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ORIGINAL RESEARCH

Sealing ability of mineral trioxide aggregate, biodentine with and without bioactive glass as furcation repair materials

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ABSTRACT

Background: Furcation repair materials in the past have included amalgam, gutta-percha, calcium hydroxide, and calcium sulfate. The present study was conducted to compare sealing ability of mineral trioxide aggregate, biodentine with and without bioactive glass as furcation repair materials. **Materials & Methods:** 60 extracted human maxillary molars which were decoronated 3 mm above the cementoenamel junction and 3 mm below it. The samples were then divided into 4 groups of 15 each, Group I: MTA, Group II: Biodentine, Group III: BG + Biodentine and Group IV: BG + MTA and the defect was treated with respective furcation repair material. **Results:** The mean spectrophotometric dye absorbance values in group I was 0.43, in group II was 0.57, in group III was 0.84 and in group IV was 0.72. The difference was significant ($P < 0.05$). **Conclusion:** The sealing ability of MTA was superior to that of Biodentine, whereas the sealing ability of BG with Biodentine was superior to that of BG with MTA.

Keywords: bioactive glass, Biodentine, mineral trioxide aggregate

INTRODUCTION

The physiological dentition protects the body from diseases. On the other hand, it also contains a variety of bacteria, which contributes to the development of diseases and the failure of treatment. Iatrogenic factors are the reason for endodontic accidents. Nonetheless, fixing these errors is essential to the procedure's success. One such accident is furcation perforation.[1]

Furcation repair materials in the past have included amalgam, gutta-percha, calcium hydroxide, and calcium sulfate.[2] These materials showed a few possible risk factors that could cause the periodontium to be destroyed. As furcation repair materials, some of these materials are no longer recommended. These days, the most often utilized materials for perforation repair include glass ionomer cement, mineral trioxide aggregate (MTA), biodentine, bioactive glass (BG), demineralized freeze-dried bone, tricalcium phosphate, and dentine chips.[3]

Furcation repair material advancements were primarily made to improve the material's ability to seal with the tooth structure, make it biocompatible to aid in the healing of the underlying periodontal tissue, control the repair material to prevent extrusion into the periodontal tissue, and have antibacterial properties. Furcation repair material should be radiopaque, promote mineralization and cementogenesis, promote healing and bone growth, and be easy to manipulate and apply.[4] Because of its exceptional qualities of marginal adaptation, sealing capacity, antimicrobial effects, biocompatibility, and bioactivity—all of which may promote the regeneration of periodontal tissue—MTA is one of the preferred materials for repairing furcation perforations.[5] The primary drawback of MTA is its delayed setting time, which reduces the adaptability of the drug and jeopardizes its initial setting time when in contact with oral fluids.[6]Biodentine is a calcium silicate-based material with a polycarboxylate-based hydrosoluble polymer system described as a water-reducing agent, reducing the mix's overall water content, along with calcium chloride asthe setting accelerator.[7]The present study was conducted to compare sealing ability of mineral trioxide aggregate, biodentine with and without bioactive glass as furcation repair materials.

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MATERIALS & METHODS

The present invitro study comprised of 60 extracted human maxillary molars which were decoronated 3 mm above the cementoenamel junction and 3 mm below it. The samples were then divided into 4 groups of 15 each, Group I: MTA, Group II: Biodentine, Group III: BG + Biodentine and Group IV: BG + MTA and the defect was treated with respective furcation repair material. All the samples were then immersed in 2% methylene blue solution for 24 h and later stored in 65% nitric acid solution. The solution obtained was subjected to centrifuge at 3500 rpm for 5 min. From this solution, 100 µl of the supernatant was collected, analyzed in UV spectrophotometer at 550 nm with nitric acid as the blank and readings were recorded as absorbance units. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of samples

Groups	Group I	Group II	Group III	Group IV
Materials	MTA	Biodentine	BG + Biodentine	BG + MTA
No.	15	15	15	15

