

# Comparative Evaluation of Effectiveness of Reciprocating and Rotary Files in Children: A Systematic Review and Meta-analysis

Shivani Sawant<sup>1</sup>, Ritesh Kalaskar<sup>2</sup>, Anija Chandanakunnummal<sup>3</sup>, Rashmi Dongarwar<sup>4</sup>

## ABSTRACT

**Background:** This systematic review and meta-analysis aimed to determine whether reciprocating file systems reduce postoperative pain more effectively than rotary file systems.

**Materials and methods:** This review followed the preferred reporting items for systematic review guidelines to ensure rigorous and transparent reporting. The databases searched included MEDLINE, Cochrane Library, and Google Scholar, targeting articles published in English between January 2000 and April 2024. Randomized controlled trials involving children aged 4–12 years requiring pulpectomy, comparing reciprocating file systems with rotary systems. Outcomes included quality of obturation, instrumentation time, and postoperative pain. The participants, settings, interventions, comparators, outcome measures, study designs, statistical analyses, results, and all other relevant data were meticulously and accurately extracted from all included studies. Data extraction was performed and recorded in Excel sheets, with separate documentation maintained for each primary outcome.

**Results:** Out of 279 studies initially identified, 272 were excluded due to duplication, non-English language, or not meeting criteria. Seven studies that met the necessary criteria were included in the systematic review. Among them are five comparisons for instrumentation time, four for postoperative pain, and two comparisons for quality of obturation. Results of the meta-analysis showed that instrumentation time was lower in the rotary file systems than in reciprocating file systems. Postoperative visual analogue scale (VAS) scores after 6 hours and 24 hours were almost similar among both file systems.

**Conclusion:** Given the limitations of this review, it can be said that the postoperative pain scores were comparable between reciprocating and rotary file systems. The root canal preparation time was significantly shorter with the reciprocating system compared to the rotary system.

**Clinical significance:** In pediatric dentistry, behavior management plays a vital role in successful treatment. Therefore, opting for the correct file system is fundamental and helps in minimizing pain and instrumentation time, thereby enhancing the overall patient experience.

**Keywords:** Instrumentation time, Pediatric reciprocating files, Pediatric rotary files, Postoperative pain, Pulpectomy, Quality of obturation.

*The Journal of Contemporary Dental Practice* (2024): 10.5005/jp-journals-10024-3799

## INTRODUCTION

The preservation of primary teeth remains a primary concern in pediatric dentistry, despite various initiatives aimed at preventing dental caries in children. Maintaining arch integrity is crucial, with the primary objective being to conserve primary teeth until their natural exfoliation.<sup>1</sup>

Pulpectomy is the preferred treatment for both symptomatic and asymptomatic decayed primary teeth, although it is often a complex and labor-intensive procedure. The success of this endodontic treatment largely depends on achieving effective chemo-mechanical preparation.<sup>2,3</sup>

Hand instrumentation remains the conventional technique for cleaning and shaping primary root canals; however, it is associated with several drawbacks, including iatrogenic errors such as zipping, ledge formation, and perforation. Additionally, this method is often time-consuming, which can pose challenges in pediatric dentistry, as the duration of the procedure significantly impacts the child's behavior and overall acceptance of the dental treatment.<sup>4</sup>

Barr et al. in the year 2000, highlighted the benefits of rotary instrumentation techniques for the preparation of primary teeth. They found that Ni-Ti rotary files facilitated biomechanical preparation by producing root canal fillings that were more

---

<sup>1-4</sup>Department of Pediatric and Preventive Dentistry, Government Dental College and Hospital, Nagpur, Maharashtra, India

**Corresponding Author:** Shivani Sawant, Department of Pediatric and Preventive Dentistry, Government Dental College and Hospital, Nagpur, Maharashtra, India, Phone: +91 7738893949, e-mail: shivanisawant322@gmail.com

**How to cite this article:** Sawant S, Kalaskar R, Chandanakunnummal A, et al. Comparative Evaluation of Effectiveness of Reciprocating and Rotary Files in Children: A Systematic Review and Meta-analysis. *J Contemp Dent Pract* 2024;25(12):1179–1189.

**Source of support:** Nil

**Conflict of interest:** None

---

predictable, faster, and cost-effective. Additionally, several studies have indicated that Ni-Ti rotary files minimize the expulsion of debris beyond the apical region.

The application of a rotary file system in primary teeth led to more tapering-shaped root canals, enabling efficient removal of dentinal fragments, improved root canal debridement, and easier placement and condensation of obturation materials compared to manual files, regardless of the material used.<sup>5</sup>

**Table 1:** Search strategy

Database	Strategy	Outcome
PubMed	#1(((rotary file OR (rotary instrumentation) OR (rotary files) OR (Kedo-S file) #2((reciprocating files) OR (reciprocal Ni-Ti file) OR (reciprocating automated preparation system) #3(((pain) OR (postoperative pain) OR (procedural pain) OR (pain assessment) #4((quality of obturation) OR (quality of root canal filling) OR (obturation quality) #1 AND #2 AND #3 AND #4	34
Google Scholar	Rotary file system Reciprocating file system Obturation quality Instrumentation time Procedural pain	184
Cochrane	#1 (rotary file) OR (rotary instrumentation) OR (Kedo-S file) #2 (rotary files) OR (rotary instrumentation) OR (Kedo-S files) OR (rotary file) #3 (reciprocating file) OR (reciprocal Ni-Ti files) OR (reciprocating automated preparation system) #4 (pain) OR (postoperative pain) OR (procedural pain) OR (pain assessment) #5 #1 AND #2 AND #3 AND #4	871 872 216 256, 353 61

