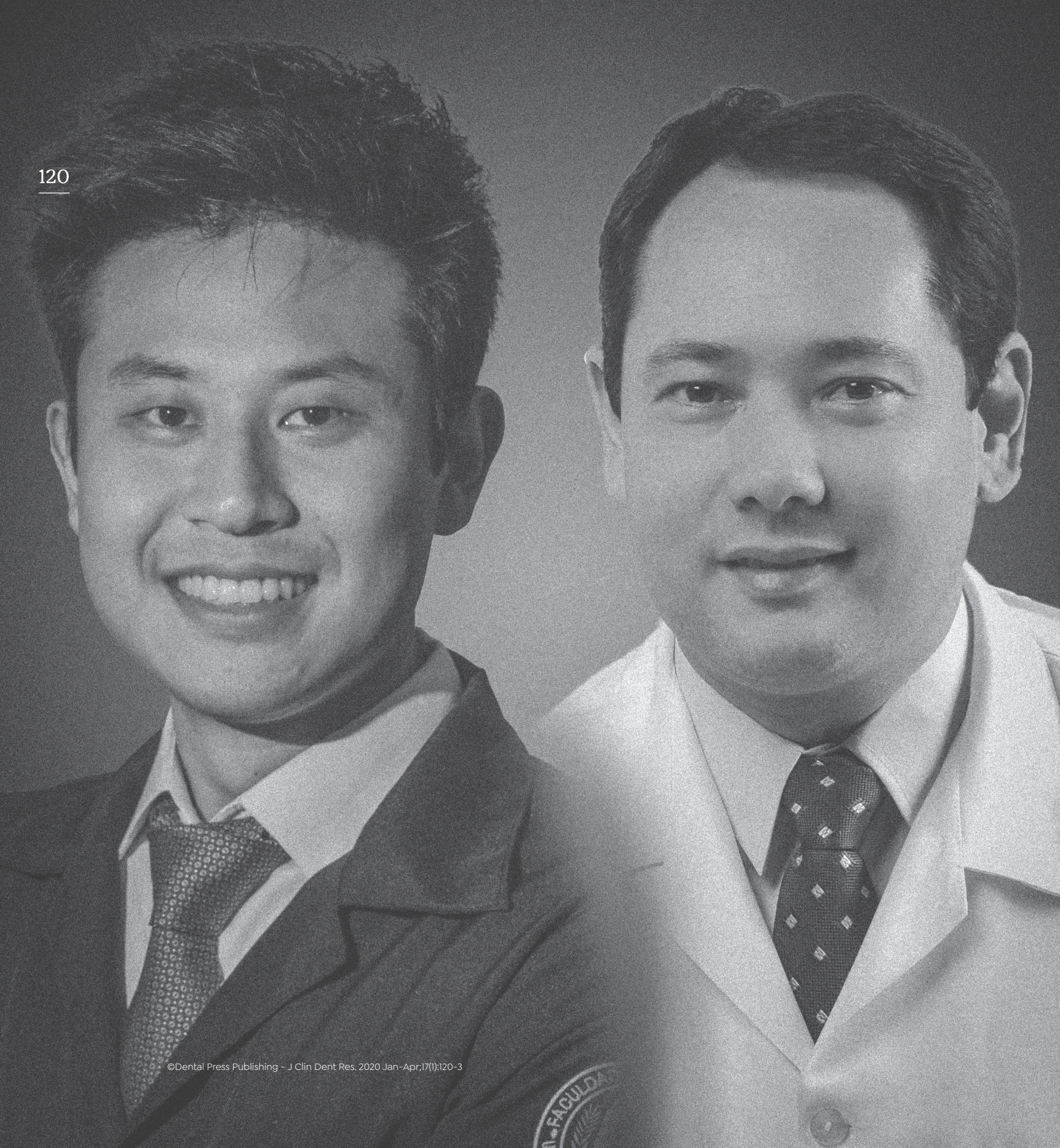

PHOTOACTIVATION

Are the light curing units all the same?

Carlos Alberto Kenji **Shimokawa** & Marcelo **Giannini**

AFTER EMPHASIZING THE IMPORTANCE OF THE PHOTOACTIVATION in the modern Dentistry, the next question, that is one of the most frequent when the topic is light curing, is: "Are the light curing units all the same?". There are light curing units from different brands, with different colors, shapes, performances and prices available for dentists.[1] The last is one of the most important factors when choosing a new light curing unit. The equipment's prices have a great variation in the Brazilian market, from less than 500 reais to light curing units that cost more than 6,000 reais. Another factor, that is not known by many dentists, is that the light emitted by light curing units can vary a lot and influence directly the polymerization of resin-based materials.

