



Blood pressure variation in patients undergoing tooth extraction

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Abstract

Introduction: Dental care triggers feelings such as fear, anxiety, stress and apprehension in most patients. These, in turn, generate physiological changes that result in some systemic changes, such as blood pressure (BP).

Objective: To evaluate the change in BP of patients undergoing tooth extractions.

Materials and Methods: We evaluated 70 patients of both genders, randomly selected in the clinic of surgery and anesthesiology of a certain university. Each patient answered a questionnaire and then had the BP measured before, during and after surgery.

Results: The results showed that there is a significant variation in BP in these three evaluated moments; there is no statistical difference between genders and the variation of pulmonary artery; it was found a significant association ($P < 0.05$) between the change in BP in the operating trans and patient age.

Conclusion: There was a variation in BP of patients undergoing tooth extractions, which showed higher values in the trans-operative period. This increase is related to fear and anxiety during dental care.

Introduction

Dental treatment usually causes feelings such as fear, anxiety and stress. They affect directly most of the population since many factors contribute to this situation, from personality and physiological aspects to environmental aspects, such as the equipment in the dental clinic.^[1-6]

In the course of anamnesis, it is possible to detect some specific signs and symptoms that characterize the degree of cooperation of that patient. Anxiety is one of the stated aspects that usually causes discomfort to both healthcare professional and patient, being increased during treatment on oral surgery.^[1]

According to Medeiros *et al.*,^[3] negative previous experiences, whether direct or indirect, may be the fundamental causes of fear and anxiety during dental treatment.

Anxiety is an emotional state that is closely related to fear. This phenomenon can interfere negatively in the dental treatment. Depending on the level of anxiety, some individuals

may experience a rise in blood pressure (BP), especially in those who have systemic changes associated with psychological factors.^[1] Dental anxiety can vary from one patient to another or even in the same patient depending on the dental procedure to be performed.^[4]

During dental treatment, some procedures listed by the majority of patients as situations in which fear and discomfort increase are anesthesia and surgery, thus people with such a behavior will wait long periods for an appointment to a dentist or cancel it because of a traumatic history or a painful experience.^[4] According to Medeiros *et al.*,^[3] some studies show that women experience more stress to dental treatment than men do. However, in other studies it can be seen that there is a clear difference in the degree of anxiety between men and women.^[3,5]

BP measured at a dental office may be slightly higher than elsewhere due to anxiety and fear of dental treatment, which negatively impacts on the individual's systemic conditions.^[7] The nerve stimulation is one of the factors causing BP elevation,

so the fear and anxiety at the dental office are predisposing factors that trigger those BP changes in patients.^[8]

According to Ferraz *et al.*,^[7] Rodrigues *et al.*,^[9] Costa *et al.*,^[10] and Malamed,^[11] surgical anesthesia causes a state of stress in the patient. This causes a number of changes in humans. In these cases, there is an increase in the release of cortisol by stimulation of the adrenal cortex, thus affecting BP during stress. At the same time, there is also the stimulation of the adrenal medulla by the autonomic nervous system, and this in turn releases endogenous catecholamines epinephrine and norepinephrine in an amount 40 times higher than the level at rest, causing faster heart rate, elevation in the systolic volume of the heart, and the constriction of the vascular bed, thereby increasing both systolic and diastolic pressures.

Therefore, it is of fundamental importance that the dentist has as routine practice in his office the measurement of BP in patients prior to procedures, especially surgical, in order to avoid possible complications such as hypertensive crises that can cause rapid heartbeat, sweating, mydriasis, pulmonary hyperventilation, agitation, and increased arterial pressure.^[1,7,12]

Thus, the professional must show credibility, bring confidence, develop a link between patient and dentist, perform a less traumatic treatment, make use of appropriate interventions that cause the least possible stress and tension, and consequently, the control of high values of the arterial pressure.^[12] This requires programming strategies, knowing how to identify and differentiate behaviors of anxiety and cardiovascular diseases.^[6]

BP is asymptomatic and is nothing, but the force that blood pumped by the heart exerts on blood vessel walls. This is divided into systolic or maximum pressure, which corresponds to the contraction of the heart; and diastolic pressure or the minimum, which refers to the relaxation of the heart.^[8,13] Diastolic pressure has reference value around 70-80 mmHg, and systolic pressure has reference value around 110-120 mmHg. In cases of change, the pressure can both raise, causing hypertension (high BP), and decrease, which characterizes arterial hypotension (low BP).^[13]

According to the Ministry of Health^[14] and the Brazilian Society of Hypertension,^[8] high BP is defined as systolic BP (SBP) ≥ 140 mmHg and a diastolic BP (DBP) ≥ 90 mmHg, in individuals who are not making use of antihypertensive medication. BP is classified as optimal, normal, borderline, Stage 1 hypertension, Stage 2 hypertension, Stage 3 hypertension and isolated systolic hypertension, which have SBP values < 120 mmHg, < 130 mmHg, 130-139 mmHg, 140-159 mmHg, 160-179 mmHg, and ≥ 180 mmHg, respectively; and DBP values of < 80 mmHg, < 85 mmHg, 85-89 mmHg, 90-99 mmHg, 100-109 mmHg, ≥ 110 mmHg and < 90 , respectively.^[15]

In patients with abnormal BP, the dentist should know the best way to control anxiety in these conditions, the most appropriate anesthetic, its ideal concentration and a solution with or without vasoconstrictor. Midazolam has a rapid onset of action, short duration of the anxiolytic effect and induces anterograde amnesia. Therefore, it is the drug of choice for sedation of young and adult patients in most dental procedures.^[13,16]

With respect to local anesthetics used in cases of hypertension, anxiety, or cardiovascular disorders, prilocaine with vasoconstrictor felypressin is often used, since this catecholamine has no cardiovascular effects, acting directly on the vascular smooth muscle tissue.^[12,16] It is very common for dentists to request medical advice for these cases, so reducing the waiting time in these cases is a benefit to the patient.^[14]

The measurement of BP is recommended to be made before the procedure and in follow-up consultations, whatever the patient's age, so that if the patient presents any change, it is detected as well as its possible causes. For example, diagnosing an uncontrolled cardiac and take the necessary measures to avoid significant complications, as they are high-risk patients.^[12]

In the literature, few studies deal with this issue, which is of fundamental importance for dental professionals. Therefore, it is necessary to draw up a research to assess the BP variation in patients undergoing tooth extractions, since this procedure is the one that brings more anxiety and fear to the patient, and obtain information that can lead to better care for this patient.

Materials and Methods

Seventy volunteers who had extraction indication of at least one tooth were randomly selected according to the number of patients in the dental clinic of a university. The study considered normotensive and hypertensive compensated patients and excluded hypertensive decompensated patients and those with cardiovascular disease.

The patients were evaluated, always by the same examiner previously calibrated, by means of a questionnaire validated by professionals, which contains information on age, gender, level of anxiety and pain, in addition to BP records. The degree of anxiety of the patients was assessed using a numerical scale, where the patient was asked about the degree of anxiety at the moment in a scale from 1 to 10, where one corresponds to lower anxiety and 10 to maximum anxiety. The level of pain was obtained through a visual/verbal numerical scale that aims to measure the intensity of pain in numeric values. The patient was lucid, conscious of their actions and thoughts and reported their pain on a scale from 0 to 10, where 0 means "no pain" and 10 means "full and intense pain." The pain scale was used before, during and after surgery, while anxiety was only used pre-operatively.

Then the BP measurement of each volunteer was performed, always by the same examiner, who was not involved in the procedure. Therefore, it was used the same stethoscope and sphygmomanometer (P.A. MED - ML 322. 2009), at three different times: 10 min before the surgery, with the patient in the waiting room (pre-operative); immediately after anesthesia (trans-operative) and 10 min after the suture (post-operative).^[4] The normality parameters used were based on reference values for BP adopted by the Ministry of Health, being considered for research SBP and DBP ≤ 140 and ≤ 90 , respectively, before surgery. Data were recorded in the questionnaires.

The collected data were organized in an excel spreadsheet (Microsoft Office, Version 2010) and then a statistical analysis

of the data was performed. The data were analyzed by statistical program IBM SPSS Statistics 20 (2011). Initially graphs and frequency tables of the variables were made. Subsequently, the normality of the numerical variables SBP and DBP in three stages (before, during and post-operative) was tested by Lilliefors test and did not present normal distribution, so they were evaluated using the non-parametric Friedman test.

The evaluation of the correlation between systolic and diastolic pressures with the level of pain was made by non-parametric Spearman correlation. The association of categorical variables and BP classification during operation and other categorical variables were made using the Chi-square test (χ^2). In all tests the significance level (α) was set at 5%, which was considered significant when $P < 0.05$.

Results

The results showed that, from the 70 volunteers who participated in the survey, 74.3% ($n = 52$) were female, and 25.7% ($n = 18$) were male. The patients' ages ranged from 12 to 49 years old, and the predominant age group was 20-29 years (37.1%). Regarding hypertension, most of the patients did not present any changes, representing 88.6% ($n = 62$), but 64.3% ($n = 45$) of the individuals presenting history of arterial hypertension in the family.

