

COMPARISON OF ANESTHETIC EFFICACY OF CONVENTIONAL INFERIOR ALVEOLAR NERVE BLOCK AND GOW GATES TECHNIQUE IN PATIENTS WITH SYMPTOMATIC IRREVERSIBLE PULPITIS-RANDOMIZED CONTROL TRAIL

RizwanUllah Afridi¹, Shafqat Ali Shah², Inam Ullah Jan Khattak³, Fawad Ali Shah⁴, Muhammad Zain⁵, Farhad Ali⁶

¹Department of Operative Dentistry, Sardar Begam Dental College Peshawar

²Department of Operative Dentistry, Sardar Begam Dental College Peshawar

³Department of Operative Dentistry, Khyber College of Dentistry Peshawar

⁴Department of Operative Dentistry, Khyber College of Dentistry Peshawar

⁵Department of Operative Dentistry, Peshawar Dental College Peshawar

⁶(Biostatistics), Khyber College of Dentistry Peshawar

ABSTRACT

Objective: The purpose of this study was to evaluate the anesthetic efficacy of the Gow-Gates techniques using 1.8 mL 2% lidocaine with 1:100,000 epinephrine in mandibular posterior teeth in patients presenting with symptomatic irreversible pulpitis.

Materials and Methods: A Randomized clinical trial was carried from January 2018 to December 2018 at Department of Operative Dentistry, Sardar Begum Dental College Peshawar. One hundred and six emergency patients with mandibular posterior teeth diagnosed with symptomatic irreversible pulpitis participated in the study and were randomly divided by lottery method into two groups (fifty three in each group). Group A received inferior alveolar nerve block and group B received Gow-Gates injection to block the inferior alveolar nerve before endodontic access. Successful anesthesia of the technique was defined as no pain on interdental probing and lip numbness and no response to electric pulp tester (EPT).

Results: Subjective lip numbness was obtained 100% of the time with both the techniques and there was no pain on interdental probing in both the groups. Anesthesia was successful in 38 out of 53 subjects (72%) in inferior alveolar nerve block group while it was successful in 45 out of 53 subjects (85%) in Gow gates technique group. There was no statistically significant difference in the anesthetic efficacy of both techniques ($p=0.099$).

Conclusions: We concluded that in mandibular posterior teeth diagnosed with symptomatic irreversible pulpitis, the conventional inferior alveolar nerve block is similar to the Gow-Gates technique regarding anesthetic efficacy. There was no statistical significant difference in the anesthetic efficacy of both technique ($p=0.099$).

Keywords: Irreversible pulpitis, inferior alveolar nerve block, Gow gates technique

Correspondence:

Dr. Shafqat Ali Shah

Professor, Operative Dentistry, Sardar Begum Dental College, Peshawar, Pakistan.

Cell: 0321-9001311

Email: shafqatalishah@hotmail.com

INTRODUCTION

Successful local anesthesia is the foundation of pain control in dentistry¹. It increases the patient comfort, cooperation and faith in the operator and also reduces stress on the dentist's mind. Anesthe-

tizing mandibular teeth is sometimes challenging especially posterior teeth with symptomatic irreversible pulpitis². In Endodontics, local anesthesia is usually achieved with regional/block anesthesia. Most commonly used block techniques are inferior alveolar nerve block (IANB), Gow gates technique and Vazirani Akinosi technique³.

Conventional inferior alveolar nerve block (IANB) is the most frequently used technique for anesthetizing mandibular posterior teeth in endodontic procedures⁴. The inferior alveolar nerve enters the mandibular foramen in the ramus of the mandible to occupy the inferior alveolar canal in the body of the mandible. In this technique the nerve is approached from the opposite side of the mouth over the contralateral premolars. After piercing the buccinator muscle on the medial border of the mandibular ramus within the pterygomandibular space and then contacting medial surface of the alveolar bone, the injection is given⁵. Complications such as pain, trismus and needle breakage, facial paralysis, hematoma, ptosis, self-inflicted trauma and pterygomandibular space infection are the major drawbacks of this block technique⁶. The success rate of achieving pulpal anesthesia of mandibular molars is 80-85% using conventional inferior alveolar nerve block which gets even worse in the symptomatic irreversible pulpitis⁷. Study done by Todorovic et al and Goldberg et al showed higher anesthetic success rates with conventional inferior alveolar nerve block (first premolar, 62%; first molar, 53%) than Gow gates technique (first premolar, 53%; first molar, 38%)⁸. However, studies done by Kaufman and Drevenet et al had shown significant anesthetic failure rates of conventional inferior alveolar nerve block technique (15-20%) and (27%) respectively, which indicates even if applied appropriately do not always results in successful anesthesia⁹. In Childers et al study, anesthetic failure rate was observed 37% for the first molar and 27% for the second molar using conventional inferior alveolar nerve block¹⁰.

