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TO COMPARE THE EFFECTIVENESS OF INTRALIGAMENTARY INJECTION ANAESTHESIA VERSUS INFERIOR ALVEOLAR NERVE BLOCK TECHNIQUE IN EXTRACTION OF MANDIBULAR POSTERIOR TEETH - A RANDOMIZED CLINICAL STUDY.

Dental Science

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ABSTRACT

BACKGROUND: Profound pulpal anaesthesia using the inferior alveolar nerve block (IANB) technique for extraction of mandibular posterior teeth is difficult to achieve. Several authors emphasised the effects of intraligamentary injection anaesthesia (ILA), also known as periodontal injection; as a primary or supplementary technique. The aim of this study was to compare the efficacy of ILA over IANB technique in providing adequate and superior anaesthesia for extraction of mandibular premolars and molars.

MATERIALS AND METHODS: 30 patients requiring bilateral extractions of mandibular posterior teeth were selected. The parameters evaluated were subjective (numbness) and objective (pain on gingival probing) signs of anaesthesia, difference in pain perception during the procedure; and duration of anaesthesia for ILA (Group A) and IANB technique (Group B).

RESULTS: The results showed that no difference was found in terms of subjective and objective evaluation of anaesthesia between the groups. A statistically significant difference was seen in Group A, where intraligamentary injection anaesthesia showed less pain perception than the IANB technique. However, longer duration of anaesthesia was noted in Group B.

CONCLUSION: With fewer failures and complications, the intraligamentary injection can be effectively used as a primary technique to alleviate pain and profoundly anaesthetize the mandibular posterior teeth during dento-alveolar extraction procedure.

KEYWORDS

Intraligamentary injection, Inferior alveolar nerve block, Periodontal injection, Mandibular teeth.

INTRODUCTION:

Effective pain control is one of the most important aspects of dento-alveolar surgery. [1] The ability to provide consistently profound anaesthesia for dental procedures in the mandible remains elusive. [1] The inferior alveolar nerve block (IANB) is the most commonly used anaesthetic technique for restorative and surgical treatments in the posterior mandible. However, it has a relatively high rate of anaesthetic failures and imminent risks associated with it. [2] Hence, to overcome these drawbacks, various supplementary injection techniques such as local infiltration, intraseptal, intraosseous and intraligamentary injections were introduced.

The technique of periodontal ligament injection, also known as intraligamentary injection anaesthesia (ILA) gained popularity in the 1920's. [3,4] It is strongly advocated as a means of avoiding the widespread soft tissue anaesthesia seen in regional anaesthesia, for providing less pain during administration and also for its benefit of providing single tooth anaesthesia. [5]

With the increasing demand for ILA, it becomes prudent to weigh the potential advantages of this technique against IANB. This study therefore, aims to compare and evaluate the effectiveness of intraligamentary injection over the conventional inferior alveolar nerve block for extraction of mandibular posterior teeth.

Materials And Methods:

Trial Design-

The study was planned as a single-center, randomized controlled, split-mouth study. The Ethical committee approval was taken and this trial was organized following the Consolidated Standards of Reporting Trials Guidelines (CONSORT).

Participants-

Subjects for the study were recruited from the OPD of the Department of Oral and Maxillofacial surgery at Y.M.T. Dental College and Hospital, Navi Mumbai. A total of 30 patients requiring bilateral extraction of mandibular posterior teeth were recruited in this study.

Inclusion Criteria -

1. Identical bilateral mandibular posterior teeth indicated for extraction.
2. Any gender between the age group of 14-50 years.
3. Physically and mentally fit patients.

Exclusion Criteria –

1. Teeth showing signs of local infection.
2. Impacted premolar or molars.
3. Subjects with underlying systemic diseases.
4. Pregnant and lactating mothers.
5. Patients with allergy to lignocaine.

Intervention-

The patients were selected based on the above-stated criteria and were provided with information about the treatment options in a language best understood by them; and duly signed informed consent was obtained before the procedure. Each side to be operated on was randomly selected and Group A was allocated for the side subjected to intraligamentary injection anaesthesia; whereas Group B was assigned for the inferior alveolar nerve block technique. Both the techniques were instituted in a single sitting.

