



Use of oesophageal flap valvuloplasty and wrapping suturing technique in preventing postoperative complications after oesophagectomy for oesophageal cancer

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Abstract

Background: Esophagogastrectomy for oesophageal cancer is the standard surgical treatment. However, traditional techniques have been associated with high frequency of anastomotic complications. The purpose of this study is to clarify the superiority of the oesophageal flap valvuloplasty and wrapping suturing technique in preventing postoperative complications after oesophagectomy for oesophageal cancer.

Methods: A prospective, randomised study was performed on 394 patients treated for esophageal cancer between January 2006 and December 2010. The trial registry number is ChiCTR-TRC-13003817 in the Chinese Clinical Trial Registry.

Results: Anastomotic leaks occurred in four patients in group A (2.1%) and in twelve patients in group B (6.2%) with statistically significant ($P = 0.038$). During the evaluation of benign stricture seven patients were excluded for hospital mortality. Thirty three patients in group A (6.9%) and 25 patients in group B (13.2%) occurred anastomotic stricture respectively ($P = 0.044$). Furthermore, reflux oesophagitis and Barrett's epithelium were found in 105 patients (55.3%) of group B, and 54 (28.7%) patients in group A ($P < 0.001$).

Conclusion: The oesophageal flap valvuloplasty and wrapping suturing technique decreased anastomotic leakage incidence and stricture rate thereby decreasing the morbidity and mortality. This procedure also prevented the occurrence of gastroesophageal reflux after esophagectomy.

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Keywords: Oesophageal cancer; Surgery; Gastroesophageal reflux

Introduction

Oesophageal cancer, which is characterised by rapid development and fatal prognosis in most cases, is the sixth most frequent tumour disease worldwide.¹ In 2013, roughly 18,000 cases of oesophageal cancer are diagnosed in the United States, with more than 15,000 people dying from the disease. Approximately 482,300 new oesophageal cancer cases were diagnosed worldwide, with 406,800 deaths in 2008.² Oesophagectomy remains the standard surgical treatment and is the curative measure for early-stage

oesophageal tumours. However, after radical oesophagectomy and oesophageal reconstruction, many complications may occur, such as anastomotic leakage, anastomotic stenosis, blood loss, recurrent laryngeal nerve injury, thoracic duct injury, tracheal injury and gastroesophageal reflux.

The anastomosis between the residual oesophagus and the stomach is routinely made in the neck or in the chest. Although in cervical anastomosis anastomotic leakage rate is larger than in chest anastomosis, most leaks at the cervical site heal spontaneously through conservative management.³ Anastomotic leaks in the chest cause considerable morbidity and mortality after oesophagectomy.

The major elements in anastomotic leakage are implicated in anatomic factors, such as inadequate blood supply,

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lack of serosa, and fragile muscle layer that are positioned longitudinally; and faulty surgical techniques, such as suture line tension, and impaired blood supply to oesophageal wall.⁴ In the last few decades, numerous reports regarding anastomotic technique development (e.g., hand-sewn, stapled, semi-mechanical, or modified triangulating stapling techniques) have been published. The stapled anastomosis technique using a circular stapler has been recently introduced and is considered useful for shortening operation time and reducing anastomotic leakage. However, high frequency of benign anastomosis stenosis occurs after esophago-gastric anastomosis using the circular stapler, which ranges from 5% to 40% in recent literature.^{5,6} The benign anastomotic stenosis can cause swallowing dysfunction associated with low quality of life for patients after oesophagectomy. Currently, the correction rate of gastro-oesophageal reflux was found to be 60%–93% after oesophagectomy for oesophageal carcinoma.^{7,8} It's well known that reflux after oesophagectomy is a significant problem, with both clinical and pathological consequences. However, recently, no surgical technique has been reported to function in preventing such complication. More recently, we reported the results of oesophageal flap valvuloplasty and wrapping suturing technique in preventing anastomotic leakage and benign stenosis after oesophageal cancer, in addition whether it can successfully prevent postoperative gastroesophageal reflux was also observed. In the current report, we describe our surgical technique and evaluate the clinical results of this technique.

