

# Application of rotary endodontics in pediatric dentistry - A review of literature

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## ABSTRACT

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 is 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.

**KEY WORDS:** Primary teeth, pulpectomy, rotary files

## INTRODUCTION

Early loss of primary teeth is a prime concern in the field of pediatric dentistry. Pre-mature loss of primary teeth results in space loss, thus affecting the integrity of the oral tissues and also the functioning such as swallowing, mastication, and speech.<sup>[1]</sup> Hence, pulpectomy should be considered as the choice of treating primary teeth with pulpal involvement.<sup>[2]</sup> Pulpectomy is defined as the complete removal of the pulp from the root canals of the primary teeth and filling them with an inert resorbable material so as to maintain the tooth in dental arch.<sup>[1]</sup> The features of an ideal pulpectomy procedure for primary teeth include: (a) Simple and fast technique, (b) reduced treatment time, (c) decreased number of appointments, (d) complete debridement of the root canals without endangering the underlying permanent tooth bud/tooth, (e) few procedural complications, and (f) ability of the treated tooth to restore and maintain the function.<sup>[3]</sup> The following factors influence the success of a pulpectomy-treated teeth: (a) Morphological variations of the primary teeth, (b) microbial flora of the root canal, (c) host defense, (d) biomechanical preparation, (e) obturation of the root canal, and (f) systemic antibiotic therapy.<sup>[4]</sup>

Root canal preparation is one of the most important phases of pulpectomy in primary teeth which is mainly aimed at debridement of the canals.<sup>[5]</sup> The primary objective of biomechanical preparation in primary teeth is to remove the soft and the hard tissue containing bacteria, to provide a pathway for the irrigants to reach the apical third of the root canal, to provide space for the medicaments and obturating paste, and to retain the integrity of the radicular structure.<sup>[1]</sup> Conventionally, biomechanical preparation was done with endodontic broaches and hand files.<sup>[6]</sup> Despite the widespread use of manual instrumentation for pulpectomy in primary teeth, there are certain potential limitations associated with its use. These include:

- Time-consuming
- Inadequate cleaning of the canals
- Possibility of ledge formation
- Risk of lateral perforations
- Dentine compaction
- Fracture of the instrument.<sup>[7]</sup>

## Introduction of Rotary Instrumentation in Primary Teeth

Nickel-titanium (NiTi) rotary files were first introduced into pediatric dentistry in the year 2000 for effective cleaning and shaping of the primary root canals. The tortuous and irregular canal walls of the primary teeth are effectively cleansed as the flexible

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nature of the NiTi instruments allows the files to closely follow the original root canal path.<sup>[6]</sup>

### Application of Rotary Instrumentation Technique for Pulpectomy in Primary Teeth

Access cavity preparation was done and the coronal pulp tissue was removed



Working length was determined from a pre-operative radiograph



NiTi file was inserted into the canal in rotating motion till the pre-determined working length



Cleaning and shaping of the canals were done with sequentially larger files



Cleaning of the pulp tissue and the dentinal debris was done each time as the file was withdrawn

In the year 2000, profile 0.04 instruments were used in a slow speed of 150–300 rpm.<sup>[6]</sup> In another study, the canals were instrumented with profile 0.04 instruments up to 35 size, and then, the canals were stepped back with 40-, 45-, and 50-sized files.<sup>[7]</sup> Profile 0.04 taper 29 series rotary instruments starting from size 2–7 were used in reduction gear handpiece for instrumenting the root canals of the primary teeth.<sup>[8]</sup>

Protaper files were used for canal instrumentation in the year 2006. SX Protaper file was used about 3 mm beyond the root canal orifice with slight buccolingual brushing motion to improve the straight line access and to remove the overlying dentin. This was followed by inserting S2 Protaper file into the canal in the rotating motion till the working length. If any resistance point was encountered, no attempt was made to go beyond it to avoid the risk of instrument separation. Using only SX and S2 files for canal instrumentation reduced the incidence of lateral perforation.<sup>[3]</sup> Protaper files were used with an X-smart electric motor at 300 rpm in another study done in the year 2012. In this study, S1, S2, F1, and F2 protaper rotary files were used for canal instrumentation. S1 and S2 Protaper files were used for shaping the primary root canals and F1 and F2 Protaper files were used for finishing the canals in an anticurvature filing method.<sup>[9]</sup> Another study

depicted a modified sequence of Protaper system in a crown-down technique for primary root canal instrumentation. S1 Protaper file was used in the coronal third of the root length, S2 Protaper file was used in the middle third, and the F1 Protaper file was used till the working length.<sup>[10]</sup>

