

Comparison of Apical Leakage between Immediate Versus Delayed Post-space Preparation Using AH Plus Sealer

Pinky Singh*

Department of Dentistry, Patna Medical College, Patna, Bihar, India.

Abstract

Aim: The purpose of this study was to compare the effect of immediate versus delayed post-space preparation on the apical seal using AH Plus sealer. **Materials and Methods:** Forty-six single-rooted anterior extracted teeth were instrumented and divided into four groups: Twenty teeth in Groups 1 and 2 and three teeth in Groups 3 and 4. In Groups 1 and 2, each canal was obturated using warm vertical compaction and AH Plus sealer. In Group 1, the post-space was made immediately at the time of obturation, and in Group 2, the post-space was made after placing the teeth in saline at 37°C for 1 week. Groups 3 and 4 represented positive and negative control groups, respectively. The teeth were placed in India ink for 72 h. The teeth were sectioned and the amount of apical dye migration was measured. **Results:** Significant differences were found between teeth whose post-spaces are prepared at the time of obturation versus 1 week later using warm vertical condensation and AH Plus sealer. **Conclusion:** Apical seal is well maintained when post-space is prepared immediately after obturation.

Keywords: AH Plus, Post-space, Immediate, Delayed, Obturation, Leakage.

INTRODUCTION

The success of root canal therapy depends on the ability to establish and maintain an apical seal. One of the major factors of root canal failure is coronal microleakage, caused by recurrent caries, open crown margins, leakage of temporary restorations, or failure to have a provisional placed on a treated tooth in a timely manner.^[1] Placement of a post in canals often becomes necessary to retain the core.

During the preparation of the post-space, it is important not to disrupt the integrity of the apical seal. There has been much debate as to how, when, and how much of the gutta-percha should be removed when making a post-space. Different methods have been used to remove the gutta-percha when making a post-space including heated instruments, Gates Glidden drills, pezzo reamers, hand instruments, and solvents in combination with these instruments. Madison and Zakariasen (1984) suggested no difference between thermal, chemical, and mechanical removal of gutta-percha as well as between immediate versus delayed removal when using Roth root canal cement (Roth Drug Co., Chicago, IL).^[2] Kwan and Harrington (1981) stated that immediate removal of gutta-percha after filling the root canal had significantly less leakage as compared to filled controls when using Grossman's sealer.^[3] Fan *et al.* (1999) suggested that delayed post-space preparation

resulted in more leakage than immediate preparation using AH26 (Dentsply) (Kerr).^[4] Dickey *et al.* (1982) showed that when using pezzo reamers and softening agents, there was significantly more leakage when gutta-percha was removed immediately at the time obturation than when removal is delayed using Grossman's formula.^[5] Portell *et al.* (1982) stated that when 3 mm of gutta-percha was left apically, delayed post-space preparation significantly increased leakage when using Grossman's formula.^[6] Bourgeois and Lemon (1981) demonstrated that there was no significant difference between immediate versus delayed post-space preparation but AH26 leaked significantly more than Grossman's formula.^[7] De Moor and De Bruyne demonstrated that both AH26 and AH Plus, when used with an identical gutta-percha obturation technique, resulted in comparable sealability at all evaluation times.^[8]

AH Plus is an epoxy-amine resin sealer that has gained recent popularity among clinicians. To date, no studies have been done showing whether there is a significant difference

Address for correspondence: Dr. Pinky Singh,
Patna Medical College, Patna, Bihar, India.
Email: drpinky.pmc@gmail.com

Received: Apr. 3, 2021; **Accepted:** May. 10, 2021; **Published:** Jun. 29, 2021

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

How to cite this article: Singh P. Comparison of Apical Leakage between Immediate Versus Delayed Post-space Preparation Using AH Plus Sealer. J Res Adv Dent 2021;12:4:90-92.

Access this article online

Website:
www.jrad.co.in

DOI:
<https://doi.org/10.53064/jrad.2021.12.4.24>

with regard to leakage between immediate versus delayed post-space preparation using AH Plus as a sealer. The purpose of this study was to compare the effect of immediate versus delayed post-space preparation on the apical seal using AH Plus sealer.

