

## Outcome of Transhiatal Esophagectomy Done for Advanced Oesophageal Cancer

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**Background:** This study was aimed at assessing a single unit experience of Transhiatal Oesophagectomy (THE) done for advanced esophageal cancer and the possible contributing factors for adverse outcomes.

**Methods:** A Retrospective hospital based longitudinal case series analysis was undertaken at Tikur Anbessa Specialized Central Referral Hospital, Addis Ababa, Ethiopia. All patients admitted for esophageal cancer and operated with transhiatal oesophagectomy over a period of six years from November 2006 to November 2011. The outcome measures studied included the demographic characters, duration and severity of symptoms, relevant investigations, stage and site of the tumor, hospital stay, mortality, morbidity, and variables associated with adverse outcomes.

**Results:** A total of 156 patients were operated for possible THE, of them 139 (89.1%) were found suitable for the planned procedure. Male to female ratio was 1:1.72 and mean age of presentation was 54.9 +/- 11.8. Majority of patients seek medical advice late in the course of the illness. At the time of surgery, One hundred twenty seven (91.4%) of them were either stage three or above. Tumor was localized in the upper (1.4%) middle (23%) lower (62.2%) and GEJ (13%). Majority were squamous cell carcinoma (82%). Patients presented after an average of 5.54 +/- 3.05 months of symptom onset. The mean duration of surgery was 152.98 +/- 37.3 minutes and the mean estimated amount of intra-operative blood loss was 733.38 +/- 380.5 ml. The average hospital stay after surgery was 11.58 +/- 7.4 days and the hospital mortality was 18.7%. The major risk factors for mortality were sepsis, anastomotic leak and respiratory conditions. All the 113 (81.3%) operative survivors were discharged from the hospital after they resumed normal swallowing.

**Conclusion:** With Transhiatal Oesophagectomy, it is possible to achieve lasting relief from dysphagia if done in appropriately selected patients even for advanced esophageal cancer with acceptable mortality and morbidity.

## Introduction

Despite its 100 year history, oesophagectomy remains one of the most challenging procedures of the 21<sup>st</sup> century. It can be, and is, performed through right or left thoracotomy, Laparotomy or combinations of these, and as of the 1990's has been approached via minimally invasive techniques. The rather unique and unusual "blunt" Transhiatal Oesophagectomy (THE) has become among the most common means of esophageal resection<sup>1</sup>. Orringer<sup>2</sup> and Herbert Sloan from the University of Michigan Medical Center presented their first results of 26 blunt transmediastinal esophagectomy at the 1978 American Association for Thoracic Surgery Meeting in New Orleans. Over a 2-year period, they had operated on 22 patients with carcinomas involving the esophagus and 4 with benign disease. Intestinal continuity was restored by a gastric pull-up in 19 patients and left-colon interposition graft in 7 patients. Mortality was 19% (5/26); average blood loss was 1350 mL. They concluded then that THE is safe and effective, and is better tolerated physiologically than a Transthoracic resection. After this report, THE became increasingly popular which also was evidenced by a 2000 report based on the National Cancer Database of the American College of Surgeons<sup>3</sup> showing that 26% of all Esophageal cancer resections were performed with this technique.

Oesophageal carcinoma is not a common tumor, it accounts for only 5% of all gastrointestinal tumors and 1% of all new tumors, however it has nearly a 1:1 mortality ratio.<sup>4</sup> Its typical symptoms like difficulty of swallowing, feeling of fullness, burning retrosternal pain, feeling of both liquids and solids becoming stuck behind the sternum are usually seen in late stage of the disease. Most patients present with stage IIB to stage IV disease. Such problem of late presentation is in fact more pronounced in developing countries like

Ethiopia. In a study done A.Ali<sup>5</sup> in Tikur Anbessa Specialized Referral Hospital (TASH) showed that only 56% of patients were operable at presentation and of them due to the advanced nature of the disease only 24% were suitable for oesophagectomy. The treatment options for such advanced esophageal cancer are often non-surgical with stents, neoadjuvant therapy, photodynamic therapy, brachytherapy, or immunotherapy. However, these treatment modalities are not available in resource limited countries like Ethiopia. Besides they also carry their own complications (some of which are lethal). Subsequent swallowing could even be poorer than that is provided by palliative resection or by pass<sup>6</sup>.

