

# Esthetic and Functional Rehabilitation of Missing Anterior Teeth with a Conservative Treatment Approach: A Clinical Case Series

Kunwarjeet Singh<sup>1</sup>, Nidhi Gupta<sup>2</sup>, Narendra Kumar<sup>1</sup>, Vikram Kapoor<sup>1</sup>, C. Nisha<sup>1</sup>

<sup>1</sup>Department of Prosthodontics, Dental Materials and Implantology, Institute of Dental Studies and Technologies, Modinagar, Ghaziabad, Uttar Pradesh, India. <sup>2</sup>Department of Pedodontics and Preventive Dentistry, Institute of Dental Studies and Technologies, Modinagar, Ghaziabad, Uttar Pradesh, India.

## Abstract

The current scenario in dentistry proposes several treatment modalities for the esthetic and functional replacement of a congenitally or traumatically missing anterior tooth in young and adult patients which includes implant supported single crown, conventional FPD, Resin Bonded FPD (RBFDP) or RPD. However when certain clinical conditions or unwillingness of the patient preclude the replacement of missing tooth with any of these prostheses, in such cases, a more conservative treatment modality, fiber reinforce composite resin fixed partial denture with composite resin, porcelain fused to metal, all ceramic or natural tooth pontic can be consider as a definitive treatment alternative in certain clinical conditions. This article describes successful rehabilitation of three different patients with three types of pontics by this technique.

*Key words: Fiber reinforced composite resin, Putty index, Palatal slots, PFM pontic, Composite pontic, Natural tooth pontic*

## Introduction

Different types of treatment modalities can be considered for the esthetic and functional replacement of a congenitally or traumatically missing anterior tooth in young and adult patients. An implant supported crown can be considered as a viable treatment option for replacing missing tooth; however as a general rule, it is contraindicated in female patients below 15 years and male patients below 18 years of age during the growing stage [1]. Any attempt to place an implant at this stage, may result in a submerged implant thereby affecting final outcome. Conventional FPD is also contraindicated owing to large pulp chambers and horns which may result in pulp exposure during tooth preparation. In adult patients, the presence of local bony defects, socioeconomic status and unwillingness of the patient to experience invasive implant surgery may preclude the use of an implant supported crown to replace the missing tooth. Some patients reject the option of a conventional fixed partial denture due to involvement of at least two natural teeth to be used as abutment for the placement of retainers. Some patients consider it as the most invasive treatment option in terms of tooth reduction. In such patients who are interested in replacing missing tooth with fixed prosthesis other than the above treatment modalities and in young patients where implant and conventional FPD's are contraindicated, the resin bonded FPD's or the fiber reinforced composite resin FPD are viable treatment options.

Composite resins are brittle materials and contain voids, cracks, and other defects causing or facilitating fissure propagation and fracture [2]. It has been demonstrated that the reinforcement of a composite resin by fibers increases the fracture toughness and resistance. Polyethylene, glass or carbon fibers embedded in resin matrix are used for the reinforcement of composite resin. The type of fiber, the fiber architecture, and the quality of the fiber/matrix coupling determine the mechanical properties of the material. Laboratory studies have shown that FRC materials exhibit flexure strength

that is comparable to or greater than that of metal alloys [3] but exhibit a lower flexure modulus [4]. Clinical usage and clinical research have shown that FRC prostheses can be used to satisfactorily restore or replace teeth with fixed prostheses [5,6].

The fiber reinforced FPD consists of a fiber reinforced composite (FRC) substructure veneered with a composite material and an all-ceramic, PFM, acrylic, composite resin or natural tooth pontic. This prosthesis can be considered as a long term alternative for successful rehabilitation of a missing tooth in patients with vital intact abutment teeth, short edentulous span (1or 2 missing teeth) and minimum dynamic occlusal contacts on the abutment teeth [7,8]. Functional and occlusal loading of the pontic should be minimal. The supporting abutment must be periodontally sound with adequate bone support. If primary abutments are weak, secondary abutments must be used to ensure long term success of the prosthesis.

## Case Series

Three different patients reported to our dental centre for esthetic replacement of missing anterior teeth. On the basis of clinical and radiographic findings, all three patients were presented with several treatment options which included implant-supported crown, conventional fixed partial denture, resin-bonded fixed partial denture and a fiber reinforced bridge. All the patients rejected the implant supported crown because of the duration of therapy and the necessity of surgical intervention. the patient 1 and 3 rejected the replacement with conventional fixed partial denture as its fabrication required involvement of secondary abutments as the primary abutment in both the cases have mobility. Both the patients considered it as more invasive in terms of tooth reduction of 4 natural teeth for replacing one tooth. Resin bonded bridge was considered less invasive but patients were concerned about non-esthetic aspect of the metal framework. All the patients opted for a

FRCFPD as this would require minimum tooth preparation on the palatal surfaces of abutment teeth.

