



Original Article

Evaluation of Postoperative Pain with EndoActivator and Conventional Syringe Irrigation in Single Rooted Teeth

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ABSTRACT

Numerous irrigant activation devices have been produced that may affect the postoperative pain in addition to manual activation techniques during the final irrigation operation. **Objective:** To evaluate the postoperative pain after using EndoActivator and conventional syringe irrigation protocol in single rooted teeth. **Methods:** Patients 18-60 years old with either gender who had symptomatic or asymptomatic apical periodontitis in single-rooted teeth with irreversible pulpitis were included in the study. Fifty patients were randomly chosen and divided into two groups i.e Experimental (EndoActivator irrigation) and control (Conventional needle). Post-operative pain was assessed using a VAS at 24 hours, 3 days, and 7 days. **Results:** Male patients were 13 (52.0%) and 10 (40.0%) and female patients were 12 (48.0%) and 15 (60.0%) with mean age of 33.68 ± 10.13 and 33.64 ± 12.34 years in group A and group B respectively. Post-operative assessment of pain at 24hrs was: no pain 9 (36.0%) and 7 (28.0%), mild pain 10 (40.0%) and 11 (44.0%), moderate pain 6 (24.0%) and 4 (16.0%) patients, severe pain 0 (0.0%) and 3 (12.0%), on day 3rd: no pain 17 (68.0%) and 13 (52.0%), mild pain 7 (28.0%) and 11 (44.0%), moderate pain 1 (4.0%) and 1 (4.0%) and on day 7th no pain 23 (92.0%) and 23 (92.0%) and mild pain 2 (8.0%) and 2 (8.0%) patients in group A and group B respectively. **Conclusions:** There was no significant difference in effectiveness of both irrigation systems.

INTRODUCTION

Post-operative endodontic pain is multifactorial condition results after endodontic intervention. During one or more treatments, patients may experience varying degrees of pain symptoms between visits. The incidence of postoperative pain decreased from 54% to 40% after 24 hours, and to 11% one week after treatment [1]. Root canal irrigation plays a key role in endodontic treatment. It facilitates the installation of the instrument by lubricating, removing debris, microorganisms, and dirt layers and preventing the accumulation of top debris. Removal of bacterial biofilm from the surface of infected canals is one

of the most important issues in root canal irrigation. It is recognized that flushing with a conventional syringe irrigation system can only deliver the cleaning agent to about 1-1.5 mm outside the needle hole. In addition to these various irrigation methods, many irrigations equipment and needle tips have also been developed to use acoustic or ultrasonic energy and negative top pressure to enhance irrigation through the root canal [2]. Nielsen and Baumgartner showed a device aimed at active irrigation and shows promising debris removal while less antibacterial efficiency [3]. The movement of ultrasonic

irrigation is effective, [4] but at a frequency of 20 to 40 kHz, even if a smooth wire designed for "passive ultrasonic irrigation" is used, it may damage the instrument and damage the dentin. EndoActivator is an electric device with preset frequencies of 33, 100 and 167 Hz, but the measured oscillation frequencies are 160, 175 and 190 Hz [5, 6]. The instrument uses polymer needle tips of different sizes (No. 15 taper, No. 0.02 taper, No. 25 taper, No. 0.04 taper, No. 35 taper, No. 0.04 taper) to avoid possible risks associated with ultrasonic powered metal instruments. It does not produce cavitation or acoustic flow, but it has been shown to allow the irrigation fluid to penetrate the dentinal tubules better than static or manual dynamic irrigation. EndoActivator does not produce any cavitation or acoustic flow, but it has been proven that it can better penetrate the dentinal tubules, remove dirt, and decrease damage to root canal, compared to static or manual dynamic irrigation, however, these advantages are not obvious when using small, tapered tips 15, 02 [7]. These activated irrigant delivery systems assert that their use results in enhanced irrigant transfer, debridement, and periapical extrusion that is limited and the elimination of biofilm or smear layers. EndoActivator, which has a maximum output power of 10,000 cycles per minute and various tip sizes, including size 25, taper 0.04, size 15, taper 0.02, or both (size 25, .04 taper and size 35, taper), has been employed in earlier research on irrigation efficiency [8]. However recent studies did not clarify the choice of needle tip, nor did it analyze the impact of needle tip size [9]. This study aim was to evaluate the effectiveness of sonic irrigation (EndoActivator) and traditional single needle irrigation to evaluate post-operative pain.

