Primary Aldosteronism

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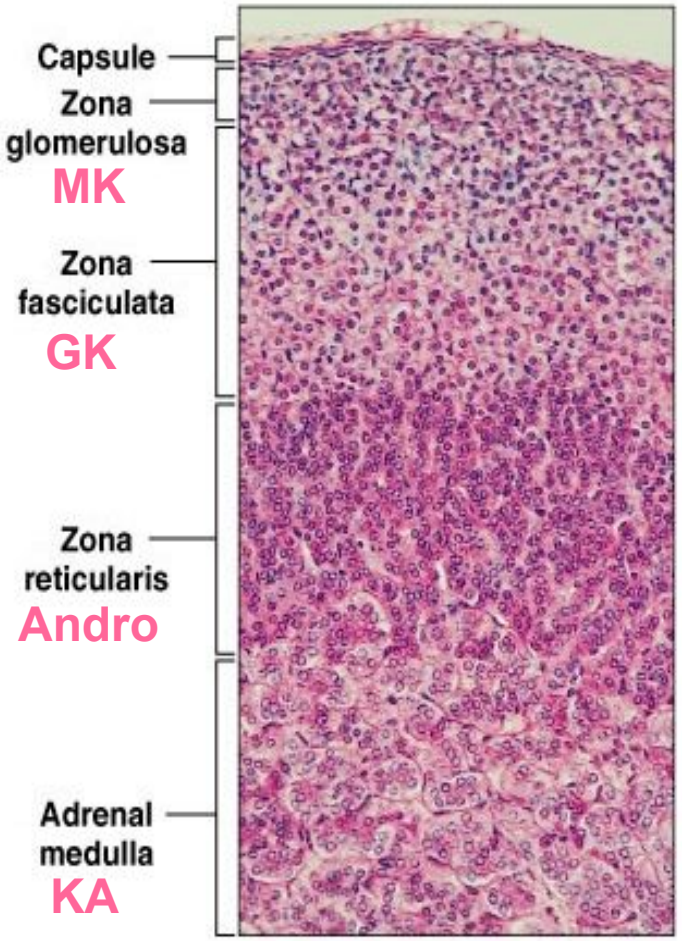
