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RESEARCH ARTICLE

SINGLE INSERTION TECHNIQUE DIRECTED BY THE ANTERIOR-THUMB AND THE POSTERIOR-FINGER FOR MANDIBULAR ANESTHESIA

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Abstract

Background and objectives: Since it has a major impact on patient comfort, compliance, and treatment results overall, effective pain management is essential to dental and maxillofacial operations. In the field of mandibular anesthesia, the inferior alveolar nerve block (IANB) is one of the most commonly utilized method. It anesthetizes the lower lip, mandibular teeth, and related soft tissues. The aim of the study was to assess the effectiveness of the Single Insertion Technique (SIT) for concurrent anesthesia of the long buccal (LBN), lingual (LN), and inferior alveolar (IAN) nerves.

Subjects and Methods: A prospective clinical trial was performed on 1,000 patients aged 18-65 years requiring mandibular procedures. This procedure involved inserting a single long needle, guided by intraoral palpation of the anterior border and extra orally supported along the posterior ramus. Lidocaine (2%) with 1:80,000 epinephrine was administered sequentially to the internal alveolar nerve (IAN), the long buccal nerve (LN), and the lower alveolar nerve (LBN) after passive aspiration.

Results: High success rates were observed: 95% for IAN, 98% for LN, and 85% for LBN blocks. Mean onset times were 3.3 minutes (IAN), 2.2 minutes (LN), and 2.0 minutes (LBN). Anesthesia duration ranged from 40 to 90 minutes, with the IAN block lasting the longest. Patient satisfaction scores exceeded 9/10 across all blocks. A strong negative correlation (r= -0.85 to -0.78, $p<0.001$) was found between onset time and success rate, indicating that faster onset is associated with greater anesthetic success.

Conclusions: This study demonstrated that the single-entry mandibular nerve block technique, focusing on the anterior thumb and posterior finger landmarks, is a reliable method for anesthetizing the inferior alveolar, lingual, and long buccal nerves. This technique has a high overall success rate (92%), rapid onset, satisfactory duration, and high patient satisfaction, demonstrating strong clinical potential.

Keywords: Inferior alveolar nerve block, lingual nerve, long buccal nerve, mandibular anesthesia, single insertion technique, tactile guidance.

INTRODUCTION

Effective pain control is a cornerstone of dental and maxillofacial procedures, as it significantly influences patient comfort, cooperation, and overall treatment outcomes. Among the numerous techniques used for mandibular anesthesia, the inferior alveolar nerve block (IANB) is one of the most normally utilize. It provides anesthesia to the mandibular teeth, associated soft tissues, and the lower lip[1]. Despite its widespread use, conventional mandibular anesthesia techniques often present challenges, including multiple needle insertions, inconsistent success rates, and significant patient discomfort. These limitations are primarily due to the dense cortical structure of the mandible and anatomical variations in nerve distribution and location of nerves[2,3]. The conventional IANB, commonly known as the Halstead technique, is one of the most regularly utilized methods for achieving mandibular anesthesia, particularly targeting the IAN and lingual nerves (LN). Despite its widespread use, the success rate remains variable, ranging from 80% to 85% in healthy teeth and dropping to 65% to 83% in cases of symptomatic irreversible pulpitis. This variability is largely attributed to anatomical differences, operator technique, and the frequent need for multiple injections[4,5]. A major limitation of the IANB is its inability to anesthetize the long buccal nerve (LBN), which innervates the buccal mucosa adjacent to the mandibular molars. This typically necessitates an additional injection to achieve complete anesthesia[6]. Repeated needle penetrations not only increase patient discomfort and anxiety but also raise the risk of complications such as trismus, hematoma, and nerve injury[7,8]. Alternative methods have been created to get around these problems. Introduced in 1973[9], the Gow-Gates Mandibular Block (GGMB) targets the mandibular nerve trunk at the condyle's neck. With a single injection, it seeks to anesthetize the IAN, LN, mylohyoid, auriculotemporal, and LBN[10]. Although this approach offers more extensive anesthetic coverage, it has a steep learning curve, is extremely technique-sensitive, and necessitates a large mouth opening[11]. For individuals with restricted mouth opening, there is an additional method called the Vazirani-Akinosi Mandibular Block (VAMB)[12]. In order to block the mandibular nerve, including the IAN, LN, and LBN, this closed-mouth approach injects the anesthetic solution into the pterygomandibular region[13], such other traditional methods, it has drawbacks, though, including the possibility of problems such vascular or parotid gland involvement, inconsistent results, and technical sensitivity[14].

