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Endodontic harvesting of furcal perforation with Mineral Trioxide Aggregate: a case report

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Abstract:

Perforations of the pulp chamber or root canals can occur during endodontic treatment. Larger, strip-type perforations that are supracrestal with bone loss and delayed repair have the most guarded prognosis, while small, furcal-type perforations that are subcrestal with minimal bone loss and immediate repair have the best prognosis. Many materials have been used to repair perforations, including amalgam, composites, and zinc oxide eugenol cements. However, these materials require a dry field, and they don't promote new tissue formation. Mineral Trioxide Aggregate (MTA) has significantly improved the prognosis for perforation repair. Currently, MTA is considered the material of choice for sealing perforations due to its biocompatibility, sealing ability, and hydrophilicity.

Introduction:

Perforations may occur during endodontic treatment and bring about difficulties for its completion. The material employed for sealing is one of the important factors for prognosis that directly interfere with the repair of these defects[1].

Several materials have been proposed for sealing of perforations. However the divergent outcomes have demonstrated that so far no ideal sealing material has been achieved, i.e. a material that may provide optimal sealing, easy manipulation, biocompatibility and ability of induction of osteogenesis and cementogenesis[2,3,4].

Mineral Trioxide Aggregate (MTA) is dental cement which has been recommended to seal artificial communications between the teeth and periodontal tissues.

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According to Torabinajed et al [7, 10]. MTA is a powder composed of thin hydrophilic particles of tricalcium silicate, tricalcium aluminate,tricalcium oxide, silicate oxide, besides small amounts of other mineral oxides and bismuthoxide, which provides it with radiopacity[8,9].

MTA has an ability to facilitate normal periradicular architecture by inducing hard-tissue barriers. Formation of cementum surrounding MTA was observed even after extrusion of MTA into a furcation[5]. The following case report demonstrates the use of MTA as a sealing material to promote healing of a mandibular first molar with a furcal perforation.

Case report:

A 20 year old patient reported with spontaneous pain in his lower left mandibular molar region. Clinical examination, revealed a history of root canal treatment done 2 years back and the tooth was tender to percussion. Radiographic examination revealed a screw post with a strip perforation of the mesial root of the mandibular left first molar. The furcal involvement was evident (Figure 1). The screw post has caused a strip perforation of the mesial root of this mandibular left first molar. After the removal of the screw posts (figure 2), the distal and mesiolingual canals were retreated and obturated with warm gutta-percha. The mesiobuccal canal was obturated with warm gutta-percha to the level of the perforation.

Figure 1: The screw post has caused a strip perforation of the mesial root of the mandibular left first molar. Note the furcal involvement.

Figure 2: The distal and mesiolingual canals have been retreated after removal of screw post and obturated with warm gutta-percha. The mesiobuccal canal has been obturated with warm gutta-percha to the level of the perforation.

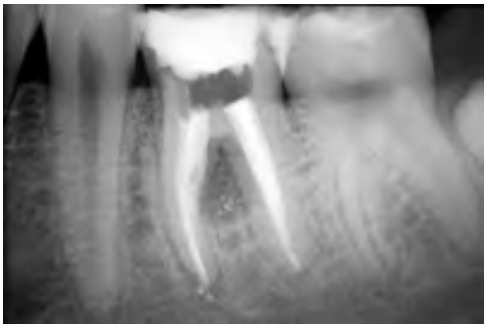

Figure 3: The mesiobuccal canal filled with MTA from the perforation to the orifice.

Figure 4: Followup radiograph at 1 year postoperatively.

The mesiobuccal canal was then filled with MTA from the perforation to the orifice(Figure3). The access opening was temporized, and the patient was then

dismissed and instructed to return in 2 weeks.

The clinical follow-up at one year showed the patient functioning well with no reportable clinical symptoms and an absence of any sinus tract formation. The radiographic follow-up at one year (Figure 4) showed complete healing of the furcal radiolucency and a regeneration of the periradicular tissue.

For the above reasons, and primarily because it is hydrophilic, MTA can be considered the ideal material to seal perforations. In fact, cementum has been shown to grow over MTA, allowing for normal attachment of the periodontal ligament[22].Furthermore, MTA doesn't require a barrier, is not affected by moisture or blood contamination, and seals better than any other material in use today.

Operative Sequence for Treatment of a Perforation

The operative sequence to treat a perforation of the root or of the floor of the pulp chamber is as follows:

First visit

(1) Isolation of the operative field with a rubber dam
(2) Cleansing of the perforation site

(3) In case of bacterial contamination, application of calcium hydroxide for 1 week.
(4) Application of 2 to 3 mm of MTA
(5) Radiograph to check the correct positioning of the material
(6) Application of a small, wet cotton pellet in contact with MTA
(7) Temporary cement

Second visit

(1) After 24 hours, removal of temporary cement to check if MTA is set
(2) Completion of therapy.

Discussion:

The four defining characteristics of a perforation that always occur in combination are level, location, size and time. Regardless of the etiology, the perforation should be repaired as soon as possible to discourage further loss of attachment and to prevent periodontal pocket formation. The perforation was repaired during cleaning and shaping so as to control bleeding into the canal, confine irrigation, and facilitate obturation.

Selecting an appropriate restorative material is very necessary to successfully repair a perforation. Different materials have been used for the nonsurgical repair of perforations with varying degrees of success. MTA has many clinical applications and represents an extraordinary breakthrough for managing radicular repairs. It exhibits superior biocompatibility and can be used as a nonabsorbable barrier and restorative material. MTA is a fine powder primarily composed of tricalcium silicate, tricalcium aluminate, tricalcium oxide, and silicon oxide that forms a colloidal gel on hydration[12], which solidifies in approximately 3 hours. Therefore, when used as a root repair material, moisture must be provided from the internal aspect of the root (using a moist cotton pellet). The choice of MTA in this particular case was made as there was no communication with the gingival sulcus. Reports have strongly suggested that the favorable biologic performance exhibited by MTA materials is due to the formation of hydroxyapatite when these materials are exposed to physiologic solutions[19]. Studies have reported its cement-inductive effect and have shown that

MTA is the material often observed with bone apposition[20].

Conclusion:

MTA may be an appropriate material for sealing furcal perforations that could otherwise impose technical challenges in obtaining adequate obturation.

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