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In Vitro Comparison of Apical Debris Extrusion during Root Canal Preparation in Primary Molars Using Two Rotary Systems

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ABSTRACT

Background and Objective: Extrusion of debris from the apex of the tooth is considered as the first cause of pain after root canal treatment, and the amount of extruded debris is related to the technique and degree of canal cleaning and shaping. The aim of the present study was to compare apical debris extrusion during root canal preparation in primary molars using conventional and reciprocal rotary systems.

Methods: This in vitro study was conducted on 32 deciduous mandibular second molars (16 in the conventional rotary file group and 16 in the reciprocal file group). The distal roots of the teeth in two groups were prepared to the working length. The extruded debris was collected in 15 ml Falcon tubes. Then, due to the presence of irrigating solution extruded from the apex, the tubes were placed in an incubator for 5 days. Then, the tubes were placed on a scale with an accuracy of 0.0001 g and the weight of the tubes was measured again. The amount of extruded debris for each tube was obtained based on the difference between the two numbers obtained from the weighing. Finally, the data were analyzed.

Findings: The mean weight of debris in the conventional and reciprocal groups was 0.0115±0.0201 g and 0.0122±0.0051 g, respectively. The mean rank of the conventional and reciprocal groups was 11.69 and 21.31, respectively. The rate of apical debris extrusion was significantly higher in the reciprocal group (p=0.003).

Conclusion: According to the results of the present study, the engine-driven reciprocal cleaning system extrudes more apical debris compared to the conventional cleaning system.

Keywords: *Pediatric Dentistry, Endodontics, Root Canal Treatment, Primary Teeth*.

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Introduction

Primary teeth are important for aesthetics, chewing, and the normal development of occlusion (1, 2). They act as guides for the correct eruption path for permanent teeth, and if lost early, there is a risk of malocclusion, loss of space, and ectopic eruption in the permanent dentition (3, 4). In addition, premature loss of primary teeth may cause speech disorders in the child (5, 6). Dental caries is one of the most common diseases in children. Caries in primary teeth progresses rapidly and in many cases the pulp of the primary tooth is involved. For this reason, pulp therapy is one of the most common and widely used treatments in pediatric dentistry and is performed in one of three general ways: pulp capping, pulpotomy, and pulpectomy (7, 8).

Pulpectomy involves the physical removal of infected and inflamed coronal and radicular pulps, using antiseptic solutions and canal debridement devices. Debridement can be performed with K-files or rotary instruments. Both effective canal debridement and proper irrigation are important for the success of pulpectomy (7, 9, 10). Because of their ease of use and reduced treatment time, many dentists now use rotary instruments for pulpectomy (11). Reducing treatment time is particularly important in the management of uncooperative children in pediatric dentistry (12).

In engine-driven filing systems, there are several types of files, such as conventional rotary files and reciprocating files. Reciprocating files are made of M-Wire NiTi alloy, which is more flexible and resistant to cyclic fatigue and torsional fatigue compared to traditional NiTi alloys (13). Unlike conventional files, reciprocating engine-driven files are used as a single file, and the direction of the flutes in these files is designed in such a way that a 150-to-170-degree counterclockwise rotation cuts and engages the root canal dentin and a 30-to-50-degree clockwise rotation separates it from the dentin. This reduces stress on the file and cyclic and torsional fatigue. Reciprocal files have a longer lifespan compared to conventional files, but are similar to conventional files in cleaning and shaping ability. Therefore, the number of consumables and treatment time are reduced, which is important in pediatric dentistry (14-16).

Endodontic postoperative flare up is one of the most common problems after root canal treatment and is also seen in primary dentition (17-19). Debris extrusion from the apex of the tooth is considered the first cause of pain after root canal treatment (20, 21), and the amount of extruded debris is related to the technique and extent of canal cleaning and shaping. Several studies have reported that preparation with rotary Ni-Ti files results in less apical debris extrusion compared to manual files (22). The amount of debris produced also varies between different rotary systems (23).

