



ISSN: 0976-3376

Available Online at <http://www.journalajst.com>

ASIAN JOURNAL OF
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 09, Issue, 02, pp.7561-7564, February, 2018

RESEARCH ARTICLE

A COMPARATIVE EVALUATION OF INSTRUMENTATION TIMING AND QUALITY OF OBTURATION IN PRIMARY MOLARS USING MANUAL AND ROTARY TECHNIQUE

¹Dr. Savitha Sathyaprasad, ²Dr. Saurabh Gandhi and ^{3,*}Dr. Dhanya, K. B.

¹Senior prof and Head, Department of Pedodontics and Preventive Dentistry,
KVG Dental College and Hospital, Sullia

²MDS, Consultant Pedodontist, Ghatkopar, Mumbai

³PG Student, Department of Pedodontics and Preventive Dentistry, KVG Dental College and Hospital, Sullia

ARTICLE INFO

Article History:

Received 26th November, 2017
Received in revised form
07th December, 2017
Accepted 08th January, 2018
Published online 28th February, 2018

Key words:

K-Files, Protaper,
Chair-Side Time,
Radiographic Evaluation,
Obturation,
Pediatric Endodontics.

ABSTRACT

Background and Objectives: Rotary endodontics has been popularized over the time in an effort to shorten the treatment duration and improve the efficacy of the operator. The aim was to compare the efficiency of instrumentation time taken by manual K-files and rotary Protapers for cleaning the root canals in primary molars, followed by evaluation of obturation time clinically and quality of obturation radiographically.

Results: The Protaper system presented shorter instrumentation time compared to the manual technique with K-files. The mean instrumentation time being 21.7 and 12.07 minutes for K-files and Protaper system respectively and the mean obturation time was 20.57 and 12.3 minutes respectively. Difference was proven statistically significant ($p < 0.001$). However, for the quality of obturation even though 76.7 % of the canals showed optimal filling with protapers as compared to only 53.3 % with K-files, there wasn't a statistical significant difference ($p > 0.05$).

Conclusion: Rotary in pediatric endodontics fared better in terms of instrumentation time and obturation time and quality than the manual instrumentation technique which can be a promising technique in pediatric endodontics as time is the poignant factor that plays a decisive role in impending cooperation of the child patients in coping with dental treatment.

Copyright © 2018, Dr. Savitha Sathyaprasad et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Pediatric Endodontics is more challenging and difficult due to the complexities of the root canal system, such as presence of fine and tortuous canals, accessory canals, lateral canals, anastomoses, etc (Prabhakar *et al.*, 2014). One of the important concerns in pediatric dentistry is premature loss of primary teeth, adversely affecting the growth, development, function and esthetics (Romero *et al.*, 2011) which can be prevented by pulpectomy as the treatment of choice. However, Pulpectomy can be challenging and time consuming (Bahrololoomi *et al.*, 2007), with manual stainless steel hand files (Schafer, 2000). The manual filing which is still the gold standard, has long been presenting some limitations (Pinheiro *et al.*, 2012), hence it will be a suitable alternative to use rotary technique which can be more appropriate in children to work faster with (Bahrololoomi, 2007). Hence this study was undertaken to evaluate and compare instrumentation and obturation timings and quality of obturation in primary molars using manual and Protaper rotary system.

*Corresponding author: Dr. Dhanya, K.B.

PG Student, Department of Pedodontics and Preventive Dentistry,
KVG Dental College and Hospital, Sullia.

METHODS

The study was initiated subsequent to approval of K.V.G. Dental College ethical committee. Patients were selected based on the inclusion criteria and consent of patients willing to participate in the study was obtained. Sixty subjects of age group 5-10 years, requiring pulpectomy therapy, reported to Department of Pedodontics and Preventive Dentistry, K.V.G. Dental College, Sullia for treatment was selected for the study. 60 subjects selected for the study was divided into two groups.

Group 1: 30 subjects with manual instrumentation using K-files.

Group 2: 30 subjects with rotary instrumentation using Protaper.

