An estimated 15% to 20% of the white population and 20% to 25% of the African American population in the United States are hypertensive. The majority of these individuals are aware of their condition. The number of people with undetected hypertension was reduced from about 49% in 1976 to 27% in 1991. However, data from 1994 show a reversal in this trend of reduction, with 32% of individuals found to have undetected hypertension today. These patients are at high risk for significant complications such as stroke, heart disease, kidney disease, and retinal disease. Those with very high blood pressure are at great risk for acute medical problems when receiving dental treatment. For those reasons, dentistry must continue to place an emphasis on the detection and referral of patients with high blood pressure. In addition, increased numbers of medically compromised patients are seeking dental treatment who should have their blood pressure monitored during the more stressful dental procedures, such as oral surgery, periodontal surgery, and placement of dental implants. This article reviews the recent advances in the dental and medical management of hypertension. It is important for dentists to be aware of hypertension in relation to the practice of dentistry.

The impact on dentistry of recent advances in the management of hypertension

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Dentistry has played an important role in the detection of patients with hypertension. Patients found to have high blood pressure at or beyond defined levels should be referred for a medical diagnosis and indicated treatment. Once the hypertensive condition is under control, oral and dental evaluation and treatment can be initiated. Beginning in 1976, the percentage of the general population in the United States with undetected hypertension declined steadily. However, this decline reversed, beginning in 1994. In addition, fewer than 50% of the patients who are aware of their hypertension have it medically under control. Thus, a significant number of patients with undetected high blood pressure or uncontrolled hypertension today are seeking dental treatment. These patients are at high risk for significant complications such as stroke, heart disease, kidney disease, and retinal disease. Those with very high blood pressure are at great risk for acute medical problems when receiving dental treatment. For those reasons, dentistry must continue to place an emphasis on the detection and referral of patients with high blood pressure. In addition, increased numbers of medically compromised patients are seeking dental treatment who should have their blood pressure monitored during the more stressful dental procedures, such as oral surgery, periodontal surgery, and placement of dental implants. This article reviews the recent advances in the dental and medical management of hypertension. It is important for dentists to be aware of hypertension in relation to the practice of dentistry.

with undetected or poorly controlled hypertension will benefit greatly if their hypertension is detected and they are referred for diagnosis and effective medical treatment of their condition.

RECENT ADVANCES IN HIGH BLOOD PRESSURE MANAGEMENT

The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure\textsuperscript{1} was published in 1997. This document provides guidelines for the management of hypertension developed by experts in the field. Many of the management recommendations in this article are based on this report.

Alvarez et al\textsuperscript{4} reported on the significance of selected risk factors in the development of high blood pressure over a short period of time in the Cienfuegos Global Project. It was shown that age, sex (male), and ethnicity (black race) were major risk factors for development of high blood pressure over a 2-year period. Beilin et al\textsuperscript{5} found that various lifestyle factors are critical determinants of blood pressure levels operating against a background of genetic susceptibility. Excess body fat is a predominant cause of hypertension; additional causes are dietary salt, excess alcohol, and physical inactivity.\textsuperscript{5} They also reported that supplemental potassium, fiber, n-3 fatty acids, and diets rich in fruit and vegetables and low in saturated fats would lower blood pressure.

The relationship between sodium intake and hypertension remains controversial.\textsuperscript{6} The most recent studies have shown only modest decreases in blood pressure with sodium reduction. However, clinical evidence shows that sodium is related to target organ damage, such as left ventricular hypertrophy and renal disease. Chrysant et al\textsuperscript{6} concludes their review by stating, “Whether dietary sodium reduction should be recommended for the general population remains questionable because of marginal benefit and the suggestion of possible deleterious effects on cardiovascular outcomes independent of blood pressure.”

