

Stapled versus hand-sewn esophagojejunal anastomosis after total gastrectomy: A single-center experience

Original
Article

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ABSTRACT

Background: Mechanical stapling is a commonly utilized alternative to the traditional hand-sewn method for esophagojejunal anastomosis (EJA) during total gastrectomy. This retrospective study sought to evaluate and compare the surgical outcomes of stapled versus hand-sewn EJA in patients undergoing open total gastrectomy for gastric cancer.

Patients and Methods: The medical records of all patients who underwent total gastrectomy followed by EJA for the treatment of adenocarcinoma of the esophagojejunal junction and proximal stomach at Minia University Hospital between 2020 and 2023 were reviewed. The patients were categorized into two groups: group I consisted of those who received stapled EJA, while group II comprised those who received hand-sewn EJA. A comparison between the groups was conducted based on operative time, length of hospital stay, and the incidence of complications, with particular attention to anastomotic leakage, stricture, and infection.

Results: The study included a total of 27 patients: 17 (63%) underwent stapled EJA, while 10 (37%) had a hand-sewn EJA. Statistically significant differences were observed between the two groups in terms of operative time ($P=0.000$), blood loss ($P=0.002$), average time to remove the nasogastric tube ($P=0.01$), average time to remove the drain ($P=0.002$), and average hospital stay ($P=0.000$).

Conclusion: This study concluded that stapled EJA is a safe and efficient method for performing esophagojejunostomy, providing faster execution, shorter hospital stays, and no increased risk of benign anastomotic stricture formation compared with hand-sewn anastomosis.

Key Words: Esophagogastric cancer, esophagojejunal anastomosis, gastric cancer, stapled, total gastrectomy.

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INTRODUCTION

Surgery remains the primary treatment for esophagogastric junction (EGJ) carcinoma and gastric carcinoma of the proximal body^[1], with chemotherapy and chemoradiotherapy often used as adjuvant or neoadjuvant therapies^[2]. Total gastrectomy with D2 lymphadenectomy provides the best overall survival prospects^[3]. However, postoperative complications, particularly those related to esophagojejunal anastomosis (EJA), present considerable risks, making this part of the procedure the ‘Achilles’ heel.’ Although minimally invasive gastrectomy has shown acceptable outcomes in some studies, it is not recommended for more advanced tumors, making open total gastrectomy an essential element of gastric cancer surgery^[4,5]. Significant complications following total gastrectomy often involve EJA, including anastomotic leakage, dehiscence, bleeding, and stenosis^[6]. Various techniques are used for gastrointestinal reconstruction postgastrectomy, such as jejunal interposition, the double tract method, and Roux-en-Y EJA^[1]. The standard method for Roux-en-Y reconstruction after total gastrectomy was

EJA, which could be performed using either a circular stapler or hand-sewn sutures. Advances in suturing have lowered failure rates once associated with hand-sewn anastomoses, making the previous 15% failure rate outdated^[7]. Studies comparing stapled versus hand-sewn anastomotic techniques have yielded mixed results. This study seeks to compare postoperative outcomes between hand-sewn and stapled EJA in gastric cancer patients undergoing total gastrectomy.

PATIENTS AND METHODS:

The records of all patients treated for adenocarcinoma of the EGJ and proximal stomach between January 2020 and January 2023 at Minia University Hospital were retrieved from a prospectively maintained database. The study included only patients who underwent total gastrectomy followed by EJA. Patients were excluded if they had undergone total gastrectomy for stump carcinoma, recurrent stomach carcinoma, palliative resections, proximal gastrectomy, transhiatal esophagectomy, or multivisceral resections. The selected patients were divided into two

groups: group I included those who received stapled EJA, while group II consisted of those who had hand-sewn EJA. Data for analysis were collected using a standardized form, which included information on age, gender, chief complaints, comorbidities, dietary habits, smoking, and alcohol use. Findings from physical examinations, such as jaundice, pedal edema, abdominal masses, hepatomegaly, ascites, and rectal masses, were also recorded.

All patients underwent upper gastrointestinal endoscopy with biopsy, ultrasonography, and contrast-enhanced computed tomography (CT) scans of the abdomen, with findings meticulously documented. Informed consent was obtained from each patient, explaining the nature of the illness, the extent of the surgery, and the potential risks of morbidity and mortality. All patients received appropriate preoperative preparation before surgery.

