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ORIGINAL RESEARCH

CPPACPF & β- TCP in controlling dental erosion-An in vitro study

Nikita Sood,

Endodontist, Private consultant, Chandigarh, India

ABSTRACT:
Background: The present study was conducted to determine resisting ability of remineralizing agents against acids on tooth enamel. **Materials & Methods:** The present in vitro study was conducted on 20 extracted mandibular molars. Different sections such as buccal, lingual, mesial and distal surfaces of molars were obtained. In group I, specimens were treated with CPPACPF and in group II specimens were treated with β- TCP. All specimens were treated for 4 minutes twice daily for 28 consecutive days, 12 hours apart; were rinsed after each application and then replaced in artificial saliva. Specimens were subjected to EDAX analysis at the end of 28 days, to obtain quantitative elemental composition. **Results:** Ca/P ratio post-remineralization in group I was 1.36 and in group II was 1.61. The difference was significant (P< 0.05). Ca/P ratio post- demineralization in group I was 1.21 and in group II was 1.34. The difference was significant (P< 0.05). **Conclusion:** Authors found that β-TCP is more effective than CPPACPF in remineralization. Thus this agent may be used in protecting enamel surface from harmful dimineralizing agents.
Key words: CPPACPF, β-TCP, Remineralizing.

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Corresponding Author: Dr. Nikita Sood, Endodontist, Private consultant, Chandigarh, India

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INTRODUCTION

Erosive tooth wear is becoming an increasingly important factor when considering the long-term health of the dentition. There is some evidence that the occurrence of this condition is steadily increasing. Dental erosion is a multifactorial condition.[1]The interplay of chemical, biological and behavioral factors is crucial and helps to explain why some individuals exhibit more erosion than others. The erosive potential of erosive agents, including acidic drinks or foodstuffs, depends on chemical factors (for example, pH, mineral content and on its calcium-chelation properties).

Biological factors, such as saliva, acquired pellicle, tooth structure and positioning in relation to soft tissues and tongue, are related to the pathogenesis of dental erosion.[2] Dental erosions are caused by acid dissolution of tooth surface without bacterial involvement. The process is also termed demineralization and may be caused by extrinsic or intrinsic agents. Extrinsic agents causing dental erosions are of greater importance to dental healthcare community as these account for this morbidity for the most part. Primary extrinsic causal agents have been identified as dietary acids from foodstuff, beverages and snacks, the consumption ofwhich is increasing at an ever faster pace. It has been reported that dietary acids are the most important extrinsic factor. In essence, these are a present day health hazard associated with modern lifestyle.[3]

Fluoride and mineral synergistic products having anti-erosive properties such as fluoride-enriched casein phosphor-peptide-amorphous calcium phosphate (CPPACPF) and β-tricalcium phosphate have been introduced as improved agents for dental enamel remineralization.[4] The present study was conducted to determine resisting ability of remineralizing agents against acids on tooth enamel.

MATERIALS & METHODS

The present in vitro study was conducted in the department of Endodontics. It comprised of 20 extracted mandibular

molars. Ethical approval was obtained from institute prior to the study.
Different sections such as buccal, lingual, mesial and distal surfaces of molars were obtained.
A small 3x3mm segment of modelling wax was placed at the centre of the external surface of all enamel sections and the remaining area was coated with acid resistant nail varnish. The teeth samples were divided in 2 groups of 10 each.

In group I, specimens were treated with CPPACPF and in group II specimens were treated with β- TCP. All specimens were treated for 4 minutes twice daily for 28 consecutive days, 12 hours apart; were rinsed after each application and then replaced in artificial saliva. Specimens were again subjected to EDAX analysis at the end of 28 days, to obtain quantitative elemental composition. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I	Group II
Agent	CPPACPF	β- TCP
Number	20	20

Table I shows that in group I, specimens were treated with CPPACPF and in group II specimens were treated with β- TCP. Each group had 20 specimens each.

Table II: Comparison of Ca/P ratio post-remineralization

Ca/P ratio	Group I	Group II	P value
Mean value	1.36	1.61	0.01

Table II, graph I shows that Ca/P ratio post-remineralization in group I was 1.36 and in group II was 1.61. The difference was significant (P< 0.05).

