

Effect of temperature, cure mode and ageing on bond strength of resin cements to dentine

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Abstract

The objective was to determine the effect of curing mode and temperature on bond strength of dual-cured resin cements to dentine after 6 months of ageing. Providing light curing to restorations significantly improved bond strength to dentine. Six-months ageing period reduced about 50% the bond strength for self-cured mode, while temperature revealed no significant influence.

Key words: Temperature, Ageing, Bond Strength, Resin Cement.

Introduction

Rising the temperature of the composite between 54°C and 60°C may rise the composite viscosity, improving manipulation, restoration placement, mechanical properties and it may not harm the pulpal tissues. On this temperature range, polymerization kinetics may be fast and may hinder the restoration placement. However, as oral cavity temperature is around 37°C is that this study tried to evaluate the influence of temperature rising on resin cement until this physiological oral temperature, on bond strength to dentin after long-term storage.

Twenty human third molars were sectioned into two halves and divided into four groups (n=10). A flat dentin surface was created for each tooth. Indirect resin blockswere cemented to the dentin surface using Scotchbond Universal adhesive following the treatment groups: I - Rely X Ultimate cement (RU) light-cured at 37°C; II- RU self-cured at 37°C; III - RU light-cured at 25°C; and, IV- RU self-cured at 25°C. Hemi-teeth from all groups were sectioned into beans (cross-sectional area: 0.8±0.1mm²) and divided in two equal parts to be stored during two ageing periods (24h/6 months at 37°C). All specimens were submitted to μ tensile bond strength test. Failure modes were classified using scanning electron microscopy. Statistical analysis consisted of a split-split plot ANOVA (three factors) and Fisher's PLSD test ($\alpha=0.05$).

Results and Discussion

For curing mode and ageing, ANOVA indicated significant effects ($p<0.001$), as well as for curing mode/temperature and curing mode/ageing interactions ($p<0.25$). Light-curing mode showed statistically higher bond strength values and 6-months ageing produced statistically lower values, than the other conditions for each factor (Table 1). For temperature, ANOVA revealed no significant effect ($p=0.2861$) as well as it interactions ($p>0.25$). Failure mode was predominantly mixed

(more cohesive in resin cement) for 24 hours storage period, having more presence of resin cement bonded to dentin on the light-cured group. After 6 months storage the most prevalent failure mode was cohesive in adhesive independent of the curing-mode. (Figure 1)

Table1. Bond Strength means of a resin cement to dentin in different temperatures, curing mode and storage time.

	Temperature	25°C		37°C	
		Light cured	Self cured	Light cured	Self cured
Storage Time	24 hours	30,7 (10,2)Aa	22,2 (7,3)Bb	36,5 (17,5)Aa	23,1 (9,9)Bb
	6 months	23,9 (14,5)Ab	12,2 (5,0)Bc	30,0 (5,5)Ab	8,8 (3,5)Bc

Different capital letters (rows) and lowercase (columns and rows within the same temperature) indicate statistical differences ($p<0.05$)

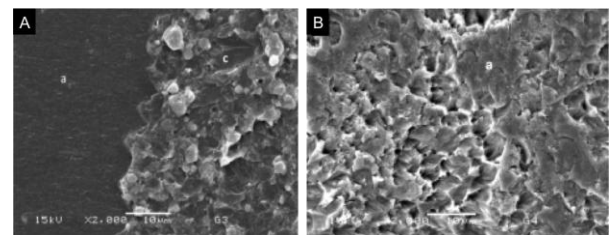


Figure 1. SEM image showing: A. Mixed failure with predominance of cohesive failure in resin cement from 24 hours group; B. Cohesive failure in adhesive from 6 months group.

Conclusions

Providing light curing to restorations significantly improved bond strength to dentine. Six-months ageing period reduced about 50% the bond strength for self-cured mode, while temperature revealed no significant influence.

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