Survival of glass fiber post retained endodontically treated teeth preliminary report

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Abstract

Background: The use of fiber reinforced composite post in restoration of endodontically treated teeth have been found to prevent irreparable root fracture and the fact that the post is bonded to the root giving a monobloc restoration, also strengthens the tooth. This preliminary study aimed to evaluate the survival of endodontically treated teeth with compromised coronal tooth structure restored with glass-fiber posts after 6 months.

Methodology: Twenty endodontically treated teeth with less than 50% coronal tooth structure, were assessed and restored with glass fiber reinforced post cemented with dual cure composite and porcelain fused to metal crown. Patients were recalled and the teeth re-assessed at 3 and 6 months to evaluate their survival. The criteria for success included post and core in situ with no displacement or detachment of the post, no crown or prosthesis decementation, no post, core, or root fracture and absence of peri-radicular conditions requiring endodontic re-treatment.

Result: Eighteen teeth were available for review at both 3rd and 6th months out of which none had post-core-crown fracture. One tooth (5%) had minimal crevice on probing the margin at 6 month's review, while another tooth had ≤ 1mm mobility of the crown during the same review period.

Conclusion: Within the limitation of the study, there was an excellent performance of the teeth restored with glass fiber post with respect to post –core- crown and root fracture at the end of the 6months recall visit.

Keywords: *Glass fiber post, endodontically treated teeth, survival, clinical study.*

Résumé

Contexte: L'utilisation renforcée de fibres post composite dans la restauration de waxup traités dents ont été trouvées pour éviter qu'un préjudice irréparable racine la fracture et le fait que le post est collé à la racine donnant un monobloc restauration, renforce également la dent. Cette étude préliminaire visant à évaluer la survie de waxup traités avec dents compromises coronale dent restaurée structure en fibre de verre postes après 6 mois.

Méthodologie : Vingt waxup dents traitées avec moins de 50% coronale structure de la dent, ont été évalués et restauré avec de la fibre de verre renforcée post cimentées avec un double cure composite et porcelaine fusionnées à la couronne en métal. Les patients ont été rappelés et les dents re-évalués à 3 et 6 mois pour évaluer leur survie. Les critères de succès inclus post et core in situ avec aucun déplacement ou de détachement de la poste, aucune couronne ou prothèses decementation, no post, core, la racine ou la fracture et absence de péri-radicalaire conditions exigeant endodontique re-traitement.

Résultat : Dix-huit dents étaient disponibles pour examen à la 3ème et 6ème mois hors de laquelle aucune n'avait post-core-couronne fracture. Une dent (5 %), étaient minimes suceur plat sur l'approfondissement des la marge à 6 mois de révision, tandis qu'une autre dent avait d"1mm la mobilité de la couronne au cours de la même période de révision.

Conclusion: Dans le cadre de la limitation de l'étude, il y avait une excellente performance des dents restaurées avec de la fibre de verre post à l'égard de post -core- la couronne et la racine une fracture à la fin du 6mois rappel visite.

Introduction

Restoration of endodontically treated teeth is one of the treatments bein provided by the dental practitioners [1]. One of the major factors determining the success of the endodontically treated tooth is the coronal restoration [2]. When there is insufficient tooth structure (less than 50%), an endodontic post and core may be necessary to provide support to the final restoration [3]. Traditionally cast or wrought metal custom made post which allow for a close adaptation of posts to the post space preparations and fit optimally [4], or

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prefabricated metallic posts in which post space can be prepared and the post directly bonded in a single appointment have been used. However, use of metallic posts have stimulated concerns due to possible failures attributed to them viz a viz root fracture which has been attributed to excessive stiffness due to the high modulus of elasticity of the metallic post and the corrosion of the metal [5].

The material for post-and-core restorations has however changed markedly in the past few decades. Different post designs have now been proposed to obtain the best properties, from the perspectives of easy assembly, the aesthetics of the final restoration, the mechanical strength and the retention ability [6]. Current use and research now supports techniques using tooth-coloured, fiber-reinforced resin-based composite posts or titanium alloy posts cemented with resin cement, followed by resin-based composite core build-ups. Various types of fiber reinforced composite posts have recently come into widespread use as an alternative to cast or prefabricated metal posts in the restoration of endodontically treated teeth [7]. The carbon fiber post was the first fiber post designed [8] this was followed by quartz and glass fiber post which was designed to overcome the unaesthetic shortcomings of the initial carbon fiber post [9,10].

