Knoop hardness of enamel and shear bond strength of brackets bonded with composite resin with and without fluoride

Silvia Amélia Scudeler Vedovello[1], Marcelo Grigoletto[2], Mário Vedovello Filho[1], Heloísa Cristina Valdrighi[1], Mayury Kuramae[1]

Objective: The aim of this study was to evaluate the Knoop hardness of enamel, shear bond strength and failure pattern (adhesive, bracket/resin interface and mixed) after bonding and debonding brackets, using resin composite with fluoride (Ortho Lite Cure, Ortho Source®) and without fluoride (Orthobond, Morelli®).

Methods: Fragments (6 mm x 6 mm) of 40 bovine incisor crowns were embedded in acrylic self-polymerizing resin. The Knoop hardness measurements were performed before and after bonding metal brackets. The specimens were divided into 2 groups, according to composite resin: with fluoride (Ortho Lite Cure, Ortho Source®) and without fluoride (Orthobond, Morelli®). After bonding, the specimens were submitted to demineralization and remineralization cycling for 14 days. Shear bond strength testing was performed in a universal test machine (EMIC), at 5 mm/min crosshead speed.

Results: There was no significant difference in shear bond strength between groups 1 and 2. After demineralization and remineralization procedures, the specimens bonded with Ortho Lite Cure showed higher Knoop hardness than Orthobond. For both groups there was predominance of failure at bracket/resin interface.

Conclusion: specimens bonded with fluoride resin composite showed higher microhardness after de-re cycling than those bonded with resin composite without fluoride, although no difference in shear bond strength was found.

Keywords: Composite resins. Orthodontic brackets. Hardness. Shear strength.

***Access www.dentalpress.com.br/revistas to read the entire article.**

[1] PhD Professor of the Program of Post-Graduation in Dentistry, concentration in Orthodontics, UNIARARAS.

[2] MSc in Orthodontics, UNIARARAS.

How to cite this article: Vedovello SAS, Grigoletto M, Vedovello Filho M, Valdrighi HC, Kuramae M. Knoop hardness of enamel and shear bond strength of brackets bonded with composite resin with and without fluoride. Dental Press J Orthod. 2012 July-Aug;17(4):21-2.

Submitted: May 12, 2009 - **Revised and accepted**: April 12, 2010

» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

Contact address: Mário Vedovello Filho
Av. Maximiliano Baruto, 500, Jd. Universitário – Araras/SP – Brazil
CEP: 13.607-339 – E-mail: vedovello@terra.com.br

Editor's summary

To reduce the incidence of caries around orthodontic brackets, materials with the ability of fluoride release were introduced, as glass ionomer cements and composite resins. With the production of these materials it is necessary to evaluate their physical-chemical behavior. Thus the authors' proposal regarding the present study was to evaluate the knoop hardness of enamel, shear strength and failure pattern (adhesive, interface bracket / resin, and mixed) after bonding and debonding of orthodontic brackets using composite resin with fluoride and without fluorine. Forty bovine incisors crowns were used and were sectioned with two-sided diamond discs under water cooling, to obtain fragments of 6 mm x 6 mm. These fragments were embedded in PVC® cylinders with acrylic self-polymerizing resin. After obtaining all the specimens, they were separated into two groups according to the bonding material used (n = 20): Group I - bonded with the Orthobond (Morelli) composite, without fluoride; and Group II – bonded with the Lite Cure Ortho (Ortho Source) composite resin with fluoride. After bonding, the specimens underwent a demineralization and remineralization cycle for 14 days and subjected to the test of shear strength in a universal testing machine EMIC, at 0.5 mm / min crosshead speed. After test shear strength the samples were analyzed with a stereomicroscope (CQA, EK3ST model), at 20X magnification, to determine the failure pattern. Knoop hardness was done before and after bonding of metal brackets (Fig 1). The data of the microhardness and shear were submitted to ANOVA and Tukey test ($p<0.05$). The findings demonstrated that there was no statistically significant difference for initial hardness values between the groups ($p>0.05$). However, the specimens that received fluoride composite (Ortho Lite Cure) had significantly higher final microhardness compared to those bonded with composite without fluoride (Orthobond) ($p<0.05$). The analysis indicates that a significant reduction in hardness values happened after the procedures of demineralization and remineralization, both in the specimens of Group I and II. The shear test showed that there was no statistically significant difference between samples bonded with Ortho Lite Cure and Orthobond ($p>0.05$). The analysis of the failure pattern showed that the specimens of group I and II had a predominance of failure at the interface composite / bracket (55%, 50%). Thus the authors could conclude that there was no significant difference in shear bond strength between Orthobond and Ortho Lite Cure. The sample bonded with composite resin with fluoride (Ortho Lite Cure) had higher microhardness after demineralization and remineralization processes when compared to the sample bonded with composite resin without fluoride (Orthobond), and for both groups there was a predominance of failures at composite / bracket interface.

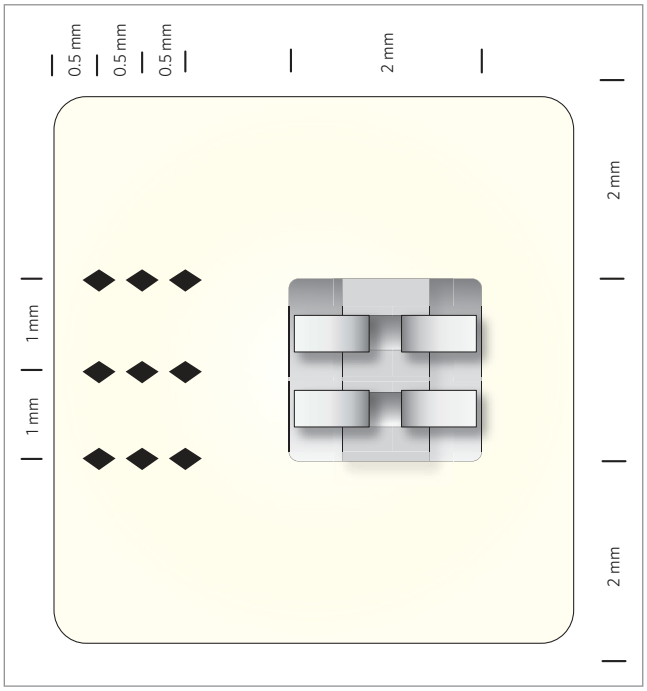

Figure 1 - Diagrammatic drawing of the Knopp Hardness readout region.