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# Anesthetic Efficacy of Vazirani-Akinosi Nerve Block, Inferior Alveolar Nerve Block, and their Combination in Mandibular Molars with Acute Irreversible Pulpitis: An In Vivo Study

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## ABSTRACT

**Background**: The purpose of the present study was to evaluate the effect of different anaesthetic technique on pulpal pain after giving Vazirani Akinosi Nerve Block, Inferior Alveolar Nerve Block, and Their Combination in Mandibular Molars with Acute Irreversible Pulpitis.

**Materials and Methods:** Total 30 patients were selected with symptomatic acute irreversible pulpitis in lower molars. The patients were assigned in 3 groups of 10 each & anaesthetic solution of 2% lidocaine with 1:80000 epinephrine was used for injection. Group 1 with 3.6 ml of anaesthetic solution using Vazirani-akinosi nerve block(VANB) technique. Group 2, with 3.6 ml of anaesthetic solution using Inferior Alveolar Nerve Block (IANB) technique and Group 3, with 1.8ml of VANB injection plus 1.8ml of IANB technique. The root canal access cavities were prepared under rubber-dam isolation. Patients were instructed to rate any pain experienced during the preparation of the access cavity or during placement of initial file using Visual Analogue scale (VAS). Statistical analysis was carried out by PostHoc test and Kruskal-Wallis test.

**Result:** There was no statistically significant difference in the success rate of anaesthesia between the VANB and IANB groups ($P > .05$). The anaesthesia success rate for the VANB + IANB group was significantly different from those of the VANB and IANB groups ($P < .05$).

**Conclusion:** A combination of VANB and IANB could improve the efficacy of anaesthesia in mandibular molars with Acute Irreversible Pulpitis, but it would still require supplemental anaesthesia. Further research may be needed to confirm the results of this study.

**Keywords:** Vazirani-akinosi nerve block, inferior alveolar nerve block, local anaesthesia, molars, Acute Irreversible pulpitis.

## INTRODUCTION

Adequate local anaesthesia is an essential initial step in the management of patients with painful pulpal condition. However, in mandibular molars to achieve profound anaesthesia is a great challenge, particularly in teeth with symptomatic irreversible pulpitis[1].

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The inferior alveolar nerve block (IANB) is the most widely used technique to achieve local anaesthesia for endodontic treatment of mandibular teeth. The target area for the deposition of local anaesthetic solution is the pterygomandibular space where the inferior alveolar nerve enters the mandibular foramen (Fig. 1B). Therefore, other branches of the mandibular nerve, including the lingual, buccal, and mylohyoid nerves, are not anesthetized because they are above the mandibular foramen. The anesthetic efficacy of this technique, compared with VANB, is controversial[2]. However, failure rates ranging from 30%–81% for IANB in mandibular posterior teeth with irreversible pulpitis have reported in clinical studies[3-5].

The most probable explanation for the decrease in the effectiveness of local anesthesia in teeth with inflamed pulps can be the activation and sensitization effect of inflammation on the nociceptors and stimulation of a greater number of nerve fibres, and inflammation evokes an increase in the anaesthetic-resistant subpopulation of sodium channels that exist on pain neurons. [7-10], resulting in a barrage of impulses from the inflamed pulp to the brain through more than a thousand unmyelinated sensory C fibers[11,12].

Advantages of the Akinosi technique over conventional techniques include the ease by which the technique may be mastered, the possibility of achieving anesthesia of the three major nerves innervating the mandible with a single injection, and the possibility that apprehensive patients will find the technique less threatening because the injection is performed with the patient's mouth in a closed position[2].

Therefore, it is hypothesized that deposition of local anesthetic solution at 2 different sites along the nerve trunk results in the exposure of a greater length of the nerve to the local anesthetic solution, thus increasing the number of voltage-gated sodium channels exposed to the local anesthetic solution, resulting in improved efficacy of local anesthesia. The combination of VANB and IANB may result in the exposure of a greater length of the inferior alveolar nerve to the local anesthetic solution and subsequently increases the efficacy of anesthesia. However, there are no studies about the effectiveness of a combination of VANB and IANB in patients with Acute irreversible pulpitis.

Thus, the purpose of this study was to compare the anesthetic efficacy of VANB, IANB, and VANB in association with IANB for mandibular molars with acute irreversible pulpitis. The null hypothesis tested was that no difference would be found between the success rates of the 2 nerve block at a different site of nerve and their combination.

