Prevalence and Distribution of Odontogenic Cyst in Indian Population: A 10 Year Retrospective Study

Deepashri H. Kambalimath · H. V. Kambalimath ·
S. M. Agrawal · Mamta Singh · Neha Jain ·
B. Anurag · P. Michael

Received: 13 July 2012 / Accepted: 3 October 2012 / Published online: 14 December 2012
© Association of Oral and Maxillofacial Surgeons of India 2012

Abstract The purpose of this study is to determine the prevalence of odontogenic cyst in an Indian population and compare it with various reports from the other geographic areas of the world. The files on odontogenic jaw cysts treated between 2001 and 2011 at the oral and maxillofacial surgery unit were retrieved retrospectively. Patient's demographic information mainly age, sex and location of the lesion was recorded and analyzed using descriptive statistics. The diagnosis of odontogenic cyst accounted in 150 cases and accounted for 15.31 % of all lesions biopsied throughout the period. Mean age of the patient was 32.2 years, and 58 % were males. The overall male to female ratio was 1.38:1. Radicular cyst was most prevalent histological type (48.67 %) followed by dentigerous cyst, odontogenic keratocyst, lateral periodontal cyst, paradental cyst, residual cyst, adult gingival cyst, glandular odontogenic cyst, calcifying odontogenic cyst. The most common locations of the odontogenic cysts were the mandibular (49.33 %) and posterior region (33.33 %). The distribution pattern of odontogenic cyst in this study is relatively similar to that in other

parts of the world but there are some geographic differences with regard to the relative frequency, sex, and anatomic distribution of the odontogenic cyst.

Keywords Odontogenic cyst · Incidence · Mandible · Radicular cyst

Introduction

A cyst is defined as a pathologic cavity containing fluid, semifluid or gaseous contents that are not created by the accumulation of pus; frequently but not always, is lined by epithelium. Odontogenic cyst (OC) is divided into two groups on the basis of their origin: developmental and inflammatory. OCs are unique in that they only affect the oral and maxillofacial region which are characterized by resorption of bone and develop from the components of the odontogenic epithelium or its residuals which remain trapped within the gingival tissue or bone [1]. Inflammatory cyst is associated with inflammation while developmental cyst are of unknown etiology [2]. Radicular and dentigerous cysts are relatively common and can be easily diagnosed [3]. Clinical and radiological presentations are almost similar for many of these cysts hence clinical misdiagnosis is possible. Some of these are known to have an aggressive behavior and propensity to recur so correct diagnosis of these lesions is very essential [4]. Hence surgically excised tissue should be duly studied histopathologically and properly diagnosed to ensure appropriate treatment.

Studies on prevalence of odontogenic cysts have been carried out in a number of countries [1–3, 5–19]. Thus, the aim of the present study was to determine the frequency of different types of OCs diagnosed histopathologically over a

D. H. Kambalimath
Department of Oral and Maxillofacial Surgery, Rishiraj College
of Dental Science and Research Centre, Bhopal, India

D. H. Kambalimath (✉)
H No. 40, Aditya Avenue, Airport Road, Bhopal, Madhya
Pradesh, India
e-mail: dkambalimath@yahoo.com

H. V. Kambalimath
Department of Pedodontics and Preventive Dentistry, Rishiraj
College of Dental Science and Research Centre, Bhopal, India

S. M. Agrawal · M. Singh · N. Jain · B. Anurag · P. Michael
Department of Oral and Maxillofacial Surgery, Modern Dental
College and Research Centre, Indore, India

period of 10 years in Indian population according to age, gender and site affected.

Materials and Methods

This retrospective study was approved by the research committee of our institution. Case records from the patients diagnosed as OCs between January 2001 and December 2011 (10 years) were retrieved from the files of the oral and maxillofacial surgery unit. The lesions diagnosed as OCs were only included in the study. Data regarding age, gender and anatomic location of all lesions were compiled from the clinical data together with the biopsy records.

