MINIMALLY INVASIVE SUBTOTAL ESOPHAGECTOMY

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In the study a subtotal videothoracoscopic and laparoscopic esophageal resection with cervical anastomosis was presented with discussion concerning the new surgical problems and positions (classical and prone) of videothoracoscopic and laparoscopic approaches. The technique of esophageal elevation during mediastinal preparation, ligation and dissection of the azygos vein, pharmacological elongation of the graft using Glucagon as well as tips regarding easier identification of the esophagus at the outlet level was described. The usefulness of the harmonic scalpel and endostaplers was stressed. Additionally, findings and outcomes were discussed.

Key words: minimally invasive esophageal resection, videothoracoscopy, laparoscopy

CASE REPORTS

1. A 75 year old patient MG (file number 4940/06) was referred to our Clinic with a diagnosis of squamous cell carcinoma localized 35cm from the teeth, assessed preoperatively as T2N0Mx. His concomitant diseases included postinfarct cardiomyopathy. He was not offered neoadjuvant chemotherapy due to its potential cardiotoxic side effects. Surgery was performed on May 31st 2005. The initial position on the operating table was typical for a right-sided posterolateral thoracotomy. 4 thoracports (size 10/12 mm) were installed in the right pleural cavity (fig. 1, 2). CO₂ insufflation was administered with pressures ranging 9-12 mm Hg (7). The camera with a 30° view angle was used due to its excellent ability to expose the entire intrathoracic esophagus. The preparation was conducted predominantly with...
cautery hook, harmonic scalpel or bluntly. Periesophageal lymph nodes were left with the esophagus. The liberated esophagus was retracted with Auto Suture ENDO RETRACT MAXI and Ethicon “gold finger” instruments. The preparation was particularly meticulous in areas close to the aortic wall and membranous portions of the trachea. The removed organ was elevated with use of stripes pulled through the thoracoports. All remaining periesophageal and subcarinal lymph nodes were removed by “Alligator” type forceps or Babcock grasper. The azygos vein was closed by polymer Hem-o-lock clips size L and dissected. The esophagus was encircled by a rubber marker made from a portion of the surgical glove. The marker was placed close to the upper chest cavity foramen for the purposes of facilitating further identification of the esophagus on the neck. Chest drain and closure of the thoracoports ended the thoracic part of the surgery.

After repositioning the patient to the supine position, laparoscopic and cervical parts of the surgery were initiated. Laparoscopy was performed with use of the same 30° camera, 5 trocars, liver retractor, Babcock graspers and harmonic scalpel (fig. 3, 4). A pneumoperito-
neum on the order of 15 mm Hg was utilized. All peritoneal cavity was carefully inspected at the beginning. The right gastroepiploic artery was localized and skeletonisation of the stomach with the safety margin at least 10 mm from this artery was conducted with use of a harmonic scalpel. The left gastric artery and vein were double-clipped and dissected. Adjacent fatty and lymphatic tissue up to the coeliac trunk was removed with the stomach. Retraction of the liver and dissection of the triangle hepatic ligament were helpful to expose the cardia and esophageal hiatus. The gastric conduit was prepared with use of 3 Ethicon Echelon 60 endostaplers (blue cartridge) as described by Michalik (3). A 3 cm long portion of the gastric fundus was left intact to provide an esophageal connection, which was necessary for intrathoracic traction of the graft.

A left side cervicotomy was used to find the cervical part of the esophagus. The entire esophagus with the cardia, gastric fundus and adjacent lymphatic tissue was pulled through the neck incision afterwards. To facilitate temporary elongation of the gastric conduit, a single dose of 1mg glucagon was administered 30 minutes earlier. The traction was also visually controlled and supported from the peritoneal side by Babcock graspers. The final anastomosis of the cervical part of the esophagus and the gastric conduit was performed on the neck with use of 2 linear staplers (Ethicon 75 mm with cutting knife and Ethicon 60 mm). The whole esophagus with gastric cardia, minor curvature and lymphatic tissue was removed en masse. The gastric tube was placed under visual control before final stapling of the anastomosis. Neck incision was closed without any drain while peritoneal cavity was closed with use of “Redon” drain. The total surgical time was 6 hours. The patient was mobilized on the 1st postoperative day but died suddenly due to a second myocardial infarct on the 3rd postoperative day. Final pathological diagnosis of the resected esophagus revealed squamous cell carcinoma without invasion of periesophageal tissue and disease-free surgical margins. All 13 subcarinal and 4 abdominal lymph nodes were negative. Final staging was pT2N0M0/IIA.