Surgical technique

The procedure was performed by three experienced surgeons in this field, with the choice between stapled and hand-sewn techniques based on the surgeons' preferences. Diagnostic laparoscopy was performed in all patients to detect peritoneal and liver metastases before proceeding with total gastrectomy. During surgery, after opening the abdomen, the tumor's resectability was assessed before proceeding with resection. Once the stomach was fully mobilized, the first part of the duodenum was divided using a GIA 60 mm linear stapler (manufactured by Medtronic), and the esophagus was transected 5 cm proximal to the tumor margin. A Roux limb was prepared by dividing the jejunum ~20–30 cm from the duodenojejunal (DJ) flexure, and it was brought up in an antecolic manner. The EJA was then performed using either a stapled or hand-sewn technique. After completing the anastomosis, an intraoperative leak test was performed by inflating the anastomosis with air via a nasogastric tube (NGT) to confirm its integrity. The proximal end of the jejunum was then anastomosed to the jejunum 40 cm distal to the EJA site, either in a side-to-side or end-to-side manner, using a hand-sewn technique according to surgeon preferences. A feeding jejunostomy was performed in all patients using a modified Witzel's technique. For the stapled anastomosis, a purse-string suture using 2–0 Prolene was placed in the distal esophagus. The anvil was passed into the esophagus, and the purse-string suture was secured tightly around the anvil head without slack. The stapler gun was introduced through the free jejunal loop, and an end-to-side stapled EJA was created using an EEA 25 mm circular stapler (manufactured by Medtronic). The stapler's doughnuts were carefully inspected for completeness. The jejunal stump was closed using either a GIA (Gastro Intestinal Anastomosis) 60 mm linear stapler or hand-sewn sutures. For the hand-sewn anastomosis, a single-layer interrupted suture in an end-to-side fashion was performed using 3–0 Vicryl sutures.

Postoperative management

Patients were monitored in the ICU postoperatively. Trial feeding through the jejunostomy began on postoperative day (POD) 2, starting with clear fluids and gradually progressing to the target volume. If there was clinical suspicion of an anastomotic leak (increased abdominal pain, fever, nausea and vomiting, signs of peritonitis, tachycardia, and hypotension), an initial bedside ultrasound of the abdomen was performed, followed by a CT scan of the abdomen with water-soluble oral contrast on POD 7. If no leak was identified, the NGT was removed, and oral intake was initiated on POD 7. Abdominal drains were removed once the patient successfully transitioned to a soft diet.

Follow-up

All patients were followed for 7–14 months postsurgery with median 12 months. The follow-up protocol included outpatient visits at 1 week, 1 month, and then every 3 months. During these follow-ups, all patients underwent clinical examinations and hemogram testing. Patients with abdominal complaints (e.g. abdominal pain, discomfort, bloating, or changes in bowel habits) were evaluated with ultrasonography, and additional endoscopy or CT scans were performed if necessary. Any anastomotic strictures indicated by dysphagia and documented by upper endoscopy were treated with dilation according to the hospital's established protocol.

Patients' general data

The analysis included a wide range of parameters, such as:

(a) Demographic data: age and sex distribution of the patients.

(b) Presenting complaints: symptoms including dysphagia, abdominal pain, vomiting, loss of appetite, and weight loss.

(c) Lifestyle factors: history of smoking, alcohol consumption, and dietary habits.

(d) Comorbidities: presence of conditions like diabetes and hypertension.

(e) Clinical signs: physical findings such as abdominal mass and pallor.

(f) Biochemical parameters: levels of hemoglobin and albumin.

(g) Disease characteristics: stage distribution of the disease.

(h) Surgical data: operative time, blood loss, and transfusion requirements.

(i) Postoperative outcomes: Incidence of anastomotic leak and stricture, time to NGT removal, time to initiation of oral feeds, timing of abdominal drain removal, wound infections, pneumonitis, length of hospital stay, and mortality.

These parameters were compared between the two patient groups.

Study definitions

Anastomotic Leak: a radiologically or clinically detectable fluid collection, associated with symptoms such as pain and/or fever.

Anastomotic Stricture: the recurrence of dysphagia due to narrowing at the EJA site, confirmed via endoscopy or radiological imaging.

Intra-abdominal Collection: any fluid collection larger than 5 cm identified through ultrasonography or contrast-enhanced CT scan.

Wound Infection: presence of pus or fluid at the surgical site, accompanied by fever, leukocytosis, and local signs of inflammation, without other major complications.

Pneumonitis: postoperative lung abnormalities, presenting with fever and decreased air entry.

Mortality: death occurring within 30 days of surgery or up to the time of discharge if this period extends beyond 30 days.

Statistical analysis

Values are given as mean±SD or percentage. To compare parametric data, Independent samples T test was used, whereas comparing nonparametric data was done using χ^2 tests. *P* value less than 0.05 was considered statistically significant.

