ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 9 | September - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

TOOTH FRAGMENT RE-ATTACHMENT – A CASE REPORT

Dental Science

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ABSTRACT

Trauma to the anterior teeth is common in childhood and adolescent. Fractures often occur and aesthetic is a major concern. Direct or Indirect composite or indirect ceramic restorations is a common choice. This case presents restoration of a fractured tooth by re-attaching the fractured fragment. Reattaching the fractured tooth fragment to the tooth remnant enhances the durability of the restoration, since the fragment wears at the same rate as that of the other teeth. Also, the natural enamel translucency and surface finish of the fragment provides the tooth with its original aesthetics.

KEYWORDS

Reattachment, direct composite veneer, dehydration of tooth, acid etch, bevelling

INTRODUCTION:

One in four people suffer from some kind of oral trauma during childhood or youth, especially males.[1] The impact during trauma transfers a large amount of energy to a limited part of the tooth crown, leading to fracture of tooth structure. Because of their vulnerable position in the dental arch, upper central incisors are the most affected.[2] Dental fractures are classified by the World Health Organization as uncomplicated (cracks and/ or enamel and dentin fractures) or complicated (with pulp exposure and/or periodontal involvement). Fortunately, uncomplicated fractures are more frequent and require less complex treatment.[3,4] The first report of fragment reattachment dates from 1964, adhesive restorations were not possible until the late 1970s (without pin retention) using enamel/dentin etching associated with an adhesive system and composite resin.[5,6]

Sometime after bonding, a fragment might exhibit a lighter shade (white) than the remaining tooth. This occurs because of possible dentin dehydration and breakdown of collagen fibers.[7] To avoid discoloration, the patient should be instructed to store the tooth fragment in water immediately after trauma. If a tooth fragment is maintained in a dry state for more than one hour, it will achieve lower bond strength[8] and must be rehydrated for at least 30 minutes before bonding.[9] Complete rehydration and colour match usually occurs after one week but could be delayed by several months or may never occur.[10,11,12]

Fragment debonding happens because of repeated trauma, non-physiological use of the tooth, or horizontal pulling of the tooth.[13]

Review of Literature:

In 1978 Tennery[14] reported using the acid-etch technique with composite resin to bond tooth fragments to the remnant tooth in 5 patients. Tennery's technique involved keeping the fragment moist until bonding. Then, after determining the correct positioning of the remnant tooth, the fragment was pumiced, rinsed, and dried. He used a finishing diamond to taper the enamel slightly on either side of the fracture line. Etching the tooth and the fragment was accomplished before applying the bonding agent to both. Then an excess amount of composite resin was applied to the tooth and the fragment was repositioned and stabilized with finger pressure until the resin cured. Excess flash was removed and the resin finished and polished. Treatment in 4 of his patients was considered successful at the time the article was written, while the fifth patient suffered an additional trauma to the repaired tooth and it was impossible to unite the fragment again.
In 1979 Simonsen[6] gave the following 4 reasons for using a circumferential bevel for reattachments.

1. It removes superficial enamel and fractured enamel prisms.
2. It allows for a resin-enamel lap joint.
3. It forms a finishing line.
4. It presents enamel prisms in "end-on" relation.

He also suggested removing dentin from the fragment to allow room for placement of calcium hydroxide in the exposed dentinal and/or pulpal areas and to increase the amount of internal enamel available on the fragment for etching.

In 1979 Starkey[15] reported reattachment of a tooth fragment in a girl aged 8 years, 6 months who had received an Ellis Class II injury to her mandibular right lateral incisor. Calcium hydroxide was placed over the dentinal tubules of the remnant tooth and fragment during the etching procedure with a solution of 50% phosphoric acid. After the Ca (OH)2 was removed, Nuva-Seal® sealant was placed with a brush on the etched enamel of both the remnant and the fragment. The two units of the tooth then were realigned and held in place while the resin sealant was polymerized with UV light.

In 1982 Simonsen[11] again reported reattachment of fractured units but, in this patient, he used an external enamel bevel on the lingual aspect of the tooth and fragment and an internal enamel bevel on the facial aspect to increase esthetics. During the 2 years between placement of the restoration and publication, the patient underwent orthodontic treatment requiring bracket bonding to the tooth. The fragment remained attached even after removal of the orthodontic brackets. One concern was the white, chalkish appearance of the fragment compared to the remnant tooth, which the author believed may have been due to the fact that the fragment was allowed to dry for 1 week before reattachment.

McDonald and Avery[16] described reattachment of tooth units following a Class II fracture of the maxillary left central incisor in a 15-year-old boy. No enamel preparation was performed in their technique other than acid etching. The fragment restoration had been retained for more than 2 years at the time of their writing.

The following case report describes the management of anterior fractured tooth where the fragment was used as the main restorative material.

Case Report:

A 25-year-old Male patient reported to the department of Conservative Dentistry and Endodontics, with a fractured 21. The patient had the tooth fragment with him (Fig 1).

Figure 1: Fractured 21 frontal and occlusal views

The fracture involved the enamel and dentin (Ellis Davey Class II and classified as uncomplicated as per WHO classification.) There was no involvement of pulp.

The patient had the broken tooth fragment that appeared white due to dehydration **(Fig 2).** The fragment was placed in distal water for half an hour before starting the procedure.

