

CASE REPORT

Initial experience of video-assisted thoracic surgery left upper sleeve lobectomy for lung cancer: Case report and literature review

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Abstract

Video-assisted thoracic surgery (VATS) sleeve lobectomy continues to represent a great challenge to thoracic surgeons. Herein we report what we believe to be the first case of thoracoscopic left upper sleeve lobectomy for lung cancer. A 61-year-old male patient with centrally located lung cancer of the left upper lobe was successfully treated by this minimally invasive technique. Based on the success of the operation, we believe that VATS left upper sleeve lobectomy is also feasible, however, surgical approaches and procedures still require further improvement.

Introduction

Video-assisted thoracic surgery (VATS) is accepted as a reasonable alternative to thoracotomy in the treatment of early stage non-small cell lung cancer.¹ It has been nearly 10 years since the first attempt to perform sleeve lobectomy with this minimally invasive technique,² but thoracoscopic sleeve lobectomy has been considered a great challenge until recent times. Sporadic cases of VATS sleeve lobectomy have been reported, including most types of sleeve resection (with the exception of left upper sleeve lobectomy).²⁻⁷ The absence of VATS left upper sleeve lobectomy has been because of the difficulties of reconstructing the bronchus through VATS incisions and the inconvenient operating angle. We present here a report that is, to the best of our knowledge, the first known case of successful VATS left upper sleeve lobectomy for centrally located lung cancer.

Case report

A 61-year-old male patient was referred to our hospital for a persistent cough and bloody sputum lasting a one month

period. His past medical history was unremarkable. He reported a more than 60 pack-year history of cigarette smoking and was currently smoking 30 cigarettes per day. A clinical examination of the patient showed no abnormalities. A computed tomography (CT) scan (Fig. 1a) confirmed a 0.8 cm round nodule of left hilum. Fiber-optic bronchoscopy showed that the nodule was located in the left upper lobar orifice. A biopsy of the mass suggested a squamous cell carcinoma. A fluoro-deoxyglucose-positron emission tomography (FDG-PET) scan showed that there were no distant or mediastinal metastasis. The patient was considered as a surgical candidate after the evaluation of general condition and cardiopulmonary function.

The patient fell into great anxiety for fear of thoracotomy before surgery and consulted us about the use of a more minimally invasive method for surgical removal of the tumor. With the experience of three VATS right upper sleeve lobectomies⁷ and careful assessment of the CT scan, we decided to perform a VATS sleeve lobectomy for this patient. The decision had also been approved by the Institutional Review Board of our hospital. Informed consent of the operation was obtained before surgery.

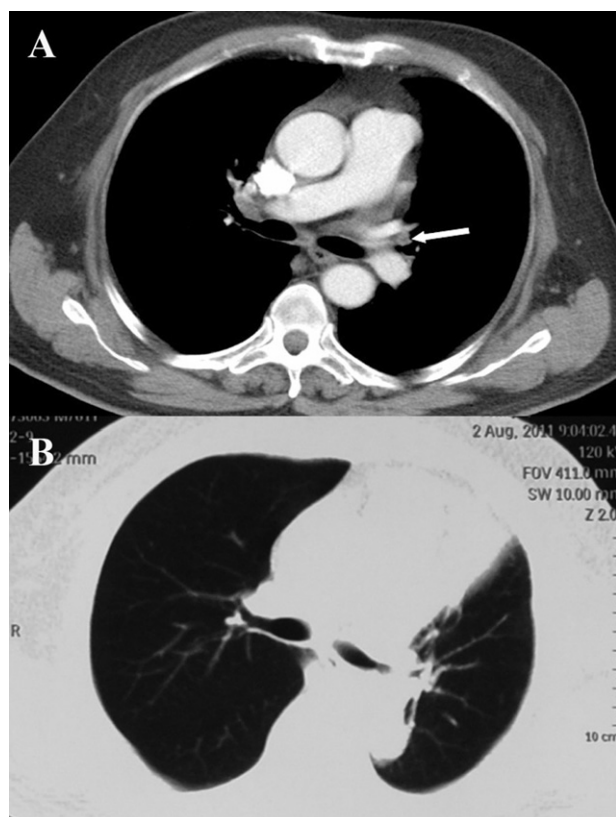


Figure 1 (a) Computed tomography scan showed a small nodule (arrow) of left hilum before surgery. (b) Proper re-expansion of left residual lung at three month follow up.

The operation was carried out under general anesthesia with double lumen endotracheal intubation. The patient was placed in the lateral decubitus position and the incisions were the same as our routine single-direction thoracoscopic lobectomy.⁸ An additional 1.5 cm incision was made on the midaxillary line in the 5th intercostal space before performing bronchial anastomosis (Fig. 2).

