Problems in Family Practice

Elevated Blood Pressure in the Young Adult

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This paper discusses elevated blood pressure, particularly as related to young adults, and suggests that this problem be considered in two subgroups. The first subgroup is termed "labile blood pressure" and not "labile hypertension." In this subgroup are those patients in whom the diastolic blood pressure is normal most of the time and elevated only occasionally. Such patients only require reassurance, although they should be followed to be certain that they do not develop hypertension. The second subgroup includes those who are found to have consistent mild elevations in diastolic blood pressure. Treatment is recommended for this subgroup. An outline of the evaluation and management is presented.

It is well established that hypertension with a diastolic blood pressure of 115 mmHg needs treatment in any individual.[1] Most physicians agree that patients with diastolic blood pressures of 105 to 115 mmHg probably need to be treated. The real problem is how to manage patients who have diastolic blood pressures of 90 to 105 mmHg, particularly the young adult population. Definitive studies are not yet available to answer this question accurately. Therefore, it is necessary for the physician to take a logical approach to the management of young adults with elevated diastolic blood pressures. The approach which will be presented here is one that seems most compatible with the amount of information available to the physician. It is not a simple matter to decide to initiate a course of medication that a young person will probably have to continue throughout life, and yet it is not prudent to ignore the now-proven complications of arterial hypertension, such as accelerated atherosclerosis leading to myocardial infarction, stroke, and even renal failure.

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This author has had the opportunity to see a number of young adults, most of them medical students or house staff, who presented with the problem of a diastolic blood pressure in the 90 to 105 mmHg range. Consequently, it became necessary to form some rational approach to this situation. The purpose of this paper is to present an approach to the medical management of these young people taking into account the relative scarcity of information concerning this problem.

Approach to the Patient

Most of this young population group will not have a so-called fixed hypertension. In most instances, their blood pressures are labile with considerable fluctuation from normal to fairly high elevations. This complicates the decision-making process as to management, since it is impossible to determine the patient's true blood pressure on only one visit. It is necessary to secure as many blood pressure readings as possible before making a decision as to what is to be done. The patients can be instructed to record their own blood pressures, usually in the morning when they arise, at noon, in the evening when they first get home, and before going to bed in the evening. These readings (time of day, activity, and personal well-being) are recorded in the form of a diary. Under some circumstances, because of schooling or occupation, the patient cannot perform a blood pressure reading at noon and this may be skipped. After keeping a diary for approximately two weeks, the patient is seen again by the physician. The figures are then averaged to determine the level at which the patient's blood pressure is usually maintained. It is reasonable to assume that if the blood pressure for most of the day or early evening is elevated, even though there may be a few normal pressures recorded, the problem is much more important than in those individuals who only occasionally have a blood pressure which is above normal and whose blood pressure the majority of the time remains within normal limits. Thus, this young population will generally fall into two subgroups: (1) those who have an occasional elevation in diastolic blood pressure but whose blood pressure is normal most of the time and remains below 90 mmHg diastolic pressure, and (2) those who prove to have more persistent elevations in diastolic blood pressure.

The first subgroup falls into the blood pressure category that I have called "labile blood pressure" and not "labile hypertension" since the elevations above normal are relatively rare. There is really no "hypertension" and it seems only reasonable that these young people should not be labeled with a "red flag" diagnosis such as labile hypertension. The approach to these patients is obvious. There is no need for an evaluation for hypertension; however, I do recommend that these individuals be seen at least once a year and that they recheck their own blood pressure at frequent intervals in order to be certain that there is no significant change between visits to the physician. Reassurance then is enough.

The second subgroup is much more complicated and includes those young people who have more consistent elevations in the diastolic blood pressure. They deserve at least a limited evaluation for hypertension. Obviously, a careful history must be taken and a physical examination must be performed, although such patients are usually asymptomatic. The pur-

pose of the history primarily falls into two categories: (1) to elicit anything that might point to previous or present renal disease; and (2) to elicit a history consistent with a pheochromocytoma (for all practical purposes a history lacking such evidence rules out this cause of hypertension). The family history of hypertension may also be significant in terms of hereditary factors. The physical examination helps rule out other known causes of hypertension, such as coarctation of the aorta. Careful palpation of the pulsations of the femoral arteries is important, since easily palpable femoral arterial pulsations will almost always rule out coarctation of the aorta. Careful auscultation of the abdomen and back will most often exclude the presence of renal artery stenosis.

