

Rotary File Systems Designed Exclusively for Pediatric Patients: A Literature Review

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ABSTRACT

Pulpal treatment in deciduous teeth is done to maintain the tooth in position for proper function including mastication, phonation and preserving the arch length until the permanent teeth erupt. Pulpectomy is a conservative treatment approach in which pulp chamber and canals are accessed for cleaning and debridement followed by filling with a suitable material. Root canals in primary teeth are different from permanent teeth in being short, slender and more divergent with multiple accessory canals and continuously shifting apical foramen due to resorption. Therefore, the technique is sensitive in primary teeth. Conventional hand files were used initially then rotary system was introduced. NiTi rotary file system provide some of the advantages like short instrumentation time, cost-effective and consistent obturations along with improving patient's cooperation. But there were various limitations of using adult rotary files in children because of larger file length and taper which causes lateral perforations and over-instrumentation. Hence, NiTi rotary files were designed for children. Kedo-S file system was the first file system to be introduced. After that, many systems have evolved specifically for children. The present literature review will discuss various rotary file systems available for children.

Keywords: Pediatric endodontics, Pediatric NiTi rotary files, Pulpectomy.

INTRODUCTION

The maintenance of deciduous teeth is of great importance till the process of physiological exfoliation as they help in mastication, maintain arch integrity, speech, esthetics, guidance of permanent successors and prevent the child from developing deleterious habits which may result in malocclusion.

Dental caries is considered to be the most common disease of irreversible nature. Pulpal involvement of carious teeth can be treated conservatively by pulpectomy and the teeth remain symptom-free until exfoliation. However, pulpectomy in

children is a very tedious task because of small and thin roots with continuing apical resorption. Moreover, children are difficult to manage in the clinic while performing the endodontic treatment.^[1]

Hand instrumentation is the conventional method of biomechanical preparation, but can result in perforation and ledge formation, also the procedure requires long time.^[2] However, duration of treatment in children should be kept small so that patient compliance can be achieved positively.^[3]

Barr *et al*, described the use of Profile 0.04 taper rotary instruments for children for the very first time in 2000.^[4] After that

pulpectomy using NiTi rotary files came into a trend. However, using adult NiTi files in children can be problematic due to relatively thin walls with continuously shifting apical foramen which can lead to over instrumentation and lateral perforation because of inherited greater taper in them. In addition, children have limited mouth opening therefore, it is difficult to use adult rotary files in them due to relatively longer length of these files.^[5]

To overcome these disadvantages, Kedo-S file system was introduced by Ganesh Jeevardhan in 2016, which brought a revolution in paediatric endodontics. After that various other rotary file system were introduced like Pro AF Baby Gold™, Prime Pedo™, DXL-Pro Pedo™, Neolix™ (France), Denco Kids files and Sani Kid rotary files.^[6]

In the present article, we have discussed the feature of various rotary files exclusively designed for pediatric endodontic use.

DISCUSSION

Rotary file systems specially designed for children

1. Kedo-S Rotary file system

It is the first file system to be designed for primary root canal preparation, introduced by Ganesh Jeevardhan (Reeganz Dental India) in 2016.

Kedo-S files are available in various generations due to manufacturing modifications.

- **Kedo-S:** First-Generation

This system has three Ni-Ti rotary files with overall length of 16 mm whereas working length is 12 mm. The files available are D1, E1, U1 and have a variable taper. The tip diameter of D1 file is 0.25 mm and is used narrow canals (mesial canals in mandibular molars and disto-buccal canal in maxillary molars). E1 file is available with 0.30 mm tip diameter which is designed for wide canals (distal canal of primary mandibular molar and palatal canal of maxillary molar).

U1 is used in anterior teeth because of its larger tip diameter i.e. 0.40 mm. The taper of the instruments is designed according to the diameter of primary teeth with narrow and wide root canals. This system is used in a constant-torque with speed of 150-300 rpm. Studies have shown significant reduction in post-operative pain with Kedo-S when compared to K-file and H-file at different time intervals.^[7]

- **Kedo-SG:** Second-Generation

These files are heat-treated NiTi rotary files using M-Wire technology. These files are time efficient and provide improved quality of obturation.^[8]

- **Kedo-SG Blue:** Third-Generation

These files are made by heat treatment and have controlled memory which provide super flexibility and resistance to cyclic fatigue up to 75% due to presence of titanium oxide. These files should be operated at a speed of 250 - 300 RPM and 2.2 - 2.4 Ncm torque. Priyadarshini *et al* reported reduced instrumentation time and better quality of obturation in lower primary molars using Kedo-SG blue files.^[9] A study by Naidu *et al* showed an ideal obturation using Kedo-SG blue when compared with Pro AF baby gold and Pedo Flex rotary file systems in CBCT evaluation.^[10]

- **Kedo-S Square:** Fourth generation

This system consists of only two files P1 file (for molars) and A1 file (for anterior) as compared to its previous generations which have three files. They have variable cross section; at apical 5mm; three-point contact to root canal with triangular cross-section, whereas coronal 7 mm shows teardrop cross section having two-point contact. Taper of A1 file is 6 to 8%, at first 5 mm of the file taper is 6% followed by increase in taper by 7 and 8%. Therefore, overpreparation is reduced and permits easy flow, also

preventing extrusion of the obturating material.^[11] These files have a low fracture rate.^[12] Rasha H Mohamed found more conservative preparation, superior taper ability and lowest instrumentation time using Kedo-S Square files compared to hand K- and H-files on CBCT evaluation.^[13]

- **Kedo-S Plus:** Fifth generation

This is the newly introduced file system by Kedo S. It has a uniform cross section with dual core material, which is heat treated along with titanium oxide coating at apical and middle region. This file system offers the advantage of preparing the apical region without lateral perforation. One file can be used in canal preparation of up to 14 molars.

