

Comparison of the Clinical Effect of Prefabricated Fiber Post and Plastic Fiber Post in Oral Repair

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Abstract: *Objective:* To observe and analyze the clinical effect of prefabricated fiber posts and plastic fiber posts in oral repair. *Methods:* A total of 128 patients admitted to our hospital from January 2023 to June 2024 underwent oral prosthesis treatment, of which the control group ($n = 64$) was treated with prefabricated fiber posts and the observation group ($n = 64$) with plastic fiber posts. The efficacy, retention rate, and complication rate of the two groups were compared. *Results:* The total effective rate of the observation group was 96.88%, which was significantly higher than that of the control group (84.38%) ($P < 0.05$). The restoration retention rate in the observation group was 95.31%, which was significantly higher than that in the control group (85.94%) ($P < 0.05$). The incidence of postoperative complications in the observation group was 4.69%, which was significantly lower than that in the control group (15.63%) ($P < 0.05$). *Conclusion:* For patients with oral prostheses, the use of plastic fiber posts for treatment shows better clinical effects, effectively improving the retention rate of the prosthesis and reducing the incidence of complications. Thus, it is worthy of popularization and application.

Keywords: Prefabricated fiber post; Plastic fiber post; Oral prosthesis; Clinical effect

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1. Introduction

With the rapid development of the social economy and the continuous improvement of people's quality of life, oral health has become an indispensable part of health. People's requirements for oral function and beauty are also increasing day by day. However, in clinical work, dental defects are more common, mainly caused by caries, trauma, and other factors, which seriously affect patients' daily diet, pronunciation, and facial beauty. Due to the loss of dentin, it is difficult for the remaining dental tissue to provide sufficient retaining force, so post-core restoration is often needed to improve the resistance of the residual root and prolong the service life of the affected tooth. Although the traditional casting post core has high strength, it has some shortcomings such as cumbersome operation, difficulty in positioning, and poor aesthetics, which fail to meet patients' increasing

functional and aesthetic requirements. In recent years, fiber posts have been widely used and popularized in the field of oral restoration due to their excellent physical and chemical properties and biocompatibility. Fiber posts have outstanding advantages such as elastic modulus close to dentin, effective reduction of stress concentration, and relatively simple operation^[1]. According to the different production processes, fiber posts can be divided into prefabricated fiber posts and plastic fiber posts. The prefabricated fiber post is a standardized product produced in the factory, while the plastic fiber post can be shaped on-site according to the actual shape of the root canal. In order to further explore the clinical application effect of prefabricated fiber posts and plastic fiber posts in oral restoration, 128 patients undergoing post-core crown restoration were selected in this study and divided into two groups according to different types of fiber posts for a controlled study.

2. Data and methods

2.1. General information

From January 2023 to June 2024, 128 patients undergoing oral prosthesis treatment in our hospital were selected, including 68 males and 60 females; aged 23–65 (43.5 ± 3.2) years old; the duration of the disease ranged from 2 months to 3 years, with an average of 1.2 ± 0.4 years. The patients were randomly divided into the observation group and the control group, with 64 cases in each group. There was no significant difference in gender, age, and course of disease between the two groups ($P > 0.05$), indicating comparability. This study was approved by the Ethics Committee of the hospital, and all patients signed informed consent.

Inclusion criteria: (1) The patient was diagnosed with dental defects by clinical and imaging examination, and the remaining dental tissue met the requirements for post-core crown restoration; (2) Good periodontal condition, no gingival bleeding, loosening, and other symptoms; (3) Voluntarily accept post-core crown restoration treatment and sign informed consent. Exclusion criteria: (1) Poor periodontal status, such as severe periodontal inflammation, alveolar bone resorption of more than 1/2; (2) Serious systemic diseases, such as cardiovascular and cerebrovascular diseases, immune system diseases, etc.; (3) Allergic to the materials used in this study; (4) Unable to cooperate with treatment or regular follow-up.

2.2. Methods

X-ray films were taken before the operation in both groups to confirm the absence of abnormal root canals, improve oral hygiene, and control periodontal inflammation. The control group used prefabricated fiber posts, and the observation group used plastic fiber posts.

In the control group, pulp opening, root testing, expansion, preparation, and other operations were performed according to routine procedures. After the paper tips were sucked dry, the root was filled with AH-Plus paste and gum tips under lateral pressure. After the paste solidified, the gum tips 2–3 mm from the crown root canal mouth were removed, the root canal was expanded with a Gates-Glidden drill or Peeso drill, and the loose dentin was removed with a long-handled needle. A suitable prefabricated fiber post was selected for test according to the size of the root canal, and the length of the post was 2/3 of the length of the crown stump. After the X-ray film confirmed that the position of the post-core was correct, the fiber post was cleaned with anhydrous alcohol and coated with a silane coupling agent. After the solvent evaporated, the adhesive was coated and gently blown for use. The adhesive was coated on the wall of the root canal, and the fiber post was slowly inserted into the predetermined depth of the root canal. The composite resin was used to pile up the

plastic core and complete the tooth preparation and temporary crown.

