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Early outcomes of laparoscopic total gastrectomy with hemi-double stapling technique in gastric cancer

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ABSTRACT

Introduction: The most difficult step of laparoscopic total gastrectomy for gastric cancer is esophagojejunostomy anastomosis. Although various techniques are recommended for this anastomosis, there is no standard method. This study aims to present the outcomes of our patients who underwent esophagojejunostomy using the hemi-double stapling technique (HDST).

Materials and Methods: Patients who had laparoscopic surgery due to gastric cancer in our hospital between October 2016 and May 2019 were retrospectively analyzed. Patients who underwent laparoscopic total gastrectomy with HDST were included in this study. The patients' clinical characteristics and histopathological data were evaluated. Age, sex, body mass index (BMI), comorbidities, and American Society of Anesthesiologists (ASA) scores were documented. Operative time, intraoperative blood loss, specimen extraction site, day of oral intake, length of stay, postoperative complications, and mortality were evaluated.

Results: A total of 13 patients (eight male, five female) were included in this study. The mean age was 63.3±15.8 years, and mean BMI was 26.4±6.8 kg/m^2. ASA score was ASA III in seven patients (54%), ASA II in three patients (23%), and ASA I in the remaining three patients (23%). Mean operative time was 222.7±39.6 minutes, and mean intraoperative blood loss was 97.3±52.4 mL. There were no complications related to esophagojejunostomy. A mean of 23.8±11.1 lymph nodes was removed, of which a mean of 10.8±11.9 were tumor-positive. Mean length of stay was 10.9±9.8 days, and mean follow-up was 10.1±7 months.

Conclusion: HDST appears to be a safe method that can be used in the esophagojejunostomy step of laparoscopic total gastrectomy for gastric cancer.

Keywords: Esophagojejunostomy; gastric cancer; laparoscopy; total gastrectomy.

Introduction

Gastric cancers are the fifth common malignancy and the third leading cause of cancer-related deaths worldwide.[1] Laparoscopic techniques have been used in the surgical treatment of gastric cancer for approximately 25 years.[2] Laparoscopic gastrectomies have been found to be oncologically safe and result in acceptable survival rates as open gastrectomy, and two approaches are comparable in terms of morbidity and mortality.[3,4] While laparoscopic distal gastrectomy has gained popularity over the years, laparoscopic total gastrectomy (LTG) has not become

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as common.[5] This is due to the technical difficulty of esophagojejunostomy (EJS) anastomosis in LTG.

EJS anastomoses can be done in various ways, and no method has been adopted as a standard technique. Surgeons have conducted studies on various EJS techniques using linear or circular staplers in LTG. However, there is still insufficient data to support the superiority of one technique over the other.[6–8] Important factors to consider include not only reliability and safety in terms of complications, but also how feasible the method is to perform during laparoscopy. Using purse-string sutures while placing the anvil of the circular stapler is one of the most challenging steps of LTG due to difficulties in terms of field of view and maneuverability. Using the HDST for EJS anastomosis has been presented as an easy and reliable method.[9,10] Our aim in the present study was to evaluate the applicability of the HDST by sharing our outcomes of LTG using this method.

Materials and Methods

Patients who had laparoscopic surgery due to gastric tumor in our hospital between October 2016 and May 2019 were retrospectively analyzed. Gastric cancer patients who underwent LTG with HDST were included in the study. Patients who had subtotal gastrectomy or laparoscopic surgery for reasons other than cancer were excluded from the study. Ethical approval was obtained from the Samsun Training and Research Hospital Ethics Committee (Number: 2019/14). All patients provided written informed consent. The patients' clinical characteristics and histopathological data were evaluated. Their age, sex, body mass index (BMI), comorbidities, and American Society of Anesthesiologists (ASA) scores were documented. Operative time, intraoperative blood loss, specimen extraction site, day of oral intake, length of stay, postoperative complications, and mortality were evaluated.

All data were recorded in a Microsoft Excel file. Categorical data of the patients are presented as mean ± standard deviation. Continuous variables are expressed as number and percentage.

Surgical Technique

Under general anesthesia, the patients were placed in 30° reverse Trendelenburg position with legs apart. Following abdominal insufflation via Veress needle entry through the umbilicus, a 10-mm trocar was placed and a camera was introduced through this port. We placed 12-mm and 5-mm in the upper right quadrant and 10-mm and 5-mm trocars in the upper left quadrant. A Nathanson retractor was used to elevate the liver. Gastrocolic ligament was cut along with the upper margin of transverse colon. Greater omentum was completely freed, and the bursa omentalis was opened. Right gastric artery and right gastroepiploic artery were ligated with clips. Duodenum was transected using a laparoscopic stapler. Following dissection of the anterosuperior lymph nodes along the hepatic artery and proximal and distal lymph nodes along the splenic artery, left gastric artery and vein were ligated with clips. Esophagocardiac junction was mobilized by dissection, while the relevant regional lymph nodes were excised with the specimen.

