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Original Article

Efficacy of Combining An Inferior Alveolar Nerve Block with A Buccal Infiltration For Mandibular Molars with Irreversible Pulpitis-A Randomized Controlled Study

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ABSTRACT

Objective: To compare the effectiveness of a combined technique using an inferior alveolar nerve (IAN) block and buccal infiltration versus an IAN block alone in performing endodontic treatment on mandibular molars with irreversible pulpitis.
Study Design: Randomized clinical trial (ClinicalTrials.gov: NCT06276842).
Place and Duration of Study: Department of Operative Dentistry, Armed Forces Institute of Dentistry Rawalpindi, Pakistan from Apr-Sep 2020.
Methodology: There were 120 participants participating in this study. The study participants were divided into 2 groups, Group-A included sixty patients who received conventional IAN block, and sixty patients of Group-B received buccal infiltration along with conventional IAN block.
Results: Median age of the patients is 31.50 (37.00-23.25) years. There were 72(60%) male and 48(40%) female patients. Effectiveness of anesthesia in Group-B was statistically (p-value < 0.05) significant than Group-A.
Conclusion: The combination of IAN block with buccal infiltration as a supplementary anesthesia technique has significant effect in controlling pain among patients suffering from irreversible pulpitis of lower molar as compared to conventional IAN block technique alone.

Keywords: Anesthesia, inferior alveolar nerve block, infiltration

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INTRODUCTION

Management of toothache is one of the most vital parts of recent dentistry. Achieving sufficient anesthesia is a major goal for a dentist[1]. A local anesthetic agent either in the form of infiltration or nerve block is needed before carrying out an endodontic procedure. Inferior Alveolar Nerve (IAN) block is a routinely used anesthesia procedure while treating lower molars[2]. This is commonly recognized that the dentition with inflamed pulp is most difficult to anesthetize[3]. IAN block can easily anaesthetize soft tissue in symptomatic irreversible pulpitis of lower molars, however pulpal anesthesia can be challenging. Main reasons for pain during procedure are technical errors, anatomic variations, ineffective anesthetic solution, inflammation and anxiety of patients.

Numerous studies are conducted to improve the achievement rate of pulpal anesthesia in lower molar[4]. These studies have concentrated on expanding capacity of the anesthetic solution, speed of administering anesthetic agent, utilization of analgesic before controlling anesthesia, including supplementary drugs for example meperidine and utilization of different injection procedures. Patients with symptomatic irreversible pulpitis may have difficulty achieving adequate anesthesia for root canal treatment, as seen in earlier studies[5].It has been usually acknowledged that when initial injection is inadequate to achieve effective anesthesia, supplementary anesthesia or technique are required[6].

Parirokh *et al.*, in 2010 reported that successful pulpal anesthesia was achieved in 14.8% of patients with the conventional IAN block technique and in 65.4% of patients with combined IAN block and buccal infiltration[7].

In this regard, the rationale of this investigation is to determine the effectiveness of combining IAN block with buccal infiltration in teeth of local population with symptomatic irreversible pulpitis. This combined technique of supplementary anesthesia can be used in routine by clinicians, if found more effective.

METHODOLOGY

This randomized controlled trial (ClinicalTrials.gov: NCT06276842) was conducted in the Operative dentistry department, Armed Forces

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Institute of Dentistry Rawalpindi from Apr-Sep 2020 after approval from the Ethics Review Committee (ref. no. 905/Trg-ABP1K2 dated 17 Aug 2019).

Sample size calculated by WHO sample size calculator of 120 patients (60 patients in each group) was estimated by using 5% level of significance, 80% power of test with expected percentage of union in both groups. Sampling technique was non-probability, consecutive sampling.

Inclusion Criteria: Patients of either gender with age ranging from 18 to 45 years, presenting in Outpatient Department of operative dentistry with Irreversible pulpitis of mandibular molar (confirmed by positive response to EPT) were included in this study.

Exclusion Criteria: Pregnant females, medically compromised patients, patient with known allergy to lignocaine, Patients taking analgesics or anti-inflammatory drugs, patients with root resorption or necrotic pulp or immature apices and retreatment cases were excluded from the study.

Written informed approval was obtained from patients and complete procedure was explained to them. Pulpal and periapical status of the tooth to be treated was evaluated with the help of palpation, percussion, periodontal probing, electric pulp tester, cold test and periapical radiographs. Two groups of patients were made (Figure) Group-A was given local anesthesia through conventional IAN block technique and Group-B was given a supplementary buccal infiltration with IAN block using local anesthetic agent containing 2% Lignocaine with 1:100,000 Epinephrine. In both groups before local anesthesia administration, topical anesthesia was applied.

