

**RATIONALE USE OF ALTERNATIVE
TECHNIQUES AFTER FAILED INFERIOR
ALVEOLAR NERVE BLOCK AMONG GENERAL DENTAL P
RACTITIONERS IN RURAL SOUTH INDIA – A
QUESTIONNAIRE BASED STUDY**

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Abstract:

Background: A “successful oral nerve block” is the key for a painless dental practice. The present study is aimed to report the use of alternatives after a failed block and explore the limitations for their use in their routine dental practice, despite the training received during the undergraduate period.

Methods: A tailor made structured questionnaire was designed and its validity determined using principal component analysis and internal consistency was reviewed with a Cronbach’s Alpha value of 0.7. Data obtained was subjected to statistical analysis.

Results: Out of 600, 444 (74%) responses considered. 56.8% of the practitioners reported a failure of block during the first attempt necessitating the use alternatives. Administration of second block at the same region by 64.7% practitioners and Gow-Gates (2.3%), Vazirani Akinosi (4.9%) are reported. A significant correlation ($p=0.03$) was found with respect to the experience of the practitioner and use of mandibular Anaesthesia techniques.

Conclusion: Unlike an institutional based practice, the Mandibular nerve blocks are rarely used, despite their higher demonstrated success rates. It should be a continuous process of learning to self assess their techniques and implement evidence-based practices into their routine dental practice for the benefit of the patient.

Key words: Inferior alveolar nerve block; Gow Gates and Vazirani-Akinosi Mandibular nerve block techniques.

Introduction:

A Dental practitioner's ability to inject painlessly and deliver painless treatment is considered a success by the patient. Pain from the orofacial structures is annoying and poses an unpleasant feeling. Among these, dental pain is excruciating and psychologically disturbing to the patients, leaving a significant impact on their daily activities. Management of these painful conditions requires the treatment of the involved teeth, wherein it requires the administration of local anesthetics to alleviate intraoperative pain during treatment.^[1]

One of the simple and effective ways to manage intraoperative pain is through administration of an oral nerve block. Halsted technique, also called the conventional inferior alveolar nerve block (IANB) technique, is the most widely used to achieve anaesthesia in one half of the mandible by dental practitioners worldwide. However, due to varying reasons, this nerve block, even when executed by experienced clinicians, is reported to have a failure rate of 15-20%.^[2] The most annoying aspect for any patient will be to bear the pain throughout the procedure because of a failed nerve block, which will be distressing to both the patient and the operator.

A nerve block is considered “failed”, if the patient continues to complain pain or presence of unpleasant sensation even after administration of Local anesthetic.^[3] The present study is aimed at assessing the incidence of failure, use of various alternatives and their application in routine dental practice after a failed conventional IANB among General Dental Practitioners.

Methodology:

A tailor-made structured questionnaire was designed and distributed through Google forms to 600 general dental practitioners. The questionnaire was non-anonymous and treated as per the

principles of Helsinki Declaration. It's validity was determined using principal component analysis and internal consistency was reviewed with Cronbach's Alpha value of 0.7.

The questionnaire was mailed, with appropriate instructions about each section in the form before starting the survey. The study period was between October 2019 to January 2020. In the present study, the Halstead technique was considered to be the conventional technique to administer IANB.

Structure of the questionnaire:

The questionnaire consisted of three sections, with a total of 17 questions.

The first section included demographic data, academic qualification, years of experience in dentistry, and the most common procedures for which IANB is administered in their routine dental practice and the encountered failure rate during the first attempt, every time on a patient.

The second section included questions to assess their knowledge about conventional IANB and other alternative techniques like Gow - Gates, and Vazirani-Akinosi.

The third section is regarding the common alternatives used after a failed conventional IANB, and their incidence of application in the routine dental practice and finally regarding the implementation of any measures to update their knowledge and recent trends.

All the obtained data were subjected to descriptive analysis using SPSS software and chi-square tests with a significant criterion of $p= 0.05$.

RESULTS:

Out of 600, 496 (82.6%) responded. After excluding the incomplete forms (52), 444 (74%) responses were considered for assessment. Among the total practitioners responded, 312 (70.3%) were General Dental practitioners holding a Bachelor's Dental (BDS) degree, and 132 (29.7%) were holding Masters Dental (MDS) degree as shown in Figure 1(a) and 281 (63.4%) were males, and 163 (36.6%) were female practitioners. Experience of the general dental practitioners ranged from more than 10 years for 109 (24.5%), 5 to 10 years for 130 (29.2%), and less than five years for 205 (46.3%) after their graduation.