Hematoxylin/eosin-stained slides of OCs or nonspecific cyst diagnoses were re-evaluated and selected according to the 2005 World Health Organization (WHO) histologic classification [20]. If the diagnosis could not be made through histopathologic evaluation alone then, clinical and radiographic findings were considered. When the original slides were not representative or were inadequate, new additional slides were prepared from paraffin blocks. The number of specimens, male:female ratio, anatomic site, and mean age were determined for each case. The anatomic sites were again subclassified as anterior and posterior for each mandible and maxilla. Microsoft ExcelTM software was used for data analysis and construction of the graphs.

Results

From a total of 980 lesions biopsied, 150 (15.31 %) met the criteria of OC after histopathologic evaluation. The overall frequency of OCs over the 10-year period is shown in Fig. 1. Eighty-seven (58 %) were found in males and 63 (42 %) in females (Fig. 2). The overall male to female ratio was 1.38:1.

The mean age was 33.2 years (range, 8–74 years), with 27.33 % of the cases being diagnosed in the third decade next 26 % in the second decades of life and least in the first

Fig. 1 Frequency of OCs

Fig. 2 Frequency of OCs according to gender variation

decade (2 %). Table 1 shows the frequency of OCs in all age groups.

Distribution of OCs according to the anatomic site is shown in Table 2 with 76 cases (50.67 %) affecting maxilla and 74 (49.33 %) occurring in mandible. The distribution of OCs according to anatomic site is as follows radicular cysts (48.67 %), dentigerous cysts (17.33 %), keratocyst (KC) (8 %), paradental cysts (7.33 %), residual and lateral periodontal cysts (LPC) (6 % each) were the most frequent lesions, accounting for 87.33 % of all OCs collected from our data. Nearly one-third of the lesions (33.33 %) were found in the mandibular posterior region and maxillary anterior (30 %) as the second most common site.

The most frequent type detected was radicular cyst with a male to female ratio of 1.35:1. The lesion was predominantly seen in patients between 11–30 years of age. Maxillary anterior teeth (50.68 %) were most commonly affected.

Second most common type of OC diagnosed was dentigerous cyst, which accounted for 26 cases (17.33 %) with a male to female ratio of 1.17:1. The majority of patients were under the age of 40 years. Mandibular posterior region was the most frequent site affected (53.85 %) next being maxillary posterior region (23.08 %).

Keratocyst (KC) was the third most common cyst accounting to 12 cases (8 %) with male to female ratio of 1.4:1. The majority of patients were in the second and third decades of their life. Mandibular posterior region (50 %) was most frequent site affected followed by mandibular anterior region (25 %).

Paradental cyst was the fourth most common cyst accounting to 11 cases (7.33 %) with a male to female ratio of 4.5:1. The majority of patients were in the fifth decade of their life. Mandibular posterior region (81.81 %) was most frequent site affected followed by maxillary posterior region (18.18 %).

Lateral periodontal cysts (LPC) and residual cysts were fifth most common cyst accounting to nine cases each (6 %). Male to female ratio for LPC was 1:3.5 while that for residual cyst was 3.5:1. The majority patients were in fifth decade in LPC and in sixth decade in residual cyst.

Table 1 Frequency of OC according to age

Sl no.	Cyst	1–10	11–20	21–30	31–40	41–50	51–60	>61
1	Adult gingival cyst	–	1	2	–	1	–	–
2	Calcifying odontogenic cyst	–	–	1	–	1	–	1
3	Dentigerous cyst	3	9	6	6	–	–	2
4	Glandular odontogenic cyst	–	–	1	–	1	–	1
5	Paradental cyst	–	3	2	2	4	–	–
6	Odontogenic keratocyst	–	4	4	2	–	1	1
7	Lateral periodontal cyst	–	3	–	–	5	1	–
8	Radicular cyst	–	19	24	14	4	6	6
9	Residual cyst	–	–	1	2	–	5	1
	Total (%)	3 (2)	39 (26)	41 (27.33)	26 (17.33)	16 (10.67)	13 (8.66)	12 (8)

