

Original Article

Comparison of hand K-files and NiTi rotary files in Biomechanical Preparation Of Root Canals

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ABSTRACT:

Background: Conventionally, hand files are used for cleaning and shaping and are time-consuming. The length of the appointment is strongly associated with the child's behavior. Removal of organic debris is the primary goal of canal preparation in primary teeth. Use of rotary instrumentation for pulpectomy is an emerging practice in pediatric dentistry. The goal for cleaning and shaping of the root canal system is to obtain a continuously tapering funnel from the coronal access to the apex that flows with the shape of the original canal. **Aim of the study:** To compare the efficacy of root canal preparation with hand K-files and NiTi rotary files. **Materials and methods:** The present study was conducted in a private dental clinic. For the study, we selected 50 maxillary central incisors. The teeth were stored in 0.5% sodium hypochlorite solution for one week prior to starting the study. After coronal access was made, canals were irrigated with normal saline and #8 and # 10 K-file was inserted in the canal to determine the working length. The working length was standardized at 15 mm for all the teeth and coronal part was modified accordingly. The teeth were randomly grouped into two groups, Group A and Group B, with 25 teeth in each group. Root canals in group A were prepared with K-files and root canals in group B were prepared with NiTi rotary files. **Results:** We selected 50 maxillary central incisors for the study and were randomly grouped into Group A and B, with 25 teeth in each group. We observed that mean instrumentation time in Group A as 22.32 minutes and in group B was 15.78 minutes. The mean score of india ink removal in coronal third was significantly significant with respect to coronal third. Middle third and apical third were non-significant. **Conclusion:** From the results of this study, this can be concluded that K-files and NiTi rotary files, both are efficient in biomechanical preparation of the root canals, however, rotary files help in reducing the preparation time of the canals.

Keywords: Root canal treatment, biomechanical preparation, hand files, rotary files.

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INTRODUCTION:

Pulpectomy is the choice of treating symptomatic decayed primary teeth and is a challenging and time-consuming procedure in pediatric dentistry.¹ An efficient chemomechanical preparation is essential for effective canal disinfection and thereby contributes to the success of the endodontic procedure. Conventionally, hand files are used for cleaning and shaping and are time-consuming. The length of the appointment is strongly associated with the child's behavior. Removal of organic debris is the primary goal of canal preparation in primary teeth.^{2, 3} Use of rotary instrumentation for pulpectomy is an emerging practice in pediatric dentistry. The goal for cleaning and shaping of the root canal system is to obtain a continuously tapering funnel from the coronal access to the apex that flows with

the shape of the original canal.⁴ Many techniques and instruments have been tried to achieve this goal. Stainless steel instruments produced satisfactory results in straight canals but chances of errors i.e. zips, perforations, ledges, etc., increased when the operator is confronted with curved canals. Ni-Ti instruments were developed in the hope that their increased flexibility would maintain the curvature of the root canal and will decrease the chances of error. Ni-Ti was developed by Buchler et al in the Naval Ordnance Laboratory.^{5, 6} Hence, the present study was conducted to compare the efficacy of root canal preparation with hand K-files and NiTi rotary files.

MATERIALS AND METHODS:

The present study was conducted in a private dental clinic. For the study, we selected 50 maxillary central incisors. The teeth were stored in 0.5% sodium hypochlorite solution for one week prior to starting the study. Teeth with morphological deformities and extensive carious lesions were excluded from the study beforehand. Coronal access was made with spherical diamond burs. After coronal access was made, canals were irrigated with normal saline and #8 and # 10 K-file was inserted in the canal to determine the working length. The working length was standardized at 15 mm for all the teeth and coronal part was modified accordingly. Preoperative radiographs were taken for all the teeth. The teeth were randomly grouped into two groups, Group A and Group B, with 25 teeth in each group. Root canals in group A were prepared with K-files and root canals in group B were prepared with NiTi rotary files. Before the preparation of canals, the canals were filled with India ink. All the teeth were prepared by same operator. Normal saline was used as irrigator. Instrumentation time was noticed for each tooth prepared with respective technique. After the preparation of teeth, teeth were placed in 10% chloridic acid for 3 days for decalcification. After decalcification, teeth were cut into apical, middle, and cervical thirds and were placed in red wax for

observation. The removal of India ink was observed using 40x magnification. The removal of India ink was scored as: 0 for total cleaning, 1 for more than 50% ink removal, 2 for less than 5 0% ink removal of total intra-canal space and 3 for no ink removal. The sections were interpreted by an endodontist and oral pathologist who were blinded for the groups.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student’s t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

