UNIVERSITY OF BRESCIA

PhD Program
in
TECHNOLOGY FOR HEALTH

EVALUATION OF THE RELIABILITY OF ENDODONTIC INSTRUMENTS USING A NEW GENERATION EQUIPMENT FOR STRESS-STRENGHT

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XXXVI Cycle

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Background

For ensuring the success and the predictability of endodontic treatment, the original endodontic anatomy should be modified using sharp Ni-Ti instruments able to carve giving a truncated-cone shape to the canal, the precondition for the root canal filling. The major limitation of Ni-Ti mechanical instruments is due to a possible fracture inside the root canal. This accident may occur because of torsional stress, cyclic fatigue, or buckling, especially in the closeness of the root canal curvature. Factors like temperature and forces or excursions applied by the operator can influence behavior of the alloy. As consequence, the fracture is investigated *in vitro*, by simulating the instrument rotation inside artificial canals, in metal or resin, with a predetermined radius of curvature. However, these methods have some limitations.

Objectives

To validate an original equipment made available by BGE Srl for the testing of mechanical instruments
To analyse the reliability of Ni-Ti mechanical instruments, commercially available
To determine the mechanical limitations of each instrument typology and each used alloy, given the large variability currently present among manufacturers.
To provide clinicians with useful data able to increase their knowledge about the Ni-Ti rotating instruments performance through a more detailed definition of ideal settings for each instrument and according to anatomical difficulties

Methodologies

A new generation dynamic simulator, based on new ISO 3630-2 standard, has been designed. This equipment reproduces pecking excursions executed by the dentist during endodontic treatment; temperature, working angles and forces applied to the instruments are also detected and recorded.

Expected Results and Impact

We can evaluate what type of the instrument is the most performing. Data could stimulate industry to improve their technology.