

A conservative single visit reattachment of fractured crown fragment

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Abstract

Injury of anterior teeth is a relatively common event that mainly affects children and adolescents. Dentists are confronted with managing dental trauma and restoring fractured teeth on a regular basis. Hence the techniques that speed and simplify the treatment, restore esthetics and improve long term success rate are considered of potential value. If an intact tooth fragment is present after trauma, immediate attachment of the incisal edge is a conservative yet, simple and aesthetic alternative. Fracture reattachment possesses challenging conservative and economically viable procedure within a single visit. The authors would report a case of fractured maxillary central incisor using fragment reattachment.

Introduction

The uncomplicated crown fracture is the most frequent dental traumatic injury. Dentists are confronted with managing dental trauma and restoring fractured teeth on a regular basis. Hence the techniques that speed and simplify treatment, restore esthetics and improve long-term success rate are therefore of potential value and should be considered.¹ The maxillary incisors are most commonly affected. As esthetics is of utmost importance to the patient and clinician, the importance of adequately restoring the esthetic elements of the tooth cannot be neglected. The immediate reattachment of a dental fragment is a technique that should be considered while treating patients with crown fractures of anterior teeth. The use of this technique requires the entire fractured segment that, if at all possible, is correctly preserved or stored.² Chosuck A *et al.*³ published the first case report on reattachment of a fractured incisor in 1964 in which complicated tooth fracture was managed by endodontic treatment followed by cast post and core. The post and core were fitted to the prepared

tooth fragment and then cemented to the remaining tooth structure.

Thereafter, many articles have been published regarding a variety of preparations design for fractures. The materials for reattachment technique have been described in demanding clinical situations, as in a case report by Simonsen⁴ where incisor fragment was reattached and tooth subsequently subjected to orthodontic treatment without difficulty. The fractured fragment needs to be preserved in sterile saline or water, Hank Bank Salt Solution to prevent color change due to dehydration. Dehydrated fractured fragment might get rehydrated over several months.⁵ Anderson *et al.*⁶ reported 25% retention of fragments for 7 years and noted that this technique is especially useful for young patients needing apexogenesis or in mixed dentition age where delaying prosthetic restoration of tooth is required until eruption and tooth position have stabilized.^{6,7}

The advantages of this alternate method include:^{4,8} i) Good esthetics and functional result; ii) Conservation of tooth material; iii) Color matching; iv) Preservation of incisal translucency; v) Maintenance of original tooth contours; vi) Economical; vii) Preservation of occlusal contacts; viii) Color stability of enamel; ix) Positive emotional and social responses from patients; x) Treatment completed in a single appointment.

Case Report

A 32-year-old male patient reported to the Department of Conservative and Endodontics, Pacific Dental College and Hospital, with the chief complaint of broken upper front tooth following trauma from fall while climbing the bus 1 h back. Initial clinical examination revealed a clean horizontal fracture line running well above the gingival margin on the palatal aspect, whereas it is situated at the gingival margin on the labial aspect of right maxillary central incisor (Figure 1). No soft tissue injury was noticed. Radiographic examination revealed a horizontal fracture line mesiodistally (Figure 2A). After routine history taking and examination, a treatment plan was formulated to immediately reattach the fragment of the teeth. Lignocaine 2%, buccal and palatal infiltration were administered. The fractured segment was completely removed and preserved in normal saline in order to prevent dehydration of the tooth fragment. The tooth was isolated with the help of cotton rolls. A single visit root canal treatment with thermoplasticized Gutta-Percha obturation technique was carried out (Figure 2B). The root canal was then prepared with parapost drill (3M) and post space prepared (Figure 2C). The fractured segment was conditioned with 37% phosphoric acid

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(Figure 3A) and a corresponding pre-fabricated fiber post was cut to size 3 to 4mm for coronal fixation (Figure 3B). Both the surfaces were etched with 37% phosphoric acid and dentin-bonding agent (Hellibond; 3M) was applied. Dual cure resin (Rely-X) was placed in the canal and a fiber post was placed up to the proper length. Simultaneously the coronal tooth fragment was placed into the post, its bonding surface and pulp cavity loaded with dual cure resin composite, this was placed into position and finger pressure was applied until the composite was light cured (Figure 3D).

After the tooth fragment was attached, a one mm depth chamfer was placed in the fracture line on the buccal surface with a diamond round bur. After the superficial etching and bonding, a layer of resin composite was applied to the chamfer surface and light cured for 40 s. Later, the repaired surface was finished, polished and the esthetic result was outstanding (Figure 3E and 3F). Occlusion was checked and post operative instructions were given. A check radiograph was then recorded to confirm apposition of the two tooth fragments. The occlusion corrections were made and final result was more than satisfying. As with all traumatic injuries, follow-up is of critical importance. At the end of 24 h the postoperative *status quo* was uneventful. The follow-up was carried out till three months with no postoperative complications.

