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The primary aim of *World Journal of Gastrointestinal Surgery* (WJGS, *World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, *etc.*

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Successful resection of colonic metastasis of lung cancer after colonic stent placement: A case report and review of the literature

Yoko Nakayama, Minekazu Yamaguchi, Keisuke Inoue, Shunichi Hamaguchi, Yoshitsugu Tajima

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Abstract

BACKGROUND

Lung cancer is the leading cause of cancer deaths worldwide. Although lung cancer can metastasize to various organs such as the liver, lymph nodes, adrenal gland, bone, and brain, metastases to the digestive organs, especially the colon, are rare.

CASE SUMMARY

An 83-year-old man diagnosed with lung cancer received radiation and chemoimmunotherapy, resulting in a complete clinical response. One year after the initial lung cancer diagnosis, the patient presented with obstructive ileus caused by a tumor in the descending colon. An elective left hemicolectomy was successfully performed after the endoscopic placement of a self-expandable metallic stent (SEMS). Pathologically, the tumor of the descending colon was diagnosed as lung cancer metastasis. The postoperative course was uneventful, and the patient is in good condition 13 mo after surgery, with no signs of recurrence. The previous 23 cases of surgical resection of colonic metastasis from lung cancer were reviewed using PubMed to characterize their clinicopathological features and outcomes.

CONCLUSION

SEMS is useful for obstructive colonic metastasis as a bridge to surgery to avoid emergency operations.

Key Words: Colonic metastasis; Colonic obstruction; Lung cancer; Self-expandable metallic stent; Surgical resection; Case report

Core Tip: Gastrointestinal metastases of lung cancer, especially colorectal metastases, are rare. We report a colonic obstruction caused by lung cancer metastasis to the descending colon, which was successfully treated with left hemicolectomy after endoscopic decompression with a self-expandable metallic stent. Although chemotherapy is the mainstay of treatment for gastrointestinal metastases of lung cancer, successful resection of solitary colonic metastases with prolonged survival suggests that surgical intervention may be the treatment of choice for selected patients with colonic metastasis from lung cancer.

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INTRODUCTION

Lung cancer is the leading cause of cancer deaths worldwide[1]. It is estimated that half of the patients with lung cancer have distant metastasis at initial diagnosis[2]. However, gastrointestinal (GI) metastasis of lung cancer is uncommon[3-7], and metastasis to the colon or rectum is even rarer[3,4,6,7]. In addition, the greater frequency of metastases reported in autopsy cases[3,4,7], compared to clinical cases[2,6,8,9], suggests that lung cancer metastases are generally asymptomatic. Colonic metastases of lung cancer are identified following the development of GI tract symptoms such as abdominal pain, obstruction, and bleeding, and are difficult to diagnose in the early stage of the disease[10-14]. Whether surgery is the optimal treatment for GI metastasis is controversial because lung cancer with GI metastasis is often associated with a poor prognosis[2,5,6,11]. Meanwhile, it has been claimed that surgical resection of GI metastases can alleviate GI symptoms, facilitate subsequent management, including chemotherapy, and improve the patient's quality of life[12,15-17].

Here, we describe a case of a patient with obstructive ileus caused by descending colon metastasis from lung cancer, in whom the metastatic tumor was resected after endoscopic decompression with a self-expandable metallic stent (SEMS). To the best of our knowledge, this is the first report of a successful tumor resection following a metallic colonic stent placement as a bridge to surgery. Decompression of colonic obstruction with a stent avoided emergency surgery and allowed safe tumor resection after the patient's general condition stabilized.

CASE PRESENTATION

Chief complaints

An 83-year-old man presented with epigastralgia and left abdominal pain for 1 mo.

History of present illness

The patient's symptoms had started a month ago, accompanied by poor appetite. No abnormal bowel movements, including constipation, were noted.

