

ODONTOGENIC KERATOCYSTS: A CLINICAL AND RADIOGRAPHIC STUDY

¹MOHAMMAD TARIQ KHAN, BDS

¹AHMAD KHAN, BDS, FCPS

²UMAR KHITAB, BDS, MSC (London)

³ABDUS-SALAM, MDS, FCPS

ABSTRACT

This descriptive study was carried out, at Khyber College of Dentistry, Peshawar from Sept 2005 to Jan 2007, on 40 patients having histopathologically confirmed odontogenic keratocysts. Maximum patients (62.5%) presented in the 2nd and 3rd decades. 21 were male while 19 were female. Seventy five percent cases occurred in the mandible, with the posterior region involved in maximum number of cases in both the jaws. Facial asymmetry, pain and cheesy aspirate were 75%, 50% and 82.5% respectively. Radiographic findings were well defined borders, multilocularity, impacted tooth and root resorption, in 45%, 55%, 50% and 7.5% of cases respectively. The objective of the study was to list the common modes of presentations of odontogenic keratocysts and educate the general dental practitioners about the aggressive nature of this lesion. As a prophylactic measure, routine dental check up will help a lot in the prevention and timely diagnosis of odontogenic keratocysts.

Key words: *Odontogenic keratocyst, Odontogenic tumor, Khyber College of Dentistry*

INTRODUCTION

Odontogenic keratocyst (OKC) is a developmental cyst with specific histopathologic features and clinical behavior. It is generally agreed that it arises from cell rests of dental lamina. Previously called primordial cyst, it may occur in place of a tooth where cystic degeneration of enamel organ epithelium may occur before the development of dental hard tissues. They account for about 3 to 11% of all odontogenic cysts.¹

Clinically, they are usually asymptomatic, but may be associated with pain, swelling, drainage and displacement of teeth. They often involve impacted teeth.² Rarely, it may present as an apparent mass in the parotid gland.³ Peripheral odontogenic keratocysts may occur very rarely in gingival soft tissues.⁴

Odontogenic keratocysts are usually discovered during the course of a routine radiographic examination. They demonstrate a well defined unilocular or multilocular radiolucency with smooth and often

corticated margins which may simulate that of a dentigerous, radicular, residual or a lateral periodontal cyst. Root resorption is seldom a feature. In older individuals, keratocysts of anterior midline can mimic nasopalatine duct cyst.³

The diagnosis of keratocyst is purely histopathological. It has a thin friable wall, typically with minimal inflammation. The lining is stratified squamous epithelium, 6-8 cells thick. There is flat epithelium-connective tissue interface. The basal cell layer is palisaded, hyperchromatic, cuboidal or columnar epithelial cells. Luminal cells are flattened and parakeratotic in wavy or corrugated appearance. Small satellite cysts, cords or islands of odontogenic epithelium may be seen in fibrous wall, in 7-26% of cases.³

The growth characteristics of keratocyst have been a matter of much debate. Their growth may be due to unknown factors inherent in the epithelium or enzymatic activity in the fibrous wall, termed as mural growth. Besides, keratocyst is considered to have a

¹Former Postgraduate Resident, Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar

²Associate Professor, Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar

³Professor, Sardar Begum Dental College, University Town, Peshawar

Correspondence: Dr. Ahmad Khan c/o Mr Mohammad Amin, Shop No; 1 Aslam Market, Baghdada, Mardan. E-mail: ahmad_surgeon@yahoo.com, Cell no: 0300-5721773.

potential for aggressive growth or even neoplasia. Multiple keratocysts may be present in nevoid basal cell carcinoma syndrome, in which case, they show a higher frequency of mural proliferation, satellite cysts and basal cell budding than non syndrome associated keratocysts.⁵ Rarely, the development of malignancy like squamous cell carcinoma has been reported in the lining of keratocyst.^{5, 6}

Keratocyst has a higher tendency for recurrence, ranging from 5 to 62%, with several other studies showing a recurrence rate of 30%. According to some authors, although this cyst can and does recur, it is not a tumor as it does not invade into soft tissues. Its recurrences are mostly related to surgical imperfections. A smaller percentage of recurrences are actually new primary keratocysts from other activated odontogenic rests.^{7, 8} On the contrary, there is much clinical, histological as well as molecular evidence, supporting a neoplastic behavior of this lesion.

