Surgical Technique

Single-direction thoracoscopic lobectomy: right side

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Introduction

Video-assisted thoracic (VATS) lobectomy has been widely accepted as a standard procedure for the surgical treatment of early stage non-small cell lung cancer (NSCLC) (1-3). Since VATS lobectomy first introduced in 1992, several techniques had been reported (4-6). Previously, we introduced a novel VATS lobectomy technique, which named single-direction thoracoscopic lobectomy (7). The aim of this paper is to illustrate the techniques of single-direction thoracoscopic lobectomies of the right lung, including the right upper, middle, and lower lobectomies in detail.

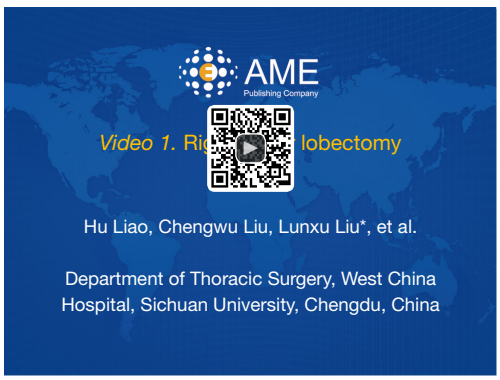

Figure 1 Right upper lobectomy (8).
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Operative techniques

Right upper lobectomy (Figure 1)

A 57-year-old male non-smoker was presented to our hospital with a 1.5 cm × 1.5 cm solid nodule in the anterior segment of the right upper lobe (RUL). PET-CT scans suggested a malignant tumor. After excluding contraindications, the patient was referred to surgery.

The patient was placed at a left-side lateral decubitus position with his body bended over. General anesthesia with double lumen intubation was administered to him (7). The observation incision (1 cm) was made at the middle axillary line in the 7th intercostal space (ICS). The utility incision (3 cm) was placed in the 3rd ICS at the anterior axillary line, through which most of the operations were performed, such as dissection, suture, ligation, retrieval of the specimen. The assistant incision was placed between the posterior axillary line and subscapular line in the 9th ICS and was mainly used for exposure and introduction of the stapler. Wedge resection was first performed followed by lobectomy and systematic mediastinal lymph node dissection after confirmation of an adenocarcinoma by frozen-section examination.

The right upper lobe was retracted toward back using endoscopic curved ring clamps through the assistant incision to expose the hilum. Then an endoscopic metal suction with side holes on the tip was inserted through the assistant incision while the electrocautery hook was inserted through the main utility incision. The technique of "suction-assisted electrocautery sharp dissection", which enabled precise dissection and clear operating field, was applied during the whole process of dissection. The mediastinal pleura was opened just posterior to the phrenic nerve. The superior pulmonary vein, which was the most superficial structure, was first dissected. The bifurcation of the right upper lobe vein and the middle lobe vein should be identified. With both upper and lower borders of the right upper lobe vein were dissected, a right-angle clamp was used to pass through the space between the vein and the right main pulmonary

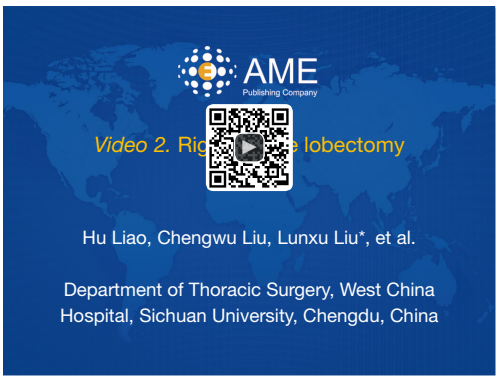

Figure 2 Right middle lobectomy (10).
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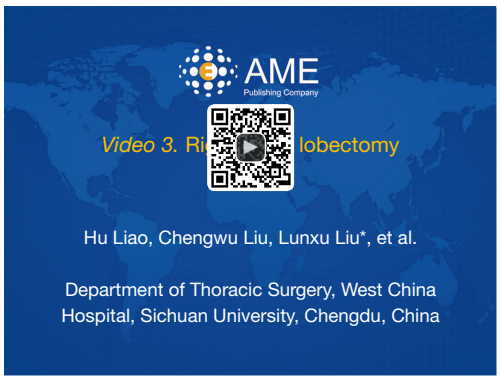

