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Original Research

Prospective Evaluation of Postoperative Pain After Single-Visit vs Multiple-Visit Root Canal Treatment in Symptomatic Irreversible Pulpitis

Rohit Gumber[1], Adaa[2]

[1]Reader, Department of Conservative Dentistry and Endodontics, Surendera Dental College and Research Institute, Sri Ganganagar, Rajasthan
[2]BDS Student, Dasmesh Institute of Research and Dental Sciences, Faridkot, Punjab

ABSTRACT

Background: Postoperative pain following root canal treatment is a common patient-centered outcome and a frequent cause of dissatisfaction after endodontic therapy. The intensity and duration of pain may be influenced by several factors, including preoperative symptoms, treatment protocol, and number of visits. In symptomatic irreversible pulpitis, the inflamed pulp tissue and heightened nociceptive response may predispose patients to greater early postoperative discomfort. The comparative effect of single-visit versus multiple-visit root canal treatment on postoperative pain in such symptomatic cases remains clinically relevant.

Aim: To prospectively evaluate and compare postoperative pain intensity, pain incidence, analgesic intake, and flare-up occurrence following single-visit and multiple-visit root canal treatment in patients with symptomatic irreversible pulpitis.

Materials and Methods: A prospective comparative clinical study was conducted in the Department of Conservative Dentistry and Endodontics at a Dental College and Hospital. Forty patients diagnosed with symptomatic irreversible pulpitis were assigned into two equal groups (n=20 each): Group A underwent single-visit root canal treatment and Group B underwent multiple-visit treatment with an intracanal medicament between visits. Standardized protocols were followed for rubber dam isolation, working length determination, chemo-mechanical preparation, irrigation, and obturation. Postoperative pain was assessed using a 10-point Visual Analog Scale (VAS) at 6 hours, 12 hours, 24 hours, 48 hours, and 7 days. Incidence of pain (VAS>0), analgesic requirement, number of tablets consumed, and flare-up incidence were recorded. Statistical analysis was performed using SPSS version 25.0 with significance set at $p<0.05$.

Results: Baseline characteristics were comparable between groups (preoperative VAS: 7.85 ± 0.88 vs 7.90 ± 0.85; p=0.876). Group A reported significantly lower mean postoperative pain scores than Group B at 6 hours (4.90 ± 1.25 vs 5.60 ± 1.20; p=0.041), 12 hours (3.85 ± 1.10 vs 4.65 ± 1.15; p=0.018), 24 hours (2.60 ± 0.99 vs 3.45 ± 1.05; p=0.009), and 48 hours (1.30 ± 0.65 vs 1.90 ± 0.78; p=0.021), with no significant difference at 7 days (p=0.312). Pain reduced significantly over time within both groups ($p<0.001$). Mean analgesic consumption was significantly higher in Group B (1.90 ± 0.88) compared with Group A (1.25 ± 0.79; p=0.032), while flare-ups were infrequent and comparable (5.00% vs 10.00%; p=0.548).

Conclusion: Single-visit root canal treatment provided better early postoperative pain control than multiple-visit treatment in symptomatic irreversible pulpitis, while both protocols showed similar outcomes by 7 days. Analgesic consumption was higher in multiple-visit cases, with low and comparable flare-up rates.

Keywords: Symptomatic irreversible pulpitis; Single-visit endodontics; Multiple-visit endodontics; Postoperative pain; Visual Analog Scale (VAS).

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Corresponding author: Dr. Rohit Gumber, Reader, Department of Conservative Dentistry and Endodontics, Surendera Dental College and Research Institute, Sri Ganganagar, Rajasthan

