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Case Report

# Laparoscopy-Assisted Distal Gastrectomy for an Early Gastric Cancer Patient With Situs Inversus Totalis

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**Situs inversus totalis (SIT) is a congenital condition in which there is complete right to left reversal of the thoracic and abdominal organs. This report describes laparoscopy-assisted distal gastrectomy (LADG) for an early gastric cancer patient with SIT. The preoperative diagnosis was c-stage IA (cT1a cN0 cH0 cP0 cM0). LADG with D1+ dissection and Billroth-I reconstruction was successfully performed by standing at the opposite position. The operating time was 234 minutes and blood loss was 5 mL. Although a mechanical obstruction occurred after surgery, the patient recovered after re-operation with Roux-en-Y bypass.**

*Key words:* Situs inversus – Laparoscopy – Stomach neoplasm – Minimal blood loss

Early gastric cancer is almost curable by gastrectomy with appropriate nodal dissection.[1] The standard treatment for early cancers is open gastrectomy.[2] However, laparoscopy-assisted distal gastrectomy (LADG) is widely selected when tumors are located at the middle to distal third of the stomach, because of cosmetic benefits and a better quality of life. Moreover, the safety of LADG has been confirmed in several retrospective[3,4] and prospective studies.[5–7]

Situs inversus totalis (SIT) is a relatively rare condition found in 1 per 4000 to 8000 persons.[8] SIT is an autosomal recessive congenital defect in which an abdominal and/or thoracic organ is positioned at a "mirror image" of the normal position, in the sagittal plane. SIT is frequently accompanied by vascular abnormalities.[9] For patients with SIT, some

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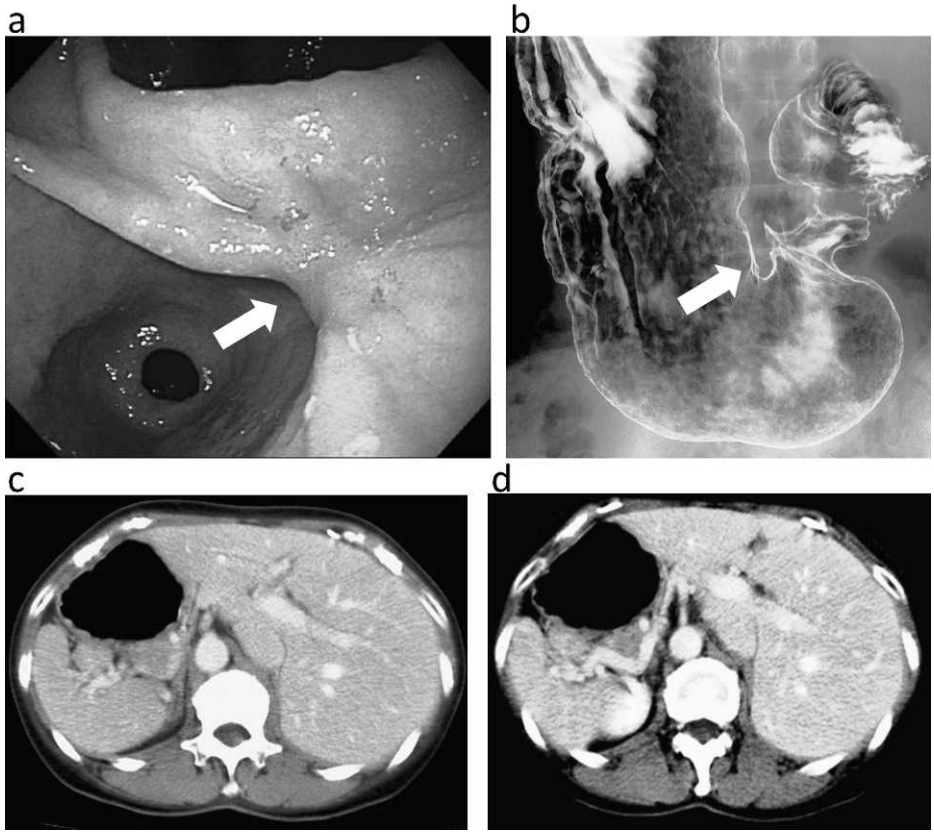


