HYPERTENSION-

CHRONIC LONG STANDING

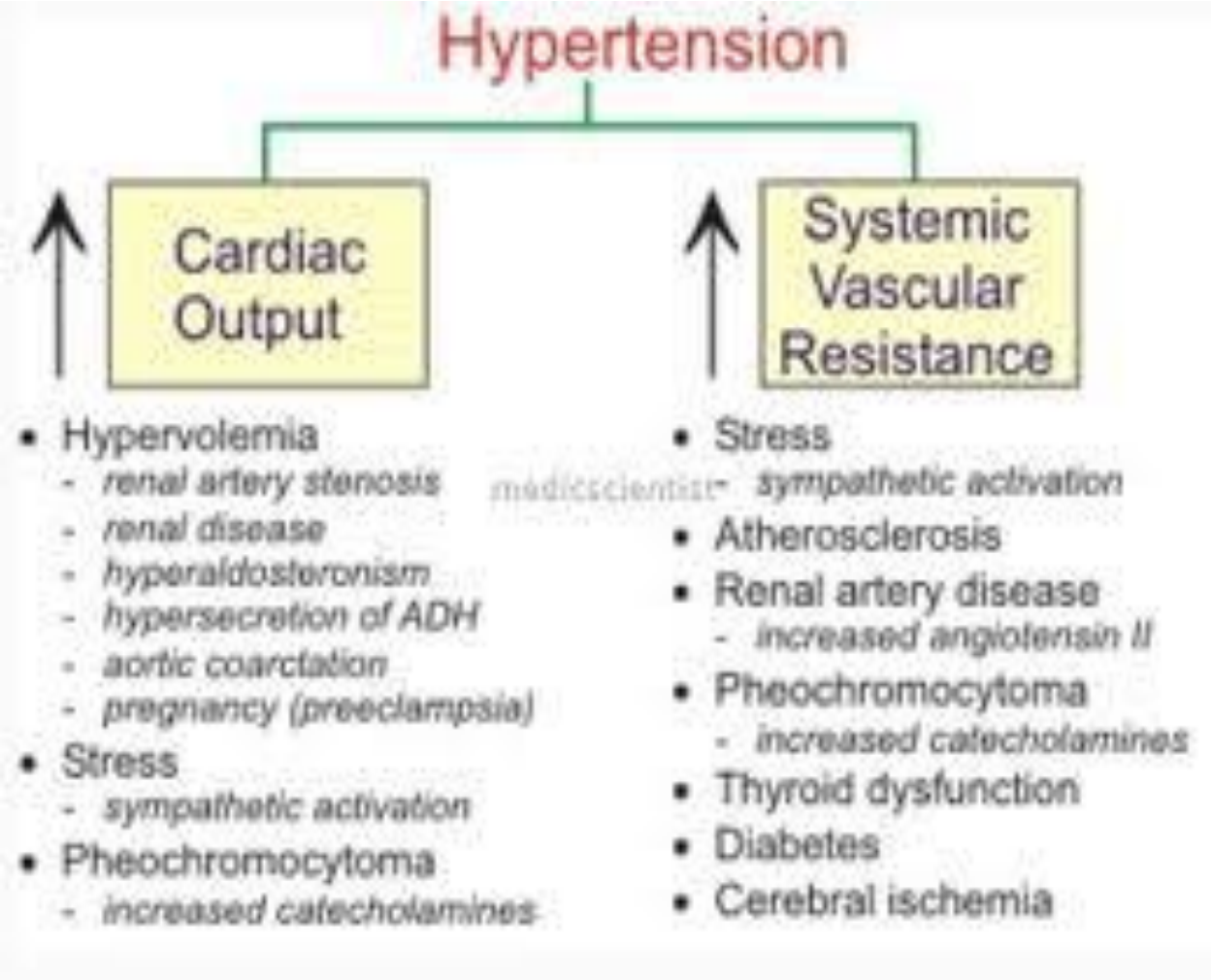
Abnormally Elevated- BP.

Means high Pressure Force exerted by
Circulating intra- vascular blood flow
laterally on blood vessels wall both in systole and diastole.

Systolic BP- measure MAX.. BP- against
blood wall during LV- contraction- systole.
It is a function of Cardiac out-put in systole.

Diastolic BP- measure the LOWEST BP- in
diastole during LV- filling before the next systole.
BP- is maintained by blood vessel wall elasticity
and compliance - peripheral vascular resistance .

HPN


Hypertension
Cardiac Output
Systemic Vascular Resistance
• Hypervolemia
- renal artery stenosis
- renal disease
- hyperaldosteronism
- hypersecretion of ADH
- aortic coarctation
- pregnancy (preeclampsia)
• Stress
- sympathetic activation
• Pheochromocytoma
- increased catecholamines
• Stress
- sympathetic activation
• Atherosclerosis
• Renal artery disease
- increased angiotensin II
• Pheochromocytoma
- increased catecholamines
• Thyroid dysfunction
• Diabetes
• Cerebral ischemia

HTN

- HTN- Extremely common clinical problem WORLD WIDE
- Affecting 20-30% of general adult population.
- 40 - 60% and more sever BLACK- AFRICAN

Age related disease 50% after age of 60Y.

