

# Retrospective Analysis of Hand-sewn versus Stapled Esophagojejunostomy after Total Gastrectomy: A single Center Experience

**Ahmed Adel Shoka, MD; Wadie Boshra Gerges, MD; Fady Makram Benjamin, MD**

Department of General Surgery, Faculty of Medicine, Ain Shams University, Egypt

**Introduction:** Stapled esophagojejunostomy is commonly used nowadays as it is time saving technique with accepted results in comparison with hand sewn anastomosis. This retrospective study aims to compare between the two techniques as regarding short term surgical outcome in two groups of patients during open total gastrectomy with roux en y esophagojejunostomy for gastric carcinoma.

**Patients and methods:** The study included 29 adult patients with gastric cancer who underwent TG with roux en-Y esophagojejunostomy in the Department of upper GIT surgery in Ain shams university hospitals between February 2019 and October 2023. The patients were divided into 2 groups according to the technique of EJA: hand-sewn (13 cases) or stapled (16 cases). We compared the two groups in terms of the operative time, occurrence of complications (focusing on bleeding, anastomotic leakage, stricture and abdominal abscess) and length of hospital stay.

**Results:** There were no significant differences in duration of the surgery ( $P=0.13$ ), blood loss ( $P=0.29$ ), or length of postoperative hospital stay ( $P=0.9$ ) among the groups. The most serious complication was anastomotic leakage, with 3 cases in both groups, 2 of them were suffering only radiological leakage ( $P=0.51$ ). During the follow up period the anastomotic stricture occurred in 1 (7.7%) cases with hand-sewn anastomosis ( $P=0.67$ ) and 2 (12.5%) cases with stapled anastomosis.

**Conclusions:** In our study there were no significant differences in the short and midterm surgical outcome between hand-sewn and stapled esophago-jejunal anastomosis in total gastrectomy.

**Key words:** Anastmosis, leakage, stricture, bleeding.

## Introduction

Total radical gastrectomy with D2 lymphadenectomy remains the primary curative treatment for gastric cancer (GC). It is indicated for lesions of the upper third of the stomach.<sup>1</sup> Many approaches are used for gastrointestinal re-construction after total gastrectomy (TG), Roux-en-Y esophago-jejunal anastomosis (EJA) is considered the gold standard method.<sup>2</sup> which may be performed either hand-sewn or stapled.<sup>2</sup> The most important complications associated with EJA, include anastomotic leak-age, stenosis, dehiscence, and bleeding,<sup>3</sup> Few decades ago occurrence of anastomotic leakage was up to 40% of cases and was the most important factor associated with postoperative deaths.<sup>4</sup> The surgical technique is the corner stone to alleviate the morbidity and mortality rates.<sup>5,6</sup> Anastomotic stenosis is considered as a late complication, which may need re interventions such as endoscopic dilation or stenting.<sup>7</sup> EJA was traditional performed using hand-sewn technique However, staplers have become more popular because of their feasibility and lessening of the operation time.<sup>8,9</sup> Yet in developed countries, due to the high cost, access to such resources sometimes is restricted.<sup>10</sup> Although misfiring is rare complication of staplers but it is still reported in few cases and needs high professional managment.<sup>11</sup> Thus our study aims to compare the short- and medium-term results of handsewn versus stapled esophagojejunostomy after total gastrectomy.

## Patients and methods

### Study design

This retrospective comparative study included patients with gastric cancer who had D2 Total gastrectomy with Roux en Y esophagojejunostomy, either stapled or hand sewn (Whether preceded or not preceded by neoadjuvent chemotherapy) at the General Surgery Department (Upper GIT Unit), Ain shams University Hospitals. The patients' data were collected prospectively from February 2019 to October 2023. An informed consent was taken from all patients including the nature of illness, the magnitude of surgery, morbidity and mortality & alternatives and the enrolment of their data in the study. The study was approved by the institutional research ethics committee (IRB No: 0006379).

Indications for D2 Total Gastrectomy included Fit patients, non-metastatic disease and oncologic allowance (With or without neoadjuvent chemotherapy).

### Eligibility criteria for the study

Patients who completed at least 6 months follow up were included.

13 patients were included in group A, hand sewn (HS) esophagojejunostomy, 16 patients were included in group B, stapled (S) esophagojejunostomy.

## Preoperative assessment

Detailed assessment of all patients were done including cardiovascular, chest condition in addition to routine laboratory work up.

