Case Report

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Reattachment of Fractured Maxillary Central Incisor Crown Using Fiber Post: A Case Report.

Abstract:
Dental fractures comprise the most frequent form of traumatic dental injury and often require an immediate procedure for their treatment. Among the treatments, the restoration of fractured teeth by reattachment of the tooth fragment to its tooth remnant is a viable clinical procedure to treat tooth fracture due to trauma because it is considered a highly conservative technique.

Key-words: Crown fracture, dental trauma, reattachment, tooth fragment.

Introduction:

Coronal fracture is the frequent type of dental trauma in the permanent dentition[1]. Eighty percent of traumatized incisors have fracture line proceeding in an oblique direction from labial to lingual aspect. The upper central incisors are the teeth most frequently affected by this type of dental injury (80%), and this high incidence can be related to the anterior anatomical position and to the protrusion caused by eruptive process[2].

A coronal fracture affects enamel dentin and cementum and may be classified as either complicated or uncomplicated according to pulpal involvement. Conventionally coronal fractures can be treated by different ways and technique depends on extent and factors influencing biological width violation, alveolar bone fracture or root fracture, endodontic involvement, fit between fragment and remaining tooth structure, esthetics and prognosis.

Trauma causing complicated tooth fracture where the fractured segments are close approximating endodontic treatment followed by reattachment of fractured segment with post is feasible and conservative option to salvage an exisiting tooth[3]. Due to recent advances in adhesive techniques and material the use of fiber reinforced polymer posts luted with resin cement is more popular as it increases the retention of the segment by creating monoblock effect (a multilayered structure with no inherent interlayer interference)[4].

The following report describes the management of complicated coronal fracture, extending subgingivally, involving pulp exposure to the permanent maxillary central incisor.

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Case Report:

This case report describes reattachment of complicated oblique subgingival coronal fracture of maxillary central incisor involving enamel, dentine and pulp. Since the fractured fragment was available and due to its intact fracture margins, the reattachment technique without any tooth preparation is a simple and a conservative approach to traumatic coronal lesions maintaining aesthetics and function.

A 17-year-old male patient reported to our clinic following dental trauma in the maxillary left central incisor from blunt hard object at home. Intraoral examination reveals, Ellis classIII fracture of crown portion of tooth no. 21 extending from middle one third of the tooth on the labial side to 2mm obliquely subgingivally on the lingual aspect (fig.1), with no soft tissue or facial injury. Periapical radiograph revealed there was no fracture of the root or alveolar bone, intact periodontal ligament space, complete root formation with no extrusion of teeth. Before any restorative step a thorough evaluation of the traumatic injury area and the condition and margins of fractured fragment was done. The fractured tooth was evaluated by trans - illumination in order to rule out the presence of enamel fissures, following a detailed examination, the fit of the fragment was checked, it was planned to proceed with the attachment of the fractured fragment with no additional tooth preparation as there was no loss of dental hard tissues and the edges matched without any disruptions.

We decided to proceed with the attachment of the fractured fragment with no additional tooth preparation as there was no loss of dental hard tissues and the edges matched without any disruptions.

A detailed explanation about the treatment plan was given to the patient, which included endodontic treatment, and then reattachment of the fractured tooth crown using a fiber post (Dentply Tulsa, Johnson city, US) with palatal flap reflection to adapt subgingival margins to the fractured tooth.

As soon as treatment started the fractured fragment was soaked in saline solution in order to prevent dehydration and discoloration of the tooth fragment.

After administration of local anaesthesia, working length was established with the help of radiograph followed by the biomechanical preparation by step back technique, with the master file being 50 k-file. Irrigants warm 2.5% sodium hypochlorite (septodent) and saline solution were used during the preparation alternately, after bio mechanical preparation of tooth, canal was dried with paper points and obturated using lateral condensation technique with gutta percha (Dentply Maillefer, Ballaigues, Switzerland) and AH plus resin sealer (Maillefer Dentply, Konstanz, Germany) (fig.2). The fibre post was tried in the canal and adjusted to the desired length. Space was also prepared in the pulp chamber of the fractured crown fragments for receiving the coronal portion of the post and also the core. The root canal was then etched with 37% ortho phosphoric acid, rinsed, and blot-dried with paper points, and bonding agent was applied. The post was then luted in the canal using dual cured resin luting cement (fig.3). Since the margins of fracture fragment was located oblique subgingivally palatal flap was reflected with P20 elevator to adapt the margins accurately (fig.4). Prior to the reattachment procedure, the fractured tooth was cleansed and polished; and, the fractured portion was "tried-in" to check for any presence of disruptions or defects between the remaining tooth structure and the fragment. The inner portion of the coronal fragment was similarly etched (fig.5) and bonded to the tooth using flowable composite resin after proper shade matching, reattachment of fracture fragment was done (fig.6). The restored tooth was light cured (fig.7) and the occlusion checked, flap was sutured back with sling suture (fig.8). Antibiotics and Analgesics along with oral hygiene instruction and soft diet was prescribed, Patient was recalled after 7 days for suture removal and final and finishing was done.

