

Reattachment of the Original Crown Fragment

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Abstract

Crown fracture is the most common type of dental injuries. One of the options of management of crown fracture is fragment reattachment, whenever intact tooth fragment is available after trauma. The fragment reattachment procedure presents a conservative, simple and esthetic alternative. This article presents two case reports of restoration of fractured maxillary central incisor using fragment reattachment.

Key Words: Fragment reattachment, Tooth fragment, Crown fracture, Dental trauma

Introduction:

In the permanent dentition, crown fracture is the most common type of dental injuries. And the teeth most commonly affected are anterior teeth, especially the maxillary central incisors. Whereas the mandibular central incisors and the maxillary lateral incisors are less frequently involved.¹ Several factors influence the management of coronal tooth fractures, including extent of fracture, endodontic involvement, alveolar bone fracture, pattern of fracture and restorability of fractured tooth, associated root fracture, soft tissue status, presence/absence of fractured tooth fragment and fit between fragment and the remaining tooth structure, occlusion, esthetics, finances, and prognosis.²⁻⁴

One of the options for managing coronal tooth fractures is the reattachment of the dental fragment when it is available. Reattachment of the original tooth fragment provides several advantages over other forms of dental restoration following crown fracture.⁴⁻⁶ An intact enamel-dentin fragment is the sole indication for reattachment.⁵ In case of uncomplicated crown fracture, fragment reattachment can be carried out immediately. Whereas in complicated crown fractures, management of the pulp either in the form of pulp curettage and placement of liner, pulpotomy

or root canal treatment need to be performed before fragment reattachment.⁵ Presented here are two cases of fragment reattachment carried out following root canal treatment. Fragments restored esthetics and function adequately and remained intact during recall visits.

Case 1

A boy aged 12 year reported with the chief complaint of fracture of upper front tooth. Patient had a fall from bicycle 3 days back and had fractured his tooth. On examination 11 had complicated crown fracture (Figure 1 & 2). Patient's parents were able to retrieve the fractured fragment (Figure 3) and carried it wrapped in cotton. IOPAR in relation to 11 revealed no root or alveolar bone fracture (Figure 4). Fractured fragment was trial seated to confirm a precise fit. Root canal treatment followed by fragment reattachment was planned.

Fractured fragment was stored in saline to prevent dehydration. Following conventional root canal treatment (Figure 5), gutta-percha was removed 1mm below the CEJ and GIC lining was placed above it. A short bevel on enamel was prepared all around on the remaining tooth structure using tapered fissure bur (TC -26, Mani Inc, Japan) as well as on the fragment. An additional internal dentinal groove was placed on the tooth fragment. Fractured area of the tooth, access cavity and fragment were acid etched with 37% phosphoric acid for 15 seconds. After thorough rinsing with copious flow of water and gentle air drying of all the etched surfaces, bonding agent (Adper Single Bond, 3M ESPE, St. Paul, MN) was applied to the etched surfaces of fragment and the tooth was light cured for 10 seconds. The access cavity was restored with composites (Tetric N- cream, Ivoclar Vivadent, NY, USA) using incremental technique. Following this composite was filled into the internal dentinal groove and a thin layer of composite was applied

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Fig 1: Complicated Crown fracture with 11



Fig 2 - Occlusal view - pulp involvement following crown fracture with 11



Fig 3: Fractured Fragment of 11

over the fragment surface. Fragment was carried and approximated with the tooth surface under finger pressure. Excess resin extruding from fracture line was removed with scalpel blade. Correct positioning of the fractured segment was confirmed

and light cured labially and lingually for 20 seconds each. Fracture line was finished and polished with composite polishing kit (Optrapol, Ivoclar vivadent, NY, USA) and the interproximal contacts were finished with polyester abrasive polishing strips (Pulp Dent, Switzerland). Reattached fragment restored esthetics and function remarkably well (Figure 6) and provided great psychological comfort to the patient and parents.

When patient reported back after 1 yr 2 months reattached fragment was intact. Fracture line showed minimal discoloration. Polishing with composite



Fig 4: IOPA with 11 following RCT



Fig 5: Fragment reattached with 11

polishing kit removed the stains and restored the appearance.