>1.3 billon pat. have HTN and > 4-5 milon/ year died from HTN

Both Systolic- Diastolic- HTN-
Carry high risk of Cardiovascular Morbidity and Mortality.
ATHEROSCLEROSIS IHD- MI- LVH- HF-
ARRHYTHMIA - CVA –
PERIPHERAL VASCULAR DISEASE – CKD - BLINDNESS.

-

BRITISH HYPERTENSION SOCIETY DEFINITION OF HPN-

Category	Systolic BP (mmHg)	Diastolic BP (mmHg)
BP		
Optimal	< 120	< 80
Normal	< 130	85
High normal	130 – 139	85 – 89
Hypertension		
Grade 1 (mild)	140 – 159	90 – 99
Grade 2 (moderate)	160 – 179	100 – 109
Grade 3 (severe)	> 180	> 110
Isolated systolic hypertension		
Grade 1	140 – 159	< 90
Grade 2	> 160	< 90

JNC-7 –DEFINITION-HTN

	SYS. BP mmHg	DIASTOLIC-BP
NORMAL	<120	<80
HIGH-NORMAL-PRE-HTN	120-139	80-89
STAGE-1-	140-149	90-99
STAGE-2-	>160	>100
ISOLATED-SYSTOLIC HTN	>140	<90

JNC-8-2014

- **2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults Report From the Panel Members Appointed to the**
- **Eighth Joint National Committee (JNC 8)**
- Normal-BP-<120/80
- Pre-HTN-BP-120-139/80-89
- HTN- stage-I-140-159/90-99
- HTN-stage-II->160/100

The National Institute for Health and Care Excellence- NICE

- NICE- 3- Recommended ABPM- Ambulatory
- HBPM- Home
- BP Mointering for diagnosis of HTN.
- STAGE 1 HTN Clinic BP- 140/90 or
- ABPM- HBPM 135/85 or higher
- STAGE 2 HTN Clinic BP- 160/100 or
- ABPM- HBPM 150/95 or higher
- SEVER 3 HTN Clinic systolic >180 or more
- diastolic >100 or more

How to measure blood pressure

1- Use a machine that has been well maintained and properly calibrated.

2- Remove tight clothing from the arm.

- Pt. should be relaxed for 5 min.
- To avoid stress and white-coat- HTN.

3- Support the arm of pt. at the level of the heart.

4- Measure both sitting and standing BP

Especially in Elderly – Diabetic- Dehydrated patients to exclude postural hypotension >20mm Hg drop in BP- after 1-2 min.standing.

