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RESEARCH ARTICLE

VEDIC MEDICINES - AN INNOVATIVE IRRIGANT AND ITS EFFECT ON PUSH OUT BOND STRENGTH OF DIFFERENT ENDODONTICS SEALERS - AN INVITRO STUDY.

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ABSTRACT

Introduction: The bond strength of root canal sealer is the amount of force required to break the connection between a bonded sealer and the root dentin surface. Now a day's synthetic irrigants are only used as root canal irrigants but they cause harm to root-dentin surrounding soft tissue and adjacent bone. To reduce these factors ayurvedic medicine takes part in innovation. Though the perception is incorrect, on balance herbal medicines are still much safer than synthetic drugs. **Aim:** To compare the Push-out bond strength of different endodontic sealers using ayurvedic intracanal irrigants. ***Methodology:*** Sixty single-rooted permanent upper anterior teeth were selected. All teeth were decoronated at the level of CEJ. Root length was specified at 15mm. All teeth were prepared with universal Protaper until F3 according to manufacturer instruction. All samples were randomly divided according to the different irrigants and sealers used. Group I: Kutkrumin + Perma evolution; Group II: Kutkrumin + Apexit plus; Group III: Chlorhexidine 2% + Perma evolution; Group IV: Chlorhexidine 2% + Apexit plus; Group V: Sodium hypo chloride 5.25% + Perma evolution; Group VI: Sodium hypo chloride 5.25% + Apexit plus. All samples were finally irrigated with normal saline. Then sealers were applied using lentulospiral. Samples were sectioned into 2 mm disc thickness. By using a universal testing machine push-out bond strength was performed. ***Results and Statistical Analysis:*** According to one-way ANOVA with a level of confidence of 95%, Kutkrumin and Chlorhexidine with Perma evolution as a sealer showed the highest bond strength values ($p < 0.005$) when compared with other groups whereas, chlorhexidine with apexit plus sealer had the most minor bond strength among other groups. Kutkrumin and sodium hypochlorite with apexit plus sealer showed equivalent bond strength this was presented by intergroup analysis post hoc Tukey test. Adhesive failures were predominant in all groups. ***Conclusion:*** Kutkrumin with Perma evolution as a resin-based sealer showed better outcomes when compared with chemical irrigants like sodium hypochlorite and chlorhexidine.

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INTRODUCTION

Historically, countless compounds in aqueous solution have been suggested as root canal irrigants, including inert substances such as sodium chloride (saline) or highly toxic and allergenic biocides such as formaldehyde (Zehnder, 2006). The irrigants that are currently used during cleaning and shaping can be divided into antibacterial and decalcifying agents or their combinations. They include sodium hypochlorite (NaOCl), chlorhexidine, ethylenediaminetetraacetic acid (EDTA) (Abraham, 2015). The excellent antibacterial and chelating property of irrigant is considerable as a root canal irrigant material. For effective irrigation EDTA as a chelator or inorganic tissue remover, Chlorhexidine as antibacterial and sodium hypochlorite as an organic tissue dissolvent is used (Iqbal, 2012). Irrigation with H2 O2 , NaOCl, or EDTA significantly decreased the microhardness of root canal dentin (Saleh, 1999) NaOCl and EDTA also increased the roughness of dentin. Irrigation solutions might also change other surface properties of radicular and coronal dentin such as wettability, which might influence the adhesion of bacteria and the interaction between the dentin and obturation material like sealers (Hu, 2010) Many root canal sealers were proposed to achieve the good sealing ability and adhesion to dentin. An ideal root canal sealer should adhere firmly to both dentin and core filling materials. The bond strength of endodontic sealer to dentin is important to maintain the integrity of root canal seal (Abada, 2015) so this study included resin based perma evolution (Becht, Germany) and calcium hydroxide based apexit plus (Ivoclar, Vivadent, Fürstentum, Schaan, Liechtenstein). Natural products have been used since ancient times in folk medicine (Sinha, 2014). In dentistry, phytomedicines have been widely used. Kutkrumin is one of the important (rasayana) drug commonly used in the Ayurvedic system of medicine as a Chelating agent for parasite and anti bacterial agent (Meena, 2009). NaOCl is a chemical irrigation material leads to decreased bond strength between dentin and resin cements and may require a reversal agent because of

its ability to affect the polymerization of the resin sealer (Ari, 2003) So new irrigation material like ayurvedic medicine came into practice. To date, studies have focused on the effects of two different resin sealers which are perma evolution and apexit plus using with ayurvedic irrigant on root dentin. This study aimed to compare and evaluate push out bond strength of different endodontic sealer using ayurvedic intra canal irrigants on radicular dentin.

