

Effect of Prefabricated Fiber Posts in Oral Prosthetic Restoration and Analysis of Treatment Success Rate

Wanxi Chen, Xuemin Yan*, Xin Gao

Zhenjiang Stomatological Hospital, Zhenjiang 212000, Jiangsu, China

**Author to whom correspondence should be addressed.*

Copyright: © 2026 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: *Objective:* To investigate the actual effects of prefabricated fiber posts on masticatory function, restoration success rate, and postoperative adverse events in patients with tooth defects undergoing oral prosthetic restoration. *Methods:* From January 1, 2023 to December 30, 2024, 100 patients diagnosed with tooth defects and scheduled for postandcore crown restoration in our hospital were selected. After screening, 86 cases meeting the inclusion criteria were enrolled in this study. They were divided into two groups using a random number table: the control group (43 cases) received traditional cast metal posts, and the observation group (43 cases) received prefabricated fiber posts. All subjects completed a 12month followup. Bite force and masticatory efficiency before and after restoration were compared between the two groups; the time required for restoration, clinical success rate, and postoperative complications were also recorded. Results: Before restoration, there were no statistically significant differences in bite force and masticatory efficiency between the two groups ($p > 0.05$). After 12 months of restoration, both groups showed improvement in masticatory efficiency and bite force, with the observation group demonstrating significantly greater improvement than the control group ($p < 0.05$). The observation group had shorter operative time per treated tooth and a higher success rate ($p < 0.05$). The overall incidence of various complications during the followup period was lower in the observation group than in the control group ($p < 0.05$). *Conclusion:* For patients with extensive tooth defects after root canal therapy, using prefabricated fiber posts for postandcore crown restoration can effectively improve masticatory function, shorten chairside operation time, increase the overall success rate, and reduce problems such as root fracture and post loosening. With strict adherence to indications, this approach is suitable for clinical application in prosthetic dentistry.

Keywords: Oral restoration; Prefabricated fiber post; Cast metal post; Bite force; Masticatory efficiency; Restoration success rate

Online publication: October 23, 2026

1. Introduction

Tooth defects are a common condition in dentistry, with caries, external trauma, and longterm attrition being frequent causes. For teeth with extensive defects, after adequate root canal therapy, the dental hard tissue loses pulp supply and overall tooth strength decreases. A simple full crown restoration often fails to achieve satisfactory retention; thus, a postandcore system is needed to establish retention, rebuild tooth morphology, and restore masticatory function ^[1]. Cast metal posts have been a commonly used restorative method in the past, offering high mechanical strength. However, the elastic modulus of metal differs significantly from that of natural dentin. Under occlusal loading, stress concentration tends to occur locally in the root canal, increasing the risk of root fracture. Moreover, metal materials can interfere with magnetic resonance imaging, and in anterior teeth, the metallic color may show through the crown, resulting in obvious aesthetic shortcomings ^[2]. Prefabricated fiber posts, as a gradually popularized postandcore material in recent years, have an elastic modulus closer to that of human dentin, which helps dissipate occlusal stresses and reduces the risk of root damage. Their color is similar to natural teeth, and they exhibit good bonding performance with a relatively simple clinical procedure. They are increasingly being used for the restoration of tooth defects after root canal therapy ^[3]. Against this background, the present controlled trial was conducted to observe the actual restorative effect of prefabricated fiber posts. The detailed report is as follows.

2. Materials and methods

2.1. Clinical data

A total of 100 patients with tooth defects requiring postandcore crown restoration admitted to our hospital from January 1, 2023 to December 30, 2024 were initially selected. After screening with inclusion and exclusion criteria, 86 subjects were enrolled and divided into a control group and an observation group using a random number table, with 43 cases in each group. Baseline data including gender composition, age range, distribution of defective tooth positions, and etiological factors were compared between the two groups, and no statistically significant differences were found ($p > 0.05$), indicating comparability between groups (see **Table 1**).

Table 1. Comparison of clinical data between the two groups

Clinical data	Control group (n = 43)	Observation group (n = 43)	χ^2/t	p
Gender (n, %)			0.186	0.666
Male	23 (53.49)	21 (48.84)		
Female	20 (46.51)	22 (51.16)		
Age ($\bar{x} \pm s$, years)	46.37 $\pm$ 7.41	45.94 $\pm$ 7.28	0.272	0.786
Tooth defect position (n, %)			0.317	0.573
Anterior teeth	16 (37.21)	19 (44.19)		
Posterior teeth	27 (62.79)	24 (55.81)		
Etiology of defect (n, %)			0.441	0.802
Caries	26 (60.47)	24 (55.81)		
Dental trauma	12 (27.91)	14 (32.56)		
Wear and others	5 (11.63)	5 (11.63)		

2.1.1. Inclusion criteria

- (1) The affected tooth had undergone adequate root canal therapy with dense obturation and no active inflammatory response in the periapical area ^[4];
- (2) The coronal defect area was $\geq 1/2$, with remaining tooth tissue sufficient to support postandcore restoration;
- (3) Root length and root canal wall thickness were adequate for post retention;
- (4) Occlusal relationship was generally normal without severe occlusal disturbances;
- (5) Patients were fully informed of the study content, voluntarily participated, and were able to complete the entire followup.

