Onset of Anesthesia in Classical Inferior Alveolar Nerve Block Technique an Observation Study

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ABSTRACT

Objective: This study investigates the onset time of anesthesia achieved through the classical inferior alveolar nerve block (IANB) technique, aiming to provide insights into the efficacy and timing of onset for clinical applications.

Methods: An observational study was conducted An observational study was conducted in the month of May 2024 involving 122 patients undergoing dental procedures requiring IANB. After administering the block using the classical technique, the onset of anesthesia was monitored. The primary outcome was the time from injection to the onset of adequate anesthesia, defined as the loss of sensation in the mandibular molar region. Secondary outcomes included variations in onset times related to patient demographics, anatomical factors, and the experience level of the administering clinician.

Results: The average onset time for effective anesthesia was 6.2 minutes, with a range of 3 to 10 minutes. Variability in onset time was observed, influenced by factors such as patient age, anatomical variations, and operator experience. Younger patients and those with less anatomical variation tended to experience faster onset times. Experienced clinicians achieved slightly quicker onset times compared to less experienced practitioners.

Conclusion: The classical inferior alveolar nerve block technique typically achieves effective anesthesia within approximately 6 minutes. Understanding the variability in onset times can assist clinicians in setting realistic expectations for patients and in planning procedural timing. Further research could explore methods to optimize onset times and improve consistency in clinical practice.

Keywords: Clinical Technique, Dental Anesthesia, Inferior Alveolar Nerve Block, Onset of Anesthesia, Observational Study.

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Crossref Doi: https://doi.org/10.36437/irmhs.2024.7.6.C

Introduction

The inferior alveolar nerve block, a common procedure in dentistry, involves the insertion of a needle near the mandibular foramen in order to deposit a solution of local anesthetic near the nerve before it enters the foramen, a region where the inferior alveolar vein and artery are also present. The pterygoid plexus is located

posterior and superior to this area. Numerous methods and related changes have been presented with reference.[1]

It has been observed that technical mistakes made by the dentist or surgeon during the local anesthetic administration procedure are the primary cause of this nerve block and anesthesia failure, rather than potential anatomical abnormalities in some patients. The onset of action of an inferior alveolar nerve block (IANB) is a critical aspect of dental anesthesia, particularly in dental procedures involving the mandibular teeth and surrounding tissues. An IANB is a common local anesthesia technique employed by dental professionals to numb the lower jaw and teeth for various procedures such as extractions, root canals, and restorative work.[2]

The onset of action refers to the time it takes for the anesthetic solution to take effect and produce numbness in the innervated area, which in the case of an IANB includes the lower teeth, gums, and surrounding soft tissues supplied by the inferior alveolar nerve.[3]

Typically, the onset of action of an IANB is relatively rapid, with patients usually experiencing numbness within a few minutes of administration. However, the exact onset time can vary depending on factors such as the type and concentration of the anesthetic solution used, the technique employed by the dental professional, the individual patient's anatomy and physiology, and the presence of any pre-existing conditions that may affect nerve function or blood flow in the area.[4]

The primary goal of achieving a rapid onset of action is to ensure patient comfort during dental procedures by effectively blocking pain sensation in the targeted region.[4] Type and concentration of local anesthetic higher concentrations and vasoconstrictors (e.g., epinephrine) enhance depth and duration of anesthesia. The technique of administration considers Proper aspiration, slow and steady injection, and adequate volume of anesthetic solution to contribute to successful blockade and rapid onset. Patient factors include individual variations in anatomy, vascularity, nerve sensitivity, and systemic health may influence the onset time and efficacy of anesthesia.[5]

Dental practitioners often assess the onset of anesthesia by testing the patient's response to a sensory stimulus, such as gentle probing or tapping on the teeth or gums, to confirm the adequacy of anesthesia before proceeding with the planned treatment.[6]

This study will be conducted as assessing the time of onset of action for an inferior alveolar nerve block is crucial in clinical dentistry to ensure effective pain management during dental procedures & its clinical relevance, potential to improve patient experience and safety, optimization of anesthetic techniques, and educational benefits.

Material and Method

Place of Study: Department of Oral and Maxillofacial Surgery, Institute of Dental Sciences, Bareilly.

Type of Study: A Clinical Trial

Study Duration: 2 Months (March 2024 – April 2024)

Subjects: patients who are reporting to the Department of Oral & Maxillofacial Surgery for extraction of teeth.