The procedures for which practitioners administer IANB in their routine dental practice is depicted in Figure 1(b). All the practitioners were aware of the conventional IANB technique, and it is being used routinely in their general Dental Practice. 94.7% of the practitioners were aware of alternative techniques to administer IANB (Gow-Gates and Vazirani-Akinosi techniques). However, only 4.3% were using them in their routine dental practice as an alternative to achieve anaesthesia in the mandible after the failure of the conventional technique

There was no significant difference ($p=0.12$) noticed regarding the knowledge about the various Mandibular nerve block techniques among the practitioners. Percentage variations in the knowledge of the practitioners towards conventional IANB, Gow -Gates and Vazirani-Akinosi are shown in the Figure 2(a).

On the other hand, only 36% of the practitioners always palpated for the anatomic landmarks before administering the block; 50% palpated occasionally, and 14% never palpated the landmarks before administering the conventional IANB.

On assessing their Knowledge, To the question on the Amount of anesthetic solution to be deposited for a conventional IANB, practitioners responded as 2 ml (58.8%), 2.5 ml (28.4%), 3 ml (11.5%) and 4ml (1.3%) irrespective of the clinical procedure planned.

In the present study, 56.8% of the practitioners have reported a failure of the block during the first attempt necessitating the use of second block or alternative techniques. 34.9% of the practitioners have occasionally faced failure, and 8.3% of them have never reported a failure. A nerve block is considered failed when the patient experiences pain, which may be either subjective or objective in origin during the treatment.

Regarding the onset of subjective symptoms after a conventional IANB, 40.5% of dentists have strongly agreed that achieving subjective symptoms is the key indicator, whereas 56.8% have just agreed, and 2.7% have disagreed. However, even after achieving subjective symptoms, 9% of the dentists always required a second block to achieve pulpal anesthesia, 87% occasionally, and 4% of them never required a second administration.

The use of various alternative techniques in the routine dental practice as reported by the practitioners is depicted in the Figure 2(b).

Only 2.3% of the practitioners have used Gow-Gates, and 4.9% Vazirani Akinosi in their practice whenever required as alternative techniques. This use is more reported by the practitioners with an experience of less than 5 years rather than more experienced practitioners with a statistically significant value of $p=0.03$.

The reason for not using the other mandibular nerve block techniques, other than conventional, was due to lack of expertise as responded by 78.6% of the practitioners, followed by a lack of knowledge and a lack of confidence, 19%, and 2.4%, respectively as shown in Figure 3(a).

None of the practitioners have used intraosseous technique. Interestingly, 6.3% of the practitioners have reported using a different anesthetic agent while administering alternative techniques, while 93.7% have used the same solution

The final question aimed to assess the attitude of the Practitioners towards measures taken to ameliorate their knowledge on alternatives, 69.2% have stated "No", and 30.8% have said "Yes" as in Figure 3(b). The distribution of replies is shown in the Table I.

Discussion:

The conventional IANB technique proposed by W.S.Halsted in 1884, is the most widely administered nerve block method in the clinical dental practice globally to anesthetize a wide anatomic area of the mandible. Despite its advantages, it is technique sensitive with a failure rate of 15-20%, even when performed by an experienced dental surgeon.^[4]

Various operator, patient and anatomical factors have been attributed for this failure in the literature. The most common Patient factors, given due consideration are the psychological factors,^[5] and infection or inflammation at the local area.^[6,7]

The anatomic factors being, altered location of mandibular foramen, like in retrognathic (14.5%) and prognathic mandibles (9.5%),^[8] presence of accessory nerve supply from the auriculotemporal, mylohyoid, cervical cutaneous nerve C1, C2, ^[9,10], innervation of long buccal and great auricular nerve through the retromolar foramen, contralateral innervation of the anterior teeth and the existence of a bifid mandibular nerve in 0.35–1% of patients.^[11,12] They are difficult to overcome because of unpredictability.

