

Odontogenic cysts

A clinicopathological study

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ABSTRACT

الأهداف: تحديد التكرار النسبي للتكييسات سنوية المنشأ، ومقارنة النتائج بما سبق نشره من دراسات.

الطريقة: أجريت هذه الدراسة الاسترجاعية في كلية طب الأسنان، جامعة الملك سعود، الرياض، المملكة العربية السعودية خلال الفترة من سبتمبر 2010م إلى فبراير 2011م حيث قمنا باسترجاع سجلات المرضى بين العامين 2010-1984م. لقد قمنا بتأكيد التشخيص للحالات المصابة بالتكييسات السنوية بما يتفق مع تصنيف منظمة الصحة العالمية للأورام السنوية والمنشور عام 2005م. كما تم جمع وتحليل البيانات السريرية والمرضية لكل حالة.

النتائج: شملت هذه الدراسة 470 حالة اتفقت مع معايير تشخيص التكييسات السنوية. لقد كونت 11% من مجموع الحالات المسجلة خلال فترة الدراسة. وأشارت نتائج الدراسة إلى أن التكييس الجذري قد مثل أعلى نسبة حدوث (64.3%)، تلاه التكييس المحتوي على سن بنسبة (25.1%). وكانت نسبة الذكور إلى الإناث (1.40:1). كما كان متوسط العمر عند التشخيص 30 عاماً مع زيادة عدد الحالات في العقد الثاني والثالث من العمر. وكانت نسبة الحالات في الفك السفلي 48.5%، والفك العلوي 43.6%.

خاتمة: أظهرت نتائج الدراسة أن نسبة انتشار التكييسات السنوية مشابهة لما تم نشره في دراسات سابقة حيث تغلب عليها التكييسات الناشئة من الالتهاب، كما تزداد نسبة حدوثها في العقد الثاني والثالث من العمر. ولقد كان الجزء الخلفي من الفك السفلي والجزء الأمامي من الفك العلوي من أكثر المناطق إصابة. ونحن بحاجة لمزيد من الدراسات المشابهة من مناطق المملكة المختلفة لفهم أعمق للتكييسات السنوية وخواصها.

Objectives: To determine the relative frequency of OC, and compare it with previous studies.

Methods: A retrospective review of histopathology archives in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia of the period 1984-2010 was carried out from September

2010 to February 2011. Diagnosis was confirmed according to the World Health Organization histological classification for odontogenic tumors published in 2005. The relevant clinicopathological data were analyzed.

Results: A total of 470 cases satisfied the diagnostic criteria as OC. They represented approximately 11% of all pathologic specimens accessioned. Apical radicular cyst (64.3%) was the most frequent OC, followed by dentigerous cyst (25.1%). The overall male to female ratio was 1.40:1. The mean age of patients at diagnosis was 30 years. It peaked at the second to third decade. The mandible was involved in 48.5%, and the maxilla in 43.6% of the cases.

Conclusion: The prevalence of OC is similar to those reported in other studies, in which most OC were inflammatory in origin. They peaked at the second to third decade with the posterior mandible and anterior maxilla being the most frequent sites affected. Studies from different regions of KSA are needed to further understand these lesions.

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Odontogenic cysts (OC) are group of lesions that originate from the tissues derived from tooth-forming apparatus.¹ They are slow growing and do not pose a significant management challenge, however, since they grow within the bones, they may cause bone or tooth resorption, bone expansion, fracture, or tooth displacement.^{2,3} Cysts are divided into inflammatory and developmental.⁴ Various attempts at classification of these lesions have been published to define diagnostic criteria, given the diversity of lesions that may arise from odontogenic tissues. A revised histopathological classification of odontogenic tumors by the World Health Organization (WHO) has been published in 2005⁵ by the International Agency for Research on Cancer (IARC), in which odontogenic keratocyst (KCOT) and calcifying odontogenic cyst (CCOT) were re-classified as tumors. There are few reports of odontogenic lesions from the Kingdom of Saudi Arabia (KSA). The study aims to establish the relative frequency of various histological types of OC over a period of 26 years, based on the latest WHO classification, and compare our findings with those reported from other parts of the world.

Methods. The study protocol was approved by the Committee of Ethics in Research from the College of Dentistry Research Center, King Saud University, Riyadh, KSA. The study was conducted in compliance with the ethical principles for medical research involving human subjects of the Helsinki Declaration. The histopathology records of the Histopathology Laboratory of the College of Dentistry, King Saud University, Riyadh, KSA was reviewed retrospectively for oral lesions seen from January 1984 to December 2010. The study was carried out from September 2010 to February 2011. All the lesions diagnosed as cysts were reviewed, and the Hematoxylin and Eosin (H&E) stained sections were reevaluated. The clinical data were reviewed for clinicopathological correlation. The diagnosis in each case was confirmed or modified in accordance with the revised histopathological classification of odontogenic tumors published by WHO in 2005. Cases without clinical data or unavailable H&E slides, as well as recurrences were excluded. The following variables were analyzed: age; gender; site of tumor; and histopathologic typing.

