



ROLE OF MINIMALLY INVASIVE ESOPHAGECTOMY VS CONVENTIONAL OPEN ESOPHAGECTOMY IN CARCINOMA OF LOWER 1/3RD ESOPHAGUS – AN INSTITUTIONAL EXPERIENCE

Oncology

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ABSTRACT

Introduction: Surgical resection has been the gold standard for localized esophageal cancer for decades. The application of minimally invasive surgery has been explored and found to be feasible in the management of esophageal cancer, although concern has been expressed about its safety, efficacy, oncologic value.] This study discusses MIE indications, techniques, and outcomes in the management of esophageal cancer.

Methodology: The data was collected retrospectively, for nonrandomized analytical study. Patients operated from July 2013 to March 2016 in Gujarat Cancer and Research Institute, Ahmedabad, MIE was performed in 23 patients of carcinoma of esophagus for open group, 24 cases of esophageal cancer were selected.

Results: The average duration of surgery observed in MIE group was 4.2 hours where as in open esophagectomy group was 5 hours. The average blood loss during MIE surgery was 255 ml whereas during open esophagectomy was 385 ml. Post operative morbidity and mortality is also comparable between both groups.

Conclusion: The implementation of MIE seems inevitable inspite of absence of randomized controlled trials as it has the potential to improve morbidity, decrease blood loss and reduce hospital stay. Overall, MIE is an integral tool that is safe and effective in the surgical management of esophageal cancer

KEYWORDS

INTRODUCTION

Esophageal cancer is the eighth most common cancer in the world, with an estimated 482,300 new cases each year and 406,800 cancer deaths per year. Survival is poor, with a high mortality-to-incidence rate of 0.84.^[1] Surgical resection has been the gold standard for localized esophageal cancer for decades. A number of open approaches are used to resect esophageal cancer. Open approaches require either thoracotomy, laparotomy or both. Thoracotomy may lead to pain, infection, pneumonia and subsequent complications like Deep Vein Thrombosis (DVT). Advances in surgical technology, staging, and perioperative care could further impact a reduction in surgical morbidity and mortality. Of these advances Minimally invasive esophagectomy (MIE) has the greatest potential to improve outcomes in patients who undergo esophageal surgery. These techniques offer the potential advantages of enhanced recovery, a reduction in pain, and a quicker return to normal function, although larger studies are needed to provide definitive evidence of these benefits.

The application of minimally invasive surgery has been explored and found to be feasible in the management of esophageal cancer, although concern has been expressed about its safety, efficacy, oncologic value, and other advantages that justify longer operative times and higher costs.^[2] This study discusses MIE indications, techniques, and outcomes in the management of esophageal cancer.

AIMS AND OBJECTIVES

The aim and objectives of this study were:

1. To compare minimally invasive (thoroscopic / laparoscopic) esophagectomy MIE with open esophagectomy approaches for esophageal cancer.
2. To compare the peri operative morbidity and mortality in MIE with open esophagectomy
3. To confirm whether MIE has the potential to improve results with respect to postoperative morbidity and perioperative mortality as compared to open methods, without compromising oncological outcomes.

In this study, we wish to compare the outcomes from approaches of MIE with open esophageal resection in a contemporary series of patients from a single hospital.

MATERIAL AND METHOD

PATIENT POPULATION

The data was collected retrospectively, for nonrandomized analytical

study. Patients operated from July 2013 to March 2016 in Gujarat Cancer and Research Institute, Ahmedabad, were included in study. All patients who are histologically proven adenocarcinoma, squamous cell carcinoma or poorly differentiated carcinoma of the esophagus, involving either lower third of esophagus or gastro-esophageal junction (Seiwert 1 type), which are surgically resectable (T1-T4a, N0-N2, M0) , treated with or without neoadjuvant treatment are included in the study. The included patients must have their European clinical oncology group (ECOG) performance status of 0, 1 or 2. Their written informed consent is obligatory. We wish to compare MIE to open approach performed by surgeons with same experience and expertise in single institute to make the comparison and conclusion valid. The study includes all patients who underwent laparoscopic, thoraco-laparoscopic and thoracoscopic mobilization and esophagectomy procedures during the study period in our unit. They were compared with patients who underwent open esophagectomy in our unit as well as other units of Department of Oncosurgery at the Gujarat Cancer and Research Institute.

