



THE "BEST CURING LIGHT" VERSUS THE "BEST RESIN": WHAT IS MOST IMPORTANT IN RESTORATIVE DENTISTRY?

O "MELHOR FOTOPOLIMERIZADOR" VERSUS A "MELHOR RESINA": O QUE
É MAIS IMPORTANTE NA DENTÍSTICA RESTAURADORA?

EL "MEJOR FOTOPOLIMERIZABLE" VERSUS LA "MEJOR RESINA": ¿QUÉ ES
MÁS IMPORTANTE EN ODONTOLOGÍA RESTAURADORA?

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ABSTRACT

Objective: To discuss what is most important in Restorative Dentistry: using the best light-curing unit or using the best resin on the market. Methodology: During the construction of this narrative review article, it was necessary to create a methodological strategy that would meet the article's need to have the maximum amount of current and relevant information on the topic. Thus, searches were made in the following databases: DeCs, BVS/BIREME, Scielo, PUBMED Central,

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Science Direct, Web of Science, The Cochrane Library in conjunction with Google Academy. Results: Studies and clinical evidence show that there is no point in having the best resin on the market in your daily clinical practice if the photoactivation is not good, causing the resin not to last if it would have if it had had better photoactivation. Thus, it is understood that it is better to use the best light-curing unit on a resin that is not so good than to use the best resin, but that will be activated by a photocuring unit that is not good. Conclusion: Studies show that even if a resin is not the best on the market, if it is activated with a good light-curing unit, it will have more durability and performance than a resin that is the best on the market but is activated by a light-curing unit that is not good. Therefore, the best option would be to use the best resin and light-curing unit on the market, thus enhancing the durability and performance of the resin.

Keywords: Resins. Dental Curing Light. Light-Curing of Dental Adhesives. Dentistry. Operative.

RESUMO

Objetivo: Discutir o que é mais importante na Odontologia Restauradora: utilizar o melhor aparelho fotopolimerizador ou utilizar a melhor resina do mercado. Metodologia: Durante a construção deste artigo de revisão narrativa, foi necessário criar uma estratégia metodológica que atendesse a necessidade do artigo de ter o máximo de informações atuais e relevantes sobre o tema. Assim, foram feitas buscas nas seguintes bases de dados: DeCs, BVS/BIREME, Scielo, PUBMED Central, Science Direct, Web of Science, The Cochrane Library em conjunto com o Google Academy. Resultados: Estudos e evidências clínicas mostram que não adianta ter a melhor resina do mercado na sua prática clínica diária se a fotoativação não for boa, fazendo com que a resina não dure se tivesse tido melhor fotoativação. Assim, entende-se que é melhor utilizar o melhor aparelho fotopolimerizador em uma resina que não é tão boa do que utilizar a melhor resina, mas que será ativada por um aparelho fotopolimerizador que não é bom. Conclusão: Estudos mostram que mesmo que uma resina não seja a melhor do mercado, se ela for ativada com uma boa unidade de fotopolimerização, ela terá mais durabilidade e desempenho do que uma resina que é a melhor do mercado, mas é ativada por uma unidade de fotopolimerização que não é boa. Portanto, a melhor opção seria usar a melhor resina e unidade de fotopolimerização do mercado, aumentando assim a durabilidade e o desempenho da resina.

Palavras-chave: Resinas. Fotopolimerizador. Fotopolimerizador de Adesivos Dentários. Odontologia. Operatório.

RESUMEN

Objetivo: Discutir qué es lo más importante en Odontología Restauradora: utilizar la mejor unidad de fotocurado o utilizar la mejor resina del mercado. Metodología: Durante la construcción de este artículo de revisión narrativa, fue necesario crear una estrategia metodológica que atendiera la necesidad del artículo de contar con la máxima cantidad de información actual y relevante sobre el tema. Así, se realizaron búsquedas en las siguientes bases de datos: DeCs, BVS/BIREME, Scielo, PUBMED Central, Science Direct, Web of Science, The Cochrane Library en conjunto con Google Academy. Resultados: Estudios y evidencias clínicas demuestran que de nada sirve tener en la práctica clínica diaria la mejor resina del mercado si la fotoactivación no es buena, provocando que la resina no dure como lo hubiera hecho si hubiera tenido una mejor fotoactivación. Así, se entiende que es mejor utilizar la mejor unidad de fotocurado sobre una

resina que no es tan buena que utilizar la mejor resina, pero que será activada por una unidad de fotocurado que no es buena. Conclusión: Los estudios demuestran que aunque una resina no sea la mejor del mercado, si se activa con un buen fotopolimerizador tendrá mayor durabilidad y rendimiento que una resina que sea la mejor del mercado pero que se active con un fotopolimerizador que no sea bueno. Por lo tanto, la mejor opción sería utilizar la mejor resina y fotopolimerizadora del mercado, mejorando así la durabilidad y el rendimiento de la resina.

