High strength and bonding achieved with new flexible EverStick posts: A case report

ABSTRACT

Tooth structure that remains after endodontic treatment has been undermined and weakened by all of the previous episodes of caries, fracture, tooth preparation, or restoration. A post and core becomes a necessity in most of the cases. The tooth is further weakened when the clinician decides to give a full coverage crown which leads to greater tooth structure loss. In these two case reports, a novel technique has been discussed involving a new material in which lost tooth structure is restored by means of direct composite resin. The teeth following the treatment are structurally strong and possess good esthetics.

Key words: Composite restoration; EverStick post; fan-shaped; interpenetrating network; mutilated tooth.

Introduction

Endodontically treated teeth often are left with little remaining coronal structure. This could either be because of the excavation of caries, access cavity preparation, previous restorative procedure, etc., during root canal treatment. In such instances, coronal restoration has to be retained with a post and core. Traditionally, post and core consisted of a metal post and core that were custom made. Further development in the field of dentistry marked the introduction of prefabricated posts, one such being fiber-reinforced posts. A novel method introduced lately for restoring a mutilated tooth is through EverStick posts which may overcome the disadvantages (one such being its rigidity and root fracture) of using metal posts. It is a soft, flexible and adaptable unpolymerized glass fiber post. It is also called as Electrical glass fiber post as it is chemical composition makes it an excellent electrical insulator. It is made from a mixture of oxides of silica, calcium, boron, aluminum, and some other oxides of alkali metals.

The preparation required for this post allows root dentin tissue to be preserved as its fibers adapt to the shape of the root canal, and the risk of dentin perforation can be prevented. Furthermore, it can be used in curved canals. It obtains high flexural strength after light curing. Its modulus of elasticity is similar to dentin. The micromechanical bonding between composite and core ensures a strong bond to the composite core and the root canal. It has unidirectional fiber bundle with diameter ranging from 0.9 to 1.2 or 1.5 mm. The fibers are impregnated with polymethylmethacrylate (PMMA) and 2,2-bis-(4-[2-hydroxy-3-methacryloyloxypropoxy]phenyl)-propane (bis-GMA) with an interpenetrating polymer network (IPN).

Case Reports

Case 1

A 40-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of missing right maxillary lateral incisor.

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complaint of pain and fractured tooth for 4 days. Clinical and radiographic examination revealed Ellis class 3 fracture in 22. The tooth was diagnosed with irreversible pulpitis, and so endodontic treatment was initiated. Access preparation was carried out. The working length was estimated using no 10 K file. Biomechanical preparation was done using the step back technique. The patient was recalled and obturation was done using the lateral condensation method. The necessity to restore the anterior tooth quickly and considerable amount of tooth destruction was the reason to choose the individual root canal post and direct composite build-up as a treatment method. The patient was recalled, and it was decided to treat the patient with EverStick post and composite core build-up.

Gutta-percha was removed with a peeso reamer till no #2 without enlarging excess of the canal, leaving 5 mm of gutta-percha apically. Then the canal was rinsed with normal saline and dried carefully using paper points. Further, the length of the root canal space was measured with a #20 K-file. The total height of the tooth, including the coronal structure required for core, was also estimated.

The EverStick post of 0.9 mm diameter was taken out from the foil bag; the required post was cut from the silicone strip using scissors, and the foil bag was closed with its sticker [Figure 1c]. The post was then carried to the canal with the help of a tweezer, and its fit was checked at the length measured by the file, which was 15 mm [Figure 1d]. The spreader was then inserted to see if any space was left for an additional post. It was taken out and light cured for 10 s [Figure 1e]. The hardened post was then inserted to ensure its snugly fit. The canal was then filled with Stick Resin with an intraoral tip and post was luted with Relyx resin cement. Further, the tooth was etched (34% Tooth Conditioner Gel Syringe, Dentsply), bonding agent applied (Prime and Bond NT) and composite restoration (3M ESPE Filtek Z 250) was carefully sculpted over it to replicate the crown structure and was light cured [Figure 1f].

Case 2
A 30-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of pain and food lodgment in the left lower back tooth region. Clinical and radiographic examination showed an extensively mutilated tooth structure in 36. Further diagnosis revealed irreversible pulpitis in 36. After performing the diagnosis, we decided to carry on with the endodontic treatment followed by post and core. Access opening was done in 36. The working length was estimated using no 10 K file. Biomechanical preparation was done using the step back technique. The patient was recalled and obturation was done using the lateral condensation method. After a week, patient was recalled for permanent restoration. It was decided to use EverStick post, as it would have anatomically adjusted to the available post space and would have prevented any further destruction of the healthy tooth. Post space was made with peeso #2 and post of 0.9 mm diameter was selected [Figure 2a]. The uncured post was inserted inside the canal, and its fit was checked [Figure 2b]. The post was then taken and light cured for 10 s [Figure 2c]. Stick resin was inserted with an intraoral tip and post was luted with Relyx resin cement. Further, the tooth was etched (34% Tooth Conditioner Gel Syringe, Dentsply), bonding agent applied (Prime and bond NT), and composite restoration (3M ESPE Filtek Z 250) was carefully sculpted over it to replicate the crown structure and was light cured [Figure 2d-f].
Discussion

