

# Comparison of pain intensity during inferior alveolar nerve block\*

## Comparação da intensidade de dor em bloqueios do nervo alveolar inferior

Felippe Almeida Costa<sup>1</sup>, Liane Maciel de Almeida Souza<sup>1</sup>, Francisco Groppo<sup>2</sup>

\*Received from the Dentistry Department, Federal University of Sergipe (UFS). Aracaju, SE.

### ABSTRACT

**BACKGROUND AND OBJECTIVES:** This study was developed to investigate anesthesia-related discomfort during dental procedures. This procedure often generates major anxiety, which increases pain. Fear of injection has been reported as a determining factor for not looking for dental treatment. This study aimed at comparing the level of pain during perforation, penetration and anesthetic solution deposition during inferior alveolar block by the Direct and Vazirani-Akinosi techniques.

**METHODS:** Randomized, crossover, double-blind clinical trial involving 30 patients seen by the Dentistry Department of the Federal University of Sergipe (DOD-UFS) who needed dental treatment and were submitted to bilateral inferior alveolar nerve block. Patients were asked about pain intensity during the following stages: perforation, penetration and local anesthetic deposition. Pain intensity was measured by the 10-cm visual analog scale (VAS), without predefined marks. Data were tabulated and submitted to statistical Friedman and Wilcoxon tests with statistical significance of 5%.

**RESULTS:** Data have not shown statistically significant differences (Wilcoxon,  $p > 0.05$ ) between VAS values of both anesthetic techniques in all operatory moments. For both techniques, penetration-induced pain was higher (Friedman,  $p < 0.05$ ) as compared to pain induced by the two other operatory moments, being the absolute majority for both techniques classified as mild pain.

**CONCLUSION:** Vazirani-Akinosi and Direct techniques had levels of pain sensitivity characterized as mild during the three anesthetic stages, being the second stage, penetration, the most painful as compared to remaining stages.

**Keywords:** Anesthesia, Block, Pain, Technique.

### RESUMO

**JUSTIFICATIVA E OBJETIVOS:** Este estudo foi idealizado para investigar o desconforto dos procedimentos odontológicos associados à anestesia. Este procedimento frequentemente gera uma grande ansiedade, o que aumenta a dor. O medo da injeção tem sido relatado como sendo um fator determinante à não procura do tratamento dental. O presente estudo teve como objetivo comparar o nível de dor na perfuração, penetração e deposição da solução anestésica no bloqueio do nervo alveolar inferior nas Técnicas Direta e Vazirani-Akinosi.

**MÉTODOS:** Estudo clínico randomizado, cruzado e duplamente encoberto envolvendo 30 pacientes atendidos no Departamento de Odontologia da Universidade Federal de Sergipe (DOD-UFS) que necessitaram de tratamento odontológico e que se submeteram a bloqueio bilateral do nervo alveolar inferior. Estes foram interrogados a respeito da intensidade de dor durante as seguintes etapas: perfuração, penetração e deposição do anestésico local. A mensuração da intensidade dolorosa foi realizada através da escala analógica visual (EAV) com comprimento de 10 cm, sem a existência de marcações pré-definidas. Os dados obtidos foram tabulados e submetidos aos testes estatísticos de Friedman e Wilcoxon com índice de significância estatística de 5%.

**RESULTADOS:** A análise dos dados revelou que não houve diferenças estatisticamente significantes (Wilcoxon,  $p > 0,05$ ) entre os valores de EAV das duas técnicas anestésicas em nenhum dos momentos operatórios. Para ambas as técnicas, a dor induzida pela penetração foi maior (Friedman,  $p < 0,05$ ) do que a dor induzida nos dois outros momentos operatórios, sendo a maioria absoluta, nas duas técnicas, classificadas como dor leve.

**CONCLUSÃO:** As técnicas de Vazirani-Akinosi e Direta apresentaram níveis de sensibilidade algica caracterizada como leve nos três estágios da anestesia, sendo o segundo estágio, a penetração, o mais doloroso se comparado com os demais.

**Descritores:** Anestesia, Bloqueio, Dor, Técnica.

### INTRODUCTION

Among the actions of a dentist, drug administration to prevent pain during dental treatment is extremely important. However, the simple action of administering local anesthetics often brings major anxiety and is associated with pain. Local anesthetic injection may not only generate pain and fear, but also be a triggering factor related to medical emergencies in dental offices, with va-

1. Federal University of Sergipe. Aracaju, SE, Brazil.

2. State University of Campinas, School of Dentistry. Piracicaba, SP, Brazil.

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Correspondence to:

Felippe Almeida Costa

Rua Cláudio Batista s/n. Hospital Universitário – Sanatório  
49060-100 Aracaju, SE.