History of past illness

The patient had a medical history of type II diabetes mellitus, hyperlipidemia, thoracic aortic aneurysm, and cerebral infarction, which was under control with medical treatment, including anticoagulants. A lung tumor was detected in the right pulmonary hilar region on a computed tomography (CT) scan performed 1 year ago, and he was diagnosed with lung cancer because the transbronchial lung biopsy revealed squamous cell carcinoma. The clinical diagnosis was cT4N2M0 cStageIIIB following a positron emission tomography (PET)-CT scan. There were no obvious findings in the upper and lower GI endoscopic examination. The patient was treated with radiotherapy (60 Gy) and chemotherapy (low dose carboplatin), along with immunotherapy with durvalumab (human monoclonal antibody against programmed cell death-ligand 1), resulting in a complete clinical response of the lung lesion. Thereafter, the patient continued to have an outpatient follow-up for lung cancer. Although prostate cancer was detected during the treatment for lung cancer, it was adequately controlled with hormone therapy.

Personal and family history

The patient denied any family history of malignant tumors.

Physical examination

Physical examination revealed mild left abdominal tenderness; however, no obvious abdominal mass could be palpated. There were no abnormalities in the chest or any neurological findings.

Laboratory examinations

Laboratory data revealed mild anemia with hemoglobin and hematocrit levels of 10.3 g/dL and 31.0%, respectively. Levels of tumor markers (carbohydrate antigen 19-9 and carcinoembryonic antigen) were not elevated. Liver and renal function tests and electrolytes were within the normal range.

Imaging examinations

An upper GI endoscopy for upper abdominal pain detected an early gastric cancer (adenocarcinoma) in the anterior wall of the lower gastric body. In addition, an abdominal CT scan showed a thickening of the descending colon wall near the splenic flexure (Figure 1), suspecting primary colon cancer. A contrast-enhanced whole-body CT scan showed no metastatic lesions, swollen lymph nodes, or relapse of the primary lung cancer. Colonoscopy depicts a mass protruding into the lumen covered with smooth and reddish mucosa, the scope could not be advanced through the lesion (Figure 2A). Gastrografin enema shows an apple core sign with luminal narrowing (white arrow), approximately 3 cm in length, in the descending colon (Figure 2B). A circumferential protruding tumor in the descending colon with stent-induced mucosal changes (Figure 3A). Hematoxylin and eosin (HE) staining, the tumor shows the appearance of squamous cell carcinoma, mainly confined to the submucosal layer (Figure 3B). Immunohistochemical staining for CK5/6, p40, and CDX2. The tumor cells are positive for CK5/6 and p40, and negative for CDX2 (Figure 3C-E). HE staining of the lung biopsy specimen of the patient (Figure 3F). The patient was diagnosed with squamous cell lung cancer.

FINAL DIAGNOSIS

According to the pathological findings, the patient was definitively diagnosed with colonic metastasis from the primary lung cancer.

TREATMENT

The postoperative course was uneventful, and the patient was discharged 16 d after surgery. He received a follow-up medical examination without adjuvant chemotherapy.

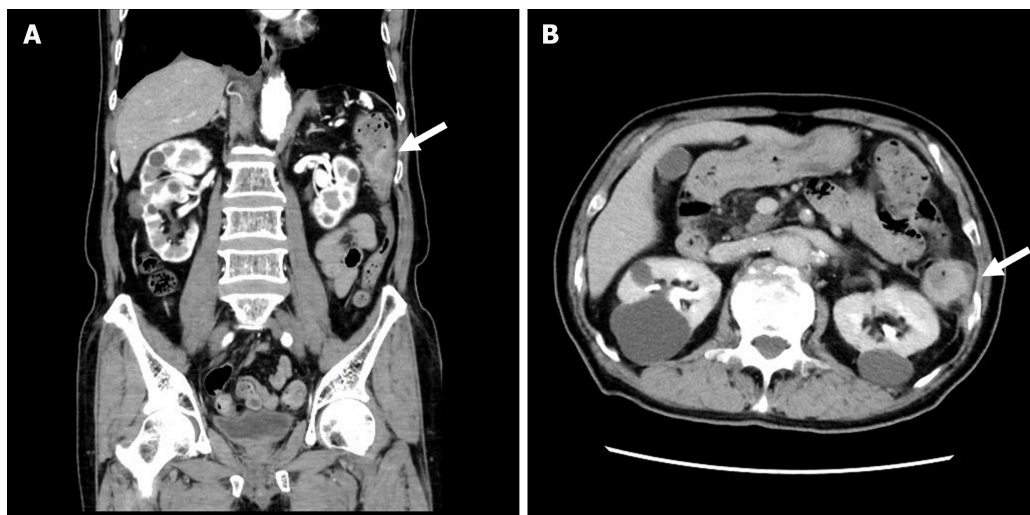
OUTCOME AND FOLLOW-UP

Eleven months after colonic surgery, he underwent endoscopic submucosal dissection for gastric cancer. Histologically, it was a primary gastric adenocarcinoma with successful tumor removal. The patient remained in good condition 13 mo after the colectomy, with no signs of metastasis or relapse of the primary lung cancer.