Up to six month follow up examination, no pain color changes, mobility or periradicular pathology were observed on restored tooth (fig.9).

Fig.1 Pre Operative (Ellis class III)

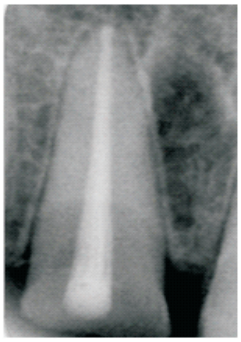

Fig.2 Post space preparation

Fig.3 Post placement

Fig.4 Palatal flap reflection

Fig.5 Etched fractured crown

Fig.6 Replacement of crown

Fig.7 Curing

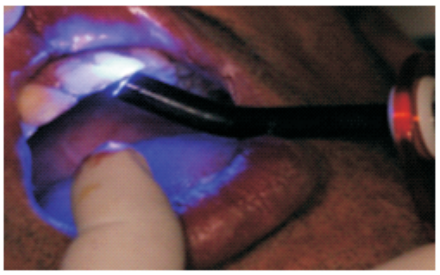

Fig.8 Sling suture

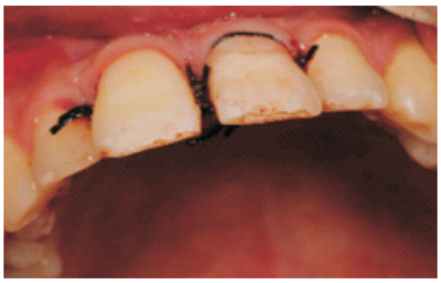

Fig.9 Follow up after 6 months

Fig.10 Follow up after 6 months

Discussion:

Treatment options for complicated fractures should be evaluated carefully based on the location of the fracture line and the patient's age, preference, and systemic health condition. This clinical case report tries to throw light on certain aspects of the reattachment technique used on fractured teeth. Many techniques are available to restore the fractured tooth but the authors chose to remain most conservative as the fractured segment was available. Whenever the fracture fragment is available reattachment should be the first choice of treatment[4].

In the present case of complicated crown fracture endodontic therapy was performed followed by fiber post placement. Fiber post is used as it has the potential for increased retention, is more flexible, and has modulus of elasticity approximately same as dentin, and when bonded with resin cement it distributes forces evenly along the root. In addition, the fiber-reinforced posts are used with minimal preparation because it uses the undercuts and surface irregularities to increase the surface area for bonding, thus reducing the possibility of tooth fracture during function or traumatic injury[5].

Reattachment of fracture segment was done using bonding technique. The bonding technique for dental fragments was chosen due to the patient's young age and the conservative nature of the technique. In recent years due to remarkable advancements of adhesive systems and resin composites, it is now possible to achieve excellent results with reattachment of tooth fragments provided that the biological factors, materials, and techniques are logically assessed and managed[6].

Another advantage is the advancement of adhesive restorative materials, which allows not only the creation of accession to the lost dental structures but also the preservation and strengthening of the tooth structure.

Bond strength of the restoration depends upon restoration time as dentine moisture is essential for achieving high bond strength of composite resin with dentin, the hydration of dental fragments is a key factor in maintaining their optical characteristics. A systematic review shows that the fragment color change could be linked to dentinal tissue dehydration[7]. The enamel and dentin have different characteristics with features that greatly influence these properties. The enamel is characterized as a highly mineralized structure that consists of prisms. A small amount of its composition is water, and it is better at reflecting light. Dentin, which has a tubular structure, is organic and less mineralized and has a larger amount of water. As soon as treatment started the fractured fragment was preserved in physiological saline solution in order to prevent dehydration and discoloration of the tooth fragment. Fragment hydration proved to be an important step in the clinical context because it prevented disharmony in the fragment of color in relation to the remaining tooth in addition to increasing the strength of the bonding. The color discrepancy may disappear within 30 days to 12 months due to water absorption of the fragment after their reinsertion.

Andreasen *et al*, used All-Bond 2 and Scotchbond MP to reattach crown fragments to the remaining portion of sheep incisors loaded at different loading rates. They suggested that reattachment with a bonding resin of the enamel dentin crown fragment after crown fracture is a realistic alternative to composite resin build up, although only half the strength of the intact tooth is achieved. Munksgaard *et al*, reported the same values[8]. The primary cause of failure of the reattached tooth fragment is a new trauma or the use of the restored tooth with excessive masticatory forces, which justify many previous attempts to improve the fracture strength of the re-bonded fragment.

Conclusion:

The direct bonding technique of fragment reattachment has proven to be a good alternative for the rehabilitation of anterior teeth. Moreover, it is a conservative esthetic procedure that can restore the masticatory function.

The clinician must consider that a dry and clean working field and proper use of bonding protocols and bonding materials are the key to achieve success in adhesive dentistry. Reattachment failures occur as a result of new trauma or parafunctional habits, so fabrication of a mouth guard and patient education about treatment limitations enhance clinical success.

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