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"THREE DIMENSIONAL FINITE ELEMENT ANALYSIS OF STRESS DEVELOPED IN TOOTH SUPPORTED OVERDENTURE USING TEETH WITH DIFFERENT CUSPAL ANGULATIONS – AN IN VITRO STUDY"

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ABSTRACT

Knowledge of the magnitude, direction and distribution of forces has a value in designing a prosthesis with high masticatory efficiency and which transfers a minimum load to the supporting tissues. Stress distribution on the abutment teeth and residual alveolar ridge underneath over denture with different occlusal scheme is at most important. Finite element analysis has been employed for mechanical investigations of removable prosthesis.

Purpose : To evaluate the stress generated in cortical bone, trabecular bone, periodontal ligament space and copings underneath the overdenture and to analyse and compare the stresses generated in different cuspal angulations by Finite element analysis.

Materials and methods: The study was done using a three dimensional finite element analysis using a Spiral CT Scan machine, softwares such as Mimics 8.11, Ansys 12.1:Analysis System Software, RAPID FORM 2004, Hypermesh 11.0.

To examine the stress levels and distribution for computer models of tooth supported overdenture, mandibular bone retaining only the right and left canines which was sectioned in the cervical region was considered with the provision for the metal(nickel-chromium) short copings and was cemented with the GIC Fuji plus luting cement. Mucosa, PDL, alveolar bone consisting of cortical and cancellous bone underneath the denture was the basis of the model.

Results: Observations made in monoplane, 20 degrees and 33 degrees cuspal teeth revealed that the stress below the overdenture onto the cortical bone, trabecular bone,

periodontal ligament and copings showed that the magnitude of stress were more for cuspal teeth than on the monoplane teeth. The study showed that there was maximum stresses on the underlying structures when 33 degrees cusped teeth when compared to 20 degrees and monoplane teeth.

Conclusion: Within the limitations of this study, the monoplane occlusal scheme has lesser magnitude of stress distribution in comparison to anatomic and semianatomic occlusal scheme.

Key words: occusal scheme, FEA, Tooth supported overdenture.