



Management of Radicular Cyst Using Platelet-Rich Plasma (PRP), Apicectomy, and Mineral Trioxide Aggregate (MTA) in the Maxillary Anterior Region: A Case Report

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KEYWORDS

Radicular cyst, Platelet-rich plasma (PRP), Apicectomy, Mineral trioxide aggregate (MTA), Periapical lesion, Endodontic surgery.

ABSTRACT:

Introduction: Radicular cysts are the most prevalent inflammatory odontogenic cysts, accounting for approximately 52%–68% of jaw cysts. Although typically asymptomatic and incidentally detected, secondary infection may lead to clinical symptoms requiring intervention. Management is dictated by lesion size and severity, ranging from nonsurgical endodontic therapy to surgical approaches such as enucleation or decompression.

Objectives: To evaluate the clinical efficacy of a combined surgical and regenerative approach in the management of a large infected radicular cyst in the maxillary anterior region, with emphasis on the role of platelet-rich plasma (PRP).

Methods: A 51-year-old male presented with a symptomatic periapical lesion associated with teeth 21 and 22. Following diagnostic confirmation, a multidisciplinary approach was employed, including root canal therapy, cyst enucleation, apicectomy, and retrograde mineral trioxide aggregate (MTA) filling. Autologous PRP was applied to the osseous defect to enhance healing and regeneration.

Results: Postoperative healing was uneventful, with significant clinical improvement and satisfactory soft tissue healing. Radiographic evaluation demonstrated progressive bone regeneration. No recurrence was observed during follow-up.

Conclusions: The integration of PRP with conventional surgical management offers a predictable and biologically favourable approach for treating large infected radicular cysts. This strategy enhances tissue regeneration and supports improved clinical outcomes.

1. Introduction

Large periapical lesions presenting as well-defined radiolucencies with corticated margins often pose a therapeutic challenge, as their potential for complete resolution following conventional nonsurgical endodontic therapy remains unpredictable.¹ Among these, radicular cysts constitute the most common inflammatory odontogenic cysts of the jaws, predominantly occurring in association with non-vital teeth. Radiographically, they are characterized by well-circumscribed periapical radiolucencies, frequently mimicking other cystic or granulomatous lesions.²

Radicular cysts originate from the proliferation of epithelial cell rests of Malassez within the periodontal ligament, stimulated by persistent inflammatory mediators derived from necrotic pulp tissue.³ Although

epithelial components are identified in a significant proportion of periapical granulomas, only a limited subset progresses to true cystic transformation, highlighting the complex and multifactorial nature of their pathogenesis. These lesions are typically asymptomatic and are often detected incidentally; however, secondary infection may result in acute exacerbation, which presents clinically with pain, swelling, and sinus tract formation.⁴

The management of large infected radicular cysts frequently necessitates surgical intervention to achieve complete resolution and prevent recurrence. Contemporary treatment strategies emphasize not only lesion eradication but also enhancement of periapical healing and bone regeneration. In this context, biologic adjuncts such as platelet-rich plasma (PRP) have gained attention due to their high concentration of growth



factors that promote angiogenesis and osteogenesis. Additionally, apicectomy combined with retrograde filling using mineral trioxide aggregate (MTA) provides superior apical sealing and biocompatibility.⁵

This case report describes the surgical management of an infected radicular cyst in the maxillary anterior region (21, 22) using a combined approach of cyst enucleation, apicectomy, retrograde MTA filling, and PRP application, highlighting its effectiveness in achieving favourable clinical and radiographic outcomes.

2. Objectives

To assess the clinical and radiographic outcomes of a multidisciplinary treatment approach involving endodontic therapy, cyst enucleation, apicectomy with mineral trioxide aggregate (MTA), and adjunctive platelet-rich plasma (PRP) in the management of a large infected radicular cyst.