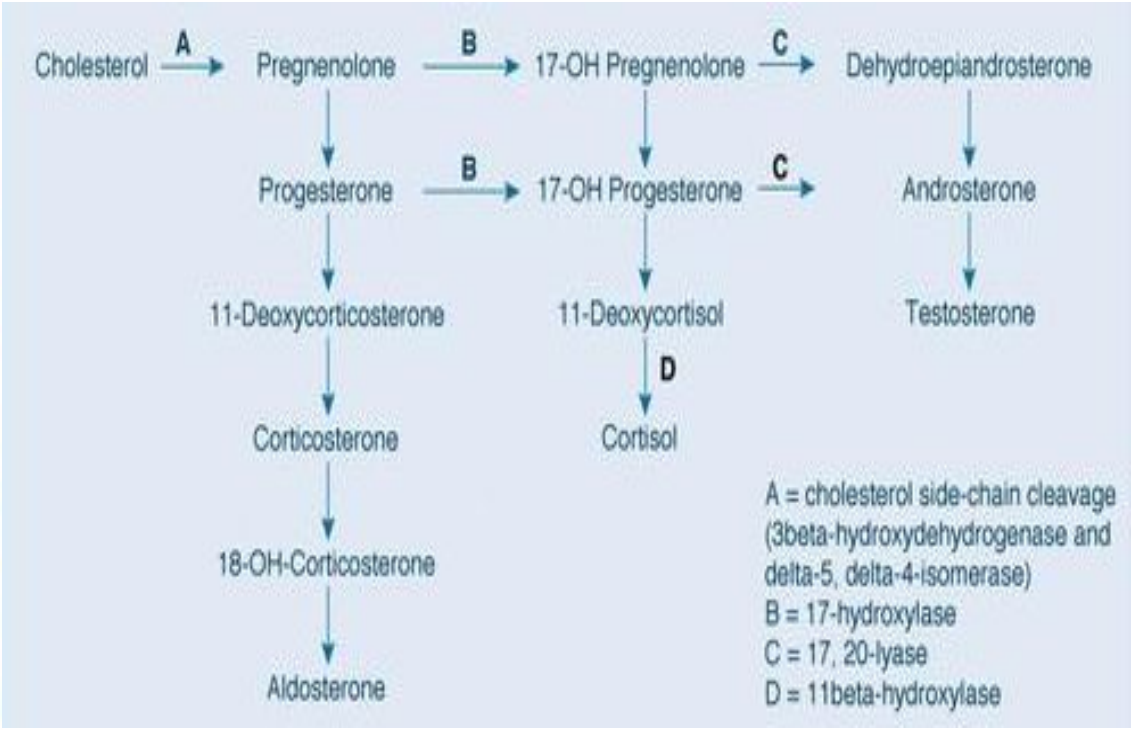
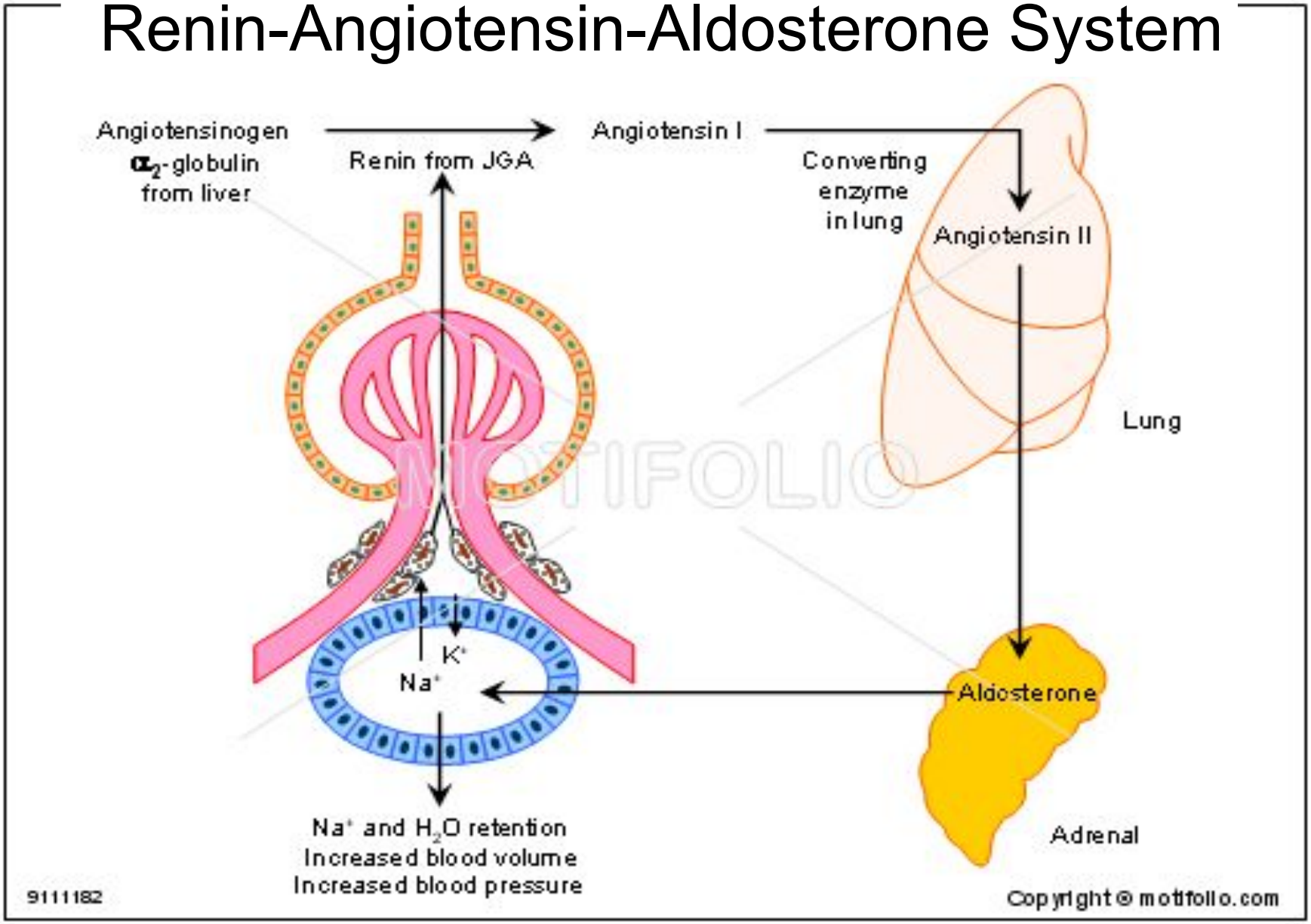
Adrenal Steroids