Figures 1 and 2 show the frequency distribution of SBP and DBP in three operative times, where it was observed that in the pre-operative most patients showed a value of 120 mm Hg SBP and 80 mmHg of DBP. Trans-operative period presented an increased value, with 140 mmHg of SBP only in the majority of patients. Post-operative period presented a reduction in the value of systolic pressure to 130 mmHg, but the value is still greater than the one of trans-operative.

Statistical analysis of the data showed a significant association ($P < 0.05$) between the operative times and the level of BP. It was found that at the time of surgery there was a significant increase in BP, from 0.0% in the pre-operative to 45.7% in the trans-operative [Table 1].

It was observed that there was a significant difference in the mean value of SBP in these three stages, where the trans-operative had a significant increase in BP. DBP showed a significant increase ($P < 0.05$) in trans-operative period [Table 2].

In Table 3, there was a significant positive correlation ($P < 0.05$) between the level of pain and DBP in two stages, pre-operative and trans-operative, and the correlation in pre-operative moment was low and in the trans-operative period it was average.

Considering the three conditions, there was no significant difference between genders ($P > 0.05$) on the change in SBP and DBP, as shown in Table 4.

A significant association was found ($P < 0.05$) between the change in BP in the trans-operative period and the age of patients. It was observed that older patients had higher BP than had other ages. Most patients from 30 to 49 years maintained normal pressure during the extraction [Figure 3].

Table 1: Chi-square test of the BP level and the three operative moments

PA	Operative moments						P
	Pre	%	Trans	%	Post	%	
Low	3	4.3	0	0.0	2	2.9	0.0005
Normal	67	95.7	38	54.3	48	68.6	
High	0	0.0	32	45.7	20	28.6	
Total	70	100.0	70	100.0	70	100.0	

PA: Pulmonary artery, BP: Blood pressure

Table 2: Friedman test of SBPs and DBPs regarding the three moments

mmHg	Pre	Trans	Post	P
SBP	122.9 ^a ±10.1	132.5 ^a ±9.0	129.4 ^b ±10.4	<0.0001
DBP	77.4 ^b ±7.2	82.1 ^a ±7.2	79.1 ^b ±6.5	0.0015

^{a,b}Different letters mean $P < 0.05$. SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 3: Spearman correlation between the pain level and its respective SBP and DBP

Blood pressure	Pain		
	Pre	Trans	Post
SBP			
Pre		0.130	
Trans			0.078
Post			
DBP			
Pre		0.382**	
Trans			0.457**
Post			
			-0.158

** $P < 0.01$. SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 4: T-test of the variation of systolic and diastolic pressures in relation with gender

Variation	Gender	N	Average	DP	P
SBP	Feminine	52	9.7	8.1	0.9120
	Masculine	18	9.4	10.6	
DBP	Feminine	52	5.4	7.3	0.1850
	Masculine	18	2.8	6.7	

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

In Figure 4, it was found that during the trans-operative period there was an increase in the BP of both patients classified as anxious in offices - dashed lines - and non-anxious - continuous lines. However, post-operative non-anxious patients recovered faster their BP, while many of the anxious ones continued with high pressure. Thus, a significant difference was observed ($P < 0.05$) in cases of low, normal and high BP in non-anxious and anxious patients in relation to the three moments.

According to Table 5, regarding the level of anxiety and the variation of BP in these three evaluated periods, it was not found significant association ($P > 0.05$).

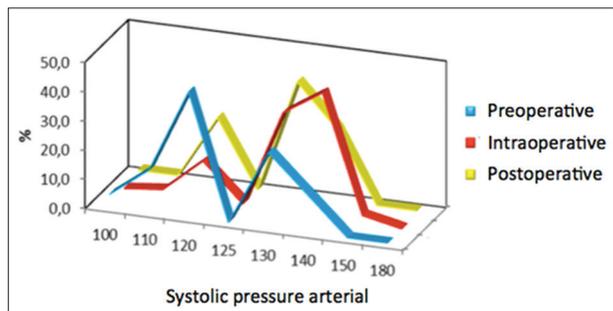


Figure 1: Frequency distribution of systolic blood pressure in the three operative moments

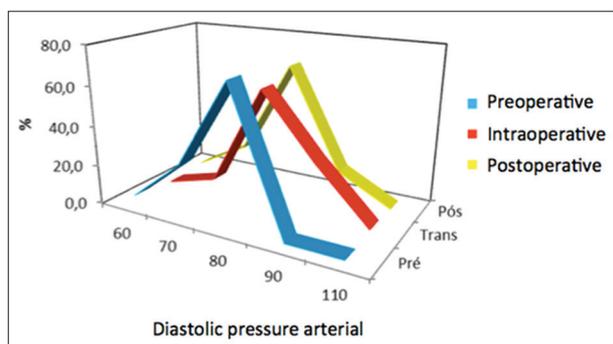


Figure 2: Frequency distribution of diastolic blood pressure in the three operative moments

