Egyptian Journal of Surgery Vol 26, No 3, July, 2007

ORIGINAL ARTICLE

CANCER ESOPHAGUS: AN AUDIT OF CURRENT MANAGEMENT FOR YEMENI PATIENTS

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Aim: ***Cancer oesophagus is one of the serious conditions which lead to death of many thousands each year worldwide. The aim of this study is to evaluate the current management of cancer oesophagus in the absence of non surgical modalities in Yemen.***
Methods: ***We retrospectively audited our records of 76 patients with histologically proved cancer oesophagus between June 2003 to July 2005 presented to Al-Thawrah Modern Teaching hospital in Sana'a- Yemen. and treated by surgical resection or intubations.***
Results: ***The study compared the different surgical approaches for resection of oesophageal carcinoma where there was non significant difference in the outcome, complications or the long term survival, but the transhiatal route proved more simple and effective than transthoracic approach.***
Conclusion: ***There was 40% reduction of operative time when the trans-hiatal approach selected instead of the classic transthoracic route without any improvement in the outcome and survival. Early detection of cancer oesophagus will be the only help to improve survival when applied to patients.***

Keyword: ***Malignancy, Oesophgus, Transhiatal resection.***

INTRODUCTION

Oesophageal carcinoma is one of the most challenging malignancy confronting the surgeon. It is a serious condition causing many thousands of deaths yearly throughout the world. It shows greater geographical variation in worldwide incidence than any other cancer. It is most common in the far-east and Africa where it is more linked to diet and way prepared, smoking and alcohol consumption. In UK it appears to have a higher incidence than USA. It is diagnosed at a median age of 65 years old with 50% more prevalent among blacks than whites. (1-4) The WHO estimated cancer oesohagus to be the 7th common cause of death,(3) while the American Cancer Society estimated that 14520 cases will be diagnosed with cancer oesophagus in 2005 in USA5. In Yemen it represent 18% of all GIT tumors(12) which seems less than the rate in Saudi Arabia (12%) and Egypt (12.5%).(14) In the last 20 years or so the number of cases diagnosed each year has risen and affects both sexes with a strong male preponderance (3/1) .More than 80% of the tumors are squamous cell carcinoma, but nowadays the percentage of adenocarcinoma is dramatically increasing.(6,7) Unfortunately, cancer oesophagus does not cause symptoms until they are quite advanced, therefore the 5-year survival of patients with cancer oesophagus varies

from less than 1% to 9% 8,9 irrespective of the form of initial treatment, so 90% of patients is dying within one year after diagnoses. Because long-term survival after any type of treatment is rare, palliation of dysphagia is the major consideration in management, while cure being as a bonus. In Yemen; cancer oesophagus became a progressive health problem with a steadily annual increase in numbers of the diagnosed patients. For no apparent reason, however, certain risk factors increase the chance of developing cancer oesophagus, such as; change of life style, the wide spread and unsafe use of pesticides in agriculture, tobacco (smoking and smokeless) overuse, long term exposure to chemical carcinogens and pollutants.(10,11,12) Despite the recent surge in different types of treatment options, surgery is the most common option followed sometimes by adjuvant chemotherapy, while other options are still unavailable in Yemen. Therefore, we report in this study our hospital surgical team experience in treating patients with cancer oesophagus.

