

## **PR-II-11. Three-Dimensional Finite Element Analysis of Stability in Proportion to Crown-to-Implant Ratio in the Implant-supported Protheses**

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### **Background**

The three dimensional finite element analysis(3-D FEA)is considered an appropriate method for investigation of the stress distribution throughout a 3-D structure. The purpose of this study was to determine the implant stability in proportion to crown-to-implant ratio in various condition with different bone quality and quantity of the atrophic posterior maxilla using finite element analysis.

### **Materials and methods**

A 3-D finite element model of a maxillary bone section with a missing second premolar was used in this study. We classified models into 3 groups according to the cancellous bone quantity. First group has over 12mm cancellous bone, second has 5mm height of cancellous bone and third has grafted bone. In addition, we further classified the third group in two sub-groups considering the difference of bone quality in grafted bone. A vertical load was applied at the palatal cusp (200 N) and central (200 N) area, and oblique load was applied at the palatal cusp (200 N) area.

### **Results**

In centric vertical loads and lateral vertical loads, there were no progression of von Mises stresses according to crown-to-implant ratio. But in oblique loads, there were in direct proportion to crown-to-implant ratio. In normal maxillary bone, von Mises stress value of 2.0 crown-to-implant ratio is three times greater than that of 0.5 crown-to-implant ratio.

## Conclusion

In conclusion, in cases of centric vertical loading and lateral vertical loading on implant, there were no progression of von Mises stress values according to crown-to-implant ratio and in case of oblique loading on implants, von Mises stress increased in proportion to the crown-to-implant ratio. The maximum stress was localized on the palatal cortex for all levels of bone.