

IADR Abstract Archives

Dentinal Microcracks and Endodontics: a Longitudinal Study Using Synchrotron-Computed Tomography

Objectives: This study assessed the development of dentinal microcracks following root canal treatment using synchrotron radiation-based micro-computed tomography (SR-microCT).

Methods: Twenty extracted molars (10 maxillary and 10 mandibular) were selected, scanned, and evaluated for the presence of dentinal microcracks at 3 experimental times: Day 1/baseline (teeth were intact); Day 2/after root canal cleaning and shaping; and Day 3/after root canal obturation. Microcracks were defined as all crack lines observed in the cross-sectional view extending from the canal lumen to the dentin/cementum. Teeth were prepared using ProTaper Gold® rotary instruments (Dentsply, Sirona) and obturated using the cold lateral compaction technique with gutta-percha points and zinc oxide-based sealer. SR-microCT at the 05ID-2 beamline at the Canadian Light Source with a 46 keV monochromatic X-ray beam was used to scan the samples. CT reconstruction of the samples was processed using the software UFO-KIT and the 3D and cross-sectional images were independently analysed with ImageJ software by two trained and calibrated examiners to detect the presence of dentinal microcracks. Data was descriptively reported (frequency and percentages).

Results: Five microcracks appeared in 3 molars after cleaning & shaping (Day-2). Three new microcracks (one in each molar) appeared in distinct samples after obturation (Day 3). The majority of microcracks in the maxillary molars were located in the mesiobuccal root, and half of the microcracks in mandibular molars were located in the mesial root.

Conclusions: Root canal treatment may induce the creation of very few microcracks in molar roots which may not be clinically relevant because a cumulative-negative effect of root canal procedures was not observed (since the microcracks appeared in some samples after shaping and in different samples after obturation). A complex canal anatomy was linked with defects formation. SR-MicroCT may be considered the optimal tool for this type of investigation.

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SESSION INFORMATION

Interactive Talk Session

Pulp Biology and Regeneration II

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