Case Report

Single visit fibre reinforced composite resin bridge: A case report

Priyamvada Singh Bais*, Romana Nisar, Sheeba Hassan

Department of Pedodontics and Preventive Dentistry, Kothiwal Dental Collage and Research Centre, Moradabad.
Email: priyamvada7.ps@gmail.com

Abstract

Replacement of the missing or lost teeth is one of the major challenges faced by the dentists, especially in children. Since years, many modes of treatment options have been available such as removable temporary acrylic prosthesis or resin-bonded bridges variety of therapeutic modalities, and from implants to conventional Maryland bridges. But the recent inception of fibre-reinforced composites (FRCs) in tooth replacement therapy has opened a new perspective in the field of restorative dentistry. Fibre-reinforced composites have been incorporated with better properties with flexural strength and fracture resistance. FRC bridges are easy, minimally invasive and reversible and a single visit procedures. It also lets other options viable for future, if need be. This paper presents a case of a congenitally missing mandibular central incisors bilaterally, which were replaced with acrylic tooth pontic using fibre-reinforced composite.

Key Words: Fibre-reinforced composite, congenitally missing teeth, conservative, minimal invasive, acrylic pontic, single visit

***Address for Correspondence:**
Dr. Priyamvada Singh Bais, Department of Pedodontics and Preventive Dentistry, Kothiwal Dental Collage and Research Centre, Moradabad
Email: priyamvada7.ps@gmail.com

Received Date: 17/10/2019 Revised Date: 23/11/2019 Accepted Date: 12/12/2019
DOI: https://doi.org/10.26611/10191311

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 12 January 2020

INTRODUCTION

The art and science of restoration in dentistry is of much value during replacement of the lost tooth. Missing tooth in the anteroir region could be due to trauma or surgical extraction for periodontal problems or a developmental disturbance such as partial anadontia. Such missing or tooth loss may have a disastrous impact on patients' psychology because of esthetic reasons along with functional difficulties. The immediate replacement of lost tooth is essential not only to restore patients' confidence but also for functional and phonetic reasons. Some of the principal factors that are considered when replacing a missing tooth are conservation, natural preservation, minimal invasion, aesthetics and cost. The replacement method could be temporary, semi-temporary or permanent in nature.[1] Different therapeutic options can be considered for the replacement of a congenitally or traumatically missing permanent incisor in young children and adolescents. Partial removable dentures, conventional porcelain fused metal restorations (PFM), resin bound fixed partial dentures (FPD), and dental implants are few of the options available for replacement of missing or lost tooth. But these have their own merits and demerits along with limitations. The RPDs are often recommended for very young patients when adjacent teeth are not in their positions in the occlusal table. Drawback is that they are not comfortable and are frequently subjected to fracture. For aesthetic purpose, as an interim treatment option during orthodontic treatment, an artificial acrylic tooth can be attached to a removable or fixed orthodontic appliance.[2] The fixed partial dentures (FPD) were proposed as one of the earliest mode of replacement of the lost or missing tooth as early as 1970 as an alternative to traditional prosthesis. A pontic was bonded to the neighboring teeth using acid etching technique and composite resin.[3] These treatments were called direct FPDs. The lost teeth could be replaced using acrylic resin teeth, extracted teeth, patients natural tooth or composite resin.[4] Conventional porcelain-fused-metal (PFM) bridge or a resin-bonded fixed partial denture (Maryland bridge) are the other means of replacement of a missing tooth. The PFM being most invasive treatment in terms of tooth reduction and could be aesthetically compromising with gingival contour modifications. The

Maryland bridge is less invasive, but is associated with few limitations such as necessity of dental reduction or preparation (grooves, etc.), challenging long-lasting bonding of metal to tooth, and lack of longevity could limit its use. Furthermore, metal bonded bridges are unaesthetic as the metal decreases the translucency of the bonded tooth.[5] The fiber-reinforced composite (FRC) bridges represent an interesting and better alternative to conventional metal bridges.[6] FRC bridges could be made directly or indirectly using an artificial plastic tooth or the avulsed tooth [7] or by a direct build up composite resin tooth with or without porcelain veneering.[8] Fibre reinforced composites (FRC) have opened a new perspective in dentistry by making composite resin bridges possible and these can be a good alternative to conventional prosthetic techniques.[9] The combination of several factors like esthetic, wear-resistance, and tough fiber material gives a new option for short-span composite bridge fabrication with use of FRC's.[10]

CASE REPORT

A 16-year-old female patient was referred to the Department of Pedodontic and Preventive Dentistry at Kothiwal Dental College and Research Centre with the chief complaint of missing mandibular front teeth. (Fig 1) According to the medical history, the patient is physically healthy and had no history of dental trauma. Clinical examination revealed missing 31, 41 and crowding with respect to (i.r.t) maxillary anteriors with Class I molar relation bilaterally. Patient was advised an OPG for evaluation of the missing teeth. OPG revealed congenitally missing 31 and 41. (Fig 2) So the diagnosis made was partially edentulous mandibular arch w.r.t 31, 41 and Class I malocclusion with crowded anterior teeth.

