

Comparative Evaluation of Laser and Ibuprofen on the Success of Inferior Alveolar Nerve Block in Irreversible Pulpitis. A Clinical Study

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ABSTRACT

Introduction: Pain control during endodontic treatment in irreversible pulpitis cases with inferior alveolar nerve block is difficult, more-so in the case of mandibular molars. The present study evaluated the effect of premedication with non-steroidal anti-inflammatory drug and low level laser therapy on local anaesthesia during endodontic treatment.

Material and methods: 150 patients (50 per group) with irreversible pulpitis were 600 mg ibuprofen, or low level laser irradiation and placebo 1 hour before local anesthesia. Each patient recorded their pain score on a visual analog scale before taking the medication, 15 minutes after anesthesia in response to a cold test, during access cavity preparation and during root canal instrumentation. No or mild pain at any stage was considered a success. Data were analyzed by the chi-square and analysis of variance tests.

Results: Overall success rates for, ibuprofen, and low level laser and placebo were 76%, 60%, and 34%, respectively ($p < 0.001$). Ibuprofen and low level laser were significantly better than placebo ($p < 0.01$). There was no difference between ibuprofen and laser ($p = 0.24$).

Conclusions: Premedication with ibuprofen and low level laser significantly increased the success rates of inferior alveolar nerve block anesthesia for teeth with irreversible pulpitis.

Keywords: Low Level Laser, Ibuprofen, Inferior Alveolar Nerve Block

inflammatory drugs (NSAIDS). They block the cyclo oxygenase enzyme thereby reducing prostaglandins in turn reducing inflammation and pain. Previous investigators have reported conflicting results for preoperative use of NSAIDS. Modaresi et al¹¹ reported significant improvements in the success rate of IANB in teeth with inflamed pulps after the use of analgesics, and Ianiro et al⁹ reported higher success rates although they were not significantly different. In contrast, two separate studies reported no significant difference in IANB success rates when the patients were premedicated with analgesics.^{12,13} Several reasons could explain these promising but not completely different results such as an insufficient number of subjects⁹ and a lack of similarity of methods and clinical conditions.¹¹

Rapid developments in laser technology and a better understanding of bio interactions of different laser systems have broadened the clinical use of laser in contemporary endodontics. A low level laser also called a soft or a cold laser has no thermal effect on tissues and produces a reaction in cells through light, called photobiositimulation or photochemical reaction. These lasers have an average output power range between 5 and 500 mW. Low level laser therapy (LLLT) is well established in clinical dentistry because of its anti inflammatory, regenerative, and teeth etching effect.^{14,15} Various studies have proven low level laser on having analgesic effects. No study has previously evaluated effect of LLLT on success of IANB. The aim of this study was to compare the effect of NSAID medication ibuprofen and low level laser therapy with a placebo regarding their effects on the success rates of IANB for endodontic treatment of

INTRODUCTION

One of the principle reasons for seeking endodontic treatment is pain. Essential pre requisite for successful endodontic treatment is an absolute pain relief. Local anesthesia is considered to be a major treatment step for dental pain control. The inferior alveolar nerve block (IANB) is the conventional method for anesthetizing mandibular molar teeth.^{1,2} However it often fails to provide adequate pain relief. Research has shown that gaining anesthesia in mandibular molars with irreversible pulpitis is much more difficult in comparison to the teeth with normal healthy pulps.^{3,4,5} Several articles have reported a success rate of 75-90% with IANB. The success rate further declines when pulp is inflamed. Numerous modalities have been performed to enhance the success rate of IANB for mandibular molars. These include use of various anesthetic techniques and solutions as well as pretreatment with analgesics.⁶⁻¹⁰ Use of preoperative analgesics such as non steroidal anti-

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mandibular molar teeth with irreversible pulpitis.

