ORIGINAL ARTICLE

EARLY RESULTS OF OESOPHAGECTOMY FOR CARCINOMA OESOPHAGUS IN 1008 CASES

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Objective: To determine the early results of 1008 oesophagectomies done for carcinoma oesophagus over a 9 years period. **Methods:** This observational descriptive study was conducted at Department of Cardiothoracic Surgery, Lady Reading Hospital, and Khyber Medical Centre Peshawar from June 2002 to June 2011. All patients had apart from routine investigations, Barium studies, Endoscopy and biopsy, CT thorax/upper abdomen with oral and I/V contrast and abdominal ultrasound. The operative approaches included left thoracolaparotomy with left neck anastomosis, transhiatal, left thoracolaparotomy with Roux en-Y, McKeown with right decortication, Ivor Lewis and left thoracolaparotomy with left decortication. All operations were done by one surgical team. The hospital records and operation reports of these patients were carefully analysed for demographic feature; operative approach and outcome. **Results:** Out of 1008 cases, 698 were males and 310 were females with a mean age of 51.6 years. The age range was 17–80 years. Out of 1008 cases 611 (60.61%) cases had lower one third tumours, 384 (38.09%) cases had middle one third tumours while 13 (1.28%) tumours were just below the thoracic inlet. Of the 611 lower ⅓ tumours stomach involvement was present in 271 (44.35%) cases. Adenocarcinoma was present in 516 (51.19%) cases, squamous cell carcinoma was present in 485 (48.11%), adenosquamous was 6 (0.59%) and carcinoma *in situ* was present in 1 case (0.09%). Morbidity was 63/1008 (6.25%), and comprised anastomotic leaks 15, aspiration pneumonia 13, wound infection 13, hoarseness 8, and strictures 14, 30-day mortality was 23/1008 (2.28%) and causes included aspiration pneumonia-respiratory failure (5), myocardial infarction (4), anastomotic leak (6), tracheal injury (2), and presumed pulmonary embolism (6). **Conclusion:** More than 1000 cases in 9 years is a very high oesophageal workload for malignancy. Morbidity of 6.25% and mortality of 2.28% shows that such major operations can be done safely in thoracic centres.

Keywords: oesophagectomy, carcinoma oesophagus, outcome

INTRODUCTION

The first resection for carcinoma of the oesophagus was performed by the Czerny in 1877.[1] Attempts at resection of the intrathoracic oesophagus was stymied by the inevitable catastrophic pneumothorax and mediastinal tamponade before the introduction of positive pressure ventilation. 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 ensuring decades, advances in the evaluation of oesophageal resection and reconstruction were made by pioneering thoracic surgeon such as Sweet and Belsy.[2] In 1978, Oringer and Sloan reported their experience with transhiatal esophagectomy.[3]

Resection of the thoracic oesophagus can be accomplished with a variety of surgical approaches. The commonly used approach for tumour of lower two thirds of thoracic oesophagus 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 tumours of the distal oesophageal cardia have been approached through a variety of incisions.[4] The commonly used is a left thoracotomy and transdiaphragmatic approach to the abdomen while others advocate left thoracolaparotomy, thus mobilization of the stomach is greatly facilitated. Resection of the intrathoracic oesophagus may be accomplished through a Transhiatal approach with an upper abdominal and cervical incision. Transhiatal oesophagectomy is best suited for the tumours of the cardia but is also used for resection of the intrathoracic oesophagus.[5]

The purpose of this study was to analyse the early results of oesophagectomy for carcinoma of the oesophagus.

MATERIAL AND METHODS

This observational descriptive study was conducted at Department of Cardiothoracic Surgery, Lady Reading Hospital, and Khyber Medical Centre, Peshawar from June 2002 to June 2011. Computerised clinical data of 1008 cases of oesophagectomy for carcinoma oesophagus was retrospectively analysed. 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 tumours, unfit for surgery were excluded. All patients had apart from routine investigations, Barium studies, Endoscopy and biopsy, CT thorax/upper abdomen with oral and I/V contrast and abdominal ultrasound and spirometry while echocardiography 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 Hospital, Lahore. On first post operative day right chest drain and urinary catheter were removed, feeding via jejunostomy tube started on second postoperative day at the rate of 50 ml/hr, 100 ml/hr on 3rd post operative day increased to 150 ml/hr on fourth post operative day and continued with the same rate onward. Nasogastric tube was removed on 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 oncologist for adjuvant therapy within six weeks of surgery. The hospital records and operation report of these patients were carefully analysed for demographic feature, operative approach, and outcome.

