Research Article

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Comparative Analysis of Action of MTA and Calcium Hydroxide in Endodontic Treatment

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ABSTRACT

Background: Root canal treatment (RCT) is a common dental procedure to retain teeth with necrotic or infected pulps. Currently calcium hydroxide is often used as an intra-canal medication during root canal treatment. It has a pH of approximately 12.5, and it has antimicrobial activity, tissue-dissolving ability, inhibits tooth resorption and induces repair by hard tissue formation. **Aim of the study:** Tocompare analysis of action of MTA and calcium hydroxide in endodontic treatment.

Materials and methods: The present study was conducted in the Department of Endodontics of the Dental institution. For the study, we selected 50 human extracted single rooted teeth with completely formed apices and free from developmental anomaly and fractures. Hand scalers were used to clean the teeth surfaces and then they were soaked in 5.25% sodium hypochlorite for 4 hours. Teeth were randomly divided into two groups. In Group 1 calcium hydroxide sealer was used and in Group 2 MTA sealer was used. Radiographs were taken to ensure complete obturation. Teeth were stored at room temperature at 100% humidity for 1 week for sealers to set.

Results: In the present study, a total of 50 extracted teeth were used to compare calcium hydroxide and MTA. The number of maxillary lateral incisors was 18, mandibular central incisors were 13, mandibular premolar was 12 and maxillary lateral incisor was 7. It was observed that mean penetrability score was more in Group 2 as compared to Group 1. The results on comparison were found to be statistically significant.

Conclusion: Within the limitations of the present study, it can be concluded that MTA root canal sealer provides better sealing ability as compared to calcium hydroxide sealer. Further studies are recommended.

Keywords: Calcium hydroxide, MTA, root canal sealer, endodontic treatment.

INTRODUCTION

Root canal treatment (RCT) is a common dental procedure to retain teeth with necrotic or infected pulps. One of the most common clinical problems affecting the endodontically treated teeth is fracture, which can potentially lead to tooth extraction. [1] Loss of tooth structure due to reparation of the access cavity and caries removal, make these teeth more susceptible to fracture. [2] Irrigants, medicaments or root canal filling materials may also affect the mechanical properties of dentin and make it more fragile. [3] Some materials can cause dentin erosion and softening during

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endodontic treatment. These changes make the dentin and root structure more vulnerable to fracture. [4] Currently calcium hydroxide is often used as an intra-canal medication during root canal treatment. It has a pH of approximately 12.5, and it has antimicrobial activity, tissue-dissolving ability, inhibits tooth resorption and induces repair by hard tissue formation. It has been promoted for intra-canal placement for various endodontic conditions, including apexification, apexogenesis, after trauma to prevent or resolve external resorption, and with routine root canal treatment in infected canals. [5, 6]Hence, the present study was conductedto compare analysis of action of MTA and calcium hydroxide in endodontic treatment.

MATERIALS AND METHODS

The present study was conducted in the Department of Endodontics of the Dental institution. The ethical clearance for the study was approved from the ethical committee of the hospital. For the study, we selected 50 human extracted single rooted teeth with completely formed apices and free from developmental anomaly and fractures. Hand scalers were used to clean the teeth surfaces and then they were soaked in 5.25% sodium hypochlorite for 4 hours. After removing from NaOCl, teeth were stored in thymol crystals. Decoronation of the teeth were done and then they were embedded in alginate containing containers. Preparation of the root canals was done using endo access bur and K files. Standard wooden blocks were made and used for taking radiographs to maintain a standard protocol for all subjects. NiTi protaper rotary files were used for biomechanical preparation till size F2. Irrigation was done using 5.0% sodium hypochlorite and EDTA was kept in root canals for 4 minutes. This was followed by rinsing with saline. Drying of the canals was done using paper points. Teeth were randomly divided into two groups. In Group 1 calcium hydroxide sealer was used and in Group 2 MTA sealer was used. Radiographs were taken to ensure complete obturation. Teeth were stored at room temperature at 100% humidity for 1 week for sealers to set. Except for the apical 2 mm all the root surfaces were covered nail varnish. After applying sticky wax to varnish area, the teeth were stored in 2% methylene blue and then in an incubator for 72 hours. This was followed by rinsing of root with water and drying with paper towels. The splitting of the rootswas done longitudinally using a spoon excavator. The linear dye penetration was estimated from root apex to the most coronal level under Stereomicroscope.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

RESULTS

In the present study, a total of 50 extracted teeth were used to compare calcium hydroxide and MTA. The number of maxillary lateral incisors was 18, mandibular central incisors were 13, mandibular premolar was 12 and maxillary lateral incisor was 7. Table 2 shows mean penetrability score. It was observed that mean penetrability score was more in Group 2 as compared to Group 1. The results on comparison were found to be statistically significant ($p<0.05$) [Fig 2].

Table 1: Demographic details of the study.

