

Clinical Behavior of Translucent-Fiber Posts: A 2-Year Prospective Study

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Purpose: This study prospectively evaluated the clinical performance of three types of translucent posts over a follow-up period of between 2 and 3 years. **Materials and Methods:** Selected were 225 patients with one premolar in need of endodontic treatment, followed by restoration with a fiber post and porcelain crown. The sample was randomly divided into three groups of 75 patients each. The same type of post was used in all patients within a group: group 1 = Aesthetic Plus; group 2 = DT; and group 3 = FRC Postec. For bonding the post, a light-curing adhesive (One-Step) and a dual-curing resin cement (Duo-Link) were applied in group 1 and 2 roots, whereas self-curing materials (Excite DSC as adhesive and MultiLink as resin cement) were used in group 3. After 6, 12, and 24 months, patients were recalled, and a clinical and radiographic examination was performed. For some patients, 30-month follow-up data were also collected. **Results:** Debonding of the post occurred in eight cases (3.5%); in another six cases, a recurrence of the periapical lesion was reported. **Conclusion:** The statistical analysis did not reveal any significant difference in the survival rate of the tested posts, suggesting that all are equally and sufficiently reliable for clinical use. *Int J Prosthodont* 2003;16:593-596.

The restoration of endodontically treated teeth with fiber-reinforced post systems has been drawing the attention of a constantly growing number of clinicians. The progress in the technology of fiber-reinforced materials addressing structure, shape, and optical properties of the posts has led to the development of materials that have overcome some of the limitations of metallic posts (platinum, alloys, or titanium) concerning esthetic appearance, mode of failure, and clinical performance.¹⁻¹⁶

As far as esthetics is concerned, several brands of translucent-glass fiber posts have been put on the market and are being preferred to carbon-fiber posts, especially for anterior roots meant to provide support to an all-ceramic coronal restoration. Also, the mechanical behavior and related mechanisms of failure of fiber posts were recently compared to those of

metallic posts.¹⁷⁻¹⁹ While metallic posts tend to produce an irreversible root fracture on failure, if a root fracture occurs in the presence of a fiber post, it is usually located more coronally and is more easily retreatable. This type of failure may be due to the greater amount of tooth structure that must be removed when a metallic post is placed.²⁰ In general, in the need for endodontic retreatment,¹¹ fiber posts are more easily removed than metallic or ceramic ones.

Only a small number of case reports^{21,22} and few retrospective studies²³⁻²⁵ have so far been published on fiber posts. It seemed of interest to conduct a prospective clinical trial on three types of translucent-fiber posts currently available on the market. Flowable composites were used for core buildups to verify whether these materials, which have proven capable of satisfactory integration with both the post surface and residual coronal structure, are also able to efficiently withstand the functional loads transmitted through the crown placed on top.²⁶ The restorations thus made were followed up clinically for up to 24 months, with the aim of testing the null hypotheses that there is a significant difference in the clinical service yielded by the three types of posts, and the use of materials from the same manufacturer when preparing

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Fig 1 Mandibular first premolar restored with a fiber post and porcelain crown at 2-year recall.

Table 1 Distribution of Teeth in the Three Experimental Groups

Type of post	Maxilla	Mandible	Total
Aesthetic Plus	34	41	75
DT	33	42	75
FRC Postec	49	26	75

fiber post-composite core units does significantly add to the clinical performance of the restoration.

Materials and Methods

Over 3 years, 225 patients treated in the Department of Restorative Dentistry, University of Siena, Italy, were judged eligible for the study; they presented with a premolar that, according to the clinical and radiographic exam, needed endodontic treatment, followed by restoration with a fiber post and a single-unit all-porcelain crown. This treatment was planned for premolars that presented with only two coronal walls left. Because the palatal root has a more favorable anatomy for receiving a post, only one post was placed in each premolar (Fig 1).

On the selected teeth, endodontic treatment was performed, and the roots were prepared for receiving a post. The root canal walls were enlarged with low-speed burs provided by the manufacturer, and a post space about 9 mm deep was created. Then, the post was tried into the root canal and cut to the adequate length with a diamond bur.

Seventy-five patients treated with Aesthetic Plus posts (RTD; group 1), 75 patients who received DT posts (RTD; group 2), and 75 patients who had FRC

Postec posts (Ivoclar-Vivadent; group 3) placed were included in the study. The age of the patients ranged between 18 and 78 years (mean 51 years). The distribution of the different types of premolars among the three groups is shown in Table 1.

In groups 1 and 2, fiber posts were bonded with the One-Step bonding system and Duo-Link dual-curing resin cement (Bisco). The root dentin was etched with 37% phosphoric acid (Uni-Etch, Bisco) for 15 seconds, rinsed with a water spray, and gently air dried. The remaining humidity was absorbed with paper points. Then, the One-Step adhesive was applied in three consecutive coats with a microbrush and air dried, and the excess left in the post space was removed using a paper point. The bonding material was light cured for 20 seconds with a Visilux 2 light-curing unit (3M/ESPE; intensity 500 mW/cm²). The two components of the Duo-Link resin cement were mixed together and brought into the canal with a lentulo drill. Lastly, the post was inserted, and the resin cement was light cured through the translucent post for 40 seconds.

In group 3, Excite DSC self-curing adhesive and MultiLink resin cement (Ivoclar-Vivadent) were used for the luting procedure, as they were materials produced by the same manufacturer as the FRC Postec posts. The adhesive was applied in two consecutive layers with a brush tip and dried with an air blast. Then, the excess left in the post space was removed using a paper point. After etching with phosphoric acid and applying two consecutive layers of Excite DSC with the self-activating microbrush, MultiLink resin cement base and catalyst were mixed and carried into the post space with a lentulo. The post was finally inserted into the canal and left undisturbed until complete setting of the cement occurred.

