

Rotary files specific for pediatric dentistry – A review

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ABSTRACT

This study aims to review on rotary files specific for pediatric dentistry. Dental caries is the most common chronic disease of childhood which presents significant clinical issues in primary teeth. If dental caries is left untreated at initial stage, it progresses toward pulp which subsequently leads to infection, abscess, and premature tooth loss. There is a continuous evolution in the field of endodontics in pediatric dentistry, resulting in a paradigm shift from using conventional hand files to rotary files for canal preparation in primary teeth. Biomechanical preparation plays an important role on the success of the root canal treatment. On literature search, there are various instrumentation techniques for performing root mechanical preparation in primary teeth. The present article highlights on the use of different rotary file systems for root canal preparation in the primary teeth. The review elaborates on the importance and different types of rotary files used in pediatric dentistry.

KEY WORDS: Pediatric dentistry, Root canal, Rotary, Teeth

INTRODUCTION

The most important concern of pediatric dentistry is the premature loss of deciduous or primary teeth which, in turn, affects the potency of oral tissues and their functions such as swallowing, mastication, and speech, due to space loss. The pulp or the vital part of the tooth is located in the center of the tooth and is made up of odontoblasts and a network of nerves and blood vessels. Odontoblasts are cells that produce dentin and connective tissue. Apart from being the source of dentin, the pulp is mainly responsible for providing nutrients to the surrounding parts. More importantly, it is the source of pain perception in cases of trauma, disease, or pressure to the dentin. When there is any infection or injury to the pulp, it can cause a great deal of pain and discomfort. Therefore, there is an increasing concern in treating primary teeth associated with pulpal involvement through a process called as pulpectomy. It is defined as the complete extirpation of the pulp from the root canals of the primary teeth followed by filling them with an inert resorbable.^[1,2] The most common attributes of an ideal pulpectomy procedure for primary teeth are as follows: Pristine and quick technique, reduced time of treatment, decreased

frequency of appointments, full debridement of the root canals without eliciting any harm to the underlying permanent tooth or tooth bud, and ability of the treated tooth to restore and maintain the function.^[3] There are few factors that influence a successful treatment which are as follows: Morphological variations of the primary teeth, microbial flora of the root canal, host defense mechanism, the efficiency of biomechanical preparation, root canal obturation, and the systemic antibiotic therapy.^[4] One of the most important phases of pulpectomy is root canal preparation that is mainly focused on debridement of the canals.^[5] Main aim of biomechanical preparation is to remove all the soft and hard tissue that contains microbes, bacteria, thereby creating a pathway for the root canal irrigants to reach the apical third of the root canal and also for the obturating paste. The irrigants also help in flushing out debris present in the root canal. Biomechanical preparation is conventionally done with the help of broaches and hand files.^[6] In spite of being the most commonly utilized, manual instrumentation has a lot of limitations associated with its use. Limitations include time consuming, improper cleaning of the canals, ledge formation possibilities, lateral perforations, and fracture of the instrument while cleaning and shaping the canal.^[7,8] The usage of nickel-titanium files (NiTi files) in primary teeth root canals was first demonstrated by Barr *et al.*^[6] The basic reason why they are becoming commonly used in recent times is due to

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their possibility of changing the traditional design and taper. They have the ability to axially rotate on their own without posing any risk or harm to the original anatomy. Moreover, they need not be precurved unlike the manual files used, due to their elastic memory. Henceforth, root canal preparation becomes quicker, precise, and more conservative. Sterile water, saline, or sodium hypochlorite (1% or 2.5%) are the commonly used irrigants. There is a necessity to inspect the file after usage to detect any instrument fracture or disintegrity. Rotary instrumentation is faster in deciduous teeth when compared to the permanent dentition due to the smaller root canal length. Rotary instrumentation not only facilitates obturation but also minimizes the material extrusion. However, NiTi rotary systems are very costly and increased learning period are some of the disadvantages.^[7,9-11]

APPLICATION OF ROTARY INSTRUMENTATION FOR PULPECTOMY IN PRIMARY TEETH

First, a pre-operative radiograph is taken to determine the integrity of the tooth and the density of the carious lesion. Then, based on that, an access cavity was prepared and the coronal pulp tissue was removed. From the pre-operative radiograph, working length was determined. Up till the predetermined working length, the file was inserted into the canal in rotating motion. Further, cleaning and shaping of the canals were done in a sequential manner with larger files. Cleaning of debris and pulp tissue was done with irrigants each time as the file was withdrawn.

