SDF's Effect on Hardness of Carious Lesions in Primary Teeth

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Introduction/Aim

Silver Diamine Fluoride (SDF) is a solution consisting of ammonia, silver, and fluoride that is applied to dentinal caries lesions in primary teeth for caries arrest. Per standard protocol, the solution is brushed onto the lesions and left to air-dry for 1 min. However, young children have trouble sitting still for the full minute and studies show that the effectiveness of SDF drops from 80% to less than 40% with shorter application times. Our previous work showed that applying an LED curing light for 20 sec after a 10 sec SDF application enhances penetration of SDF similar to that seen on a 1 min application without curing light.

The aim of this study is to evaluate the tissue hardness in various areas of untreated carious lesions and SDF-treated with different application times with and without LED curing light.

Conclusion

Shorter SDF application aided by an LED curing light results in a similar lesion hardness to the standard protocol (SDF application for 1 min).

Future studies will include density and mineral content analysis using Backscattered Electron-Scanning Electron Microscopy imaging and Energy-Dispersive X-ray Spectroscopy analysis.

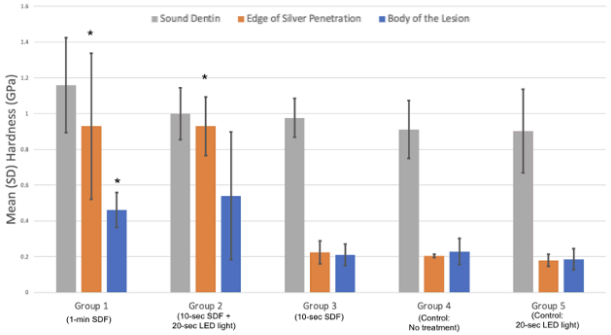
Results

Figure 1: samples from Groups 1 and 2 were significantly harder than those in Groups 3-5 in the *body of the lesion* (p<0.05).

Samples from Groups 1 and 2 were significantly harder than those in Groups 3-5 in the *deepest portion of silver penetration* (p<0.05).

In all 5 groups, the *hardness of the sound dentin* was similar (p<0.05).

Mean (SD) Hardness Per Group



Mean (SD) Elastic Modulus (Es) Per Group

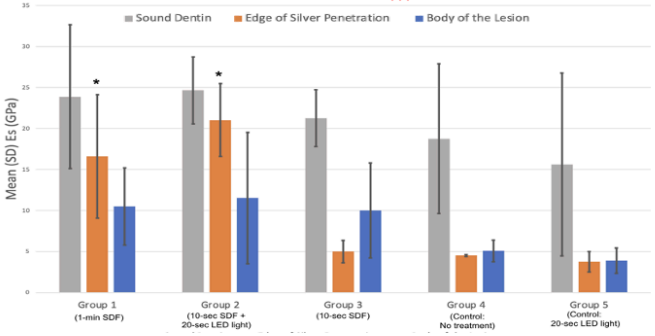


Figure 2: Group 1 (1-min SDF) and Group 2 (10-sec SDF and 20-sec LED curing light) yielded significantly higher elastic modulus values in the *deepest portion of SDF penetration* than the remaining groups.

The average elastic modulus across all 5 Groups in the *dentin and body of the lesion* show no significant differences between one another.

*indicates significance (p<0.05).

These results illustrate that SDF application for 10 sec aided with an LED curing light yields a similar lesion and edge hardness and penetration to the application of SDF alone for one minute.

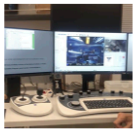
Materials and Methods

24 extracted primary molars with dentin caries lesions were cleaned, randomly assigned into 5 groups, and treated within 5 min of extraction.

Group 1	Group 2	Group 3	Group 4	Group 5
(N=6)	(N=6)	(N=6)	(N=3)	(N=3)
60 sec SDF	10 sec SDF +20 sec LED	10 sec SDF	Control	Control No SDF +20 sec LED
10 sec tap water rinse	10 sec tap water rinse	10 sec tap water rinse	No treatment	

1. All tooth samples were embedded in poly methyl methacrylate (PMMA) polymer.

2. Samples were sectioned, ground, and polished using the diamond suspension series.

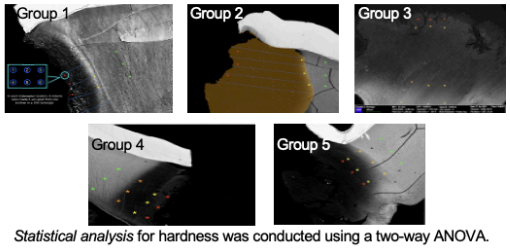


3. Samples were scanned using BSE-SEM to determine *depth of SDF penetration.*

4. Samples were placed in the Hysitron TI 950 Nanoindenter to measure the *hardness.*

Indentations were made In the following locations:

*lesion, *edge of lesion, *furthest depth of caries, and *sound dentin



Statistical analysis for hardness was conducted using a two-way ANOVA.

Acknowledgements

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