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Original Article

Comparison of shaping ability of three different rotary instruments in simulated root canals

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ABSTRACT:

Background: Biomechanical preparation of the root canal is one of the most important steps in root canal treatment. The present study was conducted to compare shaping ability of different rotary instruments in simulated root canals. **Materials & Methods:** The present study was conducted on 30 mandibular first premolar teeth with simulated root canals. The samples were divided into 3 groups. Group I teeth were prepared with Hershaper. Group II teeth were instrumented with K3 instruments. In Group III, root canals were instrumented with Protaper. In all groups, pre-instrumentation images were taken and post- instrumentation images were taken after injecting a contrast medium. **Results:** Protaper showed more volume change followed by K3 instrument and hero shaper. However, the difference was non-significant ($P > 0.05$). **Conclusion:** Authors found that Protaper showed more volume change as compared to K3 instrument and hero shaper.

Key words: Heroshaper, K3, Protaper.

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INTRODUCTION

Various instruments have been used to prepare the root canal. Biomechanical preparation of the root canal is one of the most important steps in root canal treatment. Successful root canal therapy relies on the effective shaping and debridement of the root canal system without damaging the original configuration. Preparation by using manual or rotary instrumentation techniques in a canal may lead to procedural errors, such as transportation, ledging, zipping and elbowing. However, various studies showed that NiTi rotary instruments maintained original canal shape better than stainless steel files.¹ Obtaining a continuously tapered shape canal with the smallest diameter at the apical foramen and the largest at the orifice that permits effective

irrigation, filling without changing the original curvature and hence the removal of infected dentin and organic tissue by shaping and dissolution.²

Various techniques involving simulated canals have been used to evaluate the shaping ability of endodontic instruments. The assessment of the shaping ability of endodontic instruments are usually performed using two-dimensional(2D) techniques, which rely on accurately fixed devices for taking radiographs/images and using software for calculation. These 2D techniques are inexpensive and allow for the simultaneous comparison of the root canal morphology before and after preparation. Among various instruments used for shaping in simulated canals ProTaper, K3 and Hero shapers instruments have different cross-

sections such as convex triangular cross-section with advanced flute design, asymmetric triple fluted cross-section safe ended tip, and triple helix cross-section combines multiple tapers within the shaft with safe ended tip.³ The present study was conducted to compare shaping ability of different rotary instruments in simulated root canals.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It comprised of 30 mandibular first premolar teeth with simulated root canals. The samples were divided into 3 groups. In Group I, root canals were instrumented with hero shaper in the following sequence: 0.06 #25 upto 2/3 of working length and 0.04 #25 up to full working

length. Group II teeth were instrumented with K3 instruments in the following sequence. Coronal enlargement of root canals were done with orifice shapers .10 and .08 taper till resistance. Then the complete crown down preparation was done with .06 #35,.06 #30 till resistance and final preparation with .06 #25 till working length. Group III teeth were prepared with protaper file system. ProTaper instruments in the following sequence were used. S1 used up to ¾ of estimated working length, Sx used for coronal flaring, S2 used up to working length, and F1 and F2 used up to working length. In all groups, pre-instrumentation images were taken and post-instrumentation images were taken after injecting a contrast medium.

RESULTS

Table I Distribution of teeth

Total- 30			
Groups	Group I	Group II	Group III
Instruments	Hero shaper	K3	Protaper

