



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2019; 5(4): 370-373
© 2019 IJADS
www.oraljournal.com
Received: 22-08-2019
Accepted: 24-09-2019

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Fragment reattachment of a complicated crown root fracture: A report of two cases

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Abstract

Management of traumatic injuries resulting from crown root fractures presents a clinical challenge. The line of management depends on the extent and type of fracture, biologic width invasion and presence or absence of coronal fragment. Tooth fragment reattachment represents a biological restorative treatment choice when the tooth fragment is available, with minimal biologic width violation. Maintenance of healthy periodontal attachment support is essential for long term prognosis and success of the restored tooth. This paper reinforces the advantages of fragment reattachment, with the procedures and adhesive protocols to achieve clinical success. This article presents two case reports where fragment reattachment has been done successfully for complicated crown root fractures after exposure of the fracture line using surgical crown lengthening and surgical flap elevation respectively in the two cases. Following the root canal treatment procedures, prefabricated posts have been cemented as intraradicular splint to reattach the fractured segments. Thus, Fragment reattachment provides a conservative treatment approach, combining esthetics, function and health of periodontal tissues postponing the need for the more aggressive prosthetic options. Such an approach is extremely beneficial for a young patient for some years before receiving the complex and expensive prosthetic solutions.

Keywords: Crown root fracture, trauma, reattachment, prefabricated posts

Introduction

Dento alveolar trauma constitutes approximately 25% of all traumatic dental injuries. The injuries may vary from a simple enamel dentin fracture to a complicated crown-root fracture or root fracture. Crown root fractures are fractures involving enamel, dentin and root cementum and occur below the gingival margin. If this fracture exposes the pulp, it is called as a complicated crown root fracture^[1, 2]. Factors influencing the management includes extent of fracture, invasion of biologic width presence of concomitant soft tissue and other secondary injuries, presence or absence of fractured tooth fragment, occlusal and esthetic considerations. The treatment options for restoration includes fragment removal and immediate supragingival restoration, restoration after gingivectomy or osteotomy to convert a sub gingival fracture into a supragingival position, forced orthodontic extrusion or surgical extrusion, vital root submergence or extraction^[3, 4]. The objective in the treatment of such fractures is to expose the fracture margins supragingivally to allow for a restorative management. Fragment reattachment can be considered as a biological restorative approach when the tooth fragment is available and the fracture line is not invading the biologic width^[5]. The present article describes two case reports where fragment reattachment has been done for a complicated crown root fracture.

Case Report 1

A 26 year old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of broken upper front tooth, after a bike accident. The patient was carrying with him the tooth fragment in his wallet. Clinical and radiographic examination revealed a complicated crown root fracture extending obliquely from the labial to the palatal aspect. (Fig 1a, b)) The fracture line was extending sub gingivally on the palatal aspect. Hence it was required to reflect a surgical flap to know the extent of the fracture line on the palatal aspect. The patient was explained about the treatment procedure and the probability of reattaching the tooth fragment in place.

The patient agreed and an informed consent was Obtained. The surgery was planned on the next day. Local anaesthesia was administered using 2% Lidocaine and 1:80,000 epinephrine and a mucoperiosteal flap was reflected on the palatal aspect. (Fig 1c) The fracture line was extending above the level of the bone and there was no biologic width violation. Hence, fragment reattachment was planned. A single visit root canal treatment was carried out, Working length determination was done using apex locator Root ZX (J

Morita) which was confirmed using a periapical radiograph, this was followed by master cone radiograph (Fig 1 (d)) and obturation was done using lateral condensation technique with Gutta percha and AH plus sealer (Dentsply) (Figure 1e). Immediate post space preparation was done till passo size 3 leaving 5 mm of apical gutta percha which was followed by fiber post (Easy post, size 1) cementation with resin cement (Rely X U 200, 3 M ESPE) (Fig 1f, g).



Fig 1: (a) Pre-operative buccal view (b) Pre-operative palatal view (c) Surgical flap elevation to know the extent of fracture margin (d) Master cone IOPA (e) Obturation IOPOA (f) Fiber post cementation (g) Fiber post cementation IOPA

Internal dentin groove preparation was done within the tooth fragment to create space for the fiber post and luting agent and to ensure close adaptation of the fragment with the tooth surface. Bonding procedures were then carried out on the tooth and the fragment. Etching was done with 37% phosphoric acid etchant gel (Ultra etch, Ultra dent) for 15 to 20 seconds (Fig 2h), and then washed for 5-10 seconds, followed by application of bonding agent (Adper Single Bond 2, 3 M ESPE) (Fig 2i) as per the manufacturer's instructions. Flowable composite (Filtek Z350 XT, 3 M ESPE) was used to lute the tooth fragment to the tooth surface, followed by light curing for 40 seconds (Fig 2j, k). The occlusion was checked carefully and evaluated. The margins were then finished with diamond finishing burs and polished with a series of Sof-Lex

disks (3M ESPE, USA) and polishing paste. Surgical flap was closed and sutures (3-0 black silk) were placed. Final radiograph was taken. Patient was recalled after 5 days for suture removal and follow up. (Fig 2l) Final radiograph was taken to confirm the proper alignment and adaptation of the attached fragment. (Figure 2m). The patient was given oral hygiene instructions and was recalled for follow up visits. In the follow up visit after 5 days, patient showed satisfactory results esthetically and functionally and a composite build up was done. (Figure 2n). Patient came for follow up appointment after 1 year and the results were periodontal response was satisfactory, however composite discoloration was evident in the follow up visit. (Figure 2o)



Fig 2: (h) Acid etching with 37% phosphoric acid (i) Bonding agent application (j) Fragment reattachment done (k) Fragment reattachment – palatal view (l) Suture placement (m) Post-operative final IOPA (n) Sutures removed and composite build up done (o) Follow up -6 months.

