Comparative Study of Early Postoperative Complications: Thoracic Anastomosis vs Cervical Anastomosis – in Esophageal Replacement with Gastric Graft

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Rezumat

Studiu comparativ al complicațiilor peroperatorii: anastomoză intratoracică vs anastomoză cervicală - în reconstrucția esofagiană cu stomac după esofagectomie

Stomacul este cel mai folosit segment al tubului digestiv în vederea esofagoplastiei după rezecția esofagiană pentru diverse patologii, neoplazice sau benigne. În articolul nostru comparăm diferențele de mortalitate și morbiditate între cazurile la care anastomoza esogastrică a fost efectuată intratoracic cu cele la care s-a efectuat esogastrostomia la nivel cervical. Lotul studiat cuprinde un număr de 126 de pacienți - 58 de cazuri (46%) anastomoză la nivel cervical; 68 de cazuri (64%) esogastroanastomoza a fost efectuată intratoracic. Mortalitatea totală în seria noastră este de 5.55% (7 pacienți) iar morbiditatea semnificativă a fost de 28%. Pe lotul studiat, cu excepția fistulelor anastomotice mai frecvente la nivel cervical (13.8% vs 1.5%), nu există diferențe semnificative în ceea ce privește mortalitatea și morbiditatea postoperatorie între cazurile la care s-a efectuat anastomoza la nivel cervical sau intratoracic. Recomandăm efectuarea anastomozei intratoracice ori de câte ori este posibil din punct de vedere al leziunii, tehnica fiind sigură, ușor de efectuat și scurtând și timpul operator prin eliminarea timpului cervical

Cuvinte cheie: anastomoza esogastrică intratoracică, anastomoza esogastrică cervicală, complicații post esofagectomie

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Abstract

Gastric pull-up is the most commonly used procedure for esophageal replacement in both malignant and benign conditions. In our article we compare the differences in mortality and morbidity between thoracic anastomosis and cervical anastomosis during gastric pull-up. The study group comprised of 126 patients – 58 patients (56%) with cervical anastomosis and 68 patients (64%) with thoracic anastomosis. The overall mortality in the study group was 5.55% (7 patients), while the overall morbidity was higher at 28%. There were no significant differences between the two subgroups regarding mortality and morbidity, although the rate of anastomotic leakage was higher in the cervical subgroup (13.8% vs 1.5%). We recommend performing thoracic anastomosis during gastric pull-up whenever the location of the lesion allows it, since the procedure is safe, relatively easy to master and it shortens operating time by excluding the cervical approach.

Key words: intrathoracic esophagogastric anastomosis, cervical esophagogastric anastomosis, postesophagectomy complications

Introduction

The stomach is the most commonly used gastrointestinal segment for esophageal replacement in malignant conditions and it can also be used for benign conditions, although not as frequent nor as a first choice. It presents a series of advantages for oncologic patients which in most cases are malnourished and have difficult, but manageable morbidities. The high plasticity and extensive submucosal vascular network allow the stomach to remain viable even when two thirds of its arterial supply is compromised; another advantage is represented by the ability to restore gastrointestinal function by means of only one anastomosis (1).

There is a wide variety of surgical techniques for esophageal replacement involving the stomach, and while some present only historical value, such as the Gavrilu techniques which were revolutionary at their time, other procedures have withstood the test of time and have even been updated for minimally invasive surgery.

Re-establishing the gastrointestinal function depends on a multitude of factors: location of the esophageal tumor (lesion), type of esophageal resection, the approach for gastric pull-up and, last but not least, the surgeons preference. The purpose of this article is to assess the differences in mortality and

morbidity between thoracic anastomosis and cervical anastomosis after gastric pull-up in a group consisting of patients operated in our department between the years 2007 and 2016.

Materials and Methods

We studied a number of 186 patients which underwent esophageal resection and reconstruction through different techniques. Our retrospective study was conducted on a prospective database started on January 1st, 2007, when our department was included in the Europeans Society of Thoracic Surgery (ESTS) database project (2).

In a number of 26 cases we used colon interposition. The procedure was addressed to patients with benign conditions (esophageal caustic stenosis – 18 cases) as well as patients with malignant conditions (esophageal cancer – 6 cases). In 5 cases the patients had previous gastric resection for gastroduodenal ulcer and one patient had partial necrosis of the gastric graft following esophageal reconstruction. With the exception of one case when the anastomosis was thoracic, the other cases had colon interposition with cervical anastomosis. We commonly use the transverse colon during esophageal reconstruction while preserving either the middle colic artery (antiperistaltic) or the ascending branch of the left colic artery

(isoperistaltic), depending on the size of the arterial pedicle at the time of surgery. These cases were excluded from the study.

