

Techniques for mandibular block anaesthesia - the practice of Nigerian dentists

*Akadiri OA, Olusanya AA

Department of Oral & Maxillofacial Surgery, Faculty of Dentistry,
University of Port Harcourt, Nigeria.

*Correspondence: Akadiri OA

Email: oaakadiri@yahoo.com

Abstract

Objective: To assess the knowledge and practices of Nigerian dentists in the use of alternative techniques for inferior alveolar nerve block.

Method: A survey was conducted using a self administered structured questionnaire distributed among a cross-section of Nigerian dentists. Participants were to distinguish between four alternative methods of mandibular block anaesthesia namely; Gow-Gate block (GGB), Akinosi block (AB), Vazirani block (VB) and Retromolar block (RB). The questionnaire sought demographic information about participants, types of practice, when and how the dentists received formal teaching on these techniques, how often they used the techniques, and the reasons for conventional block failure they have encountered.

Result: There were 273 respondents comprising 165 (60.4%) males and 105 (39.6%) females within the age range of 24-56 years (mean 34.4 + 6.8 years). Two hundred and forty nine (91.2%) respondents were aware of alternative methods of achieving IAN block but 45 (16.5%) employed alternative techniques in less than 5% of cases, 57 (20.9%) in 5-10% of cases and 12 (4.4%) in more than 10% of cases. Akinosi block was the preferred alternative ($p = 0.045$). Most of the alternative techniques were taught without clinical demonstrations. The relationship between years of experience and encounter with conventional block failure on one hand [$p = 0.126$] and experience and usage of alternative techniques [$p = 0.063$] were not statistically significant. The common causes of conventional block failure highlighted were aberrant anatomy (76.9%), local infection (67%), uncooperative patients (64.8%), trismus (59.3%) and poor technique (56%).

Conclusion: There is a deficiency in the undergraduate curriculum of Nigeria Dental Schools with respect to training in dental anaesthesia. Majority use conventional nerve block routinely while alternative techniques are rarely employed.

Keywords: Inferior alveolar nerve block, local anaesthesia, techniques, dental education

Introduction

Mandibular block anaesthesia (MBA) is the temporary elimination of sensation in the region of the mandible brought about by the administration of local anaesthetic agents to prevent the activities of the inferior alveolar, lingual and long buccal nerves^(1,2). Traditionally, MBA is achieved by injection at two intraoral target sites; the pterygomandibular space for inferior alveolar and lingual nerves block, and the submucosa over the mandibular buccal shelf for the long buccal nerve block. MBA is indicated for restorative or surgical procedures involving a vast area of the lower jaw such as the posterior or multiple mandibular teeth as far as the midline, body of mandible, buccal mucosa anterior to mental foramen, anterior two-third of tongue, floor of the mouth, mandibular lingual soft tissue and periosteum⁽³⁾.

While the technique for long buccal nerve block is relatively simple and straight forward, the conventional technique for achieving inferior alveolar/lingual nerve block requires special skill. This skill is generally taught during undergraduate dental education; hence, it is the first choice

for most clinicians when performing surgical or restorative dentistry in the region of the mandible. Unfortunately, a high failure rate in the range of 15% to 21% has been reported with conventional inferior alveolar block⁽⁴⁻⁶⁾. Such failures have been attributed to various causes which can be broadly categorized into⁽⁷⁾:

- Anatomical causes: accessory nerve supply (mylohyoid nerve, cervical cutaneous nerve C1, C2, auriculotemporal nerve), variable course of the inferior alveolar nerve, variation in mandibular foramen position, bifid alveolar nerve or bifid/ trifold mandibular canal.
- Pathological causes: trismus, infection, inflammation, or previous surgery;
- Pharmacological causes: chronic alcohol abuse, chronic narcotic drug abuse;
- Psychological causes: fear, anxiety, apprehension;
- Technical causes: poor technique, expired agent, wrong armamentarium;

Another drawback for conventional inferior alveolar block is its considerable potential for intravascular injections with attendant cardiovascular, visual and central nervous



systems complications, and the risk of temporary facial nerve paralysis^(1,8,9,10).

