

FAILURE OF INFERIOR ALVEOLAR NERVE BLOCK AND HOW TO OVERCOME IT: A REVIEW

Running Title: Failure of inferior alveolar nerve block- a review

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ABSTRACT

Inferior alveolar nerve block (IANB) is most commonly used technique performed to anesthetize mandibular tooth. Sometimes it fails even though it's been performed by well experienced clinicians. The reasons for failure: difficulty in identifying anatomical landmarks, patient compliance, anaesthetic solution, variation in the anatomical landmarks and inflammation. This paper is a review of various studies conducted on failure of inferior alveolar nerve block and Will be discussing in detail about the reasons for failure and how to overcome that. Selecting the best technique by the dentist or surgeon depends on complications related to the alternative techniques.

KEYWORDS: Local anaesthesia, IANB, Mandible, Failure, Complications, Techniques.

INTRODUCTION

Inferior alveolar nerve block (IANB), commonly referred as mandibular nerve block, is the most frequently used after infiltration and possibly one of the most important technique in dentistry. IANB is mostly performed in combination with infiltration of long buccal nerve and lingual nerve. This will anesthetize the mandibular tooth till the midline, Body of the mandible, inferior portion of the ramus, floor of the mouth and anterior 2/3rd of tongue and Buccal mucoperiosteum of the ipsilateral side. Unfortunately, it also proves to be with higher percentage of failure rate even when administered properly. ⁽¹⁾

CONVENTIONAL IANB TECHNIQUE

Inferior alveolar nerve block is the most common technique used in dentistry. Despite its importance, it is associated with a failure rate of 29%-39% ⁽²⁻⁴⁾, which represents the highest percentage of all clinical failures achieved using local anaesthesia. The target point for deposition of local anaesthesia is the inferior alveolar nerve before it enters the mandibular foramen. ⁽¹⁾ The nerve is approached from opposite quadrant by angling the syringe from the premolars of the opposite side to the point of insertion. The point of needle insertion is 5mm along an imaginary line bisecting the finger nail with finger resting on deepest part of the

pterygomandibular raphe. On the site insertion, tissues are stretched and become tensed for atraumatic insertion of needle. The penetration depth should be 20-25 mm until the needle contacts the bone surface, slowly withdraw the needle and aspirate in two planes, if negative-inject the anaesthetic solution slowly.⁽¹⁾

PARAMETERS TO BE CONSIDERED TO DECREASE THE FAILURE RATE OF IANB

To increase the success rate of conventional inferior nerve block technique clinicians should understand the anatomical factors, patient factors, anaesthetic solution and Injection technique.

1. ANATOMICAL FACTORS

A) Determination of the target point considering the location of the mandibular foramen

IANB is a most commonly used method of delivering anesthetic solution into the pterygomandibular space bounded by the anterior buccinator muscle, posterior parotid gland, upward lateral pterygoid muscle, internal medial pterygoid muscle, and external mandibular ramus.⁽⁵⁾ Pterygomandibular space bundles the inferior alveolar nerve, inferior alveolar vein, and inferior alveolar artery, generally have common anatomical patterns.⁽⁵⁾ The inferior alveolar neurovascular bundles are located posterolateral to the tip of lingula. Inferior alveolar vessels are located posterolateral to the inferior alveolar nerve, which is generally located at the forefront, while inferior alveolar veins are located at the rear most outward.^(6,7,8) The penetration depth should be 20-25 mm until the needle contact bone surface, slowly withdraw the needle and aspirate in two planes, if negative- inject the anaesthetic solution slowly.⁽¹⁾

B) Bifid mandibular canal

Bifid mandibular canal is one the interesting variations we might encounter in mandible. Bifid mandibular canal occurs at a rate of 0.35%. This variation can lead to difficulty in performing mandibular anaesthesia. Therefore, it is necessary to diagnose this condition. Deposit some additional anaesthetic solution inferior to the normal anatomical landmark is advised to overcome the failure rate.⁽⁹⁾

2. PATIENT FACTOR

A) Anxiety

Failure of anaesthesia is more common for extremely sensitive and anxious patients. Even if the nerve conduction is blocked completely, patient may assume or imagine still they having pain. To overcome this type of failure it is important to explain about procedure to the patient beforehand and if necessary, minimal sedation using nitrous oxide is considered.⁽¹⁰⁾

