**Title:** Management of long standing perforation using dual non-surgical and surgical approach: A case report

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**Abstract**

Sometimes during access opening of tooth, furcation perforation can occur due to iatrogenic reasons. The main aim of perforation repair in furcation area is to seal the communication between endodontic space and peri-radicular tissues. The efficacy of MTA (mineral trioxide aggregate) has been presented by various authors. This case report, presents management of long standing furcation perforation using MTA as repair material.

Keywords: Furcation, Perforation, Mineral Trioxide Aggregate

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**Introduction**

A major complication of endodontic treatment is accidental perforation of the pulp chamber floor or roots. The American Association of Endodontists (AAE) Glossary of Endodontic Terms defines perforations as mechanical or pathological communications between the root canal system and the external tooth surface. [1]

Perforation of pulp chamber floor is called furcation perforation. Furcation perforation may be a consequence of iatrogenic errors occurring during access cavity preparation due to incorrectly aligned trephination (mostly by high speed bur) [2], post space preparation [3,4] or non-iatrogenic causes such as caries and resorption [5,2]

Sealing of perforation whether it is of iatrogenic or non-iatrogenic origin, poses a challenge even for well experienced dentists. [2] But if left untreated, perforation on the floor of the pulp chamber has the worst prognosis. Also delay in repairing can lead to further bacterial contamination, thus poor prognosis of affected tooth.

Perforation defects may be repaired by surgical or nonsurgical techniques [6]. Surgical alternatives are hemisection, bicuspidization, root amputation and intentional replantation. But before choosing surgical technique, a nonsurgical technique for intracoronal placement of the material to repair the perforation should initially be attempted first. This will preserve the periodontium and increase the probability of long-term success. [7]

Various materials have been suggested for non-surgical perforation repair such as amalgam, IRM, gutta-percha, dentine chips, calcium hydroxide, cavit, tricalcium phosphate ,hydroxyapatite, various glass ionomer cement varieties ,super EBA ,zinc oxide eugenol, composite resin, calcium phosphate cement, decalcified freeze dried bone, biodentine and MTA.[8,9,6,10,11,12,13]

MTA was developed by Dr.Torabinejad at Loma Linda university in 1993[14, 15, 16]. MTA is a new class of restorative material that is a derivative of portland cement. [10] MTA is a biocompatible material [17, 18] with regenerative capacity. [19] MTA has gained a particular attention as material of choice for perforation repair.

This case report presents management of long standing furcation perforation with a dual non-surgical and surgical approach along with use of MTA as repair material.

**Case report**

A 35 year old male patient was referred to Department of Conservative Dentistry and Endodontics, Genesis institute of Dental Sciences and Research, Ferozepur, Punjab for an evaluation of prior endodontic treatment .The patient complained of a dull pain localized to the right posterior mandibular area and a foul taste in his mouth. The patient had a history of non surgical root canal treatment performed on the right mandibular first molar by a dentist more than one year back, which was immediately restored with ceramometal crown. Patient understood that a furcation perforation had been created during initial root canal exploration by the patient‘s general dentist. The tooth exhibited tenderness on percussion and crevicular suppuration from the facial gingival sulcus was found. [Fig I]

The periodontal examination revealed 8 mm probing depth adjacent to midbuccal groove. Probing depth on the lingual and proximal surfaces were 2mm and 3 mm respectively. Periapical radiograph revealed prior root canal treatment and radiolucency in furcation area of the right mandibular first molar .The sulcular depth was traced with a gutta-percha cone as a radiographic tracer, identifying involvement of furcation area of right mandibular first molar. As a result of furcal perforation and a failed attempt at repair, tooth # 46 was deemed to have a poor prognosis. The patient was informed about the risks, benefits and alternative treatments and extraction was advised. However, the patient requested that tooth be saved. The patient understood the alternative approach and provided informed consent for treatment with nonsurgical repair of the perforation with MTA. First, after removing crown, surgical curettage was done. [Fig II,III].

Then after 2 days, under rubber dam isolation, coronal restoration was removed (Fig IV)

The perforation site was irrigated with diluted sodium hypochlorite (Prevest DenPro) to control hemorrhage and allow visualization of the perforation. Then irrigation was done with 17% EDTA (Prevest Denpro). The perforation was sealed with white MTA (Angelus) mixed with sterile saline (Pentagon Labs Ltd.), as suggested by the manufacturer. The MTA was covered with a cotton pellet moistened with distilled water [Fig V] and temporary restoration material (Cavit) was placed. Apical area of tooth appeared normal radiographically, so no retreatment of root canal was done.

Then after another 2 days, permanent composite restoration (3M ESPE) was done. Initially a full coverage crown was placed on tooth which was removed during treatment, so a temporary crown was replaced to avoid any food lodgement in between adjacent teeth. At the 15-day follow-up, the patient was asymptomatic. Three months after the treatment, there was radiographic evidence of bone formation adjacent to the MTA. (Fig VI)

6 month follow up show further improvement and tooth was asymptomatic. (Fig VII). Temporary crown was replaced with ceramometal crown.

