



# Split-Lobe for Tumor between Left S3 and S4 by Uniportal Video-Assisted Thoracoscopy

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## Abstract

Video-assisted thoracoscopic surgery (VATS) segmentectomy is an optimal treatment for malignant pulmonary ground glass nodules (GGNs). However, this surgery is complicated when tumors are located between more than two adjacent segments, although combined subsegmentectomy ensures sufficient margin under uniportal approach. Lobectomy might be inevitable, especially when resecting deep nodules in the central left upper lung lobe. Here, we present cases wherein we performed uniportal VATS (UVATS) resection for GGNs located between borders of left S3 and S4, with three-dimensional reconstruction conducted before surgery. The strategy of resecting central tumors in the left upper lung lobe between left S3 and S4 via UVATS is simple and feasible.

## Keywords

- ▶ lung GGNs
- ▶ S3 and S4
- ▶ uniportal VATS

## Introduction

Since normal lung tissue and function can be preserved as much as possible while safe margins guaranteed, thoracoscopic segmentectomy is currently one of the preferred treatment options for ground glass nodules (GGNs) less than 2 cm in diameter. Studies<sup>1,2</sup> showed that sublobar resections can be used to achieve similar survival rates to those of lobectomies, while there are fewer postoperative complications and better postoperative lung function.<sup>3–5</sup> Complex segmentectomies are more demanding technically, and difficult, especially nodules located deeper in the middle of the left upper lung lobe (between the left S3 and S4), which are often dissected using lobectomies instead of segmentectomies. Herein, we reported a uniportal thoracoscopy-assisted approach for the resection of a GGN located between the S3 and S4 in the upper lobe of the left lung.

## Case Report

### Case 1

A 40-year-old woman with an upper lobe nodule of the left lung for 16 months on chest high-resolution computed tomography (HRCT) showed a GGN in the lingual segment of the left upper lobe, approximately 0.7 × 0.5 cm in size. An irregular solid nodule was seen in the posterior segment of the tip of the upper lobe of the left lung, which was partly calcified and adjacent to the pleura and considered as an old lesion.

Using a three-dimensional (3D) reconstruction technique, a lesion was located in the lingual segment of the left upper lobe (▶ **Fig. 1A**), in the S4, close to the S1, S2, and S3 (▶ **Fig. 1B**). Therefore, surgery removing only S4 was not adequate, and resections of the S1, S2, and S3 were also required (▶ **Fig. 1C**).

The patient was intubated using a double-lumen tube after general anesthesia and the right lung was ventilated.

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**Fig. 1** (A) The ground glass nodule of approximately 0.7 cm in size in the lingular segment of the left upper lobe. (B) The three-dimensional reconstruction showed the ground glass nodule in S4 and the solid nodule in S1 and S2c. (C) The approximate extent of surgical planned resection of ground glass nodules and safe surgical margin. (D) The intersegmental fissure was separated with endostaplers. (E) Postoperative resected specimens and extent of surgical planned resection.

She was put in the right lateral decubitus position with her right arm extended to 90 degrees. A 4 cm incision was made and an incision protector placed at the 4th intercostal space between the anterior axillary line and the midaxillary line.

After the thoracotomy and based on the results of the 3D reconstruction, the approximate location of the nodule was electrocauterized on the surface of the lung. The pulmonary artery was exposed at the fissure using an energy device. We divided and cut the A4 and found and cut the B4 using a stapler. Then we separated the superior lobar vein, dissected the V4, and identified the V3a + b, opening a tunnel among the V3a + b, and B4 to connect the oblique fissure. The target segments were inflated and residual segments were deflated after double lung ventilation using the inflation and deflation methods. The intersegmental plane between the S4 and S5 lingular segments was split by staplers through the tunnel; we lifted out the S4, cut sections of the S3, S1 + 2c, and S4 together at the roots of the V3a + b and beyond with enough of a surgical margin on the labeled lung surface (► Fig. 1). The specimens were removed using specimen bags (► Fig. 1E). The intraoperative frozen pathology showed the

GGN was due to minimally invasive adenocarcinoma (MIA) and the solid nodule chronic inflammation. The lymph nodes from groups 11 and 12 were dissected. The operation time was 110 minutes; the blood loss was 30 mL.

