Thoracic Cancer
Open Access
Thoracic Cancer ISSN 1759-7706

CASE REPORT

Thoracoscopic completion right lower lobectomy after anteromedial basilar segmentectomy in early-stage lung cancer

Yu-Wei Liu[1], Shah-Hwa Chou[1,2], Jen-Yu Hung[3], Chieh-Ni Kao[1] & Po-Chih Chang[1]

1 Division of Thoracic Surgery, Department of Surgery, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan
2 Department of Surgery, Pingtung Hospital, Ministry of Health and Welfare, Pingtung, Taiwan
3 Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Kaohsiung Medical University Hospital, Kaohsiung Medical University, Kaohsiung, Taiwan

Keywords
Completed lobectomy; reoperation; segmentectomy; VATS.

Correspondence
Yu-Wei Liu, Division of Thoracic Surgery, Department of Surgery, Kaohsiung Medical University Hospital, Kaohsiung Medical University, No. 100, Tzyou 1st Road, Kaohsiung 80756, Taiwan.
Tel: +886 7 312 1101 (ext. 6305)
Fax: +886 7 312 7056
Email: nipma6714@gmail.com

Received: 5 January 2019;
Accepted: 16 February 2019.

doi: 10.1111/1759-7714.13036

Thoracic Cancer **10** (2019) 1267–1271

Abstract

This report describes the surgical management of a male patient with early-stage lung cancer who underwent thoracoscopic completion right lower lobectomy after previously undergoing sublobar resection for multifocal ground glass nodules of the lung. Perioperative considerations associated with the management of dense pulmonary hilar adhesions and the techniques used are discussed.

Introduction

Reoperations ("re-do surgeries") are uncommon when surgically treating patients with ipsilateral thoracic disease. Such reoperations may require additional time to manage intrapleural adhesions that have developed after the initial surgery. Chen *et al.* recently reported success performing video-assisted thoracic surgery (VATS) reoperations when treating ipsilateral pulmonary lesions.[1] Among the wide array of reoperation options, completion lobectomy after segmentectomy is particularly challenging because of the strong adhesions that develop from hilar dissections and destructed hilar structures. A previous study reported the use of open thoracotomy to meet this challenge in 11 patients.[2] Herein, we report a case involving a patient with early-stage lung cancer in whom we performed VATS completion lobectomy after segmentectomy of the same lobe. We discuss the considerations and illustrate the details of our surgical technique.

Case report

A 46-year-old male heavy smoker was diagnosed with multifocal lung cancer in the right lower lobe (RLL) found by chest low-dose computed tomography (LDCT) and contrast-enhanced chest CT (Fig 1a,b; Fig SS1a). The patient had undergone uniportal VATS through a 4 cm incision in the fifth intercostal space (ICS) along the anterior axillary line. At that time, the patient underwent anteromedial basilar segmentectomy of the anterobasal segment (S8) containing a part-solid 13 mm ground glass nodule (GGN), wedge resection of a 6 mm posterobasal segment (S10) pure GGN, and dissection of lobe-specific mediastinal lymph nodes (stations 7–9). Figure 1c,d shows the intraoperative view (Fig SS1b–d shows the subcarinal lymphadenectomy, an almost complete major fissure, and the stapling technique used to help identify the segmental plane, respectively). Postoperative permanent pathology revealed atypical adenomatous hyperplasia of the nodule in

