

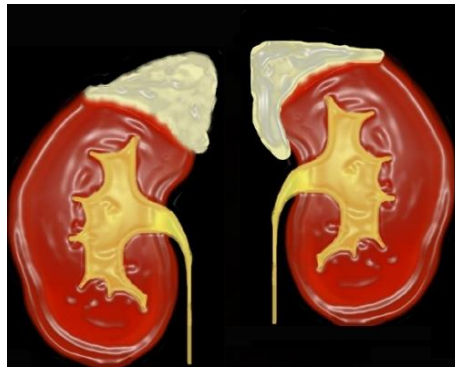


Endocrinologists as Hypertension Specialists



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CASE

62 yr old male with hypertension

HPI:

Diagnosed age 38
Rx initially atenolol
BP steadily required more meds

Home BP 155/90 mm Hg

PMHX:

Obesity: weight gain 30 pounds over 30 years

DM2 diagnosed 3 years ago, insulin requiring

OSA - CPAP not regular

Hypercholesterolemia



ANTI-HYPERTENSIVE DRUGS: 1st line

ACE Inhibitors/ **A**ngiotensin Receptor Blockers

Beta-Blockers

Calcium Channel Blockers

Diuretics

Rule Out Endocrine Causes

- onset before age 25
- not controlled on 3 drugs, including diuretic*
- palpitations, headache, sweats (1/300)
- abdominal bruit; central obesity, striae
- adrenal nodule; hypokalemia

Evaluation for Endocrine Causes

- **Renal Vascular Hypertension**

Clinical Suspicion

- **Pheochromocytoma**

HISTORY

- **Cushing's Syndrome**

EXAM

- **Primary Aldosteronism**

LAB

Renal Vascular Hypertension: Clinical Clues

- Resistant hypertension (with hypokalemia)
- Accelerated/malignant hypertension
- Flash pulmonary edema
- Renal asymmetry (one small kidney; ▲ >1.5 cm)
- Systolic/ diastolic subcostal or flank bruit
- Worsening renal function, esp. on ACE inhibitor
- Demographics: older with vascular disease (20-50% will have RAS), smoking, hyperlipidemia. Young women: FMD

Renal Vascular Hypertension Evaluation

FUNCTION

PRA, captopril-stimulated renin, renal vein renins:
Not helpful

IMAGING

Doppler Ultrasound: least \$, yields reliable velocities, waveforms when done well. Time consuming, requires technical expertise; difficult with obesity

***CTA:** contrast risk with CRD; radiation; +/- predictive values comparable to MRA

***MRA:** gadolinium risk with CRD [nephrogenic systemic fibrosis]

Angiography: gold-standard; invasive, (emboli)

Pheochromocytoma

Frequency of Symptoms

- ¹Headache ~60%
- ²Sweating ~60%
- ³Palpitations ~60%
- Pallor* 40%
- Nausea 30%
- Tremors 20%

Ross EJ, Griffith DNW. Q J Med 1989



You Initiate the Workup

Plasma Metanephrines: convenient, sensitive

But ~15% false positives
24-hour fractionated metanephrines and
catecholamines (highly sensitive and specific)

PHEO PEARLS

Neither suppression nor provocative testing needed

If pheo is causing dramatic spells, metanephrine levels should be clearly high – usually >4 times normal

Most are large, > 3 cm

MRI advantage: tissue characterization; no radiation

CT advantage: better spatial resolution

Plasma normetas: 15% false positives, esp with age.
Given rarity, 97% with htn and increased norepi
don't have pheo.

Young JCEM 2003

299 out of 300?

Pseudopheochromocytoma

1. Provide Diagnosis
2. Non-CV therapy: psychotherapy, meditation, Resperate; anxiolytic, anti-depressant
3. Mixed alpha and beta blockade

You Continue the Workup

- Overnight Dexamethasone Test:
 - 1 mg dose at 11 pm
 - 8 am plasma cortisol

Negative = plasma cortisol <1.8 mcg/dl

- 24-hour UFC
- Late night salivary cortisol x2

When to Suspect Primary Aldosteronism?

