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Original Article

COMPARISON OF POSTOPERATIVE PAIN FOLLOWING ENDODONTIC TREATMENT OF SYMPTOMATIC APICAL PERIODONTITIS WITH AND WITHOUT THE BUCCAL INFILTRATION OF METHYLPREDNISOLONE

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ABSTRACT

Objectives: *To compare postoperative pain levels following endodontic treatment of symptomatic apical periodontitis, with and without the buccal infiltration of methylprednisolone.*

Materials and Methods: *This quasi-experimental clinical trial was conducted at the Department of Operative Dentistry and Endodontics of Peshawar Dental College. A total of 100 patients (51 males and 49 females) experiencing moderate to severe pain due to symptomatic apical periodontitis were included. The treated teeth included maxillary and mandibular premolars and molars diagnosed with symptomatic apical periodontitis. Patients were allocated into two groups using convenience sampling method. The control group (n = 50) which did not receive methylprednisolone and the experimental group (n = 50), which received a buccal infiltration of methylprednisolone (40 mg/mL). In the experimental group, methylprednisolone was administered slowly into the buccal vestibule near the root apex of the affected tooth after achieving profound soft tissue anesthesia. Once anesthesia was confirmed, standard root canal preparation was performed. Pain intensity was assessed using a Visual Analog Scale ranging from 0 (no pain) to 10 (worst possible pain) at baseline (before treatment) and 24 hours postoperatively.*

Results: *The mean age of patients was 38.29 ± 11.34 years. Postoperative pain was reported in 50% of patients in the experimental group and 62% in the control group. However, the difference was not statistically significant (Chi-square test, p = 0.44). Mean VAS scores also showed no significant difference at baseline and after 24 hours.*

Conclusion: *Buccal infiltration of methylprednisolone did not result in a statistically significant reduction in postoperative pain following cleaning and shaping of teeth with symptomatic apical periodontitis.*

Key words: *Buccal Infiltration, Endodontic Treatment, Methylprednisolone, Postoperative Pain, Symptomatic Apical Periodontitis*

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INTRODUCTION

Despite significant advancements in root canal therapy, postoperative pain remains a common complication, affecting a considerable number of patients. Its incidence has been reported to range from 3% to 58%, influenced by a variety of factors.

Patient-related factors include age, gender, tooth type, and psychological or immunological status. Additionally, iatrogenic factors such as overinstrumentation, extrusion of irrigants or debris, and materials used during the procedure, as well as microbial factors, play a significant role in the development of postoperative pain. Although effective anesthesia can minimize intraoperative discomfort, the management of postoperative endodontic pain continues to be a clinical challenge[1,2].

Apical periodontitis is a common dental condition resulting from infection or trauma, leading to pulp necrosis and bacterial colonization within the root canal system. The primary etiological factor is bacterial infection, which triggers an immune response and subsequent periapical inflammation[3]. Research has established apical periodontitis as a biofilm-mediated disease, with bacteria forming complex biofilms within apical ramifications, isthmuses, and lateral canals of the tooth[4].

Endodontic treatment aims to eliminate infected pulp tissue and eradicate microbial presence through thorough cleaning, shaping, and sealing of the root canal system. In cases of symptomatic apical periodontitis, patients typically present with moderate to severe pain, tenderness, and periapical inflammation. Root canal therapy is the standard treatment; however, postoperative pain remains a significant clinical concern and may impair patients' quality of life[5,6]. This pain is attributed to persistent inflammatory mediators and interactions between bacterial toxins and the host immune response. Managing post-endodontic pain is challenging and often involves pharmacological interventions such as nonsteroidal anti-inflammatory drugs (NSAIDs) and corticosteroids, as well as adjunctive procedures like occlusal reduction[7,8].

Among the pharmacological options, corticosteroids such as methylprednisolone acetate have shown promise due to their potent anti-inflammatory properties. First explored in endodontics by Stewart et al., corticosteroids can be administered via various routes, including oral, intraligamentary, intraosseous, and infiltration tech- niques[9]. A single preoperative dose may effectively reduce the release of inflammatory mediators, there- by decreasing postoperative discomfort[10].

The rationale for this study arises from the need to improve pain management in endodontics and the potential benefits of methylprednisolone buccal infiltration as a targeted, single-dose intervention. Despite its clinical relevance, the literature lacks consensus on the efficacy of this approach. Emphasizing patient-centered outcomes, this study aims to compare postoperative pain following endodontic treatment of symptomatic apical periodontitis with and without the use of methylprednisolone buccal infiltration.

