

Root Canal Tensions Investigated With Electric Tensional Stamps During the Rotative Instrumentation

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INTRODUCTION: Root canal system preparation is one of the most important procedures during endodontic treatment. There has been a constant search for quicker, safer and more efficient methods for cleaning and shaping the root canals [1]. The purpose of this study is to describe a method for investigating the tensions in the prepared tooth, in order to be able to determine the maximum load that can lead to the fracture of the rotative instruments that were used in this procedure.

METHODS: Single rooted (n=10) and multiple rooted (n=10) teeth (extracted due to orthodontic reasons) were used in this experiment as samples. For each tooth the pulps were removed and prepared for root canal instrumentation. One set of root canal instrument was used (ProTaper, Maillefer) per each sample. Three electric tensional stamps were applied on each tooth (one in the cervical area, one in the middle area and one in the apical area).



Fig. 1. Precision sensors used in the study.

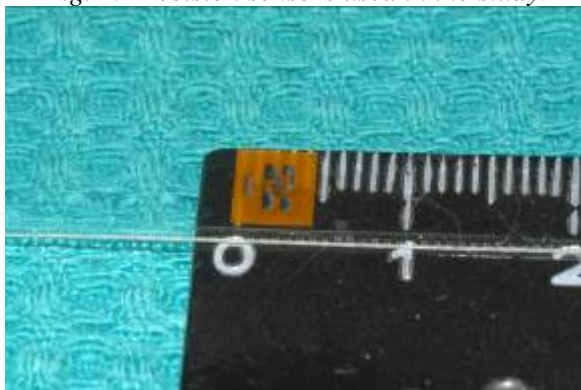


Fig. 2. Dimensions of the Precision sensors used in the study.

The method used in shaping the root canal was the crown-down procedure using rotative instruments (ProTaper). The root canal instrumentation was done at the following speeds: 400 rotation per minute (rpm), 300 rpm, 200 rpm and 100 rpm. One single rooted and one multiple rooted teeth were instrumented manually, in the step-back procedure. For each procedure mentioned above, the root canal preparation was done with and also without water irrigation. The instrumentation of the roots was done, with all instruments from the ProTaper set to the F3 finishing file, except the situations where an instrument has broken during root canal shaping.

RESULTS: Tension changes varied significantly with the teeth, with the single or multiple root, the apical form of the root and the speed. Several fractures of the instruments inside the root canals were obtained and the variation of the tensions recorded on those teeth were analyzed. The maximum tensions were recorded in the apical and the middle area of the roots. Three ProTaper instruments were fractured in the multiple rooted teeth, in the apical area. The maximum tensions were obtained for the teeth in which the preparation was done without water irrigation. For the apical regions, the fracture tensions recorded in the three cases reported above were also achieved in other teeth, in the same zone, without inducing the fracture. However, the tensions recorded were proportionally with the shaping speed.

DISCUSSION & CONCLUSIONS: The general conclusion of the study is that the root canals instrumentation represents a complex phenomenon, depending not only on the instrumentation speed and water cooling, but also on the elasticity modulus of each tooth area. This method allows the possibility to investigate the tensions that appear in the root during the root canal cleaning and shaping. Further research is required in this field in order to obtain an appropriate device that can predict fracture tension of rotative instruments.

REFERENCES:

¹ H.K. Yip, L.P. Samaranayake (1998) *Clin Oral Invest* 2:148-154.