PATIENTS AND METHODS

This is a retrospective study in which we evaluate the results of surgical treatment for patients with esophageal carcinoma over a 2 years period, from June 2003 to July 2005 at AL-Thawrah teaching Hospital, Sana'a, Yemen. During this period a total of 76 patients suffering of malignant dysphagia, 57 of them were men and 19 women, with ages ranged between 36 and 78 years old. Progressive difficulty in swallowing solid, then semisolid and finally liquid diets was the main complaint in 68 patients, retro-sternal pain or discomfort in 17 patients and regurgitation of food in 11 patients with complete obstruction proved in 3 patients. Variable weight loss was detected in 36 patients, while 5 patients were diagnosed to have cancer oesophagus during a routine endoscopic investigation for heart burn and upper abdominal pain. There were 65 patients were smokers and 26 patients added smokeless-tobacco (Al-shamma) for different periods, but no patient consumed-alcohol. Complete history and clinical examination performed in the out-patient clinic, and nearly all patients referred to endoscopic exam, and biopsy taking which proved the presence of cancer oesophagus. Barium meal was requested for 58 patients who showed irregular narrowing of the oesophagus at the site of tumor. All patients were fully assessed for operability. Abdominal ultrasonography and CT scanning were requested for patients to evaluate tumor extent to the liver, adjacent structures, regional and distant lymph nodes involvement. All patients admitted to the surgical ward, prepared and subjected to scheduled surgical resection and restoration of the alimentary tract continuity as the neo-adjuvant therapy is not yet applicable now because the late presentation of patients made long course chemotherapy disappointing and radiotherapy is unavailable in Yemen which suppresses any hope to improve the prognosis for cancer cases. Patients with cervical oesophageal cancer who need radiotherapy alone were excluded from this study as they were sent abroad. Patients admitted to the surgical department waiting scheduled esophagectomy. Most of the patients spent few days under intravenous total parenteral nutrition (TPN) as they were cachectic, anaemic and vitamin-deficient. Preoperative correction of deficiencies was necessary for patient's tolerance to major operation. Four units of blood routinely requested for each patient, will be stand-by the day before the operation. The surgical techniques selected according to the level of tumor, condition of patients and operator experience. All operations started by laparotomy for upper abdominal survey and gastric mobilization if the tumor is resectable, then thoracotomy and/or transe-cervicl oesophagectomy were selected, otherwise surgical insertion of Celestine tube through the tumor or insertion of percutaneous jejunostomy-feeding tube for patients with widely-spread and impassable tumors. Surgical procedures were divided to: laparotomy alone or followed by right thoracotomy (transthoracic-2phase), left thoraco-laparotomy and/or cervical incision in the 3-phase operation or the trans hiatal oesophagectomy. Table 5 shows the different types of operations.

RESULTS

Surgical resections of oesophageal carcinoma had been performed at AL-Thawrah Modern General Hospital (TMGH), the major teaching hospital in Yemen, which was established specifically to deal with this major therapeutic and logistic problem. Over a 2 years-period, 76 patients, 57 men and 19 women, were diagnosed to have cancer oesophagus. The ages at presentation ranged between 36 and 78 years (median age 58.6) .The peak incidence at presentation in this study was in the age group of 56-65 years old (42%) as shown in table 1. The histological types and location of tumors are shown in table 2, while the predominant symptoms leading to endoscopy and biopsy taking are listed in table 3. Barium meal was requested for 53 (76.3%) of patients which demonstrated the level and degree of obstruction. Other investigations (listed in Table 4) were requested for all patients as a routine pre-anaesthetic demands and search for distant metastasis. Staging the tumor by CT scan requested for most of the patients but few of them were scanned (34.2%only) because of its cost or rejection by the patients to wait timely appointment. There is no expert in using Endosonography in Yemen, therefore, staging the tumors depend on radiography, CT and ultrasonography in addition to the clinical assessment which determine operability. Neoadjuvant therapy is not yet practiced because radiotherapy is not available in Yemen and the late presentation of patients made chemotherapy alone ineffective and time consuming. Informed consent for surgery obtained and most of patients given intravenous TPN preoperatively. All patients were submitted to

laparotomy for evaluating resectability or palliation. For resectable tumors; laparotomy was followed by right postro-lateral thoracotomy in 18 patients (Lewis –Tunner technique) with addition of cervical incision, McKeowen 3-phase approach, in 4 patients with operative timer (OT) ranged between 3.15 - 4.45 (average: 3.30) hours. Left thoracolaparotomy with oesophago-gastric anastomosis (OGA) in the chest in 5 (6.6%) patients with average (OT) of 2.45 hours, and trans-hiatus oesophagactomy in 38 (50%) with OGA in the neck with (OT) 2-3.15 (average: 2.30) hours as shown in table 5. Complete resection of the tumor with adjacent lymphadenectomy was apparently complete for 27 (35.5%) of patients by the trans-thoracic (T.T.) approach, but this result was not clear in patients operated by the trans-hiatus (T.H.) approach, as dissection of mediastinal lymph nodes and the tracheo-bronchial involvement were performed blindly. Patients with nonresectable and widely disseminated tumors were palliated by inserting Celestin tube for 7 patients and percutaneous jejunostomy feeding tube in 2 patients. After resection, the specimens were sent for histological confirmation and staging. The operative mortality was nil and patients transferred to ICU where the stay time, shown in table 5, ranged between <1 and 12 days before transfer to the surgical ward. The least hospital stay was 5 days for minimally invasive surgery and extended more than 30 days for major and complicated procedures with a total hospital mortality of 7 patients (9.2%). Table 6 shows the postoperative complications observed in 30.3% as bleeding in five (17.4%) which followed mainly the trans-hiatal approach and managed by transfusions only without reoperation. Pulmonary complications developed from the second postoperative day ongoing in 17 (74%) as pulmonary collapse, embolism, pneumonia, mediastinitis and reactive pleural effusion. These necessitated ventilatory support, fluid titration and chest drain which prolonged the ICU stay with 4 mortalities of ARDS. Recurrent laryngeal nerve was injured in 4 patients and thoracic duct injured in 3 of T.H. group only. Chylothorax was treated conservatively until stopped in 2 but one-death. Anastomotic leak developed in 7 (30.4%) patients which closed spontaneously with conservative treatment in 5 patients also with two deaths. Wound infection observed in six (26.1%) patients. Eighteen (23.7%) patients discharged from the hospital with apparently curative surgery and 51 (67.1%) with palliative surgery who were referred to oncologists for adjuvant chemotherapy and follow-up. The overall survival rate was 17 (22.4%) patients at 6 months, 7.9% at 20 months and 4% at two years. Most of the patients dissociated of regular follow-up because they receive chemotherapy and followed-up in different cities of Yemen, since transportation and communication with patients are difficult, so the true survival rate and prognosis of surgical ablation are difficult to estimate because of the poor attendance of patients in this country.