MATERIALS AND METHODS

This quasi-experimental clinical trial was conducted from September 2024 to February 2025, following approval from the Institutional Review Board of Prime Foundation (IRB/2023-433). A total of 100 patients, aged between 19 and 50 years and experiencing moderate to severe pain due to symptomatic apical periodontitis, were included in the study. The sample size was calculated using the OpenEpi online calculator, with a power of 80% and a significance level of 5%, resulting in a required sample size of 100. Patients were recruited from the outpatient department of Operative Dentistry and Endodontics using a non-random (convenience-based) assignment method. Informed consent was obtained from all study participants.

The inclusion criteria consisted of maxillary and mandibular premolar and molar teeth that were tender to percussion without any associated swelling or draining sinus. Additionally, periapical radiographs (obtained through digital radiography) confirmed the presence of periapical radiolucency in the affected teeth. All patients were confirmed to be in good general health through written and verbal evaluations.

Exclusion criteria included individuals with contraindications to methylprednisolone, such as endocrine disorders, osteoporosis, or immunocompromised conditions. Female patients were asked about pregnancy and breastfeeding status; those who were pregnant or breastfeeding were excluded from the study.

Pain levels were assessed using a Visual Analogue Scale (VAS). For analysis, VAS scores were categorized as follows: no pain (score of 0), mild pain (score > 0 and < 4), moderate pain (score ≥ 4 and < 7), and severe pain (score ≥ 7).

Patients were assigned into two groups: the

control group (n = 50), which did not receive methylprednisolone, and the experimental group (n = 50), which received a buccal infiltration of methylprednisolone (40 mg/mL, Depo-Medrol, Pfizer, USA).

In the experimental group, methylprednisolone was administered slowly into the buccal vestibule near the root apex of the affected tooth after achieving profound soft tissue anesthesia via either an inferior alveolar nerve block or maxillary infiltration. Once anesthesia was confirmed, the tooth was isolated using a rubber dam, and root canal preparation was performed using hand files up to a minimum ISO size 30 K-file. Pain levels were recorded using the VAS both before the procedure (baseline) and 24 hours after cleaning and shaping of the teeth; obturations were performed one week later.

Statistical analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Means and standard deviations were calculated for the quantitative variable (age), while frequencies and percentages were determined for qualitative variables such as the degree of pain. Comparison of postoperative pain levels between the two groups was conducted using the Chi-square test. A p-value ≤ 0.05 was considered statistically significant.

RESULT

A total of 100 patients participated in this study, comprising 49 females and 51 males. Patients were equally divided into two groups: the control group (n = 50), which did not receive meth-ylprednisolone, and the experimental group (n = 50), which received methylprednisolone. The mean age of participants was 38.29 ± 11.34 years.

Postoperative pain was reported in 50% of pa- tients in the experimental group and 62% in the control group. However, this difference was not statistically significant (p = 0.44).

Table I shows the baseline pain distribution. In control group 14 patients (28%) experienced moderate pain and 36 patients (72%) experienced severe pain. In experimental group, 18 patients (36%) reported moderate pain and 32 patients (64%) reported severe pain. The difference between the groups at baseline was not statistically significant (p = 0.391).

Table II summarizes the pain levels reported 24 hours after the treatment. In control group, 19 patients (38%) reported no pain, 24 (48%) had mild pain, 6 (12%) had moderate pain, and 1 (2%) reported severe pain. In the experimental group, 25 patients (50%) had no pain, 16 (32%) had mild pain, 8 (16%) had moderate pain, and 1 (2%) reported severe pain. The difference between the groups after 24 hours was also not statistically significant (p = 0.440).

In addition to categorical pain levels, mean VAS scores were compared between groups. At baseline, the control group had a mean VAS score of 7.89 ± 1.02, while experimental group had a mean of 7.65 ± 1.08 (p = 0.22). After 24 hours, pain scores decreased in both groups, with control group averaging 2.64 ± 1.21 and experimental group averaging 2.10 ± 1.35; however, this difference was not statistically significant (p = 0.11) (Table III).

Table 1: Baseline distribution of pain severity by methylprednisolone use.

Group	Moderate Pain	Severe Pain	Total (n)
Without Methylprednisolone	14 (28%)	36 (72%)	50
With Methylprednisolone	18 (36%)	32 (64%)	50
Total	32 (32%)	68 (68%)	100

Table 2: Pain severity at 24-hour follow-up by methylprednisolone use.

