

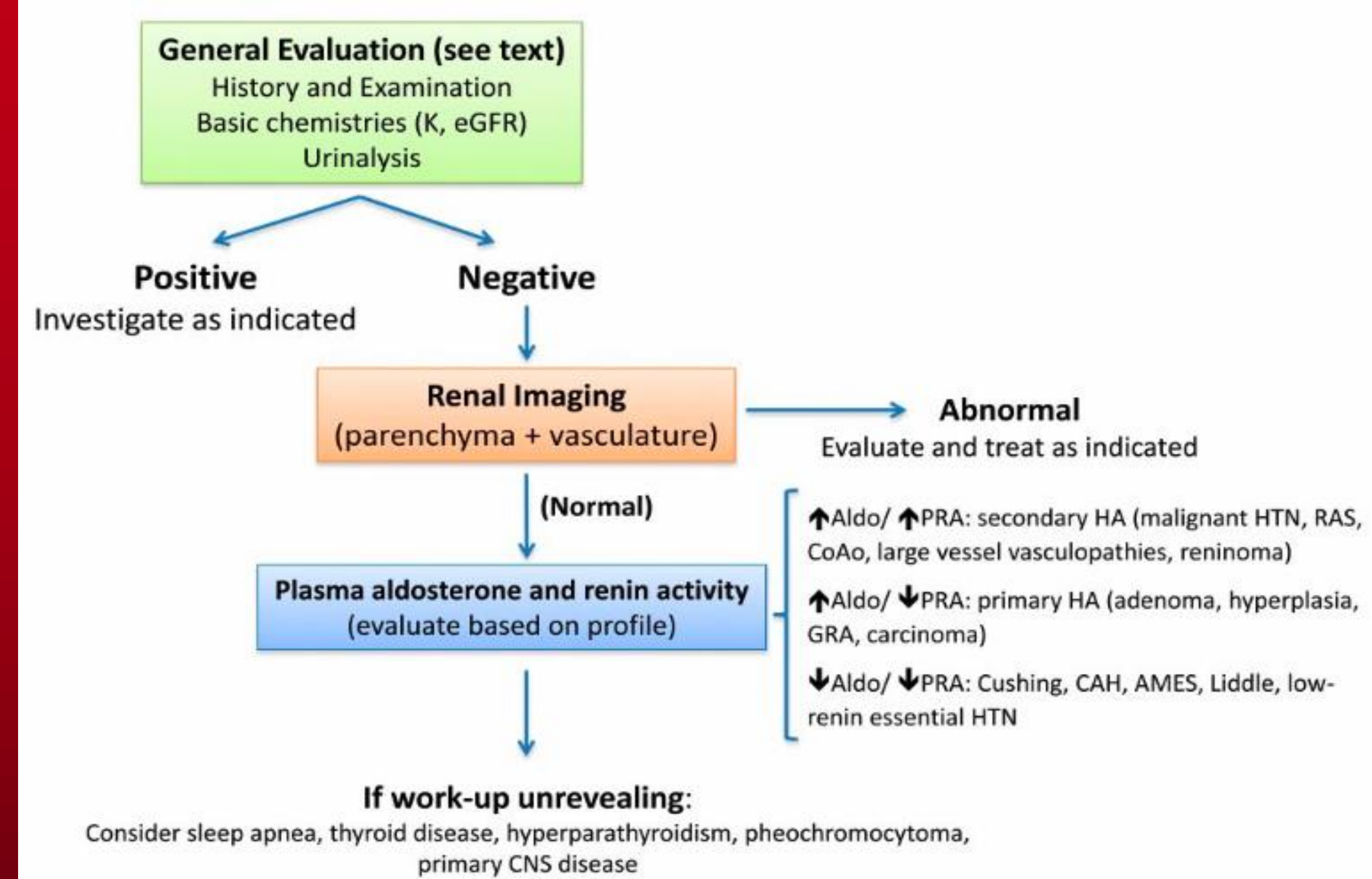
Role of Adrenal Vein Sampling in Workup of Primary Hyperaldosteronism (Conn Syndrome)

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Introduction

Primary hyperaldosteronism (PA) is an underdiagnosed cause of hypertension, with an estimated prevalence of 1-2% of all patients with HTN. PA is due to excess production of aldosterone from the adrenal gland that is unilateral (Conn Syndrome) or more commonly bilateral (hyperplasia). In patients who are suspected to have primary hyperaldosteronism, the aldosterone to renin ratio is calculated and those with values greater than 20 are determined to have PA. These patients then undergo adrenal vein sampling (AVS) in order to determine a unilateral versus bilateral cause.

