IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 3 Ver. 1 March. (2018), PP 71-74
www.iosrjournals.org

Minimally Invasive Fiber-Reinforced Composite (Frc) Bridge for the Missing Tooth: A Case Report

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Abstract: *Conventional treatment options for the replacement of the missing tooth ranges from the use of implants to conventional Maryland bridges. However, it is often also accompanied with various drawbacks such as the increased number of chairside visits and higher costs. Recently, the use of reinforced composite (FRC) bridges has been proposed and described as an alternative for the replacement of the missing tooth, owing to several excellent attributes such as its increased fracture toughness and resistance. Furthermore, fiber can act as a better alternative to conventional prosthetic techniques. In this paper, we present a clinical case of a single tooth replacement by means of a polyethylene FRC bridge, wherein, we employed a semi-direct (direct and indirect) technique to fabricate a Maryland-like composite bridge for the replacement of a missing maxillary first premolar. This innovative and non-conventional technique offers an economically more acceptable, conservative, esthetic, and noninvasive approach and can hence be considered as a permanent treatment modality or as a long-lasting reversible provisional in the case of implant placement after the end of the growth period.*

Key Words: *Composite resin, Fiber-reinforced composite (FRC) bridges, Prosthesis*

Date of Submission: 20-02-2012 Date of acceptance: 05-03-2018

I. Introduction

Several treatment options are available today for the replacement of the missing tooth irrespective of the cause of the missing tooth(1-4). Implants being one of most common choices today, is accompanied with several limitations of its own such as, the inability to place it in patients below the age of 18 years or before the end of the growth period(5). Moreover, implants being expensive compared to other options, finances are often taken into consideration while choosing an appropriate treatment plan(5). Removable partial dentures are economically affordable, but for young patients it is not comfortable option. Traditional fixed partial denture like porcelain fused to metal(PFM) bridge or Maryland bridge are considered as good options. However there is an increased compromise to the tooth structure(5). A latest technique of the fiber reinforced composite (FRC) resin bridge is less invasive and presents as an economic option for the replacement of the missing tooth(6-8). It is also a good alternative to conventional fixed bridge as it is less invasive, esthetic and economically affordable. Unreinforced composite resin when used as a primary structure to build a new tooth, does not possess adequate strength and can crack and fracture easily. Hence, it is necessary to employ the use of composite resin reinforced with fiber in order to increase structural strength and toughness. FRC is considered as one of the good options for short span bridge as it is cost effective, esthetic and wear resistant(6-9). In this paper, we discuss the case, where the maxillary first premolar tooth buildup was performed using the FRC technique.

II. Case report

A 31 year old male patient reported to a private dental office clinic in Mumbai, India with a root piece in the upper left first premolar region along with damaged restorations on the upper left canine and first molar (adjacent teeth)(see figure 1). Since the tooth (maxillary first premolar) was considered non-restorable, extraction was considered as the treatment. Post extraction, the patient wanted to have the missing tooth replaced. The conventional treatment options like implants and bridge were offered but the patient rejected the option due to the high costs involved. Furthermore, the patient refused a PFM bridge as the procedure involved the excessive reduction of healthy tooth structure. Therefore, the fiber reinforced composite bridge was considered as the treatment for the replacement of the missing tooth. After the extraction of the root piece and satisfactory healing was established (at 2 months), the damaged restorations were excavated from the adjacent

teeth and an impression was made with alginate and cast was poured with gypsum to make a working model for the construction of bridge framework.A FRC system (everStick C&B, GC, India) was used for the framework of the bridge. The length was measured using a dental floss. The exact amount of FRC material was cut with special scissor so that the cut could be consistent. A small fibre was also cut and placed transversely in the pontic area for additional support. The material is not supposed to be touched with bare hands in order to avoid contamination and affect the bond strength. On the working model, attachment surfaces were spread in order to increase the bonding area. On the canine as well, few fibers were split to extend upto the labial surface in order to strengthen the composite pontic structure in the mid region and the fibers were bent in order to form a curve so that maximum reinforcement could be achieved. The wings and the pontic area were then covered with flowable composite (Gc G-Aenial Universal Flo, Europe) layer and cured for 5 to 10 seconds, one area at a time (see figure 2). While curing one area, the rest of the fiber bundle was protected from the light cure with wide stick stepper instrument. The surface attaching to the tooth should only consisted of fibres. Once the position was secured, the basic structure was cured for 45 seconds. The tooth surface was then etched with 37% phosphoric acid for 30 sec on enamel, washed and dried. The bonding agent (GC,G-aenial bond, Europe) was applied as per the manufacturer's instructions and cured for 10 sec. Flowable composite was then applied on the bonding area and prior to curing, the basic framework was then transferred to patients mouth, firmly secured and cured for 40 seconds(See figure 3). The cavity on the adjacent teeth was filled with composite using palodent system dor contact build on adjacent teeth. Class 3 composite was filled in 23. The pontic was then built layer by layer using various enamel, dentin and translucent shade (GC,G-aenial composite, Europe), a plastic barrier was used between the gingiva and pontic to avoid contamination from the gingiva. The pontic was built in such a way that it was self-cleansable and have a light contact with the gingiva (See figure 4 and 5). Occlusion was checked for high points. Finishing and polishing was completed in order to achieve the natural esthetic prosthesis appearance.

Figure 1: Presence of the first maxillary premolar root piece prior to extraction.

Figure 2: The framework was placed using a microhybrid restorative composite.

Figure 3: Fabrication of the tooth pontic using composite resin

Figure 4: Final view of the finished bridge

Figure 5: FRC bridge in occlusion

III. Discussion

Implant, dentures or fixed PFM bridges are usually considered as an ideal option for the replacement of missing teeth. Fiber reinforced resin bridge is one of the highly esthetic, economical and less laborious therapeutic option, that can be considered as one of the treatment options(9). FRC can be done using a direct and indirect technique or both(10). When the direct technique is implemented, it is difficult to control undercuts(10). Hence, building the basic structure on the model and then transferring to the patient's mouth helps to attain the benefits of both the techniques. Moreover, direct technique allows to save lab cost and time, in addition, matching the shade is also easier. Indirect technique allows to build core framework with ease, since the lack of visibility in mouth can lead to fiber exposure, in return affecting the strength of the bridge, the use of various shades in of dentin, enamel and translucency helps to achieve perfect shade(11). It also helps in achieving a highly esthetic fixed prosthesis effect(11). Alternatively, the use of a denture tooth could also be considered instead of direct fabrication of the missing tooth, since it is often faster, easier and, in some cases, more esthetically acceptable than the direct fabrication of a tooth. However, drawbacks such as identifying and matching the precise incisal color and shape of the tooth may preclude its use. Furthermore, the interface between the restorative composite covering the beam and artificial tooth could weaken the bridge and lead to fracture in this region.

IV. Conclusion

Within the limitations of this case report, FRC can be successfully used as an excellent alternative for the missing tooth owing to its low cost, great stability and good success.

Acknowledgments: Nil

Sources of funding: Nil

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