

# A new device for the identification of lymph nodes removed during different types of neck dissection

Imre Gerlinger<sup>1\*</sup>, Tamás Ferenc Molnár<sup>2</sup>, Tamás Járai<sup>1</sup>, Péter Móricz<sup>1</sup>, Gábor Ráth<sup>1</sup>, Gyula Göbel<sup>1</sup>

<sup>1</sup>Department of Otorhinolaryngology & Head and Neck Surgery, Medical School, University of Pécs, Pécs, Hungary;

\*Corresponding Author: [i.gerlinger@freemail.hu](mailto:i.gerlinger@freemail.hu)

<sup>2</sup>Department of Otorhinolaryngology & Surgery, Medical School, University of Pécs, Pécs, Hungary

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## ABSTRACT

**Meticulous mapping of the lymph node status is a general principle in present-day head and neck surgery. The removal of a certain number of lymphatic levels during neck dissection may well be therapeutic in intent, but it is also mandatory for correct tumour staging. We present a precise lymph node mapping during different types of neck dissection in the course of major head and neck surgery by a sterile plastic tray moulded in the shape of the neck. This device makes lymph node mapping simpler, safer, quicker and methodically more structured than any of the present methods. It facilitates the work of the pathologist and the flow of reliable information along the surgeon – pathologist-oncologist chain. With this device, a more structured, methodical means of lymph node removal has become possible.**

**Keywords:** Head and Neck Surgery; Lymph Node Mapping; Neck Dissection

## 1. INTRODUCTION

In 1906, George Crile published a report on what is now considered the first surgical procedure for the en bloc resection of cervical nodes [1]. Until the 1950s, his radical neck dissection technique underwent only modest technical improvements and there was little clarification of the indications for the procedure. During the 1960s, the ideas of Suarez and Ballantyne led to advances in the technique of conservative neck dissection [2]. For the first time the non-lymphatic structures (the spinal accessory nerve, the internal jugular vein and the sternocleidomastoid muscle) were preserved, and only the lymph

nodes between the aponeurotic compartments of the neck were removed [3]. Today, a variety of different types of neck dissection are available that are considered oncologically, functionally and cosmetically effective in the therapeutic or prophylactic treatment of the neck in patients with head and neck cancers. These less radical surgical procedures are often performed bilaterally, and may be followed by postoperative radiotherapy with a very similar recurrence ratio as observed after radical/modified radical neck dissections [4,5].

Meticulous mapping of the lymph node status is a general principle in present-day head and neck surgery. The removal of a certain number of lymphatic levels during neck dissection may well be therapeutic in intent, but it is also mandatory for correct tumour staging [6]. The decisions concerning the prognosis, postoperative adjuvant therapy at the individual level and the audit at the departmental level are impossible without proper TNM staging [7].

As in other manual specialities, the identification, handling, collecting and appropriate labelling of the individual lymph nodes according to their origin during different types of neck dissection is a time-consuming procedure all participants concerned. This seemingly minor problem is customarily solved by the usage of labelled individual vials or small bottles.

The routine of individual ENT surgeons practising neck dissections is determined by a long list of factors, but it is clear that lymph node mapping is not ideally standardized and integrated into the daily routine [6]. Deficiencies and substandard attitudes towards the importance of the mapping can not be dealt with here, but it is perfectly obvious that after a neck dissection, careful attention and an extra workload are needed on the part of all the theatre staff. Their number, quality and level of enthusiasm are frequently underestimated potential sources of the misplacing and mishandling of specimens. Over noisy verbal instructions given in the course of

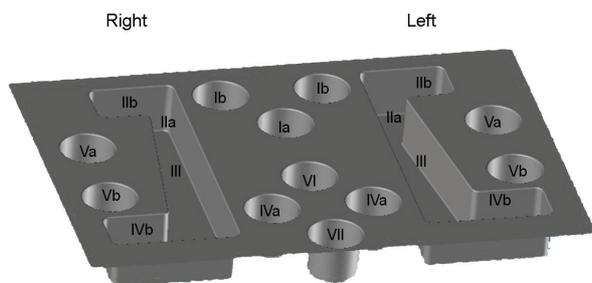
sampling with reference to the designation of the individual specimen in question can also be distractive. Even the necessary communication between the surgeon/scrub nurse and the circulating staff during identification is another possible source of misunderstanding. The routine of the postoperative filling of the pathological request forms by the junior staff and their re-checking of the designation of the vials are likewise not the strongest elements in the information chain. In spite of being a seemingly unrelated area of trouble-shooting, the inter-departmental transfer can be another source of problems.

Lymph node mapping is time and energy consuming activity in every phase starting with removal of one or more lymphatic levels from their anatomical surroundings until the specimens land on the microscope plate of the pathologist. We have modified a tool invented and originally introduced for mediastinal lymphnode mapping during lung cancer surgery and applied it for the systematic collection of different types of neck dissection specimen [6].

## 2. MATERIAL AND METHOD

A plastic tray shaped in accordance with the outline of the anatomy of the neck with the designated lymph node position represents the anatomical field of the origin of the individual specimens. The small built-in containers it holds, also made of plastic, contain a fluid (water, alcohol or formaline) and are fitted with airtight rubber caps (**Figure 1**). The individual lymph node stations are denoted in accordance with the standard [6]. The whole complex can be handled by the surgeon, the assistant or the scrub nurse at the time of the surgical removal of the lymphatic levels as it is sterile. Sterilization is achieved with formaldehyd steam, no disturbing interference with any other intraoperative activity.

