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# Palliative surgery for advanced gastric cancer: Partial gastrectomy using the inverted laparoscopic and endoscopic cooperative surgery method

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## ABSTRACT

**INTRODUCTION:** Laparoscopic and endoscopic cooperative surgery (LECS) is a minimally invasive hybrid procedure that facilitates the precise dissection of gastrointestinal malignancies. We report the use of LECS as palliative treatment for a patient with advanced gastric cancer at a high risk due to comorbidities. **PRESENTATION OF CASE:** A 68-year-old woman with general malaise was admitted to the hospital and received multiple transfusions for anemia. Endoscopy examination detected an ulcerative lesion in the stomach. She was at high risk due to comorbidities including liver cirrhosis (Child-Pugh score B), aortic stenosis, and coronary artery stenosis requiring operative treatment.

**DISCUSSION:** Imaging revealed no evidence of metastasis. We resected the tumor using LECS to control bleeding. Postoperatively, there were no short-term complications, and there was no recurrence during 6-month follow-up.

**CONCLUSION:** LECS as palliative treatment may be a viable option for high-risk patients with advanced gastric cancer.

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## 1. Introduction

Laparoscopic and endoscopic cooperative surgery (LECS), which was developed to facilitate precise dissection of gastrointestinal malignancies, is a type of minimally invasive surgery that can be used to resect gastrointestinal tumors (GISTs). [1] The LECS technique was recently used for a lateral-spreading, intra-mucosal early gastric cancer (EGC) meeting the extended criteria for endoscopic submucosal dissection (ESD) [2]. We report our experience with LECS as palliative treatment for a patient with advanced gastric cancer at high risk due to comorbidities. This work is reported in line with SCARE criteria [3].

**Abbreviations:** LECS, laparoscopic and endoscopic cooperative surgery; GISTs, gastrointestinal stromal tumors; EGC, early gastric cancer; ESD, endoscopic submucosal dissection; SN, sentinel lymph node; ICG, indocyanine green.

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## 2. Presentation of case

A 68-year-old woman presented to the hospital with physical deconditioning. She had blood in the stool beginning 1 day before admission and required transfusion. Gastroscopy and upper gastrointestinal series demonstrated a 3 × 5-cm tumor (type 3) at the greater curvature of the stomach (Fig. 1a, b). Tissue biopsy showed signet-ring cell carcinoma. The values of serum tumor markers (CEA and CA19-9) were within normal limits, and computed tomography showed no lymph node or distant metastasis; therefore, the patient was diagnosed with stage IB cT2N0M0 gastric carcinoma. We initially planned to treat her with laparoscopic distal gastrectomy, but we found that she had liver cirrhosis (Child-Pugh score, 9 points, class B; liver damage, class B), severe aortic stenosis, and unstable cardiac angina (left anterior descending branch with 75% stenosis and right coronary artery with 90% stenosis) that required operative treatment under general anesthesia. Her medical history also included a 30-year history of diabetes mellitus that was treated with insulin. Although surgery was necessary for hemostasis, we performed partial gastrectomy with LECS as palliative treatment due to her comorbidities. Informed consent regarding the advantages and disadvantages of this operation was obtained from the patient.

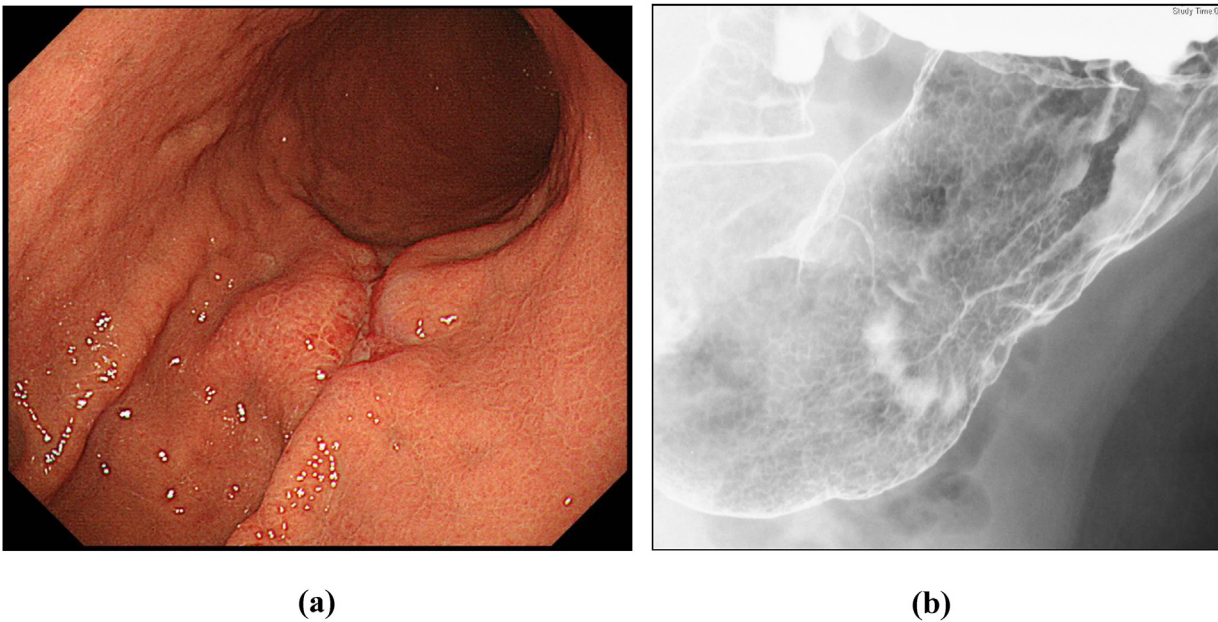


Fig. 1. Gastric tumor at the greater curvature of the stomach. (a) Endoscopy. (b) Gastrointestinal series.

