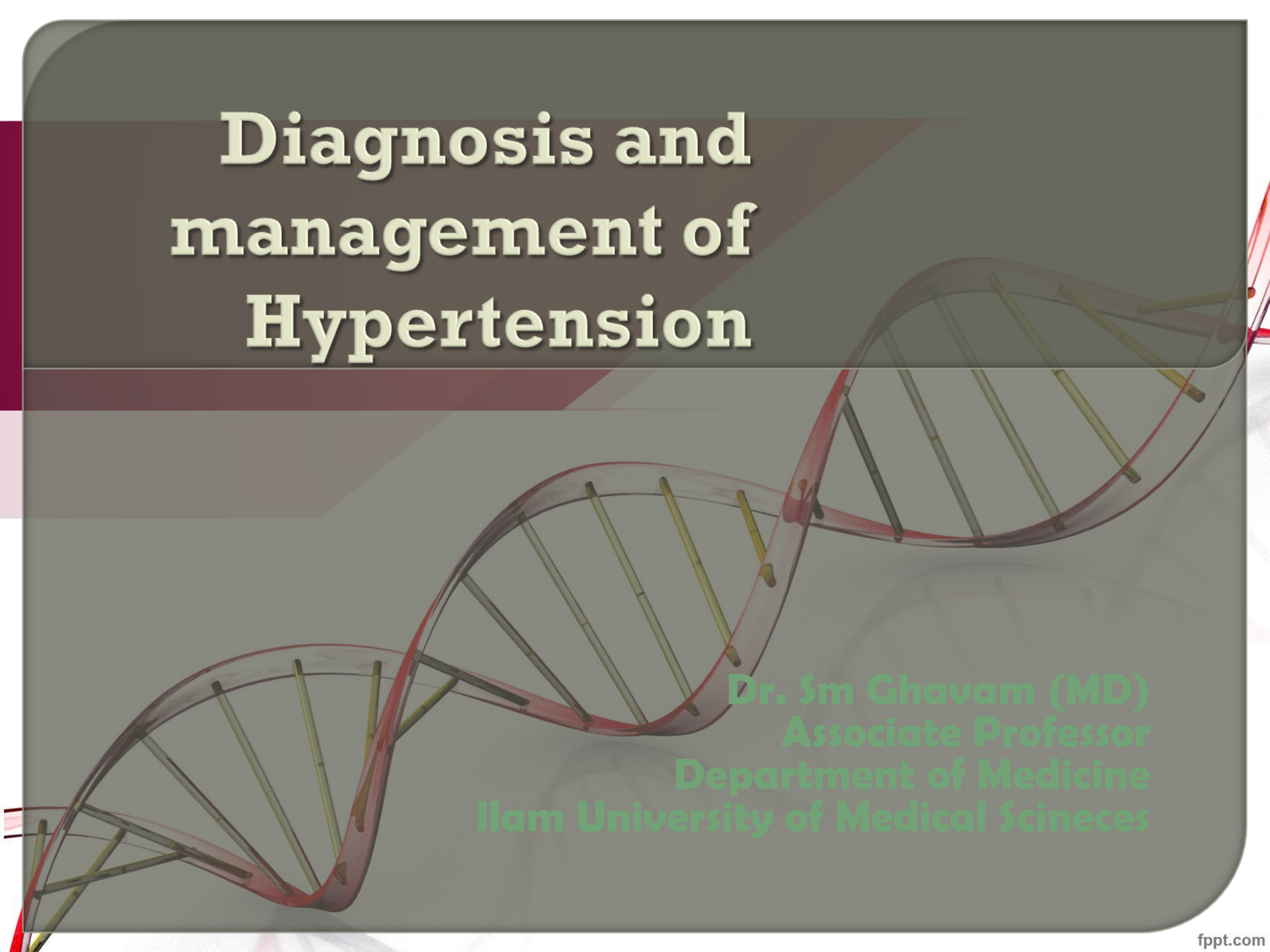


Diagnosis and management of Hypertension



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Hypertension is defined as systolic blood pressure (SBP) of 140 mmHg or greater, diastolic blood pressure (DBP) of 90 mmHg or greater, or taking antihypertensive medication.

