J Oral Maxillofac Surg
64:111-121, 2006

Hypertension: Classification, Pathophysiology, and Management During Outpatient Sedation and Local Anesthesia

*Stephen Wilford Holm, DMD,**
Larry L. Cunningham, Jr, DDS, MD,† Eric Bensadoun, MD,‡
and Matthew J. Madsen, BS§

Hypertension is defined as a systolic blood pressure (SBP) higher than 140 mHg or a diastolic blood pressure (DBP) higher than 90 mmHg; the diagnosis is based on the average of 2 or more readings taken at each of 2 or more visits after an initial screening.[1,2] When determined by these criteria, hypertension affects 20% to 30% of the adult population in most developed countries, and its prevalence appears to increase with the age of the patient.[3-5] Recent publications have shown that the lifetime risk of hypertension for patients who are normotensive at age 55 is 90%.[1] African Americans are affected by hypertension nearly twice as often as whites and seem to be more vulnerable to its complications.[5,6] Hypertension is an important risk factor for cardiovascular accidents, coronary heart disease, cardiac hypertrophy with heart failure (hypertensive heart disease), aortic dissection, and renal failure. Hypertension can also accelerate atherogenesis and can induce changes favorable for aortic dissection and cerebrovascular hemorrhage.[7] Despite the prevalence of hypertension and its associated complications, only 29% of patients with hypertension are treated, and only 45% of those treated with antihypertensive medications have controlled disease.[7,8]

This paper reviews and summarizes the new classification system based on the Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC-7). In addition, it reviews the guidelines, pathophysiology, clinical symptoms, and diagnosis of hypertension. Finally, it reviews treatment recommendations for common local anesthetics, conscious sedative agents, and general anesthetics as they pertain to hypertensive patients undergoing oral and maxillofacial surgery.

Oral and maxillofacial surgeons will frequently encounter patients with undiagnosed or poorly controlled hypertension. The recent JNC-7 report addressed the following issues: *1*) the publication of many new hypertension observational studies and clinical trials; *2*) the need for a new, clear, and concise guideline that would be useful for clinicians; *3*) the need to simplify the classification of blood pressure; and *4*) the clear recognition that previous JNC reports were not being used to their full potential.[1]

JNC Review

JNC-7 is summarized by the following key points and alterations: *1*) for patients older than 50, SBP higher than 140 mmHg is a much more important cardiovascular risk factor than DBP; *2*) the risk of cardiovascular disease (CVD) doubles with each increment of 20/10 mmHg above a baseline of 115/75 mmHg; *3*) the lifetime risk of hypertension for patients who are normotensive at age 55 is 90%; *4*) patients with SBP of 120 to 139 mmHg or DBP of 80 to 89 mmHg should be considered pre-hypertensive and require health-promoting lifestyle modifications

*Resident, Oral and Maxillofacial Surgery, Carle Foundation Hospital, Urbana, IL.

†Assistant Professor and Residency Director, Oral and Maxillofacial Surgery, University of Kentucky College of Dentistry, Lexington, KY.

‡Associate Professor, Division of Pulmonary and Critical Care Medicine, University of Kentucky, Lexington, KY.

§Dental Student, University of Kentucky College of Dentistry, Lexington, KY.

Address correspondence and reprint requests to Dr Cunningham: University of Kentucky College of Dentistry, Oral and Maxillofacial Surgery, 800 Rose Street, D-508, Lexington, KY 40536-0297; e-mail: llcunn2@email.uky.edu

0278-2391/06/6401-0019$32.00/0
doi:10.1016/j.joms.2005.09.023

Table 1. CARDIOVASCULAR RISK FACTORS

Major Risk Factors
Hypertension*
Cigarette smoking
Obesity* (body mass index >30 kg/m^2)
Physical inactivity
Dyslipidemia*
Diabetes mellitus*
Microalbuminuria or estimated glomerular filtration rate <60 mL/min
Age (older than 55 for men or 65 for women)
Family history of premature cardiovascular disease (men <55; women <65)
Target Organ Damage
Heart
Left ventricular hypertrophy
Angina or prior myocardial infarction
Prior coronary revascularization
Heart failure
Brain: stroke or transient ischemic attack
Chronic kidney disease
Peripheral arterial disease
Retinopathy

*Components of metabolic syndrome.

