Hypertension Small Talk 8/09

(Fun) Facts:

1. Guidelines (JNC VII): Go to www.nih.gov and click on "Institutes" and then click on "NHLBI" for the National Heart, Lung, and Blood Institute site or http://www.nhlbi.nih.gov
2. Risk Factors for HTN include a family history, African-American, obesity, high sodium or alcohol diet and a sedentary lifestyle
3. Every 20mm increase in SBP or 10mm in DBP doubles the risk of CVD
4. Complications of HTN include retinopathy, stroke, CAD, A Fib, CHF, CKD and PVD
5. The diagnosis is established by SBP > 139 or DBP > 89 based on the average of 3 sets of 2 or more readings obtained 2-4 weeks apart
6. Suspect secondary causes with sudden onset of severe HTN , symptoms of tachycardia, palpitations, paroxysmal headache and sweating (pheo), muscle weakness, polyuria and hypokalemia (hyperaldosteronism), snoring and daytime sleepiness (sleep apnea) and drug-resistance
7. Treatment should include detecting and managing risk factors
8. Appropriate lab: hemoglobin, U/A, BMP, lipids and ECG
9. Chlorthalidone has a longer half life and works better in renal insufficiency than HCTZ
10. Beta-blockers with high lipophilicity (metoprolol, propranolol, timolol, labetalol, pindolol) are primarily cleared by the liver and don't need major dose adjustment in renal insufficiency

Questions:

1. A 58-year-old black man has had hypertension for 5 years. He has maintained a blood pressure of 135/85 mm Hg with use of hydrochlorothiazide, 25 mg/d. Laboratory assessment reveals a serum sodium level of 141 meq/L, serum potassium level of 4.1 meq/L, and fasting plasma glucose level of 132 mg/dL. These values are confirmed on remeasurement several days later. What is most appropriate management of this patient's hypertension?
A. Continue the current therapy, with a target blood pressure less than 140/90 mm Hg
B. Discontinue hydrochlorothiazide therapy and begin ramipril therapy
C. Add amlodipine to hydrochlorothiazide therapy
D. Add ramipril to hydrochlorothiazide therapy
E. Increase the hydrochlorothiazide dosage to 50 mg/d

2. A 31-year-old man is referred for management of multidrug-resistant hypertension. His hypertension was diagnosed 2 years ago, and treatment with multiple blood pressure medications, both alone and in combination, has been ineffective. His current medical regimen includes oral hydrochlorothiazide, 25 mg/d; oral amlodipine, 10 mg/d; and atenolol, 100 mg/d. Blood pressure is 160/100 mm Hg, pulse rate is 80 per min and regular, and respiration rate is 18 per min. There is an S_4 gallop and trace pretibial edema. The patient has been consistently hypokalemic in the past, with a serum potassium level of 2.5 to 3.4 meq/L even with potassium supplementation.
His serum creatinine level is 1.1 mg/dL, blood urea nitrogen is 12 mg/dL, serum sodium level is 136 meq/L, serum potassium level is 2.8 meq/L, serum chloride level is 108 meq/L, serum

bicarbonate 30 meq/L. Electrocardiography shows left ventricular hypertrophy by voltage criteria.
What is the most likely diagnosis?
A. Volume and potassium depletion secondary to chronic overdiuresis
B. Pheochromocytoma
C. Primary aldosteronism
D. Severe essential hypertension
E. The Bartter syndrome

3. A 68-year-old woman is hospitalized with palpitations and shortness of breath. She has a history of hypertension and chronic atrial fibrillation, and her medications include furosemide, candesartan, and warfarin. On physical examination, the heart rate is 120 bpm with an irregularly irregular rhythm, and blood pressure is 130/80 mm Hg; she has an elevated jugular venous pulse, crackles in both lungs, and marked lower extremity edema. Echocardiography shows left ventricular hypertrophy, an ejection fraction of 70%, and no significant valvular disease. She is treated with intravenous diuretics, with improvement in her symptoms and resolution of peripheral edema and of crackles on lung examination. Her heart rate is now 99 bpm and her blood pressure is 120/75 mm Hg.
Which of the following would be the most appropriate medication to add?
A. Lisinopril
B. Spironolactone
C. Amlodipine
D. Metoprolol
E. Hydrochlorothiazide