#### Case report 1

A 25 year old male patient reported to our dental care centre with a chief complaint of unsatisfactory esthetics due to a missing mandibular anterior tooth (*Figure 1a*). His dental history indicated a traumatic accident responsible for the extraction of the tooth. The intraoral examination revealed a removable prosthesis replacing a missing tooth with unsatisfactory esthetic. The patient asked for a more esthetic, comfortable and conservative treatment. Oral examination also revealed healthy dentition except 41 which is grade I mobile, stable maximum intercuspation, no evidence of bruxism or wear facets on the occlusal surfaces.

For this patient (*Figure 1a*), A PFM modified ridge lap pontic of selected shade with a groove on the middle of palatal surface of approximately 3mm wide and 1.5 mm deep was fabricated on a cast obtained by pouring the die stone in the maxillary impression made with polyvinyl siloxane elastomer (Aquasil soft putty/regular set, Dentsply, Germany).

#### Case report 2

A 36 years old male patient reported to our dental centre with chief complaint of discomfort caused by three mobile mandibular anterior teeth. He also wanted to retain his natural teeth. Due to grade III mobility, these three teeth were extracted (*Figure 2b*), cleaned, modified into modified ridge lap pontic (*Figure 2b*) and used as pontic with FRC FPD after healing of extraction sockets. The cervico-incisal length and relationship of the pontics with the ridge was evaluated on the cast. The natural teeth pontics were stabilized on the cast



*Figure 1c. Etching of PFM pontic with hydrofluoric acid.*



*Figure 1d. Flowable composite placed on lingual surfaces of abutments and pontics*



*Figure 1a. Missing 31.*



*Figure 1e and 1f. Labial view of definitive prosthesis*



*Figure 1b. Putty index fabricated on cast after pontic stabilization with wax.*



*Figure 2a. Natural teeth pontics*

with wax from the lingual side (*Figure 3c*) and a putty matrix fabricated on the cast used for their stabilization in patient's mouth (*Figures 2e and 3d*). *Figures 2f and 2g* show successful splinting of the natural teeth pontics with FRCFPD.

### Case report 3

A 24 year old male patient complaint about esthetic problem due to missing maxillary right central incisor (*Figure 3a*) lost due to trauma. Radiographic evaluation revealed local bony defect related to edentulous area and bone loss on mesial aspect of maxillary left central and right lateral incisors which made

them unsuitable to be used as primary abutments. For this patient (*Figure 3a*), a composite resin pontic of the selected shade was fabricated by incremental buildup technique on the impression of the maxillary left central incisor, (Ceram x™ Duo, Dentsply, Germany) followed by light curing. The pontic obtained by this technique replicates the maxillary left central incisor which was made to resemble the maxillary right incisor with minor modifications using composite resin.

### Clinical Procedure

Try in of the pontics was done in the respective patient's mouth to evaluate the esthetics after the try in procedure; the pontics in all three cases were placed in proper relationship with the adjacent teeth and ridge on the cast and then stabilized with wax from the palatal side (*Figures 2c and 3b*). The putty matrices (*Figures 1b, 2d, 2e and 3b*) were fabricated from putty of polyvinyl siloxane elastomer. The stabilization of the pontics with wax from the palatal side prevents any change in the position of the pontics during the fabrication of putty matrix. This matrix was used for accurate positioning of pontic in patient's mouth during fabrication of FRCFPD.

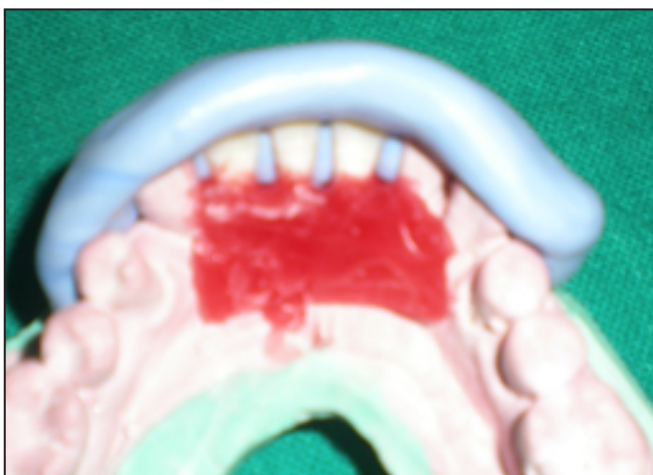
The palatal slots of dimensions 3 mm wide and 1.5 mm deep were prepared on the middle of the palatal surface of the abutments with round and inverted cone diamond burs. The slots extend through the whole of the lingual surface of



