

Custom-Made Polyethylene Fiber-Reinforced Composite Resin used as a Short Post for Pediatric Anterior Teeth

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ABSTRACT

Aesthetic requirement of severely mutilated primary anterior teeth in the case of early childhood caries has been a challenge to pediatric dentist. Among restorative treatment options pre fabricated crown, and biological and resin composite restoration either by means of direct or indirect technique are mentioned in the literature. This article presents a case of early childhood caries where Reinforcement fibers (poly ethylene fiber) have been used as an intra canal retainer. Polyethylene fibers appear to have best properties in elasticity, translucency, adaptability, tenaciousness, resistance to traction and to impact. Along with ease of application fiber can be used as an alternative to traditionally used materials in the management of early childhood caries.

Keywords: Early childhood caries, Esthetics, Hybrid Composite, Polyethylene Fiber

INTRODUCTION

There is an old saying "Health is harmony disease discord". This saying lays a foundation on which beauty rest. Hence healthy oral cavity is a primary requisite for beautiful looks. Despite the fact that it is largely preventable, dental caries is the most common chronic disease of childhood¹. Caries in very young children known as early childhood caries, may be defined as at least 1 carious lesion affecting a maxillary anterior tooth in a pre-school-age children.²

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The early loss of primary anterior teeth may result in reduced masticatory efficiency, loss of vertical dimension, development of parafunctional habits (tongue thrusting, speech problems), esthetic functional problems such as malocclusion and space loss, and psychologic problems that can interfere in the personality and behavioral development of child.^{4,5} Various restorative treatment options are pre fabricated crown, and biological and resin composite restoration either by means of direct or indirect technique are mentioned in the literature. Reinforcement fibers (poly ethylene fibers) were recently introduced and can be used as intra canal retainer associated to resin composite as an alternative option for reconstruction of primary incisors greatly damaged by extensive carious lesion. More recent approach has used composite alone or in combination with other reinforcement material and the use of fiber set in composite resin resulted in an increase in strength of restoration.

In recent years, various types of fiber reinforcement have come into widespread use as an alternative to cast or prefabricated metal post in restoration of endodontically treated teeth.¹³ The advantage of using reinforced fiber to construct an intra-canal post includes resin composite crown reinforcement, and Polyethylene fibers appear to have best properties in elasticity, translucency, adaptability, tenaciousness, resistance to traction and to impact.

The present report describes the case of a 3 year old boy with severely decayed maxillary anterior teeth that were restored using polyethylene fiber-reinforced composite resin short posts.

CASE REPORT

A 3 year old boy was referred to our pediatric dental clinic for the management of severely decayed primary maxillary anterior teeth (early childhood caries)(Fig 1).

The child's medical history was noncontributory. After clinical and radiographical examination and after attaining the consent from the parent, treatment was implemented in 2 phases, with root canal treatment performed in phase 1 and the construction



Fig 1: Decayed primary maxillary teeth

of the restoration in phase 2. Owing to the patient’s age, separate sessions were required for each restoration.

Endodontic treatment was carried out using a step back technique up to a no 35 K-file, irrigated with 2.5% sodium hypochlorite, saline and dried with paper points. The coronal two-thirds of the canals were obturated with a calcium hydroxide and iodoform paste (Metapex; Meta Biomed Co., Cheongju City, Korea).

After endodontic treatment i.e. pulpectomy cervical third of each tooth was prepared for the placement of an intra canal retainer i.e. polyethylene fiber (Ribbon) –with 2 mm thickness. A thin layer of resin modified glass-ionomer cement sealer (Fuji IX; GC Corporation) was placed inside the canals to isolate the apical one third of filling material. The necessary length of tape for each dental element was achieved by measuring internal length of each prepared root canal using millimeter periodontal probe. The fiber was cut approximately twice the height of future coronary core restoration (24mm). Polyethylene fiber (Ribbon) was taken on a sterilized wooden stick coated with composite and then placed in the canal and removed. Following this curing was done using LED curing unit (Elipar Free Light II;3M/ESPE) outside the canal so that custom post could be fabricated(Fig-2).



Fig 2: Radiographic image after fabrication of custom post

After fabrication of custom posts, canals (Fig-3) were properly air dried and then custom post were luted in the canal (GC Fuji CEM). Core build up was done with thin layer of flowable composite (ESTHETICXFLOW, DENTSPLY) (Fig-4) and visible light curing was done, and finally coronal restoration was completed using resin composite (DENTSPLY Spectrum; spectrum TPH3) and celluloid strip crowns (Strip crown Form-Pedo; 3M/ESPE). Excess composite was removed through small holes punched in palatal surfaces of the strip crown. After polymerization of the buccal and palatal surfaces, the celluloid crown form was removed by inserting the sharp tip of an explorer between the crown form and the polymerized resin composite at gingival margin. Occlusion was checked and the final finishing and polishing was done (Fig-5). Patients were followed up for six months for retention of restoration(Fig-6).



Fig 3: Custom post fabrication outside the canal



Fig 4: Custom post luted

DISCUSSION

Optimal dental treatment planning requires accurate assessment of outcome of any required endodontic treatment.¹⁶ Both the presence and quality of root filling and



Fig 5: Immediate post operative



Fig 6: 6 month post operative

the quality of coronal restoration have been associated with the development of apical periodontitis.¹⁷⁻¹⁹ However, there is no general agreement regarding the relationship between root canal post and apical periodontitis.¹⁸ Taking into account these factors, in the present case, in which no preoperative root canal infection was observed, a positive outcome is expected, with good healing and function of a severely damaged primary anterior teeth. Radiographically no damage was observed using Polyethylene fiber-reinforced resin short posts on permanent successors.

Use of post and cores enables more extensive reconstruction of grossly destructed anterior primary teeth. There are various materials available for this objective; prefabricated post, metal posts, orthodontic wire post, biologic post, composite post and fiber reinforced posts.^{3, 5, 12, 20, 21}

Prefabricated posts are fast, cheap and easy to use²². but they do not take into account the individual shape of the root canal. Although metal posts are indicated for primary teeth but because of their color metal post do not meet the esthetic requirement. Moreover these may cause problems during the course of natural exfoliation

Composite post provide satisfactory esthetics; however there is risk of loss of retention owing to polymerization shrinkage.^{9, 11}

The use of omega-shaped stainless orthodontic wire as an intracanal post is also simple. However, the wire is unable to adequately adapt to the canal form, because it is not the exact copy of the canal.

Polyethylene fiber is a recently developed material reported to have clinical advantage over traditional post and core material^{5, 13, 14}. These fibers improve the impact strength, modulus of elasticity and flexural strength of composite materials. When compared to other fibers, are almost invisible in resinous matrix. Due to these reasons, they are the most appropriate and the best esthetic strengtheners of composite materials²³. In constructing the short posts. Ribbond was placed only in the cervical one-third of the canals, to avoid interference with the process of permanent tooth eruption^{3, 5}.

Curing was done outside the canal to avoid clinical failures of resin restorations which are reported due low Depth of Cure of restorative materials which in turn causes degradation, substance loss, bulk fracture, discoloration. And the custom post was luted in the canal with glass-ionomer cement (GC Gold Label Luting and Lining Cement, GC Corporation) for improved adherence to the wall of the canal.

CONCLUSION

The treatment described in the case reports is simple and effective and represents a promising alternative for rehabilitation of grossly destructed or fractured primary anterior teeth. This combined technique of polyethylene fibers and composite resin does provide excellent functional and esthetic results.

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