Management of the hypertensive patient in dentistry: narrative review

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Abstract

***Purpose*: Considering the issues surrounding the treatment of a patient with hypertension in the dental setting, this narrative review aims to highlight what approaches and guidelines should be kept in mind when approaching a hypertensive patient.**
***Methods*: All articles and reviews considering the topic of hypertension management in dentistry were searched on the online platform of scientific reading sites such as PubMed and Medline, selecting the most current ones, up to January 2022, including any language. Considering the keywords "hypertension," "Dentistry," "blood pressure' and "posology," randomized controlled trials (RCTs), prospective studies, observational studies, reviews, and retrospective studies were considered. Textbooks relevant to the topic were then examined, and the citations of each retrieved article and those of reviews and expert opinions were examined to include as much knowledge as possible.**
***Result*: by analyzing the literature data, it could be inferred that hypertension should be carefully attended to and treated with appropriate precautions especially in the pre-surgical phase.**
Conclusion: **controlled hypertension does not represent a contraindication to dental and surgical treatment; nevertheless, in some cases, pressure abnormalities due to severe stress attributable to the hospital environment (white coat hypertension) can be found, which if they were to lead to a pressure higher than 200 mmGH in the pre-surgical phase should lead to the cessation of clinical treatment.**

Keywords: Cardiovascular diseases, hypertesion, blood pressure, essential hypertension, secondary hypertension, periodontology, oral surgery, white coat hypertension, dentistry.

Introduction

According to the World Health Report 2002 of the World Health Organization (WHO), cardiovascular diseases affect about 12 million people each year (The World Health Report. 2002). For this reason, it is important for the dental practitioner to know how to best manage the treatment course of patients with these diseases, in order to be able to deal in the most correct way with the potential complications that may arise as a result of dental maneuvers (Matsuura et al. 1993). Among the most common cardiovascular diseases there is hypertension. Hypertension is defined as an average systolic blood pressure greater than 140mmHg or a diastolic blood pressure greater than 90 mmHg. We can distinguish between hypertension of unknown origin (essential), about 90% of cases, and secondary hypertension (nephropathy, adrenal disease), which is a less frequent form. Hypertension has a prevalence of 20% and it's often not easily diagnosed because the symptomatology may be absent or nonspecific: in fact, symptoms such as headaches, mild tachycardia and lightheadedness are associated with it.

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If not properly managed, it can lead the patient to unpleasant complications such as hypertensive heart disease (left ventricular hypertrophy and myocardial ischemia), renal failure, retinopathy, and even stroke. There are several factors that may predispose the patient to hypertension. The first among them is age; in fact, blood pressure increases with advancing age and this causes stiffening of arterial vessels resulting in hypertension (Elliot WJ et al. 2007). Other factors reside in alcohol consumption, leading a sedentary lifestyle, smoking habit, being overweight and the presence of diabetic disease. (Ferdinand KC . et al. 2017).

For a correct diagnosis, an accurate measurement of blood pressure should be made, which is expressed through two parameters: systolic pressure (maximum) and diastolic pressure (minimum); both depend on the contraction of the heart muscle (systole) and the subsequent relaxation of the heart (diastole) between beats(Hermida RC. et al. 2007), (Julien J. et al. 2004).

Normal values for the adult population are within 140/85 mmHg. Therefore, hypertension is defined as when one or both blood pressure values are consistently above normal (Brouwers S. et al. 2021).

Considering that increased blood pressure values are often not accompanied by symptoms and these are not specific, the only way to diagnose hypertension is to undergo periodic blood pressure measurements. Otherwise, it may happen that a diagnosis is made when the blood pressure values, which have been high for a long time,

have already done damage or, even, during acute events (myocardial infarction, cerebral stroke) (Al Gohrani H. et al. 2021).

Once a diagnosis of hypertension has been made, it is useful to undergo some tests to find out whether hypertension has already damaged the vessels, heart, and kidneys, helping the physician in defining the cardiovascular risk profile of patients and choosing the most suitable antihypertensive therapy (Christian Ott et al. 2022).

The most common and practical method of measuring blood pressure is the indirect method, which involves the use of a mercury sphygmomanometer. It consists in a rubber cuff connected with a small hand pump on one hand and a mercury column manometer on the other (Valler-Jones T. et al. 2005). The rubber cuff is placed on the patient's arm, positioning the bell of the phonendoscope at the humeral artery. One begins the measurement by inflating the cuff until it is no longer possible to auscultate the pulse of the wrist artery, which was previously tapped with the thumb. At this point, some more air is insufflated into the cuff to raise the pressure another 20 mmHg (Dilek Gurgenyatagi Erdem et al. 2009). At this point, you slowly let air out of the cuff by turning the small valve on the pump. You continue to let the air out until the air pressure in the cuff is equal to the arterial pressure; through the phonendoscope you will be able to auscultate an initial noise that corresponds to the systolic (maximum) pressure. In contrast, the value beyond which no more noise will be auscultated will correspond to diastolic (minimum) pressure (Oparil S. et al 1989).

