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Retrospective Analysis of Dentigerous Cysts and Odontogenic Keratocysts Among a Group of Egyptian Patients Over 10-Year Period

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Aim: The aim of the current study is to determine the frequency of DCs and OKCs in biopsies submitted to the oral pathology department of the Faculty of Dentistry, Ain Shams University and to compare our findings with data from similar studies conducted globally.
Material and methods: This retrospective study was conducted in the Oral Pathology Department at Ain Shams University, analyzing patient records from January 2013 to December 2022. The data were organized in an Excel spreadsheet for analysis.
Results: A 10-year analysis of submitted 1476 biopsies found 77 cases of DCs and 39 of OKCs. Among DC cases, 67.63% were male, with the 20-29 age group being most affected (33.8%), and 66.23% located in the mandible. OKCs showed 56.41% male prevalence, most common in ages 20-39 (50%). The maxilla was more frequently affected by 51.28%. Radiographically, 75% were unilocular, with 57.14% not associated with teeth.
Conclusion: DCs were more common in males, peaking in the third decade, often in the mandible. Radiographically, they appeared as well-defined unilocular radiolucencies linked to impacted teeth. Similarly, OKCs showed well-defined unilocular radiolucencies, also prevalent in males, typically in the third and fourth decades, but with higher incidence in the maxilla than the mandible.

Keywords: Dentigerous cyst, Odontogenic keratocyst, Retrospective analysis, Prevalence.

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Introduction

Odontogenic cysts are conditions that affect the oral and maxillofacial tissues. They arise from developmental, or inflammatory factors associated with the odontogenic epithelium of the tooth-forming apparatus. The four most commonly occurring types of odontogenic cysts are periapical cysts, residual cysts, dentigerous cysts (DCs), and odontogenic keratocysts (OKCs). [1]

Odontogenic cysts are usually identified during routine radiographic examinations, appearing as well-defined, unilocular or multilocular radiolucent lesions. However, they are indistinguishable from one another. Additionally, odontogenic cysts may exhibit similar radiographic characteristics to aggressive odontogenic tumors. [2]

Dentigerous cyst is a totally benign and non-aggressive cyst that enlarges by expansion and fluid accumulation. It ranks as the second most common cyst, following the radicular cyst. It consistently encloses the crown of an impacted tooth, originating from the reduced dental epithelium surrounding the crown. [3] This condition exhibits a male predilection and is more commonly found in the mandibular region related to impacted lower third molar, [4,5] followed by the maxillary canine, maxillary third molar, and mandibular second premolar. [6] About 95% of all DCs are associated with permanent teeth, while the remaining 5% involve supernumerary teeth. [7] DCs are most frequently found in the second and third decades of life, with only 9% occurring in the first decade. [6,8]

These cysts often present no symptoms and are typically discovered through radiographic examinations. [9] However, when they grow to a significant size, they may cause pain, swelling, tooth mobility, and tooth displacement. [10] The presence of DCs can lead to significant complications, including pathological bone fractures facial asymmetry, neoplastic transformation to ameloblastoma, intraosseous mucoepidermoid carcinomas, and squamous cell carcinoma. [5,11]

Radiographically, DCs typically appear as unilocular radiolucent areas surrounding the crown of an impacted tooth, characterized by a well-defined corticated border. [9,12] They may be radiographically similar to OKCs or unicystic ameloblastomas. [5] Larger DCs can present as multilocular, which may mimic the radiographic appearance of other conditions like ameloblastoma. [13]

Histopathologically, DCs typically exhibit a nonkeratinized stratified squamous epithelium with mucous cells. The underlying connective tissue may contain a varying number of chronic inflammatory cells. [7]

The term “odontogenic keratocyst” was first introduced by Philipsen in 1956, and its essential features were later described by Pindborg and Hansen in 1963. [14] OKCs account for approximately 10% of all odontogenic cysts. [15] This distinctive cyst is characterized by a thin, corrugated, and parakeratotic squamous epithelium featuring a palisaded basal layer. Within the fibrous wall, there may be small satellite cysts, cords, or islands of odontogenic epithelium. [11] Although the most recent World Health Organization (WHO) classification 2022 categorizes OKCs as developmental cysts, [16] They differ from other odontogenic cysts due to their potentially aggressive behavior, high proliferative activity of the epithelium, elevated recurrence rates, genetic alterations, and the potential to undergo malignant transformation into squamous cell carcinoma.[17,18]

Odontogenic keratocysts are most commonly found in the posterior region of the mandible, [19] but they are also

frequently observed in the maxilla, particularly around the canine area. [18] Both OKCs and ameloblastomas exhibit similar radiographic features, such as distinct multilocular or unilocular radiolucencies associated with or independent of an unerupted tooth. The goal of this study is to evaluate the relative prevalence of DCs and OKCs among a group of Egyptian patients and to compare our findings with data from similar studies conducted worldwide

Material and methods:

The research was carried out in the Oral Pathology Department, Faculty of Dentistry, Ain Shams University. This cross-sectional retrospective study was approved by the IRB under approval number FDASU-Rec EM122207. The data utilized was obtained from patient records in the oral pathology laboratory, spanning January 2013 to December 2022, covering a duration of 10 years.