In resource-limited settings such as Yemen, where access to dental services may be restricted and patients often express anxiety regarding injections, there is a pressing need for simplified and effective anesthetic techniques[15]. A unique single-insertion method that is guided by the anterior thumb and posterior index finger has been developed in order to overcome these issues[6]. This method allows the IAN, LN, and LBN to be anesthetized simultaneously by inserting a single needle between externally palpable anatomical markers[16]. This approach aims to reduce patient suffering, streamline the process for professionals, and do away with the need for repeated injections by depending on tactile guidance instead of deep anatomical imaging[17]. This method has not received widespread clinical trial validation, especially among Yemenis, despite its apparent theoretical benefits. Thus, the purpose of the current study is to examine the efficacy and dependability of this single-insertion technique for anesthesia of the mandibular nerve.

SUBJECTS AND METHODS

Study design: This study was conducted as a prospective clinical trial to evaluate the success, accuracy, and clinical reliability of a novel technique for mandibular anesthesia targeting the IAN, LN, and LBN using the Single Insertion Technique Directed by the Anterior Thumb and the posterior Finger.

Ethical considerations: Sana'a University's Ethical Committee on Medical Research (SU/ECMA) granted ethical approval for the project, which was assigned reference number OMFS:05/08/2022.

Study area: The research was conducted at the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Sana’a University, Sana’a City, Yemen. This department serves as a primary center for minor oral surgeries involving the mandible, providing access to a diverse patient population.

Study population: The study population consisted of patients attending the Oral and Maxillofacial Surgery Clinic for various mandibular surgical treatments that required local anesthesia. Each participant was evaluated and selected based on specific clinical indications and inclusion criteria.

Study sample size: A thousand patients between the ages of 18 and 65 who sought local anesthetic for a variety of mandibular surgical procedures at the Oral and Maxillofacial Surgery Clinic were included in the study. The large sample size ensured high statistical power and accounted for anatomical variations among patients.

Selection Criteria: The inclusion and exclusion criteria were carefully chosen based on a prior study conducted by Joseph *et al.*[16].

Inclusion Criteria: The study included patients aged 18 years and older who were eligible for minor mandibular surgery, such as tooth extraction, biopsy, or surgery prior to prosthetic placement, and who were able and willing to provide informed consent.

Exclusion criteria: Study exclusion: Patients with bleeding disorders (e.g., hemophilia, anticoagulant therapy), patients with a history of hypersensitivity or allergy to local anesthetics, patients who have used medications that may affect the assessment of anesthesia (e.g., NSAIDs, opioid analgesics, alcohol), or have an active medical condition, patients with absent lower lateral incisors (which are necessary for the alignment of the technique) and inability to open the mouth adequately (e.g., mandibular spasm).

Methodology: Informed written consent was obtained from all participants. Demographic data (name, age, gender, nationality), dental, and medical histories were recorded. Extraoral and intraoral examinations were performed to confirm eligibility. Patient confidentiality was maintained, and all procedures adhered to the Declaration of Helsinki.

Study Materials: The following materials were used:

- Local Anesthetic: 2% Lidocaine hydrochloride (HCL) with 1:80,000 epinephrine concentration.
- Needle: 25-gauge, 35 mm long dental needle.
- Syringe: Aspirating dental syringe (1.8 mL cartridge).
- Personal protective equipment (PPE): sterile gloves, mask, eyewear.
- Topical anesthetic (optional): 5% Lidocaine gel to minimize insertion discomfort.
- Sharp dental explorer for objective testing.
- Data collected from patient responses and anesthesia success rates were entered directly into a data recording sheet and subsequently input into a custom Excel spreadsheet (2010).

