

Laparoscopic Assisted Proximal Gastrectomy with an Esophago-gastric Anastomosis Using a Knifeless Endoscopic Linear Stapler

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Abstract

Laparoscopic surgery has been accepted as a standard option for early gastric cancer. Laparoscopic proximal gastrectomy with esophago-gastrostomy would be an ideal minimally invasive surgery for early gastric cancer of the upper third if gastroesophageal reflux could be properly prevented. A laparoscopic assisted procedure using a knifeless endoscopic linear stapler for the esophagogastric anastomosis was performed for three patients with early gastric cancer of the upper third. The postoperative course was uneventful in all patients. No patients exhibited symptoms suggestive of acid reflux, such as heartburn, chest pain, or chronic cough. The mean percent body weight loss at 12 months in comparison to the preoperative weight was 5.3%. The body weight of patients who underwent laparoscopic assisted proximal gastrectomy recovered more quickly than those who underwent laparoscopic total gastrectomy which performed during the same period. This procedure was therefore found to be a feasible modality for early gastric cancer of the upper third of the stomach.

Key words: Proximal gastrectomy, Laparoscopic surgery, Gastric cancer, Linier stapler

Introduction

The incidence of upper gastric cancer has been increasing in Japan^{1),2)}. Total gastrectomy is considered to be the standard operation for an advanced gastric cancer of the upper third of the stomach. Proximal gastrectomy in patients with early gastric cancers has several advantages in comparison to total gastrectomy, such as a shorter operation, less postoperative body weight loss and fewer nutritional deficiencies^{3),4),5)}. However, a higher incidence of postoperative gastro-esophageal regurgitation has also been reported with the esophagogastric anastomosis⁶⁾. In open surgery, several techniques for the esophagogastric anastomosis to prevent gastro-esophageal reflux have been reported^{7),8)}. Laparoscopic proximal gastrectomy was first reported by Kitano et

al. in 1999⁹⁾. Laparoscopic surgery has now become accepted as a standard option for early gastric cancer. Laparoscopic proximal gastrectomy has not become widespread because there has been a lack of a secure method for laparoscopic anastomosis to prevent reflux. A laparoscopic procedure using a knifeless endoscopic linear stapler for the esophagogastric anastomosis that was associated with an excellent postoperative function was reported by Okabe et al¹⁰⁾. In the present study, we confirmed that using this novel procedure made it possible to achieve successful esophagogastric anastomosis with an excellent postoperative function. We used an additional mini-laparotomy for the esophagogastric anastomosis and this additional mini-laparotomy makes the esophagogastric anastomosis easier to perform for low volume institutions.

Case Report

Patients

Three patients, two males and one female, underwent laparoscopic assisted proximal gastrectomy (LAPG) in our institute from April 2010 to March 2012. Case 1 was a 62-year-old male. The patient was 159 cm tall and weighed 44 kg. An abdominal tumor was detected in the stomach during a routine health screen. Gastroendoscopy showed early gastric cancer of the upper third and lesser curvature (Fig.1). The tumor was diagnosed as a well differentiated adenocarcinoma in the mucosa, and was removed by endoscopic mucosal dissection. Because the pathological diagnosis showed that the tumor had invaded into the submucosa (1600 μm), it was judged that additional excision was required. Case 2 was a 69-year-old male. The tumor was diagnosed as a gastric cancer that had invaded the submucosa, without lymph node metastasis. The patient was 173 cm tall, weighed 57 kg and had no history of abdominal surgery. Case 3 was a 76-year-old female. The tumor was diagnosed as a gastric cancer that infiltrated into the muscular layer without lymph node metastasis. The patient was 148 cm tall, weighed 42 kg and had no history of abdominal surgery.

Methods

Surgical procedure: The proximal gastrectomy was performed according to Okabe's procedure¹⁰⁾, except



Fig. 1 Gastroendoscopy showed an early gastric cancer of the upper third and lesser curvature. The depth of the tumor invasion was diagnosed to be the mucosa.