Transhiatal oesophagectomy is often advocated as the preferred surgical approach in patients with benign disease or early tumors or those patients with more advanced disease who would not tolerate a thoracotomy. However, it also has been criticized for lack of formal two field lymphadenectomy and the failure to completely resect the tumor under direct vision<sup>7</sup>. Currently in our institution, among the different approaches used for managing cancer of the esophagus, Transhiatal oesophagectomy is the most favored one. It is specially advocated for carcinoma below the level of Carina and GEJ. This study evaluates our experience and outcome of THE done for advanced cancers of the Esophagus in an area where other modalities of treatment are nonexistent. It also is intended to contribute additional knowledge on the outcome of THE done for advanced esophageal cancer in a set up like Ethiopian with a limited resources available.

#### **Patients and Methods**

A retrospective hospital based longitudinal case series analysis of patients admitted and operated for advanced esophageal cancer with THE approach over a period of six years ( 2006 – 2011 ) at Tikur Anbessa specialized hospital (TASH) was conducted. The operative technique we follow was as described in detail by Orringer<sup>2</sup>. An initial Laparotomy performed through a rooftop incision to confirm tumor resectability, followed by abdominal exploration and gastric mobilization. The esophageal hiatus was first enlarged by splitting the diaphragm anteriorly and retractors were positioned to facilitate exposure of the intrathoracic esophagus up to the level of the carina. This enabled us to do en bloc resection of the esophagus and paraesophageal tissue including the crura and pleura (if indicated) under direct visualization. Lymph node dissections involved lymph nodes in the lower esophagus, around the oesophagogastric junction and along the lesser curvature of the stomach were done. Radical lymph node dissections were not performed. Gastrointestinal continuity were re-established with either stomach or left colon. When stomach was used, gastric tube vascularized by the right gastroepiploic artery with or without right gastric artery will be positioned within the posterior Mediastinum. An end to side hand sewn single layer oesophagogastric or end to end esophago-colon anastomosis was fashioned in the neck through a left sided cervical incision.

Data from individual medical records of eligible patients were collected on demographic characteristics, age, and gender, grade of dysphagia, histology, tumor location, stage, resection margin status, adjuvant therapy, cancer survival, anastomosis leaks, and operative morbidity/mortality. The degree of dysphagia was graded from one to four as Grade I (Dysphagia for only solid food), Grade II (dysphagia for semisolid food), Grade III (Dysphagia for liquid food) and Grade IV (Dysphagia even for saliva). Anastomosis leakage was defined as any clinical leakage of gastrointestinal contents through the wound or a drain. Tumor locations were determined through a combination of endoscopy, contrast radiography, and/or intraoperative findings. The outcome of the surgery after patients discharged from hospital was collected from the follow up visit records.

To be included in this study, patients need to have a tissue-confirmed malignancy of the esophagus and need to have a planned schedule for surgical resection with Transhiatal method. Structured formats were used to collect relevant information. Data are expressed as median with ranges (minimum – maximum), or as percentages (%). Pearson Chi-Square test is used for comparisons of the parameters responsible for adverse outcomes. A *p* -value of less than 0.05 was considered statistically significant. Statistical analysis was done using SPSS version 15.0 soft ware program. Ethical clearance was obtained from the research and

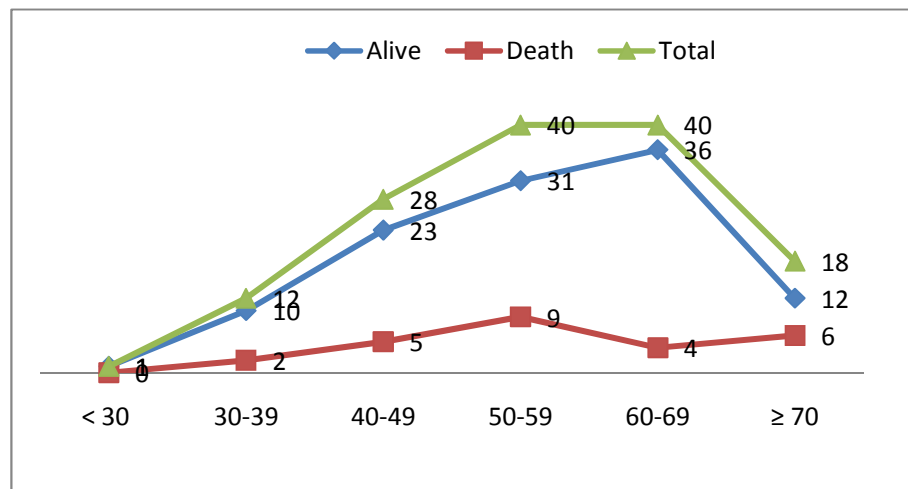
publication committee of the department of surgery, while the need for individual patient consent was waived.