Initially, an exploratory VATS was performed. Adhesions between the lung and the chest wall were identified and taken down endoscopically with a cautery hook. The left upper lobe was gripped with dorsal traction. The left superior pulmonary vein was firstly dissected and transected with an endostapler. Oblique fissure was then dissected, followed by transection of the lingular artery and anterior artery. Thoracoscope was placed into the 9th intercostal incision for the management of apical and posterior artery. The inferior pulmonary ligament was mobilized and mediastinal lymphadenectomy was performed using a harmonic scalpel before transecting the proximal and distal bronchus.

The anastomosis between the left main bronchus and the lower lobar bronchus was performed by hand through the utility incision and the 1.5 cm 5th intercostal port, using a

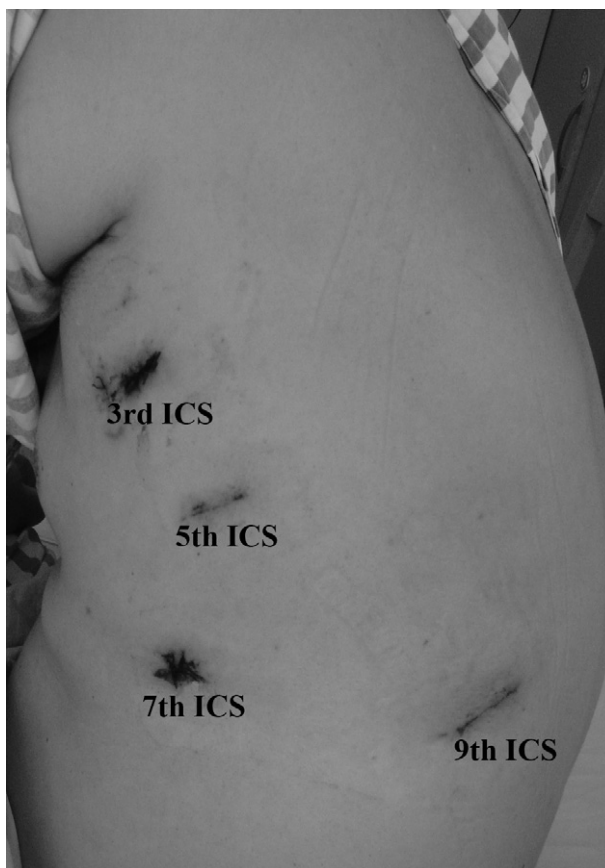


Figure 2 Incision location for thoracoscopic left upper sleeve lobectomy. A 1 cm incision for thoracoscope on the midaxillary line in the 7th intercostal space (ICS); a 3 cm utility incision on the anterior axillary line in the 3rd ICS; a 2 cm assistant incision in the 9th ICS (between the posterior axillary line and scapular line); and an additional 1.5 cm incision on the midaxillary line in the 5th ICS.

running 3-0 prolene stitch (with two needles). The mediastinal side of the bronchus was sewn first, followed by the posterior and anterior walls. The lateral wall of the bronchus was sewn up last, and the knot tied (Fig. 3 and see the Video S1). An endoscopic suction was used to retract the pulmonary artery during anastomosis when necessary. Surgical margins of the bronchus were confirmed negative by intraoperative frozen section. Bronchoscopy was performed intraoperatively and prior to discharge to confirm the patency and viability of the bronchial anastomosis (Fig. 4). The duration of anastomosis was 55 minutes and the total operation time was 290 minutes with 200 mL of blood loss.

The postoperative course was uneventful, and the patient was discharged on postoperative day eight. Pathologic examination of the specimen revealed a poorly differentiated squamous cell carcinoma invaded submucosa, without involvement of the main bronchus. A total of 12 lymph nodes were dissected, including #5, 6, 7, 9, 10 and 11. The patient was