Given the novelty of the reciprocal filing system and its application in root canal treatment of primary teeth and the insufficiency of studies on the use of this system in the primary dentition, the aim of the present study was to measure and compare the amount of apical debris extrusion in the conventional and reciprocal rotary systems in primary molars.

Methods

This in vitro study was conducted in 2023 after approval by the Ethics Committee of Qom University of Medical Sciences with code IR.MUQ.REC.1402.229. In this study, the sample size in each group was 16 second deciduous molars (24-26) according to previous studies. Inclusion criteria included intact distal roots, absence of root fractures, root decay, and internal or external root resorption. Exclusion criteria included calcification and complex and unusual root anatomy. All studied teeth were extracted for orthodontic reasons or due to over-retain as diagnosed by an orthodontist or pediatric dentist.

Extracted second primary molars were debridement with sterile gauze, placed in a 25.5% sodium hypochlorite solution (Chloraxid 5.25%, CERKAMED medical company, Poland) diluted with water in an equal 1:1 ratio, and after 24 hours, they were transferred to a physiological saline solution (Sodium Chloride 0.9%, Dp1l Irrigation P-Bottle) and stored until the experiments were performed (27).

To confirm the inclusion and exclusion criteria, the teeth were photographed using a digital radiography device (Nanopix 2, Eighteeth, Jiangsu, China) at the beginning of the intervention. Then, an access cavity was created in the crown of the confirmed teeth using high and low speed rotary instruments and coronal caries were removed. To determine the working length, a K File No. 10 (Mani, Inc, Tochigi, Japan) was passed from the apex of the tooth until the tip of the file was visible to the eye, and in the next step, the file was returned to the point where the tip of the file disappeared for the first point. Then, the rubber stop of the file was adjusted on one of the tooth surfaces and the file was removed. 0.5 mm was subtracted from the obtained length and the obtained number was recorded as the working length along with the coronal reference point (such as the mesiobuccal cusp) (27).

To measure the amount of debris extruded from the apex of deciduous teeth during distal canal preparation, a scale with an accuracy of 0.0001 g (Nano Pajouhan Raga, Iran) and Falcon®-type tubes were used. The lids of the Falcon tubes were removed before mounting the teeth, and the tubes were placed on the scale. After the display number stabilized, the initial weight of the empty Falcon tubes was recorded (Figure 1). Then, the lids of the Falcon 15 tubes were pierced at two points with a metal heat carrier, and the teeth were completely inserted into the two holes from the mesial and distal roots. The remaining cavities and pores were sealed around them with green impression compound (Hoffmann Dental Manufaktur GmbH) (Figure 2). If some molten plastic dripped into the container when piercing the lids of the tubes, the tube was removed and replaced with a new tube (28).

In this study, the distal canal of a mandibular second primary molar was used to standardize the samples. In the reciprocal group, the distal roots of the teeth were prepared to working length using a WaveOne Gold file (Dentsply Maillefer, Ballaigues, Switzerland) and a Woodpecker Endosmart plus rotary device (Woodpecker, Guilin, China) with torque settings of 2 N/cm^2, speed of 300 rpm, and rotation of 30 degrees clockwise and 150 degrees counterclockwise. If the reciprocal rotary file did not reach working length, the file was removed and the flutes were cleaned, and after irrigating the root canal and performing pitting with a K File No. 10, the reciprocal file was reinserted and this process continued until working length was reached. 5 cc of sodium hypochlorite with a concentration of 25.5% (Chloraxisd 5.25%, Cerkamed medical company, Poland) was used to irrigate the root canal with a double-side-vented closed-end 30g needle (Tribest, Jiangsu, China) (29).

