

POLARIZED LIGHT MICROSCOPIC EVALUATION OF BIOACTIVE PIT AND FISSURE SEALANT ON DEMINERALIZED ENAMEL OF PERMANENT MOLARS (IN-VITRO STUDY)

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INTRODUCTION

Sealants are proven efficacious in carious lesion prevention and arrest on the occlusal surfaces of teeth⁽¹⁾. The incorporation of bioactive microcapsules with anticaries properties into the sealant material to provide a sustained release of calcium, fluoride and phosphate ion with remineralizing capability is considered a beneficial feature to the sealants. The aim of this study was polarized light microscopic evaluation of the effect of BioCoat Bioactive resin sealant on inhibition of demineralization of enamel of permanent molars and comparing the effect of BioCoat Bioactive resin sealant to fluoride releasing and non-fluoride releasing sealants.

METHODOLOGY⁽²⁾

Thirty nine caries free third molars were selected. Standardized cavities were prepared on the buccal surface and the molars were randomly allocated into 3 groups, 13 teeth in each group. Group1 (test group) received BioCoat™ Bioactive sealant (Premier®), Group2 (test group) received fluoride releasing Clinpro™ sealant (3M ESPE), and Group3 (positive control) received non-fluoride releasing Helioseal® Clear sealant (Ivoclar Vivadent). Acid-resistant varnish covered the teeth excluding 1mm of bare enamel around sealant for caries formation. The teeth were thermocycled and exposed to artificial caries medium for 6 weeks to produce caries-like lesions in bare enamel area. Transverse ground sections of each specimen were inspected using polarized light microscope and photomicrographs of the specimens were taken with a digital camera attached to the microscope using TCCapture imaging application (4.3.0.605) and assessed histologically to evaluate the changes in enamel features and compare the extent of carious lesion between the three study groups.

RESULTS AND DISCUSSION

The photomicrographs of the study groups were inspected for qualitative evaluation. In the photomicrographs, the demineralized zones are encircled. The results of group 1 BioCoat Bioactive sealant are displayed in figure (1). These findings can be explained by the SmartCap technology that incorporated microcapsules with fluoride, calcium and phosphate ions providing a two-way permeability by allowing the anticaries ions to disperse from the microcapsules to the surrounding environment when required. When demineralization took place, this led to the influx of the fluoride, calcium and phosphate ions to the demineralized enamel promoting its remineralization. Calcium and phosphate potentiated the action of fluoride giving the obtained results of group 1⁽³⁾.

The results of group 2 Clinpro fluoride releasing resin-based sealant are displayed in figure (2). This can be caused by fluoride ions that promoted this change. Fluoride action comprises the transformation of the hydroxyapatite directly into fluoridated hydroxyapatite (FHA)⁽⁴⁾.

The results of group 3 Helioseal Clear non-fluoride releasing resin-based sealant are displayed in figure (3). These observations can be attributed to the lack of any

anticaries ions as fluoride that can inhibit the demineralizing circumstances of the current study⁽⁴⁾.

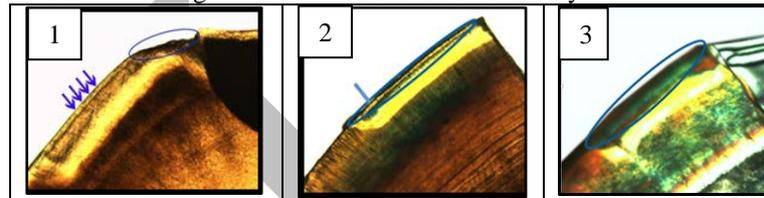


Figure (1): Polarized light photomicrograph of group 1 BioCoat Bioactive sealant showing a marked reduction in the lesion depth in comparison to group 2 and 3 emphasizing the effect of this treatment. Note the negative birefringence surface layer indicating more remineralization in this area (arrows), magnification X40.

Figure (2): Polarized light photomicrograph of group 2 Clinpro sealant showing an evident reduction in depth of the lesion with apparent surface remineralization layer (arrow) slightly less than that observed in group 1, magnification X40.

Figure (3): Polarized light photomicrograph of group 3 Helioseal Clear sealant showing a dramatic well-circumscribed thick dark demineralization band in the form of positive birefringence associated with loss in the typical enamel structure within the body of the lesion, magnification X40.

CONCLUSION

BioCoat Bioactive and Clinpro sealants have a marked inhibiting effect on enamel demineralization in contrast to Helioseal sealant. BioCoat Bioactive sealant showed the most remineralizing capability.

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