EVALUATION OF DIFFERENT ATTACHMENT TYPES IN MANDIBULAR OVERDENTURE PROSTHESES WITH 3D FINITE ELEMENT STRESS ANALYSIS METHOD

Abstract: The manner in which stresses are transferred to the bone surrounding implant-supported or implant-retained overdentures (IOs) is one of the most significant factors in determining their efficacy. The objective of this study is to evaluate the stress on the implant and prosthetic components according to the retention system: locator, ball attachment, bar attachment, and telescopic attachment system.
Material and Method: Using SpaceClaim, 3D finite element models were created to simulate clinical situations. These models included IOs with five distinct attachment systems: locator attachment system, locater R-Tx attachment system, ball attachment system (dimensions and material properties according to Zest Anchors, USA), bar attachment system and the telescopic attachment system (Dimensions and material properties of primary and secondary copings were in accordance with Dentsply, Ankylos Syncone/5°, USA).
Each overdenture's central fossa in the molar region was subjected to a 35N compressive force that was applied in both the vertical and oblique directions. A non-linear static contact analysis was performed to determine the distribution of stress among the various IOs components. Following this, the models were analyzed using the finite element software ANSYS, and the results were displayed using Von Mises stress patterns.
Results: Both oblique and vertical loading substantially increased the maximal von Mises stresses on the implants when they were affixed using the telescopic attachment system. Under vertical loading, the maximal von Mises stresses on the abutment were greater for the ball attachment system, whereas they were greater for the telescopic attachment system under oblique loading.
Conclusions: As clinical tip, bar attachment, locator attachment and locater R-Tx attachment can be considered as a suitable alternative to telescopic attachment system and ball attachment for IOs.