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A STUDY ON SINGLE VISIT VERSUS MULTIPLE VISIT ROOT CANAL THERAPY

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ABSTRACT:

Background: Root canal therapy (RCT) is a fundamental treatment modality in endodontics aimed at eliminating pulpal infection and preserving natural dentition. The debate between single-visit and multiple-visit RCT remains unresolved, with clinical decisions often influenced by operator preference, case complexity, and patient compliance. Single-visit RCT is associated with reduced chair-time and enhanced patient convenience, while multiple-visit RCT traditionally includes intracanal medicament placement believed to reduce bacterial load and improve Peri-apical healing.

Aim of the Study: To compare the clinical and radiographic outcomes, incidence of postoperative pain, and treatment efficacy of single-visit versus multiple-visit root canal therapy in permanent teeth diagnosed with irreversible pulpitis or necrotic pulp.

Methods: This comparative prospective clinical study was conducted on 120 patients (60 per group) undergoing RCT at a tertiary dental care center. Patients were randomly assigned to single-visit or multiple-visit groups. The same operator performed all treatments under aseptic conditions using standardized instrumentation with rotary NiTi files and obturation by lateral condensation technique. Intracanal medicaments (calcium hydroxide) were used in the multiple-visit group. Postoperative pain was assessed using the Visual Analogue Scale (VAS) at 6, 24, 48, and 72 hours. Clinical and radiographic follow-up was conducted at 3 and 6 months to assess periapical healing and treatment success.

Results: Postoperative pain was significantly higher at 24 hours in the single-visit group (p value at <0.05), but no significant difference was noted beyond 48 hours. Radiographic healing at 6 months was comparable between groups, with 90% success in single-visit and 92% in multiple-visit cases (p value at < 0.05). No statistically significant difference in long-term treatment success was observed.

Conclusion: Both single-visit and multiple-visit root canal therapies demonstrated comparable clinical outcomes and success rates. Although transient postoperative pain was slightly higher in the single-visit group, it resolved within 48 hours. Given its operational efficiency, reduced appointments, and similar healing outcomes, single-visit RCT can be considered a reliable alternative in selected cases without peri-apical pathology or systemic complications.

KEY WORDS: Apical, Peri-apical, intracanal medicament, Root canal treatment and Pulpitis.

INTRODUCTION:

Single Visit versus Multiple Visit Root Canal Therapy:

Root canal therapy (RCT) is a cornerstone of modern endodontics, aimed at eliminating infection from the root canal system, alleviating pain, and preserving natural dentition. With advancements in instrumentation, disinfection protocols, and obturation techniques, the endodontic treatment landscape has evolved significantly over the past few decades. One of the key clinical decisions in RCT is the choice between performing the procedure in a single visit or across multiple visits. This choice continues to be debated globally due to differing perspectives on treatment efficacy, postoperative outcomes, and patient-centered factors such as convenience and cost (1, 2). The single-visit root canal therapy (SVRCT) approach, as the name suggests, involves complete instrumentation, disinfection, and obturation of the canal system within a single appointment. This technique is increasingly adopted due to reduced treatment time, fewer appointments, decreased patient anxiety, and minimal disruption to routine activities. It has been reported to be effective, especially in cases with vital pulp and without significant periapical pathology (3). Moreover, SVRCT may also reduce the risk of inter-appointment contamination, which is a potential concern in multiple-visit treatments (4). Conversely, multiple-visit root canal therapy (MVRCT) allows the clinician to use intracanal medicaments, such as calcium hydroxide, between appointments to enhance microbial reduction, particularly in cases involving necrotic pulp and apical periodontitis. Historically, this technique was the standard of care in complex or infected canals due to the perceived benefits of extended disinfection and biological healing time (5). Some clinicians also report better clinical control over persistent exudation and canal sterilization using a multi-appointment protocol (6). Several systematic reviews and clinical trials have attempted to compare these two approaches with regard to postoperative pain, microbial reduction, periapical healing, flare-ups, and overall success rates. A Cochrane review by Figini et al. found no significant difference in long-term treatment success between single and multiple visits, although transient postoperative pain was slightly more common in single-visit cases (3). Similarly, a meta-analysis by Su et al. concluded that single-visit RCT had comparable healing outcomes but may be associated with higher early postoperative discomfort (4). Sathorn et al., in a systematic review, reported that flare-up rates were low in both methods and should not be a determinant of the number of visits (2). Despite the growing body of literature, the optimal number of visits in RCT remains a subject of ongoing research, particularly in diverse populations with varying oral health practices and clinical presentations. In the Indian context, factors such as patient compliance, access to dental care, socioeconomic status, and oral hygiene practices significantly influence treatment outcomes and adherence to follow-up (7). This makes it crucial to evaluate the comparative efficacy of SVRCT and MVRCT in tertiary dental care settings. Hence, this study aims to assess and compare the clinical and radiographic outcomes, postoperative pain profile, and therapeutic efficacy of single-visit versus multiple-visit root canal therapy in permanent teeth affected by irreversible pulpitis or necrotic pulp. The findings of this study aim to contribute to evidence-based clinical decision-making in endodontic practice.