2. A 55 year old patient K.J (file number 11072/06) diagnosed as squamous cell esophageal carcinoma localized 34 cm from the teeth was treated by neoadjuvant chemoradiotherapy with complete response. However, preoperative chest CT revealed a single lymph node 1.5 cm in diameter close to the stomach cardia. Minimally invasive esophageal resection was performed on Nov 15th 2006. The patient was placed in the reverse (prone) position (8, 9, 10). 3 thoracoports were positioned in the right hemithorax and a 12 mm Hg pneumothorax was used for better visualization. The 30° camera was utilized as previously described. The view of the posterior mediastinum in the prone position is even better than in the supine or lateral position because the gravity causes repositioning of the lung without the need for additional retraction. Due to previous chemoradiation, the periesophageal tissues were scarry and fibrotic, which rendered blunt preparation impossible. This part of surgery was performed with the use of a cautery and harmonic scalpel and all periesophageal tissue was radically excised from the right to the left pleura. The left pleural cavity was opened accidentally and required left chest drainage postoperatively.

The azygos vein was stapled and dissected by Ethicon ETS-Flex 45 endostapler. There were no removable lymph nodes in the mediastinum close to the esophagus. The remaining stages of surgical procedures were identical as described above both in the chest and peritoneal cavity. According to preoperative CT, an abdominal lymphadenectomy was performed with particular attention. The cervical part of the surgery was similar to that previously described. The total operating time was 5 hours and 20 minutes. The postoperative period was uneventful. Radiological contrast control on postoperative day 7th did not reveal any leaks. The patient was discharged home on the 12th postoperative day.

Pathological examination of the removed tissues revealed only scarry tissue without cancer in the esophagus but one of the celiac lymph nodes was metastatic, so the final staging was pT1N1M1a/IVA. Additional abdominal radiotherapy was offered to the patient afterwards. He remained stable 6 months after surgery without symptoms of any relapse.

DISCUSSION

The first Polish paper regarding minimally invasive esophagectomy was published in “The Polish Surgical Journal” in 2004 (3). The totally laparoscopic approach described there for both skeletonization of the stomach and libe-
ration of the intrathoracic esophagus has particularly important limitations in oncological cases when lymphadenectomy seems beneficial for long-term prognosis. Videotoracoscopic techniques added to laparoscopic approach makes mediastinal exploration safer and easier, particularly in patients treated with neoadjuvant chemoradiotherapy in whom massive adhesions require good visualization during preparation. Mediastinal lymphadenectomy is also easier and more radical with the use of video-camera, predominantly in the areas above the azygos vein, which are poorly visible in the transhiatal approach.

The thoracic portion of the surgery was performed similar to the first. The classic position for a posterolateral thoracotomy required one more thoracotomy for lung retraction in comparison to prone positioning when traction of the lung is performed spontaneously by gravitation. The experience based on a larger number of cases is required to assess more precisely advantages or disadvantages of both approaches. We have noticed that troacars positioned in the longitudinal axis of the esophagus should not be placed dorsally from the scapular line because the mobility of the videothoracoscopic instruments might be limited by vertebra in these cases. Preparation after neoadjuvant chemoradiotherapy was more difficult as expected, but nevertheless the accepted radical level of lymphadenectomy is achievable with use of videothoracoscopy even in very fibrotic and scarry tissues (11).