## Results

Between 2006 and 2011, One hundred fifty six patients with carcinoma of the esophagus and Gastro-esophageal junction (GEJ) underwent surgery for possible palliative resection of the esophagus with Transhiatal oesophagectomy and reconstruction with either stomach or colon. Of those patients, one hundred thirty nine (89.1%) were found suitable for the planned surgery (THE) while the rest 17(10.9%) had an advanced tumor and some other palliative procedures were done. Majority of patients, 112 (80.6%) were operated in the last two years of the study period during 2010 and 2011 (Table 1). The mean age of patients was 54.9 +/- 11.8(range between 26-95 years).

Ninety eight (70.5%) and 18(12.9%) of them were aged  $\geq 50$  years and  $\geq 70$  years respectively (Figure 1). Even though the age specific mortality is highest for age group  $\geq 70$  years, it was not found to have statistically significant ( P= 0.394).

There were 51(36.7%) men and 88(63.3%) women (M: F ratio 1:1.72). Dysphagia and weight loss were the usual symptoms. The mean duration of symptoms was 5.54 +/- 3.05 months with a range of between 1 and 18 months. Of these, only 4 (2.9%) had had dysphagia for under 1 month, 95 (68.3%) had dysphagia for between 1 and 6 months. Forty (28.8%) of the patients had dysphagia for more than 6 months. A total of 96 (69%) presented late to the hospital with Grade II, while 36 (25.9%) had Grade III dysphagia. Grade of Dysphagia was found to have statistically significant association with hospital mortality (P<0.05). It is only 9 (6.5%) and 10 (7.2%) of them had history of smoking and regular alcohol drinking habit respectively (Table 1).



**Figure 1.** Age distribution of the 139 patients with Esophageal and GEJ tumors operated with Transhiatal Oesophagectomy

**Table 1.** Analysis of Demographics, Presenting Symptoms and its Relation to Mortality

Variables	Hospital Mortality		Total	P-value <sup>‡</sup>	
	No	Yes			
<i>Age(Years)</i> < 40	11	2	13(9.4)	0.394	
40-49	23	5	28(20.1)		
50-59	31	9	40(28.8)		
60-69	36	4	40(28.8)		
≥70	12	6	18(12.9)		
<i>Sex</i> Male	41	10	51(36.7)	0.835	
Female	72	16	88(63.3)		
<i>Operative year</i> 2006	4	2	6(4.3)	0.288	
2007	8	2	10(7.2)		
2008	1	2	3(2.1)		
2009	6	2	8(5.8)		
2010	40	7	47(33.8)		
2011	54	11	65(46.8)		
<i>Dysphagia</i> Grade I	6	0	6(4.4)	0.003 <sup>‡</sup>	
Grade II	84	12	96(69.0)		
Grade III	22	14	36(25.9)		
Grade IV	1	0	1(0.7)		
<i>Duration of symptoms</i> (months)	5.54 + / - 3.05			0.507	
<i>Smoking</i> Yes	8	1	9(6.5)	0.470	
No	105	25	130(93.5)		
<i>Alcohol</i> Yes	9	1	10(7.2)	0.408	
No	104	25	129(92.8)		
<i>Average Hospital stay (days)</i> Before surgery	8.4 + / - 5.2			0.010 <sup>‡</sup>	
After surgery	11.58 + / - 7.42			0.000 <sup>‡</sup>	
Total	20.01 + / - 9.56			0.000 <sup>‡</sup>	

Data are frequencies; Values in parenthesis are percentages, <sup>‡</sup> Pearson Chi-Square, <sup>‡</sup> P <0.05

### Preoperative management

After physical examination, investigation included routine CBC and biochemical tests; ECG, liver and renal function tests were done. Localization and possible spread of the tumor was investigated by chest radiography, barium swallow, endoscopy and biopsy. Ultrasonography examination of the liver and celiac lymph nodes was done routinely, but computed tomography (CT) was performed only in 18 (12.9%) patients. No patient had indirect laryngoscope and /or bronchoscope examination. Six (4.3%) patients were found to have low haematocrit requiring preoperative blood transfusion. Twenty one (15.1%) and twenty eight (20.1%) were having low serum potassium and serum sodium level which demanded preoperative resuscitation. The serum albumin was found to be less than 3.5gm/dl in 35(25.2%) of cases.