3. Methods

A 51-year-old male patient presented to the Department of Oral and Maxillofacial Surgery with a chief complaint of pain in the upper anterior region of the jaw for 8–10 days. The patient's medical and dental history was non-contributory. Extraoral examination revealed no facial asymmetry, and regional lymph nodes were non-palpable and non-tender. Intraoral examination demonstrated erythematous and inflamed gingival mucosa in relation to teeth 21 and 22, with tenderness on palpation. Both teeth were non-vital on pulp vitality testing and were tender on percussion, suggestive of an underlying periapical pathology.

Based on clinical findings, a provisional diagnosis of acute exacerbation of chronic periapical pathology was made, with radicular cyst and chronic periapical abscess considered as differential diagnoses.

Radiographic evaluation using orthopantomogram (OPG) revealed a well-defined unilocular radiolucent lesion with corticated margins in the periapical region of 21 and 22. No evidence of cortical plate expansion, root resorption, or displacement of adjacent teeth was observed.

A Cone beam computed tomography (CBCT) Scan further confirmed a well-defined unilocular cystic lesion measuring approximately 12.1 mm, with intact cortical plates and no involvement of the nasal floor



Fig. 1. Pre operative Diagnostic OPG



Fig.2. CBCT (Sagittal View)

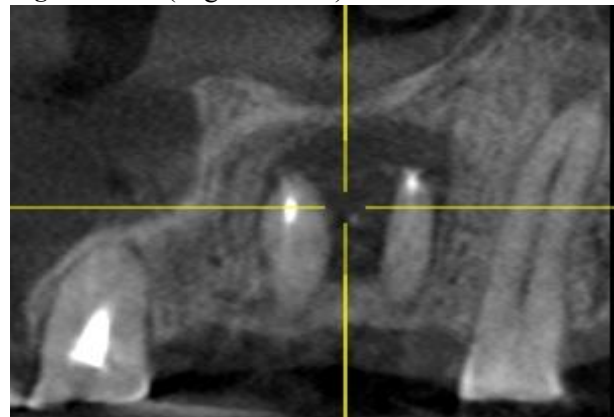


Fig. 3 CBCT (Axial View)

A staged multidisciplinary treatment approach was undertaken. Initially, nonsurgical endodontic therapy was performed for teeth 21 and 22, including access opening, working length determination, biomechanical preparation, intracanal calcium hydroxide medication, and subsequent obturation. Following completion of endodontic treatment, surgical intervention was carried out under local anaesthesia.



A crevicular incision was placed in the labial aspect extending from 23 to 11, with a vertical releasing incision given in relation to the midline region. A full-thickness mucoperiosteal flap was carefully reflected to expose the underlying bone.

A bony defect was identified in relation to 21 and 22. Surgical access was achieved, and complete enucleation of the cystic lesion along with curettage of the surrounding granulation tissue was performed. The excised specimen was preserved and sent for histopathological examination.

Apicectomy of teeth 21 and 22 was carried out, followed by preparation of the retrograde cavity. Retrograde filling was done using mineral trioxide aggregate (MTA) to achieve an adequate apical seal.

Autologous platelet-rich plasma (PRP) was prepared and placed into the bony defect to promote healing and bone regeneration.

The surgical site was irrigated with normal saline, and the mucoperiosteal flap was repositioned and secured using 3-0 silk sutures with interrupted technique. Haemostasis was achieved, and postoperative instructions were given to the patient.

The patient was prescribed antibiotics and analgesics for 5 days and was advised regular follow-up.

Written informed consent was obtained from the patient for the procedure and for publication of clinical details and images.

Histopathology report –The histopathology report confirmed the differential diagnosis of an infected radicular cyst.

Histopathological Diagnosis- The H and E stained sections show epithelium and connective tissue arranged in a cystic configuration. The epithelium is non-keratinized stratified squamous type, showing areas with an arcading pattern, while in other areas the epithelium is only one to two cell layers thick. The connective showed areas of chronic inflammatory cell infiltrate, predominantly plasma cells and lymphocytes, an area with few mature bony trabeculae is also visible. The overall features are suggestive of radicular cyst.

