Research Article

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Comparison between Conventional and Gow-Gates Techniques for Mandibular Anaesthesia

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ABSTRACT

Introduction: For achieving mandibular anaesthesia, various methods have been described. Anaesthesia by traditional inferior alveolar nerve block (IANB) is not always predictable. Thus other techniques like Gow-Gates, Vazirani-Akinosi have been advocated.
Objective: To compare the effectiveness of IANB and Gow-Gates technique for mandibular anaesthesia.
Methodology: A non-randomised trial was conducted after institutional ethical approval, from 2022 July to 2023 January, in Oral and Maxillofacial Surgery Department, Kathmandu Medical College among 134 patients requiring extraction. The participants recruited by convenience sampling were divided in two groups with 67 in each. Informed consent was taken. One group received conventional IANB and another received Gow-Gates technique. Success rate, onset time, aspiration, and complications in between two techniques were compared. Data were analysed in SPSS v.24. Chi-square test was performed for proportional difference between categorical variables and Mann-Whitney U test for comparing median difference in onset time between two groups.
Result: Anaesthetic success rate in IANB group was seen among 59 (88.1%) patients and among 56 (83.6%) in Gow-Gates group but the difference was not statistically significant ($p = 0.457$). Gow-Gates had significantly higher median onset time than IANB ($p < 0.001$). Positive aspiration was seen among six (9.0%) in IANB and only in one (1.5%) in Gow-Gates. One patient with IANB showed transient facial nerve palsy as complication.
Conclusion: Both Gow-Gates and the IANB techniques in this study were successful in achieving mandibular anaesthesia, with no significant differences in overall success rates. Further studies with larger sample size and diverse population is recommended.

Keywords: Anaesthesia; effectiveness; Gow-Gates; inferior alveolar nerve block, mandibular nerve block.

INTRODUCTION

Patients seeking dental treatment are often anxious because of pain, sensitivity, swelling, etc. Hence, before commencement of any maxillofacial procedures, effective pain control using local anaesthetic agent is crucial.[1] One of the most important factor determining the outcome of any minor oral surgical procedure is how well the nerve block is administered. Inferior alveolar nerve block (IANB), Vazirani Akinosi, and Gow-Gates techniques are popular for achieving mandibular anaesthesia.[2]

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For mandibular surgical procedures, the traditional IANB technique is commonly utilised.[3] However, it is one of the most difficult local anaesthetic techniques to perform.[4] The success rate of IANB is not always predictable and has been linked to nerve injury and unintentional intravascular injection.[1] A study has reported successful anaesthesia in only about 80-85% of the time.[3] For improved effectiveness, Gow-Gates (1973) developed a novel method for hemimandible anaesthesia. Unlike the traditional IANB, which exclusively relies on intraoral landmarks, this alternative technique makes use of both intraoral and extraoral landmarks.[5]

The effectiveness of IANB and Gow-Gates mandibular block has been compared in earlier research, however the findings are still debatable.[6] Therefore, this study was conducted to compare the effectiveness of conventional and Gow-Gates technique in achieving mandibular anaesthesia.

METHODOLOGY

A non-randomised trial was carried out among 134 patients visiting the Department of Oral and Maxillofacial Surgery, Dental Programme, Kathmandu Medical College, Duwakot, Bhaktapur, Nepal from 2022 July to 2023 January for the extraction of mandibular posterior teeth. Ethical clearance was obtained from the Institutional Review Committee of Kathmandu Medical College (Reference number: 04072022/04) before starting the study. Convenience sampling method was done to recruit the study participants. Study details were explained to each participant and informed consent was obtained from the study participants before data collection. Systemically healthy individuals of age 18 years and above visiting the department for extraction of mandibular premolars or molars with no other pathology in the mandible were included in the study. Those who were known to be allergic to local anaesthetic agent, analgesic or anti-inflammatory drugs, smokers, alcoholics, pregnant patients, and those presenting with symptoms associated with third molar within one week before extraction were excluded from the study.

Sample size was calculated using sample size formula for comparing two proportions as follows:

$n = (Z_{\alpha/2}+Z_{\beta})^2 * [p_1(1-p_1)+p_2(1-p_2)] / (p_1-p_2)^2$

where $Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$ (for a confidence level of 95%, α is 0.05 and the critical value is 1.96), Z_{β} is the critical value of the Normal distribution at β (for a power of 80%, β is 0.2 and the critical value is 0.84) and p_1 and p_2 are the expected sample proportions of the two groups. Values for p_1 = 86% for status of anaesthetic success for Gow-Gates and p_2 = 95% for IANB was obtained from a previous study.[7] Using these values in the formula, total sample size = 162.51 in each group (325.02 in total). However, the number of patients visiting the department in six months duration for mandibular posteriors extraction is only around 180 (90 in each group). Therefore, using sample size calculation formula for finite population proportion, ss/[1+{(ss-1)/pop} where, ss = sample size, pop = population size, total sample obtained for each group is 58.14. Adding 15% non-response rate, final sample in each group was 66.86 = 67 in each group (134 in total).

