Knowledge and Practice of Rotary Instrumentation in Primary Teeth among Saudi Arabian Dentists: A Cross-sectional Study

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ABSTRACT

Background: Making use of rotary instruments for doing pulpectomies in the primary teeth is one of the most developing areas in the field of pedodontics. The primary aim of this study was to assess the understanding and the ease with which Saudi Arabian dentists could use rotary instrumentation in primary teeth.

Materials and methods: A cross-sectional observational study was conducted among dentists over 3 months. A structured self-explanatory questionnaire was given, and responses were obtained from the dental practitioners.

Results: The response rate for the survey was 92.45%. Only 21.4% of them were using rotary instruments, and ProTaper was most commonly used. The most common limitation factors that obstructed its usage included the taper and length of the existing files. On assessing the need for using an exclusive rotary file for performing root canal preparation in primary teeth, there was a significant difference observed statistically. The general thought that floated among most dental practitioners (p value = 0.01) and specialists who had 11–15 years of experience was that an exclusive rotary file is the need of the hour.

Conclusion: There is an absolute need for more education programs and workshops in the country to increase the knowledge and awareness of dental practitioners, and also to give hands-on experience regarding rotary instrumentation in primary teeth. In kids, it seems appropriate to use kid-specific rotary files that make it comfortable for children too during the procedure.

Keywords: Awareness, Knowledge, Primary teeth, Pulpectomy, Rotary instrumentation.

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INTRODUCTION

Poor oral hygiene and inadequate dental care among children lead to the development of deep carious lesions, and if it is left untreated, often results in deeper carious lesions with pulpal involvement. To maintain the integrity of arch form in primary dentition, preservation of the primary tooth has to be achieved until the eruption of the permanent successors. Premature exfoliation can be prevented by pulpotomies and pulpectomies, widely used procedures in pediatric dentistry, aiming at total eradication of microbes from the root canals of primary teeth with the help of instrumentation and prevention of the reoccurrence of infection.

Pulpectomy is the treatment of choice to prevent the loss of necrotic primary molars. Elimination of hard and soft bacteria comprising tissues, provides proper space for instruments, and creating a clear path toward the apical third followed by obturation of the root canal includes tissues, provides proper space for instruments, and mechanical apparatus are used while carrying out root canal preparation. Some of the main iatrogenic errors that could occur while using hand instruments include zipping canal transportation, ledging, and apical blockage. Moreover, root canal preparation using hand instruments is time-consuming and quite tiresome. Considering the relevance of this issue, more focus was given on root canal preparations using NiTi. There are numerous studies available in literature stating the advantages of NiTi files over hand instruments. Unfortunately, all of the studies were conducted on permanent teeth. The practice of using rotary instruments in paediatric dentistry is still an emerging concept. To date, no studies have been conducted in Saudi Arabia evaluating the perception of using rotary instruments in primary teeth among dental practitioners. Hence, the primary focus of this study was to mainly estimate the insight and the use of rotary instrumentation in primary teeth among dentists in Saudi Arabia.

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Materials and Methods
A cross-sectional study was conducted among dentists from the Kingdom of Saudi Arabia. A total of 212 dentists who had either completed their bachelor's or masters in dental surgery and currently practicing in Saudi Arabia participated in the study. Dentists who were not practicing dentistry, students pursuing bachelor's in dental surgery, and students doing their internship in various dental colleges were excluded from the study. After going through the literature review, a total of 10 English questions were prepared and emailed to five experts to validate the content making use of the five-point Likert scale. The Aiken index for every question was calculated and its relevance to the study was determined. Only those questions that had a score ≥0.6 were included in the pro forma. The questionnaire was checked for reliability with the help of Cronbach’s α value—any number between 0.78 and 0.86 with a median of 0.82 was taken as reliable. All the participants were asked to choose the best answer that seemed most relevant after which the questionnaires were taken back the very same day.

