

Single versus Multiple Sitting Endodontic Treatment: Incidence of Postoperative Pain – A Randomized Controlled Trial

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INTRODUCTION

After root canal therapy (RCT), patients may have complications that might be for smaller or longer periods. Short-term complications comprise inflammation of periapical tissues causing mild pain or flare-up. Pain and swelling usually are due to forcing of endodontic instruments, irrigating solutions, infected debris, and bacteria into the periapical tissues.^[1-3]

Improper procedure results in the persistence of bacteria and subsequent recontamination. This results in persisting inflammation and infection, leading to abscess and sinus tracks. Severe pain and radiographical evidence of periapical bone resorption, necessitates repeat of treatment or extraction of involved teeth. Factors that play a role in defining the success of therapy are tooth type (anterior or posterior), vital or nonvital, and existing periapical conditions. Besides that, the complications may be also due to how much effectively the procedure has been done.^[4,5]

ABSTRACT

Aims and Objectives: The aim of the study is to assess any considerable differences in the incidence and severity of postobturation pain after single- and multiple-visit root canal treatment.

Materials and Methods: We carried our study on 400 successive patients who needed root canal treatment. They were randomly categorized into two groups of 200 each. First group underwent single-visit treatment and the other group underwent multiple-visit therapy. Visual analog scale was employed to evaluate pain preoperatively and postoperatively at 6, 12, 24, and 48 h after obturation. The Statistical Package for the Social Sciences version 20 was employed for analysis.

Results: There was a male predominance (235; 60.26%). Of 390 cases, 167 were vital and 223 were nonvital. There was an insignificant difference between the preoperative and postoperative pain levels of vital and nonvital teeth of both the groups at different time intervals.

Conclusion: There was a less incidence of pain in multiple visit group than single-visit one, which was statistically significant.

KEYWORDS: Pain, randomized controlled trial, root canal treatment, single-visit pulpectomy, Visual Analog Scale

One debated issue in the subject of endodontics is whether to do RCT in one or multiple visits, each of them having their own pros and cons. Inflammation and periradicular tissue destruction due to bacteria result in apical periodontitis, which is due to a dynamic process involving microbe and host defenses at junction of infected root pulp and periodontal ligament. This causes periapical tissue destruction and hard tissue resorption, leading to periapical lesions. The management of apical periodontitis includes complete elimination of microbes and also preventing reinfection by sealing the Root Canal (RC) space.^[6-8]

Single-visit RCTs take less time, cost-effective, prevent RC contamination and/or bacterial regrowth, less stressful

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to patient regarding anesthesia, and instrumentation related to treatment. Other problems are leakage between visits and loss of temporary seal. Its main disadvantage is that there is no possibility for checks, such as culture and reevaluation of tissue response after treatment procedure.^[9,10]

We carried out this randomized controlled trial to determine the incidence and/or severity of postoperative pain and the number of visits for endodontic treatment using “Crown-Down” technique with rotary nickel–titanium (NiTi) instruments.

MATERIALS AND METHODS

This study was conducted on 400 consecutive patients who visited King Fahad Specialist hospital, Al-Qassim, Saudi Arabia, for RCT. The study was carried from July 2017 to May 2018. The study has registered ethical committee approval and consent was attained from all participants (RCT registration number: KFSH/E12A/2017). The sample size was estimated using formula sample size $n = (DEFF \times Np [1 - p]) / ([d^2 / Z^2_{1-\alpha/2} \times (N - 1) + P \times (1 - p)])$, with 95% confidence level, we obtained 384 as sample size, expecting few dropouts, we rounded it to 400. Patients were randomly grouped into two categories (S and M), 200 each, by computer random draw method. Group S underwent single-visit RCT with zinc-oxide eugenol (ZOE) obturation, whereas Group M underwent conventional multiple-visit RCT, with intracanal calcium hydroxide and obturation with ZOE. Visual Analog Scale (VAS, modified Heft Parker) was employed to measure preoperative pain and also postobturation pain at 6, 12, 24, and 48 h postobturation.

INCLUSION CRITERIA

1. Patients above 18 years
2. Patients requiring endodontic treatment
3. Teeth with completely formed foramina and no calcified canals.

EXCLUSION CRITERIA

1. Pregnant patients
2. Patients on antibiotics or corticosteroids
3. Immunocompromised patients and those with complicating systemic disease
4. Patients below 18 years of age.

Pulp vitality was determined by electric pulp tester (Analytic Technology Corp., Redmond, WA, USA).