Rahn et al\textsuperscript{7} reviewed the role of the sympathetic nervous system in essential hypertension. They reported that most studies have demonstrated increased sympathetic nerve activity in patients with essential hypertension by using a microelectrode technique to measure sympathetic nerve traffic to skeletal muscle circulation. They concluded that the available data show that sympathetic activation is a specific feature of essential hypertension and that it may play a pathogenic role in this disease.\textsuperscript{7}

A number of studies\textsuperscript{8-16} have demonstrated the importance of systolic hypertension in regard to morbidity and mortality. Less than 10 years ago, all diagnostic and treatment decisions were based on only the diastolic blood pressure. Now it has become clear that prolonged elevation of the systolic blood pressure is just as dangerous if not more dangerous than that of the elevated diastolic blood pressure. Franklin\textsuperscript{9} reported that at similar elevations of systolic blood pressure, subjects with isolated systolic hypertension are at greater risk for cardiovascular events than those with combined systolic/diastolic hypertension. Hall\textsuperscript{10} reported that in the Systolic Hypertension in the Elderly Program and the Systolic Hypertension in Europe study that a diuretic-based regimen in patients 60 years of age or older with isolated systolic hypertension had the following effects: incidence of stroke was reduced by 36% to 42%, and all cardiovascular events were reduced by 31% to 32%. He and Whelon\textsuperscript{12} summarized the findings from available randomized controlled trials. An average reduction of 12 to 13 mm Hg in systolic blood pressure over 4 years was associated with a 21% reduction in coronary heart disease, a 37% reduction in stroke, and a 25% reduction in total cardiovascular mortality.

Angiotensin-converting enzyme (ACE) inhibitors and angiotensin II type 1 (AT1) receptor-antagonists have received increased therapeutic recognition in the treatment of hypertension.\textsuperscript{1,17-23} Peripheral resistance and arterial compliance, in large part, determine systolic blood pressure. Arterial vasoconstriction, vascular growth, and fluid retention, induced by the renin-angiotensin system directly or indirectly by enhancing sympathetic nervous system activity, are important factors in increasing peripheral resistance, decreasing arterial compliance, and consequently, elevating systolic blood pressure. Selective blockade of the AT1 receptor represents a novel mechanism for interrupting the renin-angiotensin system.\textsuperscript{17}

The problem of patients’ “white-coat” response of higher in-office blood pressure readings than ambulatory (out-of-office) readings is common. The “white-coat” effect can lead to dentists referring patients for possible hypertension and to their physicians treating them for high blood pressure.\textsuperscript{24,25} A Canadian study\textsuperscript{26} estimated the prevalence of “white-coat” response among 103 patients, 55 men and 48 women, with treated hypertension. Eleven (20%) men and 26 (54%) women showed “white-coat” response. For men, depression was a weak predictor for a “white-coat” response. Higher depression scores more strongly predicted a “white-coat” effect. For women, the perceived level of stress was the most important predictor of “white-coat” response.

The long-term significance of “white-coat” response is not clear. A study by Verdecchia\textsuperscript{21} found that over a follow-up period of 0.5 to 6.5 years, 37% of the subjects
with “white-coat” hypertension spontaneously had ambulatory hypertension develop with accompanying left ventricular hypertrophy. The probability of having ambulatory hypertension develop increased with the baseline values of ambulatory blood pressure, not of clinic blood pressure. Based on these results, Verdecchia recommended using a more restrictive upper normal limit for the daytime ambulatory blood pressure of 130 mm Hg systolic and 80 mm Hg diastolic.

Ambulatory blood pressure monitoring was not recommended by the Joint National Committee on Prevention, Evaluation, and Treatment of High Blood Pressure\textsuperscript{1} in the routine evaluation of patients suspected of being hypertensive. They stated that it could be most helpful in patients with “white-coat” hypertension. In their review of the technique, the normal sleeping ambulatory blood pressure is even lower compared with clinical blood pressure (less than 135/85 mm Hg). The normal ambulatory blood pressure is lower compared with “white-coat” hypertension spontaneously had ambulatory hypertension develop with accompanying left ventricular hypertrophy. The probability of having ambulatory hypertension develop increased with the baseline values of ambulatory blood pressure, not of clinic blood pressure. Based on these results, Verdecchia recommended using a more restrictive upper normal limit for the daytime ambulatory blood pressure of 130 mm Hg systolic and 80 mm Hg diastolic.

