

Hypertension

Susan R. DiGiovanni, M.D.
Associate Professor
VCU School of Medicine

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Proper Technique for Measurement of Blood Pressure

- Patient Conditions:
 - no caffeine during preceding hour, no smoking for 30 minutes prior to readings
 - comfortable, warm surroundings
 - pt sitting with feet on ground (or supported)
 - arm is supported at the level of the heart

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Proper Technique for Measurement of Blood Pressure

- Equipment:
 - Cuff size: the cuff should cover at least 1/2 of the length of the arm and completely surround the arm
 - The bladder should be positioned over the brachial artery
 - Manometers should be calibrated every 6 months against a mercury manometer

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Proper Technique for Measurement of Blood Pressure

- Take at least 2 readings each visit, separated by as much time as possible, if readings vary by more than 5 mm Hg, take additional readings until two consecutive readings are close
- Inflate the bladder to 20 mm Hg above the systolic blood pressure as estimated by the radial pulse

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Proper Technique for Measurement of Blood Pressure

- Deflate the bladder at a rate of 3 mm Hg per second
- Note the position of the patient, which arm and the cuff size used
- For the diagnosis of hypertension, take three readings at least one week apart (except for severe hypertension)
- Take BP in both arms initially, then in the future always use the arm with the higher reading

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Hypertension: The Problem

- 60 million Americans have high blood pressure
- Virginia has the 7th highest stroke rate in the US
- The prevalence of hypertension in Black males in our region is about 35%, many are not aware of their diagnosis
- Most patients with hypertension have additional risk factors for cardiovascular disease and thus early intervention is crucial

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Hypertension: Epidemiology

National Health & Nutrition Examination Survey

	II (1976-80)	III (Phase 1) (1988-1991)	III (Phase 2) (1991-1994)	1999-2000
Awareness	51	73	68	70
Treatment	31	55	54	59
Control	10	29	27	34

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Classification of Blood Pressure for Adults Aged 18 years and older

Category	Systolic	And/Or	Diastolic
Normal	<120	and	<80
Prehypertension	120-139	or	80-89
Hypertension			
Stage 1	140-159	or	90-99
Stage 2	>160	or	>100

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Evaluation of Hypertension

- Purpose:
 - Assess end organ damage
 - Assess cardiovascular risk
 - r/o secondary causes of hypertension

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Evaluation of Hypertension: The History

- Duration of hypertension
- Prior treatment, if any (including assessment of any side effects from medications resulting in discontinuation)
- Assess ingestion of substances known to influence blood pressure: e.g. Estrogens, adrenal steroids, sympathomimetics, excess sodium

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Evaluation of Hypertension: The History - 2

- Family history: hypertension, premature cardiovascular disease, familial diseases, renal disease, diabetes
- Symptoms of secondary hypertension: muscle weakness, spells of tachycardia, sweating, tremor, thinning of the skin, flank pain

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Evaluation of Hypertension: The History - 3

- Symptoms of End-Organ Damage: headaches, transient or permanent weakness or blindness, loss of visual acuity, chest pain, dyspnea, claudication
- Presence of other risk factors: smoking, diabetes, hyperlipidemia, physical inactivity, obesity

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Evaluation of Hypertension: The History - 4

- Dietary history: sodium, alcohol, saturated fats
- Psychological factors: family structure, work status, educational level
- Sexual function

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Evaluation of Hypertension: The Physical Exam

- Fundoscopy
- Neck: palpation and auscultation of the carotid pulses, thyroid palpation
- Heart: size, rhythm, sounds
- Lungs: listen for rales
- Abdomen: assess for renal masses, bruits over aorta or renal arteries

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Evaluation of Hypertension: The Physical Exam - 2

- Extremities: palpate peripheral pulses, assess for edema
- Neurologic Assessment: evidence of CVA

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Evaluation of Hypertension: Laboratory Testing

- CBC
- Chem 7
- Urinalysis
- Lipid Profile

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Evaluation of Hypertension: The Electrocardiogram