Figure 1. Weighing uncapped tubes on a scale with an accuracy of 0.0001 g

Figure 2. Numbering and mounting of teeth

In the conventional rotary group, the distal roots of the teeth were prepared to working length using M3 immature files (United Dental, Shanghai, China) (left to right) S_x, S_1, S_2, F_1, F_2, F_3 and a rotary motor device with a torque setting of 2 N/cm^2 and a speed of 300 rpm. Due to the size of the distal canal, preparation was first performed with a file size 20 (yellow) and then a file size 25 (red). If the rotary file did not reach working length, the rotary file was inserted again by performing a patency with a K File No. 10 and this process was continued until working length was reached. 5 cc of sodium hypochlorite with a concentration of 25.5% was used to irrigate the root canal with a double-side-vented closed-end 30g needle (28).

Finally, after the preparation was completed, the Falcon tube caps were mounted with the tooth and the green tube compound was removed, and the tubes were placed in an incubator (Pars Azma Co., Iran) at 70°C for 5 days to dry completely (30). After complete drying, the tubes were reweighed on a scale and the numbers obtained were recorded. The difference in the weight of the tubes before and after root preparation indicates the amount of debris extruded from the tooth apex (31, 32). Data were compared using SPSS version 26 and Mann Whitney test, and $p<0.05$ was considered significant.

Results

The mean amount of debris produced in the reciprocal group was 0.0122±0.0051 g and in the rotary group was 0.0115±0.0201 g (p=0.0012), and this amount was higher in the reciprocal file group (p=0.0050). Comparison of the amount of debris extruded during canal cleaning in the reciprocal and normal rotary file groups using the Mann Whitney test showed that there was a statistically significant difference between the two groups and the amount of debris removed in the reciprocal file group was significantly higher (p=0.003) (Table 1).

Table 1. Comparison of the amount of debris removed during canal cleaning in the reciprocal and normal rotary file groups using the Mann Whitney test

Group	Number	Average rank	Total ranks
Reciprocal	16	21.31	341.00
Rotary	16	11.69	187.00
Total	32		
p.value		0.003*	

*The difference is statistically significant (p<0.05).

Discussion

In the present study, the amount of debris extruded from the distal canal apex of the deciduous second molars in the reciprocal file group was significantly higher than in the conventional rotary file group. The S-shaped cross-section and cutting edges of the reciprocal files and the reciprocating motion of the rotary device can justify the fact that more debris is removed when using this type of file. A study by Eshagh Saberi et al. in permanent teeth also showed that the amount of debris extruded using a reciprocal file was significantly higher than a conventional rotary file (27). Therefore, it can be expected that if a reciprocal file is used in the clinic, more pain and inflammation will occur after the treatment compared to rotary file. This is especially important in gaining the cooperation of young children, and if there is less pain, the child's cooperation will improve in subsequent visits.

Various methods such as micro-CT imaging, q-PCR, bacterial colony evaluation, debris collection in the tube, neuropeptide release, etc. have been used to investigate and determine the amount of apical debris extrusion during canal preparation. Due to the ease of implementation and the ability to measure small amounts of debris in the direct debris collection method inside the tube, this method was used in the present study. However, the lack of similarity of periapical tissues and the investigation of antigenic properties of the extracted debris are limitations of this method (33).

The results of a study by Mohammadi et al. showed that debris extrusion after preparation with Reciproc instrument was significantly higher than other canal preparation methods (34). The results of their study are consistent with the present study regarding greater apical debris extrusion in the reciprocal file group. The differences in the methods of the two studies include the use of a scale with an accuracy of 0.0001 g and the selection of a more accurate and uniform sample in the present study, and the use of CBCT and a scale with an accuracy of 0.01 g in their study. The similarity in the methods of the two studies was the use of Eppendorf tubes and an incubator to dry the removed debris, and it seems that the method of measuring the weight of the removed debris is reliable.

A study by Vivekanandhan et al. showed that the WaveOne filing system (which is a reciprocal type) had more apical debris extrusion than the ProTaper and Revo-S systems (30). The results of their study are consistent with the present study, and it seems that the reason for the similarity of the findings of the two studies is the use of a similar reciprocal file and a similar method of measuring the debris extruded during preparation.