Various studies [11-14] have reported the success of fiber reinforced composite posts in restoration of endodontically treated teeth and have proven the use of the non rigid fiber reinforced post as an alternative to the rigid metallic post. However, in a developing environment like ours (Nigeria), there is no study (both clinical and laboratory) supporting the use of fiber reinforced post as against the traditional metallic post. Thus this prospective clinical study was set out to evaluate the survival of endodontically treated teeth restored using glass-fiber posts and composite core with metal-ceramic crowns over a 6-month period.

Methodology

The study was carried out in the Conservation clinic, Dental Centre, University College Hospital Ibadan Nigeria. Ethical approval was obtained from University of Ibadan/University College Hospital Ethical Review Committee . Twenty patients were recruited and selected teeth were studied between April 2010 and June 2011. Inclusion criteria: Teeth considered for the study were those with:

- Adequate root filling and has had successful endodontic treatment, with no evidence of any periapical pathology, perforation, or root fracture.
- Teeth with less than 50% coronal tooth structure and required post retained restoration as final coronal restoration.
- Teeth with minimum of 2mm coronal tooth structure cervically for ferrule effect.
- Teeth with healthy periodontium with no evidence of bleeding on probing and a minimum of 75% bone support.
- Patients with good oral hygiene and those that can also be motivated towards good oral hygiene practice.

The 20 teeth studied in 20 patients included, 11(55%) central incisors, 3(15%) lateral incisors, 5(25%) premolars and 1(5%) molar. Each tooth was examined both clinically and with periapical radiograph. Based on the preoperative periapical radiograph, most suitably sized fiber post was selected for each canal. Root preparation was done with peeso reamer, removing gutta percha in the canals leaving minimum of 4-5mm at the apex for maintenance of apical seal, and canal refinement completed with the drill for the appropriate size of post selected. The length of post was checked and reduced appropriately using a diamond bur (on fast handpiece) which was kept perpendicular to the long axis of the post to avoid damaging the fiber structure and its mechanical characteristics. Average length of post was between 9-10mm.

The canals were cleaned with sodium hypochlorite solution and immediately rinsed off with normal saline after which canals were dried with paper points. A self etch primer (Bond Boost: Premier Co Ltd) was applied into the canal with a microbrush after which dentin adhesive was also applied inside the canal. A dual cure luting composite (Integracem: Premier Co Ltd) was mixed according to manufacturer's instruction and applied into the canal with a file, also on the post which was immediately placed in the prepared canal gently allowing excess cement to flow out to prevent hydrostatic pressure build up in the canal. The post was held in place for about 10seconds for initial set and excess cement removed. The composite resin was then cured with composite light curing machine (Smart Lite Dentsply) of wavelength 450-500nm applied from above along the length of the post for 40 seconds. A periapical radiograph was taken at this point to access the post alignment after cementation. A core of composite was built on the coronal portion of the cemented post and prepared for porcelain fused to metal crown. A polyvinyl siloxane impression of the prepared tooth was taken and opposing arch impression taken in alginate. A temporary crown of polycarbonate (anterior teeth) or acrylic (posterior

teeth) was cemented with temporary cement pending the fabrication of the permanent porcelain fused to metal (PFM) crown.

The PFM crown was cemented in place after about 2-3weeks with zinc phosphate cement. A periapical radiograph was taken at cementation and all the clinical parameters which included marginal integrity, mobility of the restoration and gingival health were recorded.

Two dentists who had been calibrated on how and what to examine for, independently evaluated the clinical performance of the restored teeth. Each tooth was assessed both clinically and radiographically at baseline, after 3 and 6 months post cementation of the PFM crown.

Outcome was considered successful if the post and core were in situ with no displacement or detachment of the post, no crown or prosthesis decementation, and no post, core, or root fracture, intact marginal integrity without catching of the explorer or visible crevice, non mobility of final prosthesis (crown), absence of failed core portion requiring a new coronal restoration, absence of endodontic and periradicular conditions requiring endodontic re-treatment. Subjective symptoms reported by the patients were considered potential signs of failure.