Staessen and O’Brien\textsuperscript{28} discussed automated ambulatory blood pressure monitoring in a recent article. They stated that during the past 10 years, criteria for normality have been developed. The upper limits of normotension are 130/80 mm Hg for the 24-hour blood pressure, 135/85 mm Hg for daytime blood pressure, and 120/70 mm Hg for nighttime blood pressure. The authors reported that the current database supports the proposed diagnostic thresholds in terms of their associations with left ventricular hypertrophy and with the incidence of cardiovascular complications.

A number of investigators worldwide have developed a chronobiologic approach to blood pressure evaluation and diagnosis.\textsuperscript{24,29-39} Blood pressure and heart rate data are collected by automatic ambulatory monitoring every 15 or 30 minutes over a 24-hour, 48-hour, 72-hour, or preferably 7-day period. This allows the clinician to have sufficient data to be computer analyzed with chronobiology formulas that show the circadian pattern of the individual’s blood pressure. By comparing the patient’s data with age, sex, and ethnic-matched normal circadian patterns, areas of excessive blood pressure levels can be identified. By knowing the time of day or night that excessive blood pressure levels occur, medication dose and timing can be more accurately established.\textsuperscript{40}

Three studies\textsuperscript{41-43} that used a chronobiologic approach to evaluate dental patients who had been found to be normotensive by using episodic blood pressure recordings revealed a significant number of patients to be hypertensive (13%-31%). The chronobiologic approach to blood pressure evaluation decreases the number of false-positive and false-negative diagnoses.\textsuperscript{25,40,44} The use of automatic ambulatory monitoring of blood pressure and analysis of data by using chronobiologic techniques has yet to be embraced by the medical community in the United States. In contrast, it has been accepted and is now being applied in many other countries, such as Italy, Japan, Spain, and Russia. It is my opinion that within the next 10 years, the principles of chronobiology will be generally applied to the detection, diagnosis, and treatment of hypertension by the medical community in this country.

**TAKING THE BLOOD PRESSURE READING**

The blood pressure reading should be taken on all new dental patients. It also should be taken at each recall appointment. In addition, many dental patients who are medically compromised are best managed by taking their blood pressure reading during certain dental procedures such as oral surgery, long complicated restorative treatment, placement of dental implants, or periodontal surgery.

When taking the blood pressure reading on new and recall patients, the patient should be allowed to rest quietly for at least 5 minutes before the procedure. The patient should not have smoked or had caffeine for at least 30 minutes before the appointment. The patient should be seated in an upright position and the arms supported at heart level. The upper arm should be bared and the bladder of the cuff should cover about 80% of the arm, centered over the brachial artery. A large-sized cuff will accommodate most adults. Two or more readings should be taken during the appointment, at least 5 minutes apart. The readings are averaged and the appropriate action then taken based on the mean blood pressure.\textsuperscript{1}

Medically compromised patients whose blood pressure is being monitored during certain dental procedures should have the cuff placed on the arm at the start of the dental procedure and the blood pressure reading taken at various intervals. The dentist should be alert for either a sudden marked elevation or a sudden decline in the pressure. If either occurs, the dentist may have to take supportive action or stop the procedure. The blood pressure reading taken at the initial and recall appointments will serve as the base line.

**ACTION BASED ON THE INITIAL BLOOD PRESSURE READING**

The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure\textsuperscript{1} describes blood pressure findings by using the following definitions: optimal blood
pressure, normal blood pressure, high normal blood pressure, stage 1 hypertension, stage 2 hypertension, and stage 3 hypertension (Table I).

The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure1 recommends the following action be taken based on the initial blood pressure findings. If the systolic pressure is less than 130 mm Hg and the diastolic is less than 85 mm Hg, the patient’s blood pressure should be checked again in 2 years. Patients with a high normal blood pressure should be rechecked in 1 year. Patients found to have stage 1 hypertension should be rechecked within 2 months. Patients with stage 2 hypertension should be evaluated and referred to a physician within 1 month. Patients with stage 3 hypertension should be referred to a physician immediately or within 1 week, depending on the clinical situation.