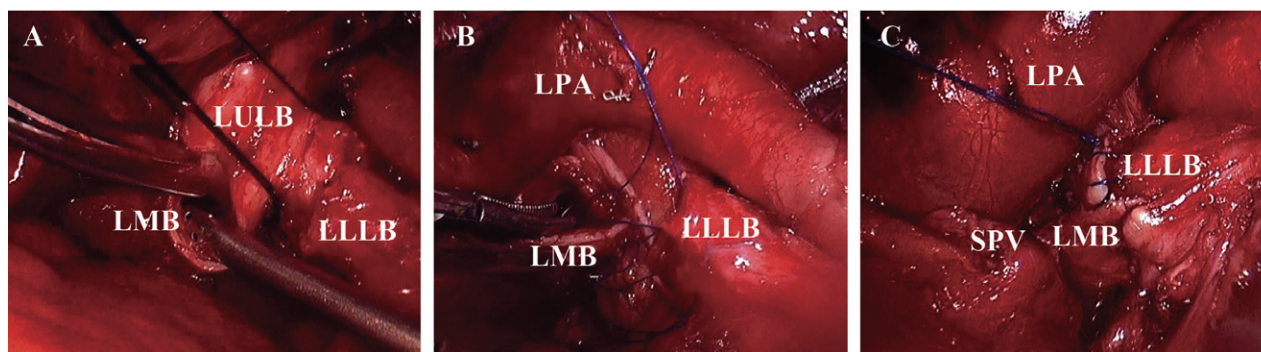


Figure 3 (a) Left main bronchus was cut down with a pair of scissors. (b) End-to-end anastomosis of the bronchus using a running 3-0 prolene stitch. (c) Anastomosis of the bronchus and surgical margin of superior pulmonary vein. LLLb, left-lower-lobe bronchus; LMB, left main bronchus; LPA, left pulmonary artery; LULB, left-upper-lobe bronchus; SPV, superior pulmonary vein.

lastly staged as T_{1a}N₀M₀ after surgery. The reconstructed bronchus continued to work well during the three month follow-up visit (Fig 1b).

Discussion

VATS sleeve lobectomy has been performed in a few experienced centers since 2002,² but this newly emerging technique is still in its infancy. Until recently, sleeve lobectomy was considered as a contraindication of VATS that should be converted to a thoracotomic procedure. Surgical procedures and results in the literature for VATS sleeve lobectomy are summarized in Table 1. Until this time, Mahtabifard *et al.*⁶ reported the largest series of VATS sleeve lobectomy cases at

13 in 2008, which involved most types of the resection except left upper sleeve lobectomy. VATS left upper sleeve lobectomy was also absent from other reports.^{2-5,7} We speculate that the main reason for this is the difficulty presented by bronchial anastomosis through VATS incisions and the inconvenient operating angle; the key point is to design more reasonable surgical approaches.

VATS or totally thoracoscopic approaches are defined as using video monitors for surgical visualization and to avoid rib spreading.⁹ Some of these reported VATS sleeve lobectomies can be considered as video-assisted minithoracotomy as the operations were performed with direct visualization through the utility incision.⁴ Though VATS lobectomy can be performed via a variety of surgical approaches, more convenient approaches are needed for bronchial reconstruction. An additional incision was made during this operation for bronchial anastomosis. The operation can be performed successfully via current incisions, but there are still some limitations on performing the bronchial anastomosis smoothly. The approach we used in this operation is not ideal and will require further improvement. As for VATS bronchial anastomosis, there are also no precedents from which we can learn. Nakanishi³ recently reported a method of VATS bronchial anastomosis with a combination of running and interrupted sutures with an operating time of 702 minutes. Mahtabifard *et al.*⁶ performed VATS bronchoplasty using an interrupted suture. Our procedure suggests that a running suture is preferable as this saves unnecessary work and time.

In Mahtabifard's case, a complete mediastinal lymph node dissection was performed after bronchial anastomosis.⁶ We believe that it is more suitable to perform systemic lymphadenectomy prior to transecting the bronchus, especially for subcarinal lymph nodes. Lymph nodes were dissected with traction of the left upper lobe during the surgery. On the one hand, the main bronchus can receive adequate exposure after dissection of the hilar and subcarinal lymph nodes,

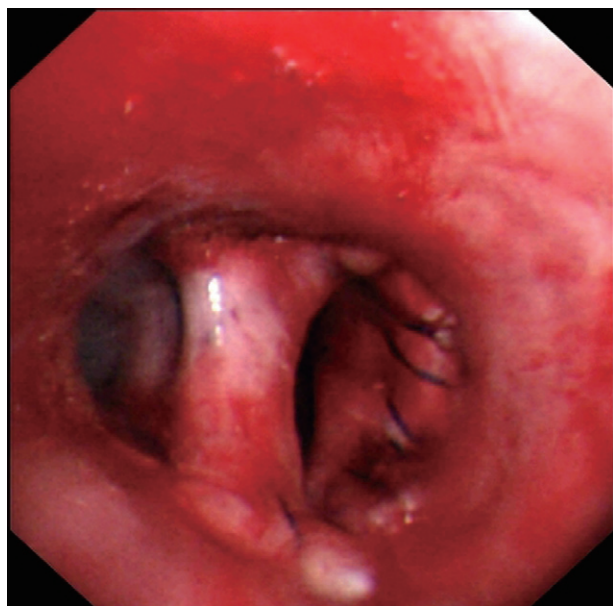


Figure 4 Postoperative endoscopic view of the anastomotic stoma.