In 1973 Gow gates introduced a new technique for mandibular nerve block¹¹. This technique uses extra oral landmarks. These landmarks are lower border of the tragus of the ear and corner of the mouth and the intraoral target site is the neck of the condyle¹². The anesthetic solution is deposited at the lateral side of the condyle just below the insertion of the lateral pterygoid muscle in a relatively avascular

area of loose fatty tissue above and away from the neurovascular bundle¹³. Advantages of Gow gates technique include single injection for mandibular nerve with no supplemental injections, high success rates, lower incidence of positive aspiration rate (2%), and few post injection complications however, the disadvantages are longer time of onset of anesthesia and requires clinically more experience for its successful administration¹⁴. Robertson study showed higher anesthetic success rates of Gow gates technique (92.6%) in comparison with IANB (71%)⁸. However another study conducted by Hung et al failed to show higher effectiveness and success rates of Gow gates technique (first premolar, 54%; first molar, 88%) in comparison to conventional inferior alveolar nerve block (first premolar, 54.8%; first molar, 83.9%)⁸.

Few studies have been conducted to compare the anesthetic efficacy of conventional inferior alveolar nerve block and Gow gates technique in patients with symptomatic irreversible pulpitis¹¹. The aim of this study is to compare the two local anesthesia block techniques in patients with symptomatic irreversible pulpitis so as to find a superior technique to anesthetize inferior alveolar nerve, with fewer complications and failure rates, thereby providing comfort to the patients as well as reduces stress on the dentists.

MATERIALS AND METHODS

All the subjects with symptomatic irreversible pulpitis in mandibular posterior teeth referred from outpatient department to the department of operative dentistry of Sardar Begum Dental College Peshawar, Kpk, were selected for the study. A total of 106 subjects were included in the study. Sample size was calculated using WHO calculator with anticipated population proportion 1 is kept 0.38 and anticipated population proportion 2 is kept 0.62.8 Power of test was kept 80% and level of significance was 5%. Patients between age of 18 to 45 who require endodontic treatment in mandibular posterior teeth having symptomatic irreversible pulpitis with no periapical radiolucency on radiographs and neither medically compromised nor taking any medications (NSAIDs, opioids, sedatives, alcohols) were included in the study. Exclusion criteria of the study was allergies to local anesthetics, pregnant patients and patients showing no response to EPT.

The inclusion and exclusion criteria was strictly

followed for all the subjects having symptomatic irreversible pulpitis in mandibular posterior teeth. A proper well-informed written consent was taken from the subjects regarding their participation in the study. All the subjects were briefed with the objectives and protocols of the study and subjects showing complete willingness were selected. After taking proper history and investigations (periapical radiographs and pulp vitality tests) patient were allotted to one of the two groups by random allocation (lottery method).

Visual analog scale was explained to each subject before starting the treatment. Each subject rated his or her initial pain on a visual analog scale (VAS). The VAS was divided into 4 categories. No pain correspond to 0 cm. Mild pain was defined as 0 cm to 4 cm. Mild pain included the descriptors of faint, weak, and mild pain. A score >4 cm and <7 cm indicated moderate pain and included the descriptor of moderate pain. Severe pain was defined as >7 cm. Severe pain included the descriptors of strong, intense, and maximum possible. Group A subjects received conventional inferior alveolar nerve block while group B subjects received Gow gates block. Each subject of both groups received a total of 1.8 mL 2% lidocaine with 1:100,000 epinephrine (MED-ICAINER Inj, Huon Co. Ltd, Korea) using standard anesthetic cartridges with aspirating syringe. The cartridges were checked to ensure that the anesthetic solution is not expired. The needle used for all injections was a 27 gauge 0.4x42mm needle. Topical anesthetic gel (Topical paste, produits Dentaires SA Vevey, Switzerland) was passively placed at all injection sites for 60 seconds using a cotton tip applicator.

After administration of local anesthesia, waited for approximately 10 minutes for induction of anesthesia. This was confirmed by attaining lip numbness, interdental probing, and no response to maximum reading (80) on electric pulp tester (EPT). This data was recorded in the performa.

The tooth was then isolated with a rubber dam, and endodontic access was performed. No pain or mild pain reported by the patient during endodontic access preparation was recorded in the performa using VAS. When the patient felt moderate to severe pain, treatment was halted and discomfort/pain was recorded on VAS in the performa and supplementary injections (intraosseous injection, intraligamentary injection, or intrapulpal injection) was administered

and emergency treatment was completed and no further records were obtained. The pulpal anesthesia was considered successful if there was no pain on interdental probing and no response from the subject at the maximum output (80 reading) of the electric pulp tester.