Specific dental management suggestions are made to accompany the staging of hypertension. Patients with stage 3 hypertension should be referred to a physician immediately, and no dental treatment should be performed. Patients with stage 1 or stage 2 hypertension should be rechecked within 1 to 2 weeks, and if the blood pressure is still greater than 140/90 mm Hg, the patient should be referred for medical evaluation. This suggested timing for referral is different from the Joint National Committee’s incomplete time schedule of 2 months (stage 1) or 1 month (stage 2). The reduced time interval between blood pressure readings generally complies with a busy dental practice. Dental treatment can be provided for patients with stage 1 or stage 2 hypertension, but in most cases it would be best to recheck the blood pressure within 2 weeks and refer those patients with continued elevation of their blood pressure before starting any dental treatment. Patients with optimal or high normal blood pressures would be checked again at the recall appointment (Table II).

### MEDICAL MANAGEMENT OF HYPERTENSION

The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure places patients into 1 of 3 risk groups to describe the recommended medical management of hypertension. Important in the defining of the 3 risk groups are major risk factors for hypertension, the presence of target organ disease, and clinical cardiovascular diseases associated with hypertension.

The major risk factors for hypertension are smoking, having hyperlipidemia or diabetes mellitus, being older than 60 years, being a man or a postmenopausal woman, and having a family history of cardiovascular disease for women under 65 years of age and for men under 55 years of age. Target organ disease (TOD) and clinical cardiovascular disease (CCD) include left ventricular hypertrophy, angina, prior myocardial infarction, prior coronary revascularization, heart failure, stroke and transient ischemic attack, nephropathy, peripheral artery disease, and retinopathy.1

Risk group A includes patients with no TOD, CCD, or major risk factors. In this group, patients with high normal blood pressure are managed by lifestyle modification. Stage 1 patients are managed by lifestyle modification for up to 12 months and then drug therapy

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### Table I. Classification of blood pressure findings

<table>
<thead>
<tr>
<th>Definition</th>
<th>Systolic BP range</th>
<th>Diastolic BP range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal BP</td>
<td>&lt;120 mm Hg</td>
<td>&lt;80 mm Hg</td>
</tr>
<tr>
<td>Normal BP</td>
<td>&lt;130 mm Hg</td>
<td>&lt;85 mm Hg</td>
</tr>
<tr>
<td>High normal BP</td>
<td>130-139 mm Hg</td>
<td>85-89 mm Hg</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>140-159 mm Hg</td>
<td>90-99 mm Hg</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>160-179 mm Hg</td>
<td>100-109 mm Hg</td>
</tr>
<tr>
<td>Stage 3 hypertension</td>
<td>≥180 mm Hg</td>
<td>≥110 mm Hg</td>
</tr>
</tbody>
</table>


### Table II. Dental management suggestions based on initial BP findings

<table>
<thead>
<tr>
<th>Stage</th>
<th>Next BP measurement</th>
<th>Medical referral</th>
<th>Dental treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High normal BP (130-139/85-89)</td>
<td>1 y or recall appointment</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Stage 1 hypertension (140-159/90-99)</td>
<td>1-2 wk</td>
<td>Yes if BP remains elevated (≥140/90)</td>
<td>Yes</td>
</tr>
<tr>
<td>Stage 2 hypertension (160-179/100-109)</td>
<td>1-2 wk</td>
<td>Yes if BP remains elevated (≥140/90)</td>
<td>Yes</td>
</tr>
<tr>
<td>Stage 3 hypertension (≥180/110)</td>
<td>Immediate</td>
<td>Yes if BP remains elevated (≥140/90)</td>
<td>No elective</td>
</tr>
</tbody>
</table>

*Joint National Committee in 1997 recommended BP be checked within 2 months.
†Joint National Committee in 1997 recommended BP be checked within 1 month. BP, Blood pressure.
if their blood pressure remains elevated. Stage 2 and 3 patients are given drug therapy.

