Team Medicine

Hypertension

Writer: Abdurrahman Alkthiry
Reviser: Tarfah Al-Obaidan
Leader: Alanood Asiri

431 Teams
medical students

■ Important notes ■ Explanatory and Doctor's notes

We took some useful notes from 429 team, so we thank them a lot..

Definition:

Hypertension is a condition in which arterial blood pressure(BP) is chronically elevated.

- The 4th most common cause of death worldwide(cardiovascular diseases-infection- cancer-HTN)
- Directly and indirectly responsible for >20% of all deaths
- 29-30% incidence of hypertension in the 18 year and older population of the United States
- 9.1% and 8.7% the population of Saudi Arabia with hypertension 160/95 mmHg (this incidence for stage II only)
- Onset stage 25-55 years mainly in 40-50y
- Occurs over 30% of persons older than 65 y
- Only 34% of persons with hypertension have their blood pressure under control
- **In 90%-95% of cases no cause can be found: primary hypertension (essential)**
- Secondary hypertension 5-10%
- The patient must be (diagnosed), then get (treated) then hopefully his HTN will be (controlled)!

Essential Hypertension

Unknown (multifactorial) etiology.

NSAIDs >> salt and water retention >> HTN!

Risk Factors

- Age & gender (more common in men)
- Obesity; metabolic syndrome
- Excessive salt intake; low potassium intake
- Excessive alcohol intake
- Polycythemia
- Lack of exercise
- Non-steroid anti-inflammatory drugs
- Family history of essential HTN
- **Caffeine and smoking increase the BP acutely but are NOT risk factors for the development of chronic essential HTN**

Any patient comes to you with HTN, you first have to Rule out renal

Secondary Hypertension

- **Primary renal disease (most common)**e.g. Chronic kidney disease, cystic kidney disease
- Oral contraceptives (most common secondary cause in young females) /drugs
- Sleep apnea syndrome (obese people Snoring at night, always fall asleep…so ASK about these symptoms!)(when treat sleep apnea the blood pressure disappear)
- Primary hyperaldosteronism (retention of salt and excretion of K+. 30% of patient don't respond to antihypertensive medication most probably have this disease e.g. aldosterone-secreting adenoma/adrenal hyperplasia)

Old women on estrogen> increase production of angiotensinogen in the liver and Renin> salt and water retention >BP> stop estrogen> her BP becomes normal in 6 months!

- Renovascular disease (In ischemic kidney disease the blood flow will decrease due to narrowing of the renal artery >>kidney need more blood so this will produce renin which will cause increase in blood flow>> HTN. More common in:1- young female fibromuscular dysplasia (birth with narrowing in renal artery). 2-old people due to arthrosclerosis→so think of renal artery stenosis.)
- Cushing's syndrome (increase production of corticosteroids).
- Pheochromocytoma (a catecholamine-secreting tumor, it usually comes suddenly with headaches, palpitations, and diaphoresis in association with severe hypertension.)
- Other endocrine disorders e.g. thyrotoxicosis, acromegaly, hyperparathyroidism.
- Coarctation of the aorta (congenital, usually in young patients→high blood pressure in upper part and low in lower part of the body. Descending aorta is narrowing. Check radiofemoral delay).

Stages

BP Classification	SBP mmHg		DBP mmHg
Normal	120	and	<80
Pre-hypertension	120-139	or	80-89
Stage 1 HTN	140-159	or	90-99
Stage 2 HTN	≥160	or	≥100

National Institute for Health and Clinic Excellence Hypertension Guidelines (UK) 2011

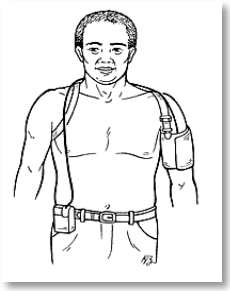
- **Stage 1**
  - Clinical (office) Blood Pressure – 140/90 mmHg
  - Ambulatory Blood Pressure Monitoring (ABPM) – 135/85 mmHg
  - Home Blood Pressure Monitoring (HBPM) - 135/85 mmHg
- **Stage 2**
  - Clinical Blood Pressure – 160/100 mmHg
  - Ambulatory Blood Pressure Monitoring (ABPM) – 150/95 mmHg
  - Home Blood Pressure Monitoring (HBPM) - 150/95 mmHg
- **Severe hypertension (Stage 3)**
  - Clinical Blood Pressure – 180/110 mmHg

Doctor has mentioned that the UK guidelines are the best to be followed, so focus on it!