MATERIALS AND METHODS

Forty-six single-rooted anterior extracted teeth were decoronated to a length of 16 mm and instrumented to a K3 (SybronEndo) #30 0.06 taper 0.5 mm from the apex. The teeth were randomly divided into four groups: Twenty teeth in Groups 1 and 2 and three teeth in Groups 3 and 4. In Groups 1 and 2, each canal was obturated using warm vertical compaction (System B and Obtura II), 0.06 taper K3 (SybronEndo) gutta-percha, and AH Plus sealer (Dentsply). The sealer was placed in the canal by coating the master cone with sealer, inserting the cone in the canal, removing the cone from the canal, then recoating the cone before placing it in the canal again. In Group 1, the post-space was made immediately at the time of obturation using a heated instrument and Gates Glidden drills at 9000 rpm to a depth that left 4 mm of gutta-percha apically. In Group 2, the teeth were placed in saline at 37°C for 1 week after obturation and the post-space was then created in the same manner as in Group 1. In Group 3, the teeth were obturated with the gutta-percha fit to tug-back with no sealer. The teeth in Group 4 were instrumented, no obturation material placed and the teeth were completely sealed with sticky wax and fingernail polish. Groups 3 and 4 represented positive and negative control groups, respectively. After post-space preparation, the coronal opening was covered with sticky wax and two coats of clear fingernail polish covered the entire root surface except for the last 2 mm. The teeth were then placed in India ink for 72 h. The teeth were then sectioned vertically using 400 grit sandpaper on a wet sander until the entire length of the remaining gutta-percha was exposed and imaged next to a millimeter ruler for reference using a stereomicroscope. No samples were excluded because of fracture during obturation or during the sectioning process. The file names were then changed to random numbers by a person not evaluating the samples for the evaluator to be blinded to the samples being measured. One evaluator measured the amount of apical dye migration using the measuring ruler in Photoshop 7.0. The file names were then changed back to their original names and the data were recorded then analyzed using an independent *t*-test with a 0.05 level of significance (Table 1).

RESULTS

The results showed that Group 1 had a mean distance of 0.30 mm whereas Group 2 had a mean of 0.93 mm. The SD of Groups 1 (Figure 1a) and 2 was 0.44 and 1.10, respectively (Figure 1b). Statistical analysis using an independent *t*-test confirmed a significant difference ($P_{0.05}$) between teeth whose post-spaces are prepared at the time of obturation versus 1 week later.

Table 1: Measurement of Apical dye penetration

S. No.	Group 1 leakage (mm)	Group 2 leakage (mm)	Pos. control leakage (mm)	Neg. control leakage (mm)
1.	0.00	0.00	3.18	0.00
2.	0.00	0.51	5.50	0.00
3.	0.14	1.61	3.25	0.00
4.	1.50	0.53		
5.	0.00	0.67		
6.	0.81	1.04		
7.	0.35	0.00		
8.	0.65	0.00		
9.	0.69	0.63		
10.	0.00	1.01		
11.	0.00	0.00		
12.	0.00	0.73		
13.	0.00	3.61		
14.	0.00	2.39		
15.	0.22	3.74		
16.	0.16	0.30		
17.	1.15	0.52		
18.	0.00	0.40		
19.	0.34	0.63		
20.	0.00	0.30		

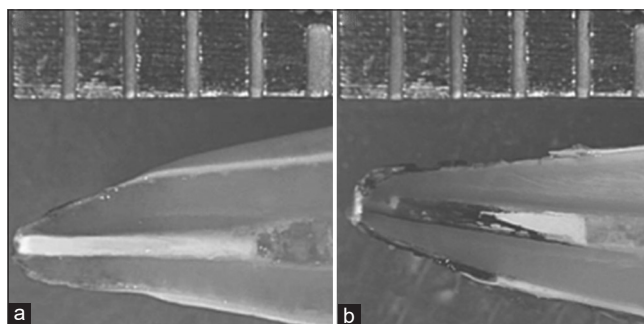


Figure 1: (a) Sample of Group 1 shows no apical leakage. (b) Sample from Group 2 shows significant apical leakage