Results
Of the 212 dental practitioners who participated in the study, only 196 returned the fully completed questionnaire taking the response rate to 92.45%. The participants were predominantly males (51.7%) belonging to the age group of 25–29 years (47.6%), and almost 74% of them were general dentists who had experience between 1 and 5 years (53.3%) as given in Table 1.

Of the study group, only a meager 21.4% of dentists (of whom 13.8% were a part of the Continuing Dental Education program about rotary instrumentation) dealt with root canal preparation of the primary teeth using rotary instruments (Table 2). ProTaper system was used by 27.5% (54) of participants for canal preparation in primary teeth (Fig. 1). Around 46.9% of dentists used other systems for rotary instrumentation, and the majority (88.8%) did not specify the name of the system they had used. Decrease in working time was the greatest advantage felt by 41.8% (88.8%) did not specify the name of the system they had used. A majority of the dentists (80.1%) did not have any idea regarding the availability of minimally invasive files and the role played by them in easing the root canal preparation in the primary teeth. For one or two pediatric cases, almost 13.3% of them primarily used rotary files for doing root canal treatment. Around 55.6% of dentists preferred the availability of exclusive rotary files for root canal preparation on primary teeth (Table 2).

An analysis about the need for a unique rotary file that helps in preparing for a root canal in primary teeth showed that 50% of the general practitioners and 71% of specialists realized its requirement and this was found to be statistically significant (p = 0.012). Around 57% of dentists with no experience, 56% with an experience of 1–5 years, and 100% with 11–15 years of experience considered that it was necessary whereas 52% of dentists with 6–10 years of experience and 100% of dentists having more than 15 years of experience felt no need for an exclusive rotary file for preparation for a root canal in primary teeth and showed statistically significant difference with a p value of 0.01 as shown in Table 3.

Discussion
Rotary endodontics in pediatric dentistry is relatively a new concept. The use of NiTi rotary instruments was one of the most important revolutions in the area of pediatric dentistry. The use of rotary files in permanent teeth has been successfully proven, whereas there is a lack of clinical data to compare the efficiency of rotary techniques with standard manual techniques for instrumentation in primary teeth. Hence, it is very important to understand the advantages and disadvantages regarding the use of rotary files in primary teeth among dental practitioners. As far as our analysis showed, this is the first study where dentists in Saudi Arabia gathered to evaluate their understanding and the predominant use of rotary instrumentation in primary teeth.