Measurement of Blood Pressure

Types of Instruments		
Sphygmomanometer (more accurate)	Home blood pressure monitoring	Ambulatory pressure monitoring





Measurement

- Patient should be seated with the back straight and the arm supported at heart level.
- The patient should rest for 5 minutes before 2nd measurement
- The bladder of the pressure cuff should encircle at least 80% of the upper arm
- BP varies widely throughout a 24-hr period; a single elevated reading is not diagnostic.
- If BP is ≥140/90 mmHg, perform second reading. If second reading is still high, take third reading.
- The diagnosis of mild hypertension **should not be made until the blood pressure has been measured on at least three to six visits**
- Average of 10 to 15 mmHg decrease between visits 1 and three

•Apply to adults on no antihypertensive medications and who are not acutely ill
•If there is a great difference in category between SBP & DBP, the higher value determines the severity of the hypertension (HTN could be due to increase in systolic BP, diastolic BP or both)
- When measuring on both arms: take the HIGHER reading
- When measuring on one arm several times: take the LOWER reading

White Coat Hypertension

A phenomenon in which patients exhibit elevated BP in a clinical setting but not in other settings. It is believed that this is due to the anxiety.

- Approximately 20 to 25% of patients with mild office hypertension
- More common in elderly
- Infrequent in patients with office diastolic pressures ≥105 mmHg

One of the causes of sudden death is HTN.

Complications

Hypertension is one of the most significant contributing factors to the development of CV and renal disease. **Complications of hypertension include coronary artery disease, congestive heart failure, stroke, renal disease (including end-stage renal disease), and peripheral vascular disease.** These diseases account for significant disability, loss of productivity, decreased quality of life and majority of deaths associated with untreated HTN.

HTN has effects on the following organs (target organ damage):

a. Cardiovascular system

I. HTN is a major risk factor for CAD, with resultant angina and MI.
II. CHF is a common end-result of untreated HTN as LVH occurs
III. Most deaths due to HTN are ultimately due to MI or CHF
IV. HTN predisposes the patient to peripheral vascular disease (PVD).
V. HTN is associated with increased incidence of aortic dissection

b. Eyes (retinal changes)

c. CNS
I. Increased incidence of intra-cerebral **hemorrhage (stroke)**
II. Increased incidence of other stroke subtypes as well (transient ischemic
attacks [TIAs], **ischemic** stroke, and **lacunar** stroke)
III. Hypertensive **encephalopathy** when BP is severely elevated (uncommon)
d. **Kidney**
I. **Arteriosclerosis** of afferent and efferent arterioles and glomerulus "**nephrosclerosis**"
II. Decreased GFR and dysfunction of tubules—with eventual renal failure

-In stroke Incidence of thrombosis more than hemorrhage because of vessels vasoconstriction (due to HTN) so the lumen will be narrow and more atherosclerotic deposit so that will cause thrombosis.
- It is important to treat elderly patient with HTN to prevent dementia.

Common cause of renal failure in black people is HTN (poorly controlled and they are not taking their medications, usually they present with proteinuria and hematouria then it progress to loss of the kidney functions at the end they develop renal failure.

