題名:In Vivo and In Vitro Natural Frequency Analysis of Periodontal Conditions.

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摘要:BACKGROUND: When measuring periodontal disease, various types of equipment for making objective measurements of tooth mobility have been proposed. However, these devices and methodology are insufficient in terms of reliability. An innovative method using vibrational theories to assess the periodontal attachment level of natural teeth is presented in this study. METHODS: Modal testing technique, a non-destructive and time-saving method, was used for non-invasive and quantitative measurement of the natural frequencies of the upper central incisor in vivo and in vitro. A finite element model was established, and modal testing experiments were simulated to assess the relationship between bone level and teeth. RESULTS: The first dominant natural frequency of healthy human upper central incisors ranges from 710 Hz to 3,360 Hz, with an average of $1,701+/-679$ Hz. Both in vitro experiment and finite element simulation showed that lowering of the attachment level causes a significant decrease in the natural frequencies, and a strong relationship ($r = -0.99$, $P < 0.01$) was observed between the frequency and the bone level height. CONCLUSIONS: Our results suggested that natural frequency is an important parameter for assessing the periodontal condition and that the modal testing technique is a useful supplemental method for assessing the attachment conditions of the periodontium.