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Improving Surgical Guidelines for Parotid Tumours: Insights on the European Salivary Gland Society Classification from Clinical Practice



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Abstract

Objective: This study evaluates the European Salivary Gland Society (ESGS) classification system's effectiveness in guiding surgical decision-making for benign parotid tumours. This study aims to identify limitations and propose refinements to optimise classification accuracy and surgical outcomes.

Material and Methods: Operative records of patients who underwent parotidectomy for benign parotid tumours between 2015 and 2019 were analysed. Tumours were classified using the ESGS system, and the recommended surgical approaches were compared with actual practices. Facial nerve paralysis rates and deviations from the ESGS guidelines were assessed.

Results: Among the 185 patients, 55.6% had pleomorphic adenomas, 37.8% had Warthin's tumours, and %6.4 had other benign tumours, with a mean follow-up of 18.72 months. Postoperative facial nerve paralysis occurred in 10.81%, increasing in the advanced ESGS categories with a permanent paralysis rate of 3.24%. All Category I tumours were managed with either a one-level parotidectomy or extracapsular dissection (ECD), aligning well with the ESGS recommendations. However, 22% of Category II Warthin's tumours required more extensive resections, suggesting that the recommendation should be revised to "one- or two-level parotidectomy (most often partial superficial) or ECD." For Category III tumors, compliance with the guideline was complete for Warthin tumors. However, the surgical management deviated from the guidelines in two cases of deep lobe pleomorphic adenomas. The recommendation should be revised to "two-level parotidectomy (more commonly superficial); tumours located in the deep lobe can be treated with three- or four-level parotidectomy." It is also necessary to acknowledge that the guideline does not address multifocal benign tumours.

Conclusion: The ESGS classification offers a valuable framework for surgical planning in benign parotid tumours; however, refinements are suggested to improve applicability, particularly for multifocal and deep lobe tumours. Further studies with larger cohorts are recommended to refine these guidelines, enhancing their efficacy in surgical decision-making.

Keywords

Parotid Neoplasms • partial Superficial Parotidectomy • Pleomorphic Adenoma • Superficial Parotidectomy • Warthin's Tumour



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INTRODUCTION

The surgical approach to parotid tumours has changed significantly since its first description. There has been a shift from extensive procedures towards more limited surgical approaches, particularly for benign tumours (1, 2). The main principle remains the same for all benign neoplasms: complete tumour removal while preserving the facial nerve. However, the extent of resection varies depending on the tumour's size and location within the gland. This variation leads to a complex nomenclature for parotidectomies (3).

To standardise this terminology, the European Salivary Gland Society (ESGS) introduced a level classification system for parotidectomies, similar to the system used for neck dissections. This system divides the parotid gland into five levels (I-V). Levels I-IV are defined using reference marks in the sagittal and transverse planes, whereas Level V corresponds to the accessory parotid gland. The transverse plane is marked by an imaginary line from the facial nerve trunk to Stensen's duct, and the sagittal plane is defined by the point where the facial nerve crosses the salivary parenchyma. According to these axes, Level I is located lateral to the facial nerve plane and superior to the imaginary line. Level II represents the caudal part of this area. Levels III and IV correspond to the parotid parenchyma, which is medial to the facial nerve, also known as the deep lobe. The deep lobe parenchyma inferior to the imaginary line is labelled as Level III, while the superior part is called Level IV (1).

Building on this classification system and considering tumour size, Quer et al. proposed guidelines for selecting the optimal surgical approach for benign lesions. They developed a four-category classification for pleomorphic adenomas and Warthin's tumours, recommending the appropriate extent of surgical resection for each category (4).

The primary objective of this study was to evaluate the applicability of the ESGS classification system in our cohort of patients undergoing parotidectomy and to assess its effectiveness in guiding surgical decision-making. The secondary objective is to identify the specific challenges and limitations in the current classification system, particularly in cases with unique tumour characteristics or location-based challenges, and to propose potential refinements to improve the classification accuracy.

