

Immediate Tooth Replacement Using Fiber-Reinforced Composite Bridge: A Case Report

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Abstract

When anterior teeth in maxilla are lost, it is very challenging procedure to replace them. If the patient has time limitation, and the patient refuse the implant surgery, minimum preparation prosthesis is advised for the replacement of the tooth. Fibre-reinforced composite bridge is one the most conservative alternative option to conventional fixed partial denture prosthesis. This article describes a clinical technique for the immediate replacement of the extracted tooth to preserve the aesthetics of the patients and the soft tissue contours by giving ovate pontics.

The patient presented with grade III mobile maxillary central incisor due to Localized periodontitis. The abutment teeth were clinically stable. Tissue part of the pontic was made indirectly on the silicon cast and the rest of the pontic was made freehand intraorally. This technique offers a conservative, aesthetic, and immediate solution for the problem. FRC bridges cannot be used only as a temporary option but also a permanent prosthesis if applied as recommended in literature.

Keywords: Fibre reinforced composite bridge, immediate prosthesis, Papilla preservation, minimal preparation bridge

Introduction:

The loss of anterior teeth can create social and psychological problems in patients and they need to be replaced immediately. There are multiple options for the replacement of these teeth, both removable and fixed prosthesis. Fixed prosthesis is preferred mostly.¹

Any trauma, or damage of the anterior teeth is considered to be dental emergency for the most of the patients, and every clinician deals this kind of emergency. This restoration is not an easy job and mostly the options that are used for the restoration are time consuming and involve lab procedures. This time consumption further increases the psychological trauma of the patient who come with the hope of immediate restoration.¹

Sometime the patient is unable to cope up with the economic issues for the restoration of the damaged or lost teeth, which is another compounding factor in the treatment plan.¹

Fibre reinforced composite bridge is the ultimate solution for all of the above mentioned problems as this procedure is minimal invasive, reversible, cost effective and importantly, an immediate solution for the problems.¹

Fibre reinforced composite consist of fibres of different materials like glass, carbon or polyethylene which are

incorporated in base resin. These fibres increase the flexural, fatigue and tensile strength of the prosthesis. The strength also depends upon the type, number, design and wetting of the fibres incorporated.¹

Goldberg and Burnstone² recommended 43-45% fibre incorporation in the resin for better strength. Initially the fibres that were used were mostly carbon or Kevlar but these were then replaced by polyethylene and glass fibres which are aesthetically more acceptable and the glass fibres have more strength as compared to the other fibres.³

The technique for the replacement with FRC bridge was suggested as acid etch technique which is described by many authors in the literature. The main problem that was faced by all the authors was fracture of composite in the proximal areas.^{4,5}

To overcome the problem of fracture composite at proximal area, many techniques were advised for example, utilizing of undercuts on the abutment teeth⁶, use of orthodontic wire⁷ or the self-threaded pins commonly used in restorative dentistry⁸. Unfortunately, none of the techniques were successful to overcome the problem.

Many clinical studies were done on the prognosis of the FRC bridges with direct techniques, and unfortunately none of the studies reported long time survival of the prosthesis^{9,10,11,12}.

Because of the all the failures of the prosthesis through direct technique, indirect technique for the fabrication of prosthesis was advised in 1982, which was also known as Maryland bridge⁹.

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These Maryland bridges also showed very variable results in its survival and the patients mostly complained about the show of metal and its effect on the overall translucency of the bonded tooth^{13,14,15}. To overcome the problems of bonding, metal free, aesthetically preferred, less time consuming, economical and conservation of tooth structure, fibre reinforcement in the composite was suggested by Ladizeski in his publication.¹⁶ It preventing the crack propagation because of the chemical adherence of the composite with the fibre¹⁷.

The re enforcement of fibre in the composite increases its flexural strength by 400-500% as compared to the composite resin used alone^{18,19}. Fortunately, this increase in the flexural strength is comparable to the conventional porcelain fused to metal fixed partial denture.^{20,21}

In clinical practice many failures were reported those were mostly delamination, or fracture of composite³. The problem was mainly because of the use of non-impregnated fibres, which led to the incomplete wetting of the fibres³. To overcome these problems, pre impregnated fibres were suggested as developed by Stick Tech Ltd. It increased the survival rate up to 93%.²¹

The design of pontic also plays major role in provision of aesthetically pleasing and functional tooth replacement. Factors that need to be incorporated in the pontics are its size, shape, emergence profile and support of the adjacent soft tissues²³. Ovate pontic in anterior region mimics the natural appearance as it gives the look of tooth emerging from the gingiva.²² It also gives effective air seal, preservation of the papilla, elimination of the black triangle which gives more natural life like appearance of the tooth. This will also give extra advantage of soft tissue support for implants later on²⁴.

