A Case of Concomitant Small Bowel GIST and Colorectal Cancer Treated by Simultaneous Laparoscopic Resection

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Abstract

This report documents simultaneous laparoscopic resection of a small bowel gastrointestinal stromal tumor (GIST) and transverse colon cancer that were diagnosed preoperatively and concomitantly. The patient was an 88-year-old man who was referred to us when computed tomography (CT) performed as follow-up for prostate cancer revealed what appeared to be a small bowel tumor. Abnormal tracer uptake in the small bowel and transverse colon was observed on FDG-positron emission tomography/CT images, so we performed lower gastrointestinal endoscopy and discovered a type 2 transverse colon cancer. Laparoscopic partial colectomy and partial small bowel resection were performed for a pathological lesion suspected of being GIST, following which a definitive histopathological diagnosis of transverse colon cancer and small bowel GIST were confirmed. Although GIST can be complicated by other malignant tumors, complication by colorectal cancer is uncommon. A literature search revealed only 8 patients who had undergone simultaneous resection for small bowel GIST and colorectal cancer, and 5 of the 8 were treated by open surgery. There are scattered reports indicating that, as in our case, laparoscopy was performed. We present a rare case of concomitant small bowel laparoscopic resection and review the relevant literature.

Key words

Small intestinal GIST, colorectal cancer, laparoscopy

Introduction

Gastrointestinal stromal tumors (GISTs) account for 0.2–0.5% of all tumors of gastrointestinal origin, and of these, 20–30% occur in the small intestine, making it a comparatively rare condition. There has been an increasing number of reports of GIST complicated by malignant tumors, and the combined frequency of the synchronous and metachronous occurrences ranges from 9.3% to 26.8%.1–3) However, reports of concomitant small bowel GIST and colorectal cancer are rare, and in the majority of the reported cases, the small bowel tumor was detected incidentally during surgery for the colorectal cancer, and thus simultaneous resection was performed. In addition, most cases were managed by means of open surgery; very few were managed laparoscopically. This report documents simultaneous laparoscopic resection of a small bowel GIST and transverse colon cancer that were diagnosed preoperatively and concomitantly. We present a rare case of concomitant small bowel laparoscopic resection and review the relevant literature.

Case

The patient was an 88-year-old man with a history of prostate cancer for whom follow-up computed tomography (CT) revealed what appeared to be a
small bowel tumor. His medical history included stroke, appendicitis, but no impaired glucose tolerance. Contrast-enhanced abdominal CT had been performed, and a neoplastic lesion with unclear margins and that measured 4 cm along the major axis was seen in the small intestine. Inhomogeneous internal contrast enhancement and extramural invasion were noted, but no intestinal obstruction, surrounding lymph node enlargement, or any other abnormality was observed in any other organ (Fig. 1), and the patient was referred to us.

In the absence of symptoms, we first obtained outpatient blood tests that showed a hemoglobin concentration of 9.3 g/dL, which was indicative of microcytic hypochromic anemia. As for tumor marker concentration, the level of carcinoembryonic antigen (CEA) was 1.1 ng/mL (reference value: <5.0 ng/mL) and cancer antigen 19–9 (CA19-9) was 6.5 U/mL (reference value: 37.0 U/mL).

The lesion was examined by means of 18F-fluorodeoxyglucose positron emission tomography/CT (FDG-PET/CT), which showed abnormal tracer uptake. The maximum standardized uptake value (SUVmax) was 8.3, consistent with a small bowel tumor. The small intestinal tumor noted on CT did not adhere to or infiltrate the surroundings as it moved in the pelvis (Fig. 2). Abnormal uptake in the transverse colon, with an SUVmax of 18.6 was also depicted (Fig. 3).

Lower gastrointestinal endoscopy was then performed, and a type 2 tumor that occupied about three fourths of the lumen of the transverse colon was detected and biopsied (Fig. 4). Histopathologically, the tumor was shown to be a moderately to highly differentiated adenocarcinoma. Subsequent barium enema revealed circumferential stenosis of the right transverse colon (Fig. 5). The small bowel tumor showed no adhesion in the periphery or invasion, and neither surrounding lymph node enlargement nor a disorder of intestinal passage was observed. Metastatic tumor, small bowel cancer, lymphoma etc. were suspected, but it was diagnosed that the possibility of GIST was higher than the above findings. Small bowel tumors can be difficult to diagnose even after an invasive examination, and because the patient was elderly, we wanted to avoid such an examination. If GIST is suspected, resection is the first choice, and after obtaining the patient’s informed consent, it is our policy to perform simultaneous resection of colon cancer and small bowel tumor.

