Comprehensive Evaluation of Prevalence of Post-Operative Pain Observed in Single Visit and Multiple Visit Root Canal Therapies: An Original Research Study

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Abstract

Background and Aim: Grossly decayed tooth with pulpal involvement is often managed by endodontic therapy. Such patients usually complain of severe pain in the concerned tooth region. Endodontic therapy reduces this problem remarkably. This randomized controlled clinical trial based study was conducted to methodically assess the Prevalence of post-operative pain in single and multiple visit root canal treatment.
Materials & Methods: Study conducted on total 60 patients who have undergone endodontic therapy at the designated dental clinics of the city in the last 1 year. Only single rooted teeth (maxillary central incisors) were selected in the. All patients were studied into two major groups of 30 each. Group one consist of patients in which endodontic treatment was finished in single appointment. Group two consist of patients wherein endodontic therapy was finished in multiple appointments. Evaluation of pain in post-operative phases was endeavoured by Heft-Parker Visual Analogue Scale (VAS) at postoperative periods of 12, 20 and 40 hours. Results thus obtained was compiled and sent for necessary statistical analysis. P value less than 0.05 was considered as significant ($p< 0.05$).
Statistical Analysis and Results: Results showed that out of 60 patients, males were 35 and females were 25. 10 patients were in age range of 30 to 34 years. P value was reported to be significant here 0.02. In group I, Mean VAS value in 12 hours post operative period was 11.562. Standard deviation was 1.456 and standard error was 0.950. Level of significance evaluation revealed very significant here. In group II, Mean VAS value in 12 hours post operative period was 5.992. Standard deviation was 1.542 and standard error was 0.054. Level of significance evaluation revealed extremely significant here [0.002]. Mean VAS value in 20 hours post operative period was 6.522.
Conclusion: Authors concluded that there were significant differences in the pain reported by the patients of both groups in 12, 20, 40 hours post treatment phase. Majority of the first group patients had experienced considerable pain. Therefore, multiple sitting endodontic therapies reduces pain incidences particularly in maxillary central incisors. All clinicians must systematically consider the teeth before finalizing the decision to go for single or multiple visit root canal therapy.

Key-Words: Endodontic Treatment, Pain, Visual Analogue Scale, Incidence, Prevalence

Introduction

The International Association for the Study of Pain's widely used definition defines pain as "An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage". In the field of medicine, pain is defined as an unpleasant feeling that is conveyed to the brain by sensory neurons.[1,2] Pain is significant in dentistry, because panic of pain is one of the major causes for dental anxiety. Pain in the maxillary or mandibular teeth is very common in the society that makes patients to seek for necessary palliative therapies.[3,4] Root canal therapy and tooth extraction are amongst the most commonly advised treatments for pain relief. Pain in post treatment phase is one of the major dilemmas in endodontic therapy. It is commonly being felt even after potent anaesthesia administration. Literature has well evidenced that the overall success of endodontic therapy is mostly concerned with the removal of post-operative pain. Studies conducted in western countries have shown that dental pain is usually ranges from 24 percent to 45 percent.[5,6] Dental practitioners are habitually unenthusiastic to perform therapeutic procedures that involve multiple visits. Most of the endodontic therapies usually require multiple visits hence treatment associated fear is also increases in similar ratio or proportion.[7,8] This actually led the foundation stone of the concept of single visit therapy instead of

multiple visits. However, many of the studies have shown that single visit endodontic therapies cannot be performed in all clinical situations. Complications like persistent pain, abscess and other related symptoms usually seen. The most common and consistent way for assessing the result of treatments is randomized controlled clinical trial. In past few years, there is an increasing concern about the requirement of multiple slots in endodontic therapies.[9,10] Many pioneer workers have shown no significant differences in antimicrobial efficiencies between the single and multiple visit therapies. In addition, the modern development of rotary systems and up-gradations in the concepts of irrigation physics and delivery systems has assisted the mechanical instrumentation and disinfection of the root canal.[11,12] This randomized controlled clinical trial based study was conducted to methodically assess the Prevalence of post-operative pain in single and multiple visit root canal treatment.

Materials & Methods

This Prevalence based study was intended, prepared and conducted on total 60 patients. All 60 patients were checked for their responses related to pain. Authors have conducted the study in the patients who have undergone endodontic therapy at the designated dental clinics of the city in the last 1 year. Both male and female patients were included the study. Only single rooted teeth (maxillary central incisors) were selected in the study to avoid any problem related to data management about the number of available root canals. Various Exclusion criteria included: ongoing or existing systemic illness, paediatric or geriatric patients, apical periodontitis, peri-apical abscess, repeated therapies, ossified root canals, patients on non steroidal anti-inflammatory drugs or corticosteroids at the time of treatment. Before starting of root canal treatment, all-inclusive history was recorded including demographic details and pain related occurrences. All patients were studied into two major groups of 30 each. Group one consist of patients in which endodontic treatment was finished in single appointment. Group two consist of patients wherein endodontic therapy was finished in multiple appointments. A small number of the early steps were common for both the treatment approaches. Local anaesthesia administration was done in all cases to control intra-operative pain. Rubber dam was used in all cases to ensure strict isolation. Soft Caries removal also attempted if present. Access cavity preparation was attempted as per the ideal recommended shapes of the particular tooth. Root canal openings were mainly examined with 15 K file. Group one teeth were obturated at the first meeting with gutta-percha cones and sealer using standard condensation technique. In Group two teeth, biomechanical preparation was finished by conventional methods and obturation was planned after 5 days. Temporary restoration was placed in crown portion if required after obturation. Informed consents were obtained from all patients. Evaluation of pain in post-operative phases was endeavoured by Heft-Parker Visual Analogue Scale (VAS). All studied patients were described specifically about this Visual Analogue Scale. Patients were requested to select a mark on VAS scale as per their own pain experience and opinion. VAS has values from 0 to 170. Pain was monitored on VAS scale for postoperative periods of 12, 20 and 40 hours. Authors have decided to execute this study by randomized controlled clinical trial because such studies are assumed to be exceptionally important to obtain complete data about personal perceptions. Randomized controlled clinical trial studies are also capable of estimating the patients at personal levels. Results thus obtained was compiled and sent for necessary statistical analysis. P value less than 0.05 was considered as significant ($p< 0.05$).

Statistical Analysis and Results

All the relevant data and responses were noted and sent for statistical evaluation using statistical software Statistical Package for the Social Sciences version 22 (IBM Inc., Armonk, New York, USA). The consequential data was subjected to right statistical tests to obtain p values, mean, standard deviation, chi-square test, standard error and 95% CI. Table 1 and Graph 1 show that out of 60 patients, males were 35 and females were 25. 10 patients were in age range of 30 to 34 years. P value was reported to be significant here 0.02. 10 patients were noted in second age range of 35-39 years. 14 patients were identified in age range of 40-44 years. P value was non significant here. Maximum 14 patients each were noticed in 40-44 years and last age group of >49 years. P value was significant here. Table 2 illustrates basic statistical explanation with level of significance assessment using pearson chi-square test [group I, n= 30, Single Visit Root Canal Therapy]. Mean VAS values were very imperative here. Mean VAS value in 12 hours post operative period was 11.562. Standard deviation was 1.456 and standard error was 0.950. Level of significance evaluation revealed very crucial results. P value was very significant here. In 40 hours Post treatment period, the mean VAS was 8.180 which were quite close to the pre-treatment VAS values. Level of significance evaluation revealed very crucial results. P value was very significant [0.001]. Table 3 shows basic statistical explanation with level of significance assessment using pearson chi-square test [group II, n= 30, Multiple Visit Root Canal Therapy]. Mean VAS values were very important here. Mean VAS value in 12 hours post operative period was 5.992. Standard deviation was 1.542 and standard error was 0.054. Level of significance evaluation revealed very critical results. P value was extremely significant here [0.002]. Mean VAS value in 20 hours post operative period was 6.522 [p value was not

significant]. In 40 hours Post treatment period, the mean VAS was 5.098 which were near to the corresponding pre-treatment VAS values. Level of significance assessment revealed very influential results. P value was highly significant [0.005]. Table 4 & graph 2 shows inter-group comparisons to correlate VAS values and related inferences. Table 5 illustrates about the estimation amongst all studied groups using one-way ANOVA. The level of significance calculated for between the groups was highly significant (0.001).

