

# Single-direction thoracoscopic lobectomy: left side

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## Introduction

Lobectomy can be done either via thoracotomy or via video-assisted thoracic surgery (VATS) (1-3). In the recent years, VATS approach is adopted increasingly worldwide due to its advantages of less pain, lower complication rate, shorter hospital stay, and equivalent long term survival rate, comparing with thoracotomy (4-7). However, VATS lobectomy is complicated, especially VATS left upper lobe resection (8,9). The aim of this paper is to introduce the detailed procedures which presented in the videos of single-direction thoracoscopic left upper lobectomy and left lower lobectomy.

## Operative techniques

### *Left upper lobe (LUL) resection (Figure 1)*

A 63-year-old male was transferred to our hospital after biopsy confirmed adenocarcinoma on his left upper lung in the local hospital. Single-direction VATS LUL resection was performed.

The patient was placed in the lateral decubitus position, and general anesthesia with double-lumen intubation was administered. A 1 cm observation incision was made in the seventh intercostal space (ICS) at the middle axillary line. The utility incision about 3 cm, was made in the third ICS at the anterior axillary line, while a 2 cm long assistant incision was placed in the ninth ICS between posterior axillary line and subscapular line. The surgeon and the camera man stood in front of the patient, while the assistant stood at the back side.

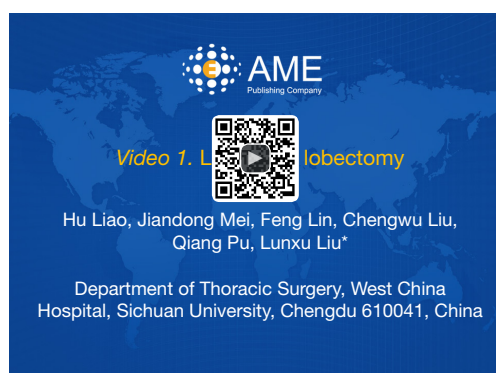
Retracted the left upper lobe posteriorly using endoscopic curved ring clamps to expose the hilum, then opened the pleura along the phrenic nerve using the

electrocautery hook. Carefully dissected fascia covering the superior pulmonary vein (SPV) and main pulmonary artery (PA). Passed a right-angle clamp around the SPV and then transected it with a vascular stapler introduced through the posterior assistant incision. Opened the pleura below the arch of aorta to help expose the superior border of the anterior trunk, and then carefully dissected the artery using the electrocautery hook and endoscopic metal suction. Passed a right-angle clamp through the utility incision to create a tunnel and to guide passing the vascular stapler around the anterior trunk. The same maneuver is used to cut the LUL bronchus. Carefully dissected the remaining branches of left pulmonary artery which supply the LUL, and ligated them separately using 4-0 threads. Finally, introduced a 3.5 mm stapler from the assistant incision to cut the oblique fissure and then retrieved the specimen through the utility incision. The traction of lung sustained backward during the whole process of resection.

### *Left lower lobe (LLL) resection (Figure 2)*

A 67-year-old man complaining of persistent mild chest pain for 2 months came to visit our hospital. Enhanced computed tomography (CT) scan of the chest found a 3 cm × 2.5 cm mass on his left lower lung, and broncho-alveolar lavage detected non-small cell lung cancer cells. After excluded contraindications, the patient was referred to surgery. Single-direction VATS LLL resection was carried out.

Preparation for surgery including anesthesia and positioning were the same as LUL resection. The utility incision was placed in the 4<sup>th</sup> ICS at the anterior axillary line while the other two incisions were the same as described above. Retracted the lung cranially and slightly posteriorly



**Figure 1** Left upper lobectomy (10).

Available online: <http://www.asvide.com/article/view/27884>



**Figure 2** Left lower lobectomy (11).

Available online: <http://www.asvide.com/article/view/27885>

using endoscopic curved ring clamps to expose the inferior pulmonary ligament, then transected the ligament using electrocautery hook. Cut the pleura along the pericardium to unveiled the SPV and defined the superior aspect of the IPV. Slightly move the lung anteromedially to expose the posterior pleura and then opened it along the posterior surface of the IPV. Passed the suction tip through the utility incision to create a tunnel around the IPV and then introduced a vascular endoscopic stapler through the utility incision to cut the IPV. Dissected the LUL bronchus beneath the IPV, brought a Kelly clamp through the utility incision and maneuvered around the LUL bronchus. Spread the Kelly clamp wide to create a tunnel for a 4.1 mm stapler which introduced through the utility incision to transect the bronchus. Removed the lymph nodes covering the artery, carefully identified the lingual PA, superior segmental PA and the basal trunk PA. Passed a Kelly clamp around the superior segmental PA and the basal trunk PA, and

then used a vascular endoscopic stapler to cut the arteries. Finally, transected the oblique fissure using a 3.5 mm stapler and then retrieved the specimen through the utility incision.

## Comments

Because the pulmonary artery surrounds the left bronchus and moreover the arterial branches varies a lot (12), VATS left upper lobectomy is difficult even for experienced surgeons. During operation, the surgeon should be utmost careful to identify and transect all branches to avoid accidental bleeding. Some authors suggest that the arterial branches can be searched and transected after the oblique fissure has been opened (13). However, this method is greatly enslaved to the development of interloper fissure. When the fissure is hypoplastic, conversion to thoracotomy may be inevitable. In our technique, we perform the operation in a single direction approach from the ventrum to the dorsum. The most superficial SPV first, followed by the anterior trunk directly beneath the vein, then the LUL bronchus. Once the bronchus has been transected, the PA can be visualized directly, and it is easy to identify and manage all the branches, even for the trainees. Finally, the fissure is transected by a stapler, which also avoids the trouble of hypoplastic fissure (14). Sometimes, the LUL bronchus lies superficial to the anterior trunk. Under this circumstance, the bronchus would be managed prior to the artery. Anyhow, the operation sequence addict to the core philosophy of “single direction”, always manage the most superficial structure first, then deeper one, without considering what the structure is.

The direction to perform LLL resection is from dorsum to cranium. Attention should be paid not to mistakenly transect the arterial branch supplying the lingual segments. After the bronchus has been cut, the interlobar lymph nodes which covering the artery should be carefully removed to better expose the artery.

In conclusion, the process of single-direction VATS lobectomy is clear and easily understood, and technically feasible for all lobes.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest

to declare.

**Informed Consent:** Written informed consent was obtained from the patients for publication of this manuscript and any accompanying images.

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