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Original Article

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Impact of Esophagojejunal Reconstruction without Division of the Mesentery for Total Laparoscopic Total Gastrectomy

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ABSTRACT

Purpose: This study aimed to compare the surgical outcomes of total laparoscopic total gastrectomy without mesentery division (LTG without MD) and conventional total laparoscopic total gastrectomy (CLTG), as well as evaluate the appropriate method for esophagojejunostomy (EJ) reconstruction after total laparoscopic total gastrectomy (TLTG).
Materials and Methods: We retrospectively analyzed data from 301 consecutive patients who underwent TLTG for upper or middle third gastric cancer between January 2016 and May 2019. After propensity score matching, 95 patients who underwent LTG without MD and 95 who underwent CLTG were assessed. Data on clinical characteristics and surgical outcomes, including operation time, length of postoperative hospital stay, pathological findings, and postoperative complications were analyzed.
Results: The LTG without MD group showed a shorter time to first flatus (3.26±0.80 vs. 3.62±0.81 days, P=0.003) and a shorter time to soft diet (2.80±2.09 vs. 3.52±2.20 days, P=0.002). The total EJ-related complications in the LTG without MD group were comparable to those in the CLTG group (9.47% vs. 3.16%, P=0.083). EJ-related leakage (6.32% vs. 3.16%, P=0.317) and EJ-related stricture (3.16% vs. 1.05%, P=0.317) rates were not significantly different between the LTG without MD and CLTG groups. No significant differences were found between the two groups in terms of other early surgical outcomes such as early complications, late complications, hospital stay, and readmission rate.
Conclusions: LTG without MD is a safe surgical treatment for upper or middle third gastric cancer. LTG without MD may be an alternative procedure for EJ anastomosis during TLTG.

Keywords: Laparoscopic surgery; Gastrectomy; Stomach neoplasms; Anastomosis

INTRODUCTION

Total laparoscopic total gastrectomy (TLTG) is being increasingly performed worldwide because of its many advantages, such as minimal invasiveness, faster recovery of bowel movement, and earlier discharge compared with open total gastrectomy [1,2]. Reconstruction of esophagojejunostomy (EJ) is the most crucial procedure in TLTG

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Conceptualization: K.C.S., Y.M.W.
Data curation: K.C.S. Formal analysis: K.M.J. Investigation: J.J.H., L.I.S., K.B.S. Methodology: K.C.S., K.M.J., Y.M.W. Writing - original draft: K.C.S., Y.M.W. Writing - review & editing: J.J.H., L.I.S., K.B.S.

Conflict of Interest
No potential conflict of interest relevant to this article was reported.

because EJ-related complications can lead to the deterioration of the patient's condition and eventually death. Most surgeons perform EJ anastomosis carefully and accurately to reduce the incidence of EJ-related complications [3-5]. Therefore, many investigators have performed TLTG using various surgical instruments and approaches. The standard procedure for EJ anastomosis has not been established to date [6-10].

To perform EJ in TLTG, the mesentery of the jejunum is divided, and then the jejunum is transected before performing EJ anastomosis [11]. In laparoscopic surgery, division of the jejunal mesentery is carefully performed because the procedure is technically difficult and can lead to jejunal vessel injury and bowel ischemia. In particular, it can be even more critical when the identification of jejunal mesentery vessels is difficult due to the presence of excessive visceral fat in obese patients with gastric cancer. A recent study on laparoscopic Roux-en-Y gastric bypass reported that gastrojejunal anastomosis without mesentery division (MD) could reduce the incidence of anastomotic complications such as leakage, ulceration, and stenosis [12]. The risk of ischemic complications in anastomosis may be reduced by preventing MD. In the field of gastric cancer surgery, a few studies have reported division of the mesentery [13]. At our institution, EJ is performed either with or without MD during TLTG. This study aimed to compare the surgical outcomes, including EJ-related complications, between two different procedures and evaluate the appropriate method for EJ reconstruction after TLTG.

MATERIALS AND METHODS

Patients

A total of 561 patients underwent total gastrectomy by three surgeons at the Asan Medical Center between January 2016 and October 2019. Those who underwent TLTG for upper or middle third gastric cancer by one of the three surgeons were included in the study. All patients with upper-or middle-third gastric cancer underwent TLTG. Furthermore, all patients underwent D1+ or D2 lymph node dissection according to the Korean Practice Guidelines for Gastric Cancer 2018 [14]. Patients with a history of abdominal operation with severe adhesion, serosa-exposed tumors, or those suspected of having adjacent organ invasion were excluded. The final sample size was set at 301.

