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Case Report

Multidisciplinary Endodontic Management of a Mandibular Anterior Periapical Cyst: A CBCT- Based Case Report

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ABSTRACT:

Background: Periapical cysts are the most common inflammatory odontogenic cysts, arising from pulpal necrosis and chronic periapical inflammation. While most periapical lesions resolve with root canal therapy, true cysts with epithelial lining often require surgical intervention. **Case Presentation:** A 45-year-old male presented with persistent pain in the mandibular anterior region and a history of trauma. CBCT imaging revealed a periapical radiolucency with cortical plate perforation involving teeth #31, #32, and #41. Nonsurgical root canal therapy, including intracanal medicaments, failed to relieve symptoms. Surgical enucleation and apical resection were performed after obturation with MTA. Bone graft (Sybograft) was placed post-curettage. Histopathology reports confirmed a chronic inflammatory cyst. The patient showed progressive healing and remained asymptomatic at follow-ups. **Conclusion:** This case emphasizes the role of advanced imaging, surgical precision, and biocompatible materials in the successful management of persistent periapical lesions. A multidisciplinary approach enhances diagnosis, treatment outcomes, and long-term prognosis.

Keywords: Periapical cyst, Endodontic surgery, CBCT, Root canal therapy, MTA, Bone graft, Cortical plate perforation, Multidisciplinary approach

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INTRODUCTION

The dental pulp is a sterile tissue protected from oral environment by enamel, dentin, and cementum. Significant injury to the pulp—due to trauma, caries, or tooth wear—can lead to inflammation and, if left untreated, progress to pulpal necrosis.[1]The infected and necrotic root canal system becomes a favourable environment for the growth and establishment of a mixed, predominantly anaerobic microbial flora. These microbes and their by-products infiltrate the periapical tissues, inducing an inflammatory response that leads to the destruction of the periodontal ligament and alveolar bone—manifesting clinically and radiographically as periapical lesions.[2]

These lesions typically heal by nonsurgical root canal treatment.[3,4]However, in some cases, periapical lesions may persist despite adequate root canal therapy due to extraradicular factors that interfere with the healing process. One such factor is the presence of a periapical cyst, which is among the common reasons for failure of periapical lesion resolution.[5]

Periapical cysts are the most common odontogenic cystic lesions of inflammatory origin, affecting both maxilla and the mandibule.[5,6]The incidence of cysts within periapical lesions varies between 6 to 55%.[7,8]They originate from the epithelial cell rests of Malassez in the periodontal ligament.These cells proliferate in response to periapical inflammation triggered by infection of the root canal system.[9,10]

These cystic lesions often evolve asymptomatically and may reach to considerable size, leading to clinical signs such as cortical plate expansion. In such cases, the affected alveolar process may exhibit a characteristic "paper-like" texture upon palpation.[11]It is believed that true periapical cysts are less likely to resolve with non-surgical root canal treatment alone

and may require periradicular surgery for complete healing.[10,12]

According to the clinical studies, endodontic surgery performed for large periapical lesions tends to yield more favourable and predictable outcomes, with faster periapical healing when compared to root canal treatment alone.Currently, intraoral periapical (IOPA) radiography remains the standard imaging technique for diagnosing, managing, and assessing periapical pathologies.[13]. However, two-dimensional (2D) radiographs often fail to reveal the true extent of the lesion or accurately assess bone thickness.[14]CBCT**,** on the other hand, offers accurate three-dimensional evaluation of lesion size, location, and extent. It plays a crucial role in surgical planning, enhancing both safety and treatment success.[13] Thus the present case report provides the stepwise non-surgical and surgical management of periapical lesion in mandibular anterior region.

CASE REPORT

A 45-year-old male patient presented with a chief complaint of a dull, throbbing ache in the lower anterior tooth region, often triggered by pressure or chewing. The patient gave a history of blunt trauma to the same region approximately 10 years ago, for which he had taken analgesics.The patient was systemically healthy, with no relevant medical or drug history.

Clinical examination revealed discolored teeth #31 and #41. Teeth #31, #32, and #41 were tender percussion. Vitality testing showed no response in teeth #31 and #41, a delayed response in #32, and a normal response in #42.Periapical radiograph (RVG) revealed a periapical radiolucency involving the #41, #31, and #32 region(fig.a). CBCT was advised for further evaluation.

