ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 6, Issue – 1, February - 2023, Page No. : 178 - 183

Effect of preoperative medications with piroxicam and ketorolac on the efficacy of inferior alveolar nerve block in patients with irreversible pulpitis - A placebo-controlled clinical study.

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Citation of this Article: Dr. Alisha Wani, Dr. Rahul Devre, Dr. Rohit Patil, Dr. Satyabrat Banerjee, "Effect of preoperative medications with piroxicam and ketorolac on the efficacy of inferior alveolar nerve block in patients with irreversible pulpitis - A placebo-controlled clinical study", IJDSIR- February - 2023, Volume – 6, Issue - 1, P. No. 178 – 183.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: The purpose of this prospective, randomized, double-blind, placebo-controlled study was to compare the effect of the administration of preoperative piroxicam and ketorolac versus placebo for the potential increased effectiveness of the inferior alveolar nerve block [IANB] anaesthesia.

Materials and methods: A total of 60 endodontic emergency patients in moderate to severe pain diagnosed with irreversible pulpitis of a mandibular posterior tooth randomly received, in a double-blind manner, either a drug or placebo 30 minutes before the administration of a conventional IANB. Cold testing was done before administration of anesthesia to determine level of pain using Heft-Parker Visual Analogue Scale (VAS) score. Success was defined as no pain or pain (VAS) on access or initial instrumentation.

Results: Overall success was 54% for all the groups. Success was highest (70%) for the ketorolac group, 55% piroxicam group, and 40% for the placebo group.

Conclusions: Under the conditions of this study, the use of preoperative medication did improve the anaesthetic efficacy of IANB for the treatment of teeth diagnosed with irreversible pulpitis but not significantly.

Keywords: Inferior alveolar nerve block; irreversible pulpitis; preoperative medications; visual analogue scale.

Introduction

Inferior alveolar nerve block (IANB) has been regarded as one of the most technically difficult local anesthesia injections and is clinically adequate in 85-90% of the time in restorative dentistry but its efficacy is reduced to 20% in irreversible pulpitis. An effective local anesthesia is a prerequisite for pain control in endodontics. The IANB is most frequently used

mandibular injection technique for achieving local anesthesia for endodontic treatment of posterior teeth. Anaesthetic failures after IANB have been reported to be between 44% and 81%.[1] The high rate of failure may be due to accessory innervations, inaccurate injection technique, needle deflection, cross innervations, central core theory.[2] Patient factors such as variations in anatomy, unpredictable spread of anesthesia, local infection, pulpal inflammation, and psychological issues also affect the effectiveness. In 30-80% of patients with irreversible pulpitis single IANB is ineffective.[3]

Local infection causes decrease in pH locally and can influence the amount of local anesthesia available in the lipophilic form to diffuse across the nerve membrane. This results in less drug interference of sodium channels. In symptomatic teeth with irreversible pulpitis, one theory regarding the high rate of local anesthetic failure is the prostaglandin induced sensitization of peripheral nociceptors. [4,5] Pulpal inflammation causes activation and sensitization of peripheral nociceptors leading to sprouting of nerve terminals in the pulp. This leads to expression of different sodium channels: Tetrodotoxin (TTX)-resistant class of sodium channels are four times as resistant to blockade by lidocaine and their expression is doubled in the presence of prostaglandin E2 (PGE2).

Earlier studies have suggested that preoperative medication might increase the success rate of the IANB. [6–8]

Therefore, there may be some potential for preoperative pain medications with piroxicam and ketorolac to increase the effectiveness of the IANB in patients with irreversible pulpitis.

Piroxicam is a non-steroidal anti-inflammatory drug (NSAID) of the oxicam class used to relieve the symptoms of painful inflammatory conditions like endodontic pain.

Piroxicam works by preventing the production of endogenous prostaglandins which are involved in the mediation of pain, tenderness and swelling. Ketorolac, Ketorolac, a pyrrolizine carboxylic acid derivative, is a potent non-steroidal, anti-inflammatory drug (NSAID used to treat pain. Specifically, it is recommended for moderate to severe pain.

