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ORIGINAL ARTICLE

The effect of LED curing mode on microleakage of Class V cavity restored by silorane-based composite

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Abstract

Objective. This *in vitro* study evaluated the effect of soft-start curing mode by LED unit on the marginal microleakage of silorane composite restoration. ***Materials and methods.*** Class V cavities were prepared on the buccal surfaces of 80 extracted molars at the cementoenamel junction and randomly divided into eight groups. In groups 1–4, four adhesive/composite combinations (silorane/silorane, silorane/Z250, Adper Single Bond/Z250, Clearfil SE Bond/Clearfil AP-X) were applied and the composites were cured under standard mode at 1500 mW/cm^2 for 20 s. In the other four groups, after applying the same adhesive/composite combinations, the composites were cured at 550 mW/cm^2 for 10 s followed at 1500 mW/cm^2 for 15 s. After 24 h of water storage and thermocycling, the specimens were placed in 1% methylene blue solution. The dye penetration was assessed under a stereomicroscope. The data were analysed using non-parametric tests. ***Results.*** There were no significant differences among four groups for two curing modes at the occlusal and gingival margins ($p > 0.05$). The soft-start curing had a positive effect on the gingival marginal sealing of group 1 ($p < 0.05$), but not for the other three groups ($p > 0.05$). ***Conclusion.*** The beneficial effect of relatively high soft-start curing on marginal sealing of Class V restoration depends on a combination of the adhesive and composite types, having a positive effect on silorane adhesive/silorane-based composite at the gingival margin.

Key Words: *silorane composite, marginal sealing, curing mode, adhesive system*

Introduction

Despite increasing advances in adhesive resin systems, polymerization shrinkage of resin composites has remained a major problem to achieve a durable successful resin restoration. During free radical polymerization, conversion of the monomers to packed polymer network is responsible for the shrinkage [1,2]. The resultant shrinkage stress can lead to deleterious effects on early developing of bonding interface, tooth structure and restoration [3]. Microleakage, post-operative sensitivity and recurrent caries can be the clinical problems following failure at the adhesive interface [4,5].

Based on the destructive impacts of polymerization stress on clinical performance of composite restorations, considerable attempts have been made to minimize the stress. To achieve this purpose, composite placement in layering techniques [6], use of a low-modulus resin layer [7] and soft-start curing have been proposed [4,5,8,9]. Recently, a novel resin composite has been introduced as a low shrinkage resin containing siloxane and oxirane functional moieties; in which cationic ring opening polymerization led to volumetric expansion. This mechanism accounts, to some extent, for compensating the shrinkage created by monomer packing/bonding [10,11].

Regarding the ongoing development of LED technology, this light-emitting diode curing unit has been widely employed in dental practice due to its advantages such as small, wireless design with stable power and spectra, higher curing efficiency and more life time with minimal heat generation compared to a halogen light curing one [12,13]. High intensity LED is capable of decreasing the time of curing, increasing the degree of conversion and depth of cure, particularly in deep cavities where the distance between the light curing tip and the most gingival layer of composite is unavoidable. However, a high intensity can also produce a higher polymerization

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