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Endodontic Mircrosurgery with Guided Tissue Regeneration in a Tooth with Apico-Marginal Defect- A Case Report

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ABSTRACT

Apico-marginal defects are endo-perio lesions that extend along the entire root length. Such defects are often linked to the failure of endodontic treatments. A commonly recommended approach for managing these defects involves endodontic surgery with the use of Guided Tissue Regeneration (GTR) membranes. Recently, platelet-rich fibrin (PRF) has emerged as a promising alternative to traditional GTR barrier membranes for treating these conditions. This case report highlights the clinical management of an apico-marginal defect with significant peri-radicular damage in a maxillary central incisor, treated with periapical surgery and PRF as a barrier membrane. The patient was monitored for a year, during which clinical evaluation revealed reduced probing pocket depth, increased attached gingiva, and radiographic findings showed periapical radiolucency resolution along with notable bone regeneration

INTRODUCTION

Large periapical radiolucencies often result from chronic apical periodontitis or failed endodontic therapy. In such cases, the goal of the endodontic microsurgery (EMS) technique is to surgically eradicate persistent peri-radicular infection. Controlling the passage of microorganisms and their metabolites from the root canal system to the periodontium is essential for the success of EMS. When associated with apicomarginal defects, the treatment becomes more complex due to the involvement of both endodontic and periodontal structures. Traditional nonsurgical approaches may prove insufficient, necessitating endodontic microsurgery. This technique, leveraging advanced magnification, illumination, and biocompatible materials, enables precise management of periapical pathologies while addressing the apicomarginal defect. Radiographic and clinical information obtained prior to flap reflection is required for differential diagnosis, even if the diagnosis of apico-marginal abnormalities is limited to periradicular surgery and is made following flap reflection.[(1,2)]The surgical treatment of an apico-marginal defect linked to maxillary incisor teeth with significant periapical lesions is described in the current case report.

Case Report

A systemically healthy male smoker, age 28, presented to the Post Graduate Institute of Dental Sciences, Rohtak in the Department of Conservative Dentistry & Endodontics with the primary complaint of pain and purulent discharge in the area of his upper left anterior teeth for the previous five months. The patient said that 10–12 years ago, there was trauma in the maxillary front region.

When examined intraorally, tooth #21 was discolored (Figure 1), and around #21, a draining sinus tract was observed on the labial gingiva. When subjected to percussion, teeth #21 and #22 both displayed Grade-I mobility and no gingival recession. Along the labial aspect of #21, periodontal probing showed a deep pocket that measured 10 mm. There were no extraoral abnormalities found.

An Intra-Oral Periapical (IOPA) radiograph of the affected teeth revealed a distinct periradicular radiolucency in relation to teeth #21 and #22 with an open orifice and no intracanal medication or temporary dressing present.Figure 2 depict the preoperative radiograph and the sinus tracing on the radiograph respectively.When teeth #21 and #22 were evaluated using Cone Beam Computed Tomography (CBCT), it was found that there was localized periapical bone loss with respect to #21 and #22(Figure 3), along with loss of facial cortical plate and marginal alveolar bone. This suggested that #21 had an apico-marginal defect and concurrent endodontic and periodontal disease. After obtaining informed consent, treatment began.

In #21 and #22, endodontic treatment with periodontal therapy (Phase I) was started. Using 3% sodium hypochlorite (Prime Dental Products Pvt. Ltd.) as an irrigant, the canals were cleaned and shaped to an apical size of #60K file (Mani, Inc. Japan) for #21 and size #55K file for #22.The canals were dried with paper points and calcium hydroxide(CH) paste (Prime Dental Products Pvt. Ltd.) was placed as an intracanal medicament and the access cavities of both teeth were temporary restoration (Neotemp,Orikam,India) and the patient was advised to maintain proper oral hygiene. After 4 weeks it was found that the pocket and pus discharge was persistentconcerning #21 although the draining sinus had healed. Intracanal medication was replaced with new CH medication in #21 & #22 and the patient was again recalled after 4 weeks for further evaluation, which revealed a persistent localized pocket of about 10 mm in #21; with no reduction in the size of periapical radiolucency in relation to #21 and #22 found on radiographs and persistent weeping canals.

Hence, surgical intervention was planned. On the day of surgery,CaOH dressing was removed from the canals and they were irrigated with NaOCl, canals were dried and using cold lateral compaction technique obturation was done using zinc-oxide sealer(Prime Dental Products Pvt. Ltd.). The access cavities were sealed with composite resin(Ivoclar Vivadent Econom Plus) after cleaning the access cavity with alcohol. During surgery, under 2% lignocaine hydrochloride with epinephrine 1:80,000 (ICPA Health Products Ltd, Ankleshwar, India)a full-thickness mucoperiosteal flap was elevated from #11-#23 using sulcular and two vertical incisions (Figure-4).Then bony window preparation was done, the cystic lining was enucleated and the tissue was sent for histopathological examination.