RESULTS:

Table 1 shows the demographic variables of the study. We selected 50 maxillary central incisors for the study and were randomly grouped into Group A and B, with 25 teeth in each group. Table 2 shows the comparison of biomechanical preparation in Group A and Group B. We observed that mean instrumentation time in Group A as 22.32 minutes and in group B was 15.78 minutes. The mean score of india ink removal in coronal third was significantly significant with respect to coronal third. Middle third and apical third were non-significant. (fig 1 and 2)

Variables	Group A	Group B
Total number of teeth	25	25
Instruments used for biomechanical preparation of root canals	K-files	NiTi rotary files

Table 1: Demographic variables

Variables	Group A	Group B	p-value
Mean instrumentation time (minutes)	22.32	15.78	0.03
Mean score for India ink removal in coronal third	0.89	0.02	0.009
Mean score for India ink removal in middle third	0.32	0.45	0.32
Mean score for India ink removal in apical third	0.99	0.88	0.74

Table 2: Comparison of biomechanical preparation in Group A and Group B

Figure 1:

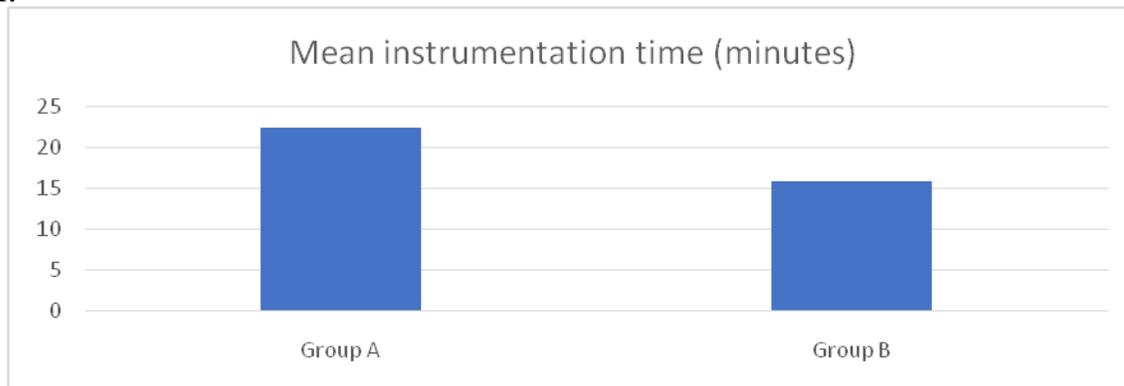
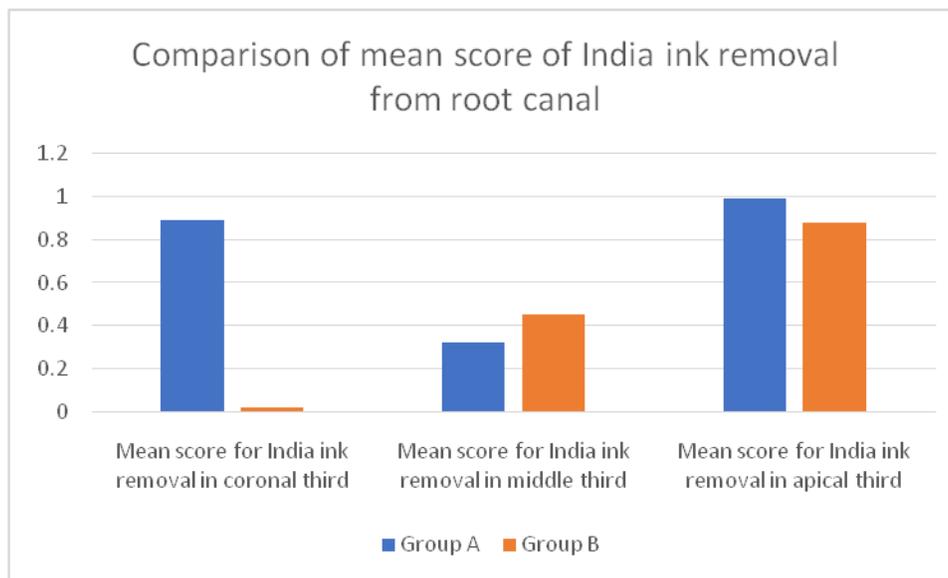


