**Renin and aldosterone**

Indications for screening for primary hyperaldosteronism (PA) in hypertensives include:

* Persistent and severe (>150/100 mmHg) hypertension
* Spontaneous Hypokalaemia (highly suspicious of PA)
* Hypokalaemia induced by diuretics
* Onset of hypertension before 35 years or after 70 years
* Hypertension requiring ≥ 4 drugs for control (<140/90 mmHg)
* Hypertension that is poorly controlled (>140/90) despite ≥ 3 agents
* Sleep apnoea
* Family history of cerebrovascular bleeding before 40 years of age.
* Incidentally discovered adrenal “adenoma”

This laboratory does not calculate an Aldosterone: Renin ratio as a screening test for PA because an optimal ratio is unknown for the combination of assays used locally.

Samples for renin and aldosterone should be collected in the morning after the patient has been out of bed for at least 2 hours, usually after they have been seated for 5 – 15 minutes.

Hypokalaemia reduce the secretion of renin and aldosterone. Therefor if hypokalaemia is present, supplement with Potassium until ≥ 4 mmol/L, prior to testing.

Spironolactone, Eplerenone, Triamterene, Amiloride as well as potassium wasting diuretics should be withdrawn for 4 weeks prior to testing. Ideally, the drugs listed in the table below should be withdrawn for 2 weeks but results may still be interpretable when taking these antihypertensives. If results are not interpretable, consider changing to drugs with minimal effects on Renin and Aldosterone.

Patients with a positive screen do not necessarily have hyperaldosteronism; confirmatory testing may be indicated. An endocrine opinion is usually appropriate.

**Drugs with no or minimal effects on Renin & Aldosterone:**

Verapamil (slow release), Hydralazine, Alpha-1 blockers (Prazosin, Doxazosin &Terazosin)

**Drugs affecting Renin**

|  |  |
| --- | --- |
| **Decrease Renin** | **Increase Renin** |
| Beta-blockers | Duiretics e.g. thiazides, frusemide |
| Clonidine, Alpha-methyldopa | ACE inhibitors |
| NSAIDS\*\* | Angiotensin receptor blockers |
|  | Renin inhibitors |
|  | DHP calcium blockers\* |

\*= Dihydropyridine Calcium Channel blockers; amlodipine, felodipine, nifedipine, nimodipine. These are vasodilators and are not useful for arrhythmias.

Non DHP calcium channel blockers: Verapamil, diltiazem – negative inotrope. Useful for arrhythmias.

\*\*NSAIDS – decreases renin by inducing renal sodium and water retention and increases Aldosterone due to potassium retention.

Guide to interpretation

**In patients with hypertension:**

* Positive screen = Renin is < 0.4 ng/mL/hr and Aldosterone is > 400 pmol/L.
* PA likely when renin is suppressed when taking drugs that increases renin.
* PA unlikely when renin is not suppressed when taking drugs that decreases renin.
* PA remains likely if aldosterone is clearly elevated and renin is suppressed even if taking drugs that decrease renin.
* “Normal” Renin and “Normal“ Aldosterone is consistent with essential hypertension
* Elevated Renin with “Normal” Aldosterone is consistent with: essential hypertension, ACE inhibitors, AR blockers
* Elevated Renin and elevated Aldosterone is consistent with: secondary hyperaldosteronism – an endocrine opinion is suggested.
* Renin < 0.4 and Aldosterone < 400: Cushing’s syndrome, Licorice, apparent mineralocorticoid excess (loss of function 11-ßHSD2), activating mutation mineralocorticoid receptor, Liddle syndrome (rare), Gordon syndrome (very rare) and CAH (11ß-OH-lase and 17α-OH-lase deficiency) – an endocrine opinion is suggested.

(Interpret borderline values with caution)

Causes of primary hyperaldosteronism:

* Aldosterone producing adenoma
* Unilateral adrenal hyperplasia
* Bilateral adrenal hyperplasia
* Rarely – adrenal carcinoma and familial causes

Causes of secondary hyperaldosteronism include:

* reno-vascular disease, aortic coarctation
* malignant hypertension,
* very rarely, renin producing tumour

**Patients without hypertension:**

Low renin (< 0.4) and low aldosterone (< 400)

* Diabetic kidney disease
* NSAIDS

Elevated Renin (>5) and elevated Aldosterone (>400) = Secondary hyperaldosteronism:

* Heart failure
* Nephrotic syndrome
* Diuretic use,
* Gittleman’s syndrome
* Bartter’s syndrome