

A Clinical Comparison of Three Techniques of Mandibular Local Anaesthesia

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ABSTRACT

Aim: Inferior dental anaesthesia via the direct intraoral approach, mandibular conduction anaesthesia via extraoral landmarks (Gow-Gates) and mandibular conduction anaesthesia via the tuberosity approach (Akinosi) were evaluated using pain during injection, aspiration test, pinprick, depth and frequency of anaesthesia, onset and duration of anaesthesia.

Materials and Methods: 120 patients of both sexes, aged from 16 years to 50 years undergoing mandibular molar tooth extraction were included. They were randomly designated into 3 groups with regards to the applied technique of mandibular anaesthesia. Each patient was given injection of 2 ml of 2% lignocaine with adrenaline (1:80,000) using 2ml disposable syringes and a 25 gauge, 1.5 inch needle.

Results: Classical inferior nerve block showed greater incidence of pain among the applied techniques. Positive aspiration was most frequently observed with classical inferior nerve block. The onset of anaesthesia was found to be slower with Gow-Gates technique while duration of anaesthesia was longer. Mandibular conduction anaesthesia via the tuberosity approach did not show any particular advantage over the other two techniques in this study.

Conclusions: After using Gow-Gates method, it was found that the Gow-Gates technique is a highly successful alternative to the conventional inferior nerve block with regards to increased success rate, constancy of landmarks, decreased positive aspiration rate, decreased incidence of complications such as trismus, the advantage of one injection to anaesthetize a greater area supplied by the mandibular nerve, longer duration of anaesthesia and less amount of pain experienced during injection.

Keywords: Local anaesthesia, Mandibular nerve, Conduction anaesthesia.

INTRODUCTION

Classical inferior dental anaesthesia is a routine block injection administered regularly in dental practice in children and adults undergoing exodontia, endodontic procedures, minor oral surgical procedures etc. A dental professional can encounter a



series of obstacles while performing a classical inferior dental anesthesia procedure such as non-cooperation from the patient during intraoral approach, pain during injection, longer duration of onset of action, post injection trismus, limited mouth opening as a result of dentoalveolar abscess or space infection etc. Unfortunately it also proves to have highest percentage of clinical failures (approximately 15%-20%) even when administered

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properly¹. To encounter the difficulties sometimes observed in achieving inferior dental nerve block, various methods of anaesthesia have been suggested which claim to be superior over the conventional direct method of classical inferior

alveolar nerve block. Alternative techniques have been introduced and adopted for circumventing some of the problems encountered with the classical inferior alveolar nerve block. They include

Table 1: Pain experienced during injection with applied technique of mandibular anaesthesia.

Method	PAIN								Total	Chi square Test value	P-value
	Severe		Moderate		Mild		No Pain				
	No of Injections	%	No of Injections	%	No of Injections	%	No of Injections	%			
Gow-Gates technique			3	7.5	10	25	27	67.5	40	13.08	0.0418*
Akinosi technique			1	2.5	9	22.5	30	75	40		
Classical inferior alveolar nerve block	1	2.5	5	12.5	18	45	16	40	40		
Total	1	0.83	9	7.5	37	30.83	73	60.83	120		

Table 2: Pinprick test for applied technique of mandibular anaesthesia.

Method	Pinprick – Inferior Alveolar Nerve						Total	Chi square Test value	P-value
	0		1		2				
	No of Injections	%	No of Injections	%	No of Injections	%			
Gow-Gates technique	36	90	4	10			40	4.252	0.372
Akinosi technique	35	87.5	4	10	1	2.5	40		
Classical inferior alveolar nerve block	32	80	8	20			40		
Total	103	85.83	16	13.33	1	0.83	120		

Table 3: Depth and frequency for applied technique of mandibular anaesthesia.

Method	Depth and frequency of anaesthesia				Total	Chi square test value	P-value
	Pressure		None				
	No of Injections	%	No of Injections	%			
Gates technique	3	7.5	37	92.5	40	7.451	0.024*
Akinosi technique	4	10	36	90	40		
Classical inferior alveolar nerve block	11	27.5	29	72.5	40		
Total	18	15	102	85	120		

