Volume 14, Issue 3 (2026) pp. 296-302 **DOI**: 10.48309/IJABBR.2026.2079033.1675

Original Article

Evaluation of the Clinical Success Rate of Fiber-Reinforced Polyethylene Composite Conservative Bridges

Mohamadreza Soltani | Fahimeh Feili * | Sepehr Zargoosh

[1]Department of Restorative Dentistry, School of Dentistry, Ilam University of Medical Sciences, Ilam, Iran

*Corresponding Author E-mail: fahimehfeili2024@gmail.com

Submitted: 2025-11-21, Revised: 2025-12-03, Accepted: 2026-01-02

Abstract

Despite advancements in materials used for restorative dentistry, there is no ideal dental material for every ideal dental application. The objective of this study was to compare the clinical success rate of FRC and direct bridges in patients attending dental clinics. This retrospective, analytical, cross-sectional study investigated the clinical success factors in patients who had undergone direct FRC treatment for the replacement of missing anterior teeth over the past 15 years. We clinically evaluated patients who had received Fiber-Reinforced Composite (FRC) Bridges for the replacement of missing anterior teeth within the last ten years. Based on a researcher-developed chart (attached herewith), the clinical performance factors of the restoration were examined meticulously by a restorative specialist. This study was conducted on 31 patients who had previously (more than 10 years ago) undergone direct FRC treatment for the replacement of missing anterior teeth. The majority of patients used a toothbrush daily and flossed occasionally. Most of them did not use mouthwash, and the majority of subjects studied (83.9%) did not have harmful oral habits (mouth breathing and bruxism). Secondary caries was not evident in the abutment teeth in most patients (74.2%). 25.8% of the patients were without aesthetic defects, but the majority of patients (64.5%) had correctable aesthetic defects, and restoration replacement was reported in only 9.7%. The synergistic effect between the fiber and the composite creates a bilayer restoration that can withstand twice the load tolerated by a conventional composite restoration.

Keywords: Clinical Success, FRC and Direct Bridges, Dentistry

Introduction

The dental community today faces an increasing demand from society to preserve teeth as much as possible. In fact, this primary goal has largely become achievable through the expansion of scientific research and the introduction of novel methods. One of the problems dentists constantly face is the restoration of teeth that have undergone root canal treatment [1,2]. Given the high prevalence of edentulism in posterior regions and the issues arising from untreated gaps—such as bone resorption, aesthetic concerns, decreased function, and the positional change of adjacent teeth—which consequently make tooth replacement more difficult, and considering the growing attention to conservative restorations, the fracture resistance of Fiber-Reinforced Composite (FRC) bridges holds significant importance [3-5].

Despite advancements in materials used for restorative dentistry, no ideal dental material exists for every ideal dental application [6]. The most crucial goal of prosthodontics in dentistry is the replacement of lost teeth, achieved through fixed prostheses supported by teeth or implants, or through removable prostheses. In fixed tooth

replacement, metal-ceramic restorations are the first choice for dentists due to their outstanding advantages (such as high strength and desirable durability) [7-10].

The development of dental materials has enabled the use of fiber-reinforced materials in conservative aesthetic treatments. These new materials lead to increased flexural strength as well as improved aesthetics in the restorations [11-14]. The selection of an appropriate restorative material is a major factor affecting the durability of the restoration. Numerous clinical applications, including the restoration of lost teeth using resin-bonded fixed dental prostheses in various forms, have been investigated [15-17].

By performing appropriate restorative treatment, the lost strength of the tooth can be compensated for. Dental composite applications include restoring dental cavities (caries), closing interdental spaces, correcting tooth shape and color, and rebuilding broken or worn-down teeth [18,19]. The objective of this study was to evaluate the clinical success rate of conservative FRC bridges in patients referred to dental clinics in Ilam City.

Methods

This retrospective, analytical, cross-sectional study investigated the clinical success factors in patients who underwent direct Fiber-Reinforced Composite FRC treatment for the replacement of missing anterior teeth. The initial sample size was set at 26 participants; however, 5 additional individuals were included, bringing the total sample size to 31. The sample for this research was selected using a convenience sampling method and then randomly assigned to form a group of 31 individuals. In this study, the clinical success factors were examined in patients treated with direct FRC for anterior tooth replacement over the past 15 years. The patients who had received Fiber-Reinforced Composite bridges for the replacement of missing anterior teeth within the last ten years were clinically evaluated. Based on a researcher-developed chart, the clinical performance factors of the restoration were examined meticulously by a restorative specialist.

