

Video-assisted thoracoscopic sleeve lobectomy

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Abstract: Although minimally invasive video-assisted thoracic surgery (VATS) lobectomy has proved to be equal and in some aspects superior to open lobectomy in T1 and T2 lung cancers, video-assisted thoracic sleeve lobectomy is not widely practiced. Reconstruction is one of the most problematic techniques in thoracic surgery. We present a case of a patient who underwent VATS right-sided sleeve lobectomy due to right lung cancer. Based on the preoperative examinations, our VATS technique consisted of four incisions: three ports and a 3–4 cm long utility incision without any kind of rib spreading. Total surgery time was 180 min and blood loss was 100 mL. The chest tube was removed on the 5th post-operative day and the patient was discharged home on the 10th postoperative day. The final histopathological examination confirmed squamous cell lung cancer (T2aN0M0 stage IB). In the authors' opinion VATS right-sided sleeve lobectomy should be performed by a surgeon with adequate experience with this approach. Despite limited indications for VATS right-sided sleeve lobectomy, if the patients fulfill the sleeve lobectomy inclusion criteria in general, they may gain from all the advantages of minimally invasive techniques.

Keywords: Video-assisted thoracic surgery (VATS); sleeve lobectomy

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Introduction

Video-assisted thoracic surgery (VATS) lobectomy is an acceptable alternative and seems equivalent to open lobectomy in terms of complications and oncological value. Its advantages compared to thoracotomy are less surgical injury, decreased postoperative pain, fewer postoperative pulmonary complications, shorter hospital stay, improved quality of life, and improved delivery of adjuvant chemotherapy, with a comparable long-term survival rate. Endobronchial tumours requiring sleeve resection have been usually considered a contraindication for VATS. However, with new technical advances and the experience gained in VATS, sleeve lobectomy has been performed by thoracoscopy in experienced VATS centres (1).

We present a case of a patient who underwent VATS right-sided sleeve lobectomy due to lung cancer at the Thoracic Surgery Department of Zhengzhou University with special consideration of technical aspects of the procedure (*Figure 1*).

Case report

The 78-year-old patient with right upper lung cancer was admitted to the Thoracic Surgery Department. On admission the patient gave a 20-day history of dry cough, hemoptysis. The main comorbidities were chronic obstructive lung disease. Computed tomography (CT) scan of the chest revealed a 2.4 cm × 3.4 cm mass located in the right upper lobar bronchus without infiltration of the pulmonary vessels in the hilum and mediastinum. Bronchoscopy confirmed exophytic tumor obliterating the distal part of the right main bronchus and infiltrating orifices of both the upper and the intermedius bronchus. A biopsy was carried out and the histopathological diagnosis of squamous cell carcinoma was made. The patient was clinically staged as IB (T2aN0M0) and was qualified for VATS sleeve lobectomy.

Surgical technique

Surgery was performed under general anesthesia. The



Figure 1 Video-assisted thoracoscopic upper right bronchial sleeve lobectomy (2). Available online: <http://www.asvide.com/articles/281>

patient was intubated with a left double-lumen endotracheal tube which allowed one lung ventilation during surgery. The patient was placed in the lateral decubitus position. Ports were placed in for VATS lobectomy: the first in the 7th inter-costal space in the anterior axillary line for camera pole; the second in the 8th intercostal space in the infrascapular line; and the third in the 6th inter-costal space in posterior axillary line. A 3 cm long utility incision was made at the level of the 4th intercostal space in the anterior axillary. An incision protection retractor was attached to each port. No rib spreader was used and the whole procedure was controlled on the monitor. The doctor and the camera holder stand in the ventral side of the patient during the process of operation.

Typically, single-direction lobectomy could be considered for the procedure. So we divided the superior pulmonary vein and segmental PA branches and then N2 lymph nodes were dissected (3). At first the anterior mediastinal pleura of the hilum was dissected by ultrasonically activated scalpel (UAS). After the dissection of the adhesions the superior pulmonary vein was stapled and cut off with a vascular (white cartridge) 60 mm long endostapler (EC60, JJMC, USA). Next the first branch pulmonary artery, horizontal fissure were treated with a linear stapler in this order. Taking into account the second branch of pulmonary artery is less than 4 mm and its angle are not suitable for application of linear stapler, it was knotted and dissected by UAS. The facts prove that it is feasible and safe for PA segmental vessels less than 4 mm (4).

