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SURGICAL MANAGEMENT OF PERIAPICAL GRANULOMA USING APICOECTOMY AND REGENERATIVE APPROACH: A CASE REPORT

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ABSTRACT
Periapical granulomas are common sequelae of chronic pulpal and periapical infections. Conventional nonsurgical root canal therapy is the treatment of choice; however, surgical intervention may be required when lesions persist. This case report describes the successful surgical management of a large periapical granuloma in relation to maxillary anterior teeth (21, 22, 23) through apicoectomy, retrograde filling with mineral trioxide aggregate (MTA), and regenerative management using bone graft and platelet-rich fibrin (PRF). Postoperative follow-up demonstrated favourable healing both clinically and radiographically.

KEYWORDs: Apicoectomy, Periapical granuloma, MTA, Bone graft, Platelet-rich fibrin, Endodontic surgery.

INTRODUCTION

Surgical endodontics has long been recognized as a reliable modality for managing periapical lesions that do not resolve with conventional root canal therapy or when orthograde retreatment is not feasible.[1] It serves to preserve the natural tooth by restoring its form, function, and aesthetics when conservative, pharmacological, or physiotherapeutic methods fail.

The primary objectives of the surgical approach are to eliminate infected or necrotic tissue, thoroughly debride the periapical region, and achieve a hermetic apical seal. This promotes an environment favourable for regeneration of the periodontal apparatus. These goals are attained through root-end resection, retrograde cavity preparation, and placement of a bacteria-tight root-end filling.[2] In addition, curettage plays a pivotal role in eliminating residual periapical pathology, extra-radicular infection, or foreign bodies that may perpetuate inflammation.[2]

According to the **European Society of Endodontology (ESE)**, the main **indications for apical surgery** include.[3]

1. Radiographic evidence of apical periodontitis and/or persistent symptoms associated with an obstructed canal where removal of the obstruction is not feasible or carries significant risk.
2. Extruded filling or foreign material associated with apical periodontitis or persistent clinical symptoms.
3. Persistent or recurrent periapical disease following root canal treatment where retreatment is impractical.
4. Root or chamber floor perforations that cannot be managed conservatively.
5. Traumatic injuries, extensive subgingival caries, furcation defects, or large root perforations requiring surgical access.

Contraindications to apicoectomy include teeth with no functional value (e.g., lacking antagonists or prosthetic

importance), unrestorable teeth, severe periodontal compromise, fused roots where separation is not possible, availability of strong adjacent teeth for prosthetic replacement, and patients who are medically compromised or uncooperative for surgical intervention[4] .

Treatment success depends on proper case selection, adherence to correct surgical protocols, patient compliance with postoperative instructions, and regular clinical and radiographic follow-up to monitor healing.

This paper presents a case report of surgical removal of a periapical pathology.

CASE REPORT

A 31-year-old female patient, Yogini, reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of pus discharge and recurrent swelling in the upper front tooth region for several weeks. Her past dental history revealed completion of orthodontic treatment approximately five years earlier.

On clinical examination, mild extraoral swelling was observed in the left maxillary anterior region. Intraorally, tenderness was elicited on percussion of teeth 21, 22, and 23, while vitality assessment with an electric pulp tester (EPT) showed negative responses in all three teeth, suggestive of loss of pulp vitality. A periapical radiograph demonstrated a well-defined radiolucent lesion involving the apices of 21, 22, and 23, consistent with a chronic periapical pathology. Based on these clinical and radiographic findings, a diagnosis of periapical granuloma was established.

Given the extent of the lesion and involvement of multiple adjacent teeth, a surgical endodontic approach was selected, as conventional retreatment alone was considered insufficient to resolve the pathology. The treatment plan involved apicoectomy of 21, 22, and 23 with retrograde filling using mineral trioxide aggregate (MTA), in conjunction with regenerative management of the defect using an alloplastic bone graft and platelet-rich fibrin (PRF).

