

Evaluation of canal preparation with Ni-Ti rotary files by micro computed tomography

Jeong-Ho Lee, Seung-Ho Baek

Department of Conservative Dentistry, College of Dentistry, Seoul National University

I. Objectives

The purpose of this study was to 1) compare the effects of preparation with nickel-titanium GT rotary files and profile .04 in shaping of root canals of extracted human mandibular molars using micro computed tomography and 2) reconstruct the three-dimensional root canal system from the micro computed tomographic data and visualize this.

II. Materials and Methods

20 extracted human mandibular molars were used in this study. Conventional access openings were prepared and the crown portion above CEJ was cut with Isomet. Crown portion cutting was performed to help stable setting of the tooth on the specimen holder and accurate working length determination. The teeth were randomly distributed into two experimental groups. In group 1, MB and ML canals were prepared in a crown-down method. For coronal flaring, GT rotary files of 12/20, 10/20, 08/20, and 06/20 were sequentially used and 04 taper profiles of #20, 25, 30 were sequentially used to the working length for apical shaping. In group 2, MB and ML canals were prepared with 04 taper profiles. For coronal flaring 04 taper profiles of #25, 30, 20 were sequentially used and then 04 taper profiles of #15, 20, 25, 30 were sequentially used to the working length. In both two groups, working length was determined by placing #10 K files until visible at the apex, then subtracting 1mm.

For each tooth pre and post operative cross-sectional images were obtained by the micro CT (SkyScan 1072). Each tooth was scanned at 50 micron intervals. Pre and post operative cross-sectional images of 1, 2, 3, 5, and 8mm from the apex were compared. For each section, canal area and centering ratio were determined. For each tooth pre- and post-operative root canal volume from the furcation to the apex of the roots was calculated by three-dimensional image software (V-works 4.0, Cybermed Inc. Korea). Data was statistically analyzed by one-way ANOVA.

III. Results

1. At 8mm from the apex, area of dentin removed by GT rotary file was significantly larger than that by Profile .04 ($p < 0.05$). And at the other level (1, 2, 3 and 5mm) there was not a significant difference ($p > 0.05$).
2. There was a trend for GT rotary file to remain more centered in the canals than Profile .04 at all levels. But at 3mm level there was a statistically significant difference ($p < 0.05$).
3. In root canal volume increments after instrumentation, there was no significant difference between two groups ($p > 0.05$).

IV. Conclusions

According to this study except the more cutting ability of GT rotary file over the orifice area, there was no clinically significant difference in effects prepared by GT rotary file and Profile .04 and the method using micro CT and image software is effective for the quantitative evaluation of root canal instrumentation.