

SURGICAL OUTCOME OF 1388 CASES OF ESOPHAGECTOMY FOR CARCINOMA ESOPHAGUS.

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ABSTRACT

OBJECTIVE: *To analyze surgical outcome of 1388 cases of esophagectomy for carcinoma esophagus.*

METHODOLOGY: *1388 consecutive cases of esophagectomy for carcinoma esophagus done between 1st June, 2002 and 30th May, 2013, at Cardiothoracic surgery Unit, Lady Reading Hospital Peshawar and Khyber Medical Center were retrospectively analyzed for surgical outcome. Contrast studies, endoscopy with biopsy, CT thorax/ upper Abdomen with oral and I/V contrast and abdominal ultrasound were done along with routine investigations. The procedures included left thoracoabdominal, transhiatal, Ivor Lewis, McKeown, left thoracotomy with Roux en- Y. All operations were done by one surgical team. Results: Out of 1388 cases, 945 were males and 443 were females with a mean age of 47.5 years. The age range was 15-83 years. Lower one third tumor was present in 62.53% cases and middle third tumor was present in 37.47 %. Of the 62.5% cases of lower one third tumor, the stomach was involved in 21.39% cases. Histopathology reports showed adenocarcinoma in 52.01% cases, squamous cell carcinoma in 47.11% cases, adenosquamous in 0.72% cases and carcinoma in-situ in 0.16% cases. Morbidity was 5.87% and included anastomotic leak 0.86%, aspiration pneumonia 1.22%, bleeding 0.93%, wound infection 1.44%, stricture 1.08 and hoarseness 0.43%. Mortality was 2.07% and comprised respiratory failure 0.57%, myocardial infarction 0.43%, bleeding 0.28%, anastomotic leak 0.36%, tracheal injury 0.14% and pulmonary embolism 0.28%.*

CONCLUSION: *In a high volume center, esophagectomy for carcinoma of the esophagus has a better surgical outcome.*

Key Words: *Esophagectomy, carcinoma esophagus, surgical outcome.*

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INTRODUCTION

The surgical treatment of esophageal cancer is often mentioned as one of the procedures for which concentration in high-volume centers might improve outcome^{1,2}. The first resection for carcinoma of the oesophagus was performed by the Czerny in 1877³. Frank Torek (1913) performed the first successful transthoracic oesophagectomy in New York before the advent of intratracheal ventilation. Subsequent attempts by other surgeons met with catastrophic consequences for a variety of reasons including severe intrathoracic anastomotic dehiscence. In the ensuing decades, advances in the evaluation of esophageal resection and reconstruction were made by pioneering thoracic surgeon such as Sweet and Belsy⁴. In 1978, Oringer and Sloan reported their experience with transhiatal esophagectomy⁵. Resection of the thoracic esophagus can be accomplished with a variety of surgical approaches. The commonly used approach for tumor of lower two thirds of thoracic esophagus is a right thoracotomy and laparotomy as initially proposed by Lewis. A modification was proposed by McKeown whereby an additional cervical incision allows the anastomosis to be performed in the neck. Historically tumors of the distal esophageal cardia have been approached through a variety of incisions⁶. The commonly used is a left thoracotomy and trans-diaphragmatic approach to the abdomen while others advocate left thoraco-laparotomy, thus greatly facilitating mobilization of the stomach. Resection of the intrathoracic esophagus may be accomplished through a transhiatal approach with an upper abdominal and cervical incision. Transhiatal esophagectomy is best suited for the tumors of the cardia but is also used for resection of the intrathoracic esophagus⁷. The purpose of this study was to analyze the surgical outcome of esophagectomy for carcinoma of the esophagus.

