IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 8, Issue 6 (Jul.- Aug. 2013), PP 10-17
www.iosrjournals.org

Evaluation of the anesthetic efficacy of inferior alveolar nerve blocks in dental patients - A Systematic Review

James D Raj[1] Sindhu Ramesh[2]
Department of Conservative Dentistry and Endodontics, Saveetha Dental College,Saveetha University, India

Abstract: *The inferior alveolar nerve (IAN) block is the most frequently used mandibular injection technique for achieving local anesthesia for dental treatment. However, the IAN block does not always result in successful anesthesia. Various other nerve blocks were introduced over the period of time to improve the success rate of anesthesia.*

The objective of this systematic review was to compare and evaluate the anesthetic efficacy of Inferior alveolar nerve block with various mandibular nerve blocks in dental patients.

Electronicdatabases were systematically searched for randomized controlled clinical studies and Clinical trials studies. Studies were selected by predefined inclusion criteria. Methodological quality was appraised and strength of evidence was determined.

Seven studies from seven countries were included based on inclusion criteria. Although there is difference in the values comparing the different techniques the data is not significantly different in the anesthetic efficacy of various mandibular nerve block in dental patients.

Based on this review, most of the articles included, point towards a better anesthetic efficacy of the classic inferior alveolar nerve block compared to the other inferior alveolar anesthesia techniques. However due to various variables like type of local anesthesia, experience of the operator and familiarity with the individual techniques it is not possible to conclude that classic inferior alveolar nerve block is relatively superior. Hence further research should be aimed at better matching of groups and variables like operator experience and familiarity to validate the findings.

Keywords*: anesthetic efficacy,local anesthesia, local anesthetic technique,mandibular anesthesia,pulpal anesthesia*

1. Introduction

Successful local anesthesia is the bedrock of pain control in dentistry. Effective pain control is essential to reduce fear and anxiety associated with dental procedures. The inferior alveolar nerve block (IANB) is the conventional method for anesthetizing mandibular teeth. Clinical studies have demonstrated significant failure rates of inferior alveolar nerve block technique, which indicates even if applied appropriately, do not always result in successful anesthesia. This failure rate of IAN blocks represents a common clinical problem for the treatment of mandibular teeth. Supplemental injections (with different techniques and/or types of anesthetic) are frequently required in certain cases to achieve complete anesthesia.

"Gow-Gates[1] introduced a new technique for mandibular anesthesia in 1973." The injection uses extra oral landmarks, and the target site is the neck of the mandibular condyle. A number of studies have shown higher success rates with the Gow-Gates technique (92%–100%) than the conventional inferior alveolar nerve technique (65%–86%). However, "Todorovic et al[2]found a higher success rate with the conventional inferior alveolar nerve block than the Gow-Gates block", whereas "(Ågren and Danielsson[3], Montagnese et al[4], and Hung et al[5]) found the 2 techniques were equivalent."

"Akinosi [6] introduced his technique for mandibular anesthesia in 1977." However, Vazirani also described a similar technique in 1960; hence the name was changed to the Vazirani-Akinosi technique. The injection is a closed mouth technique, with the landmarks for needle insertion being the mucogingival junction of the maxillary second molar. This technique is indicated when there is limited mandibular opening, for example trismus, which precludes the use of the inferior alveolar or Gow-Gates techniques. "(Sisk et al [7] and Todorovic [2]**)** found the Vazirani-Akinosi technique was equivalent to the conventional inferior alveolar nerve block." However, "(Donkor et al [8], Yücel et al [9], and Gonzales et al [10]**)"** found the conventional IANB was superior to the Vazirani-Akinosi.

II. Methods

Database:

- Electronic search done in Pubmed
- Medline
- Cochrane

2.1 Structured Question

Is there a difference in anesthetic efficacy of Inferior alveolar nerve block when compared to various mandibular blocks in achieving anesthesia in dental patients?