Inverted LECS using the crown method was performed [2]. On initial observation of the abdominal cavity, there was no ascitic fluid, peritoneal metastasis, or distant metastasis. The liver showed severe cirrhosis. The tumor was located at the greater curvature of the lower gastric body. First, we dissected the omentum near the tumor to obtain a secure resection margin. At that time, we isolated an enlarged lymph node (#4d) and submitted it for intraoperative pathologic diagnosis for staging. Pathology was negative for malignancy. After endoscopy was performed to confirm the tumor location, the endoscopist marked the tumor edge with a 5-mm margin and injected glycerin into the submucosal layer immediately surrounding the tumor. The marked area was cut circumferentially following the ESD procedure. The appropriate dissection line was easily identified because of endoscopic submucosal resection around the tumor, and it was confirmed both laparoscopically and endoscopically. Next, to prevent contact between the tumor and visceral tissue, we placed sutures around the edges of the stomach incision and lifted the stomach wall from the peritoneal cavity like a bowl. We resected the tumor laparoscopically and dropped it into the gastric cavity (Fig. 2a). After placing the tumor in the bag, the edge of the incision line was closed temporarily using hand-sewn sutures. The incision line was properly closed using a laparoscopic stapling device (Fig. 2b). The operative time was 215 min, and the estimated intraoperative blood loss was 0 mL. The postoperative course was good, and no obvious stenosis was identified during postoperative fluoroscopy. Postoperative pathologic examination demonstrated the following: 58- × 45-mm tumor with negative lateral and vertical margins; general classification, type 3; histological type, poorly differentiated adenocarcinoma and signet-ring cell carcinoma; infiltration depth, to the muscularis propria; growth pattern, diffuse; vein thrombosis, minimal; lymphatic invasion, none; and lymph node metastases, none (0/3). Gastroscopy and computed tomography performed 6 months postoperatively showed no anastomotic recurrence or metastasis.

