Received: 2 December 2020 | Accepted: 22 December 2020

DOI: 10.1111/1759-7714.13827

CASE REPORT

WILEY

How far will minimally invasive thoracic surgery go? Uniportal video-assisted thoracoscopic lingulectomy with 1 cm incision complicated by a mediastinal lingual artery: A case report

Xining Zhang | **Gang Lin** | **Jian Li**

Department of Thoracic Surgery, Peking University First Hospital, Beijing, China

Correspondence
Xining Zhang, Department of Thoracic Surgery, Peking University First Hospital, Xishiku street 7th, Beijing 100000, China.
Email: xining_bdyy@163.com

Abstract

Here, we present the case of a 36-year-old female patient who was found to have a ground-glass nodule (GGN) in the left lingual segment on chest computed tomography (CT) and who successfully underwent lingulectomy via 1 cm incision uniportal video-assisted thoracoscopic surgery (VATS). This is a technically safe and feasible procedure in selected patients and produces better cosmetic results than traditional thoracoscopic surgery.

KEYWORDS

3-dimensional reconstruction, lung cancer, minimally invasive procedure, uniportal thoracoscopic segmentectomy, uVATS

INTRODUCTION

As a novel procedure, uniportal video-assisted thoracoscopic surgery (uVATS) segmentectomy is gaining popularity worldwide.[1] Whilst it has previously been demonstrated that the uVATS procedure may reduce perioperative complications and facilitate convalescence,[2] a consensus has not yet been reached with regard to the minimal length of the incision. A set of stapleless techniques utilized in our center could help maximize the protective effects of minimally invasive surgery.

While the efficiency of segmentectomy has been recognized in stage IA non-small cell lung cancer (NSCLC),[3] it requires a more intimate understanding of segmental anatomy and a high surgical proficiency level as segmentectomy is more technically demanding than lobectomy. Commonly, the incision length has been reported to be about 4–6 cm,[4] to accomplish an uVATS segmentectomy with incision of more limited incision length, in addition to a thorough understanding of the arrangement of the specific segmental structures, a familiarity with the positioning of thoracoscopic instruments to avoid interference is required.

We herein present a case of a patient who underwent a 1 cm incision uVATS lingulectomy with intraoperative imagines together with a summary of our experience.

CASE REPORT

A 36-year-old female presented to our department with a pulmonary ground-glass nodule (GGN). The patient was asymptomatic, and chest computed tomography (CT) revealed the GGN was located in the lingual segment (Figure 1(a), (b)). A mediastinal lingual artery was identified on chest CT: the lingual artery derived from the proximal left pulmonary trunk at the same location where the anterior segmental artery branched off. This variation is more clearly shown in the three-dimensional (3D) computed tomographic bronchography and angiography (3D-CTBA) illustrations (Figure 1(c), (d)).

Preoperative examinations included physical examination, electrocardiogram, abdominal ultrasound, hematology examinations, lung function tests, and echocardiography. All results were typical without evidence of metastasis. According to the eighth edition of the TNM staging system, the clinical staging was stage IA1 (T1aN0M0).

The instruments utilized in the procedure are shown in Figure 2. The incision was located at the anterior axillary line, third intercostal space. After insertion of a 4 mm thoracoscope at a 30° angle, the partially developed pulmonary fissure was first divided, followed by the identification and electrocautery dissection of the lingual bronchus. The accompanying interlobar and peribronchial lymph nodes

