Feasibility of laparoscopic and endoscopic cooperative surgery for gastric submucosal tumors (with video)

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Background and Aims: Laparoscopic gastric resection is widely used for gastric submucosal tumors (SMTs). However, determining an appropriate resection line using only the laparoscopic approach is difficult. We developed a laparoscopic and endoscopic cooperative surgery (LECS) technique by combining laparoscopic gastric resection with endoscopic submucosal dissection, and we have used this procedure to resect gastric SMTs. In this study, the procedure is presented and its safety and feasibility for resecting gastric SMTs are evaluated.

Methods: This retrospective study included 100 patients who underwent LECS for SMTs at the Department of Gastroenterological Surgery, Cancer Institute, between June 2006 and November 2014. The demographics, tumor histopathologic characteristics, and operative and follow-up data were reviewed.

Results: Complete resection with negative surgical margins was achieved in all patients, and LECS was performed regardless of tumor location. The mean operation time was 174.3 minutes, with an estimated blood loss of 16.3 mL. In addition, the mean time until the initiation of oral intake was 1.4 days, and the mean postoperative hospital stay was 8.4 days. Moreover, no local or distant tumor recurrence was observed. The only severe adverse event was leakage, which was observed in 1 patient.

Conclusions: LECS was performed with a reasonable operation time, low blood loss, and minimal adverse events. Therefore LECS is safe and feasible for resecting gastric SMTs. (Gastrointest Endosc 2016;84:47-52.)

INTRODUCTION

Gastric submucosal tumors (SMTs) are occasionally found during upper GI endoscopy. Local excision with negative surgical margins is the standard surgical procedure for gastric SMTs, including GI stromal tumors (GISTs).[1,2] Recently, laparoscopic gastric resection has been widely used for GISTs, which benefits the patient because the technique is less invasive than open gastric resection.[3,4] However, determining an appropriate resection line is difficult during laparoscopic gastric resection for gastric SMTs, because these tumors are covered by the normal gastric wall. Therefore, excessive resection may result in postoperative transformation of the stomach and gastric stasis.

To facilitate appropriate resection, we developed a laparoscopic and endoscopic cooperative surgery (LECS) technique that combines laparoscopic gastric resection with endoscopic submucosal dissection (ESD), and we have used this procedure to resect gastric SMTs. In this procedure, the tumor location and an appropriate resection

Abbreviations: EGJ, esophagogastric junction; ESD, endoscopic submucosal dissection; GIST, gastrointestinal stromal tumor; LECS, laparoscopic and endoscopic cooperative surgery; SMT, submucosal tumor.

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line are confirmed endoscopically, and followed by submucosal dissection using intraluminal endoscopy. The seromuscular layer is then dissected laparoscopically, and the incision line is closed using a laparoscopic stapling device. We first applied LECS to gastric SMTs without ulcerative lesions because we worried that tumor cells would seed into the peritoneal cavity; the procedure was named "classic LECS." The maximum tumor size was limited to a diameter of 50 mm, regardless of the location, according to the indications for laparoscopic resection of GISTs suggested by the National Comprehensive Cancer Network.[5] Recently, we have applied LECS to SMTs with ulcerative lesions and early gastric cancer that would have been difficult to treat using ESD because of scarring or broad lateral spreading.[6]

Although LECS has recently been approved for insurance coverage by the National Health Insurance plan in Japan, only a few small case series regarding LECS have been published. In this study, the LECS technique is presented and its safety and feasibility for the resection of gastric SMTs is evaluated.

PATIENTS AND METHODS

Patients

We retrospectively reviewed a database of 105 consecutive patients with gastric tumors who underwent LECS at the Department of Gastroenterological Surgery, Cancer Institute Hospital (Tokyo, Japan), between June 2006 and November 2014. Two patients were excluded from this study because LECS was converted to open surgery to suture the incision line, which included the esophagogastric junction (EGJ), after complete resection of the tumor. In addition, 3 patients were excluded because LECS was converted to proximal gastrectomy. Therefore, 100 patients were ultimately included in the study, and their demographics, tumor histopathological characteristics, and operative and follow-up data were reviewed.

This study was approved by the clinical research review board of the Cancer Institute Hospital. The requirement for informed consent was waived because of the retrospective study design.

Indication for LECS

LECS was indicated for gastric SMTs with a maximum diameter of 50 mm, regardless of tumor location.

The LECS technique

LECS was performed as described by Hiki et al,[7] and the procedural details are described in the following paragraphs.

Setup for laparoscopic surgery. The patient was placed in the lithotomy position under general anesthesia. The operator stood at the patient's right side, the first assistant stood at the patient's left side, and the laparoscopist stood between the patient's legs. The endoscopic operator and assistant were positioned at the patient's head.

A camera port was inserted via a 12-mm port in the umbilicus, using an open technique. Four additional ports (three 5-mm ports and one 12-mm port) were inserted into the left upper, left lower, right upper, and right lower quadrants, respectively, under pneumoperitoneum (10 mm Hg). A 12-mm port was used when the manipulation of the stapling devices was limited by the location of the tumor, such as in the EGJ.

Confirmation of tumor location and blood vessel preparation. The tumor location was confirmed via intraluminal endoscopy (H260; Olympus, Tokyo, Japan). Biopsy forceps were used to exert pressure on the mucosal side of the stomach wall to confirm the location of the tumor on the laparoscopic image. The blood vessels in the excision area were prepared using an ultrasonically activated device (Harmonic Ultrasonic Scalpel; Ethicon Endo-Surgery, Cincinnati, Ohio) or Ligasure (Tyco Healthcare, Tokyo, Japan). We recommend that the area of blood vessel manipulation be minimized to prevent postoperative gastric stasis.

Endoscopic submucosal resection around the tumor and laparoscopic seromuscular dissection. The periphery of the tumor was carefully marked using a standard needle-knife with a forced 20-W coagulation current (ESG-100; Olympus, Tokyo, Japan) as close as possible to the tumor edge. After injection of 10% glycerine into the submucosal layer, a small initial incision was made using a standard needle-knife in the 100-W Endo-Cut mode, and the tip of an IT-2 knife (KD-611L; Olympus, Tokyo, Japan) was inserted into the submucosal layer. The marked area was then cut circumferentially, using the IT-2 knife (Fig. 1A) in the 100-W Endo-Cut mode. The opening of the submucosa was then pushed toward the serosa using a standard needle-knife. The tip of the standard needle-knife, which could be seen on the laparoscopic image (beyond the seromuscular layer), was used to perforate the seromuscular layer. The tip of the IT-2 knife was inserted into the perforation, and seromuscular dissection was initiated along the incision line of the submucosal layer (Fig. 1B). The full-thickness incision was performed endoscopically with laparoscopic assistance as far as possible, and the remaining part of the full-thickness wall dissection was performed laparoscopically.

After the tumor had been resected, the edge of the incision line was temporarily closed using hand-sewn sutures (Fig. 1C). The incision line was then closed using a laparoscopic stapling device (Fig. 1D and E). For tumors located near the EGJ or pyloric ring, closure of the gastric wall was performed using the laparoscopic hand-suturing technique or a laparoscopic stapling device.

The tumors were removed in a bag (Endo Catch; Tyco Healthcare, Tokyo, Japan), and an air-leak test was performed using endoscopic insufflation of the stomach. Anastomotic bleeding was evaluated using both