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ORIGINAL RESEARCH

Comparative analysis effectiveness of canal preparation and canal debridement by hand files and rotary files

Navtej Singh[1], Manjit Kaur[2]

[1]MDS conservative dentistry and endodontics medical officer (dental), Civil hospital, Dadasiba, Himachal Pradesh,
[2]BDS medical officer (dental), community health center, Rakkar, Himachal Pradesh

ABSTRACT:
Background: Clinical success of endodontic treatment occurs when the tooth is painless, firm, non-mobile, and without any signs of inflammation or infection. Radiographically, lesions should be resolved within six months, and no pathologic root resorption should be observed. Traditional endodontic treatment technique was done by hand instrumentation. Initially, the endodontic files were made with carbon steel that was susceptible to fracture, tarnish, and corrosion, so stainless steel files were introduced. Soon the nickel–titanium (NiTi) files became popular. **Aim of the study:** To compare effectiveness of canal preparation and canal debridement by hand files and rotary files. **Materials and methods:** The present study was conducted in the Department of Endodontics of the Dental institution. For the study, a total of 100 extracted first premolars were selected. Only non-carious teeth, with no signs of root resorption and absence of any structural abnormality were selected for the study. The teeth were randomly grouped into two groups, Group A and Group B with 50 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 Mtwo NiTi rotary files. **Results:** In the present study, we evaluated effect of instrumentation for endodontic treatment by K files and M-two rotary files. We observed that both the file systems are fairly good in canal preparation and canal debridement. On comparing both the systems, M-two files had better results in apical, middle and coronal regions. **Conclusion**: Within the limitations of the present study, it can be concluded that hand K files and Mtwo rotary files provide satisfactory results for canal debridement and canal preparation. Mtwo rotary system was found to be more effective in canal preparation at apical, middle and coronal region.
Keywords: Mtwo rotary files, hand K files, NiTi files, canal preparation

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Corresponding author: Dr. Navtej Singh, Medical officer (dental), Civil hospital, Dadasiba dist kangra, Himachal Pradesh, Pin 177106

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INTRODUCTION

Clinical success of endodontic treatment occurs when the tooth is painless, firm, non-mobile, and without any signs of inflammation or infection. Radiographically, lesions should be resolved within six months, and no pathologic root resorption should be observed. [1, 2] The modern endodontic specialty practice has little resemblance to the traditional endodontic practice. Traditional endodontic treatment technique was done by hand instrumentation. Initially, the endodontic files were made with carbon steel that was susceptible to fracture, tarnish, and corrosion, so stainless steel files were introduced. Soon the nickel–titanium (NiTi) files became popular.[3] Typically, stainless steel had 2% taper and NiTi files now have 12% taper. But biomechanical preparation with manual instruments was time-consuming and often causes fatigue to the operator and patient. The introduction of NiTi rotary instrumentation in 1980s has made endodontics easier and faster than manual instrumentation, resulting in consistent and predictable root canal shaping. [4, 5] The residual dentin thickness following intraradicular procedures correlates to fracture resistance of the root.[6] In case the preinstrumentation canal wall thickness is very less, it plays a vital role in selecting the file system which reduces the canal wall to a minimum level while doing biomechanical preparation to an acceptable level. To meet this challenge, NiTi rotary technique has been developed to improve root canal preparation because of the unique properties of the alloy. These instruments are able to improve both the morphological characteristics and safety of canal shaping. [4-6] Hence, the present study was conducted to compare effectiveness of canal

preparation and canal debridement by hand files and rotary files.

MATERIALS AND METHODS

The present study was conducted in the Department of Endodontics of the Dental institution. The ethical clearance for the study was approved from the ethical committee of the hospital. For the study, a total of 100 extracted first premolars were selected. 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 50 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 Mtwo NiTi rotary files. 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 clear canal, 1 was awarded to residual ink stains, 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 statistically significant.

RESULTS

In the present study, we evaluated effect of instrumentation for endodontic treatment by K files and M-two rotary files. Table 1 show the cleaning efficacy scores of K-files at apical, middle and coronal region and Table 2 shows cleaning efficacy scores of M-two rotary files at apical, middle and coronal region.

