Complete mechanical cervical anastomosis using a narrow gastric tube after esophagectomy for cancer

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Abstract

Objective: Fibrous stenosis of the esophagogastric cervical anastomosis remains a significant complication occurring in up to one-third of cases. Trying to reduce the incidence of this complication, we describe our technique of cervical esophagogastric anastomosis using endoscopic linear stapler which seems to reduce the incidence of fibrous stricture formation after resection of esophageal cancer. Methods: Between March 2000 and June 2003, 26 patients (15 males and 11 females) underwent esophagectomy using tubulized stomach for reconstruction. Cervical esophagogastric anastomosis using linear endoscopic stapler was performed in all cases. The occurrence of post-operative anastomotic leak and development of anastomotic stricture were recorded and analyzed. Results: All patients survived esophagectomy and were available for post-operative follow-up. Anastomotic leak developed in one case. No patient developed fibrous stenosis that required dilatation therapy. Conclusion: Complete mechanical esophagogastric anastomosis, using endoscopic linear stapler is effective and safe, even when a narrow gastric tube is used as esophageal substitute. This technique seems superior to other techniques to reduce the incidence of post-operative anastomotic complications. © 2004 Elsevier B.V. All rights reserved.

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1. Introduction

Fibrous stenosis of the esophagogastric anastomosis after esophagoplasty consistently contributes to post-operative morbidity, thus partially denying patients the benefits of surgery. Manual anastomosis between the esophagus and the stomach in one or two layers has been the technique of choice at our Institution for decades until March 2000. The application of this anastomotic technique was associated with late fibrous stricture in 30% of the cases [1]. To minimize this complication, in the last 3 years we employed the endoscopic linear stapler device to perform the cervical esophagogastric anastomosis, following the idea that the cross section of a linear stapled anastomosis is larger than that obtained by manual or circular stapled anastomosis.

We describe our technique to perform cervical anastomosis between esophagus and gastric tube, after total esophagectomy, using an endoscopic linear stapler device and we analyze our results.

2. Patients and methods

Between March 2000 and June 2003, 26 patients with resectable esophageal cancer underwent esophagectomy. Fifteen patients were males and 11 females with a mean age of 54.3 years, ranging from 43 to 72 years. Pre-operative study included esophagogastroscopy, fiber-bronchoscopy, whole body computed tomography and endoscopic ultrasonography. Pre-operative tumor histology and staging was as follows: 15 patients had squamous cell carcinoma (T1-T2 N0 in six cases, T1-T2 N1 in three, T3N1 in four and T4N1 in two cases); 11 patients had adenocarcinoma (T1-T2 N0 in six cases, T1-T2 N1 in three and T3 N1 in two cases). Six patients
with locally advanced squamous cell carcinoma (T3-T4 N1) underwent pre-operative chemotherapy with partial or complete response. Eighteen patients had an intrathoracic localization of the tumor, and esophagectomy was performed through a right thoracotomy. The remaining eight, with cancer of the gastro-esophageal junction, underwent thoracoscopic mobilization of the thoracic esophagus and mediastinal lymphadenectomy followed by trans-abdominal esophagectomy. In all cases, the restoration of alimentary continuity was obtained by gastric tubulization along the greater curvature through laparotomy, basing the vascular supply of the graft on the right gastro-epiploic vessels. After gastrolysis and complete abdominal lymphadenectomy around less curvature and celiac axis, the left and right gastric arteries were tied and cut, and the tube was prepared using a linear stapler. The gastric tube was calibrated to obtain a 3–5 cm in diameter. Duodenal mobilization was made by an extensive Kocher’s maneuver. This procedure not only increases the length of the tubulized stomach, but also allows the pylorus to assume a more lined up position with the new esophagus. We performed in all cases only a simple finger stretching pyloroplasty. The cervical stage of the operation was carried out through a left cervical incision. The esophagus was mobilized and sectioned. A drain tube was attached to the distal end of the esophagus that was pulled down into the abdomen. The gastric tube was then sutured with two or three silk stitches at the distal extremity of the drain tube and gently pulled up to the neck. Particular care was taken to avoid torsion or kinking of the vascular pedicle during this maneuver.

2.1. Technique of the cervical anastomosis

After transection of the cervical esophagus, frozen sections of the esophageal margins are obtained. The gastric tube and the proximal esophagus are prepared for the anastomosis. The proximal end of the gastric graft is transected and intraluminal content is evacuated by gentle suction. Two pexing silk sutures between the posterior wall of the esophagus and the posterior wall of the gastric tube are placed. This allows to maintain the cervical esophagus and gastric tube in a side-to-side position, such as a double barreled gun (Fig. 1A). In order to avoid mucosal retraction, two full thickness silk sutures are placed on the esophagus and on the gastric wall at the level of the gastrootomy to maintain an adequate traction during the anastomosis. The two forks of an endoscopic linear stapler (ETS45 blue cartridge, Ethicon Endo-Surgery) are placed across the two opposite walls with the anvil on the esophageal lumen and the cartridge in the gastric tube (Fig. 1B). After approximation of the forks and control of proximal esophagus for avoiding twisting, the stapler is fired, thus accomplishing the posterior part of the anastomosis (Fig. 1C). At this time a nasogastric tube is inserted, and the anterior aspect of the anastomosis is completed by two or more additional firings of the Endo-GIA stapler straight across the raised edges of the stomach and of the esophagus (Fig. 1D). Two or three sieromuscolar silk stitches are then placed to reinforce the anterior part of the anastomosis. Once completed, the anastomosis drops back into the thoracic inlet. A drainage tube is inserted in the cervical wound before standard wound closure.