An aggressive behavior of the cyst has been reported in a number of cases. Facial form and symmetry is greatly disturbed by cysts, due to their potential to resorb bone. They can also put the patient at risk of pathological jaw fractures when they become sufficiently large in size. The perforation of the cranial base with dissecting keratocysts in three cases has been reported.⁹

METHODOLOGY

This descriptive (case series) study was undertaken at Khyber College of Dentistry, Peshawar from Sept 2005 to Jan 2007 on 40 patients having histopathologically proved odontogenic keratocysts. Patients not willing to be included in the study were excluded. With the consent of the patients all the necessary information about the variables of the study written in preformed proforma were collected by history taking and meticulous clinical examination.

Radiographic studies included orthopantomograph, occipitomental view, true lateral, lateral oblique and postero-anterior views of the face. For each cystic lesion, either a single or a combination of these radiographs was studied for border definition, pattern of locularity, impacted/unerupted tooth in the cystic lesion, and confirmation of any missing tooth in the dental arch. Periapical radiographs were studied for the presence of root resorption of the teeth involved by the odontogenic keratocysts. An occlusal view was done for confirmation of cortical expansion.

The landmark for the site of the lesion in case of maxilla was the distal surface of the canine tooth. The area of the jaw anterior to the distal surface of canine, extending to the same point on the opposite side was termed as anterior maxilla. The area distal to the distal surface of canine extending upto the tuberosity was defined as posterior maxilla. The mandible was arbitrarily divided into anterior and posterior regions by the distal surface of the canine. The posterior mandible was further sub-divided into body and ramus by the distal surface of mandibular third molar tooth. Any lesion which overlapped at the point of definition of the site, i.e. canine and third molar; in this situation, the site was selected where more than 2/3rd of the lesion occurred. The data so obtained were evaluated and analyzed by applying descriptive statistics. SPSS version 10 was used for statistical analysis.

RESULTS

The age range was 5-75 years, with a mean value of 29.08 ±17.68. Maximum number of patients presented in the second decade (n=13, 32.5%), followed by 3rd decade (n =12, 30%), Table 1.

Gender distribution of the study showed that 52.5% patients were male (n =21), while the remaining 47.5% were female (n =19), with a male to female ratio of 1.1: 1.0.

The site distribution of the study showed that majority of the cases involved the mandible (n=30 75%), Table: 2.

Seventy five percent presented with facial asymmetry (n=30), while 50% of patients complained of pain

TABLE 1: AGE DISTRIBUTION OF ODONTOGENIC KERATOCYSTS (n=40)

Age (in years)	No. of patients	Percentage
1-10	2	5
11-20	13	32.5
21-30	12	30
31-40	5	12.5
41-50	3	7.5
51-60	1	2.5
61-70	2	5
71-80	2	5
Total	40	100

TABLE 2: SITE DISTRIBUTION OF ODONTOGENIC KERATOCYSTS IN MANDIBLE AND MAXILLA (n=40)

Site	No. of patients	Per-centage
Mandible	30	75
Anterior mandible	2	5
Posterior mandible	28	70
Body	13	32.5
Ramus	2	5
Body + Ramus	13	32.5
Maxilla	10	25
Anterior maxilla	2	5
Posterior maxilla	8	20



Fig 1: A big cystic lesion with well defined borders, impacted tooth and root resorption.

TABLE 3: CLINICAL AND RADIOLOGICAL FEATURES OF ODONTOGENIC KERATOCYSTS (n=40)

Findings	Present	Absent
Pain		
No. of patients	20 (50%)	20 (50%)
Facial asymmetry		
No. of patients	30 (75%)	10 (25%)
Missing tooth in dental arch		
No. of patients	23 (57.5%)	17 (42.5%)
Impacted / unerupted tooth in cystic cavity		
No. of patients	20 (50%)	20 (50%)
Root resorption		
No. of patients	3 (7.5%)	37 (92.5%)

at the time of presentation (n =20). In the remaining half of the patients, it was a painless lesion (Table 3). Fig 1 shows radiograph of a big cystic lesion, which was quite painless at the time of presentation.

Regarding cortical expansion, 57.5% of the patients had buccal cortical expansion only (n=23), (Fig 2).

Fluid aspiration showed cheesy material in 82.5% of cases (n=33) as shown in Fig 3. A preliminary intraoral examination of the patient showed a missing tooth in the arch in 57.5% of cases (n =23). Table 3.

