Inferior Alveolar Nerve Block Revisited

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Since the origin of local anesthesia, the inferior alveolar nerve (IAN) block has been the workhorse injection technique for dentists to achieve local profound anesthesia in the mandibular arch. During the last 7 decades, there have been many attempts to improve or replace the IAN injection. Examples include the following:

1. The mental injection, which numbs only the second bicuspid to the midline and the buccal mucosa. This injection is inadequate usually for root canals and extractions.
2. Intraosseous injection.
3. Intraosseous injection with plastic inserts (ie, Stabident [Fairfax Dental]) (Figure 1).
4. Intraligmentary injection.
5. Computerized ligmentary injection (STA System [Milestone Scientific]) (Figure 2).
7. Chairside anesthetic buffering agents.

Despite these advances, the IAN remains the primary injection technique when profound anesthesia is required, especially for root canal treatment and extractions.

It is the author’s opinion that the reason these alternative techniques quickly gain transient popularity, despite their limitations, is because both dentist and patient hate the injection. It can be a very uncomfortable or painful injection and occasionally, ligaments and tough tissue are encountered during penetration. Many research articles rate the injection for adults as only 85% effective. With the condition of acute pulpitis, outright failure rates for this injection technique skyrocket to nearly 50%. Children’s success rates are around 95%. Ineffective blocks frustrate the practitioner as well as cause the patient anxiety, pain, and loss of confidence in the practitioner.

Like in baseball, the IAN block “slumps” occasionally happen to the best of clinicians. Since the development of articaine, nerve block success rates have improved. However, with the rise in popularity of articaine worldwide, there has been a sudden rise in the rates of permanent or transient paresthesia. It should be noted that the neurotoxicity of articaine is debatable.

**Reasons for Unreliability Ratings**

In the author’s opinion, the 15% unreliability rating of the IAN injection technique is caused by the following reasons:

1. **Poor openers**, or patients who open wide initially, but close momentarily. Patients who open extremely wide greatly improve the visualization of landmarks, as well as stretch oral mucosa taut, allowing for an easy and pain-free penetration in contrast to the patient who opens poorly, keeping landmarks hidden and making the loose mucosa much more resistant to puncture. The author routinely tells poor-opening patients...
that achieving adequate local anesthesia may be a challenge. (Note: Extreme opening should be avoided on patients with a history of open lock or temporomandibular joint disorder.)

2. Numbing the right side of the patient by a right-handed dentist. The IAN injection is all about proper injection angles at the point of entry. A right-handed dentist must overcome a difficult injection angle to the patient’s ramus while backhanding the syringe from the far side of the patient’s mouth. I personally miss injections on the patient’s right side much more often than the left. (In the same way, the left-handed dentist faces this challenge doing a left IAN injection on a patient.)

3. Patients with small mouths. Occasionally, a patient has an oral opening so small that the clinician cannot swing the barrel of the syringe posteriorly enough in the opposing side to gain an effective injection angle. Since straight-line access to the mandibular foramen is difficult, this situation presents a physical challenge to achieving an effective nerve block.

4. Wide-faced patients (brachiocephalics) as opposed to thin-faced individuals (dolicocephalics). The author has observed that skeletally wide-faced patients have mandibular rami that flare away laterally at a very steep angle. With these patients, straight-line access with a long needle can be difficult, if not impossible. Also, these patients may have prominent medial lingula (the bony ridge mesial to the mandibular foramen), which can present a bony obstacle to straight-line access to the mandibular canal. Many of these types of patients mentioned above have had the same problem getting properly numb with every dentist who has worked on their mandibular arch. Upon asking these patients about their experiences, the clinician will hear some very unpleasant stories.

Technique

To overcome some of the physical challenges described above, it is possible to bend the terminal 2.0 cm of a 1.625-inch, 27-gauge (g) needle with thumb and forefinger (Figure 3) or with contouring pliers used to contour stainless steel crowns (Figure 4). Bending the tip allows the needle to “curve around” bony obstacles or into steep, laterally flared brachiocephalic and wide-flaring mandibles. The author has used this technique for many years with great success. In medicine, the practice of bending needles has routinely been used for decades. Anesthesiologists and interventional radiologists manually bend needles to perform laminectomies and spinal taps, and to gain needle access to areas behind bony obstacles, such as ribs.