ETHICAL CONSIDERATION

All the objectives and protocols of the study were briefed to the subjects and selection was done only after complete willingness and consent. Also the subjects had full right to drop out from the study at any time during the study. A proper well-informed and well-understood written consent was obtained from the subjects regarding their participation in the study. All those subjects who developed any kind of complication were advised to report back to the hospital immediately.

RESULTS

Results were analyzed using SPSS version 22 software. Total subjects that participated in this study were 106 (53 in each group) during the period of six months from 21-10-2015 to 20-04-2016. The study subjects were divided into two equal groups, group A (Inferior Alveolar Nerve Block) and group B (Gow-Gates injection technique).

The average age of our study was 32.67 ± 7.178 . Histogram was developed to present the proportions of age distribution. There were 19 females and 34 males in group A while 25 females and 28 males in group B (table 1).

In group A (inferior alveolar nerve block), the average age of the subjects was found to be 32.81 ± 7.486 (95% CI; 30.75-34.87) with minimum and maximum age of 19 and 45 years while in group B (Gow Gates technique), the average of the subjects was found to be 32.53 ± 6.924 (95% CI; 30.62-34.44) with minimum and maximum age of 19 and 45 years respectively (table 2).

Overall 42% of our subjects were females and 58% were males. In group A (inferior alveolar nerve block), out of 53 subjects there were 19 (36%) females and 34 (64%) males. In group B (Gow Gates technique) 28 (53%) subjects were males while 25 (47%) were females (table 3).

Effectiveness of anesthesia technique was analyzed using chi-square test and is presented in table

4. In group A (inferior alveolar nerve block), out of 53 subjects, anesthesia was found effective in 38 subjects. In group B (Gow Gates technique), out of 53 subjects, anesthesia was effective in 45 subjects. The difference between the anesthetic efficacy of both techniques was found statistically non-significant ($p=0.099$).

Efficacy of anesthesia technique on the basis of gender in each group is presented in table 5. Statistically significant difference was found in female subjects using Gow gates technique as compared to inferior alveolar nerve block ($p=0.024$). No statistically significant difference was found in the anesthetic efficacy of both techniques in males ($p=0.641$).

All the patients in both groups attained lip numbness (table 6) and there was no pain on interdental probing in all the patients of both groups (table 7).

DISCUSSION

The aim of this study was to assess the successful anesthesia in lower posterior teeth using the inferior alveolar nerve block and Gow-Gates techniques using 1.8 mL of 2% lidocaine with 1:100,000 epinephrine. Total of 106 patients participated in this study, 53 in each group. There was no statistical significant difference in the age and initial pain

between the two groups. The patients had to report with moderate to severe initial pain in order to qualify for this study based on visual analog scale VAS. In order to assess anesthetic efficacy between the two groups, it is very important to get a baseline of pain. Different inflammatory mediators and cytokines that are released in inflammatory process increases the nociceptors excitability thus decreasing the threshold for pain¹⁵. Different studies had shown that the preoperative pain experienced from symptomatic irreversible pulpitis influence the success rate of the conventional IANB so it would be anticipated that the same would be true for alternative IANB

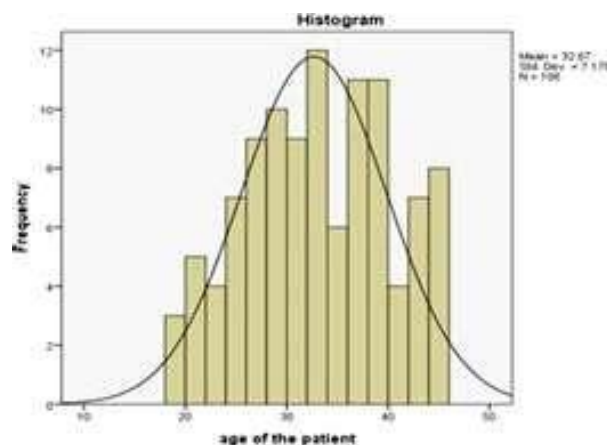


Table 1: Distribution of Patients by Gender

		Anesthesia technique		
		Inferior alveolar nerve block	Gowgates technique	Total
Sex	Female	19	25	44
	Male	34	28	62
Total		53	53	106

Table 2: Mean Age of the Patients in Both the Groups

		Anesthesia technique		Statistic
age of the patient	Inferior alveolar nerve block	Mean	Gowgates technique	32.81
		95% Confidence Inter- val for Mean	Lower Bound	30.75
			Upper Bound	34.87
		Std. Deviation		7.486
		Minimum		19
		Maximum		45
	Gowgates technique	Mean		32.53
		95% Confidence Inter- val for Mean	Lower Bound	30.62
			Upper Bound	34.44
		Std. Deviation		6.924
		Minimum		19
		Maximum		45

