CLINICAL VIGNETTE

Primary Aldosteronism: It's Out There

Aldo Ilarde, MD

Case

A 68-year-old white male presents to establish primary care. He has a past medical history of HTN, Hyperlipidemia, Obesity, TIA, and GERD. His family history is pertinent for HTN, CAD, and prostate CA. He was a former half-pack smoker for 25 years and denies alcohol or drug abuse. His medications include Amlodipine, metoprolol, Lisinopril, Furosemide, Atorvastatin, Omeprazole, CoQ, low dose aspirin, and potassium chloride (KCL 60 meq daily). He has no clinical complaints. His BP was 130/72 and the rest of his physical exam was unremarkable except for mild pedal edema. Fasting labs are also unremarkable except for mild hypokalemia of 3.4. He attributes this to erratic compliance with potassium supplements. He denies licorice intake but does admit to some muscle aches. His repeat metabolic panel on better compliance shows a potassium of 3.2 with a normal magnesium. Could he have Primary Aldosteronism?

His initial plasma aldosterone concentration (PAC) and plasma renin activity (PRA) were 20 ng/dl and 1.7 ng/ml/hr respectively with a PAC:PRA ratio (PRR) of 11.76. He agreed to discontinue Furosemide and decrease his KCL to 40 meq daily. His potassium improved to 3.7. Repeat PAC and PRA were 49.5 and 1.2 respectively with a PRR of 41.25. KCL was discontinued at this point. His next potassium level 5 weeks later was 2.9 with a PAC and PRA of 51.2 and 0.8 respectively with a PRR of 69. These values are highly suspicious for primary aldosteronism. KCL supplementation was resumed at 40 meq and eventually to 80 meq daily until potassium normalized at 3.7. PAC and PRA were 44.2 and 1.4 respectively with a PRR of 31.6. The patient remained on Lisinopril which is known to raise renin levels.[1] An Endocrinology consult was requested at this time.

Endocrinology agreed with our assessment and felt further confirmatory testing was unnecessary. It was felt that oral or IV salt loading may be harmful with the patient's pedal edema and history of TIA. A CT scan of the adrenals revealed an 11 mm right adrenal adenoma and thickening of the left adrenal gland. The adrenal nodule was also evaluated for other possible functional hormonal pathology and pheochromocytoma and Cushing's syndrome were ruled out. The patient was amenable to surgery of this adrenal adenoma and was referred to Diagnostic Interventional Radiology for adrenal vein sampling.

Adrenal vein sampling with Cosyntropin infusion was performed with inconclusive results due to difficulty in cannulating the right adrenal vein. It is known that the right adrenal vein is small and difficult to locate and cannulate.[2] The patient agreed to a second AVS which was difficult but successful, with results consistent with right adrenal Conn's adenoma. He was referred to Endocrine Surgery and was scheduled for elective laparoscopic right adrenalectomy. Preoperatively, Lisinopril was discontinued, and patient was started on Spironolactone. His BP and potassium significantly improved. Amlodipine and potassium were discontinued. Metoprolol was continued and BP and potassium remained normal.

Laparoscopic right adrenalectomy was difficult due to enormous amounts of fat surrounding the right adrenal gland and tumor. The surgeon were eventually able to isolate and surgically remove them. The tissue was extracted with a morcellator. Pathology did reveal the adrenal gland with tissue consistent with an adrenal cortical tumor. Postoperatively, Spironolactone was discontinued, and BP and potassium remained normal. PAC and PRA were 12.7 and 0.4 then 7 and 0.5 respectively. The patient was advised that he may still have essential HTN and may require additional BP medication and low dose Amlodipine was eventually added with excellent control. He was also told that the nodular appearance of the left adrenal gland suggested the possibility of a recurrence of primary aldosteronism due to possible hyperplasia of that gland. He will be monitored with serial BPS and potassium.