Much like bending a curve into an endo file, the terminal 2.0 cm of a long 27-g needle is curved into a gentle j shape with the bevel placed on the outside of the curve. Only a soft j-shaped curve is needed (Figure 5). If the curve is too accentuated, penetration on injection will be difficult, because the needle will spring backward instead of penetrating mucosa. Placing the beveled edge of the needle to the outside of the curve further deflects the penetrating needle on a curved pathway during needle entry. When bending, it is important to not kink the
needle, especially if using contour crimping pliers. Kinking may induce metal fatigue to the needle, greatly increasing the risk of separation of the needle tip during injection. Overworking the needle during the bending may also induce metal fatigue. I have never had a needle break using this technique, but bending the needle definitely increases the likelihood. A 27-g needle (or greater in diameter) is vital when bending needles. With increased diameter of the needle, the chance of separation decreases. However, with larger needle width, positive aspiration skyrockets; 100% of positive aspirations were achieved using 25-g needles.

To test the breakability of a 27-g long needle, I intentionally attempted to break 10 of them by hand, forcefully bending them sharply forward and backward at the same point. It took an average of 5 bends to break the needle. I then intentionally tried to break ten 27-g long needles with a chrome crown crimping plier. After more than 30 bends, crushing the needle forward and backward, I could not break these needles. When using the plier to bend needles for patients, it is important not to crush in the hollow lumen.

After bending the needle to the desired j shape, inject the patient in the same fashion used with the classic IAN technique, but as you penetrate, gradually swing the barrel of the syringe distally. The needle will surprisingly curve around and into spots that were very difficult with straight-line access. Because of the bend in the needle, penetration through tough mucosa may take a little coaxing and won't be as effortless as with a straight needle. Once surface mucosa is punctured, the needle will glide easily.

It is important to note that practitioners who have never used this technique should practice bending these needles prior to first attempting it during a patient procedure. There is a learning curve to master.

CASE REPORT
Perhaps we all have patients like the one pictured (Figure 6). He has been a patient in my office for more than 25 years. All previous attempts to restore mandibular molars have not gone well. At one appointment, when trying to prepare tooth No. 18 for a full crown, I attempted STA Gow Gates, and 4 attempts at a traditional IAN block shooting high and low, and in between. On each injection attempt, I could bury a long needle to the hub without finding bone (Figure 7).

This patient had similar experiences with every dentist who had worked on his lower molars. In the author’s opinion, this patient has either mandibular rami that flare away at a very steep angle, or he has prominent lingual ridges that prevent straight-line access to the mandibular foramen.

To address this challenge at the patient’s last appointment, a long 27-g needle was bent at the terminal 2.0 cm with the bevel placed to the outside of the curve. The patient was injected with the classic IAN guidelines except that, during penetration, the barrel of the syringe was slowly swung distally. Because of this patient’s history, articaine hydrochloride and epinephrine (Septocaine [Septodont]) was used to increase the likelihood of success. Much to the relief of both the patient and the entire dental team, the procedure went smoothly with only one injection.

IN SUMMARY
Despite the occasional utter dread to both patient and dentist,
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the IAN block has been the workhorse injection technique to achieve profound mandibular local anesthesia since the origin of the modern dental era, despite a success rate of only 85%. It is the author's opinion that the failure to achieve successful anesthesia lies in the fact that straight-line access to the mandibular foramen is difficult, if not impossible on some types of patients. Although, in dentistry, bending needles and readjusting the needle position during penetration has always been forbidden, this author believes that, carefully following a protocol as described herein, this can be done safely and predictably. Again, bear in mind that practitioners in the field of medicine have been bending needles and injecting around bony obstacles safely for decades.

Curving the terminal 2.0 cm of a 27-g (or greater diameter) long needle with the bevel to the outside of the curve can greatly improve the success rate of the IAN injection.

**Suggested Reading**

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POST EXAMINATION QUESTIONS

1. Many research articles rate injection success for adults at 98% effective.
   a. True  b. False

2. A right-handed dentist must overcome a difficult injection angle to the patient’s ramus while backhanding the syringe from the far side of the patient’s mouth.
   a. True  b. False

3. The author has observed that skeletally wide-faced patients have mandibular rami that flare away laterally at a very steep angle.
   a. True  b. False

4. In medicine, the practice of bending needles has not been used for decades.
   a. True  b. False

5. According to this article, curving the terminal 2.0 cm of a 27-gauge (or greater diameter) long needle with the bevel to the outside of the curve can greatly improve the success rate of the inferior alveolar injection.
   a. True  b. False
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ANSWER FORM: VOLUME 35 NO. 10 PAGE 132
Please check the correct box for each question below.
1. ☐ a. True.  ☐ b. False
2. ☐ a. True.  ☐ b. False
3. ☐ a. True.  ☐ b. False
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