Types of hypertension

- **Essential hypertension**
 - 95%
 - No underlying cause
- **Secondary hypertension**
 - Underlying cause

Causes of Secondary Hypertension

- Renal
 - Parenchymal
 - Vascular
 - Others
- Endocrine
- Miscellaneous
- Unknown

Classification

Blood Pressure Classification

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

Who are at risk?

Hypertension: Predisposing factors

- Advancing Age
- Sex (men and postmenopausal women)
- Family history of cardiovascular disease
- Sedentary life style & psycho-social stress
- Smoking ,High cholesterol diet, Low fruit consumption
- Obesity & wt. gain
- Co-existing disorders such as diabetes, and hyperlipidemia
- High intake of alcohol

Hemodynamic Pattern in Hypertension

Young : $\uparrow \text{BP} = \uparrow \text{CO} \times \text{TPR}$

Elderly : $\uparrow \text{BP} = \downarrow \text{CO} \times \uparrow \uparrow \text{TPR}$

Etiology of Systemic Hypertension

Secondary HTN (05%)

A. Renal (80%)	<ul style="list-style-type: none"> • AGN • CGN, • CPN, • Polycystic K.D 	<ul style="list-style-type: none"> • Renal Artery stenosis
B. Endocrine	<ul style="list-style-type: none"> • Adrenal 	<ul style="list-style-type: none"> • Primary aldosteronism • Cushing's syndrome • Pheochromocytoma
	<ul style="list-style-type: none"> • Acromegaly 	
	<ul style="list-style-type: none"> • Exogenous hormone 	<ul style="list-style-type: none"> • Oral contraceptive • Glucocorticoids
	<ul style="list-style-type: none"> • Hypothyroidism & • Hyperparathyroidism 	

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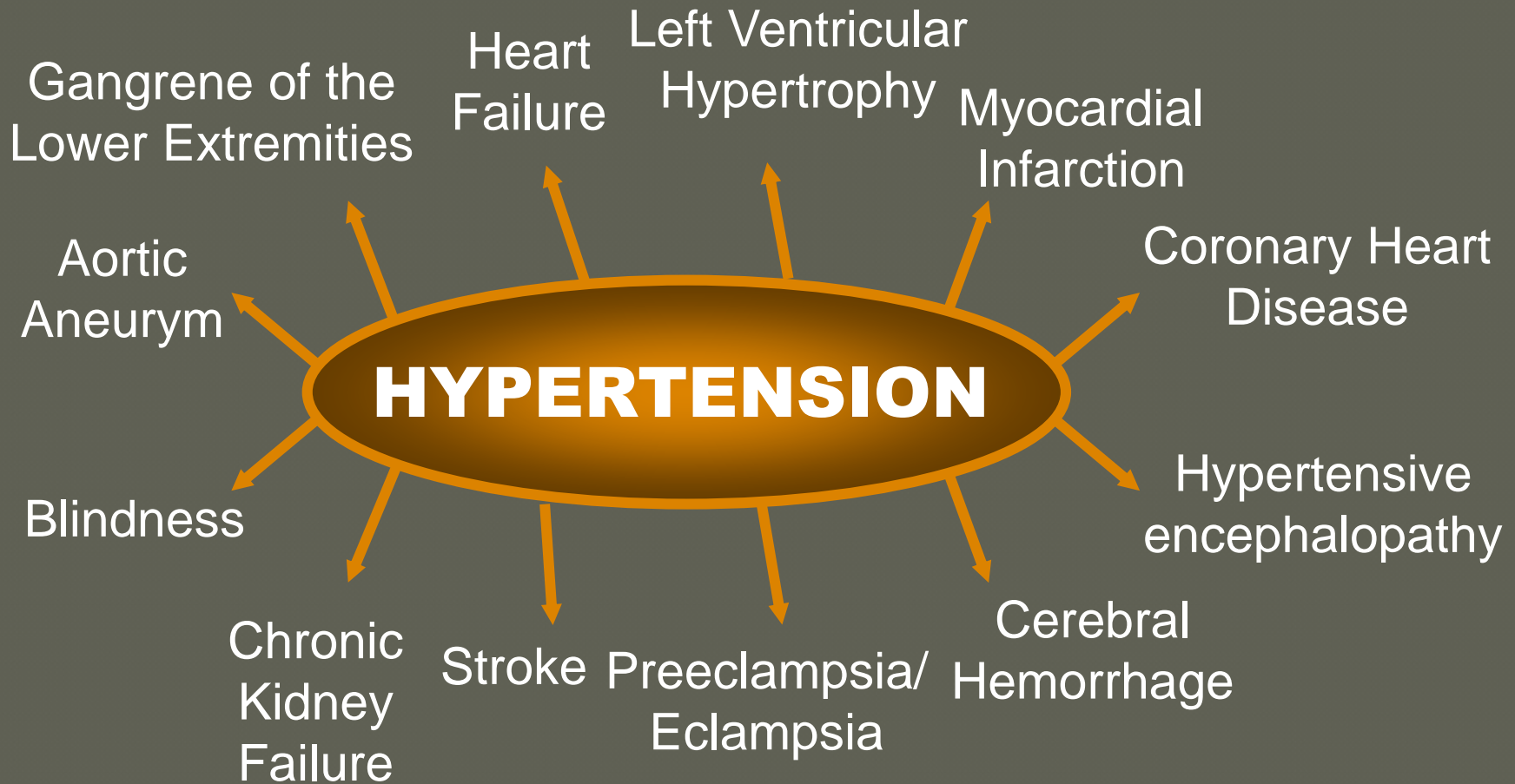
Etiology of Systemic Hypertension

