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### Comparison of Heart Rate and Blood Pressure administration of anesthesia agent with and without

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#### KEYWORDS

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Mepivacaine,  
Vasoconstrictor,  
Blood pressure,  
Pulse rate

#### A B S T R A C T

Local anesthetic agents have been used in dentistry offices for a long times. Other agents are added beside the anesthetic drug in the cartridge of these agents for different aims such as prolonging the shelf time, Prolonging the effective time of the drug, reducing the bleeding etc. Beside useful effects of these drugs, in some cases these agents can cause unwanted complications. Such as vasoconstrictor agents. The aim of this study is the Comparison of heart rate and blood pressure after administration of anesthesia agent with and without Vasoconstrictor. In a randomized clinical trial, 182 patients referred for extraction of mandibular molar teeth in dental clinic of Tabriz University of medical sciences who were undergoing in the form of two equal groups. Patients were groups were randomly assigned to two groups. We used Lidocaine 2% + 1:80000 Epinephrine cartridge for one group and Mepivacaine 3% cartridge for the other group. Heart rate Systolic and Diastolic blood pressure was recorded for patients before and after the injection, all data was analyzed statistically. In this study we studied 182 patients in two groups, the groups were matched for gender and age ( $P=0.132$  and  $P=0.33$  respectively). The mean heart rate of patients before and after Lidocaine + Epinephrine injection had a significant difference, how ever there was no significant difference in the heart rate of patients before and after Mepivacaine injection ( $P<0.001$  and  $P=0.137$  respectively). The mean systolic and diastolic blood pressure of patients before and after injection of Lidocaine + Epinephrine was significantly different ( $P<0.001$  and  $P<0.001$  respectively), the difference between diastolic and systolic blood pressure before and after Mepivacaine injection was not statistically meaningful ( $P=0.256$  and  $P=0.369$  respectively). The difference in changes of pulse rate systolic and diastolic blood pressure was significantly different in two groups ( $P<0.001$ ,  $P=0.001$  and  $P=0.011$ ). Using of local anesthetic agents containing vasopressor agents can lead in hemodynamic changes like increase in blood pressure and pulse rate. Although these changes are without complications in many patients but careful using of them in patients with cardiovascular diseases is recommended.

#### Introduction

Pain is an unpleasant sense and the common clinical experience in dental offices, thus

eliminating this feeling of the patient is important. The main drug used to reduce and

eliminate the pain to control the patient for therapeutic procedures is anesthesia drugs (1). Local anesthetic drugs, by disrupting nerve conduction lead to a temporary numb into the specific area of the body. Due to the preservative materials it might have adverse side effects beside the beneficial effects. Vasoconstriction is the most common compounds that are added to the anesthetic drugs (2).

The two most commonly used local anesthetic drugs are Lidocaine (at concentrations of 5.0%, 2%) and Mepivacaine. Lidocaine is used in order to tropical anesthesia, infiltration injection and nerve block and also has antiarrhythmic properties. Adrenaline added to this medicine, with the ability to vasoconstriction could increase the duration and the depth of anesthesia and also could reduce the possible bleeding in the site. Although they are considered as its positive effects but the adrenalin impact on the sympathetic activities might be associated with the various adverse side effects indeed. In the human body, the Mepivacaine activity is basically the same as Lidocaine but it cannot penetrate into the tissues less than Lidocaine and also its activity duration is much longer. Its potency is equal to Lidocaine and its toxicity can also be equal or slightly less than Lidocaine. This drug is available in 3% concentration with no vasoconstriction substance (3, 4).

Whereas the local anesthetic drugs have pressure vessel materials, thus they could lead to pathological conditions in people with neurological diseases or patients with cardiovascular problems; it was decided to conduct a study to compare changes in heart rate and blood pressure after local anesthetic injection with and without vasoconstriction.

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## **Methods and materials**

In a clinical trial in the maxillofacial surgery department of Tabriz faculty of dentistry during the years 2012 to 2013, the heart rate and blood pressure after local anesthetic injection with and without vasoconstriction evaluated.

