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Comparison of Different Types of Barriers Used in Non-Vital Bleaching: A Retrospective Study

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ABSTRACT

Introduction: Despite these excellent properties, GIC(Glass ionomer cements) also possesses several undesirable characteristics such as long setting time, difficulties in manipulation and insertion, high costs, and potential of discoloration. In order to overcome these limitations, various alternative formulations have been developed.

Aim: To compare and evaluate the root reinforcement potential of four different intraorifice barriers: resin-modified glass ionomer cement (RMGIC), and Glass ionomer cements, (GIC)

Materials and Methods: The treatment records of patients who had undergone treatment in Saveetha Dental College between 2019 to 2021 were assessed for this study. The extracted data was tabulated in a spreadsheet (Excel 2017: Microsoft Office) and analysed using SPSS 19.0 version software (SPSS, Inc., Chicago). Descriptive statistics and chi-square tests were performed with the level of significance at 5% (P<0.05).

Conclusion: Future development of the conventional bleaching agents by the addition of radical scavengers such as thiocarbamide or using sodium per carbonate is promising in terms of minimal penetration of hydrogen into the periodontal space.

Key words: Endodontically treated teeth, Intra orifice barrier, Nanohybrid composite, Reinforcement

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INTRODUCTION

The most common causes of dental discoloration are trauma, drugs, several genetic defects, decay, and also age. So to correct the discoloration of teeth with no pulp or damaged/necrosed pulp, internal bleaching is recommended. We can compare microleakage of several materials that are used for this purpose of bleaching such as resin modified glass ionomer and OrthoMTA used as an intraorifice barrier in non-vital bleaching [1].

Recent scientific progression has shown some evidence that the pH at the root surface is reduced due to intracoronal placement of bleaching pastes, which is actually enhancing osteoclastic activity. Hence, it is suggested that a protective barrier must be used over the canal filling to prevent leakage of the bleaching agents [2,3].

Traumatic injury to the anterior tooth is one of the main causes that mostly result in a non-vital tooth with discoloration. In the present era of aesthetic dentistry, bleaching of discolored teeth either vital or non-vital, has become popular [4]. It is considered a conservative clinical approach, where a chemical or bleaching agent is applied to the surface or the interior of the tooth. Non-vital or internal tooth-bleaching is used to lighten a discolored tooth that previously received root canal therapy [5].

Today's market offers a variety of bleaching agents for tooth-whitening. Of these, sodium perborate, also called perboric acid, is the most trusted among dentists for use as an internal bleaching agent, due to excellent results and its respect for the periodontal tissues. "Walking bleach" technique, an internal bleaching procedure can be used for whitening of discolored root-filled teeth, which is mostly used among dental practitioners with good aesthetic results, safe and has good prognosis [6,7].

It is critical to maintain a coronal seal to prevent micro leakage into the canal space. The degree to which

different temporary restorative materials are capable of establishing and maintaining a good coronal seal is questionable. Webber et al. reported that the sealing ability of temporary fillings decreased over time [6]. He showed that the least discoloration was seen in the control group with distilled water and that these tooth discolorations occurred even though the sealer does not penetrate into the dentinal tubules. Tooth discoloration following sealer application showed an increasing progression over twelve months in an in vitro trial.

Realizing this, permanent restorative materials (glass ionomer or composite resin) were placed as an additional layer beneath these intermediate restorative materials to seal the pulp chamber floor [6,8]. However, the pulp chamber often lacks adequate retention to prevent the dislodgement of the restorative material. It may be due to loss of depth due to caries or fracture of the coronal tooth structure [9].

A case report showed results about discoloration of hard dental tissues after the application of white MTA, so even with white MTA, discoloration occurs due to the iron oxidation process (tetracalcium aluminum ferrite) [10]. Although mineral trioxide aggregate (MTA) portrays very high biocompatibility, this material can very much lead to undesirable tooth discolorations in the aesthetic region of the dentition [6,10]. Depending on the situation, the walking bleach technique can be a less complicated methodology for both patients and dentists. In-office bleaching can mostly only produce short-term prognosis, majorly depending on the dehydration of the tooth. The risk of root resorption cannot be exactly determined [11]. Like this various studies have been done in our institutions [12–-31]. The purpose of this study was to compare different types of barriers used in non-vital bleaching.

