



Endoscopic lymph node dissection for thymic malignancies: lateral thoracic intercostal and subxiphoid approaches

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Abstract: The significance of lymph node dissection for thymic malignancies is currently unclear. Recently, endoscopic surgery has been indicated for the surgical treatment of thymic malignancies. We discussed the range of possible lymph node metastasis following surgery for thymic malignancies, depending on whether the lateral thoracic intercostal or the subxiphoid approach was used. While the video-assisted thoracoscopic surgery (VATS) lateral approach cannot be used for lymph nodes in the anterior region on the opposite side, it is simple enough to be used for deep-region lymph nodes. Taking an approach from the right facilitates paratracheal lymph node dissection. Taking an approach from the left may facilitate para-aortic and subaortic lymph node dissection. In addition, placing the patient in the lateral decubitus position also facilitates subcarinal lymph node dissection. The advantages of the subxiphoid approach are that a good field of vision of the cervical region can be obtained with a camera inserted from the midline of the body and the phrenic nerve on both sides can be confirmed. Accordingly, anterior lymph node dissection can be performed in a manner similar to median sternotomy. Deep-region lymph node dissection is more difficult via the subxiphoid approach than via the lateral thoracic intercostal approach. While paratracheal lymph nodes can be dissected to some extent, it is difficult to dissect subcarinal lymph nodes. If one prioritizes thorough anterior region lymph node dissection, either the subxiphoid or the bilateral lateral thoracic region approach needs to be taken. The subxiphoid approach offers the same view from the body midline as median sternotomy. Therefore, it is superior to the VATS lateral approach with regard to region lymph node dissection.

Keywords: Video-assisted thoracoscopic surgery (VATS); Thymectomy; robotic; subxiphoid; lymph node dissection

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Introduction

The significance of lymph node dissection for thymic malignancies is currently unclear. However, lymph node metastasis occurs in 25–26.8% of thymic carcinomas and 1.8–13.3% of thymomas and is reportedly a prognostic factor (1–6).

Recently, endoscopic surgery has been indicated for the surgical treatment of thymic malignancies. The three endoscopic surgery approaches are cervical, lateral thoracic intercostal, and subxiphoid. The range of possible lymph node dissections anatomically differs for each approach. In the present review is, we discussed the range of possible

lymph node metastasis following surgery for thymic malignancies, depending on whether the lateral thoracic intercostal or the subxiphoid approach was used.

Endoscopic surgery approaches for thymic malignancies

There are three types of low-invasive approaches for thymectomy: transcervical (which takes a cervical approach), video-assisted thoracoscopic surgery (VATS) lateral (the lateral thoracic intercostal approach), and

subxiphoid. Transcervical thymectomy is not in widespread use because it is difficult to secure a good field of vision from a cervical incision and the surgical technique is challenging. Currently, the VATS lateral approach is the most widely used technique. Normally, this approach is taken from either the right or the left side of the lateral thoracic region. The advantage of this technique is that the wound is inconspicuous because of being located in the lateral thoracic region. However, it has the following disadvantages: intercostal nerve damage always occurs, securing the field of vision of the cervical thymus during surgery is difficult, and the position of the phrenic nerve on the opposite side cannot be confirmed.

We previously reported single-port thymectomy via the subxiphoid approach in 2012 and robot-assisted thymectomy via the subxiphoid approach in 2015 (6-8). The advantages of the subxiphoid approach are that a good field of vision of the cervical thymus can be secured with a camera inserted from the midline of the body and the position of the phrenic nerve on both sides can be confirmed.

Lymph node dissection range in surgery for thymic malignancies

Many surgeons might do not perform lymph node sampling or dissection as part of surgery for thymic malignancies. However, lymph node sampling and dissection enable the accurate evaluation of the disease stage. While the effects of postoperative adjuvant therapy remain unclear, such findings can aid in determining whether adjuvant therapy should be performed and could, therefore, improve patient prognosis. The International Thymic Malignancy Interest Group (ITMIG) staging system divides mediastinum lymph nodes into two compartments: (I) anterior region lymph nodes located in the anterior mediastinum and around the thymus and (II) deep-region lymph nodes (9). Anterior region lymph node metastasis is considered N1 and is classified as stage IVa. Deep- and cervical-region metastasis is considered N2 and is classified as stage IVb. The superior boundary of the anterior region lymph node is hyoid bone. However, it may be difficult to resect the lymph nodes to the hyoid bone under the endoscopic resection. The resection range extends from the thyroid gland in the upper border to the phrenic nerve on the lateral borders to the xiphoid process and diaphragm on the anterior and caudal borders, respectively. If all the adipose tissue in this range is resected together with the thymus, many of the anterior region lymph nodes can also be resected. This technique is similar to that used

in extended thymectomy for myasthenia gravis. Although, deep-region and cervical region lymph node is not generally resected during open surgery in the thoracic region, it has been reported that metastasis of deep-region lymph nodes is particularly common in the right paratracheal lymph nodes (3). Therefore, it is desirable to perform sampling or dissection on the right paratracheal lymph nodes.

