

Anesthetic Efficacy of Inferior Alveolar Nerve Block: Conventional versus Akinosi Technique

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Abstract

Objective: Anesthetic techniques like the Akinosi technique were introduced to surmount the problems of the conventional inferior alveolar nerve block (IANB) technique. This study aimed to compare the local anesthetic efficacy of IANB via the conventional and Akinosi techniques in patients presenting to the Maxillofacial Surgery Department of School of Dentistry, Shahid Beheshti University.

Methods: This clinical trial was conducted on 80 candidates for bilateral extraction of mandibular molars. For each patient, local anesthesia was induced by IANB injection, which was done by the conventional technique in one side and by the Akinosi technique in the other side of the mouth. The allocation of technique to side was randomized. Time to anesthesia for the long buccal, lingual and inferior alveolar nerves (IAN), degree of pain during injection and tooth extraction and incidence of positive aspiration in the two techniques were evaluated and analyzed using Wilcoxon Signed Rank and Chi square tests.

Results: The mean time to anesthesia for the IAN was 2.82 minutes in the conventional and 3.05 minutes for the Akinosi technique. These values were 1.47 and 1.55 minutes, respectively for the lingual nerve and 1.43 and 1.56 minutes, respectively for the long buccal nerve. Four patients in the Akinosi technique and 12 patients in the conventional technique had positive aspiration. During anesthetic injection with the Akinosi technique, 72.5% were pain free, 18.8% experienced mild, 5% experienced moderate and 3.8% experienced severe pain. These values in the conventional technique were 51.3%, 27.5%, 11.3% and 10%, respectively.

Conclusion: Considering the lack of a significant difference between the success rate of conventional and Akinosi IANB techniques, Akinosi technique seems to be a suitable alternative to the conventional technique since it is less painful and has lower risk of positive aspiration.

Key words: Akinosi technique, Efficacy, Inferior alveolar nerve, Local anesthesia.

Please cite this article as:

Mohajerani H, Pakravan AH, Bamdadian T, Bidari P. Anesthetic Efficacy of Inferior Alveolar Nerve Block: Conventional versus Akinosi Technique. *J Dent Sch* 2014; 32(4): 210-215.

Received: 02.01.2014

Final Revision: 13.07.2014

Accepted: 15.07.2014

Introduction:

Inferior alveolar nerve block is a commonly used method to control pain in the mandible. It is a routine injection in dental practice; however, it sometimes fails to induce an acceptable level of anesthesia (1). Several techniques for IANB have been introduced to increase its success rate (2). By using alternative techniques for IANB introduced by Akinosi in 1977 (3) and Gow

Gates in 1973 (4), anesthesia of the long buccal, lingual and IAN branches is achieved. These methods are known as mandibular conduction anesthesia (5). Akinosi introduced his technique in 1977 (3). Since a similar technique had been earlier described by Vazirani in 1960 (6), this technique was renamed as Vazirani-Akinosi technique (7). It is a closed mouth technique and the needle is inserted into the mucogingival junction at the maxillary second molar. This

technique has the advantages of easy injection, the ability to anesthetize three major nerve branches with one single injection, and safety since patient's mouth is closed during the injection.

Sisk, *et al.* in 1986 (8) and Todorović, *et al.* in 1990 (9) reported that the anesthetic efficacy of Akinosi technique was similar to that of conventional IANB technique. However, Donkor, *et al.* (1990) (10) Yucel and Hutchison in 1995 (11) and Martinez Gonzalez, *et al.* in 2003 (12) indicated the superiority of the conventional IANB over the Akinosi technique. Considering the small number of controlled trials assessing the parameters related to local anesthesia, comparison of the efficacy of different techniques used for IANB seems logical. This study aimed to assess the efficacy of conventional and Akinosi techniques for IANB in patients presenting to the Maxillofacial Surgery Department of School of Dentistry, Shahid Beheshti University.

