

## Techniques for Cervical Lymph Node Curage: Our Approach

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### Abstract

### Review Article

Metastatic lymph node involvement occurs in a sequential and predictable manner, and its clinical detection by palpation is limited. Computed tomography (CT), followed by magnetic resonance imaging (MRI) and positron emission tomography (PET-scan), are considered to be the best tests for detecting these lymph nodes, especially in the case of sub-centimetric lymph nodes. The initial lymph node status of patients with cancer in maxillofacial surgery is a factor influencing prognosis. The management of actual or potential cervical metastases must be adapted to the location of the initial tumour and the stage of loco regional progression. The International Union against Cancer (UICC) and the American Joint Committee on Cancer (AJCC) have adopted a common cervical lymph node (N) classification.

**Keywords:** Classification, Curage, Robbins, Sentinel.

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### INTRODUCTION (ANATOMICAL REMINDER)

Cervical lymph node territories are divided into six regions in the so-called ROBBINS classification, drawn up by the American Academy of Otolaryngology-Head and Neck Surgery in 2002[1] [Table I].

This classification, created by surgeons and updated in 2008, has led to a decisive improvement in the management of regional metastatic invasion of head and neck cancers, and has served as the basis for standardized descriptions of neck resection techniques [2].

The lymphatic drainage zones of the cervico-facial regions are listed in Table II [3-5].

### Our Technique

#### How is the Patient Positioned?

We place our patients in a supine position with a slight proclivity, with a block placed under the shoulders so that the head is positioned in extension.

The procedure is performed under general anaesthetic without curare. The intubation chosen depends essentially on the associated procedures, most often nasal in the case of oral procedures. The drapes are glued to either side of the neck, behind the sternocleidomastoid (SCM) muscles, flush with the hairline (for each side, the head is hyperextended and turned to the opposite side to the drape, to give the drapes maximum laxity). The lateral drapes cover the upper edge of the scapula, leaving the supra-clavicular fossa free.

What Type of Incision Should be Used?

Table 1: ROBBINS Classification [1]

Level I	Ia: Submental group. Lymph node tissue located between the anterior belly of the digastric muscle and the midline, above and in front of the hyoid bone
	Ib: Submandibular group. Lymph node tissue located in the triangle defined by the anterior and posterior bellies of the digastric muscle and the inferior border of the mandible. The lymph nodes adjacent to the submandibular gland located along the facial vascular pedicle are included in this group
Level II: Upper jugular group	Lymph node tissue located around the upper cervical portion of the internal jugular vein and the upper part of the spinal nerve, extending from the base of the skull to the carotid bifurcation or the hyoid bone
	IIa: level II ganglia located in front of the vertical plane defined by the spinal nerve

	(clinical landmark). The posterior boundary corresponds to the posterior border of the sternocleidomastoid muscle while the anterior boundary is defined by the lateral border of the sternohyoid muscle	I Ib: level II ganglia located behind the vertical plane defined by the spinae nerve
Level II: middle jugular group	Lymph node tissue located around the middle third of the internal jugular vein, between the lower border of sector II and the omohyoid muscle or the lower border of the thyroid cartilage (clinical landmark). The anterior and posterior limits are the same as those of level I.	
Level II: lowel jugular group	Lymph node tissue located around the lower third of the internal jugular vein, between the lower border of level III and the clavicle. The anterior and posterior boundaries are the same as those of level III.	
Level V: Posterior Triangle Group	Lymph node tissue located in the environment of the lower part of the spinal nerve and along the transverse cervical vascular pedicle. This group has the shape of a triangle whose limits are the clavicle, the posterior border of the sternocleidomastoid muscle, and the anterior border of the trapezius muscle. Sublevels Va and Vb are separated by a horizontal plane passing through the lower border of the cricoid.	<b>Va:</b> level V lymph nodes located above the horizontal plane passing through the lower edge of the cricoid (spinal lymph nodes) <b>Vb:</b> ganglions du niveau V situés au-dessous du plan horizontal passant par le bord inférieur du cricoïde (ganglions de la chaîne cervicale transverse)
Level VI: central compartment	Lymph node tissue of the tracheoesophageal canal and perithyroid region, extending superiorly from the inferior border of the hyoid bone to the sternal notch inferiorly. On each side, the lateral boundary corresponds to the medial border of the carotid sheath	
Level VII: upper mediastinal group.	Lymph node tissue located in the anterosuperior part of the mediastinum	