The study participants were alternatively assigned to two groups with 67 participants in each. One group received traditional IANB and another group received local anaesthetic agent by Gow-Gates technique. The local anaesthetic agent used was 2% lignocaine with adrenaline 1:80,000 which was injected by a 25 gauge, 32 mm, three millilitre (ml) syringe. Comparison of their effectiveness was made based on the success rate and onset of anaesthesia.

The particular anaesthetic technique was considered successful if the patient did not experience any pain during the extraction procedure and if no additional nerve block was needed to achieve anaesthesia after that technique was administered. To evaluate the onset of anaesthesia, a straight probe was run around the gingival sulcus of the first premolar and lateral incisor in the area of anaesthesia. Positive aspiration was evaluated. Other measures like failure to deliver anaesthesia by a single block requiring any additional nerve blocks in both the groups of patients were evaluated every minute for first 10 minutes after injection. Other associated complications like trismus or transient facial nerve palsy were also recorded.

Data were entered in Microsoft Excel Sheet and analysed in Statistical Package of Social Sciences version 24 (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp). Chi-square test was done to compare the proportion of aspiration rate, anaesthetic success, and onset of anaesthesia between two groups. Significance level was set at $p < 0.05$.

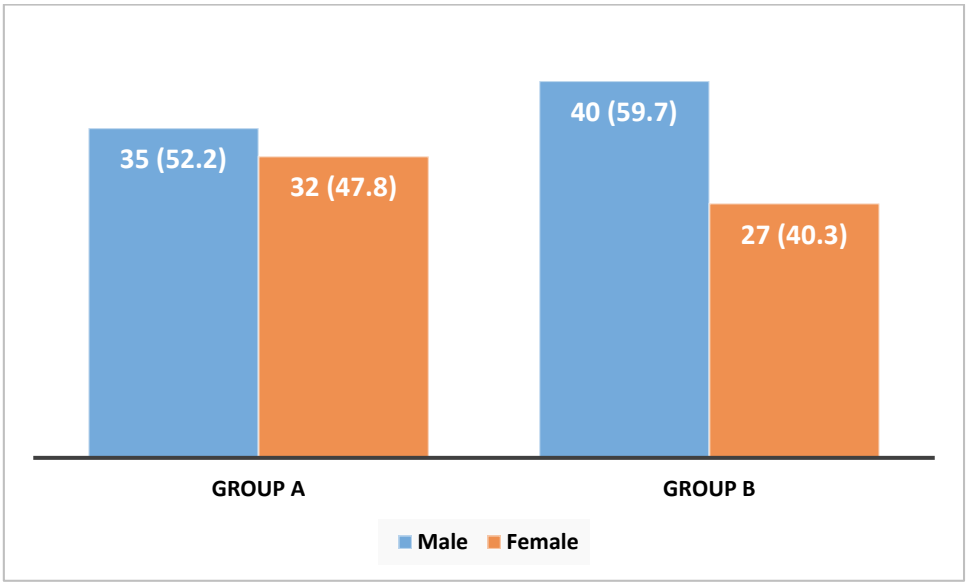

Figure 1: Sex distribution of study participants, n (%).

Table 1: Comparison of anaesthetic success rate, aspiration, and complications in between two groups.

Parameters	Group	Yes	No	p-value
Anaesthetic success rate, n (%)	**IANB group**	59 (88.1)	8 (11.9)	0.457*
	Gow-Gates group	56 (83.6)	11 (16.4)	
Positive aspiration	**IANB group**	6 (9.0)	61 (91.0)	0.058[a]
	Gow-Gates group	1 (1.5)	66 (98.5)	
Complication	**IANB group**	1 (1.5)	66 (98.5)	0.99[a]
	Gow-Gates group	-	67 (100)	

*Chi-square test [a]Fisher's exact test

Table 2: Comparison of time of onset in the two groups.

Parameter	Group	Median	IQR	Mean rank	p-value
Time of onset in minutes	IANB	3.0	2.5-3.5	39.13	<0.001
	Gow-Gates	5.0	4.0-5.5	95.87	

Mann-Whitney U test

RESULT

There were a total of 134 participants with 67 in each group. Mean age of study participants in IANB Group was 37.43 ±14.29 years and Gow-Gates group was 39.33±16.04 years. Sex distribution of study participants were also similar in both groups (Figure 1). There was no significant difference between anaesthetic success in between two groups (p = 0.457, Table 1). Positive aspiration was found while giving IANB in six (9.0%) patients and in only one (1.5%) patient with Gow-Gates. However, the difference was not statistically significant (p = 0.058). One (1.5%) patient with IANB showed complication of transient facial nerve palsy but no complication was seen in Gow-Gates group (Table 1). The time of onset of anaesthesia was significantly higher in Gow-Gates than in IANB (p <0.001, Table 2).