Figure 1: Intra-oral picture showing missing 31 and 41 **Figure 2:** OPG showing congenitally missing 31 and 41

Taking into considerations the radiographic findings, clinical findings and the age of the patient a single visit fibre reinforced composite resin (FRC) bridge was planned i.r.t missing 31, 41. As the space was available only for the prosthesis of single tooth, it was planned for a single tooth replacement. First the abutment teeth i.e 32 and 42 were roughened in mesiolingual aspect by using coarse flame shaped diamond abrasive, followed by primary alginate impression of maxillary and mandibular arch, after which impression was poured with dental die stone. Mock wax up was done i.r.t 31. (Fig 3) Then a template was prepared using putty impression material in the cast. (Fig 4)

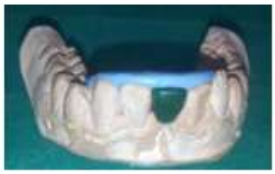

Fig 3a: Mock wax up was done i.r.t 31 (Labial aspect); **Fig 4:** Template was prepared using putty impression material in the cast; **Fig 5:** Measurement of edentulous space on cast

Fig 6: Placement of ribbond fiber w.r.t 32 and 42; **Fig 7:** composite bridge build-up; **Fig 8:** Lingual view after complete procedure; **Fig 9:** Post restoration, Facial view

The required length of the Ribbond fibre strip was predetermined by measuring the length in the cast between 32 and 42 using William's probe (Fig 5) and a piece of 10 mm wide Ribbond was cut. The abutment teeth were isolated, cleaned and dried. Then abutment teeth was etched with 37% phosphoric acid for 30 seconds, thoroughly rinsed, dried and treated with a bonding agent. Flowable composite was applied to the abutment teeth followed by placement of ribbond fiber horizontally to the abutment teeth (Fig 6) and then light cured. The embrasure areas were blocked out with wooden wedges. Template was then placed intraorally and on this bonded fibre framework composite bridge was constructed employing the layering technique(Fig 7). It was decided to leave wide open interproximal spaces mesial and distal to it for plaque control. After completion of the restoration the occlusion was adjusted in the centric and eccentric positions in order to reduce the functional forces in the restoration. The finishing and polishing procedures were carried out by using composite finishing discs and oral hygiene instructions were given to the patient.

DISCUSSION

The introduction of fiber-reinforced composite (FRC) technology has brought a new material into the world of metal-free, adhesive esthetic dentistry.[11] The combination of composite resin with fibres have shown to have significant benefits in terms of mechanical properties, higher elasticity modulus the possibility of direct chair-side application and the ability to bond to tooth structure .[12] The features of the resulting structure depend on the volume of fibres embedded in the resin matrix. The greater the number of fibres, the better the strength characteristics, provided that complete wetting of the fibres occurs. Goldberg and Burnstone1 observed that the optimum mixing ratio to be 43 to 45 percent fibre by volume. Depending on the structural design of fibre arrangement in FRC, these can be of various types: Unidirectional or Bi/ Multidirectional (Braided/ Woven) and upon the length of the fibres as long, continuous, unidimensional fibres and short fibres (300µm), randomly arranged and the material is isotropic. With the fibres being long, continuous and arranged in specific axes to resist forces in a specific direction and the material no longer behaves isotropically. Presently, two types of fibre bundles are available: Pre-impregnated with resin and non-impregnated. The pre-impregnated fibre-reinforced composite have fibre bundles pre-wetted with a low viscosity resin in the laboratory under controlled manufacturing conditions. The impregnation process is completed at the chair by "wetting" the fibres with a low viscosity resin. Complete wetting of the fibres is crucial to achieving maximum strength.[13]

Factors affecting the success rates of FCRs (1) –

1. A well-designed preparation of the abutment teeth.
2. Potential reinforcement provided for polyethylene fibers; adhesion between the fiber and the composite could increase the resistance and the hardness of the material allowing deflection without fracture.
3. The prosthetic space in resin-bonded FPDs; the distance should not be larger than 15mm, because the FPD would suffer a higher deflection and could be unsuccessful. A large prosthetic space in the mandible might increase the failure rate to 3 times.

Success rates of different FCRs (1):

AUTHOR	STUDY	TIME DURATION	SUCCESS RATE
Valittu and Sevelius	Used unidirectional glass fibers to reinforce FPDs	24 months	93%
Freilich *et al*	Used FPDs made with a framework of pre-impregnated, unidirectional fiber reinforced composite.	37 months	95%
Piovesan *et al*	Evaluated Polyethylene fiber FPDs with pontic using extracted teeth, acrylic resin teeth, or with composite resin	31 months	94.75%

Other applications of FRCs:

a. Can be used as a fixed replacement following tooth loss from trauma.
b. In medically compromised patients as a fixed tooth replacement who cannot be seated for longer periods of time or have local anesthesia.
c. As an alternative splint in anterior periodontal tooth stabilization[14] or with periodontally compromised abutments.
d. As a direct-replacement teeth, after orthodontic treatment of the patient with congenitally missing teeth, also provide for fixed orthodontic retention. This is especially pertinent for the young patient (teenager) in whom a conventional FPD or an implant is not yet indicated or practical for the given clinical situation.[15]
e. As space maintainer, for fixed orthodontic retention.[15]

CONCLUSION

Fiber-reinforced composites have emerged as promising alternative replacement restoration technique with benefits to the patient as well as for the dentist. It is more comfortable than a removable appliance, nonirritating, and hygienic. Generally, it requires little or no preparation abutment teeth, making this procedure minimally invasive, reparable, and modified. Also, being a reversible technique it permits the review of other restorative options, if need arises, especially when used as a provisional treatment if implant therapy is used at a later date.

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Source of Support: None Declared
Conflict of Interest: None Declared