DISCUSSION

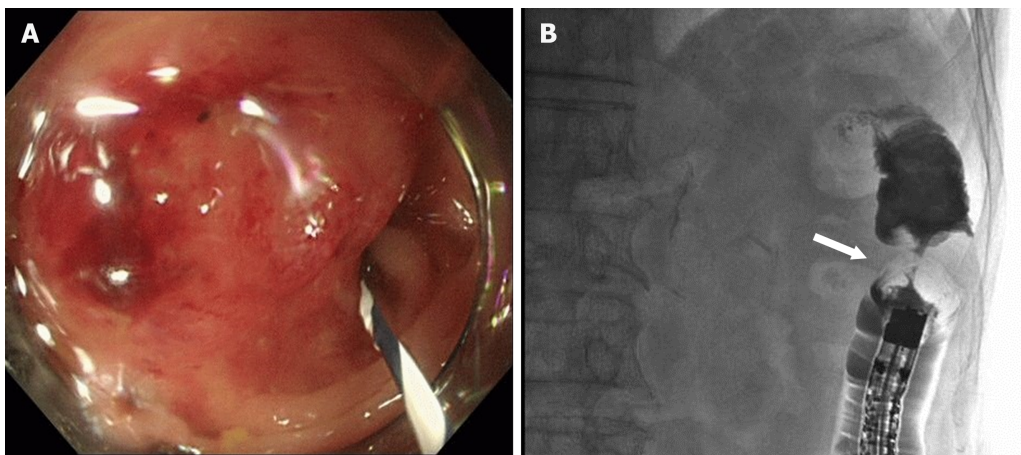
GI metastasis of primary lung cancer is a rare entity. Although a relatively high incidence of GI metastasis of lung cancer has been described in autopsy cases[3,4,7], ranging from 9.7%-14.0%, it is reported to be 0.19%-1.70%[2,9,11,17] in clinical cases, suggesting that the diagnosis of GI metastasis of lung cancer is difficult in clinical practice. Meanwhile, the incidence of GI metastasis shows an increasing trend[6,11], which may reflect the recent increase in the occurrence of lung cancer among women as well as men, more frequent endoscopic examinations performed in general hospitals, and the use of immunostaining study in the differential diagnosis of neoplasms showing an undifferentiated morphology[11]. Although the most frequently affected part of the GI tract by lung cancer is the esophagus[4], where direct invasion is possible, the most frequent site of GI metastasis is the small intestine[6,17]. The mechanism of GI metastasis of lung cancer is considered to be hematogenous and lymphogenous, and mass formation is usually observed in the submucosa of the intestinal wall in GI metastasis[9,12,18]. The small intestine with metastasis is prone to bleeding, perforation, and obstruction[2,3,6,11] because the submucosal layer has abundant blood and lymphatic vessels and a thin wall and small lumen. Colonic metastasis of lung cancer is rare, with an incidence of 2.1%-5.7% in autopsy cases[3-5,7]. Meanwhile, the incidence of colorectal metastases with clinical symptoms is reported to be 0.02%-0.30%[2,11,17], indicating that most patients with colorectal metastases are asymptomatic.

CT and PET-CT studies have been useful in diagnosing colorectal metastases from lung cancer[8,17,19]. Kim *et al*[8] reported that GI metastasis of lung cancer presents as an intraluminal polypoid mass or wall thickening with variable contrast enhancement patterns, predominantly isoattenuation; during colonoscopy, it may be observed as an elevated lesion without ulceration[20,21], a submucosal tumor with ulceration[9,18,22], or single or multiple nodules with or without ulceration[13,23,24]. Lung cancer tissue and metastatic colorectal cancer tissue may yield different results on a panel composed of cancer-related genes[25]; hence, a definitive diagnosis is made by biopsy and histopathological examination, especially confirmed by immunohistochemical staining. Cytokeratin7 (CK7), CK20, and thyroid transcription factor-1 (TTF-1) help distinguish between primary and metastatic colon adenocarcinoma[11,26,27]. In our patient, positive immunohistochemical staining for CK5/6 and p40, specific markers of lung squamous cell carcinoma,



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Figure 1 Abdominal contrast-enhanced computed tomography. A: Coronal section shows a mass lesion (white arrow) protruding into the lumen of the splenic flexure with a slight contrast enhancement; B: Horizontal section shows a mass (white arrow) occupying 3/4 the circumference of the lumen.



