



Totally laparoscopic transhiatal esophago-gastrectomy without thoracic or cervical access

The least invasive surgery for adenocarcinoma of the cardia?

R. Costi,^{1,2} J. Himpens,¹ J. Bruyns,¹ G. B. Cadière¹

¹ Clinique de Chirurgie Digestive, CHU Saint-Pierre, Université Libre de Bruxelles, 322, Rue Haute, 1000, Brussels, Belgium

² Dipartimento di Scienze Chirurgiche, Università di Parma, Italia

Received: 25 February 2003/Accepted: 2 October 2003/Online publication: 19 March 2004

Abstract

Background: The recent progress of minimally invasive surgery has allowed esophagectomy to be performed by both combined laparoscopic/thoracoscopic and totally laparoscopic transhiatal approaches. All these techniques imply a thoracic and/or cervical access for the creation of the esophago-gastric anastomosis.

Methods: Five surgical ports are introduced in the abdomen. The stomach is mobilized, divided, and tubulized, preserving the right arteries. The lymphadenectomy of the celiac trunk and the hepatic pedicle is achieved. The dissection and resection of distal esophagus and a two-fields mediastinal lymphadenectomy are performed by means of harmonic scalpel. The realization of the intrathoracic esophago-gastrostomy is accomplished by means of a circular stapler.

Results: Three patients underwent the procedure. Mean operating time and blood loss were 347 min and 360 cc. There were no intraoperative or postoperative complications. Mean postoperative stay was 9 days.

Conclusion: In selected cases, it is possible to perform a distal esophagectomy entirely by laparoscopy, without the need for any thoracic or cervical access.

Key words: Transhiatal esophagectomy — Laparoscopy — Esophagogastrostomy

The traditional open approaches to esophagectomy, the Ivor Lewis procedure [15] and the transhiatal esophagectomy [21], are burdened by high mortality and morbidity rate [13, 16].

During the nineties, the enthusiasm provoked by the encouraging results of laparoscopic approach to gastroesophageal reflux disease in improving the postoperative

outcome [10] have driven surgeons to attempt an extremely wide variety of mini-invasive approaches to esophagectomy [1, 2, 4–6, 8, 9, 11, 12, 17–20, 22, 23].

Differently from all the reported procedures, which imply thoracic [11, 17], thoracoscopic [19, 23], or cervical [1, 2, 4–6, 8, 9, 11, 12, 17, 18, 20, 22] access for the realization of the gastroesophageal anastomosis, here we present the preliminary results of a transhiatal esophagogastrectomy, carried out entirely by laparoscopy.

Patients and methods

Patients

From September 2000 to April 2002, three white male patients with adenocarcinoma of the cardia received a totally laparoscopic esophagogastrectomy. The patients complained of dysphagia and weight loss (two cases) and hypersalivation (one patient). All the patients underwent preoperative esophagogastroduodenoscopy, endoscopic ultrasounds, and CT scan of the abdomen and of the thorax. In all cases tumor was adenocarcinoma of the cardia and preoperative staging was T2NXM0. The mean of the maximum diameter of the tumors was 10 mm (range 6–14 mm).

Surgical technique

The patient is placed in a 25° anti-Trendelenburg position; the operating surgeon is situated between the legs, the assistant surgeon and the instrument nurse are on the left side of the patient, and the camera-holding surgeon is on the right side. A 14 mmHg pneumoperitoneum is induced through a Veress needle. Five trocars (three 5 mm and two 10 mm) are introduced (Fig. 1). A 30° optics is used.

