Advances in Bioresearch
Adv. Biores., Vol 7 (2) March 2016: 69-72
©2015 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
ICV Value 8.21 [2014]

Advances in Bioresearch

ORIGINAL ARTICLE

Effect of Chlorhexidine on Bonding Strength of Quartz fiber Post in Dentin root

Ezatollah Jalalian [1], Kimia Attar [2], Hadi Kaseb Ghane [3*], Nazanin Samiei [4], Reza Amiri [5]
1. Department of Fix Prostodontics, Dental Branch, Islamic Azad University, Tehran, Iran
2. Department of fix Prostodontics, Dental Branch, Islamic Azad University, Tehran, Iran
3. Department of Prosthodontics, Dental Branch, Islamic Azad University, Tehran, Iran
4. Department of Periodontics, School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran
5. Dentist, Private Office, Iran
* Corresponding Author: Hadi Kaseb Ghane

ABSTRACT
Quartz fiber posts are an important clinical option to provide retention for coronal dental restorations. The de-bonding at the dentin/cement interface has been considered as a major cause of failure of fiber post restorations. One of the factors affecting the bond strength of fiber post is irrigation regime used in post space surfaces prior to placement of fiber post. So, the aim of this study was to assess the effect of chlorhexidine 2% on bonding strength of quartz fiber post to root dentin. In this study a total 20 mandibular premolar were selected and de-coronated at the CEJ level of each tooth around 15mm. After biomechanical preparation of root canals, all specimens obturated with gutta prcha and AH26 sealer (dentsply, Germany), using lateral condensation technique. Specimens were randomly divided into 2 groups (n=10): group 1normal saline and group 2, chlorhexidine 2%. The root canals were prepared for post space using peeso reamer to reach 10mm length for each root, and then RDT finishing drill used to optimize matching of fiber post with post space shape. The posts were cemented with dual cure resin Panavia F2 (Kuararay, Japan) according to manufacturer's instruction. After 24 h storage in 100 % moisture, 3 horizontal sections (1mm thickness) were cut from coronal, middle and apical third of each root. Specimens were subjected to the universal testing machine (Instron) for push-out test. Bond strength values were statistically analyzed t-test. According to the results, administration of chlorhexidine had no significant effect on binding strength of Quartz fiber post compared to control group (P>0.05). Also, no significant difference detected on strength of Quartz fiber post in coronal, middle and apical sections in chlorhexidine-treated groups compared to the control group (P>0.05). These results suggest application of 2% chlorhexidine in conditioning step was not able to improve the bonding strength of quartz fiber post to dentine root.
Key words: *Chlorhexidine, Quartz fiber, Bonding strength, Dentin root*

Received 11/11/2015 Accepted 18/02/2016

How to cite this article:
Ezatollah J, Kimia A, Hadi K G, Nazanin S, Reza A. Effect of Chlorhexidine on Bonding Strength of Quartz fiber Post in Dentin root. Adv. Biores., Vol 7 [2] March 2016: 69-72. DOI: 10.15515/abr.0976-4585.7.2.6972

INTRODUCTION

Fiber posts were introduced in restorative dentistry as an alternative to cast posts or metal dowels. Their elastic modulus is claimed to be similar to that of the dentin and this feature reduces the risk of root fractures [1, 2]. Because debonding is a common cause of failure encountered with fiber posts, interface between root dentin and resin cement was the object of several studies, involving both bond strength tests and microscopic investigation. Some studies have considered post restoration relies on dental adhesion, the adverse effects caused by the root canal treatment [3-5].

In contrast to rigid posts, fiber posts do not need to be inserted to a length equal to or longer than the depth of the clinical crown in order to reduce the chance of root fracture [6, 7]. This is advantageous for short roots or for roots presenting a high degree of curvature. Once the fiber posts are adhesively looted into the canal, a high in-depth insertion into the root canal is not necessary to improve retention [8]. This is feasible because the bonding of the cement to dentin walls is more effective in the cervical region than

in the apical region [9, 10]. Despite the cited advantages, the mismatch between the diameters of the post space and the fiber post remains a clinical problem [11, 12].

Clinical studies have shown successful results with the use of quartz fiber-reinforced resin posts. However, there are some reports about failures, including failure of the cement- fiber-reinforced resin posts complex with debonding of the resin cement from dentin. Retention of the post is important for the long-term success of the definitive restoration and survival time of the tooth [13]. The post-cement-tooth system is susceptible to cohesive fracture of the tooth substance itself and failure at the interface between root canal dentin and luting cement as well as between the cement and post. Furthermore, failure of the post and fractures within the cement layer is possible [14].

