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Radicular Cyst in Maxillary Anterior Tooth Region with CBCT & Histologic Features

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Abstract : *Radicular cysts (RC) are the most common cystic lesions affecting the jaws. They are most commonly found at the apices of the involved teeth, however they may also be found on the lateral aspects of the roots in relation to lateral accessory root canals. Because of the close anatomical relationship between the nasal floor and the adjacent dental region in maxillary anterior teeth region and with maxillary sinus in maxillary posterior tooth region, determining the extent of cysts in these regions by invading these structures in depth can be a diagnostic dilemma. Conventional radiography renders a three-dimensional (3-D) anatomical structure two dimensionally with inherits distortions. This limitation posts a steep learning curve for novice operators to interpret information from the resulting images. In many incidences, it becomes a matter of guesswork even to the experienced user, like the relationship of the maxillary molars with the maxillary sinus as well as with nasal floor. In endodontics Cone Beam Computed Tomography (CBCT) has become a routine tool in endodontic surgery and especially implant dentistry. With increasing affordability of the computer and less expensive CB X-ray tube, CBCT will have enormous potential in endodontics. The following case report illustrates the same advantage of this novel technique in diagnosing and assessing the extent and depth of the radicular cyst associated with left maxillary anterior tooth (21 & 22), encroaching the nasal floor.*

Keywords: *Radicular cysts, Three-dimensional (3-D) and CBCT*

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I. Introduction

Radicular cysts are the most common of all jaw cysts and comprise about 52% to 68% of all the cysts affecting the human jaws. Actual prevalence of cysts is only about 15% of all apical periodontitis lesions. Their prevalence is highest among patients in their third decade of life and higher among men than women.[1, 2] Periapical lesions are usually composed of solid soft tissue (granulomas) or they have a semisolid, liquefied cystic area (bay cyst or true cyst). Therefore, to diagnose these lesions the least dense area of the radiographic lesion should be measured. The CBCT gives improved sensitivity and specificity in diagnosis of periapical lesions over conventional radiographs. [3] The analyses of diagnostic methods showed that apical periodontitis was detected more frequently when CBCT was used, compared with periapical radiograph. Dental radiography provides extensive information necessary for endodontic diagnosis and treatment planning. The useful information obtained typically relates to irregularities in hard tissues such as root and bone resorption, root configurations, canal morphology, presence of caries and restorations, and the assessment of associated alveolar bone and root fractures. Traditionally, two-dimensional dental radiography, using either film based or digital imaging, has been utilized for these examinations. Although the diagnostic value is indisputable, unfortunately there are many limitations with traditional dental radiography such as the obstruction from associated anatomic structures and an inability to visualize pathoses three dimensionally. In addition, bony lesions are often not visible if they are only confined to cancellous bone. They might not be radiographically detected until the bone loss extends into the internal junction of the cancellous and cortical bone.[5, 6] Therefore, three dimensional

imaging can often provide an earlier detection of lesions in the bone. Hence in this point of view we present a case of radicular cyst which was evaluated by CBCT and underwent enucleation.