Only lesions diagnosed as DCs and OKCs with available demographic, clinical and radiographic data were included in the study. The excluded cases were those of insufficient samples, repeated biopsies such as excisional biopsies of lesions already diagnosed through incisional ones, and cases lacking clinical or radiographic data.

Information regarding age, gender, anatomic location, and radiographic features were collected in an Excel sheet. The anatomic sites were further categorized as anterior and posterior for mandible and maxilla. Hematoxylin and eosin-stained slides from both excisional and incisional biopsies were re-evaluated by two expert oral pathologists to confirm the diagnoses according to the WHO classification 2022. [16]

In cases where the original slides were of poor quality, additional slides were prepared from paraffin blocks. When histopathologic evaluation alone was inadequate for a definitive diagnosis, correlation with clinical and radiographic findings were also considered. Data analysis and graph construction were performed using Microsoft Excel™ software.

Results:

Analysis of all patient records during the defined 10-year span revealed a total of 1476 biopsies. The slides were rediagnosed by two expert pathologists. Overall, DCs were identified in 77 samples, which accounted for 5.22% of the total samples and OKCs in 39 (2.64%). DC incidence was distributed as 67.53% in Males and 32.47% in Females (Figure 1),

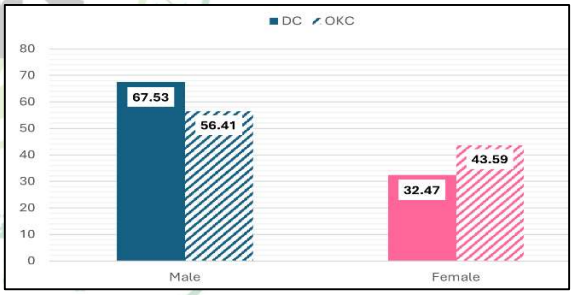

Figure 1: Bar chart showing the incidence of DCs and OKCs across different genders.

with a 2.08:1 male-to-female ratio. 16.9% of patients with DCs were between the ages of 0 and 9, 25.35% between 10 and 19 years, 33.8% between 20 to 29 years, 15.49% between 30 to 39 years, 4.23% between 40 to 49 years and 4.23% between 50 to 59 years (Figure 2).

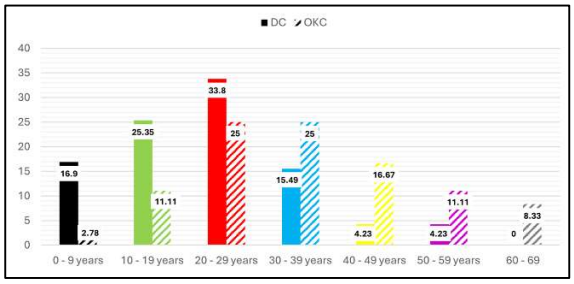

Figure 2: Bar chart showing the age group distribution of DCs and OKCs.

Additionally, the findings indicated that the mandible accounted for 66.23% of the cystic lesions, and the maxilla 33.76% (Figure 3).

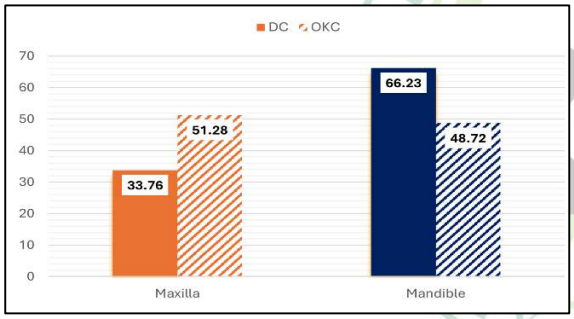

Figure 3: Bar chart displays the distribution of DCs and OKCs in mandible and maxilla.

With a frequency of 59.74%, the mandibular posterior region was the most affected, followed by 16.85% in the maxillary posterior, 15.58% in the maxillary anterior, 14.29% in the mandibular premolar, 6.49% in the maxillary premolar, 5.19% in the mandibular anterior, and 1.3% in both the maxillary and mandibular anterior and posterior regions (Figure 4).

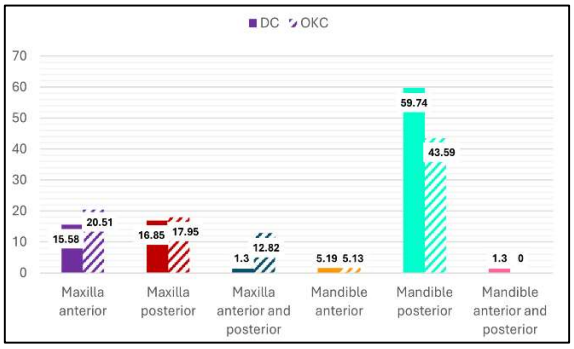

Figure 4: Bar chart illustrates the distribution of DCs and OKCs in different sites of the jaws.

