

Reattachment Of The Uncomplicated Fracture And Direct Pulp Capping For Complicated Fracture Using MTA In Maxillary Anteriors: A Case Report

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Abstract: *This is a case report of a 15yrs-year-old boy with complicated crown fractures of three traumatized teeth: left and right maxillary central and left lateral incisors. The left central incisor presented a small pulpal exposure of approximately 0.5 mm and right central and left lateral incisor had an uncomplicated fracture. Endodontic management included direct pulp capping, and restorative management including reattachment of the teeth fragments. The reattached fragments were assessed clinically and radiographically at 12 months. The teeth remained vital, there were no color changes, and the restorations had an acceptable appearance.*

Keywords: *adhesive, direct pulp capping, fracture fragment, MTA, reattachment*

I. INTRODUCTION

Trauma to the facial area generally involves the teeth and their supporting structures; the most frequent causes are falls, traffic accidents, domestic violence, fights, and sports. Most dental injuries occur during the first two decades of life, especially between 2 and 3 years and between 8 and 12 years of age; they occur more often in boys than in girls. Fractures of permanent teeth comprise the most frequent type of dental trauma. Traumatic fractures of anterior teeth are a ordinary problem in children and adolescents owing to their active lifestyle. The teeth mostly involved are the maxillary incisors because of their vulnerable position in the mouth. The majority of dental injuries involves the anterior teeth, especially the maxillary incisors because of its position in the arch which account up to 92% of all traumatic injuries to the permanent dentition.

Dental trauma in the anterior region of the mouth is often characterized by tooth avulsion and coronal fracture with or without pulp exposure; 26–76% of these injuries involve loss of hard dental tissues and this type of trauma may involve enamel, dentin, or pulp. Coronal fractures involving enamel, dentin, and pulp represent 4–16% of all traumatic lesions to the permanent dentition. Coronal fractures of permanent teeth with pulp exposure possess both endodontic and restorative challenges.

Tooth fragment reattachment offers a conservative, esthetic, and cost-effective restorative option which is an acceptable alternative to the restoration of resin based composite or full coverage crown. The treatment options of enamel-dentin crown fractures with pulpal exposure are direct pulp capping, partial pulpotomy, pulpectomy, or extraction. For young patients in whom the exposed pulp maintains its

vitality, direct pulp capping is the best endodontic treatment option in order to maintain pulpal functions.

Over the decades, Mineral Trioxide Aggregate (MTA) is one of the most used endodontic material for direct pulp capping, apexification, external root resorption and obturation of retained primary teeth. It has been proven to have several favorable properties such Biocompatibility, bioactivity, hydrophilicity, radiopacity, sealing ability, and low solubility. High biocompatibility encourages optimal healing responses. The material is non-absorbable, sets in the presence of moisture, has a relatively high compressive strength and has a sustained high alkaline pH. Unlike calcium hydroxide, however, MTA has very low solubility and maintains its physical integrity after placement. Hence, MTA was used for direct pulp capping.

The purpose of this case report is to present fracture reattachment of fragments after direct pulp capping of the complicated fracture and uncomplicated fracture.

II. CASE REPORT

A 15 year old male patient was reported 1 h after the trauma to the department complaining of fractured upper front teeth as a result of fall on the floor. The patient's medical history was unremarkable. There was no apparent trauma to the soft tissues per extra and intraoral examination. The intact teeth fragments were recovered at the accident site and brought in milk by his mother. Clinical and radiographical examination revealed a complicated crown fracture of the maxillary left central incisor, the pulp seemed in a normal status, with intact vascular supply and absence of bleeding and uncomplicated fracture of maxillary right central and left lateral incisors (Fig 1 (a)). The fractured tooth presented no mobility, no tender on percussion, and no alteration in position of gingiva. There was no bleeding on probing and no soft tissue injury. The adaptation of the fragment was found to be satisfactory. In this case the pulp vitality tests gave a negative response which could be due to pulpal edema, which could result in a negative pulpal 'response' just after injury. Thus, negative sensibility at the time of injury is not a sign of pulp necrosis, but a sign of pulpal damage, which has prognostic significance in the follow-up period. For all the teeth, periapical radiographic examination showed complete root development, closed apices, no periapical injury, and absence of root or alveolar bone fractures. (Fig 1(b)). The possibility of reattaching the same teeth fragments were explained to the patient's mother and, owing to the lower cost compared with an indirect restoration, she expressed the desire to maintain them. Endodontic management included direct pulp capping using MTA. The treatment plan was accepted.

