

## Original Research

### Analysis of Local Anesthesia with 2 Different Concentrations of Adrenaline: A comparative study

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#### ABSTRACT:

**Background:** To compare and analyze two different local anesthetic solutions. **Materials & methods:** A total of 40 subjects were enrolled. The subjects of the age group 20-50 years were included. Group 1- 2% lignocaine with 1: 80000 and group 2: adrenaline concentration with 1:200000. The data was collected and results were analyzed using SPSS software. **Results:** A total of 40 subjects were enrolled. There was no significant change in both the groups in the point of view of time of onset. With regard to the duration of action of LA, 1:80000 adrenaline concentrations showed more than that of 1:200000.

**Conclusion:** The use 2% lignocaine with 1:200000 for cardiac patients is recommended.

**Keywords:** Adrenaline, local anesthesia, concentration.

Received: 17 January, 2022

Accepted: 20 February, 2022

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**This article may be cited as:** Bhatt RA, Farooq F. Analysis of Local Anesthesia with 2 Different Concentrations of Adrenaline: A comparative study. *J Adv Med Dent Scie Res* 2022;10(3):145-149.

#### INTRODUCTION

Pain is a nearly ubiquitous phenomenon—a fact of everyday life. Pain is the chief symptom that brings patients to dental or medical attention. Local anaesthetics are frequently used by the dental surgeon to control intra-operative pain. An oral surgeon has to use local anaesthetics for most minor surgical procedures. Increase in stress, decrease in physical activity, irregular food habits, consumption of nutritionally poor food have a detrimental effect on a person's health. All these factors and many more have increased the incidence of juvenile and maturity onset diabetes on one hand and the use of hypoglycemics on the other. <sup>1</sup> Since lignocaine with or without adrenaline is one of the most commonly used local anaesthetics in our country, we decided to undertake a study to observe its effects on blood glucose concentration in patients undergoing tooth extraction. Most dental treatments are performed under local anaesthesia, and an increase in blood pressure is common even in normotensive patients. This increase is influenced by many factors, such as psychological and physical stress, painful stimuli and the action of catecholamine present in local anaesthetic. <sup>2</sup>

Local anesthesia laid the fundamental foundation for pain regulation in dentistry. The backbone of pain management was founded by William Halsted in 1885 by introducing injectable dental local anesthesia, which reformed dental surgery. <sup>3</sup> Since the beginning of this revolution, a perceptible advancement in dental anesthesiology has been apparent in the anesthetic solutions used. <sup>4</sup> There are many local anesthetic agents, lignocaine being the gold standard available with the wide selection of vaso-constrictive agents that improve the clinical efficacy and the duration LA. <sup>5</sup> Lignocaine diffuses readily through interstitial tissues and lipid rich nerves, giving rapid onset of action. Its vasodilating effect is more than that of prilocaine and mepivacaine. <sup>6</sup> Adrenaline prolongs the duration as well as the depth of anesthesia. It is effective in preventing or minimizing blood loss during surgical procedures. Due to vaso-constrictive effects of adrenaline, absorption of LA and systemic toxicity are reduced. If adrenaline is not added to lignocaine, vasodilating effect of lignocaine limits pulpal anesthesia to only 5-10 min. 0.2 mg Adrenaline is a safe maximum dose in healthy patients and it is best to limit the total dose to 0.04 mg in cardiac patients. It should be kept to a minimum amount

capable of producing adequate results. Adrenaline acts directly on both  $\alpha$  and  $\beta$ -adrenergic receptors. Systemically adrenaline like drugs can cause a number of cardiovascular disturbances while most are short lived, permanent injury or even death may follow drug induced ventricular fibrillation, myocardial infarction or cerebro-vascular accidents.<sup>7</sup> Hence, this study was conducted to compare and analyse two different local anesthetic solutions.

**MATERIALS & METHODS**

A total of 40 subjects were enrolled. The subjects of the age group 20-50 years were included. They underwent extractions of mandibular bilateral teeth using 2% lignocaine with two different concentrations

- one with 1:80000 and the other with 1:200000. The patients were divided into 2 groups and comprised of 20 subjects in each group. Group 1- 2% lignocaine with 1: 80000 and group 2: adrenaline concentration with 1:200000. The data was collected and results were analyzed using SPSS software.

