EGYPTIAN DENTAL JOURNAL
www.eda-egypt.org
VOL. 70, 3789:3794, OCTOBER, 2024
PRINT ISSN 0070-9484 • ONLINE ISSN 2090-2360
CONSERVATIVE DENTISTRY AND ENDODONTICS
Submit Date : 01-06-2024 • Accept Date : 05-08-2024 • Available online: 05-10-2024 • DOI : 10.21608/edj.2024.293625.3064

EVALUATION OF POSTOPERATIVE PAIN AFTER IRRIGATION WITH DIFFERENT IRRIGATION TIPS IN TEETH WITH IRREVERSIBLE PULPITS (A RANDOMIZED CLINICAL TRIAL)

Mahmoud Hamdy*, Reem Ahmed Lutfy Abdel Rahman** *and* Karim Galal Abdel-Kader ***

ABSTRACT

This randomized clinical trial evaluated and compared the post-procedural pain after using two different irrigation tips; end-vented NaviTip tip and double side-vented NaviTip irrigator tip immediate postoperatively and 4, 12, 24, 48, 72 hours and 7 days with irreversible pulpitis in mandibular posterior teeth.

Participants and methods: 38 patients aged between 18-60 years were included in the study and underwent one-visit root canal treatment. NiTi ProTaper system was used for the preparation of root canals, then participants were randomly divided into two equal categories based on the used irrigation needle: **Category (A)** Vented end Tip NaviTip 29-gauge of 27 mm (control) and **Category (B)** NaviTip 31-gauge 27 mm with Side vented Irrigator Tip (intervention), The irrigation needles were penetrated at a distance of 2 mm less than the operating length. Postoperative pain was recorded through numerical rating scale (NRS) and at varied periods during follow up as previously mentioned. The intake of the given placebo capsules and prescribed analgesic tablets were recorded.

Results: The two groups revealed no considerable difference in the demographics, prevalence of pre-procedural pain and postoperative pain at 4, 12, 24 and 48 hours as well as 7 days (P>0.5). Also, the two categories displayed no statistical variance regarding intake of placebo and analgesic tablets (P>0.5).

Conclusion: It could be suggested that there is no significance difference between End and Side vented NaviTip and between numbers of analgesics pills intake between two categories. There was considerable reduction in intensity of preoperative pain compared with the other time periods.

KEYWORDS: End-vented NaviTip, Irrigation, Post-procedural pain, Side-vented NaviTip

* Master Degree at Endodontic Department, Faculty of Dentistry, Cairo University, Egypt
** Professor, Endodontic Department, Faculty of Dentistry, Cairo University, Egypt
*** Associate Professor, Endodontic Department, Faculty of Dentistry, Cairo University, Egypt

INTRODUCTION

The removal of microorganisms from the root-canal system and the avoidance of their reinfection are the main factors determining the outcome of endodontic treatment. The root canal system is designed with continuous irrigation in mind to clear the root canal space of bacteria, biofilms, and other detritus, as well as inflammatory and necrotic tissue. [1] More than 35% of the root canal's surface may remain uninstrumented during non-surgical root canal therapy, despite the availability of a plethora of contemporary methods and tools. [2]

Sodium hypochlorite (NaOCl) has a broad anti-bacterial spectrum, possesses some ability to inactivate endotoxins.[3,4,5] and dissolves pulpal collagen and remnants. Despite its disagreeable flavor, toxicity, and incapacity to entirely eliminate the smear layer, NaOCl is still the preferred irrigant. [6]

The problem of needle irrigation is the requirement for the irrigation needle to be in close proximity to the apex in order to increase irrigation efficiency, as it has been shown that the irrigating solution is delivered only. 1- 2 mm deeper than the tip of the needle. [7] Nonetheless, the likelihood of apical ejection of the irrigant increases with the distance between the needle tip and the apical tissues; [8] with subsequent irritation of the periapical tissue in the form of swelling, pain, and damaged tissue. The risk of irrigant extrusion beyond the apex during irrigation is reduced when a safe end side vented needle is used in close proximity to the apex. [9]

Irrigant extrusion beyond the apex is considered one of the most common reasons that may cause postoperative pain. [10] Few studies investigated the impact of irrigation devices and strategies on post-operative pain [11], [12]. Therefore,, this work aimed to compare post-surgical pain intensity at immediate postoperatively, 4 hours, 12 hours, 24hours,48 hours, 72 hours and 7 days following of side and end vented needles usage while treating mandibular posterior teeth with symptomatic or asymptomatic irreversible pulpitis.

