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Original Research

A comparative study to appraise the efficiency of buprenorphine and 2% lignocaine with adrenaline in induction of post operative analgesia following surgical extraction of mandibular third molar

[1]Maroofa Hafiz, [2]Mansha Hassan, [3]Asiya Basheer

[1,2]Senior Resident, Department of Oral and Maxillofacial Surgery, Jaipur Dental College, Rajasthan, India; [3]Private Practitioner, Jammu and Kashmir, India

ABSTRACT:

After surgical extraction of impacted third molars the post-surgical pain is considered to be moderate to severe in intensity and is particularly used as a parameter for assessing the efficacy of various painkillers. Various trials have been performed to determine the peripheral analgesic effect of different opioids. So, the AIM of this study was to compare the efficiency of buprenorphine and 2% lignocaine with adrenaline in induction of postoperative analgesia following surgical extraction of mandibular third molar. Material and Methodology: A prospective, randomized controlled study was undertaken where 40 patients were included in the study, these patients were randomly divided into Group A and Group B with 20 patients in each group. Group A were injected a combination of 2% lignocaine with 1:80,000 adrenaline and buprenorphine and Group B were injected with 2% lignocaine with 1:80,000 adrenaline for inferior alveolar nerve block. The data was collected and finally entered in Microsoft Excel spreadsheet and further analyzed using SPSS software version 21. The data were compared using Student's t-test. The level of significance was set at 0.05. The study concluded that administration of local anesthetic solution combined with buprenorphine for intraoral block related procedures effectively reduces postoperative pain, with no significant side effects

Keywords: Buprenorphine, third molar impaction, local anaesthesia, opioid, NSAIDs, pain

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Corresponding author: Maroofa Hafiz, Senior Resident, Department of Oral and Maxillofacial Surgery, Jaipur Dental College, Rajasthan, India

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INTRODUCTION

Extraction of impacted mandibular third molars is one of the most frequently performed procedures by an oral and maxillofacial surgeon. Management of pain postoperatively is the prime and main concern during this procedure[1]. This pain and discomfort postoperatively can make the patient's experience of this procedure unpleasant[2]. Extraction of teeth is usually done under the effect of LA, commonly being lidocaine with epinephrine. The duration of action of local anesthetic agent is approximately about the duration of the surgical procedure and when the effect of this anesthetic agent disappears, the patient begins to develop pain[3]. Non-steroidal anti-inflammatory drugs usually known by the short form NSAIDS are most commonly prescribed in order to achieve adequate postoperative analgesia for treatment of patients undergoing surgical extractions. However, non-steroidal anti-inflammatory drugs have some side effects such as gastrointestinal haemorrhage, peptic ulcer disease, renal dysfunction, altered liver function, and also platelet dysfunctions, hence it is mostly advisable to limit their use for management the postoperative pain. Opioids are another group of analgesics which can be considered and in-turn are used as the first-line drugs for severe pain control. Opioid analgesics have an advantage over NSAIDs in that they do not cause direct organ damage [1]. However, these drugs can also cause central effects such as fatigue, dizziness, mental clouding, respiratory depression hypotension, and vomiting[4] which in turn led to the understanding of a drug, buprenorphine hydrochloride, with good analgesic effect and having almost no adverse systemic effects. Buprenorphine

hydrochloride is a synthetic opioid having μ-agonistic, κ-antagonistic, and anti-hyperalgesia effects. The pharmacological effects of buprenorphine are generally alike to morphine (μ-opioid receptoragonist) and is considered to be almost 20–25 times highly potent than morphine (buprenorphine 0.3mg is as equipotent as morphine 10mg) with a rapid onset and longer duration of action[5]. Thus, we aimed to evaluate the efficacy of lidocaine with or without buprenorphine for postsurgical analgesia after the removal of mandibular third molars.