**RESULTS**

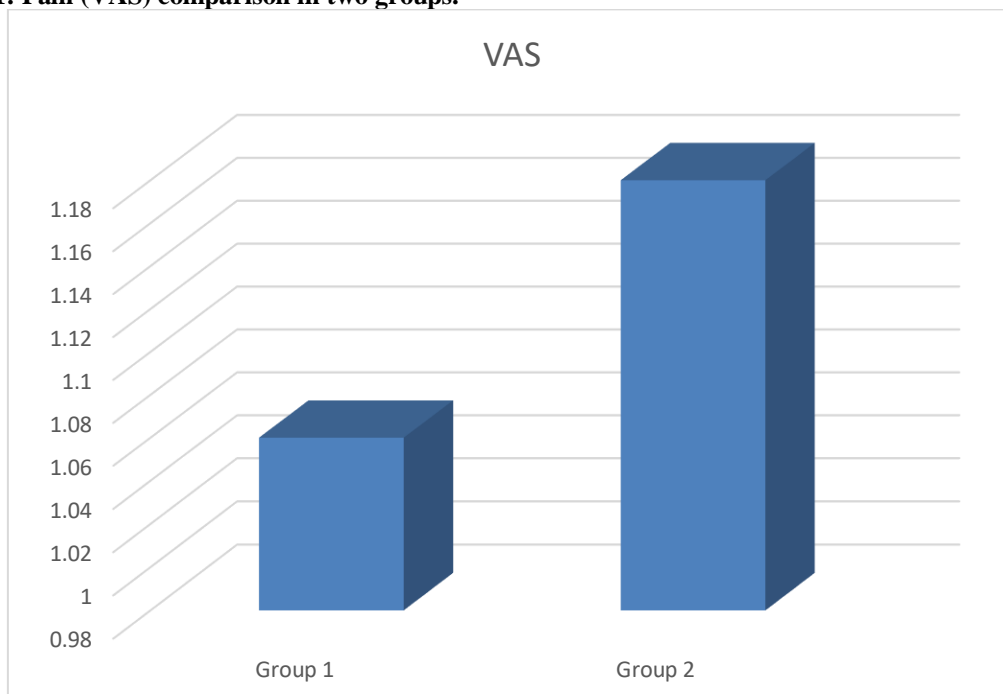
A total of 40 subjects were enrolled. There was no significant change in both the groups in the point of view of time of onset. With regard to the duration of action of LA, 1:80000 adrenaline concentrations showed more than that of 1:200000. This is due to the faster absorption of LA when used with less concentration of adrenaline.

**Table 1: Time of onset, duration, amount of LA used and pain (VAS) comparison in two groups.**

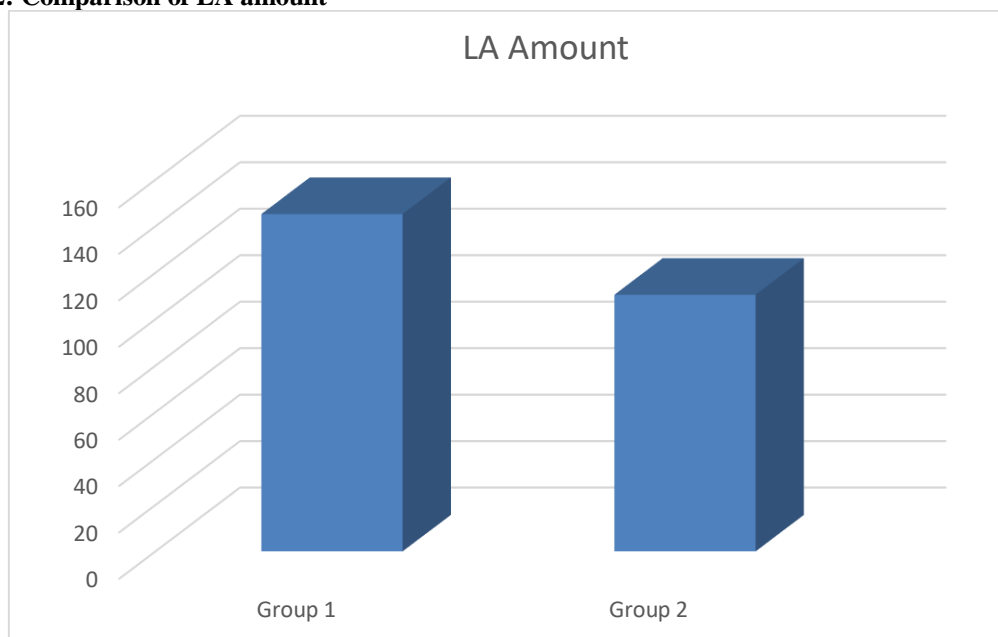
	Group	N	Mean
Time of onset (subjective)	1	20	1.72
	2	20	1.60
Time of onset (objective)	1	25	3.12
	2	25	3.30
Duration	1	25	145.23
	2	25	110.52
LA amount	1	25	145.23
	2	25	110.52
VAS	1	25	1.06
	2	25	1.18

LA: local anesthesia, VAS: visual analogue scale

**Graph 1: Pain (VAS) comparison in two groups.**



**Graph 2: Comparison of LA amount**



There was significant rise in the pulse rate immediately when LA with 1:80000 adrenaline concentrations was used and it came to the normal gradually after 60 min. But when LA with 1:200000 adrenaline concentrations was used, there was no significant rise in the pulse rate.