The method was evaluated by personal interviews with the personnel concerned (4 ENT surgeons, 6 theatre nurses, 6 theatre assistants and 2 pathologists) during a 2-months test period. Application of the tool was appro-



**Figure 1.** The original plastic tray containing built-in vials closed by rubber caps. The device measured 34 cm in diameter and can easily be handled by the assistant or the scrub nurse.

ved in advance by the Ethical Committee of Pécs University, Medical School.

## 3. RESULTS

The prototype of the tool was applied between December 1<sup>st</sup> 2006 and January 31<sup>st</sup> 2007 in 14 consecutive cases, without any adverse event. The type of neck dissections was as follows: radical neck dissections: 2 cases, modified radical neck dissections: 2 cases and selective neck dissections: 10 cases. The theatre staff did not consider the extra workload caused by the usage of the tool to be excessive. Their most important observation related to the ease of following the Health and Safety Regulations as their exposure to biohazard was obviously reduced. The positive comments from the pathologists emphasized the simplicity and reliability of processing the lymph nodes.

## 4. DISCUSSION

In 1991, the Committee for Head and Neck Surgery and Oncology created by the American Academy of Otolaryngology Head and Neck Surgery, in conjunction with the Education Committee of the American Society for Head and Neck Surgery [8], developed a classification system based on the following concepts: 1) radical neck dissection is the fundamental procedure with which all neck dissections has to be compared; 2) modified radical neck dissection denotes the preservation of one or more non-lymphatic structures; 3) selective neck dissection denotes the sparing of one or more lymph node levels; and 4) extended neck dissection denotes the removal of more lymphatic and/or non-lymphatic structures. The terminology for the current classification of neck dissections is detailed in **Table 1** [9].

For the categorization of neck dissections, we must first adopt a common nomenclature for the lymph node groups of the neck. The classification recently proposed by Som *et al.* [10] is simple and clear. It includes seven levels and proposes precise imaging-based anatomical landmarks for use in classifying metastatic adenopathy. The lymph node groups that correspond to the neck levels and subgroups are outlined in **Table 2**. This classification defines in a more precise manner the anatomical zones or levels of the neck previously classified by Shah *et al.* [11] and by Robbins *et al.* [8]. We took this classification into account while planning our device in order to simplify neck node identification during neck dissections.

Meticulous mapping of the lymph node status of the neck demands the systematic use of neck dissection classification. Our preliminary experience indicates that

**Table 1.** Terminology of the current classification of neck dissections.

Type of neck dissection	Lymph node levels removed	Structures preserved
<b>Comprehensive</b>		
Radical	I, II, III, IV, V	None
Modified radical		
Type 1	I, II, III, IV, V	SAN
Type 2	I, II, III, IV, V	SAN, IJV,
Type 3	I, II, III, IV, V	SAN, IJV, SCM
<b>Selective</b>		
Suprahyoid	I, II	SAN, IJV, SCM
Supraomohyoid	I, II, III	SAN, IJV, SCM
Extended supraomohyoid		
	I, II, III, IV	SAN, IJV, SCM
	I, II, III, IV, V	SAN, IJV, SCM
Posterolateral		
	suboccipital and retroauricular nodes	
Lateral	II, III, IV	SAN, IJV, SCM
Anterior	VI	SAN, IJV, SCM
Anterolateral	II, III, IV, VI	SAN, IJV, SCM
	I, II, III, IV, V	None
<b>Extended neck dissection</b>		
	and one or more additional lymph node groups (such as the paratracheal nodes or anterior compartment lymph nodes)	and structures that are not routinely removed by radical neck dissection (such as the carotid artery, the hypoglossal nerve, the vagus nerve) are removed

SAN: spinal accessory nerve; IJV: internal jugular vein; SCM: sternocleidomastoid muscle

the new device has already demonstrated obvious advantages in five different areas: 1) it reduces operating theatre movement as there is no need for the separate step of passing the individual lymph nodes to the circulating staff for further handling; 2) unnecessary verbal communication is avoided as the identification of individual lymph node levels is self-explanatory; 3) the quality of the lymph nodes reaching the pathologist is improved as tissue trauma during grasping and transfer is minimized; 4) the risk of exposure of the handling staff to dangerous materials (specimens and formalin) is lower than on the use of individual vials/small bottles; and 5) from an educational point of view, it is important that the device as it makes the cancer surgeon and trainees more aware of lymph node staging. With this device,

**Table 2.** Lymph node groups corresponding to levels I-VII and the various subzones.

Level	Lymph node group
Ia	Submental nodes
Ib	Submandibular nodes
IIa	Upper jugular, anterior to n. IX
IIb	Upper jugular, posterior to n. IX (submuscular recess)
III	Middle jugular nodes
IVa	Lower jugular nodes (behind sternal head of sternocleidomastoid muscle)
IVb	Lower jugular nodes (behind clavicular head of sternocleidomastoid muscle)
Va	Posterior triangle nodes (spinal accessory group)
Vb	Posterior triangle group (transverse cervical artery group, supraclavicular group)
VI	Anterior (central) compartment lymph nodes (paratracheal, perithyroideal, Delphian)
VII	Superior mediastinal nodes

a more structured, methodical means of lymph node removal has become possible, and the importance of lymph node mapping gets the emphasis it deserves.

## 5. CONCLUSIONS

The reported device makes lymph node collection and identification simpler, safer and quicker. Industrial production is planned, with the whole complex made as one integrated plastic tray. The removable vials will be replaced by designated capped bays.

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