Table 2 Distribution of OC according to the anatomic site

Sl no.	Type of cyst	Maxilla, n (%)		Mandible, n (%)		Total
		Ant	Post	Ant	Post	
1	Adult gingival cyst	1 (25)	–	–	3 (75)	4
2	Calcifying odontogenic cyst	1 (3.33)	–	–	2 (6.67)	3
3	Dentigerous cyst	1 (3.85)	6 (23.08)	5 (19.23)	14 (53.85)	26
4	Glandular odontogenic cyst	1 (3.33)	–	–	2 (6.67)	3
5	Paradental cyst	–	2 (18.18)	–	9 (81.81)	11
6	Odontogenic keratocyst	1 (8.33)	2 (16.67)	3 (25)	6 (50)	12
7	Lateral periodontal cyst	–	1 (11.11)	2 (22.22)	6 (66.67)	9
8	Radicular cyst	37 (50.68)	20 (27.4)	10 (13.7)	6 (8.22)	73
9	Residual cyst	3 (33.33)	–	4 (44.44)	2 (22.22)	9
	Total	45 (30)	31 (20.67)	24 (16)	50 (33.33)	150

Most of the LPC occurred in mandibular posterior (66.67 %) region while residual cyst occurred mostly in mandibular anterior region (44.44 %).

Adult gingival cyst, glandular odontogenic cyst (GOC) and calcifying odontogenic cyst (COC) were also diagnosed. These OCs predominantly affected the mandible.

Comparison of the relative frequency of OCs in the present study and selected references from other countries have been shown in Table 3.

Discussion

One of the most common lesions affecting the jaws is OCs and many of them share similar clinical and radiographic features [3]. Hence, the diagnosis of OCs should be based on careful clinical examination, radiographic and histopathologic features.

The 150 cases of OCs identified in the present study accounted for 15.3 % of all specimens. Similar results have

been reported in previous studies involving populations from UK [3], Chile [6], Brazil [7], Jordan [8], Sicily [9] and Iran [10]. The studies involving Mexican populations have shown lower frequencies of OCs ranging from 7.8 to 8.4 % [12].

Males showed discrete predominance in our series (58 %) and agrees with studies conducted in other countries with frequencies ranging from 52.5 to 65.0 % [3, 9, 11, 12]. On the contrary female predominance was found in Brazilian population [7].

As per anatomic location, most OCs affected the mandible, particularly the posterior region (33.33 %), followed by the anterior region of the maxilla (30 %). Coherently, these regions have been reported as the most common location of OC lesions in other studies [3]. In contrast, a study conducted in Lithuania found a higher frequency of OCs in the maxilla, with a proportion of 1.5:1 [13].

In the present study, the most common OCs were radicular cysts, dentigerous cysts and KC. These lesions accounted for 74 % of all OCs in our sample which is in accordance to other studies in various countries [1–3, 5–19].

The most frequent type of OCs are radicular cysts, accounting for 48.67 % of all OCs. Most similar studies reported a relative frequency between 47 and 58 % [3, 6, 13]. Our results showed an increase in the incidence of radicular cysts between the second and third decades of life in agreement with other studies [6–8]. In contrast, studies involving populations from UK [3] and Sicily [9] have shown a peak incidence between the third and fourth decades of life. The inflammatory genesis of radicular cysts was related to possible long term chronic pathologic processes mainly in the males (57.3 %) who neglected oral hygiene [9] as well as to a greater frequency of trauma in the anterior maxillary region (50.68 %). In agreement with other studies [3, 8, 13, 14] in our series radicular cysts were more prevalent among males with a male to female ratio of 1.35:1. In contrast, a study involving other Brazilian population [7] and Latin American countries [3, 8] has shown a slightly higher prevalence for females. The male predominance of radicular cysts might be related to the fact that men are more likely to neglect their oral hygiene and are more prone to trauma to the maxillary anterior teeth [11] (Table 3).

