Content available at: https://www.ipinnovative.com/open-access-journals

IP Indian Journal of Conservative and Endodontics

Journal homepage: https://www.ijce.in/

Original Research Article

Efficacy of pre-operative submucosal injection of dexamethasone and triamcinolone acetonide on post-operative pain following endodontic treatment of teeth with irreversible pulpitis: A randomised clinical trial

Jaykumar T[1], Pari Anand[1,*], Srirekha A[1], Champa C[1], Ashwija Shetty[1], Archana S[1]

[1] *Dept. of Conservative Dentistry and Endodontics, The Oxford Dental College, Bangalore, Karnataka, India*

ARTICLE INFO

Article history:
Received 28-04-2023
Accepted 22-05-2022
Available online 25-05-2023

Keywords:
Dexamethasone
Postoperative pain
Triamcinolone acetonide

ABSTRACT

Background: Post-endodontic pain is a challenge to clinicians. In this context the evidence for use of preoperative medication is not consistent.
Aim: The study's objective is to assess the effects of dexamethasone and triamcinolone acetonide administered submucosally in single doses on postoperative pain following single-visit root canal treatment for teeth with symptomatic irreversible pulpitis.
Materials and Methods: Thirty patients were randomly allocated in three groups. Group I received saline (control), Group II received dexamethasone (8mg) and Group III received triamcinolone acetonide (40mg) before endodontic treatment was initiated. Root canal treatment was performed in a single appointment for all the participants. Post-operative pain was assessed using Heft-Parker visual analogue scale (HP VAS).
Statistical Analysis Used: Comparison of HP VAS scores was done using Kruskal Wallis Test and Mann Whitney Test.
Results: There was no significant difference in the mean HP VAS scores between 3 groups at pre-op period (P=0.74). At 6,12 and 24h post-operative period the mean HP VAS scores in Group 2 and 3 was significantly lesser as compared to Group 1.
Conclusion: Corticosteroid preoperative dosages led to a reduction in post endodontic pain after single visit root canal treatment of teeth with symptomatic irreversible pulpitis.

1. Introduction

Endodontic pain is associated with inflammatory reactions that can last from several hours to several days.[1] Endodontic postoperative pain is often minimal and does not persist more than 72 hours. Even after receiving the right endodontic care, some patients experience persistent, moderate to severe pain that can last for a prolonged period.[2] Due to its effectiveness at low doses and capacity to reduce potential adverse effects, submucosal administration of several drugs has recently been compared to alternative approaches.[3] Non-steroidal anti-inflammatory drugs (NSAIDs) or corticosteroids help reduce endodontic pain because it is known that inflammatory mediators have a role in the pathogenesis of pulpitis. Glucocorticoids, as opposed to NSAIDs, have numerous anti-inflammatory actions and multiple sites of action.[4]The ability of corticosteroids to reduce the release of vasoactive and chemoattractive substances as well as to limit the generation of interleukins, interferon-gamma, colony stimulating factor, and TNF-alpha is what causes these substances to have an anti-inflammatory effect. Corticosteroid injection

* *Corresponding author*.
E-mail address: parianand1995@gmail.com (P. Anand).

https://doi.org/10.18231/j.ijce.2023.019

should therefore be given before the procedure rather than during or after it.[5]

Therefore, the aim of this study is to assess the effects of submucosal injections of two corticosteroids on postoperative pain following single visit root canal treatment of teeth with symptomatic irreversible pulpitis.

2. Materials and Methods

2.1. Study design

This study was a randomized clinical trial and was registered at Clinical Trials Registry-India (CTRI/2023/03/050856) and reported according to guidelines of CONSORT clinical trials.

Institutional Ethics Committee clearance was acquired for this study.

Total of 30 patients were selected based on inclusion and exclusion criteria.

2.2. Inclusion criteria

1. Healthy adults aged 18-50 years with symptomatic irreversible pulpitis.
2. Patients with good general health and no chronic systemic diseases.
3. Patients with a radiographically normal periapical region.

2.3. Exclusion criteria

1. Teeth with periapical pathology, abscesses, calcified canals or aberrant anatomy.
2. Patients with a history of allergy to local anesthesia or other experimental drugs.
3. Patients with systemic disorders, pregnant and lactating mothers, and any conditions that conflict with the use of steroids.
4. Patients taking analgesics or anti-inflammatory drugs 12 hours before the procedure.

2.4. Sample size calculation

Using the GPower programme version 3.1.9.4 [Franz Faul, Universität Kiel, Germany], the sample size was calculated. The total sample size required for the study was 30, taking into account the effect size to be measured (f) at 60%, the power of the study being 80%, and the margin of error at 5%. Each group had 10 participants.