**Figure 2b.** Evaluation of relationship of natural teeth pontics on the cast.



**Figure 2c.** Stabilization of pontics with wax.



**Figure 2d.** Fabrication of putty matrix.



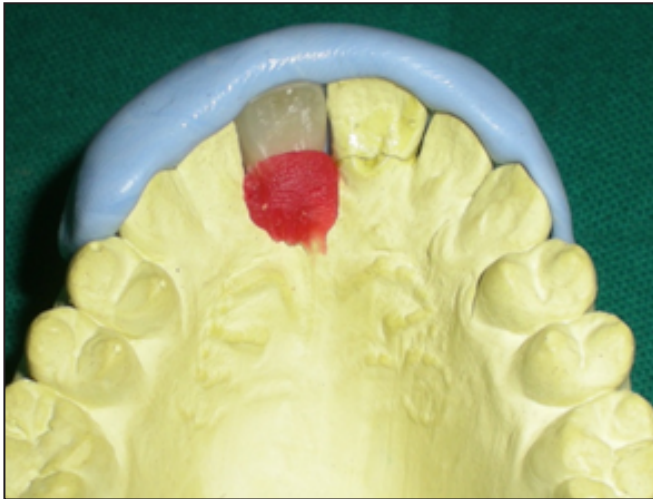
**Figure 2e.** Putty matrix.



**Figure 2f and 2g.** Lingual and labial view of definitive prosthesis.



**Figure 3a.** Missing 11.



**Figure 3b.** Fabrication of putty matrix.



**Figure 3c and 3d.** Labial view of definitive prosthesis.

primary abutments and two-third of the mesio-distal width of the secondary abutments. The palatal grooves on the abutments and pontic should be at the same level.

The distance between the grooves was measured and a piece of fiber ribbon was cut with the same dimensions as the space between the grooves. The fiber impregnated with bonding agent should be kept out of the dental light until used. One should avoid touching the fiber ribbon after it is wetted with bonding agent via the fingers as any contact can contaminate its reactive surface layer.

The grooved surface and the mesial and distal proximal surface of the PFM pontic (*Figure 1c*) were etched with 10% hydrofluoric acid (condacporcelana, FGM) for 60 seconds followed by application of a silane coupling agent (PROSIL, FGM) for 60 seconds. The grooves and mesio-proximal surfaces of the abutments and natural teeth pontics were etched with 37% phosphoric acid for 20 seconds followed by thorough rinsing with water. After drying, a bonding agent (Prime and Bond NT, Dentsply, Germany) was applied with a micro brush applicator on the prepared abutments and natural teeth pontics area. Excess bonding agent was removed with the tip of a brush and by gently blowing with air followed by light curing for 15 seconds per tooth. The pontics in all the three cases were then placed in the respective patient's mouth and held in accurate position with matrix. The Ceram x Duo composite of the selected shade was first placed properly in the grooves and then the cut piece of fiber ribbon using composite placement instruments. The excess composite which flows into the proximal embrasures should be removed carefully before the start of polymerization. The composite with fiber ribbon was carefully polymerized with a Quartz tungsten halogen light curing unit, 60 seconds each from the buccal and palatal surfaces of abutments and pontic. Finally a flowable composite (tetra flow) was placed over the fiber

(*Figures 1d and 2f*), which gives a smooth, glossy appearance on palatal surfaces. Occlusion was evaluated and premature contact was eliminated. *Figures 1e and 1f* shows the labial aspects of definitive FRCFPD with PFM pontic and *figures 2g, 3c and 3d* show labial aspects of FRCFPD with natural teeth and composite resin pontics respectively.

## Discussion

Congenitally or traumatically missing anterior tooth may result in impairment of esthetics, speech and function. Several treatment options are available for replacing anterior tooth which includes implant supported single crown, conventional FPD, Resin bonded FPD (RBFDP) or RPD [9]. Conventional FPD which require support from adjacent abutments is the most common treatment modality for replacing missing tooth but in certain clinical situations where the primary abutments are weak, (such as in these cases) the need for secondary abutments for the support, for success of FPD preclude the use of conventional PFD. Although implant-supported crowns do not require involvement of teeth adjacent to the edentulous area(s), the availability of bone volume in the edentulous region, occlusal function, systemic disorders, and socioeconomic status of patients are specific considerations that may preclude this approach [10]. RBFDP is also considered successful in certain clinical situations with short edentulous span, vital and intact abutment and minimal dynamic occlusal contacts on the abutment teeth [3]. But the esthetic concerns of the patient about the display of metal retainers of RBFBD may preclude this approach for replacing missing teeth.