Table 1. Distribution of patients by age groups.

Age groups	No. patients	%
36-45	7	9.2
46-55	21	27.6
56-65	32	42.1
66-75	14	18.4
76-85	2	2.6
>85	0	0 0

Table 2. Distribution of tumors by histological types and location in the esophagus.

Type of tumor	No. Patients	%	Upper1/3	Middle 1/3	Lower 1/3
Squamous cell carcinoma	43	56.6			
Adenocarcinoma	29	38.2			
Lymphoma	1	1.3	19.7%	59.2%	27.6%
Leiomyosarcoma	1	1.3			
Undifferentiated	2	2.6			

Table 3. The clinical presentation of esophageal carcinoma led to endoscopic diagnosis.

Clinical presentation	No. Patients	%
Progressive dysphagia	68	89.5
Regurgitation or vomiting	11	14.5
Chest pain	17	22.4
Weight loss	18	23.7
Smoke tobacco habits	65	85.5
Smokeless tobacco (shammah)	26	34.2
Accidental with endoscopy	5	6.3
Impassable endoscope	3	4

Table 4. Preoperative investigations.

Investigation	No. Patients	%
Endoscopy& Biopsy	76	100
Ultrasonography	68	89.5
Barium meal	53	69.7
Computed tomography "CT"	26	34.2
Chest x-ray, ECG& CBC *	76	100
Liver&Renal function tests	76	100

*ECG: Electrocardiography
*CBC: Complete blood count

Table 5. Types of the surgical approach for esophagectomy.

Approach to resection		No. Patients	%	ICU stay	ICU Mortality
	RTT; 2-phase	18	23.7	4-7 days	0
T.T.*	RTT; 3-phase	4	5.3	6-8 days	2 ARDS
	LTT	5	6.6	2-3 days	0
T.H	2-phase	38	50	4-12 days	2 ARDS
	T.A Resection.	2	2.6	1-3days	0
T.A.	Celestin tub	7	9.2	<1 day	0
	PCJFT	2	2.6	<1day	0

* RTT =Right transthoracic.
* LTT=Left transthoracic
* T.H = Trans hiatus.
* TA=Trans-abdominal
* ICU: Intensive care unit
* ARDS=Adult respiratory distress syndrome
* PCJFT=Percutaneous jejunostomy feeding tube

Table 6. Postoperative complications and mortality rate.

Complication	No. Patients	%	Mortality
Pulmonary +ARDS *	17	22.4	4
Bleeding	4	5.3	0
Anastomotic leak	7	9.2	2
RLN Injury *	4	5.3	0
Chylothorax	3	4	1
Pleural effusion	3	4	0
Wound infection	6	7.9	0