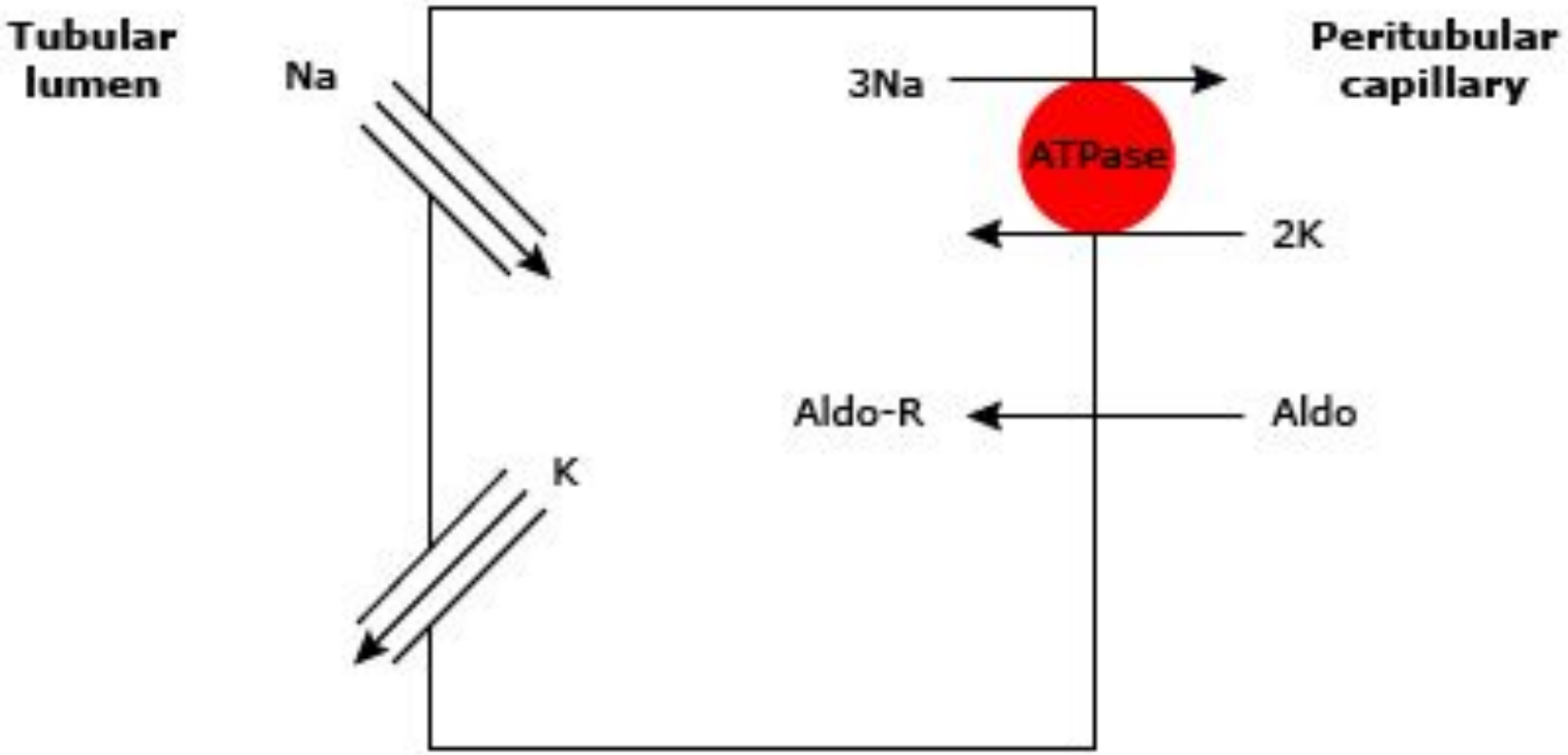




Renin-Angiotensin-Aldosterone System



Ion Transport
in Collecting Tubule Principal Cells



- Nonsuppressible (primary) hypersecretion of aldosterone is an underdiagnosed cause of hypertension.
- 1-2% in unselected patients with hypertension.
- 10-20% in patients with resistant hypertension.
- 1% of adrenal incidentaloma = aldosteronoma.

