Non-Surgical Approach for Root Perforation and Resorption - A Case Report

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Abstract:

**Aim:** Root perforations adversely affect the prognosis of teeth. The material most widely used in endodontics to seal perforations is mineral trioxide aggregate (MTA), which is extremely biocompatible, and it has been shown historically that osteoid-like material grows right into MTA. The purpose of this study was to assess the success rate of MTA to repair root perforation and resorption.

**Method:** In this case iatrogenic perforation was observed in 11 (FDI) along with external root resorption. A non-surgical approach was decided to seal the perforation and resorption defect using MTA and thermoplasticized gutta-percha.

**Results:** 12 months follow-up radiographs showed healing of the peri-radicular tissues.

**Conclusion:** Based on the study it can be concluded that MTA provides an effective seal of root perforations and resorption and shows promising results in improving the prognosis of perforated teeth that would otherwise be compromised.

**Key words:** Non-surgical, approach, root, perforation.

Introduction:

Root perforations are undesired complications of endodontic treatment, which result in loss of integrity of the root and further destruction of the adjacent periodontal tissues. A perforation is defined as the pathologic or iatrogenic communication between root canal space and the periodontal tissue⁵. Iatrogenic perforations are often a result of deviation from the pre-existing internal anatomy during access preparation, root canal preparation, post space preparation, or by aggressive canal enlargement⁶.

Pathological perforations may be due to tooth resorption, either external or internal⁷. The material employed for sealing of such perforations is one of the important factors for prognosis. Mineral Trioxide Aggregate (MTA) is a dental cement, which has been recommended to seal artificial communications between the teeth and periodontal tissues as it provides optimal sealing, has easy manipulation, is biocompatible and has the ability of inducing osteogenesis and cementogenesis⁸.

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Mineral trioxide aggregate (MTA) has been recommended as a repair material for root perforations.[5] In a human osteoblast model, Koh et al found that MTA stimulated up regulation of cytokines, such as interleukin-1a, interleukin-1b, and interleukin-6, which are involved in bone turnover.[6] A search of the literature revealed two short-term studies that evaluated the clinical efficacy of MTA as a perforation repair material. Arens & Torabinejad reported two cases in which MTA had been used to repair furcal perforations. The first case showed bone regeneration after 3 months. Continued healing was observed radiographically at 6 and 12 months. The second case had similar findings, with radiographic evidence of resolution of the lesion in the furcation region at 9 and 12 months.[7] The following case report describes the management of lateral perforation and periapical abscess using Mineral Trioxide Aggregate and Thermoplasticized gutta-percha with a follow-up of 12 months.

**Case report:**

A 13-year-old male visited, to the dental office with pain in the maxillary right central incisor. His medical history was non-contributory. Dental history revealed a dull pain, which was intermittent in nature, pain aggravated on mastication and relieved on taking medication. A general dentist had treated the tooth 1 year back. On oral examination, there was a GIC filling in 11. The tooth was sensitive to percussion and palpation. Radiographic examination revealed radio-opaque restorative material in the coronal pulp chamber and radiolucency inside the pulp chamber, which was suggestive of cotton pellet. Root canal revealed lack of any radio-opaque obturating material in the involved tooth. A lateral perforation was observed on the distal aspect, along with widening of the periodontal ligament space and periapical abscess followed by external root resorption (Fig1).

Access cavity was prepared, GIC filling was removed along with the cotton pellet, using H-file. While negotiating the canal with no. 15 K-file, a sudden occurrence of hemorrhage in the canal was noted, this was a suspicious sign of perforation (Fig 2, 3).

Labial view of the chamber was irrigated with saline and 1.25% sodium hypochlorite (NaOCl) regularly, and the bleeding was controlled with pressure pack. The canals were cleaned and shaped using the crown down approach. As there was profuse drainage from the canal a triple antibiotic paste was placed (consisting of metronidazole, ciprofloxacin, and minocycline) and patient was recalled after 3 days. On clinical examination, the patient was found asymptomatic.
Non-surgical approach was selected to restore the osseous defect (perforation area) using MTA. MTA (PROROOT white mineral trioxide aggregate Dentsply Maillefer, Switzerland) was placed into the prepared canal and condensed with a hand plugger, size3 (Dentsply Maillefer, Switzerland) into the apical third root portion of length, around 5mm, to obtain adequate apical seal. Then, the remaining root canal below CEJ (Cemento- enamel Junction) was obturated with thermoplasticized gutta-percha using Calamus Dual (Dentsply Maillefer, Switzerland) (Fig 4).