Chlorhexidine is a potent antiseptic with a broad-spectrum antimicrobial action, substantively, and low grade of toxicity; therefore, is unable to dissolve pulp tissue. The application of chlorhexidine in the root canal is a procedure described in the literature; however, its application has been specifically to clean the canal before luting procedures. Chlorhexidine application to preserve the hybrid layer and, consequently, increase bond strength longevity, such as at coronal dentin, has not yet been evaluated for fiber post cementation, to the authors' best knowledge [15]. However, there are reports claim chlorhexidine has initial effect as adhesion of fiber-reinforced post to root canal [16]. One study has shown that the use of a saline coupling agent can increase bond strength of quartz fiber posts [17].

So, the aim of this study was to determine effect of chlorhexidine on bonding strength of Quartz fiber post in dentin root.

MATERIAL AND METHODS

To investigate the effect of chlorhexidine on bonding strength of Quartz fiber post in dentin root, this study carried out on 20 mandibular premolar teeth in department of fixed prosthodontics of Islamic Azad University, Dental Branch of Tehran in the 2014-15. The selected teeth had no fraction or decay in crown or root canal. Bucco-palatal (7-8 mm) and mesio-distal (5.5-6 mm) dimensions and root lengths of all teeth selected were measured using digital calipers (Digimatic Calipers, Mitsutoyo, Tokyo, Japan).

Sample preparing

The mandibular premolar was de-coronated at the CEJ level of each tooth around 15mm using distiller water. All samples numbered using set back filing system up to 60 (K-file Mani, Japan). Also, the canals were numbered up to 35 (K-file Mani, Japan). The root canals were obturated with gutta-percha size 35. After the root canal treatments, the teeth underwent post space preparation to 2/3 of the root length by means of a preparation drill (D.T #3, Bisco Inc., Schaumburg, IL, USA). All teeth with the post preparation were reconstructed with one of the following three types of post-core restorations [18]. Specimens were randomly divided into 2 groups: group 1 normal saline and group 2, chlorhexidine 2% (n=10).

Fiber post group

A quartz fiber post (D.T. Light Post #2, Bisco, Inc.) was luted into the post space using a self-etching primer (Tyrian SPE, Bisco, Inc.), a light-cured dentin adhesive (One-Step Plus, Bisco, Inc.) and dual-cured resin cement (Duo-Link, Bisco, Inc.). First, the self-etching primer was applied to the dentin surface of the post space followed by drying with a paper point to remove moist spots. The dentin adhesive was applied and light-cured for 10 s. The surface of the fiber post was also coated with dentin adhesive. Then, the dual-cured resin cement and fiber post were inserted into the post space, consecutively. After removal of excessive cement, the resin cement was cured by irradiation for 40 s [18].

The root canals were prepared for post space using peeso reamer to reach 10 mm length for each root, and then RDT finishing drill used to optimize matching of fiber post with post space shape. The posts were cemented with dual cure resin Panavia F2 (Kuararay, Japan) according to manufacturer's instruction. After 24 h storage in 100 % moisture, Mode of fracture was observed by visual inspection with the aid of trans-illumination, and internal crack propagation was detected by means of a digital radiograph system (SMX-1000, Shimadzu Co.). Crack propagation was classified into the three categories as follows; cervical, fracture extended to 1/3 depth longitudinally from cervical portion; middle, fracture extended between 1/3 and 2/3 from cervical toward apical portion; apical, fracture extended in 1/3 depth longitudinally in apical slat portion [18].

Statistical analysis

Fracture loads among groups with different types of post-core systems and between the two types of loadings were compared using T-test at a 95% level of confidence. $P<0.05$ was considered as significant differences between treatments.

RESULTS

The effect of chlorhexidine on bonding strength of Quartz fiber post in dentin root is presented in tables 1 and 2. According to the data, administration of chlorhexidine had no significant effect on binding strength of Quartz fiber post compared to control group (P>0.05) (table 1).

Table 1. Results of binding strength of Quartz fiber post in Dentin root

Group	Min	Max	Mean ± SD	***P Value***
Control (Saline)	19.2	54.3	36.2 ± 3.8	
Chlorhexidine	16.5	55.2	34.8 ± 10.5	0.08
n= 10 for each group.				

As observed in the table 2, no significant difference detected on strength of Quartz fiber post in coronal, middle and apical sections in chlorhexidine-treated groups compared to the control group (P>0.05).

