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HYBRID MINIMALLY INVASIVE ESOPHAGECTOMY VS OPENTRANS HIATAL ESOPHAGECTOMY: COMPARISON OF PERIOPERATIVE AND ONCOLOGICAL OUTCOME IN A TERTIARY CARE CENTER

Oncology

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ABSTRACT

Materials and Methods: It is a retrospective study comparing perioperative and oncological outcomes between Hybrid Minimally Invasive Esophagectomy (HMIE) and Open Trans Hiatal Esophagectomy of 41 patients who underwent Esophagectomy for cancer at our centre between April 2015 and August 2018. Totally 21 patients underwent HMIE and 20 patients underwent open THE.

Results: We found a statistically significant difference between the two arms in nodal harvest and mean operating time. The mean nodal harvest in HMIE arm was 10 nodes higher than open THE (24 in HMIE vs 14 in open THE; p-value 0.004). The mean operating time of HMIE was 28 minutes more than open THE (182 min in HMIE vs 154 in open THE). The other perioperative factors, though not statistically significant between two arms, showed a better trend in HMIE arm.

Conclusion: In conclusion, statistically significant increase in nodal harvest was observed in the HMIE group with decreased duration of hospital stay.

KEYWORDS

Esophaagectomy, Perioperative Outcome, Oncological Outcome

INTRODUCTION:

Esophageal cancer is considered as a common gastrointestinal tract malignancy with a poor prognosis [1]. Its incidence has been increasing for past three decades. As per the GLOBOCON 2012 data, estimated number of patients with Esophageal cancer is 42,000 with a mortality of 39,000 deaths [2]. This particular cancer poses challenges to treatment and currently, multimodality treatment is advocated of which surgery is one of the main component. However, Esophagectomy is a complex surgical procedure with significant morbidity and mortality. With an attempt to decrease the perioperative morbidity, several approaches are being devised. Over the past two decades, minimally invasive approach is the most preferred approach over conventional open thoracic or abdominal surgical approaches for Esophagectomy [5]. Totally minimally invasive esophagectomy has a long learning curve and hybrid minimally invasive techniques serve as a bridge before adopting totally minimally invasive technique [6]. Multiple studies have proven the oncological safety and decreased morbidity following minimally invasive surgery [7]. In this study, we have compared the perioperative outcome and oncological safety of Hybrid minimally invasive Esophagectomy (HMIE) with open Trans Hiatal Esophagectomy (THE) done in our center.

MATERIALS AND METHODS:

A retrospective study comparing consecutive patients who underwent esophagectomy by open THE and HMIE, between April 2015 and August 2018 in our department performed by a single surgeon. Totally 41 patients were included in this study, with 21 patients in the HMIE group and 20 patients in THE group. Data with respect to demographic features, site of disease, preoperative pulmonary reserve, prior neoadjuvant chemo radiation, operating time, postoperative hospital stay, anastomotic leak, pulmonary complications and postoperative histopathology were collected from the case sheets and operative notes collected from the medical records department. Operating duration between these two groups was compared. Postoperative morbidity in terms of neck leak, pulmonary complications, duration of chest tube requirement, and duration of hospital stay were also compared. Oncological clearance with respect to margin status and nodal harvest as observed in the postoperative HPE between these two groups were compared.

SURGICAL TECHNIQUES:

HMIE - Hybrid minimally invasive Esophagectomy:

In this type of HMIE, mobilization of thoracic esophagus and mediastinal dissection was done through thoracoscopy in prone position with three ports on the right hemithorax. Celiac lymph nodal dissection and gastric mobilization was done through an upper midline, mini laparotomy. Through a cervical incision on the left side, Esophagus was transected proximally and delivered intraabdominally completing the distal transection and delivery of the specimen. The gastric tube fashioned and brought to neck through posterior mediastinum for anastomosis of gastric conduit with cervical esophagus. This technique differs from THE by the use of thoracoscopy for mobilization of intrathoracic esophagus, mediastinal dissection under vision and upper midline mini laparotomy.

THE - Trans Hiatal Esophagectomy:

Open Trans Hiatal Esophagectomy was done by conventional technique.

In both groups, pyloromyotomy was done and chest drain tube placed on both sides. Feeding Jejunostomy was not done for any of our patients and Enteral feeding was started through nasogastric tube after 3 days .

Tab.1 Demographic distribution in HMIE and THE arms - statistical comparison

Parameters		HMIE arm (n=21)	THE arm (n=20)	P-Value
Mean Age		51	60	0.376
Sex	Male	13	12	1.000
	Female	8	8	
Site	Lower third	14	16	0.928
	Middle third	7	4	
Pathology	SCC	17	13	1.91
	Adeno	4	6	
Pulmonary Reserve	Mean FEV1	1.69	1.51	0.715

STATISTICALANALYSIS:
Statistical analyses were performed using SPSS for Windows, version 26.0.0.0 subscription. A two tailed unpaired students t-test of equal variance was performed for continuous variables. A Chi-square test was performed for categorical variables if expected frequencies >5 and a two tailed Fischer's exact probability test for categorical variables if expected frequencies <5 with P value <0.05 defined as statistically significant.

RESULTS:
Of the 41 patients who were operated, 21 patients underwent HMIE and 20 patients underwent Trans Hiatal esophagectomy (THE). The mean age in the HMIE arm was 51 years and 60 years in THE arm, but this difference was not statistically significant with a p value of 0.376(not significant). There was equal gender distribution in both treatment arms.