MATERIAL AND METHOD

The study was approved by the Ankara University Ethics Committee (Date: 25.02.2019, No: 04-297-19) and performed in accordance with good clinical practice and applicable regulatory requirements. A retrospective study was designed

based on the intraoperative photographic analysis. In our institute, intraoperative photo-documentation is routinely performed for all head and neck surgeries and is archived digitally. High-resolution images are captured using a digital underwater camera, which is immersed in a 2% glutaraldehyde solution for sterilisation before use. The images are taken by the operating surgeon or an assistant at key surgical stages, ensuring proper visualisation of the tumour location, its relation to the facial nerve, and the extent of gland resection. Photographs are stored in the clinic's digital archive and indexed by patient name, operation time, and procedure type.

The operative records of patients diagnosed with benign parotid tumours and who underwent parotidectomy between 2015 and 2019 at an academic institute were evaluated. A minimum postoperative follow-up period of 1 year was required for inclusion in the study.

All patients underwent a standardised preoperative evaluation to evaluate tumour characteristics and plan the surgical approach. Ultrasonography and/or MRI examination were performed in all cases, and ultrasound-guided fine-needle aspiration cytology (FNAC) was conducted before surgery. Only patients with complete preoperative radiological reports and intraoperative photographic documentation were included.

Patients were included in the study cohort if their primary treatment and all follow-up evaluations were conducted within our department. Each follow-up visit consisted of a clinical examination and an assessment of facial nerve function using the House-Brackmann grading system.

A total of 224 patients were initially identified. However, 39 patients were excluded due to inadequate photographic documentation. The most common reasons for exclusion were missing images of the tumour's exact location, incomplete photographic records of the surgical steps, or unclear intraoperative images due to poor resolution or improper camera angle. Additionally, patients under 18 years of age or those who had undergone revision surgeries were excluded.

Demographic characteristics (age and sex) were reviewed. Facial nerve neuromonitoring was performed during surgery in all cases. Each tumour was classified by two experienced otorhinolaryngologists (SY, MKG) according to the criteria proposed by Quer (4). Size information was obtained from radiological imaging reports, and the location was determined using intraoperative photographs. Tumours measuring 3 cm or smaller, superficial, mobile, and near the parotid borders were classified as Category I. Category II tumours were smaller than 3 cm and deep or far from the parotid borders. Tumours larger than 3 cm that involved two parotid levels were classified



as Category III, while those involving more than two levels were classified as Category IV (4). The recommended surgical approach by the ESGS for each category was compared with the surgery that was performed. Any discrepancies were noted.

Statistical analysis

Statistical analysis was performed using the chi-square test in SPSS Statistics version 29, (IBM SPSS Corp., Armonk, NY, USA). P-value < 0.05 were considered significant.

RESULTS

The study population consisted of 185 patients (119 men and 66 women) with a mean age of 50.41 ± 12.60 years (min 18-max 79 years). The mean follow-up period was 18.72 months (min 12-max 36). In the final histopathological analysis, 55.6% of the cases were diagnosed as pleomorphic adenomas, 37.8% as Warthin's tumours, and 6.4% as other benign tumours. The descriptive statistics are given in Table 1.

For Category I pleomorphic adenomas, the recommended surgical approach is either a one-level parotidectomy or extracapsular dissection (ECD) (4). In our cohort, there were 19 Category I pleomorphic adenomas:

15 patients underwent a one-level parotidectomy, while 4 patients received ECD. None of the patients developed permanent or temporary facial nerve paralysis.

For Category II pleomorphic adenomas, the recommended treatment is a one- or two-level parotidectomy (4). Our dataset included 61 category II tumours. A two-level parotidectomy was performed in 48 cases. Of these, 46 involved the excision of levels I and II, while 2 involved the excision of levels I and IV. In 13 cases, single-level dissection was sufficient for complete tumour removal.

