Anesthetic Efficacy of Gow-Gates Nerve Block, Inferior Alveolar Nerve Block, and Their Combination in Mandibular Molars with Symptomatic Irreversible Pulpitis: A Prospective, Randomized Clinical Trial

Masoud Saatchi, DDS, MS, Maryam Shafiee, DDS, MS,† Abbasali Khademi, DDS, MS,* and Bahareh Memarzadeh, DDS, MS†*

Abstract

Introduction: The purpose of this prospective, randomized clinical trial was to evaluate the anesthetic efficacy of the Gow-Gates nerve block (GGNB), the inferior alveolar nerve block (IANB), and their combination for mandibular molars in patients with symptomatic irreversible pulpitis. **Methods:** One hundred fifty patients diagnosed with symptomatic irreversible pulpitis of a mandibular molar were selected. The patients randomly received 2 GGNB injections, 2 IANB injections, or 1 GGNB injection plus 1 IANB injection of 1.8 mL 2% lidocaine with 1:80,000 epinephrine. Access cavity preparation was initiated 15 minutes after injections. Lip numbness was a requisite for all of the patients. Success was specified as no or mild pain on the basis of Heft-Parker visual analog scale recordings during access cavity preparation or initial instrumentation. Data were analyzed with the chi-square, Kruskal-Wallis, and analysis of variance tests. **Results:** The success rates of anesthesia were 40%, 44%, and 70% for the GGNB, IANB, and GGNB + IANB groups, respectively. There was no statistically significant difference in the success rate of anesthesia between the GGNB and IANB groups ($P > .05$). The anesthesia success rate for the GGNB + IANB group was significantly different from those of the GGNB and IANB groups ($P < .05$). **Conclusions:** A combination of GGNB and IANB could improve the efficacy of anesthesia in mandibular molars with symptomatic irreversible pulpitis, but it would still require supplemental anesthesia. Further research may be needed to confirm the results of this study. *(J Endod 2017;■:1–5)*

Key Words

Gow-Gates, inferior alveolar nerve block, local anesthesia, molar, pulpitis

Significance

A combination of a Gow-Gates nerve block and an inferior alveolar nerve block can be helpful for clinicians to improve the efficacy of anesthesia in mandibular molars with symptomatic irreversible pulpitis.

Effective local anesthesia is an important initial step in the management of patients with painful pulpitis. However, achieving profound anesthesia is a great challenge in mandibular molars, particularly in teeth with symptomatic irreversible pulpitis (1).

The Gow-Gates nerve block (GGNB) was first introduced as a true alternative approach to anesthetize the mandibular nerve in 1973. The target area for the deposition of local anesthetic solution is the lateral aspect of the anterior portion of the condylar neck where the mandibular nerve exits through the foramen ovale (Fig. 1*A*). Therefore, all the branches of the mandibular nerve, including the auriculotemporal, lingual, buccal, and mylohyoid nerves, are anesthetized (2). However, clinical studies have reported failure rates ranging from 10%–65% for GGNB in mandibular posterior teeth with irreversible pulpitis (3–5).

The inferior alveolar nerve block (IANB) is the most widely used technique to achieve local anesthesia for endodontic treatment of mandibular teeth. The target area for the deposition of local anesthetic solution is the pterygomandibular space where the inferior alveolar nerve enters the mandibular foramen (Fig. 1*B*). Therefore, other branches of the mandibular nerve, including the lingual, buccal, and mylohyoid nerves, are not anesthetized because they are above the mandibular foramen. The anesthetic efficacy of this technique, compared with GGNB, is controversial (3). However, clinical studies have reported failure rates ranging from 30%–81% for IANB in mandibular posterior teeth with irreversible pulpitis (6–8).

The most probable explanation for the decrease in the success rate of local anesthesia in teeth with inflamed pulps can be the activation and sensitization effect of inflammation on the nociceptors and stimulation of a greater number of nerve fibers (9–12), resulting in a barrage of impulses from the inflamed pulp to the brain through more than a thousand unmyelinated sensory C fibers (13, 14). Therefore, it is hypothesized that deposition of local anesthetic solution at 2 different sites along the nerve trunk results in the exposure of a greater length of the nerve to the local anesthetic solution, thus increasing the number of voltage-gated sodium channels exposed to local anesthetic solution, resulting in improved efficacy of local anesthesia.

From the *Dental Research Center; and †Department of Endodontics, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran.

Address requests for reprints to Dr Abbasali Khademi, Department of Endodontics, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran, 81746-73461. E-mail address: a_khademi@dnt.mui.ac.ir

0099-2399/$ - see front matter

https://doi.org/10.1016/j.joen.2017.10.008

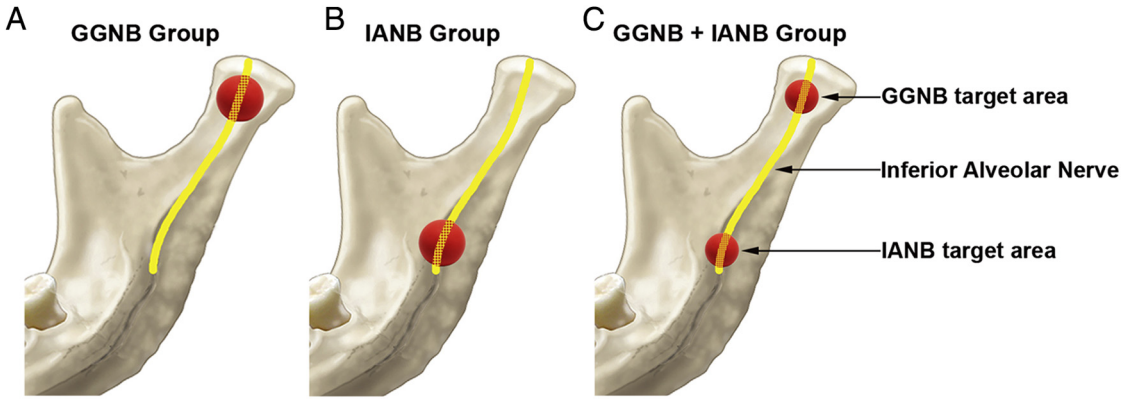

Figure 1. A schematic illustration of the injection target areas in the 3 groups: *(A)* 3.6 mL, *(B)* 3.6 mL, and *(C)* 1.8 mL of anesthetic solution was deposited at each of the injection target areas.

