Comparison of apical sealing ability of endodontic sealers at different storage times

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Abstract

the main object of this study is to test how well revelational sealers (IRoot sealer, MTA sealer, and glass ionomer sealer) can seal the apical part of roots using a single cone obturation procedure with the dye withdrawal method. Forty-five removed human mandibular premolar teeth with circular canals were decorated at a length of 13mm and instrumented with the Proteper rotary system up to apical file size F3 with 0.04 taper utilizing a crown down procedure. After that Three experimental groups (n=15) were arbitrarily chosen from prepared roots and obturated as a group (A) roots filled with I Root sealer and a single gutta-percha. Group(B) The roots were sealed with mineral trioxide aggregate (MTA) sealer and a single gutta-percha. Group(C) roots were sealed with a Glass ionomer (GIS) sealer and a single cone gutta-percha. methylene blue dye was used to assess the apical leakage and measured by a computerized spectrophotometer utilizing the dye removal procedure. measurements of the apical leakage were down at different times Interval., The data was evaluated utilizing the One Way ANOVA test.**Result** After evaluation periods, the results displayed that the groupA (I_Root sealer) had the lowest mean of dye leakage. Group B (MTA sealer), on the other hand, demonstrated an intermediate level of leakage. Group C had the greatest amount of leakage (GI sealer) with significant differences from the previous two groups about the time there was no significant difference statically in the means of the two groups one and two weeks.**Conclusion** I_Root sealer improved its ability to decrease the leakage of the obturated roots in comparison to the two others sealer while Glassinomer sealer can't improve apical protection to the root from leakage.

Keywords: Apical seal , endodontic sealers.

Introduction

The essential point of root obturation systems is to improve the hermetic seal, which reduces canal infection and contamination caused by fluid and microbe leakage. [1]. primary Root canal filling materials contain the following components: (gutta-percha) a core material that lodges in the main canal space, and a root canal sealer substance that seals the gap between the canal wall and the root dentin wall. [2] Endodontic sealers include zinc oxide eugenol, resin silicon, and others. Sealers are classified based on their composition. Various studies on the sealing properties of various sealers have been carried out in terms of sealing performance[3,4]. Numerous studies have shown that resin sealers outperform other sealants. [5,6]. Endodontic treatment with calcium-based sealers (MTA, I Root sealer) has recently been introduced. These sealers are antimicrobial and biocompatible, and they bind to dentinal tubules to improve sealing in the presence of dentine sealer interference. [7,8] preventing microleakage caused by voids or small crevices along the obturated canal

permitting bacteria to infiltrate and then re-grow As a result. The main purpose of root canal treatment is to offer a bacterial seal, which is achieved through a good obturation technique with a low void or gap formation at dentin sealer interference.[9,10]. The apical leakage test considers one of the most effective means for estimating obturation procedure quality, providing clinically and physiologically relevant data. [11,12,13]. Several methodologies have been utilized to evaluate apical leakage in endodontics, including bacterial penetration, fluid filtration, and dye infiltration strategies [14]. The dye withdrawal approach is widely used in endodontics because it provides a measurable result, simple to perform, and accounts for all absorbed dye in the specimens [15,16]. The goal of this study is to see how well IRoot sealer, MTA sealer, and glass ionomer seal can seal the apical of roots using a single cone obturation procedure with the ye withdrawal method.

Materials and Methodologies

forty-five single-rooted human mandibular first premolar teeth. All of the teeth were cleaned thoroughly and then checked for root fractures or apical cracks. To determine root canal morphology, each tooth was radiographed. The coronal portion of the teeth was then removed from cement-enamel junction with a disc to standardize the root length to 13 mm. The working length of the specimens was measured utilizing the 15-K file by subtracting 1mm from the root length Preparation of the Root Canal A rotary file system was used to prepare F3 canals (pro taperotary system). After each rotary file, each canal was irrigated with 2 ml 2.5 percent NaOCL using a disposable needle. After that, 5 mL of distilled water was used to flush thesystem[17].

All of the canals were dry using a paper point to size 40 and a 0.04 taper till obtained a dry paper point. Then After finishing the preparation procedure then the roots were varnished and the apical foremen were waxed.

Obturation & groups

Depending on the sealers applied, the specimens were divided into three experimental groups of 15 roots:

(Group A) Filling the Roots With single cone gutta-percha, I Root sealer (IBC, Canada) was employed.

Roots filled with MTA sealer and a single gutta-percha cone in Group B.

Roots filled with GIS sealer and a single gutta-percha cone in Group C.

The specimens were at that point secured in three layers of nail varnish, except the apical aperture, which was left uncoated.