Variable	Frequency
Maxillary lateral incisor	18
Mandibular central incisor	13
Mandibular premolar	12
Maxillary lateral incisor	7

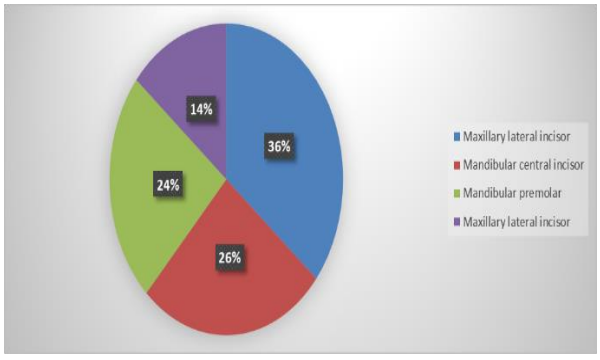
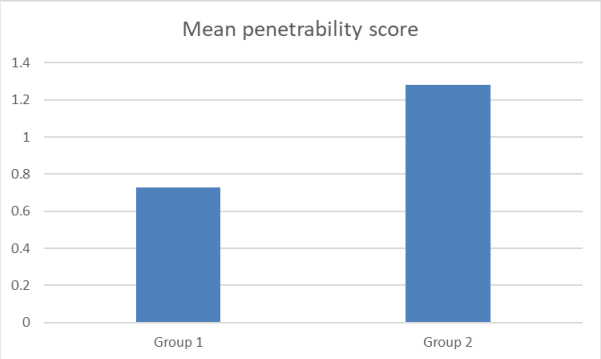


Fig 1: Demographic details

Table 2: Mean penetrability score

Groups	Mean penetrability score	p-value
Group 1	0.73±19	0.002
Group 2	1.28±0.22	

Fig 2: Mean penetrability score



DISCUSSION

Root canal treatment is an effective, less invasive and ideal treatment modality for pulpally involved tooth and salvaging it from extraction. Cleaning, shaping and three dimensional obturation of root canal system are essential steps in root canal treatment. The bacteria impervious seal that is essential for success is provided by the root canal sealer and obturation material. Innumerable root canal sealers are time tested with definitive success rates.[5, 6]In the present study, we observed that the mean penetrability of calcium hydroxide sealer is lower as compared to MTA sealer. Thus, MTA offers better sealing ability. The results of our study were statistically significant. The results were compared with previous studies and found to be consistent. Pradhan DP et al [7] compare mineral trioxide aggregate (MTA) and calcium hydroxide (Ca(OH)2) for their efficacies and time taken for formation of apical biological calcific barriers and resolution of periapical radiolucencies, if present at baseline, in teeth with unformed apices. Twenty nonvital permanent maxillary incisors with unformed apices, stratified according to the size of periapical radiolucencies and stage of root development, were equally allocated to MTA and Ca(OH)2 groups. In group 1 (MTA group), after 7 days of disinfection with Ca(OH)2, MTA was packed into the apical one third of the root canals and obturation with gutta percha (GP) was performed in 90% (9/10) of cases within 15 to 30 days. In group 2 (Ca(OH)2 group), obturation was performed following clinical and radiographic depiction of the apical stop. The mean time taken for apical biological barrier formation was 3 +/- 2.9 months for group 1 and 7 +/- 2.5 months for group 2. The periapical radiolucencies were resolved in 4.6 +/- 1.5 months for group 1 and 4.4 +/- 1.3 months for group 2. The total treatment was completed in 0.75 +/- 0.4859 months and 7 +/- 2.5 months for groups 1 and 2, respectively. They concluded that the 2 materials were found to be equally efficacious in the management of nonvital teeth with unformed apices. Li Z et al [8] compares the effectiveness of mineral trioxide aggregate (MTA) and calcium hydroxide (CH) as pulp capping materials in humans by means of a meta-analysis. They report that the MTA treatment groups showed a significantly higher success rate compared with CH-capped groups. MTA was superior to CH in terms of the absence of an inflammatory response as well as dentin bridge formation, with the OR being 4.56, respectively.

Moazami F et al [9] evaluated the effect of long-term application of CEM cement, MTA and CH on flexural strength of bovine dentin. Three hundred and twenty bovine dentin samples were divided into 4 groups, which were either exposed to CEM cement, CH, MTA or normal saline (control group). Samples of each group were divided into 4 subgroups which were tested by means of Instron Universal Testing Machine for periods of 7, 30, 180 and 365 days after exposure to the test materials. The mean value of forces to break the samples in CEM cement and CH groups was significantly lower than the control group after 1 month. After 180 days, the samples of CEM cement group retrieved their strength but in MTA and CH groups the time interval weakened the samples. After one year of exposure to CH and MTA, flexural strength of the dentin reduced to 72% and 38.7%, respectively. Yet the flexural strength of samples in CEM cement group did not change significantly compared to control group. Gomes-Filho JE et al [10] evaluated the apical sealability of Fillapex®, Endo-CPM-Sealer® and Sealapex®. Ninety-four freshly extracted single-rooted teeth were selected and decoronated. All teeth were radiographed to confirm the existence of a single and straight root canal, which was prepared using Protaper Universal and 2.5% sodium hypochlorite. The teeth were randomly divided in groups of 10 specimens each according to the sealer, and the canals were filled using the single cone technique and one of the sealers. Four additional teeth were used as controls. The teeth were submitted to dye leakage with Rhodamine B for 24 h but using vacuum on the initial 15 min. Thereafter, they were cut longitudinally and the leakage was measured in a linear fashion from apex to crown. They report

that Fillapex® and Sealapex® showed significantly less dye leakage than Endo-CPM-Sealer®. It was concluded that Fillapex® and Sealapex® were able to prevent apical dye leakage differently from Endo-CPM-Sealer®.

CONCLUSION

Within the limitations of the present study, it can be concluded that MTA root canal sealer provides better sealing ability as compared to calcium hydroxide sealer. Further studies are recommended.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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