*ARDS: Adult respiratory distress syndrome
* RLN: Recurrent laryngeal nerve

DISCUSSION

Esophageal carcinoma (Eso. Ca) is a dreadful disease causing many thousands of deaths annually throughout the world. It shows a greater geographical variation in worldwide incidence than any other cancer. It ranks the 5th common cancer in east Asia and Africa where it is more linked to diet and way food is prepared, the 9th in the western countries which is more linked to smoking and alcohol[1-4] and ranks the 6th in our study which seems more likely linked to qat (Catha Edulis) chewing, smoking & smokeless (Al-Shamma) tobacco, pesticides which are sprayed haphazardly on qat and vegetables, dietary deficiency combined to the other traditional risk factors. Eso. ca ranks the 3rd GIT cancer in Yemen (18%)[12] which is more than its rank in Egypt, Sadi Arabia, and USA (12.5%, 12%, 6% respectively).[14,13,41] There have been indications of increased incidence of cancer esophagus in the literature yearly, as the number of cases diagnosed each year has raise in the last 20 years or so,[5-9] which seems similar in Yemen.[10,11,12] Some feel that the incidence of Eso.Ca in Yemen is higher where the reports are based on pathological rather than clinical data.[10,11] Eso.Ca affects men 3 times more than women, with median age of 58.6 in this study. The prognostic nutritional index based on the serum albumin and leukocyte count, when validated it has shown to be predictive of postoperative (PO) complications.[15,16] Other factors that predict a poor surgical outcome are; poor general condition, poor cardiac, hepatic and respiratory functions, smoking, aging and diabetes. By applying a composite score of these variables to help in patient's selection and tailoring of the surgical procedure, postoperative mortality was reduced from 9.4% to 1.6% in developed countries[17,18] although, a mortality rate of 2-30% for esophagectomy was reported.[19] Surgical resection still accepted as the best treatment for suitable patients, providing good palliation and occasionally cure.[20] Because patients come late and then resection is only palliative in more than 90%. However, resection of the neoplasm, even if this is incomplete, with restoration of the alimentary tract continuity offers the best palliation, and can be achieved with an acceptable mortality and low morbidity.[21-23] Without some form of palliation these patients have a poor quality of life, rapid weight loss and unpleasant death.[24] Transthoracic (T.T) esophagectomy, even, is time-consuming under anesthesia but cure is likely achieved in some patients. Therefore, by comparing, the transhiatal (T.H) esophagectomy is more suitable for tumors of the thoracic esophagus which reduced 40% of operative time, although more liable for complications than the T.T. route. Even though the frequency of surgical complications has not changed dramatically over time, patients are more likely to survive a complication when compared to previous decades[25,26] and death in today's practice is most likely due to pulmonary complications and anastomotic leaks,[26,27] which seem highly related to lung injury and ischemia of the esophageal substitute.[28,29] Perioperative hypoxia, overhydration, hypothermia and blood transfusion of more than 3 units, as well as, the presence of other medical co-morbidity lead to poor surgical outcome[29,30] but when avoided and cautiously controlled, the operative mortality was reduced from 14% to 6.4%.[31,32] All patients in this serious were admitted to the intensive care unit (ICU) for strict monitoring of oxygenation and fluid titration against central venous pressure(CVP) in an attempt to minimize the complications because postoperative hypoxia increases the mortality[30] and arrhythmia is considered an early sign of complications[33] (either pulmonary, anastomosis leak or sepsis) raising the attention to correct the underlying cause. Although the operative mortality in this study was nil, the average ICU stay was 3.4 days and the average hospital stay was 16.7 with a hospital mortality rate of 9.2% which looks acceptable when compared to previous audits in the same hospital and to that 2% to 30% reported in other studies.[2,19,34,35] There was nonsignificant difference in ICU, hospital stay and mortality rate between patients of T.T