Others

- Coarctation of the aorta
- Pregnancy Induced HTN (Pre-eclampsia)
- Sleep Apnea Syndrome.

Why to treat?

Diseases Attributable to Hypertension



Adapted from Dustan HP et al. Arch Intern Med. 1996; 156: 1926-1935

Target Organ Damage

- Heart
 - Left ventricular hypertrophy
 - Angina or myocardial infarction
 - Heart failure
- Brain
 - Stroke or transient ischemic attack
- Chronic kidney disease
- Peripheral arterial disease
- Retinopathy

CVD Risk

- The BP relationship to risk of CVD is continuous, consistent, and independent of other risk factors.
- Prehypertension signals the need for increased education to reduce BP in order to prevent hypertension.

Clinical manifestations

- No specific complains or manifestations other than elevated systolic and/or diastolic BP (*Silent Killer*)
- Morning occipital headache
- Dizziness
- Fatigue
- In severe hypertension, epistaxis or blurred vision

Self-Measurement of BP

- Provides information on:
 1. Response to antihypertensive therapy
 2. Improving adherence with therapy
 3. Evaluating white-coat HTN
- Home measurement of $>135/85$ mmHg is generally considered to be hypertensive.
- Home measurement devices should be checked regularly.

Measuring Blood Pressure



- Patient seated quietly for at least 5 minutes in a chair, with feet on the floor and arm supported at heart level

- An appropriate-sized cuff (cuff bladder encircling at least 80% of the arm)
- At least 2 measurements

Measuring Blood Pressure

- Systolic Blood Pressure is the point at which the first of 2 or more sounds is heard
- Diastolic Blood Pressure is the point of disappearance of the sounds (Korotkoff 5th)

Measuring Blood Pressure

- Ambulatory BP Monitoring – information about BP during daily activities and sleep.
- Correlates better than office measurements with target–organ injury.

Laboratory Tests

- **Routine Tests**

- **Electrocardiogram**
- **Urinalysis**
- **Blood glucose,**
- **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**

How to treat ?

Treatment Overview

- Goals of therapy
- Lifestyle modification
- Pharmacologic treatment
- Algorithm for treatment of hypertension
- Follow up and monitoring

Goals of Therapy

- Reduce Cardiac and renal morbidity and mortality.
- Treat to BP <140/90 mmHg or BP <130/80 mmHg in patients with diabetes or chronic kidney disease.