However, only one patient had preoperative feeding jejunostomy and no one got TPN administration before surgery (TPN is not available in the country). Localization of the tumor showed that eighty seven (62.2%) were in the lower third of the esophagus, 32 (23%) were in the middle third, 18(13%) were in GEJ and only two (1.4%) were in the upper third of the esophagus. Histology showed Squamous cell carcinoma in 114 (82%) and adenocarcinoma in 25(18%) patients (Table 2).

**Operation**

All patients considered fit enough to undergo general anesthesia on the basis of pre-anesthetic evaluation were offered operation. Old age was not used as an exclusion criterion: indeed, 18 (12.9%) patients were over or equal to 70 years of age. Our operative technique for THE has previously been described. Majority of the patients, 112 (80.6%), were operated in 2010 and 2011. Post surgical TNM staging of the tumors showed that 70(50.4%) stage III, 53(38.1%) stage IVA, 10(7.2%) stage IIB, 4 (2.9%) stage IVB, and 1 (0.7%) stage I and another 1(0.7%) in stage IIA. Majority of patients seek medical advice late in the course of the illness. At the time of surgery, One hundred twenty seven (91.4%) of them were either stage three or above (Table 3).

Data are frequencies; Values in parenthesis are percentages, <sup>€</sup>Fleming, I.R., et al. (eds.) AJCC cancer staging handbook. In AJCC Cancer Staging Manual, 5th edition, Philadelphia, Lippincott-Raven, 1998

Stomach and colon was used as a neo-esophagus in 136(97.8%) and 3(2.2%) respectively. For pyloric drainage, digital dilatation alone was done in 121(87.0%) and pyloroplasty in 18(13%) patients. The method used for pyloric drainage was found statistically significant association with hospital mortality ( $P<0.05$ ) (Table 2). Only two patients had jejunal feeding tube placed at the end of the procedure. The mean duration of surgery was 152.98 +/- 37.3 minutes (range 65-225minutes) (Table 2). The mean estimated amount of intra-operative blood loss was 733.38+/- 380.5 ml (range 250-3500ml) and 87(62.5%) of cases required one or more blood transfusion during surgery. The estimated blood loss as well as the amount of blood transfusion needed were found to have statistical significant association with hospital mortality ( $P<0.05$ ) (Table 2).

Most patients were extubated at the end of the operation and were returned to the ward or surgical ICU for postoperative care. Only three patients had respiratory insufficiency requiring postoperative support with mechanical ventilation (Table 2).

**Intra/post operative complications**

Ninety one (65.5%) patients had developed Intraoperative pneumothorax due to entry to one or both pleura during blunt dissection of esophagus. This minor complication was all treated by introducing a chest drainage tube(s) and establishing an underwater seal drain system. Tracheal or bronchial membrane tear was seen in two patients. An attempt to repair with Sternotomy and right thoracotomy were done respectively. However both died of respiratory failure after 12 and 24 hours stay in ICU with a mechanical ventilator support. Five (3.6%) patients required splenectomy following intra-operative injury to the spleen. Two patients had Intraoperative massive mediastinal hemorrhage (both are mid esophageal carcinoma) that required emergency thoracotomy and one died intraoperatively from uncontrollable massive hemorrhage coming from thoracic aorta. During an attempt of digital dilatation of the pylorus, one patient had developed tear of the duodenum and it was repaired.

During the course of postoperative period, twenty two (15.8%) patients had developed leak at the anastomosis, manifesting as salivary fistulae. All of them except two were treated conservatively by opening the neck wound at the bedside and local wound packing until healing by secondary intent occurred. Those two patients had a near complete disruption of the esophagogastric anastomosis and an attempt to surgically repair was done to no avail and subsequently died. Among the other twenty patients treated conservatively, four died during their hospital stay.