After mouth preparation with povidone iodine rinse and swab, local anaesthesia (2% lidocaine with 1: 100,000 epinephrine) was administered. Notably, during access preparation, a separated endodontic file was encountered within the canal. The fractured instrument was carefully retrieved using ultrasonic tips under magnification to prevent further damage to the canal walls, thereby allowing safe continuation of the obturation treatment. A Luebke–Ochsenbein flap design was outlined using haematoxylin and carefully reflected to provide surgical access. A bony window was created in the labial cortical plate overlying the lesion, exposing the pathological tissue. Thorough curettage of the periapical lesion was performed to remove all granulation tissue. Apicoectomy of the involved teeth was carried out, and retrograde cavities were prepared and sealed with MTA to ensure a bacteria-tight apical closure. To enhance bone healing, the periapical defect was filled with an alloplastic bone graft material, followed by placement of a PRF membrane to stimulate tissue regeneration and provide biological support. The flap was repositioned to its original position and sutured securely.

The postoperative phase was uneventful, and the patient was placed on regular follow-up. At the 2-week review appointment, satisfactory soft tissue healing was observed, with no signs of infection or discomfort. Radiographic examination at 4 months demonstrated evidence of progressive osseous fill in the periapical region, indicative of favourable bone regeneration. The patient remained asymptomatic during the follow-up period, confirming the clinical and radiographic success of the combined surgical and regenerative management.

Figure 1: Pre-operative Clinical picture.

Figure 2: Pre-operative Radiographic picture.