The reciprocating movement technique for canal shaping and debridement has become increasingly favored in pediatric dentistry. This approach replaces continuous rotation with a 90° horizontal reciprocating motion, effectively reducing torsional stress and cyclic fatigue on Ni–Ti instruments. Reciprocating motion is considered a safer alternative for Ni–Ti instruments compared to continuous rotation.

The reciprocating motion enhances flexibility, allowing them to better adapt to undulated and intricate canals, thereby improving cleaning efficiency. Reciprocating files operate using a counterbalanced force motion and are powered by an automated unit that drives in a regulated to-and-fro motion.<sup>6</sup>

Thus, the research question, “Do reciprocating files cause less postoperative pain when compared to rotary file systems?”

The need of this study was to evaluate the efficacy of reciprocating and rotary file systems with regard to obturation quality, instrumentation time, and postoperative pain in children.

## MATERIALS AND METHODS

This systematic review was performed adhering to the preferred reporting items for systematic review (PRISMA) 2020 guidelines, as well as the Cochrane Handbook. The study was registered in PROSPERO under the registration code CRD42023453466. The focused research question addressed was—“Do reciprocating files cause less postoperative pain when compared to rotary file systems?”

The eligibility criteria were established based on the population intervention control outcome study design (PICOS) framework (PRISMA 2020), as outlined below:

- Population—Studies including children in the age-group 4–12 years requiring pulpectomy treatment.
- Intervention—Studies including pulpectomy treatment with reciprocating file systems like Wave One Gold, NiTiflex, Reciproc blue files, etc.
- Comparison—Studies including pulpectomy treatment with rotary files Kedo-S, Pro AF Baby Gold, ProTaper Next files.

(d) Outcome

- Studies evaluating the quality of obturation in both groups
- Studies evaluating the instrumentation time in both groups.
- Studies evaluating the postoperative pain in both groups.

(e) Study design—Randomized control trials.

Electronic databases, including PubMed, Cochrane, and Google Scholar, were systematically searched for articles published from January 2000 to April 2024, with the search limited to publications in the English language. For the database, the search strategy combined the following terms: “Systematic Review,” “Postoperative Pain,” “Instrumentation Time,” “Quality of Obturation,” “Pediatric Reciprocating Files,” and “Pediatric Rotary Files.” Boolean operators “AND” and “OR” were used to structure and refine the search. The search strategies for databases are outlined in Table 1.

The inclusion criteria focused on studies evaluating the effects of reciprocating and rotary files on instrumentation time, obturation quality, and postoperative pain in primary teeth following biomechanical root canal preparation. Only studies published in the English language and designed as randomized controlled trials (RCTs) were considered. The following were excluded: Review reports, case series, *in vitro* and animal studies, studies providing only abstract and not full text, and studies involving other filing systems.

Two authors of this study Dr. Shivani Sawant and Dr. Ritesh Kalaskar independently selected the retrieved studies by examining the titles and abstracts. Dr. Shivani Sawant assessed the full text of the studies by title and abstract. Dr. Anija C.K. and Dr. Rashmi Dongarwar are responsible for reading the full texts and judging studies to be included based on the eligibility criteria through the PICOS strategy. A mutual discussion between the authors resolved any disagreement.

Data extraction included the following factors: Authors, country, year of publication and study title, study design, sample size, participant’s age-group, gender, outcomes assessed, key results, and other relevant details. Two reviewers extracted the data from the selected articles and summarized it. Randomization,

allocation concealment, and blinding were considered. The data extraction sheet is provided in Table 2.

The risk of bias in all the studies was evaluated using the Cochrane Collaboration's tool for RCTs. By virtue of this tool, the risk of bias in included studies was evaluated by the following criteria: Random sequence generation, allocation concealment, blinding of participants, personnel and outcome assessment, selective reporting, and other types of bias. Each study's validity and quality were evaluated and classified as low, unclear, or high risk of bias.

The general characteristics of the included studies are mentioned in Table 3. For the assessment of pain score, instrumentation time means, standard deviations, and quality of obturation meantime standard deviations were considered. Continuous data, including mean instrumentation time, mean postoperative pain, and standard deviations for each group, were evaluated. The  $I^2$  statistic was computed to assess heterogeneity, and its value was used to determine the appropriate use of a non-random or random variation model. Quantitative synthesis was performed using RevMan 5.4 software.

To evaluate the certainty (or confidence) in the body of evidence for each outcome, the following methods were employed:

Risk of bias: Each study contributing to the outcome was reviewed for potential biases using a validated risk of bias tool.

Consistency: The degree of similarity across study results was examined to assess heterogeneity.

Publication bias: Funnel plots and statistical methods (where feasible) were used to detect potential publication bias.

