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I. Objectives

This study compared the shaping ability of nickel–titanium rotary files with different rake angle and radial land.

II. Materials and Methods

The nickel–titanium files used in this study were Profile (Dentsply, Maillefer, Switzerland), Hero 642 (Micromega, France), and K3 (SybronEndo, USA) file. Resin blocks with 40° curvature (Endo-training-bloc, Maillefer, Switzerland) substituted for root canals. Profile has negative rake angle and radial land, Hero 642 has positive rake angle and no radial land, and K3 has positive rake angle and radial land. 36 resin blocks were divided into 3 groups with 12 canals each. The time for canal preparation was recorded. The images of pre- and postoperative resin canal were scanned using Scanjet 5400C (Hewlett-Packard, USA) and those were superimposed using Photoshop 6.0 (Adobe Inc., USA). Amounts of canal deviation, total canal widths, inner canal widths, and outer canal widths were measured at apical 1, 2, 3, 4, 5, 6, and 7mm levels. Statistical analysis was performed using the ANOVA and Duncan's multiple range test.

III. Results

1. In the time for canal preparation Hero 642 had the shortest time, followed by K3, and Profile, and there were the significant differences. ($p < 0.0001$)
2. All of three files tended to deviate the canal significantly to the outer side of the curvature at apical 2–4mm levels.
3. The amount of canal deviation in Hero 642 group was significantly larger than the others at apical 3mm level. ($p < 0.01$)
4. The total canal widths in Hero 642 and K3 group were significantly larger than Profile group at all levels. At apical 2–4mm levels, Hero 642 group was significantly larger than K3 group. ($p < 0.001$)
5. The inner canal widths in Hero 642 and K3 group were significantly larger than Profile group at all levels. ($p < 0.05$)
6. In the outer canal widths, differences were significant at apical 2–4 mm levels in all of three groups. At apical 2mm level, Hero 642 group was significantly larger than the others. At apical 3mm level, Hero 642 group was the largest, followed by K3, and Profile. At apical 4mm level, Hero 642 and K3 groups were significantly larger than Profile group. ($p < 0.001$)

IV. Conclusions

The amount of canal deviation was the smallest in Profile group, and the time for canal preparation was the shortest in Hero 642 group. K3 group resulted in competent characteristics in both measurements.

Positive rake angle seemed to result in fast shaping of root canal and radial land guide the instrument in center of the canals and around curvatures. Radial land also tended to reduce the sense of screwing into the root canal.

The proper selection of the nickel–titanium file based on the knowledge about file design is needed for the safer, simpler and faster root canal therapy.