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Figure 2 Colonoscopy and subsequent gastrografin enema. A: Colonoscopy depicts a mass protruding into the lumen covered with smooth and reddish mucosa, the scope could not be advanced through the lesion; B: Gastrografin enema shows an apple core sign with luminal narrowing (white arrow), approximately 3 cm in length, in the descending colon.

helped diagnose colonic metastasis of lung cancer. In GI metastasis of lung adenocarcinoma, a combination of CK7 and CK20 may differentiate them from primary GI adenocarcinoma, as primary GI cancers show a CK7(-)/CK20(+) pattern [10,11]. However, owing to the presence of CK7(+) and/or CK20(-) cases in some GI cancers, the addition of TTF-1, which is also a specific marker for lung cancer, can help differentiate primary GI cancers from metastasis of lung cancer [10] because most primary adenocarcinomas are TTF-1 positive. In contrast, metastatic adenocarcinomas of the lung are almost always TTF-1 negative [28].

The prognosis of lung cancer with GI metastasis is reported to be very poor [2,6,9], with an average time of fewer than 3 mo from the diagnosis of GI metastasis to death [2,5,6]. Although chemotherapy is the standard treatment for GI metastases, surgical intervention can be applied in patients with clinical symptoms such as bowel obstruction [17,29,30], intussusception [31,32], and perforation [33]. However, surgery for advanced lung cancer with multiple metastases is highly invasive and worsens the patient's general condition, resulting in various perioperative complications [32-34] with mortality rates of 64%-100% [5,10,35]. Meanwhile, a relatively good prognosis can be achieved when GI metastases are curatively resected [6,10].

A total of 24 cases [12,16,17,22,25,29-34,36-46] of colorectal metastases of lung cancer treated with surgical resection, including our case, have been reported so far (Table 1); this includes 18 male (75%) and 6 female (25%) patients with a median age of 61.5 years (range 49-85 years). The most common symptom was abdominal pain, which presented in 14 patients (58.3%), followed by GI bleeding in 5 (20.8%). Three patients were asymptomatic and incidentally detected on follow-up CT examination for lung cancer. Colonic metastases were synchronous in 9 patients (37.5%) and metachronous in 15 patients (62.5%) with a median term of 11 mo (range 3-24 mo) from diagnosis of lung cancer to the confirmation of colonic metastasis. The number of colorectal metastasis was one in 22 patients and two in 2 patients. The tumors were

