Greater Auricular Nerve Infiltration: An Effective Way To Control Per-Operative Pain During Mandibular Third Molar Surgery

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ABSTRACT

Objective: To evaluate the efficacy of Greater Auricular Nerve infiltration (GANI) along with conventional Inferior Alveolar Nerve Block (IANB) in reducing pain during mandibular third molar surgery.

Study Design: Quasi-experimental study

Place and Duration of Study: Military Dental Centre Quetta, Pakistan from Jun 2020 to May 2021.

Methodology: One hundred patients recruited as per the inclusion criteria were divided in two groups. Group-A received inferior alveolar nerve block and greater auricular nerve infiltration, and Group-B received inferior alveolar nerve block only. Surgical removal of mandibular impacted third molar was carried out using same technique. Per operative pain score was recorded on visual analogue scale of 0-10. Data was analyzed using Statistical Package for Social Sciences (SPSS) version 23. Chi square test was applied to compare presence/absence of pain while independent samples t test was used to compare mean pain scores between the study groups. The p value <0.05 was considered significant.

Results: Majority of the subjects (53%) had Class II impactions while 17% subjects had Class III impactions. Meantime taken for surgical procedure was 21.67±5.59 mins A higher percentage (70%) of subjects in Group-A reported an absence of pain during the surgical procedure in comparison to 12% subjects in Group-B (p<0.001)

Conclusion: Use of Greater Auricular Nerve anesthesia along with conventional IANB results in better per-operative pain control in mandibular third molar surgery.

Keywords: Impactions, Nerve infiltration, Per-operative pain, Third molar.

INTRODUCTION

Administration of local anesthesia is the most frequently performed procedure for minor oral surgery. Moreover, mandibular third molar surgery is a commonly performed minor oral surgical procedure worldwide.[1] Inferior alveolar nerve block (IANB) along with the lingual and long buccal nerve block is the commonly used anesthesia for this procedure. But per operative pain is still an area of concern for many patients. The dilemma is that despite using correct technique for IANB, it is disconcerting to encounter failed anesthesia during procedure.[2] Success rate of conventional IANB is 80-85%.[3] This sub-optimal anesthesia after IANB results in varying degree of per-operative pain and discomfort, anxiety and hence, decreased patient cooperation during surgery. Therefore, this sub-optimal efficacy of inferior alveolar nerve block for lower third molar surgery needs to be augmented for per-operative pain control with some other methods.[4]

The causes of incomplete anesthesia for third molar surgery are variable. These factors include patient anxiety, local inflammation and presence of abscess,incorrect technique, efficacy of local anesthesia solution, change in ramus anatomy and altered mandibular foramen.[5] In addition, altered nerve resting potential, anesthetic-resistant sodium channels and central core theory are some other possible explanations for failed anesthesia. However, accessory innervation theory may be the most appropriate reason. Posterior mandible has been found to be innervated by branches of cervical plexus, mainly transverse cervical and greater auricular nerve. The great auricular nerve (GAN) is a cutaneous branch of the cervical plexus originating from the C2 and C3 spinal nerves. It is the accessory nerve supply to the angle of the mandible. According to a study by Ella *et al*. in 2014,[6] GAN reached the angle of mandible in 95-

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98% fresh human cadavers. It innervates the skin over the external ear, the angle of the mandible and the parotid gland.

Cases refractory to routine inferior alveolar nerve block could be treated successfully by a combination of greater auricular nerve block and inferior alveolar nerve block. The use of GAN infiltration combined with IANB can be used for intra operative pain control in terms of intensity and duration and to manage constant dull background pain.

The objective of this study was to evaluate the efficacy of greater auricular nerve infiltration (GANI), when used in combination with IANB and to compare the outcomes of these two techniques for mandibular third molar surgery.

