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Antihypertensive Drugs

Objectives:

- Identify the factors that control blood pressure.
- Outline the pharmacologic classes of drugs used in treatment of hypertension.
- Describe the mechanism of action, therapeutic uses & common adverse effects and contraindications of each class of drugs.
- Select the suitable antihypertensive drug to treat a specific patient according to efficacy, safety, suitability & cost.

Hypertension

- ❖ **High blood pressure (Hypertension):** is a common condition in which the long-term force of the blood against artery walls is high enough that it may eventually cause health problems.
- ❖ **Epidemiology:** Prevalence: 25-30% of adult population, Only 6% of diagnosed hypertensive patients have goal BP even after correct treatment. In majority of cases, hypertension persists for years without any symptoms, thus called “silent killer”. Eventually, it may lead to many complications including end-organ failure* and death (Leading cause).
- ❖ **Classified into 2 types:**
 1. Primary (essential) Hypertension: mostly no identifiable cause; tends to develop gradually over years.
 2. Secondary Hypertension:
 - secondary to another disease (e.g., Kidney problems, Adrenal gland tumors, Cushing syndrome) it occurs suddenly and causes higher BP than the primary.
 - Drug-induced hypertension, caused by a response to medication, as:
 - A. Alcohol, cocaine, Antidepressants, Caffeine, Corticosteroids, Cyclosporine, Erythropoietin, Estrogens, Nasal decongestants, NSAIDs.
 - B. Rebound hypertension occurs when blood pressure rises after you stop taking or lower the dose of a drug (typically a hypertension medication, e.g. clonidine).

Stages of hypertension

CLASSIFICATION	SYSTOLIC BLOOD PRESSURE (SBP)		DIASTOLIC BLOOD PRESSURE (DBP)
LOW**	<90	or	<60
NORMAL	<120	and	<80
PREHYPERTENSION	120 – 139	or	80 – 89
HIGH: STAGE 1 HYPERTENSION	140 – 159	or	90 – 99
HIGH: STAGE 2 HYPERTENSION	≥160	or	≥100

Management of hypertension

1. Lifestyle modification: Thus patients with hypertension should follow some lifestyle modification, as weight loss, physical activity, sodium reduction and smoking cessation.
2. Drug Therapy: Drug therapy is indicated to achieve target BP = > 140/ 90 mm Hg * (target BP for diabetics = > 130/80 mm Hg)

❖ **Antihypertensive drugs are used in**

combinations for the following reasons:

1. To achieve synergism (improve effects), and thus decrease side effects by decreasing the pharmacological individual dose.
2. Oppose side effects for one another. Note: drugs from the same class or drugs with the same mechanism of action should NOT be combined together, as they may cause resistance and increase side effects.

Continue...

Drug Management of Hypertension:

Classification of Drug		Examples
Diuretics		Hydrochlorothiazide, Chlorthiazide and chlorthalidone, Furosemide
Drugs acting on the reninangiotensin aldosterone system (RAAS)	Angiotensin receptor Blockers	Losartan, valsartan, Candesatran, Telmisartan & irbesartan
	ACE Inhibitor	aptopril, lisonopril, enalapril, ramipril
Calcium channel blockers		Verapamil, Diltiazem & Nifedipine
Vasodilators		Hydralazine, Minoxidil, Diazoxide, & Na-nitropruside
Drugs acting on sympathetic nervous system	β -Adrenoceptor Blockers	Nadolol, Bisoprolol, Atenolol, metoprolol, propranolol, Labetalol, & carvedalol
	α -Adrenoceptor Blockers	Prazosin, doxazosin & Terazosin
	Centrally acting sympatholytic	Clonidine & α methyl dopa

Diuretics Drugs:

Group:	Thiazides	Loop diuretics	Potassium-sparing diuretics
Example	<ul style="list-style-type: none"> •Hydro-chlorothiazide •Chlorthiazide •chlorthalidone <p>best for hypertensive patients with no other complications</p>	<p>Furosemide</p> <p>(more potent diuresis but a smaller decrease in (Pulse volume Recording))</p>	<ul style="list-style-type: none"> •Amiloride •Aldosterone antagonists (mainly <u>spironolactone</u>)
Uses	<p>Thiazide diuretics can be used as initial drug therapy for Mild to Moderate hypertension</p>	<ul style="list-style-type: none"> •hypertension with renal impairment NOT thiazides •manage symptoms of heart failure and edema. 	<p>minimal effect on lowering BP, but used in combination with loop diuretics and thiazides to reduce potassium loss induced by these diuretics</p>
Mechanism	<p>The initial diuresis lasts 4-6 weeks and then replaced by a decrease in PVR.</p> <p>E.g. thiazide diuretics lower BP <u>initially by increasing sodium and water excretion</u>. This causes a decrease in blood volume, resulting in a decrease in cardiac output and renal blood flow. With <u>long-term treatment</u>, plasma volume approaches a normal value, but a hypotensive effect persists that is related to a <u>decrease in peripheral resistance</u> by ↓Na⁺ in vessel wall then ↑Na⁺ - Ca⁺⁺ exchange which ↓Ca⁺⁺ in smooth muscle wall.</p>		
Note	<p>Diuretics may be adequate in mild to moderate hypertension, according to ALLHAT, chlorthalidone is superior to an ACE inhibitor, a calcium channel blocker and an alpha1- adrenergic antagonist in preventing one or more cardiovascular events (CVD). -Contra-indicated in gout & hypokalemia/hyponatremia.</p>		

ACE inhibitors

	Captopril	Lisonopril	Enalapril	Ramipril
Mechanism	<ul style="list-style-type: none"> ACE inhibitors decrease angiotensin II (vasoconstrictor) and increase bradykinin levels (vasodilator) by preventing its degradation by ACE. The antihypertensive effect of ACE inhibitors results primarily from vasodilatation (reduction of peripheral resistance) without reflexively increasing cardiac output, heart rate, or contractility. A fall in aldosterone production may also contribute. Particularly effective when hypertension results from excess renin production (renovascular hypertension, white & young people) 			
Pharmacokinetics	<ul style="list-style-type: none"> Polar, excreted in urine; do not cross BBB Rapidly absorbed from GIT after oral administration. Food reduce their bioavailability. (<i>should be taken on empty stomach</i>) Have a long half-life and thus given only once daily. *<i>Captopril given 3-4 times a day</i> Enalapril & Ramipril are prodrugs, converted to the active metabolite in the liver Enalaprilat is the active metabolite of <u>Enalapril</u>, can be given by I.V. route in hypertensive emergency. It takes 2-4 weeks to see the full antihypertensive effect of ACEI <i>Slow onset of action</i> 			
Clinical use	<ul style="list-style-type: none"> Essential hypertension *Particularly effective when hypertension results from excess renin production (renovascular hypertension in white & young patients) Hypertension with chronic renal disease, ischemic heart disease, diabetes. Treatment of heart failure. (By reducing both cardiac preload and afterload, thereby decreasing cardiac work, as well as inhibit remodelling) 			
Adverse Effects	<ul style="list-style-type: none"> Acute renal failure, especially in patients with bilateral renal artery stenosis. Dry cough (due to increased bradykinin levels) Severe hypotension in hypovolemic patients Renal failure/ agenesis in the fetus, which will lead to oligohydramnios. So contraindicated in pregnancy. Angioneurotic edema, swelling in nose, tongue, throat & larynx (caused by inhibition of bradykinin metabolism which accumulate in bronchial mucosa) First dose effect (severe hypotension). (thus should be given at bed time and start with small dose and increase the dose gradually). Hyperkalemia. Specific to captopril: skin rash, fever, dysgeusia (loss of taste), Proteinuria and neutropenia. These effects are due to a sulfhydryl group in the molecule of captopril. 			

Contraindications

- Patients with **bilateral renal artery stenosis**.
- **hypovolemic** patients (due to Severe hypotension).
- **Pregnancy** (2nd & 3rd trimester) may lead to fetal hypotension, anuria, renal failure & malformation.
- **Potassium-sparing diuretics**, because ACEI may cause hyperkalemia.
- **Contraindicated in Hyperkalemia**
- **NSAIDs**, because they reduce their hypotensive effects by blocking bradykinin-mediated vasodilatation.