How to measure blood pressure

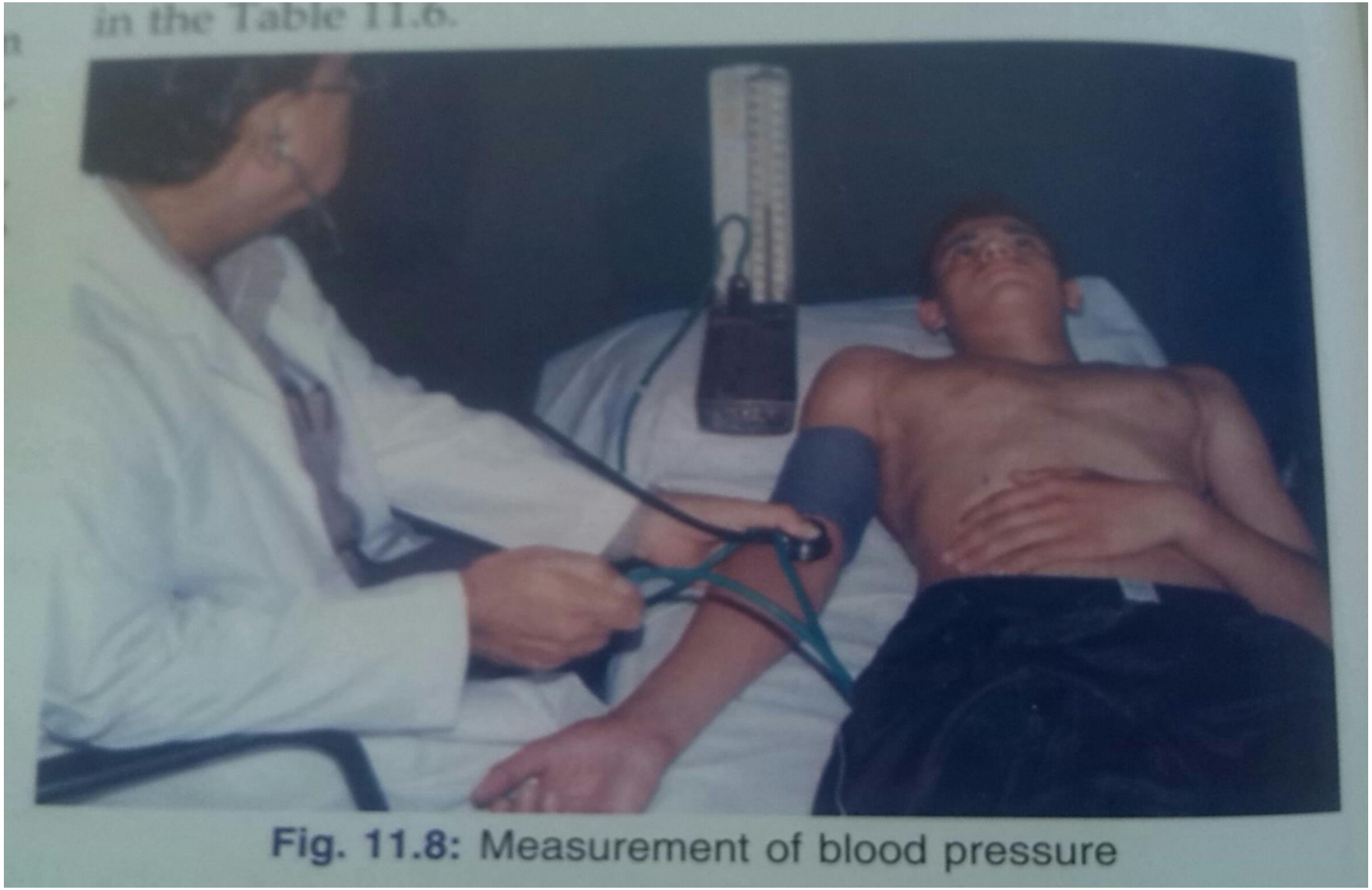


Fig. 11.8: Measurement of blood pressure

How to measure blood pressure

5- Use a cuff of appropriate size
(the bladder must encircle > 2/3 rd of the arm).

6- Lower the pressure slowly (2mmHg per second).

7- Read the BP to the nearest 2mmHg.

8- Use phase V (disappearance of sounds)
to measure diastolic BP.

9- Take two measurements at each visit.

10- 24 HOUR -Ambulatory - ABPM- Mointer .
HOME - HBPM- Machine.
Labile or White Coat- HTN - MASKED-HTN.

COMMON PROBLEMS IN BP EXAM.

1. Wrong cuff size.

- Obese pt. larger cuff must be used because
- Normal size cuff will give FALSE high BP- reading.
- Very thin pt. pediatric cuff must be used.

2- Excess pressure of stethoscope on brachial artery wrongly gives lower10mmHg reading of diastolic BP.

3- Wrong level of pt. arm- elbow to the heart.

- Higher level than the heart level will give lower 5mmHgBP. Lower level will give higher 6mmHgBP.

COMMON PROBLEMS IN BP EXAM.

4. If BP- difference in both arms >10mmHg.

- Exam. for peripheral vascular disease
- exclude - Subclavian artery stenosis.
- Record the highest reading.

6- Auscultatory gap- 20% of elderly HTN-

- After systolic pressure reading
- Sound disappears then reappears before
- reading of diastolic pressure.
- If the first systolic sound missed.
- Sys. BP will be recorded wrongly low.
- To avoid this problem palpate radial pulse .

