

REATTACHMENT OF CROWN FRAGMENT IN FRACTURED ANTERIOR TOOTH- REPORT OF TWO CASES

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Abstract

Aim: Re-attachment of crown fragment in fractured anterior tooth- report of two cases.

Methodology: Crown fractures are the most frequent traumatic injuries that affect the permanent teeth. The high prevalence of fractures in permanent anterior teeth in young patients often represents a challenge for achieving aesthetic dentistry quickly and conservatively.

In the first case, a 3mm horizontal fracture line was seen supragingivally at the labial and palatal aspect of the maxillary central incisor (11). Treatment was done by stabilizing the undisplaced fracture fragments using glass-ionomer cement, root canal therapy and fibre-optic post (Coltene) attaching the fractured coronal fragment which gets reinforced with the same post.

In the second case, Ellis class III oblique type of fracture extending mesio-distally into the subgingival tissue of maxillary lateral incisor (12). Single visit Endodontic treatment was done followed by reattachment of fracture fragment followed by fixed prosthesis.

Conclusion: Reattachment of a tooth fragment is a viable technique that restores function and aesthetics with a very conservative approach in single visit and can be considered when treating patients with coronal fractures of the anterior teeth, especially in younger patients.

Key Words Crown fracture, single visit endodontic, splinting, fibre optic post, reattachment.

INTRODUCTION

Coronal fractures of the anterior teeth are the most frequent traumatic injuries (92% of all traumatic injuries) that affect the permanent teeth. Coronal fractures of permanent incisors represent 18-22% of all trauma to dental hard tissues, 28-44% being simple (enamel and dentin) and 11-15% complex (enamel, dentin and pulp¹). Of these 96% involve maxillary central incisors because of their anterior position and protrusion caused by the eruptive process.² Traumatized anterior teeth require quick functional and esthetic repair. This is particularly true in case of young patients as it not only causes physiologic impairment, but also esthetic disfigurement leading to a psychological impact.³ The most common etiological factors of crown and crown root fractures in the permanent dentition are injuries caused by fall (about 40%), contact sports (about 20%), automobile accidents, and foreign body striking the teeth.⁴ The high prevalence of fractures in permanent anterior teeth in young patients often represents a challenge for achieving aesthetic dentistry quickly and conservatively.

Early techniques to restore the fractured crown include jacket crown, orthodontic bands, pin retained resin, porcelain bonded crown and composite resin.⁵ Tooth fragment reattachment has been shown to be an acceptable alternative to the restoration of the fractured tooth.

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Various factors influence the management of coronal tooth fractures: extent of fracture (violation of biological width, pulpal involvement, alveolar bone fracture), secondary traumatic injuries (soft tissue status), presence/absence of fractured tooth fragment and its condition for use (fit between fragment and the remaining tooth structure), occlusion, esthetics, finances, and prognosis.⁶

The traditional approach for the rehabilitation of fractured anterior teeth includes composite restoration, post supported prosthetic restoration and in some cases extraction of the offending tooth followed by fixed prosthesis. One of the viable option to traditional approach for managing coronal tooth fractures, especially when there is no or minimal violation of the biological width, is the reattachment of the dental fragments when the fragment is available.⁷

One of the earliest case report by Chosack and Eildeman published on reattachment of fractured incisor fragment in 1964 in which complicated tooth fragment was managed by endodontic treatment followed by a cast post and core. The post and core were fitted to the prepared tooth fragment and then cemented to the remaining tooth structure. Tennerly was also reported the reattachment of a fractured fragment using the acid-etch technique.⁸ Starkey Simonsen (1982) was the first who described reconstruction of fractured incisors using original tooth segments and acid-etch bonded composite resin method.^{9,10}

The advantages of tooth fragment reattachment over conventional composite restoration are as follows:

1. Positive psychological response of the patient, 2. Conservation of tooth's original anatomic form and

surface texture, 3. Color match of the remaining crown portion, 4. Preservation of incisal translucency, 5. Preservation of identical occlusal contacts, 6. Colour stability of the enamel, 7. Less time consuming, 8. Economical.

Improvements in adhesive dentistry have enabled a conservative approach by reattachment of the fragment when it is present, or reconstruction with composite resins and helps in restore the esthetics.