Non pharmacological Treatment of hypertension



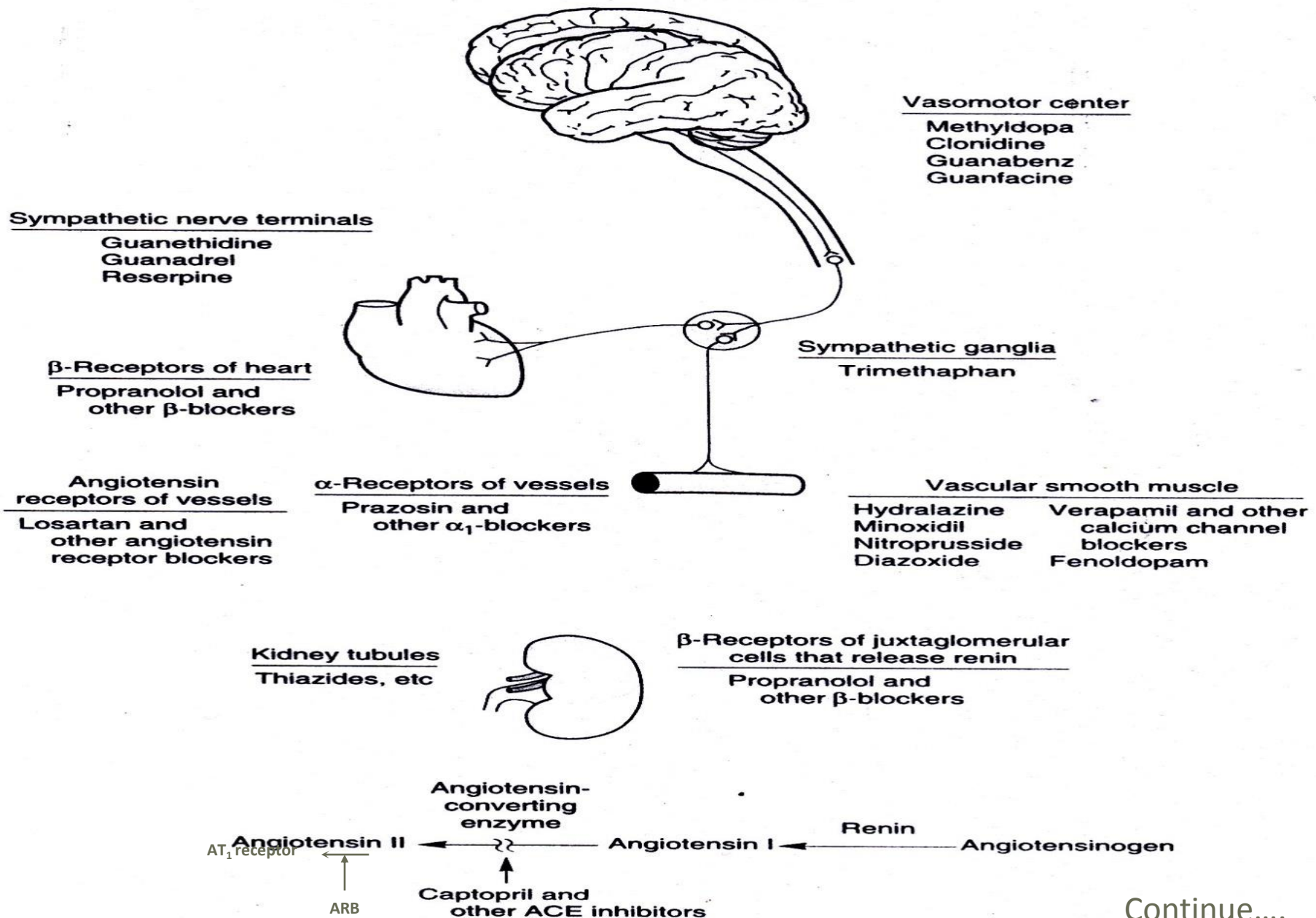
Life style modifications

- Lose weight, if overweight
- Increase physical activity
- Reduce salt intake
- Stop smoking
- Limit intake of foods rich in fats and cholesterol
- increase consumption of fruits and vegetables
- Limit alcohol intake

Lifestyle Modification

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

Antihypertensive Drugs



Continue....