After the institutional review board approved this study, a retrospectively collected database of 301 consecutive patients was reviewed (2020-0564). Of the 301 patients, 102 underwent total laparoscopic total gastrectomy without mesentery division (LTG without MD) and 199 patients underwent conventional total laparoscopic total gastrectomy (CLTG). After collecting data on age, sex, body mass index, the American Society of Anesthesiologists score, number of comorbidities, combined operation, history of abdominal surgery, and tumor staging, propensity score matching (PSM) analysis was then performed.

Surgical procedure

The method of EJ anastomosis was selected based on the surgeons' preference and familiarity with the technique; thus, each surgeon only performed the technique that he/she had chosen. Specifically, surgeon A exclusively utilized LTG without MD, while surgeons B and C adopted CLTG. The details of the procedure for LTG without MD are shown in **Fig. 1**. The patients were positioned in the reverse Trendelenburg position and LTG without MD was performed using U-shaped ports. The greater omentum was divided 3 cm from the right gastroepiploic

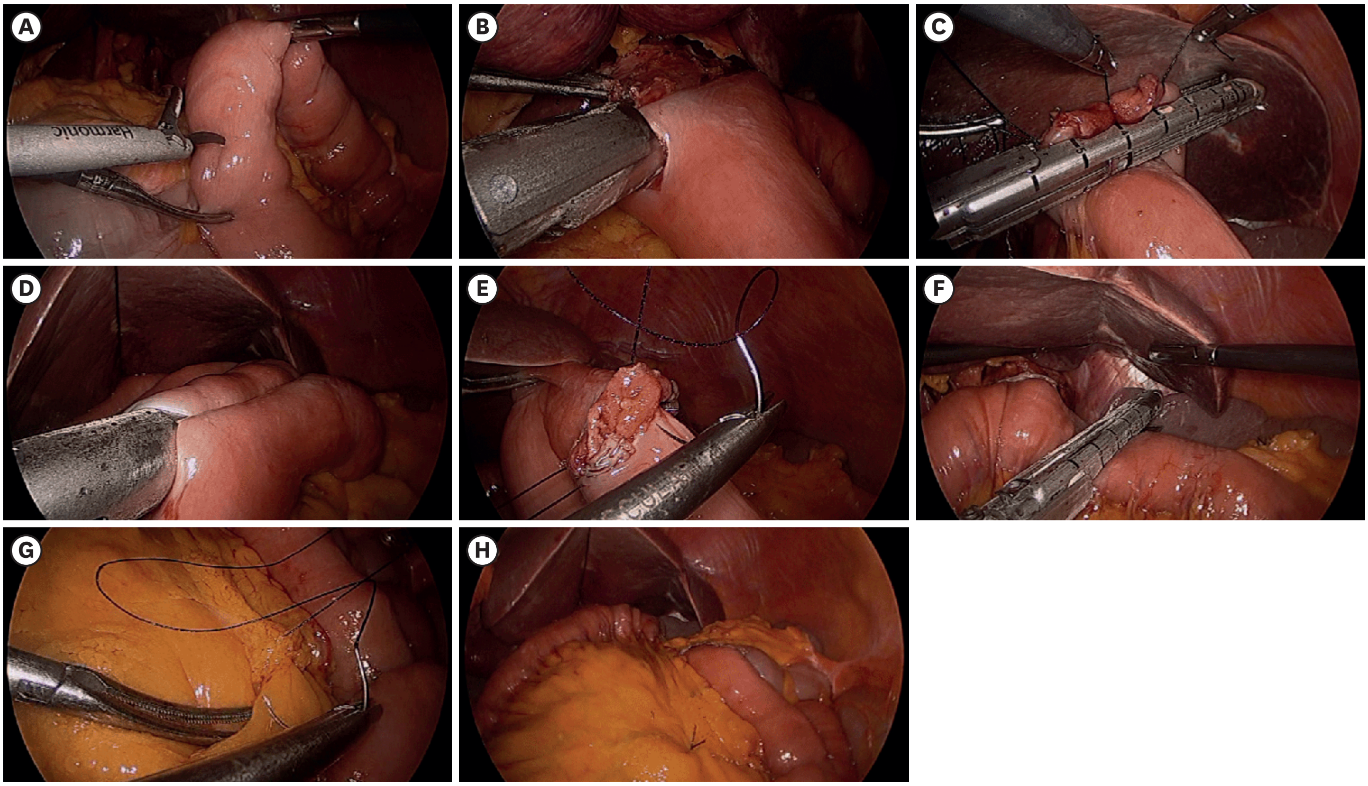

Fig. 1. Operative procedures of total laparoscopic total gastrectomy without mesentery division.
(A) Enterostomy is performed 20 cm from the ligament of Treitz. (B) A 45-mm linear stapler is inserted between the esophagus and enterostomy of the jejunum. (C) After performing the esophagojejunostomy (EJ), the entry hole is closed using the linear stapler. (D) A jejunojejunal side-to-side anastomosis is made approximately 40–50 cm below the EJ. (E) The common channel of the jejunojejunostomy is closed by a laparoscopic manual barbed suture. (F) The jejunum is transected 5 cm away from the EJ. (G) The mesentery of the jejunum is sutured to prevent internal herniation. (H) Anastomosis after completion of the reconstruction.

