Original Article

APICAL SEALING ABILITY OF GUTTA PERCHA AND C-POINT WITH DIFFERENT SEALERS- AN EX-VIVO

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Abstract

BACKGROUND- An apical seal is one which forms a barrier between the root canal and periapex. A three-dimesional seal is created by use of Gutta Percha and an endodontic sealer, which will fill the discrepancies between the core material and dentinal walls. Since years Gutta Percha has played a versatile role in root canal obturation; but newer materials have been introduced to overcome the hydrophobic nature of it. One such material is C-Point, a premade obturation point, which absorbs residual moisture (hydrophilic nature) from the canals and expands laterally to conform to canal complexities.

MATERIALS AND METHOD- Fifteen freshly extracted mandibular incisors were prepared with Protaper Universal rotary files, and obturated by dividing into three groups of 5 teeth each. Group I- Gutta-percha & AH-Plus, Group II, Gutta-percha & Nanoseal S, and Group III C-point & BioRoot RCS. After coating the teeth with nail polish except the apical 2 mm, they were suspended in methylene blue dye for 12 hour. They were then sectioned longitudinally and observed under stereomicroscope for the linear dye penetration. All the groups were compared by using ONE WAY ANOVA.

RESULTS- One way ANOVA showed Group I with minimum microleakage (Mean ± SD) of 3.29±1.32 µm, followed by Group II 4.25±1.83 µm and Group III with maximum micro-leakage 5.53±1.72 µm.

CONCLUSION- Gutta percha when used with AH-Plus showed better sealing ability as compared to Gutta Percha and Nanoseal S. The newer material, C-Point with BioRoot RCS showed the least sealing ability.

Keywords: Gutta Percha, AH-Plus, Nanoseal S, C-Point, BioRoot RCS, microleakage.

INTRODUCTION

The endodontic triad consists of cleaning and shaping, disinfection and a three dimensional obturation of the root canal1. Filling should be able to entomb the already present bacteria inside the root canal, thus preventing any chances of re-infection.2 For years now Gutta Percha remains the preferred choice as a solid core filling material for root-canal obturation. It demonstrates minimal toxicity and tissue irritability when used within the canal system3, 4. But it failed to chemically bond to dentine, which resulted in use of sealers. 5, 6

The use of resin based sealer was advocated to overcome the shortcomings of Gutta Percha 7, 8 as it does not form a monoblock even with the utilization of a resin-based sealer.9 Thus, leading to subsequent microleakage and failure of the endodontic treatment.

To enhance the penetration of sealer in to the dentinal tubules, nano-sized (1-100nm) particles have been introduced for the use in endodontics. Prevest introduced Nanoseal S incorporated with small silver particles. It is a cold flowable polydimethyl siloxane based sealer having low water sorption with expansion of up to 0.2% post-setting.10

In order to enhance the bonding of the material to the canal walls and to negate the application of heat, materials having hydrophilic properties were introduced11. C-Point (Endotechnology, LLC) is a single cone hydrophilic system which contain

a polyamide core with an outer bonded hydrophilic polymer coating. These points are designed to expand laterally by absorbing residual moisture from the instrumented root canal space12.

The main objective of this was to evaluate and compare the apical sealing ability by analysing the linear dye penetration under stereomicroscope of the teeth obturated with Gutta percha and AH-Plus, Gutta Percha and Nanoseal S, C-Point and BioRoot RCS.

MATERIALS AND METHOD

Fifteen freshly extracted mandibular incisors were taken for the purpose of this pilot study. Access opening was done for all teeth and patency of the canal was checked using a #10 file (Dentsply Maillefer). Initial filing was done till #25 K file (Dentsply Maillefer) till the determined working length with continuous irrigation by 10 mL 17% EDTA (Prep Canal, Ammdent), followed by saline and 5.25% NaOCl (Sodium Hypochlorite, Prevest DenPro). Final preparation was done with Protaper Universal rotary files (Dentsply Maillefer) till F2 (following the general sequence, Sx-S1-S2-F1-F2).

The teeth were randomly distributed into three groups, each containing five (n=5) teeth. Group I: Gutta Percha with AH-Plus; Group II: Gutta Percha with Nanoseal S; Group III: C-Point with BioRoot RCS

Obturation was done and teeth were then incubated for 24 hours at 37 º c. Two coats of nail varnish were applied on all the prepared teeth, leaving the apical 2 mm. The prepared specimens were then suspended in 5% methylene blue dye for 12 hours. After which they were sectioned using a dental diamond disc in longitudinal direction for observation under the Stereomicroscope (Lyzer Zoom Binocular Stereomicroscope) using 10X magnification (1x for the Eyepiece; 10x for the Objective). Linear dye penetration was studied with the help of Digimizer software. (Stereomicroscopic images for the 3-groups showing dye penetration.)

