

Urgent Solution for Single Tooth Loss: Fiber-Reinforced Composite Bridges

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Cite this article as: Demirel MG, Tuncdemir MT. Urgent Solution for Single Tooth Loss: Fiber-Reinforced Composite Bridges. Eurasian J Emerg Med. 2018; 17: 78-81.

Abstract

Rehabilitation in maxillary anterior teeth loss is a serious challenge in the field of dentistry. Some patients may not wish to undergo implant treatment because of economic inconvenience or the tendency to avoid surgery. In such cases, rehabilitation with full crown teeth causes important amounts of loss material. Fiber-reinforced composite (FRC) bridges are a serious alternative to conventional treatments and present considerably more conservative solutions. This article describes the clinical technique and a 6-month follow-up. The patient had lost the maxillary anterior tooth after trauma. The adjacent teeth were periodontally healthy and had no mobility. The main advantage of this FRC bridge treatment was the improvement in oral hygiene with supragingival margins and the loss of minimum tooth structure. In particular, when the patient's teeth are used as a pontic, the esthetic results are very good and patient satisfaction can be achieved.

Keywords: Conservative treatment, FRC bridge, maxillary anterior teeth

Introduction

Nowadays, due to the esthetic expectations of people, the necessity of rehabilitation in single tooth loss, particularly in the front, has become an urgent need. The teeth in the anterior region may be lost due to trauma or periodontal destruction; in this case, this region should be rehabilitated with immediate reconstruction.

The preparation of a conventional fixed partial denture treatment, in which adjacent teeth have no caries and have a good esthetic appearance, is now considered to be a radical treatment by many clinicians (1). The length of treatment duration and conventional fixed partial denture treatment dependence on the technician's skill is a major disadvantage. Nevertheless, in cases of severe bone loss with excessive periodontal tissue loss, implant treatment may not be a very successful option. In some cases, the bone tissue must be supported with graft before implant treatment so the duration of treatment will be too long. Moreover, many patients tend to avoid implant therapy because of financial difficulties or psychological concerns due to surgical procedures. Fiber-reinforced composites (FRCs) provide an innovative alternative to conventional methods

to quickly and economically improve the esthetic, phonation, and functional deficiencies. In recent studies, the 5-year survival rate using conventional bridge prostheses was found to be slightly more than 90% and using resin-supported bridges was found to 87.7% (2). Recently use of this FRC bridge treatment is more common, and it can be an alternative treatment to the traditional systems.

Case Presentations

Case 1

A 23-year-old male was referred to our clinic to esthetically compensate the loss of his maxillary central incisor. The tooth was extracted from the tooth socket because of trauma but the patient did not lose the tooth. The socket and surrounding tissues were examined, and proximal caries was found on the adjacent teeth. No mobility was found in the adjacent teeth, and no pathology was found by performing a radiographic examination. The patient opted for the economic FRC bridge option with the use of his own avulsed tooth as a pontic. Therefore, it was decided to use the avulsed tooth as a natural pontic for the anterior aesthetic FRC bridge fabrication.



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Received: 12.05.2017 • **Accepted:** 14.05.2017 • **Available Online Date:** 09.08.2017

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DOI: 10.5152/eajem.2017.40085



Figure 1. Expanded cavity



Figure 4. Frontal and palatal view of treatment



Figure 2. Ribbon is cut on the cast model



Figure 5. Six-month follow-up



Figure 3. Occlusal adjustments during lateral and protrusive movement



Figure 6. Maxillary central incisor deficiency



Figure 7. Periodontal support to the adjacent teeth is poor



Figure 8. Final view of restoration

The advantages of this treatment are as follows:

- It is easier to create a natural esthetic appearance because the patient is missing a tooth.
- Preparation procedures required for conventional systems are not required in this system.
- Treatment is more economical for the patient.

In this treatment, a cast model was first formed by taking an impression of the patient's mouth. The patient's tooth was adjusted in the model. The carious areas on abutments were polished. Existing cavities were expanded further in the mesiodistal and cervico-incisal directions, allowing Ribbond to settle (Figure 1). Thus, it reached a dimension that can provide sufficient support for a pontic. Ribbond was cut on the cast model at an appropriate size with special scissors in the set (Figure 2). Then, the primer of bond agent and 37% phosphoric acid was applied for 20 s, and the excess phosphoric acid was removed under low air pressure for 10 s. Then, bonding was applied and polymerized with light for 10 s. The pontic was conveniently positioned and attached to the abutments at contact points with a flowable composite. Then, a very thin layer of the flowable composite was applied to the tooth and pontic surfaces. After controlling the pontic in the proper position, Ribbond saturated in 20 s with the

bonding agent set with the help of a hand instrument so that the edges were in the proper position within the cavity limits was then polymerized for 20 s with light. Then, the Ribbond surface was covered with anterior region composites, and after polymerization for 40 s, the edges were smoothed. Occlusion was controlled in centric, lateral, and protrusive movements, and premature contacts were removed (Figure 3). Treatment was successfully completed (Figure 4), and the patient was educated about techniques of brushing and flossing and also came back for a follow-up visit after 6 months.

The patient's oral hygiene was good at the 6th-month visit. There was slight coloring in the teeth, but edema, hyperemia, and lesions were not found at the gingiva (Figure 5).

Case 2

A 48-year-old male was referred to our clinic for immediate treatment because of a deficiency in the maxillary central incisor (Figure 6). It was understood that the tooth was lost due to periodontal damage after the anamnesis was obtained from the patient. After performing intraoral and radiological examinations, the periodontal status of the adjacent teeth was poor (Figure 7). A FRC was planned to support to splint the teeth with a poor periodontal status. Considering the patient's expectations, rehabilitation with an implant-supported prosthesis or conventional fixed prosthesis was not preferred.

