Cervical esophagogastric anastomosis with invagination after esophagectomy[1]

Anastomose esofagogástrica cervical com invaginação após esofagectomia

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ABSTRACT

PURPOSE: To evaluate the incidence of fistula and stenosis of the cervical esophagogastric anastomosis with invagination of the proximal esophageal stump into the stomach after subtotal esophagectomy.

METHODS: We studied 54 patients who underwent subtotal esophagectomy, 45 (83.3%) patients with carcinoma and nine (16.6%) with advanced megaesophagus. In all cases the cervical esophagogastric anastomosis was performed with the invagination of the proximal esophageal stump inside the stomach.

RESULTS: Three (5.5%) patients had a fistula at the esophagogastric anastomosis, two of whom with minimal leakage of air or saliva and with mild clinical repercussion; the third had a low output fistula that drained into the pleural space, and this patient developed empyema that showed good progress with drainage. Fibrotic stenosis of anastomosis occurred in thirteen (24%) subjects and was treated successfully with endoscopic dilatation.

CONCLUSION: Cervical esophagogastric anastomosis with invagination of the proximal esophageal stump into the stomach tube presented a low rate of esophagogastric fistula and stenosis, thus becoming an attractive option for the reconstruction of alimentary transit after subtotal esophagectomy.

Key words: Esophagus. Esophagectomy. Constriction, Pathologic. Anastomotic Leak, Gastroplasty.

RESUMO

OBJETIVO: Avaliar a incidência de fístula e estenose da anastomose esofagogástrica cervical com invaginação do coto esofágico proximal no interior do estômago após esofagectomia subtotal.

MÉTODOS: Foram estudados 54 pacientes submetidos à esofagectomia subtotal, 45 (83,3%) com carcinoma e nove (16,6%) com megaesôfago chagásico avançado. Em todos os casos, a anastomose esofagogástrica cervical foi realizada com invaginação do coto esofágico proximal no interior do estômago.

RESULTADOS: Três (5,5%) pacientes apresentaram fístula, dois deles com saída mínima de ar e saliva pela incisão cervical que evoluíram com rápida cicatrização; o terceiro apresentou fístula de pequeno débito que drenou para o espaço pleural causando empiema que teve boa evolução após drenagem. Treze (24%) doentes apresentaram estenose fibrótica e foram tratados com sucesso com dilatação endoscópica.

CONCLUSÃO: A anastomose esofagogástrica cervical com invaginação do coto esofágico proximal no interior do estômago apresentou baixa incidência de fístula e estenose tornando-se opção atraente para a reconstrução do trânsito alimentar após esofagectomia subtotal.

Descritores: Esôfago. Esofagectomia. Constrição Patológica. Fistula Anastomótica, Gastroplastia.

Introduction

Esophagectomy is a complex surgical procedure and has as its main purpose the esophageal cancer treatment[1]. It is also indicated to the treatment of benign diseases, especially advanced megaesophagus[2].

Esophagectomy is a major surgery that has both a high morbidity rate (60%) and mortality rate, which may reach 26.7%, mainly due to pulmonary complications, cervical fistulas, stenosis of anastomosis, necrosis of the tubularized stomach, and mediastinitis[3-6].

Among these possible complications, fistulas of the esophagogastric anastomosis represent one of the main problems of esophagectomies. Incidence in several studies has ranged from 0% to 50%, with most authors reporting a high incidence of this complication[1,4,7,8].

Although these fistulas usually have a favorable course, about 2% of cases can have a catastrophic outcome[6]. In cases in which the fistula does not lead directly to death, it may compromise quality of life, interfere with resumption of feeding, require laborious local care, and prolong hospital stay. Additionally, 30% to 50% of those patients who present with fistula go on to develop stenosis[5].

Stenosis develops in 5% to 50% of all operated cases, and can manifest itself up to one year after surgery. In addition to fistula, other factors, such as cardiac insufficiency, ischemia of the gastric fundus, and mechanical anastomosis can contribute to the development of stenosis[9,10].