Abdominal stage

The left lobe of the liver is retracted by a three-digit 10-mm retractor (Endo Retract, United States Surgical Corp., Norwalk, CT) and the right diaphragmatic crus is dissected. The gastro-hepatic ligament is interrupted by monopolar electrocautery (hook) to expose, clip, and cut the left gastric artery. The greater curvature is mobilized from distally to proximally, preserving the right arteries. The Kocher ma-

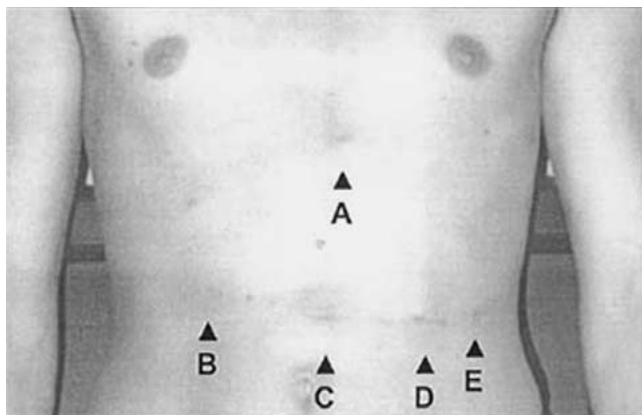


Fig. 1. Abdominal scars 3 months after totally laparoscopic distal esophagectomy. Port sites A and C are 10 mm; port sites B, D, and E are 5 mm (port site D has been enlarged to allow the extraction of the specimen and the introduction of mechanical stapler). There are no cervical or thoracic scars.

noeuver is performed. Lymphadenectomy of the celiac trunk, hepatic pedicle, and splenic artery is completed, whereas left gastro-epiploic vessels are clipped and interrupted. After having marked the anterior aspect of the stomach with electrocautery, the gastric tubulization is realized by means of an endoscopic linear stapler (Endo Gia, U.S.S.C.), the first shot perpendicularly to the smaller curvature and then parallel to the greater curvature, until the gastric fundus is reached. Some stitches are added by intracorporeal suturing device (Endo Stitch, U.S.S.C.) (Fig. 2).

Mediastinal stage

The diaphragmatic crus are opened to expose the lower mediastinum. The mediastinal dissection is realized by harmonic scalpel (Ultracision, Ethicon Endosurgery, Cincinnati, OH). The limits of dissection are (1) anteriorly, the pericardium and the left pulmonary vein (2) posteriorly, the aorta, and (3) on the sides, the left and right parietal pleuras. The three-digit retractor (Endo Retract, U.S.S.C.) is placed on the heart and moved proximally following the dissection. The mediastinum is proximally dissected, according to oncological exigencies, over the left pulmonary vein superior margin. The esophagus is interrupted by scissors (case 1) or by linear stapler (Endo Gia, U.S.S.C.) (cases 2 and 3), and the specimen is immediately inserted in a specimen bag to prevent any mediastinal contamination. The anvil of the stapler is inserted in the esophageal stump, after having entered the abdomen through a port-site (case 1), or orally, placed in the end of an orogastric tube, anvil side last (cases 2 and 3). The mechanical stapler (Premium Plus CEEA 25 w/ Tilt-Top, U.S.S.C.) is introduced by enlarging one of the trocar sites (port-site D in Fig. 1), and the anastomosis is created under the 30° optics' view (Fig. 3). Some stitches are added to reinforce the suture. The specimen bag is extracted through port-site D. Bilateral thoracic drains are systematically positioned as a precaution for eventual unseen pleural breaches.

Results

Three white male patients (mean age 49.9 years; range 28–77) underwent totally laparoscopic esophagogastric resection for adenocarcinoma of the cardia. The duration of surgery was 347 min (range 283–373). The intraoperative blood loss was 360 cc (range 320–460). One unit of RBC was transfused postoperatively in one patient. The patients were extubated in the operating room. Morphine was administered for 2 days postoperatively. All the patients begun ambulation on day 2. Postoperative course was uneventful in two cases. The eldest

