

Effect of Resin-based and Bioceramic Based Root Canal Sealers on Post-operative Pain After Single Visit Endodontics: A Randomized Controlled Clinical Trial

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Abstract

Aim: The aim of the present study was to compare the postoperative pain after single visit root canal treatment using AH plus and mineral trioxide aggregate (MTA) fillapex root canal sealers.

Methods: Forty patients with single-rooted tooth requiring endodontic therapy were included in the present study. In every patient, pre-operative pain was recorded. Local anesthesia was administered and rubber dam was applied. Then, endodontic access cavities were prepared. Working length was established and was instrumented upto #25.6%. Then, the samples were randomly divided into two groups: Group 1-AH plus and Group 2-MTA fillapex. Then, the root canal was dried with paper points and obturated with cold lateral compaction technique using gutta-percha cones and AH plus sealer/MTA fillapex. Post-operative pain was recorded by visual analog scale score after 24 h and 48 h after obturation.

Results: Results showed that all the patients in Group A experienced pain and 65% of patients in Group B experienced pain after 24 h. In total 20 patients, 45% of patients in Group A experienced pain, and 25% in Group B after 48 h. There was no significant difference between groups in the incidence of postoperative pain after 48 h.

Conclusion: Post-operative pain associated with MTA fillapex sealer reduced after 24 h as compared to AH plus sealer and there was no difference in post-operative pain after 48 h.

Key words: AH plus, Mineral trioxide aggregate fillapex, Post-operative pain, Root canal sealers, Visual analog scale scores

INTRODUCTION

The goal of endodontic treatment after cleaning and shaping is three-dimensional filling and sealing of root canal system and to prevent microorganisms and promote periradicular tissue repair.^[1] Pain management during and after root canal treatment is one of the most important concern of endodontic practice.^[2] According to I.A.S.P

“pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”.^[3] Pain after root canal treatment is a common sensation, which may initiate a few hours to days postoperatively.^[4] It is reported with high incidence rate ranging between 3% and 58%. Pain can be aggravated by -mechanical, chemical, or microbiological injuries to periodontal tissues.^[5] There are various factors that may influence postoperative pain after single visit root canal treatment include pulp status, preoperative pain level, the number of root canals present, the choice of instrumentation, the choice of root canal sealer, obturation technique.^[4] Sealers placed in the root canal may interfere with periodontal tissues through the apical foramen, lateral canals and can possibly affect the healing process in the periodontium. Thus, the local inflammation produced by root canal obturating

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materials may result in post-operative pain. The severity of inflammatory reactions is influenced by a variety of factors including the root canal sealers composition. It has been suggested that bioceramic materials improve the treatment outcome by promoting the differentiation of odontoblasts and by releasing biologically active substances. The bioceramic materials have been shown to be less cytotoxic compared with resin-based sealer (AH Plus) *in vitro*.^[6-9] The aim of the present study was to compare the postoperative pain after single visit root canal treatment using AH plus and mineral trioxide aggregate (MTA) fillapex root canal sealers.

MATERIALS AND METHODS

In this study, a total of 40 patients with single-rooted tooth requiring endodontic therapy were included. Maxillary or mandibular single-rooted teeth diagnosed with symptomatic irreversible pulpitis with either normal apical tissues or symptomatic apical periodontitis were included in the study. Patients with immature apices or root resorption were excluded from the study. Medically compromised patients, pregnant females, patients using medications such as analgesic or anti-inflammatory drugs, patients who refused to participate in the study were also excluded from the study. Patients were randomly divided into two groups Group A = AH plus and Group B = MTA Fillapex. Prior to treatment the patients were instructed how to complete a visual analog scale (VAS) [Figure 1] to determine their pain score. The VAS included a 10 cm straight horizontal line numbered at each centimeter with the following criteria.

Local anesthetic with 2% lignocaine containing 1:80000 epinephrine (Lignox, Indoco Remedies, India) was administered to each patient after preoperative pain levels were recorded [Table 1]. A rubber dam was applied. The endodontic access cavities were prepared with endo access burs (Dentsply Maillefer, Ballaigues, Switzerland). Working length was established with #10 K file and the root canal was instrumented with one shape rotary system up to #25.6% under copious irrigation with 3% sodium hypochlorite and normal saline. Before obturation root canals were final rinse with 5 ml of 17% EDTA solution.

