Clinical Evaluation of an Oval-Shaped Prefabricated Glass Fiber Post in Endodontically Treated Premolars Presenting an Oval Root Canal Cross-Section: A Retrospective Cohort Study

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Purpose: This retrospective cohort study investigated the clinical effectiveness of preformed oval-shaped glass fiber posts in combination with a dual-curing composite resin core material in endodontically treated premolars presenting an oval root canal cross-section and restored with all-ceramic crowns over up to 45 months. ***Materials and Methods:*** The study population comprised 134 patients and 154 endodontically treated premolars, with varying degrees of hard tissue loss, restored by means of oval-shaped fiber-reinforced posts. Inclusion criteria were premolars presenting an oval-shaped root canal, symptom-free endodontic therapy, root canal treatment with a minimum apical seal of 4 mm, application of rubber dam, and the need for a post and core complex because of coronal tooth loss. Four groups were defined based on the number of preserved coronal walls after endodontic treatment and before core buildup. Survival rate of the post and core restorations was determined using Kaplan-Meier analysis, and statistical analysis was performed using the log-rank test ($P < .05$). ***Results:*** The posts and cores were examined clinically and radiographically. The mean observation period was 42.3 ± 2.7 months. The overall survival rate was 95.45%. Comparisons revealed that the difference between premolars with no coronal wall retention and premolars that had maintained one to four coronal walls was statistically significant ($P = .0006$). On the contrary, comparison between premolars with one and two residual walls was found to be not significant for the overall survival rate ($P = .0698$). ***Conclusion:*** A satisfactory clinical performance was observed for preformed oval-shaped glass fiber posts. Survival was higher for teeth retaining three and four coronal walls. *Int J Prosthodont 2011;24:255–263.*

Over the years, prefabricated fiber-reinforced posts (FRPs) have been introduced as a valid alternative to metal posts for restoring endodontically treated teeth. The potential of these systems to reduce the incidence of root fracture, when compared to prefabricated metal posts or conventional custom-made metallic posts, has been demonstrated in several in vitro studies.[1–3] The biomechanical properties of FRPs have been reported to be close to those of dentin,[4–6] and both clinical prospective and retrospective studies have yielded convincing results.[7–9] However, even when using posts with moduli of elasticity similar to that of dentin, root fracture strength seems to be related to the amount of remaining dentin around the post.[10,11]

It is well known that the shape of root canals is often not circular.[12,13] The different shapes of root canals, as well as the type of instrument used for post space preparation, enhance the problem of fiber post adaptation to the root canal. The use of preformed circular posts implies the need of adapting the canal to fit the post through the use of preformed drills for post space preparation. While this mode of mechanical preparation proves to be satisfactory when the shape of root canals is circular, it poses a problem when the canal section is oval, laminar, or hourglass shaped. Furthermore, preformed drills modify the canal's anatomical shape, sacrificing sound dentin tissue, and may lead to an increased risk of root perforation or fracture.[14–17]

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Many attempts to improve the adaptation of preformed fiber posts to the canal anatomy have been tested, such as combining small multiple posts in a single root canal,[18] relining a preformed fiber post in combination with a dual-curing resin cement to create an anatomical post,[19] or modeling cylindric fiber posts to give them a shape as close as possible to the anatomy of oval root canals through use of a diamond bur.[15,16]

Recently, a new prefabricated glass fiber post with an oval cross-section was developed. To date, there are no clinical longitudinal investigations assessing the clinical effectiveness of oval FRPs for restoring endodontically treated teeth. Therefore, the purpose of this cohort study was to evaluate retrospectively the clinical performance of a new oval-shaped glass fiber post in combination with a dual-curing composite resin core material in endodontically treated premolars presenting an oval root canal cross-section, with varying degrees of preserved coronal walls, restored with all-ceramic crowns for up to 45 months.

Materials and Methods

Patients visiting the Department of Biophysics, Medicine, and Dentistry, University of Genoa, Genoa, Italy, needing restoration of endodontically treated maxillary and mandibular premolars were recruited for this study. All patients provided written informed consent and had to be willing to return at regular intervals for evaluation. The study protocol was conducted by four operators. Ethical approval for the study protocol was preliminarily obtained from the ethics committee of the University of Genoa. The study population comprised 144 patients (81 women [56.25%], 63 men [43.75%]; age range: 18 to 72 years; mean age: 56.38 ± 12.22 years). In total, 164 premolars (92 maxillary, 72 mandibular) with varying degrees of hard tissue loss were included in the study.

