



The short video lecture for robotic bilateral axillo-breast approach to lateral neck lymph node dissection

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Lateral neck lymph node dissection (LND) along with total thyroidectomy is the standard treatment for thyroid cancer patients with metastases to the lateral neck lymph nodes. In general, lateral neck LND removes lymph nodes located at levels II to V ipsilateral to the thyroid cancer and preserves the spinal accessory nerve, internal jugular vein, and sternomastoid muscle during surgery. This video article was written to introduce the robotic bilateral axillo-breast approach for lateral neck LND and to describe the surgical method.

Keywords: Neck dissection, Robotic surgical procedure, Minimally invasive surgical procedures, Thyroid gland

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INTRODUCTION

Traditionally, lateral neck lymph node dissection (LND) for thyroid cancer accompanied by metastases to the lateral neck lymph node (LN) involved neck incisions ranging from 10 to 20 cm in length, leaving a noticeable scar. Lateral neck LND performed with robotic surgical equipment, however, has generally eliminated neck scarring [1,2].

The bilateral axillo-breast approach (BABA) to robotic thyroidectomy was first performed in 2008 to remove benign thy-

roid nodules and small well-differentiated thyroid cancers [3]. Increasing surgical experiences has expanded indications for BABA surgery [4]. At present, BABA robotic surgery can be performed on all benign diseases of the thyroid, including thyroglossal duct cysts, large goiters, and Graves' disease. In addition, this technique has been used for thyroid lobectomy, total thyroidectomy, and unilateral and bilateral lateral neck LND in thyroid cancer patients. The main advantage of BABA surgery is it requires only four small incisions [5,6].

This video article summarizes the steps performed and surgi-

cal tips for robotic BABA lateral neck LND in all compartments from level II to level V.

METHODS

Case report

A 48-year-old woman female with no significant previous medical history presented with bilateral thyroid nodules and a suspicious LN on ultrasound. The ultrasound showed the right thyroid nodule, and the computed tomography scan showed a suspicious level III LN on the right side. Fine-needle aspiration of the thyroid nodule and the right LN confirmed papillary thyroid carcinoma. The patient underwent a robotic BABA total thyroidectomy with a right-sided LND. The video shows only the lateral neck LND portion of the procedure (Supplementary Video 1).

Preparation for lateral neck lymph node dissection

Lateral neck LND starts by dividing the fascia between the sternocleidomastoid (SCM) and the strap muscles. The Maryland forceps are usually docked at the ipsilateral axillary port, and the ProGrasp forceps are at the contralateral axillary port. The entire medial border of the SCM muscle is dissected with lateral traction of the muscle by the Maryland forceps. The omohyoid muscle is identified, and its inferior belly is cut with the bovie, thereby exposing the internal jugular vein. Occasionally, a small LN is observed attached to the internal jugular vein, which can be carefully dissected. Removing the LN located next to the internal jugular vein can facilitate the rest of the lateral neck LND procedure.

Level III to V dissection

The internal jugular vein is pulled medially using the ProGrasp forceps. The soft tissue containing the LNs is dissected off the internal jugular vein along its anterior surface all the way around to the posterior aspect of the vein. The dissection is performed until the common carotid artery is identified. In some cases, the vagus nerve may also be seen at this stage. Inferior dissection of the level IV LNs is performed, preserving the transverse cervical artery and the phrenic nerve. When performing the level IV dissection, especially on the left side, the branches of the thoracic duct are identified and clipped. The dissection is extended to level III after levels IV and Vb are dissected. The vagus nerve and the phrenic nerve, which may be identified during level IV dissection should be traced carefully to prevent any injury. Care should also be taken to preserve the cervical plexus as much as possible. Careful dissection of level IV is required to preserve the transverse cervical artery and the phrenic nerve. To avoid injur-

ing to the phrenic nerve, which is always found deeper than the transverse cervical artery, the surgeon should avoid unnecessarily entering the deep space beneath the transverse cervical artery. After dissecting the LNs attached to the internal jugular vein, the SCM side is approached. When dissecting the LNs around the SCM, the surgeon should be careful not to injure the spinal accessory nerve. Using the ProGrasp forceps, the LNs are pulled up, and the tissue is dissected slowly with the bovie. Although it has been reported that the SCM can be pulled up from the outside with a polydioxanone suture (PDS) for retraction, this video shows that the necessary field of view can be secured without a PDS retraction. Therefore, PDS retraction of the SCM muscle is at the discretion of the surgeon. The dissection starts at level IV and continues at level III. During this process, the surgeon should be aware that the phrenic nerve and the transverse cervical artery are located at the bottom.

