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Original Article

The effect of light curing time and intensity on the bond strength and fracture resistance of orthodontic adhesive

Abstract:

Background. This study aimed to measure the shear bond strength and compressive strength of orthodontic adhesives at different curing times and intensities.

Methods. Ninety extracted human premolars were used. Orthodontic brackets were bonded on the buccal surface of the teeth with orthodontic adhesive light-cured using VRN-VAFU LED curing light at different curing times (1, 3 and 5 seconds) and intensities (1000, 1600 and 2300 mW/cm2). A universal testing machine was used to measure the shear bond strength. The ratio of the adhesive remnant and compressive strength of the orthodontic adhesive, at each curing time at the different intensities, were also evaluated. The results were statistically analyzed using one-way analysis of variance followed by Tukey's test.

Results. The lowest bond strength values (6.4, 9.9 and 12.6 MPa) were recorded with 1000 mW/ cm2 intensity (at all curing times) in comparison with the other intensities ($P < 0.05$). Increasing the curing time significantly increased the bond strength of the orthodontic brackets ($P < 0.05$), except when the curing time was increased from 3 sec to 5 sec at 1600 mW/cm2 intensity. The highest compressive strength values (130.3, 147.1 and 174 MPa) were recorded at 2300 mW/ cm2 intensity (at all curing times) compared to the other intensities ($P < 0.05$). The highest values of the ratio of the adhesive remnants were recorded at 1000 mW/cm2 intensity (at all curing times) compared to the other intensities ($P < 0.05$).

Conclusion. Although, increasing the curing time and\or the curing intensity has a positive effect on the bond strength and compressive strength of the orthodontic adhesive, it might be possible to suggest reducing the curing time of orthodontic adhesive to 1 sec at curing intensity of 2300 mW/cm2.