## Surgical technique

The patient was placed on the table in the supine position, with the bed in slight reverse Trendelenburg position. A Foley catheter was inserted and appropriate prophylactic antibiotics administered. The patient was provided both pharmacologic and mechanical thrombophylaxis. We routinely started by performing a staging laparoscopy. D2 gastrectomy was routinely done, after transection of distal stomach and duodenum, the dissection was carried proximally toward the oesophageal hiatus in order to mobilize the oesophagus to facilitate subsequent steps in the dissection, the triangular ligament of the left lobe of the liver is taken down with electrocautery, exposing the oesophageal hiatus. The left lobe was then retracted to the right under a retractor. The peritoneal reflection overlying the oesophageal hiatus was opened in continuity with the gastrohepatic ligament to expose the diaphragmatic crura. Blunt digital dissection can be performed to encircle the oesophagus, at this time, the stomach was only the remaining attachment is the esophagus, which tends to retract into the thoracic cavity once divided. Corner sutures were placed at the lateral edges of the esophageal opening. These were not tied down but instead tagged with hemostats. The division of the esophagus was then completed, and the specimen removed from the field. Our preferred method was to perform a retrocolic Roux-en-Y end-to-side esophagojejunostomy, which can either be handsewn or stapled with an EEA stapler. The jejunum (Roux limb) was divided approximately 20 cm distal to the ligament of treitz, and was brought up through a small 4-cm incision made in the avascular portion of the transverse mesocolon, to the left of the middle colic artery. The Roux limb was aligned with the esophageal opening, for the hand sewn technique the jejunal opening was made on the antimesenteric border of the jejunum. We started with the posterior layer using PDS 3-0 interrupted full thickness sutures and anteriorly interrupted extramucosal. Two additional sutures were applied from the Roux limb to the diaphragm on both sides of the anastomosis to reduce the tension on the suture line. On the other side for the stapled technique, the anvil was introduced inside the oesophagus and kept in place by the purse-string suture placed around it, then the stapler was introduced through the jejunal end and end to side anastomosis was performed followed by closure of the jejunal end by linear stapler. The jejunum-jejunal end-to-side anastomosis was performed at least 50

cm distally from EJA.

## Postoperative management and follow-up (FU)

Early ambulation was encouraged, & oral fluid intake was allowed early on postoperative day (POD) 1 or 2 followed by excluding leakage with oral dye series. Patients were discharged home after confirming their well-being and tolerance to oral diet. Patients were seen on weekly basis for one month to assess tolerance to oral intake and to detect possible early complications. CT of abdomen and pelvis with oral contrast was done when leakage was suspected. All patients were advised to take oral supplements containing iron, calcium, vitamins B12 & D. Follow up visits were scheduled at 3 & 6 months postoperatively to assess patient general condition and any new complaint.

## Data collection, management and statistical analysis

Data were collected from our medical reports including age, sex, histopathology, operation time, intraoperative complications (Bleeding, organ injury), start of oral feeding, first bowel motion, leakage, wound infection, stricture, and cost.

The collected data were revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp). Shapiro wilk's test was used to evaluate normal distribution of Quantitative variables. Student's t test was used to compare quantitative variable between two study groups. Categorical variables were compared using the Chi-square or Fisher exact test. Pearson correlation was used to assess the strength of association between two quantitative variables. Multivariate linear regression (MLR) analysis was used to determine which variables were associated independently with outcome variable. A P-value <0.05 was considered statistically significant.

## Results

The study group consisted of 11 female patients and 18 male patients with mean age  $55.9 \pm 7.78$  (36-67). Hand-sewn anastomosis was performed in 13 (45%) cases, while stapled anastomosis was performed in 16 (55%). According to the Japanese gastric surgery Association definitions and types of the gastric surgery we performed standard total gastrectomy in our study.

