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Comparative evaluation of a resin based and calcium silicate based root canal sealer on postoperative pain: A split mouth randomized controlled trial

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Abstract

Background: Pain occurrence following root canal treatment is a matter of concern to both the dentists and the patients.The type of root canal sealer may affect the local healing response in the periodontium and have an affect on the post endodontic pain. Calcium silicate based root canal sealers have been newly introduced owing to their property of excellent biocompatibility. Thus, the aim of the present study was to compare the effect of a resin based (AH Plus) and calcium silicate based root canal sealer (Bioroot RCS) on postoperative pain incidence.

Materials and methods: Patients presenting with irreversible pulpitis without apical periodontitis were included in the split mouth randomized controlled trial. 34 single rooted maxillary central incisors were cleaned and shaped upto size F5 using ProTaper Gold rotary file system. All the 34 samples were divided randomly into two groups of 17 teeth each according to the Sealers used (AH plus and Bioroot RCS).Obturation was done using lateral condensation procedure in a single visit. Postoperative pain was measured using the Visual Analogue Scale (VAS) after 24 hours and 48 hours.

Results: There was no statistically significant difference between mean values of the VAS scores for AH Plus and Bioroot RCS groups at two time intervals 24 hours and 48 hours.

Conclusion: The results of the present study reported that the Postoperative pain of AH Plus sealer and Bio Root RCS is statistically nonsignificant. Further studies, comparing the postoperative pain of different root canals sealers should be conducted in vivo.

Introduction

Success in root canal treatment depends on a thorough chemomechanical debridement of the root canal system, followed by a complete sealing of the canal space in order to prevent ingress of bacteria from the oral environment and its spread to the periradicular tissue. Inadequate obturation seal may result in the movement of oral fluids into voids in the obturated root canal and the induction of a periapical inflammatory reaction leading to postoperative pain.[1-3]

Postoperative pain after endodontic treatment ranges from 3%–58% in different studies. Pain may be triggered by mechanical, chemical or microbiological injuries to periodontal tissues. Various procedural factors have been shown to be associated with the prevalence of postoperative pain including working length (WL) estimation technique, the number of visits, the choice of instrumentation, type of irrigant and irrigation technique and the choice of root canal sealer. Sealers placed in the root canals interfere with periodontal tissues through the apical foramina, lateral canals, or leaching and can potentially affect the healing process in the periodontium and cause local inflammation that may result in postoperative pain. The intensity of inflammatory reactions depends on the composition and type of the sealer.[6]

Epoxy resin-based sealer cements such as AH Plus sealer have been widely used because of their acceptable physical properties, reduced solubility, apical sealability, micro retention to root dentin, and adequate biological performance.[7]

More recently a new Tricalcium Silicate-based Sealer, BioRoot RCS (Septodont) is introduced based on active Biosilicate Technology, Manufacturer claims it provides a 3D tight and durable sealing all along the entire length of the root canal This silicate-based root canal sealer has less toxic effects on human periodontal ligament cells and induces a higher secretion of angiogenic and osteogenic growth factors . BioRoot RCS has the lower cytotoxicity and genotoxicity.[8-10]

Thus, the aim of the present study was to evaluate the effect of an AH Plus (Dentsply) resin based sealer and BioRoot RCS (Septodont) tricalcium silicate-based sealer on postoperative pain. The Null Hypothesis will be that there is no difference in post-operative pain after obturation using Resin based (AH plus)and Calcium silicate based (BioRoot RCS)root canal sealers.

Materials & Methods

Patient selection

- Patients reporting to the Outpatient Department of Conservative Dentistry and Endodontics in Bapuji Dental College and Hospital, Davangere, Karnataka.
- Ethical clearance obtained from the institutional review committee, Bapuji Dental College and Hospital, Davangere
- The study was performed using split mouth design. Patients requiring root canal treatment with permanent maxillary anterior with single canal with single rooted diagnosed with irreversible pulpitis were selected and randomly assigned into two groups:

Group A: Resin based sealer (AH plus)

Group B: Calcium silicate based sealer (Bioroot RCS)

Inclusion criteria

- Healthy patient between the age group of 18 to 65 years with indication for root canal treatment.

- Patients with pain score ranging from moderate to severe (4–10) on a visual analogue scale (VAS, 0–10).
- Single canal with single rooted teeth.

Exclusion criteria

- Patients who had taken analgesic or anti-inflammatory drugs before 12 hours.
- Multirooted teeth
- Pregnancy or lactation
- Teeth with calcified canals, indicated for root canal retreatment.

Endodontic protocol

- Pulpal sensibility test was assessed before treatment using Endo-Frost (Coltene) and Electric pulp tester. Palpation and percussion tests were performed. Patients diagnosed with irreversible pulpitis were included in the study.
- The entire treatment were carried out by a single operator.
- All teeth were anesthetized with 2% lignocaine with 1:80,000 epinephrine.
- Conventional access cavities was prepared with the help of a high-speed hand piece using round bur and Endo Z bur.
- Teeth were isolated with rubber dam.
- After coronal flaring of the cervical third of the root canals, no.10 K-file was used to determine the working length (WL) using electronic apex locator (Root ZX II; J Morita, Japan) which was confirmed radiographically.The canals were prepared using ProTaper gold instruments (Dentsply Maillefer) Root canal shaping with ProTaper instruments was performed using following steps
- Scouting the coronal two-thirds with size 10 and 15 manual K-files
- Shaping the coronal two-thirds with ProTaper rotary files S1 and S2
- Scouting the apical third with manual K-files from size 10 to 15 to WL
- Shaping with ProTaper rotary files S1 and S2 to WL
- Finishing the apical third with ProTaper rotary files.
- Apical gauging using manual hand files.
- Finishing the apical third to the required size and taper

10 K-file was used to recapitulate in between each file till the working length. To establish apical patency,10 K-file was passively introduced 1mm beyond the working length in between each instrument and before each irrigation sequence.