Methods:

This clinical trial was approved by the Ethics Committee of Shahid Beheshti University and registered in www.irct.ir (No. 15629N1). Sample size was calculated to be 80 in each group based on the results of previous studies (10-12) and considering $\alpha=0.05$, power of 80%, standard deviation of the difference in pain intensity in the two groups to be 38 and also taking into account the possible drop outs. Eighty candidates for bilateral extraction of mandibular molars participated in this study. All patients signed an informed consent form explaining the test and associated risks. All subjects were healthy and were not taking any pain medications or drugs affecting pain perception (such as non-steroidal anti-inflammatory drugs, opioids and antidepressants). All patients had two erupted or impacted molar teeth that needed to be extracted

at both sides of the mandible. None of the teeth were infected. After sample selection, subjects were assigned to one of the two groups of conventional and Akinosi IANB injection by tossing a coin. Subjects received an injection with the assigned technique and received IANB injection for tooth extraction in the other side in the next treatment session. In the first session, patients randomly received IANB injection via the conventional or Akinosi technique for extraction of a molar tooth in one side of the oral cavity. In the next session (one week later), a molar tooth in the other side of the mandible was anesthetized for extraction using the other technique for IANB. The local anesthetic used in the Akinosi method included 1.8 mL of 2% lidocaine with 1:80,000 epinephrines. Patients were positioned supine and asked to close into maximum intercuspation. The site of injection was at the medial surface of the ramus at the height of the mucogingival junction of the maxillary second molar. At this site, the needle was inserted into the pterygomandibular space and after aspiration; the anesthetic agent was slowly injected within 30 seconds. In the conventional technique, patients were asked to open their mouth. The injection site was the soft tissue covering the medial surface of ramus at the lateral side of the pterygomandibular raphe and the external oblique ridge. The syringe was positioned between the premolars at the opposite side of the mouth and 1.5 mL of the anesthetic solution was injected slowly with the non-injecting hand retracting the mucosa.

The following clinical parameters were evaluated:

- Success or failure of anesthesia 15 minutes after the injection
- Pain during injection: No pain, mild pain, moderate pain or severe pain)
- Pain during tooth extraction: Mild pain, moderate pain, severe pain
- Aspiration, hematoma, trismus (evaluation for 5 days post-injection)

Patients were asked to report the time of initiation of anesthesia in the long buccal, lingual and IAN braches. If no change occurred in the sensation of lower lip 15 minutes after the injection, the injection was repeated. Initiation of anesthesia in the lingual nerve was checked by asking the patient about any change in the sensation of the tongue and also by probing the lingual gingiva. Data were analyzed by Chi square test and Wilcoxon Signed Rank test. $p < 0.05$ was considered statistically significant.

Results:

A total of 45 males and 35 females with a mean age of 34.79 years (range 16-65 years) participated in this study. The frequency of pain and discomfort during the injection in the two techniques is shown in Table 1 and a significant difference was detected in this respect between the two groups ($p = 0.04$). As seen in Table 1, the majority of patients reported no pain during injection.

Table 1- Pain during injection in the conventional and Akinosi techniques

Injection technique	No pain	Mild pain	Moderate pain	Severe pain
Conventional	72.5%	18.8%	5%	3.8%
Akinosi	51.3%	27.5%	11.3%	10%

Depth of anesthesia was determined based on the level of pain and discomfort experienced by the patient during extraction and no significant

difference was noted in this respect between the two techniques ($p = 0.36$). Table 2 shows these differences.

Table 2- Depth of anesthesia achieved in the two techniques of IANB

Technique	Mild pain	Moderate pain	Total
Conventional	63 (78.8%)	17 (21.3%)	80 (100%)
Akinosi	58 (72.5%)	22 (27.5%)	80 (100%)
Total	121 (75.6%)	39 (24.4%)	80 (100%)

During patient follow up for 5 days after injection, blood aspiration was noted in 5% of patients (2 out of 80) in the Akinosi and 15% of patients (12 out of 80) in the conventional technique (Table 3). This difference between the two groups was statistically significant ($p = 0.04$). Hematoma was not reported in any patient in the

Akinosi technique but 3 cases (3.8%) of hematoma were seen in the conventional technique. Two cases (2.5%) of trismus occurred in the conventional group but no trismus was seen in the Akinosi group. These differences were not statistically significant ($p = 0.49$) (Table 3).

Table 3- The prevalence of complications in the two techniques for mandibular anesthesia

Complication	Technique	Yes	No	Total
Aspiration	Conventional	12 (15%)	68 (85%)	80 (100%)
	Akinosi	4 (5%)	76 (95%)	80 (100%)
	Total	16 (10%)	144 (90%)	160 (100%)
Hematoma	Conventional	3 (3.8%)	77 (96.3%)	80 (100%)
	Akinosi	0 (0%)	80 (100%)	80 (100%)
	Total	3 (1.9%)	157 (98.1%)	160 (100%)
Trismus	Conventional	2 (2.5%)	78 (97.5%)	80 (100%)
	Akinosi	0 (0%)	80 (100%)	80 (100%)
	Total	2 (1.3%)	158 (98.8%)	160 (100%)

The mean time to the onset of anesthesia of the IAN was 2.82 minutes in the conventional and 3.05 minutes in the Akinosi technique. This difference was statistically significant ($p=0.025$). The mean time to the onset of anesthesia in the lingual nerve was 1.47 and 1.55 minutes in the conventional and Akinosi techniques,

respectively. These values were 1.43 and 1.56 minutes, respectively for the long buccal nerve. These differences were not statistically significant ($p=0.28$ and $p=0.13$). Seven cases (8.8%) in the Akinosi and 10 cases (12.5%) in the conventional technique required reinjection. These differences are demonstrated in Table 4.