MATERIALS AND METHODOLOGY

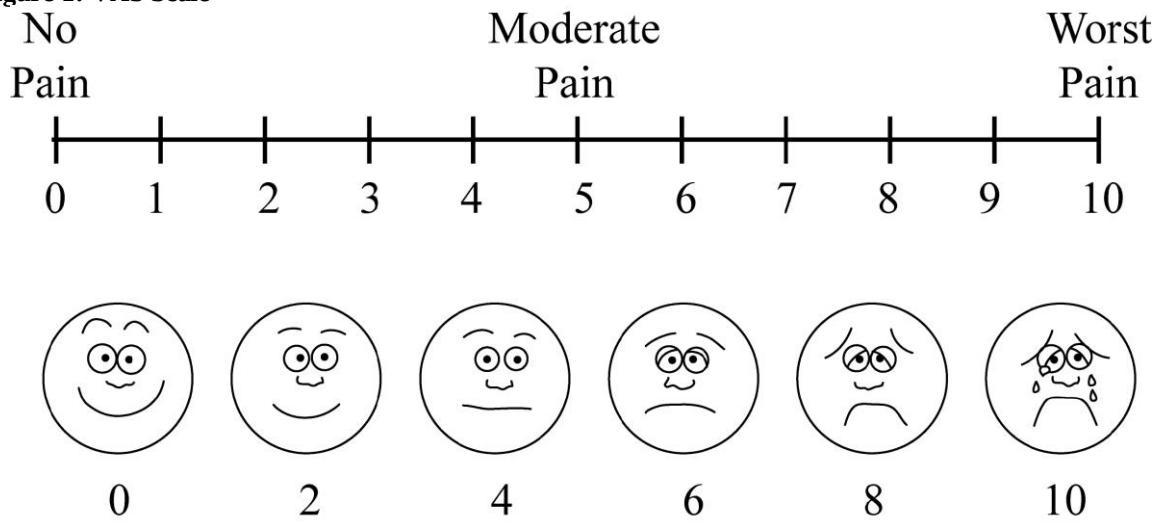
A prospective, randomized controlled study was undertaken where 40 patients referred to our department of oral and maxillofacial surgery in Jaipur Dental College for surgical extraction of mandibular third molar were selected for this study. The surgical procedures performed our study were conducted in accordance with the ethical standards which were given in 1964 "Declaration of Helsinki" as revised in 2013. Consent was obtained from all the patients who ever participated in the study. The study was conducted for 6 months (August 2019 to February 2020). The age of the patients ranged between 17 and 25 years. Patients who were medically compromised or allergic to the drugs used, or even who had consumed analgesics within 6 h of the surgical procedure were excluded from the study. Fourty patients were randomly and equally allotted under two groups (by coin toss). Group A received a combination of 2% lignocaine with 1:80,000 adrenaline and buprenorphine and Group B received 2% lignocaine with 1:80,000 adrenaline for inferior alveolar nerve block.

The reconstituted solution for Group A was prepared by adding 1 ml of 0.3-mg buprenorphine (injection Bupregesic) to 29 ml of 2% lignocaine with adrenaline 1:80,000 making each ml of this solution to contain 0.01 mg of buprenorphine. Each patient from both the groups was administered 3 ml of either the reconstituted solution or 2% lignocaine with 1:80,000 adrenaline for classical direct IAN (inferior alveolar nerve block) technique divided as 2 ml for IAN, 0.5 ml for lingual nerve block, and finally 0.5 ml for long buccal nerve block and also patients in first Group received a total dose of 0.03-mg buprenorphine. A standard operating protocol was followed while performing the surgical extraction of impacted lower third molars, following which patients were prescribed antibiotics (amoxicillin 500 mg three times a day) postoperatively for 3 days, along with analgesic (diclofenac potassium 50 mg). Patients were advised to take the analgesic only at the initiation of postoperative pain, after which they were instructed to take this medication two times daily for 3 days. Finally these patients were reviewed on the 3rd day regarding their dental status including adverse effects associated with buprenorphine, postoperative analgesia, and the timing and number of rescue analgesics consumed.

PARAMETERS

The anaesthesial onset was measured based on the appearance of objective and subjective symptoms. For the purpose of subjective symptoms, patients were asked about tingling sensation on the ipsilateral part of the tongue and lower lip. For objective symptoms, the needle stick test was performed by probing on the attached gingiva of the same side; the absence of pain signified the onset of soft-tissue anaesthesia. The depth of anaesthesia was recorded intra operatively using the Visual Analog Scale (VAS) (figure 1) during ostectomy. Duration of anaesthesia was recorded in hours from the time of injection to the re-appearance of sensation in the particular area. The duration of analgesia was also determined as the number of hours the patient spent without consuming an analgesic after the procedure, it was assessed every 4h up-to 24 h and then at every 24-h interval up to 72 h.

