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Original Article

Efficacy of Lignocaine with Clonidine and Adrenaline in Lower Third Molar Extraction

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Abstract

Introduction: The use of local anesthesia in oral surgical procedure is to ensure the comfort and safety of the patients. Local anesthetics agent may be used with or without vasoconstrictor.

Materials and Methods: The study was conducted to compare and evaluate the efficacy of clonidine as a substitute for vasoconstrictor. It was carried out on 10 patients undergoing bilaterally third molar surgeries.

Results: The hemodynamic changes were stable in clonidine group as compare to epinephrine group and post-operative analgesic effect were better in epinephrine group.

Conclusion: Clonidine as an additive to the local anesthetic solution gives stable cardiovascular hemodymic parameters and also reduces anxiety. However, there was no much difference in respect to systolic blood pressure, diastolic blood pressure, heart rate, and onset of action.

Key words: Clonidine, Epinephrine, Hemodynamic, Vasoconstrictor

INTRODUCTION

Local anesthesia is the main component in dental practice. Local anesthetic produces temporary loss of sensation. Local anesthetic alone has a greater tissue perfusion and shorter duration of action. To overcome the drawback, vasoconstrictor is added. Adding vasoconstrictor to the local anesthesia reduces the rate of absorption from the site of injection or infiltration. The action of vasoconstrictor prolongs the duration of action of the anesthetic agent and reduces bleeding at the site of surgery.

Clonidine is the centrally acting α-2 adrenoreceptor agonist. Clonidine has certain hemodynamic effects during stressful condition. This study was undertaken to evaluate the effect of the plain local anesthetic agent after adding clonidine to it and compare it with the local anesthesia with epinephrine.

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MATERIALS AND METHODS

The study was done in 10 patients who were undergoing bilateral third molar surgery and randomly selected both sexes (male and female) between the age of 18 and 40 years, American Society of Anesthesiologists I (ASA I) and surgical site free of infection. Nursing mother, pregnant and medically compromised patient were excluded from this study. Informed consent was taken from every patient before the procedure. Patient allergies to local anesthetic solution were excluded from the study. Patients received 2 ml of 2% lignocaine with epinephrine (12.5 mcg/ml) in one side and 2 ml of 2% lignocaine with clonidine (1 on the other side.

The solution of lignocaine with clonidine was freshly prepared. 9 ml of 2% lox (2% lignocaine hydrochloride) was taken in a 10 ml syringe and mixed with 1 ml of clonidine hydrochloride. Then the mixture was transferred to 2 ml syringe before the injection.

The procedure was undertaken into two different appointments. The sides were divided into two groups. The side which receives 2% lignocaine with epinephrine was named as Group A and the other side which receives

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2% lignocaine with clonidine as Group B. Patients were evaluated (starting at the time of injection till the end of the procedure) for systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR). The parameters were recorded every 10 min starting from the procedure till the end of the procedure. The post-operative analgesia was evaluated by using visual analog scale (VAS).

RESULT

The results obtained in ASA I patients demonstrate that the anesthetic solution with clonidine, as a vasoconstrictor, does not have much significant difference in SBP (Figure 1), DBP (Figure 2), and HR (Figure 3) statistically. Although the parameters of local anesthesia were similar in both the groups, the cardiovascular parameters during anesthesia with clonidine-containing local anesthetic solution were more stable than adrenaline group. The onset of action and duration of action show not much difference between the two groups (Figures 4 and 5). Comparison of VAS between the two groups states that the post-operative analgesic effect is slightly more in clonidine group (Figure 6). These findings may be relevant to oral and maxillofacial surgeons endeavoring to find a vasoconstrictor for local anesthetic solution with minimal cardiovascular risk and longer post-analgesic effect. Multiple variable factors exist such as technique variability, anatomical variations, complexity of procedure, and reporting error. Pain itself is multifactorial; and perception and pain reaction vary greatly among individuals. Clonidine has shown to reduce anxiety perioperatively and give a longer post-analgesic effect.

