Surgical Technique

Thoracoscopic left S4a subsegmentectomy

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Abstract: A 63-year-old woman who underwent a left hepatic lobectomy for hilar cholangiocarcinoma was referred to our department for further management. Chest computed tomography showed a lung nodule that was increased in size to 8 mm in the S4a. The differential diagnosis was metastasis versus primary lung cancer. Thoracoscopic left S4a subsegmentectomy was performed. The operative time was 158 min. The blood loss was minimal. Air leakage was not observed, and a chest tube was removed on POD 1. The patient was discharged home on POD 3. The final diagnosis was primary lung cancer (T1aN0M0 stage IA). Surgical margin was 2.0 cm.

Keywords: Thoracoscopy/video-assisted thoracic surgery (VATS); segmentectomy/subsegmentectomy; lung cancer

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Introduction

Video-assisted thoracic surgery (VATS) lobectomy with systematic node dissection for non-small cell lung cancer (NSCLC) has been used with increasing frequency in recent years (1). Studies have provided strong evidence that VATS lobectomy is an acceptable alternative to open lobectomy for treating early stage NSCLC (2-5). There are few data on the benefits of VATS segmentectomy. Nevertheless, indications for VATS segmentectomy have been increasing recently, due both to its potential for cure and its minimal invasiveness. Reports of subsegmentectomy have been increasing due to increasing numbers of smaller tumors. We have introduced the procedure for selected patients and safely experienced about 300 cases. We have reported use of three-dimensional (3D) multidetector CT (MDCT) images for surgical simulation during anatomic thoracoscopic pulmonary segmentectomy and the effectiveness of this technique (6,7). This enabled the resection of smaller areas such as subsegments. The numbering and symbols used to denote pulmonary segments and peripheral bronchovascular branches follow nomenclature previously described (8). Subsegmentectomy is defined as a resection of a lung area of the next order from a peripheral bronchial branch from the segmental bronchus. Accordingly, left S4 indicates the superior lingular segment and left S4a is defined as the lateral subsegment of S4. Here, we report our technique of thoracoscopic left S4a subsegmentectomy for a 63-year-old woman with left S4a nodules at the Second Department of Surgery at Yamagata University. The video demonstrates our thinking and surgical process.

A 63-year-old woman who underwent a left hepatic lobectomy for hilar cholangiocarcinoma was referred to our department for further management. Chest computed tomography showed a lung nodule that was increased in size to 8 mm in the S4a subsegment. Before the operation, pulmonary function testing, blood gas analysis, cardiac evaluation, and basic examinations were within normal limits. The differential diagnosis was lung metastasis of hilar cholangiocarcinoma versus primary lung cancer staged as IA (T1aN0M0). We decided to perform a thoracoscopic left S4a subsegmentectomy (*Figure 1*).

Operative technique

The patient was positioned in the right lateral decubitus position. The operation was conducted under general anesthesia with double-lumen endotracheal intubation.

Figure 1 Thoracoscopic left S4a subsegmentectomy (9). Available online: http://www.asvide.com/articles/1735

The utility port (20 mm soft port) was placed in the 5th intercostal space on the left anterior axillary line. The camera port (5 mm in diameter) was placed in the 6th intercostal space on the left mid-anterior axillary line. An additional 5 mm port was placed in the 4th intercostal space on the left anterior axillary line. An auxiliary port (5 mm in diameter) was placed in the 5th intercostal space on the left posterior anterior axillary line. No rib spreader was used, and the whole procedure was controlled on the monitor. We first dissected the lingular segmental artery. Branches were identified by referring to 3D reconstruction from contrast enhanced computed tomography. The key to this procedure is to divide the V3a vein between S3a and S3b first, which exposes the hilar components (A4a and B4a). A4a was divided using a sealing device. We encircled B4a using a monofilament polypropylene thread. A slip-knot was made outside the thorax and whole-lung ventilation was performed. During lung ventilation, one end of the string was pulled, and the knot slipped to reach the bronchus without a knot-pusher. The outflow of subsegmental air was blocked and the subsegment remained expanded, whereas the other segments collapsed. The proximal portion of B4a was closed using double polymer clips, then divided. The inflation-deflation lines gradually became distinct. Then, we further dissected the pulmonary parenchyma from the hilum along the inflation-deflation line. The peripheral lung was dissected with a stapler. Leak testing was conducted. A small leak from a cut surface was detected up to an airway pressure of 20 cmH_2O. Fibrin glue was sprayed at the cut surface. A 20-Fr chest tube was placed, and the incisions were closed. The total operative time was 158 min. Blood loss was minimal. Air leak was not observed after this, and the chest tube was removed on POD 1. The patient was discharged home on POD 3. The final diagnosis was primary lung cancer (T1aN0M0 stage IA). Surgical margin was 2.0 cm.