If the history and physical examination are normal except for an averaged elevated diastolic blood pressure, the laboratory evaluation becomes very simple. Serum potassium and sodium and blood urea nitrogen and serum creatinine levels should be obtained. The serum potassium test will, in general, exclude the presence of an aldosterone secreting tumor. It should be pointed out that in most instances these tests are found to be normal in this subgroup of patients; however, it is still important to obtain them for possible future reference. An intravenous pyelogram is not necessary unless there is a history suggestive of renal disease. Two other studies are performed purely for the purpose of future reference: an electrocardiogram and a routine chest x-ray (primarily for heart size). Again, it should be pointed out that it is extremely rare in this subgroup of young patients for any of these tests to show abnormal results. Since previous studies have shown that individuals with so-called labile hypertension (not labile blood pressure) are more prone to develop significant elevations in blood pressure at a later age, the laboratory work suggested here offers permanent and objective records which are of considerable importance in future evaluations and management of the patient.

To Treat or Not to Treat

As already mentioned, it has been well established that if there is a single diastolic blood pressure above 115 mmHg the decision regarding treatment is easy.[1] All of these patients should be treated with antihypertensive measures regardless of age. This was clearly indicated in the Veterans Administration Cooperative Study in which the cardiovascular complication rate was significantly higher in the patients who were not treated than in those treated, particularly in regard to cerebral vascular accidents.[1] Although no firm data are available as to whether or not to treat patients having a diastolic blood pressure below 105 mmHg, some rational approaches have been developed. The most convincing evidence that such patients should be treated is obtained from life insurance tables. The study of Deming has shown that even people with diastolic blood pressures of 90 mmHg tend to live longer than those with 100 mmHg diastolic blood pressure.[2] In fact, there is a linear relationship between early death and the degree of elevation of the diastolic blood pressure regardless of the degree of elevation above 90 mmHg. Although there are many arguments concerning the validity of life insurance tables, the data appear reasonably convincing, since the relationship is based upon a very large number of observations. Because of the size of the sample, the errors in random blood pressure observations should be nullified. In young people with an average diastolic blood pressure above 90 mmHg, it is this writer's experience that only minimum treatment is required for management, and this is accomplished in practically all instances without any significant side effects from the medication. For these reasons, all patients in this subgroup should be treated.