Once a diagnosis of hypertension has been made and lifestyle habits reviewed, it may be necessary to undertake drug therapy, the purpose of which is precisely to normalize blood pressure.

For most patients with systemic hypertension, long-term pharmacological treatment, in addition to nonpharmacological treatment options, is indicated and is beneficial to achieve desired blood pressure levels.

The currently commercially available antihypertensive drug families, if supplemented by lifestyle modifications, could potentially effectively control blood pressure in most hypertensive patients.

In fact, the drugs increase their effectiveness when used in combination with dietary restriction of sodium and caloric intake, increased physical activity, and weight loss.

Despite drug therapy, according to the literature, only 25 percent of patients with hypertension achieve optimal blood pressure control.

Among the families of antihypertensive drugs, we find Diuretics. They are effective drugs that rely on the reabsorption of water and sodium at the level of the distal tubule, going to result in decreased blood volume and thus cardiac output (Brater DC, 2000). Some studies indicate that long-term therapy with thiazide diuretics may protect against osteoporosis because of their hypercalcemic effect (LaCroix AZ et al. 2000). ACE inhibitors, another family of antihypertensive drugs, act by inhibiting angiotensin II enzyme secretion, resulting in decreased aldosterone release and vasoconstriction. ACE inhibitors are effective in 60-70% of patients with uncomplicated stage I-II hypertension. Caucasians, younger individuals show a better response with ACE inhibitors (Saunders E. et al. 1990). Pregnancy is an absolute contraindication for ACE inhibitor therapy because of fetal toxicity (fetal and placental toxicity).

Another large group of antihypertensives consists of angiotensin II receptor antagonists, which participate in the disruption of the renin-angiotensin cascade to lower blood pressure (Burnier M. et al. 2000).

Last, remember the calcium channel blocker drugs that act by blocking endothelial smooth muscle calcium channels: this results in muscle relaxation and decreased peripheral resistance (Luscher TF. et al. 1998).

Materials and methods

All articles and reviews considering the topic of hypertension management in dentistry were searched on the online platform of scientific reading sites such as PubMed and Medline, selecting the most current ones, up to January 2022, including any language. Considering the keywords "hypertension," "Dentistry," "blood pressure' and "posology," randomized controlled trials (RCTs), prospective studies, observational studies, reviews, and retrospective studies were considered. Textbooks relevant to the topic were then examined, and the citations of each retrieved article and those of reviews and expert opinions were examined to include as much knowledge as possible.

Management of the hypertensive patient in dentistry first dental examination

For the proper management of hypertensive patients, it's essential for dentists to obtain both medical and dental histories to develop a treatment plan tailored to the patient's overall health. In cases involving cardiac pathology, further analysis is necessary to identify the specific type and severity of the cardiac condition, aiding in the determination of optimal preoperative and postoperative therapies. Symptomatology also plays a crucial role, particularly in hypertensive patients (Yagiela JA et al., 2007). In this context, cardiac patients can be classified into

various risk classes based on symptomatology:
Class 1: Patients without any limitation of physical activity, able to perform regular activities without disturbance;
Class 2: Patients with mild physical activity limitations experiencing symptoms (such as dyspnea, anginal pain, palpitations, fatigue) only after exertion beyond normal levels;
Class 3: Patients with marked physical activity limitations who experience symptoms even after mild activity, though none at rest; and
Class 4: Patients incapable of any physical activity, experiencing symptoms even at rest.
The first two classes are generally considered low risk for outpatient dental treatment, with treatment plans similar to those for healthy patients. However, patients in the third and fourth classes face an increased risk of cardiovascular complications, necessitating consultation with a cardiologist. In such cases, therapies should be as conservative as possible, with preference for hospital-based procedures over outpatient settings (Rhodus NL et al., 2001).
Following the medical history, an extraoral objective examination is conducted, followed by an intraoral examination focusing not only on dental elements but also on soft tissues. Medical consultation and hematochemical tests may be employed to assess risk in symptomatic or doubtful patients requiring extensive interventions. Typical hematochemical tests include complete blood count, serum sodium, potassium, creatinine, blood glucose, total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, uric acid, urinalysis, and thyroid hormones (O'Shea PM et al., 2016).