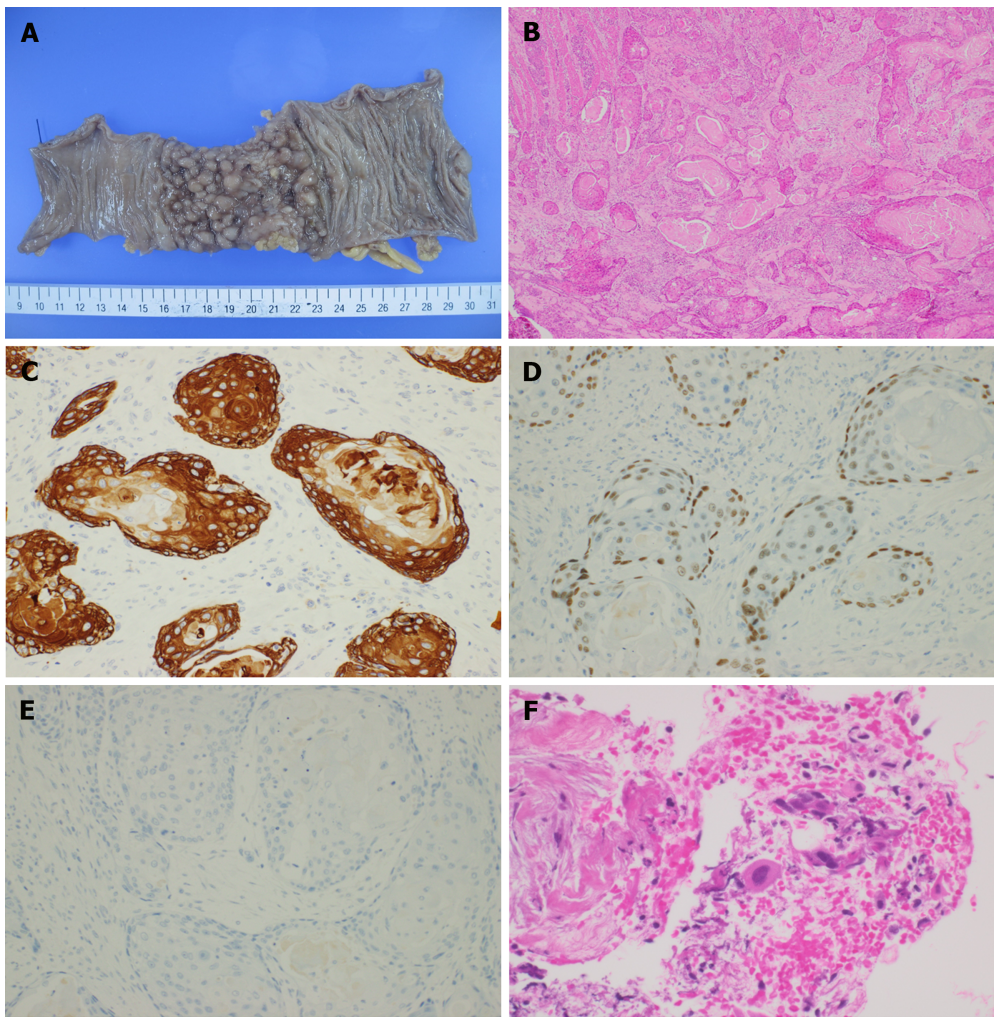
Table 1 Surgically resected cases of colorectal metastases from lung cancer

No.	Ref.	Age	Sex	Initial stage of lung cancer	Treatment for lung cancer	Colorectal metastasis	Colorectal metastasis	Other than the colorectum	Colorectal metastasis	Lung cancer to colorectal metastasis	For colorectal metastasis	Treatment for colorectal metastasis	Colorectal metastasis	Month
1	Johnson <i>et al</i> [36], 1995	50	M	NA	Lobectomy	Rectum	1	None	Sm	12 mo	Rectal bleeding	Abdominoperineal resection of rectum	Dead	19 mo
2	Carr <i>et al</i> [37], 1996	60	F	NA	Pneumonectomy	T-colon	1	None	Sq	12 mo	Rectal bleeding	Extended right hemicolectomy	Dead	24 mo
3	Carr <i>et al</i> [37], 1996	52	F	NA	Lobectomy	T-colon	1	None	ASC	6 mo	Rectal bleeding	Extended left hemicolectomy	Alive	24 mo
4	Carroll <i>et al</i> [38], 2001	68	M	Stage IV	None	S-colin	1	None	Sq	Synchronous	Diarrhoea	Sigmoid colectomy	Dead	6 mo
5	Uner <i>et al</i> [29], 2005	58	M	Stage I B	Lobectomy	D-colon	1	None	Sq	19 mo	Abdominal pain	Left hemicolectomy	Alive	9 mo
6	Miyazaki <i>et al</i> [39], 2005	64	M	Stage III A	Pneumonectomy	Appendix	1	None	Ad	9 mo	Abdominal pain	Ileocecal resection	Dead	12 mo
7	Kim <i>et al</i> [8], 2009	62	M	Stage I B	NA	Colon	1	None	ASC	169 d	Abdominal pain	Operation (unknown details)	Dead	91 d
8	Ono <i>et al</i> [12], 2009	59	M	Stage I A	Lobectomy	D-colon	1	Abdominal LN	Ad	8 mo	Abdominal pain	Left hemicolectomy	Alive	12 mo
9	Rashid <i>et al</i> [32], 2011	57	M	Stage IV	None	Cecum	1	None	PC	Synchronous	Abdominal pain	Right hemicolectomy	Dead	89 d
10	Sakai <i>et al</i> [16], 2012	60	F	Stage IV	Chemoradiotherapy	S-colon	1	None	Sq	6 mo	Abdominal pain	Sigmoid colectomy, partial transverse colectomy	Alive	6 mo
11	Doussot <i>et al</i> [40], 2013	62	M	Stage IV	Chemotherapy	A-colon	1	Bilateral lung metastases	Ad	Synchronous	Abdominal pain	Right hemicolectomy	Dead	6 mo
12	Lin <i>et al</i> [31], 2014	78	M	Stage IV	None	A-colon	2	8 jejunal metastases	PC	Synchronous	Tarry stool	Segmental resection	Dead	3 mo
13	Sifuentes <i>et al</i> [33], 2014	73	M	Stage IV	None	S-colon	1	None	Ad	Synchronous	Abdominal pain	Hartmann's procedure	Dead	2 mo
14	Costa Almeida <i>et al</i> [41], 2015	49	M	NA	Chemoradiotherapy	A-colon, S-colon	2	None	Sm	24 mo	Abdominal pain	Right hemicolectomy, sigmoid loop colostomy	Dead	3 mo
15	Vittorakis <i>et al</i> [22], 2018	49	M	Stage I A	Bilobectomy	A-colon	1	Abdominal LN	Ad	24 mo	Abdominal pain	Right colectomy	Alive	12 mo