The second most common OC was dentigerous cyst, with frequencies ranging from 11.4 to 33.0 % [3, 6, 20]. Most cases are diagnosed in men [3, 7, 9]. The posterior region of the mandible is the site most frequently affected by these lesions [3]. Similar findings were observed in the present study. According to Jones et al. [3], the high frequency of dentigerous cysts at these sites is not a surprising finding since the lower third molars are the teeth most commonly impacted. Most cases of dentigerous cysts are diagnosed in the second decade of life [4, 6, 8], a fact also observed in the present study. However, Jones et al. [3] reported a peak incidence between the fifth and sixth decades. Male predilection was more frequently noticed with male to female ratio being 1.17:1. This was in

agreement with Bataineh et al. [8], Tortorici et al. [9], Mosqueda et al. [11], Meningaud et al. [14].

Para and orthokeratinised variants of KCs were previously described [4]. According to the new WHO classification [15], these cysts have now been reclassified as keratocystic odontogenic tumors. For comparison we maintained previous classification [4]. With inclusion of KC it occupied the third most common diagnosis with frequencies ranging from 1.3 to 21.5 % [3, 6, 7, 11, 14], in agreement with the present findings. Most cases of KCs are diagnosed in men between the second and third decades of life [3, 6, 7, 11, 14]. In contrast, a study conducted on a population from Turkey demonstrated a higher frequency of these lesions in women [16]. The posterior region of the mandible is the single most common location of KC [3, 6, 7, 11, 14, 18, 19]. The recurrence rate of KC has been extensively studied in the literature. Regarding variations in number of patients and duration of follow-up examinations, recurrence rates from 18 to 58.3 % have been reported [17]. In our country, follow-up examinations are not routinely performed and recorded; therefore, no systematic data concerning the recurrence rate could be retrieved from the files. We excluded sporadic cases of recurrence from the final analysis as there were no records and to obtain an uniform data.

Multiple cases of KCs have been reported in the literature that could be associated with Gorlin syndrome. The main focus of this study was OCs as separate entities not associated with other diseases. Also it should be noted that patients, records in our institution are not computerized and follow-up examinations are not routinely recorded. The possibility that patients may visit different centers for recurrent or multiple lesions should be considered. Therefore, we could not draw any conclusion regarding the prevalence of this syndrome among our cases.

Table 3 Comparison of the relative frequency of OCs in the present study and selected references from other countries

OCs	India (current study)		Brazil (2009)		Chile (2007)		Mexico (2000)		Iran (2011)		UK (2006)	
	n	%	n	%	n	%	n	%	n	%	n	%
Radicular cyst	73	48.67	265	52.2	1,494	59.2	118	47.8	465	37.8	3,724	52.3
Dentigerous cyst	26	17.33	156	30.7	546	21.6	108	43.7	303	24.7	1,292	18.1
OKC	12	8.00	–	–	–	–	–	–	239	19.4	828	11.6
Paradental cyst	11	7.33	28	5.5	113	4.4	–	–	23	1.8	402	5.6
Residual cyst	9	6.00	30	5.9	328	13	15	6.1	99	8.0	573	8.0
LPC	9	6.00	09	2.3	17	0.7	03	1.2	7	0.6	28	0.4
Adult gingival cyst	4	2.67	05	1	10	0.4	–	–	4	0.3	16	0.2
GOC	3	2.00	04	0.8	01	0.03	–	–	4	0.3	11	0.2
COC	3	2.00	–	–	–	–	–	–	–	–	21	0.3
Total	150 cases		507 cases		2,523 cases		247 cases		1,227 cases		7,121 cases	

Paradental cyst is an inflammatory origin OC usually occurring on the lateral root surface of a partially erupted tooth and secondarily to inflammation associated with pericoronitis [3]. In the present series 11 (7.33 %) cases were found mainly in mandibular posterior region with male predominance as in accordance with Urrutia et al. [2], Jones et al. [3], Sharifian and Khalili [10] and Mosqueda et al. [11]. The relative frequency of this lesion varies from 1 to 5.6 % [2, 3, 6]. These cysts are diagnosed in the third decade of life [3]. In contrast to this, our study revealed four cases that were found in the fifth decade; these lesions were mostly retained after the eruption of last molars.