MATERIALS AND METHOD

This is a retrospective study, conducted in a university setting. The study was approved by the institutional ethical committee. The ethical clearance for the study was obtained from the Institutional Scientific Review Board. The treatment records of patients who had undergone treatment in Saveetha Dental college between 2019 to 2021 were assessed for this study. 104 patients underwent non-vital leaching. Cross checking of data including digital entry and intraoral photographs was done by an additional reviewer, and as a measure to minimize sampling bias, samples for the group were picked by the simple random sampling method. Digital entry of clinical examination and intraoral photographs were assessed. The extracted data was tabulated in a spreadsheet (Excel 2017: Microsoft Office) and analysed using SPSS 19.0 version software (SPSS, Inc., Chicago). Descriptive statistics and chi-square tests were performed with the level of significance at 5% (P<0.05).

RESULTS

Majority of the patients had used GIC as the barrier. 14.79% had used GIC as a barrier in the age group 10-21. 60.56% had used GIC as a barrier in the age group 22-35. 14.08% had used GIC as a barrier in the age group 36-55, p value was found to be <0.05 resulting in GIC being commonly used as a gingival barrier in non-vital bleaching procedure (Figure 1). Majority of the patients had used GIC as the barrier. 24.65% of females used GIC as barrier in non-vital bleaching. 64.79% of male had used GIC as a barrier in non-vital bleaching, p value was found to be <0.05 resulting in GIC was commonly used as a gingival barrier in non-vital bleaching procedure (Figure 2).

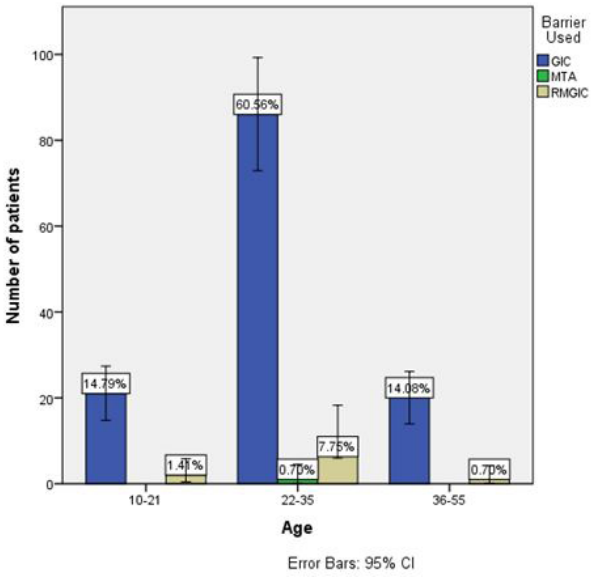

Figure 1: Bar graph represents association between age and barrier used in Non-vital bleaching. Majority of the patients had used GIC as the barrier. 14.79% had used GIC as a barrier in the age group 10-21. 60.56% had used GIC as a barrier in the age group 22-35. 14.08% had used GIC as a barrier in the age group 36-55,p value was found to be <0.05 resulting in GIC was commonly used as a gingival barrier in non-vital bleaching procedure.

