

Original Research

Comparison of Manual and Rotary Instrumentation on Postoperative Pain in Teeth with Asymptomatic Irreversible Pulpitis

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ABSTRACT:

Background: Among the most prevalent complications of root canal treatment is postoperative pain. The goal of this study was to compare the severity of postoperative pain after root canal preparation with RaCe rotary system as well as hand K-Flexofile. **Materials and methods:** With 50 mandibular molars in each group, the sample size was of 100 subjects. The study comprised participants who needed endodontic treatment for asymptomatic irreversible pulpitis in their mandibular first or second molars with normal periapical radiography images. Periapical radiographs were processed and preserved using a specialised scanner and software interface before being used for additional examinations with Rinn XCP devices and a digital radiography system. A physician divided the 100 subjects into two groups of 50 subjects each after choosing the subjects. Gender as well as the number of mandibular first and second molars with three and four root canals were matched between the two groups. **Results:** In both manual and rotary groups, severity of postoperative pain significantly decreased from the beginning to the end at all evaluated time intervals ($P < 0.001$). However, comparison of pain severity between the RaCe rotary and hand K-Flexofile groups did not reveal any significant differences between the two groups ($P = 0.79$). In this context, the mean pain severity scores four hours after treatment were 28.34 ± 5.61 in the RaCe group and 36.57 ± 6.21 in the K-Flexofile group. After eight hours, the pain severity scores were 22.32 ± 4.56 and 29.45 ± 4.72 in the rotary and hand file groups, respectively. The pain severity at both intervals in the rotary group was less than the hand file group, but the difference was not statistically significant ($P > 0.05$). At twelve hours, twenty-four hours, forty-eight hours and seven days intervals, the variations in pain severity among the 2 groups were not noteworthy ($P > 0.05$). **Conclusion:** There were found no numerically considerable variations in pain severity among the two groups at any intervals.

Key Words: Manual Instrumentation, Postoperative Pain, Root Canal Preparation, Rotary Instrumentation.

Received: 15 Jan, 2023

Accepted: 22 Jan, 2023

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This article may be cited as: Kaur A. Comparison of Manual and Rotary Instrumentation on Postoperative Pain in Teeth with Asymptomatic Irreversible Pulpitis. Int J Res Health Allied Sci 2023; 9(3):11- 13

INTRODUCTION

Postoperative pain is a common complication in endodontic treatment with the occurrence of 1.4-16%.^{1,2,3} Age, gender, tooth type, pulp status, presence of sinus tracts and sensitivity and preoperative pain have been reported as risk factors that may affect the incidence of postoperative pain after root canal therapy.² Many contributing factors are responsible for PEP such as improper cleaning and shaping of the canals, missed canals, and improper obturation, of these, the major factor responsible for pain is the extrusion of debris into the apical region that basically depends on the technique of canal preparation. It has been stated that the apical extrusion of contaminated debris during the chemomechanical instrumentation of root canals may exacerbate the inflammatory response

and may induce periapical inflammation.⁴ All instrumentation techniques have been reported to be associated with extrusion of infected debris, even when preparation is maintained short of the apical terminus. Among all the manual techniques, it has been shown that stainless steel files, K-files, extrude more amount of debris apically.^{5,6} Ruiz-Hubard et al. found that less debris was apically extruded using the crown-down pressureless technique in curved and straight canals when compared with step-back instrumentation.⁷ Hence, this study was conducted to evaluate the Comparison of Manual and Rotary Instrumentation on Postoperative Pain in Teeth with Asymptomatic Irreversible Pulpitis.

Material and methods

With 50 mandibular molars in each group, the sample size was of 100 subjects. The study comprised participants who needed endodontic treatment for asymptomatic irreversible pulpitis in their mandibular first or second molars with normal periapical radiography images. Patients having periapical abscesses and sinus tracts were disqualified from the trial. Thermal and electric pulp tests, followed by palpation and percussion, as well as periodontal charting, were used to assess the pulp vitality and periradicular health of each tooth. Periapical radiographs were processed and preserved using a specialised scanner and software interface before being used for additional examinations with Rinn XCP devices and a digital radiography system. A physician divided the 100 subjects into two groups of 50 subjects each after choosing the subjects. Gender as well as the number of mandibular first and second molars with three and four root canals were matched between the two groups.

Results

In both manual and rotary groups, severity of postoperative pain significantly decreased from the beginning to the end at all evaluated time intervals ($P < 0.001$). However, comparison of pain severity between the RaCe rotary and hand K-Flexofile groups did not reveal any significant differences between the two groups ($P = 0.79$). In this context, the mean pain severity scores four hours after treatment were 28.34 ± 5.61 in the RaCe group and 36.57 ± 6.21 in the K-Flexofile group. After eight hours, the pain severity scores were 22.32 ± 4.56 and 29.45 ± 4.72 in the rotary and hand file groups, respectively. The pain severity at both intervals in the rotary group was less than the hand file group, but the difference was not statistically significant ($P > 0.05$). At twelve hours, twenty four hours, forty eight hours and seven days intervals, the variations in pain severity among the 2 groups were not noteworthy ($P > 0.05$).

Table 1: pain severities in 2 groups based on VAS

Interval	Rotary	Manual
4 hours	28.34 ± 5.61	36.57 ± 6.21
8 hours	22.32 ± 4.56	29.45 ± 4.72
12 hours	19.32 ± 3.96	26.45 ± 4.01
24 hours	15.94 ± 3.11	14.77 ± 3.26
48 hours	9.87 ± 2.11	8.36 ± 2.15
1 week	3.45 ± 1.76	3.79 ± 1.63

The number of patients taking analgesics during the first 24-h postoperative period was 29(58%) and 21(42%) in the hand and rotary file groups, respectively, with no significant differences between the two groups.