Angiotensin receptors blockers (ARB):

<p>Note : in cases of white and young people we use ACEI and ARB because they have high levels of renin and angiotensin</p>	<h3 style="margin: 0;">Losartan</h3>	<h3 style="margin: 0;">Valsartan</h3> <p style="font-size: small; color: white;">We give Valsartan with Thiazides why? Because ACEIs and ARBs cause hyperkalemia while thiazides cause hypokalemia (balance each other out)</p>	<h3 style="margin: 0;">Candesatran & Telmisartan</h3>
<p>Pharmacokinetics</p>	<p>Has a Potent active metabolite. <i>that's why long effect</i> Effective Orally once daily (long half life). Do not cross BBB.</p>		<p>No active metabolite</p>
<p>Mechanism of action</p>	<ul style="list-style-type: none"> ● selective block of AT1 receptors, thus decreasing the activation of AT1 receptors by angiotensin II. Blocking the receptor itself, not only the ACE enzyme. ● No effect on bradykinin (<i>no accumulation=no vasodilation</i>), no cough, no angioedema.<i>why? Because bradykinin is being broken by ACE enzyme.</i> ● Produce more complete inhibition of angiotensin than ACE inhibitors, as there are other enzymes (not only ACE) that can generate angiotensin. 		
<p>Clinical Uses</p>	<p>They may be used as first-line agents for the treatment of hypertension, especially in patients with a compelling indication of diabetes, heart failure, or chronic kidney disease</p>		
<p>ADRs</p>	<p>As ACEI except cough and angioedema. (Thus can be used in asthmatic patients)</p>		
<p>Contra-indications</p>	<p>Same contraindications as ACEI</p>		

Calcium channel blockers

امل (verapamil) و ديلف (diltiazem) و عازم (nifedipine) يشرون الحليب (calcium)

class	Dihydropyridine	phenylalkylamines	Benzothiazepines
Example	Nifedipine	Verapamil	Diltiazem
Characteristic	act mainly on smooth muscle, thus more selective as vasodilators than cardiac depressants. They are, particularly beneficial in treating hypertension. نايف معضل so it's in smooth muscle	act more on myocardium as cardiac depressant اما امل فهي تحب so it's in myocardium	has intermediate effect وعازم يفك الشر بينهم (: intermedite effect)
Pharmacokinetics	<p>Note : in black and old people unlike whites and young they have low levels of renin so no use in giving them ACEI so we give them CCB</p> <ul style="list-style-type: none"> •given orally (onset= 0.5-2h) and I.V. injection for emergency (onset= 1-3min), well absorbed. •CCBs have Short half-life. Sustained-release preparations can permit once-daily dosing, and thus preferred for the treatment of hypertension. 		
	verapamil and nifedipine are highly bound to plasma proteins (more than 90%)		Diltiazem is less (70-80%)
	Nifedipine Doesn't have an active metabolite	Verapamil & Diltiazem have active Metabolites These are considered non-Dihydropyridine CCBs and are contra-indicated in bradycardia+HF	
Mechanism of action	Block the influx of calcium through calcium channels (Ca is important for muscle contraction) resulting in: 1- Peripheral vasodilatation (mainly in arterioles) 2- Decrease cardiac contractility.		
Clinical uses	1-Treatment of chronic hypertension with diabetes or angina 2-Nicardipine can be given by I.V. route & used in hypertensive Emergency nicardipine= cardiac shock		
Adverse effects	Nifedipine: Reflex Tachycardia	Verapamil & Diltiazem Peripheral edema & severe Constipation	Peripheral edema (ankle edema)
	Headache -Hypotension – Flushing (due to vasodilation) Verapamil: constipation		

β- Adrenoceptor – blocking agents

	Non-cardio selective	cardio selective
Drug	<p>Propranolol</p> <p>Never given to asthmatic/COPD patients</p>	<p>Metoprolol , Atenolol, Bisoprolol</p>
uses	<ul style="list-style-type: none"> • can be used in mild to moderate hypertension. • In severe cases used <u>in combination</u> with other drugs. • They should not be the primary agent for primary prevention but are effective as add-on therapy. • may take 2 weeks to optimal therapeutic response (as ACEI). • evidence support using it with patient has concomitant coronary artery disease. • When discontinued, β- blockers should be withdrawn gradually. 	
<u>Mechanism of action</u>	<p>Decrease blood pressure by:</p> <ul style="list-style-type: none"> • Decreasing cardiac output (blocking β1) • inhibiting the release of renin (blocking β1) • Central Mechanism (blocking β-R in CNS) 	
Adverse effect	<ul style="list-style-type: none"> • Increased triglycerides • Fatigue, <u>Hypoglycemia</u>. • Mask the symptoms of <u>Hypoglycemia</u> in diabetic patients. <i>So patient must be well monitored.</i> • Aggravate peripheral arterial disease (as Raynaud's disease) • Erectile dysfunction 	

α -adrenoceptor blockers

Drugs	Prazosin	Doxazosin
	short-acting, causes first dose hypotension & postural hypotension	Preferred, because of its long half- life
Mechanism of action	<ul style="list-style-type: none"> Block α-receptors in arterioles & venules Reduce pressure by decreasing preload & afterload 	
Clinical use	Due to weaker outcome data and their side effect profile, α -blockers are no longer recommended as initial treatment for hypertension, but may be used for refractory cases.	