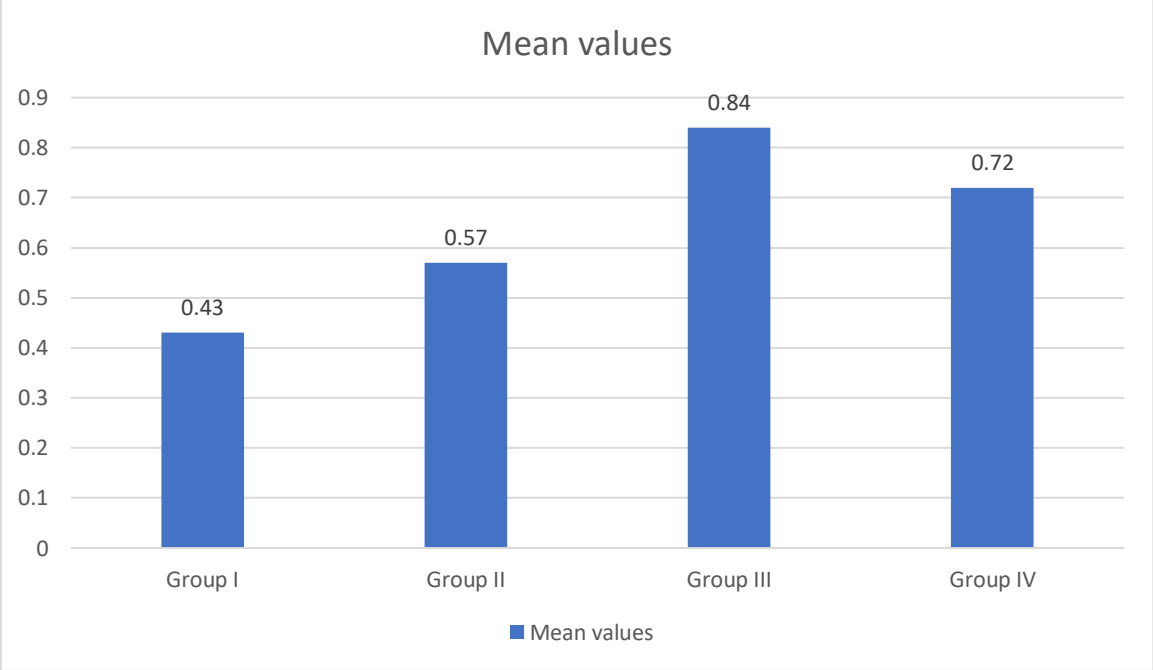
Table I shows distribution of samples. Each group had 15 samples.

Table II Spectrophotometric dye absorbance values

Groups	Mean values	P value
Group I	0.43	0.04
Group II	0.57	
Group III	0.84	
Group IV	0.72	

Table II, graph I shows that mean spectrophotometric dye absorbance values in group I was 0.43, in group II was 0.57, in group III was 0.84 and in group IV was 0.72. The difference was significant (P< 0.05).

Graph I Spectrophotometric dye absorbance values



DISCUSSION

BG is a possibly novel dental repair material that was first used as a root-end filling. SiO2, CaO5, Na2O, and P2O5 make up BG, a kind of bioactive ceramic.[8,9] For many endodontic procedures, it works effectively as a repair material. BG offers good handling and operating qualities, as well as sufficient strength and load-bearing capacity.[10,11] It sets more quickly—about 15 minutes—tolerates damp environments well, has strong marginal adaptability, and has minimal cytotoxicity that is on par with MTA.[12,13]The present study was conducted to compare sealing ability of mineral trioxide aggregate, biodentine with and without bioactive glass as furcation repair materials.

We found that mean spectrophotometric dye absorbance values in group I was 0.43, in group II was 0.57, in group III was 0.84 and in group IV was 0.72. Kamal et al[14]evaluated the sealing ability of mineral trioxide aggregate (MTA), Biodentine with and without Bioactive glass (BG) as furcation repair

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materials by ultraviolet (UV) spectrophotometric analysis. All four groups exhibited a significant difference in dye absorbance values ($P < 0.01$). Group I, i.e., MTA showed the least dye absorbance values when compared with the other three groups. MTA had superior sealing ability than Biodentine, whereas BG + Biodentine showed better sealing ability when compared with BG + MTA.

Katge et al[15]compared sealing ability of mineral trioxide aggregate (MTA) Plus™ and Biodentine™ for the repair of furcal perforation in primary molars using spectrophotometry.Access opening was done for all ninety extracted teeth. Perforation was made in furcation area in all the teeth. The sample size consisted of ninety extracted teeth. They were divided into four groups, Group 1 (n = 30) in which perforations were repaired with MTA Plus™, Group 2 (n = 30) in which perforations were repaired with Biodentine™. The other two groups were considered as control groups, Group 3 (n = 15) in which perforations were left unsealed (positive control) and Group 4 (n = 15) without perforations (negative control). Dye extraction method was used to compare the sealing ability of MTA Plus™ and Biodentine™. The highest dye absorbance was seen in the positive control group with a mean value of 0.080 ± 0.033. The mean value of MTA Plus™ was 0.031 ± 0.026 and Biodentine™ was 0.024 ± 0.031.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that the sealing ability of MTA was superior to that of Biodentine, whereas the sealing ability of BG with Biodentine was superior to that of BG with MTA.

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