Original Article on Esophageal Surgery

Minimally invasive esophagectomy and thoraco-abdominal two-field lymph node dissection for thoracic esophageal squamous cell carcinoma—antegrade dissection of the thoracic esophagus

Wentao Fang, Chunyu Ji, Jian Feng, Weigang Zhao, Xuefei Zhang

Department of Thoracic Surgery, Shanghai Chest Hospital, Shanghai 200030, China

Contributions: (I) Conception and design: W Fang; (II) Administrative support: W Fang; (III) Provision of study materials or patients: W Fang, J Feng; (IV) Collection and assembly of data: J Feng, C Ji, W Zhao, X Zhang; (V) Data analysis and interpretation: W Fang; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Wentao Fang. Department of Thoracic Surgery, Shanghai Chest Hospital, Shanghai 200030, China. Email: vwtfang12@shchest.org.

Background: Minimally invasive esophagectomy has been gaining increasing interest in management of early stage esophageal cancers. Similar oncological principles including radical removal of the tumor as well as systemic lymph node dissection should be observed, regardless of the surgical approach. Improvement in surgical techniques would help achieve comparable oncological outcomes while help patients benefit from the minimally invasive approach. This video introduces an antegrade dissection which is an alternative to the traditional retrograde esophagectomy for squamous cell carcinoma of the thoracic esophagus.

Methods: A 54-year-old male patient had a cT1bN0M0 (stage I) squamous cell carcinoma in the middle thoracic esophagus. The surgery selected was thoracoscopic-laparoscopic three-hole esophagectomy with thoraco-abdominal two-field lymph-adenectomy. In the chest part of the procedure, dissection was carried out in an antegrade fashion, from the apex of the chest downwards to the diaphragm. The thoracic esophagus and the tumor was resected en-bloc with surrounding connective tissue. Thorough lymph node dissection was carefully completed, with special attention paid to those along the bilateral recurrent laryngeal nerves.

Results: The patient recovered uneventfully and was discharged on postoperative day 6. Pathologic study revealed a pT1bN1M0 (stage IIb) tumor, with lymphatic involvement detected in a right recurrent nerve node.

Conclusions: With the help of minimally invasive approach, rapid recovery from the extensive esophagectomy could be expected. However, it is critically important to make sure that the same oncological principles including a radical resection margin and a thorough lymph node dissection should also be observed. For the thoracic part of the procedure, an antegrade dissection could help achieve this goal, while making surgical maneuver simpler and safer.

Keywords: Minimally invasive surgery; esophagectomy; lymphadenectomy

Received: 08 August 2016; Accepted: 24 August 2016; Published: 05 September 2016.

doi: 10.21037/jovs.2016.08.09

View this article at: http://dx.doi.org/10.21037/jovs.2016.08.09

Introduction

In recent years there is a surge of increasing interest in minimally invasive esophagectomy for esophageal cancers. Routine procedure would be Thoracoscopic-laparoscopic esophagectomy and reconstruction with a gastric tube. In case of squamous cell carcinoma of the thoracic esophagus, the key oncological issues would include (I) a radical resection margin, and (II) a systemic lymphadenectomy (1). These two principles should never be compromised, regardless of the surgical approach. Complete removal of the lesion depends on both the radial and the longitudinal resection margins (2). This includes en bloc removal of the

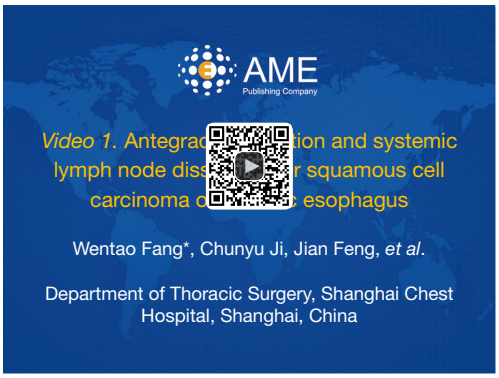

Figure 1 Antegrade dissection and systemic lymph node dissection for squamous cell carcinoma of thoracic esophagus (6).
Available online: http://www.asvide.com/articles/1128

lesion together with the thoracic esophagus, as well as the surrounding connective or fatty tissue along the esophagus so as to make sure of a radical radial margin. Another important part of the procedure is systemic lymph node dissection in the chest and the superior abdomen, so-called thoraco-abdominal two-field lymphadenectomy. Special attention is paid to nodal dissection along the right and left recurrent laryngeal nerves in the superior mediastinum, the subcarinal region, as well as all the lymphatic tissue in the mesentery of the thoracic esophagus (3). This would help ensure an accurate staging and satisfactory local control.

