Original Research

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Clinicopathological characteristics of benign soft tissue lesions of the oro-maxillofacial region: a 10-year retrospective study

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Abstract

Background. Benign soft tissue lesions of the oro-maxillofacial region feature diverse clinical presentations that often overlap, making histopathological validation essential. This study evaluated the demographic, anatomical, and clinicopathological characteristics of these lesions over 10 years, focusing on associations between diagnosis and anatomical site.

Methods. This retrospective observational study analyzed 170 patients diagnosed between January 2014 and December 2023. Patient age, sex, lesion location, histopathological diagnosis, epithelial lining, histomorphological features, and inflammatory status were collected from medical and pathology records. Data were analyzed using descriptive statistics and Pearson's Chi-square or Fisher's exact tests via IBM SPSS v26.0 ($\alpha = 0.05$).

Results. The mean patient age was 49.3 years, predominantly impacting individuals over 40, with a slight female predominance (55.9%). The most frequent anatomical locations were the labial, buccal, parotid, and cervical regions. Nevus, fibroma, epidermoid cyst, mucocele, and lipoma were the primary diagnoses. Stratified squamous epithelium was the predominant lining, and inflammatory infiltrate was present in 48.2% of cases. A highly significant association was confirmed between histopathological diagnosis and anatomical location ($p < 0.001$).

Conclusions. Benign oro-maxillofacial cysts and soft tissue lesions exhibit distinct clinicopathological and topographic patterns. Recognizing these site-specific associations enhances diagnostic accuracy and management planning, though further multicenter prospective verification is recommended.

Keywords: benign cysts, oro-maxillofacial region, clinicopathological characteristics, histopathology, retrospective study

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Introduction

Benign soft tissue lesions of the oro-maxillofacial region comprise a heterogeneous group of lesions arising from epithelial, mesenchymal, vascular, neural, and salivary gland tissues. Although these lesions generally exhibit benign biological behavior, they display considerable diversity in their clinical presentation and histopathological characteristics, making accurate diagnosis challenging. Several lesions may present with similar clinical features despite having different histological origins and biological behavior, emphasizing the importance of histopathological examination for definitive diagnosis [1–5].

Most benign oro-maxillofacial lesions present as slowly enlarging, painless masses and are frequently detected during routine dental examinations or after progressive enlargement. Depending on their anatomical location, these lesions may interfere with oral function, aesthetics, or surrounding anatomical

structures, often requiring surgical excision for both diagnosis and treatment [6–9].

Histopathological examination remains the gold standard for the diagnosis of benign soft tissue lesions. Microscopic evaluation allows accurate classification based on epithelial characteristics, stromal composition, cellular morphology, and inflammatory changes, while also distinguishing benign lesions from malignant neoplasms and reactive processes that may present with similar clinical manifestations [1,10–12].

Previous studies have described the epidemiology and histopathological features of individual benign lesions of the oral and maxillofacial region. However, studies evaluating a broad spectrum of benign cystic and soft tissue lesions within a single cohort, while simultaneously examining their clinicopathological characteristics and anatomical distribution over an extended period, remain relatively limited [13,14]. These data may contribute to a better understanding of the distribution patterns of these lesions and support the development of more accurate differential diagnoses in clinical practice.

Therefore, the present retrospective study aimed to analyze the clinicopathological characteristics of benign cysts and soft tissue tumors of the oro-maxillofacial region diagnosed over 10 years. The study evaluated demographic characteristics, anatomical distribution, histopathological diagnoses, epithelial lining, histomorphological features, inflammatory status, and their clinicopathological associations.

Methods

Study design and setting

This retrospective observational study evaluated the clinicopathological characteristics of benign cysts and soft tissue tumors of the oro-maxillofacial region diagnosed at the Department of Oral and Maxillofacial Surgery, Emergency County Clinical Hospital of Târgu Mureș, Romania. Histopathological examinations were performed in the affiliated Department of Pathology. The study included cases diagnosed between January 2014 and December 2023, with data analysis completed in 2024.

Study population

A total of 170 patients with histopathologically confirmed benign cysts or soft tissue tumors of the oro-maxillofacial region were included in the study. Eligible patients were identified from institutional medical records and pathology archives.

The inclusion criteria were:

- histopathological confirmation of a benign cyst or soft tissue tumor located in the oro-maxillofacial region;
- complete clinical and demographic records; and
- availability of the complete histopathological report following surgical excision.

Reactive lesions that clinically mimicked benign tumors and required surgical excision with histopathological confirmation were also included because they are frequently encountered in the differential diagnosis of benign soft tissue lesions.