METHODOLOGY

The Quasi-experimental study was conducted at Military Dental Center, Quetta from June 2020 to May 2021. Approval of the Ethical Review Committee (ERC ref no: 2133/MDC/Trg/OMFS/08-2020) was obtained. Sample size was calculated using Epitools sample size calculator.7 Keeping confidence level (1-α) at 99%, power of the study (1-β) at 99%, Proportion of pain-free surgery in Group I (IANB + GANI) at 81% and Proportion pain-free surgery in Group II (IANB alone) at 35%,8 a total sample size of 98 was calculated, which was rounded off to 100, with n=50 in each group.

Inclusion Criteria: Patients of either gender with age ranging from 18 to 60 years presenting to Dental Outpatient Department with complaint of pain and/or swelling due to impacted mandibular third molar were included in the study.

Exclusion Criteria: Pregnant females, patients having known allergy to lignocaine with adrenaline local anesthetic injection, acute pericoronitis and patients with acute pulpitis of adjacent molar, were excluded from the study.

The selected patients were randomly allocated to either Group-A (IANB combined with greater auricular nerve anesthesia) or Group-B (IANB alone). Figure 1 shows the phases of the study.

After informed written consent of the patients and necessary pre-operative investigations, the surgical procedure was performed giving 1.6 ml of 2% Lignocaine with Adrenaline 1:1,00,000 for IANB, 0.2 ml for lingual nerve and 0.2 ml for long buccal nerve in Group-B patients. IANB and long buccal nerve block was given by traditional technique. Group-A

subjects were given additional 0.2 ml of 2% Lignocaine with Adrenaline 1:1,00,000 for intra-oral greater auricular nerve (GAN) infiltration. For GAN infiltration, the finger of the opposite hand was placed at the angle of mandible extra orally, needle was inserted along second molar and directed towards angle of mandible. As the tip of the needle was felt at the angle of mandible region, it was drawn slightly back and local anesthesia infiltrated for GAN. Local anesthesia was given by one operator, and procedure was performed by another operator who did not know the type of anesthesia used. This was done to reduce bias in the study. The time of surgery was recorded in minutes (mins.) starting form incision to completion of sutures. The surgical procedure was same for both groups. Post-operative instructions were given to the patients. Then pain scores were graded on visual analog scale (VAS) of.[0-10]
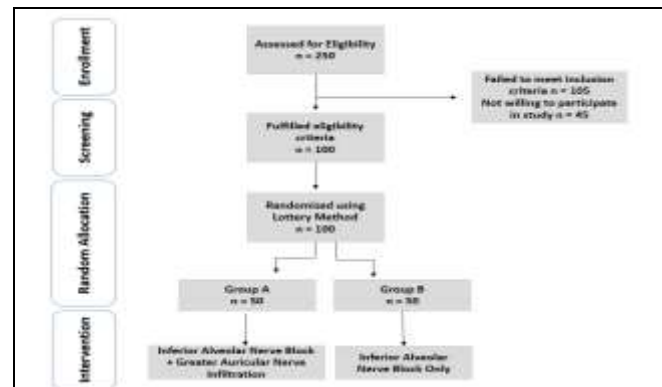

Figure-1: Flow Chart Showing Subject Selection and Randomization as Per Study Protocol

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 23. Mean and standard deviation were calculated for numerical data like age and duration of surgery. Frequencies and percentages were calculated for gender, impaction classification and intensity of pain during surgery. Chi square test was applied to compare per-operative pain experience between the study groups. The p-value≤0.05 was considered significant.

RESULTS

Of the hundred study subjects, 58(58%) were females and 42(42%) were male. Group- A comprised of 27(54%) females and 23(46%) male subjects. Whereas in Group-B, there were 31(62%) female and 19(38%) male subjects. Mean age of the study subjects was 28.86±8.17 years (range: 17-56 years).

