COMMENTARY

MARGINAL ADAPTATION AND HARDNESS OF RESIN COMPOSITE RESTORATIONS ACTIVATED WITH FOUR ENERGIES

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The controversy over different curing methods for resin composite continues. Although incremental placement and curing is the standard for posterior composites, other curing methods have been advocated. The soft cure began the low power and slow-curing method[1]; however, the 4-minute cure time per increment that was used initially was not economically feasible for busy clinicians. Therefore, the intensity increased and the curing time shorted to 40 seconds. Soft-start or ramp curing began with a low slow cure then increased or ramped to a standard curing power. Soft-start curing seemed to be successful, with several studies reporting improved marginal integrity with the technique. As a variation of this technique, some authors began to advocate a pulse-delay curing technique in which the final increment of composite was cured briefly and, after finishing the restoration, the final cure was applied at a high power; this allowed the resin time to flow. Claims are made for improved marginal integrity and less leakage with these techniques, and while in vitro data seemed promising, little clinical support has been offered for these techniques. In fact, clinical studies comparing hard and soft curing techniques have reported no difference in marginal integrity in restorations cured with these methods compared to incremental placement and curing.[2,3] This may mean that the differences are too small to be detected clinically. With shrinkage ranging from 1.6 to 3% volume, it is not surprising that it is difficult to detect differences clinically.

Unfortunately, most studies evaluating the effects of reducing polymerization shrinkage have used different amounts of energy to irradiate the composite. Lower irradiation energies could reduce the total conversion and, therefore, the polymerization shrinkage of the composite. By reducing shrinkage this way, a resin composite that is more susceptible to chemical and mechanical breakdowns is produced. Therefore, the total energy used to polymerize each resin composite must be controlled for each method of curing to make a fair comparison. This study did, and this is the reason it is unique.

This in vitro study measured the marginal integrity and hardness of composites placed into occlusal cavity preparations. The resin composite (Z250) was polymerized using four different curing methods: low power and the longest curing time (100 mW/cm^2 for 180 s); medium power (300 mW/cm^2 for 60 s); high power (600 mW/cm^2 for 30 s); and highest power and the shortest time (1,000 mW/cm^2 for 18 s). This study controlled the total energy used to polymerize the resin composite restoration but used different methods to irradiate the composite by varying the curing time and power density. The results demonstrated that margin integrity and hardness of the composite were similar in all groups but that the curing method with the lowest intensity and longest curing time produced the best enamel margin.

Given that this project was limited in its scope (more resin composites with different moduli and photoinitiators and various curing lights should be tested), further research should be conducted to determine whether this effect is seen with multiple resin composites.

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