Treatment Plan

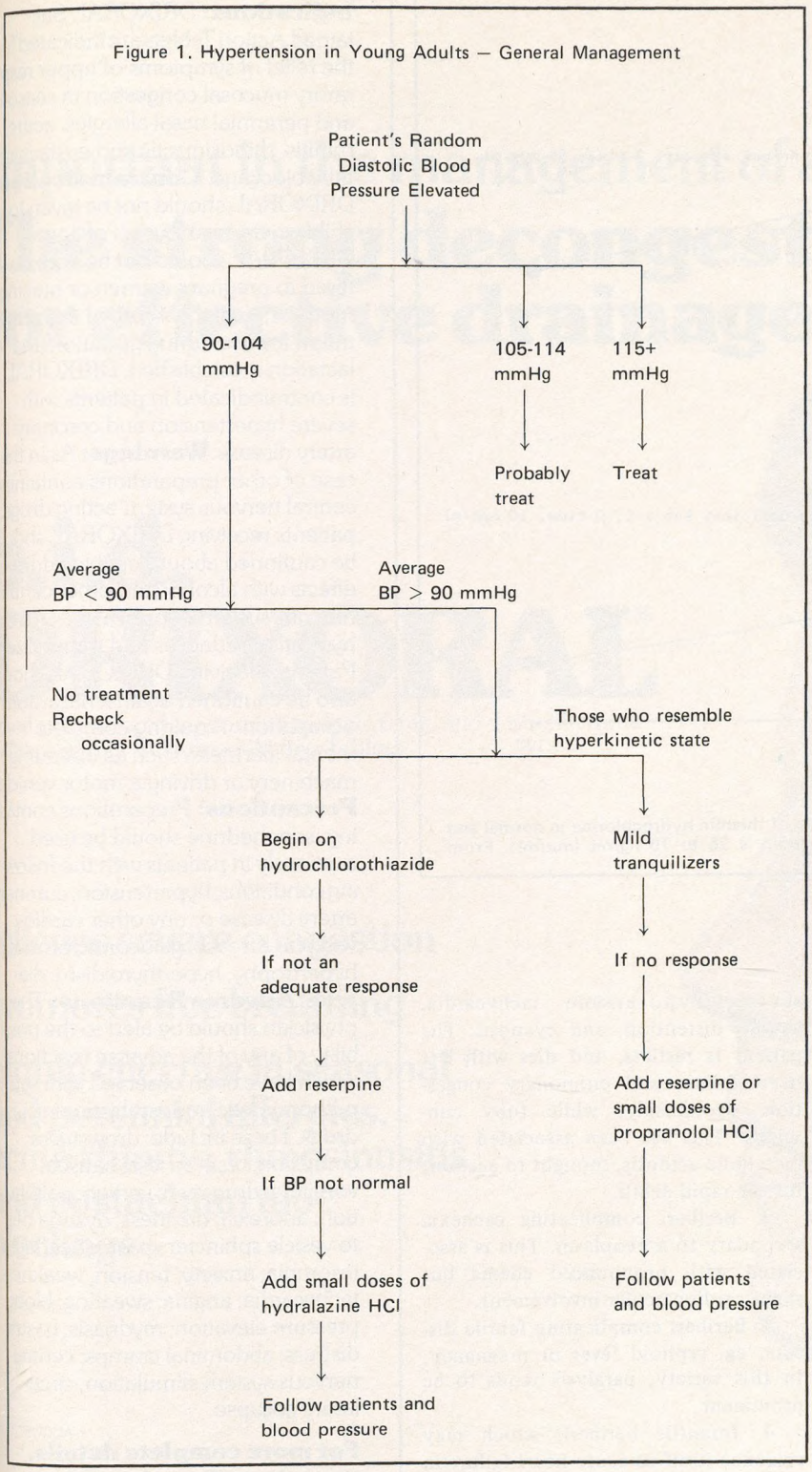
Although Dustan has recently described a rational approach to the therapy of hypertension,[3] it probably can be modified somewhat in a young population. Not all, but many of these young people are quite nervous. Often they are under pressure from their studies, their occupation, or from problems at home. They will often have a tachycardia of 90 beats a minute or more and actually may approximate the category of the so-called hyperkinetic state (not such entities as thyrotoxicosis, arterioventricular fistulas, or anemia.) It has been well recognized that the hyperkinetic state is associated with tachycardia with mild elevations in diastolic blood pressure. These patients are not usually overtly hyperkinetic, and I have never heard an aortic systolic ejection murmur, which is usually one of the features of the hyperkinetic state. Nevertheless, it has been my experience that these patients will respond to mild tranquilizers in minimal doses which lower the blood pressure to normal. If this is not successful, such patients should then be placed on small doses of reserpine with care being taken to watch for significant side effects such as depression. Most of these patients will then respond satisfactorily and no additional therapy is necessary. If the side effect of depression does occur, it is probably wise to place the patient on a small dose of propranolol hydrochloride instead.

In those patients who do not manifest any of the features of the hyperkinetic state, other therapeutic approaches are taken. Usually small doses of diuretic therapy will be sufficient to control the blood pressure; often as little as 25 mg of hydrochlorothiazide a day will do. The patient is also instructed to reduce salt intake by avoiding salty foods, such as potato chips, and pretzels, and to limit the amount of salt used at the table. The serum potassium level should be followed. However, in most of these patients the diuretic will not lower the potassium to a degree that supplemental potassium is necessary.

Treatment should be individualized because responses to different therapies vary. In the small group that still has not responded to the therapy as outlined above, a careful program of adding different drugs is followed. Since the problem is not an emergency, it is imperative to proceed very slowly with the addition of new drugs. No set routine can be given. It is only after a month or even two months that new drugs should be added, since the blood pressure lowering effect of hydrochlorothiazide is relatively slow. However, if the diastolic blood pressure is still not reduced after one to two months on hydrochlorothiazide the second drug to be added, if necessary, is usually reserpine.* Again, no medication should be added until sufficient time has elapsed to truly evaluate the effect of the current regimen.

*The patient should still take frequent blood pressure measurements since changes in therapy cannot be made or evaluated unless sufficient numbers of observations are available.

