

Received: 2022.11.17

Accepted: 2023.01.12

Available online: 2023.01.25

Published: 2023.02.22

# A Rare Case of Ruptured Appendicitis Secondary to Metastatic Ovarian Cancer

## Authors' Contribution:

Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
Funds Collection G

ABCDEF 1,2 **Alex G. Raman**BCDEF 1,2 **James Huynh**CDEF 1 **Kishan J. Patel**CDE 2 **Lynn R. Kong**CDEF 2 **Brad D. Barrows**ABCDEF 2 **Charles Hubeny** 

1 College of Osteopathic Medicine of the Pacific, Western University of Health Sciences, Pomona, CA, USA

2 Graduate Medical Education, Community Memorial Health System, Ventura, CA, USA

**Corresponding Author:** Alex G. Raman, e-mail: [raman.alex@gmail.com](mailto:raman.alex@gmail.com)**Financial support:** None declared**Conflict of interest:** None declared

**Patient:** Female, 61-year-old  
**Final Diagnosis:** Appendicitis  
**Symptoms:** Abdominal pain  
**Clinical Procedure:** —  
**Specialty:** Radiology • Surgery

**Objective:** Unusual clinical course

**Background:** Patients with advanced stage ovarian cancer typically have vague non-specific abdominal symptoms related to pelvic tumor, metastasis, and ascites. When these patients present with more acute abdominal pain, appendicitis is rarely considered. Acute appendicitis due to metastatic ovarian cancer has been sparsely documented in the medical literature; only twice, to our knowledge.

**Case Report:** A 61-year-old woman with a 3-week history of abdominal pain, shortness of breath, and bloating was diagnosed with ovarian cancer after computed tomography (CT) demonstrated a large pelvic cystic and solid mass. Five weeks later she underwent an omental biopsy to determine cell type and potential upstaging of the ovarian cancer to stage IV, as other aggressive cancers such as breast cancer can also involve the pelvis/omentum. Seven hours after her biopsy, she presented with increasing abdominal pain. Post-biopsy complications such as hemorrhage or bowel perforation were initially suspected to be the cause of her abdominal pain. However, CT demonstrated ruptured appendicitis. The patient underwent an appendectomy and histopathologic examination of the specimen revealed infiltration by low-grade ovarian serous carcinoma.

**Conclusions:** Given the low incidence of spontaneous acute appendicitis in this patient's age group, and the lack of any other clinical, surgical, or histopathological evidence to suggest another cause, metastatic disease was ruled to be the likely source of her acute appendicitis. Providers should be aware of appendicitis in a broad differential diagnosis and have a low threshold for ordering abdominal pelvis CT when advanced stage ovarian cancer patients present with acute abdominal pain.

**Keywords:** Appendicitis • Image-Guided Biopsy • Ovarian Neoplasms**Full-text PDF:** <https://www.amjcaserep.com/abstract/index/idArt/938982>

Publisher's note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher

## Background

Ovarian cancer is the fifth leading cause of cancer-related death among women. It is estimated that approximately 19880 women were diagnosed with new ovarian carcinoma in the United States in 2022 [1]. In addition, more than half of these women will already have metastatic disease at the time of diagnosis, since the cancer is often asymptomatic at early stages [2]. Patients with advanced stage ovarian cancer typically have vague, nonspecific abdominal symptoms related to the pelvic tumor, metastasis, and ascites [3]. Women diagnosed with ovarian cancer at a later age (>50) and those with omental involvement are at higher risk for appendiceal involvement (34% higher) [4]. Despite this relatively higher risk of appendiceal involvement when cancer is present, appendicitis almost never occurs, and is rarely considered as a differential diagnosis when pain is more severe. We describe a rare case of metastatic ovarian carcinoma associated with acute appendicitis, which was initially thought to be due to a post-biopsy complication.