**Discussion**

If perforation is not detected and treated timely, the breakdown of the periodontium may ultimately lead to loss of the tooth because perforations create an artificial communication between the root canal system and the supporting tissues of the teeth. [9] This communication leads to chronic inflammation of the periodontium (characterized by the formation of granulation tissue) that can lead to irreversible loss of attachment or loss of the tooth. [20]

Prognosis of perforation repair depends on the location, level and size of perforation {5]. Other factors affecting prognosis are contamination by micro-organisms, the time delay for perforation repair, accessibility of repair site[21], presence or absence of periodontal communication and sealing ability as well as biocompatibility of restorative material[22,8]

The location of the perforation is of crucial importance. Like in this case close proximity to the gingival sulcus may lead to endodontic-periodontal problems through contamination of the perforation with bacteria from the oral cavity through the sulcus.

It is also important that the level of crestal bone and epithelial attachment is taken into consideration. If the perforation lies coronal of the crestal bone it will be easy to treat and have a good prognosis. Perforations near the crestal bone are susceptible to epithelial migration and rapid pocket formation and treatment has a low success rate.[23]

Because the furcal perforation acts as a bottomless pit, control of the placement of the repair material is difficult, and extrusion of some of the filling material into the periodontal space is common. [24]

Ideally, a material with good sealability might be used for perforation repair to prevent continuous exposure to a contaminating environment [25]. Using different leakage approaches, mineral trioxide aggregate (MTA) experimentally showed better sealing ability than other materials, such as amalgam [26], zinc oxide-eugenol cement [15], resin-modified glass ionomer cements [27], and resin materials[28].So MTA is used for repair of lateral radicular and furcal perforation.[16,29,30] Same material is used in this case.

MTA is non-toxic ,non-absorbable, radiopaque and bacteriostatic or bactericidal material[31,32] It is biocompatible [17,18]material having ability to set in moisture of blood[33]and caries good handling characteristics.[5] It also has ability to promote periodontal tissue regeneration. [16] These properties make MTA, a material of choice for treatment of root perforations with a goal of regenerating a periodontal attachment. [34]

The repair capacity of MTA is due to its antimicrobial properties and high pH [2.5], which promotes osteogenesis and cementogenesis which in turn allow regeneration of periodontal ligament around the site of injury.[19] It is hydrophilic, so the moisture promotes expansion inside the defect during setting. [35, 26]

Previous studies have shown good prognosis when furcation perforation are sealed immediately with MTA. [36] Very fewer reports have shown the prognosis of cases with long standing furcation perforation, considerable bone loss and periodontal involvement. This case report shows the use of non-surgical MTA repair and surgical curettage in long standing furcation perforation resulting in significant healing. Clinical examination revealed an inadequate seal and/or disinfection at perforation site, resulting in persistent periodontal infection and concomitant bone loss .Disinfecting the perforation site and replacing the repair material with MTA was performed to ensure disinfected and sealed defect. [37-39]

Surgical curettage was performed before MTA repair, otherwise MTA would have been dislodged during surgical curetting, extra precautions were taken in this case to avoid any possible procedural errors.

Both the grey and the white versions of Pro- Root MTA perform similarly in terms of furcal sealing. [40] So we used white MTA. To prevent overfilling or under filling, a resorbable collagen matrix can be applied before placing the MTA, [41] but use of a matrix depends on the size of the lesion. Success has been reported both with [3] and without [42] the matrix. At present, there is no size classification for furcal lesions to determine appropriate treatment and prognosis; therefore, all options are considered to have a guarded prognosis. [8, 19]

The control of inflammatory processes in the defect area during management of perforation represents one of the main goals of the treatment [34] in addition to promoting the health of the surrounding tissue. To achieve a better tissue response, the perforation site was sterilized with sodium hypochlorite irrigation [43].

Recently, Holland et al [44] speculated on the importance of the debris in the defect, which could obstruct the close contact between MTA and the periodontal tissue and the subsequent healing process. To reduce the amount of debris in the perforation defect, a rinse with 17% EDTA was performed before positioning the filling materials.

The treatment of perforations, which are connected to the oral ﬂora via a periodontal pocket, presents a variety of problems. Although MTA offers a high degree of compatibility to the periodontal ligament [45], there is yet no evidence of attachment to the dental epithelium or the gingival attachment. Therefore, it must be assumed that those areas will have constant contact with the oral ﬂora and the MTA will be continuously contaminated. The development of sub gingival plaque could be promoted due to the rough surface of MTA [46]. As MTA is not a hard material, it could be partially scraped off during mechanical cleaning of the root surface and stable periodontal healing might not be expected [38].

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**CAPTIONS:**



Fig I



Fig II



Fig III



Fig IV



Fig V



Fig VI



Fig VII