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Original Article

Physical-chemical properties and acellular bioactivity of newly prepared nano-tricalcium silicate-58s bioactive glass-based endodontic sealer



Abstract:

Objectives: To evaluate the physiochemical properties and apatite-forming ability of a newly prepared nano-tricalcium silicate-58s bioactive glass-based endodontic sealer (C3S-BG-P) and compare its results with the Nishika BG canal sealer and BioRoot™ RCS.

Methods: The physicochemical properties (setting time, flow, solubility, film thickness, and radiopacity) of C3S-BG-P, Nishika BG canal sealer, and BioRoot™RCS were evaluated in accordance with ANSI/ADA 57/2000 (reaffirmed 2012) and ISO 6876:2012 for root canal sealing materials. The in vitro apatite-forming ability was evaluated after 28 days of immersion of disc-shaped specimens in phosphate-buffered saline (PBS) using field emission scanning electron microscopy and energy-dispersive X-ray spectroscopy.

Results: The results of physiochemical tests indicated that all the tested sealers complied with the ADA and ISO standards; however, the solubility of the BioRoot did not meet the two standards. C3S-BG-P revealed significantly superior properties in all physicochemical tests compared to Nishika and BioRoot; however, the solubility of Nishika was significantly lower than that of C3S-BG-P. Furthermore, all tested sealers exhibited apatite precipitation on their surfaces after 28 days of immersion in PBS.

Conclusions: C3S-BG-P had superior physicochemical properties, which mitigated the disadvantages of calcium silicate-based sealers. Moreover, it exhibited apatite precipitation after immersion in PBS.

Further in vivo studies utilizing animal models or clinical studies are necessary to support the rationale of the newly developed sealer for clinical application.