## Case Report

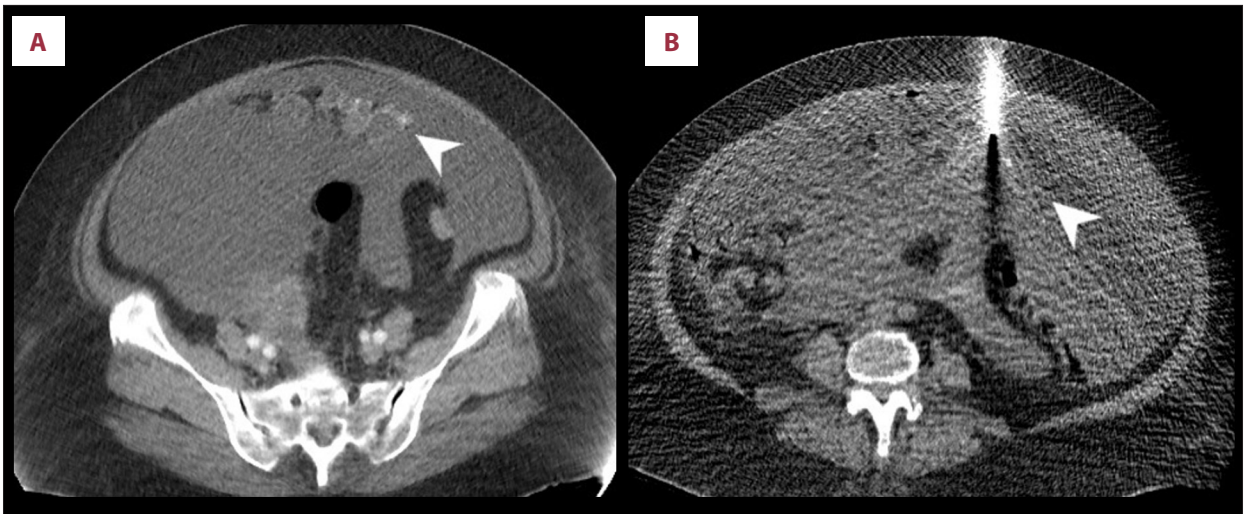
A 61-year-old woman with a past medical history of hypertension and obesity presented to the emergency department with a 3-week history of persistent abdominal pain, shortness of breath, and a feeling of “bloating.” She reported associated nausea, vomiting, diarrhea, and constipation. Her abdomen was noted to be distended and firm. Abdominal ultrasound revealed large ascites. Echocardiogram revealed grossly normal heart function, normal wall motion and ejection fraction, and no pericardial effusion. Computed tomography (CT) scan of the abdomen and pelvis showed large ascites, a 12 cm cystic and solid mass in the pelvis, as well as omental caking suspicious for metastatic ovarian carcinoma with peritoneal carcinomatosis (Figure 1). CA-125 level was elevated at 284 U/mL (reference range:  $\leq 38$  U/mL) and CA19-9 level was normal at 4 U/mL (reference range  $\leq 35$  U/mL). Her serum albumin-ascites gradient was calculated at 0.7, favoring a malignant etiology (reference cutoff: 1.1 g/dL). Her ascitic fluid cytology demonstrated scattered clusters of malignant cells with nuclear pleomorphism and focal papillary morphology, and immunohistochemical stains that were PAX8 positive and CDX2 negative. She was managed with IV fluids, and upon resolution of her symptoms she was discharged with an urgent referral to gynecology/oncology. She met with gynecology/oncology, where she underwent further workup to determine chemotherapy eligibility.