DISCUSSION

Local anesthesia is the main key of successful treatment of for any minor surgical dental procedure. The effectiveness depends on the local anesthetic agents and additive used. Normally, adrenaline is used as a vasoconstrictor to lengthen the duration of anesthetic effect and to reduce the bleeding during the procedure. It appears that clonidine could be a useful alternative to adrenaline for intraoral anesthesia and may have a role in those with cardiovascular disease or those particularly sensitive to adrenaline.[1] Several studies have been carried out using different concentrations of clonidine for the enhancement of epidural anesthesia, brachial plexus anesthesia, and anesthesia of peripheral nerves.[2] These studies have shown that the effective concentrations of clonidine, without significant side effects, were 150 μg/ml,[3] 90 μg/ml,[4] 30 μg/ml,[4] 10 μg/ml,[5] and 5 μg/ml.[6] Clonidine at 5 μg/ml can be safely used as additives with lignocaine, in intra-oral anesthesia.[7]

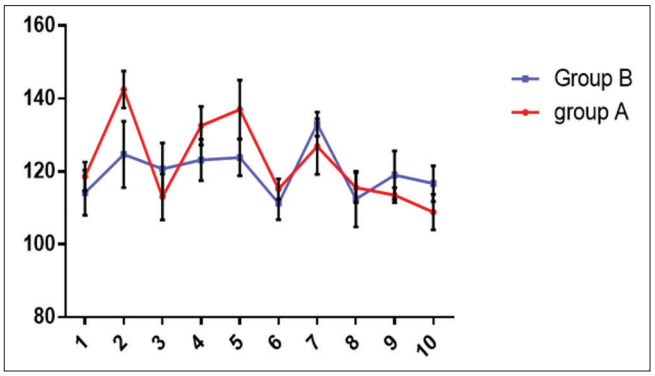

Figure 1: Systolic blood pressure

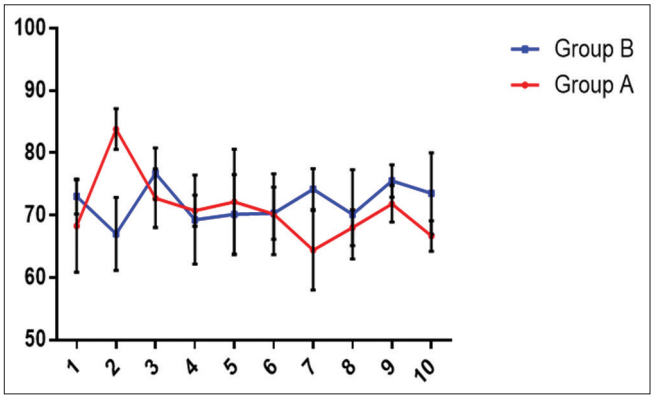

Figure 2: Diastolic blood pressure

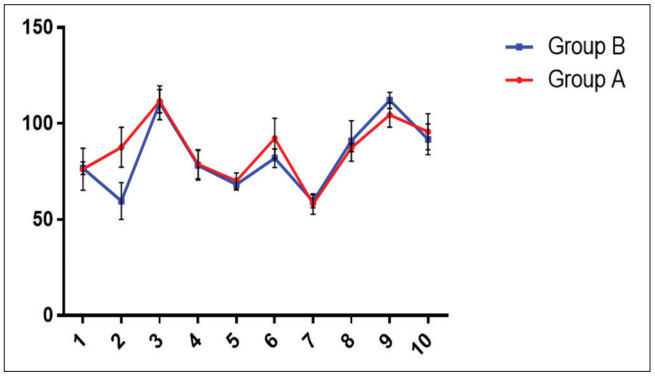

Figure 3: Heart rate

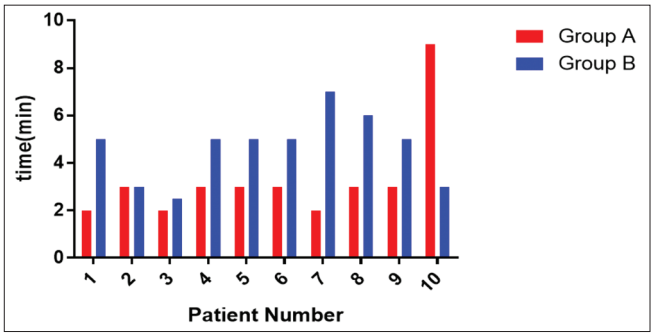

Figure 4: Onset of action

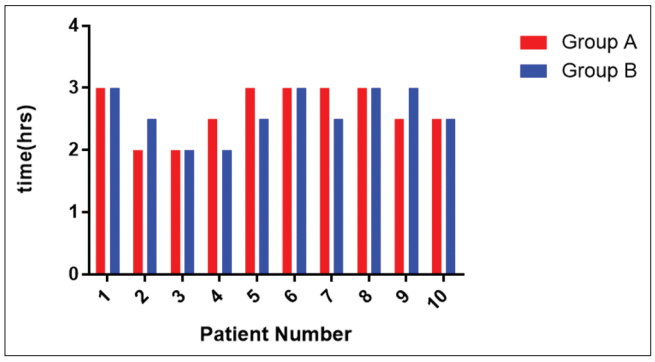

Figure 5: Duration of action till the return of normal sensation

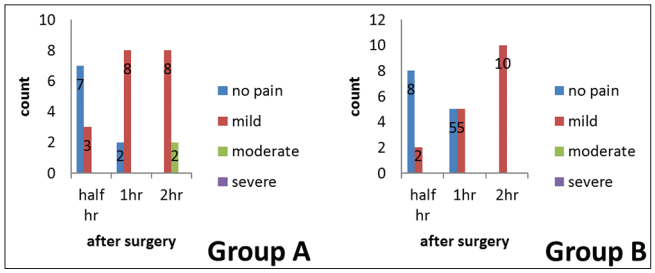

Figure 6: Post-operative analgesia

In a study by Brkovic *et al.*, there was no significant difference in the onset of anesthesia between the clonidine and the epinephrine groups, because the onset of anesthesia primarily depends on the characteristics of local anesthetics.[1]