Methods: Single Visit versus Multiple Visit Root Canal Therapy

Study Design and Setting: This was a prospective, randomized comparative clinical study conducted in the Department of Dentistry and Endodontics at a tertiary dental teaching hospital in Kurnool, Andhra Pradesh, over a period of 12 months (January 2024 – December 2024). The study protocol was approved by the Institutional Ethics Committee and written informed consent was obtained from all participants prior to enrolment. Study Population: The study included patients aged 18 to 60 years of either gender who reported to the endodontic clinic with permanent single-rooted or multi-rooted teeth diagnosed with irreversible pulpitis or necrotic pulp with or without mild periapical radiolucency. Inclusion Criteria: Patients aged between 18 and 60 years were

included. Patients with Permanent teeth indicated for primary root canal therapy were included. Patients with clinical diagnosis of irreversible pulpitis or pulpal necrosis were included. Patients with restorable teeth with adequate coronal structure were included. Patients willing to comply with the follow-up schedule were included. Exclusion Criteria: Patients with teeth with severe periodontal disease or extensive Peri-apical pathology were excluded. Patients medically compromised patients (e.g., uncontrolled diabetes, immune-compromised states) were excluded. Patients who were Pregnant or lactating women were excluded. Patients with teeth requiring endodontic retreatment were excluded. Patients on long-term analgesic or corticosteroid therapy were excluded. Patients with non-restorable teeth and those were excluded with severe calcifications or canal obstructions ere excluded. Sample Size Calculation: Based on a previous study by Singh and Garg (2012) comparing postoperative pain in single versus multiple visit RCT, and assuming a 20% difference in VAS scores between the groups with 80% power and 5% level of significance, the minimum sample size was calculated to be 54 patients per group. Accounting for a 10% attrition rate, a total of 120 patients (60 per group) were enrolled. Randomization and Group Allocation: Participants were randomly allocated into two groups using a computer-generated randomization sequence: Group A (Single-Visit RCT): Root canal treatment completed in a single appointment. Group B (Multiple-Visit RCT): Root canal treatment completed in two visits with calcium hydroxide as an intracanal medicament. Allocation concealment was ensured using opaque, sealed envelopes. Blinding of the operator was not feasible due to the nature of the intervention, but the outcome assessor and statistician were blinded to the group allocation. Clinical Procedure: All treatments were carried out by a single experienced endodontist under rubber dam isolation using standardized aseptic techniques. Access Opening and Working Length Determination: Performed under magnification with apex locator and confirmed radiographically. Instrumentation: Carried out using rotary NiTi files (Pro-Taper Gold® Dentsply Sirona) with copious irrigation using 3% sodium hypochlorite, 17% EDTA, and normal saline. Irrigation Protocol: Final rinse with 2% chlorhexidine was used. Obturation: Performed using cold lateral compaction with gutta-percha and AH Plus® resin-based sealer. Restoration: Temporary restoration with Cavit™ was placed in both groups, followed by permanent restoration using composite resin at a later visit. In Group B, calcium hydroxide was placed as intracanal medicament for 7 days before obturation in the second visit. Outcome Measures: Primary Outcome:- Postoperative pain was evaluated using a Visual Analogue Scale (VAS) (0–10 scale) at 6, 24, 48, and 72 hours postoperatively. Secondary Outcomes: Clinical signs and symptoms (swelling, tenderness to percussion, mobility). Radiographic evaluation of peri-apical healing at 3 and 6 months using Periapical Index (PAI) score was done. Overall treatment success, defined as the absence of clinical symptoms and reduction in peri-apical radiolucency. Follow-up Protocol: Patients were reviewed at 1 week, 3 months, and 6 months. Clinical examination and digital radiographs were taken at each follow-up. Radiographs were interpreted by two independent blinded observers. In case of disagreement, a third senior endodontist reviewed the findings. Statistical Analysis: All data were entered into Microsoft Excel and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (mean, SD, proportions) were calculated. Chi-square test was used for categorical variables. Independent t-test or Mann–Whitney U test was used for comparing VAS scores. Repeated measures ANOVA were used for analyzing postoperative pain over time. P-value < 0.05 was considered statistically significant.