Drug therapy for hypertension

Class of drug	Example maintenance dose	Initiating dose	Usual
Diuretics	Hydrochlorothiazide	12.5 mg o.d.	12.5-25 mg o.d.
β -blockers	Atenolol	25-50 mg o.d.	50-100 mg o.d.
Calcium channel blockers	Amlodipine	2.5-5 mg o.d.	5-10 mg o.d.
α -blockers	prazosin	2.5 mg o.d.	2.5-
10mg o.d.			
ACE- inhibitors	ramipril	1.25-5 mg o.d.	5-20 mg o.d.
Angiotensin-II receptor blockers	Losartan	25-50 mg o.d.	50-100 mg o.d.

Diuretics

Example: Hydrochlorothiazide

- Act by decreasing blood volume and cardiac output
- Decrease peripheral resistance during chronic therapy
- Drugs of choice in elderly hypertensives

Side effects-

- Hypokalaemia
- Hyponatraemia
- Hyperlipidaemia
- Hyperuricaemia (hence contraindicated in gout)
- Hyperglycaemia (hence not safe in diabetes)
- Not safe in renal and hepatic insufficiency

Beta blockers

Example: Atenolol, Metoprolol, nebivolol,

- Block β_1 receptors on the heart
- Block β_2 receptors on kidney and inhibit release of renin
- Decrease rate and force of contraction and thus reduce cardiac output
- Drugs of choice in patients with co-existent coronary heart disease

Side effects-

- lethargy, impotency, bradycardia
- Not safe in patients with co-existing asthma and diabetes
- Have an adverse effect on the lipid profile

Calcium channel blockers

Example: Amlodipine

- Block entry of calcium through calcium channels
- Cause vasodilation and reduce peripheral resistance
- Drugs of choice in elderly hypertensives and those with co-existing asthma
- Neutral effect on glucose and lipid levels

Side effects

Flushing, headache, Pedal edema

***Example:* Ramipril, Lisinopril, Enalapril**

- Inhibit ACE and formation of angiotensin II and block its effects
- Drugs of choice in co-existent diabetes mellitus, Heart failure

Side effects-

dry cough, hypotension,
angioedema

Angiotensin II receptor blockers

Example: Losartan

- Block the angiotensin II receptor and inhibit effects of angiotensin II
- Drugs of choice in patients with co-existing diabetes mellitus

Side effects-

safer than ACEI, hypotension,

Alpha blockers

Example: prazosin

- Block α -1 receptors and cause vasodilation
- Reduce peripheral resistance and venous return
- Exert beneficial effects on lipids and insulin sensitivity
- Drugs of choice in patients with co-existing BPH

Side effects-

Postural hypotension,

Antihypertensive therapy: Side-effects and Contraindications

Class of drugs	Main side-effects	Contraindications/ Special
Precautions		
Diuretics Anuria (e.g. Hydrochlorothiazide)	Electrolyte imbalance, total and LDL cholesterol levels, ↓ HDL cholesterol levels, glucose levels, uric acid levels	Hypersensitivity,
β-blockers (e.g. Atenolol) Conduction Diabetes, cardiac	Impotence, Bradycardia, Fatigue	Bradycardia, disturbances, Asthma, Severe failure

Choice of Drug

Condition	Preferred drugs	Other drugs that can be used	Drugs to be avoided
Asthma	Calcium channel blockers	α -blockers/Angiotensin-II receptor blockers/Diuretics/ACE-inhibitors	β -blockers
Diabetes mellitus	α -blockers/ACE inhibitors/Angiotensin-II receptor blockers	Calcium channel blockers	Diuretics/ β -blockers
High cholesterol levels	α -blockers	ACE inhibitors/ A-II receptor blockers/ Calcium channel blockers	β -blockers/Diuretics
Elderly patients (years)	Calcium channel blockers/Diuretics	β -blockers/ACE-inhibitors/Angiotensin-II receptor blockers/ α - blockers	(above 60
BPH	α -blockers	β -blockers/ ACE inhibitors/Angiotensin-II receptor blockers/ Diuretics/ Calcium channel blockers	

Antihypertensive therapy: Side-effects and Contraindications (Contd.)