Case report:

A 55-year-old patient came to Prosthodontics department with the chief complaint of mobile maxillary right central incisor. Thorough history and examination was done. The tooth was grade III mobile and was indicated for extraction.

The patient wanted some immediate replacement of the tooth as he had aesthetic concern because of his profession and wanted to go out of city after 4 days. Patient didn't want any removable prosthesis which according to him can lead to embarrassment in front of others. Patient mentioned that he will go for implant later on but right now want some immediate solution.

Fibre reinforced composite prosthesis was planned for the patient. Atraumatic Extraction was done and the patient was advised to wait for half an hour for the bleeding to be stopped. The papilla preservation and socket preservation technique was intended by giving ovate pontic in the prosthesis.

Impression of the area was recorded in irreversible hydrocolloid impression material with special consideration for recording the impression of the socket. The impression was poured in silicon light body and reinforced with putty impression material. After the material was set, the silicon cast was obtained from the impression.

Light cure flowable Composite restoration material was placed in the socket of silicon cast with intention of the fabrication of tissue surface of the ovate pontic and was cured. The set composite material was removed from the socket and additional polymerisation with light was done. The tissue surface was finished, polished and placed aside.

Intraoral Isolation with rubber dam was obtained and the adjacent teeth 12 and 21 were prepared for the fibre reinforced composite bridge by making small boxes in the gingula area of the teeth with diamond burs. The boxes were then etched, and bonding agent applied and cured for 40 seconds.

Flowable composite material (Filtek® Flow Composite (3M-ESPE) was placed in the box made in the central incisor and the one end of the fibre (Ever Stick® Crown and Bridge (StickTech Ltd) that was measured to be of appropriate length of the area was placed in it and light cured. The fibre was oriented according to the curvature of the arch and the other end was placed and cured with flowable composite material in the box prepared of the lateral incisor.

Additional fibre of 4mm was taken and placed vertically on the pontic area of the fibre already placed with flowable composite and was light cured. The part of the ovate pontic that was already prepared on the silicon cast before was taken and placed inside the socket at this time. Nano hybrid composite (Filtek® z350) material was placed over this part of the pontic and the fibre to attach the pontic part and fibre and was light cured.

The rest of the pontic was then made and shaped free hand with the composite material with layering technique. After the fabrication of the pontic, it was finished and polished and checked for any occlusal interference. Necessary modifications were done and the process was completed.

Discussion:

The anterior teeth can be either congenitally missing or lost because of many reasons. The replacement of the teeth can be done with different prosthodontic options.²⁵ Initially for long time the PFM prosthesis were the preferred options but the patient mainly complained of the metal show and this option was very aggressive for the tooth as a lot of tooth structured has to be removed. This led to either the sensitivity, pain or pulp exposure of the tooth.²⁶

Implant support prosthesis lead to more conservative approach for the single tooth replacement as it preserves the adjacent teeth. Unfortunately, most of the patients rejects this option either because of the systemic condition or the cost of the treatment.²⁷

To overcome the problems, another conservative approach was recommended in the form of resin bonded prosthesis the most common problem associated with it was debonding of the framework from the tooth surface.²⁸

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most common problem associated with it was debonding of the framework from the tooth surface.²⁸ This debonding was more common in teeth with slight mobility as caused compressive and tensile stresses at the interface of cement and framework.²¹

Repeated stress can predispose fatigue failures of the adhesive joint. By selecting a material that has a lower modulus of elasticity than that of cast metal alloy, stress at the interface can be diminished.²⁹ Fibre reinforced composite provides modulus of elasticity which is desired in these situations. They have additionally advantages of repair, bonding, elimination of metal and survival. It is conservative option, saving the tooth structure and avoids the laboratory procedures.²⁵

