

Uniportal right upper video-assisted thoracoscopic surgery lobectomy: safe and feasible

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Abstract: Uniportal video-assisted thoracoscopic surgery (VATS) lobectomy is now well established and performed all around the world. We are going to share the surgical technique for uniportal VATS right upper lobectomy based on our experience. A 62-year-old patient underwent Uniportal VATS right upper lobectomy for a primary non-small cell lung cancer (NSCLC). Our patient had no perioperative complications and was then discharged to his home on postoperative day 4. The patient's pain was managed with a paravertebral catheter during the first 48 hours and then with oral analgesics. Pathology report: well-differentiated adenocarcinoma; the size of the tumour was 1 cm × 0.8 cm × 1 cm; all margins were negative for residual tumour. The patient did not require adjuvant radiation or chemotherapy. Uniportal VATS lobectomy is a safe and effective procedure providing a favourable clinical outcome in the patient.

Keywords: Lung cancer surgery; surgery/incision/exposure/techniques; thoracoscopy/video-assisted thoracoscopic surgery (VATS); surgery/complication; pain

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Introduction

Video-assisted thoracoscopic surgery (VATS) lobectomy is now performed all around the world and it is associated with improved perioperative morbidity and superior perioperative survival compared to thoracotomy. Different techniques have been described: uniportal VATS was first described in 2004 by Rocco and colleagues (1), and this strategy has been used for numerous indications, including lobectomy (2-6); a two-incision VATS for anatomic pulmonary resection was performed by different groups (7-12), and a standardized three-port approach was described by different authors (13-17). Uniportal VATS lobectomy is not related with a better postoperative outcome when compared with two or three-port approach (18). However, this technique can be considered safe and feasible (19).

Patient selection and workup

Uniportal VATS lobectomy is not only indicated for initial stages of NSCLC. The feasibility of uniportal VATS approach in the treatment of advanced NSCLC was assessed and published showing excellent postoperative results (20).

Preoperative evaluation of patient includes:

- ❖ Lung function testing;
- ❖ Computed tomography (CT);
- ❖ Positron emission tomography (PET);
- ❖ Flexible bronchoscopy;
- ❖ EBUS/mediastinoscopy (central tumour and/or hilar/mediastinal lymph nodes hypermetabolic on PET).

Preoperative CT demonstrated a right upper lobe with a solitary peripheral spiculated nodule—11 mm



Figure 1 Uniportal right upper video-assisted thoracoscopic surgery (VATS) lobectomy (21).

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diameter (See image in video, *Figure 1*). PET-CT showed a hypermetabolic nodule in the right upper lobe with mean standardized uptake value (SUV) equal to 4.5. Hilar and/or mediastinal involvement was discarded. Relevant data of respiratory function testing:

- ❖ FEV1 equal to 2.70 liters (75% predicted);
- ❖ DLCO equal to 34.5% predicted.

Maximal oxygen consumption (VO₂ peak) testing was 10.5 mL/kg/min.

Pre-operative preparation

A lateral decubitus is the standard position in order to perform a uniportal VATS lobectomy. Being the aforementioned an anterior approach, the surgical team (surgeon and assistant) is always placed in front of the patient for achieving and maintaining the same endoscopic view during all the surgical procedure. Even if only one incision was performed, different inclinations of the thoracoscope allow obtaining multiple viewing angles. The main advantage of this technique is the possibility to preserve step by step the same angle of vision of an open lobectomy.

Equipment preference card

There are actually many different instruments and devices that have been developed in order to facilitate the implementation of modern and complex endoscopic techniques like SVAT lobectomy.

Recommendations:

- ❖ Scanlan instrumentation;
- ❖ Valleylab™ Laparoscopic Wire L-Hook Electrode;

- ❖ Covidien endo-GIA stapler with curved-tip stapler technology and tri-staple cartridges;
- ❖ Hem-o-Lok Ligation System, ML size;
- ❖ Olympus Ultra Telescope 10 mm;
- ❖ LigaSure™ Maryland Jaw 23 cm (COVIDIEN, Mansfield, MA, USA) device with a tip shaped for dissecting is really user-friendly.

Various types of wound protectors are commercially available for a uniportal VATS lobectomy. Personally, I prefer to use the Extra Small Size Surgisleeve™ (COVIDIEN, Mansfield, MA, USA); it is optimum for incisions between 2 and 4 cm.

Prior to performing this surgery, it is important to thoroughly master the skills of having all instrumentation sharing the same access incision alongside the thoracoscope.

Procedure

Fixed steps in the surgical procedures are listed below:

- ❖ General anaesthesia with double lumen intubation;
- ❖ Lateral decubitus;
- ❖ Anterior incision—4–5 cm in length—at the level of the 5th intercostal space (See image in video, *Figure 1*).

