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Comparison of Efficacy of Gow-Gates Mandibular Nerve Block Technique with Inferior Alveolar Nerve Block for Pain Management during Extraction of Mandibular Teeth

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ABSTRACT

Objective: The objective of this study was to compare the efficacy of the Gow-Gates Mandibular Nerve Block (GGMNB) versus Inferior Alveolar Nerve Block (IANB) Technique for pain management during extraction of mandibular molars and premolars.

Materials and Methods: This prospective clinical study was conducted in the Department of Oral and Maxillofacial Surgery, Dental Section, FMH College of Medicine and Dentistry, Lahore from May 2017 to November 2017. A total of ninety consecutive patients (45/group) meeting the inclusion criteria were randomly selected and allocated through lottery methods to GGMNB and IANB groups and were given using 2% lidocaine with 1:100000 epinephrine. After the injection, the mandibular molars or premolars were extracted using a standard surgical technique. The pain severity was evaluated using a Visual Analogue Scale (VAS) with the level of significance was set at 0.05.

Results: Age distribution showed that 51.11% (n=23) in IANB and 40% (n=18) in the GGMNB group were between 20-40 years of age whereas 48.89% (n=22) in IANB and 60% (n=27) in the GGMNB group were between 41-60 years of age. Mean±SD was calculated as 41.11±9.23 years in IANB and 43.31±8.56 years in the GGMNB group. Gender distribution of the patients showed that 55.56% (n=25) in IANB and 60% (n=27) in the GGMNB group were male whereas 44.44% (n=20) in IANB and 40% (n=18) in the GGMNB group were females. The success rates of anesthesia in the GGMNB and IANB techniques were 88.89% (n=40) and 64.44% (n=29), respectively and showed significant difference (P=0.006).

Conclusion: Efficacy of GGMNB is significantly higher than IANB Technique during extraction of mandibular teeth in terms of pain control during a surgical procedure.

Keywords: Gow-Gates Technique, Inferior Alveolar Nerve Block, Molars, Premolars, Pain, Visual Analogue Scale

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INTRODUCTION

Pain control is one of the most important considerations in oral surgical practice. The proper use of local anaesthesia techniques and pain management are mandatory for successful dental treatment. Inferior Alveolar Nerve Block (IANB) is most used for mandibular dental extractions, which was introduced by Jorgensen and Hayden in 1967.[1] Nerves anaesthetized by this technique are inferior alveolar, mental, incisive, and lingual nerves. In this technique, the anaesthetic solution is administered close to the lingula of the mandible; the target site of the anaesthetic solution is proximal to the inferior alveolar nerve and therefore, inferior alveolar and its branches (incisive and mental), lingual and mylohyoid are anaesthetized. A supplemental block (long buccal) is required if soft tissue anaesthesia in the posterior buccal area is required. Failure to achieve local anaesthesia through this technique may be due to anatomical variation or improper technique.[2]

In 1973, a new technique to anaesthetize the mandibular nerve was introduced by George Gow & Gates.[3] In this technique, the anaesthetic solution is administered close at the neck of the mandibular condyle; the target site of anaesthetic solution is proximal to the mandibular nerve innervations and therefore, inferior alveolar and its branches (incisive and mental), lingual, mylohyoid, auriculotemporal, and buccal nerves (approximately 75% of cases) are anaesthetized.[4] Anesthetic efficacy rates in terms of pain control using the Visual Analogue Scale (VAS) during a surgical procedure for Gow Gates Mandibular Nerve Block (GGMNB) and IANB have been documented 92.5% and 72.5% respectively.[5] However, some studies suggest that both techniques had the same success rate in terms of pain control during surgical procedures whereas, in some studies, the IANB had a higher success rate.[6] Reported higher rate of effectiveness is attributed to lesser variability in anatomy as well as the course of the mandibular division of trigeminal nerve in the injection location.[7]

In Pakistan, the majority of the teaching hospitals train the students with the IANB technique only. A survey conducted by dentists from Lahore and Karachi revealed low or no training in alternate mandibular nerve block techniques.[8] Considering differing results in the literature regarding the efficacy in terms of pain control during the surgical procedure of the two techniques, this study has been planned to compare both techniques. This study aimed to compare the efficacy of the Gow-Gates Mandibular Nerve Block (GGMNB) versus Inferior Alveolar Nerve Block (IANB) technique for pain management during extraction of mandibular molars and premolars.

MATERIALS AND METHODS

This prospective clinical study was conducted in the Department of Oral and Maxillofacial Surgery, Dental Section, FMH College of Medicine and Dentistry, Lahore from May 2017 to November 2017. Ethical approval was obtained from the Institutional Review Board before the study commencement [Ref. No. FMH-04-2017-IRB-245-M]. Using consecutive non-probability sampling technique, a total of 90 patients who met the inclusion criteria were recruited for the study. The sample size was calculated using the WHO calculator with a 95% confidence interval, study power of 80%, anticipated success of anaesthesia in GGMNB as 92.5% and inferior alveolar nerve block as 72.5%. The inclusion criteria were all male and female patients of 20-60 years of age requiring simple extractions of mandibular premolar and molar teeth due to caries and having mouth opening of at least 40mm. The patients taking pain killers (opioids, NSAIDs, antidepressants),

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patients allergic to lignocaine, hypertensive patients, pregnant patients, patients having acute pulpitis, and the patients who refused to take part in the study were excluded from the study. Written informed consent was taken from all the study participants.

