ADA CE Program ARTICLE 3

Effect of premedication to provide analgesia as a supplement to inferior alveolar nerve block in patients with irreversible pulpitis

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ABSTRACT

Background. The authors' objective was to determine whether scientific evidence supports the use of oral premedication to increase the efficacy of inferior alveolar nerve block (IANB) and to decrease endodontic treatment pain in patients with diagnosed irreversible pulpitis.

Types of Studies Reviewed. The authors included randomized controlled trials that involved enteral premedication and 2% lidocaine IANB for adults with irreversible pulpitis compared with placebo. In particular, the authors reviewed studies comparing nonsteroidal anti-inflammatory drugs (NSAIDs), benzodiazepines, acetaminophen, and corticosteroids with placebo. The authors searched the following electronic databases: the Cochrane Library, MEDLINE, and Web of Science.

Results. The authors analyzed 9 randomized controlled clinical trials. Patients who took the NSAIDs under study, including ibuprofen, ketorolac, diclofenac, indomethacin, and lornoxicam, 1 hour before endodontic treatment showed statistically significant improvement in the outcome of having "little or no pain" during endodontic treatment compared with patients who took a placebo 1 hour before endodontic treatment (risk ratio [RR], 1.989; 95% confidence interval [CI], 1.495-2.646; $P < .001$). Benzodiazepines were not as well represented in the literature, but the 2 included studies did not show a significant improvement in patients' having "little or no pain" during endodontic treatment over placebo (RR, 0.989; 95% CI, 0.677-1.444; $P = .954$).

Conclusions and Practical Implications. There is moderate evidence to support the use of oral NSAIDs—in particular, ibuprofen (600 milligrams)—1 hour before the administration of IANB local anesthetic (1.8-3.6 milliliters of 2% lidocaine) to provide additional analgesia to the patient.

Key Words. Local anesthetic; irreversible pulpitis; nonsteroidal anti-inflammatory drugs (NSAIDs); ibuprofen.

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Irreversible pulpitis is a common emergency in dentistry. The treatment usually involves endodontic access and removal of the pulp tissue. Owing to the frequent and emergent nature of this condition, dentists often give patients pain medication and set an appointment to complete root canal therapy on a later date to avoid having a patient wait in the office until the dentist has time to treat the patient. One significant barrier to providing rapid treatment to these patients is the difficulty of obtaining profound anesthesia. If a regimen was available that could provide additional analgesia, dentists may be able to perform this treatment more efficiently, which may result in better management of the care of patients with this painful condition.

After a dentist diagnoses irreversible pulpitis (that is, the inflammation of the pulpal tissues of a tooth that is not expected to resolve without intervention) in a patient, the dentist may find that obtaining profound anesthesia is more difficult than for a healthy tooth.[1] Clinicians have attempted various approaches to obtain anesthesia to enable treatment in teeth with irreversible pulpitis. A commonly used approach is to increase the volume of local anesthetic. According to study investigators[2] in 2012, "increasing the volume of 2% lidocaine to 3.6 [milliliters] improved the success rate of anesthesia as compared with 1.8 mL but did not give a clinical success rate of 100%." Other investigators have pursued trials using premedication with ibuprofen,[3-6]

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ketorolac,[3] dexamethasone,[6] acetaminophen,[4,7] and ketamine,[8] among others,[9,10] to increase the efficacy of anesthesia. We aimed to focus on these types of studies to determine whether there is a premedication regimen that could improve the efficacy of local anesthesia in cases of irreversible pulpitis. Although we have included many classes of medications in this review, we believe that it is highly clinically relevant to include them all to determine the best clinical guidelines.

METHODS

We limited the studies that could be eligible in our systematic review to prospective, randomized controlled trials (RCTs) that included a placebo group for comparing the effect of premedication for inferior alveolar nerve block (IANB) with 1 to 2 carpules of 2% lidocaine. We excluded studies whose investigators examined delivery methods other than the IANB, used more than 2 carpules of 2% lidocaine, or included different types of anesthetic or injections other than IANB. In addition, we excluded editorials or commentaries, reviews or systematic reviews, case studies or case series, animal studies, and guidelines. We also omitted articles not written in the English language and studies whose investigators had included children or adolescents (younger than 18 years).

