Case Study: When Aldosterone Secretion Appears as Hypertension
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A 43-year-old Caucasian female with a past medical history of hypertension was presented for initial outpatient renal evaluation. Her primary care physician referred her for worsening blood pressure control. The patient reported that she was diagnosed with hypertension in her late 20s. She was not started on medication at that time stating her blood pressure was well managed with diet. Her blood pressure was well controlled up until about 5 years ago. She developed preeclampsia with her two recent pregnancies. She recently started on two drug therapies: Carvedilol and Amlodipine. Dallas Nephrology was asked to evaluate her hypertension. Physical exam was normal except for hypertension. BP was 176/83 sitting and 169/111 standing.

The laboratory exam showed:

- Sodium: 146 mEq/L
- Potassium: 2.9 mEq/L
- CO2: 30 mEq/L
- Creatinine: 0.6 mg/dL
- Renin activity: < 0.15 ng/mL/hr
- Aldosterone: 25.5 ng/dL
- TSH: 1.6
- Cortisol: 16 mcg/dL

Our patient underwent oral NaCl loading followed by repeat testing of her renin and aldosterone levels. Repeat labs showed:

- Potassium: 3 mEq/L
- Renin: 0.08 ng/ml/hr
- Aldosterone 17 ng/dL

She underwent an adrenal CT, which showed a 2.4 x 1.7 cm hypodense right adrenal lesion exhibiting Hounsfield units < 10 — consistent with an adenoma. She subsequently was referred for adrenal vein sampling (see table). This confirmed right sided lateralization of aldosterone secretion. She was referred to surgery for resection of the adenoma.

<table>
<thead>
<tr>
<th></th>
<th>Inferior Vena Cava</th>
<th>Left Adrenal Vein</th>
<th>Right Adrenal Vein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldosterone (ng/dL)</td>
<td>34.1</td>
<td>64.3</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>36.9</td>
<td>91.2</td>
<td>497</td>
</tr>
<tr>
<td>Cortisol (mcg/dL)</td>
<td>11.3</td>
<td>36.4</td>
<td>22.6</td>
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<tr>
<td></td>
<td>11.4</td>
<td>39.4</td>
<td>35.9</td>
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</table>
Secondary hypertension is a type of hypertension attributed to an underlying disease that may be correctable. Up to 10% of hypertensive patients have a secondary cause. One of the most common etiologies of secondary hypertension is primary hyperaldosteronism (PH). The typical biochemical abnormalities suggesting PH include hypokalemia, hypernatremia and metabolic alkalosis.

Aldosterone:Renin ratio (ARR) is recommended as the initial screening test for PH. Measurement of plasma aldosterone is in (ng/dL), whereas measurement of plasma renin activity is in (ng/dL/hr). Of note, serum aldosterone must be > 15 ng/dL to be considered a significant ratio. It is preferred that values be obtained with patients not on anti-hypertensive agents that affect the renin-angiotensin system. Most literature suggests an ARR > 20 is highly suggestive of primary hyperaldosteronism. Confirmatory testing includes repeat ARR following salt loading or administration of Fludrocortisone to suppress aldosterone.

Plasma aldosterone is measured as a baseline, then following some combination of Na loading and/or medication dosing. Aldosterone should be suppressed to < 10 ng/dL. Adrenal CT should be done to evaluate for an adenoma. Adrenal vein sampling is recommended to confirm lateralization to the correct gland.
Positive case-finding test
PAC:PRA >20ng/dl per ng/ml per hour (555pmol/l per ng/ml per hour)
PLUS PAC ≥15ng/dl (416pmol/l)

Confirmatory testing
Sodium loading (oral, intravenous or fludrocortisone)

Adrenal CT

Unilateral nodule
AVS not required if patient is aged ≤40 years AND nodule size is ≥1cm AND nodule ≤10HU

Nodule size <1cm
Lateralization
No lateralization
Surgery

Normal, multinodular, unilateral or bilateral enlargement
AVS not required if patient is not a suitable candidate for, or does not wish to undergo, surgery

Adrenal venous sampling
Lateralization
No lateralization
Mineralocorticoid receptor antagonist