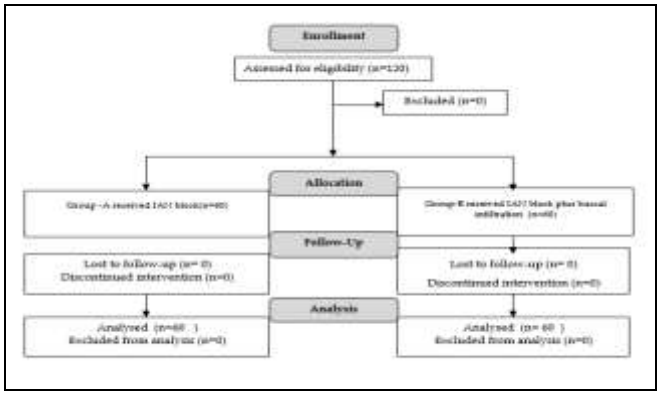

Figure: Patient Flow Diagram

Patients of Group-A received IAN block anesthesia. For this block, nerve was approached from the contra-lateral side of the oral cavity over the contralateral premolars. Needle penetrated into the mandibular tissue on the average boundary of the mandibular ramus inside the pterygomandibular space and lateral to pterygomandibular fold, it advanced until bony surface was contacted. In the event that bony contact wasn't made inside 27-29 mm of needle infiltration, needle was pulled back somewhat, moved the needle further distally toward premolars. The needle was withdrawn 1-2 mm after making bony contact, aspiration was performed, followed by 1.8 ml deposition of anesthetic solution.

Patients of Group B received buccal infiltration as supplementary injection technique to conventional IAN block, buccal infiltration was carried out. The needle was penetrated into the buccal mucosa, adjacent to mandibular 1st molar. After aspiration, 1.8 ml of anesthetic solution was administered in approximate time of 2 minutes using 2% Lignocaine with 1:100,000 Epinephrine. Following time period of 15 minutes of injection, every patient was inquired about his/her lip numbness. Those patients who did not experience significant lip numbness within 15 minutes after the block was administered were excluded from the investigation and anesthesia was considered ineffective. In case of positive lip numbness, patient concerned tooth was isolated using rubber dam and a traditional access cavity opening was started. Patient was told to lift hand if any pain will occur while doing procedure. The patient was requested to mark pain on visual analogue scale (VAS) after completion of treatment. Absence of pain was indicated if patient scored his/her pain ≤ 3 on VAS.

Data was investigated by utilizing Statistical Package for Social Sciences (SPSS) Version 22. Descriptive statistics was calculated for both qualitative and quantitative factors. Percentage and frequency were determined for qualitative variables like gender, age groups and effectiveness of anesthesia. Median was determined for quantitative variables like age. Chi square test was used to compare effectiveness after giving local anesthesia.*p*-value less than 0.05 was considered statistically significant.

RESULTS

In this study, all 120 patients actively participated in regular follow-up, resulting in a commendable follow-up rate of 100%. Among the participants, 72 individuals (60%) were males, and 48 individuals (40%) were females. Further demographic breakdown

revealed that 54 patients (45%) were below 30 years of age, while 66 patients (55%) were above 30 years of age. The Median age of the patients is 31.50 (37.00, 23.25) years (Table-I). No significant difference was found between gender (p=0.709) and age (p=0.714) amongst the patients in the two groups.

VAS was used to observe the strength of pain. A score ≤3 was considered no pain and >3 is considered to have pain in this study. Following 15 minutes of injection, VAS Score were recorded for each patient. In the study, Success rate of anesthesia among Group-A and Group- B was 23.3% and 61.7% respectively. Most patients in Group-B presented no pain. Effectiveness of technique used in Group-B was found to be significantly high (p-value <0.05) as compared to technique used in Group-A in this study. Success rate of anesthesia was compared between Group-A and Group-B as shown in Table-II.

