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HEAD AND NECK

Classification of parotidectomies: a proposal of the European Salivary Gland Society

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Abstract The objective of this study is to provide a comprehensive classification system for parotidectomy operations. Data sources include Medline publications, author's experience, and consensus round table at the Third European Salivary Gland Society (ESGS) Meeting. The Medline database was searched with the term "parotidectomy" and "definition". The various definitions of parotidectomy procedures and parotid gland subdivisions extracted. Previous classification systems re-examined and a new classification proposed by a consensus. The ESGS proposes to subdivide the parotid parenchyma in five levels: I (lateral superior), II (lateral inferior), III (deep inferior), IV (deep superior), V (accessory). A new classification is proposed where the type of resection is divided into formal parotidectomy with facial nerve dissection and extracapsular dissection. Parotidectomies are further classified according to the levels removed, as well as the extraparotid structures ablated. A new classification of parotidectomy procedures is proposed.

Keywords Parotid neoplasm · Parotid tumors · Parotid benign tumors · Parotid malignant tumors · Parotid gland · Parotid gland surgery · Parotidectomy · Parotidectomy classification · Extracapsular resection

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Introduction

Different options co-exist nowadays for treating tumors of the parotid gland, and there is no standard way to report the extent of resection performed in each case. In an effort to improve this situation, the European Salivary Gland Society (http://www.esgs.eu/) would like to propose a classification system in order to have a common way to report surgery and to facilitate scientific communication.

The classification is an evolution from a previous classification proposed by the first author. The consensus evolved from presentations and round table discussion which included the authors of this article, during the Third International Congress on Salivary Gland Diseases held in 2012 in Geneva, Switzerland.

Historical context

The evolution of surgery for tumors of parotid gland went from very limited surgery in the nineteenth century (enucleation), associated with rates of recurrence in pleomorphic adenoma from 20 [1] to 40 % [2], to a more extensive surgery that obtained significant improvement in the rate of

recurrences [3]. This was well stated by Patey in 1954: "The most striking change in the surgery of the parotid gland in the last 10 years has been the trend towards the replacement of enucleation of pathological swellings, without formal exposure of the facial nerve, by techniques in which the facial nerve and its branches are deliberately exposed and preserved as a preliminary to bold, wide and often total removal of the gland. The main factor responsible for this change has been the general dissatisfaction at the high incidence of recurrence of mixed parotid tumours after enucleation" [3]. This more formal surgery, progressively introduced in the mid-twentieth century [3], consisted mostly of *lateral parotidectomy* (also called superficial or suprafacial or exofacial) as the minimal technique for the majority of schools. However, for a few institutions, the minimum accepted surgery, even for benign disease, was *total parotidectomy* with facial nerve preservation [4].

In 1950, Klopp and Winship used for the first time the term *subtotal parotidectomy* [5]. They realized that the parotid gland has numerous and variable extensions and "while these prolongations may frequently be removed in subtotal parotidectomy, the margin of excision is so slim that no claim should be made to total removal of all parotid cells" [5]. This statement is quite realistic and has been used by other authors [6, 7], but, the term subtotal parotidectomy has taken a different meaning for others [8, 9]. The same resection was also called "near-total parotidectomy" [10] or "extended superficial parotidectomy" [8].

In 1982, Stevens and Hobsley [11] used several different terms: the names primary and secondary parotidectomy were employed for initial and revision parotid surgery and the term *semi-conservative parotidectomy* used for cases where part of the facial nerve is sacrificed during surgery.

This movement towards more extensive surgery was contested from the 1980s, mainly in Great Britain [12–14]. In this context, the term "capsular dissection" appears, defined as a "meticulous dissection just outside the capsule of the tumor where a plane of cleavage is usually found" [14]. Extracapsular dissection attempts to completely resect the benign tumor in contradistinction to enucleation which basically "expressed" the tumor from its capsule, without the goal of its complete removal.

In 1984, Donovan and Conley [15] reviewed the weaknesses of traditional parotid operations: (1) the monobloc concept is violated in instances where the nerve enters the tumor or in deep lobe tumors; (2) often (60 %) the neoplasm is in such proximity to the nerve that some form of limited capsular excision must be carried out, to preserve the nerve [15]. This statement and the results from other studies [16, 17] have encouraged surgery, less extensive than a complete superficial parotidectomy. Lyle [18], Vandenberg et al. [19], Yamashita et al. [20], and Leverstein et al. [21] speak of "partial parotidectomy" and O'Brien et al. [22] of "limited superficial parotidectomy". Progress in imaging studies, fine needle aspiration biopsy and facial nerve monitoring [23–27] might be responsible for the recent popularization of resections, which are not enucleations but are less than a complete superficial parotidectomy.