RESULTS

Out of 1008 cases there were 698 males and 310 females. Their mean age was 51.6 years. The age range was 17–80 years. Out of 1008 cases 611 (60.61%) cases had lower one third tumours, 384 (38.09%) cases had middle one third tumours while 13 (1.28%) tumours were just below the thoracic inlet. Of the 611 lower ⅓ tumours stomach involvement was present in 271 (44.35%) cases (Table-1).

Clinical record showed number of esophagectomies increased yearly wise (Table-2). The operative approaches included left thoracolaparotomy with left neck anastomosis in majority (763, 75.69%) of cases, Transhiatal in 72 (8.03%) cases, left thoracolaparotomy with Roux en-Y in 107 (10.61%) cases, McKeown with right decortication in 23 (2.28%) cases, Ivor Lewis in 9 (0.89%) cases and left thoracolaparotomy with left decortication in 34 (3.37%) cases (Table-3).

Histologically adenocarcinoma was present in 516 (51.19%) cases, squamous cell carcinoma in 485 (48.11%), adenosquamous in 6 (0.59%), and carcinoma *in situ* was present in 1 (0.09%) case (Table-1).

The postoperative morbidity was 63 (6.25%) and comprised anastomotic leaks 15, aspiration pneumonia 13, wound infection 13, hoarseness 8, and strictures 14. Thirty day mortality was 23 (2.28%) and included aspiration pneumonia-respiratory failure 5, myocardial infarction 4, anastomotic leak 6, tracheal injury 2 and presumed pulmonary embolism 6 (Table-4).

Table-1: Preoperative data of patients (n= 1008)

Variable	Frequency	%
Sex		
Male	698	69.24
Female	310	30.75
Age (yr)		
Male		
<40	291	28.86
>40	497	49.30
Female		
<40	112	11.11
>40	198	19.64
Clinical presentation		
Progressive dysphagia	1008	100
Weight loss	810	80.35
Level		
Upper third	13	1.28
Middle third	384	38.09
Lower third	611	60.61
Stomach	271	26.88
Histology		
Adenocarcinoma	516	51.19
Squamous cell carcinoma	485	48.11
Adenosquamous	6	0.59
Carcinoma in situ	1	0.09

Table-2: Number of oesophagectomies year-wise

	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 (JUNE)	61	19	80
Total	**692**	**316**	**1008**

Table-3: Surgical approaches (n=1008)

Variable	Number	Percentage
Left Thoracolaprotomy with Neck	763	75.69
Left Thoracolaprotomy with R e Y	107	10.61
McKeown with R Decort	23	2.28
Left Thoracolaprotomy with L Decort	34	3.37
Transhiatal	72	7.14
Ivor Lewis	9	0.89

Table-4: Morbidity and mortality

Complications	Number	Percentage
Morbidity 63 (6.25%)		
Anastomotic leaks	15	1.48
Aspiration pneumonia	13	1.28
Wound infection	13	1.28
Hoarseness	8	0.79
Strictures	14	1.38
Mortality 23 (2.28%)		
Aspiration pneumonia-respiratory failure	5	0.49
Myocardial infarction	4	0.39
Anastomotic leak	6	0.59
Tracheal injury	2	0.19
Presumed pulmonary embolism	6	0.59

DISCUSSION

The incidence of oesophageal cancer varies more than that of any other cancer around the globe. It is endemic in the Transkei region of South Africa and in Asian oesophageal cancer belt that extends across middle of Asia from the Caspian Sea (in the north of Iran) to china. The highest incidence in the world is in Linxian in Henan province in China, where it is most common single cause of death, with more than 100 cases per 100,000 population per annum. Incidence rates varies from less than 5:100,000 in white people in USA to 26.5:100,000 in some regions of France.[6–8] The pathogenesis of oesophageal cancer remains unclear.[9]

Data from studies suggests the oxidative damage from factors such as smoking or gastro-oesophageal reflux, which causes inflammation, increase cell turnover and may initiate a carcinogenic process. In our study we noticed high incidence of oesophageal cancer among patients, either belonging to Afghanistan or Afghan living in Pakistan. Hot fluids, spring water and snuff have been postulated to be cause in afghan.

