Original Article

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Role of Root Canal Sealer on the Post Operative Pain: a Randomized Control Trial

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ABSTRACT:

Background: Recent innovations in pulp treatment and root canal sealers include bioceramic. It is proven how bioceramics affect root restoration, radiculer perforation, and vital pulp therapy. Therefore, it is anticipated that using bioceramics as a root canal sealer in traditional root canal therapy for non-vital teeth will have positive results. **Methods:**In this investigation, 60 nonvital teeth with periapical lesions were included. These teeth were separated into two groups of 30 teeth each and treated as follows: Group A: Bioceramics (Endocequence BCTM) sealer was used to obturate these teeth. Group B was obturated using a sealer based on Zinc Oxide Eugenol (Tubli-sealTM). Participants were contacted after 3, 6, and 12 months. The clinical outcome was assessed by assessing pain by VAS, tenderness on percussion, and using the Chi-square test and unpaired student t-test for testing differences between the two groups, with a p value of 0.05 regarded as statistically significant. **Results:** It was discovered that at 6 and 12 months of observation, 100% of teeth treated with Bioceramics' root canal sealer and 93.3% of teeth treated with Zinc Oxide Eugenol did not exhibit any discomfort or soreness to percussion. The differences between the groups treated with Zinc Oxide Eugenol and Bioceramics root canal sealer were not statistically significant ($p > 0.05$). **Conclusion:**It may be determined that both bioceramics-based sealers (Endosequence BC) and zinc oxide-eugenol-based sealers (Tubli-seal TM) are efficient in reducing post-operative discomfort after endodontic therapy. As a result, sealer has no effect on post-operative pain relief.

KEYWORDS : bioceramics, zinc oxide eugenol, root canal sealer, post operative pain, root canal obturation

INTRODUCTION

Pulpal infection can arise as a result of caries, dental operational procedures, or trauma and involves a mixed, mostly Gram-negative, anaerobic bacterial flora[1]. These infections frequently result in entire pulpal necrosis and, as a result, a periapical immune response. This is generally known as a periapical lesion.[2] The majority of periapical lesions are dental granulomas, radicular abscesses, or cysts.

When treated non-surgically, a big periapical lesion may have direct communication with the root canal system.[4] Large periapical lesions can be healed non-operatively with effective infection management.[5] A greater understanding of the complexity of the root canal system in recent years has sparked the creation of newer infection-controlling methods, tools, and materials (Hoshino).[6] Essential phases in root canal treatment include cleaning, shaping, and three-dimensional fluid-tight obturation of the root canal system coronally, laterally, and apically. These procedures can lead to the healing of inflamed periradicular tissues.

Root canal sealers are utilized to create an impenetrable seal between the core materials and the root canal wall.[7] These sealers must have features such as adhesion to both the root wall and the core material, low viscosity, and good wetting properties in order to flow into irregularities on the root canal wall and fill the area between the core material and the surface of the root canal. Its biological and physiochemical qualities should be appropriate, and it should not irritate the periapical tissue. Most conventional root canal sealers lack biological activity and are cytotoxic, especially when freshly

combined [8]. Direct sealer contact with periapical tissues results in cellular damage and delayed wound healing [9].

Zinc Oxide Eugenol sealers have a long history of being used successfully. This sealer has the advantages of being radiopaque with germicidal qualities [10], having an acceptable working duration, and having good sealing properties. However, they have a delayed setting time [11], shrinkage on setting, are soluble, and can discolor tooth structure .[12]

Recently, Bioceramics for the obturation of root canal systems was introduced. Biocompatible ceramic material that can be used in biomedical or dental applications is referred to as "bioceramics." Recent investigations discovered that bioceramics have numerous advantages in both surgical and non-surgical endodontics .[13] Some of the earlier investigations have recognized its use as a root repair material, pulp treatment [14] root canal sealer [15], and root end filling.

Zirconium oxide, calcium silicates, calcium phosphate monobasic, calcium hydroxide, filler, and thickening agents make up the Bioceramics (Endosequence BCTM) root canal sealer. It maintains its non-resorbability inside the root canal and during retro-preparation because of its extraordinary dimensional stability, which means it does not shrink when it sets. Furthermore, the material becomes antibacterial during the setting process thanks to the creation of calcium hydroxide, a byproduct of the setting reaction, which results in an extremely high pH (12.8) (the pH will decrease over the next seven days). This is a crucial physical characteristic for any material, especially one that will be employed as an endodontic sealer.[16] According to research by Zhang et al, BC sealer completely eliminated all microorganisms after two minutes of contact. The authors suggest that a combination of its high pH, hydrophilic character, and its active calcium hydroxide diffusion may be responsible for its powerful anti-bacterial activity.[17] It has been claimed to develop a chemical bond with the inorganic component of dentine and to adapt well to the canal walls.[15] The setting reaction of the BC sealer is started by the moisture present in the dentinal tubules and takes three to four hours to complete, giving enough time for clinical use in surgical or non-surgical applications.[13]

This study compared the clinical effectiveness of two types of root canal sealers in reducing post-operative pain following endodontic treatment: bioceramic (Endosequence BCTM) and zinc oxide eugenol (Tubli SealTM).