III. Pico Analysis

- **Population-** Dental patients
- **Intervention-** Inferior alveolar nerve block
- **Comparison-** Various nerve block techniques of mandible
- **Outcome-** Anesthetic efficacy

Search Strategy

A search was performed in electronic database (i.e PUBMED CENTRAL and Medline) using following search terms alone and in combination by means of PUBMED search builder upto June 2012.

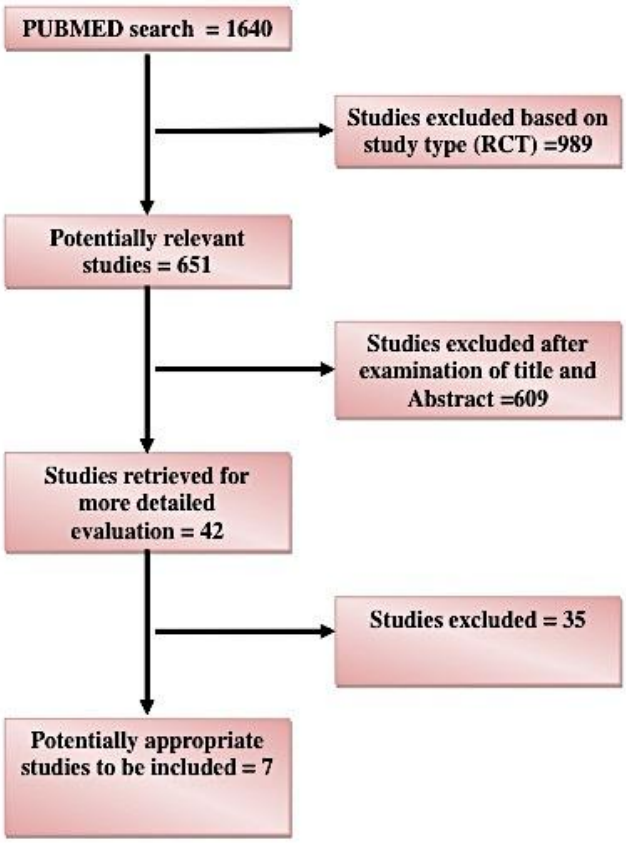
Selection Criteria

Trials were selected if they met the following criteria's: Randomized controlled clinical trials comparing the anesthetic efficacy of Inferior alveolar nerve block with various mandibular nerve blocks in dental patients were included for assessment.

Data Collection and Analysis

All the studies included were based on the data extraction and analysis of the studies for quality and publication bias. The data collection form was customized. The primary outcome measure was anesthetic success after block administration in dental patients.

