

## Assessment of Clinical Efficiency of Manual K-files, Kedo-S Plus and Fanta AF™ Pediatric Rotary Files During Pulp Therapy of Primary Teeth: A Clinical Trial

Dr. Nayan Jyoti Sahu<sup>1</sup>, Dr. Shalini Mohanty<sup>2</sup>, Dr. Namrata Karande<sup>3</sup>,  
Dr. Anurima Datta<sup>4</sup>, Dr. Swayam Pradeep Mohapatra<sup>5</sup>,  
Prof. (Dr) Susant Mohanty<sup>6</sup>

<sup>1</sup>Dr. Nayan Jyoti Sahu, Postgraduate Student, Department of Pediatric and Preventive Dentistry, Institute of Dental Sciences, Bhubaneswar, Odisha, India.

<sup>2</sup>Dr. Shalini Mohanty, Postgraduate Student, Department of Pediatric and Preventive Dentistry, Institute of Dental Sciences, Bhubaneswar, Odisha, India.

<sup>3</sup>Dr. Namrata Karande, Postgraduate Student, Department of Pediatric and Preventive Dentistry, Institute of Dental Sciences, Bhubaneswar, Odisha, India.

<sup>4</sup>Dr. Anurima Datta, Postgraduate Student, Department of Pediatric and Preventive Dentistry, Institute of Dental Sciences, Bhubaneswar, Odisha, India.

<sup>5</sup>Dr. Swayam Pradeep Mohapatra, Postgraduate Student, Department of Pediatric and Preventive Dentistry, Institute of Dental Sciences, Bhubaneswar, Odisha, India.

<sup>6</sup>Prof. (Dr) Susant Mohanty, Professor and Head, Department of Pediatric and preventive Dentistry, Institute of Dental Sciences, Bhubaneswar, Odisha, India.

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### Abstract

The objective is to evaluate the instrumentation time required for primary molar root canal preparation using two pediatric rotary file systems (Kedo-S Plus & Fanta AF™ Baby) in comparison to manual K-files. 60 lower primary molars of healthy youngsters, ages 4-8 years were participated. Three groups (n=20) received a random assignment of molars. Kedo-S Plus and Fanta AF™ Baby rotary systems were used to prepare groups I and II, while a manual K-file was used to organise group III, stopwatch was used to estimate the instrumentation time. The result shows that the

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first group had the lowest instrumentation time (78.8 seconds), followed by group II and the manual-K file group ( $p < 0.05$ ). Thus, the tested rotary file systems required less instrumentation time.

**Corresponding Author**

Dr. Nayan Jyoti Sahu  
Email: nayanfih@gmail.com

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## 1. INTRODUCTION

Preserving primary teeth aids in eliminating erroneous oral habits, supporting speech and mastication, and limiting detrimental psychological effects. Biomechanical preparation is the crucial step for pulp therapy for treatment of caries and trauma due to the complex and convoluted canal structure, proximity to the permanent tooth bud, and apparent difficulties with behavioural management, and time-consuming. Historically, primary teeth were cleaned and shaped with hand files, which had several drawbacks including lost time and iatrogenic mistake rates such as zipping, lateral perforations, and canal transit.<sup>1</sup>

**Barr et al. (2000)**<sup>2</sup> employed Profile rotary files for primary tooth pulpectomies and concluded that the method is rapid and cost-effective. Furthermore, alternative methods have been proposed for paediatric endodontics since the root structure of primary teeth is different from that of permanent teeth, resulting in lateral perforations.<sup>3</sup>

In 2016 the introduction of Kedo-S, the first file system created specifically for primary root canal preparation, by Ganesh Jeevanandan of Reeganz Dental India. Kedo-S Plus file fifth generation system is made by Kedo S, with two heat-treated core materials and titanium oxide coatings in the apical and middle regions, possesses a homogeneous cross-section avoiding lateral perforation. Up to 14 molars can have their canals prepared with a single file. Fanta AF™ Baby rotary system was created with the use of Ni-Ti controlled memory-Wire technology, which allows the files to be pre-curved prior to insertion into root canals.

These files don't completely straighten via curved canal instrumentation; instead, they follow the shape of the root canal. The Fanta AF™ Baby file minimises stress by

minimising contact between the file and dentin, thanks to its triangular cross-section and 16 mm operating length.<sup>4,5</sup>

The clinical evaluation of the Kedo-S Plus & Fanta AF™ Baby rotary system has not received much attention. The goal of the current study was to compare the instrumentation time for primary root canal preparation between hand-K-files and rotary equipment (Kedo-S Plus & Fanta AF™ Baby).

## 2. MATERIALS AND METHODS

In this prospective controlled double-blind randomised clinical research, 60 children between the ages of 4 and 8 were enrolled and evaluated using the inclusion and exclusion criteria of the study. The inclusion criteria were healthy, cooperative, free of external pathological root resorption or mobility, with asymptomatic, non-vital mandibular primary molars with sufficient coronal structure and intact second/third root structure. Uncooperative children, systemic illness, non-restorable primary molars, excessive mobility or pathological root resorption were omitted.

