REPAIR OF FURCAL PERFORATION USING MINERAL TRIOXIDE AGGREGATE- A CASE REPORT

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Abstract:

Furcal perforation is usually an unintentional mishap that may occur during preparation of an endodontic access cavities or exploring canal orifice of multirooted teeth. Inadequacy of the repair materials has been a contributing factor to the poor outcome of repair procedures. Mineral trioxide aggregate is a cement with suitable physical and biologic property for closing the communication between the pulp chamber and the periodontal tissues. There are few reports on repair of furcal perforation with mineral trioxide aggregate in molar teeth. The purpose of this case report was to describe the treatment of furcal perforation using mineral trioxide aggregate in a mandibular molar teeth. The perforation was cleaned with sodium hypochlorite and saline solution, the tooth was endodontically treated and perforation was sealed with mineral trioxide aggregate and coronally restored with composite resin and metal ceramic crown. After 6 months, the absence of any radiolucency in the furcation area, pain along with functional tooth stability indicated a successful outcome of sealing perforation in this case.

Keywords: furcal perforation, mineral trioxide aggregate, repair, root canal treatment

Introduction

Accidental perforation of the roots or the pulp chamber floor is a major complication of endodontic and restorative treatments. This may occur during nonsurgical root canal treatment or during preparation for a variety of restorative procedures.[1] This causes chronic inflammatory reaction of the periodontium (characterized by the formation of granulation tissue) that can lead to irreversible loss of attachment or loss of the tooth.[2] Such perforations are managed surgically or non-surgically, depending on the particular characteristics of the case.[3] The prognosis may be questionable if treatment involves a lesion occurring at the level of the radicular furcation, but the

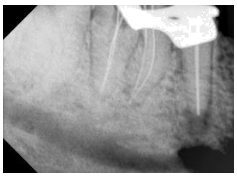
prognosis is usually good if the problem is diagnosed correctly and treated with a material having suitable sealing ability and biocompatibility.[1] The prognosis also depends on the location, size and time of contamination of the lesion.[4] Various materials have been used in managing perforations, including zinc oxide–eugenol, amalgam, calcium hydroxide, composite resin, glass ionomer and resin-modified glass ionomer.[1,4] The ideal material for treating radicular perforations should be nontoxic, non-absorbable, radiopaque, and bacteriostatic or bactericidal; it should also provide a seal against microleakage from the perforation.[5] Mineral trioxide aggregate(mineral trioxide aggregate) has all of these characteristics and has been applied with good outcomes in root-end surgery, direct pulpal coverage, apexification, radicular resorption, and repair of lateral radicular and furcal perforation.[6] Its suitability for managing all of these problems can be attributed to its biocompatibility, its low induction of inflammation, its solubility, its capacity for creating a seal between the pulpal chamber and periodontal tissues and its repair capacity. The last of these features can in turn be attributed to the antimicrobial properties and high pH (12.5) of mineral trioxide aggregate, which promote growth of the cementum and formation of bone, which in turn allow regeneration of the periodontal ligament around the site of injury.[7] In this case report mineral trioxide aggregate was used to repair furcation perforation and the potential benefits of mineral trioxide aggregate and its relative case of use for

management of perforation at easily accessed sites.