METHODS

From January to June 2022, the Department of Operative Dentistry, Institute of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro/Hyderabad conducted this randomized control trail using a non-probability sequential sampling approach. To determine the sample size for the comparison of the two groups Open Epi sample size calculator was used. The findings indicated that a total of 50 teeth were split between the two groups (Experimental Group: 25 patients received EndoActivator irrigation and Control Group: 25 patients received Conventional Needle Irrigation). Patients with either gender having age range of 18 years to 60 years were included in the study. Patients with apical periodontitis having symptomatic or asymptomatic teeth and single rooted teeth with irreversible pulpitis were also set as inclusion criteria. Subjects whose teeth have periapical abscess, periodontally compromised teeth were excluded from study. Patients who were taking medicine especially

analgesic and antibiotic and those who belong to ASA III and IV as per American society of Anesthesiologists (ASA) were also excluded from study. After approval of synopsis from Liaquat University of Medical & Health Sciences (LUMHS) and Ethical review committee (ERC) Committee, 50 patients were selected that fulfill the inclusion criteria of the study. Written informed consent in local language was explained to patient and was obtained from all patients before starting the treatment. Preoperative pain score was recorded using VAS scale. After local anesthesia with lidocaine 2% with adrenaline 1:10,0000; teeth were isolated with rubber dam and access was gained and working length was taken with apex locator and verified by radiograph. Root canals which were prepared with protaper rotary file system (M3-Pro Gold) with simultaneous irrigation of 5.25 % NaOCL (canasol, USA). In the trial group, irrigation was carried out for 30 seconds for each irrigant solution using the EndoActivator's 25/04 noncutting polymer tip, which was positioned 2 mm from the working length. After each file insertion, 10 ml of ordinary saline was added. In the control, irrigation was done after each file insertion using a standard 30-G side-vented closed-end needle. Each root canal was dried using paper points and comparable gutta-percha cone (GP) Points (Meta Biomed), which served as the master gutta percha cone and effortlessly extended to the working length (WL). A peri apical radiograph was used to validate the master cone. Using the lateral condensation method, all root canals were sealed with gutta-percha and a calcium hydroxide-based sealer (Kerr Sealapax), and the treatment was completed with cavit (3MESPE) interim restorations in the access cavities. Each patient received postoperative analgesics. The level of pain was measured postoperatively 24 hours, 3rd day and 7th day on using visual Analog Scale. (0: no pain 1-3: mild pain 4-7: moderate pain and 8-10: severe pain). On 7th day of follow up permanent restoration was placed. The statistical software for social sciences (SPSS) version 23.0 was used to input and analyze the data. Age was a quantitative variable for which the mean and standard deviation were determined. For qualitative characteristics including gender, postoperative discomfort, frequencies and percentages were determined. Chi square test was applied by taking $p \leq 0.05$ as a significant to compare the effectiveness of both groups.

RESULTS

In this study 13 (52.0%) and 10 (40.0%) patients were male and 12 (48.0%) and 15 (60.0%) patients were female in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. In this study enrolled patients were grouped as; 18-30 years having 10 (40.0%) and 12 (48.0%) patients, 31-40 years having 10 (40.0%) and 6

(24.0%) patients, 41-50years having 4 (16.0%) and 5 (20.0%) patients and 51-60years having 1 (4.0%) and 2 (8.0%) patients in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively Table 1.

Table 1: Patients Distribution according to Gender (N=70)

Gender	Group A	Group B	p-value
Male	13 (52.0%)	10 (40.0%)	0.395
Female	12 (48.0%)	15 (60.0%)	
Total	25 (100.0%)	25 (100.0%)	
Age	Mean ± SD	Mean ± SD	0.990
	33.68 ± 10.13	33.64 ± 12.34	

Distribution of pain assessment at 24 hours in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) was done. In this study enrolled patients pain level was distributed into; no pain having 9 (36.0%) and 7 (28.0%) patients, mild pain having 10 (40.0%) and 11 (44.0%) patients, moderate pain having 6 (24.0%) and 4 (16.0%) patients and severe pain having 0 (0.0%) and 3 (12.0%) patients in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. On applying chi-square test p-value was 0.296 (non-significant) Table 2.

Table 2: Patients Distribution According to Pain Assessment at 24 Hours (n=50)

Pain	Group A	Group B	p-value
No Pain	9 (36.0%)	7 (28.0%)	0.296
Mild Pain	10 (40.0%)	11 (44.0%)	
Moderate Pain	6 (24.0%)	4 (16.0%)	
Severe Pain	0 (0.0%)	3 (12.0%)	
Total	25 (100.0%)	25 (100.0%)	

Distribution of pain assessment on 3rd day reported no pain having 17 (68.0%) and 13 (52.0%) patients, mild pain having 7 (28.0%) and 11 (44.0%) patients and moderate pain having 1 (4.0%) and 1 (4.0%) patient in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. p-value was 0.491 (non-significant) Table 3.