Graph I: Comparison of Ca/P ratio post-remineralization

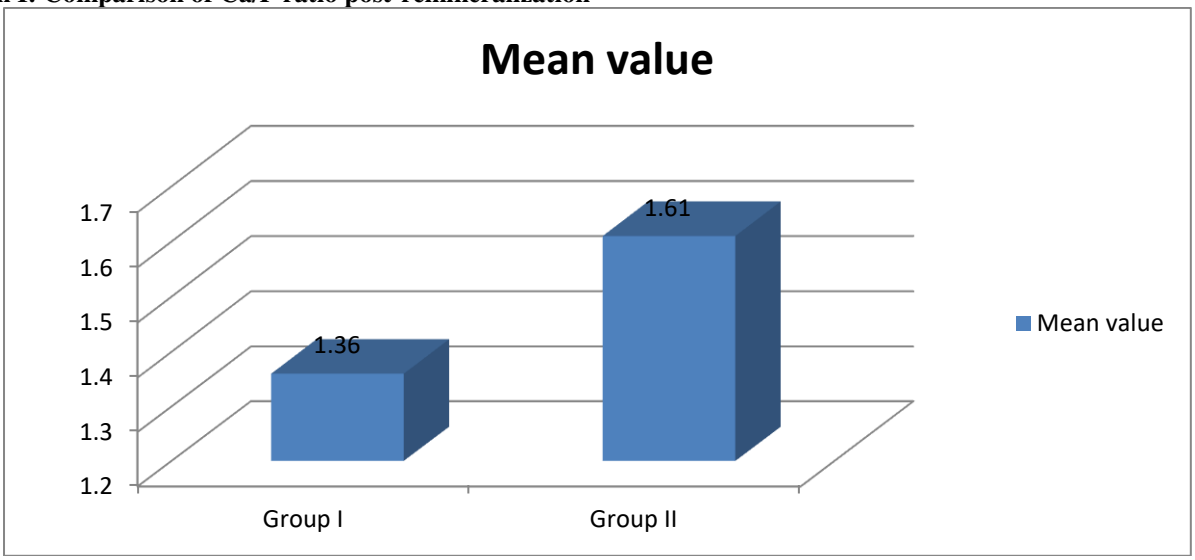
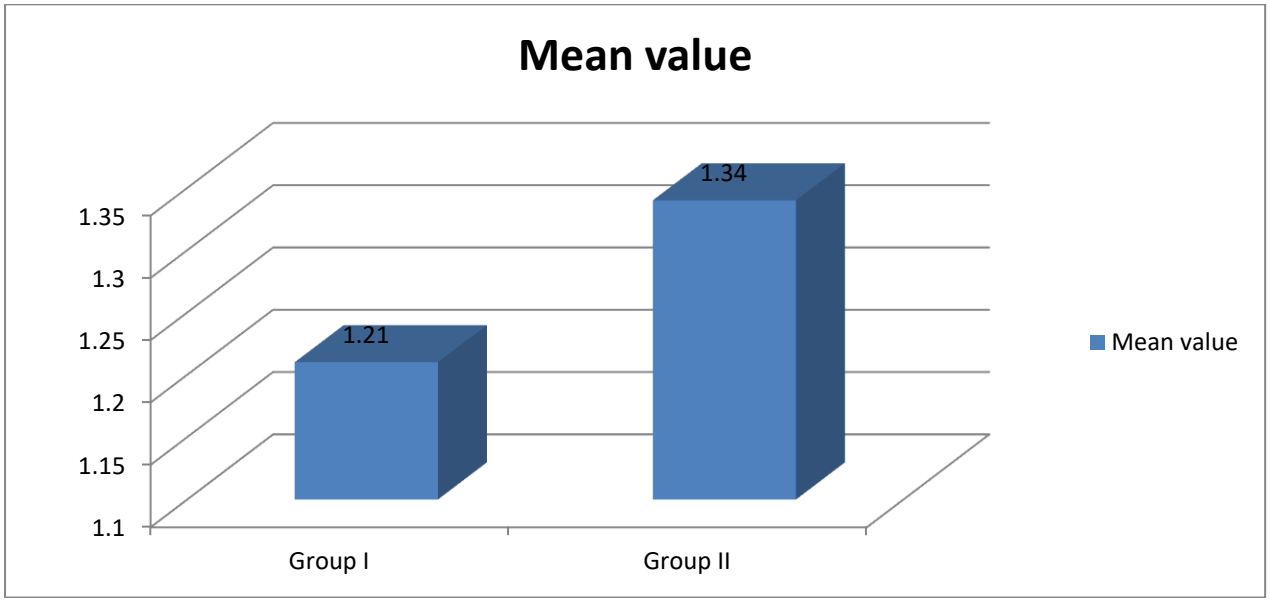


Table III Comparison of Ca/P ratio de- mineralization

Ca/P ratio	Group I	Group II	P value
Mean value	1.21	1.34	0.01

Table II, graph I shows that Ca/P ratio post- demineralization in group I was 1.21 and in group II was 1.34. The difference was significant (P< 0.05).

