



COMPARISON OF INSTRUMENTATION TIME AND OBTURATION QUALITY BETWEEN HAND K-FILES, ROTARY KEDO SG AND ROTARY PROTAPER GOLD FILES IN ROOT CANAL TREATMENT OF PRIMARY TEETH.

Dental Science

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ABSTRACT

Introduction: Pediatric Endodontics was bestowed with rotary instruments by Barr *et al.*, in 2000. It enhances the quality of obturation and reduces instrumentation time by providing conical shape to the root canal. The aim of this study was to compare instrumentation time and quality of obturation by manual instrumentation and two rotary systems in the preparation of primary molar root canals.

Method: A randomized control trial where pulpectomy was performed on 30 primary molars equally distributed for instrumentation with Hand K files, rotary Kedo SG files and rotary Protaper Gold files. The instrumentation time and obturation quality were noted.

Results: Kedo-SG files showed the least instrumentation time whereas the best quality of obturation was seen with Protaper Gold Rotary files as compared to hand files ($P < 0.001$)

Conclusion: Pediatric rotary files Kedo-SG files reduce instrumentation time whereas Protaper Gold rotary files produce improved obturation quality.

KEYWORDS

instrumentation time, Kedo-SG files, Hand K files, Protaper Gold files, obturation quality

INTRODUCTION

The treatment options available in cases of advanced pulpal degeneration that affects radicular pulp tissue are extraction and pulpectomy. Pulpectomy technique is considered over extraction since the successfully treated teeth can be retained in a non-pathologic state until they exfoliate.¹ Conventionally, hand files are used for cleaning and shaping and are time consuming. The length of the appointment is strongly associated with the child's behaviour.²

Rotary instruments were introduced into pediatric endodontics to enhance the quality of obturation. Nickel-titanium (NiTi) alloy instruments inherent flexibility that allows the files to preserve the original anatomy of curved canals, especially in primary teeth and reduce the chances of procedural errors.³

ProTaper Gold (PG). NiTi rotary system was developed with a progressively tapered design that claimed to improve the cutting efficiency and safety. PG files exhibit a convex triangular cross-section and progressive taper. PG files are available in eight sizes: SX (tip size 19 with a taper of 0.04), S1 (tip size 18 with a taper of 0.02), S2 (tip size 20 with a taper of 0.04), F1 (tip size 20 with a taper of 0.07), F2 (tip size 25 with a taper of 0.08), F3 (tip size 30 with a taper of 0.09), F4 (tip size 40 with a taper of 0.06), and F5 (tip size 50 with a taper of 0.05).⁴

Kedo SG Blue (controlled memory files) Kedo SG Blue file system consists of three Ni-Ti rotary files. The total length of the files is 16 mm. The working length of the files is 12 mm. The files are named as D1, E1, U1, respectively. All the files are heat treated and have controlled memory and have a variably variable taper corresponding to the use in primary teeth. It has super flexibility and 75% greater resistance to cyclic fatigue.⁵

The aim of this study was to compare instrumentation time and cleaning efficacy of manual instrumentation and rotary systems in the preparation of primary molar root canals.

MATERIALS AND METHOD

The randomized controlled trial was carried out in the Department of Pediatric and Preventive Dentistry in a Dental College. The trial design was approved by the Institutional Review Board. The informed consent was obtained from the parents of the children participated in the study. A total of 30 children aged 4–8 years requiring pulpectomy in any one of the primary mandibular molars were randomly allotted to one of the three groups where instrumentation was done using: Group 1: hand K files; Group 2: ProTaper Gold rotary system; Group 3: Kedo-SG rotary system.

The selection of the children was based on the following criteria: (a) vital or nonvital mandibular primary molars without sinus tract, (b) absence of internal or external pathologic root resorption, (c) presence of adequate coronal tooth structure to receive SS crown. The children lacking cooperative ability, children with underlying systemic diseases, and children with special health care needs were excluded from the study.

All the procedures were done by a single operator. A full mouth examination with intraoral periapical radiographs of the teeth indicated for pulpectomy was taken before the start of the clinical procedure. After confirmation of the diagnosis, local anesthesia was administered using 2% lignocaine with 1:200,000 adrenaline. The tooth was isolated using rubber dam.