The radiographic picture was well-defined unilocular radiolucency involving an impacted tooth. Microscopically, DC was observed to have thin nonkeratinizing epithelial lining, along with scattered mucous cells. The fibrous capsule was loosely arranged and may have shown small inactive-appearing odontogenic epithelial islands. Inflamed DCs exhibited hyperplastic cystic epithelium with rete peg formation and more collagenized stroma.

Odontogenic keratocyst incidence was 56.41% in males and 43.59% in females (Figure 1), with a 1.29:1 male-to-female ratio. 2.78% of patients with OKCs were between the ages of 0 and 9, 11.11% between 10 and 19 years, 25% between 20 to 29 years, 25% between 30 to 39 years, 16.67% between 40 to 49 years, 11.11% between 50 to 59 years and 8.33% between 60 to 69 years (Figure 2).

The findings further indicate that a higher prevalence of the lesion was observed in the maxilla at 51.28% compared to the mandible at 48.72% (Figure 3). With a frequency of 43.59%, the mandibular posterior region was the most affected area, followed by 20.51% in the maxillary anterior, 17.95% in the maxillary posterior, 12.82% in both the maxillary anterior and posterior regions, and 5.13% in the mandibular anterior (Figure 4).

Radiographically, 92.11% of the cases were well-defined radiolucencies, and 7.89% were ill-defined radiolucencies. Additionally, 75% were unilocular, while 25% were multilocular. 57.14% were not associated with an impacted tooth, and 42.86% were associated with an impacted tooth.

Histologically, OKC had a uniform epithelial lining and lacked rete ridges, often exhibiting clefting between the epithelium and the underlying fibroconnective tissue. The epithelium featured a palisaded, hyperchromatic basal cell layer composed of cuboidal to columnar cells, which occasionally displayed areas of budding growth from the basal cells. The luminal surface was notable for its wavy, or corrugated parakeratin. Additionally, small satellite cysts of odontogenic epithelium were sometimes found within the fibrous wall. In inflamed OKC, the distinctive palisaded basal layer was lost, the parakeratinized luminal surface disappeared, and the epithelium proliferated, resulting in the formation of rete ridges.

Discussion:

A dentigerous cyst is a developmental odontogenic cyst that originates when fluid builds up between the inner enamel epithelium and the outer enamel epithelium of the unerupted tooth. The incidence was around twice as high in males as in females. This is explained by the females' comparatively smaller jaws and higher prophylactic extractions of third molars. Consequently, DCs are observed to be more common in men. [20] According to a related study, men are twice as likely as women to have DCs, which is consistent with our findings. [21] The incidence of DCs was 4.5 times higher in men than in women, in accordance to other research. [22] Jones et al.'s analysis also reveals a 1.7:1 male to female ratio, indicating a male predilection. [23]

The current study also reports the frequency of affected individuals by age group. Based on the statistics, we may conclude that those between the ages of 20 and 29 were most impacted, while those between the ages of 40 and 59 were least. It is known that DCs are more prevalent throughout the third decade of life. This makes sense because the eruption of third molars, whose impaction is the most frequent cause of DCs, coincides closely with the third decade of life. Those in their second or third decade of life are more likely to develop DCs, according to a previous study that revealed an association with our study. [24,25] We also report on the frequency of jaw impacted, it was found that it is consistent with those reported by Aldelaii et al., the posterior mandible had the highest frequency, followed by the posterior maxilla. [26,27] The classic radiographic picture was a well-defined unilocular radiolucency associated with an impacted tooth.

An odontogenic keratocyst is a benign but locally aggressive developmental cyst. Our results revealed that males are more likely to develop OKCs. According to a related study, the ratio between males and females was 1.3:1, which is consistent with our findings. [28,29] The current study also reports the frequency of affected individuals by age group. Based on the statistics, we may conclude that those between the ages of 20 and 39 were most impacted, while those between the ages of 0 and 9 were least. As a result, it is known that OKCs are more prevalent throughout the third and fourth decade of life. These findings are also consistent with earlier study of peak incidence occurring between the second and fourth decades of life. [30]

A previous study documented that OKC occurs in the mandible about twice as

frequently as in the maxilla, accounting for 66.9% of cases. [31] These findings differ from our study result, which showed a higher occurrence of OKCs in the maxilla compared to the mandible Another study reported that most cases present as well-defined unilocular radiolucencies with smooth, corticated borders. 42% of the lesions were associated with embedded tooth, which aligns closely with our findings. [32] This study benefits from being conducted at an educational center, where patients from diverse regions across the country are referred, providing a more representative sample.

Conclusion

In DCs, our results align with those of others worldwide. The results in OKCs were consistent with those of previous studies, except for the site, where our findings differed. Notably, the maxilla exhibited a higher incidence of OKCs compared to the mandible. Incidence studies were crucial indicators of a population's health status. Our research has laid the groundwork for further studies to monitor, analyze, and evaluate the frequency of DCs, OKCs, and other oral lesions in the Egyptian population.

-Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

-Data availability

Data will be available upon request.

-Ethics approval and consent to participate

Exempted from ethical review as it is purely a laboratory-based study with no involvement of patients or experimental animals. The exemption number is: (FDASU-Rec EM122207).

-Competing interests

The authors declare that they have no competing interests.

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