

## SHORT COMMUNICATION

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# Impact of the functional neck dissection in maxillofacial surgical oncology: its role in robotic-based surgery era

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## Summary

Head and neck cancers demonstrate an increased prevalence worldwide. The main therapeutic approaches are still surgery and radiotherapy, although in selective cases novel targeted therapeutic strategies based on monoclonal antibodies (ie anti-EGFR) are also applied. Concerning maxillofacial surgical oncology, a variety of methods has been developed. Among them the functional neck dissection technique seems to be a reliable and significant surgical ap-

proach, especially in removing identified cervical metastatic lymph node(s). In this technical paper, we focused on the method, its modifications adding our experience and also the challenges that arise in the modern robotic-based era regarding head and neck surgery.

**Key words:** dissection, functional, head and neck, maxillofacial, surgery

## Introduction

Oral cavity represents the predominant anatomic location for head and neck carcinomas. Based on epidemiologic studies, oral cancer- especially squamous cell carcinoma- shows an increased prevalence and morbidity worldwide categorized as the sixth most common malignancy [1]. Concerning the etiologic factors, long-term tobacco and alcohol consumption and also high risk human papillomavirus (HPV) persistent infection are the most important ones [2].

In the field of head and neck surgical oncology a variety of surgical techniques has been developed even in the early 1900s. Crile in 1906

followed by Suarez, Bocca and Martin were the pioneers for describing and developing the radical neck dissection (ND) technique in its classical and modified forms [3,4]. The crucial step in improving this specific surgical operation was the identification of cervical lymph node metastatic status [5]. Based on this clinicopathologic entity that significantly modifies the stage of malignant disease, classical radical ND was updated to the modified or functional ND and then to selective ND [6,7]. In the current technical paper we describe the functional ND method including also our surgical experience and providing new data for its impact in

the modern innovative robotic surgery era.

### Functional neck dissection in maxillo-facial surgical oncology

In radical surgery for removal of oral cancer, and especially that of the lower part of the mouth, the composite operation aims at the “*en bloc*” dissection of the primary cancer lesion and the neck lymph nodes, to which the tumor has or will metastasize. When “elective” or “prophylactic” ND is used, the operation is performed in the absence of clinically demonstrable cervical metastasis, while in the presence of such cervical metastasis the operation is called “therapeutic” neck dissection [8,9]. Although the composite operation with the radical ND has proved as an extremely effective therapeutic measure, especially in the treatment of neck node metastasis, a feeling has grown among many experienced head and neck surgeons, that very often, radical ND sacrifices, unnecessarily, useful structures, particularly when performed on a prophylactic basis [10,11].

The anatomic structures concerned are the accessory nerve, sternocleidomastoid, and the internal jugular vein. The accessory nerve is very important functionally, as its resection results in dropping of the shoulder due to loss of upper trapezius function. The side-effect of losing the sternocleidomastoid or the internal jugular vein on one side only is not a very important sequel in contrast to trapezius muscle loss [12,13].

The debate between ND radicality and some types of ND has resulted in a new evaluation of the surgical approach to cervical lymph nodes, aiming to prevent complications without compromising operative effectiveness. The terms “functional”, or its alternative “modified” ND carry the implication of being less “radical”, in relation to the typical radical ND. If it is used, however, in the appropriate clinical way, and with proper indications, it functions radically. These methods have their maximum therapeutic effectiveness in the hands of experienced head and neck surgeons, capable of carrying out what is a more technically demanding procedure than a straightforward radical ND [14]. Functional ND is not a technique for the occasional operator. The versions which have been described by Joseph et al. in 1985 include [15]:

1) The procedure corresponding to a radical ND except the dissection and preservation of the accessory nerve.

2) The procedure corresponding to a radi-

cal ND except the preservation of the accessory nerve, sternocleidomastoid and internal jugular vein.

3) The same procedure as above with the preservation of the accessory nerve and sternocleidomastoid muscle.