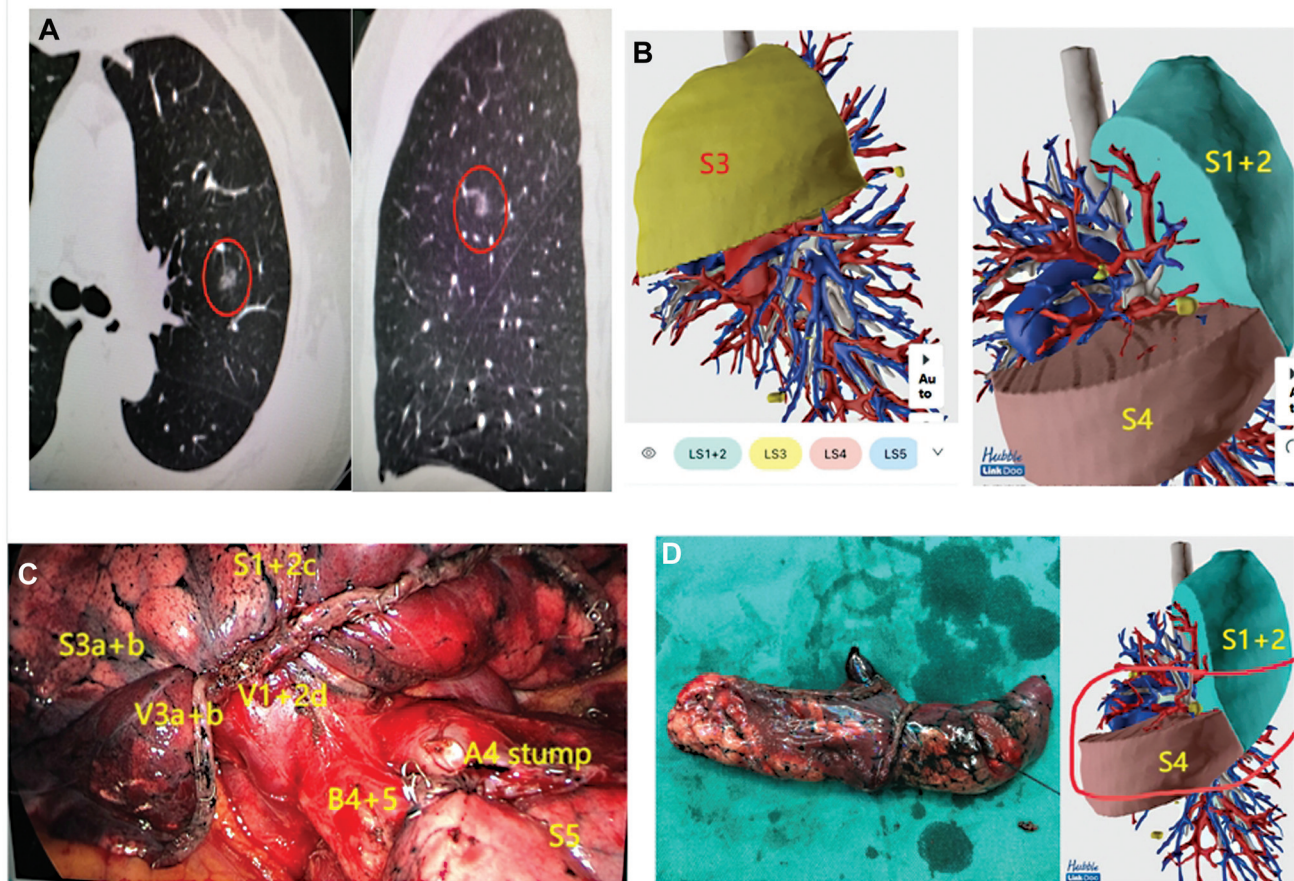
## Case 2

In a 58-year-old middle-aged woman diagnosed with a GGN in the anterior segment of the left upper lobe half a year ago, chest HRCT showed a GGN in the anterior segment of the left upper lobe, approximately  $0.7 \times 1.0$  cm in size, and the basal segment in the lower lobe of the left lung being tightly adherent to an oblique fissure GGN, approximately  $0.9 \times 0.8$  cm in size.