Technique Description

Step 1: Patient positioning: The patient was seated in a semi-supine position, with the head tilted slightly toward the opposite side of injection. The mandibular occlusal plane was kept parallel to the floor. This adjustment facilitated better visibility and access to the mandibular ramus.

Step 2: Landmark identification: The clinician used the thumb of the non-dominant hand to palpate and stabilize the coronoid notch intraorally (anterior border of the ramus) and the index finger externally along the posterior border. The mandibular foramen was estimated to lie midway between these points.

Step 3: Needle insertion: A 25-gauge long needle was inserted approximately 1 cm posterior to the distal surface of the mandibular last molar and 1 cm medial to the thumb on the coronoid notch. The patient was instructed to half-open their mouth to relax the tissues of the pterygomandibular space. The needle was inserted parallel to and about 5 mm above the occlusal plane, following an imaginary line from the disto-incisal angle of the mandibular lateral incisor on the same side of insertion.

Step 4: Needle advancement: The needle was inserted progressively to approximately 23-25 mm, which corresponds to two-thirds of its total length. Upon reaching the estimated location near the inferior alveolar nerve, aspiration was performed to ensure the needle was not in a blood vessel.

Step 5: Anesthetic deposition

Inferior Alveolar Nerve Block: After negative aspiration, 1.2 mL of lidocaine with epinephrine was slowly deposited.

Lingual nerve block: The needle was then withdrawn to half of its depth (approximately 17 mm). After re-aspiration, 0.4 mL of anesthetic was deposited.

Long buccal nerve block: The needle was withdrawn further until only 8-9 mm of the needle remained in soft tissue. After negative aspiration, 0.2 mL was deposited in the buccal vestibule adjacent to the mandibular molars.

Long buccal nerve block: The needle was withdrawn further until only 8-9 mm of the needle remained in soft tissue. After negative aspiration, 0.2 mL was deposited in the buccal vestibule adjacent to the mandibular molars.

Assessment of anesthesia

Subjective assessment: Patients were asked immediately before the procedure whether they felt numbness in the lower lip on the anesthetized side compared to the unanesthetized side, and whether they felt numbness on the side of the tongue on the anesthetized side compared to the other side.

Objective Assessment

Sensation was tested with a dental explorer in three areas:

Buccal gingiva (premolar region) for IAN block.

Lateral surface of the tongue for lingual nerve block.

Buccal mucosa adjacent to mandibular molars for long buccal nerve block.

Responses were Categorized as:

No pain (complete anesthesia); mild discomfort (partial block); sharp pain (inadequate anesthesia).

Statistical Analysis

Data were analyzed using SPSS Version 26.0. Descriptive statistics assessed success rates, while inferential statistics (Chi-square tests and independent sample t-tests) evaluated relationships between variables. A significance level of $p \leq 0.05$ was set.

RESULTS

Distribution of the study samples

Demographic characteristics of the study sample: Table 1 shows the demographic information of 1000 patients in this study. The average age of the participants was 35 years with a standard deviation (SD) of about 10 years, going from 18 to 65 years which means there is a broad age range among young and middle-aged adults. About gender mix, 52.4% (n=524) of the people were men and 47.6% (n=476) were women, showing a close to equal share of both sexes in the study group.

Table1: Age and sex of patients participating in the study.

Variable	n (%)	Mean±SD	Range
Age (years)	1000 (100%)	35.8±10.2	18–65
Gender			
Male	524 (52.4%)		
Female	476 (47.6%)		

Success rate of SIT: Table 2 shows the success rates of a specific technique used for mandibular nerve anesthesia across 1000 patients. The technique was evaluated based on its effectiveness in blocking three major nerves by a single insertion of the needle; that nerves are the IAN, LN, LBN. The IANB was successful in 95% of cases, while the LNB showed a slightly higher success rate of 98%. However, the success rate for the LBNB was lower at 85%. When all three nerves were considered collectively, the overall success rate of the technique was 92.7%, with a failure rate of 7.3%. All results were statistically significant, with *p*-values less than 0.001, indicating that the success rates observed are highly unlikely to be due to chance. These findings suggest that the technique is generally reliable and effective for achieving mandibular nerve anesthesia, though some variation exists depending on the specific nerve targeted.