and T.H routes. The mortalities were related to the postoperative

Complications mainly pulmonary, empyema, anastomotic leak, wound infection and starvation which are in accordance to other reports.[36] Inevitable reactive lung injury on the days 1-4 postoperative, causes pulmonary complication and pneumonia which is associated with a greater than 4-fold risk of death. Anastomotic leak was twice more frequent after T.H. resection than T.T but its location in the neck made it less serious than the T.T. which was associated with sepsis and empyema that increased the morbidity and mortality. Postoperative bleeding, recurrent laryngeal nerve injury and chylothorax were the non fatale complications of surgery observed after T.H and were absent in T.T route. These results seem comparable to that reported in the literature.[37,38] Comparison of the results of both approaches indicate that resection by T.T. rout provides more clearance of the tumor and lymph nodes than T.H., but it is time-consuming under anesthesia with no significant difference in complications and survival rates between the two groups. On the other hand, T.H. rout reduces 40% of operative time and seems to be a relatively safe procedure with similar long term results to the more radical T.T. approach,[39,40] even the PO complication rate of blunt T.H. dissection in this study was slightly higher than T.T. Therefore, in the majority of studies comparing the T.T. with T.H., a significant difference in PO mortality between both was not found.[23] However long-term follow-up has been difficult because many of our patients live in inaccessible rural areas, receive chemotherapy and follow-up in other regions of Yemen. However, 17 patients (22.4%) were seen at one year and 3 (4%) at two years. We conclude that surgery still an excellent tool to palliate dysphagia and likely provides relief until death in more than 85% of patients surviving operation, especially in the absence of non surgical methods in Yemen. We are waiting for radiotherapy to start and open the oncology center within few months for better services to cancer patients. Transhiatal resection seems better than the T.T. in respect to (OT) and PO complications where no difference in long term survival. Post-operative chemotherapy still not clear and doesn't improve the survival rate. Neo-adjuvant radio-chemotherapy and endoscopic palliation should be introduced to improve the results of surgery. The overall prognosis, however, remains poor and unless newer techniques for early detection and treatment of Eso. Ca is found, significant improvements in cure rates are unlikely.

REFERENCES

1. Stewart BW, Kleihues P (eds). World cancer report. Lyon: IARC. 2003;832:0411-5.
2. Ries LAG,Eisner MP, Kossary CL, Hankey BF, Miller BA, (eds). SEER Cancer Statistics Review,1975-2002, National Cancer Institute. Bethesda, MD, quoted in http://seer.cancer.gov/statfacts- Cancer of the Esophagus. 2004.
3. WHO, Regional Office for the Western Pacific. Regional statistics: Basic health information on cancer.2006. Available in www.wpro.who.int/information_sources/database/regional_statistics/rstat_canc.
4. Kneebone RL, Mannell A. Cancer of the oesophagus in Soweto. S Afr Med J. 1985;67:839-42.
5. Enzinger PC, Mayer RG. Esophageal cancer. N Engl J Med. 2003;349:2241-52.
6. Grant NS, Walsh SV. Pathology of oesophageal tumours. Surgery International. 2006;72:85-6.
7. Griffin SM, Lamb P. Oesophageal cancer. Surgery International. 2006;72:97-100.
8. Lowe WC. Survival with carcinoma of the esophagus. Ann Intern Med. 1972;77:915-21.
9. Gunn Laughson GH, Wynchulis AR, Ronald C, Ellis FHJ. Analysis of the records of 1657 Patients with carcinoma of the esophagus and cardia of stomach. Surg Gynecol Obstet. 1970;130:977-80.
10. Gunaid AA, Sumairi AA, Shidrawi RG, al-Hanaki A, al-Haimi M, al-Absi S, et al. Oesophageal and gastric carcinoma in the Republic of Yemen. Br J Cancer. 1995;71:409-10.
11. Al-THobhani AK, Raja`a YA, Noman TA. The pattern and distribution of malignant neoplasm among Yemeni patients. Saudi Med J. 2001;22:910-3.
12. Awlaqi MS, Al-Hadrani AM. Cancer in Yemen 1982 to 1992; Analysis of 2650 cases in north-western governorates of Yemen. Egyptian J Sug. 1999;18:157-164.
13. Aljarim SD. Pattern of primary gastrointestinal cancer: King Khalid University Hospital experience and review of published national data. Ann Saudi Med J. 1996;16:368-391.
14. Waterhouse J, Muir CS. A cancer incidence in five countries. IARC publication. 1982;42:42
15. Onodera T, Goseki N, Kosaki G. Prognostic nutritional index in gastrointestinal surgery of malnourished cancer patients. Nippon Geka. Gakkai Zasshi. 1984;85:1001-1005.
16. Nozoe T, Kimura Y, Ishida M, Saeki H, Korenaga D, Sugimachi K. Correlation of preoperative nutritional condition with postoperative complications in surgical treatment for oesophageal carcinoma. Eru J Surg Oncol. 2002;28:396-400.
17. Bartel SH, Stein HJ, Siewert JR,. Preoperative risk analysis and postoperative mortality of oesophagectomy for resectable oesophageal cancer. Br J Surg. 1998;85:840-44.

18. Haffejee AA, Baker LW, Bryer JV. A palliative approach to oesophageal cancer. In: Current Surgical Practice (ed; Edward Arnold: A division of Hodder & Stoughton. London). 1993;6:80-102.