Table 1: Cleaning efficacy scores of K-files at apical, middle and coronal region

Scores	Apical	Middle	Coronal
0	34	37	45
1	10	9	3
2	6	4	1
3	0	0	0

Table 2: Cleaning efficacy scores of M-two rotary files at apical, middle and coronal region

Scores	Apical	Middle	Coronal
0	42	44	48
1	5	4	2
2	3	2	0
3	0	0	0

We observed that both the file systems are fairly good in canal preparation and canal debridement. On comparing both the systems, M-two files had better results in apical, middle and coronal regions. The results on comparison were observed to be statistically significant.

DISCUSSION

In the present study, we compared Mtwo rotary files and hand K files in respect to canal preparation and canal debridement. We observed that both the file systems provide fairly good results in canal preparation and canal debridement. On comparing both the systems, M-two files had better results in apical, middle and coronal regions. The results on comparison were observed to be statistically significant. The results were compared with previous studies from the literature. Bhatti N et al [7] determined the shaping ability and cleaning efficiency of hand K-flexofiles, ProTaper, LightSpeed and Mtwo instruments during the preparation of curved root canals in extracted human teeth. A total of 120 root canals of mandibular and maxillary molars with curvature more than 20° were divided into four groups of 30 each. In group A, canals were prepared using hand K-flexofiles following the crown down technique. In group B LightSpeed, in group C ProTaper, and in group D Mtwo rotary instruments were used to prepare the root canals. The mean change in curvature for hand K-files was 7.71°, for ProTaper files 6.03°, for Mtwo 5.43°, and for LightSpeed instruments were found to be 4.57°. The percentage change in the curvature for all the four groups was statistically highly significant. LightSpeed instruments maintained the original canal curvature significantly better than the other instruments. They concluded that ProTaper and Mtwo resulted in good cleaning, and LightSpeed maintained the original canal curvature better than the ProTaper, Mtwo, or Hand K-files. Katge F et al[8] 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. 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. 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.

Govindaraju L et al [9] compared the obturation quality and instrumentation time of two rotary files systems – Protaper, Mtwo with hand files in primary molars. Forty-five primary mandibular molars were randomly allotted to one of the three groups. Instrumentation was done using K-files in Group 1; Protaper in Group 2; and Mtwo in Group 3. No significant difference was observed in the quality of obturation among three groups. Intergroup comparison of the instrumentation time showed a statistically significant difference between the three groups. They concluded that the use of rotary

instrumentation in primary teeth results in marked reduction in the instrumentation time and improves the quality of obturation. Chaudhary NR et al [10] compared the cleaning efficiency of different file systems in terms of remaining dentin thickness. A total of thirty permanent extracted anterior teeth were taken for the study and was divided into three groups – Group I – Manual Protapers, Group II – Rotary Mtwo, and Group III – Reciprocating WaveOne file systems. Protaper showed minimum reduction in dentin thickness followed by Mtwo and WaveOne showed maximum reduction in dentin thickness, but the intergroup comparison was found to be highly insignificant. Mehlawat R et al [11] compared the timing of instrumentation and cleaning efficacy between manual K files and NiTi rotary files in extracted primary molars. in-vitro study was conducted in 90 root canals of extracted primary molars which were subdivided in three groups viz. Control (No instrumentation), Manual (K files), Rotary (ProFiles) with 30 canals in each group. Mesiobuccal (MB) and Mesiolingual (ML) canals of mandibular molars, and MB and Distobuccal (DB) canals of maxillary molars were included in the test group whereas Distal canals in mandibular molars and Palatal canals in maxillary molars were included in the control group. Mean timing of instrumentation in rotary group was 3.54 ± 1.14 min and 4.32 ± 1.04 min in manual group. Mean cleaning efficacy scores in manual and rotary groups were 2.03 and 1.66 in coronal third, 1.08 and 1.18 in middle third and 0.67 and 1.08 in apical third respectively. Inter-group comparisons showed no statistically significant difference in cleaning efficacy among test groups in all thirds of root canals.

CONCLUSION

Within the limitations of the present study, it can be concluded that hand K files and Mtwo rotary files provide satisfactory results for canal debridement and canal preparation. Mtwo rotary system was found to be more effective in canal preparation at apical, middle and coronal region.

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