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ASSESSMENT OF THE OUTCOMES, FEASIBILITY, AND SAFETY OF LATE (LAPAROSCOPY-ASSISTED TRANSHIATAL ESOPHAGECTOMY) FOR SUBJECTS WITH ESOPHAGUS CARCINOMA

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ABSTRACT

Background: Management of carcinoma of the esophagus is also done using the total laparoscopic approach which has not yet gained popularity globally as it is a complex procedure. Also, the existing literature data is scarce in the literature concerning LATE for esophagus carcinoma.

Aim: The present study aimed to assess the outcomes, feasibility, and safety of LATE (laparoscopic-assisted transhiatal esophagectomy) in subjects with carcinoma of the esophagus.

Methods: The present study assessed 52 subjects with carcinoma of the esophagus that was assigned for LATE (laparoscopic-assisted transhiatal esophagectomy) by a single surgical team during the study period. The mean age of the study subjects was 54.8±2.4 years and the age range of 33-70 years.

Results: The mean hospital stay duration, blood loss, and operative time were 11.3 days (7-26), 300 ml (100-500), and 300 minutes (160-650) respectively. Cervical anastomotic leak and pulmonary complications were seen in 11.5% (n=6) and 30.7% (n=16) subjects respectively. AJCC staging was IIA, IIB, IIIA, and IIIB in 3.84% (n=2), 11.5% (n=6), 38.46% (n=20), and 46.15% (n=24) subjects respectively. Surgical resection margins were negative in all the subjects except in 3.8% (n=2) subjects. The mean retrieved lymph nodes were 11 (8-26). During the mean 19 follow-up months, mortality and recurrence was seen in 11.5% (n=6) and 19.23% (n=10) subjects.

Conclusions: The present study concludes that LATE (laparoscopic-assisted transhiatal esophagectomy) is a feasible and safe procedure for the management of the selected subjects having carcinoma of the lower thoracic esophagus.

Keywords: Carcinoma, esophagus, esophagectomy, laparoscopy, transhiatal

INTRODUCTION

Surgery for the carcinoma of the esophagus is a complex surgical procedure that has been linked to significant morbidity postoperatively. Traditionally, the approaches used for esophagectomy in subjects with carcinoma of the esophagus involve the Orringer's approach and the Ivor-Lewis approach. Both of the procedures have been used successfully in esophagus carcinoma subjects with only a few modifications in the minimally invasive esophagectomy (MIE) in subjects with carcinoma of the esophagus.¹

THE (Transhiatal esophagectomy) is the most commonly and widely used surgical procedure done for the treatment of carcinoma of the esophagus. It has been noted that THE is associated with lesser mediastinal complications, is oncologically adequate, and is a technically easier procedure for esophagus carcinoma than TTE (trans-thoracic esophagectomy). However, THE is linked to the risk of iatrogenic injury during non-systematic lymphadenectomy and transhiatal dissection.²

LATE (laparoscopic-assisted transhiatal esophagectomy) is a technique modified from Orringer's technique of MIE in subjects with carcinoma of the lower esophagus. LATE was described by DePaula et al in 1995. The feasibility and safety of the LATE have been further established in other retrospective studies. Hence, carcinoma involving the lower part of the esophagus can be effectively and safely resected in direct vision. It has potential benefits over THE (transhiatal oesophagectomy).^{3,4}

LATE ((laparoscopic-assisted transhiatal esophagectomy) is a hybrid technology that is considered to provide better visualization and access to the infracarinal esophagus, decrease the risk of iatrogenic injury, and improve lymphadenectomy. Despite being a sound technological procedure, laparoscopic-assisted transhiatal esophagectomy has scarce data in the literature mentioned.⁵ Hence, the present clinical study was aimed to assess the outcomes, feasibility, and safety of LATE (laparoscopic-assisted transhiatal esophagectomy) in subjects with carcinoma of the esophagus.

MATERIALS AND METHODS

The present retrospective clinical study was aimed to assess the outcomes, feasibility, and safety of LATE (laparoscopic-assisted transhiatal esophagectomy) in subjects with carcinoma of the esophagus. The study subjects were from the Department of General Surgery of the Institute. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed 52 subjects from both genders having carcinoma in the gastroesophageal junction or/and lower thoracic esophagus (infracarinal) and was planned for LATE during the study period. The inclusion criteria were subjects planned for LATE for esophageal carcinoma who were willing to participate in the study. The exclusion criteria for the study were subjects who did not give informed consent for study participation, had any contraindication for the surgery, subjects with locally advanced disease, and subjects having metastasis.

