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The effect of different irrigants on Cyclic Fatigue resistance of four types of rotary NiTi in double curved simulated canal (*In vitro study*)

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Abstract

Ni Ti mechanical properties is of great importance that give the files its flexibility, and grant us a more convenience preparation in curved and double curved canals. Instrument separation during canal preparation is a common incidence, and a cyclic fatigue (metal fatigue) is a common reason.

The aim of this study is to compare the effect of 4 different irrigants on the cyclic fatigue resistance of 4 types of NiTi instrument (one curve, 2shape TS2, Reciproc blue R25 and Wave one gold primary file). Four types of irrigant solutions has been used with one hundred sixty NiTi files are included in this study and these irrigants divided into 4 main groups (n=40)

Group 1: sodium hypochlorite 5.25%

Group 2: chlorhexidine digluconate 2%

Group 3: distilled water

Group 4: without irrigant

Each group subdivided into 4 subgroups (n=10)

The files used in this study is One curve rotary files (taper 0.06, 0.25 tip size) **(MicroMega,France),** 2shape (TS2) rotary files (0.06 taper, 0.25tip size) **(Micro Mega, France),** Reciproc blue rotary files R25 (taper 0.08, 0.25 tip size) **(VDW, Munich, Germany),** WaveOne Gold primary rotary files (0.07 taper, 0.25 tip size) **(Dentsplysirona, Switzerland),** in a custom made double curved stainless steel artificial canal.

A torque controlled handpiece were operated with all instruments, and mounted on surveyor with special tool for standardization and were utilized according to the manufacturer instruction and exposed to cyclic fatigue testing until instrument fracture happens.

The time for fracture was recorded then the number of cycle to fracture was calculated also fractured fragment of each instrument is measured. The data was statistically analyzed using one way ANOVA among groups. Post hoc Tukey test to determine the significance of results.

The results shows that the file with high number of cycle to fracture in all types of irrigant used in this study is Reciproc Blue ($p \leq 0.05$) followed by One Curve followed by Wave One Gold and the least one is 2shape TS2. In the same time the results showed that the best irrigant solution used in this study with little effect on the files is chlorhexidine digluconate 2% followed by distilled water and followed by sodium hypochlorite 5.25% and the least Ncf with an empty canal.

As a conclusion, this study revealed that the best of the tested endodontic irrigants used in this study that offered an increasing in the resistance to cyclic fatigue of the files used was Chlorhexidine Digluconate 2% followed by Distilled water and then Sodium hypochlorite 5.25% and the least one was an Empty canal (without irrigant) and the more resistant file to the cyclic fatigue used in this study was Reciproc Blue followed by One Curve then Wave One Gold and the least one is 2shape TS2.