Figure 1. Hypertension in Young Adults — General Management



In the very few patients in whom these two drugs together do not control the diastolic blood pressure, hydralazine hydrochloride may have to be added in small doses, such as 25 mg once or twice a day. Following these procedures I have not observed a single individual who has not responded and who has required more potent medication such as methyldopa or guanethidine sulfate. When this treatment plan is employed, patients seldom have any side effects except possibly depression when reserpine is used, and it is obvious in these instances that the drug should be discontinued. The patients are carefully instructed and properly educated, and only rarely do they complain about having to take daily medication. Under proper management they do not develop hypotension, and loss of potency is no problem. They should be instructed also that this type of therapy probably will have to be maintained for life, which is usually accepted by the patient without difficulty.

After the blood pressure is stabilized at normal ranges, it usually becomes so stable that frequent blood pressure determinations are no longer necessary. Figure 1 presents a general summary of the plan for management for all these patients. Obviously, follow-up visits are frequent while the patient is being regulated. However, after the blood pressure is stabilized in a normal range, the follow-up period may be as long as six months or even a year, provided the patient has been instructed to return if there are any difficulties. An increased sense of well-being occurs when the patient finally becomes aware that the blood pressure is normal and is being maintained at a normal level. Apparently all the anxiety associated with knowing one has an elevated blood pressure is relieved. This is not only true for the medical personnel seen by this author but also for the general population.

References

1. Veterans Administration Cooperative Study Group on Anti-hypertensive Agents: Effects of treatment on morbidity in hypertension: Results in patients with diastolic blood pressure averaging 115 through 129 mmHg. JAMA 202:1028, 1967

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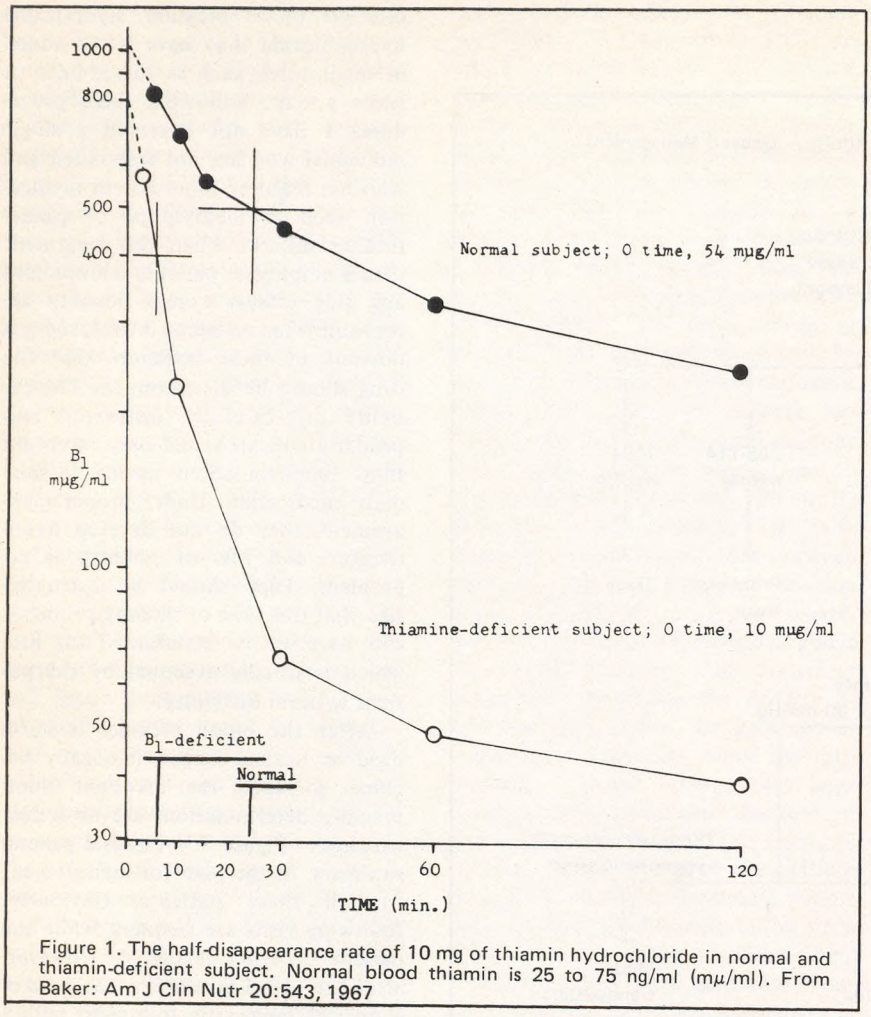