## RESULTS

A total of 279 studies were identified from electronic databases. Of these, 5 studies were duplicates and were therefore excluded. From 274 eligible papers, title, and abstract screening identified 14 studies for full-text assessment. Following a thorough review, 7 studies were excluded based on the inclusion criteria. Therefore, 7 studies<sup>1,4,7-17</sup> were included in the systematic review. Of these, 5 studies underwent quantitative assessment, while 4 studies with homogeneous data were selected for meta-analysis. The distinction between quantitative assessment and meta-analysis is based on the criteria used for data synthesis, with only 4 studies meeting the specific requirements for meta-analysis (Fig. 1).

### Characteristics of the Selected Studies

The included studies' sample sizes varied from 45 to 157 participants per group, and the participants' ages varied from 4 to 12 years. Two studies evaluated the quality of obturation by using Coll and

Sadrian criteria.<sup>4,12</sup> Five studies evaluated the instrumentation time by stopwatch.<sup>4,11-13,17</sup> Four studies evaluated postoperative pain out of which, two studies used the Wong-Baker scale and three studies used a four-point pain scale. In seven studies, a single-visit pulpectomy procedure was performed.<sup>1,4,11-14,17</sup> Three studies had an average follow-up period of 6, 24, and 72 hours.<sup>11,13,14</sup> One study had a follow-up period of 6 hours and 12 hours whereas two studies had no follow-up period.<sup>1,4,17</sup>

Four studies evaluated the instrumentation time. Only two studies stated the measurement of instrumentation time.<sup>11,12</sup> One study measured the instrumentation time from glide path establishment till the end of instrumentation.<sup>11</sup> Another study measured the instrumentation time from the beginning till the end of canal preparation.<sup>12</sup> The evaluator was blinded only in one study.<sup>13</sup> Six studies mentioned that the irrigation was done using 1% sodium hypochlorite followed by normal saline.<sup>1,4,11-14</sup> One study did not mention the use of any irrigating solution.<sup>17</sup> Four studies used Metapex as the obturating material.<sup>4,12-14</sup> One study used Endoflas as the obturating material whereas one study used Gutta percha points as the obturating material and one study did not mention the obturating material.<sup>1,17</sup>

Five studies compared the instrumentation time.<sup>4,11-17</sup> A significant difference was observed in two studies whereas there was no statistically significant difference in three studies.<sup>4,11-13,17</sup> One study stated that instrumentation time with reciprocating files was significantly less as compared to rotary file systems.<sup>11</sup> Another study stated that instrumentation time with reciprocating file was higher as compared to rotary file system.<sup>4</sup>

Five studies evaluated the postoperative pain.<sup>1,11-14</sup> Four studies stated no significant difference in pain scores among both file systems.<sup>1,11,13,14</sup> One study stated that the postoperative pain with the reciprocating file was lower as compared to the rotary file system.<sup>12</sup>

The risk of bias assessment of the included studies is mentioned in Figure 2. The studies showed a low risk of bias with attrition bias and reporting bias. High risk of bias with blinding of participants.<sup>4,11-14,17</sup> The overall risk of bias assessment is shown in Figure 3. Adequate reporting of random sequence generation was observed in 6 studies. In one study, the details of random allocation were not mentioned and hence it was categorized as an unclear risk.<sup>1,4,7,11,13,14,17</sup> The allocation concealment was reported in 4 out of 6 studies assessed and was categorized as high risk. Blinding of the participants and personnel was reported in only one study.<sup>1</sup> Outcome assessment was blinded in 6 studies and hence, it was categorized as low risk. In 7 studies, no drop-outs were reported and hence, they were categorized as low risk.<sup>1,4,11-14,17</sup>

**Table 2:** Data extraction sheet

Study	Instrumentation time				Postoperative pain			
	Group I		Group II		Group I		Group II	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Lakshmanan et al. <sup>4</sup>	75.6	9.8	190.6	10.2	-	-	-	-
Tyagi et al. <sup>13</sup>	27.40	6.27	25.26	7.86	0	0	0	0
Atesci et al. <sup>11</sup>	699	65	430	58	0.15	-	0	-
Jeevanandan and Govindaraju <sup>1</sup>	-	-	-	-	1.00	0.79	1.75	0.55
Patel et al. <sup>12</sup>	56.191	9.55935	57.47	9.26309	-	-	-	-
Alnassar et al. <sup>14</sup>	-	-	-	-	0.08	0.27	0.08	0.27
Vaidya et al. <sup>17</sup>	32.55	-	29.63	-	-	-	-	-