Using a 27-gauge needle single-use syringe using a local anaesthetic solution, an inferior alveolar nerve block was used to anaesthetize the teeth. Before the block, a topical local anaesthetic spray was used. 1.8 millilitres of a 1:100,000 adrenaline solution (Themicaïne™, Themis Medicare Ltd.) along with 2% lignocaine hydrochloride were injected at a flow rate of approximately one millilitre per minute. The single-visit pulpectomy was performed by the same operator following the attainment of subjective soft tissue anaesthetic symptoms.

The teeth were kept apart by a rubber dam. Using a sterile BR-46 round diamond bur and a mini-head high-speed airtor, the superficial caries was removed, and the pulp chamber was completely deroofed using an EX-24 diamond bur. Hemorrhage in the canal during de-roofing served as proof that the tooth was still alive. Using Ingle's radiography approach, the working length was determined. The canal's patency was assessed using a 2% taper No. 10 size K-file.

In group I (n = 20), root canals were produced with rotary Kedo-S Plus files (Reeganz Dental Care Pvt. Ltd., India) at a torque of 2.2 Ncm and 300 rpm. In group II (n = 20), root canals were prepared at 350 rpm and 2 Ncm of torque using the Fanta AF™ Baby rotary system (Shanghai Fanta Dental Materials, SUNGO Certification Company Limited, London, England). The Fanta AF™ Baby system utilised open-file #17/0.08, #20/0.04 yellow, #25/0.04 red, and #30/0.04 blue. In each tooth canal, the rotary files were employed in conjunction with an X-Smart™ endodontic motor to use a lateral brushing action at least once or twice.

Group III's canals were instrumented progressively utilising No. 15 to 35 manual K-files (Mani, Inc., Japan) using the quarter-turn-pull technique. In between files, EDTA 17% gel was employed for lubrication and 1% sodium hypochlorite was used for canal irrigation, which was then followed by routine saline irrigation. A skilled dental assistant prepared each canal for each filing, timing the active instrumentation time with a stopwatch. Following the placement of Metapex, root canals were dried with paper tips. A prefabricated stainless-steel crown was utilised after an intermediate restorative material.

### 3. STATISTICAL ANALYSIS

SPSS 24 for Windows was used for the statistical analysis. Tukey's post-hoc analysis and the analysis of variance test were utilised to compare the instrumentation times of the three groups. A significance significance of  $p < 0.05$  was used.

### 4. RESULT

Table 1 delineates the comparison of the mean instrumentation time (sec) of the three groups. The Kedo-S Plus group was found the lowest instrumentation time ( $78.8 \pm 6.7$  s), with significant variation ( $p = 0.0253$ ) between the three groups. The Fanta AF™ Baby group's instrumentation time ( $86.7 \pm 4.9$  s) was significantly less than that of the manual K-file group ( $202.7 \pm 10.0$  s). A significantly significant difference in instrumentation time was confirmed by Tukey post-hoc analysis between the Kedo-S Plus and manual K-file groups and between the Fanta AF™ Baby and manual K-file groups ( $p < 0.001$ ).

**Table 1: Comparison of the mean instrumentation time (sec) of the three different groups**

Instrumentation time	Group I	Group II	Group III	F <sup>∞</sup>	P-value	P1-value	P2-value	P3-value
Mean ± SD	78.8±6.7	86.7±4.9	202.7±10.0	248.9	0.35	0.033	<0.001	<0.001

SD: Standard Deviation, F<sup>∞</sup>: One-way ANOVA test, \*Statistically significant difference at P-value, P1-value: Tukey post-hoc of group I & group II P2-value: Tukey post-hoc of group I & group III, P3-value: Tukey post-hoc of group II & group III

### 5. DISCUSSION

The effectiveness of biomechanical instrumentation as well as reducing chair side time is important factor since it boosts children's cooperation during dental treatment, lowers anxiety, and optimises the treatment protocol.<sup>6</sup> This study was conducted to determine the most reliable file system that could be used with the primary teeth.

With a statistically significant difference, the Kedo-S Plus group had the least amount of instrumentation time of any group. This may be as a result of the rotary pediatric

file's ample operating length, which facilitates placing and removing the file from children's mouths. Eliminating the requirement for manual dexterity, raising operator productivity, and lowering hand fatigue all while significantly simplifying treatment for paediatric patients and dentists. Additionally, fewer rotary files require more instrumentation time due to their higher dentine cutting efficacy and fewer instruments overall.<sup>7</sup> With no statistically significant difference, Kedo-S Plus files in this study required less time for root canal instrumentation than Fanta AF™ Baby files in primary teeth; this could be attributed to the Kedo-S Plus system's single file (P1).

## 6. CONCLUSION

Within the limitations of the study, it can be concluded that the group I had the lowest instrumentation time, followed by group II and group III.

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