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Endodontic Management of Mid Root Perforation in Mandibular First Molar. Type of Manuscript: Case Report

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Abstract: *Root perforations can be pathologic or iatrogenic. The prognosis of root perforation repair depends on level of the defect, with cervical ones having the least success. Recent developments in the techniques and materials utilized in the root perforation repair have enhanced the prognosis in surgical and nonsurgical procedures. Mineral Trioxide Aggregate (MTA), Glass Ionomer cements, Biodentine and Bioceramic materials have been used successfully in such cases. This article presents a case of nonsurgical root perforation repair in middle third of mesiolingual canal in a mandibular right first molar with separated instrument at the apical third. The ML canal was filled with MTA and the mesiobuccal and distal canals were endodontically treated and the access cavity restored with composite resin. 2 year recall showed the absence of symptoms and radiographic healing along with functional tooth stability.*

Keywords: *MTA, Root Perforation, Separated Instrument.*

I. Introduction

An ideal orthograde obturating material is one which is nontoxic, noncarcinogenic, nongenotoxic, biocompatible with host tissues, insoluble in tissue fluids, dimensionally stable and can seal all the pathways of communication. One of the complications in endodontic therapy is root perforation. Leakage of irritants into the periapical tissues through this will lead to failure of endodontic treatment. [1, 2]

The success of the treatment and the prognosis are dependent on several factors like location of the perforation and the time lapse between exposure and repair. [3, 4] The aim of the perforation seal is to prevent contamination of the periodontal attachment apparatus surrounding the site. Traditionally, root repair was carried out using restorative materials like Silver Amalgam, EBA, Glass Ionomer cement and Cavit. Mineral Trioxide Aggregate (MTA) is a mixture of Tricalcium silicate, Dicalcium silicate and Tricalcium aluminate. It is bioactive, biocompatible, hard tissue conductive and inductive. Its properties are unaffected by the presence of moisture and it is radiopaque. [1, 5]

The following case report presents the use of DOM to visualize and repair a perforation in middle third of the mesial root in mandibular right first molar nonsurgically with MTA.

II. Case report

A 33 year old male patient reported to the Department of Conservative Dentistry and Endodontics with pain in tooth #30. He gave a history of root canal treatment having been attempted elsewhere on that tooth. A thorough clinical and radiographic examination revealed that access preparation had been attempted and file separation was seen in apical region of mesiolingual (ML) canal (Fig 1). The treatment procedure including retrieval of the separated fragment and completion of endodontic treatment, as well as the complications which may occur during the same, were explained to the patient and consent obtained.

Under rubber dam isolation, access cavity was carefully examined under dental operating microscope (Moller Wedel, Germany). Irrigation was done with 5% sodium hypochlorite (Trifarma, Thane, India). File retrieval procedure was carried out in stages. While creating the staging platform with modified Gates Glidden #2 drill, perforation occurred in the middle third of mesial side of ML root, with intense and profuse bleeding. The decision was made to nonsurgically manage the perforation using MTA and to leave the separated file as it is in the canal so as to preserve the remaining root dentin.

The orifices of mesiobuccal (MB) and distal (D) canals were covered with cotton pellets. The access cavity and perforation defect were flushed thoroughly with normal saline and dried. Angelus MTA (Londrina, Brazil) was mixed and carried to the perforation site and packed with an appropriate sized plugger. Small increments of MTA were progressively placed and packed to repair the perforation. The entire canal was filled with MTA in the same manner. The seal was confirmed with radiographs and moist cotton pellet was placed

over the MTA. The access cavity was closed with temporary restoration (Prime Dental Products, India). The MTA was allowed to set and the patient was recalled after 24 hours. Removal of the coronal seal showed that the perforation site had been sealed with well adapted, hard MTA.

In MB and D canals, biomechanical preparation was carried out using crown down technique with rotary ProTaper files (Dentsply Maillefer, Ballaigues, Switzerland) and the remaining canals obturated using lateral compaction technique with AH Plus sealer (Dentsply DeTrey Gmbh, Germany) [Fig 2]. The tooth was asymptomatic at 1 week recall appointment.

The tooth was restored with a posterior composite filling (Matrix, Medicept Dental Products, UK). A full coverage porcelain fused to metal crown was given and the patient recalled for follow up. The tooth was asymptomatic and showed excellent healing at the 2 year follow up (Fig 3).