These case reports vividly reports on two coronal fracture cases that were successfully treated using tooth fragment reattachment.

CASE REPORT 1

A 34 year old female patient reported to the department of Conservative Dentistry and Endodontics, complaining of broken upper front teeth region after sustaining trauma due to accidental fall, six months ago. On visual inspection and examination with explorer and mouth mirror, a 3mm horizontal fracture line was seen supragingivally at the labial and palatal aspect of the maxillary central incisor 11. Vitality test of the Tooth was done using heated ball burnisher and also with the ice stick. Positive response was observed in relation to 11 as per adjacent tooth. The involved tooth showed no signs of mobility. Radiographic findings showed no periapical radiolucency with respect to 11. The space between fractured segments appeared minimal. Treatment plan was stabilization of these undisplaced fracture fragments using glass-ionomer cement, root canal therapy and fibre-optic post



Figure 1: Oblique Crown Fracture In Upper Right Central Incisor Tooth

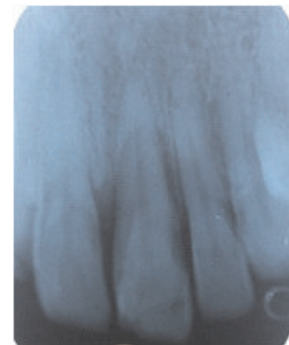


Figure 2: Preoperative Radiograph



Figure 3: Reattachment of the Fragments



Figure 4: Splinting Of Tooth

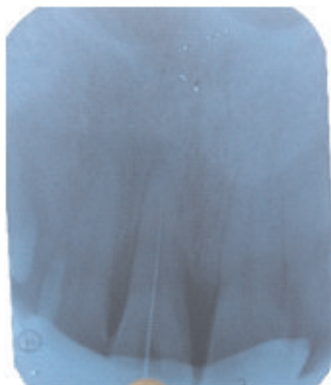


Figure 5 : Working Length Radiograph

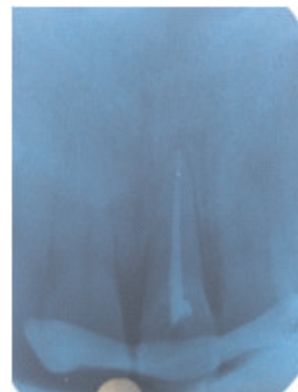


Figure 6 : Post Obturation Radiograph

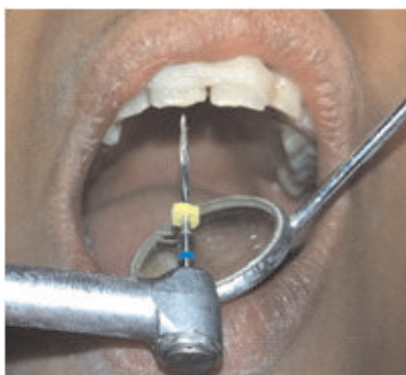


Figure 7:Post Space Preparation

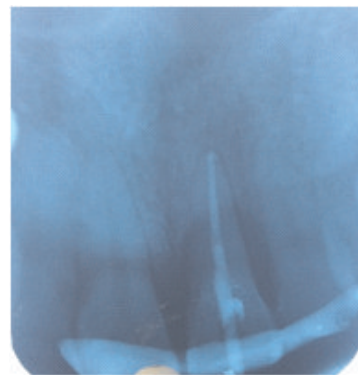


Figure 8: Radiograph Showing Cemented Fibre Post



Figure 9: Postoperative Clinical View



Figure 10: 3 Months Follow Up

(Coltene) attaching the fractured coronal fragment which gets reinforced with the same post. The treatment plan was explained to the patient. At first the area was anesthetized with nasopalatine nerve block and local infiltration using Lignocaine Hydrochloride (2%) & Adrenaline Bitartrate (1:80000). After anesthesia, mobile coronal tooth fragment was attached with Glass-ionomer cement (Gcfuji). Composite (Paracore) splinting was done in 11, 12 and 21. Access cavity preparation was done using #4 round bur (Mani). The working length was determined with the help of 10 k file and confirmed with radiograph (IOPA). The root canal was enlarged to ISO protaper size F4 finishing file (Crown-Down shaping and finishing method) at working length. 2ml volume of 3% Sodium hypochlorite was used intermittently for irrigation while preparation. The root canal was dried with paper points (Spident,

Hand Rolled, Korea) and obturated using endodontic sealer (AH26) and guttapercha with lateral compaction technique. The post space was prepared and with corresponding drills to receive the fibre reinforced post. The fibre post (1.3mm) was checked for the fit. After conditioning, paracore dual cure resin was injected into the canal and fibre post was cemented to stabilize the tooth.