Only premolars presenting an oval-shaped root canal (a longer buccolingual diameter than mesiodistal) were included in the study. Conversely, premolars with a circular canal were excluded. Other inclusion criteria were as follows: root canal treatment with a minimum apical seal of 4 mm, symptom-free endodontic therapy, application of rubber dam, and the need for a post and core complex because of coronal tooth loss. Only teeth that had been previously endodontically treated by the operator were included. Teeth with failed endodontic therapy, tooth fractures, extensive caries under the margins of the free gingiva, deep periodontal pockets, no adequate periodontal support, or poor oral hygiene or caries rates were excluded from the study. Twelve patients received crown-lengthening procedures to ensure adequate ferrule height and to correct asymmetric gingival levels. Teeth that had lost all coronal walls but had preserved circumferentially a collar of dentin at least 1.5 mm in height, as measured by a periodontal probe, providing an adequate ferrule effect were included in this trial. The selected teeth needed to be in interproximal contact with two adjacent natural teeth and in occlusal function with natural teeth. Only patients showing an orthodontic Class I occlusal scheme were included. Patients with an open or deep bite, severe parafunction, or shortened dental arches as well as patients wearing removable partial dentures were also excluded.

In addition to demographic information, other data were collected at the baseline examination, including tooth location, root morphology, number of residual walls, premolar type (first or second, maxillary or mandibular), and size of the post placed. Five experimental groups were defined based on the preserved coronal walls after endodontic treatment and before core buildup: group 1 (no walls retained), group 2 (one wall maintained), group 3 (two walls preserved), group 4 (three walls left intact), and group 5 (all coronal walls present). All teeth received a single-unit all-ceramic crown as the definitive restoration.

Clinical Procedures

All clinical procedures were performed by the same operator with the use of 4.3 × 400 surgical head-worn loupes (KS, Carl Zeiss). Root canal treatment was performed under local anesthesia using the chemomechanical technique. After isolation of the working field with rubber dam, endodontic access was performed, and the working length was established by passing size 10 K files (Dentsply Maillefer) into the root canal. Canals were first instrumented manually by means of K files with a step-back sequential technique to the working length at an apical size of 25 and shaped with nickel-titanium root canal rotary instrumentation using the ProTaper System (Dentsply Maillefer) and a crown-down technique to the working length up to 30/06 with a constant speed of 300 rpm. Root canals were irrigated with a 2.5% sodium hypochlorite solution at 40°C alternate to 10% ethylenediaminetetraacetic acid (Ogna, Laboratori Farmaceutici) between each instrument and dried with sterile absorbent paper points. Root canal filling was performed with vertically condensed warm guttapercha (Guttapercha Points, Dentsply DeTrey) and eugenol-based endodontic sealer (Argoseal, Ogna, Laboratori Farmaceutici). All teeth received a temporary filling with zinc phosphate temporary filling material (DeTrey Zinc, Dentsply DeTrey). At least 10 days later, the roots were prepared for post placement.

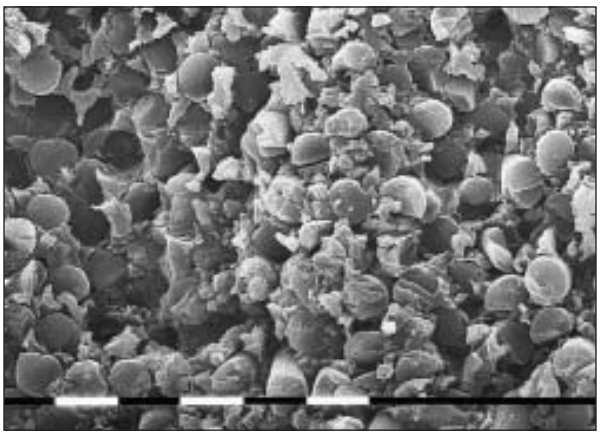

Fig 1a Scanning electron micrograph of the cross-section of an oval glass fiber post specimen (magnification ×1,000).