Table 1: Demographic characteristics of the study participants

| Parameter         | Frequency | Percentage |
|-------------------|-----------|------------|
| Age               |           |            |
| 20–24             | 60        | 30.6       |
| 25–29             | 93        | 47.6       |
| 30–34             | 20        | 10.2       |
| 35–39             | 13        | 6.8        |
| 40 and above      | 10        | 4.8        |
| Sex               |           |            |
| Male              | 101       | 51.7       |
| Female            | 95        | 48.3       |
| Specialty         |           |            |
| General Dentist   | 145       | 74         |
| Specialist        | 51        | 26         |
| Years of experience |         |            |
| No experience     | 49        | 25         |
| 1–5 years         | 105       | 53.3       |
| 6–10 years        | 29        | 14.8       |
| 11–15 years       | 8         | 4          |
| More than 15 years| 5         | 2.5        |
| Questions                                                                 | Frequency | Percentage |
|--------------------------------------------------------------------------|-----------|------------|
| 1. Do you use rotary instruments for root canal preparation during endodontic treatment in primary teeth? | No        | 154        | 78.6       |
|                                                                            | Yes       | 42         | 21.4       |
| 2. Have you attended any workshop or continuing dental education regarding rotary instruments in primary teeth? | No        | 169        | 86.2       |
|                                                                            | Yes       | 27         | 13.8       |
| 3. Which rotary file system do you use for root canal preparation in primary teeth? | ProTape system | 54        | 27.5       |
|                                                                            | Race      | 4          | 2          |
|                                                                            | K3        | 7          | 3.6        |
|                                                                            | Kedo S files | 9        | 4.6        |
|                                                                            | Prime Pedo files | 27  | 13.8 |
|                                                                            | Others    | 93         | 46.9       |
|                                                                            | Missing   | 3          | 1.5        |
| 3a. If multiple systems or other system used, Mention it.                  | I didn't use it before | 15 | 7.5  |
|                                                                            | I use hand files | 1 | 0.5 |
|                                                                            | Idk       | 1          | 0.5        |
|                                                                            | Manually  | 2          | 1          |
|                                                                            | One curve | 2          | 1          |
|                                                                            | ProTaper but with permanent teeth | 1 | 0.5 |
|                                                                            | Missing   | 174        | 88.8       |
| 4. What is the greatest advantage of using rotary files in primary teeth compared to Hand files? | a. Uniform root canal preparation | 34 | 17.3 |
|                                                                            | b. Removal of pulp tissue is better | 7 | 3.6 |
|                                                                            | c. Decrease in working time | 82 | 41.8 |
|                                                                            | d. Patient acceptance | 2 | 1 |
|                                                                            | e. I don't know | 71 | 36.2 |
| 5. What is the greatest disadvantage of using rotary files in primary teeth compared to Hand files? | a. Minimal root canal preparation | 10 | 5.1 |
|                                                                            | b. Doesn't remove the pulp tissue completely | 7 | 3.6 |
|                                                                            | c. Fracture of instrument | 48 | 24.5 |
|                                                                            | d. Cost | 50 | 25.5 |
|                                                                            | e. I don't know | 81 | 41.3 |
| 6. Ease of access using rotary files for primary tooth is more in?          | a. Maxillary arch | 20 | 10.2 |
|                                                                            | b. Mandibular arch | 60 | 30.6 |
|                                                                            | c. Same in both | 27 | 13.8 |
|                                                                            | d. I don't know | 89 | 45.4 |
| 7. What is the limitation in the use of existing rotary file systems in primary teeth? | a. Length of the file only | 20 | 10.2 |
|                                                                            | b. Taper of the file only | 4 | 2 |
|                                                                            | c. Limited knowledge in using rotary files | 29 | 14.8 |
|                                                                            | d. Both length and taper of the files are more | 32 | 16.3 |
|                                                                            | e. I don't know | 111 | 56.6 |
| 8. Are you aware of minimally invasive files and its use for root canal preparation in primary teeth? | No | 157 | 80.1 |
|                                                                            | Yes       | 39         | 19.9       |
| 9. How often do you use rotary files for root canal procedures in pediatric case? (Out of 10 cases) | a. 1–2 | 26 | 13.3 |
|                                                                            | b. 3–5  | 10         | 5.1        |
|                                                                            | c. 6–10 | 4          | 2          |
|                                                                            | d. All  | 6          | 3.1        |
|                                                                            | e. I don't know | 150 | 76.5 |
| 10. Do you think there is necessity for an exclusive rotary file for root canal preparation in primary teeth? | No | 87 | 44.4 |
|                                                                            | Yes       | 109        | 55.6       |
Knowledge and Practice of Rotary Instrumentation in Primary Teeth among Saudi Arabian Dentists

In our study, we found that only 21.4% of dentists used rotary instruments for root canal preparation in the primary teeth, of which 13.3% of them used rotary files in root canal procedures for one or two pediatric cases. On the contrary, a study done by Govindaraju et al. showed that around half (50%) of the dental practitioners in India predominantly used rotary files for pulpectomy procedures on the primary teeth on at least 3–5 pediatric cases in their regular practice routine.

