Case Report
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Bridging the Gap: A Case Report of Tooth Replacement using Resin-Bonded Fiber-Reinforced Composite Resin

Vineet Sharma[1], Sumit Bhansali[1*] and Sonal Priya Bhansali[2]

[1]Department of Prosthodontics, RUHS College of Dental Sciences, Jaipur - 302016, Rajasthan, India; bhansalisumit@gmail.com
[2]Department of Oral Surgery, RUHS College of Dental Sciences, Jaipur - 302016, Rajasthan, India

Abstract

This case report details the prosthetic replacement of a mobile mandibular left central incisor using a Fibre-Reinforced Composite resin (FRC) with a denture tooth pontic along with splinting of periodontally compromised teeth adjacent teeth. FRC is ideal because it offers excellent mechanical and esthetic properties, especially when combined with splinting for periodontally weakened teeth. The clinical procedure included selecting an acrylic denture tooth and bonding it to adjacent teeth using FRC without invasive tooth preparation procedures. The prosthetic tooth was shaped, polished, and finished to blend with the surrounding teeth, providing the patient with proper occlusion and esthetics. The patient experienced no discomfort or adverse effects during the follow-up period, and both the esthetic and functional outcomes were satisfactory. FRC offers a conservative, low-cost alternative to implant prostheses and can improve the patient's long-term periodontal outcome. However, it is essential to note that regular follow-up visits and proper maintenance are necessary to prolong the lifespan of the restoration.

Keywords: Anterior Esthetics, Fiber Reinforced Composite Resin, Fixed Restoration, Periodontal Splint, Ribbond

1. Introduction

Restorative dentistry places great importance on the prosthetic rehabilitation of missing teeth, especially in the esthetic zone[1-3]. Although dental implants are frequently utilized to replace missing teeth, certain patients may not be suitable candidates due to medical concerns, low bone density, or financial restrictions[2,4]. In these circumstances, resin-bonded fixed dental prostheses could provide a less invasive and more affordable alternativ[2,3,5].

In recent years, FRC has become increasingly popular in restorative dentistry due to its outstanding mechanical and esthetic properties[6]. FRC is utilized in dentistry for various purposes, such as periodontal and post-traumatic splints[6,7]. FRC materials comprise a resin matrix enveloping glass, carbon, or polyethene fibres, providing structural strength and durability. Studies show that FRC materials have higher flexural strength than metal alloys[2]. Therefore, FRC can be an excellent option for restoring the missing anterior tooth, especially when combined with splinting for periodontally weakened teeth[8]. A resin-bonded prosthesis comprises an acrylic denture tooth attached to the adjacent teeth using FRC without drilling or invasive procedures[8,9].

Immediate bonding of a denture tooth to adjacent teeth is a cost-effective alternative to implant prostheses[10]. Several studies have shown positive outcomes regarding esthetics, function, and patient satisfaction with FRC[10,11]. Utilizing a denture tooth as a pontic allows for a conservative restorative approach that does not require lab support[11,12]. This technique is appropriate for individuals who require rapid rehabilitation of a compromised tooth but are not suitable for implant placement. Using a denture tooth as a pontic in combination with FRC yields promising results[12].

This case report demonstrates the successful application of FRC for replacing missing teeth using denture teeth with splinting of periodontally weakened

**Author for correspondence*

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teeth. FRC provides long-lasting and aesthetically pleasing rehabilitation[12,13]. Additionally, FRC can strengthen weaker teeth and prevent further damage, resulting in improved long-term outcomes for the patient[13].

2. Case Report

A 32-year-old female patient presented with a painful, grade 3 mobile mandibular left central incisor. The patient had no notable medical history. The extraction and replacement of the mobile tooth were planned. The adjacent teeth were also showing limited mobility. The patient was informed about the treatment options, which included removable partial dentures, implant-supported single crowns, and splinting using the denture tooth. The patient declined the removable partial denture option because of a preference for a fixed solution for the missing tooth. The implant-supported crown was deemed too expensive. Therefore, splinting of the mandibular anterior with a fiber splint and the denture tooth as a pontic was suggested. The patient found the proposed treatment plan attractive due to its relatively low cost and the possibility of receiving a fixed prosthesis.

