

## EFFECTIVENESS OF MINIMALLY INVASIVE OESOPHAGECTOMY IN REDUCING MORBIDITY FOR CANCER OESOPHAGUS

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### ABSTRACT

#### BACKGROUND

Surgery remains the gold standard treatment modality for oesophageal carcinoma especially for middle third and lower third segments of oesophagus. Open trans-hiatal or transthoracic oesophagectomy is associated with increased morbidity, increased blood loss, more stay in ICU due to pain and prolonged hospital admission. To minimise morbidity, various types of minimally invasive oesophagectomies are being tried, in very few centres, having high volume, with experienced oesophageal surgeons.

#### MATERIALS AND METHODS

The aim of the study was to compare the outcomes of Thoracoscopic and laparoscopic (TLE) removal of oesophagus for resectable cancer of oesophagus with open trans hiatal (OPEN) oesophagectomy for a three years period from January 2015 to December 2017.

#### RESULTS

There were 20 patients who underwent open transhiatal oesophagectomy and thoracoscopic laparoscopic oesophagectomy was performed in 10 patients. Out of 30 patients, 18 patients (60%) are males and 12 (40%) patients are females. All TLE patients had significantly less blood loss (p value <0.0000001), 1-day ICU stay (p value <0.0000001) and pain score (p value <0.0000001) compared to open oesophagectomy.

#### CONCLUSION

Thoracoscopic & Laparoscopic Oesophagectomy is a feasible technique and has equivalent or better oncologic clearance compared to open technique. Stage by stage comparison of TLE shows significantly minimal blood loss and less ICU stay but it needs to have large volume patients in a prospective randomized trial for further validation.

#### KEYWORDS

Thoracoscopic –Laparoscopic Oesophagectomy, Minimally Invasive Oesophagectomy.

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#### BACKGROUND

Oesophageal Carcinoma accounts for 1% of all cancers diagnosed in the United states. There is an increasing incidence of lower end oesophageal adenocarcinoma nowadays which is a favourable factor for the patients for whom surgery is a very good option compared to squamous cell carcinoma where more of chemoradiotherapy is ideally suited. Though mortality has been brought down significantly, morbidity remains still high. The five-year survival rate varies from 19-46% in some series.<sup>1-3</sup> Minimally invasive oesophagectomies are being tried to minimise the morbidity of this open oesophagectomy technique since 1990. The initial experience by laparoscopic or by Thoracoscopic technique was attempted by Luketich in 1998 when 8 patients underwent minimally invasive procedure.

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They had no perioperative mortalities and one cervical anastomotic leak, thus demonstrating the potential safety and feasibility of minimally invasive oesophagectomy.<sup>4</sup>

During the period 1996-2002, Luketich, one of those earliest pioneers in this minimally invasive operation, did this complex surgery on 222 patients for high grade dysplasia or invasive cancer oesophagus and he could complete the procedure in 206 (92.8%) patients<sup>5</sup> Surgery remains the gold standard treatment modality for oesophageal carcinoma especially for middle third and lower third segments of oesophagus. Open transhiatal or transthoracic oesophagectomy is associated with increased morbidity, increased blood loss, more stay in ICU due to pain and prolonged hospital admission secondary to pulmonary complications. Recently, both Thoracoscopic and laparoscopic mobilisation of oesophagus and stomach for oesophageal cancer surgery have offered an advantageous alternative technique where tissue trauma is minimised. Nguyen and Luketich has said that 'minimally invasive oesophagectomy should be performed only in centres with large experience in oesophagectomy and oesophageal surgery and performed by surgeons with experience in open oesophagectomy and other advanced laparoscopic and Thoracoscopic operations.'



