

# Predicting Factors for Anastomotic Leakage after Esophageal Cancer Resection

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## Abstract

**Background:** Esophageal anastomosis leaks continue to be a significant cause of morbidity and mortality after esophagectomy. The purpose of the present study was to identify the predisposing factors of esophageal anastomotic leakage.

**Materials and Methods:** 95 patients who underwent surgical resection for esophageal or cardia cancer were included for the study. The mean age of the patients was 59.5 years and male to female ratio was 1.56 to 1. The preferred management strategy for anastomotic leakage was the conservative approach when possible. The operative approach was reserved for those patients with fulminant sepsis or those who did not respond to the conservative management. Data were analyzed using SPSS 13.0 software and P-values less than 0.05 were considered significant.

**Results:** Sixty six patients had cervical esophageal anastomosis and 29 had intrathoracic anastomosis; 18.9% anastomotic leakage was diagnosed. Patients with symptoms longer than 6 months prior to operation, and diabetic patients had a significantly higher risk of anastomotic leakage.

**Conclusion:** Our data showed that the presences of diabetes mellitus as well as prolonged symptoms (more than six months) are associated with higher anastomotic leakage after esophagectomy. Controlling blood glucose, early diagnosis of esophageal cancer, early resection of tumor before a long-term period of symptoms, and effective screening program for esophageal cancer may reduce the risk of esophageal leakage.

**Keywords:** esophageal cancer, anastomotic leakage, esophagectomy

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## Introduction

Esophagectomy remains the gold standard for curative treatment of esophageal cancer. Despite advances in surgical, anesthetic, and intensive care techniques, hospital morbidity and mortality are still substantial with up to 70% and 14% rates respectively[1]. Esophageal anastomosis leaks continue to be the significant cause of morbidity and mortality after esophagectomy. Esophageal anastomosis may result in mediastinitis and sepsis with a reported mortality of up to 64 % [2]; and its most important predisposing factors are attributed to ischemia of the gastric conduit and error in surgical techniques[3]. Cervical anastomosis is associated with leakage and stricture rates as high as 40% and 50% respectively, but leak-related mortality is 5% or less [4]. In contrast, reported leakage and stricture rate for thoracic anastomosis are up to 7% and 14% respectively, but leak-related mortality can be as high as 60%[5]. Prevention of gastric conduit ischemia reduce the incidence of leaks, while

improvement in management strategy may lead to reduction in leak related morbidity and mortality. The purpose of the present study was to identify predisposing factors for esophageal anastomotic leakage.

## Materials and Methods

A total of 95 patients with carcinoma of the esophagus who underwent transthoracic and transhiatal esophagectomy over a 2-year period at our Department of thoracic and esophageal surgery were enrolled in this study. The study protocol was approved by the Ethics Committees of the Isfahan University of Medical Sciences and subjects signed a written consent to participate in the study.

Data base was analyzed for the incidence, presentation, diagnosis and outcome of anastomotic leaks. Preoperative and operative factors were reviewed in order to identify risk factors for anastomotic leakage. The mean age of the patients was 59.5 years, and male to female ratio was 1.56 to 1. The choice of conduit was the stomach

in 88 patients, while colonic interposition was used in 7 patients. Hand Sewn technique was employed with a single layer of separate vicryle suture in all the cases. Resection margins were assessed grossly for tumor clearance and were not routinely subjected to intraoperative frozen section analysis. A single cervical penrose drain and single pleural drain were used for each patient. After surgery, patients were assessed for anastomotic leakage by a meglumine contrast study performed on day 7 post operation or later. Depending on the patients' condition, the diagnosis of anastomotic leakage was based on clinical and radiological evidence. The preferred management strategy for anastomotic leakage was the conservative approach when possible. An operative approach was reserved for those patients with fulminant sepsis or those who did not respond to conservative management. We hypothesized that the occurrence of anastomotic leakage is influenced by age, sex, malnutrition, hypoalbuminemi, hypoglobulinemia, smoking ,co-morbid diseases ,anastomotic techniques used by surgeons, surgeons' expertise, and duration of symptoms[6]. Statistical differences between groups were determined by student t test, chi-square test, or fisher's exact test where appropriate. P-values less than 0.05 were considered significant. Data were analyzed using

SPSS 13.0 (SPSS Inc., Chicago, IL, USA) software.

