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Case Report

Fiber-reinforced Composite Resin Fixed Partial Denture to Restore Missing Anterior Teeth: A Case Report

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Abstract

Prosthetic dentistry constantly evolving as a result of innovative treatment solution based on new material, treatment technique, and technologies. The advent of fiber reinforced has further increased the potential uses of composite material within prosthetic dentistry. As we know that, missing anterior teeth are serious concern in the social life of a patient. To restore the missing anterior teeth, we are having several treatment options such as conventional fixed partial denture and implant-supported restoration all these are may the treatment of choice, but fiber-reinforced composite (FRC) resin offers a conservative, fast, and cost-effective alternative for single or multiple teeth replacement. In this paper, we are presenting how to use FRC technology to restore anterior edentulous area in terms of esthetic values and functionality.

Key word: Anterior prosthesis, Case Report, Fiber-reinforced composite

INTRODUCTION

Loss of anterior teeth is a common form of injury mainly in children and adolescents. As we know that, the patient with lost anterior teeth requires immediate attention for the restoration of esthetics and functional reason. The increased patient demand for tissue maintenance and esthetic as well as the desire to reduce treatment costs causes clinician to seek material and technique that enables minimally invasive and chair side (direct) or laboratory side (indirect) fabrication of teeth replacement with fixed partial denture (FPD).[1]

Over the past few years, the development of fiber-reinforced composite has given the dental profession the possibility of fabricating adhesive, esthetic, and metal-free dental replacement even in case of posterior teeth.[2] The fiber-reinforced composite (FRC) bridges represent an interesting alternative to conventional metal bridge. They could be made directly or indirectly using an artificial plastic tooth or the avulsed tooth or by a direct buildup composite resin tooth with or without porcelain veneering.[3,4]

The FRC restorations are resin-based restorations containing fiber aimed at enhancing their physical properties. This group of material is a very heterogeneous one depending on the nature of the fiber, the geometrical arrangement of the fiber, and the overlying resin used. The fibers within the composite matrix are ideally bonded to the resin through an adhesive interface. The role of the fiber is to increase the structural properties of the material by acting as crack stoppers. The resin matrices act to protect the fibers and fix their geometrical arrangement, holding them at predetermined position to provide optimal reinforcement. The interface between two components plays the key role of allowing loads to be transferred from the composite used to replace missing tooth structure to the fiber.[5,6]

This clinical case report represents an indirectly made FRC resin FPD used to restore the missing anterior tooth according to the principle of the minimally invasive approach.

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CLINICAL CASE REPORT

A 17-year-old boy reported with lost upper front teeth in the department of prosthodontics, crown, and bridge at Navodaya Dental College, Raichur, Karnataka [Figure 1]. The boy's medical history revealed no specific problem. His dental history indicated a traumatic accident few days back. In this case, traditional FPD was avoided due to patient's young age, intact neighboring teeth (incisors), and due to his financial condition. The plan is to replace the missing tooth with an implant-retained prosthesis later date. Indirectly made FRC FPD was selected to provide better esthetics, stress relief of bonding surface, and a conservative fixed solution to the patient. The case has been under observation from the past 10 months and the patient is problem free.

Figure 1: Pre-operative photograph

Clinical Procedure

Shade selection and preparation of abutment teeth

The shade of veneered composite resin was selected using vita classic A1-D4 shade guide (Vita, Germany). Before starting the treatment, we did occlusal analysis with articulating paper. A box shape cavity prepared on mesiopalatal side of central incisor (21) and lateral incisor (12). Dimension of prepared cavity is 1.5–2 mm depth and 2–3 mm width. As the retention of the prosthesis was due to adhesive luting and not to parallelism, the wall of the cavity was flared between 5 and 15°. All internal line angles were rounded [Figure 2].

Figure 2: Tunnel preparation

Impression and temporization

After preparation of abutment, an impression of the prepared and opposing teeth were made using by an elastomeric impression material (Dentsply Aquasil Soft Putty and Light Body, Dentsply IH Ltd., United Kingdom) [Figure 3]. Then, the prepared cavity was provisionally restored by intermediate restorative material (Dentsply IH Ltd., United Kingdom).

FRC bridge fabrication

Impression poured with die stone [Figure 4] and casts were mounted in a semi-adjustable articulator. For this case, we were selected everStick C&B net fiber (GC Stick Tech Ltd., America). The fiber framework (i.e., substructure) was then constructed with high-volume design placed in pontic region on the patient cast [Figures 5 and 6].

Finally, the fiber framework was finished, wetted with sticky resin, and veneered with Gradia laboratory composite (by GC India) [Figure 7].

The FRC framework and veneered resin composite resin were polymerized with hand light curing unit (Optilux-501, Kerr, USA) for 40 s per layer.

