



NECK DISSECTION AND ITS SURGERY PROCEDURE

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ABSTRACT

Introduction: 40% of patients with SCC have regional dissemination at diagnosis. In patients with lymph node metastases, survival rates decrease by 50% in all SCCs. **Purpose:** to discuss the classification and procedure of neck dissection. **Literature Review:** One of the prognostic determinants of head and neck malignancy is the presence of lymph node metastases. The most widely used standard classification today is comprehensive and selective neck dissection. Comprehensive neck dissection is a surgical procedure that involves removing all cervical nodes from level I to level IV of the neck. Selective neck dissection is a surgery that only involves a few groups of nodes that have a risk of micrometastases with clinical N0 such as supraomohyoid, jugular node, anterolateral, posterolateral, and central compartment neck dissection. **Conclusion:** Many patients with upper respiratory tract malignancy diagnosed at advanced stage, so management of cervical lymph nodes is an important management component.

Keywords: dissection, neck, SCC, surgery.

INTRODUCTION

Lymph node metastases is one of prognostic determinant. American Cancer Society reports that 40% of patients with Squamous Cell Carcinoma (SCC) have regional dissemination. In patients with lymph node metastases, survival rates decrease by 50% in all SCCs. In Southeast Asia, including Indonesia, many patients with upper respiratory tract malignancy come at an advanced stage.¹

The history of neck dissection in head and neck cancer started since two centuries. This procedure was first introduced by Dr. George Crile in 1906 who described en bloc resection of the cervical lymph nodes for clinically positive metastatic nodes. Unfortunately, this procedure causes significant cosmetic disproportion and reduced function.²

The neck dissection procedure has undergone many modifications to minimize morbidity while improving efficacy.² This oncology paper aims to discuss the classification and procedure of neck dissection.

Literature Review

Anatomy

Lymphatic drainage from the scalp, head and neck regions, upper respiratory tract mucosa, paranasal sinus, salivary glands and thyroid gland is arranged in an orderly manner so that metastases from these sources occur sequentially and predictably. The first echelon nodes are the nodes with the greatest risk of developing micrometastases. The lymphatic vessels of the head and neck are composed of two sheath divided by the deep cervical fascia. The superficial channel drains into the sub-occipital, pre-auricular, post-auricular, pre-vascular fascia and external jugular lymph nodes and then into the deep jugular lymph nodes that consist of the jugulo-digastric, jugulo-omohyoid and supraclavicular besides the internal jugular vein. The posterior triangle of the neck lymph nodes lie along the spinal accessory nerves and the transverse cervical chain at the base of the posterior triangle.¹

The description of the regional nodes was based on a

level system classify the lymph nodes on the lateral side of the neck into five levels. Level I is into levels IA (submental) and IB (submandibular). Level IA is between anterior bellies of the digastric muscle. Whereas level IB is in a triangle composed of the anterior and posterior bellies of digastric muscles and lower border of mandible, including the nodes adjacent to submandibular salivary glands and facial artery.¹

Level II is the upper jugular group that located at the upper third of internal jugular vein and spinal accessory nerves. The posterior border is the posterior portion of the SCM muscle. The anterior border is the lateral part of the sterno-hyoid muscle. Nodes in front of the spinal accessory nerves are grouped in level IIA and nodes behind them are grouped in level IIB. Level III or the midjugular group is a node that is in the middle third of the internal jugular vein. Level IV or lower jugular group consists of nodes in the lower third of the internal jugular vein, from the lower border of the cricoid cartilage to the clavicle. Meanwhile, level V or the posterior triangle group is the node at the bottom of the spinal accessory nerve and along the transverse cervical blood vessels. This level is divided into the VA level which is superior to the lower border of the cricoid cartilage and the VB level which is inferior. Levels VI and VII are additional classifications. Level VI is a central group of compartments composed of lymph nodes in the pre-laryngeal, Delphian, pre-tracheal, paratracheal and trans-esophageal basins. Meanwhile, level VII is the antero-superior mediastinum group.¹

Neck Dissection

The operative management of regional lymph nodes is based on lymphatic anatomy, metastatic risk and metastatic pattern. If regional metastases can be palpated, then removing of entire regional lymph nodes is recommended. The gold standard management is classic neck dissection. Nonetheless, classic neck dissection is associated with aesthetically deformities and functional morbidity such as shoulder disability causing chronic pain due to accessory nerve damage. Understanding the pattern of metastases significantly reduces morbidity.¹