Using a round carbide bur in a high speed handpiece, the superficial caries and roof of the pulp chamber were removed. Coronal pulp amputation was done with spoon excavator. No. 10 size K file was used to determine the patency of the canals. The working length was determined with radiograph and was kept 1 mm short of the apex. The canal preparation was done using:

Group 1: K files from size 15 to size 30 in quarter pull turn method.

Group 2: SX, S1, S2 ProTaper Gold file were used till the working length using an X Smart motor. (Dentsply India Pvt. Ltd., Delhi, India)

Group 3: Kedo SG Blue files D1, E1 and U1 with X Smart motor till the full working length were used.

During the canal preparation, the instrumentation time was recorded in seconds using a stopwatch by an assistant. The canals were then irrigated with saline and sodium hypochlorite and dried using sterile paper points. The obturation was done using calcium hydroxide and iodoform paste by gently pushing with cotton pellets. A postobturation radiograph was taken to assess the quality of obturation. It was assessed by another pediatric dentist who was blinded to the type of instrumentation used for canal preparation. The obturation quality was graded as underfill, optimal fill, overfill.

The glass ionomer cement was given as the postobturation filling. The pulpectomy treated teeth were restored with SS crowns either on the same day or in the next appointment. The statistical analysis was done using SPSS software version 17.0. (Chicago, SPSS Inc). Chi square test was used for inter and intra group analysis of quality of obturation. Paired t test was used to compare the instrumentation time.

RESULTS

A total of 30 children participated in the study. With respect to quality of obturation among the groups, in Group 1 (K files): 46.77% of the canals were optimally filled; 30% and 23.33% were under and over filled, respectively. In Group 2 (Protaper Gold): 76.67% of the canals were optimally filled; 3.33% were under and 20% were over filled each. In Group 3 (Kedo-SG): 63.34% of the canals were optimally filled; 3.33% were underfilled and 33.33% was overfilled.

Intergroup comparison of quality of obturation was done using Chi square test. Statistically significant difference was found among the three groups with the quality of obturation superior in Protaper Gold followed by Kedo-SG and least in Manual technique [Table 1].

The mean instrumentation time is depicted in Table 2. Intergroup comparison was done using Welch two sample independent t test and a statistically significant difference was noted between the three groups ($P < 0.001$). A comparison of mean instrumentation time is shown in Fig. 2.

Table 1: Comparison of obturation quality between the three groups

Obturation quality	Manual technique	Protaper Gold Rotary	Kedo-SG Rotary	P value
Optimal filling	14(46.67%)	23(76.67%)	19(63.34%)	<0.001
Under filling	9(30%)	1(3.33%)	1(3.33%)	
Over filling	7(23.33%)	6(20%)	10(33.33%)	
Total	30(100%)	30(100%)	30(100%)	

Pearson's Chi-squared Test

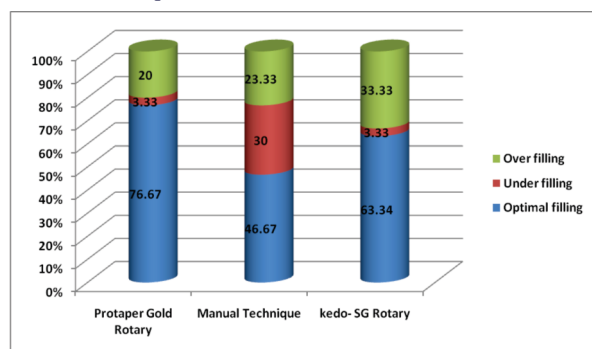


Figure 1: Comparison of obturation quality between three groups.