After local anesthesia administration, round bur was used to create a trough pulp close to the exposure site to a depth of 0.5-1mm. Further, bleeding was controlled with cotton pellets soaked in sterile saline. MTA angelus(MTA Angelus: Blanco) was placed on the exposed pulp area and was allowed to set for 15 mins with a wet cotton pellet over it as MTA is said to be set in moisture.(Fig 2) To avoid dehydration during clinical and radiographic evaluation and endodontic therapy, the teeth fragments were immersed in milk. All the fragments and

dental structures were acid etched 37% phosphoric acid (Ivoclar Vivadent AG, Schaan/Liechtenstein) for 15 seconds and thoroughly rinsed off.(Fig 3) A dental adhesive [Adper™ Single Bond 2, 3M ESPE] was applied to all the fragments and light cured for 40 s and a flowable resin (Tetric Flow, Ivoclar Vivadent AG, Schaan/Liechtenstein) was used to adhere the fragments to the teeth; a thin layer of this resin was placed in the fractured surface of the teeth to allow for a small excess of material when the fragments were repositioned, then flowable resin was light cured for 60 s labially and palatally was applied to both the substrates. Finally, the residual excess at the restorative margins were finished and polished with Sof-Lex™ Discs (Sof-Lex™ Finishing and Polishing Discs: 3M ESPE). (Fig 4) Clinical and radiographic examinations were made after treatment. 12 months after the trauma, the patient showed no periodontal or periapical pathology, and no pulpal signs or symptoms. The teeth were found to be vital; the restoration was functional and aesthetically acceptable. (fig 5 (d)).

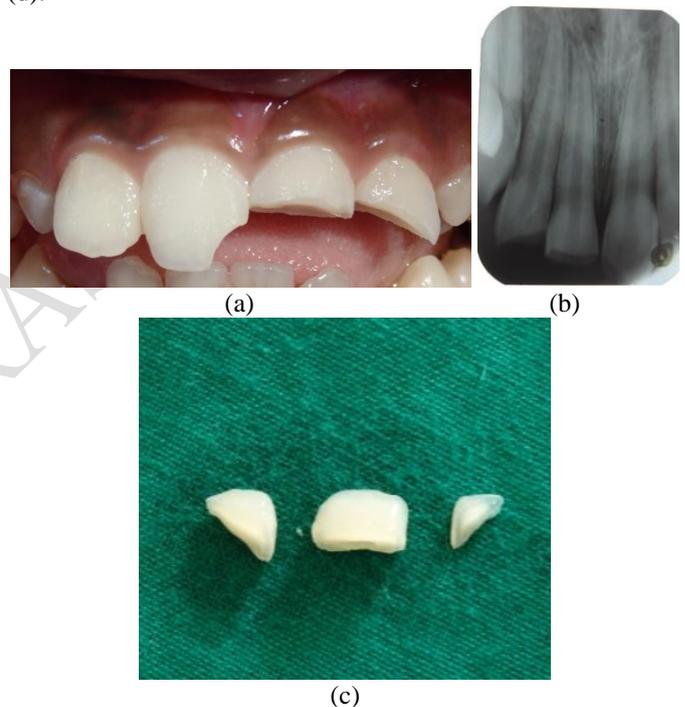


Figure 1: (a) Preoperative intraoral image (b) periapical pre-operative radiograph (c) Fractured fragments



