Postoperative Pain Management with Oral Methylprednisolone in Symptomatic Patients with a Pulpal Diagnosis of Necrosis: A Prospective Randomized, Double-blind Study

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Abstract

Introduction: The purpose of this prospective randomized, double-blind, placebo-controlled study was to evaluate postoperative pain by using an oral dose regimen of methylprednisolone in symptomatic patients with pulpal necrosis and symptomatic apical periodontitis, a periapical radiolucency, and experiencing preoperative moderate to severe pain. **Methods:** One hundred twenty-five adult symptomatic patients presenting for emergency endodontic treatment with a pulpal diagnosis of necrosis and symptomatic apical periodontitis, a periapical radiolucency, and experiencing moderate to severe pain participated. All patients received complete endodontic debridement and were randomly divided into 2 groups. In a double-blind manner, the groups received either an oral regimen of methylprednisolone (96 mg immediately after treatment followed by 48 mg each day for 5 consecutive days) or a lactose placebo. All patients received 600 mg ibuprofen and an opioid-containing escape medication to take if needed. Patients completed a 7-day diary to record pain and number of analgesic medications taken each day. **Results:** Moderate to severe pain was experienced by 40%–50% of the patients on day 1 and 31% of the patients on day 2, with the pain ratings decreasing during the next 7 days. There were no statistically significant differences in pain ratings between the methylprednisolone and placebo groups. **Conclusions:** When compared with a placebo, the current regimen of oral methylprednisolone did not significantly reduce postoperative pain after complete debridement of symptomatic patients presenting for emergency endodontic treatment with a pulpal diagnosis of necrosis and symptomatic apical periodontitis, periapical radiolucency, and experiencing moderate to severe pain. *(J Endod 2018;44:1457–1461)*

Key Words

Methylprednisolone, postoperative pain, steroids, symptomatic patients

Significance

When compared with a placebo, the current regimen of oral methylprednisolone did not significantly reduce postoperative pain after complete debridement of symptomatic teeth with pulpal necrosis and symptomatic apical periodontitis, with associated periapical radiolucency.

Endodontic debridement is the treatment of choice for symptomatic patients with a pulpal diagnosis of necrosis, periapical radiolucent area, and moderate to severe pain (1). However, after debridement, moderate to severe pain may still be experienced (1–6). The administration of a steroid would possibly help decrease postoperative pain.

Corticosteroids have been studied for postoperative pain relief after endodontic debridement. Oral administration of steroids has been studied by Krasner and Jackson (7), Goldberg et al (8), Glassman et al (9), Torabinejad et al (10), Jalalzadeh et al (11), Praveen et al (12), and Pochapski et al (13). Collectively, they found a reduction in postoperative pain with steroid administration. Intramuscular injection of steroids has been studied by Marshall and Walton (14) and Liesinger et al (15). Likewise, they found a significant reduction in postoperative pain. Supraperiosteal injections of steroids by Sahntiaee et al (16) and Mehrvarzfar et al (17) also showed a reduction in postoperative pain. These studies evaluated asymptomatic and symptomatic vital teeth or combined vital and necrotic teeth, making the conclusions difficult to interpret because of the preoperative diagnosis. In addition, the observed postoperative pain was evaluated for only the first 12, 24, or 48 hours.

Some investigations have shown that an intracanal steroid was effective in reducing postoperative pain in vital teeth but not in teeth with pulpal necrosis (18, 19). An intraligamentary injection of Depo-Medrol has been shown to significantly reduce the frequency and intensity of postoperative pain after routine endodontic treatment of vital teeth (20). Pulpal pain from untreated irreversible pulpitis can be temporarily reduced by using an intraosseous injection of Depo-Medrol (21, 22). However, there are substantial differences in the quantity and quality of periapical inflammation in the patient with symptomatic irreversible pulpitis and the symptomatic patient with pulpal necrosis and periapical radiolucency.

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In a preliminary study, Claffey et al (23) evaluated the effects of an oral dose of 48 mg methylprednisolone, taken each day for 3 days, on postoperative pain in symptomatic teeth with pulpal diagnosis of necrosis and periapical radiolucency. They found that the methylprednisolone group had significantly lower pain scores and a decreased use of opioids for the first 3 postoperative days when compared with the placebo group. However, on the day of endodontic treatment and on days 4 through 7, patients still had moderate or severe pain or took a large number of analgesics. Claffey et al theorized that the initial dose of methylprednisolone was too low and had worn off later in the week, resulting in a rebound of postoperative pain.

When compared with Claffey et al (23), the rationale for this protocol was to increase the amount of oral methylprednisolone on the day of treatment from 48 mg to 96 mg and extend the 48-mg dose past 3 days (ie, 48 mg to be given for 5 postoperative days), which may decrease moderate or severe postoperative pain to clinically manageable levels.

No other study has shown the clinical effectiveness of the proposed dosing schedule of methylprednisolone. We hypothesized that oral methylprednisolone would significantly reduce postoperative pain when compared with a placebo. The purpose of this prospective randomized, double-blind, placebo-controlled study was to evaluate postoperative pain by using an oral dose regimen of methylprednisolone in symptomatic patients with pulpal necrosis and periapical radiolucency experiencing preoperative moderate to severe pain.