Inclusion Criteria for the study group was as follows:

- Frankel behaviour rating: definitely positive and positive child,
- Primary posterior teeth with necrotic pulp, abscess, or sinus tract,

- Radiolucent areas in furcation or periapical region and Atleast 2/3rd of root remaining, and the exclusion criteria was as mentioned below:
- Teeth with root resorption more than 1/3 rd of the actual root length,
- Patients with systemic illness,
- Non-restorable tooth,
- Perforated pulpal floor,
- Excessive mobility,
- Limited mouth opening.

A detailed case history charting with medical and dental history was obtained from each patient after which under local anesthesia and rubber dam isolation, an access opening was made using No. 4 round carbide bur at high speed. The canals were located and extirpation of the pulp was done with Barb Broach. For manual group, canal length was determined by the conventional Ingle's radiographic method and the file was kept 1mm short of the apex. For rotary group, measured the estimated working length from the preoperative periapical radiograph. The root canal was prepared using the shaping files Sx up to the estimated canal length and working length was confirmed using stainless steel k files up to size 15 with radiographic confirmation.

For manual technique, tooth was prepared using the conventional step back method with stainless steel k – files and quarter turn pull technique and the rotary group using Protaper Ni-Ti instrument system. The coronal third was prepared by inserting Sx file into the canal using passive pressure. Care was taken not to go beyond 3/4th of the estimated canal length. Irrigated with 2.5% sodium hypochlorite solution and recapitulated the canal using No 10 file. The working length was determined using no 15 file. Then depending on the patency of the canal S1 shaping file or F1 finishing files up to the established working length were used to complete the apical preparation. The instrumentation timing was noted in minutes from the start of instrumentation till the completion of cleaning and shaping of the canals using a stop watch. For both groups after final irrigation the canals were dried with absorbent paper points and obturated with Metapex by means of hand pluggers to push the paste just short of the apex. The coronal space was filled with Type IX GIC and post-operative periapical intraoral radiograph was taken. The obturation time was also noted in minutes from the start of placing of the obturating material till the obturation is completed using stopwatch. The quality of root canal filling material was recorded as Optimal, under filled and overfilled with the help of post-operative intraoral periapical radiograph.

Table 1. Mean instrumentation time and obturation time in control and experimental group (Mann-Whitney U test)

Group of treatment		Instrumentation time	Obturation time
Control group	Mean (SD)	21.10(1.24)	20.57(1.22)
	Median	21.00(20.00-22.00)	20.50(19.75-21.25)
Experimental group	Mean (SD)	12.07(0.82)	12.30(1.14)
	Median	12.00(11.75-13.00)	12.00(11.75-13.00)
U Statistics		0.00	0.00
p-value		<0.001	<0.001

Statistical Analysis

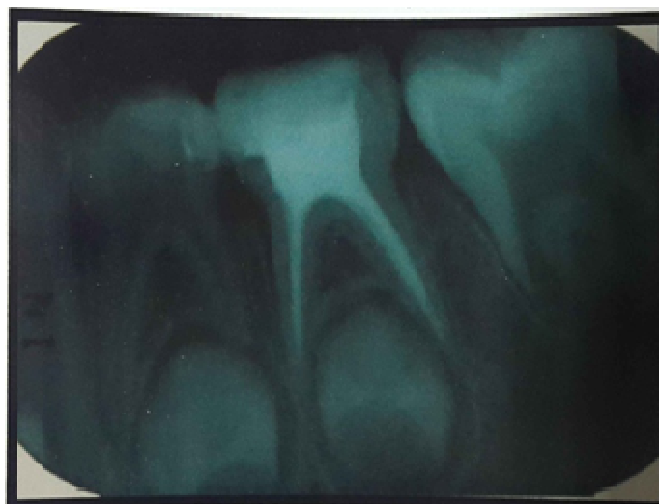
The data was statistically analyzed using SPSS 17 software, under Mann-Whitney U test, Fisher exact tests, and Kappa statistics with the P value <0.05.

RESULTS

The instrumentation time elicited in the manual technique group (mean: 21.00; median:20.00-22.00 min) was significantly longer ($p<0.001$) than that in the rotary technique group (mean: 12.00; median:11.75-13.00 min).

Similarly, the obturation time in the manual technique group (mean: 20.50; median: 19.75-21.25) was significantly longer ($p<0.001$) than that in the rotary technique group (mean:12.00; median:11.75-13.00 min).The Protaper system presented shorter instrumentation time compared to the manual technique with K-files. The mean instrumentation time being 21.7 minutes and 12.07 minutes for K-files and Protaper system respectively.

