

Original Article

Assessment of Root Canal Preparation Time by Hand K-files and ProTaper Rotary Files

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ABSTRACT:

Background: The technical demands and level of precision required for successful performance of endodontic procedures have traditionally been achieved by careful manipulation of hand instruments within the root canal space and by strict adherence to the biologic and surgical principles, essential for disinfection and healing. To improve the speed and efficiency of the treatment stainless steel instruments have been used in a variety of preparation techniques, in an attempt to produce the appropriate canal shape. **Aim:** To compare the root canal preparation systems by hand K-files and ProTaper rotary files. **Materials and method:** The present study was conducted in the Department of Conservative Dentistry and Endodontics of the dental institution after obtaining ethical approval from the ethical committee of the institute. For the study, 85 extracted teeth were selected. Only non-carious premolars with single canal with completely formed apex and absence of structural and morphological defects were included in the study. Root canals of teeth in Group 1 were prepared using stainless steel hand K-files whereas in Group 2 were prepared using ProTaper rotary files (0.04 taper). Preparation time for each canal preparation was recorded. **Results:** In the present study, 85 extracted teeth were selected and were randomly grouped into two groups. Group 1 (canals prepared with hand K-files) and Group 2 (canals prepared with rotary ProTaper files). The mean preparation time for K-files was 12.51±2.32 minutes and for Protaper files was 10.85±3.21 minutes. **Conclusion:** The time taken for preparation of root canals is more in case of hand K-files as compared to ProTaper rotary files. Thus, rotary files reduce the mean preparation time for canal preparation.

Keywords: Root canal, K-files, ProTaper file, Rotary system.

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INTRODUCTION:

The technical demands and level of precision required for successful performance of endodontic procedures have traditionally been achieved by careful manipulation of hand instruments within the root canal space and by strict adherence to the biologic and surgical principles, essential for disinfection and healing.¹ To improve the speed and efficiency of the treatment stainless steel instruments have been used in a variety of preparation techniques, in an attempt to produce the appropriate canal shape. The use of rotary Ni-Ti files for root canal preparation has significantly reduced the time required to prepare the root canal, with minimal deviations from the original canal path compared with manual instrumentation.² ProTaper is amongst the pioneer engine driven instruments with full 360° rotation. It has an active file design, with a convex triangular cross-section and an advanced flute design that has multiple tapers within the shaft.^{4,5} The basic

system is comprised of three shaping (SX, S1 and S2) and three finishing (F1, F2, F3) instruments.⁶ Hence, the present study was planned to compare the root canal preparation systems by hand K-files and ProTaper rotary files.

MATERIALS AND METHOD:

The present study was conducted in the Department of Conservative Dentistry and Endodontics of the dental institution after obtaining ethical approval from the ethical committee of the institute. For the study, 85 extracted teeth were selected. Only non-carious premolars with single canal with completely formed apex and absence of structural and morphological defects were included in the study. The total teeth were randomly grouped into two groups, Group 1 and Group 2. Root canals of teeth in Group 1 were prepared using stainless steel hand K-files whereas in Group 2 were prepared using ProTaper rotary files (0.04 taper). Preparation of access cavities was done and working length

(WL) was determined using visible method with size 10 K file. In group 1, canal was prepared using stepback technique with size 15 file as starting file and size 45 file as master apical file. In group 2, preparation of canal was done using crown-down technique with profile 0.04 taper 29 series rotary instruments. In both the procedures, copious irrigation was done throughout the procedure with 2.5% NaOCl and recapitulation was done during the procedure using size 10 K file. Different elements were recorded i.e. Preparation time and root canal blockage.

The statistical analysis of the data was done using Software of Statistical Package for Social Sciences (SPSS) for windows. Chi-square test and Student's t-test were used to ensure the significance of the data. The significance of the results was predetermined at P value less than 0.5.

RESULTS:

In the present study, 85 extracted teeth were selected and were randomly grouped into two groups. Group1 (canals prepared with hand K-files) and Group 2 (canals prepared with rotary ProTaper files). Table 1 shows the comparative analysis of canal preparation time between K-file (hand) and Protaper 0.04 taper (rotary) files. The mean preparation time for K-files was 12.51±2.32 minutes and for Protaper files was 10.85±3.21 minutes. These results were statistically significant with p-value less than 0.05 [Figure 1].