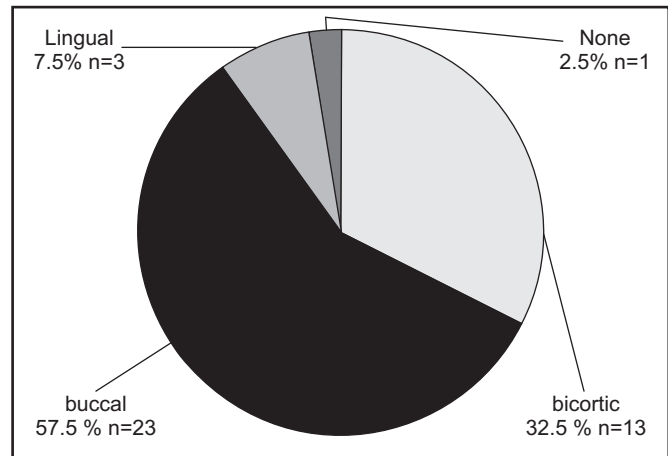


Fig 2: Distribution of cortical expansion (n=40)

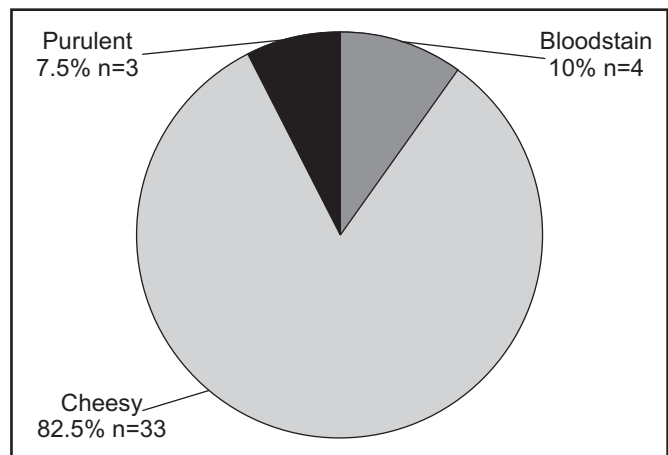


Fig 3: Distribution of fluid aspirate obtained from odontogenic keratocysts (n=40)

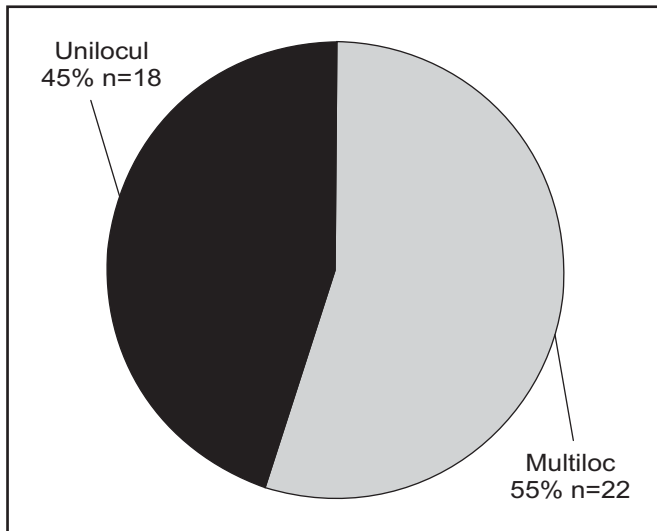


Fig 4: Radiographic locularity of odontogenic keratocysts (n=40)

Distribution of radiographic border definition showed that 55% were diffused and 45% were well defined. Pattern of locularity is given in figs 4. Root resorption was noted in only 3 cases (7.5%), while 50% of the odontogenic keratocysts contained an impacted or unerupted tooth (n= 20). Table 3.