METHODOLOGY

This retrospective, observational, descriptive study was conducted at the Department of Cardiothoracic Surgery, Lady Reading Hospital, and Khyber Medical Centre, Peshawar from 01 June 2002 to 30 May 2013. Computerised clinical data of 1388 cases of esophagectomy for carcinoma esophagus were retrospectively analyzed. The data base included data regarding the preoperative workup and staging, histology (endoscopic), operative notes, post operative ICU and HDU stay, morbidity and mortality and post operative specimen histology. All those with irresectable tumors unfit for surgery, were excluded. Apart from routine investigations all patients had Barium studies, Endoscopy and biopsy, CT thorax/upper abdomen with oral and I/V contrast, abdominal ultrasound and spirometry, while echocardiography was done in elderly patients. Various surgical approaches were used accordingly and Witzel feeding jejunostomy was done in all cases. All operations were done by one surgical team. All the resected specimens were sent for histology to Shaukat Khanum Memorial Hospital, Lahore. On the first post operative day, the right chest drain and urinary catheter were removed, feeding via jejunostomy tube started on the second postoperative day at the rate of 50 ml/hr, 100 ml/hr on the third post operative day increased to 150 ml/hr on the fourth post operative day and continued with the same rate onward. The nasogastric tube was removed on the 5th postoperative day, oral sips allowed and left chest drain were removed on seventh post operative day. They were all seen in OPD after 2 weeks with the histology result of resected specimen and then followed up at gradually increasing intervals. All patients were sent to the oncologist

Variable	Frequency	%
SEX		
Male	945	68.08
Female	443	31.92
AGE (YR)		
Male		
<40	348	25.07
>40	597	43.01
Female		
<40	144	10.37
>40	289	20.82
CLINICAL PRESENTATION		
Progressive dysphagia	1388	100
Weight loss	1145	82.49
LEVEL		
Middle third	520	37.47
Lower third	868	62.53
Stomach	297	21.39
HISTOLOGY		
Adenocarcinoma	722	52.01
Squamous cell carcinoma	654	47.11
Adenosquamous	10	0.72
Carcinoma in situ	2	0.14

table-1: Preoperative data of patients (n= 1388)

No of oesophagectomies			
Year	LRH	KMC	Total
2002 (JUNE)	11	21	32
2003	43	27	70
2004	56	32	88
2005	62	32	94
2006	74	35	109
2007	78	37	115
2008	93	38	131
2009	102	39	141
2010	112	36	148
2011	118	58	176
2012	129	67	196
2013(June)	48	40	88
Total	926	462	1388

table-2: Number of esophagectomies; year-wise.

for adjuvant therapy within six weeks of surgery. The hospital records and operation report of these patients were carefully analyzed for demographic feature, operative approach, and outcome.

RESULTS

Out of 1388 cases, 945 were males and 443 were females with a mean age of 47.5 years. The age range was 15-83 years. Lower one third tumor was present in 62.5% cases and middle one third tumor was present in 37.47 %. Of the 62.53% cases of lower one third tumor, the stomach was involved in 21.39% cases (table-1). The clinical record showed the number of esophagectomies increased on a yearly basis (table-2). The operative approaches included left thoraco-laparotomy with left neck anastomosis in a majority of cases, other procedures included Transhiatal, left thoracotomy with Roux en-Y, McKeown with right decortication, Ivor Lewis and left thoraco-laparotomy with left decortication (table-3). Histopathology reports showed adenocarcinoma in 52.01% cases, squamous cell carcinoma in 47.11% cases, adenosquamous in 0.72% cases and carcinoma in-situ in 0.14% cases (table-1). Morbidity was 5.87% and included anastomotic leak 0.86%, aspiration pneumonia 1.22%, bleeding 0.93%, wound infection 1.44%, stricture 1.08 and hoarseness 0.43%. Mortality was 2.07% and comprised respiratory failure 0.57%, myocardial infarction 0.43%, bleeding 0.28%, anastomotic leak 0.36%, tracheal injury 0.14% and pulmonary embolism 0.28% (table-4).

DISCUSSION

Oesophageal cancer's incidence varies more than that of any other cancer around the globe. It is endemic in the Transkei region of South Africa and in the Asian oesophageal cancer belt that extends across the middle of Asia from the Caspian Sea (in the north of Iran) to China. The highest incidence in the world is in Linxian, in the Henan province in China, where it is the most common single cause of death, with more than 100 cases per 100,000 population per annum. Incidence rates vary from less than 5:100,000 in white people in the USA to 26.5:100,000 in some regions of France⁸⁻¹⁰. The pathogenesis of esophageal cancer remains unclear¹¹. Data from studies suggest that the oxidative damage from factors such as smoking or gastroesophageal reflux, which cause inflammation and increase cell turnover may initiate a carcinogenic process. In our study, we noticed a high incidence of esophageal cancer among patients either belonging to Afghanistan or Afghans living in Pakistan. Hot fluids, spring water and snuff have been postulated to be the cause in Afghans.

