AMSER Case of the Month: May 2023

47yo male with refractory hypertension and hypokalemia

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Patient Presentation

- HPI: 47yo male presented to Endocrinology with chief complaint of hypertension refractory to 5 medications and hypokalemia. Hypertension started at the age of 20 and has required increasing amounts of medications to control. He has occasional episodes of headaches with vision changes.
- Past Medical History: hypertension, hyperlipidemia, obesity, OSA
- Past Surgical History: cardiac catheterization
- Allergies: lisinopril, nifedipine
- Medications: clonidine, chlorthalidone, carvedilol, valsartan, amlodipine, potassium chloride
- Social History: never smoker

Patient Presentation

Physical Exam

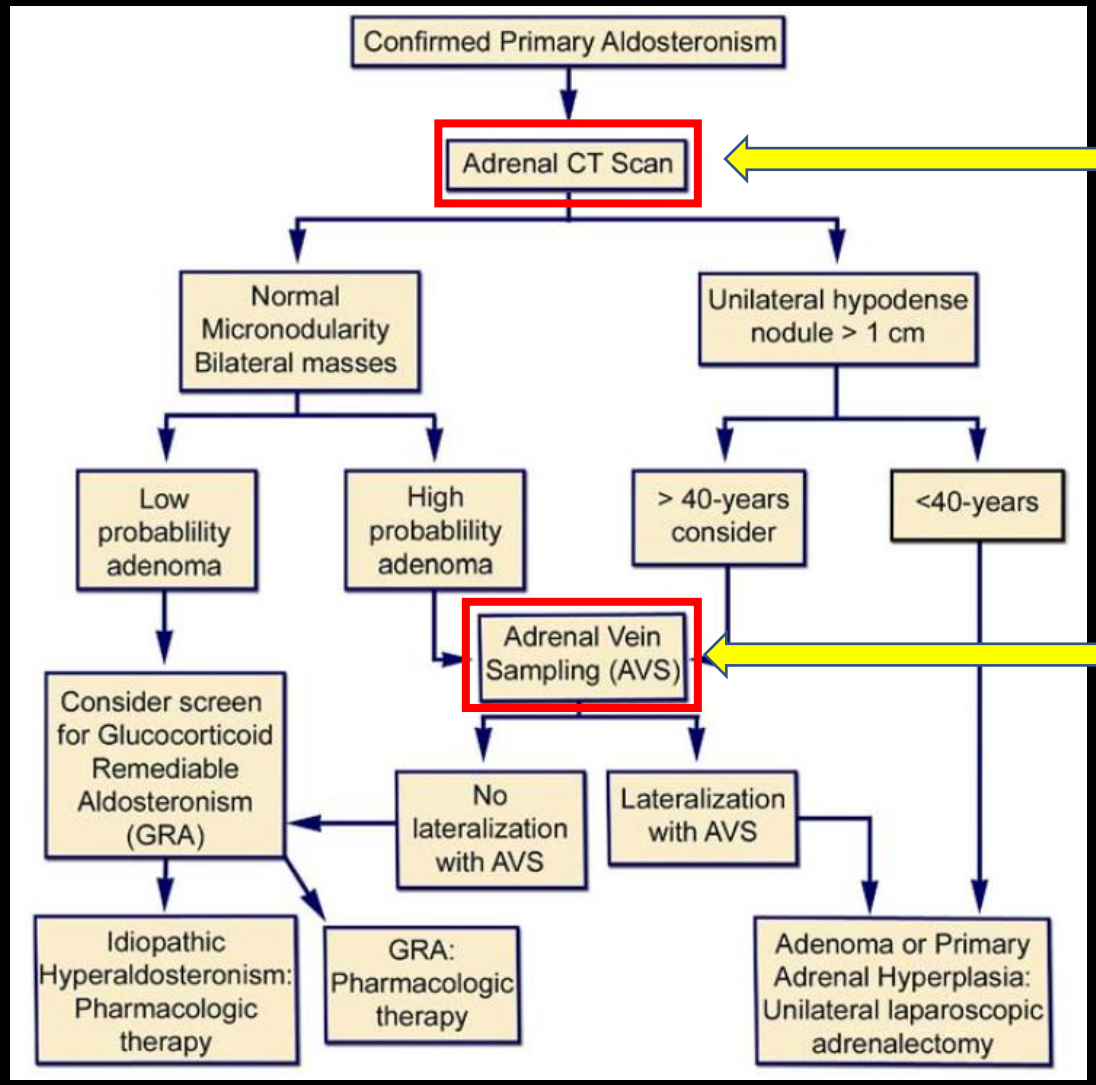
- Vitals: BP: 184/111 mmHg after medication, Pulse: 68 bpm, Weight: 123 kg
- Neck: Normal carotid upstroke without bruits
- CV: regular rate and rhythm, S1 and S2 audible, peripheral pulses 2+ and symmetric
- Respiratory: clear to auscultation bilaterally

Pertinent Labs

- K: 2.8 mEq/L (low)
- AM Cortisol: 1 ug/dL (low)
- Serum Plasma Renin Activity: .3 ng/mL/hr (low)
- Serum Aldosterone: 16.7 ng/dL (normal)
- Aldosterone-Renin Ratio: 55.67 (high)
- IV NS Suppression Test: aldosterone still 17.4 ng/dL (abnormal)

What is the next step in the workup of this patient?

