



Comparative evaluation of postoperative pain between rotary and reciprocating files

Lukka Jagadish¹, Aswathy Krishna²

^{1,2} post graduates, Maharaja Ganga Singh Dental College and Research Centre, Sri Ganganagar, Rajasthan, India

Abstract

Background: During the root canal preparation procedures, dentin chips, pulp tissue, microorganisms and/or irrigants may get extruded into the periradicular tissues. Postoperative pain, which is an undesirable complication, is frequently encountered and found to range between 3% and 58% in root canal treatment. Hence; the present study was planned for evaluation and comparison of postoperative pain between rotary and reciprocating files.

Materials & Methods: A total of 50 patients were enrolled in the present study. All the patients were broadly and randomly divided into two study groups as follows: Group 1: 25 patients in whom treatment was carried out using XPS files (continuous rotary single file system), and Group 2: 25 patients in whom treatment was carried out using REC Blue files (reciprocating single file system). Root canal therapy was carried out in all the patients according to their respective study groups. Visual analog scale (VAS) was used for pain assessment. On a scale of 1 to 10, patients were asked to grade the pain at 24-hour, 48 hour and 1 week postoperative interval. Pain was categorized on the basis of VAS as no pain (0), mild pain (1–3), moderate pain (4–6) and severe pain (7–10). All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software.

Results: Mean VAS at 24 hour postoperatively among patients of group 1 and group 2 was found to be 0.87 and 2.11 respectively. Significant results were obtained while comparing the mean VAS among patients of both the study groups at 24 hours postoperatively. Mean VAS at 48 hour postoperatively among patients of group 1 and group 2 was found to be 0.71 and 1.23 respectively. Significant results were obtained while comparing the mean VAS among patients of both the study groups at 48 hours postoperatively. Mean VAS at 1 week postoperatively among patients of group 1 and group 2 was found to be 0.10 and 0.25 respectively. Non-significant results were obtained while comparing the mean VAS among patients of both the study groups at 1 week postoperatively.

Conclusion: files are associated with lesser postoperative pain in comparison to reciprocating files in patients undergoing root canal therapy.

Keywords: postoperative pain, rotary, reciprocating

Introduction

During the root canal preparation procedures, dentin chips, pulp tissue, microorganisms and/or irrigants may get extruded into the periradicular tissues. Though a thorough control of the working length (WL) may decrease the risk, but nevertheless extrusion of any debris may potentially cause post-operative complications such as flare-ups, which are characterized by pain, swelling causing unscheduled visits of the patients resulting in interappointment emergency^[1, 3].

The incidence of flare-ups is reported to be between 1.4% and 16% after 627 teeth with necrotic teeth were examined over a three-year period. It seems that all current instrumentation techniques result in extrusion of intracanal content into the periradicular tissues, even when the area of preparation does not extend to the apical terminus, but the amount of extruded debris differs between instruments and file designs^[4].

Postoperative pain, which is an undesirable complication, is frequently encountered and found to range between 3% and 58% in root canal treatment. This postoperative pain is dependent on many factors that include host-dependent factors such as host immunity, history of preoperative pain, and occlusal trauma or operator-dependent factors such as chemical, mechanical, or bacterial injury during root canal preparation. Of these, inadvertent extrusion of dentin chips, microorganisms, pulpal tissue remnants, or necrotic debris

into the periapical region during preparation forms a major factor of postoperative pain. This debris varies with the instrumentation technique and the instrument per se. Therefore, an instrument that extrudes minimal debris into the periapical area, thus causing lesser pain, is desirable^[5, 7]. At present, all preparation techniques and instruments are associated with extrusion of debris, even when the preparation is maintained short of the apical terminus. Several studies reported that instrumentation with an in-and-out motion tended to produce more apically extruded debris than instrumentation with rotational motion. This has led to the assumption that engine-driven rotary instruments produce less extrusion than hand instrumentation as rotary instruments have a tendency to pull the debris into their flutes, thus leading the debris out of the root canal in a coronal direction^[8].