Five weeks later, she presented to the emergency department with a 3-day history of generalized weakness, abdominal pain without tenderness, poor appetite, and a 2-day history of dark

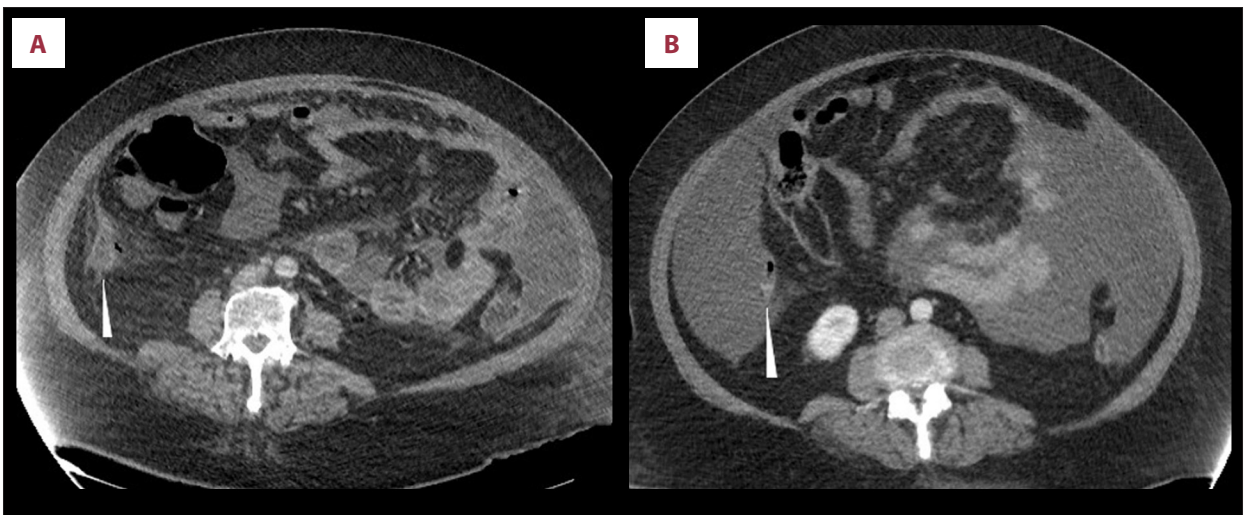


**Figure 1.** Coronal contrast-enhanced CT shows large ascites throughout the abdomen, displacing the organs centrally as well as the large cystic/solid ovarian mass (white arrow) in the pelvis. CT – computed tomography.

orange urine. She developed a 102°F (38.9°C) fever while in the Emergency Department (initial temperature, 100.6°F (38.1°C)). Her pulse was 99 and respiratory rate was 22. With a history of an outpatient paracentesis performed by interventional radiology 1 week earlier, sepsis was suspected due to an abdominal infection, and she was admitted to the medicine floor for continued care. Laboratory test results were notable for positive urine nitrites, worsening renal function with an elevated serum creatinine (sCr) of 2.3 mg/dL (reference range 0.5-1.2 mg/dL), grossly elevated creatine kinase of 3581 IU/L (reference range 38-173 IU/L), and a slightly low white blood cell count of 3.9 K/ $\mu$ L (reference range 4.5-13.5 K/ $\mu$ L). Ultrasound of the kidneys and bladder showed an unremarkable appearance of the kidneys without evidence of hydronephrosis as well as moderate volume ascites fluid. She was subsequently started on vancomycin, piperacillin/tazobactam, and ceftriaxone to treat her suspected infection as well as intravenous hydration to treat her acute kidney injury. On day 2 of her hospital stay, she no longer met the criteria for sepsis and her renal function improved with a sCr of 1.53 mg/dL. She was then scheduled for an omental biopsy and paracentesis to improve her abdominal distension. These procedures were subsequently performed by interventional radiology without immediate



**Figure 2.** Omental caking (white arrow head) along the greater omentum is seen anteriorly with surrounding ascites on contrast-enhanced CT at presentation (A), which was subsequently biopsied with an 18-gauge needle under CT guidance (B). CT – computed tomography.