Diagnosis is generally made by endoscopic biopsy aided by cytology. CT scan, endoscopic ultrasound, bronchoscopy, PET studies and laparoscopy helps in staging. The overall prognosis is poor and survivals rates of 4–14 years have been noted in different studies.[10] Treatment modalities include surgery, chemotherapy and radiotherapy. Surgery is mainstay of treatment in both curative and palliative approaches. After resection of cancer commonly the gut continuity is restored using stomach tube anastamosed to remaining portion of oesophagus.[7]

No EUS and PET scan facilities are available in our unit and we staged 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 oesophagus. Each surgeon or surgical group has a procedure or a procedure of choice for removing tumours at various locations of the thoracic oesophagus.[1,2]

The controversy as to which is the best operation probably will not be resolved and may as well be of little importance.[3,4] Standard transthoracic Oesophagectomy is performed through either a right or left Thoracotomy depending on the location of the tumor.[11] Lesions of the distal oesophagus and gastric cardia have been approached though a variety of left chest incisions which vary in the degree to which they extend into the abdomen. Upper two third of oesophagus were most directly approached through a right Thoracotomy usually in the fifth interspaces. After a standard transthoracic oesophageal resection the mobilized stomach is positional in the original oesophageal bed. The posterior mediastinum is the preferred position, because it is shortest and most direct route between beck and abdominal cavity and if direct route between neck and abdominal and if subsequent anastomotic dilation is required it is usually easy to carryout endoscopy and dilatation. Transhiatal oesophagectomy 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 morbidity.[12] Proponents of Transhiatal oesophagectomy maintain that overall survival rates are not significantly different than standard transthoracic resection, in patients without nodal metastasis. Critics of Transhiatal oesophagectomy 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 decades[13], surgical resection continues to be the mainstay of care for treatment of localised oesophageal adenocarcinoma. Multiple approaches have been described for oesophagectomy, 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 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 procedure.[14]

We have used various surgical approaches which included Left thoracolaparotomy with left neck anastomosis in majority of cases (75.69%) for tumour involving the middle third, lower third with or without involving the gastroesophageal junction. Advantages of our approach through left thoracolaparotomy were that there was adequate exposure of oesophagus and stomach, proper regional lymph node dissection, adequate proximal tumour free margin and external fistula in case of neck anastomosis leak. Transhiatal oesophagectomies were done in a limited number (8.03%) of cases in tumour involving the gastro-oesophageal junction. The reason was that most of the

procedure blind and proper lymph node dissection is not possible. Left thoracolaparotomy with Roux en-Y was done in cases (10.61%) in which tumour was involving the stomach along with gastro-oesophageal junction. We have done McKeown oesophagectomy with right side decortication in cases (2.28%) of middle third carcinoma oesophagus with iatrogenic perforation resulting in right empyema thorax. Ivor Lewis oesophagectomy in cases (0.89%) in which the tumour was involving the gastro oesophageal junction, middle one third and left thoracolaparotomy with left decortication in a situation (3.37%) when iatrogenic oesophageal perforation resulted in left empyema thoracic with carcinoma oesophagus.

Recent studies examining the relationship of volume and outcome for specific surgical procedures including oesophagectomy have demonstrated a consistent improvement in clinical outcomes with increased hospital volumes.[15–18] According to the definitions in literature we defined 4 levels of volume[19]:

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

We have the highest number of patients being operated during nine years period when compared with other national studies.[20,21] Our series of 1008 oesophagectomies in 9 years in one centre is one of the largest national as well as international literature.[1,2,4,21,23,27,32–,34,37] 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 oesophagectomies have better results with early clinical outcomes and marked reductions in mortality compared with low volume hospitals.[8,22] Our 30-day mortality was 2.28%.