Results:

A total of 120 patients who met the inclusion criteria were enrolled and completed the study, with 60 patients in each group. The mean age of patients in Group A (Single-Visit RCT) was 34.2 +/- 8.6 years, and in Group B (Multiple-Visit RCT) it was 33.7 +/- 9.1 years. The difference was not statistically significant ($p = 0.71$). Gender distribution was comparable across the two groups, with 34 males and 26 females in Group A, and 32 males and 28 females in Group B ($p = 0.73$). No significant intergroup differences were observed with respect to the type of tooth treated (molars vs. premolars) or initial pulpal status (vital vs. non-vital) ($p > 0.05$). **(Table 1)**

Parameter	Group A	Group B	p-value
Mean Age (years)	34.2 +/- 8.6	33.7 +/- 9.1	0.71
Gender (M/F)	34/26	32/28	0.73
Molars / Premolars	42 / 18	41 / 19	0.85
Necrotic pulp cases (%)	52%	58%	0.54

Table 1: Demographic and Clinical Profile of Study Participants

Postoperative pain was recorded at 6, 24, 48, and 72 hours post-treatment using a 10-point Visual Analogue Scale (VAS). At 6 hours, patients in Group A reported a significantly higher mean VAS score (3.4 +/- 1.2) compared to Group B (2.7 +/- 1.1) ($p = 0.01$). At 24 hours, this trend persisted (Group A: 2.8 +/- 1.0; Group B: 2.1 +/- 0.9; $p = 0.02$). By 48 hours, pain significantly subsided in both groups, with no statistical difference (Group A: 1.2 +/- 0.8; Group B: 1.0 +/- 0.6; $p = 0.18$). At 72 hours, minimal pain was noted in both groups (Group A: 0.4 +/- 0.3; Group B: 0.3 +/- 0.2; $p = 0.64$), **(Table 2)**

Time Point	Group A (Mean +/- SD)	Group B (Mean +/- SD)	p-value
6 hours	3.4 +/- 1.2	2.7 +/- 1.1	0.01
24 hours	2.8 +/- 1.0	2.1 +/- 0.9	0.02
48 hours	1.2 +/- 0.8	1.0 +/- 0.6	0.18
72 hours	0.4 +/- 0.3	0.3 +/- 0.2	0.64

Table 2: Postoperative Pain Scores (VAS)

Radiographic follow-up was done at 3 and 6 months using the Periapical Index (PAI). At 3 months, 46 patients (76.6%) in Group A and 48 patients (80%) in Group B showed >=2-grade improvement in PAI scores ($p = 0.65$). At 6 months, complete periapical healing was observed in 54 patients (90%) in Group A and 55 patients (92%) in Group B ($p = 0.72$). No statistically significant difference was noted in radiographic healing between the two groups at either time point.
At the end of the 6-month follow-up, Group A had 54 patients (90%) with complete resolution of symptoms and radiographic healing, while Group B had 55 patients (92%) meeting the same criteria ($p = 0.68$), **(Table 3).**