Sample Size

T-tests - Means: Difference from constant (one sample case)

Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	One
	Effect size d	=	0.3
	α err prob	=	0.05
	Power (1-β err prob)	=	0.95
Output:	Noncentrality parameter δ	=	3.3136083
	Critical t	=	1.6575443
	Df	=	121
	Total sample size	=	122
	Actual power	=	0.9505430

A power analysis was established by G*power, version 3.0.1(Franz Faul universitat, Kiel, Germany). A sample size of 122 subjects would yield 95% power to detect significant differences, with a significance level of 0.05, According to Khalil H, et al., (2014).[3]

Aim and Objectives

Aim

- To evaluate the time of onset of action in the inferior alveoler nerve block technique.

Objective

- Time taken for numbness on the lower lip and chin area.
- Onset of numbness on the buccal mucosa and lingual soft tissues and periosteum.
- Time is taken to anesthetise the anterior two-thirds of the tongue.
- Inter-comparison between close demographic data on the basis of Age, Sex & BMI.

Inclusion Criteria

1. Patients requiring IANB for any dental procedure.
2. Healthy adult patients within the age group of 18-60 years.

Exclusion Criteria

1. Patient allergic to local anesthesia (eg; lignocaine).
2. Severe periapical infection.
3. Patients with any systemic condition (Diabetes).
4. Patent with a history of adverse drug reactions.

Procedure

The complete information about the study will be provided to the participants by providing the participant information sheet (Appendix I). Signed information consent will be obtained from all the participating subjects after explaining the complete procedure in their vernacular language (Appendix II). The survey will be conducted in April 2024. The questionnaire (Appendix III) included questions related to the patient's age, sex, onset of anesthesia, BMI, and assessment of numbness in various regions.

The inferior alveolar nerve block will be deliver as per standard technique (**Raj JD, et al., 2013**) under moderation of specialized dental practitioner.

Subjective Symptoms

Patient ask to report any changes they notice in sensation, such as numbness or tingling, in the lower lip, chin, teeth, or tongue on the side where the injection was administered. Patients often start to perceive changes in sensation within a few minutes of the injection.[2]

Objective Symptoms

Use objective measures to assess the onset of anesthesia this may include:

Testing the response to sharp or blunt stimuli (e.g., dental explorer or cotton swab) on the teeth and gingiva of the affected side.1 Testing the response to light touch or pinprick on the skin of the lower lip, chin, and tongue.[2]

Timing: Note the time of injection and periodically assess the onset of anesthesia at regular intervals, such as every minute or every few minutes, depending on the expected duration of onset.[3]

Documentation: Document the time of injection and the onset of anesthesia in the patient's dental record. This helps track the effectiveness of the nerve block and provides valuable information for future procedures.[4]

Communication: Maintain open communication with the patient throughout the process. Inform them about what to expect and encourage them to report any sensations or changes they experience during the onset of anesthesia.[4]

It's essential to consider individual variations in response to anesthesia, as well as factors such as the type and concentration of the anesthetic solution used, the technique of administration, and the presence of any anatomical variations that

may affect the efficacy of the nerve block. Additionally, if the onset of action is delayed or inadequate, supplementary techniques or adjustments may be necessary to achieve optimal anesthesia for dental procedures.[5]

Statistical Analysis

Data will be entered in the Excel spreadsheet. Descriptive statistics like mean, standard deviation, and percentage will be calculated. Inferential statistics like t-tests - Means: Wilcoxon signed-rank test (matched pairs) will be used to find out the statistical difference among the two groups using SPSS (statistical package for social sciences) version 24. (IBM SPASS statistics [IBM Corp. Released 2011] any other necessary tests will be dealt with at the time of analysis based on data distribution using normalcy tests.

Results

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age (in Years)	109	18.0	67.0	38.77	12.88
BMI	109	18.5	52.0	27.35	4.94
Onset of time of inferior alveolar nerve block (in Seconds)	109	1.9	10.0	4.15	1.46