For Category III pleomorphic adenomas, the recommended surgical approach is a two-level parotidectomy (4). Among the 20 tumours classified as category III, 18 patients underwent a two-level parotidectomy. Of these, 16 involved resections at levels I and II, while 2 involved resections at levels II and III. In two cases, the tumour was at levels III and IV. To access it, the surgeon performed a partial superficial parotidectomy (levels I and II), identified the facial nerve branches, and then proceeded with tumour resection (Figure 1).

In this study, there were only three Category IV pleomorphic adenomas. The recommended surgical approach for Category IV tumours is a three- or four-level parotidectomy (4). A three-

Table 1. Demographic, pathological, and clinical characteristics of the cases

	Pleomorphic adenomas	Warthin's tumour	Other benign tumours
Number of tumours (n)	103	70	12
Mean age (years)	45.41 ± 13.28	57.07 ± 7.18	39.75 ± 15.74
Gender (Female/Male)	47/56	13/57	4/8
Median tumour size (mm)	22 (min 13-max 80)	27 (min 15 -max 72)	21 (min 17-max 26)
Mean follow-up period (months)	18.27 (min 12-max 30)	16.75 (min 12-max 30)	21.16 (min 12-max 36)
Location of tumour			
Level I -II	35	24	5
Level II	28	27	4
Level I	13	9	2
Level II-III	9	8	0
Level III	7	1	0
Level IV	5	0	0
Level III-IV	3	0	0
Level I-II-III	3	0	1
Multifocal	0	1	0
ESGS Category** (n)			
Category I	19	21	6
Category II	61	22	6
Category III	20	26	0
Category IV	3	0	0
Unclassified	0	1	0

ESGS: European Salivary Gland Society, * According to ESGS level system, **According to ESGS classification proposal

level parotidectomy was performed in two cases, while a four-level parotidectomy was performed in one case. Figure 2 shows the ESGS categories and the surgical modalities used for tumour removal.

In the Warthin's tumour cohort, 21 tumours were classified as Category I, 22 tumours as Category II, 26 tumours as Category III. There were no Category IV Warthin's tumours in our series. One Warthin's tumour could not be classified due to its multifocality.

For Category I Warthin's tumours, the recommended surgical approach is a one-level parotidectomy or ECD (4). ECD was performed in six cases, while the remaining 15 tumours were treated with a one-level parotidectomy.

For Category II Warthin's tumours, the recommended approach is a one-level parotidectomy or ECD (4). A one-level parotidectomy was performed in 17 cases, while a two-level dissection was performed in five cases.

The recommended surgical approach for Category III Warthin's tumours is either a two-level parotidectomy or, in selected cases, ECD (4). A two-level parotidectomy was performed for 24 tumours, while ECD was performed for the remaining two tumours.

Among the 12 other benign parotid tumours, the distribution of histopathological diagnoses is presented in Table 2. Fifty percent of these tumours were classified as Category I, while the remaining were classified as Category II. ECD was performed in two cases. In one oncocytoma case, a three-level parotidectomy was conducted because of the deep-lobe location of the tumour. The remaining cases underwent either a one-level parotidectomy (n=4) or a two-level parotidectomy (n=5).

The overall incidence of postoperative facial nerve paralysis was 10.81% (n=20). Of these cases, 70% (n=14) were temporary and fully recovered during follow-up. The rate of permanent

Table 2. Distribution of histopathological diagnoses of other benign parotid tumours

Histopathological diagnosis	Number of cases (n)
Myoepithelioma	5
Oncocytoma	2
Lymphadenoma	2
Sebaceous adenoma	1
Basal cell adenoma	1
Cystadenoma	1
Total	12

facial nerve paralysis was 3.24%. The incidence of facial nerve paralysis increased significantly as the ESGS category advanced ($p=0.034$) (Figure 3).

