
Renovascular Hypertension

Physiology and Management

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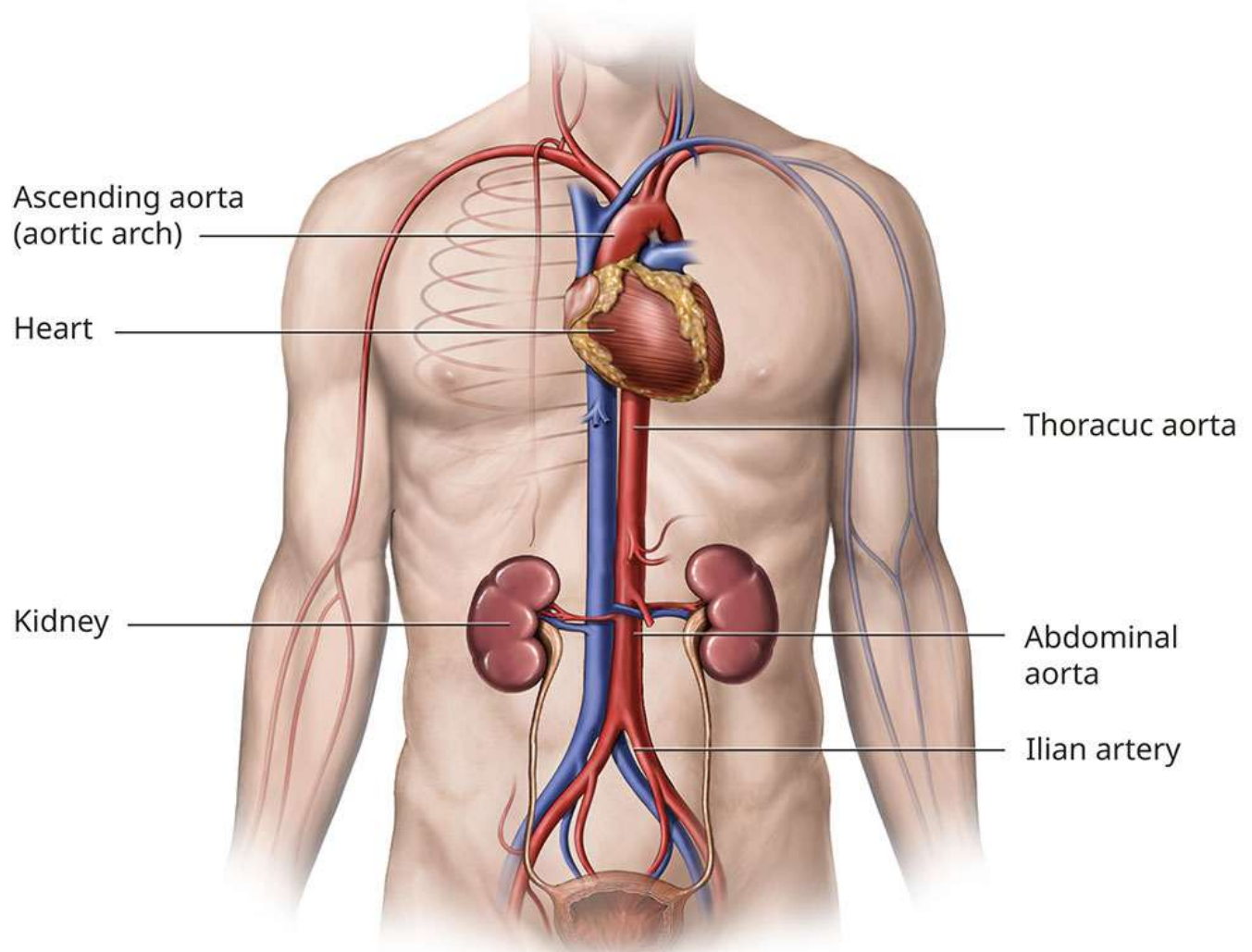


Disclosures

Nothing to disclose and no conflict of interest.

“The kidney has a very special place in the heart.”