Management of the hypertensive patient in the dental setting

After obtaining a comprehensive medical history and conducting a thorough dental evaluation, it's advisable to measure the patient's blood pressure. Blood pressure should be measured under resting conditions to avoid elevations due to stress induced by dental therapy.
In cases of uncontrolled hypertension (systolic blood pressure > 140 mmHg or diastolic blood pressure >90 mmHg), dental intervention is not recommended, and services should be deferred. The patient should be referred for cardiology consultation, and all non-urgent dental services should be postponed until blood pressure is adequately controlled. Urgent procedures that cannot be delayed should be performed in a hospital setting rather than an outpatient setting.
If dental treatment is deemed necessary, the choice of anesthetic becomes crucial. Factors such as the duration of the procedure and the need for hemostasis should be considered. Vasoconstrictors are commonly added to anesthetic solutions to prolong their duration of action and enhance vasoconstrictive effects (Holm SW et al., 2005).
The use of vasoconstrictors is generally indicated, except in cases of:

1. Severe uncontrolled hypertension (200/115 mmHg)
2. Refractory arrhythmia
3. Myocardial infarction or stroke within the past 6 months
4. Unstable angina
5. Coronary artery bypass surgery within the past 3 months
6. Uncontrolled congestive heart failure

However, recent guidelines no longer consider myocardial infarction an absolute contraindication to the use of vasoconstrictors, provided they are administered in minimal doses and when deemed necessary. This is because the stress of pain induces a release of endogenous catecholamines approximately 40 times higher than at rest. In contrast, a standard 1:100,000 anesthesia with epinephrine injects only 0.018 mg of adrenaline. Therefore, there are generally no contraindications to using vasoconstrictor-containing anesthetics in patients with controlled hypertension (based on findings from S. Malamed's studies).
According to the previous informations, key points in management of hypertensive patients in dental practice were summarized as follows (Table 1).

Table 1. Key points in management of hypertensive patients in dental practice.

Aspect	Summary
Initial Assessment	Comprehensive medical history and dental evaluation, including blood pressure measurement under resting conditions, are essential.
Management of Uncontrolled Hypertension	Dental intervention is not recommended for patients with uncontrolled hypertension (systolic BP > 140 mmHg or diastolic BP > 90 mmHg). Urgent procedures should be done in a hospital.
Considerations for Dental Treatment	Choice of anesthetic is crucial, considering procedure duration and need for hemostasis. Vasoconstrictors are commonly used but contraindicated in specific conditions.
Contraindications for Vasoconstrictor Use	Severe uncontrolled hypertension, refractory arrhythmia, recent myocardial infarction or stroke, unstable angina, recent coronary artery bypass surgery, uncontrolled heart failure.
Recent Guidelines on Vasoconstrictor Use After Myocardial Infarction	Minimal doses of vasoconstrictors may be used post-MI if deemed necessary, as stress-induced catecholamines are much higher than those released by vasoconstrictors.
Implications for Controlled Hypertension and Vasoconstrictor Use	Controlled hypertension generally does not contraindicate vasoconstrictor use in minimal doses.

Operatory risks of the hypertensive patient

Hypertensive patients undergoing dental procedures do not face an increased risk as long as their hypertension is well controlled. This assertion, supported by Yagiela et al. in 1997, underscores the importance of managing the underlying condition prior to dental interventions.

When administering local anesthesia before dental treatment, the use of adrenaline-containing solutions, known for their vasoconstrictive properties, is not contraindicated. On the contrary, research suggests that adrenaline in local anesthetics may actually be beneficial. Montebrugnoli et al. (1990) demonstrated that adrenaline does not significantly increase mean blood pressure compared to the release of endogenous catecholamines triggered by anesthesia lacking vasoconstrictors. In fact, adrenaline can mitigate stress responses, making it a valuable tool for intraoperative pain control. This is crucial because uncontrolled stress during dental procedures can activate significant cardiovascular responses, as highlighted by Becker et al. in 2012.

Moreover, studies indicate that the administration of local anesthetic with adrenaline does not significantly alter blood pressure or heart rate in hypertensive patients. Serrera Figallo et al. (2012) found that the injection of approximately two vials of local anesthetic with adrenaline did not lead to notable hemodynamic changes. Even when plasma epinephrine levels increase following anesthesia administration, the associated cardiovascular effects remain within acceptable limits, unlike the drastic elevation seen with stress-induced endogenous catecholamines, as noted by Càceres et al. in 2008.

The rationale for using vasoconstrictors in local anesthesia extends to implant surgery, where controlled hypertension (defined as 140/90 mmHg) does not pose an absolute contraindication. However, it is essential for dentists to measure blood pressure preoperatively and employ appropriate stress-reduction techniques during the perioperative period. These may include psychosedative methods, minor tranquilizers like diazepam, or the use of nitrous oxide.

