

End to End Hand Sewn Cervical Esophago Gastric Anastomosis Versus Semi Mechanical Stapled Anastomosis in Patients Undergoing Esophagectomy - A Retrospective Comparative Study

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ABSTRACT

Introduction: The Anastomotic leak is one of the main cause of morbidity following esophageal resection for carcinoma of the esophagus. We compared end to end hand sewn anastomotic technique with side to side stapled anastomotic technique in terms of anastomotic leak.

Material and methods: It was a retrospective study comparing fifty patients with esophageal cancer who underwent Transhiatal esophagectomy (THE) with cervical esophagogastric anastomosis (CEGA) at a single academic center for the period from 2013 to 2016.

Results: Out of fifty patients analyzed, twenty-five underwent end to end hand-sewn anastomosis and another twenty-five underwent side to side stapled anastomosis. The anastomotic leak rate was more with side to side technique than the end to end hand-sewn anastomosis (P-value 0.042). Other parameters like blood loss, hospital stay, and age were comparable except surgery duration which was more with side to side stapled technique. The anastomotic stricture was more with side to side stapled group, but it was statistically not significant.

Conclusion: End to end hand-sewn anastomosis is more effective than side to side stapled anastomosis. Anastomotic leak is more in the side to side stapled group if we use narrow tip gastric conduit.

Keywords: Carcinoma Esophagus, Esophagectomy, Cervical Esophagogastric Anastomosis, Hand Sewn Anastomosis, Stapled Anastomosis, Gastric Conduit

INTRODUCTION

Esophageal cancer is the fourth common cause of cancer-related death in India. It is prevalent among both men and woman. Squamous cell carcinoma accounts for up to 80% of these cancers, although adenocarcinoma is on the increase due to changing lifestyles. The etiological factors for Squamous cell carcinoma show a regional variation in different parts of India, but tobacco consumption in the various forms, alcohol, hot beverages and poor nutrition remain the predominant predisposing factors. The gold standard of surgery for carcinoma of the esophagus is the removal of the esophagus by means of Transhiatalesophagectomy or Mckeown three-stage procedure or Minimally invasive esophagectomy. The principles of surgery are to obtain a longitudinal margin of 5 cm both proximal and distally from the primary tumor and to achieve a free circumferential margin. The surgical approach may be transhiatal or transthoracic (Ivor Lewis) or in the neck (Mckeown, Transhiatal, Minimal invasive). Reconstruction is as important as resection in

the patient undergoing esophagectomy and complications of reconstruction might adversely affect the outcome of the surgical treatment of esophageal cancer. One of the critical aspects of reconstruction is esophagogastric anastomosis. Anastomotic leak is one of the causes of morbidity and mortality following esophageal resection.^{1,2} One of the advantages of cervico-esophageal gastric anastomosis (CEGA) is when the leak occurs; it is seldom associated with mediastinitis compared to intrathoracic anastomosis.³ Among the hand-sewn CEGA anastomosis single layer (end to side) is the commonly used technique.^{4,5} Collard and colleagues proposed a partially stapled, partially hand sewn anastomotic technique (terminalized, semi-mechanical, side to side cervical esophagogastric anastomosis) to increase the cross-sectional area of the anastomosis.⁶ Early reports using staplers showed no difference in the leak rate but the higher incidence of stricture.^{7,8} Oringer et al. reported a leak rate below 3% following side to side stapled anastomosis along with a lower rate of anastomotic stricture and improve satisfaction in swallowing compared to the hand-sewn anastomosis. Subsequent studies^{9,10} have not demonstrated consistent results with stapled anastomosis.

