Tissue Hardness of SDF-Treated Carious Lesions in Primary Teeth

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INTRODUCTION

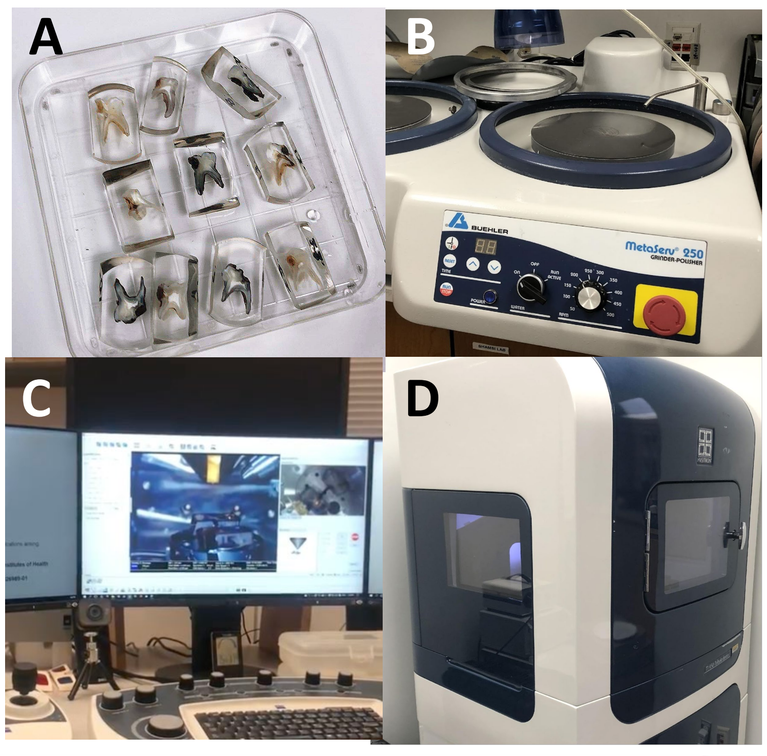
Silver Diamine Fluoride (SDF) is a solution consisting of ammonia, silver, and fluoride that is applied to dentinal caries lesions in primary teeth for caries arrest. Per standard protocol, the solution is painted onto the lesions and left to air-dry for 1 min. However, young children have trouble sitting 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 only 10 sec SDF application enhances penetration of SDF similar to that seen on a 1 min application without curing light.

AIM

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.

MATERIALS AND METHODS

A. All tooth samples were encased in an acrylic.
B. Samples were ground and polished using the diamond suspension series.
C. Samples were imaged using BSE-SEM to determine depth of SDF penetration (Figure 1).
D. Samples were placed in a nanoindenter to measure the hardness.



