

ESTHETIC, BIOLOGIC AND RESTORATIVE CONSIDERATIONS IN CORONAL SEGMENT REATTACHMENT FOR A FRACTURED TOOTH

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ABSTRACT:

Coronal fractures of permanent dentition are the most frequent type of dental injury. Subgingival crown fractures with pulp exposure in permanent teeth present both endodontic and restorative problems. Reattachment of fractured tooth fragment offers a viable restorative option for the clinician because it restores tooth function and esthetics in a very conservative and cost-effective manner. This article presents a multidisciplinary approach to the rehabilitation of a crown-root fracture with original fragment for immediate esthetics. Surgically reattached fragment succeeded in providing long-lasting esthetics, improved function and positive psychologic response to the patient.

Key Words: Crown-root Fracture, Surgical Reattachment, Trauma, Esthetics



INTRODUCTION:

Traumatic injuries of teeth involve varying degrees of damage to the supporting soft tissues or the teeth itself. A very common injury to the permanent dentition affecting children and adolescents during their growing years is the anterior crown fracture.

Uncomplicated crown fractures are a frequent form of dental injuries encountered in a dental clinic requiring immediate management. Uncomplicated crown fractures are a frequent form of dental injuries encountered in a dental clinic requiring immediate management.^[1,2]

Reattachment of fractured tooth provides the best esthetic results as natural tooth shape, contour, surface texture, occlusal alignment and color are maintained (5-10). Additionally, this approach provides positive psychological and social response from the patient.^[3]

Tennery was the first to report the reattachment of a fractured fragment using acid-etch technique^[4]. Subsequently, Starkey^[5] and Simonsen^[6,7] have reported success with similar cases. The introduction of composite in combination with the use of acid-etch technique to bond composite to enamel, made restoration possible for the fractured incisor, with minimal preparation^[6]. However, composite resin

has the disadvantages of poor abrasion resistance in comparison to enamel [7], water absorption, and staining. Reattachment techniques for tooth fragments present several advantages over restorations obtained with composite resin systems: better and long-lasting esthetics, improved function, immediate results, a positive psychosocial response, and faster and less complicated procedures [8,9,10] .

Recently, with the advancement in the materials and bonding techniques, this new method of retaining fractured tooth segment is gaining popularity. Various techniques have been suggested to achieve the desired goal. This includes various methods employed to improve adhesion between the fractured and the remaining segments, using a circumferential bevel before reattaching, placing a chamfer at the fracture line after bonding, using a V-shaped enamel notch, placing an internal groove or a superficial overcontour over the fracture line [13].

This article discusses the management of a case of crown fracture of anterior tooth which was successfully treated in a conservative manner by reattachment.

CASE DETAIL:

A 12-year-old boy reported with a history after a bicycle accident . The child complained of sensitivity in the upper anterior teeth. Complete history of events of trauma was recorded and no significant finding was observed.

The fragment was brought by patient wrapped in a dry handkerchief with an

elapsed time of 20 minutes (Figure : 1a-d). The fragment was then stored in saline to prevent dehydration. The tooth was isolated and mock placement of the fragment into position was done to evaluate the result. As fragment reattachment can be problematic by free hand, it was adapted on a thermoplastic stent like sticky wax. The fragment was prepared for reattachment by giving an external chamfer bevel and retentive grooves on both the fragment and the tooth (Figure : 2) . Acid etching was done on both the fragment and the tooth using 37% phosphoric acid for 15 seconds and thoroughly rinsed off. Both the fragment and the tooth dentin were kept moist and excess water was removed using blotting paper. Dentin bonding agent was applied to both the substrates and light cured for 15 seconds. A flowable composite was used for filling the interfragmentary space and the fit was re-verified. The excess was removed and the composite layer was polymerized from both the buccal and palatal surface. Finishing and polishing was done using Soflex disks(Figure : 3a-b) . Occlusion of the patient was relieved and post op instructions were given. Patient was put on antibiotics and anti-inflammatory drugs for 5 days. He was regularly recalled after 1, 3 and 6 months.

DISCUSSION:

Reattachment should be first choice when reconstructing fractured teeth and the fragment is available. This method has a number of advantages shown in clinical and experimental studies. Reattached fragment to a great extent

restores esthetics, as it uses the original tooth's shape, color, translucence and surface structure [14].

Reattachment of tooth fragment of anterior teeth is easy to practice and economic method that has the potential to assume the incisal strength during tooth functioning. The method ensures increased wearing steadiness and thus creates better function. Other advantages of this method are the psychological comfort of patient, less time spent in dental chair, exact reconstruction of tooth's morphology and usage of structure that wears out as the antagonists [15].

The first case was published in the 1964 by Chosack and Eildeman, on the reattachment of a fractured incisor fragment in which complicated tooth fracture was managed by root canal treatment followed by a cast post and core. It was reported that the use of a fibre post with fractured teeth, as resin based restorative material interlocks the two fragments, minimizes the stress on the reattached tooth fragment. [7]

Occlusal forces, generated at protrusive movements of the mandible are extremely destructive to the relation tooth fragment – bonding agent [14]. That is why many authors consider placement of porcelain or composite veneers after reattachment will increase strength of these teeth to values close to the intact teeth [16,17].