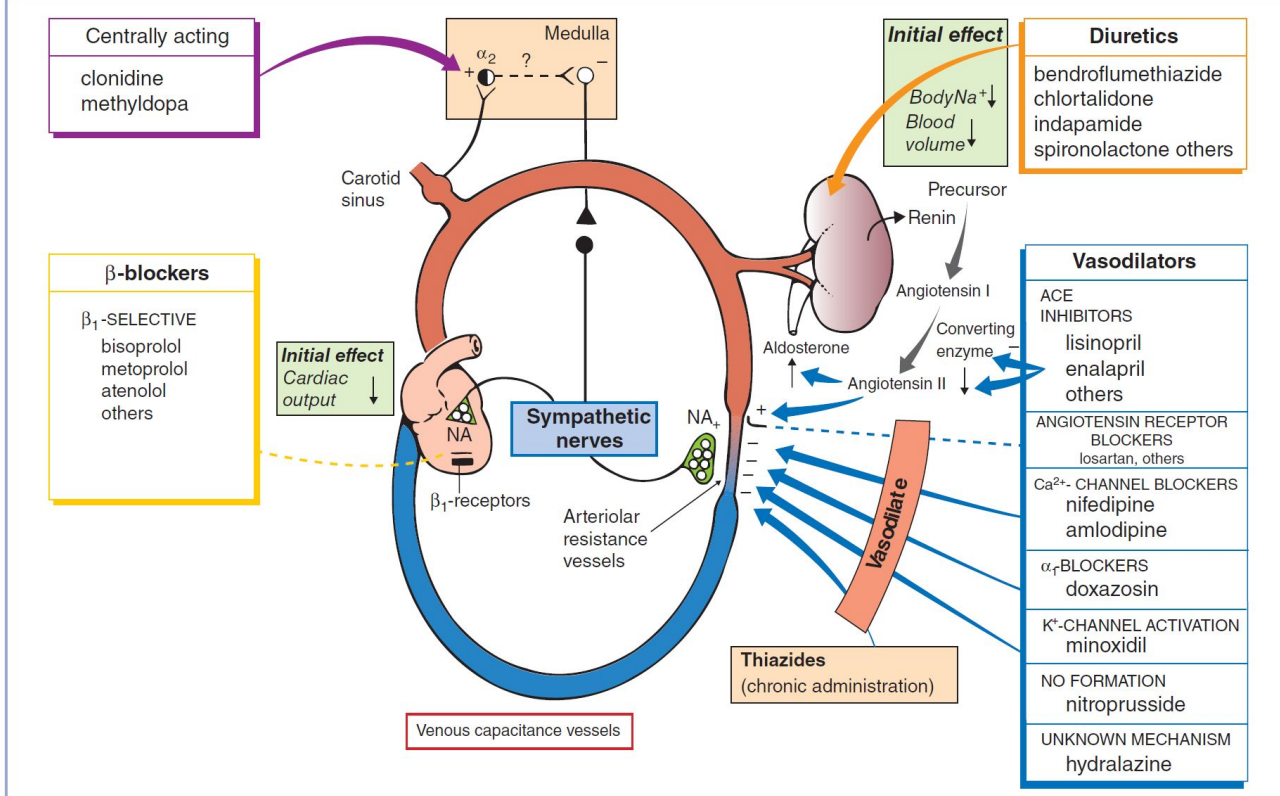
Centrally acting sympatholytic drugs

	Clonidine (Direct α_2 -agonist)	α -methyldopa (Indirect α_2 agonist, converted to methyl norepinephrine)
Mechanism of action	Diminish central adrenergic outflow from the C.N.S, & increase parasympathetic outflow to the heart. This leads to reduced total peripheral resistance, and decreased BP.	
uses	<ul style="list-style-type: none"> hypertension with renal disease (it Does not decrease renal blood flow or glomerular filtration) resistant hypertension 	Safely used in hypertension in pregnancy (first-line)
Adverse effect	Sudden withdrawal of clonidine can lead to rebound hypertension	

