# Comprehensive Multidisciplinary Treatment Approaches of Fractured Tooth Fragment-Case Reports

### Abstract

**Aim:** Reattachment techniques of tooth fragments present several challenges to the dentist. The advantages of reattachment procedures over restorations with composite resin systems are better and long-lasting esthetics, improved function, a positive psychosocial response, is faster and less complicated. Three clinical cases are presented here describes a treatment modality that restores, through the reattachment of the dental fragment, where in the esthetics,function of anterior teeth in which fracture has invaded the biologic width has been done successfully with two years follow-up.

### **Key Words**

Reattachment; fiber post; biological width; resin cement

# INTRODUCTION

techniques<sup>[1]</sup> Tooth fragment reattachment "represent an important step in the science and art of restoring fractured anterior teeth and present some advantages" over the restoration obtained with a composite resin system viz.: better esthetics, improved function, a positive emotional and social response from the patient to the preservation of natural tooth structure. Some cases of tooth fracture causes invasion of biological width. Such cases pose difficult in reattachment technique. It is probably due to several factors namely: Difficulties in gaining access to the margins of the tooth remnant, difficulty in obtaining adequate rubber dam isolation and need to restore the biologic width before proceeding with the restoration. Gargiulo el al.,<sup>[2]</sup> described the dimensions and relationships of the tissues of the gingival attachment. They quantified dimensions of the various the components using human autopsy material. Their findings showed that, on the average, the sulcus depth is 0.69 mm. the junctional epithelium is 0.97 mm, and the supracreslal connective tissue attachment is 1.07 mm. Among the three tissue components, they found the supracrestal connective

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tissue attachment to be the least variable, with a range between 1,06 and 1,08 mm, whereas the range for the junctional epithelium was 0.71 to 1.35 mm. Together, these two components presented a mean of 2.04 mm. which is considered to be the normal dimension for the periodontal attachment apparatus. The space between the bone crest and the base of the gingival sulcus (junctional epithelium and connective tissue attachment) is referred to as the biologic width. The importance of not having the biologic width violated has been emphasized by several authors<sup>[3-6]</sup> as have methods<sup>[5-7]</sup> and difficulties<sup>[8]</sup> of restoration, particularly in anterior teeth. Two ways have been described as most convenient for restoration of the biologic width: flap surgery with osteotomy and forced extrusion, associated with<sup>[5,6]</sup> or without<sup>[7]</sup> osteotomy. Although such measures can prove efficacious, they are also difficult to apply to anterior teeth, particularly when optimal esthetics is the goal. Surgical resection of the alveolar bone is a useful technique to restore the biologic width: nevertheless, the technique has some disadvantages. Significant amounts of tooth-supporting bone must usually be removed from the involved tooth as well



Geeta IB, Anoop P, Jain M, Agrawal P



Fig. 13: Fiber Post Placed

Fig. 14: Post-operative

Fig. 15: Pre-operative Photograph

as from the adjacent teeth, to avoid the surgical formation of pockets and to establish a plane of bone contour on which the gingival tissue may position itself. At the anterosuperior region, esthetic problems may be created, and the removal of healthy supportive bone of uninvolved teeth is undesirable." As an alternative, to bypass such disadvantages, orthodontic traction can be applied, although it can also offer serious inconveniences.<sup>[8]</sup> CASE 1

A male patient aged 22 years reported to the Department of Conservative Dentistry and Endodontics, Rajarajeshwari Dental college hospital, 20 mins after he met with an accident. After reviewing medical and dental histories,



Fig. 16: Removal of Coronal Fragment and Stored in Saline



Fig. 17: Obturation Completed



Fig. 19: Fiber Post Placed

clinical and radiographic examinations were conducted. An oblique crown fracture was observed in the left mandibular central incisor involving enamel, dentine and pulp with detached fracture fragment. The fracture was extending from middle third labially to the level of gingiva lingually and confirmed radiographically for to rule out root fractures. The fracture fragment was stored in saline. Patient was explained about the procedure and informed consent was obtained. Local anesthesia was administered. Single sitting Root canal therapy was carried out using hand files and obturation was done by lateral compaction method

The post space was prepared with the aid of peeso reamers leaving 5 mm of apical plug to maintain a good seal and to receive the fiber post. The prefabricated post was selected and checked in the canal for proper length and adaptation and required adjustments is done by trimming the post. Orientation of post was checked according to approximation of the fractured fragment and tooth.

