ORIGINAL RESEARCH

Ion Release from Nanohydroxyapatites-reinforced Orthodontic Adhesive: An *In Vitro* Study

Abstract:

Aim: To solve the enamel demineralized lesion, a novel orthodontic adhesive that can regularly release phosphate ion (PO4–3) was developed; to study the interaction of nanofiller concentration, storage time, and immersion media pH are the main objectives of this study.

Materials and methods: Nanohydroxyapatite powder was prepared by sol–gel method. A transmission electron microscope was used to study the structural properties of this material, which was then mixed with Heliosit orthodontic adhesive at 2% and 4% by weight. Fifty-four cylindrical samples for each nanoparticle concentration were prepared and divided equally into 18 groups (three in each group). Each was immersed in 3 mL deionized water with pH (4, 7, and 9) for six time points (1, 3, 5, 7, 14, and 21) days. Released ion concentrations were measured using atomic absorption (AA) spectrometry.

Results: The maximum amount of ion release was recorded for the sample immersed in deionized water at pH 7 on the first and fifth days of the study. Although pH 9 showed intermediate or sometimes high values at certain time points.

Conclusion: This study demonstrated that time, nanoparticle concentration, and pH significantly affect ion release. With 2% nano hydroxyapatite particles at pH 7 showed the highest ion release overall. Future research should explore the effects of other circumstance factors that may influence ion release mechanics, such as temperature, curing time, and sample surface area, in order to optimize critical ion release for these sensitive drug delivery systems.

Clinical significance: Nano hydroxyapatites are biomaterials that can be recommended as a remineralizing agent as they act as a reservoir of crucial ions, Ca and PO4–3.