4. A 58-year-old man who has longstanding diabetes mellitus and peripheral vascular disease involving the left leg comes to your office for a routine follow-up visit. He has intermittent claudication when he plays golf. He is obese, with a body mass index of 40 kg/m^2, and his blood pressure is 160/95 mm Hg.
Physical examination shows normal jugular venous pressure. Cardiac examination is normal. Examination of the extremities shows no edema and absent left pedal pulses. The left leg ankle–brachial index is 0.8. Electrocardiogram obtained 1 year ago showed no significant findings. His last lipid profile showed a total serum cholesterol level of 260 mg/dL, high-density lipoprotein cholesterol level of 25 mg/dL, low-density lipoprotein cholesterol level of 165 mg/dL, and triglyceride level of 250 mg/dL. His hemoglobin A_{1c} level was 8%. Heart failure has not been suspected or diagnosed. The patient smokes and is sedentary. However, he works and is apparently compliant with his medication regimen. He was taking simvastatin, 40 mg/d, last year, but discontinued this medication because of diffuse muscle and joint aches that have since resolved. He takes rosiglitazone, 4 mg/d; atenolol, 50 mg/d; hydrochlorothiazide, 50 mg/d; and aspirin, 80 mg/d. You suggest smoking cessation, weight loss, and physical conditioning.
Which of the following interventions would prevent the progression of complications of diabetes and atherosclerosis in this patient?
A. Prescribe a nonstatin lipid-lowering agent
B. Recommend vitamin E, 500 IU/d
C. Substitute insulin for rosiglitazone
D. Start treatment with amlodipine

E. Start treatment with ramipril

HTN Answers

1. (D) The confirmed fasting glucose level greater than 126 mg/dL establishes the diagnosis of diabetes. As such, the goals of antihypertensive therapy become more stringent. Although some disagreement remains about the optimal target blood pressure, 140/90 mm Hg is no longer acceptable. Improved cardiovascular outcomes in patients with diabetes have been demonstrated after reduction of diastolic pressures to less than 80 mm Hg. Thiazide diuretics are effective first-line therapy, with documented reduction in cardiovascular events; however, patients with diabetes experience greater renal protection at any blood pressure with use of an angiotensin-converting enzyme (ACE) inhibitor or an angiotensin-receptor blocker.
Because this patient has unacceptably high blood pressure, additional therapy is warranted. Increasing the hydrochlorothiazide dosage provides little additional decrease in blood pressure and increases the potential for electrolyte imbalance. Substituting an ACE inhibitor for hydrochlorothiazide is unlikely to achieve the desired blood pressure and will not offer the cardioprotection provided by the thiazide therapy. Although they are very effective in lowering blood pressure, calcium-channel blockers (particularly dihydropyridines, such as amlodipine) are not renoprotective and may increase the risk for cardiovascular disease in patients with diabetes.

2. (C) Primary aldosteronism is the most likely disorder in this patient for 2 reasons: the lack of control of hypertension despite multidrug therapy and the longstanding and clinically significant hypokalemia despite potassium supplementation. History and physical examination reveal no other obvious secondary cause for the hypertension. Pheochromocytoma is in the differential diagnosis but is less likely because of the mild edema and hypokalemia, 2 signs not usually seen with pheochromocytoma. Severe essential hypertension is less likely given the patient's age and lack of family history.