PARTICIPANTSAND METHODS

This is a randomized clinical trial; comparing douple side port irrigator tip NaviTip® 31-gauge 27 mm with end vented tip NaviTip® 29-gauge 27 mm. 38 patients ranged between 18-60 years with asymptomatic or symptomatic teeth with irreversible pulpitis in mandibular posterior recruited from the oral and dental medicine faculty, Cairo University. All participants had good health and receiving no medications that would change pain perception. Ethical approval and informed written consent from the patients were obtained. Exclusion was guaranteed for those with systemic disorders that could impact the therapy, pregnant females, and allergy to the used materials, necrotic pulp teeth, sweeling, periapical radiolucency, or sinus tract.

After history taking and investigations (periapical radiographs and pulp vitality tests), patients were anesthetized using Mepivacaine HCl 3% (ALEX CO., Egypt) (3.6 ml). Access cavity preparation was done by a small round Endo-Z bur. Rubber dam was used for tooth isolation. Using an apex locator, the working length was calculated and radiographically verified to be 0.5–1 mm shorter than the radiographic apex. Rotary ProTaper made of nickel-titanium was used to prepare root canals. The canals were irrigated using the assigned irrigation protocol. For each group, the irrigation was applied as follows:

Group 1: Double side port irrigator apex **NaviTip®** 31-gauge 27 mm (Ultradent Products Inc., South Jordan, UT, USA).

Group 2: End vented apex **NaviTip** 29- the gauge 27 mm (Ultradent Products Inc., South Jordan, UT, USA).

All patients underwent distribution of sodium hypochlorite by a syringe. Irrigation was performed within 2 mm short of the final working length, which

was verified by rubber stops. After using each rotary instrument for a duration of 30 seconds, 2 milliliters of 2.5% NaOCl were expressed. As a last flush, 10 milliliters of distilled water were added after 3 milliliters of 17% EDTA was used for a minute to remove the smear layer.

The canals were obturated using ProTaper gutta percha cones matching the final preparation size and auxiliaries as needed till the canal orifice opening with Resin based Sealer ADSEAL. All the interventions were performed in one visit. The tooth was restored using temporary filling.

All candidates received one capsule of placebo and tablets of 200 mg ibuprofen following treatment and to take the placebo then only one pill if needed within the 0–4-hour time interval following treatment and administration of one every 8 hours in case of pain and to calculate the frequency of pills needed.

RESULTS

In each group, there was a potential reduction in median preoperative NRS scores compared with immediate postoperative, 4, 12, 24, 48 and 72 hours, as well as 7 days. However, there was no statistically significant decrease in median NRS scores comparing immediate postoperative with 48 and 72 hours and one week. Also, no statistically considerable decrease was found in median NRS scores comparing scores at 48 hours to 72 hours and 7 days or comparing 7 days to 72 hours.

The pain incidence wasn't varied in immediate-postoperative, after 4 hours, after 12 hours, after 24 hours, after 48 hours at different pain categories between the two groups. After 72 hours, the pain disappeared in both categories.

TABLE (1) Numbers (n), proportions and findings of Chi-square (x2) and fisher exact tests for comparison of pain incidence for different pain categories between the two groups.

Different Time intervals	Pain category	Group A		Group B		P value
		No	%	No	%	
Preoperative pain	Mild	0	0.0	1	5.3	0.410
	Moderate	9	47.4	6	31.6	
	Severe	10	52.6	12	63.2	
Immediate	No Pain	14	73.7	16	84.2	0.693
	Mild/moderate	5	26.3	3	15.8	
After 4hr	No Pain	1	5.3	1	5.3	0.900
	Mild	9	47.4	10	52.6	
	Moderate	7	36.8	5	26.3	
	Severe	2	10.5	3	15.8	
After 12hr	No Pain	3	15.8	4	21.1	0.897
	Mild	9	47.4	10	52.6	
	Moderate	6	31.6	4	21.1	
	Severe	1	5.3	1	5.3	
After 24hr	No Pain	6	31.6	7	36.8	0.815
	Mild	11	57.9	11	57.9	
	Moderate	2	10.5	1	5.3	
After 48hr	No Pain	16	84.2	16	84.2	1.000
	Mild/moderate	3	15.8	3	15.8	