FLOWCHART



IV. Tables

Table 1: Variables of interest

S.No	Variables Of Interest
1	Anesthetic success

Table 2: Characteristics of excluded studies

S No	Author	Year	Reason for Exclusion
1	Kämmerer PW, Palarie V, Daubländer M, Bicer C, Shabazfar N, Brüllmann D, Al-Nawa	2012	2 different formulations compared with same technique
2	Kanaa MD, Whitworth JM, Meechan JG.	2012	Different formulations and supplementary techniques assessed
3	Poorni S, Veniashok B, Senthilkumar AD, Indira R, Ramachandran S.	2011	Comparison between block and infiltration.
4	Kämmerer PW, Palarie V, Daubländer M, Bicer C, Shabazfar N, Brüllmann D, Al-NawasB.	2011	Anesthetic efficacy with or without epinephrine analyzed
5	Martin M, Nusstein J, Drum M, Reader A, Beck M.	2011	Different volume of anesthetic agent analyzed
6	Aggarwal V, Singla M, Rizvi A, Miglani S.	2011	Different formulations and their combination analyzed
7	McEntire M, Nusstein J, Drum M, Reader A, Beck M.	2011	Different formulation with difference in epinephrine concentration
8	Jaber A, Whitworth JM, Corbett IP, Al-Baqshi B, Kanaa MD, Meechan JG.	2010	Different formulations comparing infiltrations
9	Nuzum FM, Drum M, Nusstein J, Reader A, Beck M.	2010	Combination of infiltration vs single infiltration
10	Parirokh M, Satvati SA, Sharifi R, Rekabi AR, Gorjestani H, Nakhaee N, Abbott PV.	2010	Combination of buccal infiltration and IANB
11	Batista da Silva C, Berto LA, Volpato MC, Ramacciato JC, Motta RH, Ranali J, Groppo FC.	2010	Different agents analyzed for anesthetic success
12	Fan S, Chen WL, Pan CB, Huang ZQ, Xian MQ, Yang ZH, Dias-Ribeiro E, Liang YC,Jiao JY, Ye YS, Wen TY	2009	Comparison between IANB plus buccal infiltration vs IANB plus periodontal ligament
13	Aggarwal V, Jain A, Kabi D.	2009	Buccal and lingual infiltrations compared with IANB
14	Kanaa MD, Whitworth JM, Corbett IP, Meechan JG.	2009	Combination of IANB plus Articaine infiltration analyzed
15	Tortamano IP, Siviero M, Costa CG, Buscariolo IA, Armonia PL.	2009	Different formulations for anesthetic agent used analyzed
16	Goldberg S, Reader A, Drum M, Nusstein J, Beck M.	2008	Not in patients but in healthy volunteers
17	Haase A, Reader A, Nusstein J, Beck M, Drum M.	2008	Different solutions in buccal infiltration
18	Sherman MG, Flax M, Namerow K, Murray PE.	2008	Maxillary infiltration compared against Gow-gates block
19	Kohler BR, Castellón L, Laissle G.	2008	Different volumes of solution compared
20	Whitworth JM, Kanaa MD, Corbett IP, Meechan JG.	2007	Injection speed and anesthetic effectiveness compared
21	Robertson D, Nusstein J, Reader A, Beck M, McCartney M.	2007	Buccal infiltration with two different formulations
22	Sierra Rebolledo A, Delgado Molina E, BeriniAytís L, Gay Escoda C.	2007	Two different formulation analyzed
23	Bigby J, Reader A, Nusstein J, Beck M.	2007	Two different formulation analyzed
24	Nusstein J, Steinkruger G, Reader A, Beck M, Weaver J.	2006	1-stage vs 2-stage block, subjects were not patients
25	Lai TN, Lin CP, Kok SH, Yang PJ, Kuo YS, Lan WH, Chang HH.	2006	Only mandibular block analyzed
26	Clark K, Reader A, Beck M, Meyers WJ.	2002	Infiltration and combination analyzed
27	Claffey E, Reader A, Nusstein J, Beck M, Weaver J.	2004	Two different formulation analyzed

28	Kennedy S, Reader A, Nusstein J, Beck M, Weaver J.	2003	Conventional vs computer assisted
29	Dumbrigue HB, Lim MV, Rudman RA, Serraon A.	1997	Nerve block compared with intraligamentary injection
30	Dunbar D, Reader A, Nist R, Beck M, Meyers WJ.	1996	Intra osseous injection vs inferior alveolar nerve block
31	Childers M, Reader A, Nist R, Beck M, Meyers WJ.	1996	Periodontal ligament injection against inferior alveolar nerve block
32	Syverud SA, Jenkins JM, Schwab RA, Lynch MT, Knoop K, Trott A.	1994	Healthy volunteers participated in study.
33	Zanette G, Manani G, Facco E, Mariuzzi ML, Tregnaghi A, Robb ND.	2011	Comparison not relevant
34	Takasugi Y, Furuya H, Moriya K, Okamoto Y	2000	Comparison not relevant
35	Nist RA, Reader A, Beck M, Meyers WJ.	1992	Healthy volunteers participated in study.

