

Original Research

Comparative Evaluation of sealing ability of bioceramic sealer, AH plus and epiphany sealer: An *in vitro* study

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ABSTRACT:

Objective: To evaluate the sealing ability of three different types of sealers using dye penetration method. **Materials & Methods:** Forty five single-root premolars were selected and divided into three groups (15 teeth in each group) according to the type of sealer used. Group I: Ceraseal bioceramic sealer, Group II: AH Plus sealer and Group III: Epiphany sealer. Root canal preparation and obturation were done in all the samples. Microleakage was evaluated using dye penetration method. Teeth were split longitudinally and then horizontally markings were made at 2, 4 and 6 mm from the apex. Dye penetration evaluation was done under stereomicroscope (30X magnification). **Results:** The results of this study showed that the vertical and horizontal dye penetration was least for Group I and III and highest for Group II suggesting that Ceraseal bioceramic sealer and epiphany sealed the root canal better than AH plus sealer. **Conclusion:** Newer sealers found to be effective but complete leakage cannot be avoided.

Key words: AH Plus, ceraseal, epiphany, microleakage.

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INTRODUCTION

Root canal treatment without obturation or with improper obturation is termed as incomplete root canal treatment. Ingle and colleagues radiographically studied endodontic success and failure; they indicated that 58% of treatment failures were due to incomplete obturation.¹ The three-dimensional obturation is the primary objective of root canal therapy, the purpose of obturation in turn is to seal all "portals of exit". Obturation impedes any sort of communication between periapex, periodontal space and root canal. Thus, burying the micro-organisms and preventing re-infection by spread of microbial toxins.²

Root canal sealers serve as lubricants during the obturation process, seal the space between the dentinal wall and the root filling material and fill the accessory canals, voids and irregularities in the root canals.³ AH Plus is epoxy resin-based sealer and has been commonly used as gold standard endodontic sealers due to its high bond strength to dentine,

adequate radiopaque, flow, dimensional stability, low solubility and high resistance.⁴

Bioceramics are inorganic, non-metallic, biocompatible materials that have mechanical properties similar to dental hard tissues. They are chemically stable, noncorrosive, and interact well with organic tissue. Newer Bioceramic sealers such as Ceraseal possess very high bond strength with dentin walls by formation of hydroxyapatite crystals.⁵ The present study compared sealing ability of Ceraseal bioceramic sealer, AH plus and Epiphany sealer.

MATERIALS & METHODS

The present study comprised of 45 extracted single rooted permanent teeth with fully developed root apices. Approval for the study was taken beforehand.

After removal of the external debris, teeth were placed in 2.5% sodium hypochlorite solution for 2 hours and stored in normal saline. Teeth were decoronated 12 mm from the apex, canals were accessed. Instrumentation was done with 11 mm working length

using a crown-down technique with Rotary Pro taper files to F3. All the canals were irrigated with 10 mL of a freshly prepared solution of 5.25% sodium hypochlorite and 17% EDTA solution alternatively between files and the final irrigation was done with normal saline. The canals were then dried with sterile paper points. Specimens were divided into 3 groups of 15 samples. Group I with Ceraseal BC, group II with

AH Plus sealer and group III with Resilon epiphany system. Microleakage was evaluated using dye penetration method. Teeth were split longitudinally and then horizontally markings were made at 2, 4 and 6 mm from the apex. Dye penetration evaluation was done under stereomicroscope. 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
Agent	Ceraseal BC	AH Plus sealer	Resilon epiphany
Number	15	15	15

Table I shows distribution of specimens based on system of sealing used.

Table II Vertical penetration of dye

Groups	Mean	P value
Group I	5.32	0.02
Group II	8.06	
Group III	6.52	

Table II, graph I shows that mean vertical penetration of dye in group I was 5.32, in group II was 8.06 and in group III was 6.52. The difference was significant (P< 0.05).

