

Management of vital pulp exposure with Cvek’s pulpotomy and fragment Reattachment - A Case Report

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Abstract

Anterior teeth crown fracture is one of the most common injury among children and adolescent. The best option for managing coronal tooth fractures, especially when there is minimal or no violation of the biological width, and the fractured fragment is retained, is the reattachment of the dental fragment. Here we present a case of a 11-year-old child reported with fracture of both central incisors with vital pulp exposure treated with Cvek’s pulpotomy and fragment reattachment.

Keywords: Reattachment, direct pulp capping, Cvek’s pulpotomy

Introduction

Anterior teeth crown fracture is one of the most common injury among children and adolescent. The position of maxillary incisors and their eruptive pattern itself carries a significant risk for trauma (1). The most frequent

causes of trauma are falls, bicycle, motorcycle and car accidents, sports activities, collision with other people and objects, and domestic violence fights and physical assault. Before the advent of adhesive restoration , fractured teeth were restored either with pin-retained inlays or cast restorations that sacrificed healthy tooth structure(1). But now with adhesive system, tooth fragment reattachment offers several advantages, as it preserves the original shape, color, brightness, and surface texture of enamel. Besides these, incisal edges of reattached fragments tend to wear at a rate similar to that of adjacent natural teeth and provide more predictable long-term results improved function, a positive psychological response, and is a faster and less complicated procedure(2, 3).

Factors that influence the management of coronal tooth fractures include the site of fracture, size of fractured

fragments, periodontal status, pulpal involvement, root maturation, biological width invasion, occlusion, and time(2) . One of the options for managing coronal tooth fractures, especially when there is minimal or no violation of the biological width, and the fractured fragment is retained, is the reattachment of the dental fragment. Chosack and Eildeman for the first time in 1964 reported reattachment of tooth fragment after trauma of a 12-year-old child. The fractured anterior crown was cemented to a cast post. Tennery was the first to use acid etch technique for the reattachment of fractured tooth fragment (. Subsequently, Starkey and Simonsen have reported similar cases (3,4).

When the fracture involves pulp, vital pulp therapy (VPT) is considered. VPT should be performed in young patients because of the high healing capacity of pulp tissue compared to older patients and resistance to masticatory forces compared with a root-canal-filled tooth(5) .

In immature permanent teeth with pulp exposure of traumatic origin, vital pulp treatment is recommended and should be preferred to root canal treatment. In these particular scenarios, vital pulp treatment has a high success rate, reduced time requirements and in comparison to root canal treatment, it has better cost-effectiveness also(6). One of the most important issues in VPT is the status of the pulp tissue. VPT should only be carried out in teeth with signs and symptoms of reversible pulpitis. The clinical signs and symptoms such as sensibility and pain testing do not precisely reflect the pulp condition. The degree of pulpal bleeding may be a better indicator of pulpal inflammatory status. Increased bleeding on exposure site that is difficult to stop, suggest that the inflammatory response extends deeper into the pulp tissue and the treatment procedure should be modified, for example by shifting from direct pulp cap to

partial pulpotomy. the presence of a healthy periodontium is necessary for success of VPT. A suitable dressing material that is biocompatible, noncytotoxic, and antibacterial and an appropriate coronal seal should be provided (5)

A combined treatment modality for vital pulpal exposure with Cvek's pulpotomy and fragment reattachment is presented here.

Case report

A 11 yrs. old boy reported to Department of Pedodontics and Preventive Dentistry, Government Dental College, Kozhikode with fracture of front teeth while playing at school 1 hour ago by his teachers and mother. The fractured fragment was also brought by covering it in a paper.

On clinical examination, intra oral findings revealed Ellis class III fracture of 11, 21 with bleeding from fractured site. The fracture on 21 was a pinpoint exposure, while the fracture on 11 was a horizontal fracture at middle third of the crown (fig-1). There was no associated soft or hard tissue injury following trauma. There was no relevant medical history.

Considering the age, minimum time lapse after injury, bleeding from fractured site, size of exposure and availability of fractured fragment it was decided to do direct pulp capping (DPC) on 21, partial pulpotomy on 11 followed by reattachment of fractured segment to its original position using adhesive system. The fractured fragment was immediately stored in saline (fig-2) for 20 minutes as per International Association of Dental Traumatology (IADT) guidelines 2020 for rehydration (7). Treatment plan was explained to mother.

The fractured teeth was isolated after giving local anesthesia. The bleeding on fractured 21 was controlled using wet cotton and calcium hydroxide used for direct pulp capping (fig-3). On fractured 11, partial pulpotomy

done by excavating the superficial pulp using clean spoon excavator and bleeding controlled with wet cotton and Bio dentine (Septodent) mixed as per manufacturer's instruction was placed (fig-4) over which a GIC lining was given.