**Table 3:** General characteristics of included studies

Sr. no	Author, year	Sample size	Age (years)	Outcome assessed					Results	Conclusion	
				Intervention group (reciprocating file)	Control group (rotary file)	Follow-up	Quality of obturation	Instrumentation time			Postoperative pain
1.	Lakshmanan et al., 2020 India <sup>4</sup>	45 primary molars	6.06 + 1.25 years	Ni-Ti K-flex reciprocating file (n = 15)	Kedo-S rotary file—D1, E1 (n = 15)	N/A	Coll and Sadrian criteria	Stopwatch	N/A	Mean instrumentation time in reciprocating file group (190.6 sec) and rotary file group (75.6 sec) Quality of obturation—Kedo-S group (60%) and Reciprocating files (20%). The highest overfill was in the rotary group (27%) and the highest underfill the reciprocating group (60%)	The rotary system resulted in superior quality of obturation. Instrumentation time reduced in rotary files compared to reciprocating instrumentation techniques
2.	Tyagi et al., 2021 India <sup>13</sup>	60 primary molars	4–8 year	WaveOne GOLD reciprocating files (n = 25)	Pro AF Baby Gold rotary file (n = 25)	6, 24, 72 hours, and 1 week	N/A	Stopwatch	Four point pain scale	The postoperative pain after 6 hour (0.44 + 0.71) rotary files and (0.31 + 0.61) reciprocating files. The mean time—(40.02 ± 7.08) hand K-flex files, rotary groups (27.40 ± 6.27 and reciprocating 25.26 ± 7.86)	The study showed lower postoperative pain (6 hours) for rotary files vs manual files, whereas the pain values at 24, 72 hours, and 1 week showed no significant intergroup variations. The mean instrumentation time for obturation was also higher for Wave one reciprocating group which was also found to be statistically significant. No significant differences in the child's behavior among the three groups.

(Contd...)

Table 3: (Contd...)

Sr. no	Author, year	Sample size	Age (years)	Intervention group (reciprocating file)	Control group (rotary file)	Follow-up	Outcome assessed			Conclusion
							Quality of obturation	Instrumentation time	Postoperative pain	
3.	Atesci et al., 2021 Turkey <sup>11</sup>	50 permanent molar teeth	9–12 years	Reciproc Blue reciprocating file (n = 25)	ProTaper Next rotary file (n = 25)	6, 24, 48, and 72 hours	N/A	Stopwatch	Modified Wong-Baker	<p>Instrumentation time of ProTaper Next rotary system (699 sec) and Reciproc Blue system (430 sec). Mean postoperative pain at 6 hours for reciprocal blue (0.85) and rotary system (1.05)</p> <p>Postoperative pain was found to be same in both the file systems at follow-up intervals. Root canal preparation time with the reciprocating system was significantly shorter compared to rotary file system. The instrumentation time of the rotary system was significantly longer than that of the single-file Reciprocating system.</p> <p>Limitation—lack of a cross-over type study design where all three groups could be compared in a single child, which could not be done due to its impending sensitivity in sample selection.</p>
4.	Jeevanandan and Govindaraju 2018 India <sup>1</sup>	60 Primary molars	6–8 years	NITI-K-flex reciprocating file (n = 20)	Kedo-S rotary files (n = 20)	6, 12 hours	N/A	N/A	Four-point pain scale	<p>Mean postoperative pain for rotary file system (2.40 ± 0.50) and reciprocating file (2.45 ± 0.51).</p> <p>At 6- and 12-hour intervals, the intensity of pain experienced was higher in NITI-K flex files in the reciprocating motion group followed by the manual NITI-K flex files group, and least in the Kedo-S rotary file-group</p> <p>Limitations—pain caused by a rubber dam or matrix/wedge or pain caused by the coronal restoration of heavy occlusal contact.</p>

(Contd...)

Table 3: (Contd...)

Sr. no	Author, year	Sample size	Age (years)	Outcome assessed				Results	Conclusion		
				Intervention group (reciprocating file)	Control group (rotary file)	Follow-up	Quality of obturation			Instrumentation time	Postoperative pain
5.	Patel et al., 2021 India <sup>12</sup>	60 Primary molars	5.56 ± 1.02	Wave one gold reciprocating file (n = 20)	Kedo-S rotary file (n = 20)	N/A	Coll and Sadrian criteria	Stopwatch	Wong-Baker scale	Mean instrumentation time for the rotary (59.23 sec) and for reciprocating group (57.47 sec). The maximum number of optimally filled canals in rotary group (85%) followed by reciprocating group (70%)	One of the major constraints in evaluating the pain is the patient's subjective evaluation and its measurement. Mean pain scores were compared using ANOVA test which stated lowest mean pain score of 0.50 for Wave One Gold file followed by Kedo-S Plus and Kedo-S Square. Also, reciprocating systems result in less pain and discomfort than the rotary systems however, there are no significant differences among them in terms of instrumentation time and quality of obturation. Limitations—A larger sample size could have yielded more definitive results. The amount of apical debris extrusion could have been evaluated in conjunction with cone beam computed tomography assessment of obturation quality.

(Contd...)

Table 3: (Contd...)