Since many years, post and core mainly custom-made were the restoration of choice for a mutilated endodontically treated tooth. Due to its various disadvantages which include multiple visits, laboratory fabrication, and other complications like root fractures and risk of corrosion; technology has shifted to prefabricated posts systems which are available in today’s market. Nowadays, prefabricated posts used are fiber-reinforced composite posts that are composed of glass fiber, quartz fiber, or carbon fiber embedded in a polymer matrix.[6]

Both the custom made and prefabricated post systems present certain difficulties such as more removal of dentin during post space preparation, lack of flexibility of posts which leads to poor adaptation with the root canal and lack of reversibility of core structure once the curing process is over. To overcome these difficulties EverStick post have been introduced.

Ever stick post is a flexible, resin impregnated, uncured glass fiber post which has an Interpenetrating polymer network (IPN) resin matrix that can be cured to the anatomic shape of the crown.[7] The specialty of this technique is that resin impregnated unpolymerized glass fiber post very well adapts to the morphology of the root canal and attains high flexural strength after light curing. The glass fibers can be reactivated even after polymerization, leading to desired shape of the core. In addition, it provides maximum support to the crown structure by filling the root canal space completely with fibers. After curing these fiber-reinforced posts exhibit high tensile strength and elastic modulus being similar to the elasticity of dentin, thereby causing less root fracture. This allows the stress of occlusion to be evenly distributed throughout the root structure.[8]

The preparation required for the EverStick post is less as compared to cast metal and prefabricated metal/fiber posts. This allows root dentin to be preserved and causes less chances of root perforation. It was suggested that remaining dentin thickness is a critical factor in resisting fracture.[9] For this reason, the canal was prepared till peeso #2 in both the cases.

This interpenetrating network post is designed in an attempt to strengthen the bond between the post and the resin so that adhesive failures and microleakage can be prevented. The bonding of the fiber reinforced post with Interpenetrating network resin matrix to the composite resin and adhesives cement was improved by an interdiffusion bonding mechanism resulting in a “Monobloc” type of restoration.[10,11] An in vitro and in vivo research indicates that the failure of fiber post and core restorations often occurs because of debonding between the fiber post and the resin interface as a result of inadequate bond strength.[11]

A wig shape or fan shape core was made in the anterior which bonded with the composite core build-up material.

The fracture resistance values (950.1 ± 4.7 N), which is higher than other glass fiber posts as tested in various in vitro studies.[12,13] This is due to the IPN structure of the post enabling a strong bond to the dentin. In a study, these
posts showed maximum penetration of bonding resin in all three sections of the post as compared to other groups. A layer of PMMA is present on the outer surface of these posts. Adhesive resins which have solubility parameters close to that of PMMA can diffuse into the EverStick post. Stick Resin is one such adhesive resin that contains bis-GMA, triethylene glycoldimethacrylate (TEGDMA), camphoroquinone and 2-(dimethylamino) ethyl methacrylate. The bis-GMA and TEGDMA present in Stick Resin have solubility parameters close to that of PMMA, thus enabling the diffusion of the resin into the PMMA enriched outer surface of the EverStick posts, which becomes interlocked into the IPN polymer matrix after polymerization. Stick Resin was inserted before the post, directly into the canal to prevent any voids.

The premanufactured fiberglass posts would not have been as effective as they do not allow any individual shaping of the post. Both the patients were very happy with the outcome because they got their teeth restored quickly, with a good esthetic result, without pain, and with a low cost.

Conclusion
This technique provides the clinicians with a glorious opportunity of giving perfect esthetic restoration with high flexural strength and bonding with composite without compromising on the tooth structure in one sitting. Further studies are needed in relation to the longevity of the post.

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Conflicts of interest
There are no conflicts of interest.

References
1. Ferrari M, Vichi A, Garcia-Godoy F. Clinical evaluation of fiber-reinforced epoxy resin posts and cast post and cores. Am J Dent 2000;13:15-8.
2. Kalkan M, Usumez A, Ozturk AN, Belli S, Eskitascioglu G. Bond strength between root dentin and three glass-fiber post systems. J Prosthet Dent 2006;96:41-6.
3. Boudrias P, Sakkal S, Petrova Y. Anatomical post design meets quartz fiber technology: Rationale and case report. Compend Contin Educ Dent 2001;22:337-40.
4. Mannocci F, Bertelli E, Sherriff M, Watson TF, Ford TR. Three-year clinical comparison of survival of endodontically treated teeth restored with either full cast coverage or with direct composite restoration. J Prosthodont 2002;88:297-301.
5. Lastumäki TM, Lassila LV, Vallittu PK. The semi-interpenetrating polymer network matrix of fiber-reinforced composite and its effect on the surface adhesive properties. J Mater Sci Mater Med 2003;14:803-9.
6. Vichi A, Grandini S, Ferrari M. Clinical procedure for luting glass-fiber posts. J Adhes Dent 2001;3:353-9.
7. Kallio TT, Lastumäki TM, Vallittu PK. Bonding of restorative and veneering composite resin to some polymeric composites. Dent Mater 2001;17:80-6.