

## Case Report

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# Laparoscopic Surgery for Colon Cancer with Intestinal Malrotation: A Case Report and Review of the Literature in Japan

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### Abstract

Colorectal cancer with intestinal malrotation is very rare, while intestinal malrotation is one of congenital anomaly that is rare in adults. We thus report a case of sigmoid colon cancer with intestinal malrotation treated by laparoscopic surgery. A 39-year-old woman was admitted to our hospital with constipation. A colonoscopy revealed the sigmoid colon tumor. Three-dimensional abdominal enhanced computed tomography showed that small and large intestines occupied the right- and left-side of the abdominal cavity, respectively. Her diagnosis was the sigmoid colon cancer with nonrotation type of intestinal malrotation, and she underwent laparoscopic sigmoidectomy. There have been 43 cases reports of colorectal cancer with intestinal malrotation who underwent laparoscopic surgery in Japan medical literatures. Colorectal cancer was in the right-side in 69.8% of these cases, although that in the left-side is generally more common. Three-dimensional abdominal enhanced computed

tomography angiography can reveal vascular anatomic anomalies to allow laparoscopic surgery to be performed safely.

**Keywords:** Colorectal cancer; Intestinal malrotation; Laparoscopic surgery

**Abbreviations:** CT- Enhanced computed tomography; SMA- Superior mesenteric artery; SMV- Superior mesenteric vein; IMV- Inferior mesenteric vein

## **1. Introduction**

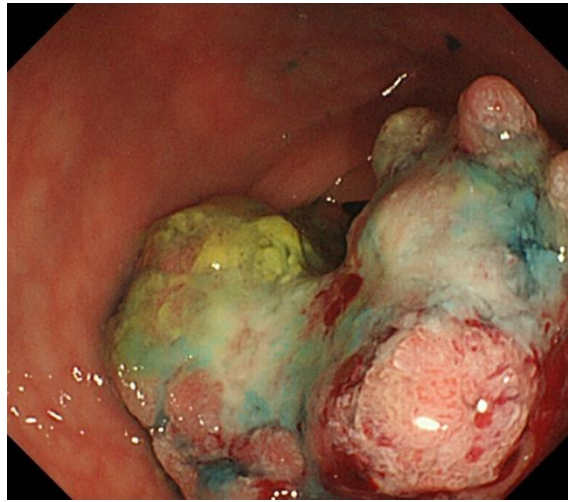
Intestinal malrotation tract is rare, and occurs in around 1 in 6000 live births. Colorectal tumors are common, with an incidence of more than 1 million new cases each year [1, 2]. When the two are combined it can create a diagnostic conundrum that may delay diagnosis and inevitably lead to disease progression. Malrotation of the intestinal tract is believed to stem from incomplete rotation and fixation of the bowel during development. In normal embryogenesis, week 5 signifies a 270°clockwise rotation of the gut around the superior mesenteric artery (SMA) following enlargement of the midgut portion, then, at week 10, the tract normally attaches to the posterior aspect of the abdominal cavity. If this process is interrupted at any point, then intestinal malrotation will result [3]. Malrotation typically presents in the first month of life - it is rare to find cases or complications from childhood disease in adults.

Patients with colorectal cancer has gradually increased, and colorectal cancer for women and men were ranked as the second and third in 2007 Japan, respectively [4]. Recently, the laparoscopic procedures for colon cancer has been commonly undergone. However, laparoscopic procedures of colorectal cancer with intestinal malrotation has not yet been established due to rare incidence of intestinal malrotation, and it is difficult to understand the abnormal anatomies.

This case, and 42 cases who had been previously performed laparoscopic surgery in Japan, highlight the need to review new findings and three-dimensional computed tomography angiography is used to safe and effective to treat with colorectal cancer by laparoscopic surgery.