Lymph node dissection range with the VATS lateral approach

The resection range via the VATS lateral approach extends over the thymus in the anterior direction from the phrenic nerve on the same side. However, it is impossible to observe the entire length of the phrenic nerve on the opposite side. Therefore, lymph nodes in the anterior region cannot be completely dissected via the VATS lateral approach. A bilateral lateral thoracic approach is needed to perform lymph node dissection in the anterior region. Furthermore, using the VATS lateral approach, it is difficult to secure a field of vision of the proximal side of the cervical region from innominate veins. While the VATS lateral approach cannot be used for lymph nodes in the anterior region on the opposite side, it is simple enough to be used for deep-region lymph nodes. Taking an approach from the right facilitates paratracheal lymph node dissection. Taking an approach from the left may facilitate para-aortic and subaortic lymph node dissection. In addition, placing the patient in the lateral decubitus position also facilitates subcarinal lymph node dissection. *Figure 1* shows paratracheal lymph node dissection via the lateral thoracic intercostal approach with the patient in the dorsal position. Our patient was found to have paratracheal lymph node enlargement and thymic hyperplasia. Postoperative pathology results indicated that thymic hyperplasia had occurred without any lymph node abnormalities. Therefore, taking the lateral thoracic intercostal approach facilitated paratracheal lymph node dissection (*Figure 1*).

Lymph node dissection range with the subxiphoid approach

The advantages of the subxiphoid approach are that a good field of vision of the cervical region can be obtained with a camera inserted from the midline of the body and the phrenic nerve on both sides can be confirmed. Accordingly, anterior lymph node dissection can be performed in a manner similar to median sternotomy. Deep-region

lymph node dissection is more difficult via the subxiphoid approach than via the lateral thoracic intercostal approach. While paratracheal lymph nodes can be dissected to some extent, it is difficult to dissect subcarinal lymph nodes. *Figure 2* shows lymph node dissection using robot-assisted thymectomy via the subxiphoid approach (*Figure 2*). The patient, an 89-year-old man preoperatively diagnosed with

thymic malignancy, exhibited adhesion of the entire surface of the left lung to the thoracic wall. Invasion of the tumor into innominate veins and the right lung was suspected after confirming the entire length of the phrenic nerves on both sides. Therefore, thymectomy was performed with partial combined resection of the right lung and innominate veins. In addition, blood vessel prosthesis implantation with anterior region lymph node dissection and right parabronchial lymph node sampling was performed. In total, 26 lymph nodes were resected, and no instances of metastasis were identified. The range of possible lymph node dissection with the VATS lateral approach and subxiphoid approach is shown in *Table 1*.

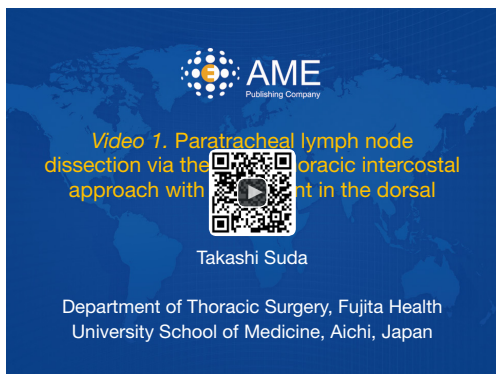


Figure 1 Paratracheal lymph node dissection via the lateral thoracic intercostal approach with the patient in the dorsal position (10). Available online: <http://www.asvide.com/article/view/30851>

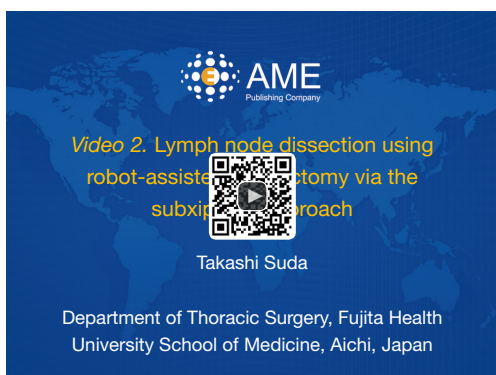


Figure 2 Lymph node dissection using robot-assisted thymectomy via the subxiphoid approach (11). Available online: <http://www.asvide.com/article/view/30852>

Comments

While the VATS lateral approach from the right cannot achieve sufficient anterior region lymph node dissection, it can enable paratracheal lymph node dissection. In contrast, the VATS lateral approach from the left cannot achieve sufficient anterior region lymph node dissection but can enable para-aortic and subaortic lymph node dissection. However, considering the rarity of metastasis to the para-aortic and subaortic lymph nodes, the VATS lateral approach from the left does not seem appropriate with regard to lymph node dissection. The bilateral lateral thoracic region approach enables anterior region lymph node dissection as well as paratracheal, para-aortic, and subaortic lymph node dissection. Subcarinal lymph node dissection can be performed from either side if the patient’s position is switched to the lateral decubitus position. While the subxiphoid approach enables anterior region and paratracheal lymph node dissection, it is difficult to dissect other deep-region lymph nodes.

If one prioritizes thorough anterior region lymph node dissection, either the subxiphoid or the bilateral lateral thoracic region approach needs to be taken. The subxiphoid approach offers the same view from the body midline as median sternotomy. Therefore, it is superior to the

Table 1 The range of possible lymph node dissection with the VATS lateral approach and subxiphoid approach

Approach	Anterior region lymph nodes (N1)	Deep region lymph nodes (N2)	
		Paratracheal lymph nodes	Subcarinal lymph nodes
Lateral approach	Difficult	Possible	Possible
Subxiphoid approach	Possible	Difficult	Difficult

VATS, video-assisted thoracoscopic surgery.

VATS lateral approach with regard to region lymph node dissection. The reason thoracic surgeons have not accepted the subxiphoid approach is possibly their lack of familiarity with the approach. However, it is not difficult to become familiar with the techniques involved in the subxiphoid approach if methods combining the intercostal and subxiphoid approaches are used without being restricted to single-port surgery or if robot-assisted surgery is conducted. When performing lymph dissection with endoscopic surgery, it is recommended to use the subxiphoid approach, which facilitates anterior region lymph node dissection in a manner similar to median sternotomy.

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Footnote

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