Patients found to have unilateral disease may undergo surgical management, whereas patients with bilateral hyperplasia undergo medical management with aldosterone sparing antagonists such as Spironolactone.



Methods

We present three patients who exhibited symptoms of hypertension, hypokalemia and hyperaldosteronism. All three patients underwent adrenal vein sampling at the University of Louisville Hospital.

Tables and Figures

	Cortisol (mcg/dl)	Aldosterone (ng/dl)	Cortisol AV:P	Aldosterone/Cortisol (A/C) LI
Patient 1				
Left Adrenal Vein	270	553	11.3	2.0
Right Adrenal Vein	811	214	33.9	0.26
Peripheral	23.9	42		
Patient 2				
Left Adrenal Vein	822	1363	32.5	1.7
Right Adrenal Vein	911	406	36.0	0.4
Peripheral	25.3	35		

Table 1. Under normal physiologic conditions, central adrenal vein cortisol levels should be several times greater than peripheral levels. Thus, peripheral venous cortisol levels are used as a positive control to determine if the adrenal vein is adequately sampled. A selectivity index (adrenal vein:peripheral, AV:P) is used to determine the adequacy of samples. Analysis of the selectivity index value depends on administration of cosyntropin (Cortrosyn) before the AVS. Cosyntropin is an ACTH analogue that is given before AVS to stimulate cortisol production by the adrenal glands. The selectivity index used for adequacy is usually >2 for cosyntropin unstimulated samples, or >4 for stimulated samples. The lateralization index (LI) is then calculated by normalizing the aldosterone level (A) to the cortisol level (C) collected in each vein (A/C), then dividing this value by that of the contralateral vein. An LI of greater than or equal to 4, suggests a unilateral source of aldosterone.