Early experiences in minimally invasive esophagectomy have proved its efficacy in reducing functional morbidities associated with this extensive procedure (4). However, its benefit is somewhat offset by the difficulty in ensuring complete tumor removal and thorough lymph node dissection while avoiding technical problems related (5). It is therefore critically important to abide by the oncological rules, while developing more readily acceptable surgical techniques so as to ensure that patients could benefit from the minimally invasive approaches. We hereby introduce an antegrade dissection of the thoracic esophagus, which we believe would help achieve the above mentioned purpose.

Patients and methods

Informed consent was acquired from the patient before surgery. The patient was a 54-year-old male complained of dysphagia for 1 month before presentation. Esophagoscopy revealed a superficial lesion 32 cm from the incisor, which turned out to be a squamous cell carcinoma after biopsy. The lesion was staged as cT1bN0M0 (I) after preoperative workup, including chest and abdominal CT scans, neck and endoscopic ultrasonography, and PET scan. The patient has good cardiopulmonary function and no other complication apart from mild hypertension which was well under control by medication. Surgical resection was selected as the first-line therapy, as it was considered to offer the best chance of cure for this patient.

The chest part of the procedure was carried out under the aid of video thoracoscope and artificial pneumothorax with CO_2 insufflation to help collapse the right lung (*Figure 1*). The authors routinely use a four port approach, with three 12-mm trocar and one 5-mm trocar. Dissection began at the superior mediastinum from opening the mediastinal pleura along the right vagus nerve. The right recurrent nerve was exposed posterior to the right vagus nerve and inferior to the right subclavian artery. Lymph nodes at this place were dissected away from the right recurrent nerve toward the esophagus and were then removed en-bloc with the pleura and all the connective tissue including the lymph nodes along the upper thoracic esophagus. After transecting the right bronchial artery and the azygos arch, the thoracic esophagus was then divided close to the thoracic inlet with an endostapler. The mediastinal pleura in the mid- and inferior mediastinum were opened posteriorly along the descending aorta and anteriorly along the right hilum. Then the distal stump of the esophagus was pulled forward and downward to reveal the right and left layers of the esophageal mesentery. In this way the dissection could be made away from the esophageal body and close to the neighboring structures including the right and left main bronchus, the aorta, the pericardium, and the left mediastinal pleura. The left bronchial artery was clamped and then transected. Otherwise, all the connective tissue including the small vessels to the esophagus could be cut safely with harmonic scalpel. The dissection went down all the way to the diaphragm till the hiatus curare was exposed, leaving no residual tissue between the mediastinum and the upper abdomen to ensure a thorough dissection. After the thoracic esophagus was dissected completely, subcarinal nodes were removed en bloc with the lymph nodes near the right and left main bronchus. Then the connective tissue in the left superior mediastinum was dissected away from the trachea and the left main bronchus to expose the left recurrent nerve. All lymph nodes along the nerve were harvested together with the surrounding tissue between the left recurrent nerve and the left border of the trachea. In this way when the chest part of the dissection was completed, all lymphatic tissue in the esophageal mesentery

was removed, leaving the surrounding vital structures skeletonized.

The patient was then repositioned and the abdominal part of the procedure was fulfilled under laparoscopy. The stomach was freed and lymph nodes along the gastric cardia, lesser curvature, and the left gastric vessels were removed en bloc while a 5–6 mm gastric tube along the greater curvature was prepared with staplers. It was then pulled up into the neck through the posterior mediastinum for anastomosis with the cervical esophagus in the neck. A nasogastric tube and a duodenal feeding tube were placed before completion of the procedure.