Operative Technique-

A thorough case history was taken, followed by an intra oral examination of the patient. All the cases were performed by the same operator to minimize bias.

Group A: This method was implemented using the pistol type pressure syringe (Figure 1). Topical local anaesthetic gel was applied in the area of injection. A 2% lidocaine hydrochloride solution was used, along with a 1:80000 adrenaline cartridge and a 30 gauge needle. The needle was bent at 90 degrees to achieve good visibility in the area of injection. The needle was inserted in the mesial (Figure 2) and distal interdental regions along with the lingual sulcus area; through the gingival crevice at an angle of 30 degrees to the long axis of the tooth. The bevel of the needle was placed towards the tooth to be anesthetised and 0.2cc of the solution was injected over 10-20 seconds using strong backpressure at each site.

Figure 1- Pistol Type Pressure Syringe For Intraligamentary Injection

Figure 2- Intraligamentary Injection In The Mesial Interdental Papilla Of 44

Group B: In this technique, topical local anaesthetic gel was applied in the area of injection. A 2 % Lidocaine hydrochloride with 1:80000 adrenaline cartridge and a 26 gauge needle was used. After identification of the appropriate landmark, the needle was inserted from the contra lateral arch to a length of 20 to 25 mm length until bone was contacted, then 1.4 ml of the solution was deposited to anaesthetise the inferior alveolar nerve. Next, the angle of the needle was shifted to the same side and slightly withdrawn to deposit 0.1 ml of solution to anaesthetise the lingual nerve. The buccal nerve was anaesthetised by inserting the needle in the mucous membrane distal and buccal to the most distal molar tooth in the arch, and gradually depositing 0.3ml of anaesthetic solution in that area.

Outcomes-

Primary:

1. Subjective evaluation of anaesthesia by questioning for numbness.
2. Objective evaluation of anaesthesia by observing pain on gingival probing.
3. Pain perception during the procedure using Visual Analog Scale.

Secondary:

1. Duration of anaesthesia from the time the injection is given until the anaesthetic effect wears off (in minutes).

Sample Size, Randomization, And Allocation Concealment-

The sample size was determined using the expected proportion of event/outcome in each group, values of which were estimated from literature and using suitable formulas. A minimum of 30 subjects per group were included in the study**.** There were no dropouts. A simple randomization of the side to be subjected to either technique was done using the coin toss method. Blinding had no scope in this study.

Statistical Method-

The data obtained was compiled on an MS Office Excel Sheet (v 2010) and was subjected to statistical analysis using Statistical Package for Social Sciences (SPSS v 21.0, IBM). The subjective and objective evaluation of anaesthesia between the groups was done using the chi-square test. Comparison of the means of outcome variables like pain perception on VAS and the duration of anaesthesia was analyzed using the Mann Whitney test. For all the statistical tests, $p<0.05$ was considered to be statistically significant.

RESULTS:

A total of 30 patients (22 females and 8 males) were included in the study, with a mean age of 17.20 years. 60% of the subjects in this study were advised to undergo orthodontic extraction of mandibular premolars. Each side of the patient was divided into two groups; intraligamentary injection served as Group A and IANB as Group B.

The first primary objective of our study was to compare the efficacy of both the techniques by evaluating the subjective and objective signs like numbness and pain on gingival probing respectively (Table 1). There was no statistical difference observed in this outcome for both groups.

Table 1: Comparison Of Subjective And Objective Symptoms Between The Groups.

		Group A		Group B		Chi-Square test	p-value of test
	Observation	Count	N %	Count	N %		
Numbness	Present	25	83.3%	22	73.3%	0.884	0.347
	Absent	5	16.7%	8	26.7%		
Pain on Gingival Probing	Present	5	16.7%	8	26.7%	0.884	0.347
	Absent	25	83.3%	22	73.3%		

Furthermore, the pain perception during intraligamentary injection technique and inferior alveolar nerve block technique was assessed using the Visual Analog Scale. The scale ranged from a value of 0 to 4, suggesting no, mild, moderate, severe, and very severe pain respectively. Table 2 depicts the mean values of the VAS score with a statistically significant difference between both groups; demonstrating less pain perception during intraligamentary injection.

