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Use of Clonidine as an Adjuvant to Adrenaline in Local Anaesthesia for third Molar Surgery-A Clinical Study

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ABSTRACT

Background: The study aimed to compare the efficacy of anesthesia and hemodynamic parameters of clonidine and epinephrine in lignocaine for lower third molar surgery. **Methods**: 30 patients controls with impacted mandibular third molar were randomly selected from both sexes between the age group of 21–48 years. Patients were divided equally into two groups: Group I (Adrenaline group) and Group II (Clonidine group). Patients received 2.5 ml of 2% lignocaine with adrenaline (12.5 µg/ml) in the Adrenaline group and 2.5 ml of 2% lignocaine with clonidine (15 µg/ml) in Clonidine group. Hemodynamic parameters (heart rate, systolic blood pressure [SBP], diastolic blood pressure [DBP], and mean arterial pressure [MAP]) were recorded preoperatively, intraoperatively, and postoperatively. The onset of anesthesia and the duration of anesthesia were recorded using a pinprick test for both groups. Postoperatively, patients were evaluated for pain experience by the visual analogy scale. **Results**: Lignocaine with clonidine intraoperatively and postoperatively decreases SBP and DBP and MAP compared to lignocaine with adrenaline. However there was no significant difference in the onset and duration of anesthesia in both the groups. There was a statistically significant difference seen in the visual analogy scale. **Conclusion**: Clonidine has similar efficacy as that of adrenaline with better hemodynamic parameters and can be used as an alternative to adrenaline for third molar surgeries.

Keywords: Clonidine, lignocaine, local anesthesia, visual analogy scale.

INTRODUCTION

Third molar surgery performed under local anesthesia needs adequate anesthesia which is mainly dependent on the presence and concentration of the added vasoconstrictor.[1] Epinephrine enhances the duration and intensity of anesthesia and provides desirable homeostasis at the surgical site.. Even with a relatively small dosage of epinephrine, it is essential to note that in patients having cardiovascular problems (poorly controlled American Society of Anesthesiologists [ASA] III and all ASA IV group) it is recommended to limit or avoid exposure to vasoconstrictor epinephrine, if possible as Goldstein et al.[2] have reported that intraoral block anesthesia with 2% lidocaine with epinephrine (1:100,000) in healthy controls, resulted in increased circulatory epinephrine levels associated with cardiovascular changes. There is evidence that clonidine, an alpha- 2 adrenoceptor agonist, used as a central antihypertensive agent, enhances local anesthesia and analgesia in a variety of routes of administration and clinical circumstances. The addition of clonidine to LA has been shown to increase its duration of action. Clonidine decreases blood pressure and causes central analgesic activity as well as sedation through central activation of presynaptic alpha- 2 adrenoceptors,[3] By the activation of peripheral postsynaptic alpha- 2 adrenoceptors, clonidine produces vasoconstriction of the peripheral blood vessels. The aim of the study was to compare the efficacy of anesthesia of clonidine and epinephrine in lignocaine for third molar extraction.

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MATERIALS AND METHODS

After obtaining ethical clearance from the institutional ethical committee, 30 healthy patients who reported to the Department of Oral and Maxillofacial Surgery Government Dental College & Hospital Srinagar for the removal of impacted mandibular third molar were selected for the study. The study included both genders in the age group of 21 to 48 years. Inclusion criteria were healthy patients and minimal to moderately impacted mandibular third molar.[4] whereas patients with systemic diseases, pregnancy and lactating mother were excluded. Patients were randomly divided into two groups: Group 1 (Clonidine group) received 2.5 ml of 2% lignocaine with clonidine (15 µg/ml) and Group 2 (Adrenaline group) received 2.5 ml of 2% lignocaine with adrenaline (12 µg/ml). A freshly prepared solution was used for every patient. To make the concentration of lignocaine + clonidine of 15 µg/ ml, 9 ml of 2% xylocaine was mixed with 1 ml ampule of 150 µg/ml of clonidine hydrochloride in a 10 ml syringe After inducing the nerve block; the patients were evaluated for onset, duration, and intensity of anesthesia. The response to pinprick in the buccal

attached gingiva between mandibular canine and first premolar with a 26- G sterile needle was used to determine the onset and duration of anesthesia. The beginning of anesthesia was tested every 30 seconds until prick elicited no sensation. The term was also evaluated by pinprick testing being repeated every 30 min after surgery to the time point when the patient feels blunt sensation and then continued every 10 min till the return of complete consciousness. Patients were evaluated with a 100- mm VAS, unmarked except for one end with "no pain" and the opposite end of the scale marked "worst pain."

