S^2 segmentectomy of the right upper lobe: an uncommon but very useful segmentectomy

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Abstract: Compared to lobectomy, performing a segmentectomy needs more experience and anatomical knowledge, in particular atypical segmentectomies like S^2 resection. It is considered an uncommon but very useful procedure for the treatment of patient with early stage lung cancer in the right upper lobe. Here, we present two cases of patients with different anatomies of hilar structures in the S^2 segment of the right upper lobe. Case 1: an 82-year-old male patient came to our attention for a chest CT-scan finding of a 13 mm solid nodule in the S^2 segment of the right upper lobe. The patient was in follow up and no regression of the lesion was seen in the last CT scan. As we considered the lesion highly suspicious of early stage lung cancer, a surgical excision was proposed. So, a right S^2 segmentectomy by minimally invasive approach was carried out. Case 2: a 42-year-old female patient presented to our attention for a chest CT-scan finding of a 20 mm mixed-ground-glass opacity (GGO) in the S^2 segment of the right upper lobe. The patient was in follow up and no regression of the lesion was seen in the last CT scan. As we considered the lesion highly suspicious for a tumour, a surgical excision was proposed. A right S^2 segmentectomy by minimally invasive approach was performed. The post-operative course was uneventful in both patients. Final histopathological examination revealed an invasive mucinous adenocarcinoma of the lung, staged as pT1bN0M0 for the case 1 and an invasive papillary adenocarcinoma of the lung, staged as pT1bN0M0 for the case 2. S^2 segmentectomy is an uncommon, demanding, but very useful surgical procedure. The most difficult part lies in how to identify a recurrent A^2 and the right B^2. A clear understanding of different anatomies is critically important to complete a successful procedure.

Keywords: Video-assisted thoracoscopic surgery (VATS); VATS segmentectomy; sublobar resection; segmentectomy; lung cancer

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Introduction

In the last years, the number of reports comparing lobectomy and segmentectomy is increasing, many of them showing that segmentectomy can be oncologically equivalent to lobectomy in terms of recurrence and survival for early stage lung cancers without nodal involvement (1-5). Thoracoscopic segmentectomy is also indicated for patients with poor cardio-pulmonary function. It is generally preferred to open lobectomy to reduce the trauma of open procedures and to better preserve pulmonary function than a lobectomy (6,7). Posterior (S^2) segment resection is often considered an uncommon type of segmentectomy. Although technically demanding, its usefulness is significant, with the possibility to spare the remaining segments of the right upper lobe. As in every individual upper and lower segmentectomies, the dissection must be carried inside the lobe for the precise division of segmental vessels and

Figure 1 Three-port VATS right posterior (S^2) segmentectomy for a small ADK in the posterior segment of the right upper lobe (8). Available online: http://www.asvide.com/article/view/26321

bronchus. Regarding S^2 segmentectomy, one of the most challenging features is that there is sometimes a recurrent pulmonary artery (PA) branch as contrary to the typical course. This recurrent A^2 gives out together with the apical segment PA (A^1) from the truncus superior artery but goes on the ventral side of B^1 and then along B^2 (recurrent A^2) into the posterior segment. We hereby present two videos showing the procedures of S^2 segmentectomy with and without a recurrent A^2.