Sr. no	Author, year	Sample size	Age (years)	Intervention group (reciprocating file)	Control group (rotary file)	Follow-up	Outcome assessed			Conclusion
							Quality of obturation	Instrumentation time	Postoperative pain	
6.	Alnassar et al., 2021 Syria <sup>14</sup>	157 Primary molars	5-8 years	Wave one gold reciprocating file (n = 53)	ProTaper Next rotary file (n = 52)	6, 12, 24, 48, 72 hours, 1 week	N/A	N/A	Four-face facial pain scale	Mean pain score in the rotary system (0.00) and reciprocating system (1.00) at 12 hour interval.  The manual method caused more pain than the other 2 preparation systems, but there was no difference in terms of pain caused between the 2 automated methods. Auto mated root canal preparation systems could be used to reduce the intensity of postoperative pain in the endodontic treatment of primary teeth.
7.	Vaidya et al., 2023 India <sup>17</sup>	90 primary molars	4-8 years	(n = 30)	(n = 30)	N/A	N/A	N/A	N/A	Stopwatch  The mean instrumentation time in the rotary group (32.55) and the reciprocating in hand files and rotary files was (29.63)  Pediatric rotary and reciprocating files performed better in clinical settings, and the choice of file system did not significantly affect patient behavior.

N/A, not applicable; Sr. no., serial number



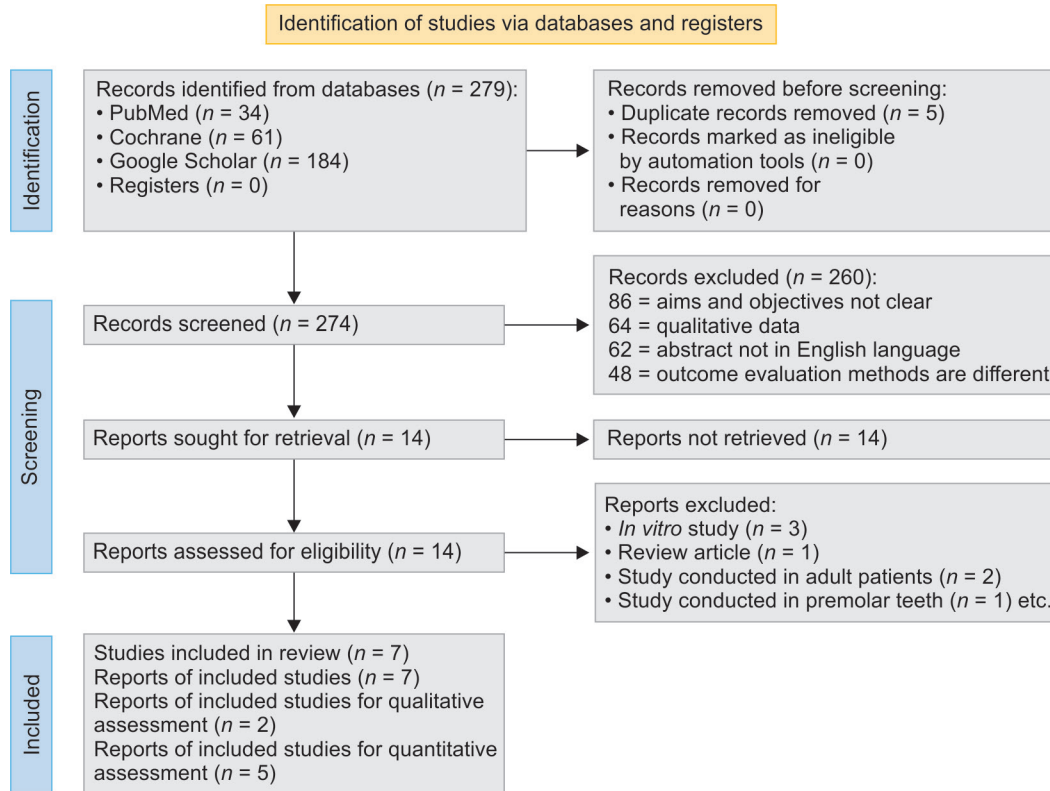


Fig. 1: PRISMA flowchart of the literature search and selection process

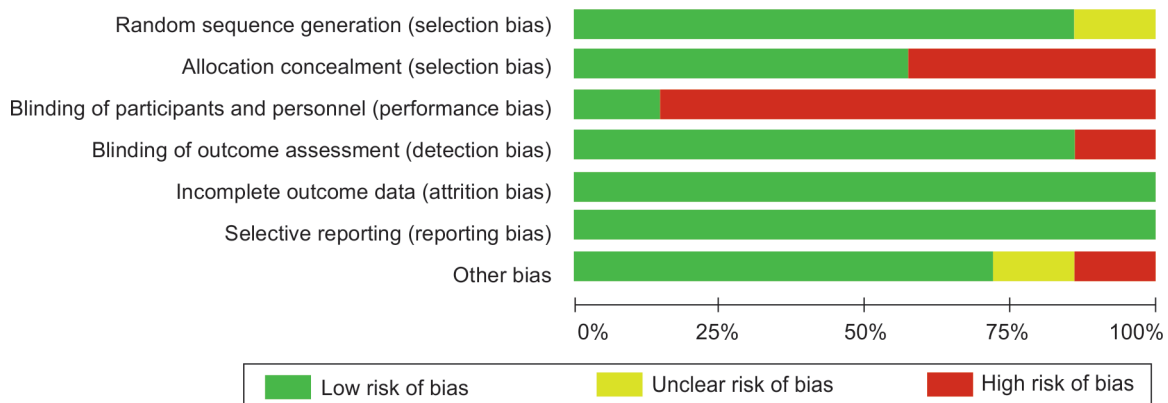


Fig. 2: Risk of bias assessment of included randomized-controlled studies

### Meta-analysis

Instrumentation time and postoperative pain score among the subjects treated with either rotary or reciprocating file systems were considered as the main outcome. One comparison for instrumentation time and two comparisons for postoperative pain score were performed: Comparison of instrumentation time and comparison of postoperative pain score after 6 and 24 hours.