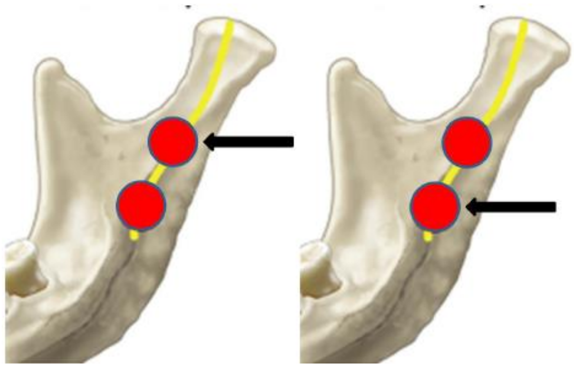


Fig. 1A & 1B- A schematic illustration of the target area in both groups.

## MATERIALS AND METHODS

Total of thirty adult patients participated in the study. All of the subjects were emergency patients of the department of conservative and endodontics of karnavati school of dentistry, uvarsad, gandhinagar, Gujarat, india.criteria for inclusion in the study consists of age between 25 to 40 years, mandibular molars with acute irreversible pulpitis and teeth with intact/closed apex and patients with the ability to understand the pain scales. Criteria for exclusion from the study consisted of teeth with resorption of the root, teeth with dental anomalies(e.g. germination, fusion, concrescence), calcified canals, pregnancy, the use of any medications such as analgesics , antianxiety, an antidepressant that might influence pain assessment, subjects with any significant medical problems (e.g. diabetes, cardiac patients etc.) the presence of pathosis in the area of injection and inability to give prior written informed consent were excluded. The ethics committee of the university approved the protocol of the study Written informed consent was also approved by the ethics committee of Karnavati University (Ethical approval No. KSDEC/19-20/Apr/013) and was obtained from each patient before treatment.

Each patient assessed his or her initial pain on a visual analogue scale (VAS)[6]. The pain VAS is a continuous scale comprised of a horizontal (HVAS) line, usually 10 centimetres (100 mm) in length, anchored by 2 verbal descriptors, one for each symptom extreme. The pain VAS is self-completed by the patient. The patient was asked to place a line perpendicular to the VAS line at the point that represents their pain intensity. A higher score indicates greater pain intensity. postoperative pain intensity was described as none, mild, moderate, or severe, the following cut points on the pain VAS have been recommended: no pain (0–4 mm), mild pain (5–44mm), moderate pain (45–74 mm), and severe pain (75– 100 mm).

The patients were randomly assigned to 3 groups of 10 each : VANB, IANB, and VANB + IANB. Before each injection procedure, the mucosa was dried, and a topical anesthetic agent was applied to the injection site using the topical anesthetic spray for 1 minute. Using aseptic technique, a total of 3.6 ml of 2% lidocaine with 1: 80,000 epinephrine using anaesthetic cartridge was administered. The needle used for all injection was 27 Gauge, 31 mm long needle(Septodont).

In the VANB group, each patient received two 1.8-mL cartridges of 2% lidocaine with 1:80,000 epinephrine was administered in the manner described by akinosi and Vasirani. The patient was placed in a semisupine position with relaxed muscles of mastication and closed mouth. A thumb was placed under the same sided upper lip to facilitate visualization of the site of injection. The cheek was retracted laterally using a thumb, allowing the edge of the thumb to rest on the anterior border of the ramus. The injection site was the soft tissue overlying the medial surface of the ramus adjacent to the maxillary tuberosity in the area of the maxillary second molar at a height established by the mucogingival junction. The site for needle insertion was on a horizontal line parallel to the occlusal plane and the needle was bent medially at approximately 3 mm from its hub to facilitate the needle close to the pterygomandibular space. The Vazirani- Akinosi needle insertion depths were 30-35 mm. Anesthetic solution was deposited for 2 minutes after aspirating. The second injection was performed immediately after the first one with the same technique & procedure.