2.5. Randomization and allocation

Computer generated randomization was undertaken by a person not involved in the trial. Opaque, sequentially numbered envelopes, containing the group name and the drug to be used for each patient, were used to ensure allocation confidentiality. Each envelope was delivered to the clinician who performed the intervention prior to the procedure.

2.6. Treatment protocol

Each patient had to obtain consent from a physician prior to the study. After explaining the treatment procedure, possible discomfort, risks and benefits an informed consent was taken from the patients. Preoperative pain intensity was measured by asking patients to complete the Heft-Parker Visual Analogue Scale (HP VAS).[3]

The studied samples were divided using a simple randomization method into three groups.

In all groups, local anesthesia was administered using 1.5 ml of 2% lidocaine with 1:80000 adrenaline at room temperature using inferior alveolar nerve block (IANB) in the mandible and buccal infiltration in the maxilla. After anesthesia, patients received pre-operative submucosal injections of one of the study groups.

In group 1: 2 ml saline solution was administered submucosally to the control group after local anesthesia into the mucobuccal fold of the teeth.

In group 2: 8 mg 2 ml dexamethasone was administered submucosally in the mucobuccal fold of the teeth.

In group 3: 40 mg of triamcinolone acetonide dissolved in 2 ml of injection water was administered submucosally in the mucobuccal fold of the teeth.

All patients underwent electrical pulp testing. If the tooth recorded a positive response, the anesthesia was considered "failed" and the data was recorded. If the tooth gave a negative response on pulp testing, endodontic access was initiated.

After isolating with rubber dam, access opening was done and the working length was determined using an apex locator (Root ZX mini) and confirmed with periapical radiographs. Glide path was established with K-files up to size 15 (Mani, Japan) and Hyflex CM (Coltene) instruments were used for root canal instrumentation. Irrigation was done with 2.5% sodium hypochlorite and 17% ethylenediaminetetraacetic acid (EDTA). Saline was used as the final irrigant. The root canals were then dried with paper points and obturated. Composite resin was used to restore the access cavity and the occlusion was relieved for all teeth. Endodontic treatment for all the patients was completed in a single visit. All the study participants were recalled after four days for evaluation.

3. Results

Mean HP VAS scores for pain was compared at different time intervals between 3 groups and was evaluated using Kruskal Wallis Test (Table 1) and multiple comparison of the mean difference in HP VAS scores between groups at different time intervals was done using Mann Whitney Test (Table 2).

Table 1: Comparison of mean HP VAS scores for pain at different time intervals between 3 groups using kruskal wallis test

Time	Groups	N	Mean	SD	Min	Max	p-value
Pre-op	Group 1	10	134.60	19.42	114	170	0.74
	Group 2	10	141.70	19.22	114	170	
	Group 3	10	137.20	22.34	114	170	
6 Hrs	Group 1	10	53.50	47.02	0	170	0.03*
	Group 2	10	13.60	19.50	0	54	
	Group 3	10	22.60	22.05	0	54	
12 Hrs	Group 1	10	67.50	27.70	23	114	<0.001*
	Group 2	10	15.40	18.54	0	54	
	Group 3	10	21.80	17.86	0	54	
24 Hrs	Group 1	10	35.70	23.62	0	85	0.009*
	Group 2	10	8.20	13.67	0	36	
	Group 3	10	12.80	14.04	0	36	
48 Hrs	Group 1	10	17.20	20.02	0	54	0.04*
	Group 2	10	2.30	7.27	0	23	
	Group 3	10	4.60	9.70	0	23	
72 Hrs	Group 1	10	12.30	18.23	0	54	0.04*
	Group 2	10	0.00	0.00	0	0	
	Group 3	10	4.60	9.70	0	23	

*–StatisticallySignificant

Table 2: Multiple comparison of mean difference in HP VAS scores b/w groups at different time intervals using mann whitney test

Time	(I) Groups	(J) Groups	Mean Diff. (I-J)	95% CI for the Diff.		p-value
				Lower	Upper	
6 Hrs	Group 1	Group 2	39.90	4.39	75.41	0.01*
		Group 3	30.90	-4.61	66.41	0.08
	Group 2	Group 3	-9.00	-44.51	26.51	0.33
12 Hrs	Group 1	Group 2	52.10	27.89	76.31	0.001*
		Group 3	45.70	21.49	69.91	0.001*
	Group 2	Group 3	-6.40	-30.61	17.81	0.38
24 Hrs	Group 1	Group 2	27.50	7.85	47.15	0.006*
		Group 3	22.90	3.25	42.55	0.02*
	Group 2	Group 3	-4.60	-24.25	15.05	0.44
48 Hrs	Group 1	Group 2	14.90	-0.08	29.88	0.04*
		Group 3	12.60	-2.38	27.58	0.11
	Group 2	Group 3	-2.30	-17.28	12.68	0.54
72 Hrs	Group 1	Group 2	12.30	-0.92	25.52	0.03*
		Group 3	7.70	-5.52	20.92	0.30
	Group 2	Group 3	-4.60	-17.82	8.62	0.15

*–StatisticallySignificant

Amongst the three groups, there was no statistically significant difference in mean age (P=0.99). There was no statistically significant differences in the distribution of gender among the groups (P=0.59), and there was no statistically significant difference in the array of teeth treated among the three study groups (P=0.99).