## Comparison between Hand-Sewn and Stapled Groups

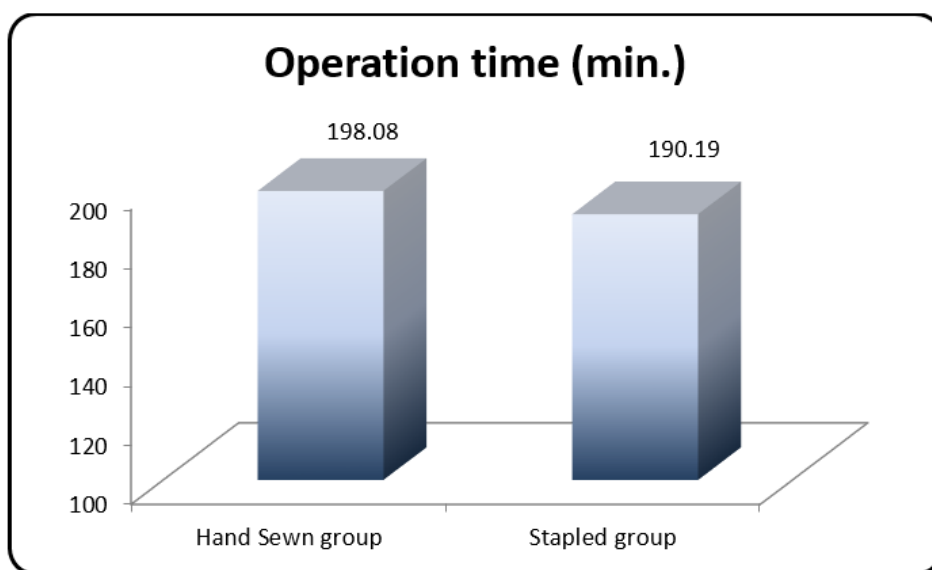
The groups were quite similar to each other. There

were no statistically significant differences among the patients' age, gender, comorbidities (Including diabetes, hypertension, non-ischemic heart disease, and others), BMI, previous abdominal operations, and neoadjuvant chemotherapy as shown in **(Table 1)**

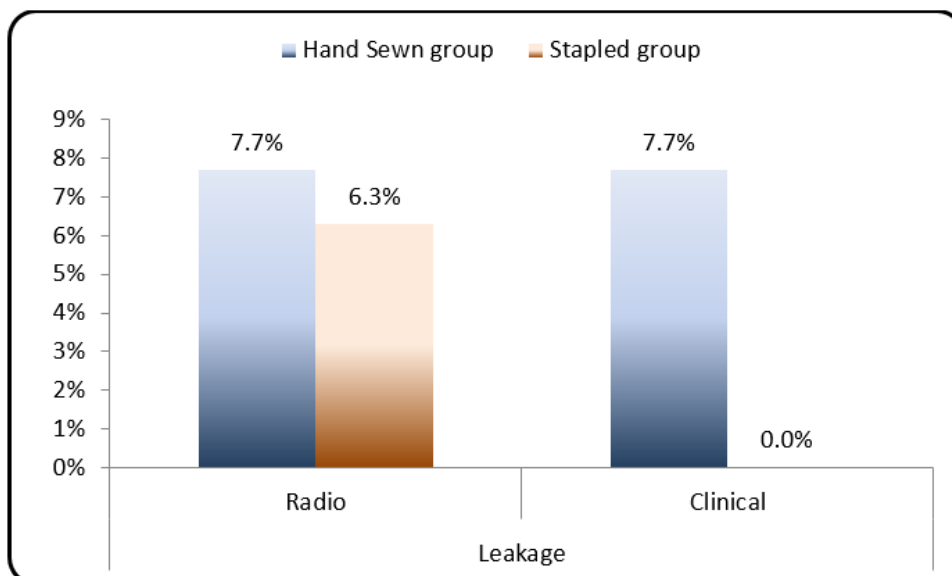
Perioperative parameters such as duration of surgery, blood loss, need blood cell transfusion, start of oral feeding, first motion, anastomotic leakage, intraabdominal abscess, wound infection, length of hospital stay, short term anastomotic stricture and were also not significantly different between the analyzed groups ( $P>0.05$  in each case) as shown in **(Table 2)**

For the operation time the hand sewn group was slightly longer ( $198.08 \pm 14.99$  minutes) while