Under adequate magnification 3-mm apicectomy, without beveling, were performed using a laminated tungsten truncated cone drill and an Impact air 45 turbine with distilled water. Thinner bone was removed only with curettes. After the apicectomy, the removal of the granulation tissue was completed with small curettes and a mini-Jaquette curette around the periodontal ligament space. The "new" apex was then inspected with micro mirrors (Hufriedy, Chicago, USA) to locate the canals and look for micro fractures. The retrograde cavities were performed with nondiamond ultrasound tips (Sybron Endo, Orange CA, USA) and Kis tip 1D (Dentsply, Ballaigues, Switzerland) coupled in a piezoelectric ultrasound unit (Satelec Acteon, Cedex, France).The cavities, after being dried and achieveing adequate haemostasis, root end was filled with white MTA(Dentsply, Ballaigues, Switzerland), with a wall-carver, and compacted and burnished with a micro presser and a micro burnisher, respectively (Sybron Endo, Orange CA, USA), while the excesses were removed in the end (Figure-5,6).

PRF was prepared by drawing the required amount of blood into a 10 ml test tube without an anticoagulant and centrifuged immediately using a table top centrifuge (REMI Laboratories, Mumbai, Maharashtra, India) for 10 minutes at 3000rpm.[3]After centrifugation the final end product comprised of acellular platelet poor plasma at the top of the tube. Middle layer consisted of PRF and red blood corpuscles were present at the bottom of the tube. During preparation of PRF, the blood was collected and centrifuged at a faster rate in order to avoid the coagulation.The clot was squeezed between two sheets of sterile cotton gauze to form a membrane.

The PRF membrane was placed on the denuded root surface before flap repositioning.The flap was repositioned and sutured using nonabsorbable 5-0 silk sutures (Ethicon Inc., Johnson &Johnson, Piscataway, NJ, USA)(Figure-7). Postoperative instructions were given to the patient and was advised to take Ibuprofen 400 mg in cases of severe pain and swelling. Antibiotics were not prescribed. Suture removal was carried out after 1 week.

The patient was recalled at 6 and 12 months for evaluation. At 12 months follow-up, the patient was asymptomatic, the sinus tract was closed and the probing depth was reduced to 2 mm about #21. IOPARmade at 12 months follow-up showed bone fill in the osseous defect with complete resolution of the periapical radiolucency about #21 and #22 (Figure-9,10).

DISCUSSION

Endodontic microsurgery has emerged as a reliable method for managing large periapical radiolucencies, particularly in cases involving apicomarginal defects. Enhanced visualization with an operating microscope allows precise debridement, root-end preparation, and defect management. Biocompatible materials like MTA ensure effective sealing of the root canal system, while GTR techniques facilitate periodontal regeneration.[4]

The presence of deep periodontal pocket, large periapical radiolucency with endodontic periodontal communication to the apex and lastly the presence of buccal bone loss with no evidence of vertical root fracture categorizes the present case into E and F type of periodontal lesions as described by Kim E.[5]PRF is a second-generation platelet concentrate extensively utilize to improve soft and hard-tissue healing. It helps in stimulating the defense mechanism.

The various growth factors released by PRF like cytokines, present in the fibrin meshwork plays an important role in healing process. The role of PRF has been well documented in regeneration process for the treatment of periodontal intrabony defects, gingival recessions and furaction defects.[6,7] Complete periapicalradiographic healing was found at

12 months follow up period. The possible reasons of healing in present case may be attributed by the two factors. Firstly by the immune-regulatory action of PRF and secondly removal of infection from the surgical site, promotes the connective tissue and bone formation from adjacent healthy periodontium. PRF acts like a competition barrier and accelerates wound closure and mucosal healing due to fibrin bandage and growth factor release. PRF membrane can serve as an interposition matrix with biological properties such as promoting neo-angiogenesis and preventing necrosis and shrinkage of the surgical flap.It also functions as fibrin glue exhibiting space-maintaining abilities and holding the flap in a stable position.[7] Thus, the result of this case report suggests that a PRF barrier membrane promotes bone healing and bone growth in apico-marginal and periapical bone defects.

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Fig 1- Preoperative Sinus Present

Fig 2- Intraoral Periapical Radiograph With Sinus Tracing

Fig 3- Preoperative CBCT View

Fig 4- Flap Reflection

Fig 5,6-Root end preparation and filling with MTA

Fig 7- Flap Closure With Silk Suture

Fig 8-Immediate Post Operative Intraoral Radiograph

Fig 9- 6 Months Follow Up

Fig 10- 12 Months Follow Up