The patients were randomly divided into two groups using the lottery method. Group A was the control group in which IANB was given whereas Group B was for GGMNB. 27 gauge 42 mm long needle (H-Dent 25G cartridge needles) used for both techniques. 1.8ml Cartridges of 2% lignocaine with 1: 100,000 adrenaline was injected with conventional corkscrew type local anaesthesia aspiration syringes. Buccal infiltration anaesthesia was given, if needed, after the effectiveness of inferior alveolar nerve block was confirmed through probing of buccal gingival sulcus of canine. Ineffective long buccal nerve anaesthesia for both IANB and GGMNB was documented. The subjects were asked to report any unusual symptoms during and after the injection. To reduce operator bias, the local anaesthesia blocks were given by a single operator having clinical experience of more than two years in the OMFS department.

For IANB, after opening the mouth wide open and placing the thumb at the coronoid notch, the needle coming from the contralateral premolar area was inserted three-fourths of the anteroposterior distance from coronoid notch back to the deepest part of pterygomandibular raphe and 6-10mm above the occlusal plane. The needle was advanced around 20-25mm where it contacted with bone. After aspiration, the local anaesthesia (two cartridges; 3.6 mL) was injected in the area near the lingula at a rate of 1 mL/min. For GGMNB, after opening the mouth wide open and placing the thumb at the coronoid notch, the needle coming from the contralateral premolar area was inserted distal to maxillary second molar at the level of its mesiopalatal cusp. The needle was advanced around 25mm where it contacted with bone. After bony contact, the needle was withdrawn slightly, aspiration was performed, and a 3.6 mL (two cartridges) anaesthetic solution was delivered.

After confirming of loss of sensations from the lower lip (patients were asked about lip numbness and gingival sulcus of canine was probed for objective analysis of loss of sensation), the surgical procedure was started. The mandibular molars or premolars were removed using a standard surgical technique.

Pain during surgical procedures was analyzed using a visual analogue scale (VAS). The VAS was divided into three equal parts: Pain that can be tolerated (VAS: 1-3), Moderate pain that cannot be tolerated (VAS: 4-6), Severe pain that cannot be tolerated (VAS: 7-9). Each patient's pain severity was determined using these codes. Evaluation of pain control in the whole procedure was done at the end of the procedure by giving the Performa of VAS to the patient. If the patients report the pain <3 on VAS, it was labelled as efficacy.

All the qualitative variables like gender were described in terms of frequencies and percentages. Quantitative variables like age, VAS score was described in the form of Mean±SD. All collected data were entered and analyzed by using Statistical Package for Social Sciences (SPSS) version 22.0. For efficacy, and a number of cartridges, chi-square was used to determine statistically significant differences between the patients for two groups. *P*-value < 0.05 was considered as significant value.

RESULTS

A total of 90 participants (45 in each group), fulfilling the inclusion criteria were enrolled to compare the efficacy of GGMNB versus IANB technique during extraction of mandibular molars or premolars in terms of pain control during a surgical procedure.

Age distribution of the patients showed that in group A, 51.11 % (n=23) patients were between 20-40 years and 48.89% (n=22) were between 41-60 years while in Group B, 40 % (n=18) were between 20-40 years of age and 60 % (n=27) were between 41-60 years of age. The mean age for Group A was 41.11±9.23 years while the mean age for group B was 43.31±8.56 years. Gender distribution of the patients showed that 55.56 % (n=25) in group A were male while 44.44% (n=20) were female. Similarly in group B 60 % (n=27) were males 40 % (n=18) were females.

Comparison of efficacy of local anaesthesia during extraction of mandibular molars or premolars shows that IANB was effective in 64.44 % (n=29) cases while GGMNB was effective in 88.89 % (n=40). P-value was 0.006 as shown in Table 1.

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Table 1: Efficacy of IANB and GGMNB technique during Extraction of Mandibular Molars and Premolars

Tooth	Technique	Efficacy		*p*-value
		Yes	No	
Premolar	**IANB**	14	7	0.002
	GGMNB	23	0	
Molar	**IANB**	15	9	0.27
	GGMNB	17	5	
Overall	**IANB**	64.4%	35.6%	0.006
	GGMNB	88.9%	11.1%	

Mean VAS and SD for Group A was 2.27±1.51, while mean VAS and SD for Group 2 were 1.82±1.093 as shown in Table 2.

