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IS THERE ANY EFFECT OF DIFFERENT NERVE BLOCK OF LOCAL ANESTHETICS WITHOUT EPINEPHRINE ON SELECTED CARDIOVASCULAR PARAMETERS?

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ABSTRACT

Lidocaine, also known as xylocaine or lignocaine is a medication used to numb tissue in a specific area and to treat ventricular tachycardia. It can also be used for nerve blocks. Sixty subjects (15 female, 45 male) in the 18–40 years old range, without history of systemic disease and no medications in the previous 6 months with normal BP (≤140/90) were selected for this study. Subjects were divided into two groups: in the first group, the infiltration method (upper arch teeth) and in the second group, inferior alveolar nerve block technique (lower arch teeth) was applied. The mean systolic and diastolic BP were reduced after injection of lidocaine without epinephrine in the both maxillary and mandibular nerve block methods. The differences were statistically significant ($P < 0.05$).The mean HR was reduced after injection of lidocaine without epinephrine in the both maxillary and mandibular nerve block methods. The differences were statistically significant ($P < 0.05$).

KEYWORDS: Lidocaine, mandibular nerve block, maxillary nerve block.

INTRODUCTION

Lidocaine, also known as xylocaine and lignocaine is a medication used to numb tissue in a specific area and to treat ventricular tachycardia.[1] It can also be used for nerve blocks. Lidocaine mixed with a small amount of adrenaline (epinephrine) is available to allow larger doses for numbing, to decrease bleeding, and to make it last longer.When used as an injectable, it typically begins working within four minutes and lasts for half an hour to three hours.[2] Lidocaine may also be applied directly to the skin for numbing.[1]

In 1948, lidocaine (LID) became the first local amid anesthetic to be marketed, and is the most widely used LA in many countries. It is currently the "gold standard"[3] against which all the new LAs are measured.[4,5]

Lidocaine is available in various forms like injection, cream, gel and spray and in different concentrations of 0.5%, 1%, 2%, 5% and 10%.[6]

A common belief in medicine, dentistry and even among the patients is that the use of epinephrine is contraindicated in cardiovascular patients as epinephrine suddenly raises the blood pressure (BP) and hearth rate (HR).[3,4,6] On the other hand, some studies have shown that the amount of epinephrine in dental cartridges is so low that use of one to three cartridges of lidocaine with epinephrine is safe and has no considerable effect on the cardiac parameters like BP, HR, etc.[7-9]

Lidocaine is usually used with epinephrine in a single cartridge. Epinephrine is added to lidocaine to reduce toxicity, prolong duration of anesthesia and control bleeding. It is available in a synthetic form and can be harvested from the central part of the adrenal gland. An LA cartridge usually contains 1.8 mL of lidocaine with 1/200,000, 1/1,000,000 and 1/80,000 concentrations of epinephrine (10 µg, 20 µg and 25 µg of epinephrine, respectively).[10]

The purpose of the present study was to compare the effects of 2% lidocaine without epinephrine on BP and HR in two types of different nerve block. The main aim was to verify the effects of lignocaine on vital cardiac parameters.

MATERIAL AND METHOD

The subjects were recruited from Ratna dental hospital Bikaner Rajasthan between March 1 and June end of 2017.Sixty subjects (15 female, 45 male) in the 18–40 years old range, without history of systemic disease and no medications in the previous 6 months with normal BP (≤140/80) were selected for this study. Subjects were divided into two groups: in the first group, the infiltration method (upper arch teeth) and in the second group, inferior alveolar nerve block technique (lower arch teeth)

was applied.Each subject was asked to take rest for at least 5 min before measuring the BP and HR. Then, immediately before and at least 10 min after injection, systolic and diastolic BP and HR were measured.

ANALYSIS OF OBSERVATIONS

Analysis was done by statistical analysis. Students't' test (two tailed) has been used to find the significance. P=0.05 was considered as statistically significant.

RESULT

1. Effect of maxillary nerve block on blood pressure and heart rate.

	Before Injection	After Injection	P value
	Mean ±S.D.	Mean ±S.D.	
Systolic blood pressure	121.26±5.05	118.46±5.16	0.03
Diastolic blood pressure	84.2±2.98	82.46±2.86	0.02
Heart rate	73.76±2.45	71.63±3.06	0.004

The mean systolic and diastolic BP were reduced after injection of lidocaine without epinephrine in the maxillary nerve block method. The differences were statistically significant ($P < 0.05$).The mean HR was reduced after injection of lidocaine without epinephrine in the maxillary nerve block method. The differences were statistically significant ($P < 0.05$).