Method of Constructing the Conservative FRC Bridge

The patient's occlusion was first examined to ensure sufficient space for the placement of the conservative FRC bridge. The abutment teeth were checked for health, absence of caries, periodontal problems, or heavy occlusion. The presence of periodontal problems, deep occlusion, and controversial occlusal issues (cross-bite, traumatic occlusion, etc.) were contraindications for this treatment. Caries in the abutment teeth were treated. If sufficient occlusal clearance existed between the palatal surface of the abutment teeth and the opposing jaw teeth, the palatal surface preparation of the abutment teeth was performed merely by removing debris and freshening the enamel. If adequate space was not present, the palatal surface was reduced by 1 mm to allow the polyethylene fiber to be bonded in the prepared area on the palatal surface of the abutment teeth as a double-wing structure. The required length of the fiber was measured using dental floss (the distance between the abutment teeth, including the two wings attached to the palatal surface of both abutment teeth). The appropriate size was cut from the material specification using specialized scissors and protected from ambient light. Patients who had received FRC bridge treatments as described within the 10-year timeframe were contacted, and their clinical success factors were examined and compared.

The Factors Investigated Included

1- Is there secondary caries in the abutment teeth? 2- Is there a fracture in the abutment teeth? 3- Has the restoration (pontic

or wings) fractured? 4- Is there periodontal disease in the periodontium beneath the pontic or the abutment teeth? 5- Are there aesthetic problems with the restoration? The general factors examined in this study included the patient's age, gender, and the duration since the FRC bridge placement.

The collected data were subjected to statistical analysis using SPSS software. The data were analyzed and examined using Kaplan-Meier survival curves and the log-rank test with a 95% confidence interval.

Result

This study was conducted on 31 patients who underwent direct FRC treatment for the replacement of missing anterior teeth more than 10 years ago. The majority of patients were female (64.5%) with associate/bachelor's degrees (51.6%). Most patients used a toothbrush daily and flossed occasionally. The majority did not use mouthwash, and most studied individuals (83.9%) did not have harmful oral habits (mouth breathing and bruxism). Secondary caries was not evident in the abutment teeth of most patients (74.2%). 25.8% of the patients were without aesthetic defects, but the majority of patients (64.5%) had correctable aesthetic defects (Table 1). Furthermore, the results showed that the majority of patients (87.1%) presented with periodontal swelling, discoloration, and mild periodontal bleeding (Table 2).

The results indicate that among the 8 teeth affected by caries, 3 patients (30%) experienced caries progression in over 10 years, and 5 patients (33.3%) developed caries in the 5–10-year timeframe. Among the 23 patients who were caries-free, 6 patients remained caries-free for less than 5 years, 10 patients between 5 and 10 years, and 7 patients also did not develop secondary caries for over 10 years.

Table 1. Determination of demographic characteristics of studied patients

Variable	Frequency	Percentage
Gender	Male	11 (35.5%)
	Female	20 (64.5%)
Education	Diploma and below	10 (32.3%)
	Associate/Bachelor's Degree	16 (51.6%)
	Above Bachelor's	5 (16.1%)
Daily hygiene compliance	Brush daily + Floss occasionally	2 (6.5%)
	Brush and floss daily + Mouthwash occasionally	1 (3.2%)
	Brush and floss daily + No mouthwash use	6 (19.4%)
	Brush daily + Mouthwash occasionally + Floss occasionally	1 (3.2%)
	Brush daily + Floss occasionally + No mouthwash use	18 (58.1%)
	Brush and floss occasionally + No mouthwash use	3 (9.7%)
Specific oral habits	Has mouth breathing	4 (12.9%)
	No mouth breathing or bruxism	26 (83.9%)
	Has mouth breathing + bruxism	1 (3.2%)

Table 2. Determination of secondary caries in abutment teeth in the study group

Questions	Domains	Frequency	Percentage
Secondary caries	Tooth has secondary caries	8	25.8
	Tooth has no secondary caries	23	74.2
Fracture rate in abutment teeth	Abutment tooth has no pathological mobility or fracture	30	96.8
	Abutment tooth has pathological mobility	1	3.2
Periodontal health	Healthy periodontium (regarding color, contour, probing depth, and absence of calculus)	4	12.9
	Periodontium with swelling, discoloration, or mild bleeding	27	87.1
Aesthetic problems	No aesthetic defect	8	25.8
	Correctable aesthetic defect	20	64.5
	Restoration must be replaced	3	9.7

Regarding aesthetic factors, significantly, 4 individuals in the less than 5-year time frame and 4 individuals in the 5–10-year time frame were observed to have no aesthetic defects. Correctable aesthetic defects were reported in 20 patients, specifically: 2 in the less than 5-year range, 10 in the 5–10-year range, and 8 in the over 10-year range. Restoration replacement was required for 3 patients: 1 in the 5–10-year range and 2 in the over 10-year range. Periodontal health factors also showed that the majority of patients presented with slight gingival swelling and discoloration/bleeding of the periodontium in the less than 5-year period (18 patients) and in the 5–10-year period (14 patients). Furthermore, the majority of patients had no pathological mobility in their abutment teeth and restorations across all studied time intervals. Additionally, health of the periapical area was reported across all time intervals (Table 3).