The combination of GGNB and IANB may result in the exposure of a greater length of the inferior alveolar nerve to the local anesthetic solution and subsequently increases the efficacy of anesthesia. However, there are no studies on the efficacy of a combination of GGNB and IANB in patients with irreversible pulpitis. Thus, the purpose of this prospective, randomized clinical trial was to compare the anesthetic efficacy of GGNB, IANB, and GGNB in association with IANB for mandibular molars with symptomatic irreversible pulpitis. The null hypothesis tested was that no difference would be found between the success rates of the 2 nerve block techniques and their combination.

Materials and Methods

One hundred fifty adult patients participated in this prospective, randomized clinical trial. All of the subjects were emergency patients of the Dental Clinic of Isfahan University of Medical Sciences, Isfahan, Iran. Criteria for inclusion in the study consisted of age over 18 years, active pain in a mandibular molar, a lingering response to cold testing with cold spray (Endo-Frost; Coltene-Whaledent, Langenau, Germany), absence of any periapical radiolucency on radiographs (except for a widened periodontal ligament with an intact lamina dura), a vital pulp at access cavity preparation, and the ability to understand the use of pain scales. Criteria for exclusion from the study consisted of an allergy to local anesthetics; pregnancy; the use of any medications such as sedatives, antianxiety, antidepressants, or analgesics that might influence pain assessment; a history of significant medical problems; the presence of active pathosis in the area of injection; and the inability to give written informed consent. Therefore, each patient had a mandibular molar with a clinical diagnosis of symptomatic irreversible pulpitis.

The research was conducted in full accordance with the World Medical Association Declaration of Helsinki. The ethics committee of the university approved the protocol of the study with number 395437, and the study was registered at the clinical trials website (http://www.clinicaltrials.gov) with number NCT03117491. Written informed consent was also approved by the ethics committee and was obtained from each patient before treatment.

Each patient assessed his or her initial pain on a Heft-Parker visual analog scale (HP-VAS) (15). This scale is a horizontal marked line ranging from 0–170 mm. The patients placed a mark on the scale where it best described their pain level. The scale was divided into 4 categories with various descriptive terms. The no pain, mild pain, moderate pain, and severe pain choices were described by 0-mm, 1- to 54-mm, 55- to 113-mm, and 114- to 170-mm divisions, respectively. Patients with moderate or severe initial pain were included in the study.

The patients were randomly assigned to 3 groups of 50 each using random number generator software (Random Allocation Software; M. Saghaei, Isfahan, Iran): GGNB, IANB, and GGNB + IANB.

Before each injection procedure, the mucosa was dried, and a topical anesthetic agent (20% benzocaine; Ultradent Products Inc, South Jordan, UT) was applied to the injection site using a cotton tip applicator and left in place for 1 minute. All of the injections were administered using 2% lidocaine with 1:80,000 epinephrine (2% Persocaine-E; Daroupakhsh, Tehran, Iran), a standard aspirating dental injection syringe, and a 27-G 31-mm needle (CK Ject; CK Dental, Kor-Kyungji-do, Korea). A single operator (M.S.) performed all of the injections.

In the GGNB group (Fig. 1*A*), each patient received two 1.8-mL cartridges of 2% lidocaine with 1:80,000 epinephrine using the conventional GGNB technique. The patient was placed in the supine position with the neck extended and the mouth open as wide as possible. The injection site was the soft tissue just distal to the maxillary second molar at the height of its mesiopalatal cusp. The needle was placed through the mucosa of the injection site and inserted along an imaginary line between the 2 extraoral landmarks at the lower border of the intertragic notch and the corner of the mouth. The needle was advanced slowly until bony contact was felt at the lateral region of the condyle neck (target area) or until a penetration depth of approximately 25 mm was reached. If contact was not felt, the needle was withdrawn and redirected at another angle. After bony contact, the needle was withdrawn slightly, aspiration was performed, and the anesthetic solution was deposited over a period of 1 minute. The patient was asked to keep his or her mouth wide open for a further 1 minute. The second GGNB injection was performed immediately after the first one in the same way as described previously.

In the IANB group (Fig. 1*B*), each patient received two 1.8-mL cartridges of 2% lidocaine with 1:80,000 epinephrine using the conventional IANB technique. The patient was placed in the supine or semisupine position with an open mouth. The injection site was the soft tissue over the medial surface of the ramus, lateral to the pterygomandibular raphe. The coronoid notch on the anterior border of the ramus was touched by the thumb, and the posterior border of the ramus was touched by the first or second finger of the noninjecting hand. The line between the finger and the thumb determined the height of the injection site. The syringe was kept parallel to the mandibular occlusal plane and directed from the premolars on the opposite side. The needle was placed through the mucosa of the injection site and then advanced slowly until bony contact was felt. Then, the needle was withdrawn slightly, aspiration was performed, and the anesthetic solution was