

## Original Research

### Evaluation of marginal adaptation of two different root canal sealers during root canal therapy: A comparative study

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#### ABSTRACT:

**Background:** The key to success for endodontic treatment is thorough debridement of the root canal system of necrotic or infected pulp tissues, microorganisms, and complete sealing of the root canal space. Hence; the present study was undertaken for comparing the marginal adaptation of two different root canal sealers during root canal therapy. **Materials & methods:** A total of 40 freshly extracted tooth specimens were randomized into two groups of 20 teeth each, as following. Group A: Obturation using AH PLUS, and Group B: Obturation using Endosequence BC sealer. All the sample teeth were obturated using single cone obturation technique. The root canal opening of all five groups was then sealed with glass ionomer cement. Obturated teeth were stored at 37°C and 100% humidity. Each root was sectioned longitudinally using a diamond disk on slow speed handpiece to obtain a dentin-root canal filling interface at apical 3 mm of the root. All specimens were dehydrated using aqueous ethanol and then were gold sputtered. Specimens were observed and analysed. Overall average gaps at interface were calculated for each sample and results were tabulated. **Results:** Mean marginal adaptation among the specimens of group A and group B specimens was 3.95 and 2.89 respectively. Mean marginal adaptation was significantly higher among specimens of group A in comparison to group B. **Conclusion:** Marginal adaptation of AH Plus is significantly higher in comparison to Endosequence BC.

**Key words:** Marginal adaption, Sealer, Therapy

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#### INTRODUCTION

The key to success for endodontic treatment is thorough debridement of the root canal system of necrotic or infected pulp tissues, microorganisms, and complete sealing of the root canal space. The failure to localize and treat all of the canals of the root canal systems on the part of the operator is considered as one of the major causes of the root canal treatment failures. It has been shown that in majority of cases the general dental practitioners were responsible for the endodontic failures.<sup>1,2</sup>

The main function of a sealer is to fill the spaces between the core material and the walls of root canal

and between the gutta-percha cones, in an attempt to form a coherent mass of obturating material without voids. The sealer is expected to fill irregularities and minor discrepancies between the filling and canal walls, accessory canals, and multiple foramina.<sup>3</sup>

A great variety of endodontic sealers are available commercially and they are divided into different groups according to their chemical composition (Eg: Zinc oxide eugenol based, MTA based, Epoxy resin based). It is a well-known fact that three dimensional impervious obturation of the root canal system is of prime clinical importance for the long-term success of endodontic treatment.<sup>4-6</sup> Hence; the present study was

undertaken for comparing the marginal adaptation of two different root canal sealers during root canal therapy.

## MATERIALS & METHODS

The present study was undertaken for comparing the marginal adaptation of two different root canal sealers during root canal therapy. A total of 40 freshly extracted single rooted teeth were included in the present study. Only those tooth specimens were enrolled which had root with curvature less than 5°, free from any open apices, cracks, calcified canals, canal curvature, and resorptive defects. Teeth were washed under tap water to remove blood and debris. They were stored in normal saline before treatment. The length of the roots was standardized to  $12 \pm 1$  mm by the removal of the crown of each tooth with a diamond disc. The working length of the root canal was determined with a K file by inserting until it is just visible at the apical foramen using radiography and then subtracting 1mm from the before mentioned measurement. The root canals were prepared using crown down technique. The canals were dried with absorbent paper points and were randomized into two groups of 20 teeth each, as following.

Group A: Obturation using AH PLUS

AH-Plus was used as a sealer after mixing its two components and was introduced in the canal with size 40; 0.06 master cone gutta-percha.

Group B: Obturation using Endosequence BC sealer  
Endosequence BC sealer was used along with size 40; 0.06 mastercone in this group.

All the sample teeth were obturated using single cone obturation technique. The root canal opening of all five groups was then sealed with glass ionomer cement. Obturated teeth were stored at 37°C and 100% humidity. Each root was sectioned longitudinally using a diamond disk on slow speed handpiece to obtain a dentin-root canal filling interface at apical 3 mm of the root. All specimens were dehydrated using aqueous ethanol and then were gold sputtered. Specimens were observed and analysed. Overall average gaps at interface were calculated for each sample and results were tabulated. The results were subjected to statistical analysis using SPSS software. Student t test was used for evaluation of level of significance.

