Case Report

Changing Concepts in Reattachment of Tooth Fracture

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ABSTRACT

The majority of dental trauma involves anterior teeth, especially the maxillary central incisors. A crown fracture with pulp tissue involvement, severe sensitivity, and pain is certainly unpleasant for the patient. If the original tooth fragment is retained following fracture, the natural tooth structures can be reattached using adhesive protocols to ensure reliable strength, durability and aesthetics. This case report will discuss a case history of 21 year old patient who accidentally injured his maxillary left central incisor. After local anesthesia, the fractured part was carefully separated and at the same time, the Supernumerary tooth was removed. After completion of root canal treatment, the tooth fragment was successfully reattached with an adhesive tooth reattachment technique.

INTRODUCTION

Dental trauma often has a severe impact on the social and psychological well being of a patient. Coronal fractures of permanent incisors represent 18-22% of all trauma to dental hard tissues, 28-44% being simple (enamel +dentin) and 11-15%, complex (enamel +dentin +pulp). Of these 96% involve maxillary central incisors [1]. The major challenge for the clinician is to re-establish the natural aesthetics of the traumatized tooth, thus its form and dimensions, shade, opacity and translucency, fluorescence and opalescence. Traumatized anterior teeth require quick functional and esthetic repair. Traditionally such injuries have been restored with composite resins. They have the primary disadvantage of colour mismatch and variable wear. Therefore if a broken fragment is available, the restoration of the tooth using its own fragment has been suggested as an alternative [2]. When an anterior tooth is involved, there is often sufficient tooth structure present to reattach the fractured segment [3].The treatment modalities varies from simple reattachment to complex interdisciplinary approach. Treatment alternatives for fractures involving biologic width include crown lengthening, flap surgery, osteotomy /ostectomy and rapid orthodontic tooth extrusion.

Although evidence based literature shows that materials do not play an important role in fracture strength recovery, the advantage of reattachment of fractured fragments include immediate esthetics, more reliable outline form, possibility of maintaining the occlusal function, absence of differential wear, lowered economic burden and excellent time resource management [4]. Moreover, the patient's self-esteem remains positive due to maintaining the natural appearance of his teeth.

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This case report will present an emergency situation of a young man who presented with crown fracture (Class IV), [Table 1]. There are several "crown fracture" classification systems in the literature, such as Andreasen and Andreasen's Classification [Table 1]. The most recent one in 2002 by Spinas and Altana [Table 2] may describe the clinical crown fracture better and it is easy to remember. In this case, endodontic therapy was followed by an adhesive tooth reattachment technique

Table 1: Andreasen and Andreasen's

Class I	Enamel infraction (crack)
Class II	Enamel fracture (crown fracture, not complicated)
Class III	Enamel-dentin fracture (crown fracture, not complicated)
Class IV	Complicated crown Fracture
Class V	Crown-root fracture not complicated.
Class VI	Complicated crown-root fracture
Class VII	Root fracture

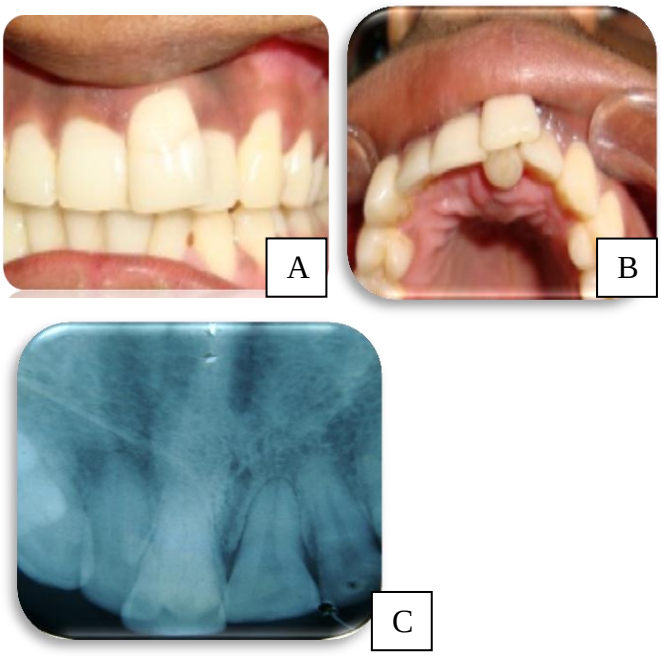
Table 2: Spinas and Altana's Classification (2002)

