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EVALUATION OF FLUORIDE RELEASE AND UPTAKE ABILITY OF BIOACTIVE RESTORATIONS IN PRIMARY DENTITION (IN VITRO STUDY)

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INTRODUCTION

ACTIVA™ bioactive is a hybrid material between resin modified glass ionomer and composite and a resin composit with imporoved mechanical and physical properties

The innovative hydrophilic ionic resin matrix and bioactive ionic glass fillers in the material diffusion of calcium, phosphate, and fluoride ions, which react to variations in oral pH. [1].

Aim of study is to Compare the fluoride release and uptake of ACTIVA™ and Fuji II LC glass ionomer, and to evaluate the Ca and P elemental ratio in the two groups.

METHODOLOGY

Teeth were allocated randomly in two main groups. Group I (n=22) teeth were restored with ACTIVA™ Bioactive restorative material and group II(n=22) teeth were restored with FUJI II LC restorative material. Groups were then subdivided randomly into two subgroups (A and B) according to the method of evaluation. Teeth in subgroup A were evaluated using EDX and fluoride release test while teeth in subgroup B were evaluated using acid etch biopsy for fluoride uptake evaluation.

RESULTS AND DISCUSSION

By comparing the two study groups during demineralization and remineralization phase both materials presented the same release pattern, However the means recorded for each study group was different at all time intervals, Subgroup IIA (Fuji II LC) showed higher fluoride release than subgroup IA (ACTIVA™) with a statistically significant difference ($p<0.0001^{*}$). (Frigure1,2)

By comparing the two study groups at baseline, there was no statistically significant difference in mean F content (P =0.810). While after pH cycling a there was a statistically significant difference in favor of sub group IIB (Fuji II LC) (P<0.0001). (Figure 3)

By comparing the two study groups at baseline, there was no statistically significant difference in mean Ca/P between the two study groups (P =0.098). While after pH cycling there was, a statistically significant difference in favor of Sub group IA (ACTIVA™) (P<0.0001). (Figure 4)

According to the results of the current investigation The initial burst of fluoride release from Fuji II LC was possibly due to bulk fluoride diffusion during the maturation period as a result of contact with the storage medium, reaction of the polyalkenoic acid with the fluoride-containing glass particles during the setting reaction and the rapid dissolution of fluoride from the outer surface which resulted in an initial “burst”.[2] On the other hand ACTIVA™ fluoride release may be related to its patent resin matrix containing higher resin filler content (urethane dimethacrylate monomers) which limits ion exchange with the external environment affecting the permeability leading to lower ability to be recharged and acting like fluoride reservoir.[2]

fluoride uptake in teeth restored with Fuji II LC was significantly greater than that of ACTIVA. This may be attributed to the significant greater amount of fluoride release from Fuji II LC as shown in this study.

The present study suggests that the bioactive fillers and patented bioactive ionic resin present in ACTIVA™ are responsible for the high release and recharge of calcium, and phosphorus, in addition to the acid catalyzed hydrolysis of AI-O-Si bond in fluoroaminosilicate ionomer glass that occurs low pH.

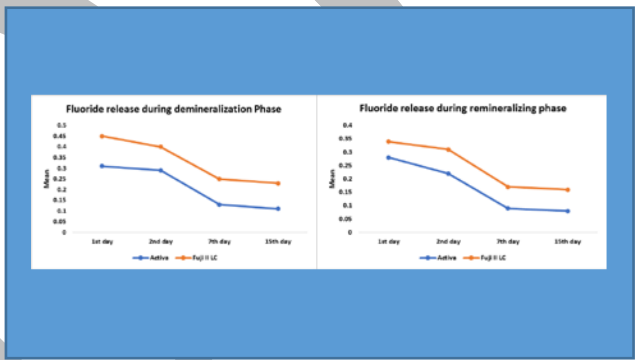

Figure (1,2): comparison of fluoride released during demineralization and remineralization phase

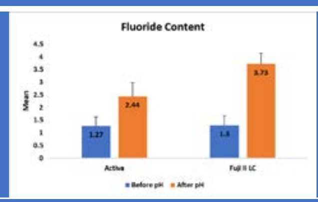

Figure (3) Comparison of Fluoride content between the study groups

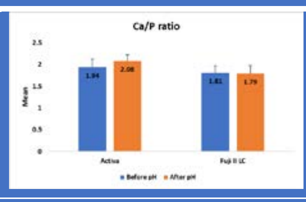

Figure (4) Comparison of Ca/P ratio between the study groups

CONCLUSION

FUJI II LC exhibited greater Fluoride release than ACTIVA™. Regarding calcium and phosphorus ACTIVA™ showed higher release as compared to Fuji II LC

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