Figure 3 Right lower lobectomy (11).
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artery (PA). Then an endoscopic vascular stapler was used to transect the vein. After the vein was stapled, the underlying PA appeared. The following step was to dissect and transect the truncus anterior using a vascular stapler. The ascending artery was exposed when we dissected along the main PA. It was ligated using 4-0 silk thread and transected by harmonic scalpel (HS). After detachment of the pulmonary vein and arterial branches, the right upper lobe bronchus would come into sight. The lymph nodes between the upper lobe bronchus and the intermediate bronchus were dissected using the HS, which were removed immediately or pushed to the distal part of the bronchus and harvested along with the lobe. An endoscopic stapler with long feet (4.1 mm) was used to transect the RUL bronchus. At last, the fissures were divided using endoscopic staplers. The specimen was removed through the main utility incision using a bag made from a surgical glove. The technique of systematic lymph node dissection was described in our previous article (9) and not demonstrated here.

Right middle lobectomy (Figure 2)

A 56-year-old female was referred to our hospital with a nodule of 1.5 cm × 0.8 cm in her right middle lobe (RML). A malignant tumor was highly suspected after PET-CT scans, and single-direction thoracoscopic right middle lobectomy and systemic lymph node dissection were performed.

The placement of the incisions was the same as those of right upper lobectomy described above. The RML was retracted toward back using endoscopic curved ring clamps through the assistant incision to expose the hilum. The technique of dissection was the same as aforementioned during the right upper lobectomy. The pleura was opened first followed by the dissection of the RML vein, which was then transected via an endoscopic vascular stapler. Then the middle lobe bronchus appeared and would be dissected. A right-angle clamp was used to pass through the posterior space and a stapler was used to transect the bronchus. After the bronchus been transected, the PA was exposed. There were usually two arterial branches feeding the middle lobe. The branches were ligated using 4-0 silk thread and divided by HS respectively. The fissures were the last structures divided. The specimen was removed using the same maneuver described above.

Right lower lobectomy (Figure 3)

A 62-year-old male was presented to our hospital with chief complain of irritable cough for 2 months. Enhanced chest CT scan revealed a 2 cm × 2 cm nodule in his superior segment of the right lower lobe (RLL). CT-guided percutaneous lung biopsy confirmed an adenocarcinoma. After careful preoperative evaluation, the patient received a single-direction thoracoscopic right lower lobectomy and systemic lymph node dissection. The positioning and placement of incisions were the same as those in upper lobectomy except that the utility incision was placed in the 4th ICS. The RLL was retracted toward the cranial. The inferior pulmonary ligament was first dissected followed by dissection of the right inferior pulmonary vein. The vein was then transected by an endoscopic vascular stapler inserted through the utility incision. The underlying structure would be the RLL bronchus. Identification of the bifurcation of the lower bronchus and middle lobe bronchus was crucial. After removal of the lymph nodes between the

bifurcation, a Kelly clamps was used to pass through the space between the bronchus and the PA. Then the bronchus was transected using stapler. After that, the RLL PA would appear. It was dissected and transected by stapler. At last, the fissures were completed using staplers. The specimen was removed using the same maneuver described above.

Comments

There were two main approaches for VATS lobectomy including the "transfissure" and "fissureless" techniques. During a "transfissure" VATS lobectomy surgeons needed to dissect through the fissures to manage the PA first and then move back to the hilum to manage the bronchus and vein. The procedure began at various sites and advanced through different directions. Dissecting through the fissures might cause high risk of postoperative air leakage. What's worse, when the fissures were severely hypoplastic, the operation would be very difficult to advance and conversion to thoracotomy might be inevitable. Some authors introduced the "fissureless" technique to complete lobectomy either from anterior or posterior approaches (6,12,13). This technique enabled surgeons to dissect beginning at the hilum while there's no need to worry about the fissures were complete or not. However, this technique was mainly used in upper lobectomies.