In view of the high incidence of esophagogastric fistulas associated with significant levels of mortality and morbidity, several surgical techniques have been tried to reduce the frequency of fistula formation. These approaches include: anastomosis in two stages[11], revascularization of the gastric tube[12], laparoscopic mobilization of the stomach and preparation of the gastric conduit five days before the esophagectomy[13], omentoplasty of cervical esophagogastrostomy[14,15], stapled anastomosis following partial resection of the sternum and left clavicle[16], manual two-layer anastomosis[1], mucosal tube technique[17] and anastomosis with invagination[18-20].

Haight[21] reported the successful correction of tracheal esophageal fistula in newborns by using esophageal-esophageal anastomosis and telescoping of all layers of the cranial end towards the distal end.

Nigro[22] carried out esophageal-esophageal anastomosis with invagination in dogs. This author performed such procedure by making a 2.0 cm long segment of submucosa and mucosa in the proximal stump that was invaginated into the distal stump and concluded that the anastomosis is safe and effective.

Szücs *et al*.[20] reported 108 cases that underwent esophagectomy with esophagogastric anastomosis and telescoping of a 10-15 mm length of the esophageal end into the stomach. Of these cases, 12 (11.1%) developed fistula at the anastomotic site.

Given this scenario and personal experience of a high incidence of cervical esophagogastric fistula in treatment of carcinoma of the esophagus[7], we decided to perform cervical esophagogastric anastomosis with invagination. We conducted a comparative study of the cervical esophagogastric anastomosis with and without invagination after esophagectomy for cancer and observed significantly lower incidence of fistula when the anastomosis was performed with invagination[18] and that the fistula had minimal clinical impact[18,19].

The objective of this study was to analyze the incidence of fistula and stenosis of the cervical esophagogastric anastomosis with invagination after subtotal esophagectomy and esophagogastroplasty for the treatment of carcinoma of the esophagus and advanced chagasic megaesophagus.

Methods

We studied 54 patients who underwent subtotal esophagectomy and esophagogastroplasty. Forty five (83.3%) patients had carcinoma of the esophagus and nine (16.6%) had advanced chagasic megaesophagus.

The study group included 44 (81.4%) men and 10 (18.6%) women, with a mean age of 58.5 years (range 30 to 84 years).

In patients with carcinoma of the esophagus the diagnosis was confirmed by upper esophageal endoscopy and biopsy: 33 (73.3%) patients had squamous cell carcinoma and the remaining 12 (26.6%) had adenocarcinoma. Lesions were located in the medial third of the esophagus in 21 cases (46.6%) and the inferior third in 24 patients (53.3%).

The inclusion criteria for operation were: esophagogram with no abnormal axis deviation, lesions up to 5.0 cm long, absence of signs of invasion of the respiratory tree on bronchoscopy, and absence of signs of irresectability of the esophageal lesion or neoplastic dissemination on thoracic and abdominal tomography. Cases in which an anesthetic or surgical procedure was contraindicated due to compromised clinical state and/or concurrent serious systemic disease were excluded from the study.

In patients with chagasic megaesophagus, the diagnosis was confirmed by endoscopy and contrast radiography of the esophagus. The candidates for esophagectomy were cases with

dolicomegaesophagus, transverse diameter of the esophagus body larger than 10 cm, megaesophagus recurrence after surgery on the gastroesophageal junction, and patients without serious comorbidities that contraindicated a major operation.

All patients underwent pre-operative clinical evaluation: 18 (33.3%) had serious clinical malnutrition as shown by weight loss of greater than 20%, 12 (22.2%) patients presented systemic arterial hypertension, five (9.2%) had chronic obstructive pulmonary disease, three (5.5%) had diabetes and 30 (55%) had alcohol abuse and/or tobacco abuse.

In the absence of contraindications, a subtotal esophagectomy followed by a cervical esophagogastroplasty was performed. In 41 (75.9%) patients, surgery was performed with a transhiatal approach, and 13 (24%) with an abdominothoracocervical approach.

All surgeries were carried out by two teams, with one team operating in the abdominal region and the other in the cervical region. In cases of cancer, lymph node resection was done in both the abdominal and inferior mediastinal fields. In all cases the tubularized stomach was pulled up to the cervical region by the posterior mediastinum.

