CODS Journal of Dentistry
Official Publication of College of Dental Sciences Alumni Association, Davanagere

Volume 6, Issue 1, 2014

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Review Article

Variants of inferior alveolar nerve block: A review

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Abstract:

The inferior alveolar nerve block is the most common method for obtaining mandibular anaesthesia in dental practice, but it is estimated to have a success rate of only 80 to 85%. Traditional anaesthesia of the mandibular nerve and its branches consists of deposition of anaesthetic solution in the region of the mandibular foramen. This commonly used technique eliminates all somatosensory perception of the mandible, mandibular teeth, floor of the mouth, ipsilateral tongue, and all but the lateral (buccal) gingivae. In the case of difficulty-to-anesthetize patient, the inferior alveolar nerve can be particularly challenging. In those patients, other approaches may be necessary to achieve profound anaesthesia. This article summarizes the different approaches that may be utilized in such cases.

Keywords: Inferior alveolar nerve block, mandibular anaesthesia.

Introduction:

Successful local anaesthesia is the bedrock of pain control in dentistry. Without the availability of regional anaesthesia, the routine dental treatment would be difficult or impossible to perform. The inferior alveolar nerve block is the conventional method used for anesthetizing mandibular teeth. William Halsted and Richard J. Hall in 1884[1] was the first to apply inferior alveolar nerve block technique to anesthetise inferior alveolar nerve with cocaine. Halsted used an intra-oral approach and since then it is referred as the "indirect thrust technique". Modification to Halsted's approach was proposed by Ashley Lindsay in 1929.[1]

Many clinical studies have demonstrated significant failure rates of inferior alveolar nerve block technique, which indicates even if applied appropriately, do not always result in successful anaesthesia.[2] The percentage for failure to achieving profound inferior alveolar anaesthesia has been reported to be 5-15%.[3]

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The overall objective of this review is to enlighten the dental community about the different approaches of Inferior alveolar nerve block.

1. Classical inferior alveolar nerve block:

(a) Direct technique:

In this technique the operator's thumb is placed on th coronoid notch. The 2nd, 3rd and 4th fingers are placed on the posterior border of the mandible that helps in the appreciation of the anteroposterior size of the ramus. And even it helps the clinician to access the degree of flare of the ramus and also in the superior or inferior orientation for the location of the mandibular foramen.[4]

The injection site is approached from the contralateral second premolar. The needle is placed lateral to the pterygo-mandibular raphe. The needle penetrates the buccinator muscle and inserted until bone is contacted. An additional step by 100 bend onto the needle aids in the placement of the tip of the needle more laterally on the medial surface of the ramus of the mandible.[5] A full cartridge of solution is injected (Fig 1).

Disadvantages:

1. Failure rate of about 5-15%.[6]
2. High positive aspiration rate of about 10-15%.

Complications:

1. If the needle is placed too far posteriorly, the needle enters the substance of the parotid gland and causes transient facial nerve paralysis.

2. Hematoma can be produced by the breakdown of blood vessels in the area to be anesthetised.[7]
3. If the needle is placed too medially, it penetrates the medial pterygoid muscle and causes trismus.
4. Intravascular injection into the inferior alveolar artery may lead to “Reverse carotid blood flow”.

(b) Indirect technique:

In this technique the finger is placed on the external oblique ridge. The needle is inserted more lateral and it immediately strikes the bone. The syringe is now moved from opposite to same side, where the syringe lies parallel with the lower molars. A few drops of analgesic solution are deposited and the syringe is now swung back to the opposite side, where the syringe lies over the lower premolars.[8] The needle is inserted until it reaches the pterygomandibular space and strikes bone. The anaesthetic solution is deposited. If it is required to block the lingual nerve then the syringe is withdrawn halfway and the solution is deposited.

2. Method of Clarke And Holmes (1959):

This technique is a modification of the indirect method. In this technique the deposition of the solution is at a higher level than usual. In the standard technique the solution is placed immediately behind the mandibular foramen which is approximately 1cm above the occlusal plane of the molar teeth. At this level the anterior part of the nerve is concealed by the lingula and the sphenomandibular ligament and so local anesthetic solution may not reach the anterior fibres. By depositing the solution at higher level avoids this problem. The index finger is placed in the retromolar fossa and the syringe is advanced from the opposite side premolars. The needle is inserted until the bone is contacted. The syringe is then swung around until it lies over the lower central incisors. The needle is passed another 2cm deeper inside and solution deposited. At this point the anesthetic solution will have been injected more than 1cm higher than usual.[8]

3. Technique of Angelo Sargenti (1966):

This is a modification of direct method. In this technique the deposition of the solution is at a higher level than usual. The index finger is placed in the retromolar fossa with the nail facing lingually. The syringe is now placed between and in contact with upper premolars of the opposite side and it is kept in this position whilst the needle is slowly inserted in a downward and backward direction until it touches the bone.[8]

4. Fischer 1, 2, 3 technique:

This technique uses the anatomical landmarks such as external oblique ridge, coronoid notch, apex of buccal pad of fat, pterygomandibular raphe and the retromolar pad. During the course of injection in the first stage 3-6mm distance, second stage 12mm distance, and in the third stage 24mm distance of needle insertion to be made from 42mm length needle. Since there are no markings in the needle it is difficult to apply by operators.