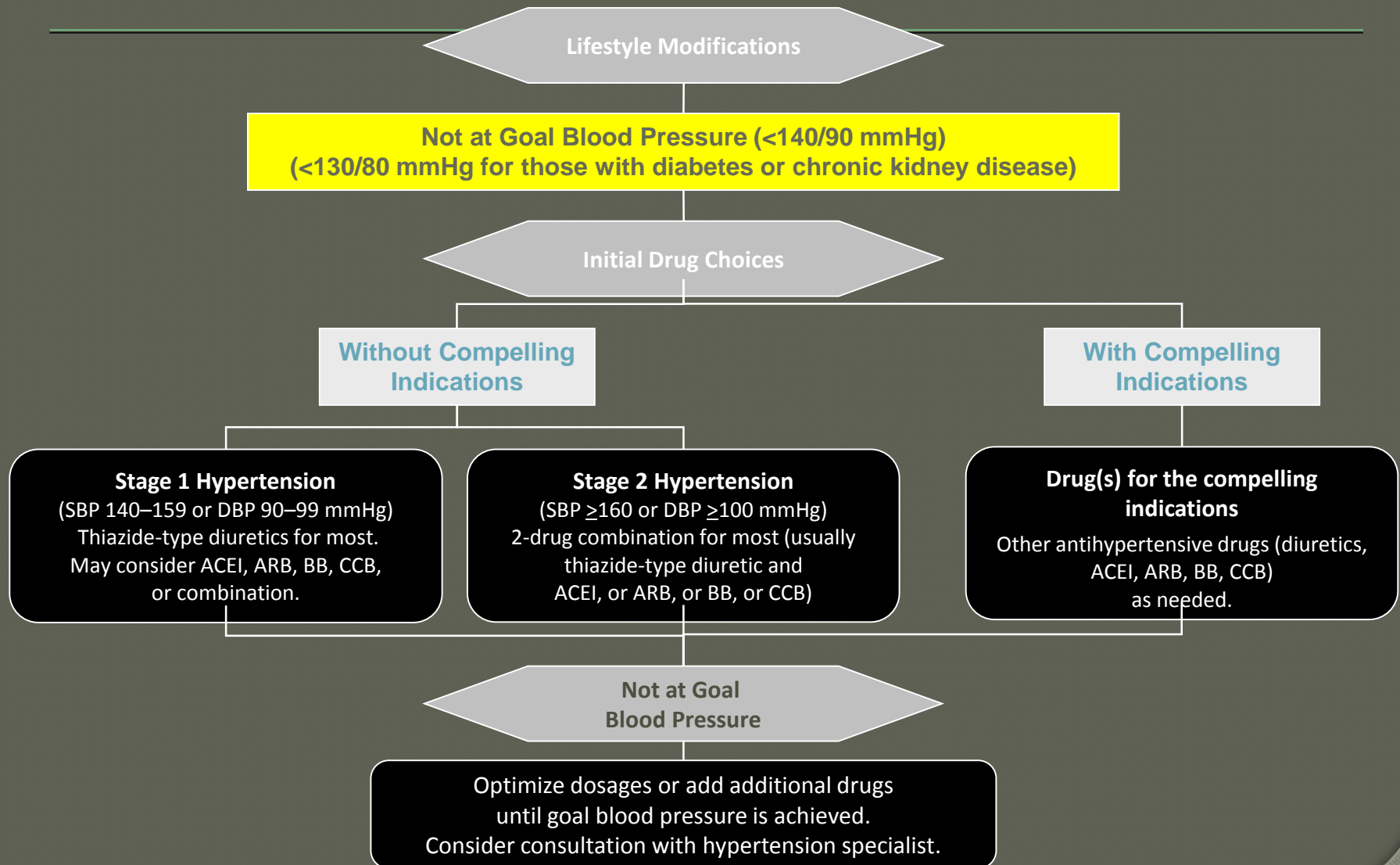
Class of drug	Main side-effects	Contraindications/ Special Precautions
Calcium channel blockers (e.g. Amlodipine, Diltiazem)	Pedal edema, Headache	Non-dihydropyridine CCBs (e.g diltiazem)– Hypersensitivity, Bradycardia, Conduction disturbances, CHF, LV dysfunction.
α-blockers (e.g. prazosin)	Postural hypotension	Hypersensitivity
ACE-inhibitors (e.g. Lisinopril) stenosis	Cough, Hypotension, Angioneurotic edema	Hypersensitivity, Pregnancy, Bilateral renal artery
Angiotensin-II receptor blockers (e.g. Losartan) stenosis	Headache, Dizziness	Hypersensitivity, Pregnancy, Bilateral renal artery