Histologically, 30 (73%) of our cases are Squamous cell cancers and 11 (27%) are Adenocarcinomas. In HMIE arm, out of 21 patients, 17 (81%) are Squamous cell cancers and 4 (19%) are Adenocarcinomas. In THE arm, out of 20 patients, 13 (65%) are Squamous cell cancers and 7 (35%) are Adenocarcinomas. Though more number of squamous cell esophageal cancers was operated in the HMIE group, this did not achieve statistical significance. Site wise, majority of our patients had lower third lesions (30, ie,73%) and rest were middle third lesions (11, ie,27%). Among mid third lesions 7 patients accounting for 64% were operated in the HMIE group. Though the preponderance of middle third lesion is observed in HMIE group, it did not reach statistical significance. Preoperative pulmonary reserve of the patients included in both the arms was comparable.

The mean operating time of HMIE arm (182 minutes) was 28 minutes longer than that of THE Esophagectomy (154 minutes) with strong statistical significance is observed (p=0.001). On analyzing the postoperative factors, the mean duration of chest drainage needed in the HMIE arm (5 days) was 1 day less than THE arm (6 days). There was no statistically significant difference in the incidence of lung complications. Basal atelectasis and basal pneumonitis were observed as pulmonary morbidity. One patient in the open transhiatal esophagectomy required elective ventilation, others were managed with antibiotics and chest physiotherapy. Neck leak rate was comparable between the two groups. All neck leaks were minor in grade that settled with conservative management.

The mean hospital stay in HMIE arm (11 days) was 4 days less than THE arm (15 days). The mean number of nodes harvested was significantly higher in HMIE arm (24 nodes) than in THE arm (18 nodes). Margin negative resection was achieved in all the cases in both the groups.

Tab.2 Comparison of Postoperative Outcomes between Hybrid and THE arms

Parameters	HMIE arm (n=21)	THE arm (n=20)	P-Value
Mean Operative Time (minutes)	182	154	0.001
Mean ICD Removal day	5	6	0.661
Lung Complications	2	2	0.678
Neck Leak	7	5	0.405
Mean Hospital Stay	11	15	0.279

Tab.3 Comparison of Oncological outcomes in Two arms

Parameters	HMIE arm (n=21)	THE arm (n=20)	P-Value
Nodal harvest	24	18	0.004
R0 Resection	21	21	1.00

DISCUSSION: Esophagectomy, a major surgical procedure known for its significant morbidity and mortality. Different types of surgical techniques for Esophagectomy have been adopted. It ranges from historical Conventional approaches to modern day robotic assisted surgeries. In an attempt to decrease the morbidity, minimally invasive techniques are most preferred nowadays. Conventional Open types include Orringer Trans Hiatal and Trans Thoracic procedures like Ivor-Lewis, Mckeown procedures. Minimally invasive esophagectomies are broadly classified as shown in the figure.1 [3]. Minimally invasive techniques, though technically demanding are known for its better

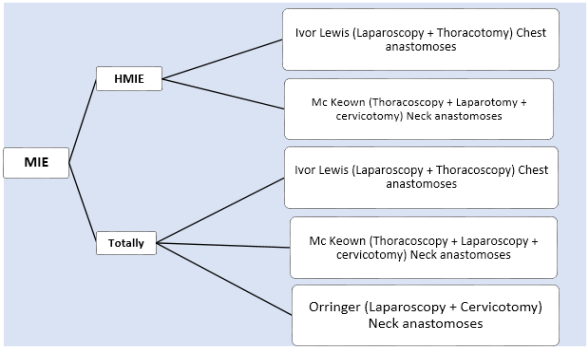

FIG 1. Classification Of Minimally Invasive Esophagectomy

In our institution, we prefer to do either an open Trans Hiatal or Mc Keown Hybrid Minimally Invasive Esophagectomy. The demographic profiles of patients in both the treatment arms were comparable. Middle third esophageal cancers and squamous histology are higher in HMIE group compared to open THE. This may be due to surgeon's preference for HMIE in this set of patients. This observed difference was not significant statistically. HMIE consumes more operating time than open THE, which was mainly due to time taken for change of patient's posture from prone to supine intraoperatively. Similar observation was reported in the series by Bernard M et al [8]. Patients in HMIE arm showed trend toward decrease in the duration of chest tube requirement when compared to open THE group. This may be due to meticulous dissection and perfect hemostasis achieved under thoracoscopic visualization.

Totally 4 patients developed pulmonary complications in this study, with 2 patients in each group. Patients in the HMIE group developed basal pneumonia, which improved with medical measures and chest physiotherapy. One patient in the open THE group developed basal atelectasis requiring elective ventilation for 24 hours. Though pulmonary complication rate is equal in both groups, increased severity and need for ventilator support required in the open THE group. In a multicenter trial by Bierre ss et al comparing open and minimally invasive esophagectomy reported lower incidence of pulmonary complications in minimally invasive group [9]. Larburu Etxaniz et al [10] had a cervical anastomotic leak rate of 23.3% in a series of 77 patients after Esophagectomy.

In our study, no significant difference in cervical neck anastomosis was observed between the two groups. Although our series had a little higher rate of cervical anastomotic leak, all of them were minor grade and resolved with conservative management. HMIE arm had a statistically significant higher nodal harvest with an average of 24 nodes in the HMIE group and 18 nodes in the open group. This was possible due to dissection under thoracoscopic vision rather than a blind dissection of open THE.

In our study HMIE group has shown trend towards decreased hospital stay probably due to lesser surgical trauma. In a meta analysis comparing the length of hospital stay between open and minimally invasive esophagectomy, significant reduction in the duration of hospital stay was reported [11].

CONCLUSION:
In conclusion, statistically significant increase in nodal harvest was observed in the HMIE group. Though there was significant increase in the operating time in the HMIE group, it has yielded benefits in terms of decreased length of hospital stay and less severe pulmonary complications.

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