

Hemodynamic evaluation of normotensive and hypertensive patients undergoing dental extraction under local anesthesia with 3% prilocaine with felypressin

Avaliação hemodinâmica de pacientes normotensos e hipertensos submetidos à exodontia sob anestesia local com cloridrato de prilocaína 3% associado à felipressina

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ABSTRACT

Objective: this study evaluated hemodynamic variations of normotensive and hypertensive patients undergoing dental extraction under local anesthesia with 3% prilocaine with 0.03 UI/ml felypressin. **Material and Methods:** Forty-nine patients from the Department of Surgery and Maxillo-facial Traumatology ambulatory were evaluated. Thirty were normotensive and 19 hypertensive; they presented initial systolic blood pressure lower than 160 mmHg and diastolic blood pressure lower than 100 mmHg, besides being under medical supervision. Patients underwent molar or premolar extraction, typically deployed with maximum degree of mobility 2, according to Miller's classification. The parameters evaluated were systolic and diastolic blood pressures and heart rate, using an automatic digital pulse device, in the following periods: T1 - Initial (5 min before the beginning of surgery, with the patient seated); T2 - post-anesthesia (after 2 min of anesthetic administration); T3 - trans-operative (every 5 min after the measurement T2 to complete 20 min, totaling 4 trans-operative measurements); T4 - after surgery (5 min after removal of the surgical field). **Results:** statistical analysis showed for the parameters systolic blood pressure ($P = 0.959$) and diastolic blood pressure ($P = 0.754$), no statistically

RESUMO

Objetivo: Este estudo avaliou as alterações hemodinâmicas de pacientes normotensos e hipertensos submetidos a exodontia de dentes normalmente implantados sob ação do anestésico local cloridrato de prilocaína 3%, com felipressina 0,03UI/ml. **Material e Métodos:** Foram avaliados 49 pacientes do ambulatório da Disciplina de Cirurgia e Traumatologia Buco-Maxilo-Facial do Curso de Odontologia do Instituto de Ciência e Tecnologia da Universidade Estadual Paulista "Julio de Mesquita Filho" campus de São Jose dos Campos, sendo 30 normotensos e 19 hipertensos que deveriam ter no momento da avaliação inicial pressão sistólica até 160 mmHg e diastólica até 100 mmHg além de estarem sob acompanhamento médico. Os pacientes foram submetidos a exodontia de molares ou pré-molares normalmente implantados, com grau máximo de mobilidade 2, segundo a classificação de Miller. Os parâmetros avaliados foram pressão arterial sistólica, diastólica e frequência cardíaca, por meio de um aparelho digital automático de pulso, nos seguintes períodos: T1 - inicial (5 min antes do início da cirurgia, com o paciente sentado); T2 - pós-anestesia (após 2 min da administração do anestésico); T3 - trans-operatório (a cada 5 min após a aferição em T2 até completar 20 minutos, totalizando 4 mensurações trans-operatórias); T4 - pós-cirurgia (5 min após a remoção dos campos cirúrgicos). **Resultados:** A análise estatística demonstrou que para os parâmetros pressão arterial sistólica ($P = 0,959$) e pressão arterial diastólica ($P = 0,754$) não

significant difference for these parameters in different evaluation periods. The analysis of heart rate values showed statistical difference ($p < 0.05$) between the values obtained in T1 in hypertensive and normotensive patients in T3.3. **Conclusion:** it was concluded that the evaluated hemodynamic parameters varied in different periods evaluated in group of normotensive and hypertensive patients, but did not differ significantly.

KEYWORDS

Hypertension; Anesthesia; Hemodynamics; Dental extraction.

houve diferença estatística significante para estes parâmetros nos diferentes períodos de avaliação. A análise dos valores de frequência cardíaca demonstrou haver diferença estatística ($p < 0,05$) entre os valores obtidos em T1 nos pacientes hipertensos e T3.3 nos pacientes normotensos. **Conclusão:** Concluiu-se que os parâmetros hemodinâmicos avaliados oscilaram nos diferentes períodos avaliados no grupo de pacientes normotensos e hipertensos, porém não diferiram de forma significativa.

PALAVRAS-CHAVE

Hipertensão; Anestesia; Hemodinâmica; Extração dentária.