MATERIAL AND METHODS

The following inclusion and exclusion criteria were used for this study. The exclusion criteria were the presence of systemic disorders, a sensitivity to lidocaine with 1:80,000 epinephrine or to NSAIDs, nasal polyp, a history of gastrointestinal ulcers, the presence of widening of the periodontal ligament space, the presence of a periapical radiolucency, lactation, pregnancy, using any type of analgesic medication in the preceding 12 hours before the treatment, having a tooth not suitable for restoration, and having a full crown. Inclusion criteria included healthy patients having a first or second mandibular molar tooth with irreversible pulpitis and normal periapical radiographic appearance. The clinical diagnosis of irreversible pulpitis was confirmed by a response to an electric pulp test (The Element Diagnostic Unit; SybronEndo, Glendora, CA) and a prolonged exaggerated response (10 seconds) with moderate to severe pain to a cold test (Roeko Endo-Frost; Roeko, Langenau, Germany) after the size 2 cotton pellet was removed. One hundred fifty patients were eligible to participate in this prospective, randomized double-blind study. All patients were adults over 18 years of age, and they were treated in the postgraduate clinic of the endodontic department of Govt. Dental College Srinagar. Informed consent of all subjects who participated in this study was obtained after the nature of the procedure and the possible discomforts and risks had been fully explained. All patients who agreed to participate in the study were randomly divided into three groups of 50 patients each. In group A patients were given 600 mg ibuprofen one hour preoperatively, in group B patients were given low level laser therapy at the periapical area of the involved tooth for 5 min, and in group C no ibuprofen or low level laser was given. Before the start of treatment patients recorded their pain using a Heft- Parker visual analog pain scale (VAS) after the cold test. The VAS scores were divided into four categories. No pain corresponded to 0 mm, mild pain was defined as being >0 mm and <54 mm, moderate pain was defined as being >54 mm and <114 mm, and severe pain was defined as being >114 mm. A disposable 5 ml syringe was used to administer the injections. The syringe was equipped with. A 25-G 38-mm needle in all patients, after needle insertion

and based on a standard IANB method, when bone contact was established, the needle was withdrawn 1 to 2 mm and aspiration was performed. If the aspiration was negative for blood, then the anesthetic solution 1.8ml (2% lidocaine with 1/80000 epinephrine; Lignox Warren, India) was injected. Fifteen minutes after administering anesthesia, each patient was checked for subjective and objective symptoms. If the patient did not report profound lip numbness, then the IANB was considered to be a failure, and the patient was excluded from the study. the teeth were isolated with a rubber dam, and endodontic access cavity preparation was commenced. Access cavity preparation was only started in patients who reported lip numbness after administration of the anesthetic. Patients again recorded their pain scores after 15 min following IANB with another cold test, third pain score was recorded during access cavity preparation and fourth during instrumentation. All patients were observed for 48 hrs. No or mild pain (faint, weak, and mild pain) were classified as success, whereas moderate and severe pain were classified as the failure of anesthesia.

STATISTICAL ANALYSIS

One way analysis of variance (ANOVA) test was used to compare the data between the three groups. Comparison between groups at different steps was carried out using Kruskal-Wallis test. The data were analysed using the software SPSS version 21.0. The comparisons were considered significant if P-value was less than 0.05.

RESULTS

No patients reported any side effects for up to 48 hours. Table 1 shows the distribution of the baseline characteristics of the participants in the present study. The youngest and the oldest participants were 18 and 66 years old, respectively. No significant differences were found between sex and age among the patients in the three groups ($p > 0.05$). The average pain score 1 hour after the medication was taken based on the Heft-Parker VAS were not significantly different among the three groups ($p = 0.567$) (Table 1). However, after adjusting for baseline VAS scores, there was a significant difference in the amount of pain relief between patients who were given placebo and those who took either LLLT or ibuprofen ($p < 0.001$) (fig. 1). All patients reported lip numbness, which was

| variable | Group A | Group B | Group C | p-value |
|-------------------------|----------|----------|---------|---------|
| Age(yrs) | 26.7 | 26.5 | 25.7 | .962 |
| Sex | | | | .706 |
| Male | 23(46%) | 24(48%) | 22(44%) | |
| female | 27(54%) | 2(52%) | 28(56%) | |
| Preoperative pain score | 115±26.4 | 118±23.4 | 120±24 | .567 |

Table-1: Comparison of variables

| Group | Success (%) | Failure (%) | P value* |
|-------|-------------|-------------|-------------------|
| A | 38(76) | 12(24) | .001 ⁺ |
| B | 30(60) | 20(40) | |
| C | 17(34) | 33(66) | |

