Risk Factors Influencing Postoperative Mortality In Transhiatal Esophagectomy

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Citation

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Abstract

Aim: The aim of this study is to evaluate our transhiatal esophagectomy experiences, and to determine risk factors that set early stage survival probability.

Material and Methods: Seventy five patients operated due to esophageal cancer were evaluated in two groups, retrospectively. Group I was composed of middle and distally localized esophageal cancer and group II of proximally localized esophageal cancer. Patients in group I were treated with transhiatal subtotal esophagectomy with gastric pull-up for reconstruction. All patients in group II had total pharyngolaryngectomy with bilateral neck dissection and transhiatal total esophagectomy with gastric pull-up for reconstruction. The data of demographic features and preoperative risk factors were recorded.

Results: In group II, mortality was seen in shorter periods and more frequently. The mortality risk increases 2.0 times in histopathologic stage 3-4, 1.5 times with high ASA classifications and 1.9 times in adenocarcinoma type tumors. Complications, additional diseases and operation type were detected 4.4, 1.2 and 5.6 times more frequently, respectively. It was determined that operation type was an independent risk factor for survival chance (p=0.038).

Conclusion: The type of surgical approach is the most important risk factor for postoperative mortality and morbidity in the treatment of esophageal cancer. In postoperative follow-up, the first three weeks are very important due to possible problems, follow-up in the second and third week is as important as in the first week.

INTRODUCTION

Surgery is the golden standard in the treatment of esophageal cancer. Different techniques were described for surgical treatment ([1]). Transhiatal approach, in the treatment of esophageal cancer with low level, has low morbidity and mortality as well as successful oncologic results in experienced clinics. From the point of non-experienced clinics, determination of risk factors in the preoperative period is crucial in terms of postoperative success ([1, 2]). In this study, we aimed to evaluate our transhiatal esophagectomy experiences and to determine risk factors that set early stage survival probability.

MATERIAL AND METHODS

Our retrospective study included 75 patients, admitted to the General Surgery and Oto-Rhino-Laryngology Departments at Çukurova University Medical Faculty and was performed between January 1, 1992 and January 1, 2005. Group I was composed by middle and distally localized esophageal cancer and group II by proximally localized esophageal cancer. Patients in group I were treated with transhiatal subtotal esophagectomy with gastric pull-up for reconstruction. All patients in group II had total pharyngolaryngectomy with bilateral neck dissection and transhiatal total esophagectomy with gastric pull-up for reconstruction. Operations of group II patients were performed together with the department of oto-rhino-laryngology.

The recorded data were age, sex, duration of symptoms, hospitalization time, peroperative blood transfusion rate, additional diseases, preoperative chemotherapy (CT), preoperative radiotherapy (RT), preoperative total parenteral nutrition (TPN) and the American Society of Anesthesiologists' (ASA) physical status classification (I-IV). The pTNM criteria for carcinoma of the esophagus,

described by the American Joint Committee on Cancer ($_3$), have been used to classify the carcinoma of the esophagus.

Major intraoperative and postoperative complications included embolism, leakage of anastomoses, bleeding, myocardial infarction, pneumonia, adult respiratory distress syndrome, tracheal necrosis, gastric necrosis and anastomotic stenosis. Moreover, minor complications such as wound infection were evaluated.

Statistical analyses: Student t-test or Mann Whitney tests were used to analyze continuous variables and Chi-Square and Fisher's Exact tests were used for the categorical data analyses. In survival analyses, life table, Kaplan Meier method and log rank tests were used. A Cox regression analysis was performed as well in order to determine the independent variables. Results were presented as n, percent (%) mean SD (standard deviation), median and minimum-maximum. Statistical analyses were performed using the statistical package SPSS v12.0.

RESULTS

Forty four (58.7%) of the patients were male and 31 (41.3%) were female with an average age of 53.6±12.4 years (min.-max.: 17-73). The mean hospitalization time was 21.9±9.2 days (9-90). There were 53 patients in group I and 22 in group II. The demographic characteristics of the patients according to operation type are presented in Table 1. In group II, complication and mortality rates were significantly higher. Most of the patients in the group II had tumor stages 3 and 4 and ASA classifications 3 and 4 (p=0.009 and p=0.04, respectively).

