



**COMPARATIVE EVALUATION OF TWO DIFFERENT ALLOYS
USED IN THE FABRICATION OF DISTAL EXTENSION
REMOVABLE PARTIAL DENTURE ON STRESS
DISTRIBUTION ON THE ALVEOLAR BONE AND THE
ABUTMENT TOOTH – A FINITE ELEMENT ANALYSIS.**

By

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ABSTRACT

BACKGROUND AND OBJECTIVES: In prosthetic treatment, the structural design of removable partial dentures (RPDs) is critical for preventing distortion of the prosthesis, protecting abutment teeth and residual ridges and for good masticatory performance. To optimize the RPD design, we must fully understand the damages to the abutment teeth and the supporting periodontal ligament potentially caused by the RPD. However, since the stresses and strains in the periodontal tissues are hardly experimentally measurable, it remains uncertain to what extent the forces from a RPD are acting upon the stresses in the remaining oral tissues. Finite element analysis (FEA) has been employed for mechanical investigations of removable prostheses. Influence of morphological factors of denture base, occlusal rests, clasps, connectors etc. on the state of stress distribution in abutments and supporting tissues have been investigated by FEA models. The purpose of the study is to analyze the stress distribution patterns on the alveolar bone, and also the abutment tooth when a given amount of load is applied on distal extension removable partial denture fabricated using two different alloys through Finite Element Analysis.

METHOD: This study involved the designing of a distal extension removable partial denture model fabricated using two different alloys for Finite Element analysis. This investigation uses ANSYS software to examine stress levels, stress distribution patterns and abutment tooth movement for the computer models. A load of 222 Newton was applied at three different locations:

- 1) Load concentrated at the central fossa of the second molar.
- 2) Load concentrated in the region of the occlusal rest and the mesial marginal ridge

3) Load distributed over the first and second molars

For all the cases the condylar and coronoid process and angle of mandible on either side is fixed and marked as boundaries. The boundary conditions can determine the degree of support that the mandible receives from the surrounding muscles and tissues.

RESULTS:

Within the limitations of the study the following conclusions were drawn

1. The titanium alloy could withstand higher amount of occlusal stresses as compared with the cobalt – chromium alloys.
2. The stress values in the supporting structures were higher for the cobalt chromium framework RPD as compared to the titanium alloy.
3. The abutment tooth movement was almost similar for the cobalt – chromium and titanium alloy frameworks
4. Because of absence of the indirect retainer, the displacement of anterior teeth was increased.

INTERPRETATION AND CONCLUSION:

From this particular study, it can be concluded that the titanium alloy could withstand higher amount of occlusal stresses as compared with the cobalt – chromium alloys. The stress values in the supporting structures were higher for the cobalt chromium framework RPD as compared to the titanium alloy.

KEYWORDS: removable partial denture, finite element analysis, stress