Open Access

Original Article

Minimally Invasive Esophagectomy as an Alternative to Open Esophagectomy: Experience from a Tertiary Care Hospital in Pakistan

Sohail Saqib Chatha, Bilal Umair, Farhan Majeed, Rashid Husnain, Farhan Ullah, Arshman Rauf, Jawad Ahmad

Department of Surgery, Combined Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan

ABSTRACT

Objective: To share our experience regarding Minimally invasive Esophagectomy, being one of the leading centres in the country.

Study Design: Prospective observational study.

Place and Duration of Study: Combined Military Hospital, Rawalpindi Pakistan, from Jan 2019 to Dec 2021.

Methodology: After obtaining approval from ethical review committee all patients who underwent minimal invasive esophagectomy were included in the study whereas those who underwent open esophagectomy were not included in the study.

Results: Total of 104 patients underwent Minimal invasive esophagectomy out of which 83(79.81%) were for malignant diseases and 21(20.19%) for benign disorders. Overall mortality rate was 6.73 % while morbidity rate was 15.40%. Our mean operative time was 240.00+30.00 minutes and average hospital stay was 7.00+3.00 days.

Conclusion: Minimal invasive esophagectomy is a safe alternative to open esophagectomy with low mortality and morbidity rate with satisfactory results.

Keywords: Carcinoma Oesophagus, Minimal Invasive Esophagectomy, Video Assisted Thoracoscopic Surgery.

How to Cite This Article: *Chatha SS, Umair B, Majeed F, Husnain R, Ullah F, Rauf A, Ahmad J. Minimally invasive esophagectomy as an alternative to open esophagectomy: Experience from a tertiary care hospital in Pakistan. Pak Armed Forces Med J 2025; 75(Suppl-1): S73-S76.*
DOI: https://doi.org/10.51253/pafmj.v75iSUPPL-1.10386

INTRODUCTION

Esophagectomy as a surgical procedure is associated with high morbidity and mortality and is historically considered as a morbid procedure.[1] Historicaly open transthoracic and trans hiatal esophagectomies were most commonly performed procedure for.[2] Most commonly performed trans-thoracic approaches are Ivor Lewis and McKeown. All of these approaches are quite invasive and associated with high rates of operative and post operative complications and mortality.[3]

With the development of new technology there has been an increasing trend in performing minimally invasive surgery and minimal invasive esophagectomy is now becoming an alternative to classical open procedures. Studies are now showing that Minimal invasive approach is associated with less surgical trauma, less bleeding, decreased incidence of post operative complications, shorter hospital stay and less requirement for blood transfusions.[4-6]

Minimally invasive esophagectomy is a complex procedure with longer learning curve and better oncological outcome over period of time. In recent years there has been an increase in the number of centres who are using minimal invasive approach for esophagectomy.[7,8] In a developing country like Pakistan there are very few centres who have adopted minimally invasive esophagectomy and there is paucity of published literature and results. We are amongst few of high volume centres in country where minimal invasive esophagectomy is being performed regularly.

Aim of our study is to share our experience regarding minimal invasive esophagectomy, its effect on mortality, morbidity, hospital stay, operative time and requirement of blood transfusion and its comparison with the published international literature.

METHODOLOGY

This was a prospective observational study performed at CMH Rawalpindi over a period of 3 years from January 2019 to December 2021. Approval was obtained from ethical review committee (serial number 373). Sample size of was calculated using online sample size calculator with confidence level of 95% and margin of error of 5, using 30 day mortality after oesophagectomy at a rate of 6.7%.[9] The estimated sample size came out to be 97, however slightly more

Correspondence: Dr Sohail Saqib Chatha, Department of Surgery, Combined Military Hospital, Rawalpindi Pakistan
Received: 20 May 2023; revision received: 10 Jul 2023; accepted: 20 Jul 2023

number of patients were added in order to cater for drop outs/lost to follow up or change in any surgical decision at the time of surgery.

Inclusion Criteria: All patients who underwent minimal invasive esophagectomy at our department were included in the study.

Exclusion Criteria: Those who underwent open esophagectomy were not included in the study.