E-mail: felippeodonto@gmail.com

sodepressor syncope and hyperventilation as major psychogenic reactions<sup>1</sup>.

Anxiety is reported as a barrier for dental treatment, being concern with dental treatment one of the primary reasons, in addition to fear of pain and also several factors such as the area to be anesthetized<sup>2,3</sup>.

Local anesthetic injection very often is the only painful sensation perceived by patients, and fear associated to injection has been reported as a determining factor for not looking for dental treatment<sup>4</sup>. So, the association of anesthetic agents and techniques has been used to decrease nociceptive impulses in surgical stages, thus decreasing morbidity<sup>5</sup>.

It is known that pain is the perception of an aversive and unpleasant sensation, primary manifestation of distress, informing the nervous system about some external or internal conditions incompatible with people's morphological or functional integrity<sup>6</sup>. In case of inferior alveolar nerve block (IANB), which is induced by the most popular, and possibly the most important dentistry technique<sup>7</sup>, it is paramount to evaluate pain during anesthetic induction.

IANB has three stages: initial needle insertion, needle penetration to the destination site and anesthetic solution deposition. These procedures have been associated with pain and discomfort. A technique was developed in the 1970s for patients unable to open their mouths. For such, patients' mouth should be partially closed without occlusal contact. This provides cheek muscles relaxation in addition to giving better visualization of the area and decreasing minor needle insertion trauma<sup>8</sup>. However, there was a very similar technique described by Vazirani in 1960, and so the name Vazirani-Akinosi mandibular block was adopted in recognition to both professionals<sup>1</sup>.

Studies regarding pain during anesthesia are described by the scientific community<sup>9-11</sup>. For the anesthetic solution deposition in the destination site, authors reported that the incidence of moderate to severe pain varies from 20% to 40%<sup>9</sup>. A different study<sup>9</sup> has evaluated the Direct and Vazirani-Akinosi techniques and, as result, there has been no significant difference between pain during needle insertion and during anesthetic solution deposition. A study<sup>11</sup> to compare IANB, Direct technique and Vazirani-Akinosi technique has shown that among patients anesthetized with this technique, 19% had no pain, 65% mild discomfort and 16% moderate pain.

The establishment of pain levels of both anesthetic techniques is highly important to decrease pain, making procedures less traumatic, as shown by a research<sup>12</sup> with students and employees of a university. When asked about dental prevention and fear of dental injections, more than 25% of respondents have reported fear of injections. Almost one out of every 20 respondents has reported avoiding, cancelling or not attending the dental visit for fear of dental anesthesia. Factors such as pain at injection, as well as possible injuries caused by the act are the two most common causes of fear of anesthesia.

Another important study<sup>13</sup> has reported that fear of anesthesia is related to oral health worsening due to lack of treatment, to decreased number of dental assistances and to increased stress of the dentist during treatment.

In light of the above, this study aimed at measuring pain intensity during IANB with Direct and Vazirani-Akinosi techniques.

## METHODS

This was a randomized, crossover and double blind clinical trial carried out by 3 investigators, being 2 interrogators and 1 executor of the anesthetic techniques. Each investigator had a restricted and unique function not being allowed the exchange of investigators throughout the experiment. Sample was made up of 30 adult patients of both genders, aged between 18 and 45 years, with indication of lower third molar extraction and without associated pain.

Patients were included in the study according to the order of arrival to the dental department of the Dentistry Course of the Federal University of Sergipe.

After agreeing to participate in the research by signing the Free and Informed Consent Term, patients were submitted to history and clinical evaluation to identify conditions electing or preventing them of participating in the study. Exclusion criteria were alcoholic patients and those using drugs, antihistamines, antidepressants, cimetidine or any other drug and physical status that could interfere with patients' sensitivity to pain. Patients with systemic disorders, such as diabetics, hypertensive, cardiac, allergic to any component of the formula or to sulfa and pregnant women, odontophobics and children were also excluded.

After meeting inclusion criteria, patients were referred to the first examiner who has raffled order and side of anesthetic procedures. After this procedure, patients were referred to the surgeon, who induced IANB.

