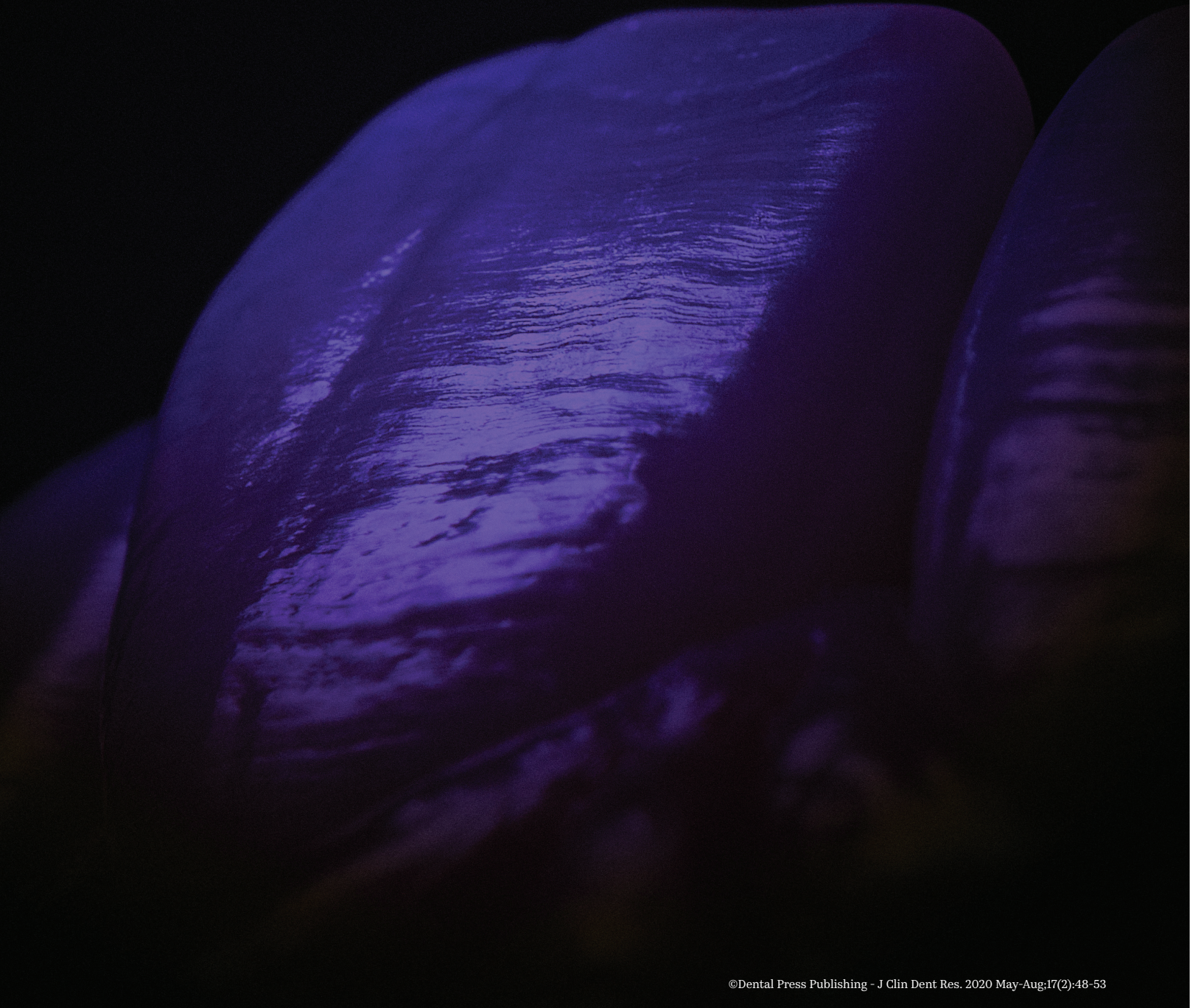


What is the **influence**
of the design of the
equipment in the
polymerization of
resin materials?