Each increment of MTA was then placed on the osseous defect using MAP system, until the full defect was sealed both from the external and the internal root surface. (Fig 5) Post endodontic restoration was done using restorative glass ionomer cement.

Follow up was done and IOPA X-ray films were recorded after 2, 6, 8, 12 months, to evaluate the success of the treatment. On follow up after 12 months, clinical and radiographic success with no evident radicular lesion was found (Fig 6). Crown built up was done with composite resin restoration (Fig 7).

Discussion:

Successful treatment of perforations depends mainly on the immediate sealing of the perforation and prevention of infection\(^8\). Factors, such as time elapsed since the perforation and size of the perforation \(^8,9\), as well as the repair material are important for a better prognosis following perforation\(^8\). Another important factor is the location of the perforation as the more apical the perforation, the better the prognosis, the more coronal the perforation, the lesser the prognosis\(^10\).

This is due to the fact that perforation of the crown or root causes an inflammatory process which causes break down of the periodontium, which may extend to the gingival sulcus, producing a deep and unmanageable periodontal defect, the chances of which, is higher when the perforation is coronal as compared to one that is apical \(^11\). Ideal material requirements to seal perforations should include the ability to promote regeneration of peri-radicular tissues, antimicrobial activity, and the capacity to prevent leakage of microorganism and their by products\(^12\). The material should ideally be dimensionally stable, radiopaque, insensitive to moisture, adhesive to dentine, non-toxic, non-irritant, non-carcinogenic and biocompatible\(^13\). Several materials that have been documented to
be used as sealers in root perforations include amalgam, zinc oxide eugenol, IRM, Super EBA, Cavit, zinc polycarboxylate, zinc phosphate, glass ionomer cement, calcium hydroxide and mineral trioxide aggregate (MTA)\(^{14-16}\). MTA has proven to cause less dye leakage (both in dry and blood contaminated field) when compared to most of the commonly used materials like amalgam, Intermediate restorative material (IRM) and Super-EBA\(^{17}\). It is for the same reason that MTA has been considered as a material of choice for repairing root perforations, as it has not only shown biocompatibility to the surrounding peri-radicular tissue (minimal inflammatory reaction) but also has demonstrated the ability to allow regeneration of hard tissue like cementum, thus facilitating the regeneration of periodontal apparatus\(^{18}\).

Mahmoud Torabinejad at the Loma Linda University developed MTA in the 1990’s. MTA is a fine powder primarily composed of tricalcium silicate, tricalcium aluminate, tricalcium oxide, and silicon oxide that, upon hydration, forms a colloidal gel that solidifies in approximately 3 hours thus allowing early completion of final obturation of the root canal when acting as artificial barrier. MTA was initially introduced as a root end filling material, however because of its biocompatibility it is now also considered as a material of choice to seal perforations.

Current literature supports the efficacy of MTA, as it has an alkaline pH of 12.5 and the presence of several mineral oxides in its composition, promotes the overgrowth of cementum and also facilitates the regeneration of the periodontal ligament\(^{20}\). MTA was chosen in this case to fill the fragile root because of its excellent biological and physical properties. The MTA mixture was placed to seal the apical area so as to prevent the extrusion of the obturating material. This allowed healing and prevented the occurrence of any clinical and radiographic symptoms.

MTA appears to be advantageous for repair of perforations and resorptive lesions. Deposition of cementum and establishment of a periodontal ligament is achieved with the use of MTA. The cementum may form a biological seal that is similar to that of a normal root surface\(^{18}\).

**Conclusion:**

Based on the outcome of the cases presented in this article, MTA seems to be an excellent material for the repair of perforations and there seems to be a marked improvement in the prognosis of teeth repaired with MTA. However, further long term studies are needed to further evaluate the prognosis of MTA as a sealing material for root perforation.

**References:**