The number of 182 patients referring to maxillofacial surgery ward during 2012-2013 for extraction of mandibular molar teeth lacking any systemic disease and taking any pharmaceutical, were selected voluntary and divided into two groups composed of 91 member (randomly using Rand list software).

The number of patients was set according to a similar study by Chaudhry et al (11) in 2008. The first group were injected with two cartridges (3.6 ml) containing 2% Lidocaine with adrenaline 1: 80000 (made by Daroupakhsh, Iran) and the second group were injected with two cartridges (3.6 ml) containing 3% Mepivacaine (Made by Espe, Germany) as numbing material. Pulse oximetry instrument was connected to all the people before the injection until the end of tooth extraction and the number of beats per minute was presented. A stopwatch was used for the time determination.

The number of beats was fixed before the injection and then injection was done. In the meantime, the maximum rate of changes and corresponding time interval was registered.

Systolic and diastolic blood pressures' measurement was carried out with the use of a Heine mercury barometer before and

after the injection for all patients and the information was recorded.

### **Inclusion criteria**

- 1-age range of 25-50 years old
- 2- Referring for removal of mandibular molars
- 3-having the satisfaction to participate in the study

### **Exclusion criteria**

- 1-catching any systemic disease
- 2-a history of taking any medication chronically for the last 6 months
3. Occurring any accident during the operation of teeth extraction such as dental root breaking, etc.

### **Ethical criteria**

Before starting the study, steps of research must be explained to patients orally and in an understandable language and written testimonial should be obtained from them. This study also has been presented in Ethics Committee of Tabriz Medical University and authorization is done. All the information from the patients is confidential and the name and address of patients have not been and will not be mentioned in this study.

### **Statistical Analysis**

The collected data were analyzed by SPSS-17 statistical software. The collected data were expressed as percentage and mean  $\pm$  SD. Continuous (quantitative) variables were compared by Independent samples and Paired t test. Categorical (qualitative) variables were compared by contingency tables and Chi-square test or Fisher's exact test. P-value  $\leq 0.05$  was considered statistically significant.

### **Result and Discussion**

The mean age of the patients in the epinephrine + Lidocaine group and Mepivacaine group were respectively estimated as  $36.67 \pm 8.42$  and  $35.45 \pm 357.99$  which were in the range of 25 to 50 years old ( $P=0.33$ ).

49 patients (53.8%) of epinephrine + Lidocaine group and 44 patients (48.4%) of Mepivacaine group were male and 42 patients (46.2%) of epinephrine + Lidocaine group and 47 patients (51.6%) of Mepivacaine group were female. ( $P=0.132$ ) In Table 1, the clinical findings such as PR, RR, systolic and diastolic blood pressure between the two groups before and after the injection are shown.

Pain control is an important controversial issue in dental procedures. Local anesthetic drugs are used by dentists for a long time. These drugs can reversibly impair nerve conduction and causes the local anesthesia in the preferred site. These drugs are used in combination with other medications which increase drug efficacy and storage duration and also decrease hemorrhage in the preferred site. Along with beneficial effects, this drug might have many adverse side effects. The vasoconstriction substance is the most common compounds added to the anesthetic drugs(6).

In the dental procedures, epinephrine could be pointed as a most common medications used along with the anesthetic drugs. This drug is a vasoconstriction substance which is typically used in dental offices since 50 years ago which contributes to the sustainability of anesthetic drug efficacy and also reduces hemorrhage in the preferred site. However - based on the various studies- no unpleasant side-effects have been reported in different human sources until

now but also the use of this drug has been controversial in many communities. These materials might change the hemodynamic status of the patients so in someone who suffered from cardiovascular disease, the adverse side effects of the drug might be appeared. The study was conducted as a clinical trial; we evaluated the hemodynamic changes such as systolic and diastolic blood pressure and heart rate following the use of Lidocaine 2% along with the Mepivacaine and epinephrine 1:80000 and then we have compared these changes.