Finally, malignant cases are sometimes treated with radical parotidectomy, where the entire parotid gland and the facial nerve were removed en bloc with various amounts of surrounding, non-parotid tissue.

Thus, at present, all these surgical options coexist for the treatment of a parotid tumour and include, from the least to the highest volume of resection: extracapsular dissection, partial lateral parotidectomy, lateral parotidectomy, total parotidectomy with preservation of the facial nerve, and radical parotidectomy.

Such a variety of techniques, along with certain dispersion in the criteria that define them, has led to some confusion about the surgery performed in each situation and about the extent of resection. So, the ESGS believes there is a need for a rational and clear nomenclature for the different types of parotidectomy in order to facilitate scientific communication.

Parotidectomy classifications

Different authors have proposed classifications for parotid surgeries. For example, Snow [28] (Table 1) proposed to consider five types of surgery: superficial parotidectomy, total parotidectomy (those two were called formal parotidectomies), partial superficial parotidectomy, selective deep lobe parotidectomy (he calls them partial parotidectomies) and finally extracapsular dissection. In 2009, Tweedie and Jacob [29] (Table 2) proposed a revised classification subdividing total parotidectomy into total parotidectomy with and without facial nerve resection. Also they added the prefix "complete" to the superficial parotidectomy and divided the partial superficial parotidectomy in three segments: upper, middle and lower, each of them being possible with and without deep lobe resection.

Table 1 Snow's [28] classification

Formal parotidectomy	Superficial parotidectomy
	Total parotidectomy
Limited operations	Partial superficial parotidectomy
Partial parotidectomy	Selective Deep Lobe parotidectomy
Limited operations	Extracapsular dissection
Extracapsular dissection	

Table 2 Tweedie and Jacob's [29] classification

1	Total parotidectomy	± Facial nerve resection
2	Complete superficial parotidectomy	
3	Partial superficial parotidectomy	
	Upper segment	± Deep lobe dissection
	Middle segment	± Deep lobe dissection
	Lower segment	± Deep lobe dissection
4	Selective deep lobe parotidectomy	
5	Extracapsular dissection	

Levels in parotid surgery

In 1989, a Japanese group [30] proposed to divide the partial superficial parotidectomy according to the segment of gland removed with respect to the divisions of the facial nerve. They divided this partial superficial parotidectomy into: (1) over the upper division; (2) over middle portion, over both divisions, (3) over the lower division and finally (4) most inferior part, parotid tail.

In 2010, a Spanish group [31] proposed to divide the parotid gland into five levels to report the surgery performed: I (lateral superior), II (lateral inferior), III (deep superior), IV (deep inferior), V (accessory), and to classify the resection performed reporting the levels removed. The separation between superior and inferior was established with an imaginary line connecting the bifurcation of the facial nerve trunk into its two major branches (temporofacial and cervicofacial) with Stensen's duct. Basically, the superior level is the area corresponding to the branch of the temporofacial nerve and the inferior level the area of the cervicofacial branch.

The ESGS proposes to accept and use this Barcelona classification with a modification. The modification consists in changing level III to IV and vice versa, providing a more logical continuity between the inferior parts of the gland (levels II and III in the ESGS classification). So the levels proposed by the EGSG are: I (lateral superior), II (lateral inferior), III (deep inferior), IV (deep superior), V (accessory). Using these five levels will facilitate defining, reporting on, and comparing the resections performed in parotid surgery (Table 3, Figs. 1, 2).

Definitions

We propose to use only two terms to define the parotid surgery: extracapsular dissection and parotidectomy (Table 4).

The term extracapsular dissection (ECD) should be used when no facial nerve dissection is performed or <1 level is removed.

