

The Comparison of Hand-Sewn and Stapled Anastomosis in Esophagectomy

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Abstract:- Introduction: Historically, open esophagectomy has been the norm. However, minimally invasive esophagectomy has gained popularity in recent decades due to its improved disease-specific survival rate, and post-operative complications. The current study compares the hand-sewn and staple anastomosis outcomes in esophagectomy. **Method:** All patients who underwent esophagectomy with neck anastomosis between January 2017 and March 2021 at the surgical oncology department of Hayatabad Medical Complex, Peshawar was included in this study. Descriptive statistics were used to analyze the data summary. The inferential statistics were performed to compare hand-sewn and stapled anastomosis outcomes. The p-value was significant at a 0.05 level. **Result:** In the current study, the mean operation time was quite higher on the staple group ($p < 0.0001$). However, the anastomotic time was less in the staple group compared to the hand-sewn group. Moreover, there was a significant difference in right intercostal drainage tube time across the hand-sewn and staple groups ($p < 0.0001$). The major anastomotic leakage was high in the hand-sewn group. **Conclusion:** The current study highlighted that stapled anastomosis should be preferred instead of hand-sewn anastomosis in esophagectomy. The anastomotic time, right intercostal tube removal time, and hospital stay were significantly reduced in the stapled anastomosis compared to the hand-sewn anastomosis.

Keywords:- esophagectomy, hand-sewn anastomosis, staple anastomosis.

I. INTRODUCTION

Surgical excision was believed to be the primary treatment for gastrointestinal tumors. The anastomotic method is one of the determinants of surgical success. In clinical practice, hand-sewn and stapled sutures are the most used anastomotic techniques for gastrointestinal procedures (1).

Initially, staplers were created to address the perceived complications with hand-sewn anastomosis, including blood leakage, particularly in anastomoses (2). After the 1980s, with the introduction of staple anastomosis in esophagectomy, post-operative complications were significantly reduced. Multiple reports compared the two surgical procedures in esophagectomy; some results are contradictory. A systematic review of 1,233 patients comparing stapled and hand-sewn anastomosis showed that there was no significant difference in term of mortality, leakage, and re-operations (3). However, another review of 1,125 patients found that in stapled anastomosis there were fewer leaks than hand-sewn anastomosis, although there was no difference in other post-operative complications (3).

The standard therapy for regional esophageal cancer is esophagectomy. After esophageal resection, gastric pull-up and intra-thoracic or cervical-esophagogastric anastomosis are often used to repair the stomach (4). Historically, open esophagectomy has been the norm. However, minimally invasive esophagectomy has gained popularity in recent decades due to its improved disease-specific survival rate, and post-operative complications (5-7). 2-4 Anastomotic leak rate is relatively high 5,6. The development and use of minimally invasive procedures raises problems about the ideal anastomotic technique, as the thoracoscopic/laparoscopic approach makes hand-sewn anastomosis difficult. There are few high-quality studies assessing the influence of the anastomotic method on the development of anastomotic leak, especially in minimally invasive settings. Therefore, the current study compares the

hand-sewn and staple anastomosis outcomes in esophagectomy.

II. METHOD

A. Participants

All patients underwent esophagectomy with neck anastomosis between January 2017 and March 2021 at the surgical oncology department of the Hayatabad Medical Complex in Peshawar were included in this study.

B. Operative technique

After preoperative planning and preparation, surgery was conducted either by a trans-hiatal esophagectomy (THE) or a right posterolateral TTE route. A midline abdominal incision moved the stomach, and a gastric channel was created utilizing linear cutter staplers based on the right gastroepiploic and right gastric veins. Left lower neck mobilization, isolation, and division of the esophagus. The stomach conduit was taken up via the posterior mediastinal pathway into the neck. Hand-sewn with suture or a linear cutter stapler was used to conduct an anastomosis in the left lower neck.

C. Esophagogastric anastomosis

a) Hand-sewn anastomosis

An end-to-side anastomosis was done using a single-layer, full-thickness, interrupted 3-0 absorbable polyglycolic acid suture. A Ryle tube was inserted into the gastric conduit to decompress the gastric conduit. To provide adequate vascularity, a location was chosen on the anterior wall of the gastric conduit distant from the stapled anastomotic line and roughly 3cm below the organ's highest position.

b) Stapled anastomosis

In the neck, a side-to-side anastomosis was accomplished using an endo linear cutter stapler with a 45mm blue cartridge. Two centimeters from the suture line, a hole was formed in the posterior wall of the pulled-up stomach conduit. By firing the linear cutter stapler, the posterior layer of anastomosis was created longitudinally. Then, a Ryle's tube was inserted into the stomach conduit to facilitate postoperative stomach decompression. The anterior layer of anastomosis was created by firing a linear

cutter stapler in a transverse direction, therefore opposing the stomach and esophagus. Using a few seromuscular sutures, the anterior staple line was concealed.

