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Case Study

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MANAGEMENT OF PULPAL FLOOR PERFORATION BY USING BIODENTINE: A CLINICAL REPORT

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ABSTRACT

Furcal perforation may be the consequence of procedural error or a pathologic process such as caries and root Resorption. Furcal perforations are one of the most challenging cause of endodontic failure of multirooted teeth. Inadequacy of the repair materials has been a contributing factor to the poor outcome of repair procedures. Several materials including MTA, GIC have been used for non-surgical repair of furcal perforations. On the basis of physical and biological property this material may be suitable for closing the communication between the pulp chamber and the underlying periodontal tissues. The presence of bismuth oxide in MTA formulation may darken the tooth. Significant downside to MTA is the prolonged setting time of approximately 2 hours and 45 minutes. This requires that pulp capping with MTA can be in two-steps. Recently, new materials such as, Biodentine® Biodentine (Septodont: Saint Maurdes Fosses France) with similar composition was introduced with shorter setting time (10 minutes), greater biocompatibility, bioactivity and biomineralization properties than MTA. Moreover, Biodentine shows improved antibacterial property and low cytotoxic effect as compared to MTA. The purpose of this case report was to describe the treatment of furcal perforation using Biodentine® in molar teeth. The tooth was endodontically treated and the perforations were cleaned with NaOCl and saline solution and sealed with Biodentine®. Finally, the coronal portion of tooth is restored with composite resin and then a ceramic veneer crown is placed over it. After six months, absence of any periradicular radiolucent lesion, pain, and swelling along with abnormal functional tooth stability indicated a successful outcome of the sealing perforations.

KEYWORDS: Repair, Furcal perforation, Biodentine, Root canal treatment.

INTRODUCTION

Mineral trioxide aggregate (MTA) have revolutionized furcation repair, root-end therapy and pulp capping procedures.[1] MTA is comprised of calcium oxide in the form of tricalcium silicate, dicalcium silicate, tricalcium aluminate, and bismuth oxid for Radiopacity. MTA is considered a silicate cement rather than an oxide mixture, so its biocompatibility is due to its reaction products. Interestingly, the primary reaction product of MTA with water is calcium hydroxide, formation of calcium hydroxide makes MTA biocompatible.[2,6]

There are several disadvantages of MTA, as well i.e it has shown high solubility rate, demonstrating 24% loss after 78 days of storage in water.[3,7] The presence of bismuth oxide in MTA formulation may darken the tooth. Significant downside to MTA is prolonged setting time of approximately 2 hours and 45 minutes. This requires that pulp capping with MTA either can be done in a two-steps.[4,6,7] Beside a long setting time the major drawbacks of MTA are: its relatively low compression and flexural strength, which are lower than those of dentine.[7]

Recently, a new calcium silicate–based materials have been developed in response to the growing demand to overcome the disadvantage of MTA, called Biodentine®. The new high purity, calcium silicate-based dental cement, was designed as a dentin substitute for, pulp capping, and endodontic repair material.[5,9] Biodentine® contains tricalcium silicate, calcium carbonate, zirconium oxide and a water-based liquid composed of calcium chloride as a water-reducing agent for shorter initial and final setting times, as it also accelerates the rate of early strength development. Biodentine® has improved sealing ability, higher compressive strength, shorter setting time (10 minutes), greater biocompatibility, bioactivity and biomineralization properties than MTA. Moreover, Biodentine® shows

improved antibacterial property and low cytotoxic effect as compared to MTA.[5,9,10]

CASE REPORT

A 14 year old systemically healthy, non-smoker male patient reported to the department of Pediatric and Preventive Dentistry with the chief complaint of continuous dull pain in right lower back tooth region from more than 4 months. On clinical examination, it was diagnosed as a case of chronic irreversible pulpitis. and on radiographic examination caries involving furcation area was seen hence the respective tooth was advised for extraction (Fig. no. – 1). However, patient was reluctant for the extraction, and was reported to the institution for its management.

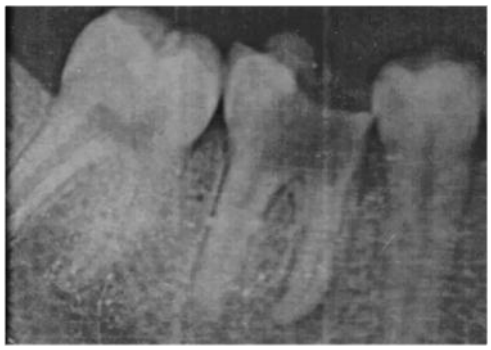

Fig. no. – 1

Treatment plan: Another treatment option is root canal treatment with furaction repair with endodontic repair material was chosen as the treatment plan. Patient was informed about the prognosis of the treatment.

Procedure: A written consent form was obtained from the parents. Endodontic treatment was initiated under local anesthesia 2% lignocaine with 1:200000 adrenaline. The mesial and distal canals were cleaned and shaped using ProFile ISO files (Dentsply Maillefer, Ballaigues, Switzerland) in a crown-down technique and copious irrigation with 5.25% sodium hypochlorite. The Metapex was placed into the canal as a medicament and secured with temporary restoration for 15 days. On second visit, tooth was isolated with rubber dam, canal was irrigated with saline, the root canals were then obturated with gutta-percha points (fig. no. – 2) protaper F3 (Dentsply Maillefer, Ballaigues, Switzerland).