2.1.2. Exclusion criteria

- (1) The root had cracks or fractures, or extensive defects in the root canal wall;
- (2) Severe parafunctional habits such as bruxism or clenching;
- (3) Severe periodontal disease with tooth mobility of grade II or above ^[5];
- (4) Severe systemic diseases precluding tolerance of prosthetic procedures;
- (5) Pregnancy or lactation;
- (6) Incomplete followup data preventing outcome assessment.

2.2. Treatment methods

2.2.1. Control group

For all affected teeth in the control group, periapical radiographs and oral CT were taken preoperatively. The root canal morphology, root wall thickness, and periapical tissue status were carefully evaluated to confirm that the quality of prior root canal treatment met the standards ^[6]. The control group received cast metal post restorations: post space preparation was performed, followed by root canal impression taking and gypsum cast pouring. The casts were sent to a dental laboratory for fabrication of cast metal post-and-core units. After the finished restorations were returned to the department, intraoral tryin was conducted to check seating and marginal adaptation, followed by adjustment and trimming; resin cement was used for luting and fixation. Subsequently, routine tooth preparation was performed, intraoral impressions were taken, and full crowns were fabricated. After tryin, occlusal adjustments were made and the crowns were cemented. Postoperative oral hygiene instructions were provided to the patients, and regular followup visits were scheduled.

2.2.2. Observation group

The observation group received prefabricated fiber post restorations: post space preparation was performed according to standard protocols, and glass fiber posts of appropriate specifications were selected based on the actual internal diameter of the root canal. Intraoral tryin was conducted to confirm smooth seating. The root canal was etched, rinsed, and dried evenly; adhesive was uniformly applied; and the prefabricated fiber post was luted and fixed within the root canal using resin cement, followed by lightcuring. Thereafter, composite resin was used to build up the core structure, and the core contour was trimmed. Tooth preparation, impression taking, full crown fabrication, tryin, occlusal adjustment, and cementation were then completed. Postoperative oral hygiene instructions and followup schedules were consistent with those of the control group. All fiber post luting procedures strictly followed the technical specifications for clinical luting of fiber posts, so as to minimize the risk of restoration failure due to improper cementation procedures ^[7].

2.3. Observation indicators

2.3.1. Occlusal force and masticatory efficiency

Measurements were performed before restoration and at 12 months after restoration completion. Masticatory efficiency was determined using a 2g peanut chewing test: the subjects chewed with bilateral target teeth for 20 strokes on each side; the peanut residues in the oral cavity were collected and weighed, and masticatory efficiency was calculated. For occlusal force measurement, a bite test sheet was placed on the target tooth, and the subject was asked to bite evenly for 20 seconds; the test was repeated 10 consecutive times, and the average of the three highest values was taken as the occlusal force result for that tooth^[8].

2.3.2. Operation time for singletooth restoration

The time from the completion of post space preparation to the completion of postandcore luting and curing was recorded, in minutes.

2.3.3. Restoration success rate

Restoration outcomes were evaluated during a 12month followup. Success criteria included: stable restoration without loosening or detachment; stable occlusion with no masticatory pain; and no periapical abnormalities or root fracture on radiographic reexamination. Failure was defined as the occurrence of any of the following: postandcore loosening, crown detachment, root fracture, recurrent occlusal pain, or new periapical lesions^[9].

2.3.4. Complication rate

The total incidence of complications, including postandcore loosening, root fracture, secondary periapical periodontitis, and gingival inflammation, was recorded during the 12month followup period.

2.4. Statistical methods

Data analysis was performed using SPSS 24.0 software. Measurement data were expressed as mean $\pm$ standard deviation ($\bar{x} \pm s$), and between group comparisons were conducted using independentsamples *t* tests. Count data were expressed as n (%) and analyzed using the chisquare test. A *p* value of < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of occlusal force and masticatory efficiency between the two groups before and after treatment

Before restoration, there was no statistically significant difference in masticatory efficiency or occlusal force between the two groups ($p > 0.05$). At 12 months after restoration, both functional indicators improved compared with baseline in both groups, and the improvements in the observation group were significantly greater than those in the control group ($p < 0.05$), as shown in **Table 2**.