vessel. The left gastroepiploic vessel was ligated at its origin and the surrounding lymph nodes (4sb) were divided. Thereafter, the right gastroepiploic vessels and surrounding lymph nodes were completely dissected and ligated. The liver was then retracted using the triangle method, the right gastric vessels were ligated, and the duodenum was transected using an endoscopic linear stapler. The left gastric vessels were ligated and lymph node dissection was performed. Approximately two-thirds of the esophageal diameter was transected using an endoscopic linear stapler. The unstapled esophageal stump was then transected using an ultrasonic scalpel, and the stomach was removed from the abdominal cavity using an endobag.

After the patient was positioned in the supine position, the correct location of the jejunal loop was identified for the creation of a small enterotomy on the anti-mesenteric side of the jejunal loop without division of the mesentery (**Fig. 1A**). The limb of a 45-mm endoscopic linear stapler was inserted into the efferent loop and drawn up to the esophagus. The other limb of the endoscopic linear stapler was introduced into the small orifice of the esophagus to create an EJ (**Fig. 1B**). After EJ reconstruction, the entry hole was closed using an endoscopic linear stapler or handsewn (**Fig. 1C**). A jejunojejunal side-to-side anastomosis was made approximately 40–50 cm below the EJ (**Fig. 1D**). The common channel of the jejunojejunostomy was closed by a laparoscopic manual barbed suture (**Fig. 1E**). A small mesenteric hole was created using monopolar electrocautery without MD or vessel ligation. The jejunum was then transected 5 cm from the EJ for Roux-en-Y anastomosis (**Fig. 1F**).

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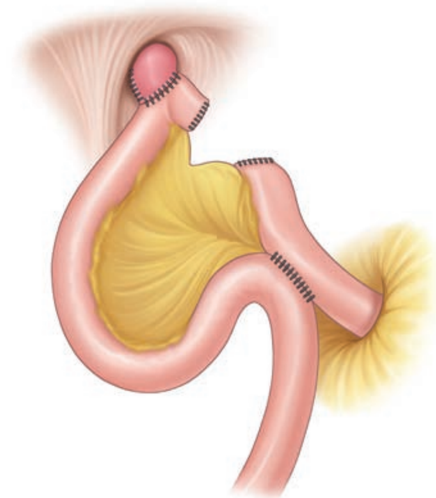

Fig. 2. Anastomosis after total laparoscopic total gastrectomy without mesentery division.

Finally, the mesentery of the jejunum was sutured to prevent internal herniation (**Fig. 1G**). **Fig. 2** shows the Roux-en-Y esophagojejunostomy after LTG without MD (**Fig. 1H**).

CLTG was performed using intracorporeal anastomosis, which is similar to that reported in previous studies (**Fig. 3**) [11]. The most prominent difference between CLTG and LTG without MD is whether the division of the jejunal mesentery is conducted in order to generate the Roux limb when performing esophagojejunal reconstruction.

