Influence of Light Irradiation on the Early Bonding Characteristics of Self-adhesive Resin Cements

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Abstract

Purpose: Self-adhesive resin cements (SARC) have been marketed to simplify clinical procedures and overcome the technical sensitivity of multiple-step systems. However, the dentin bonding performance under different light irradiation conditions of the cement is not known. This study monitored the chronological change of dentin bond strengths of SARC.

Methods: Three SARC: Clearfil SA Cement Automix (SA; Kuraray Noritake Dental), RelyX Unicem 2 Automix (UC; 3 M ESPE) and BeautiCem SA (BC; Shofu), were used. Bovine dentin was wet-ground with #600 SiC paper. Resin columns (4 mm in diameter, 2 mm in height) were cemented and light-irradiated with the power density of 600 mW/cm\(^2\) or not irradiated (chemical-cured). The shear bond strength of 10 specimens per group were measured at a crosshead speed of 1.0 mm/min after 10 min, 1, 6, 12, and 24 h storage in a chamber at 37 ± 1°C, 90 ± 5 RH%. Statistical analysis was done to test for the presence of a significant difference between the mean bond strength at each test time at a significance level of 0.05. The time at which there was a significant increase in bond strength was identified as “time of increase in bond strength”.

Results: The dentin bond strength increased with prolonged specimen storage time. When the specimens were light-irradiated, higher bond strengths were obtained compared to those specimens without irradiation. The fracture mode of the UC specimens without irradiation changed from adhesive failure to mixed failure after 24 h storage. When the specimens were light-irradiated, cohesive failure in the resin was observed for UC, and cohesive failure in the cement was observed for BC.

Conclusion: The results of this study indicated that the chronological change in the dentin bond strengths of the SARC was affected by the light irradiation of the specimen. Light irradiation with a sufficient power density is necessary to achieve optimal dentin bond strength, even in materials with a dual-cured setting reaction.

Key words: Self-adhesive cement, Bonding characteristics, Light irradiation conditions