GCTAB Column

Video-assisted thoracoscopic superior segmentectomy of the right lower lobe

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Abstract: A 61-year-old male patient was referred to the thoracic surgery department due to repeated hemoptysis for more than one year. The computed tomography revealed a 5.2 cm × 3.1 cm mass in the right lower lobe and the nature of the mass was confirmed to be chronic inflammation by trans percutaneous lung biopsy. Bronchiectasis of the right lower lobe was considered based on the symptoms, signs, and imaging findings. Surgery for bronchiectasis is used only as part of a multimodality treatment approach. After the adequate pretreatment with a targeted antimicrobial, thoracoscopic resection of superior segment of the right lower pulmonary lobe was finally performed in the order of the superior segmental artery, the superior segmental vein, the superior segmental bronchus, and the pulmonary tissues of the superior segment. Total surgery time was 70 min and blood loss was 100 mL. The chest tube was removed on the 3th postoperative day. The patient was discharged home on the 8th postoperative day.

Keywords: Video-assisted thoracic surgery; segmentectomy; bronchiectasis; multimodality treatment approach

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Introduction

The definition of thoracoscopic segmentectomy is the completion of sublobar anatomic pulmonary resection, with individual vessel ligation and without the use of a utility thoracotomy, retractors, or rib spreading (1). There is now a better understanding of the potential advantages of the thoracoscopic segmentectomy the video-assisted thoracoscopic surgery (VATS) approach-for anatomic pulmonary resection. VATS segmentectomy, by inducing less trauma than does open segmentectomy and additionally preserving more lung function than does lobectomy, would offer patients higher tolerance than those patients undergoing lobectomy or open segmentectomy (2). Although the thoracoscopic approach may be used for any anatomic segmental resection, the most commonly performed segmental resections are lingula-sparing left upper lobectomy, lingulectomy, superior segmentectomy, and basilar segmentectomy (3). In this case, we describe our experience with the use of video-assisted thoracoscopic right lower lobe superior segmentectomy for the treatment of a 61-year-old male patient with localized bronchiectasis. The patient underwent targeted anatomic resection to remove diseased, damaged lung parenchyma as part of a multimodality treatment program.

Case presentation

The 61-year-old male patient was referred to the Thoracic Surgery Department due to repeated hemoptysis for more than one year. The blood was bright red in color, and the patient spitted about 3 times during each attack. Before admission, he underwent high-resolution computed

Figure 1 Video-assisted thoracoscopic superior segmentectomy of the right lower lobe (6).
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tomography of the chest to assess the extent of the parenchymal lung disease. The computed tomography revealed a 5.2 cm × 3.1 cm mass in the right lower lobe and patchy intensities were visible around it. Then, he visited our hospital for further management. Auscultation revealed slightly harsh breath sounds in the right lower lung field. However, no dry or wet rales or pleural friction rubs were heard. No other positive sign was detected. Bronchoscopy was performed, primarily for diagnostic purposes and to rule out concomitant endobronchial disease. The bronchoscopy did not show visible lesions. The nature of the mass was confirmed to be chronic inflammation by trans percutaneous lung biopsy. The results of the laboratory investigations, including a complete blood count, liver and renal function tests and coagulation studies, were within the normal range. Pulmonary function tests revealed that the patient's forced expiratory volume in 1 s (FEV1) was 2.3 liters (73.6%) and vital capacity was 2.8 liters (80.9%). So, bronchiectasis of the right lower lobe was considered based on the symptoms, signs, and imaging findings.

Collection of sputum and bronchoalveolar lavage specimens allowed identification of the likely microbial pathogens. Evaluation of culture results included in vitro susceptibility testing appropriate for the cultured organism. The patient was then initiated on three-oral antimicrobial therapy, combined with intravenous antibiotics. The duration of the preoperative antibiotic lasted 1 week for bacterial infections. The goal with the preoperative therapy was to achieve a "nadir" in the bacterial counts before surgical resection, which we believed limits complications in the perioperative period (4). A complete nutritional assessment was made at the time of initial presentation. After the planned duration of preoperative antibiotic therapy, patients returned for repeat clinical and radiologic evaluation before surgery. Computed tomography scanning again confirmed the presence of focal disease amenable to surgical resection. Assessment of pulmonary function was made to ensure adequate postoperative pulmonary reserve in view of the planned resection.

Surgery for bronchiectasis was used only as part of a multimodality treatment approach, and the patient was discussed at a weekly multidisciplinary conference attended by surgeons, pulmonologists, and infectious disease clinicians with specialization in respiratory infectious disease. Indications for surgery included the presence of focal parenchymal disease associated with recurrent pulmonary infections or hemoptysis, usually in the setting of failure or intolerance of medical therapy (5). The patient in this case had focal, persistent lung damage (bronchiectasis) amenable to complete anatomic resection after initiation of appropriate antimicrobial therapy. Because the patient's job required heavy physical exertion, he was very concerned regarding decreased job performance due to lung resection. Considering preoperative auxiliary examinations, thoracoscopic resection of superior segment of the right lower pulmonary lobe was finally performed in the order of the superior segmental artery, the superior segmental vein, the superior segmental bronchus, and the pulmonary tissues of the superior segment (*Figure 1*).

