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Case Report

Repair of Iatrogenic Furcal Perforation using Mineral Trioxide Aggregate (MTA): A Case Report

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Abstract:

Furcal perforation is usually an undesired complication that can occur during preparation of endodontic access cavities or exploring canal orifice of multirooted teeth. Inadequacy of the repair materials has been a contributing factor to the poor outcome of repair procedures. On the basis of the recent physical and biologic property, mineral trioxide aggregate (MTA) may be suitable for closing the communication between the pulp chamber, underlying periodontal tissues and alveolar bone. The purpose of this case report is to describe the treatment of an iatrogenic furcal perforation using MTA in maxillary molar teeth. The perforation was cleaned with sodium hypochlorite (5.25%), saline solution and sealed with MTA. Finally, the tooth was endodontically treated and coronally restored with Glass ionomer cement and metal veneer crown.

Keywords: Iatrogenic furcal perforation, MTA repair, Root canal treatment

Introduction

Furcal perforation is one of the most unpleasant and frequent accidents that can occur during endodontic treatment [1]. Burs which have incompatible dimensions and/or inadequate direction during the pulp chamber roof removal, inexperience and improper knowledge about root canal location can contribute to this type of accident. Furcal and/or root perforation prognosis is unfavorable [2]. Dental extraction or perforation repair using different materials such as endodontic or restorative cements are usually recommended, and chosen based on prognosis [3-5]. The best clinical results were obtained using calcium hydroxide with different clinical strategies [6, 7]. However, large-sized furcal perforations do not respond favorably to calcium hydroxide, possibly due to its restricted physical and chemical properties [6,7,8]. Thus, other materials have been proposed to solve this problem, such as calcium silicate-based cements, which has demonstrated excellent biological and clinical results [8-12].

Mineral trioxide aggregate (MTA) is one of these calcium silicate cements that was introduced in 1990s and extensively studied to be used for perforation repairs,

apexification, regenerative procedures, apexogenesis, pulpotomies, and pulp capping [13]. The present case report shows repair of a furcal perforation using Angelus MTA in a maxillary first molar using clinical and radiological evaluation.

A Case Report

A 45-year-old male patient reported to the department of Conservative Dentistry and Endodontics, Awadh dental college and Hospital, with pain following endodontic treatment, elsewhere, in left maxillary first molar tooth. Clinical history revealed that the previous dentist was unable to locate the mesiobuccal, distobuccal canal orifices and an iatrogenic furcal perforation occurred while locating these canal orifices. The endodontic treatment was left incomplete, only the palatal pulp chamber was filled with Gutta percha, and the coronal access was left open (figure 1).

Initial clinical examination showed no presence of fistula in gingival mucosa near to the radicular cervical region or any draining pus. Absolute isolation was carried out using rubber dam and then the temporary restorative material was removed. The pulp chamber was cleaned with sodium hypochlorite (5.25%) and saline solution, and a visual inspection revealed a furcal perforation between the mesial and distal roots that presented measure similar to spherical bur #8 (Figure 2). Periapical radiography revealed furcal perforation with significant communication to periodontal ligament (Figure 3).

The mesiobuccal and distobuccal canals were located. The gutta percha from the palatal canal was removed using ProTaper Universal Retreatment file system (Dentsply Maillefer, Switzerland). The working length of the mesiobuccal (MB), distobuccal (DB) and the palatal (P) canal was determined using apex locator (Propex Pixi, Dentsply Maillefer), and confirmed radiographically (figure 4). Biomechanical preparation was done using ProTaper Gold file system (Dentsply Maillefer, Switzerland) up to F1 for MB, DB canals, and F2 for palatal canal. Irrigation was done using normal saline.

White MTA (MTA – Angelus, Angelus Dental, Brazil) was placed using a MTA applicator at the perforation site and confirmed radiographically (figure 5,6). A damp cotton pallet was placed in the pulp chamber to produce a humid ambient for the MTA to set, and the tooth was temporarily restored with temporary restorative material (Cavit G, 3M ESPE, St. Paul, Minnesota, USA). The patient was recalled after 24 hours and was found to be asymptomatic. Irrigation was done using normal saline and master cone selection was done (figure 7). The canals were obturated with gutta percha points (Dentsply ProTaper Universal gutta percha points, Dentsply Maillefer) and AH plus sealer (Dentsply Maillefer, Konstanz, Germany) using single cone technique (figure 8). After 1-week patient was recalled and final restoration was done with Glass ionomer cement (GC gold label hybrid restorative GIC, GC Corporation, Tokyo, Japan) (figure 9).

