Thoracoscopic vagal-sparing esophagectomy and colonic interposition for caustic stricture

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ABSTRACT

Minimally invasive esophagectomy is an increasing trend in surgery. Thoracoscopic esophagectomy is applicable and an alternative procedure to conventional esophagectomy in patients especially with end-stage benign diseases like caustic stricture.

Thirty three-year-old female patient was admitted to the department of general surgery with dysphagia. The patient was suffering from caustic stricture due to ingestion of hydrochloric acid. A totally thoracoscopic vagal-sparing esophagectomy and colonic interposition with laparotomy was carried out.

As a more physiologic alternative, vagal-sparing esophagectomy is the ideal operation for these patients.

Keywords: Vagus nerve preservation, thoracoscopy, esophagectomy, minimally invasive surgery, esophageal diseases, caustic esophageal stricture

INTRODUCTION

The general intention of surgeons is to perform a standard transhiatal or transthoracic esophagectomy with colonic interposition or gastric pull-up procedure for benign end-stage and premalignant or in situ malignant lesions of esophagus. During none of these operations, the standard preservation of paraesophageal vagal nerves is carried out (1). According to the complex connections of vagal innervation, the complications of truncal vagotomy are, as well known, diarrhea, gastric stasis, dumping, early satiety, weight loss, and also cholelithiasis. Consequently, vagal sparing esophagectomy (VSE) may avoid all these complications and might be considered as an attractive alternative to the conventional esophagectomy.

Vagal sparing esophagectomy first described by Akiyama in 1982 (2), Collard et al. (3) and Banki et al. (1) also performed successful esophageal stripping operation series with preservation of the vagus nerve. Regarding the literature, there are some other author who reported preservation of vagus nerve during esophagectomy (4-6). The common aim of all studies about vagal-sparing esophagectomy was to convince that esophagectomy might be the “gold standard” procedure for end-stage benign and early malignant esophageal diseases if vagal nerves could be preserved during the operation (1). However, most authors are not to be in favour of preserving the vagi (7-9). Thus, in the literature, there are very few reports of esophagectomy with vagal preservation.

CASE PRESENTATION

Thirty three-year-old female patient was admitted to the department of general surgery with dysphagia. She had a suicide attempt 1 year ago by ingesting of caustic substance (hydrochloric acid: HCl). She had undergone several unsuccessful endoscopic dilatation. Her past medical history revealed an epileptic seizure.

On admission the blood pressure was 110/65 mmHg, heart beat rate was 92 beats/min and body temperature of 36.7. Laboratory tests revealed Hct: %37.8, Hb: 12.9 g/dL, WBC: 8900/µl, Plt: 385000/µL, BUN: 10 mg/dL, creatinin: 0.7 mg/dL, blood glucose: 97 mg/dL, K: 4.2 mEq/L, Na: 139 mEq/L, CA 19-9: 17.8, AFP: 2, CEA: 0.8, Ast: 16, ALT: 11, ALP: 116, GGT: 65, total bilirubine: 0.4, albumin: 4, International Normalized Ratio (INR): 1.00, ESR: 22 mm/hour, hsCRP: 6.0 mg/L. Physical examination revealed burn scars in her both upper extremities. Chest radiography and ECG at that time did not reveal any pathology. Upper endoscopy showed an intense fibrosed stenosis at the proximal esophagus, 15 cm from the teeth, impeding the progression of a 9 mm endoscope. Computerized axial tomography (CT) scan of the thorax and abdomen was performed the same day. CT scan showed a suspicious tracheoesophageal fistula at the arcus aorta level. No finding on behalf of a fistula but multiple strictures was noticed in esophageal fluoroscopic studies performed with a water-soluble oral radiocontrast material (Figure 1). The colonic vascular structure was evaluated by mesenteric angiography and no significant finding was noticed.
Pulmonary function studies were performed. The patient's respiratory reserve was found favourable. Patient was consulted with the neurology and psychiatry clinics. Psychiatry consultant was diagnosed major depression with psychotic features. Thus she was put on escitalopram (10 mg/d oral solution) and risperidone liquid (2 mg/d). She was also put on valproic acid (750 mg/d oral solution) as the neurologist and psychiatrist both are suggested.

