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Case Report

CBCT assessment of healing of a large radicular cyst treated with enucleation followed by PRF and osseograft placement: A case report

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Abstract: Radiographic imaging is essential in diagnosis, treatment planning and follow-up in endodontics. The interpretation of the 2-D images can be confounded by superimposition of both teeth and supporting structures and the geometric distortion that is present. These problems are overcome by cone beam computed tomography (CBCT) which produces accurate 3-D images which can be used for pre-surgical assessment. The spatial relationship of the specific tooth root(s) undergoing the surgical procedure (and the associated bony destruction) to adjacent anatomical structures can be precisely assessed. The radicular cyst arises from epithelial remnants stimulated to proliferate by an inflammatory process originating from pulpal necrosis of a non-vital tooth. Radiographically, the classical description of the lesion is a round or oval, well circumscribed radiolucent image involving the apex of the tooth. Radicular cyst is usually sterile unless it is secondarily infected. This case report presents successful management of an infected radicular cyst associated with a permanent maxillary left central incisor (21) in a 38 year old male by complete enucleation of the cyst and using platelet rich fibrin (PRF) and bone graft to fill in the bony cavity to hasten the healing.

Keywords: CBCT, Radicular cyst, PRF, MTA.

INTRODUCTION

The radicular cyst is a true cyst which is the most common odontogenic cystic lesion of inflammatory origin (60%)[1]. Its cystic lining is derived from the cell rest of malassez. It occurs as a consequence of pulpal necrosis secondary to caries, trauma or periodontal disease. Radicular cysts are slow growing and symptomless unless secondarily infected[1].

In a two-dimensional radiograph, radicular cysts appear as round, pear or ovoid shaped unilocular radiolucency associated with the periapex of the offending tooth, outlined by a narrow radiopaque margin. The cyst may displace adjacent teeth or cause mild resorption.

A review of the literature suggests that two-dimensional radiographs are unable to clearly demonstrate three-dimensional problems. The limitations to two-dimensional radiographs include superimposition of three-dimensional anatomy as well as possible exposure or geometric errors[2]. The integration of cone beam computed tomography (CBCT) with dentistry has proven to be helpful in diagnosing periapical lesions that periapical radiographs failed to show.

The treatment options for radicular cyst can be conventional non-surgical root canal therapy when the lesion is localized or surgical treatment like enucleation, marsupialization or decompression when the lesion is large. The advantage of CBCT in endodontics is that it demonstrates root canal and the periapical anatomy in 3 dimension that is not possible with intraoral periapical radiographs[3].

This case report presents the successful management of an infected radicular cyst associated with a permanent maxillary left central incisor (21) in a 35-year-old male by complete enucleation of the cyst and using platelet rich fibrin and bone graft to fill in the

bony cavity to hasten the healing. A pre and 6-month post-operative CBCT were taken.

CASE REPORT

A 38-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, Krishnadevaraya College of Dental sciences, Bangalore, with a chief complaint of pain in the upper left front teeth region which was associated with swelling in the palatal aspect for one month. He gave a history of trauma to upper anterior teeth 20 years back and noticed gradual discoloration of teeth. He revealed that when pus gets collected the swelling increases in size then discharges. Once the pus discharged the swelling subsides and reoccurs after few days.

Intraoral examination revealed a soft tissue swelling on the palatal aspect of 21 extending from the midpalatine raphe to the distal aspect of 25 measuring 3cmsx4cms at its greatest diameter. The swelling was soft and fluctuant in nature, not crossing the midline. Hard tissue examination revealed a discolored tooth irt 21 and Ellis class III fracture irt 21, with tenderness to percussion irt 21 and 22. EPT and thermal pulp test confirmed that teeth 21 and 22 were nonvital. Initially Intraoral periapical radiograph (IOPA) and maxillary occlusal radiograph revealed a large well defined periapical radiolucency with sclerotic border in relation to the apices of 21,22.

Preoperative CBCT was requested to know the spatial configuration of the lesion. 3D reconstructed section of maxilla showed a well-defined radiolucency with sclerotic border at the apex of 21, 22 measuring 21.23X 20.6 mm in the largest dimension with partial loss of the buccal cortical plate and palatal plate. Perforation with the erosion of the left nasal floor and perforation of the palatal vault was also identified.

The cone beam computed tomography periapical index (CBCTPAI) is a 6 point scoring (0-5) system for grading periapical lesion utilizing the largest extension of the lesion. Due to the depth of field added by CBCT 3-D images variables expansion of cortical bone (E) and destruction of cortical bone (D) were included in the scoring system to describe the lesion precisely [4]. Utilizing the CBCTPAI scoring system, score of 5+D was given for the present case (Fig 1-A.1, A.2, A.3) (Fig 2A&B).