Periapical radiographs were taken to check for the accuracy of the endodontic treatment and post placement. Following this, the core buildup was performed using the proprietary flowable resin composite material (AEIiteFlo, Bisco, in groups 1 and 2; TetricFlow, Ivoclar-Vivadent, in group 3). Then, the abutment was prepared with diamond burs, and a polyether impression (Impregum, 3M/ESPE) was taken for the fabrication of a single-unit all-porcelain crown (Empress 2, Ivoclar-Vivadent).

Six, 12, and 24 months after post insertion, patients were recalled for a radiographic assessment of the results of endodontic treatment, as well as for a clinical evaluation of the restoration's condition. Clinically, treatment was considered successful when, in the absence of any radiologic sign of periapical pathology, the post and core were soundly retained and neither a root nor a post fracture had occurred. Mobility and possible opening of margins

were carefully examined. When provisional restorations were in service, the integrity of the resin core was checked. Also, the occurrence of any post dislodgment during debonding of the crown was recorded.

Two observers carried out the clinical and radiologic examinations independently. These two investigators were different from the operator who had performed the restorations and were blinded as to the types of materials that had been used. No episodes of disagreement between the two examiners occurred in the evaluation of clinical and radiologic signs. The Actuarial Life Table statistical analysis and the Mantel-Haenszel survival curve were elaborated at a 95% level of confidence.

Results

Among all of the 225 teeth on trial, 14 (6.2%) failures were reported during the follow-up period, similarly distributed among the three tested groups (Table 2). Eight restorations failed because of debonding of the post (3.5%). Six (2.7%) of the recorded failures were due to the recurrence of endodontic periapical lesions, as revealed by the radiographic examination. Endodontic failure was reported but not regarded as post failure.

Discussion

Some retrospective studies on the clinical performance of fiber posts have recently appeared in the literature.^{21,24} However, most of them were unable to ensure an adequate control of all the variables that might come into play under clinical conditions. Also, the clinical procedures were rarely described in detail.

On the other hand, in a prospective study design, many of the variables possibly involved are already controlled at the stage of case selection, and experimental groups can be made homogeneous in all but the variable under study. Such a study model, by limiting the effect of confounding factors, delivers more truthful, reliable, and therefore valuable information. For instance, in the present research, the experimental groups were controlled for type of tooth since only premolars were included, for single operator, and for type of endodontic treatment, which was performed following the same technique in all the teeth on trial. Thus, the variables under study, ie, the different materials used for the restoration, became the factors most crucially responsible for the variability in the clinical performance of the teeth over time.

In any case, the results of the present clinical trial were in line with the findings of previous retrospective studies,^{22,27,28} which also reported a survival

Table 2 Type of Failures Recorded in Each Experimental Group (n = 75)

Type of post	Debonding	Periapical pathology
Aesthetic Plus	3	3
DT	2	2
FFC Postec	3	1

rate of the tested posts comparable to the 96% value recorded in this investigation. Essentially, all of the clinical investigations on fiber posts have provided the same indications regarding fiber posts:

1. The failure of fiber posts is never due to a root fracture,^{21,27} as opposed to cast posts,^{24,27} in which root fracture becomes a real risk. A possible reason for the quite common occurrence of root fracture with cast posts has been seen in the friction created along the walls, as well as in the rigidity of the metallic materials in comparison with dentin.²⁶
2. The most frequent cause of failure of luted fiber posts is debonding. This is usually the result of an adhesive failure at the interface between dentin and resin cement.

In the present study, no fracture of the root or abutment was seen, and no post dislodgment or crown debonding was recorded. Failures consisted only of post debonding, which was ascribed to a loss of integrity at the adhesive interface between dentin, adhesive, resin cement, and post.

All of the debondings occurred during the removal of provisional crowns, and in teeth with less than 2 mm of dentin structure left at the coronal level. This observation is in agreement with previous findings²⁶ that the amount of residual coronal tooth structure is the most influential factor in predicting fracture resistance. All of the debonding failures could be solved. In four of the cases, the post had to be replaced; otherwise, the same post was simply rebonded. Almost half of the failures were due to the recurrence of periapical lesions that required endodontic retreatment.

This study evaluated three types of translucent-fiber posts used with different combinations of adhesive and restorative materials under similar clinical conditions. No significant difference emerged in the performance of the three classes of posts. Frequency and patterns of failure were similar to those already reported in some previous studies.²⁴

In two groups, the combination of a light-curing adhesive and a dual-curing cement was tested, whereas in the third group, self-curing materials were used. As

no statistically significant differences were found among the three groups, it follows that the selection of the adhesive-cement combination basically becomes a matter of personal preference of the clinician, based on experience and habits. The study also demonstrated that using materials from the same manufacturer for luting fiber posts and building up composite cores does not significantly add to the clinical performance of the restoration.

This study evaluated two flowable resin composites used for core buildups. Given the relatively low stiffness of flowable composites, the question of whether their mechanical properties make them reliable as core materials can reasonably be raised. However, in the present trial, flowable materials proved able to provide a valid support to porcelain crowns for at least 2 years of clinical service. This satisfactory performance encourages the daily use of flowable composites for building up abutments around fiber posts.^{26,29}

The null hypotheses tested in this study were not confirmed: There was no significant difference in the clinical service yielded by the three types of posts, and the use of materials from the same manufacturer when preparing fiber post-composite core units did not significantly add to the clinical performance of the restoration. Longer follow-up data on translucent-fiber posts and different resin composites used for core buildups are expected from a prospective multicenter study currently in progress.

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