

Comparative study of the novel and conventional injection approach for inferior alveolar nerve block

**K. Boonsiriseth, N. Sirintawat,
K. Arunakul, N. Wongsirichat**
Department of Oral & Maxillofacial Surgery,
Faculty of Dentistry, Mahidol University,
Thailand

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Abstract. This study aimed to evaluate the efficacy of anesthesia obtained with a novel injection approach for inferior alveolar nerve block compared with the conventional injection approach. 40 patients in good health, randomly received each of two injection approaches of local anesthetic on each side of the mandible at two separate appointments. A sharp probe and an electric pulp tester were used to test anesthesia before injection, after injection when the patients' sensation changed, and 5 min after injection. This study comprised positive aspiration and intravascular injection 5% and neurovascular bundle injection 7.5% in the conventional inferior alveolar nerve block, but without occurrence in the novel injection approach. A visual analog scale (VAS) pain assessment was used during injection and surgery. The significance level used in the statistical analysis was $p < 0.05$. For the novel injection approach compared with the conventional injection approach, no significant difference was found on the subjective onset, objective onset, operation time, duration of anesthesia and VAS pain score during operation, but the VAS pain score during injection was significantly different. The efficacy of inferior alveolar nerve block by the novel injection approach provided adequate anesthesia and caused less pain and greater safety during injection.

Key words: novel injection approach; conventional injection approach; inferior alveolar nerve block; anesthesia; lower third molar surgery; pain; visual analogue scale; anesthesia onset; anesthesia duration.

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One of the most useful techniques to reduce pain from the various surgical interventions involving the mandible is inferior alveolar nerve block. It is the most routine common anesthesia for dental treatment.

The inferior alveolar nerve crosses the mandibular canal via the mandibular foramen, towards the bone at the body of the

mandible around the premolar.¹ When surgical intervention is conducted at the lower molars, increased buccal nerve anesthesia² is needed.

Previous studies of local dental anesthesia describe many techniques for blocking the inferior alveolar nerve such as the Gow-Gates technique, the Vazirani-Akinosi technique or closed mouth mandibu-

lar block technique³ and the conventional technique or direct injection approach^{4,5} including using a computer-controlled injection system.^{6,7} The conventional injection approach is the most frequently used and possibly the most important injection technique to block the inferior alveolar nerve, with failures of 15–20%^{8,9} or 7–77%.^{10–12}

To perform the inferior alveolar nerve block the tip of the needle must be inserted near the nerve or the mandibular foramen. The needle insertion point is at the mucous membrane on the medial side of the mandibular ramus. The average depth of penetration is two-thirds of a long dental needle,¹ approximately 20 mm for Thai patients.⁹

In some patients, the dentist often cannot insert a needle into the soft tissue from the conventional injection approach, so an alternative technique is used by withdrawing the needle slightly within the tissue, moving the syringe towards the front of the mouth, over the canine or lateral incisor on the contralateral side then redirecting the needle until the appropriate depth of insertion.¹ The patient can see the movement of the syringe in this alternative technique which may intimidate them. The novel injection approach does not require movement of the syringe while inserting the needle, and the depth of needle penetration is no more than that in the conventional injection approach. The syringe was on the occlusal surface of the posterior teeth at the injection site.

The novel injection approach is probably an easier and more comfortable choice for inferior alveolar nerve block. The aim of the novel injection approach was anesthetic efficacy in the inferior alveolar nerve block compared with the conventional injection approach.

Materials and methods

40 Thai patients (20 males, 20 females) ranging in age from 20 to 54 years (average 27 years) were enrolled in the study. The inclusion criteria were patients requiring surgical intervention of the bilateral lower third molar with inferior alveolar nerve blockade. The patients were healthy without systemic disease, had no history of allergy to drugs, were not taking any medication that would alter their perception of pain, and the women had to be of nonpregnant status. Patients not meeting the inclusion criteria were not included.