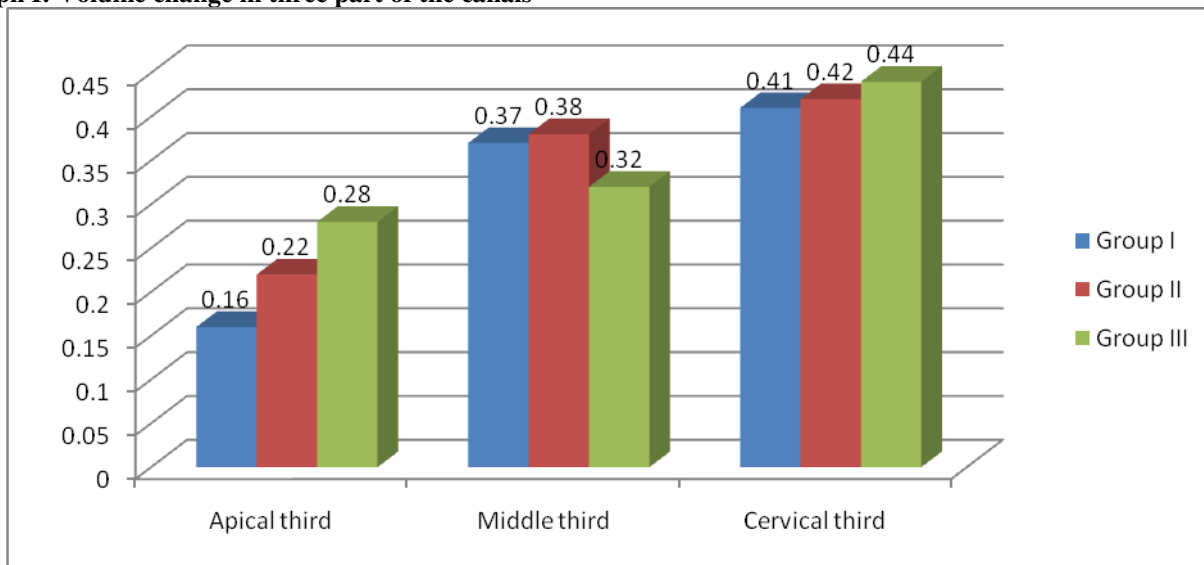
Table I shows that group I teeth were prepared with heroshaper file system, group II teeth were instrumented with K3 instruments and group III root canals were instrumented with Protaper.

Table II Volume change in three part of the canals

Groups	Apical third	Middle third	Cervical third	P value
Group I	0.16	0.37	0.41	0.50
Group II	0.22	0.38	0.42	0.41
Group III	0.28	0.32	0.44	0.21

Table II shows that protaper showed more volume change followed by K3 instrument and hero shapers. However, the difference was non- significant (P> 0.05).

Graph I: Volume change in three part of the canals



DISCUSSION

The biological aspects of cleaning and shaping of root canal system are to remove the infected soft and hard tissue and for creating access for irrigants, intracanal medicaments to the apical canal space, and retaining the integrity of radicular structures.⁴

Time needed for canal preparation is significantly longer with manual than with rotary instrumentation techniques. At the same time, consumption depends on the experience of the therapist. Ni-T rotary systems provide canal preparation with fewer procedural errors. However, complex anatomy of the root canal makes the mechanical preparation one of the most difficult tasks and errors are possible regardless of the applied instrumentation technique.⁵ The present study was conducted to compare shaping ability of different rotary instruments in simulated root canals.

In this study, group I teeth were prepared with Heroshaper, group II teeth were instrumented with K3 instruments and group III root canals were instrumented with Protaper.

The ProTaper Universal (PTU) rotary system was launched several years ago. According to the manufacturer, the convex cross-sectional design with a shallow U-shaped groove in each convex triangular edge seeks to improve the flexibility of instruments and reduce apical transportation. The cross section of finishing files F3, F4, and F5 are designed as concave shape for increasing the flexibility.⁶

We found that protaper showed more volume change followed by K3 instrument and hero shapers. Perez et al⁷ compared the overall change in the width in the mesial view by using ProTaper, K3, and Hero Shapers. ProTaper showed more change in width, followed by K3 and Hero Shapers. ProTaper and K3 showed significant removal of material in the outer wall of the coronal and apical 3rd, followed by inner wall of the middle 3rd. HeroShaper showed significant removal of material in the outer wall of coronal 3rd, with less significant changes in the middle 3rd and apical 3rd.

Paqué et al⁸ in their study found that Reciproc produced greater volume change in the apical part of the canals compared with PTU and K3XF. K3XF exhibited less transportation and better centring ability at the 2- and 3-mm levels from the apical foramen compared with PTU and Reciproc. There were no significant differences in the centering ratio and transportation between PTU and Reciproc. Preparation time was significantly shorter in the Reciproc group.

Sam et al⁹ in their study compared time of preparation and canal aberrations in a simulated root canals after using three different rotary systems: Endostar E5, Endostar E3 and T One File Gold. Instrumentation with T One File Gold system is significantly faster compared to instrumentation with Endostar E5 and Endostar E3 systems. There are no statistically significant differences in the type and number of procedural errors between Endostar E5, Endostar E3 and T One File Gold systems when the operators have no previous experience in rotary instrumentation techniques.

CONCLUSION

Authors found that protaper showed more volume change as compared to K3 instrument and hero shapers.

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