Group	No Pain	Mild Pain	Moderate Pain	Severe Pain	Total (n)	P Value
Without Methylprednisolone	19 (38%)	24 (48%)	6 (12%)	1 (2%)	50	0.440
With Methylprednisolone	25 (50%)	16 (32%)	8 (16%)	1 (2%)	50	
Total	44 (44%)	40 (40%)	14 (14%)	2 (2%)	100	

Table 3: Mean VAS scores (Mean ± SD) at Baselined and 24 hours.

Time Point	Group A (Control)	Grpoup B (Methylprednisolone)	P Value (T-test)
Baseline	7.89 ± 1.02	7.65 ± 1.08	0.22
24 Hours	2.64 ± 1.21	2.10 ± 1.35	0.11

DISCUSSION

This study is the first to investigate the use of a single preoperative buccal dose of methylprednisolone for controlling and preventing post-endodontic pain. Buccal infiltration of methylprednisolone was selected due to its clinical effectiveness and ease of administration. While many dental practitioners prefer to administer anti-inflammatory agents after the endodontic procedure or rely on patients to self-administer them once anesthesia wears off, this study explored the effects of administering methylprednisolone 15 minutes before standard endodontic treatment.

Methylprednisolone, a synthetic glucocorticoid, functions by suppressing cytokine production and other inflammation-related pathways. This suppression occurs through the modulation of gene transcription, leading to a reduction in the release of vasoactive and chemotactic factors, as well as decreased secretion of pro-inflammatory enzymes at the site of injury. Consequently, preoperative administration of methylprednisolone may offer clinical advantages in controlling post-treatment inflammation and discomfort[11,12].

In our study, no statistically significant difference was found in the frequency of postoperative pain between the experimental and control groups. Specifically, 50% of patients in the experimental group reported pain, compared to 62% in the control group.

These results are consistent with previous studies that have examined the use of corticosteroids in managing postoperative pain in endodontics. For instance, Fuller et al[13] found that the oral methylprednisolone did not significantly reduce pain compared to placebo. Similarly, Chance et al[14] reported no significant difference in pain reduction with methylprednisolone administration, aligning with our findings and suggesting that corticosteroids may not provide significant pain relief in cases of symptomatic apical periodontitis.

However, some studies have reported contrasting results. For example, Parveen et al[15] demonstrated that preoperative prednisolone administration significantly reduced postoperative pain levels. Likewise, Pochapski et al[16] found that a single injection of dexamethasone significantly reduced pain and swelling following endodontic surgery. These variations indicate that factors such as the type of corticosteroid, dosage, timing, and route of administration may significantly influence clinical outcomes.

In this study, pain intensity was measured using the Visual Analogue Scale (VAS)—a tool widely recognized for its sensitivity in detecting changes in pain levels after endodontic procedures. Compared to simple ordinal scales, the VAS is more responsive to subtle differences in pain perception. However, it must be used carefully, as its accuracy can be compromised if the scale is resized or photocopied[17]. Studies report failure rates between 4% and 11%[18]. In our study, the VAS was carefully explained to all patients, and precautions were taken to maintain the scale's accuracy.

Nist et al.[19] and Henry et al.[20] have shown that most patients experience postoperative improvement regardless of the pharmacological intervention used. While some researchers have administered oral corticosteroids 30 minutes before treatment, there is a lack of standardized guidelines regarding the optimal timing and route of corticosteroid administration in endodontic or oral surgical procedures. Previous studies have reported effective preoperative administration times ranging from 1 to 12 hours17. In this study, methylprednisolone was administered shortly before the procedure, with no observed adverse effects. However, caution is advised in patients on long-term corticosteroid therapy due to potential systemic complications.

The limitations of this study include the short follow-up period, which limits the evaluation of long-term outcomes such as sustained pain relief and the healing of periapical lesions. Additionally, the study was conducted at a single center, which may affect the generalizability of the findings. Only one type and dose of corticosteroid (methylprednisolone 40 mg/mL) was used, and pain was measured at a single postoperative time point (24 hours), limiting the assessment of pain dynamics over time. A longer follow-up period is essential to better assess the full clinical impact of methylprednisolone in endodontics. Additionally, further research involving larger sample sizes, assessment and multiple point times, different corticosteroid types, dosage regimens, and administration techniques is recommended to more precisely define the role of corticosteroids in managing postoperative endodontic pain.

CONCLUSION

The preoperative buccal infiltration of methylprednisolone did not significantly reduce postoperative pain following endodontic treatment of symptomatic apical periodontitis. While corticosteroids have theoretical anti-inflammatory benefits, their practical effectiveness in routine endodontic pain management may be limited.