In this study, 2% lignocaine hydrochloride with 1:80,000 adrenalines was used for the anesthesia of one side and 2% lignocaine hydrochloride with clonidine (15 μg/ml) on the other sides. Clonidine is α-2 adrenoreceptor agonist with both central and peripheral action. It decreases the blood pressure, produces a central analgesic effect and is a mild sedative due to its central activation of presynaptic α-2 adrenoreceptor. It brings about vasoconstriction of peripheral blood vessels due to activation of postsynaptic α-2 adrenoreceptors. When used as a central hypotensive agent, in different routes of administration, it enhances local anesthesia and analgesia.[8] Hemodynamic parameters of all the patients were monitored. HR, SBP, and DBP were noted. In a study done by Hassan *et al.*, the cardiovascular parameters during anesthesia with clonidine-containing local anesthetic solution were more stable than adrenaline group, whereas parameters of local anesthesia were similar in both the groups.[9] In our study, there was no statistically no significant difference between mean values of SBP and DBP in the clonidine and adrenaline groups, but the stability of the cardiovascular parameters was more in clonidine group than the adrenaline group.

Mazoit *et al.* reported that in cardiovascular patients, clonidine in lidocaine anesthesia given for cervical plexus block produces hemodynamic stability, which was not observed in lidocaine with epinephrine-treated patients in whom significantly increased HR was recorded.[10]

In a study by Brkovic *et al.*,[2] it was proved that HR before anesthesia administration for lidocaine with clonidine group was 85.4 ± 3.1 bpm and decreased significantly 10 min after surgery (80.9 ± 2.8 bpm). Clonidine increased the risk of bradycardia, arterial hypotension, and sedation. This was not unexpected and it is most likely the result of systemic reabsorption.[11] This study showed the difference in mean HR preoperatively and intraoperatively was not so significant between clonidine and adrenaline group.