16	Choi <i>et al</i> [30], 2019	74	M	Stage IV	None	A-colon	1	Abdominal LN	Ad	Synchronous	Abdominal pain	Right hemicolectomy	Dead	41 d
17	Prabhakaran <i>et al</i> [42], 2020	85	M	Stage IV	Immunotherapy	A-colon	1	None	Ad	Synchronous	Rectal bleeding	Right hemicolectomy	Alive	24 mo
18	Wang <i>et al</i> [25], 2019	47	F	Stage II B	Lobectomy, AC	S-colon	1	None	Ad	3 mo	No	Sigmoid colectomy	Alive	8 mo
19	Pararas <i>et al</i> [43], 2021	72	F	Stage I B	Lobectomy, AC	D-colon	1	Liver, abdominal LN	Sq	24 mo	No	Left hemicolectomy, segmentectomy of liver	Alive	1 mo
20	Bhutta <i>et al</i> [34], 2021	61	M	Stage IV	Chemotherapy	S-colon	1	None	Ad	Synchronous	Dyspnea	Sigmoidectomy	Dead	A few days
21	Catalano <i>et al</i> [44], 2022	78	M	Stage II A	Lobectomy	T-colon	1	Stomach, abdominal LN	Ad	5 mo	No	Partial colectomy	Alive	48 mo
22	Cheng <i>et al</i> [45], 2023	74	M	Stage IV	NA	T-colon	1	None	Sq	Synchronous	Abdominal pain	Partial transverse colon resection	NA	19 mo
23	Luo <i>et al</i> [46], 2022	58	F	Stage IV	Immunochemotherapy	A-colon	1	Ileum, bone, multiple LN	Ad	11 mo	Vomiting	Right hemicolectomy, gastrojejunostomy	NA	NA
24	Present case	83	M	Stage III B	Radiochemoimmunotherapy	D-colon	1	Abdominal LN	Sq	12 mo	Abdominal pain	Left hemicolectomy	Alive	13 mo

M: Male; F: Female; NA: Not available; AC: Adjuvant chemotherapy; T-colon: Transverse colon; S-colon: Sigmoid colon; D-colon: Descending colon; A-colon: Ascending colon; LN: Lymph node; Sm: Small cell cancer; Sq: Squamous cell carcinoma; ASC: Adenosquamous cell carcinoma; Ad: Adenocarcinoma; PC: Pleomorphic carcinoma.

