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Thermomechanical treatment: A game changer in endodontic instruments

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Aim: The objective of this study was to evaluate the effect of different thermomechanical treatments on the mechanical behavior of rotary files under bending and torsion conditions using finite element analysis.

Methods: A geometric model of a file (25/.06) with triangular cross section was created. The file FE model was built using CAD software. The same FE file model was used to create four models with different material properties, the data for the M-wire, CM wire, R-phase and NiTi alloys were obtained from the literature. The mechanical behavior of the four models under bending and torsion was analyzed mathematically in solid works software package.

Results: Under bending conditions the maximum Von Mises stress value was related to NiTi file model (330 MPa), followed by M-wire (311 MPa), then CM file model (191 MPa), while the least amount of stress value was related to R-phase file model (169 MPa). When torsion test was performed the maximum stress value was also related to NiTi file model (270 MPa), followed by M-wire (261 MPa), then CM file model (191 MPa), while the least amount of stress value was related to R-phase file model (188 MPa).

Conclusions: Thermomechanical treatment of rotary instruments resulted in improving the flexibility and the torsional resistance of these files.

Biography

Manar Galal Hamoda has completed her PhD from Ain Shams University. She is currently a Researcher of Endodontics in Department of Restorative and Dental Materials, Oral and Dental Division, National Research Centre, Cairo, Egypt. She is a Lecturer of Endodontics at Misr International University, Cairo, Egypt.

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