Palabras clave: Resinas. Lámpara de Polimerización Dental. Fotopolimerización de Adhesivos Dentales. Odontología. Operativa.



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INTRODUCTION

Restorative dentistry is a dynamic and essential field in dentistry, characterized by continuous advances in both materials and equipment. The main objective of this specialty is to provide aesthetic, functional and long-lasting restorations that meet the expectations of patients and the biomechanical requirements of the oral cavity. Within this context, two elements stand out as protagonists: the light-curing unit and the composite resin.

The light-curing unit is an indispensable device in the polymerization process of composite resins, and its effectiveness is directly linked to the quality of the material's cure. On the other hand, composite resin, as a restorative material, has evolved significantly over the last few decades, incorporating advances such as nanoparticle particles, state-of-the-art photoinitiators and universal systems adaptable to different clinical techniques (Ferracane, 2018; Price et al., 2018). The literature indicates that the interaction between these two components is critical for the success of restorations. Recent studies highlight that factors such as light intensity, wavelength, and exposure time are as important as the intrinsic properties of resins, such as wear resistance, polymerization shrinkage, and color stability (Rueggeberg & Blalock, 2019; Malhotra et al., 2019). This work will address how these variables interact to determine clinical performance and which of them exerts the greatest influence on the final results.

Thus, the aim of this review article is to discuss what is most important in Restorative Dentistry: using the best light-curing unit or using the best resin on the market.

METHODOLOGY

This work is a narrative literature review, so it was necessary to seek a range of information on the subject, content that is scientifically proven, up-to-date and of reliable origin, coming from journals and newspapers that have carried out peer reviews and analysis of the information used. Thus, we used only research projects, articles, master's and doctoral theses and other information that were available in the following databases: PUBMED Central, PROSPERO, Web of Science, DeCs, BVS/BIREME, The Cochrane Library, Scielo together with the Google Academy platform. In order to exclude data that are not related to this article and aiming to use only information related to the review topic, the following descriptors were used to narrow the data obtained: Resins, Dental Curing Light, Light-Curing of Dental Adhesives, Dentistry, Operative. To provide guidance on how a narrative review should be developed, the work of Rother (2007) was used, a study that covers everything from the data search methodology that should be used in this type of article, structure, development to how the approach used should be. Grey Literature was also a key point used in this article, bringing more rich content to compose its review, contributing to the quality of the work.

RESULTS

Light Curing Unit

Importance in the Restorative Process

The light curing unit is responsible for activating the polymerization reaction of composite resins, promoting monomer-polymer conversion and determining the final properties of the material. Studies indicate that inadequate power or incompatible light spectra can result in restorations with low mechanical strength and greater susceptibility to wear (Jäger et al., 2020). In addition, insufficient polymerization can lead to increased release of residual monomers, increasing the risk of pulp irritation and allergic reactions (Peutzfeldt & Asmussen, 2021).

Characteristics of an Efficient Light Curing Unit

- **Light Power:** Must be sufficient to polymerize the deep layers of the resins (Malhotra et al., 2019). The ideal power varies between 800 and 2000 mW/cm², depending on the layer thickness and the type of resin.
- **Emission Spectrum:** Compatibility with the photoinitiators of modern resins is essential to ensure adequate polymerization. For example, multiwavelength light curing units are indicated for resins containing alternative photoinitiators such as Lucirin TPO (Neumann et al., 2021).
- **Light Uniformity:** Minimizes regions of inadequate curing, especially in hard-to-reach areas, such as deep cavities or complex preparations (Price et al., 2018).
- **Durability and Ergonomics:** Equipment with an ergonomic design and long service life are preferable for intensive clinical use (Rueggeberg & Blalock, 2019).

Impact of the Light Curing Agent on the Final Result

Even with high-quality resins, poor light curing can lead to clinical failures, such as marginal leakage, detachment, and early esthetic changes (Rueggeberg & Blalock, 2019). In addition, the use of light curing agents with low intensity or inadequate spectra can result in a compromised surface polymerization layer, reducing the longevity of the restoration (Ilie et al., 2020).

Composite Resin

Evolution of Composite Resins

Composite resins have evolved significantly, incorporating nanotechnology and advanced photoinitiation systems. These advances have enabled greater esthetic control, reduced polymerization shrinkage, and improved wear resistance (Ferracane, 2018). Nanofilled resins, for example, have a reinforced matrix that improves mechanical resistance without compromising esthetics (Da Rosa et al., 2020). Furthermore, universal resins have gained prominence due to their versatility in different clinical situations. These resins combine aesthetic and mechanical

characteristics suitable for both posterior and anterior areas, reducing the need for multiple materials in the dental office (Peutzfeldt & Asmussen, 2021).