In adjacent nodes with possible micrometastases, a complete neck dissection of all levels (I-V) of the cervical lymph node is rarely necessary but selective dissection is performed. In oral cavity primary tumor, dissection is performed on lymph nodes levels I, II and III and IV in some cases such as lateral tongue lesions. In pharynx and larynx tumors, dissection at levels II, III and IV is recommended. If the primary tumor crosses the midline, bilateral dissection should be performed.¹

Absolute contraindications to neck dissection are non-resectable lesions such as carcinoma with invasion of the cranial base or deep muscles of the neck. Carotid artery involvement is still being debated whether it is an absolute or relative contraindication. Meanwhile, relative contraindications are uncompensated coagulopathy, poor general condition, high risk of experiencing anesthetic complications and poor neurocognitive condition.²

Currently, there are several classifications of neck dissection. The most widely used standard classification today is comprehensive and selective neck dissection.¹

- a. Comprehensive neck dissection is a operative procedure that involves removing all cervical nodes from level I to level IV of the neck.
- b. Selective neck dissection is a surgery that only involves a few groups of nodes that have a risk of micrometastases with clinical N0 such as supraomohyoid, jugular node, anterolateral, posterolateral, and, central compartment neck dissection

Preoperative Preparation

That is no specific preoperative preparation required in the patient undergoing neck dissection. Reconstructive preparations to repair surgical defects resulting from an incision should be considered after excision of the primary tumor. Currently there are several variations of incisions for selective, comprehensive, unilateral and bilateral neck dissection, each of which has its own problems in the field of reconstruction. Most of the incisions cause scars that interfere with aesthetics.¹

Procedure

The procedure begins with node mapping using a radioisotope scan technique, blue dye injection and isotope tracer probe for localization. The combination of the three significantly increased the accuracy of the KGB's identification. Images were taken using a gamma camera after three minutes, five minutes and one hour after injection. The first node to appear is considered the sentinel node. Examination with Single Photon Emission Computer Tomography with CT (SPECT-CT) is recommended to more clearly visualize other sentinel nodes and find out their anatomical location. Gamma probes are used prior to making an incision to determine the location of the node before surgery.

a. Comprehensive ND

- Modified Type I Neck Dissection (MND-1)

MND-1 is indicated to comprehensively clean the KGB at five levels while preserving one anatomical structure, namely the spinal accessory nerve. A transverse incision is made in the natural neck crease at least two-finger widths beneath the angle of the mandible or in a mid-cervical skin fold below the hairline for men. Surgery begins with the elevation of the posterior skin flap. Particular care should be taken while elevating the lateral portion of the skin flap to the anterior border of the

trapezius muscle, where the accessory nerve penetrates the muscle. The fascia and soft tissue at the anterior border of the trapezius muscle are then dissected. Then soft tissue dissection and posterior triangle KGB can be continued to the upper part of the neck.^{1,3}

The upper part of the SCM is released from the mastoid process to continue dissection of other tissues. The SCM muscle is separated from the posterior belly of the digastric muscle to expose the spinal accessory nerve from the jugular foramen. This nerve is then released from the surrounding tissue. The specimen is then taken from the bottom of the nerve and retracted medially.¹

The flap can be elevated medially to expose the inferior insertion of the SCM. Dissection should be performed cautiously at the lower end of the jugular vein so as to preserve the integrity of the common carotid artery, vagus and phrenic nerve and sympathetic chain. The dissection is continued in the direction of the carotid sheath towards the lower border of the digastric muscle where the hypoglossal nerve will be exposed. The superior thyroid artery must be preserved while the vein can be ligated.¹

- Modified Type II Neck Dissection (MND-II)

This dissection is similar to MND-III in that it preserves the SCM and spinal accessory nerve but sacrifices the IJV. MND-II is indicated in patients with massive metastases from the thyroid gland involving the IJV or SCC metastases that invade the IJV. This procedure can be done simultaneously with a thyroidectomy. The SCM muscle is pulled laterally to expose tissue at the level of the VB and laterally to expose the spinal accessory nerve. The lymph nodes in the posterior triangle and the deep jugular chain surrounding the IJV were removed along with the primary thyroid lesion.^{1,4}