3. (D) The patient has a history and echocardiogram consistent with diastolic dysfunction. She has hypertension, which predisposes to the development of left ventricular hypertrophy and associated impaired ventricular relaxation. Although she presented with evidence of heart failure, the echocardiogram demonstrated normal systolic function and no significant valvular abnormalities that could account for the heart failure. The primary treatment goals in diastolic heart failure are to treat the underlying cause (if possible), to manage any potentially exacerbating factors, and to optimize diastolic filling. In this case, the likely cause of the patient's decompensation is atrial fibrillation with rapid ventricular rate, which reduces diastolic filling time. In general, optimizing diastolic filling involves adequate rate control and avoidance of intravascular volume depletion. The patient is taking the angiotensin-receptor blocker

candesartan, which has been shown to reduce heart failure–related hospitalizations, but not mortality, in patients with diastolic heart failure. This patient's heart failure symptoms and physical examination improved with diuresis. However, her heart rate is still not adequately controlled; thus, the most appropriate medication to add would be an agent for rate control, such as metoprolol.
There is no established role for angiotensin-converting enzyme inhibitors, such as lisinopril, in the management of diastolic heart failure beyond management of hypertension. This patient's hypertension is already well controlled. Spironolactone has a proven survival benefit for patients with severe systolic heart failure; however, there is no significant evidence for similar benefits in patients with diastolic heart failure. Although some calcium-channel blockers have negative chronotropic effects, amlodipine does not have significant effects on heart rate or intropy. The patient seems euvolemic on her current medical regimen, so the addition of another diuretic, such as hydrochlorothiazide, would not be appropriate.

4. (E) Because some patients are clearly at increased risk for structural heart disease and symptomatic left ventricular dysfunction, preventing the progression of disease is an important goal. In addition to avoiding factors that may increase the risk for heart failure, such as smoking, obesity, and a sedentary lifestyle, important measures include physical conditioning, optimizing body habitus, controlling blood pressure, and treating lipid disorders in accordance with recommended guidelines. However, in this patient, one strategy that offers clear benefit is initiating treatment with an angiotensin-converting enzyme inhibitor. In the HOPE trial, ramipril, 10 mg/d, was given to patients who had controlled blood pressure and did not have heart failure. In this trial, ramipril reduced cardiovascular morbidity and mortality rates in patients who had a history of atherosclerotic disorders (including peripheral vascular disease), diabetes mellitus, or hypertension and associated cardiovascular disease risk factors. Whether or not all angiotensin-converting enzyme inhibitors provide the same benefit is contentious. Furthermore, vitamin E supplementation did not have the same effect. Using other strategies to control this patient's lipid disorder is wise, but should be done in concert with angiotensin-converting enzyme inhibitors. It was never proven that this patient had myositis, and benign myalgias are common in patients taking simvastatin. It might be reasonable to start this patient on pravastatin, which is less likely than simvastatin to cause myositis, and follow the patient closely for evidence of this complication. Because this patient is not congested and apparently has metabolic syndrome, the thiazolidinedione agent rosiglitazone is an attractive option, but the dose may need to be increased. Perhaps with a modified diet, increased physical activity, and weight loss, insulin can be avoided. The calcium channel blocker amlodipine is an excellent antihypertensive agent, particularly when given with a thiazide diuretic and a -blocker, but its use is not associated with a reduction in atherosclerotic cardiovascular event rates, as was seen with an angiotensin-converting enzyme inhibitor in the HOPE trial.

Table 6. Compelling Indications for Individual Drug Classes

Heart Failure: Diuretic, ß-blocker, ACE inhibitor, ARB, aldosterone antagonist
Postmyocardial infarction: ß-blocker, ACE inhibitor, aldosterone antagonist
High coronary disease risk: Diuretic, ß-blocker, ACE inhibitor, ARB + CCB
Diabetes: Diuretic, ß-blocker, ACE inhibitor, ARB, CCB
Chronic kidney disease: ACE inhibitor, ARB
Recurrent stroke prevention: Diuretic, ACE inhibitor

Algorithm for Hypertension Treatment: