Effect of Pretreatment Prednisolone on Postendodontic Pain: A Double-blind Parallel-randomized Clinical Trial

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Abstract

Introduction: Effective management of endodontic pain represents a continuing challenge. This study evaluates the use of a preoperative, single oral dose of prednisolone for the prevention and control of postendodontic pain. **Methods:** Forty patients were randomly assigned to 2 groups, placebo and prednisolone (30 mg). The medications were administered 30 minutes before the start of standard endodontic treatment. Postoperative pain was assessed after 6, 12, and 24 hours by using a visual analogue scale. **Results:** The outcome showed that prednisolone resulted in a statistically significant reduction in postendodontic pain at 6, 12, and 24 hours ($P < .0001$). No side effects were reported for any of the medications used. **Conclusions:** This study suggests that a preoperative, single oral dose of prednisolone substantially reduced postendodontic pain. Further studies are needed to evaluate the applicability of these findings to other clinical conditions, single- versus multiple-visit endodontic treatment, and drug regimens. *(J Endod 2010;36:978–981)*

Key Words

Double-blind study, oral administration, postoperative pain, prednisolone, pulpectomy, root canal therapy

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Post-treatment endodontic pain has been reported in 25%–40% of all endodontic patients (1–3). Patients with severe preoperative pain tend to have more severe postendodontic pain than patients with mild or no preoperative pain. The possible causes for endodontic interappointment pain are related to endodontic instrumentation, irritating irrigants, intracanal medications, periapical contamination, and temporary restorations in hyperocclusion (1, 2, 4–7). Irritation of periradicular tissues caused by local trauma, caustic irrigating solution, or contamination during root canal therapy causes an acute inflammatory reaction, potentially leading to pain and/or swelling (8). Many chemical mediators (prostaglandins, leukotrienes, bradykinin, etc) have been associated with this inflammatory process. Prostaglandins increase vascular permeability, elevate chemotactic activity, induce fever, and increase sensitivity of pain receptors to other active inflammatory mediators (8–12).

A variety of approaches have been recommended for the management of interappointment pain. These include occlusal reduction, prescription of analgesics, and the use of steroidal and nonsteroidal anti-inflammatory agents (4, 13–15). In this context, drugs that modulate the inflammatory response should be considered for the prevention and control of postendodontic pain. Therefore, systemic drugs (analgesic and anti-inflammatory) have been used to reduce the severity of post-treatment pain. However, a definitive anti-inflammatory protocol to prevent and control the occurrence of postendodontic pain has not yet been established (4, 12, 15–17).

In comparison to repeated doses during the postoperative period, a preoperative, single oral dose of anti-inflammatory drugs can modulate release of inflammatory mediators and reduce the occurrence of side effects. The maximum benefit of the anti-inflammatory is obtained when therapeutic levels are reached before tissue manipulation (1, 4, 10, 11, 16, 18–20).

Prednisolone is a steroidal anti-inflammatory drug (SAID) that inhibits phospholipase A_2 and consequently reduces prostaglandin and leukotriene synthesis, decreasing polymorphonuclear leukocyte chemotaxis. It also suppresses the production of free oxygen radicals and nitric oxide by endothelial cells. Furthermore, SAIDs are also able to down-regulate many proinflammatory cytokines and increase interleukin (IL)-10, which inhibits nuclear factor kappa B activity and affects many immune cells involved in the inflammatory process (11, 21–23).

Nevertheless, few studies have evaluated the effect of SAIDs with regard to prevention and control of postendodontic pain after root canal instrumentation (1, 24–26). The optimal oral prednisolone dosage for the prevention and control of interappointment endodontic pain is yet to be determined. The purpose of the present study was to evaluate the effect of prednisolone (30 mg) administered as a single, preoperative oral dose for the prevention and control of postendodontic pain.

Materials and Methods

This study was approved by the Joint Research and Ethics Committee of the University of Medical Sciences, Hamadan, Iran, and each patient provided informed consent to participate in the study. Sixty-three patients between the ages of 18 and 59 years were selected at the Department of Endodontics, Hamadan Dental School to take part in this double-blind parallel-randomized clinical trial.

Clinical examinations were conducted by 3 operators (senior postgraduate students). The examination included a thermal (cold) test, percussion and palpation evaluation, periodontal probing, mobility assessment, and a periapical radiograph.

All past and present symptoms were noted. A diagnosis was determined on the basis of the history as well as clinical and radiographic features.

The inclusion criteria for the study were requirement for nonsurgical endodontic therapy in single or multiroot teeth (premolar and molar); vital and nonvital pulp and asymptomatic and symptomatic teeth were included. Exclusion criteria were analgesic and inflammatory drugs taken within the last 6 hours, acute endodontic or periodontal abscess, periodontal diseases, requirement for prophylactic antibiotics, pregnancy or lactation, mental disabilities, systemic diseases that contraindicated the endodontic therapy, and any known sensitivity or other adverse reactions to prednisolone.

The volunteers were randomly divided into 2 experimental groups: group 1, placebo (dextrose gelatin capsule), and group 2, prednisolone (30 mg). Both medications were administered 30 minutes before conventional root canal therapy. To maintain the double-blind design, a second investigator (S.M.J.) provided the 2 agents, and each tablet was disguised so that the patient was not aware of the medication he/she was taking.

Treatment in all cases (vital and nonvital teeth) was completed by 3 postgraduate endodontic students in a single visit. Each patient (according to individual needs) was anesthetized with a solution of 2% lidocaine with 1:100,000 epinephrine (Daroupakhsh, Tehran, Iran), followed by rubber dam isolation, access, cleaning and shaping of the canals. The root canal treatment procedure was conducted by using the passive step-back technique. The canals were enlarged to a minimum size of #30 file or larger (depending on the size of the canal), which were 0.5–1.0 mm short of the radiographic apex. Copious irrigation with a saline solution (0.9% of NaCl) or 2.5% sodium hypochlorite was used between each file, and the irrigant remained in the canal throughout the entire procedure.

When instrumentation was completed, the canals were dried with paper points. The canals were filled with gutta-percha (AriaDent, Tehran, Iran) and AH26 sealer (Dentsply DeTrey GmbH, Konstanz, Germany) by using the lateral compaction technique. After placing a cotton pellet in the pulp chamber, the access cavity was closed with Coltosol (Coltene AG, Altstatten, Switzerland). The occlusion was evaluated and reduced if necessary.

Patients were instructed to complete a pain diary 6, 12, and 24 hours after root canal instrumentation. The method used to measure clinical pain intensity was the visual analogue scale (VAS), which consists of a 10-cm line anchored by 2 extremes, "no pain" and "pain as bad as it could be" (26). Patients were asked to make a mark on the line that represented their level of perceived pain. Thus, pain intensity was assigned into 4 categorical scores: 1, none (0); 2, mild (1–3); 3, moderate (4–6); and 4, severe (7–10).

The volunteers received rescue medication (ibuprofen or acetaminophen) and were instructed to take this medication as needed; however, in this case, patients were removed from the study.

Baseline comparisons of the study were performed by using Fisher exact test (age, gender, teeth, diagnosis, and rescue medications). The results of pain intensity (VAS) were computed as the means and standard error (SE). Statistically significant differences among groups (placebo and prednisolone) were evaluated by the unpaired Student *t* test, which was used to determine the differences between groups at each time point. To fit the requirements for this method (normal distribution), the raw data were transformed by using the square root extraction. The normal distribution of the data was tested by the D'Agostino and Pearson omnibus normality test. All calculations were made through the programs SPSS (Statistical Package for the Social Science) version 17.0 for Windows (SPSS Inc, Chicago, IL) and GraphPad Prism, version 5.00 for Windows (GraphPad Software, San Diego, CA). The significance levels were set at $\alpha = 5\%$ ($P \leq .05$).

Results

A total of 40 subjects (12 men and 28 women) completed the study. Fourteen and 9 patients were excluded from the placebo and prednisolone groups, respectively, as a result of rescue medication consumption.

The sample was distributed in a similar way in regards to age, gender, teeth, and endodontic diagnosis, with no significant differences between the groups. However, the percentage of subjects with preoperative pain between placebo (100%) and prednisolone (75%) had significant difference ($P = .0472$) (Table 1).

Postendodontic pain showed a statistically significant difference between groups at 6, 12, and 24 hours ($P < .05$). Prednisolone treatment was associated with the lowest levels of endodontic pain (Fig. 1).

When comparing differences in pain intensity between vital and nonvital teeth, both groups (placebo and prednisolone) had a higher intensity of pain 24 hours after endodontic treatment in nonvital teeth (Fig. 2).

The percentage of subjects reporting no or mild pain after a 6-hour period was 30% for the placebo group and 75% for the prednisolone group. After a 12-hour period, 25% of patients in the placebo group and 80% of patients in the prednisolone group reported no or mild pain. After a 24-hour period, no pain was observed in 15% of the patients in the placebo group and 85% of patients in the prednisolone group (Fig. 3).

No side effects were reported for any of the medications used.

Discussion

Traditionally, impacted third molar extractions and periodontal surgery have served as excellent models for testing analgesic and anti-inflammatory drugs (19, 20, 22). The dental literature presents few studies evaluating oral administration of glucocorticoids for the prevention and control of postendodontic pain (1, 14, 24–26) and no evaluations with oral prednisolone.

TABLE 1. Demographic and Clinical Features

Variables	Group 1 (placebo) (n = 20)	Group 2 (prednisolone) (n = 20)	*P* value
Age (%)			
18–39 y	95	85	.6050 ns
40–59 y	5	15	
Gender (%)			
Male	70	70	1.000 ns
Female	30	30	
Teeth (%)			
Upper	40	45	1.000 ns
Lower	60	55	
Single root	10	15	1.000 ns
Multiroot	90	85	
Diagnosis (%)			
Vital	60	65	1.000 ns
Nonvital	40	35	
Preoperative conditions (%)			
Asymptomatic	0	25	.0471 s
Symptomatic	100	75	
Rescue medications (%)			
Yes	41*	31*	.4424 ns
No	59	69	

Fisher exact test: s, significant; ns, not significant.

*Patients excluded (rescue medication consumption).