Figure 1: Gutta Percha with AH-Plus

Figure 2: Gutta Percha with Nanoseal S

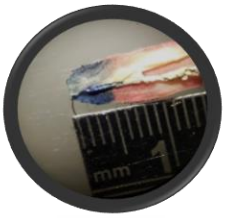

Figure 3: C-Point with BioRoot RCS

RESULTS

The mininum linear dye penetration was observed for Group II (Gutta Percha with Nanoseal S=2.120 µm) (Figure 2), followed by Group I (Gutta Percha with AH-Plus) (Figure 4). Maximum linear dye penetration was recorded for Group III (C-Point with BioRoot RCS=7.85 µm) (Figure 3).

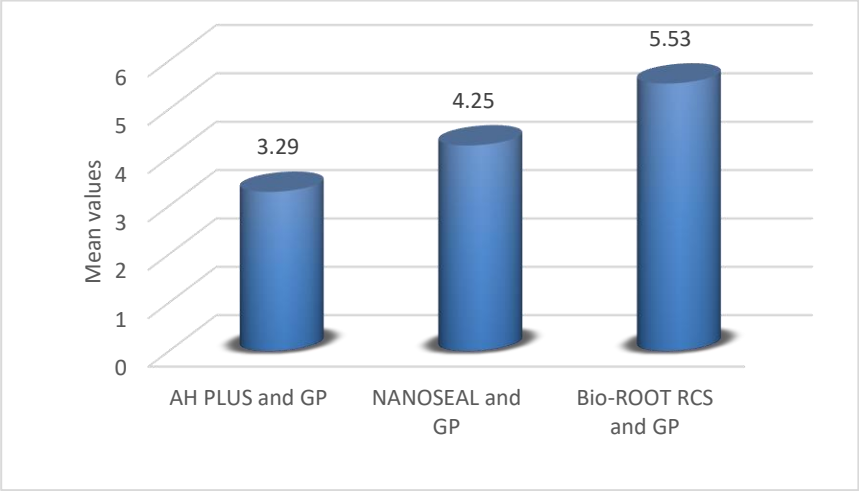

Figure 4: Comparison of micro-leakage amongst the different groups

DISCUSSION

Microleakage, a crucial cause for an endodontic treatment to fail, mainly occurs because of the gaps which are present the root-canal filling material-tooth interface.13 Apical leakage is controlled by many variables, type of filling material being one of them as this forms the basis of an important interface, i.e. filling material-Dentinal wall. The sealer in root canal should attain maximum depth of penetration into the dentinal tubules as this increases the interface between sealer and dentinal tubules, which influences the sealing ability of obturation.14,15

Group I (Gutta Percha with AH-Plus) showed the lowest dye penetration overall, which could be due to the fact that AH-Plus has better penetration in to the micro-irregularities, leading to a better sealing ability. Roggendorf in 2004 suggested that swelling of the epoxy resin component of AH-Plus after water sorption may also increase the adaptability and dentinal penetration.16 During the manipulation of the cement it was also noted that AH Plus flowed better as compared to BioRoot RCS. This might have resulted in better coating of the Gutta Percha cones with the sealer in the samples.

In Group II (Gutta Percha with Nanoseal S), possible cause for microleakage could be due to the presence of remaining irrigating particles interfering with the curing of Nanoseal S.

For the Group III (Gutta Percha with C-Point) one of the prime reasons for increased microleakage could be due to the limited moisture availability from intra-radicular dentine. Additionally, canals were dried prior to obturation using sterile paper points. As C-points need residual moisture to laterally expand (hygroscopic lateral expansion) this possibly resulted in failure.17

A great emphasis was relied upon the newer novel hydrophilic obturation system, C-Points used with Bioceramic based sealer to provide an apical seal better than the hydrophobic system (ProTaper Gutta-Percha used in single-cone technique with AH Plus as a root-canal sealer). But less amount of dye-penetration signifying a better apical seal exhibited in case of the Gutta-Percha/AH Plus reiterate the point that the period of these conventional hydrophobic root-canal filling materials have not come to an end.

CONCLUSION

Under the conditions of this ex-vivo evaluation, we may conclude that Gutta Percha when used with AH-Plus showed better sealing ability than Gutta Percha with Nanoseal S and C-Point with BioRoot RCS. However, the findings of this study may need further validation on larger sample size.

CONFLICT OF INTEREST

Conflict of interest declared-None

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