

Uniportal video-assisted thoracoscopic combined segmentectomy for lung cancer with incomplete fissure

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Abstract: This video clip demonstrated a performance of uniportal video-assisted thoracoscopic surgery combined segmentectomy. The patient had a potential invasive nodule located near the bifurcation of right bronchus, 3-dimensional reconstruction image showed the fissure between posterior segment of upper lobe and superior segment of lower lobe was incomplete. An up-to-down approach was applied in this operation with the en bloc resection of the two segments. Pathological report was adenocarcinoma with negative margin (TNM stage: T1aN0M0).

Keywords: Uniportal; video-assisted thoracoscopic surgery (VATS); segmentectomy; lung cancer

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Introduction

For patients with poor cardiopulmonary function, segmentectomy is a more reasonable surgical method, and it has been proved to be safe without compromising oncologic results for small cancers (1). Recently growing evidences show the feasibility and safety of uniportal video-assisted thoracoscopic surgery (VATS) lobectomy for lung cancer (2,3), but uniportal VATS segmentectomy is usually more technically difficult than lobectomy. With the gained experience, uniportal VATS segmentectomy for treating small pulmonary lesions can also be performed safely with acceptable morbidity and mortality (4,5), even for special segments (6). However, there are few reports about combined segmentectomy, here we share a video clip about uniportal VATS combined segmentectomy for treating a small lung cancer, not only to demonstrate the safety and feasibility of combined segmentectomy by uniportal approach, but also to evaluate the indication of combined segmentectomy to treat lung cancer in this case.

Clinical data

A 59-year-old male non-smoker had a 2-year history of chronic cough. In the past 2 years, he had received several times of chest CT scan, the results showed multiple small nodules in his lungs. The recent CT scan showed that a potential invasive nodule was located near the bifurcation of right bronchus with no change of other nodules. No positive result was found by bronchoscope, and no metastasis sign was found preoperatively. The 3-dimensional reconstruction image showed the fissure between posterior segment of upper lobe (S2) and superior segment of lower lobe (S6) was incomplete, and the nodule was just in the middle of the two segments (*Figure 1*). After preoperative discussion, the patient underwent combined segmentectomy (S2 + S6) by uniportal VATS approach (gross specimen, *Figure 2*). The pathological report was adenocarcinoma with negative margin, the tumor was 1.5 cm × 1.0 cm × 0.5 cm in size, TNM stage was T1aN0M0.



Figure 1 The coronal CT image of the tumor.

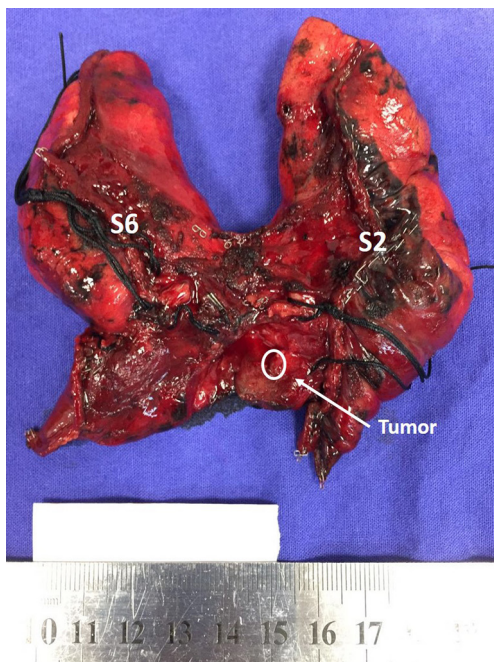


Figure 2 Gross specimen.



Figure 3 The uniportal incision and our way to keep camera stable (7).

Available online: <http://www.asvide.com/articles/1483>



Figure 4 Uniportal VATS combined segmentectomy for lung cancer with incomplete fissure (8). VATS, video-assisted thoracoscopic surgery.