Table 1 Surgical procedures and results of published case reports and case series of video-assisted thoracic surgery sleeve lobectomy

Study	Type of resection	Cases	Surgical approach	Technique of bronchial anastomosis	Blood loss (mL)	Operative time (min)	Complications (Number)
Santambrogio <i>et al.</i> (2002) ²	LLL	1	5-cm lateral incision in the 5 th ICS, two 1.5-cm incisions in the 7 th ICS on PAL and AAL.	NR (Using 4-0 absorbable suture)	NR	NR	None
Nakanishi (2007) ³	RUL	1	Utility incision in the 3 rd ICS on AAL, two incisions in the 6 th ICS on PAL and AAL.	Running and interrupted 3-0 absorbable suture.	1118	702	None
Kamiyoshihara <i>et al.</i> (2008) ⁴	LLL	1	5–8 cm incision in the 4 th or 5 th ICS, two incisions in the 7 th on the AAL and/or 9 th ICS on the PAL.	NR	NR	NR	NR
DeArmond <i>et al.</i> (2008) ⁵	RUL	1	NR	NR	NR	NR	None
Mahtabifard <i>et al.</i> (2008) ⁶	RUL	7	4–6 cm utility incision in the 4 th ICS on anterior edge of the latissimus dorsi muscle, 2-cm incision in the 6 th ICS on the MCL, thoracoscopic port in the 7 th or 8 th ICS on MAL, 1-cm incision in the auscultatory triangle.	Interrupted 3-0 absorbable suture.	250 (75–800)	174† (90–300)	Anastomotic stricture (1); Atrial fibrillation (1); Reintubation/urinary retention (1); Bronchial leak (1).
	RML+S VI	2					
	LLL	2					
	RML+S VI+S II	1					
	RLL	1					
Liu <i>et al.</i> (2011) ⁷	RUL	3	3-cm utility incision in the 3 rd ICS on AAL, 1.5-cm incisions in the 7 th on the AAL and 2-cm incision in the 9 th ICS behind the PAL.	Running 3-0 prolene suture.	155 (55–230)	255 (220–285)	None

†Median operative time. AA, anterior axillary line; ICS, intercostal space; LLL, left lower lobectomy; MAL, midaxillary line; MCL, midclavicular line; NR, not reported; PAL, posterior axillary line; RLL, right lower lobectomy; RML, right middle lobectomy; RUL, right upper lobectomy; S II, posterior segment of right upper lobe; S VI, superior segment of right lower lobe.

however, on the other hand, performing lymphadenectomy after anastomosis may cause injury to the anastomotic stoma.

In summary, VATS left upper sleeve lobectomy for centrally located lung cancer is feasible, but surgical approaches and procedures continue to require further improvement.

Disclosure

No authors report any conflict of interest.

References

- 1 Ettinger DS, Akerley W, Bepler G *et al.* Non-small cell lung cancer. *J Natl Compr Canc Netw* 2010; **8**: 740–801.
- 2 Santambrogio L, Cioffi U, De Simone M, Rosso L, Ferrero S, Giunta A. Video-assisted sleeve lobectomy for mucoepidermoid carcinoma of the left lower lobar bronchus: a case report. *Chest* 2002; **121**: 635–6.
- 3 Nakanishi K. Video-assisted thoracic surgery lobectomy with bronchoplasty for lung cancer: initial experience and techniques. *Ann Thorac Surg* 2007; **84**: 191–5.
- 4 Kamiyoshihara M, Ibe T, Takeyoshi I. Video-assisted thoracoscopic lobectomy with bronchoplasty for lung cancer: tip regarding bronchial anastomosis. *Gen Thorac Cardiovasc Surg* 2008; **56**: 476–8.
- 5 DeArmond DT, Mahtabifard A, Fuller CB, McKenna RJ Jr. Photodynamic therapy followed by thoracoscopic sleeve

lobectomy for locally advanced lung cancer. *Ann Thorac Surg* 2008; **85**: e24–6.

- 6 Mahtabifard A, Fuller CB, McKenna RJ Jr. Video-assisted thoracic surgery sleeve lobectomy: a case series. *Ann Thorac Surg* 2008; **85** (Suppl.): S729–32.
- 7 Liu L, Mei J, Pu Q *et al.* Video-assisted thoracoscopic surgery bronchial sleeve lobectomy for lung cancer: report of preliminary experience. *Chin J Clin Thorac Cardiovasc Surg* 2011; **18**: 387–9.
- 8 Liu L, Che G, Pu Q *et al.* A new concept of endoscopic lung cancer resection: single-direction thoracoscopic lobectomy. *Surg Oncol* 2010; **19**: e71–7.
- 9 Burfeind WR, D'Amico TA. Thoracoscopic lobectomy. *Oper Tech Thorac Cardiovasc Surg* 2004; **9**: 98–114.

Supporting information

Additional Supporting Information may be found in the online version of this article:

Video S1 The video showed that the resected left upper lobe was taken out through the utility port, and an additional port was made before bronchial anastomosis. The process of bronchial anastomosis was briefly demonstrated.

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