Table 2. Results of binding strength of Quartz fiber post in different portions of Dentin root

	Portion of section		
Group	Coronal	Middle	Apical
Control (Saline)	46.7 ± 5.08	37.08 ± 4.3	37.08 ± 4.3
Chlorhexidine	45.6 ± 11.9	45.6 ± 11.9	45.6 ± 11.9
P Value	0.9	0.9	0.6
n= 10 for each group.			

DISCUSSION

The most relevant finding of the study was that the chlorhexidine had no significant effect on binding strength of Quartz fiber post compared to normal saline. Chlorhexidine belongs to a group of medicines called antiseptic antibacterial agents. Chlorhexidine is active against Gram-positive and Gram-negative organisms, facultative anaerobes, aerobes, and yeasts [19]. Chlorhexidine has been suggested as an irrigant in endodontic treatment due to its good antimicrobial properties and adhesion into root canal dentin [20]. Due to the substantive activity, chlorhexidine restricts bacterial ingress and penetration into dentinal tubules. While NaOCl irrigation, either alone or followed by EDTA, may reduce the immediate composite bond strength into pulp chamber or root dentin,[21] chlorhexidine irrigation has no such negative effect [22] chlorhexidine also improves the longevity of composite adhesive bonding to dentin by inhibition of hybrid layer collagen-degrading enzymes, matrix metalloproteinases [23].

However, in this study, chlorhexidine had no significant effect on binding strength of Quartz fiber but it is improved the apical and medial binding strength. Interestingly, Hiraishi et al. (25) also found reduced bond strength after chlorhexidine application with Panavia F2.0, a self-etching resin cement, as well as increased nanoleakage with RelyXUnicem. Several reports exist on effectiveness of chlorhexidine binding strength [16]. In a study, it is reported after 6 months, chlorhexidine application did not effectively arrest bond strength degradation of fiber posts cemented in human roots [15]. The reason for this difference may lay with different testing methods. With improved adhesive bond strength, the increase in shear stress may subject the sample dentin to higher forces, thus increasing the rate of dentin cohesive failures, as observed in this study.

Restorative dentistry and endodontics aim to preserve tooth structure with optimal function and esthetics. Endodontically treated teeth are structurally different from vital, non-restored teeth and require specific restorative treatments. Bond strength of bonding systems depends on the bond to wet, smooth and porous dentin surfaces. If resins cannot adequately bond to the collagen network in demineralized dentin, bond strength decreases. Factors such as the use of irrigating solutions, intracanal medicaments and endodontic sealers can also affect the bond strength [26].

The increasing use of fiber posts for restoring endodontically treated teeth with the loss of coronal tooth structure has been proved to be effective and the post in combination with resin cement and restorative material can form a structurally and functionally homogeneous complex with root dentin.1 Fiber posts are promoted due to their excellent biocompatibility, esthetic and mechanical properties. Fiber post systems that have a similar modulus of elasticity to root dentin are generally preferred to metal post systems and show less microleakage under dynamic loading and fracture patterns availing a retreatment of the fracture. Numerous *in vitro* studies have been done to investigate different adhesive systems and pre-treatments of dentin or posts for improving bond strength, and have shown that most failures of fiber posts are caused by bond failure between the post and the dentin [17]. Some studies have reported that the type of adhesive system and root region had a significant influence on the bond strength of the adhesive luting fiber posts. Based on this study, 2% of chlorhexidine had no significant effect on bonding

strength of Quartz fiber post in dentin root. We think further researches needed to investigate effect of other substances on bonding strength of Quartz fiber post.

