ORIGINAL ARTICLE

COMPARISON OF EFFECTIVENESS OF INFERIOR ALVEOLAR NERVE BLOCK AND GOW GATES TECHNIQUE IN MANDIBULAR MOLAR TEETH WITH IRREVERSIBLE PULPITIS

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Background: Local anaesthetics are the most important and most utilized agents in the dental profession today. Achieving effective pain control holds a prime importance for any dental procedure. The most commonly employed technique to achieve effective anaesthesia in mandibular molar teeth with irreversible pulpitis is Inferior Alveolar Nerve Block. However, in some cases this technique may not prove successful and the clinician may have to resort to alternative methods of achieving effective anaesthesia. Our study aims to compare two different techniques employed for anaesthesia, i.e., the conventional Inferior Alveolar Nerve Block and the alternative Gow Gates Technique in achieving effective anaesthesia in mandibular molar teeth. **Methods:** We conducted a randomized controlled trial in the Operative Dentistry department of Rawal Institute of Health Sciences Islamabad. We selected 102 patients presenting with irreversible pulpitis in mandibular posterior teeth. The selected patients were randomly allocated into two groups. In each group, the subjects were given 1.8 ml of lidocaine (2%) with epinephrine 1: 100,000 (Medicainer Inj, HuonCo., Ltd, Korea) by using anaesthetic cartridges that had aspirating syringe. **Results:** Subjects in Group A were given inferior alveolar nerve block while those in Group B received Gow-Gates nerve block. The patients were then asked to rate their pre-operative and intra-operative pain on a visual analogue scale (VAS). Data analysis was done using SPSS-22, followed by comparison of efficacy between the two groups. anaesthesia was found to be effective among 36 subjects (69%) of Group-A and 44 subjects of (84%) Group-B. Hence, we concluded that the success rate of Gow-Gates technique and Inferior alveolar nerve block anaesthetic technique differs significantly. **Conclusion:** Gow-Gates technique can be considered as an applicable alternative to the conventional Inferior alveolar nerve block technique while providing anaesthesia to patients presenting with irreversible pulpitis in mandibular posterior teeth, having a higher anaesthetic success of (84%) when compared with the conventional Inferior alveolar nerve block (69%).

Keywords: Irreversible Pulpitis; Inferior Alveolar Nerve Block Technique; Gow Gates Technique

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INTRODUCTION

For any practicing dentist, anaesthetic administration to prevent pain during dental treatment is extremely important. A number of techniques have been proposed to achieve effective anaesthesia for procedures in mandibular posterior teeth including conventional Inferior Alveolar Nerve Block, Vazirani Akinosi and Gow Gates. Among these the most commonly employed technique is the Inferior Alveolar Nerve Block Technique.[1] There are a number of factors employed in achieving an effective anaesthesia including clinician's knowledge of the anatomy, skills, experience and pharmacological variability as well as patient related factors.[2] However, the simple action of administering local anaesthetics often brings major anxiety and is associated with pain. Local anaesthetic injection may not only generate pain and fear, but also be a triggering factor related to medical emergencies in dental offices, with vasodepressor syncope and hyperventilation as major psychogenic reactions may also become a major reason for the patients to avoid dental treatment.[3]

The technique most commonly employed for anesthetizing mandibular posterior teeth while performing endodontic treatment is inferior alveolar nerve block, with point of target being the Mandibular foramen where the inferior alveolar nerve enters.[4] For inferior alveolar nerve block (IANB), it is paramount to evaluate pain during anaesthetic induction. IANB has three stages: initial needle insertion, needle penetration to the destination site and anaesthetic solution deposition. These procedures have been associated with pain and discomfort. Despite being a

common technique, high failure rates (30%–81%) in mandibular posterior teeth with irreversible pulpitis have been reported, primarily because of the variable anatomical location of mandibular foramen and also some additional branches of the mandibular nerve which are not anesthetized.[5]