Patients take Placebo: ***There was no considerable variance between the two categories.***

Treated Patients (200mg Ibuprofen): ***there was no potential variance between the categories.***

The number of Ibuprofen pills administrated: ***The number of Ibuprofen pills intake between both groups wasn't varied (p=0.904).***

DISCUSSION

Post-surgical pain is any pain that occurs following RCT initiation, whereas flare-up is the onset or pain continuation and/or swelling post endodontic management. [13,14]

The objective of this trial was the comparison of difference in postopergative pain following usage of irrigation using End and side vented NaviTip needle. Pain after treatment of root canal is a common event for patients [15]. Among the mechanical causes of irreversible pulpitis patients' postoperative discomfort are over-instrumentation, and among the chemical causes are the extrusion of irrigants, intracanal materials, or filling materials. [16] Great effort was exerted to minimize any unavoidable causes of postsurgical pain. This trial included only candidates who had spontaneous pain associated with non-reversed pulpitis teeth with no radiological signs or clinical symptoms of chronic or acute or apical periodontitis [17].

Mandibular posterior teeth (premolars and molars) were eligible because of higher incidence of post- operative pain and flare-up than maxillary teeth[18,19]. This might be attributed to the dense bone trabeculae with lower blood flow and localized infection resulting in delayed healing in mandibular teeth [20]. In addition, longer time is needed to treat posterior teeth with resultant decreased anesthetic efficacy and increased patient apprehension might contribute to the higher postoperative pain.[20] **Kirchner et al.**[21] stated no significant variation in postprocedural pain between mandibular molars and premolars.

In this work, intracanal irrigant was 2.5% of NaOCl in agreement with **Gomes-Filho et al.**[22] who demonstrateda good biocompatibility. Irrigation was performed within 2 mm below the intended operating length, as confirmed by rubber stops. **Bout- sioukis et al.**[10] reported that the needle penetration depth of 2 or 3 mm shorter from working length was considered as a proper depth to ensure adequate ex- change of irrigant as the apical pressure decreased with effective debris removal.

NRS was used to measure the pain intensity dur- ing access preparation and instrumentation as it is characterized by sensitivity to small changes, responsiveness, high test-retest reliability and validity [23]

The intensity of pain was preoperatively recorded, immediately and at 4, 12, 24, 48, 72 hours postoperatively and after 7 days. Recording of pain was performed at intervals as the immediate postoperative interval supply a reference for postsurgical pain following root canal treatment [24], the 4hour postoperative interval provides adequate time for the anesthetic impact to vanish [25] and the 12- and 24-hour intervals were selected as researches revealed that most cases of the postsurgical pain occurred on the first day following endodontic treatment.[26, 27] One study [28] found that most of pain after endodontic treatment occurred 24-48 hours interval, hence, the pain was recorded at such intervals in this study. **Singh et al.** [29] displayed that some subjects may complain pain till one week following root canal treatment. Thus, pain was evaluated at 72 hours and 7 days postoperatively.

Side vented NaviTip and End vented one displayed a notable decline in pain level that was recorded instantly postoperative, 4 hours, 12 hours, 24 hours, 48 hours, 72 hours and 7 days post- operatively until lapsed. This is in line with previous research that found reduction of post-obturation pain incdence over time; it was highest during the first 48 hours, with a steady declining in the subsequent 7 days. [30, 31]

Results revealed no considerable variation between End vented NaviTip and Side vented NaviTip regarding postsurgical pain which was in accordance to **Middaha et al.** [32] who reported no potential different between continuous ultrasonic irrigation and end vented needle at different time interval except first 24 hours as there was significant decrease in pain in continuous ultrasonic irrigation group.

In accordance to the result of this study, **Bilgil et al.** [33] found no clinical variation between vibringe and conventional irrigation groups at different time intervals.