**Table 2: Variations in pulse rate.**

Time	Mean value pulse rate	
	Group 1	Group 2
Initial	72.04	75.82
Immediate	81.25	76.12
10 minute	80.45	74.18
60 minute	75.25	74.56

**DISCUSSION**

Though there are many LA agents available in the market, lignocaine is the most widely used in dentistry. Most of the time, LA agents are used with vasoconstrictors, though the concentrations may vary. The presence of a vasoconstrictor in the anesthetic cartridge has a major influence on the duration of anesthesia. <sup>8</sup> The ability of vasoconstrictors to retard the systemic absorption of injected LA agents is the basis for their widespread use. <sup>7</sup> Vasoconstrictors employed in local anesthetic solutions have the potential for interacting with the wide variety of drugs. <sup>9</sup> Physiological responses associated with local anesthetic solutions containing a vasoconstrictor have included changes in heart rate and BP, dysarrhythmias, ischemic changes (ST segment and T wave), the release of endogenous catecholamines, endocrine response to surgery and hypokalemia. <sup>10</sup> Hence, this study was conducted to compare and analyse two different local anesthetic solutions. In the present study, a total of 40 subjects were enrolled. There was no significant change in both the groups in the point of view of time of onset. With regard to the duration of action of LA, 1:80000 adrenaline concentrations showed more than that of

1:200000. This is due to the faster absorption of LA when used with less concentration of adrenaline. A study by Managutti A et al, a total of 40 subjects were enrolled. There was no significant change in both the groups in the point of view of time of onset. With regard to the duration of action of LA, 1:80000 adrenaline concentrations showed more than that of 1:200000. This is due to the faster absorption of LA when used with less concentration of adrenaline. <sup>11</sup> In the present study, there was significant rise in the pulse rate immediately when LA with 1:80000 adrenaline concentrations was used and it came to the normal gradually after 60 min. But when LA with 1:200000 adrenaline concentrations was used, there was no significant rise in the pulse rate. Another study by Kalra P et al, the mean blood glucose concentration increased from the base line level of 84.81 to 85.09 mg/dl in healthy patients and from 206.82 to 207.09 mg/dl in diabetic patients 10 min following the injection of 2% plain lignocaine. This increase in blood glucose concentration following the administration of plain lignocaine was statistically not significant ( $P > 0.05$ ). There was statistically significant ( $P < 0.005$ ) increase in the blood glucose concentration from 88.81 to 105.55 mg/dl in healthy,

and 208.77 to 242.46 mg/dl in diabetic patients 20 min following the injection of lignocaine with adrenaline.<sup>12</sup> Epinephrine concentration does not affect the clinical efficacy of local anesthetic agent as reported by the study conducted by Santos et al. and Dagher et al.<sup>13,14</sup> The time of onset of anesthesia as well as the amount of LA used in our study is similar to the study conducted by Malamed et al.<sup>15</sup> Elad et al. (2001) demonstrated significant cardiovascular changes 10 mins after the injection of lidocaine with the higher adrenaline concentration of 1:80000.<sup>10</sup> Gregorio et al. has reported after his study that it is important to stress that with articaine and other local anesthetic solutions in general, 1:100000 and 1:50000 epinephrine concentrations are associated with greater cardiovascular stimulation than 1:200000 epinephrine formulations.<sup>16</sup> Vasoconstrictors are used in local anesthetic solutions to retard their systemic absorption. This enhances the local anesthetic effect by localizing it to the site of injection, decreases toxicity by retarding systemic absorption, prolongs the duration of anaesthesia, and may decrease the total dose of the local anaesthetic drug required.<sup>17</sup> Another secondary advantage to the use of vasoconstrictors in local anesthetic solutions is in the control of bleeding or haemostatic effect that the vasoconstrictor provides.<sup>17</sup> Meechan JG recorded the rise in blood glucose following the injection of 30 ml of local anesthetic solution containing 1:200,000 adrenaline as crural blocks.<sup>18</sup> However, it has been reported that the hyperglycaemic effect of adrenaline occurs at plasma adrenaline concentration 4–5 times basal levels, i.e. at values of 150–200 pg/ml.<sup>19</sup> Such concentrations may be obtained shortly after the injection of clinical doses of adrenaline containing local anesthetic.<sup>20</sup> Vasoconstrictors employed in local anesthetic solutions have the potential for interacting with the wide variety of drugs.<sup>9</sup> Physiological responses associated with local anesthetic solutions containing a vasoconstrictor have included changes in heart rate and BP, dysarrhythmias, ischemic changes (ST segment and T wave), the release of endogenous catecholamines, endocrine response to surgery and hypokalemia.<sup>10</sup> Local aesthetic agents with adrenaline as the vasoconstrictor used for the surgical soft tissue and bone interventions in the oral region tend to cause more post-operative pain than LA without adrenaline as the vasoconstrictor.<sup>21</sup>

## CONCLUSION

The use 2% lignocaine with 1:200000 for cardiac patients is recommended.

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