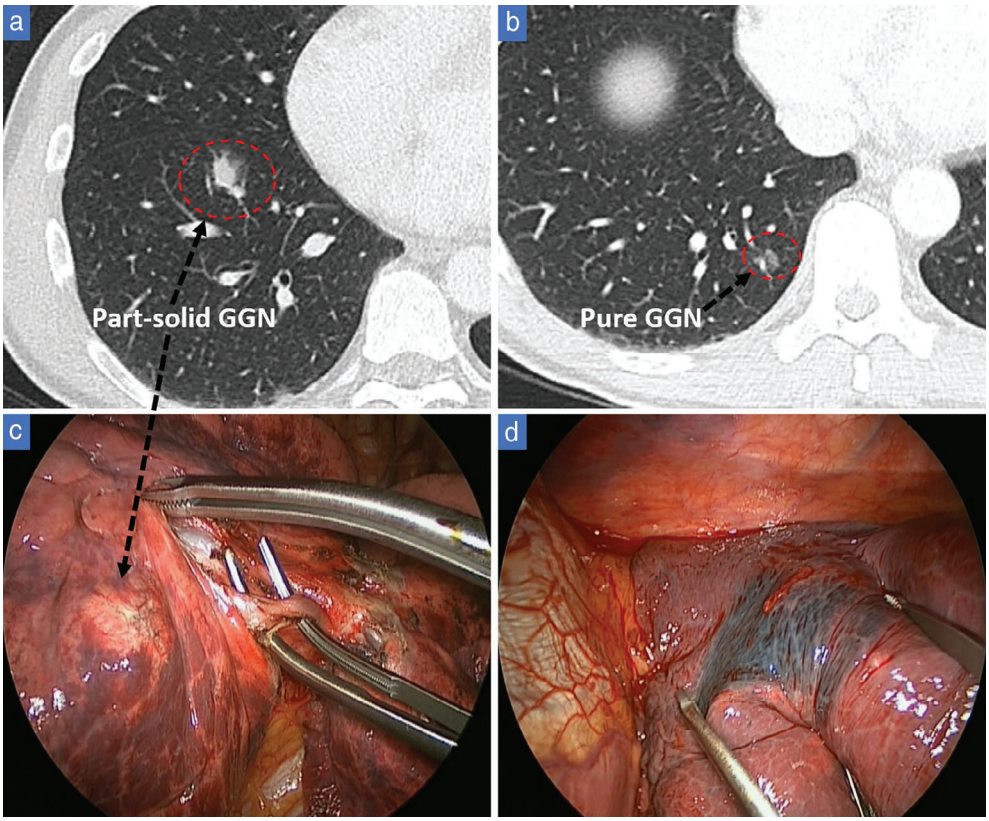

Figure 1 Chest computed tomography of the patient and intraoperative view of the first operation. (**a**) CT imaging revealed a 13 mm part-solid ground glass nodule (GGN) in segment 8 and (**b**) another 6 mm pure GGN in segment 10. (**c**) The part-solid GGN shown during hilar dissection for pulmonary arterial division. (**d**) CT-guided dye localization of the pure GGN.

S8 and invasive lepidic-predominant adenocarcinoma of the nodule in S10. The surgical margin of specimens was clear in both the segmentectomy and wedge resection, although the 6 mm pure GGN nodule in S10 only had a 3 mm safe margin. Considering the small margin and the possibility of locoregional recurrence, we decided perform a completion right lower lobectomy. Ten weeks after the first operation, we performed this reoperation under thoracoscopy.