Case 2

A -13- year old female patient reported with fracture of maxillary left central incisor (21). Patient gave history of fracture while-playing with her friends in school premises 2 hours back. On examination 21 had complicated crown fracture with pulpal involvement (Figure 6 & 7). Patient's parents were able to retrieve



Fig 6: Complicated crown fracture with 21



Fig 9: Hemostasis achieved following pulp curettage



Fig 7: Occlusal view- pulp involvement following crown fracture with 21



Fig 10: Calcium hydroxide lining placed over the pulp



Fig 8: Fractured fragment of 21 stored in milk



Fig 11: Trial seating of fractured fragment following pulp curettage

the fractured fragment and carried it in milk (Figure 8). No root or alveolar bone fracture was evident on the radiograph.

Since patient reported just 2 hours after the trauma, Cvek's pulpotomy was carried out. Approximately 1 mm outer layer of exposed pulp was removed using

round diamond points and sharp spoon excavator. Pulp was irrigated with saline and hemostasis was achieved by placing wet cotton pellet under pressure for 30 seconds (Figure 9). Hard setting calcium hydroxide lining (Dycal, Dentsply Caulk, Milford, USA) was placed over the pulp (Figure 10). A thin protective Glass Ionomer lining (GC corp, Type III) was placed over the calcium hydroxide. Fractured fragment was trial seated to confirm precise fit (Figure 11).



Fig 12: Fragment reattached with 21

Circumferential enamel bevel was placed over the fragment and the tooth. An internal dentin groove was prepared on the fragment for additional retention. This was followed by same steps as described in case 1 with acid etching, rinsing, drying, bond application, reapproximation using composite, finishing and polishing of composite. Reattached fragment restored esthetics and function extremely well (Picture 12). Reattached fragment remained intact at 6 months and 1yr follow up. Radiographs showed no sign of periapical pathology.

Discussion

An intact enamel-dentin fragment is the sole indication for reattachment. That is, the majority of the enamel margin should be present so that the fragment can rest firmly against the fracture surface when it is tried against the fractured tooth. Small defects, however, can be restored with composite resin at the time of or following the bonding procedure. Moreover, if the fragment is in 2 pieces, these fragments can be bonded together prior to bonding the final fragment.⁵

The fragment reattachment has several advantages over other direct or indirect restoration techniques⁴⁻⁶

- It is esthetically superior as it results in exact restoration of crown and surface morphology and preserves incisal translucency
- Abrades at the same rate as adjacent teeth.
- Chair time for the completion of the restoration is minimal compared to other direct and indirect restorations
- Stress resistance is similar to that of an intact tooth, thus, preferred to composite restoration in case of repeated trauma
- Positive emotional and social responses from patients
- Economical

One of the common problems at recall visits could be discoloration of the composite at fracture line which

might require occasional polishing.⁶ Initial color disharmony, if any, between fractured fragment and the tooth because of desiccation of the fragment is present, gets resolved on its own.⁷

Fragment debonding is another problem, which is inconvenience to the patient as well as clinician. Fracture strength is an important factor in preventing fragment debonding and determining the success of fragment reattachment. Assortments of techniques of tooth and fragment preparation have been advocated to improve fracture strength of the attached segment.

- Use of a V-shaped enamel notch⁸
- Placement of a circumferential bevel^{10,11}
- Placement of an external chamfer at the fracture line after bonding¹¹
- Internal groove^{10,12}
- Leaving a superficial over contour of restorative material¹³

Combination of these can be used to improve fracture strength. Reis et al (2001), have shown that buccal chamfer recovers 60.6% of the fracture strength. Whereas over contour and internal dentin groove technique nearly achieved intact tooth fracture strength recovering 97.2% and 90.5% respectively. However, simple reattachment recovered only 37.1% of intact tooth fracture resistance.¹³ In our cases we used circumferential beveling and internal dentin groove as additional retentive features to enhance fracture resistance. Since our first case had complicated crown fractures, following root canal treatment we filled pulp chamber with composite resin to act as inner reinforcement.

While fragment debonding represents a practical inconvenience, it has no impact on pulpal vitality since debonding occurs as a cohesive failure within the bonding resin and not in dentin. Thus the fracture surfaces of teeth with debonded fragments are glossy from retained resin plugs within the treated dentin. For this reason, the dentin must be freed of bonded resin, (e.g. with a slurry of pumice and water) prior to rebonding of fragment.⁵

Reports and clinical experience suggest that reattachment of fractured crown segment with modern adhesive system have fair chance of success.^{6, 11,12, 14- 16}

Conclusion

Reattachment of the tooth fragment is the best treatment option for restoring fractured coronal segment whenever it is available and intact. In recent years due to remarkable advancement of adhesive systems and resin composites has made reattachment procedure no longer a provisional restoration.

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