Figure 1: VAS Scale



STATISTICAL ANALYSIS

The data was collected and finally entered in Microsoft Excel spreadsheet and was also analyzed using SPSS software version 21. The data were compared using Student's t-test. The level of significance was set at 0.05 and was then considered to be significant.

RESULTS

A total of fifty patients were enrolled in the study who were randomly allotted in the two groups (Group A and Group B). The time to onset of anesthesia is shown in Table 1 and Figure 2. There was a significant difference in the time to onset between Group A (3 min and 6 secs) and Group B (2 min 12secs) ($P \leq 0.05$). Thus, the addition of buprenorphine to local anesthesia prolongs the onset of action in our study. Following which the depth of anesthesia was recorded intraoperatively using the Heft-Parker VAS (visual analogue scale) during ostectomy. The pain experienced by former group was less than the pain experienced later group. The duration of anaesthesia was a mean of 2 h 28 min in Group first (A) and 3 h 58 min in Group second (B) Table 2 and Figure 3. The difference between the groups was found to be highly significant ($P = 0.00$). Thus, the addition of buprenorphine to local anesthesia had a significant effect on the duration of anaesthesia, i.e. it wore off quickly. The duration of postoperative analgesia is shown in Table 3 and Figure 4. On comparison, the difference between Group A (56 h 16 min) and Group B (3 h 12 min) was also statistically significant ($P = 0.000$). Thus, the addition of buprenorphine to local anesthesia prolonged the duration of postoperative analgesia considerably.

Table 1

Onset Of Anesthesis				
	Subjective Symptom	**P Value**	**Objective Symptom**	**P Value**
Group A	**3mins 6s**	**significant**	**4mins 2s**	**Significant**
Group B	**2 mins 12s**		**2mins 16 s**	

