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Anatomical-based classification for transoral lateral oropharyngectomy

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ABSTRACT

Purpose: The aim of the study is proposing a classification of different transoral lateral oropharyngectomy procedures in order to ensure better definitions of post-operative results.
Methods: The classification resulted from the consensus of the different authors and was based on anatomical-surgical principles.
Results: The classification comprises three types of lateral oropharyngectomy: type 1 is the resection of the palatine tonsil deep to the pharyngobasilar fascia; type 2 is performed by removing the entire palatine tonsil, the palatoglossus muscle, the palatopharyngeal muscle and the superior constrictor muscle; type 3 is performed by removing the entire palatine tonsil, the palatoglossus muscle, the palatopharyngeal muscle, the superior constrictor muscle, the buccopharyngeal fascia with extension to the pterygoid muscle and parapharyngeal space fat content. Based on the extension of the dissection we can use the suffix A (soft palate), B (posterior pharyngeal wall), C (base of tongue) and D (retromolar trigone).
Conclusion: The proposed classification introduces a simple and easy to use categorization of transoral lateral oropharyngectomies into three classes. Resection extensions are easily described using suffixes.

Introduction

The incidence of oropharyngeal squamous cell carcinoma (OSCC) is rising worldwide and a greater proportion of younger patients seem to be affected by this clinical entity. It is likely that this may be correlated with the worldwide spread of human papilloma virus (HPV) infection [1]. Chemoradiotherapy is widely used as upfront treatment option, but it includes the development of long term post-operative sequelae and reduced quality of life. Moreover, metachronous radiation-induced sarcomas and other second primary tumors may potentially develop after administration of high dose radiotherapy [2]. Those potential sequelae become more relevant in younger HPV-positive patients who naturally have a longer life expectancy. Upfront transoral surgery would likely lead to less long-term complications, conferring the same or higher survival results when compared to upfront chemoradiotherapy [3].

The introduction of TORS is giving a fresh imulse to this field of research [4–10]. Actually OSCC represents the most established application for TORS [11].

Moreover, the number of patients that may benefit from transoral surgery is potentially rising, since there is emerging evidence for the role of TORS in advanced oropharyngeal cancer (stages III and IV) [12], as well as for residual and recurrent disease [13].

Despite the worldwide spread of transoral surgery and the number of published clinical experiences, few efforts have been done towards the establishment of a common language for surgical reports. In the

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absence of a common language, lateral oropharyngectomies (LO) are often reported in the literature as 'radical tonsillectomy', 'transoral oropharyngectomy', 'TORS surgical procedure'.

In 2014 de Almeida et al. [14] proposed a classification whose aim was mainly to guide the reconstruction process. In 2017 the SCORL Working Group [15] proposed the 'Transoral Oropharyngeal Resection Classification' in which the authors systematized the various sub-sites of the oropharynx. The limit of these classifications is that they do not take into consideration anatomical depth landmarks and thus we do not obtain synthetic informations on the deep extension of the surgical procedure.

For all these reasons, we believe that there is a need for a common language and an anatomically based classification system. In the present paper we report our LO classification proposal.

Classification proposal

With the aim of providing a classification that is at the same time exhaustive and simple to use, we have based our classification on 3 classes that define the depth of excision and on 4 possible extensions (superior, posterior, inferior, anterior).

Type 1 lateral oropharyngectomy (LO 1)

LO 1 is the resection of the palatine tonsil deep to the pharyngobasilar fascia. In order to guarantee a radical excision, it can include all or part of the palatoglossus arch. This surgical procedure spares the superior constrictor muscle (Fig. 1).

As the entire tonsil could be affected in various degrees of severity, it is necessary to resect it completely. This is undertaken in order to avoid leaving in place a dysplastic or even carcinomatous area.

Because LO 1 ensures a histopathological examination of the entire palatine tonsil, the main role of this surgical procedure is diagnostic.