DISCUSSION

This study provides a critical evaluation of the ESGS classification system in guiding surgical decision-making for benign parotid tumours, highlighting both its strengths and limitations. While previous studies have validated the classification framework, our findings underscore the need for refinements, particularly in the surgical management of multifocal Warthin's tumours and deep-lobe lesions. By systematically comparing ESGS recommendations with real-world surgical practices, our analysis identifies key areas where refinements could enhance the applicability and accuracy of the classification system. The proposed refinements for the guidelines are listed in Table 3.

In this study, the surgical procedures performed were largely consistent with the ESGS guidelines, especially for Category I tumours. All Category I tumours were managed with a one-level parotidectomy or ECD, aligning well with the ESGS recommendations (4). No recurrence or facial nerve paralysis was observed in either one-level parotidectomy or ECD cases. However, in our cohort, ECD was performed in only a

Table 3. The proposed refinements to the ESGS surgical guidelines for pleomorphic adenomas and Warthin's tumours

Category	Pleomorphic adenoma		Warthin's tumour	
	ESGS guidelines	Proposal for change	ESGS Guidelines	Proposal for change
Category I	Parotidectomy one level or ECD	None	Parotidectomy one level or ECD	None
Category II	Parotidectomy at one or two levels	None	Parotidectomy one level or ECD	Parotidectomy at one or two levels, or ECD
Category III	Parotidectomy at two levels	Parotidectomy two levels; tumours located in the deep lobe can be treated with three- or four-level parotidectomy	Parotidectomy at two levels, ECD in selected cases	None
Category IV	Parotidectomy at three or four levels	None	Parotidectomy at three or four levels	None

ECD: Extracapsular dissection, ESGS: European Salivary Gland Society



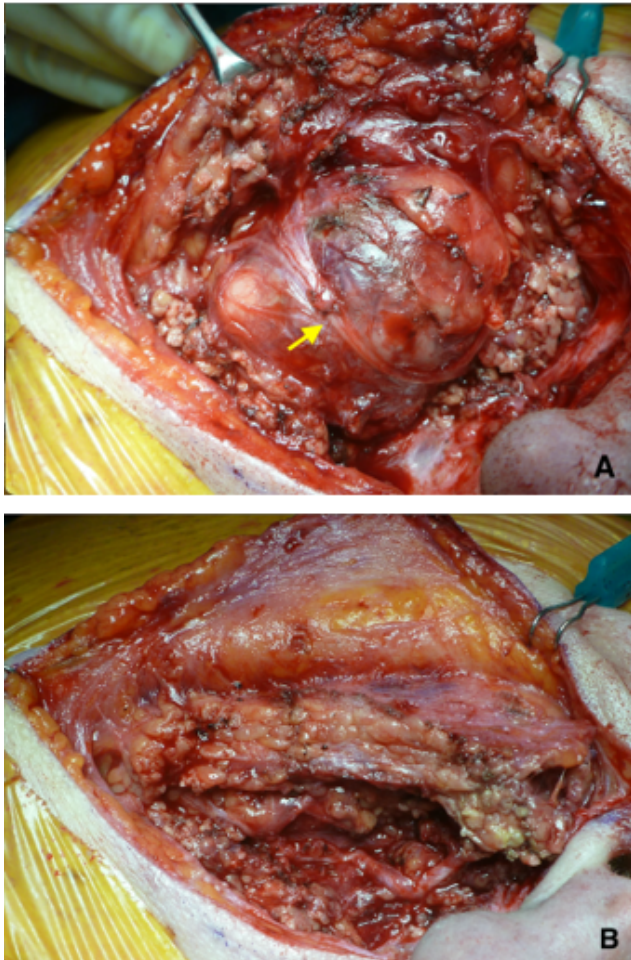


Figure 1. Category III Pleomorphic Adenomas

A. The surgical site shows a pleomorphic adenoma at levels III and IV of the left parotid gland. The cervicofacial branch is visible above the tumour (arrow). B. The surgical site after tumour removal, showing partial resections of levels I and II.

small subset of cases, limiting our ability to draw definitive conclusions regarding the equivalence of outcomes and complication rates between ECD and parotidectomy.

