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## Missed Gastric Cancer Metastasis to the Appendix: Case Report and Literature Review

Authors' Contribution:  
Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
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Funds Collection G

ABDEF 1 **Daeya Alhadid**  
ABE 1,2 **Abdullah AlShammari**  
BD 3 **Hadeel Almana**  
AEF 1,2 **Mohammad Aburahmah**

1 College of Medicine, Alfaisal University, Riyadh, Saudi Arabia  
2 Department of Surgery, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia  
3 Department of Pathology, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

**Corresponding Author:** Daeya Alhadid, e-mail: [dalhadid@alfaisal.edu](mailto:dalhadid@alfaisal.edu)  
**Conflict of interest:** None declared

**Patient:** Female, 54-year-old  
**Final Diagnosis:** Metastatic gastric cancer  
**Symptoms:** Incidental finding  
**Medication:** —  
**Clinical Procedure:** Right extended hemicolectomy  
**Specialty:** Surgery

**Objective:** Rare disease





**Background:** Gastric cancer metastasis to the appendix is a rare condition that might present with symptoms of acute appendicitis or remain asymptomatic and be diagnosed incidentally. This report summaries 6 previously reported cases in addition to the presented case.

**Case Report:** We report a 54-years-old female patient who presented with gastric cancer metastasis to the appendix that was found incidentally in the second surgery when she underwent bowel resection due to bowel entrapment in internal hernia, a complication of her primary gastric cancer surgical intervention. Six case-reports on gastric cancer metastasis to the appendix were reviewed. The metastasis was symptomatic in 4 cases, and solitary in 3 cases. The diagnosis was delayed in 4 cases as there was no evidence of metastasis at the diagnosis of the primary tumor; appendectomy was performed in all cases. The prognosis of the cases varied considerably.

**Conclusions:** We question the real incidence of appendiceal metastasis in gastric cancer, and the benefit-risk ratio of appendectomy in every gastrectomy. Guidelines on management of similar cases is also needed.

**MeSH Keywords:** Abdominal Neoplasms • Appendectomy • Neoplasm Metastasis

**Full-text PDF:** <https://www.amjcaserep.com/abstract/index/idArt/920010>

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## Background

Despite the general decline in the incidence of gastric cancer and the advances in management, it remains one of the most common malignancies and a leading cause of morbidity and mortality worldwide [1,2]. Metastasis of gastric cancer to the appendix is an extremely rare condition, with only a few cases reported in the literature [3–8]. In most reported cases, the appendiceal metastasis presents with symptoms of acute appendicitis. It can, however, remain asymptomatic and be diagnosed incidentally. Herein, we are reviewing all reported cases that we could access, in conjunction with this case.

We report here a case of gastric cancer metastasis to the appendix that was found incidentally after an emergency surgery for bowel entrapment in internal hernia after laparoscopic total gastrectomy with D2 lymph node dissection and Roux-en-Y anastomosis for gastric adenocarcinoma. The final pathology of the resected bowel surprisingly showed metastasis to the normal looking appendix.

