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ASSESSMENT OF POSTOPERATIVE PAIN AFTER USING RECIPROC VERSUS ONE SHAPE NITI SYSTEMS IN PATIENTS WITH SYMPTOMATIC IRREVERSIBLE PULPITIS: (A RANDOMIZED CLINICAL TRIAL) (PART THREE)

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ABSTRACT

Aim: Comparing the prevalence and the severity of postoperative pain after usage of two different rotary systems Reciproc in reciprocating motion versus One shape in continuous rotation for instrumentation of root canals among symptomatic irreversible pulpitis patients.

Methodology: Fifty four patients, males and females, aged between 25-45 years, with non-contributory medical history, were incorporated into this trial who found eligible. In a single Visit root canal treatment, Vital mandibular premolars with single, straight canals were only chosen and treated with one of the aforementioned instrumentation systems. The eligible Participants were randomly subdivided into two groups (n=27); Reciproc and One Shape. Pain assessment was done using the NRS; Pre-operative pain was recorded, then patients were provided with instructions to report their pain scores at 6,12,24,48 and 72 hours postoperatively as well as the number of analgesics tablets " Ibuprofen 400 mg" taken on demand up to three days post-treatment.

Results: The severity and prevalence of postoperative pain reveal no statistically significant difference at various follow-up periods (6,12,24,48 and 72 hours post-treatment) following single visit root canal treatment in patients with symptomatic irreversible pulpitis between both groups. Likewise, no significant difference was found concerning the number analgesics administered in both groups .

Conclusion: The different motions used for root canal instrumentation have the same effect on postoperative pain as well as the number analgesics administered.

KEYWORDS: endodontic, tooth teeth, root canal treatment, rotation, rotary, single file, reciprocation, reciprocating, Postoperative Pain.

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INTRODUCTION

Pain is an undesirable yet regrettably prevalent sensation subsequent to root canal treatment (RCT), manifesting within a few hours or days following the intervention, and invariably constituting an unwanted ordeal for patients and practitioners. [1,2] The magnitude of pain as reported by patients may differ based on gender, age, and the condition of the pulp. The sole variable that is under the control of the operator pertains to the technical aspect, encompassing instrumentation, irrigation, and obturation. [3] It has been documented that the occurrence of postoperative pain subsequent to RCT, predominantly characterized as mild discomfort, has been observed to range from 3% to 58% [1,4], although fewer than 12% of patients encounter severe pain. [4] The etiology of postoperative pain is multifactorial, mechanical, encompassing microbial, or chemical injury to the periapical tissue, with one key factor purportedly being the extrusion of apical debris. [1-4]

Several variables influence the expulsion of debris during the RCT process. These factors include the specific irrigation method employed, the extent of apical enlargement, the duration of the preparation procedure, the technique used for instrumentation, and the design of the instruments themselves. It should be emphasized that all current instruments and preparation techniques are linked to the expulsion of debris, even if the preparation does not reach the apical terminus. Additionally, it appears that manual instrumentation may result in a greater expulsion of debris than utilizing engine-driven rotary instruments. [5-7]

A wide range of concepts and techniques have arisen in the field of canal negotiation and shaping, resulting in an overwhelming array of documents. [8])

Traditionally, Continuous rotary motion has been employed when utilizing NiTi instruments([9] but recently, different new Reciprocating motion have been introduced by **Ghassan Yared 2008.** [9-11] It was claimed, it relieves instrument stresses which diminishes the likelihood of cyclic fatigue resulting from compression and tension **(De-Deus et al., 2010).** [9,12 ,13]

Two disparate understandings of single-file systems (one shape, Reciproc) have been launched using both motion (Rotation, Reciprocation) respectively. [14] It has been stated that the utilization of a sole instrument can effectively and thoroughly prepare root canals, resulting in simplification, reduced time consumption, and cost savings. One Shape (Micro Méga, Besançon, France) is among the few single file instruments composed of austenite 55-NiTi alloy, featuring various cross-sectional strategies. Its usage involves continuous clockwise rotation to facilitate rapid and secure root canal preparation, owing to its minimal fatigue and flexibility. Furthermore, it utilizes an electropolished safety tip instrument to improve cutting effectiveness and comes in a sterile blister packaging for single-use applications. [15,17]