Surgical technique

Upon arrival at the operating room and induction with general anesthesia via a dual lumen endotracheal tube, the patient was placed in the left lateral decubitus position with the bed flexed just above the hip to increase the intercostal space. The surgeon stood anterior to the patient and the assistant drived the thoracoscope while standing posteriorly to the patient. An incision of about 1.5 cm was made as the thoracoscopic observation hole in the 7th intercostal space of the median axillary line. Then, an incision of about 2.0 cm was made as the main operation hole in the 4th intercostal space on the right anterior axillary line. Finally, an incision of about 1.5 cm was made as the auxiliary operation role in the 9th intercostal space on the right posterior axillary line.

The operative strategy for thoracoscopic segmentectomy was similar to that of thoracoscopic lobectomy. In general, the approach to thoracoscopic segmentectomy begins with ligation of the segmental pulmonary vein, or the bronchus, or the artery, depending on the segment. In

this case, adhesions were encountered throughout the hemithorax, particularly involving the diseased lung segment. These adhesions were divided with cautery or blunt dissection, taking care to identify and preserve vital structures. After partial separation of the fissure with two tissular (golden cartridge) 60 mm long endostaplers (ECR60D, JJMC, USA), the superior segmental artery was first cut off with a vascular (white cartridge) 60 mm long endostapler (ECR60W, JJMC, USA), followed by the superior segmental vein which was cut off with a vascular (white cartridge) 60 mm long endostapler (ECR60W, JJMC, USA). Then, the superior segmental bronchus was circumferentially dissected out and transected with a thick tissular (green cartridge) 60 mm long endostapler (ECR60G, JJMC, USA). Finally, the inter-segmental gap was separated using four tissular (golden cartridge) 60 mm long endostaplers (ECR60D, JJMC, USA), and thus the superior segment was removed. A specimen bag was inserted via the auxiliary port to harvest the specimen. Washed the thoracic cavity and the residual lungs were well dilated, without air leakage. One 26F chest tube was placed, and the incisions were closed. Total surgery time was 70 min and blood loss was 100 mL. The chest tube was removed on the 3th postoperative day. The patient was discharged home on the 8th postoperative day.

Discussion

Bronchiectasis represents an abnormal dilation of the bronchi and bronchioles, attributable to repeated cycles of airway inflammation and infection (4). Traditional treatment paradigms have included repeated cycles or schedules of antibiotic therapy along with maneuvers designed to aid in airway clearance of purulent secretions (7). Surgery has usually been reserved for patients with focal disease who have failed or become intolerant to medical therapy, have recurrent episodes of hemoptysis, or both (5). We have previously emphasized the importance of a multidisciplinary approach to the surgical treatment of patients with infectious lung disease. Careful consultation with pulmonologists and infectious disease specialists with a dedicated interest in lung infection is essential, and surgery should be considered as part of a multimodality therapy program. Although the antibiotic therapy remains the mainstay of treatment for those with focal bronchiectasis, the goal of adding surgery to the treatment regimen is to remove these areas of permanently damaged lung parenchyma that can serve as a reservoir or nidus for recurrent infection (8). Adequate pretreatment with a targeted antimicrobial regimen minimizes perioperative complications, and we believe this leads to optimal outcomes. It is our bias to perform thoracoscopic segmentectomy in the setting of focal bronchiectasis associated with recurrent lung infection, believing this approach removes all of the bronchiectasis and damaged lung parenchyma that might lead to later recurrence of disease.

Thoracoscopic segmentectomy for bronchiectasis poses several technical challenges. Pleural adhesions are almost always present to some degree, and in some cases can be extensive and vascular in nature. They typically involve the affected segment of lung, but can also be scattered throughout the hemithorax. The adhesions can be divided through a minimally invasive approach, often with improved visibility compared with thoracotomy.

Technical difficulties in the division of segmental vessels and bronchi might be a major limitation to achieving a successful operation. In addition, a complete understanding of pulmonary segmental anatomy and a consideration of intraoperative findings on the relationships between pulmonary segmental vessels, bronchi and the correct intersegmental plane are essential to avoid catastrophic surgical error. The parenchymal margin is occasionally identified by a segmental fissure. Otherwise, a test inflation may assist in delineating the parenchymal margin. In this case, the fissures and lines of parenchymal division for segmentectomy were completed using the endostapler, erring a bit to the side of uninvolved lung. We believe this latter point is an important technical feature that ensures complete excision of the infected, diseased lung tissue.

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None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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