**Fig. 1** (a, b) Upper gastrointestinal endoscopy and gastrointestinal imaging study show a superficial lesion with a slight depression and convergence of the mucosal fold due to an ulcer scar (0-IIc+III) on the anterior side of the lesser curvature of the gastric body. (c, d) Enhanced abdominal CT identified no metastasis to the lymph nodes and distant organs. No vascular anomaly was observed.

investigators have reported the use of laparoscopic surgery, including laparoscopic cholecystectomy, laparoscopic exploration of the common bile duct, laparoscopic sigmoidectomy, and LADG. So far, only 5 investigators have reported experiences with LADG for patients with gastric cancer and SIT.[10–14] In one case report, the extent of the lymphadenectomy was not described, and the details were unclear.[10] In 3 cases,[11–13] a D1 + β resection was performed, but no abnormal course of the blood vessel was found. Only one case reported the abnormal course of the right gastric artery, which was bifurcated from the aorta.[14] To successfully complete LADG for patients with SIT, the accumulation of more cases is necessary so that the risks and characteristics can be better understood and tips for making the procedure easier can be given. We here report a rare case of LADG with D1+ nodal dissection and Billroth-I reconstruction in a patient with early gastric cancer and SIT.

## Case Report

A 60-year-old female was admitted for the treatment of gastric cancer detected by a health check program. SIT was diagnosed via chest X-ray and computed tomography (CT). Upper gastrointestinal endoscopy and gastrointestinal imaging identified a superficial lesion with slight depression and convergence of mucosal fold due to an ulcer scar (0-IIc) on the anterior side of the lesser curvature of the gastric body (Fig. 1a and 1b). An endoscopic biopsy revealed moderately differentiated adenocarcinoma. Preoperative enhanced CT identified no metastasis to the lymph nodes and distant organs. No vascular anomaly was found (Fig. 1c and 1d). Therefore, the patient was clinically diagnosed with M0P0H0T1aN0, stage IA gastric cancer, according to the Japanese Classification of Gastric Carcinoma.[15]

The whole procedure was performed with the surgeons in the opposite position of that for

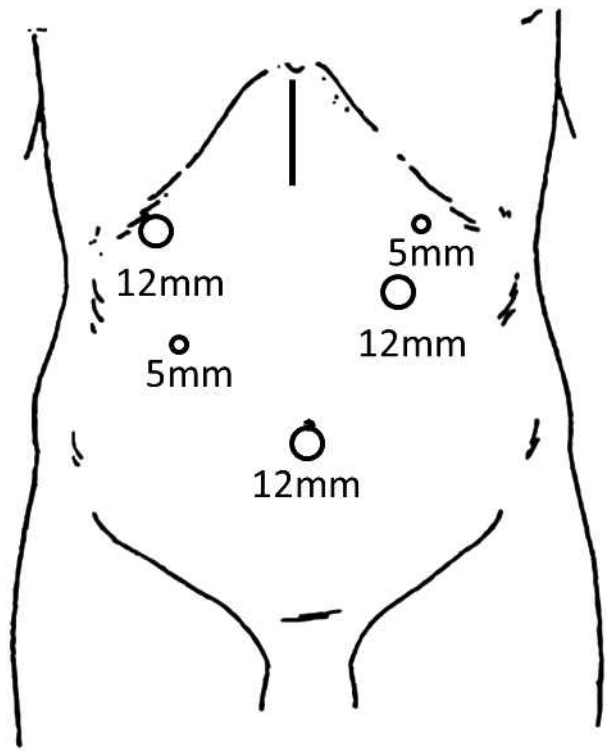


**Fig. 2** The sites of trocar placement.

standard LADG. The surgeon initially stood on the right side of the patient for dissection of the subpyloric nodes and thereafter on the left side of the patient for the dissection of the other nodes and the reconstruction. The first assistant stood on the other side of the surgeon. The camera operator stood at the patient's feet. A camera port was created below the umbilicus by an open technique. Another 4 trocars were inserted into the left and right subcostal area and bilateral abdominal regions, as shown in Fig. 2.