Table 2: Comparison Of Pain Perception On VAS Between Both Groups.

	Group A				Group B				p value for Mann Whitney test
VAS Score	Count	Percentage	Mean	Standard deviation	Count	Percentage	Mean	Standard deviation	
0	0	0%	1.63	0.72	0	0%	2.37	0.85	0.001
1	15	50.0%			4	13.3%			
2	11	36.7%			14	46.7%			
3	4	13.3%			9	30.0%			
4	0	0%			3	10.0%			

The outcome of mean duration of anaesthesia was observed by recording the start time of administration of injection till the end time of anaesthesia when its effect wore off (Table 3). A statistically significant difference was noted with a considerably longer duration of anaesthesia in Group B.

Table 3: Comparison Of Duration Of Anaesthesia Between Both Groups.

	Group A		Group B		p value for Mann Whitney test
	Mean	Standard Deviation	Mean	Standard Deviation	0.000
Duration	21.47	5.51	175.20	21.29	

DISCUSSION:

The inferior alveolar nerve block technique is considered the gold standard for administering local anaesthesia for posterior mandibular teeth; due to its longer duration of action and depth of anaesthetic effect. [6] However, this regional block possesses numerous demerits, such as the thickness of soft tissue through which the needle must penetrate to access the nerve, failure of action due to anatomical variability, accidental facial palsy, post-operative trismus, and inadvertent lip or tongue biting due to prolonged numbness. [7]

Therefore, alternative techniques that could overcome these failings of IANB were put forward, and one such method successfully developed was the intraligamentary injection. This technique involves using high injection pressure to force the local anaesthetic solution through the periodontal ligament into the cancellous medullary bone surrounding a tooth; as well as diffuse it into its pulpal chamber, anaesthetising all of the nerves supplying that particular tooth. [8] Additionally, lower volume of anaesthetic solution is required, which reduces systemic toxicity. The major advantage of ILA is that its potency is restricted to the teeth to be treated, avoiding unnecessary regional soft tissue numbness, and it serves as an excellent option for shorter dental treatments and extractions. [8,9]

A comparison of the efficacy of subjective and objective symptoms for the action of either anaesthesia administration technique has not been reported in the literature; our study also found no significant difference between the two groups. A probable reason could be a variation in the subjective perception of the patient and an initial lack of clear discernment about gingival probing. However, during the procedure, there was a distinct difference noted in evaluating the pain levels; with

less pain using the intraligamentary injection. This finding of our study is consistent with clinical studies previously reported in the literature by Shabazfar et al, P. W. Kämmerer et al, and Kaufman et al. [2,5,10]

The duration of action was significantly less for intraligamentary injections, a mean of 21 minutes was noted in our study. This observation was similar to studies by P. W. Kämmerer et al and Richa Prama et al, who also reported less duration for ILA. [5, 11] The superfluous prolonged duration of numbness seen in IANB is often exceeded by far the average time required for tooth extraction; and hence ILA ascertains to be beneficial in this outcome.

Nevertheless, despite the numerous advantages, intraligamentary injections present few complications as well. Reversible damage of periodontal tissue, bone and root resorption, risk of dry socket occurrence, and severe bacteraemia due to penetrance in the fenestrations of bone are well-documented pitfalls of ILA. [5,8]

Inferior alveolar nerve block has been the conventional technique for anaesthetizing the posterior mandible; nonetheless with its potential drawbacks, intraligamentary injections have paved their way. The latter is superior over IANB for simple extractions and routine dento-alveolar restorative purposes in terms of better pain control, less requirement for anaesthetic solution, minimal soft tissue numbness, and faster resolution of anaesthesia. [12]

CONCLUSION:

Thus, within the limited sample size of this study, we conclude that the intraligamentary injection technique is a minimally invasive and promising anaesthetic alternative to the conventional inferior alveolar nerve block for posterior mandibular teeth.

Acknowledgement:

Consent-

The Institutional Ethical Committee approval was obtained and all consent forms were duly signed by the patient after explaining the entire procedure in a language best understood by them.

Conflicts Of Interest-

All the authors declare that they have no conflicts of interest.

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