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Case Report

BLOOD PRESSURE VARIATIONS IN PATIENTS DURING IMPLANT DENTISTRY PROCEDURES

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ABSTRACT

Dental and medical treatments are a source of stress for the patient, with intense psychosomatic alterations due to pain and anxiety. Stress induces an increase in arterial blood pressure and tachycardia. The investigation aims to evaluate the blood pressure during implant surgery at pre, peri and post-operative phases. A non-invasive pressure monitoring was performed by a digital device, prior to injecting anaesthesia, during implant insertion and after stitching sutures. Immediately before and after implant surgery, systolic pressure was significantly higher than the patient's standard pressure. Alterations of systolic pressure are observed before and after dental treatment. Therefore, pressure monitoring is highly recommended during the surgical procedure.

KEYWORDS: *pressure, artery, implant, dentistry, pulse, pressure, hypertension*

INTRODUCTION

Dental implants are medical devices widely used to replace one or more missing teeth (1–6). Implant placement and dental treatment are generally related to anxiety and stress. In some cases, the physiological tension associated with the operative procedure generates phobia and panic attacks (7). Physiological factors influence the nociception of patients, in particular in dentistry, where it was confirmed that anxiety is related to a lower level of pain tolerance (8–11). Vassend et al. (9) reported that the perspective of perioperative pain and anxiety represent the most significant obstacle for patients to

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undergo dental treatment. Rosa et al. (11) reported that anxious patients generally avoid dental treatment for longer time with determinant consequences in terms of maintaining oral and dental health status.

The patients are frequently exposed to stress during dental treatment related to perceived pain, tension and anxiety (8). One of the most diffused evidence of physiological modification is arterial pressure (AP) alteration. In this way, the surgical procedure needs an atraumatic approach to reduce patient stress and preserve normal vital function (12, 13).

The AP variation can determine significant alteration, especially in patients with systemic diseases. Therefore, the surgeon should provide a recording of the AP as a praxis to identify potential subjects with hypertension (13).

Table I. *Arterial pressure classification of joint national committee on prevention, detection evaluation and treatment of, high blood pressure.*

	SYSTOLIC		DIASTOLIC
NORMAL	<120	And	<80
Pre-hypertension	120 - 139	Or	80 - 89
Hypertension grade 1	140 - 159	Or	90 - 99
Hypertension grade 2	> or = 160	Or	> or = 100

The circulatory apparatus is a closed system that permits blood circulation (14). A blood volume is ejected from the aorta at every heart contraction, which determines the AP's continued increase and decrease (15). The maximum pressure is the systolic (SP); the minimum is the diastolic pressure (DP).

The SP is sensibly influenced by physiological features, such as exercise. On the other hand, the DP depends on the peripherical resistance of the vascular apparatus, and it is strictly related to the vessel's tone. In this way, the DP has minor temporal variations compared to SP (9).

Moreover, many factors could determine a wrong evaluation of AP: smoking, caffeine, alcohol, and drugs assumption could determine an increase in blood pressure (14,16).

The recording of the AP and the diagnosis of the subjects affected by uncontrolled hypertension is essential in order to prevent clinical complications (17).

The "Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure" classifies the AP into groups: 3 grades for standard pressure and 3 for hypertension (Table I). Specifically, normal pressure is divided into optimal (120/80 mm/Hg), standard (<130/85 mm/Hg) and high standard (between 130-139/85- 89 mm/Hg). Hypertension is defined for level 1 (140-159/90-99 mmHg), level 2 (160-179/100-109 mmHg) and level 3 (higher than 180/110 mmHg) (12, 13).

Patient treatment is strictly related to the grade of hypertension: the subject affected by hypertension of level 3 must procrastinate any dental treatment, whereas, in case of hypertension of level 1 or 2, the subject must perform adequate therapy and then repeat the record of AP two weeks before surgery in order to verify if pressure is under control. The study aims to investigate pressure of subjects under implant surgery.

MATERIALAND METHODS

Subjects' recruitment

A total of 40 patients (aged 18-70 years) were recruited and treated in the Post-Graduation Implantology and Advanced Research Center of the University of UNINGA in Cachoeiro of Itapemirim (ES, Brazil) for dental implant surgery. Exclusion criteria were: concomitant bone regeneration procedures, subjects affected by severe systemic diseases, head and neck radiation therapy, chemotherapy and uncontrolled diabetes.

Surgical procedures

Before the procedure, patients rinsed with a chlorhexidine digluconate solution of 0.2%. Then loco-regional anaesthesia

was performed by Articaine Pierrel (Pierrel S.p.A, Milan, Italy) with epinephrine 1:100.000. A midcrestal incision was made, and a full thickness flap was elevated to perform the implant placement (Fig. 1) (Isomed, Due Carrara, Padua, Italy). All implant placements were performed at a speed of 800 rpm in accordance with the implant manufacturer protocols with a saline solution cooling system (18-20). The flap was then sutured with Polimid 4.0 (Assut Europe, Magliano dei Marsi, Aquila Italy).

Antibiotic therapy (Amoxicillin 1g) was prescribed two times/die for six days, and an analgesic drug (Ibuprofen 600mg) was provided two hours after the surgical procedure and repeated every six hours for three days. Suture removal was performed one week after surgery.

Three AP recordings (HEM 7113, OMRON, Brazil) were collected before the procedure and then used for monitoring blood pressure during surgery. This mean value of AP was defined as "baseline" pressure. The AP recording was repeated during implant insertion and at the end of surgery.