- Hypokalemia (spontaneous, or new)
- Hypertension and an adrenal lesion
- Resistant hypertension
- Family h/o early onset hypertension, stroke

Clinical Presentation

HTN. physical exam otherwise unremarkable

Screening Test for Primary Aldosteronism

Plasma Aldosterone / Plasma Renin Activity before aldactone

$$\frac{\text{PA (ng/dl)}}{\text{PRA (ng Angl/ml/hr)}}$$

Most commonly adopted cutoff value:

30:1 With PA \geq 10 ng/dl: why?

** Better than ratio: interpret both values **

Hypertension Drugs: Main Effects on Plasma Renin Activity & Plasma Aldosterone

Diuretics: raise PRA, raise aldosterone

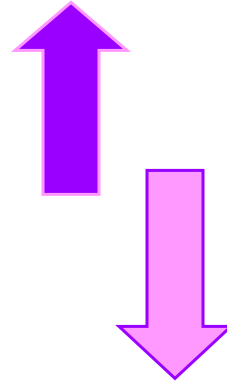
Beta Blockers: suppress renin

Clonidine: suppresses renin

ACEI/ ARBs: raise renin, especially acutely

CCBs: neutral (minimal fall in aldosterone)

MRAs: raise PRA and aldosterone. Must be withheld ~6 wks



Causes of Secondary Hypertension

- Obesity*
- Aging*
- Improper BP measurement
- White coat phenomenon
- Noncompliance
- Sleep apnea
- Chronic kidney disease (Cr >1.5 mg/dL)
- Thyroid or parathyroid disease
- Excess sodium intake
- Drugs: NSAIDs, illicit drugs, supplements, sympathomimetics, OCs
- Excess alcohol
- Primary aldosteronism, Cushings, pheochromocytoma

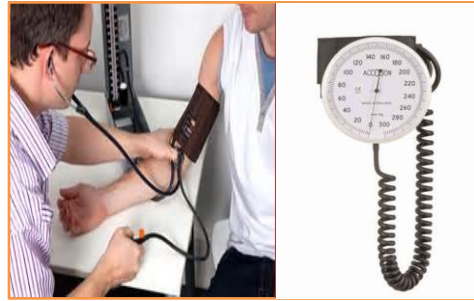


BP Measurement

Oscillometric (electronic)
Cuff is sensor



Auscultatory
mercury vs aneroid



<http://www.dableducational.org/sphygmomanometers.html>
<http://www.bhsoc.org/bp-monitors/bp-monitors/>

Your advice?

Encourage weight loss;
Diet review; nutritionist referral
Review sodium guidelines
Alcohol: reduce drinking
Encourage exercise
Encourage CPAP use nightly

Monitor home BP



HOME BLOOD PRESSURE Tracker

	1 st morning BP Before pills	Repeat morning BP 3 minutes later	1 st evening BP Before pills	Repeat evening BP 3 minutes later
Day 1				
2				
3				
4				
5				
6				
7				




Normal BP: Average <135/85 mm Hg

Lifestyle Modification

Modification	~SBP reduction
Weight reduction	5-20 mmHg/10 kg
DASH diet	8-14 mmHg
Na ⁺ reduction	2-8 mmHg
Physical activity	4-9 mmHg
Moderate alcohol	2-4 mmHg

LIFESTYLE MODIFICATION

Initial Therapy (Attempts)

- Exercise: ≥ 30 min 5/wk; 60 min daily?
- Sodium restriction (<2.3 gm  / <1.5 gm/day*)

*Htn, >50 years, DM, blacks, CKD




Americans eat 3.5-4 grams sodium/day

- Moderate alcohol (1-2/day)

ANTI-HYPERTENSIVE DRUGS

1, 2 and 3:
A, C, D

ACE Inhibitors/ Angiotensin Receptor Blockers

-  renal protection. DM. CHF. LVH. post MI
albuminuria reduction
increase insulin sensitivity
-  lipids
-  hyperkalemia. pregnancy. bilateral RAS.
cough. angioedema

Calcium Channel Blockers

- effective in blacks, elderly, DM
- ✚ effective in low-renin hypertension
- renal protection
- angina. Raynaud's syndrome

- insulin sensitivity
- lipids

- edema

Diuretics

- ✚ effective, esp in CHF, ISH, blacks, DM

- hypokalemia
- hyperglycemia
- hyperlipidemia
- hyperuricemia

4, 5

Beta-Blockers

- ✚ effective in htn, coronary disease, migraine. thyrotoxicosis. essential tremor. CHF. MI. perioperative HTN
- asthma. heart block. ↓ insulin sensitivity & glucose tolerance