- Diagnosis of LVH made by:
 - R wave in I + S wave in lead III > 25mm
 - R wave in aVL > 11 mm
 - R wave in aVF > 20 mm
 - S wave in aVR > 14 mm
 - R wave in V5 or V6 > 26 mm
 - R wave in V5 or V6 + S wave in V1 > 35 mm
 - Largest R wave + largest S wave in precordial leads > 45

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Retinal Disease In Hypertension

- Arteriolar Thickening
 - Grades I & II: enhanced prominence of light reflex, vascular tortuosity, A V nicking
 - Grades III & IV: copper wire, then silver wire changes of arterioles

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Retinal Disease In Hypertension

Hypertensive Retinopathy

- Grades I & II: focal then generalized arteriolar constriction representing the autoregulatory response to increased blood pressure
- Grades III: flame shaped hemorrhages, fluffy, white cotton wool spots, yellow white exudates

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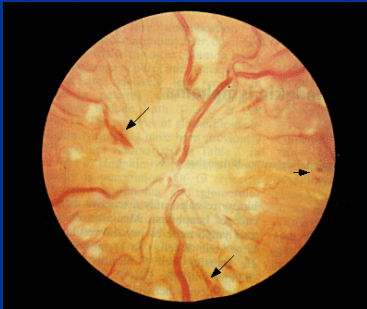
Retinal Disease In Hypertension

Grade IV Hypertensive Retinopathy

- Hemorrhages and exudates
- Papilledema (blurring of disk margins)

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Retinal Disease In Hypertension



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Retinal Disease In Hypertension



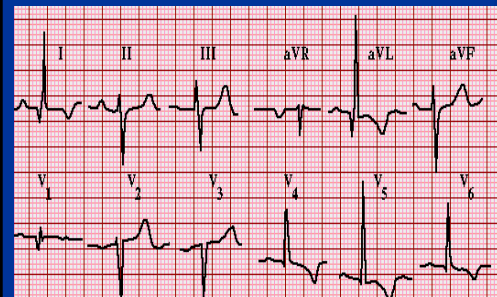
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Retinal Disease In Hypertension



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Left Ventricular Hypertrophy



Secondary Hypertension

Etiology

- Renal Artery Stenosis
- Hyperaldosteronism or Glucocorticoid Responsive Hypertension
- Cushing's Syndrome
- Hypothyroidism
- Coarctation of the Aorta

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Secondary Hypertension

Etiologies Continued

- Renal Parenchymal Disease
- Pheochromocytoma
- Oral Contraceptives

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Renal Artery Stenosis

- New onset hypertension <20 or >50 y.o.
- No family history of hypertension
- Severe or refractory hypertension
- Asymmetric renal size (Sono, IVP or CT)
- Abdominal Bruit (esp. if diastolic)
- Acute rise in Serum creatinine post starting ACE inhibitor

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Secondary Hypertension: Renovascular Disease

- Screening Tests
 - "Hypertensive Urogram"
 - Renal artery ultrasound
 - Captopril Renal Scan
 - Magnetic Resonance Angiography
 - Spiral CT
 - Angiogram

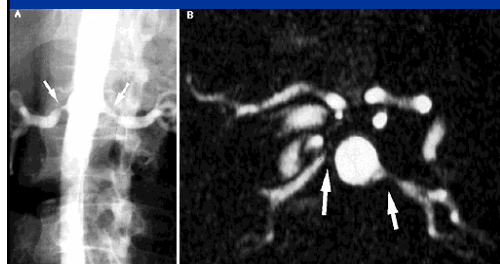
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Secondary Hypertension: Renovascular Disease

- Captopril Renal Scan
 - DTPA Nuclear Medicine scan post administration of Captopril 25 mg po
 - Criteria for "positive" test:
 - Decrease relative uptake of one kidney in which that kidney accounts for $\leq 40\%$ GFR
 - Delayed uptake by both kidneys that is improved on a "resting" scan

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Secondary Hypertension: Renovascular Disease



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Secondary Hypertension: Primary Renal Disease

■ Screening/Detection:

- Abnormal Urinalysis
- Elevated serum creatinine
- Renal Ultrasound

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Secondary Hypertension: Primary Renal Disease

■ Mechanisms of Hypertension in Renal Parenchymal Disease:

- Activation of RAAS
- Increased Sodium & Water Retention
- Activation of the Sympathetic Nervous System
- ? Secondary Hyperparathyroidism

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Secondary Hypertension: Oral Contraceptives

- 2-5% of women on oral contraceptives develop hypertension
 - It is thought that these women are susceptible to hypertension genetically
- Mechanisms not well understood ?
Increase renin substrate
- Stopping therapy should return BP to normal in 2-3 months

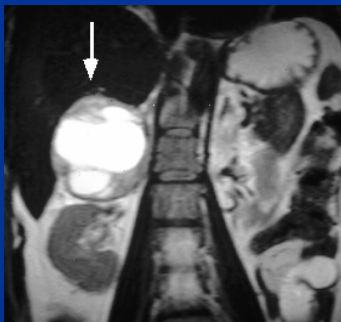
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Secondary Hypertension: Pheochromocytoma

- Paroxysmal elevations of blood pressure
- Triad of symptoms:
 - Headache
 - Palpitations
 - Sweating
- Weight Loss

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Secondary Hypertension: Pheochromocytoma

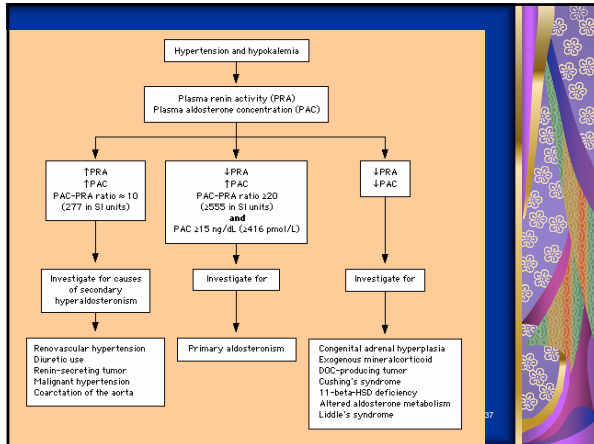


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Secondary Hypertension: Primary Hyperaldosteronism

- Unexplained hypokalemia with accompanying renal potassium wasting
- Metabolic Alkalosis

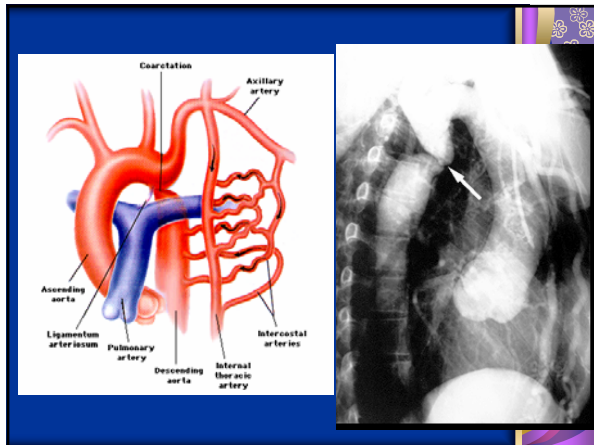
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Secondary Hypertension: Coarctation of the aorta

- Usually picked up by the pediatrician/ family practitioner
- 3-5% of all congenital heart disease
- More common in males
- Differential blood pressures and pulses between the upper and lower extremities is the hallmark of the disorder

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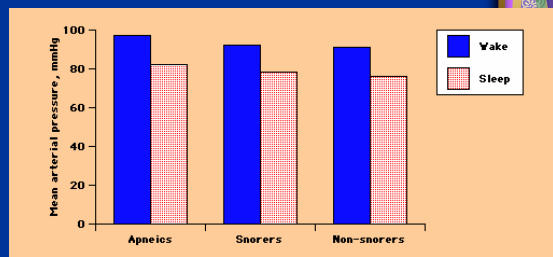