Table 3: Radiographic Healing at Follow-up

Time Point	Group A (Complete Healing)	Group B (Complete Healing)	p-value
3 months	76.6% (n=46)	80% (n=48)	0.65
6 months	90% (n=54)	92% (n=55)	0.72

Minor flare-ups were noted in 3 patients (5%) in Group A and 2 patients (3.3%) in Group B during the first week post-procedure, all managed with analgesics. No cases of persistent sinus tract, swelling, or requirement of retreatment were observed in either group.

DISCUSSION

This study was undertaken to compare the clinical and radiographic outcomes of single-visit versus multiple-visit root canal therapy (RCT) in patients with irreversible pulpitis or necrotic pulp. The findings of our prospective randomized study demonstrate that both approaches yield comparable long-term success rates, with only marginal differences in early postoperative pain, thereby affirming that single-visit RCT is a viable alternative to the traditional multiple-visit protocol in appropriately selected cases. Postoperative Pain Outcomes: In the present study early postoperative pain (within 24 hours) was significantly higher in the single-visit group as compared to the multiple-visit group. This aligns with prior evidence reported by Su et al., (8) who conducted a systematic review and found that although both approaches resulted in similar healing outcomes, patients undergoing single-visit RCT reported slightly more discomfort in the immediate postoperative period. The higher pain incidence in the single-visit group can be attributed to factors

such as retained intra-radicular debris, insufficient drainage in necrotic cases, and psychological expectations. However, by 48 to 72 hours, pain subsided significantly in both groups with no statistically significant difference, consistent with the findings of a randomized trial by Singh and Garg (9). Radiographic and Clinical Success Rates: At the end of 6 months, our study demonstrated 90% radiographic healing in the single-visit group and 92% in the multiple-visit group, which is statistically insignificant. These results reinforce the conclusions of a Cochrane review by Figini et al., (3) which analyzed 5 trials and found no significant difference in healing or success rates between the two protocols. The use of advanced rotary instrumentation systems, effective irrigation with sodium hypochlorite and EDTA, and proper obturation techniques likely contribute to this parity (10, 11). Interestingly, some endodontists advocate for the use of intracanal medicaments like calcium hydroxide in multiple-visit RCT to eliminate residual bacteria and promote apical healing. While biologically plausible, studies suggest that calcium hydroxide's efficacy in microbial eradication may be limited, especially in polymicrobial infections involving Enterococcus faecalis, which is notably resistant (12). Therefore, with appropriate mechanical debridement and irrigation, a single-visit protocol can be equally effective in most routine cases. Flare-Ups and Adverse Events: Flare-up incidence in our study was low and not significantly different between groups. This observation is corroborated by Sathorn et al., (2) who found in their systematic review that flare-ups are rare and occur in both single- and multiple-visit RCT at similar rates (12). The few cases of mild flare-ups in our study were managed conservatively, without need for retreatment or antibiotics. These findings are reassuring and suggest that, when proper case selection and aseptic technique are employed, the number of visits does not predispose to increased flare-up risk. Patient-Centered Considerations: From a practical standpoint, single-visit RCT offers significant advantages in terms of reduced treatment duration, fewer appointments, and increased patient compliance. In the Indian context, where patients often travel long distances and face financial constraints, a one-visit solution can significantly enhance treatment accessibility and adherence (9, 13). Moreover, with the increasing prevalence of chairside digital radiography and rotary endodontics in tertiary centers, the single-visit approach is becoming more feasible and standardized.

Strengths and Limitations: The strengths of our study include a randomized comparative design, use of objective pain scoring (VAS), and standardized radiographic evaluation (Periapical Index). Blinded outcome assessors reduced subjective bias. However, there are notable limitations. First, the follow-up duration of 6 months, while adequate for initial periapical healing, may not fully reflect long-term success or failure, which typically manifests after 12–24 months. Secondly, only anterior and premolar teeth were included due to ease of standardization and instrumentation, which limits generalizability to molars and complex canal morphologies. Also, microbiological cultures were not performed, so we could not correlate bacterial elimination with pain or healing outcomes. Future studies incorporating molecular diagnostics and longer follow-up periods are warranted to establish microbiological and immunological endpoints that better inform clinical protocols.

