

Case Report

A conservative single sitting treatment of a complicated crown root fractured teeth - A case report

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ABSTRACT

Complicated crown root fractures is one of the most challenging form of dental trauma. Reattachment of the tooth fragment should be the first choice while reconstructing fractured tooth if the fragment is available. Reattachment of fracture fragment can restore esthetic, original tooth shape, color, translucency and functions. This case report presents a case of a complicated crown root fracture of a permanent maxillary right central incisor. The traumatized tooth was treated endodontically. Access to the subgingival margins was gained by raising the palatal flap. The fractured fragment was reattached using bonding system and dual cure resin.

INTRODUCTION

Dental trauma often has a severe impact on the social and psychological well-being of a patient.¹ Crown root fracture involves enamel, dentin and cementum and occurs below gingival margin. Crown root fracture without pulp exposure is uncomplicated and with pulp exposure is termed as complicated. Complicated fractures of anterior teeth can be treated by means of direct or indirect restorations.² Reattachment of fragment should be a first priority when the tooth fragment is available and there is no or minimal violation of the biological width.³

In 1964, Chosack and Eilderman had done the first reattachment case on a 12 yr old child.⁴ A reattachment of fragment restores esthetic, original tooth shape color, translucency and surface structure. It is easy to practice, economic and has potential to assume incisal strength during tooth functioning. It give psychological comfort to patient while maintaining healthy periodontal attachment.³ Factor which influence the success of reattachment depends on site of fracture, size of fracture remnant, time of dehydrated fracture remnant, patient's periodontal status, maturity of root formation.⁵

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This article describes management of complicated crown root fracture of maxillary right central incisor by adhering fractured tooth fragment.

CASE REPORT

A 24 yr old male patient reported to department of conservative dentistry and endodontics. Patient complained of mobile and broken tooth in upper front tooth region.(Fig. 1 a) He brought a fractured fragment to the department. He had experienced trauma one day back. He gave history of malaligned teeth in upper front region. His medical history was not relevant. On intraoral examination , no apparent trauma to soft tissue was found. While examining the maxillary right central incisor one more fracture fragment was seen which was attached to gingival fibers of soft tissue on the palatal side. On clinical and radio-graphical examination, diagnosed a complicated crown-root fracture of maxillary right central incisor. (Fig. 1 b) The fracture line was supragingival on labial aspect and subgingival on palatal aspect. Biologic width was determined by measuring probing depth and conducting intrasulcular bone sounding. No periapical pathosis was present. Different treatment options were given to patient he chose reattachment treatment modality.

A palatal mobile fragment was removed under local anesthesia and both the fragments were disinfected with 2% chlorhexidine(Fig. 2 a) and adhered to each other with resin cement and stored in saline till reattachment. (Fig. 2 b)

Inflamed pulp from maxillary central incisor was removed. Working length of the affected tooth was determined, biomechanical preparation using k file and h file was done.

A crevicular incision was given from distal to maxillary right lateral incisor upto distal to maxillary left central

incisor. A conventional palatal flap was raised followed by obturation using AH plus sealer was done under proper isolation.

Post space preparation was made by using Peeso reamers leaving the apical 4 mm of gutta-percha intact, and obtained a radiograph.

Fiber post (Mailyard fiber post) was selected with the same size corresponding to peeso reamer. (Fig 3) Retention box was made using a straight fissure bur in coronal fragment to accommodate head of the post. Etching the surface of the post and the canal by using 37% phosphoric acid (D-tech) for 15 seconds followed by rinsing the surface with water, dried it with air. An application of single universal adhesive (3M ESPE) by using a applicator tip was done. Light curing the adhesive for 10 seconds was done after removing the excess by using paper points. Post was cemented using dual cure adhesive (Fusion Ultra D/C Universal Prevest DenPro). (Fig. 4) Isolation was maintained throughout the procedure.

Etching , rinsing and drying of the tooth fragment followed by application of bonding agent was done. Light curing was done for 10 seconds to fragment. Dual cure was applied on fragment as well as tooth, reattachment of the fragment to the tooth was done. Light curing for 40 seconds from both buccal and palatal direction was done.

On the coronal aspect of the fractured tooth, a double chamfer margin was created 1 mm coronally and apically to the fracture line using a round diamond bur. After acid etching, single bond adhesive was applied to the chamfer area, followed by restoring with composite resin (Filtek Z250, shade A2) and light curing was done, according to the manufacturer's instructions. Final finishing and polishing of the margins and composite resin restoration was done using finishing burs and composite finishing

kit(SHOFU, SHANK CA, PN 0306, Shofu Dental Corporation, USA). Flap was sutured using 3.0 black silk material and post operative instructions were given. The occlusion was carefully checked and adjusted, and the patient was dismissed after receiving instructions to avoid exerting heavy function on this tooth and to follow regular home care procedures relative to oral hygiene. Suture removal was done after 7 days. (Fig. 5 a,b)

One month later, clinical and radiographic examination revealed a stable reattachment of crown fragments. (Fig. 6) After 6 months, the clinician found a 1-mm palatal probing depth, no bleeding on probing and normal mobility, and radiographic examination showed a stable reattachment of the fragments and good periodontal health. (Fig. 7) The patient was asymptomatic throughout the period and the tooth was serving both esthetics and function.



