

Case Report

Uniportal video-assisted thoracic surgery for right intralobar pulmonary sequestration

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Abstract: Purpose: A pulmonary sequestration is an embryonic mass of lung tissue that has no identifiable bronchial communication. It is characterized by nonfunctional pulmonary parenchyma separated from the normal tracheo-bronchial tree and abnormal blood supply from the systemic circulation. Methods: We report a 61-year-old male with progressive chest distress and pain, recurrent pneumonia, was diagnosed pulmonary sequestration. The clinical features, treatment, pathological findings, and prognosis following were reviewed. Results: Contrast-enhanced computed tomography (CT) of the thorax revealed a mass in the right lower lobe indicating an aberrant blood vessel. A high resolution CT scan with three-dimensional reconstructions showed a 7 mm feeding artery arising from the right side of the descending thoracic aorta, running up on paraspinal tissue into the posterior basal segment of the right lower lobe, and continuing via right lower venous drainage to the left atrium. The patient received uniportal video-assisted thoracic surgery (VATS) for pulmonary sequestration. Conclusions: Uniportal VATS lobectomy as an alternative approach to appropriately treat patients for pulmonary sequestration.

Keywords: Minimally invasive, uniportal video-assisted thoracic surgery, right pulmonary sequestration

Introduction

Pulmonary sequestration is a relatively rare congenital malformation that is characterized by nonfunctional pulmonary parenchyma separated from the normal tracheobronchial tree and abnormal blood supply from the systemic circulation. Thoracic and abdominal aortas are the most common sites of origin of the abnormal nutrient branches. Anatomically it is divided into intralobar and extralobar forms. Most intralobar sequestrations are located in the left lower lung and clinical trials investigating right pulmonary sequestration are thus relatively sparse. A lobectomy has been considered to be an effective treatment for pulmonary sequestration but it may result in the loss of a large fraction of healthy lung tissue if the sequestered lesion is small and localized [1]. Nevertheless, a lobectomy for pulmonary sequestration has been employed via traditional VATS or thoracotomy for many years. Here, we describe a successful approach for right intralobar pulmonary sequestration by uniportal VATS.

Case description

Clinical features

A previously healthy 61-year-old male with complaints of progressive chest distress and pain was admitted to our hospital with a 2-month history of recurrent right lower lobe pneumonia. Contrast-enhanced computed tomography of the thorax revealed a mass in the right lower lobe indicating an aberrant blood vessel. A high resolution CT scan with three-dimensional reconstructions showed a 7 mm feeding artery arising from the right side of the descending thoracic aorta, running up on paraspinal tissue into the posterior basal segment of the right lower lobe, and continuing via right lower venous drainage to the left atrium (**Figure 1**). The patient received uniportal VATS pneumonectomy for right intralobar pulmonary sequestration.

Surgical treatment

The patient was placed in the left lateral decubitus position. After the induction of general

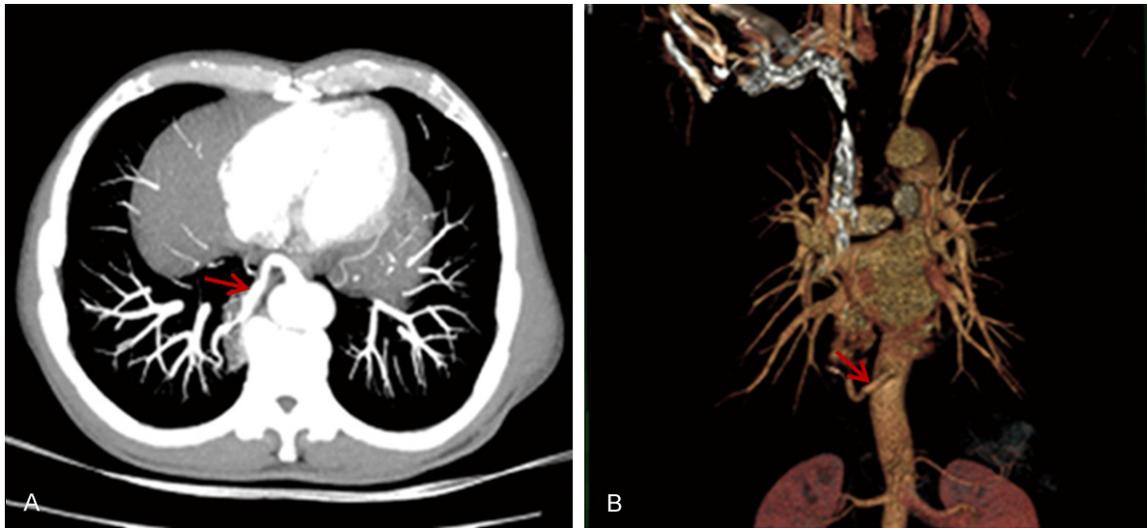


Figure 1. Contrast-enhanced CT scanning with three-dimensional reconstructions showing the aberrant artery originating from the descending thoracic aorta.

