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Review Article

Rotary endodontic files versus manual files for root canal treatment

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ABSTRACT

Many studies have been published to compare the efficacy of root canal filling with either rotary and manual instrumentation. The most commonly reported factors included instrumentation, obturation time and to obturation quality. Besides, the different studies in the literature have used different assessment tools and parameters of their outcomes. In addition, to using different rotary instrumentation techniques. In thisliterature review, we have formulated strong evidence regarding the effectiveness of rotary and manual instrumentation files for root canal filling based on the findings from the current studies in the literature. Our results indicate the effectiveness of rotary instrumentation in reducing the root canal instrumentation time and enhancing the obturation and filling quality as compared to the manual instrumentation techniques. Our findings also indicate the potential variability in the effectiveness between the different rotary instrumentation techniques. However, it was not an area of concentration among the different studies in the literature. Thus, to formulate such evidence, further relevant investigations to this topic might be required. Finally, we recommend that rotary endodontic files should be indicated for the root canal filling settings to obtain better outcomes and alleviate the associated quality of work.

Keywords: Endodontics, Filling material, Rotary, Manual, Root canal

INTRODUCTION

Various technical advances have been introduced to the field of dentistry and pulp therapy within the recent few years regarding the used materials and approaches. This has been significantly associated with reduced instrumentation time and increased quality of work and enhanced outcomes. In 1960, Buelher et al introduced the NiTi system as the first rotary instrumentation modality, which became very common among other settings following this approach. NiTi rotary files were first produced in markets in 1993, and Serene et al first introduced the manual K files for root canal filling.[1,2]

Advances continued to be introduced to this field leading to further enhancements in the relevant outcomes. At the early start of this decade, NiTi files were effectively reported for adequate preparation of root canals by Barr et al.[3] The authors of this investigation reported that rotary files were faster, cost-effective, and were associated with predictable and uniform fillings (Figure 1). Accordingly, many studies have been published to compare the efficacy of root canal filling with either rotary or manual instrumentation.[4-8] The most commonly reported factors included instrumentation, obturation time and obturation quality. Besides, the different studies in the literature have used different assessment tools and parameters of their outcomes. In addition, to using different rotary instrumentation techniques. Accordingly, the present literature review aims to formulate strong evidence regarding the effectiveness of rotary and manual instrumentation files for root canal filling, based on the findings from the current studies in the literature.

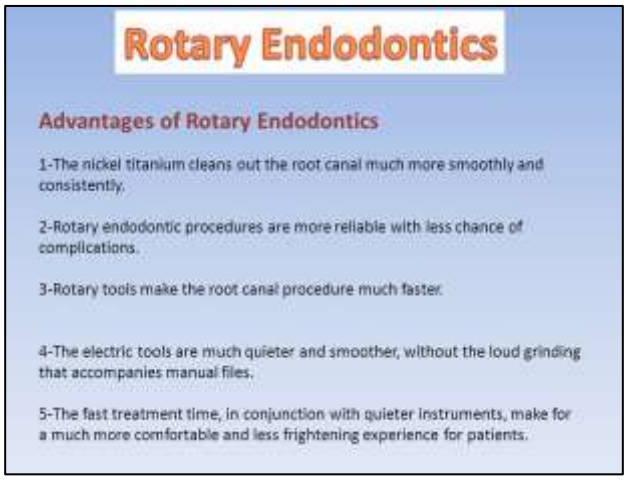

Figure 1: Advantages of rotary endodontics.

METHOD

We performed an extensive literature search of the Medline, Cochrane, and EMBASE databases which was performed on 25th July 2021 using the medical subject headings (MeSH) or a combination of all possible related terms. This was followed by the manual search for papers in Google Scholar while the reference lists of the nitially included papers.[9,10] Papers discussing the effectiveness of rotary and manual instrumentation files for root canal filling were screened for relevant information, with no limitation on date, language, age of participants, or publication type.