Esophageal cancer diagnosis is generally made by endoscopic biopsy aided by cytology. CT scan, endoscopic ultrasound, bronchoscopy, PET studies and laparoscopy help in staging the disease. The overall prognosis is poor and survival rates of 4-14 years have been noted in different studies¹². Treatment modalities include surgery, chemotherapy and radiotherapy. Surgery is the mainstay of treatment in both curative and palliative approaches. After resection of the cancer, the gut continuity is restored using stomach tube anastomosed to remaining portion of esophagus⁹. No EUS and PET scan facilities are available in our unit and we stage the disease with the help of computed tomography thorax/upper abdomen with contrast. No unanimity of opinion exists as to what is the best operation for the removal of cancer of the esophagus. Each surgeon or surgical group has a procedure or a procedure of choice for

removing tumors at various locations of the thoracic esophagus^{3,4}. The controversy as to which is the best operation probably will not be resolved and may as well be of little importance^{5,6}. Standard transthoracic esophagectomy is performed through either a right or left thoracotomy depending on the location of the tumor¹³. Lesions of the distal esophagus and gastric cardia have been approached through a variety of left chest incisions which vary in the degree to which they extend into the abdomen. The upper two thirds of esophagus was most directly approached through a right thoracotomy usually in the fifth interspace. After a standard transthoracic esophageal resection, the mobilized stomach is positioned in the original esophageal bed. The posterior mediastinum is the preferred position, because it is the shortest and most direct route between the neck and the abdominal cavity. If subsequent anastomotic dilation is required, it is usually easy to carry out endoscopy and dilatation. Transhiatal esophagectomy is best reserved for patients in whom palliation is clearly the objective of treatment because of the advanced stage of the disease, or the presence of serious co-morbidity¹⁴. Proponents of transhiatal esophagectomy maintain that overall survival rates are not significantly different than standard transthoracic resection, in patients without nodal metastasis. Critics of Transhiatal esophagectomy however argue that a complete lymphadenectomy is a necessary component of resection of curative purposes. Despite improvements in systemic chemotherapy and radiotherapy, and the increasing acceptance of multimodality treatment that have resulted in enhanced survival rates over the past three successive decades¹⁵, surgical resection continues to be the mainstay of care for treatment of localised esophageal adenocarcinoma. Multiple approaches have been described for esophagectomy, and they can be thematically categorized under two major headings: transthoracic or transhiatal. The transthoracic procedure is performed more commonly by means of combined laparotomy and right thoracotomy (Ivor Lewis procedure). Other options include left thoracotomy with or without cervical incision, a single left thoracoabdominal incision, or a three-incision resection with a cervical anastomosis (McKeown procedure). The transhiatal approach is performed through midline laparotomy and left cervical incision. There has been considerable controversy about which procedure provides the best short-and long-term outcomes. The discussion centres on whether a more extended resection through thoracotomy provides superior oncological outcomes than resection with relatively limited morbidity and mortality through a transhiatal approach. Decisions regarding surgical technique are frequently based on personal bias, surgeons' experience and comfort with a procedure¹⁶. We have used various surgical approaches which included left thoracolaparotomy with left neck anastomosis in the majority of cases (72.91%) for tumor involving the middle third and lower third with, or without, involving the gastroesophageal junction. The perceived advantages of our approach through the left thoracolaparotomy were that there was adequate exposure of esophagus and stomach, proper regional lymph node dissection, adequate proximal tumor free margin and external fistula in case of neck anastomosis leak. Transhiatal esophagectomies were done in a limited number (5.40%) of cases in tumor involving the gastro-oesophageal junction. The reason was that most of the procedure was done blindly and proper lymph node dissection was not possible. Left thoracolaparotomy with Roux en-Y was done in cases (15.20%) in which tumor was involving the stomach along with gastro-esophageal junction. We have done McKeown esophagectomy with right side decortication in cases (3.09%) of middle third carcinoma esophagus with iatrogenic perforation resulting in