Consequent on the foregoing, several alternative techniques of achieving anaesthesia have been described^(7,11). Some of these are local infiltration techniques targeted at individual tooth or localized region. They include intraligamental, intraseptal, intrapulpal and intraosseous techniques which do not produce block anaesthesia. True alternatives to conventional inferior alveolar nerve block so far described include the Gow-Gate block (GGB), Akinosi block (AB), Vazirani block (VB) and Retromolar block (RB) which are capable of producing mandibular block anaesthesia. A literature search showed that these alternative techniques have been adopted either routinely or to circumvent difficulties with conventional block in some dental practices in Europe and America. On the contrary, the learning exposure and use of alternative techniques for MBA among Nigerian dentists is not yet known.

Therefore, in this study, we conducted a survey to assess the exposure of Nigeria dentists to knowledge and skills in the use of true alternative techniques to inferior alveolar nerve block. The objectives were to identify the dentists' experience with conventional inferior alveolar nerve block (CB), to assess the current uptake and application of alternative techniques in clinical practice, and to ascertain the adequacy of undergraduate dental education curriculum with respect to training in dental anaesthesia.

Materials and Method

A cross sectional study was carried out using a self administered structured questionnaire with close-ended questions. The questionnaire was distributed among Nigerian dentists in both public and private practices in three Nigerian cities namely; Port Harcourt, Ibadan and Lagos. Participants were clearly informed that completion and returning of questionnaire was the required evidence of consent.

In terms of content, demographic data like age, gender, type of practice, and years of experience were included, while the questionnaire sought the frequency of encounter with failure of Conventional inferior alveolar nerve block (CB) and how the dentists overcame such difficulty. The questionnaire also contained 12 items of enquiries into the knowledge, exposure and utilization of alternative techniques to conventional block (CB). Participants were to distinguish between four alternative methods of mandibular block anaesthesia namely; Gow-Gate block (GGB), Akinosi block (AB), Vazirani block (VB) and Retromolar block (RB). Each dentist was required to indicate which of the methods was taught during their undergraduate training, and whether the mode of teaching included practical simulation or clinical demonstration. They were also required to indicate which of the techniques they learnt during continuing postgraduate education or by interaction with colleagues, and whether demonstration was involved. It also sought which of the techniques a dentist had applied in his or her clinical practice on at least one occasion. Information collected was analysed using SPSS 17.0 statistical software; descriptive statistics are presented in tabular and chart forms. The association between years of experience in clinical practice and frequency of Conventional block (CB) failure on one hand

and utilization of alternative methods on the other hand were respectively tested. Test of association was accomplished with Fischer Exact test and significance level was established at 95% confidence interval.

Result

Four hundred questionnaires were distributed and there were 273 respondents comprising 165 (60.4%) males and 105 (39.6%) females. The age range of respondents was 24-56 years and mean age was 34.4 ± 6.8 years. Two hundred and sixteen (79.1%) participants were in public practice while 57 were in private practice. All the participants routinely administer inferior alveolar nerve block in their practices and 93.4% had encountered failure to achieve mandibular block anaesthesia at one time or the other..

Table 1: Years of practice experience versus frequency of failure with conventional Inferior Alveolar Nerve (IAN) Block

Years of Experience	Never	Rarely	Occasionally	No. in group
1-5	3(3.7%)	48(59.3%)	30(37.0%)	81(100%)
6-10	9(7.9%)	51(44.7%)	54 (47.4%)	114(100%)
11-15	0(0%)	6(25.0%)	12(75.0%)	18(100%)
16-20	0(0%)	21(63.6%)	12(36.4%)	33(100%)
21-25	0(0%)	3(14.3%)	18(85.7%)	21(100%)

Fischer Exact test {Value= 1,263; P = 0.126}

Table 2: Years of practice experience versus use of alternative techniques for Inferior Alveolar Nerve (IAN) Block

Years of Experience	Akinosi	Vazirani	Gowgate	Retromolar	NUA	Total
1-5	42(51.9%)	0	3(3.7%)	9(11.1%)	46(33.3%)	84(100%)
6-10	62(73.8%)	0	0	12(10.5%)	26(19.0%)	84(100%)
11-15	9(37.5%)	0	0	3(12.5%)	12(50.0%)	24(100%)
16-20	17(51.5%)	0	0	3(9.0%)	13(39.4%)	33(100%)
21-25	5(23.8%)	0	3(14.3%)	3(14.3%)	10(47.6%)	21(100%)