The operator factors that influence the failure rate are improper or poor technique, inadvertent intravascular injection, and inadequate anesthetic solution.^[13] These can be overcome with knowledge and practice unlike other factors. However, the conventional IANB technique's,

sensitivity lies in determining the three standard parameters based on specific anatomic landmarks in the mandible, the height of injection, anteroposterior plane of injection, and the depth of penetration as described by Malamed. An appropriate technique for the conventional IANB involves determining the height of injection by establishing an imaginary horizontal line along with the coronoid notch, the anteroposterior plane of injection, i.e., the presence of mandibular foramen at a three-fourths distance from the anterior border of the ramus of the mandible, approximately located 2.75mm posterior to the vertical midline of the ramus of the mandible and penetrating the needle to a depth of 20-25mm.^[14] This technique necessitates considering the anatomic landmarks before depositing the solution in the vicinity of the nerve, just before it enters into the mandibular foramen on the medial aspect of the ramus of the mandible, failing which predisposes an unwarranted failure.

In a study conducted by Kriangcherdsak et al., reported an increase in failure rate by 33.3% among 106 dental practitioners who administered the conventional IANB block for the first time, without localization of anatomic landmarks when compared to the practitioners localizing them.^[15] In the present study, 14% of the practitioners stated that they never palpated the anatomical landmarks before administering IANB, which should be of serious concern, also a factor contributing to the failure of the nerve block.

In the present study, 56.8% of the practitioners reported a failure of the anaesthesia, during their first attempt on a patient necessitating the use of second block or other alternative techniques. This can be attributed to the fact that the most common procedure to administer IANB in the General Dental Practice is an endodontic procedure carried out in irreversible pulpitis cases. A systematic review conducted by Meric et al. referred to a failure rate of a single injection of local anesthetic for IANB in patients with irreversible pulpitis ranging between 30 and 90 percent.^[16]

From the observations made in the present study, practitioners, to overcome this failure, have administered higher amounts of the local anesthetic solution during the first injection ranging from 2.5 ml to 4 ml. The use of an initial bolus of the solution has demonstrated to have the potency to spread around the nerve effectively, covering the maximum length of the nerve.^[17] Despite this advantage, one should keep in mind not to breach the maximum recommended dosage levels of local anesthetic with adrenaline solution in a cardiovascular compromised patient, which is limited to 0.04 mg per day. The unexpected high serum concentration of this solution may cause acute cardiac and neurotoxicity, leading to a series of events categorized under local anesthetic systemic toxicity (LAST).^[18]

Pertaining to the use of alternative techniques after failure, 64.7% of the practitioners repeated the conventional IANB block at the same level, while 23.6% practitioners, at a slightly higher level. Kanaa and others have reported only a 32% success rate with the conventional IANB repeated at the same level, and with the same solution, while only 23.6% success rate when deposited at a slightly higher level.^[19] Although this is effective in a few cases, repeated needle pricks in the same region may lead to trismus and severe inconvenience to the patients.^[20]

However, practitioners also reported the use of other alternative injection techniques like buccal/lingual infiltrations (47%), intrapulpal (48.1%), or periodontal (5.4%) injections in the present study.

Use of Buccal infiltration, as an alternative in the mandible after a failed IANB is gaining popularity especially with the advent of 4% Articaine, due to its rapid diffusion through the soft and hard tissues. Haase et al. reported that, 4% articaine was more effective than 2% Lignocaine, as buccal infiltration for endodontic procedures on symptomatic mandibular first

molars after a failed IANB. Buccal infiltration techniques in the mandible have been reported to have success rates ranging from 24 to 84%.^[21,22]

Interestingly, in the present study, 6.3% of the practitioners have reported the use of different anesthetic agent while administering alternative techniques, assuming that the most commonly used local anesthetic being lidocaine. A systematic review conducted by Seema et al. suggested articaine as an alternative to lidocaine due to its various benefits.^[21]

Unlike other alternatives, the use of intrapulpal injection is only limited to endodontic procedures or open extractions where the pulp is directly encountered. The analgesia attained is attributed to the pressure that develops within the pulp chamber irrespective of the solution used.^[7]

Other less commonly used alternatives include intraligamentary and intraosseous techniques. Intraligamentary technique involves an impulsive injection of 0.2 ml local anesthetic using a computer-controlled device or equally effective 27 gauge needle into the periodontal ligament space through the crestal bone.^[21] Shabazfar et al., in a meta analysis concluded that intraligamentary injection could be a successful alternative to failed IANB, with minimal systemic toxicity and being least painful on injection.^[23]

In contrast, the intraosseous technique requires special equipment or drilling into the cortical bone to gain access into the intramedullary space to achieve anesthesia posing difficulties in the regular dental practice. This technique is avoided in severe periodontal disease, due to the fear of fenestrations and secondary infections.^[24]

Gow- Gates (2.3%) and Vazirani Akinosi (4.9%), also called Mandibular nerve block techniques, are reported to be used very less often in the routine dental practice.