DISCUSSION

Occurrence of odontogenic keratocyst varies over a wide age range. In this study, the age range was 5- 75 years, with a mean age of 29.08 years. The age range of this study coincides with that done on 60 patients of OKCs, in 1988 at Ohio State University, which was 5 – 78 years, with a mean age of 40 years.¹⁰ The mean age coincides with that of a retrospective study done in Singapore and Malaysian population, which was 26.98 years.¹¹ Another coinciding figure for the mean age was that of a study done on 30 patients of Gorlin syndrome with 58 OKCs, which was 33.71 years.¹² The small difference may be due to the time of presentation of the patients to the hospital. Still another retrospective study done by Maxine Patridge,¹³ on 60 patients of OKC at St. George's hospital, showed a mean age of 38 years (age range 11 – 81). The difference in the value of mean age may be due to racial differences. It is also possible that with the passage of time, the OKC is diagnosed earlier due to patient awareness or some likely phenomena. This study showed the maximum number of patients in the second decade, which is in accordance with the values in other international studies.^{11, 12, 13, 14}

This study showed that 52.5 % patients were male, while 47.5 % were female patients. Gender distribu-

tion, in other studies reported, showed the percentage of male patients as 57.4 %¹¹, 58.62 % in a study done on patients with Gorlin's syndrome¹² and 56.7 % in a study by Haring.¹⁰ In Patridge's study¹³, 64% cysts occurred in males, while 36% in females. Overall, this study showed a male preponderance of patients with OKCs, which correlate with the international values. Somehow, the small statistical difference of male to female ratio, as compared to the rest of the world, may be due to the reason, that females are more concerned for the jaw swellings than males, and also because the males in this area tolerate the mild pain associated with these lesions due to their comparatively higher pain threshold.

In the present study, 30 cases occurred in the mandible (75%), while 10 cases in the maxilla (25%). The figures for the jaw involvement in this study coincide well with that of a study done in Northwestern USA, which showed mandibular involvement in 74 % of cases.¹⁴ Other figures reported in the literature were 69.8%¹⁵ and 66.8%¹⁶. Somehow, the percentage of OKCs occurring in the mandible ranges from 65 %¹⁰ to 83 %¹⁷ in the literature. The differences in the values of different studies may be due to the individualized landmarks for the site in each study, apart from many other factors.

History and clinical examination of the patients showed that 50% of the patients experienced pain, while the remaining lesions were quite painless.^{18,19} In 75% of patients, there was facial asymmetry. Cortical expansion was present in 97.5% of cases in such a pattern, that 57.5% had buccal cortical expansion, in 32.5%, there was bicortical expansion, while the lingual cortex alone was expanded in only 7.5% of patients.

Despite these high figures for the facial asymmetry and buccal cortical expansion,²⁰ even then, the patients ignored the problem, and by the time of diagnosis of the lesion, it had caused a great deal of bone loss.

Fluid aspiration is one of the essential steps towards diagnosis of a cystic lesion²¹. In this study, all of the 40 cases were aspirated positively. The cheesy aspirate typical of OKC was present in 82.5 % of cases. In 10%, it was blood stained, while the remaining 7.5 % showed purulent aspirate due to chronic suppurative infection.

The old theory that primordial cyst forms due to cystic changes in whole of the tooth primordium before the formation of dental hard tissues, dictates the

importance of missing tooth in the dental arch of the patients with OKCs. This study showed that 57.5% of patients had a missing tooth in the dental arch. Somehow, the presence of a full complement of dentition in the remaining 42.5% of patients, without any missing tooth in the arch, puts this theory in suspicion. Another reasonable explanation for the concomitant presence of an OKC lesion and the full complement of teeth is that lesion may have developed from cystic degeneration of a supernumerary tooth.

Any lesion with more than one corticated radiolucent area is defined as multilocular. This study showed a multilocular pattern of the cystic lesion on the radiograph in 55% of the patients. In Patridge's study¹³, 82% lesions appeared as unilocular, while only 18% as multilocular, while in Haring's study¹⁰, 73.3% lesions appeared unilocular and only 26.6% as multilocular. Apart from the fact that multilocular lesions are usually larger in size than unilocular ones, no other satisfactory explanation can be given for the gross difference in the values of locularity of the lesion in this study and other international studies. Somehow, the quality of radiographs used in the study may also have an effect upon the values of locularity in different studies. Out of the 40 cases of OKCs, 45 % had well-defined borders.

Root resorption was seen in 7.5% of cases. As the OKC is the cyst least commonly associated with root resorption as compared to dentigerous and radicular cysts. Root resorption in Haring's study was 5%¹⁰, 11% in Maxine Patridge's study¹³, while it was 4.4% in Browne's study.¹⁷ In 50% of cases, the cystic lesion was associated with an impacted or unerupted tooth, the condition called "OKC in a dentigerous relationship". This figure correlates very well with other international figures, like 48.6% in Haring's study¹⁰, and 49.4% in Browne's study.¹⁸ However; the same value in Patridge's study was 22%.

