International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 20-07-2020; Accepted: 05-08-2020; Published: 21-08-2020
www.medicalsciencejournal.com
Volume 6; Issue 8; 2020; Page No. 201-204

An interdisciplinary approach for fragment reattachment of fractured maxillary central incisor: A Case Report

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Abstract
Crown fractures are the most common consequences of traumatic injuries that mainly occur in the anterior permanent dentition. The most common reasons are attributed to falls, high-impact sports, and motor vehicle accidents. The choice of the aesthetic restorative treatment of fractured anterior teeth remains the biggest challenge for the dentist. Treatment options include composite resin restoration, fragment reattachment, and ceramic restorations (full crowns, laminate veneers, or ceramic fragments). When the tooth fragment is present and in good working condition, the best option for the treatment of a coronal fracture fragment is reattachment. Proposed as a simple and conservative option, fragment reattachment restores the morphological, functional, and aesthetic aspects of the dentition, while maintaining the shape, contour, texture, colour, and alignment of the natural teeth.

Keywords: fragment reattachment, aesthetic, functional, conservative

Introduction
Dental trauma has a high prevalence, which ranges between 7.4% - 58% and has a negative impact on functional, aesthetic, and psychological aspects of the life of those affected. These traumatic injuries occur mostly in children aged between 9 and 11 years. Highest prevalence of dental trauma is in permanent dentition in which maxillary central incisors are the most affected followed by maxillary lateral incisors and mandibular central incisors [1]. The most common reasons are attributed to falls, high-impact sports, and motor vehicle accidents. Choosing the correct treatment to be followed is based on the extent of the fracture (severity and location of the invasion of the biologic width); the presence or absence of endodontic involvement; the presence/absence of the tooth fragment and patient expectations. The choice of the esthetic restorative treatment of fractured anterior teeth remains the biggest challenge for the dentist. Treatment options include composite resin restoration, fragment reattachment, and ceramic restorations (full crowns, laminate veneers, or ceramic fragments). When the tooth fragment is present and in good working condition, the best option for the treatment of a coronal fracture fragment is reattachment. Proposed as a simple and conservative option, fragment reattachment restores the morphological, functional, and esthetic aspects of the dentition, while maintaining the shape, contour, texture, color, and alignment of the natural teeth. Furthermore, fragment reattachment can be considered a fast and low-cost treatment solution, creating a positive emotional and psychological response in the patient [2].
Tennery was the first to report the reattachment of a fractured fragment using acid-etch technique [3].

Case Report Proper
A 25-year-old male patient reported to Department of Conservative Dentistry and Endodontics, College of Dental Sciences, Davangere, with a chief complaint of broken upper front due to fall 1 day back. The medical history of the patient was non-contributory. Intraoral finding showed fracture with pulpal involvement at the cervical third of the crown wrt 11. IOPAR revealed a fracture line passing horizontally in mesio-distal direction in the cervical third of the crown wrt 11. Based on the radiographic and clinical findings, diagnosis was made to be Ellis Class 3 fracture. Treatment plan was laid out, firstly the fragment was removed, followed by endodontic treatment and fragment reattachment.

Fig 1: Pre-Op Labial View

Fig 2: Pre-Op Palatal View

Fig 3: IOPAR wrt 11

First Visit

Atraumatic removal of fragment was done using tweezer and gauze and the fragment was stored in saline. On evaluation, it was noted that the fracture line was below the free gingival margin. Single visit endodontic therapy was performed wrt 11 in the same appointment and Cavit was placed as temporary dressing.

Fig 4: After Fragment removal (Labial view)

Fig 5: After Fragment removal (Palatal view)

Fig 6: Removed Fragment wrt 11

Fig 7: Post obturation IOPAR wrt 11

Second Visit

Temporary dressing was removed. Post space preparation was done using Peeso reamer #3, leaving behind apical 5mm of gutta percha plug and patient was referred to Department of Periodontology for minimum gingivectomy and osteotomy. Patient was recalled after 1 week.