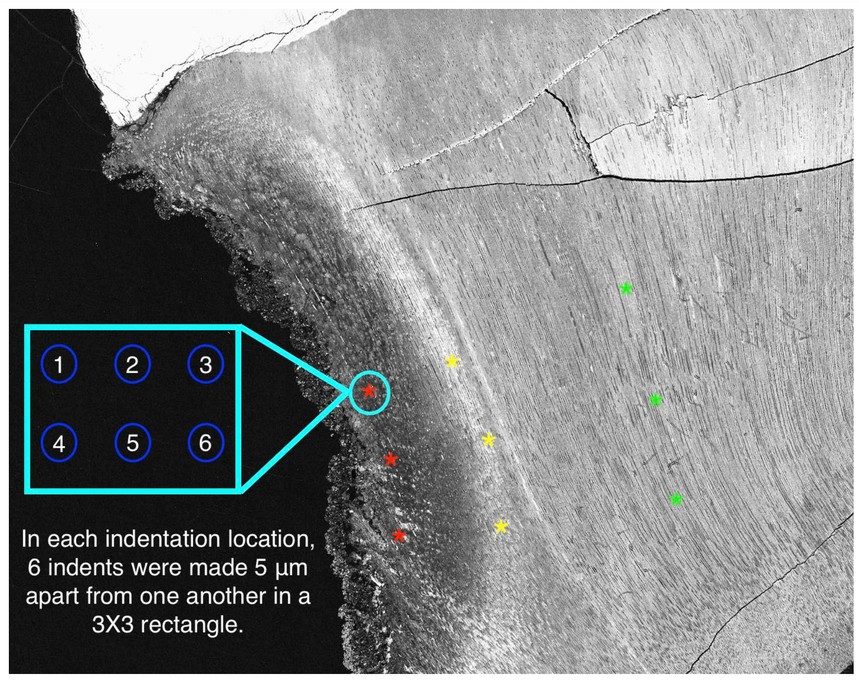
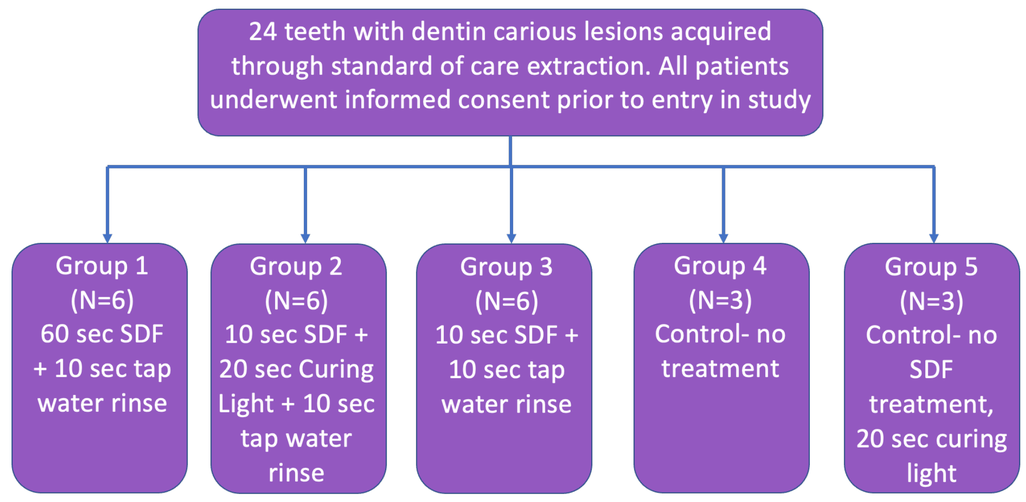