This study was conducted on 182 patients in the two equal groups and the patients were matched by age and sex. ( $P=0.132$ ,  $P=0.33$ ) There was significant increase in the heart rate of the patients anesthetized with lidocaine 2% along with epinephrine but the heart rate average of the cases anesthetized with Mepivacaine 3% was not significant ( $P=0.137$ ).

The heart rate changes of the patients anesthetized with lidocaine 2% along with epinephrine were significantly more than those who were anesthetized with Mepivacaine 3% ( $P<0.001$ ).

Dr. Bayat and colleagues investigated the hemodynamic changes following the use of Lidocaine and Mepivacaine + epinephrine in the patients and stated that after injection of Lidocaine + epinephrine, the 12.25 beats were added to the heart rate every per minute and this change is very significant so Lidocaine + epinephrine combination is significantly leads to heart rate increase in these cases (6). It should be noticed that the results of our study were completely the same as Bayat et al' results.

Salonen and colleagues showed that the use of Lidocaine in combination with epinephrine caused a significant increase in

heart rate of the patients (8) which are comparable and consistent with our findings. Furthermore the Reploge et al' findings were consistent with our too. In contrast to our results, Ogunlewe and colleagues didn't report the significant changes following the use of anesthetic drugs containing epinephrine (10).

Smith and colleagues showed that the use of mepivacaine not caused a significant increase in heart rate in patients which are not consistent with our findings (13).

The systolic and diastolic blood pressure average in patients anesthetized with Lidocaine 2% + epinephrine was significantly increased while there was no significant difference among the cases in Mepivacaine 3% group. The mean of changes in the systolic and diastolic blood pressure average of the patients anesthetized with lidocaine 2% + epinephrine compared with those influenced by Mepivacaine was significant. In addition our findings were consistent with the Ezmic et al' results indicating that the systolic and diastolic blood pressure increase following the use of lidocaine + epinephrine (12).

The meta-analysis conducted by the Bible, expressed that lidocaine + epinephrine which induce anesthesia in dental procedures lead to increase the systolic and diastolic blood pressure and also heart rate.(9) These findings are consistent with our results.

Ogunlewe and colleagues reported that the anesthetic medication with or without vasoconstriction substances has no significant changes in systolic and diastolic blood pressure in patients thus it is significantly different with our results (10).

**Table.I** evaluation of vital sign of patients before and after of injection

	Group Lidocaine			Group Mepivacaine		
	Before	After	P	Before	After	P
Pulse Rate	76.69 ± 6.65	82.61 ± 6.26	<0.001	77.02 ± 6.88	77.71 ± 6.93	0.137
Systolic blood pressure	114.71 ± 8.48	125.66 ± 8.91	<0.001	114.42 ± 8.13	117.32 ± 8.11	0.369
Diastolic blood pressure	80.35 ± 6.95	87.13 ± 6.68	<0.001	80.41 ± 7.44	83.84 ± 7.02	0.256
Respiratory Rate	14.85 ± 2.09	14.62 ± 2.07	0.561	14.62 ± 2.07	14.23 ± 2.16	0.450

### Conclusion

According to the findings of this study and comparison with other studies, it can be concluded that whereas the use of Mepivacaine causes no significant changes in systolic and diastolic blood pressure and heart rate, the use of anesthetic lidocaine 2% in combination with epinephrine 1:80000, can increase heart rate and systolic and diastolic blood pressure. Despite the changes induced by lidocaine in combination with epinephrine increases the heart rate and blood pressure but these changes have been in the normal range and in the patients without underlying diseases (like cardiovascular disorders) and it would not be problematic. However to avoid other complications in patients with cardiovascular problems during dental procedures, use of those drugs which have no pressure vessel materials such as Mepivacaine is recommended.

### Recommendations

At the end of this research, the following recommendations could be proposed:

A similar study should be performed with a larger sample size, with the aim of better generalizing the results.

A similar study should be conducted on the controlled patients suffering from cardiovascular disease (particularly hypertension) to assess the effect of the

anesthetic drugs containing the pressure vessel materials, on hemodynamic changes in these patients.

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