

Original Research

Evaluation of prognosis of fibre post and core supported crowns in less than ideal ferrule height cases: A 3 year prospective study

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ABSTRACT:

Background: Endodontically treated teeth most often have structural loss due to caries, fracture or access preparation and need special considerations to prevent their fracture and tooth loss during use over a period of time. **Materials & methods:** Fifty root canal treated teeth with coronal structural loss warranting the placement of post and core buildup were included in the study. Teeth had ferrule height between 1.5 and 2mm. Glass fibre post and dual cure composite core buildup was done and porcelain fused to metal crown was given as final restoration in each case. Patients were followed for 36 months to evaluate the success rate of the post core retained crowns. **Results:** Results showed that almost two third of cases were successful after three years and one third of cases failed within the three years. Half of the failures occurred due to the fracture at post core interface. **Conclusion:** significantly higher failure rates were observed to occur in post core buildup cases with less than ideal ferrule height.

Key words: Fibre Post, Core Buildup, Crowns

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INTRODUCTION

Restoration of endodontically treated teeth can pose a difficult challenge to the dental operator.¹ Depending on the amount of remaining coronal tooth structure, a post may be necessary to allow the tooth crown to withstand the intraoral forces during normal function.² Laboratory and clinical studies have failed to provide evidence that a post may strengthen endodontically treated teeth or enhance their survival.^{3,4} Thus, the primary purpose of post placement is to retain the core material.²

Traditionally metallic alloys have been used to fabricate dental posts (and cores) due to their suitable physical properties and their ability to be cast or machined into precise forms. However, these systems have a number of drawbacks.⁵ Currently, a plethora of different fibre resin post systems are available commercially. Composite resin is the preferred core buildup material to use with direct posts because of high fracture resistance and bonding to tooth structure.^{6,7} According to the literature, 2 mm tooth ferrule height is considered ideal to provide retention

and resistance to the post and core.^{8,9} However, clinically it is not always possible to maintain minimum of 2mm circumferential ferrule in all cases. So the present study was conducted to evaluate the success of post and core in cases where ferrule height was between 1.5mm and 2mm and surgical crown lengthening or orthodontic extrusion was either denied by the patient or not possible due to various reasons.

MATERIALS & METHOD

A total of 50 root canal treated teeth were included in this prospective study. In each case there had been severe loss of coronal tooth structure so that a dental post was needed to retain a full coverage restoration. Christensen's guidelines¹⁰ suggest that a core needs post retention where more than 50% of the tooth's coronal structure has been destroyed and these guidelines were adopted in this study.

All teeth for inclusion were endodontically treated at least one week prior to post preparation, each with an adequate quality of root filling with no clinical or

radiographic evidence of the existence of any periapical pathology, perforation, or root fracture. Teeth with a minimum of 1.5mm ferrule of dentine were included in the study but none of the teeth had complete 2mm circumferential ferrule that is being considered ideal for fibre post and core. The patients included in study were not willing for surgical crown lengthening or cast post & core fabrication and were informed in detail about the effects of reduced ferrule on outcome. The length of the ferrule was determined using a calibrated periodontal probe. Removal of gutta percha for post preparation was carried out using Peeso reamers (Mani, Japan). A minimum apical seal of 5.0 mm of gutta percha filling was retained in the apical portion.¹¹ The post canals were not prepared to receive a predetermined size of post, rather the root filling was removed and the Reforpost fibre post (Angelus, Brazil) that best fitted the remaining space (size 1 -3) was selected. No anti-rotational features were prepared at the top of the pulp chamber.

Naturally occurring undercuts were not removed to aid core retention. Moisture control was established where possible using rubber dam. For cases where this was not possible, cotton wool rolls and suction were used. The Reforposts were tried in. The length of the post was adjusted to ensure the desired length of the post projected beyond the root face and 2mm short of the opposite tooth. Posts were cut coronally using diamond burs in a high speed handpiece with a water spray; the bur was kept perpendicular to the long axis of the post to avoid damage to the fibre structure and its mechanical characteristics.¹² Where possible, the length of the post within the root was determined, such that it was at least equal to or greater than the height of the clinical crown. After try in, the fibre post were cleaned with alcohol and dried. A layer of silane (Silano, Angelus) was applied and post allowed drying for 1 minute as per manufacturer's recommendations. The root canal was treated with Non-Rinse conditioner from Coltene ParaCore kit (Coltene Whaledent, Switzerland) for 30 seconds. Excess non-rinse conditioner was removed using paper points and dried gently with a stream of air for 2 seconds. One drop each of Adhesive A and Adhesive B from ParaCore kit were mixed and applied for 30 seconds onto the root canal preparation and contact surfaces with excess removed using paper points and air stream for 2 seconds. ParaCore material (TRANS)

was dispensed directly into the prepared root canal using the root canal tip. Fibre post was completely coated with the mixed ParaCore material and inserted into the root canal using gentle pressure. Excess ParaCore material was removed and light cured for 30 seconds. For all the teeth restored, a single post was used per tooth; for multi-rooted teeth, the post was positioned in the canal which proved most favorable.

