Evaluate the Total Mechanical Gastroesophageal Anastomosis for Carcinoma Esophagus

Muhammad Abid Khan, Tahir Aslam, Asif Ahmed, Viqar Aslam, Imran Tahir**

Lady Reading Hospital, Peshawar Pakistan, *Hayatabad Medical Complex, Peshawar Pakistan

ABSTRACT

Objective: To evaluate total mechanical gastroesophageal anastomosis in patients with carcinoma of esophagus.
Study Design: Cross sectional study.
Place and Duration of Study: Department of Surgery, Bolan Medical University, from Jan 2020 to Jun 2021.
Methodology: Total of 75 patients were included consecutively in this observational cross sectional study involving patients diagnosed with esophageal cancer and awaiting to undergo esophagiectomy with mechanical anastomosis in-between 18 to 60 years and were ASA I and II were included. Patients that were ASA III or IV and having any systemic disorder and those that refused to participate were excluded. SPSS version 23.0 was used for data analysis keeping *p*-value <0.05 as significant.
Results: Mean age of patients was 58.31 ± 6.2 years wherein 42(56%) males and 33(44%) females. 29 (38.7%) of patients were ASA I while 46 (61.3%) were ASA II. Mean operative time of patients was 240 ± 65.2 minutes while mean blood loss was 205 ± 32.3 ml. Regarding anastomotic leakage, minor (type I) leakage was observed in 05(6.7%) of patients while major (type II or III) leakage was seen in 03(4%) of patients. Anastomotic dilatation, stricture formation and death were reported in 01(1.33%) patient each.
Conclusion: Total mechanical gastro-esophageal anastomosis was found to have safe, less time consuming and with minimal post-operative anastomotic leakage or stricture formation and morbidity.

Keywords: Anastomotic leak, Carcinoma esophagus, Suturing, Total mechanical anastomosis.

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INTRODUCTION

Anastomotic leakage of the gastro-esophageal region tends to be a fatal complication in patients undergoing esophagectomy for carcinoma (CA) esophagus.[1] The prevalence of anastomotic leakage is estimated to be in-between 2-20%, depending upon various factors.[2] Carcinoma of the esophagus is a complex, multi-faceted disease having an ever-rising incidence, exerting not only financial but also social and healthcare economic burden. At present, the treatment considered to be gold standard for CA esophagus is esophagectomy. In CA esophagus, after esophagectomy, stomach takes on the part to be the substitute.[3]

Nonetheless, the chief complications that are commonly encountered after esophagectomy include anastomotic stricture, leakage and gastroesophageal reflux. Such complications might lead to compromising the quality of life of patients and may even become life-threatening.[4] As a result, to find effective techniques for promoting anastomotic healing as well as preventing leakage of stricture formation of anastomosis till date tends to pose a challenge for surgeons undertaking surgeries of esophagus.[5] Presently, multiple surgical methods are being practiced for post-esophagectomy re-construction for producing improved outcomes, like mechanical (circular or linear stapled) and hand-sewn anastomosis.[6]

The prevalence of anastomotic leakage or complications following esophagectomy has varied in-between 2-20%, the variation being different in terms of mechanical or hand-sewn anastomosis.[7] Complication occurrence is linked to various factors, the most vital being the type of anastomosis being made for esophageal reconstruction, taking a central place in practicing esophageal surgeries. Majority of anastomosis can be successfully completed when site of anastomosis remains free of tension and is nourished by profound supply of blood.[8]

Nonetheless, the anastomosis in-between esophagus and conduit of replacement is specifically prone to leakage as compared to majority of the other gastrointestinal anastomosis.[9] Significance of surgical technique is seldom under-estimated as the incidence of anastomotic complications tends to vary amongst surgeons as well as the technique used for anastomosis tends to be an issue, depending upon experience of

Correspondence: Dr Tahir Aslam, Department of Surgery, Bolan Medical College, Quetta Pakistan
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surgeon.[10] Decades ago, success rate of esophageal anastomosis remained low. With the advancement of technology, a substantial improvement in anastomotic technique and performance was achieved.[11]The chief attribution to the improved outcome of patients undergoing esophageal surgery in terms of anastomotic complications is given to the refined techniques in anastomosis and peri-operative management strategies.[12]

Yet till today, it has remained controversial as to which anastomotic technique should be the choice of technique in terms of rates of success, peri and post-operative complications and quality of life.[13] The objectives of this study were to evaluate total mechanical gastroesophageal anastomosis for carcinoma of esophagus.

METHODOLOGY

This study was carried out at the Department of Surgery Bolan Medical University, from January 2020 to June 2021. A total of 75 patients were included consecutively in this non-randomized controlled trial involving patients diagnosed with esophageal cancer and awaiting to undergo esophagectomy with mechanical anastomosis in-between 18-60 years of age.

