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Original Article

Post-Operative Pain Intensity After Using Different Instrumentation Techniques for Canal Preparation

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ABSTRACT

Objective: To measure the intensity of post-operative pain after using two techniques for root canal treatment.
Study Design: Quasi-experimental study.
Place of Study and Duration: Operative Dentistry Department, Fatima Jinnah Dental College, Karachi Pakistan, from May to Oct 2019.
Methodology: The study was conducted on 60 patients referred to the Department of Endodontic, Fatima Jinnah Dental College. Enrolled patients were randomly divided into two groups (A and B) using the sealed envelope technique. Two different root canal file systems were used to assess the post-operative pain intensity in both groups.
Results: The post-operative pain intensity considerably decreased in both groups. The difference between the rotational and reciprocal techniques was found to be statistically insignificant (p=0.86) in the 6 hours (p=0.73) and 24 hours' periods (p=0.147) between the instrumentation techniques. However, pain experienced in the 48 hours was statistically different between the two groups (p=0.03).
Conclusion: Post-operative pain is a consequence of both instrumentation techniques, which should be thoroughly investigated and assessed.

Keywords: Instrumentation, Post-operative pain, Pro-taper, Root canal treatment, Wave-one.

How to Cite This Article: *Avinash, Sheikh A, Ali M, Rashid S, Atkary G, Atkary G. Post-Operative Pain Intensity after using Different Instrumentation Techniques for Canal Preparation. Pak Armed Forces Med J 2022; 72(6): 1937-1940. DOI: https://doi.org/10.51253/pafmj.v72i6.5743*

INTRODUCTION

Root canal treatment (RCT) is a method which involves the cleaning of pulp canals using different instrumentation techniques and filling the prepared canals with an obturating material.[1,2]

There are various methods for root canal preparation, but engine-driven instrumentation has been considered the mainstay for the last many years.[3,4] However, the reciprocating file system was proposed a few years ago as a new technique for root canal preparation.[5] This technique provides its cutting action on a counterclockwise movement while the instrument is released in a clockwise direction. This instrumentation method increases the durability and fatigue resistance of rotary NiTi instruments, which are more prone to fracture due to fatigue and stress when used in continuous rotation.[6]

However, even with the utmost care taken while performing the RCT, the primary problem following a single-visit or multiple-visit RCT is post-operative pain.[7] Previous studies have reported the frequency of post-operative pain ranging from 1.4-16% and sometimes up to 50%.[8] Post-operative pain usually peaks during the first two days and generally subsides after a few hours. However, it may continue for multiple days in some patients.[9] Many factors are responsible for post-operative pain, such as instrumentation technique, extrusion of debris or irrigation, preoperative pain, periapical pathology, and inadequate preparation during root canal instrumentation. Among them, the instrumentation procedure is considered the most important factor.[10]

This study aims to measure the intensity of post-operative pain after a single visit root canal procedure associated with different instrumentation techniques. The study will help us focus more on a technique associated with less post-operative pain and avoid instruments that result in increased discomfort after the root canal treatment.

METHODOLOGY

A quasi-experimental study was conducted at Fatima Jinnah Dental College, Karachi Pakistan, from May 2019 to October 2019. This study was approved by the Ethics Review Committee (Ref No. JAN-2019-OPR01) of Fatima Jinnah Dental College, Karachi Pakistan. In this study, two different root canal instrumentation systems were used to assess the post-operative pain intensity in endodontically treated patients.

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Received: 26 Nov 2020; revision received: 15 Mar 2021; accepted: 30 Mar 2021

Inclusion Criteria: Patients of either gender, aged 18 or older, diagnosed with symptomatic irreversible pulpitis in maxillary and mandibular molars without any systemic disease were included in the study. These patients had a preoperative pain level from 0 to 50 on the visual analogue scale (VAS) of 0-100mm and responded to cold testing.

Exclusion Criteria: All patients presenting with palpation pain, patients presenting with supra-gingival calculus and diagnosis of periodontal disease, patients having no response to cold testing, patients having evidence of widening periodontal space on periapical radiographs were excluded from this study. Pregnant patients and those unwilling to participate in the study were also excluded. Patients with a history of taking antibiotics or analgesia analgesics in the past 24 hours were also not considered.

Sixty patients referred to the Department of Endodontics, Fatima Jinnah Dental College, were enrolled in this study. Only mandibular molars and maxillary molars were included in this study. Informed consent was taken from all the participants before starting the study.

Patients were randomly divided into two groups; Group-A and Group-B. Randomization was done using a sealed envelope. In Group-A, a rotational or Universal protaper file system was used as the instrumentation method, while a reciprocating or Wave one file system was used in Group-B. Before starting the instrumentation, teeth were anaesthetized using a local anaesthetic solution which contained 1.8 ml of Lidocaine with 1:100000 Epinephrine. The buccal infiltration technique was used to anaesthetize the upper and lower anterior teeth, while an inferior alveolar nerve block was given for the lower posterior teeth. After giving anaesthesia, a rubber dam was applied, an access cavity was prepared, and straight-line access was achieved. Working length was determined using an electronic apex locator and radiographs. X-SMART PLUS Endo motor was used, and a designated file system program was used in both groups.

