

## Frequency of Postoperative Pain after Endodontic Preparation with Rotary Versus Manual Method

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### Abstract

**Introduction:** The study aimed to assess the frequency of postoperative pain after endodontic preparation with rotary versus manual method by patient follow up.

**Method:** Study was conducted at IRE, Dental Department F G poly clinic hospital and Department of operative dentistry, Pakistan institute of medical sciences, Islamabad. A sample size of 64 patients was collected. Patients were recruited through non probability consecutive sampling. And were divided randomly into two group; In group A rotary system was used while in group B manual system was used. Data analysis was done using SPSS version 24. Chi-square and independent T test was applied. P value  $\leq 0.05$  was considered significant.

**Results:** Among 64 participants there were 34(53.1%) male and 30(46.9%) female. Mean age of patients was  $34.3 \pm 4.3SD$ . We found pain scores significantly less in rotary system as compared to manual system at 8 hours ( $p=0.000$ ), at 12 hours ( $p=0.000$ ), at 24 hours ( $p=0.000$ ) and at 48 hours ( $p=0.000$ ).

Majority of patients in rotary group had no to mild pain while majority of patients in manual system had moderate pain after 48 hours ( $p=0.000$ ). Frequency of pain was no-mild 45.3%, moderate 4.7% and severe 0% in rotary group while 6.3% no-mild, 23.4% moderate and 20.3% severe pain in manual system.

**Conclusion:** Endodontic preparation is associated with less post operative pain in rotary system as compared to manual or conventional method. Further research is required on detail understanding of procedure at larger scale with high sample size.

### Keywords

Endodontic treatment; Rotary system; Manual system

## Introduction

Vast developments have been done in dentistry in last few decades. In endodontics newer techniques and materials are being introduced which has provided betterment in quality and time. In 1960 Buelher invented NiTi rotary instrumentation system [1]. The aim of the endodontic preparation is debridement and shaping the root canal space without producing any iatrogenic error like zipping, transportation, perforation or ledge. NiTi rotary system use has raised in endodontic clinical practice as they are easy to use, flexible, along with the modified blade design provides better shaping of canal. The pseudo-elastic behaviour of SMA (Shape Memory Alloys), to which the Ni-Ti alloy belongs, confers flexibility. NiTi rotary tools can be employed in continuous rotation even in curved root canals to create a desired, tapered root canal morphology due to the material's super-elasticity, with a low risk of transporting the original canal lumen [2]. Along benefits there are few disadvantages which include fracture of Ni-Ti files during clinical use and is the most common procedural error. Breakage of Ni-Ti instruments happens with or without any obvious signs of previous permanent deformation. Stresses developed in file during root canal preparation may cause fatigue and instrument fracture [3]. It seems reasonable that flexible instruments are recommended for curved canals.

Clinical endodontics has been working towards engine-driven instrumentation of the root canal system since the turn of the millennium. These tools aim to decrease the preparation time and simplification of root canal instrumentation [4].

Apical periodontitis is a condition developed due to bacterial invasion from root canal into surrounding tissues which can be controlled by quality root canal treatment. Proper chemomechanical debridement of pulp tissue remnants, microorganism and their toxin from root canal is mandatory for successful outcomes. The objective of endodontic treatment is to decrease the quantity of bacteria and their toxins which contributes in exacerbation of symptomatic apical periodontitis and pain postoperatively [5]. Chemomechanical debridement is said to be the most important phase of root canal treatment, because, in addition to carving a shape for proper filling, it eliminates the cause of apical periodontitis. By mechanical and chemical means, bacteria and their products are eliminated from the canal, and necrotic tissue is removed, which might serve as substrate for bacterial regrowth ultimately the pain [6]. Therefore, this study is performed to assess postoperative pain in patients having root canal treatment done with the rotary method and conventional method.

**Results:** Among 64 participants there were 34(53.1%) male and 30(46.9%) female. Age of participants was 18-40 years in 33(51.6%) and 31(48.4%) in >40 years age group. Other demographics are shown in table 1.

A significant change in mean pain scores before and after 8 hours of procedure was seen in group A as compared to group B ( $p=0.000$ ) as shown in table 2.