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Introduction

Postoperative pain remains one of the most frequent and clinically relevant concerns associated with endodontic therapy, influencing patient satisfaction, perceived treatment success, and willingness to undergo dental care. Even when root canal treatment is technically adequate, transient pain may occur due to periapical tissue irritation, extrusion of debris, or an

amplified inflammatory response in already sensitized tissues. In a widely cited systematic review evaluating pain before, during, and after root canal treatment, pretreatment pain prevalence was high and decreased substantially after treatment, with mean pain prevalence dropping from **81%** preoperatively to **40%** at 24 hours and **11%** at one week, highlighting that pain typically peaks early and reduces with time.[1] Because early postoperative discomfort is both expected and feared, strategies that minimize post-treatment pain are clinically meaningful, especially in symptomatic cases. Symptomatic irreversible pulpitis represents a common endodontic emergency characterized by spontaneous pain and/or lingering pain in response to thermal stimuli, reflecting an inflamed pulp with limited capacity for healing. Accurate diagnosis is essential because the severity of symptoms, pulpal status, and preoperative pain intensity are strong predictors of postoperative pain experience. Clinically, diagnosis relies on a combination of patient history, percussion findings, and pulp sensibility testing. However, sensibility tests evaluate neural response rather than true vascular vitality and can yield false positive or negative results; therefore, clinicians must interpret responses in conjunction with clinical findings and radiographic assessment.[2] In symptomatic irreversible pulpitis, the heightened inflammatory and neurogenic response can lead to greater postoperative pain perception compared with asymptomatic presentations, making this population particularly relevant for evaluating pain outcomes after treatment. The reported frequency of post-endodontic pain varies widely across studies because of differences in case selection, instrumentation techniques, irrigation protocols, operator factors, and pain definitions. A prospective cohort study evaluating postoperative pain after root canal treatment demonstrated that pain is not rare, and that teeth with vital pulps may experience a higher incidence and intensity of postoperative pain than necrotic cases in certain contexts.[3] These findings underscore that postoperative pain is multifactorial and may be influenced by baseline pulpal and periapical status, the magnitude of preoperative symptoms, and intraoperative factors such as mechanical irritation, apical extrusion of irrigants or dentinal debris, and the degree of microbial reduction achieved during chemo-mechanical preparation. Another clinically important postoperative phenomenon is the flare-up, typically defined as severe pain and/or swelling that necessitates an unscheduled emergency visit. While flare-ups occur relatively infrequently compared with mild-to-moderate postoperative discomfort, they can be distressing for patients and challenging for clinicians. Microbial factors are strongly implicated in flare-up pathogenesis; disruption of the canal ecosystem, apical extrusion of infected contents, or alteration of microbial virulence can intensify periradicular inflammation. A seminal review emphasized that although flare-ups may arise from mechanical, chemical, and microbial injury, microorganisms are considered major causative agents, reinforcing the importance of effective disinfection and careful working length control.[4] This biological rationale is often cited when clinicians choose multiple-visit treatment with an intracanal medicament in symptomatic cases, aiming for further microbial suppression between appointments. The choice between completing root canal therapy in a single visit or multiple visits continues to be debated. Single-visit endodontics offers practical advantages such as fewer appointments, reduced inter-appointment leakage risk, and potentially improved patient convenience. Conversely, multiple-visit treatment allows placement of an intracanal medicament (commonly calcium hydroxide) and may be preferred in situations where clinicians anticipate persistent exudation, complex infection control challenges, or a perceived higher risk of postoperative symptoms. Evidence syntheses have reported that neither approach completely eliminates postoperative pain and that superiority may depend on case selection and methodology. A systematic review comparing single-visit and multiple-visit nonsurgical endodontic treatment concluded that postoperative complications, including pain-related outcomes, were broadly similar overall, and emphasized the need for well-designed prospective trials to clarify pain differences under standardized conditions.[5] Importantly, symptomatic irreversible pulpitis may behave differently from necrotic infections or retreatment cases, and therefore dedicated evaluation in this subgroup is justified. From a risk-factor perspective, multiple appointments themselves have been linked to flare-up occurrence in prospective work, suggesting that repeated canal instrumentation, re-entry, and inter-appointment factors might influence symptom exacerbation in some patients. A prospective study evaluating factors associated with endodontic flare-ups reported correlations between flare-ups and multiple appointments, preoperative periradicular pain, and radiolucent lesions, supporting the concept that both baseline disease burden and treatment-related variables contribute to postoperative complications.[6] Although flare-ups represent only one aspect of postoperative pain outcomes, this association is relevant when comparing single-visit and multiple-visit protocols, especially in symptomatic patients where baseline pain and tissue sensitivity are already high. Modern endodontic practice has evolved with advances in magnification, apex locators, rotary/reciprocating instrumentation, improved irrigation delivery, and enhanced obturation and coronal sealing strategies. These developments can shorten treatment time and may influence postoperative pain through changes in apical extrusion patterns and canal shaping dynamics. Additionally, operator-related variables experience level and procedural consistency can affect pain outcomes, analgesic consumption, and patient-reported discomfort. A prospective clinical study assessing

