EDITORIAL

An Update on the Analysis of the Mechanical Properties of New Generation Ni-Ti Rotary Instruments

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In recent years, various heat treatments have been introduced for Ni-Ti alloys by manufacturers, to improve the mechanical characteristics of resistance to torsional and flexural stresses, which have led to a high level of resistance of current rotary Ni-Ti instruments.[1,2] This state makes increasingly difficult for the clinician to navigate the vast panorama of available Ni-Ti rotary files, and in this regard, the static tests used up to now to conduct this type of evaluation are no longer sufficient to discriminate in this difficult choice.[3-5] After careful 3D planning, made extremely easy by modern CBCTs, even with a low dose of radiation, it is possible to tackle even the most complex anatomies with instruments that are increasingly resistant to a great multitude of stresses, and which allow to obtain extremely linear root canal preparations that can be easily filled in three dimensions.[6,7] As an evaluation of the summation of the stresses to which these instruments are subjected, so that it can also be performed dynamically, the Operative Torque and the Polar Moment of Inertia have recently been proposed.[4,8] The Operative Torque allows to dynamically evaluate the torsional stresses that the instrument accumulates in relation to the torque it generates in its intracanal rotation.[9]The Polar Moment of Inertia allows to study the resistance to torsional stress as a function of the tendency that a body rotating on its axis opposes this movement.[8] This feature allows a more precise comparative evaluation of the instruments than the previous methods used to compare the resistance to torsional stresses.[3,8] It is also necessary to remember that in recent years other physical characteristics of the instruments have also been analyzed, including the influence of shaft length, that should be considered as an instrument related factor, on torsional resistance of a nickel-titanium rotary instrument and could be stated that the longer the instrument, the higher the torsional resistance is.[10,11] The study of cyclic fatigue, and in general of the physical characteristics of rotating instruments, needs, to date, to be conducted exclusively with dynamic tests, which better represent the real dynamics of rotating instruments in their clinical use.[5,12]It is therefore necessary, to date, the introduction of standardized dynamic tests to compare the multitude of instruments offered on the market, which allow the clinician to choose the most suitable instrument for the specific clinical case due to its mechanical characteristics.[8]

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