Table 3 EGSG level classification (modified from Quer et al. [31])

Anatomical site	Level
Superficial superior	I
Superficial inferior	II
Deep inferior	III
Deep superior	IV
Accessory	V

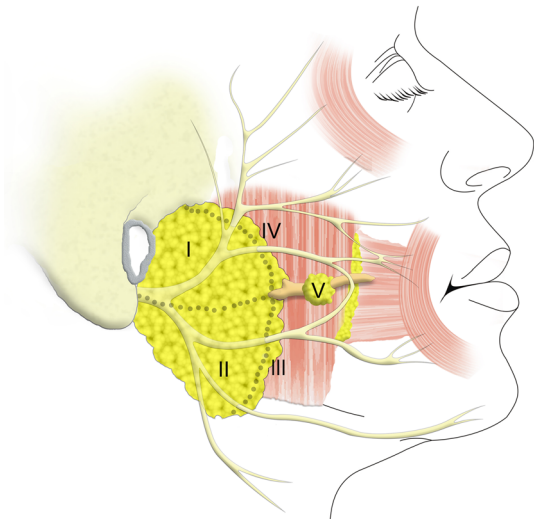

Fig. 1 ESGS division in five levels (modified from Quer et al. [31]). The division in five levels: I (lateral superior), II (lateral inferior), III (deep inferior), IV (deep superior), V (accessory). The superior level is the area corresponding to the branch of the temporofacial nerve and the inferior level the area of the cervicofacial branch

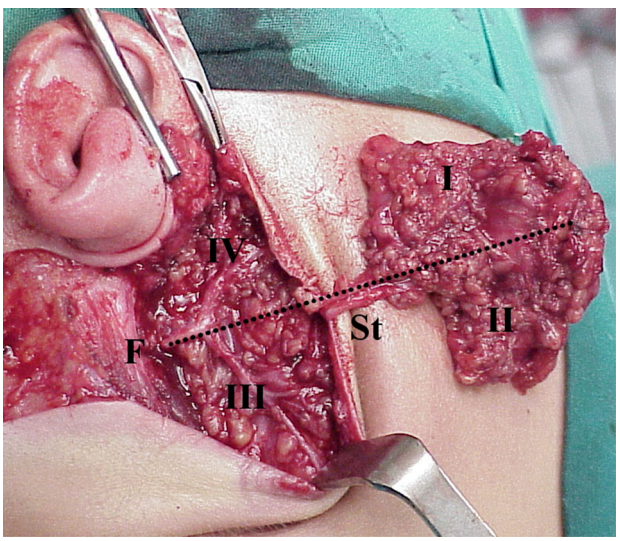

Fig. 2 ESGS division in five levels (modified from Quer et al. [31]). A case of lateral parotidectomy showing the four levels. The separation between superior and inferior was established with an imaginary line connecting the bifurcation of the facial nerve trunk (*F*) in its two major branches (temporofacial and cervicofacial) with Stensen's duct (*St*)

Table 4 ESGS definitions of resections

Term	ESGS definition
Parotidectomy	Two conditions needed
	Dissection of the facial nerve (at least the main trunk and one the two major divisions—temporofacialis, cervicofacialis)
	At least one level is removed
Extracapsular dissection (ECD)	At least one condition
	No facial nerve dissection performed and/or
	Less than one level removed

The term parotidectomy should be used when two conditions are fulfilled: dissection of the facial nerve (at least the main trunk and one the two major divisions) and removal of at least one level.

ESGS classification

All parotid resections are termed parotidectomy or extracapsular dissection. The extent of parotid resection is further specified by the parotid levels and by the extra-parotid structures removed.

A. Parotidectomy

1. The term parotidectomy is the first component of the description. A prefix should be included to denote the side using the abbreviation L for left, and R for right. If bilateral, both sides must be classified independently.
2. The second component of the description should be the level or levels removed, each designated by the Roman numerals I through V, in ascending order.
3. The third component of the description should be the non glandular structures removed, each identified through the use of specified acronyms (symbols), all of which have been universally accepted (Table 5).

B. Extracapsular dissection

1. The symbol "ECD" should be used to represent the term extracapsular dissection and applied as the first component of the description. A prefix should be included to denote the side using the abbreviation L for left, and R for right. If bilateral, both sides must be classified independently.
2. The second component of the description should be the level where the tumor was located (level I or level II; it does not mean that both levels have been completely removed, it just means the tumor was located in this level).

Table 5 Non-parotid structures that could be removed

Symbol	Definition
CN VII	Facial nerve trunk and/or all the main branches (*)
CN VII t-z-b-m-c	Facial nerve branches (*)
ECA	External carotid artery
GAN	Greater auricular nerve
LTB	Lateral temporal resection
MB	Mastoid bone
MM	Masseter muscle
S	Skin
Others to be defined	

* In the case of facial nerve, when all the nerve has been sacrificed just use CN VII, but when the surgeon has sacrificed just some branches then CN VII z for example means the surgeon has removed only the zygomatic branches

Discussion

The evolution of the extension of the resection in the treatment of benign and malignant tumors of the parotid gland has ranged from limited resections to total parotidectomy [4, 32]. At present there is a tendency to use limited surgeries, especially in small benign tumors. A recently published clinical trial has concluded that more functional surgery in benign tumors enables better cosmetic results, with better sensitivity, less morbidity and equal tumor control [33]. However, in practice there are still various coexisting surgical options and each of these surgeries is subject to different interpretations. As a consequence of this situation it is difficult to exchange information on the extent of surgery and it is very difficult to compare results.

