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Combination of MTA and PRF for the Management of Iatrogenic Pulpal Floor Perforation with GradeII Furcation Involvement: Case report

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Abstract:
Iatrogenic furcation perforation is an undesired mishap that can occur during endodontic acess cavity preparation or while locating canal orifices. These perforations can lead to periodontal defects and subsequent tooth loss. This case report presents the use of MTA (Mineral Trioxide Aggregate) combined with PRF (platelet Rich Fibrin) mixed with bone graft to treat furcal perforation with Class 2 furcation involvement (Glickman's). Six month follow up post treatment showed successful healing.

Keywords*: Perforation, Furcation, MTA, PRF, Guided tissue regeneration*

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I. Introduction

American association of endodontists (AAEs) Glossary of endodontic terms defines perforation as a mechanical or pathologic communication between the root canal system and the external tooth surface[1].

Perforations can occur due to carious lesions, resorption, or iatrogenic factors like during access cavity preparation, coronal flaring and post space preparation[2]. According to a study on endodontic failures by Ingle, perforations were second greatest cause of endodontic failures which account for 9.6% of unsuccessful rates[3].Prognosis of iatrogenic perforations usually depend on the location and size of the perforation, accessibility of main canal, the feasibility of sealing the perforation successfully, time elapsed before the perforation is sealed[4].

The trauma of a perforation at the furcation level invariably incites inflammation causing peri radicular tissue injury, bone resorption, periodontal fiber destruction, epithelial proliferation and formation of periodontal pocket[4,5,6]. Perforations in the coronal third are more serious than those which occur in the middle and apical third of the canals. Ideally perforation should be sealed immediately to prevent persistent periodontal infection and furcal bone loss[7].

Various materials have been used for the repair of perforations including amalgam, calcium hydroxide, cavit, zinc oxide and eugenol, tricalcium phosphate, hydroxyapatite, glass ionomer, super- EBA cement, decalcified freeze-dried bone, etc. However, the most popular material today is mineral trioxide aggregate (MTA). Many clinical studies have shown that MTA promotes long term healing in perforation cases. It is biocompatible, causes minimal toxicity and pulpal irritation, non mutagenic, leads to cell adherence and growth, causes increase in levels of alkaline phosphatase and osteocalcin and also triggers inter leukin production (IL-6, IL-8), favors periodontal ligament attachment, cementum growth, and promotes dentinal bridge formation[8].

Attempts to seal the perforation simultaneously targeting bone and periodontal regeneration might promote healing and overall prognosis[7]. This case report presents the combined use of MTA for the repair of endodontic perforation and Platelet Rich Fibrin (PRF) mixed with bone graft and PRF membrane for the regeneration of lost periodontal tissues.

II. Case Report

A 14 year old systemically healthy, female patient reported to the department of Conservative Dentistry and Endodontics with the chief complaint of pain on biting in right lower back region of jaw for more than four months . Past dental history revealed that the patient had undergone root canal treatment 6 months back.

Clinical examination showed root canal filled right mandibular first molar (tooth 46) and periodontal probing depth of 8 mm in tooth 46 on lingual aspect. Lingual swelling was also present in 46.

Radiographic examination: Radiographsrevealed properly-filled mesial an distal root canals till apex. A radiolucency in the inter radicular area with a coronal extension from furcation area suggested of pulpal floor perforation. The condition was diagnosed as pulpal fioor perforation with grade || furcation defect resulting in a primary endodontic and secondary periodontal lesion in tooth 46.

Treatment plan: Scaling and root planing followed by regenerative periodontal surgery and MTA placement for pulpal floor perforation repair.

Procedure: In first visit, restoration was removed and pulpal floor was cleaned, then calcium hydroxide and iodoform was placed at perforation site, then access cavity was sealed with temporary restoration. Medication was prescribed, amoxicillin 500mg, TDS, for five days.

On the next visit, periodontal surgery was performed under local anesthesia. Inferior alveolar nerve block and buccal infiltration was administered using 2% xylocaine hydrochloride with adrenaline (1:80,000). Before starting the surgical procedure, 10 mL blood sample was taken from the cubital region of the forearm in a 10 ml test tube without anticoagulant and immediately centrifuged using a table-top centrifuge at 3000 rpm for 12 minutes.The resultant product consisted of following three layers: (a) RBC at the bottom, (b) PRF clot in middle and(c) upper most layers consisting of platelet poor plasma (PPP). Platelet rich fibrin (PRF) in middle clot thus obtained was carefully collected using tweezer. Full thickness mucoperiosteal envelop flap was reflected from the lingual aspect of tooth 45, 46 and 47. After complete debridement, the furcation was filled with PRF gel mixed with bovine derived xenograft material (Geistlich Bio-oss ,granule size 0.25-0.1mm) and over it PRF membrane was placed. Flap was later on readapted and stabilized with sling sutures and Coepak dressing was given. After completion of periodontal surgery, the perforation was repaired using MTA to form a complete layer on the floor of the pulp chamber, and then the tooth was completely sealed using glass ionomer cement.

Post operative instructions were given to the patient and analgesic (diclofenac +PCM three times a day) was prescribed for 3 days. Antibiotic (Amoxiclav 625mg thrice daily) for seven days and 0.2% chlorhexidine mouth rinse was instructed for 10 days. Sutures were removed 10 days after the surgical procedure, when patient reported with uneventful healing. The tooth 46 was subsequently restored with composite resin. Patient was instructed to maintain meticulous oral hygiene .