Table 2. Comparison of masticatory efficiency and occlusal force between the two groups before and after treatment ($\bar{x} \pm s$)

Group	Masticatory efficiency (%)		Bite force (kg)	
	Before treatment	After treatment	Before treatment	After treatment
Control group (n = 43)	52.41 $\pm$ 4.72	71.25 $\pm$ 5.84*	37.42 $\pm$ 4.83	48.71 $\pm$ 5.26*
Observation group (n = 43)	52.63 $\pm$ 4.58	79.64 $\pm$ 6.37*	37.16 $\pm$ 4.65	55.33 $\pm$ 5.74*
<i>t</i> value	0.219	6.418	0.254	5.581
<i>p</i> value	0.827	< 0.001	0.800	< 0.001

Note: Compared with the same group before treatment, * $p < 0.05$.

3.2. Comparison of restoration procedure time and success rate between the two groups

The mean time for postandcore restoration per affected tooth in the observation group was significantly shorter than that in the control group, and the proportion of successful restorations was higher in the observation group, with statistically significant differences between the groups ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of restoration procedure time and success rate between the two groups

Group	Number of cases	Single tooth restoration time ($\bar{x}$, min)	Success n (%)	Failure n (%)
Control group	43	74.36 $\pm$ 8.42	34 (79.07)	9 (20.93)
Observation group	43	51.73 $\pm$ 6.25	41 (95.35)	2 (4.65)
<i>t</i> / χ^2 value		14.124	5.108	
<i>p</i> value		< 0.001	0.024	

3.3. Comparison of complication rates between the two groups

After 12 months of followup, the overall incidence of complications in the observation group was lower than that in the control group, and the difference was statistically significant ($p < 0.05$), as shown in **Table 4**.

Table 4. Comparison of complication rates between the two groups [n (%)]

Group	Postcore loosening or dislodgement	Root fracture	Apical periodontitis	Gingival inflammation	Total incidence rate
Control group (n = 43)	3 (6.98)	3 (6.98)	2 (4.65)	3 (6.98)	11 (25.58)
Observation group (n = 43)	1 (2.33)	0 (0.00)	1 (2.33)	1 (2.33)	3 (6.98)
χ^2					5.460
<i>p</i>					0.019

4. Discussion

After root canal treatment, the dental hard tissue loses the nutritional and metabolic support from the pulp, leading to increased tooth brittleness. When the crown defect is extensive and the remaining tooth structure is limited, direct fullcrown restoration often fails to achieve adequate retention, necessitating the use of a postandcore system to establish a foundation for retention, reconstruct the crown morphology, and restore the patient's daily masticatory function^[10]. Cast metal postandcores have been used clinically for a long time and possess high mechanical strength; however, the elastic modulus of metal posts differs considerably from that of human dentin. When the tooth bears occlusal loads, stress concentration tends to occur at weak points

within the root canal, increasing the risk of root fracture. Additionally, metal materials interfere with the imaging quality of magnetic resonance examinations, and in anterior tooth restorations, the metallic shade is prone to show through the restoration crown, adversely affecting aesthetics, thus limiting their clinical application ^[11].

Prefabricated glass fiber posts are mainly composed of glass fiber and resin composite, with an elastic modulus closer to that of natural dentin. When the tooth bears occlusal forces, they can distribute stress within the root canal, thereby reducing the risk of root fracture ^[12]. As prefabricated products, these posts do not require impressiontaking or offsite processing; after root canal post space preparation, the appropriate post can be selected and bonded directly, and the post core can be built up onsite with composite resin, significantly reducing chairside time and alleviating the burden of multiple visits for the patient ^[13]. The resin matrix of fiber posts achieves favorable bonding with resin cement and resin core materials, providing good interfacial sealing, reducing microleakage, and lowering the risk of secondary periapical pathology. The material color closely resembles that of natural teeth, allowing for better aesthetic outcomes in anterior restorations. If failure occurs later, fiber posts are easier to remove from the root canal than metal posts, creating more opportunities for preserving the natural root ^[14].

The present data indicate that after 12 months of followup, the observation group showed greater improvement in bite force and masticatory efficiency than the control group; the restoration success rate in the observation group reached 95.35%, higher than the 79.07% in the control group, while chairside time was shorter and complication rates were lower. Analysis suggests that the biomechanical properties of prefabricated fiber posts are more compatible with the root dentin, allowing uniform distribution of occlusal stress, reducing localized stress damage to the root, and maintaining masticatory function. The elimination of casting and processing steps, along with direct intraoral fabrication of the postandcore, shortens the clinical operation time. The postcementsresin core forms a continuous composite resin system, providing good interfacial sealing, reducing microleakageinduced gingival and periapical inflammation, and decreasing adverse events such as postandcore loosening and root fracture, thereby improving overall restorative prognosis ^[15].