The Gow-Gates technique, introduced in 1973, is considered the choice of mandibular nerve block in cases where accessory innervation could be the reason for failure. A single injection of 1.8ml of anesthetic solution, deposited on the lateral aspect of the condylar neck of the mandible, considering both extra oral and intraoral landmarks, can block the entire course of the Mandibular nerve.^[25]

The Vazirani - Akinosi technique, also called a closed-mouth mandibular nerve block, was introduced in 1960. It is a preferred technique in patients with limited mouth opening to anesthetize the entire Mandibular nerve on ipsilateral side. It is a simple technique compared to the Gow-Gates and depends on a single anatomic landmark with no bony contact.

Both techniques involve depositing the anesthetic solution at a higher level compared to the conventional IANB. This drives the gravitational flow of the solution along the nerve, bathing it for a longer length. Hence, they can be used successfully in cases of inflammation or infections involving the local area.

Studies conducted by Rini et al and Saatchi et al, concluded that Gow - Gates when used alone or in combination with conventional IANB had higher success rates (66.7%) when compared to Vazirani - Akinosi (60%) and conventional techniques (44%) administered individually.^[26,27]

Even though the success with the Mandibular nerve blocks techniques is reported to be high, they are very rarely used in the General Dental Practice. Their practice is more successfully reported by the speciality practitioners. The obtained results in the present study have shown that although there are no significant differences in the knowledge related to various alternative Mandibular nerve block techniques, It is the lack of expertise and inhibitions to adopt "technique sensitive" methods by the practitioners that makes them "less often used".

Recent additions to the alternative techniques proposed in the literature to overcome the failure of IANB are use of premedication in conjunction with the conventional technique, modified inferior alveolar nerve block techniques proposed by Nooh et al., Palti et al., and Thangavelu et al., to improve on the overall success rate of IANB.^[28,29,30] A summary of the alternatives from the literature is presented in Table II.

Conclusion:

Although diverse alternatives to the inferior alveolar nerve block are proposed, practitioners should explore the more suitable, and successful techniques. General Dental practitioners should spend sometime from their busy schedules to explore the literature for recent trends and modifications in the standard techniques for better outcome. It enables practitioners to provide exceptional and more satisfying treatment to the patients, as ineffective analgesia may turn the treatment into a traumatic experience. It should be a continuous process of learning to self assess their techniques and implement evidence-based practices into their routine dental practice.

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Table I : Distribution of replies given by the practitioners

	Always	Rarely	Never
Do you palpate the landmarks before administration as per the conventional IANB technique	36% (160)	50% (222)	14% (62)
Have you encountered failure of block during first attempt on a patient while performing procedure	56.8% (252)	34.9% (15)	8.3% (37)
Even after achieving subjective symptoms have you required to administer second block	9% (40)	87% (386)	4% (18)
	Agreed	Just agreed	Disagreed
Achieving subjective symptoms is key for a successful nerve block	40.5% (180)	56.8% (252)	2.7% (12)

Table II: Summary of Alternative techniques after a failed conventional IANB from the literature

Alternative techniques	Indications
Alternative solutions to lignocaine	
Articaine	Infiltration in irreversible pulpitis
Mepivacaine	Local inflammation is the reason for failure
Alternative techniques to conventional IANB	
Nooh et al	Could be used for all clinical procedures
Palti et al	Could be used for all clinical procedures
Thangavelu et al	Could be used for all clinical procedures
Mandibular nerve block techniques	
Gow Gates	Used in all clinical procedures where infection/ inflammation at local area is a factor

Vazirani-Akinosi	Trismus
Supplementary injection techniques	
Buccal infiltration techniques	In addition to IANB techniques, useful in anterior mandible
Periodontal ligament injection	Pulpitis
Intrapulpal injections	In pulpal procedures
Use of premedication	
Ibuprofen and other NSAID's	Ibuprofen, ketorolac, Lornoxican, Aceclofenac, piroxicam. Symptomatic irreversible pulpitis cases/ local inflammation
Acetaminophen - if NSAIDS's contraindications	If NSAID's are contraindicated, in irreversible pulpitis cases/ local inflammation
Opioids	Tramadol, Meperidine. If NSAID's are contraindicated and to reduce anxiety