Majority of the subjects (53%) had Class II impactions while 17% subjects had Class III

impactions (Figure 2). For most of the subjects (n=61), surgical procedure was completed in 16-30 mins, while for 12 subjects, surgical procedure took more than 30 mins. Meantime taken for surgical procedure was 21.67±5.59 mins. (Range: 15-38 mins.). Details of procedure time taken according to impaction class are given in Table-I.
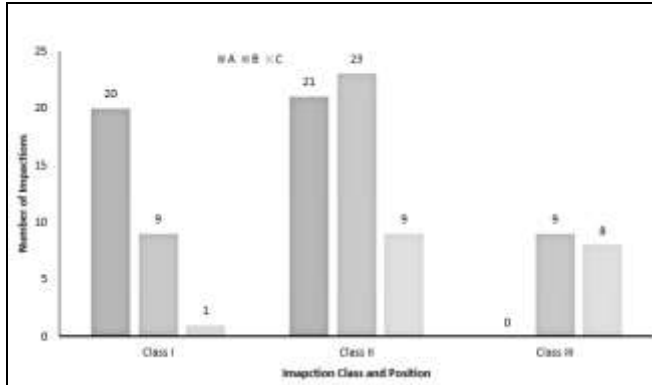

Figure-2: Class Wise Distribution of Mandibular Third Molar Impactions in The Study Sample (n=100)

association between class or position of the impacted third molar and degree of per-operative pain was observed.

DISCUSSION

The study demonstrated that the use of Greater Auricular Nerve infiltration along with conventional IANB resulted in better per-operative pain control in mandibular third molar surgery. Failure rate of local anesthesia for inferior alveolar nerve is about 20-47%.[9] Failure of anesthesia does not allow performing any surgical procedure in oral cavity. The effectiveness of anesthesia is mandatory as it results in satisfactory pain management during third molar surgery, which in turn leads to positive outcomes like reduction in anxiety and uninterrupted surgical procedure.[10] Various methods for effective per operative pain control like choice of anesthetic medications, technique of anesthesia, anxiety reduction techniques, and practice of additional per-operative local anesthesia are in use. Use of IANB with or without 2%

Table-I: Procedure time according to Impaction Class in each Study Group (n=100)

Procedure time (minutes)	Study Groups (n=50/Group)	Impaction Class and Position n (%)								Total n (%)
		IA	IB	IC	IIA	IIB	IIC	IIIB	IIIC	
0-15	A	2(4%)	2(4%)	-	2(4%)	3(6%)	-	-	-	9(18%)
	B	9(18%)	1(2%)	-	5(10%)	2(4%)	1(2%)	-	-	18(36%)
	Total (n=100)	11(11%)	3(3%)	-	7(7%)	5(5%)	1(1%)	-	-	27(27%)
16-29	A	4(8%)	4(8%)	1(2%)	5(10%)	9(18%)	2(4%)	3(6%)	4(8%)	32(64%)
	B	4(8%)	1(2%)	-	8(8%)	8(8%)	3(6%)	4(8%)	1(2%)	29(58%)
	Total (n=100)	8(8%)	5(5%)	1(1%)	13(13%)	17(17%)	5(5%)	7(7%)	5(5%)	61(61%)
30 and above	A	0	1(2%)	-	1(2%)	1(2%)	2(4%)	1(2%)	3(6%)	9(18%)
	B	1(2%)	-	-	-	-	1(2%)	1(2%)	-	3(6%)
	Total (n=100)	1(1%)	1(1%)	-	1(1%)	1(1%)	3(3%)	2(2%)	3(3%)	12(12%)
Total	A	6(12%)	7(14%)	1(2%)	8(8%)	13(26%)	4(8%)	4(8%)	7(14%)	50(100%)
	B	14(28%)	2(4%)	-	13(26%)	10(20%)	5(10%)	5(10%)	1(2%)	50(100%)
	Total (n=100)	20(20%)	9(9%)	1(1%)	21(21%)	23(23%)	9(9%)	9(9%)	8(8%)	100(100%)

Majority (95%) of the patients reported no or mild pain while 5% had moderate pain during the procedure. Figure 3 highlights the intensity of per-operative pain reported by subjects in each study group.