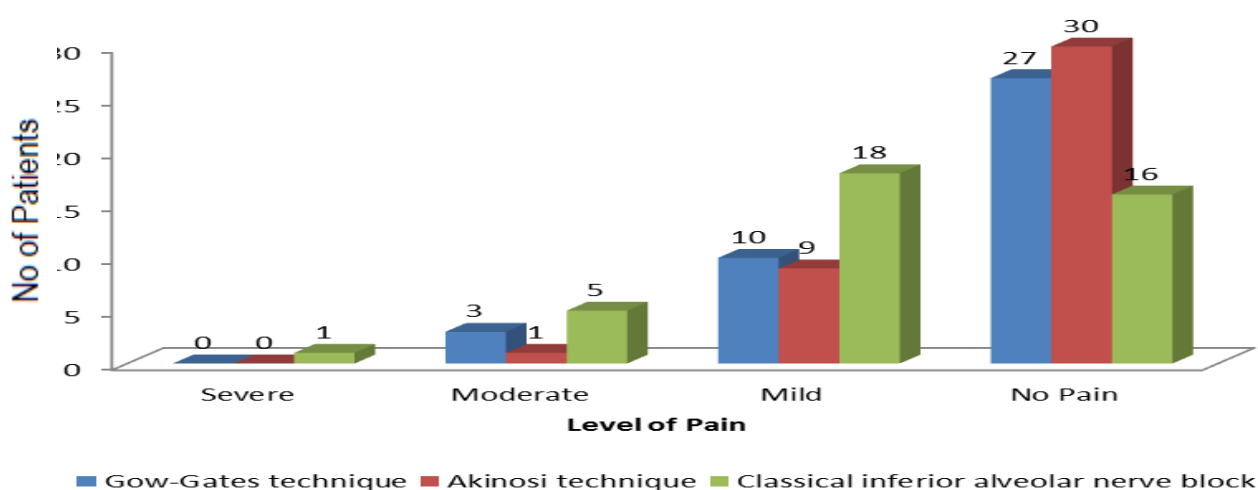
Table 4: Onset for applied technique of mandibular anaesthesia onset of anesthesia(In minutes).

Method	No. of Injections	Median	Range		Mean	Std Deviation
			Min	Max		
Gow-Gates technique	40	4	1.5	7	3.85	1.20
Akinosi technique	40	3	2	5	2.78	0.64
Classical inferior Alveolar nerve block	40	2	1	4	2.15	0.76
Total	120	3	1	7	2.92	1.14

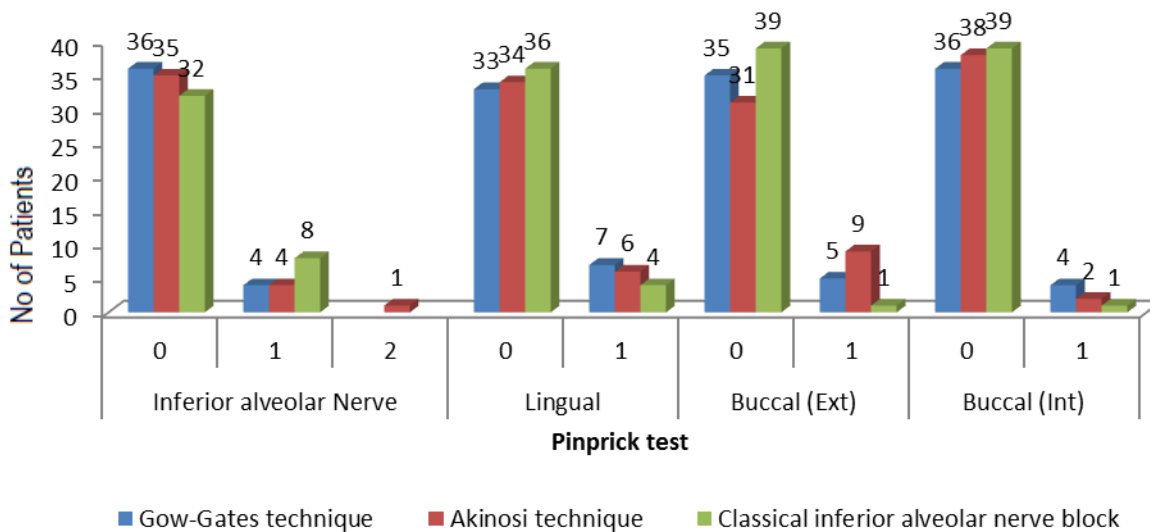
Table 5: Duration for applied technique of mandibular anaesthesia onset of anesthesia(In Minutes).

Method	No. of Injections	Median	Range		Mean	Std Deviation
			Min	Max		
Gates technique	40	70	45	105	69.3	12.92
Akinosi technique	40	55	45	65	54.2	4.01
Classical inferior alveolar nerve block	40	45	40	60	45.83	4.94
Total	120	55	40	105	56.44	12.77