RESULTS:

The records of all patients treated for adenocarcinoma of the EGJ and proximal stomach between January 2020 and January 2023 at Minia University Hospital were retrospectively studied. The study included 27 patients who underwent total gastrectomy for carcinoma of the EGJ or proximal gastric cancer. Of these, 17 (63%) patients received stapled EJA, while 10 (37%) patients underwent hand-sewn EJA. In terms of demographics, 16 (59%) patients were male, and 11 (41%) were female. The mean age in group I (stapled EJA) was 49.6 years (range: 25–63), while in group II (hand-sewn EJA), it was 54.6 years (range: 24–67). The most common symptoms reported were dysphagia 23 (85.2%) patients, abdominal pain 10 (37%) patients, and vomiting seven (25.9%) patients. Hematemesis and melena, indicating tumor-related bleeding, were observed in three (17.7%) patients from group I and two (20%) patients from group II. A large proportion of patients (25, 92.6%) experienced appetite loss and weight loss, while abdominal mass was palpable in only two (7.4%) patients. Regarding comorbidities and personal habits, only one (3.7%) patient had diabetes mellitus and one (3.7%) had systemic hypertension. In group I, 12 (70.6%) patients were smokers, and three (17.7%) patients were alcohol consumers. In group II, eight (80%) patients were smokers, while one (10%) patient consumed alcohol. All patients followed a non-vegetarian diet. The mean hemoglobin concentration was 9 g/dl (range: 5–14.2 g/dl), with preoperative transfusion required for hemoglobin levels below 8 g/dl. The mean serum albumin level was 3.1 g/dl (range: 2.4–4 g/dl), with no statistically significant difference between the groups in these parameters. All patients underwent multislice contrast-enhanced CT of the chest and abdomen, upper GI (Gastro Intestinal) endoscopy, and biopsy to confirm the diagnosis and assess resectability, with staging based on the AJCC (American Joint Committee on Cancer) eighth edition TNM (Tumor Node Metastasis) classification. The majority of cases were stage II (18.5%) and III (81.5%), reflecting the advanced nature of the cases treated (Table 1).

Table 1: Patients' general data

	Group I (n=17) N %	Group II (n=10) N %	<i>P</i> value
M/F	10/7	6/4	0.95
Age (mean±SD)	49.6±14.1	54.6±12.1	0.36
Dysphagia	15 (88.2)	8 (80)	0.56
Vomiting	5 (29.4)	2 (20)	0.59
Abdominal pain	7 (41.2)	3 (30)	0.56
Hematemesis and melena	3 (17.7)	2 (20)	0.88
Abdominal mass	1 (5.9)	1 (10)	0.69
Loss of appetite and weight	16 (94.1)	9 (90)	0.69

Smoking	12 (70.6)	8 (80)	0.59
Alcohol	3 (17.7)	1 (10)	0.58
Hb (g/dl, mean±SD)	8.9±2.3	9.2±2.9	0.75
Albumin (g/dl, mean±SD)	3.1±0.38	3.1±0.44	0.92
Stage:			0.88
Stage II	3 (17.7)	2 (20)	
Stage III	14 (82.3)	8 (80)	
Adjuvant chemotherapy	16 (94.1)	8 (80)	0.26

The mean operative time was 167.8 min in group I and 202.1 min in group II, with a statistically significant difference ($P<0.001$). Preoperative transfusions were required in 52.9% of stapled EJA cases and 60% of hand-sewn EJA cases, a nonsignificant difference ($P=0.72$). Blood loss was significantly lower in the stapled EJA group (168.3 ml) compared with the hand-sewn group (197.5 ml) ($P=0.002$). An EJA leak occurred in one (10%) patient from group II, with no significant difference between the two groups ($P=0.18$). This patient was treated with intercostal drainage and a self-expanding metallic stent but unfortunately, expired during the hospital stay due to sepsis. Wound infections occurred in two patients from each group (11.8% in group I, 20% in group II), and one patient in each group developed pneumonia (5.9% in group I, 10% in group II), with no statistically significant differences. The mean time to NGT removal and initiation of oral fluids was

significantly shorter in group I (6.2 days) compared with group II (7.9 days) ($P=0.01$). Similarly, the mean time to drain removal was shorter in group I (7 days) compared with group II (9.3 days) ($P=0.002$). The mean hospital stay was also significantly shorter in group I (8.7 days) compared with group II (12 days) ($P<0.001$). Anastomotic strictures occurred in one patient from each group (5.9% in group I, 10% in group II), both of which were managed with endoscopic dilatation, with no significant difference between the groups. Tumor recurrence at the anastomotic site was observed in one patient from group II (10%), managed with palliative chemoradiotherapy. Mortality was observed in one patient from each group (in group I due to chest infection one month after discharge, in group II due to sepsis from anastomotic leak during the hospital stay), with no statistically significant difference ($P=0.69$). The overall mortality rate was 7.4%. VI and OSI (Table 2).