MATERIALS AND METHODOS

SAMPLE PREPARATION: Sixty freshly extracted single rooted upper anterior teeth were stored in the saline until use. The teeth were decoronated to standardized root length of 15 mm from apex to coronal. The canal patency was confirmed by inserting K-file size #10 (Mani, Inc, Tochigi, Japan). The working length was established by inserting K-file size #15 (Mani, Inc, Tochigi, Japan) until it visible at the apical foramen, then subtracting 1 mm from this measurement. All teeth were instrumented using Pro Taper universal (Dentsply Maillefer, Ballaigues, Switzerland) rotary system and prepared up to F3 apical size.

ROOT CANAL IRRIGATION AND SEALER PLACEMENT: A teeth were divided according to different irrigant and sealer used. Group I: Kutkrumin + Perma evolution; Group II: Kutkrumin + Apexit plus; Group III: Chlorhexidine 2% + Perma evolution; Group IV: Chlorhexidine 2% + Apexit plus; Group V: Sodium hypo chlorite 5.25% + Perma evolution; Group VI: Sodium hypo chlorite 5.25% + Apexit plus. Each group contain ten samples (n=10).

KUTKRUMIN EXTRACTS: Whole plants of Kutaj, Haritaki, Bibhitak, Amalaki, Chitrak, Kumari, Bilwagarbha, Indrajav, Shuddha Bhallatak, Ushir, Twak, Sunthi, Marich, Pippali, Vidang were obtained. The plant materials were washed, shade dried and powdered in a mechanical grinder. A weighed quantity of the air-dried powdered herbal plants was repeatedly macerated with 500 ml of 99% ethanol and filtered using Whatman filter paper. The ethanol was evaporated and the extracts were concentrated using rotary flash evaporator and stored at 4°C until used (Vinothkumar, 2013).

OBTURATION OF SAMPLES: The root canals were irrigated using 5ml of kutkrumin, 5mL of 5.25% sodium hypochlorite (Prime Dental Product, Mumbai, India), and 5ml of 2% chlorhexidine during instrumentation and after instrumentation using a 27-gauge needle 1mm shorter than the working length. Finally, the canals were flushed with 0.9% normal saline as a final irrigating solution. The root canals were dried using paper points size #30. An epoxy resin-based sealer (Perma evolution) and calcium hydroxide based (Apexit plus) was applied to the root canal walls by using #30 lentulospiral (Dentsply Maillefer, Ballaigues, Switzerland). All specimens were obturated using the single cone technique to obtain standard specimens for the push-out test. All the teeth were stored at 37º C in 100% humidity for one week to allow the sealer to completely set before testing.

BOND STRENGTH EVALUATION

Each specimen was sectioned perpendicular to its long axis using a precision saw at a slow speed under water cooling. The slices were obtained from each tooth approximately from 5 mm coronally obtaining the disc thickness of 2 mm. The push-out test was performed on each specimen with a universal test machine, at a crosshead speed of 1 mm/min using estimated diameter of cylindrical plugger. The diameter of the pluggers was approximately (at least) 80% of the diameter of the canal. The maximum load applied to the filling material before failure was recorded in newtons and converted to megapascals (MPa) according to the following formula: Push-out bond strength (MPa) = maximum load (N)/adhesion area of root filling (A) (mm^2) According to formula all result were formulated.