Then, which characteristics are more important and should be considered when choosing a light curing unit? There are characteristics related to: 1- the light emitted and 2- the shape of the light curing units. Regarding the light emitted, three factors should be considered: power, emission spectrum and light beam profile.[2]

The equipment's power shows how powerful is the light emitted. It is many times described by an irradiance value (mW/cm^2), that is the power

(mW) emitted by determined area (cm^2). However, contrary to what may be thought, very high irradiance values are not desirable, since they can lead to a lower polymerization, besides of increasing the temperature of the irradiation site and the tooth.[3] Very low irradiance values can also lead to lower polymerization of the resin-based materials. Therefore, values around 1,000 mW/cm2 are preferable.[4]

The emission spectrum shows the color of the light emitted by the light curing units. There are light curing units that emit blue light only and light curing units that emit blue and violet light at the same time (Fig 1). Resin-based materials may have photoinitiators that need violet light to be sensitized in their composition. The polymerization of these materials may be improved with the use of violet light.[5] However, the materials that have these photoinitiators also present conventional photoinitiators, that are sensitized by blue light, and this guarantee its polymerization, even when using light curing units that emit blue light only. Another factor to be considered is the lower penetration of the violet light when compared to the blue light. Therefore, in higher thicknesses, the violet light is not efficient.[6] However, the light curing units that emit violet light also emit blue light, ensuring the polymerization in high thicknesses.

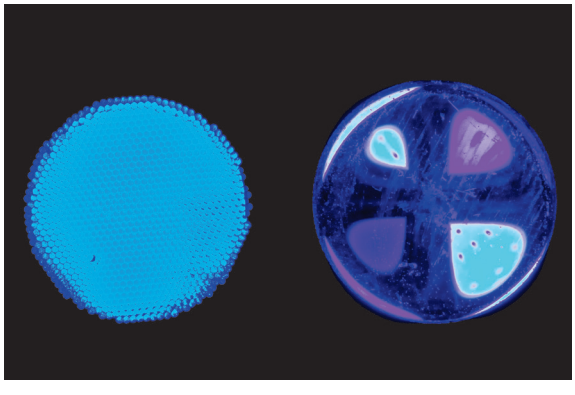

Figure 1: Emission spectrum of two light curing units. One of them emit blue light only (left), while the other emit blue and violet light at the same time (right).

The light beam profile shows the homogeneity of the light emitted by light curing units across their tips, and the distribution of the light over the composites. There are light curing units that emit light with areas of high power concentration (Fig 2).[7] In practice, light curing units with a non-homogeneous light emission will have regions of their tips emitting very powerful light and regions emitting low power. The resin-based material may also present well polymerized areas and areas with low polymerization, what is not desirable for restorations.

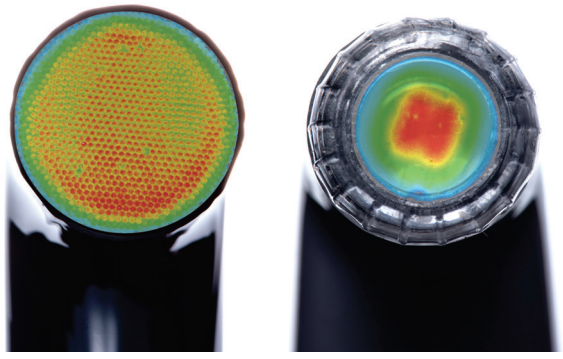

Figure 2: Light beam profile of two light curing units. One of them emit homogeneous light across its tip (left), while the other emit powerful light (red and yellow colors) in the central region of the tip and light with low power in the peripheral region (green and blue colors). Regions of the tip that emit light with low power will lead to an inadequate polymerization in determined regions of the restorations.

Therefore, only by analyzing the different characteristics associated to the light emitted by light curing units, one can conclude that they can be very different. What about the other factors? Which is the influence of the light curing units' design in the polymerization of resin-based materials? These factors are also very important when choosing a light curing unit, but this question will be answered in the next issue of the column.

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