2.1 Clinical Procedure

The mandibular left central incisor was extracted with local anesthesia, which was uneventful (Figure 1-(A)). An acrylic denture tooth was selected based on the adjacent tooth size, shape, and color. A round abrasive tip was used to make a 1.25-mm groove in the lingual middle third region of the denture tooth. The adjacent teeth were isolated with a rubber dam, and their enamel surfaces were etched for 20 seconds with 37% phosphoric acid, rinsed, and dried. A bonding agent (Ribbond Wetting Resin, Ribbond, Seattle, USA) was then applied to the etched enamel surfaces and cured with a light-curing unit.

The FRC (Ribbond Ultra, Ribbond, Seattle, USA) was cut to the required length and shape and was submerged in a bonding agent (Ribbond Wetting Resin, Ribbond, Seattle, USA) for 10 seconds to enhance the bond strength. A composite resin (Ribbond Securing Composite, Ribbond, Seattle, USA) was then applied to the lingual mid-groove of the denture tooth and the lingual surface of the adjacent teeth. The FRC was then placed against the composite resin followed by light cure (Figure 1 (B) and (C)).

After the FRC was bonded, it was polished using polishing burs and rubber polishing cups to blend in with the surrounding teeth (Figure 1 (D) and (E)). The occlusion was adjusted to ensure that the patient had a comfortable bite. Follow-up appointments were scheduled for one week, one month, three months, and six months later. The patient did not experience any discomfort or adverse effects during the follow-up period.

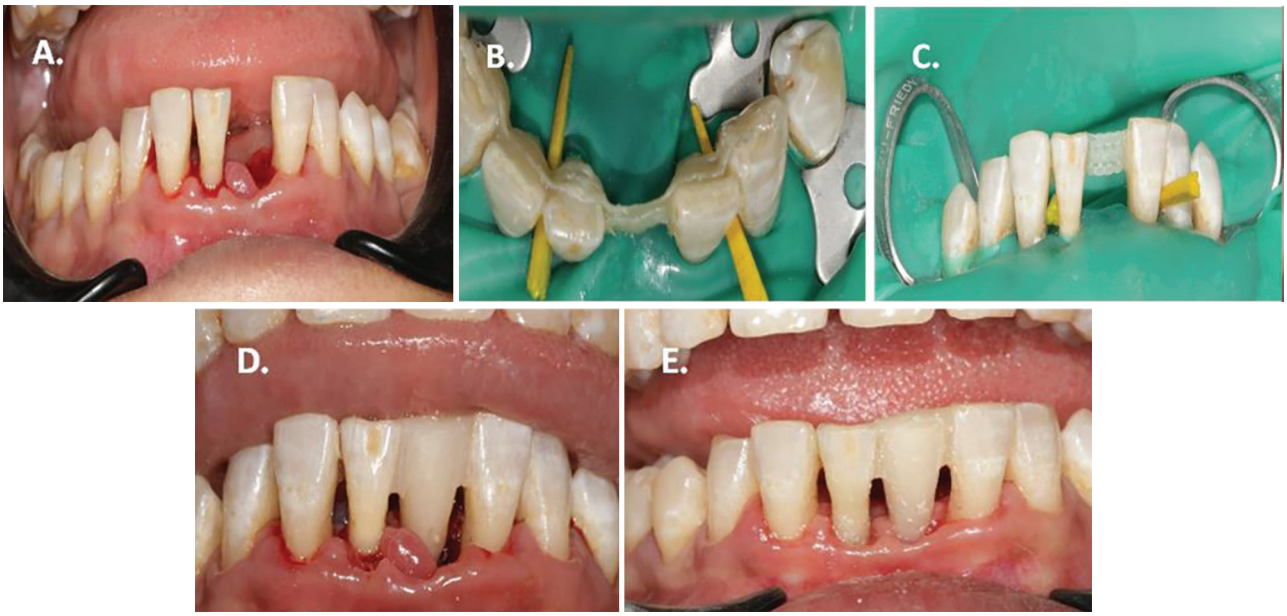


Figure 1. **(A)** Recently extracted mandibular left central incisor, **(B)** Occlusal, **(C)** Frontal view of FRC framework in place, **(D)** Final FRC bonded prosthesis in situ, **(E)** At a one-month follow-up visit.