Additionally, dentists should be mindful of potential interactions between nonsteroidal anti-inflammatory drugs (NSAIDs) and antihypertensive medications. Rhodus et al. (2001) noted that NSAIDs could diminish the efficacy of antihypertensive drugs, emphasizing the importance of medication management in hypertensive patients undergoing dental treatment.

In conclusion, the judicious use of local anesthesia with vasoconstrictors and meticulous management of hypertension and stress are essential aspects of dental care for hypertensive patients. By adhering to these guidelines (**Table 2**), dentists can ensure the safety and well-being of their hypertensive patients during dental procedures.

Hypertension and periodontitis

Extensive epidemiological studies have suggested a potential correlation between periodontal disease and hypertension. This relationship may stem from chronic systemic inflammation, which triggers local inflammation and the release of inflammatory mediators like proteases, cytokines, and prostaglandins. Consequently, this inflammatory cascade leads to periodontal tissue destruction, alveolar bone resorption, and eventual tooth loss (De Pinto R. et al., 2020).

Research indicates that individuals with periodontal disease may have an elevated risk of developing hypertension, and there is evidence to suggest that controlling blood pressure could positively impact oral health outcomes (Aarabi G et al., 2017), (Zhou M et al., 2021). While the precise nature of this association remains somewhat elusive, it appears to be independent of common risk factors and may potentially have a causal relationship (Del Pinto R et al., 2020), (Sanz M et al., 2020). Moreover, there appears to be a bidirectional relationship between periodontal disease and hypertension, underscoring the importance of comprehensive oral hygiene practices, both at home and through professional dental care, for promoting dental and cardiovascular health (Munoz Aguilera E. et al., 2020), (Dietrich T. et al., 2013).

Hypertension and oral surgery

In the realm of oral surgery, particular consideration must be given to a phenomenon known as “white coat hypertension.” This condition refers to instances where blood pressure measurements taken in a medical setting indicate hypertension, while measurements taken outside of such settings fall within the normal range. If systolic blood pressure surpasses 200 mmHg, it is advisable to halt any ongoing dental procedures.

Table 2. Guidelines for hypertensive patient’s dental procedures.

Aspect	Summary
Hypertension Control	Well-controlled hypertension is crucial for minimizing risks during dental procedures.
Use of Local Anesthesia with Adrenaline	Adrenaline-containing solutions in local anesthetics are not contraindicated and can help mitigate stress responses.
Cardiovascular Effects of Local Anesthetic	Studies show that local anesthetics with adrenaline do not significantly alter blood pressure or heart rate in hypertensive patients.
Considerations for Implant Surgery	Controlled hypertension is not an absolute contraindication for implant surgery, but preoperative blood pressure measurement and stress reduction techniques are essential.
Interaction with NSAIDs	Dentists should be mindful of potential interactions between NSAIDs and antihypertensive medications, as NSAIDs may diminish the efficacy of antihypertensive drugs.
Importance of Management	Meticulous management of hypertension and stress, along with judicious use of local anesthesia with vasoconstrictors, ensures the safety of hypertensive patients.

White coat hypertension can pose challenges during dental interventions, as elevated blood pressure levels may increase the risk of complications such as bleeding or cardiovascular events. Therefore, it is essential for oral surgeons to remain vigilant and take appropriate measures to manage hypertension in these situations.

One strategy to address transient hypertension and ensure the safe completion of dental procedures is the administration of medications such as midazolam or propofol. These sedatives can help alleviate anxiety, induce relaxation, and stabilize blood pressure levels, thereby facilitating the successful execution of oral surgical procedures. Additionally, intravenous sedation may be employed to achieve deeper sedation and better control over the patient's physiological responses during the dental intervention.

By effectively managing white coat hypertension and employing appropriate pharmacological interventions, oral surgeons can enhance patient safety and optimize treatment outcomes in the context of oral surgical procedures.

Conclusions

Dentists need to be particularly cognizant of the implications that hypertension may have in dental practice. When treating hypertensive patients, specific recommendations should be followed to ensure their safety and well-being.

Firstly, it's crucial to limit dental care in patients with severe hypertension. This includes deferring non-urgent procedures and referring the patient for cardiology consultation if their blood pressure is uncontrolled.

Secondly, efforts should be made to reduce stress during dental procedures for hypertensive patients. Stress management techniques, such as relaxation exercises or the use of nitrous oxide, can help mitigate the potential impact of stress on blood pressure levels.

Lastly, periodic monitoring of blood pressure throughout the dental visit is essential to detect any fluctuations and ensure that the patient remains within safe parameters. This monitoring allows for prompt intervention if blood pressure rises to levels that may pose risks during treatment.

By adhering to these recommendations, dentists can provide safe and effective dental care for hypertensive patients while minimizing the potential risks associated with hypertension.

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