DISCUSSION

Reducing the time needed to complete root canal instrumentation is essential within the pediatric dentistry settings to relieve the potentially associated anxiety experienced by children and to enhance their cooperation and to improve the clinical outcomes. This will also be associated with better quality, safer, and faster treatment operations as a result of the potential reduction in both the dentist's and patient's fatigue and efforts.[8-11] Additionally, many studies have been published to compare the effectiveness of rotary endodontic files versus manual files for root canal treatment, including clinical and in vitro investigations. In this section, we will discuss the findings of these studies. Among the various relevant investigations in the literature, biochemical cleaning, number of visits, types of restorations, and the root canal filling materials are all significant factors that can be associated with the success or failure of pulpectomy procedures.[12-14] Canal irrigation and mechanical instrumentation are both two major processes for conducting successful chemomechanical preparatory processes to effectively eradicate any potentially present microorganisms within the root canal to achieve better management.[7] Furthermore, previous investigations showed that conducting chemomechanical preparation for root canal systems management is an essential step that is mainly directed to the debridement of the canal.[15,16] Among the different in vitro investigations, stereomicroscopic evaluation was the most commonly used approach to evaluate the efficacy of root canal treatment and processing, and are mainly directed to check the ink removal following the end of the preparatory steps.[4,14,17,18] A previous in vitro investigation by Silva et al17 showed that profiles 0.4 mm had no significant difference in the cleaning efficiency of root canal systems over the manual instrumentation, although the authors also reported that using the rotary instrumentation was significantly better than not using any instrumentations. Similarly, Moghaddam et al also indicated this by reporting that their used rotary flex files did not significantly differ from the effectiveness of manual instrumentation.[19] Besides, they also showed that the K files showed significantly better cleaning efficiencies of the cervical third of the root canals as compared to the rotary flex files. However, this was inconsistent with the findings reported by the previous investigation by Silva et al.[17] In another investigation by Ramezanali et al they reported that both K and Mtwo files had similar cleaning efficiencies of the root canal systems.[20] On the other hand, Ramazani et al showed that the K files had a significantly lower efficiency of cleaning the cervical third of the root canal as compared to the Mtwo systems.[21] Furthermore, the authors also indicated that the Mtwo systems and the reciprocating system had similar cleaning efficiencies in cleaning all the cervical thirds. In the same context, Katge et al reported that Wave One systems showed significantly better cleaning efficiency over ProTaper systems within the middle third of the root canal, however, both modalities had similar effectiveness within the apical third.[22] Azar et al also indicated that ProTaper had better cleaning effectiveness than the Mtwo and manual instrumentation approaches, however, they also estimated that manual and rotary instrumentation did not significantly differ from each other regarding the cleaning effectiveness.[18]

Moreover, a novel approach of instrumentation was suggested by Musale et al for root canal treatment in

primary teeth, which has been recommended because these teeth usually have anatomic variations that might lead to unintentional perforation, and to the reduced availability of files for treating these teeth.[23] Furthermore, to make the process of straight-line access easy, early coronal enlargement using intro files as ProTaper SX, ProFiles OS, and the Hero Shaper Endo flare, and also by removing the dentin shelf that overlies the orifice of the canal.23 Although previous investigations have doubted the efficacy of such procedures, Musale and Mujawar showed that the cleaning effectiveness of the rotary files is better than manual instrumentation.[4,17,22,23] Many previous investigations have also used radiographic evaluation modalities to evaluate the effectiveness of dentin removal by estimating the differences of pre-and-post cone-beam computed tomography.[23-28] Additionally, in a previous investigation by Musale et al, the results indicated that hero shapers and ProTapers had significantly better cleaning efficiencies and mechanical preparation characteristics than the manually used K files.[23] These results are also consistent with the findings by Poornima et al that assessed the volumetric changes within the corresponding root canal systems showing that the used hand K files had reduced volumes and lower mechanical preparation characteristics than the M two systems.[24] Another investigation by Selvakumar et al also showed that their approach using the K3.06 system was significantly associated with more dentin removal in the cervical third and less in the coronal one than the hand K files.[26] This was furtherly indicated by Kummer et al that showed that more dentin removal was significantly associated with using manual instrumentation than using rotary files.[25] In addition, the authors of this investigation used stereomicroscopic measures to evaluate the rates of dentin removal, according to the obtained images of the pre-and-post evaluation processes. On the other hand, it is worth mentioning that other investigations also indicated that dentin removal was similar between manual instrumentation and rotary files, and no significant differences were noticed between the two approaches.[17,25] When assessing the cleaning effectiveness of rotary and manual instrumentation, evaluation of microbial elimination is also important, in addition to the mechanical preparation, and has been evaluated by many investigations in the literature.[20] Pinheiro et al reported that both the rotary files and manual instrumentation did not significantly differ in terms of cleaning effectiveness.[29]