Select the next steps for adrenal adenoma



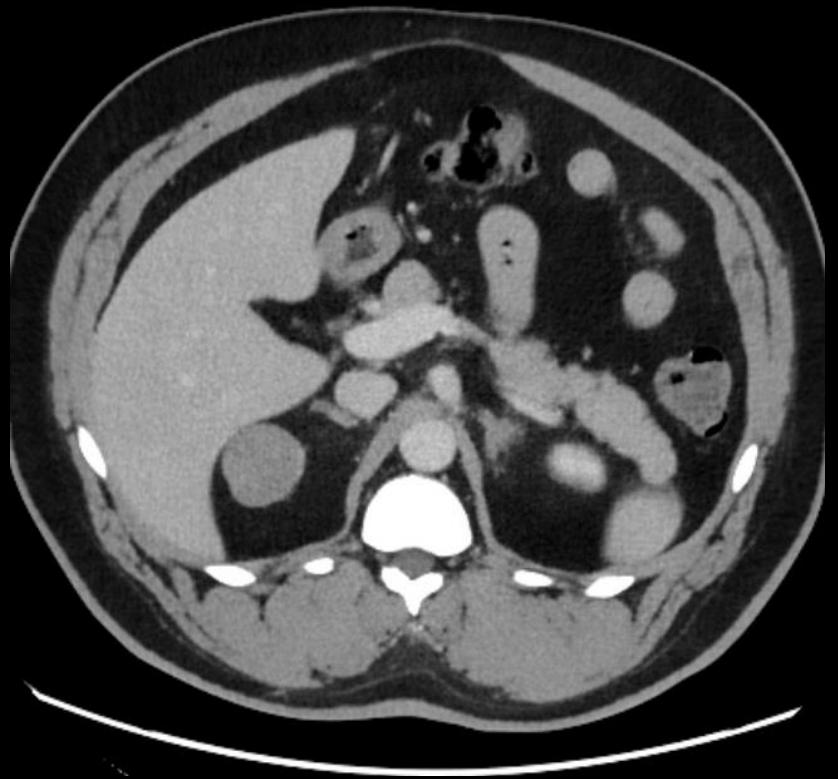
This imaging modality was ordered by the Nephrologist

Performed by Interventional Radiologist

CT was ordered to assess for any obvious adenomas and localize adrenal veins for future AVS.

Khan, S., Angle, J. (2010). Adrenal Veins Sampling. *Techniques in Vascular and Interventional Radiology*. 13, 110-125. doi: 10.1053/j.tvir.2010.02.006

