

## **Comparison of marginal adaptation of epoxy resin based sealer (AH Plus) and MTA based sealer (MTA Fillapex) at dentin sealer interface at apical one third of the root canals**

**Dr Swati Chaturvedi<sup>1</sup>, Dr. Sharv Ahuja<sup>2</sup>, Dr.Govind Nandkumar Agrawal<sup>3</sup>, Dr Abhijeet Khade<sup>4</sup>, Dr. Akshay M. Dhewale<sup>5</sup>, Dr. Rohit Singh<sup>6</sup>**

<sup>1</sup>Senior lecturer, Department of Oral Pathology and microbiology, Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital, Nagpur, Maharashtra;

<sup>2</sup>Senior lecturer, Department of Endodontics, Desh bhagat Dental College, Mandi Gobindharh, Punjab;

<sup>3</sup>Reader, Department of Conservative Dentistry And Endodontics, Dr.R.R.Kambe Dental College and Hospital, Kanheri Sarap, Akola;

<sup>4</sup>Lecturer, Department of conservative dentistry and Endodontics, Dr H S R S M Dental College and hospital, Hingoli;

<sup>5</sup>Senior Lecturer, Department of conservative dentistry and Endodontics, VYWS Dental College & Hospital, Amravati Maharashtra;

<sup>6</sup>Reader, Institute Of Dental Education and Advance Studies Gwalior-Etawah Road Gwalior, Madhya Pradesh

### **Abstract**

**Background:** *Pulp necrosis denotes the cessation of the metabolic processes of this tissue, with consequent loss of its structure, as well as its natural defenses. 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). Hence; the present study was undertaken for comparing the marginal adaptation of epoxy resin based sealer (AH Plus) and MTA based sealer (MTA Fillapex) at dentin sealer interface at apical one third of the root canals.*

**Materials & methods:** *50 Straight maxillary central incisors (each root with curvature less than 5°), free from any open apices, cracks, calcified canals, canal curvature, and resorptive defects teeth were used. The canals were dried with absorbent paper points and were randomized into two groups of 25 teeth each, as following. Group 1: Obturation using AH PLUS, and Group 2: Obturation using MTA fillapex. All the sample teeth were obturated using single cone obturation technique. All specimens were dehydrated using aqueous ethanol and then were gold sputtered. Specimens were observed under Scanning Electron Microscope (SEM). Overall average gaps at this interface were calculated for each sample and results were tabulated.*

**Results:** *Mean marginal adaptation at the apical end among the specimens of group 1 and group 2 was 1.86 and 0.53 respectively. Mean marginal adaptation at the coronal end among the specimens of group 1 and group 2 was 2.86 and 0.56 respectively. While analysing statistically, it was seen that mean marginal adaptation was significantly among specimens of group 1 in comparison to group 2.*

**Conclusion:** *Marginal adaptability of AH PLUS was significantly higher in comparison to specimens of MTA fillapex group.*

**Key words:** *MTA, Fillapex, Marginal adaptation*

## **Introduction**

Pulp necrosis denotes the cessation of the metabolic processes of this tissue, with consequent loss of its structure, as well as its natural defenses. In these cases, the recommended endodontic treatment is known as necropulpectomy.<sup>1,2</sup>

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. This will prevent the persistence of infection and reinfection of the root canal space. The failure of endodontic treatment can be determined on the basis of clinical signs and symptoms and radiographic findings of root canal treated tooth. The literature shows that many factors are considered responsible for endodontic treatment failure. These includes residual necrotic pulp tissue, presence of peri-radicular infection, periodontal disease, root fractures, broken instruments, mechanical perforations, root canal overfillings, root canal underfillings, missed canals or unfilled canals.<sup>2,3</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). Epoxy resin based sealers were introduced in endodontics by Schroeder and current modifications of the original formula are widely used nowadays. Epoxy resin sealers have been used because of their reduced solubility better apical seal and micro-retention to root canal dentin. The manufacturers of AH26 set out to develop an improved product named AH PLUS which has better technical, clinical and cytotoxic characteristics than the original AH26.<sup>4,5</sup> Hence; the present study was undertaken for comparing the marginal adaptation of epoxy resin based sealer (AH Plus) and MTA based sealer (MTA Fillapex) at dentin sealer interface at apical one third of the root canals.

## **Materials & methods**

50 Straight maxillary central incisors (each root with curvature less than 5°), free from any open apices, cracks, calcified canals, canal curvature, and resorptive defects teeth were used. 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 with ProTaper NiTi rotary files until size 40; 0.06 till working length. EDTA was used as the final rinse before root canal obturation. The canals were dried with absorbent paper points and were randomized into two groups of 25 teeth each, as following.

Group 1: Obturation using AH PLUS

Group 2: Obturation using MTA fillapex

All the sample teeth were obturated using single cone obturation technique. All specimens were dehydrated using aqueous ethanol and then were gold sputtered. Specimens were

observed under Scanning Electron Microscope (SEM). Overall average gaps at this interface were calculated for each sample and results were tabulated.

## Results

Mean marginal adaptation at the apical end among the specimens of group 1 and group 2 was 1.86 and 0.53 respectively. Mean marginal adaptation at the coronal end among the specimens of group 1 and group 2 was 2.86 and 0.56 respectively. While analysing statistically, it was seen that mean marginal adaptation was significantly among specimens of group 1 in comparison to group 2.