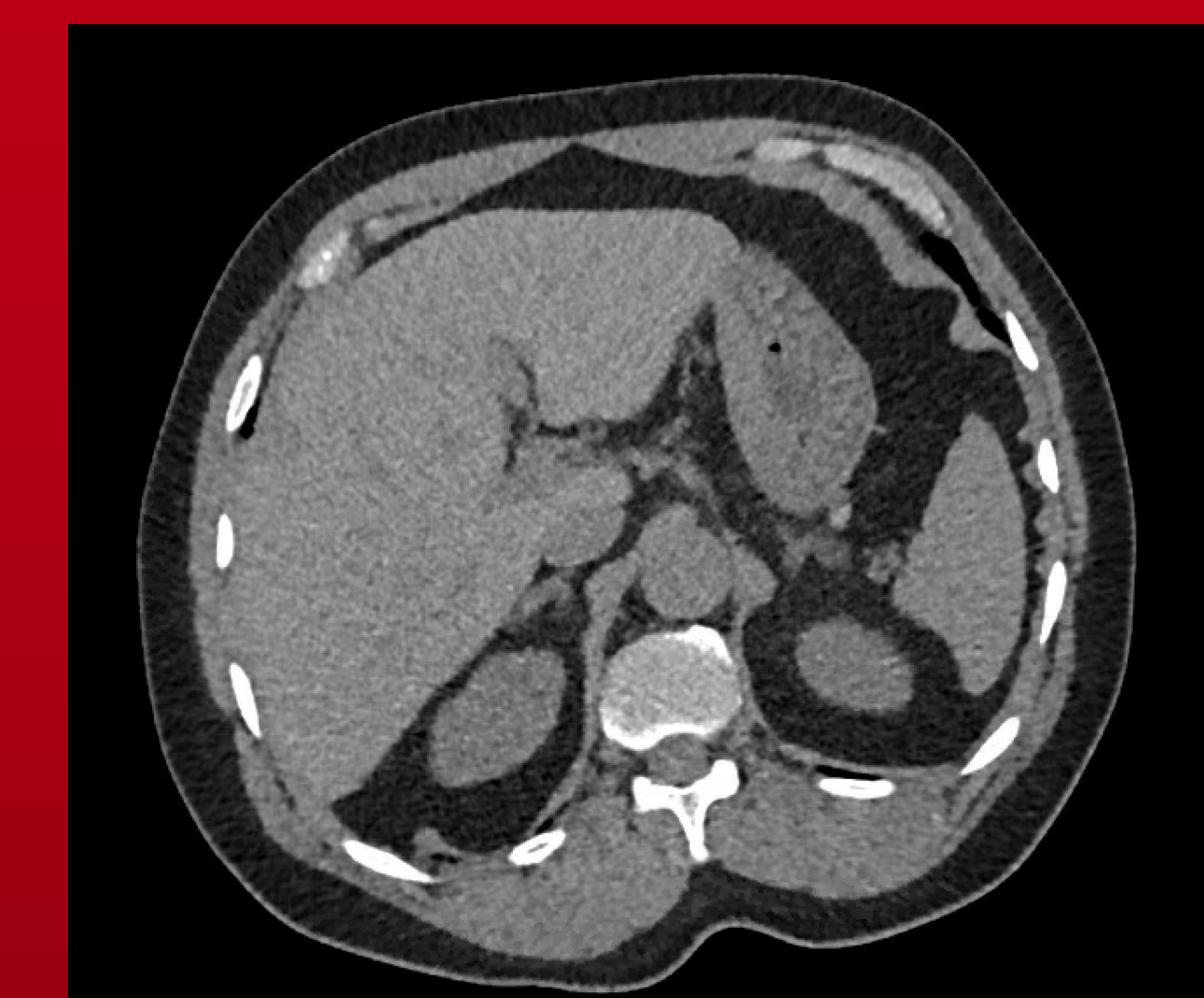
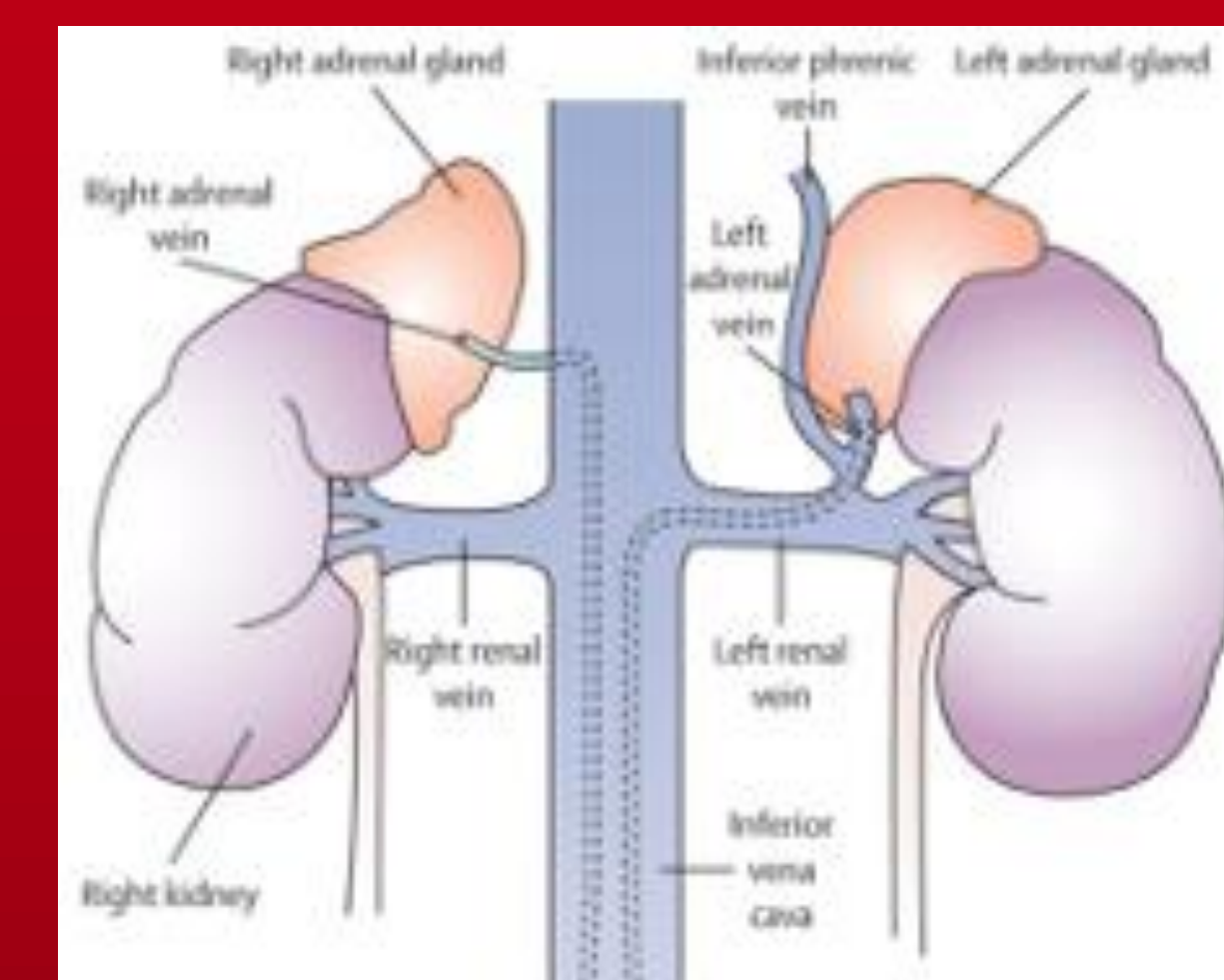