- Modified Type III Neck Dissection (MND-III)

MND-III comprehensively clears the lymph nodes at five levels of the neck while preserving the function of the SCM, spinal accessory nerve and IJV. This procedure is indicated in patients with lymph node metastases from undifferentiated thyroid carcinoma along with thyroidectomy for lymph node metastases that are palpable through a single transverse incision at the level of the cricoid cartilage. The incision extends from the anterior border of the trapezius muscle to the opposite side. The upper skin flap is elevated to the mastoid process laterally and over the hyoid bone in the midline. Specimen dissection was performed in two segments, namely the primary tumor of the thyroid gland with the central compartment of the lymph nodes and the lymph nodes from the anterior triangle on the ipsilateral side and the lymph nodes from the posterior triangle.¹

- Classic Radical ND

Classic radical neck dissection is the gold standard for the surgical treatment of lymph nodes with clinically visible metastases. This dissection comprehensively cleans the lymph nodes level I - V. However, this dissection often causes damage to the SCM, spinal accessory nerve, IJV and submandibular salivary gland thereby increasing postoperative morbidity and aesthetic deformity. Therefore, this procedure is now only indicated for certain cases such as N3, clinically or radiologically severe soft tissue damage, invasion. Several variations of the incision can be made such as single transverse incision and T-shaped or trifurcation incisions. In the T incision,

the transverse section begins at the mastoid process, extends along the curve of the neck skin and terminates at two fingers beneath the angle of the mandible. The incision extends across the midline to the anterior border of the contralateral SCM muscle. The vertical incision starts from the midline of the transverse incision, at the posterior border of the SCM to a point in the middle of the clavicle. This incision expands the operating field by elevating skin flaps posteriorly, anteriorly and superiorly.¹

Dissection begins with elevation of the posterior skin flap. The incision starts from the posterior half of the transverse incision in the mastoid process and continues into the vertical incision. In this procedure, a skin incision is made with a scalpel while the other dissection is performed with cautery. The incision is deepened towards the platysma. If an enlarged KGB is found and the extension is thought to be out of the nodal capsule, then the flap is elevated superficially from the platysma and taken.¹ The dissection is continued along the lateral side of the carotid sheath and posterior to the vein and anterolateral to the vagus nerve exposing the hypoglossal nerve. Finally, the superior skin flap is then elevated.¹

After radical neck dissection, all nodes at all five levels should be cleaned. The wound was irrigated with bacitracin. Two drains are attached, one over the anterior border of the trapezius muscle in the posterior triangle and the other over the strap muscle. The wound was then closed with two layers of 3-0 chromic catgut on the platysma and 5-0 nylon on the skin. As soon as the wound is sutured, the wound is closed. Drain continues to be installed until the serous volume is minimal, less than 50mL/24 hours.^{1,3}

- Extended Radical Neck Dissection This dissection aims to capture nodes at all five levels of the neck with additional excision of nodes, other tissues and structures such as the para-pharyngeal lymph nodes, retropharynx, superior mediastinum and axillary apex as well as non-lymphatic structures such as skin, cranial nerves, carotid arteries and muscles at the base of the posterior triangle of the neck. This extension is required in patients with severe local metastases to the lymph nodes of the neck. A hockey-stick-type incision is made from the mastoid end of the process downwards towards the anterior border of the trapezius muscle and ends at the sternoclavicular joint. A myocutaneous pectoral flap will be used to fill the soft tissue defect of the dissected neck. The flap is reconstructed 180 degrees and positioned over the defect without causing traction on the vascular pedicle.¹

