Section A-Research paper

Clinical Evaluation of Postoperative Pain After Single Visit Endodontic Treatment Using Different Rotary File System in Tooth with Irreversible Pulpitis

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Abstract

Aim: The objective of this randomized clinical trial was to evaluate the incidence of postoperative pain after root canal treatment of tooth with irreversible pulpitis of teeth using two different instruments rotary file systems.

Material and Method: In this prospective randomized clinical trial, 40 teeth with symptomatic irreversible pulpitis, indicated for root canal therapy, were randomly assigned to two groups according to instrument system used, namely, protaper universal and protaper next. Root canal treatments were performed in single visit. After 12 hours, 24 hours, 72 hours the participants

were asked to rate their level of postoperative pain on a visual analogue scale (VAS) (no pain, mild discomfort, moderate pain, and severe pain). Data obtained were analyzed using the chi square test and Statistical significance was defined as $p < 0.05$.

Result: Results showed that there was a significant differences between both rotary file groups. Postoperative pain was significantly higher in protaper universal group than protaper next file group.

Conclusion: Postoperative pain was lower in the protaper next file system than in the protaper universal file system after single-visit root canal therapy at 12, 24, and 72 h.

Keywords: Root Canal Treatment, Postoperative Pain, Protaper Universal, Protaper Next, VAS

Introduction: As post-obturation discomfort is a major concern, treating patients with symptomatic irreversible pulpitis in a single visit is challenging. Any level of pain experienced following the start of root canal therapy is referred to as post-operative pain.[1] Numerous clinical research have found that post-operative pain can range in intensity from 25% to 40%.[2,3] Preoperatively symptomatic teeth have been found to have a higher prevalence of post-operative pain than asymptomatic teeth.[4] The incidence of post-operative pain was 40% in the first 24 hours and declined to 11% after 7 days, according to a comprehensive study on the prevalence and severity of pain in root canal treated teeth.[5,6]

The elimination of root canal irritants, obturation of the root canal system, and preservation of the normal dentition are the fundamental tenets of endodontic therapy.[7] Despite groundbreaking advancements in root canal therapy (RCT), research has shown that post-endodontic pain can vary in frequency and degree.[8] The prevalence of postobturation discomfort, despite its brief duration, is frustrating for patients and dental surgeons alike, especially when there were no symptoms in the tooth before to treatment.

The general public has a misconception that single-visit endodontic therapy results in increased postoperative pain, discomfort, and flare-ups. Numerous studies demonstrated that single-visit RCTs conducted in critical pulp patients replicated positive results. Compared to multiple visit endodontic therapy, single visit endodontic treatment has a higher risk of flare-up, discomfort, and postoperative pain.[10]

Recently, various single file systems with the capability to prepare root canals with only one instrument have been introduced. Over the years, research has produced the ProTaper Universal (PTU) by Dentsply Maillefer, a full sequence, variable taper rotary

instrument. (Switzerland's Ballaigues). Regarding the system's capacity for shaping, impressive findings have been obtained. The increasing number of instruments, learning curve, and instrument fatigue are some of its drawbacks.[11]

The fifth generation of files, which are more recent, have been engineered with offset centres of mass and/or rotation. This results in a mechanical wave of motion travelling along the file's active length, minimising the file's interaction with the root dentin. This generation is exemplified by ProTaper Next (PTN) (Dentsply Maillefer, Ballaigues, Switzerland).[12] Hence, the objective of this randomized clinical trial was to evaluate the incidence of postoperative pain after root canal treatment of tooth with irreversible pulpitis of teeth using two different instruments rotary file systems i.e. protaper universal and protaper next files.

Material and Method: Present randomized clinical trial was carried out after obtaining the approval of the Institutional Ethical Committee. A total of 40 patients age between 18 and 45 years having symptomatic irreversible pulpitis with mandibular premolar, requiring endodontic therapy were included in the study. Patients with periapical abscess, facial cellulitis, sinusitis, known allergies to aspirin or nonsteroidal anti-inflammatory drugs, known allergies to local anaesthesia, sodium hypochlorite, or chlorhexidine, systemic diseases like cardiovascular disease, renal disease, or any bleeding disorders, as well as pregnant women and nursing mothers, were excluded from the study. The study did not include patients with more than 1 symptomatic tooth.

Patients were divided into two groups using table of random numbers. Group A (n = 20) Protaper universal and Group B (n = 20) Protaper next. All the teeth were treated by single operator. Endodontic therapy consisted of local anesthesia administration and rubber dam isolation followed by access cavity preparation. A size # 10 stainless steel hand K-file (Mani; Japan). Root ZX II apex locator (J Morita Corp, Kyoto, Japan) was used to determine the working length which was further confirmed using periapical radiographs After working length determination, the canal was enlarged to size # 15 using stainless steel hand K-files (Mani; Japan). According to the manufacturer's instructions, root canal preparation was then carried out using one of the two instrumentation systems listed below: Group A with full sequence rotary PTU files up to size F2 (25/08) and Group B with PTN files up to size X2 (25/06) up to the working length in continuous rotary motion at the speed of 300 rpm and torque 2 Ncm.