Fig 2:**DISCUSSION:**

In the present study, we observed significant difference between preparation time in K-files and rotary files. Rotary files were more efficient and completed the work in short duration of time. The results were compared with previous studies and were found to be statistically significant. Ramezanali F et al compared the cleaning efficacy and instrumentation time of hand K-files and Mtwo rotary system for preparation of human primary molars. This experimental study was conducted on 100 extracted primary maxillary and mandibular intact molars with no resorption. Access cavities were prepared and India ink was injected into the root canal on a vibrator using an insulin syringe. Canals were then divided into 5 groups (n=20): in group I, canals were instrumented using K-files up to #25 for mesial and buccal canals and #30 for palatal and distal canals. In group II, canals were prepared using Mtwo rotary files (15/0.05, 20/0.06 and 25/0.06 for mesial and buccal canals and 15/0.05, 20/0.06, 25/0.06 and finally 30/0.05 for distal and palatal canals). In group III, root canals were only irrigated with saline. Groups IV and V were the positive and negative control groups, respectively. The time required for cleaning and preparation of the canals for each of the specimens in groups I, II and III was recorded. The mean score of cleanliness of Mtwo was not significantly different from K-file group. However, the mean instrumentation time in Mtwo group was significantly shorter. They concluded that there were no differences regarding the cleaning efficacy of either system, Mtwo rotary files were far more time efficient. Katge F et al compared the cleaning efficacy and instrumentation time between manual Hedstrom files (H-files) and rotary Mtwo files in primary molar root canals. A total of 90 primary

root canals were selected using standardized radiographs. The canals were injected with India ink with 30 gauge insulin syringe and divided into three groups. Group I-30 root canals instrumented with H-files, group II-30 root canals instrumented with Mtwo files, and group III-control group in which no canal instrumentation was done. The teeth were cleared in various solutions and then observed under a stereomicroscope. No significant difference was seen in cleaning efficacy between H-files and Mtwo files in coronal, middle, and apical thirds of the root canal. The instrumentation time recorded for H-files was significantly less than that of Mtwo files. They concluded that there was no significant difference in cleaning capacity, further studies should be carried out using the single file systems.^{7, 8}

Silva LA et al evaluated, in vitro, the cleaning capacity and time needed for instrumentation of root canals of deciduous molars by manual and rotary instrumentation. Thirty-three deciduous molar root canals were injected with India ink and divided into 3 groups: group I--the root canal instrumented manually with K files; group II--the root canal instrumented with rotary Profile .04 instruments; group III--control group, (ie, root canals not instrumented). Instrumentation time was recorded. The teeth were cleared and the removal of India ink was measured in the cervical, middle, and apical thirds. There was no significant difference for cleaning capacity between manual and rotary techniques in the 3 root thirds, but both techniques were different from the control group ($P < .001$). Significantly less time was needed for instrumentation with the rotary technique (3.46 minutes) than with the manual technique (9.06 minutes). They concluded that no differences were found for cleaning capacity, the reduction of