DISCUSSION

Among the various methods of delivering anaesthesia in mandible, the technique most frequently used is IANB. However, this approach has a significant failure rate, particularly in mandibular molars with acute irreversible pulpitis.[4] The factors that are thought to contribute to the unpredictable success in achieving anaesthesia by IANB are mostly the technical errors like failure of identification of the landmark, improper syringe angulation; presence of infected tissue, and patient anxiety that may cause anaesthesia to fail. The mandibular foramen is the primary landmark of IANB, and its anatomical variability can cause anaesthesia to fail.[8] Gow-Gates can be used as an alternative to IANB for delivering mandibular anaesthesia. The Gow-Gates approach entails depositing the anaesthetic solution close to the pterygoid fovea, which is located at the condylar head which is significantly higher position than that utilised in traditional IANB. This anaesthetic solution then flows down with gravity and enters the pterygomandibular region.[9] Therefore, this study was conducted to evaluate and compare the efficacy of IANB and Gow-Gates technique of mandibular anaesthesia.

In the present study, although a higher success rate in achieving mandibular anaesthesia was seen in IANB (59, 88.1%) than in Gow-Gates (56, 83.6%), the difference was not statistically significant (p = 0.457). Similar rate of anaesthetic success rate (84.29%) by Gow-Gates technique was observed in a study by Almasri et al.[9] Hung et al., in their study also noted no significant difference between success rate of two anaesthetic techniques.[6] In another study by Shah et al., anaesthetic success was seen among 86% of patients with Gow-Gates and 95% with IANB.[7] Some of the published research indicate that the conventional IANB has a higher success rate compared to alternative methods.[10,11] The traditionally preferred IANB is reported to have a higher success rate because the dentist administering the nerve block has more experience in using this technique.[11] However, certain researchers linked the higher success rates of alternative Gow-Gates technique to the consistency of the landmarks utilised to guide the needle insertion when comparing mandibular anaesthetic success rates. They postulated that variations in the mandibular foramen and lingula's locations were the primary causes of the

IANB method's inability to provide good mandibular anaesthesia.[12] Gow-Gates is an alternate approach that circumvents these issues and produces successful mandibular anaesthesia.[8]

In the present study, the median time required for onset of anaesthesia by IANB was three minutes and that by Gow-Gates was five minutes and the difference was statistically significant (p <0.001). Similar results showing higher mean onset time by Gow-Gates as compared to IANB was seen in other studies.[7,8,12] However, a study by Maqsood *et al.*, showed a lower mean onset of action in Gow-Gates group, 3.29 ± 1.80 min and in the IANB group, 1.73 ± 0.91 min.[14] A meta-analysis by Yu *et al.* indicated that the IANB technique has a statistically significant faster anaesthetic onset time than the Gow-Gates method.[15] The reason behind difference in onset time is unclear. However, Gow-Gates differs from the IANB technique primarily in terms of the location of injection. It is possible that a delayed onset time is due to distinct anatomical characteristics associated with different injection sites. Also, difference in nerve distribution, condition of blood flow, or even soft tissue disorders linked with specific injection sites.[15]

In this study, six (9%) out of 67 IANB injections showed positive aspiration while only one (1.5%) out of 67 injections in Gow-Gates which was similar to a study by Thomas et al.[1] Other studies also showed lower rate of positive aspiration in Gow-Gates than in IANB technique.[7,16] Positive aspiration is less likely observed in Gow-Gates technique because of the site of needle placement that is 12 mm anteromedial to the condylar neck which is comparatively an avascular area.[1]

Complication seen in administering mandibular anaesthesia was minimal in this study, with only one case of transient facial nerve palsy noted in the IANB group and no complication in Gow-Gates technique. This finding underscores the importance of technique and anatomical knowledge in minimising complications associated with nerve blocks. The absence of complications in the Gow-Gates group further supports its safety profile.

The study was conducted at a single centre which limits the generalisation of study findings. Also, the selection of study participants by convenience sampling method and non-random allocation of study participants in two groups can be considered as the limitation of this study.

CONCLUSION

The study findings showed that both the IANB and Gow-Gates techniques were effective for achieving mandibular anaesthesia, with no significant differences in overall success rates. However, the Gow-Gates technique may offer advantages in terms of lower aspiration rates and less chances of complications, albeit with a longer onset time. Further studies with larger sample sizes and diverse populations are warranted to validate these findings and explore the long-term outcomes associated with each technique.

Conflict of interest: None.

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