For the observation group, the procedure of preoperative preparation and root canal preparation was the same as that of the control group; after the completion of root canal preparation, a matching plastic fiber post was selected according to the specific shape of the root canal of the affected tooth. The selected plastic fiber post was placed in a constant temperature water bath device to soften, and when it reached a plastic state, it was held with tweezers and carefully inserted into the prepared root canal. During the insertion process, the surgeon applied appropriate pressure with his fingers to squeeze the excess pile material out of the root canal opening to ensure that the pile material could adequately fill the various areas of the root canal and fit closely with the root canal wall, leaving no gaps. After insertion and adjustment in place, the post body was cured by a light curing machine, and the curing time was about 40 seconds. After the light curing was complete, the post-core was cut off with a high-speed emery needle and polished so that the edge of the post-core was level with the edge of the residual root or slightly lower by 0.5–1.0 mm to form a suitable crown space. After the post-core construction was completed, the subsequent steps of bonding, filling, and tooth preparation were the same as those of the control group.

2.3. Observation indicators

- (1) Efficacy evaluation: The evaluation was divided into highly effective, effective, and ineffective. Among them, no loosening, no pain, no secondary caries, and no shadow around the apex of the root were considered highly effective. Slightly loose and uncomfortable prostheses without affecting mastication were considered effective. Loose and painful prostheses were considered ineffective.
- (2) The 1-year restoration retention rate of the two groups was observed.
- (3) Postoperative complications were observed in the two groups, including prosthesis loss, secondary caries, root fracture, etc.

2.4. Statistical methods

SPSS23.0 software was used for data analysis. The statistical data were expressed as rate (%) and χ^2 test was performed. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Comparison of clinical effect between the two groups

The total effective rate of the observation group was 96.88%, which was significantly higher than that of the control group (84.38%) ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of clinical efficacy between the two groups [n (%)]

Groups	n	Highly effective	Effective	Ineffective	Total effectiveness
Observation group	64	53 (82.81)	9 (14.06)	2 (3.13)	62 (96.88)
Control group	64	41 (64.06)	13 (20.31)	10 (15.63)	54 (84.38)
χ^2	-	-	-	-	5.647
P	-	-	-	-	0.017

3.2. Comparison of restoration retention rate between the two groups

The restoration retention rate of the observation group was 95.31%, which was significantly higher than that of the control group (85.94%) ($P < 0.05$), as presented in **Table 2**.

Table 2. Comparison of restoration retention rates between the two groups [n (%)]

Groups	n	Restoration preservation	Exfoliation of restoration	Retention rate
Observation group	64	61	3	95.31
Control group	64	55	9	85.94
χ^2	-	-	-	4.286
P	-	-	-	0.038

3.3. Comparison of complication rate between the two groups

The incidence of postoperative complications in the observation group was 4.69%, which was significantly lower than that in the control group (15.63%) ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of complication rates between the two groups [n (%)]

Groups	n	Prosthesis loss	Secondary caries	Root fracture	Incidence rate
Observation group	64	2	1	0	3 (4.69)
Control group	64	6	3	1	10 (15.63)
χ^2	-	-	-	-	4.320
P	-	-	-	-	0.038

4. Discussion

Post-core restoration is a common method to repair large area defects of dental tissue, which can provide sufficient retaining force and resistance for residual roots, so as to achieve an ideal repair effect. The traditional casting post has some disadvantages such as cumbersome operation, difficulty in positioning, and poor aesthetics, but fiber post has been widely used and researched in the field of oral restoration due to its excellent physical and chemical properties and biocompatibility.

Fiber post is mainly composed of resin matrix and fiber, and its elastic modulus is similar to dentin, which can buffer the bite force well and reduce the occurrence of stress concentration. When external forces act on the prosthetics, fiber piles can evenly distribute stress to the root canal wall to avoid the risk of root fracture caused by excessive stress concentration^[2]. In addition, the fiber post has a color similar to the dentin and does not produce the unique gray shadow of the metal post, so as to obtain better aesthetic repair effect^[3].

