Combined operative technique with anterior surgical approach and video-assisted thoracoscopic surgical lobectomy for anterior superior sulcus tumours

Yuhei Yokoyama, Fengshi Chen, Akihiro Aoyama, Toshihiko Sato and Hiroshi Date*

Department of Thoracic Surgery, Kyoto University, Kyoto, Japan

* Corresponding author. Department of Thoracic Surgery, Kyoto University, 54 Shogoin-Kawahara-cho, Sakyo-ku, Kyoto 606-8507, Japan. Tel: +81-75-7514975; fax: +81-75-7514974; e-mail: hdate@kuhp.kyoto-u.ac.jp (H. Date).

Received 28 April 2014; received in revised form 6 June 2014; accepted 12 June 2014

Abstract

Video-assisted thoracoscopic surgery (VATS) has been widely used, but surgical resections of superior sulcus tumours remain challenging because of their anatomical location. For such cases, less-invasive procedures, such as the anterior transcervical-thoracic and transmanubrial approaches, have been widely performed because of their excellent visualization of the subclavian vessels. Recently, a combined operative technique with an anterior surgical approach and VATS for anterior superior sulcus tumours has been introduced. Herein, we report three cases of anterior superior sulcus tumours successfully resected by surgical approaches combined with a VATS-based lobectomy. In all cases, operability was confirmed by VATS, and upper lobectomies with hilar and mediastinal lymph node dissections were performed. Subsequently, dissections of the anterior inlet of the tumours were performed using the transmanubrial approach in two patients and the anterior trans-cervical-thoracic approach in one patient. Both approaches provided excellent access to the anterior inlet of the tumour and exposure of the subclavian vessels, resulting in radical resection of the tumour with concomitant resection of the surrounding anatomical structures, including the chest wall and vessels. In conclusion, VATS lobectomy combined with the anterior surgical approach might be an excellent procedure for the resection of anterior superior sulcus tumours.

Keywords: Lung cancer • Superior sulcus tumour • Transmanubrial approach • Video-assisted thoracoscopic surgical lobectomy • Video-assisted thoracoscopic surgery

INTRODUCTION

Despite the advances of multimodality treatments, the surgical resection of superior sulcus tumours remains critical and challenging. The anterior surgical approaches, such as transcervical-thoracic [1] and transmanubrial approaches [2], have been widely used because of their excellent visualization of the subclavian vessels. Video-assisted thoracoscopic surgery (VATS) has replaced thoracotomy as a standard surgical technique for lung cancers. Recently, a combined operative technique with an anterior surgical approach and VATS for anterior superior sulcus tumours was introduced [3]. Herein, we report three cases of anterior superior sulcus tumours successfully resected by surgical approaches combined with VATS lobectomy.

CASE 1

A 79-year old man presented with a right apical non-small-cell carcinoma (cT3N0M0, Fig. 1). Considering the patient’s age and the extent of tumour invasion, surgical resection without preoperative treatment was proposed. First, the patient was positioned in the left lateral decubitus position and the VATS procedure was initiated (Fig. 2A). After confirming the resectability of the tumour, VATS lobectomy with two ports and one utility incision without rib spread was performed. The upper pulmonary veins, arteries and bronchus were resected safely. The apical adhesion was left untouched, but dissection of the hilar and mediastinal lymph nodes (station 2R, 4R, 7 and 10) was performed successfully. Subsequently, the patient was turned to the supine position. The transmanubrial approach was then undertaken. An inverted L-shaped incision was made as shown in Fig. 2B. To preserve sternoclavicular joint stability, the sternal manubrium was transected with an L-shaped transection. The first costal cartilage was separated from the sternal manubrium. These procedures allowed the clavicle and inverted L-shaped manubrium to be lifted up, and this afforded excellent access to the apical site. After confirming the absence of tumour invasion to the subclavian vessels, a radical tumour resection with concomitant resection of the first and the second ribs was performed through this approach. The lobe was extracted through the anterior incision. Definitive pathological examination of the specimen revealed that the tumour was a pleomorphic carcinoma with a possible microscopic tumour invasion of the posterior cut surface of the first rib (pT3N0M0). Postoperatively, 60-Gy radiation at the posterior margins of the first rib was performed. The patient is still alive with no indications of recurrence four years after the operation.