For reattachment of the fractured segment, both the tooth and fragment were prepared with small grooves and etched with phosphoric acid for 30 seconds and washed off with water and dried by gently blowing air and bonding agent was applied and cured. Subsequently flowable composite was placed to the tooth fragment and the fractured teeth. The fragment was repositioned (fig-5) and light cured. During curing, firm and stable finger pressure was applied to the coronal fragment to closely oppose it to the tooth. After curing, excess composite was removed. Afterwards, final polishing was done (fig-6). IOPA radiograph taken post operatively (fig-7).

The case was followed up for 1 year

Discussion

If the fractured fragment is available, an uncomplicated fracture of anterior tooth crown without involvement of pulp (Ellis class I and II fracture) reattachment with adhesive system is the best choice. In cases if pulp is involved (Ellis class III fracture) and if vitality can be preserved, vital pulp therapy and reattachment is considered. In cases if pulp is compromised or non-vital (Ellis class IV fracture) root canal treatment and reattachment of fragment with a post (cast post / fibre post) can be considered (6).

Tooth fragment reattachment allows restoration of the tooth with minimal sacrifice of the remaining tooth structure. A growing number of case reports in the literature suggests that reattachment of a fractured tooth fragment is a viable approach for the treatment of coronal fracture of anterior teeth when the fractured segment is available. A dry and clean working field and

the proper use of bonding protocol and materials is the key for achieving success in adhesive dentistry. Reattachment failures may occur with new trauma or parafunctional habits(8).

A study on Tooth fragment reattachment technique on a pluri traumatized tooth in 2012 by

Giuseppe Lo Giudice et al states that attachment of the fractured fragment with no additional tooth preparation as there was no loss of dental hard tissues and the edges matched without any disruptions (9). But in our study small grooves was added to accommodate the restorative materials used for partial pulpotomy and direct pulp capping. In 2001 Reis et al have shown that a simple reattachment with no further preparation of the fragment or tooth was able to restore only 37.1% of the intact tooth's fracture resistance, whereas a buccal chamfer recovered 60.6% of that fracture resistance; bonding with an over contour and placement of an internal groove nearly restored the intact tooth fracture strength, recovering 97.2 and 90.5% of it, respectively (10).

In 2008 Macedo GV et al states that in case of complicated fractures where the fractured segments are closely approximating, root canal treatment (RCT) followed by reattachment of the fractured segment with fiber post reinforcement is a feasible option(8)

Numerous factors play an important role in determining how long the reattached tooth fragment remains functional. Among these factors, the study by Acharya S et al in 2020 shows that the media used to store the tooth fragment after fracture, type of material used for adhesion, use of materials to protect the dentin-pulp complex, flow of composite resins or cement, and technique used for the reattachment procedure are the most prominent. (4)

In our study the fractured fragment was placed in saline for rehydration for 20 minutes as per IADT guidelines

2020 (7). For protecting pulp dentin complex Calcium hydroxide as pulp capping and Bio dentine for Cvek's pulpotomy was used.

Farik et al. analyzed the strength of reattached fractured teeth dehydrated for a period from 5 s to 24 hrs. Fragments dehydrated for more than 1 hr. significantly decrease its fracture resistance. At the same time, teeth reattached with fragments dehydrated for 24 hrs. and rehydrated in water for at least 1 day and night (the same period of time) did not lose its strength. Wet dentin offers greater shear bond strength (SBS) as dehydration of dentin causes collapse of collagen fibers and obstruction of adequate resin monomers' penetration, leading to a poor adhesion between dentin and composite material.

IADT guidelines 2020 states, in patients where teeth have immature roots and open apices, it is very important to preserve the pulp. Partial pulpotomy or pulp capping are recommended in order to promote further root development. Conservative pulp treatment (e.g., partial pulpotomy) is also the preferred treatment in teeth with completed root development. Non-setting calcium hydroxide or non-staining calcium silicate cements are suitable materials to be placed on the pulp wound. If a post is required for crown retention in a mature tooth with complete root formation, root canal treatment is the preferred treatment. If the tooth fragment is available, it can be bonded back on to the tooth after rehydration and the exposed pulp is treated. In the absence of an intact crown fragment for bonding, cover exposed dentin with glass ionomer or use a bonding agent and composite resin (7)

Conclusion

Reattachment of fractured anterior crown is one of the immediate and easiest mode of treatment for an uncomplicated crown fracture especially in children and

adolescents as it gives a faster result and positive psychological response for the child as well as the parents. More over Cvek pulpotomy helps root maturation. Thus, the deleterious effects of performing a cervical pulpotomy or a pulpectomy such as crown discoloration, tooth fragility, and the need for apexification or in teeth with open apices is avoided (11). The main advantage of the reattached teeth is that all the alternative treatment such as direct adhesive resin reconstruction, veneers, and crowns can be performed in case of failure (4). Patient education, care and understanding of limitation of treatment will lead to success of the treatment.

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