RESULTS

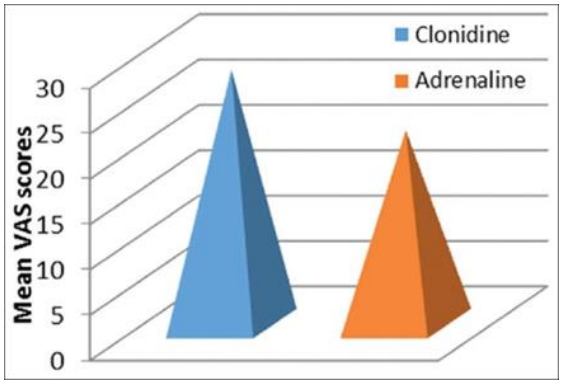

Figure 1: Visual Analog scale

The study comprised patients with a mean age of 30 and age, ranging from 21 to 48 years. The Clonidine group contained 45% male and 55% female, whereas the Adrenaline group included 33.3% male and 66.7% female. Impactions assessed according to the Pederson index were within mild- to- moderate difficulty level. There was no significant difference between the groups with respect to age, gender distribution, the difficulty of impaction, and duration of the procedure. The results obtained from the study suggest that clonidine used with lignocaine as a vasoconstrictor produces more stable hemodynamic parameters. There was a decrease in Systolic blood pressure, Diastolic blood pressure, and mean arterial pressure within the clonidine group when compared to the baseline preoperative values of the clonidine group. However, there was no statistically significant difference seen when values were compared between the groups. The mean onset of anesthesia in clonidine was 120.0 s and adrenaline was 106.0 s. The mean duration of anesthesia for the Clonidine group was178 min and the adrenaline was 187.3 min. There was no statistically significant difference in the onset and duration of anesthesia between the groups. These criteria strongly depend on the presence of the vasoconstrictor effect of local anesthesia, hence supporting the vasoconstrictor action of clonidine when added to lignocaine. Upon comparison of pain score, here was a statistically significant difference seen in the visual analog scale [Figure1].

DISCUSSION

Lignocaine with adrenaline as vasoconstrictor is common in dental practice, but its cardiovascular safety is doubtful in individual patients. However, changes in HR and blood pressure can be significant during and after extraction, as LA solutions contain adrenaline in different concentrations. Hence, the type and frequency of vasoconstrictors should be considered when selecting a LA solution. In our study, 1:80,000 (12.5 µg/ml) concentration of adrenaline was compared to (15 µg/ml) concentration of clonidine as an adjuvant for the efficacy of local anesthesia. Use of adrenaline as vasoconstrictor since long been a controversial subject in dentistry and medicine and remains a subject of continuing study as well as a persistent controversial topic in the etiology of cardiovascular reactions. It is essential to avoid pain and minimize patient anxiety to ensure safe clinical practice. The results of the present study suggest that clonidine, like epinephrine, is able to increase and prolong the efficacy of lidocaine anesthesia in an inferior alveolar nerve block. Several studies have been carried out using different concentrations of clonidine for the enhancement of epidural anesthesia,[5] brachial plexus anesthesia,[6] and anesthesia of peripheral nerves.[7] Alemany- Martinez et al.[8] studied hemodynamic changes during third molar surgery and concluded that although cardiovascular changes were within the normal range, stress and anxiety have an impact on these changes and should be considered. Brkovic et al.[9] mentions that clonidine (15 µg/ml) added to 2% lidocaine produces an onset, duration, and intensity of intraoral block anesthesia similar to those gained by a solution of 2% lidocaine with epinephrine (12.5 µg/ml). In the present study, there was no significant difference in the onset of anesthesia between the clonidine and adrenaline groups. This mainly depends on the characteristic of LA. Thus the presence of adrenaline and clonidine does not have an impact on the onset of anesthesia. Similar results were obtained in the other studies for the intraoral block.[10- 12] Patients in the clonidine group had their SBP and DBP within the standard limit and were more hemodynamically stable. There was a significant decrease in SBP, DBP, and MAP in the clonidine group when compared with values before administration, while there was an increase in SBP, DBP, and MAP in the Adrenaline group from preoperative to intraoperative. Shadmehr et al.[13] in his study, he concluded that the addition of clonidine to lidocaine improved the success rate of an inferior alveolar nerve block (IANB) compared

to a standard lidocaine/epinephrine solution. Clonidine is alpha- 2 adrenoceptor agonist with both central and peripheral action. Three mechanisms of action for clonidine additive effects have been proposed. They include (i) direct action on the peripheral nerve, (ii) central alpha- 2 receptor- mediated analgesia, and (iii) alpha- 2- mediated vasoconstriction.[14] It is known that duration and intensity are parameters that depend on the presence of vasoconstrictor. Concerning the results of Mazoit et al.,[15] the addition of clonidine to lidocaine for epidural anesthesia has led to the reduction of the plasma peak concentration of lidocaine. It could be concluded that this effect is the result of vasoconstriction due to clonidine. It has been noticed that epidurals injected clonidine induces a reduction in local blood flow and that the decrease in regional blood flow correlates with the injection dose. Pain is an essential criterion by which patient comfort can be assessed during the treatment procedure. In our study, we used VAS for determining the intensity of anesthesia during the surgical procedure. There was a statistically significant difference in VAS between the groups. Patil et al. compared clonidine and epinephrine in poorly controlled, moderate hypertensive patients. The results suggested that there were no significant differences between the two agents with regard to the time of onset of action, duration, or intensity of anesthesia, or the vasoconstrictor properties. The clonidine group showed better hemodynamic parameters compared with the epinephrine group. The clonidine group showed significantly lesser postoperative pain and, therefore, had lower analgesic consumption.

CONCLUSION

Based on the results of the present study, it can be concluded that clonidine, when used as an adjuvant to adrenaline in lignocaine, can be a safe and useful alternative to adrenaline. It is as efficient as adrenaline with respect to onset, duration, and intensity of anesthesia. Hemodynamic parameters are stable and better than adrenaline.

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