MATERIAL AND METHODS

This study comprised 60 non-vital teeth with periapical lesions in total. Following a random division into two groups of 30 teeth each, these teeth were given the following care: Group-A: Bioceramics (Endocequence BCTM) sealer was used to obturate these teeth. Group B was sealed with a zinc oxide-based eugenol sealer (Tubli-sealTM). Root canals were constructed using a conventional procedure, and they were sealed using the lateral condensation method. It was done according to standard non-tooth irrigation protocol. Following intervals of 3, 6, and 12, participants were returned. By measuring pain using a VAS scale and percussion-induced tenderness, clinical outcomes were examined. The results were statistically analyzed using computer-based statistical-software, SPSS 20.00 edition (SPSS Inc. Chicago, USA). A value of p 0.05 was regarded as statistically significant when comparing the two groups using the chi-square test and the unpaired student t-test.

RESULTS

Pain, discomfort on percussion, periodontal ligament widening, and the extent of the lesion of the study teeth in both groups were examined at baseline, 3, 6, and 12 months after treatment completion.

After one year, 100% of Bioceramics root canal sealer treated teeth and 93.3% of ZnO Eugenol treated teeth showed no pain or discomfort when percussion was applied. There were no statistically significant differences between the Bioceramics root canal sealer and ZnO Eugenol treated groups (p>0.05).

Table I: Comparison of pain level (VAS score) between two groups (n= 30 teeth in each group)

Evaluation period	Group A (n=30 teeth)		Group B (n=30 teeth)		p value
	No.	%	No.	%	
Baseline					
No pain	27	90.0%	26	86.7%	0.687[ns]
Mild pain	3	10.0%	4	13.3%	0.687[ns]
Moderate pain	0	0.0%	0	0.0%	ND
Severe pain	0	0.0%	0	0.0%	ND
After 3 months					
No pain	29	96.7%	27	90.0%	0.301[ns]
Mild pain	1	3.3%	3	10.0%	0.301[ns]
Moderate pain	0	0.0%	0	0.0%	ND
Severe pain	0	0.0%	0	0.0%	ND
After 6 months					
No pain	30	100%	28	93.3%	0.491[ns]
Mild pain	0	0.0%	2	6.7%	0.491[ns]
Moderate pain	0	0.0%	0	0.0%	ND
Severe pain	0	0.0%	0	0.0%	ND
After 12 months					
No pain	30	100%	28	93.3%	0.491[ns]
Mild pain	0	0.0%	2	6.7%	0.491[ns]
Moderate pain	0	0.0%	0	0.0%	ND
Severe pain	0	0.0%	0	0.0%	ND

Table-I shows the comparison of Pain level (VAS score) between Bioceramics root canal sealer and ZnO Eugenol sealer groups following each observation period. It was observed that at 3, 6 and 12 months follow up period, the differences between two groups were statistically not significant (p>0.05).

Table II: Comparison of tenderness on percussion between two groups (n=30 teeth in each group).

Evaluation period	Group A (n=30 teeth)		Group B (n=30 teeth)		p value
	No.	%	No.	%	
Baseline					
Present	4	13.3%	5	16.7%	**0.717^{ns}**
Absent	26	86.7%	25	83.3%	**0.717^{ns}**
After 3 months					
Present	1	3.3%	3	10.0%	**0.301^{ns}**
Absent	29	96.7%	27	90.0%	**0.301^{ns}**
After 6 months					
Present	0	0.0%	1	3.3%	**0.313^{ns}**
Absent	30	100%	29	96.7%	**0.313^{ns}**
After 12 months					
Present	0	0.0%	1	3.3%	**0.313^{ns}**
Absent	**30**	**100%**	**29**	**96.7%**	**0.313^{ns}**

Table-II: shows the comparison of tenderness on percussion between Bioceramics root canal sealer and ZnO Eugenol sealer groups following each observation period. It was observed that at 3,6and 12 months follow up period, the differences between two groups were not statistically significant (p>0.05).

DISCUSSION

The goal of the current study was to compare the two distinct root canal sealers' clinical performance in treating post-operative discomfort following endodontic obturation. The findings of this study have demonstrated that the kind of root canal sealer does not affect post-obturation pain. Both Endosequence BC and Zinc Oxide Eugenol sealer were found to lessen pain and soreness on percussion when it was examined at 3, 6, and 12 months.