In 34 other cases (esophageal cancer) we used the stomach in order to re-establish gastrointestinal function through different techniques. Since all these patients previously had induction chemotherapy, radiotherapy or both and did not constitute a homogeneous group, we decided to not include them in our study as to not influence the final results.

In the remaining 126 cases we either used the stomach as a hole or a gastric tube obtained by dividing the stomach along the lesser curvature. The stomach as a hole was used in benign affections (postcaustic stenosis – 9 patients, peptic stenosis – 2 patients, achalasia – 1 patient and esophageal leiomyomatosis – 1 patient); the gastric tube, obtained by dividing the stomach along the lesser curvature (in order to lengthen the gastric graft and perform lymphadenectomy), was used for cancers of the esophagus or gastro-esophageal junction. These 126 patients represent our study group and their clinical data is presented in *Table 1*.

Our decision regarding the anastomotic site, cervical or thoracic, was strictly based on the patients underlying condition. As such, a lesion (frequently malignant) located in the lower third of the esophagus or at the gastro-esophageal junction was resolved by thoracic anastomosis, while a lesion located in the

upper two thirds of the esophagus was resolved by cervical anastomosis.

In 58 cases (46%) the anastomosis was made in the cervical region. The McKeown triple approach was used in 51 cases, while the Sloan-Orringer transhiatal approach was used in 7 cases. In 68 cases (64%) the thoracic anastomosis was performed on the right side (Ivor-Lewis technique – 65 cases), while in three cases the thoracic anastomosis was performed on the left side (Sweet technique).

The preferred techniques were the McKeown triple approach for cervical anastomosis (3) and Ivor-Lewis approach for thoracic anastomosis (4). The Orringer approach was used for benign conditions or in-situ malignant lesions without apparent lymphnode involvement. The Sweet technique for left side thoracic anastomosis was used when the left pleural cavity was opened by accident during transhiatal dissection. In these cases we performed median laparotomy and left lateral thoracotomy, without the need to perform an incision along the rib cage border or incise the diaphragm which we consider to be more traumatic and compromise the integrity of the thoracic wall (5).

In all of the cases the procedures were performed by classic, open surgery. We are perfectly aware that these procedures can also be performed by using a minimally-invasive approach with real benefits for the patients (6) but unfortunately we do not possess the

Table 1.

////////////////////////////////////	Cervical anastomosis - 58	Thoracic anastomosis - 68
Age (median/limits)	65 (47 - 76)	67 (42 - 78)
Sex (M:F)	44 : 14	50 : 18
Pathology	////////////////////////////////////	////////////////////////////////////
Benign	8	5
Squamous carcinoma	41	22
Adenocarcinoma	9	41
Disease stage	////////////////////////////////////	////////////////////////////////////
I	4	7
II	22	31
III	19	24
IV	5	1

necessary means and many of the cases were in an advanced stage disease which would have made the minimally-invasive approach even more difficult.

No matter which approach is used, open surgery or minimally-invasive surgery, we believe extensive lymphadenectomy in cervical, abdominal and thoracic regions is extremely important especially from a staging point of view but also for better local disease control (7, 8). This constitutes the main reason why we prefer to perform a thoracic anastomosis (by open surgery or minimally-invasive surgery) instead of using the Sloan-Orringer technique.

Both the thoracic and cervical anastomosis are performed in a standard manner, terminal-lateral ends, with separate 4-0 polydioxanone stitches which have an absorption rate of 182 – 238 days. After the posterior wall of the anastomosis is completely sutured and the anterior stitches have been placed, we insert the nasogastric tube for both protection and drainage of the gastric content before tying the anterior stitches; the nasogastric tube will not be used for nourishment (the patient will be fed by jejunostomy starting 8 hours after surgery) and will be removed on day 2 or 3 after surgery when gastric drainage is less than 200 ml/24h (*Figs. 1, 2*). Also, when there is „sufficient” surrounding tissue at the site of the anastomosis (generally in thoracic anastomosis) for protection and gastric reflux prevention, we employ the Sweet technique which consists in elevating two folds of the gastric fornix, one on each side, and suturing them to one other towards the anterior of the anastomosis thus protecting both the anastomosis and the esophagus which now „rests” on the stomach (*Fig. 3*).