NUA: Never Used Alternatives

Fischer Exact Tests:

{Value = 1.246; P =0.063}for differences between levels of experience

{Value = 7.262; P=0.045}for differences between techniques

Difficulty with Conventional IAN block

When asked how often they failed to achieve IAN block with conventional method, 18(6.5%) respondents said they never experienced failure, 117(42.9%) rarely did, while 138(50.5%) did occasionally. As to how they overcome the failure, majority, 213 (78%) repeat the block until successful (within the limit of acceptable doses) while in 56(20.5%) treatment was postponed to avoid anaesthetic overdose and 4(1.5%) rescheduled under general anaesthesia.

Two hundred and forty nine (91.2%) respondents were aware of alternative methods of achieving IAN block while 24 (8.8%) claimed complete ignorance of any alternative technique. As to the percentage of difficult cases (i.e initial failure with Conventional IANB) that required alternative techniques; 84 (19.8%) dentists were able to eventually achieve anaesthesia after repeated attempts (within acceptable doses) at conventional block in 50 - 75% of cases, 45 (16.5%) employed alternative technique in less than 5% of cases, 57 (20.9%) used alternative techniques in 5-10% of cases and 12 (4.4%) in greater than 10% of cases, while 75(27.5%) did not indicate any response to the question.

Exposure to alternative techniques during undergraduate training

Two hundred and seven respondents (75.8%) out of the 273 were theoretically taught Akinosi block (AB) technique but only 96 (31.2%) had clinical demonstration. Fifty one (18.7%) were taught Retromolar block (RB) technique without demonstration, 51 (18.7%) were taught Gow-Gate block (GGB) without clinical demonstration, while only 15 (5.5%) dentists had learnt of Vazirani technique but never experienced a clinical demonstration.

Exposure to alternative techniques after graduation

After graduation, 45 (16.5%) respondents learnt Akinosi block (AB), 9 (3.3%) learnt Retromolar block (RB), and 81 (29.7%) learnt of Vazirani block (VB) either through interaction with colleagues, continuing medical education, personal study or postgraduate training. On at least one occasion, 135 (49.5%) dentists had used Akinosi technique successfully, 6 (2.2%) had used Gow-Gate technique, 30 (10.9%) used retromolar, none used Vazirani and 63 (23.1%) had never used any alternative technique successfully. Preference for Akinosi block was statistically significant ($p = 0.045$).

Association with practice experience

Dentists who have practiced for over 10 years had encountered failure of conventional IAN block more often (**Table 1**). Only a few with less than 10 years experience never encountered failure with conventional IAN block. However, there does not appear to be a significant relationship between years of experience and encounter with conventional block failure. Likewise, the association of experience (determined by number of years in practice) with usage of alternative techniques (**Table 2**) was also not statistically significant. However, when the differences between the alternative techniques was tested by layered crosstabulation using Fischer Exact test, there was a significant tendency towards the use of Akinosi techniques irrespective of the duration or years of practice experience.

Reasons for failure of conventional block

A list of reasons for failure was provided and respondents were requested to highlight the commonest causes of failure from their personal clinical experience. Aberrant anatomy (210), local infection (183), uncooperative patients (177), trismus (162) and poor technique (153) were the most frequently indicated (**Figure 1**).