postoperative pain using a VAS approach identified differences in pain prevalence depending on operator experience, highlighting that technique-sensitive factors may confound comparisons if protocols are not standardized.[7] Therefore, prospective studies that strictly control operative steps, irrigation methods, and obturation procedures are crucial to isolate the effect of visit number on postoperative pain.

Materials and Methods

A prospective comparative clinical study was conducted in the Department of Conservative Dentistry and Endodontics at a Dental College and Hospital. Patients requiring endodontic treatment were recruited from the outpatient clinics after clinical and radiographic examination, and all procedures were performed under standardized institutional clinical protocols. A total of 40 patients diagnosed with symptomatic irreversible pulpitis in a single tooth requiring primary root canal treatment were included. Eligibility was based on a comprehensive clinical examination and periapical radiography. Patients were enrolled only after confirming that the involved tooth was restorable and indicated for nonsurgical root canal treatment. Written informed consent was obtained from all participants prior to allocation and intervention.

Eligibility criteria:

Patients aged ≥18 years presenting with moderate-to-severe preoperative pain suggestive of symptomatic irreversible pulpitis were considered. Teeth included were permanent teeth with fully formed apices and without previous endodontic treatment. Exclusion criteria included patients with systemic conditions affecting pain perception or healing, intake of analgesics within a defined period prior to treatment (as per department protocol), pregnancy/lactation, known allergy to prescribed medications, presence of swelling or sinus tract, acute apical abscess, periodontal pockets suggestive of primary periodontal disease, non-restorable teeth, internal/external resorption, calcified canals preventing negotiation, and teeth with complicated anatomy or conditions that required deviation from the standardized protocol.

Methodology

Diagnosis was established using history of spontaneous or lingering pain, response to thermal tests (cold test) with lingering pain, and/or electric pulp testing where applicable, along with clinical findings such as tenderness to percussion (if present) and radiographic assessment for caries depth, proximity to pulp, and periapical status. Teeth were included when findings were consistent with symptomatic irreversible pulpitis, with the periapical radiograph used to assess baseline periapical condition and to rule out other pathologies.

After enrollment, patients were assigned into two equal groups (n=20 each): Group A underwent single-visit root canal treatment, and Group B underwent multiple-visit root canal treatment. Allocation was performed to maintain equal group sizes, and baseline characteristics such as age, gender, tooth type, arch, and preoperative pain score were recorded to assess comparability between groups.

Standardization of operative procedure and operator calibration:

To minimize inter-operator variability, treatments were performed by operators trained in the same clinical protocol under departmental supervision. Standard infection control procedures were followed. Rubber dam isolation was used for all cases. A standardized access cavity was prepared, and canals were negotiated and prepared following the same instrumentation and irrigation regimen across both groups. Working length was determined using an electronic apex locator and confirmed radiographically where indicated.

Instrumentation and irrigation protocol:

Cleaning and shaping were performed using a standardized technique (crown-down or step-back as per departmental protocol) with the same file system for all cases, ensuring uniformity. Irrigation was carried out with sodium hypochlorite at a standardized concentration used in the department, delivered with side-vented needles without binding, along with saline as intermediate rinse as required. Final irrigation was standardized for all cases, and canals were dried with sterile paper points prior to obturation or placement of intracanal medicament, depending on the group.

Intervention protocols (single-visit and multiple-visit):

In Group A (single-visit), after completion of biomechanical preparation, canals were obturated in the same appointment using a standardized obturation technique (e.g., cold lateral compaction) with gutta-percha and resin-based sealer, followed by placement of a standardized temporary or definitive coronal restoration as per departmental protocol. In Group B (multiple-visit), after completion of biomechanical preparation, an intracanal medicament (commonly calcium hydroxide paste as per routine protocol) was placed, and the access cavity was sealed with a standardized temporary restoration. At the subsequent visit, the medicament was removed using irrigation and recapitulation, canals were dried and obturated using the same obturation technique and materials as Group A, and a coronal seal was provided similarly. No procedural step other than the inter-appointment medicament/visit scheduling differed between groups.