- A) Timothée Chalamet
- B) Dr. William Osler
- C) Donald Trump
- D) Sidney Crosby



Ascending aorta
(aortic arch)

Heart

Thoracic aorta

Kidney

Abdominal
aorta

Iliac artery

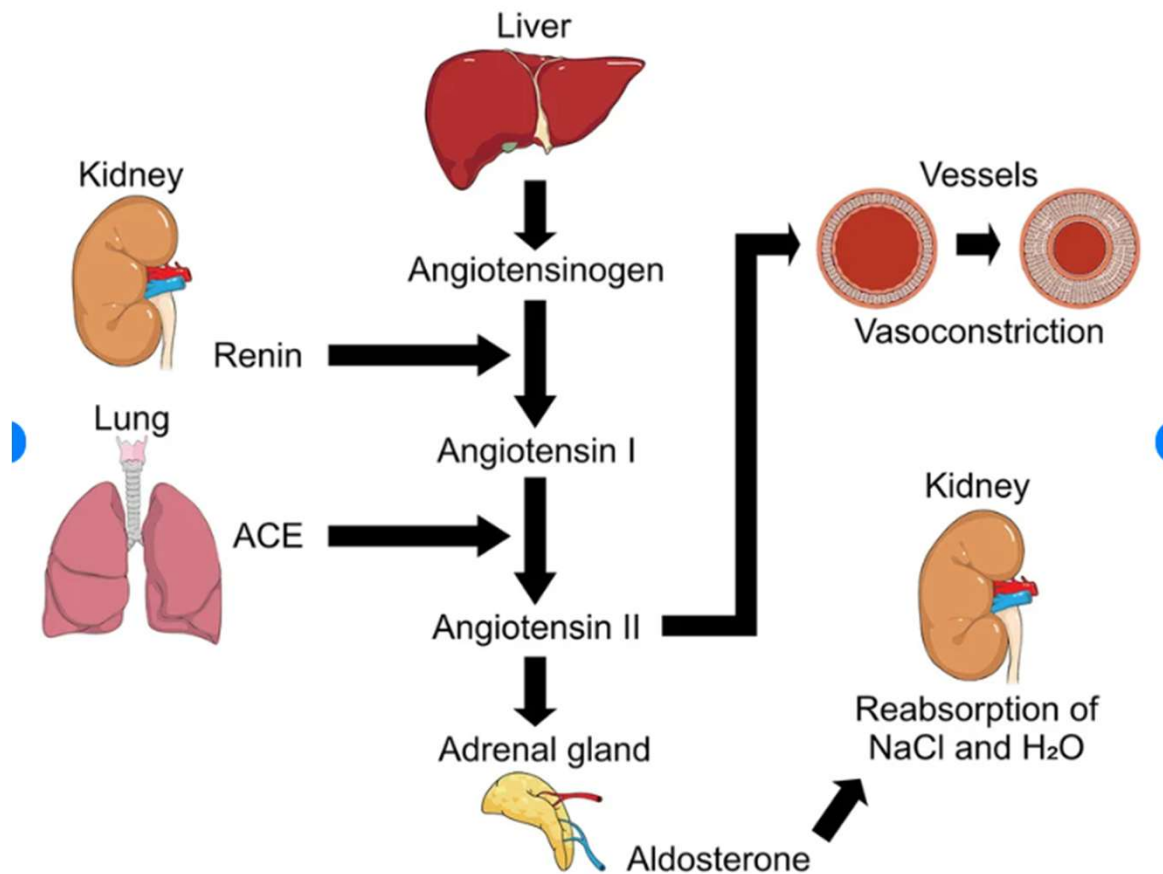


Introduction to the kidneys

- The kidneys receive about 1.2 liters per minute or 20% of the cardiac output.
- Extremely dependent on their blood supply: renal arteries +/- accessory renal arteries.
- They use this extensive blood flow to monitor and regulate body-wide blood pressure (RAAS).



Renin-Angiotensin-Aldosterone System (RAAS)



Renin Secretion

- Changes in renal perfusion via arteriolar mechanoreceptor
- Sodium and chloride delivery to the distal convoluted tubule
- Increased β -adrenergic sympathetic activity
- Humoral factors

Angiotensin II

- Induces vasoconstriction in arterioles
- Stimulates aldosterone secretion from the adrenal cortex
- Increases sodium reabsorption by enhancing activity of the NaH antiporter in the proximal convoluted tubule
- Elevates sympathetic outflow from the CNS.
- Triggers the release of vasopressin from the hypothalamus

Aldosterone

- Binds to mineralocorticoid receptors on principal epithelial cells in the renal cortical collecting duct. Sodium reabsorption occurs via the epithelial sodium channels (ENaC);
 - Aldosterone increases the abundance of ENaC, resulting in enhanced sodium reabsorption.
 - Modulates thirst and salt appetite.
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Definition of renovascular hypertension

“Renovascular hypertension is one of the most common causes of secondary hypertension. It is due to the narrowing of blood vessels in the kidney, resulting in compromised blood flow.”