In their study, Predin Djuric et al. showed that the WaveOne Gold reciprocal system, which is a type of counter-clockwise reciprocal, extruded more apical debris during preparation. Their study was conducted using permanent molars, which have longer roots compared to primary teeth. However, their results are consistent with the current study in that more debris was extruded in the reciprocal file. The similarity in the findings of the two studies can be attributed to the same type of reciprocal file and the preservation of the main canal path (glide path) (35). Uzun et al. examined and compared the amount of apical debris extruded during cleaning using rotary reciprocal and conventional systems in mandibular premolar teeth. Apical debris was extruded in both groups, but in this study, unlike the previous study and our study, the reciprocal files extruded less apical debris. The reason for the difference in the findings of this study could be the use of distilled water instead of sodium hypochlorite and the larger diameter of the root canal of the teeth (36).

Koçak et al. compared the apical debris extruded after preparation with manual files, reciprocal files with a single file system, and two types of rotary systems. In their study, unlike the present study and other studies mentioned, no difference was observed between the different files in the amount of debris extruded during canal preparation, and their findings were inconsistent with the findings of the present study. The reasons for this can be the choice of a different reciprocal system, not using sodium hypochlorite as irrigant, and the

longer length of permanent teeth compared to primary teeth. However, the results of their study showed that apical debris was extruded during preparation in all 4 file groups, which is similar to the findings of the present study (37). A study by Gungor et al. in primary teeth showed that although debris is extruded during root preparation with both rotary and reciprocal files, there is no significant difference in the amount of debris in the two systems. The results of their study are inconsistent with the present study. The reasons for the difference in findings can be attributed to the type of primary tooth and root, and the type of reciprocal files used; in their study, the mesiobuccal root of maxillary primary molars was prepared using a VDW reciprocal file. Furthermore, two types of canal irrigation systems were used in their study, and more debris was extruded in laser-activated irrigation (38). As mentioned, the type of reciprocal file used, the type of tooth and root, and even the irrigation materials are effective in the amount of apical debris extrusion. Since sodium hypochlorite is the most commonly used irrigant during canal preparation, it was used in the present study.

The strengths of the present study include the accuracy of 0.0001 g of weighed debris and the study of deciduous teeth (in which the use of rotary files has been studied less than permanent teeth). The limitations of the present study include the lack of use and comparison of manual files, the relatively small sample size, and the lack of examination of possible complex anatomies with micro-CT.

The results of this study showed that the amount of apical debris extruded in the distal root of the deciduous mandibular second molars using the reciprocal file system was greater than that using the conventional file system.

It is suggested that other studies with a larger sample size, micro-CT examination, and examination of more types of reciprocal files in different deciduous teeth and comparison with manual files be conducted to achieve a more accurate comparison.