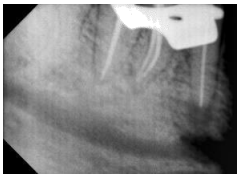
Case Report

A 36-yr-old male patient reported to the Department of Conservative Dentistry and Endodontic of Saraswati Dhanwantari Dental College and Hospital, Parbhani with the chief complain of pain in his lower right back region of the jaw since one month. Deep occlusal caries was seen with 46. There was pain on percussion. The mean probing pocket depth was within normal level. Firstly tooth was anesthetized (2% lidocaine with epinephrine 1:100000) and isolated using rubber dam. Access cavity was prepared. Due to extensive caries,access cavity preparation lead to furcation perforation (Fig 1,) Hemostasis was achieved with 1:80,000 adrenaline containing 2% local anesthesia. The working length was determined using Mini Root ZX apex locator (J. Morita, Tokyo Japan) and confirmed using radiograph (Fig 2). The mesial and the distal canals were cleaned and shaped using ProTaper Rotary File Systems(Dentsply, Maillefer, Switzerland) in a crown –down technique and copious irrigation with 5.25% sodium hypochlorite and final rinse with 2% Chlorhexidine(Dentochlor, Ammdent). Master Cone selection was done (Fig 3) and the root canals were then obturated with gutta-percha points and AH Plus (Dentsply, DeTray Konstanz, Germany) using lateral condensation technique. The perforation was sealed with mineral trioxide aggregate(mineral trioxide aggregate Angelus, Brazil) mixed as directed by the manufacturer (Fig 4 &5). In this appointment, which mineral trioxide aggregate was applied with the help of a mineral trioxide aggregate carrier, a damp cotton pellet was then placed in the pulp chamber to produce a humid ambient for the mineral trioxide aggregatewith the aim of achieving solidification, and the tooth was temporary filled with Cavit temporary restoration material (Cavit-G, 3M ESPE, St. Paul, Minnesota, USA). The patient was recalled after 24 hours to the department with no symptoms or signs. Temporary sealing materials and wet cotton pellet were removed and the hardness of the mineral trioxide aggregate was gently tested with an operator explorer. In this appointment, permanent restoration was done with the help of composite resin (Filtek P60, 3M ESPE, USA) (Fig 6,). Later a full metal crown was advised. (Fig 7).

Furcation Perforation (FIG 1)



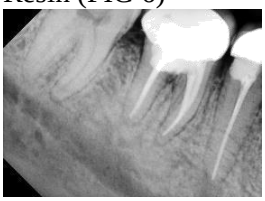
Working Length confirmed with radiograph (FIG 2)



Master Cone Selection (FIG 3)

Perforation sealed with Mineral trioxide aggregate (FIG 4 & 5)

Permanent Restoration with composite Resin (FIG 6)



Full Metal Crown (FIG 7)

Discussion

Furcal perforation is an endodontic mishap that may occur during root canal treatment or post preparation. A risk of perforation always arises during removal of infected tissue in a patient with caries involving the pulpal chamber. Most important thing in themanagement of perforation is immediate repair of perforation to reduce the possibility of bacterial contamination as well as inflammatory process in the defect area for better post-treatment prognosis[4].The prognosis of perforations always depends on the location, size, and time of contamination of the lesion and the material used for repair.[8] In the case presented here, the problem was resolved promptly by application of mineral trioxide aggregate(Pro-Root mineral trioxide aggregate - Maillefer, Dentsply, Switzerland).Mineral trioxide aggregate is available in grey or white. According to the manufacturer's material safety data sheet, Pro-Root mineral trioxide aggregate is composed of 75% Portland cement, 20% bismuth oxide and 5% dehydrated calcium sulfate. The dominant compounds in both types of grey and white mineral trioxide aggregate are calcium oxide, silica and bismuth. Although both the grey and the white versions mineral trioxide aggregate perform similarly in terms of furcal sealing 9and antimicrobial effectiveness,[9]the grey version has a more favorablebehavior in vitro in terms of development of odontoblasts,[10] whereas the white version is associated with development of cementoblasts and keratinocytes.[11] which is required in furcation repair. Pitt Ford et al. in 1995 stated that mineral trioxide aggregate has a capacity to produce hard tissue formation. In the current report, white mineral trioxide aggregate(Pro-Root mineral trioxide aggregate - Maillefer, Dentsply, Switzerland) was used. Mineral trioxide aggregate is difficult to manipulate because of its granular consistency and slow setting time.[12]Contamination of the blood should be avoided when using this type of material, as such contamination can reduce the retention capacity of the mineral trioxide aggregate.[13] Some authors suggest to prevent overfilling or under filling, a resorbable collagen matrix can be applied before placing the mineral trioxide aggregate, but use of a matrix depends on the size of the lesion. Himel et al stated that mineral trioxideaggregate has less micro leakage than amalgam, zinc-oxide-eugenol (ZOE) preparation and a conventional glass-ionomer material. Materials used to repair furcal perforations and restore molar teeth must respond to occlusal forces. In recent studies, maximum bite force was found to be 640N in all teeth and 265 N in one tooth.[14] At 24 hour'smineral trioxide aggregate had the lowest compressive strength (40 MPa) among amalgam, Super- EBA, and intermediate restorative material (IRM) but itincreased after 21 days to 67 MPa. Although the use of mineral trioxide aggregate has been indicated in several endodontic procedures, the literature on its success in furcal perforation repair has been limited. Mineral trioxide aggregate treatment was successful as indicated by imaging at 6 months.

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