Our aim of the study was to analyze and compare the outcome of cervical esophagogastric anastomosis between end to end hand sewn and partial side to side stapled technique (Modified Collard technique)

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MATERIALS AND METHOD

The study population included patients who underwent transhiatal esophagectomy for malignant disease in the Institute of Surgical Gastroenterology, Rajiv Gandhi Government General Hospital, Chennai, Tamil Nadu, South India from Jan 2013 to Dec 2016. It was a retrospective study comparing the outcome between hand sewn end to end anastomosis and semi-mechanical side to side stapled technique. The primary outcome measure was the anastomotic leak. The secondary outcome measures included operation time, the occurrence of anastomotic stricture, blood loss, and hospital stay.

Inclusion criteria: All patients underwent transhiatal esophagectomy regardless of the type of the tumor, and site of the tumor.

Exclusion criteria: Patients who underwent end to side cervical esophagogastric anastomosis was also excluded from the study. Repeat esophagectomy or emergency oesophagectomy are excluded. Perioperative complicated patients and immediate postoperative death patients are excluded. Patients underwent thoracotomy were excluded from the study. Patients who were in ventilatory support for more than twenty-four hours or patients who needed reintubation are excluded from the study.

After preoperative diagnostic workup, preoperative preparation, anesthetic clearance and getting informed consent, surgery was performed through a transhiatal approach. The gastric conduit based on the right gastric and right gastroepiploic vessels was prepared. Gastric drainage procedure was not done. The gastric conduit was constructed using a linear cutter along the lesser curve forming a narrow tube in such a way that, near the tip of the conduit should have the least diameter of around 3cm. Approximately four TLC 80 and one TLC 60 are used to form the narrow tube. The stomach tube was brought up into the left side of the neck through the posterior mediastinal route. The CEGA

was done either by a partial side to side stapled technique or end to end hand sewn technique using single layered interrupted 2-0 vicryl suture. All anastomosis was performed by the team of experienced surgeons in the department. After haemostasis the neck wound was closed (skin only) with loose interrupted silk sutures, so that any secretions can easily come out. Bilateral chest tubes are placed in all cases. A feeding jejunostomy (Witzel type) with 12 F suction catheter was performed in all patients for postoperative nutrition.

Hand sewn technique: The tip of the conduit was lifted up, and after assessing the length, the tip was divided below 3 to 4 cm for having good vascularity. Now the opened conduit is anastomosed end to end (mucosa to mucosa) with proximal cervical oesophagus using 2-0 interrupted vicryl sutures. A 16 F nasogastric tube was placed across the anastomosis into the intrathoracic gastric tube after finishing the posterior row of sutures.

Stapled technique: We performed collard's modification of the stapled esophagogastric anastomosis (partial stapled and partial hand-sewn anastomosis). Three interrupted seromuscular stay sutures were taken between the posterior wall of the esophagus and fundal aspect of the stomach (opposite to the lesser curve staple line border). The gastrotomy was made 5cm distal to the stapled tip on the fundal aspect of the conduit. End GIA stapler was then passed one limb in the stomach, and other in the esophagus and then fired. Haemostasis was achieved, and then a 16 Fr nasogastric tube was placed in the conduit. The anterior layer was closed with interrupted 2-0 vicryl sutures

RESULTS

Review of the Institute of Surgical Gastroenterology database at Rajiv Gandhi Government General hospital reveals fifty patients underwent oesophageal resection by transhiatal esophagectomy over a period of 48 months full filling the above criteria. Patients were divided into two groups based on the type of anastomosis. Hand sewn end to end anastomosis was performed in twenty-five patients, and another twenty-five patients underwent semi-mechanical side to side stapling technique.