During whole instrumentation, RC prep was used as lubricant and 2.5% sodium hypochlorite and normal saline was used as irrigation solution.

After cleaning and shaping, the canals were dried and obturation was done using AH Plus and Bioroot RCS sealers.

Based on the type of sealer patients were randomly divided into 2 groups:-

Group A: AH Plus (Dentsply) was used as root canal sealer. The apical extent of the master cone was confirmed with radiograph. Manufacturer's instructions were followed for mixing the sealer. The root canal was coated with the sealer using lentulospirals in a slow speed handpiece. Obturation was performed with Gutta-percha cones and sealer by lateral compaction technique.

Group B: Calcium silicate-based sealer (BioRoot RCS) was used as a sealer. Manufacturer's instructions were followed for mixing the sealer. The same procedure was followed for obturation as in Group A.

Permanent restorations were done with composite resin (Filtek Z 350 XT, 3M ESPE) and occlusion was relieved. Postoperative pain evaluation was done at

interval of 24 and 48 hours using the VAS score after the procedure.

Results

The Tabular representation shows the postoperative pain values for each group (GROUP A: AH Plus and GROUP B : Bioroot RCS) at different time intervals using independent Student "t" test. The results indicate

The mean preoperative pain values was recorded in AH Plus (Group-A) – 6.12 and Bioroot RCS (Group-B) – 6.06 preoperative. The mean postoperative pain was recorded in AH Plus (Group-A) – 1.82 at 24H interval and 0.65 – at 48 H interval . The mean postoperative pain was recorded in Bioroot RCS (Group-B) - 1.35 at 24H interval and 0.71 at 48 H interval .The differences in mean postoperative pain between two groups AH Plus & Bioroot RCS was not found to be statistically significant

Table 1: Comparison of pain intensity between the study groups at different time intervals

	N	AH Plus		Bioroot RCS		t	df	p value
		Mean	S D	Mean	S D			
Pre-operative	17	6.12	1.58	6.06	1.56	0.16	16	0.875
24 hour	17	1.82	2.13	1.35	1.94	0.79	16	0.440
48 hour	17	0.65	1.46	0.71	1.69	0.12	16	0.906

p<0.05 statistically Significant

P>0.05Non Significant

Discussion

The aim of endodontic therapy is to achieve complete elimination of the microorganisms, debris and pulpal remnants and allow for a three dimensional sealing of the root canal space.[11,12] These steps must be carried out with minimum post operative discomfort. Pain after root canal treatment is influenced by various tooth related and procedural related parameters. Along with the other factors, the type of filling material may also influence the healing potential of the periodontium and in turn, the pain occurrence may differ.[13]

The present randomized controlled trial was conducted to assess the pain intensity after 24 and 48 hours using two different root canal sealers namely AH plus (resin based) and Bio Root RCS (calcium silicate sealers) treated in a single visit approach. Amongst the different pain scales available, VAS was chosen for the study due its simplicity, ease of use and validity.[14]The spit mouth design allowed differences in pain evaluation within individuals and eliminated potential differences that could arise due to age and gender related host factors. In addition, only single rooted teeth were included to eliminate bias since multirroted teeth due to their complex root canal system have higher post operative pain incidence.[2,15]

On comparison of pain between groups, there was no statistically significant difference in pain experienced by the subjects in any of the time intervals evaluated. The results are in accordance with the study by Graunite et al [16] in which the authors evaluated the post obturation pain with resin based (AH plus) and Bioceramic based (Total Fill) sealer and found no significant differences. However, there have been no study evaluating post endodontic pain utilizing Bio Root RCS as root canal sealer and this is the first study on the same. Regarding AH plus sealer, various studies have reported its cytotoxic effects due to the presence of epoxy resins and amines in its composition. However, the toxic effects diminish as the resins undergo polymerization.[17,18] This could be the reason for higher pain during the first 24 hours with AH plus, however it was statistically non significant.On the other hand, Bio Root RCS sealer is found to be non cytotoxic and has greater biocompatibility as compared to other silicate based cements. In addition, the sealer is

known to release certain components that aid in tissue healing.[19-21]The results of the present study could be attributed to the fact there was no extrusion or overfills in any of the cases, thus suggesting a limited contact area of the sealer with the periodontal ligament.

The results of the present study reported that the Postoperative pain with the use of AH Plus sealer (Dentsply) and Bio Root RCS (Septodent) is statistically nonsignificant. Further studies, comparing the postoperative pain of different root canals sealers should be conducted in vivo.

Conclusion

Within the limitations of the present study, it can be conclude that the postoperative pain of AH Plus (Resin based sealer) and Bioroot RCS (Septodent) is statistically nonsignificant. Further, more studies comparing the postoperative pain using different root canal sealers should be conducted.

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