Table 2: Instrumentation time per group of treatment

Groups of treatment	N	Mean $\pm$ Standard Deviation	Median (Range)	P-value
Manual technique	10	21.14 $\pm$ 4.76	20.70 (14.36 – 30.19)	<0.001
Protaper Gold Rotary	10	10.51 $\pm$ 1.86	10.88 (7.43 – 13.22)	
Kedo SG Rotary	10	5.49 $\pm$ 1.90	5.45 (2.32 – 8.21)	

Welch two sample independent t-test

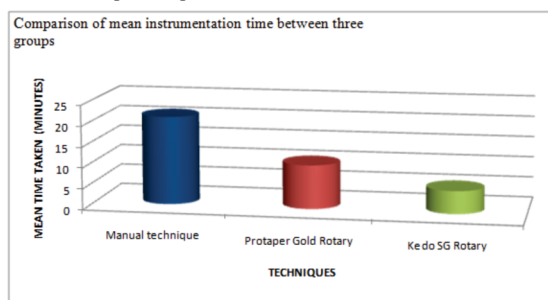


Fig 2: Comparison of mean instrumentation time among the three groups

DISCUSSION

Root canal shaping is one of the most significant pulpectomy procedure. Babaji P et al compared rotary system with manual system and concluded that rotary system is superior in terms of instrumentation time.⁶ Our results are in agreement with those of Ochoa-Romero *et al.* They included forty necrotic teeth which were treated with rotary system and manual technique. The authors found rotary system better than manual system. There was optimal filling of canals and less instrumentation time with rotary instrumentation.¹

Panchal V et al also deduced that pediatric rotary files Kedo-SG has better obturation quality in minimum instrumentation time as compared to Hand K and H files which is in support of our study.⁷

Pathak S et al also concluded that WaveOne took less time and showed better cleaning efficacy when compared to other instrumentation techniques, especially in coronal and middle one-third.³

Ni-Ti endodontic instruments facilitate instrumentation of curved canals and minimize transportation. They have 2 to 3 times the flexibility of stainless steel files owing to their very low modulus of elasticity, and they show superior resistance to torsional fracture because of their ductility. The flexibility of Ni-Ti instruments permits easy access to all duct systems with greater confidence, since it reduces the possibility of fracturing instruments. In this study, we used a Protaper Gold rotary system, which, due to its design, facilitates efficient and safe root canal preparation, with few limitations. Instruments can be moved smoothly down the canal without threading themselves into it; they cut well and resist torsional and cyclic fatigue. This rotary system has been studied in terms of its mechanical properties, deformation, flexural fatigue, torsional overloading, fracture, number of uses, and corrosion. Results of these studies suggest that rotary systems can be used under clinical conditions.¹

In this study we found that the use of the rotary technique diminished instrumentation time and it improved the quality of the filling. This result is a relevant clinical factor for pediatric endodontic treatment.

Reason for better obturation quality with rotary Protaper Gold and Kedo-SG rotary files as compared to hand files can be due to the use of NiTi material used, which increases the flexibility of files. This aids in the adaptation of files to the primary canal curvature, rather than increased zipping and transportation as in hand instrumentation. One more factor which can provide better preparation with the present rotary Protaper Gold and Kedo-SG instrumentation is the wider cervical enlargement and more conical preparation which aids in ease of obturation as compared to less conical preparation with hand files.

Jeevanandan in his study suggested that, though Ni-Ti instruments are widely used for root canal preparation in permanent tooth than primary teeth, there is effective and accurate filling with rotary system. The mean time of root canal preparation in rotary system was found to be less as compared to protaper and manual method groups. It was 20.10 $\pm$ 7.86, 9.37 $\pm$ 2.19, and 10.45 $\pm$ 4.77 min, respectively. Rotary system had less underfilled and overfilled canals than that of other groups.⁸

The use of rotary files in primary teeth has several advantages when compared with manual K files: Promotes efficiency in both preparation time and root canal shaping, decreases working time, helps maintain patient cooperation by diminishing fatigue, improves conical shaping of the root canal and promotes a higher quality of filling, increasing clinical success.

In pediatric dentistry, the duration of the treatment is very essential in decreasing the anxiety among children. Shorter treatment duration decreases the anxiety, thus rendering optimal treatment protocol.⁷

CONCLUSION

With the use of rotary instruments for pulpectomy in primary teeth, improved obturation quality and marked reduction in the instrumentation time has been appreciated resulting in decreased chair side time thereby positively influencing the child's behavior.

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