An alternative nerve block technique was developed in 1973, called the Gow-Gates technique to achieve anaesthesia of all the branches of mandibular nerve. The target area for deposition of local anaesthetic in this technique is along the lateral aspect of anterior portion of the neck of condyle, where the mandibular nerve exits the foramen ovale. According to literature, the failure rate for this technique ranges from 12–65% for.[6] The Gow Gates is comparatively an easier and convenient technique for beginners because it is performed on the basis of extraoral landmarks (a line drawn from the inter tragic notch of the ear to the angle of the mouth).In Gow Gates technique, the pterygoid fovea region of the mandible is the target area for deposition of the local anaesthetic solution, from where it diffuses inferiorly into the pterygomandibular space. However, the Gow-Gates technique involves a wide mouth opening and this may pose a problem for patients with limited mouth opening. Some rare complications associated with the Inferior Alveolar Nerve Block technique are hematoma formation and transient facial palsy and trismus while hematoma formation, middle ear problems and ocular complications like diplopia, temporary blindness are some of the reported complications of an inadvertent Gow-Gates Nerve Block Technique.[7] Successful anaesthesia is very important for pain control in dentistry. There has been a scarcity of studies comparing the different anaesthetic techniques in mandibular posterior teeth with irreversible pulpitis. Therefore, the purpose of our randomized clinical study was to determine the most efficacious anaesthetic technique for irreversible pulpitis cases by comparing the anaesthetic efficacies of Gow-Gates mandibular conduction block, with conventional Inferior Alveolar Nerve Block (control) using 2% lidocaine with 1:80,000 epinephrine as the anaesthetic agent in mandibular first molars. The concept of this study was based on the research conducted by Almasri *et al* which was done to compare the anaesthetic efficacy of different anaesthetic techniques.

The study was conducted at Department of Operative dentistry, Rawal Institute of Health Sciences, Islamabad. It was a Randomized Control trial conducted from the month of February 2023 till the month of July 2023.

Sample size was calculated with 95% confidence interval, alpha=5%, power=80%. P1=48% and P2=27.5 % (whereas p1 was the expected proportion (success rate) in population and p2 was the expected proportion (success rate) in population 2.

A total of 104 patients both males and females that met the inclusion criteria were selected from the outpatient department of Rawal Institute of Health Sciences Islamabad.

The selected inclusion criteria was:

- Patients falling within the age group of 18 to 60 years
- Patients with a clinical diagnosis of irreversible pulpitis in mandibular posterior teeth
- Patients willing to undergo root canal treatment in the affected teeth
- Patients not undergone any previous treatment for pain relief in the selected teeth

While the exclusion criteria was:

- Pregnant females
- Patients with any previous reaction to local anaesthetics
- Patients with a clinical diagnosis of reversible pulpitis
- Patients with a clinical diagnosis of pulpal necrosis (teeth showing no response to pulp sensibility tests)

MATERIAL AND METHODS

Patients were randomly divided into two groups of 52 sample size each, (Group A) receiving Inferior alveolar nerve block and (Group B) receiving the Gow-Gates nerve block. All the patients were briefed about the study objectives and protocols and informed consent obtained. Basic demographics were noted like age, gender, and weight on weighing machine. Randomization was done by computer generated random list for both groups.

A total of 1.8ml 2% lidocaine (*HD CAINE PLUS Inj.)* with 1:1000,00 epinephrine was loaded into an aspirating dental syringe that had conventional anaesthetic cartridges. Prior to the injections, the cartridges were checked to ensure that the anaesthetic solution was not expired. A 27-guage $1^{1/2}$ inch needle (Monojet; Sherwood Medical) needle was used for all the injections. A 60 seconds application of topical anaesthetic gel (20% benzocaine; Patterson Dental Supply, Inc, St Paul, MN) with a cotton tip applicator was also done on all the block injection prior to the procedure thus ensuring better patient's comfort.