AUSCULTATORY GAP

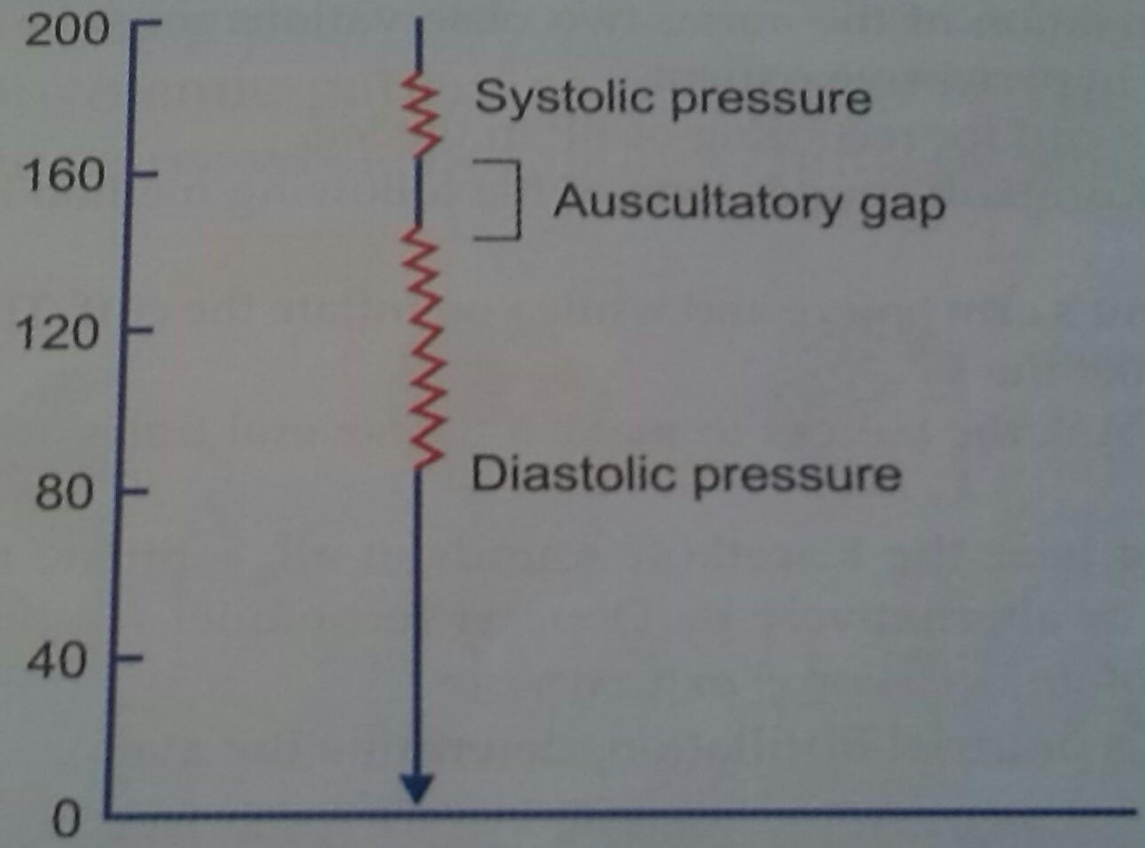


Fig. 11.9: The korotkoff sounds and an auscultatory gap. If you find an auscultatory gap, record your finding as follows; BP-I30/90 with an auscultatory gap from 160-150 mmHg

AETIOLOGY- MULTI-FACTORIAL

- HTN- a complex interaction between
- Genetics and Enviromental –life style factors.
- 95% pt. Idiopathic HTN
- 5% pt. Secondary HTN
- Essential - Idiopathic- HTN-
- No specific underlying cause can be identified
- which may be related to following CAUSES.
- I- GENETIC FACTORS
- HTN- has complex genetic disorders
- large number of Genes may be involved in HTN.

AETIOLOGY-

1- RENIN- ANGIOTENSIN - ALDOSETERON -SYSTEM- GENE

HIGH-RENIN- HTN– YOUNG.

LOW RENIN- HTN- ELDERLY- BLACK

2- ADRENERGIC RECEPTORS- GENE-

- Peripheral vascular resistance and vascular tone

3- VASCULAR ENDOTHELIAL FUNCTIONS –GENE-

- Vasoconstrictors Cytokines
- Agiotensin-II- Endothelin- Thrombaxin A2.
- Vasodilators – Cytokines

Prostaglandin- NO- Prostacyclin.

AETIOLOGY-

4- Na- and salt Sensitivity –GENE - Salt Sensitive HTN

5- Metabolic GENES-

- Regulator of insulin receptors .
- Hyperinsulinemia and insulin Resistance.
- SYNDROME-X- Metabolic syn.
- Marked central Obesity- Dyslipidemia- DMT2- HTN

II- FAMILIAL FACTORS-HTN-

Children of hypertensive parents tend to have Higher BP- Compared with Children of Normotensive parents.

AETIOLOGY-

III- RACIAL- FACTORS - ETHNIC GROUPS-

HTN more common and MORE sever in

BLACK- AFRICAN with higher incidence up to - 40-60%

IV- FETAL FACTORS –

Low birth wt. babies Impaired intra-uterine growth

- Reduced Small kidneys volume and size

Lower Nephrones number.

Glomerular Hyper-filteration -

Hypertrophy of the remaining Glomeruli.

RENAL- GLOMERULOSCLEROSIS

Higher chance to develope HTN during their adult life.

AETIOLOGY-

V- ENVIROMENTAL FACTORES-

- Obesity- Lack of exercise- Alcohol intake- Smoking
- Sleep- Apnea- syn. - Hypoxia
- High Na -ingestion-
- DRUGS - STEROID – NSAIDS- LICURICE- PILLS.
- All can cause HPN