Distributions of age, duration of symptoms, need of blood transfusions and hospitalization time according to operation type are shown in Table 2.

Figure 1

Table 1: Demographic characteristics of the patients. CVD: Cardiovascular diseases, RD: Respiratory diseases, DM: Diabetes mellitus, ASA: The American Society of Anesthesiologists' classification, TPN: Total parenteral nutrition, CT: Chemotherapy, RT: Radiotherapy

		GROUP I (n=53)	GROUP II (n=22)	Total (n=75)	p value
Sex	Male	37 (69.8)	7 (31.8)	44 (58.7)	0.002
	Female	16 (30.2)	15 (68.2)	31 (41.3)	
Additional diseases	None	27 (50.9)	9 (40.9)	36 (48.0)	
	CVD	8 (15.1)	7 (31.8)	15 (20.0)	0.4
	RD	8 (15.1)	3 (13.6)	11 (14.7)	
	DM	10 (18.9)	3 (13.6)	13 (17.3)	
Pathology	Epidermoid carcinoma	32 (60.4)	21 (95.5)	53 (70.7)	0.002
	Adeno-carcinoma	21 (39.6)	1 (4.5)	22 (29.3)	
Localization	Upper	-	22 (100)	22 (29.3)	
	Middle	27 (50.9)	-	27 (36.0)	0.0001
	Distal	26 (49.1)	-	26 (34.7)	
Stage	1+2	32 (60.4)	6 (27.3)	38 (50.7)	0.009
	3+4	21 (39.6)	16 (72.7)	37 (49.3)	
ASA	1+2	39 (73.6)	11 (50.0)	50 (66.7)	0.04
	3+4	14 (26.4)	11 (50.0)	25 (33.3)	
TPN	Not received	27 (50.9)	7 (31.8)	34 (45.3)	0.1
	Received	26 (49.1)	15 (68.2)	41 (54.7)	
CT	Not received	52 (98.1)	20 (90.9)	72 (96.0)	0.1
	Received	1 (1.9)	2 (9.1)	3 (4.0)	
RT	Not received	51(96.2)	19(86.4)	70(93.3)	0.1
	Received	2 (3.8)	3 (13.6)	5 (6.7)	
Complications	No	23 (43.4)	4 (18.2)	27 (36.0)	0.03
	Yes	30 (56.6)	18 (81.8)	48 (64.0)	
Mortality in first month		5 (9.4)	6 (27.3)	11 (14.7)	0.04

Figure 2

Table 2: Distributions of age, need of blood transfusions, duration of symptoms and hospitalization time of patients

	Age	Duration of symptoms (months)	Hospitalization time (days)	Blood transfusions (units)
		Average ± SD		
		Middle (min-max)		
Group I	57.3 ± 9.7	5.2±2.2	19.1±6.2	1.7±1.8
(n=53)	59 (27-73)	5 (1-12)	18 (9-37)	2 (0-10)
Group II	44.4 ±13.5	5.0±1.1	28.5±11.9	3.4±1.4
(n=22)	46 (17-67)	5 (3-7)	24 (12-60)	4 (0-6)
Total	53.6±12.4	5.2±1.9	21.9±9.2	2.2±1.8
(n=75)	55 (17-73)	5 (1-12)	21 (9-60)	2 (0-10)
P value	0.0001	0.7	0.0001	0.0001

