

ROTARY ENDODONTICS IN PEDIATRIC DENTISTRY: A REVIEW OF LITERATURE

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ABSTRACT

There is a continuous evolution in the field of pediatric endodontics resulting in a paradigm shift from traditional hand files to rotary files for canal preparation in primary teeth. Canal preparation plays an important role on the success of the pulpectomy procedure. On literature search, there are numerous instrumentation techniques for performing root canal 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

Rotary files, Primary teeth, Canal preparation

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INTRODUCTION

One of the most important concern in the field of pediatric dentistry is early loss of primary molars due to caries and pulpal diseases which leads to space loss and hampers the arch integrity, swallowing and chewing.¹ Pulpectomy is considered as the treatment of choice for primary tooth with severe pulpal involvement which can prevent premature loss of the tooth.² It is done with an objective of complete removal of necrotic pulp tissue from the canals and filling them with an inert resorbable material.¹ The primary objective during cleaning and shaping of root canals is to completely remove soft and hard bacteria containing necrotic tissue and thus providing an effective irrigation path for the apical third of the canal.³ Traditionally root canal preparation of primary tooth can be performed with hand instruments like files and reamers which is time consuming and often leads to several iatrogenic errors like ledging, zipping and canal transportation. These drawbacks have drawn the attention towards canal preparation of primary tooth with Nickel-Titanium (Ni-Ti) rotary file system.⁴ Ni-Ti file system can closely follows the original shape path of root canals because of its design and high flexibility and can create smooth funnel form shape with minimal risk of iatrogenic errors.^{5,6,7}

Requirements of an ideal pulpectomy procedure:⁸

- The pulpectomy procedure should be simple and fast with short appointment time and minimal number of appointments.
- Complete debridement of root canals without causing iatrogenic errors or endangering underlying permanent tooth/tooth bud.
- The procedural complications should be minimal.
- It should restore the tooth function until exfoliated naturally.

Factors influence the success of a pulpectomy procedure:⁹

- Morphological variations of root canals.
- Variations and characteristics of microbial flora present in root canals.
- Debridement and biomechanical preparation of canals.
- Host defense.
- Quality of canal filling with an inert resorbable material.
- Systemic antibiotic therapy.

Introduction of Ni-Ti rotary instrumentation technique in primary tooth: Mechanical preparation of primary teeth root canals using Ni-Ti rotary file system was first done by Barr et.al. in the year 2000.¹⁰ They concluded that this instrumentation technique was cost effective, required less appointments and could produce consistently uniform and predictable canal fillings.¹⁰ It could also produce effective cleaning and debridement of tortuous root canals of primary teeth as Ni-Ti rotary files are highly flexible and can closely follow the original canal path. In 2004 Silva et.al. conducted a study on extracted primary molars where they compared the instrumentation time between manual and rotary technique and concluded that rotary instrumentation was faster than hand preparation.¹¹

Application of rotary instrumentation technique in pulpectomy procedure of primary teeth:

In the year 2000 Ni-Ti Profile 0.04 instruments were used by Silva et.al. at a speed of 150-300 rpm.¹⁰ The file is inserted into the canal while rotating and is taken to the working length. It cleanses the pulp tissue and dentinal debris when withdrawn. In 2006 Shashikiran et.al. conducted a study where they compared between Ni-Ti rotary Profile and stainless steel hand file and concluded that Profile 0.04 taper 29 series rotary instruments starting from size 2-7 used in reduction gear handpiece required less time for canal preparation in primary teeth than conventional hand file.¹²

In 2006 protaper files were first used for canal preparation in primary teeth. In this procedure SX file was first inserted into the canal with slight buccolingual brushing motion to about 3mm beyond the root canal orifice. It was used to remove overlying dentin and to create straight line access. After SX, S2 was inserted into the canal in rotating motion and was taken to the working length. S2 file was helpful in removal of remaining pulp stump which is uncommon with K files.⁸

In 2012 another study was done where S1, S2, F1 and F2 Protaper files were used at 300 rpm for preparation of primary tooth root canals. S1 and S2 files were used for canal shaping whereas F1 and F2 files were used in an anticurvature filling method for canal finishing.¹³

In 2006 Elmsallati et.al. showed that K3 rotary file system produces minimal wearing of root canal walls which could be beneficial for canal preparation of primary molars.¹⁴ K3 rotary file system was used in root canal preparation of primary teeth in 2014 by Ochoa-Romero et.al. where they used 3 progressively larger tapered files at a speed of 350 rpm in crown-down technique.¹⁵

HERO 642 was another system used for root canal preparation of primary molars using 50:1 reducing handpiece where 21 mm instruments with 2% and 4% taper were used in a crown-down

method.¹⁶ The efficacy of rotary Profile, Protaper, HERO shaper and K file in root canal preparation of primary molars were compared and it was found that rotary instrumentation produces more conical preparation with predictable canal filling than manual preparation.¹⁷ It was also concluded that the canal preparation time using rotary instruments is shorter than manual one.¹⁸

Protaper next has been recently introduced which consist of five file i.e. from X1-X5 and it is made up of M-wire Ni-Ti technology. This file system is formed by thermomechanical processing and has increased flexibility and cyclic fatigue resistance. Chances of instrument breakage are less when used in tortuous and thin canals.^{19,20}

Wave-one is another Ni-Ti file system which uses M-wire technology with increased flexibility and cyclic fatigue resistance. It is a single file system which utilizes only one Wave-one shaping file to prepare the canal to an adequate size and taper.²¹ Katge et al. in their study on primary molar pulpectomy concluded that Wave-one and Protaper technique show better cleaning efficiency than manual instrumentation particularly in middle and coronal thirds of root canals.²²

Another Ni-Ti rotary system is M-two endodontic instrument which has a specific design and increased flexibility and thus can maintain original canal curvature. It can be effectively and safely used in curved canals of permanent teeth.²³

Azar et al. compared the cleaning efficacy of M-two and Protaper rotary file system with manual K file in primary molars and concluded that all three file system can produce equally acceptable canal preparation in primary molars.²⁴

Advantages of rotary instrumentation over manual instrumentation in root canal preparation of primary teeth:^{10,11,17}

- Decreased appointment time
- It produces more consistent and funnel shaped canal preparation with predictable canal fillings.
- Chances of iatrogenic errors like ledging, perforation and canal transportation are less.
- Effective debridement with quick removal of necrotic pulp tissue and dentinal debris.
- Increases patient cooperation.

Disadvantages of rotary instrumentation over manual instrumentation in root canal preparation of primary teeth:¹⁰

- Root tip resorption is often undetectable hence apical overextension of instrument leads to overfilling of canal.
- Aggressive cutting may leads to canal wall perforation in ribbon shaped canals.

- High cost of instruments.
- Need skills and training.

CONCLUSION

Although rotary instrumentation is not cost effective and requires extensive learning and training, it has certain advantages over manual instrumentation in root canal preparation of primary teeth. Some authors also believe that it reduces the child's anxiety level as less appointment time is required but more studies are still needed to emphasize its advantages in child behavior control.

Conflict of interest: None

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