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References

1.Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. Bull World Health Organ. 2005;83(9):661-9.
2.Mehdipour A, Abbasi R, Keykha E, Nattaj MH, Aghaali M, Saleh A. The Association between Dental Caries, Periodontal Status, and Sleep Patterns in Children. Int J Clin Pediatr Dent. 2024;17(8):925-32.
3.Makiguchi T, Imai H, Arakawa A, Tashiro A, Yonezu T, Shintani S. Development of Jaw and Deciduous Teeth in Japanese Children -Comparing Size of Crown and Alveolar Area between Today and 40 Years Ago. Bull Tokyo Dent Coll. 2018;59(3):171-81.
4.Mehdipour A, Masoumi M, Shajari P, Aghaali M, Mousavi H, Saleh A, et al. Oral health-related quality of life and dental caries in rheumatoid arthritis patients: a cross-sectional observational study. J Med Life. 2022;15(6):854-9.
5.Nadelman P, Bedran N, Magno MB, Masterson D, de Castro ACR, Maia LC. Premature loss of primary anterior teeth and its consequences to primary dental arch and speech pattern: A systematic review and meta-analysis. Int J Paediatr Dent. 2020;30(6):687-712.
6.Mehdipour A, Aghaali M, Janatifar Z, Saleh A. Prevalence of Oral Parafunctional Habits in Children and Related Factors: An Observational Cross-sectional Study. Int J Clin Pediatr Dent. 2023;16(2):308-11.
7.Tirupathi SP, Krishna N, Rajasekhar S, Nuvvula S. Clinical Efficacy of Single-visit Pulpectomy over Multiple-visit Pulpectomy in Primary Teeth: A Systematic Review. Int J Clin Pediatr Dent. 2019;12(5):453-9.
8.Mehdipour A, Chaboki P, Rasouli Asl F, Aghaali M, Sharifinejad N, Shams S. Comparing the prevalence of Helicobacter pylori and virulence factors cagA, vacA, and dupA in supra-gingival dental plaques of children with and without dental caries: a case-control study. BMC Oral Health. 2022;22(1):170.
9.Hsieh YD, Gau CH, Kung Wu SF, Shen EC, Hsu PW, Fu E. Dynamic recording of irrigating fluid distribution in root canals using thermal image analysis. Int Endod J. 2007;40(1):11-7.
10.Kahvand M, Vahedian M, Hadadzadeh M, Saleh A, Mehdipour A. Comparison of primary molar crown dimensions with two brands of stainless steel crowns in a sample of Iranian children. J Dent Med. 2023;36:130-9.
11.Azim AA, Wang HH, Tarrosh M, Azim KA, Piasecki L. Comparison between Single-file Rotary Systems: Part 1-Efficiency, Effectiveness, and Adverse Effects in Endodontic Retreatment. J Endod. 2018;44(11):1720-4.
12.Ochoa-Romero T, Mendez-Gonzalez V, Flores-Reyes H, Pozos-Guillen AJ. Comparison between rotary and manual techniques on duration of instrumentation and obturation times in primary teeth. J Clin Pediatr Dent. 2011;35(4):359-63.
13.Kim HC, Kwak SW, Cheung GS, Ko DH, Chung SM, Lee W. Cyclic fatigue and torsional resistance of two new nickel-titanium instruments used in reciprocation motion: Reciproc versus WaveOne. J Endod. 2012;38(4):541-4.
14.De-Deus G, Neves A, Silva EJ, Mendonça TA, Lourenço C, Calixto C, et al. Apically extruded dentin debris by reciprocating single-file and multi-file rotary system. Clin Oral Investig. 2015;19(2):357-61.
15.Bürklein S, Schäfer E. Apically extruded debris with reciprocating single-file and full-sequence rotary instrumentation systems. J Endod. 2012;38(6):850-2.
16.Alsilani R, Jadu F, Bogari DF, Jan AM, Alhazzazi TY. Single file reciprocating systems: A systematic review and meta-analysis of the literature: Comparison of reciproc and WaveOne. J Int Soc Prev Community Dent. 2016;6(5):402-9.
17.Sathorn C, Parashos P, Messer H. The prevalence of postoperative pain and flare-up in single- and multiple-visit endodontic treatment: a systematic review. Int Endod J. 2008;41(2):91-9.
18.Kaushal D, Reddy SG, Biswas KP, Dixit A, Chowdhry R, Chug A. Apical extrusion of debris with root canal instrumentation in primary teeth: A systematic review. J Indian Soc Pedod Prev Dent. 2022;40(1):9-18.