Comments

The number of reports on small-sized lung cancer, which is believed to be noninvasive, has recently increased. There are few data describing the benefits of VATS segmentectomy. Nevertheless, indications for VATS segmentectomy have been increasing recently, because of the potential for cure and minimal invasiveness. We have reported 3D MDCT imaging for surgical simulation during anatomic thoracoscopic pulmonary segmentectomy and the effectiveness of this technique. Furthermore, we have reported a slip knot bronchial ligation method for visualization of the anatomic plane and inflation-deflation line during lung segmentectomy (10). The use of a polymer clip can be an alternative method to close the bronchial stump during subsegmentectomy (11). These techniques facilitated the performance of anatomic lung segmentectomy thoracoscopically. In this case, branches were identified using 3D computed tomography angiography imaging. The key to this procedure is to divide the V3a vein between S3a and S3b first, which exposes the hilar components (A4a and B4a) by blunt dissection of the intersegment plane between the upper division and the lingular segment through the interlobar fissure. The intersegmental surface of S4a was identified using a slipknot technique and the proximal portion of B4a was closed using double polymer clips, then divided. Anatomical knowledge for dividing the V3a vein is useful for thoracoscopic left S4a subsegmentectomy.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

References

1. McKenna R Jr. Vats lobectomy with mediastinal lymph node sampling or dissection. Chest Surg Clin N Am 1995;5:223-32.
2. Onaitis MW, Petersen RP, Balderson SS, et al. Thoracoscopic lobectomy is a safe and versatile procedure: experience with 500 consecutive patients. Ann Surg 2006;244:420-5.
3. Swanson SJ, Herndon JE 2nd, D'Amico TA, et al. Video-assisted thoracic surgery lobectomy: report of CALGB 39802--a prospective, multi-institution feasibility study. J Clin Oncol 2007;25:4993-7.
4. Whitson BA, Andrade RS, Boettcher A, et al. Video-assisted thoracoscopic surgery is more favorable than thoracotomy for resection of clinical stage I non-small cell lung cancer. Ann Thorac Surg 2007;83:1965-70.
5. Watanabe A, Koyanagi T, Ohsawa H, et al. Systematic node dissection by VATS is not inferior to that through an open thoracotomy: a comparative clinicopathologic retrospective study. Surgery 2005;138:510-7.
6. Oizumi H, Kanauchi N, Kato H, et al. Total thoracoscopic pulmonary segmentectomy. Eur J Cardiothorac Surg 2009;36:374-7; discussion 377.
7. Oizumi H, Kanauchi N, Kato H, et al. Anatomic thoracoscopic pulmonary segmentectomy under 3-dimensional multidetector computed tomography simulation: a report of 52 consecutive cases. J Thorac Cardiovasc Surg 2011;141:678-82.
8. Boyden EA. A critique of the international nomenclature on bronchopulmonary segments. Dis Chest 1953;23:266-9.
9. Hamada A, Oizumi H, Kato H, et al. Thoracoscopic left S4a subsegmentectomy. Asvide 2017;4:421. Available online: http://www.asvide.com/articles/1735
10. Oizumi H, Kato H, Endoh M, et al. Slip knot bronchial ligation method for thoracoscopic lung segmentectomy. Ann Thorac Surg 2014;97:1456-8.
11. Oizumi H, Kato H, Endoh M, et al. Management of Bronchial Stumps in Anatomic Lung Segmentectomy. Ann Thorac Surg 2016;101:2120-4.

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