The esophagus was dissected and separated from its neighboring structures in the cervical, thoracic, and abdominal areas. The esophagus was sectioned in the cervical region, with care taken to preserve enough of the proximal end to allow 4.0 cm of esophagus to be inserted into the stomach, with a safety margin greater than or equal to 5.0 cm. The esophagus was then pulled to the abdominal region, and the stomach sectioned with a linear stapler that released the surgical specimen. If the safety margin was judged to be inadequate, end-to-end anastomosis was performed instead of invagination and this patient was excluded from the study.

In the region elected for anastomosis, a transverse myotomy was carried out around the entire circunference of the esophagus (Figure 1). The proximal border of the myotomy was anastomosed with the tip of the tubularized stomach placed in the cervical region. The anastomosis of the posterior wall was performed first by using suture of 4-0 polydioxanone (Figure 2). Subsequently, the 4.0 cm segment of the proximal esophageal stump was introduced or invaginated into the stomach. The anastomosis of the anterior wall was equal to the one performed on the posterior wall (Figure 3).

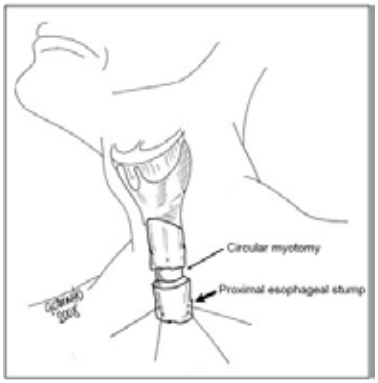

FIGURE 1 - Diagram showing the circular myotomy (thin arrow) in the proximal esophageal stump (thick arrow), creating a 4.0 cm segment of extension to be invaginated into the stomach

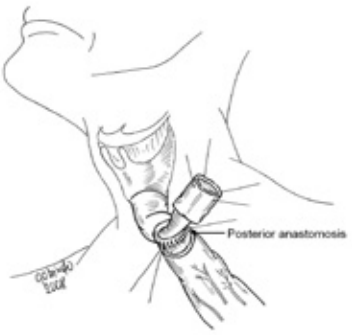

FIGURE 2 - Diagram showing the suture of the posterior wall of the esophagogastric anastomosis (the illustration of the trachea was omitted).

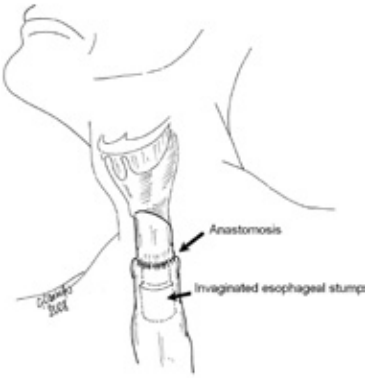

FIGURE 3 - Diagram showing the proximal esophageal stump invaginated into the stomach (the illustration of the trachea was omitted).

In cases of chagasic megaesophagus, the technique of esophagectomy was approximately the same as that for the cases with esophageal cancer. Lymphadenectomy was not performed and invagination anastomosis was held in a different way: the esophagus was sectioned in the neck with care to get a bigger esophageal proximal stump, with nearly 6 cm length, which was invaginated into the stomach. In addition, the muscular layer of the esophageal segment to be invaginated was removed so that the invaginated portion inside the stomach was comprised only of the

mucosal layer (Figure 4).

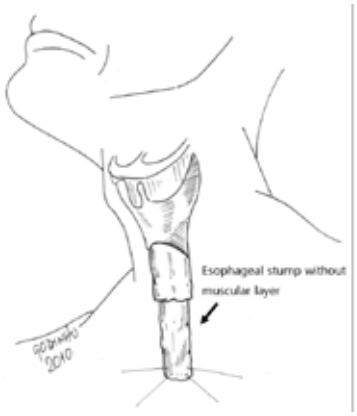

FIGURE 4 - Diagram showing the proximal esophageal stump without the muscular layer (the illustration of the trachea was omitted).

In all patients extra mucosal pyloroplasty was carried out, a nasoenteral tube was inserted and the cervical region was drained.