Different authors have proposed classification systems for parotid surgery and have defined basically six types of resection: radical parotidectomy, total parotidectomy, complete superficial parotidectomy, partial superficial parotidectomy (with different subdivisions), selective parotidectomy of the deep lobe, and extracapsular dissection. Although these approaches has helped clarifying surgical options, in our opinion there are still a lack of clarity, especially in defining different partial superficial parotidectomies and with combinations of removals (for example, resection of superficial and deep lobe in the tail of the parotid).

The Barcelona group [31] proposed to use levels for define parotid areas in a similar way it has been used in neck dissections where levels helped to unify nomenclature [34]. EGSG recommends to follow this level classification system with a modification (change level III for IV and vice versa). The level classification system is easy and

flexible and can help to explain the resection performed. The level classification uses clearly recognizable anatomical landmarks, and from clinical and surgical points of view this division is of obvious interest. Most benign parotid tumors are located in what is generally known as the "tail" of the parotid gland, i.e. the inferior part, defined as level II when lateral and level III when deep to the facial nerve. Since deep lobe resections are more frequent in the inferior parotid, the ESGS proposed modification of the deep lobe levels might facilitate the use of this classification.

The ESGS would like to clearly define the term extracapsular dissection. Extracapsular dissection should be used when there is no attempt to dissect the facial nerve or <1 level is removed. In the majority of cases ECD is performed for small tumors, so in these cases the two conditions are evident (no facial nerve dissection and <1 level removed). However, two unusual situations exist that we would still denote ECD. The first one may occur in a more voluminous tumor (at least one level) when the surgeon decides to remove it without dissection of the facial nerve, so in this case one level or more are removed but without facial nerve dissection. The second situation that can be described as ECD might occur with a small tumor in the upper or lower part of the gland: the surgeon dissects the facial trunk and the upper or the lower division, but realizes that the tumor is very small and could be removed with a slice of healthy parotid tissue that is clearly much <1 level. For these reasons the ESGS classification defines extracapsular dissection with two conditions that are usually both present but in unusual cases only condition suffices to qualify as ECD.

The fact that ECD is a recognized form of parotid resection reflects its use by certain surgeons and is thus included to provide a comprehensive classification of parotidectomies. It should not be seen as a endorsement by ESGS of this type of approach for parotid tumors and especially for pleomorphic adenoma where it could lead to an increased incidence of difficult to treat recurrences because of pseudopodia and an absent capsule [35, 36].

In contrast, when the facial nerve is dissected and at least one level is removed the operation should be defined as parotidectomy. Once the distinction between parotidectomy and ECD is clear, the extension of the resection can be specified (as in neck dissections) with the use of two components: the levels removed and the non-parotid structures removed. With these two components any surgeon can understand what has been done. Some examples of correspondence between the newly proposed classification and classical terms can be found in Table 6.

Table 6 Comparison of the new proposed classification and classical terms

ESGS proposal	Classical classifications
Parotidectomy I–IV (VII)	Total parotidectomy with facial nerve resection
Parotidectomy I–IV	Total parotidectomy with facial nerve preservation
Parotidectomy I–IV (VII, S, MM)	Extended total parotidectomy with facial nerve resection plus skin and masseter muscle resection
Parotidectomy I–II	Superficial parotidectomy
Parotidectomy III–IV	Deep lobe parotidectomy
Parotidectomy I	Partial superficial parotidectomy
Parotidectomy II	Partial superficial parotidectomy
Parotidectomy I–II–III	Superficial parotidectomy extended to the inferior deep lobe
Parotidectomy V	Accessory lobe removal
ECD I	Extracapsular dissection with tumor in level I
ECD II	Extracapsular dissection with tumor in level II
ECD V	Extracapsular dissection with tumor in level V

Conclusion

In conclusion, the ESGS proposes a classification system that appears to be simple and easy to use in order to define the surgery performed in each parotid resection. This classification simplifies the description of the surgery performed even in unusual resections.

Compliance with ethical standards

Conflict of interest None.

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