Table 1: Comparison of mean canal preparation time between K-file (hand) and Protaper 0.04 taper (rotary).

| Method of instrumentation | Mean preparation time (minutes) | P-value |
|------------------------------|---------------------------------|---------|
| K-file (hand) | 12.51±2.32 | 0.02 |
| Protaper 0.04 taper (rotary) | 10.85±3.21 | |

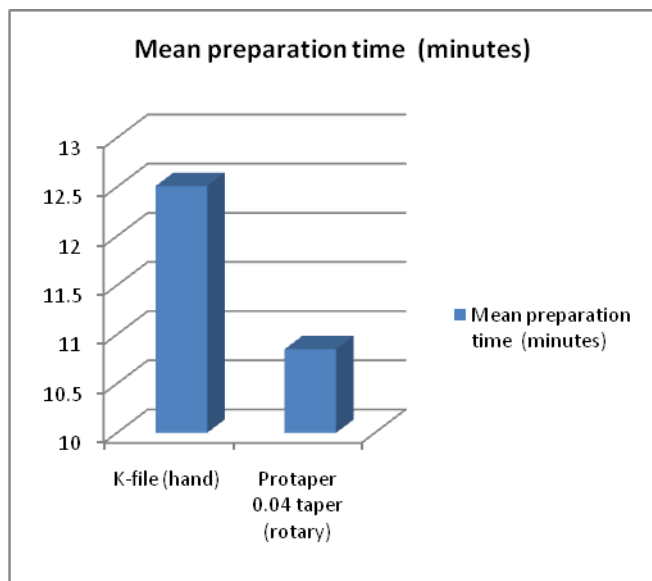


Figure 1: Comparison of mean canal preparation time between K-file (hand) and Protaper 0.04 taper (rotary)

DISCUSSION:

Bio-mechanical preparation of the root canals is one of the most important stages of a root canal treatment. Original canal curvature, especially at the apex and inner side of the root curvature should be preserved during canal shaping. In this regard, any straightening which might interfere with canal integrity has to be prevented.⁷In this present study, we comparatively analyzed the preparation of root canal system with hand K-files and Protaper rotary files. The preparation time for K-files was less as compared to Protaper NiTi files and was statistically significant. The results compared with previous studies from the literature and results were found to be consistent with studies. Nazari Moghaddam K et al compared the cleaning efficacy and time taken for instrumentation of deciduous molars using hand K-files and Flex Master rotary system. In this study, 68 canals of 23 extracted primary molars with at least two third intact roots and 7-12 mm length were selected. After preparing an access cavity, K-file size #15 was introduced into the root canal and India ink was injected with an insulin syringe. Sixty samples were randomly divided in to experimental groups in group I (n=30), root canals were prepared with hand K-files; in group II (n=30), rotary Flex Master files were used for instrumentation, and in group III 8 remained samples were considered as negative controls. After clearing and root sectioning, the removal of India ink from cervical, middle, and apical thirds was scored. There was no significant difference between experimental groups cleaning efficacy at the cervical, middle and apical root canal thirds. Only the coronal third scored higher in the hand instrumented group. Instrumentation with Flex Master rotary files was significantly less time consuming. This was concluded that although there was no difference in cleanliness efficacy at the apical and middle thirds, the coronal third was more effectively cleaned with hand files. Arya A et al compared the cleaning efficiency of manual and rotary instrumentation in the apical third of the root canal system. In group 1 (n=10), instrumentation was performed with stainless steel K-file; in group 2 (n=10), it was done with hand ProTaper files; and in group 3 (n=10), instrumentation was done with ProTaper rotary. Distilled water was used for irrigation. The apical third was sectioned transversally and histologically processed. The cross sections were examined under optic microscope and debris was measured using Motic software. Instrumentation with stainless steel K-files showed minimum amount of debris, followed by ProTaper hand files, and rotary ProTaper files were least effective with maximum amount of debris; however, there were no significant differences between the three experimental groups. The authors concluded that both the manual and rotary instrumentation are relatively efficient in cleaning the apical third of the root canal system and the choice between manual and rotary instrumentation should depend on case to case basis.^{8,9}