Furthermore, in a previous randomized controlled trial (RCT), Babu et al reported that the root canal instrumentation time was significantly reduced with using the HERO Shaper rotary file systems and the Kedo-S pediatric rotary files than with using manual instrumentation in their population.[30] This is consistent with the results of other previous investigations, indicating the effectiveness of these modalities and their superiority over the manual files.[6,8,11,17,23,31,32] On the other hand, another investigation by Madan et al4 reported that the time taken to perform root canal instrumentation was significantly longer with using the rotary file systems than manual instrumentation in their investigation of primary teeth. It is worth mentioning that the time estimated for rotary instrumentation by Babu et al. 30 was longer than that estimated by other studies for the same modalities, although the authors indicated that their estimated time was still significantly shorter than with using manual instrumentation for the same teeth.[5,8,23,33] This might be attributed to the potential differences in the levels of knowledge, skills, and experience with using rotary instrumentation modalities. Furthermore, considering the age of the included population is also important because operations for younger children might require longer durations to maintain full and adequate cooperation during the procedure.

Moreover, root canal instrumentation time is also inconsistent among the different rotary files systems. Among the variously reported rotary files, the Kedo-S pediatric rotary files were reported to take lower root canal instrumentation time than the HERO Shape rotary files.[30] This is mostly attributable to the increased consumption of the number of files with the HERO Shape rotary files to complete adequate root canal instrumentation as compared to the number of files consumed with the Kedo-S pediatric rotary files. Obturation time is also another important factor to consider. Clinical studies have indicated that this factor also favors the use and application of the rotary files over manual instrumentation. This might be owing to the facilitated obturation techniques with rotary files as a result of the ability to induce conical wide canals that are suitable for performing obturation. The anatomy of the root canals and easily removing cervical obstructions might also be other potential factors.[8,11,17] In addition to the obturation time, the quality of obturation is also important to consider when assessing the effectiveness of instrumentation. In the literature, studies have demonstrated that rotary files can obtain more frequencies of optimal obturation than manual instrumentation.[6,8,30,33] Enhanced obturation quality might be attributable to the conical form obtained after using the rotary files. Another characteristic of the rotary files might also be the inactive tips and wall support to the root canal as a result of the radial land and elastic memory of these files, leading to enhanced quality of obturation.[6,34] The reported success rates for rotary instrumentation approaches were high among the different studies in the literature. Within the first two years, the estimated success rate was 100% for different files.[30] ProTaper rotary files were reported to be associated with a 95% success rate after one year.[5] HyFlex CM rotary files were associated with a 92.3% success rate after one year.[11] It is worth noting that high success rates are also reported with manual instrumentation, as indicated in a previous investigation by Ozalp et al that manual instrumentation was associated with a 100% success rate at 18 months of follow-up in primary teeth.[35] Variable rates between 70 and 100% were estimated for the different instrumentation files among studies in the literature, and the causes of these variations might be attributable to the condition of the treated teeth and the ability to resist treatment rather than the used filling material and intended approach.[7,14,35-41] The radiographic success rates are also high and are reported to be ranging

between 89.5%, and 100% for the differently reported files, and some studies even reported lower rates for both the rotary and manual instrumentation techniques of primary teeth.[5,11,30,35,37,39]