A large number of specialists (28%) preferred this rotary technique in comparison to practitioners having a bachelor’s degree in Dental Surgery (18%). Around 13.8% of practitioners involved in our study had the experience of attending workshops or CDE on rotary instrumentation of the primary teeth. This finding suggests that there is a need for conducting and organizing such programs in Saudi Arabia to increase their knowledge and to provide more practice-oriented sessions, which in turn can increase the total number of dental practitioners using rotary instruments in primary teeth. The results of our study were similar to a study conducted by Mozayeni et al. where lack of education was considered an important reason for not using NiTi instruments by dental practitioners. Our study results showed that only 27.5% of practitioners made use of ProTaper file system in contrast to the study results shown by Govindaraju et al. where the major dentist population favored the use of ProTaper file system (34%).

Decrease in working time was the greatest advantage felt by 41.8% of dentists who use rotary files in primary teeth. Similar findings were reported in previous studies. Barr et al. In his study showed that the use of NiTi files in primary teeth for rotary instrumentation led to funnel-shaped canals (which in turn resulted in better obturation quality) was similar to the results that 17.3% of dental practitioners favored the use of uniform root canal preparation using NiTi files. But, the expensive costing of rotary instruments was the biggest disadvantage that prevented a majority of the practitioners from choosing it, but a study by Gambarini et al. showed that instrument separation was the biggest advantage of NiTi files. The current rotary instrument system had a design limitation none other than the increased taper and file length, a general concern raised by 16.3% of the study group. Almost 55.6% of dentists preferred using an exclusive rotary file for root canal preparation in the primary teeth as this provided better accessibility and accurate preparation. The results were supported by another study done by Jeevanandan et al. where using pediatric-specific rotary files resulted in better-quality obturation and preparation of the root canal. A study by Kuo...
et al. proclaimed that it would lead to better results when dentists used exclusive rotary files for primary teeth, along with modified length and taper. These findings suggest that exclusive pediatric files, with the said modifications, would help practitioners perform pulpectomies on primary teeth with better precision and speed.

The small sample size and homogeneity of the population can be considered as a limitation of the study. Further studies should be conducted with more sample size directed towards pedodontists and endodontists, analyzing different rotary systems and exclusive pediatric file systems available to come to a definitive conclusion about the efficiency of both.

**Conclusion**

The study focused mainly on assessing the understanding and the use of rotary instrumentation in primary teeth among dentists in Saudi Arabia. Results of our study stated that only a limited number of dental practitioners were using rotary techniques on primary teeth. Knowledge and awareness regarding the same were less among a majority of the dentist population who preferred the use of an exclusive pediatric rotary system for root canal preparation in primary teeth, which would increase the acceptability rates in children. There is a need to conduct more CDE programs and workshops in the country to increase the knowledge of dental practitioners about the practice of rotary instrumentation in primary teeth and also give hands-on experience regarding the same.

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**References**

1. Patil PD, Katge AF, Rusawat DB. Knowledge and attitude of pediatric dentists, general dentists, postgraduates of pediatric dentistry, and dentists of other specialties toward the endodontic treatment of primary teeth. J Orofac Sci 2016;8(2):96–102. DOI: 10.4103/0975-8844.195917
2. George S, Anandaraj S, Issac JS, et al. Rotary endodontics in primary teeth— a review. Saudi Dent J 2016;28(1):12–17. DOI: 10.1016/j.sdent.2015.08.004