Before transecting the esophagus, the first step of HDST was performed. First, we knotted approximately 8 cm of polypropylene suture with needle to the end of the anvil of a 25-mm circular stapler (Fig. 1a). We pulled the stomach caudally and performed an esophagotomy (Fig. 1b). The anvil was inserted into the esophagus through this incision and advanced toward the proximal esophagus (Fig. 1c). The needle of the suture on the anvil tip was passed through the anterior wall of the esophagus (Fig. 1d). When the suture was taut, we transected the esophagus immediately distal to it using a laparoscopic linear stapler (Fig. 1e). The anvil suture was cut and removed, and Roux-en-Y reconstruction was initiated. We enlarged the 10-mm trocar incision on the left to allow insertion of the circular stapler and the EJS was completed. Jejunojejunostomy was performed with the laparoscopic linear stapler. The stapler orifice was closed intracorporeally using 3/0 polypropylene suture. We extracted the specimen from the abdomen either through the enlarged trocar incision on the left or via the suprapubic or transvaginal route.

Results

A total of 13 patients, 8 men and 5 women, were included in the study. Their mean age was 63.3±15.8 years and mean BMI was 26.4±6.8 kg/m^2. Comorbidities included hypertension (HT) in 5 patients, diabetes mellitus (DM) in 3 patients, chronic obstructive pulmonary disease (COPD) in 3 patients, coronary artery disease (CAD) in 2 patients, and abdominal aortic aneurysm, iron deficiency anemia, and hypothyroidism in 1 patient each. ASA score was ASA II in 7 patients (54%), ASA II in 3 patients (23%), and ASA I in the remaining 3 patients (23%) (Table 1).

