

Ivor Lewis esophagectomy with manual esogastric anastomosis by thoracoscopy in prone position and laparoscopy

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Abstract

Introduction Only a few authors have reported the technique of Ivor Lewis esophagectomy by minimally invasive means, and anastomosis was usually performed by a circular stapler. We report an Ivor Lewis esophagogastrectomy with manual esogastric anastomosis performed by thoracoscopy in the prone position.

Case report An adenocarcinoma of the distal esophagus without lymph nodes invasion was diagnosed in a 51-year-old man. General anesthesia and double-lumen endotracheal tube intubation were used. First the patient was placed in the supine position, and five abdominal trocars were placed. Celiac lymphadenectomy was performed with section of the left gastric vessels. A wide Kocher maneuver and pyloroplasty were performed. A wide gastric tube was performed and advanced through the hiatus into the right chest. Subsequently the patient was placed in the prone position. Three trocars (two 5-mm and one 11-mm) were placed on the posterior axillary line in the fifth, seventh,

and ninth right intercostal space. The intrathoracic esophagus was dissected. Mediastinal lymphadenectomy with en bloc resection of the left inferior mediastinal pleura was performed. The azygos vein was sectioned, and the esophagus was transected by scissors 1-cm cranial to the azygos vein. A completely thoracoscopic manual double-layer anastomosis was performed by using running sutures with PDS 2/0 externally and Maxon 4/0 internally. Finally the patient was replaced in the supine position to retrieve the specimen through a suprapubic incision, and the gastric tube was fixed to the hiatus.

Results Thoracoscopy lasted 157' (anastomosis 40'), laparoscopy 160', and second laparoscopy 20'. Blood loss was estimated at 170 ml. The gastrograffin swallow on postoperative day 4 showed absence of stenosis and leak. The patient was discharged on postoperative day 6.

Conclusions Thoracoscopy in the prone position allows the surgeon to perform a thoracoscopic esogastric anastomosis completely handsewn without selective lung desufflation, and using only three trocars.

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Minimally invasive esophagectomy by thoracoscopy, laparoscopy, and cervicotomy has been described by several authors [1–3]. Only a few authors reported the technique of Ivor Lewis by minimally invasive means. Watson et al. [4] reported in 1999 a technique of hand-assisted laparoscopy and thoracoscopy in the prone position, with manual one-layer anastomosis. More recently, Nguyen et al. [5] and Bizekis et al. [6] described a thoracoscopic approach with the patient in the left-lateral position. They systematically used four trocars and a “facility” minithoracotomy for the

introduction of a circular stapler for the anastomosis, and for extraction of the specimen.

The intercostal space is rather limited, well innervated, and noncompliant. Hence, extensive manipulations in this space or the use of a great number of trocars or a thoracotomy (even small) will result theoretically in significant postoperative pain, which can cause pulmonary problems by chest splinting if analgesia is insufficient.

We present a technique of esophagectomy with intraperitoneal dissection and manufacturing of the gastric tube by laparoscopy, and distal esophageal resection and esogastric anastomosis by thoracoscopy with the patient in the prone position. Thoracoscopy is performed with the help of just three trocars (one 11-mm and two 5-mm). At the end of the procedure, the specimen is retrieved by a 3.5-cm-long lower abdominal suprapubic incision.

Case report

A 51-year-old man had a complaint of dysphagia for solid food for more than 6 months. Gastroscopic diagnosis was adenocarcinoma of the distal esophagus amidst Barrett dysplastic mucosa. Endoscopic ultrasound revealed one suspicious lymph node just proximal to the highly stenotic lesion. CT scan and PET scan showed a 3-cm-long distal esophageal lesion, but failed to demonstrate lymph node invasion or distant metastatic disease. The lesion appeared to be resectable and surgery was offered to the patient. Because of socioeconomic and geographic considerations, additional treatment was declined.

Operative procedure

The procedure was performed in three stages.