DISCUSSION

When using warm vertical condensation and AH Plus sealer, there was significantly less leakage when the post-space was prepared at the time of obturation compared to post-spaces prepared 1 week after obturation. When deciding how to measure leakage, a vertical sectioning technique was used to visualize the amount of dye penetration. The sectioning was done with a wet sander using 400 grit sandpaper and the tooth was sanded until the length of the gutta-percha was exposed. The disadvantage of this technique is that only the visible dye is measured and does not account for the leakage that appears in the portion of the root that is removed during the sanding process. The author recognizes that evaluator error and possible bias could have been reduced or eliminated if two evaluators had been used instead of one for the measuring of the samples. When deciding how much gutta-percha to leave apically for this study, Abramovitz *et al.* (2001)^[9] suggested that 3–6 mm of gutta-percha be left to maintain an apical seal. Metzger

et al. (2000)^[10] showed that leaving <7 mm of gutta-percha apically diminished the quality of the apical seal and that the sealing is proportional to the length of the remaining filling. Portell *et al.* (1982)^[7] concluded that 7 mm of remaining apical fill resulted in less disturbance of the apical seal than 3 mm. A level of 4 mm was chosen for this study, which is within the acceptable range of the previously mentioned studies.

The results of this study are in agreement with the results of Portell *et al.* (1982),^[7] Fan *et al.* (1999),^[5] and Kwan and Harrington (1981)^[4] who showed significantly less leakage when post-spaces were prepared immediately after obturation. In contrast, the studies by Madison and Zakariasen (1984),^[3] Bourgeois and Lemon (1981),^[8] and Abramovitz *et al.* (2000)^[11] resulted in conclusions that there was no difference between immediate versus delayed post-space preparations. The scope of this study does not answer the question as to why there is more leakage when preparation of the post-space is delayed. Because AH Plus is a resin sealer and has an 8 h setting time, one possible hypothesis is that when the post-space is made at the time of obturation the sealer has not formed a lasting bond to the gutta-percha or canal wall. When the heated instrument or rotary instrument is introduced into the canal to remove the gutta-percha, the sealer is still within its working time and allows the sealer to set without introducing micro fractures where the sealer is in contact with the gutta-percha and canal wall. When the sealer is set during delayed post-space preparation, it is possible that the rotational forces of the Gates Glidden drill cause movement of the gutta-percha, thus breaking the bond at the sealer interface. In most situations, it is better to have the clinician would performed the root canal therapy prepare the post-space because that person has become intimately familiar with the root canal anatomy.^[12]

CONCLUSION

The clinical implications of this study are that when using AH Plus and warm vertical condensation, the clinician will be better able to maintain an apical seal when the post-space is prepared at the time of obturation.

REFERENCES

1. Saunders WP, Saunders EM. Coronal leakage as a cause of failure in root-canal therapy: A review. *Endod Dent Traumatol* 1994;10:105-8.
2. Madison S, Zakariasen KL. Linear and volumetric analysis of apical leakage in teeth prepared for posts. *J Endod* 1984;10:422-7.
3. Kwan EH, Harrington GW. The effect of immediate post preparation on apical seal. *J Endod* 1981;7:325-9.
4. Fan B, Wu MK, Wesselink PR. Coronal leakage along apical root fillings after immediate and delayed post space preparation. *Endod Dent Traumatol* 1999;15:124-6.
5. Dickey DJ, Harris GZ, Lemon RR, Luebke RG. Effect of post space preparation on apical seal using solvent techniques and Peeso reamers. *J Endod* 1982;8:351-4.
6. Portell FR, Bernier WE, Lorton L, Peters DD. The effect of immediate versus delayed dowel space preparation on the integrity of the apical seal. *J Endod* 1982;8:154-60.
7. Bourgeois RS, Lemon RR. Dowel space preparation and apical leakage. *J Endod* 1981;7:66-9.
8. de Moor RJ, de Bruyne MA. The long-term sealing ability of AH 26 and AH plus used with three gutta-percha obturation techniques. *Quintessence Int* 2004;35:326-31.
9. Abramovitz L, Lev R, Fuss Z, Metzger Z. The unpredictability of seal after post space preparation: A fluid transport study. *J Endod* 2001;27:292-5.
10. Metzger Z, Abramovitz R, Abramovitz L, Tagger M. Correlation between remaining length of root canal fillings after immediate post space preparation and coronal leakage. *J Endod* 2000;26:724-8.
11. Abramovitz I, Tagger M, Tamse A, Metzger Z. The effect of immediate vs. delayed post space preparation on the apical seal of a root canal filling: A study in an increased-sensitivity pressure-driven system. *J Endod* 2000;26:435-9.
12. Schwartz RS, Robbins JW. Post placement and restoration of endodontically treated teeth: A literature review. *J Endod* 2004;30:289-301.