Repair of an Extensive Furcation Perforation with Mineral Trioxide Aggregate: A Case Report

Aditi Jain¹, Pragya Jaiswal², Vaibhav Sharma¹, Abhinav Singhal¹, Apoorva Bhatnagar³

¹Senior Lecturer, Department of Conservative Dentistry and Endodontics, Maitri Dental College and Research Center, Anjora, Chhattisgarh, India, ²Assistant Professor, Department of Dental, Government Medical College, Rajnandgaon, Chhattisgarh, India, ³Post Graduate, Department of Conservative Dentistry and Endodontics, Pacific Dental College, Udaipur, Rajasthan, India

ABSTRACT

Furcal perforations are undesired complications of endodontic therapy. Once it has been diagnosed, treatment must be rendered to seal the site to minimize injury and prevent contamination from the surrounding periodontal attachment apparatus. Successful treatment and prognosis depend on many factors such as the site of perforation, the time lapse between exposure and repair, and the material of choice. The location of perforations at the level of the epithelial attachment and crestal bone suggested a guarded prognosis. Perforation repair has historically been an unpredictable treatment modality, with an unacceptably high rate of clinical failure. Recent developments in the techniques and materials utilized in repair have dramatically enhanced the prognosis. Mineral trioxide aggregate (MTA) is a relatively new bioactive and biocompatible material that is being successfully used to repair perforations. The aim of this long-term follow-up case report is to present the successful treatment of iatrogenic furcal perforation by MTA.

Key words: Iatrogenic, Furcal perforation, Mineral trioxide aggregate

INTRODUCTION

Iatrogenic perforation of pulpal floor is an undesirable complication that can occur during access cavity preparation or during exploring canal orifice in multirooted teeth, and this can have a negative impact on the treatment prognosis.¹,² The size, site and level of the perforation, as well as the time interval between the accident and its repair, will directly influence the prognosis.² Myriad of materials has been suggested for nonsurgical repair of perforations including zinc oxide eugenol, calcium hydroxide, Cavite, amalgam, glass ionomer, composite resin, mineral trioxide aggregate (MTA), biodentine, and calcium enriched mixture cement.

The bioactive material MTA was developed by Dr. Torbinejad at Loma Linda University in 1993.³,⁴ The chemical composition of MTA consist of hydrophilic fine particles and the main constituents were tricalcium silicate, tricalcium aluminate, tricalcium oxide, and silicate oxide.⁵,⁶ Bismuth oxide acted as a radio-opacifier. They declared that calcium and phosphorus were the main ions in MTA.⁷,⁹ Several studies indicate that MTA has antibacterial and antifungal effects, provides a physical and biological seal, is non-toxic and biocompatible, and able to induce osteogenesis, dentinogenesis, and cementogenesis.¹⁰⁻¹² It has a pH of 12.5 and sets in the presence of moisture in approximately 4 h and its desirable chemical and physical characteristics make it an optimal biomaterial for repairing the furcal perforations.¹³,¹⁴

This article presents a case of an extensive perforation of the pulp chamber floor in the first mandibular left molar and its subsequent repair with MTA.

CASE REPORT

A 42-year-old patient was referred to the Department of Conservative Dentistry and Endodontics with a chief complaint of episodes of pain in the right lower back tooth region which had started after initiation of endodontic therapy by general dentist about 2 weeks before. On clinical examination, a localized inflammation overlying the buccal mucosa in Furcal region of the tooth #36 became evident which was tender on palpation. The tooth had no tenderness on percussion and no mobility. Careful periodontal probing showed a pocket depth within the normal range (<3 mm). Radiographic
Jain, et al.: Repair of an Extensive Furcation Perforation with MTA

examination revealed overextended endodontic access cavity preparation and extensive destruction of pulp-chamber floor (Figure 1).

After administering local anesthesia (2% lidocaine with 1:80000 adrenalin; Daroupakhsh, Tehran, Iran), a slight modification in the outline of access cavity was done, and then all canal orifices were located. The access cavity and perforation site were copiously irrigated with normal saline and then chlorhexidine. All canal orifices were flared with #2 and 3 Gates-Glidden drills. Then, the canals were blocked with using gutta-percha points to avoid obstruction with perforation repair material. MTA was mixed according to manufacturer’s instruction and was placed into the cavity. To obtain a good marginal adaptation, the bulk of MTA was gently packed and then wet cotton pellet was placed over it (Figure 2). After application of temporary restoration, the patient was dismissed. The patient returned to the clinic three days later with no symptoms or signs then permanent restoration was done. During the 1-year follow-up, the tooth remained functional and asymptomatic. Clinical examination showed that the tooth had no tenderness to percussion/palpation, no swelling, no sinus tract and the probing depth is within the normal level. Radiographic examination demonstrated adequate filling and sealing of the perforation site with a normal periodontal apparatus (Figure 3).

DISCUSSION

A perforation is defined as the pathological or iatrogenic communication between the root canal space and the periodontal tissue. Furcal perforation is usually an undesired complication that can occur during preparation of endodontic access cavities or explore canal orifice of multirooted teeth. These undesirable situations such as excess removal of tooth structure or perforation occur during attempts to locate canals or as a direct result of failing to achieve straight line access to the canals. In the process of searching for canal orifices, perforations of the crown can occur either peripherally through the sides of the crown or through the floor of the chamber into the furcation. The interval between perforation and repair is one of the critical factors for success. Immediate sealing of perforations enhances the repair process due to reduce the possibility of bacterial contamination of the defect. Such perforation is managed surgically or nonsurgically.

In the past years, amalgam, composite resin, and glass ionomer cement have been used for sealing furcal perforation. However, the studies have shown that MTA is apparently superior to these materials with respect to marginal adaptation, bacterial leakage, and cytotoxicity. Main et al. concluded that MTA provides an effective seal and can be considered a potential repair material enhancing the prognosis of perforated teeth that would otherwise be compromised. Economides et al. also reported that MTA is a biocompatible material when used in root-end cavities, stimulating reparation of periradicular tissues, showed no inflammation and has the ability to induce hard tissue formation. The desirable properties of MTA make it a useful material in repairing the root and furcal perforation.

Figure 1: Pre-operative periapical radiograph of a mandibular right first molar showing an unusual extensive furcation perforation

Figure 2: Post-operative radiograph after mineral trioxide aggregate application

Figure 3: Radiograph after 1-year follow-up
Arens and Torabinejad reported that two cases are described in which MTA was used to repair furcation perforation successfully. Pace et al.\textsuperscript{20} had done clinical and radiographic follow-ups at 6 months, 1 year, 2 years, and 5 years, and after 5 years and indicated a successful outcome of sealing perforations in 9 out of 10 teeth.

In the presented case no radiographic and clinical sign/symptoms of disease in the bifurcation area was evident after a 1-year follow-up; accordingly, MTA may be a suitable endodontic biomaterial for the non-surgical repair of extensive furcal perforations.

**CONCLUSION**

The favorable treatment outcomes of this case confirm that MTA is a cementogenic and osteogenic biomaterial with good biocompatible sealing properties and is ideal for use as a repair material in cases of furcal perforation.

**REFERENCES**