A significant difference was observed between the study groups in terms of presence or absence of per-operative pain (Table-II). A higher percentage (70%) of subjects in Group-A reported an absence of pain during the surgical procedure in comparison to 12% subjects in Group-B (*p*<0.001). However, no difference in terms of per-operative pain was seen between males and females (*p*=0.76). Also, no

lignocaine was not found to be very effective in mandibular third molar surgery.[11] To enhance the effectiveness of IANB, various methods are used in conjunction like intra-osseous injection, buccal and lingual infiltration of other local anesthetics such as 4% Articaine. All these methods have shown improved effectiveness of IANB.[12]

The present study included both genders, 58 females and 42 males. Majority (53%) impactions in the present study were classified as class II, while 30% belonged to class I. This finding is in accordance to previous studies.[13-16] However, a recent study reported class I impactions to be most prevalent in their study sample.[17]

In Group-A, 70% patients had no pain, and 30% patients had mild pain during third molar surgery compared to 24% patients with no pain and 68% patients with mild pain in Group-B during procedure. This difference between the study groups was statistically significant (p<0.001). A study conducted by Mehmood et al. on GANB on local population also showed comparable results.[18] However, this study used extra oral GANB technique which is not accepted by most of the patients requiring third molar surgery since it is associated with pain and needle tract infections. The present study utilized intra oral GAN infiltration technique, which is much safer to apply and acceptable to patients as no extra oral injection is involved. No statistically significant difference was found between per-operative pain and time taken for third molar surgery. To the best of our knowledge, no study has compared length of procedure time and per-operative pain in mandibular third molar surgery. However, literature suggests difficulty index of mandibular impaction as a common risk factor for post-operative complications including pain.[19]
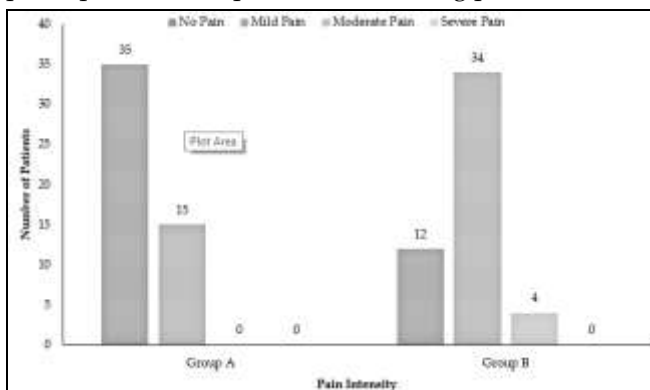

Figure-3: Intensity of Per-Operative Pain Reported by Study Subjects (n=100)

Table-II: Association of Per-Operative Pain Among Study Subjects (n=100)

	Study Groups		p-value
	Group-A (IANB + GANI) n=50	Group-B (IANB only) n=50	<0.001
Pain Experience			
No Pain	35(70%)	12(24%)	
Pain	15(30%)	38(76%)	

Another study conducted by Liaqat et al.[8] used intra oral GAN infiltration technique and confirmed the efficacy of this technique. According to them, 65% patients experienced pain during surgery, and of those, 80.8% patients became pain free after giving GANB. In contrast to this study, the present study

provided GANB to the study group before start of the procedure. Use of GAN anesthesia has been used to relieve post-operative pain by Liaqat et al.[8] while the present study used this technique to control per-operative pain.

GANB has been used in other specialties for a number of procedures including external ear surgery, tympano-mastoid surgeries and parotidectomies.[20] We could not find any study in the literature that used GANB as an adjunct for effective per-operative pain control method in third molar surgery. The use of sedation and general anesthesia is advocated in cases with increased difficulty index and expected per- and post-operative pain. But these methods have their own consequences like cost and anesthesia related complications. With the use of GANB in third molar surgery cases, undesirable alternatives can be avoided.

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LIMITATIONS OF THE STUDY

This study needs to be conducted on a larger and more diverse sample in order to generalize the results to the whole population. The procedures were performed by more than one consultant, which may have caused some difference in pain experience.

CONCLUSION

Use of GAN infiltration along with conventional IANB resulted in better per-operative pain control in mandibular third molar surgery. A significant difference in pain experience of patients and mean pain scores was observed between the two study groups.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MA & AB: Data acquisition, data analysis, critical review, approval of the final version to be published.

BP & SGAB: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MS & AAB: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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