Case Report

Fracture Fragment Reattachment Using Projectors and Anatomic everStick Post™: An Ultraconservative Approach

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Abstract

Traumatized anterior teeth require quick functional and esthetic repair. Tooth fragment reattachment is a simple and conservative clinical procedure to restore fractured anterior teeth. Different techniques of reattachment include enamel beveling, "v-" shaped internal enamel and dentin grooves, external chamfer, over contouring, and by placing fiber post, all of which were invasive methods. This article describes a novel technique of reattachment using canal projectors for stabilizing fractured fragments followed by endodontic therapy and internal reinforcement with custom fiber post (everStick Post™, GC Corporation, Tokyo, Japan).

Keywords: *Canal projectors, fiber post, reattachment*

Introduction

Reattachment of fractured coronal tooth fragment without invading the attachment apparatus is one of the most currently acceptable noninvasive treatment options with a high clinical success due to vast advancements in adhesive technology.[1] Simple complicated supragingival fractures can be managed by endodontic therapy followed by bonding the fragments and stabilized with a fiber post.[2-4] An ultraconservative option of managing such fractures is by preendodontic stabilization using projectors followed by endodontic therapy and internal reinforcement using individualized custom fiber post.

Canal projectors were first introduced by Gerald N Glickmann and Roberta Pileggi to maintain the patency of the root canal during preendodontic buildup of a badly mutilated tooth. These projectors provide direct visualization and access to the projected canals. In this case report, we have described the unique benefits of using canal projection, not only for stabilizing fractured coronal fragment but also acts as a "hydraulic chamber" with increased surface area for even distribution of stresses.[5]

Recently a new soft, flexible individually formable resin-impregnated E-glass fiber post (everStick Post™, GC Corporation, Tokyo, Japan) with patented interpenetrating polymer network was introduced to suit any root canal morphology without the need for postspace preparation thus preserving the root dentin. These are available in three diameters of 0.9 mm, 1.2 mm, and 1.5 mm having 1600, 2000, and 4000 fibers, respectively, with a modulus of elasticity similar to that of dentin, facilitating even distribution of occlusal stresses.[6]

This article presents a novel technique of fractured fragment reattachment using projectors and individually formable everStick™ glass fiber posts.

Case Report

A 23-year-old male patient reported a day after trauma with fractured maxillary left central incisor. On clinical examination, a simple complicated fracture with a supragingival fracture line in the cervical third extending mesiodistally on the labial surface with

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access cavity prepared on the palatal surface was noted [Figure 1a and b]. On occlusal examination, Angle's Class I molar relation with normal overjet and overbite was noted. Intraoral periapical radiograph revealed fracture line involving pulp with intact root and periodontium [Figure 1c]. After explaining various treatment options, a single visit endodontic therapy with tooth fragment reattachment was planned after obtaining patient consent.

Reattachment of fractured fragment with canal projector technique

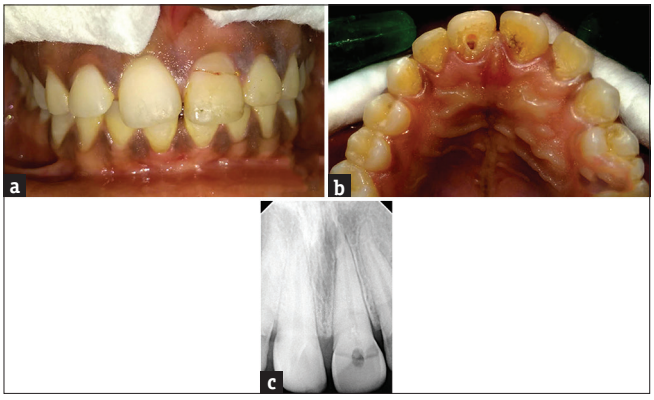
A tightly fitting, greater taper gutta-percha cone that acts as a projector was selected and sealed at the orifice level without any gap. Now, the coronal fragment was gently reflected palatally and universal flowable resin composite (G-aenial universal flowable composite resin) was injected and the fragment was approximated, excess composite was removed and light cured for 40 s from both the labial and the palatal surfaces [Figure 2a and b]. Now, gutta-percha projector was removed with a gentle counterclockwise rotation.

Single visit endodontic therapy

After stabilizing the fragment, working length was established as 26 mm using Ingle's method and the canal was shaped till 45 k file, and sectional obturation with gutta-percha was done till 5 mm from the apex using warm vertical compaction technique.

Internal reinforcement with customized everstick post™

The desired length of everStick post™ was cut and inserted till a depth of 21 mm. The wide cavum area was filled with additional everStick posts™ using a hand spreader in lateral condensation technique. Now this customized, well-adapted glass fiber post was tack cured for 10 s and removed from the canal [Figure 3a]. This post was luted with a dual cure resin luting agent, Rely X U 200(3M ESPE, St. Paul, USA) and cured for 20 s [Figure 3b]. A nanohybrid composite resin was used to contour the palatal surface, and the patient was completely satisfied with the immediate esthetic results [Figures 4a and b]. Follow-up evaluation after 1 year was clinically and radiographically satisfactory [Figure 5a-c].



Figures 1: (a and b) Preoperative labial and palatal view. (c) Preoperative radiograph

Discussion

The procedure of reattaching the fractured tooth fragment and reinforcing it with a prefabricated fiber post is a minimally invasive technique as it requires atraumatic removal of the coronal fragment and preparation of a channel on its inner surface to fit the head of the post during rebonding. This removal of the fragment might result in a subgingival fracture which requires either gingivectomy or raising a palatal flap for predictable bonding. The retention and resistance offered by the fiber post mainly depend on how well the post adapts to the root canal wall.[7] The closer the adaptation, the better will be the retention and stress distribution.[8] However, the main drawback with the prefabricated fiber posts is that they are rigid and customization to the available canal diameter is even difficult. Hence, reattachment without removal of fractured fragment using a customized anatomic fiber post would be an ideal method of reattachment in complicated crown fractures.