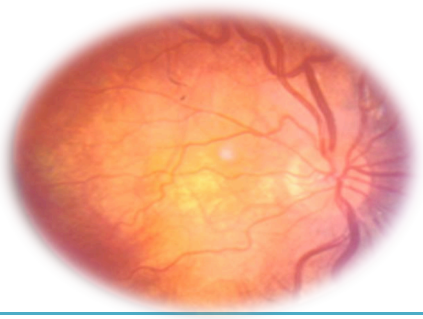
Risk of Hypertension for each 2 mmHg increase in systolic blood pressure:
-Increase risk of cardiovascular mortality by 7%
-Risk of stroke by 10%

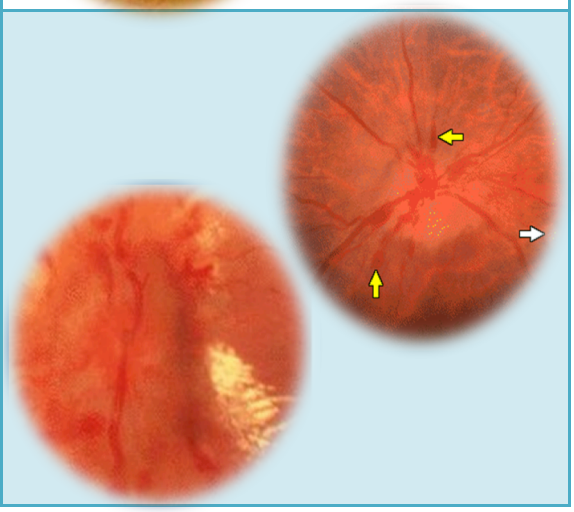
If you don't treat patients with hypertension after six months they will develop emergency or urgency HTN→ BP very high and difficult to control and they might have end organ failure.

Malignant Hypertension

- Marked hypertension with encephalopathy (confusion etc) & retinal hemorrhages, exudates, or papilledema

Associated with a diastolic pressure >120 mmHg.

Hypertensive Retinopathy			
Grade	Description	A:V Ratio	Image
I	*Normal A:V ratio is 2:3* • Minimal Narrowing of the retinal arteries • Generalized arteriolar constriction seen as "silver wiring" • Vascular tortuosities	**50%**	

II	Narrowing of the retinal arteries in conjunction with regions of focal narrowing and arteriovenous nipping (the vessel wall thickens due to arteriolosclerosis, the vein is displaced. If, as the artery crosses over the vein, the vein is compressed, it will appear "nicked")	**33%**	
III	Abnormalities seen in Grades I and II, as well as • Retinal hemorrhages (intraretinal) • Hard exudation (exudation of fluid & lipids) • Cotton-wool spots (contain cell organelles; are due to damage to nerve fibers) Flame-shaped hemorrhages (blood accumulates at the level of nerve fiber layer)	**25%**	
IV	Abnormalities encountered in Grades I through III, as well as: • Swelling of the optic nerve head • Macular star (Blurring of the borders of the optic disk with hemorrhages (yellow arrows) and exudates (white arrow)) Papilledema from malignant hypertension.	**<20%**	

Hypertensive Emergency

Severe hypertension (diastolic blood pressure >120 mmHg) in end organ damage (MI, STROKE, AKI, CHF) = severe headache, altered mentation, visual disturbances. Give IV agents e.g. nitroprusside, labetalol, or nitroglycerin

Hypertensive Urgency

- Severe hypertension (diastolic blood pressure above 120 mmHg) in asymptomatic patients with no evidence of acute end-organ
- There is **no proven benefit from rapid reduction of BP** in these patients
- BP should be lowered over a period of 24 hours with oral agents

Diagnosis

Clinical Presentation

- Asymptomatic (so it is important to do screening for people who have risk factors)
- Headache
- Chest discomfort
- Symptoms of complications

Screening

- Every two years for persons with systolic and diastolic pressures <120 mmHg and 80 mmHg
- Yearly for persons with a SBP of 120 to 139 mmHg OR DBP of 80-89 mmHg

History

- Presence of precipitating or aggravating factors
- Natural course of the blood pressure
- Extent of target organ damage
- Presence secondary HTN of other risk factors for cardiovascular disease