Table-I: Gender and Age distribution of patients

Distribution of patients	Group-A (IAN Block) n (%)	Group-B (IAN Block +Buccal Infiltration) n (%)	p-value
Gender			
Male(n=72)	37(61.7%)	35(58.3%)	0.709*
Female (n=48)	23(38.3%)	25(41.7%)	
Total	60(100%)	60(100%)	
Age (Years)			
18-30 (n=54)	26(43.3%)	28(46.7%)	0.714*
31-45 (n=66)	34(56.7%)	32(53.3%)	
Total	60(100%)	60(100%)	

*IAN-inferior alveolar nerve*Chi-square test*

Table-II: Comparison of Effectiveness of Anesthesia among both Groups

Effectiveness	Group-A (IAN Block) n (%)	Group-B (IAN Block+Buccal infiltration) n (%)	p- value
No pain (Pain score ≤3)	14 (23.3%)	37 (61.7%)	<0.05*
Pain (Pain score >3)	46 (76.7%)	23 (38.3%)	
Total	60 (100.0%)	60 (100.0%)	

*IAN Inferior Alveolar Nerve *Chi Square Test*

DISCUSSION

The result of this study exhibited significantly improved anesthesia when we combined buccal infiltration as supplementary anesthesia with conventional IAN block as compared to those in which only IAN block (1.8ml of 2% lidocaine with epinephrine in concentration of 1:100,000) was given alone, among patients with irreversible pulpitis of lower molars.

Effective pain control is a hallmark in restorative and endodontic dentistry. Without achieving effective pain control, it is difficult rather impossible to proceed with the best treatment provision and it makes more challenging to gain patient cooperation. The first mandibular molar is the earliest permanent tooth that erupts in oral cavity[8]. This is the reason that it is most commonly affected tooth which is either carious or pulp is involved with caries[9]. Difficulty in achieving pulpal anesthesia is most commonly seen in lower molars with irreversible pulpitis[10]. Local anesthesia is widely regarded as one of the most reliable methods for achieving painless endodontic treatment, and it is the preferred choice for the majority of clinicians. The benefits of local anesthesia, especially buccal infiltration anesthesia, are as follows: it is easier to administer, the patient and the clinicians find it comfortable, there is no tongue insensitivity, and there is a much lower chance of nerve damage or accidental intravenous injection of the anesthetic solution than with inferior alveolar nerve block (IANB). Several studies have been carried out to compare the success rates of buccal infiltration anesthesia and IANB[11,12].

A study conducted by Parirokh *et al.,* showed results similar to our study that effectiveness of anesthesia between Group I (those who were given conventional IAN block alone) and Group III (those who were given buccal infiltration as supplementary technique with conventional IAN block) was 14.8% and 65.4% respectively[7] which was also statistically significant. In another study, Alireza Farhad et al assessed the success of intraosseous injection with IAN block which was significantly greater than IAN block[13].The Heft-Parker visual analogue pain scale was used in this study to evaluate patient discomfort both before and after the injection process, similar to some other researchers[14-16]. Similar to our study, Monteiro *et al.,* conducted a study to compare the efficacy of 4% articaine with 1:100,000 epinephrine in inferior alveolar nerve block (IANB) and infiltration anesthesia techniques for treating irreversible pulpitis in mandibular molars using a randomized double-blind trial design. The researchers utilized the Heft-Parker Visual Analog Scale to document the pain response of the patients during the procedures of access opening and pulp removal. Following statistical analysis, the study concluded that both inferior alveolar nerve block and buccal infiltration of 4% Articaine are equally effective for pulpal anesthesia in patients with irreversible pulpitis of mandibular molars. Therefore,

buccal infiltration can be considered a viable alternative to inferior alveolar nerve block[17].

However, a study conducted by Song Fan and colleagues showed no significant difference between the two groups (IANB/BI vs. IANB/PDL injection)[18].

In conclusion, studies have demonstrated that buccal infiltration along with an IAN block greatly improves the efficacy of local anesthetic in mandibular molar teeth with irreversible pulpitis as compared to an inferior alveolar nerve (IAN) block alone. Even with this advancement, it's crucial to remember that some situations can still require more anesthesia to ensure painless endodontic care.

CONCLUSION

The combination of IAN block with buccal infiltration as a supplementary anesthesia technique has significant effect in controlling pain among patients suffering from irreversible pulpitis of lower molar as compared to conventional IAN block technique alone.

LIMITATIONS OF STUDY

The study has certain limitations that may affect the generalizability and reliability of its findings. Firstly, the sample size was restricted to 120 participants, which may not be adequate to represent the entire population, and a larger sample size could have provided more reliable results. Secondly, the study was conducted over a short period of six months, which may not be sufficient to assess the long-term effects of the anesthesia techniques. Moreover, the study did not take into account other influential factors such as anxiety, fear, and pain thresholds, which may have impacted the outcomes of the study.

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Authors' Contribution

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

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

DR & MJR: Data acquisition, data analysis, approval of the final version to be published.

IR: Critical review, concept, 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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