### Comparison of Instrumentation Time between Rotary or Reciprocating File Systems

Instrumentation time was shorter with rotary file systems compared to reciprocating file systems, with a difference of  $-0.69$  (95% CI). However, this difference was not statistically significant ( $p = 0.52$ ). (Fig. 4).

### Comparison of VAS Score after 6 hours between Rotary or Reciprocating File Systems

The postoperative visual analogue scale (VAS) score after 6 hours was comparable between the two file systems, with a difference of 0.09 (95% CI). However, this difference was not statistically significant ( $p = 0.74$ ) (Fig. 5).

### DISCUSSION

The intention of root canal therapy in children is to completely remove the diseased tissue and fill the canal with a biocompatible material. In pediatric dentistry, it is crucial to complete the root canal procedure efficiently, minimizing treatment time while ensuring high-quality results.<sup>7</sup>



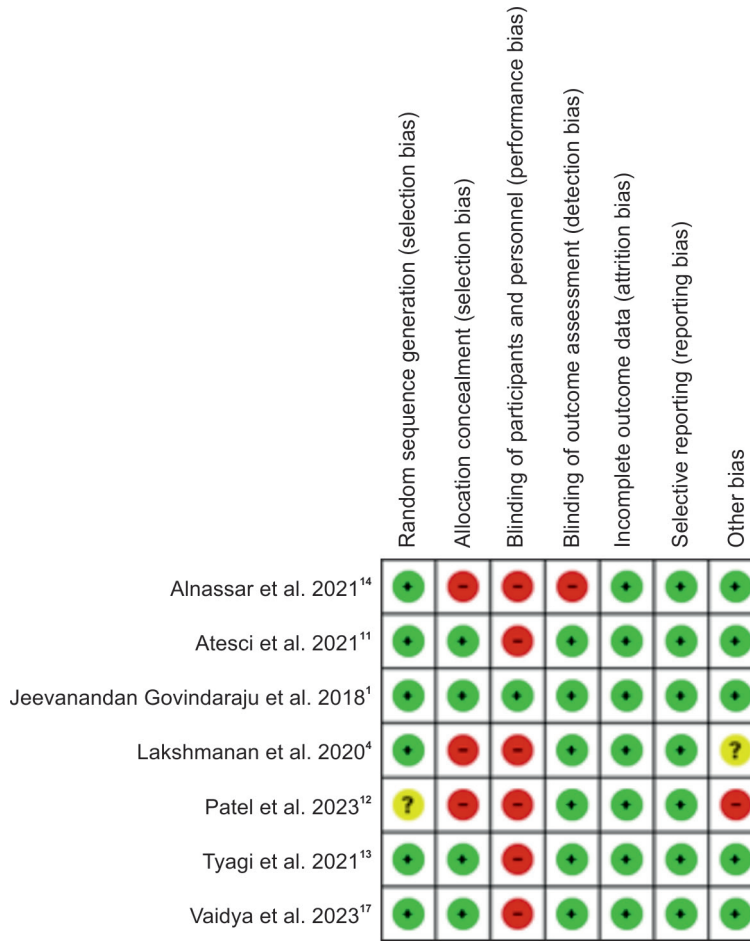


Fig. 3: Overall risk of bias assessment of included randomized controlled studies summary

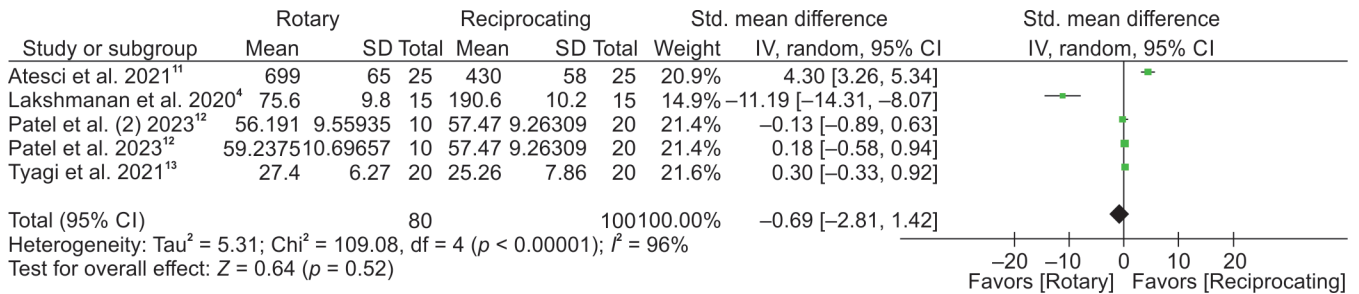


Fig. 4: Comparison of instrumentation time between rotary and reciprocating file systems