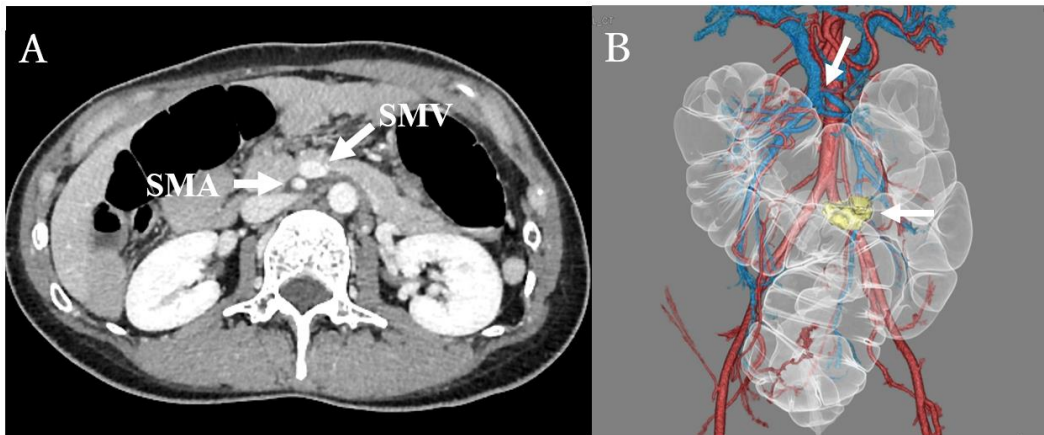
## **2. Case Presentation**

A 39-year-old Japanese woman was admitted to our hospital with constipation. A Borrmann type II tumor located at the 30 cm from the anal verge by the colonoscopy (Figure 1).



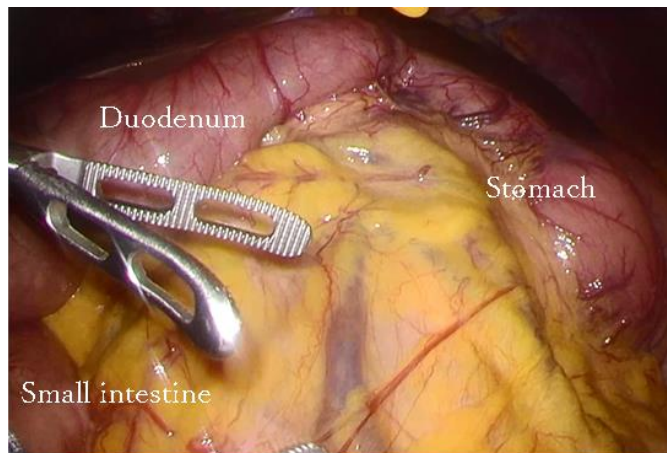
**Figure 1:** Preoperative examinations. Gastrointestinal endoscopy revealed the tumor at the sigmoid.

A tumor was indicated as thick walls by abdominal enhanced computed tomography (CT), and located in the left-side of the abdominal cavity. Lymph nodes swelling at the paracolic region was present in the absence of distant metastatic lesions. The superior mesenteric vein (SMV) was located on the left side of the SMA in the three-D-CT (Figure 2A), and that the inferior mesenteric vein (IMV) flowed to the SMV (Figure 2B). Consequently, laparoscopic sigmoidectomy was scheduled.



**Figure 2:** (A) Enhanced CT revealed a superior mesenteric artery (SMA) in the right-side and a superior mesenteric vein (SMV) in the left-side. (B) 3D-CT revealed inferior mesenteric vein (IMV) flow to the SMV (arrow) and the tumor in the sigmoid colon (yellow).

At the laparoscopy, the small and large intestine occupied in the right-side and the left-side of the abdominal cavity, respectively. The marked tumor was found in the sigmoid colon. The ligament of Treitz could not found (Figure 3), and the cecum and ascending colon were not fixed to the retroperitoneum. The patient was diagnosed with sigmoid colon cancer with nonrotation type of intestinal malrotation. We performed sigmoidectomy with D3 lymph node dissection.



**Figure 3:** At the laparoscopy, the most of small intestine occupied the right-side of the abdominal cavity with no existence of the Treitz ligament.

Histopathological examination revealed a well-differentiated tubular adenocarcinoma, and tumor invaded the serosa with three lymph node metastases (pT4aN1bM0; pStage IIIB). The patient was discharged on the 23th postoperative day. At the time of this writing, she is doing well without recurrence at 21 months postoperatively.