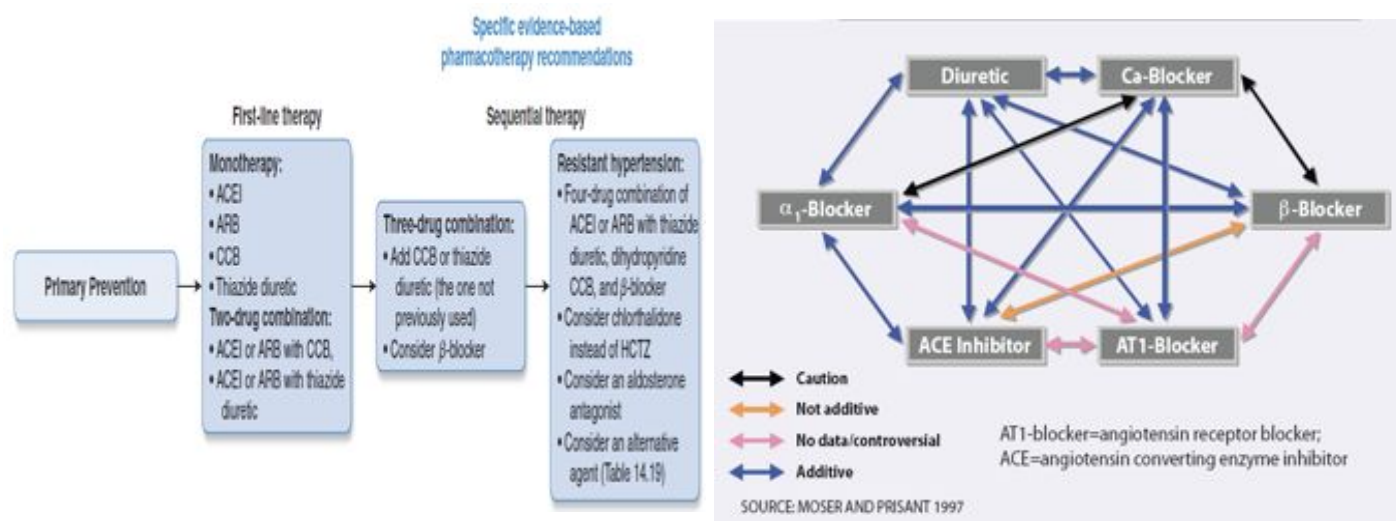
Vasodilators

Classified into arterial, venous or mixed vasodilators

Drug	Hydralazine	Minoxidil	Diazoxide	Sodium nitroprusside
Site of action	Arteriodilator			Arterio & venodilator
Mechanism	Direct	Opening of potassium channels in smooth muscle membranes by minoxidil sulfate.	Opening of potassium channels.	Release of nitric oxide (NO)
Administration	Oral		I.V infusion	
Uses	1. Moderate-severe hypertension.		1. Hypertensive emergency.	
In combination with a diuretic & β -blockers:	2.Hypertensive pregnant woman, but not as first-line.	2. Correction of baldness, since it causes Hypertrichosis (the growth of body hair).	2. Treat hypoglycemia due to Insulinoma (tumor of the pancreas that secretes insulin).	2. Severe heart failure.
Adverse effect	Hypotension, reflex tachycardia, palpitation, angina, salt and water retention (edema). These ADRs are due to activation of the sympathetic system & the RAAS after vasodilators-induced fall in BP, and thus should be used in combination with a diuretic and a β -blocker.			1. Severe hypotension 2. Headache and palpation (disappears when infusion is stopped) 3. Methemoglobin during Infusion 4. Cyanide toxicity (resulting in metabolic acidosis, arrhythmias, Severe hypotension and death) 5. Thiocyanate toxicity
Specific adverse effects	Lupus erythematosus like syndrome	Hypertrichosis, excess hair growth thus contraindicated in females	Hyperglycemia (due to Inhibited insulin release from β cells of the pancreas), thus contraindicated in diabetics	



1. The ALLHAT clinical trial (antihypertensive and lipid-lowering treatment to prevent heart attack) compared amlodipine, a dihydropyridine Ca²⁺-channel blocker, lisinopril, an ACE inhibitor, and doxazosin, an α₁-adrenergic antagonist, with chlorthalidone, a thiazide diuretic.
2. Thiazide diuretics are the preferred initial therapy for hypertension in most cases.
3. Beta-blocking agents can cause depression, insomnia, male impotency, bronchoconstriction.



