

Original Article

Investigating the Effect of Selenium Nanoparticles on Mineral Trioxide Aggregates as a Promising Novel Dental Material

Abstract:

Aim: To enhance mineral trioxide aggregate high plasticity (MTA HP), a commonly used dental calcium silicate cement, by incorporating selenium nanoparticles (SeNPs) known for their antioxidant and anti-inflammatory properties. The objectives included investigating the impact of SeNPs on the setting time and chemical properties of MTA HP. **Materials and Methods:** We performed a comprehensive study to formulate and profile SeNPs integrated into MTA HP. Diverse concentrations of SeNPs were introduced into MTA HP, and the commencement and culmination of the setting process were gauged employing a Gillmore needle cabinet. The chemical composition was validated using Fourier transform infrared spectroscopy with attenuated total reflectance and X-ray diffraction analysis. **Results:** The incorporation of SeNPs led to remarkable improvements. Notably, SeNPs positively affected the setting time of MTA HP, with faster setting times corresponding to higher SeNPs concentrations. Chemical analyses confirmed the successful integration of SeNPs with MTA HP. These enhancements make the material may be suitable for dental applications, especially due to its accelerated setting time. **Conclusions:** MTA HP incorporated with SeNPs represents a significant advancement in dental materials. Its faster setting time, combined with the antioxidant and anti-inflammatory properties of selenium, provides dental professionals with an efficient and time-saving option for complex treatments. This novel nanomaterial holds promise for improving dental procedures and patient outcomes.