Available online: <http://www.asvide.com/articles/1484>

Operative techniques

After being anesthetized with double-lumen endotracheal intubation, the patient was positioned in left lateral decubitus position. The uniportal incision located in the 5th intercostal space, anterior to latissimus dorsi and posterior to pectoralis major. We used a lap-protector to avoid contamination. In order to get a stable vision, we usually use a suture to fix the camera on one side of the incision (*Figure 3*). Both the operator and the camera holder stand on the ventral side. In this video, the procedures were as followed (*Figure 4*):

- (I) Exploration: no pleural adhesions, pleural indentation, pleural effusion and pleural nodules were found; the dorsal half part of oblique fissure was incomplete;
- (II) At the middle of oblique fissure, the fissure was divided by using electrocautery to identify ascending artery of S2 (Asc. A2) and its proximate vein of S2 [V2(a+b)];
- (III) Pulling the upper lobe caudally to expose and divide mediastinal pleura. After dissection of the level 10 lymph nodes, the artery and its branches of upper lobe were well exposed. The recurrent artery of S2 (Rec. A2) was carefully identified and cut off by a staple;
- (IV) The bronchus of S2 (B2) was well exposed by separation of all the adjacent tissues. After verifying the bronchus of apical segment (B1), B2 was cut off by a staple;
- (V) Beneath the B2 stump, the Asc. A2 was revealed integrally and cut off subsequently. We could

clearly see the precise anatomic location of the stumps of Rec. A2, B2 and Asc. A2 from cranial side to caudal side;

- (VI) At the ventral side of Asc. A2, V2(a+b) was exposed and divided into two branches: V2a and V2b. V2b was cut off by suture ligation with preserved V2a;
- (VII) Pulling the right lung ventrally to divide the dorsal mediastinal pleura. After dissection of the level 7 lymph nodes, the inferior pulmonary vein was exposed from dorsal side to identify the vein of S6 (V6), which usually branched to V6a and V6(b+c). V6a was the first cranial branch of V6;
- (VIII) After cutting off the V6a, the artery of S6 (A6) was exposed from dorsal side by pulling the right lung caudally. The A6 was cut off by a staple, the bronchus of S6 (B6) was just at the dorsal side of it;
- (IX) B6 was well exposed by dissection of the lymph nodes around it and cut off by a staple;
- (X) The right lung was inflated to identify the inflated-deflated line which indicated the intersegmental plane of S2 + S6;
- (XI) Marks were made by using electrocautery along the inflated-deflated line. The segmentectomy of S2 + S6 was performed by using staples along the marks.

Before we finished the operation, a chest tube was put into chest through the uniportal incision.

Comments

Uniportal VATS provides a direct vision to the surgical field, less postoperative pain, shorter hospital stay and similar morbidity, it is also a good option for segmentectomy by experienced surgeons (9). For young surgeons, high level of acquainted anatomical knowledge, special surgical strategy and skill, and experience for VATS trouble-shooting are keys to successful uniportal VATS segmentectomy.

Most reported uniportal VATS segmentectomy were about segments easy to be excised. In this case, the S2 and S6 were en bloc resected without dividing the fissure by staples to keep no-touch surgical principle. An up-to-down approach was applied in this combined segmentectomy to counteract the hamper that came from the incomplete fissure. The operation time was 110 min, less than 50 mL of blood loss.

A key point to segmentectomy was identification of intersegmental resection plane, the inflated-deflated line

was one of effective methods. From our experience, it was better to wait about 10 minutes for the well collapsed normal lung parenchyma in order to see a clear inflated-deflated line (showed in the video clip).

In this case, the target nodule was located in the middle of the incomplete fissure, it was difficult to identify which lobe was the nodule belonged to both from CT image and surgical exploration. In consideration of the multiple small nodules in different lobes, lung function-preserving was demanded for this patient because of the potential of a second operation. On the other hand, the lesion of the patient was a small potential invasive nodule (1.5 cm in longest diameter), recent study suggested that sublobectomy could achieve similar survival for patients with stage IA tumors less than 2 cm in diameter (10). Although similar result was reported by other research (11), whether sublobectomy for early lung cancer as a curative surgery still needed to be verified by RCTs such as JCOG0802/WJOG4607L, JCOG0804/WJOG4507L and JCOG1211 trials (12). So the difficult but feasible combined segmentectomy was a perfect choice in this case.

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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 patient for publication of this manuscript and any accompanying images.

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