Reciprocating Single files offer a safer approach to root canal preparation as it is thought to reduce instrumentation stresses. When a reciprocating instrument becomes stuck in the canal, it will not break because it will never rotate beyond its specific breaking point. [18] The Reciproc (VDW, Munich, Germany) is a nickel-titanium system that is utilized in reciprocating motion. It is fabricated from a unique nickel-titanium (NiTi) alloy called M-Wire, which is manufactured through a novel thermal treatment process. This process enhances the instrument's flexibility and augments its resilience against cyclic fatigue. [11,12,19]

The impact of varying kinematics on postoperative pain after single visit showed that reciprocating motion resulted significantly in less duration and intensity of post-treatment pain than continuous rotation. [3] Other research investigations have provided evidence to suggest that the reciprocating movement has a tendency to enhance the volume of debris that is extruded beyond the apex, which in turn heightens the

probability of experiencing postoperative pain. [10] However, our understanding of the prevalence of postoperative pain following instrumentation using a reciprocating motion remains limited.[3,9] On the contrary, Other studies concluded that, continuous rotation motion gives a higher amount of extruded debris than different kinematics on reciprocating motion.[20] The motivation behind our study arises from the existence of contradictory findings in relation to the comparison between reciprocating and rotary instruments.

For the patient's best interest, a reduction in the encounter of postoperative pain is cardinal along with the clinician's choice of an instrumentation system that combines simplicity, efficiency the decreased quantity of instruments used and eradication of the transfer of contaminants linked to instruments that are intended for one-time use.

MATERIALS AND METHODS

1) Ethical approval

The applicable IRBs/ECs at the Faculty of Oral and Dental Medicine, Cairo University reviewed and granted approval for the informed consent forms and the protocol, ensuring adherence to scientific standards and compliance with relevant research and human subjects' regulations. The ethical review also examined and approved the site-specific informed consent forms in Arabic and English, participant education and recruitment materials, and any subsequent modifications. Furthermore, the participants received detailed explanations regarding the treatment procedures, study objectives, potential side effects, and alternative treatments. Subsequently, all participants were requested to adhere to general instructions and provide their signatures on the informed consents prior to commencing the treatment.

2) Sample size

A total of 46 participants (23 per group) were sufficient with power 80% and 5% significance level. To account for non-parametric usage, the total count of patients was raised to 54. According to the instrumentation system used, two groups were formed by randomly assigning patients (n=27); One shape for the comparison group and Reicproc for the intervention group. The G power software was employed to estimate the sample size. [21]

Eligibility criteria for participants:

1. Inclusion criteria:

i. Age group between 25-45years old.

ii. Both Genders.

iii. Lower premolar teeth with:

- Single, straight canals.
- Pre-operative sharp pain.
- Vital pulp tissue response.
- Normal peri-apical radiographic appearance or limited widening in lamina dura.

iv. The ultimate determination of the condition of an elligible patient was made through the utilization of an intra-oral peri-apical radiograph and the application of pulp testing.

2. Exclusion Criteria:

i. Patients on previous pre-operative medication, including steroidal or non-steroidal anti-inflammatory medicines, and analgesic within 12 hours prior to treatment.

ii. Patients with multiple teeth to be treated endodontically in the same quadrant and/or opposite quadrants.

iii. Pregnancy.

iv. Antibiotics administration over the previous two weeks prior to patients visit.

v. Bruxism or clenching.

vi. Teeth with:

- Non-vital pulps.
- The presence of swelling or a fistulous tract.

- Any periodontal pockets with a depth more than 5 mm.
- Earlier endodontic fillings.

3) Management Protocol:

A standardized protocol for both groups involved an inferior alveolar nerve block utilizing 2% mepivacaine (1:20,000 levonordefrin) local anesthetic solution with a 30G short needle and an aspirating syringe. Access cavity preparation was done by a round bur and an Endo-Z bur. After tooth isolation with rubber dam, working length was estimated electronically and confirmed radiographically. Then, root canals were explored with hand K-files ISO sizes 10, and 15 and mechanically prepared by either system in accordance with the manufactuer's instructions. In the intervention group, Reciproc file R40 (40/0.06) was utilized, whereas the Comparison group involved the use of One Shape files up to size (37/0.06). The rotary files were inserted within the canal utlizing EDTA gel.

a) Irrigation protocol:

- The root canals underwent irrigation with 3ml of a 2.6% solution of sodium hypochlorite. This irrigation process took place inbetween each of the subsequently used instruments in the One Shape group. Additionally, in the Reciproc group, irrigation took place after preparing the cervical, middle, and apical portions of the root canals.
- Irrigation was conducted using a side-vented 30 gauge needle that was appropriately fitted to a disposable plastic syringe with a capacity of 3ml. The needle was carefully inserted into the canal space without encountering any resistance, stopping 1mm before reaching the Working length, which was confirmed by means of a silicone stop.
- The solution was prepared by combining 10 ml of sterile distilled water with an equal amount of 5.25% NaOC.
- b) Obturation protocol:
- A gutta-percha master cone was carefully inserted into the root canal that ensures compatibility with the previous instrumentation used for cleaning and shaping. In Reciproc group, a size (40/0.04) master cone was used, where in One Shape group, a size (35/0.04) master cone was used.
- After the master cone placement was confirmed radiograpically, sterile absorbent paper points were employed for the purpose of drying the canals.
- Obturation of the root canal system was accomplished through cold lateral compaction method utilizing ADSEAL resin based sealer.
- A size 30 spreader was used to allow space for accessory cones with size (25/0.02) to be placed to complete the root canals obturation.
- Excess gutta-percha is cut off with the aid of heated instrument.
- Temporary restoration Coltosol was employed to seal the access cavity.

4) Pain scoring

Pain assessment was done using the NRS; Preoperative pain was recorded, then patients were requested to document their levels of pain at 6,12,24,48 and 72 hours post-operatively as well as the number of analgesics tablets " Ibuprofen 400 mg" taken on demand up to three days post-treatment.

5) Statistical analysis

- Data was gathered and organized, followed by statistical analysis conducted using Microsoft Office 2016 (Excel). Demographic data about age, gender and tooth type was collected for each patient. Also, Preoperative pain intensity was collected. In addition, NRS Scores for postoperative pain intensity were collected for each group. For each group in each test, the standard deviation and mean values were

computed. The data's normality was evaluated using the Shapiro-Wilk and Kolmogorov-Smimov tests, data exhibited non-parametric (not-normal) distribution. The Mann-Whitney test was employed to compare two groups in unrelated samples. The Friedman test is applied when comparing related samples among more than two groups, whereas the Wilcoxon rank test is employed for comparing related samples between two groups. The chosen significance level was established as p-values ≤0.05. Statistical analysis was performed with IBM® SPSS® advanced statistics (Statistical Package for Social Sciences), version 21 (SPSS Inc., Chicago, IL)

Pain intensity data using NRS:

Comparison of median NRS scores in the tested groups:

Table (1) and figure (1) display the median and range values of NRS scores for the two groups**.**

Preoperatively, the range and median of the NRS scores was 8 (6-10) for Reciproc group and 8(Min.6, Max.9) for one shape group with statistically insignificant difference between both groups (p= 0.345).

Immediately after treatment, the range and median of the NRS scores was (0) (Min.0,Max.3) for Reciproc group and (0) (Min.0,Max.3) for one shape group with statistically insignificant difference between both groups (p= 0.469).

After 6 hours, the range and median of the NRS scores was (2) (Min.0, Max.3) for Reciproc group and (2) (Min.0,Max.3) for one shape group with statistically insignificant difference between both groups (p=0.364).

After 12 hours, the range and median of the NRS scores was (1) (Min.1, Max.2) for Reciproc group and (1) (Min.1,Max.2) for one Shape group with statistically insignificant difference between both groups (p=0.115).

After 24 hours, the range and median of the NRS scores was (1) (Min.0, Max.2) for Reciproc group and (1) (Min.0,Max.2) for One Shape group with statistically insignificant difference between both groups (p=0.446).

TABLE (1) Median and range of NRS score at various time points within the investigated groups by Mann Whitney test and overtime in each group by Friedman Test.