We created an incision along the previous wound, cut surrounding mild adhesions, and separated them using our fingers and electrocautery. We found dense fibrous adhesions between the right middle lobe (RML) and the remaining RLL (Fig 2a), as well as adhesions of different degrees around the diaphragm, chest wall, and pericardium (Fig SS2a,b). This complexity required multidirectional adhesiolysis. We created two additional small incisions at the most strategic ICSs, 1 cm wounds over the 4th ICS along the posterior axillary line and the 7th ICS along the midaxillary line. We encountered difficulty identifying the posterior mediastinal structure, and therefore created a pericardial window using a harmonic scalpel (Ethicon, Inc., New Jersey, NJ, USA) to locate the inferior pulmonary vein (Fig 2b,c). We used a curved tip stapler (Covidien, Minneapolis, MN, USA) to divide the vein (Fig 2d). Especially dense adhesions between RML and RLL were divided by stapling (Fig SS2c–e). However, stapling failed during simultaneous division of the RLL bronchus and remaining pulmonary arteries using a stapler with a black cartridge (Covidien) (Fig 3a). Because the tissues were particularly dense, we inserted a 60 mm TA stapler with a 4.8 mm cartridge (Covidien) through the enlarged main utility port to complete the procedure (Fig 3b,c). The staple lines along the remaining hilar structure were sound and had no air leaks (Fig 3d). Completion RLL lobectomy was performed via thoracoscopic approach without incident and upper mediastinal lymphadenectomy (stations 2R and 4R) was performed (Fig SS2f). The total reoperation time was 350 minutes and intraoperative blood loss was 450 ml, mostly a result of loss while managing severe adhesions. There was no major bleeding while separating the adhesions. The patient was discharged three days post-surgery and has experienced no complications six months following reoperation.

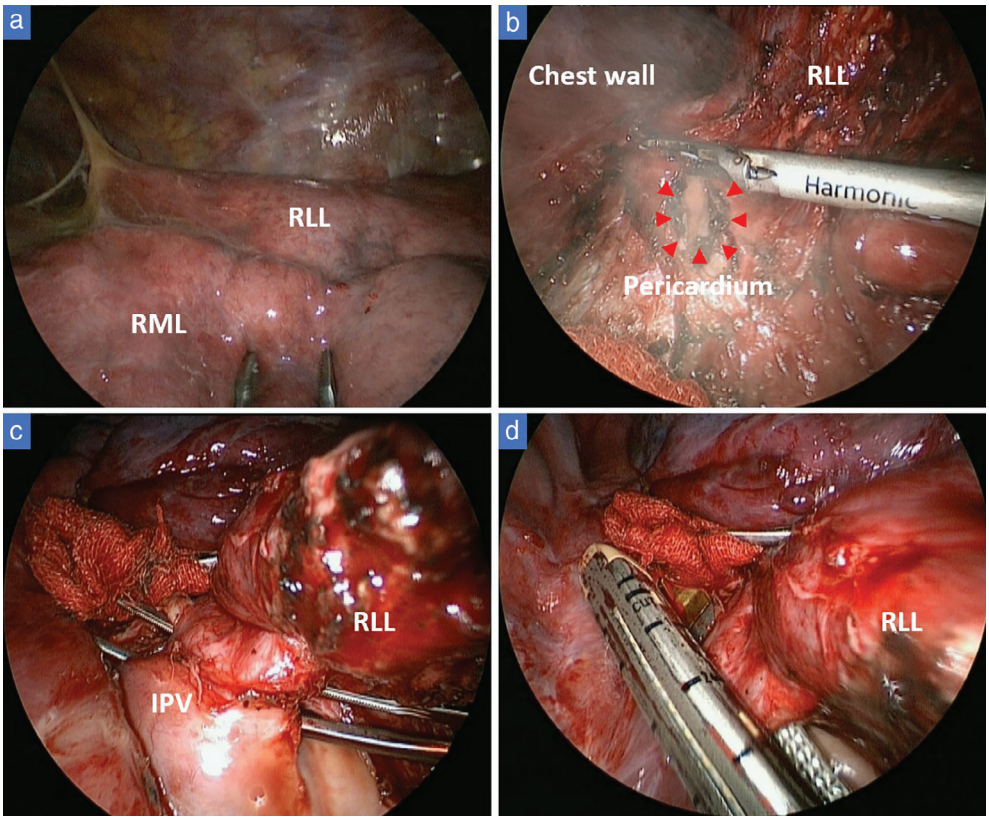

Figure 2 Intraoperative view of the reoperation. (**a**) Dense fibrous adhesions between the right middle lobe (RML) and residual right lower lobe (RLL). (**b**) A pericardial window was created via harmonic scalpel. (**c**) Identification of the inferior pulmonary vein (IPV). (**d**) The IPV was divided using a curved tip stapler.