Although our patient was older but appeared to be able to withstand surgery, we performed laparoscopically assisted surgery under a diagnosis of transverse colon cancer (cT3N0M0, c Stage IIa) and suspected small intestinal GIST because stenosis due to the colon cancer and progression of anemia were observed. The surgery was performed as follows: A 4-cm incision was made in the epigastrium, 1 port was placed in the incision, and 3 additional abdominal ports were placed. Upon laparoscopic examination, a small tumor was found in the jejunum, approximately 20 cm caudal to the ligament of Treitz. The pneumo-
peritoneum was suspended, and traction was applied to the section of small intestine containing the tumor. The section was exteriorized through the epigastric incision, and the tumor was resected extracorporeally. Because the transverse colon cancer was mainly on the right, the pneumoperitoneum was re-established, and laparoscopic D2 lymph node dissection was performed. We then mobilized the section of colon between the hepatic flexure and ascending colon, applied traction, exteriorized the section head, and performed a partial colectomy (transverse colon). All anastomoses were functional end-to-end anastomoses. We were guided in our decision making by the patient’s advanced age and the fact that his performance status was between 3 and 4.

Upon macroscopic inspection of the surgical specimens, the cancer in the transverse colon measured approximately 55 mm x 35 mm and was determined to be a type 2 transverse colon cancer. The tumors in the small intestine appeared to be solid submucosal tumors with indistinct margins that occupied a section of small intestine measuring 35 mm x 35 mm. A solid submucous tumor covered with normal mucosa was also present that protruded outside the intestinal tract (Fig. 6).

Histopathologically, the cancer was classified as a type 2, 55 x 35 mm, tub1>tub2, pT3, int, ly0, v1, pN0, PM0, DM0, pStage IIa, CurA transverse colon cancer. Spindle-shaped cells proliferating in fascicles were seen upon examination of the small bowel tumors (Fig. 7). The cells were immunohistochernically positive for c-kit and CD34 (Fig. 8a, b), and small bowel GIST was diagnosed. The GIST was 35 mm in maximum diameter, the MIB-1 proliferation index was <1%, and the mitotic count was < 5/50 per high-power field. The tumor was classified as a low-risk tumor according to both the modified Fletcher system and Miettinen system.

The postoperative course was good, there were no complications, and the patient was transferred to a rehabilitation hospital on postoperative day 34. The

Figure 3. FDG-PET/CT also showed abnormal uptake of tracer (SUVmax = 18.6) in the transverse colon.

Figure 4. Gastrointestinal endoscopy depicted a type 2 colorectal cancer that occupied three fourths of the luminal diameter of the transverse colon.

Figure 5. Barium enema performed after the endoscopic examination revealed circumferential stenosis of the right transverse colon.
Upon macroscopic inspection, solid tumors measuring 4 cm were observed.

A proliferation of spindle-shaped cells is seen.

A patient died of pneumonia 18 months after the surgery, but without any sign of tumor recurrence.

**Discussion**

GIST is widely defined as a mesenchymal tumor originating in the gastrointestinal tract and derived from the interstitial cells of Cajal (ICCs), which function as pacemakers for gastrointestinal peristalsis. Due to mutations in the c-Kit gene, these tumors show overexpression of c-Kit protein, a receptor tyrosine kinase, but the definition also includes tumors that do not fall into a c-Kit mutation class. The various GISTs comprise 0.2–0.5% of all tumors of gastrointestinal origin, with 60–70%, 20–30%, and 5% onset in the stomach, small intestine, and colon, respectively. Small bowel GIST is the most difficult to diagnose upon imaging, and early detection is challenging because patients are often asymptomatic when the tumors are small. Fujita et al. studied patients with gastric or small bowel GIST and reported that whereas 48.5% of patients with incidentally detected gastric GIST were asymptomatic, 95% of patients with small bowel GIST had some kind of symptoms. The prognosis of small bowel GIST is less favorable than that of gastric GIST, with reports indicating a 10-year-survival rate of 80.4% for gastric GIST vs. 42.4% for small bowel GIST.

