



Direct Pulp Capping with Mineral Trioxide Aggregate and Reattachment of Fractured Fragment Using Ribbond Fibers - A Case Report

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Abstract

One of the options for managing coronal tooth fractures when the tooth fragment is available and there is no or minimal violation of the biological width is the reattachment of the fragment. Rebonding of the fractured fragment to the tooth retrieved in a fairly intact condition provides an ultra-conservative treatment option. Rebonding techniques provide good esthetics, restores immediate function and provides positive psychological support to the patient. This article presents a novel technique for reattachment of horizontal fractured fragment of vital maxillary left central (21) with pulp exposure. Pulp capping was done using mineral trioxide aggregate. Polyethylene fiber (ribbond) and panavia F cement were used to reattach the fractured fragment using an internal groove technique to provide high fracture strength to restored tooth.

Introduction

Upper anterior teeth especially, the maxillary central incisors are most commonly injured because of their position in the arch.⁽¹⁾

For fracture restricted to the crown with pulp involvement in anterior teeth, immediate reattachment of a dental fragment is a technique that should be considered.⁽²⁾

Enamel/dentin fractures, with or without pulp exposure and with invasion of biological width, are exceptionally challenging. The clinician has to determine whether to maintain the exposed vital pulp, employing a conservative treatment, or to sacrifice the pulp and perform the endodontic treatment.⁽³⁾

This article discusses the reattachment of the tooth fragment to the fractured maxillary left central incisor with pulp exposure using a novel technique.

Case report

A 15 year-old male patient reported to the Department of pedodontics, Sri Aurobindo college of dentistry, with a chief complaint of fractured left maxillary central tooth. Patient's history revealed that he had sustained the injury during sports activity and had reported within an hour of injury. The fractured fragment was recovered by the patient at the site of injury and was brought to the clinic stored in water.

Intraoral examination revealed that the maxillary left central incisor was fractured in the oblique direction labially with the involvement of the pulp (crown fracture - Ellis Class II) [Figure 1a and b]. Upon examination of the fractured fragment, it was found that the fragment was in healthy condition and its approximation on the fractured tooth was good. The treatment options suggested to the patient were (1) pulp protection with direct composite resin restoration/or newer pulp protective materials (2) full coverage crown and (3) reattachment of the tooth fragment. After discussing about the advantages, disadvantages, prognosis and cost of every treatment option the patient opted to have the tooth fragment reattached.

Since the pulpal exposure was fresh, the exposed site was disinfected with chlorhexidine and saline and direct pulp capping was done with mineral trioxide aggregate (MTA) (Dentsply, Tulsa Dental, Tulsa, OK, USA) [Figure 2a and 2b]. Glass ionomer cement (Fuji IX GC Corporation Tokyo, Japan) was placed as the final restoration.. The procedure of reattachment of fragment was carried out the next day, since MTA after 24 hours

The pulp chamber of the fragment (MLCI), which was stored in saline, was debrided of pulp and a groove was made with a long flat ended tapered fissure bur to act as a retentive area (Mani, Japan)[Figure 3] . Etching (37% phosphoric acid gel, Prime Dent, New Delhi, India) and bonding (Bond I, Pentron Technologies LLC, Wallingford, CT, US) of the MLCI fragment was done.

A small pre-measured piece (2 mm) of ribbon (Ribbon Inc., Seattle, WA, USA) was selected, bonding agent applied (Bond I, Pentron Technologies LLC) and cured for 20 s. The ribbon was placed vertically in the groove prepared in the fractured fragments along with panavia F dual cure cement (Kuraray, Osaka, Japan) [Figure 4a and 4b]. The fragment was then verified for a fit with the tooth surface to ensure proper adaptation. Excess cement was removed and light cured from both buccal and palatal side. The occlusion was carefully adjusted and the patient was instructed to avoid exerting heavy function on the reattached tooth. Patient was recalled after 6 months, vitality test was done with electric and cold test. The MLCI responded positively but MLCI showed no response.



Figure 1a and 1b Clinical pre-operative image with pulp exposure



Figure 2a and 2b Pulp capping with MTA and groove placement in the fractured fragment



Figure 3a and 3b: Ribbon fiber placed in the coronal section of tooth for anchorage, final post operative clinical image

Discussion

Among traumatic injuries, uncomplicated crown fracture accounts to more than 50% cases whereas complicated crown fractures accounts to 2 to 13% of all dental injuries.^(4,5)

Treatment of crown fractures with exposed pulp in permanent young teeth depends on the degree of pulp exposure, time between accident and examination, effect of the traumatism, and the stage of root development. Treatment options of 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, pulpotomy is the best endodontic treatment option in order to maintain pulpal functions.⁽⁶⁾

Various clinicians have employed an assortment of bevel designs, chamfers, dentinal and enamel grooves, and choices of resin composite materials and techniques for the reattachment of tooth fragments. In the present case report, an internal groove was placed in the fractured fragment using a flat ended tapered fissure bur, to provide space for placement of ribbon and panavia F cement. This technique provides high fracture strength to the restored tooth due to the incorporation of ribbon fibers. Further studies are required to assess the amount of increase in fracture resistance.

Panavia F has modulus of elasticity same as that of dentin. It has been demonstrated that elastic modulus is one of the important parameters to evaluate property of the cements. When cement with an elastic modulus close to the dentin was selected, optimal combination and mechanical

compatibility of the cement and dentin could be achieved; this enhanced the ability to resist external force together. Stress in dentin was reduced due to the cement sharing parts of the stress.⁽⁷⁾

Conclusion

The present case reports a novel method of using ribbon fibers to strengthen the fractured fragment as a result of trauma that leads to conservation of the tooth.

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