

**The effect of curvature angle and  
rotational speed on the cyclic fatigue of  
three types of endodontic rotary  
instruments (in vitro): comparative study**

*A Thesis*

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**By**

**Thaer Abdulkareem Mukhlif**

**B.D.S.**

**Supervised By**

**Prof. Dr. Abdul-Karim J. AL-Azzawi**

**B.D.S., M.Sc**

## **Abstract**

The fracture of instruments within root canal during endodontic treatment is a common incidence, fracture because of fatigue through flexure occurs because of metal fatigue. The present study aimed to: assess the effect of curvature angle and rotational speed on the cyclic fatigue of different types of NiTi Endodontic Rotary Instruments, compare the fracture resistance among three types of rotary instruments with tip size 0.25: ProTaper F2 (variable taper, Densply, Malifier), Revo-S SU (0.06 taper, MicroMega) and RaCe (0.06 taper from FKG, Dentaire), in addition compare the length of fractured fragment for rotary instruments used. Forty file of each instrument were used within two canals with angle of curvature ( $40^{\circ}$  &  $60^{\circ}$ ) at two speed (250 & 400) RPM, twelve group were formed for all instruments (total number=120), ten file for each group. The testing canals customized within stainless steel block covered with glass face for easy visualization and to prevent slippage of instrument from the canal, the time of fracture measured and the mean of cycles to fracture (MCF) detected for each instrument. Data were analyzed statistically by ANOVA, LSD and independent t-test at 5% significant level.

The results of this study showed high significant effect of curvature angle on cyclic fracture of rotary instruments that when the angle increased the fracture resistance decreased, in addition the rotational speed showed significant effect on fracture resistance for instruments which decreased as the rotational speed increased. In comparison among the three instruments used in this study, RaCe revealed the best fracture resistance followed by ProTaper then Revo-s that showed the less resistance. The present study explained that the rotary instruments more prone to fracture when used at more angle of curvature and at higher rotational speed. As well as the rotary instruments differ in cyclic fracture resistant from each other according to manufacturing process, taper, cross section and other factors.