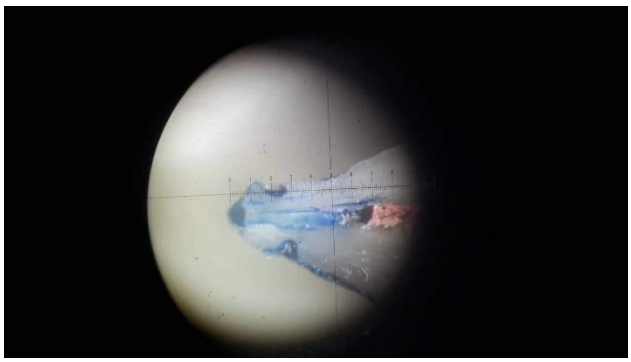
Application and Extraction of Dye

To evaluate the apical seal, 2 ml of 1% methylene blue dye was embedded into glass vial. Then the specimen was sealed in the vial with adhesive, and each vial was then flipped with the apical foramen directing upward to ensure that the dye had entirely covered the apical portion of the root. After that, the specimens were kept at room temperature(25°) for ten days. They were carefully removed and bathed under running water until the bottle was filled with clear water. The specimens were dried, and the nail polish was detached using a scalpel scratch. After that, the roots were placed for 48 hours in a glass test tube filled with 3.0 mL of 60 percent nitric acid solution. Standard solutions of 1% methylene blue in 60% nitric acid were made and kept in a dim filing cabinet at room temperature for 48 hours, Moradi S.[18]

Concentrations of Leaked Dye are measured based on each specimen. The absorbance of spilling color in nm was measured in a uniform volume of 2.0 ml of each sample solution using a spectrophotometer equipment photometric mode and 620 nm lambda as shown in the image(1).

The absorbance of each sample in each group was tested twice: once after seven days and again after fourteen days.

Image (1) shows the root during the measurement of leakage



Results

Group A showed the lowest apical leakage ability while MTA groups showed more leaking than group A but without significance differences, while groups C showed significant leaking ability in comparison to the previous group table 1 showed the result p valve 0.05

Table (1) comparison and p_ value between tested groups

Groups	N	Mean	SD	P
GroupA	15	1. 4407	. 34693	
GroupB	15	1. 4827	. 33146	
GroupC	15	5. 1200	. 49891	.000*

*Significant

Tukey post hoc test as a comparison between the tested groups shows significant differences between the sealing ability of roots filled with glass ionomer sealer and the other two groups as shown in table (2)

Tablet (2) Tukey post hoc within groups

Tukey	n	1	2
Gpa	15	1.4407	
SGpb	15	1.4827	
Gpc	15		5.1200

As a comparison of the tested groups at different times after one and two weeks, the result shows differences between the two times but there are no significant differences between them {p <0.05}.

Table (3) show difference Between groups at different times
but there are no significant differences between them {p <0.05}.

Table (3) show difference Between groups at different times

Group	Mean	sd	P value
1week	2.6811	1.78730	.148
2week	2.7371	1.78130	

Discussion

In root canal therapy, using a sealer is critical for improving the seal between the dentine and gutta-percha and preventing root canal system connection with periapical tissue. The consistency, setting features, flow, setting, and adhesion to root canals are all significant in achieving a tight seal and preventing failure.. [19] Inadequate obturation with a poor apical seal is one of the main causes of root canal treatment failure. As a result, this study was conducted to estimate and compare the sealing capacity of three sealer types. In comparison to other sealers, the I Root sealer has lower leakage values, Pawar SS et al. agree with our findings in their investigation. In addition, Ersahan S and Aydin C. confirmed decreased apical leakage values in I Root sealer in his work (hydrophilic sealer). These investigations' findings are consistent with ours. These findings could be attributed to Perfect sealing, as I Root does not shrink during the setting process, providing greater resistance to dye penetration than MTA with no significant difference and significant differences with the GIS group. Because of its inorganic mineral composition, effective sealing of the I Root group may be related to more stable dimensions. [20]. MTA has good biological characteristics but

does not bind to dentin or gutta-percha - percha[21,22] Another cause, according to Basturk FB et AL, is inadequate and/or non-homogeneous mixing of MTA, which can increase apical leakage.[23,24] Another cause, according to Basturk FB et AL, is a short working time during handling, which resulted in the appropriate coating of the canal wall during the other obturation procedure. MTA had less leakage than GIS group, and there were significant differences between the two other groups [25]. These findings concur with Koch et al. [26] and Muharsya et al. [23]but differ with Yavari et al [27] The GI sealer shows that there is higher leakage between groups. This could be owing to the GI sealer difficult handling, short working duration, and challenging control of the power liquid ratio [28,29] hydrophilic characteristics, micro-gaps, and/or porosities, all of which could impair the sealer's sealing ability and other physical qualities. It also tends to shrink throughout the setting process, which results in a loss of marginal integrity and leads to microleakage Divya KT.[30]

Conclusions

There are no materials that can eliminate apical leaking and microbial invasion. using I Root sealer decreasing the apical leaking tenancy due to its bioactivity reaction. More study is needed to provide the optimal clinical presentation of a single gutta-percha filling method using various sealer materials and times.

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