

人工牙根穩固度檢測儀之設計與驗證

黃豪銘;鄭光祐;鄭璧瑩;李勝揚

Abstract

More and more researchers pay attention to the area of stability and detecting method on dental implant. But most of the research works are categorized to invitro preliminary study or experiment with heavy sensor facility. None of the related study can verify the performance if biosensor installed in human body. It can still hardly to detect the osseointegration condition of dental implant on the tooth bone boundary. The current study presents a new clinical technology to detect the stability of dental implant precissively by using natural frequency detection methodology. The study also designs and sets up a compact dental implant stability detector for verifying the theoretical prediction and its usefulness. The proposed device adopts micro size low voltage electro magnetic servo valve insteading of using hammer manually to beat the dental implant for providing the uniform and stabilized input signal. The following process is to retract the vibration resonance signal by using non contacting acoustic receivers. The fast Fourier transform (FFT) method is also applied to analyze the resonance signal for providing the clinical inspection information. In order to verify the practicability of the proposed device. Three experiments have been implemented for illustration. The natural frequency of the tested dental implant is measured as 588.375 ± 0.84 Hz, which is verified by using standard tonometer ($f=600$ Hz). While in the stability test, the average natural frequency is measured as 5885.0 ± 5.59 Hz~ 7420.0 ± 11.18 Hz, when the dental implant is clamped by vise with force increasing from 2 Kgf-cm~10 Kgf-cm. The third experiment is to examine the stiffness of the dental implant. The dental implants are fixed in the bakelite cube with different outside length from 7 mm to 11 mm. The measured data of natural frequency are varied from 3727.5 ± 18.5 Hz~ 2470.0 ± 21.4 Hz. As checking the verified data from the three invitro preliminary experiments, the stability and sensitivity of the dental implant detector proposed by he study are approved.