Figure 2: Fractured tooth fragment

Excellent fragment adaptation was observed, and it was determined that the best treatment plan was to reattach the fragment. Approximation of the tooth fragment was done to ensure a proper seating **(Fig 3).**

Figure 3: Approximation of the tooth and fractured fragment

The preparation of each tooth and fragment involved placing a circumferential bevel of ~ 45° to the fractured surface by means of a #169 carbide bur in a high-speed handpiece, using air as the coolant to improve the fracture resistance. **(Fig 4).**

Figure 4: The bevelled surface of the tooth

The fragment and tooth were etched with 37% phosphoric acid for 15 seconds **(Fig 5)** and rinsed.

Figure 5: Etching the surface of the tooth

The enamel was air dried while the dentin was maintained in a moist state using a cotton pellet. Two adhesive coats were then applied without light curing. An unfilled composite resin increment was placed over the entire fractured surface, and the fragment was positioned and properly adjusted. After the excess resin composite was removed, the restoration was light cured for 40 seconds each on the buccal and palatal surfaces using an LED unit with a 900 mW/cm2 output **(Fig 6).**

Figure 6: Attachment of the tooth and fractured fragment

The tooth fragment appears whiter than the natural tooth due to dehydration.

The patient was informed that the shade may get better within a few weeks to a month but the patients work demanded him to have a lot of interaction with people and aesthetics was of prime importance.

A direct composite veneer was planned for the patient.

A layer of enamel and dentin was reduced by about 1.5mm at the dehydrated portion of the fragment. Care is taken to leave behind a thin layer at the incisal edge to give the final restoration the desired translucency **(Fig 7).**

Figure 7: The facial reduction of the enamel and dentin done

A body dentin shade of A2 is applied on the reduced portion of the fragment to a thickness of about 0.75mm. Care is taken to maintain the incisal edge. (Fig 8)

Figure 8: A2 Body shade applied to mask off the dehydrated tooth fragment

An A2 opaque shade is used to mask out the line of the fractured fragment. A layer of A1 is placed as the enamel shade. Mylar strip is used to maintain the proximal contact. A thin layer of A1 shade composite is also applied on the incisal edge. **(Fig 9)**

Figure 9: Completed composite restoration

Surface details are carved in the tooth to give it a natural appearance (characterization) and it is polished. Polishing was performed using abrasive discs and polishing paste. **(Fig 10)**

Figure 10: Characterized and polished restoration

In the occlusal view, the dehydrated portion of the tooth is visible and since there was proper bonding, no changes were made there. **(Fig 11)**

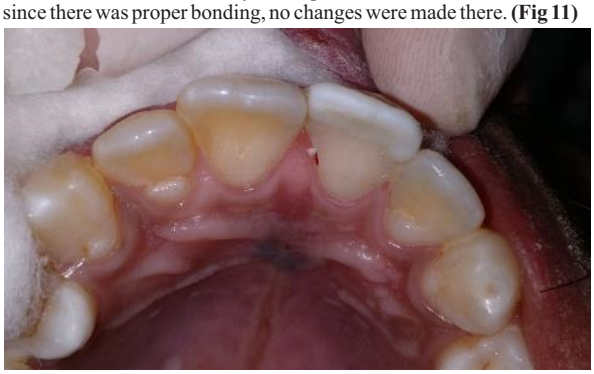

Figure 11: Occlusal view of the tooth with the visible dehydration

A 3-month follow-up shows a reduction in the white tone, indicating rehydration of the tooth fragment. **(Fig 12)**

Figure 12: 3-month post op occlusal view

DISCUSSION:

Dentists are often required to treat (usually as an emergency situation) the aesthetic, functional, and emotional discomforts that tooth fractures can cause. Treatment strategies range from simple enamel polishing to prosthetic rehabilitation.

Adhesive reattachment requires minimum healthy tooth reduction, has a predictable aesthetic result, is usually faster than a complete composite restoration.[17,18]

Modifications to both tooth and fragment prior to bonding have been proposed, with an estimated recovery of fracture resistance up to 97%.[19] Theoretically, these techniques (dentin groove, bevel, chamfer, or over contour) remove fractured enamel prisms and retain prisms that are in a favourable position for effective etching.[8] Preparations can also be performed after bonding to improve aesthetics by grinding the buccal fracture line and masking it with composite.[18,9,20]

Simple reattachment recovers approximately 37–50% of the tooth fracture resistance.[21,22] Nevertheless, this procedure is feasible because retention relies on hybridization.[17,18,20,23,24,25] Similar bonding results are achieved with the use of adhesives alone or in combination with composites. However, there is a trend of improving fracture resistance when adhesives are associated with composite resin because they would fill possible interface gaps.[22]

Some authors have demonstrated long-term reattachment prognosis that are better than composite restorations, reaching a 90% success rate after five years.[2,13]

Advantages:

- Conservative treatment
- Low cost
- Faster than direct restorative procedures
- Predictable aesthetic result

Limitations:

- Possible fragment debonding
- Incomplete fragment rehydration
- colour mismatch

CONCLUSION:

Considering the high incidence of dental fractures as a result of trauma, the working knowledge of the dentist regarding treatment possibilities is essential.

Tooth fragment reattachment should be performed whenever possible because it is a simple, fast, and affordable procedure and presents a predictable aesthetic result.

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