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.<sup>[11]</sup> Rotary flex master system was used in a crown-down preparation for primary root canal shaping and cleaning.<sup>[12]</sup>

The primary root canal instrumentation was also carried out using Hero 642 system in a 50:1 handpiece in a crown-down technique.<sup>[13]</sup>

K3 rotary NiTi file system was used for canal instrumentation in primary teeth using 3 progressively larger tapered files in a crown-down technique with X-smart motor at 350 rpm and slow torque.<sup>[14]</sup>

Another file system that was used for instrumentation of primary root canals was MTwo rotary file system. 21 mm long MTwo rotary files of taper 10/0.04, 15/0.05, 20/0.06, and 25/0.06 were used in a crown-down technique till the working length for efficient cleaning and shaping of the primary root canals.<sup>[10]</sup>

A study done in the year 2014 compared the efficiency of three file systems for canal instrumentation: (1) Hand files, (2) rotary light speed LSX instruments, and (3) Protaper.<sup>[15]</sup>

The use of a new generation of NiTi rotary files with the reciprocating system - wave one for canal instrumentation in primary molars - was studied, and it was found to be effective in cleaning the coronal and the middle one-third of the primary root canals.<sup>[16]</sup>

Govindaraju *et al.* conducted a study comparing Protaper, Mtwo, and Hand files for canal instrumentation and reported that the canal instrumentation time was statistically reduced with the use of rotary files. No significant differences were noted in the quality of obturation among the three groups.<sup>[17]</sup> 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.<sup>[18]</sup>

Recent advancement includes the use of exclusive pediatric rotary file - Kedo-S (Reeganz Dental Care Pvt. Ltd., India) with modified length, taper, and tip size for performing pulpectomy in primary teeth more

conveniently and efficiently. This system consists of three sets of files - D1, E1, and U1. The former is for the canal preparation of the primary molars, while the latter was indicated exclusively to prepare the primary maxillary anterior.<sup>[19]</sup>

#### Advantages of Rotary Systems for Canal Instrumentation in Primary Teeth

- Decreases the chairside time
- Results in preparation of funnel-shaped canals which in turn produces uniform fill of the obturation paste
- Quick removal of the tissue and debris
- Better cleaning ability of the canals when compared to the manual technique
- Increases the patient cooperation.<sup>[6,7,20]</sup>

#### Disadvantages of Rotary Systems for Canal Instrumentation in Primary Teeth

- Increased risk for perforation which is attributed due to the anatomy of the primary teeth- thin dentinal walls
- Chances for separation of the instrument within the canal when instrumented aggressively and in dry field
- Overfill of the obturation paste occurs as the apical overextension of the instrument enlarges the apical foramen
- High cost
- Need for training to learn the technique.<sup>[6]</sup>

#### Influence of Rotary Instrumentation for Pulpectomy on the Children's Behavior

Long chairside time during pulpectomy procedure can cause difficulty in managing the children.<sup>[21]</sup> Pulpectomy procedure is considered to be the most stressful and heavier treatment for the child, and the complication is further attributed by the anatomical complexities that are not found in the permanent teeth.<sup>[1]</sup> Application of rotary files may be more appropriate in children with behavior management problems. Various studies have stated that using rotary files for canal instrumentation in primary teeth significantly reduces the chairside time which plays a prime role in treating children who are less cooperative, thus causing a positive impact on the child's cooperation.<sup>[14,20]</sup>

## CONCLUSION

Many studies have concluded that rotary instrumentation for pulpectomy in primary teeth indirectly causes a positive impact on the child's behavior by significantly reducing the treatment time. However, the direct relations of the use of rotary instrumentation on the child's behavior and the anxiety levels have not been assessed. Hence, more studies have to be conducted to compare and evaluate the

child's behavior, anxiety level, and the pain perception on using manual and rotary instrumentation for cleaning and debridement of the primary root canals.

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