Methods

Case 1

A 13 mm solid lesion in the right S^2 segment in an 82-year-old male patient was identified 5 months previously. No change or regression of the pulmonary nodule was seen in the follow up chest CT-scan. Considering that it was highly suspicious for a neoplastic lesion, as well as the senior age and the functional status of the patient, a surgical excision by a S^2 segmentectomy was proposed. Patient's informed consent was acquired before surgery. Two hours before the operation, a hook wire was inserted under CT-scan guidance to help accurate localization of the lesion. Courses of the PA, vein, and bronchus were carefully studied before surgery on thin-sliced CT scan, proving that they were of the typical type configuration. After intubation, the patient was placed in a left lateral decubitus position with her right arm abducted and suspended on a frame above her head. A three-port VATS approach was selected. First, a camera port was created in the 7^{th} intercostal space on the mid-axillary line to allow the introduction of a 10-mm 30-degree thoracoscope through a 12-mm trocar. Under the guide of the camera, a 4 cm working port in the 4^{th} intercostal space on the anterior axillary line and a 2 cm assistant port in the 8^{th} intercostal space on the posterior axillary line were created. Upon exploration, the lesion was confirmed to be located in S^2 segment of the right upper lobe with the help of the hook wire. So, we proceeded with the planned S^2 segmentectomy (*Figure 1*). First, the fissure between the right upper and the middle and the lower lobe was opened to reveal the central vein, the PA and the right upper lobe bronchus. All the branches of V^2, including V^2t, V^2a+b and V^2c, were exposed as distally as possible. A^2 in its usual ascending course was also exposed. The very thin V^2t was cut first with harmonic scalpel. Since in this case the V^2a+b, V^2c, and the ascending A^2 ran quite parallel to each other, they were divided together with a single fire of stapler. The right upper lobar bronchus was then exposed peripherally, to reveal B^1, B^2 and B^3 (notice there was no recurrent A^2 between B^1 and B^2 in this case). Before cutting B^2, it is always indicated to first identify the neighbouring B^1 and B^3, and make sure of the B^2 in between. It is also helpful to clamp B^2 while asking the anaesthesiologist to re-expand the right lung, in order to verify the right segmental bronchus to cut and to create an obvious inflation-deflation line as the demarcation for the S^2 segment parenchyma. After dividing the bronchus, the B^2 stump was lifted up and moved away from the hilum. This allowed the S^2 segment to be lifted together with the bronchial stump and helped dissection of its parenchyma to the distal part as much as possible. Finally, the intersegmental plane was divided with endo-staplers along the marked-out inflation-deflation line on the surface of the right upper lobe. It is advisable to use inflation-deflation method repeatedly before each fire of staplers to make sure that the neighbouring bronchus is not affected. Finally, the resected S^2 was placed in a retrieving bag and taken out through the working port. Lymph node stations #10, #11, #12 in the right upper lobe were removed along with resected S^2, and stations #2, #4, #7 in the mediastinum were then sampled before closing the wound.

Case 2

In *Figure 2*, we show another S^2 segmentectomy of a 42-year-old female patient with a 20 mm mixed-GGO which had not gone away after 6 months follow-up. The V^2 branches and the ascending A^2 were divided similarly as in

Figure 2 Three-port VATS right posterior (S^2) segmentectomy: a recurrent A^2 is clearly evident (9).
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Figure 1 after the interlobar fissure had been opened. When dissecting the B^2, another PA branch was identified between the B^1 and the B^2. It ran along the superior border of the B^2 into the S^2 segment and was thus confirmed as the recurrent A^2. At this point, it is always important to differentiate between a recurrent A^2 or A^1a. A recurrent A^2 would run towards the distal part of B^2, whereas A^1-branches run away from it. In this case, the recurrent A^2 was ligated with suture and hemlocks and cut with harmonic scalpel. After the B^2 and the intersegmental plane were divided, the S^2 segmentectomy was completed.

Results

The post-operative course was uneventful for both patients. They were discharged on the 3th post-operative day after operation. Final histopathological examination revealed an invasive mucinous adenocarcinoma of the lung, staged as pT1bN0M0 for case 1, and an invasive papillary adenocarcinoma of the lung, staged as pT1bN0M0 for case 2. Both patients were put under routine follow-up.

Conclusions

S^2 segmentectomy is an uncommon, demanding, but very useful procedure. As in every individual segmentectomy, care must be taken to identify the right branches of the segmental pulmonary arteries, veins, and bronchus and to dissect them as distally as possible into the lung parenchyma. In the treatment of patients with early stage lung cancer located in the posterior segment of the right upper lobe, S^2 segmentectomy is a safe and feasible therapeutic procedure that permits sparing of the remaining segments of that lobe. The combination of limited resection and minimally invasive surgery should be considered an acceptable therapeutic approach.

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