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Case Report

USE OF GLASS FIBER POST FOR ESTHETIC REHABILITATION OF SEVERELY MUTILATED PRIMARY INCISORS: CASE REPORT OF 2 CASES

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ABSTRACT

Dental caries is most common childhood disease which affects children in their very early stages of development. This severe form of caries is also associated with the deleterious effects like difficulties in phonation, mastication and altered esthetics. Restoration of primary maxillary incisors severely damaged by rampant caries or trauma is a clinical challenge in pediatric dental clinics. In the past, the only treatment option would have been to extract the affected teeth and replace them with prosthetic substitutes. With the introduction of new adhesive systems and restorative materials, alternative approaches in treating these teeth have been proposed. This paper presents the clinical sequence of rehabilitation of maxillary anterior primary teeth. Endodontic treatment was followed by the placement of a glass fibre-reinforced composite resin post. The crown reconstruction was done with composite restoration.

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INTRODUCTION

Despite the fact that it is largely preventable, dental caries is one of the most prevalent oral diseases of modern times. Caries in very young children known as early childhood caries (ECC) may be defined according to the American Academy of Pediatric Dentistry as “the presence of one or more decayed, missing (due to caries)”, or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. [1] ECC and trauma are the main reasons for the restoration of anterior teeth in young children. The irony of the situation is that these patients usually approach the dentist only when the teeth are grossly broken down and merely the root stumps are left. [2,3]

The early loss of primary anterior teeth may result in neuromuscular imbalance with reduced masticatory efficiency, speech disturbances, such as interfering with the pronunciation of tongue-tip consonants (e.g. “t,” “d,” “s,” “sh,” and “ch”) and labial sounds (e.g. “f” and “v”); 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 the child. [4,5,6]

In the past, the extraction of involved tooth was most common treatment protocol. This treatment was justified on the basis

that permanent teeth would eventually replace extracted teeth. Now, however, dentists recognize the importance of preserving the integrity of the primary dentition until the appropriate exfoliation time because the consequences of premature loss of primary teeth are well known. Also, more parents are demanding the esthetic restoration of teeth and are not satisfied with extraction. [2,7]

Due to the development of new restorative materials and restorative technique in dentistry, treatment of primary maxillary incisor teeth cannot be neglected. A major issue with maxillary primary incisor teeth that are grossly decayed is the lack of coronal structure to support and provide adhesion for a composite resin. In such cases, the use of an intracanal post in endodontically treated teeth improves the retention for a longer-lasting restoration. [8,9] A variety of materials can be used for this purpose, such as resin composite, metal, biologic and prefabricated posts, orthodontic wire posts, and, recently, omega-shaped stainless steel wire posts. Either direct composite or strip crowns can be used over these posts to complete the final coronal restoration. [6,10,11,12]

In recent years, various types of fiber reinforcement have come into widespread use as an alternative to cast or prefabricated metal posts in the restoration of endodontically treated teeth. Fiber glass post composed of unidirectional glass fibers

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embedded in a resin matrix that strengthens the dowels without compromising the modulus of elasticity. Another advantage of glass fibers is that they distribute stresses over a broad surface area, increasing the load threshold. [11, 13] This paper discusses the restoration of carious primary maxillary incisors using composite resin restoration reinforced with fiber glass post. Two case reports are presented here to describe the procedure.

CASE REPORT

Case one

A 5 year old, male patient reported to the Department of Pedodontics and Preventive Dentistry, Government Dental College, Patiala, with a chief complaint of decayed upper anterior teeth. Patient's medical history was non-contributory. Patient's mother gave a history of breast feeding for 1 year after which the child was bottle fed for 2 years. The milk contained sugar and the child went to sleep with the bottle in his mouth. Intra-oral examination revealed a complete set of deciduous dentition. (Fig. 1) It was observed that 54, 53, 52, 51, 61, 62, 63, 64, 74, 75, 84 and 85 were affected by dental caries. Intra-oral periapical radiographs revealed pulpal involvement w.r.t 51,52,61 and 62. (Fig. 2)



Figure 1 Preoperative clinical picture showing grossly decayed teeth 51, 52, 61 and 62

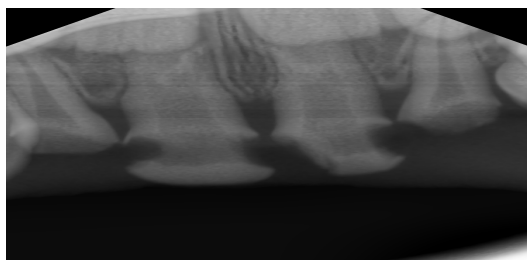


Figure 2 Preoperative radiograph showing teeth 51, 52, 61, and 62.