Risk group B includes patients with at least 1 risk factor that is not diabetes, and with no TOD or CCD. Patients with high normal blood pressure are managed by lifestyle modification. Stage 1 patients are managed by lifestyle modification for up to 6 months and then by drug therapy if their blood pressure remains elevated. Stage 2 and 3 patients are given drug therapy.

Risk group C includes patients with TOD, CCD, and/or diabetes, with or without other risk factors. Patients with high normal blood pressure and stage 1, stage 2, and stage 3 patients are all treated by drug therapy (Tables III and IV).

### Lifestyle modification

Lifestyle modification is used to prevent hypertension and to manage group A and B patients with high normal blood pressure and stage 1 hypertension. Overweight individuals are encouraged to lose weight. Alcohol intake is limited to no more than 1 ounce of ethanol for men and one-half ounce for women per day. Aerobic physical activity of 30 to 45 minutes for most days of the week is recommended. Individuals are recommended to reduce daily sodium intake to no more than 100 mmol/L or 2.4 grams of sodium or 6.0 grams of sodium chloride. Patients are encouraged to maintain adequate dietary potassium, calcium, and magnesium intake for general health. Patients should stop smoking and reduce the intake of saturated fat and cholesterol.

### Drug therapy

When drug therapy is indicated, the committee recommends that treatment start with 1 drug, low dosage, and then titrate the dosage upward until the blood pressure is controlled. The schedule is dependent on the patient’s age, needs, and response to the drug. Optimal therapy is when the drug provides 24 hours of efficacy with 1 daily dose with at least 50% of the effect remaining at the end of 24 hours. The combination of 2 agents from different drug classes by using a lower dose for each drug has been shown to provide increased efficacy and to minimize adverse effects of each drug. The following classes of drugs are used to treat hypertension: diuretics (thiazides, loop, potassium-sparing, combination), adrenergic inhibitors (peripheral, central, alpha-blockers, beta-blockers, combined alpha- and beta-blockers), direct vasodilators, calcium antagonists, ACE inhibitors, and angiotensin II receptor blockers.

The angiotensin II receptor blockers are a new class of drugs added to the list recommended by the committee. Common drug combinations include beta-blockers and diuretics, ACE inhibitors and diuretics, angiotensin II receptor blockers and diuretics, and calcium antagonists and ACE inhibitors.

Patients with type I diabetes are usually treated with ACE inhibitors. Patients with heart failure are recommended to use ACE inhibitors and diuretics. Older adults with isolated systolic hypertension (ISH) are initially treated with diuretics. Other drugs used to treat older adults with ISH are long-acting dihydropyridines, calcium antagonists, beta-blockers, and ACE inhibitors.

If the first drug choice has no or inadequate effect or causes adverse side effects, a drug from a different drug class is selected for use. If the initial drug results in an
inadequate response and causes no adverse effects, a second agent from a different drug class is added. For patients whose desired blood pressure goal is still not reached, drugs from other classes are added. If this still fails to control the patient’s blood pressure, then referral to an expert in hypertension is recommended.\textsuperscript{1}

**DENTAL MANAGEMENT**

**Patients unaware of their high blood pressure**

The detection of the patient who is hypertensive is important from several aspects. Significant complications of hypertension can be avoided or minimized by early detection and treatment. From a dental standpoint, potential life-threatening complications can be prevented by not performing dental treatment for patients at risk because of severe uncontrolled hypertension.

Data from 1976 to 1980 showed a 49\% rate of patients unaware of their high blood pressure.\textsuperscript{1} By 1988 to 1991 the number of individuals unaware of their high blood pressure was reduced to 27\%.\textsuperscript{1} However, of great concern is that this reduction trend of the number of people unaware of their high blood pressure was reversed from 1991 to 1994, showing that 32\% of the people surveyed were unaware of their high blood pressure.\textsuperscript{1} It is clear that much work remains to be done in the screening for hypertension and the education of the general population concerning the significance of high blood pressure and the importance of its treatment. With about one third of all adult patients with hypertension being unaware of their condition, we must continue to screen our dental patients for high blood pressure.

