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A Retrospective Cone Beam Computed Tomography (CBCT) Study of the Prevalence of Incidental Odontogenic Cyst Findings in an Indian Subpopulation

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ABSTRACT

The aim of this study was to determine the prevalence of odontogenic cysts in an Indian subpopulation and compare it with various reports from the other geographic areas of the world. The data files regarding odontogenic jaw cysts diagnosed between 2012 and 2016 at the oral radiology center were retrieved retrospectively. Patient's demographic information mainly sex and location of the lesion was recorded and analyzed using descriptive statistics. The diagnosis of odontogenic cyst accounted in 115 cases and accounted for 36.97 % of all lesions throughout the period. In total, 115 patients, out of which 72 were males and 43 were females. Radicular cyst was most prevalent histological type (44.34 %) followed by dentigerous cyst (23.47%) , 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 (53.04%). 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, CBCT, Radiology

Running title: Prevalence and distribution of Odontogenic Keratocyst

I. INTRODUCTION

Imaging is an important parameter in diagnosis and treatment management in health care sector(1). However, all the intraoral and extra oral procedures produce only uniplanar images, i.e. two dimensional images(1). Hence, there aroused a need for the development of a more complex imaging system that could evaluate the skeletal structure in a three dimensional fashion(2). Introduction of Cone beam Computed Tomography (CBCT) specifically for maxillofacial structures has been an exemplar shift from 2D imaging to 3D imaging(3). In Dentistry, CBCT

was introduced in 1997 in Italy, which widely spread to the United States in 2001(3). CBCT has expanded the role of imaging from diagnosis to image guidance in various surgical and endodontic procedures(4).

CBCT is appropriate for the field of dentistry because its ability to produce superior quality images of high-contrast structures such as maxillofacial bony anatomy and teeth at a potentially lower radiation dose and a lower cost to the patient as compared to computed tomography (CT)(5). Its greatest advantages over the use of two-dimensional conventional radiographs resides in its ability to eliminate two primary problems associated with plain film radiography: geometric distortion and superimposition of surrounding anatomical structures that can thus, aid in diagnosing occult pathology, thereby reducing the possibility of missing clinically relevant disease(5). Early detection and improved diagnostic accuracy are essential in treating life-threatening diseases.

A cyst is defined as a non-cancerous pathologic sac containing fluid (pus), semifluid or gaseous contents and is lined by epithelium. The most common cysts in the oral cavity are odontogenic cysts that have a dual origin arising either from a developmental defect such as from the components of the odontogenic epithelium or its residuals which remain trapped within the gingival tissue or bone or an inflammatory origin characterized by resorption of bone and develop and are only observed in the orofacial region. In oral radiology, CBCT can be used to diagnose orofacial cystic pathology. Nakata et al. reported that CBCT may present as an aid in detecting the presence of previously undiagnosed periapical disease where prior clinical evaluation and conventional radiographs have failed to reveal pathology(6). Asymptomatic or occult pathology may lead to delayed diagnosis, which may adversely affect eventual treatment strategies and outcomes. Studies on prevalence of odontogenic cysts have previously been carried out(7-9). The aims of this retrospective study were to determine the prevalence of incidental odontogenic cysts (OC) findings in a large sample of Indian subpopulation patients by CBCT with a wide FOV and assess the relationships of such abnormalities with gender.

II. METHODS AND MATERIAL

The study involved a study of 311 archived CBCT cases at a private dental CBCT lab in Mumbai, India. Examination was achieved with the iCAT 17-19 CBCT scanner (iCAT, hatfield, PA). Scan parameters were Voxel size- 0.25, Beam Diameter- 16 x 13 cm, Scan time - 26 seconds. Scans obtained were from the year 2012 to 2016.
Inclusion Criteria: Inclusion criteria comprised of CBCT exams which showed the entire maxilla and mandible as well as maxillary sinuses bilaterally or, at least, the four sinus walls, independently of whether the whole maxilla and other anatomical structures are visualized or not.
Exclusion Criteria: Exclusion criteria comprised of patients under 14 years of age, because of their incomplete sinus development. Images of low resolution quality and those in which the presence of metallic artifacts impaired sinus visualization was excluded.

The iCAT vision software was used for analysing images and to obtain Axial, Coronal and Sagittal views with the 3D view and panoramic view.

Scans were either of full mouth or only maxilla including the nasal sinus and alveolar bone as required by the consulting Oral Radiologist.

III. RESULTS AND DISCUSSION

Results:

Table 1 and 2 show the results of the incidental odontogenic cyst findings. In total, 115 patients, out of which 72 were males and 43 were females. The most common findings were cysts, which were detected in 115 patients (36.97%). Gender was a significant predictor of cysts (p<0.01), with male subjects showing a higher % of this pathology (62.60 %) as compared to females (37.39%). The cysts were predominantly located in the mandibular region (53.04%) as compared to the Maxillary region (45.21%).