A significant change in pain scores after 12 hours of procedure was seen ( $p=0.000$ ) as shown in table 3.

A significant lower pain scores were reported in group A as compared to group B ( $p=0.000$ ) after 24 hours of procedure as shown in table 4.

A significant change in pain scores was reported following 48 hours in both groups ( $p=0.000$ ) as shown in table 5.

Intensity of pain showed significant association with gender ( $p<0.05$ ) as shown in table 6.

Intensity of pain showed significant association with age ( $p<0.05$ ) as shown in table 7.

Intensity of pain showed significant association with education ( $p<0.05$ ) as shown in table 8.

Intensity of pain showed significant association with duration of procedure ( $p<0.05$ ) as shown in table 6.

Demographics characteristics	Frequency (N=64)	Percentage
<b>Gender</b>		
Male	34	53.1%
Female	30	46.9%
<b>Age</b>		
18-40 years	33	51.6%
>40 years	31	48.4%
<b>Education</b>		
Illiterate	16	25.0%
Matric	22	34.4%
Intermediate	16	25.0%
Bachelors or higher	10	15.6%
<b>Occupation</b>		

Public	27	42.2%
Private	37	57.8%
<b>Marital status</b>		
Married	27	42.2%
Unmarried	37	57.8%
<b>Interventional groups</b>		
Group A=Rotary system	32	50%
Group B=conventional system	32	50%
<b>Residence</b>		
Rural	29	45.3%
Urban	35	54.7%
<b>Molar</b>		
<20	34	53.1%
>20	30	46.9%

**Table1:** Socio-demographic characteristics.

Pre-Treatment pain scores	Interventional groups	(N =64)	Mean±SD	P value
	Group A (Rotary system)	32	7.5±0.50	0.676
	Group B (Conventional method)	32	7.4±0.72	-
<b>Post Treatment Pain scores at 8 hours</b>	Group A (Rotary system)	32	3.4±0.5	0.000

	Group B (Conventional method)	32	5.5±0.50	
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**Table 2:** Comparison of pain scores after 8 hours.

Pre-Treatment pain scores	Interventional groups	(N =64)	Mean±SD	P value
	Group A (Rotary system)	32	7.5±0.50	0.676
	Group B (Conventional method)	32	7.4±0.72	-
<b>Post Treatment Pain scores at 12 hours</b>	Group A (Rotary system)	32	2.1±0.3	0.000
	Group B (Conventional method)	32	4.1±0.3	-

**Table 3:** Comparison of pain scores at 12 hours.

Pre-Treatment pain scores	Interventional groups	(N =64)	Mean±SD	P value
	Group A (Rotary system)	32	7.5±0.50	0.676
	Group B (Conventional method)	32	7.4±0.72	-
<b>Post Treatment Pain scores at 24 hours</b>	Group A (Rotary system)	32	1.1±0.3	0.000
	Group B (Conventional method)	32	3.0±0.0	-

**Table 4:** Comparison of pain scores at 24 hours.

Pre-Treatment pain scores	Interventional groups	(N =64)	Mean±SD	P value
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	Group A (Rotary system)	32	7.5±0.50	0.676
	Group B (Conventional method)	32	7.4±0.72	-
<b>Post Treatment Pain scores at 48 hours</b>	Group A (Rotary system)	32	0.08±0.1	0.000
	Group B (Conventional method)	32	2.0±0.0	-

**Table 5:** Comparison of pain scores at 48 hours.

Gender	Pain	Interventional groups		Total	P value
		Group A	Group B		
<b>Male</b>	No-mild	16(47.1%)	0(0%)	16(47.1%)	0.00
	Moderate	0(0%)	8(23.5%)	8(23.5%)	-
	Severe	0(0%)	10(29.4%)	10(29.4%)	-
	Total	16(47.1%)	18(52.9%)	34(100%)	-
<b>Female</b>	No-mild	13(43.3%)	4(13.3%)	17(56.7%)	0.01
	Moderate	3(10%)	7(23.3%)	10(33.3%)	-
	Severe	0(0%)	3(10%)	3(10%)	-
	Total	16(53.3%)	14(46.7%)	30(100%)	-