This was in contrast to **Ramamoorthi et al.** [34] who reported that Endo Activator resulted in significantly less postoperative pain than syringe with 27-gauge open end needle. This may be related to irrigant activation by Endo Activator and the treatment was performed in 2 visits. Moreover, two rotary files were applied in the present work, only universal ProTaper rotary files were used in the mechanical preparation.

Also, in contrast to Al-zaka IM [35] found significant less post pain by using the Safety Irrigator than subsonic Endo Activator and conventional irrigation. This could be explained by the safety irrigator, an irrigation and evacuation device that uses a big needle at the root canal orifice to evacuate the solution and an apically delivered irrigant under positive pressure through a thin needle with a lateral hole. Also, the types of selected teeth were the anterior ones, whereas in current study the posterior ones were selected.

Placebos were administered to avoid prompt administration of analgesics because of psychological fear that could have an impact on the study's results. [36]

Patients were only prescribed 200 mg of ibuprofen as an over-the-counter medication if they experienced pain after taking the placebos drug during the 7 days follow-up period. It has shown to have a faster and higher effect on pain reduction with minimal safety concerns. A minimal dosage of ibuprofen was recommended because a bigger amount could skew the results, particularly given the extremely low pain levels produced by our endodontic treatment approach overall. [37]

The findings revealed no potential variations between both groups in drug administration; thus, the impacts of this variable were considered to be minimized.

CONCLUSION

It could be deduced that:

- Both side and end vented NaviTip displayed no significant difference.
- The numbers of analgesics pills intake didn't differ be- tween two categories.
- Preoperative pain intensity revealed significant reduction compared with other time intervals.

REFERENCES

1. European Society of Endodontology, Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. Endod. J 2006; 39:921–30
2. Burleson A, Nusstein J, Reader A, Beck M. The in vivo evaluation of hand/rotary/ultrasound instrumentation in necrotic, human mandibular molars. J Endod. 2007; 33:782-87.
3. Schäfer E, Zapke K. A comparative scanning electron microscopic investigation of the efficacy of manual and automated instrumentation of root canals. J Endod. 2000; 26:660-64.
4. Siqueira J, Rôças I, Favieri A, Lima K. Chemomechanical reduction of the bacterial population in the root canal after instrumentation and irrigation with 1%, 2.5%, and 5.25% sodium hypochlorite. J Endod. 2000; 26:331-34.
5. Ricucci D, Siqueira J. Biofilms and apical periodontitis: study of prevalence and association with clinical and histopathologic findings. J Endod. 2010; 36:1277-88.
6. Zehnder M. Root canal irrigants. J Endod. 2006; 32: 389-98.
7. Nielsen B, Craig J. Comparison of the EndoVac system to needle irrigation of root canals. J Endod. 2007; 33:611-15.
8. Al-Jadaa A, Paqué F, Attin T, Zehnder M. Acoustic hypochlorite activation in simulated curved canals. J Endod.2009; 35:1408-11.
9. Beus C, Safavi K, Stratton J, Kaufman B. Comparison of the effect of two endodontic irrigation protocols on the elimination of bacteria from root canal system: a prospective, randomized clinical trial. J Endod. 2012; 38:1479-83.
10. Boutsioukis C, Lambrianidis T, Verhaagen B, Versluis M, Kastrinakis E, Wesselink P, Sluis L. The effect of needle-insertion depth on the irrigant flow in the root canal: evaluation using an unsteady computational fluid dynamics model. J Endod. 2010; 36:1664-68.