As the vagi are divided, most surgeons perform some form of a gastric drainage procedure. However most of them are doing an Ivor-Lewis procedure with anastomosis in right chest.[12,21,23] In our series with our technique of left thoracolaparotomy and left neck anastomosis in 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 and anatomised 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 was relieved after 3 months.[24,25]

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 for our weighed by its advantages Feeding Jejunostomy tube was placed with ease. It is a natural source of nutrition, cheaper than TPN and not associated with metabolic and septic complications which occur with TPN: facilitation of early ambulation supplemental nutritional support and the ease means of providing nutrition in the event of an anastomotic disruption.[12,23] Because oesophageal 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 leak.

Squamous cell carcinoma is the most common malignancies tumour of the body of the oesophagus and represents more than 95% of oesophagus malignancies some series.[12,26] Primary adenocarcinoma is rare, less than 1–7% of oesophageal malignancies. The common glandular tumour is an adenocarcinoma that arises in the columnar epithelium of Barrett's oesophagus which represents 86% of all adenocarcinoma in one series[4]. In our study >51% patients had adenocarcinoma whereas squamous cell carcinoma was reported in >48% cases. Lower third of oesophagus was involved in >60% cases while middle third tumour was reported in 38% cases. Majority of the cases were in stage III disease in our study.

Location and technique of oesophagogastric anastomosis is a subject of much discussion. The site of anastomosis is selected upon the location of primary tumour and preference of the surgeon. The site of anastomosis becomes an issue when the primary tumour is in the middle or the lower thoracic oesophagus. Should it be in the chest or in the neck? Ribet *et al*[27] reports that a cervical anastomosis provides an average additional tumour clearance of 3.28 Cm. cervical anastomosis avoids the potential hazard of mediastinitis of an intra-thoracic anastomosis.[28] Moreover the inverse relation between the height of oesophago-gastric anastomosis and the degree of subsequent gastro-oesophageal reflux is well established.[29,30] Low intrathoracic oesophago-gastric anastomosis is almost invariably associated with marked gastro-oesophageal reflux whereas with cervical oesophago-gastric anastomosis, considerable gastro-oesophageal reflux is uncommon. In several studies an anastomosis in the

neck has a higher incidence of postoperative leak than does chest placement but the incidence of postoperative mortality is lower if a leak occurs in the neck than in the chest.[31] 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 leak.[32] The overall anastomotic leak rate following cervical esophago-gastric anastomosis with the stomach positional in the posterior mediastinum in the original oesophageal bed in 7.9%.[33] The incidence of anastomotic leak in our study was 1.4%. Mathisen *et al*[34] 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.[35,36] Due to neck anastomosis there is no fear of mediastinitis. The other advantages of a neck anastomosis are (i) it is technically easier to do then an intra-thoracic anastomosis and (ii) you get very generous tumour free margin, resulting in adequate clearance and less chances of recurrence. Finally our results in terms of morbidity and mortality are comparable with other studies.[37]

Anastamosis can be performed by several techniques which includes hand sewn (continous, intruppted, single layered and double layered) and by stapler (circular and linear). Anastamotic leak continue to be a major challenge. It is responsible for post operative mortality and poor quality of life, and hence most feared complication.[2] It is direct consequence of poor healing secondary to conduit ischemia and anastomotic technique.[3] The rate of anastomotic leak ranges from 4.2–22% in various studies.[38-43]The frequency of leakage following hand sewn anastomosis was 4.2%[12], and that of stapled technique was 3.8%[44] in various studies.

We have started stapler anastomosis from the start of year 2010 and have more than 50 cases since then and comparing the outcome with hand sewn anastomosis, the study is going on and intended to publish the article 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 11/2 hours. Use of blood products has also been decreased from 3–4 to 1–2 pints of blood due to reduced blood loss with the use of harmonic.

High volume thoracic centre with multiple approaches using computed tomography as mainstay staging modality, harmonic scalpel and staplers along with adjuvant therapy without EUS and PET scan giving good results in cost effective manner.

CONCLUSION

One thousand and eight (1008) cases in 9 years is a very high volume of oesophageal work load for malignancy. A 30 day mortality of 2.28%, and a morbidity of 6.3% speak for themselves.

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