In Group A, subjects received inferior alveolar nerve block. The patients were placed in the supine position, with the neck extended and the mouth open as wide as possible. The site of injection in this group was mainly the soft tissue overlying the mandibular ramus on the medial surface, just lateral to the pterygomandibular raphe, while the height of injection site was determined by the coronoid notch on the anterior most border of the mandibular ramus. The

aspirating syringe was kept in a position parallel to the mandibular occlusal plane and was it approached the target site from the premolars on the contralateral side. To gauge the intended depth of the needle, a sterile rubber stopper was used on the needle at a distance of approximately 20 mm from the needle tip. The needle insertion was done through the mucosa while advancing slowly until a gentle contact with the bone was felt. The needle was then withdrawn by 1 mm, to perform aspiration followed by deposition of solution over a period of about 2 minutes. Following the injection, the subjects were instructed to keep their mouths wide open for about another 60 seconds.

In group B, the subjects were given the Gow Gates nerve block. The subjects were placed in a supine position and instructed to open the mouth wide. The anaesthetic was administered just anterior to the neck of condyle in close proximity to the mandibular branch of trigeminal nerve. Aspiration was done, followed by solution deposition over a period of about two minutes. After the injection, the subject in this group were also instructed to keep their moths wide open for about 60 seconds to ensure blinding of the techniques.

After administration of local anaesthesia by either technique to both the groups approximately 15 minutes were given for induction of anaesthesia. Induction of anaesthesia was then confirmed by asking the patients, soft tissue testing with interdental probing, and absence of response to highest reading (60) on the electric pulp tester. The collected data was then recorded in the respective proformas.

Root canal treatments were initiated with effective isolation. Access cavities were prepared on the teeth and patients were asked to rate any experienced pain during access preparation on the visual analogue scale. anaesthetic success was considered when patients reported either no pain or only a slight pain. In case of moderate to severe pain, the anaesthetic technique was rendered unsuccessful and, in these cases, supplemental intra ligamentary injection was given to carry out the root canal treatment.

Data analysis was done using statistical analysis program (IBM-SPSS-V-22). The purpose of analysis was to compare proportion of Group A and Group B. Frequency and percentage were computed for qualitative variables like gender, side of mandibular molar and pain. Mean ±SD was presented for quantitative variables like age, VAS score and weight. Chi-square test was used to compare outcomes in the two groups taking $p<0.05$ as significant.

Stratification was done with respect to gender, age, weight and mandibular sides to determine the effect of these variables on outcomes. Following stratification, chi-square test was used for both groups and p 50.05 was considered statistically significant.

RESULTS

Amongst the total 104 patients, 52 each were designated to both the groups. In Group A, the mean age was 37.48±13.16 years, while it was 41.35±13.38 years in Group B. Patients in both the group were compared for efficacy in a cross-tabulation manner with the results showing significantly better responses for Group B patients, details in Table 1. *P*-value for group A and B was found to be very significant $p=0.012$. The group distribution based on the efficacy between different age groups and gender as shown in Table-2, clearly depicts a higher percentage of successful group B anaesthesia results in all the categories.

Table-1: efficacy results of group A and group B

Efficacy	Group-A (Inferior alveolar nerve block)	Group-B (Gow Gates nerve block)	*p*-value
Yes	36(69.2%)	44(84.6%)	0.012
No	16(30.8%)	8(15.4%)	

Table-2: Group distribution based on efficacy in different genders and age groups

Age (Year)	Group	Efficacy	
		Yes n (%)	No n (%)
18-40	Group-A	23(78.00)	5(19.23)
	Group-B	22(95.00)	0(0)
41-60	Group-A	10(67.00)	5(35.71)
	Group-B	18(82.00)	2(10.53)