All the surgical procedures were done by a single team of surgeons with expertise in the field. After the final inclusion of the study subjects, preoperative surgical planning and staging were done using the CECT (contrast-enhanced computed tomography) of the abdomen, chest, and neck after the confirmed carcinoma diagnosis (endoscopic biopsy) at the time of the surgery. Also, routine preoperative work done included pulmonary function tests, electrocardiogram, chest X-ray, and routine blood investigations.

For the surgical procedure, subjects were placed in the French position. The pneumoperitoneum was created using Hassan's technique, and laparoscopic parts were completed using a total of four ports. Division and dissection of the vessels were done using the ultrasonic shear, hem-o-lock clips, ligaclips, and Laparoscopic camera set. The stomach was mobilized after the resectability was assessed. After preservation of the right gastric artery, the left gastric artery was divided between the clips. Via widened hiatus, using direct vision, the esophagus was mobilized. Mediastinal dissection was done carefully to ensure the preservation of all vital structures and adequate lymphadenectomy.

Following the laparoscopic part dissection completion, a cervical incision was made following the lower part of the left sternocleidomastoid muscle that reached across the midline. The muscle and deep fascia were dissected to expose the esophagus which was encircled to prevent the recurrent laryngeal nerve injury. A small incision was then made in the upper midline of 5-6cm diameter to complete transhiatal mobilization following Orringer et al⁶ in 1999. Nearly 4-5 cm distal to the crico-esophageal junction, the esophagus was divided, and the specimen was taken through the abdominal wound. A gastric conduit was created and the specimen was excised.

The gastric conduit was made to the neck utilizing the orthotopic route and silk sutures were used to complete the CEGA (cervical-esophagus-gastric anastomosis). Following Stamm's method, a feeding jejunostomy was made. The abdominal wound was closed after placing the drains in the left sub-hepatic space and right pleural space. The cervical wound was closed following the placement of an 18 FG suction drain near the cervical-esophagus-gastric anastomosis.

The data gathered were analyzed statistically using the SPSS software version 21.0 (IBM Corp., Armonk, NY, USA) and the Mann-Whitney U test with chi-square or Fisher's exact test. The data were expressed as mean and standard deviation for normally distributed and non-normally distributed continuous variables and frequency and percentage for categorical variables. Statistical significance was kept at a p-value of <0.05.

RESULTS

The present retrospective clinical study was aimed to assess the outcomes, feasibility, and safety of LATE (laparoscopic-assisted transhiatal esophagectomy) in subjects with carcinoma of the esophagus. The present study assessed 52 subjects with carcinoma of the esophagus that was assigned for LATE (laparoscopic-assisted transhiatal esophagectomy). The mean age of the study subjects was 55.2 ± 2.4 years with an age range of 33-70 years. There were 76.92% (n=40) males and 23.07% (n=12) females in the present study. Smoking history was positive in 65.38% (n=34) of study subjects. For comorbidities, the highest prevalence was seen for hypertension with 15.38% (n=8) subjects followed by diabetes mellitus in 11.5% (n=6) subjects, cardiac diseases in 3.84% (n=2) subjects, and COPD in 11.5% (n=6) study subjects. The most common disease symptom was progressive dysphagia was seen in 100% (n=52) study subjects followed by weight loss in 65.38% (n=34) subjects, reflux esophagitis in 34.61% (n=18) subjects, and hematemesis in 3.84% (n=2) study subjects respectively. For preoperative laboratory findings, mean albumin was 3.3 mg/dl and mean hemoglobin was 12.83 mg/dl respectively as shown in Table 1.

The study results showed that for operative variables and complications in the study subjects, ICU stay duration was 3 days (1-4), and mean postoperative stay was 12 days (7-24). Resurgery was done in 3.84% (n=2) subjects, blood transfusion was done in 19.23% (n=10) study subjects, the chylous leak was seen in 3.84% (n=2) subjects, conduit necrosis in 3.84% (n=2) subjects, the anastomotic leak was in 11.53% (n=6) study subjects, vocal cord paralysis in no subject, arrhythmias were seen in 11.53% (n=6) study subjects as depicted in Table 2.