## RESULTS

A total of 40 freshly extracted tooth specimens were randomized into two groups of 20 teeth each, as following.

Group A: Obturation using AH PLUS

AH-Plus was used as a sealer after mixing its two components and was introduced in the canal with size 40; 0.06 master cone gutta-percha.

Group B: Obturation using Endosequence BC sealer  
Endosequence BC sealer was used along with size 40; 0.06 mastercone in this group.

Mean marginal adaptation among the specimens of group A and group B specimens was 3.95 and 2.89 respectively. Mean marginal adaptation was significantly higher among specimens of group A in comparison to group B.

**Table 1:** Group-wise distribution of specimens

Group	Number of specimens	Type of sealer used
Group A	20	AH PLUS
Group B	20	Endosequence BC sealer

**Table 2:** Overall mean marginal adaptation

Group	Mean	SD
Group A	3.95	0.48
Group B	2.89	1.13

**AH PLUS > Endosequence BC**

## DISCUSSION

Ingle and colleagues radiographically studied endodontic success and failure; they indicated that 58% of treatment failures were due to incomplete obturation. The three dimensional (3D) 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 communication between periapex, periodontal space and root canal. Thus entombing the micro-organisms and preventing re-infection by spread of microbial toxins. Sealers can be a cause of root canal failure due to microleakage at sealer-dentin or sealer-core material interface. Bonding of the sealer to the root canal dentin wall and formation of a monoblock can eliminate this drawback.<sup>7-11</sup>

A total of 40 freshly extracted tooth specimens were randomized into two groups of 20 teeth each, as following. Group A: Obturation using AH PLUS, and Group B: Obturation using Endosequence BC sealer. Mean marginal adaptation among the specimens of group A and group B specimens was 3.95 and 2.89 respectively. Polineni S et al compared the marginal adaptation of three newer root canal sealers to root dentin. Thirty freshly extracted human single-rooted teeth with completely formed apices were taken. Teeth were decoronated, and root canals were instrumented. The specimens were randomly divided into three groups (n = 10) based upon the sealer used. Group 1 - teeth were obturated with epoxy resin sealer (MM-Seal). Group 2 - teeth were obturated with mineral trioxide aggregate (MTA) based sealer (MTA Fillapex), Group 3 - teeth were obturated with bioceramic sealer (EndoSequence BC sealer). The highest marginal gap was seen in Group 2 (apical-

16680.00 nm, coronal-10796 nm) and the lowest marginal gap was observed in Group 1 (apical-599.42 nm, coronal-522.72 nm). Coronal halves showed superior adaptation compared to apical halves in all the groups.<sup>12</sup> Gade VJ et al compared the push-out bond strength of root filled with Endosequence BC, AH Plus and Endomethasone N sealers using lateral condensation and thermoplasticized technique. Thirty mandibular premolars with completely formed roots were selected. Teeth were decoronated, working length was determined. Instrumentation and irrigation were performed. Teeth were then obturated with Group 1-Cold lateral compaction (n = 15) or Group 2-Thermoplasticized technique (n = 15). Each group was again subdivided into three depending on the sealers used. AH Plus sealer in Group 1 showed the maximum ( $4.77 \pm 1.67$  MPa) push-out bond strength among the three sealers and between two groups. The mean strength of Bioceramic sealer was lower in Group 1 ( $2.62 \pm 0.76$  MPa) and higher in Group 2 ( $3.52 \pm 0.69$  MPa). The push-out bond strength of Endosequence BC sealer was lower than the AH Plus root canal sealer with cold lateral condensation technique.<sup>13</sup>

In the present study, mean marginal adaptation was significantly higher among specimens of group A in comparison to group B. Pawar SS et al compared the microleakage of three sealers; Endosequence bioceramic (BC) sealer, AH Plus and Epiphany. Study was done on 75 extracted human single rooted permanent teeth, which were decoronated and the root canals were instrumented. The specimens were randomly divided into three groups (n = 25) and obturated by continuous wave condensation technique. Group A: using Endosequence BC, Group B: using AH Plus sealer, Group C: using 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 (30X magnification). 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. Newer root canal sealers seal the root canal better but cannot totally eliminate leakage.<sup>14</sup>

## CONCLUSION

From the above results, the authors conclude that marginal adaptation of AH Plus is significantly higher in comparison to Endosequence BC.

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