A	Class Simple enamel lesions involving one proximal angle or only incisal edge
B	Class Enamel-dentin lesions involving one proximal angle or only incisal edge
B1	Subclass —with pulp exposure
C	Class Enamel-dentin lesions involving the incisal edge and a third of the crown
C1	Subclass —with pulp exposure
D	Class Enamel-dentin lesions involving the mesial or distal angle And the incisal or palatal surface And root involvement
D1	Subclass- with pulp exposure

CASE REPORT:

A 21 year old patient was referred to the Department of Conservative Dentistry & Endodontics, BSMMU with a history of trauma and injury to the upper front tooth 2 days back. The patient complained of pain and traumatic fracture of the maxillary left central incisor. The patient had an accident while he was working in a factory. Initial examination revealed the horizontal fracture on maxillary left central incisor involving middle of the clinical crown with associated exposure of the pulp [Fig-1(A)] and a Supernumerary tooth was present just below the maxillary left central incisor [Fig-1(B)]. Clinical examination intraorally revealed an Ellis class-3 fracture [table 1] on the maxillary left central incisor running in a horizontal direction. The fracture line was evaluated clinically and a radiograph was taken to confirm the diagnosis [Fig-1(C)]. Vitality testing with a stream of cold water demonstrated maxillary left central incisor was hypersensitive with lingering pain. On palpation, maxillary left central incisor was tender. Percussion was not performed as the clinical crown was mobile. The fragment was still attached due to presence of the Supernumerary tooth at the palatal aspect.

After local anesthesia the fractured part was carefully separated and stored in sterile water to prevent discoloration and/or infractions from dehydration [Fig-2(B)]. At the same time, the Supernumerary tooth was removed [Fig-3(A & B)].



Figur 1: Preoperative facial view (A), Occlusal view (B) and Radiograph (C) of left central incisor tooth.

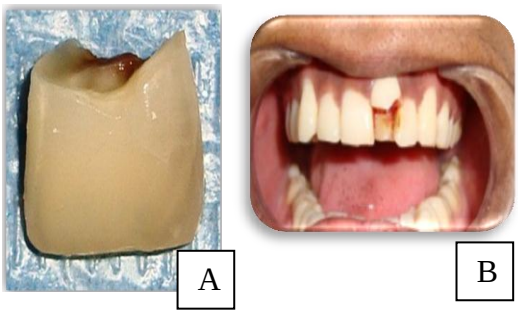


Figure 2: The separated crown segment (A) and the incisor tooth. (B)

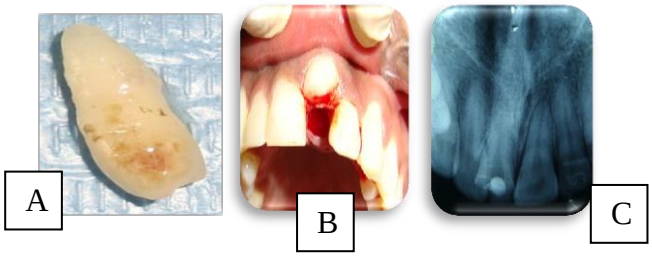


Figure 3: After extracted super numarary tooth (A) the clinical area (B) on radiography view (C).

Figure 4: Post operative clinical view (A) and radiography view after obturation (B).

Since there was clinical exposure of pulp, a single visit root canal therapy was done. The fragment was then assessed for placement in the original position. The margins of the tooth and fragment were well fitting. The tooth fragment was prepared for reattachment by removing the dentin tissue around the pulp chamber with a large round bur. The same procedure was done on the tooth, and a retentive groove was made in pulp chamber. 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. A bonding agent [STAE, DENTIN/ENAMEL SINGLE BOND, SDI, Australia] was applied in 2 coats to both the substrates, gently air thinned and light cured for 15 seconds. The pulp chamber from the fragment was also filled with microfilled composite [DENSPLY] to reinforce the teeth. The fragment was then placed on the fracture site and carefully aligned and smoothness of the margin was checked. Excess composite was removed and the tooth was polymerized from both buccal and labial aspects. Restoration finishing and polishing was carried out with Super Snap polishing discs and occlusion was evaluated [Fig-4(A & B)].