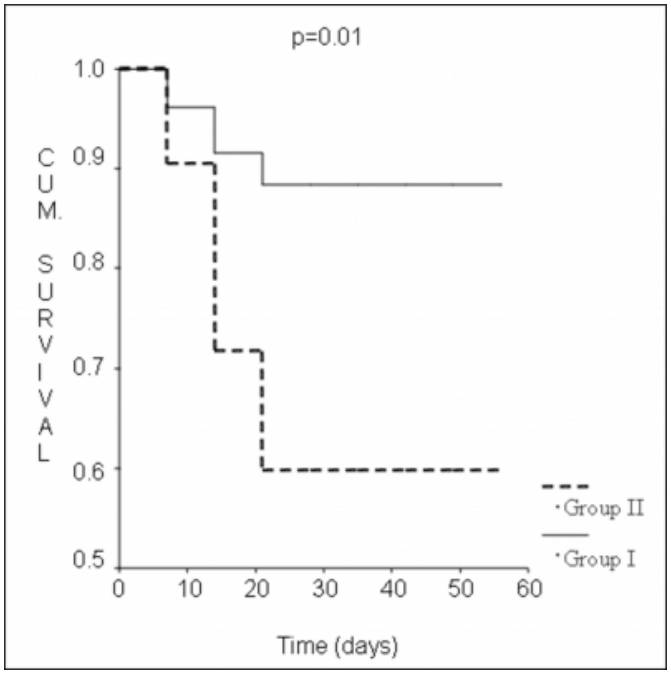
In group I, the major complication rate was 39.6% (21). Leakage of esophago-gastrostomy anastomoses was the most frequent major complication (13.2%, n=7). Mediastinitis was not observed due to the location of the anastomoses in the neck. All patients with leakage recovered conservatively. In group II, the major complication rate was 54.5%. The most common major complication was pneumonia (18.2%, n=4).

The most common causes of mortality were adult respiratory distress syndrome in group I and adult respiratory distress syndrome (2) and gastric necrosis (2) in group II.

Survival analysis and results of two months' follow-up patients can be seen in Table 3 and Figure 1. In group I, the survival period was 51 days, whereas in group II it was 36 days (p=0.01) (Figure 1).

Figure 3

Figure 1: Cumulative survival curves according to operation type (Kaplan Meier method)



In group I, the 7 days' survival rate was 96%, whereas in group II it was 90%. These rates were 91% and 71% on the 7 th day, and 88% and 59% on the 14 th day, respectively. In both groups, there was no mortality after the 21 st day (Table 3).

Figure 4

Table 3: Cumulative survival rates (life table method)

	Before 7th day	7th day	14th day	21st day
	Cumulative survival rates /exitus number			
Group 1	0.96 / 2	0.91 / 2	0.88 / 1	0.88 / 0
Group 2	0.90 /2	0.71 / 3	0.59 / 1	0.59 / 0
Total	0.94 / 4	0.86 / 5	0.81 / 2	0.81 /0

In group II, there was a higher rate of mortality and of early mortality. Results of Cox regression analysis, which aimed to determine independent factors that had effects, are monitored in Table 4. The mortality risk increased 2.0 times for histopathologic stage 3-4, 1.5 times for high ASA classifications and 1.9 times for adenocarcinoma type tumors. For complications, additional diseases and operation type the mortality risk increased 4.4, 1.2 and 5.6 times, respectively. It was determined that operation type is an independent risk factor for survival chance (p=0.038).

Figure 5

Table 4: Risk factors that determine survival rates in early stages according to Cox analysis results

	OR	95% CI for OR (Lower- Upper)	Sig.
Age	1.0	(0.9-1.1)	0.097
Stage (3-4)	2.0	(0.5-8.8)	0.343
ASA (3+4)	1.5	(0.4-5.6)	0.582
Type of tumor (Adenocarcinoma)	1.9	(0.3-13.6)	0.512
Complication (Yes)	4.4	(0.5-42.1)	0.198
Disease (Yes)	1.2	(0.3-4.8)	0.816
Operation type (group II)	5.6	(1.0-28.8)	0.038

DISCUSSION

There are a lot of studies on esophageal cancer surgery that compare early and late stage results in transhiatal (THE) and transtoraxic (TTE) methods. Chou et al. ([2]) stated in their prospective studies that THE is a safe and rapid procedure, with recovery and survival periods similar to those for TTE. Hulscher([4]) found significantly higher early morbidity and mortality rates after transthoracic resections, which was confirmed in a later randomized study of 220 patients. Nowadays, gastric pull-up and free jejunal and colonic transpositions as reconstructions after esophagectomy are often used. Squamous cell carcinomas of the hypopharynx and cervical esophagus are often considered together since they share similar clinical characteristics and therapeutic problems and pose a challenge in treatment ([5]). When diagnosed, the stage is usually locally advanced. Their prognosis is worse than for distal tumors ([6]). In our group treated with pharyngo-laryngo-esophagectomy (PLE), 16 (72.7%) of 22 cases were stage 3 or 4. Compared to group I, group II had long hospitalization time, needed more blood transfusions and had significantly higher complication and mortality rates (p<0.05).