II. Case Report

A 32 years male patient visited to the department of Oral Medicine and Radiology, Sharad Pawar Dental College, Datta Meghe Institute of Medical Sciences, Deemed University (DMIMSU, DU), Sawangi (Meghe), Wardha, Maharashtra, India, with the chief complaint of pain in maxillary anterior tooth region of jaw since 2 months and swelling since 3 weeks. The pain was throbbing in nature and aggravates on mastication and relieved on medications. The swelling was slow growing and initially was of grain size and grown to a present size of 1×1cm. Past medical history and dental history were unremarkable. He was taking the medication and had no history of known drug allergy. Clinical examination revealed a small dome shaped soft and fluctuant swelling seen on labial attached gingiva of 21 and 22. The swelling was pinkish red in colour and was smooth surface.In intra-oral periapical (IOPA) radiograph (fig. 1) a single radiolucent shadow was evident with well defined borders, without cortication, seen peri-apical to 22. There was loss of lamina dura and cystic borders passed through the middle third of root of 21 and 22. There was a radiographic evidence of apical root resorption with 21 and radio-paque shadow seen with crowns of 21 and 22. 3-D reconstruction image generated by CBCT (fig.2a) shows evidence of bony lytic lesion seen in relation to the roots of 21 and 22. Whereas multi planar reconstruction (MPR) images in axial (fig.3) and coronal (fig.4) section shows the expansile lytic alveolar bone with resorption and destruction which encroaching the nasal floor on left side of anterior nasal spine. Radiographically features suggestive of radicular cyst in relation to 22. Histological Analysis The presence of varying thickness of epithelium fibro-cellular connective stroma. In scanner view, one-bit of tissue with epithelium and underlying connective tissue stroma. Low power view, showed stratified squamous hyperplastic epithelium with arcading pattern of reteridges and underlying dense fibro cellular connective tissue stroma consisting of sparsely arranged collagen fibers, fibroblasts and few vascular spaces with extravasated red blood cells (Figure 5). High power view showed diffuse and dense infiltration of chronic inflammatory cells along with vacuolations. Connective tissue showed dense infiltration of lymphocytes and plasma cells with few macrophages (Figure 6). The clinical, radiographic, hematological and histological examination concluded radicular cyst with 22 as the final diagnosis. Therefore, the treatment plan included oral-antibiotics and analgesics, personal oral hygiene and diet counseling, oral prophylaxis, RCT wrt 21 22. The Surgical treatment included enucleation of cyst and plasma rich protein graft. Patient was also undergone apicectomy with 22. Patient had kept on a follow up for further evaluation and gave no positive history of any swelling or pain in the same region thereafter.

III. Discussion

Cysts constitute about 17 % of the tissue specimens submitted to oral pathology biopsy services. The periapical cyst is the most common odontogenic cyst (52.3-70.7% of all odontogenic cysts) followed by the dentigerous cyst (16.6-21.3 % of all odontogenic cysts) and odontogenic keratocyst, or OKC (5.4- 17.4 % of all odontogenic cysts). [7] The choice of treatment may be determined by some factor such as the extension of the lesion, relation with noble structures, evolution, origin, clinical characteristic of the lesion, cooperation and systemic condition of the patient .[8] The treatment of these cysts are still under discussion and many professionals opt for a conservative treatment by means of endodontic technique (Hoen, 1990; Rees, 1997).Three dimensional radiography has been used in medicine for about 30 years using a large field of vision imaging with computerized axial tomography scans known as CAT scans. [9] More recently, as computer and radiographic technology have become more advanced and affordable, this technology has entered the dental market as CBCT. [10] These devices are similar to conventional panoramic radiography whereby a cone shape radiographic beam is directed to a target area and the image is captured on a reciprocating sensor on the opposite side of the target. The captured digital information is digitally interpreted and displayed as either slices of the targeted area or reconstructed to provide a three dimensional image.In our case of radicular cyst the in anterior region of jaw in relation to 22 was evident on the radiograph. Even the root resorption with 21 was evident in intra-oral peri-apical radiograph, the extent of the cyst remained inadequate as the intra-oral periapical radiograph showed no extent or any involvement of nasal fossa, eroding the nasal floor. Secondly By use of the CBCT scan grayscale readings we were able to differentiate the solid from cystic or cavity type lesions. CBCT-scan may provide a better, more accurate, faster method to differentially diagnose a solid from a fluid filled lesion or cavity. However, to get an accurate reading the whole lucency should be scanned for the most lucent or least dense area. If the least dense area has a negative grayscale value on the CBCT-scan then this may be a semi-solid or fluid filled area. The CBCT gives improved sensitivity and specificity in diagnosis of periapical lesions over conventional radiographs. [11] The analyses of diagnostic methods showed that apical periodontitis was detected more frequently when CBCT was used, compared with periapical radiograph. [12]