**Table 6:** Association between gender and pain.

Age	Pain	Interventional groups		Total	P value
		Group A	Group B		
<b>18-40 years</b>	No-mild	15(45.5%)	3(9.1%)	18(54.5%)	0.00
	Moderate	3(9.1%)	5(15.2%)	8(24.2%)	-
	Severe	0(0%)	7(21.2%)	7(21.2%)	-
	Total	18(54.5%)	15(45.5%)	33(100%)	-

<b>&gt;40 years</b>	No-mild	14(45.2%)	1(3.2%)	15(48.4%)	0.01
	Moderate	0(0%)	10(32.3%)	10(32.3%)	-
	Severe	0(0%)	6(19.4%)	6(19.4%)	-
	Total	14(45.2%)	17(54.8%)	31(100%)	-

**Table 7:** Association between age and pain.

Education	Pain	Interventional groups		Total	P value
		Group A	Group B		
<b>Illiterate</b>	No-mild	6(37.5%)	1(6.3%)	7(43.8%)	0.00
	Moderate	0(0%)	7(43.8%)	7(43.8%)	-
	Severe	0(0%)	2(12.5%)	2(12.5%)	-
	Total	6(37.5%)	10(62.5%)	16(100%)	-
<b>Matric</b>	No-mild	10(45.5%)	0(0%)	10(45.5%)	0.01
	Moderate	0(0%)	3(13.6%)	3(13.6%)	-
	Severe	0(0%)	9(40.9%)	9(40.9%)	-
	Total	10(45.5%)	12(54.5%)	22(100%)	-
<b>Intermediate</b>	No-mild	8(50%)	0(0%)	8(50%)	0.000
	Moderate	3(18.8%)	3(18.8%)	6(37.5%)	-
	Severe	0(0%)	2(12.5%)	2(12.5%)	-
	Total	11(68.8%)	5(31.3%)	16(100%)	-
<b>Bachelors or higher</b>	No-mild	5(50%)	3(30%)	8(80%)	0.000
	Moderate	0(0%)	2(12.5%)	2(12.5%)	-
	Severe	0(0%)	5(31.3%)	5(31.3%)	-
	Total	11(68.8%)	5(31.3%)	16(100%)	-

**Table 8:** Association between education and pain.

Time of procedure	Pain	Interventional groups		Total	P value
		Group A	Group B		
<25 min	No-mild	24(72.7%)	2(6.1%)	26(78.8%)	0.231
	Moderate	3(9.1%)	3(9.1%)	6(18.2%)	-
	Severe	0(0%)	1(3%)	1(3%)	-
	Total	27(81.8%)	6(18.2%)	33(100%)	-
>25 min	No-mild	5(16.1%)	2(6.5%)	7(22.6%)	0.667
	Moderate	0(0%)	12(38.7%)	12(38.7%)	-
	Severe	0(0%)	12(38.7%)	12(38.7%)	-
	Total	5(16.1%)	26(83.9%)	31(100%)	-

**Table 9:** Association between time and pain.

## Discussion

In operative dentistry, both clinician and patient need shorter procedure time, comfortable and painless procedure. Pain is a discouraging factor both for patient and clinician. Thus, now a days in clinical endodontics, the establishment of improved diagnostic aids, protocols of instrumentation and disinfection, and advanced obturation systems have allowed single-visit endodontics into everyday clinical practice both for old and young patients. Although many researches in the literature have elaborated that there is insignificant difference between the conventional and rotary endodontic systems with respect to prevalence and severity of post-operative pain, but limited proven studies are available so far [7]. Nevertheless, occurrence of post-endodontic pain seen after step back root canal preparation was higher (11.4%) than Ni–Ti rotary profile system. Post-endodontic pain management is the major concern of endodontics. Post-endodontic pain after root canal treatment has appeared to range between 3% to 50% [8]. To analyse the pain perceived, numerous pain scales are being used for example, visual analog scale, modified visual analog pain scale, and modified verbal pain scale in literature. In current study, modified verbal scale was selected to measure the pain, which is merged form of verbal descriptor scale of slight pain to maximum pain and numeric scale that range from 0 to 10 [9]. When correctly designed and applied, a modified verbal descriptor scale is shown to be a reasonable ratio scale instrument for the calculation of human pain severity and discomfort. Current systematic reviews came up with similar outcomes in post-operative pain between single and multiple visit root canal treatment. In this current study, in Group I (rotary ProTaper), pain scores at base level ranged from 1 to 10 with a mean value of  $4.20 \pm 2.25$ , whereas in Group II (manually), pain scores ranged from 1 to 8