The obturation was also shorter and the mean obturation time was 20.57 minutes and 12.3 minutes respectively. This difference was proven highly statistically significant ($p<0.001$). However for the quality of obturation eventhough 76.7 % of the canals showed optimal filling with protapers as compared to only 53.3 % with K-files, there wasn't a statistical significant difference ($p>0.05$).



Figures 1. Optimal obturation with manual instrumentation

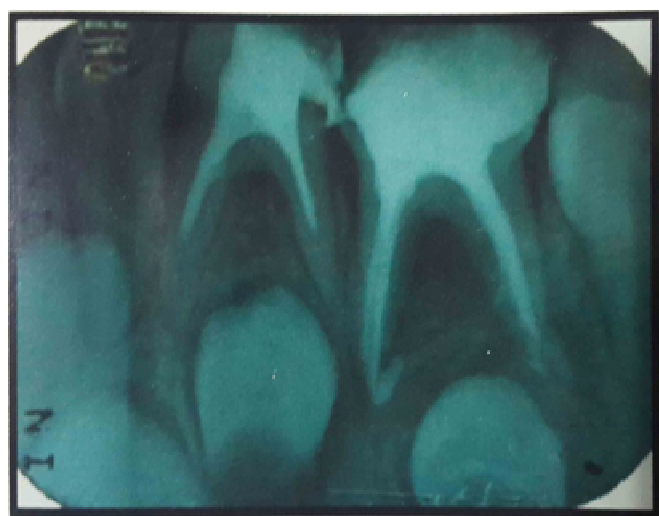


Figure 2: Underfilled obturation with manual instrumentation



Figure 3. Optimal obturation with rotary instrumentation



Figure 4. Underfilled obturation with rotary instrumentation

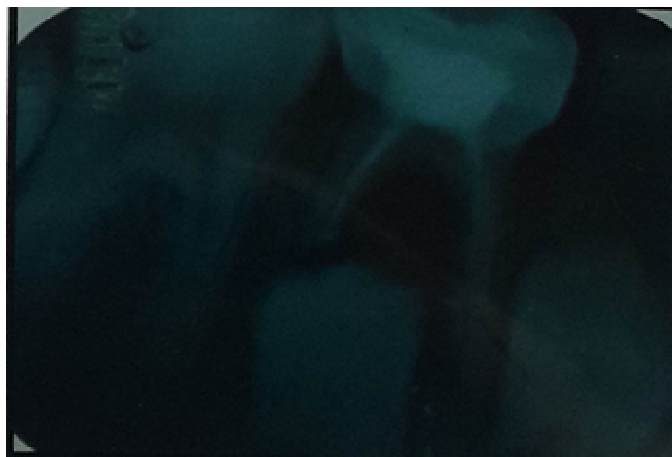


Figure 5. Overfilled obturation with rotary instrumentation

DISCUSSION

One of the most important concerns in pediatric dentistry is premature loss of primary teeth caused due to necrotic pulp which has a deleterious effect on the growth of the facial skeletal complex particularly for the full development of the dental complex, its occlusion, esthetic qualities, and soft tissue support¹. In order to sustain the tooth as a natural space maintainer pulpectomy is the treatment of choice. Pulpectomy can be performed by various techniques depending on confluence of various patient related factors. The

treatment options charted out may be a single or multi visit pulpectomy. Irrespective of the multitude of factors involved, the basic criteria for assessment of success remains the efficacy of biomechanical preparation and quality of obturation. Before placing filling material for pulpectomy, the root canals of primary teeth have to be shaped and cleaned. Since the inception of the concept of root canal therapy, stainless steel hand files have been extensively used for root canal preparation. However, all stainless steel files have the propensity to create aberrations as a result of inherent stiffness of metal which is confounded by the instrument design and canal shape (Al Omari *et al.*, 1992; Thompson *et al.*, 1997; Eldeeb, 1985). In most cases, use of stainless steel in narrow curved canals is difficult and limits apical enlargement thus hindering obturation (Nagaratna *et al.*, 2006). To counter the difficulties faced with the use of stainless steel instrument, NiTi was developed that allows shaping of narrow curved canals without causing aberrations. These instruments show an advanced flexibility, super elasticity and superior resistance to fracture (Nagaratna *et al.*, 2006). Protaper NiTi rotary files substantially simplify root canal preparations. The distinguishing feature of Protaper system is the progressively variable taper of each instrument that develops a progressive preparation in both vertical and horizontal directions. Under use the file blades engage a smaller area of dentin thus reducing torsional load that lead to instrument fatigue and file separation.