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Power, emission spectrum and light beam profile are important factors related to the light emitted by light curing units and must be considered when choosing a light curing unit.¹ Besides that, there are equipment made with different materials, shapes and sizes. Therefore, one should also consider factors related to the equipment's design: shape/angle and size of the light tips.

The shape and angle of the light curing units' tips are important to enable their correct positioning over the materials to be polymerized. Therefore, it is fundamental that the equipment's tip is positioned perpendicular to the material and the light beam is covering the whole material, without regions of shadow, caused by the inclination of the tip. Some equipment have their tip with angles that make their correct positioning unfeasible, especially when trying to reach posterior teeth.² The incorrect positioning may generate non

irradiated regions and affect the polymerization of the restorative material.³

Another factor related to the design of the light curing units is their tips' size. Since one needs to cover the light cured material with light for its adequate polymerization, the size of the tips associated to the light beam profile emitted by the equipment has its importance evidenced. The wider and more homogeneous the light emitted by the equipment; the wider will be the coverage of this light. Therefore, in a situation of a posterior restoration made of bulk fill resin-based composite using a big increment,⁴ or in a direct veneer, where the last layer may be made using a single increment, the use of an equipment with a narrow tip may lead to the necessity of more than one light curing spot, while an equipment with a wide tip may cover the whole restoration using only one light curing cycle (Fig 1).

