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ORIGINAL ARTICLE

Comparative Analysis of Efficacy of Mtwo NiTi Rotary Files and Hand K-files

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***ABSTRACT*:**
Background: The advantages of rotary NiTi instruments over hand instruments include facilitating canal preparation, preserving the shape of curved canals and producing smooth surfaces in lesser time than with manual instruments. **Aim of study:** To compare efficacy of MtwoNiTi rotary files and Hand K-files. **Materials and methods:** The study was conducted in the Department of Conservative Dentistry of the Dental institution. We selected 40 extracted first mandibular molars. The teeth were randomly grouped into two groups, Group A and Group B with 20 teeth in each group. The instrumentation of specimens of the Group A was done using stainless steel K-files and in Group B was done using MtwoNiTi rotary files. The working length of the root canals was standardized at 20 mm. The cleared specimens were viewed under stereo microscope at 10X for checking the amount of residual india ink at coronal, middle and apical region of the canals and scored from 0 to 3. Score 0 was awarded to wholly clean canal, 1 was awarded to hardly any ink residues, 2 was awarded to incomplete ink removal and 3 was awarded to no ink removal. The results were evaluated. **Results:** We observed that in case of K-files, highest frequency was seen in score 1 followed by score 0. In case of Mtwo files, highest frequency was seen in score 0 followed by score 1. On comparing the results significant results were obtained. **Conclusion:** MtwoNiTi rotary files were more efficient in cleaning tooth root canals.
Key words: K-files, Rotary files, Root canal treatment

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INTRODUCTION:

Root canal treatment is based on cleaning, shaping and sealing the root canal system. Its main objective is the elimination of microorganisms from the root canals and the prevention of recontamination after filling. [1, 2] Irrigating solutions facilitate the disinfection and the debridement of the root canal, so they are considered to be essential for successful endodontic treatment. Instruments alone cannot effectively eliminate bacteria from the root canal system and modern rotary instrumentation techniques produce a large quantity of smear layer that covers root canal walls.[3, 4] In recent years, the use of nickel-titanium (NiTi) rotary files and automated root canal devices has been increasing in endodontic treatments. The advantages of rotary NiTi instruments over hand instruments include facilitating canal preparation, preserving the shape of curved canals and producing smooth surfaces in lesser time than with manual instruments.[5, 6] Several studies have compared the effectiveness of rotary NiTi and hand instruments in cleaning root canals. Most studies have confirmed that NiTi rotary systems are faster than hand instruments; eliminate problems during the preparation of curved root canals.[7, 8] Hence, the current study was conducted to compare efficacy of MtwoNiTi rotary files and Hand K-files.

MATERIALS AND METHODS:

The study was conducted in the Department of Conservative Dentistry of the Dental institution. We selected 40 extracted first mandibular molars for study. Only non-carious teeth, with no signs of root resorption and absence of any structural abnormality were selected for the study. Organic debris from the teeth surface was cleared by immersing them in Sodium hypochlorite solution for 3 days. Access cavity was prepared using round diamond bur and patency checked using no. 10 K-file. Barbed broaches were used to take out pulp from the canal. After removal of pulp, the root canals were rinsed with 2mL normal saline. Then, using 30-

guaze needle root canals were packed with India ink. To assure the penetration of ink, no. 15 K-file was introduced into canal. The teeth were randomly grouped into two groups, Group A and Group B with 20 teeth in each group. The instrumentation of specimens of the Group A was done using stainless steel K-files and in Group B was done using MtwoNiTi rotary files. The instrumentation was done by the same operator. The working length of the root canals was standardized at 20 mm. After completion of instrumentation, the canals were irrigated with 5 ml normal saline dried with paper points, pulp chamber sealed with temporary cement and stored in moistened gauze. The teeth were completely decalcified by immersing the specimens first in hydrochloric acid for 2 days and dehydrated by immersing successively in alcohol solutions. Teeth were cleared in methyl salicylate.

The cleared specimens were viewed under stereo microscope at 10X for checking the amount of residual india ink at coronal, middle and apical region of the canals and scored from 0 to 3. Score 0 was awarded to wholly clean canal, 1 was awarded to hardly any ink residues, 2 was awarded to incomplete ink removal and 3 was awarded to no ink removal. The results were evaluated.

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 and 2 depicts the cleaning efficacy of K-files and Mtwo files respectively at Apical, middle and coronal region. We observed that in case of K-files, highest frequency was seen in score 1 followed by score 0. In case of Mtwo files, highest frequency was seen in score 0 followed by score 1. On comparing the results significant results were obtained **[Fig 1 and 2]**.

Table 1: Frequency of cleaning efficacy scores of K-files

SCORES	Apical region	Middle region	Coronal region	Total
0	6	6	8	20
1	8	10	10	28
2	6	4	2	12
3	0	0	0	0
Total	**20**	**20**	**20**	**60**

Table 2: Frequency of cleaning efficacy scores of M-two rotary files

SCORES	Apical region	Middle region	Coronal region	Total
0	10	10	10	30
1	6	8	8	22
2	4	2	2	8
3	0	0	0	0
Total	**20**	**20**	**20**	**60**