Table 2: Single insertion technique (SIT) success rate among participating patients.

Nerve Block	Total Patients (n)	Successful Blocks (n, %)	Unsuccessful Blocks (n, %)	*p*-value
Inferior alveolar Nerve	1000	953 (95.3)	47 (4.7)	<0.001
Lingual nerve	1000	979 (97.9)	21 (2.1)	<0.001
Long buccal nerve	1000	851 (85.1)	149 (14.9)	<0.001
Overall, success rate	1000	927 (92.7)	73 (7.3)	<0.001

Similarly, the LNB demonstrated a high success rate of 97.9% (n=979), with only 2.1% (n=21) of blocks being unsuccessful. In contrast, the LBNB exhibited a lower success rate relative to the other two, with 85.1% (n=851) of the blocks being successful and 14.9% (n=149) failing to achieve adequate anesthesia. The statistically significant *p*-values (<0.001) indicate that the differences observed in the success rates are unlikely to be due to chance, thereby underscoring the reliability of the block techniques used in this study.

Onset times for achieving anesthesia: Table 3 summarizes the mean onset times for effective anesthesia following successful nerve blocks. The IANB exhibited a mean onset time of 3.3 minutes (±1.1 SD), with a range between 2 and 5 minutes, indicating that this block generally required a slightly longer time to achieve adequate anesthesia compared to the others. For the LNB the mean onset time was 2.2 minutes (±0.9 SD), ranging from 1 to 3 minutes, suggesting a relatively faster onset. The LBNB demonstrated the shortest onset time, with a mean of 2 minutes (±0.8 SD) and a range of 1 to 3 minutes, indicating a rapid anesthetic effect in most patients. These findings suggest variability in the time required to achieve effective anesthesia depending on the nerve targeted, with the IANB typically requiring a longer onset time compared to LNB and LBNB.

Table 3: Onset times for anesthesia among successful blocks patients.

Nerve Block	N (%)	Onset Time (min)	Range (min)
Inferior alveolar nerve	953 (95.3%)	3.3±1.1	2–5
Lingual nerve	979 (97.9%)	2.2±0.9	1–3
Long buccal nerve	851 (85.1%)	2±0.8	1–3

Table 4: The mean, SD and range of the duration of anesthesia for each of the nerve blocks administered in the study.

Nerve Block	N (%)	Duration (min)	Range (min)
Inferior alveolar nerve	953 (95.3%)	89±11	68-119
Lingual nerve	979 (97.9%)	81±14	59-111
Long buccal nerve	851 (85.1%)	39±4.7	28-61

Duration of anesthesia

Table 4 presents the mean duration of anesthesia for each of the nerve blocks used in the study. For the IANB which was successfully administered in 953 patients, the mean duration of anesthesia was 89 minutes, with a standard deviation of ±11 minutes, indicating that most patients experienced anesthesia lasting between 68 to 119 minutes. This suggests a relatively consistent and prolonged anesthetic effect for this nerve block, which is essential for procedures involving the mandibular teeth. In the case of the LNB anesthesia was successful in 979 patients, with a slightly shorter mean duration of 81 minutes and a wider standard deviation of ±14 minutes. The range of anesthetic duration in these cases was 59 to 111 minutes, demonstrating some variability in the duration of numbness among patients. This block typically provides anesthesia to the tongue and the floor of the mouth, which often require less prolonged anesthesia compared to deeper structures. For the LBNB in 851 patients, the mean anesthetic duration was notably shorter at 39 minutes, with a standard deviation of ±4.7 minutes. The duration ranged between 28 to 61 minutes, showing that this nerve block produces a more transient effect, which is usually sufficient for minor soft tissue procedures on the buccal mucosa.

