COMMENTARY

EFFECT OF CURING LIGHTS AND BLEACHING AGENTS ON PHYSICAL PROPERTIES OF A HYBRID COMPOSITE RESIN

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The article by Lima and colleagues reinforces the effect of whitening agents on resin composites. The merit of this publication is that the authors attempt to investigate the reasons for the alterations in composites that influence microhardness (MH) and diametral tensile strength (DTS). Questions are raised regarding what causes these alterations. Is it the resin composite polymerization process? How is the light source going to impact this process? Does the whitening gel concentration have an effect? The introduction of this article invites the reader to be part of the authors' thinking process during the development of the research.

In this study, the minifill hybrid composite, Z250, was light-cured by either a quartz–tungsten–halogen light-curing unit or an LED light-curing unit prior to the bleaching gel application. The authors found that both lights performed similarly when the MH of the composite was evaluated, and the LED light showed higher DTS when the same whitening protocol was performed. The authors suggest that the LED light probably achieved higher DTS results because its spectral wavelength emission is closely matched to the camphorquinone photoinitiator. Lima and colleagues also emphasized that if the resin composite contains other photoinitiators, in addition to camphorquinone, which do not coincide with the emission spectrum of the light source, composite polymerization is compromised. Therefore, it is pertinent to mention that the results of this study only apply for the composite evaluated; other composites probably will behave differently. Another plausible explanation for the better performance of the LED is that it was cured for a longer period of time, and the longer the composite is subjected to the curing light, the more effective the cure.

It has been previously shown that the contact of tooth whitening agents may lead to a slight but significant increase in surface roughness and extent of porosity in resin composites. Lima and colleagues evaluated two different whitening agents, 16% carbamide peroxide and 35% hydrogen peroxide, representing home and in-office whitening systems. They found that both whitening systems behaved similarly to the control group when DTS was evaluated, and the lower concentration of whitening agent presented the lowest MH, for both polymerization units tested. The authors linked this result to the carbopol present in this whitening agent because of the fact that carbopol presents the solubility parameters similar to this whitening agent, and bis-GMA copolymer is susceptible to softening by chemicals with a broad range of solubility parameters. Apart from that, it should be noted that the total time period of whitening application was much higher for the low concentrated regimen than for the highly concentrated one. This represents a plausible reason why the lower concentration of tooth whitening gel showed an increase in surface roughness. Furthermore, this was an in vitro study and the samples were not stored in saliva. It is conceivable that storage in saliva might have modified or attenuated the whitening agent impact by the formation of a surface-protection salivary layer on the restorative material.

Caution needs to be taken when using high hydrogen peroxide on hard and soft tissues. According to the study protocol, 35% hydrogen peroxide was applied for a total of 1.5 hours. Usually, the in-office protocols are used for 1 hour maximum, with 15 minutes whitening application performed four times. Even though the authors stated that this procedure did not show any significant effect on the composite MH and DTS, it is possible that this application might provoke a great deal of tooth sensitivity and perhaps some effect on the enamel surface.

As mentioned by the authors, the decrease in MH promoted by the whitening agent depends on the material. In this study, only one resin composite was evaluated. Although Z250 was designed to be used on both anterior and posterior restorations, clinicians usually use this material only on the posterior region of the mouth because of its difficulty in polishing. Nowadays, there is a great gamut of resin composites that have smaller particle size, therefore,

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a better polishing effect than Z250, and these composites should be used in the esthetic zone of the mouth. That would be pertinent to evaluate the effect of whitening agents on composites that are usually applied in the anterior region, as the whitening gel is applied on the facial/buccal surface of the teeth. However, in common practice, the resin composites on the anterior area are usually replaced after tooth whitening because of color mismatch.

To conclude, it is paramount to use the appropriate light-curing unit with a certain composite taking into account irradiance, irradiance time, and composition of the material to be cured in order to achieve optimal clinical performance. Hence, if the composite is well cured, the whitening agent will have reduced effect on its surface and core.

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