All diagnosed cases of carcinoma of oesophagus were pre staged with the help of Upper GI endoscopy, CT Chest and abdomen, and PET CT when indicated. All these patients were discussed in Multidisciplinary meeting. Patients who had locally advanced disease underwent neo adjuvant therapy followed by Minimal Invasive oesophagostomy whereas those with early-stage disease underwent upfront oesophagostomy.

Procedure was performed by consultant thoracic surgeon with an experience of more than 10 years in thoracic surgery. Record of the patients in terms of age, gender, diagnosis was maintained. Any intraoperative or post operative complication and mortality was also recorded. Operative time duration and estimated blood loss was also noted. In case of surgeries performed for carcinoma record of histopath report was also maintained and adjuvant treatment was provided depending on histopath report and decision of the multidisciplinary meeting.

Patients were placed in prone position and thoracic oesophagus was mobilised along with lymphadenectomy using 3 ports. Abdominal portion of the procedure was performed by repositioning patient in modified lithotomy position. Mini laparotomy incision was made and stomach tube created. For cervical portion oblique incision was made along anterior border of left sternocleidomastoid, and cervical oesophagus was mobilised, divided at appropriate level. Specimen was retrieved via abdominal incision and stomach tube was passed through posterior mediastinum to neck and esophagogastric anastomosis was performed.

Record of all patients including their demographic characteristics along with indication for surgery was noted. In case of carcinoma of oesophagus, type of tumour and stage of the tumour were also recorded. Per operative details including operative time, estimated blood loss or any per op complication was noted. Record was also kept for post op complications and any death occurring in post op period.

Data was analysed using Statistical package for Social Sciences (SPSS) version 22.0. Qualitative variables like gender, type of tumour was expressed in terms of frequencies and percentages whereas quantitative variables like age, operative time, duration of hospital stay were expressed in the form of mean and standard deviation.

RESULTS

Over a period of three years 104 minimal invasive esophagectomies (MIE) were performed at our centre. Most common cause for esophagectomy was carcinoma of oesophagus in 83(79.81%) followed by corrosive stricture in 20(19.23%) patients and boherave syndrome in 1(0.97%). Amongst subjects under study 61(58.70%) were males while 43(41.30%) were females. Mean age of the patients undergoing MIE was 50.41±13.98 year with range from 19 - 70 years. Year wise breakdown of esophagectomies performed along with their diagnosis and pathological characteristics are given in Table.

Table: Diagnosis of Oesophageal diseases (n=104)

Year	Number of MIE	Diagnosis			Type of Carcinoma	
2019	46	Corrosive stricture	Boherave syndrome	Carcinoma	SCC	Adenocarcinoma
		8(7.69%)	1(0.96%)	37(35.57%)	22(21.15%)	15(14.42%)
2020	25	6(5.76%)	-	19(18.26%)	10(9.61%)	9(8.65%)
2021	33	6(5.76%)	-	27(25.96%)	16(15.38%)	11(10.57%)

Mean operative time was 240.00+30.00 minutes and average blood loss was 191.83+64.20ml with minimum of 10.00 ml and maximum of 400.00ml. Mean ICU stay was 2.00+1.00 day whereas average hospital stay was 7.00+3.00 days which was case in 84(80.80%) cases. There was no perioperative mortality, however death occurred in 7(6.73%) cases in post operative period. Most common causes of death were related to cardiorespiratory system. Our complication rate was 16(15.40%). Most common complication was anastomotic leak which occurred in 8(7.7%) cases. These anastomotic leaks were managed conservatively by providing drainage to the neck wound along with washing and dressing of the wound, keeping patient Nil per oral and continuing feed via feeding jejunostomy. On stoppage of discharge from neck wound contrast study was performed and with no evidence of leak, oral diet was

restored. As per Clavien Dindo classification, 10(62.50%), complications fell under category of Grade-III while 6(37.50%) complications were category-II. Delayed complications occurred in 38% patients most common of which was anastomotic stricture occurring over a period ranging from 3 - 7 months. Five of these cases were managed with repeated dilatation and one case underwent re exploration in which anastomotic site stricturoplasty was done.