2.2. Post-operative assessment of the anastomosis

A contrast medium swallow study was routinely performed in sixth or seventh post-operative day. If no anastomotic leak was identified the patient was allowed to start oral intake. Esophagoscopy was performed between the seventh and the 10th post-operative day using a pediatric endoscope (9.8 mm in diameter) introduced under direct vision after low gas inflation, with the aim to evaluate the quality of the anastomosis and the vitality of the gastric graft. Endoscopic re-evaluation was performed in all patients 3 months after operation. A clinico-radiological follow-up has been possible after 6 months only in 22 cases, since four patients (15%) died for progression of their neoplastic disease.

3. Results

Patients were routinely extubated in the I.C.U. 12 h after the procedure, and prophylactic broad spectrum intravenous antibiotics were administrated. All patients received continuous epidural analgesia and were mobilized as early as possible. No peri-operative deaths occurred. All six patients undergone esophagectomy after neo-adjuvant chemotherapy received radical resection and in two cases we found complete response (T0 N0). Definitive tumor’s histology and pathological staging was as follows: adenocarcinoma was confirmed in 11 cases (43%) (T1–T2 N0 in three, T1–T2 N1 in five and T3 N1 in three), and squamous cell carcinoma in 15 (57%) (T1–T2 N0 in four, T1–T2 N1 in nine and T0 N0 in two). In all cases early endoscopic evaluation demonstrated that the anastomosis was fully patent. Three patients (23%) developed limited dehiscence of the abdominal wound, and two experienced respiratory complications treated successfully. In one case early anastomotic leakage was clinically suspected and confirmed endoscopically (Fig. 2A). No evidence of ischemia of the gastric tube was demonstrated and complete spontaneous healing was observed in 20 days. A follow-up of at least 3 months was recorded for every patient regarding symptoms and endoscopic features: endoscopy excluded anastomatic sticture or neoplastic recurrence (Fig. 2B). Median post-operative hospitalization was 21 days, ranging from 12 to 39 days. Two patients developed mediastinal recurrence, and one of them died 4 months after the operation. Three more patients died for liver and kidney metastases after 5 months.
4. Discussion

The use of stomach as an esophageal substitute is a well described procedure. However, there are conflicting reports regarding the best method for mobilization and moulding of the stomach for the reconstruction of the alimentary continuity after esophagectomy. Whole stomach and wide or narrow gastric tube can be employed [2–5]. In our previous experience (1990–2000) the use of a narrow gastric tube (3–5 cm in diameter), in a consecutive series of 93 esophagoplasty, was associated with an operative mortality of 3.4% (three pts) that in only one case was due to gastric tube necrosis and subsequent mediastinitis [1]. Early leakage of the cervical manual anastomosis developed in 2% of the patients and complete spontaneous healing was achieved with cervical drainage and parenteral nutrition. The most frequent post-operative complication in our previous series was the late fibrous stenosis of the esophagogastric anastomosis, developed in 28 patients (30%). With the aim of reducing the incidence of this specific complication, at the end of the 2000 we started to perform a cervical totally mechanical anastomosis using an endoscopic linear stapler, based on the technique previously proposed by Collard et al. [6] and Orringer et al. [7].

Fig. 2. (A) Endoscopic view of the cervical esophagogastric anastomosis. Partial dehiscence of the antero-lateral portion of the anastomosis is clearly evident. (B) The endoscopic follow-up demonstrates the complete spontaneous healing without stricture or neoplastic recurrence.
Experimental studies [8,9] demonstrated that the diameter of the anastomosis using linear stapler was greater than that obtained with circular stapled or manual anastomosis with lower incidence of late fibrous stenosis. Nevertheless, the employment of linear stapler GIA was limited because of the large dimension of the device when used for cervical anastomosis. Likewise, mechanical circular stapler for cervical anastomosis did not reach large diffusion because of technically demanding and associated with an high rate of late stenosis [10].

The availability of smaller cutting and stapling device (endoscopic stapler) allowed to perform the esophagogastric cervical anastomosis as proposed by Collard et al. [6] and Orringer et al. [7]. More recently Singh et al. [11] reported the technique to perform a totally mechanical cervical esophagogastric anastomosis. Nevertheless, all previous reports [5,7,11,12], describe a side to side, or a end to side anastomosis technique. Our technique is still a side to side anastomosis but it functionally works such as an end to end anastomosis. This characteristic is clearly evident from the endoscopic images that show no difference between the caliber of the esophagus and gastric tube and no angle between their axes. Other authors have described techniques of side to side semimechanical anastomosis using whole—stomach [6] or narrow gastric tube [5]. Many papers recommend to use a whole stomach when performing mechanical anastomosis since the authors suggest that if the caliber of the gastric tube is small the stapler line along the lesser curvature terminates at the top of the transplant and theoretically this could be a factor that increases the incidence of anastomotic leakage [5,6]. Our experience using a narrow gastric tube and totally mechanical anastomosis seems to bring to different conclusions, since we observed a small self healing leakage in only one case without development of fibrous stenosis.

The linear stapler mechanical anastomosis requires a longer proximal esophageal stump and we agree with other authors that it should not be employed for cervical or upper thoracic esophageal cancer [6].

Although larger experience is required, we may conclude that complete mechanical stapled esophagogastric anastomosis is effective and safe even when a narrow gastric tube is used as an esophageal substitute.

References