Table 3: General information of selected articles

Sno	Author	Year	Country	Study design	Sample size	Age	Set-up	Techniques used	Method of evaluation
1	Aggarwal V et al	2010	India	RCT double blinded trial	97	>18yrs	University	Gow-gates, Vazirani-Akinosi, Buccal plus Lingual Infiltrations and Inferior alveolar nerve block	Lip numbness Initial access opening
2	Hung PC et al	2006	Taiwan	RCT double blinded trial	162	>18yrs	University	Gow-gates and Inferior alveolar nerve block	Electric pulp tester and a sharp explorer
3	Martínez González JM et al	2003	Spain	RCT double blinded trial	56	>18yrs	University	Direct Mandibular Nerve Block and Akinosi technique	Lower lip numbness
4	Yucel et al	1995	Turkey	RCT double blinded trial	69	>18yrs	University	Direct technique, and Akinosi technique	Numbness of the lower lip Adequacy of tissue anesthesia - Probing
5	Waikakul A et al	1991	Thailand	RCT double blinded trial	136	>18yrs	University	Direct technique and Extra-Intraoral Landmark (EIL) technique.	Thickening sensations on lower lip, tongue and cheek. Explorer testing
6	Donkor P et al	1990	Australia	RCT double blinded trial	200	>18yrs	University	Closed-mouth and Conventio-nal Block Injection Technique	Lip numbness Probing the soft tissues
7	Todorovic et al	1986	Former Yugoslavia	RCT double blinded trial	90	>19yrs	University	Gow-gates, Vazirani-Akinosi, and Direct Inferior Alveolar Nerve block	Numbness of lower lip. Pinprick on tissue supplied by sensory branches of mandibular nerve

Table 4: Results

S. No.	Author and Year	Materials used	Method of evaluation	Mean values	Outcome
1.	Aggarwal V et al 2010	Gow-gates, Vazirani-Akinosi, Buccal plus Lingual Infiltrations and Inferior alveolar nerve block	Subjective: Lip numbness Objective: Initial access opening	Gow-gates- 52% Vazirani-Akinosi-41% Buccal plus Lingual Infiltrations-27% Inferior alveolar nerve block-36%	Gow-Gates success rate of 52%, which was statistically higher than control IANB (36%) (P < .05).
2.	Hung PC et al 2006	Gow-gates and Inferior alveolar nerve block	Objective: Electric pulp tester and a sharp explorer	IANB group Central Incisor-6% Canine-37% First PM- 54% First Molar- 88% GGMBgroup Central Incisor- 8.1% Canine-37.1% First PM- 54.8% First Molar- 83.9%	No significant difference between the two groups
3	Martínez González JM et al 2003	Direct Mandibular Nerve Block and Akinosi technique	Subjective: Lower lip numbness	Success rates Direct mandibular nerve block – 100% Akinosi technique- 92%	Akinosi technique is not as effective as conventional direct mandibular block.
4	Yucel et al 1995	Direct technique, and Akinosi technique	Subjective: Numbness of the lower lip Objective: Adequacy of tissue anesthesia -Probing	Direct technique – 98% Akinosi technique - 76%	The direct technique was more successful in achieving inferior alveolar nerve anesthesia (SND:3.815; p<0.001).
5	Waikakul A et al 1991	Direct technique and Extra-Intraoral Landmark (EIL) technique.	Subjective: Thickening sensations on lower lip, tongue and cheek. Objective: Explorer testing on the lower lip and labial and lingual gingiva of canine.	Subjective : EIL technique – 66.2% Direct technique-47.1% Objective: EIL technique- Labial-85.3% Lingual-89.7% Direct technique- Labial-58.8% Lingual-76.5%	Failure rate of Direct technique significantly greater than in the EIL group (x2 = 9.68, P <.05). Numbness of labial and lingual gingiva significantly greater in the EIL group than the control group (x2 = 10.55, P <.05).
6	Donkor P et al 1990	Closed-mouth and Conventio-nal Block Injection Technique	Subjective: Lip numbness Objective: Probing the soft tissues	Success rates Conventional group 97% Closed-Mouth group 79%	Conventional technique more effective than Closed Mouth Technique in achieving anesthesia (SND=3.917,p<0.001).
7	Todorovic et al 1986	Gow-gates, Vazirani-Akinosi, and Direct Inferior Alveolar Nerve block	Subjective: Numbness of lower lip. Objective: Pinprick on tissue supplied by sensory branches of mandibular nerve	Direct method – 96.6% Gow-Gates- 90% Akinosi-76.6%	Statistical difference between Direct method and Akinosi