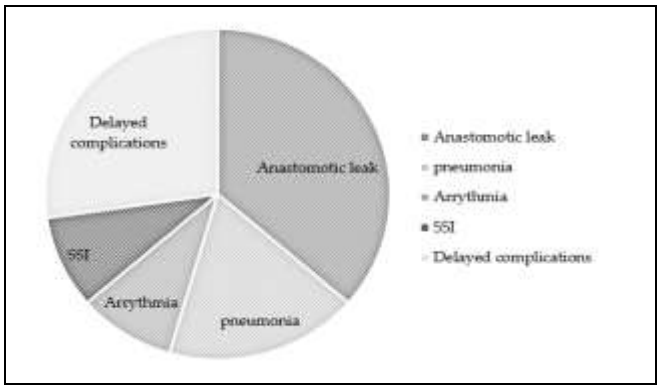

Figure: Complications of Minimal Invasive Esophagectomy (n=16)

DISCUSSION

During last three decades there has been a marked shift towards minimally invasive surgical approaches and large number of centres are adopting these approaches. Many studies have now proved that Minimal invasive esophagectomy can now be easily performed for both benign as well as malignant disorders[10,11] and similar results were produced in this study as well. Luckitech *et al.*,[12] in his study demonstrated a mortality rate of 13% which was much less than of open oesophagectomy.[13] In this study mortality was 6.73% which is lesser than the published literature. There was no perioperative mortality in this study as compared to 11.80% and 8.6% for transthoracic and trans hiatal esophagectomies respectively.[14]

Schopmann *et al.*,[15] in his study had described a morbidity rate of 40% whereas in study conducted by Zingg *et al.*,[16] morbidity rate was 34.50%. A local study carried out by Farrukh *et al.*, showed a mortality rate of 31.37%[17] whereas in our study morbidity was much lower as compared to various published studies which were published many years ago. This was perhaps due to good case selection, better expertise due to better technical facilities and maturation of learning curve and large number of esophagectomies being performed at our centre.

In our study most common complication was anastomotic leak and similar results were reported in study by Warner *et al.*,[18] who reported a leak rate of 14% whereas in our study it was 7.70%. Second most common complication in our study was pneumonia occurring in 3.84% of study population which is lower than study by Schopmann *et al.*,[19] but higher than results demonstrated by Farrukh *et al.* Delayed complication in our study was anastomotic stricture with a stenosis rate of 5.76% which was much lower than studies conducted by Henriques *et al.*,[20] who demonstrated a stenosis rate of 24% whereas in local study reported stenosis rate was 9.80%.In our study re exploration for cervical stenosis was done in 1 case. In our study mean ICU stay of the patient was 2 days with an average hospital stay of less than 10 days and these results are almost similar to the local study of Farrukh Rizvi *et al.*

LIMITATION OF STUDY

This is an observational study with no long term follow up especially for patients operated for carcinoma of oesophagus. Hence more studies with more robust design and longer follow up time are required to prove safety and efficacy of minimally invasive esophagectomy.

CONCLUSION

Minimally Invasive Esophagectomy is now replacing open esophagectomy as a safe alternative for both benign as well as malignant oesophageal disorders. Though it is a complex procedure and associated with longer learning curve however it is associated with lesser complications and at same time with satisfactory results.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SSC & BU: Data acquisition, data analysis, critical review, approval of the final version to be published.

FM & RH: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

FU, AR & JA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. J. B. Putnam Jr., D. M. Suell, M. J. McMurtrey et al., "Comparison of three techniques of esophagectomy within a