Discussion

Nowadays, segmentectomy is thought to better preserve lung function than lobectomy and has become a treatment option for early-stage lung cancer. Its use is likely to expand worldwide as a result of the increase in early detection of suspicious GGNs by LDCT screening. However, the performance of completion lobectomy after segmentectomy has been associated with some rare adverse circumstances, including complications or local recurrences in the remaining lobe, as well as unexpected nodal involvement. Omasa *et al.* reported more severe adhesion around the hilum five weeks after segmentectomy, complicating completion lobectomy.[2]

In our case, the completion lobectomy required adhesiolysis of a remaining RLL surrounded by dense fibrous tissues. Because we could not identify the posterior mediastinal structure, we opened a pericardial window and performed intrapericardial inferior pulmonary vein division. Some experts advocate securing the main pulmonary artery before performing completion lobectomy for hilar dissection after initial segmentectomy to avoid injury to the remaining pulmonary arteries. We used a TA stapler to simultaneously staple and divide the dense hilum between RLL and RML under thoracoscopy. Simultaneous stapling of the bronchus and pulmonary artery is not generally preferred because of the risk of staple line bursts, bronchopleural fistula, and massive bleeding; however, no adverse events resulting from simultaneous stapling have been reported in the literature. Lewis *et al.* encountered no significant complications related to stapling in their 400 cases of consecutive lobectomies, all performed using simultaneous stapling.[3] Recently, Murakami *et al.* also described uneventful simultaneous stapling of pulmonary artery and bronchus in an animal study.[4] The decision to manage completion lobectomy using simultaneous stapling is controversial. We do not report this case to justify or encourage use of the procedure. However, we believe, on rare occasions, simultaneous stapling of the pulmonary artery and bronchus during hilar division may be reliably used if the patient has dense adhesions following previous hilar dissection.

Anatomic segmentectomy is increasingly being advocated for treatment of early-stage lung cancer or centrally located metastases. According to Zhao and Ng, it is