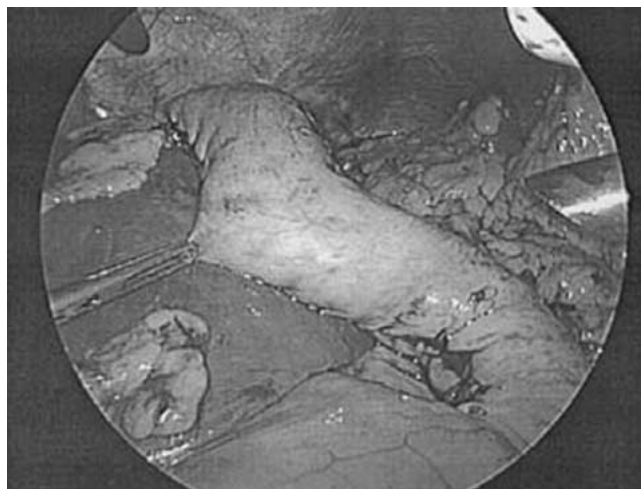


Fig. 2. Stomach after tubulization.



Fig. 3. The laparoscopic esophago-gastric anastomosis, transhiatal view.

patient (77 years old) had paradoxical supraventricular tachycardia, with no sequelae. All the patients had the first bowel movement on day 4; the mean hospital stay was 9.3 days (range 7–12), return to normal domestic activity was a median of 18 days (range 15–20), and return to work was a median of 30 days (range 25–40).

At pathological examination, in all cases resection margins were tumor free. In Fig. 4, the surgical specimen of patient 1 is shown. Mean proximal resection margin was 5.6 cm (range 5–6). A mean of 19 lymph nodes was achieved (range 11–30). In all cases, the specimen showed the presence of a poorly differentiated adenocarcinoma of the cardia, in one case infiltrating the serosa, with no metastasis in 13 lymph nodes (pT3N0M0); in one case focally infiltrating the muscular layer, with one metastasis in 11 lymph nodes (pT2N1M0); and in the last case focally infiltrating the muscular layer, with 16 metastases in 30 lymph nodes (pT2N2M0).

Two patients are tumor free at follow-up (35 and 27 months). The last patient had both local and systemic recurrence 4 months postoperatively.

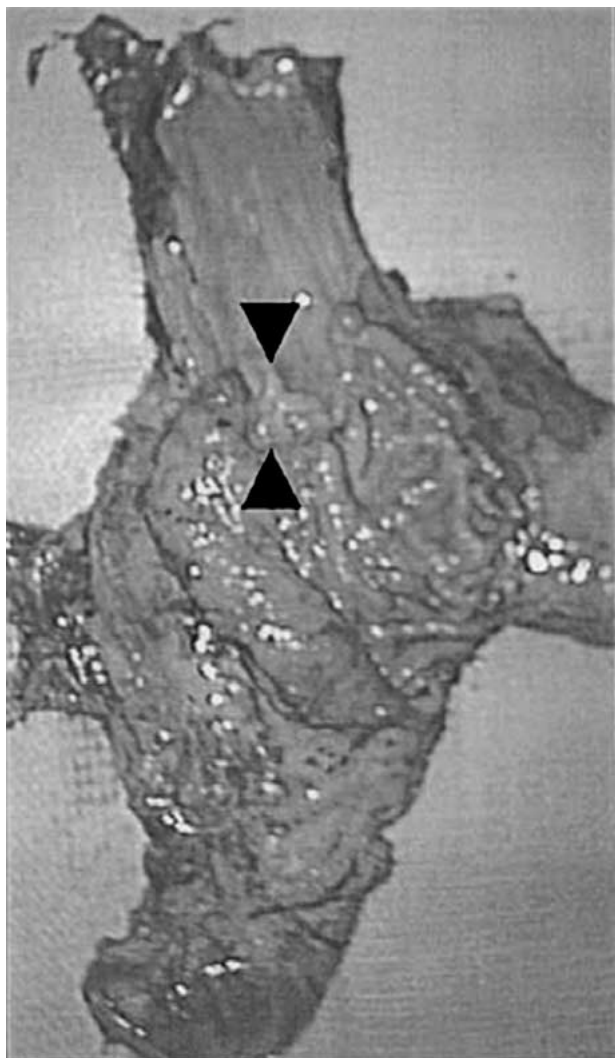


Fig. 4. The specimen of patient 1. Proximal margin is 6 cm.