Important aspects of the history in the patient with hypertension	
Duration of hypertension	**Presence of other risk factors**
Last known normal blood pressure	Smoking
Course of the blood pressure	Diabetes
Prior treatment of hypertension	Dyslipidemia
Drugs: types, doses, side effects	Physical inactivity
Intake of agents that may cause hypertension	**Dietary history**
Estrogens	Sodium
Adrenal steroids	Alcohol
Cocaine	Saturated fats
Sympathomimetics	**Psychosocial factors**
Excessive sodium	Family structure
Family history	Work status
Hypertension	Educational level
Premature cardiovascular disease or death	**Sexual function**
Familial diseases: pheochromocytoma, renal disease, diabetes, gout	**Features of sleep apnea**
Symptoms of secondary causes	Early morning headaches
Muscle weakness	Daytime somnolence
Spells of tachycardia, sweating, tremor	Loud snoring
Thinning of the skin	Erratic sleep
Flank pain	
Symptoms of target organ damage	
Headaches	
Transient weakness or blindness	
Loss of visual acuity	
Chest pain	
Dyspnea	
Claudication	

Physical Examination

- To evaluate for signs of end-organ damage
- For evidence of a cause of secondary hypertension

Important aspects of the physical examination in the hypertensive patient
Accurate measurement of blood pressure
General appearance
Distribution of body fat
Skin lesions
Muscle strength
Alertness
Fundoscopy
Hemorrhage
Papilledema
Cotton-wool spots
Neck
Palpation and auscultation of carotids
Thyroid
Heart
Size
Rhythm
Sounds
Lungs
Rhonchi
Rales
Abdomen
Renal masses
Bruits over aorta or renal arteries
Femoral pulses
Extremities
Peripheral pulses
Edema
Neurologic assessment
Visual disturbance
Focal weakness
Confusion

Laboratory Tests

- Routine Tests (to rule out kidney disease)
  - Electrocardiogram
  - Urinalysis
  - Blood glucose, and hematocrit
  - Serum sodium ,Serum potassium, creatinine, or the corresponding estimated GFR,
    and calcium
  - Lipid profile, after 9- to 12-hour fast, that includes high density and low-density lipoprotein cholesterol, and triglycerides
- Optional tests
  - Measurement of urinary albumin excretion or albumin/creatinine ratio
- More extensive testing for identifiable causes is not generally indicated unless BP control is not achieved

Treatment

1- Lifestyle modifications

- High normal SBP >130 – 139 mmHg
  DBP 85 – 89 mmHg
  in high risk patients

2-Drug therapy

- If BP is 140/90 mmHg

Treating HTN will decrease the risk of stroke by 50%, (strokes in HTN happen d/t ↑ atherosclerosis >> ↑ thrombosis!) (Doctor)

Who Should Be Treated?

- Persistently elevated BP after 3-6 visits over a several month period
- If the SBP is persistently ≥140 and/or the DBP is persistently ≥90 mmHg
- SBP is persistently > 130 mmHg and/or the DBP is > 80 mmHg in patients w/CVS disease, post-myocardial infarction, heart failure, CKD & DM
- Patients with office hypertension, normal values at home, and no evidence of end-organ damage should undergo ambulatory blood pressure monitoring
- Blood Pressure Target (UK):
  - Age > 80 yrs - 150/90 mmHg
  - Age < 80 yrs (high risk) – <140/90 mmHg
  - Age < 80 yrs (no risk) – 140/90 mmHg
- Blood Pressure Target(European) :
  - <140/90 mmHg

Benefits of lowering BP: Average Percent Reduction	
Stroke incidence	35–40%
Myocardial infarction	20–25%
Heart failure	50%
Renal Failure	35-50%

1-Lifestyle Modifications

Modification	Approximate SBP reduction (range)
Weight reduction	5–20 mmHg/10 kg weight loss
Adopt DASH eating	8–14 mmHg
Dietary sodium	2–8 mmHg
Physical activity	4–9 mmHg
Moderation of alcohol consumption	2–4 mmHg

Dietary Approaches to Stop Hypertension (DASH)

- Diet high in fruits and vegetables and low-fat dairy products
- Recommends 7-8 servings/day of grain products, 4-5 vegetable, 4-5 fruit, 2-3 low/non-fat dairy products, 2 or less meat, poultry, and fish

Follow Up & Monitoring

- Patients should return for follow-up after 4 weeks and adjustment of medications until the BP goal is reached.
- More frequent visits for stage 2 HTN or with complicating co-morbid conditions.
- Serum potassium and creatinine monitored 1–2 times per year.

