

# Video-assisted thoracoscopic pneumonectomy

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**Background:** Lung cancer often requires pneumonectomy. This procedure is challenging and usually performed by thoracotomy, which is traumatic and may involve complications. Video-assisted thoracoscopic surgery (VATS) lobectomy is a recognized procedure that has been accepted by surgeons. There is no standard procedure to perform a pneumonectomy using VATS. The aim of this paper is to share our experiences and to show our technique for performing a pneumonectomy using VATS.

**Methods:** A 65-year-old man was admitted to the First Affiliated Hospital of Chongqing Medical University. A thoracic computed tomography (CT) scan revealed a 56 mm × 45 mm × 40 mm lesion in the left upper lung lobe. Lesions involving the left lower lung lobe were also identified and the subcarinal and hilar lymph nodes were enlarged. A VATS pneumonectomy was performed.

**Results:** The total surgery time was approximately 90 min, the intraoperative blood loss was 100 mL, the number of resected lymph nodes was 15; and the postoperative hospital stay was 8 days. Follow-up revealed no recurrence or metastasis for 6 months.

**Conclusions:** Video-assisted thoracoscopic pneumonectomy is a safe and effective treatment procedure.

**Keywords:** Video-assisted thoracoscopic surgery (VATS); pneumonectomy; lung cancer

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## Introduction

The incidence of carcinoma of the lung has increased worldwide. Surgical treatment remains the primary treatment for this condition. Video-assisted thoracoscopic surgery (VATS) lobectomy is now a well-accepted method to cure carcinoma of the lung and has been shown to be both safe and effective.

Video-assisted thoracic surgery for carcinoma of the lung was first described more than 20 years ago (1). Compared with conventional open surgery, the advantages of VATS for carcinoma of the lung include reduced surgical trauma, postoperative pain and intraoperative blood loss; less operative time; less effect on pulmonary functions; fewer complications; and rapid recovery (2-4). Long-term survival is similar to that of conventional open surgery (5).

Most publications have reported thoracoscope-assisted

anatomical pneumonectomy but few reports have described the use of VATS for pneumonectomy. The aim of this paper is to illustrate our technique for VATS pneumonectomy (*Figure 1*) and share our experience.

A 65-year-old man with a history of smoking for 40 years was admitted to the First Affiliated Hospital of Chongqing Medical University. A thoracic computed tomography (CT) scan revealed a 56 mm × 45 mm × 40 mm lesion in the left upper lung lobe. Lesions involving the left lower lung lobe were also identified and the subcarinal and hilar lymph nodes were enlarged. Routine laboratory tests, electrocardiogram (ECG), pulmonary function tests, positron emission tomography (PET) and an anesthesia-related assessment were performed. All test results indicated that the patient could undergo surgery. No evidence of metastasis was seen. The patient stopped smoking 2 weeks before the surgery.



**Figure 1** Video-assisted thoracoscopic pneumonectomy (6).

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## Surgical technique

The patient was intubated with a double lumen endotracheal tube and intravenous anesthesia was administered and single-lung ventilation was initiated. The patient was placed in lateral recumbency. The surgeon stood in an anterior position to the patient. Three ports were used. A 1.5-cm thoracoscope was inserted in the 7<sup>th</sup> intercostal space at the mid-axillary line. A 4-5-cm working port was placed in the anterior axillary line in the 3<sup>rd</sup> intercostal space. A 1.5-2-cm assistant's port was placed in the 9<sup>th</sup> intercostal space between the posterior axillary and subscapular lines.

The VATS procedure to perform a left pneumonectomy was divided into these steps:

- (I) Using the electrocoagulation hook and suction tip, we opened the mediastinal pleura and fully exposed the left superior and inferior pulmonary veins;
- (II) We completely freed the left pulmonary artery;
- (II) The pulmonary vein was transected using the endo-stapler introduced through the assistant's port;
- (IV) The pulmonary artery was transected using the endo-stapler introduced through the working port;
- (V) The left bronchus was fully exposed and transected using the endo-stapler through the assistant's port. The hilus pulmonis lymph nodes were dissected and removed;
- (VI) The 4 L, 5, 6, 7 and 9 groups of lymph nodes were dissected and removed.

## Results

The total surgery time was approximately 90 min, the intraoperative blood loss was 100 mL, 15 lymph nodes were

resected, and postoperative hospital stay was 8 days. Follow-up revealed no recurrence or metastasis for 6 months.

## Discussion

Compared to lobectomy, open pneumonectomy is more traumatic for patients, recovery is more difficult, and the possibility of postoperative complications is greater.

In recent years, standard procedures for VATS lobectomy have been developed. However, there are no standard procedures for pneumonectomy using VATS (7-9).

We gradually began to perform VATS pneumonectomies and have the following experiences to share. This technique is suitable for selected patients with bronchogenic carcinoma who have stage I or II disease with a normal mediastinum and clear access to the hilar structures. It is also feasible in patients with peripheral lung cancers involving other lobes or in patients in which one side of the entire lung has benign damage, such as extensive lung cysts or leafy bronchiectasis. As equipment and techniques improve, the indications can be extended to other conditions.

Unlike some other surgeons, we are continuing to use the classic three ports method. We believe one advantage of this method is that the instruments do not easily interfere with each other. With a single port, the equipment and the camera are parallel, the front end of the instrument is not easily seen, and special endoscopic equipment is often needed. In the case of an emergency, the three ports method allows better access. The main working port was located in the anterior axillary line in the 3<sup>rd</sup> intercostal space, adjacent to the hilum where there is a shorter distance between the hilar structures and the port. An assistant's port was located in the 9<sup>th</sup> intercostal space between the posterior axillary and subscapular lines, parallel to the mediastinal plane which facilitated placement of the endo-stapler and isolation of vessels and bronchi.

Compared to lobectomy, all structures of the hilum are easier to manipulate; however, the risk is higher. It is very important for the target structure to be clearly visible and the endo-stapler to pass easily to reduce the risk of damage to the surrounding structures.

The field of vision encompassing the mediastinum is wide after pneumonectomy and accessing the mediastinal lymph nodes is easier using VATS.

## Conclusions

In our experience, VATS pneumonectomy is a simple,

easily replicable procedure with minimal trauma and complications.

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