Written informed consent was obtained from the patient and she was operated at the 10th day of her administration. A thoracoscopic vagal-sparing esophagectomy and colonic interposition was carried out. First days of the postoperative period were uneventful. On the 2nd postoperative day, 20% human albumin (100 cc/d) and total parenteral nutrition were started. The patient was allowed gradually to drink water at the 2nd day and she was put on early liquid enteral nutrition at the 3rd day of the surgery. Apical thorax tube and abdominal drain was withdrawn on the 4th day. Unfortunately, on the night of the 7th postoperative day, she had an unexpected cardiopulmonary arrest due to an other suicide attempt by taking a box of warfarin sodium pills per os - probably acquired with the help from one of her family member -, despite of frequent psychiatric consultation and 24-hour-under strict surveillance by nurses. She does not respond to CPR and died at hospital.

**Surgical Tactic**

The surgical tactic consists of three main operations fallingow: thoracoscopy, laparotomy, and cervicotomy.

After the routine general anesthesia induction, the patient selectively intubated with a double-ducted 7 F endobronchial tube and left lung was isolated. The proflactic antibiotic combination (cefuroxime axetil 1500 mg flacon IV + metronidazole 500 mg flacon IV) was infused just after the induction. Then the patient was positioned in left lateral decubitus for optimum exposure of upper portion of the mediastium. The skin was cleaned with antiseptics and the area was covered with the sterile scrubs.

**Thoracoscopy**

Four thoracoscopic ports introduced into the thorax have been used for the thoracoscopic exploration and dissection - 4th intercostal space on mid-axilla line, 5th intercostal space on anterior-axilla line, 7th intercostal space on mid-axilla line, 8th intercostal space on posterio-axilla line (Figure 2). With an endoscopic retractor, the right lung was displaced to the medial portion of the right hemithorax. The mediastinal pleura was incised and an adequate exposure of the esophagus was obtained. Vagal nerves were identified and medially retracted and then the dissection of distal portion of esophagus was performed (Figure 3). According to the dissected portion of the esophagus, the surgical instruments and even the optics were transferred from one port to another. Identification of the azygos vein and its division were performed using the endoscopic vascular stappler device (Endo-Gia device - US Surgical, Norwalk, CT). The vagal nerves were freed from the muscular wall of the esophagus. The preservation of the nerves was the critical part of this procedure (Figure 4). The esophagus was dissected from the superior thoracic aperture to the hiatus. 28 and 30 F thorax catheter were placed and attached to an underwater-seal bottle without negative suction. The port sites sutured. The thoracoscopic time took about 2 and a half hours.

**Laparotomy and Cervicotomy**

After esophageal dissection, the two other main operations were performed in sequence, with colonic transposition and hypopharingocolonic anastomosis.

The patient was replaced in a supine position and the skin was prepared in the routine manner. Medain incision was performed. The abdominal part of the vagal nerves were also preserved. The left colonic portion vascularised by the left colic artery prepared for the interposition. Left cervical incision made through the skin and platysma muscle along the anterior bor-
of the caustic esophageal strictures is a reconstructive surgery. Traditional procedures of esophageal reconstruction are transthiatal or transthoracic esophagectomy with gastric pull-up or colonic interposition with interruption of vagal nerves. On the other hand, the sacrifice of the vagi may result in many severe postoperative gastrointestinal complications such as diarrhea, gastric stasis, dumping, weight loss and cholelithiasis.