There was no significant difference in the mean HP VAS scores between 3 groups at pre-op period (P=0.74)

At 6,12 and 24h post-operative period the difference in the mean HP VAS scores between 3 groups was statistically significant and the mean HP VAS scores in Group 2 and 3 was significantly lesser as compared to Group 1.

At 48 and 72h post-operative period mean HP VAS scores in Group 2 was significantly lesser as compared to Group 1, However, no significant difference was found between Group 1 and Group 3 and also between Group 2 and Group 3. (Table 1)

4. Discussion

Debridement and shaping of root canals during endodontic treatment may cause the extrusion of irritants into the periapical tissues, including microorganisms, bacterial toxins, pulp remnants, and irrigating solutions, necessitating the administration of analgesics in a significant number of cases.[2]

After a root canal procedure, pain levels have been estimated to range from 25 to 69%.[6,7]

Some research claim that only 4–10% of endodontic patients experience moderate to severe postoperative pain,[8] whereas other studies claim that the prevalence is closer to 50%.[9]

Post-treatment endodontic pain has been managed with a variety of medication groups, including NSAIDs, opioids, acetaminophen and steroids.[10,11]

The objective of this clinical trial was to evaluate the impact of preoperative submucosal corticosteroid administration on postoperative pain following single-visit root canal therapy. As such, corticosteroids should be administered prior to the procedure rather than during or after it. Therefore, in the current study, medications were given before the start of the root canal procedure. Steroids may also work by reducing bradykinin mediators by accelerating the production of angiotensin converting enzyme.[12,13]

The investigation of pain intensity revealed that all three groups had similar mean pain levels prior to endodontic treatment. The study's findings demonstrated a significant decrease in post-operative discomfort in the groups receiving preoperative corticosteroids.

According to research by Shantiaee et al., dexamethasone local infiltration reduced postoperative endodontic pain after surgery for 24 hours more effectively than morphine.[14] In their investigation, Sharma et al. hypothesised that preoperative oral dexamethasone administration and preoperative oral administration of SAID both considerably reduced postoperative endodontic pain.[15]

Dexamethasone has a far stronger anti-inflammatory effect than other steroids, such as 25 times that of hydrocortisone and 6 times that of prednisolone.[16,17]

Triamcinolone is frequently used in oral surgery and intralesional injections, while its usage in endodontics is less prevalent. The usefulness of submucosal triamcinolone in reducing pain after root canal therapy has not been studied.

By decreasing the volume and activity of lymphatic networks, triamcinolone acetonide inhibits the immune system. reduces inflammation by reversing capillary permeability and inhibits the movement of polymorphonuclear leukocytes. Since it has better local potency, a longer half-life, and less systemic absorption, it is a better corticosteroid for intralesional injection.[18,19]

This study aimed to evaluate the efficacy of submucosal dosage over other techniques since submucosal application has recently been compared to other methods because of its low-dose efficiency and capacity to minimise potential negative effects.[20]

The study's potential limitations include the limited sample size and confinement to patients with irreversible pulpitis, which prevents extrapolation of the findings to patients with pulpal necrosis. To assess the effectiveness of these drugs in root canal therapy, additional clinical studies with diverse clinical situations, greater sample sizes, and varying drug dosages can be conducted.

5. Conclusion

In conclusion, following single visit root canal treatment for teeth with symptomatic irreversible pulpitis, a preoperative submucosal dosage of dexamethasone and triamcinolone acetonide is capable of minimising post endodontic pain.

6. Source of Funding

None.

7. Conflicts of Interest

None.