Table 5: Summation tables for individual parameter

S. No	Author	Year	Outcome Anesthetic Success (%)			
			IANB	GOW-GATES	VAZIRANI AKINOSI	OTHERS
1.	Aggarwal et al	2010	36%	52%	41%	27%
2.	Hung PC et al	2006	88%	83.9%	-	-
3.	González et al	2003	100%	-	92%	-
4.	Yucel et al	1995	98%	-	76%	-
5.	WaikakulA et al	1991	67.65%	-	-	87.5%
6.	Donkor P et al	1990	97%	-	79%	-
7.	Todorovic et al	1986	96.6%	90.6%	76.6%	-

Table 6: Evidence level of selected articles

S.No	Author	Year	Study Design	Level of Evidence
1	Aggarwal V	2010	Randomized double blinded clinical trial	Level 2
2	Hung PC	2006	Randomized controlled clinical trial	Level 2
3	Martínez González JM	2003	Randomized clinical trial	Level 2
4	Yucel M	1995	Randomized double blinded controlled clinical trial	Level 2
5	Waikakul A	1991	Randomized double blinded clinical trial	Level 2
6	Donkor P	1990	Randomized double blinded clinical trial	Level 2
7	Todorovic	1986	Randomized clinical trial	Level 2

Table 7: Risk of bias - major criteria

Study	Random -ization	Allocation Concealed	Assessor Blinding	Dropouts Described	Risk of Bias
Aggarwal V et al	No	No	No	None	High
Hung PC et al	No	No	No	None	High
González JM et al	Yes	No	No	None	Mod
Yucel et al	Yes	No	Yes	None	Low
Waikakul A et al	No	No	Yes	None	Mod
Donkor P et al	Yes	No	Yes	None	Low
Todorovic et al	No	No	No	None	High

Table 8: Risk of bias - minor criteria

Study	Sample Justified	Baseline comparison	I/ E Criteria	Method Error
Aggarwal V et al	Yes	Yes	Yes	No
Hung PC et al	No	Yes	Yes	No
González et al	No	Yes	Yes	No
Yucel et al	No	Yes	Yes	No
Waikakul A et al	No	Yes	Yes	No
Donkor P et al	No	Yes	Yes	No
Todorovic et al	No	No	Yes	No

V. Results

Description of Studies

The search identified 1640 publications out of which 989 were excluded after applying limits for randomized controlled clinical trial. Further 609 were excluded from 651 after reviewing the title or abstract based on relevance to our topic. Full articles were obtained for 42 studies 35 of these publications were excluded after reading the full text article. Therefore, a total of 7 publications fulfilled all criteria for inclusion.

Although there is difference in the values comparing the different techniques the data is not significantly different in the anesthetic efficacy of various mandibular nerve block in dental patients.

Aggarwal V et al [11] included 97 adult subjects, who were actively experiencing pain, participated in prospective, randomized, double-blinded study. Twenty-five patients received Gow-Gates mandibular conduction block anesthesia, 24 patients received "high" Vazirani-Akinosi inferior alveolar nerve block, 26 received only buccal-plus-lingual infiltrations, and 22 patients (control) received conventional IANB anesthesia.

Endodontic access preparation was initiated after 15 minutes of anesthesia. Pain during treatment was recorded using a Heft-Parker visual analog scale. Success was recorded for "none" or "mild" pain. Gow-Gates gave a success rate of 52%, which was statistically higher than control IANB (36%) ($P < .05$).Vazirani-Akinosi and infiltrations gave 41% and 27% success rates, respectively, with no statistically significant differences from control IANB.