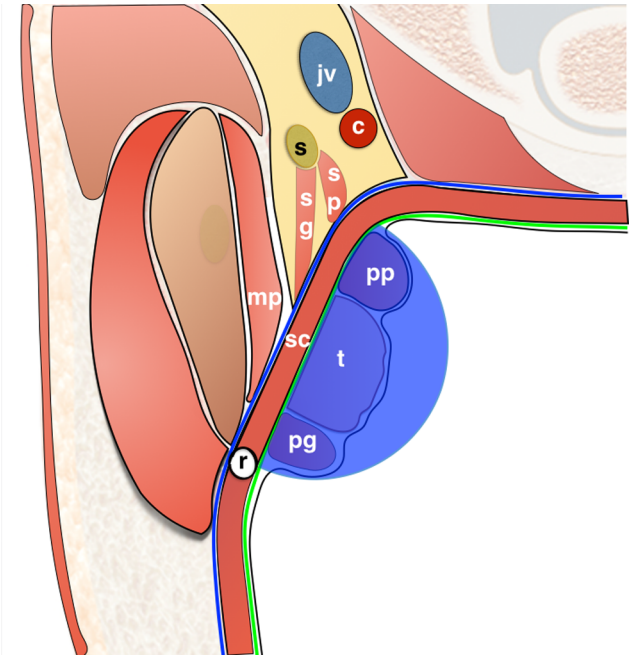

Fig. 1. Type 1 lateral oropharyngectomy (LO 1). LO 1 is the resection of the palatine tonsil deep to the pharyngobasilar fascia (green line) sparing the superior constrictor muscle. jv: internal jugular vein; c: carotid artery; s: styloid process; sp: styloglossus muscle; sp: stylopharyngeus muscle; pp:palatopharyngeal muscle; mp: medial pterygoid muscle; sc: superior constrictor muscle; t: palatine tonsil; pg: palatoglossus muscle; r: pterygomandibular raphe. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

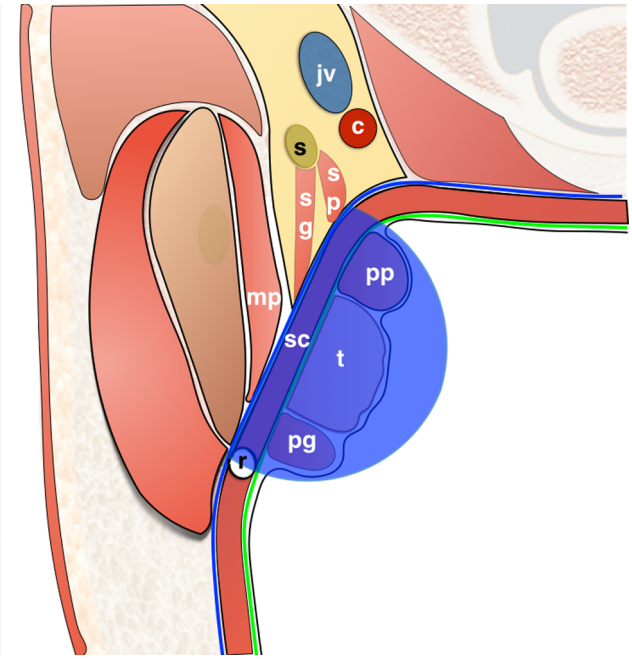

Fig. 2. Type 2 lateral oropharyngectomy (LO 2). LO 2 is performed by removing the entire palatine tonsil, the palatoglossus muscle, the palatopharyngeal muscle and the superior constrictor muscle. The deep limit of the resection is represented by the buccopharyngeal fascia (blue line). Along the lateral aspect of the superior constrictor muscle, stylopharyngeus and styloglossus muscles crosses the dissection plane and should be transected. jv: internal jugular vein; c: carotid artery; s: styloid process; sp: styloglossus muscle; sp: stylopharyngeus muscle; pp:palatopharyngeal muscle; mp: medial pterygoid muscle; sc: superior constrictor muscle; t: palatine tonsil; pg: palatoglossus muscle; r: pterygomandibular raphe. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

It can be therapeutic if histological results confirm a hyperplasia, dysplasia, or carcinoma in situ without signs of microinvasion. If, on the other hand, there are signs of invasive tumor spread, a further procedure is required.

Type 2 lateral oropharyngectomy (LO 2)

LO 2 is performed by removing the entire palatine tonsil, the palatoglossus muscle, the palatopharyngeal muscle and the superior constrictor muscle (Fig. 2). The deep limit of the resection is represented by the buccopharyngeal fascia which covers anteriorly the medial pterygoid muscle and posteriorly the parapharyngeal fat. Since buccopharyngeal fascia represents a strong barrier against the tumor spread, this technique can be used in case of invasive malignant tumors not grossly infiltrating the superior constrictor muscle [12]. During the dissection along the lateral aspect of the superior constrictor muscle, stylopharyngeus and styloglossus muscles crosses the dissection plane and should be transected.