**Table 2.** Analysis of Investigations, operative findings and complications Encountered and its relation with Hospital Mortality

		Hospital Mortality		Total	P-Value †
		No	Yes		
Haematocrit	Normal	109	24	133(95.7)	0.348
	Low ( < 30)	4	2	6(4.3)	
Serum Potassium	Normal	96	22	118(84.9)	0.965
	Low	17	4	21(15.1)	
Serum Sodium	Normal	91	20	111(79.9)	0.679
	Low	22	6	28(20.1)	
Serum Albumin	Normal	83	21	104(74.8)	0.438
	Low	30	5	35(25.2)	
Barium Study	Proximal Esophagus	1	1	2(1.4)	0.197
	Mid-Esophagus	23	9	32(23.0)	
	Distal Esophagus	75	12	87(62.6)	
	GEJ	14	4	18(13)	
Histology	SCC	96	18	114(82.0)	0.060
	Adenocarcinoma	17	8	25(18.0)	
Intraoperative Blood Transfusion					0.000 <sup>‡</sup>
	None	46	6	52(37.4)	
	1 unit	38	3	41(29.6)	
	2 unit	25	12	37(26.6)	
	3 unit	4	3	7(5.0)	
	≥ 4 unit	0	2	2(1.4)	
Neo-Esophagus	Stomach	111	25	136(97.8)	0.511
	Colon	2	1	3(2.2)	
Pyloric Drainage	Digital Dilatation	102	19	121(87.0)	0.019 <sup>‡</sup>
	Pyloroplasty	11	7	18(13.0)	
Intra Operative	Stage I	1	0	1(0.7)	0.208
	Stage IIA	1	0	1(0.7)	
	Stage IIB	9	1	10(7.2)	
	Stage III	61	9	70(50.4)	
	Stage IVA	39	14	53(38.1)	
	Stage IVB	2	2	4(2.9)	
Duration of surgery (minutes)		152.98 + / - 37.3			0.970
Estimated blood loss (ml)		733.38 + / - 380.5			0.001 <sup>‡</sup>
Intraoperative Complications	Yes	85	25	110(79.1)	0.018 <sup>‡</sup>
	No	28	1	29(20.9)	
Postoperative complications	Yes	51	26	77(55.4)	0.000 <sup>‡</sup>
	No	62	0	62(44.6)	

Data are frequencies; Values in parenthesis are percentages, † Pearson Chi-Square, ‡ P <0.05



The rest sixteen had complete recovered with conservative management in four week period. Other complications seen were Atelectasis/pneumonia 19 (13.7%), ARDS 8 (5.8%), mediastinitis 5(3.6%) abdominal wound dehiscence 3 (2.2%) and Anastomosis stricture 5 (3.6%). There was no chylothorax seen.

Due to lack of proper documentation on status of recurrent laryngeal nerve, the incidence of its injury is difficult to calculate (Table 4). Complications developed during surgery as well as in the course of postoperative period were found to have statistically significant association with hospital mortality ( $P<0.05$ ).

**Table 3.** Postsurgical TNM Staging<sup>€</sup> of 139 Oesophageal and GEJ tumors

Stage <sup>€</sup>	Number by tumor site				Total Number (%)
	Proximal Esophagus	Mid Esophagus	Distal Esophagus	GEJ	
I	0	0	1	0	1( 0.7)
IIA	0	0	0	1	1( 0.7)
IIB	0	2	7	1	10( 7.2)
III	0	12	52	6	70( 50.4)
IVA	2	16	26	9	53( 38.1)
IVB	0	2	1	1	4(2.9 )
Total	2(1.4)	32(23)	87( 62.6 )	18( 13 )	139(100)

**Table 4.** Cross tabulation on the Types of Postoperative complication Vs Hospital Mortality

Type of Postoperative complications	Hospital Mortality		Total Number (%)
	No	Yes	
Anastomosis leak	16	6	22(15.8)
Anastomosis stricture	5	0	5 (3.6)
Gastric stasis	1	0	1 (0.7)
Sepsis	0	3	3 (2.1)
MI	0	2	2 (1.4)
BPF	0	2	2 (1.4)
Bleeding (requiring re-exploration Thoracotomy)	1	1	2 (1.4)
Atelectasis/ Pneumonia	17	2	19(13.7)
ARDS	4	4	8 (5.8)
Mediastinitis	0	5	5 (3.6)
Abdominal wound dehiscence	3	0	3 (2.1)
DVT	1	0	1(0.7)
None	64	0	64 (46)
Total	113(81.3)	26(18.7)	139(100)

### **Mortality**

There was one intra-operative death from massive mediastinal hemorrhage. Twenty six patients died within 30 days of operation, resulting in a hospital mortality rate of 18.7%. . Even though the age specific mortality rate is higher for age group  $\geq 70$  years (33.3%), it was found to have statistically insignificant relation ( P-Value, 0.286) (Table 1). The most prevalent cause of death was Anastomosis leak 6 (4.3%), followed by mediastinitis 5(3.6%), respiratory insufficiency from ARDS 4 (2.9%) and Bronchopleural fistula (BPF) 2 (1.4%) , sepsis 3(2.15%) and MI 2 (1.4%) (Table 4).