Table 1: Age & Gender Wise Distribution of Patients

Age Group (Yrs)	Male	Female	Total	P value
30-34	5	5	10 [17 %]	0.02*
35-39	6	4	10 [17 %]	0.70
40-44	9	5	14 [23 %]	0.90
45-49	8	4	12 [20 %]	0.20
>49	7	7	14 [23 %]	0.01*
Total	35	25	100 %	***Significant**

Graph 1: Age & Gender Wise Distribution of Patients

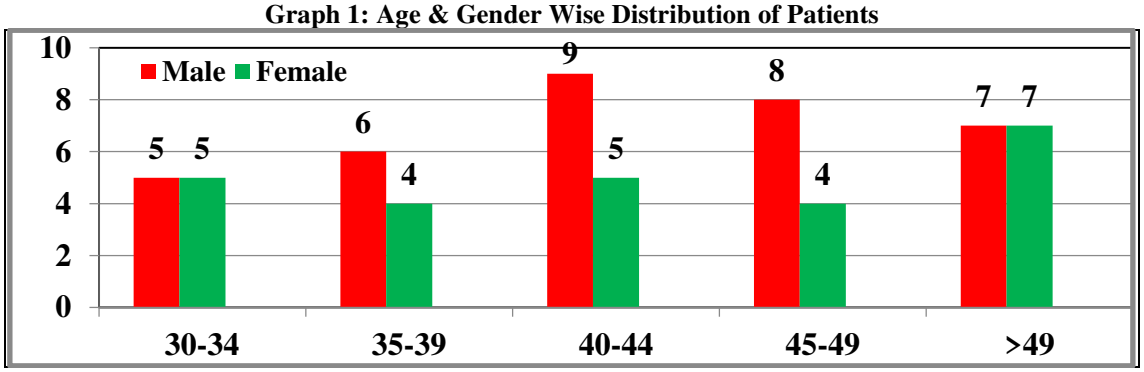


Table 2: Basic Statistical Explanation with Level of Significance Assessment Using Pearson Chi-Square Test [Group I, n= 30, Single Visit Root Canal Therapy]

Parameters	Mean VAS	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Before treatment	9.769	1.872	0.823	1.67	1.564	1.0	0.900
12 hours Post treatment	11.562	1.456	0.950	2.24	2.675	1.0	0.001*
20 hours Post treatment	10.902	1.904	0.648	2.98	2.566	1.0	0.080
40 hours Post treatment	8.180	0.554	0.758	2.34	1.646	2.0	0.001*
***p<0.05 Significant**							

Table 3: Basic Statistical Explanation with Level of Significance Assessment Using Pearson Chi-Square Test [Group 2, n= 30, Multiple Visit Root Canal Therapy]

Parameters	Mean VAS	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Before treatment	6.348	1.098	0.9543	1.96	1.090	1.0	0.500
12 hours Post treatment	5.992	1.542	0.054	2.90	2.421	2.0	0.002*
20 hours Post treatment	6.522	1.097	0.623	2.32	2.904	1.0	0.060
40 hours Post treatment	5.098	0.550	0.709	2.86	1.875	2.0	0.005*
***p<0.05 Significant**							

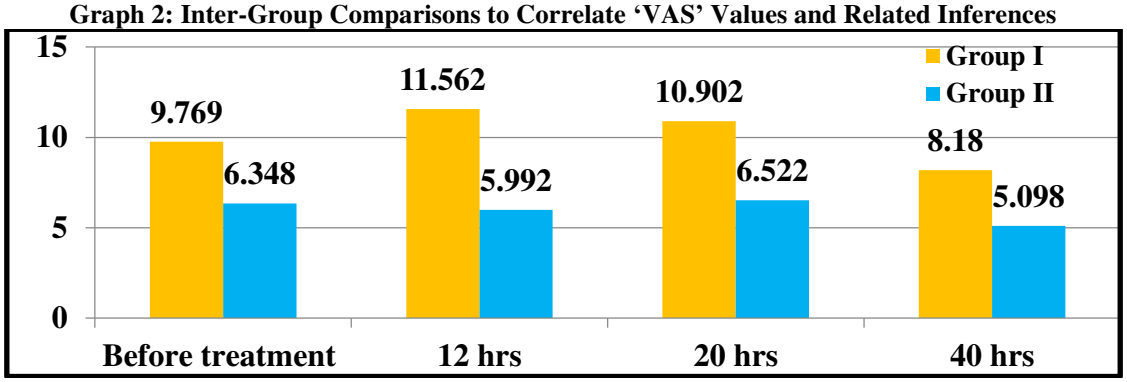
Table 4: Inter-Group Comparisons to Correlate 'VAS' Values and Related Inferences