PAIN MEASUREMENT

Initially, the endodontist who was performing the procedure was properly trained how to use a VAS. Before the treatment, all the participants were told to put a mark on the horizontal scale to correspond to pain intensity with the help of verbal descriptors as a

guide. After treatment, they were requested to fill forms after 6, 12, 24, and 48 h of obturation and return to the department.

ROOT CANAL TREATMENT PROCEDURE

All the procedures were done by a single operator. 2% lidocaine with 1:80,000 epinephrine local anesthesia (Xicaine®, ICPA Health Products, India) was given followed by rubber dam isolation (Hygienic®, Coltene/Whaledent Inc., USA), pulp extirpation, and access preparation. Canals were prepared by hand files and ProTaper engine-driven rotary NiTi files (Dentsply Maillefer, Ballaigues, Switzerland). About 2.5% hypochlorite was used as irrigant, and all teeth were prepared to working length, and with paper points, canals were dried. Then, Group S canals were filled with ProTaper universal gutta-percha (Dentsply Maillefer) and AH plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany), by lateral compaction method and restored with temporary restorative material (Cavit G). However, in Group M canals, sterile dry cotton pellet was put in the pulp chamber, and temporarily seal of the access was done using Cavit-G. After a week, obturation was done [Figure 1]. The filled VAS forms were collected 48 h postobturation.

STATISTICAL ANALYSIS

The obtained data were entered on a Microsoft Excel sheet. The Statistical Package for the Social Sciences (SPSS) version 20 (SPSS Inc., Chicago, IL, USA) was used for analysis. Independent sample *t*-test was done for analysis. Sample size was determined from a similar studies using the formula: $n = ([z\alpha + z\beta] \sigma d) 2$. With a confidence interval of 95% and power of 95% for the study, a sample size of 300 was obtained. $P < 0.05$ was considered statistically significant.

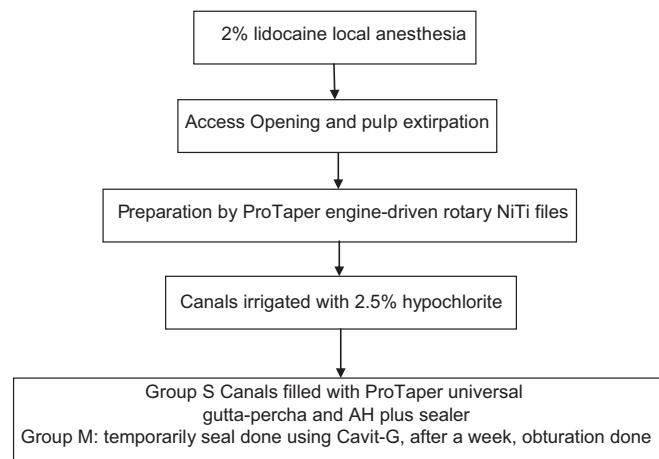


Figure 1: Schematic representation of methodology

Table 1: Categorization of patients based on pulpal status, tooth type, and gender

Variable	Number of participants (%)
Pulp status	
Vital	167 (42.82)
Nonvital	223 (57.18)
Tooth type	
Anterior	170 (43.59)
Posterior	220 (56.41)
Gender	
Male	235 (62.41)
Female	155 (37.59)

Table 2: Sex distribution according to tooth type

Gender	Male	Female	Total
Single-visit group	132	63	195
Multiple-visit group	103	92	195
Total	235	155	390

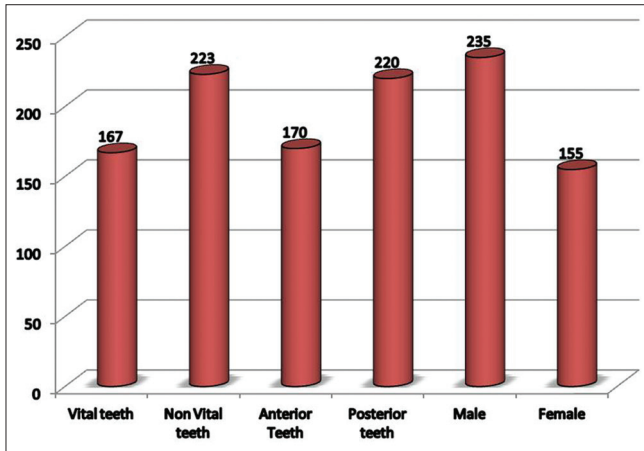


Figure 2: Categorization of patients based on pulpal status, tooth type, and gender

RESULTS

Ten patients (five each from both the groups) were excluded as they did not report back, making the effective sample size as 390 [Table 1, Figures 2 and 3]. Complications or experience of flare-ups were not noticed. Gender of the data revealed a male predominance (60.26% [Table 2]).