Lateral periodontal cysts occur laterally to the roof of a vital tooth, causing no clinical signs or symptoms and are therefore normally found in routine radiographs [1]. Frequency of this type of cyst ranges from 0.3 to 8 % of all OCs [6, 11, 12, 14] which was in accordance to our study (6 %). Females [10] were more frequently affected in the fifth decade [3] and in the mandibular posterior region. Male predominance was found by Jones et al. [3], Mosque et al. [5] and Meningaud et al. [14]. There does not seem to be a positive gender predilection in this entity [10].

Residual cyst occurs as a remnant of infection within the jaw due to improper removal of the infected tissue during the removal of tooth. This accounted for 6 % of all OCs. Urrutia et al. [2] accounted for 5.9 %, Ledesma et al. [12] accounted for 6.1 % and Ochsenius et al. [6] mentioned 13 % of cases. These lesions occurred in the sixth decade with male predominance and mainly in the mandibular anterior region. In the present study, residual cysts were the fifth most frequent type of OC. However, our findings differ from those reported by other authors [1, 3, 8, 12, 14] who found this type of lesion in the third and fourth decades. These lesions are well distributed among different age groups and are prevalent above the seventh decade of life in many aforementioned studies. Younger patients are also affected when the teeth are lost prematurely [1].

Our cases accounted for 2.67 % of gingival cysts of adults. These cysts are thought to arise from the epithelial remnants within gingival connective tissue. They commonly present in the fifth and sixth decades [3] of life but in our study we found them in the third decade. Mandible (75 %) was the most frequent site mainly in females than in males (3:1) which was in accordance with Jones et al. [3]. The gingival cyst of infants is rarely submitted for histopathological diagnosis as these lesions usually undergo spontaneous involution within 3 months of birth [3].

GOCs and COCs were lesions with lower frequency of 2 % each. COC has been reclassified as Calcifying Cystic Odontogenic Tumor (CCOT), an odontogenic tumor in the new classification [15]. These lesions occurred in third, fifth and seventh decade, predominantly in mandibular posterior region with male predilection. This was in accordance with

other studies Avelar et al. [1], Jones et al. [3], Kaplan et al. [4]. CCOT was first coined by Gorlin in 1962. Some authors tend to consider COCs as two entities both a cyst and a tumor [3]. The frequency of occurrence is estimated at less than 1 % [3]. In our study we found its occurrence as 2 %. There was a predilection for males (2:1) with approximately equal distribution for each decade and an age range from 22–74 years, which is in accordance with Jones et al. [3].

Conclusion

Our results revealed that there is a wide range of OCs, with some cysts having a predilection for certain ages, sex and sites. It is important to realize that some of these cysts have a marked propensity to recur as well as behave in a locally aggressive manner. Lesions such as KC can grow to a larger size, resulting in facial deformity, destruction of facial structures and difficult surgical management. It is essential that these lesions are detected as early as possible to minimize any necessary surgery. Patients need to be reviewed regularly to monitor possible recurrence. Based on our findings, the distribution pattern of OCs in Indian population is relatively similar to studies from other parts of the world. The importance of collecting adequate clinical information regarding final diagnosis of these lesions and performing routine follow-up examination is further emphasized.

Conflict of interest None.