Figure 1: Frequency of cleaning efficacy scores of K-files

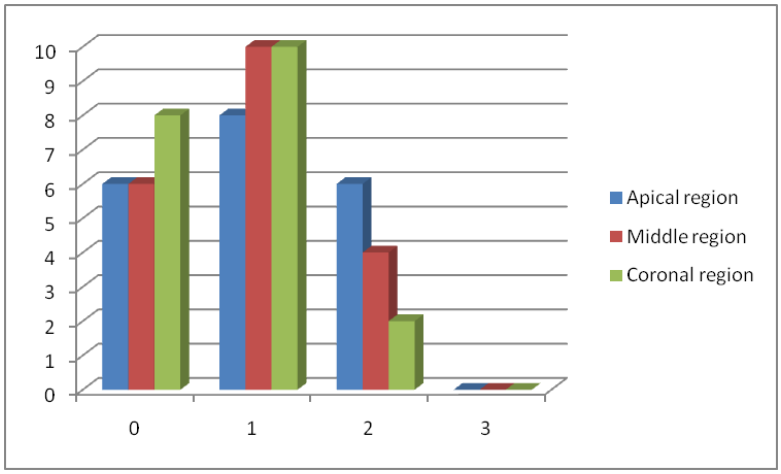
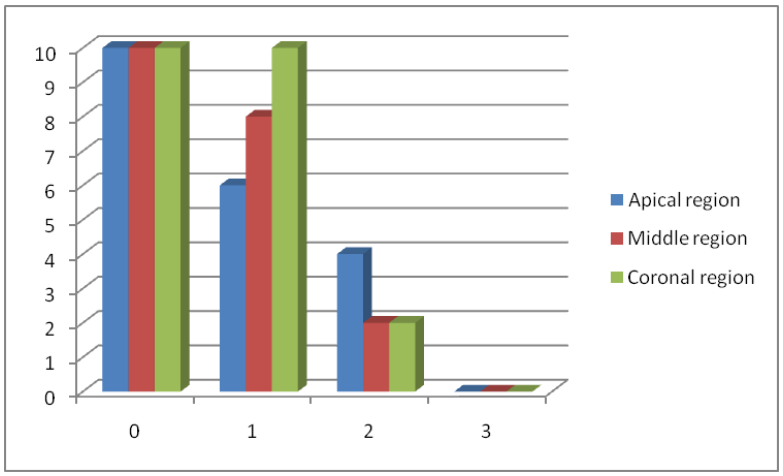


Figure 2: Frequency of cleaning efficacy scores of M-two rotary files



DISCUSSION:

Advantages of rotary files includes maintenance of canal shape, reduced working time and reduced operator fatigue whereas disadvantages includes higher incidence of file separation, extrusion of obturating material and debris through the apical foramen, alterations of root canal morphology.

In the present study, we evaluated the efficacy of Mtwo rotary NiTi files and hand K-files. We observed that both the techniques were able to remove the ink from the canals. Statistically significant difference was observed in the apical, middle and coronal thirds of root canals on comparing Group A and B. Poggio C et al compared the cleaning efficacy of two conventional (Mtwo, Revo-S) Ni-Ti rotary instruments with HyFlex CM. 30 single-rooted freshly extracted teeth were divided into three groups. Root canals were shaped with three NiTi instruments (Mtwo, Revo-S and HyFlex CM) using 5.25% NaOCl and 17% EDTA solutions. Specimens were fractured longitudinally and prepared for SEM analysis at standard magnification of 1000×. The presence/absence of debris smear layer and the presence/absence of smear layer at coronal, middle, and apical third of each canal were evaluated using a 5-step scale for scores. Numeric data were analyzed using Kruskall-Wallis and Mann-Whitney U statistical tests and significance was predetermined at $P < 0.05$. This study revealed significant differences among the various groups. Despite some minor differences, all instruments removed smear layer and debris produced during instrumentation. HyFlex CM seem to be not so effective in promoting cleanliness of root canal walls and in removing smear layer from dentine if compared to Mtwo and Revo-S. Musale PK et al evaluated the efficacy of rotary ProFile, ProTaper, Hero Shaper and K-files in shaping ability, cleaning efficacy, preparation time and instrument distortion in primary molars. Sixty extracted primary mandibular second molars were divided into four equal groups: Group I K-file, Group II ProFile, Group III ProTaper file and Group IV Hero Shaper file. The shaping ability was determined by comparing pre- and post-instrumentation CBCT scans and data analysed with SPSS program using the Chi-square test. Cleaning efficacy was evaluated by the degree of India ink removal from the canal walls under stereomicroscopy. Instrumentation times were calculated for each tooth and instrument distortion was visually checked and duly noted. The cleaning efficacy and instrumentation time were determined using ANOVA with Tukey's correction. Instrument distortion was analysed using Chi-square test. The canal taper was significantly more conical for rotary files as compared to K-files with Chi-square test. Cleaning efficacy of rotary files with average scores was significantly better than K-files. Mean instrumentation time with K-file was significantly higher than rotary files. Instrument distortion was observed in Group I (4.3%), while none of the rotary files were distorted. It was concluded that rotary files prepared more conical canals in primary teeth than manual instruments. Reduced preparation time with rotary files enhances patient cooperation especially in young children.[9, 10]

Azar MR 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. 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. 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. Significantly less time was needed for instrumentation with the rotary technique than with the manual technique. It was concluded that although no differences were found for cleaning capacity, the reduction of instrumentation time by the rotary technique was a relevant clinical factor for endodontic treatment.[11,12]

CONCLUSION:

Based on the findings of present study, we conclude that MtwoNiTi rotary files were more efficient in cleaning tooth root canals.

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