Table 4- Frequency of the need for reinjection in the two techniques for mandibular anesthesia

Technique	Need for reinjection	No need for reinjection
Conventional	12.5%	87.5%
Akinosi	8.8%	91.3%

Discussion:

Failure in achieving an acceptable level of anesthesia in mandibular teeth occurs in some cases due to several factors (13). The prevalence of completely satisfactory anesthesia has reported to be 85% (14) or lower (15) in the conventional technique. However, the prevalence of completely satisfactory anesthesia has reported to be more than 96% in Akinosi technique (14, 15). Anatomically, this is expected because injection at a higher level into the pterygomandibular space (16) prevents errors related to the variable location of mandibular foramen (17). In the current study, completely satisfactory anesthesia was achieved in 91.3% and 87.5% of cases in the Akinosi and conventional techniques, respectively. The same result was obtained in some previous studies (8, 9, 18, 19). However, some others have reported a higher success rate for the conventional compared to Akinosi technique (10, 12). In general, for pulp anesthesia, Akinosi technique may be as efficient as the conventional technique. Akinosi (1997) (3) does not claim that his technique is superior to the conventional technique for IANB. In the current study, the onset of anesthesia for the long buccal, lingual and IAN occurred later in the Akinosi technique compared to the conventional technique. However, this difference only for the IAN was significant. Donkor, *et al.* in 1990 (10), Yucel

and Hutchison in 1995 (20), Todorović, *et al.* in 1986 (9) and Martinez Gonzalez, *et al.* in 2003 (12) reported slower anesthesia in the Akinosi compared to the conventional technique. Sick, *et al.* in 1986 (8) reported that anesthesia was achieved faster with the Akinosi technique than with the conventional technique; this finding is in contrast to our obtained result. Goldberg, *et al.* in 2008 (19) reported slower onset of pulpal anesthesia in the Gow Gates and Akinosi techniques compared to the conventional method.

Obviously, patients are more comfortable not opening their mouth during injection and injection would be less painful if the needle is injected into relaxed tissue. These are the advantages of the Akinosi technique. In the current study, injection with Akinosi technique was reported to be less painful than with the conventional method. Goldberg, *et al.* in 2008 (19) found that in the conventional method needle insertion caused moderate pain in 22-25% and severe pain in 0-2% of patients. Nusstein and Beck in 2003 (21) reported moderate pain in 19% and severe pain in 1-3% of cases during injection with the conventional technique. In our study, a significant difference was noted between the two techniques in terms of pain during injection. Refua and Abbas-Zadeh in 2001 (18) also found a significant difference in this respect between the two techniques. Montagnese, *et al.* in 1984 (22), Jacobs, *et al.* in

2003 (23) and Todorovic, *et al.* in 1986 (9) detected no significant difference among the three methods of IANB in terms of pain during injection.

The importance of aspiration before anesthetic injection has been well recognized for prevention of vascular incidents. Mandibular nerve block injection has the highest risk of occurrence of positive aspiration (24). However, the Gow Gates technique decreased the risk of positive aspiration to a great extent (14); which may be due to the lack of major blood vessels in the lateral side of the mandibular neck (6). The results of the current study indicate lower frequency of positive aspiration in the Akinosi compared to the conventional technique (5% versus 15%). Similar results were also reported by Donkor, *et al.* in 1990 (10), Refua and

Abbas-Zadeh in 2001 (18), Todorović, *et al.* in 1986 (9) and Martinez Gonzalez, *et al.* in 2003 (12).

Conclusion:

The results of this study showed later initiation of anesthesia in the long buccal, lingual and inferior alveolar nerves in the Akinosi compared to the conventional technique. The Akinosi technique does not seem to be different from the conventional technique in terms of efficacy; but, the prevalence of pain and positive aspiration is lower in the Akinosi technique.

Conflict of Interest: “None Declared”

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