Figure 2: Direct pulp capping using MTA with 21



Figure 3: Etching of the fragments with 37% phosphoric acid



Figure 4: Postoperative

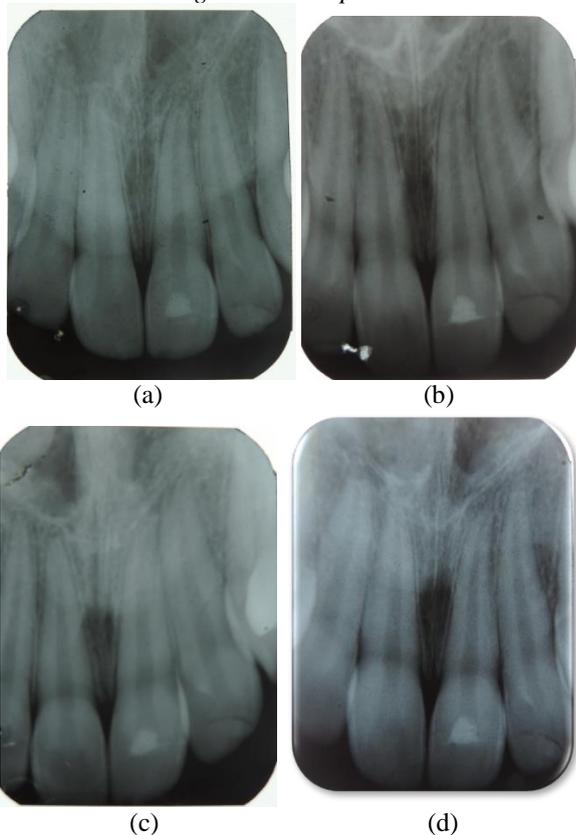


Figure 5: (a) postoperative IOPA (b) one month follow up (c) Six months follow up (d) Twelve months follow up

III. DISCUSSION

Among the children and adults the most common trauma is to the orofacial region and which can be considered as a

serious problem. Of these traumas, dental crown fractures play a major role, comprising an estimated 70% of all orofacial trauma. Crown fractures with pulp exposure represent 18 to 20% of traumatic injuries involving the teeth, the majority being in young permanent teeth. Various treatment modalities have been described for the management of the fractured teeth. They include: Fragment removal followed by restoration, fragment reattachment, orthodontic extrusion with/without gingivoplasty, forced surgical extrusion, vital root submergence and extraction followed by implants. Tooth fracture can now be treated by reattachment of the tissue fragments using an adhesive system (acting as a 'dental super glue') to provide what is considered to be the most conservative of restorations.

Various materials such as flowable composite, dual cure, or resin modified glass ionomers have been suggested to reattach fragments. In this case a flowable composite was used reattach fragments. Newer dentine bonding systems work with such efficiency that they easily allow for normal masticatory forces. Survival rates for such restorations have been shown to be good, with failure often only resulting from subsequent trauma.

The reattachment of the fractured crown fragments using the bonding fragment technique offers several advantage including the re-establishment of function, esthetics, shape, shine and surface texture in a short time, there by preserving the original contour and alignment of dental tissues and also offers a positive emotional and social response from the patient for preservation of natural tooth structure. Also, replacement of fractured portion may be less time consuming than needed for completion of a provisional restoration.

The remarkable advancement of adhesive systems and resin composites has made reattachment of tooth fragments a procedure that is no longer a provisional restoration, but rather a restorative treatment offering a favorable prognosis. However, this technique can be used only when the intact tooth fragments available.

The reattachment technique is indicated when the fracture results in only one fragment. The present case report shows that the fragment can be used even if the fracture is complicated, but the margins are accessible.

The pulp of a tooth can be exposed due to several causes: caries, trauma or mechanical reasons, the latter typically due to a misadventure during tooth preparation. The direct pulp cap, in which a material is placed directly over the exposed pulp tissue, has been suggested as a way to promote pulp healing and generate reparative dentin. Some studies have shown that a tooth is more likely to survive direct pulp capping if the initial exposure is due to mechanical reasons rather than caries.

According to Zander and Hess the main indicator of success in direct pulp capping or pulpotomies is the formation of dentin bridges. Specific literature has shown that MTA stimulates the formation of mineralized tissue and recent studie have applied MTA directly to the exposed pulp tissue in direct capping or pulpotomies, forming dentin bridges and showing no inflammatory response.

MTA was used for direct pulp capping .The main advantages of MTA are that it provides a good protective barrier against bacterial penetration and is biocompatible. It

has also been shown that the bioactive property of MTA is superior (when compared with Ca[OH]₂ and other materials) in dentin bridge formation after pulp capping and pulpotomies. Hence, MTA was chosen as the material for vital pulp therapy. The formation of dentin adjacent to the MTA occurs due to its sealing ability, which prevents microleakage, to its biocompatibility, alkalinity, or due to other properties such as the capacity to stimulate cytokine release by the bone cells.¹⁶

The success rates of reattached fragments has been seen to be up to 90 % for the parameters of periodontal, restorative and color harmony for a follow up of 24 months.” The reattached fragments were assessed clinically and radiographically at 12 months. The teeth remained vital, there were no color changes, and the restorations had an acceptable appearance.

IV. CONCLUSION

With the materials available today, in conjunction with an appropriate technique, esthetic results can be achieved with predictable outcomes. Thus, the reattachment of a tooth fragment is a viable technique that restores function and esthetics with a very conservative approach, and it should be considered when treating patients with coronal fractures of anterior teeth, especially younger patients.

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