PATIENT SELECTION

All patients had endoscopic biopsy proof of esophageal cancer. In all patients routine hematological investigations, chest x-ray, ultrasound of abdomen, upper GIscopy, CECT of thorax and upper abdomen were done to stage the tumor, judge the patient operability and for anesthesia fitness. The patients who were inoperable by preoperative work up and imaging were excluded from the study. All patients for surgery were given antibiotic prophylaxis. The standard postoperative care was observed for all the patients. Routine investigations were repeated twice weekly in uncomplicated causes and appropriate corrections were made accordingly. Histopathology report was evaluated and standard adjuvant treatment was given according to unit protocol after postoperative recovery.

Patients were staged using the AJCC staging system. MIE was performed in 23 patients of carcinoma of esophagus in which laparoscopic THE was performed in 10 patients and Thoracoscopic assisted esophagectomy in 13 patients. In open group, 24 cases of esophageal cancer were selected out of which 13 underwent open THE and other 11 patients underwent Trans thoracic(2 stage/ 3 stage) esophagectomy.

All cases were followed up bimonthly for first year, once in 3 months

during 2nd year, once in 4 monthly during 3rd year, 6 monthly for next 2 years and then annually. Clinical examinations were performed during each visit and appropriate investigations were done as and when indicated.

RESULTS

DEMOGRAPHICS

In MIE group, out of 23 patients, 10 (43%) were female and 13 (57%) were male. While in open esophagectomy group, out of 24 patients 14(58%) patients were female and 10(42%) were male.

In MIE group median age was 49.5 years (range 35 to 65 years) while in open surgery group median age was 53.5 years (range 30 to 72 years).

In MIE group, 8(35%) patients had adenocarcinoma whereas 15(65%) patients had SCC. In comparison to that, open esophagectomy group had 8(33%) patients with adenocarcinoma and 16(67%) patients with SCC.

PERIOPERATIVE INDICES

The average duration of surgery observed in MIE group was 4.2 hours (range 3 to 7 hours) where as in open esophagectomy group was 5 hours (range 3.5 to 9 hours).

TABLE : 1 SURGICAL PROCEDURE WISE DISTRIBUTION

Mie	Number	Open Esophagectomy	Number
Laparoscopic Assisted Esophagectomy	10(43%)	Trans Hiatal Esophagectomy	13(54%)
Thoracoscopic Assisted Esophagectomy	13(57%)	Trans Thoracic (2 Stage/ 3 Stage) Esophagectomy	11(46%)
Total	23		24

The average blood loss during MIE surgery was 255 ml (range 100 to 800 ml) whereas during open esophagectomy was 385 ml (range 150 to 800 ml).

The average stay in ICU after MIE was 5 days (range 2 to 10 days) while in open esophagectomy group it was 6.8 days (range 4 to 13 days). Average hospital stay after MIE surgery was 13.5 days (range 8 to 18 days) and in open surgery was 19 days (range 10 to 40 days). During hospital stay restoration of bowel function was achieved at average 5th day and removal of all drains was possible at average 13 days for both the study groups.

There was major difference seen in post-operative morbidity amongst the patients of both the groups. After MIE 5(22%) patients developed major morbidities, which included 2(8%) patients having anastomotic site leak and 3(14%) developed pulmonary complications (pneumonia) and required ventilator support. All the leaks were managed conservatively. After open esophagectomy 10(41%) patients developed major morbidities, which included 2(8%) developed anastomotic leaks, 2(8%) developed burst abdomen, 1(4%) developed post-operative psychosis and 5 (21%) patients developed pneumonia and required post-operative ventilator support. No postoperative mortality was conceded during the study period in any of the study groups.

HISTOPATHOLOGIC DATA

Total number of lymph nodes retrieved after MIE surgery were average 9.1 (range 2 to 14 nodes) and after open surgery nodal retrieval was average 8.6 (range 2 to 14 nodes).

TABLE: 2 FINAL HISTOPATHOLOGICAL STAGING

STAGE	IA	IB	IIA	IIB	IIIA	IIIB	IIIC	IV
MIE	0	2	3	12	3	1	2	0
OPEN	0	0	3	11	9	0	1	0

FOLLOWUP

After complete resection (R0), during short term follow up of average 6 months (range 3 to 18 months), 1 (4%) patient developed distant organ recurrence and no patient developed local recurrence in MIE group. 1(4%) patient developed local recurrence and 3(12%) patients developed distant organ recurrences in open surgical group.