The exclusion criteria were:

- malignant or premalignant lesions;
- inflammatory lesions managed without histopathological confirmation;
- incomplete clinical or histopathological documentation;
- inconclusive pathological diagnoses; and
- duplicate records or recurrent lesions from the same patient.

Following application of these criteria, 170 patients were eligible for analysis.

Data collection

Clinical and pathological information was collected retrospectively from medical records, operative reports, and histopathological reports. All data were anonymized before analysis.

The following variables were recorded:

- patient age at diagnosis
- sex
- anatomical location of the lesion
- definitive histopathological diagnosis
- epithelial lining characteristics
- predominant histomorphological features
- presence or absence of inflammatory infiltrate

Histopathological evaluation

All surgical specimens were routinely fixed in 10% neutral-buffered formalin, processed using standard paraffin-embedding techniques, sectioned, and stained with hematoxylin and eosin (H&E). Histopathological examination was performed by experienced pathologists.

Lesions were classified according to the current World Health Organization (WHO) Classification of Head and Neck Tumours [15,16]. For each specimen, the epithelial lining was evaluated according to its microscopic appearance, while the predominant stromal or cellular components and the presence of inflammatory infiltrate were recorded.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA).

Continuous variables were summarized as mean, standard deviation (SD), median, and range, whereas categorical variables were presented as absolute frequencies (n) and percentages (%).

Associations between categorical variables, including histopathological diagnosis, anatomical location, epithelial lining, and inflammatory status, were assessed using Pearson's Chi-square test. Fisher's exact test was applied when the assumptions for the Chi-square test were not fulfilled because of small expected cell frequencies.

All statistical tests were two-tailed, and a p-value <0.05 was considered statistically significant.

Ethical considerations

The study was conducted in accordance with the principles of the Declaration of Helsinki. Patient confidentiality was maintained by anonymizing all clinical and pathological data before analysis. The study was approved by the Institutional Ethics Committee of the Department of Oral and Maxillofacial Surgery, Emergency County Clinical Hospital of Târgu Mureș, Romania (Approval No. 13555/21.06.2022) and was conducted in accordance with the principles of the Declaration of Helsinki.

Results

Patient characteristics

A total of 170 patients with histopathologically confirmed benign cysts and soft tissue tumors of the oro-maxillofacial region were included in the study.

The majority of the study population was older, with 68.2% aged over 40 years (34.7% aged >60 years; 33.5% aged 41–60 years). Children and adolescents (<18 years) represented the smallest cohort at 11.2%. The distribution according to age is summarized in table I.

Table I. Distribution of patients according to age group.

Age group (years)	n	%
<18	19	11.2
18–40	35	20.6
41–60	57	33.5
>60	59	34.7
Total	170	100.0

There is a slight female predominance, with 55.9% female patients compared to 44.1% male patients.

Anatomical distribution of lesions

More than half of all documented cases (52.3%) were concentrated within five primary anatomical sites. The labial region is the most frequently affected site at 12.9%, followed by the buccal region at 11.2%. The parotid, cervical, and jugal regions each account for an identical share of 9.4%. The remaining 14 anatomical sites detailed in the study—including the parietal, commissural, and submandibular regions—are significantly less common, with each site representing less than 8% of the total patient cohort.

Histopathological diagnosis

Nineteen different histopathological diagnoses were identified. Nevus was the most frequent diagnosis (15.3%), followed by fibroma (10.0%), epidermoid cyst (10.0%), mucocele (8.2%), lipoma (8.2%), hemangioma (7.1%), trichilemmal cyst (5.3%), follicular infundibulum tumor (5.3%), trichoepithelioma (5.3%), and fibrolipoma (5.3%). The remaining lesions each represented less than 4% of the study population (Table II).

Table II. Histopathological diagnosis of benign cysts and soft tissue tumors.

Histopathological diagnosis	Number of patients (n)	Percentage (%)
Nevus	26	15.3%
Trichilemmal cyst	9	5.3%
Hemangioma	12	7.1%
Mucocele	14	8.2%
Fibroma	17	10.0%
Follicular infundibulum tumor	9	5.3%
Epidermoid cyst	17	10.0%
Warthin tumor	3	1.8%
Branchial cyst	3	1.8%
Thyroglossal duct cyst	3	1.8%
Pleomorphic adenoma	6	3.5%
Hydrocystoma	6	3.5%
Lipoma	14	8.2%
Trichoepithelioma	9	5.3%
Fibrolipoma	9	5.3%
Fibroepithelial polyp	3	1.8%
Pyogenic granuloma	3	1.8%
Trichofolliculoma	3	1.8%
Schwannoma	4	2.4%
Total	170	100.0%

Histopathological characteristics

Epithelial lining

Stratified squamous epithelium was the most common epithelial lining (39.4%), followed by stratified pavement epithelium (30.6%). Bistratified epithelium accounted for 8.8% of cases, whereas keratinized squamous, non-keratinized squamous, thin conjunctival, focal squamous, and hyper-orthokeratinized squamous epithelium were less frequently observed (Table III).