Hung et al [5] 162 patients (93 males and 69 females) who were randomly allocated to receive Gow Gates or IANB for extraction of third molars. Both methods used 2.7 mL of 2% xylocaine for each patient. Pulpal and gingival tissue anesthesia of mandibular central incisors, canines, first premolars and first molars were evaluated at 0, 5, 10, 15 and 60 minutes after injection of local anesthetic solution using both an electric pulp tester and a sharp explorer. The success rates of pulpal anesthesia in the IANB group (central incisor, 6%; canine, 37%; first premolar, 54%; first molar, 88%) were not significantly different from the GGMB group (central incisor, 8.1%; canine, 37.1%; first premolar, 54.8%; first molar, 83.9%). The efficacy of pulpal and gingival tissue anesthesia is not significantly different between the GGMB and IANB methods.

Martínez González JM et al [10] included 56 patients programmed for lower third molar extraction. 22 males and 34 females were randomly assigned to two groups of 28 subjects each: control (subjected to direct

mandibular nerve block) and study group (anesthesia with the Akinosi technique). The same anesthetic solution was used in all cases, i.e., a cartridge containing 1.8 ml of 4% articaine with epinephrine 1:100,000. The statistical analysis of the results was based on the comparison of means for quantitative variables using the Student t-test, with the chi-square test for the comparison of qualitative variables. Comparison between groups was done using ANOVA. Anesthetic effect was achieved in all of the patients subjected to conventional mandibular nerve block, versus in 92% of those subjected to the Akinosi technique.

Yucel et al [9] included 250 patients of both sexes requiring the extraction of lower first or second molar teeth. Patients were divided into two groups: a control group underwent the direct technique, and the Akinosi technique was used on the experimental group. In all cases injections of 2 mL of lignocaine hydrochloride with 1:200 000 epinephrine hydrochloride were given with 27-gauge, 50 mm long disposable needles. Results of the study were statistically analyzed using the Student's t test and the standard normal deviate test (SND). The direct technique was more successful in achieving inferior alveolar nerve anesthesia (SND: 3.815; $p<0.001$).

Waikakul A et al [12] 136 Patients who came to the Oral Surgery Clinic, Faculty of Dentistry, Mahidol University for mandibular tooth extraction were selected for this study. They were divided equally into two groups: a control group that underwent the direct technique as described by Bennett and the experimental group, with which the EIL technique was used. The local anesthetic solution used was 1.8 mL of 2% lidocaine HCI with 1:100,000 epinephrine injected with a 27-gauge, 30- mm-long disposable needle. The randomized matching of the operators and techniques was done just prior to the injection by the first investigator. Second investigator, not aware of which technique had been used, recorded the patient's feelings concerning the onset of tingling or thickening sensations on the lower lip, tongue and cheek.

Donkor et al [8] included 200 patients, who were randomly allotted to the closed mouth and conventional mandibular technique. Lip numbness was reported as early as 5min or between 5-10min.if no change in lip sensation after 10min supplementary block injection given using same technique. Probing the soft tissues supplied by branches of inferior alveolar, lingual and long buccal nerves tested anesthetic efficacy.

Anesthesia was considered successful if no pain was reported on probing. The conventional technique was significantly more successful in achieving inferior alveolar nerve anesthesia ($p<0.001$).

Todorovic et al [2] included 90 patients of both sexes, aged from 17 to 62 years, undergoing simple tooth extraction into his prospective study. They were randomly allocated into 3 groups with regard to the applied technique of mandibular anesthesia. In all cases, injections of 2 ml of 2% lidocaine with adrenaline (1:80,000), using disposable syringes, were given by the authors. The results were statistically analyzed using the chi square test.

VI. Defending the Results

From this review classic inferior alveolar nerve block/Direct Technique is shown to provide better anesthetic efficacy compared to other techniques. This could be attributed to more practitioners being familiar with this technique as it is the commonest technique taught in dental schools.