Parameters	Mean VAS [G-1]	Mean VAS [G-2]	p value
Before treatment	9.769	6.348	0.250
12 Hr Post treatment	11.562	5.992	0.002*
20 Hr Post treatment	10.902	6.522	0.001*
40 Hr Post treatment	8.180	5.098	0.060
*p<0.05 Significant			

Table 5: Estimation amongst all studied groups using one-way ANOVA [Group 1= Single Visit Root Canal Therapy, Group 2= Multiple Visit Root Canal Therapy]

Variables	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Sig. (p)
Between Groups	2	1.530	1.937	1.1	0.001*
Within Groups	15	2.504	0.237	-	
Cumulative	101.13	07.234	*p<0.05 significant		

Graph 2: Inter-Group Comparisons to Correlate 'VAS' Values and Related Inferences



Discussion

In the common dental practice, root canal treatment and tooth extraction are amongst the most frequently performed treatments for pain control. Irreversible blocking of the pain sensations during root canal therapy is attempted with the administration of local anesthesia.[13] However, controlling the painful sensations is controlled by prescribing over the counter non-steroidal anti-inflammatory drugs. These non-steroidal anti-inflammatory drugs are usually interfering prostaglandin creation at the site of wound. In the routine root canal therapy, operator usually attempt preparation of the root canals.[14,15] This biomechanical preparation involves meticulous cleaning and logical shaping of the root canals followed by filling inert materials. With the newer advancements and discoveries in endodontics, the latest ideology of biomechanical preparation is changed. It is now aimed to shaping and cleaning instead of cleaning and shaping.[16,17] This procedure of shaping and cleaning enables the effectual and proficient cleaning of the root canal milieu from the vegetating micro-organisms. Obturation is the process to fill the canals with a biocompatible material. Obturation necessitates perfect funnel shaped root canals that facilitate the accurate positioning of gutta-percha.[18,19] Perfect obturation removes the future possibility of re-infection by sealing the canals apically. Existing literature on single-visit versus multiple-visit endodontics have shown variety of intermingling concepts and facts.[20,21] Even there are plenty of conflicting and contradictory opinions and recommendations. However, recent research papers have shown that patients usually bear and choose single-visit endodontic treatment. Consequently, single-visit root canal therapy has become a popular practice.[22] Single visit endodontic treatment also offers numerous benefits, including no risk of inter appointment leakage through temporary restorations. Additionally, patient desires and prospects for cure have made single-visit root canal treatment popular among dental practitioners.[23,24] It is a well established fact that single visit root canal treatment is less time taking and inexpensive. Moreover, single visit root canal treatment is more demanding and suitable for busy patients belonging to executive and elite class. Single visit root canal treatment is a very attractive option to the patient since it is less time consuming and comparatively economical. Additionally, single visit therapy is usually less traumatic to the nervous patient. In single visit therapy, the patient is not bothered by the added anaesthetic doses.[10,11,23,25,26]

Conclusion

Within the limitations of the study authors concluded that there were significant difference in the pain reported by the patients of both groups in 12, 20, 40 hours post treatment phase. Moreover, these differences were highly significant in clinical decision makings. Here, majority of the first group patients had experienced considerable pain. Therefore, multiple sitting endodontic therapies reduces pain incidences particularly in maxillary central incisors. On contrary, single sitting endodontic therapies are seems to be attracting however it cannot be attempted in all clinical circumstances equivalently. All clinicians must methodically assess the teeth before finalizing the decision to go for single or multiple visit root canal therapy.