REFERENCES

1. Torbjörner A, Karlsson S, Syverud M, Hensten-Pettersen A.(1996). Carbon fiber reinforced root canal posts. Mechanical and cytotoxic properties. Eur J Oral Sci; 104: 605–11.
2. Fredrikson M, Astback KJ, Pamenius M, Ardvidson. (1998).A retrospective study of 236 patients with teeth restored by carbon-fiber reinforced epoxy resin posts. J Prosthet Dent; 80:151–7.
3. Schwartz RS, Murchison DF, Walker WA. (1998).Effects of eugenol and noneugenol endodontic sealer cements on post retention. J Endod; 24:564 –7.
4. Tjan AH, Nemetz H. (1992).Effect of eugenol-containing endodontic sealer on retention of prefabricated posts luted with adhesive composite resin cement. Quintessence Int;23:839–44.
5. Hagge MS, Wong RD, Lindemuth JS. (2002).Effect of three root canal sealers on the retentive strength of endodontic posts luted with a resin cement. Int Endod J; 35:372– 8.
6. D'Arcangelo C, De Angelis F, Vadini M, et al. (2008).In vitro fracture resistance and deflection of pulpless teeth restored with fiber posts and prepared for veneers. J Endod ; 34:838–41.
7. Santos-Filho PC, Castro CG, Silva GR, et al. (2008).Effects of post system and length on the strain and fracture resistance of root filled bovine teeth. Int Endod J; 41: 493–501.
8. Braga NM, Paulino SM, Alfredo E, et al. (2006).Removal resistance of glass-fiber and metallic cast posts with different lengths. J Oral Sci ; 48:15–20.
9. Faria e Silva AL, Arias VG, Soares LE, et al. (2007).Influence of fiber-post translucency on the degree of conversion of a dual-cured resin cement. J Endod ; 33:303–5.
10. Faria e Silva AL, Casselli DS, Ambrosano GM, et al. (2007).Effect of the adhesive application mode and fiber post translucency on the push-out bond strength to dentin. J Endod ; 33:1078–81.
11. D'Arcangelo C, Cinelli M, De Angelis F, et al. (2007).The effect of resin cement film thickness on the pullout strength of a fiber-reinforced post system. J Prosthet Dent ; 98: 193–8.
12. Teixeira CS, Silva-Sousa YT, Sousa-Neto MD. (2009).Bond strength of fiber posts to weakened roots after resin restoration with different light-curing times. J Endod; 35:1034–9.
13. Goracci C, Ferrari M. (2011).Current perspectives on post systems: a literature review. Aust Dent J; 56(suppl 1):77–83.
14. Johannes Ebert, Andrea Leyer, Oliver Gunther, Ulrich Lohbauer Anselm Petschelt, Roland Frankenberger, Matthias Johannes Roggendorf. (2011).Bond strength of adhesive cements to root canal dentin tested with a novel pull-out approach. J Endod; 37:1558–1561
15. Leitune, V. C.; Collares, F. M.; Werner Samuel, S. M. Influence of chlorhexidine application at longitudinal push-out bond strength of fiber posts. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, Sant Loius, v. 110, n. 5, p. e77-81, 2010.
16. Ritva M. Lindblad, Lippo V.J. Lassila, Veijo Salo, Pekka K. Vallittu, Leo Tja derhane. Effect of chlorhexidine on initial adhesion of fiber-reinforced post to root canal. Journal of dentistry 38 (2010) 796–801
17. Liu C, Liu H, Qian YT, Zhu S, Zhao SQ. The influence of four dual-cure resin cements and surface treatment selection to bond strength of fiber post. International Journal of Oral Science (2014) 6, 56–60.
18. Hayashi M, Takahashi Y, Imazato S, Ebisu S. Fracture resistance of pulpless teeth restored with post-cores and crowns. Dental Materials (2006) 22, 477-485.
19. Leikin, Jerrold B.; Paloucek, Frank P., eds. (2008), "Chlorhexidine Gluconate", Poisoning and Toxicology Handbook (4th ed.), Informa, pp. 183–184.
20. Basrani B, Lemonie C. (2005).Chlorhexidine gluconate. Australian Endodontic Journal The Journal of the Australian Society of Endodontology ;31:48–52.
21. Erdemir A, Ari H, Gungunes H, Belli S. (2004). Effect of medications for root canal treatment on bonding to root canal dentin. Journal of Endodontics. 30:113–6.
22. Carrilho MR, Geraldeli S, Tay F, De Goes MF, Carvalho RM, Tjaderhane L, et al. (2007).In vivo preservation of the hybrid layer by chlorhexidine. Journal of Dental Research; 86:529–33.
23. Santos JN, Carrilho MR, De Goes MF, Zaia AA, Gomes BP, Souza-Filho FJ, et al. (2006).Effect of chemical irrigants on the bond strength of a self-etching adhesive to pulp chamber dentin. Journal of Endodontics. 32:1088–90.
24. Sulkala M, Tervahartiala T, Sorsa T, Larmas M, Salo T, Tjaderhane L. Matrix metalloproteinase-8 (MMP-8) is the major collagenase in human dentin. Archives of Oral Biology 2007; 52:121–7.
25. Hiraishi N, Yiu C, King N, Tay F. (2009).Effect of 2% chlorhexidine on dentin microtensile bond strengths and nanoleakage of luting cements. Journal of Dentistry; 37:440–8.
26. Zare Jahromi M, Mirzakouchaki P, Barekatein M, Akhtari M, Riazifar N, Ranjbarian P, Saee MR. (2015).Effect of triple antibiotic paste and calcium hydroxide as intracanal medicaments on bond strength of composite to dentin. Journal of Dental School; 33(2): 169-174.