ECD remains a topic of significant debate in the management of benign parotid tumours (5). While many authors advocate ECD as an effective technique offering favourable facial and cosmetic outcomes, others argue that it is linked to higher recurrence rates and a greater risk of facial nerve paralysis (6, 7). A key issue is the comparison of heterogeneous lesions: comparing deep or large lesions with small, superficial ones may lead to misleading conclusions. Categorising lesions and comparing surgical outcomes for similar cases would enable better -informed decision-making when selecting the optimal surgical technique.

For Category II tumours, full compliance with the guidelines was observed in pleomorphic adenomas; however, some discrepancies were noted in Warthin tumours. For Category

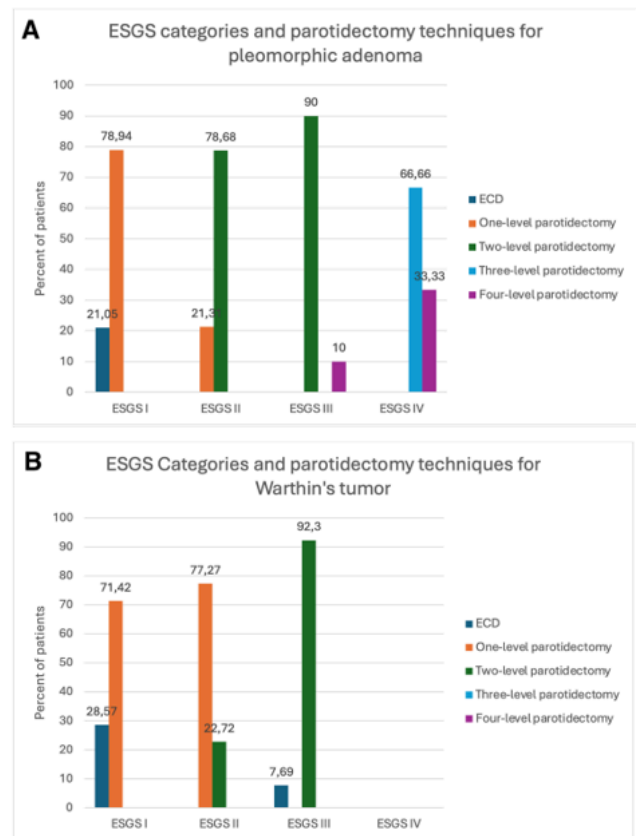


Figure 2. ESGS categories and surgical techniques performed for pleomorphic adenoma (A) and Warthin's tumour (B)

ECD: Extracapsular dissection, ESGS: European Salivary Gland Society

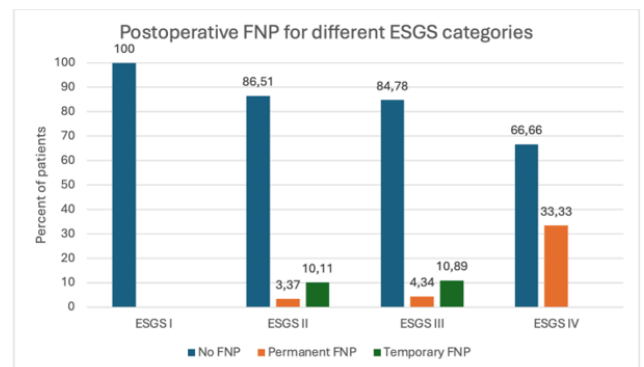


Figure 3. Incidence of postoperative facial nerve paralysis (FNP) according to the ESGS categories

ESGS: European Salivary Gland Society, FNP: Facial nerve paralysis

II Warthin's tumours, the recommended surgical options are one-level parotidectomy or ECD (4). However, in our cohort, certain Warthin's tumours required a two-level parotidectomy. The primary reason for this discrepancy was the tumour's location. Some tumours were positioned between levels I and II, necessitating the partial resection of both levels (Figure 4). To address these clinical challenges, Wong et al. proposed a modification to the ESGS level system, subdividing levels I