Figure 2

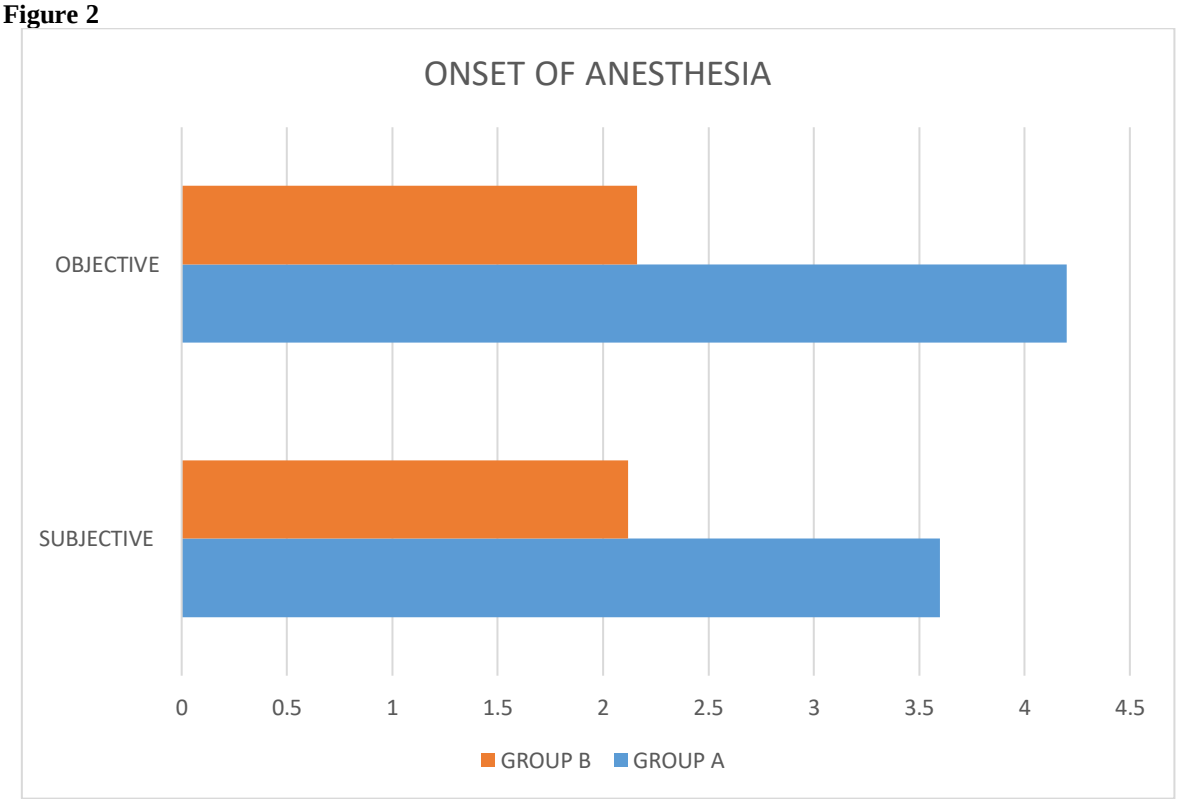


Table 2

Duration Of Anesthesis		
GROUP A	**2h 28 Mins**	**Significant P Value**
Group B	**3h 58 Mins**	

Figure 3

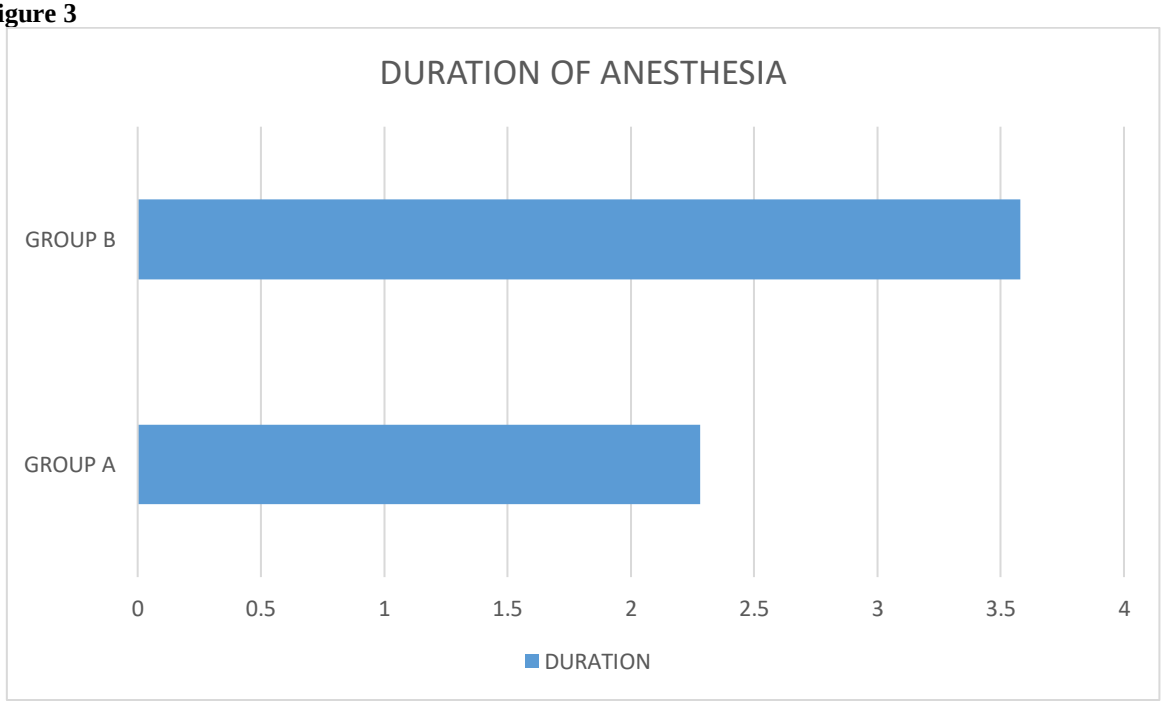
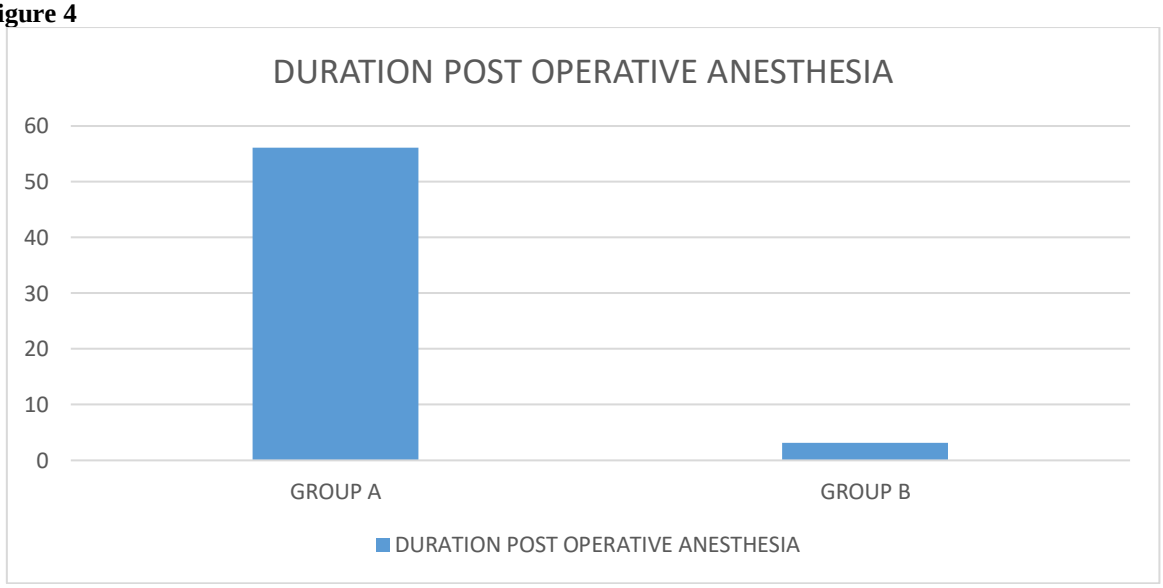


