

Heading: One Year Follow Up Of Clinical Outcome Of Deep Caries Management Using Mineral Trioxide Aggregate: A Preliminary Prospective Longitudinal Study

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Abstract:

One of the main objectives of modern restorative dentistry is to prevent secondary caries under the restoration. This can be achieved by inducing the remineralization of hypomineralized carious dentine during primary restorative procedure, to protect and preserve the pulpal vitality. Currently there is considerable research focus directed towards the identification of the bio-inductive materials for pulp capping especially having which are able to induce a well formed dentin bridge at pulpo-dentinal junction. Gold standard material calcium hydroxide which is used since almost a century, creates an uncontrolled necrotic zone on the outer layer of the pulp and porous dentinal bridge which may lead to microleakage. Hence, Mineral Trioxide Aggregate (MTA) is considered to be one of the successful materials for the management of deep caries lesions since quality of dentin bridge formed with MTA creates an effective hermetic seal which can merge with the dentin walls when compared to that of calcium hydroxide and thereby preserves the pulp vitality. This paper describes the successful treatment outcome of ten cases of clinical management of deep carious lesions using MTA with the follow-up at regular intervals of 1month, 3months, 6 months and 1 year.

Keywords: Deep caries management, Direct pulp capping, Indirect pulp capping, Mineral Trioxide Aggregate

Introduction

In the recent times, there have been tremendous changes in dental caries management strategies, and are more moving towards prevention of dental caries than restorative therapy. The ultimate goal of the restorative treatment is to maintain the normal form and function of the tooth while preserving the pulpal vitality and normal root length with apical end closure. [1] Mild pulpal inflammation caused by deep caries can be clinically managed with an attempt to preserve the pulpal tissue by using pulp capping agents or performing pulpotomy procedure. Literature recommends pulp capping procedure to be performed only on affected teeth with uninflamed pulp with minimum pulpal exposure lying underneath the pulp capping agent. [2]

Numerous studies proved a great deal of success with the formation of reparative dentin with calcium hydroxide [3,4,5]. Hence, Calcium hydroxide is considered as gold standard for the deep caries management procedures. The calcium hydroxide creates a wide necrotic zone not confining to the exposure site which, over a period of time results in the non-vitality of the teeth. To overcome this scenario, certain biomaterials like MTA(Mineral Trioxide Aggregate), tricalcium silicate, hydroxyapatite, calcium enriched mixture etc. have been found and adopted [6,7,8]. MTA is well known bioactive biomaterial which helps in preservation of pulpal vitality. Hence, this paper intends to validate the use of Mineral Trioxide Aggregate as a pulp capping material in five case reports with one year follow-up at regular intervals of one month, 6 months and one year.

Presentation of Case Reports: Ten cases with deep carious lesions were treated. A detailed case history and a thorough clinical examination was carried out. Pre-operative IOPA was taken using paralleling technique. Finally, decision was taken to perform deep caries management procedure under rubber dam. Case procedures were explained to patients thoroughly and informed consents were obtained from them for photography and clinical procedures.

In one of the cases, a 36- year old female patient presented to our dental clinic with the chief complaint of sensitivity to hot and cold foods with respect to tooth #36 (Case 1). The patient's medical history was non-contributory. On

clinical testing #26 revealed Class I occlusal caries involving enamel and dentin. #36 was non tender upon percussion, no pain on mastication and a no lingering response to cold. Pulp sensibility tests were performed and the tooth gave positive response. Deep caries management by pulp capping procedure was suggested to the patient. (Figure 1). Direct Pulp Capping procedure was performed with respect to #36. The infected soft caries was excavated using sterile sharp spoon excavator, first from the cavity walls and then from the floor of the cavity. Bleeding was controlled with 2.5% NaOCl (Vishal Dentocare Pvt Ltd.) soaked sterile cotton plug. The disinfection of the cavity was done with 2% Chlorhexidine gluconate solution. MTA(MTA ANGELUS®) was mixed as per manufacturer's instructions and applied as pulp capping material followed by the placement of moist cotton and temporization was done using zinc oxide eugenol restoration (Deepak Enterprises). The patient was recalled after 24hrs to remove the cotton pellet from the cavity and restored with glass ionomer (GC Glass Ionomer Universal Restorative) restoration. On one-month follow-up, pulp vitality tests were done with thermal and electrical tests. The tooth showed normal positive response and proved to be vital. Clinical tests performed showed no signs of infection and tooth was non-tender to percussion. Post-operative IOPA was taken using paralleling technique. The follow-up was continued at intervals of 3 months, 6 months and 1 year and showed successful clinical outcome.