### 3. Discussion

The intestinal malrotation induces midgut volvulus or intestinal obstruction in infants, and most cases of intestinal malrotation present within several months after birth [5]. It is difficult to diagnose of intestinal malrotation in adults, due to remain asymptomatic, in addition, colorectal cancer with intestinal malrotation is very rare. Most cases of intestinal malrotation are found by chance when they were examined abdominal examinations or surgeries in adults. From 2007 to 2020, 43 cases of colorectal cancer with intestinal malrotation including the present case, underwent laparoscopic surgery in Japan (Table 1) [6].

	(2007~2020)		
<b>Age (n=39)</b>		67.2±14.2 (39~90)	68 <sup>a</sup>
<b>Sex</b>	Male	32 (74.4)	(55.8)
	Female	11 (25.6)	(41.2)
<b>Location</b>	Appe	1	(0.3)
	C	11	(7.4)
	A	12	(14.3)
	T	6	(9.8)
	D	0	(4.7)
	S	6	(25.4)
	Rs	1	(11.9)
	R	6	(26.2)
<b>Type of malrotation (n=34)</b>	Non rotation	24	
	Malrotation	9	
	Reserved rotation	1	

Indicated in the references, age; n=39, type; n=34; (); the percentage in parentheses; a: Case treated in 2007 (Multi-institute registry of Large Bowel Cancer in Japan)

**Table 1:** Background in the 43 patients, who had undergone a laparoscopic surgery for colorectal carcinoma with intestinal malrotation.

We reviewed the available literature on this topic in Japan, and found that the rate of patients with colorectal cancer with intestinal malrotation occurred in the right- and left-side were 69.8% and 30.2%, respectively. Surprisingly, the rate of colorectal cancer in the right-side with intestinal malrotation was higher than that of left-side. In 2007 Japan, the rate of colorectal cancers in the right-side and left-side was 31.8% and 68.2%, respectively [7]. Commonly, the rate of colorectal cancer in the left-side is predominant to that in the right-side. The reason for the right-side predominance in the colorectal cancer with intestinal malrotation is unknown. However, since the midgut portion is the cause of the intestinal malrotation, the colon cancer may also be located at the midgut portion, from the cecum to the transverse colon.

The malrotation types are the most common of the four types, including nonrotation, malrotation, reversed malrotation and paraduodenal hernia [8]. Indeed, in the current review, 24 of 34 cases were nonrotation type.

As the surgical approach, laparoscopic surgery is more recently performed, while open surgery was more common previously. In 2007, Yamamoto et al. firstly reported that laparoscopic surgery could be performed for ascending colon cancer with nonrotation type of intestinal malrotation [9], while 43 cases have undergone laparoscopic surgery from 2007 until now in Japan. The laparoscopic surgery has been rapidly adopted for the treatment of colorectal cancers with lymph node dissection, and the quality of laparoscopic procedure is progressing in many countries. It is difficult to safely perform vascular ligations and lymph node dissection by laparoscopic surgery because most cases with intestinal malrotation have arterial abnormalities [10]. Therefore, an exact understanding of the vascular anomalies is preoperatively important to perform safety in the laparoscopic surgery. Three-D-CT angiography is useful for examine abnormalities of the artery, when laparoscopic surgery for colorectal cancer with intestinal malrotation is performed.

The majority of patients with colorectal cancer with intestinal malrotation are male, and the cancer is more frequently present in the right-side. If intestinal malrotation is diagnosed preoperatively, three-D-CT angiography would be used to understanding of the vascular anomalies, due to perform safety in the laparoscopic surgery.

### **Competing Interests**

The authors declared that they have no competing interests.

### **Consent for Publication**

The informed consent for publication and presentation was obtain from the patient.

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### **Authors' Contribution**

MY participated in the drafting of the manuscript. KS, HY, TG, YT and HK acquired data, and MT diagnosed pathological examinations. All authors read and approved the final version of manuscript.

### **Acknowledgment**

The authors have no competing of interests to declare. This manuscript was approved by the ethics committee in the hospital.

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