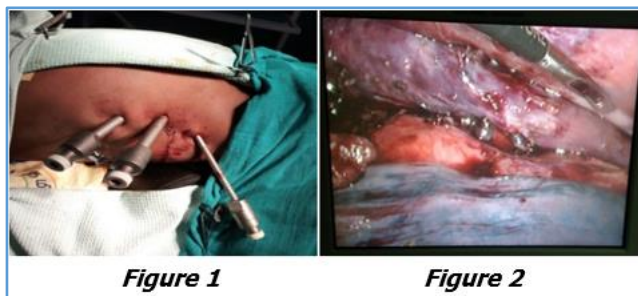
**MATERIALS AND METHODS**

Between January 2015 and December 2017, 30 patients underwent oesophagectomy for carcinoma oesophagus. Among them Thoracoscopic-laparoscopic-oesophagectomy (TLE) was performed for 10 patients. 20 patients underwent open trans hiatal esophagectomy (OPEN). These two groups were compared with demographic profile, blood loss, duration of operation, ICU stay, pain score, respiratory complications and hospital stay. The post-operative management was same in all patients.

**Surgical Technique**

Single lumen Endotracheal tube was used in all patients.

**Thoracic Part**



Patient was positioned in the prone position for Thoracoscopic dissection of the oesophagus. Thoracic ports were inserted through 5<sup>th</sup>, 7<sup>th</sup>, 9<sup>th</sup> intercostal space. (figure-1) Zygous vein was ligated intracorporeally using 2/0 silk. Mediastinal pleura was dissected along with diseased oesophagus. Monopolar, bipolar cautery and in some cases Harmonic scalpel were used. Oesophagus with growth was completely dissected off from its surrounding vital structures. (Figure-2) Once mobilisation was carried out from oesophageal hiatus to thoracic inlet the prone position was changed to low Lithotomy position.

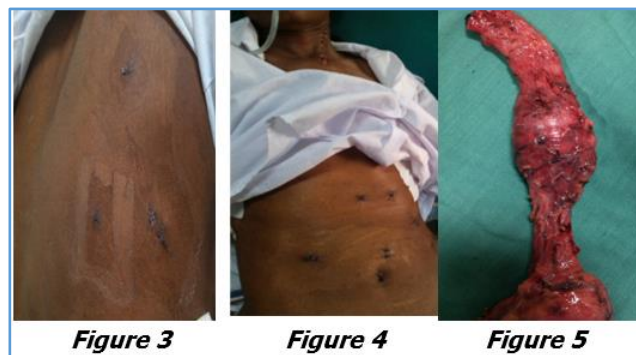
**Abdominal Part**

Patient was placed in supine position with low Lithotomy position for Laparoscopic dissection of stomach for preparing gastric conduit. After complete mobilisation of stomach using Harmonic scalpel, the gastric conduit was prepared using 30 mm and 60 mm laparoscopic linear staplers leaving a small bit near the fundus which was securely utilised for pulling the conduit. Smaller and firmer lesions could be pulled through the neck in 5 patients without making an incision in the abdominal wall. On the other hand, larger, bulky and friable growth were removed through a small abdominal incision and feeding jejunostomy was done. Pyloroplasty was added in those patients where there was thickening /narrowing in the antropyloric region. An important point to be observed in thoraco-laparoscopic method is most of the times only few gauze pieces were being utilised in contrast to large sized mopping pad in open the cases which in turn reflected the minimal loss of blood in TLE method.

**Neck Part**

As in any other standard technique oesophagogastric anastomosis was done with 3/0 Vicryl interrupted sutures.

TLC staplers were being used increasingly now-a-days. Out of 30 patients.



- Healed Thoracoscopic Port Sites (Figure 3).
- Post-operative laparoscopic port sites and healed neck wound without laparotomy wound (Figure 4).
- Thoracoscopic and laparoscopic oesophagectomy (Figure-5). Specimen of oesophagus with growth.

**RESULTS**

	<b>TLE</b>	<b>OPEN</b>
Age	28-68 years	30-70 years
Male: Female	6: 4	12: 8
Duration of surgery	280 -360 mts.	200 – 300 mts.
Blood loss	200- 400 ml	400-1200
ASA pain score	2-3	6-8
Median ICU stay	1 day	3 days
Respiratory complications	1	4
Median Hospital stay	6 – 8 days	10 – 16 days
Anastomotic Leak	One	Three

**Table 1**

**Statistical Analysis**

**1. Duration of Surgery**

<b>Type</b>	<b>Mean (minutes)</b>	<b>S.D.</b>
TLE	330	50
OPEN	270	40

**Table 2. Duration of Surgery**

p=0.002675

Although duration of surgery varies depending on the individual experience of the surgeon, the working atmosphere, availability of the modern gadgets like intracorporeal staplers, energy sources, HD laparoscopic system with advanced imaging and assisting man power, there is statistically significant difference in the operating time if we compare stage by stage, experience by experience between the two procedures. It goes without saying the more experience the lesser operative time, is applicable for both the procedures.