Concerning other complications, cardiac complications were seen in 11.53% (n=6) study subjects, and ARDS (acute respiratory distress syndrome) was seen in 3.84% (n=2) subjects. Empyema was seen in 7.69% (n=4) of study subjects. Pleural effusion was seen in 19.23% (n=10) of study subjects. Respiratory complications were seen in 30.76% (n=16) study subjects. Wound infection was seen in 19.23% (n=10) of subjects and 30-day mortality was not reported in any study subjects as summarized in Table 2.

It was seen that for pathological findings in study subjects, the tumor was located at the GE (gastro-esophageal) junction in 7.69% (n=4) study subjects and lower 1/3rd esophagus in 92.30% (n=48) study subjects. For T staging, T1 and T4 were not seen in any subject. T2 and T3 were seen in 76.9% (n=40) and 23.07% (n=12) study subjects respectively. For N staging, N0, N1, and N2 stage was seen in 46.15% (n=24), 46.15% (n=24), and 7.69% (n=4) study subjects respectively. In AJCC staging, 1 and 4 stagings were not seen in any subject. 2A, 2B, 3A, and 3B staging was seen in 46.15% (n=24), 38.46% (n=20), 7.69% (n=4), and 3.84% (n=2) study subjects respectively (Table 2).

The status of the lymph node was positive lymph node number was 2 with the range of 0-5 and the total lymph nodes resected were 12 with the range of 8-26 nodes. In the histological types, adenocarcinoma was seen in 88.46% (n=46) study subjects, and squamous cell carcinoma was seen on histopathological examination in 11.53% (n=6) study subjects respectively. The resection R0 was done in 96.15% (n=50) study subjects, R1 in 3.84% (n=2) study subjects, and R2 in no study subject as reported in Table 3.

DISCUSSION

The present study assessed 52 subjects with carcinoma of the esophagus that was assigned for LATE (laparoscopic-assisted transhiatal esophagectomy). The mean age of the study subjects was 55.2 ± 2.4 years with an age range of 33-70 years. There were 76.92% (n=40) males and 23.07% (n=12) females in the present study. Smoking history was positive in 65.38% (n=34) of study subjects. For comorbidities, the highest prevalence was seen for hypertension with 15.38% (n=8) subjects followed by diabetes mellitus in 11.5% (n=6) subjects, cardiac diseases in 3.84% (n=2) subjects, and COPD in 11.5% (n=6) study subjects. The most common disease symptom was progressive dysphagia was seen in 100% (n=52) study subjects followed by weight loss in 65.38% (n=34) subjects, reflux esophagitis in 34.61% (n=18) subjects, and hematemesis in 3.84% (n=2) study subjects respectively. For preoperative laboratory findings, mean albumin was 3.3 mg/dl and mean hemoglobin was 12.83 mg/dl respectively. These data were similar to Rizik N et al⁷ in 2006 and Lerut T et al⁸ in 2004 where authors assessed subjects with demographic data comparable to the present study.

It was seen that for operative variables and complications in the study subjects, ICU stay duration was 3 days (1-4), and mean postoperative stay was 12 days (7-24). Resurgery was done in 3.84% (n=2) subjects, blood transfusion was done in 19.23% (n=10) study subjects, the chylous leak was seen in 3.84% (n=2) subjects, conduit necrosis in 3.84% (n=2) subjects, the anastomotic leak was in 11.53% (n=6) study subjects, vocal cord paralysis in no subject, arrhythmias were seen in 11.53% (n=6) study subjects. These recordings were comparable to Dunn DH et al⁹ in 2013 and Parry K et al¹⁰ in 2017 where operative variables and complications reported by the authors were comparable to the present study.

The study results showed that concerning other complications, cardiac complications were seen in 11.53% (n=6) study subjects, and ARDS (acute respiratory distress syndrome) was seen in 3.84% (n=2) subjects. Empyema was seen in 7.69% (n=4) of study subjects. Pleural effusion was seen in 19.23% (n=10) of study subjects. Respiratory complications were seen in 30.76% (n=16) study subjects. Wound infection was seen in 19.23% (n=10) of subjects and 30-day mortality was not reported in any study subjects. These results were consistent with the studies of Gurusamy KS et al¹¹ in 2016 and Wang J et al¹² in 2020 where authors reported similar complications as a present study in their respective studies.