Groups / Different times	(Reciproc) group			(One shape) group			
	Median	Min.	Max.	Median	Min.	Max	P value
Preoperative pain	8	6	10	8	6	9	0.345
Immediately After treatment	0	0	3	0	0	3	0.469
6 Hours	2	0	3	2	0	3	0.364
12 Hours	1	1	2	1	1	2	0.115
24 Hours	1	0	2	1	0	2	0.446
48 Hours	0	0	1	0	0	1	1.000
72 hours	0	0	0	0	0	0	1.000
P value 2		<0.001			<0.001		

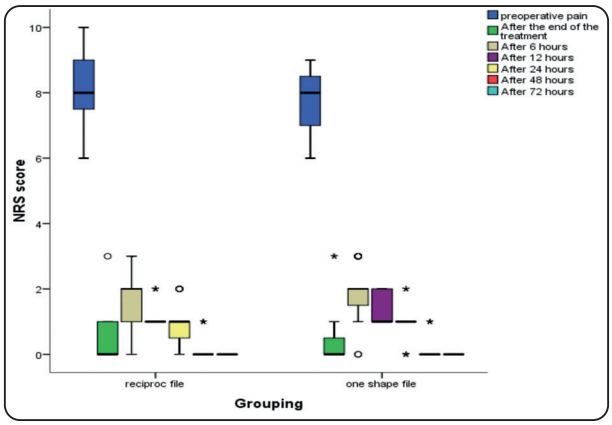

Fig. (1) Box plot illustrating the median NRS score in the investigated groups at various time point

After 48 hours, the range and median of the NRS scores was (0) (Min.0, Max.1) for Reciproc group and (0) (Min.0, Max.1) for one shape group with statistically insignificant difference between both groups (p=1.000).

After 72 hours, the range and median of the NRS scores was (0) (Min.0, Max.0) for Reciproc group and (0) (Min.0, Max.0) for one shape with the difference between both groups was not statistically significant (p=1.000).

There was statistical significance (p<0.001) when comparing the median pain score over time within each individual group.

B) Pain incidence in different pain categories:

Overall occurrence of pain and its category was not statistically significant comparing two groups (they were comparable) except at 6 hours.

Preoperatively, for both groups 2 patients out of 27 patients (7.4%) showed moderate pain, 25 patients (92.6%) showed severe pain. No statistically significant distinction in pain incidence was found between both groups (p=1.000).

Immediate after ttt, For Reciproc group (17) patients out of 27 patients (63.0 %) showed no pain, (10) patients (37.0%) showed mild pain. While in One Shape group (20) patients out of 27 patients (74.1%) showed no pain, (7) patients (25.9%) showed mild pain. No statistically significant distinction in pain incidence was found between both groups (p= 0.379).

After 6 hours, the incidence of pain did not vary significantly between both groups (p=1.000). For both groups (2) patients out of 27 patients (7.4%) showed no pain, 25 patients (92.6%) showed mild pain.

After 12 hours, all patients had mild pain.

After 24 hours, For Reciproc group (7) patients out of 27 patients (25.9%) showed no pain, (20) patients(74.1%) showed mild pain. While in One Shape (4) patients (14.8%)out of 27 patients showed no pain , (23) patients (85.2%) showed mild pain. No statistically significant distinction in pain incidence was found between both groups (p=0.311).

After 48 hours, for both groups (24) patients out of (27) patients (88.9%) showed no pain, (3) patients (11.1%) showed mild pain. No statistically significant distinction in pain incidence was found between both groups (p=1.000).

After 72 hours, for both groups pain score=0

C) Drug intake:

Data for drug intake findings are presented in **Table (3) and figure (3)**

Patients received the Analgesic :

For both groups; 96.3% received one tablet of analgesics

In Reciproc group 26 out of 27 participants (one lost to follow up) consumed the prescribed postoperative analgesic. One participant was excluded from the analysis for consuming an analgesic other than that prescribed. 9 analgesic tablets were consumed within the first hour after the end of treatment (postoperative) by 9 participant, 8 analgesic tablets after (6 hours) by 8 participants, 7 analgesic tablets after(12 hours) by 7participants, 1analgesic tablets after(24hours) by 1participant, 1analgesic tablet after (48hrs) by 1 participant, and no analgesic tablets consumption after (72 hours).

In One Shape group 26 out of 27 participants consumed the prescribed postoperative analgesic.10 analgesic tablets were consumed within the first hour after the end of treatment (postoperative) by

10 participant, 7 analgesic tablets after (6 hours) by 7 participants, 3 analgesic tablets after (12 hours) by 3participants, 3 analgesic tablets after (24 hours) by 3 participants, 2 analgesic tablets after (48 hours) by 2 participants, an 1analgesic tablets after (72 hours) by 1 participant.