### **Survival**

The 113 surviving patients were discharged after a mean hospitalization period after operation of 11.58 +/- 7.4 days. The mean hospitalization period before surgery, after surgery as well as the total time were found to have statistically significant association with hospital mortality ( $P < 0.05$ ) (Table 1).

### **Discussion**

Transhiatal Oesophagectomy was first described by Levy in 1898; the procedure however was first carried out successfully by Grey-Turner<sup>8</sup> in 1933. Subsequently it was recommended again by Kirk<sup>9</sup> in the UK as a potential therapy for patients unfit to withstand thoracotomy. In the past 30 years, Transhiatal Oesophagectomy has developed further and become an accepted operation that has substantially reduced the morbidity and mortality associated with traditional transthoracic esophageal resection. Such reduction in mortality was also seen in the present study. Transhiatal Oesophagectomy has been increasingly performed in our hospital for patients with esophageal carcinoma. This is because palliative treatment of advanced tumors is possible at an acceptable surgical risk; besides the new fellowship training program in cardiothoracic surgery has contributed to its recent development. Analysis of our institute present data showed a substantial improvement in comparison to earlier, with hospital mortality rates of 28% (1992 - 1996)<sup>5</sup> as compared to 18.7% (2006-2011). Such improvement might directly correlates with increased annual volume of Oesophagectomy done which were 47 and 65 patients per year during 2010 and 2011 respectively. Dimick<sup>10</sup> and associates have also reported significant differences in risk-adjusted mortality between high-volume (more than 12 Oesophagectomy per year) and low-volume (less than 5 Oesophagectomy per year) hospitals (24.3% vs. 11.4%;  $P < 0.001$ ) and high-volume (more than 5 Oesophagectomy per year) and low-volume (< 2 Oesophagectomy per year) surgeons (20.7% vs. 10-7%;  $P < 0.001$ ).

The largest series of Transhiatal Esophagectomy reported so far for benign and malignant disease of the esophagus is from Orringer<sup>11</sup>. It is this data from his experience that act as a benchmark regarding this procedure. With their experience of 1085 Transhiatal Esophagectomy, they were able to perform resection in 98.6% of all patients. Study done in Tikur Anbessa specialized referral hospital by A.Ali et al<sup>5</sup> a decade ago showed resectable rate of only 24% which is much lower than the current result (89.1%). Similarly, high rate of resectability were also seen by Alderson et al<sup>14</sup> (90%), Orringer<sup>4</sup> (96%), Gotley et al<sup>15</sup> (60%), and Ahmed ME<sup>16</sup> (87%). Unlike many other studies, female preponderance is seen. The mean age of the patients who underwent Transhiatal Esophagectomy for esophageal carcinoma as 64 years in the series reported by Orringer et al<sup>12</sup>, 69 years in study done by D.C. Gotley et al<sup>15</sup> and 57.4 years in the series of N.Gurkan et al<sup>17</sup>. In our series, the mean age was 54.9 years, but 70.5% and 12.9% of our patients were more than 50 and 70 years respectively. Some studies showed operative mortality rate for Esophagectomy having significantly greater in those over 70 years of age<sup>18</sup> and may even reach 71 % in those over 80 years<sup>19</sup>. In the current study, though the age specific mortality was still highest for age group  $\geq 70$  years (33.3%), it was found not to be statistically significant (Table 1). Therefore old age could not be claimed as a contraindication for Transhiatal Esophagectomy.

Inadvertent tearing of the mediastinal pleura accounts for the high incidence of pneumothorax (65.5%). In orringer's<sup>4</sup> experience 63% require drainage. Many other similar studies<sup>9-17</sup> showed similarly high incidence of pneumothorax. Besides fluid collections within the chest cavity are frequently seen later during the immediate post operative days and is more difficult to drain once Loculated. In an attempt to minimize these squeal, most institutions put bilateral chest drains routinely and adopt this as a protocol for all Transhiatal Esophagectomy.