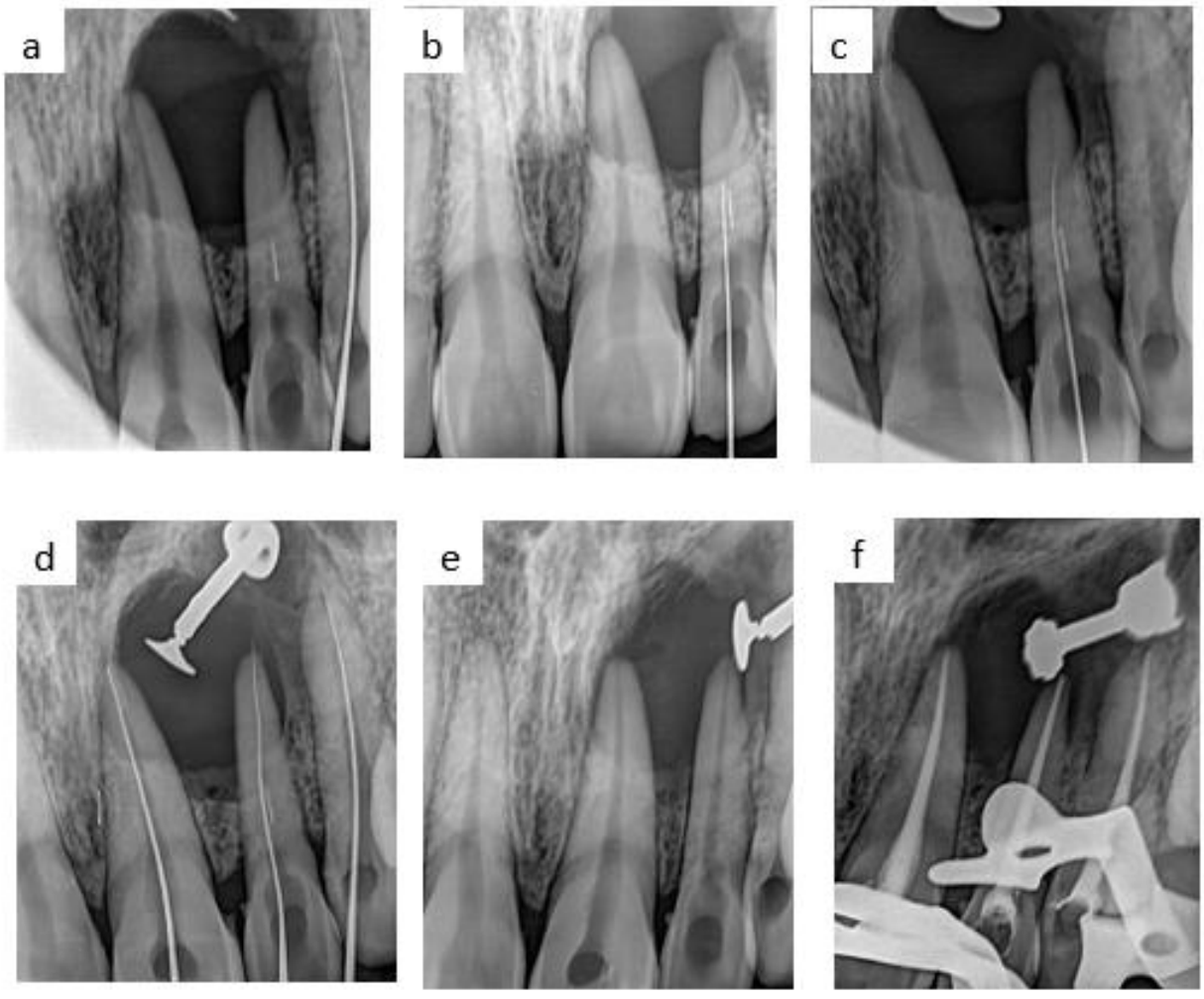

Figure 3: Steps In File Retrieval And Obturation.

