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Effect of Light Intensity on the Polymerization Rate of Composite Resin Using Real-time Measurement of Volumetric Change

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Objectives : The aim of this study is to evaluate the effect of light intensity variation on the polymerization rate of composite resin using IB system(experimental equipment designed by Dr. IB Lee) by which real-time volumetric change of composite can be measured.

Methods : Three commercial composites [Z100(Z1), AeliteFil(AF), SureFil(SF)] were photopolymerized with Variable Intensity Polymerizer unit (Bisco, U.S.A.) under the variable light intensity (75/150/225/300/375/450mW²) during 20sec. Polymerization shrinkage of samples was detected continuously by IB system during 110 sec and the rate of polymerization shrinkage was obtained by its shrinkage data. Peak time(P.T.) showing the maximum rate of polymerization shrinkage was used to compare the polymerization rate.

Results : Peak time decreased with increasing light intensity($p<0.05$). Maximum rate of polymerization shrinkage increased with increasing light intensity($p<0.05$). Statistical analysis revealed a significant positive correlation between peak time and inverse square root of the light intensity (AF:R=0.965, Z1:R=0.974, SF:R=0.927). Statistical analysis revealed a significant negative correlation between the maximum rate of polymerization shrinkage and peak time(AF:R=-0.933, Z1:R=-0.892, SF:R=-0.883) and a significant positive correlation between the maximum rate of polymerization shrinkage and square root of the light intensity (AF:R=0.988, Z1:R=0.974, SF:R=0.946).

Discussion and Conclusions : The polymerization rate of composite resins used in this study was proportional to the square root of light intensity. Maximum rate of polymerization shrinkage as well as peak time can be used to compare the polymerization rate. Real-time volume method using IB system can be a simple, alternative method to obtain the polymerization rate of composites.

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Periapical tissue reactions and root resorption following replantation with different calcium hydroxide pastes

Aim

Along with the expanded clinical use of calcium hydroxide, literatures have suggested mixing calcium hydroxide with various vehicles. We evaluated and compared the periapical tissue reactions and root resorption after the canals were filled with various preparations of calcium hydroxide in replantation of rat molar.

Methodology

The study was conducted on 31 maxillary first molars of Sprague-Dawley female rats aged 30 days old. The upper 1st molars were extracted and the mesiobuccal canals were instrumented with K-files. The teeth were randomly divided into 4 groups and filled with one of the following materials: aqueous preparations of calcium hydroxide (mixture of saline), Metapaste (mixture of polyethylene glycol), Vitapex (mixture of silicone oil), or IRM, and then replanted. Rats were sacrificed 3 weeks after replantation; blocks containing replanted teeth were obtained and fixed. After paraffin embedding, the blocks were cut into 4-㎛-thick sections and stained with hematoxylin-eosin. Apical tissue responses were observed under light microscope.

Results

1. In aqueous preparation-group and Metapaste group, losses of pastes were observed in the apical portion of all samples.
2. In aqueous preparation-group and Metapaste group, the fibrous capsule widths were significantly thicker than in Vitapex group and IRM group ($P<0.05$).
3. There was no statistical significant difference in the prevention of root resorption among the groups.

Conclusions

Within the evaluated parameters of this study, it appears that aqueous preparation and Metapaste, which were absorbed faster in the