

## The Comparison of the Complications between Two Surgical Techniques of Esophageal Cancer

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### ABSTRACT

**Introduction:** Esophageal cancer is a common gastro intestinal malignancy. One of the most common techniques of surgery in esophageal cancer is transhiatal esophagectomy with esophagogastric anastomosis in the neck. This technique is accompanied by complications like chronic gastro-esophageal reflux and late stenosis. This study was designed to compare the risk of complications after two surgical techniques for esophageal cancer: esophagogastric anastomosis with partial fundoplication and esophagogastric anastomosis without it.

**Materials and Methods:** In this retrospective cohort study, 100 patients with distal two thirds of esophageal cancer who underwent transhiatal esophagectomy in Ghaem and Omid hospitals Mashhad University of Medical Sciences from 2005 to 2010 were included. Esophagogastric anastomosis to the posterior gastric wall was performed with a partial gastric fundoplication in the first group but simple routine anastomosis was done to the posterior gastric wall in the second group.

**Results:** In a retrospective cohort study 100 patients entered the study with 59 male & 41 female and with a mean age  $54.6 \pm 6.4$  years. Squamous cell carcinoma was observed in 77% of the patients and adenocarcinoma was reported in 23% of them. Seventy-two percent of tumours were located in distal third and 28% were in middle third of esophagus. Esophagogastric anastomotic leakage was observed in 3 cases of fundoplication group and 7 cases of simple anastomosis technique ( $P=0.182$ ) so there was no significant difference between the two groups. Benign anastomosis stricture was reported in one of the patients who underwent esophagogastric anastomosis with fundoplication, but it was observed in 8 cases with simple anastomosis technique ( $P=0.03$ ) so there was a significant difference between the two groups.

**Conclusion:** Esophagogastric anastomosis with partial fundal fundoplication is a safe technique with low incidence of anatomic leakage and late stenosis.

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### Introduction

Esophageal cancer is one of the most common gastrointestinal cancers. Esophageal tumors usually lead to dysphagia and, odynophagia. Esophageal

cancer is endemic in the North of Iran. Surgery is generally performed in esophageal cancers and chemoradiotherapy may be added. The most

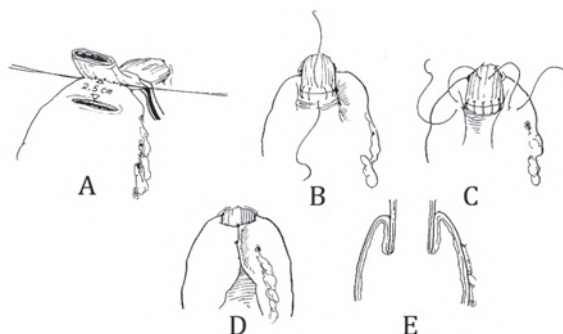
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**Table 1.** Patients Characteristics

100		without Fundoplication (50)	Fundoplication (50)	P-value
Sex	Female	22 (53.6%)	19 (46.3%)	0.68
	Male	28 (47.4%)	31 (52.5%)	
Site	Middle	35 (48.6%)	37 (51.4%)	0.65
	lower	15 (53.6%)	13 (46.4%)	
Tumor	ScC	38 (49.4%)	39 (50.6%)	0.81
	Acc	12 (52.2%)	11 (47.8%)	
Leak	NO	43 (47.8%)	47 (52.2%)	0.182
	Yes	7 (70.0%)	3 (30.0%)	
Stricture Late	NO	42 (46.6%)	49 (53.8%)	0.03
	Yes	8 (88.8%)	1 (11.1%)	

**Figure 1.** Esophagogastric anastomosis technique with partial fundoplication

common surgical procedure is Trans hiatal esophagectomy in which cervical esophagogastric anastomosis is made by stapler or hand suture (1). The leakage from the anastomosis and the stricture in the anastomosis area are the most common early and late complications, respectively (2).

Leakage from cervical esophagogastric anastomosis is easily managed by adequate drainage (2-3). The most common causes of stricture in anastomosis are tumor recurrence or benign stricture due to reflux and esophageal exposure to gastric secretion. The latter needs repetitive endoscopic dilatation or occasionally stricturoplasty (4-6). This study was designed to compare the risk of complications after two surgical techniques for esophageal cancer: esophagogastric anastomosis with partial fundoplication and esophagogastric anastomosis without it.

## Materials and Methods

In this retrospective cohort study between 2005 to 2010 with at least 3 years follow up, 100 patients with esophageal cancer in Ghaem and Omid hospitals Mashhad University of Medical Sciences operated by Trans hiatal esophagectomy were enrolled into the study. Inclusion criteria were middle and distal esophageal cancer, no history of neoadjuvant therapy, performed neck anastomosis by hand at least 3 years follow up. Exclusion criteria were proximal esophageal cancer, severe intra operation complication (air away or vessels injury). We had 2 groups with 50 patients in each. In the first group, cervical

esophageal anastomosis to stomach was performed routinely in single layer without fundoplication in posterior wall of stomach and in second group esophageal anastomosis to the stomach was performed in 2 layers with partial fundoplication around esophagus with incomplete coverage in posterior wall of stomach (Figure 1). All patients evaluated for age, sex, type of pathology, and location of tumor. Seven days after surgery barium swallow (BS) performed for detection of leakage. After discharge of patients, every 6 month until 3 years, barium swallow (BS) was performed for detection of stricture. The evidence of narrowing in BS was confirmed by endoscopy. We evaluated patients of the 2 groups for the frequency of leakage and late stenosis. Chi Square test was used to compare these two techniques for leakage and recurrence. Data were statistically analyzed by SPSS software version 11.5.