**Table 1:** Mean marginal adaptation at the apical end

Group	Mean	SD
Group 1	1.86	0.36
Group 2	0.53	0.16
p- value	0.00 (Significant)	

**Table 2:** Mean marginal adaptation at the coronal end

Group	Mean	SD
Group 1	2.86	0.22
Group 2	0.56	0.08
p- value	0.01 (Significant)	

## Discussion

In the present study, mean marginal adaptation at the apical end among the specimens of group 1 and group 2 was 1.86 and 0.53 respectively. Mean marginal adaptation at the coronal end among the specimens of group 1 and group 2 was 2.86 and 0.56 respectively. Huang Y et al analysed the ability of multiple compounds to seal the dental tubules using scanning electron microscopy (SEM) and micro-computed tomography (micro-CT). Twenty-four single-root human mandibular premolars were selected and instrumented with nickel-titanium rotary file and the final file size was #40/06. They were then randomly allocated into 2 groups, and all samples were filled with single cone gutta-percha (#40/06) and one of the tested sealers (AH Plus and EndoSequence BC sealers). According to SEM, both root canal sealers showed sufficient adaptation to dentin along the whole length of the root canal, though the coronal sections presented superior sealing than the apical sections. By using the single cone technique, neither EndoSequence or AH Plus provides a porosity-free root canal filling.<sup>10</sup> Baruah K et al compared the apical sealability of mineral trioxide aggregate (MTA) Fillapex and Endosequence BC sealer at three different lengths of remaining gutta-percha after postspace preparation. There was a statistically significant difference in leakage at 3 mm and 5 mm level in both groups. Although less microleakage occurred, the bioceramic sealers could not totally eliminate leakage.<sup>11</sup>

In the present study, while analysing statistically, it was seen that mean marginal adaptation was significantly among specimens of group 1 in comparison to group 2. Arikatla SK et al evaluated the interfacial adaptation and penetration depth of Bioroot RCS and MTA Plus sealers to root dentin. AH Plus sealer has shown significantly higher depth of penetration and minimum gaps than bioceramic sealers. MTA Plus sealer exhibited significantly more interfacial gaps and less penetration depth than Bioroot RCS. At all root regions, AH plus sealer exhibited minimum gaps and more tubular penetration whereas MTA Plus sealer exhibited more gaps and less penetration.<sup>12</sup> Kumar B compared the marginal adaptation of EndoSequence BC sealer, MTA Fillapex & ProRoot ES root canal sealers to dentin by using SEM. They showed that Endosequence BC sealer along with C point group showed least microgap between root canal sealer and dentin when compared with MTA Fillapex sealer and ProRoot ES sealer groups.<sup>13</sup>

### Conclusion

Marginal adaptability of AH PLUS was significantly higher in comparison to specimens of MTA fillapex group.

### References

1. Santos-Junior AO, De Castro Pinto L, Mateo-Castillo JF, Pinheiro CR. Success or failure of endodontic treatments: A retrospective study. *J Conserv Dent.* 2019;22(2):129-132.
2. Stiegemeier D, Baumgartner C, Ferracane J. Comparison of push-out bond strengths of resilon with three different sealers. *J Endod* 2010;36: 318–21.
3. Sousa-Neto MD, Passarinho-Neto JG, Carvalho-Junior JR, Cruz-Filho AM, Pecora JD, Saquy PC. Evaluation of the effect of EDTA, EGTA and CDTA on dentin adhesiveness and microleakage with different root canal sealers. *Braz. Dent. J.* 2002;13: 123–128.
4. Jain S, Adhikari HD. Scanning electron microscopic evaluation of marginal adaptation of AH-plus, GuttaFlow, and RealSeal at apical one-third of root canals – Part I: Dentin-sealer interface. *J Conserv Dent* 2018;21:85-9.
5. Polineni S, Bolla N, Mandava P, Vemuri S, Mallela M, Gandham VM. Marginal adaptation of newer root canal sealers to dentin: A SEM study. *J Conserv Dent* 2016;19:360-3.
6. Trope M, Chow E, Nissan R. In vitro endotoxin penetration of coronally unsealed endodontically treated teeth. *Endod Dent Traumatol.* 1995;11(2):90-4.
7. Iqbal A. The Factors Responsible for Endodontic Treatment Failure in the Permanent Dentitions of the Patients Reported to the College of Dentistry, the University of Aljouf, Kingdom of Saudi Arabia. *J Clin Diagn Res.* 2016;10(5):ZC146-ZC148.
8. AL-Haddad A, Aziz ZACG. Bioceramic-Based Root Canal Sealers: A Review. *International Journal of Biomaterials.* Volume 2016 |Article ID 9753210 | <https://doi.org/10.1155/2016/9753210>
9. Kaur A, Shah N, Logani A, Mishra N. Biotoxicity of commonly used root canal sealers: A meta-analysis. *J Conserv Dent.* 2015;18(2):83-88.

10. Huang Y, Orhan K, Celikten B, Orhan AI, Tufenkci P, Sevimay S. Evaluation of the sealing ability of different root canal sealers: a combined SEM and micro-CT study. *J Appl Oral Sci.* 2018;26:e20160584.
11. Baruah K, Mirdha N, Gill B, Bishnoi N, Gupta T, Baruah Q. Comparative Study of the Effect on Apical Sealability with Different Levels of Remaining Gutta-Percha in Teeth Prepared to Receive Posts: An in vitro Study. *Contemp Clin Dent.* 2018;9(Suppl 2):S261-S265.
12. Arikatla SK, Chalasani U, Mandava J, Yelisela RK. Interfacial adaptation and penetration depth of bioceramic endodontic sealers. *J Conserv Dent.* 2018;21(4):373-377.
13. Kumar B, *JBR Journal of Interdisciplinary Medicine and Dental Sciences*, Marginal adaptation of endo-sequence BC Sealer, MTA fillapex and Pro-Root ES root canal sealers to dentin: A SEM study, Dental Congress 2020, 3rd International Conference on Dentistry and Oral Health. 2020; 7: 20- 21.