Methods

From January 2006 to December 2010, 385 patients with oesophageal carcinoma were operated on at our institute. Among these cases, 327 patients (85.0%) had squamous cell carcinoma and 58 (15.0%) had adenocarcinoma. This study was based on randomised control trials (RCTs) using the CONSORT guidelines of 1999.⁹ Inclusion criteria for this study were as follows: (1) age above 18 years (2) biopsy-proven stage I, stage II, and stage III untreated oesophageal or esophagogastric junction cancer (including neoplasms of the upper, middle, or lower third of the oesophagus). Exclusion criteria were: previous gastric surgery, benign disease, advanced tumour stages (T4 disease), advanced lymph node involvement or distant metastasis according to the TNM classification, gastric tube reconstruction, neoadjuvant chemotherapy, or radiation therapy, and patients withheld consent for the wrapping suturing technique with oesophageal flap.

Our institute's ethics committee approved the study before randomisation and participants have signed written informed consent. Patients were randomised through the sealed envelope method to have the anastomosis constructed by wrapping and suturing around the oesophageal flap (group A) or by the stapled technique (group B). Before surgical intervention, informed consent was

Table 1
General patient information in two study groups.

	Group A (n = 191)(%)	Group B (n = 194)(%)	P value	Statistical method
Age (year) [median (range)]	64(34–75)	68(36–78)	0.192	Student's <i>t</i> -test
Sex			0.420	Chi square test
Female	48(25.1)	42(21.6)		
Male	143(74.9)	152(78.4)		
Site of tumour			0.943	Chi square test
Upper thoracic	31(16.2)	33(17.0)		
Middle thoracic	105(55.0)	108(55.7)		
Lower thoracic	55(28.8)	53(27.3)		
Stage of tumour			0.573	Mann–Whitney <i>U</i> test
I	19(9.9)	21(10.8)		
IIa	59(30.9)	66(34.0)		
IIb	69(36.1)	59(30.4)		
III	44(23.0)	48(24.7)		

Group A = patients with wrapping suturing around the oesophageal flap;
Group B = patients with only a stapled technique.

obtained from all patients. Patients were assigned randomly to permuted blocks of four or six patients; such that 191 patients were in group A and 194 in group B. The length of the permuted blocks was varied randomly to overcome bias caused by the possible prediction of the block length. The demographic data of 385 patients are listed in Table 1. No differences in age, sex, chronic illness, tumour location, and tumour stage were observed in the two groups.

Ivor–Lewis type transthoracic esophagogastrctomy (TTE) with esophagogastric anastomosis in the chest was performed in 259 (67.3%) patients, and transhiatal esophagogastrctomy (THE) was performed in 126 (32.7%) patients. Among the patients who had the oesophageal flap valvuloplasty and wrapping suturing technique (group A), 133 underwent TTE and 58 patients underwent THE. In the control group (group B), 126 patients underwent TTE and 68 patients underwent THE (Table 2).

The mean age of the patients was 64 years. The sex ratio of male to female is 3:1 which showed a male preponderance. Type 2 diabetes mellitus occurred in 13 patients which were controlled well by oral hypoglycemic agents, and the hypertension was diagnosed in 28 patients which was controlled by antihypertensive drugs. No radiation therapy, history of alcoholism, and steroid intake was recorded among all patients. Two-hundred and twenty-one patients were smokers, and among them 32 had given up smoking for one year before admission. All patients lacked severe pulmonary insufficiency; however, 50 patients (13.0%) had moderate pulmonary dysfunction on spirometry (defined as vital capacity less than 50%), forced expiratory volume of 1 s less than 70%, and maximum voluntary ventilation less than 50% of normal.

All patients were operated on in-line with standard procedures for radical surgery. After providing written consent, we used a restricted randomisation plan to assign the

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