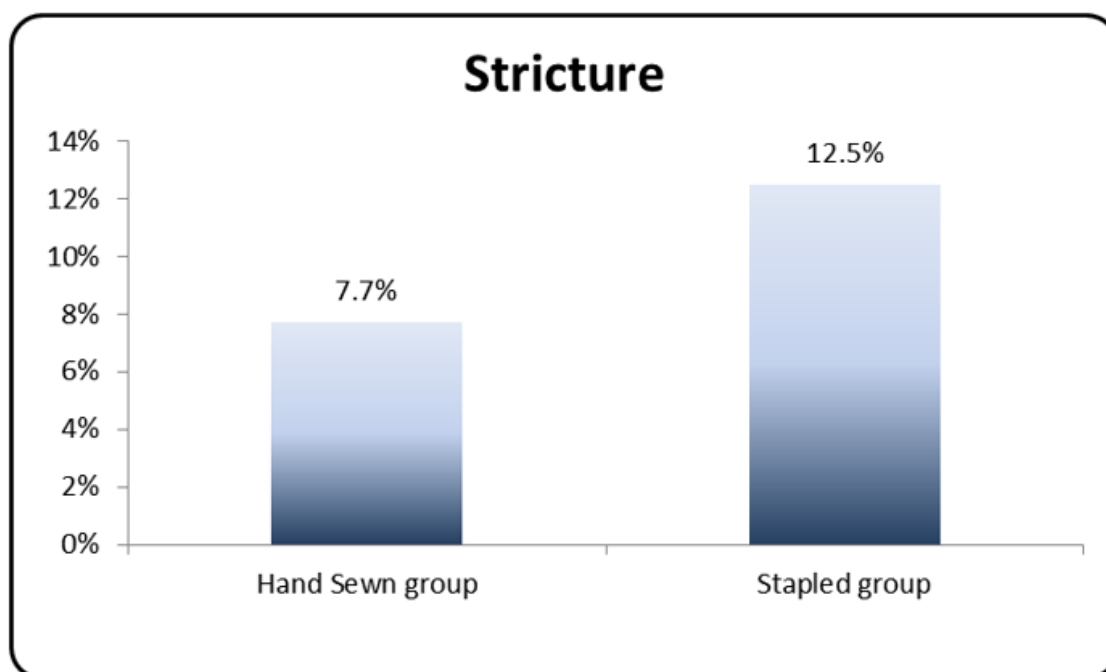
for the stapled group ( $190.19 \pm 12.28$  minutes) **(Fig. 1)**, while blood loss was nearly the same in both groups as well as start of oral feeding and the first motion. Only 3 cases of both groups suffered from leakage, 2 cases from the HS group one of them was only radiological leakage and the other was clinically manifested leakage and was treated endoscopically by stenting, while the stapled group only one case was diagnosed as radiological leakage during the routine postoperative gastrographin study **(Fig. 2)**. Length of hospital stay was always the same in both groups. Short term anastomotic stricture was manifested with symptoms of dysphagia in only one case of the HS group and 2 cases in the stapled group and they required no definitive treatment other than some instruction as drinking plenty of water during meals and required no mechanical dilation **(Fig. 3)**.



**Fig 1: Comparison between hand sewn and stapled groups regarding operative time (Min.) among the studied patients.**



**Fig 2: Comparison between hand sewn and stapled groups regarding leakage among the studied patients.**



**Fig 3: Comparison between hand sewn and stapled groups regarding stricture among the studied patients.**

**Table 1: The general characteristics of patients**

		Stapled group No.=16	HS group No.=13	Test- value	P- value	Sig.
<b>Age</b>	Mean±SD	55.38 ± 7.6	56.54 ± 8.25	-0.395•	0.696	NS
	Range	37 – 65	36 – 67			
<b>Sex</b>	Female	6 (37.5%)	5 (38.5%)	0.003*	0.958	NS
	Male	10 (62.5%)	8 (61.5%)			
<b>BMI</b>	Mean±SD	26.25 ± 2.05	25.15 ± 1.63	1.568•	0.129	NS
	Range	23 – 29	22 – 28			
<b>Previous abdominal operations</b>		8/16(50%)	6/13 (46.2%)	0.042*	0.837	NS
<b>Comorbidities</b>		10/16 (62.5%)	8/13 (61.5%)	0.003*	0.958	NS
<b>Neoadjuvant chemotherapy</b>		11/16 (68.8%)	8 /13(61.5%)	0.165*	0.684	NS

P-value > 0.05: Non significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant.

\*: Chi-square test; •: Independent t-test.