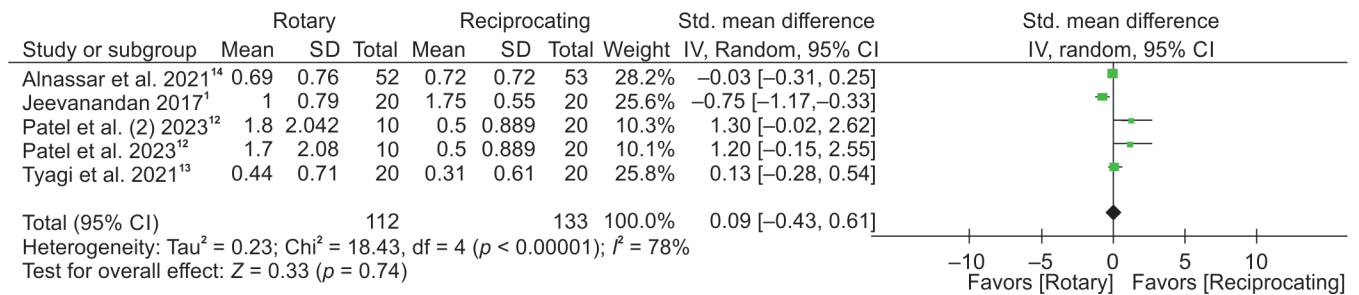


Fig. 5: Comparison of VAS score after 6 hours between rotary and reciprocating file systems

The present systematic review was conducted to assess the effectiveness of reciprocating and rotary instrumentation techniques in pulpectomy treatment, with a focus on instrumentation time, obturation quality, and postoperative pain. Caviedes-Buchel et al.<sup>8</sup> performed a similar systematic review, which assessed the impact of reciprocating and rotary-file systems on the apical expulsion of debris and its association with apical periodontal conditions. The study concluded that instrumentation with reciprocating systems leads to less pain than rotary systems. In pediatric dentistry, completing the root canal procedure efficiently is crucial, minimizing treatment time while ensuring high-quality outcomes.

Traditionally, hand files were used for root canal preparation; however, they have been reported to be time-consuming and prone to various iatrogenic errors.<sup>9</sup>

The emergence of nickel–titanium (Ni–Ti) represented a pivotal milestone in the evolution of endodontics. They are 2 to 3 times more flexible than stainless steel files owing to their low modulus of elasticity. The two major characteristics of Ni–Ti are shape memory and super elasticity (or pseudo elasticity). Superelasticity, or pseudoelasticity of the alloy makes it possible to adapt to the shape of the canal. This makes it possible to rotate and shape the canal while remaining centered despite the existence of prominent curves.<sup>10</sup>

De Pedro-Muñoz et al.<sup>15</sup> conducted a systematic review and meta-analysis comparing the cyclic fatigue resistance of rotary vs reciprocating files. Their study found that when cyclic fatigue resistance is measured as the number of cycles to fracture, reciprocating files showed statistically significantly greater resistance compared to rotary files ( $p = 0.03$ ). In reciprocating motion, the clockwise angle of rotation is smaller, enabling the instrument to unlock and navigate safely through the root canal, thereby reducing the risk of fracture.

da Silveira et al.<sup>16</sup> conducted a systematic review to evaluate the effect of reciprocating and rotary files on postoperative pain in adults. In this study, they found out that the postoperative pain intensity showed a statistically significant difference favoring rotary files.

Many clinical trials are done on primary teeth to compare the efficiency of hand and rotary files regarding obturation quality, instrumentation time, and postoperative pain. However, the literature noted a discrepancy regarding the comparison of both filing systems. In a study performed by Atesci et al.<sup>11</sup> postoperative pain was evaluated based on the modified Wong-Baker scale.

The pain score was selected by the patient from the pain rating scale. Another study done by Patel et al.<sup>12</sup> evaluated postoperative pain based on the Wong-Baker scale. Pain score was recorded from the pain rating scale. Hence, this systematic review was performed with the intention to address this lacunae in the literature.

In the present systematic review, one study reported higher instrumentation time with reciprocating files, while four studies indicated higher instrumentation time with rotary files.<sup>4,11–13,17</sup>

Regarding the quality of obturation, two studies found the highest percentage of optimally filled canals with rotary files.<sup>4,12</sup>

Regarding postoperative pain, two studies reported higher postoperative pain with reciprocating files, while another two studies reported higher postoperative pain with rotary files.<sup>1,11,13,14</sup>

This review demonstrated that reciprocating systems in primary tooth pulpectomy significantly reduce instrumentation time, directly leading to shorter chair time. A reduction in instrumentation

time minimizes fatigue for both the child and the operator, thereby facilitating faster and more efficient treatment.

This review followed the PRISMA guidelines, employing a precise search strategy. By performing a quantitative synthesis, this review combines data from multiple studies, potentially yielding more precise outcome estimates compared to individual trials. Additionally, the study successfully identified heterogeneity among clinical trials and quantified key parameters, such as instrumentation time and postoperative pain, through meta-analysis.

A limitation of this review is the reliance on only a few databases for the literature search. Additionally, the review included only trials reported in English, which may slightly influence the pooled estimates and summary treatment effects by excluding studies in other languages. Limited number of clinical trials in this review contributed to heterogeneity among the studies. Furthermore, the meta-analysis was unable to quantify obturation quality.