During rotation there is also an increased tactile sense compared with traditionally shaped rotary instruments (Madhusudhana *et al.*, 2010). Considering all these advantages Protaper was used in the present study. Primary tooth morphology has a significant difference when compared to permanent dentition. Barr *et al.* suggested that rotary files are least aggressive to be used in primary root canals and they are recommended to be used by novice clinicians. For the same reason Protaper rotary instruments have recently started enjoying wide popularity. Silva *et al.* (2004), Crespo *et al.* (2008) have documented various in vitro studies that compare the cleaning efficacy of rotary system with manual biochemical preparation techniques and most of them concluded that there was no much difference between the two systems in relation to this parameter. Moreover the studies done by them were in -vitro and evaluating the cleaning efficacy has not been included in this study and the statistical analysis only takes into account the criteria of time and quality of obturation, when studies in-vivo. Madan *et al.* (2011) in his study found that the rotary technique takes more chair side time as compared to manual technique. The reason cited by him can be considered as a matter of operator's experience. Reducing instrumentation and obturation time directly correlates with less chair side, thus causing a positive impact on child cooperation. The decreased chair side time has added advantage in children who are less cooperative, patients whose dental treatment is carried out under general anesthesia, and children who cannot tolerate multiple appointments. It is also beneficial in decreasing the working time for children having several teeth indicated for pulpectomy (Makarem *et al.*, 2014). An in-vitro study by Crespo *et al.* (2008) demonstrated that the use of rotary files in primary teeth were efficient in terms of root canal shape, favoring a higher quality of root canal filling. Nagaratna *et al.* (2006) found good smoothness, taper and flow with rotary instrumentation compared to K files. This might be due to increased taper of the instruments combined with their

planning action during rotation. Ochoa-Romero *et al.* (2014) found that the rotary technique improved the quality of obturation as rotary instrumentation allows for greater apical enlargement, reducing apical transportation and improving canal shape over traditional hand filling. But in this study even though we found 76.7% more optimal filling with rotary technique as compared only 53.3% to manual technique, which was not statistically significant ($p > 0.05$). The higher percentage of superior canal filling in the rotary method relative to conventional method might be attributed to better preparation of canals with the rotary method which thereby leads to better flow of filling materials into the canals. Only 16.7% of the rotary cases showed under-filing, the main reason being improper working length. Shorter length results in shorter preparation and the flow of the material is only up to the prepared length. Thus estimation of proper working length is one of the most important step. 6.7% cases showed overfilling in both techniques. This might be due to the extrusion of material through the resorption area. In this study, we used pro-tapers which showed 0% fracture and few limitations. Considering the benefits and costs of the rotary root canal instrumentation, it may be indicated for utilization in deciduous teeth, enhancing root canal preparation with a shorter treatment time. This increases the comfort of the patient and improves the working conditions for the professional.

Conclusion

The pulpectomy procedure for restorable primary teeth is the preferred treatment of infected pulpal tissue in single roots teeth and in molars with signs of furcal radicular involvement. Prior to the placement of pulpectomy paste, the root canals of primary teeth are shaped and cleansed. However, in clinical perspective of the time efficacy in young patient primary teeth, primary teeth is relatively more challenging because of the difficulty of canal morphology. Recently, nickel-titanium rotary system to compare with conventional manual system. Our study showed the Pro-taper to be more advantageous as the chair side time was significantly reduced. It promoted efficiency in both preparation time and root canal shaping, helped in maintaining the patient cooperation by diminishing fatigue, improved conical shaping of canals and promoted a higher quality of filling, thereby increasing clinical success. The study provided conclusive evidence that rotary system in pediatric endodontic fared better in terms of instrumentation time and obturation time than the manual instrumentation technique. The quality of obturation, however, was similar in both and was dependent on operator skills and clinical expertise. Thus, the use of rotary instruments in pulpectomy of primary molars deemed to be a promising technique in pediatric endodontics as time is the poignant factor that plays a decisive role in the impending cooperation of the child patients in coping with the dental treatment. However long term follow up studies should be further conducted to evaluate the effectiveness of different obturating techniques and materials alongside with rotary systems to establish their role in pediatric endodontics.