Similar protocols were followed in the remaining nine cases as explained in the first case with the same restorative materials as mentioned above. The follow up was also performed at regular intervals as mentioned in case 1. The pulp vitality tests were performed and radiographs were taken to confirm the success of the treatment (Figure 2 and 3).

Discussion

Mineral trioxide aggregate is recent and biologically acceptable pulp capping material in dental medicine. The ideal pulp capping material for vital pulp therapy should prevent bacterial ingress, leakage and stimulate the formation of reparative dentin [1]. Dentinal bridge formed with MTA when compared to that of calcium hydroxide, created effective hermetic seal which can merge with the dentin walls [9].

MTA being bioactive, helps in neo-regeneration of the lost tissues due to caries process in both direct and indirect pulp capping procedures [10, 11]. Hence, the present case series was conducted to evaluate the clinical response of MTA as pulp capping agent. With the present case series, the patients were followed up at one month, 6months and one year intervals. All the cases were asymptomatic at 1 month follow up with not even mild inflammatory reactions presented by patients. The pulp sensibility tests of all the cases showed positive response indicating preservation the vitality of the pulp clinically. No widening or lesion could be seen in radiographic images at one month follow up indicating no residual inflammation. This results are in accordance with other studies which helps in maintaining the vitality of pulp [12, 13, 14]. Disinfection of the cavity plays a very important role for the success of the vital pulp therapy. Chlorhexidine gluconate has good antimicrobial activity, substantivity and reduces the ingress of microorganisms which provides the basis for the success of treatment. [15]. Moreover, MTA being a prototype of hydraulic calcium- silicate cement has gained a good popularity as a pulp capping material showing favorable success rates of more than 90% with clinical trials and has a greater long-term sealing ability and stimulates a high quality of reparative dentin [1,11,13].

Conclusion

From the observation and follow up of all the cases treated with MTA for direct and indirect pulp capping showed the faster and good results. It may be a better substitute for calcium hydroxide in vital pulp therapy. Further studies can be carried out with more number of cases and longer follow up period to prove its healing and regenerative capability.

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Figures and Legends

Figure 1. Clinical Procedure of MTA procedure with respect to #36



Figure 2. Radiographic outcome of MTA procedure with respect to #36

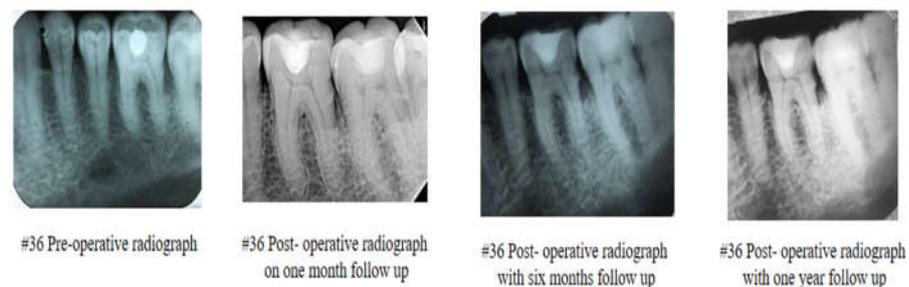


Figure 3. Radiographic outcome of MTA procedure with respect to #35 over a period of one year