Oral feeding was usually started on the 10th post-operative day, in the absence of signs of esophagogastric fistula. If a fistula was present, the affected site was treated, and feeding was maintained by the nasoenteral tube. In this case, oral diet was begun following closure of the fistula.

Results

No patients died intra-operatively. Post-operative complications occurred in 41 (75.9%) patients. Five (9.2%) patients had serious complications which led to death: two as a result of bronchopneumonia, one due to multiple organ failure after acute cholecystitis, one from sepsis following ischemic necrosis of the stomach and the last due to mesenteric trombosis; all of them with no relation with abnormalities in the esophagogastric anastomosis.

Three (5.5%) patients had fistula at the esophagogastric anastomosis with minimal leakage of air or saliva, two of whom with mild clinical repercussions and only one (1.8%) with important clinical manifestation. Two of these had a fistula on the 7th and 10th post-operative day, with the leakage of a small amount of air or saliva from the cervical incision and consequent formation of a bubble during swallowing. In these two patients, spontaneous closure occurred after ten and five days, respectively. The 3rd case had a sero-purulent pleural effusion on the 13th post-operative day, which was drained; the methylene blue test indicated an esophagopleurocutaneous low output fistula. The patient was treated with antibiotics and pleural drainage, had good evolution and was discharged on the 23rd postoperative day.

No patients had esophagogastric fistula with intense saliva leakage from either the cervical incision or the thoracic drain.

Postoperative fibrotic stricture of the anastomosis occurred in thirteen (24%) patients; in twelve of these cases this appeared within 16 days to 12 months; in one pacient it appeared 36 months after surgery. All of these patients obtained relief from their dysphagia with endoscopic dilatation of the anastomosis, with the number of sessions required ranging from 1 to 7 (mean=4). The other complications were successfully treated: dysphonia in 24 (44.4%), bronchopneumonia in eleven (20.3%), atelectasis in three (5.5%), renal failure in three (5.5%), acute atrial fibrillation in one (1.8%) and wound infection in one (1.8%). The mean length of hospital stay was 15.7 days, with a range of 11 to 40 days.

Discussion

Esophagogastric anastomosis with invagination is a modification of a technique performed with the purpose of reducing fistula formation at the anastomosis site[18].

In cancer cases, we chose to invaginate a 4.0 cm segment made up of all the layers of the esophagus wall, a longer segment than that suggested by Szucs *et al*.[20] and we added a transverse myotomy around the circumference of the esophagus. Our intention was not only to cover the entire site of the anastomosis, but also to encourage the discharge of saliva in a lower region, aiming to leave the anastomosis site out of alimentary transit. To this end, it was necessary to invaginate a longer segment consisting of all the layers of the wall of the esophagus, so that the inserted portion remained in the shape of a tube in the interior of the stomach.

To execute the anastomosis, we elected a region at the proximal esophagus where the suture would be placed, and preserved a 4.0 cm esophagus segment to be invaginated into the stomach. At this point, a transverse myotomy was done around the circumference of the esophagus. We sutured the proximal border of the myotomy together with the seromuscular layer of the stomach. The purpose of the myotomy was to create a bloody border in the muscular layer of the esophagus, to be sutured with the seromuscular layer of the stomach, and also to elongate the esophageal stump to be inserted into the stomach.

Section of the cervical esophagus should be performed in a region that ensures adequate safety margin, as carcinoma of the esophagus can spread within the wall to sites distal from the principal lesion[23,24]. Akiyama[24] and Roth *et al*.[25] recommended a 5.0 cm margin of tumor-free esophagus for a safe resection, with exception made for well-circumscribed lesions in the cervical

esophagus, where smaller margins are tolerated. To perform an esophagogastric anastomosis with invagination, it is necessary to save 4.0 cm more of proximal esophagus than for anastomosis without invagination. If it is not possible to achieve an adequate margin, the invagination procedure should be abandoned.

