

A Comparison of Time Needed for Instrumentation of Simulated Curved Canals by Using Different Files

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ABSTRACT

Background : A more flexible file was needed for instrumentation of curved canals using step back enlargement technique Ni-Ti files has been shown to be exceptionally elastic , having a lower bending moment and lower permanent set after torsion with similar gauge stainless steel files .

Aim of the study: is to compare the time needed to prepare curved resin simulated root canals with Ni-Ti, S.S., and SS K-Flex files using a step –back enlargement technique.

Materials and methods: 30 simulated root canals were constructed using size 20 silver points as a mold, then divided into 3 groups: group 1: Canals instrumented with SS K – files, group 2: Canals instrumented with stainless steel K- flex files. And group 3: Canals instrumented with Ni – Ti files.

Results: The comparison between the three groups using ANOVA and T- test, showed a significant difference in time needed to fully instrument the canals.

CONCLUSION: Ni- Ti files required more time to instrument the canals than other files.

KEYWORDS

instrumentation time, curved canals, files .

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INTRODUCTION

preparation of the root canals plays an important role in endodontic treatment, as the main objectives of the latter are to clean, disinfect and shape the root canals to enable easy and appropriate filling ^(1,2).

New products, instruments and instrumentation techniques are appearing which claim to make endodontic instrumentation both faster and better than more conventional treatment ⁽³⁾.

Lim and Webber ⁽⁴⁾ speculated that a more flexible file would produce less, or perhaps no, apical transport. Nickel Titanium (Ni- Ti) alloy has been shown to be exceptionally elastic , having a lower bending moment and lower permanent set after torsion compared with similar gauge stainless steel (S.S.). Hand and rotary files fabricated from Ni-Ti alloy are now available which have expanded the therapeutic options available for root canal preparation and are claimed to be superior in curved canals ⁽⁵⁾.

MATERIALS AND METHODS

The time required to prepare curved artificial root canals in resin blocks was compared using 3 groups of root canal files.

30 simulated root canals were constructed using size 20 silver points as mold which were given a gentle “C” type curvature that is defined mathematically with an angle of approximately 30 degrees and a radius of 18 mm. The degree of curvature was approximated using Pruett et al modification of Schneider method

⁽⁶⁾.

The silver points were coated with a thin film of vegetable oil to prevent the resin from binding to the points. The mold was constructed from silicon rubber impression material and the resin was poured into it and when polymerized the material was clear.

The canals were divided into 3 groups:

- Group 1: canals instrumented with SS K – files.
- Group 2: canals instrumented with SS K- flex files.
- Group 3: canals instrumented with Ni-Ti files.

A standard step – back enlargement technique using simple in / out filing motion was used. The canals were instrumented to size 25 file to the full length. Followed by a step – back to size 45 in 1 mm increment, the canals were irrigated using 1.5 ml of distilled water after each instrument size to ensure that the canals were free of resin debris. The preparation time required for each canal was recorded in minutes. Timing was begun when size 15 file could be negotiated to the full working length. Timing ended when the canal was prepared to master apical file size 25, flared with step – back to size 45. The recorded time also covered irrigation and recapitulation.

RESULTS

The mean values of time taken to complete the preparation of canals are outlined in Table (1) and figure (1).

Table (1) Time taken to complete preparation of canals in minutes

	<i>No.</i>	<i>Mean</i>	<i>SD</i>	<i>SE</i>	<i>Min</i>	<i>Max</i>
Group1	10	13.6	3.660	1.160	10.00	16.00
Group2	10	15.40	3.098	0.980	10.00	20.00
Group3	10	18.20	2.440	0.772	13.00	20.00

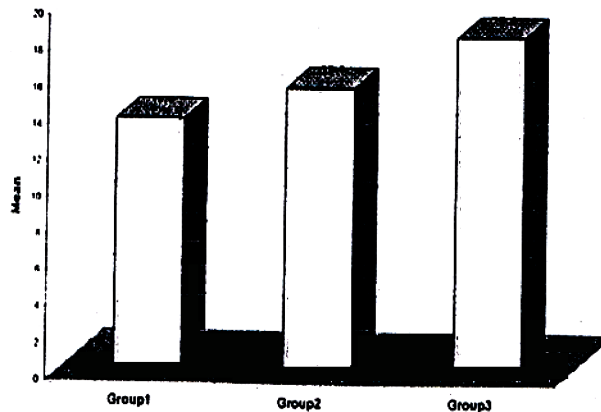


Fig (1): Mean values of time taken to complete the preparation

Using ANOVA test, there was a significant difference in time needed to fully instrument the canals. Group 1 (S.S. files) instrument the canals more quickly than group 2(K- Flex files) and group 3 (Ni-Ti files).

The comparison between the three groups using t-test showed a significant difference between group 1&3 and group 2&3, and no significant difference between group 1&2 (Table2).

Table (2).Comparison between the three groups using t-test

	<i>t-test</i>	<i>P-value</i>	<i>Sig</i>
Group1 &Group2	1.53	0.150	NS
Group1 &Group3	4.55	0.003	S
Group2 &Group3	2.240	0.038	S

****P>0.05 Non Significant, NS=non-significant.**

DISCUSSION

Simulated canals were selected for root canal preparation in this study and other studies because the size, curvature and material characteristics are identical in all canals and good comparability of the results could be expected^(5,7,8,9).

The three instruments used; S.S, SSK- Flex and Ni-Ti files, were chosen because of the variability in their flexibility. Ni-Ti; files have 2-3 times the elastic flexibility of SS files because of the very low values of modulus of elasticity in tension and shear modulus of⁽¹⁰⁾, while flexibility of K- flex files is between them and the decrease of flexibility is more uniform with an increase in file size⁽¹¹⁾.

Possible disadvantage of such flexibility of Ni-Ti files may be the decrease in the force that can be applied laterally to dentin to affect canal wall planning so cutting efficiency may be reduced as compared with SS due to the greater elasticity⁽¹¹⁾.

Instrumentation techniques have become widely studied particularly after the development of Ni-Ti alloy files, which allow faster and safer debridement of curved and flattened root⁽¹²⁾.

Our results showed that Ni-Ti files required more time to instrument the canals and this is in agreement with Coleman and Svec⁽⁷⁾ who found that time of instrumentation with Ni-Ti files in resin blocks was significantly greater than SS files. Coleman et al.⁽⁵⁾ also found that time of instrumentation was greater for Ni-Ti files compared with SS in natural teeth, but the difference was not significant.

Our results disagree with Gambil et al. who showed that root canals prepared by Ni-Ti files using reaming technique required less instrumentation time than those prepared with SS K-Flex files used in a quarter turn / pull technique.

In this study, canals enlargement was time consuming and this may be due to the physical properties of the resin used in constructing the canals,

in addition to the complicated nature of the step-back technique with repeated measurements of files, recapitulation and constant irrigation.

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