instrumentation time by the rotary technique was a relevant clinical factor for endodontic treatment. Azar MR et al compared the cleaning ability and preparation time of rotary instruments (Mtwo) and conventional manual instruments (K-file) in preparing primary and permanent molar root canals. Access cavities were prepared in 70 primary and 70 permanent teeth and India ink was injected into 120 canals of selected molars. The teeth were randomly divided into two main subgroups (n=20) and three control groups (n=10). In each of these main subgroups, either the manual instrument (K-file) or the rotary system (Mtwo) was used to prepare root canals. After cleaning the canals and clearing the teeth, dye removal was evaluated with the help of a stereomicroscope. In addition, the time needed for root canal preparation was recorded by a chronometer. With regard to the cleaning ability of root canals, there were no significant differences between the K-file and Mtwo rotary system in primary and permanent teeth in the apical, middle or coronal third of the canals. Moreover, there were no significant differences between primary and permanent teeth prepared with K-files and rotary instruments. In all the groups, shorter times were recorded with the rotary technique. The working time was shorter in primary than in permanent teeth. They concluded that the Mtwo rotary system showed acceptable cleaning ability in both primary and permanent teeth, and achieved results similar to those of K-files in less time.^{9,10}

CONCLUSION:

From the results of this study, this can be concluded that K-files and NiTi rotary files, both are efficient in biomechanical preparation of the root canals, however, rotary files help in reducing the preparation time of the canals.

REFERENCES:

1. Bowen JL, Mathu-Muju KR, Nash DA, Chance KB, Bush HM, Li HF. Pediatric and general dentists' attitudes toward pulp therapy for primary teeth. *Pediatr Dent*. 2012;34:210–5.
2. Endo MS, Ferraz CC, Zaia AA, Almeida JF, Gomes BP. Quantitative and qualitative analysis of micro-organisms in root filled teeth with persistent infection: Monitoring of endodontic retreatment. *Eur J Dent*. 2013;7:302–9.
3. Shahi S, Mokhtari H, Rahimi S, Yavari HR, Narimani S, Abdolrahimi M, Nezafati S. Effect of premedication with ibuprofen and dexamethasone on success rate of inferior alveolar nerve block for teeth with asymptomatic irreversible pulpitis: a randomized clinical trial. *J Endod*. 2013;39(2):160–2.
4. Seltzer S, Naidorf JJ. Flare-ups in endodontics: I. Etiological factors. 1985. *J Endod*. 2004;30(7):476–81. ; discussion 5.
5. Hulsmann M, Rummelin C, Schafers F. Root canal cleanliness after preparation with different endodontic handpieces and hand instruments: A comparative SEM investigation. *J Endod*. 1997;23:301–6.
6. Foschi F, Nucci C, Montebugnoli L, Marchionni S, Breschi L, Malagnino VA, et al. SEM evaluation of canal wall dentine following use of Mtwo and ProTaperNiTi rotary instruments. *Int Endod J*. 2004;37:832–9.
7. Ramezani F, Afkhami F, Soleimani A, Kharrazifard MJ, Rafiee F. Comparison of Cleaning Efficacy and Instrumentation Time in Primary Molars: Mtwo Rotary Instruments vs. Hand K-Files. *Iran Endod J*. 2015 Fall;10(4):240-3. doi: 10.7508/iej.2015.04.006.
8. Katge F, Chimata VK, Poojari M, Shetty S, Rusawat B. Comparison of cleaning Efficacy and Instrumentation Time between Rotary and Manual Instrumentation Techniques in Primary Teeth: An in vitro Study. *Int J Clin Pediatr Dent* 2016;9(2):124-127.
9. Silva LA, Leonardo MR, Nelson-Filho P, Tanomaru JM. Comparison of rotary and manual instrumentation techniques on cleaning capacity and instrumentation time in deciduous molars. *J Dent Child (Chic)*. 2004 Jan-Apr;71(1):45-7.
10. Azar MR, Mokhtare M. Rotary Mtwo system versus manual K-file instruments: efficacy in preparing primary and permanent molar root canals. *Indian J Dent Res*. 2011 Mar-Apr;22(2):363. doi: 10.4103/0970-9290.84283