

Effects of different implant-abutment connections on micromotion and stress distribution: Prediction of microgap formation

Type: Article

Abstract:

Objectives: The aim of this study was to analyse micromotion and stress distribution at the connections of implants and four types of abutments: internal hexagonal, internal octagonal, internal conical and trilobe. **Methods:** A three dimensional (3D) model of the left posterior mandible was reconstructed from medical datasets. Four dental implant systems were designed and analysed independently in a virtual simulation of a first molar replacement. Material properties, contact properties, physiological loading and boundary conditions were assigned to the 3D model. Statistical analysis was performed using one-way analysis of variance (ANOVA) with a 95% confidence interval and Tukey's Honestly Significant Difference (HSD) multiple comparison test. **Results:** The internal hexagonal and octagonal abutments produced similar patterns of micromotion and stress distribution due to their regular polygonal design. The internal conical abutment produced the highest magnitude of micromotion, whereas the trilobe connection showed the lowest magnitude of micromotion due to its polygonal profile. **Conclusions:** Non-cylindrical abutments provided a stable locking mechanism that reduced micromotion, and therefore reduced the occurrence of microgaps. However, stress tends to concentrate at the vertices of abutments, which could lead to microfractures and subsequent microgap formation.

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