**Patients who are noncompliant hypertensive**

Less than 50\% of treated hypertensive individuals have their blood pressure well controlled.\textsuperscript{2} Noncompliance with drug therapy is a common cause of poor control. It is estimated that only one third of patients regularly take their medication.\textsuperscript{2} The noncompliant patient can be identified in dental practice by taking the medical and drug history and by measuring the blood pressure. Once a noncompliant patient is identified, the dentist should do everything possible to get the patient to return to the primary care physician. Patients who have stopped taking their medication because of adverse drug effects, such as decreased sexual drive, dry mouth, or weakness, should be advised that their physicians could select other drugs that do not have those side effects. Patients who complain that cost was the major factor leading to noncompliance should likewise be told that their physicians might be able to prescribe another drug that is less costly. All patients who are noncompliant should be informed of the long-term complications associated with hypertension, such as heart disease, kidney disease, stroke, eye disease (retinopathy), and peripheral artery disease.\textsuperscript{1,2,45} It should be made clear that these changes are taking place even though the patient may feel well. Those patients who have, for whatever reason, lost confidence in their physicians should be encouraged to seek new ones.

**The patient who is controlled hypertensive**

Dental management of the patient who is controlled hypertensive involves optimal pain control, stress and anxiety reduction, cautious but adequate use of vasoconstrictors, avoidance of drug interactions, and management of adverse drug effects such as orthostatic hypotension or dry mouth.

Effective control of operative and postoperative pain after surgical, periodontal, or other dental procedures is one of the most important things the dentist can do to minimize blood pressure elevation in the patient who has controlled hypertension.\textsuperscript{45}

Stress and anxiety can raise blood pressure. The reduction of stress and anxiety that may be associated with dental treatment is another very important area for the dentist in the dental management of the patient who is controlled hypertensive. The first step in stress and anxiety reduction is for the dentist to establish an honest, supportive relationship with the patient. The dentist should discuss a patient’s dental condition, how it can be treated, and any concerns or fears the patient may have regarding the dental treatment. The patient should be encouraged to ask questions, and the dentist should respond in a direct and open manner. The patient should be informed what will be done to make the patient pain free and comfortable during the treatment. If there is going to be some discomfort during certain procedures, the patient should be informed at what point this will occur. Very anxious patients can be given a small dose of diazepam (5 mg) or shorter-acting benzodiazepines, such as oxazepam (30 mg) the night before and 1 hour before the dental appointment. Nitrous oxide can be used during the appointment for the more anxious patients. Long appointments should be minimized when treating patients who are hypertensive.\textsuperscript{35}

In 1955, a special committee of the New York Heart Association\textsuperscript{46} made recommendations regarding the use of epinephrine in connection with procaine in dental procedures. This committee suggested that a maximum of 0.2 mg of epinephrine (11 cartridges of 1:100,000 epinephrine with procaine) be used at one session for dental patients with heart disease.

In 1964, a Working Conference of the American Dental Association and the American Heart Association concluded that the “concentrations of vasoconstrictors normally used in dental local anesthetic solutions are not
produced in 15 patients found to have CAD and none artery disease (CAD), significant symptoms were stress test for 39 patients suspected of having coronary µ study evaluating epinephrine infusion (2.1 to 21.0 patient’s blood pressure and must be avoided.57,58 been clearly shown that operative pain can increase the thetic solution or termination of the procedure. It has to use judgment regarding the use of additional anes- resulting anesthesia is inadequate, the dentist will have epinephrine from 3 cartridges to 2 cartridges for patients who were hypertensive. However, if the amount of local anesthetic solution with 1:100,000 epinephrine (1 cartridge) into healthy patients did not result in any significant changes in heart rate or blood pressure.53-55 In contrast, 5.4 mL of the solution (3 cartridges) resulted in a significant increase in both heart rate and systolic blood pressure, but with no adverse symptoms.56 These and other findings have led Little et al45 to lower their recommendation for the amount of local anesthetic solution with 1:100,000 epinephrine from 3 cartridges to 2 cartridges for patients who were hypertensive. However, if the resulting anesthesia is inadequate, the dentist will have to use judgment regarding the use of additional anesthetic solution or termination of the procedure. It has been clearly shown that operative pain can increase the patient’s blood pressure and must be avoided.57,58