The Committee on the Ethics of Research on Human Beings of the Mahidol University Institutional Review Board approved and accepted this as a clinical study with Protocol No. MU-IRB 2010/266.0809. Written consent was obtained from the voluntarily participating patients for the study findings, and consent forms were signed in the presence of a witness for all examinations and treatments performed.

Both the novel and the conventional injection approaches for the inferior

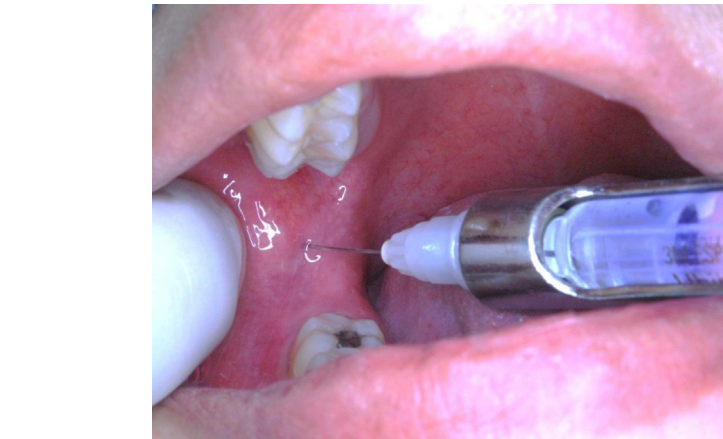


Fig. 1. The conventional approach to blocking the inferior alveolar nerve.

alveolar nerve block were conducted by the same surgeon and were assessed by another dentist.

The patients were double-blind randomized using a paired sample clinical trial for this study. The patients received an inferior alveolar nerve block at the operation site with the conventional injection approach at one appointment and the novel injection approach at another appointment with a 1 month washout period after the first injection and lower third molar operation. The lower third molar was surgically extracted by the same surgeon.

Before injection and surgical conduct, the gingival sulcus of the lower canine at the operation site was evaluated for anesthesia by a sharp probe calibrated to deliver a force of up to 200 mN (20 g)¹³ and pulpal sensation of the teeth on the anesthetized side was evaluated by an electric pulp tester (EPT) (Parkell Pulp Vitality Tester (Digitest) Model No. D626D Parkell Electronics Division, Farmingdale, NY 11735, USA).

Conventional injection approach

The conventional inferior alveolar nerve block is described by Malamed.¹ The barrel of the syringe was placed parallel to the mandibular occlusal plane and was directed from the premolars on the contralateral side. The injection site was the soft tissue overlying the medial surface of the ramus, lateral to the pterygomandibular raphe, at a height determined by the coronoid notch on the anterior border of the ramus. The point of the injection site was the middle of the palpated finger. The needle was inserted through the mucosa and advanced slowly until gentle contact with the bone. The needle was withdrawn 1 mm, the anesthetic solution was slowly deposited

after aspiration in the amount of 1.7 ml (Fig. 1).

Novel injection approach

A long dental needle (30 mm) was also used with the rubber stop located 20 mm from the tip of the needle, but the barrel of the syringe was placed on the occlusal surface of the posterior teeth at the same operation site. The needle insertion point was the same point as for the conventional injection approach (height of injection, anteroposterior site of injection). The needle was slowly advanced into the soft tissue until the rubber stop contacted the mucosa.⁹ Aspiration was performed before slowly depositing any local anesthetic solution in the amount of 1.7 ml (Fig. 2).

Immediately post-injection, the authors started to record data about injection pain using a visual analog scale (VAS) and sensation change experienced by the patients.

Measurement of post-injection anesthesia

The gingival sulcus of the lower canine at the operation site was evaluated for anesthesia using a sharp probe and the posterior teeth (molars and premolars) of the anesthetized side were evaluated again by EPT. After injection, the patient reported the sensation change every 5 min. The patient indicated when the sharp probe and EPT changed the sensation to pain by raising their left hand.

The lower lip and the tongue of the anesthetized side were evaluated by indicating any feeling of numbness in the lower lip and tongue. The buccal nerve block² was injected and the operative intervention was continued. Evidence of

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