Discussion

Hypertension is prevalent in the United States with up to 46% of the adult population having this disorder and on hypertensive medication.[3] Hypokalemia is also common, seen in 14% of outpatient lab testing, 20% of hospitalized patients, and up to 80% of patients on diuretics (50% of these with hypomagnesemia).[4] With this prevalence HTN with hypokalemia can be quite common. We should be alert in recognizing which patients may need further evaluation. Patients, with HTN and spontaneous hypokalemia without diuretics on ACE-inhibitors are suspect for primary aldosteronism (PA).

PA was not thought to be a common occurrence with less than 1% of all hypertensives. More current literature prevalence could be closer to 10% especially since more widely used

screening with PAC/PRA ratios.[5] Indications for testing of this disease has expanded to include normokalemic hyperten-sives with drug-resistant HTN (> 3 medications), HTN with an adrenal incidentaloma, HTN with early-onset HTN with CVA at young age (< 40 years old), HTN with first-degree relative with PA, and HTN with obstructive sleep apnea.[6]

Our patient's PAC > 10 with a suppressed PAC and a PRR > 20 makes the diagnosis of PA likely and obviates the need for further confirmatory testing with IV or oral slat loading.[6] Localization with CT scan and AVS sampling then determines if the PA is amenable to surgery or is best managed with medical therapy with mineralocorticoid antagonists. The evaluation can be facilitated by Endocrinology who can arrange for further testing and treatment. AVS sampling is best done in a facility with experienced radiology which improves testing accuracy.[7] Laparoscopic adrenalectomy in the hands of an experienced surgeon is also recommended.[7] Or patient had a radiologic study that identified a right adrenal adenoma and localized on AVS. Surgery was successful with prompt resolution of hyperaldosteronism and spontaneous hypokalemia. Of note is that he responds to the mineralocorticoid antagonist, Spironolactone, which bodes well for medical management if his PA recurs due to hyperplasia of the left adrenal gland.

REFERENCES

1. **Fisher N**. Overview of the renin-angiotensin system. In: *UpToDate*, Post, TW (Ed), *UpToDate*, Waltham, MA, 2019.
2. **Young WF, Stanson AW**. What are the keys to successful adrenal venous sampling (AVS) in patients with primary aldosteronism? *Clin Endocrinol (Oxf)*. 2009 Jan;70(1):14-7. doi: 10.1111/j.1365-2265.2008.03450.x. PubMed PMID: 19128364.
3. **Egan B**. The prevalence and control of hypertension in adults. In: *UpToDate*, Post, TW (Ed), *UpToDate*,Waltham, MA, 2019.
4. **Kardalas E, Paschou SA, Anagnostis P, Muscogiuri G, Siasos G, Vryonidou A**. Hypokalemia: a clinical update. *Endocr Connect*. 2018 Apr;7(4):R135-R146. doi: 10.1530/EC-18-0109. Epub 2018 Mar 14. Review. PubMed PMID: 29540487; PubMed Central PMCID: PMC5881435.
5. **Mulatero P, Stowasser M, Loh KC, Fardella CE, Gordon RD, Mosso L, Gomez-Sanchez CE, Veglio F, Young WF Jr**. Increased diagnosis of primary aldosteronism, including surgically correctable forms, in centers from five continents. *J Clin Endocrinol Metab*. 2004 Mar;89(3):1045-50. PubMed PMID: 15001583.
6. **Young WF**. Diagnosis of Primary Aldosteronism. In: *UpToDate*, Post, TW (Ed), *UpToDate*, Waltham, MA, 2019.
7. **Funder JW, Carey RM, Mantero F, Murad MH, Reincke M, Shibata H, Stowasser M, Young WF Jr**. The Management of Primary Aldosteronism: Case Detection, Diagnosis, and Treatment: An Endocrine Society Clinical Practice Guideline. *J Clin Endocrinol Metab*. 2016 May;101(5):1889-916. doi: 10.1210/jc.2015-4061. Epub 2016 Mar 2. PubMed PMID: 26934393.

Submitted January 27, 2019