Outcome measurement

To evaluate surgical outcomes, data on operation time, time to first flatus, time to first soft diet, perioperative transfusion, hospital stay, and readmission rate were obtained. Postoperative complications were classified into categories based on time to event and severity. They were initially classified as early and late complications, where early

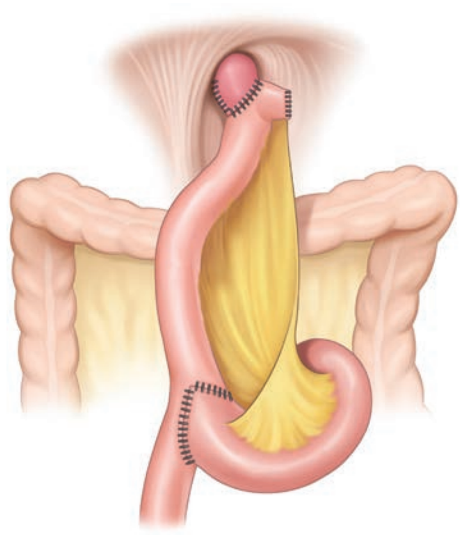

Fig. 3. Anastomosis after conventional total laparoscopic total gastrectomy.

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complications were defined as events occurring within 30 days while late complications were defined as those occurring 30 days after the surgery. The complications were further classified by severity based on the Clavien-Dindo classification (CDC) system [15]. To examine the safety of LTG without the MD method, we also evaluated the prevalence of EJ-related complications, including leakage and strictures.

Statistical analysis

In the unmatched groups, numerical data were analyzed using a Student's t-test or Kruskal-Wallis test described as means with standard deviations. Cross-tabulation analysis was performed using a chi-squared test. To reduce the potential confounding effects in this study, a PSM analysis including all possible variables was performed. All propensity scores were estimated using multiple logistic regression analysis without considering the outcomes. A full non-parsimonious model was developed, which included all the variables listed in **Table 1**. Model discrimination was assessed using the C-statistic, and model calibration was evaluated using Hosmer-Lemeshow statistics. The model was well calibrated (Hosmer-Lemeshow test; P=0.491) with reasonable discrimination (C-statistic=0.701). We presented the p-values before and after PSM to demonstrate the differences in baseline covariates between the two groups.

In the matched groups, numerical data were described as means with standard deviations using the Wilcoxon signed-rank test. Cross-tabulation analysis was performed using McNemar's test or the marginal homogeneity test. To evaluate the interaction between the group and postoperative nutritional status, we performed a general linear model. All reported P-values were two-sided, and P-values <0.05 were considered statistically significant. Data manipulation and statistical analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

Table 1. Clinical characteristics of patients who underwent LTG without MD and CLTG

Variables	Total set (n=301)		P-value	PSM set (1:1) (n=190)		P-value
	LTG without MD (n=102)	CLTG (n=199)		LTG without MD (n=95)	CLTG (n=95)	
Age (yr)	60.48±10.51	59.86±10.18	0.623	59.54±10.04	59.80±10.28	0.852
Sex			0.001			0.670
Male	79 (77.45)	115 (57.79)		73 (76.84)	75 (78.95)	
Female	23 (22.55)	84 (42.21)		22 (23.16)	20 (21.05)	
BMI (kg/m^2)	24.44±3.01	24.35±3.20	0.811	24.51±3.08	24.38±3.05	0.758
ASA score			0.096			0.941
I	15 (14.71)	48 (24.12)		14 (14.74)	15 (15.79)	
II	78 (76.47)	141 (70.85)		74 (77.89)	74 (77.89)	
III	9 (8.82)	10 (5.03)		7 (7.37)	6 (6.32)	
No. of comorbidities			0.225			>0.999
0–2	90 (88.24)	184 (92.46)		85 (89.47)	85 (89.47)	
>2	12 (11.76)	15 (7.54)		10 (10.53)	10 (10.53)	
Combined surgery			0.394			0.782
No	89 (87.25)	180 (90.45)		85 (89.47)	86 (90.53)	
Yes	13 (12.75)	19 (9.55)		10 (10.53)	9 (9.47)	
History of abdominal surgery			0.761			>0.999
No	78 (76.47)	149 (74.87)		76 (80.00)	76 (80.00)	
Yes	24 (23.53)	50 (25.13)		19 (20.00)	19 (20.00)	
Pathologic tumor stage			0.069			0.904
I	86 (84.31)	144 (72.36)		79 (83.16)	81 (85.26)	
II	11 (10.78)	38 (19.10)		11 (11.58)	10 (10.53)	
III	5 (4.9)	17 (8.54)		5 (5.26)	4 (4.21)	

Values are expressed as mean±standard deviation or number (%).
LTG = laparoscopic total gastrectomy; MD = mesentery division; CLTG = conventional totally laparoscopic total gastrectomy; PSM = propensity score matching; Stddiff = standardized difference; BMI = body mass index; ASA = American Society of Anesthesiologists Physical Status Classification.