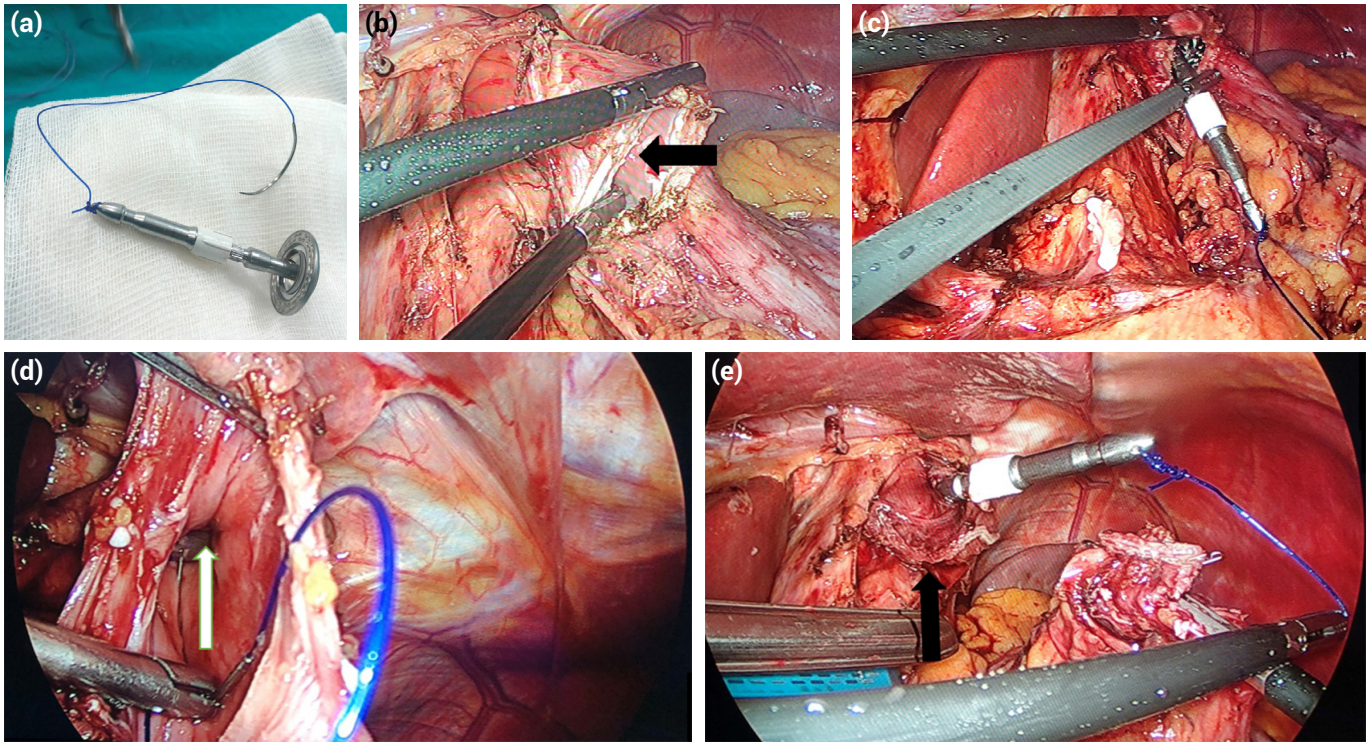

Figure 1. (a) Anvil with polypropylene suture. **(b)** Esophagotomy (Black arrow shows the anterior wall of esophagus with esophagotomy). **(c)** Anvil placement into the esophagus. **(d)** Suture pass through the anterior esophageal wall (White arrow shows entrance point for needle). **(e)** Transection of esophagus (Black arrow shows the esophageal stump with anvil).

The mean operative time was 222.7±39.6 minutes and mean intraoperative blood loss was 97.3±52.4 mL. Specimen removal was performed by enlarging the trocar incision in 10 cases, while a suprapubic incision was made in 2 cases. Natural orifice specimen extraction (NOSE) via transvaginal route was used in 1 case. The mean time to oral intake

Table 1. Features of the patients

Patients (n=13)	Age (year)	Gender	BMI (kg/m²)	Co-morbidity	ASA
1	53	Male	24.2	Iron deficiency anemia	2
2	60	Female	32	DM, HT, COPD, hypothyroidism	3
3	65	Female	40.3	DM, HT, CAD	3
4	44	Male	19.2	None	2
5	79	Male	20.7	HT	3
6	79	Female	19.5	HT	2
7	84	Male	17.5	None	3
8	41	Male	28.2	None	1
9	46	Female	27	None	1
10	77	Male	24.9	HT, DM, CAD, COPD, abdominal aortic aneurysm	3
11	81	Female	33	COPD	3
12	46	Male	33.9	None	1
13	68	Male	23.3	None	3

ASA: American Society of Anesthesiologists scores. BMI: Body mass index; DM: Diabetes mellitus; HT: Hypertension; COPD: Chronic obstructive pulmonary disease; CAD: Coronary artery disease.

Table 2. Outcomes of the patients

Patients (n=13)	Operative time (min)	Blood loss (mL)	Postop morbidity	Postop mortality	Diagnosis	Dissected LN	Positive LN	Hospital stay (day)	Follow-up (month)
1	170	80	–	–	Adeno Ca	41	19	8	8
2	240	100	–	–	Adeno Ca	18	0	8	9
3	230	50	–	–	Adeno Ca	26	14	7	15
4	250	70	Paralytic ileus	–	Adeno Ca	13	10	18	9
5	190	40	–	–	Adeno Ca	16	9	6	13
6	210	80	–	–	Adeno Ca	16	7	9	7
7	160	20	–	–	Adeno Ca	15	1	7	10
8	250	150	–	–	Adeno Ca	42	39	9	9
9	240	100	–	–	Adeno Ca	22	2	7	23
10	210	120	–	–	Adeno Ca	32	29	8	23
11	250	80	Pneumonia, ARDS	•	Adeno Ca	17	6	42	1.4
12	305	175	--	--	Adeno Ca	12	4	6	2
13	190	200	--	--	Adeno Ca	39	0	7	2

LN: Lymph node; ARDS: Acute respiratory distress syndrome.

was 3.7±0.9 days. In terms of postoperative complications, one patient had paralytic ileus which was managed with medical treatment. One patient had postoperative acute respiratory distress syndrome (ARDS). This patient did not respond to treatment and died on postoperative day 42. A mean of 23.8±11.1 lymph nodes were removed, of which a mean of 10.8±11.9 were tumor-positive. The mean length of stay was 10.9±9.8 days, and the mean duration of follow-up was 10.1±7 months.

Discussion

As with surgery for other oncologic diseases, various studies in the literature have investigated whether appropriate treatment is applied in the laparoscopic treatment of gastric cancer, and research on this topic is still ongoing. Currently available data indicate that in addition to the advantages of minimally invasive surgery, such as rapid recovery, reduced blood loss, less pain, and fewer surgical site complications, laparoscopic gastric cancer surgery also provides acceptable oncological outcomes.[11–16] In our clinic, we try to utilize laparoscopic approaches in gastroenterologic cancer surgery as much as possible.