Descriptive statistics and test of significance were used as appropriate. Data were analyzed using the Statistical Package for Social Sciences for Windows version 17.0 (SPSS Inc., Chicago, IL, USA), in which the Chi-square test was applied to analyze the statistical

significance of the data when applicable. The critical level of significance was set at $p < 0.05$.

Results. A total of 4,408 lesions of the oral cavity and the jaws were diagnosed between January 1984 and December 2010. Of these, 470 (11%) satisfied the criteria to be included in this study as OCs. The relative frequency for different lesions is presented in Table 1. Apical radicular cyst (ARC, 64.26%) was the most frequent OC, followed by dentigerous cyst (DC, 25.11%). When KCOT and CCOT was included, KCOT was the third most frequent odontogenic lesion (12.55%). The age of the patients at diagnosis ranged from 8-76 years with a mean of 30 years. It peaked at the second to third decade (Table 2). Among these cases, 271 were males (58.41%), and 193 females (41.59%), with an overall male to female ratio of 1.40:1. Gender was not specified in 6 cases of ARCs. The gender distribution of different OC is presented in Table 3. Table 4 summarizes the site distribution of OC. The mandible was involved in 48.5% of the patients, and the maxilla in 43.6%. There were 37 (7.9%) cases with unstated localization. The most frequent exact localization in the maxilla was the anterior region, with 54.2% of all maxillary cysts. Among the 228 cysts localized in the mandible, 175 (76.8%) cases affected the posterior region.

Discussion. Odontogenic cysts and tumors are uncommon lesions and should be included in the differential diagnosis of gnathic bone pathoses. A number of published studies have been carried out on large series

Table 1 - Relative frequency of 470 odontogenic cysts included in a study in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia.

Types of lesion	n	Excluding KCOT, CCOT (%)	With KCOT, CCOT (%)
<i>Cyst</i>			
Apical radicular cyst	302	(64.3)	(54.9)
Dentigerous cyst	118	(25.1)	(21.5)
Glandular odontogenic cyst	5	(1.1)	(0.9)
Residual cyst	31	(6.6)	(5.6)
Orthokeratinized cyst	7	(1.5)	(1.3)
Gingival cyst of adult	1	(0.2)	(0.2)
Eruption cyst	1	(0.2)	(0.2)
Paradental cyst	5	(1.1)	(0.9)
Total	470	100.00	(85.5)
<i>Tumor</i>			
KCOT	69		(12.6)
CCOT	11		(2.0)
Total	550		100.00

KCOT - keratocystic odontogenic tumor,
CCOT - calcifying cystic odontogenic tumor

Table 2 - Age distribution of patients with odontogenic cysts included in a study in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia.

Cyst	Age group in years							Total
	1-10	11-20	21-30	31-40	41-50	51-60	> 60	
Apical radicular cyst	16	51	95	58	30	18	7	275
Dentigerous cyst,	13	36	26	17	12	5	3	112
Glandular odontogenic cyst	0	0	0	3	0	0	2	5
Residual cyst	0	1	7	6	6	6	2	28
Orthokeratinized cyst	0	0	2	1	1	1	2	7
Gingival cyst	0	0	1	0	0	0	0	1
Eruption cyst	0	1	0	0	0	0	0	1
Paradental cyst	0	0	5	0	0	0	0	5
Total	29	89	136	85	49	30	16	434*
%	6.68	20.51	31.34	19.59	11.29	6.91	3.69	100

*These are cases with unspecified age

Table 3 - Gender distribution of patients with odontogenic cysts included in a study in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia.

Cyst	Male	Female	Total
Apical radicular cyst	150	146	296*
Dentigerous cyst	82	36	118
Glandular odontogenic cyst	2	3	5
Residual cyst	27	4	31
Orthokeratinized cyst	4	3	7
Gingival cyst	0	1	1
Eruption cyst	1	0	1
Paradental cyst	5	0	5
Total	271†	193	464

*Gender was not specified in 6 cases. †p=0.0004

in some counties to assess age, gender, and site of these lesions.^{3,6} Despite the necessity of accurate classification and review of large number of OC, there is only a limited number of relevant reports available, especially in KSA.^{7,8} Most of the published data regarding the prevalence of OC comes from oral pathology diagnostic services, which might be considered as a reliable source of clinicopathological features despite some sampling bias.^{9,10} The OC is reported to be diagnosed in 7-12% of all oral and maxillofacial biopsies.^{10,11} In our study, OC made up 11% of all oral cavity and jaw lesions that is consistent with previous studies^{2,11}.

The mean age of patients at diagnosis was 30 years, with a peak at the second to third decade, which is in agreement with previous reports.^{2,12} The OC in the

Table 4 - Site distribution of the cysts in patients included in a study in the College of Dentistry, King Saud University, Riyadh, Kingdom of Saudi Arabia.