Materials and Methods

One hundred twenty-five adult patients presenting for emergency treatment were statistically analyzed in this study. All subjects were in good physical condition as determined by a written questionnaire and oral questioning. Subjects presenting with any contraindications to corticosteroids (active peptic ulcers, Crohn's disease, colitis, gastroesophageal reflux disease, active herpetic or fungal infections, severe osteoporosis, diabetes mellitus, compromised immune status), or lactose intolerance (placebo) were excluded from participation. Patients younger than 18 and older than 65 years were also excluded. All female subjects were questioned regarding pregnancy, or suspected pregnancy, and nursing. None were allowed to participate if they were pregnant, suspected of being pregnant, or were trying to conceive, or were nursing. Approval for this study was obtained from The Ohio State University Human Subjects Review Committee, and written consent was obtained from each subject.

To qualify for the study, patients must have presented with a minimum 4 × 4 mm radiolucency as evaluated on a periapical radiograph at the periapex of the symptomatic tooth diagnosed with pulpal necrosis. A periapical image of the tooth was obtained by using a paralleling device (Rinn Corp, Elgin, IL) and digital radiography (Schick Technologies, Long Island, NY). Pulp tests were performed with Endo-Ice refrigerant (The Hygenic Corporation, Akron, OH). All patients had teeth that tested positive to percussion (symptomatic periapical periodontitis). In addition, all subjects must have presented with spontaneous moderate to severe pain, without cellulitis or fluctuant swellings, and had no draining sinus tract.

Each patient rated his or her initial pain on a Heft-Parker visual analogue scale (VAS) (24). This 170-mm scale was divided into 4 categories according to pain level as reported previously (6). This rating was used to confirm that patients presented with moderate to severe pain. If they presented with none or mild pain, they were excluded from the study.

Before the experiment, the methylprednisolone and placebo groups were assigned 6-digit random numbers by the lead researcher using a random number table. The number assignment determined which drug regimen would be administered postoperatively for each patient. Only the random numbers were recorded on the data collection sheet to maintain blinding of the experiment to both the operator and patient.

The blinding of the methylprednisolone and placebo was done as follows. A registered pharmacist compounded identical-appearing capsules of the methylprednisolone and placebo in #3 blue/green capsules. Each capsule contained 24 mg methylprednisolone or 24 mg lactose (placebo). The pharmacist prepared the master code sheet and assigned the random numbers to the amber bottles containing the appropriate capsules. A copy of the master list of random numbers was supplied by the compounding pharmacist solely to the lead researcher and was not made available to anyone else during the data collection period.

Each patient was anesthetized with 3.6 mL 2% lidocaine with 1:100,000 epinephrine (Xylocaine; AstraZeneca LP, Dentsply, York, PA) administered by inferior alveolar nerve block or maxillary infiltration. After subjective soft tissue anesthesia was obtained (lip or cheek numbness), the tooth was isolated with a rubber dam. K-type hand files (Patterson Dental, St Paul, MN) and rotary Vortex files (Dentsply Tulsa Dental, Tulsa, OK) were used for canal preparation. An apex locator (Root ZX II; J. Morita USA, Irvine, CA) was then used to determine the working length approximately 1.0 mm from the apex and confirmed with a digital radiograph. The minimum canal preparation was a size 30 with a .04 taper because it was important that complete cleaning and shaping were performed. The final size and taper were determined by the initial size of the canal, while also considering curvatures. Canals were irrigated with 3% sodium hypochlorite (Clorox Company, Oakland, CA) after the use of every third hand and rotary file. The canals were not obturated. After drying the canals, calcium hydroxide (Multi-Cal; Pulpdent Corp, Watertown, MA) was placed, and the tooth was temporized with Cavit (Cavit G; 3M ESPE, Seefeld, Germany) with a minimum thickness of 4 mm. If the tooth needed an extended restoration, a zinc oxide/eugenol restoration was placed. All endodontic treatments were performed by the 2 primary investigators (M.F., K.Y.).

All patients were given written and oral instructions to take 4 capsules (96 mg methylprednisolone or the lactose placebo) immediately after the endodontic procedure in the presence of the doctor delivering treatment and 2 capsules (48 mg methylprednisolone or the lactose placebo) on arising each morning for the next 5 days. Oral methylprednisolone is rapidly and almost completely absorbed, with a plasma bioavailability of 82% (25).

Each subject also received sixteen 600-mg tablets of ibuprofen (Upjohn, Kalamazoo, MI) in amber pill bottles. Patients were instructed to take the ibuprofen first for pain relief. Dosage was reviewed with the patient and was labeled on the bottle as follows: Take one tablet every six hours as needed for pain. Subjects were also given sixteen tablets of Tylenol #3 (acetaminophen 325 mg with 30 mg codeine; Upjohn) in labeled, amber pill bottles. Subjects were instructed to take these tablets only if the ibuprofen did not significantly reduce their pain. The recommended dose was given verbally and written on the vial as follows: Take one or two tablets every four to six hours as needed for pain. We prescribed the pain medications to be taken as needed. If the medication were taken at specific time intervals (for example, every 6 hours) during the 7 days, the patient would have taken medication they did not require. Ideally, medications are taken at specific time intervals in a drug study; however, drug trials usually only last from 4 hours to 24 hours. Patients were directed to record the type and