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The Effect of Different Rotary Instrumentation Systems on Smear Layer Removal Using Different Irrigation Protocols

(A Comparative *in vitro* SEM Study)

A Thesis Submitted to the Council of the College of Dentistry at the
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Abstract

The success of endodontic treatment relies on successful cleaning and shaping and adequate sealing of the root canal system. Smear layer is generated during the procedure of canals shaping and cleaning due the action of mechanical instruments on the dentinal walls. It has been considered as an important challenge for the overall outcome of the treatment.

The aim of the study was to evaluate the cleaning efficiency of three rotary Ni-Ti systems by evaluating the remaining smear layer on the root canal walls. Seventy-two palatal roots of permanent human maxillary molars freshly extracted were selected and assigned into three groups. Group 1: samples were instrumented with ProTaper Next system, Group 2: instrumentation with XP-endo Shaper system and Group 3: instrumentation with WaveOne Gold system. Each group was subdivided into three subgroups according to the irrigation protocol: subgroup A: irrigation with 5.25% NaOCl, subgroup B: irrigation with 5.25% NaOCl+ EndoActivator and subgroup C: irrigation with 5.25% NaOCl+17% EDTA+ EndoActivator. All the samples were instrumented using the instructions recommended by the manufacturers. Each root was split longitudinally into two halves. The samples were then examined by scanning electron microscope (SEM) at the center of the coronal, middle and apical thirds at $\times 5000$ magnification.

The data was statistically analyzed using Kruskal Wallis and Mann-Whitney U tests using IBM SPSS Statistics 24 software. The significance level was set at 0.05

At the coronal third, ProTaper Next and WaveOne Gold was better than Xp-endo Shaper when the irrigation was composed of NaOCl with/without EndoActivator. When EDTA was used, WaveOne Gold and Xp-endo Shaper showed the lowest smear layer mean.

At the middle and the apical thirds, a significant difference was seen only when EDTA was used where WaveOne Gold had lower smear layer means when compared to other systems.

When comparing the smear layer means for each system, there was no significant difference at all thirds no matter what irrigation protocol was followed when ProTaper Next was used. For Xp-endo Shaper, a significant difference was found at the coronal third only where irrigation with EDTA has the best performance.

A significant difference was seen at all thirds of WaveOne Gold group where EDTA group showed better smear layer removal ability in comparison to other irrigation protocols. EndoActivator didn't show any improvement in smear layer removal.