Treatment Plan

Diet analysis, counseling and oral prophylaxis were undertaken. 54, 64, 74 and 84 were carious and restored with direct composite restoration. 52, 51, 61, 62 were indicated for pulpectomy, followed by glass fibre reinforced composite resin posts and direct composite restoration. 75 and 85 were grossly carious and indicated for pulpectomy followed by stainless steel crowns.

Treatment Progress

The treatment plan was divided into 2 phases for 51, 52, 61 & 62:-Phase 1- endodontic phase & Phase 2- construction of the restoration.

Phase one: the Endodontic Phase

An infraorbital block was administered for 51, 52, 61 and 62. Cotton roll isolation was carried out. Gross carious lesions were removed with a no. 330 round carbide steel bur. Unsupported enamel was not removed so as to preserve as much tooth structure as possible. The pulp chamber was opened & working length was determined using 40 no. k file on RVG and pulp tissue was extirpated using no. 20-no. 80 k files. After irrigation with copious amounts of 2.5% NaOCl & Normal Saline, the root canal was dried using paper points. Canals were obturated with metapex available in syringe form. (Fig.3)

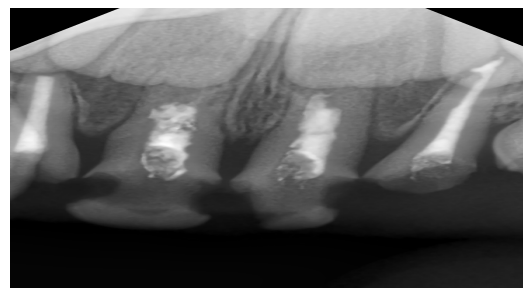


Figure 3 Postobturation radiograph in relation to 51, 52, 61, and 62.

Phase two: the Construction of Restoration

The post space was prepared in the second appointment, seven days after the endodontic treatment was completed. The post space was created by removing approximately 4mm of metapex material using a passo reamer with rubber stopper attached to a contra-angle handpiece. The diameter of the passo reamer used was less than the root canals. All visible metapex on the walls of the post space was removed. The prepared post space was then cleaned with saline, air-dried & acid-etched with 37% phosphoric acid for 20 seconds. This space was rinsed and air dried with oil-free compressed air. A light cured bonding agent was brushed on the etched surface & uniformly dispersed by a compressed air blast. It was then light cured with (Sirona LED Light) for 20 seconds.

The glass fiber post was then cured for 20 seconds in order to gain rigidity, before insertion into the post space. Light cured flowable composite resin was then inserted into the canal and chamber after which the glass fiber post was inserted. The fiber canal and chamber were then cured together for 60 seconds. The coronal portion of the glass fibre reinforced composite post was splayed to increase the surface area for the retention of the core.

The coronal enamel was then etched for 20 seconds, rinsed with water & air dried followed by application of bonding agent - which was then light cured. The coronal post was then covered with the flowable composite for core build-up, followed by light curing it for 60 seconds and using packable composite crown buildup was done. The final finishing & polishing was done with finishing burs. Occlusal interferences in normal & paranasal mandibular movements were removed. (Fig.4)



Figure 4 Post operative view

Case two

A 6 year and 5 month old, female patient reported to the Department of Pedodontics and Preventive Dentistry, Government Dental College, Patiala, with a chief complaint of decayed upper anterior teeth. It was observed that #54, 53, 52, 51, 61, 62, 63, 64, 74, 84 and 85 were affected by dental caries. Intra-oral periapical radiographs revealed pulp involvement with # 51, 52, 53, 61, 62, 63 and 75. (Fig. 5)



Figure 5 Pre operative view

Treatment plan

Glass ionomer restoration was done w.r.t #73, 82, 83, 85. Direct composite restoration was done w.r.t # 54, 64, 74, 84. After clinical and radiographic examination, extraction of #75 was planned and reverse band and loop space maintainer was delivered. Pulpectomy followed fiberpost placement in root canal and composite restoration w.r.t # 51, 52, 53, 61, 62, 63. (Fig. 6)



Figure 6 Post operative view

DISCUSSION

The successful restoration of badly mutilated primary anterior teeth in preschool children is a challenging task. Conventional glass ionomer restorations have demonstrated high failure rates in the primary dentition. In addition, adhesion of the bonding agents to the enamel and dentine of primary teeth (less

mineralized structure) is poor as compared to that of permanent teeth and can compromise the final restoration. [2, 10] When there is severe loss of coronal tooth structure, the use of posts placed inside the canal after endodontic treatment will give retention, provide stability to the reconstructed crown, and withstand masticatory forces in function.

