Simulation of reverse torque on implant external hexagon to verify the stress generated in the bone structure – a finite element analysis

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Abstract
This study presented a mechanical stress behavior of bone/implant system according different bone densities after reverse-torque simulation by finite element analysis. The stress was changed in cortical bone, internal implant structure and external hexagon abutment connection according the changes of bone density.

Key words: finite element analysis, implant, bone.

Introduction
The application of reverse torque on dental implants is important for maintaining the stability of the implant screw. The prosthetic connector design also influences the adaptation of the bone implant and better transfer of forces to the bone tissue. Bone tissue may have different morphological characteristics in accordance with the density and cortical and cancellous bone.

Data related to the mechanical efficiency of prosthetic connectors with such bone tissue characteristics are still insufficient. The aim of this study was to verify the stress distributed to bone structure with different densities in a simulation of the reverse torque on implant external hexagon by finite element analysis.

Results and Discussion
The von Mises stress showed the load transfer from reverse-torque in dental implant to the bone structure. With external hexagon abutment the changes in bone density caused similar stress response according location and size. However, the stress intensity presented low increase according the decrease of cortical bone thickness and the spaced cancellous bone. Moreover, in D4 bone density the internal structure of implant presented more concentrated stress.

Conclusions
The external hexagon abutment connected to implant transferred more load to bone structure from reverse-torque, according the changes in bone density.

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Image 1. The equivalent von Mises stress in bone-implant system according different bone densities.


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