S^{1+2} Segmentectomy of the left upper lobe: a good solution to preserve the pulmonary function of patients with stage I NSCLC

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Abstract: Limited resections for early stage lung cancer have recently aroused increasing interests. However, it is still unclear if a limited resection could preserve the pulmonary function more than a standard lobectomy, especially in the field of the minimally invasive surgery. It seems that postoperative functional benefit could be expected only if at least more than half of the lung parenchyma in the corresponding lobe is preserved. In this context, the role of S^{1+2} segmentectomy could be fundamental, in order to preserve the pulmonary function of the patient. Here, we present a case of a patient with a minimally invasive adenocarcinoma in the S^{1+2} segment of the left upper lobe treated with a S^{1+2} segmentectomy. A 55-year-old female patient came to our attention for a chest CT-scan finding of a 9.8 mm subsolid nodule in the S^{1+2} segment of the left upper lobe. As we considered the lesion highly suspicious for a tumour, a surgical excision was proposed. So, a left S^{1+2} segmentectomy by minimally invasive approach was performed. The post-operative course was uneventful, and the patient was discharged on the 4th post-operative day. Final histopathological examination revealed a minimally invasive adenocarcinoma of the lung. In the treatment of patient with early stage lung cancer located in S^{1+2} segment of the left upper lobe, S^{1+2} segmentectomy is a safe and radical therapeutic procedure that permit to spare the remaining segments of the left upper lobe.

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

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Introduction

Limited resections for early stage lung cancer have recently aroused increasing interests. Theoretical advantages of limited resections for early stage lung cancer include preservation of pulmonary function and potentially similar oncologic results supported by quite a few studies recently published (1-6). Several retrospective reports have demonstrated that video-assisted thoracoscopic surgery (VATS) segmentectomy for stage IA lung cancer may have survival and local recurrence rate comparable to VATS lobectomy (4,5). But it is still unclear to what extent a limited resection could preserve the pulmonary function comparing to a standard lobectomy, especially in the context of the minimally invasive surgery (7-9).

Although segmentectomy helps to spare more lung parenchyma than lobectomy, it is not necessarily associated with more pulmonary function preserved. As recently reported by Gu *et al.* (10), pulmonary function loss per segment resected would be almost doubled after segmentectomy than after lobectomy. And combined segmentectomy would certainly cost more functional loss than single segmentectomy. It seems that postoperative functional benefit could be expected only if at least more than half of the lung parenchyma in the corresponding lobe is preserved. Therefore, for small peripheral lung cancers located in the apico-dorsal segment of the left upper lobe, it is less likely for lingual-sparing left upper lobectomy to

Figure 1 Three-port VATS left apico-dorsal (S^{1+2}) segmentectomy for a MIA in the left upper lobe (11). VATS, video-assisted thoracoscopic surgery; MIA, minimally invasive adenocarcinoma.
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have significantly more functional preservation comparing to a standard left upper lobectomy. In this context, the role of S^{1+2} segmentectomy could be more beneficial comparing to a typical tri-segmentectomy, in order to preserve the pulmonary function of the patient. Here, we present a case of a patient with a minimally invasive adenocarcinoma (MIA) in the S^{1+2} segment of the left upper lobe treated with a S^{1+2} segmentectomy.

Case presentation

A 55-year-old female patient, non-smoker, with no significative past clinical history, came to us for a chest CT scan finding of a 9.8 mm subsolid nodule in the S^{1+2} segment of the left upper lobe. PET scan showed a slight FDG uptake of the pulmonary nodule. Considering it highly suspicious for neoplastic lesion, a surgical excision of the pulmonary nodule by a S^{1+2} segmentectomy was proposed. The patient was in good clinical condition, with a good cardio-pulmonary function. Patient's informed consent was acquired before surgery. Two hours before the operation, a hook wire was inserted into the lesion under CT guidance. After intubation, the patient was placed in a right lateral decubitus position. The left arm was suspended on a frame above her head. A three-port VATS approach was selected. In the *Figure 1*, we show the surgical procedure. First, a camera port was created in the 7^{th} intercostal space on the mid-axillary line and a 10-mm 30-degree thoracoscope was introduced through a 12-mm trocar for exploration. Under the guide of the camera, a 4 cm utility port in the 4^{th} intercostal space, on the mid-anterior axillary line and a 20 mm assistant port in the 8th intercostal space, on the posterior axillary line were created. On exploration, the lesion was confirmed to be located in the S^{1+2} segment according to the position of the hook wire. Thus, we proceeded with the S^{1+2} segmentectomy. First, the incomplete fissure was divided. On the distal part of the fissure, between the S^{1+2} and S^6 segments, the artery for the S^2 segment (A^2) was identified and divided. Sometimes, it is not so easy to differentiate A^2 from A^{4+5}. In this case, this artery clearly ran towards the S^{1+2} segment. Then, the anterior hilum of the left upper lobe was exposed to reveal the superior pulmonary vein and the left pulmonary artery; the pulmonary vein for the apical segment of the LUL (V^1) was then exposed and divided. This helped revealing the pulmonary artery branches to the apical (A^1) and the anterior (A^3) segments. The subsequent step was to divide the A1 from the posterior hilum. After cutting the A^1 and A^2, No. 12 lymph nodes could be readily dissected, and this helped identifying the bronchus for the apico-dorsal segment of the LUL (B^{1+2}). Before cutting the B^{1+2}, it is always helpful to first localize B^3 nearby, and to clamp the B^{1+2} bronchus while asking the anaesthesiologist to re-expand the lung. This helps verifying the correct bronchial branch to be cut and creating a marked parenchymal inflation-deflation line to identify the S^{1+2} parenchyma. After dividing the B^{1+2}, the bronchial stump was lifted up from the hilum. This permitted elevating the lung parenchyma of the S^{1+2} away from the remaining left upper lobe and allowed dissecting it as peripherally as possible. Finally, the S^{1+2} was cut by endo staplers along the lung inflation-deflation line between the deflated S^{1+2} and the inflated remaining lung. The resected specimen was then removed in a retrieving bag through the utility port. And stations 4, 5, and 7 lymph nodes were sampled.

Results

The post-operative course was uneventful, and the patient was discharged on the 4^{th} post-operative day. Final histopathological examination revealed a MIA of the lung, staged as pT1miN0M0. Currently, the patient is in good condition and under routine follow-up.

Conclusions

In the treatment of early stage lung cancer located in apico-dorsal segment of the left upper lobe, S^{1+2} segmentectomy is a safe and useful procedure that permits to spare more remaining segments than a typical lingual-sparing tri-segmentectomy. The combination of limited anatomical

resection and minimally invasive surgical approach is beneficial for the functional preservation of the patients as long as the oncological efficacy could be maintained.

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Footnote

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