Clinicians have used a variety of materials for the reattachment purpose, which include flowable composites, hybrid and

microfilled light-cured and dual-cured composites, chemically cured composites and dual-cured, chemically cured and light-cured resin cements. Most in vitro studies that have tested adhesive systems show that the kind of adhesive system used alters the fracture strength of the reattached teeth and is in the range of 40-60% of the fracture strength of sound teeth. Conversely, Reis *et al.* [14,18] have shown, in a study, that the sole use of an adhesive system or its combination with higher mechanical property materials such as foldable resins, resin cements and resin composites have led to similar results when the fragment was reattached with no additional preparation. The study also tested the same materials with an additional preparation (buccal chamfer at the fracture line). Although no differences among the materials were detected, the fracture strength of the chamfer group was superior to that obtained when no additional preparation was performed. These results suggest that the technique employed for reattachment is Tewari *et al.* [19] have reported reattachments of 25 incisal fractures. In cases with extensive complicated incisal fractures they had given metallic post and core to reattach the broken crown fragments. The broken crown fragments. The same procedure has been more important than the association of the materials.

Badami and associates have shown neither the bevel nor the material used could obtain the original fracture resistance of the tooth. Specimens prepared with chamfer and bonded had a fracture resistance of 40 to 60%, with

internal dentin groove and over contour it reached around 90%. A simple reattachment procedure as in the first case is indicated, since bevel with flowable composite improves fracture strength recovery. The resistance of the fracture segment can be directly proportional to the surface area of adhesion. Most of the 5th generation bonding agents increased the fracture resistance of reattached coronal fragments when used with conjunction with unfilled resin. Extensively fractured fragments have to be restored with conjunction with a resin. The highest fracture resistance was obtained by chemically cured composite followed by light cured and resin cement and least by only dentin bonding agent. [20]

Amir et al. have shown that have shown that the coronal pulp chamber can be used as reinforcement; thereby avoiding excess tooth preparation in cases where endodontic therapy is indicated and further stated that the direction of fracture line is an important aspect in re-restorability and has a direct bearing on the prognosis of teeth. [21]

Hayashi et al indicated that, the best restorative methods needed to be identified for teeth with extensive loss of structure, and reinforcing pulpless teeth. When a tooth has more than 50% of its coronal structure missing, the use of a post-and-core foundation is recommended prior to restoration [22]. In recent literature reviews, it has become clear that posts do not strengthen endodontically treated teeth, and their

use is justified only for retention of the coronal restoration. [13]

Wadhvani et al [23] reported a successful one year follow up of esthetic reattachment of a coronal fragment in a complicated crown fracture of permanent right central incisor.

Macedo GV et al [24] reported two coronal tooth fracture cases that were successfully treated using tooth fragment reattachment. Reattachment of fractured tooth fragment offers a viable restorative option for the clinician because it restores tooth function and esthetics with the use of very conservative and cost effective approach.

Preeti Kore et al [25] reported a successful one year follow up of esthetic reattachment of a coronal fragment in a complicated crown fragment of permanent right central incisor

Reattachment of the original tooth fragment poses many advantages over other restorative methods because the tooth colour, contour, texture, incisal translucency and occlusal contacts remain the same. Moreover, reattached fragment may sometimes act as a transitional restoration if a definitive prosthetic restoration, such as crown is required. These advantages of reattachment and high success rates negate the use of other expensive restorations. [13] But this single visit, multidisciplinary approach to crown root fracture requires consideration of periodontal, endodontic, restorative and occlusal factors. Follow-up is of critical

importance in such cases. The patient should be followed regularly for a few years. During each follow-up visit, the clinician should confirm the Esthetics, tooth mobility and periodontal status of the reattached tooth.

In the present case, a conservative approach was adopted and the fractured fragments were reattached with the use of post for retention, like many previously reported cases. Post provides excellent retention with long-term stability of restored portion.

The possible post-operative complications include discolouration of the reattached fragment and fracture to labial horizontal forces with new trauma. Hence, regular follow-up is necessary,

In this era of conservative, esthetic dentistry, the reattachment of fractured tooth segments has established itself as a realistic treatment option in the

restoration of fractured teeth. It permits rapid restoration of original tooth contours and overall esthetics with greatly reduced chair time for both the patient and operator.

CONCLUSION:

Tooth fragment reattachment procedure offers ultraconservative, safe, fast and esthetically pleasing results when the fractured fragment is available. Reattachment of the dental fragment as a restorative procedure becomes possible with the improvement of adhesive techniques and restorative materials.

Every treatment is bounded by limitations but this technique if well performed, can dramatically increase the success rate and caters with patient's satisfaction of receiving immediate aesthetics with natural tooth which would otherwise be difficult to obtain with conventional methods of management.

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FIGURES:



Figure: 1a Pre Op Clinical Photograph



Figure: 1b Pre occlusal Clinical Photograph



Figure: 1c Fracture fragment



Figure: 1d Pre Op IOPA Radiograph



Figure: 2 Retention Grooves on natural tooth



Figure: 3a Composite application to camouflage the fracture line, curing, Finishing & Polishing with soflex discs



Figure: 3b Postoperative Radiographs