Figure 3. This CT of patient three demonstrates bilateral adenomatous hyperplasia, most likely benign. Although CT can demonstrate nodules, is not used in diagnosis because it is an insensitive measure. This is due to the presence of non-secreting adenomas and difficulty in detecting sub centimeter adenomas, which make up the majority of these masses.

Approximately 50% of patients are misdiagnosed on CT. However, all patients should undergo initial CT to rule out rare cases of adrenal cortical carcinoma.

Results

Two of the three patients were found to have left adrenal adenomas using AVS. After surgical consults, they were scheduled to undergo removal. The third patient who was found to have benign adenomatous hyperplasia on CT, had nondiagnostic findings from AVS. This patient is being medically managed with Amlodipine, Spironolactone and oral potassium supplementation with adequate control of blood pressure and symptoms.

Discussion

AVS is the standard test for further workup of PA. However, it also has its challenges. It is a technically challenging procedure and can be nondiagnostic in a significant number of cases, similarly to patient 3 this series. In a small subset of patients, cortisol can be co-secreted with aldosterone, leading to false results with the A/C ratio. In addition, variation in vasculature can result in failure to access the adrenal vein, especially on the right due to challenging anatomy. Although rare, AVS also can result in complications such as venous rupture, adrenal infarction or catheter induced venous thrombosis.

AVS should only be considered for patients in which adrenalectomy is an option, because adrenalectomy is curative for patients with a unilateral adenoma. It is important for providers to understand the indications for testing for PA and AVS because it is a reversible cause of hypertension. Patients who are found to have bilateral hyperplasia from AVS can be successfully medically managed.

References

- Figure 1 Peixoto AJ. A young patient with a family history of hypertension. Clin J Am Soc Nephrol. 2014;9(12):2164-2172.
- Figure 2 Monticone S, Viola A, Rossato D. Adrenal vein sampling in primary aldosteronism: towards a standardized protocol. The Lancet. 2015;3(4):296-303
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