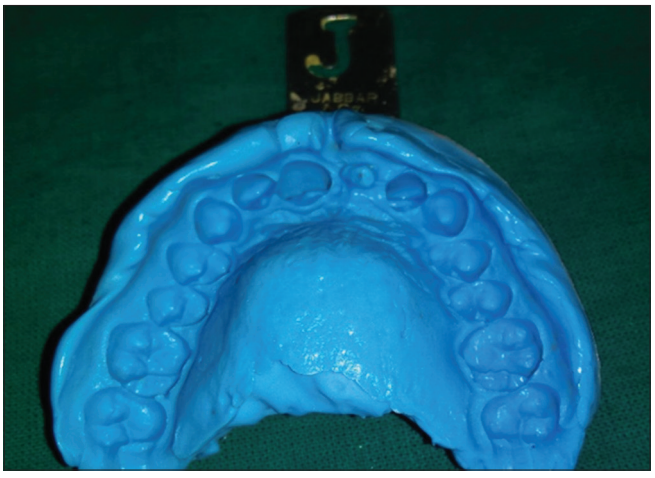

Figure 3: Elastomeric impression made

Try in and cementation of the FRC bridge

At the time of luting, the provisional restorations were removed with scaler and the preparation was cleaned with polishing paste. The prosthesis was evaluated intraorally to assess marginal fit, occlusion, and esthetics before definitive cementation.

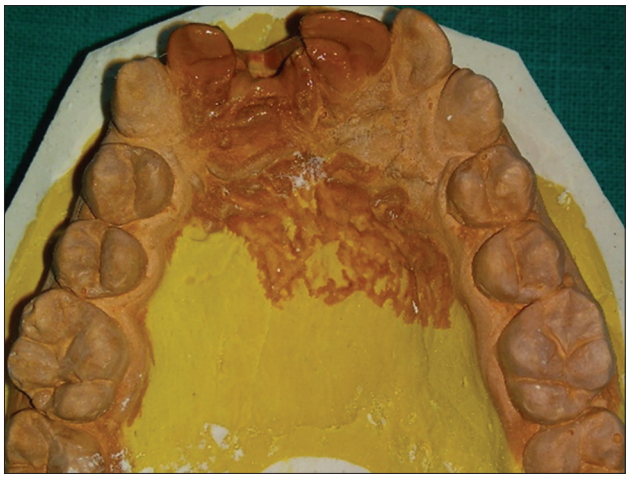

Figure 4: Cast poured with die stone

Figure 6: Fiber-reinforced composite framework

Figure 5: Fiber-reinforced composite framework facial view

Figure 7: Fiber-reinforced composite prosthesis

The adhesive cementation of the prosthesis followed the recommendations of the manufacturer. The area was isolated with a cotton role and the prepared cavity was ringed with an Ed primer, then gently dried with air. The inner surface of the retainers was etched (37% phosphoric acid) and then brushed with mega bond primer. Cementation was made using dual cure cement (GC G-Cem Linkage).

After removing the excess cement, and checking and adjusting the occlusion, then prosthesis was finished with diamond burs and polished with a polishing system (Shofu Composite Polishing Kit by Shofu Dental Corp, South America) [Figure 8].

DISCUSSION

The replacement of missing permanent anterior teeth could be performed through different prosthetic options. Fixed FRC bridges represent one of these options, with many advantages including bondability, reparability, ease of fabrication, and relative longevity. This considered a noninvasive or minimally invasive procedure with very little or no tooth reduction. Compared to traditional prosthetic options, an FRC bridge is generally less costly and labor intensive.[7-9]

Compared to direct technique, the indirect technique described in this article provides a better result in terms of adaptation, rate of polymerization, and final smoothness of the prosthesis. With direct technique, it is very difficult to control and avoid the composite excess in the embrasures and the undercuts. After curing, the composite can only be removed by rotary instruments. The use of burs is time consuming, imprecise, and possibly invasive. The lack of visibility and access could lead to fiber exposition during finishing and polishing procedures.[10]

From clinical point of view, there is lack of long-term clinical research of FRC prosthesis. However, the longitudinal studies reported general failure rates between 5% and 16% over periods up to 4–5 years. These findings

Figure 8: Post-operative photograph

were demonstrated for prosthesis with both extracoronal and intracoronal retainer designs, but only for patients who did not exhibit severe parafunctional habits. Van Heumen *et al.* showed a survival rate of 64% after 5 years follow-up of three units anterior FRC prosthesis made with the material and techniques used in the late 1990s.[10-12] One study reported much higher failure rate of 40% over a 3-year period. The recent clinical data, on the semi-IPN resin matrix FRC FPDs made directly in patient mouth, suggest high survival rate (more than 96% at 5 years), which reflects material development and learning of fabricating FRC FPDs. The most common failures in FRC FPDs reported in the earlier studies were delamination of veneering composite at pontic area, which are normally easy to repair in patient mouth. The current designing principles enable to fabricate FRC FPD to eliminate known risks for technique failure.[13-15]

CONCLUSION

Over recent years, the desire expressed by many patients for cosmetic and metal-free restorations has led to the development of better performance and truly esthetic composite resins. The use of fibers as reinforcement has also provided appropriate mechanical behavior of materials used to replace missing teeth. When we are using FRCs as a direct technique for a bridge construction, it requires a high level of skill in the composite buildup and knowledge of the esthetic aspect of teeth. To provide longer lasting FRCs bridges, the indirect technique would be recommended.[16,17]

Based on current studies and clinical results, it is reasonable to expect FRC FPDs reach longevity of 5–10 years. However, it needs to be emphasized the importance of many high quality and proven material.

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