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Finite Element Stress Analysis of Konus Partial Denture in the Abutment Teeth with Mobility

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The thought prevails that splinting teeth that are in a straight line in the arch does not effectively brace them against buccal and lingual forces. Therefore, teeth from two or more segments of an arch are included in the splint so as to resist forces from all directions.

The purpose of this study was to assess the loading distributing characteristics of two Konus partial denture designs according to the number of abutment teeth when the abutments were subjected to a progressive loss of periodontal support, under vertical and inclined loading using finite element stress analysis.

Two kinds of finite element models were designed according to the number of abutment teeth. The testing models were designed Kennedy classification Ⅱ case(lower right first and second molar missing). For the reduction of periodontal support, crown-to-root ratio of abutment teeth (lower right first and second premolar) was adjusted to 40/60.

This study simulated loads of 200N at the buccal cusp tip and central fossa in a vertical direction, in a 30° and 45° transverse direction. Von-Mises stresses were recorded and compared in the supporting bone, abutment teeth, and Konus partial denture.

The results were as follows:

1. The magnitude of the stress was greater with the oblique loading, especially the part between Konus outer crown and denture base recorded the greatest stress.
2. The stresses were concentrated mainly at the cortical bone connecting in distal side of distal end tooth, but the stresses in the cancellous bone were low.
3. The stresses were concentrated mainly at the distal side of the distal end tooth, and increasing the number of the abutment tooth increased the stress in the first and second premolar.
4. Increasing the number of the abutment tooth decreased the stress in the inner crown, outer crown and denture base. But, it did not proportionately reduce the stresses around the weakened abutment teeth.

Conclusively, Increasing the number of the abutment tooth is more advantageous in Konus partial denture strength due to the little stress. But, there is no large difference of stress pattern in the supporting tissues. Further studies are necessary to design the ideal partial denture in the teeth with reduced supporting.