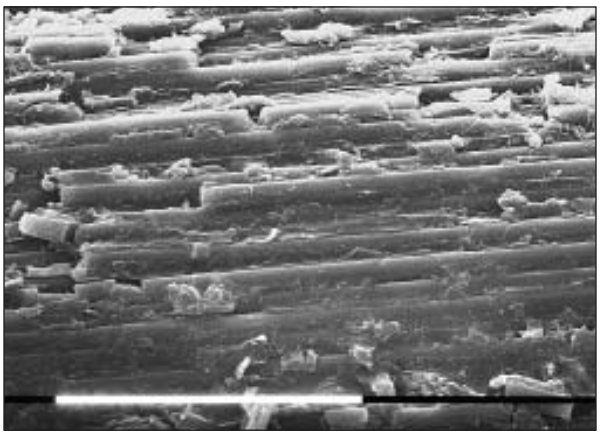

Fig 1b Scanning electron micrograph of the parallel surface of an oval glass fiber post specimen (magnification ×500).

Fig 2a Representative image of oval glass fiber post specimens.

Fig 2b Cross-sections of oval glass fiber posts (magnification ×2).

For adhesive procedures, isolation of the working field was performed with rubber dam. Gutta-percha was removed from the root canal to a length of 8 to 9 mm with a nickel-titanium rotary endodontic instrument specifically designed for post space preparation (Mtwo Post file, Sweden & Martina), respecting the root canal morphology and preserving the oval shape of the root canals without removing sound root canal dentin. No less than 4 to 5 mm of apical seal was maintained.

Oval-shaped FRPs (Oval Translucent Post, Bioloren) were used. This type of post is made from S-glass fibers (72% ± 3% content by weight) embedded in an epoxy resin matrix (23% ± 2% content by weight) containing barium-based fillers such as barium silicate, barium sulfate, and barium molybdate (5% ± 1% content by weight) (Figs 1a and 1b). The appropriate post size (1.5, 1.7, or 1.9 mm) was assigned according to the dimension and shape of the root canal (Figs 2a and 2b). Each tooth received one post only.

The posts were tried in and, if necessary, shortened using a diamond separating disk. Before cementation, the FRPs received a surface pretreatment. The posts were first cleaned with acetone and then silanized with a silane coupling agent (Silane, DMG). After, the post surface was wetted with a single coat of bonding resin (Mono, DMG) using Microbrush brushes (Microbrush) and thinned out with oil-free air. The posts were then light cured by means of a halogen light-curing unit with a light intensity of 1,200 mW/cm^2 (Bluephase 16i, Ivoclar Vivadent) for 10 seconds. The root canal was rinsed and dried with sterile paper points (Absorbent Paper Points, Dentsply DeTrey). Etching gel (37% phosphoric acid; Total Etch, Ivoclar Vivadent) was applied into the post space for 60 seconds, rinsed off with water using an endodontic syringe, and dried with sterile paper points without desiccating the etched dentin. A single coat of a dual-curing adhesive system (LuxaBond, DMG) was applied according to the manufacturer's instructions using Microbrush fine or Microbrush X and not light cured. Excess bonding components were absorbed completely with sterile paper points. A dual-curing composite resin cement (LuxaCore Z, DMG) was

applied into the post space and on the post surface, then seated. After removal of the excess cement, the correct position of the post was verified and light cured (Bluephase 16i) for 20 seconds. The dual-curing composite cement used has the capability to self-cure in approximately 5 minutes. Buildup of the core, prior to crown coverage, was performed using the same dual-curing composite resin material as that for cementation. To standardize the adhesive procedures for all core buildups, the same dentin adhesive system was used (LuxaBond).

For the preparations, a circumferential shoulder with rounded internal line angles was created using diamond burs. The margins were preferably located on the enamel supragingivally or equigingivally, thus resulting in simplified impression procedures, evaluation of marginal adaptation, and maintenance of periodontal health. A standard ferrule height of 1.5 to 2.0 mm was preferred. However, in several teeth, nonuniform ferrules had to be prepared depending on the loss of tooth structure. In such cases, the achieved ferrule height was never below 1.0 mm. All-ceramic crowns were fabricated using the OPC 3G System (Pentron). All patients received hygiene instructions, and complete plaque removal by means of mechanical scaling and root planing was performed every 6 months.