On other hand another factors can decrease BP-

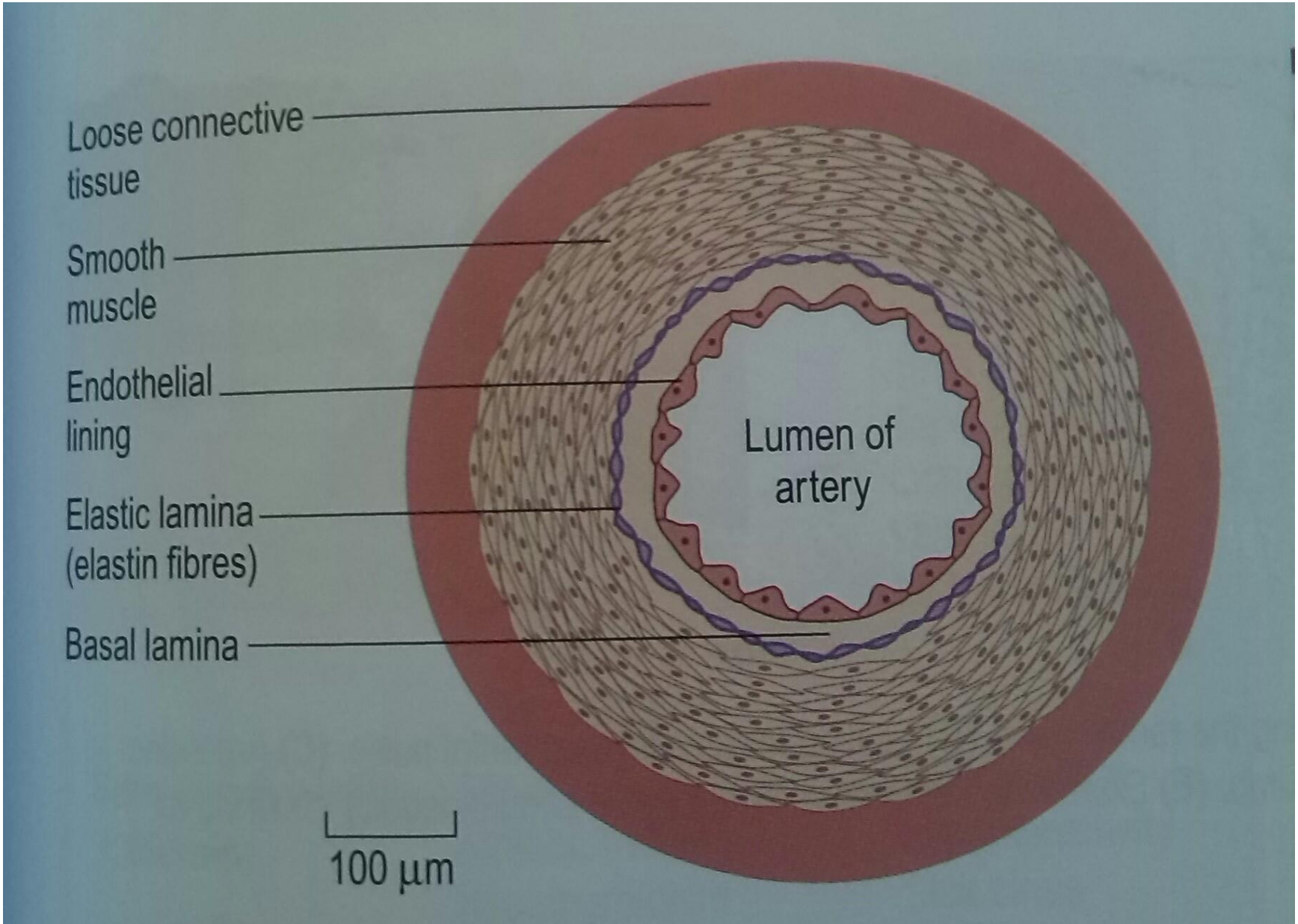
high -K- Ca- and Mg -intake - wt. loss-

Fresh fruits-Vegetables – Regular Aerobic Exercise

No alcohol drinking or Smoking – good sleep .

AETIOLOGY-

PATHO-GENESIS OF ESSENCIAL HPN-



PATHO-GENESIS OF ESSENCIAL HPN-

- Resistance small arteriols <1mm diameter.
- Vascular Intimal layer proliferation
- Muscular layer wall Thickening.
- Reduced vascular lumen diameter.
- Secondary Calcium and Hyaline deposition .
- Ending in vascular- ATHEROMA- atherosclerosis.

Increased peripheral vascular resistance

Tissues hypo-perfusion and tissues ischemia.

Arteriolar wall micro- aneurysm formation.

PATHO-GENESIS OF ESSENCIAL HTN-

- Larger arteriols >1mm diameter-
  Thickened internal elastic lamina.
- Smooth muscles wall hypertrophy .
- Collagen- fibrous tissues formation- Fibrosis.
- Arterial wall calcification.

ONION - SKIN appearance.

Blood vessels becomes dilated tortuous

With loss of wall compliance.

ATHEROSCLEROSIS - IHD - MI - LVH- HF- CVD-PVD- CKD.

HTN more and more sever.

SECONDARY HTN-

- 5% of HTN- UNDERLYING secondary Aetiology

1- High Alcohol intake-

Obesity- DM- SLEEP APNEA SYN.

- Pregnancy- Pre-eclampsia- Eclampsia.
- DRUGS-
- ORAL CONTRA- CEPTIVE PILLS-
- CORTICOSTEROIDS - NSAIDS- CICLOSPORINE
- CABINOXOLONE - LICURICE INTAKE.

2- RENAL DISEASE.

- A- RENAL-VASCLAR DISEASES
- RENAL ARTERY STENOSIS - UNI- BILATERAL

SECONDARY HTN-

- B- RENAL PARENCHYMAL DISEASE-
- Chronic –GN – Small size shrinked kidneys
- Chronic -TIN- Reflux Nephropathy
- POLYCYSTIC KIDNEYS DISEASES
- DIABETIC NEPHROPATHY-
- LIDDLES SYN.

3- ENDOCRINE DISEASES.

- CUSHING SY. ACROMEGALY-
- HYPER- PARATHYOIDISM-
- HYPER- and HYPOTHYROIDISM.