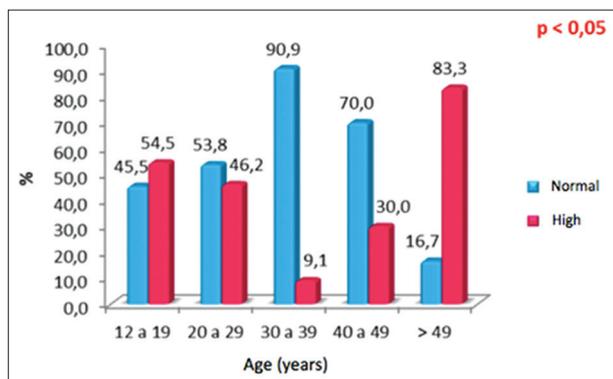


Figure 3: Correlation between blood pressure variation and patients' ages

Discussion

BP is one of the cardiovascular patterns that may change in situations that generate nerve stimulation as in cases of anxiety and fear. Such a situation occurs with most patients who need to go to the dentist, or especially to undergo a surgical procedure. It is vital that the dentist is aware of systemic conditions as well as the variations that can happen to the patient so that in this way can provide a safer service.^[3,5,17]

Anxiety and fear of dental treatment are common feelings that generate discomfort and negative expectations of the

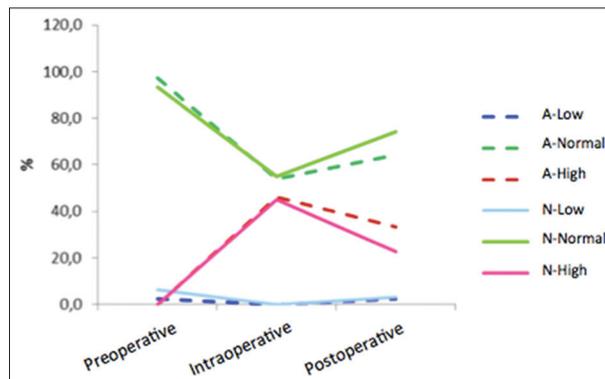


Figure 4: Relationship between type of patient – Anxious (A) or non-anxious (N) – and blood pressure variation (low, normal or high)

Table 5: Association between BP classification and anxiety level in each of the three moments (pre, trans, post)

Moments	BP	Anxiety degree			P
		Slight	Moderate	High	
Pre	Low	1	1	1	0.9198
	Normal	17	30	20	
Trans	Normal	11	15	12	0.6565
	High	7	16	9	
Post	Low	1	0	1	0.5261
	Normal	13	23	12	
	High	4	8	8	

BP: Blood pressure

patient regarding to healthcare service.^[5] The procedures that generate more fear and anxiety in dentistry are tooth extractions, anesthesia and cavity preparation, which can generate systemic consequences, such as increased BP, which happens because of the nerve stimulation during the situation.^[5,8] Confirming this, this research has shown that during the extraction procedure there is a BP variation, as it is observed a significant increase ($P < 0.05$) in SBP and DBP, especially in the trans-operative period of the evaluated extractions. There was a difference in the mean values of SBP and DBP in the three evaluated periods.

Other studies^[5,7] show a significant BP changes in dental procedures. However, according to Rodrigues,^[4] there are studies that show no significant change in BP in different operative periods, but there is an increase in SBP and DBP only during anesthesia, or during the trans-operative period, agreeing with the results of this research.

In this study, the age group with the greatest variation in BP in pre-operative and trans-operative time was >49 years, but the BP remained normal in patients aged between 30 and 49 years old. This relationship between age and BP variation was not found in the literature, but data correlating anxiety and age of the patients, showing that higher levels of anxiety are found in patients over 24 years of age, can be observed.^[5]

Some studies^[18-20] show that females have a higher degree of anxiety to dental treatment when compared to males, which is in contrast with the results obtained in this study, which showed no significant difference in anxiety between genders. There was also no significant difference between genders ($P > 0.05$) on the change in SBP and DBP considering the BP difference between the moments during and before the operation.

With respect to pain ratio and BP variation, it was observed that there was a low and medium significant correlation between the level of pain and DBP in pre-operative and trans-operative periods, respectively. This enters into an agreement with another study^[18] that showed a significant association between these variables, including pain related to SBP, which is in contrast with this study, which did not show this relationship.

Conclusion

There was a variation in BP of patients undergoing dental extractions, which showed higher values in the trans-operative period. This increase is related to fear and anxiety during dental care.

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