Case Report 2

A 23 year old male patient reported to the Department of Conservative dentistry and Endodontic with the complaint of broken upper front tooth, after trauma from a bike accident, 3 days back. The medical history was noncontributory. Clinical and radiographic examination revealed an oblique crown root fracture, with pulp exposure in the maxillary left lateral incisor. (Fig 3a, b). The patient had brought the tooth fragment with him wrapped in the handkerchief. Periodontal probe was used and an intramuscular bone sounding was done, to determine if there was any biologic width violation. The patient was informed about the treatment option of

fragment evaluation and reattachment, for which the patient Agreed and hence an informed consent was obtained prior to the treatment procedures. The fracture line was extending below the gingival margin, hence a laser crown lengthening procedure by approximately 1.5-2 mm was performed on the palatal aspect for the maxillary left lateral incisor before the reattachment procedure. (Fig 3 (c)). The tooth fragment was stored in physiological saline solution till the reattachment procedure. Following the crown lengthening procedure, the fragments were checked for their close adaptation to the tooth structure. Local anaesthesia was administered using 2% lidocaine with 1:80,000 epinephrine. A single visit root canal

treatment was initiated (Fig 3 (d) which was followed by post space preparation (Fig 3 (e) fiber post cementation (Figure 3 (g, h)) similar to the previous case. Internal dentin groove preparation was done in the tooth (Fig 3 (f) Following which, the bonding procedures were carried out both on the tooth and the fragment in a similar manner (Fig 3i, j) and the tooth fragment was luted using flow able composites. (Fig 3k, l)

Final radiograph was taken (fig 3m) and the patient was given oral hygiene instructions. The patient was recalled and followed up after 3 months. The patient was satisfied, however, staining was evident on the labial surface. (Fig 3 (n)) The palatal aspect showed satisfactory gingival healing. (Fig 3 (o))



Fig 3: (a) Preoperative buccal view of complicated crown root fracture (b) Laser crown lengthening done palatally (c) Pre-operative IOPA (d) Laser crown lengthening done palatally (e) Post space preparation (f) Internal dentin groove within the fragment (g) Fiber post cementation done (h) Post cementation IOPA (i) Acid etching with 37% phosphoric acid for the fragment (j) Bonding agent application (k) Fragment reattachment done (labial view) (l) Fragment reattachment (palatal view) (m) final IOPA (n, o) Post-operative after 3 months – labial & palatal view.

Discussion

Conventional methods for restoration of fractured teeth includes partial and full coverage crowns, laminate veneers and composite resins, all of which are time consuming, expensive and involves sacrifice of sound tooth structure [4]. With the continuous development of bonding techniques and the achieved high bond strength, reattachment of the fractured piece to the fractured tooth has emerged as a treatment modality in the field of dental practice. Tooth fragment reattachment presents a viable alternative for restoration of fractured tooth, when the coronal fragment is intact and offers several advantages such as conservation of tooth structure, preservation of incisal translucency, favourable colour match and colour stability, maintenance of original contacts, favourable wear mechanism, positive emotional influence, cost effective and less time consuming [5]. The present paper reports two successful cases of fragment reattachment done for a complicated crown root fracture with a follow up of 1 year. The success of fragment reattachment procedure depends on adequate rehydration of the tooth fragment. Dehydration of the fragment results in collapse of the collagen fibres resulting in insufficient resin monomer penetration and hence reduction in the bond strength values. Hence, for a successful rehydration procedure fragment must be rehydrated for at least thirty minutes prior to reattachment procedure [6]. In the above cases, sufficient hydration of the fragment was maintained by storage in physiologic saline solution. In both the above cases, fracture line was extending subgingivally on the palatal aspect, so to allow for perfect visualization and approximation of the margins, procedures like crown lengthening was done in the first case and surgical flap elevation in the second case. Since, the fracture line was not violating the biologic width, osteotomy was not done. A single visit approach with the use of prefabricated posts was followed for all the cases. This is in accordance with other studies where a fiber post has been inserted in the root canal and can be used to connect the fractured portion and

further decreases the need for preparation of external preparation of bevels or grooves [7, 8]. The use of fiber posts offers several advantages such as suitable elastic modulus, esthetics, good bonding between post and cement, lower chair time, and minimal tissue removal. It has been suggested that fiber posts luted with resin cement increases the retention of the segment, further providing a monobloc effect [6]. E above case reports. Study by *Reiss et al.* assessed the fracture strength of different reattachment techniques and concluded that Simple reattachment recovered only 37.1% of intact tooth fracture. Superficial over contour, placing a internal groove provided fracture strength as high as sound teeth, 97.2% & 90.5% respectively [9, 10]. A total etch adhesive system (Adper Single Bond 2) along with flowable composite resins were used in the present cases. Total etch systems provide higher bond strength values than self-etch systems. Further, Studies have reported that flowable composite resins can be used to fill the minor discrepancies between the fracture segment and the remainder of the tooth surface [11]. Success of the reattachment procedure depend on several factors such as perfect adaptation and accurate fit of the fragment, adequate fragment rehydration, adequate bonding procedures and rubber dam isolation [12]. Use of prefabricated post with the original fragment has been reported in the literature and provides a conservative and esthetic rehabilitation treatment strategy [13, 14]. However, more number of patient with longer follow up periods would be necessary to substantiate the efficacy of the treatment.

Conclusion

Fragment Reattachment procedure can provide favorable and long-lasting esthetics because the tooth's original anatomic form, color, and surface texture are maintained. Reattachment also restores function, provides a positive psychological response, and is a relatively simple procedure.

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