Table 3: Patients Distribution According to Pain Assessment On 3rd Day (n=50)

Pain	Group A	Group B	p-value
No Pain	17 (68.0%)	13 (52.0%)	0.491
Mild Pain	7 (28.0%)	11 (44.0%)	
Moderate Pain	1 (4.0%)	1 (4.0%)	
Total	25 (100.0%)	25 (100.0%)	

Distribution of pain assessment on 7th day demonstrated no pain having 23 (92.0%) and 23 (92.0%) patients and mild pain having 2 (8.0%) and 2 (8.0%) patients in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. P-value was 1.000 (non-significant) Table 4.

Table 4: Patients Distribution According to Pain Assessment On 7th Day (n=50)

Pain	Group A	Group B	p-value
No Pain	23 (92.0%)	23 (92.0%)	

Mild Pain	2 (8.0%)	2 (8.0%)	1.000
Total	25 (100.0%)	25 (100.0%)	

DISCUSSION

The efficacy, durability, and dependability of contemporary endodontic treatments are supported by the efficiency of endodontic files, rotary instruments, irrigating solutions, and chelating agents to clean, shape, and disinfect root canals [10-12]. In order to improve the distribution of irrigant throughout the root canal utilising sonic or ultrasonic energy and negative apical pressure, a variety of irrigation solutions with a wide variety of irrigation systems and needle tips have been created [13, 14]. Irrespective of their pulp and periradicular state, 25-40% of patients suffer postoperative pain, which is defined as the feeling of any discomfort after root canal therapy [15, 16] post-endodontic discomfort often develops during the first two days of therapy and subsides within a few hours. But sometimes it lasts for many days. Thus, the practitioner has a significant problem in managing pain during and after root canal therapy [17-19]. Conventional syringe irrigation does not lead to thorough cleaning of root canal anatomy, so ultrasonic irrigation (EndoActivator) is introduced which increases the flow and distribution of irrigant throughout the root canal and clean the canal walls, irregularities within the canal and apical third of canal. In this study, male patients with symptomatic or asymptomatic apical periodontitis were 13 (52.0%) and 10 (40.0%) and female patients were 12 (48.0%) and 15 (60.0%) in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. Different similar studies also reports that female patients were mostly affected with symptomatic or asymptomatic apical periodontitis as compared to male patients [20-23]. In this study, mean age of symptomatic or asymptomatic apical periodontitis patients was 33.68 ± 10.13 and 33.64 ± 12.34 years, whereas majority of the patients were in age group of 18-30 years having 10 (40.0%) and 12 (48.0%) patients followed by age group of 31-40 years having 10 (40.0%) and 6 (24.0%) patients, 41-50 years having 4 (16.0%) and 5 (20.0%) patients and 51-60 years having 1 (4.0%) and 2 (8.0%) patients in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. Ahmed *et al.*, reported the mean age of 27.8 ± 5.2 and 28.8 ± 5.6 years in both groups [21]. Shaik *et al.*, reported the mean age of 34.43 ± 6.26 and 33.57 ± 6.18 years in both groups [22]. Ali *et al.*, reported the mean age of 32.7 ± 7.8 and 31.2 ± 7.7 years in both groups [23]. In this study, pre-operative assessment of pain shows non-significant difference (p-value = 0.810) in both groups i.e., 6.76 ± 6.76 vs. 6.60 ± 2.47 in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. Similarly, post-operative assessment of pain also shows non-significant difference

in both groups at 24 hours (p -value = 0.296), on 3rd day (p -value = 0.491) and on 7th day (p -value = 1.000). Post-operative assessment of pain was; no pain 9 (36.0%) and 7 (28.0%) patients, mild pain 10 (40.0%) and 11 (44.0%) patients, moderate pain 6 (24.0%) and 4 (16.0%) patients and severe pain 0 (0.0%) and 3 (12.0%) patients at 24 hours, no pain 17 (68.0%) and 13 (52.0%) patients, mild pain 7 (28.0%) and 11 (44.0%) patients and moderate pain 1 (4.0%) and 1 (4.0%) patients on 3rd day and no pain 23 (92.0%) and 23 (92.0%) patients and mild pain 2 (8.0%) and 2 (8.0%) patients on 7th day in group A (EndoActivator irrigation) and group B (Conventional Needle Irrigation) respectively. Ahmed et al., and Shaikh et al., also reports the non-significant post-operative pain in both groups, whereas one study reports the that EndoActivator group resulted in significantly less postoperative pain and analgesics intake than endodontic needle group [21, 22].

CONCLUSIONS

It was concluded from the study that there was no significant difference in effectiveness of both irrigation systems EndoActivator irrigation and conventional syringe irrigation in the management of postoperative pain in the treatment of single-rooted teeth.

Authors Contribution

Conceptualization: S, SAK

Methodology: S, M, SE

Formal analysis: S, M

Writing-review and editing: SAK, AAK, M, RK

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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