Title

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CLINICAL VIGNETTE

When Hypertension is Due to Primary Hyperaldosteronism

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A 63-year-old male with a past medical history significant for hypertension (HTN), type 2 diabetes mellitus, and Parkinson disease presented to the clinic for evaluation of elevated blood pressures. His blood pressure had been well controlled using one antihypertensive medication for twenty years, but over the past five years, it had progressively worsened, resulting in the need for five antihypertensive medications. His blood pressure medication regimen consisted of Amlodipine, Losartan, Metoprolol, Furosemide, and Hydralazine. He reported full compliance with his medications. He had recently felt disorganized after a flight and was taken to the hospital. His systolic blood pressure was found to be in the 200's. He underwent a full cardiac evaluation with an echocardiogram and stress test which was unremarkable. Other than that episode, he was asymptomatic. He kept a blood pressure log at home which confirmed uncontrolled hypertension.

Vital signs were notable for a blood pressure of 186/104. On physical exam, he was well appearing in no acute distress. His exam was notable for a resting tremor in both hands. Otherwise, his exam was unremarkable.

Given his uncontrolled blood pressures despite being on five antihypertensive medications, he was evaluated for secondary causes of hypertension. A kidney ultrasound did not show any evidence of renal artery stenosis. Plasma metanephrines were within the normal range. However, plasma aldosterone concentration was 20.6 ng/dL and plasma renin activity was 0.1 ng/mL/hr. A CT scan of his adrenal glands revealed bilateral subcentimeter adrenal nodules. He underwent adrenal vein sampling with the left adrenal producing 2044 ng/dL of aldosterone while the right only 201 ng/dL, most consistent with a left adrenal source for hyperaldosteronism. He underwent left laparoscopic adrenalectomy with significant improvement in his hypertension. Since his surgery, his blood pressure has been well controlled on Amlodipine and Metoprolol.

Discussion

Based on the American College of Cardiology/American Heart Association (ACC/AHA) guidelines from 2017, hypertension is defined as a blood pressure greater than 130/80.[1] Resistant hypertension is defined as a lack of blood pressure control despite three blood pressure medications from different classes including a diuretic.[2] Blood pressure medications need to be titrated to appropriate doses and patient adherence needs to be confirmed. Secondary hypertension occurs when another medical condition or medication is resulting in hypertension.

Factors that should prompt consideration and evaluation of secondary hypertension include the following: resistant hypertension, an acute rise in blood pressure in a patient previously controlled, hypertension in an individual younger than thirty without other risk factors such as obesity, or family history of hypertension, or severe hypertension systolic blood pressure >180/ or diastolic >120.[3] The patient in this case had resistant hypertension and had worsening blood pressures that were previously controlled.

The differential diagnosis for secondary hypertension is broad and includes conditions such as renal artery stenosis, renal failure, primary hyperaldosteronism, pheochromocytoma, and some medications, such as NSAIDs.[3] Lately, new chemotherapeutic agents have been implicated in causing hypertension. These agents are usually part of the vascular endothelial growth factor, VEGF class.[4]

Aldosterone is a mineralocorticoid hormone produced in the zona glomerulosa of the adrenal cortex in the adrenal gland. Aldosterone's main function is to increase sodium reabsorption in the aldosterone sensitive distal nephron resulting in increased extracellular fluid volume and eventual hypertension. Aldosterone also increases distal potassium secretion resulting in hypokalemia.[5] However, not all patients will have hypokalemia. Once primary hyperaldosteronism is suspected, initial workup involves obtaining plasma renin activity (PRA) and plasma aldosterone concentration (PAC). Ideally, the sample should be collected in the morning. Mineralocorticoid receptor antagonists such as spironolactone and eplerenone can interfere with the results and should be stopped or not initiated during workup. Other blood pressure medications can be continued but one must remember that ACEI and ARBs can increase plasma renin. Primary hyperaldosteronism is suspected once the PRA is less than 1 and the PAC is over 10. Additionally, the Aldosterone Renin Ratio is calculated with the PAC divided by the PRA and a ratio over 30 when the PAC is over 20 is over 90% sensitive and specific.[6] A lot of patients will require further evaluation given aldosterone renin ratio may not be conclusive. Either the saline infusion test or an oral sodium loading can help uncover the diagnosis. Our patient did not require either test given his PAC/PRA ratio was over 200. Once the laboratory data is strong enough to confirm the diagnosis, imaging studies are obtained to look for either an adrenal adenoma or bilateral

adrenal hyperplasia. CT provides better resolution as compared to MRI. Additionally, for surgical candidates, adrenal vein sampling is performed to help localize the hyperaldosteronism. If the findings localize to one side then adrenalectomy can be performed while if there is bilateral involvement then medical management is pursued with mineralocorticoid receptor blockers.

Although a majority of patients with hypertension are diagnosed with primary hypertension, being able to identify patients with secondary hypertension is important as treating the underlying cause can result in a dramatic improvement in blood pressure control.

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