Questions

MCQs:

- 1. A 45-year-old man was just started on therapy for hypertension and developed a persistent, dry cough. Which is most likely responsible for this side effect?**
 - A. Enalapril.
 - B. Losartan.
 - C. Nifedipine.
 - D. Prazosin.
 - E. Propranolol.
- 2. Which may cause reflex tachycardia and/or postural hypotension on initial administration?**
 - A. Atenolol.
 - B. Hydrochlorothiazide.
 - C. Metoprolol.
 - D. Prazosin.
 - E. Verapamil.
- 3. Which can precipitate a hypertensive crisis following abrupt cessation of therapy?**
 - A. Clonidine.
 - B. Diltiazem.
 - C. Enalapril.
 - D. Losartan.
 - E. Hydrochlorothiazide.
- 4. A 48-year-old hypertensive patient has been successfully treated with a thiazide diuretic for the last 5 years. Over the last 3 months, his diastolic pressure has steadily increased, and he was started on an additional antihypertensive agent. He complains of several instances of being unable to achieve an erection and not being able to complete three sets of tennis as he once did. Which is the likely second antihypertensive medication?**
 - A. Captopril.
 - B. Losartan.
 - C. Metoprolol.
 - D. Minoxidil.
 - E. Nifedipine.

Questions

MCQs:

5. **A 40-year-old male has recently been diagnosed with hypertension due to pressure readings of 163/102 and 165/100 mm Hg. He also has diabetes that is well controlled with oral hypoglycemic medications. Which is the best initial treatment regimen for treatment of hypertension in this patient?**
- A. Felodipine.
 - B. Furosemide.
 - C. Lisinopril.
 - D. Lisinopril and hydrochlorothiazide.
 - E. Metoprolol.
6. **A 60-year-old white female has not reached her blood pressure goal after 1 month of treatment with a low dose of lisinopril. All of the following would be appropriate next steps in the treatment of her hypertension except:**
- A. Increase dose of lisinopril.
 - B. Add a diuretic medication.
 - C. Add on a calcium channel blocker medication.
 - D. Add on an ARB medication
7. **A patient returns to her health care provider for routine monitoring 3 months after her hypertension regimen was modified. Labs reveal elevated serum potassium. Which is likely responsible for this hyperkalemia?**
- A. Chlorthalidone.
 - B. Clonidine.
 - C. Furosemide.
 - D. Losartan.
 - E. Nifedipine.
8. **A 58-year-old female reports that she recently stopped taking her blood pressure medications because of swelling in her feet that began shortly after she started treatment. Which is most likely to cause peripheral edema?**
- A. Atenolol.
 - B. Clonidine.
 - C. Felodipine.
 - D. Hydralazine.
 - E. Prazosin.

Questions

MCQs:

9. **Which is an appropriate choice for hypertension treatment during pregnancy?**
- A. Aliskiren.
 - B. Fosinopril.
 - C. Hydralazine.
 - D. Valsartan.
10. **DD is a 50-year-old male with newly diagnosed hypertension. His comorbidities include diabetes and chronic hepatitis C infection with moderate liver impairment. He requires two drugs for initial treatment of his hypertension. Which should be prescribed in combination with a thiazide diuretic?**
- A. Lisinopril.
 - B. Spironolactone.
 - C. Fosinopril.
 - D. Furosemide.
 - E. Hydralazine.
11. **A 45-year-old man has hypertension. A thiazide diuretic agent had been prescribed with continued elevated blood pressure. The inclusion of spironolactone to the thiazide diuretic is done to achieve which of the following?**
- A. Reduce hyperuricemia.
 - B. Reduce Mg + loss.
 - C. Decrease the loss of Na +.
 - D. Reduce K + loss.
12. **A 42-year-old woman is noted to have Type II diabetes for 20 years. She is noted to have hypertension with BP in the 150/94 range. The urinalysis shows mild proteinuria. Which of the following drugs would be the best to treat the hypertension in this individual?**
- A. Enalapril.
 - B. Propranolol.
 - C. Hydrochlorothiazide.
 - D. Nifedipine.

