Comparative Evaluation of Mental Incisal Nerve Block, Inferior Alveolar Nerve Block, and Their Combination on the Anesthetic Success Rate in Symptomatic Mandibular Premolars: A Randomized Double-blind Clinical Trial

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Abstract

Introduction: The purpose of this study was to compare the effectiveness of mental incisive nerve block (MINB) and inferior alveolar nerve block (IANB) that were given alone or in combination to provide anesthesia to symptomatic mandibular premolars. **Methods:** One hundred fifty-three patients participated in this randomized, double-blind clinical trial. The patients were divided into 3 groups; first group received MINB with 2 mL 2% lidocaine with 1:200,000 epinephrine and a mock IANB with 2 mL sterile saline, patients in group 2 received mock MINB and an IANB with 2 mL 2% lidocaine, and patients in group 3 received both MINB and IANB with 2 mL each of 2% lidocaine. Access cavity preparation was initiated after 10 minutes. **Success** was defined as no pain or faint/weak/mild pain during endodontic access preparation and instrumentation. The anesthetic success rates were analyzed with Pearson $\chi^2$ test at 5% significance levels. **Results:** The MINB and IANB gave 53% and 47% anesthetic success rates, respectively, with no significant difference between them. Adding an IANB to MINB significantly improved the success rates to 82%. **Conclusions:** A combination of MINB and IANB can provide improved local anesthesia for symptomatic mandibular premolars. (J Endod 2016;42:843–845)

Key Words

Inferior alveolar nerve block, irreversible pulpitis, local anesthesia, mandibular premolars, mental incisive nerve block

Use of MINB and IANB for Mandibular Premolars

**P**ainful pulpitis usually requires pulpectomy under local anesthesia. The local anesthetic injections are comparatively less effective in mandibular teeth as compared with their maxillary counterparts (1). Maxillary teeth can be adequately anesthetized with infiltration anesthesia, whereas the mandibular molars require nerve block anesthesia (2, 3). However for mandibular premolars, depositing anesthetic solution near mental foramen has been shown to provide adequate anesthesia (4). The mental nerve block, also known as mental incisive nerve block (MINB), provides anesthesia in the distribution of mental nerve (4–7). It is a useful alternative to the inferior alveolar nerve block (IANB) in providing anesthesia for mandibular premolars (4).

Various studies have evaluated the factors affecting the success of MINB injections, including injection speed (7), injection site (5), and type of anesthetic solution (8). Joyce and Donnelly (5) have reported that it is not necessary to enter the mental foramen for a successful MINB. Depositing anesthetic solution near the mental foramen provides similar success rates as compared with depositing inside the mental foramen. Other studies have reported that the speed of injection or massaging the soft tissues over mental foramen did not improve the MINB’s effectiveness (7, 9).

One important aspect of MINB is the short duration of anesthesia (4). Although the onset of anesthesia is quick as compared with IANB, the duration of anesthesia in premolars is much less (approximately 30 minutes). The addition of an IANB has been shown to sustain the early peak of anesthesia provided by MINB (6). All the studies evaluating MINB have been performed in healthy volunteers. The symptomatic teeth pose a challenge to local anesthetic solutions. The activation of nociceptors including tetrodotoxin (TTX) and capsaicin-sensitive transient receptor potential vanilloid type 1 (TRPV1) reduces the effectiveness of local anesthetic solutions (1, 10).

The purpose of this prospective randomized, double-blind clinical trial was to comparatively evaluate the anesthetic efficacy of MINB, IANB, and MINB augmented with IANB in symptomatic mandibular premolars. The null hypothesis tested was that there was no difference between the success rates of different techniques.

**Materials and Methods**

A power analysis that used data from a previous study (11) indicated that a sample size of 46 subjects would give 80% power to detect a 20% difference in the success rates of the test groups. The $\alpha$ level type I error was kept at 0.05 for a single-tailed test, and $\beta$ level type II error was 0.20. The primary outcome (end point) was defined as success or
failure, which was indicated as the ability to undertake pulp access and canal instrumentation with no or mild pain.