Manual preparation is usually associated with more extrusion of debris compared to the use of nickel-titanium (NiTi) systems. Recently, single-file, full-sequence NiTi systems (rotary and reciprocating) have attracted attention, and manufacturers have introduced new single-file systems with different kinematics and file designs. Stainless steel instruments been used in previous years have showed more chances of canal transportation. They have become dispensable with the introduction of the more flexible nickel-titanium (NiTi) instruments. With the introduction of M-wire or control memory wire improved the instruments

(easier, faster and better root canal shaping, greater resistance to fracture) [9, 10]. Hence; the present study was planned for evaluation and comparison of postoperative pain between rotary and reciprocating files.

Materials & Methods

The present study was conducted for assessment and comparison of postoperative pain between rotary and reciprocating files. Ethical approval was obtained from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 50 patients were enrolled in the present study. Inclusion criteria for the present study included:

- Patients within the age group of 25 to 60 years;
- Patients asymptomatic necrosis of maxillary second premolar with absence of peri-apical pathology
- Patients with negative history of any other systemic illness

Complete intra-oral examinations of all the patients were done and demographic details were recorded separately. Thermal and electric pulp tests were used for assessing of pulp vitality and peri-apical status. Detailed charting of the periodontal status of all the patients was done. Patients were instructed to all the patients not to take any form of medication two three prior to study. All the patients were broadly and randomly divided into two study groups as follows:

Group 1: 25 patients in whom treatment was carried out using XPS files (continuous rotary single file system), and Group 2: 25 patients in whom treatment was carried out using REC Blue files (reciprocating single file system)

Local anesthetic solution containing 1:100,000 epinephrine and 4% articaine was used for applying the nerve block. Cavity preparation was made and root canal orifices were located using K-files. Working length was confirmed by per-apical radiography. Root canal therapy was carried out in all the patients according to their respective study groups. Visual analog scale (VAS) was used for pain assessment. On a scale of 1 to 10, patients were asked to grade the pain at 24-hour, 48 hour and 1-week postoperative interval. Pain was categorized on the basis of VAS as no pain (0), mild pain (1–3), moderate pain (4–6) and severe pain (7–10). All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test and student t test were used for assessment of level of significance. P-value of less than 0.05 was taken significant.

Results

In the present study, a total of 50 patients were analysed. All the patients were divided broadly into two study groups; Group 1 and group 2 with 25 patients in each group. Mean age of the patients of Group 1 and group 2 was found to be 42.5 years and 45.8 years respectively. 40 percent of the patients of both the study groups belonged to the age group of 41 to 50 years. 60 percent of the patients of group 1 and group 2 were males while the remaining were females. In the present study, mean VAS at 24 hour postoperatively among patients of group 1 and group 2 was found to be 0.87 and 2.11 respectively. Significant results were obtained while comparing the mean VAS among patients of both the study groups at 24 hours postoperatively.

In the present study, mean VAS at 48 hour postoperatively among patients of group 1 and group 2 was found to be 0.71

and 1.23 respectively. Significant results were obtained while comparing the mean VAS among patients of both the study groups at 48 hours postoperatively. In the present study, mean VAS at 1 week postoperatively among patients of group 1 and group 2 was found to be 0.10 and 0.25 respectively. Non- significant results were obtained while comparing the mean VAS among patients of both the study groups at 1 week postoperatively.