DISCUSSION

With advancement in dental bonding technology, it is now possible to achieve excellent results with reattachment of dislocated 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[4].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.

Badami and associates[5] 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 40-60%, with internal dentin groove and over contour it reached around 90%. A simple reattachment procedure as in this 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 [6] .The pulp chamber was used for increasing the surface area for composite bonding and without the use of post. Amir et al in1986 [7] 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. The direction fracture line is an important aspect in re-restorability and it has a direct bearing on the prognosis of teeth[6].

The fracture line was in a favourable direction in this case undertaken. Extensive damage of the tooth structure and missing fragment warrants reinforcement using fiber posts. Tooth colored fiber posts have several advantages .They are more aesthetic, bonded to tooth tissue, modulus of elasticity similar to that of dentin and less chances of fracture. Traditionally cast metal post and core were used for fracture reattachment. The newer variety of non metallic posts is made of either ceramic or fiber reinforced materials like carbon, quartz or glass in an epoxy matrix .By using glass fiber post with composite core and with recent advances in adhesive techniques and materials one can create a Mono-block, a multilayered structure with no inherent weak inter-layer interfaces. The unique advantage of this system is that it reinforces the teeth structure through this concept. Therefore, the integrity of the final endodontic-restorative continuum mono-block approaches that of the original healthy tooth itself [8]. An additional use of fiber posts is that it helps to distribute the stress to remaining radicular dentin. Trope et al[9] showed that endodontically treated teeth can be reinforced with the use of resin composite restoration.

The flowable composite not only reinforces the tooth but also helps in achieving higher bond strengths of the fractured segments. Flowable composite also minimizes the inclusion of air voids. Several studies have shown that replacement of composite using dentin bonding agents give strength to the root[10]. When they are used with resin cements they have a decreased chance of micro leakage .The resin luting cements exhibits good bond strength to the tooth, easy to use and predictable. Resin based sealers are used treat teeth planned for restoration of light posts as eugenol based sealers may inhibit the set of resin cements. The amine accelerator necessary for dual polymerization can cause the colour of the luting cement to change over time [11], so the light cured resins are more preferable. Reis et al[12] showed improved fracture resistance with this additional procedure. Since light cured resins are more colour stable they are recommended in areas of esthetic concern.

If the fracture line is supragingival, the procedure for reattachment will be straight forward. However when the fracture site is sub gingival or intraosseous, orthodontic extrusion with a post retained crown may be necessary. Alternatively, surgical techniques such as electrosurgery, elevation of tissue flap, clinical crown lengthening surgery with removal of alveolar bone and removal of gingival overgrowth for access to the fractured site are all viable methods for bonding fractured component. It has been suggested that whenever the fracture site invades the biologic width, surgery should be performed with minimum osteotomy and osteoplasty[13].

However in cases with minimal biologic width invasion the organism is able to restore the biologic width by itself provided assiduous plaque control is done. The prognosis of the reattached teeth would also depend on the fitness, contour and surface finishing of the subgingival restoration. If the invasion of biologic width is minimal, satisfactory esthetics and function can be achieved, without conventional flap surgery, however requiring long term follow up. The cases which required crown lengthening were in order to keep the restorations on definite margins. A temporary crown should be given to the patient for esthetic reasons at the first appointment in coordination with the endodontic therapy. The success rates of reattached fragments has been seen to be upto 90 % for the parameters of periodontal, pulpal and colour harmony for a follow up of upto 24 months [2].

CONCLUSION

Several aspects govern the choice of a technique or the association of materials for fragment reattachment. Reattachment proved to be a successful technique in this case for restoring esthetics and function. However because few long term studies have been reported in literature, the patient should be informed of possible interim nature of the treatment. For traumatized patients with broken teeth, pain relief and an esthetic immediate restoration is the treatment goal.

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