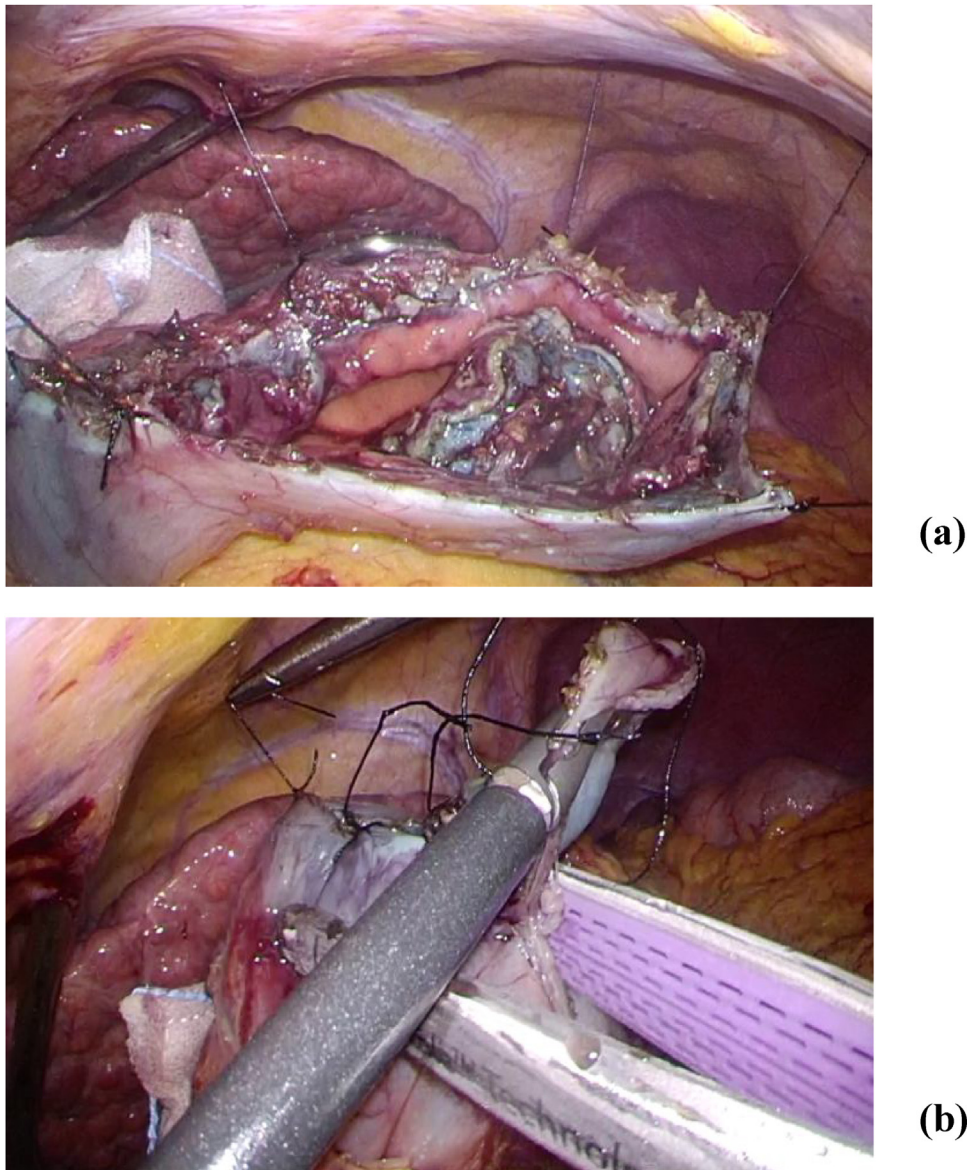
### 3. Discussion

LECS combines laparoscopic and endoscopic procedures, thus representing a hybrid approach that was introduced as a minimally invasive technique for submucosal tumor resection. Seeding of tumor cells into the peritoneal cavity must be prevented; there-

fore, we used a LECS technique to avoid spread of gastric fluid and contact between the tumor and surrounding tissues. Other advantages of LECS are that the tumors are observed both intraluminally and extraluminally and that the gastric wall is dissected layer by layer. We commonly use a laparoscopic seromuscular dissection (LSD) technique for intraluminal GISTs at our institution [4]. This procedure is greatly advantageous for the treatment of esophagogastric junction tumors because it enables precise resection without abdominal cavity perforation.

For this patient, laparoscopic distal gastrectomy with lymph node dissection was required according to the Japanese gastric cancer treatment guidelines [5], but palliative surgery was performed due to comorbidities [6,7]. Nunobe et al. reported the use of LECS for EGCs that would be difficult to treat with ESD, including large lesions (>30 mm diameter) located at the greater curvature of the gastric body or fornix or lesions with significant ulceration. We used this technique to determine the exact dissection line and provide an adequate resection margin when approaching from the exterior of the stomach. We prevented contact of the tumor with visceral tissue by pulling the stomach up using several stitches at the edge of the remnant stomach. Therefore, we could better ensure the precise location of the dissection line using inverted LECS versus LSD.

In contrast, lymph node metastases are common in patients with advanced gastric cancer [8]. Wang et al. [9] reported a systematic review evaluating the diagnostic value of sentinel lymph node (SN) biopsy for gastric cancer. They concluded that the concept of SN biopsy is technically feasible for gastric cancer, especially for patients with early T stage (T1) disease, with the use of combined tracers and submucosal indocyanine green (ICG) injections. However, recruitment of patients for the Japan Clinical Oncology Group (JCOG) 0302 study was terminated midway due to the high false-negative rate [10]. The classification of lymph node metastasis that should be deemed the best predictor of prognosis remains controversial [11]. If the SN concept is established as a component of surgical treatment for gastric cancer, then the indications for LECS for EGC could be expanded, resulting in increasingly successful gastric cancer treatment. Although further studies are needed to confirm the best procedure and standard criteria, this technique may be adapted as palliative surgery, as in the current case, to provide minimally invasive treatment. For each patient, it is nec-



**Fig. 2.** Intraoperative findings.  
 (a) The laparoscopically resected tumor was dropped into the gastric cavity like a bowl.  
 (b) The incision line was properly closed using a laparoscopic stapling device.

essary to determine the best treatment approach after explaining the positive and negative aspects of the available options.

#### 4. Conclusion

LECS was successfully used as minimally invasive palliative treatment for a high-risk patient with advanced gastric cancer.

#### Conflicts of interest

None of the authors have any financial conflict of interest related to this manuscript.

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#### Ethics approval and consent to participate

Ethical Review Board of Onomichi General Hospital gave approval, OJH-201831.

#### Consent for publication

This patient consented to the reporting of this case in a scientific publication.

#### Authors contribution

All authors mentioned in this manuscript have contributed to the interpretation of data, and drafting, and writing of this manuscript. Hitomi Takechi is the first author of this paper. Nobuaki Fujikuni is the corresponding author. Hitomi Takechi, Nobuaki Fujikuni and Yuki Takemoto conceived and designed the study and drafted the manuscript. Nobuaki Fujikuni first diagnosed this condition in the patient. Hitomi Takechi, Nobuaki Fujikuni, Yu-

ki Takemoto, Hironobu Amano, Masahiro Nakahara, and Toshio Noriyuki were engaged in the patient's care in our hospital including surgery. Kazuaki Tanabe contributed to the concept of our study, review of the final manuscript, and submission of the paper. All coauthors read and approved the final manuscript.

#### Registration of research studies

researchregistry4245.

#### Guarantor

Nobuaki Fujikuni.

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