Discussion

Traumatic injuries involving tooth fracture can be treated by reattachment using an adhesive system to provide what is considered to be

the most conservative form of restoration. Newer dentine bonding systems work with such efficiency that they easily countenance for normal masticator forces. Survival rates for such restoration have shown to be good with failure often resulting from subsequent trauma.² Factors influencing the extent and feasibility of such repair include the site of fracture, size of fractured remnants, periodontal status, pulpal involvement, maturity of root formation, biological width invasion, occlusion, time and resources of the patient.⁷ If the fracture involves two-third or more of the crown a post-reattachment is more commonly used. The traditional conservative treatment of crown fractures is with composite resin and a dental bonding system. Mobile but still in place fractured fragment needs to be splinted with adjacent teeth, if delay is expected in completing endodontic treatment in order to prevent further damage to the periodontium. According to the amount of the restoration, screw posts, cast posts, fiber posts or dentin pins could be used for supporting the fragment.⁶ The use of posts increases retention and distributes stress along the root.⁷ Tooth preparation technique would be relative to the site and amount of tooth fragment available for reattachment.

The advantages of using the original tooth fragment over other materials include better color match, morphology, translucency, physiochemical characteristics, patient acceptance and economical status.^{8,9} Other treatment options available have associated limitations like multiple visits, stabilization and are less conservative in nature. After long term the tooth may develop a periapical lesion or get discolored. The patient continued with the reattached fragment as a permanent restoration. Preparation of ceramic/porcelain fused to metal restoration requires additional visits, tooth preparation and laboratory procedures. Hence, we recommend that the original reattached fragment should be allowed to continue as permanent restoration unless tooth exhibits color changes. The composite reinforcement technique together with light-transmitting post had been widely used to functionally and esthetically restore compromised root filled teeth.¹⁰⁻¹² The teeth which previously would have been condemned to extraction, could now best lengthened by a sufficiently thick lining of intra-radicular composite, thereby salvaging them for continued function in the mouth.¹²

Cavalleri *et al.*¹³ reported that reattachment of the crown fragment appeared to have a better long-term prognosis than composite resin restoration. The results indicated that reattachment of fractured incisal fragments by using newer generation bonding agents was effective against shear stresses and comparable with the intact teeth. Two cases of palatal sub-gingival crown fractures were reported which reattachment of the fragment with composite and the



Figure 1. A) The line of fracture is apparent from the palatal view along with the fractured tooth placed in normal saline from B) labial and C) lingual aspect.



Figure 2. A) Preoperative radiograph showing fractured tooth with B) immediately after obturation of root canal and C) after the preparation of post space.



Figure 3. A) The fractured segment was conditioned with 37% phosphoric acid gel with B) fibers post attached to the root segment, C) post and fractured segment assembly together luted in the root canal, D) light curing of luting cement, E) postoperative palatal and F) labial view.

help of flap surgery¹⁴ had restored.

The reattachment of the crown fragment to a fractured tooth can be considered as the most conservative treatment and could be first choice for crown fractures of anterior biological width invasion, occlusion, time and resources of the patient. If the fracture involves 2/3 or more of the crown a post-reattachment is more commonly used.^{13,15} But this technique is not without limitations. Firstly, the resistance to fracture gained after reattachment is only 50-60% that of intact tooth. Secondly, the success of reattachment also depends on how dehydrated the fragment is, because the longer the fragment remains dehydrated, the lesser will be the fracture strength of the tooth; however strength can be reinstated by hydrating the fragment. Prolonged dehydration may present esthetic problems, like lighter tonality than the tooth remnant. Return to original color may take time or may not occur at all. With remarkable advancement of the adhesive systems and resin composites, reattachment procedures are no longer a temporary/provisional restoration, but rather a permanent restorative treatment providing favorable prognosis.

Conclusions

Reattachment technique is the most conservative and biological method of restoring a fractured anterior tooth. Reattaching a tooth fragment with newer adhesive materials may be successfully used to restore fractured teeth with adequate strength, but long term follow

up is necessary in order to predict the durability of the tooth-adhesive-fragment complex and the vitality of the tooth. This procedure helps us to preserve maximal natural tooth structure. Patient cooperation and understanding of the limitations of the treatment is of utmost importance for good prognosis. The need of the day is to educate the population to preserve fractured segment and seek immediate dental treatment.

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