With the patient comfortably accommodated on the dental chair, in supine position, the experimental procedure was started. Patient was asked to mouthwash with 5 mL of 0.12% chlorhexidine for approximately one minute for oral antiseptis. Before the anesthetic technique itself, topic anesthetic was applied to the region corresponding to needle puncture, respecting the protocol described in the literature<sup>1</sup>. After topic anesthesia, one of the anesthetic techniques was adopted according to the raffled technique.

In the Direct technique, the long 27G needle penetrated the mucosa between the internal oblique branch and the pterigomandibular raphe and was advanced until contact with the bone. Syringe was supported by lower premolars of the opposite side. No anesthetic solution was deposited until the needle reached the target area. Aspiration was performed before the deposition of 1.8 mL of solution.

In the Vazirani-Akinosi technique, long 27G needle was introduced in the mandibular branch adjacent to the maxillary tuberosity at the height of the mucogingival junction. Then, it penetrated 25 mm in the tissue to deposit 1.8 mL of anesthetic solution.

All patients were anesthetized in both tested techniques with 2% lidocaine hydrochloride, with 1:100.000 epinephrine, preceded by negative aspiration.

The interval between anesthetic procedures was one week. So,

those starting the procedure with the Direct technique have received the Vazirani-Akinosi technique in the second moment, and vice-versa.

After needle removal, volunteers were asked by the third examiner about discomfort associated to the procedure in the following stages: perforation, penetration and deposition, by means of a 10-cm pain visual analog scale (VAS) with parameters such as 0 cm (no pain) and 10 cm (unbearable pain), without preexisting marks in the scale.

Participants received VAS and were oriented to mark pain intensity in one point of each of the three straight lines, related to the corresponding anesthesia stage, being that scores could vary from 0 to 10 and were obtained by measuring, in millimeters, the distance between the extremity anchored by the words *no pain* and the point marked by the participant. Such scale has the advantage of being easy to apply<sup>14</sup>. In this study, preexisting marks, traditionally represented in VAS, were removed to avoid bias during patients' demarcations, thus preventing data distortions.

After anesthesia, the dental treatment was performed according to patients' treatment plan recorded in their clinical charts. After collection, data were tabulated and submitted to statistical Wilcoxon and Friedman tests with statistical significance of 5%. This study was approved by the Ethics and Research Committee, Federal University of Sergipe (UFS), protocol CAAE 03259912.6.0000.5546-2012.

## RESULTS

Participated in this study 14 females with mean age of  $26.7 \pm 9.3$  years and 16 males with mean age of  $23.4 \pm 2.6$  years. There has been no statistically significant differences (Wilcoxon,  $p = 0.2635$ ) between genders with regard to age. Figure 1 and table 1 show pain measured by VAS, as a function of measurement time (perforation, penetration or solution deposition).

Data analysis has shown no statistically significant differences (Wilcoxon,  $p > 0.05$ ) between VAS values for both anesthetic techniques in all surgical moments. For both techniques, pain induced by penetration was higher (Friedman,  $p < 0.05$ ) as compared to pain induced by the other two surgical moments. Absolu-

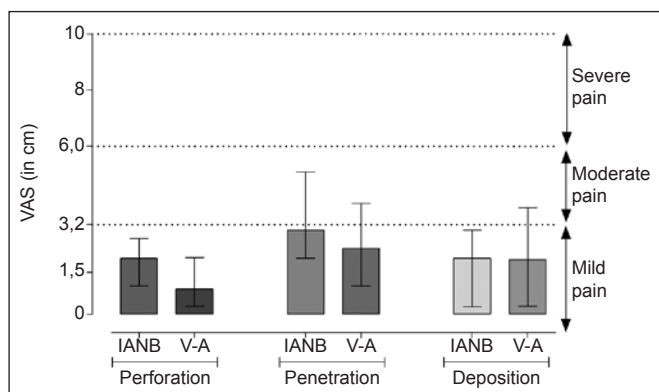


Figure 1 – Measurement (median-interquartile deviation).

IANB = inferior alveolar nerve block. V-A = Vazirani-Akinosi.

Table 1 – Pain intensity measured by visual analog scale, as a function of measurement moment.