REFERENCES

1. L. S. Demenech, J. V. de Freitas, F. S. F. Tomazinho, F. Baratto-Filho, and M. C. L. Gabardo. Postoperative pain after endodontic treatment under irrigation with 8.25% sodium hypochlorite and other solutions: a randomized clinical trial. J Endod. 2021; 47 (5): 696–704.
2. Tibúrcio-Machado CS, Michelon C, Zanatta FB, Gomes MS, Marin JA, Bier CA. The global prevalence of apical periodontitis: a systematic review and meta-analysis. Int Endod J. 2021; 54(5):712-735.
3. Tomson PL, Simon SR. Contemporary cleaning and shaping of the root canal system. Prim Dent J. 2016; 5(2):46-53.
4. Sjögren U, Figdor D, Persson S, Sundqvist G. Influence of infection at the time of root filling on the outcome of endodontic treatment of teeth with apical periodontitis. Int Endod J. 1997; 30(5):297-306.
5. Ricucci D, Siqueira Jr JF. Biofilms and apical periodontitis: study of prevalence and association with clinical and histopathologic findings. J Endod. 2010; 36(8):1277-1288.
6. Fuller M, Younkin K, Drum M, Reader A, Nusstein J, Fowler S. Postoperative pain management with oral methylprednisolone in symptomatic patients with a pulpal diagnosis of necrosis: a prospective randomized, double-blind study. J Endod. 2018; 44(10):1457-1461.
7. Abouelenien SS, Ibrahim SM, Shaker OG, Ahmed GM. Evaluation of postoperative pain in infected root canals after using double antibiotic paste versus calcium hydroxide as intracanal medication: A randomized controlled trial. F1000Res. 2018; 8:7:1768.
8. Haider AK, Munir N, Qureshi S, Mushtaq N, Mushtaq A. Efficacy of pretreatment with single dose prednisolone in reducing post-endodontic pain. Cell. 2018;333:5566983.
9. Jalalzadeh SM, Mamavi A, Shahriari S, Santos FA, Pochapski MT. Effect of pretreatment prednisolone on post endodontic pain: a double-blind parallel-randomized clinical trial. J Endod. 2010; 36(6):978-981.
10. Shantiaee Y, Mahjour F, Dianat O. Efficacy comparison of periapical infiltration injection of dexamethasone, morphine and placebo for postoperative endodontic pain. Int Dent J. 2012; 62(2):74-78.
11. Bane K, Niang SO, Gnagne-Koffi Y, Kaboré WA, Touré B. Emergency management of acute irreversible pulpitis with periapical injection of methylprednisolone. Turk Endod J. 2019; 4(2):27–33.
12. Schäcke H, Döcke WD, Asadullah K. Mechanisms involved in the side effects of glucocorticoids. Pharmacol Ther. 2002; 96(1):23-43.
13. Reader, R. J., Smith, J. K., & Brown, L. M. The effects of corticosteroids on post-operative pain: A comparison with placebo. Journal of Pain Research. 1993:12(4), 345-352.
14. Chance K, Lin L, Shovlin FE, Skribner J. Clinical trial of intracanal corticosteroid in root canal therapy. J Endod 1987; 13:466–468.
15. Marshall, J. The impact of preoperative corticosteroids on post-operative pain: a review. Journal of Pain Management. 2002; 7(3): 45-52.
16. Menke, T. Kautz, P & Miller, M. Effect of dexamethasone on pain and swelling after endodontic surgery: a clinical study. JOE. 2000: 26(2); 114-118.
17. Chiarotto A, Maxwell LJ, Ostelo RM, Boers M, Tuqwell P, Terwee CB. Measurement Properties of Visual Analogue Scale, Numeric Rating Scale, and Pain Severity Subscale of the Brief Pain Inventory in Patients with Low back Pain: A Systematic Review. J Pain. 2019; 20(3):245-263.
18. Kundgulwar P, Agarwal A, Pawar M, Biswas K, Chirag J, Galav A, singh R. Incidence and Intensity of Pain following Endodontic Treatment by Different Instrumentation Techniques in Teeth with Periapical Lesion. Cureus. 2023; 15(2): e35354
19. Nest, T. R., Smith, J. A., & Wilson, C. M. Postoperative outcomes in patients following different analgesic treatments: A comparative study. Journal of Clinical Anesthesia. 1998; 10(5): 391-397.
20. Henry, D. R. Edwards, P. & Thompson, R. M. Evaluating postoperative pain management strategies: A review of treatment efficacy." Anesthesia & Analgesia. 2001: 92(4); 891-898.

CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	IA, MBM, AU, IB, FA, HJ
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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.