Based on this, it is clear that epinephrine may be used with caution in patients who have controlled hypertension. Excessive doses of this agent can increase the blood pressure and cause arrhythmia in some patients. Most patients who have controlled hypertension can safely be given up to 2 cartridges of 2.0% lidocaine with 1:100,000 epinephrine (0.036 mg epinephrine). Patients with stage 3 hypertension should not be given an anesthetic containing even small amounts of epinephrine for treatment of emergency dental problems.

It would be best to avoid the use of norepinephrine and levonordefrin as vasoconstrictors in local anesthetics for patients with hypertension. These agents cause unopposed α-receptor stimulation, which can raise blood pressure.45,49,50

Epinephrine is a potent stimulator of both α and β receptors with a predominance of β2 activation.59 In small doses, epinephrine can result in a slight decrease in blood pressure because of the β2 activation that causes dilatation of arterioles in skeletal muscle.45,50 The potential exists for adverse interaction between epinephrine and some of the adrenergic blocking agents, especially the nonselective β-adrenergic blocking agents.60 The nonselective β-adrenergic blocking agents, such as propranolol, block the β2 receptor action of epinephrine and can lead to increased blood pressure. However, clinical experience has shown that 1:100,000 epinephrine (no more than 0.036 mg of epinephrine) in the local anesthetic can safely be used for most of these patients.45

Methyldopa, a central sympatholytic, may enhance the blood pressure elevation of vasoconstrictors. However, small amounts of epinephrine, 0.036 mg per cartridge, can be used in the local anesthetic. Peripheral adrenergic antagonists, such as guanethidine and reserpine, also can enhance the blood pressure elevation of vasoconstrictors. These drugs are now seldom used in the treatment of hypertension. However, patients treated with them can tolerate small amounts of epinephrine, 0.036 mg per cartridge, in a local anesthetic.45

The activity of many of the antihypertensive drugs can be decreased by the prolonged use of nonsteroidal anti-inflammatory drugs. Some antihypertensive drugs can potentiate the action of barbiturates or other sedatives. These drugs can still be used, but the dosage will have to be reduced. The dentist should use the Physicians Desk Reference or some other standard drug reference to check for drug interactions that may occur with the specific drug or drugs the patient is taking.45

Some antihypertensive drugs can produce a tendency for nausea and vomiting. Excessive stimulation of the gag reflex during dental treatment in patients taking these drugs may precipitate nausea and vomiting and should be avoided. Dry mouth may occur as an adverse reaction with many of the antihypertensive drugs. The dentist can contact the patient’s physician and see if an antihypertensive drug can be prescribed without this side effect. If not, the dentist will need to provide symptomatic relief for the xerostomia to make the patient more comfortable and to minimize oral compli-
cations. Many of the antihypertensive drugs will predispose the patient to orthostatic hypotension. To avoid or minimize the development of this problem and possible injury, the chair position should be changed slowly and patients should be supported as they get out of the dental chair.45

Lichenoid reactions (clinically appears as lichen planus) have been reported with thiazides, methyldopa, propranolol, and labetalol. Patients with oral lichen planus who are taking any of the above antihypertensive drugs should be referred to their physicians with the request that a new drug be used or the current drug be stopped for several weeks to see whether the lesions clear. The lesions, if associated with an antihypertensive drug, will usually clear once the drug is stopped. When the lesions clear, the physician can choose a different agent to treat the patient if the initial drug has been stopped. If the lesions fail to heal, the physician can return the patient to the original drug or continue to use a new drug to treat the hypertension.45 All calcium antagonists, and especially nifedipine, can cause gingival hyperplasia. When this association is suspected, the dentist should suggest to the patient’s physician that a different class of antihypertensive drugs be used. Patients who have changed to a nonrelated drug may require surgery if significant gingival hyperplasia persists.45 61-63

REFERENCES