Figure 1

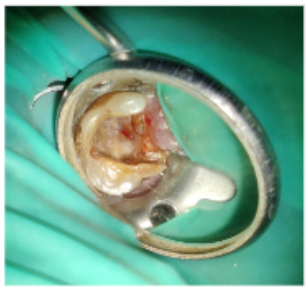

Figure 2

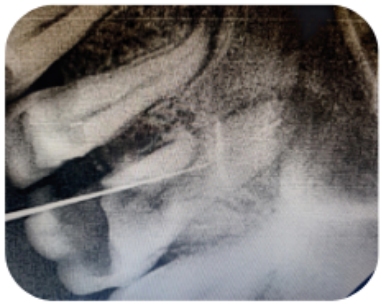

Figure 3

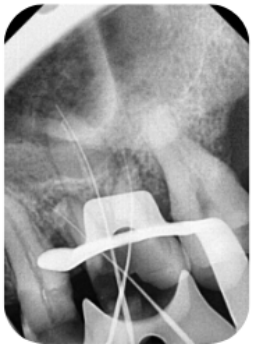

Figure 4

Figure 5

Figure 6

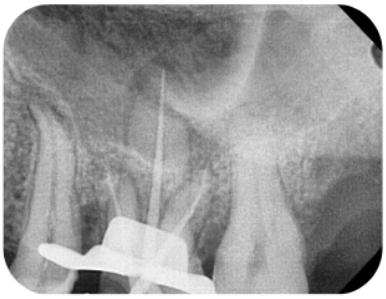

Figure 7

Figure 8

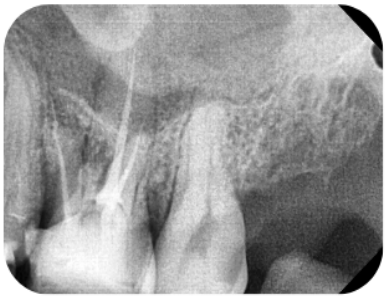

Figure 9

Discussion

The prognosis of furcal perforation has been doubtful, and since decades, the only treatment was tooth extraction. Calcium hydroxide was developed as an alternative treatment; however, due to its limited physical and chemical properties, some cases did not present good clinical results, especially for larger perforations and which reported after few days or weeks [4, 7, 8]. Calcium silicate-based materials (MTA) have created new expectations in endodontic treatments, especially in cases that were considered lost in the past [6]. Due to the rather large perforation size in the present case, calcium hydroxide was avoided as partial or definitive treatment option, in accordance to Bryan *et al.* [6]. In addition, an immediate sealing with MTA was carried out since Holland *et al.* [7], have observed that medication with calcium hydroxide prior to MTA use did not favor local repair. White MTA is composed of SiO_2, K_2O, Al_2O, Na_2O, Fe_2O, SO_3, CaO, Bi_2O_3, MgO and insoluble residues of CaO, KSO_4, $NaSO_4$ and crystalline silica. It presents favorable biological compatibility, favoring alkaline phosphatase activity, mineralized nodules formation and cell proliferation, as well as lower incidence of

inflammatory chemical mediators, favoring local tissue repair [10]. Although, it promotes an immediate inflammatory reaction, a reduction in the number of inflammatory cells is observed after 60 days with significant periodontal space repair, under similar conditions to normal tissue [11].Various modifications in composition and/or handling techniques have been proposed to optimize the MTA use [3, 14, 15], however, the present study followed the manufacturer´s instructions maintaining the original composition. Modification in the composition and/or handling of MTA was avoided as no difficulty was found in the insertion of MTA at furcal perforation site. [16,17].

Conclusion

This case report describes the successful non-surgical management of an iatrogenic furcal perforation on a maxillary molar teeth using MTA. Perforation during an operative or endodontic procedure should always be prevented. Any procedural error requires immediate sealing of the perforation to control contamination of the underlying periodontal ligament and alveolar bone. Studies have indicated MTA as a good sealing material that can be used in repair of different types of crown and root perforations. However, further studies are needed to find out the strength of MTA regarding various occlusal forces.

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