Aldosterone-Renin Ratio

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Primary aldosteronism occurs when aldosterone production is inappropriately high in relation to the patient's sodium status, which causes cardiovascular damage, hypertension, sodium retention, and suppression of plasma renin. An increase in potassium excretion can occur that can lead to hypokalemia (low blood potassium levels). Aldosterone-renin ratio (ARR) is the most reliable method for screening for primary aldosteronism. ARR is determined by measuring both aldosterone and renin concentrations. Renin concentrations may be determined by measuring direct renin concentrations or renin activity. A variety of factors may need to be considered when interpreting ARR results.

Featured ARUP Testing

Aldosterone and Renin Direct, With Ratio 3005949

Method: Quantitative Chemiluminescent Immunoassay (CLIA)

- Initial test for primary aldosteronism
- Test includes direct measurement of aldosterone and renin
- Aldosterone-renin ratio is determined by calculation

Aldosterone/Renin Activity Ratio 0070073

Method: Quantitative Chemiluminescent Immunoassay (CLIA) / Quantitative Enzyme-Linked Immunosorbent Assay (ELISA)

- Initial test for primary aldosteronism
- Test includes direct measurement of aldosterone and measurement of renin activity
- Aldosterone-renin ratio is determined by calculation

Disease Overview

Diagnostic and Prognostic Considerations

It is now recommended that all individuals with hypertension be screened for primary aldosteronism. This may be accomplished by measuring aldosterone and renin and calculating the aldosterone-renin ratio. The results of this testing inform clinical care, allowing decision-making regarding surgical treatment (when indicated) or medical therapy.[1] A significant associated finding can be adrenocortical carcinoma, often identified by an initial computed tomography (CT) scan for exploratory assessment and subtype assignment. Primary aldosteronism can be unilateral or bilateral, determined by bilateral adrenal venous sampling, allowing decision-making regarding medical therapy, including surgery.[2]

A diagnosis of primary aldosteronism is associated with a significantly higher risk of cardiovascular events compared with essential hypertension, even after adjustment for age, sex, and blood pressure. Targeted treatment is of clear benefit, and the identification of patients with primary aldosteronism should be an important public health objective.[1] For more information about the diagnosis and management of aldosteronism, refer to the Endocrine Society guideline.[1]

Genetics

Patients who have onset of primary aldosteronism before 20 years of age, or who have a family history of primary aldosteronism or stroke before 40 years of age, should undergo genetic testing for familial hyperaldosteronism type 1 (FH-I). Patients with early-onset primary aldosteronism should be considered for germline genetic testing for variants in *KCNJ5*, which cause familial hyperaldosteronism type 3 (FH-III).[2]

Testing Protocol

The ARR should be considered a detection test only, as false-positive and false-negative results are possible.[1] Refer to Interpretive Factors to Consider for information about the effect of different variables on the ARR. Repeat testing should be performed if initial results are inconclusive or uninterpretable, or in the case of a negative result when primary aldosteronism is strongly suspected.[1]

Accurate ARR testing requires careful attention to patient preparation, timing of sample collection, and additional sample collection conditions and requirements. Detailed considerations and steps for sample collection and testing are linked in the ARUP Laboratory Test Directory under Aldosterone/Renin Activity Ratio 0070073 and Aldosterone and Renin Direct, With Ratio 3005949, as well as in the Endocrine Society clinical practice guideline.[1] For additional information about laboratory testing for primary aldosteronism, refer to the ARUP Primary Aldosteronism Testing Algorithm.

Test Interpretation

Interpretive Factors to Consider

For more information, refer to the Factors Affecting ARR Results table.

- Patient age: At 65 years of age or older, patients can have raised ARR due to a greater decrease in renin than aldosterone with age.
- Sex: In females who are ovulating or premenstrual, ARR levels are higher than for age-matched males when renin is measured as direct renin concentration (DRC) (not applicable for plasma renin activity [PRA]).
- Time of day, posture, length of time in posture, and recent dietary intake
- Medication use or exposure
- Method used for blood collection, considering any challenges or difficulties with collection
- Potassium levels in blood
- Creatinine levels in blood (Renal failure can cause false-positive results.)