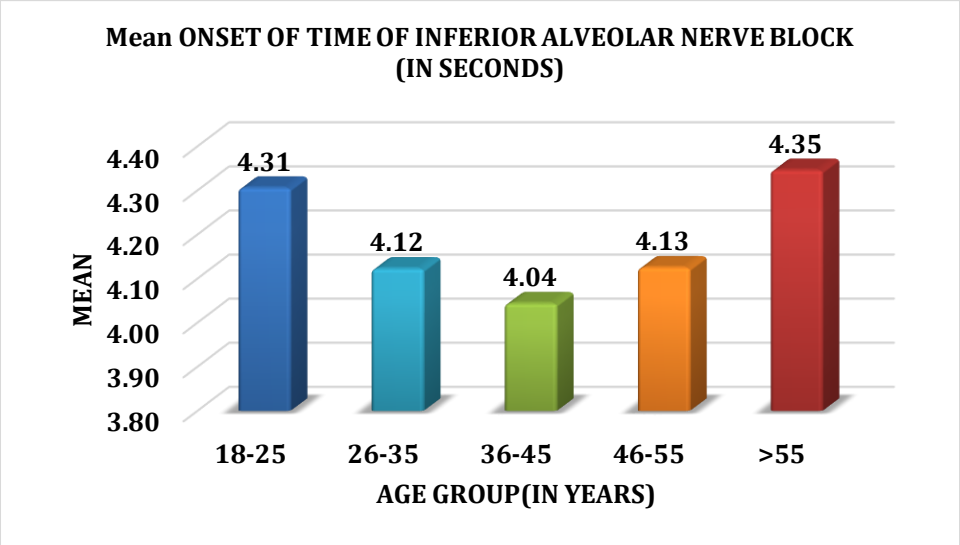
Table 1: Descriptive

In our study of 109 study subjects, the mean age of the study subjects was 38.77 ± 12.88 years, the mean BMI of study subjects was 27.35 ± 4.94 and the Mean Onset of time of inferior alveolar nerve block (in minutes) in study subjects was 4.15 ± 1.46 minutes.

Age Group (In Years)	N	Mean	Std. Deviation	P-Value
18-25	21	4.31	2.18	0.963#**(not significant)**
26-35	34	4.12	1.39	
36-45	36	4.04	1.29	
46-55	18	4.13	1.26	
>55	13	4.35	1.18	

Table 2: Comparison of mean onset of time of inferior alveolar nerve block (in Minutes) in different age groups.

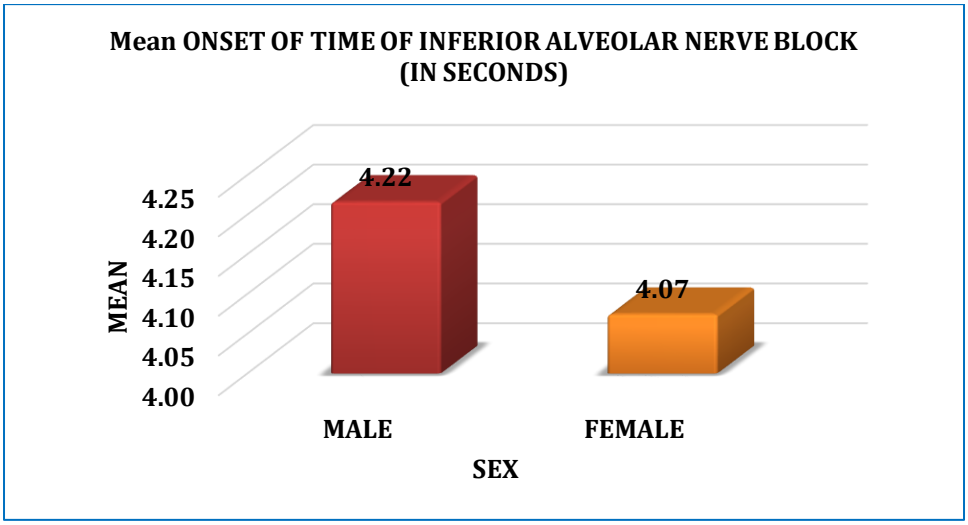
In our study of 122 study subjects, the mean Onset time of inferior alveolar nerve block (in seconds) in the age group of 18-25 years was 4.31 ± 2.18 minutes, in the age group of 26-35 years, it was 4.12 ± 1.39 seconds, in the age group of 36-45 it was 4.04 ± 1.29 minutes, in the age group of 46-55 it was 4.13 ± 1.29 minutes and in the age group of >55 years, it was 4.35 ± 1.18 minutes. The mean Onset time of the inferior alveolar nerve block (in seconds) in the age group of 36-45 years was minimum and in the age group of >55 years, it was maximum but there was no significant difference in the mean Onset time of inferior alveolar nerve block (in seconds) in the different age groups.