SECONDARY HPN-

4- ADRENAL CAUSES

- CONNS SYN.- HYPERALDOSTERONISM
- CONGENITAL ADRENAL HYPERPLASIA PHAECHCROMOCTOMA

5- CO-ARCTATION OF AORTA

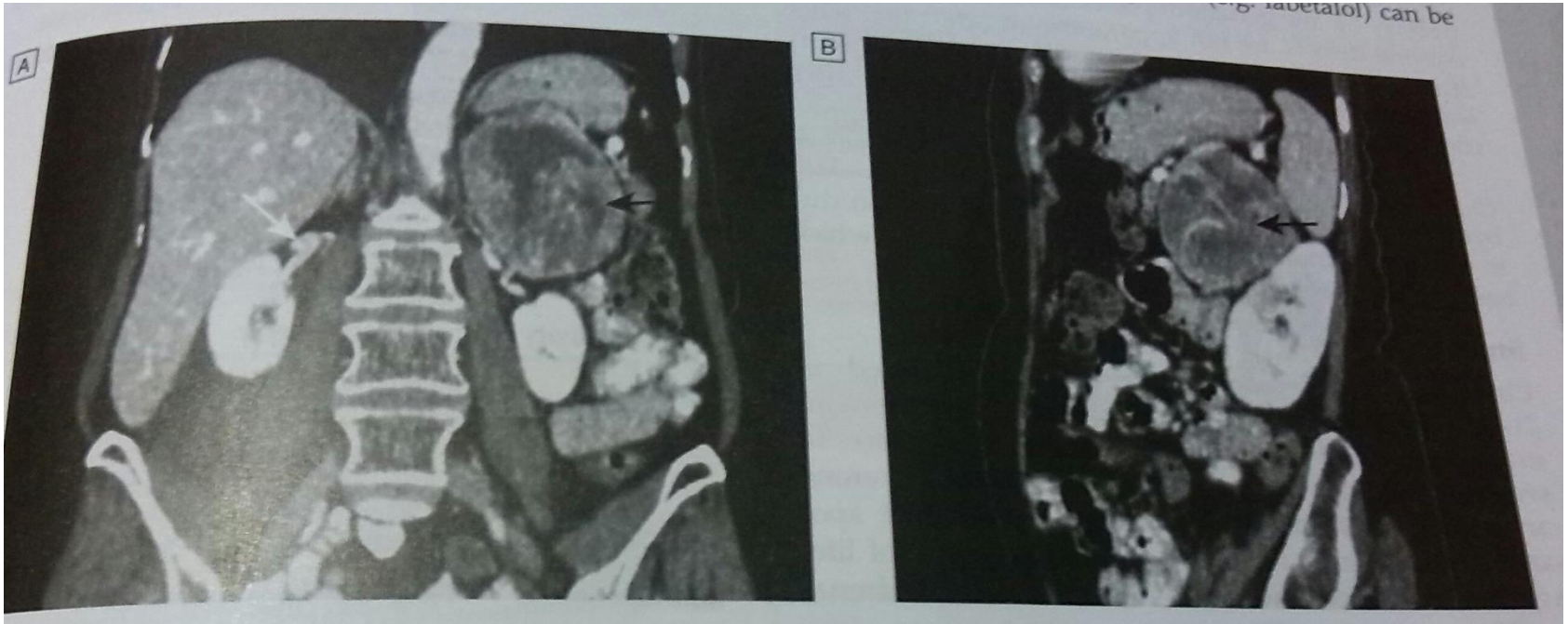
6- VASCULITIS- GN-

RENO-VASCULAR-

TAKAYASU ARTERITIS- SCLERODERMA

Polycystic -kidney

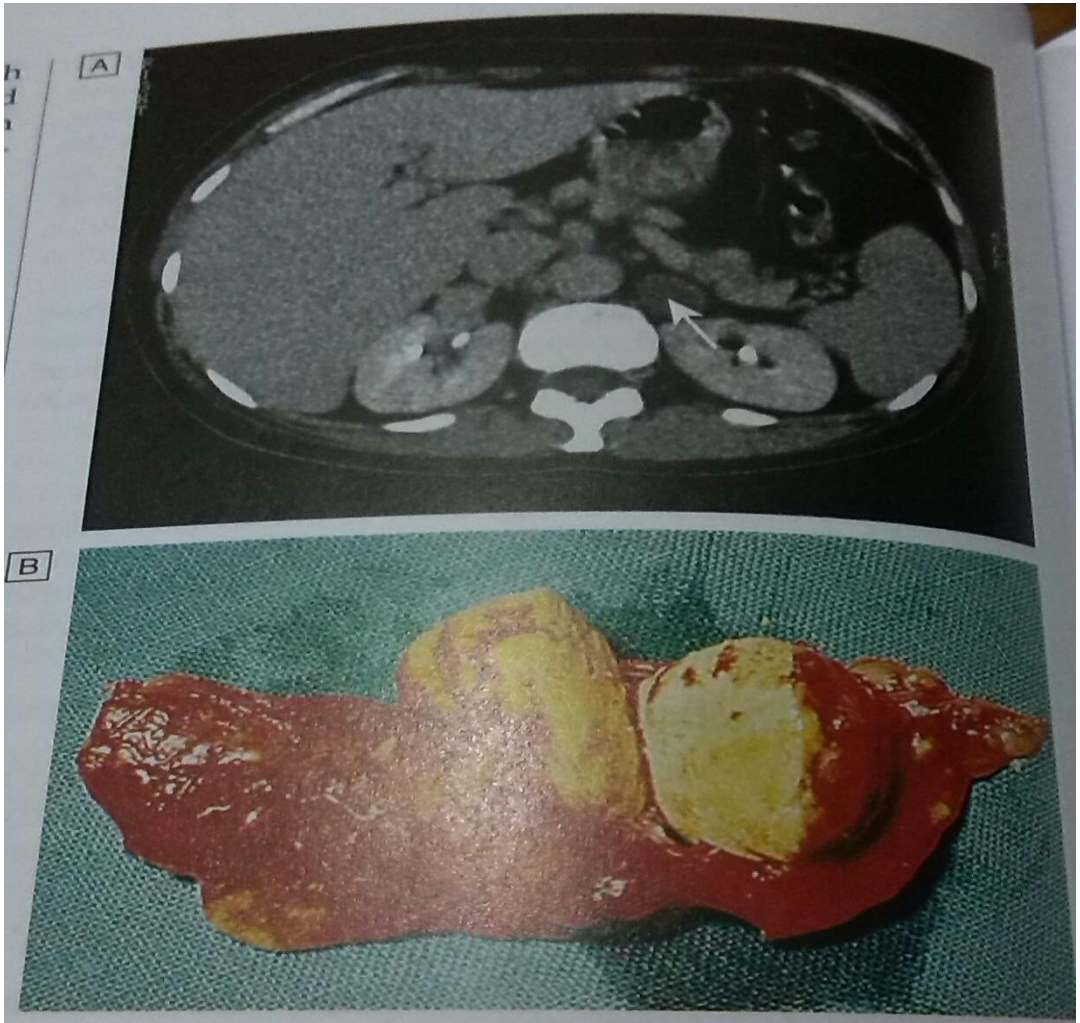