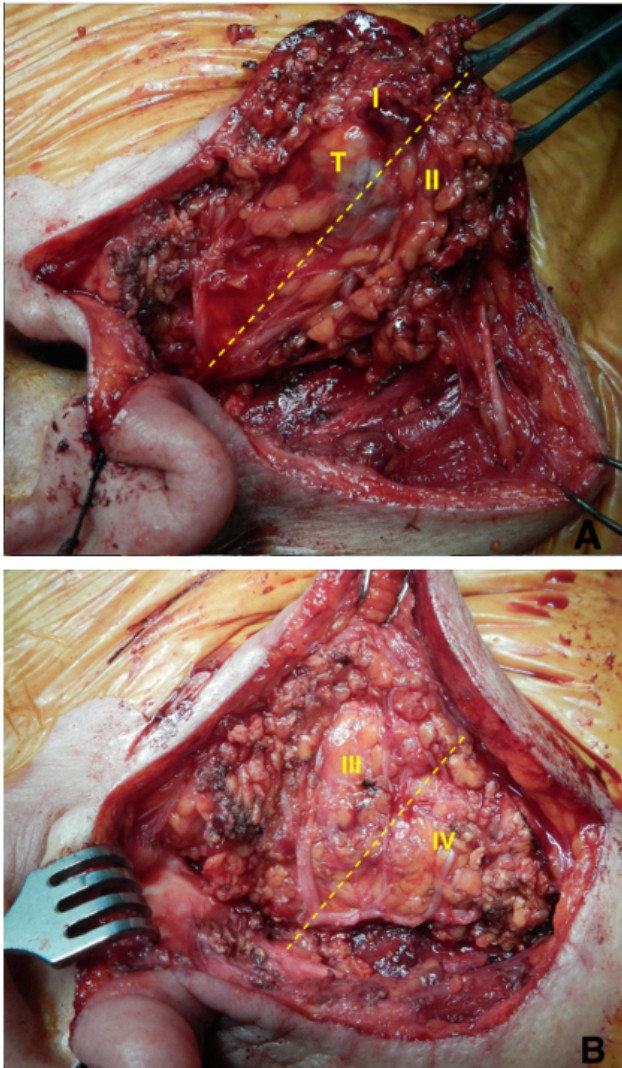


Figure 4. A case of parotidectomy showing a category II Warthin's tumour (T) located between levels I and II

A. The separation between the levels was established by an imaginary line drawn from the bifurcation of the facial nerve towards Stensen's duct. **B.** Surgical site after tumour removal. A two-level parotidectomy (levels I and II) was performed. T: Tumour

and II into Ia, Ib, IIa, and IIb (8). Additionally, Nishimura et al. introduced a more detailed classification of benign parotid lesions into eight subgroups (9). While these proposals provide better specificity regarding tumour location within the gland, they also introduce a more complex and potentially confusing nomenclature. We believe that the ESGS level system remains practical due to its simplicity; however, the surgical recommendations for category II Warthin's tumours should be revised to "one- or two-level parotidectomy (most often partial superficial) or ECD."

According to the ESGS guidelines, the recommended surgical approach for Category III tumours is a two-level parotidectomy. For very superficial Warthin tumours, extracapsular dissection (ECD) is suggested as an alternative

(4). In our cohort, compliance with these guideline recommendations was complete for Warthin tumours. However, the surgical management deviated from the guidelines in two cases of pleomorphic adenoma. Both tumours were in the deep lobe (levels III and IV). To access them, a partial superficial parotidectomy was performed, followed by tumour removal beneath the branches of the facial nerve.

