

Original Article

The effect of nanoparticles incorporation titanium dioxide and zirconium oxide within self-adhesive resin cement on the push-out bond strength of the fiber post to the radicular dentin: An *in vitro* study

Abstract

Introduction: Incorporating nanotechnology into dental practice can present exciting prospects for advancing material adhesion properties. Therefore, this research aimed to assess the outcome of incorporating 3% titanium oxide or zirconium oxide nanoparticles (ZrO₂ NPs) within RelyX Unicem Aplicap self-adhesive resin cement on FRC LuxaPost radicular dentin's push-out bond regarding curing method type and root regions.

Materials and Methods: Sixty roots of human permanent premolars were obturated, postspace prepared, and at postcementation process, they were randomly divided into three groups ($n = 20$) depending upon the nanoparticles type, Group 1 (control): RelyX Unicem without nanoincorporation; Group 2: RelyX with 3% ZrO₂ NPs; and Group 3: RelyX with 3% titanium oxide nanoparticles (TiO₂ NPs), then each was subgrouped ($n = 10$) associated with the curing modes. The roots were sectioned into 2 mm-thick splits perpendicular to the long axis. The push-out bond strength (PBS) values of the radicular dentin/post were measured. The ANOVA and Duncan's multiple range tests ($P \leq 0.05$) were used to analyze the data. Assign the bonding failure modes using a stereomicroscope.

Results: The ZrO₂ NPs inclusion of RelyX resin cement used to bind the fiber posts produced the highest significant PBS values at " $P \leq 0.001$." No significant values between the RelyX Unicem Aplicap and (RelyX + TiO₂ NPs). The light curing mode produced preferable results with the highest significant bonding values at " $P \leq 0.001$." There is a significant difference among root third region PBS values at " $P \leq 0.001$," with the coronal one having the highest. **Conclusions:** The 3% ZrO₂ NPs reinforcement of light-cured RelyX Unicem Aplicap self-adhesive resin cement enhanced the fiber post/dentin bond strength with consideration of dentin root regions.