Table-2: success rates of three groups

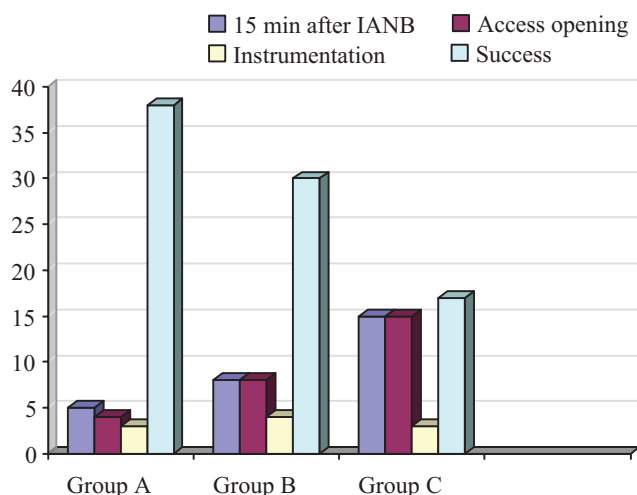


Figure-1: Comparison of success rate among treatment groups

assumed to be a sign of IANB success. The overall success rates for the placebo, ibuprofen, and low level laser groups were 32%, 78%, and 62%, respectively ($p < 0.001$) (Table 2). The ibuprofen and LLLT groups showed significantly higher success rates compared with the placebo group ($p < 0.01$). There was no significant difference between ibuprofen and low level laser therapy ($p = 0.24$). There was a significant difference between groups A and C and between groups B and C ($p < 0.01$)

DISCUSSION

The results of the present study have shown that premedication with ibuprofen and LLLT significantly increased the success rate of IANB anesthesia for mandibular molar teeth with irreversible pulpitis compared with a placebo. The demographic parameters of the patients were not significantly different in the three groups and so, did not affect the study results.

Pain is a highly subjective experience and can be influenced by numerous factors that include physical, psychological, behavioural and cultural factors. No significant difference in pain score among the three groups before anesthesia was present. Previous studies that have assessed the effectiveness of anesthesia after premedication have used either an electric pulp test or a VAS^{9,11} to rate pain. In the present study, the Heft-Parker VAS was used to assess patient pain before and after local anesthetic injection. Most of the previous investigations on the efficacy of anesthetic techniques and solutions have used the same method of evaluation.^{16,17,12} In the present study, 2% lidocaine with 1:80000 epinephrine was used because this is a common anesthetic solution in dental practice plus most of the previous investigations have used the same solution.

Failure to achieve pulpal anesthesia following IANB has been attributed significantly higher amounts of prostaglandins in inflamed pulps compared with normal pulps have been reported.¹⁸ Prostaglandins can affect tetrodotoxin-resistant receptors and decrease nerve responses to anesthetic agents.^{19,20} Previous investigations have described the anti-inflammatory effects of ibuprofen. Gould et al²¹ in their

animal study showed that prostaglandins play an important role in sodium channel augmentation during inflammation and that pretreatment with ibuprofen prevented up-regulation of Nan 1.7 and Nan 1.8 sodium channels. In particular, the effects of Nan1.7 were greater. Seymour and Ward²² evaluated various doses of ibuprofen (200 mg, 400 mg, and 600 mg) for the management of postoperative dental pain, and they reported a trend of higher pain relief in patients who had taken 600-mg doses. Only few studies has previously evaluated the effect of LLLT on postendodontic pain. Asnaashari et al.²³ found that LLLT significantly reduced postendodontic pain at 4, 8, 12, and 48 hrs. Lizarelli,²⁴ reported a significant reduction of pain following irradiation of low level laser pre and post implant surgeries. Sakuraba et al.,²⁵ showed LLLT diminished pain in sensitive pulps using a semiconductor low level laser unit. Kreisler et al.,²⁶ demonstrated more pain reduction in laser group than the placebo group in the 1st day after endodontic surgery. Nabi, et al.²⁷ in their study also found LLLT to significantly reduce post endodontic pain upto 48 hrs. Lllt in the present study also significantly helped in increasing the success of IANB. Currently the following analgesic effects are recognized, low level laser inhibit the release of mediators from injured tissues, decrease concentration of chemical agents such as histamine, acetylcholine, serotonin, H⁺ and K⁺, all of which are pain mediators, inhibit concentration of acetylcholine, a pain mediator, through increased acetylcholine esterase activity, cause vasodilatation and increase blood flow to tissues, accelerating excretion of secreted factors.²⁷ In the current investigation, the overall success rates for the ibuprofen, LLLT and placebo groups were 76%, 60%, and 34%, respectively. The current study suggests that analgesics or LLLT can greatly increase the success rate of IANB. LLLT can also be used as a non invasive alternative to NSAIDS for increasing success of IANB especially in patients that have some contraindication for use of NSAIDS.

CONCLUSION

The present study concludes that the use of NSAID like ibuprofen premedication increases the efficacy of local anaesthesia in patients with irreversible pulpitis. LLLT also showed significant success in increasing the efficacy of IANB. LLLT can serve as an alternative to use of NSAIDS for achieving higher success for IANB. However, to reach a consensus amongst dentists about whether to use or not to use premedication, more extensive studies need to be performed in future.

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