The purpose of this study was to compare the effect of the administration of preoperative piroxicam(20mg), ketorolac (10 mg), versus placebo for the potential increased effectiveness of the IANB anesthesia in patients with irreversible pulpitis.

Materials and methods

The study consisted of 60 patients in the age group of 18-65 years consisting of 30males and 30 females, in acute pain with mandibular molar teeth (first or second molar) diagnosed as acute irreversible pulpitis. Written informed consent was obtained from all human subjects who participated in the experimental investigation after the nature of the procedure and possible discomforts and risks had been fully explained. Patients were questioned regarding inclusion/exclusion criteria. Inclusion criteria were: Between the ages of 18 and 65 years; in good health; informed consent granted; vital mandibular molar teeth were taken.

Exclusion criteria

Allergy to piroxicam, ketorolac history of significant medical problem; gastrointestinal problems; syndrome of nasal polyps; angioedema or bronchospastic reactivity to aspirin or other nonsteroidal anti-inflammatory drugs (NSAIDs); taken central nervous system (CNS) depressants (including alcohol or any analgesic medications) within the last 48 hours; pregnancy; lactating; or inability to give informed consent. To qualify for the study, each patient had a vital mandibular tooth, and actively experiencing moderate-to-severe pain

(≥85 mm) as determined by a Heft-Parker Visual Analogue Scale (VAS),[9] and had a prolonged response to cold testing. Patients with no response to cold testing or peri radicular pathosis (other than a widened periodontal ligament) were excluded from the study.

Patients were randomly assigned to three groups with patients 20 in each group. Group I were administered placebo with sugar coated pills, Group II were piroxicam (20mg) Group III were administered Ketorolac (10 mg, Dr. Reddy's)

Cold testing using Green Endo ice spray (Hygenic) was done before administration of anesthesia to determine level of pain on a scale of 1-170 mm using Heft-Parker VAS score. Medication was given 30 minutes before the anesthesia was administered. IANB was administered under aseptic conditions by using 2% lignocaine with 1:100000 adrenaline (Astra Zeneca).

The tooth was then isolated with a clamp and rubber dam and an endodontic access was performed after 15 minutes.

There were three phases of the treatment: Access into dentin, access into the pulp chamber, and instrumentation of the canals. Each patient was instructed to rate any discomfort during endodontic treatment using the VAS.

Results

Table 1: Overall comparison of pre-op pain score (VAS score) among three groups.

Group	Mean	SD	P value
Placebo	7.00	1.84	0.691 (NS)
Ketorol	6.60	1.43	
Piroxicam	6.85	1.09	

One-way ANOVA test

Non-significant difference Overall comparison of post-op pain score (VAS score) among three groups.

Table 2:

Group	Mean	SD	P value
Placebo	6.65	2.16	<0.001*
Ketorol	2.45	1.57	
Piroxicam	4.00	1.69	

One-way ANOVA test; *

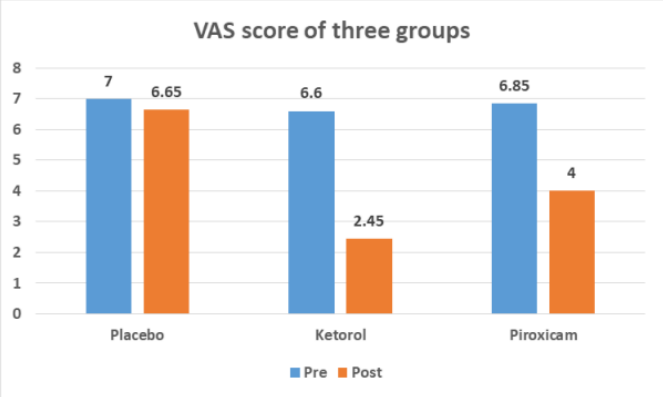
indicates significant difference at p≤0.05 Pairwise comparison of post-op pain scores.