B) Localized Infection

If there is any infection in the course of mandibular nerve or in the pterygomandibular space, it becomes histologically acidic, which may interfere with the onset of anaesthesia. Failure rates of IANB in a teeth associated with irreversible pulpitis are extremely high in the mandibular posteriors. Therefore, the risk of inferior alveolar nerve anaesthesia failure can be reduced by depositing the anesthetic solution as far from the infected area as possible.⁽²⁾

C) Trismus

It is difficult to perform IANB in patients with very minimal or restricted opening and it's important for the patient to wide open his mouth while performing IANB, when mouth opening is minimal, the nerve is stress-free, away from the lingual tip where the anesthetic solution is usually injected, this will lead to inadequate anaesthesia. Closed mouth technique or vazirani-akinosi technique is most commonly followed in patients with trismus or inadequate mouth opening.^(1,2,10)

3. ANESTHETIC SOLUTION

Cohen et al. conducted a study comparing two different anesthetic solution ,3% mepivacaine and 2% lidocaine with 1:100 000 epinephrine respectively in achieving pulpal

anaesthesia with IANB, the effectiveness of each solution remains same. M. Singla conducted a study comparing the efficacy of different volumes of 4% articaine, 1.8ml and 3.6ml respectively^(11,12), effectiveness of achieving inferior alveolar nerve block using different volumes of 4% articaine solution remains same.⁽⁵⁾ There has been introduction many anesthetic formulation but the failure rate of IANB remains the same.

4. IMPROPER PLACEMENT OF NEEDLE

Inserting the needle tip too below or above the mandibular foramen leads to incomplete or failure in anesthetizing the inferior alveolar nerve. The needle should be inserted to a precise depth of 20–25 mm to the pterygo temporal depression between the pterygomandibular raphe and coronoid notch to correct this redirect the needle above previous site of insertion.^(13,14)

TECHNIQUES TO OVERCOME THE FAILURE OF CONVENTIONAL IANB.

Gow-Gates

Gow-Gates technique provides sensory anaesthesia to the entire division of mandibular nerve. Important advantage of practicing Gow-Gates over conventional IANB is higher success rate. Nerves that anesthetized in this technique are inferior alveolar, lingual, nerve to mylohyoid, mental, incisive, auriculotemporal and buccal nerves.^(6,10,15)

Vazirani-Akinosi

Vazirani-Akinosi is a closed mouth mandibular anaesthesia technique. This technique is mainly indicated in patients with very minimal mouth opening and trismus. Nerves that anesthetized in this techniques are inferior alveolar, incisive, mylohyoid, lingual and mental nerves.^(6,10,11) This technique is contraindicated in patients with lip and tongue biting habit.⁽¹⁾

Incisive Nerve Block

Provides pulpal and buccal soft tissue anaesthesia for the tooth present anterior to the mental foramen, from central incisor to second premolar, it is indicated in procedures requiring bilateral IANB.^(1,16)

SUPPLEMENTARY TECHNIQUES

Buccal infiltration technique

This technique is more successful with 4% articaine. This technique more effective in mandibular molars with irreversible pulpitis.⁽¹⁷⁾

Periodontal Ligament Injection

This technique has been introduced due to continuous failure of IANB. The advantage of this technique over IANB is that minimal dose is required to anesthetize the tooth. It has rapid onset and is suitable in cases where bilateral IANB is required.^(17,18) It is contra indicated in patients with infection and also in anesthetizing primary tooth.⁽¹⁾

Intraosseous Injection

This technique requires special kit like Stabident system.

Intra Pupal Injection

This is a highly successful technique. Onset action is immediate.

CONCLUSION

Local anaesthesia plays inevitable role in routine surgical and for some dental procedures. IANB is most commonly used technique, though the failure rate of IANB is comparatively higher when compared other techniques. The common reason for failure has been summarized in this review article are anatomical factors like position of mandibular foramen, variation mandibular canal anatomy, patient Anxiety, Localized infection, Volume and concentration of anaesthetic solution and incorrect placement of the needle. Many studies had been conducted using different formulation and volume anaesthetic solution but they haven't shown any effective results. Alternative techniques as their own advantage and disadvantage and most of them are technique sensitive. So, its important for the clinicians to master one

basic technique and to know at least two alternative techniques to perform painless procedure in routine dental practice.

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