Influence of curing time, overlay material and thickness on three light-curing composites used for luting indirect composite restorations.


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Abstract

PURPOSE: To assess the microhardness of three resin composites employed in the adhesive luting of indirect composite restorations and examine the influence of the overlay material and thickness as well as the curing time on polymerization rate.

MATERIALS AND METHODS: Three commercially available resin composites were selected: Enamel Plus HRI (Micerium) (ENA), Saremco ELS (Saremco Dental) (SAR), Esthet-X HD (Dentsply/DeTrey) (EST-X). Post-polymerized cylinders of 6 different thicknesses were produced and used as overlays: 2 mm, 3 mm, 3.5 mm, 4 mm, 5 mm, and 6 mm. Two-mm-thick disks were produced and employed as underlays. A standardized amount of composite paste was placed between the underlay and the overlay surfaces which were maintained at a fixed distance of 0.5 mm. Light curing of the luting composite layer was performed through the overlays for 40, 80, or 120 s. For each specimen, the composite to be cured, the cured overlay, and the underlay were made out of the same batch of resin composite. All specimens were assigned to three experimental groups on the basis of the resin composite used, and to subgroups on the basis of the overlay thickness and the curing time, resulting in 54 experimental subgroups (n = 5). Forty-five additional specimens, 15 for each material under investigation, were
produced and subjected to 40, 80, or 120 s of light curing using a microscope
glass as an overlay; they were assigned to 9 control subgroups (n = 5). Three
Vicker’s hardness (VH) indentations were performed on each specimen. Means
and standard deviations were calculated. Data were statistically analyzed using 3-
way ANOVA. Within the same material, VH values lower than 55% of control were
not considered acceptable.

RESULTS: The used material, the overlay thickness, and the curing time
significantly influenced VH values. In the ENA group, acceptable hardness values
were achieved with 3.5-mm or thinner overlays after 120 or 80 s curing time (VH
41.75 and 39.32, respectively), and with 2-mm overlays after 40 s (VH 54.13). In
the SAR group, acceptable hardness values were only achieved with 2-mm-thick
overlays after 120 or 80 s curing time (VH 39.81 and 29.78, respectively). In the
EST-X group, acceptable hardness values were only achieved with 3-mm or
thinner overlays, after 120 or 80 s curing time (VH 36.20 and 36.03, respectively).

CONCLUSION: Curing time, restoration thickness, and overlay material
significantly influenced the microhardness of the tested resin composites
employed as luting agents. The clinician should carefully keep these factors under
control.

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