In both groups, irrigation was done with saline and sodium hypochlorite using side vented needles. 2 ml of 2% chlorhexidine were used during the last irrigation. After the last irrigation, the canals were dried with absorbent paper points before being sealed with AH Plus (Dentsply Maillefer, Ballaigues, Switzerland) sealer and 6% gutta-percha cones that matched the size of the apical preparation. Finally access cavity is filled with Fuji II GIC (GC, Tokyo, Japan). After 12 hours, 24 hours, 72 hours the participants were asked to rate their level of postoperative pain on a visual analogue scale (VAS) (no pain, mild discomfort, moderate pain, and severe pain). Statistical Package for the Social Sciences (SPSS) version 20 is used to calculate and statistically analyse all of the results.

Result: 40 patients were enrolled in the current randomised experiment, and their data were analysed without dropouts or exclusions. From 12 h to 72 h time intervals, Group I protaper universal group displayed a decreasing mean. The highest mean was reported at 12 hours (4.03 ± 0.58), followed by 24 hours (2.59 ± 0.76), and the lowest mean (0.83 ± 0.10) at 72 hours. Except for the intervals following 48 and 72 hours, there was a statistically significant difference between all of the intervals. The protaper next group's findings revealed a decreasing mean during intervals of 12 to 72 hours. The greatest mean was observed at 12 hours (2.78 ± 0.43), followed by 24 hours (1.45 ± 0.32), while the lowest mean was reported at 72 hours (0).

In this study, compared to a protaper Next rotary file, WaveOne gold file caused more noticeable pain. The results of the current study showed that, on average, postoperative pain scores decreased over the course of the 12 to 48-hour period, whereas no postoperative pain were observed after 72 hrs. When comparing the two systems, results showed that protaper universal had higher mean values in all observation periods than protaper next and this was statistically significant at $P \leq 0.05$.

Table no 1: Mean Pain Score (VAS) for Group I

	Time	**Mean with Std. Deviation**	**P Value**
Group I Protaper Universal	12 Hrs	4.03 ± 0.58	< 0.05*
	24 Hrs	2.59 ± 0.76	

	72 Hrs	0.83 ± 0.10	

Table no 1I: Mean Pain Score (VAS) for Group II			
	Time	**Mean with Std. Deviation**	**P Value**
Group II Protaper Next	12 Hrs	2.78 ± 0.43	< 0.05*
	24 Hrs	1.45 ± 0.32	
	72 Hrs	0.00	

Discussion: Over the past 30 years, it has been clear that endodontic disease has a microbiological pathophysiology. Therefore, endodontic illness is treated by removing bacteria from the root canal space by root canal therapy. It is commonly acknowledged that mechanical enlargement of the main canals is necessary for root canal space cleaning and obturation, and most methods and tools are designed with these goals in mind.[4]

In this regard, there have been two techniques suggested. By using an inter appointment dressing during the multi-visit root canal treatment, one method eliminates or prevents remaining germs from repopulating the root canal system. By encasing the remaining bacteria in a complete, three-dimensional obturation and completing the treatment in a single visit, the second strategy aims to eradicate any residual bacteria or render them harmless by depriving the microorganism from nutrition and the space they need to thrive and reproduce.[8]

A single visit for endodontic treatment is also possible. To execute single-visit endodontics, a set of requirements must be met. Regarding the advantages of single-visit versus multiple-visit endodontics, there has been discussion for many years. According to one theory, quick obturation during root canal preparation reduces postoperative pain in single-visit endodontics by limiting the penetration of medicines, irrigants, and repetitive instruments, which are thought to be the causes of postoperative discomfort.[13] In present study was conducted to evalaute the incidence of postoperative pain after root canal treatment of tooth with irreversible pulpitis of teeth using two different instruments rotary file systems i.e. protaper universal and protaper next files.

There have been numerous different methods used to quantify postoperative pain. This study used VAS since it is often used to assess pain severity and has a proven track record of dependability.[14,15] In this investigation, only mandibular premolars are looked at. The irreversible pulpitis preoperative diagnosis was used to select teeth for treatment in order to avoid bias. This removed the possibility that discomfort could be brought on by intracanal medicines or other elements. One appointment was required to treat every tooth. The quantity, nature, and concentration of the irrigating fluids used in all endodontic operations, including root-filling procedures, are all standardised.[16,17]

In present research it was observed that; with increasing time, it was seen that the intensity of the pain gradually decreased in both groups. It makes sense and is to be anticipated that tooth discomfort will lessen over time as the disease process progresses naturally after debridement. None of the patients mentioned any further signs or side effects, such as paresthesia or postoperative edema. The level of care that was taken to establish an atraumatic treatment protocol is highlighted by all of these facts. No participants in either of the therapy groups in the current trial required analgesics at any point during the investigation.

