Abstract

**Introduction:** Instrumentation of the mesial root canal system of mandibular molars may hinder disinfection by packing hard-tissue debris within the isthmuses. Removal of accumulated hard-tissue debris (AHTD) by three supplemental irrigation systems, two ultrasonically-assisted and one multisonic, was assessed with micro-computed tomography (micro-CT). **Methods:** Twenty-four extracted mandibular molars having two mesial canals connected by an isthmus and converging to a single foramen were selected. After preparation of the mesial canals with WaveOne Gold instruments (Dentsply Sirona Maillefer, Ballaigues, Switzerland), anatomically matched specimens were assigned to three final irrigation protocols (n=8): intermittent-ultrasonic (IU) with an ultrasonically-energized 200 μm wire (Irrisafe; Satelec, Bordeaux, France), continuous-ultrasonic (CU) with an ultrasonic irrigation needle (ProUltra PiezoFlow; Dentsply Sirona Maillefer) and GentleWave (GW) system (Sonendo Inc, Laguna Hills, CA). Specimens were imaged by micro-CT (SkyScan 1176; Bruker-microCT, Kontich, Belgium) at 17.18 μm pixel size before and after preparation and irrigation protocols. Datasets were co-registered and the percentage reduction of AHTD, calculated within the canals and isthmus for each specimen, was statistically compared using one-way ANOVA and post-hoc Tukey tests with 5% significance level. **Results:** Mean percentage reduction of AHTD in canals and isthmuses was significantly higher for GW (96.4% and 97.9%, respectively) than for CU (80.0% and 88.9%, respectively) ($P<0.05$). AHTD reduction for IU (91.2% and 93.5%, respectively) did not differ significantly from GW and CU ($P>0.05$). **Conclusions:** GW achieved greater efficacy in the removal of AHTD from the mesial root canal system of mandibular molars compared to CU, but not to IU. Efficacy of CU and IU was comparable.