Cysts	n	Mandible	Maxilla	Unstated	Mandible				Maxilla			
					A	A & P	P	U	A	A & P	P	U
Apical radicular cyst	302	132	144	26	25	2	103	2	75	4	62	3
Dentigerous cyst	118	67	43	8	12	2	53	0	26	3	11	3
Residual cyst	31	16	13	2	5	0	11	0	8	0	5	0
Glandular odontogenic	5	3	2	0	2	0	1	0	1	0	1	0
Gingival cyst	1	0	1	0	0	0	0	0	0	0	1	0
Orthokeratinized cyst	7	6	1	0	3	0	3	0	1	0	0	0
Eruption cyst	1	0	1	0	0	0	0	0	0	0	1	0
Paradental cyst	5	4	0	1	0	0	4	0	0	0	0	0
Total	470	228	205	37	47	4	175	2	111	7	81	6

A - anterior, P - posterior, U - unstated

present study also showed a male predominance, which is in agreement with several reports from different parts of the globe^{10,12}. The posterior mandible was the most frequently affected anatomical site found in this study, which agree with the findings reported by others^{2,13}. The ARC is an inflammatory OC that results as a consequence of pulp involvement. In the present study, it was the most common diagnosis, accounting for 64.3% of all OCs with an approximately equal gender distribution. This finding is comparable to those reported by de Sousa et al⁶ and Jones et al¹⁴. A lower incidence of APR was found by Ledesma-Montes et al.¹¹ Dental caries is the most common etiologic factor in the formation of cysts, and remain as the major dental health problem in KSA.¹⁵ Another related lesion is the residual cyst, which is most commonly a retained APR from extracted tooth. There were 31 cases of residual cyst accounting for 6.6% of all cysts with a male predominance (87.1%). The relative frequency of this lesion varies from 2.2-11.2%.^{10,12} In some previous reports, radicular cysts were found in a greater number in females, while the residual cysts were more frequent in males.^{10,12}

In the literature, the frequency of DC varied from 24.8-38%.^{10,11,16} The incidence of DC in our series was 25.1%. The variation in the frequency among reports has been attributed partly to under-reporting, due to the clinician's confidence in diagnosis, so the extra fee for the service involved is reduced.¹⁷ The histopathology laboratory at the College of Dentistry provide free services, and the frequency of DCs reported here might represent the true value. There were 5 cases of glandular odontogenic cysts (GOC) accounting for 1.1% of all OC and all occurred in patients over 30 years of age. The GOC is an uncommon jawbone cyst of odontogenic origin. It has a frequency rate of 0.012-1.3% of all cysts.¹⁸ The histological diagnosis of GOC had been considered challenging as the exact criteria for the diagnosis have not been clearly defined. In the present study, we followed the diagnostic criteria proposed by Kaplan et al.¹⁹ These cysts are characterized by aggressive clinical behavior and high recurrence rate, hence it is necessary to raise the awareness level among oral surgeons, oral, and general pathologists to the clinical and histopathologic diagnostic criteria.

There has been one case of eruption cyst and gingival cyst of adult out of the 470 cases. Both lesions are uncommon developmental OC occurring within the soft tissues. Eruption cyst occurs within the mucosa overlying a tooth that is about to erupt.⁴ Such lesions are clinically diagnosed and require no treatment, and that might explain the rarity of reported cases. On the

other hand, gingival cyst of the adult is frequently seen near mandibular canines and premolars, and is routinely treated with excisional biopsy.²⁰ The paradental cyst is an inflammatory OC that arises in association with partially erupted, vital mandibular third molar teeth with a history of pericoronitis.⁴ There are controversies regarding the terminology and what is to be considered as paradental cyst, and in the present study, we followed the definition of paradental cysts by Craig²¹. Most of the paradental cysts occur in the third decade of life with a male predominance.²² In the current series, there were 5 cases, all involving males in third decade of life.

Orthokeratinized odontogenic cyst was described by Philipsen²³ as a variant of KCOT, however it was categorized in 1981 by Wright²⁴ as a distinct entity from other OC. A few recent investigations have demonstrated significant differences in the histological features and clinical behavior of keratocysts and orthokeratinized odontogenic cysts.^{25,26} Among the 7 cases of orthokeratinized odontogenic cysts, 6 were diagnosed as orthokeratinized variant of keratocysts. It is very essential to make the distinction between the 2 lesions as the orthokeratinized OC does not show aggressive clinical behavior or recurrences as compared with KCOT.⁴

Although OC have peculiar clinical and radiographic characteristics, the differential diagnosis can sometimes be challenging, and the lack of clinical and radiographic data makes it difficult to reach a definitive diagnosis in some cases. The histopathology of some of the OC is non-specific, especially when inflamed. In our series, there were approximately 7.5% of inflamed OC that could not be classified as other cysts, due to lack of clinical and radiographic information.

The main limitation of this study was the absence of clinical data or radiographs, which is essential to reach to a definitive diagnosis of such lesions. Patients' files were not available in many cases partly due to the referral nature of the laboratory. It receives referred cases from governmental and private hospitals. The clinician should be aware of the importance of providing complete clinical data to the pathologist. Establishing a good differential diagnosis is a key step to success in treatment planning, therefore, more studies investigating odontogenic lesions and their pathogenesis are needed.

In conclusion, this relatively large series analysis of OCs revealed that the prevalence of OC is similar to those reported in other studies,^{6,11,14} in which most OC were inflammatory in origin. Further studies are needed to characterize the incidence of these lesions from different regions of KSA.

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