

Research Article

Adjunctive Periapical Dexamethasone Infiltration and 24-Hour Pain Following Single-Visit Root Canal Treatment

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ABSTRACT

Background: Pain following root canal obturation can compromise early patient comfort. Anti-inflammatory treatment is one strategy for controlling the acute periradicular response. This study evaluated whether a single periapical dexamethasone infiltration, added to postoperative ibuprofen, was associated with less pain at 24 hours than ibuprofen alone.

Methods: In this comparative clinical study, 128 patients aged 16-45 years with asymptomatic non-vital premolars and no periapical radiolucency were allocated by lottery into two equal groups. All teeth received single-visit root canal treatment using step-back preparation and cold lateral condensation. Group A received adjunctive periapical dexamethasone infiltration and ibuprofen 400 mg three times daily; Group B received the same ibuprofen regimen without dexamethasone. Presence of pain was evaluated 24 hours later using a visual analogue scale. The dexamethasone dose and study dates require verification against original records.

Results: Pain was reported by 6/64 (9.4%) in Group A and 16/64 (25.0%) in Group B (reported $p=0.019$). The absolute difference in pain incidence was 15.6 percentage points; the unadjusted risk ratio was 0.38. Pain was absent in 58/64 (90.6%) and 48/64 (75.0%) patients, respectively.

Conclusion: Adjunctive periapical dexamethasone infiltration was associated with a lower incidence of reported pain at 24 hours than ibuprofen alone in this selected cohort.

Keywords: Dexamethasone, Ibuprofen, Endodontics, Postoperative Pain, Single-Visit Root Canal Treatment, Periapical Infiltration.

INTRODUCTION

Postoperative pain remains a relevant patient-centred outcome after root canal treatment, even when canal instrumentation and obturation are completed in one appointment. Mechanical, chemical and microbial irritation of periradicular tissues may initiate inflammatory signalling and transient discomfort. Pain outcomes should therefore be assessed separately from longer-term healing and treatment success.^{1,2}

Nonsteroidal anti-inflammatory drugs (NSAIDs), including ibuprofen, reduce prostaglandin synthesis through cyclooxygenase inhibition and are widely used for acute dental pain. Contemporary guidance supports nonopioid analgesia as first-line pharmacological management in relevant acute dental pain settings; recommendations

for extraction-related pain should not automatically be extrapolated to every endodontic intervention.³ Dexamethasone acts upstream on several inflammatory pathways, making it a plausible adjunct, although the magnitude and safety of benefit depend on dose, route, patient selection and timing.⁴ Recent evidence syntheses have renewed interest in corticosteroids for post-endodontic pain, while emphasizing variability in clinical protocols and outcomes.⁴ The present historical clinical trial compared a combined local infiltration and oral NSAID regimen against oral NSAID alone after standardized single-visit treatment of asymptomatic necrotic premolars. Its primary reported outcome was the presence of pain 24 hours after obturation.

MATERIALS AND METHODS

Study Design and Participants

This comparative was conducted in the Department of Operative Dentistry, Nishtar Institute of Dentistry, Multan, Pakistan, following institutional ethical approval and written informed consent. The study carried out from December 2025 to May 2026.

Eligible participants were 16–45 years old, of either gender, with an asymptomatic non-vital premolar, necrotic pulp, and no periapical radiolucency. Diagnosis relied on history, clinical and radiographic examination and lack of response to thermal and electrical pulp testing. Exclusions comprised extensive intracanal calcification, incomplete root formation, retreatment, current analgesic/anti-inflammatory/tricyclic antidepressant use, allergy to endodontic medication, and grade II or III tooth mobility.

Allocation and Intervention

A total of 128 participants were allocated by lottery to Group A (n=64) or Group B (n=64). Under rubber-dam isolation, access was prepared and canals instrumented with H-files using a step-back technique and 2.6% sodium hypochlorite irrigation. Cold lateral

condensation with gutta-percha was used for obturation. All procedures were performed by one operator under supervision.

Following obturation, Group A received a single local periapical dexamethasone infiltration; Group B received no dexamethasone infiltration. Both groups were prescribed ibuprofen 400 mg orally three times daily.

Outcome and Statistical Analysis

Patients recorded their pain response at 24 hours on a visual analogue scale (VAS), with telephone details collected to facilitate follow-up. Analysis was reported using SPSS version 17.0, descriptive statistics and chi-square testing, with $p \leq 0.05$ considered statistically significant.