INTRODUCTION

The increase in life expectancy of the population, the increasingly early diagnosis and increased incidence of hypertension (SAH), has made dental care of hypertensive patients a routine in the professional activity of the dentist. Blood pressure is an important risk factor in cardiovascular complications. In hypertensive patients, the sympathetic discharge caused by dental procedure might trigger a hypertensive crisis, possibly affecting the function of vital organs such as heart, brain, kidney and lungs [1-3]. Hypertensive crisis trans or postoperative might lead to hemorrhagic cases of difficult control and, diagnostic measures such as monitoring and prevention of hemodynamic changes should be routinely performed in the dental office.

Stress, anxiety and fear of dental procedures are the most responsible for the hemodynamic variations in the outpatient setting, the individual suffers in this situation, changes in their physiological balance, as the release of endogenous catecholamines that act on blood pressure [4-7].

At the same time, pain control has always been a subject of numerous studies in dentistry, through the evolution of anesthetic techniques and also the salts and their associations [8]. For this reason, dentists currently have a very wide range of anesthetic agents.

Local anesthetics and their associations to vasoconstrictor substances are able to effectively prevent painful sensation, causing a minimum of unwanted side-effects by blocking nerve conduction reversibly, and its use followed by complete recovery of nerve function. The local anesthetic site of action is the cell membrane, which interrupt the conduction-excitation process [9].

The added vasoconstrictor operates mainly in delaying the absorption of local anesthetic, thereby increasing its effectiveness and reducing the occurrence of adverse effects. The incidence of systemic toxicity phenomena is lower when using association [10].

However, most studies evaluating the hemodynamic alterations in patients with hypertension or heart disease used local anesthetics associated with adrenergic vasoconstrictors such as epinephrine, and norepinephrine or even the use of anesthetics without vasoconstrictor [1,11-15].

The main hemodynamic changes related to local anesthetics are caused by direct action on the smooth muscle, cardiac and autonomic innervation of the heart. According to the drug concentration changes in heart rate and blood pressure may be observed. However, adverse effects such as tachycardia, are generally related to high doses of administration or inadvertent intravascular injection. The stimulation of adrenergic receptors by the use of adrenergic

vasoconstrictors can also lead to adverse effects and therefore is prevented in cardiac patients [9,12,16]. Felypressin is a non-adrenergic vasoconstrictor, and by not acting directly on adrenergic receptors but on vascular smooth muscle, does not produce significant changes in heart rate. This action on the venous circulation does not generate arrhythmogenic effects, but presents a lower vasoconstrictor effect than adrenaline [10,17]. Due to these characteristics, such vasoconstrictor administration is indicated in patients with cardiovascular disease.

In Brazil, felypressin is associated with prilocaine hydrochloride salt, belonging to the amide group. This salt is metabolized primarily by the liver and therefore has intermediate duration of anesthetic effect (between 45-120 min), has a higher risk of toxicity by a slower inactivation, but with rare allergic cases.

Considering the use of non-adrenergic substances, clinical and scientific evidence has demonstrated important benefits of vasoconstrictors association with local anesthetics. The main benefits are the increase of the intensity and duration of anesthesia, decreased toxicity and improved hemostasis [18,19].

The objective of this study was to evaluate and compare the hemodynamic changes in normotensive and hypertensive patients undergoing dental extraction of teeth usually implanted under the action of the local anesthetic prilocaine hydrochloride 3% with felypressin 0.03 UI/ml. The null hypothesis is there is no significant difference in systolic and diastolic blood pressures and heart rate in the different evaluation periods.

MATERIALS AND METHODS

Forty-nine patients of the Department of Surgery and Maxillo-facial Traumatology ambulatory of the Institute of Science and Technology, São Paulo State University "Júlio de Mesquita Filho" were evaluated (protocol

number 015/2008-PH/CEP). Thirty were normotensive and 19 hypertensive. Inclusion criteria were patients of both genders, with molar or premolar extraction indication and maximum mobility degree 2, according to Miller's classification. Patients should present initial systolic blood pressure lower than 160 mmHg and diastolic blood pressure lower than 100 mmHg, besides being under medical supervision. Patients underwent molar or premolar extraction, typically deployed with maximum degree of mobility 2, according to Miller's classification. Hypertensive patients should be under medical supervision and have, at the time of initial evaluation, systolic blood pressure to 160 mmHg and diastolic up to 100 mmHg. Normotensive patients were considered those subjects that during the preoperative physical examination, showed peak systolic and diastolic blood pressure of 130 mmHg and 89 mmHg, respectively. Pregnant women and children were not included in the study, as well as patients with metabolic diseases or other uncompensated systemic changes.

Prilocaine hydrochloride 3% with felypressin 0.03 IU/ml was the local anesthetic used in all surgeries. For each procedure, a maximum of four carpules of 1.8 mL anesthetic were used to perform regional blocking techniques, always with aspiration prior to injection. There was no need to exclude some case study due to accidental intravascular injection of the anesthetic solution. The hemodynamic parameters were heart rate (HR), systolic blood pressure (systolic blood pressure) and diastolic (diastolic BP) by means of a single automatic digital calibrated pulse, into four periods: T1 - Initial (5 min before the beginning of surgery, with the patient seated); T2 - post-anesthesia (after 2 min of anesthetic administration); T3 - trans-operative (every 5 min after the measurement T2 to complete 20 min, totaling 4 trans-operative measurements); T4 - after surgery (5 min after removal of the surgical field).

RESULTS

Descriptive statistics was based on calculation of mean values and standard deviations, whereas the inferential statistical analysis was performed using non-parametric variance, or for data analysis with non-normal distribution (Kruskal-Wallis test) complemented by multiple comparisons between pairs of groups by Dunn test.

In descriptive analysis mean values and standard deviation of the evaluated parameters were calculated in the different experimental periods as described in Table 1

Kruskal-Wallis statistical test analyzed data collected and led to acceptance of the null

hypothesis for the systolic blood pressure parameters ($p = 0.0959$) and diastolic blood pressure ($p = 0.0754$), ie, there was no statistically significant difference for these parameters in different evaluation periods. On the other hand, the analysis of heart rate values showed statistical difference ($p < 0.05$) between the values obtained in T1 in hypertensive and normotensive patients in T3.3.

Figures 1, 2 and 3 illustrate the mean values distribution throughout the experimental period for the hypertensive and normotensive groups in the parameters heart rate, systolic pressure and diastolic pressure respectively.

Table 1 - Mean values distribution table of the parameters evaluated in different periods for normotensive patients (n = 30) and hypertensive (n = 19). Statistically significant (*) when $p < 0.05$

	Normotensive			Hypertensive		
	HR	Systolic BP	Diastolic BP	HR	Systolic BP	Diastolic BP
T1	72.83 ± 16.91	126.87 ± 14.22	81.37 ± 14.24	80.26 ± 7.65*	131.79 ± 5.52	88.21 ± 6.67
T2	70.60 ± 13.15	131.60 ± 20.07	83.2 ± 12.79	78.79 ± 7.79	129.84 ± 14.24	84.48 ± 9.51
T3.1	70.36 ± 13.16	127.60 ± 30.89	84.53 ± 13.08	77.84 ± 7.14	130.05 ± 14.43	83.15 ± 8.28
T3.2	70.80 ± 14.71	135.10 ± 20.58	85.30 ± 13.16	77.11 ± 6.25	129.05 ± 14.59	83.11 ± 8.20
T3.3	68.15 ± 13.97*	133.20 ± 21.45	82.07 ± 15.21	77.17 ± 6.11	133.41 ± 16.27	84.59 ± 9.78
T3.4	70.59 ± 13.53	134.89 ± 27.05	84.82 ± 13.64	75.50 ± 5.44	129.20 ± 13.98	82.30 ± 11.14
T4	71.46 ± 15.37	132.20 ± 15.00	86.83 ± 12.15	77.31 ± 5.92	136.21 ± 10.90	89.31 ± 9.29

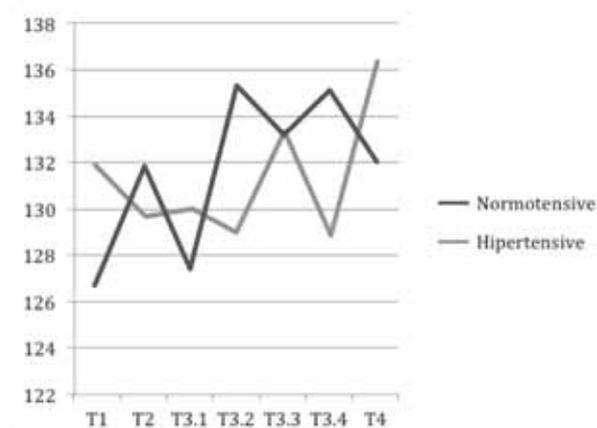


Figure 1 - Mean values distribution graph of heart rate in different periods for normotensive (n = 30) and hypertensive (n = 19) patients.

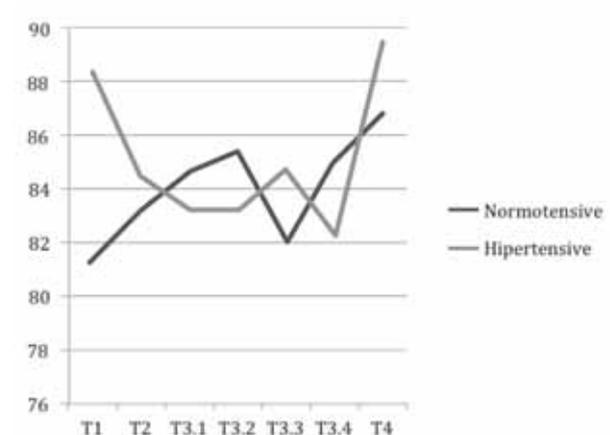


Figure 2 - Mean values distribution graph of systolic blood pressure in different periods for normotensive (n = 30) and hypertensive (n = 19) patients.

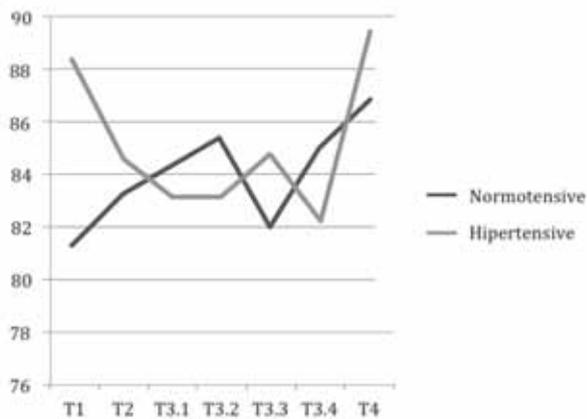


Figure 3 - Mean values diastolic blood pressure distribution graph in different periods for normotensive (n = 30) and hypertensive (n = 19) patients.

DISCUSSION

Hemodynamic alterations were evaluated and compared based on the analysis of heart rate, systolic blood pressure and diastolic blood pressure. Blood pressure was used as study parameter because it is an important risk factor in cardiovascular complications [13]. In hypertensive patients sympathetic discharge caused by the dental procedure can trigger a hypertensive crisis may affect the function of vital organs such as heart, brain, kidney and lung [2,16,20]. In this study, the hemodynamic parameters evaluated when compared to the immediately preceding surgery values, rose after the use of local anesthetic and remained at this level during the surgery. At the end of the procedure the values tended to decrease and to approach to the initial values. Diastolic blood pressure was the only parameter that changed at the end of surgery, being statistically significant when compared to the initial values before the procedure presented in normotensive patients.

Alterations in heart rate and systolic and diastolic blood pressure, may have occurred because of alterations caused by the anesthetic agent in the cardiovascular system, because of its direct effect on the heart, peripheral vessels and also indirectly, by conduction block of nerve fibers which control the functions of the heart and peripheral blood vessels [21].

Anxiety, fear and stress triggered by dental procedures promote the raise of various vital

functions, manifested by tachycardia, peripheral vasoconstriction, mydriasis, increased blood pressure, pulmonary hyperventilation, sweating, restlessness and general increase of body metabolism [22,23].

In normotensive patients, a negative feedback process easily reverses these alterations, however, in hypertensive patients with organ dysfunction, these functional changes can assume unexpected dimensions, producing complex problems. Surgeries and other forms of trauma generate a catabolic state due to changes in the endocrine control with increased catabolites hormones and reduced secretion of anabolic resulting in increased demands of the cardiovascular system [24].

According to Holm et al. [25], hypertensive crises may be considered when systolic blood pressure reaches a value equal to or greater than 250 mmHg and/or diastolic blood pressure equal to or greater than 130 mmHg. However, the oscillations identified in heart rate and blood pressure of the subjects, were within normal ranges in both groups, that allow the completion of surgical procedures without problems and without changes in the treatment protocol.

Similarly, when compared the variations in the parameters evaluated between normotensive and hypertensive individuals, it was not observed statistically significant differences, confirming the results obtained by Meiller et al. [26]. This fact contributes to the understanding that hypertensive patients who are under medical treatment with blood pressure control may undergo outpatient dental procedures under local anesthesia with the anesthetic assessed in the same way as normotensive individuals.

CONCLUSION

Within the limitations of this study can be concluded that the observed hemodynamic parameters varied in different periods evaluated both in the group of normotensive and hypertensive patients, but without differ significantly. The null hypothesis presented was accepted.

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