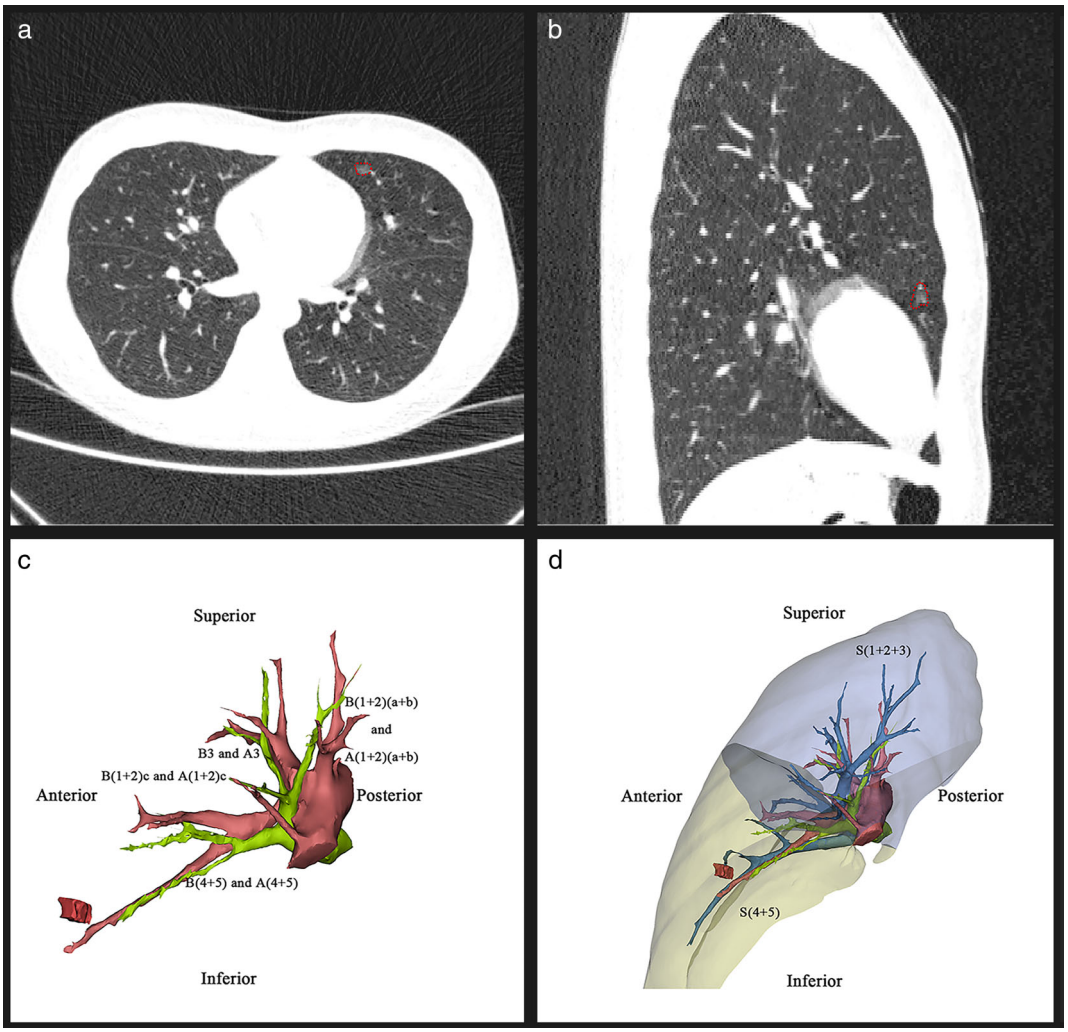

FIGURE 1 The chest CT and 3-D CTBA images of the nodule and segmental structures. (a) The axial image of the nodule, marked by the red dotted line. (b) The sagittal image of the nodule is marked by the red dotted line. (c) The segmental bronchi (green), arteries (ocher) and the nodule (red). (d) The general configuration of the left upper lobe showing the lingual segment (yellow), anterior and apical-posterior segments (purple), pulmonary artery (ocher), bronchi (green), pulmonary vein (blue) and nodule (red). A (1 + 2)(a + b), apical and posterior subsegmental artery of apical-posterior segment. B (1 + 2) (a + b), apical and posterior subsegmental bronchus of apical-posterior segment. A (1 + 2)c, horizontal subsegmental artery of apical posterior segment. B (1 + 2)c, horizontal subsegmental bronchus of apical posterior segment. A3, anterior segmental artery. B3 anterior segmental bronchus. A (4 + 5), lingual segmental artery. B (4 + 5), lingual segmental bronchus. S (1 + 2 + 3), anterior and apical-posterior segments. S (4 + 5), lingual segment

were harvested in the process (Figure 3(a)). Adequate exposure of the targeted field was obtained by the traction conducted with a suction tube and a thoracoscopic clamp. The ligation of the lingual artery was then accomplished by double ligation using silk threads, guided and knotted with a thoracoscopic clamp (Figure 3(b)). Following division of the lingual artery' with Metzenbaum scissors, the stump of the lingual bronchus was closed by PDS II (polydioxanone) suture in continuous style. The lingual vein was then divided distally with electrocautery after adequate freeing. During ligation, suturing, and division, sufficient exposure was provided by the traction conducted by a suction tube. The inflation-deflation technique was then applied to demarcate the intersegmental plane between lingual and anterior segments (Figure 3(c)), which was dissected by electrocautery with traction brought on by two thoracoscopic clamps. The remaining parenchyma and the stump of the lingual vein were sutured with 3–0 vicryl thread in an interrupted style. A central vein catheter was utilized for postoperative pleural drainage. Due to the small size of the nodule and absence of solid component, intraoperative frozen-section pathological examination and mediastinal lymph node sampling were deemed unnecessary. The operation lasted 2 h and 47 min, and the blood loss was less than 50 ml. The postoperative course was uneventful despite a self-limited air leakage, and the patient was discharged on postoperative day 4. Postoperative pathological examination indicated a minimally invasive adenocarcinoma. There was no sign of involvement of visceral pleural or lymphovascular invasion. No metastasis was found in the lymph nodes. The pathological stage was IA1

FIGURE 2 The thoracoscopic instruments utilized in the procedure

(T1aN0M0). Postoperative follow-up confirmed that the patient had been able to return to everyday life and the surgical wound had fully healed (Figure 3(d)).