Studies have also demonstrated that the manual files might be associated with increased numbers of underfilled root canals as a result of the lesser tapering of these files which might intervene against the proper and adequate flow of the filling materials.[33,42,43] On the other hand, Morankar et al reported that the obturation quality was similar between the two rotary and manual instrumentation groups.[11] Obturating the primary teeth might also contribute to the increased quality, regardless of the used instrumentation techniques.[5,30,44,45] Chug et al conducted a meta-analysis of 11 investigations and reported that rotary instrumentation was associated with a significant reduction in instrumentation time and obturation time than manual instrumentation approaches.[46] Besides, the authors showed that rotary instrumentation was associated with significantly more frequencies of optimal obturation techniques when compared to manual instrumentation. The authors also reported that the quality of evidence for such estimations of findings from their included studies was estimated to be moderate. Another meta-analysis of RCTs was also conducted by Manchanda et al and included 13 RCTs to compare the effectiveness of rotary versus manual instrumentation techniques in primary teeth.[47] The authors reported that there was no significant difference between rotary canal filling and manual instrumentation in terms of quality of filling. Besides, they showed that root canal instrumentation time and canal filling time were significantly more reduced with rotary instrumentation than manual groups. Interestingly, the authors estimated that the post-operative pain was not significant as estimated for the two modalities within the first 12, 24, and 72 hours following the process, while significantly less time was reported with the rotary instrumentation at 6 and 48 hours.

CONCLUSION

When using rotary instrumentation in reducing the root canal instrumentation time and enhancing the obturation and filling quality is considered more effective when compared to the manual instrumentation techniques. Our findings also indicate the potential variability in the effectiveness between the different rotary instrumentation techniques. However, it was not an area of concentration among the different studies in the literature. Thus, to formulate such evidence, further relevant investigations to this topic might be required. Finally, we recommend that rotary endodontic files should be indicated for the root canal filling settings to obtain better outcomes and alleviate the associated quality of work.

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REFERENCES

1. Buehler WJ, Gilfrich JV, Wiley R. Effect of low-temperature phase changes on the mechanical properties of alloys near composition TiNi. Journal of applied physics. 1963;34(5):1475-7.
2. Serene TP, Adams JD, Saxena A. Nikel-Titanium Instruments Applicatins in Endodentics. Ishiyaku EuroAmerica. 1995.
3. Barr ES, Kleier DJ, Barr NV. Use of nickel-titanium rotary files for root canal preparation in primary teeth. Pediatric dentistry. 2000;22(1):77-8.
4. Madan N, Rathnam A, Shigli AL, Indushekar KR. K-file vs ProFiles in cleaning capacity and instrumentation time in primary molar root canals: an in vitro study. Journal of the Indian Society of Pedodontics and Preventive Dentistry. 2011;29(1):2-6.
5. Kuo CI, Wang Y-L, Chang H. Application of Ni-Ti Rotary Files for Pulpectomy in Primary Molars. Journal of Dental Sciences. 2006;1:10-5.
6. Makarem A, Ravandeh N, Ebrahimi M. Radiographic assessment and chair time of rotary instruments in the pulpectomy of primary second molar teeth: a randomized controlled clinical trial. Journal of dental research, dental clinics, dental prospects. 2014;8(2):84-9.
7. Mortazavi M, Mesbahi M. Comparison of zinc oxide and eugenol, and Vitapex for root canal treatment of necrotic primary teeth. International journal of paediatric dentistry. 2004;14(6):417-24.
8. 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. The Journal of clinical pediatric dentistry. 2011;35(4):359-63.
9. Hashan MR, Ghozy S, El-Qushayri AE, Pial RH, Hossain MA, Al Kibria GM. Association of dengue disease severity and blood group: A systematic review and meta-analysis. Rev Med Virol. 2021;31(1):1-9.
10. El-Qushayri AE, Ghozy S, Abbas AS. Hyperimmunoglobulin therapy for the prevention and treatment of congenital cytomegalovirus: a systematic review and meta-analysis. Expert Rev Anti Infect Ther. 2020;1-9.
11. Morankar R, Goyal A, Gauba K, Kapur A, Bhatia S. Manual versus rotary instrumentation for primary molar pulpectomies- A 24 months randomized clinical trial. Pediatric Dental Journal. 2018;28.
12. Avery DR, Dean JA. Dentistry for the Child and Adolescent. Mosby; 2004.
13. Ingle JI, Bakland LK. Endodontics. Decker. 2002.
14. Moskovitz M, Sammara E, Holan G. Success rate of root canal treatment in primary molars. Journal of dentistry. 2005;33(1):41-7.
15. Hargreaves KM. Pathways of the pulp. Mosby. 2006.