Result

Out of the 20 cases treated, 18 cases were available for review at the 3 and 6 months review giving a 10% drop out in the cases seen. At the 3 months, all the teeth present had intact marginal integrity with no visible crevice. However at 6 months only one central incisor (5.6%) out of 18 teeth evaluated had minimal crevice on probing with explorer (Table 1). There was also slight mobility of another central incisor at 6 months but other cases were intact as they were at 3 months review (Table 2). At the 3rd and 6th month review, out of the 18 teeth available there was no case of failure in terms of fracture of the restoration, fracture of the root, fracture of post and periapical and periodontal pathology during clinical and radiographic assessment (Table 3).

Table 1: Marginal Integrity of the restoration

Marginal Integrity n=20	A	B	C
Baseline	20 (100%)	0	0
3 months recall	18	0	0
6 months recall	18	1	0

A: Excellent continuity at the restorative-tooth interface, no ledge
B: Slight ledge/ditch at the interface detectable with explorer
C: Visible marginal ditch or ledge or actual separation of interface between the restoration and tooth.

Table 2: Mobility of crown

	A	B	C
Baseline	20 (100%)	0	0
3 months recall	18	0	0
6 months recall	18	1	0

A: absence of mobility of tooth on clinical examination with ends of mirror and probe.
B: Tooth with slight movement ≤ 1mm
C: Tooth with movement ≥1mm leading to crown dislodgement

Kappa was used to check degree of agreement between the two observers and this gave a score of 0.97 showing strong agreement.

Table 3: Result of the Clinical and radiographic assessment of other parameters checked in the restored teeth.

	Baseline (n=20)		3 months (n =18)		6 months (n=18)	
	A	P	A	P	A	P
Post retention	20(100%)	0	18(100%)	0	18(100%)	0
Post fracture	20	0	18	0	18	0
Root fracture	20	0	18	0	18	0
Periapical radioluscency	20	0	18	0	18	0
Fracture of coronal restoration	20	0	18	0	18	0
Core fracture	20	0	18	0	18	0

A: absence of defect
P: Presence of defect.

Discussion

Since the introduction of carbon fiber posts in the early 1990s [8], and the improvement made on it to overcome its unaesthetic appearance by using quartz and glass fiber which are translucent and tooth coloured [9], the performance of these posts has delivered excellent clinical results [9, 10], thus enabling the dentist to restore the involved teeth in a cosmetic and conservative manner.

The result observed in the present study, has further confirmed the use of glass fiber post in restoration of endodontically treated teeth with compromised tooth structure. In combination with the resin cement and composite resin restoration, the clinical performance of the glass fiber posts was good over a 6-month period and this is in accordance with many studies that have documented excellent clinical performance of glass fiber reinforced posts [10-12, 15].

The possibility of fiber posts to flex with tooth under function has been documented to be a favourable property of the post [16, 17]. However, excessive flexion can also open the margins leading to caries, endodontic leakage and apical reinfection [17]. This could be responsible for the minimal crevice on probing observed in one of the teeth at 6 months.

Although the tooth with slight marginal defect observed in this study was intact when other parameters were assessed, the defect can be taken as a potential failure of the restoration and thus the need for further review of the cases.

The use of fiber post in endodontically treated teeth has been documented to reinforce the teeth because they are bonded to the root with resin cement forming a monobloc with the root dentin thus increasing the resistance of the tooth to fracture under stress [17].

With respect to fracture of the restoration, fracture of the root, fracture of post, post retention and periapical or periodontal pathology requiring crown removal and retreatment, the present study has shown through both clinical and radiographic examination, 100% success rate in all the teeth restored with glass fiber-reinforced posts with composite cores and restored with porcelain-fused-to-metal crowns at the end of 6months recall visit. However, longer-term follow-up is necessary to determine whether having a flexible post allows movement of the core, resulting in increased microleakage under the crown, especially when restoring teeth with minimal remaining tooth structure.

Conclusion

Over a 6-month period, the rehabilitation of endodontically treated teeth using glass fiber posts showed good clinical results. No crown or prosthesis decementation was observed, and no post, core, or root fractures were recorded. However, long term clinical review for a period of at least 2 years would have cleared some level of doubt of failure of the restoration. Also, other studies comparing the clinical performance of glass fiber post with the traditional rigid metallic post used for rehabilitation of endodontically treated teeth with gross coronal tooth loss is recommended.

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