with a mean value of  $4.43 \pm 2.03$ . Statistically, insignificant difference was found between two groups ( $P = 0.586$ ). In a study done in 2003, relatively high incidence of post-operative pain with S.S hand file preparation was reported as compared to NiTi rotary system [10]. In the current study, post-operative pain in all patients was relieved with the use of mild pain killers. So, none of the patients reported signs of inflammation thus antibiotics was not needed in any case. This is in agreement with researches which reported that pain related to endodontic is best treated by eradicating the source of infection or inflammation as much as possible, and whenever medications are needed, the correct use of non-opioid analgesics can be useful and is the first line of action [11].

By randomization, administration of rather large sample size and also applying strict inclusion criteria many confounding factors such as age, gender, preoperative pain, type of tooth, pulpal and periapical status, number of treatment visits were kept in similar distribution so that only the shaping technique would remain as the key and distinguishing factor. All efforts were made so that the all procedural steps including the number of anesthetic cartridges used, working length measurement, debridement and obturation procedures would remain same among the groups. Since various teeth in the same patient would not behave independently, so, only one tooth from each patient was added in this research. The area of focus in recent years has been the comparison of post-endodontic pain following various instrumentation methods and toolkits [12].

One more study found insignificant difference in post-operative pain among One shape and Reciproc groups; although, the control group showed significantly higher pain intensity than the patients in the two other groups. This finding may be related to the Archimedes' screw effect, which reduces debris extrusion periapically [13]. These outcomes are in line with previous researches that showed less postoperative pain using TiNi rotary files than stainless steel hand files, however these researches utilized different engine-driven systems. In contrast to our findings, prior studies found no difference between stainless steel hand files and TiNi rotary files in postoperative pain; this could be because of utilising different rotary systems in their interventions [14].

It is well known that extrusion of debris periapically may irritate the periradicular tissues and cause inflammation resulting in postoperative pain and flare-ups. Moreover few researches have implemented full-sequence rotary files with increased extrusion of debris compared to reciprocating rotary file while others have shown vice versa. The difference seen could be related to differences in the cross-section, cutting-edge design, taper, tip type, configuration, flexibility, alloy type, number of used files, kinematics, or cutting efficacy [15].

This study, however, has reported insignificant difference with respect to postoperative pain among reciprocating (Reciproc) and full-sequence rotary files (OneShape). In a randomized clinical trials, [16] found that severity and time duration of postoperative pain was significantly less in cases in which canal instrumentation with Reciproc system was done as compared to OneShape. On contrary there is a difference in result between that study and the present study, which might be related to differences in sample size ( 624 vs. 50 in each group), periapical condition (symptomatic apical periodontitis vs. normal pulps), preoperative pain categorize on the VAS (severe vs moderate), type of teeth (mandibular molars

vs. mandibular and maxillary molars), number of teeth requiring root canal (two molar in different arch which were treated the same day with a minimum time interval 4 h vs. one molar), sealer and obturation technique (MTA plus- warm vertical condensation vs, AH-26- lateral condensation), Micro-computed tomography ( $\mu$ CT) researches reported that reciprocating motion gives improved canal shaping, with reduced chances of canal transportation, in comparison to rotary files. OneShape files reported significantly increased canal straightening and apical transportation compared to Reciproc. This could be one of the causes for higher severity of postoperative pain by OneShape. It should be taken into account that the outcome of only one clinical research cannot be generalized to all clinical cases, and further studies related to this topic are needed; thus, more studies, with larger sample sizes are warranted to further investigate the pros and cons of these two systems in relation to pain and discomfort after endodontic treatment [17].

## Conclusion

Endodontic preparation is associated with less post operative pain in rotary system as compared to conventional method. Further research is required on detail understanding of procedure at larger scale with high sample size.

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