3D-FE analysis of functionally graded structured dental posts

Abstract

This study aimed to compare the biomechanical behaviour of functionally graded structured posts (FGSPs) and homogenous-type posts in simulated models of a maxillary central incisor. Two models of FGSPs consisting of a multilayer xTi-yHA composite design, where zirconia and alumina was added as the first layer for models A and B respectively were compared to homogenous zirconia post (model C) and a titanium post (model D). The amount of Ti and HA in the FGSP models was varied in gradations. 3D-FEA was performed on all models and stress distributions were investigated along the dental post. In addition, interface stresses between the posts and their surrounding structures were investigated under vertical, oblique, and horizontal loadings. Strain distribution along the post-dentine interface was also investigated. The results showed that FGSPs models, A and B demonstrated better stress distribution than models C and D, indicating that dental posts with multilayered structure dissipate localized and interfacial stress and strain more efficiently than homogenous-type posts.

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