Follow-up Procedures

All patients were instructed to consult the Department of Biophysics, Medicine, and Dentistry, University of Genoa, if they experienced problems. Follow-up examinations were performed at the oral hygiene recalls every 6 months for a total of 45 months. Patients were examined clinically and radiographically by two independent clinicians from the Prosthetic Department, University of Genoa, according to the predetermined criteria for survival. Disagreement was resolved with consensus. Radiographs of all restorations were taken with the standardized long-cone technique and examined at 4.3 × 400 with surgical head-worn loupes. Photographs, radiographs of the restorations, and data forms were used as documentation tools, and comparisons were made with photographs and radiographs obtained immediately after treatment. The criteria for survival were: no root fracture, no post fracture, no post debonding, no failure of the core buildup requiring a new coronal restoration, no crown displacement, and no failure of endodontic treatment. Periodontal failure, marginal discoloration, and integrity of the crowns were also noted but not included for statistical analysis.

Statistical Analysis

Post and core restorations were defined as either survived or not survived according to the following criteria: survived was the positive, censored event, whereas not survived was defined as the negative, uncensored event. Based on this definition, survival rates from time-related events were calculated using the Kaplan-Meier nonparametric survival analysis.

Post placement was considered as baseline in the analysis of the present study. Time until failure or censoring (ie, last follow-up examination) was recorded in months. The end of the observation period for a successful restoration corresponded to the reevaluation date. The end of observation for a failed restoration was the date when this event was noted in the record or when the failed restoration was detected during the reevaluation appointment. Statistical analysis was performed to determine the survival rate using SPSS version 13.0 (IBM) for Windows. The probability of an event (failure of the post and core restoration) at any time point was tested by means of the log-rank test. The analysis is based on the times of events, and the level of significance was set at $P < .05$.

Results

A total of 164 oval-shaped FRPs and 164 laboratory-fabricated all-ceramic single crowns were placed in 144 patients. In this study, no follow-up information could be collected for 10 post and core restorations (dropout: 6.1%). Reasons for not attending recall appointments were checked. Of those 10 patients (3 women, 7 men), 4 could not be contacted (4 restorations), 5 were no longer interested in participating in the study (5 restorations), and 1 moved to another area (1 restoration). Hence, 154 endodontically treated premolars restored by means of oval-shaped FRPs in 134 patients (78 women, 56 men) contributed to follow-up. The restored teeth included 71 maxillary and 83 mandibular premolars and were followed for a mean observation period of 42.3 ± 2.7 months. Data for the five groups and distribution of the restored premolars are listed in Table 1.

Thirteen premolars presented no coronal walls (group 1), 25 premolars had one wall (group 2), 49 premolars preserved two walls (group 3), 48 premolars maintained three walls (group 4), and 19 premolars retained all four coronal walls.

During the evaluation period, seven post and core restorations failed (4.55%). No root fractures were observed. The failure modes recorded were post debonding (two restorations, 1.3%) and failure of the

Table 1 Group Data and Distribution of Restored Premolars

Group (no. of walls)	Maxillary first premolar	Maxillary second premolar	Mandibular first premolar	Mandibular second premolar	Total
Group 1 (0)	2	5	2	4	13
Group 2 (1)	3	12	4	6	25
Group 3 (2)	1	21	19	8	49
Group 4 (3)	2	17	22	7	48
Group 5 (4)	2	6	4	7	19

Table 2 Outcomes over the 45-Month Follow-up Period

	Observations (n)	Events (n)	Censored (n)	Censored (%)	95% confidence interval	Missing (n)	Invalid (n)
Group 1	13	3	10	76.92	44.21–91.91	0	0
Group 2	25	3	22	88.00	67.26–95.96	0	0
Group 3	49	1	48	97.96	86.38–99.71	0	0
Group 4	48	0	48	100.00	–	0	0
Group 5	19	0	19	100.00	–	0	0
Total	154	7	147	95.45	90.70–97.81	0	0

core buildup with fracture of the core and a small portion of residual coronal dentin (five restorations, 3.25%). All failures occurred in teeth that presented with a reduced amount of residual dentin with no or only one coronal wall maintained. In one of the post debonding cases, an asymptomatic periapical radiolucency was observed, and endodontic retreatment was performed. In all failures, the tooth was restored in the same manner as described previously and remained in service. All premolars that exhibited three and four walls after endodontic treatment survived the 45-month clinical observation period.