Approval was taken from the institutional ethics committee, and all the participants provided informed written consent. The study design was randomized, double-blind clinical trial. Both the patient and the clinician were blinded to the anesthetic administration method. A total of 153 patients who reported in the dental emergency department participated in this study. The inclusion criteria were curiously exposed symptomatic mandibular premolars with signs and symptoms consistent with irreversible pulpitis, a sharp and lingering pain on thermal stimulus and an electric pulp tester, and hemorrhaging on access opening. Other inclusion criteria were American Society of Anesthesiologists class I or II medical history and the ability to understand the use of pain scales. Exclusion criteria included known allergy or contraindications to any content of local anesthetic solution, patients who were pregnant or breastfeeding, a history of known or suspected drug abuse, and patients taking any drugs that could have affected pain perception. Patients having active pain in more than 1 tooth were excluded from the study. The treatment procedure and the use of pain scales were explained to the patients. A combined visual analogue scale (VAS), Heft-Parker (HP) scale, was used in the present study. It is composed of 6 categorical scales (faint, weak, mild, moderate, severe, and intense) on a 170-mm VAS line with ends labeled “no pain” and “unbearable pain.” The patient was asked to mark the line corresponding to his/her pain, with cues from the different categorical points. The “faint, weak, or mild” pain corresponded to 1–54 mm and was kept as a cutoff for assessing successful anesthesia. If the patient reported no pain or pain up to 54 mm on HP VAS scale during the treatment, the anesthesia was marked as successful.

The patients were randomly allocated to 3 treatment groups \((n = 51)\) with the help of an online random generator by using permuted block stratified randomization protocol. The patients in the first group received an MINB injection and a mock IANB. The site of injection for MINB was the mucobuccal fold between the apices of first and second mandibular premolars. No attempt was made to locate the mental foramen. The area of injection was dried by using sterile gauze, and topical anesthesia of 20% benzocaine was applied by using sterile cotton tip applicator for 60 seconds. The anesthetic solution was injected via a 5-mL disposable syringe with a 31-mm 24-gauge needle. After reaching the target area, aspiration was performed, and 2 mL 2% lidocaine with 1:200,000 epinephrine was deposited during a period of 120 seconds. No anesthetic solution was deposited during needle insertion and placement. A mock IANB injection of 2 mL sterile saline was given to blind the procedure. The patients in the second group received a mock MINB with 2 mL sterile saline, followed by conventional IANB with 2 mL 2% lidocaine with 1:200,000 epinephrine by using a direct Halstead technique. In group 3, the patients received MINB and IANB with 2 mL 2% lidocaine with 1:200,000 epinephrine. No mock injections were given in group 3. The injections were prepared by a trained dental hygienist who was blinded to the study outcomes. The injections were marked with alpha-numeric codes. The clinician was also blinded to the content of the injections. Only the codes were noted on the evaluation sheet. The codes were broken only after the completion of the study.

After 10 minutes, conventional access opening was initiated after isolation with a dental dam. Patients were instructed to raise their hand if any pain was felt during the procedure. In case of pain during the treatment, the procedure was stopped, and the patients were asked to rate the pain on the HP VAS. Success was defined as no pain or faint/weak/mild pain during endodontic access preparation and instrumentation (HP VAS score < 55 mm).

The age and gender of patients were analyzed by using Mann-Whitney \(U\) test at \(P < .05\). The anesthetic success rates were analyzed with Pearson \(\chi^2\) test.

### Results

One hundred fifty-three patients, 81 men and 72 women, with an average age of 34 years, ranging from 19 to 46 years, participated in this prospective randomized, double-blind study (Table 1). There was no difference in the age and gender of the patients in the groups.

The comparison of percentage of patients with successful anesthesia (no pain or weak/mild pain during endodontic access preparation and instrumentation) is presented in Table 2. The MINB injection group had 53% success rate, and the IANB group had 47% success rate (Table 3). Adding IANB to MINB increased the success rates to 82%, which was significantly more than either MINB or IANB given alone (\(\chi^2 = 15.3, P = .0004\)).