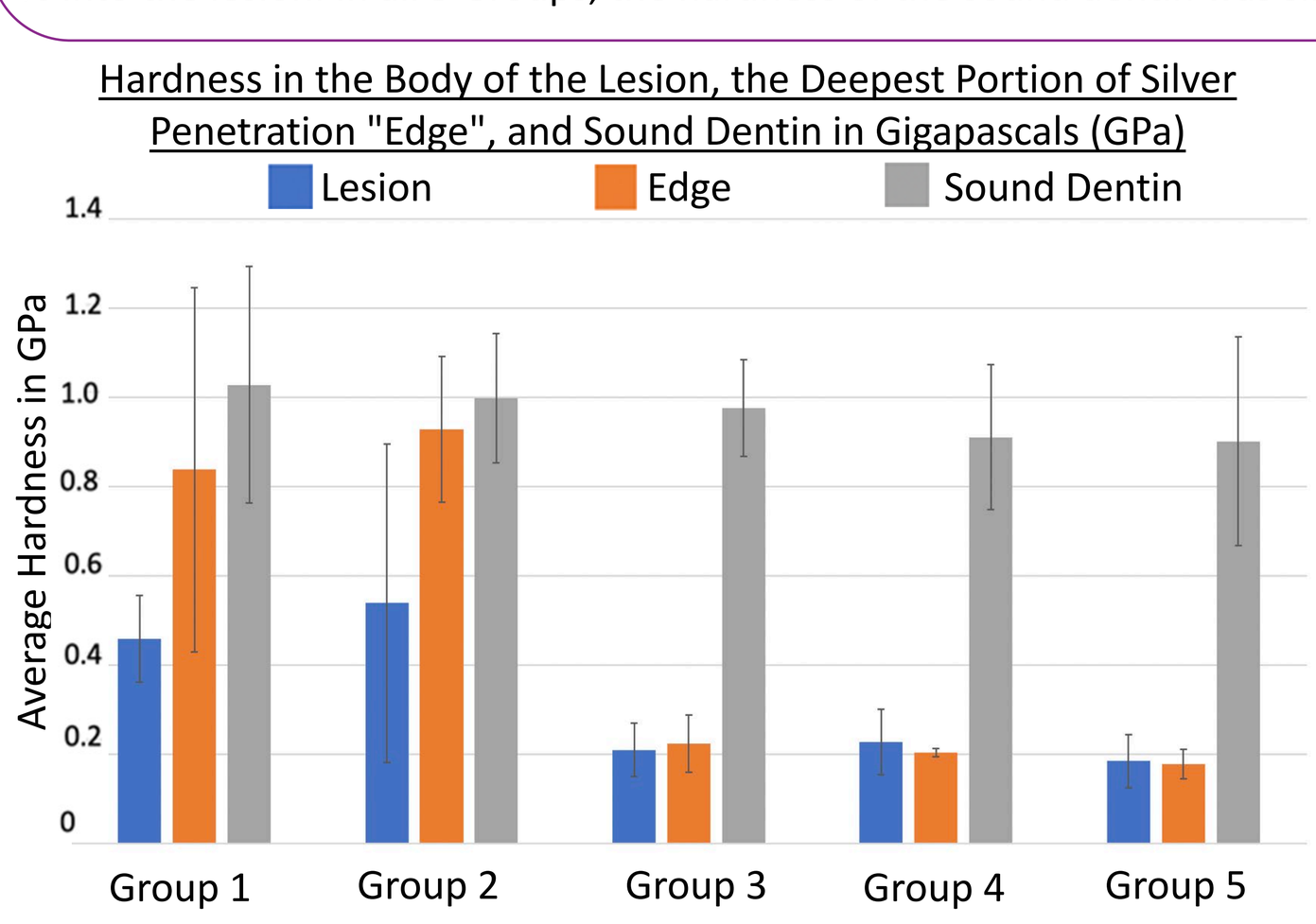
Figure 1. Illustrates the BSE-SEM image of sample 2 (part of Group 1). Indentation points were made in the body of the lesion (red), furthest extent of silver penetration (yellow), and sound dentin (green).

Carious human teeth were cleaned and treated within 5 min of extraction and randomly assigned into 5 Groups. Three groups were treated with SDF for different time intervals with or without LED curing light. The hardness values of each sample were measured using a Hysitron TI 950 Triboindenter.



RESULTS AND DISCUSSION

This study illustrates that SDF application for 10 seconds aided with an LED curing light yields a similar lesion and edge hardness and penetration to the application of SDF alone for one minute. Both edge hardness measurements in Groups 1 and 2 were significantly higher than those in Groups 3, 4, and 5. Utilization of an LED curing light may present itself as a viable option for increasing the efficacy of shorter SDF application in carious lesions in children. SDF application for 10 seconds aided by an LED curing light (lesion H=0.540 ± 0.357 GPa) resulted in a similar hardness as SDF application for 1 minute (lesion H = 0.460 ± 0.097 GPa). These two Groups yielded significantly higher hardness values in both the lesion and edge of SDF penetration than those in the remaining Groups. Because Group 4 and 5 are control groups (no SDF applied), the deepest portion of silver penetration was measured at ¼ - ⅓ into the lesion. In all 5 Groups, the hardness of the sound dentin was similar (*p value > 0.001*).



CONCLUSION

In this study, we found that shorter SDF application aided by an LED curing light results in a similar lesion hardness to the standard protocol (SDF treatment for 1 min). Future studies are needed to better understand the *mechanism of an LED curing light* and to validate *its role in remineralization enhancement and sustained arrest*.

ACKNOWLEDGEMENTS

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