Fig. 1 a: Preoperative clinical view



Fig. 1 b: Preoperative radiographic view



Fig. 2a: Fracture Fragments



Fig. 2b: Adhered Fragment



Fig. 3: Intracanal radiograph showing fiber post selection



Fig. 4: Post-operative radiograph



Fig. 6: clinical view after 1 month



Fig. 5a: Clinical view after suture removal (Labial View)



Fig. 7: clinical view after 6 month



Fig. 5b: Palatal View

DISCUSSION

Management of a complicated crown root fracture is challenging because of difficulty in achieving isolation. There are various modalities in treating crown-root fracture which involves direct or indirect restorations.⁶ Cavalleri and Zerman compared fragment reattachment versus direct adhesive restorations for treatment of coronal fractures. The best result after 5 years was of tooth fragment reattachment technique, particularly regarding esthetic results. Thus, among the conservative approaches that are available, the reattachment technique offers reasonable prognosis and longevity.⁷

If the fracture line is supragingival and the fragment is available in a good condition then reattachment of fragment should be the first choice. But when the fracture line is subgingival, then various treatment

options such as surgical extrusion of root, orthodontic extrusion, clinical crown lengthening or gingivectomy can be taken into consideration.⁸ In this case, the fracture line was present supragingival on labial aspect and subgingival on palatal aspect. So, reattachment of fragment was considered as a treatment choice.

In the present report, fracture was directed from the labial to lingual aspect in an apical direction. This fracture shows low resistance to labially applied forces. Hence it was important that the restored fragments be reinforced with techniques that exhibit high fracture resistance to labially applied forces.⁹ Reis *et al.* demonstrated that creation of an internal groove on both fragment and on the fractured tooth, as well as, composite over contouring to the fracture line by placement of a bevel provided high fracture strength.^{10,11,12} So, in present report retentive groove were prepared before bonding to improve the strength. External double chamfer margin was created after the bonding procedure to mask the fracture line, along with the strength which improved the esthetics.

Maintenance of adequate hydration of the fracture fragment when it is outside the mouth is another important factor to ensure adequate bond strength. Hydration also maintains original esthetic appearance of the tooth.⁶ In the present case, the fractured fragment was preserved in distilled water until reattachment, it improved the esthetics with proper color matching to the natural tooth structure.

In this study, AH plus sealer was used in obturation because eugenol inhibits resin polymerization by releasing free radicals. AH plus sealer is an epoxy amine sealer with high flexural strength and sealing ability. According to literature, post space could be prepared immediately after obturation using AH plus sealer.^{8,13}

Fiber post has excellent biocompatibility, esthetic and mechanical properties. Modulus of elasticity of fiber post is equal to modulus of elasticity of root dentin. In theory, a post that flexes together with the tooth during function should result in better stress distribution and fewer fractures.⁸

In this case, Resin cement was used because they increase retention by forming micromechanical bond with dentin and also provides superior strength and fracture resistance. Junge *et al.* reported that posts cemented with resin cements were more resistant to cyclic loading than were those cemented with zinc phosphate or resin-modified glass-ionomer cement. Using the fiber post with the resin cement, monoblock effect is produced which also increases the retention of the segment.¹⁴

Soliman *et al.* demonstrated as long-term observational study of 8 years follow-up showed that the functional survival of adhesive fragment reattachment (AFR) treated teeth was high, suggesting that adhesive fragment reattachment might be suitable as a long-term temporary treatment option. In particular, in young patients, where other options such as fixed partial dentures or dental implants are not possible or are contraindicated, AFR can help to postpone more invasive treatments.

Nevertheless, all teeth with hairline cracks, infractions or splinters suggestive of additional root fractures should be excluded from AFR treatment and possibly considered for other treatment options such as orthodontic extrusion or intra-alveolar transplantation or extraction.¹⁵

Limitation of the study includes, resin cements are technique sensitive. So, extra care has to be taken while etching and bonding of tooth and post to avoid contamination of dentin and post.

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.

CONCLUSION

Reattachment technique is the most conservative and biological method of restoring a fractured anterior tooth. Reattaching a tooth fragment with newer adhesive materials may be successfully used to restore fractured teeth with adequate strength, but long term follow up is necessary in order to predict the durability of the tooth-adhesive-fragment complex and the vitality of the tooth. This procedure helps us to preserve maximal natural tooth structure. Patient cooperation and understanding of the limitations of the treatment is of utmost importance for good prognosis.

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