

The System for Root Canal Length Measurement Based on Multifrequency Impedance Method

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Abstract : Electronic apex locators (EAL) has been widely used clinically for measuring root canal working length with high accuracy, which is crucial for successful endodontic treatment. In order to maintain high accuracy in different measurement environments, this study presented a system for root canal length measurement based on multifrequency impedance method. This measuring system can generate a sweep current with frequencies from 100 Hz to 1 MHz through a direct digital synthesizer. Multiple impedance ratios with different combinations of frequencies were obtained and transmitted by an analog-to-digital converter and several of them with representatives will be selected after data process. The system analyzed the functional relationship between these impedance ratios and the distance between the file and the apex with statistics by measuring plenty of teeth. The position of the apical foramen can be determined by the statistical model using these impedance ratios. The experimental results revealed that the accuracy of the system based on multifrequency impedance ratios method to determine the position of the apical foramen was higher than the dual-frequency impedance ratio method. Besides that, for more complex measurement environments, the performance of the system was more stable.

Keywords : root canal length, apex locator, multifrequency impedance, sweep frequency

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