We recommend the Sébilleau-Carrega incision, which avoids one of the counter-incisions of the Hayes-Martin double-Y line. The important landmarks are the

mastoid process, the mandibular angle, the thyroid cartilage and the chin. It starts from the mastoid behind, passing through a fold in the neck and rising half a.

**Table 2: Lymphatic drainage areas of cervicofacial tumors [3-5]**

Group IA	Lips, oral cavity, nasal pyramid
Group IB	Lips, oral cavity, nasal pyramid
GroupeII <sub>A</sub>	Larynx, three pharyngeal floors, thyroid, oral cavity, parotid gland, ear
Group IIB	Larynx, three pharyngeal floors, thyroid, oral cavity, parotid gland, ear
Group III	Larynx, three pharyngeal floors, thyroid, oral cavity
Group IV	Larynx, oropharynx, hypopharynx, thyroid, thorax, abdomen
Group V <sub>A</sub>	Nasopharynx, oropharynx, parotid, ear
Group VB	Nasopharynx, oropharynx, parotid, ear
Group VI	Larynx, thyroid

Fingerbreadth above the thyroid cartilage. It extends forward towards the chin in unilateral incisions. In bimastoid incisions, the incision is made symmetrically towards the other mastoid.

In front, the incision is made along this line as far as the skin muscle of the neck (platysma) in depth, and in the posterior region, the incision stops above the plane defined by the external jugular vein and the greater auricular nerve.

How is the Functional Radical Resection performed?

## DISSECTION

We use the electric scalpel to lift the flap formed by the platysma muscle upwards to the mandibular

border and forwards and down wards to below the omohyoid muscle.

The posterior limit of dissection is the sternocleidomastoid muscle and the anterior limit is determined by the sub hyoid muscles.

**Dissection of the Submandibular Triangle:** First, we try to respect the chin branch of the facial nerve, situated about two fingerbreadths below the edge of the mandible, by locating the facial vein situated below the nerve, tying it off and sectioning it, then we continue our dissection under this vein. The contents of the submandibular cavity are dissected, sectioning Wharton's canal and the nerve fibres that secrete the submandibular gland from the lingual nerve. The lingual

nerve and greater hypoglossus nerve are preserved. The sub mental lymph nodes between the 2 anterior bellies of the digastricus were resected with a hot knife.

**Dissection of the Spinal Nerve:** As we have said, the landmark of the spinal nerve is the junction between the upper 1/3 and the lower 2/3 of the sternocleidomastoid muscle. The latter is retracted posteriorly and the posterior belly of the digastricus upwards. The nerve is dissected upwards, parallel to the nerve. The cellulo-ganglionic tissue above and behind the nerve is dissected from the deep plane (spleniuscapitis and levatorscapulae muscles) and retracted downwards, passing under the nerve.

**Dissection of the Vascular Sheath:** The carotid sheath is dissected carefully so as not to damage its contents and take it with the rest of the specimen.

The thyro-lingual-facial trunk is sought, which is an essential landmark for freeing the internal jugular vein (IJV). This trunk must be sectioned and ligated.

On the left, the lower part of the IJV is dissected with great care so as not to damage the thoracic duct, which is a source of lymphoids.

### Superior Triangle

Our landmarks in this region are: the upper edge of the clavicle below, the anterior edge of the trapezius muscle behind, and the spinal nerve as it exits the sternocleidomastoid muscle and enters the trapezius muscle above. Dissection is carried out from the back to the front, starting from the anterior edge of the trapezius muscle. The dissection is then extended as far as the jugulocarotid sheath, without going beyond it in order to respect the cervical sympathetic system.