Because of the vast videothoracoscopic preparation performed before laparoscopy, we modified the scheme of laparoscopic port placement; they were more horizontal above the belly button than that described by Michalik (3, 7), which seemed to be more convenient for skeletonizing the stomach. There were no pyloromyotomy or microjejunitostomy performed and alimentation in the early postoperative period was totally intravenous. The length of surgery (6 hours and 5 hours 20 minutes) is just slightly longer than three-field conventional esophageal resection in our hands (appr. 5 hours) and should be shortened in the future (6). Pathological examination revealed that both resections and lymphadenectomy were properly performed, maintaining appropriate surgical margins with sufficient distance from the tumor. The lack of mediastinal lymph nodes in the second case was probably caused by neoadjuvant therapy. The described method is quite similar to the technique used at the Sloan Kettering Cancer Center in New York by Tracey Weigel, trained by Luketich, who is considered an expert in minimally invasive esophageal resections (12). The dilemmas of minimally invasive esophagectomy (MIE) were one of the main topics of the symposium on esophageal disorders organized by Prof. G. Wallner in Lublin in 2006. This technique seems to be one of the pathways of modern esophageal surgery. Our own initial experience is promising and remains in accordance with modern trends and patient expectations. (13-16).

REFERENCES

10. Ali H, Biswas S, Thairu N et al.: Resection of oesophagus in the chest using a prone thoracosco-
The Authors of the study highlight an important problem considering the use of minimally invasive techniques in the surgical treatment of neoplastic diseases. Apart from the ongoing discussion concerning the oncologic legitimacy and safety of minimally invasive techniques, debates concerning their application in clinical situations, which thus far required classical surgical intervention with abdominal cavity or thorax opening, are being conducted.

Based on the literature as well as our own clinical experience, verification of the oncologic safety relative to the extent of the procedure, risk of neoplastic cell infiltration, and evaluation of distant treatment results is history. In most clinical investigations and publications concerning the above-mentioned problem, evidence that would undermine the diagnostic and therapeutic value of minimally invasive techniques as compared to classical surgical procedures is limited. Additionally, laparoscopic or thoracoscopic minimally invasive techniques are characterized by their evident benefits and advantages, considering numerous aspects of neoplastic therapy.

One should mention the innovative character of presented techniques in the therapy of esophageal diseases. The Authors should be congratulated on their radical therapeutic solutions by means of minimally invasive techniques in patients with esophageal squamous cell carcinomas. In the past several years, “The Polish Journal of Surgery” mentioned the application of the laparoscopic or thoracoscopic approach in case of patients requiring radical excision of the esophagus. The novel thoracoscopic approach with the patient placed on the abdomen is evidence of progress in the surgical management of esophageal neoplasms.

The above-mentioned technique, employed in western European countries and the United States, is a breakthrough in the surgical possibilities of esophageal carcinoma treatment by means of the thoracoscopic approach. Hence, its application in other Polish centers.

According to promoters of the above-mentioned technique including Cadier from Brussels, Gossot from Paris, Luketich from Pittsburg, and Swanström from Portland, abdominal positioning of the patient enables the surgeon to safely excise the esophagus, while maintaining the novel principles of modern surgery. Additionally, perioperative trauma is minimized, hospitalization is shorter, one observes a reduction in cardiovascular and septic complications, and distant survival results are similar. The breakthrough considering the thoracoscopic technique consists of better visualization of prepared tissues without the need for pulmonary pneumatization on the operated side, less bleeding into the operative field, which increases patient safety, and reduction in surgical duration. The abdominal positioning of the patient requires proper preparation, with animal experimental investigations and autopsy training considering the use of equipment in totally different anatomical topography conditions, in comparison to the “classical” placement of the esophagus.
patient in the case of a laparoscopic approach or when the patient is placed on the left side in case of thoracoscopy. Novel operative possibilities with the use of minimally invasive techniques considering therapy of esophageal carcinomas were widely discussed and enthusiastically accepted during the OESO (Avignon) and ACS (Chicago) congresses. The use of minimally invasive techniques in the therapy of digestive tract neoplasms is important and topical, and will be under discussion during the 56th convention of The Society of Polish Surgeons, which will be held in September 2007.

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