## Results

Hundred patients were enrolled in the study. Forty-one (41%) patients were female and 59 (59%) were male. Mean age of the patients was  $54.6 \pm 6.4$  years (Range: 46 to 65 years). The tumor type was squamous cell carcinoma in 77 patients (77%) and adenocarcinoma in (23%) (23 patients) ( $P=0.81$ ). The tumor site was in distal third in 72 patients (72%) and in middle third in 28 patients (28%) ( $P=0.65$ ). The overall rate of leak from anastomosis was 10 (10%) and the rate of stricture was 9 (9%) of total cases. Patients Characteristics demonstrate (Table 1). Leakages from cervical anastomosis were seen in 3 cases (6%) in group 1 (fundoplication) and 7 (14%) cases in group 2 (without fundoplication). There was not statistically significant difference in the frequency of anastomosis leakage between two groups by using Chi Square test ( $P=0.182$ ). The leakage was resolved in all patients with conservative management.

Within 3 years of the follow-up, one stricture 1 (2%) was developed among 50 patients of the "fundoplication group", but it was observed in 8 (16%) patients in the other group ("without fundoplication"). By using the Chi Square test, the comparison between the two groups showed a

significant statistical difference ( $P=0.03$ ) in late stricture.

## Discussion

Esophageal cancer is one of the most common malignancies and has highly metastatic behavior. In previous European and American studies, more than 40-72% of patients had micrometastasis before surgery. In 2011, Bagheri and colleagues also reported that the prevalence of micro metastasis in Iranian patients is approximately 30% (7). Various methods are recommended for controlling the disease such as surgery with chemotherapy or radiation therapy. One of the most common methods for the treatment is neoadjuvant chemotherapy with radiation therapy after surgery. In the study by Bagheri et al, neoadjuvant chemotherapy did not increase the risk of respiratory complications (8).

Surgery is the best curative and palliative treatment in the management of esophageal cancer patients. Trans hiatal esophagectomy with stomach replacement is the preferred treatment approach to esophageal cancer. Cutting both vague nerves will disturb gastric stomach emptying because of pyloric dysfunction. Thus different techniques such as pyloroplasty, pyloromyotomy with cutting pyloric muscles with mucosal preserving and finger-assisted pyloromyotomy were used to drain the stomach.(8) Bagheri et al showed that Butolinum toxin injection is a suitable minimal invasive method in comparison of pyloroplasty with acceptable results (10)

Conduit type is so important in postoperative complication; for example: prevalence of leakage and reflux is lower in colon interposition than stomach conduit, but feeling fullness and operative complication are higher, that leads to limitation in colon interposition (9).

Leakage from anastomosis appears as induration, pain and erythema in incision site. Factors affecting leakage from anastomosis are: ischemia, tension, distal obstruction, poor technique and the other systemic factors affecting the healing (diabetes mellitus, chronic renal failure, chronic cardiovascular disease) (9). The rate of leakage from esophagogastric anastomosis was 8 to 22.6 % in different reports (11, 12).

Multiple techniques were introduced to reduce leakage from anastomosis. In the study by Guiy and colleagues, they experienced good results with reinforcement of anastomosis by omentum in rats (12). In the study by Fekete F et al, they used Fibrin glue to reinforce the anastomosis and earned good results (13).

The stricture of anastomosis area is another complication that may be technical or due to local tumor recurrence and Presents by dysphagia.

Strictures due to local tumor recurrence are often difficult to manage and needs systemic or surgical treatment. The cause of benign stricture is persistent duodenogastric reflux due to vagotomy and pyloroplasty and lower esophageal sphincter destruction after operation. The mean duration for presence of stricture is 6 month after surgery, but rarely seen later (11). Different studies were performed to prevent long term reflux and one of the most reliable one is Huang study (15).

Huang et al pointed that the most important cause of benign stricture in esophago gastric anastomosis is reflux of gastric secretion (15). By using partial fundoplication (partial wrapping of stomach) anastomosis site would be reinforced and acts as an artificial sphincter, preventing reflux and so stricture of anastomosis site.(15) In addition, tension on anastomosis would reduced; protecting anastomosis by a serosal layer, leakage rate decreased. In our study, according to most studies, the mean time for presence of stricture was 3 years. So we followed up patients for 6 months and if any symptom of stricture were available upper gasterointestinal endoscopy and barium study was performed to rule out strictures due to local tumor recurrence. Stricture was seen in 1 patient in group 1 (fundoplication) and 8 patients had stricture in group 2 (without fundoplication). It shows significant statistical difference between two groups ( $P=0.03$ ).

In several studies that used stapler for esophagogastric anastomosis, the frequency of benign stricture was higher than hand-sew technique and there was no different in leakage rate.

## Conclusion

Esophagogastric anastomosis with partial fundal fundoplication is a safe technique with low incidence of anatomic leakage and late stenosis. Of course, for further confirmation a subject, request to better studies, more patients and longer follow-up is necessary.

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## Conflict of Interest

The authors declare no conflict of interest.

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