RESULTS

The two groups each comprised 64 patients. Mean age was 28.00 ± 6.718 years in Group A (range 16–45) and 26.484 ± 6.060 years in Group B (range 16–43). At 24 hours, 22 of 128 patients (17.2%) reported pain. Group A had fewer patients reporting pain than Group B (9.4% versus 25.0%; reported $p=0.019$).

Table 1. Postoperative Pain Incidence at 24 Hours.

Outcome at 24 hours	Group A: ibuprofen + dexamethasone (n=64)	Group B: ibuprofen only (n=64)	Total (n=128)
Pain present	6 (9.4%)	16 (25.0%)	22 (17.2%)
No pain	58 (90.6%)	48 (75.0%)	106 (82.8%)
Total	64 (100%)	64 (100%)	128 (100%)

Table 2 presents the gender-wise distribution of postoperative pain recorded 24 hours after single-visit root canal treatment. Among male patients, postoperative pain was reported in 3 (9.1%) patients in Group A (ibuprofen with dexamethasone infiltration), compared with 7 (25.0%) patients in Group B (ibuprofen alone). Similarly, among female patients, pain

was reported in 3 (9.7%) patients in Group A and 9 (27.3%) patients in Group B. Overall, the frequency of postoperative pain was lower in Group A than in Group B in both genders, suggesting a beneficial effect of adjunctive dexamethasone infiltration irrespective of gender.

Table 2. Gender-Stratified Counts Transcribed From The Source.

Gender	Group	Pain present, n	No pain, n	Implied group total
Male	A	3	30	33
Male	B	7	21	28
Female	A	3	28	31
Female	B	9	24	33*

DISCUSSION

This study found a lower 24-hour incidence of pain when periapical dexamethasone

infiltration was added to an identical oral ibuprofen regimen. The 15.6-percentage-point absolute difference is clinically noteworthy, but

its interpretation should be restricted to the selected asymptomatic, non-vital premolars treated in the study. The data do not establish effects on later pain, healing, infection, or other patient-centred outcomes.

Biologically, a local glucocorticoid may attenuate the acute inflammatory response associated with instrumentation and obturation, whereas ibuprofen inhibits prostaglandin production. A 2024 systematic review specifically examined systemic corticosteroid use in endodontics, including locally injected preparations, underscoring the contemporary relevance of this question.⁴ Nevertheless, protocol heterogeneity limits direct comparisons across studies.

The broader literature also shows that postoperative pain is not unique to conventional single-visit root canal treatment; a 2024 systematic review compared pain outcomes following single-visit root canal treatment and vital pulp therapy.² Evidence-based guidance published in 2024 favors NSAIDs alone or in combination with acetaminophen as first-line treatment for specified acute dental pain scenarios.³

Using nonsteroidal anti-inflammatory drug (Ibuprofen) was also effective for pain control. However, the single oral administration of the drug failed to reduce the pain incidence. 50% of this group exhibited pain in the first 24 hours following endodontic treatment. This percent was reduced to a significant level after 3 days. The oral administration of Ibuprofen along with the intraoral injection of dexamethasone was insignificantly reducing the post endodontic pain versus only oral administration of Ibuprofen tablets.

Krasner et al. also determined that the oral administration of dexamethasone significantly reduced the postoperative pain than those of placebos, when 7 tablets were taken along the first day.⁵ The regular oral administration of piroxicam was able to reduce the severity of pain incidence. However, some patients complained of gastrointestinal pain.

Morse et al. reported that the post-treatment prophylactic administration of diflunisal resulted in a statistically significant reduction in endodontic postoperative pain than that of on-demand usage of diflunisal.⁶ It was also suggested that the nonsteroidal anti-inflammatory drugs inhibited the cyclooxygenase enzyme preventing the formation of prostaglandins.⁷ While the medication must be extended for 3 days to obtain successful results.⁸ Recently, it has been reported that

indomethacin could also inhibit the interleukins and prostaglandins with subsequent inflammatory process.

The intraoral injection of Ketorolac was proven to be a useful adjunct in management of endodontic pain patients. It reduced the pain for 60 minutes; however, it combined with intramuscular injection of either ketorolac or placebo.⁸

CONCLUSION

Among 128 patients undergoing single-visit root canal treatment of asymptomatic non-vital premolars, reported pain at 24 hours was less frequent in the adjunctive dexamethasone plus ibuprofen group than in the ibuprofen-only group (9.4% versus 25.0%). The result is encouraging but should be interpreted in light of incomplete reporting, short follow-up and unresolved discrepancies in the source record.

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