In our view, the fact that this technique preserves 4.0 cm more of the esophagus does not detract from the radical nature of the operation. Esophagectomy using the Ivor Lewis technique has been performed by many authors[26,27]. In this technique, esophagogastric anastomosis is carried out in the apex of the thorax and, besides preserving 5.0 cm more of esophagus compared to cervical anastomosis, is considered a radical surgical technique. Upon constructing a cervical esophagogastric anastomosis with invagination, the amount of remaining esophagus is no greater than that usually left when anastomosis is done in the thoracic apex. Walther *et al*.[23], in a prospective randomized study, compared cervical with intra-thoracic esophagogastric anastomosis. They concluded that the withdrawal of an extra 5.0 cm of esophagus to perform anastomosis in the neck did not impact the five years survival rate. Consequently, we believe that, following all the recommendations and leaving a safety margin, esophagogastric anastomosis with invagination does not breach any radical oncological principles.

In cases of chagasic megaesophagus, the anastomosis with invagination was performed in a different way from that performed in cases of cancer: the muscular layer of the segment to be invaginated was removed and it was made with greater length of about 6 cm. Taking into account that the lesions causing dysphagia in chagasic megaesophagus occur in the muscular layer of the viscera, we consider unsuitable to save a segment of this layer to be invaginated into the stomach. Because of this, the invaginated segment was composed only of the mucosa layer of the esophagus, a little longer to compensate for the slight shortening of this layer due to the removal of the muscular layer. Although the esophagogastric anastomosis with invagination performed on patients affected by cancer has been executed differently from the one executed in patients with chagasic megaesophagus, the rationale for the use of the anastomosis with invagination is the same in the two conditions: it covers the anastomosis and promotes drainage of saliva in the region located below the suture line, an attempt to "exclude" the anastomosis from the salivary transit.

The diagnosis of fistula of the esophagogastric anastomosis was made based exclusively on clinical criteria, given that a radiological study with water-soluble contrast has low sensitivity and a high incidence of false negatives[28].

None of our cases operated by esophagectomy with esophagogastric anastomosis with invagination developed fistula with heavy egress of saliva from the cervical incision. Compared with results from the literature[4,7,8], which show an incidence of fistulas up to 50%, cervical esophagogastric anastomosis with invagination had a low incidence of fistula formation, with only one case (1.8%) having important clinical repercussion.

It is possible that esophagogastric anastomosis with invagination did not influence the factors responsible for the formation of the fistula. Moreover, it is likely that points of dehiscence can occur along the suture line similarly to occasions when we perform the end-to-end technique. However, as the saliva flows to an area below the anastomosis, these points of dehiscence can undergo rapid regeneration. On the other hand, in cases without invagination, the saliva discharges directly into the area of the suture with dehiscence, which provokes inflammation and infection, thereby delaying the healing process and enlarging the dehiscence area.

In view of this mechanism, we believe that the three cases observed of fistula formation in esophagogastric anastomosis presented with mild clinical repercussion, even when the fistula was directed toward the pleural space.

The application of self-expanding stents in the treatment of esophagogastric anastomosis fistula applies the same principle. The stent is inserted by means of an endoscopy, in the anastomosis region, totally covering the circumference of the suture line. Because of this, the saliva flows to an area below the anastomosis allowing the dehiscence area to undergo rapid healing[29,30].

In the present study, 13 (24%) cases developed postoperative strictures of anastomosis; this rate lies within the five to 45% limit described by other authors[9,10]. We believe this result could have been due to the fact that anastomosis with invagination did not influence the factors that might predispose the formation of fistula, such as ischemia in the proximal portion to the gastroplasty. In this situation, the points of dehiscence would have occurred along the suture line at a similar rate to anastomosis without invagination. However, the presence of a fistula was not always identified by using clinical criteria, possibly due to the fact that saliva discharges below the point of the dehiscence. These events could possibly trigger a fibrotic reaction and scarring, with subsequent stenosis formation in the anastomosis.

The other complications encountered in the present study were inherent in the nature of the operation, having no direct relation to esophagogastric anastomosis with invagination.

Conclusion

Cervical esophagogastric anastomosis, with invagination of the proximal esophageal stump into the stomach in subtotal esophagogastrectomy with gastroplasty, has low incidence of fistula formation and, when it occurs, it has mild clinical repercussion.

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