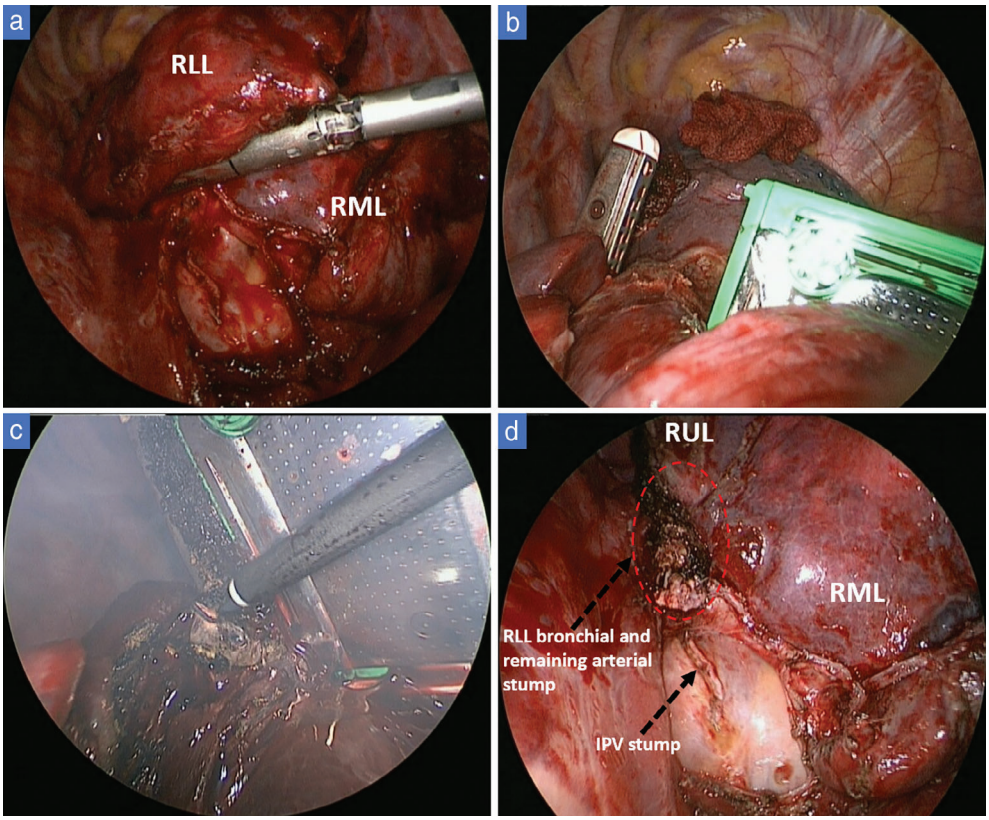

Figure 3 Intraoperative view of the reoperation. (**a**) A stapler with a black cartridge was used to simultaneously divide the right lower lobe (RLL) bronchus and remaining pulmonary arteries. (**b,c**) A TA stapler was used to divide the above-mentioned dense fibrous tissue. (**d**) Intact staple lines along the remaining hilar structure and inferior pulmonary vein (IPV) stump were observed.

becoming important to be able to perform completion lobectomy or re-segmentectomy after previous segmentectomy regardless of whether it is performed on the ipsilateral side or the same lobe, because of the growing number of early lung cancers being detected through screening programs and advances in precision cancer medicine.[5] The procedures we used during our performance of thoracoscopic completion lobectomy after segmentectomy of the same lobe can be added to the possible skill set of surgeons performing these reoperations.

Disclosure

No authors report any conflict of interest.

References

1 Chen D, Mao R, Kadeer X *et al.* Video-assisted thoracic surgery is an optimal alternative to conventional thoracotomy for reoperations for ipsilateral pulmonary lesions. *Thorac Cancer* 2018; **9**: 1421–8.
2 Omasa M, Date H, Takamochi K, Suzuki K, Miyata Y, Okada M. Completion lobectomy after radical segmentectomy for pulmonary malignancies. *Asian Cardiovasc Thorac Ann* 2016; **24**: 450–4.
3 Lewis RJ, Caccavale RJ, Bocage JP, Widmann MD. Video-assisted thoracic surgical non-rib spreading simultaneously stapled lobectomy: A more patient-friendly oncologic resection. *Chest* 1999; **116**: 1119–24.
4 Murakami J, Ueda K, Hayashi M, Sano F, Hamano K. Simultaneous stapling of the lobar bronchus and pulmonary artery: Is it actually dangerous? *Interact Cardiovasc Thorac Surg* 2016; **22**: 671–3.
5 Zhao ZR, Ng CSH. Sequential segmentectomy: Known knowns, known unknowns, and unknown unknowns. *J Thorac Cardiovasc Surg* 2018; **155**: 1305–6.

Supporting Information

Additional Supporting Informationmay be found in the online version of this article at the publisher's website:

Figure S1. Intraoperative view of the first operation. (a) Computed tomography (CT) imaging revealed a 13 mm

part-solid ground glass nodule (GGN) in segment 8. (b) Subcarinal lymphadenectomy. (c) Nearly complete major fissure without visible hilar lymph nodes. (d) The segmental plane was identified using the inflation-deflation method. (e) Stapling technique for segmentectomy. (f) Application of polyglycolic acid sheet (Neoveil) for staple lines.

Figure S2. Intraoperative view of the reoperation. (a,b) Different degrees of adhesions around the diaphragm, chest wall, and pericardium were observed. (c–e) Dense adhesions between the right middle lobe (RML) and right lower lobe (RLL) were divided using a stapling technique. (f) Upper mediastinal lymphadenectomy (stations 2R and 4R) was also performed.