Core build-up in all cases was then performed using ParaCore (Coltene Whaledent). The post and root face were acid etched using 37% phosphoric acid for a period of 15 seconds. The etch gel was washed away and the preparation gently air dried. The bond and adhesive conditioner, bottles A and B respectively, were dispensed in equal amounts and mixed for 30 seconds and subsequently applied with a brush to the post and root face. Para Core base and catalyst pastes (Dentin Shade) were carefully dispensed through automix tips and the core material was then carefully packed into the pulp chamber and around the post head. The core was built-up incrementally and light cured for 40 to 60 seconds on each application. Following a recommended waiting period of 7 minutes, teeth were then prepared to receive full coverage crowns using porcelain fused to metal.

The definitive crowns were cemented using glass ionomer luting cement (GC Corporation, Japan) 4 to 7 days after tooth preparation. The restorations were designed with an occlusal form such as to have light holding contacts in the intercuspal position and minimal guiding contacts and to fit into the existing occlusal scheme. All the restorative procedures and follow-up assessments were carried out by one single operator. Patients were reviewed at least six months after the completion of restoration and were assessed for up to a minimum period of 36 months after completion. The outcome was considered successful if the post and core were insitu with no displacement or detachment of the post, no crown de-cementation, no post, core or root fracture, secondary caries or endodontic complications.

RESULTS

The age range of patient sample varied from 16 to 43 years with mean age of 36.5 years. 60 percent of the patient population was male. Three fourth of the samples were maxillary teeth and almost half the teeth included were of premolar variety (Table 1).

Table 1: The distribution of endodontically treated teeth restored with Glass fibre post cemented with ParaCore

	Incisor	Canine	Premolar	Molar	Total
Maxilla	12	4	18	6	40
Mandible	2	2	4	2	10
Total	14	6	22	8	50

Three cases were excluded from the analysis for failing to attend the full minimum 36 month recall period (Table 2).

Table 2: Overall results attained for cases restored with Reforpost Fibre posts and Cemented with ParaCore

Category	Number of post core cases	Percentage
Successful Cases	31	62
Failed Cases	16	32
Cases that failed to attend minimum recall period	3	6 (min recall period 36 months)
Total	50	100

Of the remaining 47 cases, a total of 16 were classified as failed. Thus, 66% of the sample was deemed successful and 34% failed. Success and failure rates were derived by dividing the number of cases that attended for the minimum recall interval. The cause of failure and the number of cases accountable for each type has been shown in Table 3.

Table 3: Distribution of failures by cause

Cause of Failure	Number of Cases
Fracture at post-core interface	8
Endodontic Failure	1
Secondary Caries	1
Post de-cementation	3
Root fracture	1
Post and Core separation	2
Total Failed in study sample	16

DISCUSSION

The survival of endodontically treated and restored teeth depends on many baseline factors, among which the amount of remaining coronal structure, restorative procedures, and material selection seem to be key factors affecting tooth longevity. In particular, preservation of at least one residual coronal wall¹³ or a circumferential 2-mm ferrule effect may contribute to overall tooth mechanical resistance.⁸ The load-bearing ability of pulpless teeth may also be improved by the choice of high-filler-content composite resins for restorations. Such materials, suitable for build-up as well as for fiber post luting, would simplify the clinical procedures and result in more mechanically homogeneous restorations.

Studies have shown that physical surface features such as serrations,¹⁴ the use of posts with greater diameters^{15,16} or the presence of a retentive head design at the coronal aspect of the post^{14,17} appear to be more significant with respect to improving retention of the post to the root and that of the core to the post, respectively. The latter features may improve the ability of the resin lute/ core material to interlock to the resin fibre post.¹⁴

Overall the results of this study showed that only 66% of cases were successful following an evaluation period of 36 months. A number of clinical studies have been published to assess the prognosis of endodontically treated teeth when restored with resin fibre posts.^{12,15,16} However, in contrast to the results elucidated in our study, many of the above have reported higher success rates. The results of this study showed that most of the failures were fractures occurring at the junction of post and core. In total, 8/16 cases failed in this way. Higher failure rate by this mode may be attributed to the lack of minimum of 2mm ferrule although careful attention was given

to marginal fit and occlusal prescription of final restoration.

Although a high failure rate by means of fracture at the post-core interface is cause of concern but the results of this study showed that root fractures were seldom encountered with only one case of root fracture observed in our study similar to results of study by Mehta and Millar.¹⁸ Failures by means of root fractures are critical drawbacks of the use of metallic post systems.⁵ Many in vitro studies also suggest that while mechanical failures can occur with resin fibre post and core systems, fractures tend to occur at the post-core interface, which are less catastrophic and more amenable to repair than the root fractures typically associated with more traditional metallic post systems.^{19,20,21}

The second most common overall cause of failure in this study was due to de-cementation (3/47) followed by post and core separation (2/27). But all these cases were retreated without any significant damage to the residual tooth structure.

CONCLUSION

Although fiber post and core buildup results in less destructive failures if any but presence of adequate ferrule and consideration of occlusal status of other teeth has a significant effect on the success rate. A long term follow up of cases is needed to better arrive at decision making regarding the success of fibre post and core buildup in cases with less than ideal ferrule height.

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