TABLE (2) Frequencies (n), percentages and results of Chi-square (x2) for comparison of pain for different pain categories between the two groups (Group A: Reciproc group; Group B: one shape group)

		(Reciproc) group		(One shape) group		
		Count	**%**	**Count**	**%**	**P value**
Preoperative	Moderate	2	7.4	2	7.4	1.000
	Severe	25	92.6	25	92.6	
Immediate	None	17	63.0	20	74.1	0.379
	Mild	10	37.0	7	25.9	
After 6 h	None	2	7.4	2	7.4	1.000
	Mild	25	92.6	25	92.6	
After 24h	None	7	25.9	4	14.8	0.311
	Mild	20	74.1	23	85.2	
After 48h	None	24	88.9	24	88.9	1.000
	Mild	3	11.1	3	11.1	

P≤0.05 is significant, all patients were mild at 12 h in both groups, pain disappeared completely at 72 h.

TABLE (3) Frequencies (n), percentages and results of Chi-square(x2) for comparing drug intake for the investigated groups.

Group / **Variables**		(Reciproc) group		(One shape) group		
		No	**%**	**No**	**%**	**P value**
Analgesic	None	1	3.7%	1	3.7%	1.000
	One tablet	26	96.3%	26	96.3%	

P≤0.05 is significant.

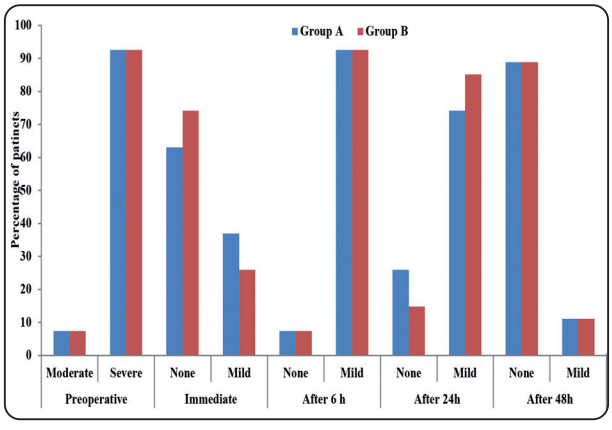

Fig. (2) Bar chart comparison of pain incidence for different pain categories between the two groups (Reciproc group; One Shape group).

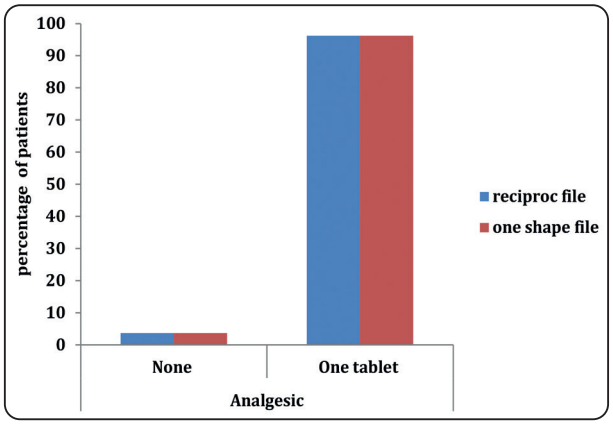

Fig. (3) Bar chart demonstrating analgesic consumption distribution in the investigated groups

DISCUSSION

The instrumentation of the RCS is a crucial component in the process of root canal treatment. The meticulous preparation of the RCS would enhance the efficiency of medicaments and irrigants, along with optimizing the geometrics of the root canal for subsequent filling techniques. [22] Throughout the years, various concepts and techniques have been introduced for the root canals preparation, resulting in a wide range of files available for their shaping and negotiation. [23] The advent of Nickel Titanium (NiTi) alloy in the field of endodontics in 1988, pioneered by Walia, brought about a revolutionary change in the manner of shaping the RCS. [24] The utilization of Nickel Titanium (NiTi) rotary shaping systems has been associated with a decrease in the extrusion of infected debris compared to manual instrumentation. [25]

An extensive examination of the expulsion of debris from the tip of the root canal in the literature on dental treatment has occurred due to its practical importance. [28] While other laboratory studies have assessed the expulsion of debris using various techniques, only a few studies have focused on the actual outcome in clinical settings and its impact on pain experienced after root canal treatment. [3,26] Nevertheless, the findings obtained from laboratory studies may not be directly applicable to real-life cases. Despite this, the previously conducted clinical studies have presented contradictory results regarding the effect of different mechanical techniques, such as reciprocation and rotation, on postoperative pain. [29] Therefore, the objective of this clinical trial was to evaluate and contrast the frequency and the postoperative pain severity among patients diagnosed with symptomatic irreversible pulpitis. This was achieved by employing two distinct instrumentation techniques: the One Shape rotary system and the Reciproc reciprocating system.

