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Biomechanical analysis of new material applied to dental implants.

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Abstract – This paper presents the biomechanical analysis of different alloys used in dental implants and a new alloy model. The biomechanical analysis includes the boundary conditions in a dental application, showing the results of structural analysis using the element method finite (FEM), the analysis was performed for the different alloys, in the case of the alloy proposed the mechanical characterization was performed and presented their results.

The interest of science in biomedical solutions for replacing dental pieces lost, has increased, so that innovations are frequent in this field, such innovations tend to the improvement of existing solutions and the search for new materials as alternatives for this type of applications.

So far the Ti6Al4V alloy has been used for the manufacture of dental implants, the mechanical properties of Ti were enhanced with the addition of Al and V, its elastic modulus was increased to get better resistance to compressive loads. However, there are reasons for question the use of this alloy. One reason is related to the release of Al and V ions, their prolonged exposition time in the body can be cytotoxic.[1] Comes a new proposal seeking eliminate the harmful effects of Ti6Al4V, which is the case of Tiadyne® alloy [2]

This work presents the biomechanical analysis made in dental implants inserted into bone, where we compared two alloys Ti6Al4V and Tiadyne ®, the new alloy was evaluated for this application.

The analysis includes biomechanical boundary conditions based on a model of dental implant inserted in the posterior mandible bone of density porous type III. The analysis was developed with different insertion torques, applied to the implant. The experimental development began with the search of properties for the different alloys, in the case of Tiadyne® was necessary his characterization, [3] fig 1. Once obtained the properties, we will design the implant with the help of CAD tools (Computer Aided Design), Fig 2. And their subsequent analysis based on CAE tools (Computer Aided Engineering), the results of structural analysis were obtained through the finite element method (FEM), Fig 2(b). Under these conditions was possible to assess the relationship in bone-implant interface and hence the feasibility of applying the new material, the analysis and comparison of the efforts produced in the implant for both materials and their effect on the microdeformation in bone [4].

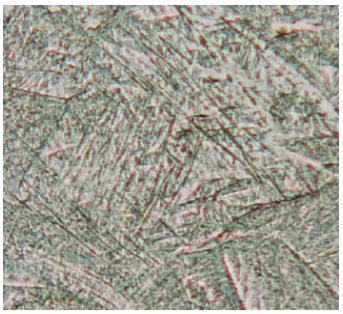

Figure 1: micrographics of Tiadyne [2]

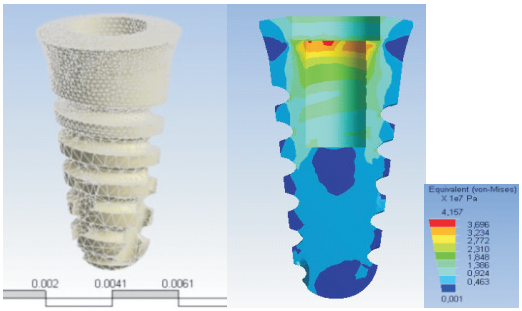

Figure 2: a) design of the implant. **b)** Stress resultant in the implant.

References

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