Discussion

This study was conducted on 31 patients who had previously undergone direct FRC treatment for the replacement of a missing anterior tooth. The majority of the patients were female (64.5%) with associate degrees and bachelor's level education (51.6%). Most patients brushed daily and occasionally used dental floss. The majority did not use mouthwash, and most subjects studied (83.9%) did not have harmful oral habits (mouth breathing and bruxism). In most patients (74.2%), secondary caries were not evident in the abutment teeth. While 25.8% of patients had no aesthetic defects, the majority (64.5%) had correctable aesthetic defects, and restoration replacement was only reported in 9.7% of cases. In a study by Ozudogru *et al.* on the clinical evaluation of composite restorations with and without polyethylene fibers in first permanent molars, it was shown that no changes were observed in the first six months.

Table 3. Determining clinical success rate based on time

Variable	Time category	*P* −value	< 5Years	5 ≤ Time ≤ 10 years	> 10 years
Secondary caries	Tooth has secondary caries	0.26	0	5 (33.3%)	3 (30%)
	Tooth has no secondary caries		6 (100%)	(66.7%) 10	7 (70%)
Aesthetic factors	Without aesthetic violation		4 (66.7%)	4 (26.7%)	0
	Correctable aesthetic defect	0.04	2 (33.3%)	(66.7%) 10	8 (80%)
Periodontium health factors	Restoration must be replaced		0	1 (6.7%)	2 (20%)
	Healthy periodontium (color, Contour, and sulcus depth)	0.59	1 (16.7%)	1 (6.7%)	2 (20%)
	Periodontium with swelling, Discoloration, mild bleeding		18 (83.3%)	14 (93.3%)	8 (80%)
Abutment and restoration status	Abutment tooth has no pathological mobility	0.33	6 (100%)	15 (100%)	9 (90%)
	Restoration fracture		0	0	1 (10%)
Radiographic factors	Health of periapical region of Abutment teeth	-	6 (19.4%)	(48.4%) 15	(32.3%) 10

After 24 months of follow-up, slight changes in marginal consistency and marginal color were observed in both groups [20]. Ayna *et al.* conducted a three-year clinical evaluation of root canal-treated anterior teeth restored with polyethylene fiber-reinforced composite. Based on the results of the three-year study, polyethylene FRC restorations appear to be clinically successful. The three-year assessment demonstrated remarkable stability across all measured variables relative to baseline data. Specifically, no statistically significant variation was observed concerning marginal characteristics (irregularity and discoloration), surface morphology (texture and wear/anatomic form), mechanical performance (fracture, retention, and debonding), or radiographic integrity [21].

Conclusion

Since this study was retrospective, the treatments were performed under completely natural conditions without the clinicians' intentional effort to perform a more precise treatment, which might exist in prospective studies. This very issue makes the results of the present study fully consistent with the reality of daily clinical conditions and allows for a more confident confirmation of the efficacy of this type of treatment and its recommendation for similar materials based on these results. Furthermore, the success of the fiber assembly can be attributed to the discontinuous phase created by the combination of nanohybrid composite with the ribbon fiber. This complexity also increases the possibility of void formation in the restoration, which may affect the flexural strength of the fibers.

Acknowledgements

The authors would like to thank Ilam University Medical Science.

ORCID

Mohamadreza Soltani
http://orcid.org/0000-0001-8990-3545

Fahimeh Feili
https://orcid.org/0000-0001-6638-4308
Sepehr Zargoosh
https://orcid.org/0000-0002-9391-6354

