

# Techniques and difficulties dealing with hilar and interlobar benign lymphadenopathy in uniportal VATS

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**Background:** Surgical treatment of lung cancer has evolved to a minimally invasive approach and currently is recognized as an acceptable treatment for resectable non-small cell lung cancer (NSCLC). As the volume and complexity of cases has increased technical difficulties had arisen. Hilar and sublobar lymph nodes can represent a challenge for video-assisted thoracoscopic surgery (VATS) surgeons in order to complete a safe dissection of vascular and bronchial structures without complications or conversion. It is not unusual the patients with smoking history or benign infections in the past present with enlarged calcified nodes that are fused to the hilum, fissure and specially the bronchus which can lead to an accident during the procedure if the surgeon has no experience handling this issue. As the amount of surgeons carrying out VATS lobectomies grows it is very important for them to know what to do in this specific case so the completion of the procedure can be achieved safely.

**Methods:** The coordination between the surgeon and the assistant is very important in order to carry out the procedure without discomfort positions and good visualization, the use of energy devices in expert hands can help considerably during the dissection of lymph nodes in the hilum and fissure reducing the bleeding, which provides a clean operative field. It is a necessary maneuver during the dissection to find the correct adventitial plane between the lymph node and the structure before passing it.

**Results:** The videos in this article show the different maneuvers a VATS surgeon can implement when facing enlarged fused lymph nodes in the hilum, fissure or mediastinum. Improving exposure, opening the fissure, using energy and carrying out the dissection through the correct plane are keys to complete the procedure successfully.

**Conclusions:** With growing experience in uniportal VATS and advances in surgical technology, enlarged or fused lymph nodes are no longer a contraindication to complete a VATS lobectomy, experience VATS surgeons have a repertory of options in order to perform a safe and effective dissection.

**Keywords:** Uniportal video-assisted thoracoscopic surgery (VATS); lymph node dissection; lymphadenectomy; minimally invasive

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## Introduction

Currently video-assisted thoracoscopic surgery (VATS) lobectomy is recognized as an acceptable option for resectable non-small cell lung cancer (NSCLC) (1). Minimally invasive approach in thoracic surgery offers a number of advantages for patients including less pain, faster recovery and better cosmesis.

Uniportal VATS lobectomy was first describe by González-Rivas in 2010 (2), and since then it has continuously been adopted by more and more surgeons around the world. This also has been possible thanks to numerous workshops and masterclass that teach the technique to willing surgeons.

As experience grows in uniportal VATS that complexity and technical difficulty of the cases approach become continuously more challenging for the VATS surgeon. One particular task in order to complete a uniportal VATS lobectomy is successfully carrying out the dissection of structures that are block by enlarged lymph nodes fused to them.

A correct training following the steps necessary to acquire experience with the technique prepare the VATS surgeon to face this challenging cases and permits that the patient receive the advantages of a minimally invasive approach.

This article focus on the different options the surgical team has for the dissection of particularly difficult lymph nodes during uniportal VATS lobectomy.

## Methods

### *Patient selection and workup*

The steps for obtaining good results begin with patient selection through and adequate medical history and preoperative workup. Patients with past history of tuberculosis (TB) infection, heavy smokers or exposed to working places with hazardous environmental conditions like mining, constructions and factories tend to have enlarged, calcified lymph nodes that get severely stacked, so based on the patient medical history the surgeon can be prepared in advanced for this findings.

Preoperative CT is an important tool that can help the surgeon identify the specific anatomic location of enlarged lymph nodes. Usually they can be easily identified as a conglomerate in the hilum or in the fissure near the bronchus or vessels. Once the surgeon knows in advance in which moments of the dissection they will face this

difficulty, they can use it to plan in advance how to deal with this issue during the dissection of structures in an anatomical lung resection.

### *Equipment preference*

Although uniportal VATS can be perform with conventional VATS instruments, the use of special instruments can facilitate considerably the procedure. Longer instruments with distal and proximal articulation, high definition camera with 30 degree thoracoscope and distally mounted charge-couple device (CCD) facilitates instrumentation and reduce “fighting” between instruments (3,4). Recent advance in technology has contribute a lot in the simplification of dissection, with energy devices that permit precise dissection between lymph nodes, sealing small vessels around them avoiding bleeding that can obscure the field and compromise the visualization during the rest of the step or even the procedure. Sometimes when the plane between the lymph nodes and structures is difficult to identified, having the proper uniportal VATS forceps can help to reach the correct adventitial plane, which is the key for successful dissection (5).

### *Procedure*

During single-incision video-assisted surgery there are many considerations that will make the procedure more comfortable and fluent for the surgeon and the team involved in the surgery. The surgeon and the assistant should be position in the same side, allowing them to share the same thoracoscopic view and improve coordination between the surgeon and the camera assistant (3,4). The role of the camera assistant is important during any VATS procedure but is specially demanding during uniportal VATS since it lacks the fixation of one port for the camera only that is usual during multiport VATS. This requires that the assistant is always focused in keeping the camera in the posterior part of the incision (4). A learning curve is also necessary to get the right view angles, usually through the rotation of a 30-degree lens camera that permits a target visualization during complex dissection steps, such as vascular dissection between enlarged and fixated lymph nodes. When the assistant is position in the other side of the operating table it is usual that they end up adopting uncomfortable positions to get the right view, which ends up being very exhausting for them.