Graph I Vertical penetration of dye

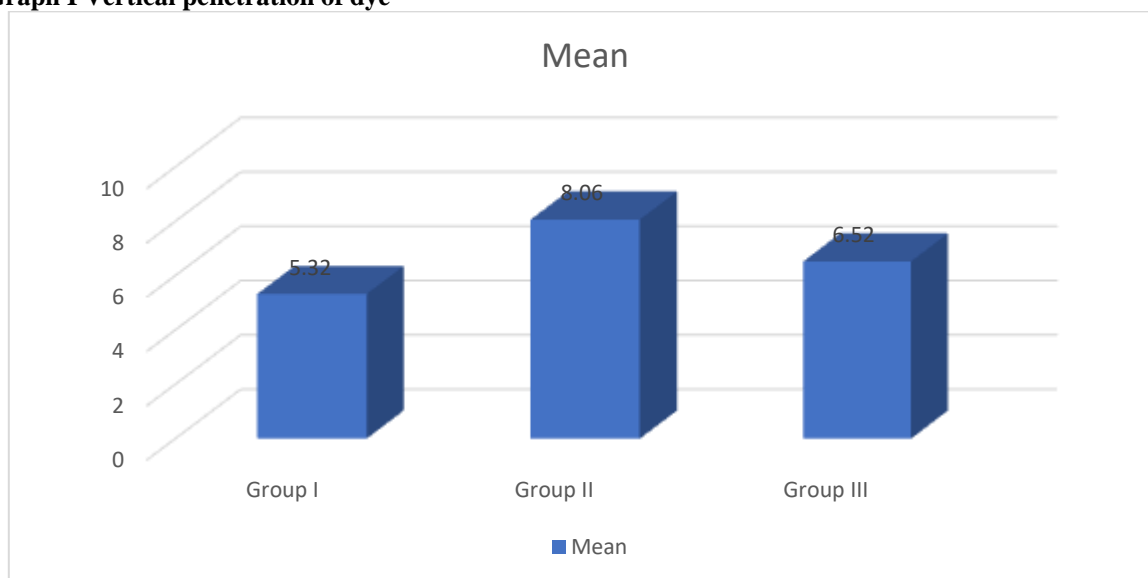
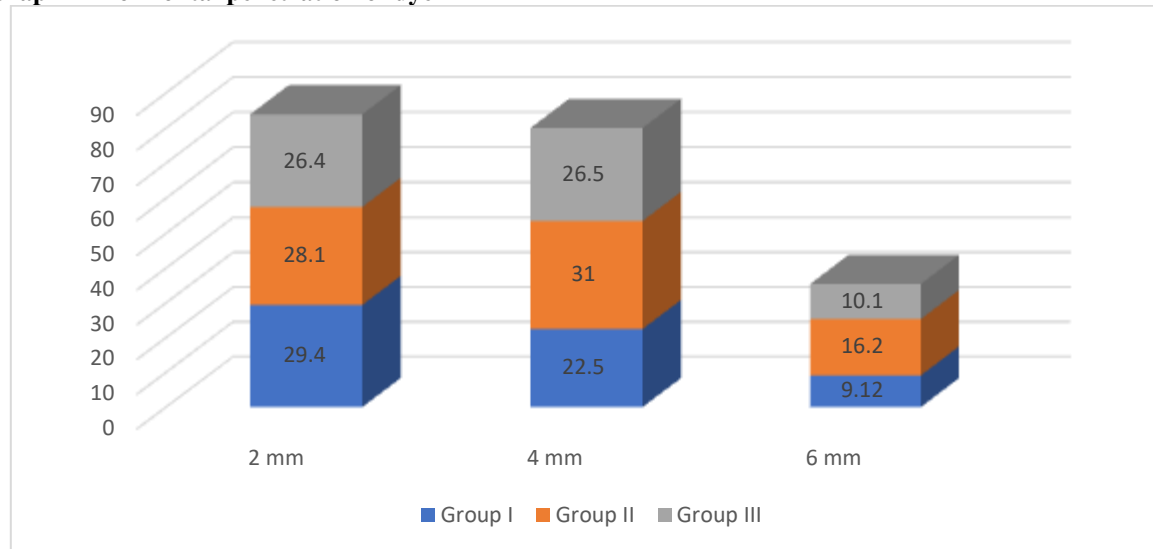