Inclusion criteria: Patients that were ASA (American Society of Anesthesiologists) I and II were included in the study.[14]

Exclusion criteria: Patients that were ASA III or IV and having hypertension, diabetes, coronary artery disease or any other systemic disorder and those patients that refused to participate were excluded from the study.

All the included patients had undergone routine pre-operative staging depending on exact location and histological sub-type of esophageal tumor, computed tomography (CT scan) or positron emission tomography (PET scan). All surgeries were carried out under general anesthesia by endotracheal intubation. Stapler selection was done on the basis of esophageal lumen diameter and is wall thickness using 24" in or 26 in.

Following removal of the esophageal tumor, a tube-type stomach was created with the help of straight-line incision. The width of tube-type stomach was around 4-5 cm. Using 3.0 absorbable suture, continuous sutures were placed for strengthening gastric serosa. This aided in making it easy to pull stomach up to neck without any substantial tension.

Insertion of anvil of stapler using, purse clamp, a straight needle reserved purse string suture and esophagus was cut off which was followed up by insertion of anvil into esophagus and the suture was tightened. Purse shape was then carefully kept in place, since if it was not properly in place, anastomosis would not tighten and then anastomosis was strengthened using prolene or silk suture for ensuring stapler anvil was kept stable and closely fitting esophageal mucosa.

The anastomosis was then made at top of tube-type stomach through 2cm incision in gastric wall. Insertion and piercing was made using stapler at site of stomach's greater curvature (for ensuring distance in-between anastomosis and gastric closure is >1 cm) in order to accomplish mechanical anastomosis.

Furthermore, stapler is removed and intraluminal examination of anastomosis ends was completed. Oval clamp was then used for examining mucosal integrity at both the anastomotic ends with the help of stapler. Suction was done for facilitating better surgical view. In cases where musical rupture was seen, 5-0 absorbable intraluminal suture was used for aligning esophageal and gastric mucosa. A gastric tube was then inserted via anastomosis under direct vision. After fixing gastric tube, straight stapler or stump closure was then used for closing gastric wall channel, which was then strengthen using embedded suture. Finally, integrity of anastomotic external ring structures was checked. If needed, reinforcement was done by performing 2-4 extra additional sutures for reducing anastomotic tension.

Data Analysis

For data analysis, SPSS-23 was used. Qualitative variables were represented as frequency and percentages while quantitative variables were reported as mean and standard deviation. For determining the association of total mechanical gastro-esophageal anastomosis and variables, chi-square test was applied keeping *p*-value of <0.05 as statistically significant.

RESULTS

From the total of 75 patients included in the study, mean age of patients was 58.31 ± 6.2 years wherein 42 (56%) were males and 33 (44%) were females. Regarding adjuvant therapies, 21 (28%) of patients were planned for radiotherapy plus chemotherapy while 32 (42.7%) for chemotherapy and 22 (29.3%) only underwent surgical intervention. With regards to the ASA status, 29 (38.7%) of patients were ASA I, i.e. had no other systemic disease while 46 (61.3%) of patients were ASA II, having a mild systemic disease, as shown in Table-I.

Table I: Baseline demographics of study participants n=75.

Variables		Mean ± SD / Frequency (%)
Age (years)		58.31 ± 6.2
Gender	Male	42 (56 %)
	Female	33 (44 %)
Neoadjuvant therapy	Radiotherapy + Chemotherapy	21 (28 %)
	Chemotherapy	32 (42.7 %)
	Upfront	22 (29.3 %)
ASA	I	29 (38.7 %)
	II	46 (61.3 %)

The mean operative time of patients included in the study was 240 ± 65.2 minutes while mean blood loss was 205 ± 32.3 ml (Figure-1).

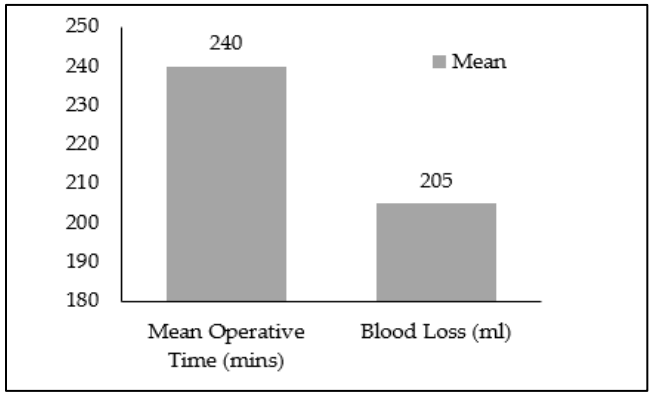

Figure I: Mean operative time (in mins) and blood loss (in ml) of study patients (n=75).

