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Apical Debris Extrusion of Rotary and Reciprocating Files Combined with Two Supplementary Irrigation Techniques

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Abstract

Objectives: To quantify the amount of debris extrusion after root canal instrumentation with rotary (Zenflex; ZF) and reciprocating (EdgeOne Fire; EOF) file systems combined with either Manual Dynamic Activation (MDA) or Passive Ultrasonic Irrigation (PUI).

Methods: Ninety mandibular molars with complete root formation and 10°-20° curvature were selected, disinfected, and stored. Teeth with immature apex, resorption, caries, or calcified canals were excluded. High-speed diamond burs accessed the teeth and mesial roots were used for investigation. Specimen were randomly divided into 6 groups (n=15) based on file (ZF and EOF) and irrigation systems(MDA and PUI). The apical size of prepared root canal was 25. The Myers and Montgomery method was used to collect apical debris. Debris extrusion was measured by weighing tubes pre- and post-experiment after incubating for 5 days. The mean weight differences of debris extrusion among file and irrigation system groups were compared using Two-way ANOVA with Tukey's test.

Results: The statistics showed a significant effect of irrigation technique on debris extrusion (p=0.002), while file system (p=0.698) and interaction (p=0.406) were not significant. PUI as an adjunctive irrigation with ZF and EOF (mean=0.19±0.17 and 0.19±0.14 µg respectively) significantly reduced debris extrusion compared to reciprocating EOF systems without adjunctive irrigation technique (mean=0.37±0.13 µg) (p=0.020 and p=0.017, respectively).

Conclusions: Irrigation technique significantly influenced debris extrusion, while file system had no effect. The use of PUI with both file systems reduced debris extrusion compared to EOF without adjunctive irrigation.

Keywords: apical debris extrusion, mechanical instrumentation, root canal preparation, rotary NiTi file