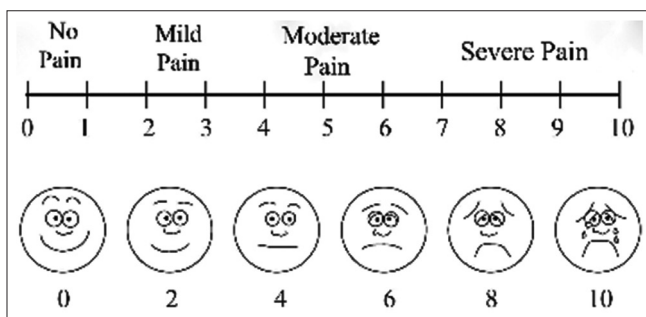


Figure 1: Visual analog scale

In both groups, the root canal was dried with paper points and obturated with cold lateral compaction technique using gutta-percha cones and AH plus sealer/MTA fillapex. Coronal access cavities were restored with direct composite restorations using dentinal adhesives and universal composite resin (Kerr, United States). Postoperative VAS scores were recorded after 24 h and 48 h to determine their post-operative pain [Table 1]. Data were analyzed by student *t*-test using SPSS software.

RESULTS

After 24 h all the patients in Group A experienced pain and 65% of patients in Group B experienced pain. After 48 h in total 20 patients, 45% of patients in Group A experienced pain and 25% in group B [Table 2].

After 24 h, mean VAS score was significantly better for MTA fillapex than AH plus ($P = 0.000166$). However after 48 h, there was no significant difference in mean VAS score between MTA fillapex and AH plus [Figure 2 and Table 3].

DISCUSSION

Postoperative pain in endodontics represents activation of the local inflammatory response in the periapical tissues, which is known to be associated with release of biochemical mediators such as reactive oxygen species (ROS), root canal sealer composition, and obturation methods. ROS have been shown to be associated with inflammatory pain *in vivo* and the production of ROS increased 4–7 times when the human pulp had been treated with the root canal sealers *in vitro*.^[4,5]

AH Plus (Dentsply, Konstanz, Germany) is an epoxy resin-based root canal sealer that has the ability to improve the wettability of the dentine and gutta-percha surfaces. Resin-based root canal sealers are preferred as a material

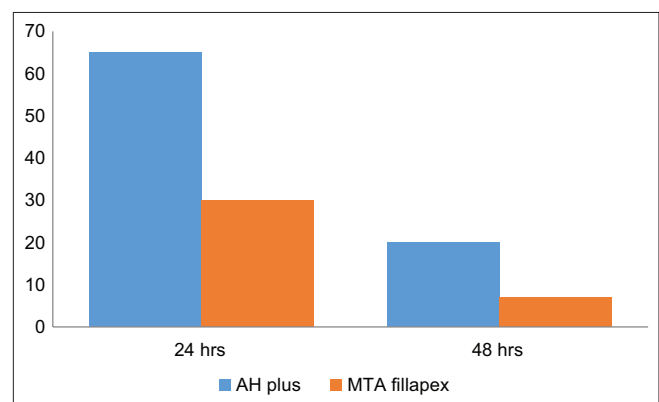


Figure 2: Graphic representation of the post-operative pain intensity after 24 h and 48

Table 1: Pre-operative and post-operative vas score were recorded

	Groups					
	AH Plus			MTA Fillapex		
	Pre-operative	24 h	48 h	Pre-operative	24 h	48 h
7	5	3	6	4	2	
4	2	0	8	4	2	
6	3	0	7	3	1	
5	3	0	5	3	1	
4	2	0	6	2	0	
5	4	2	5	2	0	
4	1	0	4	0	0	
8	6	3	5	1	0	
7	4	2	4	0	0	
5	2	0	5	2	0	
3	1	0	4	0	0	
4	2	0	5	1	0	
4	3	1	5	2	0	
6	5	3	3	0	0	
6	4	2	3	0	0	
5	2	0	6	3	1	
8	5	2	4	0	0	
4	3	0	4	0	0	
5	4	0	4	1	0	
6	4	2	6	2	0	