*Renal artery stenosis – Most commonly from atherosclerosis
Fibromuscular dysplasia (FMD)*

Arteritis – Takayasu's, antiphospholipid antibody, etc.

Extrinsic compression of renal artery

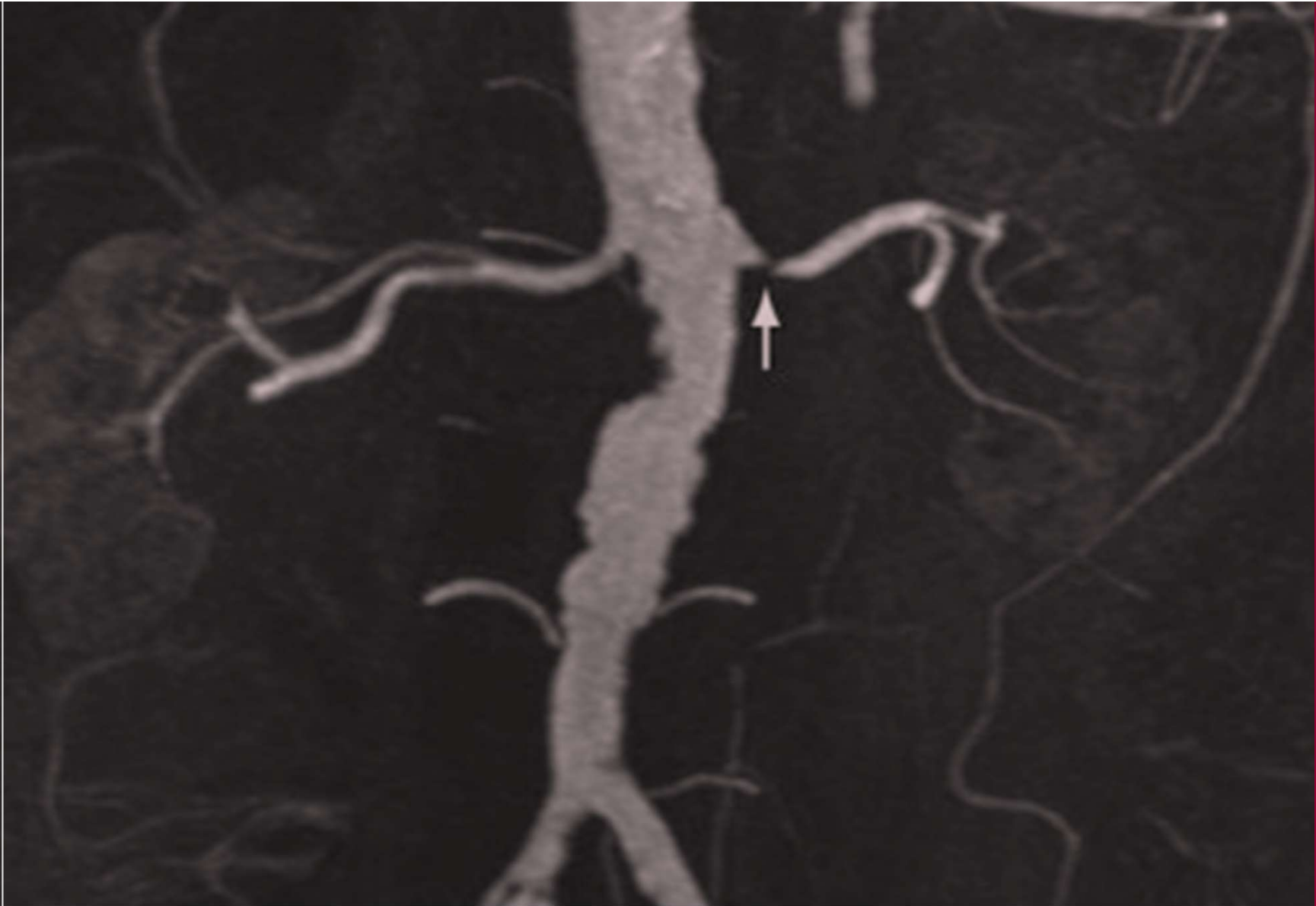
Dissection or infarction

Radiation fibrosis

Obstruction from aortic endovascular graft

Renal artery stenosis : *Atherosclerosis*

- Accounts for approximately 90% of all renal stenosis.
 - Usually involves the proximal segment.
 - Can be unilateral or bilateral (14-28%).
 - Risk factors :
 - Hypertension
 - Dyslipidemia
 - Cigarette smoking
 - Diabetes
 - Others : immune injury / CKD / increased homocysteine, accessory renals
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Management of atherosclerotic RAS

Conservative management is key!