REFERENCES

- Al Omari MA, Dummer PM, Newcombe RG, Doller R. 1992. Comparison of six files to prepare simulated root canals: Part 2. *Int. Endod J.*, 25:67-81.
- Bahrololoomi Z, Tabrizzadeh M, Salmani L. 2007. In vitro comparison of instrumentation time and cleaning capacity between rotary and manual preparation techniques in primary anterior teeth. *Journal of dentistry*, 4: 59-62
- Barr S, Elizabeth, Kleier DJ, Barr Nelle. 2000. Use of nickel-titanium rotary files for root canal preparation in primary teeth. *Pediatric Dent.*, 22:1:77-78.
- Crespo, S., Cortes, O., Garcia, C., Perez, L. 2008. Comparison between rotary and manual instrumentation in primary teeth. *J Clin Pediatr Dent.*, 32(4):295-8.
- Eldeeb ME, Boraas JC. 1985. The effect of different files on the preparation shape of severely curved canals. *Int. Endod J.*, 18:1-7.
- LAB Silva, P Nelson-Filho, MR Leonardo, JM Tanomaru. 2004. Comparison of rotary and manual instrumentation techniques on cleaning capacity and instrumentation time in deciduous molars. *J Dent Child (Chic) Jan-Apr*; 71(1):45-7.
- Madan, N., Rathnam, A., Shingli, AL., Indushekar, KR., 2011. K-file vs ProFiles in cleaning capacity and instrumentation time in primary molar root canals: An in vitro study. *J Indian Soc Pedod Prev Dent.*, 29(1):2-6.
- Madhusudhana, K., Mathew, V., Reddy, NM. 2010. Apical extrusion of debris and irrigants using hand and three rotary instrumentation systems— An in vitro study. *Contemp Clin Dent.*, 1(4):234-236.
- Makarem, A., Ravandeh, N., Ebrahimi, M. 2014. Radiographic assessment and chair time of rotary instruments in the pulpectomy of primary second molar teeth: a randomized controlled clinical trial. *J Dent Res Dent Clin Dent Prospects Spring*; 8(2):84-9.
- Musale PK, Mujawar SA. 2014. Evaluation of the efficacy of rotary vs. hand files in root canal preparation of primary teeth in vitro using CBCT. *European Archives of Paediatric Dentistry*. Apr 1; 15(2):113-20.
- Nagaratna, P.J., Shashikiran, ND., Subbareddy. VV. 2006. In vitro comparison of NiTi rotary instruments and stainless steel hand instruments in root canal preparations of primary and permanent molar. *J Indian Soc Pedod Prev Dent.*, Dec; 24(4):186-91.
- Pinheiro SL, Neves LS, Imparato JP, Duarte DA, Bueno CE, Cunha RS. 2012. Analysis of the instrumentation time and cleaning between manual and rotary techniques in deciduous molars. *Revista Sul-Brasileira de odontologia South Brazilian Dentistry Journal.*, 9:238-44.
- Prabhakar AR, Yavagal C, Vallu RK. 2014. Twisted vs Protaper Files in Contemporary Pediatric Endodontics. *Int J Clin Pediatr Dent.*, 7(2):93-96.
- Romero TO, Gonzalez VM, Reyes HF, Guillen AP. 2011. Comparison between rotary and manual techniques on duration of instrumentation and obturation times in primary teeth. *J Clin Pediatr Dent.*, 35:359-63.
- Schafer E, Zapke K *et al.* 2000. A Comparative scanning electron microscope investigation of the efficacy of manual vs. automated instrumentation of root canals. *Journal of Endodontic* 26: 660-664.
- Thompson SA, Dummer PM. 1997. Shaping ability of profile 0.04 taper series 29 rotary nickel-titanium instruments in simulated root canals: Part 1. *Int. Endod J.*, 30:1-7.