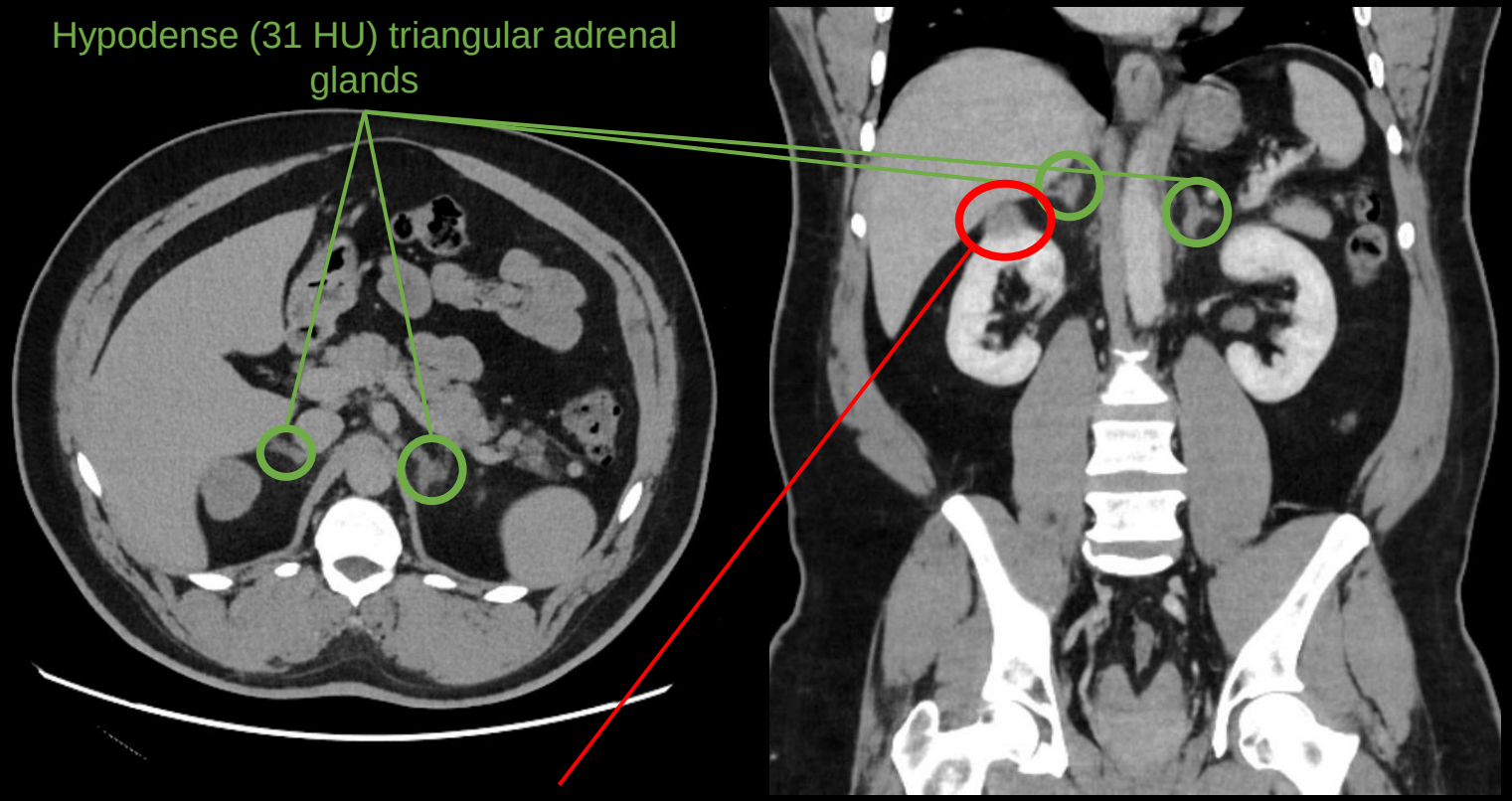
Findings (Unlabeled)



Findings

Abdominal CT w/o Non-Contrast

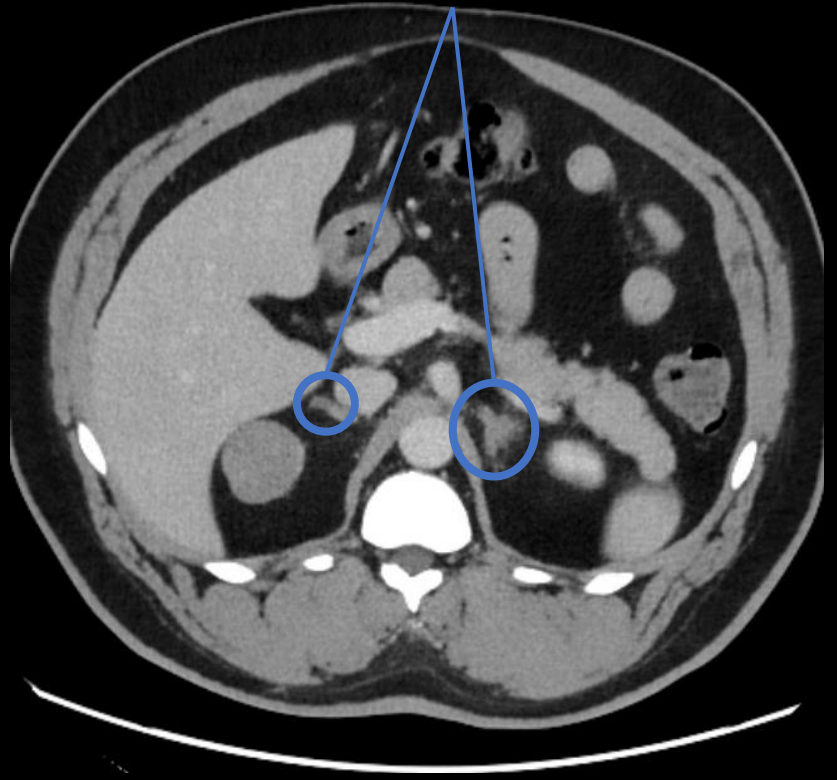
Hypodense (31 HU) triangular adrenal glands



Incidental right renal mass

Abdominal CT w/ Contrast

Hypodense (65 HU) triangular adrenal glands, washout of 85%



Presence of multiple 1 cm nodular thickenings in left adrenal gland. Incidental right renal mass also found.