There are different methods of its fabrication. Direct, indirect or direct indirect. The procedure in this article is direct indirect technique, in which portion of the pontic is fabricated indirectly on flexible cast made of silicon and the remaining structure fabricated directly intraorally. The direct indirect technique for the fabrication of an FRC bridge by using a flexible cast of silicon has many advantages as compared to the stone cast. As the silicon is fast set as compared to dental stone, it saves a lot of time. The chairside fabrication avoids the laboratory involvement and saves time and money. The prosthesis can be provided in single appointment³⁰

Glass fibres in unidirectional reinforce the composite in the final structure. The composite material is more easy to bond with the tooth as compared to metals and also aesthetically more good because of the avoidance of metal in the prosthesis³⁰. The layering technique through different shades of the composite gives very lifelike appearance giving the translucency, opalescence and opacity.³¹

The ovate part of the pontic inside the socket will preserve the papilla and socket which gives pleasant aesthetic effect which can also be later on replaced easily with implants with compromising the adjacent teeth along with the superb aesthetics because of the tissue preservation.

Conclusions:

FRC bridge fabrication technique presented in this article suggests a new treatment option for the replacement of a missing anterior tooth. This technique is simple, economical and very rewarding. The ovate pontic given supports the soft tissues and gives natural emergence profile. As it a conservative technique, the option can be used either temporarily or permanent.

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Figure A: Intraoral picture of the patient with extracted I I

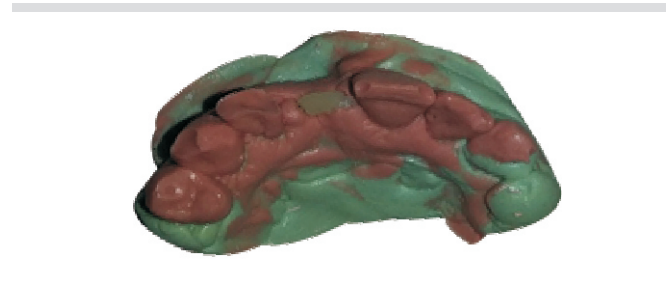


Figure B: Immediate cast of the patient made in silicon



Figure C: Comparing the cast with intraoral picture of the patient

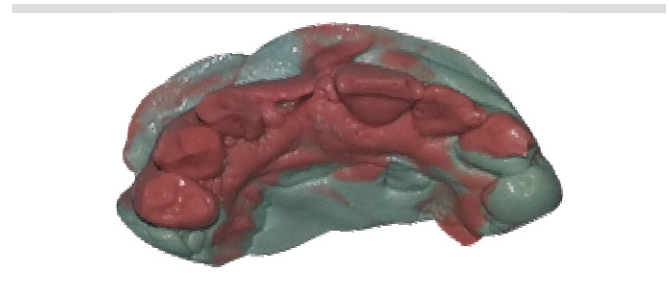


Figure D: Ovate pontic part fabricated in the extracted socket on silicon cast



Figure E: The ovate pontic part placed in the socket intraorally



Figure F: Application of the glass fibre on adjacent teeth

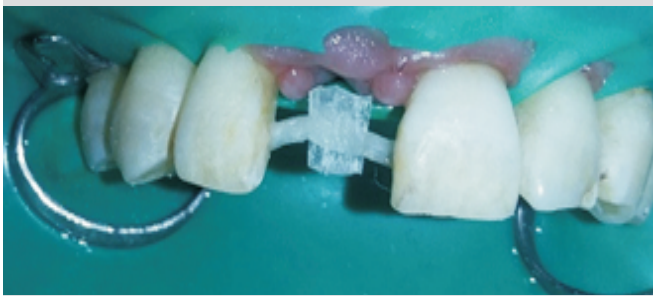


Figure G: Vertical fibre placed for fabrication of the pontic



Figure H: Free hand building up of the pontic over the fibre



Figure I: Fibre reinforced bridge fabricated intraorally

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Author Contributions

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| 1. Shafqat Hussain- Concept and paper writing | 4. Muhammad Afzal Khan- Data Collection |
| 2. Nazia Yazdanie- Proofreading | 5. Uzma Khalil- Data Collection |
| 3. Aamna Mansur- Data analysis | 6. Muhammad Irfan- approval of questionnaire |