For pathological findings in study subjects, the tumor was located at the GE (gastro-esophageal) junction in 7.69% (n=4) study subjects and lower 1/3rd esophagus in 92.30% (n=48) study subjects. For T staging, T1 and T4 were not seen in any subject. T2 and T3 were seen in 76.9% (n=40) and 23.07% (n=12) study subjects respectively. For N staging, N0, N1, and N2 stage was seen in 46.15% (n=24), 46.15% (n=24), and 7.69% (n=4) study subjects respectively. In AJCC staging, 1 and 4 stagings were not seen in any subject. 2A, 2B, 3A, and 3B staging was seen in 46.15% (n=24), 38.46% (n=20), 7.69% (n=4), and 3.84% (n=2) study subjects respectively. These findings were in agreement with the results of Li B et al¹³ in 2020 and Lee Y et al¹⁴ in 2019 where pathological findings reported by the authors in their studies were comparable to the results of the present study.

On assessing the status of the lymph node was positive lymph node number was 2 with the range of 0-5 and the total lymph nodes resected were 12 with the range of 8-26 nodes. In the histological types, adenocarcinoma was seen in 88.46% (n=46) study subjects, and squamous cell carcinoma was seen on histopathological examination in 11.53% (n=6) study subjects respectively. The resection R0 was done in 96.15% (n=50) study subjects, R1 in 3.84% (n=2) study subjects, and R2 in no study subjects. These results were in line with Takeda FR et al¹⁵ in 2022 and Vageesh BG et al¹⁶ in 2018 where resection and lymph node status comparable to the present study was reported by the authors in their studies.

CONCLUSIONS

Considering its limitations, the present study concludes that LATE (laparoscopic-assisted transhiatal esophagectomy) is a feasible and safe procedure for the management of the selected subjects having carcinoma of the lower thoracic esophagus. Further, longitudinal studies with large sample sizes and long monitoring are needed by authors to reach a definitive conclusion.

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TABLES

Characteristics	Number (n)	Percentage (%)
Mean age (years)	55.2±2.4	
Age range (years)	33-70	
Gender		
Males	40	76.92
Females	12	23.07
Smoking history	34	65.38
Comorbidities		
COPD	6	11.5
Cardiac diseases	2	3.84
Diabetes mellitus	6	11.5
Hypertension	8	15.38
Symptoms		
Reflux esophagitis	18	34.61
Weight loss	34	65.38
Hematemesis	2	3.84
Progressive dysphagia	52	100
Preoperative laboratory findings		
Albumin (mg/dl)	3.3	
Hemoglobin (mg/dl)	12.83	

Table 1: Demographic and disease data in study subjects

Operative variables	Number (n)	Percentage (%)
Operative blood loss (ml)	300 (100-500)	
Operative time (min)	311.4 (160-650)	
ICU stay	3 (1-4)	
Postoperative stay	12 (7-24)	
Re-surgery	2	3.84
Blood transfusion	10	19.23
Chylous leak	2	3.84
Conduit necrosis	2	3.84
Anastomotic leak	6	11.53
Vocal cord paralysis	0	0
Arrhythmias	6	11.53

Cardiac complications	6	11.53
ARDS	2	3.84
Empyema	4	7.69
Pleural effusion	10	19.23
Respiratory complications	16	30.76
Wound infection	10	19.23
Mortality (30 days)	0	0

Table 2: Operative variables and complications in the study subjects

Tumor-specific parameters	Number (n)	Percentage (%)
Location of the tumor		
GE junction	4	7.69
Lower 1/3 rd esophagus	48	92.30
T staging		
T1	0	0
T2	40	76.9
T3	12	23.07
T4	0	0
N stage		
N0	24	46.15
N1	24	46.15
N2	4	7.69
AJCC staging		
1	0	0
2A	24	46.15
2B	20	38.46
3A	4	7.69
3B	2	3.84
4	0	0
Lymph node status		
Positive lymph node number	2 (0-5)	
Total lymph nodes resected	12 (8-26)	
Histological type		
Adenocarcinoma	46	88.46
Squamous cell carcinoma	6	11.53
Resection		
R0	50	96.15
R1	2	3.84
R2	0	0

Table 3: Pathological findings in the study subjects