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COMPARISON OF REMINERALIZATION WITH SURFACE PREREACTED GLASS IONOMER FILLER, CASEIN-PHOSPHOPEPTIDE AMORPHOUS CALCIUM PHOSPHATE, AND FLUORIDE VARNISHES IN PRIMARY TEETH (In-Vitro Study)

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INTRODUCTION

Professionally applied topical fluoride preparations have been commonly used to treat white spot lesions (WSLs) in primary teeth. However, the conventional 5% sodium fluoride (NaF) varnishes were unable to remineralize subsurface lesions (1). Novel biomaterials such as GIOMER technology provide deeper and superior remineralizing abilities (2). This study aimed to investigate the remineralizing potential of Giomer varnish, surface-prereacted glass ionomer (s-PRG) filler varnish, in comparison to the conventional 5% NaF varnish and Casein-phosphopeptide amorphous calcium phosphate-fluoride varnish (MI varnish) on WSLs in primary teeth.

METHODOLOGY

Enamel window of 4 x 4 mm was prepared in the center of middle third of the labial surface in 33 extracted/exfoliated sound primary anterior teeth. All teeth surfaces were coated with acid-proof nail varnish except for the labial window. Teeth were subjected to artificial caries system for 96 hours to induce white spot lesions (3). Teeth were then assigned randomly into 3 equal groups according to the remineralizing agent applied: Group I (n=11) PRG varnish test group, Group II (n=11) MI varnish (MIV) test group, and Group III (n=11) Fluoride varnish (FV) as positive control group. The teeth were sectioned longitudinally in a labiolingual direction into 2 equal halves, mesial half (sub group A) and distal half (subgroup B). Subgroup A received the remineralizing agent and Subgroup B remained untreated, serving as the negative control in each tooth. After removing varnishes' residues, the specimens were subjected to a pH cycling model for 10 days which involves 3 hours of demineralization twice a day with 2 hours of remineralization in between. The specimens were placed in remineralizing solution overnight (4). Elemental analysis of teeth was evaluated using energy dispersive x-ray (EDX) to measure Ca, P, and Ca/P ratio at baseline, and after pH cycling model. Enamel surface topography was also recorded using scanning electron microscope (SEM), at baseline and after pH cycling model. Data were analyzed using Shapiro Wilk test, One Way ANOVA followed by Tukey's post hoc test with Bonferroni correction. The Kruskal Wallis was used test for between-groups comparison.

Elemental Content	Group I (PRG group)		Group II (MIV group)		Group III FV group)		P value
	Subgroup I A (test)	Subgroup IB (control)	Subgroup IIA (test)	Subgroup IIB (Control)	Subgroup IIIA (test)	Subgroup IIIB (control)	
Mean Ca % (SD)	35.12 (4.95)	20.72(4.76)	29.09(4.66)	19.47(4.94)	29.28(4.54)	19.41 (4.24)	P >0.05
Mean P % (SD)	16.52 (1.66)	12.76 (2.44)	15.54(1.91)	12.61(2.44)	15.60(1.60)	12.61(1.33)	P>0.05
Mean Ca/P Mean (SD)	2.01(0.24)	1.61 (0.16)	1.88(0.14)	1.53(0.13)	1.88(0.21)	1.46 (0.19)	P>0.05
P value	*P<0.05		*P<0.05		*P<0.05		

*Table (1): P values in the right-hand column compare between test groups. P values in the final row compare between test specimens and control specimens.*Statistically significant values at P<0.05.*

RESULTS AND DISCUSSION

According to the EDX results, values of subgroup A (remineralized specimens) in the 3 experimental groups were significantly superior to values of subgroup B (their negative controls), (P < 0.001), regarding mean Ca, mean P, and Ca/P ratio (Table 1). The highest Ca/P ratio after remineralization occurred in PRG group, followed by MIV group and FV group (2.01 %, 1.88%, and 1.88 % respectively as demonstrated in table 1). This proves that PRG possesses superior remineralizing abilities. However, no statistically significant difference was recorded between the 3 study groups (P>0.05) (Table 1). The SEM images obtained complimented our EDX results and proved the remineralizing ability of the 3 experimental varnishes (Fig 1A-3A), as opposed to their negative controls (1B-3B). Specimens coated with the experimental varnishes illustrated relative re-establishment of enamel surface integrity, suggesting that the ions released from the varnishes resulted in remineralization of the enamel surface.

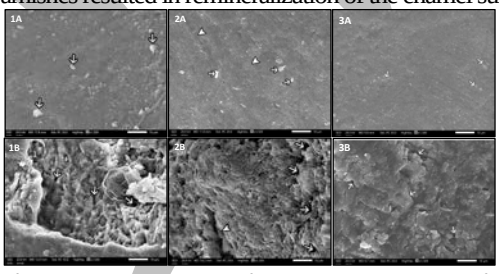

Fig. 1A: SEM of PRG test specimen. Fig.2A: SEM of MIV test specimen. Fig. 3A: SEM of FV test specimen. Fig. 1B: SEM of PRG control specimen. Fig. 2B: SEM of MIV control specimen. Fig. 3B: SEM of FV control specimen. Figures 1A-3A demonstrating relatively smooth enamel surface interrupted with some globular structures (arrows) and some surface scratches (arrow heads). Figures 1B-3B demonstrating generalized loss of enamel structure, deep concavities (arrows), and a linear groove (arrow head). (Mag. X 1500).

CONCLUSION

Giomer varnish (S-PRG filler varnish) exhibited a remineralizing ability of primary teeth white spot lesions similar to 5% NaF varnish and MI varnish. However, further clinical research is needed to confirm our in-vitro results.

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