The morbidity rate after esophagectomy for esophageal carcinoma has been reduced in recent years as a result of improvements in selection of patients, surgical techniques and advancement in perioperative management ([1,2]). However, it is still quite high ([5,7]). In the literature, major complications were reported with different rates after transhiatal esophagectomy. Total major complications were reported by Ellis ([8]) as 52%, by Gockel ([9]) as 42.7%. Pulmonal complication rates were 8.3% by Gupta ([10]), 23%

by Van Sandick ([11]) and 4.65% by Homenesh ([12]). Anastomotic leak rates were 15%, 15.8% and 16.7%, recurrent laryngeal nerve palsy rates 14%, 24% and 9.5% and operative mortality rates were 6%, 3.5% and 9.3%, respectively. Orringer et al. ([13]) stated one of the most succussful operative results. He reported major complications in cancer patients with anastomotic leakage as 13.75%, pulmonary complications as 2%, recurrent laryngeal nerve paralysis, chylothorax, and tracheal laceration <1% each and operative mortality was 4.5%. This may be because they deal with specific esophageal surgery and have an experienced clinic. The morbidity rate in PLE varies from 27% up to 63% with a mortality rate up to 17% ([14]). In our cases, the total complication rate was 39.6% in patients of group I. The pulmonary complication rate was 5.7%, anastomotic leakage rate was 13.2% and recurrent laryngeal nerve paralysis rate was 5.7%. Our operative mortality rate was 9.4%. In patients of group II (PLE), the total major complication rate was 54.5%. Operative mortality rate was 27.3%. Since various surgeons committed the operations and learning process was left out of study, our mortality and morbidity rates are similar to results of series in the literature that are upper margin.

In this study, the average cumulative rate was 51 days in group I, 36 days in group II (p=0.01). Total survival rate in the early postoperative period (first week) was 94%. In the second week, survival rate was 71% in group II and 86% in total. In the third week, it was 59% in group II and 81% in total. Postoperative patient monitoring is very important. Generally, patients are monitored in the intensive care unit in the early postoperative stage ([15]). Preventing expected complications in early stages gives confidence to staff. However, higher morbidity and mortality rates possibly develop in later stages due to increased nosocomial, anastomotic, wound and nutrition problems ([1,2,9]). In recent years, hospitalization time has been reduced to 10 days in experienced centers ([13]). Especially, with the existence of preoperative risk factors, esophagectomy patients have to be monitored in the first 21 days also, when they are discharged from the hospital. In our studies, postoperative mortality is highest in the second week. The English literature between 1995 and 2006 reveals no study that deals with hospital mortality including 30 days' mortality.

In this study, according to Cox analysis, operation type is an independent risk factor that determines survival chance probability (p=0.038). Patients having PLE which is an aggressive operation have a 5.6 times lower early stage survival chance. In risk analysis after esophagectomy, Gockel et al. ([9]) have reported that the types of the surgical procedure are crucial for both incidence of postoperative complications and rates of mortality. Whooley ([16]) indicated that the selection of a limited resection technique can be crucial for the development in the postoperative course. In our study, other risk factors that determine early stage survival rate are not statistically significant. However, stage and complications increase mortality risk dramatically. In contrast to our study, multiple risk factors were found in the literature. Gockel ([9]) reported a comparison of the risk profiles between various histological tumor types, and a significantly higher nutritional risk, poorer preoperative lung function and higher prevalence of hepatopathy was observed in risk patients. On the other hand, Ferguson ([17]) reported the optimal model for the overall prediction of mortality risk to be defined by age, intraoperative blood loss, pulmonary complications, and the need for inotropic support. Whooley ([16]) reported perioperative factors correlated with decreased mortality rate such as postoperative use of epidural analgesia and bronchoscopy (for clearance of pulmonary secretions), a decrease of smoking in the history and a decrease in surgical blood loss of more than 1,000 mL.

As a result, the type of surgical approach is the most important risk factor for postoperative mortality and morbidity in the treatment of esophageal cancer. In the preoperative stage, patients should be examined well. All risks, possible surgical procedures and alternative treatments should be evaluated in detail. In postoperative follow-up, the first three weeks are very important due to possible problems, follow-up in the second and third week is as important as in the first week.

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