MTA: the new biocompatible material of choice for direct pulp capping in cariously exposed teeth: A case report

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Abstract

The significance of pulp vitality preservation can never be exaggerated. Cvek's partial pulpotomy helps to recover the exposed pulps preventing the necessity for additional endodontic therapy. It is usually embraced in teeth with open apices or thin dentinal wall to advance root development. MTA is new bioactive cement with dentin-like mechanical properties which can be utilized as a dentin substitute. It's a positive result on vital pulp cells and stimulates tertiary dentin formation. In direct contact with vital pulp tissue, it likewise promotes the formation of reparative dentin and in properly elite cases may add to the long-term maintenance of tooth vitality. MTA pulpotomy comprised of pulp tissue removal to a depth of 2 mm, then capping the pulpal wound with MTA, followed by immediate restoration. The teeth were evaluated clinically through pulpal sensitivity tests and radiographically for periapical healing. At every recall (24 hours, 1 week, 30 days, 3, 6, 12, and eighteen months), no spontaneous pain was observed; the pulp showed signs of vitality and absence of periapical radiolucency after 18 months. MTA pulpotomy is usually recommended as a treatment selection for cases of vital pulp exposure in young permanent teeth due to carious exposure.

Keywords: MTA, Direct Pulp Capping, Reversible pulpitis, Reparative Dentin

Introduction

Pulp integrity of the tooth should be maintained for:

1. Long term survival
2. Retain the tooth as functional unit
3. Withstand heavy masticatory forces.

A vital, functioning pulp is capable of initiating many defense mechanisms to shield the body from microorganism invasion. It's advantageous to preserve the vitality of an exposed pulp rather replacing it with a root canal filling material following pulp exposure. Direct pulp capping in cariously exposed pulp of young immature teeth has yielded an especially high success rate. In 1920, another period in the treatment of exposed pulp began when Hermann introduced Calcium Hydroxide that promoted the bridging of the exposed pulp with reparative dentin.[1,2] Both clinically and histologically it has been found to form satisfactory outcomes in indirect and direct pulp capping. For a long time calcium hydroxide formulations are the best documented and most dependable materials for direct pulp capping and fill in as the "gold standard". In any case, calcium hydroxide features a few disadvantages like tunnel defect during dentinal bridge formation, poor bonding to dentin, material resorption and mechanical instability. The high pH (12.5) of calcium hydroxide suspensions causes liquefaction necrosis at the surface of the pulp tissue.[3,4]

Different competitive substitutes have been presented in restorative dentistry, out of that MTA, a bioactive cement is almost superior to others. MTA remains for mineral trioxide aggregate, which means the three predominant oxides within the material's composition, to be specific–calcium, aluminum and selenium. Its molecules sizes are entirely controlled during manufacturing, as all of them should be under ten microns, so that the material could be entirely hydrated.[5,6] MTA encompasses a comparative mechanism of action to Calcium Hydroxide therein the principle element of the material, calcium oxide, when in contact with a humid environment, is changed into calcium hydroxide. This outcome in a high Ph of 12.5, creating its surroundings inhospitable for microorganism development, and making a hostile to bacterial impact for a long period of time.[6]

The following case report describes the method of MTA pulpotomy in mature permanent teeth following several days of carious pulpal exposure.

Case Discussion

A 19-year-old female patient reported to the department with the complaint of a pain on consuming hot and cold food stuff only when it was in contact with the exposed tooth. History revealed that patient experienced transient pain on having cold beverages which was relieved once the stimulus was removed. On examination pulpal involvement was found in relation to mandibular right molar.

The procedure of was explained to the patient and an informed consent was taken. Right mandibular tooth was anesthetized using 0.6ml lignocaine (1:200,000 adrenaline) and teeth were disinfected with chlorhexidine. The superficial layer of the exposed pulp and the encompassing tissue were excised to a depth of

2 mm using a high-speed no. 2 round diamond bur along with a water coolant. The bleeding from the radicular pulp signified sound status of the pulp. The surface of the remaining pulp was irrigated with isotonic saline along with gentle application of small sterile cotton pellets for 5 minutes until the bleeding was arrested. Freshly mixed MTA was immediately placed over the exposed pulp, after placing the MTA, the operator laid a flat, water dampened cotton pellet directly over the material and temporarily restored the tooth with unbonded Clearfil Photocore (Kuraray Medical, Okayama, Japan) that was photo polymerized for 60 seconds. In second visit temporary restoration was removed and afterward at last finally sealed with direct composite restoration.

Periodic follow-ups were completed out at 24 hours (Fig. 1); 1 week; 30 days; 3, 6, 12, and 18 months (Fig. 2). The following was checked: Tenderness to percussion, swelling and pain. Electric pulp testing was done after a period of time & Radiographic examination to check for conformation of any root resorption or widening of the periodontal ligament space.