Nevertheless, prefabricated fiber posts have certain limitations. In teeth with severely curved root canals or irregularly shaped wide root canals, prefabricated posts may not fully adapt to the root canal wall, compromising the bonding effect. In such cases, cautious use is advised, and clinicians should comprehensively assess root canal imaging and select the appropriate restorative approach ^[16]. In addition, the followup period of the present study was only 12 months, and longterm fracture resistance and aging performance over 5 years or more have not been observed. Future studies with larger sample sizes and extended followup are needed to further validate the longterm restorative effects of prefabricated fiber posts.

5. Conclusion

In conclusion, for cases of extensive tooth defects after root canal treatment, prefabricated fiber posts can improve bite force and masticatory efficiency, shorten chairside time, increase restoration success rates, and reduce various postoperative complications. Under strict control of indications, this restorative approach is worthy of clinical promotion in prosthodontic practice.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Chen W, Ou L, Liu X, et al., 2016, Effect of Fiber Post and Cast Metal Post-and-Core in the Treatment of Teeth with Large Defects. *Chinese Journal of Prosthodontics*, 17(5): 285–287.
- [2] Yin Q, 2017, Application of Fiber Post-and-Core Crown and Cast Metal Post-and-Core Crown in the Restoration of Large Posterior Tooth Defects. *Anhui Medical and Pharmaceutical Journal*, 21(1): 91–93.
- [3] Min H, Dong J, Yue P, 2025, Effects of Prefabricated Fiber Post and Pure Titanium Metal Post on the Aesthetic Outcome, Periodontal Index, and Oral Function in Anterior Tooth Defect Restoration. *Shanghai Journal of Stomatology*, 34(5): 508–512.
- [4] Li L, 2019, Role of Metal Post Restoration and Prefabricated Fiber Post Restoration in Prosthodontics. *Journal of Clinical Practical Medicine*, 23(11): 93–95.
- [5] Zhong Y, 2025, Evaluation of the Application Effect of Prefabricated Fiber Posts in Prosthodontic Treatment. *Contemporary Medical Symposium*, 23(7): 112–114.
- [6] Wang X, Qiao M, Hao Z, et al., 2016, Clinical Effect of Prefabricated Fiber Post and Plastic Fiber Post in the Restoration of Residual Roots and Crowns. *Progress in Modern Biomedicine*, 16(22): 4280–4282.
- [7] Prosthodontics Committee of Chinese Stomatological Association, 2020, Clinical Operating Specifications for Adhesive Bonding of Fiber Posts. *Chinese Journal of Stomatology*, 55(7): 461–465.
- [8] Yue X, Wang Y, 2024, Efficacy of Prefabricated Fiber Posts in Restoring Large Tooth Defects and Its Effect on Masticatory Function. *Sichuan Journal of Physiological Sciences*, 46(2): 278–280.
- [9] Pang J, Wu D, 2023, Comparison of Long-Term Efficacy Between Fiber Post and Cast Metal Post-and-Core in Restoring Tooth Defects. *Journal of Clinical Stomatology*, 39(8): 483–486.
- [10] Ayibao S, 2026, Research Progress of Computer-Aided Design and Manufacturing Integrated Fiber Post-and-Core. *Chinese Journal of Stomatological Research (Electronic Edition)*, 18(1): 102–107.
- [11] Cai R, Yu Y, 2022, A Clinical Comparative Study of Different Post-and-Core Systems in the Restoration of Tooth Defects After Root Canal Treatment. *Hebei Medicine*, 28(11): 1835–1839.
- [12] Wu N, Lu Y, Du Y, et al., 2017, Effect of Glass Fiber Posts in Tooth Defect Restoration and Long-Term Success Rate. *Laboratory Medicine and Clinic*, 14(22): 3193–3195.
- [13] Li B, Shi R, 2024, Clinical Observation of Prefabricated Fiber Posts in the Restoration of Residual Roots and Crowns. *Journal of Rare and Uncommon Diseases*, 31(3): 28–30.
- [14] Chen C, Liu F, 2023, Effect of Glass Fiber Post-and-Core Restoration on Periodontal Health and Success Rate in Tooth Defects. *Reflex Therapy and Rehabilitation Medicine*, 4(12): 145–148.
- [15] Zhu F, Xu Y, 2024, Efficacy Analysis of Prefabricated Fiber Posts in Tooth Defect Restoration After Root Canal Treatment. *International Medicine and Health Guidance News*, 30(10): 1492–1495.
- [16] Bai H, Wei M, Quan Z, et al., 2026, Better Clinical Application Effects of Fiber Posts: Personalized Customization, Precise Surface Treatment, and New Materials and Technologies. *Chinese Journal of Tissue Engineering Research*, 30(20): 5341–5348.

Publisher's note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.