Also the use of CBCT in location of maxillofacial pathologic lesions such as periapical cysts is an appreciable and accurate. It has also been evaluated for the detection of carious lesions and has shown better results than F-speed film in assessing the depth of proximal lesions. [13, 14] Centers including Case Western Reserve University and Loma Linda University, among others in the United States, have begun to adopt CBCT imaging into routine dental examination procedures. Preliminary, unreported findings suggest that the incidence of oral abnormalities, ie, cysts, ectopic teeth, and supernumerary teeth, is higher than previously suspected.

In view of the limitations of periapical radiography to visualize apical periodontitis, a review of epidemiologic studies should be undertaken considering the quality of periapical aspects offered by CBCT images. In addition, it will certainly reduce the influence on radiographic interpretation, with minor possibility of false-negative diagnosis. In the present study, AP prevalence in endodontically treated teeth, when comparing the panoramic and periapical radiographs and CBCT images, a considerable discrepancy can be observed among the imaging methods used to identify apical periodontitis. [12]The truth is that most dentists do not have CBCT equipment in their dental offices. Thus, during endodontic treatment, it is important to choose a radiographic technique that minimizes image distortions, such as cone parallel technique, to obtain a high level of reproducibility and increase the diagnostic accuracy of the imaging method. The viability and cost-effectiveness of CBCT images in clinical routine should be weighed, considering the caution with radiation doses, because it is not in accordance with the standard dose recommended in some countries. It is important to remember that this study was done on the basis of databases from a radiologic institute.A positive factor to use the CBCT is production of high-resolution images. The CBCT images provide clinicians with sub-millimeter spatial resolution images of high diagnostic quality with relatively short scanning times (10 –70 seconds) and a radiation dose equivalent to that needed for 4 –15 panoramic radiographs. [15] However, image quality might vary according to CBCT source.