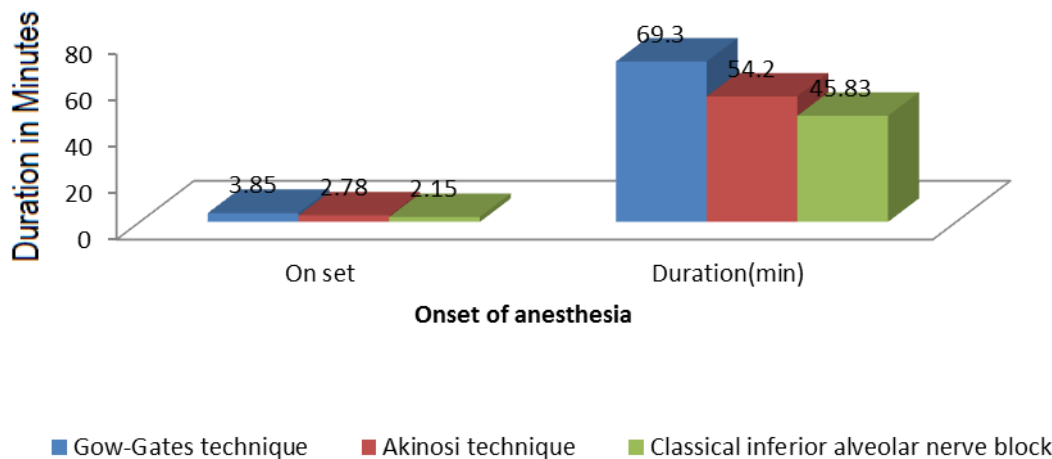
Graph 1: Showing the comparison of level of Pain.



Graph 2: Showing the comparison between results of pinprick test.



Graph 3: Showing the comparison between onset of anesthesia.



the Gow-Gates technique introduced in 1973 and the Akinosi technique introduced in 1977^{2,3}. There has been considerable controversy as to whether the alternative techniques match the reliability and efficiency of the classical inferior alveolar nerve block. This study has been laid down in an attempt to evaluate the merits and demerits of the three techniques in a randomly selected series of patients undergoing extraction of mandibular permanent molar tooth.

MATERIALS AND METHODS

120 patients of both sexes, aged from 16-50 years undergoing extraction of grossly decayed mandibular first molar tooth were selected from the

outpatient door of Institute of dental sciences, Bhubaneswar, India. They were randomly designated into 3 groups with regards to the applied technique of mandibular anaesthesia. Each patient was given injection of 2 ml of 2% lignocaine with adrenaline (1:80,000) using 2ml disposable syringes and a 25 gauge, 1.5 inch needle. The sites of penetration of the needle were dried with sterile gauze and topical antiseptic was applied for all patients. The techniques applied were as follows: Classical inferior nerve block via intra oral approach; mandibular conduction anaesthesia via extra oral landmarks (Gow-Gates); and via the tuberosity approach (Akinosi). All the techniques were performed by a single investigator and

assessed by a single examiner who was unaware of the technique used for the patient.

Clinical assessment

Clinical criterias for the assessment of the applied techniques were as follows: pain during injection; aspiration test; pinprick test; onset and duration of anaesthesia; depth and frequency of anaesthesia.

After insertion of the needle, aspiration was performed and the anaesthetic solution was injected. The patient was instructed to inform examiner of the beginning of numbness of the lower lip, which was regarded as the onset of anaesthesia. Fifteen minutes later, anaesthesia of the tissue innervated by the sensory oral branches of the mandibular nerve was tested using a pinprick on the following areas of the corresponding side: the lower lip; skin of the cheek 2cm laterally from the angle of the mouth, buccal mucosa adjacent to the lower first molar and the dorsal side of the tongue. Insensitivity to a pinprick was assigned 0, incomplete sensation and definite sensation were assigned 1 and 2 respectively.

During dental extraction, the patient was observed and the occurrence of pain if any was noted according to the severity as mild, moderate and severe as experienced by the patient. The need for further anaesthesia was also noted. This provided the information on the depth of anaesthesia. In order to estimate the frequency of anesthesia, patients who did not experience numbness of lip or who had severe pain at the commencement of the extraction procedure were counted as failures. In order to determine duration of anesthesia, patients or patients parent were asked to record the exact time when the anesthesia of lower lip wore off. The results were then tabulated and statistically analyzed using Chi square test (χ^2).

RESULTS

In the present study, evaluation of pain experienced during injection suggested that classical inferior nerve block had greater incidence of pain in respect to Gow-Gates and Akinosi technique (Table 1, Graph 1). Aspiration tests were positive in 19% of total cases. Positive aspiration

was encountered mostly in classical inferior alveolar nerve block technique and the least in Gow-Gates technique.

Pinprick test for the inferior alveolar nerve revealed that the tissue insensitivity was more in Gow-Gates technique as compared to other techniques. Pinprick test was performed in the areas innervated by the lingual nerve, buccal (ext) and buccal (int). The tissue insensitivity was more in classical inferior alveolar technique as compared to other techniques. The pinprick test done along the innervations of buccal nerve (ext) for classical technique presented with 97.5% of tissue insensitivity and 2.5% with incomplete sensation, Gow-Gates presented with 87.5% of tissue insensitivity and 12.5% with incomplete sensation and Akinosi technique presented with 77.5% of tissue insensitivity and 22.5% with incomplete sensation to pinprick. Along the innervations of buccal nerve (int) values for pinprick test for classical inferior alveolar nerve block was 97.5% of tissue insensitivity and 2.5% with incomplete sensation, Gow-Gates technique presented with 90% of tissue insensitivity and 10% with incomplete sensation and Akinosi technique presented with 95% of tissue sensitivity and 5% of incomplete sensation to pinprick (Table 2, Graph 2).