Type 3 lateral oropharyngectomy (LO 3)

LO 3 is performed by removing the entire palatine tonsil, the palatoglossus muscle, the palatopharyngeal muscle, the superior constrictor muscle, the buccopharyngeal fascia with extension to the pterygoid muscle and parapharyngeal space fat content (Fig. 3). Dissection typically start at the pterygomandibular raphe in order correctly identify the superior constrictor and the medial pterygoid muscles. During the dissection immediately posterior to the posterior border of the medial pterygoid muscle, styloglossus and stylopharyngeus muscles

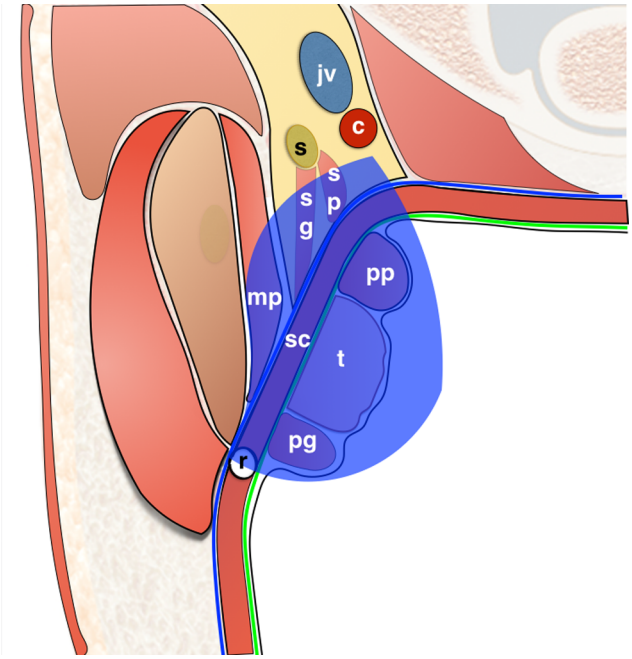

Fig. 3. Type 3 lateral oropharyngectomy (LO 3). LO 3 is performed by removing the entire palatine tonsil, the palatoglossus muscle, the palatopharyngeal muscle, the superior constrictor muscle, the buccophryngeal fascia with extension to the pterygoyd muscle and parapharyngeal space fat content. Styloglossus and stylopharyngeus muscles crosses the dissection plane and should be resected totally or partially to ensure a safe margin from the tumor. jv: internal jugular vein; c: carotid artery; s: styloid process; sp: styloglossus muscle; sp: stylopharyngeus muscle; pp:palatopharyngeal muscle; mp: medial pterygoid muscle; sc: superior constrictor muscle; t: palatine tonsil; pg: palatoglossus muscle; r: pterygomandibular raphe.

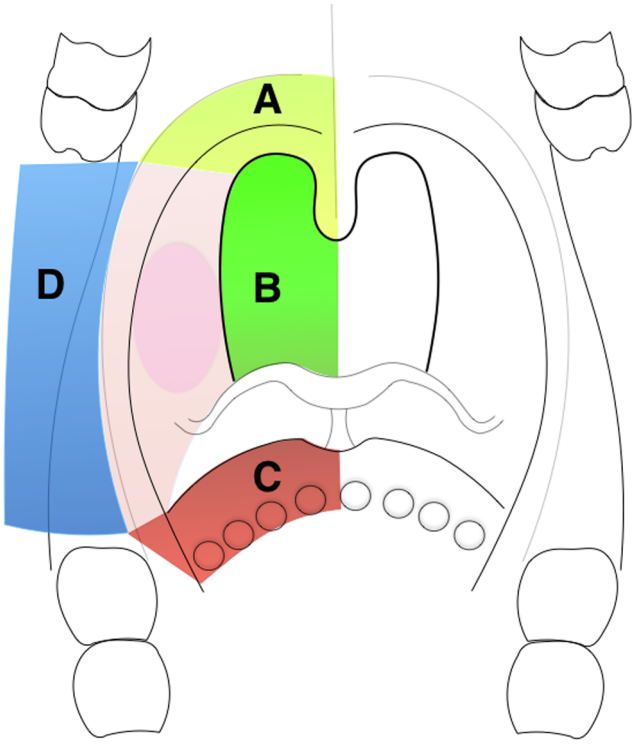

Fig. 4. LO extensions. 'A' suffix indicates the extension of the resection toward the soft palate and its muscles (tensor veli palatini, levator veli palatini) up to midline; 'B' suffix indicates a resection extended to the posterior pharyngeal wall up to the midline; 'C' suffix indicates the extension to the base of tongue; 'D' suffix indicates a resection extended anteriorly toward the retromolar trigone mucosa.

crosses the dissection plane and should be resected totally or partially to ensure a safe margin from the tumor.