What are the particularities of selective cut-outs?

**Supraomohyoid Cut-Outs:** The supraomohyoid incision is a one-piece incision of levels I, II and III. Our reference points are the mandibular border at the top, the posterior edge of the sternocleidomastoid muscle at the back and the upper edge of the omohyoid muscle at the bottom.

The surgical technique is based on the concept of the functional recess.

**Jugular Cut:** The jugular cut corresponds to levels II, III and IV, which must be resected as a single unit.

Our landmarks are, posteriorly, the posterior border of the sternocleidomastoid muscle, anteriorly, in the sub hyoid region, the external border of the sub hyoid muscles, and in the supra hyoid region, the inferior border of the posterior belly of the digastric muscle. The lower limit is the upper edge of the clavicle and the upper limit corresponds to the base of the skull.

### At the End of Curage?

After washing and meticulous haemostasis, we believe that the experienced surgeon should insert one or two Redon drains, as they are close to the large vessels in the neck. The platysma is closed with separate stitches using 3-0 absorbable Vicryl thread. Then subcutaneous closure with Vicryl 4 and the cutaneous plane with 5-0 or 4-0 prolene (intra dermal overjet or simple stitches).

## DISCUSSION

The current literature on hollowing out focuses more on the nomenclature of this surgery, and not on anatomical dissection techniques.

We have analysed Robbins' classification of lymph node areas. We found that it has both advantages and disadvantages:

**Advantages:** The Robbins lymph node level system has made it possible to define the classification of cervical cut-outs thanks to the introduction of standardised, fixed and clearly identifiable surgical landmarks.

This classification ensures consistency in the language used by the various specialists (surgeons, radiologists, radiotherapists, pathologists) and facilitates exchanges and understanding of the objectives of each discipline in a particularly complex field.

**It is a Normative Tool:** Through the standardisation that it imposes, enabling a methodologically satisfactory comparison of the results obtained by different teams, when new diagnostic or therapeutic measures are introduced, or their pooling within the framework of multicentre studies or meta-analyses.

**It is Also a Cross-Disciplinary Tool:** By pooling this classification for different specialties, it is possible to correlate the information collected by each of them (radio surgical, anatomical-surgical, anatomical-radiological, etc....), which greatly enhances the value of the data collected during clinical studies.

**Disadvantages:** The main criticism of this classification is that it does not respect the anatomy and physiology of lymphatic drainage in the head and neck. The classification does not take into account lymph node regions that are not commonly dissected during cervical surgery (retropharyngeal, parotid, facial, occipital and mastoid regions). The lower limit of levels IV and V is imprecise. It is defined by the upper edge of the clavicle, the position of which varies with shoulder movement.

Which curage for which tumour?

Lymph node dissection is generally indicated for any clinically positive lymph node involvement or for any advanced tumour stage without lymph node involvement (T3-T4).

Radical neck dissection is reserved only for clinically positive resectable neck disease involving the MTS, IJV and XI spinal nerve.

Selective neck dissection and modified radical neck dissection (functional) are the gold standard for clinically positive, resectable lymph node disease. Selective neck dissection is frequently performed for clinically and radiographically node-positive disease with a high T stage (T3-T4). In patients with clinically negative disease and tumours that place them at high risk of cervical metastases (greater than 20%), selective neck dissection is performed appropriately depending on the location of the tumour [7].

**Supra Omohyoid Incision:** This procedure is the most suitable for carcinomas of the oral cavity [8] and the facial integument (nose, eyelid, chin) [3].

**Jugular Resection:** This procedure is indicated for carcinomas of the pharynx and larynx [9].

**Central Compartment Incision:** This procedure is indicated for thyroid carcinomas [9].

**Postero Lateral Incision:** This procedure is indicated for melanoma and squamous cell carcinoma of the posterior scalp [9].