Excision of the primary mass was performed while maintaining continuity with a radical neck dissection. The specimen must be released slowly to prohibit damage to the vagus nerve and recurrent laryngeal nerve. The defect was irrigated with bacitracin. Drainage with thoracostomy tube installed. The chest incision is closed while the neck defect is closed with a rotational advancement flap from the anterior chest wall.¹

b. Selective ND

- Supraomohyoid Neck Dissection
This dissection can be performed on the oral cavity primary tumor continuously where the primary tumor and lymph nodes level I, II and III are removed monoblock or separately where the primary tumor is excised via a peroral approach and the dissection is carried out through a transverse incision in the upper part of the neck that extends from the posterior side. SCM muscle toward the

hyoid bone and midline. The incision is made at least two finger widths beneath the angle of the mandible. If the primary tumor cannot be removed orally or if it is desired to be removed en bloc with tissue in the supra-omohyoid triangle, a flap of the lower cheek should be performed. Facial nodes were dissected and kept in continuity with other specimens. The dissection is continued anteriorly until it attaches to the digastric muscle.^{1,4}

Mobilization of the submandibular gland is carried out by gentle traction using a hemostat. The gland is then retracted posteroinferiorly. After the posterior belly of the digastric muscle is exposed, the proximal portion of the facial artery is shifted so that the entire contents of the submandibular triangle can be dissected and retracted inferiorly.⁴

Cautery is used to separate the anterior border of the SCM muscle from the facial attachment. The SCM is then retracted posteriorly to expose the jugular vein which is still covered by the deep jugular and jugulo-digastric nodes. The node was then dissected and retracted anteriorly along with the rest of the specimen. A node at the apex of the posterior triangle behind the IJV was also dissected. Exploration is continued caudally towards the supra-omohyoid triangle axes to dissect the mid-jugular node then proceed medially to be released from its final attachment, namely the thyrohyoid membrane with cautery. The tissue was then irrigated with bacitracin solution and a drain was placed parallel to the anterior border of the SCM towards the mandibular triangle.¹

- Extended Supraomohyoid Neck Dissection

In lateral border of the tongue carcinoma, the risk of skip metastases to the ipsilateral level IV is increased. Therefore, the elective surgery in this case should include a level IV lymph node in addition to the standard supra-omohyoid dissection with a very similar procedure. In this procedure, after a level III lymph node dissection, the flap is retracted caudally to expose the tendon of the omohyoid muscle. Dissection was continued along the lower half of the IJV to KGB level IV. In this procedure, only the lymph nodes along the lower spinal accessory chain and the transverse cervical chain in the posterior triangle of the neck are not dissected.^{1,5}

- Jugular Node Dissection

If the lesion crosses the median plane, jugular node dissection can be performed ipsilateral or bilateral to the lesion. The incision used follows the incision for resection of the primary tumor such as a transverse incision along the neckline at the thyrohyoid membrane level from the posterior border of the SCM to the other side. After incision, the platysma is separated exposing the anterior border of the SCM. Nodes at levels II, III and IV are excised in a monobloc fashion, covering at least the internal jugular chain at the posterior border of the SCM.^{1,7}

- Middle Compartment Neck Dissection

This dissection is done to remove the lymph nodes involved in metastases from the thyroid gland. This procedure involves invasion of the thyroid gland capsule to ensure local and regional cleanliness. If the primary tumor involves both sides, then dissection of both sides of the esophageal cavity is performed. Meanwhile, if enlargement of the central compartment lymph nodes is found to be minimal during thyroidectomy and as long as other lateral parts of the neck are not suspected of metastases, then middle compartment neck dissection

alone is sufficient. The surgical procedure begins with a thyroidectomy.⁶ A transverse incision is made parallel to the neck crease at the level of the cricoid cartilage. After exploration of the thyroid gland and the central compartment, if there is an enlarged KGB, then a central compartment dissection is performed.^{6, 8}

- **Posterolateral Neck Dissection**

This dissection is recommended for cleaning of the lymph nodes in the suboccipital triangle and posterior triangle of the neck. The procedure can be performed simultaneously with excision of primary carcinoma or posterior scalp melanoma or performed separately using a hockey-stick-type incision with posterior extension on

the upper side to expose the occipital area. The trapezius muscle is detached from the occipital bone and moved posteriorly to expose the occipital triangle. The suboccipital nodes and those below the trapezium are dissected from the muscle and pulled anteriorly to maintain continuity with the nodes of the posterior triangle. During dissection, the accessory nerve must be preserved if it does not have obvious metastases. Deep jugular lymph node dissection is performed by traction on the SCM anteriorly exposing the IJV and maintaining continuity with level II, III and IV lymph nodes. Defects after surgery at the primary site can be covered with a skin graft.¹

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