Fig. 1: Preoperative and postoperative after 24 hours

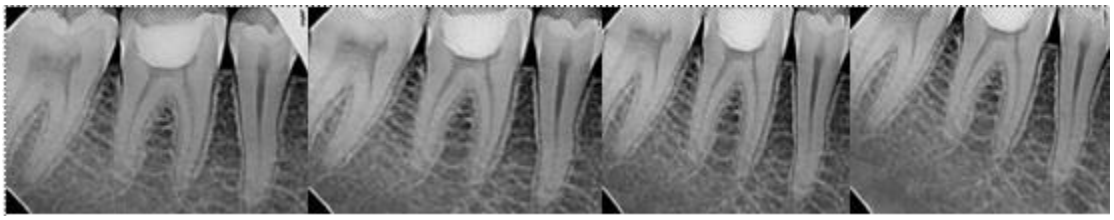

Fig. 2: Follow up radiograph at 3, 6, 12 and 18 months

Discussion

Direct pulp capping with MTA over a carious exposure in a immature permanent tooth might be a reasonable contrasting option to root canal treatment or extraction. Different reviews on pulp capping have been done on mechanically exposed teeth and mature teeth with great outcomes. Seltzer and Bender have proposed that a mechanically exposed young pulp has a superior prognosis due of its repair potential in the absence of contamination when contrasted with carious exposures which have chronic inflammation secondary to microbial invasion.[7] Bodem et al. found that pulps remained vital after direct capping of cariously exposed primary molar pulp with MTA.[8]

Factors which impact treatment choices when encountering teeth with pulp exposure include the level of infection and inflammation of the pulp instead of the size or duration of pulp exposure. For traumatic exposures in young asymptomatic immature teeth, direct pulp cap or partial pulpotomy are the treatments of choice. Conversely, carious process can lead to marked changes within the pulp-dentin complex which can differ extensively relying upon on the severity of the disease and the age of the pulp. It is for the most part agreed that larger carious exposures have a poor prognosis due to a more severely inflamed pulp, risk of necrosis and bacterial contamination. Careful case selection and treatment planning is basic for better result of treatment rendered.

The histologic degree and level of inflammation can't be precisely predicted clinically. The present study included components that are accepted to give signs of the health and healing capacity of pulpal tissue preceding to treatment i.e. age of the patient, size of exposure and radiographic appearance. Each of these variables has been referred in the literature as having some importance in the capacity of the pulp to recuperate from a pulp exposure.

Since years calcium hydroxide is being utilized for direct pulp capping. MTA has been appeared to give preferred outcomes over calcium hydroxide in direct pulp capping of non-inflamed pulps. Aeinehchi et al. revealed less inflammation and thicker dentin bridge with MTA than calcium hydroxide when utilized as a pulp capping material in human teeth with mechanical pulp exposures.[9] According to Pitt Ford et al. MTA's prevalence could be due to its good sealing ability and biocompatibility.[10] MTA has turned to be one of those very few exogenous materials that is not only well tolerated by connective tissues as well as adds to a bacteria-tight seal. Optimum hemorrhage control is fundamental for effective result of direct pulp capping regardless of the material used. Sodium hypochlorite (NaOCl) in concentrations 2.5-5.25% when placed on

an exposed pulp, in addition to being ideal for hemorrhage control, gives asepsis. NaOCl results in chemical amputation of the blood coagulation and fibrin alongside with the expulsion of damaged cells and operative debris from the exposed pulp site. Ideal hemostasis will also likewise accomplish the objective of bacteriostatic seal. A few reviews have demonstrated that sodium hypochlorite did not debilitate or impede the cellular recuperating of exposed pulps and is not inhibitory to the biologic mechanisms of odontoblastic cell or dentin bridge formation.[11,12] In addition it can be utilized for removal of residual microbial flora, which can be a major obstruction in healing of exposed pulp.

Infected dentin in contact with pulp tissue is probably going to encourage inflammation and discourage reparative dentin formation. The utilization of sodium hypochlorite for hemostasis and disinfection is suggested by few authors for MTA pulp caps and is referred to by a couple of authors as being basic to the success of this technique. Others favored a cotton pellet moistened with sterile saline for this step.

Following a pulp capping procedure, bacterial leakage through the final restoration is taken into account by some to be a lot of adverse to result than bacterial contamination at the time of the treatment. This finding underlines the necessity for a good seal in the final restoration after the finish of the pulp capping procedure. Thus, unbonded Clearfil Photocore was put above the pulp cap before permanent restoration. Composite restoration was preferred as permanent restoration.

Conclusion

MTA is an intriguing and promising material which has the capability of making significant contributions to maintain pulp vitality in patients judiciously selected for direct pulp capping. The teeth in which direct pulp capping was completed were asymptomatic and did not develop any tenderness to percussion. Electric pulp testing revealed vital response at the end of year and a half. Radiographic examination revealed absence of periapical lesion or widening. In both cases a well-defined radio-opaque layer formation was seen on the pulpal aspect adjacent to the layer of MTA suggestive of a calcific barrier and apical closure was also seen. Cveks pulpotomy can be viewed as a suitable treatment alternative in such cases.

Clinical Implications

Vital pulp therapy using MTA is a treatment option for teeth diagnosed with a condition no more severe than reversible pulpitis.

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