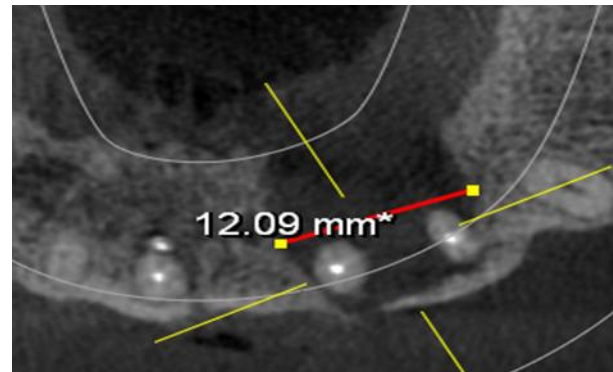


Fig. 4. Intraoral Preoperative Photograph



Fig. 5. Crevicular incision



Fig. 6. Full Thickness Mucoperiosteal flap

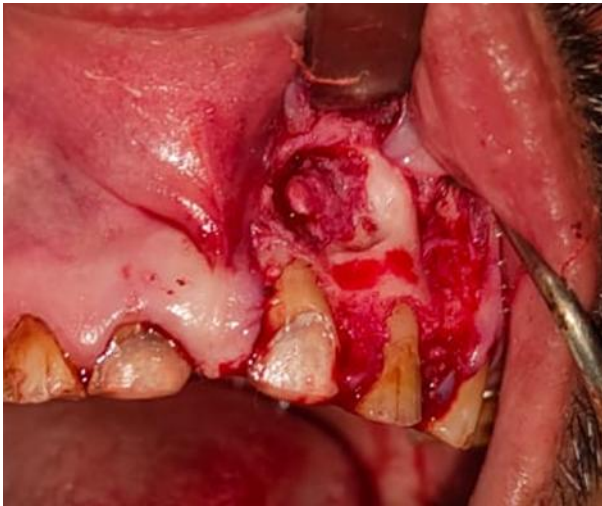


Fig .7. Bony Window Created



Fig .10. Apicectomy with 21,22



Fig .8. Enucleation of Cystic Lesion



Fig. 11. MTA Placement done with 21,22



Fig. 9. Enucleated Cystic Specimen



Fig. 12. PRP Plug Placement done in bony cavity

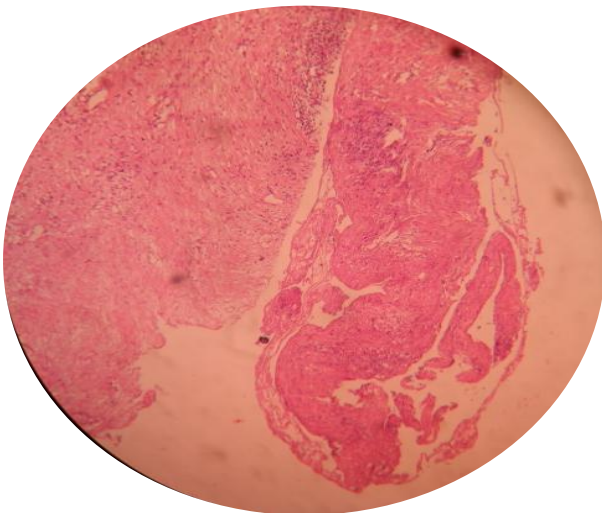


Fig. 13. Histopathological Examination



Fig. 14. Immediate Post-Operative Photograph



Fig. 15. Two Months Follow-up



Fig. 16. Post Operative OPG with Root Canal Treatment

4. Results

Histopathological examination confirmed the diagnosis of an infected radicular cyst, demonstrating non-keratinized stratified squamous epithelium with chronic inflammatory cell infiltrate.

The postoperative period was uneventful, with satisfactory healing of the surgical site observed at 1-week follow-up. Clinically, there was a marked reduction in swelling and symptoms, along with restoration of normal mucosal architecture.

At 2-month follow-up, no recurrence was observed. Radiographic evaluation using orthopantomogram (OPG) revealed evidence of new bone formation at the site of the cystic lesion, indicating progressive osseous regeneration and successful healing. No signs of infection, wound dehiscence, or other postoperative complications were noted during the follow-up period.