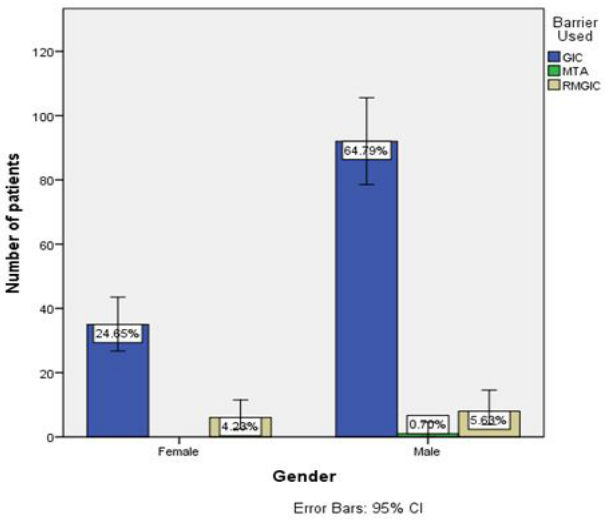

Figure 2: Bar graph represents association between Gender and barrier used in Non-vital bleaching; Majority of the patients had used GIC as the barrier. 24.65% of females used GIC as barrier in non-vital bleaching. 64.79% of male had used GIC as a barrier in non-vital bleaching. P value was found to be <0.05 resulting in GIC was commonly used as a gingival barrier in non-vital bleaching procedure.

DISCUSSION

Much of the fracture susceptibility of endodontically treated teeth is intrinsic to the root canal morphology, dentin thickness, canal shape, and size and curvature of the external root; thus, special attention should be given for securing sufficient remaining dentin. However, enlargement of the coronal third of the root canal space is considered important to support root canal length measurement, debris removal, effective irrigation, and canal obturation [32].

Our results show that the highest age group among which non-vital bleaching was required by patients was between 15-25 years was 50 % and the least among the age group between 36-55 was 13.46 %. The management of dental trauma to immature permanent teeth in young children can be challenging. As a result of dental trauma, these teeth may become non-vital, which leads to arrested root development Root-canal treatment at this time is a significant challenge.

In our results, when the association between Gender and barrier used in non-vital bleaching was done, the majority of the patients were males who had used GIC as the barrier. 24.65% of females used GIC as barrier in non-vital bleaching. 64.79% of male had used GIC as a barrier in non-vital bleaching. Fragile dentin walls and the large open apex. Apexification has long been the treatment of choice, enjoying considerable success in preserving traumatized nonvital immature teeth.Ca (OH)2 has been the material most frequently used to induce the formation of a calcified apical barrier in teeth with non-vital immature apices [33].

In our study, 60.56% of the majority of patients had used GIC as a barrier in the age group 22-35 and the least used material among the same age group was 0.7% MTA. This shows that the durability and preference was more for GIC among a larger group.

MTA provides a superior seal against microleakage when used as an intracanal medicament. Nagas et al. results of study also showed the lowest values for fracture resistance for MTA among all the tested groups [34].

Recently, a new calcium silicate-based bio ceramic material, Bio Aggregate, has been introduced with the intention of preserving the properties and clinical applications of MTA without its negative characteristics. Bio Aggregate is composed of tricalcium silicate, dicalcium silicate, tantalum pent oxide, calcium phosphate monobasic, hydroxyapatite, and amorphous silicon dioxide

There are different options to treat discolored teeth such as restorative procedures, veneers and crowns. Actually, bleaching of non-vital teeth is a routine conservative approach to have a suitable esthetic result for endodontically treated teeth. Various methods to bleach non-vital teeth have been proposed [35,36]. Various materials have been used to achieve a coronal seal like cavit, intermediate restorative material, GIC, zinc oxide eugenol cement, resin modified GIC, compomer, composites and recently MTA. Each of these materials has their own benefits and limitations [37].

Analyzing the results in the present study, it has been observed that there was a statistically significant difference found among the groups tested. At this point, it would be interesting to compare the results obtained in the study with the results obtained in previous studies using these materials. There are very few studies available at present using the above materials as coronal sealants. The results of the study were compared with various other leakage studies using these materials, either alone or in combination [38,39]. Research in further laboratory study with different materials coupled with clinical trials is is important in future.

CONCLUSION

External bleaching of endodontically treated teeth using an in-office technique requires a very increased concentration gel. It might act as a complementing factor to the walking bleach technique, if the results are not satisfactory after 3–4 visits. As there have been known diagnosed discoloration of hard dental tissues after the application of white MTA, even with white MTA, discoloration occurs due to the iron oxidation process (tetra calcium aluminum ferrite). Therefore, it is important to always be aware of the possible complications and risks that are associated with the different bleaching techniques.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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