Characteristics of a Good Resin

- **Aesthetics:** Variety of opacities and colors that mimic the tooth structure, in addition to color stability over time (Da Rosa et al., 2020).
- **Mechanical Properties:** High resistance to fracture and occlusal wear, essential to withstand masticatory forces in posterior teeth (Ferracane, 2018).
- **Biocompatibility:** Materials with low toxicity and minimal risk of adverse reactions. Studies have highlighted the importance of minimizing the release of residual monomers to ensure patient safety (Van Landuyt et al., 2019).
- **Polymerization Shrinkage:** Resins with lower shrinkage reduce the risk of marginal leakage, a critical factor for long-term clinical success (Ilie & Hickel, 2020).

Impact of Resin Properties on Restorative Success

Even with a high-quality curing light, a resin with inadequate mechanical or esthetic properties can compromise the final result, leading to functional failures or the need for early replacement (Van Landuyt et al., 2019). Furthermore, choosing specific resins for each clinical situation is essential to maximize the benefits of technological innovations. For example, bulk-fill resins allow application in thicker layers, reducing clinical time without compromising polymerization efficacy (Peutzfeldt & Asmussen, 2021).

Polymerization Efficiency

Research has shown that multi-wavelength LED light curing devices offer superior conversion rates, especially when used with resins containing highly sensitive photoinitiators, such as Lucirin TPO (Neumann et al., 2021). These devices also have a lower risk of excessive heating of the dental pulp, increasing their clinical safety. Studies such as those by Peutzfeldt and Asmussen (2021) confirm that the uniformity and intensity of the emitted light are critical factors for polymerization in deep areas.

Durability of Restorations

Comparative studies indicate that nanoparticle resins, when associated with high-intensity light curing devices, have greater wear resistance and a lower rate of microleakage in posterior tooth restorations (Ilie et al., 2020). On the other hand, microhybrid resins continue to be a viable choice in cases where aesthetics are less required, such as in posterior areas (Ferracane, 2018). In addition, studies by Rueggeberg and Blalock (2019) indicate that durability is directly influenced by the balance between the material used and the clinical conditions, such as humidity and thickness of the applied layers.

Aesthetic Performance

The color stability of resins is closely linked to the quality of polymerization. Studies by Price et al. (2018) show that the use of broad-spectrum photopolymerizers reduces the tendency to yellowing, even under conditions of high pigment load. Da Rosa et al. (2020) emphasize that the choice of aesthetic resins, combined with appropriate polymerization techniques, is essential to ensure restorations that maintain their appearance for long periods.

DISCUSSION

The choice between a curing light and a composite resin should not be analyzed in isolation, but rather as part of an integrated system. Studies such as those by Peutzfeldt and Asmussen (2021) indicate that even the best materials can present inferior clinical performance when subjected to inadequate techniques or suboptimal equipment. On the other hand, a state-of-the-art curing light does not compensate for the intrinsic limitations of low-quality resins.

The clinical impact of inadequate curing is significant, directly affecting the longevity and aesthetics of restorations. For example, research by Ilie et al. (2020) suggests that the monomer-to-polymer conversion rate influences the wear resistance and chemical degradation of the resin in the oral environment. In addition, the interaction between light intensity and resin layer thickness must be carefully balanced, as highlighted by Price et al. (2018).

Nanoparticulate resins have stood out for their high mechanical strength and better clinical handling, but they require light curing devices that emit at specific wavelengths to maximize the

activation of photoinitiators, such as Lucirin TPO (Neumann et al., 2021). Universal resins, on the other hand, offer greater versatility, but may require adjustments in the light curing technique to avoid inadequate shrinkage. In terms of equipment, multi-wavelength LED technology has been gaining ground, ensuring better compatibility with a wide range of resins. However, the high cost of these devices is still a barrier to their universal adoption, as discussed by Rueggeberg and Blalock (2019).

The synergy between material and equipment also depends on the professional's training. Inadequate light curing procedures, such as incorrect positioning of the light curing device tip, can drastically reduce the quality of the cure, regardless of the technology used. Therefore, investments in continuing education and standardized clinical protocols are essential to maximize the benefits of technological innovations.

CONCLUSION

The debate over the relevance of the best curing light or the best resin should be replaced by a holistic approach. Both equipment and material should be chosen based on compatibility criteria and specific clinical case requirements. Future research could explore how different combinations of resins and curing lights affect clinical variables such as restoration longevity and patient satisfaction. Thus, the integration of technological advances with optimized clinical techniques remains the greatest challenge and opportunity in restorative dentistry.

Studies show that even if a resin is not the best on the market, if it is activated with a good light-curing unit, it will have more durability and performance than a resin that is the best on the market but is activated by a light-curing unit that is not good. Therefore, the best option would be to use the best resin and light-curing unit on the market, thus enhancing the durability and performance of the resin.

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