IV. Figures and Tables

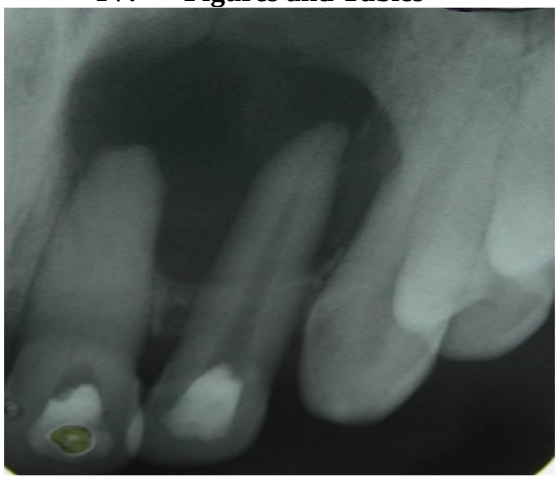

Fig 1. Intra-oral Periapical radiograph of 21 22

Fig 2. 3 D CBCT of Radicular cyst showing lytic lesion with 21 22

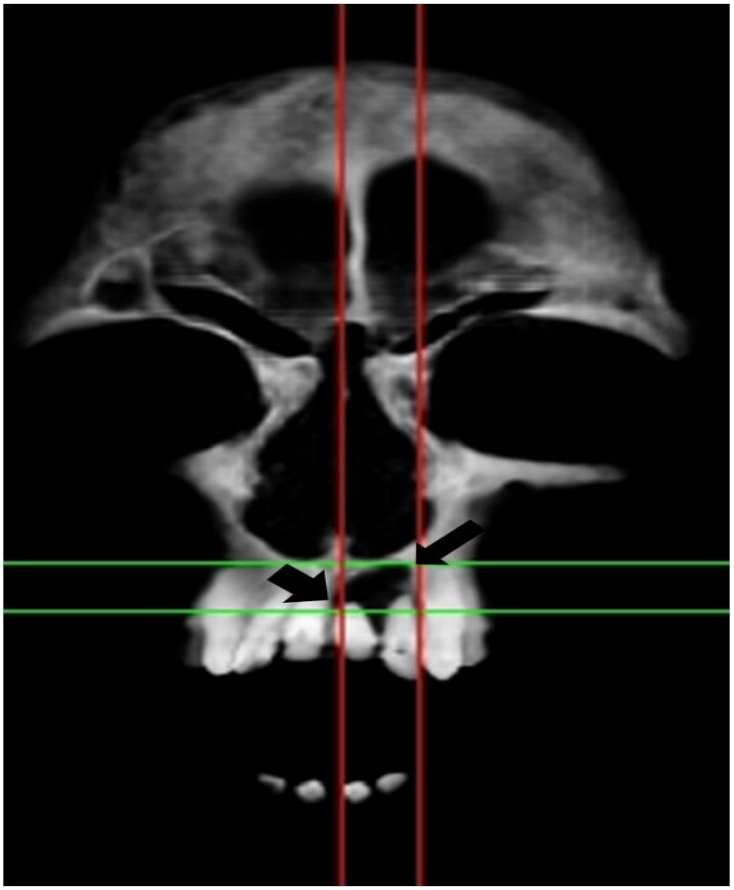

Fig 3. Coronal CBCT image showing cystic lesion

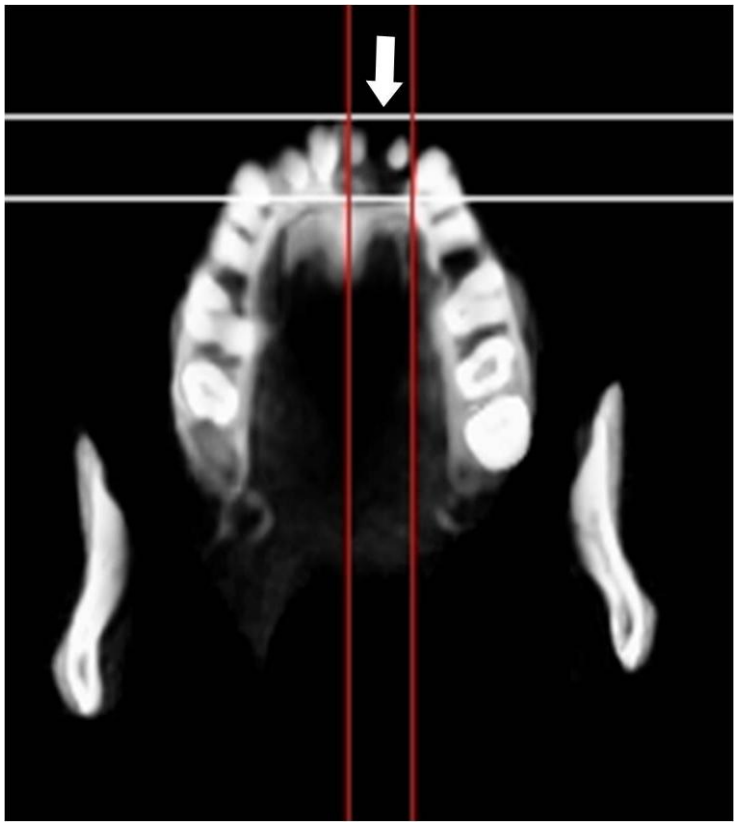

Fig 4. Axial CBCT image showing cystic lesion

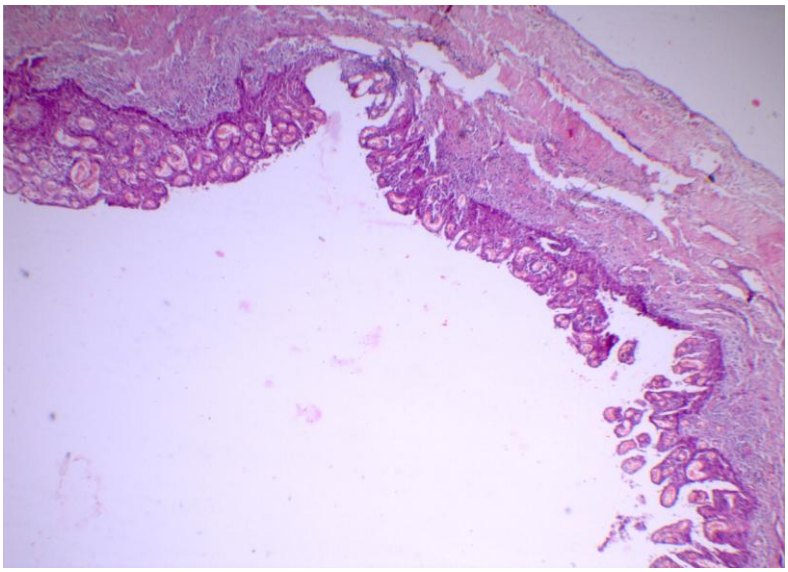

Fig 5. Photomicrograph showing cystic lining and inflammatory cells with connective tissue stroma (10 X)

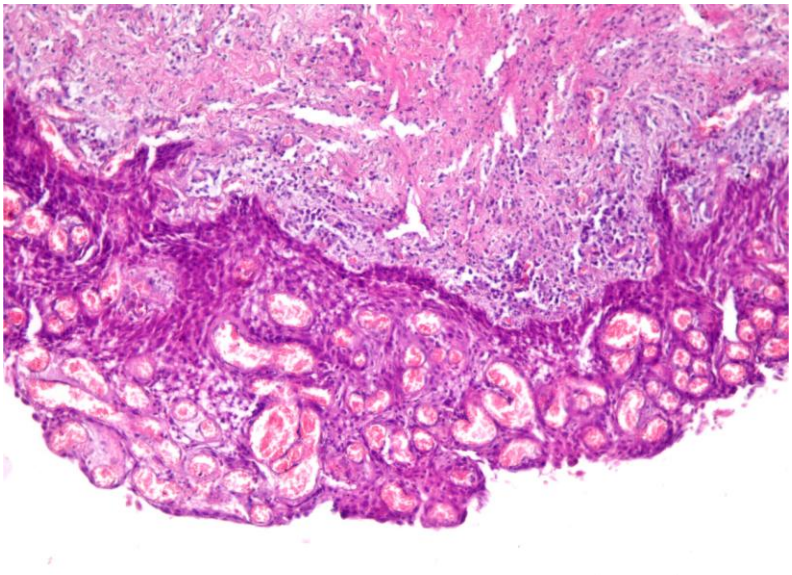

Fig 5. Photomicrograph showing cystic lining arcading pattern and inflammatory cells within the connective tissue stroma (40 X)

V. Conclusion

The CBCT is a valuable adjunct to the endodontist's armamentarium. The learning curve is not steep and variability of clinical interpretation is low. However it is a sophisticated tool, requiring special skills for operating the machine and the image manipulation afterwards. Like any equipment in the digital age, continuous evolution and refinement is anticipated. Extra hidden expenses in depreciation and upgrades have to be added to the initial installation cost. In conclusion the CBCT is a useful tool for the diagnosis and management of endodontic problems. Its use is becoming increasingly popular but some machines are better suited for endodontic purposes than others. The operators should consider their specific needs before making the move to acquiring one in the office.A great advantage of using CBCT in endodontics refers to its usefulness in aiding in the identification of periapical lesions and in a differential diagnosis with a noninvasive technique with high accuracy. Minor changes in sensitivity were found for the different tooth groups, except for incisors in panoramic radiographs. CBCT was proved an accurate diagnostic method to identify AP.

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