CASE REPORT 2

An 26-year-old male reported to the department of conservative dentistry and endodontics, Guru Nanak Institute of Dental Sciences and Research, Kolkata - 700114, with the chief complaint of broken tooth of upper front region of mouth associated with a history of trauma 5 days ago (Figure 1). The family medical and dental histories were non-contributory. No abnormalities in general growth and development



Transfer tray is fabricated with polyvinyl siloxane



Figure 2: Preoperative Radiograph Showing Radiolucent Fracture Line on 12

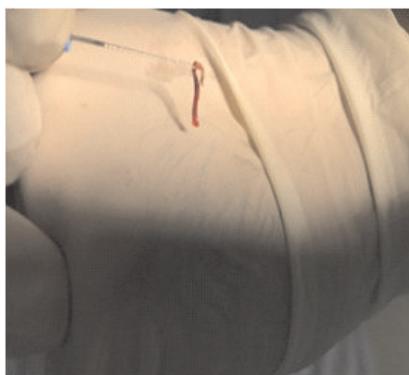


Figure 3: Extirpation Of Pulp



Figure 4: Working Length Radiograph.

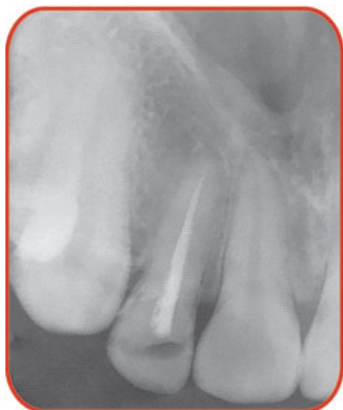


Figure 5 :Post Obturation Radiograph

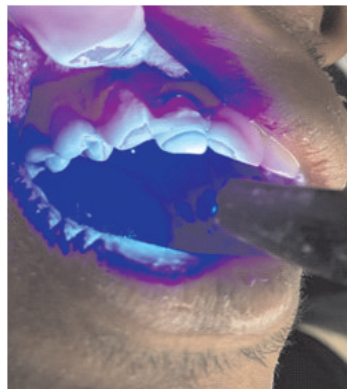


Figure 6: Reattachment Of Fragment With Dual Cure Composite Resin And Light Cured



Figure 7: Post Operative Clinical View Showing Crown Fragment Reattached From Labial Aspect



Figure 8: Post Operative Clinical View With The Fixed Prosthesis On 12

were noted.

Clinical examination revealed that –

- The oblique crown fracture in upper right lateral incisor tooth (12).
- The fracture fragment attached to gingival soft tissue only from the palatal aspect and the palatal portion is mobile.
- The tooth was tender on vertical percussion.

Radiography was recommended for diagnosis and it revealed that the oblique crown fracture in upper right lateral incisor tooth (12) (Figure 2)

The tooth (12) was isolated and adequate anaesthesia was achieved by Buccal Infiltration technique using Lignocaine Hydrochloride (2%) & Adrenaline Bitartrate (1: 80000) and access cavity was prepared with #4 round bur (Mani) and the cavity was refined with Endo z bur (Coltene) (Fig 3). No. # 15 K file (Dentsply) was inserted into the root canal and radiograph was taken. Working length (22mm) was established radiographically (Fig 4) and chemo-mechanical preparation was performed using crown-down technique with rotary Protaper Universal (Dentsply) files and the canal was enlarged upto # F2. 2 ml of Sodium hypochlorite (2.5%) and normal saline were alternatively used as irrigants at every change of instruments. The canal was dried with sterile paper points and obturation of the root canal was done with gutta-percha points using lateral compaction technique and AH plus sealer [Dentsply] (Fig 5). After obturation gutta-percha was removed below the level of CEJ with the help of heated spoon excavator. Self etching light cured adhesive (Adper Single Bond Plus, 3M ESPE) was applied. Fracture fragment was fixed with the help of Dual cure composite resin and light cured (Fig 6). The margins were properly finished with diamond burs and polished with a series of Sof-Lex disks (3M ESPE) and diamond polishing paste. Tooth was de-occluded in both centric and protrusive movement.