One of the main goals in the treatment of gastric cancer is to perform adequate and appropriate lymph node dissection.[17,18] In our clinic, we routinely perform D2 lymph node dissection in patients with indication for laparoscopic surgical treatment of gastric cancer. We prefer to perform D1+ lymph node dissection only in T1N0 cases. We do not perform prophylactic splenectomy unless there is lymph node metastasis close to the spleen or direct invasion of the spleen or distal pancreas. However, in these situations, we prefer open procedures rather than laparoscopic surgery. The gastric cancer patients who underwent LTG in this study had a mean of 23.8±11.1 lymph nodes removed, which is acceptable.

The most difficult step in minimally invasive total gastrectomy is EJS anastomosis. There are various types of anastomosis and they can be made manually or using a stapler. Techniques using staplers can be classified as circular stapler and linear stapler techniques.[5] Circular stapler techniques can be subcategorized as the single-stapling technique (SST), double-stapling technique (DST), and hemi-double-stapling technique. Linear stapler techniques can be subdivided into two groups, the functional end-to-end anastomosis (FEEA) and side-to-side anastomosis (overlap method).[19–27] Although all of these techniques can be applied safely, it is not possible based on the available data to reach a consensus on whether any is superior to the others.[5–7]

The circular stapler technique is actually the standard method for open total gastrectomy. However, the diffi-

culty of applying purse-string sutures to the esophagus during anvil placement in laparoscopic surgery is one of the reasons alternative methods have been sought.[15,21] The linear stapler technique may be difficult for inexperienced surgeons because it requires greater mobilization of the esophagus and suturing of the stapler entry site. However, advantages of this technique are that the linear stapler is more suitability for insertion through a trocar, and an experienced surgeon can perform the anastomosis more easily using a linear stapler than a circular stapler. This is supported by evidence in the literature that operative time in LTG performed with linear stapler is significantly shorter than for LTG performed with circular stapler. However, no significant differences in terms of early and late complications have been reported between the two methods.[28] Trocar entry sites are not large enough to insert circular staplers, necessitating either an additional incision or enlargement of the trocar incision. The extent to which this offsets the benefits of minimally invasive surgery has not been determined. Decisions regarding anastomosis technique are usually made according to the experience and preference of the surgeon. Although there are numerous methods, there is no enough comparative prospective studies to reach a conclusion about EJS technique.

Transoral insertion of the anvil facilitated the use of circular staplers.[19] However, while this method is beneficial in the anastomosis stage of the procedure, it is both costly and requires assistance from health personnel other than the surgeon to implement. We use the HDST,[24] which is another method that makes this step easier. In this study, we aimed to evaluate the applicability of this technique by sharing our HDST outcomes.

There are different technical methods for performing HDST during esophagojejunostomy. As described by Omori,[24] we first passed a suture through the hole at the anvil tip and knotted it, leaving a suture length of about 8 cm. We then performed semicircumferential esophagotomy. The anvil with suture was advanced through this opening into the esophagus. The needle of the anvil suture was passed through the anterior wall of the esophagus and by pulling this suture, the tip of the anvil appeared as a protrusion in the anterior esophagus wall. With a linear stapler, we transected the esophagus immediately below this protrusion. Then, using the suture, we removed the tip of the anvil through the anterior wall of the esophagus and positioned the anvil for anastomosis.

Omori et al.[24] observed no complications in their study including 10 patients. Similarly, we detected no complications related to the anastomosis in our study. We also obtained outcomes that are comparable in terms of operative time and blood loss. While they used the ECS 25 Ethicon Endo-Surgery as a circular stapler, we used the EEA 25 mm Covidien circular stapler. Though the anvil structure differs in these two staplers, we could not find any studies comparing them in terms of HDST.

Some surgeons are using HDST in LTG, but each group makes small modifications to the technique.[9,23,28] In general, the practice varies in terms of how the circular stapler anvil is placed in the esophagus. As minimally invasive surgery for gastric cancer becomes more widely adopted, more information on the technical details and postoperative outcomes will become available. In our study, HDST seems to be a feasible and reliable method for the EJS step of LTG for the treatment of gastric cancer. Prospective studies and larger patient groups are needed to establish a standard method for EJS anastomosis.

Disclosures

Ethichs Committee Approval: The study was approved by the Local Ethics Committee.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

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