Discussion:

To date, this is the first study describing the prevalence of odontogenic cysts in an Indian subpopulation in Mumbai. In the present study, 311 CBCT scans were examined for the frequency of oral pathologies. The pathologies were grouped as calcifications, TMJ disorder, salivary gland diseases, tumors, bone diseases, trauma, cystic/tooth related findings, and others. These findings varied from benign lesions to pathologic findings. The study consisted of 311 patients of which 183 of them being males and 128 females.

A majority of the incidental findings comprised of cysts (36.97%). One of the most common lesions affecting the jaws is OCs and many of them share similar clinical and radiographic features. In this study, we used CBCT as a tool for diagnosis, as mentioned by a previous study(10). The 115 cases of OCs identified in the present study accounted for 36.97% of all specimens. Similar results have been reported in previous studies involving populations from Libya, India, Brazil, Jordan, Sicily and Iran(8, 9, 11-17). The studies involving Mexican populations have shown lower frequencies of OCs ranging from 7.8 to 8.4 %(13). Males showed discrete predominance in our series (62.60 %) and agrees with studies conducted in other countries with frequencies ranging from 52.5 to 65.0 %. On the contrary female predominance was found in Brazilian population(14). 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. In the present study, the most common OCs were radicular cysts, dentigerous cysts and KC.

The most frequent type of OCs in our study were radicular cysts, accounting for 44.34 % of all OCs. Most similar studies reported a relative frequency between 47 and 58 %. Studies have speculated the inflammatory genesis of radicular cysts to possible long term chronic pathologic processes mainly in the males (57.3 %) who neglected oral hygiene as well as to a greater frequency of trauma in the anterior maxillary region (50.68 %). The second most common OC was dentigerous cyst, which was detected by CBCT as mentioned in previous studies(18) with frequencies ranging from 11.4 to 33.0 %, which was in accordance with our study where we observed an occurrence rate of 23.4%. The posterior region of the mandible is the site most frequently affected by these lesions. Similar findings were observed in the present study with impacted molars. According to Jones et al., 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.

According to the new WHO classification(2017), Para and orthokertinised variants of KCs have now been reclassified as keratocystic odontogenic tumors as compared to its previous position under the neoplastic

category (2005 classification)(19). With inclusion of KC it occupied the third most common diagnosis with frequencies ranging from 1.3 to 21.5 %, in agreement with the present findings. 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(7, 20). 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. 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, hence there remains a possibility that patients may visit different centers for recurrent or multiple lesions should be considered, which precluded the consideration of this syndrome in our studies.

Maxilla accounted total of 45.21% of cases which was in accordance with previous studies(21-23), and included cyst involving maxillary sinus, nasopalaine cyst, dentigerous cyst, radicular cyst and simple bone cyst. Maxillary Cyst are the ones involving maxillary sinus are usually retention cyst either caused due to pathology like polyp or intended by a decayed tooth or periodontal pathway. Usually they are spontaneously regressed or show no change in size. Transillumination test or MRI is suggest to rule out the exact cause.

Nasopalatine Duct Cyst or Cyst of the Incisal canal (Incisive papilla cyst) is a non-odontogenic developmental cyst located in the incisive canal or in the anterior palatine papilla. Radiographically the nasopalatine duct cyst is a well-demarcated radiolucency in the midline of the palate, apical to the central incisor teeth. The lucency varies from round to oval or heart-shaped. In this study, it accounted 1.73% of the total cases. 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 7.83% of all OCs.

The limitations of the present study are that the study was based on the application of CBCT and not histopathology in diagnosing the odontogenic cysts. In spite of the limitation, the present study indicates CBCT scans can help in early detection and evaluation of pathologies in asymptomatic patients

IV. CONCLUSION

CBCT has become one the integral part for diagnosis of oral manifestations and generously used into clinical practice in India. The interpretation of the radiograph is an important aspect which is done by the radiologist. Radiologist should be well acquainted of normal anatomy and the various abnormalities seen in maxillofacial region.

Our results revealed that there is a wide range of OCs, 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.

Moreover, radiographic features of cysts is an important criteria for the final diagnosis. Also biopsy is considered as a standard procedure but the invasive procedure comes with its own drawbacks such as the decreased ability to heal and can also be time consuming. This procedure (CBCT) offers an alternative noninvasive diagnostic tool (CBCT) which helps to avoid potentially unnecessary surgery.

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Table 1: Prevalence of odontogenic cysts

Pathologies	No. of cases diagnosed from the CBCT	Percentage from the total scans (out of 115)
Radicular cyst	51	44.34 %
Dentigerous cyst	27	23.47 %
Residual cyst	9	7.82 %
Nasopalatine cyst	2	1.73 %
Maxillary cyst	10	6.69 %
Simple bone cyst	4	3.47 %
Aneursymal bone cyst	2	1.73 %
Odontogenic keratocyst	6	5.21 %
TOTAL SCANS	115	

Table 2: Origin of dentigerous cysts

Dentigerous cyst origin	
impacted canine	6
impacted molars	17
impacted premolar	2
supernumerary	1
mesiodens	1
TOTAL	27

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