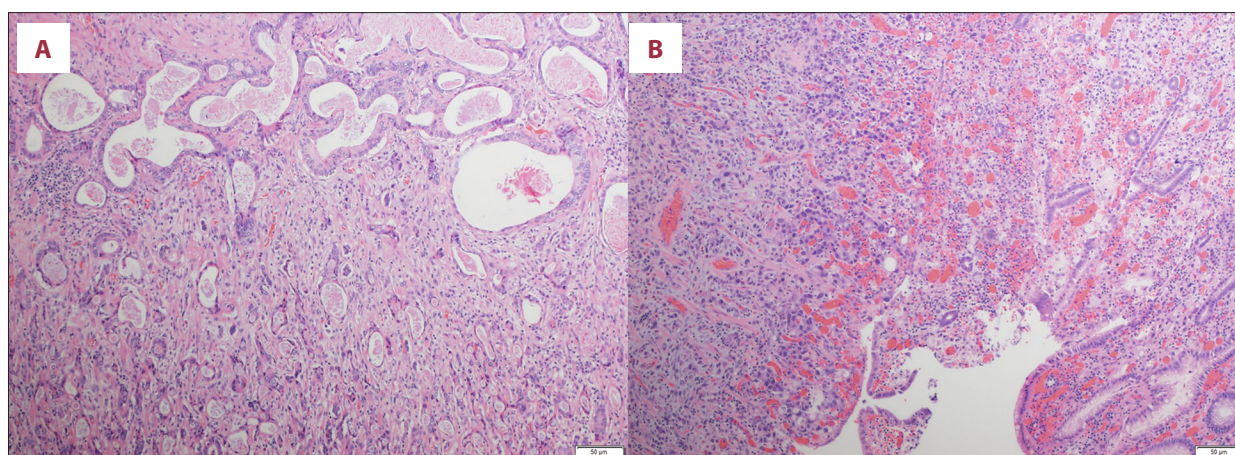
## Case Report

The patient, a 54-year-old female, was referred to our hospital after being initially diagnosed with gastric cancer. Gastroscopy showed a 3 cm gastric mass that was biopsied and found to be invasive adenocarcinoma, diffuse type with signet ring morphology. The patient underwent staging computed tomography (CT) of the chest, abdomen, and pelvis, which showed no appreciated gastric mass, and no metastases or lymphadenopathy within the chest, abdomen, and pelvis. Positron emission tomography (PET)-CT showed no significant focal FDG (18F fluorodeoxyglucose)-avid gastric lesions; with no significant FDG-avid disease elsewhere.

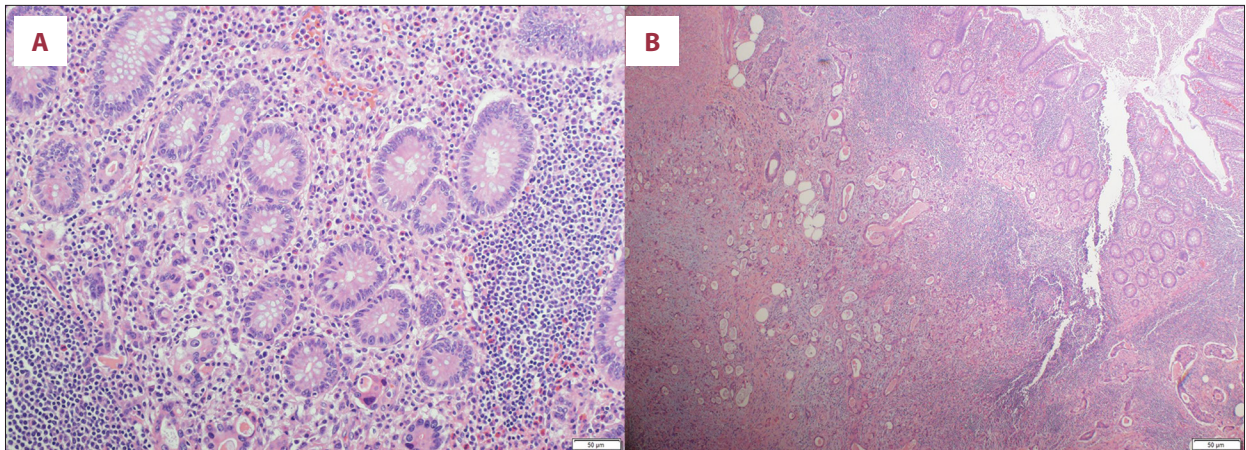
Following diagnosis, the patient underwent a laparoscopic total gastrectomy, esophagojejunal anastomosis and jejunojejunal anastomosis with D2 lymph node dissection. Post-operative pathological report showed mixed intestinal and diffuse type gastric adenocarcinoma with signet-ring morphology, poorly differentiated (G3), infiltrating the full thickness of the gastric wall and extending to the sub-serosal soft tissue; 27 lymph nodes were included in the specimen and all were negative for malignancy; stage pT3, N0, MX (Figure 1). Peritoneal lavage cytology was performed, and the peritoneal fluid was negative for malignant cells.

During the post-operative course, the patient complained of abdominal pain and nausea. Her abdomen was diffusely tender with leukocytosis. CT with contrast was done to rule out any cause of post-operative acute abdomen causes. It showed dilated entrapped colon and internal hernia. The patient was not taken to the operating room and the on-call team decided not to operate on this patient. Surgical exploration was decided immediately after the patient was seen by the primary surgeon. Surgical exploration showed redundant transverse colon entrapped in the internal hernia, proximal colon was severely dilated but not ischemia and not healthy looking, thin walled and was perforated proximal to entrapment point. Right extended hemicolectomy was done because the remnant part of right colon was cecum and was too small to be connected with the transverse colon, thus the decision was made to take it with the specimen removed and to perform ileocolic anastomosis.

The pathological report of the resected colon part including the resected cecum and appendix showed transmural inflammation, ulceration, and granulation tissue and, unexpectedly, a metastatic poorly differentiated adenocarcinoma involving the appendix (Figure 2).



**Figure 1.** Gastric sample showing poorly differentiated carcinoma with focal signet ring morphology, (A) high power, (B) low power (hematoxylin and eosin).



**Figure 2.** Appendix sample showing metastatic poorly differentiated carcinoma with mural involvement, (A) high power, (B) low power (hematoxylin and eosin).