- *Resistant hypertension* - failure to achieve goal blood pressure (BP) despite adherence to an appropriate three-drug regimen including a diuretic.

- *Refractory hypertension* – failure to control the BP even with maximal medical therapy (four or more drugs with complementary mechanisms given at maximal tolerated doses) under the care of a hypertension specialist.

Secondary aldosteronism	**Primary aldosteonism**	
Renin dependent	Generally autonomous (ACTH dependent?)	Aldo secretion
or N ↑	↓↓↓	Renin level
▪ HTN (renovascular, malignant, renal disease) ▪ CHF ▪ Cirrhosis ▪ Nephrotic syndrome ▪ Bartter's syndrome		

Clinical Features of Primary Aldosteronism

- Hypertension
- Hypokalemia only 40-50%
- Lack of edema
- Metabolic alkalosis
- Mild hypernatremia, hypomagnesemia
- ↑ GFR, polyuria, proteinuria, CRF
- Muscle weakness&cramps (hypokalemia less than 2.5 meq/L)
- LVH, MI, CVA, AF

Subtypes of Primary Aldosteronism

Table 1 Subtypes of primary aldosteronism. Adapted from reference 45.

Subtype	Relative frequency (%)	
Idiopathic hyperaldosteronism	65	Hyperplasia
Aldosterone-producing adenoma	30	Adenoma
Primary unilateral adrenal hyperplasia	3	
Aldosterone-producing adrenocortical carcinoma	1	
Aldosterone-producing ovarian tumor	<1	
Familial hyperaldosteronism type I (glucocorticoid-remediable aldosteronism)	<1	
Familial hyperaldosteronism type II (familial occurrence of aldosterone-producing adenoma and/or idiopathic hyperaldosteronism)	Unknown	

Idiopatic Aldosteronism	Aldosteronoma (Conn's)	
older	younger	age
male	female	sex
↓↓ or ↓	↓↓↓	K
↓↓ or ↓	↓↓↓	PRA
bilateral enlargement or normal	unilateral adenoma	CT findings
resistant HTN	↓ BP **N** or	Response to surgery

Screening for Primary Aldosteronism

- severe hypertension (>160/100 mmHg) or drug-resistant hypertension
- HTN and spontaneous or diuretic-induced hypokalemia
- hypertension with adrenal incidentaloma
- hypertension and a family history of early onset hypertension or CVA at a young age (<40 years)
- case detection for all hypertensive first-degree relatives of patients with PA is recommend

Screening (cont.)

- Plasma Aldosterone-to-Renin ratio
  - ✔ mid-morning, after the patient has been up for at least 2 hours and seated for 5-15 minutes

- have to be withdrawn for at least 4 weeks:
  - ✔ Spironolactone, eplerenone, amiloride, and triamterene
  - ✔ Potassium-wasting diuretics
  - ✔ Confectionary licorice, chewing tobacco

- Results:
  - ✔ PRA↓
  - ✔ PAC ≥15 ng/dL (416 pmol/L)
  - ✔ PAC/PRA ≥20

Confirmation of the Diagnosis

- Oral sodium loading

  24-h urine Na excretion >200 meq

  Urine Aldo excretion>12 mkg/24h

- Saline infusion test

  PAC>10 ng/dL (>277 pmol/L)