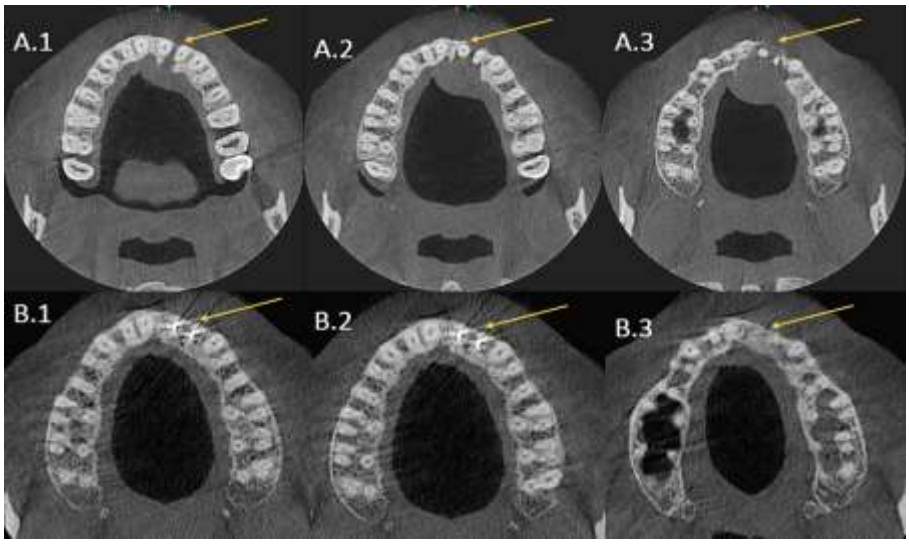

Fig-1: A.1, A.2, A.3- Pre-operative CBCT; B.1, B.2, B.3 - 6 Month post-operative CBCT

From the history, clinical examination and radiological features a provisional diagnosis of the infected radicular cyst was made. Treatment planning was followed by an explanation of the procedure to the patient and informed consent was obtained.

Root canal treatment was initiated followed by working length determination. After completion of cleaning and shaping of the canal, the master cone fit was assessed and intracanal medicament calcium hydroxide was given for one week. Obturation was done on the day of the surgery.

Routine blood investigations were carried out and the patient was prescribed prophylactic antibiotics one day prior to surgery. Surgical procedure done was as follows: standardized skin preparation was done followed by bilateral infraorbital nerve block, nasopalatine nerve block and was infiltrated using 2% lignocaine with adrenaline. The incision was marked using tissue marking ink extending from distal aspect of 25 to mesial aspect of 15. Two vertical releasing incisions were placed on both the sides. A full thickness mucoperiosteal flap was elevated. The cyst lining was noticed and the cyst was enucleated. Apicoectomy was done with respect to 21, 22 and retrograde preparation of the same was done using a surgical handpiece and

small round bur. The retrograde filling was done using Mineral trioxide aggregate (MTA) (ProRoot™MTA; Dentsply/Tulsa Dental, Tulsa, OK, USA).

As the defect was large, a mixture of Platelet rich fibrin (PRF) and osseograft (Advanced Biotech Products Ltd, India) was used to fill the osseous defect. 20 ml of blood was collected from the right cubital vein and was centrifuged at 3000rpm for 20 minutes to obtain PRF. PRF in combination with osseograft material was used to fill in the defect. The flap was repositioned and airtight closure was done using 3-0 vicryl suture. Immediate post-operative IOPA revealed satisfactory obturation with retrograde filling intact. The histopathology report confirmed the diagnosis of an infected radicular cyst. Post-operative instructions were given to the patient and the patient was prescribed antibiotics and analgesics for 5 days and the patient was discharged. The patient was recalled at intervals of 1, 7 days, 3, 6 months. A 6-month post-operative CBCT was taken.

DISCUSSION

The radicular cyst is an odontogenic cyst of inflammatory origin. The radicular cyst is commonly found at apices of involved teeth but can also be found on the lateral aspects of roots in relation to the lateral accessory root canals. It has the highest incidence in the 3rd and 4th decade of life with a male predilection. Radicular cysts may occur in all tooth bearing sites of the jaw but are more frequently seen in the maxillary anterior region than the mandibular region. When infected radicular cysts can enlarge and cause bone resorption[5].

Surgical enucleation of a radicular cyst is a common treatment in endodontic practice. The advantage of enucleation is the immediate rehabilitation of the patient which results in fewer control appointments, which makes it a good choice for patients with poor compliance.

The diagnosis and management of endodontic pathologies are dependent on radiography. A 2-dimensional radiograph will not be able to represent the 3-dimensional problem. Literature has shown that periapical lesions that are confined to the cancellous bone are often missed until they start to erode the cortical plate[6].The introduction of 3-dimensional imaging has revolutionized dental health care and as a result, the dental profession is experiencing remarkable improvements in the area of diagnostic imaging. Today this technology is flawlessly integrated into endodontic practice. CBCT provides a 3-D image which allows complete visualization of an area in question in, axial plane, the sagittal and coronal plane and it also adds depth of field to conventional radiographs. Thus in this case, use of CBCT preoperatively helped in assessing the extent of the cyst and plan the surgery better than with conventional radiographs.