Discussion

Whereas some surgeons have adopted the laparoscopic transhiatal esophagectomy [6, 9, 11, 22] by a combined laparoscopic/cervical approach, other authors have recently proposed a minimally invasive version of the traditional Ivor Lewis procedure [15], by a combined laparoscopic/thoracoscopic/cervical [5, 17, 18, 20] or laparoscopic/thoracoscopic [19, 23] approach.

In our opinion, the thoracoscopic approach has a nonnegligible morbidity and should be limited to selected cases (technical difficulty, advanced stage). Significantly, in the series from the Pittsburgh group [18], respiratory complications occurred in almost half of the patients (36 of 77). Moreover, regarding the most recently described laparoscopic/thoracoscopic [19, 23] approach, it implies the realization of a hand-sewn thoracoscopic esophagogastronomy, which is difficult task for average laparoscopic surgeons.

The procedure we usually perform for esophagectomy is a laparoscopic transhiatal esophagectomy with a left cervical incision. As a natural evolution of this

technique, here we propose an even less invasive esophagogastronomy, accomplished entirely by laparoscopy. This technique seems to be technically feasible and oncologically correct, allowing resection of large tumor-free esophageal margins and a wide lymphadenectomy. Moreover, it seems to maximize the advantages of the minimally invasive approach, as witnessed by the encouraging results on the outcome.

From a technical point of view, owing to the narrowness of the operating field, the 30° optics together with an effective retractor must be considered mandatory, especially during the mediastinal stage, as well as the harmonic scalpel, which has been proved to cut and effectively coagulate during mediastinal dissection. The esophago-gastrostomy has been easily accomplished by a mechanical stapler, especially when the anvil has been inserted orally, similarly to what is described in New York group's technique [7].

From an oncological point of view, since this technique allows only a distal esophagectomy, squamous cell carcinomas, in which the recommended proximal resection margin is ≥ 10 cm. [14], and adenocarcinomas of the lower third of the esophagus, which have been reported to be often associated with a proximally directed lymphatic spread and Barrett's esophagus [3], should not undergo this procedure. In contrast, when a resection limited to the distal esophagus is indicated, such as in the case of adenocarcinoma of the cardia (reported cases) or benign pathologies of lower esophagus, the entire procedure may be performed by totally laparoscopic transhiatal esophagogastronomy.

Conclusions

The totally laparoscopic esophagectomy constitutes an oncologically correct, very low morbidity alternative to old and new approaches. The esophagogastric anastomosis is easily performed by means of mechanical stapler and does not require specific skills of the surgeon. Finally, since no cervical or thoracic incisions are performed, the cosmetic result is excellent, even comparable with that of gastro-esophageal reflux surgery (Fig. 1).

References

1. Akaishi T, Kaneda I, Higuchi N, Kuriya Y, Kuramoto J, Toyoda T, Wakabayashi A (1996) Thoracoscopic en bloc total esophagectomy with radical mediastinal lymphadenectomy. *J Thorac Card Surg* 112: 1533–1540
2. Azagra JS, Ceuterick M, Goergen M, Jacobs D, Gilbert E, Zaouk G, Carlier E, Lejeune P, Alle JL, Mathys M (1993) Thoracoscopy in oesophagectomy for oesophageal cancer. *Br J Surg* 80: 320–321
3. Classification of adenocarcinoma of the oesophagogastric junction (1998) *Br J Surg* 85: 1457–1459
4. Cuschieri A, Shimi S, Banting S (1992) Endoscopic oesophagectomy through a right thoracoscopic approach. *J R Coll Surg Edinb* 37: 7–11
5. Dallemagne B, Weerts JM, Jehaes C, Markiewicz S, Bona S, Hosselet JL, Vadhat O, Lombard R (1992) Case report: subtotal oesophagectomy by thoracoscopy and laparoscopy. *Minim Invas Ther* 1: 183–185

