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Original Research

Assessment of sealing ability of different root canal filling materials- An in vitro study

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***ABSTRACT*:**
Background: Microleakage is one of the significant causes for endodontic failure. The present study compared sealing ability of zinc oxide eugenol sealer, AH Plus and Apexit. **Materials & Methods:** The present study was conducted on 90 recently extracted periodontally weak non carious teeth. The teeth were divided into 3 groups of 30 teeth each. Group I was conventional zinc-oxide eugenol group, group II was AH Plus group and group III was apexit. Methylene blue dye solution 2% was poured into the each tube until the root was completely immersed into the solution. Teeth samples were sectioned longitudinally and the samples were studied under a stereomicroscope. The end point of dye infilteration was calculated as the point where dye no longer penetrated the obturating material. **Results:** The mean dye penetration in group I was 4.12 mm, in group II was 1.82 mm and in group III was 2.16 mm. The difference was significant (P< 0.05). **Conclusion:** There was significant difference in sealing ability of root canal filling materials. It was maximum in AH Plus group followed by apexit and zinc-oxide eugenol.
Key words: AH Plus, Apexit, Zinc-oxide eugenol.

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INTRODUCTION

The primary functions of the root canal obturation are sealing the in-growth of the bacteria's from outside the canal, entombment of residual bacteria and, thorough obturation at a microscopic level to avoid stagnant fluid from collecting and aiding as nutrient for micro-organisms from any source.[1] Microleakage is one of the significant causes for endodontic failure, which occurs due to poor contacts between the gutta-percha and the sealer, the sealer and the dentin, or through voids within the sealer.[2] In general, the oral bacteria could contaminate the entire length of root canal within 30 days of obturation, while endotoxins from Actinobacillus actinomycetemcomitans could be observed in obturated root canals within 20 days.[3]

Due to the complexity of root canal systems, pulp tissue and inorganic debris remain in areas instruments and irrigation solutions cannot easily access after root canal treatments. Thus, microorganisms surviving in the root canal will subsequently grow and spread to the periradicular areas between the sealer and dentin. Sealer accomplishes the objective of providing fluid tight seal.[4] The core occupies space serving as a vehicle for sealer. Before setting, the sealer can be made to flow and fill the accessory canal and multiple apical foramina. Many root canal sealers have been developed for use and can be classified according to chemical composition that is eugenol based, calcium hydroxide based or resin based.[5]

The present study compared sealing ability of zinc oxide eugenol sealer, AH Plus and Apexit.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It comprised of 90 recently extracted periodontally weak non carious teeth. All were informed regarding the study. Ethical approval was obtained from institute prior to the study.

The teeth were stored in 1% sodium hypochlorite (NaOCl) solution and then they were stored in distilled water. Access preparation was done using an endo-access bur and a barbed broach was used to remove the pulp. The canal were cleaned and shaped with K-files (Mani, Japan) using a step-back technique.

After drying the canals with paper points, standardized gutta-percha cones (Dentsply, China) were selected as master points. The teeth were divided into 3 groups of 30 teeth each. Group I was conventional zinc-oxide eugenol group, group II was AH Plus group and group III was apexit. Methylene blue dye solution 2% was poured into the each tube until the root was completely immersed into the solution. Teeth samples were sectioned longitudinally and the samples were studied under a stereomicroscope. The end point of dye infilteration was calculated as the point where dye no longer penetrated the obturating material. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I	Group II	Group III
Material	Conventional Zinc-Oxide Eugenol	AH Plus group	Apexit
Teeth	30	30	30