Table 2: Comparison of VAS in IANB and GGMNB technique

	Technique	Mean	SD	*p*-value
VAS	**IANB (n=45)**	2.27	1.51	**0.001**
	GGMNB (n=45)	1.82	1.093	

DISCUSSION

Administration of local anaesthesia for extraction and other restorative work is a common occurrence in dentistry and all dentists are required to learn local anaesthesia techniques to practice pain-free dentistry. A patient's pain during mandibular teeth extraction often creates problems for a dental surgeon and can also cause immense patient discomforts, such as decreased quality of life, serious complications, or even danger to the patients' lives. Effective pain management is therefore of great importance. The present study compared the efficacy of GGMNB and IANB techniques in terms of pain management during the extraction of mandibular molars and premolars.

The anaesthetic agent used in this study (2% lidocaine with 1:100000 epinephrine) is the most used worldwide.[9] Like previous studies, two cartridges of the anaesthetic agent were administered to ensure successful local anaesthesia with both techniques.[10,11] In an evaluation of the effect of local anaesthetic agent volume, Aggarwal et al.[12] found that the administration of 1.8 mL lidocaine with the IANB technique successfully achieved anaesthesia in 26% of cases, and the delivery of 3.6 mL anaesthetic agent was successful in 54% of cases.

Although several previous studies have compared the efficacy of GGMB and IANB, the results remain controversial. This study was planned with the view that variation is found in previous studies regarding the efficacy in terms of pain control during the surgical procedure of the two techniques. The present study evaluated the pain response using VAS. This tool is widely used to assess acute pain in a reliable, valid, sensitive, and appropriate way.[13] Many previous studies have used VAS for the assessment of pain during the extraction of mandibular teeth.[14,15]

In this study, the mean age was 41.1±9.2 for the IANB group and 43.3±8.5 for the GGMNB group. These results are in accordance with the results of other studies conducted by Katyal et al[16] and Goldberg et al[17] which showed that majority of the patients 62.14% in IANB and 69.36% in the GGMNB group fall between the age groups of 41-60 years. Whereas Katyal et al[16] also confirmed that the majority of patients in both the groups were above 50 years of age 51.13% in IANB and 59.10% in the GGMNB group.

In this study, 57.7% of the participants were male while 42.2% were female with an overall male to female ratio of 1.3:1. This male predilection was also reported by other studies performed by Karm et al[9] who reported 52.31% of males and 47.69% of females in their study and Gandhi et al[18] who reported 57% males and 43% females. This may be determined by the fact that the males are more susceptible to conditions that are associated with a high possibility of tooth damage due to activities like contact sports, road traffic accidents or

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increased para-functional habits in males as compared to females that ultimately lead to tooth extractions.

When the efficacy of GGMNB was compared with that of IANB for extraction of mandibular molars or premolars, the results showed that IANB was effective in 64.44% of cases whereas GGMNB was effective in 88.89% of cases. This distribution compared favourably with the results obtained in a recent study [19] where the success rate of the GGMNB technique was 50% when compared to IANB which showed 42.5% with no significant difference ($p>0.05$). A study performed by Sharma and colleagues[20] also reported similar findings where GGMNB showed more superior results (66.7%) when compared with IANB (46.7%). However, the study conducted by Hass et al[21] described no significant difference regarding efficacy between the IANB and GGMNB groups. They showed a 74.43% success rate in IANB and 75.12% success in the GGMNB group. This might be due to the smaller sample size of the study population.[21] A more recent study by Aggarwal et al[14] showed the impact of VAS score on both the techniques and concluded a success rate of 88% in the GGMNB technique and only 61.5% success rate in the IANB technique. These findings are suggestive of the fact that the GGMNB technique is more effective in terms of pain control as compared to IANB for simple extractions of mandibular premolar and molar teeth. The possible reasons could be the length of the nerve exposed to the anaesthetic solution which is significantly greater as compared to the conventional IANB[22], thus increasing the number of voltage-gated channels being exposed to the local anaesthetic solution. Besides, a lower incidence of positive aspiration (1.6% in GGMNB vs 3.6-22% in IANB)[19] is another reported reason which makes GGMNB more superior in terms of pain control. The only significant limitation of GGMNB is the learning curve of the clinician as it is usually not being taught in dental schools and the dependence on the extraoral landmark. It has been observed that the majority of the dentists and dental students are familiar with IANB only and are not adept at giving GGMNB.

The major limitation of this study was a smaller sample size that was of 45 patients in each group. Another limitation was dependence on the patient's perception and threshold for pain. Further studies with larger sample size and different anaesthetic agents should be conducted so that significant differences can be observed, and results can be generalized to a greater population.

CONCLUSION

This study concludes that the efficacy of GGMNB is significantly higher than IANB Technique during extraction of mandibular molars or premolars in terms of pain control during a surgical procedure.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

The ethical approval is provided by the Ethical Review Board at FMH College of Medicine and Dentistry [Ref. No. FMH-04-2017-IRB-245-M].

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AUTHORS CONTRIBUTION

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Acquisition of data: M.M. Usama, N. Ghauri

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