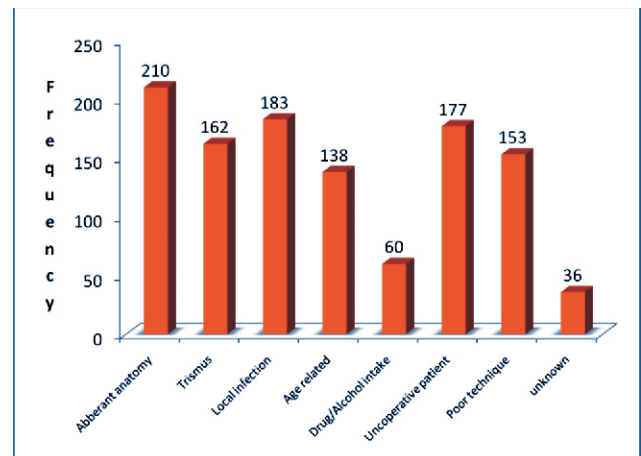
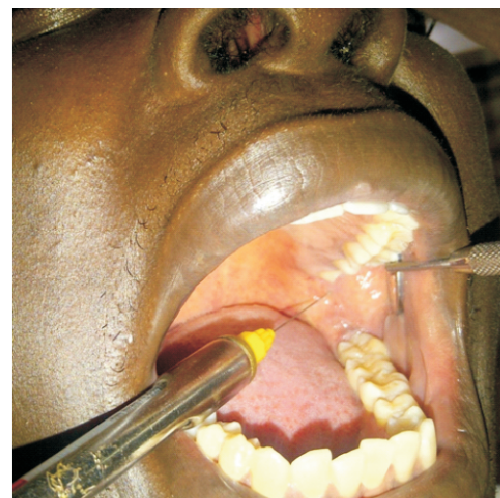


Fig. 1: Reasons for failure of conventional IAN Block



Discussion

Most dentists sometimes encounter failure with conventional inferior alveolar nerve block. Reported failure rates ranged between 8.1% and 21% in the world dental literature⁽¹²⁻¹⁴⁾. Although, the failure rate among Nigerian dentists has not been formally reported, anecdotal experiences shared among colleagues does not suggest a different scenario. Considering that most restorative and surgical procedures in the lower jaw would require mandibular block anaesthesia, failure rate should be minimal.



This study involved Nigerian dentists with varying degree of practice experience ranging from one to twenty four years. Over 93% of the participating dentists indicated to have encountered failed conventional block at varying frequencies. The reasons mostly adduced for these failures are aberrant anatomy, local infection, uncooperative patients, trismus and poor technique. In some foreign practices, some of these obstacles have been overcome by the use of alternative techniques^(7,11). But, how do Nigerian dentists respond to this challenge?

We found that majority would repeat conventional block several times within the limits of acceptable dosages until successful. Otherwise, procedures were usually abandoned or rescheduled; sometimes to take place under general anaesthesia. Conventional block is certainly not the only means of achieving mandibular block anaesthesia but most participants were unfamiliar, uncomfortable or unskillful in alternative techniques, hence the tendency to repeat the conventional techniques over and over again. Repetition involves repeated needle pricks at the same site and penetration through fibres of the medial pterygoid muscle which could result in post-injection pain and trismus^(7,12). The rich vascularity of the pterygomandibular space could also predispose to haematoma formation^(1,15). Going by the current survey, one might infer that only few dentists in Nigeria perform successful alternative techniques.

Practical skill is naturally a function of exposure and training; so, one would expect that if properly trained in the use of different alternative techniques during undergraduate education, a dentist would be confident to use any of the techniques, if not routinely, at least, when indicated. Johnson et al⁽¹¹⁾ conducted a survey of dental graduates of the Harvard School of Dental Medicine classes 2000 through 2006 to find out their primary means of achieving mandibular anaesthesia. All subjects received clinical training in the conventional inferior alveolar nerve block and two alternative techniques (the Akinosi mandibular block and the Gow-Gates mandibular block) during their undergraduate dental education. The authors found that conventional block was mostly utilized, while an average of 47.5% of the graduates never used Gow-Gate and an average of 72.3% never used Akinosi techniques. It would seem therefore that dentists are generally more comfortable with conventional block. Unequal emphasis during undergraduate training or perceived technical ease with conventional block might have made the latter the preferred choice while alternatives are reserved for difficult cases.

This study revealed that an average Nigerian dentist was not adequately taught the alternative techniques of local anaesthesia administration. Akinosi block (AB) was the most frequently taught alternative as indicated by 75.8% of participants. However, the teaching appeared deficient since only 31.2% was exposed to practical simulation or clinical demonstration of the technique; teaching was mostly theoretical. Worse still, trainings in Gow-Gate, Vazirani and Retromolar block techniques were alarmingly poor and practically non-existent during undergraduate training. Although, there appeared to be an increase in knowledge during postgraduation years of practice, this occurred via informal interactions, continuing medical education or formal postdoctoral training. Usually, practical demonstration was not involved; hence, the exposure might not translate to skill acquisition.

