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Original Article

Microhardness and Cutting Resistance in Enamel of Primary Molars Among Various Caries Experience Groups *In Vitro*

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Abstract

Objectives: To investigate cutting resistance, microhardness, and their correlations with primary teeth enamel, from different caries experience groups.

Methods: Forty-five extracted primary molars were divided equally into three groups using the dmft/dmft+DMFT index: low, moderate, and high caries experience groups. Each tooth was divided into 2 parts to test cutting resistance and microhardness. All data were compared statistically between groups with different caries experiences using the one-way ANOVA. The correlations were investigated using the Spearman's and the Pearson's correlation.

Results: The high caries experience group had significantly lower microhardness of enamel (295.8±12.73 Vickers Hardness Number (VHN)) than the moderate and low caries experience groups (315.01±16.13 VHN; p=0.001 and 325.96±9.91 VHN; p<0.001, respectively). The cutting resistance of enamel from the high caries experience group (87.23±15.06 grams) was also significantly less than those from the moderate and low caries experience groups (112.78±16.02 grams; p=0.002, and 111.67±24.75 grams; p=0.003, consecutively). There were negative correlations between caries experience and cutting resistance (r=-0.46; p=0.002) and between caries experience and microhardness (r=-0.71; p<0.001) but a positive correlation between cutting resistance and microhardness (r=0.39; p=0.009).

Conclusions: Enamel of primary teeth from the high caries experience group had less microhardness and cutting resistance than those of the moderate and low caries experience groups.

Keywords: caries experience, cutting resistance, enamel, hardness, primary tooth

Introduction

Enamel, the hardest tissue in the body[1], contains the highest proportion of mineralization in its composition[2] that makes it highly resistant to acid from dental caries[3] and acidic drinks.[4,5] The microstructure orientation of enamel rods and hydroxyapatite crystals also enhance the mechanical properties of enamel.[1,6-8] Within the same tooth, enamel at buccal and lingual surfaces can be easier to cut than occlusal surfaces, due to their relatively lower hardness and Young's modulus.[6]

The enamel hardness gradually decreases from surface towards the dentin, as the mineral deposition of calcium and phosphorus decreases.[9] At the enamel surface, the Vickers Hardness Number (VHN) in permanent teeth ranges from 316.0 to 328.4[10] and in primary teeth range, from 299.54 to 374.06.[11,12] Our previous studies sug-