**Table 3: Perception about the necessity for an exclusive rotary file for root canal preparation in primary teeth**

| Do you think there is necessity for an exclusive rotary file for root canal preparation in primary teeth? | p-value |
|---|---|
| No | Yes |
| **Age** | | | |
| 20–24 | N | 29 | 31 |
| % within age | 48.30% | 51.70% |
| 25–29 | N | 37 | 56 |
| % within age | 39.80% | 60.20% |
| 30–34 | N | 13 | 7 |
| % within age | 65.00% | 35.00% |
| 35–39 | N | 3 | 10 |
| % within age | 23.10% | 76.90% |
| Above 40 | N | 5 | 5 |
| % within age | 50.00% | 50.00% |
| **Sex** | | | |
| Male | Count | 42 | 53 |
| % within sex | 44.20% | 55.80% |
| Female | N | 45 | 56 |
| % within sex | 44.60% | 55.40% |
| **Specialty** | | | |
| General practitioner | N | 72 | 73 |
| % within specialty | 49.70% | 50.30% |
| Specialist | N | 15 | 36 |
| % within specialty | 29.40% | 70.60% |
| **Experience** | | | |
| No experience | N | 21 | 28 |
| % within experience | 42.90% | 57.10% |
| 1–5 years | N | 46 | 59 |
| % within experience | 43.80% | 56.20% |
| 6–10 years | N | 15 | 14 |
| % within experience | 51.70% | 48.30% |
| 11–15 years | N | 0 | 8 |
| % within experience | 0.00% | 100.00% |
| More than 15 years | N | 5 | 0 |
| % within experience | 100.00% | 0.00% |

*p-Statistical Significance set at 0.05*
3. Ahmed HM. Pulpectomy procedures in primary molar teeth. European J Gen Dent 2014;3(1):3–10. DOI: 10.4103/2278-9626.126201

4. Panchal V, Jeevanandan G, Erolappan SM. Comparison between the effectiveness of rotary and manual instrumentation in primary teeth: a systematic review. Int J Clin Pediatr Dent 2019;12(4):340–346. DOI: 10.5005/jp-journals-10005-1637

5. Peralta-Mamani M, Rios D, Duarte MA, et al. Manual vs. rotary instrumentation in endodontic treatment of permanent teeth: a systematic review and meta-analysis. Am J Dent 2019;32(6):311–324. PMID: 31920058.

6. Babaji P, Mehta V, Manjooran T. Clinical evaluation of rotary system over manual system in deciduous molars: a clinical trial. Int J Pedod Rehabil 2019;4(1):13–16. DOI: 10.4103/ijpr.jpr_27_18

7. Govindaraju L, Jeevanandan G, Subramanian EM. Knowledge and practice of rotary instrumentation in primary teeth among Indian dentists: a questionnaire survey. J Int Oral Health 2017;9(2):45–48. DOI: 10.4103/ijoh.ijoh_4_17

8. Mozayeni MA, Golshah A, Kerdar NN. A survey on NiTi rotary instruments usage by endodontists and general dentist in Tehran. Iran Endod J 2011;6(4):168–175. DOI: 10.1.1.946.7727

9. Gavini G, Santos MD, Caldeira CL, et al. Nickel-titanium instruments in endodontics: a concise review of the state of the art. Braz Oral Res 2018;32(suppl 1):e67. DOI: 10.1590/1807-3107bor-2018.vol32.0067

10. Kuzekanani M. Nickel–titanium rotary instruments: development of the single-file systems. J Int Soc Prev Community Dent 2018;8(5):386–390. DOI: 10.4103/jispcd.JISPCD_225_18

11. Barr ES, Kleier DJ, Barr NV. Use of nickel-titanium rotary files for root canal preparation in primary teeth. Pediatr Dent 2000;21(7):453–454. PMID: 10730297.

12. Gambarini G. Advantages and disadvantages of new torque-controlled endodontic motors and low-torque NiTi rotary instrumentation. Aust Endod J 2001;27(3):99–104. DOI: 10.1111/ j.1747-4477.2001.tb00466.x

13. Jeevanandan G. Kedo-S paediatric rotary files for root canal preparation in primary teeth– case report. J Int Oral Health 2017;11(3):Z903–Z905. DOI: 10.7860/ICDR/2017/25856.9508

14. Kuo CI, Wang YL, Chang HH, et al. Application of Ni-Ti rotary files for pulpectomy in primary molars. Journal of Dental Sciences 2006;1(1):10–15. DOI: 10.30086/JDS.200603.0002