The lesion was located in the anterior segment of the left upper lobe (► Fig. 2A), and clearly in the S3a, close to the S1, S2c, and S4 (► Fig. 2B). Therefore, removing the S3 would not ensure an adequate surgical margin. Partial resections of S1, S2, and S4 were necessary.

We divided and separated the A4, then divided the superior lobar vein and identified the V3a + b. The B4 was not divided and cut because the S4 subsegmentectomy was





**Fig. 2** (A) The ground glass nodule was located in the anterior segment of the upper left lobe. (B) Nodule located in S3, immediately adjacent to S4, S1, and S2. (C) The intersegmental fissure was separated with endostaplers. (D) Surgical resection specimens and extent of pre-operative planned resection specimens.

not performed. We opened a tunnel between the V3a + b and B4 across the oblique fissure. The intersegmental plane between the S4 and S5 segments was split using staplers. We lifted the S4, and parts of the S3a + S3b, S1 + 2c, and S4 were resected together at the roots of the V3a + b and V1 + 2d and beyond with enough of surgical margin on the labeled lung surface (►Fig. 2C). The specimens were removed using specimen bags (►Fig. 2). Frozen pathology showed that both GGNs were MIAs.

### Comment

To achieve maximum preservation of the healthy lung tissue, subsegmentectomy, although more difficult, is preferable. No method has been reported using uniportal video-assisted thoracoscopic surgery at this location.

Our reported method had some key points. First, dissecting the A4, which facilitate the establishment of a tunnel between the V3a, V3b, and B4 to the oblique fissure. The independent origin of the A4 was a favorable condition for the S4 resection. Second, deciding whether to sever the B4 based on the attributable lung segment of the nodule. The strategy of this approach included the splitting of the left upper lung into upper and lower parts and resecting the upper part, on the premise of a safe margin.

In conclusion, for lung GGNs of approximately 10 mm, with MIA pathology, the prognosis after localized pulmonary resection has been shown to be excellent.<sup>1,2</sup> More complex multiple combined standard subsegmentectomies are not necessary as long as the safe margins are adequate. For small GGNs located within the left upper lung and on borders of multiple subpulmonary segments, our approach exemplified the advantages of uniportal access.

### Conflicts of Interest

The author has no conflicts of interest to declare.

### Acknowledgments

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### References

- 1 Cao J, Yuan P, Wang Y, et al. Survival rates after lobectomy, segmentectomy, and wedge resection for non-small cell lung cancer. *Ann Thorac Surg* 2018;105(05):1483–1491
- 2 Winkelmans T, Decaluwé H, De Leyn P, Van Raemdonck D. Segmentectomy or lobectomy for early-stage non-small-cell lung cancer: a systematic review and meta-analysis. *Eur J Cardiothorac Surg* 2020;57(06):1051–1060

- 3 Kim HK, Han KN. Uniportal video-assisted thoracoscopic surgery segmentectomy. *Thorac Surg Clin* 2017;27(04):387–398
- 4 Zeng W, Zhang W, Zhang J, et al. Systematic review and meta-analysis of video-assisted thoracoscopic surgery segmentectomy versus lobectomy for stage I non-small cell lung cancer. *World J Surg Oncol* 2020;18(01):44
- 5 Suzuki K, Saji H, Aokage K, et al; West Japan Oncology Group. ; Japan Clinical Oncology Group. Comparison of pulmonary segmentectomy and lobectomy: safety results of a randomized trial. *J Thorac Cardiovasc Surg* 2019;158(03): 895–907