Questions

MCQs:

- 13. A 33-year-old man is diagnosed with essential hypertension. He is started on a blood pressure medication, and after 6 weeks, he notes fatigue, rash over his face, joint aches, and effusions. A serum antinuclear antibody (ANA) test is positive. Which of the following is the most likely agent?**
- A. Hydralazine.
 - B. Propranolol.
 - C. Thiazide diuretic.
 - D. Nifedipine.
 - E. Enalapril.
- 14. 68-year-old male with hypertension presents for annual examination. On review of systems he reports urinary hesitancy and nocturia. Your examination reveals a nontender but enlarged prostate without nodules. On review of his blood pressure logs and clinic readings he is averaging values of 150/80 mm Hg. Which of the following medications would offer treatment of the hypertension and prostatic symptoms?**
- A. Furosemide.
 - B. Aliskiren.
 - C. Propranolol.
 - D. Terazosin.

Answers

(zoom in to check the answers)

1-Correct answer = A. The cough is most likely an adverse effect of the ACE inhibitor enalapril. Losartan is an ARB that has the same beneficial effects as an ACE inhibitor but is less likely to produce a cough. Nifedipine, prazosin, and propranolol do not cause this side effect.

2-Correct answer = D. Prazosin produces first-dose hypotension, presumably by blocking α_1 receptors. This effect is minimized by initially giving the drug in small, divided doses. The other agents do not have this adverse effect.

3-Correct answer = A. Increased sympathetic nervous system activity occurs if clonidine therapy is abruptly stopped after prolonged administration. Uncontrolled elevation in blood pressure can occur. Patients should be slowly weaned from clonidine while other antihypertensive medications are initiated. The other drugs on the list do not produce this phenomenon.

4-Correct answer = C. The side effect profile of β -blockers, such as metoprolol, is characterized by interference with sexual performance and decreased exercise tolerance. None of the other drugs is likely to produce this combination of side effects.

5-Correct answer = D. Because the systolic blood pressure is more than 20 mm Hg above goal (10 mm Hg above goal diastolic), treatment with two different medications is preferred. Because the patient is diabetic, he also has a compelling indication for an ACE inhibitor or ARB.

6-Correct answer = D. Increasing the dose of lisinopril or adding a second medication from a different class (such as a calcium channel blocker or diuretic) would be appropriate steps to control the blood pressure. Adding an ARB as the second medication is not recommended. ARBs have a similar mechanism of action to ACE inhibitors, and combination therapy may increase the risk of adverse effects.

7-Correct answer = D. Losartan, an ARB, can cause an increase in serum potassium similar to ACE inhibitors. Furosemide and chlorthalidone can cause a decrease in serum potassium. Nifedipine and clonidine do not affect potassium levels.

8-Correct answer = C. Peripheral edema is one of the most common side effects of calcium channel blockers. None of the other agents commonly cause peripheral edema.

9-Correct answer = C. Hydralazine is an appropriate choice for a hypertensive pregnant patient. ACE inhibitors, ARBs, and the direct renin inhibitor, aliskiren, are all contraindicated in pregnancy due to their potential for fetal harm.

10-Correct answer = A. Because DD has diabetes, he has a compelling indication for an ACE inhibitor or ARB for the treatment of his hypertension and prevention of diabetic nephropathy. However, most ACE inhibitors undergo hepatic conversion to active metabolites, so his hepatic impairment is of concern. Because lisinopril is one of the two ACE inhibitors that does not undergo hepatic conversion to active metabolites, it is the best choice. Fosinopril is the only ACE inhibitor that is not eliminated primarily by the kidneys but does undergo hepatic conversion. An additional diuretic like spironolactone or furosemide is not indicated. DD does not have a compelling indication for hydralazine.

11-Correct answer = D. Spironolactone is a "potassium-sparing" diuretic that reduces K^+ excretion in the collecting duct. It diminishes the K^+ -wasting effects of thiazide diuretics.

12- Correct answer = A. ACE inhibitors, such as enalapril, have been shown to reduce the progressive loss of renal function that is often seen in diabetic patients. The nonselective beta blocker, propranolol, would worsen the diabetes.

13- Correct answer = A. Hydralazine is associated with a lupus-like presentation, with photosensitivity, malar rash, joint pain, and sometimes pericardial effusion or pleural effusion.