Following Endosequence BC therapy, pain gradually subsided at 3, 6, and 12 months of observation. When pain was assessed using the VAS, it was discovered that 30 (100%) teeth had been treated by Endosequence BC, compared to 27 (90.0%) teeth at baseline, 29 (96.7%) teeth at three months, and 30 (100%) teeth at six and twelve months. Previous research has shown that bioceramics' high alkaline pH, antibacterial activity,[13] great biocompatibility, and ability to induce mineralization can all help to lessen pain. Additionally, according to Zhang et al. (2009),[18] Endosequence BC eradicated all bacteria upon contact within two minutes, helping to lessen apical discomfort and pain.The combination of its high pH, hydrophilic nature, and active calcium hydroxide diffusion may result in an anti-bacterial action.[17]

However, three (10%) Endosequence BC-treated teeth experienced minor pain at baseline, followed by one (3%) tooth at three months. The current study does not provide a clear explanation for the cause of pain in Endosequence BC-treated teeth. However, it could be owing to the mild toxicity of the sealer [19] or the rapid flow of the sealer, which could cause apical extrusion and irritation of the periapical tissues. [20] TublisealTM instances, on the other hand, indicated minor pain at the start, followed by 3 (10%) at 3 months and 2 (6.7%) at 6 and 12 months. Previous research has found that Zinc Oxide Eugenol-based sealers cause discomfort due to tissue toxicity and cause an inflammatory reaction in connective tissue.[21] Furthermore, shrinking during the setting process might lead to bacterial penetration and post-operative discomfort. The current study's findings were also consistent with those of prior investigations. Farzana et al. (2010)[22] discovered that 20% of patients experience pain on the first day after obturation. According to Koba et al. (1999)[23], 7% of post-obturation pain may persist after 3 months.

In terms of tenderness to percussion, it was discovered that both Endosequence BC and TublisealTM saw a progressive decline in tenderness, and the differences between the two groups were not statistically significant (P>0.05). Previous studies suggested that Bioceramics' capacity to encourage biological repair and regeneration of periodontal ligament may lessen pain after treatment. [24] On the other hand, free eugenol emissions are gradually decreased over time, which could diminish the likelihood of percussion pain.When eugenol comes into contact with periradicular tissues directly, during extrusion/overfilling, or through its diffusible components, it causes damage and inflammation, which manifests as pain and sensitivity on percussion.[25]

Throughout the course of treatment, all patients completely followed the directions. The confounders introduced by the participants were adjusted for in this study. As a result, the study's findings are unlikely to be influenced by other confounding variables.

CONCLUSION:

It may be determined that both Bioceramics-based sealers (Endosequence BC) and Zinc Oxide Eugenol-based sealers (Tubli-seal TM) are efficient in reducing post-operative discomfort after endodontic therapy. As a result, it may be concluded that sealers play no or little role in post-operative pain reduction following root canal obturation.

CONFLICT OF INTEREST:

The authors declares that there is no conflict of interest regarding the publication of this article.

INSTITUTIONAL REVIEW BOARD STATEMENT AND ETHICAL APPROVAL:

Institutional Review Board Statement and Ethical approval: The study is a randomised clinical trial and is a component of dissertation of MS Residency phase-B. The study was conducted according to the guideline of the clinical study designed by the ethical board of BSMMU. The institutional review board (IRB) did not find any ethical issue and conflict of interest during the study. The IRB approval reference of the study is BSMMU/IRB/443/2015.

REFERENCES:

1. Sundqvist G. 'Taxonomy, ecology and pathogenicity of the root canal flora'. J Oral Surg Oral Med Oral Pathol, 1994;78, 522-530. https://doi.org/10.1016/0030-4220(94)90047-7 PMid:7800383
2. TorabinejadM, Walton RE. 'Priradicular lesion. In: J.I. Ingle and L.K. Blackland, ed. Endodontics. 5th ed. Hamilton Ontario, Canada : B.C. Decker, 2002; 175-201.
3. Bhaskar SN, 'Periapical lesion- types, incidence and clinical features'. J Oral Surg Oral Med Oral Path, 1966; 21, 657-670 https://doi.org/10.1016/0030-4220(66)90044-2 PMid:5218749
4. Simon JHS.' Incidence of periradicular cyst in relation to the root canal'. J Endod, 1980;6, 845-84 https://doi.org/10.1016/S0099-2399(80)80039-2 PMid:6935342
5. Saatchi M. 'Healing of large periapical lesion: A non surgical endodontic treatment approach'. AusEndocJl, 2007; 33, 136-140. https://doi.org/10.1111/j.1747-4477.2007.00061.x PMid:18076582
6. Hoshino E, Kurihara NA, Satol UH., Sato M, Kotak. 'In vitro antibacterial susceptibility of bacteria taken from infected root dentine to a mixture of Ciprofloxacin, Metronidazole, Minoclicin in situ'. IntEndodJl, 1996; 29 ,125-130 https://doi.org/10.1111/j.1365-2591.1996.tb01173.x PMid:9206436
7. Gutmann, JL, Kuttler, S, &Niemczyk, SP. 'Root canal obturation:An update'. Acad Gen Dent , 2010;1-11.
8. Huang TH, Yang JJ, Li H, Kao CT. 'The biocompatibility evaluation of epoxy resin-based root canal sealers in vitro Biomaterials'.j Endod, 2002;23,77-83 https://doi.org/10.1016/S0142-9612(01)00081-3 PMid:11762857
9. Sousa CJA, Montes, CRM, Pascon, EaLoyla, AM, Versiani MA. 'Comparison of the intraosseous biocompatibility of AH plus endoREZ, and Epiphany root canal sealer.' J Enodod , 2006;32:656-62. https://doi.org/10.1016/j.joen.2005.12.003 PMid:16793475
10. Khatib ZZ, Baum RH, Morse. 'The antimicrobial effect of various endodontic sealers'.OralSurg Oral Med Oral Pathol, 1990;70(6),784-90. https://doi.org/10.1016/0030-4220(90)90022-K PMid:2263342
11. Allan NA, Walton RC, Schaeffer MA. 'Setting times for endodontic sealers under clinical usage and in vitro conditions'. J Endod , 2001;27(6):421-3. https://doi.org/10.1097/00004770-200106000-00015 PMid:11487139
12. Davis MC, Walton RE, Rivera EM. 'Sealer distribution in coronal dentin'. J Endodo, 2002; 28, 464-6 https://doi.org/10.1097/00004770-200206000-00012 PMid:12067131
13. Koch K, Brave D. ' Bioceramic technology - the game changer in endodontics Endodontic Practice'2(2): 2009;17-21.
14. Zhang S., Yang X., Fan M. 'Bioagreggate and iRoot BP Plus (RRM™ Putty) optimizes the proliferation and mineralization ability of human dental pulp cells'. IntEndod J, 2013;43,769-74.
15. Highgate DJ, Frankland JD. Deformable polymeric compositions. U S Pat Num 1986;4,565,722.
16. Torabinejad M, Hong CU, McDonald F, Pitt Ford TR.' Physical andchemical properties of a new root-filling material'. J Endod, 1995; 21,349-53. https://doi.org/10.1016/S0099-2399(06)80967-2 PMid:7499973
17. Zhang H, Shen Y, Ruse ND, Haapasalo M.' Antibacterial activity of endodontic sealers by a modifed direct contact test against E. faecalis' .J Endod, 2009; 53,1051-5. https://doi.org/10.1016/j.joen.2009.04.022 PMid:19567333
18. Zhang H, Pappen FG, Haapasalo M. 'Dentin enhances the antibacterial effect of mineral trioxide aggregate and bioaggregate'. J Endod, 2009; 35,221-4. https://doi.org/10.1016/j.joen.2008.11.001 PMid:19166777
19. Zhang W, Li Z Peg B. 'Ex vivo cytotoxicity of a new calcium cilicate based canal filling material'. IntEndodJ , 2010; 43,769-74. https://doi.org/10.1111/j.1365-2591.2010.01733.x PMid:20546044
20. Hess D, Sollomon E, Spears r he J .' Retreatalility of a bioceramic Root Canal material'. J endo, 2011;11:1547-9. https://doi.org/10.1016/j.joen.2011.08.016 PMid:22000460
21. Chang YC, Huang, FM. 'Mechanisms of cytotoxicity of eugenol in human osteoblastic cells in vitro'. IntEndod J, 2006; 39:389-393. https://doi.org/10.1111/j.1365-2591.2006.01091.x PMid:16640638
22. Farzana F, Hossain SMI, Islam SMN, Rahman MA 'Post operative pain following mult-visit root canal treatment of teeth with vital and non-vital pulps'. JAFMC Bangladesh, . 2010; vol 6, No2 https://doi.org/10.3329/jafmc.v6i2.7271
23. Koba K, Kimura Y, Matsumoto K. Post-operative symptoms and healing after endodontic treatment of infected teeth using pulsed Nd:YAG laser'. Endod DentTraum 1999;15, 68-71. https://doi.org/10.1111/j.1600-9657.1999.tb00756.x PMid:10379275
24. Zhang W, Li Zhi, Peng B. 'Effects of iRootSP (aka BC Sealer™) on Mineralization-related Genes Expression in MG63 Cells'. J Endod, 2010; 36(12)1978-1982. https://doi.org/10.1016/j.joen.2010.08.038 PMid:21092816
25. Robert G.Craig, Textbook on Restorative Materials 11th edition, page 134-142.

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