

Comparative Study on the Shaping Ability of Rotary Nickel-Titanium K3 and HERO Shaper Instruments Compared with Stainless Steel Hand K-Flexo file in Simulated Curved Canals

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Abstract

This study was conducted to compare the shaping ability of K3, HERO Shaper rotary nickel-titanium instruments with stainless steel K-Flexo files manipulated by hand in simulated curved root canals.

Simulated canals with 40° curves in resin blocks were prepared with K3 and HERO Shaper rotary instruments using a crown-down preparation technique or by K-Flexo files using balanced force technique (n = 15 canals in each case). Pre- and post-instrumentation images were recorded and assessment of canal shape was completed with a computer Image analysis program. Material removal was measured at 5 different levels: at the canal orifice (O); half-way to the orifice in the straight section (HO); the beginning of the curve (BC); the apex of the curve (AC); the endpoint (EP). Incidence of canal aberrations, preparation time, changes of working length and instrument failures were also recorded.

The data were analyzed statistically using ANOVA, Student t-test and chi square tests.

In general, canals prepared with K3 instruments achieved better canal geometry compared with those enlarged with HERO Shaper instruments and hand Flexo files. In comparison with stainless steel K-Flexo files, rotary K3 and HERO Shaper instruments achieved better canal geometry and showed minimal transportation towards the inner wall of the canal curve at the beginning and apex of the curve and toward the outer aspect of the curves at the endpoint of preparation and created fewer canal aberrations.

No significant differences were detected between rotary Ni-Ti systems and hand K-Flexo files for alteration of working length ($P > 0.05$). Concerning the preparation time, HERO Shaper was significantly faster ($P < 0.001$) than K3 instruments and K-Flexo files.

One K3, two HERO Shaper instruments and none of the K-Flexo files fractured during preparation ($P < 0.05$).