Factors Affecting ARR Results

Factor	Effect on Plasma Aldosterone Concentrations	Effect on Renin Concentrations	Effect on ARR	Potential False Result
Medications				
ACE inhibitors	Decreased	Significantly increased	Decreased	False negative
Angiotensin II type 1 receptor blockers	Decreased	Significantly increased	Decreased	False negative
β-adrenergic blockers	Decreased	Significantly decreased	Increased	False positive
Ca2+ blockers (dihydropyridine)	Normal or increased	Increased	Decreased	False negative
Central alpha-2 agonists (e.g., clonidine, α-methyldopa)	Decreased	Significantly decreased	Increased	False positive
Nonsteroidal anti-inflammatory drugs	Decreased	Significantly decreased	Increased	False positive
Potassium-sparing diuretics	Increased	Significantly increased	Decreased	False negative
Potassium-wasting diuretics	Normal or decreased	Significantly increased	Decreased	False negative
Renin inhibitors	Decreased	Decreased (PRA) Increased (DRC)	Increased (PRA) Decreased (DRC)	False positive (PRA) False negative (DRC)
Electrolyte Status				
Hypokalemia	Decreased	Normal or increased	Decreased	False negative
Potassium loaded	Increased	Normal or Decreased	Increased	—
Sodium loaded	Decreased	Significantly decreased	Increased	False positive
Sodium restricted	Increased	Significantly increased	Increased	False negative
Demographic Characteristics				
Age >65 years	Decreased	Significantly decreased	Increased	False positive
Premenopausal, ovulating individuals[a]	Normal or Increased	Decreased	Increased	False positive[b]
Other Conditions				
Malignant hypertension	Increased	Significantly increased	Decreased	False negative
Pregnancy	Increased	Significantly increased	Decreased	False negative

Factor	Effect on Plasma Aldosterone Concentrations	Effect on Renin Concentrations	Effect on ARR	Potential False Result
Medications				
Pseudohypoaldosteronism type 2	Normal	Decreased	Increased	False positive
Renal impairment	Normal	Decreased	Increased	False positive
Renovascular hypertension	Increased	Significantly increased	Decreased	False negative

[a]In premenopausal, ovulating women, plasma aldosterone concentration is similar to that of men (and renin concentrations are lower) in all phases except the luteal phase. ARR is generally higher in women than in men, and it increases further during the luteal phase.

[b]If possible, screening during the follicular phase may reduce the likelihood of false-positive results. When screening during the luteal phase, renin should be measured as PRA (rather than DRC) to avoid false positives.

ACE, angiotensin-converting enzyme

Source: Funder, 2016[2]

Results Interpretation

Result	ARR (Aldosterone/Renin Activity Ratio 0070073)	ARR (Aldosterone and Renin Direct, With Ratio 3005949)	Clinical Interpretation[a]
Positive	>25[b]	>3.7	Suggestive of hyperaldosteronism; requires confirmation
Negative	≤25	≤3.7	Primary aldosteronism unlikely

[a]Refer to Factors Affecting ARR Results table.

[b]If aldosterone concentration is >15 ng/dL.

Limitations

- Reference intervals for serum aldosterone are based on normal sodium intake.
- Reference intervals for aldosterone are dependent on whether patient is upright or supine at blood draw.
- Aldosterone and Renin Direct, With Ratio (3005949) should not be used for patients being treated with cathepsin B.
- Aldosterone/Renin Activity Ratio (0070073) is preferred for menstruating females and those taking medications containing estrogen.

References

1. Adler GK, Stowasser M, Correa RR, et al. Primary aldosteronism: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*. 2025;110(9):2453-2495.

2. Funder JW, Carey RM, Mantero F, et al. The management of primary aldosteronism: case detection, diagnosis, and treatment: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*. 2016;101(5):1889-1916.

Related Information

Primary Aldosteronism
Primary Aldosteronism Testing Algorithm