**Table 2: Perioperative parameters**

		Hand Sewn group	Stapled group	Test value	P-value	Sig.
		No. = 13	No. = 16			
<b>Operation time (min.)</b>	Mean ± SD	198.08 ± 14.99	190.19 ± 12.28	1.559•	0.131	NS
	Range	175 – 240	165 – 225			
<b>Bleeding (CC)</b>	Mean ± SD	334.62 ± 77.42	365.63 ± 76.85	-1.077•	0.291	NS
	Range	250 – 500	250 – 550			
<b>Leakage</b>	No	11 (84.6%)	15 (93.8%)	1.319*	0.517	NS
	Radio	1 (7.7%)	1 (6.3%)			
	Clinical	1 (7.7%)	0 (0.0%)			
<b>Start of oral feeding</b>	First	9 (69.2%)	14 (87.5%)	1.459*	0.227	NS
	Second	4 (30.8%)	2 (12.5%)			
<b>First motion (days)</b>	Median (IQR)	3(2 – 3)	3(2.5 – 3.5)	-0.666#	0.506	NS
	Range	1 – 4	1 – 5			
<b>Wound infection</b>	No	12 (92.3%)	13 (81.3%)	0.738*	0.390	NS
	Mild	1 (7.7%)	3 (18.8%)			
<b>Intra-abdominal abscess</b>	Negative	12 (92.3%)	16 (100.0%)	1.275*	0.259	NS
	Positive	1 (7.7%)	0 (0.0%)			
<b>Hospital stay (days)</b>	Median (IQR)	7(6 – 9)	7(6.5 – 8)	-0.113#	0.910	NS
	Range	6 – 20	6 – 12			
<b>Stricture</b>	Nil	12 (92.3%)	14 (87.5%)	0.179*	0.672	NS
	Mild	1 (7.7%)	2 (12.5%)			

P-value > 0.05: Non-significant; P-value < 0.05: Significant; P-value < 0.01: Highly significant.

\*: Chi-square test; •: Independent t-test; #: Mann-Whitney test.

## Discussion

In our study we compared the surgical outcomes of hand-sewn versus stapled esophago-jejunal anastomosis in open total gastrectomy. The two groups of patients were fairly comparable with respect to different parameters including age, laboratory values, tumour staging, and other variables. The main finding of our study is that there were no significant differences in terms of operation time, LOS, and perioperative complications, with particular emphasis on leakage, intra-abdominal abscess, and anastomotic strictures during the 6 months following surgery. Additionally, during the follow-up we assessed the recurrence rate and long-term survival of patients with gastric cancer after TG.

An ideal gastrointestinal anastomosis should fulfil the following principles: good approximation of both ends, well vascularized, tension-free and spillage from the operation field should be avoided.<sup>8</sup> The manual procedure has been used in tract anastomosis for a long time, but stapler suturing has been increasingly used as an anastomotic method in digestive tract surgery in the past decades.<sup>9,10</sup> China 2014

A Chinese study collected Data retrospectively from

499 patients who underwent surgery to remove gastrointestinal tumors (Including gastric, colonic, esophageal) from January 2008 to December 2009.<sup>11</sup> The gastric cancer group included 104 patients with stapled anastomosis and 74 patients with hand sewn anastomosis demonstrated that stapler suturing shortened the operation time compared to conventional handsewn suturing for three types of digestive tract tumors. Shortening the operation time means reducing surgical trauma and intra-operative blood loss and also abating local infection and reducing the chance of surgical complications. Also their results revealed that the stapled anastomosis significantly shortened the restoration of normal functions of the digestive tract compared to the hand-sewn procedure for gastric carcinoma and (P < 0.05) and the same was as regarding anastomotic leakage and anastomotic bleeding which were significantly lower in the stapler group than hand sewn group (P < 0.05), on the other hand duodenal stump leakage showed no significant difference between both groups. However, the superiority of stapling did not extend to post-surgery ICU admission and postoperative hospital stay, which is consistent with the previous reports that postoperative hospital stay time showed no difference between the patients who received stapler suturing and manual procedure

after gastrectomy. Interestingly, the stapled method had a higher incidence of anastomotic stricture according to another report.<sup>12</sup>

Data from 79 patients who underwent total radical gastrectomy for gastric cancer at Medical University of Silesia, Katowice, Poland between 2018 and 2021 were retrospectively analyzed by K. Majewska,<sup>13</sup> The main finding of this study is that there were no differences between two groups: stapled (44 cases) or hand-sewn (28 cases) in terms of surgery duration, and postoperative complications particularly anastomotic leakage, intra-abdominal abscess, and anastomotic strictures in long-term follow-up. Regarding anastomotic leakage as the most important complication 2 cases in the stapled group and 2 in the hand-sewn group (4.5% and 7.1%, respectively,  $P=0.76$ ) suffered from leakage which is comparable with our study. Also anastomotic stricture occurred in 7 (15.9%) of 44 cases with stapled anastomosis, and in 6 (21.4%) of 28 cases with hand-sewn anastomosis ( $P=0.52$ ). Additionally, during the follow-up they assessed the recurrence rate and long-term survival of patients with gastric cancer after TG, and there were no significant differences, which is another factor proving the similarity of these 2 groups.

