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ORIGINAL ARTICLE

Necessity of routine thoracostomy tube insertion after transhiatal esophagectomy

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Abstract

Introduction: Transhiatal esophagectomy is a widely accepted approach for palliative resection of subcarinal esophageal cancers. This study was designed to evaluate the necessity of routine thoracostomy tube insertion in this technique.

Methods: This descriptive study was conducted on 123 consecutive patients with esophageal cancers undergoing transhiatal esophagectomy from March 2001 to February 2005. Chest tube insertion was performed according to our defined criteria. Thoracostomy tube would be inserted intraoperatively, if the estimated amount of bleeding was more than 200 ml. In patients with unilateral or bilateral diffuse haziness in chest-x-ray representative of considerable fluid collection, and symptomatic patients with each amount of pleural fluid, it would be inserted postoperatively.

Results: Thoracostomy tube was intraoperatively inserted in 41 cases (33.3%). Among other 82 patients only 19 cases (15.4%) required chest tube during admission period. There was significant relation between intraoperatively and postoperatively inserted thoracostomy tubes ($p<0.001$). There was no statistically relation between chest tube insertion and hospital mortality ($p=0.71$). The mortality rate didn't show a significant relation with the amount of chest tube drainage ($p=0.056$).

Conclusions: Routine intraoperative chest tube insertion is not necessary for all patients following THE, and it should be limited to the patients with significant intrathoracic bleeding.

Key Words: Hageal cancer; Esophagectomy; Chest Tubes

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Introduction

Esophageal cancer is the eighth common cancer in the world, with two main histopathological subtypes: squamous cell carcinoma (SCC) and adenocarcinoma [1]. Although SCC is more common, adenocarcinoma of the esophagus has an increasing rate [2].

Transhiatal esophagectomy (THE) is one of the common procedures accepted as a palliative treatment for esophageal cancer [3-5] and also as the treatment of choice for some benign esophageal diseases [4, 6, 7]. In this procedure, thoracic esophagus is resected through the diaphragmatic hiatus and suprasternal notch with blunt dissection; and reconstruction of the esophagus is performed by substitution of the esophagus with stomach or colon. The esophageal substitute is conducted to the neck through esophageal groove and continuity of the alimentary tract is restored by anastomosing the cervical esophagus either to stomach or colonic graft. Other routes including retrosternal, or subcutaneous one can be used if intrathoracic resection is impossible [2].

It seems that this procedure have some priorities over the other esophagectomy techniques Avoidance of thoracotomy, and performing the cervical esophageal anastomosis are the main advantages that would prevent the potential complications related to thoracic incision and fatal anastomosis leakage.

Many authors have advocated routine placement of bilateral chest tube at the end of the THE procedure [8-10].

We present our study of 5-year experience of transhiatal esophagectomy. In this study we attempted to examine the necessity of routine chest tube insertion and to determine clinical criteria for placement of thoracostomy tube at the end of the procedure.

Methods

This descriptive study consisted of 123 consecutive patients with esophageal carcinoma of subcarinal region who were hospitalized in the department of General Surgery of Imam Reza Hospital between March 2001 and February 2005 and were candidate for palliative resection. Patients who underwent thoracotomy and those who were candidates for curative resection were excluded. All data including age, sex, pathological diagnosis, intraoperative findings and follow-up information were collected into special forms prepared for this study.

Preoperative evaluations included upper gastrointestinal (GI) endoscopy with biopsy, upper GI series, chest x-ray, abdominal ultrasonography as well as complete blood count, serum biochemistry tests, electrocardiography, and pulmonary function tests. All patients received intravenous prophylactic antibiotics (Ceftriaxone & Metronidazole), which were continued postoperatively.

All patients underwent the same surgical procedure. Blunt transhiatal esophagectomy was performed as the standard approach. The surgical procedure was carried out with the patient under general anesthesia and in a supine position. The head was also hyperextended and turned toward the right side to allow the surgeon easy access to the left neck for cervical anastomosis. Both nasogastric intubation and urinary catheterization were performed in all patients.

Following a midline incision, the abdomen was explored for possible intra-abdominal metastases. The esophagus was bluntly dissected from the surrounding tissues up to the thoracic inlet, and the mediastinum was packed with large sterile gauze pads. The procedure proceeded with gastrolysis with preservation of right gastric and gastro-epiploic vessels. The pyloric drainage procedure used included pyloromyotomy, pyloroplasty or finger bougie method. To ensure adequate mobilization of the stomach, a Kocher maneuver was performed. Through a cervical incision, the esophagus was exposed. The esophagus and cardia were resected and proximal stump of the stomach was then sewn and transmitted to the neck, where a hand-sewn esophagogastric anastomosis was performed with a single layer of interrupted 0-3 or 0-4 silk sutures. Finally, a feeding jejunostomy tube was inserted.

The total blood loss volume was estimated by measuring the volume in the suction bottles and counting the wet sponges. When the intraoperative mediastinal bleeding exceeded 200 ml, a unilateral or bilateral thoracostomy tube(s) were placed on the side of pleural torn. Otherwise, mediastinal secretions were suctioned without thoracostomy tube insertion.

All patients were observed in the intensive care unit (ICU) at least for 48 hours, postoperatively.

The first chest radiography was performed 6-12 hours after surgery and repeated with different intervals according to the patient's clinical condition. Postoperative tube thoracostomy insertion was performed for two groups of patients: those with unilateral or bilateral diffuse haziness on chest x-ray, which was suggestive of considerable fluid collection, and patients who

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suffered from respiratory distress with any detectable amount of pleural fluid collection.

Daily amount of chest tube drainage was measured and recorded. Chest tubes were removed after 4 days if fluid output was less than 400 ml (100 ml/day). Otherwise, pleural fluid analysis was performed for the diagnosis of chylothorax.