Fig. 1. *Implant with conical connection used in the present investigation*

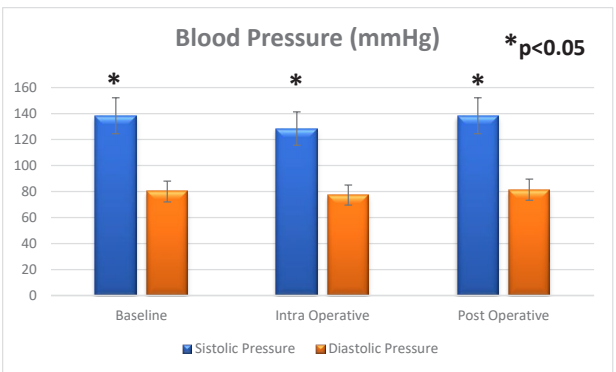

Fig. 2. *Chart summary of the arterial pressure evaluated at the experimental times. The intraoperative phase is related to a significative decrease in the SP (* p<0.05).*

RESULTS

A total of 40 patients were enrolled in the study for implant placement: 7 subjects with hypertension grade 2 (17:5%), 6 with hypertension grade 1 (15%), 13 patients classified into pre-hypertension (32,5%) and 14 (35%) with standard AP. All patients received three implants. The values of AP are shown in Table II and Fig. 2. At baseline (i.e., immediately before the procedure) and in the post-operative phase, SP was significantly higher if compared with standard patient pressure. However, DP did not show a statistically significant difference during surgery.

Table II. *Arterial pressure calculated at baseline, intra-operative and post-operative. (* p<0.05).*

	Baseline	Intra Operative	Post Operative
Systolic pressure	138.33± 24.23 mmHg (*)	128.46± 18.25 mmHg (*)	138.33± 21.96 mmHg (*)
Diastolic pressure	80.02 ± 9.22 mmHg	77.30± 10.49 mmHg	81.43± 11.72 mmHg
Pulse pressure	48.35 ± 19.73 mmHg	41.15± 17.77 mmHg	49.89± 17.79 mmHg

DISCUSSION

The dental treatment promotes psychosomatic alteration that could potentially generate a hypertensive crisis, which could compromise vital organ function and induce potential medical urgency and systemic compliances. The principal evidence related to this pathological condition is tachycardia, peripheric vasoconstriction, mydriasis, AP increasing, hyperventilation, sweating, state of agitation, general increasing of the body metabolism and stress (12). Moreover, the AP could be increased in perioperative period connected to an uncomfortable medical ambient feeling defined "white coat hypertension" (21, 22). This process is connected with an increased secretion of adrenocorticotropin hormone (ACTH) from pituitary gland in blood circulation. ACTH stimulates the production of cortisol, a molecule related to the stress condition able to increase the blood pressure. Also, the autonomic nervous system stimulates the adrenal gland, that release catecholamines like adrenalin and noradrenalin. At high concentrations these molecules in blood circulation increase cardiac frequency (CF), vessel tone as well as SP and DP (13).

The influence on blood pressure of the sympathomimetics vasoconstrictor present in local anesthetics on the AP is still debated in literature. The use of epinephrine on subject affected by uncontrolled hypertension was been associated with a sensible increase of DP and SP (23, 24). The combination of stress and the local anesthesia with vasoconstrictor may induce a dangerous alteration of the blood pressure in compromised patients. Zottis et al. (25) investigated about the influence of the association of lidocaine and noradrenalin to AP and CF in dental treatment. The study reported that no significant evidence of blood pressure variations or CF in patients that received local anesthesia. Consequently, it seems that stress condition, state of anxiety, phobia and pain are more important factors able to determine variation in blood pressure and CF. Brand et al. (13) also studied the variation of AP in patients that received local anesthesia compared with subjects that do not received anesthesia, with a significant increasing of the blood pressure rate in the first group. Also, Nichols et al. (26) compared norm tensed and hypertense patients monitored during surgery and highlighted significative increase of AP and CF from the first 5 minutes of the treatment until the end of surgery. Both Nakamura et al. (27) and Matsumura et al. (28) investigated the AP before the surgery, during the anesthesia and after operation. The group of Nakamura (27) highlighted an increasing of SP and DP during the surgery. Instead, in the second study no significative effects were evident during the treatment (28). Cavalcanti et al. (29) reported an alteration of AP before anesthesia and after surgery, where 73% of subjects showed a sensible increase of the AP, 11,6% of patients do not provide any variation. Authors concluded the stress could be a determinant factor for the increasing of the AP. Goldman et al. (30) observed the variation of AP of 20 operated subjects, with no significative alterations of SP and DP; a sensible alteration of CF was correlated to stress and posture.

A correct anamnesis and diagnostic process is a key factor to reduce the risks connected to the dental procedures. Those concepts were confirmed by Ferreira et al. (31), which outlined that the anamnesis represents an important aid to detect hypertension in asymptomatic subjects. Costa et al. (32) reported a lower SP during the peri operative phase, but higher before and after surgery without significative alteration of DS. These data are similar to our results. The stressed subjects presented an increased release of adrenaline, aldosterone, plasmatic renin, and angiotensin II that induces a vasoconstriction (33–35). Therefore, all these factors induce an increase of pressure. Alterations of CF, SP and DP are observed before and during the dental treatment and are related to individual factors like age, sex, hypertension, previous dental procedure experience and psychological response (36).

In conclusion, alterations of systolic pressure are observed before and after dental treatment. Pressure monitoring is highly recommended during surgical procedure.

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