Independent sample *t*-test was done for mean and standard deviation of pain at different time intervals, and it revealed statistically insignificant variation in the pre and postoperative pain levels of both the groups [Table 3].

Of 390 cases, 167 were vital and 223 were nonvital. There was an insignificant difference between the preoperative and postoperative pain levels of vital and nonvital teeth of both the groups at different time intervals [Tables 4, 5 and Figure 4].

Table 3: Visual analog scale pain measurements for all cases

Time interval	Mean VAS	SD	P
Preoperative			
Group 1	29.12	28.98	>0.05
Group 2	30.76	22.33	
6-h postoperative			
Group 1	12.96	14.92	>0.05
Group 2	15.12	16.89	
12-h postoperative			
Group 1	10.16	13.75	>0.05
Group 2	11.94	14.39	
24-h postoperative			
Group 1	8.13	10.38	>0.05
Group 2	8.16	11.14	
48-h postoperative			
Group 1	4.42	7.35	>0.05
Group 2	5.31	9.63	

VAS=Visual analog scale, SD=Standard deviation

Table 4: Visual analog scale pain measurements for vital cases only (n=117)

Time interval	Mean VAS	SD	P
Preoperative			
Group 1	30.13	29.33	>0.05
Group 2	31.22	23.98	
6-h postoperative			
Group 1	13.89	17.85	>0.05
Group 2	13.85	15.98	
12-h postoperative			
Group 1	10.37	14.14	>0.05
Group 2	10.08	13.83	
24-h postoperative			
Group 1	9.58	11.92	>0.05
Group 2	7.86	11.18	
48-h postoperative			
Group 1	5.48	9.64	>0.05
Group 2	5.42	9.12	

VAS=Visual analog scale, SD=Standard deviation

DISCUSSION

Even following best possible disinfection by biomechanical preparation and irrigation of canals, bacteria generally persist within the root canal system. Basically, success of RCT is based chiefly on eliminating microorganisms and establishment of an environment which is most favorable for healing. This may be attained either in one visit or in multiple visits, where dressings are placed in between the appointments. Majority of the patients are worried about the chances of encountering pain after endodontic treatment. Hence, both endodontists and patients are ardent to make out the factors that enhance the chances of postobturation pain.^[11-13]

Table 5: Visual analog scale pain measurements for nonvital cases

Time interval	Mean VAS	SD	P
Preoperative			
Group 1	29.27	30.10	>0.05
Group 2	30.14	21.76	
6-h postoperative			
Group 1	12.56	12.34	>0.05
Group 2	16.21	16.87	
12-h postoperative			
Group 1	10.54	13.91	>0.05
Group 2	13.35	14.89	
24-h postoperative			
Group 1	7.12	9.03	>0.05
Group 2	8.38	10.83	
48-h postoperative			
Group 1	3.61	5.31	>0.05
Group 2	5.34	9.63	

VAS=Visual analog scale, SD=Standard deviation

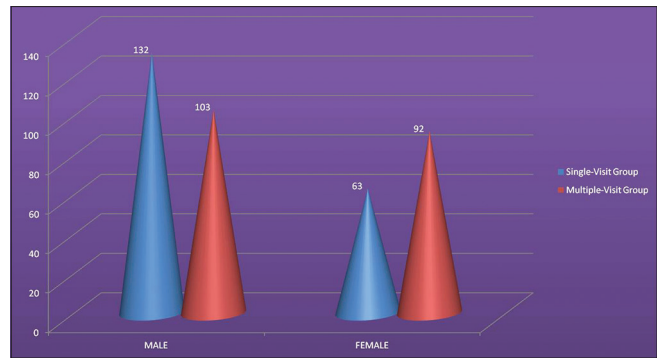
Usually, endodontists favor to carry out RCT of vital teeth in a single visit. There is a dilemma and controversy whether to carry single- or multiple-visit therapy in pulpal necrosis cases with or without apical periodontitis. The primary reason in such cases is that bacteria spread into dentinal tubules, lateral canals, and apical deltas, thus causing difficulties in their elimination by chemomechanical means of preparation. It is believed by many endodontists that in such cases, intracanal medicament should be placed for longer periods as to lessen or eliminate bacteria resulting in better healing.^[14,15]

Pain perception is mainly a subjective and variable experience that depends on many psychological and physical factors. We used a modified Heft–Parker VAS scale. There was no significant variation in pre- and postobturation pain based on age or gender. This is similar to few other studies.^[16-19]