Clonidine is known to produce sedation, analgesia, and hemodynamic stability. It is also known that clonidine prolongs spinal anesthesia when added to intrathecal local anesthetic agents or when taken orally.[12] There are no differences in the enhancement of duration and intensity of intra-oral anesthesia with adrenaline and clonidine, whereas clonidine might have hemodynamic advantages over adrenaline as a vasoconstrictor because of its central hypotensive effect.[7] James Eisenach showed that there was no significant statistical difference between clonidine and adrenaline group when intensity of anesthesia was evaluated VAS and verbal rating scale.

In a study done by Hassan *et al.*,[9] the total number of pain medication doses taken was significantly lower in clonidine-treated patients, compared with those treated with adrenaline in 24 h postoperatively. The mean duration of analgesia was more with clonidine group compared with adrenaline group indicating that clonidine increases the duration of post-operative analgesia. In our study, post-analgesic effect was slightly more in clonidine 2 h after the procedure. All the patients show mild pain 2 h after the procedure in clonidine with adrenaline group, whereas 80% of the patient shows mild pain and 20% of the patients show moderate pain in lignocaine with adrenaline group. The mean duration of analgesia was slightly more with clonidine group compared with adrenaline group indicating that clonidine increases the duration of post-operative analgesia. Overall, hemodynamic changes were stable in lignocaine with clonidine group as compared to lignocaine with adrenaline group.

Clonidine has also been shown to have a peripheral analgesic effect by releasing enkephalin-like substances.[7] The mechanism by which clonidine produces this neurological blockade is not clear, but it may be a result of: (1) A membrane stabilizing effect on the axons similar to that of local anesthetics solution, (2) the α-2/α-agonist effect on the neurones, (3) or a combination of both of these effects. Clonidine alone or in combination with local

anesthesia is more likely to produce effective analgesia in patients with neurological deficit associated with their pain, i.e., neuropathic pain. The combination of lignocaine + clonidine provides the best short- and long-term analgesia, suggesting that clonidine is supra-additive.[13]

Brummett *et al.* have stated that clonidine when used with short and intermediate-acting local anesthetics prolongs the duration of anaesthesia.[14] Clonidine is said to also cause sedation when used in high doses (100 μg), but the concentration (10 μg) used in our study did not produce any untoward side effects.[6]

In this study, one patient shows longer onset of action in lignocaine with adrenaline group. There are several factors which affect the action of local anesthesia. Site of injection, pKa of the anesthetic solution and the injection technique relative to nerve morphology are some of the factors which might give false reading during the onset of the local anesthesia.

All the patients were monitored for 2 h following the procedure and discharged without any complaints, side effects and local or systemic adverse reactions to the drug under study. All the patients at the end of 2 h were discharged with a prescription containing analgesic, anti-inflammatory, and antibiotic. Shelf-life of freshly prepared lignocaine with clonidine was 8 h, whereas lignocaine with adrenaline has a proven longer shelf-life. This indicates that freshly prepared solution of lignocaine with clonidine should be used for every procedure, which may add to the cost of treatment. Patients falling in ASA I category was only included in this study. The cardiovascular soothing effect of clonidine suggests that this drug can be a safe choice to be used in patients in whom adrenaline use was to be avoided.

CONCLUSION

From our study, we conclude that clonidine as an additive to the local anesthetic solution gives stable cardiovascular hemodymic parameters and also reduces anxiety. However, there was no much difference in respect to SBP, DBP, HR and onset of action. Post-analgesic effect in clonidine was found out to be better than adrenaline group. However, a more elaborate study with a larger sample size may be essential to be more conclusive.

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