BERGMANS L, DE CORT S, VAN CLEYNENBREUGEL J, WEVERS M, LAMBRECHTS P. *Catholic University of Leuven, Belgium.*

X-ray-micro-CT (XMCT) for non-destructive evaluation of the shaping ability of NiTi rotary instruments and subsequent obturation

The aim was to optimize the qualitative and quantitative evaluation capacity of XMCT to determine the effectiveness of NiTi files in different canal curvatures combined with Thermafil filling. A desk-top XMCT for 3D-non-destructive microscopy was used at 130 kV/300 μA, 10 μm spot size, 512 $\times$ 512 pixel X-ray-CCD-camera, 45 $\times$ 45 mm field-of-view, $\times$4.5–120 magnification, 500 sections, 3 h acquisition and reconstruction. Six NiTi preparation techniques combined with one filling technique were evaluated: Lightspeed (Kerr Dental); Quantec (Tycom); Hero642 (Micro-Mega); ProFile OS/0.04–0.06, GT-File, NiTi-Flex handfiles, Thermafil and Topseal (Maillefer Dentsply). Selected roots, stratified in three groups by degree of curvature, were assigned to the preparation groups. The roots are XMC-Ted at three stages: preoperatively after perfusion with 2.5% NaOCl, after instrumentation with a preparation technique, and after obturation. Original medical image volume fusion software was modified for qualitative and quantitative evaluation of the root canal shape and volume. The XMCT was accurate, reproducible and viable to visualize teeth in 2 and 3 dimensions. Its resolution was principally dependent on the noise level resulting from the scanning settings, and optimized for this application. A spatial resolution of better than 40 μm was obtained. After volume fusion, contouring of the inner and outer root perimeter at consecutive sections was computed and automatically compiled for the volume. The surface area of the root canal at every slice was defined. Different root canal volumes were calculated based on surface area and inter-slice distance. The values were mathematically subtracted to compare the different stages of instrumentation and obturation. This software for 3D-rendering, image fusion and quantitative analysis is being refined to quantify root canal transportation.