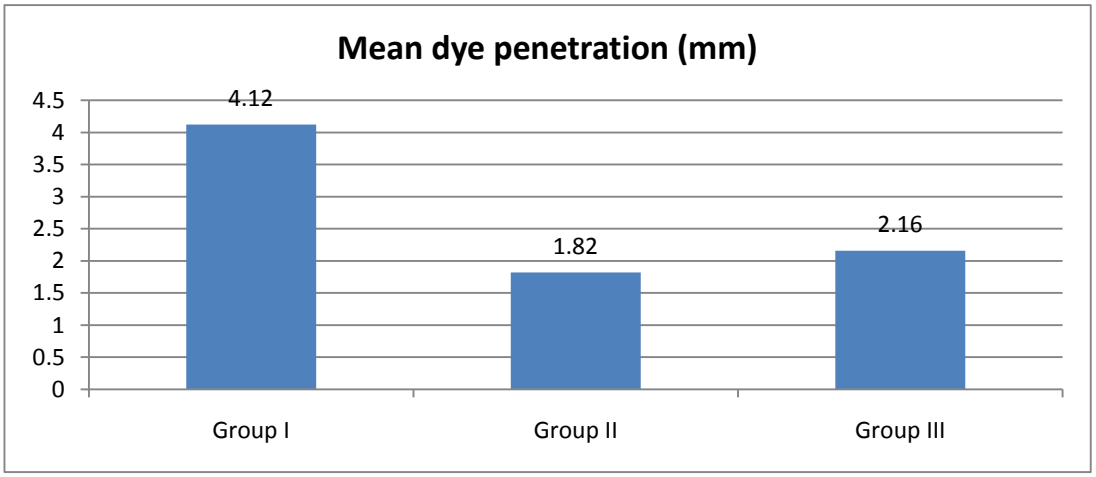
Table I shows that group I was conventional zinc-oxide eugenol group, group II was AH Plus group and group III was apexit. Each group had 30 teeth each.

Table II Dye penetration in all groups

Groups	Mean dye penetration (mm)	P value
Group I	4.12	0.01
Group II	1.82	
Group III	2.16	

Table II, graph I shows that mean dye penetration in group I was 4.12 mm, in group II was 1.82 mm and in group III was 2.16 mm. The difference was significant (P< 0.05).

Graph I Dye penetration in all groups



DISCUSSION

Ideally, a root canal sealer should be capable of producing a bond between the core material and the root dentin, effectively preventing leakage.[6] Obturation of the canal with gutta-percha and any sealer will not result in a seal that is dependable over the long term. Leakage studies on the sealing properties of endodontic materials are still important and relevant. Recently, the fluid transport method has been demonstrated to be the method of choice in the determination of leakage. Leakage can be measured with greater sensitivity with this method than with dye penetration along the root canal.[7]

The entire root canal system should be filled three dimensionally following thorough cleaning and shaping of the root canal space to ensure long term clinical success. The concept of a perfect apical seal has led to search for filling and sealing materials that are stable, non-irritating and provide a flawless seal at the apical foramen. The selection of sealers is dependent on its capacity to create a comprehensive seal but it must also be well accepted by peri-radicular tissues and be comparatively easy to manipulate so that its optimum physical and biological properties can be clinically achieved.[8] The present study compared sealing ability of zinc oxide eugenol sealer, AH Plus and Apexit.

In present study, group I was conventional zinc-oxide eugenol group, group II was AH Plus group and group III was apexit. Each group had 30 teeth each.

mean dye penetration in group I was 4.12 mm, in group II was 1.82 mm and in group III was 2.16 mm. The difference was significant (P< 0.05). Emmanuel et al[9] conducted a study in which 66 single-rooted human anterior teeth were fully instrumented by using the "stepback" technique and irrigated with 5.25% sodium hypochlorite. The smear layer was removed by washing in 10 ml of 17% EDTA. The specimens were randomly divided into three experimental groups of 18 teeth each, plus two groups of 6 teeth each for positive and negative controls. The specimens were obturated by the lateral condensation technique, with gutta-percha and AH 26 or AH plus sealers, or Epiphany sealer and Resilon core material. The fluid transport method used in this study gave quantitative results and allowed nondestructive evaluation of the specimens. The teeth filled with gutta-percha and AH 26 exhibited the most leakage. The least leakage was seen with Epiphany sealer and Resilon core material. The differences in leakage among the groups were statistically significant.

Pommel L et al[10] conducted a study in which 100 single-rooted extracted human permanent teeth with a single root canal were used. The sealers tested were conventional Zinc oxide eugenol ealer, Apexit, AH-Plus and Roekoseal Automix (RSA). The specimens were examined under a stereomicroscope. The polydimethylsiloxane endodontic root canal sealer RSA provided a significantly better apical seal followed by AH plus and Apexit whereas conventional zinc oxide eugenol showed the lowest sealing ability.

CONCLUSION

Authors found that there was significant difference in sealing ability of root canal filling materials. It was maximum in AH Plus group followed by apexit and zinc-oxide eugenol.

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