

Endodontics

Effects of simultaneous liquid or gel sodium hypochlorite irrigation on cyclic fatigue of two single-file nickel titanium systems at room and body temperature

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Aim: To evaluate the effects of simultaneous liquid or gel sodium hypochlorite (NaOCl) irrigation on cyclic fatigue of F6 SkyTaper (F6ST; Komet Dental, Gebr. Brasseler, Lemgo, Germany) and OneCurve (OC; Micro Méga, Besançon, France) single files at room (20 °C±1°C) and body (37°C±1°C) temperature.

Methods: One hundred and eighty new 25/.06 F6ST and OC files were randomly allocated into 6 groups (n = 15) for each brand. Groups 1 and 4 included new files that were not exposed to NaOCl at 20°C and 37°C, respectively. Groups 2 and 5 included instruments activated with liquid NaOCl at 20°C and 37°C, respectively. Groups 3 and 6 consisted of instruments tested with NaOCl gel at 20°C and 37°C, respectively. A customized static cyclic fatigue testing device was used. The device allowed the standardized instrument insertion thanks to a fixed block and the possibility to test the files at different inclinations. For this study, all instruments were tested at the standard position which corresponds to a 0° inclination. In addition, a simulated 16-mm-long ceramic artificial was employed (60° angle and 5-mm radius of curvature) by reproducing the instrument's size and taper. The simultaneous irrigation was ensured by a

cover formed by the superimposition of two Plexiglas slides in which a channel and a small circular hole were built inside to permit the irrigation flow and outflow through aspiration system, respectively. A thermostat associated to the customized device allowed the temperature adjustment in the artificial canal. Fifteen instruments of each system were activated in continuous rotation (300 rpm) following the manufacturer's instructions and torque fixed at the maximum value provided. For control groups (without NaOCl), the friction of the file on the artificial canal walls was reduced by a special high-flow synthetic oil (Super Oil; Singer Co Ltd, Elizabeth, NJ) designed for lubrication of mechanical parts while experimental protocols (for liquid and gel solutions) included a continuous and constant injection of irrigant for 10 seconds every 30 seconds of rotation of the instruments. For each instrument, the time to fracture in seconds (TtF) from the start of the test until the moment breakage was detected visually and/or audibly was recorded with a chronometer to an accuracy of 0.1 second and the length of the fractured file tip was measured by using a digital microcaliper (Mitutoyo Italiana srl, Lainate, Italy). The surface of fractured instruments was studied by field-emission scanning electron microscopy (SEM). The means and standard deviations of TtF were calculated and statistically analyzed (P<0.05, Two-way ANOVA, Tukey Test).

Results: TtF of all tested instruments decreased at body temperature (P<0.05). At 20°C, NaOCl enhanced TtF of F6ST and OC (P<0.05). Instruments irrigated with NaOCl liquid had higher TtF in comparison with gel for F6ST (P<0.05); no difference was observed between the two formulations for OC. At 37 °C, both NaOCl formulations had no significant influence on TtF for F6ST while improved cyclic fatigue resistance of OC (P<0.05). Independently from the temperature

and irrigant use, OC reported significant higher TtF than F6ST ($P < 0.05$). The length of the fractured file fragments was not statistically different among the tested instruments (5.1 mm) ($P > 0.05$). Moreover, SEM analysis of the fractured surfaces showed the typical features of cyclic fatigue failure for both instruments.

Conclusion: Within the limitations of the present in vitro study, NaOCl (liquid or gel) improved cyclic fatigue resistance of OC, independently from the temperature, while for F6ST the negative impact of higher temperature reduced the irrigant benefits.

Analysis of C-shaped anatomical configuration in mandibular premolars and molars: prevalence, differences, correlation and bilateral symmetry. A cone-beam computed tomography study in vivo

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Aim: The aim of this in vivo cone-beam computed tomographic (CBCT) study was to analyze the prevalence, correlations and differences of C-shaped canal morphology in mandibular premolars and molars, within the Asian population.

Methods: A total of 221 subjects (49% males, 51% females), with a mean age of 29 ± 1.20 years, coming from the middle East, were included in this study. Among 1768 screened teeth, 1523 were valid for analysis. Previously treated root canal, calcification or resorption, and distorted CBCT images have been excluded. 810 mandibular premolars (411 first premolars, 399 second premolars) and 713 molars (307 first molars, 406 second molars) were evaluated using CBCT scans, using the following parameters: FOV 170x120 mm, 90 kV, 5–8 mA, 17.5 s exposure time and 0.25 mm voxel size. Axial sections were acquired at coronal, middle, and apical levels to explore C-shaped canal types. A premolar tooth is considered to have a C-shaped canal when two anatomical features are found: an external radicular groove and a C1 or C2 configuration, present at any position of the root canal system (Fan et al. C-shaped classification). For a molar to have a C-shaped canal, three anatomical features are instead needed: fused roots, a longitudinal groove, and one cross-section of the canal showing C1, C2 and C3 or only C4 configuration types present in all axial sections. Furthermore, the study investigated also the prevalence, correlations, differences of C-shaped configuration types between premolars and molars, differences between genders and location in the mandibular, bilateral symmetry between right and left side of the same individuals and the external grooves

on roots. The same endodontist examined the CBCT images twice, with a 4-week interval between the two analyses.

Results: The prevalence in premolars was of 1,4% (72,7% first premolars, 27,3% second premolars) and of 4,8% in molars (100% in second molars and none in first molars). The presence of C-shaped configuration in premolars, molars and between the two groups in the same individual has no correlation. Different C-shaped canals were found in both premolars and molars. Axial sections at coronal levels showed the prevalence of C4 in premolars and C1 in molars, whereas middle and apical sections proved the prevalence of C2 in premolars and C3 in molars. The whole prevalence was of C2-shaped canals in premolars, and of C3-shaped canals in molars. External longitudinal grooves were frequently localized on the mesiolingual surface (7 cases, 63,6%) in premolars and on the lingual side (20 cases, 58,8%) in the second molars.

Conclusions: The prevalence of C-shaped canals in mandibular premolars was relatively low, whereas it was more relevant in second molars. No C-shaped canals correlation was found between premolars and molars and amongst the two groups for the same patient. Significant differences relevant to the presence or absence of C-shaped configuration were not found in relation to gender and sides. No significant data emerged in support of the bilateral symmetry in the same patients. Despite CBCT gives a higher dose of radiation than traditional x rays, it permits to adopt a more predictable root canal treatment in case of difficult and uncommon canal system anatomy such as C-shaped canals, giving to clinicians the possibility to exactly preview root canal system, so that they can plan endodontic therapy, adopting specific techniques or using certain instruments in order to reduce complication.

MicroCT study of the shaping ability of Procodile and Reziflow reciprocating instruments

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Aim: Micro-computed tomography (μ CT) is an accurate qualitative method to evaluate the shaping ability of