Compared to other methods inferior alveolar nerve block easier to learn due to the numerous traceable landmarks. Also even though positive aspiration is higher in IANB clinically evident hematoma formation is lower compared to other methods, thus it is safer for clinical applications. Although not all articles reported statistically significant differences between the various techniques, they do however report a higher level of anesthetic efficacy with classic inferior alveolar nerve block.

Inference

Implications for Practice

Anesthetic success depends on familiarity of the practitioner with one technique. Based on this review the evidence points more towards the experience of the operator rather than technique.

Implications for Research

In future research should be aimed at better matching of groups and variables like operator experience and familiarity to validate the findings.

VII. Conclusion

Based on this review,most of the articles included point towards a better anesthetic efficacy of the classic inferior alveolar nerve block compared to the other inferior alveolar anesthesia techniques. However due to various variables like type of local anesthesia, experience of the operator and familiarity with the individual techniques it is not possible to conclude that classic inferior alveolar nerve block is infact superior.

Hence further research should be aimed at better matching of groups and variables like operator experience and familiarity to validate the findings.

References

[1]. Gow-Gates, G. A., and J. E. Watson. "The Gow-Gates mandibular block: further understanding." Anesthesia Progress 24.6 (1977): 183.

[2]. Todorović L, Stajcić Z, Petrović V. Mandibular versus inferior dental anaesthesia: clinical assessment of 3 different techniques.Int J Oral Maxillofac Surg. 1986 Dec; 15(6): 733-8.

[3]. Agren, E., and K. Danielsson. "Conduction block analgesia in the mandible. A comparative investigation of the techniques of Fischer and Gow-Gates." Swedish dental journal 5.3 (1981): 81.

[4]. Montagnese, Thomas A., Al Reader, and Rudy Melfi. "A comparative study of the Gow-Gates technique and a standard technique for mandibular anesthesia."Journal of endodontics 10.4 (1984): 158-163.

[5]. Hung PC, Chang HH, Yang PJ, Kuo YS, Lan WH, Lin CP. Comparison of the Gow-Gates mandibular block and inferior alveolar nerve block using a standardized protocol.JFormos Med Assoc. 2006 Feb; 105(2): 139-46.

[6]. Akinosi, J. O. "A new approach to the mandibular nerve block."British Journal of Oral Surgery 15.1 (1977): 83-87.

[7]. Sisk, Allen L. "Evaluation of the Akinosi mandibular block technique in oral surgery."Journal of Oral and Maxillofacial Surgery 44.2 (1986): 113-115.

[8]. Donkor P, Wong J, Punnia-Moorthy A. An evaluation of the closed mouth mandibular block technique. Int J Oral Maxillofac Surg. 1990 Aug; 19(4): 216-9.

[9]. Yücel E, Hutchison IL. A comparative evaluation of the conventional and closed-mouth technique for inferior alveolar nerve block.Aust Dent J. 1995Feb; 40(1): 15-6.

[10]. Martínez González JM, Benito Peña B, FernándezCáliz F, San HipólitoMarín L, PeñarrochaDiago M. A comparative study of direct mandibular nerve block and the Akinosi technique. Med Oral. 2003 Mar-Apr;8(2): 143-9. English, Spanish.

[11]. Aggarwal V, Singla M, Kabi D. Comparative evaluation of anesthetic efficacy of Gow-Gates mandibular conduction anesthesia, Vazirani-Akinosi technique, buccal-plus-lingual infiltrations, and conventional inferior alveolar nerve anesthesia in patients with irreversible pulpitis.OralSurg Oral Med Oral PatholOralRadiolEndod. 2010 Feb; 109(2): 303-8.

[12]. Waikakul A, Punwutikorn J. A comparative study of the extra-intraoral landmark technique and the direct technique for inferior alveolar nerve block. J Oral Maxillofac Surg. 1991 Aug; 49(8): 804-8; discussion 808-9.