For the rotational system, the canals were instrumented using a universal protaper system in sequence S1 and S2 and then finished at F1, F2 or F3, depending on the size of a canal at a rotational speed of 300rpm and 200g/cm torque. Again, the files were used up to the corrected length. For the reciprocal technique, canals were prepared using a Wave One file with a size of 20/.08 and 25/.8 in a slow in-and-out pecking motion. Again, the files were taken up to the working length. The canals were irrigated continuously throughout the procedure using 2.5% Sodium Hypochlorite solution with a safety tip needle approximately 4mm short of the working length. The final rinse was done using 2.5% Sodium Hypochlorite and 17% EDTA to remove the smear layer.

After completing the instrumentation, the canals were dried with paper points and obturated with a single master Gutta percha cone. The chamber was then filled with ketac molar, and occlusion was adjusted. The whole procedure was done in a single visit. Patients have been prescribed painkillers in case of unbearable pain and were asked to maintain a record of painkiller intake. Pain assessment was done by a single clinician blinded to the groups. Post-operative pain levels were recorded by making phone calls after completing the procedure at intervals of 6, 24, and 48 hours respectively (Figure). The Pain scores were obtained using a 4-point pain intensity scale.[11-13] The pain was categorized as no, mild, moderate and severe. Patients with mild pain required no treatment. Patients with moderate pain significantly decreased after taking painkillers, while patients with severe pain required dental treatment.

Figure: Flow Chart of the Patients Included in the Study

Statistical analysis was conducted using the SPSS version 20 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were expressed as mean and standard deviation. Kruskal Wallis test was used to evaluate the difference among the groups. The *p*-value lower than or up to 0.05 was considered as significant.

RESULTS

A total of 60 patients were recruited for the study. The baseline demographic data of the patients were highlighted in Table-I. Both males and females were included in the study. Thirty-three teeth (55%) treated endodontically belonged to the maxillary arch, while 27(45%) belonged to the mandibular region.

Table-I: Patient Demographics (n=60)

Demographic Factors	Group-A (Rotational File System) n=30 (50%)	Group-B (Reciprocating File System) n=30 (50%)	*p*-value
Gender n(%)			
Male	12(40.0%)	12(40.0%)	1.00*
Female	18(60.0%)	18(60.0%)	
Age (years)			
Median (IQR)	30(17.25)	32(8.5)	0.48‡
Location n(%)			
Maxillary	18(60.0%)	15(50.0%)	0.60*
Mandibular	12(40.0%)	15(50.0%)	

**Chi Square test mann whitney u test*

Unbearable pain was experienced mostly during the first 6 hours following any of the endodontic procedures. However, overall median (IQR) pain intensity in both groups (A and B) considerably decreased over time from 6 hours (3.60, IQR: 1.75) through 24 hours (2.70, IQR: 2.18) & finally to 48 hours (1.60, IQR: 2.40).

The difference in pain intensity between the rotational and reciprocal techniques was statistically insignificant (s=0.176) in the 6 hours. However, pain experienced in the 24-hour and 48-hour time period was found to be statistically different between the two groups (p=0.016) and (p<0.001), respectively, showing that pain intensity was observed to be significantly higher in the Reciprocal Technique-Group as compared to Rotational Technique-Group after 24 and 48 hours of procedure (Table-II).

Table-II: Intensity of Pain at Different Intervals of Time and its Association with Different Techniques (n=60)

Groups	6 hours Median (IQR)	24 hours Median (IQR)	48 hours Median (IQR)
Rotational Technique	3.15(1.55)	2.10(1.95)	1.15(1.15)
Reciprocal Technique	4.05(1.82)	3.10(2.22)	2.85(2.97)
p-value*	0.176	0.016	<0.001

**kruskal wallis test*

DISCUSSION

Our study showed no significant results within 6 hour time period produced by rotational technique and reciprocal technique. Moreover, the rotational and reciprocal techniques were found to be insignificant between groups after 24 hours, which is inconsistent with Cicek *et al*.[3] However, the difference in the last 48 hours category was statistically significant between the groups (p <0.040).

Many factors play an important role in deciding between the single versus multiple-visit endodontic treatment procedure. However, the only factors that the operator can control are instrumentation, irrigation, and obturation.[14,15] Other factors include the preoperative diagnosis, ability to control the infection, anatomy of a root canal, and complications that may arise during the procedure. Then the subjective factors like the symptoms of the patients.[16,17] Demographic factors such as the age and gender of the patient and the location of the tooth showed no significant association with the two types of techniques used in the study. These findings are inconsistent with the other studies.[3] The pain scale used in this study was sufficiently validated and reliable. The patient was followed up for a maximum of 48 hours to assess the post-operative pain, as the prevalence and severity of the pain decreased considerably by the end of the first two days. This study evaluated the effect of two commonly used root canal instrumentation techniques on post-operative pain intensity at different time intervals. Both the instrumentation techniques utilized within this study showed similar results for the incidence and intensity of pain study conducted by Silva *et al*.[18] The results of the reciprocating technique showed a slight increase in pain scores compared to the rotational technique; however, the difference was insignificant.

The findings of this study also showed that the value of mean post-operative pain scores slowly reduced over time up to 48 hours of follow-up. No study participant complained of any increase in pain from 6-48 hours. However, the mean pain score at the end of 48 hours of follow-up was more for the reciprocal than the rotational technique.

CONCLUSION

Post-operative pain is a consequence of both instrumentation techniques used in this study. The mean scores exhibited that both techniques produced a slight degree of pain that led to patient discomfort, but it warrants no additional treatment.

Conflict of Interest: None

Author Contribution

Following authors have made substantial contributions to the manuscript as under:

A & AS: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

MA & SR: Conception, drafting the manuscript, approval of the final version to be published.

GA & HA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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