It is recommended to the general dental practitioners to have an overview of whole of the stomatognathic system, even if a patient comes for a single tooth problem. It is also recommended to have a routine radiographic check up of the stomatognathic system, especially in patients in 2nd and 3rd decades of life.

REFERENCES

1 Neville BW, Damm Dallen CM, Boquot JE. Odontogenic cysts and tumors. In: Oral and maxillofacial pathology. 2nd ed. New Delhi: Elsevier, 2004; 589-610.

2 Chow HT. Odontogenic keratocyst: a clinical experience in Singapore. *Oral Surg Oral Pathol Oral Med Oral Radiol Endod* 1998; 86: 573-77.

3 Righi PD, Wells WA, Wagner JD, Kim SA, Anderson MW, Longardner NR. Odontogenic keratocyst of mandible: an unusual cause of a parotid mass. *Ann Plast Surg* 1998; 41: 89-93.

4 Ide F, Shimoyama T, Horie N. Peripheral odontogenic keratocyst: a report of 2 cases. *J Periodontol* 2002; 73: 1079-81.

5 Hasegawa K, Amagasa T, Shioda S, Kayano T. Basal cell nevus syndrome with squamous cell carcinoma of the maxilla: Report of a case. *J Oral Maxillofac Surg* 1989; 47: 629 – 33.

6 Makowski GJ, McGuff S, Van Sickels JE. Squamous cell carcinoma in a maxillary odontogenic keratocyst. *J Oral Maxillofac Surg* 2001; 59: 76-80.

7 Marx RE, Stein D. A rationale for diagnosis and treatment. In: Oral and maxillofacial pathology. Chicago: Quintessence, 2002; 590-602.

8 Marx RE, Smith BH, Smith BR, Frenndrich KL. Swelling of the retromolar region and cheek associated with limited mouth opening. *CPC J Oral Maxillofac Surg* 1993; 51: 304 – 10.

9 Jackson IT, Potparic Z, Faching M, Schievink WI, Tidstrom K, Hussain K. Penetration of the skull base by dissecting keratocyst. *J Craniomaxillofac Surg* 1993; 21:319 – 25.

10 Haring JI, Van Dis ML. Odontogenic keratocysts: a clinical, radiographic, and histopathologic study. *Oral Surg Oral Med Oral Pathol* 1988; 66:145 – 53.

11 Ngeow WC, Zain RB, Yeo JF, Chai WL. Clinicopathologic study of OKC in Singapore and Malaysia. *J Oral Sci.* 2000; 42: 9 – 14.

12 Pavelic B, Valter K, Vucicevic-Boras V, Katanec D, Levanat S, Donath K. Incidence of OKCs in patients with Gorlin-Goltz syndrome according to age, gender and location. *Acta Stomatol Croat.* 2004; 38:23 – 25.

13 Patridge M, Towers JF. The Primordial cyst (odontogenic keratocyst): its tumour-like characteristics and behaviour. *Br J Oral Maxillofac Surg* 1987; 25:271 – 79.

14 Oda D, Rivera V, Ghanee N, Kenny EA, Dawson KH. Odontogenic Keratocyst: The Northwestern USA Experience. *J Contemp Dent Pract* 2000; 2:1 – 8.

15 Lipovec A, Hren NI. Keratocysts in the jaws. *Radiol Oncol* 2004; 38: 187 – 92.

16 Ali M, Baughman RA. Maxillary odontogenic keratocyst: A common and serious clinical misdiagnosis. *J Am Dent Assoc.* 2003; 134: 877 – 83.

17 Brown RM. The odontogenic keratocyst. Clinical aspects. *Br Dent J* 1970; 128: 225 – 31.

18 Arafat AL. odontogenic keratocyst. *J Baltimore Coll Dent Surg* 1984; 36: 5 – 13.

19 Alföhrs E, Larson A, Sjogren S. The odontogenic keratocyst: a benign cystic tumor? *J Oral Maxillofac Surg.* 1984; 42: 10 –19.

20 Main DMG. Epithelial jaw cysts: a clinicopathological reappraisal. *Br J Oral Surg* 1970; 8:114–25.

21 Brannon RB. The odontogenic keratocyst. A clinicopathologic study of 312 cases. Part I. Clinical features. *Oral Surg Oral Med Oral Pathol* 1976; 42:54–72.