The observation from the result of this study is that neither the frequency of failure of conventional block nor utilization of alternative techniques showed significant statistical association with the duration of practice experience. Although dentists who have practiced for a longer period admitted to failure more often than those with fewer number of practice years; this assessment however did not include the learning curve of each participant during undergraduate training. The observation suggests that every dentist, irrespective of length of practice, requires training and retraining in skills that enhance quality clinical outcomes such as adequate anaesthesia for pain free dentistry.

The Gow-Gate, Retromolar, Akinosi and Vazirani techniques provide a rich armamentarium of learnable skills a practicing dentist should desire. Although each of them possesses specific indications, any one could be applied in all situations where Mandibular block anaesthesia (MBA) is indicated. The Gow-Gate block (GGB) was primarily developed to circumvent the high failure rate and to reduce the potential risk of complications associated with conventional block (CB)^(2,6). Although, it has also been associated with the risk of intravascular injection into the internal maxillary artery⁽¹⁵⁾. The Retromolar technique, also called retromolar triangle block, is mostly indicated in individuals with bleedings diathesis such as haemophiliacs^(16,17) while both Akinosi and Vazirani techniques are particularly favoured in the scenario of trismus^(7,18). In fact, recent literature regard these two techniques as one method, now referred to as Vazirani-Akinosi block (VAB)^(7,18). Although the techniques were described by separate authors from different geographical locations and at different times, the procedures and targets are essentially the same, the only difference being the level of approach and point of penetration. It is noteworthy that the alternative techniques have several merits and demerits, the knowledge of which could guide a dentist in deciding the optimal choice per case per time.

In conclusion, this study involving a cross section of Nigerian dentists has revealed a deficiency in the undergraduate curriculum of Nigeria dental schools with respect to training in dental anaesthesia. The majority used conventional nerve block and, alternative techniques are rarely deployed even in the scenario of difficulty or failure to achieve anaesthesia with conventional block techniques. Therefore, it might be necessary to give equal emphasis to both conventional block and alternative techniques and to incorporate learning opportunities via practical simulations and clinical demonstration of skills as well as hands-on rehearsals for clinical year dental students and in postgraduate dental education.

References

1. Robinson PD, Ford TRP, McDonald F. Local anaesthesia in dentistry. Wright, Woburn MA, 2000.
2. Kafalias MC, Gow-Gates GAE, Saliba GJ. The Gow-Gates technique for mandibular block anesthesia: a discussion and a mathematical analysis. *Anesth Prog* 1987;34:142-149.
3. Scheinfeld NS, Nerve Block, Inferior Alveolar. Updated May 17, 2009 available at www.emedicine.com. Accessed Feb 22, 2011.
4. Malamed SF: The Gow-Gates mandibular block. *Oral Surg* 1981; 51:463-467.



5. Yamada A, Jastak JT. Clinical evaluation of the Gow-Gates block in children. *Anesth Prog* 1981; 28:106-109.
6. Sisk AL. Evaluation of the Gow-Gates mandibular block for oral surgery. *Anesth Prog* 1985; 32:143-146.
7. Madan GA, Madan SG, Madan AD. Failure of inferior alveolar nerve block - Exploring the alternatives. *J Am Dent Assoc* 2002; 133:843-846.
8. Zenouz AT, Ebrahimi H, Mahdipour M, Pourshahidi S, Amini P, Vatankhah M. The incidence of intravascular needle entrance during inferior alveolar nerve block injection. *J Dent Res* 2008; 2:38-41.
9. Arian F. *Oral Surgery Handbook*. Tehran: Noor-e-Danesh 2000, 142-143.
10. Webber B, Orlansky H, Lipton C, Stevens M. Complications of an intra-arterial injection from an inferior alveolar nerve block. *J Am Dent Assoc* 2001; 132:1702-1704.
11. Johnson TN, Badovinac R, Shaefer J. Teaching alternatives to the standard inferior alveolar nerve block in dental education: outcomes in clinical practice. *J Dent Educ* 2007; 71:1145-1152.
12. Malamed SF. Techniques of mandibular anesthesia. In: *Handbook of local anesthesia*. 4th ed. Noida, India: Harcourt Brace; 1997, 193-219.