ORIGINAL ARTICLE

Comparing the frequency of flare-ups in a single versus multiple visit nonsurgical root canal therapy in multirooted non-vital teeth

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ABSTRACT

Background and Objective: Root canal treatment (RCT) is performed to eliminate pain caused by an infection in the tooth and postoperative pain is one of the complications which distress the patients. An ongoing debate in the field of endodontics concerns the optimal approach to root canal therapy: performing it in one visit or dividing it into multiple visits. Therefore, this study was conducted to compare the frequency of flare-ups occurring in single versus multiple-visit nonsurgical root canal therapy in multirooted teeth with pulpal necrosis.

Methods: This randomized controlled trial was carried out at the Department of Operative Dentistry, Lahore Medical and Dental College, Lahore. A total of 360 patients with multiple-rooted nonvital teeth between the ages of 20 and 60 years, from both genders, were selected and randomly assigned into two groups. In group A, patients underwent RCT in a single visit, while in group B RCT was completed in multiple visits. The procedure consisted of extracting the infected pulp, cleaning, disinfecting, and shaping the canals followed by obturation with an inert material. A flare-up was noted if the patient complained of endodontic pain not controlled with medication and swelling within 24-48 hours of follow up.

Results: There were 148 (41.11%) males and 212 (58.89%) females. The mean age recorded in groups A and B was 41.90 ± 10.94 years and 41.21 ± 9.25 years, respectively. Flare-ups were reported in 21 (11.67%) patients of group A as compared to 5 (2.78%) patients of group B (p-value = 0.001).

Conclusion: The pain control and flare-ups in multirooted teeth with pulp necrosis are better with multiple visits to RCT as compared to a single visit treatment modality.

Keywords: Endodontics, postoperative pain, pulpal necrosis, root canal therapy, nonvital tooth, multiple visits, single visit.

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Introduction

Root canal therapy is the most common endodontic procedure used to treat infected root canal systems. It consists of extracting the infected pulp, cleaning and disinfecting the canals, and shaping the canals, which are then obturated with an inert material to provide a three-dimensional corono-apical seal and permanent restoration.[1] Root canal is considered successful if clinical signs and symptoms as well as radiographic evidence of periodontal involvement subsides. However, teeth might encounter short-term or long-term complications during and after root canal therapy.[2] Mechanical instrumentation, disinfection with different irrigants, and obturation of the root canal system are all completed in a single visit during single-visit root canal therapy. On the other hand, instrumentation is performed on the first visit followed by obturation in the second visit in multiple-visit root canal therapy.[2] Over-instrumentation is associated with pain and edema, ejection of irrigant, intra-canal medicines, infected debris, and bacteria into the surrounding periapical tissues.[3]

Endodontic treatment outcomes are affected by tooth type, vitality, symptomatic/asymptomatic tooth, periapical

involvement, and provision of root canal treatment (RCT). Therefore, completing this procedure in a single visit might be attributable to issues such as post-operative discomfort, flare-ups, rate of effective healing, increased time consumption, and patient's preferences. An abrupt worsening of asymptomatic pulpal/periapical pathosis following the beginning or continuation of RCT is referred to as a flare-up that has an incidence of 2%-20%. Severe pain and swelling within a few hours or days associated with an endodontic flare-up necessitate an emergency unplanned appointment following the first root canal debridement.[4,5] Multiple visits with inter-appointment medication administration may reduce the frequency of flare-ups in teeth with periapical disease and necrotic pulp. In necrotic teeth, a favorable connection exists between single-visit root canal therapy and flare-ups.[6]

In the past years, several local and international studies have been conducted favoring single-visit RCT and found fewer flare-ups in single than multiple-visit endodontics. The endodontic community is engaged in a heated discussion on whether single- or multiple-visit treatment is the optimal method for performing RCT. Therefore, this study was conducted to determine the frequency of flare-ups in multirooted teeth with pulpal necrosis treated with single versus multiple visit nonsurgical root canal. This study may provide clarity on the single-visit versus multiple-visit debate, enhance patient care, and contribute valuable local evidence to guide clinical practice and potentially influence the development or revision of treatment guidelines.

Methods

This randomized controlled trial was carried out at the Department of Operative Dentistry, Lahore Medical and Dental College, Lahore, Pakistan, from February 16, 2019 to August 15, 2019. A total of 360 patients were recruited through a nonprobability, consecutive sampling technique. Both males and females between the ages of 20 and 60 years, who had multiple-rooted nonvital teeth with pain intensity of Visual Analogue Score (VAS) > 4 were included. Patients with systemic diseases like raised blood sugar levels, hypertension, or teeth with specific conditions such as sinus tract, acute abscess, radiolucency, compromised periodontal health, and resorptive lesions, as well as those who had recently experienced mandibular or maxillary trauma within the previous 3-4 weeks, were excluded.

A written consent was obtained after explaining the purpose, advantages, and disadvantages of the procedures of the study to the patients. Demographics (names, age, gender, tooth involvement, mandibular, or maxillary) were recorded and the vitality of the tooth was confirmed. A total of 180 patients were randomized into each group based on 80% research power and a significance level of 5%. In group A, patients have undergone RCT in a single visit. Participants in group B received RCT over two visits and had a calcium hydroxide dressing placed in the canals for 7 days before obturation.

The tooth was anesthetized using local anesthesia (1.8 ml 2% lignocaine) before starting the procedure in both groups. To prepare the canal, instrumentation with hand files was done. After the canal patency was confirmed and the working length radiograph was taken, cleaning and disinfection of the canals using sodium hypochlorite was done followed by shaping the canals, and obturation with an inert material to provide a three-dimensional corono-apical seal and permanent restoration. In group A, all the

Table 1. *Distribution of demographics and flare-ups among 180 patients in both groups.*

Variables	Categories	Group A (*n* = 180)		Group B (*n* = 180)		Total (*n* = 360)	
		Frequency (*n*)	Percentage (%)	Frequency (*n*)	Percentage (%)	Frequency (*n*)	Percentage (%)
Age (years)	20-40	73	40.56	83	46.11	156	43.33
	41-60	107	59.44	97	53.88	204	56.67
	Mean ± SD	41.90 ± 10.94		41.21 ± 9.25		41.56 ± 9.89	
Gender	Male	70	38.89	78	43.33	148	41.11
	Female	110	61.11	102	56.67	212	58.89
Tooth involvement	Mandibular	111	61.67	109	60.56	220	61.11
	Maxillary	69	38.33	71	39.44	140	38.89
VAS	>6	21	11.67	05	2.78	26	7.22
Flare-ups	Yes	21	11.67	05	2.78	26	7.22
	No	159	88.33	175	97.22	334	92.77

above stages of the RCT procedure were done in a single visit while in group B, extraction of pulp, disinfection using sodium hypochlorite, and shaping or root canals were performed in the first visit while obturation was done in the second visit. Painkillers were prescribed every 6 hours in case of pain. Then, patients were followed up in outdoor clinics after 24-48 hours. The flare-up was determined if a patient had experienced endodontic pain as measured by the VAS > 6 score that was not abated by medication, increased edema, or moderate to severe swelling within 24-48 hours after the procedure.

Statistical analysis

Statistical Package for the Social Sciences (SPSS) version 21.0 was used to enter and analyze the data. Mean and standard deviation were calculated for age. While frequencies and percentages were determined for qualitative variables including gender, tooth position, and flare-ups. A chi-square test was applied to compare the frequencies of flare-ups in both groups. *p*-values lower than 0.05 were regarded as significant.

Results

The mean age of the patients in both groups was 41.56 ± 9.89 years with a range from 20 to 60 years. The mean age for groups A and B was 41.90 ± 10.94 years and 41.21 ± 9.25 years.

Table 1 shows that the majority of the patients [204 (56.67%)] belonged to the age range of 41-60 years. Out of 360 patients, 148 (41.11%) were males whereas 212 (58.89%) were females, with a male-to-female ratio of 1:1.4. A total of 26 patients reported VAS greater than 6 on follow-up. Flare-up was reported in 21 (11.67%) patients in group A as compared to 5 (2.78%) patients in group B (*p*-value = 0.001).

Stratification of flare-ups with respect to age, gender, and tooth involvement in both groups is shown in Table 2. The patients belonging to the age group of 41-60 years in group A had significantly higher flare-ups than group B (*p* = 0.002). The flare-ups in group A were reported more in the mandibular teeth as compared to maxillary molars in group B (*p* = 0.001). A significant difference was observed between the two groups with respect to the age, gender, and involvement of teeth in flare-ups. The findings of this study imply that age and tooth position may be the key risk factors for flare-ups in patients with pulpal necrosis undergoing RCT.

Discussion

This study was conducted to compare the frequency of flare-ups in single versus multiple visits for nonsurgical root canal therapy in multirooted teeth with pulpal necrosis. The current study showed that age and tooth involvement were significant risk factors for flare-ups in RCT. Until recent times, the most widely regarded endodontic treatment strategy emphasized multiple-visit procedures.[7] Endodontic treatment may presently be completed in one session. However, convenience, patient acceptability, and reduced postoperative discomfort are all arguments for a single-visit treatment. Multiple-visit root canal therapy has long been taught as a safer approach than single-visit root canal therapy.[8] Furthermore, flare-ups can be handled prior to obturation in multivisit treatments, but this is not a possibility in a single-visit regimen.[9] In the absence of a calcium hydroxide dressing between sessions, bacterial elimination may not be maximized consistently, thus compromising the potential for healing.[10]

A meta-analysis found no significant differences between the single and multiple-visit RCT groups in terms of incidence or intensity of post-endodontic flareup. A single RCT or a series of RCTs are not independent predictors of

Table 2. *Distribution of flare-ups according to age groups, gender, and location of tooth.*

Variables	Categories	Group A (*n* = 180)		Group B (*n* = 180)		*p*-value
		Flare-ups		Flare-ups		
		Yes	No	Yes	No	
Age (years)	20-40	06	67	03	80	0.002*
	41-60	15	92	02	95	
Gender	Male	10	60	00	78	0.160*
	Female	11	99	05	97	
Tooth Involvement	Mandibular	17	94	01	70	0.001*
	Maxillary	04	65	04	105	

*Chi-squared test was used to test the significance levels.

post-endodontic pain or flare-ups following root canal therapy.[11] Another meta-analysis of randomized trials found similar occurrences of post-operative pain in both treatment protocols.[12] A local study compared the single visit versus multiple visits endodontic treatment in teeth with pulpal necrosis in terms of frequency of post-operative pain with reported lesser frequency of postoperative pain in a single visit (20.5%) than the multiple visits treatment (26.5%).[13]

Another randomized controlled trial compared post-operative pain and tenderness on percussion between single and multiple visits of RCT, and found a statistically higher incidence of these outcomes in the group having single-visit RCTs after 24 hours of obturation. However, no flare-ups were recorded in either group after a month.[14] A study conducted in Endodontic Department of Jaipur Dental College India observed fewer flare-ups and reduced post-operative discomfort in single-visit endodontic treatments.[15] Different studies analyzed the strength of risk factors associated with endodontic flare-ups and ranked them in order of relevance. The multiple-visit endodontic treatment was the third most important risk factor for the incidence of flare-up.[16,17]

Flare-ups are complex events involving mechanical, chemical, and microbiological components and are related to age, tooth type, irrigation procedures, frequency of visits, and intra-canal medicaments.[18] A large study conducted in Srinagar Govt. Dental College and Hospital, Kashmir found a significant association of intra-operative variables including quality of debridement, and instrumentation technique with flare-ups apart from the number of visits only.[19]

Conclusion

It has been concluded that the frequency of flare-ups and other associated complications is lesser with nonsurgical root canal therapy in multirooted teeth with pulpal necrosis done in multiple visits as compared to a single visit of the patient.

Limitations of the Study

This was a single center study, therefore the findings may not be generalizable to other groups. Future studies should investigate a more thorough assessment of treatment success that takes into account other factors such as post-operative discomfort, quality of life, and radiographic indications of healing. Long-term follow-up studies might give important insights into the long-term viability of treatment outcomes.

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List of Abbreviations

RCT	Root canal treatment
n	Number
SD	Standard deviation
VAS	Visual Analogue Scale

Conflict of interest

None to declare.

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None to disclose.

Ethical approval

The study was approved by the Institutional Ethics Review Committee of College of Physicians and Surgeons vide letter no: CPSP/REU/DSG-2015-080-1624, dated 16-02-2019.

Authors' contributions

MA: Concept and design of study, acquisition and analysis of data, drafting of manuscript.
URS, MMK: Acquisition and analysis of data.
TA, NS: Drafting of manuscript, critical intellectual input.
MA: Critical intellectual input.
ALL AUTHORS: Approval of the final version of the manuscript to be published.

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References

1. Iandolo A. Modern therapeutic strategies in endodontics and restorative dentistry. Medicina. 2023;10;59(2):333. https://doi.org/10.3390/medicina59020333
2. Schwendicke F, Göstemeyer G. Single-visit or multiple-visit root canal treatment: systematic review, meta-analysis and trial sequential analysis. BMJ Open. 2017;7(2):e013115. https://doi.org/10.1136/bmjopen-2016-013115
3. Onay EO, Ungor M, Yazici AC. The evaluation of endodontic flare-ups and their relationship to various risk factors. BMC Oral Health. 2015;15(1):142. https://doi.org/10.1186/s12903-015-0135-2
4. Cohen S. Management of endodontic emergencies. In: Hargreaves KM, Berman LH, editors. Cohen's pathways of the pulp. New York, NY: Elsevier Health Sciences; 2016. p 719.

5. Lakshmi KA, Rao GU, Jayaraman M, Ramdhas A. Endodontic flare-ups: a review. RGUHS J Med Sci. 2020;10(1):9–17. https://doi.org/10.26463/rjms.10_1_11
6. Azim AA, Azim KA, Abbott PV. Prevalence of inter-appointment endodontic flare-ups and host-related factors. Clin Oral Investig. 2017;21(3):889–94. https://doi.org/10.1007/s00784-016-1839-7
7. Olcay K, Eyüboglu TF, Özcan M. Clinical outcomes of non-surgical multiple-visit root canal retreatment: a retrospective cohort study. Odontology. 2019;107:536–45. https://doi.org/10.1007/s10266-019-00426-6
8. AbdurRahman S, Aziz SM, Gawdat SI, AbdalSamad AM. Postoperative pain of participants with necrotic teeth with apical periodontitis following single visit endodontic treatment versus multiple visit endodontic treatment using triple antibiotic paste: a randomized clinical trial. F1000Research. 2019;8:1–17. https://doi.org/10.12688/f1000research.19936.1
9. Darvesh SA, Naz I, Ahmed AR, Butt F, Latif W, Shahzad A. To compare post obturation endodontic flare-ups following single and multiple visit root canal treatment. Prof Med J. 2020;10;27(07):1516–20. https://doi.org/10.29309/TPMJ/2020.27.07.4618
10. Kurt SM, Demirci GK, Serefoglu B, Kaval ME, Çalışkan MK. Usage of chlorhexidine as a final irrigant in one-visit root canal treatment in comparison with conventional two-visit root canal treatment in mandibular molars: a randomized clinical trial. J Evid Based Dent Pract. 2022;1;22(3):101759. https://doi.org/10.1016/j.jebdp.2022.101759
11. Vishwanathaiah S, Maganur PC, Khanagar SB, Chohan H, Testarelli L, Mazzoni A, et al. The incidence and intensity of postendodontic pain and flareup in single and multiple visit root canal treatments: a systematic review and meta-analysis. Appl Sci. 2021;8;11(8):3358. https://doi.org/10.3390/app11083358
12. Nunes GP, Delbem AC, Gomes JM, Lemos CA, Pellizzer EP. Postoperative pain in endodontic retreatment of one visit versus multiple visits: a systematic review and meta-analysis of randomized controlled trials. Clinic Oral Investig. 2021;25:455–68. https://doi.org/10.1007/s00784-020-03767-7
13. Tanvir H, Haris M, Ehsan S, Usman Z, Khan MT, Sultan ZA. Comparison of post-operative pain frequency after single visit and multiple visit root canal treatment in non-vital teeth. J Pak Dent Assoc. 2022;31(2):91–4. https://doi.org/10.25301/JPDA.312.91
14. Dhyani VK, Chhabra S, Sharma VK, Dhyani A. A randomized controlled trial to evaluate the incidence of postoperative pain and flare-ups in single and multiple visits root canal treatment. Med J Armed Forces India. 2022;1;78:S35–41. https://doi.org/10.1016/j.mjafi.2020.03.010
15. Singh P. A comparative study of flare ups in single visit & multiple visit root canal treatment. J Adv Med Dent Scie Res. 2019;1;7(4):35–7. https://doi.org/10.21276/jamdsr
16. Aksoy U, Pehlivan S, Buhara O. The top risk factors for endodontic flare-up: a monte carlo simulation. Clin Oral Invest. 2021;25:3681–90. https://doi.org/10.1007/s00784-020-03692-9
17. Alshehri AA, Alshraim RA, Dawood AA, Alhawsawi AS, Ibrahim MB, Almutairi AH, et al. Endodontic flare-ups: a study of incidence and related factors. Egypt J Hosp Med. 2018;1;70(2):349–53. https://doi.org/10.12816/0043103
18. Bassam S, El-Ahmar R, Salloum S, Ayoub S. Endodontic postoperative flare-up: an update. Saudi Dent J 2021;1;33(7):386–94. https://doi.org/10.1016/j.sdentj.2021.05.005
19. Misgar OH, Bhat SA, Mir A. Prospective observational study of factors associated with endodontic flare ups. J Adv Med Dent Sci Res. 2019;7(4):129–32. https://doi.org/10.21276/jamdsr