At first, the surgeon stood on the right side of the patient. Dissection was initiated from the separation of the omentum 5 cm away from the pedicle of the right gastro-epiploic artery. Then, the omentum was resected at the layer above the anterior membrane of the transverse colon. After taking down the mesentery of the transverse colon, the gastro-colic vein was exposed. Then, the route of the gastro-epiploic vein was exposed and resected. The area of the subpyloric node was dissected to expose the head of the pancreas, and the route of the gastro-epiploic artery was resected.

Then, the surgeon stood on the left side of the patient. After the supra-duodenal arteries were resected, the route of the right gastric artery was exposed and resected. After that, the nodal dissection above the pancreas was initiated from the left to the right side of the patient. The common hepatic and the splenic artery were exposed. The left coronary vein located at the superior border of the pancreas was resected. Thereafter, the celiac artery and the left gastric artery were identified, revealing a relatively large accessory left hepatic artery branching from the celiac artery (Fig. 3a). Then, the left gastric artery was resected.

The nodal dissection was completed and a 4-cm incision was made at the middle of the epigastric region. The stomach was pulled out of the peritoneal cavity through the small incision. Reconstruction was performed by Billroth-I using a circular stapler. The anvil head of a circular stapler was inserted into the resected duodenum. The main unit of the circular stapler was introduced into the remnant stomach, and the center rod was introduced at the posterior side of the remnant stomach. The anastomosis was constructed (Fig. 3b). The operating time was 234 minutes, and blood loss measured by the weight increase of gauzes was 5 mL. The histopathologic examination showed a 0-IIc

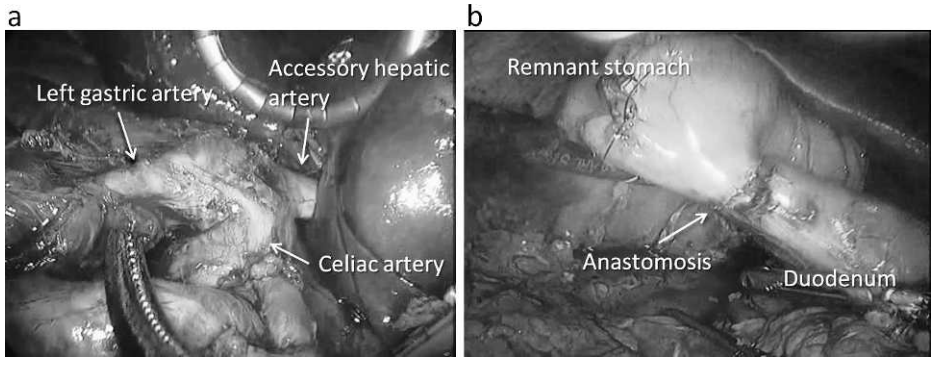


**Fig. 3** (a) The accessory left hepatic artery was branched from the celiac artery. (b) Billroth-I reconstruction was performed.

*Table 1 Profiles of reported cases of LADG for a patient with SIT*[a]

| No. | Author | Year | Age | Sex | Dissection of lymph node | Anomaly of vessel | Operating time (min) | Blood loss (mL) | Standing position |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Yamaguchi *et al* | 2003 | 76 | M | Unknown | Unknown | Unknown | Unknown | Unknown |
| 2 | Futawatari *et al* | 2010 | 53 | M | D1 + β[16] | None | 300 | 350 | Opposite |
| 3 | Kang *et al* | 2010 | 60 | M | D1 + β[16] | Right gastric artery from aorta | 160 | 100 | Opposite |
| 4 | Inoue *et al* | 2011 | 73 | M | D1 + β[16] | None | 296 | 190 | Opposite |
| 5 | Kyung and Ki | 2011 | 60 | M | D1 + β[16] | None | 200 | 70 | Usual side |
| 6 | Present case | 2012 | 60 | F | D1 + [2] | Accessory left hepatic artery from celiac artery | 234 | 5 | Opposite |