  normal <5 ng/dL

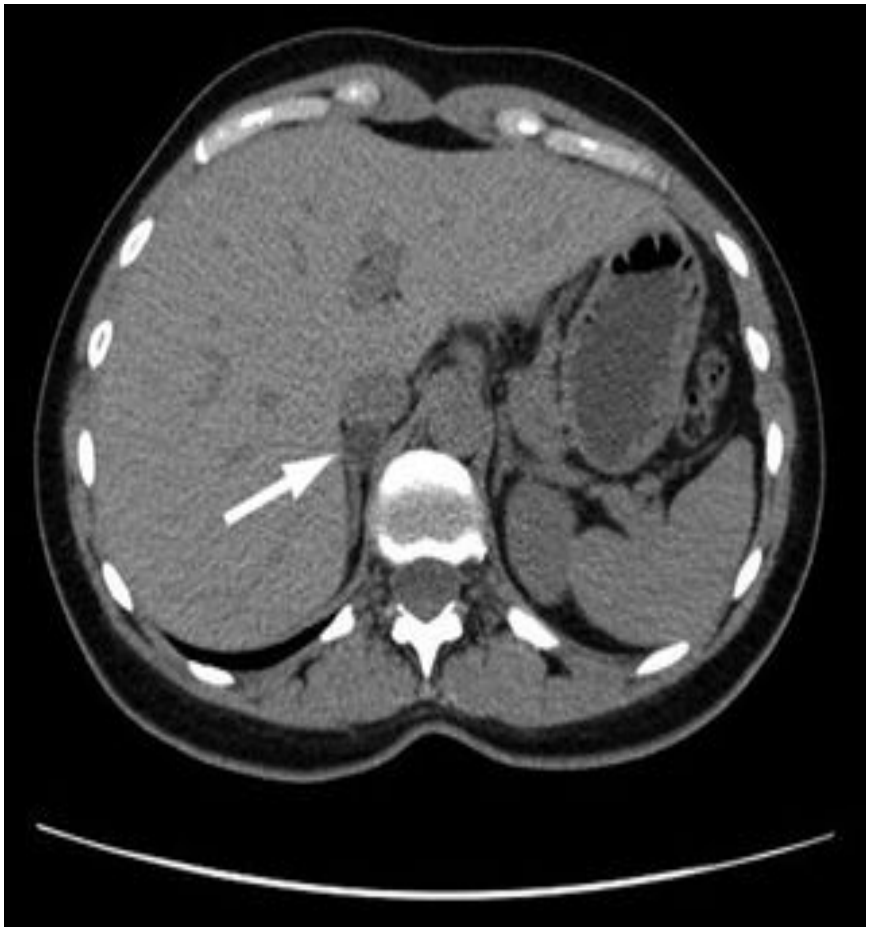
TABLE 2. Medications that have minimal effects on plasma aldosterone levels and can be used to control hypertension during case finding and confirmatory testing for primary aldosteronism

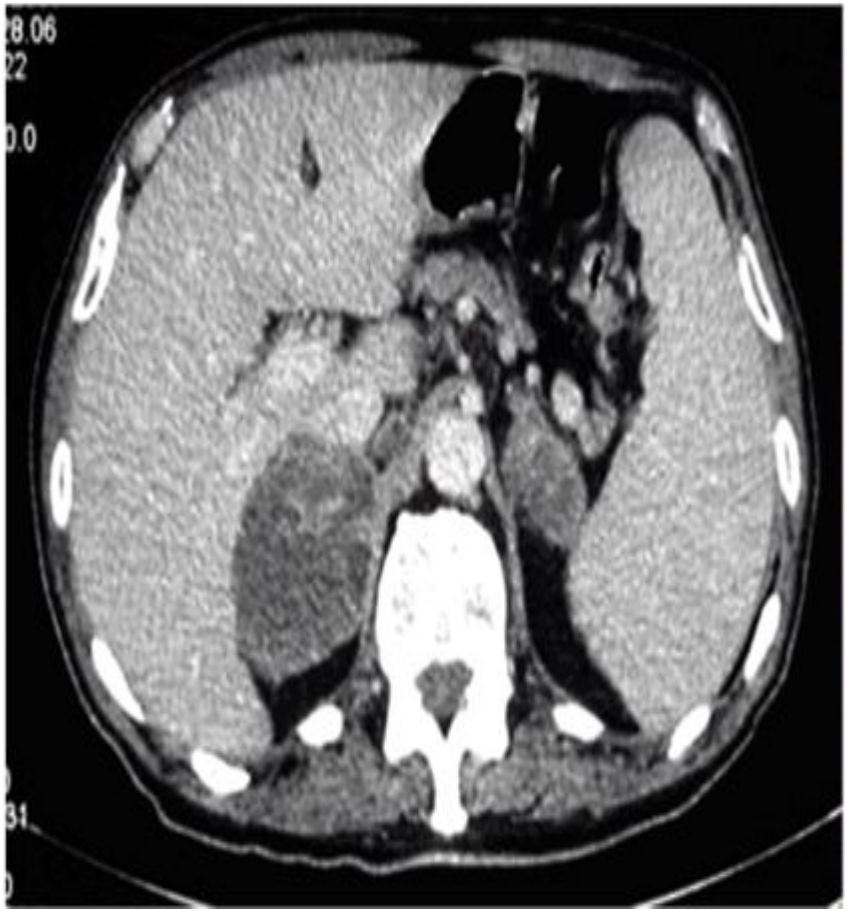
Drug	Class	Usual dose	Comments
Verapamil slow-release	*Non-dihydropyridine antagonist calcium channel*	*90–120 mg twice daily*	*Use singly or in combination with the other agents listed in this Table.*
Hydralazine	*Vasodilator*	*10–12.5 mg twice daily, increasing as required*	*Commence verapamil slow-release first to prevent reflex tachycardia. Commencement at low doses reduces risk of side effects (including headaches, flushing, and palpitations).*
Prazosin hydrochloride	*Alpha-adrenergic blocker*	*0.5–1 mg two to three times daily, increasing required*	*Monitor for postural hypotension.*
Doxazosin mesylate	*Alpha-adrenergic blocker*	*1–2 mg once daily, increasing as required*	*Monitor for postural hypotension.*
Terazosin hydrochloride	*Alpha-adrenergic blocker*	*1–2 mg once daily, increasing as required*	*Monitor for postural hypotension.*