Patient satisfaction scores: Table 4 presents the mean patient satisfaction scores following the administration of each nerve block, using a scale of 0 to 10. The IANB resulted in a mean satisfaction score of 9.2 (±0.8 SD), with scores ranging from 8 to 10. The LNB had a slightly higher mean satisfaction score of 9.4 (±0.6 SD), with scores also ranging from 8 to 10. The LBNB achieved the highest mean satisfaction score of 9.6 (±0.5 SD), with scores falling within the same range of 8 to 10.

These results indicate that all three nerve blocks resulted in high levels of patient satisfaction, with the LBNB receiving the highest average score, followed by the LNB and IANB.

Correlation between onset time and success rate

Table 6 presents the correlation coefficients between onset time and success rate for each of the three nerve blocks. The correlation coefficient (r) indicates the strength and direction of the relationship between these two variables (onset time vs success rate).

For the IANB the correlation coefficient was -0.85, with a *p*-value of <0.001, suggesting a strong negative correlation between onset time and success rate. This implies that as the onset time increased, the success rate decreased significantly.

Table 5: The mean, SD and range of patient satisfaction scores following the administration of each nerve block, using a scale of 0 to 10.

Nerve Block	N (%)	Mean Satisfaction Score (0–10)	Range (0–10)
Inferior alveolar nerve	953 (95.3%)	9.2±0.8	8–10
Lingual nerve	979 (97.9%)	9.4±0.6	8–10
Long buccal nerve	851 (85.1%)	9.6±0.5	8–10

Table 6: Correlation between onset time and success rate.

Nerve Block	Correlation Coefficient (r)	*p*-value
Inferior alveolar nerve	-0.85	<0.001
Lingual nerve	-0.82	<0.001
Long buccal nerve	-0.78	<0.001

For the LNB the correlation coefficient was -0.82, with a *p*-value of <0.001, indicating a similarly strong negative correlation between onset time and success rate. The LBNB showed a correlation coefficient of -0.78, with a *p*-value of <0.001, also reflecting a negative relationship between the onset time and success rate, although slightly weaker than the other two nerve blocks. In all three nerve blocks the *p*-values <0.001, indicating that the correlations observed were statistically significant.

DISCUSSION

The present study aimed to investigate the efficacy and applicability of a single-insertion mandibular anesthesia technique guided by the anterior-thumb and posterior-finger method. This technique, which incorporates both intraoral and extraoral anatomical landmarks, is designed to enhance the accuracy and success rate of the IANB. In this technique, the anterior thumb is placed intraorally on the coronoid notch to provide tactile feedback for locating the anterior border of the mandibular ramus, while the posterior index finger is positioned extra-orally along its posterior border.

This configuration creates a tactile triangulation system that aids in precisely identifying the mandibular foramen. The use of the coronoid notch as a primary landmark aligns with the findings of Krishna *et al.*,[18], who emphasized its concavity and palpability, which assist in guiding needle angulation and depth. Similarly, the extraoral guidance component reflects the concept of ultrasound-assisted nerve blocks, where external landmarks such as the tragus and mandibular angle enhance spatial orientation and needle trajectory[18]. The midpoint between the two fingers approximates the position of the mandibular foramen, supporting anatomical studies by Mandal[5], and Cesario[20], while reducing reliance on visual estimation, a common limitation of traditional techniques such as the Halstead method[21].

This technique was applied to 1,000 patients aged 18 to 65 years (mean age 35.8±10.2), with an almost equal gender distribution (52.4% male, 47.6% female), enhancing the generalizability of the findings. The use of 2% lidocaine with 1:80,000 epinephrine, known for its rapid onset of 2-3 minutes and intermediate duration of 59-89 minutes, contributed to the high success rate observed. Epinephrine also helped to prolong anesthetic action by reducing systemic absorption and bleeding, and lowering toxicity[21]. The needle was inserted to a standardized depth of 23-25 mm, which corresponds well with anatomical data indicating that the IAN lies 20-25 mm within the pterygomandibular space[19]. This is deeper than the 15-20 mm range often used in the Halstead technique, which is associated with higher failure rates[18]. Compared to the Gow-Gates technique, which requires deeper penetration, 25-30 mm at a steeper angle, and carries a higher risk of intravascular injection[22]. The present method follows a needle path that remains parallel to the occlusal plane, offering better operator control and minimizing vascular trauma. An important advantage of this method is its adaptability across various anatomical variations, including edentulous cases, where the coronoid notch remains a consistent and palpable landmark even when other structures, such as the retromolar pad, are absent[23]. Previous studies on tissues by da Silva *et al.*[24], and Kattan *et al.*[25], have also confirmed the safety and effectiveness of this approach. Additionally, the needle trajectory in this technique avoids the inferior alveolar artery, which lies lateral to the nerve, thereby minimizing the risk of intravascular injection when compared to steeper approaches like[21]. Collectively, these findings support this technique as a safe, effective, and patient-friendly alternative to conventional methods of mandibular nerve block.

