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GEOMETRICAL EFFECTS OF ORTHODONTIC MINISCREWS ON RESULTING DISTORTIONAL STRESSES IN A SIMULATED MAXILLA MODEL FOR DIFFERENT APPLIED FORCES: A FEM STUDY

ABSTRACT

Objective: The purpose of this study was to investigate the influence of implant design and diameter on stresses in a miniscrew and peri-implant bone by varying the amount of tangential orthodontic force using FEM.

Material and methods: Three dimensional finite element models of bone with four miniscrews, 6 mm in length, with diameters 1.2 mm and 1.4 mm and cylindrical and tapered shape were created. The effect of four forces 50gf, 75gf, 100gf and 150gf were evaluated.

Results: Regardless of diameter and shape, von Mises stress in miniscrew and surrounding cortical and cancellous bone increased with increasing applied forces. Highest von Mises stresses were generated within the body of miniscrews, followed by cortical bone. Least stress values were found in the cancellous bone. Maximum von Mises stresses occurred in the region of cortical bone adjacent to miniscrew neck. Stresses did not change with alteration in diameter from 1.2 mm to 1.4 mm regardless of shape. Similar pattern of stress distribution was found in bone and miniscrews for the studied four models.

Conclusion: Major stresses are generated in miniscrew body in neck region and around cortical bone on loading the miniscrew. Least stresses are seen in cancellous bone. Change in miniscrew diameter from 1.4 mm to 1.6 mm or shape does not significantly affect the stress distribution in the range of forces used in this study.