RESULTS

Patient characteristics

Table 1 shows the clinical characteristics of the LTG without the MD and CLTG groups. After PSM, the differences between the two groups disappeared, and 95 matched pairs were then selected. All baseline variables included in the model were well-balanced, with a standardized difference of <0.1.

Surgical outcomes and pathologic results of the LTG without MD group and CLTG group after PSM

The mean follow-up period for the LTG without MD group was 43.33 months, while that for the CLTG group was 38.40 months. There was only one reported case of conversion from LTG without MD to CLTG. **Table 2** presents the details of the early surgical outcomes of patients who underwent LTG without MD or CLTG. The mean operative times were 178.99±37.63 and 155.17±31.38 minutes in the LTG without MD group and CLTG group, respectively, and were significantly different (P<0.001). The LTG without MD groups showed a shorter time to first flatus (3.26±0.80 vs. 3.62±0.81 days, P=0.003) and a shorter time to soft diet (2.80±2.09 vs. 3.52±2.20 days, P=0.002). The number of retrieved lymph nodes in the LTG without MD group was greater than that in the CLTG group. No significant differences were observed with respect to other surgical outcomes, such as perioperative transfusion, length of hospital stay after surgery, readmission rate, tumor size, and proximal resection margin between the two groups.

Postoperative complications and EJ-related complications in the LTG without MD and CLTG groups after PSM

Early and late postoperative complications are shown in **Table 3**. As shown in the table, there were no significant differences in the incidence of early and late postoperative complications between the two groups (P=0.182 and P=0.317, respectively). The incidence of complications of CDC grade >3 in the early and late postoperative periods was comparable between the two groups (P>0.999 and P=0.317, respectively). Postoperative mortality was not noted in either group.

EJ-related complications and other complications are shown in **Table 4**. No significant differences were observed in EJ-related complications (total), EJ leakage, and EJ stricture between the two groups (P=0.083, P=0.317, and P=0.317, respectively). EJ-related complications (total) were observed in 9 (9.47%) patients in the LTG without MD group and

Table 2. Early surgical outcomes and pathologic data for patients undergoing LTG without MD and CLTG

Variables	Total set (n=301)		P-value	PSM set (1:1) (n=190)		P-value
	LTG without MD (n=102)	CLTG (n=199)		LTG without MD (n=95)	CLTG (n=95)	
Operative time (min)	182.77±40.25	151.42±29.19	<0.001	178.99±37.63	155.17±31.38	<0.001
Time to first flatus (days)	3.33±0.85	3.53±0.81	0.061	3.26±0.80	3.62±0.81	0.003
Time to soft diet (days)	2.81±2.05	3.25±1.98	0.006	2.80±2.09	3.52±2.20	0.002
Perioperative transfusion			0.723			0.999
No	100 (98.04)	192 (96.48)		93 (97.89)	93 (97.89)	
Yes	2 (1.96)	7 (3.52)		2 (2.11)	2 (2.11)	
Hospital day after surgery (days)	9.00±12.31	7.90±5.91	0.088	9.00±12.64	8.13±5.57	0.304
Readmission	4 (3.92)	5 (2.51)	0.494	3 (3.16)	1 (1.05)	0.317
Tumor size (cm)	3.74±2.73	3.79±2.41	0.298	3.75±2.82	3.37±2.30	0.358
Retrieved LN	43.17±15.82	40.80±16.85	0.094	43.08±16.18	39.98±18.22	0.034
PRM (cm)	2.28±1.58	2.54±2.00	0.656	2.31±1.62	2.42±1.92	0.954

Values are expressed as mean±standard deviation or number (%).
LTG = laparoscopic total gastrectomy; MD = mesentery division; CLTG = conventional totally laparoscopic total gastrectomy; PSM = propensity score matching; LN = lymph node; PRM = proximal resection margin.

