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A comparative study of several nickel-titanium instruments on canal shaping ability in the simulated canal with abrupt curvature

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I. Objectives

This study was done to evaluate which type of Ni-Ti instrument be able to perform canal shape well in the simulated canal with abrupt curvature near it' s apex.

II. Materials and Methods

A total of 96 simulated root canals were made in epoxy resin (EPOXICURETM, BUEHLER , USA), #15 finger spreader (MANI , Japan) were used as root canal templates. The simulated root canal were made with radius of curvature of 1.5 mm, 3.0 mm, 4.0 mm, 6.0 mm respectively, and angle of curvature of all simulate canals was 90 degree. The simulated root canal were prepared by ProFile (Dentsply Maillefer, Ballagiues, Switzerland), ProTaper (Dentsply Maillefer, Ballagiues, Switzerland), HERO 642 (Micro Mega, Besancon, France) and K3 (SybronEndo, West Collins, CA, USA) with a rotational speed of 300 R.P.M using crown-down preparation technique. Pre-operative and post-operative image were taken by digital camera, and the images were compared by image analysis program.

Maintaining of original root canal curvature were measured at inner and outer side of curvature with 9 measuring point. The change of root canal center line were evaluated, and total preparation time were also recorded. Statistical analysis was performed using one-way ANOVA.

III. Results

The result were as follows :

1. At 1.5 mm radius of curvature, during the instrumentation, most of Ni-Ti instrument were deformed or separated.
2. At 3 mm, 4 mm and 6 mm radius of curvature, ProFile maintained the original canal shape better than ProTaper, Hero 642 and K3 ($p<0.05$).
3. At 3 mm, 4 mm radius of curvature, HERO 642 caused the most widening of the canal at apical area ($p<0.05$).
4. ProTaper caused the most widening of the canal at coronal area, regardless of radius of curvature ($p<0.05$).

IV. Conclusions

This result suggests ProFile be able to maintain original root canal shape better than others in the canal with abrupt curvature near the apex.