- Antiplatelet + dyslipidemia control.
- Multimodal antihypertensive agents should be used
 - ACE-I or ARBs are preferred.
 - CCBs can be considered if the above is not tolerated

When do we operate?

ORIGINAL ARTICLE

Revascularization versus Medical Therapy for Renal-Artery Stenosis

The ASTRAL Investigators*

- 806 patients with moderate atherosclerotic RAS
- 1:1 angioplasty + stenting + medical therapy vs Medical therapy alone.
- Small difference in number of antihypertensive agent used (2.77 vs 2.97, $p = 0.03$).
- No difference in the primary outcome (Change in renal function).
- No difference in :
 - Systolic blood pressure
 - Time to renal event
 - Major cardiovascular event
 - Death
- 23 patients had serious complications from revascularization procedures.

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Stenting and Medical Therapy
for Atherosclerotic Renal-Artery Stenosis

CORAL TRIAL

- 947 patients with atherosclerotic RAS and either HTN on 2 or more agents or CKD.
- 1:1 stenting vs Medical Therapy alone.
- Modest difference in SBP : -2.3mmHg in stenting group (p = 0.03)
- No difference in the primary outcomes :
 - Death from cardiovascular or renal causes
 - Myocardial infarction
 - Stroke
 - Hospitalization for heart failure
 - Progressive renal insufficiency
 - Dialysis at over 3.5 years.

When do we treat?

Recommendations

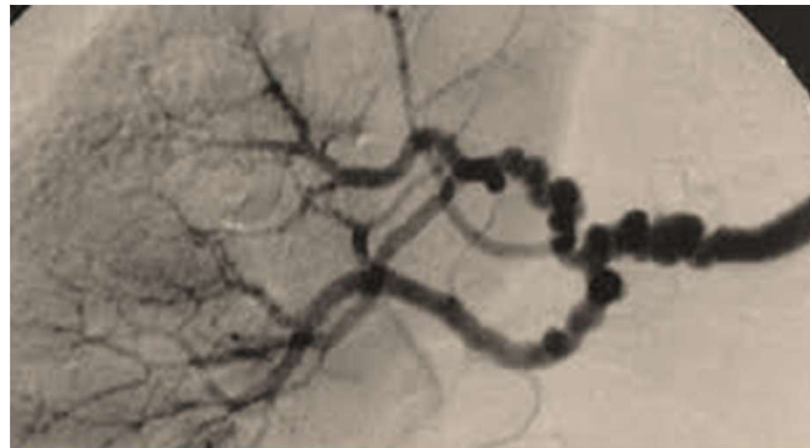
1. Patients with hypertension attributable to atherosclerotic renal artery stenosis should be primarily medically managed because renal angioplasty and stenting offers no benefit over optimal medical therapy alone (Grade B).
 - i. Uncontrolled hypertension resistant to maximally tolerated pharmacotherapy,
 - ii. Progressive renal function loss,
 - iii. Acute pulmonary edema.

Guidelines

Hypertension Canada's 2020 Comprehensive Guidelines for the Prevention, Diagnosis, Risk Assessment, and Treatment of Hypertension in Adults and Children

Fibromuscular dysplasia

- Much rarer (10%).
- Often affects women aged 35 to 50-year-old.
- Will involve the middle to distal segment.
- Does not cause lumen occlusion



When do we treat?

4. Renal artery angioplasty without stenting is recommended for treatment of FMD-related renal artery stenosis. Stenting is not recommended unless needed because of a periprocedural dissection. Surgical revascularization should be considered in case of complex lesions less amendable to angioplasty, stenosis associated with complex aneurysm, and restenosis despite 2 unsuccessful attempts of angioplasty (Grade D).
 - Much more favorable response to treatment.
 - 20% will require reintervention – monitoring is crucial.
 - Consideration for antiplatelet agents.
 - Despite successful intervention, only 1/3 of patients can discontinue their antihypertensive medications.

Guidelines

**Hypertension Canada's 2020 Comprehensive Guidelines for
the Prevention, Diagnosis, Risk Assessment, and Treatment
of Hypertension in Adults and Children**



Kenny the Kidney – *Mascot of the National Kidney Foundation*

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