

# Effects of a Nano-composite Adhesive on Mechanical Properties of Tooth Enamel After Removing Orthodontics Bracket – an Experimental Study Using Nano-indentation Test

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## Abstract

The purpose of this study is to investigate and compare effect of bracket bonding-debonding by nano-composite and composite adhesives on mechanical properties of tooth enamel. Orthodontic brackets were bonded to the enamel surface and the mechanical properties of tooth enamel were studied by nano-indentation technique after bracket removal. Twenty human premolar teeth were prepared and divided into two groups. In one group, orthodontic brackets were bonded by a conventional composite adhesive and in the other group a dental nano-composite was used for bonding the brackets on the buccal surface of tooth enamel. The brackets were then debonded with a sharp-edged debonding pliers. After debonding the brackets, the teeth were sectioned transverse to their longitudinal axes from the middle of the bracket bonded regions. Nano-indentation experiments were performed on the enamel section at two regions: intact enamel and under-the-bracket enamel. Then mechanical properties of the enamel at these two regions, including elasticity modulus, hardness and fracture toughness were determined from the nano-indentation test results for both types of adhesives. Using the nano-composite decreases the magnitudes of elasticity modulus and hardness of the dental enamel under the brackets significantly in comparison with the conventional orthodontic adhesives. However, no significant difference is seen between the fracture toughness reductions due to the use of composite and nano-composite adhesives.

## Keywords

Dental nano-composite adhesive Bracket bonding effect Nano-indentation experiment Mechanical properties Enamel

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Effects of a Nano-composite Adhesive on Mechanical Properties of Tooth Enamel After Removing Orthodontics Bracket – an Experimental Study Using Nano-indentation Test

### Journal

*Experimental Mechanics*  
*Volume 55, Issue 9 , pp 1769-1777*

### Cover Date

2015-11

### DOI

10.1007/s11340-015-0087-0

### Print ISSN

0014-4851

### Online ISSN

1741-2765

### Publisher

Springer US

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### Keywords

- Dental nano-composite adhesive
- Bracket bonding effect

- Nano-indentation experiment
- Mechanical properties
- Enamel

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