#### Technical

Various incisions can be used depending on the surgeon's preference. They must take into account factors such as resection of the primary tumour, aesthetic factors, and vascularisation of the detached flaps [10].

For Zanaret, the double Y incision of Hayes-Martin is the most classic design. The incision can be extended anteriorly towards the chin when an intraoral approach is required. The Sébilleau-Carrega incision that we recommend avoids one of the counter-incisions of the Hayes-Martin double-Y incision. It does, however, make access to the supraclavicular region more difficult.

The Mac Fee incision provides an excellent cosmetic result but at the cost of less good surgical exposure. The Gluck incision is a bilateral incision sometimes combined with a vertical counter-incision to facilitate access to the supra-clavicular region. The Paul André incision starts at the tip of the mastoid, descending opposite the sternocleidomastoid muscle and turning forwards to join the midline, following a path above and parallel to the clavicle. This type of incision is suitable for bilateral cervical recesses, in which case it corresponds to a bimastoid incision [9].

After analysing the data in the literature, the key elements within each lymph node area are as follows:

**Area I:** The lingual nerve, hypoglossal nerve, Wharton's canal and facial artery and vein are all found in level I. The only significant structures found lateral to the

posterior belly of the digastricus are the facial vein and the marginal nerve. The mandibular marginal branch of the facial nerve lies in the fascia overlying the sub maxillary gland, superficial to the facial vessels and deep to the platysma [11].

**Area II:** Level II is divided into two parts by the spinal nerve. It extends deep to the posterior digastricus muscle and the occipital artery. Most of the time (~85%) it is superficial to the IJV, but it can also be deep (~14%) or through (<1%) the vein [12]. It often gives off a small branch to the trapezium before entering the SCM.

**Area III:** The facial, lingual and thyroid veins must be transected and ligated to free the internal jugular vein. Particular attention should be paid to the lower part of the jugular vein, especially on the left side.

**Level IV:** From superficial to deep, the structures encountered are the omo hyoid, carotid sheath, thoracic duct (more commonly seen in the left neck, although accessory thoracic ducts may be seen in the right neck), transverse cervical artery, phrenic nerve and anterior scalene muscle. Lung apices may also be present on the underside of level IV [13].

The phrenic nerve is integrated into the fascia covering the anterior scalene muscles and can be protected by remaining superficial to this plane. The brachial plexus extends across the floor of level Vb between the anterior and middle scalene muscles.

#### *What about the Sentinel Node Technique?*

Applied to cancer, the sentinel node concept implies that lymphatic extension is not a random phenomenon, but follows a specific and predictable progression. If the sentinel node effectively filters the afferent lymph, the tumour cells should be retained there.

The sentinel lymph node is detected by lymphoscintigraphy 15 to 60 minutes after injection of a radioactive element (technetium-99) into the primary tumour. Intraoperative localisation of lymphatic drainage sites is carried out using a gamma detection probe specially designed for this application [14]. It can be detected even with injection of methylene blue.

It can be used to detect any lymph node invasion in patients with small tumours classified as T1 or T2, N0. It avoids the need for selective lymph node dissection, which would be the only way of confirming with certainty the presence or absence of lymph node metastasis [15].

We have never used this technique, but we believe that the sentinel lymph node could, if studies are carried out to determine its indication in maxillofacial surgery, reduce the number of cut-outs, operating time and financial cost, and prevent complications.

## CONCLUSION

Cervical lymph node dissection requires perfect anatomical knowledge of the region. It should be learned in the operating theatre alongside a senior surgeon to improve the quality of surgical treatment of lymph nodes, which remains essential for the management of cancers with lymph node metastases in maxillofacial surgery.

The introduction of new surgical techniques, in particular the sentinel lymph node, will lead to better results with fewer complications.

**Conflicts of Interest:** The authors declare no conflicts of interest.

**Authors' contributions:** All authors contributed to the production of this work

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