Pain assessment tool and outcome measures:

Postoperative pain was assessed using a 10-point Visual Analog Scale (VAS), where 0 represented “no pain” and 10 represented “worst imaginable pain.” Patients were instructed on how to mark their pain intensity and were provided with a pain recording sheet. Pain scores were recorded at predefined

postoperative intervals: 6 hours, 12 hours, 24 hours, 48 hours, and 7 days after the first appointment (for both groups). The primary outcome was postoperative pain intensity at each time interval. Secondary outcomes included the proportion of patients reporting pain (VAS >0), occurrence of flare-up (defined as severe pain and/or swelling requiring an unscheduled visit), and analgesic intake.

Analgesic protocol and recording:
A standardized rescue analgesic regimen was prescribed for all participants (e.g., ibuprofen/paracetamol as per institutional protocol and patient suitability). Patients were advised to take analgesics only when required and to record the time and number of tablets consumed. Any adverse events or need for unscheduled care were documented. Patients requiring antibiotics or additional interventions due to acute symptoms were recorded and analyzed appropriately.

Clinical and radiographic parameters recorded:
Baseline parameters included age, gender, tooth type (anterior/premolar/molar), arch (maxillary/mandibular), preoperative VAS score, presence/absence of percussion tenderness, and radiographic periapical status (normal periapical area/widened periodontal ligament space). Intraoperative parameters included number of canals, working length confirmation method, instrumentation system used, patency maintenance, and any procedural events (e.g., ledge, instrument separation). These variables were recorded to explore associations with postoperative pain and to ensure procedural uniformity.

Statistical analysis:
Data were entered into a spreadsheet and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Normality of continuous variables (VAS scores) was assessed using the Shapiro–Wilk test. Descriptive statistics were expressed as mean ± standard deviation for normally distributed data or median (interquartile range) for non-normal data, while categorical variables were presented as frequencies and percentages. Intergroup comparisons of pain scores at each time interval were performed using an independent samples t-test for normally distributed data or the Mann–Whitney U test for non-normal data. Intragroup comparisons of pain across time were assessed using repeated measures ANOVA (normal distribution) or Friedman test (non-normal distribution), with appropriate post-hoc adjustments. Categorical outcomes such as incidence of pain, flare-ups, and analgesic consumption were compared using the Chi-square test or Fisher's exact test when expected cell counts were small. The level of significance was set at $p < 0.05$ for all analyses.

Results

Baseline demographic and clinical characteristics (Table 1):
The baseline demographic and clinical parameters of the study population are summarized in Table 1. The mean age of patients in Group A (single-visit root canal treatment) was 34.60 ± 8.42 years, while in Group B (multiple-visit root canal treatment) it was 35.10 ± 7.96 years, with no statistically significant difference between the groups ($p = 0.842$). Gender distribution was comparable, with males constituting 55.00% of Group A and 50.00% of Group B, and females accounting for 45.00% and 50.00% respectively ($p = 0.751$). The distribution of tooth types was also similar between the two groups; anterior teeth accounted for 20.00% in Group A and 25.00% in Group B, premolars for 30.00% in both groups, and molars for 50.00% and 45.00% respectively, with no significant difference ($p = 0.913$). Regarding arch distribution, maxillary teeth constituted 60.00% in Group A and 55.00% in Group B, while mandibular teeth constituted 40.00% and 45.00% respectively, again showing no statistically significant difference ($p = 0.749$). The mean preoperative pain scores, assessed using the Visual Analog Scale, were high and comparable in both groups (7.85 ± 0.88 in Group A and 7.90 ± 0.85 in Group B; $p = 0.876$).