DISCUSSION

Many articles have previously been published on uVATS, with incision length ranging from 4–6 cm.[4] We reported a single-center retrospective study in 2016 with a total of eight patients with stage IA who received uVATS resection. This is the first case that we have reported of uVATS segmentectomy with 1 cm incision using a 4 mm thoracoscope. The surgical time and operative bleeding were acceptable, and the length of thoracic drainage time, postoperative stay, and number of lymph nodes harvested were also satisfactory.[5]

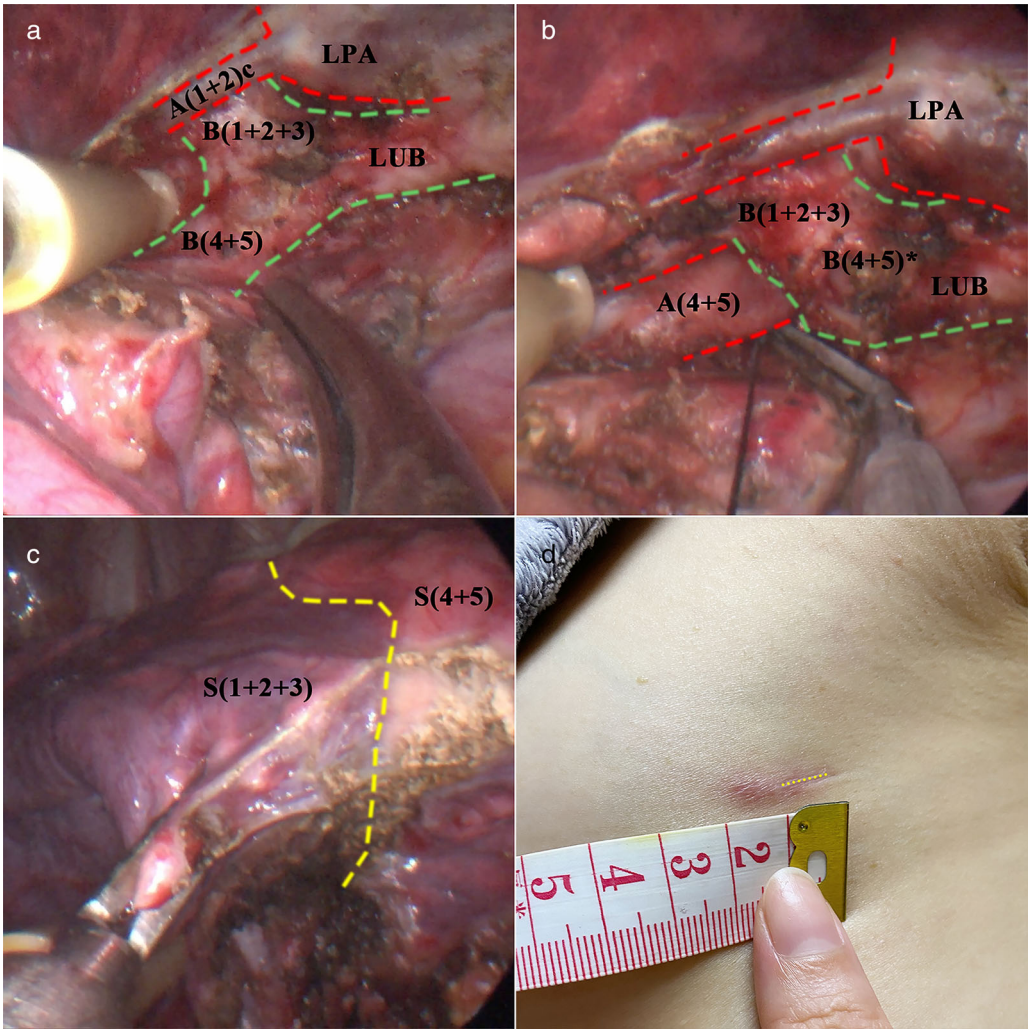

FIGURE 3 Intraoperative images showing relevant segmental structures and the incision. (a) The left upper lobar bronchus and the segmental bronchi, marked by a green dashed line, and the pulmonary artery marked a by red dashed line. (b) The abnormal lingual artery marked by a red dashed line, and the stump of lingual bronchus marked by "*" and a green dashed line. (c) The intersegmental plane, marked by a yellow dashed line, delineated by inflation-deflation technique. (d) The postoperative incision, marked by a yellow dotted line, and the juxtaposed standard metric ruler. A (1 + 2)c, horizontal subsegmental artery of apical posterior segment. B (1 + 2 + 3), anterior and apical-posterior segmental bronchus. B (4 + 5), lingual segmental bronchus. LPA, left pulmonary artery. LUB, left upper lobe. S (1 + 2 + 3), anterior and apical-posterior segments. S (4 + 5), lingual segment

In 1 cm incision uVATS, interference between instruments is the greatest obstacle. We recommend using the specialized VATS instruments and for better performance the distal part of the electrocautery pen should be adjusted to a 30° angle. Because the limited incision length precludes the use of endoscopic staplers, the pulmonary vessels are manually ligated and the bronchial stump sutured. The inflation-deflation technique has been previously recommended for determining the intersegmental plane, for its convenience and effectiveness.[6] Dissection of the intersegmental plane can be performed with electrocautery, and the dissected plane should be sutured to control alveolar-pleural fistulae.[7]

In this study, we selected a slender patient with GGN located in the lingual segment as the safety and oncological efficiency of the procedure was undetermined for a patient with more advanced disease. Mediastinal lymph node harvesting was not conducted since previous evidence suggests that it is unnecessary in patients with GGO.[8]

