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A New, Simple and Innovative Technique for Pre-Heating/ Pre-Warming of Dental Composite Resins in Thermal Assisted Light Polymerization Technique

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Abstract

A thermal assisted light polymerization method for enhancing the degree of conversion of resin composite and reducing viscosity thus improving marginal adaptation of the restoration is to preheat the composite resin before placement. Heating the composite also dramatically decreases the curing time required for light polymerization. With the added benefit of greater depth of cure of the restorative composite, increased chemical conversion, and ease of flow for easier dispensing into the cavity preparation, pre-heating or sometimes called as pre-warming has become an indispensable technique for better dentistry. In spite of all these advantages, the cost and availability of device is a limiting factor in its use which can be overcome by using this simpler device commonly available in all clinics to make this technique popular and economically viable. A new, simple and innovative technique for pre-heating/pre-warming of dental composite resins in thermal assisted light polymerization technique is presented.

Introduction

The adequate polymerization of dental composite is essential in order to produce restorations with optimal properties [1] and to maintain integrity of the interface [2,3]. A thermal assisted light polymerization method for enhancing the degree of conversion of resin composite and reducing viscosity thus improving marginal adaptation of the restoration is to preheat the composite resin before placement [4-8]. Daronch et al. [8] found a higher degree of conversion in the top and bottom layers when the composite resin was preheated to 54°C and 60°C. Lucey et al. [7] showed that pre-heating the composite to 60°C improved hardness in the top and bottom surfaces. This is highly desirable in situations in which the polymerization of the resin composite cannot be adequate due to the distance between the tip of light-curing unit and the increments of the composite resin. An increase in temperature of resin decreases its viscosity and enhances radical mobility, resulting in additional polymerization [8]. The additional free volume of the resin composite increases with the increased temperature, improving the mobility of trapped radicals and resulting in further enhanced conversion. In this way, it is possible that pre-heating/pre-warming the resin composite shows a more homogeneous polymerization in the bottom and top surface layers of the resin composite, indirectly leading to more homogeneous shrinkage and decreasing the micro leakage on the cervical walls [9].

Heating the composite also dramatically decreases the curing time required for light polymerization. With the added benefit of greater depth of cure of the restorative composite, increased chemical conversion, and ease of flow for easier dispensing into the cavity preparation [4,10], pre-heating or sometimes called as pre-warming has become an indispensable technique for better dentistry. The commercially available systems available in the market are CALSET (Calset, AdDent Inc, Danbury, CT, USA). The cost of such equipment varies between 500-800 USD which is at a significantly higher side in developing countries like India where Dentistry is developing at a very fast pace. The cost of device can be a limitation in adopting this useful and promising technique. To make this technique popular and economically viable, this innovation is presented wherein a wax melter is utilized to work as a composite warmer.

Clinical Technique

In this innovative and simple technique, we have used a wax melter (Figure 1). The wax is replaced with common salt. The wax melter has temperature settings which can be varied as per the

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Figure 1: Digital wax melter with wax replaced by common salt used as a composite warmer.

clinician requirement. It takes 10 min to pre-heat, and once the unit is warm, it takes 2-3 min to warm the composite. A standard composite compule, a syringe tray option, or pre-loaded compule guns from different manufacturers can be directly used.

Discussion

Over recent years there has been growing interest in making highly filled resin composite less viscous by pre-heating without detriment to the properties of the polymerized material [4,6,9,10]. Potential benefits to pre-heating highly filled resin composites are: (a) easier extrusion from compules or syringes; (b) enhanced adaptation of the material to cavity walls; (c) decreased potential to trap air and therefore less risk of voids at the margins or within the bulk of the material; (d) increased monomer conversion and therefore improved physical and mechanical properties of the final restoration [10]. The clinician is still able to control the morphology of composite increments, since preheated highly filled resin composite does not become as fluid as room temperature flowable composite and will not sink under its own weight. In spite of all these advantages, the cost and availability of device is a limiting factor in its use which can be overcome by using this simpler device commonly available in all clinics. The wax compartment is filled with salt. The replacement of salt in our device is useful for retaining heat and it's a normally available thing. Regarding the price, it hardly costs 10 USD which means 50 times less. Nevertheless, the same unit can also be used to heat irrigant syringes & anesthetic syringes. So, this device is a multifunctional unit which can serve multiple purposes in a dental clinic.

Conclusion

The above presented device is an innovation which is simple to use and has the potential to make pre-heating/pre-warming technique popular among dentists in all parts of the world especially in the developing countries where cost is a significant factor in acceptance of any new technique in Dentistry.

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