As the height of the mandibular foramen from occlusal plane is 11 mm, the selection of site of initial needle penetration is 12 to 16 mm above the occlusal plane and also it is essential to insert the needle to a distance of 20 to 25 mm from anterior border to reach the space above mandibular foramen, then the needle tip would be nearer and above the nerve entry. In this way the tip of needle is placed superior to mandibular foramen, on complete insertion of 22 to 24 mm needle distance from the anterior border (Fig 2).[9]

5. The "A. R. T." (Anterior Ramus Technique) mandibular block:

The anterior border of the ramus is palpated and thecoronoid notch is identified with the thumb. The middle finger and the thumb are used to determine the width of the ramus in its anterior-posterior dimension. The average width of the ramus, including the thickness of the soft tissue in the coronoid notch, is approximately 35mm, which is also the length of the needle. Inject the needle until bone in the coronoid notch is contacted. The syringe and needle at this stage are buccal to the posterior molars. The thumb is used to guide the needle as it is advanced in a medial-posterior direction, inserting half the length of the needle (17-18mm.). The needle/syringe is turned approximately 30 degrees in a horizontal plane, so that the syringe now rests on the anterior teeth of the same side. The end of the needle should now lie medially and in proximity to the inferior alveolar nerve as it begins to enter the mandibular foramen. It should sit slightly superior and medially to the foramen (Fig 3).

The administration of a second carpule to anaesthetize the long buccal nerve is recommended.

This technique avoids separate injection to anesthetise the lingual nerve.

Advantages:

1. Simple to learn and easy to accomplish.
2. It is not associated with high risks or numerous complications.
3. Good anatomical landmarks.
4. It utilizes the lower portion of pterygomandibular space. Unlike the Gow-Gates and Akinosi, there is no danger of injecting the needle and depositing the local anaesthetic contents into the maxillary artery and vein, the middle meningeal artery and vein or the temperomandibular joint capsule.

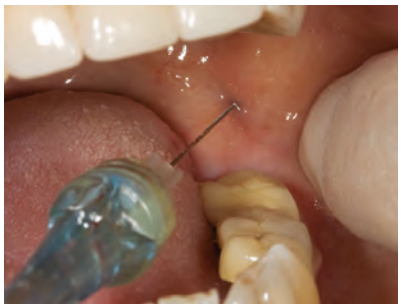

Fig 1: Conventional technique

Fig 2: Fischer 123 technique

Fig 3: A.R.T technique

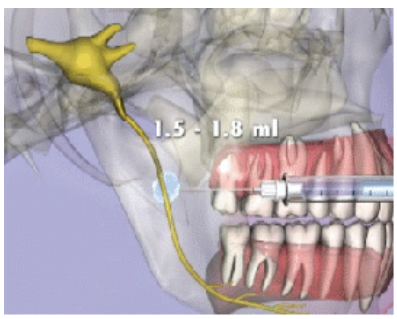

Fig 4: Vazirani Akinosi technique

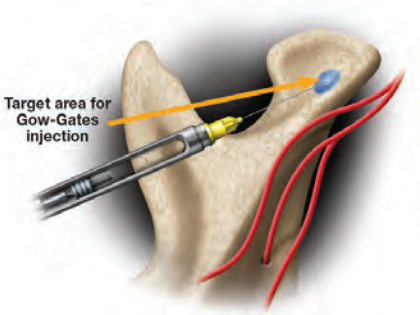

Fig 5: Gow Gates technique

Fig 6: Extra oral inferior alveolar nerve block technique

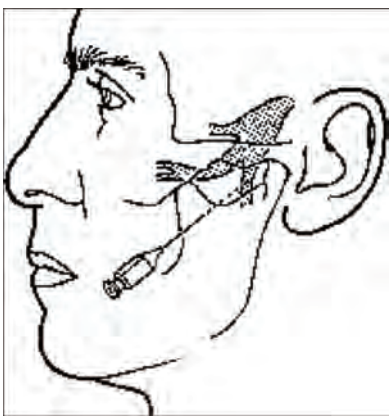

Fig 7: Extra oral mandibular technique

6. Vazirani akinosi technique:

Indications:

1. Evidence of anatomical variability
2. Evidence of accessory innervations
3. Presence of trismus.
4. Difficulty in seeing intraoral landmarks (because of large tongue).