### Results

During the study period, 95 patients who underwent surgical resection for esophageal or cardia cancer were included. Based on their condition and tumor site, subjects were divided into two groups. Sixty six patients had cervical esophageal anastomosis and twenty nine had an intrathoracic anastomosis. Eighteen (18.9%) anastomotic leakage were diagnosed ; 15.5% in males and 24.3% in females. Table 1 demonstrates the demographic data and predisposing factors of all the patients. Most of the patients were presented with dysphagia (57.8%) but other symptoms like odinophagia, cough, weight loss, chest pain, and dyspnea were also observed. Patients with symptoms longer than 6 months prior to operation had a more chance of anastomotic leaks (P value= 0.001). We did not find any association between anastomotic leaks and serum levels of albumin and globulin. Co-morbidities like renal failure, congestive heart failure, obstructive or restrictive pulmonary disease, past history of Myocardial Infarction, and malignancy (except esophageal cancer) were not associated with anastomosis leak but diabetic patients had a significantly higher risk of anastomotic

**Table 1:** Comparison between patients with leakage and patients without leakage.

	leak	no leak	P value
Number of patients	18	77	
Age(years),mean	60	61.7	NS
Symptomatic more than six month's before admission	5	5	0.001
FEV1 (mean)	2.19	0.43	NS
Albumin (mean)	3.31	0.68	NS
Globulin (mean)	2.71	0.655	NS
Smoking history	7	31	NS
Congestive Heart Failure	0	3	NS
Diabetes Mellitus	4	3	0.02
Corticosteroid therapy	0	2	NS
Renal failure	10	39	NS
Malignancy	1	6	NS
Transhiatal esophagectomy	13	53	NS
Transthoracic esophagectomy	5	24	

**Table 2:** Comparison between location of anastomosis and pulmonary complication.

	With p.c*	Without p.c	P value
Cervical anastomosis	3	10	0.047
Thoracic anastomosis	4	1	0.047

\* p.c: pulmonary complication

leakage.

Our study showed that anastomotic leak is not associated with the location of anastomosis. However, postoperative pulmonary complications, especially emphysema, were significantly more frequent in transthoracic anastomosis (table 2).

## Discussion

Esophageal cancer surgery had a high mortality and morbidity rate. In most centers, the reported mortality following esophagectomy ranged from 8% in high volume centers to as high as 23% in low volume centers [7]. Esophagectomy is not only a technically demanding operation, but patients may have associated comorbid problems such as old age, malnutrition, and underlying illness.

The result of esophageal cancer surgery is strongly related to surgeons' experience and hospital volume. Migliore et al. showed that low volume surgery increased the odds of in-hospital mortality by more than four times, and the surgeon's case volume was an independent risk factor for hospital mortality [8]. Matthews et al. showed better surgical results in the esophagectomy which was performed by a surgeon who handled esophagectomy cases more than 6 times per year[9]. Andersen suggested that esophageal surgery should be restricted to centers performing at least 20 cases per year[10]. It is venerable that more than 40 patients with esophageal cancer were operated in our hospital. Esophagectomy needs a considerable amount of learning; and extensive mediastinal dissection may require additional experience. Furthermore, for the esophageal surgeon, there is a continuing improvement in the overall performance for the outcome of esophagectomy[11-13].

Our data showed that the presences of diabetes mellitus as well as prolonged symptoms (more than six months) are associated with higher anastomotic leakage after esophagectomy. Anastomotic dehiscence, if it occurs, is still associated with a very high postoperative mortality. The prevalence of anastomotic leakage is 60% in intrathoracic anastomosis and 5% or less in cervical anastomosis[4,5]. Although published literature showed that cervical anastomosis leakage is more common [14] but our data did not show a significant difference between the two groups. We defined a high volume surgeon as a surgeon with more than 5 annual esophagectomy.

Our study demonstrated that past history of diabetic mellitus as well as duration of symptoms more than 6 months prior to operation are associated with anastomotic leakage. This may

attributable to microvascular changes due to diabetes mellitus. Many authors have advocated transhiatal esophagectomy and cervical anastomosis due to low associated mortality and morbidity compared with transthoracic anastomosis, especially for pulmonary complications (like present study). Nevertheless, cervical anastomosis can also complicate with anastomotic stricture, conduit necrosis, and even death[14].

In addition, we found that the location of anastomosis is not associated with anastomotic leakage. It is presumed that clinical factors such as location of the tumor as well as experience and familiarity of the surgeon with the operative approach should dictate the choice of anastomotic location.

## Conclusion

Our results showed that diabetic mellitus as well as duration of symptoms more than 6 months prior to operation are associated with anastomotic leakage. Controlling blood glucose can reduce the adverse effect of diabetes on esophageal anastomosis. Additionally, early diagnosis of esophageal cancer, early resection of tumor, and effective screening program for esophageal cancer may reduce the period of symptoms before surgery and decrease the risk of esophageal leakage substantially.

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