Level II dissection

After finishing the dissection of the level IV, Vb, and III compartments, the camera trocar is repositioned slightly forward to provide a better view for level IIa dissection. This dissection proceeds until the posterior belly of the digastric muscle is exposed superiorly, at the upper right side of the screen. It is important to preserve the spinal accessory nerve, which runs under the internal jugular vein in most patients, but can also run over the internal jugular vein. The hypoglossal nerve and the marginal mandibular branch of the facial nerve should also be preserved during level IIa dissection but they are not necessarily exposed unless more excessive dissection is needed for nearby clinically metastatic LNs.

Final procedure in level IV

Prior to the end of the surgery, the camera is placed toward the contralateral axillary trocar to identify the level IV LNs and perform the necessary resections. Finally, after identifying important structures, such as the spinal accessory nerve and the phrenic nerve, the surgery is complete.

RESULTS

The operation time required for robotic total thyroidectomy with the right side LND was 190 minutes. After surgery, hypoparathyroidism and vocal cord dysfunction were not observed. Also, Horner's syndrome or chyle leakage was not observed. The total number of retrieved LNs was 48 and we found metastasis in a single LN in level III.

DISCUSSION

The development of robotic surgical equipment and the accumulation of surgical experience has enabled surgeons to perform thyroidectomy and lateral neck LND in patients with thyroid cancer and lateral neck metastasis, obtaining excellent surgical results without making neck scars. Robotic BABA lateral neck LND provides a comfortable surgical environment for surgeons because it provides a surgical field similar to that of conventional lateral neck LND. In addition, sophisticated surgery is possible using a magnified surgical view [5].

During this operation, the surgeon must preserve the function of important surrounding structures, rather than simply removing the LNs confirmed as being metastatic. The three major structures are the SCM muscle, the spinal accessory nerve, and the internal jugular vein. In addition, care should be taken not to injure the vagus nerve, phrenic nerve, common carotid artery, transverse cervical artery, and thoracic duct.

Patients with well-differentiated thyroid carcinoma with suspicious or pathologically confirmed lateral neck metastases are candidates for robotic BABA lateral neck LND. Contraindications to date for robotic BABA lateral neck LND include patients with (1) advanced medullary thyroid carcinoma or poorly differentiated carcinoma, (2) metastatic LNs encasing the common carotid artery or internal jugular vein, and (3) suspicious LNs located beneath the clavicle.

Lateral neck LND is feasible using the BABA approach, but high body mass index and certain anatomical variations found in patients do present as obstacles when performing level IV LN dissection. The biggest challenge those factors bring is obscuring the surgical field for safe dissection. To completely visualize the surgical field, one arm must be used to retract the SCM. This only allows two working arms to perform the dissection. The axillary port can be used for docking the camera in such events where vision is obscured as shown in the video. It is important to improvise and try changing docking positions to fully visualize structures for safe LND.

It is vital not to damage the lymphatic ducts during lateral neck LND. This is especially important when performing left LND because thoracic duct passes through the left lateral neck area. Identifying such important structures becomes easier during robotic surgery since robotic camera magnifies vision approximately 10 to 15 times compared to the naked eye. Moreover, the robotic console allows finer movements which enable surgeons to perform LND more carefully. In cases of thoracic injury, V-Loc closure device (Covidien V-Loc 180 3-0; Covidien, Minneapolis, MN, US) can be used to effectively control damage, preventing chyle leakage.

Damaging the internal jugular vein during lateral LN dissection does not occur frequently. Moreover, when damage does

occur, it is usually a pinpoint perforation. Such small damages usually require a simple suture using a V-Loc or a vicryl cut in approximately 15-cm length. Luckily we did not experience any major bleeding from the internal jugular vein, but ligating the entire vein could be an option when such event occurs.

This step-by-step video article illustrating and describing robotic BABA modified radical neck dissection may enable many patients to undergo oncologic surgery.

NOTES

Ethics statements

This study was approved by the Institutional Review Board of Seoul National University Bundang Hospital with a waiver of informed consent (No. B-2201-735-701).

Authors' contributions

Conceptualization, Supervision: JYC
 Data Curation, Visualization: HWY, JHC
 Resources: JKL, WK
 Writing—original draft: HWY
 Writing—review & editing: HWY, JHC
 All authors read and approved the final manuscript.

Conflict of interest

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Supplementary materials

Supplementary materials can be found via <https://doi.org/10.7602/jmis.2022.25.2.80>.

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