Table 3

Duration of post operative analgesia		
Group A	**56 h 16 min**	**Significant P Value**
Group B	**3h 12 mins**	

Figure 4



DISCUSSION

Buprenorphine, as already discussed is a partial agonist at μ-receptor, was used in our study for postoperative pain management as it is approximately 25–100 times more potent than morphine[5] and also due to its cost effectiveness and ease in its availability, moreover it also has the less side effects than other drugs (already discussed). Our study showed that the addition of buprenorphine statistically increases the duration of analgesia. In 1970's, opioids were shown to have peripheral antinociceptive effects in cases of inflammation[6]. In our study, the time to onset of anesthesia was prolonged in Group A (3 min 6 s) compared to Group B (2 min 12 s), the result of our study were in accordance to the study done by **Bagade, et al** however these results were also in in contrast with other studies, where there was no difference in the time in onset of anaesthesia[7,8.] A study was done by **Mehta et al.,** in which the time to onset of anaesthesia was prolonged in the group receiving 25-mg fentanyl plus bupivacaine as compared to bupivacaine alone[9] and finally suggested

that prolonged onset of action of anaesthesia could have been caused because of reduction in pH of bupivacaine when fentanyl was added to local anaesthesia. Similar results were observed in a study performed by **Patil et al** where they reported the increase in the time to onset of anaesthesia when 0.03 mg of buprenorphine was added to 0.5% bupivacaine and 2% lignocaine with 1:200,000 adrenaline for supraclavicular brachial plexus block[10]. The depth of anaesthesia was also found to be greater in the group that received local anaesthesia with buprenorphine (Group A) as compared to the control group (Group B). Group A also had the shorter duration of anesthesia i.e 2h 28mins but sufficient enough to perform the third molar surgery, the results were in contrast to the study done by **Chhabra et al. and Kumar et al**. who had concluded with no change in the duration of anaesthesia[11,12]. In our study, the addition of buprenorphine to lignocaine for regional block commonly reduced the postoperative severity of pain as a number of analgesics consumed by patients in Group A were significantly lesser (P value significant) when compared to the patients in Group B. This significant result can be attributed to the theory of the presence of peripheral opioid receptors. The Dissociation (slow) from μ-receptor also plays an important role for its prolonged therapeutic effect to treat opioid dependence as well as pain[5]. Numerous other studies have also shown a beneficial effect of adding buprenorphine to various local anesthetic agents while administering regional blocks[13-15]. A metaanalysis by **Schnabel et al.** evaluated the efficacy and safety of buprenorphine in regional blocks showed significantly postoperative analgesia. However, it was also found to be associated with postoperative nausea and vomiting[16].

CONCLUSION

Administration of local anesthetic solution mixed with buprenorphine for intraoral block (inferior alveolar nerve block for surgical extraction of impacted third molar) related procedures effectively reduces postoperative pain, with no significant side effects. This negates the need for consumption of analgesics post operatively. Benefits of buprenorphine outweigh the marginal increase in the onset of anaesthesia and reduction in the duration of anaesthesia.

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