Nitrous oxide and other sedatives - apprehensive patients Oral ketamine	Triazolam, Aprazolam, Psychological factors has a role in failure of conventional block Irreversible pulpitis cases and to reduce postoperative pain
Additives to LA solution	
Addition of clonidine to lignocaine	Irreversible pulpitis

Figure 1: (a) Educational qualification of respondents **(b)** Most common procedures for which IANB was administered in the routine dental practice

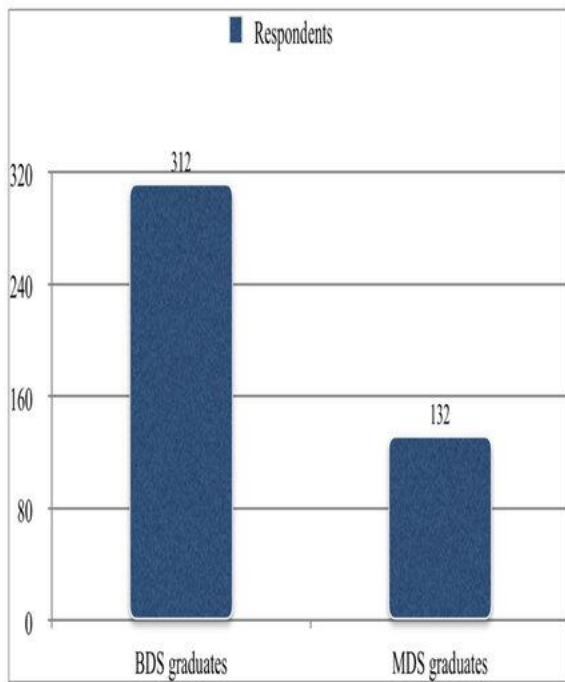


Figure 1(a)

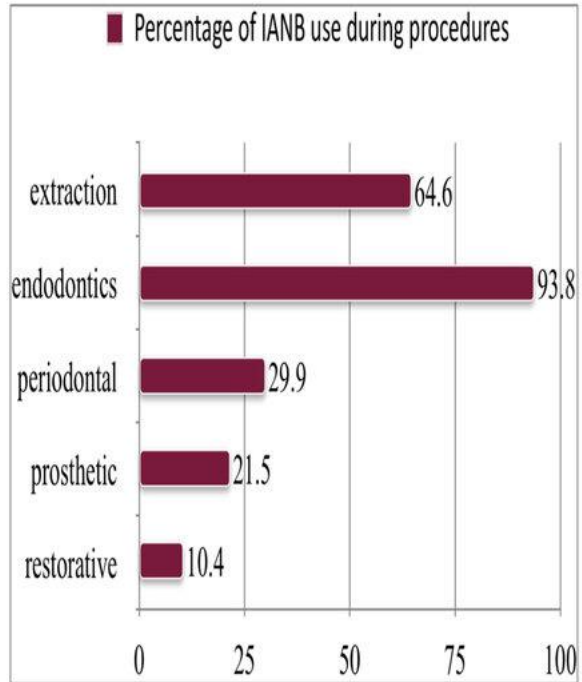


Figure 1(b)

Figure 2: (a) knowledge of the respondents about various Mandibular anesthetic techniques
(b) Use of various other alternative techniques to conventional IANB in the routine dental practice

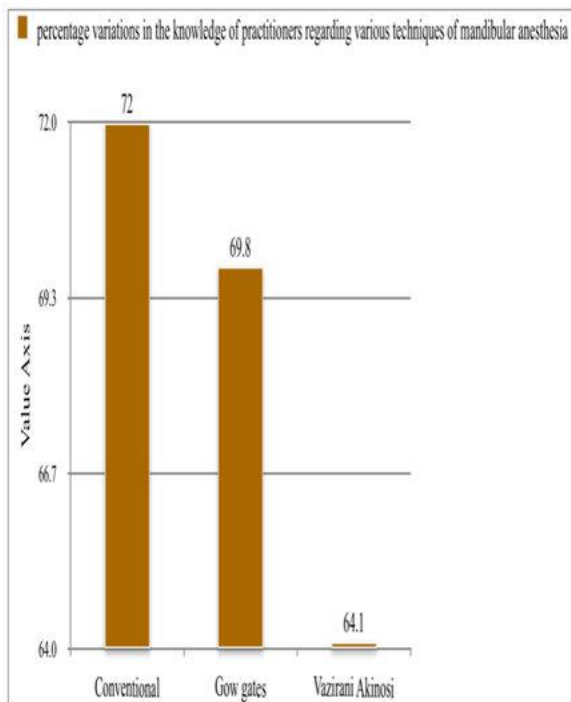


Figure 2 (a)

