



Right sided VATS thymectomy: “current standards of extended thymectomy for myasthenia gravis”

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Abstract: Video-assisted thoracoscopic surgery (VATS) is a major component of minimally invasive technics with increasing number as a consequences of advancements in modern technology. VATS thymectomy is also became a feasible and safe surgery in high-volume VATS experience centers. Right sided videothoroscopic approach for thymectomy that we perform is explained in this review article.

Keywords: Video-assisted thoracoscopic surgery (VATS); thymectomy

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Introduction

Endoscopic approaches for the resection of thymus in the treatment of myasthenia gravis (MG) and thymoma are increasing. In this issue of *VATS* journal, readers may recognize that, there is a growing experience and developing surgical technics with video-assisted thoracoscopic surgery (VATS) approaches. The classical approach is right sided VATS thymectomy which has been described many times in different journals with the accompanying videos. In right sided 3-portal VATS thymectomy, appropriate patient selection is crucial.

For appropriate patient selection, a proper radiologic examination is essential. This examination may be contrast enhanced computerized chest tomography in non myasthenic patients and magnetic resonant imaging in myasthenic patients to define the borders of resection plan.

Patient with (I) nonthymomatous MG or (II) small (<2 cm) intrathymic thymoma or (III) large but well encapsulated thymoma (preferably <5 cm) without invasion to lung, major vessels (left innominate vein being the smallest) and phrenic nerves. We prefer our

patients have been examined by a qualified neurologist and anesthesiologist in MG before surgery.

Operative procedure

We prefer the right side approach for both non thymomatous MG and thymoma patients even if the thymoma is completely located on the left side. We prefer the right side because there is more room and landmarks are much clear. And also thymoma which is located on the left side maybe pulled towards the operative area after the dissection of the right thymus.

We position the patient in a 30-degree semi-supine position. The patient is supported with a roll placed under the right shoulder, and the right arm is abducted over a support attached to the table (*Figure 1*).

A double lumen endotracheal tube provides the lung isolation. We do not use carbon dioxide insufflation because we open the contralateral pleura for dissection of the left side. We never convert to open surgery due to hypoxemia, which is thought to be due to insufficient gas exchange of the left lung. In this situation, we immediately open the



Figure 1 Position of patients.



Figure 2 Right VATS thymectomy incisions. VATS, video-assisted thoracoscopic surgery.

pleura and check the left upper lobe ventilation. Sometimes endotracheal tube maybe is located distal to left upper lobe so that it prevents the ventilation of the left upper lobe and causes the hypoxemia. Then the endotracheal tube is pulled back 1–2 cm after deflating the cuff of the both lumens.

Three ports are opened around the mammary gland without violating the mammalian tissue in females and from similar areas in males (*Figure 2*). The first port is always the camera port and a 10 mm port is inserted. A 30-degree scope is used, the left port is opened in the anterior axillary fossa lateral to the pectoralis major muscle and the right port is opened in the 5–6th intercostal space lateral to the midclavicular line. The surgeon and camera man stand side by side and the nurse stands on the other side.

The 30° is introduced and the hemithorax is evaluated. The right phrenic nerve is defined with its relations to thymus or a thymoma. We begin the dissection with resection of the right sided pericardiophrenic fatty tissue. Then the dissection of the thymus begins by removing it

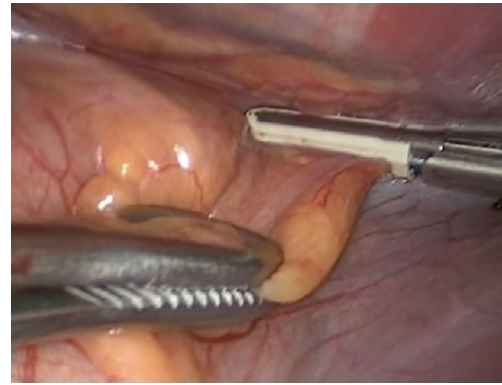


Figure 3 Dissection of the thymus with the fatty tissue at the right inferior pole and over the diaphragm.



Figure 4 Dissection of the thymus from the pericardium (1). Available online: <http://www.asvide.com/articles/1526>

from the pericardium anterior to the phrenic nerve with blunt dissection or with LigaSure™ 5 mm tissue sealer (Medtronic, Inc., Doral, FL) (*Figures 3,4*).

Then the thymus is dissected of the sternum by opening the mediastinal pleura along the right internal mammary artery/vein under the sternum (*Figure 5*). The dissection from the right side parallel to the phrenic nerve enables visualization of the superior vena cava and junction of both innominate veins clearly becomes visible. The most dangerous and accident inviting part of this operation is the dissection of the upper poles. By gentle traction on both superior poles of the thymus could be dissected and under direct visualisation (*Figure 6*). The superior poles dissection is best provided with gentle force applied caudally, with the use of countertraction dissection towards thyroid gland. The arterial and venous branches from the internal mammary vessels could be identified

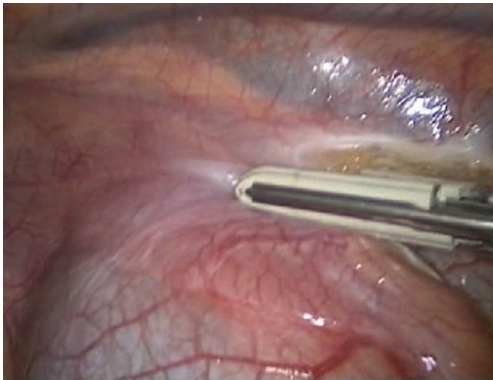


Figure 5 Dissection of mediastinal pleura.