Deep lobe tumours in the presence of a particular challenge due to difficult access and limited field exposure (10, 11). In the past, the standard approach to deep lobe tumours involved a near-total parotidectomy, often requiring the sacrifice of the superficial lobe (12). However, recent literature supports more limited approaches and preservation of the parenchyma whenever possible (13-15). Selective deep lobe parotidectomy preserves the superficial parotid lobe, ensuring better function and cosmesis and reducing complications associated with more extensive procedures (13). On the other hand, there are some concerns that should be kept in mind. First, preserving the superficial parotid parenchyma may restrict field exposure and increase the risk of facial nerve paralysis, especially for less experienced surgeons (16). Another concern, particularly for pleomorphic adenomas, is the possibility of local recurrence (17). Furthermore, an accurate preoperative diagnosis is not always possible, and given the higher incidence of malignancy in deep lobe tumours, near-total parotidectomy should remain a viable option (2, 18). We believe that both approaches should be included in the guidelines, and the recommendation for Category III pleomorphic adenomas should be revised to "two-level parotidectomy (more commonly superficial); tumours located in the deep lobe can be treated with three- or four-level parotidectomy."

Among other benign parotid tumours, the ESGS guidelines recommend following the same surgical approach as for pleomorphic adenomas (4). In our cohort, surgical management was generally consistent with these guidelines, except for one Category II oncocytoma located in Level III. In this case, a partial superficial parotidectomy was performed to access the deep lobe, followed by tumour excision along with the surrounding parotid tissue. Because of the limited data available on rare benign parotid tumours, we are unable to propose specific recommendations. Instead, the extent of resection should be guided by multiple factors, including the histopathological type, risk of recurrence, tumour location, and extent of involvement within the gland. Further studies with larger case series are needed to establish more definitive guidelines for these uncommon tumour types.

Another important observation is that the guideline does not address multifocal lesions. Although multifocality is uncommon, it remains a significant concern, particularly in the context of Warthin's tumour. According to the literature, Warthin's tumour is multifocal in 4-23% of cases (19, 20). In our cohort, there was a single case of multifocal Warthin's tumour, which was treated with near-total parotidectomy (levels I, II, and III). While we understand that it is not feasible to include all rare conditions in a guideline, it would be helpful to note that multifocal tumours cannot be adequately addressed by the existing recommendations.

Undoubtedly, one of the most severe surgical complications after parotidectomy is postoperative facial nerve paralysis. In a large benign tumour cohort, Guntinas-Lichius et al. reported a rate of 18% for transient facial paralysis and 4% for permanent facial paralysis (21). In another meta-analysis, the incidence of permanent facial nerve paralysis ranged from 0% to 12.2% in patients who underwent nerve monitoring (22). Consistent with the literature, in our cohort, the incidence of postoperative facial nerve paralysis was 10.81%, with the majority of cases being temporary and resolving during follow-up. The incidence of postoperative facial nerve paralysis increased significantly as the ESGS category advanced. Schapher et al. reported a correlation between the ESGS categories and facial nerve paralysis (23). Gur et al. demonstrated the effect of tumour size and deep location on postoperative facial nerve function (24). All these results underscore the critical influence of the location and extent of surgical dissection on facial nerve outcomes. Thus, tumour classification is valuable in predicting the likelihood of postoperative facial nerve paralysis.

There are some limitations to this study. First, the ESGS classification was applied retrospectively to the patient cohort using intraoperative photographs, making it challenging to accurately determine the exact tumour position and the amount of resected tissue. Second, our results are based on the retrospective analysis of a single institution. A prospective, multicenter study with larger cohorts may better address the necessary modifications and refinements. Furthermore, our study focused only on facial nerve paralysis and did not examine other potential complications of parotidectomy, such as Frey's syndrome, cosmetic outcomes, or recurrence rates. The retrospective design of the study and insufficient follow-up time limited our ability to comment on these outcomes.

CONCLUSION

Our findings support the ESGS classification as a valuable framework for guiding parotidectomy procedures while also highlighting the need for some refinements. Future studies

with larger cohorts and longer follow-up periods may further refine these guidelines. The adoption of standardised nomenclature and surgical records will enhance inter-clinic communication and facilitate accurate comparisons between techniques and outcomes.



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