Holm et al. Hypertension During Outpatient Sedation and Local Anesthesia. J Oral Maxillofac Surg 2006.

to prevent CVD; *5*) most patients with hypertension will require 2 or more antihypertensive medications to achieve goal BP (<140/90 mmHg, or <130/80 mmHg for patients with diabetes or chronic kidney disease); *6*) if blood pressure is more than 20/10 mmHg above goal blood pressure, consideration should be given to initiating therapy with 2 agents, one of which is usually a thiazide-type diuretic; and *7*) the most effective therapy prescribed by the most careful clinician will control hypertension only if patients are motivated to follow the prescribed regimen. JNC-7 recognizes 3 objectives in classifying hypertension and in evaluating patients for hypertension: *1*) assessing lifestyle and identifying other cardiovascular risk factors or concomitant disorders that may affect prognosis and guide treatment; *2*) revealing identifiable causes of high blood pressure; and *3*) assessing the presence of target organ damage and CVD. A patient's overall cardiovascular status cannot be based on blood pressure alone; risk factors and known causes of hypertension must also be assessed. JNC-7 also provides guidelines for assessing cardiovascular risk factors (Tables 1, 2).

CLASSIFICATION

The recent JNC-7 has simplified the classification of hypertension into 3 categories: prehypertension (SBP 120 to 139 mmHg, DBP 80 to 89 mmHg), stage 1 hypertension (SBP 140 to 159 mmHg, DBP 90 to 99 mmHg), and stage 2 hypertension (SBP >160 mmHg, DBP >100 mmHg) (Table 3).[9] The correlation between blood pressure and the risk of CVD has been shown to be continuous, consistent, and independent of other risk factors.[1] As blood pressure increases, so does the possibility of heart attack, stroke, and kidney disease. For patients between 40 and 70 years old, each increment of 20 mmHg in SBP or 10 mmHg in DBP doubles the risk of CVD across the entire range from 115/75 mmHg to 185/115 mmHg.[1] The reorganization of JNC classifications recognized that patients with prehypertension are at increased risk of progression to hypertension and that risks are associated with even mildly elevated blood pressure, even pressures in the range previously considered "normal."

HYPERTENSION ETIOLOGY

Most cases of hypertension arise through a chronic disease process; however, some patients will experience sporadic increases and decreases in blood pressure, a condition called labile hypertension. A small percentage of patients may experience accelerated hypertension, known as malignant hypertension. Nearly 90% of cases of hypertension are idiopathic or primary and are classified as essential hypertension. The remaining 10% of cases result from renal failure, cardiovascular disorders, hormonal disease, or neurologic dysfunctions.[5] Essential and secondary hypertension may be caused by genetic or environmental factors.[10] Recent research has not clearly determined whether mutation at a single gene locus or a polygenetic mutation is more commonly responsible for the phenotype of a hypertensive disorder.[3,5,10] Considering environmental factors, nutrition can be used as a potential aid in determining and diagnosing hypertensive risk.[1-3,10,11] Variable contributive causes are high salt intake, alcohol, obesity, and reduced physical activity.[10-12] Early signs and symptoms of hypertension include fluctuating changes in blood pressure and narrowing of the retinal arteries with or without hemorrhage. Symptoms of early hypertension include headache, vision changes, ringing in the ears, or tingling of the hands and feet.[13,14] Later signs may in-

Table 2. IDENTIFIABLE CAUSES OF HYPERTENSION

Sleep apnea
Drug-induced or related causes
Chronic kidney disease
Primary aldosteronism
Renovascular disease
Chronic steroid therapy and Cushing's syndrome
Pheochromocytoma
Coarctation of the aorta
Thyroid or parathyroid disease

Holm et al. Hypertension During Outpatient Sedation and Local Anesthesia. J Oral Maxillofac Surg 2006.