PHAEOCHROMOCYTOMA



labetalol) can be

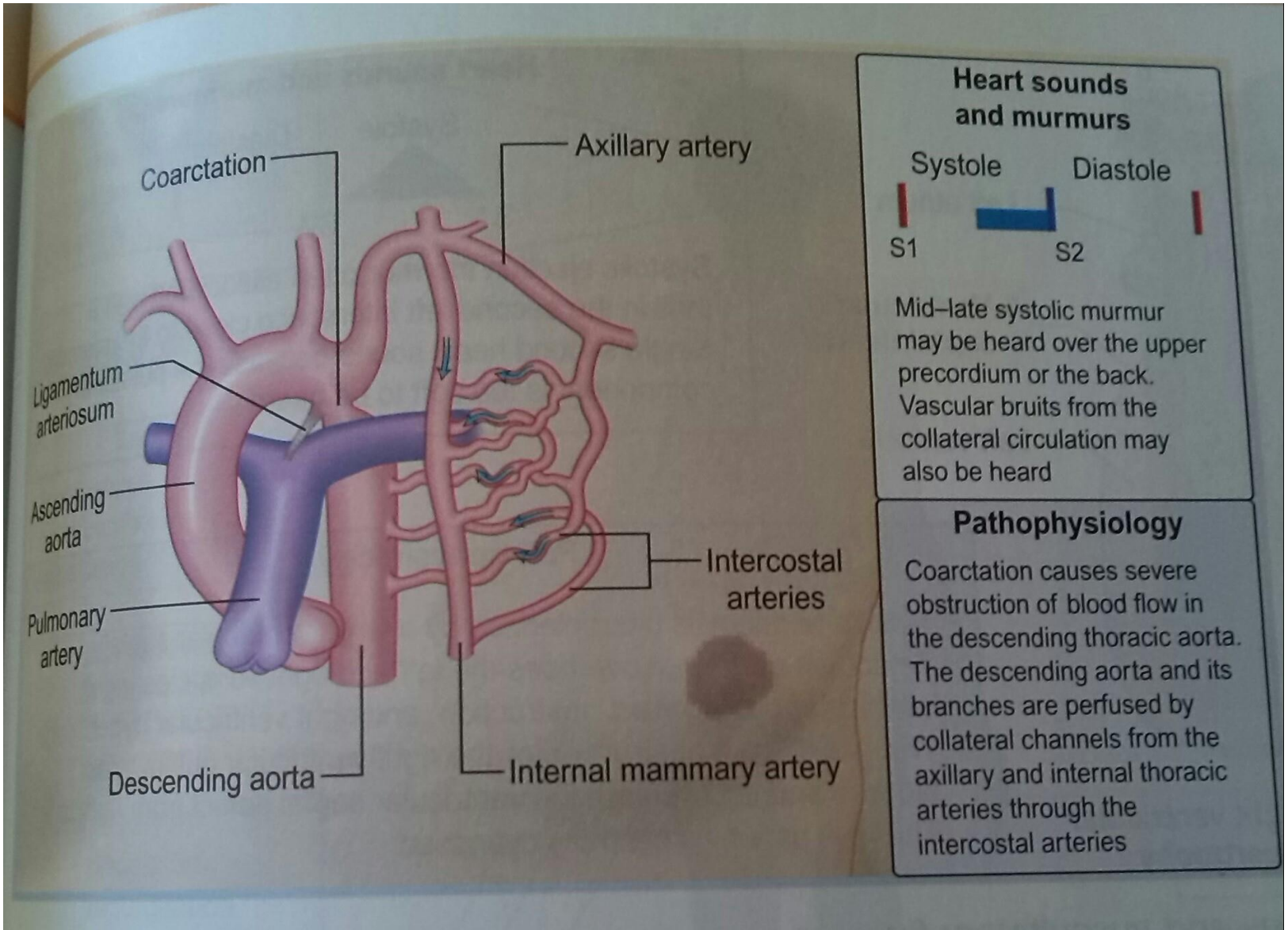
CT scan of abdomen showing large left adrenal phaeochromocytoma. A Coronal view. B Sagittal view. The normal right adrenal contrasts with the large heterogeneous phaeochromocytoma arising from the left adrenal gland (black arrows).