In the present study, it was noted that comparatively higher VAS scores were observed with protaper universal at the end of 12 h, 24 h, showing relatively higher scores even at the end of 72 hr when compared to the protaper next file. The result of our study in accordance to the study conducted by arora et al. (2017).[20]

The discrepancy in the number of files used—five for the protaper universal group against just three for the protaper next group - could be the cause of this.[18] An further explanation can be provided by the protaper next files' off-center rectangular cross section. With such a change in the cross-section, the area in contact with the canal is reduced, which increases cutting efficiency and decreases the amount of time needed for preparation.[19]

Conclusion: Postoperative pain was lower in the protaper next file system than in the protaper universal file system after single-visit root canal therapy at 12, 24, and 72 h

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References

1. Sathorn C, Parashos P, Messer H. The Prevalence of Postoperative Pain and Flare up in Single and Multiple Visit Endodontic Treatment:A Systematic Review. Int Endod J. 2008;41:91–9.
2. Torabinejad M, Cymerman JJ, Frankson M, Lemon RR, Maggio JD, Schilder H. Effectiveness of various medications on postoperative pain following complete instrumentation. J Endod. 1994;20:345–54.
3. DiRenzo A, Gresla T, Johnson BR, Rogers M, Tucker D, BeGole EA. Postoperative pain after 1 and 2 Visit Root Canal Therapy. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002;93:605–10.
4. El Mubarak AH, Abu-Bakr NH, Ibrahim YE. Postoperative Pain in Multiple-visit and Single-visit Root Canal Treatment. J Endod. 2010;36:36–9.
5. Pak JG, White SN. Pain Prevalence and Severity before, during, and after Root Canal Treatment:A Systematic Review. J Endod. 2011;37:429–38.
6. Sudhakar K, Kumar CS, Lavanya A, Swapna S. Influence of instrument design on post-operative pain in single-visit root canal treatment with Protaper Next and V taper 2H rotary systems in symptomatic irreversible pulpitis of multirooted teeth - A randomized clinical trial. J Clin Transl Res. 2020 May 12;5(5):230-235. PMID: 32875132; PMCID: PMC7453807.
7. Chan D. Single visit endodontic treatment in the management of pulpal disease J Dent Res Rev. 2016;3:2
8. Singh S, Garg A. Incidence of post-operative pain after single visit and multiple visit root canal treatment: A randomized controlled trial J Conserv Dent. 2012;15:323–7
9. Neelakantan P, Sharma S. Pain after single-visit root canal treatment with two single-file systems based on different kinematics--A prospective randomized multicenter clinical study Clin Oral Investig. 2015;19:2211–7
10. Jain, Pooja; Sanjyot, Mulay; Bhosale, Swapnil. Assessment of Postoperative Pain after Single-Visit Root Canal Treatment using Wave One® and One Shape® Single File System: A Clinical Study. Journal of Pharmacy And Bioallied Sciences 13(Suppl 2):p S1506-S1512, November 2021. | DOI: 10.4103/jpbs.jpbs_267_21

11. Gambarini G, Laszkiewicz J. A scanning electron microscopic study of debris and smear layer remaining following use of GT rotary instruments. Int Endod J 2002;35:422‐7.
12. Ruddle CJ, Machtou P, West JD. The shaping movement: Fifth‐generation technology. Dent Today 2013;32:94, 96‐9.
13. Fatima SA, Shaik MM, Pain after single visit endodontic treatment using fifth generation file systems -An invivo study. Indian Journal of Conservative and Endodontics, July-September,2017;2(3):107-114
14. Myles PS, Troedel S, Boquest M, Reeves M. The pain visual analog scale: is it linear or nonlinear? *Anesth Analg.* 1999;89:1517–1520.
15. AlOmari T, AlThobiti G, AlThobaiti S, AlOufi F, Masuadi E, Jamleh A. *Clin Oral Investig.* 2020;24:2445–2450. Incidence of postoperative pain after canal shaping by using Reciproc and Twisted File Adaptive systems: a prospective, randomized clinical trial.
16. Fava LR. A comparison of one versus two appointment endodontic therapy in teeth with non-vital pulps. Int Endod J 1989;22:179-83.
17. Kherlakian D, Cunha RS, Ehrhardt IC, Zuolo ML, Kishen A, da Silveira Bueno CE. Comparison of the incidence of postoperative pain after using 2 reciprocating systems and a continuous rotary system: A prospective randomized clinical trial. J Endod 2016;42:171-6
18. Capar ID, Arslan H, Akcay M, Ertas H. An *in vitro* comparison of apically extruded debris and instrumentation times with ProTaper Universal, ProTaper Next, Twisted File Adaptive, and HyFlex instruments J Endod. 2014;40:1638–41
19. Blum JY, Machtou P, Micallef JP. Location of contact areas on rotary Profile instruments in relationship to the forces developed during mechanical preparation on extracted teeth Int Endod J. 1999;32:108–14
20. Arora, Neha; Joshi, Sonal Bakul. Comparative evaluation of postoperative pain after single visit endodontic treatment using ProTaper Universal and ProTaper Next rotary file systems: A randomized clinical trial. Indian Journal of Health Sciences and Biomedical Research (KLEU) 10(2):p 124-130, May–Aug 2017. | DOI: 10.4103/kleuhsj.ijhs_427_16