Regarding anastomotic leakage, minor (type I) leakage was observed in 05(6.7%) of patients while major (type II or III) leakage was seen in 3 (4%) of patients. Anastomotic dilatation, stricture formation and death was reported in 1 (1.33%) patient each [Table II].

Table-II: Anastomotic leakage of patients undergoing total mechanical anastomosis for CA esophagus (n=75).

Anastomotic leakage	Frequency (%)
Minor (I)	05 (6.7)
Major (II / III)	03 (4)
Mortality	01 (1.33)
Anastomotic stricture	01 (1.33)
Dilatation	01 (1.33)

The mean length of stay in ICU (intensive care unit) was observed to be 1.4 ± 0.8 days and the mean length of stay in the hospital was 3.3 ± 1.3 days (Figure II).

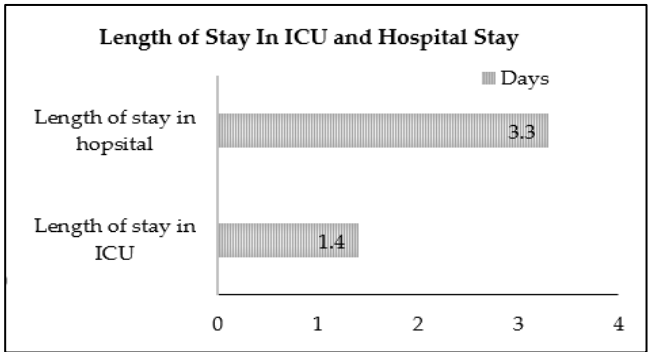

Figure II: Graphical representation of length of stay in ICU (intensive care unit) and length of stay in hospital (days) (n=75).

DISCUSSION

The results of our study showed that using total mechanical gastro-esophageal anastomosis using stapler in patients undergoing surgery for CA esophagus, anastomotic leakage was observed only in 8 (10.7%) of patients overall, with 05(6.7%) out of 08 being minor (type I leakage). In line with our study, another study reported 16 (10.1%) patients with anastomotic leakage after undergoing either mechanical (stapler) of hand-sewn anastomosis for CA esophagus. Type I leakage (minor) denotes that the leakage was minimal, as to being managed conservatively without any intervention, while type II leakage involved either medicinal or minor mechanical intervention while type III anastomotic leakage meant that re-thoracotomy was needed with re-wash and re-drainage.[15]

The use of mechanical anastomosis has been employed for decades now. It has aided in changing surgical practices gradually but definitely. Presently, mechanical anastomosis are being widely utilized for esophagectomy and reconstructing surgery, as it is convenient and most importantly, surgeons tend to rely on it in order to successfully establish esophageal anastomosis.[16] Benefits of esophageal anastomosis include shortened operative time period along with increases in the validation of mechanical anastomosis, more so when anastomosis is done at apex of thorax in which surgeons may encounter poor exposure in hand-sewn anastomosis.[17] Although various different opinions persist, mechanical anastomosis carries the advantage of the staples being made of titanium, which has minimal reaction with tissues and has non-magnetic properties.[18]

Minimal complications were observed in our study in terms of anastomotic leakage and early rehabilitation of patients. One draw-back of our study was

that we did not use the study design to compare total mechanical anastomosis with hand-sewn or the different types of mechanical anastomosis employed. However, published literature and our study also showed that mechanical anastomosis over manual hand-sewn anastomosis is all the more better in terms of uniformity, less time consuming, lesser blood loss, fewer intra-operative or post-operative anastomotic leakages and improved patient outcomes.[19]

Since the most vital contributor to peri-operative morbidity and mortality after esophagectomy is anastomotic leakage, with leakage being linked in long-term recurrence of cancer in a handful of studies.[20] Whilst in medium-term, anastomotic stricture formation may also lead to patient morbidity, causing the requirement of further interventional procedures.[21] In our study, only 01 patient was found to have stricture formation and morbidity.

In one of the studies it was reported that in patients undergoing either mechanical or hand-sewn anastomosis, both the methodologies were found to be equally safe in terms of leakage of anastomosis. However, formation of stricture was seen higher in hand-sewn than mechanical anastomosis, by 9.5 %.[22] Overall, the formation of stricture in studies has varied from 8 to as high as 42%. Nonetheless, all the factors ought to depend upon surgical expertise of the surgeon, duration of surgery, frequency of blood loss, patients' co-morbidities etc.[23]

CONCLUSION

According to the results of our study, total mechanical gastro-esophageal anastomosis was found to have safe, less time consuming and with minimal post-operative anastomotic leakage or stricture formation and morbidity. However further multi-centered studies with greater sample size are needed to authenticate the findings of this study.

Conflict of Interest: None.

Author's Contribution:

MAK: Conduct study as principal author, TA: Data collection writing & analysis, AA: Data collection, VA: Review manuscript & supervision, IT: Data anaysis.

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