Table 3:

Group pair	Mean difference in VAS score	p value
Placebo vs Ketorol	4.20	<0.001*
Placebo vs Piroxocam	2.65	<0.001*
Ketorol vs Peroxicam	-1.55	0.025*

Post hoc Tukey test; * indicates significant difference at p≤0.05

Graph 1:



Discussion

No attempt was made to balance the number of male versus female subjects, nor the ages of the patients. Children under the age of 18 were not included in this study and the results of the study may not be applicable to patients under 18 years of age. Mandibular molar teeth were used exclusively for this study and all teeth were diagnosed with clinical irreversible pulpitis including spontaneous pain, which was rated as moderate to severe.

Though the recording of pain is always subjective, it is probable that the current study had a similar patient pool in terms of initial pain as the other studies [1,10] with

the mean pain ratings being classified as moderate-to-severe in intensity.

These findings support the fact that irreversible pulpitis can cause a significant degree of pain.[11] Therefore, compared with asymptomatic teeth, we would expect a lower IANB success rate. Again, there was no statistically significant difference between the groups with regard to initial pain thus eliminating initial pain as a confounding variable. Electric pulp testing (EPT) has been used to determine pulpal anesthesia. [12,13] An EPT is not always an accurate method of determining pulpal anesthesia in teeth with a diagnosis of irreversible pulpitis [14] and was not used in the current study.

Clinical endodontic access gives a clinically relevant determination of pulpal anesthesia and was the method used in the current study to test anesthetic efficacy of the IANB. The IANB success rate studies done by Cohen et al.,[1] Kennedy et al.,[10] Matthews et al., [11] Reisman et al.,[13] Claffey et al.,[15] Nusstein et al.,[16] Big by et al.,[17] and Lindemann et al. [18]

suggest that success rate is not adequate for performing clinical endodontic treatment on mandibular posterior teeth. This has historically been a problem and many studies have researched the IANB and supplemental anesthesia techniques to further increase anesthetic success. Cohen's group [1]

studied mandibular posterior irreversible pulpitis teeth and found 23 out of 61 (38%) subjects required supplemental anesthesia because the IANB failed to give adequate anesthesia. The reported IANB success was 62%. In symptomatic teeth with irreversible pulpitis, one theory regarding the high rate of local anesthetic failure is the prostaglandin induced sensitization of peripheral nociceptors.[19]

Peripheral terminals of nociceptors express receptors that can detect chemical and physical stimuli. This results in activation of various ion channels. Inflammatory mediators such as prostaglandins produce their effects by binding to various protein receptors. Level of prostaglandin is increased in inflamed pulps.

Interventions that decrease the overall concentration of prostaglandins, such as administration of ibuprofen, lead to reduced activation of these receptors. [20,21] Therefore, it appears logical that if the production of prostaglandins is interrupted, it may increase the efficacy of local anesthetics.

Ianiro et al. [7] found a 71% success rate for the acetaminophen group, a 76% success rate for the combination of acetaminophen and ibuprofen, and a 46% success rate for the placebo group. While there were no significant differences between the groups, the authors stated that there was a trend toward higher success in the medication groups. In the current study also, though not statistically significant we found an increased success of IANB in the premedication groups as compared with the placebo group.

The patients who had pain upon endodontic access were given a buccal infiltration of lidocaine. For those patients who continued to have pain after administration of the supplemental anesthetic, other supplemental injections were given, such as intrapulpal injections, periodontal ligament (PDL) injections, and other infiltrations, until emergency endodontic treatment could be completed. Supplemental anesthetic success was not evaluated in the present study.

Conclusion

Under the limitations of the study, this study confirmed that mandibular anesthesia in symptomatic teeth is difficult to attain with an IANB alone. Administering ketorolac 10 mg, 30 minutes prior to treatment did improve success (70%) as compared with piroxicam

group (40%) whereas other groups showed no significant success.

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