Table 1: Distribution of patients according to age

Age (years)	Group 1		Group 2	
	N	%	N	%
25 to 40	6	24	7	28
41 to 50	10	40	10	40
50 to 60	9	36	8	32
Total	25	100	25	100
Mean (years)	42.5		45.8	

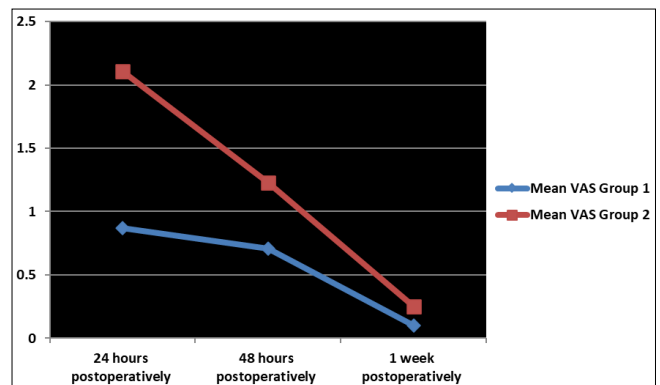
Table 2: Distribution of patients according to gender

Gender	Group 1		Group 2	
	N	%	N	%
Males	15	60	13	52
Females	10	40	12	48
Total	25	100	25	100

Table 3: Comparison of postoperative pain

Time interval	Mean VAS		p- value
	Group 1	Group 2	
24 hours postoperatively	0.87	2.11	0.002*
48 hours postoperatively	0.71	1.23	0.035*
1 week postoperatively	0.10	0.25	0.771

*: Significant



Graph 1: Mean postoperative pain

Discussion

Postoperative pain is a frequent complication associated with root canal treatment, and can be influenced by insufficient root canal preparation, extrusion of irrigant, debris or intracanal interappointment medicament, presence of preoperative pain, presence of periapical pathosis, and apical patency during root canal instrumentation. The apical extrusion of irrigant and debris, including bacteria and necrotic tissue, may lead to postoperative pain, periapical inflammation and postoperative flare-ups. Even though all instrumentation techniques and instruments are associated with debris extrusion, the instrumentation techniques and the design of the files may affect the amount of debris extrusion. Recent studies have demonstrated that reciprocating systems can produce extrusion of debris in the apical region, which could be related with postoperative

pain when compared with other traditional instrumentation techniques. Reciprocating motion may increase the amount of debris extruded beyond the apex and consequently the risk of postoperative pain compared to rotary instrumentation [9, 12].

In the present study, a total of 50 patients were analysed. All the patients were divided broadly into two study groups; Group 1 and group 2 with 25 patients in each group. Mean age of the patients of Group 1 and group 2 was found to be 42.5 years and 45.8 years respectively. 40 percent of the patients of both the study groups belonged to the age group of 41 to 50 years. 60 percent of the patients of group 1 and group 2 were males while the remaining were females. Mollashahi NF *et al* compared the intensity of postoperative pain after endodontic treatment using hand files, single file rotary (OneShape), and single file reciprocating (Reciproc) systems. A total of 150 healthy patients aged between 20 to 50 years old were diagnosed with symptomatic irreversible pulpitis of one maxillary or mandibular molars. The teeth were randomly assigned to three groups according to the root canal instrumentation technique: hand files (control), OneShape and Reciproc. Treatment was performed in a single visit by an endodontist. The severity of the postoperative pain was assessed by the visual analogue scale (VAS) after 6, 12, 24, 48 and 72 h. The patients in control group reported significantly higher mean postoperative pain intensity at 12, 24, 48, and 72 h compared to the patients in the two other groups ($P < 0.05$). There was no significant difference in mean intensity of postoperative pain between Reciproc and OneShape at 5 time points. The instrumentation kinematics (single-file reciprocating or single-file rotary) had no impact on intensity of postoperative pain [13].

In the present study, mean VAS at 24 hour postoperatively among patients of group 1 and group 2 was found to be 0.87 and 2.11 respectively. Significant results were obtained while comparing the mean VAS among patients of both the study groups at 24 hours postoperatively. In another study conducted by Kashefinejad M *et al*, authors compared single visit post endodontic pain using Mtwo (NiTi) rotary and hand K-file instruments. 60 teeth with symptomatic irreversible pulpitis in 53 patients were selected and randomly assigned into two groups of 30 teeth. In group A, the root canals were prepared with Mtwo (NiTi) rotary instruments. In group B, the root canals were prepared with hand K-file instruments. Pain assessment was implemented using visual analog scale (VAS) at four, eight, 12 and 24 hours after treatment. Patients treated with rotary instruments experienced significantly less post-endodontic pain than those treated with hand instruments. The use of Mtwo (NiTi) rotary instruments in root canal preparation contributed to lower incidence of postoperative pain than hand K-files [14].

