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Case Report

Non-surgical endodontic management of endo-perio lesion and furcation perforation using L-PRF as an internal matrix and biodentine: A case report

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ABSTRACT: BACKGROUND: Furcal perforations are common contributors to endodontic treatment failures. The present case describes a 6-month follow-up of an iatrogenic furcal perforation repair using a novel treatment combination of an autologous L-PRF membrane as an internal matrix along with biodentine.

CASE REPORT: A 30-year-old male patient was referred from a private dental clinic for continuation of endodontic treatment in a mandibular molar, due to a procedural error. Clinical and radiographic examination revealed an iatrogenic furcal perforation with periapical radiolucency and grade one mobility. Non-surgical endodontic management was carried out under a dental operating microscope. The perforation site was electrocauterized via diode laser and was repaired using L-PRF as an internal matrix along with biodentine. A 6 month follow up was carried out to assess healing.

RESULT: At 6-month follow-up, the patient was clinically asymptomatic with no tooth mobility. Radiographs showed evidence of osseous repair of the furcal area with resolution of periapical radiolucency. The use of L-PRF along with biodentine resulted in a favorable and uneventful wound healing. Despite a perceived poor prognosis, the present case report showed a good clinical result.

CONCLUSION: L-PRF and biodentine can be successfully used in the non-surgical management of large perforation defects.

Keywords: Biodentine, Furcal perforation, Internal matrix, L-PRF.

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INTRODUCTION

Perforations have been shown to be a prominent contributor in up to 9.6% of endodontic failures, making them the second most common reason of treatment failure [1]. Furcal perforation may occur iatrogenically (procedural errors) or pathologically due to resorption and caries [2]. The etiology, site, size, and time elapsed before perforation repair play a pertinent role in treatment planning and prognosis of such cases [1].

A significant aspect in the prognosis of perforation repair is prompt closure of the perforated site with suitable bioactive sealing material. Experimentally, in terms of the sealing ability, MTA outperformed other materials. A study on dog's teeth showed the formation of cementum in the absence of inflammatory cell infiltrate, when intentional furcal perforations were sealed with MTA [2]. However, long setting time, tooth discoloration, and high cost are some known disadvantages of MTA [3]. Biodentine (Septodont) is a tricalcium silicate material similar to MTA, but with lesser cytotoxicity. It has good biocompatibility, osteoconductivity, better handling properties, and with its short setting time, can be used for early perforation repair [3].

Furcation repair material can protrude into the interradicular area in teeth with large furcal perforations, causing tissue irritation and foreign body reaction. To avoid extrusions and the problems that follow, it has been suggested that biocompatible materials be used [2]. Concomitant regeneration of the missing periodontium remains the elusive goal of modern dentistry. Recent literature suggests, the procedures using autologous platelet concentrates such as platelet-rich fibrin (PRF) play a significant role in successful regenerative endodontic treatment. A recent study, highlighted the successful use of A-PRF (advanced-platelet rich fibrin) and biodentine in the repair of pulpal floor perforation of a maxillary molar [3].

Literature lacks evidence-based data required to strategically plan the treatment needed for large perforation cases. Human control trials and studies with large clinical data that evaluate the effect of internal matrix and biodentine on the outcome of clinical procedures are sparse [4]. This report, thus, illustrates the novel use of L-PRF (leukocyte-platelet rich fibrin) and biodentine for furcal perforation management of a mandibular molar with 6-months follow-up.

CASE REPORT

A male patient, 30-year-old, was referred from a private dental practitioner for continuation of endodontic treatment, due to a procedural error. Patients' medical history and family history were insignificant. Dental history revealed attempted endodontic treatment in the lower right back tooth a week back with a complaint of intermittent pain and discomfort.

On clinical examination, mandibular right first molar #46 had a dislodged restoration. There was no evidence of swelling or sinus opening. The periodontal status was compromised. Probing depth observed was 7mm with grade II furcation involvement. Further, tenderness on percussion and grade I mobility were detected. Pulp vitality test (Parkell, Inc., NY, USA) was negative. Radiographic examination of tooth # 46 revealed a radiolucency in the furcation and periapical area of both mesial and distal roots and overzealous access cavity preparation. To ascertain any canal morphological variation, eccentric radiographs were taken at different angulations. Bone height was 4mm below CEJ. In the furcation area, bone loss of 6mm was detected.

