PEDIATRIC ROTARY INSTRUMENTS: A CYCLIC FATIGUE IN VITRO STUDY

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Background

Fractures of Nickel Titanium (NiTi) alloy rotary instruments continue to be frequent, but these accidents can jeopardize the prognosis of paediatric endodontic treatments. This situation occurs as a consequence of cyclical fatigue due to excessive stress on the alloy when working in root canals with abrupt curvatures.

Purpose

The aim of this in vitro study is to compare the resistance of cyclic fatigue of two pediatric endodontic rotary instruments

Methods

This *in vitro study* was performed using a stainless steel device that simulated root canals that presented different angles of curvature (Fig.1).

Fig. 1. Curvature angles of 90°, 75°, 45° and 25 °.

The artificial root canals were covered with tempered glass to prevent the escape of the instrument and to observe the instrument rotating to determine when it fractures (Fig. 2).

Fig. 2. Simulated root canals device.

A sample of 30 rotating NITI instruments divided into two groups was utilized: 15 instruments of the M3 immatural Files brand (Group A) (Fig. 3) and 15 instruments from the AF Baby Rotary Files brand (Group B) (Fig.4).

Fig. 3. Group A

Fig. 4. Group B

Each instrument was placed into the simulated root canal (Fig.5), then, activated the rotation at a speed of 350rpm using an E-Connect Pro Engine Eighteenth (Fig.6), with continuous movement rotation. The instruments rotated freely inside the simulated root canal and the total time until the instrument´s fracture was recorded.

Fig. 5. E-Connect Pro Engine Eighteenth.

Fig. 6. Instrument placement.

Results

The mean cyclic fatigue fracture times were 43.2 seconds for AF Baby Rotary Files system and 27.3 seconds for the M3 Immatural Files system.

Table.1. Cyclic fatigue resistance time.

Group	Time (s)														
A	90.4	30.2	21.3	7.9	97.8	14.4	11.5	11.3	35.0	08.3	13.2	10.8	17.3	35.2	10.4
B	17.7	24.2	62.6	25.0	91.9	19.5	17.2	16.5	22.6	24.7	109.4	127.0	15.6	12.5	70.3

Table 2. Comparative analysis of cyclic fracture time between AFTM Baby Rotary File and M3 Immatural File.

Rotary system	Mean	Median	Average range	U	Significance
M3 Immatural Files	27.3	14.0	27.3	67	0.059
AF Baby Rotary Files	43.2	24.0	18.5		

The Mann-Whitney U-test analysis was performed, yet no statistical significance was identified (*p*= 0.059), which determined no differences in cyclic fracture time between both rotary systems.

Conclusion

The results reflected that the AF Baby Rotary Files system has greater cyclic fatigue resistance, although this difference was not statistically significant.

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