During the evaluation period, three all-ceramic crowns (1.95%) failed. Two crowns (1.3%) with clinically unacceptable chipping of the veneering ceramic were replaced; the other crown (0.65%) debonded after 2 weeks because of an adhesive failure and was rebonded immediately. All crowns remained in service until the end of the observation period. Superficial marginal discoloration was sometimes associated with a decrease in marginal integrity and was observed in nine ceramic crowns (5.84%). Stains on supragingival nonpenetrating margins could usually be removed using a finishing bur. No ceramic restoration failed because of marginal infiltration, and no teeth were lost for periodontal reasons. During the study period, periodontal treatment procedures, including deep scaling and root planing as well as surgical pocket elimination, were needed in four patients (2.6%). These criteria for clinical evaluation of the ceramic crown were not included in the longitudinal study.

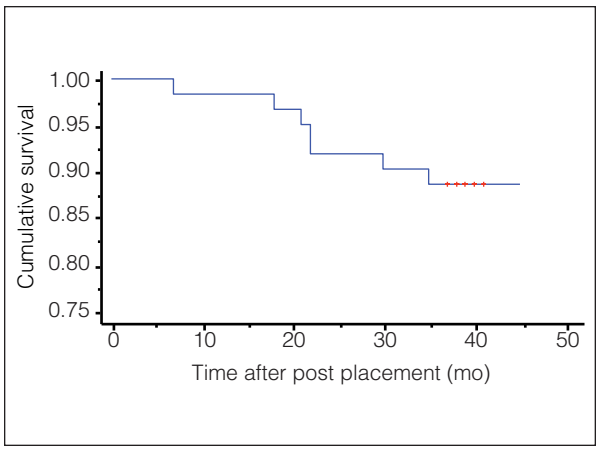

Fig 3 Cumulative survival of oval-shaped posts in relation to time.

The results of the Kaplan-Meier analysis of cumulative survival are presented in Table 2 and Fig 3. After a mean observation period of 42.3 ± 2.7 months, the overall survival rate of endodontically treated premolars restored with all-ceramic crowns and prefabricated glass fiber posts with an oval cross-section was 95.45%. Survival rates for groups 1 through 5 were 76.92%, 88.00%, 97.96%, 100.00%, and 100.00%, respectively.

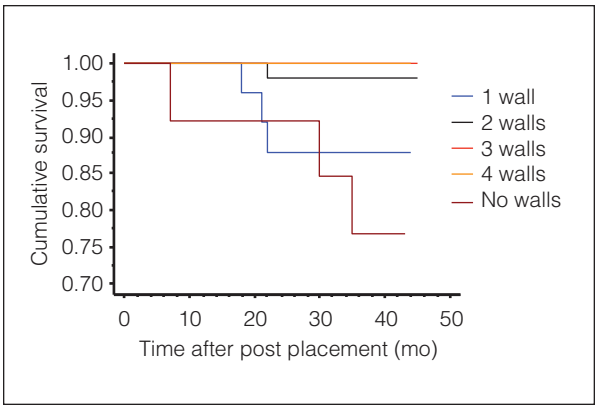

Fig 4 Cumulative survival of oval-shaped posts according to the number of residual walls in relation to time.

Table 3 Results of the Log-Rank Test Comparing all Five Groups

Contrasts	Log-rank (chi-square)	*P*
Group 2 vs group 1	0.70	.4019
Group 3 vs group 1	7.67	.0056*
Group 4 vs group 1	12.02	.0005*
Group 5 vs group 1	4.76	.0291*
Group 3 vs group 2	3.29	.0698
Group 4 vs group 2	6.00	.0143*
Group 5 vs group 2	2.38	.1231
Group 4 vs group 3	0.98	.3223
Group 5 vs group 3	0.39	.5335

*Statistically significant ($P < .05$).

Table 4 Overall Outcome of Posts in Premolars with No Coronal Walls and Those with One to Four Walls

	Observations (n)	Events (n)	Censored (n)	Censored (%)	95% confidence interval	Missing (n)	Invalid (n)	*P*
No wall	13	3	10	76.92	44.21–91.91	0	0	
1 to 4 walls	141	4	137	97.16	92.62–98.93	0	0	
Total	154	7	147	95.45	90.70–97.81	0	0	.0006

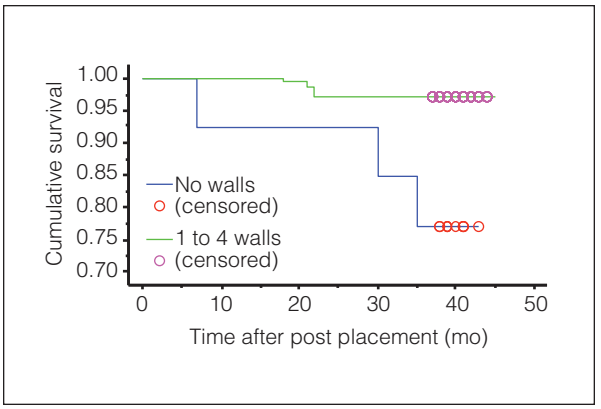

Fig 5 Overall survival rates of posts with no coronal walls and retention of one to four coronal walls.