**2. Blood Loss**

Type	Mean(ml)	S.D.
TLE	350	35
OPEN	800	90

**Table 3. Blood Loss**

p <0.0000001 (significant).

As we do the laparoscopic procedure using energy sources in each and every step instead of blunt dissection with fingers as in open procedures and gauze is used instead of mopping pad the expected blood loss is very minimal in TLE compared to open oesophagectomy.

**3. Pain Score**

Type	Mean (VAS)	S.D.
TLE	2.8	09
OPEN	5.9	08

**Table 4. Pain Score**

P <0.000001 (significant).

Absence of a long abdominal /thoracotomy incision mandates smaller requirement of analgesic and consequent early mobilisation.

**4. ICU Stay**

Absence of a long abdominal /thoracotomy incision mandates less analgesic and consequent early mobilisation and less hospital ICU stay as is evidenced by significant p value.

Type	Mean (Days)	S.D
TLE	1	0.2
OPEN	3	0.8

**Table 5. ICU Stay**

p <0.0000001 (significant).

On the other hand, other parameters like leak rate following oesophagectomy, mortality rate remains unaffected by the procedures. There is no difference between the two procedures.

**5. Anastomotic Leak Rate**

Type	Leak (Yes)	Leak (No)	Total
TLE	1	9	10
OPEN	3	17	20

**Table 6. Anastomotic Leak Rate**

X<sup>2</sup> = 0.1442p = 0.7041

**6. Mortality Rate**

Type	Yes	No	Total
TLE	0	10	10
OPEN	1	19	20

**Table 7. Mortality Rate**

X<sup>2</sup> = 0.5172p =0.4720

**DISCUSSION**

Minimally invasive oesophagectomy (Thoraco-Laparoscopic oesophagectomy) is still considered one of the demanding gastrointestinal surgical operations and has not been practised widely. It provides the advantages of minimally invasive surgery and the morbidity is reduced to a great extent and the oncologic clearance is either equal or better than open trans hiatal oesophagectomy. In one of the large series in India 463 patients underwent minimally invasive oesophagectomy (Rajan et al<sup>6</sup>) during 1997 to 2009 and their overall morbidity was 16%. In another published systematic reviews of minimally invasive oesophagectomies by Gemmill and McCulloch during the year 1997 to 2007, they found that there are plenty of literature suggesting the feasibility and safety of minimally invasive operation for oesophageal cancer, but their standard was of poor quality.<sup>7</sup>

Biere et al. published the study protocol on the "TIME" trial or traditional invasive versus minimally invasive esophagectomy, which will be the first prospective, multicenter, randomized study comparing open versus MIE.<sup>8</sup> In yet another Indian paper, Palanivalu et al., compared open oesophagectomy with Thoracoscopic mobilisation of oesophagus in prone position. Their operative time ranged from 160 minutes to 450 minutes (early cases) and the median hospital stay was one day.<sup>9</sup>

There are various technique in cervical oesophagogastric anastomosis. Initially hand sewn anastomosis was used then stapler technique (TLC-55) and some people used EEA stapler (Luketich). Campos encouraged applying a circular stapler using transoral anvil. In his study 37 patients underwent minimally invasive oesophagectomy in which he observed unusually high rate of stricture rate (13.5%) which were treated successfully with endoscopic dilatations.<sup>10</sup> If there were oesophageal leak following surgery, stent across the anastomosis was kept or clipping was used depending on the expertise.<sup>11,12</sup>

As in cancer surgery, all patients were assessed for QOL (quality of life) following minimally invasive surgeries for well-being, food intake, fatigue and generalised malaise Parameswaran et al.,<sup>13</sup> After 3 months postoperative pain. Fatigue, gastrointestinal pain were all less with minimally invasive oesophagectomy compared to open oesophagectomy.<sup>14</sup>

Luketich et al have reported excellent results in more than 2000 minimally invasive oesophagectomies But the TLS procedure has its own limitations like increased operating time, prolonged learning curve, limited availability of technical expertise.