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Table 3. Postoperative complications including EJ-related complications

Variables	Total set (n=301)		P-value	PSM set (1:1) (n=190)		P-value
	LTG without MD (n=102)	CLTG (n=199)		LTG without MD (n=95)	CLTG (n=95)	
Early complications	34 (33.33)	41 (20.60)	0.016	30 (31.58)	22 (23.16)	0.182
CDC ≥3	9 (8.82)	15 (7.54)	0.697	8 (8.42)	8 (8.42)	>0.999
Late complications	4 (3.92)	11 (5.53)	0.544	3 (3.16)	6 (6.32)	0.317
CDC ≥3	4 (3.92)	11 (5.53)	0.544	3 (3.16)	6 (6.32)	0.317
EJ-related complications (total*)	11 (10.78)	5 (2.51)	0.003	9 (9.47)	3 (3.16)	0.083
EJ leakage	8 (7.84)	5 (2.51)	0.039	6 (6.32)	3 (3.16)	0.317
EJ stricture	4 (3.92)	1 (0.50)	0.047	3 (3.16)	1 (1.05)	0.317
Intra-abdominal abscess	8 (7.84)	10 (5.03)	0.329	7 (7.37)	6 (6.32)	0.782
Internal herniation	1 (0.98)	5 (2.51)	0.668	1 (1.05)	4 (4.21)	0.180

Values are expressed as mean±standard deviation or number (%).
EJ = esophagojejunostomy; LTG = laparoscopic total gastrectomy; MD = mesentery division; CLTG = conventional totally laparoscopic total gastrectomy; CDC = Clavien–Dindo classification; PSM = propensity score matching.
*Total: EJ leakage and stricture.

Table 4. Characteristics of the patients with esophagojejunostomy-related complications

Case	Sex	Age	Primary operation	TNM stage	Early or late	Type of complication	CDC	Treatment	Hospital day
1	M	52	CLTG	I	Early	Leakage/stricture	3B	Operation	22
2	F	63	CLTG	I	Early	Leakage	2	Conservative	30
3	M	74	CLTG	I	Early	Leakage	2	Conservative	10
4	M	68	LTG without MD	I	Early	Leakage	2	Conservative	38
5	M	54	LTG without MD	II	Early	Stricture	4A	ICU care	119
6	M	48	LTG without MD	I	Early	Stricture	3A	Intervention	5
7	M	60	LTG without MD	I	Early	Leakage	2	Conservative	18
8	M	64	LTG without MD	II	Early	Leakage	2	Conservative	17
9	M	59	LTG without MD	I	Early	Leakage	2	Conservative	19
10	M	75	LTG without MD	I	Early	Leakage	3A	Intervention	6
11	M	47	LTG without MD	I	Early	Leakage	3A	Intervention	31
12	M	48	LTG without MD	II	Early	Stricture	2	Conservative	12

CDC = Clavien–Dindo classification; CLTG = conventional totally laparoscopic total gastrectomy; LTG = laparoscopic total gastrectomy; MD = mesentery division.

3 (3.16%) patients in the CLTG group. Six (6.32%) patients in the LTG without MD group and three (3.16%) patients in the CLTG group experienced EJ leakage. Moreover, 3 (3.16%) patients in the LTG without MD group and 1 patient in the CLTG group presented with EJ stricture. Other complications, such as intra-abdominal abscess and internal herniation, were not significantly different between the two groups (P=0.782 and P=0.180, respectively).

DISCUSSION

This study showed that LTG without MD is an acceptable procedure for gastric cancer surgery. The incidence of EJ-related complications such as leakage and strictures after LTG without MD was comparable to that after CLTG. The main advantage of dividing the mesentery for the construction of the Roux limb is that a tension-free anastomosis is created. However, to reduce excessive tension at the EJ site, we conducted LTG without MD in patients in the supine position and utilized a longer jejunal loop for anastomosis compared with that used in CLTG. Thus, we were able to perform LTG without MD without creating excessive tension at the EJ site in most patients. Our results show that Roux-en-Y esophagojejunostomy can be completely performed without division of the mesentery.

Recent studies have reported that the prevalence of EJ-related complications after laparoscopic total gastrectomy ranges from 1.1% to 8.0% [16-18]. Our study reported that both groups showed a similar incidence of EJ-related complications. We thought it was

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acceptable and nothing out of the ordinary. The prevalence of EJ-related complications in the LTG without MD group was slightly higher than that in the CLTG group in this study, although the difference was not statistically significant. This result was expected as data for the early stages of the learning curve of LTG without MD were assessed.