With respect to GIST concomitant with malignant tumors, Agaimy et al. reported that of 4777 cases of GIST, 444 (9.3%) were complicated by a synchronous or metachronous malignant tumor. Approximately half of these complicating cancers were of gastrointestinal origin, with colorectal cancer accounting for 22%. Non-gastrointestinal cancers that complicate cases of GIST include prostate cancer, lymphoreticular tumors, and breast cancer.
lon cancer and GIST are presented simultaneously in our case. The etiologies of those neoplasms are suspected as follows: (1) those two neoplasms were occurred incidentally and unrelated, (2) those two neoplasms share common pathogenesis, or (3) one tumor promotes the onset of the other. To date, pathogenesis of those two neoplasms is considered to be incidental occurrence and unrelated. When GIST is diagnosed, it is also necessary to examine the patient for gastrointestinal cancer including colorectal cancer.

We searched ICHUSHI Web using the key words "small intestinal GIST" and "colorectal cancer", and, after excluding academic meeting abstracts, we found 8 reported cases of concomitant small bowel GIST and colorectal cancer (Table 1). In addition, in this case only GIST was found in the preceding case, two cases diagnosed with GIST and colorectal cancer before surgery were diagnosed with colorectal cancer in advance, and one case was postoperative, 5 cases were diagnosed intraoperatively. For colorectal cancer cases, CT examination was performed for all cases in the search of metastases before surgery, so the interpretation of the CT examination seemed to be important for finding other lesions. Three of the cases were diagnosed preoperatively and treated simultaneously by laparoscopic resection, which has become increasingly popular, and the other 5 cases were treated by open surgery. The case reported herein brings the total number to 9, with a mean maximum GIST diameter of 61.3 mm (35–90 mm) for tumors resected laparoscopically and a smaller mean maximum GIST diameter of 27.4 mm (7–50 mm) for those treated by open surgery. This difference in size might be due to the fact that laparoscopic surgery allows for a more comprehensive examination of the abdominal cavity, even though there are fewer opportunities to directly palpate the gastrointestinal tract. Small bowel tumors were identified intraoperatively by means of palpation in 2 of the 5 patients who underwent open surgery. However, palpation is useful only when extra-intestinal invasion is seen upon visual inspection; otherwise, small bowel lesions are difficult to detect. Laparoscopic surgery will be performed increasingly in the future, and thus we believe that the opportunities for palpation will decrease, and this might in turn decrease opportunities for intraoperative diagnosis.

If this scenario unfolds, preoperative examination will increase in importance. When we searched ICHUSHI Web using the keyword "small intestinal GIST" (excluding academic society abstracts) for the 5 years between 2010 and 2014, we found a total of 43 cases. We added these 43 cases to the cases, including ours, shown in Table 1 and thus identified 52 reported cases in which attempts were made to diagnose small bowel GIST by means of CT. The mean maximum diameter of the GIST for all cases was 47.9 mm (range: 3–170 mm), and the mean maximum diameter of the GIST for the 33 cases identified preoperatively by means of CT was 61.6 mm (range: 20–170 mm). It was not possible to identify the tumors on the CT image in the remaining 19 cases. The mean maximum tumor diameter in these cases was 27.3 mm (range: 3–60 mm), significantly smaller.