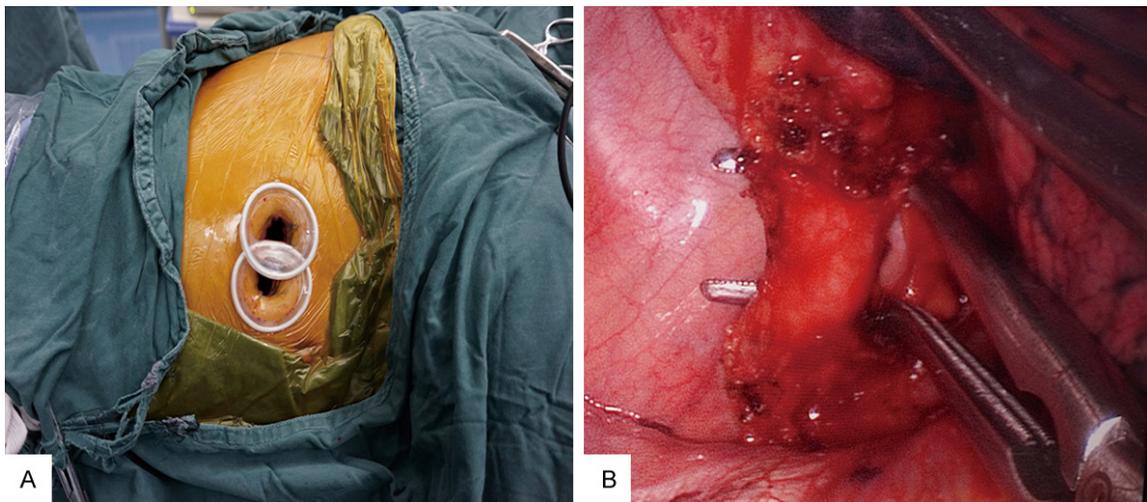


Figure 2. A. A pair of surgical instruments crossed at the incision site. B. Thoracoscopic exploration identifying an aberrant blood vessel from the aorta.

anesthesia, double-lumen endotracheal tube intubation was performed and a single 4 cm incision was made in the 5th intercostal space at the right anterior axillary line without rib spreading. Surgical equipment was applied, including Echelon Flex 45 Endoscopic Articulating Linear Cutters (Ethicon Endo-Surgery, LLC, USA), long curved endoscopic surgical instruments with double articulation and curved suction (Yundi, China), and a 10-mm 30° thoracoscope. We placed two plastic wound protectors (Demai, Beijing, China) in the incision to form two channels: one for the thoracoscope and the other for surgical instruments

(**Figure 2A**). After thoracic exploration revealing no intrathoracic adhesions between the lung and the chest wall, we used the electrocautery hook and ultrasonic scalpel to carefully dissect the inferior pulmonary ligament. An aberrant blood vessel from the aorta was identified that surrounded the inferior pulmonary ligament entering the basal segment of the right lower lobe (**Figure 2B**).

We anatomized the aberrant artery closer to the side of the lung tissue to prevent injuring the aberrant blood vessel and used an ETS-Flex 45 stapler to divide the aberrant artery

