

# **A Finite Element Study of the Multilayered Structured Dental Post**

## **Abstract**

Ideally, dental post should have stiffness that is similar to the crown at the coronal part and stiffness similar to the dentine at the apical part. This will reduce stress concentration at either coronal or the apical parts of the dentine and minimize the chance of interfacial loosening and enhance the reliability of post.

**Objective:** To investigate the biomechanical behaviour of Multilayered Structured Dental Posts (MSDPs) using finite element analysis (FEA).

**Methods:** Two models of MSDPs consist of multilayer design of xTi-yHA composition added to a zirconia layer (model A) and the same compositions added to alumina layer (model B) was compared with pure zirconia (model C) and pure titanium (model D) posts. The fractions of Ti and HA was varied layer by layer, gradually. FEA of models A, B, C and D were compared. Stress distributions due to 100 N vertical, oblique, and horizontal loads were investigated.

**Results:** The highest stress regions were observed at area of the applied force and at the apical part of the dentine when vertical load was applied. Models C and D showed a considerable stress at the middle and apical region of the posts compared to models A and B. Oblique load showed high stresses around the loading area, then at the outer surface of the dentine for all the models. While in models C and D the stress highly propagated into the inner part of the canal compared to A and B. Horizontal load showed a similar stress distribution as the oblique load, but it demonstrated higher propagation of stress into the centre of the canal.

**Conclusions:** The results showed that models A and B demonstrated advantages compared with models C and D. Therefore, it is recommended that dental post have multilayered structure to function efficiently at coronal and apical parts.

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