

Minimally invasive and aesthetic rehabilitation of missing maxillary anterior teeth with indirect fiber reinforced composite bridge: A case report

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Abstract

Missing anterior teeth is still a common problem affecting the patient's psychological and social life. Fiber Reinforced Composite (FRC) bridge is a promising alternative treatment to replace missing anterior teeth. The indirect FRC method can be a solution to reduce chairside time and optimize bridge aesthetics. Patients with missing maxillary central incisors were planned for indirect FRC bridge treatment. Reduction of palatal abutment area (maxillary central incisors and canines) using a diamond bur and taking impressions using a two-step putty wash technique. Fabrication of FRC bridges by an indirect method in the laboratory with polyethylene fiber and composite resin. The insertion procedure starts with surface treatment with etching (37% Phosphoric Acid) on the reduced abutment area. The FRC bridge was cemented using self-adhesive resin cement. Indirect FRC bridge provides treatment results with high esthetics and maximally preserves tooth tissue. It is minimally invasive to tooth tissue, so it can be an alternative treatment for missing anterior teeth. Patients showed high satisfaction with this treatment.

Keyword: Missing anterior teeth; Fiber-reinforced composite; Minimally invasive; Aesthetics; Indirect method

1. Introduction

Missing anterior teeth is still a common problem for patients. This problem can damage the patient's psychological and social life [1]. Determining effective treatment is still a challenge for dentists. Fiber Reinforced Composite (FRC) bridge is a promising alternative treatment to replace missing anterior teeth. The FRC bridge design comprises a polymeric matrix (composite resin) and reinforcing filler (framework fiber). Framework fiber is covered with veneering composite resin [2]. FRC bridges offer a highly conservative, high-aesthetic, relatively low-cost treatment option. This treatment is minimally invasive because of little or no preparation of the abutment teeth. In addition, this treatment is reversible because dentures are constructed with composite resin, so they can be easily repaired if there is damage [3]. FRC bridges demonstrate high success and survival rates for replacing single anterior teeth in patients [4].

FRC bridges can be fabricated in direct or indirect methods. The direct method is popular because this method can provide immediate treatment in a single visit, but obtaining optimal esthetics requires a long chairside time [5]. Other authors also stated that the direct method requires a long time, and finishing and polishing procedures are relatively difficult [6]. The indirect method can be a solution to reduce chairside time and optimize the bridge's aesthetics.

2. Case

A 25-year-old female patient visited the dentist complaining of a lack of confidence in her appearance due to missing two maxillary anterior teeth. The patient needs to gain experience using dentures. Extraoral examination revealed no abnormalities. Intraoral examination showed missing teeth on both maxillary lateral incisors, with maxillary central

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incisors and canines in good condition and qualified as abutments (Figure 1). In this case, treatment options are Fixed-fixed, Maryland, and FRC bridges. Considering financial factors and reducing healthy tissue that is too invasive, patients prefer the indirect fiber-reinforced composite treatment option.



Figure 1 Patients with missing maxillary lateral incisors with maxillary central incisors and canines qualified as abutments

Reduction of palatal abutment area (maxillary central incisors and canines) using diamond burs to create space for composite and fiber reinforcement. Taking impressions uses a two-step putty wash technique (VPS/3M ESPE) to create an accurate master model. Bite records were obtained using bite registration material (3M ESPE Imprint Bite).



Figure 2 Indirect FRC bridge fabricated in the laboratory

Fabrication of FRC bridge in a laboratory (indirect technique) with polyethylene fiber that is cold gas treated and impregnated with silane and resin (Construct/KerrLab) and composite (3M Filtek Z250) (Figure 2). The insertion procedure starts with surface treatment with etching (37% Phosphoric Acid) on the reduced abutment area. The FRC bridge was cemented using self-adhesive resin cement (3M Relyx) (Figure 3). Correct occlusion with articulating paper. Recall that a month post insertion showed FRC bridge and abutment teeth in good condition. The results of the post-insertion treatment showed that the dentures had high esthetics, and the patients were satisfied with this treatment (Figure 4).



Figure 3 Indirect FRC bridge cemented using self-adhesive resin cement

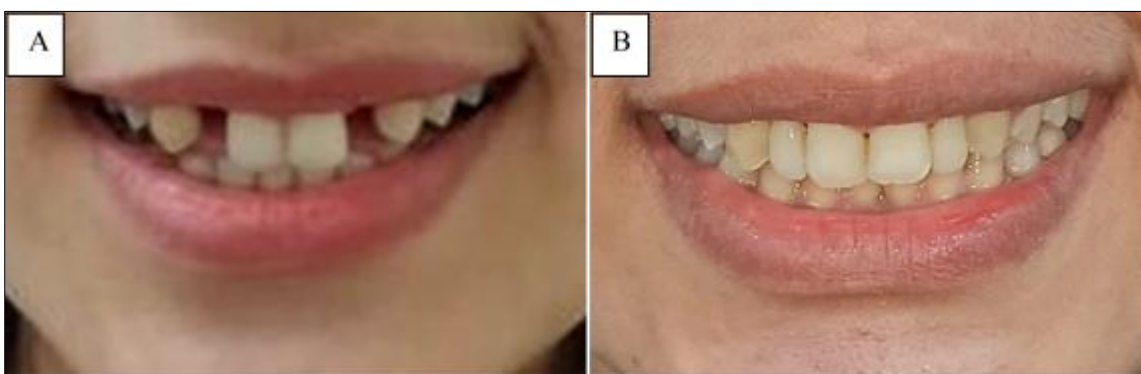


Figure 4 Results of Indirect FRC bridge treatment. (A) pre-treatment; (B) post-treatment