Stage I: Laparoscopy

The patient was placed supine, the legs apart (French position). General anesthesia and endotracheal intubation with a selectively inflatable tube (Carlens) was used. Five trocars (one 12-mm, one 11-mm, and three 5-mm) were used as for any foregut surgery. Dissection was started by transection of the hepatogastric ligament to the left of the right gastric artery. Mobilization of the greater curvature of the stomach was performed with great care not to damage the gastroepiploic arcade. Extensive en bloc lymph node sampling was performed around the celiac axis (groups 1, 2, 7, 8A, 8p, 9). A wide gastric tube was fashioned by transecting the stomach from right to left with a linear stapler blue load, starting at the gastric angulus and ending in the vicinity of the splenic hilum. The staple line was secured by separate stitches of silk 2/0. A pyloroplasty was

performed. Dissection was continued from the celiac axis going cephalad along the aorta, up to the hiatus. The hiatal crura were incised circumferentially approximately 1.5 cm from the free edge, leaving a sizeable chunk of diaphragmatic muscle fibers as well as parts of the right and left pleura attached to the specimen. Anteriorly dissection was discontinued short of the pericardium. The upper part of the gastric tube was sutured to a Penrose drain, which was advanced through the hiatus, well into the mediastinum.

Stage II: Right Thoracoscopy

The patient was placed supine, and three trocars were introduced into the chest on the posterior axillary line: one 11-mm in the seventh space, and two 5-mm, one in the fifth and one in the ninth intercostal space (Fig. 1). The mediastinal pleura was incised posteriorly alongside the aorta, and anteriorly from the right stem bronchus going caudad, crossing the inferior pulmonary vein and along the pericardium. The aorta was dissected and several small vessels stemming from the aorta were severed by hook coagulation. Dissection started at the carena and was performed flush with the pericardium, down to the right crus. The tumor and the fatty areolar tissue around it, containing both pleurae were removed en bloc. The azygos vein was severed between clips and the esophagus was sectioned approximately 4-cm proximal to the tumor, approximately 1-cm cranial to the azygos. The specimen was placed in a plastic bag and was allowed to drop inside the abdomen. The drain attached to the gastric tube was retrieved and pulled cranially, which deployed the gastric tube in the pleural cavity without twisting it.

The anterior side of the gastric tube was sutured manually in two layers side-to-end to the esophagus, by two running sutures: Maxon 4/0 internally and PDS 2/0 externally. The apex of the gastric tube was sutured to the esophagus and to the parietal pleura by a couple of silk 2/0

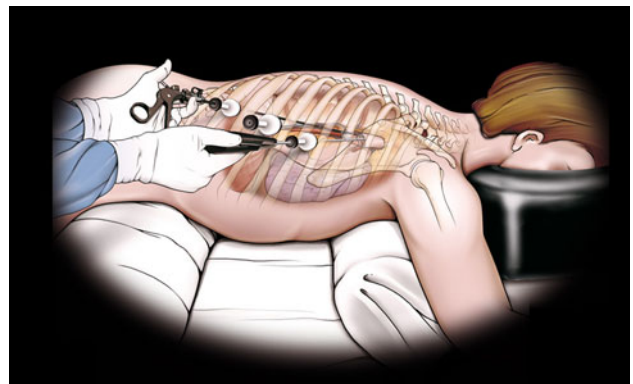


Fig. 1 Patient and trocars position during right thoracoscopy in the prone position

stitches. A nasogastric tube was left in place across the anastomosis. A 28-Fr chest tube was left into the right costodiaphragmatic sinus and placed under 20-cm water seal.

Stage III: Laparoscopy

The patient was again placed supine. The gastric tube was secured circumferentially to the hiatus by separate stitches of silk 2/0. The specimen, in the plastic bag, was removed through a 3.5-cm suprapubic incision, which concluded the R0 en bloc resection of the distal esophagus and the cardia, with two-field lymph node dissection.

Results

Total operative time was 337 min as following: thoracoscopy lasted 157 min, laparoscopy for celiac trunk lymphadenectomy and manufacturing of the gastric tube lasted 160 min, and the second laparoscopy lasted 20 min. The remaining time was dedicated to the manipulation of the patient. The anastomosis was performed in 40 min. Blood loss was evaluated at 150 ml for the laparoscopy and 20 ml for the thoracoscopy.

The patient was out of bed and ambulating on the first postoperative day. Analgesia was obtained by paracetamol therapy (4 g/day) for 4 days. A gastrograffin swallow on postoperative day 4 showed good clearance of the stomach and no leak (Fig. 2). The chest tube was subsequently