Imaging

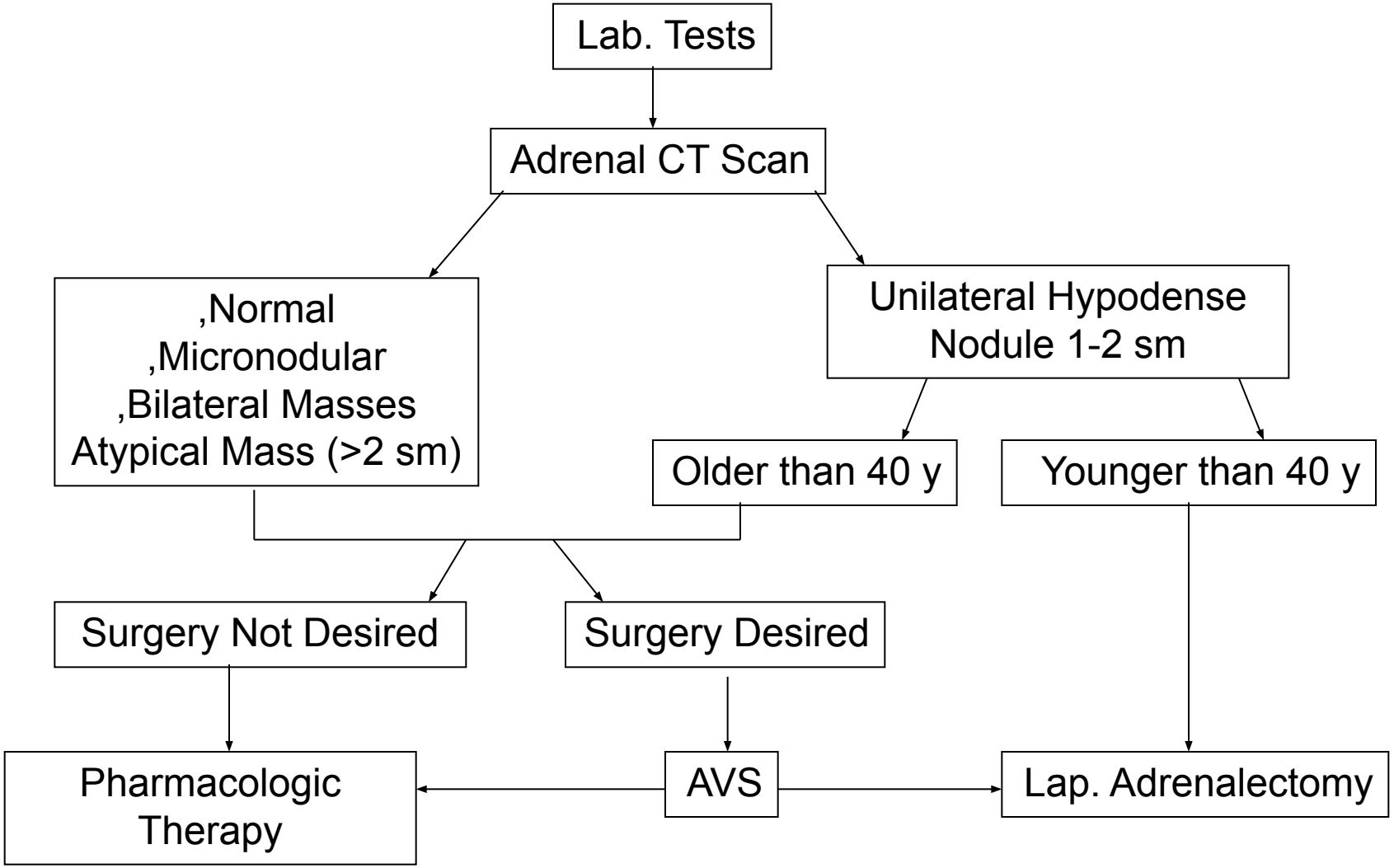
- CT scan
- MRI
- Adrenal venous sampling
- Iodocholesterol scintigraphy