The consolidation of uniportal VATS oncologic surgery has been possible because it has shown that transoperative



**Figure 1** Uniportal video-assisted right upper lobectomy (9). This video shows a case of benign (TB) lymphadenopathy blocking the bronchus and the space between the pulmonary artery and upper pulmonary vein. It demonstrates the relevance of finding the correct adventitial plane to dissect away the lymph nodes. TB, tuberculosis.

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**Figure 2** Uniportal VATS left upper lobectomy (12). This video shows lymphadenopathy blocking the left upper bronchus and the pulmonary artery in the fissure. It shows how to improve exposure by opening the fissure and finding the correct adventitial plane to dissect the lymph nodes. VATS, video-assisted thoracoscopic surgery.

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oncologic principles can be achieved by this approach without compromising safety of the patient (6). It is of most relevance that during the dissection of structures, oncologic principles must be respected and followed, accomplishing individual dissection of veins, arteries and bronchus, as well as to complete an appropriate lymphadenectomy (3).

The procedure must be carried out with safety and this requires to maintain always a correct exposure through

retraction and bimanual instrumentation that allows good visualization of the operation field you are working on (7,8). For example, when dealing with hilar lymph nodes, an adequate retraction of the lung can help to expose to superior, posterior and inferior part of the hilum, so it allows the surgeon to dissect all around the lymph nodes that are blocking the structures, making it easier to identify the correct plane and remove the lymph nodes exposing completely the hilum for dissection and subsequent individualization and division of the vessels and bronchus.

When the hilar lymph nodes are between vascular structures such as the pulmonary artery and vein, and they are blocking the way between them, the key step is to identify the adventitial plane adjacent to the vessel and carry the dissection and individualization of the vessel through that layer, avoiding the lymph node (5) (Figure 1). Forcing the dissection through the lymph node is a mistake frequently made, it usually leads to bleeding from the lymph node which obscures the operative field and can result in applying excessive force in order to pass across the lymph node, which at the same time could lead to injure the vessel the surgeon is trying to dissect or even injure other structures around like bronchus, lung parenchyma or nearby vessels.

There are maneuvers that can be made in order to avoid undesirable injuries during dissection of the interlobar pulmonary artery or lobar bronchus in the fissure when they are obstructed by enlarged and fused lymph nodes. When the fissure is complete, if it's possible, avoid the lymph node blocking the structure and dissect proximally or distally to it, where the planes are more preserved and safer, and after doing so, dissect the lymph nodes away using blunt dissection or pulling them carefully away to get enough space to divide the structure with a stapler if necessary. If the fissure is incomplete is very important to open the fissure and complete it through the fissureless technique (10,11), doing it, allows a better visualization and optimized control (Figure 2), because it lets the surgeon see the other side of the pulmonary artery and bronchus when dissecting and passing them, making it a safe maneuver. The second maneuver the surgeon can make is to dissect the adventitial tissue on top of the structure the lymph node is blocking, and use this plane to easily dissect and remove the lymph node. After removing the lymph nodes the structures usually become apparent very easily and facilitates subsequent steps of the procedure. This option is better than trying to remove the lymph node by grasping directly to it, because frequently leads to fragmentation and bleeding from it.



**Figure 3** Uniportal VATS radical lymph node dissection (14). This video shows how energy devices can help during lymph node dissection in complex cases with big lymph nodes reducing bleeding and facilitating the procedure. VATS, video-assisted thoracoscopic surgery.

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Another consideration to be made during VATS uniportal procedures is that to improve the visualization in a specific step of the procedure, changing the position and orientation of the operating table improves the exposure and minimize the retraction that is necessary to see the surgical field. For example, rotating the table anteriorly when the surgeon is dissecting station 7 or putting it in anti-Trendelenburg position when dissecting station 2 and 4 (4).

It is important to keep in mind that in difficult cases with enlarged lymph nodes that are severely pasted to vascular structures, in spite of all the measures that are carried out by the surgical team to avoid complications they can still happen. Complications such as bleeding from branches of the pulmonary artery during the dissection should be anticipated and the surgeon must be ready to deal with them. In case that they present it is crucial to remain calm, use a sponge stick to compress the bleeding site and in that moment decide if the bleeding can be controlled through the VATS approach or if it is necessary to convert to open surgery. Usually experience surgeons are able to control the bleeding under VATS maneuvers, using energy devices, clips or suturing the injury. All of the steps are carried out after adequate exposure and control of the bleeding site (13).

## Results

### *Tips and tricks*

- High definition cameras and appropriate uniportal VATS

instruments facilitates considerably the procedure for the surgeon.

- The use of energy devices during the dissection helps minimized the bleeding, permitting a more clean operative field (*Figure 3*).
- Maximize exposure of the operative field by adequate retraction of the lung and opening the fissure when needed.
- Avoid dissecting through the lymph node, instead find the correct adventitial plane of the structure being dissected, it facilitates the dissection and avoids bleeding from the lymph node.
- Use the adventitial plane of the structure being dissected to remove and pull away the lymph node obstructing it, instead of grasping it directly.
- Surgeon always must anticipate possible complications in order to be ready to handle them.

## Conclusions

Benign lymphadenopathy that are fused to vascular or bronchial structure do not contraindicate uniportal VATS lobectomy in the hands of experience surgeons. Conversion and complications can be avoided by dealing with the lymph nodes with a careful surgical technique that avoids injury to surrounding structures. The surgeon that face this kind of cases should be experience in handling bleeding through a VATS approach and has the support of an team (assistant, anesthesiologist and nurses) prepare to face such situations.

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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. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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