19.Topçuoğlu G, Topçuoğlu HS, Akpek F. Evaluation of apically extruded debris during root canal preparation in primary molar teeth using three different rotary systems and hand files. Int J Paediatr Dent. 2016;26(5):357-63.
20.Seltzer S, Naidorf IJ. Flare-ups in endodontics: I. Etiological factors. J Endod. 1985;11(11):472-8.
21.Suresh B, Jeevanandan G, Ravindran V, Mashyakhy M, Alessa N, Syed AA, et al. Comparative Evaluation of Extrusion of Apical Debris in Primary Maxillary Anterior Teeth Using Two Different Rotary Systems and Hand Files: An In Vitro Study. Children (Basel). 2023;10(5):898.
22.Wang C, Xu P, Ren L, Dong G, Ye L. Comparison of post-obturation pain experience following one-visit and two-visit root canal treatment on teeth with vital pulps: a randomized controlled trial. Int Endod J. 2010;43(8):692-7.
23.Singh AK, Chavan SC, Shah A, Parida R, Kansar N, Poojary S. Assessment of Apical Extrusion of Debris during Root Canal Preparation with Different Ni-Ti File Systems: An *In Vitro* Study. J Contemp Dent Pract. 2021;22(4):349-52.
24.Hülsmann M. A critical appraisal of research methods and experimental models for studies on root canal preparation. Int Endod J. 2022;55(Suppl 1):95-118.
25.Abdelnaby P, Ibrahim M, ElBackly R. In vitro evaluation of filling material removal and apical debris extrusion after retreatment using Reciproc blue, Hyflex EDM and ProTaper retreatment files. BMC Oral Health. 2023;23(1):902.
26.Guha A, Shivangi S, Jain R, Rao RD, Verma MR, Jain AK. Comparative evaluation of apically extruded debris during root canal instrumentation using Neoendo Flex, Pro-HS, and Mani Silk: An: in vitro: study. Endodontol. 2021;33(4):227-31.
27.Eshagh Saberi A, Ebrahimipour S, Saberi M. Apical Debris Extrusion with Conventional Rotary and Reciprocating Instruments. Iran Endod J. 2020;15(1):38-43.
28.Cohenca N, Silva LA, Silva RA, Nelson-Filho P, Heilborn C, Watanabe E, et al. Microbiological evaluation of different irrigation protocols on root canal disinfection in teeth with apical periodontitis: an in vivo study. Braz Dent J. 2013;24(5):467-73.
29.Eliasz W, Czarnecka B, Surdacka A. Apical Extrusion of Debris during Root Canal Preparation with ProTaper Next, WaveOne Gold and Twisted Files. Materials (Basel). 2021;14(21):6254.
30.Vivekanandhan P, Subbiya A, Mitthra S, Karthick A. Comparison of apical debris extrusion of two rotary systems and one reciprocating system. J Conserv Dent. 2016;19(3):245-9.
31.Uzunoglu E, Görduysus M. Apical extrusion of debris and irrigant using novel preparation systems. J Contemp Dent Pract. 2014;15(4):423-7.
32.Yu D, Guo L, Gao J, Liu J, Yang D. Evaluation of apical extrusion of debris and centering ability in different nickel-titanium files during curved root canal preparation. BMC Oral Health. 2023;23(1):395.
33.Tanalp J. A critical analysis of research methods and experimental models to study apical extrusion of debris and irrigants. Int Endod J. 2022;55(Suppl 1):153-77.
34.Mohammadi D, Mehran M, Frankenberger R, BabeveyNejad N, Banakar M, Haghgoo R. Comparison of apical debris extrusion during root canal preparation in primary molars using different file systems: an in vitro study. Aust Endod J. 2022;48(3):473-80.
35.Predin Djuric N, Van Der Vyver P, Vorster M, Vally ZI. Comparison of apical debris extrusion using clockwise and counter-clockwise single-file reciprocation of rotary and reciprocating systems. Aust Endod J. 2021;47(3):394-400.
36.Uzun I, Güler B, Özyürek T, Tunc T. Apical extrusion of debris using reciprocating files and rotary instrumentation systems. Niger J Clin Pract. 2016;19(1):71-5.

37.Koçak S, Koçak MM, Sağlam BC, Türker SA, Sağsen B, Er Ö. Apical extrusion of debris using self-adjusting file, reciprocating single-file, and 2 rotary instrumentation systems. J Endod. 2013;39(10):1278-80.
38.Gungor OE, Kustarci A. Evaluation of Apically Extruded Debris using Two Niti Systems Associated with Two İrrigation Techniques in Primary Teeth. J Clin Pediatr Dent. 2016;40(6):490-5.