In 1977, Akinosi brought this method to the attention of educators, but they soon realized that this technique had been published by Vazirani in 1960. The objective is to place the needle tip between the ramus and the medial pterygoid muscle.[6]

This technique is used when the patient is in a closed-mouth position. Local anesthetic is injected into the superior position of the pterygomandibular space. In this technique the needle is inserted to its predetermined depth. The needle is posi¬tioned at the level of the maxillary marginal gingiva, parallel to the maxillary occlusal plane.[1] The syringe is advanced posteriorly, and the needle penetrates approximately 2.5 cm to 3 cm into the soft tissues in the embrasure between the mandibular ramus and the maxillary tuberosity (Fig 4).

Advantages:

1. Delivers anesthetic more proximally than the conventional block, leading to a larger area of anesthesia and a reduced chance that accessory innervation will cause failure.
2. Blocks the long buccal nerve, obviating the need for a separate injection.
3. The Akinosi block utilizes a closed-mouth approach, affording a clear advan¬tage when trismus frustrates administration of the injection.
4. Rapid induction of anesthesia.

Disadvantages:

1. No bony contact
2. Difficult to visualize the path and depth of needle penetration.

Complications:

1. Hematoma.
2. Trismus – rare.
3. Facial nerve paralysis.

7. Gowgates technique:

In 1973, George Albert Edwards Gow-Gates described the technique. In this technique the needle tip is at the neck of the condyle and the solution is deposited. The nerves anesthetized by the Gow-Gates technique include the inferior alveolar, incisive, mental, lingual, mylohyoid, auriculotemporal and long buccal.

After palpating the intraoral landmarks, the injection site is approached from the contralateral premolars or canine. After palpating the intraoral landmarks, the injection site is approached from the contralateral premolars or canine. The intraoral insertion is lateral and superior compared with standard technique. The superior boundary of the insertion point is the maxillary occlusal plane. Usually, the needle lies just below the mesiopalatal cusp of the maxillary second molar, which can be a reliable landmark, provided that this tooth has not drifted or rotated. The needle is inserted, advanced slowly until it contacts bone[10] (Fig 5).

Advantages:

1. Anesthesia of the buccal nerve precludes the need for performing a separate buccal nerve block.
2. Anesthesia of the mylohyoid and auriculotemporal nerves could resolve the concern about accessory innervation, as would the more superior position of the administration of the local anesthetic.
3. High success rate (95%).
4. Few post injection complications (e.g. trismus).

Disadvantages:

1. Slower onset of anesthesia.
2. The anesthetization of the lower lip, temporal area.

8. External approach:

This method has been given by Kurt and Thoma. Patient is asked to clench the teeth and lowest point on the anterior border of massester muscle is located. A line is drawn from this point to the tragus of the ear. The midpoint of this line which marks externally the mandibular foramen is marked. A line is drawn from this point parallel with posterior border of the mandible to the lower border. This line is measured and a 21guage needle of 6-8cm length is marked to a similar length by means of a piece of rubber dam. The long needle is now inserted on the inner aspect of lower border of the mandible. The needle is gradually inserted parallel with the line marked on the skin of the external surface of the mandible. When it reaches the depth indicated by the marker that is opposite the point marked on the skin overlying the position of the foramen the solution is slowly injected (Fig 6).[8]

9. Extraoral mandibular nerve block[9]:

The midpoint of the zygomatic process is located and the depression in its inferior surface is marked. With a 25guage needle, a skin wheal is raised just below this mark in the depression, which is identified by having the patient open and close jaw. Using a 4inch (8.8cm), 22guage needle, and 5cm marking with a rubber marker is done. The needle is inserted through the skin wheal, perpendicular to the median sagittal plane until the needle point gently contacts the lateral pterygoid plate.

Care should be taken that the needle should never be inserted beyond the depth of the marker. The needle is withdrawn, with only the point left in the tissue, and redirected upward and slightly posteriorly so that the needle will pass posterior to the lateral pterygoid plate.[11]

Conclusion:

The inferior alveolar nerve block is the conventional method for anesthetizing mandibular teeth. In the case of difficulty-to-anesthetize patient, the inferior alveolar nerve can be particularly challenging. In such situations the alternatives to inferior alveolar nerve block described in this article can be successfully utilised with the best knowledge and skill of the operators.

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How to cite this article:
Anuradha M, Yashavanth Kumar DS, Harsha VB, Rahul S. Variants of inferior alveolar nerve block. CODS J Dent 2014;6;35-39

Source of support: Nil. **Conflict of interest**: None Declared.