Endodontic treatment often leads to the experience of postoperative pain as a common sensation. [30,31] In most cases, root canal treatment can effectively reduce the occurrence and intensity of postoperative pain. However, it is possible for certain patients to experience heightened pain immediately after the procedure, which gradually diminishes within the initial two days. [3] While the appropriate handling of post-endodontic pain is vital for both patients and clinicians, there is currently insufficient documentation regarding the specific origins of pain subsequent to root canal treatment. It has been observed that the extent of apical debris extrusion can vary depending on factors, including the number of files utilized, cross section, taper, and cutting efficiency. [25] The instrumentation process has been identified as one significant factor contributing to this phenomenon. The potential cause for this effect may be attributed to the inadvertent expulsion of debris and bacteria during the chemo-mechanical preparation process, which can exacerbate the inflammatory response, particularly in cases where there is pre-existing periradicular inflammation. [3] These findings highlight the necessity for an examination of the commonly employed systems.

Single file instrumentation systems were recently introduced in the market. The utilization of the single file approach has been shown to effectively decrease the amount of time needed for endodontic treatment. In a 2014 study performed by **Bürklein et al** [32], it was noticed that the preparation time was reduced by approximately 62-30% when employing the single-file systems. This discovery holds significant clinical relevance as it allows for a notable reduction in the time required for irrigating and chemically cleansing the root canal system.

In the current study, root canal instrumentation in the intervention group was achieved using Reciproc ***(VDW, Munich, Germany)*** NiTi file. Reciproc single -file concept with reciprocating protocol (4^{th} generation) were recently introduced in the market with some potential advantages including

the reduced number of instruments to reduce the preparation time owing to it's single -file design. They are accessible in three distinct sizes: R25 (25/0.08), R40 (40/0.06), and R50 (50/0.05). They possess an S-shaped configuration, sharp cutting borders, and a tip that does not engage in the cutting process.[33] Reciproc files are made of a new thermo-mechanically processed NiTi wire "M-wire" Which has an optimized alloy's microstructure. M-wire alloy or R-phase which provides enhanced flexibility and increased resilience against cyclic fatigue, reduces screwing effect.[34,35] In addition, showing better canal centering ability with lesser incidence of canal transportation and elimination of cross contamination **(Gavini et al., 2012[36]; Pedulla et al., 2013)[37].**

On the Other hand, in the comparison group root canal preparation was done using One Shape (**MicroMega, Besancon Cedex, France),** another single-file NiTi system that utilizes full-sequence rotary motion (5th generation) and is offered in three different sizes: 25/0.06,30/0.06 and 40/0.06with variable cross sections, longer pitch and anon-cutting safety tip . The fifth generation file system has an offset centre of mass or centre of rotation. This particular design is capable of generating a distinct type of wave motion, one that is mechanical in nature, and this specific wave motion is able to traverse along the active length of the file, thereby reducing the level of entangling that occurs between the file and the dentin, ultimately resulting in a minimization of engagement between these two components. [28,38] Furthermore, it has an improved debris release from the root canal and an enhanced flexibility throughout the active section of the file.[23] One Shape file is made out of austenite 55-NiTi alloy, which exhibits distinct cross-sectional configurations throughout its active length. These configurations include a triangular or modified triangular cross-section with three sharp cutting edges in the apical and middle regions, as well as an S-shaped design with two cutting edges near the shaft and a longer pitch. These designs contribute to the reduction of preparation time, efficient cleaning, and decreased accumulation of debris in the apical region. [26,39]

The Crown-down technique, when performed with engine-driven Ni-Ti systems, minimizes the generation and extrusion of debris throughout the apical foramen. This technique was used in the current study. It was performed to gradually introduce each instrument to the working length using brushing movement and without pressure. This strategy was employed because it allows the instruments to first enlarge the coronal third of the root canal, providing a pathway for debris to escape from the root canal. This follows the principle of Archimedes' screw effect, which reduces the apical extrusion of debris. By cleaning the coronal parts of the canal before addressing the contents of the apical part, the risk of debris being pushed further down is minimized. In addition, the insertion of an instrument is a delicate, passive process **(Vaudt et al., 2009).[42]**

