

Effects of periodontal bone loss on the natural frequency of human canine: a three-dimensional finite element analysis.

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Abstract

Background/Purpose

Assessing periodontal conditions has always been a concern for dental researchers. In this study, we evaluated the potential of a natural frequency (NF) analysis to detect the health status of natural human canine teeth.

Materials and methods

Three-dimensional finite element models of the human maxillary canine were constructed. NF values of the canine model were calculated with one-, two- and three-sided vertical bone loss.

Results

By simulating a modal testing experiment, the NF value for a healthy canine was found to be 2581 Hz. As the bone level was lowered, a strong linear relationship between the frequency and attachment level was demonstrated in all three models. Results from this study demonstrated that the change in the NF was < 12% in canines with a one-sided defect when the bone level varied by 10 mm from the cementoenamel junction. However, when a three-sided bony defect was simulated, the change in NF ranged from 20% to 60%.

Conclusion

This study demonstrates that the NF of the human canine decreases with various degrees of periodontal bone height loss.