Our first objective was to find the variation in pain incidence in these two methods. We found less incidence of pain in multi-visit group than single-visit one, which was statistically insignificant. Our findings are in accordance with C. Keskin *et al.*^[20] and Soltanoff and Montclair.^[21]

Soares and César evaluated the postoperative pain incidence and periapical healing after 12 months of RCT and found single-session therapy to be successful clinically in 100% of the cases, even though radiographic success was lagging far behind.^[22]

However, Roane *et al.* reported contrast findings that the incidence of pain was higher at a ratio of 2:1 after multi-visit treatment than single-visit mode.^[23]

**Figure 3: Sex distribution according to tooth type**

Our second objective was to assess the intensity of pain and the presence of any flare-ups. We observed that the intensity of pain was more in single-visit group, and there were not any flare-ups. Eleazer and Eleazer reported that single-visit RCT is better than multiple-visit treatment regarding flare-ups.^[24] Mulhern *et al.* did not observe any significant variation among the pain levels of teeth treated in both groups.^[25]

A systematic review revealed that continual irrigation with profuse quantity of antimicrobial agents and mechanical instrumentation significantly reduces intracanal bacterial level.^[26]

RCT, nowadays, is a mainstream procedure in dentistry. RCT is supposed to be successful, and no clinical signs and symptoms are seen in teeth posttreatment and also without any radiographic confirmation of periodontal involvement. Studies have shown that the chief cause of RCT failure is persistent bacteria after treatment. The main reason for endodontic failure is the bacteria. Keeping in mind that to eliminate entire bacteria, nonvital teeth require many appointments with intracanal medicament placed between the visits, we also compared pain levels in vital and nonvital teeth. There was an insignificant variation in the pain levels of both nonvital and vital teeth at various time intervals. In multi-visit group, we did not place any intracanal medicament. We placed Cavit G, which provides a good bacterial tight seal in between the visits to close the access preparations. Literature search and our results do not give any evidence of significantly reduced pain after multi-visit RCT. However, single-visit RCT is not mandatory. The number of visits must be based on careful evaluation of the involved tooth by the endodontist.^[24-27]

We did not record the potential confounding factors, such as the obturation quality and experience of the endodontist. Because of this limitation, our findings have to be interpreted with care. In the future, studies have to be carried out in endodontic clinical settings

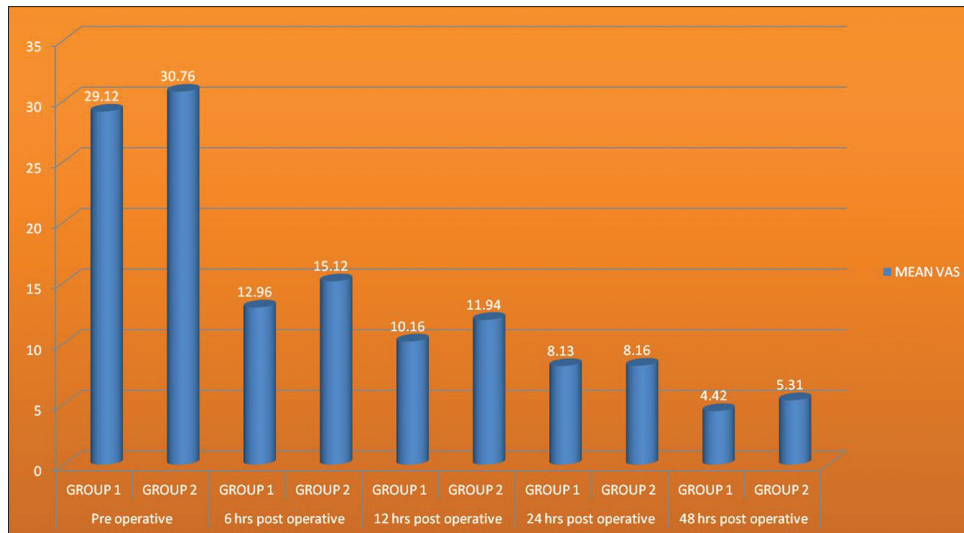


Figure 4: Visual analog scale pain measurements for all cases

with adequately longer follow-up periods since complications are usually expected to arise in the long term.

SUMMARY OF KEY FINDINGS

An insignificant variation was observed among the pre and postoperative pain levels of both vital and nonvital teeth.

LIMITATIONS

The following are the limitations of the study:

1. Smaller sample size
2. Variations between single- and multiple-rooted teeth should have been carried out.

CONCLUSION

We observed less incidence of pain in two-visit group than single-visit one, which was not statistically insignificant and also found more intense pain in single-visit category and did not notice any flare-ups in multi-visit group.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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