Table 2: Surgery related data

	Group I (n=17) N %	Group II (n=10) N %	P value
Duration of surgery (days, mean±SD)	167.8±19.7	202.1±10.5	<0.001
Blood loss (ml, mean±SD)	168.3±18.4	197.5±21.5	0.001
Preoperative transfusion	9 (52.9)	6 (60)	0.72
Wound infection	2 (11.8)	2 (20)	0.56
Pneumonia	1 (5.9)	1 (10)	0.69
Time to NGT removal and start of oral fluids (days, mean±SD)	6.2±1.4	7.9±1.6	0.01
Time to drain removal (days, mean±SD)	7±1.54	9.3±1.9	0.002
Hospital stay (days, mean±SD)	8.7±1.3	12±1.5	<0.001
Anastomotic leak	0	1 (10)	0.18
Anastomotic stricture	1 (5.9)	1 (10)	0.69
Recurrence	0	1 (10)	0.18
Mortality	1 (5.9)	1 (10)	0.69

NGT, nasogastric tube

DISCUSSION

Despite ongoing improvements in anastomotic techniques, EJA leakage remains one of the most significant complications after total gastrectomy, affecting 4-15% of patients^[8]. Postoperative morbidity and mortality—both short-term and long-term—are closely associated with EJA, with complications like anastomotic leakage leading to sepsis and anastomotic stricture being particularly concerning^[7]. This study investigated the outcomes of stapled versus hand-sewn EJA following total gastrectomy in our surgical department, aiming to predict results and establish a standard surgical protocol. Interest in comparing stapled and hand-sewn anastomosis has existed since the advent of the first mechanical stapler^[9]. While some studies, such as those by Honório *et al.*,^[10] have indicated no significant difference in overall complication rates between the two techniques, the discussion continues, with some evidence suggesting slightly better outcomes for stapled anastomosis. Larger studies have reported a reduction in the incidence of anastomotic leakage with stapled techniques^[11–13]. As a result, many now regard stapled EJA as the superior approach. In our findings, the operative time was significantly longer in the hand-sewn EJA group compared with the stapled group (P value = 0.000). A recent meta-analysis indicated that while hand-sewn and stapled anastomosis provide similar surgical outcomes, stapled anastomosis reduces operative time^[10]. Additionally, the stapled group experienced significantly less blood loss than the hand-sewn group (P value = 0.001). Regarding EJA leakage, there was no significant difference between the techniques ($P=0.18$). Anastomotic stricture occurred in one case in each group during follow-up, which was not statistically significant ($P=0.69$), suggesting that the technique used did not affect stricture rates. Some prior studies noted a shorter surgery duration and lower anastomotic leakage rates in the stapler group but reported a higher stricture rate. Nevertheless, other research found no significant differences between the two methods^[11,12,14,15]. Although several randomized controlled trials have shown no significant differences in leak rates and major morbidity, stapled anastomoses provide benefits such as shorter operating times, enhanced anastomotic integrity, reduced morbidity, and shorter hospital stays. Stapled techniques also facilitate higher anastomosis after radical total gastrectomy for esophagogastric junction and proximal gastric cancers without requiring thoracotomy, especially in cases with intramural infiltration^[7]. The stapled group had earlier NGT removal and initiation of oral intake ($P=0.01$). The differences in wound infection and pneumonia rates between the groups were not statistically significant^[16]. Wound infections were managed through suture removal, thorough washing, and antibiotics tailored to culture sensitivities.

Pneumonitis was treated with aggressive interventions, including ambulation, chest physiotherapy, antibiotics, and nasal oxygen. There was no statistically significant difference in anastomotic site recurrence rates between groups ($P=0.18$), indicating that the technique did not influence recurrence. The overall recurrence rate was 3.7%, lower than what is reported in the literature (16.1–29.2%)^[17], possibly due to the small sample size and limited follow-up duration in our study. The overall mortality rate was 7.4% during the follow-up, with no significant difference between groups ($P=0.69$). Meta-analyses on esophagogastric anastomosis by Markar *et al.* and recent analyses on EJA have corroborated these findings^[10,18]. This study has limitations, including small sample size, short follow-up duration, and variability in surgical expertise due to multiple surgeons involved, all of which could impact anastomotic outcomes.

CONCLUSION

EJA is a significant source of postoperative morbidity after total gastrectomy for malignancy. This study shows that the stapled anastomosis group experienced shorter operative times, reduced blood loss, earlier oral feed initiation, faster drain removal, and shorter hospital stays compared with the hand-sewn group. These findings support stapled EJA as a safe and efficient method for esophagojejunostomy compared with hand-sewn techniques.

CONFLICT OF INTEREST

There are no conflicts of interest.

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