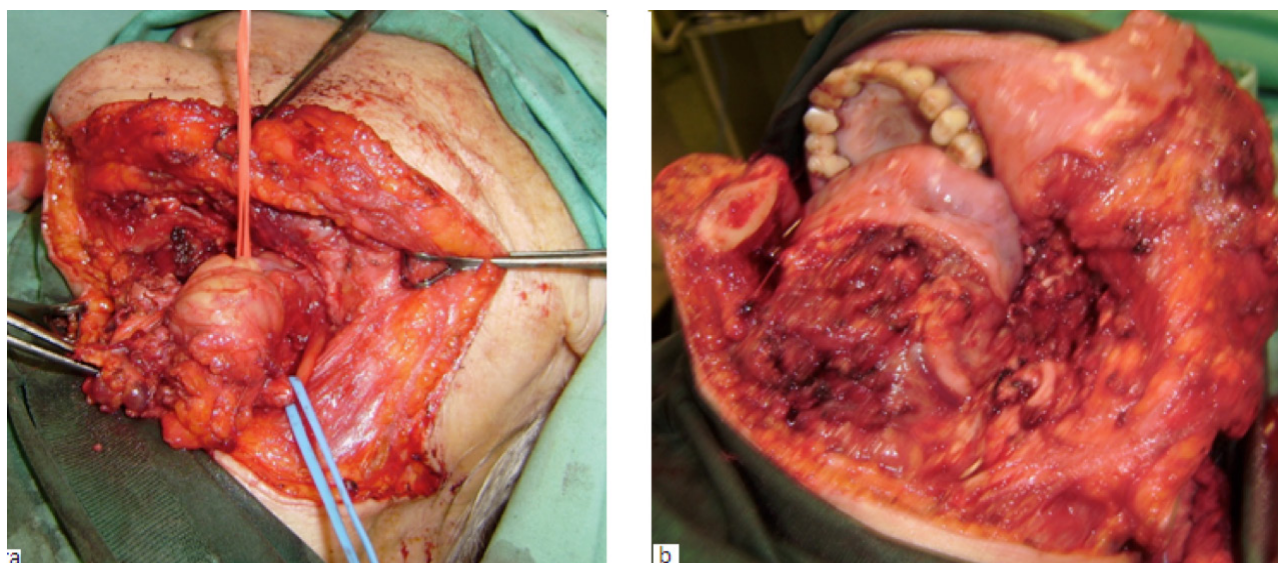
4) As 4<sup>th</sup> version is considered the preservation of all these anatomic elements and that of the posterior triangle.

Common to all versions is the removal of the deep jugular chain of nodes along with the contents of the submandibular triangle, preserving at the same time structures like the accessory nerve and the others.

Concerning our experience in Greece regarding this surgical technique, between 1971 and 2005 1400 cases of oral carcinoma (out of a sum of more than 1800 patients) have been operated. Of these patients 36.7% presented with clinically apparent metastatic cervical lymph nodes, and 32.12% had received preoperative radiation therapy. In 474 cases (33.8%) the size of the lesions was larger than 2 cm. Composite operations were performed in 720 patients. Out of these patients, 310 underwent elective ND, 271 therapeutic and 139 suprahyoid elective ND. In the majority of the cases (80%) the composite operation was performed with the Commando method by using some type of bone graft, while the others (20%) with the Kremen type of median mandibular temporary procedures.

Functional ND was applied to 152 of our patients and particularly as prophylaxis in 72 cases, and as therapy in the rest of them (N=80) (Figure 1). The prophylactic procedure took place in the absence of clinically demonstrable lymph node metastasis. The patient 3-year survival rates after functional ND was almost the same as in patients after typical radical ND performed with a type of composite operation, reaching 52% (therapeutic 31.4%, prophylactic 62.4%). In comparison to the typical composite (radical ND) operation from our data concerning the same survival rates, the 3-year survival after prophylactic (elective) radical ND was 63.2%, and after therapeutic 30.5%.

The radicality of functional ND depends on the clinical conditions under which it is performed (negative neck, positive internal jugular vein lymph node chain) and the ability and experience of the surgeon in neck cancer surgery. This procedure may be extremely radical, taking into account that it is performed in relatively favorable cases, such as in patients with a clinically negative neck [16].



**Figure 1. A:** Intraoperative image during functional neck dissection in patient with mandible carcinoma. **B:** Semi-mandibulectomy–disarticulation of the left mandible, after middle lower lip section and after functional neck dissection.

### Functional neck dissection in modern robotic-based head and neck surgery

Since 2000, head and neck surgical oncology has met new challenges regarding the development of modern, sophisticated techniques, but some critical issues are still under investigation. Transoral laser microsurgery (TLM), transoral robotic surgery (TORS) combined to or versus radiotherapy are therapeutic options that seem to significantly modify the oncologic treatment decisions [17]. Quite recently some studies focused on evaluating the value and feasibility of endoscopic robot-assisted ND followed or not by TORS [18]. Furthermore, introduction of robot-assisted selective ND especially for removing neck nodes of levels II to V after transoral robotic surgery of a primary lesion seems to be a feasible and safe technique to manage the neck in cN0 laryn-

gopharyngeal carcinoma patients [19]. Although these results are characterized as significant for the usefulness of robotic-based surgery in head and neck surgical oncology, there is a need for extensive studies based on long-term results in order to establish the validity of robot-assisted ND.

In conclusion, functional neck dissection as a treatment for head and neck cancer represents a reliable and significant method and its value regarding the therapeutic result increases if preservation of the cervical root branches is secured during the operation [20]. This provides greater shoulder mobility, less loss of face and neck sensation, and better quality of life. Concerning head and neck cancers, surgical and radiotherapy options remain the gold standards in handling these patients, improving locoregional control and survival rates, especially in early disease stages.

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