TYPES OF ROTARY FILES

In the year 2000, instruments such as profile 0.06 were used at a slow speed of 150–300 rpm. Another study demonstrated how the canals were instrumented with profile 0.04 instruments up to 35 size and then were stepped back with 40-, 45-, and 50-sized files.^[6,7] Profile 0.04 taper 29 series ranging from size 2 to 7 was also utilized in reduction gear handpiece for biomechanical preparation of the root canals of primary teeth.^[12] In the year 2006, Protaper files were used for canal instrumentation. To improve the straight line access and remove the overlying dentin, SX Protaper was utilized about 3 mm beyond the root canal orifice with buccolingual brushing motion. This was followed by inserting S2 Protaper file into the canal in the rotating motion till the working length. In case of encountering any resistance point, no attempt was made to go beyond that due to instrument separation. SX and S2 files reduced the chances of lateral perforation during instrumentation. Another study demonstrated the usage of Protaper files with an X-smart electric motor at

300 rpm in the year 2012. Shaping the primary root canals was done by S1 and S2 Protaper files and F1 and F2 Protaper files were used for finishing the canals in an anticurvature filing method.^[13] One study elicited a modified sequence of Protaper system in a step-down technique for root canal instrumentation. S1 Protaper file was utilized in the coronal third of the root length, S2 Protaper file was used in the middle third, and the F1 Protaper file was used up till the predetermined working length.^[11] A study was carried out using 25 mm long flex master system with 35/0.06, 35/0.04, 30/0.06, and 40/0.02 tapers in a modified crown-down technique for primary root canal instrumentation.^[14] For step-down preparation for root canal shaping and cleaning, rotary FlexMaster system was used.^[15] Pulpectomy was also carried out utilizing hero 642 system in a 50:1 handpiece in a crown-down technique.^[16] K3 rotary NiTi file system was used using three progressively larger tapered files in a crown-down technique along with X-smart motor at 350 rpm and slow torque.^[17,18] Another file system that was used for instrumentation was Mtwo rotary file system. The use of a new generation of NiTi rotary files with the reciprocating system was studied and was found to be effective in cleaning the coronal and the middle one-third of the primary root canals.^[19] Govindaraju *et al.* demonstrated a study comparing Protaper, Mtwo, and hand files for canal instrumentation and reported that the biomechanical preparation time was extensively reduced with the use of rotary files. However, no differences were noted in the obturation quality among the three groups.^[20] Furthermore, in another study comparing Protaper, K3 rotary files, and hand files, it was demonstrated that there was a decrease in the instrumentation time with Protaper files followed by K3 rotary files. There was no statistically significant difference in the quality of obturation between rotary and hand instrumentation.^[21] Recent advancement includes the use of exclusive pediatric rotary file – Kedo-S with modified length, taper, and tip size for performing pulpectomy in primary teeth more conveniently and efficiently. This system includes three sets of files – D1, E1, and U1. The former was utilized for primary molars, while the latter was used for the primary maxillary anterior.^[22]

ADVANTAGES OF ROTARY INSTRUMENTATION

- There is reduced chairside time.
- Rotary instrumentation results in funnel shaping of canals, thereby leading to a three-dimensional fill of the obturation paste.
- It also aids in quick removal of debris and pulp tissue when compared to manual files and reamers.
- There is a better cleansing action when compared to the manual method.
- Increases patient cooperation and satisfaction due to reduced time and quality treatment.^[23]

DISADVANTAGES OF ROTARY INSTRUMENTATION

- Due to the thin dentinal walls, may result in perforation.
- Chances for instrument separation or fracture when instrumented aggressively in a dry field.
- Overextension or enlargement of the apical foramen can result in overfill of obturation paste.
- They are very costly. Integrity of the files decreases after using for about 20 patients.
- Lack of training to learn the technique.

ROTARY INSTRUMENTATION EFFECTS ON THE CHILDREN'S BEHAVIOR

Long chairside time during procedure can elicit difficulty in managing the children. Pulpectomy procedure is considered to be the most stressful treatment for the child, and the complication is further enhanced by the anatomical complications that may not be found in the permanent teeth. Rotary files application may be more appropriate in children with behavior management problems due to their pristine and quicker treatment time. Various studies have also stated that there was reduced chairside time during the treatment and elicited a lot of advantages in treating children who are less cooperative, thereby leading to a positive impact on the child's cooperation.^[24]

CONCLUSION

From this study, it was concluded that rotary files were not only time efficient but also indirectly created a positive impact on the child's behavior. However, anxiety levels of the child due to the rotary instrumentation and the disadvantages it poses have not been evaluated. Hence, more studies have to be conducted to compare and evaluate the child's behavior, anxiety level, and pain perception on using rotary instrumentation as well as its disadvantages.

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