Our technique operated at the hilum only (single site) and proceeded in a single direction without turnover of the lung back and forth repeatedly. During the right upper lobe and middle lobe resection, the proceeding direction is from ventrum to dorsum, while in the lower lobe resection from caudal to cranial. The pulmonary veins were the most superficial structures and would be managed first, followed by the underlying structures (bronchus or arteries), and the fissures would be the last.

During the single direction VATS right upper lobectomy, there were several technical notes. In some cases, a common anterior trunk supplied the whole lobe while there's no posterior ascending artery. On this occasion, the superior segmental artery (A6) might be easily mistaken for posterior ascending artery and been transected by inexperienced hands. It should be noted that the posterior ascending artery travels upward and backward while the A6 travels downward and backward. When performing a middle lobectomy in single direction, the first arterial branch might hide just behind the upper lobe vein, which should be carefully dissected. In addition, the arterial branches of the middle lobe were usually small and not easy to be transected by staplers due to inappropriate angle for the placement of staplers. They could be managed via ligation using common silk thread, which was also money saving.

During a single direction right lower lobectomy, it could be mistaken the IB for lower lobe bronchus. Therefore, it is crucial to identify the bifurcation between the middle lobe bronchus and lower lobe bronchus before we fire the stapler. More discreetly we could close the stapler before firing and inflate the lung to confirm the right bronchus. Sometimes, the superior segmental artery would originate proximally and be far from the origination of the basal segmental artery. Under this circumstance, the superior segmental artery could be managed separately.

In conclusion, single-direction thoracoscopic lobectomy is an effective technique with streamlined process. The simplicity of this technique suggests that this procedure may be easier to be adopted by more surgeons.

Acknowledgements

None.

Footnote

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

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

References

1. Yan TD, Black D, Bannon PG, et al. Systematic review and meta-analysis of randomized and nonrandomized trials on safety and efficacy of video-assisted thoracic surgery lobectomy for early-stage non-small-cell lung cancer. J Clin Oncol 2009;27:2553-62.
2. Wood DE, Kazerooni EA, Baum SL, et al. Lung Cancer Screening, Version 3.2018, NCCN Clinical Practice Guidelines in Oncology. J Natl Compr Canc Netw 2018;16:412-41.
3. Zhang W, Wei Y, Jiang H, et al. Video-Assisted Thoracoscopic Surgery Versus Thoracotomy Lymph Node Dissection in Clinical Stage I Lung Cancer: A Meta-Analysis and System Review. Ann Thorac Surg 2016;101:2417-24.
4. Hansen HJ, Petersen RH, Christensen M. Video-

assisted thoracoscopic surgery (VATS) lobectomy using a standardized anterior approach. Surg Endosc 2011;25:1263-9.
5. Dolci G, Dell'Amore A, Daddi N. A new approach for video-assisted thoracoscopic lobectomy "the caudal position". J Thorac Dis 2015;7:2348-51.
6. Balsara KR, Balderson SS, D'Amico TA. Surgical techniques to avoid parenchymal injury during lung resection (fissureless lobectomy). Thorac Surg Clin 2010;20:365-9.
7. 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.
8. Liao H, Liu C, Mei J, et al. Right upper lobectomy. Asvide 2018;5:821. Available online: http://www.asvide.com/article/view/27886
9. Liu C, Pu Q, Guo C, et al. Non-grasping en bloc mediastinal lymph node dissection for video-assisted thoracoscopic lung cancer surgery. BMC Surg 2015;15:38.
10. Liao H, Liu C, Mei J, et al. Right middle lobectomy. Asvide 2018;5:822. Available online: http://www.asvide.com/article/view/27887
11. Liao H, Liu C, Mei J, et al. Right lower lobectomy. Asvide 2018;5:823. Available online: http://www.asvide.com/article/view/27888
12. Demmy TL. Video-atlas of thoracoscopic formal lung resections emulating traditional open techniques. Ann Cardiothorac Surg 2012;1:88-99.
13. Hansen HJ, Petersen RH. Video-assisted thoracoscopic lobectomy using a standardized three-port anterior approach - The Copenhagen experience. Ann Cardiothorac Surg 2012;1:70-6.

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