6. DePaula AL, Hashiba K, Ferreira EA, de Paula RA, Grecco E (1995) Laparoscopic transhiatal esophagectomy with esophagogastroplasty. *Surg Laparosc Endosc* 5: 1–5
7. de Csepel J, Nahouraii R, Gagner M (2001) Laparoscopic gastric bypass as a reoperative bariatric surgery for failed open restrictive procedures. *Surg Endosc* 15: 393–397
8. Dexter SP, Martin IG, McMahon MJ (1996) Radical thoracoscopic esophagectomy for cancer. *Surg Endosc* 10: 147–151
9. Gerhart CD (1998) Hand-assisted laparoscopic transhiatal esophagectomy using the dexterity pneumo sleeve. *JLS* 2: 295–298
10. Hinder RA, Filipi CJ, Wetscher G, Neary P, DeMeester TR, Perdakis G (1994) Laparoscopic Nissen fundoplication is an effective treatment for gastroesophageal reflux disease. *Ann Surg* 220: 472–481
11. Jagot P, Sauvanet A, Berthoux L, Belghiti J (1996) Laparoscopic mobilization of the stomach for oesophageal replacement. *Br J Surg* 83: 540–542
12. Kawahara K, Maekawa T, Okabayashi K, Hideshima T, Shiraishi T, Yoshinaga Y, Shirakusa T (1999) Video-assisted thoracoscopic esophagectomy for esophageal cancer. *Surg Endosc* 13: 218–223
13. King RM, Pairolero PC, Trastek VF, Payne WS, Bernatz PE (1987) Ivor Lewis esophagogastrectomy for carcinoma of the esophagus: early and late functional results. *Ann Thorac Surg* 44: 119–122
14. Law S, Arcilla C, Chu KM, Wong J (1998) The significance of histologically infiltrated resection margin after esophagectomy for esophageal cancer. *Am J Surg* 176: 286–290
15. Lewis I (1946) The surgical treatment of carcinoma of the esophagus with special reference to a new operation for growths of the middle third. *Br J Surg* 34: 18–31
16. Lozach P, Topart P, Etienne J, Charles JF (1991) Ivor Lewis operation for epidermoid carcinoma of the esophagus. *Ann Thorac Surg* 52: 1154–1157
17. Luketich JD, Nguyen NT, Weigel T, Ferson P, Keenan R, Schauer P (1998) Minimally invasive approach to esophagectomy. *JLS* 2: 243–247
18. Luketich JD, Schauer PR, Christie NA, Weigel TL, Raja S, Fernando HC, Keenan RJ, Nguyen NT (2000) Minimally invasive esophagectomy. *Ann Thorac Surg* 70: 906–911
19. Nguyen NT, Follette DM, Lemoine PH, Roberts PF, Goodnight Jr JE (2001) Minimally invasive Ivor Lewis esophagectomy. *Ann Thorac Surg* 72: 593–596
20. Nguyen NT, Follette DM, Wolfe BM, Schneider PD, Roberts P, Goodnight Jr JE (2000) Comparison of minimally invasive esophagectomy with transthoracic and transhiatal esophagectomy. *Arch Surg* 135: 920–925
21. Orringer MB, Marshall B, Stirling MC (1993) Transhiatal esophagectomy for benign and malignant disease. *J Thorac Cardiovasc Surg* 105: 265–276
22. Swanstrom LL, Hansen P (1997) Laparoscopic total esophagectomy. *Arch Surg* 132: 943–947
23. Watson DI, Davies N, Jamieson GG (1999) Totally endoscopic Ivor Lewis esophagectomy. *Surg Endosc* 13: 293–297