Another retrospective study by Kollandasamy C.<sup>14</sup> where Patients underwent total gastrectomy for gastric adenocarcinoma, with a sample size of 63 patients. Hand sewn anastomoses was done by single layer, interrupted sutures using 3-0 vicryl in 15 patients and stapler anastomoses was done by using SDH 25mm circular stapler in 48 cases, There was a prolonged operative time (mean 208 mins) in hand sewn esophagojejunal anastomoses group when compared with the hand sewn esophagojejunal anastomoses group (171 mins) and which was statistically significant with  $p$  value=0.000, also amount of blood loss was statistically significant with  $p$  value = 0.002 although the need for blood transfusion was not statistically significant with  $p$  value = 0.552 due the small amount of blood loss in both groups. Esophagojejunal anastomotic leak in stapler anastomosis group was present in 1 patient (2.1%) and in hand sewn anastomosis group were present in 2 patients (13.3%). They were not statistically significant with  $p$  value of 0.138. regarding the LOS it was significantly longer in the hand sewn group (Mean = 15.6 days) in comparison with the stapler group ( mean = 9.52 days). On the long term follow up one patient (2.1%) in stapler group and one patient (6.7%) in handsewn group suffered from stricture which was managed by endoscopic dilatation. Which was not statistically significant with  $p$  value = 0.422.

In a review by Umemura et al, circular staplers (CSs) methods were significantly associated with

anastomotic leakage (4.7% vs. 1.1%,  $p < 0.001$ ) and stenosis (8.3% vs. 1.8%,  $p < 0.001$ ) of the EJ as compared with the linear stapler method.<sup>15</sup>

A systematic review and meta-analysis collected data from 12 different studies,<sup>16</sup> Two randomized clinical trials and 10 observational studies,<sup>16-27</sup> were included including 1761 patients that compares hand-sewn and mechanical esophagojejunal anastomosis for total gastrectomy and showed that only operation time differed between groups, favouring stapled over hand-sewn. Other outcomes such as leakage, intra-abdominal abscess, reoperation rate, general complications, stenosis, LOS, and mortality were similar for handsewn and stapled anastomosis.

The time of operation, which is including the anastomosis time, is an impacting factor on the patient's general condition after surgery. Lengthy surgery and anaesthesia puts additional burden on the patient and increases the incidence of postoperative complications.<sup>28</sup>

In our study, there was no significant difference between hand-sewn anastomosis and circular stapling anastomosis ( $P=0.131$ ) which is compatible with the recent study done by K. Majewska that also reported no significant difference in the operation time between both groups ( $P=0.61$ ).

However a recent meta-analysis,<sup>29</sup> revealed a conflicting reports on this issue as the operation time was 22 minutes longer during the hand sewn procedure but still without a serious impact on the overall morbidity and mortality of the procedure.

Three randomized controlled trials (RCT) compared the hand-sewn to circular stapler anastomosis and showed no difference in operating time.<sup>21,30,31</sup> on the other hand , a RCT done by Liu et al reported a significant difference in the operation time between the stapler group and hand-sewn group (193 and 226 minutes respectively,  $P<0.001$ ) in the creation of esophago gastric anastomosis.<sup>32</sup>

Anastomotic leakage remains one of the most serious complications in total gastrectomy, affecting up to 15% of patients, with several risk factors including, old age, male sex, malnourishment, anemia, uncontrolled cardiovascular and pulmonary diseases, diabetic patients, obesity, tumour stage, and surgical technique.<sup>33</sup>

Several studies reported different results considering leakage after EJA, some comparative studies declared lower leakage rates after stapled anastomosis,<sup>15,26</sup> while larger cohort studies reported equivalent results or even higher incidence of leakage using circular staplers.<sup>34</sup>

There are some limitations to our study, as it was a single-center retrospective study restricted to only

29 patients because many patients were presented with advanced disease and only palliative treatment was possible for them; however, the 2 groups were comparable, and homogenous. Another limitation accompanied with the retrospective design of our research is the risk of selection bias, as the choice of anastomosis technique was based only on the surgeon's preferences, so randomized controlled trials are needed to confirm these results.

## Conclusions

There were no significant differences in operative time and postoperative morbidity between the hand-sewn and stapled anastomosis groups. The results indicate that both techniques in open total gastrectomy are equivalent, safe, and feasible. The utilization of the open conventional technique could be recommended nowadays in some cases where shortage of resources is present.

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