Condition	Preferred Drugs
● Pregnancy	● Nifedipine, labetalol, hydralazine, beta-blockers, methyldopa, prazosin
● Coronary heart disease	● Beta-blockers, ACE inhibitors, Calcium channel blockers
● Congestive heart failure	● ACE inhibitors, beta-blockers

Causes of Resistant Hypertension

- Improper BP measurement
- Excess sodium intake
- Inadequate diuretic therapy
- Medication
 - Inadequate doses
 - Drug actions and interactions (e.g., (NSAIDs), illicit drugs, sympathomimetics, OCP)
 - Over-the-counter drugs and some herbal supplements
- Excess alcohol intake
- Identifiable causes of HTN

Algorithm for treatment of hypertension



take home message -----

- Hypertension is a major cause of morbidity and mortality, and needs to be treated
- It is an extremely common condition; however it is still under-diagnosed and undertreated
- Hypertension is easy to diagnose and easy to treat
- Aim of the management is to save the target organ from the deleterious effect
- Besides pharmacology we have other choices and one has to be acquainted with that choice
- Life style modification should always be encouraged in all Hypertensive patients

Any questions?



Q 1) Life style intervention for management of hypertension includes all except:

- a) Regular aerobic activity 30 min /day
- b) Salt intake to <6 gm./day
- c) Attain and maintaining BMI >25 k/m²
- d) Diets rich in fruits and vegetables and restricted content of saturated fats
- e) Moderation of alcohol consumption

Q 2) Hypertension management is helpful in the prevention of all except:

- a) Coronary heart disease
- b) Heart failure
- c) Chronic kidney disease
- d) Deep venous thrombosis
- e) Cerebrovascular disease

Q 3) Isolated systolic hypertension is common in:

- a) Young
- b) Elderly
- c) Pregnancy
- d) Blacks

Q 4) Antihypertensive agent recommended for the protection of cardiovascular diseases is:

- a) Calcium channel blockers
- b) Diuretics
- c) ACE inhibitors
- d) Alpha antagonists
- e) Central sympatholytic

Q 5) Angiotensin Receptor Blockers play Reno protective effect through all except:

- a) Decreasing proteinuria
- b) Decreasing intraglomerular pressure
- c) Preventing endothelial dysfunction
- d) Inhibiting conversion of angiotensin-I to angiotensin –II
- e) Blocking the angiotensin mediated renal remodelling

Q 6) which of the following is the side effect of ACE inhibitors:

- a) Hyperkalaemia
- b) Hypercalcemia
- c) Hyperglycaemia
- d) Hypertension
- e) Hypermagnesemia

Q 7) Calcium channel blockers cause all except:

- a) Pedal oedema
- b) Flushing
- c) Hyperkalaemia
- d) Headache

Q 8) : Safest drug for hypertension in pregnancy is:

- a) ACE inhibitors
- b) Angiotensin receptor blockers
- c) Diuretic
- d) Methyldopa

Q 9) the first line antihypertensive in diabetic patients is:

- a) Diuretics
- b) Angiotensin converting enzyme inhibitors
- c) Beta blockers
- d) Calcium channel blockers

Q10) which of the following antihypertensive agent is relatively contraindicated in congestive cardiac failure:

- a) ACE inhibitors
- b) Angiotensin receptor blockers
- c) Beta blockers
- d) Diuretics