The reattachment technique described in our case report is simple and ultraconservative without removal of the fragment and reinforced with a well adapting customized anatomic everStick™ fiber post. As the patient presented with a completed access preparation through the fractured fragment, instead of removal and rebonding, the canal projection technique was selected for preendodontic stabilization. A greater taper, gutta-percha canal projector was used, which is readily available and a very economical alternative to Projector Endodontic Instrument Guidance System as described by Tanikonda.[9] The main benefit of using projectors in complicated fractures is that the fragment can be bonded with the composite resin, thus stabilizing the fragment, and preventing further propagation of the fracture line. When the canal is projected, the orifice will be relocated 3–4 mm coronally on to the occlusal surface

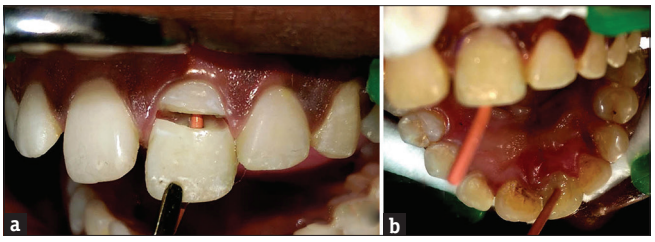


Figure 2: (a) Gutta-percha canal projector. (b) Labial and palatal view after bonding

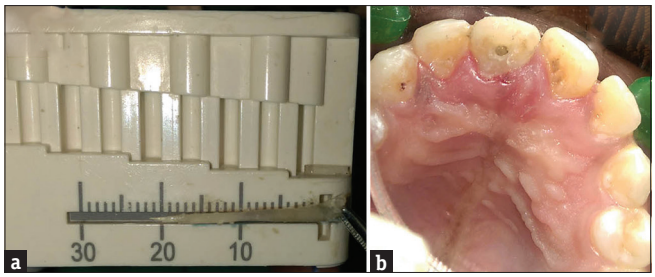


Figure 3: (a) Customized 21 mm long everStick™ post. (b) Reinforcement with anatomic everStick™ post

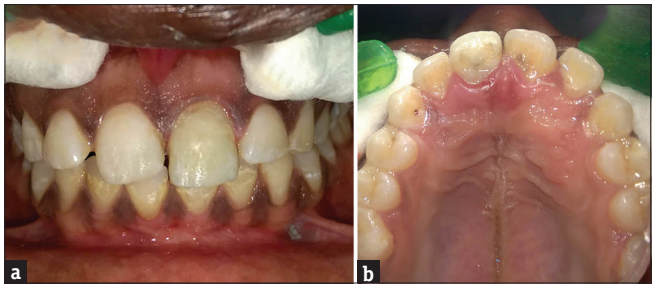


Figure 4: (a and b) Postoperative labial and palatal view

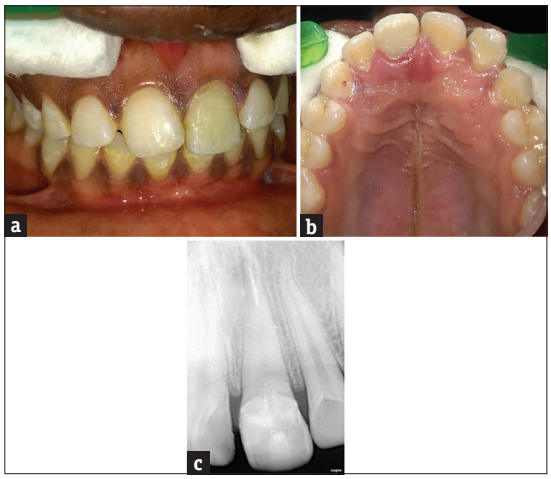


Figure 5: (a and b) Clinical images of follow-up after 1 year. (c) Follow-up radiograph

thus elongating the canal. This elongated canal provides an additional surface area for bonding during internal reinforcement with fiber post.

The other additional advantages are the projectors prevent blockage of the canal lumen by the entry of resin composite, the elongated chamber acts as a reservoir for the irrigant and also facilitates hydraulic condensation of gutta-percha during warm vertical compaction by acting as a "hydraulic chamber" Glickman and Pettiette 2006.[5]

Reinforcement with anatomic everStick™ E-glass fiber post creates a classic primary monoblock, with a single interface between root dentin and the resin luting cement. The anatomic post is fabricated by adding additional everStick™ posts to the main post. The bond between two everStick™ posts is by the free radical polymerization between the polymethyl methacrylate (PMMA) molecules present on their outer surfaces thus uniting the posts into a single, coherent unit that exactly replicates the canal morphology. The resin in the luting agent diffuses into the PMMA-enriched outer surface of the everStick™ post and gets interlocked into the interpenetrating polymer resin network after polymerization by interdiffusion bonding.[10] Completely extending the everStick fiber posts into the elongated chamber provides maximum support to the coronal fragment by minimizing the occlusal stresses over it.

Conclusion

This procedure of reattachment using canal projector technique and customized everStick™ post with satisfactory esthetic and functional outcome neither requires removal of the fractured fragment nor drilling and therefore would be an ideal, ultraconservative approach than conventional reinforcement with a prefabricated fiber post.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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