Vasodilating BB

MRA

- ✚ effective; esp post MI and CHF; resistant htn
- gynecomastia. high K+ esp with renal insufficiency

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Clonidine

- ✚ transdermal once weekly
- fatigue, depression, xerostomia, withdrawal syndrome

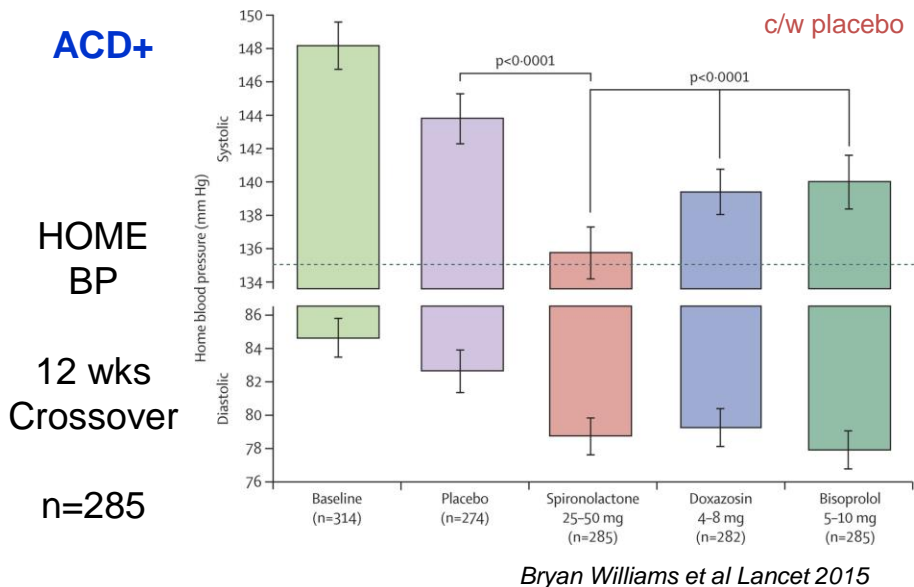
Alpha-Antagonists

- ✚ increase insulin sensitivity and glucose tolerance
- slightly lower lipids
- prostatism
- orthostatic hypotension. CHF
- lacking controlled intervention trial data

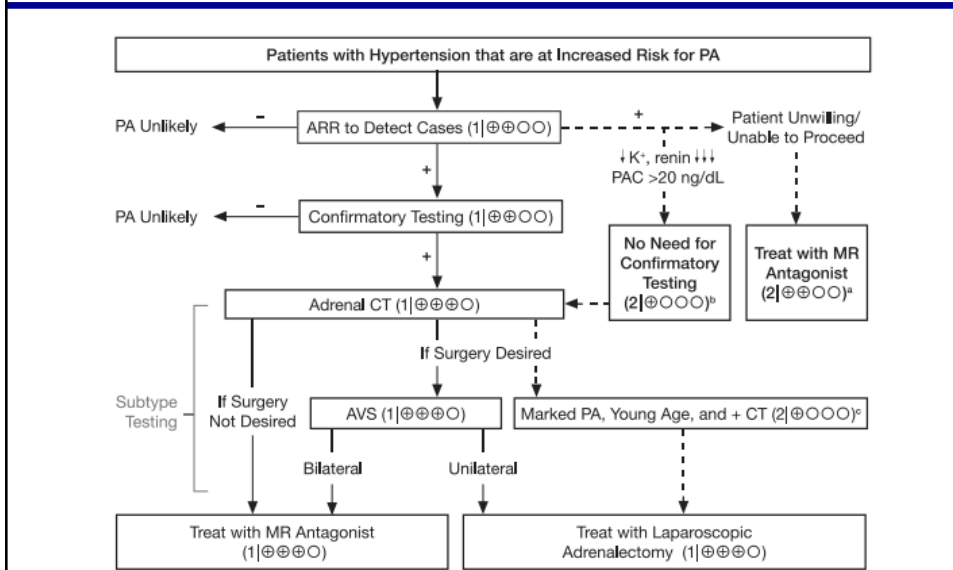
Hydralazine

- QID dosing; tachycardia; lupus-like syndrome; unpredictable response

Spironolactone for Resistant Htn



Primary Aldosteronism: Endocrine Society Clinical Guidelines 2016



JNC7 Blood Pressure Classification

2003

Normal	<120	and	<80
Prehypertension	120–139	or	80–89
Stage 1 Hypertension	140–159	or	90–99
Stage 2 Hypertension	≥160	or	≥100