Drug Therapy

- A low dose of initial drug should be used, slowly titrating upward.
- Optimal formulation should provide 24-hour efficacy with once-daily dose.
- Combination therapies may provide additional efficacy with fewer adverse effects.

Drug	Example	Side effect
Diuretics	**-Thiazides:** Hydrochlorothiazide **-Loop Diuretics:** Furosemide **-Aldosterone Blockers:** Spironolactone **-Combinations:** Hydrochlorothiazide & spironolactone	-Hypokalemia. - Hyponatremia
β-Adrenergic Blocking Agents	**Cardio-selective :** atenolol. **Cardio non-selective :** propranolol.	Bradycardia
Angiotensin-Converting Enzyme Inhibitors (ACEI)	Enalapril Lisinopril	Hyperkalemia + cough
Angiotensin II Receptor Blockers (ARBs)	Losartan	Hyperkalemia
Calcium Channel Blocking Agents	Amlodipine Verapamil	Edema + Tachycardia + Bradycardia
α-Adrenoceptor Antagonists	Prazosin	1st dose hypotension
Drugs with Central Sympatholytic Action	Clonidine	Drowsiness
Arteriolar Dilators	Hydralazine	Tachycardia + Edema

High-Risk Group Therapy

-Start in pre-hypertension (130 – 139)/(85 – 89) mmHg
-Lifestyle change

Heart Failure	Thiazides, B-Blockers, ACEI, Aldosterone Antagonist
Post-MI	B-Blockers, ACEI
Diabetes	Thiazides, ACEI, ARB, CCB
Chronic Kidney Disease	ACEI, ARB, Thiazide
Recurrent Stroke Prevention	ACEI, CCB

