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Original Research

Assessment of efficacy of three different root canal sealers used in root canal therapy: A comparative study

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ABSTRACT:
Aim: The present study was conducted for comparing the efficacy of three root canal sealers: AH Plus, MTA Fillapex, and Bio-C® Sealer. **Materials and methods:** Root canal sealers are essential components in endodontic therapy, significantly affecting both sealing efficacy and biocompatibility. This study involved thirty freshly extracted mandibular lateral incisors characterized by straight, single root canals. The prepared specimens were subsequently categorized into three groups, each comprising 10 teeth, for obturation with different sealers: Bio C Sealer, AH Plus, and MTA Fillapex. All sealers were mixed in accordance with the manufacturer's instructions. The specimens were then sectioned, and the sealing ability was assessed. Data analysis was performed using SPSS software, with the ANOVA test employed to determine the significance level. **Results: Conclusion:** Root canal sealers are essential in endodontic therapy, as they significantly affect both the sealing capacity and biocompatibility of the treatment. Notable variations were identified in the sealing effectiveness among AH Plus, MTA Fillapex, and Bio-C Sealers.
Keywords: Sealers, Root canal, biocompatibility

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INTRODUCTION

Endodontic sealers are essential for establishing a hermetic seal within the root canal system, effectively occluding the apical foramen and addressing any irregularities present between the dentinal walls and the core filling material. This sealing function is critical for preventing leakage, thereby reducing the likelihood of residual bacteria infiltrating periapical tissues and supporting the healing process of periapical lesions. As noted by Grossman, an optimal root canal sealer should exhibit robust sealing capabilities post-setting, dimensional stability, an extended setting time to allow for sufficient working duration, insolubility in tissue fluids, strong adhesion to canal walls, and biocompatibility.[1, 2]

Sealers fulfill various roles that enhance the efficacy of root canal therapies. They serve as binders, facilitating the adhesion of gutta percha cones to each other and to the dentinal walls during the lateral condensation obturation process, while also filling voids and correcting irregularities within the canal. Some sealers demonstrate bioactive properties, which can positively affect the host tissue response and promote healing, particularly those formulated with calcium hydroxide and mineral trioxide aggregate (MTA). Furthermore, they possess antibacterial characteristics that help manage bacterial proliferation and diminish the risk of infections following treatment. Additionally, sealers act as lubricants, easing the placement of obturation materials in the apical region and serving as diagnostic indicators for conditions such as root resorption, accessory canals, and fractures.[3, 4]

Epoxy resin-based root canal sealers, particularly those utilized in conjunction with gutta-percha, have been successfully implemented in clinical settings for an extended period, demonstrating satisfactory physical characteristics and biological efficacy. Notably, the AH series, with AH Plus (Dentsply, Konstanz, Germany) being its most recent version, stands out as the most commonly employed resin-based sealer. AH Plus exhibits commendable sealing

and adaptation properties; however, research suggests that its sealing performance may not achieve optimal standards, as it may not ensure complete sealing of the root canal system when paired with gutta-percha. In contrast, the Bio-C® Sealer (Angelus, Londrina, PR, Brazil) is a premixed calcium silicate-based sealer that contains a variety of compounds, including tricalcium silicate and zirconia oxide.[5, 6]The present study was conducted for comparing the efficacy of three root canal sealers: AH Plus, MTA Fillapex, and Bio-C® Sealer.

MATERIALS AND METHODS

Root canal sealers are essential components in endodontic therapy, significantly affecting both sealing efficacy and biocompatibility. The present study was conducted for comparing the efficacy of three root canal sealers: AH Plus, MTA Fillapex, and Bio-C® Sealer.This study involved thirty freshly extracted mandibular lateral incisors characterized by straight, single root canals. To maintain consistency, the teeth were decoronated to standardized lengths. The root canals were then prepared to the working length utilizing a size 60 K file, with thorough irrigation conducted throughout the process using a 2.5% sodium hypochlorite solution and normal saline. Following instrumentation, the smear layer was eliminated by treating the canals with a 17% ethylenediaminetetraacetic acid (EDTA) solution for one minute. The prepared specimens were subsequently categorized into three groups, each comprising 10 teeth, for obturation with different sealers: Bio C Sealer, AH Plus, and MTA Fillapex. All sealers were mixed in accordance with the manufacturer's instructions. The specimens were then sectioned, and the sealing ability was assessed. Data analysis was performed using SPSS software, with the ANOVA test employed to determine the significance level.