All participants were 18 years or older with a clinical diagnosis of irreversible pulpitis on a mandibular premolar or molar. Among the studies, the common diagnostic factors were having a symptomatic mandibular posterior tooth and having a prolonged response to cold testing; participants' responses to cold testing varied among studies by at least 10 seconds to as long as 45 seconds. Other common factors were that the participants did not have contraindications to the medications or anesthetics used for their respective interventions and that there was an absence of periapical pathosis on radiographs.

For this review, we focused on the intervention of taking an oral medication before the administration of local anesthetic. The investigators of all of the studies included the oral administration of a medication or placebo 30 to 60 minutes before the administration of 1.8 to 3.6 mL of 2% lidocaine as the local anesthetic. The investigators of 5 studies[3-6,9] used nonsteroidal anti-inflammatory drugs (NSAIDs). NSAID interventions included ibuprofen (300 milligrams,[3] 400 mg,[6] and 600 mg[4,5]), ketorolac (10 mg[3]), indomethacin (75 mg[5]), lornoxicam (8 mg[9]), and diclofenac (50 mg[9]). Other premedication included benzodiazepines (triazolam 0.25 mg[10] and alprazolam 0.5 mg[1]), acetaminophen (300 mg[7] and 1,000 mg[4]), ketamine (10 mg[8]), and steroids (dexamethasone, 0.5 mg[6]) (Table 1). Obtaining profound anesthesia was defined as a patient's report of having "little or no pain" when treatment was initiated.

We developed appropriate search strategies for each database we searched. We restricted the language used to English and the species to human.

We used the following electronic databases and search strategies:

- MEDLINE via PubMed (from inception to April 16, 2014) using this search strategy: (irreversible pulpitis OR ("Pulpitis/surgery" [MeSH]) OR pulpitis OR "Pulpitis/therapy" [MeSH]) AND (anesthesia OR "Anesthesia, Dental/methods" [MeSH] OR "Anesthetics, Local/therapeutic use" [MeSH]) AND (medication OR drug OR ("Anti-Inflammatory Agents, Non-Steroidal/therapeutic use" [MeSH]) OR "Premedication" [MeSH] OR "preoperative medications");
- The Web of Science (from inception to April 16, 2014) using these search topics: (irreversible pulpitis OR pulpitis) AND (anesthesia OR local Anesthetics) AND (medication OR drug OR "Anti-Inflammatory" OR "Premedication" OR pre-medication OR preoperative medication*); and
- The Cochrane Library (from inception to April 16, 2014), using this search strategy: pulpitis AND (anesthesia OR local Anesthetics) AND (*medication* OR drug *).

We checked the reference lists of all eligible RCTs and reviews for additional studies.

Data synthesis and meta-analysis. Three authors (D.L., J.G., and E.H.) independently screened the titles and abstracts of articles resulting from the search strategy. The same 3 authors screened the full article if its abstract met the inclusion criteria or if the authors could not make a decision to include it on the basis of the title or abstract. They also reviewed the full text of articles selected to be included in the study. A fourth author (R.E.) resolved any disagreements regarding accepting or rejecting articles.

Three authors (D.L., J.G., E.H.) extracted data from the full articles, including the characteristics of trial participants, interventions, control groups, and outcomes (Table 1[1,3-10]). They independently and collaboratively assessed the risk of bias according to the methodology described in *Cochrane Handbook for Systematic Reviews of Interventions*.[11] The authors completed a risk-of-bias assessment for each included study.

We included in the meta-analyses the reported number of patients who had a successful event (that is, reporting "little or no pain during endodontic treatment") as well as the sample size for each group. We used risk ratios (RR) with 95% confidence intervals (CIs) for all analyses performed using Comprehensive Meta-Analysis software, version 2 (Biostat). The analyses included only published data. We assessed statistical heterogeneity by means of Cochran Q test[12] and quantified by the I^2 statistic.[13]

For our systematic review, we included in the meta-analyses only the studies whose investigators had reported

ABBREVIATION KEY. **IANB:** Inferior alveolar nerve block. **NSAID:** Nonsteroidal anti-inflammatory drug. **RCT:** Randomized controlled trial.