	Perforation		Penetration		Deposition	
	IANB	Vazirani-Akinosi	IANB	Vazirani-Akinosi	IANB	Vazirani-Akinosi
Median	2	0.9	3	2.35	2	1.95
Interquartile deviation	1.6	1.7	2.9	2.9	2.5	3.4
Arithmetic mean	2.4	1.5	3.7	2.8	2.2	2.4
Standard deviation	2.2	1.8	2.5	2.3	2.1	2.2

IANB = inferior alveolar nerve block.

lute majority of pain reported in numbers in all situations may be considered mild, based on pain classification<sup>15</sup>.

Table 2 shows absolute distribution of volunteers according to their pain classification.

Table 2 – Absolute distribution of volunteers.

		Pain intensity		
		Mild	Moderate	Severe
Perforation	IANB	24	3	3
	Vazirani-Akinosi	28	0	2
Penetration	IANB	16	8	6
	Vazirani-Akinosi	19	8	3
Deposition	IANB	25	2	3
	Vazirani-Akinosi	20	6	4

IANB = inferior alveolar nerve block.

Considering the total of volunteers with severe/moderate pain and those with mild pain, it could be observed that there have been no statistically significant differences (Fisher Exact test,  $p > 0.05$ ) in the prevalence of mild or severe/moderate pain in all moments.

## DISCUSSION

This study aimed at comparing the level of pain sensitivity in three IANB moments, namely perforation, penetration and anesthetic deposition, using two techniques. As described in the literature<sup>8</sup>, there has been significant variation between genders in the three IANB stages by the Direct technique, which is in disagreement with this study which has not evidenced statistically significant data during blockade stages.

With regard to puncture, which involves the moment when the needle perforates the mucosa, study results<sup>10</sup> indicate that pain induced in this stage was higher with the Direct technique as compared to Vazirani-Akinosi technique, as opposed to our study which has shown no statistically significant difference between both techniques. It is known that in the closed mouth technique, at perforation, there is further tissue relaxation in this zone as compared to the other technique, thus inducing less pain in the first anesthetic stage<sup>7</sup>.

Another relevant data observed by this research was the presence of pain in all patients during perforation; in a different study<sup>10</sup>, 19 patients have reported no pain during perforation by the Vazirani-Akinosi technique. Previous studies have evaluated other factors which might be involved with pain during anesthesia, such as tissue distensibility, injection speed, patient's psychological characteristics, temperature of injected solution<sup>3</sup>, needle gage<sup>2</sup> and the use of local anesthetics<sup>16,17</sup>. Aiming at minimizing such discomfort, topic anesthesia is recommended before needle penetration<sup>1</sup>.

In this study, there have been no statistically significant differences in pain during perforation as compared to other stages in both techniques. However, this has been the most painful stage as compared to penetration and anesthetic deposition. Such data are in disagreement with our results where penetration was the most painful moment.

However, a different study<sup>8</sup> has shown that penetration was the most painful IANB stage, in line with our findings.

A paper reported in the literature<sup>9</sup> comparing anesthetic effectiveness of Direct, Vazirani-Akonosi and Gow-Gates techniques at the level of pulpal anesthesia, has shown no significant difference in mild, moderate and severe pain scores described by forty patients for pain induced by perforation and anesthetic solution deposition, thus confirming the findings of our study.

In this same study, the incidence of severe pain during IANB tissue puncture by the Direct technique was 0% to 2%; however, another author<sup>8</sup> has found incidence of 57% to 89% of moderate to severe pain in 102 cases of IANB by the Direct technique. Our study has identified incidence varying from 7% to 47% of cases.

IANB may be considered as mild pain, with a peak of pain lasting few seconds, however previous blockade experiences, level of anxiety and fear of pain and injection are factors affecting pain intensity reported by patients. Higher levels of anxiety, as well as previous painful experiences end up exacerbating the actual pain felt by patients, as reported by studies where patients with less anxiety have reported lower pain levels and duration as compared to more anxious patients<sup>18,19</sup>. Similar studies, with previous analysis of anxiety levels and a questionnaire about the history of previous unpleasant anesthetic experiences should be carried out aiming at decreasing possible variables which may affect data found in the research.

## CONCLUSION

Direct and Vazirani-Akinosi techniques have not shown significant differences in pain reported by patients in the three stages (perforation, penetration and anesthetic deposition) during IANB, being the absolute majority mild pain; however, more extensive studies should be carried out to minimize the negative effects, such as pain felt by patients during the procedure.

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