Case Report

Fiber-reinforced Composite for Chairside Replacement of Anterior Teeth: A Case Report

Garoushi S[1,2], Vallittu PK[1], Lassila LVJ[1]

[1]Department of Prosthetic Dentistry & Biomaterials Science, Institute of Dentistry, University of Turku, Turku, Finland. [2]Benghazi Dental Centre, Benghazi, Libya

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ABSTRACT

A variety of therapeutic modalities, from implant to conventional Maryland prosthesis, can be used for the replacement of a missing anterior tooth. Whenever a minimal tooth reduction is preferred, a fiber reinforced composite (FRC) prosthesis could be a good alternative to conventional prosthetic techniques, chiefly as temporary restoration before making a final decision on the treatment. The purpose of this case report is to describe the clinical procedure of fabricating anterior chairside FRC prosthesis with pre-impregnated unidirectional E-glass fibers and veneered particulate filler composite. Fiber-reinforced composite in combination with adhesive technology appears to be a promising treatment option for replacing missing teeth. However, further and long-term clinical investigation will be required to provide additional information on the survival of directly-bonded anterior fixed prosthesis made with FRC systems.

INTRODUCTION

Over the last few years, the development of fiber-reinforced composite (FRC) has offered the dental profession the possibility of fabricating resin bonded adhesive, esthetic and metal-free tooth replacements even in the case of molar teeth. FRC-fixed partial denture (FPD) could be an alternative to metal-ceramic adhesive FPD and in some cases also to full coverage crown retained FPD [1,2]. Many studies have focused on the improvement of FRC FPD's strength [3-5]. The most accepted concept to fabricate FRC FPDs is based on the use of continuous unidirectional glass fibers in dimethacrylate resin matrix as a substructure for the FPD. With the FRC prostheses, there are two approaches on the use of fibers: one is based on conventional tooth preparation and laboratory-made restorations while the other is based on using the fibers in minimally invasive restoration (conservative) by direct or indirect fabrication. This article describes a clinical case of chairside (directly-made) FRC Maryland bridge, which was used according to the principles of minimal invasive approach. FRC systems enable the use of different retainer types even in the same prosthesis (hybrid). For example, it is possible to create space for the retainer by removing the old filling or making completely surface-retained restorations. In this journal, we have previously published two case reports of FRC bridges [6,7]. However, this clinical report describes, for the first time, the use of fiber technology in Libya (Benghazi Dental Centre). In the dental literature there are few clinical studies on the fiber reinforced FPDs and most of them present short-term results [2,8,9].

CASE ANALYSIS

A twenty two-year-old patient lost his upper left central incisor due to accidental trauma (Fig. 1). Having discussed with the patient, it became clear that replacement of the missing tooth with a single implant was not possible due to the high financial expenses of the treatment. The fabrication of a conventional fixed partial denture was avoided in order to conserve the tooth substance because of the patient's young age. The missing tooth was planned to be replaced with an implant retained crown later on. Directly-made FRC FPDs was chosen in order to provide good aesthetics, preserve tooth substance and postpone the final decision on the prosthetic treatment. The treatment was completed in a one-visit appointment.

Table 1: Materials used in the study

Brand	Manufacturer	Composition
Z250	3M ESPE, Seefeld, Germany	Aliphatic and aromatic acrylic monomer
everStick	StickTeck Ltd, Turku, Finland	PMMA, BisGMA, E-glass fibers
Stick Resin	StickTeck Ltd, Turku, Finland	60% BisGMA-40% TEGDMA
Stick Flow	StickTeck Ltd, Turku, Finland	BisGMA, TEGDMA and fillers
Scotchbond (multi-purpose) Adhesive.	3M ESPE,St Paul, MN, USA	HEMA, BisGMA, water

PMMA, poly methyl methacrylate, M_w 220.000
BisGMA, bisphenol A-glycidyl dimethacrylate.
TEGDMA, triethylenglycol dimethacrylate.
HEMA, hydroxyethyl methacrylate

Figure 1. Frontal view of patient with missing central incisor.