References

1. Avelar RL, Antunes AA, Carvalho RWF, Bezerra PGC, Neto PJO, Andrade ESS (2009) Odontogenic cysts: a clinicopathological study of 507 cases. *J Oral Sci* 51:581–586
2. Urrutia SN, Figueiredo R, Gay-Escoda C (2010) Retrospective clinicopathological study of 418 odontogenic cysts. *Med Oral Patol Oral Cir Bucal* 15:e767–e773
3. Jones AV, Craig GT, Franklin CD (2006) Range and demographics of odontogenic cysts diagnosed in a UK population over a 30-year period. *J Oral Pathol Med* 35:500–507
4. Kaplan I, Gal G, Anavi Y, Manor R, Calderon S (2005) Glandular odontogenic cyst: treatment and recurrence. *J Oral Maxillofac Surg* 63:435–441
5. Mosque-Taylor A, Irigoyen-Camacho ME, Diazo-Franco MA, TorresTejedo MA (2002) Odontogenic cysts. Analysis of 856 cases. *Med Oral* 7:89–96
6. Ochsenius G, Escobar E, Godoy L, Penafiel C (2007) Odontogenic cysts: analysis of 2,944 cases in Chile. *Med Oral Pathol Cir Bucal* 12:E85–E91
7. Batista de Souza L, Gordón-Núñez MA, Weege Nonaka CF, Costa de Medeiros M, Fernandes Torres T, Guedes Emiliano GB (2010) Odontogenic cysts: demographic profile in a Brazilian population over a 38-year period. *Med Oral Patol Oral Cir Bucal* 15:e583–e590

8. Bataineh AB, Rawashdeh MA, Al Qudah MA (2004) The prevalence of inflammatory and developmental odontogenic cysts in a Jordanian population: a clinicopathologic study. *Quintessence Int* 35:815–819
9. Tortorici S, Amodio E, Massenti MF, Buzzanca, Burruano F, Vitale F (2008) Prevalence and distribution of odontogenic cyst in Sicily: 1986–2005. *J Oral Sci* 50:15–18
10. Sharifian MJ, Khalili M (2011) Odontogenic cyst: a retrospective study of 1,227 cases in an Iranian population from 1987 to 2007. *J Oral Sci* 53:361–367
11. Mosqueda-Taylor A, Irigoyen-Camacho ME, Diaz-Franco MA, Torres-Tejero MA (2002) Odontogenic cysts. Analysis of 856 cases. *Med Oral* 7:89–96
12. Ledesma-Montes C, Hernández-Guerrero JC, Garcés-Ortíz M (2000) Clinico-pathologic study of odontogenic cysts in a Mexican sample population. *Arch Med Res* 31:373–376
13. Varinauskas V, Gervickas A, Kavoliūniene O (2006) Analysis of odontogenic cysts of the jaws. *Medicina (Kaunas)* 42:201–207
14. Meningaud JP, Oprean N, Pitak-Arnnp P, Bertrand JC (2006) Odontogenic cysts: a clinical study of 695 cases. *J Oral Sci* 2006:59–62
15. Madras J, Lapointe H (2008) Keratocystic odontogenic tumour: reclassification of the odontogenic keratocyst from cyst to tumour. *J Can Dent Assoc* 74:165–165h
16. Koseoglu BG, Atalay B, Erdem MA (2004) Odontogenic cysts: a clinical study of 90 cases. *J Oral Sci* 46:253–257
17. Chirapathomsakul D, Sastravaja P, Jansisyanont P (2006) A review of odontogenic keratocysts and the behavior of recurrences. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 101:5–9
18. Selvamani M, Donoghue M, Basandi PS (2012) Analysis of 153 cases of odontogenic cysts in a South Indian sample population: a retrospective study over a decade. *Braz Oral Res* 26:330–334
19. Ramchandra P, Maligi P, Raghuvver HP (2011) A cumulative analysis of odontogenic cysts from major dental institutions of Bangalore city: a study of 252 cases. *J Oral Maxillofac Pathol* 15:1–5
20. Kramer IR, Pindborg JJ, Shear M (1992) The WHO histological typing of odontogenic tumours. A commentary on the second edition. *Cancer* 70:2988–2994