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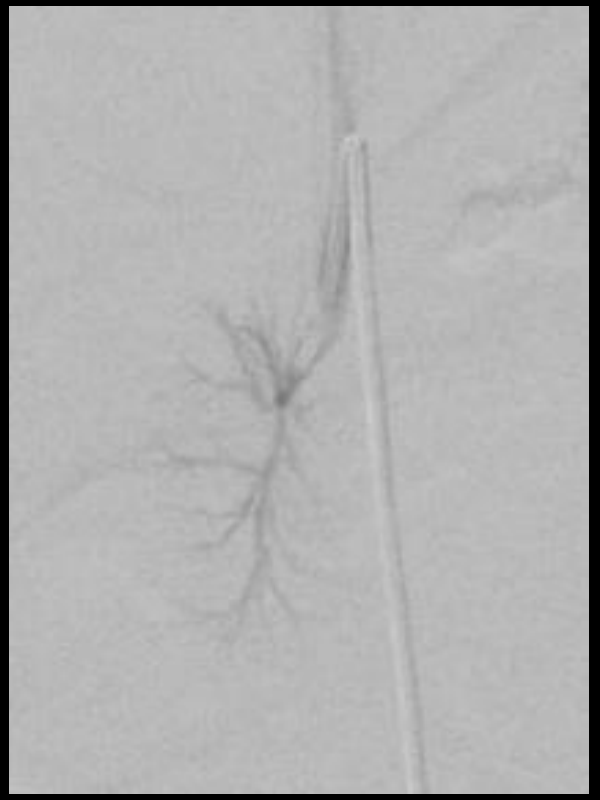
Findings

Adrenal Vein Sampling (AVS) was performed with ACTH suppression and sequential sampling to confirm the laterality of the aldosteronoma.



Right Adrenal Venography: Central Vein Pattern with Stellate Branches

Left Adrenal Venography: Separate Adrenal and Phrenic Veins

Findings

Vein	Aldosterone, (A), ng/dL	Cortisol, ©, ug/dL	A/C Ratio	Indexes
Right Adrenal Vein	527.0	> 634	< 0.83	Right Selectivity Index > 35.4
Left Adrenal Vein	6832.0	> 634	< 10.8	Left Selectivity Index > 35.2
Low IVC	59.4	18	3.30	Left Lateralization Index = 13
High IVC	41.4	20	2.07	Right Contralateral Suppression Index < 0.29

1. Right and left selectivity indexes > 5, indicating successful bilateral adrenal vein sampling
2. Left lateralization index > 5, indicating elevated left adrenal aldosterone secretion
3. Right contralateral suppression index < 1, indicating right adrenal suppression

Final Dx:

Primary Hyperaldosteronism due to Left Adrenal Aldosteronoma

Primary Hyperaldosteronism

Primary Hyperaldosteronism (PH) is a condition in which there is abnormal secretion of aldosterone independent of renin. This often leads to refractory hypertension that is difficult to control.

- Etiology: The most common causes of PH are bilateral adrenal hyperplasia and adrenal adenomas. Other causes are type I and II familial hyperaldosteronism
- Clinical Presentation: Patients usually present with early onset, uncontrollable hypertension refractory to several medications. Patients may also experience hypokalemic symptoms.

Primary Hyperaldosteronism (cont'd)

Diagnosis:

- In practice, if there is clinical suspicion, the first screening test is an aldosterone/renin ratio.
- A captopril suppression test (most common) or the saline suppression test (gold standard) are used to confirm abnormal aldosterone levels.
- Abdominal CT w/ and w/o contrast is used to find adenomas and map out the adrenal veins.
- Adrenal Venous Sampling (AVS) is performed to confirm lateralization of the adenoma.

Management:

- Aldosterone secreting adenomas are treated with adrenalectomy.
- Bilateral adrenal hyperplasia is controlled using mineralocorticoid receptor antagonists.

Outcome

- After AVS confirmed increased left adrenal aldosterone secretion, the patient underwent robot assisted laparoscopic left adrenalectomy.
  - Pathology confirmed diffuse and nodular cortical hyperplasia with nodules up to 1 cm in the zona glomerulosa as well as mild medullary hyperplasia.
- Patient also underwent robot assisted laparoscopic right partial nephrectomy.
  - Partial nephrectomy was performed to spare this young patient's glomeruli
  - Pathology confirmed a 3.9 cm papillary renal cell carcinoma with negative bed margins.
- At 6 month follow up, the patient's blood pressure was well controlled on hydralazine, diltiazem, labetalol, and losartan.
  - The patient has been weaned off clonidine.
  - Patient's at home blood pressure measurements now range from 120-140/70-90.

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