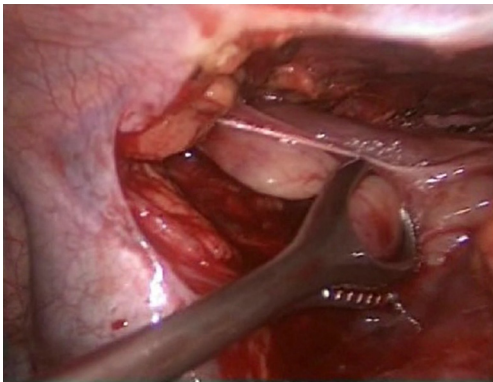


Figure 6 Traction of superior pole.

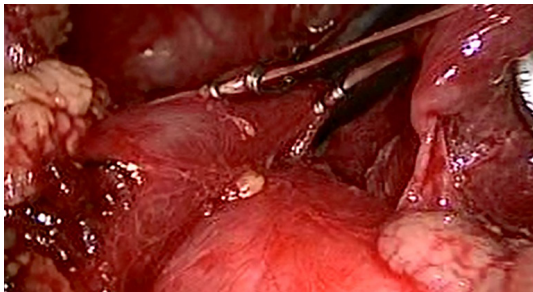


Figure 7 Major thymic vein clubbing.

and clipped. The major thymic veins may be at different numbers and locations could be dissected and divided by clipping (*Figures 7,8*).

By retracting the thymus toward the right side and the dissection of the thymus is completed anteriorly and posteriorly on the right and upper half of the gland. Now, the left side of the thymus is to be dissected of



Figure 8 The major thymic vein dissected and divided by clipping (2). Available online: <http://www.asvide.com/articles/1527>

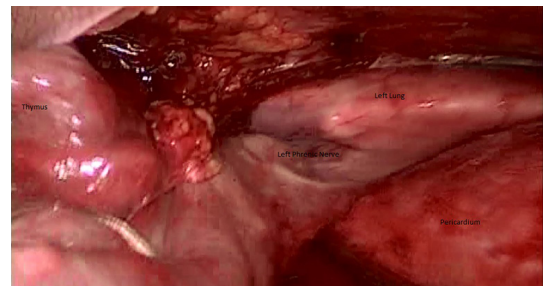


Figure 9 Exploration of phrenic nerve, during the dissection of left side thymus.



Figure 10 Visualization of area after thymectomy is completed.

the pericardium without injuring the left phrenic nerve (*Figure 9*). To observe the left phrenic nerve, all thymic tissue is pulled toward the surgeon and camera moved anteriorly into the left hemithoracic cavity and the dissection by the phrenic nerve is carried out (*Figures 10,11*). By completion of the left thymus dissection some of the fatty tissue from left pericardiophrenic angle is dissected.



Figure 11 To observe the left phrenic nerve (3).

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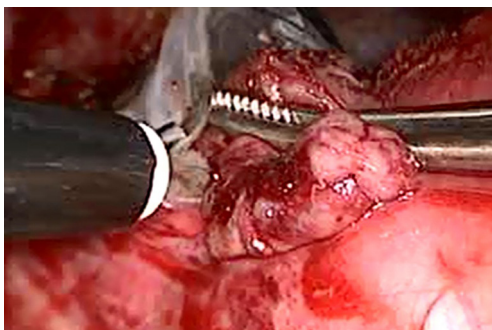


Figure 12 Removing the thymus by Endo bag.



Figure 13 The most anterior port is used for inserting the drain.

The specimen is removed with an Endo bag (*Figure 12*). The mediastinum is carefully inspected for any foreign body or any remaining fatty mediastinal tissue or hemostasis. One 10 mm drain is placed through the most anterior port across the mediastinum to drain the both chest (*Figure 13*).

If the operation is carried out for a thymoma, the tumour

should be dissected at the last part of the operation and surgery should be achieved with no touch technique. The non-tumorous part of the thymus is dissected first and these tissues are used for grasping and traction. Dissecting the thymoma at the last part of the operation also provides minimization of the tumor handling. Like us, many authors recommend to leave the tumor to the last part of the operation because, if the tumor is dissected first, it may cause insufficient visualization of area and contamination of the surgical field.

Discussion

Median sternotomy has been the gold standard for thymectomy (4). In the past 20 years, minimal invasive approaches are in increase in number and various technics are available (5-8).

A radical thymectomy operation can be performed with minimally invasively and patients could be discharged within the next 1 to 2 days (9). In addition cosmesis is much better compared to a sternotomy operation (10,11). To be experienced with VATS thymectomy, a surgeon should be doing non-thymomatous thymectomy at least 5–10 cases per years and completed 70 cases (12). After gaining some experience small thymomas, and then larger tumours could be resected. In MG a complete resection of thymus is crucial because it is well known that long-term clinical outcomes are related with the amount of tissue dissected.

During the surgery, identification of both phrenic nerves should be routine. Possible thermal injury to the phrenic nerves can be minimized by using a safe energy source. The superior horns are usually dissected from the innominate vein first, followed by dissection of the right horn and followed by the left horn.

Though most surgeons use three ports, routine retraction through the additional 4th medial most 5 mm port has been presented to be helpful. But, we never needed to increase the number of ports for a better exposure. The supine position is useful for quick conversion to a sternotomy but we prefer a small anterior thoracotomy, if necessary.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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