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Evaluation of Microleakage Beneath Orthodontic Molar Bands Cemented With Resin-Modified Glass Ionomer Using Two Enamel Deproteinization Agents

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ABSTRACT

Objective: The aim of this study was to evaluate the microleakage beneath orthodontic bands cemented with resin-modified glass ionomer (RMGI), following enamel treatment with two different deproteinizing agents in comparison to a control group.

Materials and Methods: Thirty-six human third molars were used for this cross-sectional study. The samples were randomly divided into three equal groups of 12. The method of band cementation in each group was as follows: Group I (6% bromelain enzyme as deproteinizer + GC Fuji plus Conditioner + GC Fuji Plus Glass ionomer), Group II (chlorhexidine [CHX] as deproteinizer + GC Fuji Plus Conditioner + Glass ionomer), and Group III (GC Fuji Plus conditioner + GC fuji plus Glass ionomer) as the control group. All samples were sealed and dyed with methylene blue and then exposed to thermocycling. The samples were sectioned and prepared for microleakage evaluation at both occlusal and gingival sides for the enamel–cement interface margins. A stereomicroscope was used to evaluate the amount of dye penetration as the microleakage. Comparison of the microleakage values among the groups was done using the Kruskal–Wallis and Mann–Whitney *U* test as the post hoc test.

Results: The 6% bromelain enzyme deproteinization showed the least amount of microleakage at both occlusal and CEJ sides of the bands ($p < 0.05$). Group II also showed a better microleakage value at the gingival side in comparison to the control group ($p < 0.05$).

Conclusion: This study revealed that the pretreatment of enamel with 6% bromelain enzyme significantly reduced the microleakage beneath orthodontic bands cemented with RMGI cement (RMGIC). Improved marginal sealing by 6% bromelain enzyme was significant compared with that of the CHX pretreatment and untreated enamel surfaces.

1 | Introduction

The term white spot lesion is defined as the first sign of a caries lesion on the enamel that can be detected with the naked eye and presents itself as a milky white opacity, which is located on smooth surfaces [1]. Enamel demineralization and white spot lesions are

undesirable, but they are common complications of orthodontic fixed appliance therapy, especially when oral hygiene is poor [2]. Moreover, after orthodontic fixed appliances are attached intraorally, there is a rapid shift in the bacterial flora of the dental plaque. In orthodontic patients, higher bacterial concentrations

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The decrease in the mechanical properties of adhesives may be caused by the presence of oxygen after disintegrating NaOCl into NaCl and O₂. Release of oxygen during polymerization might inhibit the process [40].

The results of the present study bring new perspectives while considering band cementation during fixed orthodontic treatments. Deproteinization led to a decrease in the microleakage, which would increase the retention of bands, especially under heavy forces such as those applied with headgear. Although we know that proper band selection is the key to successful banding in orthodontics, enamel pretreatments can also be helpful. However, this study had some limitations, such as the small sample size and lack of long-term evaluation since this was an in vitro and cross-sectional study. As a result, further clinical evaluations are necessary to enable a comprehensive understanding of the mechanisms by which deproteinizing agents act.

Another limitation of the present study is the absence of a conventional GIC control group. Including classic GIC—with and without thermo-curing—could have provided a more comprehensive comparison, as conventional GICs have been shown to exhibit superior marginal sealing and lower microleakage compared to RMGICs [39]. Future investigations should include these materials to further validate the performance of deproteinizing agents with various cement types.

5 | Conclusion

This study revealed that the pretreatment of enamel with 6% bromelain enzyme significantly reduced the microleakage beneath orthodontic bands cemented with RMGIC. Improved marginal sealing by 6% bromelain enzyme was significant compared with that of the CHX pretreatment and untreated enamel surfaces.

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Ethics Statement

Ethical approval for this study was provided by the ethics committee of Shiraz University of Medical Sciences, Shiraz, on February 13, 2018, with the code of IR.SUMS.REC.1397.653.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available upon request from the corresponding author.

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