Sex	N	Mean	Std. Deviation	P-Value (Result)
Male	72	4.22	1.51	0.617#**(not significant)**
Female	50	4.07	1.39	

Table 3: Comparison of mean onset of time of inferior alveolar nerve block (in Seconds) in different genders.

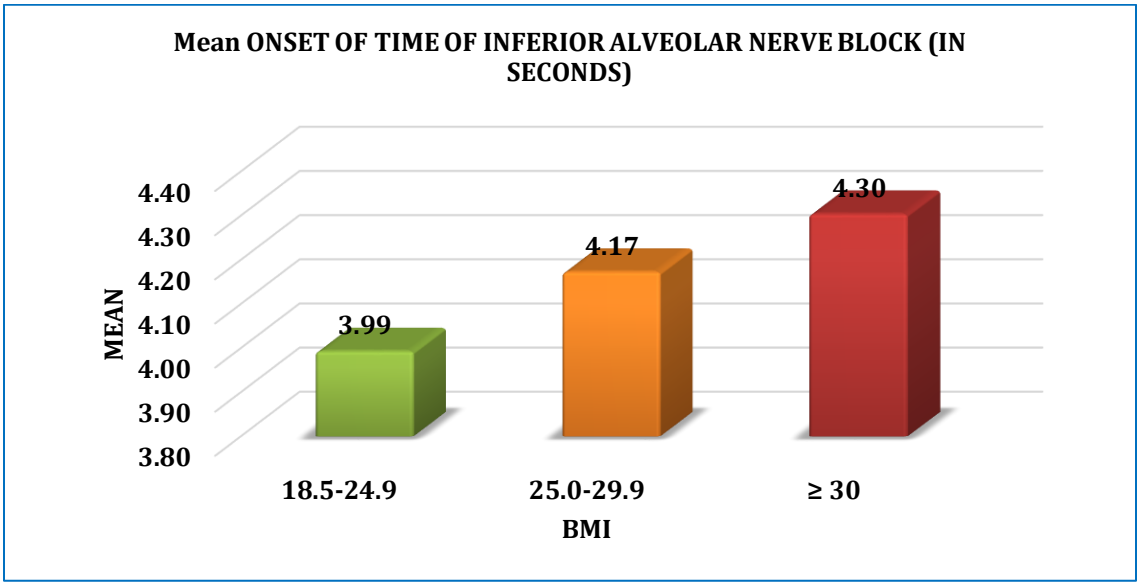
In our study of 122 study subjects, the mean Onset time of inferior alveolar nerve block (in minutes) in the male subjects was 4.2 ± 1.51 minutes, and in the female subjects, it was 4.07 ± 1.39 minutes. The mean Onset time of the inferior alveolar nerve block (in seconds) in the male subjects was more as compared to female subjects but there was no significant difference in the mean Onset time of inferior alveolar nerve block (in minutes) in the different genders.



BMI	N	Mean	Std. Deviation	P-Value (Result)
18.5-24.9	31	3.99	1.61	0.734#**(not significant)**
25.0-29.9	58	4.17	1.48	
≥ 30	30	4.30	1.24	

Table 4: Comparison of mean onset of time of inferior alveolar nerve block (in Minutes) in different BMI.

In our study of 122 study subjects, the mean Onset time of inferior alveolar nerve block (in minutes) in the BMI group of 18.5-24.9 was 3.99 ± 1.61 minutes, in the BMI group of 25.0-29.9, it was 4.17 ± 1.48 seconds, and in the BMI group of ≥ 30years, it was 4.30 ± 1.24 minutes. The mean Onset time of the inferior alveolar nerve block (in minutes) in the BMI group of 18.5-4.9 was minimum and in the BMI group of ≥ 30 years was maximum but there was no significant difference in the mean Onset time of inferior alveolar nerve block (in minutes) in the different BMI groups.



Summary

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How to cite this Article: Chakrabortty. D, Singh. H. P, S. Gokkulakrishnan, Vashishat. B; Onset of Anesthesia in Classical Inferior Alveolar Nerve Block Technique an Observation Study; Int. Res. Med. Health Sci., 2024; (7-6): 10-16; doi: https://doi.org/10.36437/irmhs.2024.7.6.C
Source of Support: Nil, **Conflict of Interest:** None declared.
Received: 22-11-2024; **Revision:** 08-01-2025; **Accepted:** 15-01-2025