2. Prime Pedo Rotary file system

Prime Pedo file system (Sky International Enterprises, India) includes Starter file (8% taper, 16 mm), P1 file (#15, 6% taper, 18 mm), P2 file (#25, 6% taper, 18 mm) and Endosonic file (2% taper, 18 mm). Orifice enlargement is done by starter file, P1 file is for narrow canals whereas P2 file is to be used in the wide canals. Apical preparation is done by endosonic file. These files are gold treated, have triangular cross section and controlled memory facilitating better canal centricity. This file system is used at 300 rpm and 2.4 N/cm torque. M-Wire technology is incorporated in them which increase their durability. Katge F reported improved cleaning and better obturation.^[14]

3. DXL-Pro Pedo Rotary file system

DXL-Pro Pedo (Kraft marketing, India) rotary file system is available in pack of three files (#30, #20 and #25) that are used sequentially. #30 with 8% taper is used as orifice enlarger, 6% taper file for apical preparation. These files show convex triangular cross section. These files have controlled memory and non-cutting guiding tip.

4. Pro-AF Baby Gold Files Rotary file system

Pro AF Baby Gold file (Kids-e- dental Pvt. Ltd.in India) is a five-file system utilizing NiTi CM wire technology having constant taper of 4% or 6%. B1 file (#20–04%), B2 file (#25–04%), B3 file (#25–06%), B4 file (#30–04%), and B5 file (#40–04%). B1 and B2 files are used for preparing the narrow canals while the wide canals (distal/palatal) are prepared by B3 and B4.^[9] Specially designed with short length of 17 mm offers more safety and comfort. Advanced NiTi heat treated M wire provides better canal centricity. These files have high flexibility with minimal chances of separation. These files can also be used in adult patients with restricted mouth opening and third molar root canal preparation.^[15] On CBCT evaluation canal centricity was found to be significantly better in apical region with Pro AF Baby Gold than Kedo-S.^[16]

5. Baby Blue Rotary file system

Baby blue rotary file system (A to Z Kids dental, India) consists of foster file (variable analogues taper) which creates a gliding path in the apical part and widens the coronal orifice, B1(28/.05) file is used for instrumentation of narrow and medium wide canals and B2(38/.05) file is used for instrumentation of wide canals.

6. Pedo flex files

Pedo flex system (Orikam Health care, India) is a three-file system [#20 (yellow), #25 (red), and #30 (blue)] recommended for use at 350 RPM and 1.5 Ncm torque. Files are presented with a length of 16 mm with 4% taper and are super flexible. Cross-section is triangular having sharp cutting edges and non-cutting tip, thereby preventing apical transportation.^[10]

7. Endogal kids' rotary system

Endogal Kids Rotary system (Galician Endodontics Company, Lugo, Spain)

consists of EK1 file (0.25 tip diameter, taper 4%) for narrow canals; EK2 file (0.25 tip dia, taper 6%) for medium canal; EK3 file (0.30 tip dia, taper 4%) for wide canals; EK4 (0.40 tip dia, taper 4%) for very wide canal of anterior teeth. Both rotary and reciprocating motion can be used with this system; however, reciprocating movement should be in children, as it shortens the working time. These files are made up of heat treated NiTi alloy having triangular cross section and has 17 mm length except EK4 file which have 19mm length. Studies have shown similar results using Endogal and Reciproc Blue NiTi endodontic reciprocating systems in canal preparation, but in coronal third, more conservative preparation was seen by Reciproc Blue NiTi endodontic reciprocating system.^[17]

8. Reciproc Blue NiTi Rotary file system

Reciproc Blue NiTi files ((VDW, Baillagues, Switzerland) function in a reciprocating motion and are made by using CM-Blue Wire NiTi alloy with heat treatment. These files have a length of 17 mm with apical diameter of 300µm in double-S cross-section. The physical properties of NiTi files get improved by heat treatment.^[17]

9. Denco dental Kids files

Denco kedo files (Shenzhen Denco medical Ltd., China) are heat activated blue niti files consists of four files #25 (.04 mm tip dia), #25 (.06 mm tip dia), #30 (.04 mm tip dia), #40 (.04 mm tip dia). These files available in 17mm and 19mm length and are used at a speed of 300 RPM with torque of 2 Ncm.

10. Sani Kid rotary files

Sani kid system (Chengdu Sani medical equipment Co. Ltd., China) consists of three files – blue, red, yellow. They have short thread design facilitating chip evacuation. These files are available in 17mm and 19mm length with taper of 4%

and 6% and are used at 150- 300 rpm and 2.0-2.5 N.cm torque.

11. AF Baby Rotary files

AF Baby Rotary (Fanta dental materials, India) NiTi files are based on AF- H wire technology with triangular cross section design. These files have non-cutting tip which prevent ledge formation. These have better cyclic fatigue resistance and preserve more dentin. These files are available in 4% and 6% taper and used at 350 rpm and 2 Ncm torque.

CONCLUSION

Pediatric rotary systems facilitate efficient instrumentation, improved obturation quality and shorter duration of instrumentation because of increased taper, controlled memory and shorter length. Thus, these files can be recommended in routine pediatric practice in primary teeth. However proper training of operator is mandatory to achieve desirable results. The use of the paediatric rotary files is not limited to primary teeth but can be used in adult patients with limited mouth opening and third molar root canal treatment.

Declaration by Authors

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