The survival curves according to the number of residual walls are presented in Fig 4. The log-rank test was used to assess differences in the survival rates between different groups (Table 3). In particular, the comparison revealed that the difference between premolars with no coronal walls and premolars that maintained one to four coronal walls was statistically significant ($P = .0006$). On the contrary, the comparison between premolars with one and two residual walls was found to be not significant for the overall survival rate ($P = .0698$). Additionally, Fig 5 and Table 4 show separate Kaplan-Meier analyses and a comparison of the survival rate for premolars with no coronal walls and premolars that maintained one to four coronal walls.

Discussion

The design of this retrospective cohort study was specifically meant to assess the clinical effectiveness of prefabricated glass fiber posts with an oval cross-section in endodontically treated premolars with an oval-shaped root canal restored with all-ceramic crowns over up to 45 months.

Comparisons across studies are often difficult because of the different inclusion criteria, study populations, dentitions, materials and methods, and observation times. Considering that to date there are no clinical longitudinal trials assessing the clinical performance of oval-shaped FRPs for restoring endodontically treated teeth, adequate comparison of the actual clinical outcome with other studies may be even more difficult.

In this study, the dropout rate was 6.1%, which seems acceptable compared with other studies.[20,21] The cumulative survival rate was 95.45%. A lower 3-year survival rate (90.9%) was recorded in a longitudinal trial

in which endodontically treated premolars restored with FRPs were included. However, all the teeth were definitively restored with a single-unit metal-ceramic crown.[22] In a previous 2-year prospective study on root-treated premolars restored with glass fiber posts and all-ceramic crowns, a failure rate of 7.7% was recorded.[23] In another clinical investigation, the overall 2-year survival rate of crowned endodontically treated premolars was 81.3%.[24] In the present study, the success rate for groups 4 and 5 (with three and four residual walls, respectively) was 100%.

The most common failure observed in the current investigation was failure of the core buildup with fracture of the core and a small portion of residual coronal dentin, and this occurred in teeth retaining no coronal walls or presenting only one or two residual walls (groups 1, 2, and 3). It is the opinion of the authors that this may be explained by the determinant role of the remaining tooth structure. There is a growing amount of data from clinical and laboratory investigations demonstrating that the more residual coronal dentin that remains, the better the survival rate.[9,24–28]

In the present study, no post fracture was observed, and loss of retention was detected as an unfavorable event for two (1.3%) oval FRP and core restorations. Post debonding occurred in teeth retaining no coronal wall or presenting only one residual wall (groups 1 and 2). These findings uphold the statement that the role of residual coronal dentin in post retention is significant, as suggested in previous clinical investigations.[7,9,24,29,30]

FRP debonding may occur along either the cement-dentin or the cement-post interface. Pretreatment of the post surface with coupling agents (silane or bonding resin) permits adhesion enhancement.[31,32] Additionally, bonding to intraradicular dentin presents several challenges to clinicians that may impair optimal dentin hybridization.[33–35] The dislocation resistance of fiber posts into the root canal is also significantly influenced by the selected luting agent. Light-curing resins are not recommended for FRP cementation because of inadequate curing depth in the apical portion of the root canal, even if translucent posts are used.[36] Therefore, dual-curing or self-curing resin cements have been promoted for FRP cementation. Dual-curing resin cements are expected to adequately polymerize in portions of the post space that cannot be reached entirely by light.[37] Nevertheless, in the absence of light, some dual-curing cements may not reach an adequate degree of polymerization. It was reported that the mechanical properties of the cement layer significantly decrease from the coronal to apical third of the post space.[38] Therefore, light curing was recommended for dual-curing cements. On the other hand, in areas with insufficient light, self-curing cements acquire a high conversion rate, even in the most apical areas, with an improvement of the mechanical properties. In the present clinical study, a dual-curing composite cement that was also self-curing was used. This cement hardens without light curing in approximately 5 minutes, even though, according to the manufacturer's instructions, the cement was light cured.