References

1. Negm MM. Intracanal use of a corticosteroid-antibiotic compound for the management of posttreatment endodontic pain. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2001;92(4):435–9. doi:10.1067/moe.2001.115975.
2. Yavari HR, Jafari F, Jamloo H, Hallaj-Nezhadi S, Jafari S. The effect of submucosal injection of corticosteroids on pain perception and quality of life after root canal treatment of teeth with irreversible pulpitis: A Randomized Clinical Trial. *J Endod*. 2019;45(5):477–82.
3. Aksoy F, Ege B. The effect of pretreatment submucosal injections of tramadol and dexamethasone on post-endodontic pain in mandibular molar teeth with symptomatic irreversible pulpitis: a randomized controlled clinical trial. *Int Endod J*. 2020;53(2):176–85.
4. Aggarwal V, Singla M, Saatchi M, Gupta A, Hasija M, Meena B, et al. Preoperative intraligamentary injection of dexamethasone can improve the anesthetic success rate of 2% lidocaine during the endodontic management of mandibular molars with symptomatic irreversible pulpitis. *J Endod*. 2021;47(2):161–8.
5. Suresh N, Nagendrababu V, Koteeswaran V, Haritha JS, Swetha SD, Varghese A, et al. Effect of preoperative oral administration of steroids in comparison to an anti-inflammatory drug on postoperative pain following single-visit root canal treatment- a double-blind, randomized clinical trial. *Int Endod J*. 2021;54(2):198–209.
6. Pochapski MT, Santos FA, De Andrade E, Sydney GB. Effect of pretreatment dexamethasone on postendodontic pain. *Oral Surg, Oral Med, Oral Pathol, Oral Radiol, Endod*. 2009;108(5):790–5.
7. Ince B, Ercan E, Dalli M, Dulgergil CT, Zorba YO, Colak H, et al. Incidence of postoperative pain after single- and multi-visit endodontic treatment in teeth with vital and non-vital pulp. *Eur J Dent*. 2009;3(4):273–9.
8. Wong AW, Zhang C, Chu CH. A systematic review of nonsurgical single-visit versus multiple-visit endodontic treatment. *Clin Cosmet Investig Dent*. 2014;6:45–56. doi:10.2147/CCIDE.S61487.
9. Direnzo A, Gresla T, Johnson BR, Rogers M, Tucker D, Begole EA, et al. Postoperative pain after 1- and 2-visit root canal therapy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2002;93(5):605–10. doi:10.1067/moe.2002.121900.
10. Doroschak AM, Bowles WR, Hargreaves KM. Evaluation of the combination of flurbiprofen and tramadol for management of endodontic pain. *J Endod*. 1999;25(10):660–3.
11. Rogers MJ, Johnson BR, Remeikis NA, Begole EA. Comparison of effect of intracanal use of ketorolac tromethamine and dexamethasone with oral ibuprofen on post treatment endodontic pain. *J Endod*. 1999;25(5):381–4.
12. Marshall JG. Consideration of steroids for endodontic pain. *Endodontic Topics*. 2002;3(1):41–51. doi:10.1034/j.1601-1546.2002.30105.x.

13. Mohammadi Z. Systemic and local applications of steroids in endodontics: an update review. *Int Dent J*. 2009;59(5):297–304.
14. 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):74–8.
15. Sharma N, Nikhil V, Gupta S. Effect of preoperative administration of steroid with different routes on post endodontic pain: a randomized placebo controlled clinical trial. *Endodontology*. 2015;27(2):107–12. doi:10.4103/0970-7212.218373.
16. Goodman-Gilman A, Goodman LS, Rail TW, Murad F. Goodman and Gilman's: The pharmacological basis of therapeutics. New York: Macmillan; 1985. p. 1478–9.
17. Physicians' Desk Reference, 39th edn. Oradell, New Jersey: Medical Economics; 1985. p. 1286–7.
18. Singh M, Niranjan HS, Mehrotra R, Sharma D, Gupta SC. Efficacy of hydrocortisone acetate/hyaluronidase vs triamcinolone acetonide/hyaluronidase in the treatment of oral submucous fibrosis. *Indian J Med Res*. 2010;131:665–9.
19. Mohammadi Z. Systemic and local applications of steroids in endodontics: an update review. *Int Dent J*. 2009;59(5):297–304.
20. Suneelkumar C, Subha A, Gogala D. Effect of Preoperative Corticosteroids in Patients with Symptomatic Pulpitis on Postoperative Pain after Single-visit Root Canal Treatment: A Systematic Review and Meta-analysis. *J Endod*. 2018;44(9):1347–54.

Author biography

Jaykumar T, Professor https://orcid.org/0000-0002-7249-1211

Pari Anand, Student https://orcid.org/0009-0001-4043-5362

Srirekha A, HOD https://orcid.org/0000-0002-7306-5548

Champa C, Professor https://orcid.org/0000-0001-5712-9022

Ashwija Shetty, Professor https://orcid.org/0000-0002-5127-5018

Archana S, Reader https://orcid.org/0000-0003-3866-5481

Cite this article: Jaykumar T, Anand P, Srirekha A, Champa C, Shetty A, Archana S. Efficacy of pre-operative submucosal injection of dexamethasone and triamcinolone acetonide on post-operative pain following endodontic treatment of teeth with irreversible pulpitis: A randomised clinical trial. *IP Indian J Conserv Endod* 2023;8(2):102-106.