Fig. no. – 2

After that caries was removed from the furcation area with sharp spoon excavator, and then larger perforation, the radiographic imagine of the perforation was detected clinically. Haemorrhage was controlled with copious irrigation with saline & 1% sodium hypochlorite. The perforation site was cleaned and dried with cotton pellet. The Biodentine was mixed according to the manufacturer's instructions and then placed at the perforated site (fig. no. – 3) with the help of MTA carrier.

Fig. no. – 3

A cotton pellet was then placed over I, to produce a humid ambient for the Biodentine with the aim of achieving its solidification and secure with temporary restoration. In the same visit tooth was permanently restored with composite resin (Fig. no. – 4) (FiltekTM Supreme XT, 3M ESPE, St. Paul, Minnesota, USA). Later, a ceramic veneer was applied.

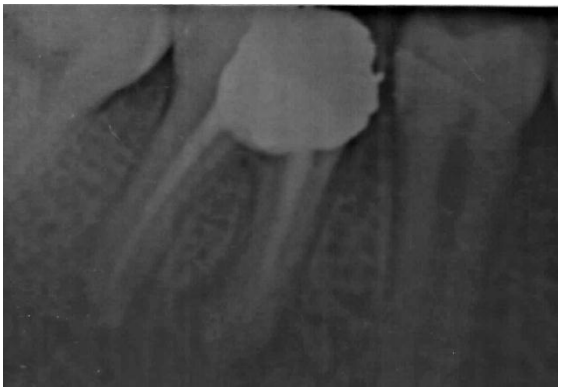

Fig. no. – 4

DISCUSSION

The prognosis of perforations depends on the location, size and time of contamination of the lesion. In our cases, furcal perforations were small, with a low risk of filling material extrusion. Finally, time between perforation and repair is one of the critical factors for success. Immediate sealing of perforations enhances the repair process due to reduction possibility of bacterial contamination of the defect.[7,10,12]

In the past years, amalgam, composite resin, and glass ionomer cements have been used for sealing furcal perforation. However, studies have shown that MTA is apparently superior to these materials with respect to

marginal adaptation, bacterial leakage and cytotoxicity.[7,10] Joo-Hee Shin et al. concluded that MTA provides an effective seal of perforations and can be considered a potential repair material enhancing the prognosis of perforated teeth. Mineral trioxide aggregate (MTA) is a bioactive endodontic cement mainly comprised of calcium and silicate elements. The cement was introduced by Torabinejad in the 1990s, the main constituents are tricalcium silicate, bismuth oxide, dicalcium silicate, tricalcium aluminate, calcium sulfate dehydrate or gypsum. It contains a hydrophilic powder that react with water and produces calcium hydroxide and $CaSiO_4$ hydrate gel.[5,9,11] MTA was originally formulated to provide the better physical properties, setting requirements and characteristics necessary for an ideal repair and medicament material.[21] The lower microleakage values of MTA may be attributed to its superior marginal sealing ability resulting from its hydrophilic properties and formations of an interfacial layer between the material and dentin. The interfacial layer reduces the risk of marginal percolation and gives promising long-term clinical success.[9,11]

Beside a long setting time and discoloration of tooth the major drawbacks of MTA are its relatively low compression and flexural strength, which are lower than those of dentine. These factors are limiting the field of application to the low stress-bearing areas.[7,8] In recent years, various material like Biodentine®, MTA plus have been introduced with the aim to overcome some of the disadvantage of the MTA.[8]

Biodentine® the new high purity, calcium silicate-based dental cement, was designed as a dentin substitute for resin composite restorations, pulp capping, and endodontic repair material.[6] Biodentine® contains tricalcium silicate, calcium carbonate (filler), zirconium oxide (radiopacifier) and water based liquid, composed of calcium chloride as a water reducing agent, for shorter clinical and final setting time, as it also accelerates the rate of early strength development. Biodentine® has improved sealing ability, higher compressive strengths, shorter setting time (10 minutes), greater biocompatibility, bioactivity and biomineralization properties than MTA.[7,8] Moreover, Biodentine® shows improved antibacterial properties compared to MTA, as well as a low cytotoxic effect. Biodentine may have a more prominent biomineralisation ability than MTA[8]. Bismuth oxide is replaced by zirconium oxide in Biodentine. These alternative radiopacifers were adequate because materials produce comparable radiopacity, and they did not interfere with the hydration of the materials.[5,7]

Resin composite is a very popular in restorative dentistry because of their esthetic qualities They cannot be placed directly over freshly mixed MTA because the effect of phosphoric acid, which is used to increase the retention and sealability of composite resin restorations,. Acid-etching procedures affect its setting, and rinsing of unset MTA can dislodge the material.[7,11] This indicates that it may be better to postpone restorative procedures for at least 4 Days after mixing MTA. Etching created surface change, that might have the potential to enhance bonding of resinous materials. However, it has been claimed that the setting time of Biodentine® is 12 minutes, so the hypothesis is that resin composites can be layered over set Biodentine® after 12 minutes, which might enable single-visit procedures.[5,7,8]

CONCLUSIONS

Biodentine® may be a good alternative over MTA in sealing the furcal perforations in molars, thereby increasing the life of the tooth.

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