

Original Research

Comparative evaluation of two pediatric rotary file systems in primary teeth: A scanning electron microscope study

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ABSTRACT:

Background: To study and compare two pediatric rotary file systems in primary teeth. **Materials & methods:** A total of 30 extracted primary teeth were included in the study which were divided into 3 groups as; Group 1-Kedo- S rotary file, Group 2- Pro- AF Baby Gold rotary file and Group 3- Manual NiTi K files. Evaluation of smear layer was done. The data obtained was collected and then the result was analysed using SPSS software. **Results:** A total of 30 primary molars were enrolled. In comparison to the coronal and middle thirds, the smear layer was found to be higher in the apical third of the root canals. In Group 1- the mean smear layer for apical third was 3.71 whereas in Group 2- the mean smear layer was 3.76. The smear layer values were less in group 3. **Conclusion:** Pediatric Rotary files were significantly better than manual NiTi K files with evaluation of smear layer.

Keywords: rotary files, primary teeth, pediatric rotary system, smear layer.

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INTRODUCTION

Endodontic root canal preparation in primary teeth is considered to be a challenging procedure because of the perplexing anatomy, tortuous course of the canals, dynamic alteration at the root apex, close proximity to the succedaneous tooth bud as well as the perceived difficulties in behavioral management. ¹ Pulpectomy is considered the treatment of choice for pulpally involved primary teeth in which the pulpal tissue is infected due to caries or trauma. ² Biomechanical preparation is one of the most crucial phases of pulpectomy in primary teeth, which are targeted primarily during debridement of the canals. ³ The standardized method for cleaning and shaping of primary teeth was employed using hand files. Despite being commonly used as the most standard and widely accepted method for biomechanical preparation in primary teeth, certain limitations were associated with hand files as being time-consuming and the occurrence of iatrogenic errors such as lateral perforations, zipping, apical blockage, and canal transportation. ⁴

The launch of new exclusive pediatric rotary files into the field of pediatric dentistry, has dramatically

transformed the pediatric endodontic field. ⁵ Kedo files are rotary endodontic files, which are indigenously manufactured and designed for primary teeth in 2016. Kedo Dental is the name of the manufacturer, and the files were produced in Chennai, Tamil Nadu, India. Kedo rotary files include five generations of products, which were launched and are known respectively as ⁶: Kedo-S rotary file, Kedo-SG, Kedo-SG blue, Kedo-S Square and Kedo-S Plus. ⁷

Since then the use of various rotary Ni-Ti systems for instrumentation of the primary root canals became popular among pediatric dentists.

Kedo-S Square rotary file has revolutionized the arena of pediatric endodontics as being the first exclusive single pediatric rotary file system. It is the fourth generation of rotary Kedo-S files, which were introduced in 2019. It consists of two files, one file to be used for anterior primary teeth (A1) and one file to be used for posterior primary teeth (P1). It has a dual core made of NiTi heat-treated alloy and coated with titanium—oxide. The A1 Kedo-S Square file is used for preparation of primary incisors and canines. Kedo-S Square rotary files have a unique feature that includes a variably variable taper design that provides

the flexibility and efficiency to facilitate consistently successful cleaning and shaping.⁵ Hence, this study was conducted to study and compare two pediatric rotary file systems in primary teeth.

MATERIALS & METHODS

The research was carried out in the Department of pediatric and Preventive Dentistry, Guru Nanak Dev Dental College and Research Institute, Punjab, India after obtaining an approval from the ethical committee of Guru Nanak Dev Dental College and Research Institute, Sunam, Punjab, India. A total of 30 extracted primary teeth were included in the study. They were divided into 3 groups as Group 1: Kedo- S rotary file, Group 2: Pro- AF Baby Gold rotary file and Group 3 : Manual NiTi K files. After root canal preparations, the apex was cut using rotary diamond disc burs and

was conserved and processed for examining under Scanning Electron Microscope (SEM) at 1000x magnification. Evaluation of smear layer was done. Data was collected and result was analysed using SPSS (Statistical Package for the Social Sciences 2016) software.