In the IANB group, each patient received two 1.8-mL cartridges of 2% lidocaine with 1:80,000 epinephrine using the conventional IANB technique. The patient was placed in the semisupine position with an open mouth. The injection site was the soft tissue over the medial surface of the ramus, lateral to the pterygomandibular raphe. The coronoid notch on the anterior border of the ramus was touched by the thumb, and the posterior border of the ramus was palpated by the fingers of the noninjecting hand. The line bisecting the thumb determined the height of the injection site. The syringe was kept parallel to the occlusal plane and directed between the two premolars on the opposite side. The needle was placed through the mucosa of the injection site and then slowly advanced until the bone was hit. When the needle touches the bone, the needle was withdrawn slightly and aspirated. If the aspiration was negative, the anaesthetic solution was injected slowly over a period of 1 minute. Second IANB was given immediately after the first one in the same manner.

In the VANB + IANB group , each patient has injected 1.8-mL cartridge of 2% lidocaine with 1:80,000 epinephrine using IANB technique and one 1.8-mL cartridge of 2% lidocaine with 1:80,000 epinephrine using the conventional VANB technique as described earlier.

Numbness of the lip was considered as a subjective criterion for the success of nerve block. The patient was asked for numbness of lip after 15 minutes of injection. Each tooth was isolated using rubber dam and access cavity preparation was initiated. If pain occurs during the access cavity preparation or placement of initial file upto working length than patient were instructed to rate their level of pain om Visual analog scale. The success of anesthesia was defined as the tooth without pain or with mild pain. Patient who had moderate to severe pain, supplymentory injection(Intrapulpal) was administered and the endodontic treatment proceeded.

**Statistical Analysis**

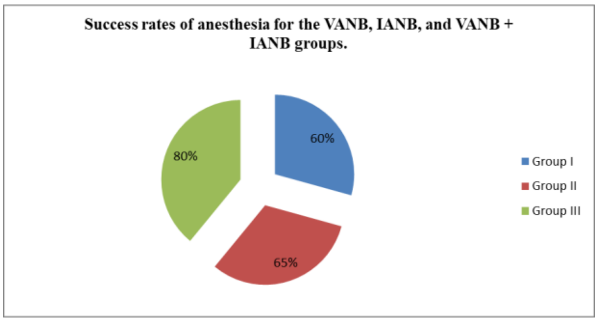
Data were analyzed with SPSS, Version 22. Comparisons among the 3 groups for the success of anesthesia and the initial pain was analyzed using the Kruskal-Wallis test and Post Hoc test. A statistically significant difference was determined at 95% confidence level. All statistical procedures were carried out with SPSS version 20 (SPSS Inc., Chicago, IL, USA), and $P \leq 0.05$ was considered significant.

## RESULTS

The success rates of anesthesia were 60%, 65%, and 80% for the VANB, IANB, and VANB + IANB groups, respectively. There was no statistically significant difference in the success rate of anaesthesia between Group I and Group II. (P > .05).The success rate of anaesthesia in group 3 shows a statistically significant difference between group 1 and 2. (P < .05).

Table 1: baseline variable for 3 groups.

| | N | Mean | Std. Deviation | 95% Confidence Interval for Mean | | Minimum | Maximum | P Value | Post hoc test |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound | | | | |
| I | 10 | 39.10 | 13.017 | 29.79 | 48.41 | 14 | 55<br>84<br>41<br>84 | | |
| II | 10 | 33.70 | 21.103 | 18.60 | 48.80 | 9 | | 0.012 | 3>2>1 |
| III | 10 | 19.30 | 11.908 | 10.78 | 27.82 | 4 | | | |
| Total | 30 | 30.70 | 17.523 | 24.16 | 37.24 | 4 | | | |




Graph 1: Success rates of anesthesia for the VANB, IANB, and VANB + IANB groups.

Group I Vazirani- akinosi nerve block(VANB)
Group II Inferior alveolar nerve block(IANB)
Group III VANB+ IANB

## DISCUSSION

The results of this study indicated that a combination of VANB and IANB techniques increased the success rate of anesthesia for symptomatic mandibular molars compared with the success rate of each technique alone. All of the teeth had moderate or severe initial pain, a lingering response to cold testing, and a vital coronal pulp tissue on access preparation, which indicated the diagnosis of symptomatic irreversible pulpitis for the teeth.