14- Correct answer = D. Terazosin is an α_1 -adrenoceptor antagonist that is a useful antihypertensive. It also reduces symptoms associated with benign prostatic hyperplasia. Patient should be cautioned on side effects of orthostatic hypotension. The goal is to start low and go slow with the dosing to minimize side effects. Furosemide, a loop diuretic, would improve the blood pressure but worsen the nocturia.

Questions

SAQ:

A 50-year-old male with a past medical history of hypertension and a history of palpitations presents for follow-up of his hypertension. He is adherant with a low sodium diet, exercises 150 minutes weekly, and is taking his metoprolol at maximum dose (for the HTN and palpitations). His home blood pressure logs and the clinic reading reveal blood pressures in the range 140–150/90–100. The rest of his vitals including heart rate are normal, as his examination. You decide to add a thiazide diuretic to his existing antihypertensive regimen.

1-What is the mechanism of action of metoprolol?

2-What is the mechanism of action of thiazide diuretics?

3-What electrolyte abnormalities commonly occur with thiazide diuretics?

Questions

SAQ:

A 58-year-old woman comes to see you for her annual check-up. She was diagnosed with prehypertension and was overweight 2 years ago. At that time, you recommended a low sodium, low-calorie diet, exercise, and weight loss. Since that time, she has diligently watched her salt intake, exercised routinely, and lost 20 pounds. She remains compliant with all of her appointments. However, during the past 5 months she has experienced some exertional fatigue, which she attributes to “getting older.” She denies chest pains, orthopnea, paroxysmal nocturnal dyspnea, palpitations, or lightheadedness. She smoked one pack of cigarettes per day for 20 years and quit when she was 45 years old. She drinks one glass of red wine per week on the weekends. Her mother was diagnosed with coronary heart disease at age 60 years while being evaluated for aortic stenosis and has an older brother whom had a myocardial infarction and coronary stents at age 47 years. On examination the patient is nondistressed and overweight, and you calculate her body mass index (BMI) at 28 kg/m². Her blood pressure is 146/ 91 mmHg (right arm, sitting) and 150/ 94 (left arm, sitting). There were no postural changes in blood pressure. Her pulse was 73 bpm and regular. There is no thyromegaly or palpable lymphadenopathy. Fundoscopic examination reveals arteriovenous nicking. The cardiac examination reveals a laterally displaced, forceful, and sustained point of maximal impulse (PMI). There is an S4 gallop without any murmur on auscultation. The pulmonary and abdominal examinations are normal. All pulses are brisk and symmetric. Her extremities are warm, noncyanotic, and without clubbing or edema.

1-What is the best initial therapy?

Answers

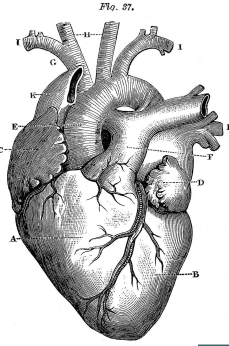
SAQ:

Case1 :

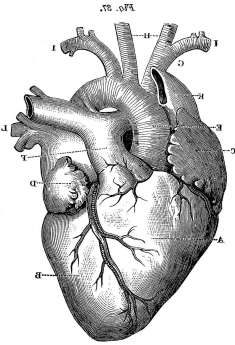
- 1. Mechanism of action of metoprolol: β_1 -Selective adrenoreceptor antagonist.**
- 2. Mechanism of action of thiazide diuretics: Inhibit active reabsorption of NaCl in the distal convoluted tubule by interfering with a specific Na⁺ /Cl⁻ cotransporter.**
- 3. Electrolyte abnormalities seen with thiazide diuretics: Hypokalemia, hyponatremia, hypochloremia.**

Case2 :

Initial Treatment: Start the patient on chlorthalidone (a thiazide diuretic), consider an exercise stress test, and continue to emphasize the importance of lifestyle changes, including a low-sodium diet.



“It is not hard, you just made it to the end!”



Team Leaders:

Yazeed Alharbi & Hadeel Awartani

Sub-leader

khaled Aldosari

Design

Omar Alyabis

Content

Yazeed Alkhayyal

Mohammed nouri

Fahad Alfaiz

Abdullah Alzahrani

Abdullah Alharbi

Adel Alsuhaibani

Notes:

Anas Alsaif

Nawaf Alsubaie

Questions

Faisal Alhawtan

References:

- ✓ Doctors' notes and slides



@Pharma4370



pharmacology437@gmail.com