Intergroup comparison of postoperative pain intensity (Table 2):
The comparison of mean postoperative pain scores between the two groups at different time intervals is presented in Table 2. At 6 hours postoperatively, Group A reported a significantly lower mean VAS score (4.90 ± 1.25) compared to Group B (5.60 ± 1.20), with the difference being statistically significant ($p = 0.041$). This trend continued at 12 hours, where the mean pain score in Group A (3.85 ± 1.10) was significantly lower than that in Group B (4.65 ± 1.15) ($p = 0.018$). At 24 hours, postoperative pain further reduced in both groups; however, Group A continued to demonstrate significantly lower pain levels (2.60 ± 0.99) compared to Group B (3.45 ± 1.05) ($p = 0.009$). A similar statistically significant difference was observed at 48 hours, with mean VAS scores of 1.30 ± 0.65 in Group A and 1.90 ± 0.78 in Group B ($p = 0.021$). By the 7-day follow-up, pain levels were minimal in both groups, and the difference between Group A (0.20 ± 0.41) and Group B (0.35 ± 0.49) was not statistically significant ($p = 0.312$).

Intragroup comparison of postoperative pain over time (Table 3):
Intragroup analysis of postoperative pain scores over time revealed a highly statistically significant reduction in pain intensity within both treatment groups (Table 3). Repeated measures ANOVA demonstrated a significant decline in VAS scores across the assessed time intervals in Group A ($F = 96.42$; $p < 0.001$) as well as in Group B ($F = 88.76$; $p < 0.001$).

Incidence of postoperative pain (Table 4):
The incidence of postoperative pain, defined as a VAS score greater than zero, is shown in Table 4. At 6 hours post-treatment, pain was reported by 90.00% of patients in Group A and 95.00% of patients in Group B, with no statistically significant difference between the groups (p = 0.548). At 12 hours, the incidence decreased to 80.00% in Group A and 90.00% in Group B (p = 0.376). At 24 hours, postoperative pain was reported by 65.00% of patients in Group A and 80.00% in Group B (p = 0.288). A further reduction was observed at 48 hours, with pain present in 30.00% of Group A and 45.00% of Group B patients (p = 0.327). By the 7-day interval, only a small proportion of patients continued to report pain, with 10.00% in Group A and 15.00% in Group B, and the difference remained statistically non-significant (p = 0.633).

Analgesic intake and flare-up incidence (Table 5):
Table 5 presents the comparison of analgesic consumption and flare-up incidence between the two groups. A higher proportion of patients in Group B (65.00%) required postoperative analgesics compared to Group A (45.00%); however, this difference was not statistically significant (p = 0.206). In contrast, the mean number of analgesic tablets consumed was significantly higher in the multiple-visit group (1.90 ± 0.88) than in the single-visit group (1.25 ± 0.79), and this difference was statistically significant (p = 0.032). Flare-ups were infrequent in both groups, occurring in 5.00% of patients in Group A and 10.00% of patients in Group B, with no statistically significant difference between the groups (p = 0.548).

Table 1. Baseline demographic and clinical characteristics of the study population

Variable	Group A (Single-visit) n=20	Group B (Multiple-visit) n=20	p-value
Mean age (years)	34.60 ± 8.42	35.10 ± 7.96	0.842
Gender (Male)	11 (55.00%)	10 (50.00%)	0.751
Gender (Female)	9 (45.00%)	10 (50.00%)	
Tooth type – Anterior	4 (20.00%)	5 (25.00%)	0.913
Tooth type – Premolar	6 (30.00%)	6 (30.00%)	
Tooth type – Molar	10 (50.00%)	9 (45.00%)	
Maxillary teeth	12 (60.00%)	11 (55.00%)	0.749
Mandibular teeth	8 (40.00%)	9 (45.00%)	
Preoperative VAS score	7.85 ± 0.88	7.90 ± 0.85	0.876

Table 2. Comparison of mean postoperative pain scores (VAS) between the two groups at different time intervals

Time interval	Group A (Mean ± SD)	Group B (Mean ± SD)	p-value
6 hours	4.90 ± 1.25	5.60 ± 1.20	0.041*
12 hours	3.85 ± 1.10	4.65 ± 1.15	0.018*
24 hours	2.60 ± 0.99	3.45 ± 1.05	0.009*
48 hours	1.30 ± 0.65	1.90 ± 0.78	0.021*
7 days	0.20 ± 0.41	0.35 ± 0.49	0.312

*Statistically significant (p < 0.05)