that the reconstruction was performed through a mini-laparotomy. Patients positioning and location of ports were prepared according to Okabe's procedure. Lymphadenectomy (D1+) was performed according to the *Japanese Gastric Cancer Treatment Guidelines 2010* (version3)¹¹⁾. After lymphadenectomy, the lower esophagus was completely isolated and transected with an endoscopic linear stapler. A 4-cm upper median laparotomy was performed for the esophagogastrostomy and the specimen was removed. The center of the anterior wall of the remnant stomach was transversely opened 3 cm, approximately 3-4 cm from the edge, through the median laparotomy hole. After the median hole was closed by groove, the anvil side of a knifeless stapler (Powered Multifire Endo GIATM 60 stapler - 4.8 Knifeless Single Use Loading Unit, Covidien, Mansfield, MA, USA) was inserted into the hole and fixed the left side of the esophagus to the anterior stomach wall under pneumoperitoneum. After the groove was removed, a posterior wall anastomosis was performed by hand suturing through the median laparotomy hole, using 3-0 VicrylTM (Ethicon, Cincinnati, OH) (Fig.2a) The anterior wall was closed with sutures. The reproduction of the anti-reflux procedure as same as Okabe's method was performed through the median laparotomy hole (Fig. 2b).

Comparison between LAPG and laparoscopic total gastrectomy (LTG): The clinicopathological data were compared LAPG and LTG. LTG were performed for 9 patients at the same period, from April 2010 to March 2012.

Results

All LAPG were successfully completed, and R0 operations were performed. The mean length of the operation was 292 min, and the mean blood loss was 59 g (Table 1). The mean number of dissected lymph nodes was 27.7. The postoperative course was uneventful in all three cases. The patients started eating on the fifth postoperative day. The mean postoperative hospital stay was 18 days. The patients are all currently doing well. None of the patients evaluated in this study experienced any acid reflux symptoms after the operation. The results of an endoscopic examination for case 1 one year after the operation are shown in Figure 3. A fundus-like space is seen behind the new esophagogastric junction. The grade of esophagitis was considered to be M. The mean percent body weight loss at 12 months in comparison to the preoperative weight in the three patients was 5.3% (Table 2). The improvement rate of the body weight and serum

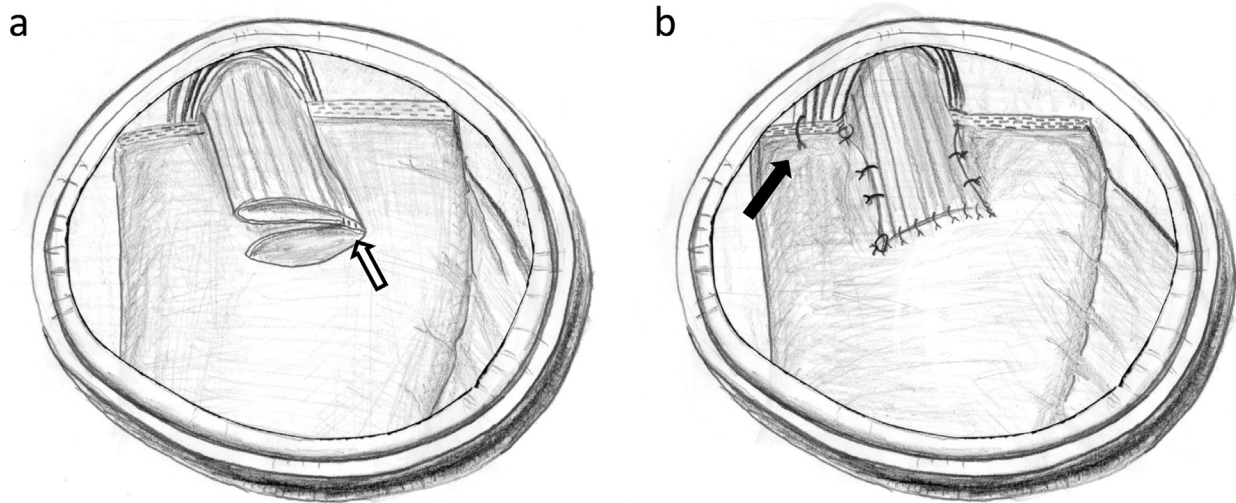


Fig. 2 Schematic outline of the reconstruction with an esophago-gastrostomy under the median small laparotomy.

a. The left side of the esophagus is fixed to stomach wall (white arrow).

b. After the anastomosis is completed at an anterior wall, the gastric stump is anchored to right crus of the diaphragm (black arrow) and the posterior partial fundoplication is done according to the original Okabe's procedure.

albumin value was compared between LAPG patients and laparoscopic total gastrectomy patients treated during the same period. In the LAPG group, the mean percent body weight loss at 12 months was 5.3%, and the serum albumin value recovered to normal levels at six months. In the laparoscopic total gastrectomy group, the mean percent body weight loss at 12 months was 17.9%, and the serum albumin value recovered to 96.1% of the normal levels at six months. The body weight of the LAPG group recovered more quickly than did that of the LTG group.