The highest incidence of successful anaesthesia was recorded with Gow-Gates technique (92.5%) followed by Akinosi technique (90%) and Classical inferior nerve block (72.5%) (Table 3).

Onset of anaesthesia recorded with classical inferior alveolar nerve block technique was 2.15min. Onset of anesthesia as recorded for Gow-Gates and Akinosi technique were 3.85minutes and 2.78minutes respectively. The onset of anaesthesia was found to be slower with Gow-Gates technique in comparison with the other two techniques. Duration of anaesthesia was longer in Gow-Gates technique with 69.3minutes while in Akinosi and Classical technique duration of anesthesia were recorded as 54.2minutes and 45.83minutes respectively (Table 4, Graph 3). No complications were encountered during the study, except that one patient who received classical inferior alveolar nerve block had post-extraction trismus where the

patient had undergone atraumatic extraction of the lower first molar

DISCUSSION

Inferior alveolar nerve blocks are routine procedures in dental practice and failure to achieve satisfactory levels of anesthesia often occurs mostly because of anatomical variations or faulty technique. Anatomical variations in the shape and size of the mandible may make accurate location of the mandibular fossa difficult. The width of the ascending rami and their divergence determine the position of the mandibular foramen, which varies accordingly from one individual to another⁴. In addition, failure to achieve anesthesia may also be due to a number of other factors like inadequate dosage of the anaesthetic solutions or presence of supplementary or accessory innervations which may together account for increase in failure of inferior alveolar anaesthesia². As a result of these difficulties, a variety of methods have been suggested for mandibular anaesthesia, with superior results over the conventional direct inferior alveolar nerve block technique.

Complete satisfactory anesthesia has been reported in literatures with a frequency of more than 96% with Gow-Gates technique⁵. Similar results were also reported with Akinosi technique². In the present study, similar results were reported, where in Gow-Gates technique satisfactory anaesthesia was achieved in 92.5 % of cases followed by Akinosi technique with 90% and Classical technique with 72.5%. The significance of performing an aspiration before deposition of anaesthetic solution is to eliminate vascular accidents. The most frequent chances of positive aspiration reported amongst intraoral injections were with the inferior alveolar nerve block at the rate of 10-15%. Malamed S F indicates a very low incidence of aspiration with Gow-Gates⁶ technique and similar value for Akinosi technique by Todorovic and colleagues⁷. The results also reported less chances of positive aspiration with Gow-Gates and Akinosi technique as compared with classical technique which deposits anaesthetic solution near the mandibular foramen.

The results concerning pain during injection were almost identical for all techniques. Experience of pain is unpredictable and perhaps

valid judgement differentiating various techniques. In this study pinprick test was found to be a very reliable method for estimation of anaesthesia achieved. The highest values of inferior alveolar nerve anaesthesia were achieved by Gow-Gates technique while values of lingual and buccal nerve anaesthesia were achieved by classical technique. With regards to onset of anaesthesia, the slowest onset of anesthesia in the study was accounted for Gow-Gates technique in comparison with other methods. Duration of anaesthesia was longer in Gow-Gates technique.

From the present study it was concluded that the Gow-Gates technique is a highly successful alternative to the conventional inferior nerve block with regards to increased success rate, constancy of landmarks, decreased positive aspiration rate, decreased incidence of complications such as trismus, the advantage of one injection to anaesthetize a greater area supplied by the mandibular nerve, longer duration of anaesthesia and less amount of pain experienced during injection.

CONCLUSIONS

Classical technique is the most commonly used technique in dental practice. Classical technique has got its own limitations like delayed onset of action, proper positioning of needle and in trismus or limited mouth opening which creates unfavourable condition for the operator to achieve profound anesthesia. Therefore, other techniques have to be explored to achieve inferior dental anesthesia.

In the present study all the three techniques showed a high rate of success in achieving mandibular anaesthesia. However, the area anaesthetized varied drastically. Maximum area was anaesthetized with the Gow-Gates mandibular nerve block. Therefore, this block can be reserved for cases where a large area of the mandible is involved for surgical procedures. Gow-Gates technique is easy to learn and can be used on a routine basis. The Akinosi technique, despite the decreased visibility, also gave high success rate. Though a variety of mandibular nerve block anaesthesia techniques are available, this study focuses that, these three commonly used techniques are almost equally effective and can be used in

situations which necessitate the particular technique.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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