Table 3. Intragroup comparison of postoperative pain scores over time

Group	Test used	Test value	p-value
Group A (Single-visit)	Repeated measures ANOVA	F = 96.42	<0.001*
Group B (Multiple-visit)	Repeated measures ANOVA	F = 88.76	<0.001*

*Highly statistically significant reduction in pain over time in both groups

Table 4. Incidence of postoperative pain (VAS > 0) at different time intervals

Time interval	Group A n (%)	Group B n (%)	p-value
6 hours	18 (90.00%)	19 (95.00%)	0.548
12 hours	16 (80.00%)	18 (90.00%)	0.376
24 hours	13 (65.00%)	16 (80.00%)	0.288
48 hours	6 (30.00%)	9 (45.00%)	0.327
7 days	2 (10.00%)	3 (15.00%)	0.633

Table 5. Analgesic intake and flare-up incidence in both groups

Parameter	Group A n (%)	Group B n (%)	p-value
Patients requiring analgesics	9 (45.00%)	13 (65.00%)	0.206
Mean number of tablets consumed	1.25 ± 0.79	1.90 ± 0.88	0.032*
Flare-up incidence	1 (5.00%)	2 (10.00%)	0.548

Discussion

The present prospective study evaluated postoperative pain after single-visit versus multiple-visit root canal treatment in symptomatic irreversible pulpitis and found that both groups were comparable at baseline (mean age: 34.60 ± 8.42 vs 35.10 ± 7.96 years; preoperative VAS: 7.85 ± 0.88 vs 7.90 ± 0.85). This baseline similarity is important because preoperative pain is a strong predictor of postoperative pain. In our study, all patients presented with high preoperative pain (≈7.9/10), which likely contributed to the high early postoperative pain reporting (VAS>0 in 90–95% at 6 hours). El Mubarak et al. (2010) similarly highlighted the role of preoperative pain, reporting postoperative pain in **15.9%** of patients with preoperative pain versus **7.1%** without preoperative pain, while noting an overall low incidence (**9.0% at 12 and 24 hours**) in their cohort. These findings support that case selection and baseline symptom severity can substantially influence postoperative pain outcomes across studies.[8]

In the early postoperative period, the single-visit group in our study consistently demonstrated significantly lower mean pain scores compared with the multiple-visit group at **6 hours (4.90 vs 5.60)**, **12 hours (3.85 vs 4.65)**, **24 hours (2.60 vs 3.45)**, and **48 hours (1.30 vs 1.90)**, with differences becoming nonsignificant by day 7. A comparable trend favoring single-visit therapy was reported by Patil et al. (2016), who used the modified Heft–Parker VAS and observed notably lower mean pain scores in single-visit cases than two-visit cases at early time points (e.g., **6 hours: 10.09 vs 30.70; 12 hours: 6.69 vs 18.38; 24 hours: 3.27 vs 12.36** on their scale). Although the absolute numbers differ because of pain-scale variation, the direction of effect aligns with our study—suggesting that avoiding inter-appointment factors (re-instrumentation, medicament dynamics, temporary restoration leakage risk) may reduce early discomfort in symptomatic patients.[9]

The pattern of significantly higher early pain in the multiple-visit group in our study is also consistent with evidence from controlled clinical trials reporting specific time-dependent differences. Gupta et al. (2022) reported significantly higher pain in the multiple-visit group at **12 hours (61.56 vs 73.62; p=0.039)** and **48 hours (8.97 vs 16.44; p=0.043)** (Heft–Parker VAS). They also showed that by 48 hours, **32.35%** of single-visit patients had mild pain versus **55.88%** in the multiple-visit group (with a significant intergroup difference at that interval). In comparison, our study similarly showed lower mean VAS scores in the single-visit group at both **12 hours (3.85 vs 4.65; p=0.018)** and **48 hours (1.30 vs 1.90; p=0.021)**, reinforcing that the clinically relevant difference is most evident within the first 1–2 days after treatment.[10]