### Discussion

The present study evaluated the MINB, an alternative technique to IANB, in providing anesthesia for mandibular premolars. The inferior alveolar nerve divides into mental nerve and incisive nerve in the mandibular molar region. The mental nerve emerges from the mental foramen and provides sensory innervation to the mucosa of the anterior teeth and to the skin of the lip and mental area. The inferior alveolar nerve continues as incisive nerve in the incisive canal, which is actually a continuation of mandibular canal. The mandibular premolars are innervated by nerve fibers originating from either the undivided inferior alveolar nerve or the incisive nerve. The MINB involves depositing the anesthetic solution close to the mental foramen or into it, allowing the diffusion of anesthetic solution into the mandibular canal through mental foramen. It is not necessary to place the needle inside the mental foramen for a successful injection. The technique has been shown to provide adequate anesthesia to asymptomatic mandibular premolars. The MINB does not produce lingual anesthesia as compared with an IANB, minimizing the risks associated with a nerve block.

In the present study, the MINB was slightly more effective than IANB in providing anesthesia to symptomatic mandibular premolars; however, the difference was not significant. Limited studies have evaluated the effectiveness of MINB in providing anesthesia for mandibular premolars. Joyce and Donnelly evaluated the effect of depositing 0.9 mL 2% lidocaine inside and outside the mental foramen. The authors reported that the site of injection had no effect on anesthesia for the first premolars. For second premolars, depositing the solution in...
inside the foramen gave better results. Batista da Silva et al (8) evaluated 0.6 mL 2% lidocaine and 4% articaine deposited outside the mental foramen and reported 70%–80% anesthetic success rates by using 4% articaine. No significant differences were reported between the first and second premolars. Whitworth et al (7) evaluated the effect of speed of injecting 2 mL anesthetic solution for MINB and reported success rates of 81.8% for mandibular premolars. The injection speed did not affect the anesthetic success rates. Effect of soft tissue massage over the foramen on anesthetic efficacy of MINB has been evaluated by Jaber et al (9). The authors reported 86.8%–89.5% success rates for the premolars with no effect of massage. In the present study, MINB gave anesthetic success rates of 53%. The success rates were lower than those reported by other authors. This can be attributed to the activation of nociceptors such as TRPV1 by inflammation (1, 10). Inflammatory mediators reduce the threshold for activation of nociceptor neurons to a point that a minor stimulus now may fire these neurons (1, 10). Moreover, these channels are somewhat resistant to lidocaine solutions.

A shortcoming of MINB is the short duration of anesthesia; however, the onset of anesthesia is quite fast (2–5 minutes) as compared with an IANB (4–9). Nist et al (6) evaluated the combination of IANB and MINB and reported that the combination was more successful in the first and second premolars and it enhanced anesthesia for the lateral and first molars. Moreover, the addition of IANB sustained the early onset of anesthesia produced by MINB. The present study also evaluated the combination of both the injections compared with MINB or IANB given alone. The addition of IANB significantly improved the anesthetic success rate to 82%, which was comparable to success rates obtained in the asymptomatic premolars. However, the failed cases shall require supplementary techniques such as intraosseous injection.

Depositing anesthetic solution near the mental foramen can also allow the retrograde spread of solution in the mandibular canal posteriorly to the first molar (17, 18). It has been suggested by Carrie et al (18) that the buccal infiltration at first molar is actually a modified MINB. The authors reported 90% anesthetic success rates for mandibular premolars after depositing 1.8 mL 4% articaine with 1:100,000 epinephrine in the first molar region. In the present study no efforts were made to locate the mental foramen, and the solution was deposited between the first and second premolars. The location of injection has no effect on anesthetic success of MINB. Depositing anesthetic solution proximal to the first molar provides similar success rates as depositing in the premolar region (18). A possible limitation of the present study is injecting an increased volume of local anesthetic solution in the MINB + IANB group as compared with MINB or IANB group alone.

In conclusion, a combination of MINB and IANB can provide improved local anesthesia for symptomatic mandibular premolars.

Acknowledgments
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References