Recent investigations advocated that a thick layer of cement between the root canal dentin and post surface predisposes the post to adhesive failure and debonding.[39,40] Preformed conventional fiber posts either have a circular, progressively tapered, or cylindric shape, yet they are commonly placed in oval- or ribbon-shaped canals. The more oval the canal, the greater the discrepancy between the canal and post. In an attempt to place conventional preformed FRPs in such canals, one would be forced either to round out the canal walls with burs, thus sacrificing an important amount of residual root canal dentin and could possibly lead to a reduction of the root strength, or to apply a thick layer of cement to fill the spaces between the canal walls and the loosely fitting post.[16,40,41] Additionally, if a post does not fit well, especially at the coronal level, the cement layer may be too thick and bubbles are likely to be present. The formation of bubbles or voids, representing areas of weakness within the material, is less likely to occur in a thin and uniform layer of cement.[16,40,42] FRPs presenting an oval cross-section may reduce the thickness of the cement layer, thus reducing polymerization stress caused by a large amount of cement around a post.[43,44] Several investigations reported that thin and even thickness of the cement layer and the absence of voids increase the retention of the post, thus reducing the risk of debonding.[45,46] The authors must report that when luting an oval fiber post in oval-shaped canals, the adaptation of the posts to canals is much poorer than that with a round post in a round post space prepared by dedicated drills.[44] The cement thickness around the post was not predictable or uniform. These findings have to be considered when interpreting the modes of failure.

In the present clinical trial, no root fracture occurred. In agreement with these findings and with previous clinical trials, it can be claimed that fiber post placement resulted in a low risk of root fracture.[1,5,24] Moreover, it is the opinion of the authors that, according to the results, a conservative post space preparation without modifying the canal's anatomical shape could reduce the risk of root fracture.

In another study, two more risk factors were found: the type of definitive restoration and the number of

proximal contacts.[25] However, in the present trial, the type of restoration was not identified as a risk factor and the number of proximal contacts was not recorded.

With regard to the clinical performance of all ceramic crowns during the evaluation period, three crowns (1.95%) failed. Failure patterns of all-ceramic crowns (fracture of the veneering ceramic or early adhesive failure) were excluded from this clinical trial for the purpose of standardization, since these cannot be considered as a failure of the post and core complex.

The present study does have some limitations. All clinical procedures were performed by experienced clinicians, and the post and core restorations were placed over a period of 45 months, not simultaneously. The mean observation period was 42.3 ± 2.7 months, which is indeed shorter than a patient's or clinician's expectations of restoration service. In addition, this investigation was performed in a preselected population. Since tooth loss resulting from endodontic and periodontal failure was excluded, the data represented restorative failure. The study limitations included the fact that the post assignment was not randomized but performed with respect to the root morphology, the number of teeth in each group was not uniformly distributed, and the observation periods were unequal. However, analysis using the Kaplan-Meier method made it possible to manage these limitations since survival is calculated each time a failure occurs. These limitations must be considered when interpreting the results.

Nevertheless, this study also promoted some major advantages compared to previously published investigations. The trial was restricted to premolars with an oval root canal shape after endodontic treatment, which represents a common clinical situation, and premolars were divided into five cohorts in relation to the number of preserved coronal walls. All patients treated were serially accounted for at the end of the study. The clinical procedures required during endodontic treatment and placement of restorations were performed under standardized conditions, which were given in detail and presented so they could be compared with other studies.

Further laboratory studies and long-term longitudinal trials regarding the clinical performance of endodontically treated teeth presenting oval- or ribbon-shaped canals restored with oval FRPs will provide additional data to support the validity of these results. In this regard, it should be mentioned that the groups in this study are still under observation, with the aim of collecting long-term survival data.

Conclusions

Within the limits of this study, it can be concluded that over an observation period of 45 months, a 95.45% survival rate for endodontically treated premolars presenting an oval root canal cross-section restored with preformed oval-shaped glass fiber posts in combination with a dual-curing composite resin core material was recorded. For these new preformed oval posts, a satisfactory clinical performance was observed. The placement of oval FRPs resulted in a low risk of failure. In particular, the types of complications (post debonding and failure of the core buildup) were not severe. All teeth could be restored in the same manner as performed previously and remained in service. With regard to the influence of residual coronal dentin, survival was higher for teeth with three and four coronal walls. The amount of coronal tooth destruction was identified as a variable that influenced the survival of oval-shaped post and core systems.

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