#### **Surface Treatment for Post**

Fiber post is etched with 24% hydrogen peroxide for one minute. Etching will partially dissolve the epoxy resin and expose the fibers which enable both mechanical and chemical bonding of the resin core to the fiber post. A silane coupling agent was applied in a single layer on the post surfaces and gently air dried after 60 seconds. Deroofing of pulp chamber is done by maintaining the lingual wall to receive post and resin cement. First glass fibre post is cemented to the post space and then the fractured



Fig. 18: Post space preparation



Fig. 20: Coronal Fragment Cemented - Labial View

fragment is attached to the glass fibre post and tooth. Post space is etched using 37% phosphoric acid for 20 seconds and then dried using air and paper points. Dual cure bonding agent is applied to the post space. Dual cured resin cement is mixed and luted to the post and is inserted into post space. Excess cement is removed and light cured for 30 seconds. Fracture fragment is etched using 37% phosphoric acid for 20 seconds and dried using air.

Dual cure bonding agent is applied and cured for 30 seconds. Fractured fragment is luted with dual cured resin cement which is attached to the post and the tooth. It is cured for 30 seconds. The occlusion was checked with articulating paper, and margins were properly finished. The margins were polished with the composite polishing kit. The follow up of these cases are done at 2 weeks, 1, 3, 6, 12, 24 months periodically and tooth was asymptomatic.

#### CASE 2

A 31 years old healthy female reported to the department with the chief complaint of pain in broken upper front teeth due to road traffic accident the previous day.

On clinical examination, the following findings were noted:

- Tooth '12' was tender on percussion.
- Pulpal exposure evident irt'12'
- Complicated crown root fracture irt'12'

The crown-root fracture line was localized just below the gingival margin on the palatal surface

• The crown fragment of '12' was excessively mobile.

Radiographic examination with intraoral periapical radiograph revealed:

- Complicated crown-root fracture irt'12'
- There was absence of periapical pathology and/or dental caries.
- No bone fracture was observed.

Local anesthesia was administered and the fractured fragment was removed and stored in saline. Patient was explained about the procedure and informed consent was obtained. Root canal therapy was carried out on the tooth followed by the compound surgical crown lengthening in the Department of Periodontics. The fracture extent was 2-3 mm After lengthening subgingival. crown the reattachment was planned. The post space was prepared on the teeth with corresponding drills to receive the fiber post. The pre-fabricated post was checked in the canal for proper length and adaptation. A box like preparation was made on the fracture fragment, remnant of pulp tissue was removed and it was prepared to receive post and composite. The box preparation and the canal was etched for 15 seconds rinsed and dried, bonding agent (Prim & Bond NT, Dentsply) was applied on to the tooth and post and was cured for 30 seconds. Resin cement (Relyx U 100, 3M ESPE) along with the post was placed into the canal and the fractured segment of crown was placed over the post to get a good approximation of the fractured fragment and cured for 30 seconds. Excess cement was removed and the margins were polished with the composite polishing kit. The patient was recalled after 1 month at which the periodontal status was stable and gingiva was free of inflammation. Re-evaluation was done at 6 months and the tooth was symptom free.

# CASE 3

A 27 year old male patient reported to our department with the chief complaint of broken upper front tooth following trauma 3 hours earlier due to a road traffic accident. Initial examination revealed a complicated crown-root fracture with pulp exposure on the labial surface of maxillary left central incisor. The fracture was evident palatal extending sub-gingival till the coronal third of the root. Radiographic examination revealed an oblique fracture labio-palatal. After routine history taking and examination, a treatment plan was formulated to immediately reattach the dental fragment of the tooth.

