

Total thoracoscopic combined lingulectomy and pericardial cystectomy

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Abstract: Thoracoscopic anatomic segmentectomy is usually more complex than lobectomy. This video shows a 58-year-old female who suffered from limited bronchiectasis of the lingular segment of the left upper lung and a pericardial cyst on the same side. Both of these benign thoracic diseases can cause pleural adhesions. Repeated chronic inflammation contributes to hypervascularity and lymph node enlargement, making surgery more difficult. We used single-direction thoracoscopic segmentectomy via a three-port approach and successfully removed the lingula and pericardial cyst.

Keywords: Pulmonary segmental resection; bronchiectasis; pericardial cyst; total thoracoscopy

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Introduction

Segmentectomy is an effective treatment for certain lung diseases. In principle, for some benign lesions, lung resection should be sufficient for complete removal without risk of recurrence, but the procedure should conserve a maximum amount of normal lung tissue in order to maintain better lung function. Compared to segmentectomy a lobectomy results in removal of more normal lung tissue, with the potential for worse post-operative lung function. Pulmonary wedge resection also conserves lung tissue, but because it is a non-anatomic resection, it is unsuitable for deep lung tissue resection. In this instance, segmentectomy is a good choice. The increased use of low-dose spiral CT for screening will result in more lung cancer being diagnosed early, including in an older population, therefore thoracoscopic segmentectomy is becoming a topic of much interest and research.

Surgical technology (Figure 1)

Triple-port approach by thoracoscopy; the 7th intercostal space on the axillary line for an observation port, the fifth intercostal space on the anterior axillary line for the

operating port, and the 8th intercostal on the posterior axillary line for the secondary operations port (Figure 2).

Step 1: removal of the pericardial cyst (01:15-01:42)

We used a diathermy hook and an ultrasonic scalpel dissection to divide intrathoracic adhesions. The boundary of pericardial cyst was clear, so we removed it first. We removed the pericardial cyst from the edge, while trying to maintain the integrity of the cyst wall in order to obtain better exposure. The assistant pulled the cyst in the opposite direction to form tension in favor of removal. Neovascularization may exist in the base of the cyst, so we used the ultrasonic scalpel to avoid hemorrhage.

Step 2: release the left inferior pulmonary ligament and mediastinal pleura (03:21-03:50)

The left inferior pulmonary ligament and mediastinal pleura were released, improving lung exposure and retraction in all directions. For the triple-port approach, we place the suction and diathermy hook through the utility port in the 5th intercostal space to divide the anterior mediastinal pleura then use the access through the posterior working



Figure 1 Total thoracoscopic combined lingulectomy and pericardial cystectomy (1).

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Figure 2 Incision position.

port in the 8th intercostal to divide the posterior mediastinal pleura. We have found this to be the simplest.

Step 3: division of the lingular vein (10:27-11:09, 14:20-14:35)

We dissected the left superior pulmonary vein from proximal to distal, isolated three tributaries, confirmed the anatomy, and divided the lingular vein. Vascular variation in lung segments is common, and therefore it is sometimes difficult to separate the independent segment vein. When the segment venous anatomy is difficult to judge, our principle is to divide the most distal vein, to avoid affecting the venous return to the remaining lung segment, which may cause pulmonary congestion. When the left superior pulmonary vein was trifurcated, we would cut only the lowest tributary to the lingula.

Step 4: division of the lingular segmental bronchi (15:45-16:35)

We cleared the bronchus circumferentially then isolated and divided the lingular bronchus. The lingular bronchus can

be divided directly without lung expansion if the bronchial anatomy can be clearly demonstrated. We attempt to thoroughly free up the distal bronchi in order to avoid dividing the entire upper lobe bronchi. When we cannot confidently confirm the anatomy, lung expansion, while clamping the presumed lingular bronchus, can be used to avoid accidental lobectomy.

Step 5: complete interlobar fissure and divide the lingular segmental artery (22:50-25:19)

The anterior part of the oblique fissure can be dealt with safely without injuring the pulmonary artery. We next open the pulmonary vascular sheath, making it easier to separate the interlobar fissure. By retracting the left upper lobe superiorly after dividing the interlobar fissure, the lingular artery can be more easily identified, dissected, and divided.

Step 6: completion of the intersegmental fissure (25:55-26:58, 27:40-28:12)

The posterior interlobar fissure does not require division. As the lingular bronchus has been divided, when the left lung is inflated, the intersegmental fissure will be clearly demonstrated. The lingulectomy is completed by dividing the line where the lung tissue fails to inflate.

Surgical evaluation

- (I) VATS access can be by single, double, triple or four ports in contemporary practice. Single-port surgery promises minimal trauma and best cosmesis, but may result in more difficult operating conditions. By increasing the number of operating ports, the surgery is easier, surgical speed is improved and we can save more time. Different port access approaches each have their advantages and disadvantages, and should be based on the surgeon's skill and operating practices, as well as the equipment used. We routinely use triple-port surgery, in this way we can place the suction and electrical hook through the utility port in the 5th intercostal space to divide the anterior mediastinal pleura, and through the posterior working port in the 8th intercostal space to divide the posterior mediastinal pleura. During division of the vein and bronchus, when using the stapler from the posterior working port, it is possible to get a better operating perspective, especially using non-roticulating stapler

- instruments;
- (II) This patient suffered from bronchiectasis in the lingular segment and a pericardial cyst in the ipsilateral hemithorax. Therefore, using triple-port thoroscopic resection to deal with two lesions in the same incision at the same time was appropriate. The pericardial cyst was mobilized and easily removed, providing much improved space for the VATS approach;
- (III) The instruments included suction, diathermy hook, ultrasonic scalpel, and energy platform to dissect tissue in the chest. The diathermy hook is flexible and accurate. The ultrasonic scalpel and energy platform provides good hemostasis;
- (IV) Lymph node dissection is unnecessary with benign lesions, but removal of hilar lymph nodes can help reveal blood vessels, trachea and other important structures, improve the speed of surgery and make the surgery safe;
- (V) We adhere to the concept of single-direction total thoroscopic lobectomy (2). We reveal the bronchi and pulmonary artery from front to back after the pulmonary vein is dealt with;
- (VI) The difficulties of segmentectomy are the judgment of the target segment and the intersegmental fissure. There are several ways of resolving these. Firstly, the target lung segment remains collapsed, while the surrounding lung segment is inflated (3). Secondly, the target lung segment can be inflated while the surrounding lung segment remains collapsed (4). To achieve this, Okada *et al.* (5) used selective jet ventilation of the target segments via fiberoptic bronchoscopy to determine the boundaries of the segment. A third method is lung segment chromogenic technology. In order to determine the boundary between the lung segments, Misaki *et al.* injected

intravenous dye following pulmonary vessel division, so that adjacent lung segments stained, but the target segment did not (6). In keeping with single-direction surgery, the lingular segmental bronchus should be divided first, so we used the first method to determine the target lung segment. This method is relatively simple and easy to teach, and the result is satisfactory.

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