The inferior pulmonary ligament was divided to expose the mediastinal pleura. The surrounding connective tissue of the right main bronchus and the intermedius bronchi of the right lung was removed. Stations 2, 3, 4, 7, 8, 9, 10 and

11 lymph nodes were dissected before dissection of bronchus. It is beneficial for the anastomosis without tension.

The right main stem bronchus was divided first, and then the bronchus intermedius was divided using scissors and a scalpel. Frozen sections of the cut ends of the right main bronchus and the bronchus intermedius were negative of tumor infiltration as confirmed pathologically during surgery.

Right bronchial sleeve lobectomy was then performed. We place no stay sutures in the bronchus to facilitate the anastomosis. Bidirectional and uninterrupted sutures were used for the bronchial anastomosis with 2-0 prolene suture to first anastomose the less exposed tracheal wall (3). A total of two ligation position, the first in suture starting position, second in the suture end position. The entire operation was performed with conventional long instruments. Freed lobes were placed in an endocatch bag. Leak testing was conducted following the anastomosis, in which no leakage was detected up to an airway pressure of 30 cm H₂O (2.94 kPa). Two 26F chest tubes were placed, and the incisions were closed.

Total surgery time was 180 min and blood loss was 100 mL. The chest tube was removed on the 5th postoperative day. Postoperative bronchoscopy and CT scan were performed to observe the healing of the anastomotic stoma. The final histopathological examination confirmed squamous cell lung cancer (T2aN0M0 stage IB). The patient was discharged home on the 10th postoperative day.

Patient was followed up for 2 months after surgery without occurrence of death, tumor recurrence or other adverse events.

Discussion

Despite advances in VATS lobectomy, sleeve lobectomy and bronchoplastic procedures in general have traditionally been performed through a posterolateral thoracotomy. Until recently sleeve resection has been viewed as an absolute contraindication to VATS lobectomy, despite numerous advantages associated with minimally invasive procedures (1). The first documented VATS sleeve lobectomy was reported by Santambrogio and colleagues in 2002 for a 15-year-old female with low-grade mucoepidermoid carcinoma of the left lower lobe bronchus (5). VATS sleeve lobectomy should be performed in comparatively experienced centers.

A interrupted suture was used in bronchial anastomoses in the published studies (3,6), while Liu *et al.* reported the use of a continuous suture with 3-0 or 4-0 prolene sutures (7,8). In the case we also use 3-0 prolene sutures at the beginning, but

suture is broken when knotted. This is a fatal for beginners, so we modified the method in this case. We used 2-0 prolene sutures in bronchial anastomosis with the first suture made in the less exposed tracheal wall about the six o'clock position of the bronchial wall and knotted outside the bronchus, followed by further bidirectional and continuous sutures to cover the entire circumference, with a final knot at the outer side of the wall to complete the anastomosis. The outcome of the anastomosis was considered satisfying.

Xu *et al.* have reported the sleeve reconstruction of the left upper lobe. The deep location of the operative field partly hidden under the left pulmonary artery trunk during bronchial anastomosis in this region has made it even more difficult to operate thoroscopically. To improve exposure of the operative field, they managed to raise the left main bronchus by passing two 1-0 silk sutures. In this way, a widely open, exposed field was achieved (9). Compared to the sleeve reconstruction of the left upper lobe, the right is relative easy, we place any stay sutures in the bronchus to facilitate the anastomosis.

Our techniques have some advantages. Firstly, four ports were placed in for VATS sleeve lobectomy, which greatly reduced the entanglement of sutures as reported by Liu *et al.* (7). Secondly, the whole-course of application of UAS reduces operation time and bleeding. Thirdly, the anastomosis in an uninterrupted and bidirectional fashion with 2-0 prolene suture makes surgery satisfying and more safety.

Very limited indications for VATS sleeve lobectomy are the reason why the frequency of this type of procedure remains low. However, if the patients fulfill the sleeve lobectomy inclusion criteria in general, they may gain from all the advantages of minimally invasive techniques.

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