TABLE :3 OVERALL COMPARISON

	MIE GROUP	OPEN SURGERY
AGE (Median) (Yrs)	49.5	53.5
DURATION OF SURGERY (Hrs)	4.2	5.0
BLOOD LOSS (ml)	225	385
ICU STAY(Days)	5.0	6.8
TOTAL HOSPITAL STAY(Days)	13.5	19.0
PERI OPERATIVE MORBIDITY	2	5
PULMONARY COMPLICATIONS	3	5
NODAL RETRIEVAL(Mean)	9.1	8.6
30 DAYS MORTALITY	0	0

DISCUSSION

With improved experience and skills, laparoscopy and thoracoscopy have been used in association with the thoracic dissection of the esophagus or gastric mobilization, and for both widely. These reports have confirmed that these approaches are possible, safe and have reasonable outcomes when compared with the literature^[3] Review of MIE study has shown that it has potential to improve mortality rate, hospital stay and other outcomes as compared to open surgery.

In our study the average duration of surgery was observed to be 4.2 hours (range 3 to 7 hours) in MIE group. Initially it was longer in earlier surgeries but later it reduces to an average 3.5 hours which is less as compared to Jabot, James D. Luketich and Senkowski CK, where it was 7-8 hrs^[4] The average duration of surgery was observed to be 5 hours. (Range 3.5 to 9 hours) in the open group. We have noticed that operative time was less in the patients who were operated later on in the series because of learning curve associated with this procedure in the earlier cases.

The thoracoscopy assisted group lost less blood and hence had fewer requirements for transfusion during the admission than the open approach group. Median blood loss in the MIE group was 255 ml (100 to 800 ml) versus open 385 ml (150 to 800 ml). Similar observations were made by Nyungen et al. Senkowski CK, in combined laparoscopic and thoracoscopic esophagectomy which had less operative blood loss as compared to open THE in trans thoracic esophagectomy^{[5][6]}

In our series, we have observed that hospital stay was significantly less in MIE groups as compared to open group. Average duration of hospitalization 13.5 days (8 to 18 days) in MIE group and average duration of hospitalization open esophagectomy was 19 days (10 to 40 days). In C Palanivelu series the median hospital length of stay was 8 days and the mean hospital stay observed by Luektich et al. (1998) in his initial experience of 222 patients was 13.8 days.^{[7][4]}

The perioperative mortality was not observed in this initial experience and morbidity 22% which is quite similar to what noticed by Martin et al. Luketich series has a mortality rates 1.3%. Martin et al 2005 in their initial experience of 36 patient with thoracoscopic mobilization combined with either open or hand assisted laparoscopic abdominal gastric mobilization had mean operating time of 263 minutes, the median hospital stay was 16 days The mortality was 5.5% and perioperative morbidity was 41%. [8] A meta-analysis of the randomized trials comparing these approaches suggested there was a higher pulmonary complication rate for the open approach. In our thoracoscopic / laparoscopic group 8% patients developed pneumonic consolidation and 14% would infection was seen in 2 patients. Similarly in open group after resection 41% of the patients developed morbidities which included wound infection in 8% patients, leakage 8% patients and pneumonia in 21%.

In the thoracoscopic/laparoscopic group of 2 to 14 nodes (average 9.1) were excised during surgery. In the open group a range of 2 to 14 nodes, (average 8.6) were excised during surgery. The average lymph node harvest observed by Nguyen et al 2000 in MIS group was 10.8 which was more than in open Trans thoracic/Trans hiatal esophagectomy.[5] The number of lymph node dissection is more with MIS because of magnified view offered by MIE. In thoracoscopy/ laparoscopy group out of 23 patients, 70% had stage II and 30% had stage III disease. In open group of 24 patients 60% had stage II and remaining 40% patients in stage III according to final histopathological report.

By comparing the open approach to esophageal resection in our

experience, we observed that MIE for esophageal cancer was a safe option in experience hands. Importantly, we have observed that the pathologic and oncological outcomes using MIE are not compromised when compared with the open approach. Palanivelu C., Senkowski CK, Nigh T. Nguyen and Luketich series have shown that the application of minimally invasive techniques has the potential to improved mortality hospital stay and other outcomes when compared with open methods. [5][4][7] Although technically complex, laparoscopic total esophagectomy is a feasible option.

CONCLUSION

By comparison with the Open esophagectomy, MIE for esophageal cancer is a safe option and comparable outcomes with respect to operative technique and procedure related complications. The pathologic and oncological outcomes using MIE are not compromised when compared with the Open approach. The data suggest that operative mortality is not significantly different between open and MIE, and operative morbidity is reduced after MIE. The MIE group had less operative blood loss, less operative time, decreased ICU stay, reduced respiratory complications, less in hospital stay along with improved nodal retrieval due to less trauma and magnified view.

The implementation of MIE seems inevitable inspite of absence of randomized controlled trials as it has the potential to improve morbidity, decrease blood loss and reduce hospital stay. Overall, MIE is an integral tool that is safe and effective in the surgical management of esophageal cancer, and further study is warranted to determine if it should be the gold standard procedure.

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