Figure1:Pre-Operative Radiograph

Figure2: Pulpal Floor Perforation

Figure3: Preparation of Platelet Rich Fibrin (PRF)

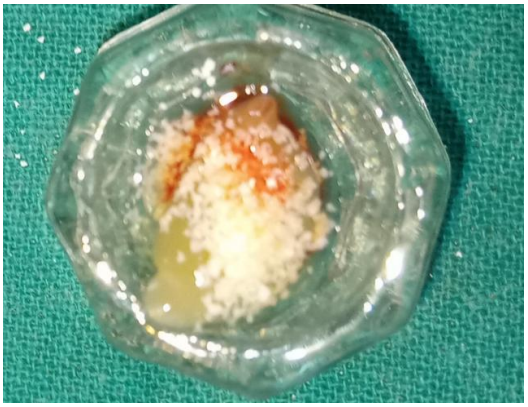

Figure4: PRF Gel mixed with graft

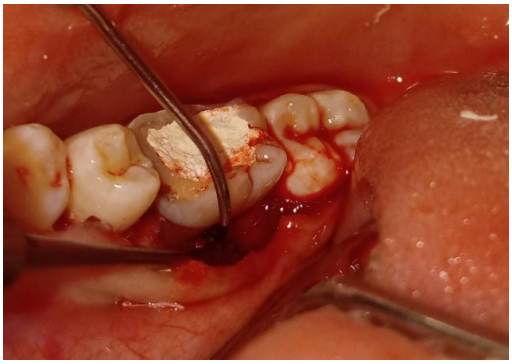

Figure5: Naber's Probe in furcation area

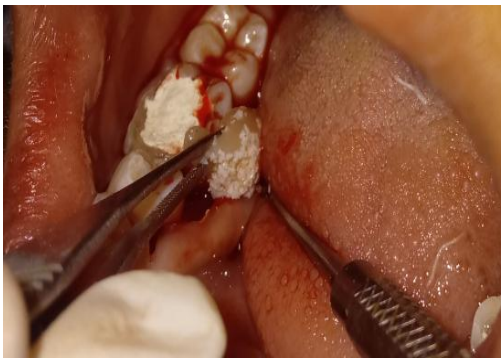

Figure6: Graft Placed in defect

Figure7: Post surgical site

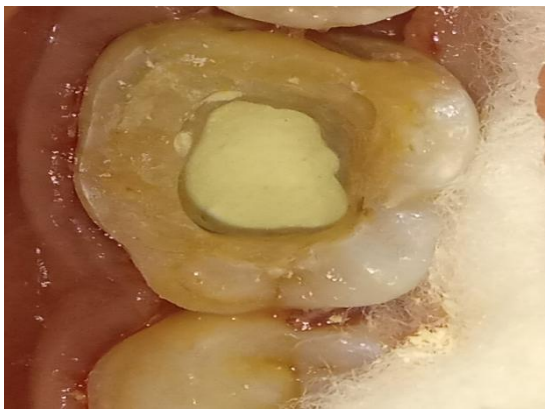

Figure8: MTA placed at sub pulpal floor

Figure9: 3 months follow up

Figure10: 6 month follow up

III. Follow Up

Patient was asymptomatic when she reported 3 months and 6 months post treatment. There was significant reduction in radiolucency and probing depth decreased from 8 mm pre operatively to 3 mm post operatively at 6 months follow up. The patient continues to be under active follow up.

IV. Discussion

As furcal perforations lead to periodontal infection and bone loss attempt to seal these perforations with MTA and PRF combined with bone graft seem to have a favorable tissue response as shown in a case report by Bains et al[9].In this report a similar methodology was tried and the results were promising. Previous studies have been reported which illustrated successful use of MTA as perforation repair material. Though the outcome of treatment also depends on experience of the practitioner performing treatment, presence of preoperative lesions, and communication between perforation site and oral cavity, location and size (greater than 3 mm) of the perforation, still the success rate of perforation repair with MTA alone was 80.9%. MTA is composed of calcium and phosphate ions and the composition being similar to that of tooth structure leads to Hydroxyapatite formation. This accounts for its excellent sealing ability[10].

In a study conducted by Taufik et al PRF when used to repair furcal perforation in dogs' teeth demonstrated statistically significant reduction in vertical bone loss and inflammatory count.[11] PRF produces leukocyte and platelet cytokine(PDGF, TGF, IGF-1). These growth factors stimulate collagen production, recruits cell at site of healing, induce anti-inflammatory reaction, increase vascular proliferation which in turn accelerates wound healing[12]. So, cases where perforation lead to periodontal tissue destruction PRF chosen as an internal matrix promotes wound healing and also acts as a barrier for sealing material. This collaborative treatment therapy using autologous Platelet Rich Fibrin eliminated the risk associated with the use of bovine thrombin, used in preparation of Platelet Rich Plasma; thus, reducing the risk of disease transmission. Collaborative therapy utilizing autologous PRF gel (with graft) and PRF membrane results regenerative management of the furcation defect. This use of PRF both as a graft and membrane has been developed by Choukron J et al.[13]

Asimuddin et al in a randomized clinical trial studied the effect of autologous PRF in grade || furcation defects in human mandibular molars and reported that the biochemical constituents within PRF help in healing of periodontal defects. Also, PRF acts as a matrix for the growth of periosteal cells which favour bone repair. Its use as a membrane, has been advocated because PRF membranes augment soft tissue healing by protecting the site of surgery. PRF membranes act as a biomimetic connector to the graft and a scaffold to promote the growth of new blood vessels, and facilitate the growth of osteoprogenitor cells to the centre of the graft.[14]

To re establish periodontal attachment and to enhance bone regeneration PRF was used in conjuction with bone graft material along with PRF membrane which probably works on the principle of GTR, facilitating improved space conducive to cellular events required for periodontal regeneration and mineralized tissue formation due to collective PRF-bone graft osteoinductive properties. Simultaneously, MTA present in the coronal pulp chamber encourages cementogenesis while sealing the perforation[9]. This combination can be beneficial for long term clinical results.

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