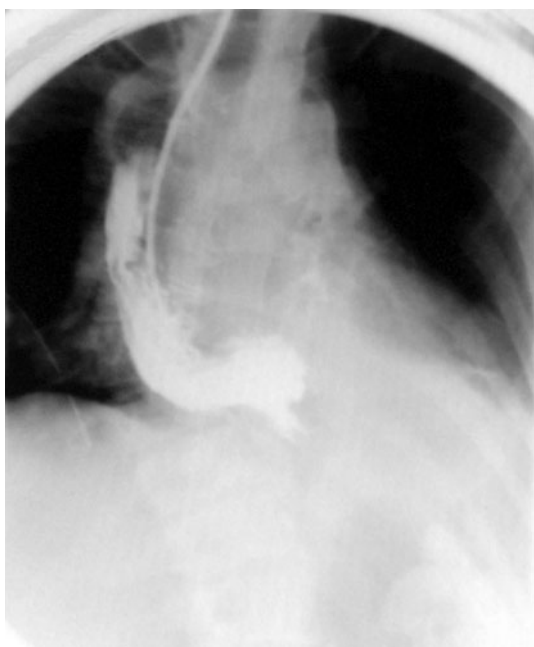


Fig. 2 Gastrograffin swallow on postoperative day 4

removed, and the patient was discharged home on postoperative day 6. Return to work was allowed from postoperative day 10.

On pathology, the specimen contained 25 lymph nodes. Resection edges were clear of tumor, with a proximal tumor-free margin of 4 cm. The right pleura were adherent to but not invaded by the tumor. Final histological staging was IVa, because four lymph nodes at the celiac axis proved to be invaded (pT3N1M1a). After 6 months, the patient is free of disease and gastroscopy failed to demonstrate a stenosis.

Discussion

The approach by laparoscopy, thoracoscopy, and cervicotomy in case of esophageal cancer seems to have better results as to morbidity and mortality than the classic open approach (laparotomy, thoracotomy or thoracophrenolaparotomy and cervicotomy) [7–10]. Randomized studies are still missing however.

Better outcome might be linked to reduced postoperative pain after thoracoscopy versus thoracotomy, which influences respiratory function [10–13]. Despite its adequate standardization, the technique remains challenging, essentially because of issues around the cervicotomy (damage to the recurrent nerve, leaks, stenosis, and problems of esophageal clearance) [9, 14]. Despite these drawbacks, the technique is usually preferred to the Ivor Lewis technique by thoracoscopy because of technical issues and the risks in case of fistula. Hence reports on thoracoscopic and laparoscopic Ivor Lewis esophagectomy are scarce [5, 6].

The reduced space and compliance of the intercostal space will not allow substantial manipulations and does preclude the use of large bore trocars. Except for Watson's publication [4] of hand-assisted laparoscopy with specimen extraction through the opening for hand insertion, most authors, however, mention the need to perform a facility minithoracotomy, which can be used for specimen extraction or for the introduction of the circular stapler for the esogastric anastomosis in the chest. The circular stapling technique is quite painful because of manipulation damage to the intercostal space. Moreover, this type of anastomosis—whether 21 or 25 mm—is characterized by a significant number of stenosis [15, 16].

The left-lateral position for thoracoscopy as described by Luketich et al. [1] implies the need to use four trocars because one trocar will be used for reclining the lung, despite selective desufflation of the latter. With the patient in the prone position, as described in 1992 by Cuschieri et al. [17], on the other hand, there is no need for reclining or for selectively desufflating the lung to obtain good working conditions [2]. Thanks to gravity, the lung will

drop out of the way with minimal intrathoracic insufflation and blood will no longer obscure the operative field.

Thoracotomy can be avoided by performing a manual esogastric anastomosis. Only three trocars (one 11-mm and two 5-mm) will be needed. By placing the trocars in the fifth, seventh, and ninth space at some 10 cm from the vertebrae, the rules of triangulation for access of the upper third of the esophagus will be respected. Thus, the trocar for the optics will be at the bissectrice of the 90-degree angle formed by the two 5-mm trocars containing the working tools. This provides good ergonomic conditions, and by consequence allows for a safe suture within acceptable time limits, especially with the surgeon who has vast experience with manual sutures.

The chest cavity was drained by a 28 chest tube placed exactly in the costodiaphragmatic sinus without any undue manipulation, unlike other techniques in which the drain is left in a 12-mm trocar opening in a less favorable spot. The need for displacing the patient three times is an obvious limitation of the technique. This is, unfortunately, inevitable with the Ivor Lewis technique, no matter which approach is used.

The margins of the specimen were free of tumor, except for the lateral margin where adherence to the right-sided pleura was seen. Twenty-five lymph nodes were sampled, similar to the open approach.

In this particular case, all of the theoretical advantages of the minimally invasive approach were met: little analgesia, short hospital stay, and rapid return to work.

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