Bane K et L compared the shaping ability of two single-file systems and conventional rotary instruments in severely

curved root canals of extracted human molars. Mesio Buccal canals of 120 mandibular molars with angles of curvature ranging between 25° and 35° and radii of curvature from 5 to 9 mm, were divided into three groups (n=40). In each group the canals were instrumented with either WaveOne (W), Reciproc (R) or ProTaper (P). The time required for canal shaping and the frequency of broken instruments were recorded. The standardized pre and post-instrumentation radiographs were taken to determine changes in working length (WL) and straightening of canal curvature. The presence of blockage or perforation was also evaluated. Both single-instrument systems reduced the canal preparation time by approximately 50%. No incidence of broken instruments from single-file systems was reported; however, two F2 instruments in the P group were broken. Reduction in WL and straightening of canal curvature was observed in all three systems with the highest scores belonging to P system. No case of blockage or perforation was found during shaping in any group. Conclusion: Single-file systems shaped curved canals with substantial saving in time and a significant decrease in incidence of instrument separation, change in WL, and straightening of canal curvature. Talebzadeh B et al compared the severity of postoperative pain after root canal preparation with RaCe rotary system and hand K-Flexofile. A total of 96 mandibular first and second molars were divided into two groups (n=48) based on root canal preparation technique. The teeth in both groups underwent one-session root canal treatment and the severity of postoperative pain was evaluated using visual analog scale (VAS) at 4-, 8-, 12-, 24- and 48-h and 1-week intervals. In addition, the type and dosage of analgesics were recorded. The difference between the two groups during this period and at subsequent intervals was not significant. There were no significant differences between the two groups in type and the number of analgesics in pain-free subjects. There were no statistically significant differences in pain severity between the two groups at any intervals.^{10,11}

CONCLUSION:

From the results of the present study, we evaluated that the time taken for preparation of root canals is more in case of hand K-files as compared to ProTaper rotary files. Thus, rotary files reduce the mean preparation time for canal preparation.

REFERENCES:

1. West JD, Roane JB, Goerig AC. Cleaning and shaping the root canal system. In: Pathways of the pulp. 6th ed. Cohen S, Burns RC, eds. St. Louis: CV Mosby, 1994:179–218.
2. Stabholz A, Friedman S, Tamse A. Endodontic failures and re-treatment. In: Pathways of the pulp. 6th ed. Cohen S, Burns RC, eds. St. Louis: CV Mosby, 1994:690–729.
3. Deplazes P, Peters O, Barbakow F. Comparing apical preparations of root canals shaped by nickel-titanium rotary instruments and nickel-titanium hand instruments. J Endod 2001;27:196-202.
4. Rödig T, Hulsmann M, Muhge M, Schafers F. Quality of preparation of oval distal root canals in mandibular using nickel-titanium instruments. IntEndod J 2002;35:919-928.
5. Garala M, Kuttler S, Hardigan P, Steiner-Carmi R, Dorn S. A comparison of the minimum canal wall thickness remaining following preparation using two nickel-titanium rotary systems. IntEndod J 2003;36:636-642.
6. Hülsmann M, Rummelin C, Schäfers F. Root canal cleanliness after preparation with different endodontic handpieces and hand instruments: a comparative SEM investigation. J Endod 1997;23:301-6.
7. Drukteinis S, Balciuniene I. A scanning electron microscopic study of debris and smear layer remaining following use of AET instruments and Kflexofiles. Stomatologija 2006;8:70-5.
8. NazariMoghaddam K, Mehran M, FarajianZadeh H. Root Canal Cleaning Efficacy of Rotary and Hand Files Instrumentation in Primary Molars. Iranian Endodontic Journal. 2009;4(2):53-57.
9. Arya A, Bali D, Grewal MS. Histological analysis of cleaning efficacy of hand and rotary instruments in the apical third of the root canal: A comparative study. Journal of Conservative Dentistry: JCD. 2011;14(3):237-240. doi:10.4103/0972-0707.85797.
10. Bane K, Faye B, Sarr M, Niang SO, Ndiaye D, Machtou P. Root Canal Shaping by Single-File Systems and Rotary Instruments: a Laboratory Study . Iranian Endodontic Journal. 2015;10(2):135-139.
11. Talebzadeh B, Nezafati S, Rahimi S, Shahi S, Lotfi M, Ghasemi N. Comparison of Manual and Rotary Instrumentation on Postoperative Pain in Teeth with Asymptomatic Irreversible Pulpitis: A Randomized Clinical Trial. Iranian Endodontic Journal. 2016;11(4):273-279. doi:10.22037/iej.2016.4.

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