References

1. Rossi-Fedele G, Rödig T. Effectiveness of root canal irrigation and dressing for the treatment of apical periodontitis: A systematic review and meta-analysis of clinical trials. Int Endod J. 2023 Oct;56 Suppl 3:422-435.
2. Schwendicke F, Göstemeyer G. Single-visit or multiple-visit root canal treatment: systematic review, meta-analysis and trial sequential analysis. BMJ Open. 2017 Feb 1;7(2):e013115.
3. Manfredi M, Figini L, Gagliani M, Lodi G. Single versus multiple visits for endodontic treatment of permanent teeth. Cochrane Database Syst Rev. 2016 Dec 1;12(12):CD005296. doi: 10.1002/14651858.CD005296.pub3. Update in: Cochrane Database Syst Rev. 2022 Dec 13;12:CD005296.
4. Glennon JP, Ng YL, Setchell DJ et al.. Prevalence of and factors affecting postpreparation pain in patients undergoing two-visit root canal treatment. Int Endod J 2004;37:29–37.
5. Ng YL, Glennon JP, Setchell DJ et al.. Prevalence of and factors affecting post-obturation pain in patients undergoing root canal treatment. Int Endod J 2004;37:381–91.
6. Figini L, Lodi G, Gorni F et al.. Single versus multiple visits for endodontic treatment of permanent teeth. Cochrane Database Syst Rev 2007;(4):CD005296
7. Ng YL, Mann V, Rahbaran S et al.. Outcome of primary root canal treatment: systematic review of the literature—Part 2. Influence of clinical factors. Int Endod J 2008;41:6–31.
8. Raju TB, Seshadri A, Vamsipavani B et al.. Evaluation of pain in single and multi rooted teeth treated in single visit endodontic therapy. J Int Oral Health 2014;6:27–32.
9. Su Y, Wang C, Ye L. Healing rate and post-obturation pain of single- versus multiple-visit endodontic treatment for infected root canals: a systematic review. J Endod 2011;37:125–32.
10. De-Deus G, Canabarro A. Strength of recommendation for single-visit root canal treatment: grading the body of the evidence using a patient-centered approach. Int Endod J 2016.
11. Wong AW, Tsang CS, Zhang S et al.. Treatment outcomes of single-visit versus multiple-visit non-surgical endodontic therapy: a randomised clinical trial. BMC Oral Health 2015;15:162.
12. American Association of Endodontists. Glossary of endodontic terms. 7th edition. Secondary Glossary of endodontic terms. 7th edition 2003.
13. Masood M, Masood Y, Newton JT. The clustering effects of surfaces within the tooth and teeth within individuals. J Dent Res 2015;94:281–8.
14. Higgins JPT, Thompson SG. Quantifying heterogeneity in a meta-analysis. Stat Med 2002;21:1539–58.
15. Egger M, Smith GD, Schneider M et al.. Bias in meta-analysis detected by a simple, graphical test. BMJ 1997;315:629–34.
16. Higgins JPT, Green S, eds. Cochrane Handbook for Systematic Reviews of Interventions. Version 5.10 (updated March 2011) The Cochrane Collaboration, 2011.
17. Duval S, Tweedie R. Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. Biometrics 2000;56:455–63.
18. Wetterslev J, Thorlund K, Brok J et al.. Trial sequential analysis may establish when firm evidence is reached in cumulative meta-analysis. J Clin Epidemiol 2008;61:64–75.
19. Thorlund K, Engstrøm J, Wetterslev J et al.. User Manual for Trial Sequential Analysis (TSA) 2011:1–115.
20. Schwendicke F, Goestemeyer G, Gluud C. Cavity lining after excavating caries lesions: meta-analysis and trial sequential analysis of randomized clinical trials. J Dent 2015;43:1291–7.
21. Atkins D, Best D, Briss PA et al.. Grading quality of evidence and strength of recommendations. BMJ 2004;328:1490.
22. Andrews J, Guyatt G, Oxman AD et al.. GRADE guidelines: 14. Going from evidence to recommendations: the significance and presentation of recommendations. J Clin Epidemiol 2013;66:719–25.
23. Akbar I, Iqbal A, Al-Omiri MK. Flare-up rate in molars with periapical radiolucency in one-visit vs two-visit endodontic treatment. J Contemp Dent Pract 2013;14:414–18.
24. Albashaireh ZS, Alnegrish AS. Postobturation pain after single- and multiple-visit endodontic therapy. A prospective study . J Dent 1998;26:227–32.
25. Al-Negrish AR, Habahbeh R. Flare up rate related to root canal treatment of asymptomatic pulpally necrotic central incisor teeth in patients attending a military hospital. J Dent 2006;34:635–40.
26. DiRenzo A, Gresla T, Johnson BR et al.. Postoperative pain after 1- and 2-visit root canal therapy. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2002;93:605–10.