3. Discussion

Rehabilitation of missing anterior teeth with FRC bridge has many benefits. FRC bridges are a minimally invasive, esthetically favorable, reversible, and cost-effective treatment option [1,3]. Minimal invasiveness is the main advantage of the FRC bridge. Minimally invasive treatment options should always be considered, and the destruction of enamel and dentin during the preparation phase for healthy teeth should be kept to a minimum [3]. FRC bridge treatment can make it possible to maintain as much tooth tissue as possible so that natural tooth tissue can be preserved. FRC treatment results show high patient satisfaction. Satisfaction with the FRC bridge is obtained not only because of the aesthetic results of the treatment but also because it allows the patient to avoid the uncomfortable experience of using a removable device. FRC bridge is a cheaper treatment, painless treatment, and minimal tissue reduction compared to fixed-fixed bridges and implants [7].

Direct and indirect techniques can construct FRC bridges. In this case, the author chose the FRC bridge with the indirect technique, and bridges are fabricated in the laboratory. FRC bridges using the indirect technique have aesthetically pleasing results, but they have the disadvantage of being visited more frequently. In addition, the indirect technique has a shorter chairside time and is also indicated for less patient cooperation [3]. Other authors claim that FRC bridge construction indirectly provides superior aesthetics, surface polish, color stability, and durability compared to the direct method [5].

FRC bridges can be used for temporary, medium-term, and long-term solutions. FRC bridges are claimed to have high success and survival rates in rehabilitating missing anterior teeth. Hmeadi and Sultan [4] demonstrated that the indirect FRC bridge has an excellent success rate (93%) and survival rate (100%) evaluated after 24 months, which allows it to be a long-term treatment option. Ahmed [8], in his clinical study, stated that the FRC bridge has a high survival rate (94.5%) with predictable performance results in medium-term management use.

One of the crucial steps in manufacturing fixed partial dentures is accurate impressions. The putty wash technique is one of the impression techniques recommended for manufacturing fixed dentures. Putty acts as a tray, and a light body (wash) with lower viscosity, can flow to record more accurate details. There are two putty wash techniques: (1) one-

step technique; (2) two-step technique. In this case, the author uses a two-step putty wash technique to make the final impression. This technique was chosen because it can create a uniform and controlled wash space to fit the restoration precisely [9]. Nissan [10], in his study, explained that the two-step putty wash method is the best polyvinyl siloxane (VPS) impression technique, besides that, the two-step method gets the best marginal fit of cast restoration. VPS impressions combined with the two-step putty wash technique produce a more accurate cast than the one-step putty wash technique [11,12].

Cementing is an essential procedure for successful fixed denture treatment. Resin cement is still the most popular cement in fixed denture cementing procedures. Resin cement is divided into three types based on their bonding mechanism: conventional resin cement (total-etch), adhesive resin cement (self-etch), and self-adhesive resin cement [13,14]. In its application, conventional resin cement requires phosphoric acid followed by a dentine bonding system. Adhesive resin cement requires self-etching primer and is not rinsed off to adhere to dentin [15]. Self-adhesive resin types of cement are often used. They have a simpler procedure because they do not require preliminary teeth preparation and bonding material application before cementation. This material is also less technique sensitive [13,14]. In this case, the authors cemented the FRC bridge using self-adhesive resin cement, starting with 37% Phosphoric Acid preliminary preparation for 15 seconds on the abutment teeth. The adhesion of self-adhesive resin cement to dentine can be increased by etching 37% phosphoric acid for 15s before the cementing procedure. The preliminary preparation procedure with dentin etching aims to remove the smear layer, open the dentinal tubules, expose collagen fibers, and increase wetting capacity [16]. Kamabara [17] explained that the presence of a smear layer affects the bonding of self-adhesive resin cement to dentine. Self-adhesive cement cannot completely demineralize the smear layer, reducing adhesion ability. Several studies have confirmed that preliminary preparation on dentin can improve the performance of self-adhesive cement [16–19].

4. Conclusion

Indirect FRC bridge provides treatment results with high aesthetics and maximally preserves tooth tissue. It is minimally invasive to tooth tissue, so it can be an alternative treatment for missing anterior teeth. Patients showed high satisfaction with this treatment. Further studies need to be carried out to evaluate the FRC bridge in the long term

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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