Variable	Number	Percentage
Left Thoracotomy with Neck	1012	72.91
Left Thoracotomy with R e Y	211	15.20
McKeown with R Decort	43	3.09
Left Thoracotomy with L Decort	38	2.73
Transhiatal	75	5.40
Ivor Lewis	09	0.64

table-3: Surgical approaches (n=1388).

Complications	Number	Percentage
MORBIDITY	83	(5.87%)
Anastomotic leaks	12	0.86
Aspiration pneumonia	17	1.22
Wound infection	20	1.44
Bleeding	13	0.93
Hoarseness	06	0.43
Strictures	15	1.08
MORTALITY	29	(2.07%)
Aspiration pneumonia-respiratory failure	08	0.57
Myocardial infarction	06	0.43
Anastomotic leak	05	0.36
Bleeding	04	0.28
Tracheal injury	02	0.14
Presumed pulmonary embolism	04	0.28

table-4: Morbidity and mortality

right empyema thorax. Ivor Lewis esophagectomy in cases (0.64%) in which the tumor was involving the gastro esophageal junction, middle one third and left thoracotomy with left decortication in a situation (2.73%) when iatrogenic esophageal perforation resulted in left empyema thoracis with carcinoma esophagus.

Recent studies examining the relationship of volume and outcome for specific surgical procedures including esophagectomy have demonstrated a consistent improvement in clinical outcomes with increased hospital volumes¹⁷⁻²⁰. According to definitions in the literature, we defined four levels of volume²¹.

- Very low volume (VLV): less than 5 esophagectomies per year
- Low volume (LV): 5–10 oesophagectomies per year
- Medium volume (MV): 11–20 esophagectomies per year, and
- High volume (HV): more than 20 esophagectomies per year

We have the highest number of patients operated during the last nine years when compared with other national studies^{22,23}. Our series of 1388 esophagectomies in 11 years in one centre, is one of the largest in both the national as well as international literature^{3,4,6,22,25,29,34,36,39}. This reflects both the high incidence in KPK and neighbouring Afghanistan as well as paucity of health services, as our unit is the only Thoracic Centre in KPK. Several complex surgical procedures

have reduced mortality when they are performed at high volume centres. Hospitals that perform a high volume of esophagectomies have better results with early clinical outcomes and marked reductions in mortality compared with low volume hospitals^{10,24}. Our 30-day mortality was 2.07%.

Most surgeons perform some form of a gastric drainage procedure as the Vagi are divided. However, most of them are doing an Ivor-Lewis procedure with anastomosis in right chest^{14,23,25}. In our series with our technique of left thoracotomy and left neck anastomosis in the majority of cases, we did not do any drainage procedure. The rationale behind it was that when an adequately mobilised stomach is brought up, under vision to be comfortably anastomosed in the neck, it is converted into a vertical tube, which empties by gravity. In our follow-up, no adverse effects regarding gastric stasis were observed. In other series, stasis after vagotomy ranges from 0–37%, but is relieved after 3 months^{26,27}.