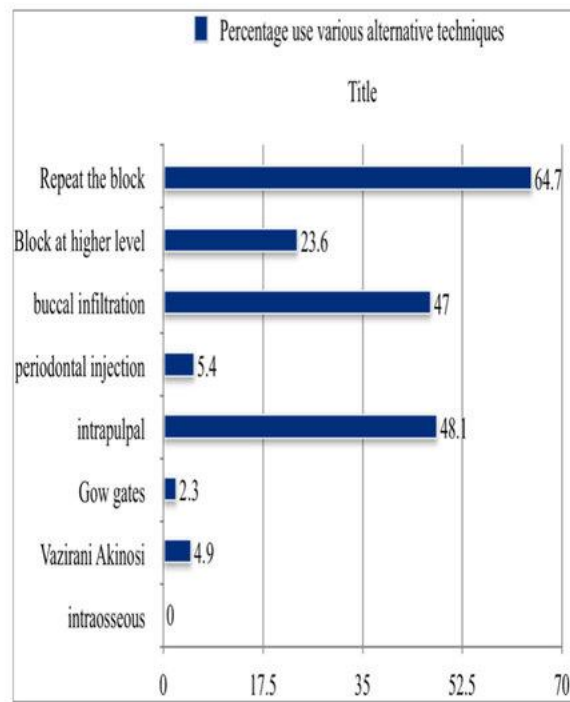


Figure 2 (b)

Figure 3: (a) Reasons given by the respondents for not using other successful alternative techniques in their routine dental practice (b) Number of respondents attempted to include evidence based practice by referring to literature

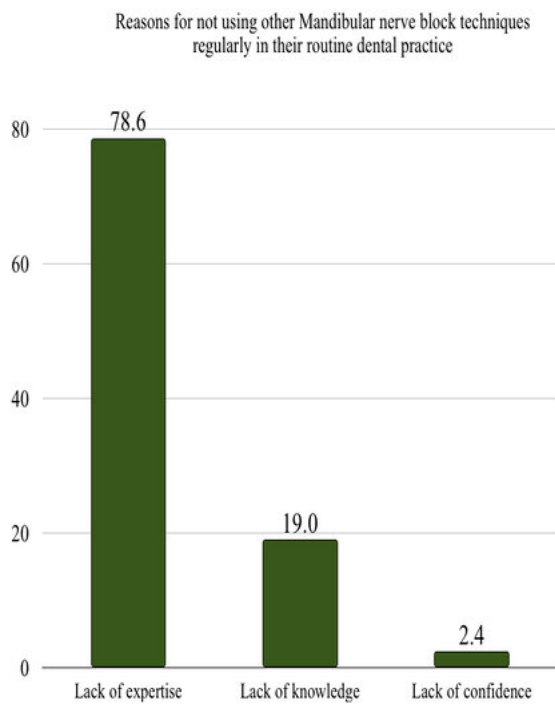


Figure 3 (a)

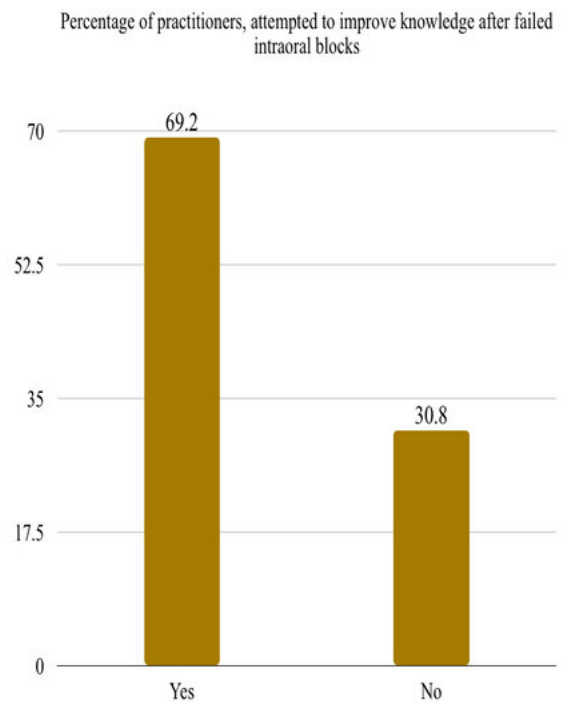


Figure 3(b)