Fig 8: Post Space Preparation wrt 11

Fig 9: Gingivectomy and Osteotomy

Fig 10: Periodontal Pack placed

Third visit

Patient had failed to visit after 1 week as per appointment. Gingival overgrowth was seen wrt 11. Laser removal of overgrown gingiva was done using diode laser (810 nm diode laser 2.5 W power in continuous mode, 320 µ m fiber) in the Department of Periodontology. #25 ISO fiber post (3M ESPE) was selected and cemented with dual cure resin cement (Fluoro Core 2+, Dentsply Sirona) according to manufacturer's instructions. A trough was created in the centre of the original crown fragment, and both the intact coronal portion of the tooth and the original crown fragment were etched with 37% phosphoric acid gel for 20 s, rinsed for 20 s and dried. Flowable composite resin (3M Filtek Z350 XT) was applied at the intact coronal portion of the tooth and the original crown fragment. Following this, the original fragment was accurately placed and photo polymerised for 40 s.

Fig 11: Laser assisted removal of gingiva

Fig 12: Post- laser removal

Fig 13: Post selection

Fig 14: Preparation of fragment

Fig 15: Fiber Post Cementation

Fig 16: Post-op fragment reattachment (labial view)

Fig 17: Post-op Fragment reattachment (Palatal view)

Fig 18: Post- Op fragment reattachment IOPAR wrt 11

Fig 19: Follow up after 1 month (labial view)

Fig 20: Follow up after 1 month (Palatal view)

Discussion

The development of adhesive material creates new perspective in the reconstruction of fractured teeth; it is now possible to achieve excellent results with the reattachment of dislocated tooth fragment provided that the biological factors, materials and techniques are properly assessed and managed. Reattachment should be the first choice of treatment when the fracture fragment is available. The advantage of this alternative treatment includes regaining colour and size of the original tooth, being worn away in similar proportion to adjacent tooth and giving positive psychological response to the patient and is also cost effective [4].

Cavalleri and Zerman reported that the long-term prognosis for reattached crown fragments appears to be better than for composite resin restorations [4].

Complicated fractures involving pulp have been treated by reattachment with post and core [3].

The following reattachment strategies have been advocated for reattaching a tooth fragment

1. Placement of a circumferential bevel
2. Placement of an external chamfer at the fracture line after bonding
3. Use of a V-shaped enamel notch
4. Placement of an internal groove
5. Superficial over contour of restorative material over the fracture line and pulp chamber, in case of complicated fracture

In the present case, the placement of an internal groove was used, as it provided a better strength recovery than simple reattachment. Reis *et al*. have reported 90.5% recovery of

fracture strength with this technique with minimal loss of natural fit of the fragment compared to other methods which increased the strength recovery [10].

Another important factor is the maintenance of adequate hydration while the fragment is outside the mouth Hydration maintains original aesthetic appearance of the tooth. The hydrophilic characteristic of adhesive systems also means that hydration acts to ensure adequate bond strength. In the present case, the fragment was stored in saline to maintain adequete hydration [5].

The literature suggests that whenever biologic width is invaded, surgery should be performed with minimum gingivectomy and osteotomy [6].

In the present case, patient had failed to report 1 week after the gingivectomy which lead to an overgrowth of the gingiva. Laser assisted removal was done thereafter. It is a non-invasive technique and cause no bleeding and keeps the surgical field clean. Soft tissue diode laser causes no damage to bone and periosteum and faster rate of healing as compared to the scalpel. Also, laser wounds are sterile and are less likely to become inflamed because blood vessels smaller in diameter are sealed by laser ablation effect [7].

Fiber reinforced posts have been used owing to its property of modulus of elasticity being similiar to dentin, that allows a more even distribution of occlusal stresses in the root dentin. FRC post needs less dentin removal as it uses the undercuts and surface irregularities to increase the surface area for bonding, thus minimizes the possibility of tooth fracture. In addition, using it with composite core and adhesive materials can create a monoblock, reinforces the tooth structure [8].

The dual cure resin cement has a good bond strength, ensures complete curing till the depth of the root canal and reduces microleakage [9].

Conclusion

Complex coronary fractures require a specialized interdisciplinary treatment and must be carefully assessed by the dental clinician to achieve the best possible outcome.

Bearing in mind that it is a simple, fast, affordable, and esthetically predictable technique, tooth fragment reattachment should always be the treatment method of choice when the fragment is present and is in good condition, even if a perfect adaptation is not observable.

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