A diagnosis of endo perio lesion in relation to #46 was made. The treatment options were explained to the patient. Root canal treatment and non-surgical perforation repair, surgical perforation repair with periodontal regenerative therapy and extraction were the options for #46. The patient expressed a desire to preserve the tooth and chose root canal treatment and non-surgical perforation repair. Treatment planning for #46 included RCT and perforation repair using L-PRF and biodentine in multiple visits.

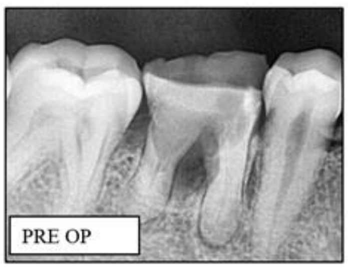
On the first visit, a dental operating microscope (Leica M320, Wetzlar, Germany) was used to examine the access cavity under local anaesthesia and rubber dam isolation. There was evidence of overzealous access cavity preparation with a large perforation measuring approximately 2 × 2 mm in size in the furcal area between the mesial and distal canals. It was laced with granulation tissue and bled spontaneously on examination. The distal pulpal floor was also grossly excavated probably in search of canals. Granulation tissue was curetted and bleeding was arrested by electrocautery using a diode laser (Epic X, Biolase, Inc.). Mesiobuccal, mesiodistal and a large distal canal were located and negotiated with 08-size K files (Mani Inc.). Working length was established using an apex locator (Root ZX Mini) and later confirmed radiographically. An initial apical preparation was done till 25 K file (Mani Inc). The perforation site was debrided with 1% sodium hypochlorite. Calcium hydroxide paste (RC Cal, Prime Dental) was placed as an intra canal medicament. Hard setting calcium hydroxide was placed over the perforation site and the pulp chamber was packed with Cavit (3M, ESPE).

On subsequent visit, the patient was asymptomatic. A standard venipuncture was performed (median cubital vein) 30 minutes prior to the endodontic procedure. L-PRF was formed using single centrifugation of blood, as described by Dohan Ehrenfest et al. 9ml of intravenous blood was drawn into a tube without anticoagulant and centrifuged (Centrifuge 5702, Germany) at 2700 rpm for 12 min. The fibrin clot was isolated with a small red portion after centrifugation to entail the "buffy" coat, that is surplus with leucocytes. The L-PRF clot was modelled on a sterile surgical plate.

Biomechanical preparation wad done up till Protaper universal finishing file F2 (Dentsply Maillefer, Ballaigues, Switzerland) while irrigating with 1% sodium hypochlorite and normal saline. 17% EDTA (Prime Dental, India) was used for final rinse. The tooth was obturated with F2 gutta percha (Dentsply) and resin-based sealer (AH plus, Dentsply), using single cone obturation technique.

The L-PRF clot was gently placed into the perforation site with a small endodontic plugger. Biodentine was placed over the L-PRF, using an amalgam carrier. After 12 minutes, the biodentine placement was confirmed radiographically. Once it was set, access cavity was restored with composite (Ivoclar Vivadent AG, Liechtenstein, Germany). The tooth was reduced from occlusion and the patient was kept under review.

On 3-month follow-up visit, the patient was asymptomatic. The tooth was not tender when percussed. Probing depth reduced to 3mm and no mobility was detected. Intraoral radiograph showed healing and evidence of bone formation. The furcal bone height improved by 2mm. Bone level was 3mm below CEJ. On a 6-month follow up, the intraoral radiograph showed complete resolution of periapical pathology in relation to # 46. Bony defect on the lingual side showed considerable healing when compared to the buccal side.



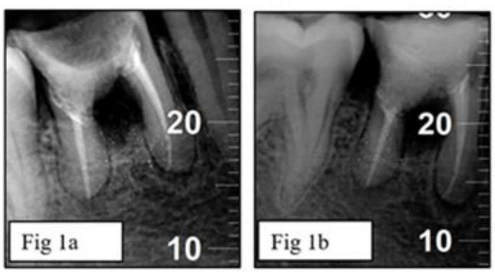


Figure 1a: Radiograph after obturation and placement of L-PRF matrix and biodentine

Figure 1b: Radiograph after final restoration

Figure 2a: Radiographic healing assessment at 3 months interval

Figure 2b: Radiographic healing assessment at 6 months interval

DISCUSSION

Iatrogenic perforations restrict effective endodontic therapy and elevate the probability of treatment failure, compromising the prognosis, particularly in non-vital teeth or teeth with periradicular diseases. In the short or long term, perforations may cause infection, periapical cyst, or granuloma. Bacterial contamination, periradicular tissue damage, inflammation, and bone resorption follow root perforation. Furcation perforation, further, is associated with epithelial proliferation and periodontal pocket development [1].