19. Patti MG, Corvera CU, Glasgow RE, Way LW. A hospital's annual rate of esophagectomy influences the operative mortality rate. J Gastrointest Surg. 1998;2:186-192.

20. Robertson CS. Non-surgical treatment of oesophageal carcinoma. Recent Advances in Surgery. 1995;18:39-51.

21. Cederquist C, Nielsen J, Berthelsen A. Cancer of the oesophagus. II. Therapy and outcome. Acta Chir Scand. 1978;144:233-40.

22. Moertel CG. Carcinoma of the oesophagus: is there a role for surgery? The case against surgery. Amer J Digest Dis. 1978;23:735-6.

23. Muller JM, Erasmi H, Stelzner M. Surgical therapy of oesophageal carcinoma. Br J Surg. 1990;77:845-57.

24. Fellows IW, Greensmith J, Atkinson M. The nutritional effects of endoscopy intubation for carcinoma of the oesophagus and cardia. Clin Nutr. 1984;2:167-168.

25. Hofstetter W, Swisher SG, Corea AM. Treatment outcomes for resected oesophageal cancer. Ann Surg. 2002;236:376-84.

26. Whooley BP, Law S, Murthy SC, Alexandrou A, Wong J. Analysis of reduced death and complication rates after esophageal resection. Ann Surg. 2001;233:338-44.

27. Gray AJG, Hoile RW, Ingram GS, Sherry K. (eds) Management of Patients Undergoing Oesophagectomy. The Report of the National Confidential Enquiry into Peri-Operative Deaths 1996/1997 (National CEPOD). London: Department of health. 2002;57-61.

28. Ferguson MK, Durkin AE. Preoperative prediction of the risk of pulmonary complications after esophagectomy for cancer. J Thorac Cardiovasc Surg. 2002;123:661-9.

29. Hulscher JB, Van Sandick JW, de Boer AG. Extended transthoracic resection compared with limited transhiatal resection for adenocarcinoma of the oesophagus. N Engl J Med. 2002;347:1662-69.

30. Kusano C, Baba M, Takao S. Oxygen delivery as a factor in the development of fatal postoperative complications after oesophagectomy. Br J Surg. 1997;84:252-57.

31. Tandon S, Batchelor A, Bullock R. Perioperative risk factors for acute lung injury after elective oesophagectomy. Br J Anaesth. 2001;86:633-8.

32. Karl RC, Schreiber R, Baker S, Boulware D, Coppola D. Factors affecting morbidity, mortality and survival in patients undergoing Ivor Lewis esophagectomy. Ann Surg. 2000;231:635-643.

33. Amar D, Burt ME, Bains MS, Leung DH. Symptomatic tachydysrhythmias after esophagectomy: incidence and outcome measures. Ann Thorac Surg. 1996;61:1506-09.

34. Homesh NA, Alsabahi AA, Al-Agmar MH, Alwashaly AA, Valenzwella R, Al-Qubati S, et al. Transhiatal versus transthoracic resection for oesophageal carcinoma in Yemen. Singapore Med J. 2006;47:54-59.

35. Ferguson MK, Martin TR, Reeder Lb, Olak J. Mortality after esophagectomy: risk factor analysis. World J Surg. 1997;21:599-603.

36. Lau H, Law S, Wong J. Postoperative evaluation of vacuum pleural drainage after thoracotomy in patients with esophageal carcinoma . Arch Surg. 1997;132:749-752.

37. Hulscher Jb, Van Sandick JW, Devriese PP, Van Lanschot JJ, Obertop H. Vocal cord paralysis after subtotal oesophagectomy . Br J Surg. 1999;86:1583-7.

38. Alexious C, Watson M, Beggs D, Salama FD, Morgan WE. Chylothorax following oesophagectomy for malignant disease. Eur J Cardiothorac Surg. 1998;14:460-466.

39. Fok M, Sin KF, Wong J. A comparison of the transhiatal and transthoracic resection for carcinoma of the thoracic esophagus. Amer J Surg. 1989;158:414-9.

40. Shahian DM, NeptuneWB, Ellis FH. Transthoracic versus extrathoracic esophagectomy: Mortality, morbidity and long survival . Ann Thorac Surg. 1986;112:237-246.

41. Goldber MR.Gastrointestinal tract cancers. Manual of Clinical Oncology, Ed. Casciato AD, Lowitz BB, Lippincott Williams& Wilkins. PP. 2000;172-217.