11. Gu L, Kim J, Ling J, Choi K, Pashley D, Tay F. Review of contemporary irrigant agitation techniques and devices. J Endod. 2009; 35: 791-804.
12. Hülsmann M, Hahn W. Complications during root canal irrigation - literature review and case reports. Int Endod J. 2000; 33:186-93.
13. Sathorn C. The prevalence of postoperative pain and flare-up in single- and multiple-visit endodontic treatment: a systematic review. Int Endod J 2007; 10: 1-9.
14. ElMubarak H, Ibrahim Y. Postoperative pain in multiple-visit and single-visit root canal treatment. J Endod 2010; 36: 36-38.
15. Sathorn C, Parashos P, Messer H. The prevalence of post-operative pain and flare-up in single- and multiple-visit endodontic treatment: a systematic review. Int Endod J.2008; 41:91-99.
16. Siqueira J., Barnett F. Interappointment pain: mechanisms, diagnosis, and treatment. Endodontic Topics 2004; 7: 93–109.
17. Henry M, Hargreaves K. Peripheral mechanisms of odontogenic pain. Dent Clin North Am 2007; 51:19-44.
18. Arias A, Macorra J, Hidalgo J, Azabal M. Predictive models of pain following root canal treatment: A prospective clinical study. Int Endod J. 2013;46: 784–93.
19. Alaçam T, Tinaz A. Interappointment emergencies in teeth with necrotic pulps. J Endod. 2002; 28:375–77.
20. Mathew S. Post operative pain in endodontics: A systemic review. J Dent Oral Hyg.2015;7:130–37.
21. Watkins C, Logan H, Kirchner H. Anticipated and experienced pain associated with endodontic therapy. J Am Dent Assoc. 2002; 133:45-54.
22. Gomes E, Aurelio G. Comparison of the biocompatibility of different root canal irrigants. J Appl Oral Sci 2008; 16:137-44.
23. Hjermstad M, Fayers P, Haugen F, Caraceni A, Hanks W, Med D, Kaasa S. Studies Comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for Assessment of Pain Intensity in Adults: A Systematic Literature Review. J Pain Symptom Manage. 2011; 41: 1073–93.
24. Brandt G, Anderson P, McDonald N, Sohn W, Peters M.The pulpal anesthetic efficacy of articaine versus lido- caine in dentistry: a meta-analysis. J Am Dent Assoc.2011; 142:493-504.
25. Singh S, Garg A. Incidence of postoperative pain after single visit and multiple visit root canal treatment: A ran- domized controlled trial. J Conserv Dent. 2012; 15: 323-27.
26. Ince B, Ercan E, Dalli M, Dulgergil C, Zorba Y, Colak H.Incidence of postoperative pain after single- and multi-visit endodontic treatment in teeth with vital and non-vital pulp. Eur J Dent. 2009; 3:273-79.
27. Price D, McGrath P, Rafii A, Buckingham B. The vali- dation of visual analogue scales as ratio scale measures for chronic and experimental pain. Pain. Am J Med.1983; 17:45-56.
28. Damyanov N, Witter J, Bronkhorst M, Creugers J. Dental status and associated factors in a dentate adult population in Bulgaria: A cross-sectional survey. Int J Dent. 2012;74(8):17-31.
29. Williamson A, Hoggart B. Pain: a review of three commonly used pain rating scales. J Clin Nurs. 2005; 14: 798-804.
30. Genet M, Wesselink R, Velzen S, Thoden K. The incidence of postoperative pain in endodontic therapy. Int Endod J1986; 19: 221-29
31. Yoldas O, Topuz A, Isci S, Oztunc H. Postoperative pain after endodontic retreatment: single versus two visit treatment. Oral Surg Oral Med Oral Pathol Oral Radiol Endod2004; 98:483-87.
32. Middha M, Sangwan P, Tewari S, Duhan J. Effect of Continuous Ultrasonic Irrigation on Postoperative Pain in Mandibular Molars with Non-vital pulps: A Randomized Clinical Trial. Int Endod J 2016; 10:132-37.
33. Bilgili D, Yilmaz S, Dumani A, Yoldas O. Postoperative pain after irrigation with Vibringe versus a conventional needle: A randomized controlled trial. Int Endod J 2015;10: 88-92.
34. Ramamoorthi S, Nivedhitha M, Divyanand J. Comparative evaluation of postoperative pain after using endodontic needle and Endo Activator during root canal irrigation: A randomised controlled trial. Aust Endod J 2014; 41:78-87.
35. Al-Zaka M. The incidence of pain after root canal treatment using different irrigation methods. TJDS 2012; 1:38-43.
36. Epstein B. Understanding placebos in dentistry. J Am Dent Assoc. 1984; 109:71-74.
37. Bakhsh S, Khan M, Menaa F, Khan A. Parmacokinetic evaluation of ibuprofen-controlled release matrix tablets using hydrophilic Eudragit® polymer and co-excipients. Pak J Pharm Sci. 2015; 28:1745-55.