In the present study, mean VAS at 48 hour postoperatively among patients of group 1 and group 2 was found to be 0.71 and 1.23 respectively. Significant results were obtained while comparing the mean VAS among patients of both the study groups at 48 hours postoperatively. Adiguzel M *et al* compared the postoperative pain intensity following the root canal preparation carried out with XP-endo Shaper (XPS; FKG Dentaire SA, La Chaux-de-Fonds, Switzerland), iRace (iRC; FKG Dentaire SA) and Reciproc Blue (REC Blue; VDW, Munich, Germany) files. Mandibular molar teeth with asymptomatic necrotic pulps in 69 patients were

randomly divided into three groups ($n=23$). The root canals were prepared using XPS, iRC or REC Blue instruments and obturated using the lateral condensation technique. The patients were asked to record their pain intensity at 24-, 48- and 72-hour and 1-week postoperative intervals on VAS. For intolerable pain after the procedure, ibuprofen (400 mg) was prescribed. The postoperative pain gradually decreased during the study period in all the groups ($P < 0.05$). No statistically significant difference was found between iRC system and the two other systems at 12-, 24- 48-hour and 1-week intervals ($P > 0.05$). When compared to XPS system, a higher level of postoperative pain was observed with REC Blue system at 24- and 48-hour intervals ($P < 0.05$). The XPS group exhibited less postoperative pain than the REC Blue group at 24- and 48-hour intervals. iRC, XPS and REC Blue systems were found to be similar in terms of postoperative pain severity [15].

In the present study, mean VAS at 1 week postoperatively among patients of group 1 and group 2 was found to be 0.10 and 0.25 respectively. Non-significant results were obtained while comparing the mean VAS among patients of both the study groups at 1 week postoperatively. Adiguzel M *et al* compared postoperative pain intensity after root canal treatment with One G (OG) vs. R-Pilot (RP) files used for glide path preparation. Ninety-three single-canaled mandibular premolar teeth with asymptomatic non-vital pulp were randomly assigned into 3 groups ($n = 31$): OG, RP, or without glide path (WGP). After creating the glide path, the root canals were prepared using sequential Mtwo rotary files to size 30/0.05. One endodontic specialist carried out single-visit endodontic treatment. The patients were asked to rate the severity of postoperative pain on a visual analogue scale at 24, 48, and 72 hours after the visit. In all 3 groups, postoperative pain decreased significantly at each time interval ($p < 0.05$). At 24 hours, the OG group had less postoperative pain than the WGP group ($p < 0.05$). However, no significant difference was found between the RP group and the others. No statistically significant difference was found among the WGP, OG, and RP groups in postoperative pain intensity at 48 or 72 hours or in analgesic tablet intake at the 3 assessed time intervals. The OG group had less postoperative pain than the WGP group in the first 24 hours [16]. In a randomized multicenter clinical study, Neelakantan *et al*. reported that intensity and duration of postoperative pain was significantly lower in patients undergoing canal instrumentation with Reciproc compared with OneShape. There is a contrast between results of that study and those of the present study, which might be attributed 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 (μ CT) studies have shown that reciprocating motion provides better shaping, with less incidence of canal transportation, compared to rotary files [17, 18]. It should be noted that the results of only one clinical study cannot be generalized to all clinical cases, and more studies regarding this matter are required; therefore, more studies, with larger sample sizes

are warranted to further investigate the drawbacks and benefits of these two systems with regards to pain after endodontic treatment.

Conclusion

From the above results, the authors concluded that rotary files are associated with lesser postoperative pain in comparison to reciprocating files in patients undergoing root canal therapy. However; further studies are needed on this topic.

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