In the present study, the success rate of anaesthesia was evaluated by measuring the severity of pain during access cavity preparation or placement of the original file using the VAS; other tests with an electric pulp tester were not performed. This was based on the results of Nusstein et al[3], who used an electric pulp tester for measuring the severity of pain for teeth with irreversible pulpitis. They showed that 42% of patients who showed a negative response to electric pulp testing after administering anaesthesia still had pain during treatment and required another injection.

Some clinical studies have reported that in IANB success rate increases as the volume of anesthetic solution increases[17-19], whereas others have reported no beneficial effects [20-25]. However, to avoid the confounding factor of anesthetic solution volume, all of the patients received the same volume of the anesthetic solution, consisting of two 1.8-mL cartridges of 2% lidocaine with 1:80,000 epinephrine.

The success rate of VANB has been reported to range from 13%– 50%inmandibular posterior teeth with symptomatic irreversible pulpitis[13]. In the present study, we evaluated the success rate of VANB in 10 patients using 3.6 mL 2% lidocaine with 1:80,000 epinephrine in symptomatic mandibular molars and found it to be 60%. Moreover, the success rate of IANB has been reported to range from 19%–70% in mandibular posterior teeth with symptomatic irreversible pulpitis [3-5], and it was 65% under the conditions of this study. Differences in the results might be attributed to the size of the sample, experience of the clinician and the volume & type of local anesthetic solution.

In this study, the success rates of VANB and IANB techniques exhibited no significant difference. Our results are consistent with those of studies that indicated no significant differences in the anesthetic efficacy of VANB and IANB techniques [26,27]. However, our results do not coincide with those of other studies indicating that the anesthetic efficacy of the VANB technique is superior to that of the IANB technique [16]. Differences in the results might be attributed to the volume & type of local anesthetic solution, type of treatment (root canal treatment or tooth extraction), condition of the pulp (normal or inflamed), and clinician experience.

In the present study, none of the VANB and IANB techniques given alone provided profound anesthesia in patients with irreversible pulpitis. These results are consistent with those of other studies concluding that the GGNB, IANB, and Vazirani- Akinosi mandibular block techniques given alone could not provide acceptable success rates in patients with irreversible pulpitis, and all of the required supplemental anesthesia [14,15]

The pterygomandibular space is a part of the infratemporal fossa, which contains loose connective tissue suspended in various fascial planes. The volume of this space has been estimated to be approximate 2mL [26]. The site of the injection for both VANB and IANB is located in this space, and anesthetic solution fills the space. However, the solution might escape from the pterygomandibular space through the hiatus where the internal maxillary artery enters this space between the sphenomandibular ligament and the condyloid process [29]. We found that injecting 3.6 mL anesthetic solution at 2 different target area in the pterygomandibular space was more successful than injecting at only 1 site. Berns and Sadove [29] reported that anesthetic solution travelled in the least resisting area of the pterigomandibular space. which is not determined by the placement of the needle, it determined by fascial planes and structures encountered. They claimed that a solution might take an uncontrollable erratic course away from the path of the inferior alveolar nerve it does not follow a predictable path. Therefore, deposition of anesthetic solution at two different sites of the pterygomandibular space is more likely to cause the anesthetic solution to follow inferior alveolar nerve. Another explanation is that, the length of nerve exposed to anesthetic solution might be greater when we inject anesthetic solution at two different sites whereas when the same volume of anesthetic solution is deposited at 1 site length of nerve exposed would be less.

Kohler et al. [30] reported a higher success rate for VANB when the anesthetic volume was increased from 1.8–3.6 mL (18%–82%). However, we found that only a 1.8-mL VANB injection in combination with a 1.8-mL IANB injection increased the success rate of anesthesia. This may be because of the fact that deposition of anesthetic solution at 2 different sites has a better chance to expose the more length of inferior alveolar nerve.

The results of this study support the hypothesis that deposition of local anesthetic solution at two different sites of the nerve trunk blocks transmission of pain impulses better than deposition of local anesthetic solution at 1 site. Therefore, it would be helpful for clinicians to use a combination of two different local anesthesia techniques when conventional singal IANB or VANB fails to get complete anesthesia. However, even though the success rate of the combination technique was 80%, supplemental injections may be still needed.

## CONCLUSION

In conclusion, a combination of VANB and IANB could improve the efficacy of anesthesia in mandibular molars with symptomatic irreversible pulpitis, but it would still require supplemental anesthesia. Further research may be needed to confirm the results of this study.

## CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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