Damage to the trachea or main bronchus occurs rarely during Esophagectomy, but when it happens the prognosis is unfavorable. We saw two patients (1.4%) with these complications and both died subsequently. There are no unambiguous guidelines for treatment in such cases. Conventionally, tracheal laceration is approached via right thoracotomy or partial sternotomy.<sup>21,22</sup> A variety of technical modifications has been described to tackle airway injury during Esophagectomy.<sup>20-24</sup> Even though the current opinions do not recommend it, Wylezol et al<sup>24</sup> reported successful treatment with conservatively with long days of mechanical ventilation. Vikas Gupta et al<sup>26</sup> reported as trans-cervical approach being an effective way of repairing thoracic membranous tracheal laceration during Transhiatal Esophagectomy without any significant increase in the morbidity.

Surprisingly, many reported series showed exsanguinating hemorrhage as being not a major problem of the procedure. In their collective review of the complications of Transhiatal Esophagectomy in 1353 reported patients, Katariya et al<sup>25</sup> reported an incidence of 1.3% massive intra-operative bleeding necessitating conversion to a transthoracic procedure. The more recent review of Transhiatal Esophagectomy done in 1192 patients by Gandhi et al<sup>27</sup> showed an incidence of 3% mediastinal hemorrhage. Orringer<sup>12</sup> reported that Postoperative mediastinal bleeding requiring thoracotomy for control within 24 hours occurred in five (<1%) patients, three with carcinoma and two with a mega-esophagus of Achalasia; each had arterial bleeding in the esophageal bed.

We encountered massive bleeding twice (1.4%); one from injury of the azygous vein and the other from thoracic aorta invaded by tumor. Both occurred during middle third tumor mobilization. In comparison to other reviews, the median transfusion of one unit of blood seems acceptable, however the estimated amount of bleeding as well as the unit of blood transfusion needed is significantly related to adverse outcome. Because of such low incidence of massive bleeding, some authors have even started to operate without a routine cross match blood being prepared. Transhiatal Oesophagectomy is most hazardous for middle-third tumors, where damage to the mediastinal vessels, the membranous trachea, main bronchi or thoracic duct has been encountered. For this reason some surgeons consider that a Transhiatal approach for middle-third esophageal carcinoma as relative contraindication.

We identified anastomotic leak and pulmonary complications as the most common causes of postoperative death. In Postlethwait<sup>28</sup> series, more anastomotic leakages were observed in bypass procedures (34.1 per cent) than in palliative (7.6%) or curative resections (3.7%). In our review anastomotic leak was clinically seen in 15.8 % of patients. Orringer<sup>29</sup> reported leak in 12% of 143 patients, of whom 43 had benign disease. One year later, Orringer<sup>4</sup> observed leak in only 5% of patients with carcinoma of the thoracic esophagus. Others have reported similar figure<sup>41-43</sup>. The most serious consequence of anastomotic leakage is mediastinitis, but this is uncommon after Transhiatal oesophagectomy owing to the positioning of the anastomosis in the cervical region and because the transposed stomach blocks the entrance to the mediastinum.

Even though the incidence of leakage is either comparable to some reports from developed countries<sup>17,39</sup> or even less when compared to other African countries report<sup>16,40</sup>, we have confirmed its high incidence after Transhiatal oesophagectomy, and the unfavorable outcome of such leakage in some of the patient.

In majority of patients with esophageal carcinoma, the goal of oesophagectomy is palliation, not cure. With the notable exception of a few reported series in which the hospital mortality has been less than 5%,<sup>30-33</sup> esophageal resection and reconstruction for carcinoma carries a mortality that is generally between 15-40%.<sup>34,35</sup> Giuli and Gignoux<sup>36</sup>, presenting the results in 2400 patients with esophageal carcinoma operated upon in multiple European hospitals, report a mortality for Oesophagectomy of 30%. Similarly, Earlam and

Cunha-Melo<sup>37</sup>, in an extensive literature review, report a hospital mortality of 33.3% in 83,783 oesophagectomy.