Outpatient follow-up was performed weekly in surgery clinic and Chest radiography was repeated in patients with pleural effusion who were treated conservatively until complete resolution of pleural effusion.

Statistical analysis was performed using SPSS version 16. For the descriptive statistics, we have used the frequency tables and bar charts. Fisher's exact test in cross tabulation was used to compare relation between the qualitative variables. The level of significance was set at five percent.

Results

The participant included 123 patients with subcarinal esophageal cancers, of which 84 (68.3%) were male and 39 (31.7%) were female. The mean age of the patients was 57.7±12 years (range 35 to 79 years). Pathological analysis showed that 116 (94%) were squamous cell carcinomas, 5 (4%) adenocarcinomas, and 2 (2%) sarcomas.

Thoracostomy tube was placed in 41 patients (33.3%) intraoperatively. In 82 other patients who didn't meet our criteria for chest tube insertion, only 19 (15.4%) required chest tube after operation, while in the remaining 63 there was no need for thoracostomy tube. There was significant relation between intraoperative and postoperatively inserted thoracostomy tubes ($p<0.001$). Total chest tube output in 36 (29%) of the cases exceeded 400 ml and chest tube was maintained for more than 4 days.

Seven patients (5.6%) died in hospital. Four hospital deaths (57%) occurred in patients who had chest tube. There was no statistically relation between chest tube insertion and hospital mortality ($p=0.71$). Among these 4 (57%) deaths, the volume of thoracostomy tube output was more than 400 ml in 3 (75%) cases. As shown in Table 1, the mortality rate didn't show a significant relation with the amount of chest tube drainage ($p=0.056$).

The results showed that overall complication rate was 8% (for only 10 patients). Intra-operative massive bleeding occurred in one (10%) patient which required an emergent thoracotomy. Rupture of the azygus vein was the etiologic factor for bleeding which was controlled by ligation of the injured vein. Two (20%) patients developed chylothorax, which were treated conservatively. Injury of the right main bronchus occurred in a 75-year- old man with a tumor near the carina (10%). The injury was managed by continuation of left bronchial intubation for 10 days which was healed spontaneously. Two (20%) cases of cervical anastomotic fistula developed, which was treated with conservative management. Wound infection was developed in 4 (40%) patients, who were managed with open drainage (Table 2).

Follow-up in patients with pleural effusion who were treated conservatively showed no major complication and only two (3.1%) cases, experienced pneumonia which were treated by a course of oral antibiotics.

Table1: Frequency table of mortality status

Status	Volume of drainage	Frequency	Percent
With chest tube	>400 ml	3	75
	≤400 ml	1	25
		4	57
Without chest tube	-	3	43
Total	-	7	100

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Table 2: Complications of transhiatal esophgectomy

Complications	Number (%)	Intervention
Intraothoracic massive bleeding	1 (10)	Emergent thoracotomy
Chylothorax	2 (20)	Reoperation
Right main bronchus injury	1 (10)	Conservative management
Cervical anastomotic fistula	2 (20)	Conservative management
Wound infection	4 (40)	Conservative management
Overall incidence	10 (8)	-

Discussion

The transhiatal approach to esophageal resection was introduced by Denk in 1913 which was later refined by Turner in 1931. The first successful THE was carried out by Turner [11], but it was subsequently popularized by Orringer et al [12, 13]. Thereafter several studies confirmed the safety and efficacy of this surgical technique in the treatment of both benign and malignant diseases of the esophagus.

Results of the comparison between transhiatal and transthoracic esophagectomy (TTE) have demonstrated significant advantages in favor of THE [4, 13, 14]. An elaborate meta-analysis of 7527 patients by Hulscher JB et al. pointed out considerable benefits to be gained from THE in terms of mortality, several complications such as blood loss, pulmonary complications, chylous leakage, wound infection, and also ICU and hospital stay. Though, it indicated lower incidence of recurrent laryngeal nerve injury and anastomotic leakage in TTE patients than in THE patients [15].

Nevertheless, some shortcomings in this method must be acknowledged. In addition to the blind manipulation of the esophagus in the mediastinum which can be associated with higher incidence of complications, the incomplete mediastinal lymphadenectomy may lead to the increased rate of early recurrence.

However, THE as a palliative treatment may provide the patient with a higher probability of uncomplicated recovery, relief of symptoms, and improvement in swallowing [10, 16, 17]. Less complications and better outcomes have encouraged many surgeons to adopt this procedure even in the early stages of esophageal carcinoma [18, 19]. This study confirms the low rate of complications in THE (8%).

Pleural injury is a frequently occurred complication following blunt dissection in this procedure [4, 13, 14, 20]. Rao et al reported 312 (76%) cases of pleural injury among 411 patients who underwent THE [4]. In another study by Orringer et al, THE was performed in 1085 patients, and entry into one or both pleural cavities during surgery occurred in 831 (77%) patients which were treated with chest tube insertion [13].

As part of the procedure, routine insertion of bilateral chest tubes is advised by some authors [4, 8-10, 13, 21]. This is in contrast to our result, in which of 123 patients who underwent THE, 41 (33.3%) required chest tube(s) intraoperatively and 19 (15.4%) postoperatively. In the other hand, only 23.1% of the patients without intraoperative tube thoracostomy needed further intervention to resolve pleural effusion.

Conclusions

In patients with esophageal cancer who underwent THE, routine chest tube insertion is not advised, unless significant mediastinal bleeding occurs. Furthermore, according to this study other criteria for postoperative chest tube insertion should include incidence of respiratory distress syndrome with any detectable amount of pleural fluid or asymptomatic extensive pleural effusion discovered on chest x-ray.

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