Replacement of missing teeth with a fiber reinforced composite resin fixed partial denture with a PFM, natural tooth, composite resin or all ceramic pontic is a conservative treatment approach which require minimal preparation of palatal/lingual and proximal surfaces of abutments. The success of FRC FPD's depends on effective bonding between pontic, fibers/composite and tooth surface. Composites do not bond chemically with tooth structure and ceramics. The mechanical adhesion of composite with enamel and dentine with etchant and bonding agent is a well known fact. The effective adhesion between ceramic and composite requires the application of 10% hydrofluoric acid on ceramic followed by the application of silane coupling agent. The hydrofluoric acid attacks the glassy phase of the ceramic, dissolving the surface to the depth of a few micrometers. The application of silane coupling agent over etched ceramic results in chemical interaction between composite resin and dental ceramics; resulting in a strong bond between them.

The esthetics of fiber-reinforced composite FPD's are superior as compared to the esthetics of FPDs with metal frameworks as determined by other investigators [11]. This prosthesis has been successfully used as short term alternative for the replacement of missing anterior teeth in young patients when conventional FPDs are contraindicated. The conservative preparation, advancement in bonding systems and reported success suggest that this prosthesis can be used as a long term definitive alternative in situations similar to the case described here. Long term success depends on proper abutment selection, slot preparation, careful bonding

technique and type of occlusion. There should be no contact on the pontic, sufficient horizontal and minimum vertical overlap.

This technique is simple, easy and time effective than other approaches. It is a quick solution for the patients who reject more invasive treatment.

### Conclusion

This article describes the clinical procedures for the esthetic

and functional rehabilitation of missing anterior teeth with fiber reinforced composite resin FPD with a PFM, natural tooth and composite resin pontics for three different patients. It is a conservative treatment option which involves minimum preparation of palatal/lingual and proximal surfaces of abutments. This technique can be successfully used as a short or long term alternative for replacing missing teeth in certain clinical situations. With FRC FPDs, the dentist might have a new option to treat patients with a less invasive FPD treatment.

### References

1. Misch CE (Editor) Contemporary implant dentistry (3<sup>rd</sup> edn.) Netherlands: Elsevier, 2007; pp. 347.
2. Turker SB, Sener ID. Replacement of a maxillary central incisor using a polyethylene fiber-reinforced composite resin fixed partial denture: A clinical report. *Journal of Prosthetic Dentistry*. 2008; **100**: 254-258.
3. Barrack G. Recent advances in etched cast restorations. *Journal of Oral Rehabilitation*. 2005; **93**: 1-7.
4. Corrente G, Vergnano L, Re S, Cardaropoli D, Abundo R. Resin-bonded fixed partial dentures and splints in periodontally compromised patients: a 10-year follow-up. *International Journal of Periodontics & Restorative Dentistry*. 2000; **20**: 628-636.
5. Zalkind M, Hadani RE, Hochman N. Resin-bonded fixed partial denture retention: a retrospective 13-year follow-up. *Journal of Oral Rehabilitation*. 2003; **30**: 971-977.
6. Ozcan M, Akkaya A. New approach to bonding all-ceramic adhesive fixed partial dentures: a clinical report. *Journal of Prosthetic Dentistry*. 2002; **88**: 252-254.
7. Puig IMA, Cabornero A. Inlay fixed partial denture as a conservative approach for restoring posterior missing teeth: a clinical report. *Journal of Prosthetic Dentistry*. 2003; **89**: 443-445.
8. Shen C, Oh WS, Williams JR. Effect of post-salinization drying on the bond strength of composite to ceramic. *Journal of Prosthetic Dentistry*. 2004; **91**: 453-458.
9. Hagiwara Y, Matsumura H, Tanaka S, Woelfel JB. Single tooth replacement using a Modified metal-ceramic resin-bonded fixed partial denture: a clinical report. *Journal of Prosthetic Dentistry*. 2004; **91**: 414-417.
10. Turker SB, Guvenli SY and Arikan A, Replacement of two mandibular central incisors using a zirconium resin-bonded fixed partial denture: A clinical report. *Journal of Prosthetic Dentistry*. 2005; **94**: 499-503.
11. Freilich MA, Meiers JC, Duncan JP, Eckrote KA, Goldberg AJ. Clinical evaluation of fiber-reinforced fixed bridges. *Journal of the American Dental Association*. 2002; **133**: 1524-1534.