located in the colon in 22 patients, the rectum in one, and the appendix in one. There was no specific distribution of colonic metastases. Seven patients (29.2%) had regional lymph node metastasis of the colorectum[14,28,34,41], and five patients (20.8%) had distant metastasis other than the colorectum such as the liver[46], stomach[47], small intestine[35, 48], bone[49], and the bilateral lung[25]. Most colonic metastases showed the histological appearance of adenocarcinoma (11 patients); squamous cell carcinoma was observed in 7, pleomorphic carcinoma in 2, small cell carcinoma in 2, and adenosquamous cell carcinoma in 2 patients, which were naturally identical to the primary lung cancer. Non-small cell lung cancers, including adenocarcinoma[10,47], squamous cell carcinoma[47], and large cell adenocarcinoma[3,4], are more likely to metastasize to the GI system when compared to small cell carcinomas; a similar finding was observed in colorectal metastases. Colectomy with curative intent was performed in 11 patients and conservative surgery in 13. The median survival after colorectal surgery was 7 mo (range: A few days to 48 mo); 12 mo in patients receiving curative surgery and 3.1 mo in patients with conservative surgery. Patients who underwent curative resection of colorectal metastasis showed a better prognosis. Fujiwara *et al*[15] reported that postoperative survival for patients receiving radical surgery for GI metastases ranged from 40.0 mo to 93.6 mo, compared with 3.7 mo to 14.9 mo for those receiving conservative surgery. Nine patients with primary lung cancer and synchronous GI metastasis had a median survival time of 3.1 mo (range: A few days to 24 mo) after colectomy. On the other hand, 15 patients with metachronous GI metastasis showed a prolonged median survival time of 12 mo (range: 1-48 mo) after colectomy. Fujiwara *et al*[15] reported that the longer the time to metastatic recurrence in the GI tract after pneumonectomy for lung cancer, the longer the survival.



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Figure 3 Macroscopic and microscopic findings. A: A circumferential protruding tumor in the descending colon with stent-induced mucosal changes; B: Hematoxylin and eosin (HE) staining ($\times 40$), the tumor shows the appearance of squamous cell carcinoma, mainly confined to the submucosal layer; C-E: Immunohistochemical staining for CK5/6 (C, $\times 200$), p40 (D, $\times 200$), and CDX2 (E, $\times 400$). The tumor cells are positive for CK5/6 and p40, and negative for CDX2; F: HE staining of the lung biopsy specimen of the patient ($\times 40$). The patient was diagnosed with squamous cell lung cancer.

Although systemic chemotherapy is the standard treatment for lung cancer with GI metastasis, it cannot be used in cases associated with abdominal symptoms, such as abdominal pain, bleeding, and bowel obstruction, due to GI metastasis. Tumor resection[17,30], colostomy[14,48], and SEMS[49], followed by chemotherapy, have been reported in such patients. Although the usefulness of SEMS as a bridge to surgery for primary colorectal cancer is accumulating[50-54], little is known regarding the application of SEMS for metastatic colonic stricture. In our patient, the placement of SEMS for colonic obstruction was useful as a bridge to surgery, and prolonged survival was observed. The SEMS placement had no technical difficulty because the tumor had grown mainly in the submucosal layer without neoplastic changes in the mucosal surface.

On the other hand, the possibility of migration, perforation, and bleeding during a long-term placement of SEMS should be considered. The incidence of SEMS migration has been reported to be 5.6%-7.7% in cases of colonic stenosis caused by non-colonic malignancy with peritoneal carcinomatosis[55,56]. The incidence of perforation related to SEMS is reported to be 4.3%-8.3% in primary colorectal cancer[50,51,54,57]. In particular, bevacizumab-based chemotherapy is associated with a high risk of GI perforation[57]. It has also been claimed that perforation may result in further cancer recurrence and peritoneal dissemination[58,59]. In the present case, curative resection of colonic metastasis was achieved 18 d after SEMS implantation, in which the SEMS allowed careful evaluation of the tumor status and improved the patient's general condition. In cases with solitary GI metastasis associated with GI symptoms, as in our case, SEMS may be useful as a bridge to surgery.

CONCLUSION

We report a rare case of colonic metastasis of lung cancer associated with bowel obstruction. Colonic metastasis was successfully resected following placement of SEMS, and it was suggested that SEMS could be used as a bridge to surgery

to avoid emergency operation and allow a more adequate treatment planning in cases with obstructive colonic metastasis.

FOOTNOTES

Author contributions: Nakayama Y wrote the original draft; Yamaguchi M performed the operation; Hamaguchi S followed up with the patient; Yamaguchi M, Inoue K, and Hamaguchi S contributed to the writing, review, and editing; Tajima Y contributed to the supervision.

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