CBCT scan was performed using a 4 × 4 cm field of view (FOV), voxel size of 0.125 mm, tube voltage of 90 kV, tube current of 10 mA, and an exposure time of 15 seconds, optimizing high-resolution imaging of the region of interest.

CBCT examination revealed a well-defined, unilocular periapical radiolucency involving the mandibular anterior teeth, most prominently around the right central and left central incisors(#41&#31) extending till lateral incisors. The radiolucency was consistent across multiple sagittal and axial sections and extending apically beyond the root apex. Perforation of the labial cortical plate is observed in the region of the lesion, along withbreach in palatal cortical plate in #31 region. Final diagnosiswasPulpal necrosis with Asymptomatic apical periodontitis involving teeth #41, #31, and #32.

Non-surgical root canal treatment was initiated for teeth #41, #31, and #32. Following access opening and working length determination, biomechanical preparation was performed with ColteneHyflex CM files till 25.04 at speed of 500 rpm and a torque of 2 N·cm in both canals with an Endomotor (Motopex M, Orikam Healthcare Ltd., India). The irrigation protocol involved an initial rinse with 2ml of 3% sodium hypochlorite (NaOCl), which was activated with EndoActivator (EndoActivator, Dentsply Sirona, York, PA, USA), followed by an intermediate flush with 0.9% normal saline to neutralize the effects of NaOCl. This was followed by 2 ml of 17% EDTA to facilitate smear layer removal. A final flush with 5 ml of 0.9% normal saline completed the irrigation cycle and calcium hydroxide was placed as an intracanal medicament for one week. However, no symptomatic relief was observed. A second dressing with calcium hydroxide combined with chlorhexidine was given for another week, yet symptoms persisted. Due to the lack of resolution, surgical enucleation was considered. Orthograde MTAwas placed using MTA Plus®, (PrevestDenPro Ltd., India) in teeth #41, #31, and #32(fige). In the next appointment permanent restoration was done.

Under aseptic conditions, afterlocal anaesthesia administration (2% lignocaine with 1:100,000 adrenaline), a full-thickness mucoperiosteal flap was reflectedusing a 15c blade through an internal bevel incision and vertical releasing incisions on distal side of right & left lateral incisors (from #42 to #32) under magnification using loupes(3.5x, Zumax India). Upon flap reflection(fig.g)perforation of labial cortical plate with granulation tissue was seen. Curettage of the lesion was performed, and the cystic lining was sent for histopathological examination and haemostasis was achieved using 0.1% epinephrine-soaked cotton pellets. After achieving haemostasisapicectomy of #41 & #31 was performed at 3mm from apexusing low speed diamond bur under copious saline irrigation(fig.h).The resected surface was carefully inspected under magnification for cracks and anatomical complexities. Then the bony cavity was irrigated with metronidazole followed by pre-suturing with 5-0 vicryl suture by sling technique and sybograft was placed followed by complete closure(figi).Hemostasis was achieved, the patient was provided with postoperative instructions, including a course of antibiotics, analgesics and oral hygiene guidance and immediate post operative radiograph was taken(fig.l).

Histological examination showed a cystic lining of non-keratinized stratified squamous epithelium andfibrous connective tissue wallshowsdense inflammatory cell infiltrate**,** consistent with chronic inflammatory Odontogenic cyst(fig.k). The sutures were removed 10 days postoperatively(fig.m,n). At 2, 4, 6-month follow-up visits, the patient remained asymptomatic with no radiographic signs of pathology(fig.o-s).