In this article we will analyze the characteristics of the two subgroups of patients, thoracic anastomosis vs cervical anastomosis, while trying to underline the key differences between anastomotic sites.

Results and Discussions

The complications following esophageal resection and reconstruction are formidable and well known to surgeons involved in this field (9).

Figure 1. Thoracic terminal-lateral anastomosis – posterior wall is finished, passing the nasogastric tube for protection

Figure 2. Cervical terminal-lateral anastomosis – posterior wall is finished, passing the nasogastric tube for protection

Figure 3. Preventing gastric reflux – Sweet technique – for thoracic terminal-lateral anastomosis

Postoperative mortality and morbidity are significantly higher than in other procedures

and strongly correlate with the surgeons experience and number of patients operated on (10). Respiratory complications, being the most frequent, are responsible for 50% - 75% of post-operative deaths; 15% – 30% of the patients will develop a respiratory problem, of which 80% will be in the first 5 days (11).

Table 2 shows mortality and morbidity rates in the study group.

Overall mortality was 5.55% (7 patients). Four patients died from respiratory complications (pneumonia) after prolonged intubation, which led to multiple system organ failure. Two patients died from acute coronary events and one patient died from pulmonary embolism. There is no significant difference in mortality between the two subgroups.

In 72% of the patients (91 cases) there were no complications or the complications were minor (seroma, prolonged air loss, alcohol withdrawal syndrome) and the overall morbidity was 28%.

Among pulmonary complications we list pneumonia, stagnation of pulmonary secretions which required bronchoscopy and pleural effusions which required chest tube drainage (not chylothorax). Cardiac complications consisted of acute coronary events and various types of arrhythmias (atrial fibrillation was the most frequent). There were no significant differences between the two subgroups.

One patient developed partial gastric graft necrosis and required emergency resection of the gastric tube followed by colon interposition

3 months later. Laryngeal nerve palsy is common given the extensive dissection in the cervical region and in both cases paralysis was temporary. Deep venous thrombosis, and later pulmonary embolism, lead to the death of one patient in spite of anticoagulant therapy. Postoperative dysphagia was reported in one case and resolved by resection of the sternoclavicular joint in order to enlarge the thoracic inlet. After such an experience we decided to perform resection of the sternoclavicular joint whenever a patient requiring cervical anastomosis had a reduced diameter of the thoracic inlet and was at risk of dysphagia. Even though the article refers to early morbidity it is important to mention that on long term, impaired deglutition – dysphagia, airway aspiration – were more frequent in cases when the anastomosis was performed at cervical level.

Renal and hepatic complications were easily managed and not worth mentioning. In four cases evisceration was treated conservatively.

Anastomotic leakage (AL) was the only complication with significant differences between the two subgroups (13.8% vs 1.5%). All cases were treated conservatively; according to existing international evidence only selected cases require surgery (12). The difference in values between AL rates for cervical anastomosis and thoracic anastomosis are well documented. The suggested explanations for a higher rate of cervical AL are 1) the reduced blood supply available in the cervical region, 2)

Table 2.

////////////////////	Cervical anastomosis - 58	Thoracic anastomosis - 68
Mortality	3 (5.17%)	4 (5.88%)
No complications	41 (70.6%)	50 (73.5%)
Respiratory complications	5 (8.6%)	7 (10.3%)
Cardiac complications	4 (6.9%)	6 (8.8%)
Pulmonary embolism / Deep venous thrombosis	1 (1.7%)	0
Anastomotic leakage	8 (13.8%)	1 (1.5%)
Graft necrosis	1 (1.7%)	0
Laryngeal nerve palsy	2 (3.4%)	0
Dysphagia	1 (1.7%)	0
Other complications	4 (6.9%)	6 (8.8%)

high anastomotic tension in a short gastric graft, 3) lack of protective tissue with rich blood supply, 4) low protein levels, especially albumin, and 5) anemia (13). International studies have demonstrated the correlation between mortality rate and the presence of an AL, a correlation not present in our study, most likely due to the small number of patients involved.

Conclusions

In our study, with the exception of anastomotic leakage, which is more frequent after cervical anastomosis, we did not find significant differences in mortality and morbidity between the two types of anastomosis. We recommend performing thoracic anastomosis whenever the location of the lesion allows it and we consider the technique to be safe, easy to master and it shortens operating time by excluding the cervical stage. The recorded overall mortality and morbidity correspond with values published in international literature.

Conflicts of Interest and Source of Funding

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