Early detection of the defect, treatment selection, materials used, host reaction, and the practitioner's experience all play a significant role in the management of root perforations. Perforations should be corrected as soon as possible to avoid bacterial contamination [1]. The use of an artificial internal matrix before placement of a biomaterial during perforation repair, has been recommended to prevent the extrusion of material into the periradicular tissues and to control hemorrhage. It should, however, not affect the sealability of the material [3]. Some authors advocate the application of an internal matrix to prevent the sealing material from extruding and causing inflammation of the periradicular tissues. [2]

A failed root canal treatment with apical and furcal radiolucency was the subject of this case report. The perforation was located in the furcal area of the lower right first molar, possibly as a result of access preparation. To avoid this, the access cavity should be prepared with precision, taking into account the anatomy of the tooth.

Literature states that mandibular molars are more prone to perforations and the pulpal floor is the most common site. During access cavity and biomechanical preparation, a higher perforation risk is anticipated and nonsurgical repair is the most commonly sought treatment option. Better clinical results are seen with the newer bioceramic materials [4].

In the present case, because of the accessibility and visibility of the perforation, a non-surgical method of treatment was adopted. Nonsurgical treatment goals in such cases include disinfection thorough debridement and three-dimensional canal obturation to eradicate the etiological factors, while conserving the root dentin. Gaining access, while maintaining an intact periodontal attachment system, to prepare and seal the perforation with a biocompatible material is prioritized [1].

Biocompatible materials are routinely used for perforation repair. Although a gold standard, MTA has poor handling properties, extended setting time, and high cost. Biodentine has since been considered a substitute for MTA as it has shown greater deposition of hydroxyapatite in the presence of tissue fluids, excellent physical and chemical properties, high pH, more calcium ion release, antimicrobial properties, and low solubility. Its use is associated with greater expression of RUNX2 (mineralization marker) in the periodontal ligament leading to biomineralization and greater repair induction capacity when used to seal furcation perforations. Based on histopathologic results, biodentine has been proven to be comparable to MTA and is considered as an adequate perforation repair material. [3]

In the current case, L-PRF was used. It is made up of a complex fibrin network that is progressively polymerized incorporating leukocytes, glycoproteins, and a high concentration of growth factors [5]. It contains more leukocytes than PRP and PRF, and these cells play an important role in the wound healing process by their immune regulation and anti-infectious action. L-PRF leukocytes produce a high level of angiogenesis stimulators such as vascular endothelial growth factor (VEGF). It is an effective biomaterial sub structure for periapical and furcal bone healing. [6]

The time lapse between creation and repair of perforation did not exceed 6months in the case presented here. Furcal perforations that are repaired immediately appear to be associated with a reduced risk of bacterial contamination. To attain better healing, the perforation site was disinfected with sodium hypochlorite and packed with calcium hydroxide. Holland et al [3] stated the negative implication of debris presence in the defect. It could affect healing by disturbing the interplay of biodentine and periodontal tissues. Thus, to reduce the amount of debris in the defect, prior to obturation, canals were rinsed with 17% EDTA.

Appropriate root canal cleaning, shape, antisepsis, and filling can be attributed to the resolution of apical and furcal radiolucency. The application of calcium hydroxide paste for one week could have been effective in removing any leftover microorganisms from the root canal system and promoting periapical repair, by managing the inflammatory response, mitigating the products of osteoclast acid, inducing cellular differentiation and mineralization with endotoxin neutralization [1].

Based on the result of the presented case, it can be concluded that biodentine + L PRF are effective in the repair of perforations. This may be a consequence of the superior sealing ability, cemento-conductivness, osteoinductivness, biocompatibility, high pH, immune regulative properties of the materials and an absence of microleakage at the site of perforations.

CONCLUSION

The present case describes a 6-month follow-up of furcation perforation repair using a novel treatment combination utilizing autologous L-PRF membrane as an internal matrix along with biodentine, which resulted in a favorable and uneventful wound healing. Future studies, in the directions of combining the platelet concentrates and biomaterials in the management of perforations are encouraged.

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