Right upper lobectomy

The thoracoscope is usually placed at the top, corresponding to the posterior part of the incision, and the instruments at the bottom, corresponding to the anterior part.

Operative steps for right upper lobectomy:

- ❖ Anterior and apical segmental trunk;
- ❖ Upper vein (it is essential to identify and preserve the vein from the right middle lobe);
- ❖ Upper bronchus;
- ❖ Posterior segmental artery;
- ❖ Fissure: from anterior to posterior (fissureless technique).

Dividing first the bronchus and not the posterior segmental artery is recommended to achieve a better control of the vessel, especially in case of small trunks.

As a rule, the use of staplers for all hilar structures is preferable.

Before performing a systematic lymph node dissection, the lobe is removed into a protective bag. If it needs an intraoperative diagnosis, the paratracheal lymph nodes are removed after performing the wedge resection.

Final step consists in infiltrating the intercostal spaces with bupivacaine under thoracoscopic view. This manoeuvre

is usually performed from the second intercostal space to the utility port level to minimize the pain caused by the chest tube.

A single 28 F chest tube is placed in the anterior part of the incision. A paravertebral catheter is routinely inserted for a minimum of 24 hours: continuous infusion, via an elastomeric pump, of 1.25 mg·mL⁻¹ levobupivacaine plus 1 µg·mL⁻¹ fentanyl, set at a rate of 5 mL/h.

Lymphadenectomy

With the camera in the upper part of the utility port, a systematic lymph node dissection was carried on.

For paratracheal dissection the patient was placed in the anti-Trendelenburg position, thereby making the lung drop or “fall down”.

With the patient in the Trendelenburg position, the subcarinal lymph nodes were better exposed after dividing the pulmonary ligament.

The hilar and N1 lymph nodes dissection could be easily performed moving the table in a posterior rotation (*Figure 1*).

Role of team members

As with all surgical procedures, a team approach is a requirement to facilitate efficiency in the operating theatre.

The surgical team consists of:

- ❖ Surgeon and assistant;
- ❖ Anaesthesiologist;
- ❖ Scrub nurse;
- ❖ Circulating nurse.

The surgeon is the leader and directs other team members to ensure coordination of care in the theatre. It is mandatory that the surgeon be trained in VATS technique and has experience with open lobectomy principles. Moreover, the surgeon should be prepared to guide the surgical team in addressing and resolving unexpected intraoperative events and complications.

First of all, the surgeon should review emergency procedures audibly with the entire team. Blood availability should be remembered and techniques for emergency thoracotomy should be addressed to ensure availability of correct surgical instruments.

The anaesthesiologist is responsible for monitoring and maintaining patient hemodynamic and pulmonary stability. The anaesthesiologist performs single lung ventilation in the patient to avoid intraoperative hypoxemia. Close

communication regarding fluid management and blood pressure management, especially in case of hemodynamic instability and/or emergency pneumonectomy is vital to the safety of procedure.

Postoperative management

Postoperative course following lobectomy includes pain management, aggressive pulmonary physiotherapy, and early mobilization.

The anaesthetist retired the mechanical ventilation in the theatre and the patient received a close monitoring in the intensive care unit during the first 24 hours.

The pleural drain was retired after 48 hours.

Before removing the chest tube, pain management was via the paravertebral catheter and then with oral analgesics.

Tips, tricks and pitfalls

- ❖ Location of incision: placement of the incision should be versatile early in the learning curve so as to face the target lesion. At the top of the learning curve, surgeons can perform uniportal VATS for the majority of lesions throughout the chest as well as anatomic lung resections and other complex resections by moving the incision between the fourth and the sixth intercostal spaces. For an upper lobectomy, if the wound is located too high in the fourth space, dissection of the hilar vessels may be easier but the instruments enter in such a direct way towards the hilum that there is insufficient angle for the stapler to pass without damaging the structures behind;
- ❖ Always insert the staplers with angulation for vascular division;
- ❖ Use vascular clips when no angle for staplers;
- ❖ It could be useful to divide the minor fissure first in the event of not being able to pass the superior pulmonary vein with the stapler;
- ❖ In case of complete fissure, an energy device can be used to divide it. When doing so, the line of cutting should be kept slightly away from the remaining middle and lower lobes to reduce postoperative air leak;
- ❖ The following measures can be applied to avoid compromising dexterity:
 - ◆ Using an optic with chip on tip;
 - ◆ Using a thoracoscope of 383 mm length;
 - ◆ Valuing the option that the assistant can sit;
 - ◆ Placing the instruments in different planes respect to the camera head.

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Footnote

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