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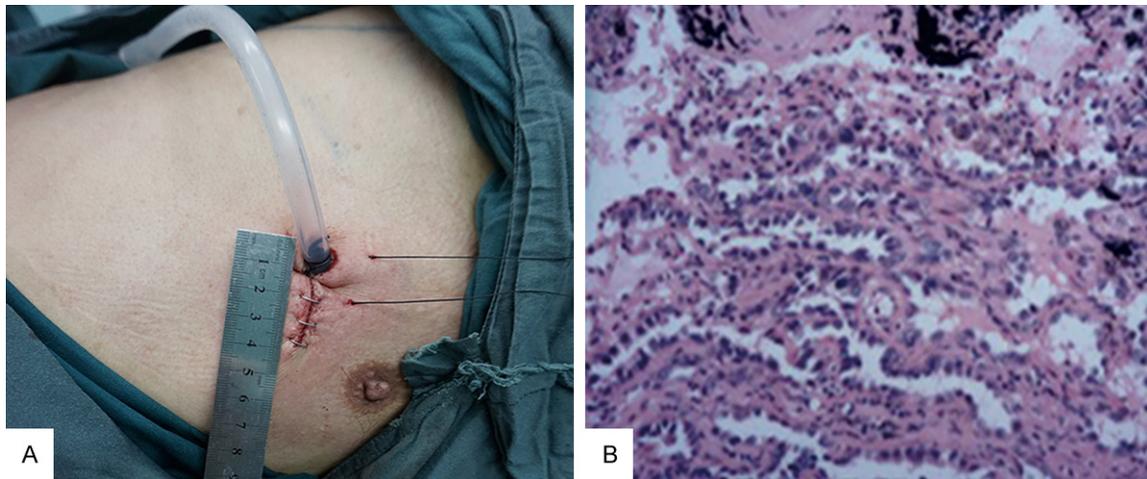


Figure 3. A. Chest tube placed at the posterior part of the incision. B. Post-pathology revealing that the right mass was an intralobar sequestration.

and to dissect the sequestered fractional lobe. The resected fractional lobe had a size of 9×5×4 cm and was removed in a protective bag. At the end of the operation, a chest tube was placed at the posterior part of the incision through the posterior thoracic cavity to the apex and a U-shaped suture was set surrounding the chest tube in order to close the drainage spout after extubation (**Figure 3A**). The operation had a total duration of 110 min and a total blood loss of 50 mL. The patient underwent an uneventful postoperative recovery with a drainage time of three days and a hospitalization period of seven days. Post-pathology revealed that the right mass was an intralobar sequestration with severe inflammation and abscess formation (**Figure 3B**).

Discussion

Pulmonary sequestration is a relatively rare congenital malformation. It is usually asymptomatic and potentially results in recurrent infections, hemoptysis, congestive heart failure, and skeletal anomalies that can only be treated with surgical resection [2, 3]. However, the difficulty of resecting a pulmonary sequestration lies in the preoperative identification of the aberrant blood vessel. Aberrant vessels often lead to recurrent infections and inflammatory changes in the area of the sequestration, making them especially difficult to identify. Many patients who were not diagnosed preoperatively experience severe vessel bleeding during the operation. Therefore, we must pay

close attention to unexpected interruption of blood vessels during resection. Notably, due to recurrent infections, the area of sequestration should be carefully dissected to avoid severe bleeding. In our patient, we used a stapler device to divide the aberrant artery and achieved an effective result.

Conventional computed tomography as part of the physical examination did not show the artery, but contrast-enhanced CT is highly accurate in the preoperative diagnosis of pulmonary sequestration. Angiography is the method of choice and may establish the origin of the supplying arteries [1, 4]. Three-dimensional reconstruction enhances the CT of the chest and can reveal the aberrant artery route; thoracoscopic exploration can confirm the diagnosis during operation. Thus, surgical resection has been used to confirm the diagnosis and therapy for pulmonary sequestration. The patient's postoperative follow-up was evaluated using a visual analog scale at 24, 48, 72 h, and 1 week after surgery; scores obtained were 3, 2, 2, and 1, respectively, indicating reduced pain compared with traditional thoracoscopic [5].

Recently, the techniques and reliability of uniportal VATS lobectomy have improved considerably. This approach has changed our views of this technique, which is minimally invasive yet technically demanding. Owing to our previous VATS experience with conventional VATS, we began performing VATS lobectomies through a uniportal approach with no rib spreading in

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January 2015. Uniportal thoracoscopic lobectomy has become a successful approach for minimally invasive thoracic surgery. In our case, the patient underwent an uneventful postoperative recovery with decreased drainage time, a shortened hospitalization period, less postoperative pain, and excellent results compared with traditional VATS.

Uniportal VATS wedge resections not only excise pulmonary lesions tissue but preserve lung volume and pulmonary function. However, possible defects are bleeding and air leaks of the lung. In this case, we used the Echelon Flex 45 stapler that achieved an entire occlusion without bleeding or air leaks. For pulmonary sequestration, lobectomy remains the main method of choice, whereas sublobar resection should be considered only when urgently needed. Our case indicates the feasibility and advantages of uniportal VATS lobectomy as an alternative approach to appropriately treat patients for pulmonary sequestration.

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Disclosure of conflict of interest

None.

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