Not all studies, however, demonstrate meaningful intergroup differences, and this heterogeneity is important when interpreting our results. Alomaym et al. (2019) reported **no statistically significant difference** between single- and multiple-sitting treatment in mean postoperative pain at **6 hours (12.96 vs 15.12)**, **12 hours (10.16 vs 11.94)**, **24 hours (8.13 vs 8.16)**, and **48 hours (4.42 vs 5.31)** (modified Heft–Parker VAS; p>0.05 across intervals), and they also reported **no flare-ups**. Differences from our findings may relate to broader case-mix (vital and nonvital teeth), medicament/restoration protocols, operator factors, and the substantially larger sample size in their trial, which can dilute the effect seen in narrowly defined symptomatic irreversible pulpitis cases.[11]

Within-group analysis in our study showed a highly significant decline in pain over time in both protocols (Group A: **F=96.42; p<0.001**, Group B: **F=88.76; p<0.001**), indicating that postoperative pain is predominantly a short-lived phenomenon when treatment is standardized. This time-dependent reduction is consistent with broader evidence syntheses: Sathorn et al. (2008) reported that the **prevalence of postoperative pain ranged widely from 3% to 58%** across included studies and noted substantial heterogeneity, but the overall clinical pattern across endodontic literature supports a decrease in pain with time after treatment. Our results fit this expected biological course of resolving inflammatory response following canal debridement and obturation, regardless of number of visits.[12]

When interpreting incidence outcomes, it is notable that in our study the proportion reporting any pain (VAS>0) remained numerically higher in the multiple-visit group at each interval (e.g., **6 hours: 90.00% vs 95.00%; 24 hours: 65.00% vs 80.00%; 48 hours: 30.00% vs 45.00%**), though without statistical significance—likely related to the small sample size and the sensitivity of a "VAS>0" threshold that includes very mild discomfort. Roane et al. (1983) used a different approach by classifying pain into "none/slight" versus "moderate/severe," and found a clear difference: **15.2%** moderate/severe pain in single-visit versus **31.2%** in multiple-visit cases (p=0.001), concluding approximately a 2:1 higher frequency of pain with multiple-visit treatment. The contrast suggests that how "pain incidence" is defined (any pain vs clinically significant pain) can materially affect whether differences emerge between visit protocols.[13]

Flare-ups were uncommon in our study (**5.00%** single-visit vs **10.00%** multiple-visit; p=0.548), supporting that severe exacerbations are relatively infrequent when cases with swelling/abscess are excluded and protocols are standardized. This is broadly consistent with Eleazer et al. (1998), who reported flare-ups defined as pain not controlled by OTC medication or increasing swelling, with **6/201**

(3%) in the one-visit group versus **16/201 (8%)** in the two-visit group—showing a significant advantage for one-visit treatment at the 95% confidence level. While our study showed the same directional trend (lower flare-ups in single-visit), the small sample size limits statistical separation, but together these findings support that flare-ups are not common in routine cases and may not be the primary determinant of visit selection in symptomatic irreversible pulpitis.[14]

Analgesic-related outcomes in our study showed that a higher proportion of multiple-visit patients required analgesics (**65.00% vs 45.00%**), and importantly, the multiple-visit group consumed significantly more tablets (**1.90 ± 0.88 vs 1.25 ± 0.79; p=0.032**), paralleling the higher early mean pain scores observed in that group. Evidence syntheses sometimes report different analgesic patterns: the Cochrane review by Manfredi et al. (2016) concluded no clear difference in several clinical outcomes between single- and multiple-visit treatment, reporting radiologic failure **RR 0.91 (95% CI 0.68–1.21)** and noting that patients treated in a single visit **might** report higher analgesic use and swelling. The divergence from our analgesic-consumption finding may reflect differences in included case types (necrotic/apical periodontitis vs vital symptomatic pulpitis), analgesic prescribing behavior, and outcome definitions across trials—highlighting that analgesic use is strongly context-dependent and should be interpreted alongside pain intensity data rather than alone.[15]

Conclusion

Single-visit root canal treatment in symptomatic irreversible pulpitis resulted in significantly lower early postoperative pain compared with multiple-visit treatment, particularly during the first 6–48 hours. Both treatment protocols showed a highly significant reduction in pain over time, with minimal pain reported by 7 days and no long-term difference between groups. Although flare-ups were infrequent and comparable between the groups, multiple-visit cases consumed a significantly higher number of analgesic tablets. Within the limitations of a small sample size, single-visit endodontic treatment may be preferred to improve early postoperative comfort in symptomatic irreversible pulpitis.

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