Hand sewn	Stapler	P-value
1	6	.042

Table-1: Primary outcome; CEGA leak

Variables	Type of surgery	N	Mean	Standard deviation	P - value
Age	Hand sewn	25	57.12	7.24	0.107
	Stapler	25	60.44	7.04	
Hospital stay	Hand sewn	25	12.12	2.13	0.763
	Stapler	25	12.32	2.51	
Surgery duration	Hand sewn	25	265.20	29.74	0.042
	Stapler	25	286.00	39.79	
Blood loss	Hand sewn	25	304.80	40.32	0.655
	Stapler	25	299.20	47.34	

Table-2: Secondary outcome

Hand sewn	Stapler	P-value
1	2	0.552

Table-3: Anastomotic stricture

The results depict (Table 1) that hand sewn end to end anastomosis was better than stapled anastomosis as for as primary outcome is concerned (P-value 0.042). As far as the secondary outcome is concerned blood loss, hospital stay and occurrence of anastomotic stricture were not statistically significant (P-value >0.05). Regarding surgery duration side to side stapler technique took more time than the end to end hand-sewn anastomosis. (Table 2 and 3). As the end to end hand-sewn anastomosis is technically easier to perform, it has taken less time than stapled anastomosis.

DISCUSSION

Following oesophagectomy, restoration of alimentary tract is usually performed by gastric transposition and esophagogastric anastomosis. However, it is associated with both early and late complications. Among the early complications, the anastomotic leak is the leading causes of perioperative morbidity and mortality after an esophagectomy.¹¹

Causes of the anastomotic leak are multifactorial and include both patient and surgery-related factors. Proper preoperative preparations and perioperative care also help in reducing the risk related to these factors and achieving a good outcome.

Preparation of gastric conduit and anastomotic technique are two major surgery-related factors to be modified. Various gastric tubes have been proposed to maintain the blood flow at the gastric tip. Use of a broad tip preserving sufficient tissue for maintaining submucous vascular communication between the gastric tip and right gastric vessels, while achieving adequate surgical margin rather than narrow tube has been advocated by Collard, Boarding and Akiyama.^{5,12,13} In this study, we have not used the broad tip as advocated by the above authors, but we have used the narrow tip.

According to surgical anatomy submucosal plexus that interconnect the extra-gastric arteries and allows the stomach to tolerate extensive ligation of its extrinsic blood supply. It should be noted that the mucosa of the lesser curvature is supplied by small extrinsic branches of the left and right gastric arteries rather than vessels from the submucosal plexus.¹⁴

So even though we made a broad tip or narrow tip, the contribution from the right gastric artery to the fundal tip is meager or negligible. Even if it is a narrow tip or broad tip, the extra-gastric arterial interconnections along the lesser curvature are disconnected by dividing, the lesser curvature using the stapler for gastric tube formation. So naturally, the blood supply of the gastric conduit is mainly from the right epiploic vessels and extra-gastric arcades formed between right and left gastroepiploic vessels. Again the blood supply is further augmented by extensive submucosal plexus in the greater curvature side. By the above facts, the narrow tip is well vascularized than the broad tip.

So in our study, we amputated the tip and end to end anastomosis was done using 2-0 vicryl. Out of twenty-five cases, only one patient had the leak and treated conservatively. Staplers have been introduced to reduce the incidence of anastomotic leak. Proposed benefits of stapled technique over

hand sewn anastomosis include a watertight anastomosis along with minimal tissue trauma by less tissue handling and quicker anastomosis. A wider anastomosis by the stapled technique would decrease the chance of anastomotic stricture, especially after the anastomotic leak.

The use of side to side stapled anastomosis was first advocated by Collard⁶ and later modified by Orringer. Although Orringer et al.³ show a reduction in leak rates from 14% to 2.7%. Using this technique gastric tip necrosis and the radiological leak was excluded from this analysis. If the radiological leak and gastric tip necrosis were included, then the leak rate in their study would be increased to 7%. Saluja et al.¹⁰ reported the first randomized trial comparing hand sewn with side to side partial stapled technique which thrown no difference in leak rate (16% vs.18%).