### Table 1. Reported cases of concomitant small bowel GIST and colorectal cancer.

<table>
<thead>
<tr>
<th>Report year</th>
<th>Author</th>
<th>Age</th>
<th>Sex</th>
<th>Cancer onset site</th>
<th>Colorectal cancer p stage</th>
<th>GIST Onset site</th>
<th>GIST Timing of diagnosis</th>
<th>GIST Maximum diameter (mm)</th>
<th>Surgical method</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Kusano et al.</td>
<td>70</td>
<td>Woman</td>
<td>Ascending colon</td>
<td>II</td>
<td>Ileum</td>
<td>Intraoperative</td>
<td>15</td>
<td>Laparotomy</td>
</tr>
<tr>
<td>2008</td>
<td>Tsujimoto et al.</td>
<td>92</td>
<td>Man</td>
<td>Transverse colon</td>
<td>II</td>
<td>Ileum</td>
<td>Intraoperative</td>
<td>50</td>
<td>Laparotomy</td>
</tr>
<tr>
<td>2009</td>
<td>Ogawa et al.</td>
<td>68</td>
<td>Woman</td>
<td>Ascending colon</td>
<td>IIIa</td>
<td>Jejunum</td>
<td>Intraoperative</td>
<td>70</td>
<td>Laparoscopy</td>
</tr>
<tr>
<td>2010</td>
<td>Kanazawa et al.</td>
<td>65</td>
<td>Woman</td>
<td>Sigmoid colon</td>
<td>II</td>
<td>Jejunum</td>
<td>Intraoperative</td>
<td>15</td>
<td>Laparotomy</td>
</tr>
<tr>
<td>2013</td>
<td>Yagi et al.</td>
<td>87</td>
<td>Woman</td>
<td>Transverse colon</td>
<td>II</td>
<td>Jejunum</td>
<td>Intraoperative</td>
<td>50</td>
<td>Laparotomy</td>
</tr>
<tr>
<td>2013</td>
<td>Yagi et al.</td>
<td>84</td>
<td>Woman</td>
<td>Ascending colon</td>
<td>II</td>
<td>Ileum</td>
<td>Postoperative</td>
<td>7</td>
<td>Laparotomy</td>
</tr>
<tr>
<td>2013</td>
<td>Nanno et al.</td>
<td>77</td>
<td>Man</td>
<td>Ascending colon</td>
<td>IIIa</td>
<td>Ileum</td>
<td>Preoperative</td>
<td>50</td>
<td>Laparoscopy</td>
</tr>
<tr>
<td>2016</td>
<td>Tsukamoto et al.</td>
<td>70</td>
<td>Woman</td>
<td>Cecum</td>
<td>I</td>
<td>Ileum</td>
<td>Preoperative</td>
<td>90</td>
<td>Laparoscopy</td>
</tr>
<tr>
<td>2018</td>
<td>Our case</td>
<td>88</td>
<td>Man</td>
<td>Transverse colon</td>
<td>II</td>
<td>Jejunum</td>
<td>Preoperative</td>
<td>35</td>
<td>Laparoscopy</td>
</tr>
</tbody>
</table>
than that of tumors that could be identified on the CT image (p <0.01).

According to the GIST treatment guidelines, it is difficult to identify lesions of approximately 2 cm with no gastrointestinal invasion\(^{10}\), and it is preferable to obtain 3-dimensional data by means of multi-detector CT (MDCT) with a slice thickness of 2 mm instead of 5 mm. The small bowel GIST in our case measured 35 mm and was relatively large and easy to identify. Radiologists must exercise caution when interpreting diagnostic images, and we believe that MDCT is useful for diagnosis. As noted in the surgical treatment guidelines, the characteristics of the GIST should be thoroughly understood, but surgeons who are experienced in performing laparoscopic surgery can safely resect gastric and small bowel GISTs measuring <5 cm by considering the site of origin\(^{10}\).

We believe that the diagnosis of small-diameter tumors will increase the likelihood of management by laparoscopic surgery. Recently, laparoscopic surgery has tended to be selected due to its minimal invasiveness, and although it was a retrospective study, one report showed the usefulness of laparoscopic surgery in the elderly\(^{11}\).

Based on the above, we believe that it is important to perform careful preoperative diagnosis to facilitate the performance of simultaneous laparoscopic resection of concomitant GIST and colorectal cancer, as in the present case, although a possible limitation is whether it is possible to perform diagnosis using CT scans when the tumor diameter is approximately 2 cm. However, the reported cases indicate that small bowel GISTs with a diameter of 15 mm have been identified using MDCT\(^{12}\), and we believe that MDCT will prove to be useful for the diagnosis of small GISTs. We have also seen a number of fairly recent reports documenting the diagnosis of small bowel lesions by means of capsule endoscopy or double-balloon endoscopy\(^{13,14}\), and increasing the diagnostic potential of these types of examination may be useful for the diagnosis of these tumors. The recurrence rate of small bowel GIST is high\(^{15}\), making conscientious diagnosis important.

**Conclusion**

This report documents a case of concomitant small bowel GIST and transverse colon cancer that were diagnosed preoperatively and then resected simultaneously under laparoscopic guidance. The preoperative diagnosis of concomitant diseases allowed us to perform simultaneous laparoscopic resections.

In comparison to open surgery, laparoscopic surgery yields fewer opportunities for intraoperative palpation. This means that with widespread adoption of laparoscopic resection, preoperative diagnosis will become increasingly important.

**References**

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