**CONCLUSION**

Minimally invasive oesophagectomy is a patient-friendly, technically demanding operative procedure. The possible potential benefits for TLE include less tissue trauma, early postop recuperation, less analgesic requirement, minimal blood loss, reduced postop respiratory complications (secondary to early mobilisation, delicate dissection under macroscopic vision leading to less injury to vital structures), shorter ICU stay and consequently lesser hospitalisation

period. The limiting factors are- time consuming procedure and long learning curve.

To be validated, it needs to have larger study and further RCT studies.

#### REFERENCES

- [1] Portale G, Hagen JA, Peters JH, et al. Modern 5-year survival of resectable esophageal adenocarcinoma: single institution experience with 263 patients. *J Am College of Surg* 2006;202(4):588-596.
- [2] Kim T, Grobmyer SR, Smith R, et al. Esophageal cancer--the five year survivors. *J Surg Oncol* 2011;103(2):179-183.
- [3] Swanson SJ, Batirel HF, Bueno R, et al. Transthoracic esophagectomy with radical mediastinal and abdominal lymph node dissection and cervical esophagogastrotomy for esophageal carcinoma. *Ann of Thoracic Surg* 2001;72(6):1918-1925.
- [4] Luketich JD, Nguyen NT, Weigel T, et al. Minimally invasive approach to esophagectomy. *JLS* 1998;2(3):243-247.
- [5] Luketich JD, Alvelo-Rivera M, Buenaventura PO, et al. Minimally invasive esophagectomy: outcomes in 222 patients. *Ann Surg* 2003;238(4):486-495.
- [6] Rajan PS, Vaithiswaran V, Rajapandian S, et al. Minimally invasive oesophagectomy for carcinoma oesophagus - approaches and options in a high volume tertiary centre. *J Indian Med Assoc* 2010;108(10):642-644.
- [7] Gemmill EH, McCulloch P. Systematic review of minimally invasive resection for gastro-oesophageal cancer. *Br J Surg* 2007;94(12):1461-1467.
- [8] Biere SS, Maas KW, Bonavina L, et al. Traditional invasive vs. minimally invasive esophagectomy: a multi-center, randomized trial (TIME-trial). *BMC Surg* 2011;11:2.
- [9] Palanivelu C, Prakash A, Senthilkumar R, et al. Minimally invasive esophagectomy: thoracoscopic mobilization of the esophagus and mediastinal lymphadenectomy in prone position--experience of 130 patients. *J Am Coll Surg* 2006;203(1):7-16.
- [10] Campos M, Jablons D, Brown LM, et al. A safe and reproducible anastomotic technique for minimally invasive Ivor Lewis oesophagectomy: the circular-stapled anastomosis with the trans-oral anvil. *Eur J Cardiothorac Surg* 2010;37(6):1421-1426.
- [11] Kowalczyk L, Forsmark CE, Ben-David K, et al. Algorithm for the management of endoscopic perforations: a quality improvement project. *Am J Gastroenterol* 2011;106(6):1022-1027.
- [12] Ben-David K, Lopes J, Hochwald S, et al. Minimally invasive treatment of esophageal perforation using a multidisciplinary treatment algorithm: a case series. *Endoscopy* 2011;43(2):160-162.
- [13] Parameswaran R, Blazeby JM, Hughes R, et al. Health-related quality of life after minimally invasive oesophagectomy. *Br J Surg* 2010;97(4):525-531.
- [14] Naftoux P, Moons J, Coosemans W, et al. Minimally invasive oesophagectomy: a valuable alternative to open oesophagectomy for the treatment of early oesophageal and gastro-oesophageal junction carcinoma. *Eur J Cardiothorac Surg* 2011;40(6):1455-1463.