Table III Horizontal penetration of dye

Length	Group I	Group II	Group III	P value
2 mm	29.4	28.1	26.4	0.15
4 mm	22.5	31.0	26.5	0.03
6 mm	9.12	16.2	10.1	0.04

Table III, graph II shows that mean penetration at 2 mm was 29.4, 28.1 and 26.4, at 4 mm was 22.5, 31.0 and 26.5 and at 6 mm was 9.12, 16.2 and 10.1 in group I, II and III respectively. The difference was statistical significant (P< 0.05) among all groups at 4 and 6mm, but at 2mm the difference found was not statistical significant.

Graph II Horizontal penetration of dye

DISCUSSION

An ideal endodontic sealer should fulfil all ideal requisites. The tight seal at the apex can be enhanced, sealer bonds chemically to the dentinal wall of root canal, and mild expansion of the sealer improves its adaptation to the canal walls.⁶ It should be antibacterial and resistant to dissolution. One of such sealer is bioceramic (BC) sealer. BC sealer is a recently introduced sealer, composed of zirconium oxide, calcium silicates, calcium phosphate monobasic, calcium hydroxide, and various filling and thickening agents.⁷ The material is available in premixed calibrated syringes with intra-canal tips. As a hydrophilic sealer it utilizes moisture within the canal to complete the setting reaction and it does not shrink on setting.⁸ The present study compared sealing ability of Ceraseal BC, AH plus and epiphany sealer.

Our results were consistent with the findings of Pawar et al⁹ where they had compared the microleakage of three sealers; Endosequence bioceramic (BC) sealer, AH Plus and Epiphany. Group A: using Endosequence BC, Group B: using AH Plus sealer, Group C: using Resilon Epiphany system. Microleakage was evaluated using dye penetration method. The dye penetration in Group B was more than in Group A and C in both vertical and horizontal directions, suggesting that newly introduced BC sealer and Epiphany sealer sealed the root canal better compared to AH Plus Sealer.

Asaworarit et al¹⁰ evaluated the apical sealing ability of bioceramic (Endo Sequence BC Sealer) and epoxy resin-based (AH Plus) sealers at 24 h, 7 days and 4 weeks. Endo Sequence BC Sealer had significantly better sealing ability than AH Plus at all test periods ($P < 0.001$). SEM showed Endo Sequence BC Sealer had better penetration into dentinal tubules. Hasnain et al¹¹ evaluated and compared the apical sealing ability of new bioceramic-based (Total Fill BC), methacrylate-based (Hybrid Root SEAL) sealers

and epoxy resin-based (AH Plus) sealer using a dye penetration method. Experimental groups were obturated as follows - Group A: Obturated with AH Plus + 6% conventional gutta-percha, Group B: Obturated with Total Fill BC + 6% conventional gutta-percha, Group C: Obturated with Total Fill BC + 6% bioceramic gutta-percha, and Group D: Obturated with Hybrid Root SEAL + 6% conventional gutta-percha. The best results were obtained with Total Fill BC with bioceramic gutta-percha followed by total fill BC with conventional gutta-percha, AH Plus, and hybrid root seal. Bioceramic sealer with bioceramic gutta-percha or conventional gutta-percha provides comparable sealing ability to AH Plus and superior to Hybrid Root SEAL.

Zhang et al¹² evaluated the microleakage in canals obturated with Total Fill BC and AH Plus sealer using fluid filtration method and scanning electron microscope analysis. Samples showed gaps at sealer dentin and cone-sealer interface for specimens that leaked the most, and it was concluded that Total Fill BC performed better than AH Plus sealer. In both the studies, results were statistically nonsignificant.

CONCLUSION

Authors found that newer sealers found to be effective but complete leakage cannot be avoided.

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