5. Discussion

A cyst is defined as a pathological cavity lined by epithelium and surrounded by a connective tissue wall, containing fluid, semisolid, or gaseous material. Radicular cysts represent the most common inflammatory odontogenic cysts of the jaws, with a higher prevalence in the maxilla (approximately 60%) compared to the mandible. They are typically associated with the apices of non-vital teeth and exhibit slow, centrifugal growth.⁶ Inflammation ensues following the necrosis of dental pulp either due to caries or trauma, which eventually leads to granuloma, Malassez cell rest activation, and cyst formation if left untreated for a very long period.¹³ Apical surgery, which has an 86%-92% success rate, is the main method available to treat a



significant nonhealing periapical lesion when standard orthograde endodontic treatment fails.¹²

In the present case, the lesion was associated with teeth 21 and 22 in the maxillary anterior region. Although radicular cysts are often asymptomatic, secondary infection may lead to pain and clinical signs of inflammation, prompting patient presentation. Despite the presence of a relatively large cystic lesion, there was no evidence of tooth mobility, root resorption, or displacement, which is consistent with the variable clinical behaviour of these lesions.²

The etiopathogenesis of radicular cysts remains complex and multifactorial. Several theories have been proposed, including epithelial colonization, epithelial cavitation, and microabscess formation.⁷ The epithelial colonization theory suggests that epithelial proliferation occurs along a pre-existing sinus tract originating from a periapical abscess, eventually leading to cyst formation. In contrast, the epithelial cavitation theory postulates that proliferating epithelial cell masses undergo central degeneration due to loss of nutrition, resulting in cystic cavity formation. The microabscess theory attributes cyst development to necrosis within a granulomatous lesion, followed by epithelial proliferation lining the cavity.²

Management of radicular cysts depends on lesion size, extent, and clinical presentation. While smaller lesions may respond to nonsurgical endodontic therapy, larger or infected lesions often require surgical intervention. For several reasons, surgical treatment may be the preferred approach to treating a large periapical cyst. For example, if the apical radiolucency is very large (diameter > 20 mm or cross-sectional area > 200 mm²), surgical removal may be the best option.¹⁴ In the present case, a combined approach involving endodontic treatment followed by surgical enucleation was adopted to ensure complete removal of the lesion and elimination of infection.⁸

Apicectomy with retrograde filling using mineral trioxide aggregate (MTA) was performed to achieve an optimal apical seal. MTA is widely regarded as a superior retrograde filling material due to its excellent sealing ability, biocompatibility, and capacity to promote periapical healing.⁹

In addition, platelet-rich plasma (PRP) was used as a biologic adjunct following cyst enucleation. PRP contains a high concentration of growth factors such as

platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β), and vascular endothelial growth factor (VEGF), which play a crucial role in enhancing angiogenesis, osteogenesis, and soft tissue healing. The placement of PRP within the bony defect in this case likely contributed to accelerated bone regeneration and improved postoperative healing.¹⁰

Following elimination of infection through endodontic therapy, resolution of periapical inflammation and bone regeneration occurs concurrently. Osteoblastic activity leads to progressive bone deposition, while apoptosis and degradation of the cystic epithelial lining result in gradual regression of the lesion.¹¹

Surgical enucleation remains the gold standard for the management of radicular cysts, particularly when complete removal of the lesion is feasible. Alternative approaches such as marsupialization or decompression may be considered in large lesions to reduce intraluminal pressure and preserve adjacent structures. However, in the present case, complete enucleation combined with regenerative adjuncts provided a definitive and effective treatment outcome.¹¹

6. Conclusion

The present case highlights the efficacy of a combined endodontic–surgical approach in the management of large infected radicular cysts. The use of mineral trioxide aggregate (MTA) provided an effective apical seal, while the adjunctive application of platelet-rich plasma (PRP) significantly enhanced soft tissue healing and bone regeneration through its high concentration of growth factors.

This integrative treatment strategy offers a predictable, minimally morbid, and biologically favourable outcome, supporting its use as a viable modality for the management of complex periapical lesions.

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