JNC 8 Recommendations

2014

Patient Subgroup	Target SBP (mm Hg)	Target DBP (mm Hg)
≥ 60 years	<150	< 90
< 60 years	<140	< 90
> 18 years with CKD	<140	<90
> 18 years with diabetes	<140	<90

CKD = chronic kidney disease; DBP = diastolic blood pressure; SBP = systolic blood pressure

James PA, et al. *JAMA*. 2013 Dec 18. [Epub ahead of print]

SPRINT

Systolic Blood Pressure Intervention Trial

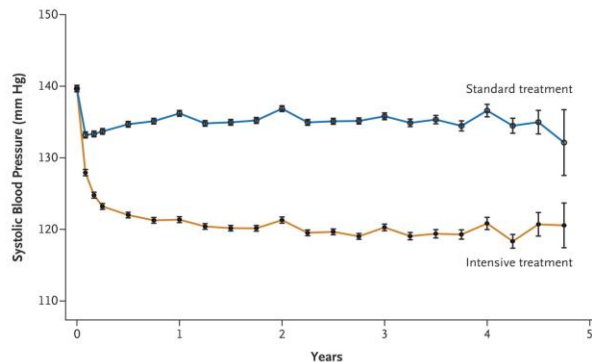
Background: Optimal target for SBP lowering uncertain

Randomized 9300: SBP 120 vs 140 mm Hg

Stopped at 3.3 years; planned average 5 year f/u

“Landmark NIH study... Milestone... Major Advance... SPRINT shows intensive blood pressure management may save lives”

Systolic Blood Pressure over Course of the Trial



Average SBP during follow-up:

Standard: 134.6 mm Hg

Intensive: 121.5 mm Hg

No. with Data

Standard treatment	4683	4345	4222	4092	3997	3904	3115	1974	1000	274
Intensive treatment	4678	4375	4231	4091	4029	3920	3204	2035	1048	286

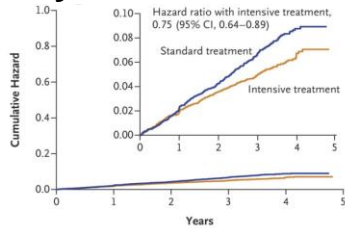
Mean No. of Medications

Standard treatment	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
Intensive treatment	2.3	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0

MDs chose drugs

SPRINT: MAIN RESULTS

Primary Outcome

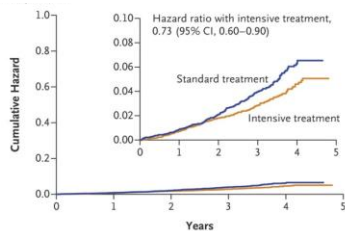


↓ 25%

MI, ACS,
Stroke,
CHF,
CV death

243 vs 319
NNT 61

Death from any Cause



↓ 27%

ANY
DEATH

155 vs 210
NNT 90

DIABETES GOALS ?



“More uncertainty about appropriate BP targets in diabetic patients” Feb 2016



DM

2003
JNC7 <130/80 mm

2013
ADA raised target to
<140/90 mm Hg

2016...
Goal may revert to
<130/80 mm Hg


SUMMARY

MANY CAUSES of resistant hypertension

Obesity Salt

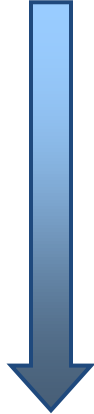
White Coat Sleep Apnea Alcohol

Renovascular disease



Primary aldosteronism

Cushing's
pheochromocytoma



THOROUGH EVALUATION crucial,
including history, habits, exam and labs

LOWERING BP reduces risk, prevents death:
assess risk and BP

CHANGING GOALS

140/90 still. 135/85, 130/80

Individualized; ranges

120

80

LIFESTYLE, COMBINED REGIMENS crucial