An impression was first taken with alginate, and a cast was prepared. Cavities were prepared in an enamel boundary on the palatal surfaces of the teeth. The surface was roughened with 37% orthophosphoric acid, and bonding agents were applied on the tooth surface. The enamel surface was covered with a flowable composite. Ribbond was cut on the cast model at a proper length and was saturated in the bond for 20 s. Then, it was placed on the tooth surface in a suitable position and covered with a flowable composite again. Occlusion was controlled in all movements, and premature contacts were removed (Figure 8). The patient was given oral hygiene motivation and was called for follow-up visit 6 months later.

Discussion

Polyethylene or glass fibers are generally used to support the resin matrix in FRC bridges. Although aramid or carbon graphite fibers can be used, they are not particularly preferred due to their esthetic deficiencies. Fiber reinforcement on the resin provides improved mechanical properties and optimized material properties. They are synthetic compounds and inherently non-toxic and are not used in materials that come into direct contact with oral tissues.

In vitro studies have shown that FRC material is an anisotropic material which means its clinical and mechanical performance is directly related to fiber direction. Fibers applied parallel to the resin show highest performance, but it has been found that application in the vertical direction causes severe performance losses. In short, the strength of FRC depends on:

- Fiber and composite material properties.
- Quantity of fiber and composite.
- Adhesion of fiber and resin matrix.
- Fiber rate in the resin matrix.

- Fiber orientation.
- Localization of the fiber in the prosthesis (3).

Silane agents are used in prosthodontics as adhesion-improving material between different materials (4). It is applied to increase the glass fiber--resin connection. Surface roughening is done by a technique called plasma treatment to increase the polyethylene fiber--resin bond. If these processes are not properly applied, the surface wettability of the resin is reduced, and as a result, no proper connection can be achieved (5). Indications of FRC bridges include:

- Splinting teeth with increased periodontal loss.
- Increase retention in the orthodontic treatment.
- Provisional bridge construction.
- To increase support in the construction of fixed partial bridges.
- Prosthetics repair.
- Strengthening the structure of teeth with excess material loss after endodontic treatment (5).

This article describes fabricating an FRC bridge with using patients' own permanent central incisor after extraction.

Conclusion

Fiber-reinforced composites are frequently used as splint materials, and their use has achieved successful results. They can be used for permanent restoration because of the simplicity of construction steps and the very conservative treatment method in case of a single tooth defect. The most important advantages are: if FRCs are properly prepared, they will not transfer overload to abutments and necessary shaping can be achieved so that the gingiva can be properly cleaned.

One of the major disadvantages of prosthetic restorations is the necessity of completing the missing soft tissue with another material in case of severe bone loss and when soft-tissue shaping is not possible (6). However, FRC bridge restoration can become weak, and long-term esthetic results may not be as desirable. If a patient's tooth is used in restoration, the root does not cut and gingival recession can be simulated.

Some of the other advantages include; FRC bridge restorations being an economically suitable treatment, the absence of a metal portion that can cause corrosion, and its reversible nature if problems

are encountered. Strength against occlusal and lateral forces is very limited (7). Implant-supported restoration may be a more conservative treatment method than FRC bridges but may not be used because of economic problems of patients or concerns about the surgical procedure. FRC bridges are easily accepted by patients because of the ease of implementation and economic advantages.

Informed Consent: Written informed consent was obtained from patients who participated in this case.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – M.G.D.; Design – M.G.D., T.M.T.; Supervision – T.M.T.; Resources – M.G.D., T.M.T.; Materials – M.G.D.; Data Collection and/or Processing – M.G.D.; Analysis and/or Interpretation – M.G.D., T.M.T.; Literature Search – M.G.D.; Writing Manuscript – M.G.D.; Critical Review – M.G.D., T.M.T.; Other – M.G.D., T.M.T.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Singh K, Gupta N, Kumar N, Kapoor V, Nisha C. Esthetic and functional rehabilitation of missing anterior teeth with a conservative treatment approach: a clinical case series. *Oral Health Dent Manag.* 2014; 13: 656-60.
2. Pjetursson BE, Bragger U, Lang NP, Zwahlen M. Comparison of survival and complication rates of tooth supported fixed dental prostheses (FDPs) and implant supported FDPs and single crowns (SCs). *Clin Oral Implants Res.* 2007; 18: 97-113. [\[CrossRef\]](#)
3. Vallittu PK. Strength and Interfacial Adhesion. In: Vallittu PK, editors *The Second International Symposium of Fiber Reinforced Plastics in Dentistry.* 2011 Oct 13; Nijmegen, Netherlands; 2011: 2-28.
4. Lung CYK, Matinlinna JP. Aspects of silane coupling agents and surface conditioning in dentistry: an overview. *Dent Mater.* 2012; 28: 467-77. [\[CrossRef\]](#)
5. Strassler HE, Tomona N, Spitzangel JK Jr. Stabilizing periodontally compromised teeth with fiber-reinforced composite resin. *Dentistry Today.* 2003; 22: 102-4.
6. Alani A, Maglad A, Nohl F. The prosthetic management of gingival aesthetics. *Br Dent J.* 2011; 210: 63-9. [\[CrossRef\]](#)
7. Karaman AI, Kir N, Belli S. Four applications of reinforced polyethylene fiber material in orthodontic practice. *Am J Orthod Dentofacial Orthop.* 2002; 121: 650-4. [\[CrossRef\]](#)