Among the EJ-related complications, EJ leakage can be diagnosed with upper gastrointestinal series or esophagogastroduodenoscopy or on the basis of clinical signs and symptoms [19]. If EJ leakage was detected after TLTG, the patient should not only fast for a long time until the leakage is completely resolved but should also receive parenteral nutrition through central venous access. Furthermore, EJ leakage can cause secondary problems such as nutritional deficiencies as well as surgical site and catheter-related infections. In more serious cases, mortality is observed or intensive care may be required [3]. Therefore, EJ leakage is considered an extremely severe complication. Based on our results, 7 out of 12 patients who had EJ-related complications received conservative treatment such as fasting, antibiotics, and total parenteral nutrition. Two patients underwent endoscopic ballooning for treatment of EJ strictures while one patient underwent esophageal stent insertion for treatment of EJ leakage. One patient admitted to the intensive care unit was eventually cured because aspiration pneumonia occurred due to an EJ stricture. The other patients with EJ leakage and strictures underwent simultaneous reoperation. The mean hospital stay duration for these patients was approximately 30 days. All patients with EJ-related complications fully recovered.

Blood supply is a major factor that can aid in maintaining the robustness of intestinal anastomosis. If the blood supply in the intestinal anastomosis is poor, ischemia may ensue, eventually leading to anastomotic leakage [20,21]. Since the blood supply in the small intestine is maintained by the mesentery vessel, division of the mesentery can disturb the blood supply in the anastomosis area. It has been demonstrated that irrespective of whether the mesentery is divided during laparoscopic Roux-en-Y gastric bypass in bariatric surgery, there is still a risk of anastomotic complications [12]. However, division of the mesentery during laparoscopic total gastrectomy has not yet been reported probably because EJ anastomosis is more likely to cause anastomotic complications than gastrojejunostomy (GJ) anastomosis, which is relatively more dangerous. Tension can also be a concern because the location of the EJ anastomosis is more proximal than that of the GJ anastomosis.

Antecolic EJ anastomosis was successfully performed using the jejunal loop without division of the mesentery. No adverse events occurred during surgery. No afferent loop syndrome developed despite the relatively long length of the Y limb.

EJ strictures are critical complications that develop due to passage disturbances, such as adhesion, kinking, and angulation. This can induce EJ leakage due to backward pressure, or pulmonary complications such as aspiration pneumonia. We expected less twisting or rotation of the mesentery axis because an EJ anastomosis was created without division of the mesentery. All patients with EJ strictures after LTG without MD had partial obstructions and recovered after undergoing endoscopic balloon dilation or stenting. Previous studies have indicated that EJ strictures occur within approximately 2 years after surgery [22, 23]. However, considering the follow-up period of our study, we believe that it is adequately long enough to evaluate EJ strictures.

The operation time of LTG without MD was significantly longer than that of CLTG. We believe that the difference in the operation time between LTG without MD and CLTG is largely

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due to differences between operators. All surgeons are highly experienced in laparoscopic gastrectomy; however, because they have different dispositions and habits as surgeons, they exhibit different styles in performing the procedures. We believe that such discrepancies in styles led to the differences in the lengths of operation time between the two procedures.

The times to first flatus and soft diet were significantly shorter in the LTG without MD group than in the CLTG group. The network of interstitial cells of Cajal in the myenteric plexus is known to regulate intestinal motility. Although small bowel resection was performed to create a Roux limb for EJ anastomosis, bowel motility is more likely preserved using this method than with conventional methods with MD because of the preservation of the small bowel mesentery [24]. The difference in the number of retrieved lymph nodes between the two groups is likely due to differences in the technique used to perform lymph node dissection. It was assumed that the difference was due to the tendency of skeletonization, which means that the vessels near the lymph nodes were fully exposed and the lymph nodes were completely removed.

This study had several limitations. First, this was a retrospective study conducted at a single institution. A multicenter prospective study is required to evaluate the safety and feasibility of this procedure. Second, the learning curve of laparoscopic total gastrectomy could influence the results of this study. However, this effect could be reduced because surgeons who participated in our current study performed an average of 200 laparoscopic gastrectomy procedures annually. Third, we were not able to incorporate information on the length of the abdominal esophagus. To ensure a sufficient resection margin, surgeons may resect an adequate length of the abdominal esophagus. In such cases, EJ anastomosis can be technically difficult. This might have influenced the occurrence of EJ-related complications. Finally, the sample size may not be sufficiently large to adequately address our research question. Therefore, we plan to conduct a subsequent study with a larger sample size once the needed data become available in the future.

In conclusion, the current study reported that LTG without MD may serve as an alternative procedure for EJ anastomosis during TLTG. However, the results of this study should be confirmed by performing a large cohort study involving multiple institutions.

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