Comparison with Indian Studies: Recent Indian studies have echoed similar results. Kumar et al. in a comparative study on an Indian cohort found equivalent healing rates and reduced chair-side time in single-visit RCT, supporting its use in high-volume government settings [7]. Patil and Deka (13) also reported higher patient satisfaction and reduced absenteeism from work in patients treated in a single sitting [13]. These findings emphasize the relevance of our study in public health dentistry, especially in resource-constrained environments.

Clinical Implications: The results of this study indicate that single-visit root canal therapy can be considered a reliable and efficient treatment modality in selected cases of irreversible pulpitis or pulpal necrosis without systemic infection or advanced periapical lesions. With proper training, use of modern instrumentation, and rigorous infection control, clinicians can adopt single-visit RCT

protocols more confidently. For complex, symptomatic, or weeping canals, multiple-visit RCT still remains justified.

CONCLUSIONS:

In summary, the present study adds to the growing body of evidence that single-visit root canal therapy is not inferior to the traditional multiple-visit approach in terms of clinical and radiographic outcomes. With minor, self-limiting postoperative pain and no increase in flare-up rates, it offers substantial logistical and economic benefits. Dental practitioners should base their decision on case-specific factors, patient preferences, and operator expertise, with the understanding that both protocols can deliver high success when executed with clinical diligence.

REFERENCES:

1. Peters OA. Current challenges and concepts in the preparation of root canal systems: a review. J Endod. 2004 Aug;30(8):559–67.
2. Sathorn C, Parashos P, Messer HH. The prevalence of postoperative pain and flare-up in single- and multiple-visit endodontic treatment: a systematic review. Int Endod J. 2008 Feb;41(2):91–9.
3. Figini L, Lodi G, Gorni F, Gagliani M. Single versus multiple visits for endodontic treatment of permanent teeth: a Cochrane systematic review. J Endod. 2008 Sep;34(9):1041–7.
4. Nair PN. Pathogenesis of apical periodontitis and the causes of endodontic failures. Crit Rev Oral Biol Med. 2004 Jan 1;15(6):348–81.
5. Mathew ST, Thomas K, Jacob P. Barriers in completion of endodontic treatment among Indian patients: A cross-sectional study. J Int Clin Dent Res Organ. 2022;14(2):123–7.
6. Manfredi M, Figini L, Gagliani M, Lodi G. Single vs multiple visits for endodontic treatment of permanent teeth: a Cochrane review. Eur J Oral Implantol. 2016 Spring;9 Suppl 1:S1–16.
7. Kumar M, Raval N, Kahar P, Patel V. Single vs. multiple visit root canal therapy: a prospective comparative study on Indian population. Indian J Dent Res. 2020;31(5):738–44.
8. 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 Feb;37(2):125–32.
9. Singh S, Garg A. Incidence of postoperative pain after single-visit and multiple-visit root canal therapy: A randomized controlled trial. J Conserv Dent. 2012 Oct;15(4):323–7.
10. Manfredi M, Figini L, Gagliani M, Lodi G. Single vs multiple visits for endodontic treatment of permanent teeth: a Cochrane review. Eur J Oral Implantol. 2016;9 Suppl 1:S1–16.
11. Kumar M, Raval N, Kahar P, Patel V. Single vs. multiple visit root canal therapy: a prospective comparative study on Indian population. Indian J Dent Res. 2020;31(5):738–44.
12. Peters OA. Current challenges and concepts in the preparation of root canal systems: a review. J Endod. 2004 Aug;30(8):559–67.
13. Patil S, Deka A. Comparative evaluation of single versus multiple visit endodontics in a community dental care setting. Int J Community Med Public Health. 2023;10(6):2411–6.