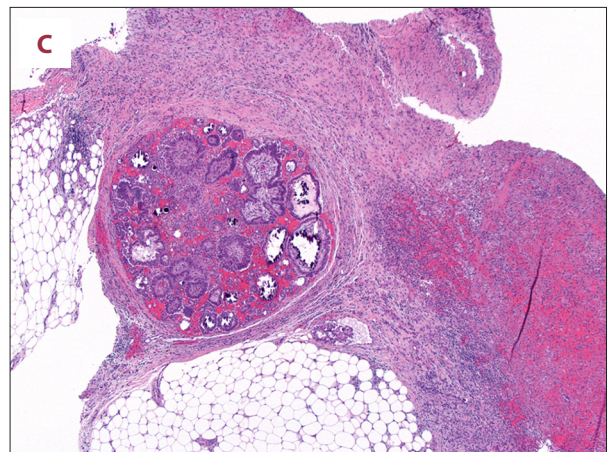
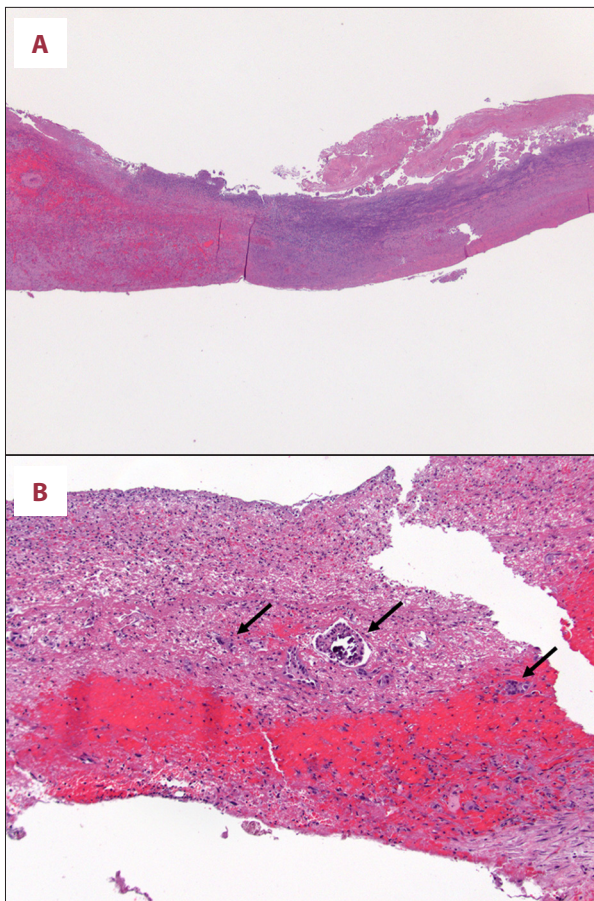


**Figure 3.** (A) The patient's appendix is seen in the right lower quadrant (white triangle), enlarged and inflamed, with a small fleck of adjacent extraluminal air. (B) As a reference, her appendix was small, non-inflamed, and normal on her original presenting CT. CT – computed tomography.

complication (Figure 2A, 2B). Omental biopsy demonstrated clusters of malignant cells with desmoplastic stromal response and necrosis.

About 7 hours post-biopsy, the patient complained of severe worsening of upper abdominal pain that was eased with hydromorphone. Given the persistence of the pain, an abdomen/pelvis CT was ordered to assess for bleeding or other post-biopsy complications. The CT demonstrated acute appendicitis with rupture, showing an enlarged and inflamed appendix and several flecks of free intraperitoneal air, including adjacent to the appendix itself (Figure 3A, 3B). There was no complication at the omental biopsy site.

General surgery was consulted and physical exam findings were consistent with appendicitis. She was promptly taken to the operating room for a laparoscopic appendectomy, lysis of adhesions, and omental biopsy. The appendectomy was complicated by significant inflammatory changes throughout the abdominal cavity and peritoneum that made it difficult to discern different tissue structures. However, the appendectomy was successful and appendix and omental biopsy specimens were obtained. Histology sections of the appendix showed patchy involvement by malignant cells, consistent with infiltrating low-grade serous carcinoma, suggestive of an underlying etiology of acute gangrenous appendicitis (Figure 4A, 4B). Sections of the omentum also showed involvement by low-grade serous



**Figure 4.** Histology. Hematoxylin and Eosin (H&E) stains of (A) thin appendix wall with acute gangrenous appendicitis (20× magnification) and (B) representative clusters of malignant cells (arrows) in appendix wall near perforation site (100× magnification). H&E stain of (C) omentum shows low-grade papillary serous carcinoma with associated prominent acute inflammation and patchy gangrenous necrosis.

carcinoma associated with severe acute inflammation and patchy gangrenous necrosis (Figure 4C).

