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In vitro evaluation of accuracy and reliability of ProPex Dentsply electronic apex locator using stereomicroscope and cone beam computed tomography (CBCT)

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Introduction: Evaluation and determination of working length during endodontic treatment is a significant valuable factor for the success of endodontic treatment. The purpose of this study was to evaluate "*In vitro* the accuracy and reliability of ProPex Dentsply apex locator utilizing stereomicroscope and Cone Beam Computed Tomography (CBCT)".

Materials and Methods: Thirty maxillary single root teeth from 49 patients are included in this study. After teeth preparation for *in vitro* measurements using file no. 13, teeth are immersed into alginate plastic molds to create optimal experimental conditions. The file was slowly inserted into the canal till the device screen/audio signal showed 0. 0 or anatomic apex, followed by 1 mm withdraw up to the calibration margin/working length (showed on the display, and then silicon stopper is positioned at the crown margin). The file was pulled out and the distance between file tips and silicon stopper was measured with Mini Endo Block. Following this measurement, file is returned back inside the root canal and the endodontic cavity is filled with flowable light curing composite to fix the file for further measurements. Sequentially radiologic working length determination is performed using Computed Dental Radiography (CDR, Schick Technology) followed by CBCT (Sirona, Galileos Confort Plus) and stereomicroscope (Brunel Microscope 130 M). The working lengths of the root canals were compared to a control length measurement performed by Computerized Digital Radiography and the differences were tested using an independent-sample t-test, meanwhile, the distance from the apical foramen as measured by CBCT and stereomicroscope was used to determine the accuracy of ProPex apex locator within the 0. 5 mm of the measurement.

Results: Statistical analysis was performed using STATA software Version 11. Results from comparative measurements using apex locators and CDR (19. 99 mm /±1. 35 and 20. 15 mm/±1. 33) cannot reject the null hypothesis that the length measurements are different from control lengths at a high significance level. P-values of the t-tests was >0. 10 (P=0. 6609). The results obtained using Pearson's $\chi 2$ test conducted for the differences between the measurement results using CBCT and stereomicroscope falling within the distance ±0. 5 mm from the apical foramen were accurate ($\chi 2$ =0. 9, 87%).

Conclusion: Within limitations of this *in vitro* study, ProPex Dentsply electronic apex locator expressed sufficient precision and reliability in determining root canal working length.