A standardized irrigation protcol was performed using 3ml of 2.6% sodium hypochlorite (NaOCl) solution [43,44,45,46] between every subsequent instrument using a side vented 30 gauge needle to fit to a 3ml disposable plastic syringe. The needle was inserted into the canal space smoothly, stopping 1mm before reaching the working length. An efficient irrigation solution during root canal preparation is needed for the sanitatization process since it facilitates cleansing and shaping while neutralizing necrotic content which benefits root canal enlargement for subsequent filling [47]. NaOCl has gained extensive utilization in endodontics as an irrigant due to its ability to meet a broader range of requirements for endodontic irrigation compared to any other known compound[48,49]. This is because of its pronounced antimicrobial activity, which allows it to rapidly kill vegetative spore-forming bacteria, fungi, protozoa, and viruses (comprising hepatitis A and B viruses, HIV, HSV-1 and-2, and rotavirus) [49]. Also, evidence has

demonstrated that its cytotoxicity is lower compared to 5.25% sodium hypochlorite. [48,49]

Furthermore, copious amount of EDTA gel lubricants and NaOCl are recommended for canal lubrication to prevent binding of the flutes to the dentin and this lead to reduce the incidence of file breakage. **(Bahcall et al.,2005).**[5]

After conducting a comprehensive cleansing and shaping of the root canal system, the root canals were sealed by employing the cold lateral compaction method along with an ADSEAL resin-based sealer specifically designed for root canals. Subsequently, sterile absorbent paper pads were utilized to dry the canals. Complete obturation of the root canal system with a hermetic seal is a prime goal in root canal treatment. It is advised that filler materials with low toxicity and good interfacial adaptability, such as gutta-percha and sealers, be used.[51]

Numerous methods have been devised to attain a satisfactory three-dimensional obturation of the prepared root canal. The widely acknowledged and commonly employed approach at present involves utilizing the cold lateral condensation technique coupled with a resin-based root canal sealer to fill and seal the root canal. [52] Lateral compaction is regarded as the gold standard for cold compaction methods. Also, this technique was chosen because it was reported that it resulted in minimum postoperative pain when compared to thermal obturation technique **(Alonso- Ez Peleta et al., 2012).**[53]

Optimal pain management necessitates the judicious evaluation of pain, which can be accomplished through the utilization of diverse rating scales.[40] The main result of this trial was judged using a numerical rating scale (NRS). Due to its simplicity, reliability, and validity as a pain measurement scale, it has been widely used clinically for pain assessment. [125] It is a uni-dimensional measure of pain intensity in adults, where the most widely used is the 11-item NRS which was used in this trial. [41] NRS had been shown to be more sensitive and less complicated than VAS. **(Sathorn et al., 2008).** [1] The participants were instructed to use NRS to report their pain scores at 6, 12, 24, 48, and 72 hours. [15]

In the event of experiencing postoperative pain that requires control, the participants were asked to note how many painkillers they had taken in the following 3 days after completion of the endodontic treatment as a secondary outcome. In this trial, the prescribed on-demand analgesic consisted of 400 mg tablets of ibuprofen. The administration of analgesics was limited to an on demand case-by-case basis and not provided as a routine prescription of medication, as this practice could potentially impact the outcome measures of the investigation. To summarize, both the reciprocating single file and rotary file system techniques for root canal instrumentation result in the release of debris and neuropeptides expression, as well as postoperative pain due to the inflammatory reaction. It is important to highlight that the number of files employed does not affect these factors, but rather the specific type of movement and design of the instrument.

CONCLUSION

The different motions used for root canal instrumentation have the same effect on postoperative pain as well as the number analgesics administered.

RECOMMENDATIONS

1. Additional studies with increased sample sizes is required to delve deeper into the advantages and disadvantages of these two systems concerning post-endodontic treatment pain.
2. Further research comparing the impact of instrumentation Kinematics on Postoperative pain experienced in patients with necrotic pulp and periapical radiolucency.
3. Conduction of similar clinical trials in molar teeth with curved root

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