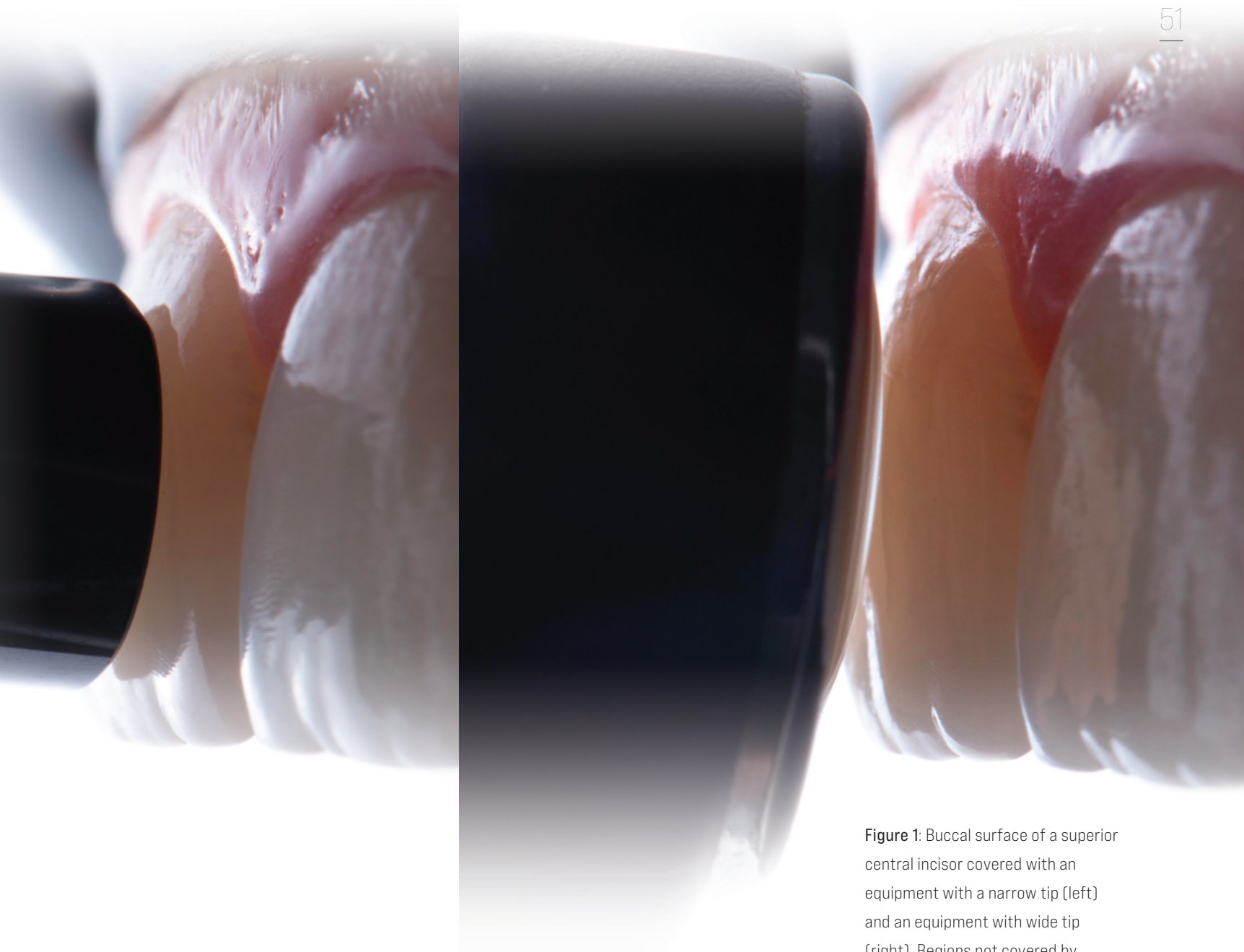


Figure 1: Buccal surface of a superior central incisor covered with an equipment with a narrow tip (left) and an equipment with wide tip (right). Regions not covered by light will have their polymerization prejudiced.

If the restorative material is not completely covered by the light beam emitted by the light curing units, its polymerization will not be adequate, not being homogeneous.⁵

Regions not covered by light will have reduced mechanical properties,⁶ lower color stability⁷ (Fig 2) and reduced biocompatibility,⁸ that may lead to premature failure of the restorations.



Figure 2: Resin-based composite discs with a 12-mm diameter light cured for 20 seconds using an equipment with narrow tip (left) and an equipment with tip compatible with the disc size (right). Discs were immersed in red wine for 7 days to evidence the accelerated staining of regions not covered by the light emitted by the light curing units. Yellow dashed circles represent the size of the light curing units' tips.

With the knowledge of the characteristics of the light curing units that influence the polymerization of resin-based materials, one may be able to choose the most suitable equipment for the daily practice. However, the light curing unit itself does not guarantee the correct polymerization of the materials. We must use them adequately for the correct polymerization of resin-based materials. Therefore, another frequent question is: What is the relevance of the technique while light curing? And this question will be discussed in the next number of the column.

REFERENCES

1. Price RB, Ferracane JL, Shortall AC. Light-curing units: a review of what we need to know. *J Dent Res.* 2015;94(9):1179-86.
2. André CB, Nima G, Sebold M, Giannini M, Price RB. Stability of the light output, oral cavity tip accessibility in posterior region and emission spectrum of light-curing units. *Oper Dent.* 2018;43(4):398-407.
3. Shimokawa CAK, Giannini M. Qual a real importância da fotoativação na Odontologia. *J Clin Dent Res.* 2019;16(3):152-6.
4. Shimokawa C, Turbino ML, Giannini M, Braga RR, Price RB. Effect of curing light and exposure time on the polymerization of bulk-fill resin-based composites in molar teeth. *Oper Dent.* 2020; 45(3):E141-E155.
5. Shimokawa CAK, Turbino ML, Giannini M, Braga RR, Price RB. Effect of light curing units on the polymerization of bulk fill resin-based composites. *Dent Mater.* 2018;34(8):1211-21.
6. Rueggeberg FA, Giannini M, Arrais CAG, Price RBT. Light curing in dentistry and clinical implications: a literature review. *Braz Oral Res.* 2017;31(suppl 1):e61.
7. Imazato S, Tarumi H, Kobayashi K, Hiraguri H, Oda K, Tsuchitani Y. Relationship between the degree of conversion and internal discoloration of light-activated composite. *Dent Mater J.* 1995;14(1):23-30.
8. Fujioka-Kobayashi M, Miron RJ, Lussi A, Gruber R, Ilie N, Price RB, et al. Effect of the degree of conversion of resin-based composites on cytotoxicity, cell attachment, and gene expression. *Dent Mater.* 2019;35(8):1173-93.

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