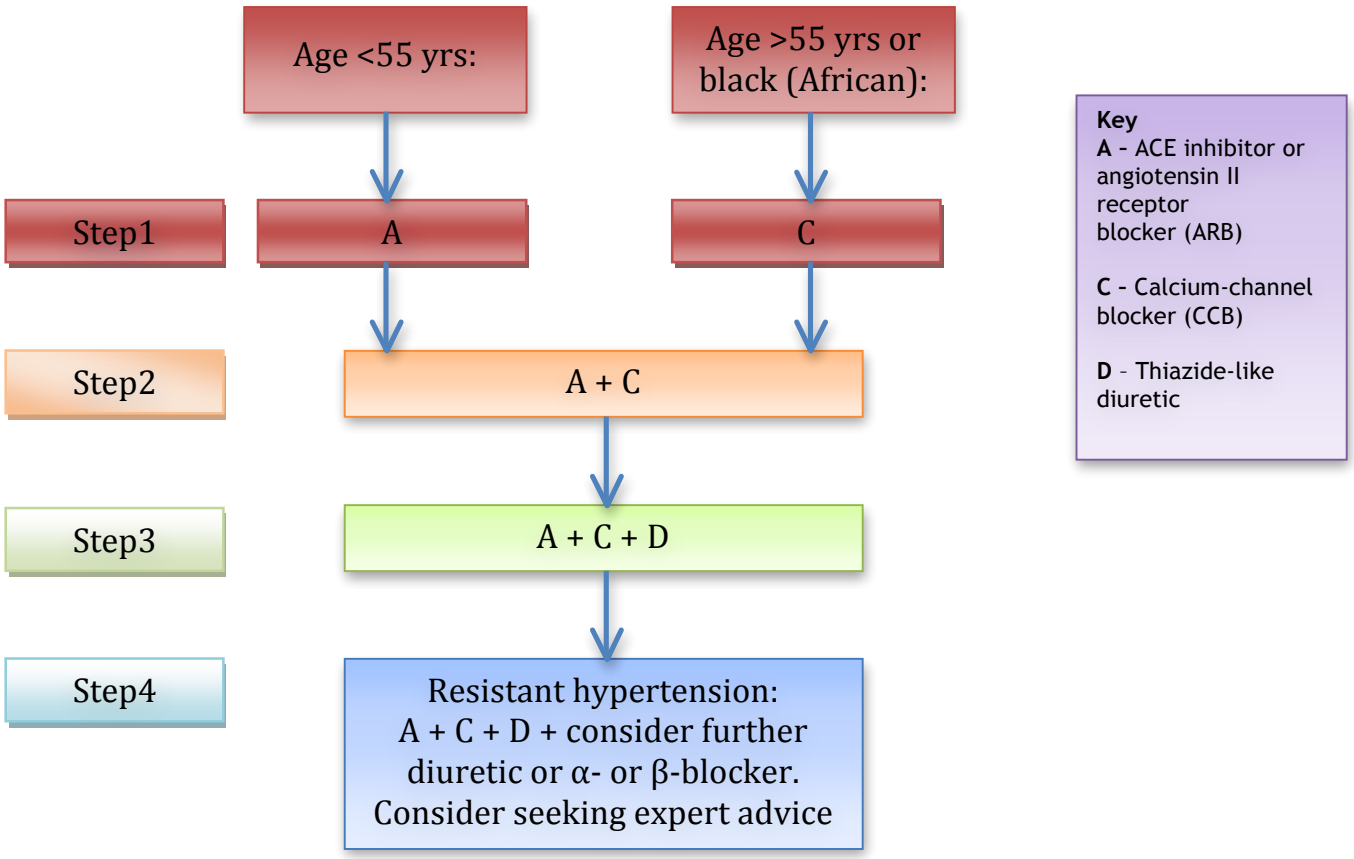
Combination Therapies

We try to avoid Beta blocker because incidence of stroke is higher than other medication

- ACE inhibitors and diuretics
- Angiotensin II receptor antagonists and diuretics
- Calcium antagonists and ACE inhibitors
- Angiotensin II receptor antagonists & β-adrenergic blockers or ACEI NOT RECOMMENDED
- Other combinations (β-adrenergic blockers and diuretics)

Not recommended combination:
ACEI+ ARB→ Acute renal failure hyperkalemia - deteriorattion of kidney function - high mortality
Beta Blocker + ARB→High mortality

Summary of antihypertensive drug treatment:



Summary:

Definition: hypertension is a condition in which arterial blood pressure(BP) is chronically elevated.
Stages: normal, Pre-hypertension, Stage 1(140/90 mmHg), stage2 (160/100 mmHg) and stage3(180/110 mmHg).
BP Measurement: Sphygmomanometer(more accurate), home blood pressure monitoring and ambulatory pressure monitoring.
Tests: routine Tests (to rule out kidney disease): Electrocardiogram, urinalysis, blood glucose, hematocrit, serum sodium , serum potassium, creatinine, or the corresponding estimated GFR, calcium and lipid profile.
Treatment: Diuretics, B-Blockers, ACEI, , ARB and CCB.
Complications: complications of hypertension include coronary artery disease, congestive heart failure, stroke, renal disease (including end-stage renal disease), and peripheral vascular disease.

Questions:

1- A 34 year old man comes to your clinic with history of headache and dizziness for 2 months. His examination is unremarkable apart from repeated BP measurements of 200/100 mmHg.
What is the most appropriate next step:

A. Recheck his BP again in 1 month.
B. start low salt diet only.
C. start antihypertensive medications.
D. order CT scan of his head.

2- A 55 years old male presented to outpatient clinic with history of fatigue found to have BP of 155/90 , no previous history of hypertension, no diabetes mellitus, with normal laboratory test.
-What is the best next step for the patient?

A. Start Anti hypertension with beta blockers .
B. Repeat the blood pressure measurements after 3 days.
C. Give out patients a follow up after 3 months .
D. Reassure the patient.

Answers:

1- C, 2- B

Recall your information (Extra):