16. Young GR, Parashos P, Messer HH. The principles of techniques for cleaning root canals. Australian dental journal. 2007;52(1):S52-63.
17. Silva LA, Leonardo MR, Nelson-Filho P, Tanomaru JM. Comparison of rotary and manual instrumentation techniques on cleaning capacity and instrumentation time in deciduous molars. Journal of dentistry for children (Chicago, Ill). 2004;71(1):45-7.
18. Azar MR, Safi L, Nikaein A. Comparison of the cleaning capacity of Mtwo and Pro Taper rotary systems and manual instruments in primary teeth. Dental research journal. 2012;9(2):146-51.
19. Nazari Moghaddam K, Mehran M, Farajian Zadeh H. Root canal cleaning efficacy of rotary and hand files instrumentation in primary molars. Iran Endod J. 2009;4(2):53-7.
20. Ramezanali F, Afkhami F, Soleimani A, Kharrazifard MJ, Rafiee F. Comparison of Cleaning Efficacy and Instrumentation Time in Primary Molars: Mtwo Rotary Instruments vs. Hand K-Files. Iran Endod J. 2015;10(4):240-3.
21. Ramazani N, Mohammadi A, Amirabadi F, Ramazani M, Ehsani F. In vitro investigation of the cleaning efficacy, shaping ability, preparation time and file deformation of continuous rotary, reciprocating rotary and manual instrumentations in primary molars. Journal of dental research, dental clinics, dental prospects. 2016;10(1):49-56.
22. Katge F, Patil D, Poojari M, Pimpale J, Shitoot A, Rusawat B. Comparison of instrumentation time and cleaning efficacy of manual instrumentation, rotary systems and reciprocating systems in primary teeth: an in vitro study. Journal of the Indian Society of Pedodontics and Preventive Dentistry. 2014;32(4):311-6.
23. Musale PK, Mujawar SA. Evaluation of the efficacy of rotary vs. hand files in root canal preparation of primary teeth in vitro using CBCT. European archives of paediatric dentistry : official journal of the European Academy of Paediatric Dentistry. 2014;15(2):113-20.
24. Poornima P, Disha P, Nagaveni NB, Roopa KB, Bharath KP, Neena IE. 'Volumetric analysis of hand and rotary root canal instrumentation and filling in primary teeth using Spiral Computed Tomography' - an invitro study. International journal of paediatric dentistry. 2016;26(3):193-8.
25. Kummer TR, Calvo MC, Cordeiro MM, de Sousa Vieira R, de Carvalho Rocha MJ. Ex vivo study of manual and rotary instrumentation techniques in human primary teeth. Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics. 2008;105(4):e84-92.
26. Selvakumar H, Kavitha S, Thomas E, Anadhan V, Vijayakumar R. Computed Tomographic Evaluation of K3 Rotary and Stainless Steel K File Instrumentation in Primary Teeth. Journal of clinical and diagnostic research.. 2016;10(1):Zc05-8.
27. El-Qushayri AE, Ghozy S, Reda A, Kamel AMA, Abbas AS, Dmytriw AA. The impact of Parkinson's disease on manifestations and outcomes of Covid-19 patients: A systematic review and meta-analysis. Reviews in Medical Virology. 2020:e2278.
28. Thieu H, Bach Dat B, Nam NH. Antibiotic resistance of Helicobacter pylori infection in a children's hospital in Vietnam: prevalence and associated factors. Minerva medica. 2020;111(5):498-501.
29. Pinheiro SL, Araujo G, Bincelli I, Cunha R, Bueno C. Evaluation of cleaning capacity and instrumentation time of manual, hybrid and rotary instrumentation techniques in primary molars. International endodontic journal. 2012;45(4):379-85.
30. Research O, Babu DKLG, Kavyashree G. Evaluation of the clinical efficiency of rotary and manual files for root canal instrumentation in primary teeth pulpectomies: A comparative randomized clinical trial. 2021;2:21-34.
31. Juliet S, Jeevanandan G, Govindaraju L, R V, Subramanian E. Comparison Between Three Rotary Files on Quality of Obturation and Instrumentation Time in Primary Teeth − A Double Blinded Randomized Controlled Trial. Journal of Orofacial Sciences. 2020;12:30.
32. Crespo S, Cortes O, Garcia C, Perez L. Comparison between rotary and manual instrumentation in primary teeth. The Journal of clinical pediatric dentistry. 2008;32(4):295-8.
33. Jeevanandan G, Govindaraju L. Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial. European archives of paediatric dentistry. 2018;19(4):273-8.
34. Nazari M K, Mehran M, Zadeh H. Root Canal Cleaning Efficacy of Rotary and Hand Files Instrumentation in Primary Molars. Iranian endodontic journal. 2009;4:53-7.
35. Ozalp N, Saroğlu I, Sönmez H. Evaluation of various root canal filling materials in primary molar pulpectomies: an in vivo study. American journal of dentistry. 2005;18(6):347-50.
36. Bawazir OA, Salama FS. Clinical evaluation of root canal obturation methods in primary teeth. Pediatric dentistry. 2006;28(1):39-47.
37. Chawla HS, Setia S, Gupta N, Gauba K, Goyal A. Evaluation of a mixture of zinc oxide, calcium hydroxide, and sodium fluoride as a new root canal filling material for primary teeth. Journal of the Indian Society of Pedodontics and Preventive Dentistry. 2008;26(2):53-8.
38. Fuks AB, Eidelman E, Pauker N. Root fillings with Endoflas in primary teeth: a retrospective study. The Journal of clinical pediatric dentistry. 2002;27(1):41-5.
39. Pandranki J, NR VV, Chandrabhatla SK. Zinc oxide eugenol and Endoflas pulpectomy in primary molars: 24-month clinical and radiographic evaluation. Journal of the Indian Society of Pedodontics and Preventive Dentistry. 2018;36(2):173-80.