The patient noted improved abdominal pain the next day, which continued to progressively improve until she was discharged 5 days postoperatively. Six weeks later she met with gynecology/oncology for chemotherapeutic management of her ovarian cancer with carboplatin/paclitaxel/bevacizumab. Her last abdomen/pelvis CT demonstrated an unchanged size of her primary pelvic mass and unchanged distribution of omental caking.

## Discussion

Over 75% of ovarian cancer cases present at an advanced stage, with peritoneal carcinomatosis at the time of diagnosis [5]. Symptoms are generally non-specific, most often presenting as vague abdominal symptoms, bloating, or other gastrointestinal dysfunction [6]. Similar to the case presented in this report, a combination of bloating, increased abdominal size, and urinary symptoms was found in 43% of those diagnosed with ovarian cancer [7].

Various cancers have been noted to cause appendicitis. In particular, primary appendiceal tumors almost always present as acute appendicitis [8]. Appendicitis secondary to metastatic disease has been documented with melanoma and cancer from other sites including the lungs, prostate, and colon [9-12].

It is important to note that, during cytoreductive surgery, the appendix has been found to be a site of metastasis in patients with stage III/IV ovarian cancer 43.5% to 80.4% of the time [13-15]. Some have recommended appendectomy at the time of surgical staging for ovarian carcinoma due to a relatively high probability of involvement [16]. However, acute appendicitis due to metastatic ovarian cancer is an extremely rare finding, sparsely documented in the medical literature; only twice, to our knowledge [17,18]. Another study demonstrated that, in 136 patients with ovarian cancer that had metastasized to the appendix, who received appendectomies, 4 appendices were found to be inflamed; however, none of these patients were symptomatic [19]. The case presented here demonstrates advanced acute gangrenous appendicitis with rupture. Sepsis was initially attributed to a generalized abdominal infection, and possibly secondary to a recent paracentesis. Unfortunately, a CT was not performed when the patient presented with weakness, loss of appetite, and dark urine. Additionally, during the hospitalization, the CT-guided biopsy focused on the mid-abdomen in the area of omental caking, and the appendix was not included in the field of view. It is assumed that the appendix was not ruptured at the time of the CT-guided biopsy, since no free peritoneal air was seen at that time.

Given the timing, the hospital team was appropriately concerned about post-biopsy complications. Complications after omental biopsy are exceedingly rare, but may include hemorrhage, bowel perforation, and infection [20]. One study highlights the safety profile of omental biopsies, with 181 performed with no related complications based on Society of Interventional Radiology guidelines, reported at 24 hours and 3 months [21]. Perforated appendicitis was an unexpected finding on CT, and the CT was valuable for excluding a biopsy complication or pain related to her underlying ovarian cancer. Pathologic examination of her appendix was compatible with carcinomatosis as a potential cause of her appendicitis. Nevertheless, it is important to consider the possibility that her acute appendicitis may have been a coincidental event. Cancer was deemed to be the most probable cause of her appendicitis due to the prominent extent of appendix involvement and the absence of any other clinical, surgical, or histologic findings to suggest another cause. In addition, the incidence of acute appendicitis decreases from 20.5 per 10000 per year in females aged 15-19 to 4 per 10000 per year in women aged 45 years or older, supporting the notion that a random bout of appendicitis would be less likely in this 61-year-old patient [22].