Results

The patient was extubated in the recovery room after operation and transferred back to the Intensive Care Unit. He started to ambulate on the first postoperative day. The chest drains were removed on the second postoperative day. He was then transferred back to the ordinary ward. Recovery was uneventful afterwards. And the patient was discharged on the 6^{th} postoperative day with his naso-duodenal feeding tube.

Upon histological examination, the lesion was found limited to the submucosal layer, but with metastasis in one of the right recurrent nerve lymph nodes. So the final stage was pT1bN1M0 (IIb). He thus received three cycles of adjuvant chemotherapy and was then put under regular follow-up.

Conclusions

During the thoracic part of minimally invasive esophagectomy for squamous cell carcinoma of the thoracic esophagus, most surgeons would begin with right recurrent nerve node dissection in the apex of the thoracic cavity. But to remove the tumor and the thoracic esophagus, usually dissection would start from the inferior mediastinum where the esophagus is most distant to its neighboring structures and receives less direct vessel supply from the descending aorta. Then the dissection needs to go retrogradely upward to the superior mediastinum again. The most difficult part is around the middle thoracic esophagus near the left main bronchus and the original part of the descending aorta, where the mesentery is the shortest and blood supply to the esophageal body is most abundant. With the esophageal body lying between the surgeon and those vital structures, it is always cumbersome to maneuver in a narrow space. Even with the aid of thoracoscope, it is sometimes difficult to have a clear vision of the structures behind. Much care should be taken to avoid inadvertent injury to the aorta, major airway, and the thoracic duct. However with esophagus transected at a higher level, dissection could be carried out from the thoracic apex antegradely downward to the diaphragm, cutting both the left and right layer of the esophageal mesentery at the same time. This antegrade dissection is not only time saving, but with the distal stump pulled anteriorly, the mesentery is extended at its full length, making dissection much safer under direct vision. Besides, a radical radial margin and complete removal of all lymphatic tissue in the mesentery could be more readily achieved through the antegrade dissection, as dissection was made close to the neighboring structures instead of close to the esophagus. For early stage lesions not invading into the adjacent organs, the tumor could be removed without even been exposed during surgery. Furthermore, lymph node dissection, especially subcarinal and left recurrent nerve nodes behind the esophagus, becomes much easier and straight forward under direct vision when the esophagus has already been removed from the posterior mediastinum. This would allow a safer and more thorough dissection. Therefore, antegrade dissection should be considered an ideal alternative for minimally invasive surgical resection of squamous cell carcinoma of the thoracic esophagus.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The manuscript is on a certain surgical procedure and no clinical study involved. Thus, approval from ethnical committee is not needed. Written informed consent was obtained from the patient.

References

1. Biere SS, van Berge Henegouwen MI, Maas KW, et al. Minimally invasive versus open oesophagectomy for patients with oesophageal cancer: a multicentre, open-label, randomised controlled trial. Lancet 2012;379:1887-92.
2. Müller JM, Erasmi H, Stelzner M, et al. Surgical therapy

of oesophageal carcinoma. Br J Surg 1990;77:845-57.
3. Rizzetto C, DeMeester SR, Hagen JA, et al. En bloc esophagectomy reduces local recurrence and improves survival compared with transhiatal resection after neoadjuvant therapy for esophageal adenocarcinoma. J Thorac Cardiovasc Surg 2008;135:1228-36.
4. Mao T, Fang W, Gu Z, et al. Comparison of perioperative outcomes between open and minimally invasive esophagectomy for esophageal cancer. Thorac Cancer 2015;6:303-6.
5. Mao T, Fang W, Gu Z, et al. Video-assisted thoracolaparoscopic esophagectomy: the experience of Shanghai Chest Hospital. J Thorac Dis 2013;5:906-9.
6. Wang G, Wang Z, Sun X, et al. Antegrade dissection and systemic lymph node dissection for squamous cell carcinoma of thoracic esophagus. Asvide 2016;3:359. Available online: http://www.asvide.com/articles/1128

doi: 10.21037/jovs.2016.08.09
Cite this article as: Fang W, Ji C, Feng J, Zhao W, Zhang X. Minimally invasive esophagectomy and thoraco-abdominal two-field lymph node dissection for thoracic esophageal squamous cell carcinoma—antegrade dissection of the thoracic esophagus. J Vis Surg 2016;2:151.