DISCUSSION

This study highlights that mandibular posterior teeth with symptomatic irreversible pulpitis were anesthetized successfully in (84%) of cases with the Gow-Gates nerve block technique as compared to Inferior alveolar nerve block (69%). This proves to be accordance with study of Aishwarya *et al*, in which the success rate of the Gow-Gates technique was significantly more (84%) as compared to the Inferior alveolar nerve block (61%). Malamend also reported a 97% success rate for the Gow Gates technique. There is also a lesser frequency of positive aspiration in Gow-Gates technique as compared to the IANB,

although a comparatively higher dose of (3ml) has been suggested by Malamed.[7] Some other researches in literature have also reported higher success rates of Gow Gates technique. However, two separate studies by Goldberg *et al*. and Hung P.C *et al* are in contrast to our study where no significant difference was noted between the anaesthetic efficacy of inferior alveolar nerve block and Gow Gates technique.[8,9]

The traditional technique to anesthetize mandibular posterior teeth is Inferior Alveolar Nerve Block technique which sometimes does not prove fruitful. The reasons attributed to the low success rate of Inferior lveolar Nerve Block include operator related factors like inadequate knowledge of the anatomy, technical errors like improper angulation of syringe and needle as well as patient related factors apprehension, presence of infected tissues ,and anatomical factors like cross inervation.[10]Because of these factors, the success rate of this traditional technique is only 80-85 % or even lower in few reports.[11]The clinicians who have learnt and mastered the alternative nerve block techniques like Gow-Gates and Vazirani Akinosi nerve block techniques have higher likelihood of providing successful anaesthesia in patients with infected tissues or anatomical variability. Both these techniques deliver the anaesthetic solution at a deeper site than the conventional IANB.[11] Clinicians should have a detailed knowledge of safer options for their patients. In cases where the conventional IANB fails, or there is any inadvertent intra-vascular administration of local anaesthesia that may result in any untoward medical problems like unstable angina or cardiac arrhythmias, alternative techniques like Gow-Gates or a more distal administration as Intra ligamental injection must be considered .Alternatively in patients presenting with limited ability to open their mouths due to any condition like muscle trismus, infection, or the presence of tumour the Vazirani Akinosi technique which is a closed mouth mandibular block technique may be employed. It can also be considered as an alternative local anaesthesia technique in case of conventional block anaesthesia failure. Presently limited level of training in Gow-Gates and Vazirani Akinosi techniques emphasizes the need to practice these techniques more often at undergraduate level. The reason of the failure of the primary local anaesthesia technique should be the primary determining factor while choosing the supplemental local anaesthesia technique. Inadequate technique is the most commonly cited factor for failure of IANB and repetition the IANB may prove successful in these cases. In an evaluation of the effect of local anaesthetic agent volume, Aggarwal *et al* 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. According to Aggarwal *et al*. The Gow Gates mandibular nerve block technique increases the success rate of achieving effective anaesthesia in mandibular molar teeth with irreversible pulpitis, it was regarded as a true mandibular nerve block that overcame the disadvantages of the IANB and reported to have a higher success rate when used by experienced operators.[12-13] Just like the conventional inferior Alveolar Nerve Block, the Gow Gates Technique can be combined with supplemental aesthetic techniques to ensure more profound pulpal anesthesia.[14] Increased level of training on part of the practitioners will prove fruitful in in this regard.[15] With Gow Gates Technique, the higher success rates, lower incidence of positive aspiration and the absence of problems with accessory sensory innervation to the lower teeth are the major reported benefits of the Gow-Gates technique over the traditional IANB.

CONCLUSION

The success rate of Gow Gates mandibular nerve block technique and inferior alveolar nerve block differs considerably. Gow Gates mandibular nerve block technique may be considered as a suitable alternative to the Inferior alveolar nerve block in anesthetizing patients with irreversible pulpitis.

AUTHORS' CONTRIBUTION

AF: Literature review, data collection, write-up. RQ: Conceived the idea, supervision. SM, GD: Data collection and entry. MAR: Final proofreading. SS: Data collection, entry.

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