Figure 1. The half-disappearance rate of 10 mg of thiamin hydrochloride in normal and thiamin-deficient subject. Normal blood thiamin is 25 to 75 ng/ml (mμ/ml). From Baker: Am J Clin Nutr 20:543, 1967

encephalopathy.[6,7] In patients who survive, the psychosis (Korsakoff's) may be permanent.[6] (b) Wet beriberi, the variety associated with peripheral edema, digitalis resistant cardiac failure, is characterized by generally right sided, peripheral venous dilatation and increased venous pressure, tachycardia, although instances of bradycardia have been documented; cardiomegaly, abnormal EKG findings consisting of depressed, diphasic or inverted T waves, low voltage and prolonged Q-T intervals may also be present.[8-10] Anorexia may be prominent. As the disease persists, the neurologic manifestations become increasingly evident.

Special varieties of beriberi have been described.[11] These include:

1. Shoshin beriberi,[12] a fulminating form of the disease with biventricular cardiac failure, is characterized by severe hypotension, tachycardia, venous distention, and cyanosis. The patient is restless, and dies with left heart failure and pulmonary congestion, agonizingly, while fully conscious. This has been associated with metabolic acidosis, thought to account for the rapid death.

2. Beriberi complicating cachexia secondary to a neoplasm. This is associated with pronounced edema but slight cardiovascular involvement.

3. Beriberi complicating febrile disease, eg, typhoid fever or pregnancy. In this variety, paralysis tends to be prominent.

4. Infantile beriberi, which may evidence itself as acute heart failure in a previously healthy child. The chronic

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Table 1. Thiamin-Dependent Enzymes

1.	Embden-Meyerhof Glycolytic Pathway Decarboxylation of pyruvic acid to acetyl coenzyme A
2.	Citric Acid Cycle Decarboxylation of ketoglutarate to succinyl coenzyme A
3.	Hexose Monophosphate Shunt Formation of sedoheptulose-7-phosphate and fructose-6-phosphate

forms are associated with marked weight loss due to diarrhea and vomiting which occur; the infants may have aphonia or make crying motions. Occasionally the signs may be primarily neurologic or intermittent.

Considerable confusion has arisen in distinguishing among beriberi heart disease, alcoholic cardiomyopathy, and other causes of high-output cardiac decompensation.[13] The diagnostic criteria of beriberi heart disease formulated by Blankenhorn[14] are:

1. Cardiomegaly with normal rhythm
2. Dependent edema
3. Increased venous pressure
4. Peripheral neuritis or pellagra
5. Gross dietary deficiency for three months
6. No other cause for the heart disease
7. Clinical improvement and reduction in heart size after specific treatment

Laboratory confirmation of thiamin deficiency is essential. Methods for detecting thiamin in biologic fluids and tissues[15-17] include analysis of intact metabolically active thiamin in blood and tissues by sensitive and specific protozoologic techniques; half-disappearance times to determine tissue desaturation after an intravenous test dose (Figure 1);[16] determination of transketolase levels; and determination of urinary thiochrome. The determination of lactate and pyruvate levels and their ratio have also served as indices of thiamin nutriture.[18] Ideally, the blood thiamin level and transketolase activity should be known before treatment. The blood-thiamin level furnishes an index of thiamin availability while transketolase activity provides information on ability to convert thiamin into metabolically active forms.[16,17]

Treatment

The therapy of beriberi heart disease consists of initial parenteral rather than oral administration of thiamin·HCl; opinions as to dosage vary. The generally accepted range in severe cardiac or neurologic disease is up to 100 mg intravenously (IV). Several workers have cautioned about potential hazards of large amounts of IV thiamin.[19,20] It has been noted that the increased peripheral vascular tone following rapid administration of thiamin alone may aggravate the existing biventricular high-output cardiac failure; the administration of digitalis glycosides simultaneous with thiamin may prevent this phenomenon.[21] After initial parenteral treatment for several days, thiamin may be given orally: 5 to 10 mg three times a day for several weeks in conjunction with a good diet; this suffices for clinical improvement. Resistance to thiamin therapy is sometimes encountered, especially when thiamin hydrochloride is given orally.

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