Our study in contradiction to above studies, the leak rate is more with side to side stapler anastomosis. Out of the twenty-five patients, six patients had a clinically significant leak (24%). The reason for increased percentage of leak rate in side to side stapler anastomosis is that in narrow tip conduit, the distance between the lesser curve staple line and the anastomotic staple line is very small compared to broad tip conduit, and the extra-gastric arterial interconnections and submucosal plexus are totally divided by anastomotic staplers, so zone of ischemia/necrosis developed in between the stapler lines producing clinically significant leak. The secondary outcomes are comparable in both groups except, the operative time which is more with stapler group. There are a few limitations of this study. This study is a retrospective study, not a randomized controlled trial. This study has the small sample size, and the single center design might have biased results.

CONCLUSION

In our study end to end, the hand-sewn anastomosis is having better results than side to side stapled anastomosis. We recommend an end to end hand sewn technique as a standard of care. To avoid side to side stapler technique when your gastric conduit is having a narrow tip.

REFERENCES

1. Muller J, Erasmi H, Stelzner M, Zieren U, Pichlmaier H. Surgical therapy of oesophageal carcinoma. *British Journal of Surgery*. 1990;77:845-857.
2. Urschel J. Esophagogastric anastomotic leaks complicating esophagectomy: A review. *The American Journal of Surgery*. 1995;169:634-640.
3. Orringer M, Marshall B, Iannettoni M. Eliminating the cervical esophagogastric anastomotic leak with a side-to-side stapled anastomosis. *The Journal of Thoracic and Cardiovascular Surgery*. 2000;119:277-288.
4. Zieren H, Muller M, Pichlmaier H. Prospective randomized study of one- or two-layer anastomosis following oesophageal resection and cervical esophagogastric anastomosis. *British Journal of Surgery*. 1993;80:608-611.
5. Bardini R, Bonavina L, Asolati M, Ruol A, Castoro C, Tiso E. Single-layered cervical esophageal anastomoses: A prospective study of two suturing techniques. *The*

- Annals of Thoracic Surgery. 1994;58:1087-1089.
6. Collard J, Romagnoli R, Goncette L, Otte J, Kestens P. Terminalized Semimechanical Side-to-Side Suture Technique for Cervical Esophagogastronomy. The Annals of Thoracic Surgery. 1998;65:814-817.
 7. Rao Y, Pal S, Pande G, Sahni P, Chattopadhyay T. Transhiatal esophagectomy for benign and malignant conditions. The American Journal of Surgery. 2002;184:136-142.
 8. Law S, Fok M, Chu K, Wong J. Comparison of Hand-Sewn and Stapled Esophagogastric Anastomosis After Esophageal Resection for Cancer. Annals of Surgery. 1997;226:169-173.
 9. Santos R, Raftopoulos Y, Singh D, DeHoyos A, Fernando H, Keenan R et al. Utility of total mechanical stapled cervical esophagogastric anastomosis after esophagectomy: A comparison to conventional anastomotic techniques. Surgery. 2004;136:917-925.
 10. Saluja S, Ray S, Pal S, Sanyal S, Agrawal N, Dash N et al. Randomized Trial Comparing Side-to-Side Stapled and Hand-Sewn Esophagogastric Anastomosis in Neck. Journal of Gastrointestinal Surgery. 2012;16:1287-1295.
 11. Urschel J, Blewett C, Bennett W, Miller J, Young J. Handsewn or stapled esophagogastric anastomoses after esophagectomy for cancer: meta-analysis of randomized controlled trials. Diseases of the Esophagus. 2001;14:212-217.
 12. Collard J, Tinton N, Malaise J, Romagnoli R, Otte J, Kestens P. Esophageal replacement: Gastric tube or whole stomach?. The Annals of Thoracic Surgery. 1995;60:261-267.
 13. Akiyama H. Single-user cervical esophageal anastomosis: a prospective study of two suturing techniques. Ann. Thorac. Surg. 1994;58:481-98.
 14. Lee J Skandalakis, David A, Mc Clusky, Marios Loukas, and Petros Mirilas. Anatomic Considerations in Gastro duodenal Surgery. Chapter 80, Page 970.

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