## References:

1. Siegel RL, Miller KD, Fuchs HE, Jemal A. Cancer statistics, 2022. *Cancer J Clin.* 2022;72(1):7-33
2. Doubeni CA, Doubeni AR, Myers AE. Diagnosis and management of ovarian cancer. *Am Fam Physician.* 2016;93(11):937-44
3. Goff BA, Mandel LS, Drescher CW, et al. Development of an ovarian cancer symptom index. *Cancer.* 2007;109(2):221-27
4. Sarı ME, Korkmaz E, Öz M, et al. Risk factors for appendiceal involvement in women with epithelial ovarian cancer. *J Turk Ger Gynecol Assoc.* 2017;18(3):116-21
5. Lengyel E. Ovarian cancer development and metastasis. *American J Pathol.* 2010;177(3):1053-64
6. Goff BA, Mandel L, Muntz HG, Melancon CH. Ovarian carcinoma diagnosis. *Cancer.* 2000;89(10):2068-75
7. Goff BA. Frequency of symptoms of ovarian cancer in women presenting to primary care clinics. *JAMA.* 2004;291(22):2705
8. Esmer-Sánchez DD, Martínez-Ordaz JL, Román-Zepeda P, et al. [Appendiceal tumors. Clinicopathologic review of 5,307 appendectomies]. *Cir Cir.* 2004;72(5):375-78 [in Spanish]
9. Kitano M, Maker AV, Lanier BJ, et al. Appendicitis secondary to metastatic melanoma. *JAMA Surg.* 2014;149(7):735-38
10. Shiota N, Furonaka M, Kikutani K, et al. Appendicitis complicated by appendiceal metastasis via peritoneal dissemination from lung cancer. *Respirol Case Rep.* 2016;4(4):e00164
11. Ozyazici S, Karateke F, Menekse E, et al. Metastasis from prostatic carcinoma causing acute appendicitis: Report of a case. *Int J Surg Case Rep.* 2013;4:409-11
12. Abe T, Sakai H, Hayashi M, et al. Intramural metastasis to the appendix from ascending colon cancer: A case report. *Surg Case Rep.* 2020;6(1):69
13. Malfetano JH. The appendix and its metastatic potential in epithelial ovarian cancer. *Obstet Gynecol.* 1987;69(3 Pt 1):396-98
14. Rose PG, Reale FR, Fisher A, Hunter RE. Appendectomy in primary and secondary staging operations for ovarian malignancy. *Obstet Gynecol.* 1991;77(1):116-18
15. Sonnendecker EW, Margolius KA, Sonnendecker HE. Involvement of the appendix in ovarian epithelial cancer – an update. *S Afr Med J.* 1989;76(12):667-68
16. Ayhan A, Gultekin M, Celik NY, et al. Occult metastasis in early ovarian cancers: Risk factors and associated prognosis. *Am J Obstet Gynecol.* 2007;196(1):81.e1-6
17. Clark SK, Qureshi T, Sen M. Acute appendicitis: An unusual cause. *Postgrad Med J.* 2001;77:123-24
18. Costello C, Saxton J. Appendicitis and cancer. *Postgrad Med.* 1951;9(6):482-86
19. Ayhan A, Tuncer ZS, Tuncer R, et al. Is routine appendectomy beneficial in the management of ovarian cancer? *Eur J Obstet Gynecol Reprod Biol.* 1994;57(1):29-31
20. Vadvala HV, Furtado VF, Kambadakone A, et al. Image-guided percutaneous omental and mesenteric biopsy: Assessment of technical success rate and diagnostic yield. *J Vasc Interv Radiol.* 2017;28(11):1569-76
21. Hill DK, Schmit GD, Moynagh MR, et al. Percutaneous omental biopsy: Efficacy and complications. *Abdom Radiol.* 2017;42(5):1566-70
22. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol.* 1990;132(5):910-25

## Conclusions

Although uncommon, providers should be aware of appendicitis in patients with carcinomatosis with potential appendix involvement. Having a low threshold for ordering abdominal CT studies may be useful when similar advanced stage ovarian cancer patients present with acute abdominal pain in an emergent setting or following abdominal biopsy.

## Department and Institution Where Work Was Done

Graduate Medical Education Department, Community Memorial Health System, Ventura, CA, USA.

## Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.