MTA: Mineral trioxide aggregate

Table 2: No. (percentage) of patients in the groups

Intensity	AH plus group (%)		MTA fillapex group (%)	
	24 h	48 h	24 h	48 h
No pain	0 (0)	11 (55)	7 (35)	15 (75)
pain	20 (100)	9 (45)	13 (65)	5 (25)

MTA: Mineral trioxide aggregate

Table 3: Pre-operative, 24 h and 48 h mean VAS score in two group

Groups	Pre-operative (total score)	24 h (total score)	48 h (total score)
AH plus	106	65	20
MTA Fillapex	99	30	7
<i>t</i>	0.82047	3.9457	2.09586
	<i>P</i> =0.2085	<i>P</i> =0.000166	0.021405

MTA: Mineral trioxide aggregate, VAS: Visual analog scale

of choice due to their ability to penetrate into dentinal tubule and the possibility of creating monoblocks between the root canal filling material and intraarticular dentin.^[10]

MTA Fillapex (Angelus, Londrina, Brazil) is a MTA-based, salicylate resin root canal sealer. It contains 13% MTA and salicylate resin. It has high radiopacity, low solubility, low expansion during setting, bactericidal property, biocompatibility, cementum regeneration with good sealing property. MTA Fillapex root canal sealer releases free calcium ions (Ca²⁺) which help in the healing process by stimulating tissue regeneration.^[10]

For the past 30 years, bioceramic-based sealers have only been available for use in endodontics, their rise to popularity in the fields of medicine and dentistry leading to the increased use of bioceramic technology. Bioceramics are ceramic materials which are designed specifically for medical and dental use. Bioceramics are ceramic materials that have been specifically developed for medical and dental use. They include alumina, zirconia, bioactive glass, glass ceramics, hydroxyapatite, and calcium phosphates.^[10] In *in vitro*, bioceramic materials have been shown to be less cytotoxic compared with resin-based AH plus. However, AH plus exhibited stronger bonding capacity and higher radiopacity compared bioceramic sealers. The clinical relevance of these features is still uncertain.^[5]

Resin-based AH Plus was mildly cytotoxic and released toxic monomers such as bisphenol A diglycidyl ether. Zhou *et al.* concluded that AH Plus was cytotoxic only as freshly mixed sealer and allowed growth of gingival fibroblasts on the surface of the set material.^[11] Benetti *et al.* conducted a study on cytotoxicity and biocompatibility on Sealer Plus BC, AH Plus, and MTA Fillapex. Based on the result of this study, MTA fillapex and AH plus caused minor cytotoxic effects toward L929 cells.^[12]

Graunaite *et al.* revealed that AH Plus sealer and Total Fill sealer have similar effect on the occurrence and intensity of postoperative pain in teeth after 24 h and 48 h.^[5] In the present study, after 48 h there was no significant difference in mean VAS score between MTA fillapex and AH plus. After 24 h, MTA fillapex was significantly better than AH plus. This may occur due to the release of biochemical mediators such as ROS.

Many clinician focus on drugs for pain management such as NSAID's along with antibiotics to prevent post-endodontic pain.^[13] Ates *et al.* in 2018 compared the postoperative pain after root canal treatment using a carrier-based obturation system and two different sealers. Based on the result of this study, they concluded that iRoot SP sealer (Bioceramic based sealer) was associated with less analgesic intake compared to AH Plus sealer (Resin based sealer).^[4]

Acc. To Paz (2018), single cone with Bioceramic root canal sealer referred post-endodontic pain more frequently than continuous wave with resin root canal sealer or Lateral condensation with resin root canal sealer. Single cone with Bioceramic root canal sealer also showed the highest percentage of moderate post-endodontic pain intensity felt during the 7 day evaluation period. Obturation technique may influence postoperative pain after single-visit root canal. This could be the probable reason for pain after 7 days.^[14]

There has been no study reported till date comparing the effect of AH plus sealer and MTA fillapex sealer

on post-operative pain after single-visit endodontics. Therefore furthermore studies are required in this field.

CONCLUSION

Within the limitation of this study, it can be concluded that post-operative pain associated with MTA fillapex sealer reduced after 24 h as compared to AH plus sealer. There was no difference in post-operative pain after 48 h.

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