Secondary Hypertension: Sleep Apnea

- Obesity is a common denominator in many patients with Sleep Apnea Syndrome and Hypertension
- Even if correct for BMI, blood pressure is higher in apneic patients
- Treatment of sleep apnea will alleviate the hypertension in many but not all patients

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Secondary Hypertension: Sleep Apnea



Hypertension: Therapy

- Why Treat?**
 - Hypertension increases risk for cardiovascular disease, stroke, blindness, renal disease
 - Studies indicate that control of BP reduces risk of MI or stroke

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Antihypertensive Treatment

BP Classification	Lifestyle Modification	Initial Drug Therapy	
		W/O Compelling Indication	W/ Compelling Indication
Normal	Encourage	No Antihypertensive Drug Indicated	Drug(s) for compelling indication
Prehypertensive	Yes	No Antihypertensive Drug Indicate	Drug(s) for compelling indication
Stage 1	Yes	Diuretics, consider ACEI, ARB, BB, CCB or combo	Drug(s) for compelling indications and other drugs as needed
Stage 2	YES	Two-drugs: Thiazide & ACEi or ARB or BB or CCB	

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Drug Guidelines for "Compelling Indications"

Compelling Indication	Recommended Drugs					
	D	BB	ACEi	ARB	CCB	Aldo Antag
CHF	X	X	X	X		X
Post MI		X	X			X
CAD	X	X	X		X	
DM	X	X	X	X	X	
CKD			X	X		
Stroke Prevention	X		X			

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Hypertension: Therapy

- Nonpharmacologic Treatments
 - Weight reducing diet
 - Exercise
 - Stop smoking
 - Limit caffeine
 - Low sodium diet
 - "Stress" reduction

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Hypertension: Therapy Thiazide Diuretics

- Still recommended as initial treatment of hypertension
- Particularly useful in AA males
- Use low dose (12.5-25mg)
- Cheap (about \$4.00/month)
- Disadvantages: hypokalemia, altered glucose metabolism (increases insulin resistance), increase lipids (& decrease HDL), increase uric acid, sexual dysfunction

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Hypertension: Therapy Beta Blockers

- Very effective
- Older preparations are inexpensive
- Especially useful to decrease reflex tachycardia seen from other antihypertensives
- Preferred drug in patients with migraines, h/o recent MI, angina, glaucoma

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Hypertension: Therapy Beta Blockers

- Disadvantages:
 - Fatigue
 - Weakness
 - Impotence
 - Increase insulin resistance
 - Decrease HDL, increases LDL & triglycerides
 - Withdrawal syndrome

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Hypertension: Therapy ACE Inhibitors

- Major advantage in patients with CRF, DM, CHF
- Few side effects
- Many can be given once or twice daily
- Higher doses may be required for AA pts
- Disadvantages: cough, angioedema, contraindicated in pts with bilateral renal artery stenosis

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Hypertension: Therapy ANG II Receptor Inhibitors

- No cough or angioedema, so better tolerated than ACE inhibitors
- Disadvantage: No experience with long-term benefits

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Hypertension: Therapy Calcium Channel Blockers

- 3 classes: dihydropyridines (e.g. nifedipine)
 - verapamil
 - diltiazem
- Very effective as monotherapy in AA
- Hypotensive effect partially attenuated by RAA and sympathetic nervous system (esp. dihydropyridines)

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Hypertension: Therapy Alpha -1 Blockers

- Modest antihypertensive effect
- Good drug in older men with prostatic hypertrophy
- Disadvantages: fatigue, drowsiness, dizziness

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Hypertension: Therapy Central Sympathetic Blockers

- E.g. Clonidine, methyldopa, guanabenz, guanfacine
- Do not effect lipid metabolism
- Methyldopa has the best track-record for pregnant women
- Most cause severe withdrawal hypertension

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Hypertension: Therapy Vasodilators

- E.g. Minoxidil, hydralazine
- Excellent antihypertensive agents
- Disadvantages: fluid retention, minoxidil causes hair growth and hydralazine has been shown to cause drug-induced lupus in some patients

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