Table 3: Percentage of Patients in Each Group

		Percentage (%)
Inferior alveolar nerve block	Female	36
	Male	64
Gow Gates technique	Female	47
	Male	53
Total	Female	42
	Male	58

Table 4: Total Effectiveness of Anesthesia Techniques

		Effectiveness of anesthesia		Total	Total p value
		Yes	no		
Anesthesia tech- nique	Inferior alveolar nerve block	38	15	53	0.099
	Gowgates techniqu	45	8	53	
Total		83	23	106	

Table 5: Effectiveness of Anesthesia Techniques

			Anesthesia technique			
			inferior alveo- lar nerve block	gowgates tech- nique	Total	P value
Sex						
Female	effectiveness of anesthesia	Yes	9	20	29	0.024
		No	10	5	15	
	Total		19	25	44	
Male	Effectiveness of anesthesia	Yes	29	25	54	0.641
		No	5	3	8	
	Total		34	28	62	

Table 6: Lip Numbness In Both Techniques

			Anesthesia technique		
Sex			Inferior alveolar nerve block	Gowgates technique	Total
Female	numbness of lip	Yes	19	25	44
	Total		19	25	44
Male	numbness of lip	Yes	34	28	62
	Total		34	28	62
Total	numbness of lip	Yes	53	53	106
	Total		53	53	106

Table 7: Pain on Interdental Probing

			Anesthesia technique		
Sex			Inferior alveolar nerve block	Gowgates technique	Total
Female	Pain on interdental probing	No	19	25	44
	Total		19	25	44
Male	Pain on interdental probing	No	34	28	62
	Total		34	28	62
Total	Pain on interdental probing	No	53	53	106
	Total		53	53	106

techniques i.e the Gow- Gates and Vazirani-Akinosi techniques. If patients presented with higher initial pain in one group than the other, then there could be biasness in the results of this study^{7,8}.

Lip numbness achieved in the present study was 100%. This finding of the present study is in accordance to the studies done by Clark et al¹⁶ and Hung et al¹⁷ who achieved 100% lip numbness after administration of conventional IANB.

In the present study the success rate of IANB was 72% while the Gow gates technique resulted in 85% of success. A double blinded study done by Aggarwal et al⁷ to evaluate the success rate of IANB, Gow gate technique and Akinosi Vazirani technique had shown that the success rate for IANB was 36% and Gow gates technique was 52%. The difference between the results of Aggarwal et al study and present study may be due to the fact that different anxiety scale were used to evaluate the pain and the endodontic access was used for successful anesthesia in contrast to EPT used in present study. Sherman et al¹⁵ conducted a study to show the success rate of 4% articaine with 1:100,000 epinephrine and 2% lidocaine with 1:100,000 epinephrine using the Gow Gates technique in posterior teeth. Sherman et al found that the success rate of Gow gates technique was 87.5 %. The success rate of the present study 85% can be comparable with the success rate of Sherman et al study 87.5%.

Martínez González JM et al¹⁸ conducted a study to compare IANB and Akinosi Vazirani technique for lower third extraction. He included 56 patients in the study, 22 males and 34 females. Anesthesia was successful in all the subjects of conventional mandibular nerve block group. The difference between the success rates with present study (72%) may be due the small sample size of Martínez González JM et al study.

Robertson⁸ and Gow-Gates¹⁴ evaluated the success of IANB and Gow gates technique using restorative procedures and shown 71-86% success rate for IANB and 92%-98% success rate for the Gow-Gates technique, which is close to the present study i.e 72% for IANB and 84% for Gow gates technique. Using an extraction model, Todorovic et al¹⁵ had shown that the conventional inferior alveolar nerve block was better than the Gow-Gates technique, however comparing the results of these previous studies with

the present study is difficult because extractions and the different endodontic and restorative procedures cannot be used to measure pulpal anesthesia.

Studies done by Ågren and Danielsson , Montagnese et al⁸, and Hung et al¹⁷ had shown no statistical significant difference between the Gow-Gates and conventional inferior alveolar nerve blocks using EPT which is in accordance to the results of the current study.

Study done by Jung et al²⁰ showed that the success rate of inferior alveolar nerve block was lower in females. This finding of Jung et al. study is in accordance to the present study where there is a higher success rate of Gow gates technique ($p=0.024$) in females as compared to inferior alveolar nerve block. However, further research is needed to better understand the difference in the success rate of Gow gates technique as compared to IANB in females that was observed in this study.

CONCLUSIONS

We concluded that GGMB is as effective as IANB in teeth diagnosed with symptomatic irreversible pulpitis. Although GGMB has slight higher success rates (85%) than IANB (72%) in teeth tested, no statistical significant difference was found in the overall efficacy between the two techniques. GGMB was more effective in females than IANB ($p=0.024$). However, further research is needed to better understand the difference in the success rate of Gow gates technique as compared to IANB in females that was observed in this study.

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