Success rates: In the current study, the IANB was successful in 95.3% of cases, while the LNB showed a slightly higher success rate of 97.9%. However, the success rate for the LBNB was lower at 85.1%. When all three nerves were considered collectively, the overall success rate of the technique was 92.7%, with a failure rate of 7.3%. All results were statistically significant, with p-values less than 0.001, indicating that the success rates observed are highly unlikely to be due to chance. These findings suggest that the technique is generally reliable and effective for achieving mandibular nerve anesthesia, though some variation exists depending on the specific nerve targeted. These findings align with the anatomical and clinical insights discussed by Khoury *et al.*,[19], who noted that the IAN is more difficult to anesthetize due to its deeper location and anatomical variability, whereas the LN is more superficial and accessible. On the other hand, the relatively lower success rate of the LBN anesthesia in this study is also consistent with findings by Agarwal *et al.*,[26], who highlighted the technical challenges in accurately locating the LBN due to its variable path and superficial position in the buccal vestibule. Conventional IANB techniques, as reviewed by Malamed[21], typically report success rates between 80-85%, with some studies noting even lower rates due to anatomical variability and technical sensitivity. This study achieved a 92.7% success rate, closely aligning with the 93.2% reported by Joseph *et al.*[16], who also employed a SIT to minimize patient trauma while effectively targeting all three nerves. The high success rate in our study may be attributed to the precise tactile guidance provided by the anterior thumb and posterior finger, which enhances needle placement accuracy and reduces anatomical variability.

Onset times: The present study found that the mean onset time for the IAN was 3.3 minutes, while the LN and LBN faster onset times (2.2 and 2.0 minutes, respectively). This result is consistent with the expected pharmacological action of 2% lidocaine with 1:80,000 epinephrine, which typically achieves onset within 2 to 5 minutes[27]. The shorter onset times observed in this study may be attributed to more precise deposition of the anesthetic closer to the nerve trunk. Such precision is enhanced by tactile guidance and a solid understanding of intraoral landmarks. In contrast, previous studies such as those by Haas[12], and Malamed[21], have reported greater variability in IANB onset times, with some cases requiring more than 10 minutes to achieve effective anesthesia. These delays were often linked to anatomical complexity or variations in technique, suggesting that while the single insertion method improves consistency, it may not guarantee uniformly rapid onset in all patients. Also, the faster onset observed LNB aligns with findings by Balasubramanian *et al*.[28], who reported that the LN tends to have a smaller diameter and fewer fascicles, promoting quicker uptake and distribution of local anesthetic. This finding may not consistently anesthetize the LN, especially in patients with atypical nerve courses. Similarly, the quick onset seen with the LBNB may be due to its superficial location and limited intervening tissue barriers, which facilitate rapid diffusion.

Duration of anesthesia: Regarding the results of the present study, the IANB demonstrated the longest duration of anesthesia, at 89±11 min, followed by the LN block at 81±14 min, and the LBN block at 40±5 min. These results correspond with lidocaine with epinephrine's profile, which offers pulpal anesthesia lasting 60 to 150 minutes, depending on the injection site and surrounding tissue characteristics[21]. The shorter durations observed for the LN and LBN block can likely be attributed to their more superficial locations and increased vascular perfusion, which facilitate faster washout of the anesthetic, supporting findings from Yadav *et al*.,[29]. While Hegde *et al*.[30], employed a similar SIT they did not provide specific duration data for individual nerve blocks, which limits direct comparison. Conversely, Ono *et al*.[31], reported more variable durations for mandibular blocks, particularly for the LBN block, where inconsistencies were noted. These variations may result from differences in patient anatomy, operator technique, or the use of different anesthetic formulations. Nonetheless, the standardized method used in the present study appears to yield more predictable duration outcomes.