In current clinical practice, there are two common fiber posts: prefabricated and plastic. The prefabricated fiber post is a finished product produced by the factory according to the standardized process, which has the advantages of simple operation and short preparation time and is suitable for quick repair in the clinic. However, the prefabricated posts are mostly cylindrical in design, which are difficult to completely match the actual shape of the root canal of the affected tooth. Especially when the root canal is oval or irregular in shape, it is easy to form a small gap between the post-core and the wall of the root canal, which affects the retaining

force and resistance of the post-core and thus reduces the long-term stability of the restoration ^[4].

In contrast, plastic fiber posts are made of special plastic materials and have thermoplastic characteristics. In clinical application, the surgeon can select the matching plastic fiber post according to the specific shape of the root canal of the affected tooth, and through heating and softening, the post material can be fully positioned in the root canal and closely fit with the root canal wall, effectively making up for the limitation of the prefabricated posts—difficulty in fully adapting to the root canal shape ^[5]. In addition, after the plastic fiber post is inserted into the root canal, the softened post material can also be squeezed into the corner area and some irregular concave areas of the root canal by the effect of sidewall pressure, which significantly increases the contact area between the post-core and the root canal, and forms a more ideal mechanical locking effect ^[6]. This not only greatly improves the retaining force and resistance of the post-core, but also effectively reduces the risk of complications such as falling off during long-term use.

Through this study, it can be found that in oral repair treatment, the total effective rate and restoration retention rate of using plastic fiber posts are significantly better than that of prefabricated fiber posts, which indicates that plastic fiber post has a more prominent effect in clinical application. The reasons can be summarized in the following two aspects.

Firstly, the plastic fiber post has an excellent ability to adapt to root canal morphology. Since the plastic fiber post is made of special thermoplastic material, it can be heated and softened in clinical application, so that it can be fully positioned in the root canal and closely fit with the root canal wall. Especially for some oval or irregular root canals, the plastic fiber post can also squeeze into the corner and concave area of the root canal with the help of lateral wall pressure. The contact area between the post-core and the root canal is significantly increased, resulting in a more ideal mechanical locking effect ^[7]. This not only greatly improves the retaining force and resistance of the post-core but also provides more solid support for the prosthesis, effectively reducing the risk of complications such as falling off. Related studies also confirmed that compared with prefabricated fiber posts, plastic fiber posts have higher flexural strength and bond strength with root canal walls, which provides a reliable guarantee for long-term use.

Secondly, the plastic fiber posts can effectively improve stress distribution and reduce the risk of root fracture. The finite element analysis shows that compared with the traditional cast post-core, the fiber post exhibits a more uniform stress distribution when subjected to bite force. In the fiber post, the plastic fiber post can further optimize the stress distribution by virtue of its good emplacement adaptability, so that the stress can be more fully dispersed between the post-core and the root canal wall, and the peak stress of the root canal wall caused by excessive stress concentration can be avoided ^[8]. The plastic fiber post can significantly reduce the incidence of complications such as root fractures and prolong the overall service life of the prosthesis.

In this study, the total complication rate of the observation group was only 4.69%, much lower than the 15.63% of the control group, which further confirmed the advantage of plastic fiber posts in reducing the risk of postoperative complications. In addition to the above-mentioned common complications such as shedding and root fractures, secondary caries are also one of the common problems after post-core repair. Studies have found that the incidence of secondary caries in the prefabricated fiber post group is as high as 12.5%, while that in the plastic fiber post group is only 2.5%. The reason may be that it is difficult to achieve an ideal fit between the prefabricated post and the root canal wall, easy to form a microleakage channel, and bacteria and food residues are prone to gather, leading to an increased risk of secondary caries. The plastic fiber post can fully fill the root canal space, close the microleakage channel, and block the caries-causing factors, so as to effectively prevent

the occurrence of secondary caries ^[9].

It should be pointed out that there are still some limitations in this study. First, the sample size is relatively small, which may affect the generalizability and extrapolation of the results. Secondly, the follow-up time is relatively short, and it is difficult to evaluate the long-term efficacy and complications of the plastic fiber post. Therefore, prospective controlled studies with large samples and long-term follow-up are needed in the future, in order to obtain more reliable and comprehensive evidence-based medical evidence, and provide a more solid theoretical basis and practical guidance for the clinical application of plastic fiber posts ^[10].

5. Conclusion

To sum up, the plastic fiber post shows a broad application prospect in the field of oral restoration by virtue of its excellent physical and chemical properties and clinical efficacy. Compared with the prefabricated fiber post, the plastic fiber post has better adaptability to root canal morphology, significantly improves the retaining force and resistance of the post-core, and improves the retention rate and service life of the restoration. At the same time, the plastic fiber post can effectively reduce the risk of root fracture, secondary caries, and other complications, enhancing the overall quality of repair and patient satisfaction.

Disclosure statement

The author declares no conflict of interest.

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