III. Discussion

The etiology of root perforations can be pathological, i.e. secondary to resorption or caries, or iatrogenic, occurring during root canal treatment. [6] Approximately 2–12% of endodontically treated teeth show accidental root perforations. [6,7] These act as an open channel between the root canal and surrounding periodontium facilitating bacterial entry. When the perforation occurs laterally or in the furcation area, it might be followed by an overgrowth of gingival epithelium towards the perforation site. [8]

Perforations may occur during access cavity preparation, post space preparation or as a result of pathological internal resorption extending into the periradicular tissues. [9] Fuss & Trope have proposed a classification of root perforations based on the level at which the defect occurs. [10]

a) Coronal – coronal to the level of crestal bone and epithelial attachment with minimal damage to the supporting tissues and easy access.

b) Crestal – at the level of the epithelial attachment into the crestal bone.

c) Apical – apical to the crestal bone and the epithelial attachment.

The prognosis of furcal perforations in multi-rooted teeth depends on the level of the defect, with crestal sites having a questionable prognosis. The prognosis depends on a number of factors, including the size and location of the defect, duration of its exposure to contamination, the material used for its repair, the feasibility of sealing the perforation and the accessibility to the main canal. [9]

The factor that is under the control of operator is the choice of material to be used for furcation repair. Knowledge about the new materials introduced is essential so as to make an informed decision regarding which material is to be used. MTA has been commonly employed for a wide range of uses. It contains fine hydrophilic particles of Tricalcium silicate, Tricalcium aluminate, Tricalcium oxide, Silicate oxide, calcium sulphatedihydrate, tetracalciumaluminoferrite with small amounts of mineral oxides like bismuth oxide. [11] The mean setting time of MTA is 165±5 minutes. [11] It has the property of stimulating cementoblasts to produce matrix for cementum formation. It is biocompatible with the periradicular tissues and shows a superior ability to seal perforation sites, making it suitable for use as a root repair material. [12,13]

In this case, the perforation site was several millimeters below the alveolar crest. The wide communication with the external surface of the root along with the thinning of the dentinal wall made the prognosis of retrieving the separated fragment without the additional thinning of the root questionable. There are different techniques used for removing the separated instrument such as chemical solvents, mini forceps, broach and cotton, wire loops, hypodynamic surgical needles, braiding of endodontic files, Masserann instruments, extractors, post removal system, canal finder system, ultrasonics, file removal system, softened gutta-percha point. Treatment options included immediate extraction and subsequent restoration with either a three-unit partial fixed prosthesis or a single-tooth implant. Considering the absence of periodontal pockets, prognosis and the cost-effectiveness of each procedure, the decision was taken to retain the tooth by attempting a nonsurgical root canal treatment with repair of the perforation with MTA.

There have been studies reported on the use of MTA as an obturating material. The decision of sealing the perforation and filling the entire canal with MTA was done to avoid any excessive removal of root structure. This would have undoubtedly occurred if the separated fragment was attempted to be removed. The 2 year follow up showed good healing radiographically.

IV. Conclusion

Successful endodontic treatment depends on adequate seal of the root canal system from coronal and radicular aspect. Iatrogenic mishaps like separation of fragments and root perforations, though avoidable, need knowledge on their management on the part of the dentist. MTA has emerged as an ideal material for sealing perforation defects and along with the use of operating microscope, the clinician can choose a conservative, non surgical option of saving root perforated teeth.

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Figure Legends

Figure 1: pre operative radiograph

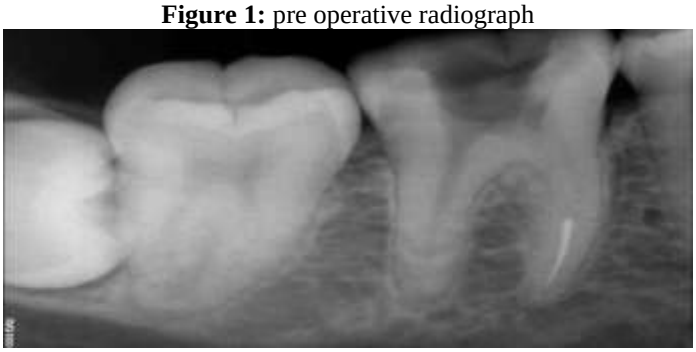

Figure 2: Immediate post obturation radiograph

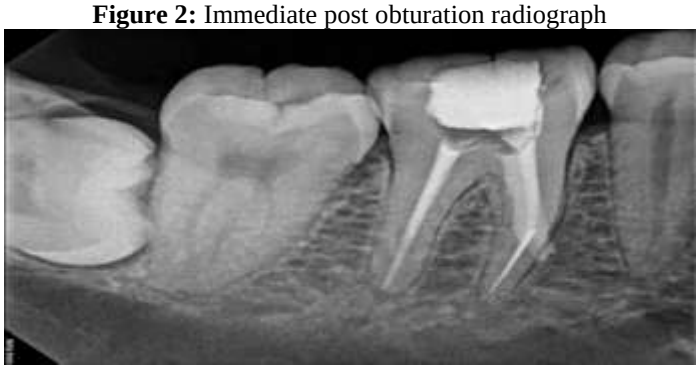

Figure 3: 2 year recall radiograph