines M, et al. Acute epiploic appendagitis: radiologic and clinical features of 12 patients. *Int J Surg Case Rep* 2016;28:219-222.
5. Rioux M, Langis P. Primary epiploic appendagitis: clinical, US, and CT findings in 14 cases. *Radiology* 1994;191:523-526.
6. Jalaguier A, Zins M, Rodallec M, Nakache JP, Boulay-Coletta I, Jullès MC. Accuracy of multidetector computed tomography in differentiating primary epiploic appendagitis from left acute colonic diverticulitis associated with secondary epiploic appendagitis. *Emerg Radiol* 2010;17:51-56.
7. Van Breda Vriesman AC, Lohle PN, Coerkamp EG, Puylaert JB. Infarction of omentum and epiploic appendage: diagnosis, epidemiology and natural history. *Eur Radiol* 1999;9:1886-1892.
8. Mollà E, Ripolés T, Martínez MJ, Morote V, Roselló-Sastre E. Primary epiploic appendagitis: US and CT findings. *Eur Radiol* 1998;8:435-438.
9. Zissin R, Hertz M, Osadchy A, Kots E, Shapiro-Feinberg M, Paran H. Acute epiploic appendagitis: CT findings in 33 cases. *Emerg Radiol* 2002;9:262-265.
10. Hwang JA, Kim SM, Song HJ, et al. Differential diagnosis of left-sided abdominal pain: primary epiploic appendagitis vs colonic diverticulitis. *World J Gastroenterol* 2013;19:6842-6848.
11. Chen JH, Wu CC, Wu PH. Epiploic appendagitis: an uncommon and easily misdiagnosed disease. *J Dig Dis* 2011;12:448-452.

12. Legome EL, Belton AL, Murray RE, Rao PM, Novelline RA. Epiploic appendagitis: the emergency department presentation. *J Emerg Med* 2002;22:9-13.
13. Ozdemir S, Gulpinar K, Leventoglu S, et al. Torsion of the primary epiploic appendagitis: a case series and review of the literature. *Am J Surg* 2010;199:453-458.
14. Ergelen R, Asadov R, Özdemir B, Tureli D, Demirbaş BT, Tuney D. Computed tomography findings of primary epiploic appendagitis as an easily misdiagnosed entity: case series and review of literature. *Ulus Travma Acil Cerrahi Derg* 2017;23:489-494.
15. Hasbahceci M, Erol C, Seker M. Epiploic appendagitis: is there need for surgery to confirm diagnosis in spite of clinical and radiological findings? *World J Surg* 2012;36:441-446.
16. Ng KS, Tan AG, Chen KK, Wong SK, Tan HM. CT features of primary epiploic appendagitis. *Eur J Radiol* 2006;59:284-288.
17. Nugent JP, Ouellette HA, O'Leary DP, Khosa F, Nicolaou S, McLaughlin PD. Epiploic appendagitis: 7-year experience and relationship with visceral obesity. *Abdom Radiol (NY)* 2018;43:1552-1557.
18. Almeida RR, Singh AK, Mansouri M, Spilberg G, Alkasab T, Lev MH. Impact of radiology report wording on care of patients with acute epiploic appendagitis. *AJR Am J Roentgenol* 2019;212:1265-1270.
19. Sirvanci M, Balci NC, Karaman K, Duran C, Karakaş E. Primary epiploic appendagitis: MRI findings. *Magn Reson Imaging* 2002;20:137-139.
20. Saad J, Mustafa HA, Elsani AM, Alharbi F, Alghamdi S. Primary epiploic appendagitis: reconciling CT and clinical challenges. *Indian J Gastroenterol* 2014;33:420-426.