Myth-busting the curing light

Light curing plays a critical role in the final stages of a successful restoration. But how much do you really know about your curing light? Is more power, better? Can you over-cure a restoration? Dr. Geiselhardt, DDS, breaks down what you may or may not have realized about curing lights. Read more

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Interostral access plays a major role in the success of light curing. See how even a slight angle change in a pen-style design can affect interstral access. Watch Video

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Q. I’m considering purchasing a high output light that can cure my restorations in 3-5 seconds. Is there anything I should know before I make the purchase?

Q. Why should I consider a pen-style curing light?

Q. Which are the most significant variables when it comes to light curing?

See Answers

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Try a curing light that’s favored to perform at clinical distances. Request Demo
Shedding Light on Proper Curing and Successful Restorations.

By: Jason H. Goodchild, DMD

Polymerization of composites is the process by which the material’s filler and the physical properties and functionality of the composites are established. The energy from the light curing Unit (LCU) interacts with the monomer to excite the polymerizable monomers to form polymers. The more energy delivered to the restoration by the LCU, the more monomers will react with each other, and the more effective the restoration will be. Despite the importance of ensuring a high index of polymerization, the lack of information related to this topic makes it difficult for practitioners to follow proper procedures. This article aims to help explain research findings reporting that more than 95% of composite restorations being insufficient cured. An insufficient cure can lead to suboptimal effects on physical properties, reduced bond strengths, breaking at the margins, decreased marginal integrity, increased propensity for microleakage, and undesirable secondary posts and failures. These facts can be mitigated by following guidelines to ensure adequate light curing and maximum pre-polymerization of the restoration. To help clinically, practitioners should remember the acronym CORE (Curing light, Operator techniques, Restorative characteristics, and Equipment requirements) to ensure best performance and outcomes when using LCU.

One of the characteristics of LCUs that is most often overlooked is the output of irradiance. Measures and in uranium, just because an LCU has an advertised irradiance level of 1400 W/cm² does not mean that how much energy is being emitted is compatible to cured. All curing light experiences an energy drop-off that decreases the amount of energy delivered to the restorative over distance, reducing the energy at the curing lights. In one study, a 50% reduction in intensity was reported at a distance of more than 2 feet. If the average clinical crown height of anterior teeth is limited, clinicians may be forced with curing composite material to use deep preparation to minimize the influence from the LCU.2,3

Remembering the acronym CORE, deep composite restorations demand a high-quality LCU, good operator technique, the ability to direct the light into the preparation, and sufficient curing time for the material type and shade of material. To provide clinicians with a LCU that can perform at both relevant distances and help maximize curing efficiency, DENTSPLY Caulk has introduced the SmartFit® Focus. (Figure 1)

The SmartFit® Focus is an ergonomically powerful, fixed-protocol, LED curing light from DENTSPLY Caulk for both direct and indirect restorative applications. SmartFit® Focus is designed to ensure instant access and curing efficiency, and provide reliable curing power over long durations. Some important features of the new LCU are:

- Improved Access: The newly designed light tip provides increased access for providing a light beam profile and deep collimation that is at least 50% more efficient in light path through the mouth.

- Maximized Curing Power and Efficiency: It features a homogeneous beam profile for uniform performance in the curing area. The SmartFit® Focus emits light from the beam, ensuring that energy is transmitted throughout the resin composite, preventing the common issue of uneven curing.

- Convex Renge: Smart Renge Technology checks the battery condition and initiates the proper curing mode. "Automatic quick curing mode" for times of 20 seconds with just a 10-minute charge; "standard curing mode" to achieve a full charge in less than 3 hours; and "standing mode," which prevents overheating when SmartFit® Focus is left to rest.

- Simple Operation: It features a variable adjustment and ergonomic design, weighing only 10g.