Discussion

Conventionally, root canal therapy was performed in multiple visits, now a days with the use of recent advances such as NiTi rotary instrumentation, more

reliable apex locators, ultrasonics, microscopic endodontics, digital radiography, newer obturation system, and biocompatible sealing materials enable the practitioners to perform single-visit endodontics in their dental clinics. The rationale for this treatment regimen includes less stress, use of single anesthesia, and less time consuming and reduces the risk of inter-appointment contaminations. All make it very well accepted by the patients.⁸ There are several factors associated with endodontic pain. The preoperative factors include acute exacerbation of chronic lesion, nonvital tooth, previously opened tooth, unusual canal anatomy, periapical cyst abscess, or fractured teeth; while the intraoperative factors include lack of isolation, apical extrusion of intracanal medicaments, irrigating solution, and infected debris, all leading to severe PEP.⁹

Evaluation of pain is inherently difficult; therefore, in the present study the subjects received adequate explanations about postoperative pain and VAS. Most subjects understand VAS technique easily and are able to rate their pain severity. VAS is considered a reliable and valid technique for evaluation of pain relief.¹⁰ In this context, the two groups of the study were matched in relation to age, gender, tooth type, and pulp and periapical status. In addition, all the technique- and operator-related variables were controlled since one single operator performed all the root canal therapy (RCT) procedures; the only differences were the file type and instrumentation technique in two separate groups. A recent systematic review¹¹ reported an incidence rate of 40% for postoperative pain during a 24-h period, which decreased significantly during the first 48 h after treatment, with 10% or less after 7 days, and is consistent with the present study.

In the present study, among both manual and rotary groups, severity of postoperative pain significantly decreased from the beginning to the end at all evaluated time intervals ($P < 0.001$). However, comparison of pain severity between the RaCe rotary and hand K-Flexofile groups did not reveal any significant differences between the two groups ($P = 0.79$). In this context, the mean pain severity scores four hours after treatment were 28.34 ± 5.61 in the RaCe group and 36.57 ± 6.21 in the K-Flexofile group. After eight hours, the pain severity scores were 22.32 ± 4.56 and 29.45 ± 4.72 in the rotary and hand file groups, respectively. The pain severity at both intervals in the rotary group was less than the hand file group, but the difference was not statistically significant ($P > 0.05$). At twelve hours, twenty four hours, forty eight hours and seven days intervals, the variations in pain severity among the 2 groups were not noteworthy ($P > 0.05$).

In a study carried out by Shandilya A et al¹², eighty patients, with asymptomatic irreversible pulpitis in maxillary anterior teeth, were selected and treated with single-visit endodontic treatment. Patients were randomly divided into 2 groups (40 each), Group A (K files using step-back technique) and Group B (ProTaper Next using crown down technique) along

with passive ultrasonic irrigation. Patients were recalled, examined, and asked to fill up questionnaire after 24 h, 48 h, and 7 days. On the basis of response given in the feedback forms, incidence, duration, and intensity of PEP were evaluated. Statistical analysis of the data was carried out using Chi-square test, and level of significance ($P < 0.05$) was evaluated. More incidence of pain was noticed in Group A when compared with Group B. Significant difference found between two groups ($\chi^2 = 22.759$; $P = 0.001$). There was also statistically significant difference between two groups at different time intervals.

In an in vitro study by Yeter et al.¹³, there were no significant differences in extrusion of debris between Revo- system rotary files and hand K-files.

In a study conducted by Mankanjuola JO et al¹⁴, 120 consecutive consenting subjects were included. The inclusion criteria comprised medically fit individuals with restorable anterior, premolar or first molar tooth diagnosed with irreversible pulpitis, pulp necrosis or apical periodontitis; they had no to moderate pain, with periodontally sound and not excessively curved tooth. Randomization was performed by balloting using sealed envelopes and subjects were assigned in equal numbers to one of two groups, rotary and manual. Subjects were monitored following treatment for clinical and radiographic parameters at 1 day, 1 week, 1 month, 3 months and 6 months. Data analysis was done using SPSS-version 20.0, and differences were considered significant if $p < 0.05$. It was discovered that twenty-seven (45%) and 23(38.3%) teeth in manual and rotary group respectively had pain at 1-day review. Significant difference in occurrence of pain in relation to both gender ($p=0.001$) and tooth-type ($p=0.026$) was noted between the groups at 1-day review. By the final review, there was no reported post-operative pain. There was no significant difference between the two groups in relation to the other clinical parameters at the different review periods. Twenty-four (40%) and 16 (26.7%) teeth had pre-existing periapical radiolucency in manual and rotary groups respectively; by final review, periapical radiolucency had reduced to 16.9% and 3.4% respectively, with the rotary group having significantly less radiolucency. Favourable outcome at 6-month review was significantly higher in the rotary group (96.6%), compared to the manual group (83.1%) in ($p=0.033$); the difference in outcome was due to significantly better outcomes with the molar tooth category in the rotary group. There was a significantly more favourable treatment outcome in the rotary compared to the step-back technique in canal preparation, employing clinical and radiographic criteria.

Conclusion

Considering the lack of significant differences in the severity of postoperative pain between the RaCe rotary and hand K-Flexofiles, it appears use of the crown-down technique is more effective in postoperative pain

than the file type. Therefore, it is suggested that future studies evaluate the hand and rotary files with the same crown-down technique in both groups.

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