【別紙２】

論文名：Efficiency of the dual-curable resin cement polymerization induced by high intensity LED curing units through ceramic material)

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Objectives: This study aimed to evaluate the ability of high intensity LED and other curing units to cure dual-curable resin cement through ceramic material.
Methods: A halogen curing unit (Jetlite 3000, Morita), a second-generation LED curing unit (Demi, Kerr), and two high intensity LED curing units (PenCure 2000, Morita; Valo, Ultradent) were tested. Feldspathic ceramic plates (VITABLOCS Mark II, A3; Vita Zahnfabrik) with thicknesses of 1.0, 2.0, and 3.0 mm were prepared. Dual-curable resin cement samples (Clearfil Esthetic Cement, Kuraray Noritake Dental) were irradiated directly or through one of the ceramic plates for different periods of time (5, 10, 15, or 20 seconds for the high intensity LED units and 20, 40, 60, or 80 seconds for the others). The Knoop hardness test was used to determine the level of photopolymerization that had been induced in the resin cement. Data were analyzed by one-way ANOVA and Dunnett's post-hoc test for each curing unit ($p < 0.05$).
Results: For all curing units, the curing conditions had a statistically significant effect on the Knoop hardness numbers (KHN) of the irradiated cement samples ($p<0.001$). In general, the KHN decreased with increasing plate thickness and increased as the irradiation period was extended. At a plate thickness of ≥2.0 mm, the LED units (except for the PenCure 2000 at 3 mm) were able to achieve similar KHN values to those seen during direct irradiation when the irradiation time was extended, but the Jetlite 3000 failed to achieve this. At a plate thickness of 3.0 mm, irradiation for 20 seconds with the Valo or for 80 seconds with the Demi were the only methods that produced KHN values equivalent to those produced by direct irradiation.
Conclusion:
Regardless of the type of curing unit used, indirect irradiation of dual-curable resin cement through a ceramic plate resulted in decreased KHN values compared with direct irradiation. When the irradiation period was extended, only the LED units were able to achieve similar KHN values to those observed under direct irradiation in the presence of ≥2.0 mm-thick plates. High intensity LED units require a shorter irradiation period than halogen and second-generation LED curing units to obtain similar KHN values to those observed during direct irradiation.