

Comparative analysis of surface roughness and plastic deformation of reciprocating instruments after clinical use

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Abstract-

This study assessed the surface topography and plastic deformation (PD) of new and used contemporary reciprocating instruments. Twenty-six WaveOne Gold (WOG) and EdgeOne Fire (EO) instruments were photographed under magnification. The instruments were randomly assigned to a control group of new instruments preserved for surface roughness analysis (n = 6 each), or to an experimental group to shape the root canal system of a single molar (n = 20 each), making a total of four groups (WOGnew, EOnew, WOGused, EOused). Used instruments were also photographed after instrumentation. The presence of fractures was registered. Preoperative and postoperative images were randomly ordered for evaluation. Two blinded calibrated examiners evaluated the presence of PD. Inter-observer agreement was calculated with the Kappa coefficient (K = 0.89). 3D profilometry was also used for the surface roughness analysis of six randomly selected instruments from the WOGused and EOused groups. Chi-square and two-way ANOVA tests were used to, respectively, compare PD and changes in surface roughness among the groups. No instruments fractured; however, a significantly greater percentage of EO instruments suffered plastic deformation than WOG instruments (p < 0.001), (OR = 11.09 (CI 95% 2.6–56.3)). The overall surface roughness was higher for most parameters in the EO instruments (p < 0.05). Single uses of EO instruments produced significantly higher chances of PD and increased surface roughness values compared to WOG.

Index Terms- surface roughness; WaveOne gold; EdgeOne fire; profilometry; plastic deformation; nickel–titanium; root canal preparation; Ni-Ti file

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