Discussion

Okabe's procedure made it possible to achieve successful esophagogastric anastomosis with an excellent postoperative function. However, this totally laparoscopic proximal gastrectomy is a difficult and complex procedure in terms of technical aspects for low volume institutions. Our procedure differs from Okabe's procedure in that we used an additional mini-laparotomy for the esophagogastronomy. This additional mini-laparotomy makes the esophagogastronomy easier to perform for low volume institutions. In our present condition, hand-sewn anastomosis under laparotomy is more reliable and safer method than totally laparoscopic anastomosis.

Upper gastric cancer has aggressive biological behavior, a poor prognosis and a higher incidence of recurrence^{12), 13)}. Deeper invasion is associated with a higher incidence of hematogenous metastasis and

peritoneal recurrence¹⁴⁾. However, proximal gastric cancer within the submucosa had no N2 lymph node metastasis¹⁵⁾. Therefore, limited resection for proximal gastric cancer might be acceptable for tumors that invade within the submucosa. The Japanese Gastric Cancer Treatment Guideline indicate that esophagectomy and proximal gastrectomy with gastric tube reconstruction should be considered for cT1cN0 tumors located on the proximal side¹¹⁾. An accurate preoperative evaluation of the tumor is therefore important for selecting the most appropriate surgical procedure.

Gastric cancer in the remnant stomach occurred

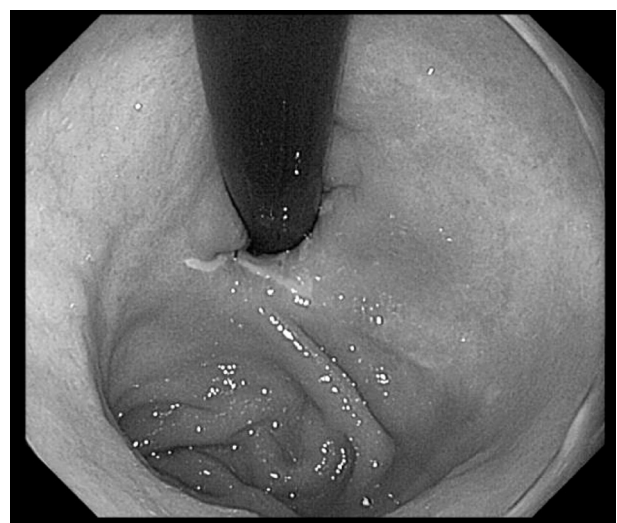


Fig. 3 A fundus-like space was seen behind the new esophagogastric junction.

Table 1 Early surgical outcome

	Case 1	Case 2	Case 3	LAPG(average)	LTG
operation time (min)	305	285	285	291.7	348
Intraoperative blood loss (g)	118	59	0	59	57.7
postoperative complication	(—)	(—)	(—)	(—)	2
leakage	0	0	0	0	0
SSI	0	0	0	0	2
ileus	0	0	0	0	0
time to first eating (day)	5	5	5	5	4.6
postoperative hospital stay (day)	16	23	15	18	17.5

LAPG: laparoscopic assisted proximal gastrectomy
 LTG: laparoscopic total gastrectomy

Table 2 Recovery of body weight and serum albumin

	Case 1	Case 2	Case 3	LAPG(average)	LTG
6 months weight	95.0	92.7	89.5	92.4	82.1
serum albumin	95.7	105.0	105.0	101.9	96.1
12 months weight	100.0	94.5	89.5	94.7	82.1
serum albumin	102.2	110.0	105.5	105.9	98.6

value is percentage

LAPG: laparoscopic assisted proximal gastrectomy

LTG: laparoscopic total gastrectomy

in 1.7-9.1% of cases in previous studies^{16), 17)}. Long-term endoscopic follow-up is needed for the remnant stomach in patients with risk factors in order to detect metachronous gastric cancer at an early stage¹⁸⁾. It was not difficult to examine the remnant stomach in the patients after proximal gastrectomy using this anastomosis procedure.

Proximal gastrectomy has been applied for selected patients as a less invasive and function-preserving surgery. This procedure was feasible for early gastric cancer of the upper third of the stomach. Additional studies in a larger number of patients are needed to confirm our findings.

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