

Case Report

Fibre Reinforced Composite Resin- A New Innovation for Anterior Tooth Replacement

Neelam Mittal¹, Vijay Parashar², Kaushal Pati Tripathi³, Prasad Suresh Patel⁴

¹Professor, ²Senior Resident, ³Ph.D Scholar, ⁴Junior Resident,

Faculty of Dental Sciences, Institute of Medical Sciences, Banaras Hindu University, Varanasi, (U.P.), India

ABSTRACT:

One of the most serious apprehension in most of the Indian cultures is missing teeth in anterior region. Most common treatment of choice are crown and bridge or dental implants. Instead, fiber-reinforced composite (FRC) resins can be another treatment modality that is more conservative and economic for replacement of single or multiple teeth. The present case shows how missing anterior tooth can successfully be restored by fibre reinforced composite technology (FRC Technology) to reestablish its function and esthetics.

Key words: Fibre reinforced composite, Fixed partial denture, Esthetics.

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Corresponding author: Dr. Vijay Parashar, Faculty of Dental Sciences, Institute of Medical Sciences, Banaras Hindu University, Varanasi, (U.P.), India

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INTRODUCTION

One of the most common form of dental injury in children and adolescents is Loss of anterior teeth, whereas aged people retaining their teeth for longer span of time, often have advanced carious or periodontal diseases that can lead to teeth removal. These patients with loss of anterior teeth need immediate restoration of teeth for the sake of esthetics and function. Development of fiber reinforced composite (FRC) has offered a good choice to the dental professionals as well as to the patients for the possibility of single visit restoration of missing teeth by fabricating resin bonded adhesive and metal-free tooth replacements that is esthetically comparable to other tooth replacement methods. FRC-fixed partial denture (FPD) can be considered as an alternative to metal-ceramic FPD and sometimes also to full coverage crown retained FPD.^{1,2} Many studies have focused on the improvement of FRC FPD's strength.³⁻⁵ FRC, made of glass fibers, is the only existing esthetically acceptable material, which can be processed in mouth in the shape of a bridge that adheres to the remaining tooth structure, and reaches paramount

strength to withstand masticatory forces. The most admitted theory to fabricate FRC FPDs rests on the use of continuous glass fibers unidirectionally in dimethacrylate resin matrix as a substructure for the FPD.⁶ There are two approaches on the use of fibers with FRC prostheses: one based on conventional tooth preparation and laboratory processed restorations while another is based on use of fibers in minimally invasive conservative restoration by direct or indirect fabrication.⁷ In the dental literature, there are presently a limited number of clinical studies on the fiber-reinforced FPDs; however, based on those results, it is reasonable to expect FRC prostheses to have good longevity, especially with those made by direct technique.^{6,7} This case report presents a case with minimally invasive direct restoration with FRC.

CASE REPORT

Twenty two -year-old female patient had a chief complaint of esthetics because of a gap of missing upper left lateral incisor (Fig.1). The patient has normal overbite and overjet. After discussing all the treatment options with the patient,

directly made FRC FPDs was decided as the final treatment protocol because of maintaining esthetics, conservation of tooth structure and single visit completion of the process. After isolating the tooth, the resin impregnated fibers were cut according to the distance between central incisor and canine. After application of etchant (37% phosphoric acid gel), the gel was rinsed thoroughly and then air dried. Adhesive resin was applied according to the manufacturer's instructions (Scotch bond multipurpose adhesive, 3M ESPE, USA). Flowable composite resin (Stick Flow, Stick Teck Ltd, Turku, Finland) was then applied onto the bonding surfaces before placement of resin impregnated fibers (ever Stick). The flowable composite

was light cured only after the fibers were pressed onto the tooth surface by using a transparent silicone package (mold) of the fibers. The resin impregnated fibers were cured through the silicone mold. The flow composite provided to seal the space between the fiber and the tooth surface. The fiber meshwork was cured twice for 40 seconds (Fig.4 &5). Fiber framework was covered completely by a thin flowable composite layer and missing tooth was built by adding layers of hybrid particulate composite resin that was cured step by step (Fig.4). Tooth was checked for occlusal clearance and final finishing and polishing was done (Fig.5).



Fig.1: Preoperative photograph



Fig.2: Appearance of the FRC framework with a layer of flow composite between FRC and tooth (Labial view)



Fig.3: Palatal view



Fig.4: After Final Restoration



Fig.5: After Final Finishing

DISCUSSION

There are various treatment modalities by which congenitally or traumatically missing permanent anterior tooth can be replaced. Fixed FRC bridges are one of these options, that has several advantages whether it is bonding ability, reparability, ease of fabrication or relative longevity. Its main advantage is its minimal or noninvasiveness with little or almost no tooth reduction. Compared to traditional prosthetic options, a fiber-reinforced composite bridge is generally less costly and labor intensive.

Metal prostheses that are laboratory-made surface-retained resin-bonded prostheses made of metals are commonly supported and bonded from one end to reduce the number of debondings, whereas surface-retained FRC prostheses may be supported from both ends rendering to its better bonding characteristics and biomechanical flexibility.⁴. The flexibility permits movement of abutment teeth without inducing stress to the cement-framework interface in function resulting in loosening of the prostheses. However, the cases where abutment has increased mobility, it is advised also to support resin-bonded FRC FPD from one end only. Cantilever designs need special care to ensure sufficient design-based rigidity of the FRC framework to withstand bending forces by masticatory function. By increasing the cross-sectional diameter of the connector, sufficient rigidity can be obtained. Framework fibres need to cover as much surface as possible on the abutments in the anterior area and preferably be placed near to incisal edge to abolish dislodging forces⁸

The use of different dentin and enamel composites to build up the intermediate tooth according to the anatomical layering technique provides a vital final aspect, with natural opalescence, translucency, and opacity. Instead of direct fabrication of the missing tooth, denture tooth can also be used. This method is easier, faster, and, in some cases, more esthetically acceptable than the direct fabrication of a tooth. The shape and the incisal color of denture teeth are, in some cases, however, difficult to match to the adjacent teeth. Moreover, the interface between the restorative composite covering the beam and artificial tooth could weaken the bridge and lead to fracture in this region.

Long term clinical research of FRC prostheses is lacking from clinical point of view. However, the longitudinal studies reported general failure rates between 5% and 16% over periods up to 4-5 years.⁹ Van Heumen et al. showed a 64% survival rate after 5 years of follow-up of anterior 3-unit FRC prostheses in late 1990.¹⁰ One study reported a much higher failure rate of 40% over a 3-year period.¹¹ The clinical data using semi-IPN resin matrix FRC FPDs directly made in patients mouth have suggested high

survival percentages (>96% at five years), that reflects development in material and learning of fabrication of FRC FPDs.¹² Most common cause of failure in FRC FPDs is delamination of veneering composite at pontic area, that can be easily repaired in patients mouth. These factors that can cause failure are being taken care of in newer designing principles.

CONCLUSION

FRC bridge technique has come up with a new treatment option for the replacement of a missing anterior tooth. This technique efficiently restores esthetic and function of the tooth. It is more hygienic and less irritating compared to removable appliance. Generally, it does not require any tooth reduction and could be repaired, modified, or removed from teeth without any iatrogenic problem. It can be considered a permanent treatment or a long-lasting provisional treatment if implant therapy is used at a later date.

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