Local anesthesia was administered (Lignocaine 2%).

- 2. The fracture segment was completely removed and preserved in physiological saline solution in order to prevent dehydration of the tooth fragment.
- 3. Root canal treatment was initiated and obturation was done with single visit root canal treatment.
- 4. The patient was referred to Department of Periodontology for gingivectomy in the palatal aspect till 1-2 mm of coronal third of root to expose the area of fracture.
- 5. The root canal was then prepared with peeso reamers, and a corresponding pre-fabricated fiber post (Tenax glass fiber post, Ivoclar) was selected for coronal fixation.
- 6. Preparatory alignment was done, by placing selected fiber post in to the canal and access prepared in the coronal tooth fragment to fit the post. Its bonding surface and pulp cavity was loaded with self-adhesive resin cement (Relyx U 200, 3M) to attach post, maintaining alignment with finger pressure until the resin cement set by light curing for 40s.
- 7. The coronal segment was prepared and placed on the fiber post and radiograph was then recorded to confirm apposition of the two tooth portions. Following which self-adhesive resin cement (Relyx U 200, 3M) was again placed over the coronal portion of fiber post, coronal fragment placed over it, fragments repositioned and curing done for 40s.

Patient was recalled after 2 days. At the end of 2 days, the post-operative situation was uneventful. Patient was asked to visit every 6 months for 2 years for periodic follow up.

# DISCUSSION

A healthy coexistence between dental restorations and their surrounding periodontal structures is the goal of the conscientious dentist and the expectation of the informed patient.<sup>[9]</sup> Healthy coexistence is best obtained when restorations are placed out of gingival sulcus,<sup>[4]</sup> because supragingival the restorations are more likely to be appropriately finished and polished and such restorations allow better plaque removal by the patient. Nevertheless, there are situations in which the cervical margin of the restoration must be placed subgingivally, as when lesions (caries, fractures, perforations, etc) have already reached that level or when, for esthetic reasons, such lesions must remain hidden. In such cases, the practitioner should keep in mind the dimensions of anatomic structures that make up the

# **50** Fractured tooth fragment

periodontal attachment apparatus and sulcus,<sup>[2,4]</sup> which are minute and easily damaged by mechanical processes of preparation and restoration. High- and low-speed cutting tools, gingival retraction, and impressions can cause serious and irreversible damage to the supracrestal junction complex if performed without consideration to tissue fragility and to the small margin allowed for errors,<sup>[9]</sup> Minor traumas to the region can be reversible if there is no plaque during the healing process.<sup>[10]</sup> Significant trauma, on the other hand, could be irreversible, resulting in permanent loss of periodontal support and the possible formation of pockets. The practitioner has a better chance of avoiding periodontal damage if he or she keeps in mind the microscopic anatomy and the damaging effects of plaque accumulation on the area being treated. If it is true that subgingival placement of the cervical margin of a restoration is not advisable<sup>[4]</sup> mainly because it makes plaque removal difficult even when adequately finished then it is critical that the margin be maintained within the biologic width. Invasion of the biologic width may cause an inflammatory response, formation of a periodontal pocket, and progressive osseous resorption<sup>[4]</sup> with possible pain and hypersensitivity of adjacent teeth and tissue.<sup>[8]</sup> After the lesions (caries, fracture, perforation) have invaded the biologic width, restoration becomes necessary to maintain tissue health over the short, medium, and long term<sup>[4,8]</sup> Thus, a totally healthy dental structure of about 3 mm must be exposed coronally to the bone crest during surgery: 2 mm of this structure is used to accommodate the biologic width (0.97 mm for the junctional epithehum and 1.07 mm for the connective tissue attachment), and 1 mm for the placement of the restorative margin.<sup>[3]</sup>

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