Patient Satisfaction: All three nerve blocks received high satisfaction scores. The LBN block achieved the highest rating at 9.6±0.5, followed by the LN block at 9.4±0.6 and the IANB at 9.2±0.8. This elevated score may be attributed to the LBN block's superficial anatomical location and the minimal pain experienced during its administration. This observation aligns with findings by Kanaa *et al*.[32], which indicated that reduced tissue penetration is associated with improved patient comfort. These findings are consistent with prior research demonstrating that fewer needle insertions, shorter latency, and a smooth delivery improve the overall patient experience[32,33]. Moreover, minimizing the number of injections is particularly beneficial for individuals with a history of dental anxiety or traumatic experiences, as noted by Arm field Spencer and Stewart[34].

Correlation between onset time and success rate: Although this study identified a strong negative correlation between onset time and success rate across all three nerve blocks. Specifically, it indicates that as the onset time decreases, the success rate increases significantly. The strength of this correlation is highest for the IANB, followed by the LN and long LBN, with correlation coefficients of r=-0.85, -0.82, and -0.78, respectively. These findings suggest that a rapid onset is a key predictor of effective anesthesia, particularly for deeper and more complex nerve blocks. Kanaa *et al*.[32], emphasized that shorter onset times are associated with more successful nerve blocks, as they facilitate better tissue diffusion and enhance patient cooperation. Additionally, Malamed[21], noted that faster-acting anesthetics, such as lidocaine, yield higher success rates, especially when needle placement is anatomically precise. This underscores the importance of both the pharmacological properties of the anesthetics and the accuracy of the technique in enhancing the effectiveness of nerve blocks. Some studies show conflicting data on nerve block effectiveness. For instance, Aggarwal *et al*.[26], pointed out that rapid onset can still fail the success of anesthesia, whereas Nusstein *et al*.[35], noted that the delayed onset and occasional failure of the IANB can lead to patient frustration and diminished satisfaction. These discrepancies suggest that individual anatomical variations, operator skill, and patient psychological factors all influence the subjective experience of anesthesia. Additionally, Moore *et al*.[36], indicated that factors such as pKa (the pH at which a drug is 50% ionized), tissue pH, and nerve morphology can affect both onset time and success, highlighting the complexities involved.

Limitations of the study

One of the obstacles facing the study was the reluctance of a large number of patients or their fear when informed that the anesthesia technique used was new and different from traditional methods. The study relied on a specific anesthetic solution produced by Al-Awadi Company, a Korean product available in Yemen. During a certain period, this anesthetic was unavailable, causing disruptions in case recruitment and study continuity. The study focused only on the population of Sana'a, which may limit the generalizability of the results to the entire Yemeni population.

CONCLUSIONS

The study evaluated a single-insertion mandibular nerve block technique, revealing high success rates (95.3% for the inferior alveolar nerve, 97.9% for the lingual nerve, and 85.1% for the long buccal nerve) and high patient satisfaction. The study highlighted the importance of accurate needle placement and anatomical landmark identification for successful anesthesia. The anterior-thumb/posterior-finger technique simplifies injections, reduces needle penetrations, minimizes soft tissue trauma, and shortens procedure time. It adapts to anatomical variations, aligns with patient centered care trends, and reduces anxiety, pain, and complications, making it a popular choice in dental and oral surgery.

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AUTHOR'S CONTRIBUTIONS

Al-Sarori WEA: writing the original draft, methodology, investigation. **Abbas AKMA:** design and supervision of clinical work. **Al-Shamahy HA:** formal analysis, data processing. Final manuscript was checked and approved by all authors.

DATA AVAILABILITY

The empirical data used to support the study's results can be obtained upon request from the corresponding author.

CONFLICT OF INTEREST

Regarding this project, there are no conflicts of interest.

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