Table III. Distribution according to epithelial lining.

Epithelium type	Number of patients (n)	Percentage (%)
Stratified Pavement	52	30.6%
Stratified Squamous	67	39.4%
Bistratified	15	8.8%
Keratinized Squamous	12	7.1%
Non-keratinized Squamous	9	5.3%
Thin Conjunctiva	9	5.3%
Focal Squamous	3	1.8%
Hyper-orthokeratinized Squamous	3	1.8%
Total	170	100.0%

Histomorphological features

The predominant histomorphological findings are summarized in table IV. Type A and B melanocytes (12.9%), histiocytes with foamy cytoplasm (11.2%), laminae of desquamated keratin (11.2%), and blood vessels with lobular architecture (9.4%) were the most frequently recorded microscopic features.

Table IV. Histomorphological features of the lesions.

Associated histomorphological features	Number of patients (n)	Percentage (%)
Type A and B melanocytes	22	12.9%
Rounded cells with abundant cytoplasm	6	3.5%
Blood vessels with lobular architecture	16	9.4%
Histiocytes with foamy cytoplasm	19	11.2%
Fibroblasts and fibrocytes	13	7.6%
Collections of erythrocytes	10	5.9%
Isthmic structures with eosinophilic cytoplasm and small nuclei	3	1.8%
Ortho-keratinized areas	3	1.8%
Cubic cells	13	7.6%
Thyroid follicles	3	1.8%
Lymphoid follicles	3	1.8%
Laminae of desquamated keratin	19	11.2%
Serous salivary acini	6	3.5%
Hair follicles	6	3.5%
Cellular debris and eosinophilic material	3	1.8%
Adipocytes	6	3.5%
Collagen fibers and adipocytes	3	1.8%
Sebaceous glands and hair follicles	3	1.8%
Basoid cells	6	3.5%
Cells with biphasic appearance	3	1.8%
Total	170	100.0%

Table V. Association between histopathological diagnosis and anatomical location.

Histopathological Diagnosis	Predominant Anatomical Localizations (Number of cases)	Total (n)
Nevus	Genian (9), Infraorbital (6), Parietal (4), Cervical (4), Commissural (3)	26
Trichilemmal cyst	Parietal (9)	9
Hemangioma	Labial (6), Jugal (3), Gingival (3)	12
Mucocele	Labial (14)	14
Fibroma	Jugal (11), Commissural (3), Hard palate (3)	17
Follicular infundibulum tumor	Genian (3), Auricular (3), Not specified (3)	9
Epidermoid cyst	Submandibular (9), Genian (4), Palpebral (4)	17
Warthin tumor	Parotid (3)	3
Branchial cyst	Cervical (3)	3
Thyroglossal duct cyst	Cervical (3)	3
Pleomorphic adenoma	Parotid (6)	6
Hydrocystoma	Palpebral (5), Nasal (1)	6
Lipoma	Cervical (3), Parotid (3), Occipital (3), Retromolar (3), Jugal (2)	14
Trichoepithelioma	Genian (3), Frontal (3), Temporo-zygomatic (3)	9
Fibrolipoma	Cervical (3), Gingival (3), Labial (2), Not specified (1)	9
Fibroepithelial polyp	Lingual (3)	3
Pyogenic granuloma	Commissural (3)	3
Trichofolliculoma	Nasal (2), Not specified (1)	3
Schwannoma	Parotid (4)	4
Total cases		170

Clinicopathological associations

A statistically significant association was observed between histopathological diagnosis and anatomical location (Pearson's Chi-square test, $p < 0.001$).

Distinct anatomical predilections were identified for several lesion types. Mucoceles were observed exclusively in the labial region (n = 14). Trichilemmal cysts were confined to the parietal region (n = 9), whereas pleomorphic adenomas and Warthin tumors occurred exclusively in the parotid region. Epidermoid cysts were most frequently located in the submandibular region (n = 9), and fibromas predominated in the buccal mucosa (n = 11). Detailed clinicopathological correlations are presented in table V.

Regarding tissue inflammation, the cohort was distributed almost equally: an inflammatory process was absent in 51.8% of the lesions and present in 48.2% of cases.

Discussion

The present retrospective study evaluated the clinicopathological characteristics of benign cysts and soft tissue tumors of the oro-maxillofacial region diagnosed over 10 years. The findings demonstrate that these lesions comprise a heterogeneous group with distinct anatomical and histopathological characteristics, emphasizing the importance of integrating clinical examination with histopathological assessment for accurate diagnosis.