## CONCLUSION

This systematic review evaluates obturation quality, instrumentation time, and postoperative pain in reciprocating and rotary file systems. Postoperative pain was similar for both systems. The single-file reciprocating system required significantly less preparation time, while the rotary system achieved better root canal filling quality.

## REFERENCES

- 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. *Eur Arch Paediatr Dent* 2018;19(4):273–278. DOI: 10.1007/s40368-018-0356-6.
- Kumar D, Ravindran V. Comparison of quality of obturation and instrumentation time using manual hand-K files and rotary Kedo-S square files for pulpectomy in primary molars: A double-blinded randomised controlled trial. *J Popul Ther Clin Pharmacol* 2023;30(10):46–53. DOI: 10.47750/jptcp.2023.30.10.008.
- Girish Babu KL, Kavyashree GH. Evaluation of the clinical efficiency of rotary and manual files for root canal instrumentation in primary teeth pulpectomies: A comparative randomized clinical trial. *Contemp Pediatr Dent* 2021;2(1):21–34. DOI: 10.51463/cpd.2021.42.
- Lakshmanan L, Jeevanandan G, Vignesh R, et al. Assessing the quality of obturation and instrumentation time using kedo-S files, reciprocating files and hand K-files. *Braz Dent Sci* 2020;23:10. DOI: 10.14295/bds.2020.v23i1.1822.
- Juliet S, Jeevanandan G, Ganesh G, et al. Comparison between three rotary files on quality of obturation and instrumentation time in primary teeth: A double-blinded randomized controlled trial. *J Orofac Sci* 2020;12:30–34. DOI: 10.4103/jofs.jofs\_99\_18.
- Sruthi S, Jeevanandan G, Govindaraju L, et al. Assessing quality of obturation and instrumentation time using kedo-SG blue, kedo-SH, and reciprocating hand K-files in primary mandibular molars: A double-blinded randomized controlled trial. *Dent Res J* 2021;18:76. DOI: 10.4103/1735-3327.326649.
- Jha A, Jha A, Megha V, et al. Comparison of kedo-S rotary file system, universal protaper, and manual instrumentation in pediatric patients: A clinical study. *Int J Res Health Allied Sci* 2019;5(1):114–117. ISSN: 2455–7803.
- Caviedes-Bucheli J, Castellanos F, Vasquez N, et al. The influence of two reciprocating single-file and two rotary-file systems on the apical extrusion of debris and its biological relationship with symptomatic apical periodontitis. A systematic review and meta-analysis. *Int Endod J* 2016;49(3):255–270. DOI: 10.1111/iej.12452.

9. Kaushik M, Gojanur S, Masih U, et al. Comparative evaluation of instrumentation time and quality of obturation between different file systems in primary molars: A randomised clinical trial. *J Clin Diagn Res* 2022;16(4): ZC18–ZC22. DOI: 10.7860/JCDR/2022/52311.16214.
10. Iandolo A, Iandolo G, Malvano M, et al. Modern technologies in Endodontics. *G Ital Endodonzia* 2016;30(1):2–9. DOI: 10.1016/j.gien.2015.12.001.
11. Atesci AA, Topaloglu-Ak A, Turan E, et al. Evaluation of postoperative pain following single-visit root canal treatment with rotary and reciprocal Ni-Ti File systems in children. *Medicina (Kaunas)* 2021;58(1):50. DOI: 10.3390/medicina58010050.
12. Patel F, Patel M, Bhatt R, et al. Evaluation of instrumentation period, procedural pain, and quality of obturation using different single-file systems in deciduous molars: A randomized clinical trial. *J Coast Life Med* 2023;11(2):473–480. ISSN: 2309–6152.
13. Tyagi R, Khatri A, Kalra N, et al. Comparative evaluation of hand K-flex files, pediatric rotary files, and reciprocating files on instrumentation time, postoperative pain, and child's behavior in 4–8-year-old Children. *Int J Clin Pediatr Dent* 2021;14(2):201–206. DOI: 10.5005/jp-journals-10005-1919.
14. Alnassar I, Altinawi M, Rekab MS, et al. Pain assessment following endodontic treatment using two automated systems compared to manual treatment in primary molars. *Dent Med Probl* 2021;58(3):305–310. DOI: 10.17219/dmp/130083.
15. De Pedro-Muñoz A, Rico-Romano C, Sánchez-Llobet P, et al. Cyclic fatigue resistance of rotary versus reciprocating endodontic files: A systematic review and meta-analysis. *J Clin Med* 2024;13:882. DOI: 10.3390/jcm13030882.
16. da Silveira MT, Batista SM, Mamede Veloso SR, et al. Effect of reciprocating and rotary systems on postoperative pain: A systematic review and meta-analysis. *Iran Endod J* 2021;16(1):1–16. DOI: 10.22037/iej.v16i1.27944.
17. Vaidya A, Chauhan A, Sherpa HL, et al. Comparative evaluation of hand K-flex files, pediatric rotary files, and reciprocating files on instrumentation time in children. *International Journal of Life Sciences, Biotechnology and Pharma Research* 2023;12(3):1860–1862. ISSN: 2250–3137.