**Table 5.** A comparative study of Leakage and Mortality of Oesophagectomy Series Done

Study Article				Procedure type	Leakage (%)	Mortality	
First Author	Place	Year	Total no.			Leakage related (%)	Overall (%)
Orringer <sup>4</sup>	Michigan, USA	1976 - 1983	100	THE	5	0	6
Orringer <sup>11</sup>	Michigan, USA	1976 -1998	1085	THE	13	6.8	4
Orringer <sup>12</sup>	Michigan, USA	1998 -2006	944	THE	9	NS	1
Andrew <sup>42</sup>	London, UK	2000 - 2006	215	THE	5.6	NS	0.9
Chris <sup>41</sup>	Ontario, Canada	NS	74	THE ILE (74%)	NS	NS	4
Alderson <sup>14</sup>	London, UK	1989 - 1992	40	THE	5	NS	2.5
Gotley <sup>15</sup>	London, UK	1981 - 1988	54	THE	3.7	0	11
Chang <sup>39</sup>	Galway , Ireland	1994 - 2007	126	THE, ILE, McE	8.7	20	6.3
Curran AJ <sup>46</sup>	Galway , Ireland	NS	37	THE	NS	NS	16
Gurkan <sup>17</sup>	Istanbul, Turkey	1979 - 1990	148	THE	10.1	25	8.1
Rao <sup>44</sup>	NS	1982 - 2000	411	THE	14	NS	11
Mannell <sup>45</sup>	Johannesburg, South Africa	NS	127	THE ILE (27%)	NS	NS	11.8
Ogendo <sup>40</sup>	Nairobi, Kenya	1998 - 2004	201	THE ILE (67%)	16.4	48.4	28.9
Ahmed <sup>16</sup>	Khartoum, Sudan	NS	101	ILE	NS	NS	27.8
Ali <sup>5</sup>	Addis Ababa, Ethiopia	1992 - 1996	142	ILE	12	NS	28
Present study	Addis Ababa, Ethiopia	2006-2011	139	THE	15.8	23	18.7

NS – not specified, THE – Transhiatal Esophagectomy, ILE – Ivory Lewis Esophagectomy, McE - McKeown Esophagectomy

The international organization for statistical studies on disease of the esophagus<sup>38</sup> reported the results of a prospective multicenter study of over 700 patients undergoing resection for carcinoma of the esophagus, of which 91 had Transhiatal Oesophagectomy. Perioperative mortality was 19%, compared with 17% after resection via a left thoracotomy and 13% after right thoracotomy. Orringer<sup>13</sup> has showed that the hospital mortality rate has steadily fallen as the volume of THE operations has increased, averaging 10% from 1978 to 1982 with an average of 23 THE operations annually; 5% from 1983 to 1987 with an average of 45 THE operations; 2% from 1988 to 1992, with an average number of 55 THE operations; 3% from 1993 to 1997, with an average number of 82 THE operations; and since 1998, 1%, with more than 100 THE operations annually.

A similar pattern was also observed in the current series, with a mortality of 2/6, 2/10, 2/3, 2/8, 7/47 and 11/65 per year during the period of 2006 and 2011 subsequently. Our overall hospital mortality of 18.7%, as well as the fact that 82% of our patients surviving operation leave the hospital within two weeks of operation, attest to the merits of Transhiatal Esophagectomy in providing efficient and relatively safe palliation of dysphagia even for patient with advanced carcinoma of the esophagus done under less privileged setup.

### Conclusion

Though the most recent reviews from developed countries showed as low as 5% mortality and less morbidity, our operative outcomes is still comparable to most of the international results. However if better result is need to be achieved, improvements in facilities for peri-operative critical care, proper case selection criteria, a well defined preoperative staging criteria and developing in early referral system in the region are essential. Trying to improve the public and other health workers awareness of symptoms of esophageal cancer and improving the availability for a rapid access to diagnostic facilities are also imperative. Chang<sup>39</sup> has observed a significant reduction of 30-day mortality rate from 8.2% in the time period 1994–2002 to 5.1% in the time period 2003–2008, which corresponded with the restructuring of the intensive care and high dependency unit at Galway university Hospital. A similar achievement can be expected if our institute develops a high dependency unit.

Finally, this initial result from our series of patients undergoing Transhiatal Oesophagectomy for advanced esophageal cancer is encouraging and is justifiable to continue its use in this centre. With the current tendency of concentrating cases in our hospital thereby increasing the number of surgeries done, will definitely offer the opportunity to develop greater team experience and pursue research in to management strategies which may help to improve the outcome. In conclusion, the data from this study supports the concept that Transhiatal Oesophagectomy in appropriately selected patients is safe and feasible even for advanced esophageal cancer done under less privileged setup. The study also showed that with Transhiatal Oesophagectomy, one can achieve lasting relief from dysphagia with a mortality rate of 18.7 % which is somewhat comparable with that of several other series of conventional transthoracic resections.

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