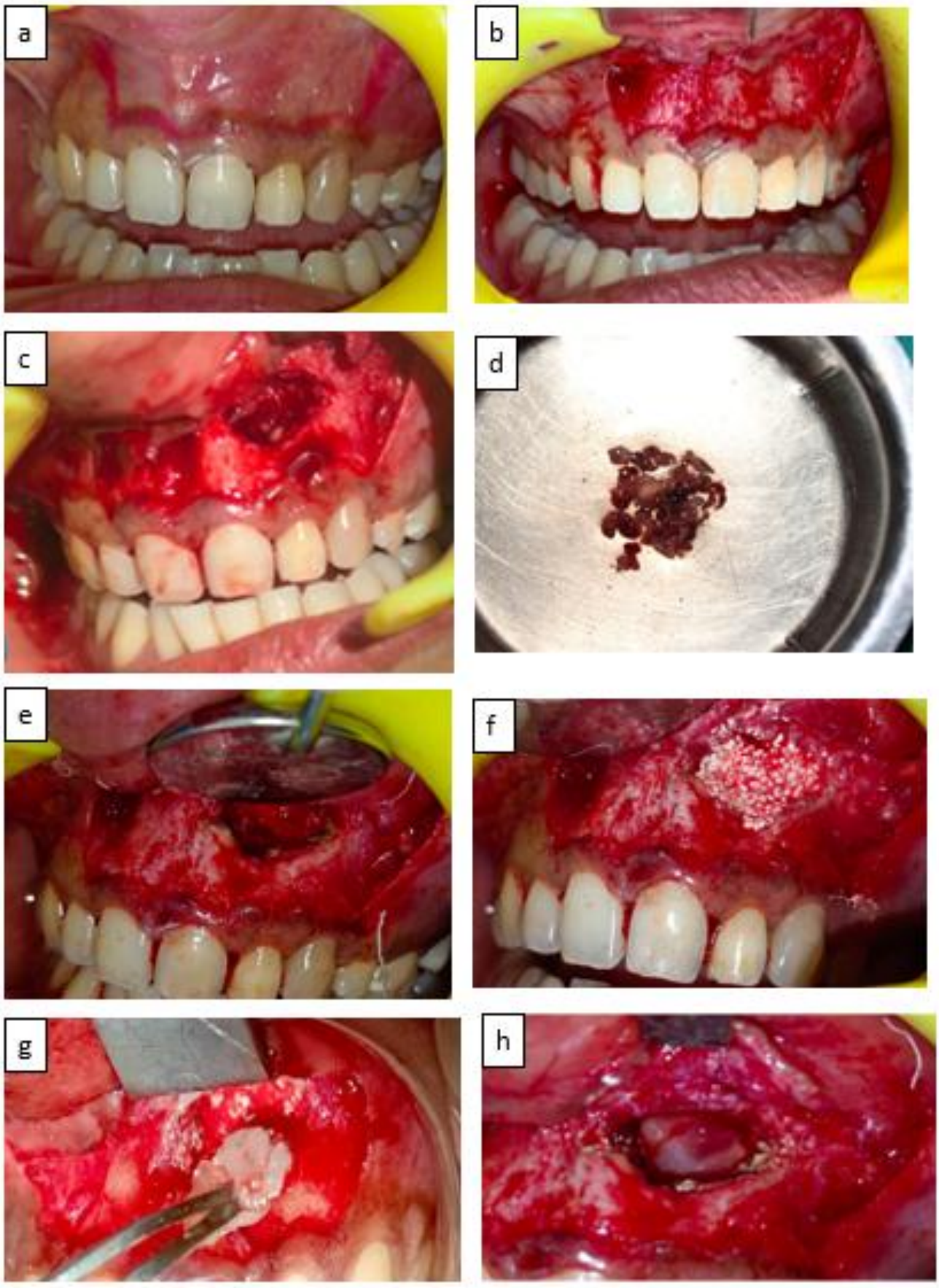

Figure 4: Surgical procedural steps.

Figure 5: Surgical procedural steps.

Figure 6: 2 week follow up.

Figure 6: 2 week and 4 month follow up.

DISCUSION

In this case, orthograde obturation of the canals was performed prior to surgery in order to achieve a complete three-dimensional seal of the root canal system.

During the surgical phase, mineral trioxide aggregate (MTA) was placed as a retrograde filling material to reinforce the apical seal. MTA was chosen owing to its favourable properties, including ease of handling, moisture tolerance, superior sealing ability, biocompatibility, and the potential to enhance root-end strength.[5] Histological studies have demonstrated that MTA can support deposition of cementum on its surface, contributing to periodontal regeneration. Consistent evidence in the literature highlights the higher success rate of apical surgery when MTA is used for root-end filling compared to other restorative materials.

To further support periapical healing, a guided tissue regeneration (GTR) approach was incorporated using an alloplastic bone graft along with a platelet-rich fibrin (PRF) membrane. PRF, prepared freshly from the patient's venous blood, is an autologous biomaterial with no risk of immune rejection or disease transmission.[6,7] Acting as a fibrin scaffold enriched with platelets and growth factors, PRF stimulates angiogenesis, enhances bone regeneration, and reduces postoperative discomfort.

As the central objective of apical surgery is to prevent reinfection, establishing a hermetic apical seal is paramount to block microbial ingress and endotoxin leakage from the canal system into the periradicular tissues.[4] The combination of prior obturation, retrograde MTA placement, and regenerative adjuncts provided an ideal biological environment for periapical healing.

Anatomical study of the root apex showed that at least 3 mm of the root-end must be removed to reduce 98% of the apical ramifications and 93% of the lateral canals.[9]

Bogdan et al compared the outcomes of apicoectomy with traditional and modern concepts and suggested the clinical success rate after 1 year increased to 85-96.8% with microsurgery compared to 40-90% with traditional way.[8] The success rate also depends on multiple factors including prognosis, size of periapical lesion, apical seal and techniques and materials used to treat the tooth. Moreover, use of CBCT enhances the pre and postoperative examination three dimensionally, providing better comparison with the site and size of actual lesion.[10]

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