Adenoma vs. Bilateral Hyperplasia

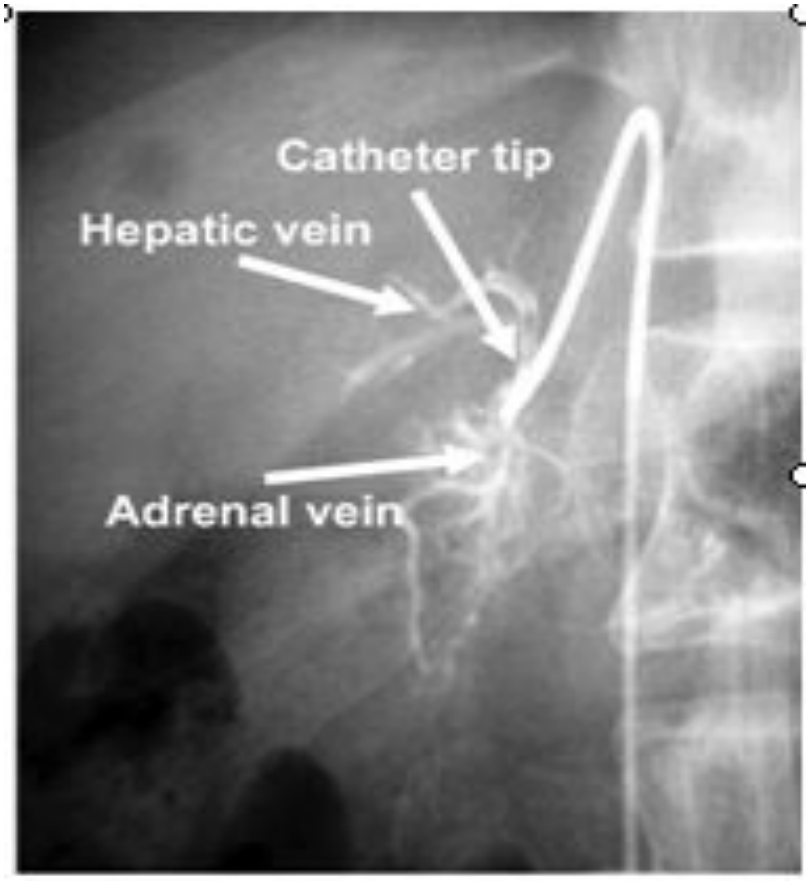


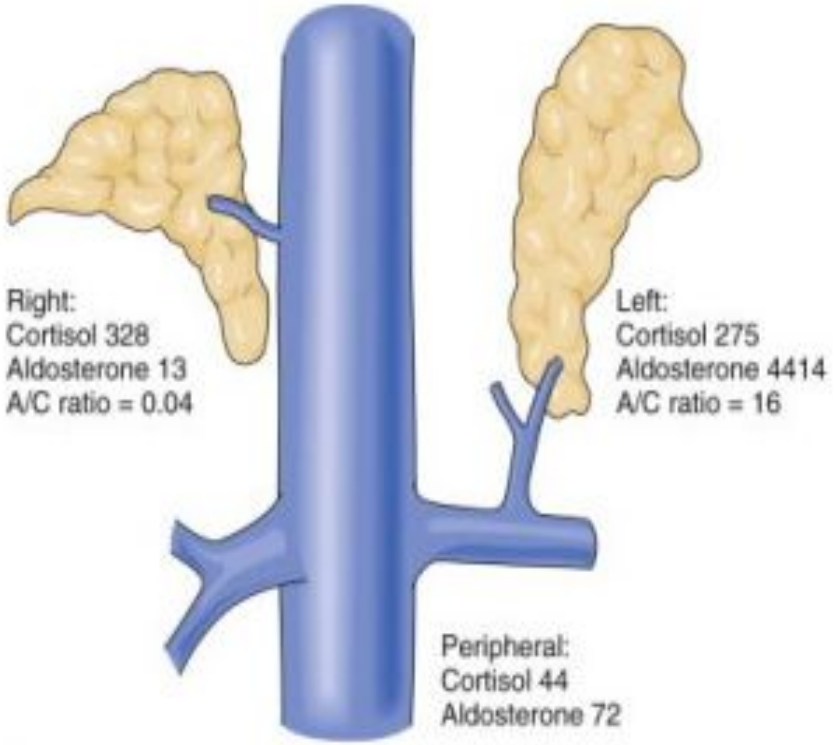


Diagnosis of Primary Aldosteronism



Adrenal Venous Sampling

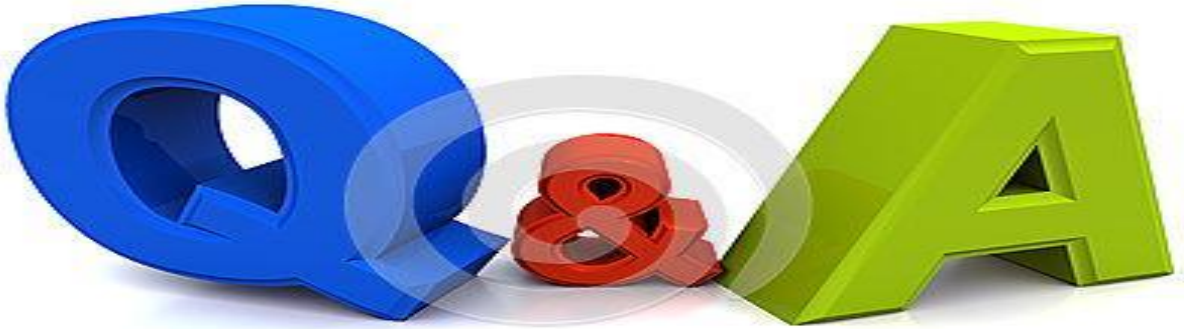




Treatment

HTN is improved in all and is cured in .35-60% of pt

Laparoscopic adrenalectomy	APA PAH
Medical treatment Aldactone, eplerenone, amiloride, triamterene	IAH
GK treatment	GRA
+Open adrenalectomy chemotherapy	Adrenal carcinoma


Q&A


HYPERTENSION
rx
vessels
factors
help
high
stroke
co-morbidity
awareness
obesity
140/110
hospital
genetic
blood
testing
heredity
systolic
diet
doctors
men
140/100
health
weight
arteries
cost
meds
nurse
blood
white coat
135/95
lab tech
headache
women
care
people
risk
heart
pressure
bp
readings
meds
htn
doctor
disease
condition
normal
causes
rx
control
diastolic
exercise
prevention
research
130/90
treatment
spike
rise
blood
stress
bmi
medication
causes
rn
salt
cuff
HIGH BP CONDITION RX RISK HEART EXERCISE RISK DIET ARTERIES PREVENTION
HYPERTENSION DISEASE BP MEDICATION