D. Statistical analysis

Initially, the data was recorded on a predefined Excel file. Then this data was imported into SPSS v25. Descriptive statistics were used to analyze the data summary. The inferential statistics were performed to compare hand-sewn and stapled anastomosis outcomes. The p-value was significant at a 0.05 level.

III. RESULTS

The mean age of the study participants in the hand-sewn group was 49±4 years, whereas in the staple group was 51±2 years. The male proportion in the hand-sewn group was higher compared to the staple group (16 vs. 8). The detail can be seen in Table 1.

		Group	
		Hand-Sewn	Staple
		N (%)	N (%)
Age (mean±SD)		49±4	51±2
Gender	Male	16 (66.7)	8 (33.3)
	Female	8 (40.0)	12 (60.0)
Site	Lower	8 (66.7)	4 (33.3)
	Lower Middle	8 (50.0)	8 (50.0)
	Middle	4 (50.0)	4 (50.0)
	Lower + GE junction	4 (50.0)	4 (50.0)

Table 1: Detail of patient's characteristics

In the current study, mean operation time was quite higher on the staple group (p<0.0001). However, the anastomotic time was less in the staple group compared to the hand-sewn group. Moreover, there was a significant difference in right intercostal drainage tube time across the hand-sewn and staple groups (p<0.0001). The major anastomotic leakage was high in the hand-sewn group as shown in Table 2.

		Group		P-value
		Hand-Sewn	Staple	
		N (%)	N (%)	
Operation time, min (mean±SD)		308±6	348±3	<0.0001
Anastomotic time, min (mean±SD)		29±2	13±1	<0.0001
Blood Loss, ml (mean±SD)		351±8	352±5	0.66
Left intercostal drainage tube time, days (mean±SD)		8±2	7±1	0.322
Right intercostal tube removal time, days (mean±SD)		11±1	8±1	<0.0001
Hospital Stay, days (mean±SD)		13±1	9±2	<0.0001
Anastomotic leakage	Nil	12 (50)	12 (50)	0.160
	Minor	8 (50)	8 (50)	
	Major	4 (100)	0 (0)	

Table 2: Comparison of the outcome parameters

IV. DISCUSSION

The success of esophageal surgery is predicated on the well-healed anastomosis. Since the beginning of esophageal surgery, hand-sewn anastomosis has been the standard of treatment. Numerous hand-sewn anastomosis procedures have been reported. The most common consequences of esophageal surgery are anastomotic leaks and strictures. As anastomosis get improved, the success rate was also improved, and when linear stapled was invented, the success rate is much increased. Linear staple anastomosis was initially reported (8) in 1998 and improved by Orringer et al., (9) who conducted side-to-side esophagectomy with a linear stapled anastomosis or with a side-to-side positioning, which improved the postoperative results after esophagectomy.

The current study found that stapled anastomosis is associated with less post-operative complications. The anastomotic leakage was higher in the hand-sewn group than staple group. However, the lack of serosa and the longitudinal orientation of muscle fibers, may affect the healing process and incidence of anastomotic leakage. The surgical anastomotic method remains an essential modifiable element among these parameters.

Linear stapler anastomosis has a lower rate of anastomosis leakage compared to hand sewn. It may be due to the stapled anastomoses which is more expedient and less traumatic to tissues and the lateral stay sutures allow for reduced tension on the anastomosis without compromising gastric conduit microcirculation. In addition, linear stapler provides a triple-layered staple construction which is more water-tighten (10). It has been observed that the incidence of esophagectomy leakage using the linear stapler approach in cervical anastomosis ranges from 15% to 25%, which is higher than in thoracic anastomosis (11, 12). Therefore, the linear stapler approach's advantage in lowering the leakage rate is more remarkable in cervical than in thoracic anastomosis.

Inadequate follow-up was one of the drawbacks of this research; a small number of patients were followed for longer periods. We acknowledged that a lengthier follow-up would enhance the reliability of the research. However, we anticipated that most dysphagia and anastomotic strictures resulting from the anastomotic approach would emerge during the first three months after surgery. By then, we may have compiled an adequate comparison. After three months, additional influencing variables, such as adjuvant radiation, may play a role and impede the comparison. More patients will be lost to follow-up, some patients may get postoperative radiotherapy or chemotherapy, and others will pass away. Therefore, fair comparison over the long term is problematic.

V. CONCLUSION

The current study highlighted that stapled anastomosis should be preferred instead of hand-sewn anastomosis in esophagectomy. The anastomotic time, right intercostal tube removal time and hospital stay were significantly reduced in the stapled anastomosis compared to the hand-sewn anastomosis.

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