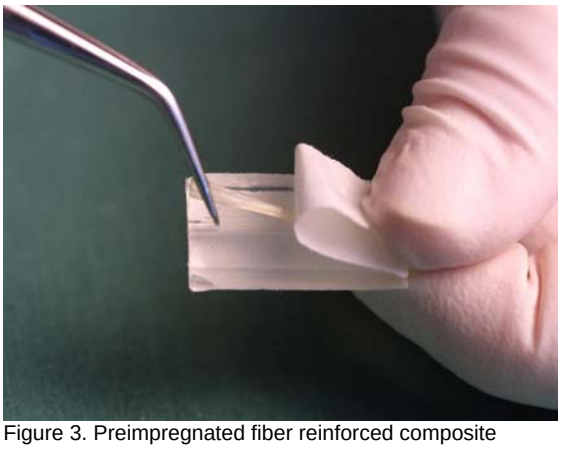
Figure 3. Preimpregnated fiber reinforced composite

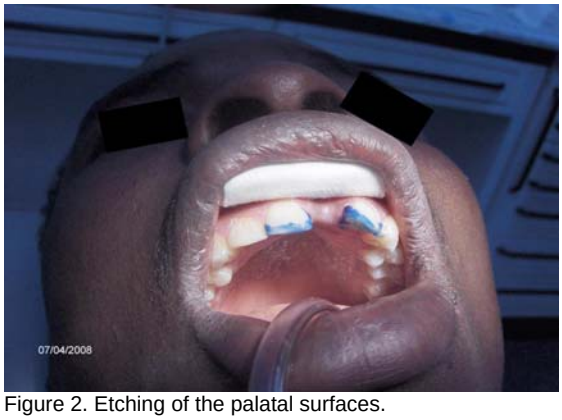

Figure 2. Etching of the palatal surfaces.

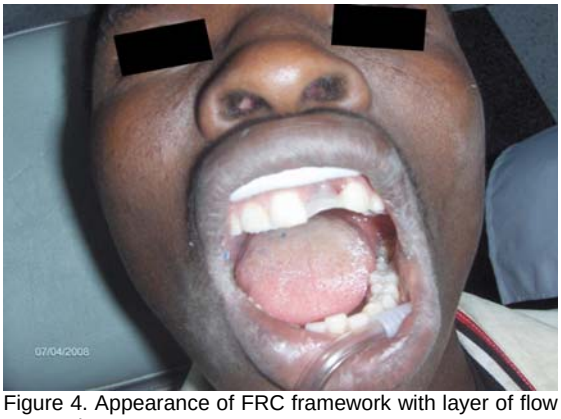

Figure 4. Appearance of FRC framework with layer of flow composite.

CLINICAL PROCEDURE

Materials used in this clinical report are shown in Table 1.

1. There were free spaces on the palatal surfaces for fibers of the framework. Therefore, no preparation was needed.
2. Cotton rolls for isolation were used even though rubber dam is recommended.
3. Application of acid etching technique (37% phosphoric acid gel). Subsequently, the gel was rinsed thoroughly and gently air dried (Fig. 2). Adhesive resins were applied according to the manufacturer's instructions.
4. A bundle of resin impregnated glass fibers was cut and spread from the ends for increasing the bonding surface area (Fig. 3). The fiber bundle was placed so that the palatal surfaces of the adjacent incisors were covered with the fibers.
5. Flow composite was applied on the bonding surfaces prior to placing the fiber bundle. The flow composite was not light-cured before fibers were pressed tightly against the tooth surface using a transparent silicone mould. The resin-impregnated fibers were light-cured initially through the silicone mould. The purpose of the flow composite was

to seal the space between the fiber frame and the enamel surface.
6. Fiber-framework was fully covered with a thin layer of flow composite resin (Fig. 4) and pontic was built up by using particulate filler composite resin. Successful chemical bond between fiber framework and veneered composite was achieved after curing.
7. The shade of the final veneered composite resin was selected using a composite shade guide.
8. Occlusion was carefully adjusted. Fig. 5 shows a frontal view of the finished restoration.

Figure 5. View of the final restoration.

CONCLUSIONS

The combination of filling composite resin, adhesive system and fiber reinforcement has introduced a new generation of metal-free conservative restorations. Although FRC applications in dentistry have been growing, this treatment is not still used in Libya.
Currently, acceptable success rates in long-term FRC restorations such as crowns and bridges have been reported [8,10,11]. However, the importance of using high quality and proven materials and their correct clinical use needs to be emphasized.

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CORRESPONDING AUTHOR:
Garoushi S, e-mail: sufgar@utu.fi

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