In the past various root-end filling materials have been used. MTA appears to have become the gold standard for a root-end filling material. The success rate for periapical surgery with MTA as the retrograde filling material has been reported to be around 84% after 12 months and 92% after 24 months, which is higher than IRM[7]. Mineral trioxide aggregate has been shown to induce hard tissue formation,[8] including deposition of cementum[9,10].

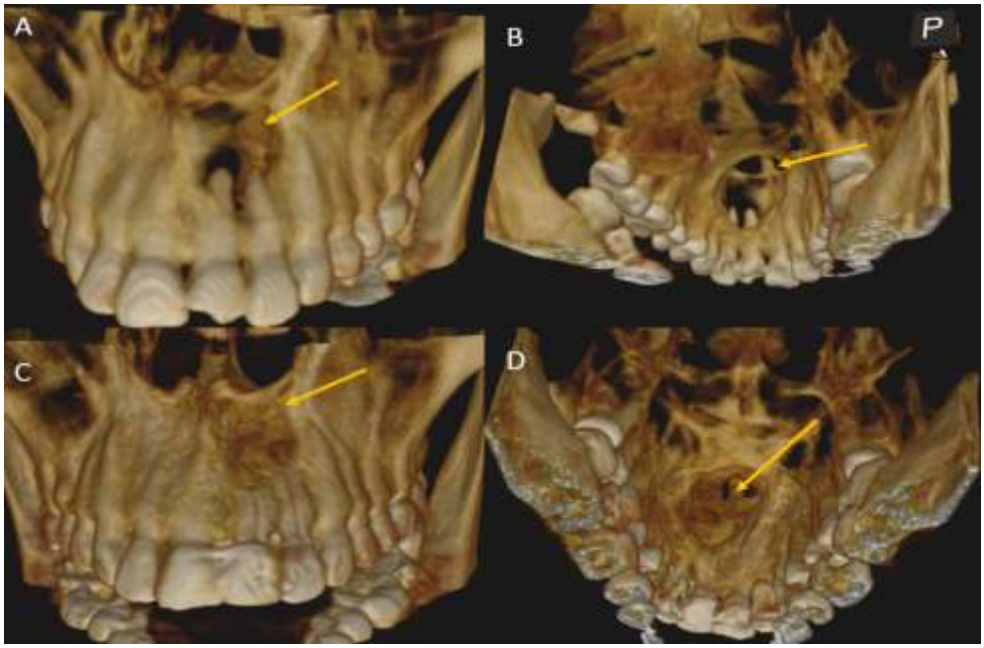

Fig-2: 3-D rendering CBCT; A: Pre-operative buccal view with destruction of buccal cortical plate. B: Pre-operative palatal view with destruction of palatal cortical plate, C: 6 month Post-operative buccal view with healing, D:6 month Post-operative palatal view with healing.

PRF is a second generation platelet concentrate. There are no artificial biochemical agents involved in production of PRF which makes it safe and inexpensive. The physiologic fibrin matrix of PRF, obtained as the result of slow polymerization, has the ability to hold various growth factors and cytokines and release them at the wound site for a prolonged time period[11]. The application of PRF has demonstrated successful and rapid results in terms of bone regeneration. Osseograft is believed to act as an osteoconductive and osteoinductive material and also as a bone growth promotor. Ahmad et al, Ashish et al, Sonal et al had concluded that combination of growth factors in PRF along with bone graft had increased the bone density in many clinical trials[12,13,14].

The CBCTPAI scores are calculated by analysis of a lesion in 3D with CBCT scans. The measurement of the lesion depth contributes significantly to the diagnosis and consequently to indicate the case prognosis [4]. In the present case report a preoperative CBCTPAI score of 5+D was given because of the large size of 21.23X 20.6 mm and perforation of the buccal and palatal cortical plate. The 6-month post-operative CBCT revealed the presence of diffuse radiolucency with 7.8x 5.5mm diameter with trabecular pattern indicating healing. 6months post-operative CBCT evaluation scored a CBCTPAI score of 4 suggestive of healing site. The periapical healing was better appreciated using CBCT showing periapical bone changes over small time intervals. Therefore, pre- and post-treatment CBCT scans can provide an accurate and reproducible method for estimation of healing of periapical lesion utilizing CBCTPAI. (Fig 1- B.1, B.2, B.3)(Fig 2 C&D).

CONCLUSION AND CLINICAL SIGNIFICANCE:

The clinical case reported in this article was successfully managed by endodontic therapy followed by surgical intervention. Digital technology integration into endodontic practice has opened up new avenues for diagnosis, treatment planning (pre-surgical assessment) and for follow-up. CBCT was used in the present case scenario to evaluate the post-operative healing. The CBCT images revealed the integration of the alloplastic bone graft material which was used to fill the osseous defect. Hence, the CBCTPAI proves to be a useful diagnostic tool in evaluating the healing of large periapical lesions.

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