DISCUSSION

Reattachment of the fragment to its original position is considered an excellent approach for the management of a coronal fracture. The application of dental adhesives capable of reattaching a fragment to the remaining tooth structure appears to offer a number of advantages compared with the conventional methods for restoring fractured teeth. With advancement in dental bonding technology, it is now possible to achieve excellent results with reattachment of fractured tooth fragments provided that the biologic factors, materials and techniques are logically assessed and managed. The use of natural tooth substance clearly eliminates the problems of differential wear of restorative material, unmatched shades and difficulty of contour and texture reproduction associated with other techniques. Treatment plan can be made after evaluation of the

periodontal, endodontic, coronal and occlusal status. Other factors that might influence the choice of technique include the need for endodontic therapy, extension of fracture, quality of fit between fragments and the fracture pattern. The treatment principles for horizontally fractured coronal fracture involve maintaining pulp vitality by immobilizing the coronal segment. In the first case splinting both the fragments was carried out as the fracture line was apical to the alveolar crest level. Post space preparation was done involving both coronal and apical fragments leaving 4mm of apical gutta-percha. Hence in this case splinting was attempted to approximate the fragment for a better healing of the fracture. At the same time, a fibre post has been used along with self cure resin cement to reattach the coronal fragment. Here fibre post serves as a splint as well helps to reinforce the coronal fragment. Early retrospective studies indicate that the clinical performance of fibre post is promising and the failure rate is 3.2% over a period for upto 4 years. The fibre post acted as a splint between the fractured tooth segment and intact tooth, further reinforcing the fractured segment. Use of fibre post in cases of reattachment have a no. of advantages. They help not only in conservation of tooth structure, good esthetics, better adhesion but also the stress distribution is better as the modulus of elasticity is similar to that of dentin.

The techniques described in the second case reports are reasonably simple, quick and economic as compared to other more invasive procedures, while restoring function and esthetics with a very conservative approach. However, it has to keep in mind that a dry and clean working field and the proper use of bonding protocol and materials is the key for achieving success in adhesive dentistry. Rubber dam was not used in this case but adequate isolation has been achieved by using cotton rolls and cheek retractor. 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. Various techniques and designs have been proposed for reattachments of fractured tooth fragments, like simple reattachment, enamel beveling, V shaped internal enamel groove, internal dentin groove, external chamfer and overcontour.^{11,12} Reis and colleagues have shown that a simple reattachment with no further preparation of the fragment or the tooth was able to restore only 37.1% of the intact tooth's fracture resistance, where as 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 respectively¹¹. In this case an additional bevel preparation in enamel was done to ensure successful bonding and longevity in the long run. The pulp chamber was used for increasing the surface area for composite resin bonding and without the use

of post. Amir et al in 1986 showed when endodontic therapy is required, the space provided by pulp chamber may be used as an inner reinforcement, thus avoiding any excess preparation of teeth.¹³ Trope et al in 1985 showed that endodontically treated teeth can be reinforced with the use of resin composite restoration.¹⁴ The flowable composite resin not only reinforces the tooth but also helps in achieving higher bond strengths of the fractured segments. Flowable composite resin also minimizes the inclusion of air voids. But still fragment reattachment technique has some disadvantages such as

- lesser than ideal esthetics (caused by dehydration of tooth)
- unknown longevity
- chances of separation of the repair caused by progressive breakdown of the bonded junction.

Hence continuous monitoring is necessary.

CONCLUSION

Reattachment of a tooth fragment is a viable technique that restores function and aesthetics with a very conservative approach in single visit and can be considered when treating patients with coronal fractures of the anterior teeth, especially in younger patients.

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