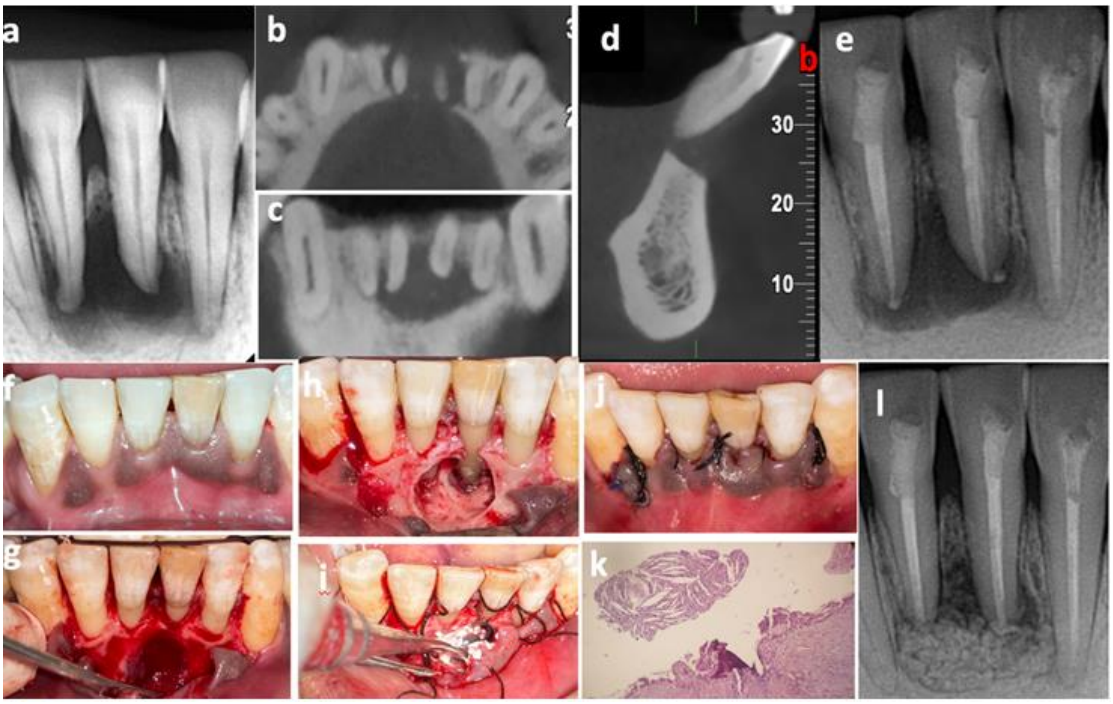

Figure 1: a.Preoperative radiograph, b,c,d.CBCT sections of axial, coronal, sagittal planes e.Afterorthograde MTA placement, f. Preoperative intraoral photograph,g.Flap reflection h.Post curettage and apicectomy #31,#41, i.Bone graft placement j.Post suturing, k.Histopathological analysis, l.Immediate postsurgical radiograph