**Table 1.** Summary of previous published cases.

Study	Age	Gender	Time lag	Presentation	Prognosis
Karanikas, 2018 [3]	53	Male	3 years	Acute appendicitis	Signs of recurrence after 4 months
Simpson, 2013 [4]	73	Female	13 months	Acute appendicitis	No evidence of disease recurrence at 2 years
Erçetin, 2016 [5]	32	Female	Simultaneous	Acute appendicitis	Patient died on the second day of chemotherapy
Piña-Oviedo, 2007 [6]	67	Female	Simultaneous	Epigastric pain and abdominal discomfort	N/A
Fu, 2007 [7]	59	Male	1 year	Anal pain	Patient died 1 year after receiving systemic chemotherapy
Lin, 2005 [8]	48	Female	2 years	Acute appendicitis	No evidence of disease recurrence at 1 years

Terminal ileum pathology showed transmural inflammation with granulation tissue and serositis. However, no evidence of malignancy seen.

The patient received 8 cycles of FOLFOX chemotherapy regimen post-operatively. Since then, she remained well and had multiple follow up visits. During the 6-, 12-, and 18-month post-operative follow-up visits, the patient underwent whole body PET-CT which revealed no obvious recurrence at the surgical anastomotic sites, locoregionally or distally. The patient continued to have no evidence of disease recurrence until the time of writing this report.

## Discussion

Gastric cancer is the fourth most common malignancy and the second leading cause of cancer-related mortality worldwide [1]. The disease is associated with poor prognosis with

5-year survival rate of 20% in most countries, and a median survival of around 1 year in metastatic disease. As the early stage of the disease is frequently asymptomatic, most patients are diagnosed at advanced stages [1,2].

Gastric metastasis can occur through lymphatic dissemination or invasion of adjacent structures. Common sites for distant metastases include liver, peritoneum, lungs, adrenal glands, and ovaries [4,7]. Metastasis of gastric cancer to the appendix is an extremely rare condition with only a few cases reported in the literature [3–8]. Table 1 summarizes the data from these cases.

Appendiceal metastasis can remain asymptomatic until diagnosed incidentally by imaging or colonoscopy [6,7]. However, acute appendicitis is the most common presentation in the cases reported in the literature [3–5,8]. The hypothesized mechanism attributes this to the attachment of metastatic cancer cells to the serosa and their infiltration through the



appendiceal wall layers, which may occlude the lumen of the appendix, resulting in obstruction and causing secondary inflammation or even perforation [3,7].

The metastatic tumor presented in all reported cases within 3 years of the diagnosis of the primary tumor. There was no evidence of metastatic disease on primary tumor diagnosis in cases with delayed presentation. Simultaneous diagnosis of the primary and metastatic tumors was present in 2 cases. The staging CT scan, after diagnosis of gastric adenocarcinoma was made, revealed thickening of the wall of the appendix in 1 case [6]. Another case presented with acute appendicitis symptoms, for which appendectomy was performed. The post-operative pathological evaluation of the appendix showed gastric signet-ring cell carcinoma. Gastroscopic biopsy confirmed the diagnosis [5].

Most metastasis to the appendix present solitary in most cases, and further investigations upon diagnosis showed no evidence of metastatic disease involving other organs [3,4,7]. A large amount gelatinous ascites, and omental and peritoneal implants were seen during appendectomy of 1 case, which raised the suspicion of metastatic tumor [5]. Gallbladder involvement and concurrent neurogenous hyperplasia of the appendix was reported in another case [6].

Although it is believed that appendectomy does not improve the survival rate in patients with secondary tumors of appendix, appendectomy was performed in all reported cases. The correct diagnosis of metastatic disease was reached pre-operatively in 1 case only [7]. The rest of the cases were only diagnosed after the surgery, which was performed for acute appendicitis management [3–6,8]. Two patients received chemotherapy post-surgery [5,7]. In the other cases, no further management were considered necessary.

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Metastatic tumors of the appendix arising from gastric primary origin are associated with poor prognosis [9]. The outcome of the reported cases has considerable variation. No evidence of disease recurrence at 1-year or 2-years following resection was reported in 2 cases, respectively [4,8]. One case had recurrence at 4 months [3]. One patient died 1 year after receiving systemic chemotherapy and another died on the second day of chemotherapy from complications associated with tumor lysis syndrome [5,7]. Despite the poor prognosis, solitary appendiceal metastasis does not present a preterminal condition, and an aggressive approach of management is recommended in symptomatic patients [8].

## Conclusions

The review of these scattered cases raises a question regarding the true incidence of appendiceal involvement in gastric tumors, particularly the asymptomatic metastases. The answer of which leads to re-questioning the benefit-risk ratio of performing appendectomy for every gastric oncology surgery. Guidelines on management of such cases, in view of reported patients' prognoses, is also needed.

## Department and Institution where work was done

Department of Surgery, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia

## Conflicts of interest

None.