There are a variety of root posts used in pediatric dentistry. A resin composite post building up directly, A resin composite post built up directly resin composite short post placement, alpha or omega shaped orthodontic wires, stainless steel pre fabricated posts, nickel- chromium cast posts with macro retentive elements, natural teeth from a tooth bank or reinforced fibers. The use of omega-shaped stainless orthodontic wire as an intracanal post is also simple and inexpensive. However, the wire is unable to adequately adapt to the canal form, because it is not the exact copy of the canal which may lead to radicular fracture on excessive masticatory forces. [10, 14]

The biological posts use natural extracted teeth that are prepared in a post shape for cementation in the root canal. The natural crowns provide excellent esthetics but it requires establishment of tooth bank and secure methods of sterilization and storage to ensure the safety of teeth. 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 posts do provide satisfying esthetics; but, there polymerization shrinkage increases risk of loss of retention. [15] The development of the fibre-reinforced composite technology has brought a new material into the realm of metal-free adhesive esthetic dentistry. Different fiber types such as glass fibers, carbon fibers, Kevlar fibers, vectran fibers, and polyethylene fibers have been added to composite materials. Carbon fibers prevent fatigue fracture and strengthen composite materials, but they have a dark colour, which is undesirable esthetically. Kevlar fibers made of an aromatic polyamide increase the impact strength of composites but are unaesthetic, and, hence, their use is limited. Vectran fibers are synthetic fibers made of aromatic polyesters. They are highly resistant to abrasion and impact strength, but not commonly used due to their high expansion. [16] Polyethylene fibers are esthetic but fall short in their flexural strength in comparison to glass fiber-reinforced composite posts. [17]

The advantages of glass fiber post over the older fibers are:

1. Greater flexural strength (1280 MPa) over 650 MPa of the older fibers.
2. Ease of handling since fibers do not fray
3. Can be used in high stress bearing areas because fibers are arranged parallel in a unique interpenetrating polymer matrix (IPN).
4. Can bond to any type of composites.

Scanning electron microscopic (SEM) evaluation of glass fiber reinforced restoration has shown clearly the formation of a hybrid layer, resin tags, and an adhesive lateral branch. Successful bonding minimizes the wedging effect of the post within the root canal, requires less dentin removal to accommodate a shorter and thinner post, and leads to lower susceptibility to tooth fracture. These posts are placed in cervical one third of the canals, to avoid interference with the

process of permanent tooth eruption. When compared to other fibres, they are almost invisible in resinous matrix. These reasons make them the most appropriate and the best esthetic enhancers of composite materials.^[18]

In a 1 year follow study, Sharaf A *et al* (2002) found that restoration carried out on grossly broken down primary incisors using fiberglass posts remains intact and significantly improved the fracture resistance of teeth. Another clinical study Subramaniam P *et al* (2008) compared fiberglass post with omega shaped stainless steel wire in primary maxillary anterior teeth. After 1 year, they found fiberglass posts showed better retention and marginal adaptation than omega shaped stainless steel wire. Various studies stated that higher retention strength was observed with glass fiber posts, followed by orthodontic “γ” wire posts and composite posts.

The fiber post technique offers certain advantages:-

1. Employs fiber posts that are easy to use.
2. Its modulus of elasticity is similar to that of root dentine so reduces the risk of root fracture and its diametric tensile strength is also low.
3. Provides homogenous mechanical and chemical bonding of all components.
4. Presents no potential hazards of corrosion and hypersensitivity.

The treatment described in the case report is simple and effective and represents a promising alternative for rehabilitation of grossly destructed or fractured primary anterior teeth. This technique of glass fibre-reinforced composite resin post and core has shown promising results and has presented the pediatric dental world with an additional treatment option.

CONCLUSION

Early loss of the anterior primary teeth may lead to psychological disturbances and affect the child's self-esteem and socialization during the important phase of development. The direct composite resin restoration using a glass fiber post reinforced with composite resin used in these case reports demonstrated good retention and esthetics. It was easy to perform chair side and benefitted the child immensely.

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