Regarding the literature, Akiyama (2) is the first author who described esophageal stripping with preservation of the vagus nerves. Nevertheless, this technique did not achieve the deserved popularity and transthiatal esophagectomy with colonic interposition still remains the most favorite operation. Whereas esophageal stripping with preservation of the vagus nerves could be performed with a very small morbidity rate (12). But surgeons are unwilling to perform vagal-sparing esophagectomy by stripping because the technique includes a blind dissection. Yet, the apologists authors emphasize the importance of necessity of the many communicant branches between the two vagus on the physiological vagal function. Chang et al. (13) and DeMeester (14, 15) indicated that it is possible to protect this physiological functions by preserving of the vagal plexus. Also in the latest articles, preservation of vagal nerves is still recommended regarding the advantages of a vagal-sparing procedure over a standard esophagectomy for patients with end-stage benign disease and Barrett’s high-grade dysplasia or intramucosal adenocarcinoma (16-18). Our aim was to avoid the postoperative complication of the vagatomy; hence we performed vagal-sparing esophagectomy. The patient was put on early liquid enteral nutrition and during her early postoperative monitorization, the patient did not suffer from the arduous classical post-vagatomic complications (dumping, diarrhea, gastric stasis, etc.) until her suicide attempt. Unfortunately, we would not be able to observe long term outcomes of the surgery, because of sudden suicidal death of the patient.

The preservability of the vagus nerves and the esophageal plexus with esophageal stripping technique was particularly emphasized by Banki et al. (1). Their study demonstrated that vagal-sparing esophagectomy had better result in terms of gastric secretion, gastric emptying, meal capacity, and body mass index when compared to standard esophagectomy. This procedure allowed the patients to eat a normal meal, free of dumping or diarrhea.

Traditional anatomy textbooks described mediastinal portions of vagal nerves composing a plexus around esophagus. However, Herbell et al. (19) identified four patterns of vagal trunks in their cadaveric study. Two distinct trunks without communicating branches, present in 26.7% (type 1) and two crossing trunks in 3.3% (type 4). The two other vagi patterns includes two trunks communicating with a plexus (56.7%) - which were classified as type 2 - and one or more bifurcated trunks (13.3%) - as type 3. The authors reported that the vagal-sparing esophagectomy procedure had been feasible in all cases. Nevertheless, the study were conducted on cadavers; so it could be much more difficult to perform such surgery in patients with type 2 or 3 anatomical variation of vagi. Yet, in 30% of all cases, there are only two vagal trunks and no esophageal plexus. In this manner, in 30% of all cases,
it would be easier to preserve the vagal nerves. In patients with type 1 and 4 intramediastinal vagal anatomy, the vagi should be preserved during esophagectomy to avoid post vagotomic syndromes.

Regarding the literature, in most of the studies about vagal preservation, patients underwent open surgery. On the other hand, minimally invasive thorascopic surgery is associated with significantly less blood loss, reduced postoperative pain and pulmonary complication, increased respiratory function, diminished risk of chylothorax and shortened length of hospital stay (20-22). Likewise, thorascopic procedure offer to the surgeon a closer wide range of sight with its magnification which can not be obtained even during the exploration with standard thoracotomy (20). Furthermore a combination of thoracoscopy and laparoscopy could be performed in these patients. In our case, for esophagectomy, we chose the minimally invasive approach instead of thoracotomy. Accordingly, we could be able to remove apical thorax tube of the patient on the 4th day. Her daily pulmonary auscultations after surgery showed no major abnormality, she did not suffer from major pain and her respiratory function was good.

Nowadays, an increasing trend in surgery, minimally invasive esophagectomy might be applicable as an alternative procedure to conventional esophagectomy in patients especially with end-stage benign disease (8, 9). Also it is possible sparing the vagus nerves by thorascopic way with a careful dissection which is a more physiologic alternative. In case of benign or early malignant lesions there is no need of nodal or en-block dissection which make the thorascopic vagal-sparing esophagectomy an ideal operative technique for these patients.

CONCLUSION

Although the surgical approach must be chosen according to the patient, it is evident that thorascopic vagal-sparing esophagectomy is applicable and an alternative procedure to conventional esophagectomy in patients with end-stage benign disease. Because of the insufficient end-stage caustic strictures series, our only proposal is the technical possibility of this procedure. If a conventional esophagectomy is planned to a patient with benign esophageal disease, vagal-sparing thorascopic esophagectomy can also be chosen instead of the standard procedures.

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REFERENCES