40. Ramar K, Mungara J. Clinical and radiographic evaluation of pulpectomies using three root canal filling materials: an in-vivo study. Journal of the Indian Society of Pedodontics and Preventive Dentistry. 2010;28(1):25-9.
41. Yacobi R, Kenny DJ, Judd PL, Johnston DH. Evolving primary pulp therapy techniques. Journal of the American Dental Association (1939). 1991;122(2):83-5.
42. Panchal V, Jeevanandan G, Subramanian E. Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. Journal of the Indian Society of Pedodontics and Preventive Dentistry. 2019;37(1):75-9.
43. Lakshmanan L, Mani G, Jeevanandan G, R V, Emg S. Assessing the quality of obturation and instrumentation time using Kedo-S files, Reciprocating files and Hand K-files. Brazilian Dental Science. 2020;23.
44. Govindaraju L, Jeevanandan G, Subramanian EMG. Comparison of quality of obturation and instrumentation time using hand files and two rotary file systems in primary molars: A single-blinded randomized controlled trial. European journal of dentistry. 2017;11(3):376-9.
45. Govindaraju L, Jeevanandan G, Subramanian E. Clinical Evaluation of Quality of Obturation and Instrumentation Time using Two Modified Rotary File Systems with Manual Instrumentation in Primary Teeth. Journal of clinical and diagnostic research. 2017;11(9):Zc55-8.
46. Chugh VK, Patnana AK, Chugh A, Kumar P, Wadhwa P, Singh S. Clinical differences of hand and rotary instrumentations during biomechanical preparation in primary teeth-A systematic review and meta-analysis. International journal of paediatric dentistry. 2021;31(1):131-42.
47. Manchanda S, Sardana D, Yiu CKY. A systematic review and meta-analysis of randomized clinical trials comparing rotary canal instrumentation techniques with manual instrumentation techniques in primary teeth. International endodontic journal. 2020;53(3):333-53.

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