3. Discussion

Composite materials are often used to replace damaged or missing teeth because of their aesthetic appeal. However, their low fracture resistance and resilience limit their use in fixed dental prostheses. To address this issue, fiber reinforcement has been introduced to create a chemical bond between the strengthening fiber and composite, thereby preventing crack propagation[14]. FRC-bonded prostheses are a minimally invasive and cost-effective solution for replacing missing teeth[2,8]. In recent years, FRC has emerged as a promising material for producing resin-bonded prostheses that are both durable and natural-looking[10,11].

Resin-bonded FRC with fiber reinforcement enhances the composite resin's strength and fracture resistance while providing flexibility that allows for a more natural and comfortable fit[15]. In addition, FRC demonstrates a rigidity and flexural strength seven times those of particulate composites alone. This is particularly important for anterior teeth with high aesthetic and functional demands[14]. The technique described in this case report involved using a prefabricated FRC framework bonded to a denture tooth to replace the missing tooth. The FRC framework was selected for its strength, durability, and esthetics. In addition, the denture tooth was chosen based on its shape and color, which closely matched the adjacent teeth, resulting in an aesthetically pleasing restoration.

The clinical steps involved in the fabrication and placement of the restoration were relatively quick and straightforward. First, the tooth was cleaned and prepared. Then, an FRC framework was selected and shaped according to the desired size and contours. Next, this framework was bonded to the tooth using composite resin. Next, the denture tooth was bonded to the framework using the same resin. Finally, the restoration was finished and polished to ensure proper occlusion and esthetics, blending seamlessly with the adjacent teeth.

The aesthetic and functional outcomes of the restoration were satisfactory, with the shade and contour of the restoration matching those of the adjacent teeth. The patient did not report any discomfort or adverse effects during the follow-up period, and clinical examination revealed no signs of debonding, chipping, or discoloration of the restoration. The restoration remained stable and functional throughout the six months of follow-up. However, it is important to instruct the patient to avoid applying excessive biting pressure to the splinted teeth and to alleviate all eccentric movements.

Using prefabricated FRC frameworks is a conservative and minimally invasive approach to preparing adjacent teeth[16]. FRC restorations provide numerous benefits, including improved durability, longevity, and esthetics[17,18]. Furthermore, minimal tooth preparation is necessary for FRC restorations, making them a less invasive option than other restorative techniques[2,8,9]. Additionally, FRC restorations are significantly less expensive than traditional options, making them a more affordable treatment alternative for patients[8,18].

However, FRC restorations have some limitations, as they may not be suitable for all patients, particularly those with severe occlusal forces or bruxism. In addition, these restorations may require more frequent maintenance and replacement compared to traditional restorative options[19]. Therefore, it is crucial to ensure proper patient selection, treatment planning, and execution of clinical steps to achieve successful outcomes with FRC restorations. Long-term studies are necessary to evaluate resin-bonded FRC restorations' durability and clinical efficacy.

4. Conclusion

In conclusion, restoring a missing anterior tooth using FRC is a promising option that offers many advantages over traditional restorative techniques. FRC frameworks allow for a conservative preparation of the adjacent teeth, resulting in less invasive treatment for patients. Furthermore, FRC restorations are cost-effective, durable, and provide excellent esthetics. While further research is needed to evaluate FRC restorations' long-term efficacy and outcomes, this case report provides evidence of the successful use of resin-bonded FRC for prosthetic replacement. Therefore, clinicians should consider FRC restorations a viable treatment option for patients seeking minimally invasive, cost-effective, and aesthetically pleasing solutions to missing teeth.

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