- Case Example: 35-year-old female presented for a composite cavity restoration on the distal surface of No. 30. After local anesthesia and administration of 4% lidocaine (6 mL), the preparation was completed with high-speed handpiece with rubber dam. The preparation was filled with a sectional matrix system and resin-based flowable and hybrid composites. (Figure 2) The light tip was positioned at a 45-degree angle to the material to be cured, and the SmartFit® Focus was used to achieve the necessary cure. The SmartFit® Focus is designed to ensure instant access and curing efficiency, and provide reliable curing power over long durations.

- Conclusion: Proper light curing of composites to another step is creating consistently excellent restorations. By practicing CORE guidelines of light curing and using a high-quality LCU, clinicians can safeguard against negative outcomes related to insufficiently cured composite restorations.


References:

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Ask Dr. Janyavula
Dr. Janyavula takes on a few questions about curing restorations.

Q. I’m considering purchasing a high output light that can cure my restorations in 3-5 seconds. Is there anything I should know before I make the purchase?

A. High output lights with short cure times are understandably attractive to clinicians looking to save time – however, research suggests that short cure times may put you at risk for undercuring by not achieving the minimum degree of conversion (monomer to polymer) required for a successful restoration. Since adequate light curing is essential to the success of the restoration and the establishment of material physical properties, it may not be a step in the procedure the clinician should look to for time savings. Depending on their technical design, curing lights may require higher light intensities to ensure proper curing over distance or to reduce the curing time and offer a ‘fast cure’ option.

Even when using these short cure cycle lights (which subsequently tend to have above average output), many clinicians often tack on an additional cure cycle or two just to be sure they are getting a full cure. However, it is not advised to arbitrarily increase cure times above manufacturers recommendations, because while you can’t overcure the composite itself, you CAN, in fact, deliver too much radiant energy to the tooth. This can cause an excessive increase in temperature which laboratory studies have shown can lead to sensitivity and damage to the pulp and oral tissues.

Shortening the cure time comes with additional risk. If the light tip of a high-power curing light is misaligned for 1 second when using the light for only 3 seconds, the amount of energy delivered to the resin can be reduced by as much as 30%. Using a light with a longer cure time reduces the risk of brief misalignment – the same 1 second misalignment during a 20 second curing cycle reduces the potential amount of energy delivered by just 6%.

Q. Why should I consider a pen-style curing light if I am more comfortable with a gun-style design or a light with an angled light guide?

A. Angled light guides may be preferred in anterior applications, but 74% of direct restorations are performed in the posterior, where curing light access may be limited. The angle at which the probe tip is directed can also affect the amount of energy that is delivered to the restoration. The light guide tip should be as close as possible and flat against the restorative surface to have the best chance at reaching all corners of the box. This is especially critical in a Class II, because the gingival portion of the proximal box is often in the shadow of the matrix band or remaining tooth structure and furthest from the curing light. Angled light guides inherently produce light that strikes the restoration at an angle, causing light energy to reflect off the surface and to not be absorbed by the restoration, particularly in the corners of the proximal box. Pen or wand-style curing light designs can make it easier to keep the light tip flat to the surface of the restoration in areas where space is an issue (back of mouth, geriatrics, pediatrics).

Q. It seems there are a number of important variables to consider and control when it comes to light curing. Which is the most significant?

A. Despite the many important curing light and material variables to consider when curing, operator technique is the largest variable impacting the amount of energy delivered to the restoration. A recent study using new curing lights tested the ability of 20 dental professionals to deliver energy to simulated restorations. Using a light curing simulator to measure the amount of energy received by the restoration, it was determined that 27% of the clinicians delivered less energy than was necessary to adequately cure a Class I, and 85% delivered less energy than was necessary to adequately cure a posterior Class V. Even with new curing lights capable of delivering high energy, operator technique often prevents sufficient useful light from reaching the restoration. Although the harmful effects of blue light have taught us not to look when the light is on, proper eye protection should be used to allow the operator to pay attention, and stabilize the light flat against the surface of the restoration, and to maintain that position for the duration of the curing cycle.