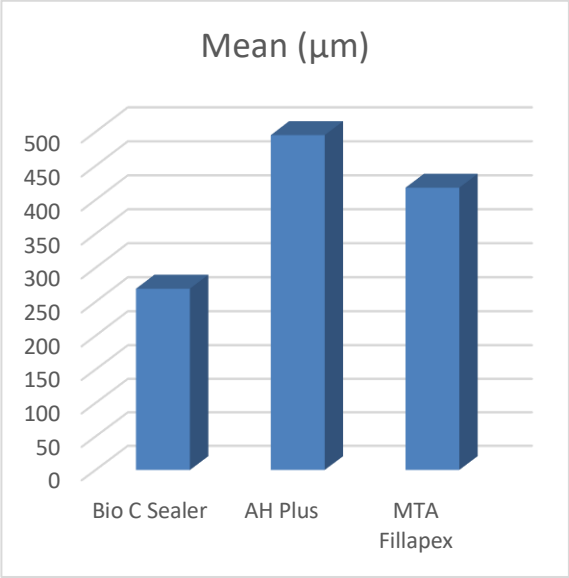
RESULTS

A total of 30 specimens were evaluated. All the specimens were randomly divided into three study groups with 10 specimens in each group. Mean sealing ability of Bio C Sealer, AH Plus and MTA Fillapex was 269.2 µm, 495.2 µm and 417.8 µm respectively. While comparing the sealing ability of all the sealers, significant results were obtained.

Table 1: Sealing ability of all three sealers

Sealer name	Mean (µm)	p- value
Bio C Sealer	269.2	0.001 (Significant)
AH Plus	495.2	
MTA Fillapex	417.8	

Graph 1: Sealing ability of all three sealers



DISCUSSION

The efficacy of endodontic treatment is contingent not only upon the thorough cleaning and shaping of the root canals but also on the sealing properties of the materials employed for canal obturation. The role of root canal sealers is pivotal in establishing a fluid-tight seal, which is critical for preventing leakage and minimizing the likelihood of bacterial reinfection in the periapical region. Among the various sealers available, epoxy resin-based sealers, mineral trioxide aggregate (MTA) sealers, and calcium silicate-based sealers each possess distinct characteristics that may influence their clinical effectiveness. This in vitro investigation seeks to compare three specific root canal sealers: AH Plus, MTA Fillapex, and Bio-C® Sealer, by assessing their sealing capabilities, flow properties, and dimensional stability. Gaining insights into the performance of these sealers is essential for improving endodontic results and assisting clinicians in the selection of the most suitable materials for root canal treatment.[7- 10]The present study was conducted for comparing the efficacy of three root canal sealers: AH Plus, MTA Fillapex, and Bio-C® Sealer.

A total of 30 specimens were evaluated. All the specimens were randomly divided into three study groups with 10 specimens in each group. Mean sealing ability of Bio C Sealer, AH Plus and MTA Fillapex was 269.2 µm, 495.2 µm and 417.8 µm respectively. While comparing the sealing ability of all the sealers, significant results were obtained. Mangat Pet al analyzed the antimicrobial activity of three different root canal sealers. The antimicrobial activity of three different root canal sealers were compared against two strains of bacteria Enterococcus faecalis which is known to be common isolates of necrotic pulp and endodontic lesions. This test was done at various time intervals (1, 6, 15, and 60 min) using agar diffusion test and direct contact test.Bioceramic showed the best antimicrobial activity

against E. faecalis among the three groups of sealers used. Moreover, the results were statistically analyzed.Bioceramic sealer showed the best antimicrobial activity followed by MTA Fillapex and Apexit.[11]Al-Ashou WMO et al evaluated the apical sealing ability of various types of sealers (Sure-Seal Root, AH Plus, and GuttaFlow2) at different levels of remaining gutta percha after post space preparation at two time intervals (1 day and 1 week after obturation).One hundred and two single canal mandibular premolars were decoronated at the cement–enamel junction and biomechanically prepared. Twelve samples served as negative and positive controls (n = 6). The remaining 90 samples were distributed into three groups (n = 30 each), based on the used sealer for obturation with gutta percha (Sure-Seal Root, AH Plus, GuttaFlow2). Each experimental group was divided into two subgroups (n = 15 each), subgroup I: post space prepared 1 day after obturation and subgroup II: post space prepared 1 week after obturation. For each subgroup, the post space was prepared to a length that remained 3, 4, or 5 mm of gutta percha apically for each of five samples. Sure-Seal Root sealer demonstrated the best apical seal compared with other tested sealers. Post space preparation 1 day after obturation exhibited less microleakage than the group with 1 week after obturation. Additionally, 5 mm of remaining gutta percha showed superior sealing value than 3 and 4 mm.Bioceramic (Sure-Seal) sealer is the material of choice to be used when post space preparation is required.[12]

CONCLUSION

Root canal sealers play a crucial role in endodontic treatment by influencing sealing ability and biocompatibility. Significant differences were observed between the sealing abilities of AH Plus, MTA Fillapex, and Bio-C Sealers. A thorough understanding of these sealers is essential for making informed clinical decisions.

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