Graph I: Comparison of Ca/P ratio de- mineralization



DISCUSSION

Dental erosion is the loss of dental hard tissue due to various factors including acids, eating disorders and gastroesophageal reflux. They can lead to loss of occlusal morphology and pulp exposure in more severe cases.[5]It is very important to identify the factors which cause the establishment of dental erosion in order to prevent enamel demineralization in the initial stage which is followed by tissue softening and the final loss of tooth structure. In a normal physiologic environment, the hydroxyapatite crystals of enamel are in a dynamic equilibrium with calcium and phosphate ions. Dental erosion is a localized loss of tooth surface by a chemical process of acidic dissolution without the involvement of bacteria. Demineralization caused by acidic environment is reversible if there are sufficient bioavailable calcium and phosphate ions in the immediate vicinity.[6]

Dental erosion has increased its prevalence in our society, mainly due to a high in- take of foods and drinks containing acids. Consequently, it has become a very important issue in the dental field because of its serious impact on teeth. Therefore, it is fundamental to identify both extrinsic and intrinsic etiologic agents which accompany it. That way, it is possible to make a reliable diagnosis and carry out the indicated therapy according to the case; taking into account the effects produced by the erosion on dental materials with the objective of selecting the best restorative material.[7]The present study was conducted to determine resisting ability of remineralizing agents on tooth enamel.

In this study, in group I, specimens were treated with CPPACPF and in group II specimens were treated with β-TCP. We observed that Ca/P ratio post-remineralization in group I was 1.36 and in group II was 1.61. β-TCP is a hybrid material formed by fusion of tricalcium phosphate and sodium lauryl sulphate. This blending results in weakly bonded calcium and a 'free' phosphate, designed to increase the efficiency of fluoride remineralization. β-TCP is also similar to hydroxyapatite structure and possesses unique calcium characteristics capable of reacting with fluoride and enamel.[8]

Casein phosphopeptide-amorphous calcium phosphate is a nanocomplex derived from bovine milk protein, casein. The CPP–ACP preparations have also been reported to significantly remineralize enamel subsurface lesions in vitro. CPP binds to nanoclusters of ACP through multiple phosphoseryl residues, preventing their growth to the critical size required for nucleation and phase transformation.[9]

We found that Ca/P ratio post- demineralization in group I was 1.21 and in group II was 1.34. Sharmaet al[10] in their in-vitro study of remineralization potential of CPP-ACPF and β-TCP was evaluated on human enamel sections with one control group (Gp I) and two experimental groups (Gp II and III, n=15 in all three groups). Both agents resulted in remineralization and protection against acid demineralization. β-TCP was found to provide better remineralization and protection from acid attack than CPP-ACPF. The difference in both findings was statistically significant.

Robert et al[11] stated that the process of remineralization involves diffusion of calcium and phosphate ions through the protein/water filled pores of the carious enamel surface into the body of the enamel lesion. Once in the body of the enamel lesion, these calcium and phosphate species increase the activities of Ca^{2+} and PO_4^{3}-, thus increasing the degree of saturation with hydroxyapatite.

CONCLUSION

Authors found that β-TCP is more effective than CPPACPF in remineralization. Thus this agent may be used in protecting enamel surface from harmful dimineralizing agents.

REFERENCES

1. EC Reynolds. Calcium phosphate-based remineralization systems: scientific evidence? Australian Dental Journal 2008;53:268–273.
2. Robert L. Karlinsey, Allen C. Mackey, Emily R. Walker, Katherine E. Frederick. Preparation, characterization and in vitro efficacy of an acid modified β-TCP material for dental hard-tissue remineralization. ActaBiomaterialia 2010;6:969–978.
3. R.L. Karlinsey, A.M. Pfarrer. Fluoride Plus Functionalized β-TCP: a Promising Combination for Robust Remineralization. Adv Dent Res 2012;24(2).
4. Namrata Patil, Shantanu Choudhari, Sadanand Kulkarni1, Saurabh R Joshi. Comparative evaluation of remineralizing potential of three agents on artificially demineralized human enamel: An in vitro study. Journal of Conservative Dentistry 2013;16(2).
5. F.C. RehderNeto, F.A. Maeda, C.P. Turssi, M.C. Serra. Potential agents to control enamel caries-like lesions. Journal of dentistry 2009;37:786-790.
6. B. Willershausen, B. Schulz-Dobrick. In vitro study on dental erosion provoked by various beverages using Electron probe microanalysis. Eur J Med Res 2004;9:432-438.
7. M.E. Barboura,b, J.S. Rees. The laboratory assessment of enamel erosion: a review. Journal of Dentistry 2004;32:591.
8. Praphasri Rirattanapong et al. Effect of various forms of calcium in dental products on human enamel microhardness in vitro. South East Asian J Trop Med Public Health 2012;43(4).
9. Cai F et al. Effect of addition of citric acid and casein phosphopeptide-amorphous calcium phosphate to a sugarfree chewing gum on enamel remineralization in situ. Caries Res 2007;41(5):377-83.
10. Sharma A, Patel C, Mandlik J. Comparative evaluation of two remineralizing agents in limiting dental erosion. Ind J Conserv Endod, 2016;1(3):86-92.
11. Robert L. Karlinsey et al. In vitro evaluation of eroded enamel treated with fluoride and a prospective tricalcium phosphate agent. Journal of Dentistry and Oral Hygiene 2009;1(4):52-58.