We routinely placed a Jejunostomy feeding tube in all our patients, using a 14F rubber tube secured in place with a Witzel Maneuver. The relatively few potential complications are far outweighed by its advantages. A feeding jejunostomy tube can be placed with ease, it is a natural source of nutrition, it is cheaper than TPN and not associated with the metabolic and septic complications which occur with TPN, there is facilitation of early ambulation with supplemental nutritional support and the easy means of providing nutrition in the event of an anastomotic disruption^{14,25}. Because esophageal replacement with stomach is essentially an upper abdominal operation that requires minimal manipulations of the intestines, postoperative ileus for more than 48–72 hours is unusual. It is therefore possible to begin jejunostomy tube feeding with juices within 2–3 days of the operation and advance to full strength tube feedings soon thereafter, allowing discontinuation of IV fluids and greater ease of ambulation for the patient as oral intake is being increased. Also it is the safety net for a dehiscence or leak. Squamous cell carcinoma is the most common malignant tumor of the body of the esophagus and represents more than 95% of esophagus malignancies some series^{14,28}. Primary adenocarcinoma is rare and less than 1–7% of esophageal malignancies. The common glandular tumor is an adenocarcinoma that arises in the columnar epithelium of Barrett's esophagus which represents 86% of all adenocarcinoma in one series⁶. In our study, >52% patients had adenocarcinoma whereas squamous cell carcinoma was reported in >47% cases. The lower third of esophagus was involved in >62% cases while middle third tumor was reported in 37.47% cases. The majority of cases were in stage III disease in our study.

The location and technique of esophagogastric anastomosis has always been a subject of much discussion. The site of anastomosis is selected upon the location of primary tumor and preference of the surgeon. The site of anastomosis becomes an issue when the primary tumor is in the middle or the lower thoracic oesophagus. Should it be in the chest or in the neck? Ribet et al²⁹ reports that a cervical anastomosis provides an average additional tumor clearance of 3.28 cms and a cervical anastomosis avoids the potential hazard of mediastinitis of an intra-thoracic anastomosis³⁰. Moreover, the inverse relation between the height of esophago-gastric anastomosis and the degree of subsequent gastroesophageal reflux is well established^{31,32}. a low intrathoracic esophago-gastric anastomosis is almost invariably associated with marked gastro-esophageal reflux, whereas, with cervical oesophago-gastric anastomosis, considerable gastro-esophageal reflux is uncommon. Mortality is lower if a leak occurs in the neck than in

the chest³³. The occurrence of an anastomotic leak after esophagectomy is multifactorial. Blood supply and good surgical technique are the two most important factors in avoiding a leak³⁴. The overall anastomotic leak rate following cervical esophago-gastric anastomosis with the stomach positional in the posterior mediastinum in the original esophageal bed is 7.9%³⁵. The incidence of anastomotic leak in our study was 0.86%. Mathisen et al³⁶ emphasised the techniques of anastomosis 1) Atraumatic handling of tissue, 2) Preservation of blood supply of both oesophagus and stomach, 3) Avoidance of the use of crushing clamps, 4) Cutting the tissues with a sharp knife^{37,38}. Because of a neck anastomosis, there is no fear of mediastinitis. The other advantages of a neck anastomosis are (i) it is technically easier to do than an intra-thoracic anastomosis and (ii) you get very generous tumor free margin, resulting in adequate clearance and less chances of recurrence. Finally, our results in terms of morbidity and mortality are comparable with other studies³⁹.

Anastomoses can be performed by several techniques which includes hand sewn (continuous, interrupted, single layered and double layered) and by stapler (circular and linear). Anastomotic leak continues to be a major challenge. It is responsible for post operative mortality and poor quality of life, and hence the most feared complication⁴. It is a direct consequence of poor healing secondary to conduit ischemia and anastomotic technique³. The rate of anastomotic leakage ranges from 4.2–22% in various studies^{40–45}. The frequency of leakage following hand sewn anastomosis was 4.2%¹⁴, and that of stapled technique was 3.8%⁴⁶ in various studies. We have started stapling anastomoses from 2010 and have done more than 200 cases since then. We are studying comparing the outcomes of stapling versus hand sewn anastomosis in an ongoing study which is intended to be published in the last quarter of this year.

Initially our operative time was 3 or >3 hours but with the introduction of harmonic scalpel the operative time has been reduced to 1 or 1½ hours. The use of blood products has also been decreased from 3–4 to 1–2 pints due to reduced blood loss with the use of the harmonic scalpel.

This is a high volume thoracic centre treating Carcinoma of the Oesophagus through multiple approaches using computed tomography as the mainstay staging modality, harmonic scalpel and staplers along with adjuvant therapy without EUS and PET scan giving good results in a cost effective manner.

CONCLUSION

In a high volume center esophagectomy for carcinoma esophagus has better surgical outcome.

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