The study has several limitations. First, the applicability of the procedure for the general population awaits further verification. Second, whether this procedure is sufficient for patients with NSCLC of more advanced stage is unclear. Finally, the requirement of specific instruments to appropriately conduct the procedure may prevent its application in less well equipped centers.

In conclusion, this case shows that 1 cm incision uVATS could be safely performed for selected patients with early stage NSCLC. However, more samples are still needed to confirm our conclusions concerning the safety and oncological efficiency of this procedure.

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

ORCID

Gang Lin https://orcid.org/0000-0003-3789-9753

REFERENCES

1. Hernandez-Arenas LA, Purmessur RD, Gonzalez-Rivas D. Uniportal video-assisted thoracoscopic segmentectomy. J Thorac Dis. 2018;10 (Suppl 10):S1205–S14.
2. Harris CG, James RS, Tian DH, Yan TD, Doyle MP, Gonzalez-Rivas D, et al. Systematic review and meta-analysis of uniportal versus multiportal video-assisted thoracoscopic lobectomy for lung cancer. Ann Cardiothorac Surg. 2016;5(2):76–84.
3. Koike T, Yamato Y, Yoshiya K, Shimoyama T, Suzuki R. Intentional limited pulmonary resection for peripheral T1 N0 M0 small-sized lung cancer. J Thorac Cardiovasc Surg. 2003;125(4):924–8.
4. Rocco G, Martucci N, La Manna C, Jones DR, De Luca G, La Rocca A, et al. Ten-year experience on 644 patients undergoing single-port (uniportal) video-assisted thoracoscopic surgery. Ann Thorac Surg. 2013;96(2):434–8.
5. Liu B, Lin G, Liu J, Liu H, Li J. [Clinical application of uniportal video-assisted thoracoscopic lobectomy through a 2 cm skin incision]. Chin J Clin Thorac Cardiovasc Surg. 2017;24(07):566–8.
6. Chen L, Wu W. [The main technical points of thoracoscopic anatomical lung segment resection]. Zhongguo Fei Ai Za Zhi. 2016;19(6): 377–81.
7. Liu H, Lin G, Zhang S, Huang W, Shang X, Li J. [Electrocautery versus stapler for intersegmental plane dissection in complete thoracoscopic segmentectomy]. Zhongguo Fei Ai Za Zhi. 2017;20(1):41–6.
8. Lin YH, Chen CK, Hsieh CC, Hsu WH, Wu YC, Hung JJ, et al. Lymphadenectomy is unnecessary for pure ground-glass opacity pulmonary nodules. J Clin Med. 2020;9(3):672.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Zhang X, Lin G, Li J. How far will minimally invasive thoracic surgery go? Uniportal video-assisted thoracoscopic lingulectomy with 1 cm incision complicated by a mediastinal lingual artery: A case report. *Thoracic Cancer*. 2021; 12:703–706. https://doi.org/10.1111/1759-7714.13827