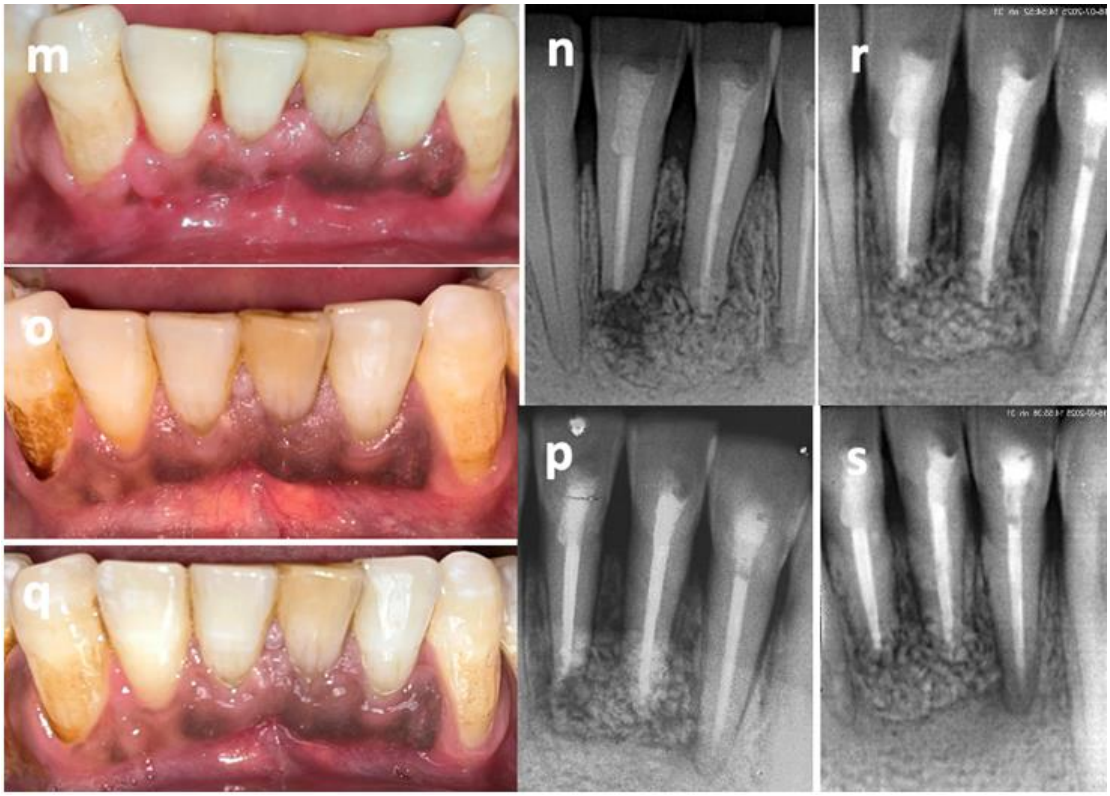

Figure 2: m. After suture removal (1 week), n. Radiograph after 1week o. Intraoral photograph after 1month, p. Radiograph after 1month q. Intraoral photograph after 6months, r,s. Radiograph after 6months

DISCUSSION

Periapical lesions, particularly those of endodontic origin, are common consequences of pulpal necrosis and chronic inflammation extending beyond the root apex[9,10]. In the present case, the chronicity of symptoms and the presence of a well-defined

radiolucency with cortical plate perforation raised clinical suspicion of extra radicular infection, most likely a cystic lesion.

Periapical cysts are considered the most prevalent inflammatory odontogenic cysts, arising from the proliferation of epithelial cell rests ofMalassez in response to chronic periapical inflammation.[9,10]While most periapical lesions resolve with adequate root canal therapy, true cystsbeing self-sustaining due to their epithelial liningoften require surgical removal for complete resolution.[5] In this case, failure to achieve symptomatic relief after intracanal disinfection, including calcium hydroxide and chlorhexidine dressings, further supported the need for periradicular surgery.

CBCT played a crucial role in diagnosis and treatment planning. The 3D imaging allowed precise localization of lesion, evaluation of its extent, and identification of labial and palatal cortical plate perforation, which may not have been evident on conventional 2D radiography.[13]This highlights the value of CBCT in distinguishing cystic lesions from granulomatous tissue and improving the predictability and safety of surgical procedures.

Several studies support the observation that periapical cysts are less likely to heal solely with non surgical endodontic treatment alone due to the presence of an epithelial lining and their potential to become self-sustaining.[5,10,15,16] Nair et al. classified periapical cysts into pocket (bay) and true cysts, the latter being completely enclosed by epithelium and thus isolated from the root canal system.[5] True cysts, as suspected in this case, are less responsive to intracanal disinfection and often necessitate surgical removal to achieve healing.

Root canal treatment should ideally be performed prior to surgical intervention to reduce the intracanal microbial load and periapical surgery should always be considered as extension of nonsurgical treatment. In the present case, MTA was chosen for obturating material due to its proven biocompatibility, excellent sealing ability, and capacity to promote periapical healing and cementogenesis. MTA has been widely used in periradicular surgeries, especially where apical resection is required, due to its superior marginal adaptation and bioactivity compared to conventional materials.[17,18]

Performing endodontic surgery under magnification offers numerous advantages. It allows for a more conservative approach by minimizing surgical site dimensions (from right lateral to left lateral incisor), which in turn reduces trauma, lowers the risk of injury to adjacent anatomical structures, and promotes faster postoperative healing. Magnification also enhanced the clinician's ability to thoroughly inspect the resected root end for cracks, isthmuses, or additional canals, and to ensure complete removal of cystic lining remnants, to prevent recurrence.[19]

Following cystic enucleation, Sybograft, a synthetic bone graft material, was placed in the defect to support bone regeneration. The use of bone grafts in large cystic cavities post-curettage has been shown to accelerate healing, maintain alveolar bone architecture, and prevent soft tissue collapse. Studies have demonstrated that guided tissue regeneration, when combined with proper debridement, significantly improves the quality of bone fill.[20,21]

Histopathological examination confirmed the presence of a periapical cyst, which validated the need for surgical enucleation over nonsurgical management. This approach facilitated faster and more predictable healing in this case.

CONCLUSION

This case highlights the importance of a comprehensive diagnostic approach, including advanced imaging and histopathological confirmation, in the management of persistent periapical lesions. Clinicians should be aware that while nonsurgical endodontic therapy remains the first line of treatment, cases that do not resolve as expected may warrant timely surgical intervention. A multidisciplinary strategy involving accurate diagnosis, evidence-based material selection, and surgical precision can significantly enhance treatment outcomes and long-term prognosis in complex endodontic cases.

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