This technique can be performed in case of radiological evidence of superior constrictor muscle involvement, in order to obtain safer resection margins. For this reason, by definition, it should not include both medial pterygoid and parapharyngeal space tissue but, based on the extension of the tumor, only medial pterygoid muscle or parapharyngeal space could be included. Parapharyngeal space tissue removal often implies the exposure of the internal carotid artery, thus a flap coverage should be performed.

LO extensions

Based on tumor clinical features, LO can be extended toward different directions: superomedial toward the soft palate, posteriorly toward the posterior pharyngeal wall, inferomedial toward the base of tongue, anteriorly toward the retromolar trigone. Based on the extension of the dissection we can use the suffix A, B, C and D (Fig. 4). In order to synthetically describe the surgical procedures we can obtain different combinations (e.g.: RLO 1B, RLO 2AC etc.)

A: 'A' suffix indicates the extension of the resection toward the soft palate and its muscles (tensor veli palatini, levator veli palatini) up to midline. This resection can include as required the removal of the ipsilateral half of the uvula. This extension is performed in case of tumors involving the palatine tonsil superior pole or extended to part of the soft palate.

B: 'B' suffix indicates a resection extended to the posterior pharyngeal wall up to the midline. Dissection is usually performed using as reference the buccopharyngeal fascia or prevertebral fascia. This extension is usually performed in case of posterior palatine arch tumor extension of macroscopic posterior pharyngeal wall extension.

C: 'C' suffix indicates the extension to the base of tongue. This extension can be performed for diagnostic purposes in type 1 LO when ipsilateral lingual tonsil can be removed or in case of tonsil tumors involving the amigdaloglossus sulcus mucosa or base of tongue. In order to minimize permanent swallowing impairment usually the base of tongue resection does not overcome the midline.

D: 'D' suffix indicates a resection extended anteriorly toward the retromolar trigone mucosa. This extension can be performed in case of macroscopic involvement of the anterior palatine arch and retromolar trigone mucosa involvement. Dissection can be conducted deep to the mandible periosteum including part of the medial pterygoid muscle.

Discussion

The aim of our proposal is to allow the interpretation and comparison of postoperative results achieved by different centers, depending on the extent of the tumor and various surgical indications; it is not our aim to define therapeutic indications.

In fact, we believe that a common classification of LO, which may vary according to surgeon's preference, is necessary in order to understand and compare different postoperative results.

We believe that the guidelines are important in order to obtain reproducible surgical techniques. Developing any guideline requires the development of a common language in terms of procedural classification, and this is not available today. Our classification should fill this gap. Furthermore, this system can be useful to improve the teaching and training of inexperienced surgeons.

This is a classification of LO and the proposed classification remains valid independent of the surgical system, the technique, or the instrument used for surgery (electrocautery, ultrasound, CO^2 laser, YAG laser or thulium laser).

To describe more extensive procedures, we included suffixes. For

example, a resection extended deep to the superior constrictor muscle and extended to base of tongue and posterior pharyngeal wall can be synthetizes as a LO2 BC.

Thus, each type of lateral oropharyngectomy in the present classification is defined by 3 alternative numbers which define the depth of excision and by 4 suffixes which could be used in various combinations depending on the different extensions. Definition via a number is more comprehensible for surgeons still unfamiliar with the proposed classification. The numerical definitions are, however, accompanied by a alphabetical classification, which is short to enumerate and therefore more practical in everyday practice. Obviously, this definition can only stand out if the classification becomes a reference such as the TNM classification. Until that time, the present classification avoids the risk of confusion with other existing personal classifications.

Since this classification refers to LO procedures it can't be used to classify all oropharyngeal subsites but only procedures in which primary tumor originates from tonsillar area. However, about 80% of oropharyngeal primary tumors originate from tonsillar fossa.

Our proposed classification results from an agreement among the different authors.

We chose a simple categorization. A more sophisticated one might have been more rigorous but less practical for everyday practice.

Declaration of Competing Interest

The authors declared that there is no conflict of interest.

Acknowledgments

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