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COMPARATIVE EFFECT OF NANOSILVER FLUORIDE AND SILVER DIAMINE FLUORIDE ON THE ULTRASTRUCTURE OF DEMINERALIZED DENTIN (IN VITRO STUDY)

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INTRODUCTION

Silver diamine fluoride (SDF) is an arresting caries agent used as a cavity treatment to destroy bacteria that may be present in dentin. Its black staining of dental tissues has limited its use specially in esthetic area.(1) Nanosilver fluoride (NSF) is a potential formulation combining the antibacterial effect of silver nanoparticles (AgNPs) with the remineralizing action of fluoride without staining tissues(2). The aim of this study is to evaluate and compare the surface topographic changes of demineralized dentin treated with 5% NSF and 38% SDF in primary molars using the scanning electron microscope (SEM).

METHODOLOGY

Standardized Class V cavities were prepared in the middle of the buccal surface using #330 carbide bur and high-speed handpiece. Cavity dimensions were 2x3 mm with 1.5mm axial depth. Specimens were randomly divided into 5 groups: Group I: Normal dentin, Group II: Demineralized dentin, Group III: NSF group, Group IV: SDF group and Group V: GIC group. Artificial residual carious dentin was created in Groups II, III, IV and V by pH cycling method for 14 days (8 hours in demineralizing solution and 16 hours in remineralizing solution)

5%NSF preparation: Weight dilution method(3) was adopted by using AgNPs (Ag 99.9%, particle size 50-80 containing polyvinyl pyridoline, metal basis) (US-nano™) and 5% sodium fluoride varnish (Enamel Pro-varnish™).

Cavity treatment and restoration placement:

Group III: NSF varnish was applied to cavities for 3 mins, then cavities were washed and dried. Resin modified glass ionomer cement (RMGIC) (Fuji II®) was applied according to manufacturer's instructions. Group IV: 38% SDF was applied to cavities, left for 60 secs, excess was removed and RMGIC was applied. Group V: cavities were dried and RMGIC was applied.

Groups III, IV and V were stored in artificial saliva for 2 weeks and all groups were prepared for SEM evaluation.

RESULTS AND DISCUSSION

Normal dentin showed intact dentinal tubules with mineralized peritubular dentin surrounding each dentinal tubule (Fig 1A&C). Demineralized dentin showed collapsed dentinal tubules with remnants of odontoblastic process emerging from the dentinal tubules (Fig1 B&D). The images also showed the loss of uniformity of dentin structure in demineralized dentin in comparison to normal dentin (Fig1)

NSF treated dentin showed multiple spherical particles precipitated and occluded the dentinal tubules (Fig2A&D). The surface topography of dentin was somehow preserved. SDF treated dentin showed heavier deposits on the dentin surface occluding the dentinal tubules giving the appearance of sclerotic dentin (Fig2 B&E). GIC restored dentin showed the least structural changes among the groups (Fig2 C&F)

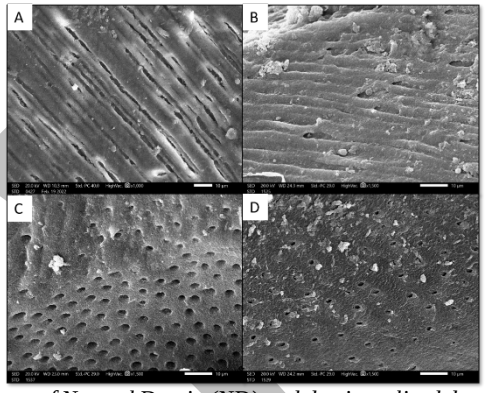

*Fig1: SEM images of Normal Dentin (ND) and demineralized dentin (demin D): **A:** Longitudinal section in ND. A:x 1000. **B**: Longitudinal section in demin.D B:x 1500. **C**: Cross-sectional image of ND. C:x1500. **D**: Cross-sectional image of demin. D. D:x1500.*

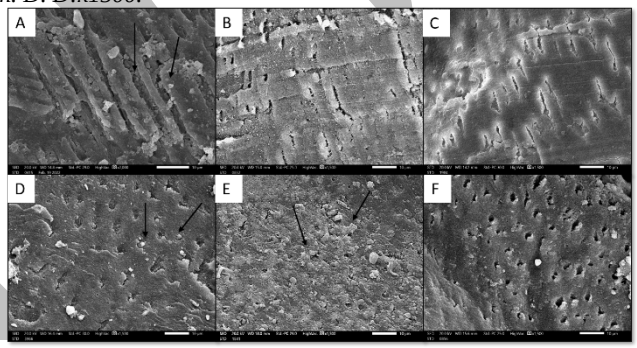

Fig2: SEM Images of SDF treated dentin, NSF treated dentin and dentin restored with GIC:
A: Longitudinal section in NSF treated dentin, D: cross-sectional image of NSF treated dentin. A&D:x1500
B: Longitudinal section in SDF treated dentin, E: cross-section in SDF treated dentin. B:x2000, E:x1500
C: Longitudinal section in dentin restored with GIC, F: cross-section in dentin restored with GIC. C & F:x1500

CONCLUSION

NSF could be considered as an alternative to SDF as it causes less destruction of dentin topography and without staining teeth and gingiva.

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