DISCUSSION

This invitro study compared the bond strength of resin sealers (apexit plus and perma evolution) when exposed to different irrigants like Kutkrumin, Sodium hypochlorite and Chlorhexidine. The push-out testing method allows bond strength measurements of adhesive materials to root canal dentin. The results of the present study showed higher bond strength for the kutkrumin with perma evolution sealer compared to sodium hypoclorite and Chlorhexidine as a irrigant and apexit plus as a sealer. An ideal root canal filling material should have the ability to seal the root canal, should prevent micro leakage, and resist dislodging forces (Torabinejad, 1999; Saunders, 2008). Sodium hypochlorite breaks down into sodium chloride and oxygen; free oxygen can interfere with resin sealer polymerization (Vongphan, 2005) Sodium hypochlorite leading to strong inhibition at the resin-dentin interface and decreasing bond strength. Chlorehxidine (CHX) can be applied clinically as antimicrobial agent during all phases of the root canal preparation, as root canal irrigant, as an intracanal medicament alone or combined with other substances like calcium hydroxide. This is a only property of chlorhexidine it not interact with any organic or inorganic tissue in root canal (Kim, 2014) Sabatini C, showed that reduced degradation of the dentin adhesive interface has been shown with the use of 2% CHX as a therapeutic application of the adhesive in vivo and in vitro (Sabatini, 2013) both the agent fail to remove smear layer in vivo and ex vivo studies. While Kutkrumin has been relatively new to endodontics and has been suggested as an alternative to NaOCl because of its chelating ability to remove smear layer and antimicrobial activities, especially against anaerobic bacteria such as E. faecalis and C. albicans. Its antimicrobial and chelating ability is because of its component like triphala (Amalaki, Bibhitaki, and Haritaki), trikatu (kali mirch, adhrakh, and pippali**),** Kutaj, Chitrak, Kumari, Bilwagarbha, Indrajav, Shuddha Bhallatak, Ushir, Twak, and Vidang (Prabhakar, 2010). Choudhary E *et al*, resulted that overall antimicrobial effects of different irrigants were maximum for CHX, whereas Triphala juice also showed significant reductions (Choudhary, 2018). Prabhakar J rt al, showed Triphala is also a very good chelating agent because of the fruits that are rich in citric acid and holds promise in the removal of smear layer (Prabhakar, 2010). In this study resin based perma evolution and calcium hydroxide based apexit plus were used to check affect on dentinal strength after using different irrigant. Single cone obturation technique is used and Push out bond test take into consideration. The results of the present study showed higher adhesion of Perma evolution sealer with irrigation of kutkrumin compared to apexit plus with irrigation of sodium hypochlorite and chlorhexidine that it can be used as an appropriate irrigation solution in endodontics given the advantages of natural medications and the disadvantages of NaOCl. This claim needs more investigation.

STATISTICAL ANALYSIS

All the data were entered into Microsoft Excel 2010. Descriptive statistics for mean force (Mpa) was expressed as mean ± standard deviation (SD) for each group. Six groups were compared for force (Mpa) by Analysis of variance (ANOVA) followed by Tukey's Post hoc Test for pair wise comparison. SPSS (Statistical Package for Social Sciences) version 19 software was used for analysis.

Figure 1. Sample testing under universal testing machine

RESULTS

The values of Mean ± SD push-out bond strength of all the six groups are represented in Table No.1.

Table 1. Descriptive Statistics BOND STRENGTH (Mpa) among four groups

Descriptive Statistics					
Groups	N	Minimum	Maximum	Mean	Std. Deviation
Kutkrumin + Perma evolution	10	125	157	143	16.65
Kutkrumin + Apexit plus	10	92	124	110	16.26
Chlorhexidine 2% + Perma evolution	10	125	148	140	13
Chlorhexidine 2% + Apexit plus	10	80	96	86	8.32
Sodium hypo chloride 5.25% + Perma evolution	10	108	124	113	8.96
Sodium hypo chloride 5.25% + Apexit plus	10	103	122	109	10.69

Table 2. Comparison of BOND STRENGTH (Mpa) among four groups by Analysis of Variance (ANOVA)

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F- value
Between Groups	6835.778	5	1367.156	8.416142	0.001276	3.105875
Within Groups	1949.333	12	162.4444			
Total	8785.111	17				

*There was statistically significant difference among four groups with <0.005

Highest mean push out bond strength was observed in Group I, whereas observation in Group I, II, III, V and VI which was statistically significant, compared to group IV showed. The mean push out bond strength value of group I, III and V was statistically insignificant with that of Group II, and VI. In this result adhesive, cohesive bond failure checked accordingly only adhesive bond failure taken in consideration. All the tested 'p' value was considered statistically significant when it was <0.05 represented in table No. 2.

CONCLUSION

In the recent past, there has been a shift from the recently used synthetic chemical substances to the natural herbal ingredients. Hence, we can easily replace NaOCl with herbal irrigating material. However, natural alternatives such as kutkrumin might be more inert irrigating solutions. We can consider as a potent irrigating solution.

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