Demographic characteristics

The predominance of lesions in middle-aged and older adults observed in the present study is consistent with previous epidemiological reports describing a higher frequency of benign oral and maxillofacial lesions in these age groups [1–3,17]. This distribution may reflect the slow clinical progression of many benign lesions, which frequently remain asymptomatic for prolonged periods before surgical treatment is sought. A slight female predominance was also observed, in agreement with previous studies reporting similar sex distributions for fibromas, mucoceles, and salivary gland tumors [18,19]. Although the reasons for this difference remain uncertain, variations in healthcare utilization and lesion-specific epidemiology have been proposed.

Anatomical distribution

A significant association between histopathological diagnosis and anatomical location was identified, indicating that many benign lesions exhibit characteristic topographic distributions. Lesions involving the labial, buccal, parotid, and cervical regions were particularly common, reflecting the anatomical distribution of minor salivary glands, connective tissue, and other soft tissue structures within the oro-maxillofacial region [20,21]. The exclusive occurrence of mucoceles in the labial region is consistent with their well-established pathogenesis related to trauma and obstruction of minor salivary gland ducts [11,22]. Likewise, the localization of Warthin tumors and pleomorphic adenomas within the parotid region corresponds to their recognized salivary gland origin [8,23]. These anatomical patterns may assist clinicians in establishing an appropriate differential diagnosis before histopathological confirmation.

Histopathological findings

The broad spectrum of histopathological diagnoses identified in this study illustrates the morphological diversity of benign oro-maxillofacial lesions. Nevi, fibromas, epidermoid cysts, mucoceles, and lipomas represented the most frequent entities, findings that are generally consistent with previous retrospective investigations of oral and maxillofacial pathology [3,14,24]. The inclusion of selected reactive lesions reflects routine clinical practice, where reactive and neoplastic lesions frequently present with similar clinical appearances and therefore require histopathological examination for definitive diagnosis. These observations further support the central role of microscopic evaluation in distinguishing lesions that cannot be reliably differentiated on clinical grounds alone [10,25].

The predominance of stratified squamous epithelium among the examined specimens reflects the epithelial origin of many cystic and mucosal lesions encountered in oral pathology. Differences in epithelial lining and stromal architecture among the various diagnostic entities are consistent with current histopathological classifications and emphasize the value of combining architectural and cytological features during microscopic evaluation [15,16,26]. Similarly, the diversity of stromal components observed across the study population highlights the heterogeneous biological origin of benign soft tissue lesions and reinforces the importance of comprehensive histopathological assessment [27].

Inflammatory changes

Nearly half of the lesions demonstrated an associated inflammatory infiltrate. Although inflammation is frequently a secondary phenomenon resulting from local trauma or infection, it may also modify the clinical appearance of benign lesions and complicate the initial clinical diagnosis [24,28,29]. Conversely, the absence of inflammatory changes in many encapsulated lesions supports their distinct pathological nature and may facilitate histopathological differentiation from reactive processes.

Clinical implications

The statistically significant association between histopathological diagnosis and anatomical location observed in this study supports the clinical value of correlating lesion location with histopathological findings during diagnostic assessment. Although histopathological examination remains the definitive diagnostic method, knowledge of characteristic anatomical distributions may improve the formulation of differential diagnoses and assist clinicians in planning appropriate surgical management. The results also emphasize the importance of submitting all excised lesions for microscopic examination, as lesions with similar clinical appearances may represent distinct pathological entities requiring different clinical follow-up.

Study limitations

Several limitations should be considered when interpreting these findings. First, the retrospective single-center design may have introduced selection bias and limits the generalizability of the results. Second, although the overall cohort was relatively large, several histopathological subgroups contained only a small number of cases, limiting detailed statistical comparisons between individual lesion types. Third, only univariate statistical analyses were performed because of the heterogeneous distribution of diagnoses. Nevertheless, the inclusion of histopathologically confirmed cases collected over 10 years provides a representative overview of the spectrum of benign cysts and soft tissue tumors encountered in routine oral and maxillofacial practice. Future multicenter prospective studies involving larger patient populations are warranted to validate these observations.

Conclusions

This retrospective study demonstrated that benign cysts and soft tissue lesions of the oro-maxillofacial region exhibit characteristic demographic, anatomical, and histopathological patterns. Histopathological examination remains the reference standard for definitive diagnosis, while knowledge of clinicopathological associations may improve the accuracy of the clinical differential diagnosis. Larger multicenter studies are required to validate these findings and further characterize the biological behavior of these lesions.

Author Contribution

I.-V.G. study conception and design, M.P. Statistical analysis, C.N. Data validation and interpretation, S.M.B. English translation, A.O. literature review.

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