

VATS lymph node dissection

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Introduction

The treatment of lymph nodes has been controversial in the past, but analysis of the highest level of evidence available suggests that in unknown stage or Stage II-III non-small cell carcinoma of the lung, it is associated with a survival benefit (1). Whatever a surgeon's personal node policy may be for open lobectomy, it should be reflected in the approach to VATS lobectomy. There is no particular extra skill required, only intent. The following videos are intended to demonstrate the basic techniques of clearing the minimum node set as set out in the ACOSOG Z0030 trial protocol (2). Throughout these videos I will be referring to the node stations as specified in the same trial. These are station 2R (upper paratracheal), 4R (lower paratracheal), 7 (subcarinal), 8 (paraesophageal), 9 (inferior pulmonary), 10L/10R (hilar) and 11L/11R (interlobar).

Operative techniques

Video 1 - right-sided dissection

As a general rule, I remove the package of Station 2R and Station 4R as a bloc. The roof of this package is a triangle bounded by the azygos vein (inferior), vagus nerve (posterior) and superior vena cava (anterior). The floor is the trachea, and the apex of the floor is the right subclavian artery. After incising the pleural triangle as described, most of the dissection is blunt, using an implement similar to a blunt periosteal elevator [00 min 30 sec]. There is often a small vein that drains directly from this node-bearing fat into the superior vena cava, and this needs to be clipped and divided. After thinning out the lympho-vascular pedicle tissue, generously apply clips or use ultrasound or impedance-modulated diathermy to reduce bleeding and

later lymphatic leakage [01 min 20 sec]. Station 2R lymph nodes are best accessed by simple caudal traction on the entire package, then teasing out and clipping the small draining vessels. If the Station 4R nodes break away, then remove those separately, then re-grasp the lower part of station 2R with a curved sponge-holder [02 min 00 sec]. Whilst it would take quite aggressive dissection to injure the recurrent laryngeal nerve, care must be taken to avoid the intersection of the vagus nerve and subclavian artery at the posterior aspect of the apex of the dissection [02 min 38 sec]. Likewise, the phrenic nerve should be avoided when dissecting along the superior vena cava. At the conclusion all of the boundaries of the superior mediastinum are clearly visible [02 min 48 sec].

Station 10R is dissected by retracting the azygos vein superiorly and incising the hilar pleura. All tissue between the pulmonary artery, right upper lobe bronchus and azygos vein is dissected and removed. A tie can be passed around the azygos vein to facilitate its retraction during the superior mediastinal dissection.

Attention is then turned to Stations 7 and 8. These are often dissected together, clearing all of the tissue between the posterior hilum and oesophagus down to the carina. In the video, the patient has undergone a right middle lobectomy, so access to Station 7 is available from the anterior approach, medial to the bronchus intermedius [03 min 00 sec].

The normal posterior approach is seen in the video of the left-sided dissection. After the station has been cleared, I have retracted the lung forward and opened the posterior space to show that Station 7 is indeed gone, and to search for any Station 8 tissue [05 min 10 sec].

Station 9 is highly variable in quality and quantity. In this right-sided dissection video, there was very little nodal

tissue or fat caudal to the inferior pulmonary vein. In contrast, a high volume package was found at the beginning of the video of the left-sided dissection.

Video 2 - left-sided dissection

This patient had a left lower lobe non-small cell lung cancer and, because of previous coronary surgery, required significant division of pleural adhesions prior to commencing any dissection. The dissection therefore commences with station 9, since the inferior pulmonary ligament must be divided in any case. I tend to dissect the entire ligament off the oesophagus and inferior aspect of the inferior pulmonary vein. This leaves it attached to the lower lobe. I then remove the package to label it for the pathologist [02 min 00 sec].

Once the inferior pulmonary vein has been divided [02 min 45 sec], the nodal tissue around the bronchus can be dissected. In fact, this manoeuvre facilitates the lobectomy [04 min 30 sec]. Immediately posterior to the bronchus is Station 8, which must be dissected off the vagus nerve and oesophagus posteriorly. On the bronchus itself is Station 11 L, which may be contiguous with Station 8. There are usually two or three vagal branches to the lung that need to be divided to free up Station 8 [05 min 30 sec].

Rolling the lung forward and dissecting upwards along the underside of the bronchus gives access to station 7 [06 min 40 sec]. The pericardium is swept clean and the package is dissected off the oesophagus. Lastly the subcarinal space is opened by spreading a sponge-holder and the nodal tissue grasped [06 min 40 sec]. All structures suspicious for nodal or bronchial arteries should be clipped as bleeding from a retracted vessel is a considerable nuisance. Station 10L is located between the left main bronchus and the underside of the left pulmonary artery. This is best dissected before division of the bronchus as there is more tissue to grasp for retraction, and it limits the stresses placed directly on the pulmonary artery. After division of the lower lobe bronchus in this case, any remaining nodal tissue can then be cleared from stations 10 L and 11 L [07 min 20 sec].

The lung is next rolled posteriorly to access Stations 5 and 6 [07 min 50 sec]. An incision is made in front of the hilum, behind and parallel to the phrenic nerve. This is continued over the aorta. The nodal tissue between the pulmonary artery and underside of the aorta is Station

5. Care must be taken to stay well anterior to the vagus nerve and not to divide any structure that could possibly be the recurrent laryngeal nerve. Blunt teasing of the tissue inferiorly and anteriorly will usually allow safe removal of these nodes, even if the recurrent nerve is not specifically identified. Station 6 is then grasped and often needs to be dissected off the phrenic nerve [08 min 45 sec].

Comments

Not all surgeons practice, or are comfortable with, complete mediastinal dissection; even in open cases. Therefore a practical compromise is to at least perform a routine minimum node-sampling set. For the right upper and middle lobes, I would recommend a minimum of Station 4R, 7, 8 and 10R. For the right lower lobe, I would recommend Stations 4R, 7, 8 and 9. On the left side for the upper lobe I recommend Stations 5, 6, 7, 8 as a minimum, and for the lower lobe Stations 5, 7, 8 and 9.

I would also comment that often it is simpler and less bloody to removal a whole package at a given site than just a single node, especially if very fatty.

Practice makes perfect for this procedure, and eventually it should add little time to a VATS lobectomy. With routine sampling, there is less than 5% chance of missing a patient with occult N2 disease (2). This is the most critical point, given the known advantage of adjuvant chemotherapy in this setting.

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References

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