References

[1] Abdal, K., Yari, A., Bonyadi, M., Shafiei, E. Predictive role of ectopic calcifications on digital panoramic radiographs in the west of iran. *Journal of Research in Dental and Maxillofacial Sciences*, **2024**, 9(1), 43-48.
[2] Abbaspour, G., Barzegar Reyhani, N., Safarzadeh Khosroshahi, S., Jalalian, S. Fracture resistance of unsupported enamel reinforced by glass fiber ribbon. *Journal of Research in Dental and Maxillofacial Sciences*, **2025**, 10(3), 184-191.
[3] Bidgoli, M., Montazeri, M. Fracture resistance of polyethylene fiber reinforced composite versus glass fiber reinforced composite fixed partial dentures (in vitro). *Journal of Research in Dental Sciences*, **2009**, 6.
[4] AlJarboua, R.T., Alshihry, R.A., Alkhaldi, H.O., Al Marar, F.H., Aljaffary, M.A., Almana, M.L., Balhaddad, A.A., Alkhateeb, O. Effect of fiber-reinforced composite placement site on fracture resistance of premolar teeth: An in vitro study. *Clinical, Cosmetic and Investigational Dentistry*, **2024**, 255-266.
[5] Özcan, M., Breuklander, M., Salihoglu-Yener, E. Fracture resistance of direct inlay-retained adhesive bridges: Effect of pontic material and occlusal morphology. *Dental Materials Journal*, **2012**, 31(4), 514-522.
[6] Panchbhai, A. Nanocomposites: Past, present, and future of dentistry. *Applications of Nanocomposite Materials in Dentistry*, **2019**, 181-190.
[7] Edelhoff, D., Spiekermann, H., Yildirim, M. Metal-free inlay-retained fixed partial dentures. *Quintessence International*, **2001**, 32(4).
[8] Dobrzański, L.A., Dobrzański, L.B. Dentistry 4.0 concept in the design and manufacturing of prosthetic dental restorations. *Processes*, **2020**, 8(5), 525.
[9] Ohlmann B, Rammelsberg P, Schmitter M, Schwarz S, Gabbert O. All-ceramic inlay-retained fixed partial dentures: preliminary results from a clinical study. *Journal of Dentistry*, **2008**, 36(9), 692-6.
[10] Göhring TN, Roos M. Inlay-fixed partial dentures adhesively retained and reinforced by glass fibers: clinical and scanning electron microscopy analysis after five years. *European journal of oral sciences*, **2005**, 113(1), 60-9.
[11] Vallittu, P.K. Survival rates of resin-bonded, glass fiber–reinforced composite fixed partial dentures with a mean follow-up of 42 months: A pilot study. *The Journal of Prosthetic Dentistry*, **2004**, 91(3), 241-246.
[12] Lobprise, H.B., Dodd, J.R.B. Wiggs's veterinary dentistry: Principles and practice. *Book*, **2019**.
[13] van Heumen CC, Tanner J, van Dijken JW, Pikaar R, Lassila LV, Creugers NH, Vallittu PK, Kreulen CM. Five-year survival of 3-unit fiber-reinforced composite fixed partial dentures in the posterior area. *dental materials*, **2010**, 26(10), 954-60.
[14] Van Heumen CC, Kreulen CM, Creugers NH. Clinical studies of fiber-reinforced resin-bonded fixed partial dentures: a systematic review. *European journal of oral sciences*, **2009**, 117(1), 1-6.
[15] Scribante, A., Vallittu, P.K., Özcan, M., Lassila, L.V., Gandini, P., Sfondrini, M.F. Travel beyond clinical uses of fiber reinforced composites (FRCS) in dentistry: A review of past employments, present applications, and future perspectives. *BioMed Research International*, **2018**, 2018(1), 1498901.
[16] Jardim, J., Henz, S., Barbachan, E., Silva, B. Restorative treatment decisions in posterior teeth: A systematic review. *Oral Health and Preventive Dentistry*, **2017**, 15, 107-115.
[17] Vallittu PK. An overview of development and status of fiber-reinforced composites as dental and medical biomaterials. *Acta biomaterialia odontologica Scandinavica*, **2018**, 4(1), 44-55.
[18] Ferracane, J.L. Resin composite—state of the art. *Dental Materials*, **2011**, 27(1), 29-38.
[19] Kamal, F.Z., Ciobica, A., Dascalescu, G., Rammali, S., Aalaoui, M.E., Lefter, R., Vata, I., Burlui, V., Novac, B. Eugenol nanoparticles in dental composites: Literature review of antimicrobial, anti-inflammatory, and clinical applications. *Microorganisms*, **2025**, 13(5), 1148.
[20] Özüdoğru, S., Tosun, G. Clinical evaluation of composite restorations with and without polyethylene fiber in first permanent molars: A 24-month randomized clinical trial. *Pesquisa Brasileira*

em Odontopediatria e Clínica Integrada, **2023**, 23, e220022.
[21] Ayna, B., Celenk, S., Atakul, F., Uysal, E. Three-year clinical evaluation of endodontically treated anterior teeth restored with a polyethylene fibre-reinforced composite. *Australian Dental Journal*, **2009**, 54(2), 136-140.

How to cite this article:
M. Soltani, F. Feili, S. Zargoosh. Evaluation of the Clinical Success Rate of Fiber-Reinforced Polyethylene Composite Conservative Bridges. *International Journal of Advanced Biological and Biomedical Research*, 2026, 14(3), 296-302.
DOI: https://doi.org/10.48309/ijabbr.2026.2079033.1675
Link: https://www.ijabbr.com/article_733258.html