residency training program," Annals of Thoracic Surgery, vol. 57, no. 2, pp. 319–325, 1994.
2. Soltani E, Mahmoodzadeh H, Jabbari Nooghabi A, Jabbari Nooghabi M, Ravankhah Moghaddam K, Hassanzadeh Haddad E. Transhiatal versus transthoracic esophagectomy for esophageal SCC: outcomes and complications. J Cardiothorac Surg 2022; 17(1): 150.
3. Subramanyeshwar RT, Raju KVVN, Patnaik SC, Saksena AR, Pratap RR, Rayani BK et al. Indian J Surg Oncol 2021; 12(2): 335-349.
4. M. B. Orringer, B. Marshall, A. C. Chang, J. Lee, A. Pickens, and C. L. Lau. "Two thousand transhiatal esophagectomies: changing trends, lessons learned," Annals of Surgery, vol. 246, no. 3, pp. 363–372, 2007.
5. Mederos MA, de Virgilio MJ, Shenoy R, Ye L, Toste PA, Mak SS, Booth MS, et al. Comparison of Clinical Outcomes of Robot-Assisted, Video-Assisted, and Open Esophagectomy for Esophageal Cancer: A Systematic Review and Meta-analysis. JAMA Netw Open. 2021; 4(11): e2129228. https//doi.org/10.1001/jamanetworkopen.
6. Braghetto, A. Csendes, G. Cardemil, P. Burdiles, O. Korn, and H. Valladares. "Open transthoracic or transhiatal esophagectomy versus minimally invasive esophagectomy in terms of morbidity, mortality and survival," Surgical Endoscopy and Other Interventional Techniques, vol. 20, no. 11, pp. 1681–1686, 2006.
7. Thammineedi SR, Patnaik SC, Nusrath S. Minimal Invasive Esophagectomy-a New Dawn of EsophagealSurgery. Indian J Surg Oncol 2020; 11(4): 615-624. https//doi.org/10.1007/s13193-020-01191-7
8. Mu J, Yuan Z, Zhang B, Li N, Lyu F, Mao Y, at al. Comparative study of minimally invasive versus open esophagectomy for esophageal cancer in a single cancer Chin Med J 2014; 127: 747-752.
9. Gockel I, Exner C, Junginger T. Morbidity and mortality after esophagectomy for esophageal carcinoma: a risk analysis. World J Surg Oncol 2005; 3: 37. https//doi.org/10.1186/1477-7819-3-37
10. Xie J, Zhang L, Liu Z, et al. Advantages of McKeown minimally invasive oesophagectomy for the treatment of oesophageal cancer: propensity score matching analysis of 169 cases. World J Surg Oncol 2022; 20(1): 52.
11. Dolan DP, Swanson SJ. The modern approach to esophagectomy-review of the shift towards minimally invasive surgery. Ann Transl Med 2021; 9(10): 901. https//doi.org/10.21037/atm.2020.03.143
12. J. D. Luketich, M. Alvelo-Rivera, P. O. Buenaventura et al., "Minimally invasive esophagectomy : outcomes in 222 patients," Annals of Surgery, vol. 238, no. 4, pp. 486–495, 2003.
13. Yin Z, Yang RM, Jiang YQ, Chen Q, Cai HR. Perioperative Clinical Results of Transcervical and Transhiatal Esophagectomy versus Thoracoscopic Esophagectomy in Patients with Esophageal Carcinoma: A Prospective, Randomized, Controlled Study [published correction appears in Int J Gen Med 2022; 15: 7797-7798]. Int J Gen Med 2022; 15: 3393-3404.
14. Horstmann O, Verreet P, Becker H, Ohmann C, Röher HD. Transhiatal oesophagectomy compared with transthoracic resection and systematic lymphadenectomy for the treatment of oesophageal cancer. Eur J Surg 1995; 161: 557–567.
15. S. F. Schoppmann, G. Prager, F. Langer, M. Riegler, E. Fleischman, and J. Zacherl, "Fifty-five minimally invasive esophagectomies: a single centre experience," Anticancer Research, vol. 29, no. 7, pp. 2719–2725, 2009.
16. U. Zingg, A. McQuinn, D. DiValentino et al., "Minimally invasive versus open esophagectomy for patients with esophageal cancer," The Annals of Thoracic Surgery, vol. 87, no. 3, pp. 911–919, 2009.
17. R. Farrukh, S. Syed ,A. Aamir, K.Shahid, K. Ali. (2014). Minimally Invasive Esophagectomy for Esophageal Cancer: The First Experience from Pakistan. International journal of surgical oncology 2014: 864705. https//doi.org/10.1155/2014/864705
18. Warner S, Chang YH, Paripati H, Ross H, Ashman J, Harold K, et al. Outcomes of minimally invasive esophagectomy in esophageal cancer after neoadjuvant chemoradiotherapy. Ann Thorac Surg 2014; 97: 439-445.
19. S. F. Schoppmann, G. Prager, F. B. Langer et al., "Open versus minimally invasive esophagectomy: a single-center casecontrolled study," Surgical Endoscopy and Other Interventional Techniques, vol. 24, no. 12, pp. 3044–3053, 2010.
20. Henriques A, Fuhro F, Godinho C, Campos AL, Waisberg J. Cervical esophagogastric anastomosis with invagination after esophagectomy. Acta Cir Bras 2012; 27: 343–349.

.....