© The Author 2014. Published by Oxford University Press on behalf of the European Association for Cardio-Thoracic Surgery. All rights reserved.
CASE 2

A 51-year-old man presented with a right apical non-small cell carcinoma that was suspected to have invaded the right subclavian vein (cT4N0M0). The patient was treated with six cycles of carboplatin and paclitaxel with concurrent 50-Gy radiation at the primary site. Post-chemoradiotherapy images showed a partial response of the tumour (ycT4N0M0); therefore, surgical resection was performed. First, VATS right upper lobectomy with dissection of the hilar and mediastinal lymph nodes (Stations 2R, 4R, 7 and 10) was successfully performed. Then, the transmanubrial approach was undertaken. Given that there was severe adhesion between the tumour and the subclavian vein, radical resection of the tumour with a concomitant resection of the subclavian vein and the first rib was performed (Fig. 2C). Definitive pathological examination of the specimen revealed a partial response of the tumour without invasion to the subclavian vein and the first rib (ypT3N0M0). The patient was alive with no indications of recurrence 6 months after the operation.

CASE 3

A 52-year old man presented with a left apical non-small-cell carcinoma invading the apical chest wall and anterior mediastinum (cT4N1M0). The patient was treated with four cycles of carboplatin and paclitaxel with concurrent 40-Gy irradiation at the primary site and left hilum. After chemoradiotherapy, images showed a partial response of the tumour (ycT4N0M0) and, thus, surgical resection was proposed. Firstly, VATS left upper lobectomy with dissection of the hilar and mediastinal lymph nodes (Stations 5, 6, 10) was performed. No severe adhesions were observed because of the induction of chemoradiotherapy. However, because of the presence of apical adhesions, the first branch of the pulmonary artery was ligated after the resection of the upper bronchus. Subsequently, the transcervical-thoracic approach was undertaken resulting in radical resection of the tumour with a concomitant partial resection of the clavicle, as well as that of the first and the second ribs (ypT4N0M0). The patient was alive 50 months after the operation without any indications of recurrence.

COMMENTS

For the removal of superior sulcus tumours invading the anterior part of the thoracic inlet, the anterior transcervical-thoracic approach was introduced by Dartevelle [1], which was also refined by Grunenwald as a transmanubrial approach to preserve sternoclavicular joint stability [2]. In our series of patients, the transmanubrial approach was used in the first two cases and the anterior transcervical-thoracic approach was taken in the last case. Both approaches provided excellent access to the anterior inlet of the tumour and exposure of the subclavian vessels, resulting in radical resection of the tumour with concomitant resection of the surrounding anatomical structures. Although these approaches provided a good view and enabled tumour resection from the apical structure, achieving a full upper lobe lobectomy with dissection of the hilar and mediastinal lymph nodes required a wide incision or an additional thoracotomy.

Recently, successful cases of combined VATS lobectomy with a transmanubrial approach for superior sulcus tumours have been reported [3, 4]. In our study, induction chemoradiotherapy was performed in two out of three patients, but there was no difficulty in VATS procedures. In Case 3, the irradiation field included the hilum, but VATS lobectomy was accomplished even under complete monitoring vision.

The superiority regarding the order of VATS lobectomy and the anterior surgical approach cannot be determined. However, we favour our strategy because we can confirm the extent of surgery.
by thoracoscopy before the anterior surgical approach. All 3 patients recovered from surgery relatively early without morbid-
ities because of the less-invasive procedure combined with the anterior surgical approach and VATS lobectomy. This procedure might be considered as a primary surgical approach for anterior superior sulcus tumours.

In conclusion, VATS lobectomy combined with the anterior surgical approach might be an excellent procedure for the resection of anterior superior sulcus tumours.

**Conflict of interest:** none declared.

**REFERENCES**


[2] Grunenwald D, Spaggiari L. Transmanubrial osteomuscular sparing ap-