RESULTS

A total of 30 primary molars were enrolled. In comparison to the coronal and middle thirds, the smear layer was found to be higher in the apical third of the root canals. In group 1, the mean smear layer for apical third was 3.71 whereas in group 2, the mean smear layer was 3.76. The p- value was 0.001 for the group 1 as the result was significant. The smear layer values were less in group 3.

Table: Intra group comparison

Groups	Thirds	Smear layer values (mean)	p- value
Group 1	Coronal	3.26	0.001*
	Middle	2.54	
	Apical	3.71	
Group 2	Coronal	3.18	0.03*
	Middle	3.44	
	Apical	3.76	
Group 3	Coronal	2.61	0.004*
	Middle	2.96	
	Apical	3.38	

*p-value : <0.05 = statistically significant.

DISCUSSION

Chemo-mechanical preparation is an integral part of root canal treatment. It includes mechanical Pulpectomy remains the preferred modality in pediatric dentistry for the treatment of infected pulpal tissue.⁸ Before the development and introduction of Nickel-Titanium (NiTi) files in the field of dentistry, stainless steel (SS) K files used to be the choice for biomechanical preparation of the root canals. These files lacked in flexibility which created undesirable alterations in curved canals including ledges, perforations, zips and transportation.⁹ Rotary instrumentations performed in primary teeth was through use of rotary files designed specifically for permanent teeth until 2016. The taper and length were limitations in using existing rotary systems for permanent teeth when used in primary teeth.¹⁰ This led to the occurrence of lateral perforations in the root surface especially in primary curved rooted canals.¹¹ This resulted in a great need for the design of an exclusive pediatric rotary file system that could be used in primary teeth.¹²

In the present study, a total of 30 primary molars were enrolled. In comparison to the coronal and middle thirds, the smear layer was found to be higher in the apical third of the root canals. In group 1, the mean smear layer for apical third was 3.71 whereas in group 2, the mean smear layer was 3.76. A study by Subramaniam et al, in-vitro study was done to

evaluate and compare the smear layer formed using Kedo-S, Pro AF Baby Gold rotary files and manual Ni-Ti files in the root canals of primary anterior teeth. Sixty primary maxillary incisors which fulfilled the inclusion criteria were randomly assigned into 3 groups of 20 teeth each. Both Kedo-S and Pro AF Baby Gold rotary files were significantly better than manual Ni-Ti K files in effectively debriding the root canal walls of primary teeth as evaluated by the smear layer. Highlights Rotary file systems having instruments of shorter length, variable taper and individual files for anterior and posterior teeth make them suitable for routine use in pulpectomy. These new file systems can be used in endodontic practice in primary teeth for faster and better instrumentation. Kedo-S and Pro AF Baby Gold rotary files were significantly better than manual Ni-Ti K files when the smear layer was evaluated by a scanning electron microscope.¹³

In the present study, the p- value was 0.001 for the group 1 as the result was significant. The smear layer values were less in group 3. Another study by Waly A S et al, study was done to compare two rotary file systems and hand instrumentation for root canal preparation in regard to canal transportation, centering ability ratio, and dentin thickness using cone-beam computed tomography (CBCT). A total of 72 canals from 24 freshly extracted mandibular deciduous second molars were divided into a set of 8 teeth, then

prepared using 2 rotary files systems: the Kedo-S pediatric file system (Group A) and Pro AF Baby Gold file system (Group B) were compared to hand instrumentation (Group C). A significant difference was observed between hand instrumentation using K-files (117.3 s) and both rotary systems (Kedo-S (81 s) and Pro AF Baby Gold (81.5 s)) in terms of canal preparation time ($P < 0.001$). Both tested rotary systems and hand instrumentation demonstrated comparable canal preparation results, with differences that were statistically non-significant in most tested parameters, without shaping errors. However, both the rotary systems were more efficient and faster than hand instrumentation.¹⁴

The variable taper of the rotary Kedo-S Square file creates conservative coronal shape, which preserves dentin with deep apical shaping enabling better access for irrigation and cleaning resulting in three-dimensional obturation.¹⁵ The principle behind varying taper is that each successive file is only engages a minimal aspect of the canal wall.¹⁶

CONCLUSION

Pediatric rotary file systems were significantly better than manual NiTi K files with evaluation of smear layer in deciduous teeth.

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