[a]Dissection of lymph node, based on Japanese gastric cancer treatment guidelines 2010 (ver. 3)[2] and Guidelines for Diagnosis and Treatment of Carcinoma of the Stomach, April 2004 edition.[16]

lesion located at the lesser curvature of the gastric body, measuring 4.0 × 3.0 cm in size, moderately differentiated adenocarcinoma, ly0, v0, n0, and stage IA (pT1[sm], pN0, sH0, sP0, sM0).

A mechanical obstruction occurred after surgery. Conservative treatment was ineffective, and open surgery was selected. Re-operation revealed that the anastomosis adhered tightly to each other in front of the pancreas. Roux-en-Y bypass was selected considering the risk of injury to the remnant stomach, duodenum and/or, pancreas. The postoperative course was favorable. The patient was discharged 8 days after the second operation. The patient is still alive without recurrence or symptoms 3 years after surgery.

## Discussion

SIT is a relatively rare anomaly that occurs at incidence of 1 in 4000 to 8000 of the population. SIT could be accompanied by cardiopulmonary malformation, including familial long QT syndrome, total esophageal duplication, agnathia, and several urologic anomalies. Typically, the frequency of cardiovascular anomaly is 10 times the normal one. In our case, major vascular abnormalities were not found.

This tumor was clinically diagnosed as a mucosal tumor with differentiated histology, but it had a maximum diameter greater than 2 cm. For such tumors, the current Japanese Gastric Cancer Treatment Guidelines 2010[2] recommend gastrectomy and D1+ lymph node dissection as a standard treatment, based on the uncertainty of the clinical diagnosis and a possibility of nodal metastasis.[16] Therefore, gastrectomy with nodal dissection was selected in this case.

Three previously reported cases were performed with the surgeon standing opposite the standard of surgery.[11,12,14] The authors mentioned that they did not have any difficulties performing the operation in a mirror image point of view. Only one case was performed by standing in the standard position.[13] This author reported that the mirror image led to confusion (Table 1). We could safely perform the dissection itself by reversing the position of the surgeons. In usual procedures without SIT, the right hand, which is the dominant hand, uses the ultrasonic cut and coagulation device for resecting the membrane and dissecting lymph nodes, while the left hand uses laparoscopic forceps. However, we had to use these instruments in the reverse hand in this patient. Thus, surgeons have to be able to use the ultrasonic cut and coagulation device with the nondominant hand when operating on patients with SIT. Moreover, more careful operation than usual is necessary for preventing vascular or organ injuries. In our case, as a result, LADG with D1+ dissection and Billroth-I reconstruction was completed in 234 minutes with 5 mL bleeding. In many of the earlier reports of LADG, the blood loss was more than 200 or 300 mL.[17] However, the reported blood loss has decreased in recent articles owing to the improvement in surgical skills, instruments, and energy devices, as well as a better understanding of the laparoscopic anatomy. Recently, we reported that the median blood loss was only 35 mL in a prospective series of 193 cases.[5] In this patient with SIT, the blood loss was only 5 mL. Because this patient was thin, with a body mass index of 20.8, there was little visceral fat observed during surgery. Most major arteries were therefore detectable without difficulty. Moreover, the tumor was a T1 tumor without nodal metastases, and no vascular anomalies were found in this patient. Our

experience suggests that a skillful laparoscopic surgeon can complete LADG for patients with SIT without much blood loss if the case is not surgically difficult from the viewpoint of the tumor and patient factors.

In this patient, mechanical obstruction occurred after surgery. This was caused by adhesion of the anastomosis to the pancreas tightly. The reconstruction technique we selected in this patient was the one frequently selected for Billroth-I anastomosis. Moreover, the anastomosis was successfully formed. Thus, we considered that this complication was not related to the SIT, but was an error related to the procedure itself.

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