2. Effect of mandibular nerve block on blood pressure and heart rate.

	Before Injection	After Injection	P Value
	Mean ±S.D.	Mean ±S.D.	
Systolic blood pressure	121.06±5.52	116.93±7.29	0.01
Diastolic blood pressure	84.26±2.81	82.33±3.60	0.02
Heart rate	79.4±4.94	76.23±5.52	0.02

The mean systolic and diastolic BP was reduced after injection of lidocaine without epinephrine in the mandibular nerve block method. The differences were statistically significant ($P < 0.05$). The mean HR was reduced after injection of lidocaine without epinephrine in the mandibular nerve block method. The differences were statistically significant ($P < 0.05$).

3. Effect of different nerve block after lignocaine on blood pressure and heart rate.

	Maxillary nerve block	Mandibular nerve block	P value
	Mean ±S.D.	Mean ±S.D.	
Systolic blood pressure	118.46±5.16	116.93±7.29	0.35
Diastolic blood pressure	82.46±2.86	82.33±3.60	0.87
Heart rate	76.23±3.06	76.23±5.52	0.0001

The mean systolic and diastolic BP were reduced after injection of lidocaine without epinephrine in the both type of nerve block method. The differences were statistically insignificant (P 0.05). The mean HR was reduced after injection of lidocaine without epinephrine in the both type of nerve block method. The differences were statistically significant (P >0.05).

DISCUSSION

Variations of cardiocirculatory parameters during dental treatment have long been a major concern for dentists and researchers. Several authors have reported significant changes that might affect physiologic stability in normoreactive patients, and particularly in those with circulatory disease,[11] as well as elderly patients.[12] Both laboratory research[13] and clinical research have evaluated changes occurring during dental procedures, in pre-, trans-, and postoperative periods.[14]

The findings of this research were mostly in agreement with studies by Meral *et al.*[15] Silvestre *et al.*,[7] and Faraco *et al.*[16] all of which showed a small but not clinically important increase in cardiovascular parameters after injection of LA with epinephrine (BP, PR and HR).

Frabetti et al.[17] conducted a study with 14 patients whether the epinephrine in the local anesthetics carries cardiovascular risks. The systolic and the diastolic blood pressure were analyzed, as well as the average and the maximal heart rate. The comparison of the initial blood pressure and the one after the post-anesthetic period showed insignificant tendency towards increasing the systolic pressure and slightly more statistically significant increased diastolic blood pressure. The heart frequency increases only in small number of the patients, however, not more than 10 beats per minute. In general, the group of the studied patients showed a statistically decrease in the average and the maximal heart rate from

the beginning to the end of the session. Thus, the dosages of epinephrine administered to these patients result in insignificant changes in the heart rate and blood pressure. The decrease of the heart rate at the end of the therapy underlines the important role of the autonomic nervous system in the modulation of the cardiovascular response during dental therapy.

On the other hand, Faraco *et al*.[18] studied the cardiovascular effects produced by intravascular injection of 2% lidocaine with 20 µg/mL of norepinephrine on systolic, diastolic and mean arterial pressure and HR of rats, and the results showed significant increases in systolic, diastolic and mean arterial pressure and a noticeable decrease in HR.

Meechan *et al*.[19] also investigated the cardiovascular responses of cardiac transplant recipients to dental local anesthetic solutions with and without epinephrine, and concluded that cardiac transplant patients experienced a significant tachycardia 10 min after injection of the epinephrine-containing solution. No significant change in HR was detected after the injection of an epinephrine-free solution. The BP was not also affected.

Knoll-Koeler et al.[20] studied the effect of the different concentration of adrenaline. The objective of this study was to define to what extend the surgical stress and the adrenaline in the anesthetics affect the levels of the serum catecholamines, the level of the potassium ions and the change in the cardiac-hemodynamic parameters. Articaine Hydrochloride (4 ml, 4%) with two different concentrations of adrenaline was randomly used in patients for extraction of retained wisdom tooth. The results showed that the exogenously obtained adrenaline during the anesthesia increases the serum levels of the catecholamines. The increased level of the serum adrenaline did not correlate with the cardiac-hemodynamic changes during the study. The serum levels of the catecholamines changes related to adrenaline, while the level of the potassium ions remained unchanged.

CONCLUSION

In the present study, three anaesthetic solutions containing adrenaline showed similar reaction for cardiovascular parameters and were found to be safe for routine use in dentistry. There is influence in clinical stages on the cardiovascular dynamic which shows the effect of anxiety during dental restorative procedures.

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