CONN S SYNDROME

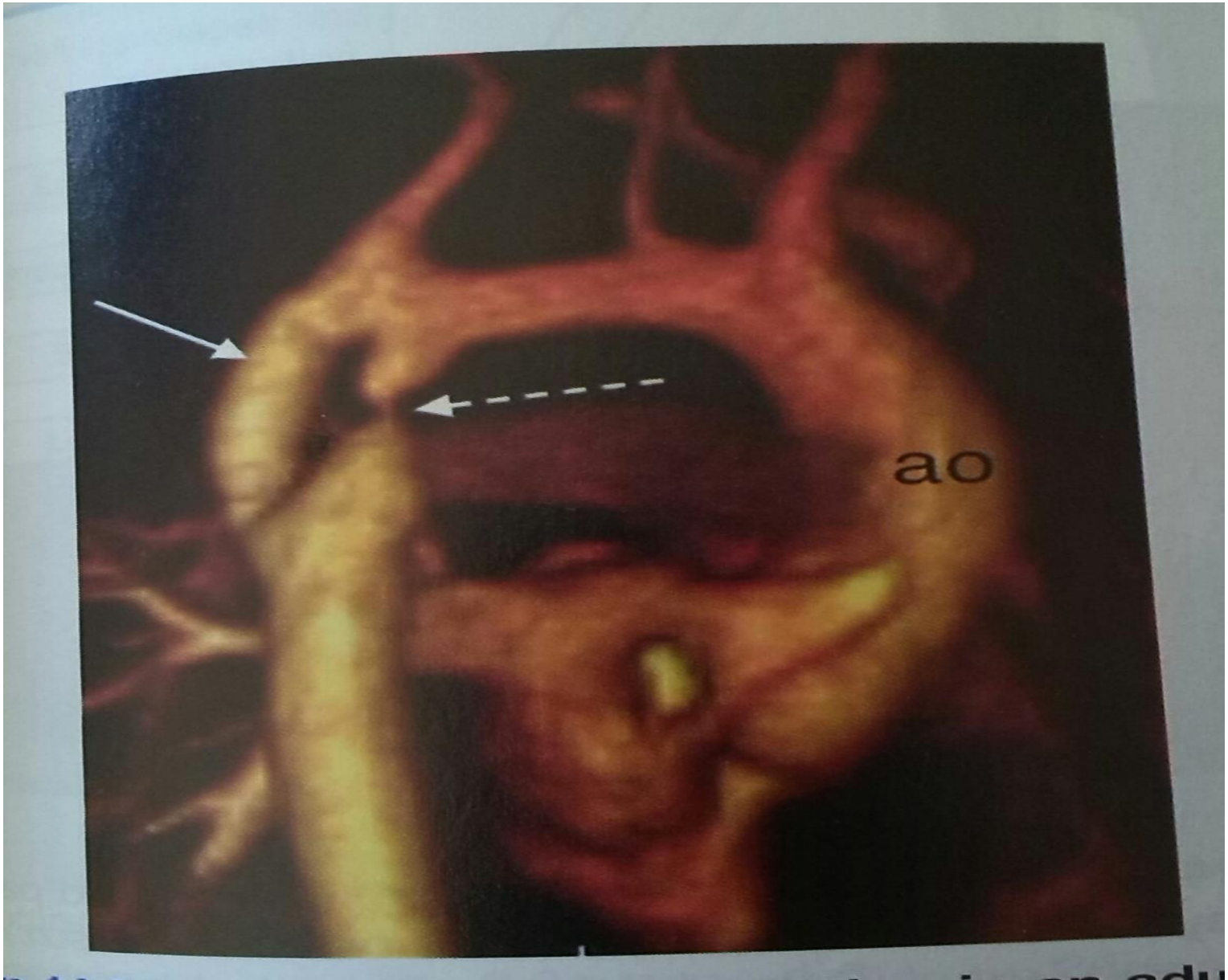


20.23 Aldosterone-producing adenoma causing Conn's rome. A CT scan of left adrenal adenoma (arrow). B The tumour is ry yellow' because of intracellular lipid accumulation.

CO-ARCTATION-OF -AORTA



CO-ARCTATION-OF -AORTA



KIDNEY AND HTN-

- HTN-

  may be the cause or the result of renal diseases.
- Difficult to differenciate between them .
- Renal mechanisms causing HTN-

1- Activation of Renin- Angiotensin- Aldosterone- sys.

2- Inability of the kidneys to excrete the Excess
Of Na from the body.
to maintain normal Na- balance
and intravascular volume.

KIDNEY AND HPN-

3- Reno- Vascular disease- ISCHAEMIA

- UNI- LATERAL
- BILATERAL Renal Artery diseases.

A- Fibro-Muscular dysplasia

Renal Artery Stenosis- CONGENITAL

More common in young female< 40years old.

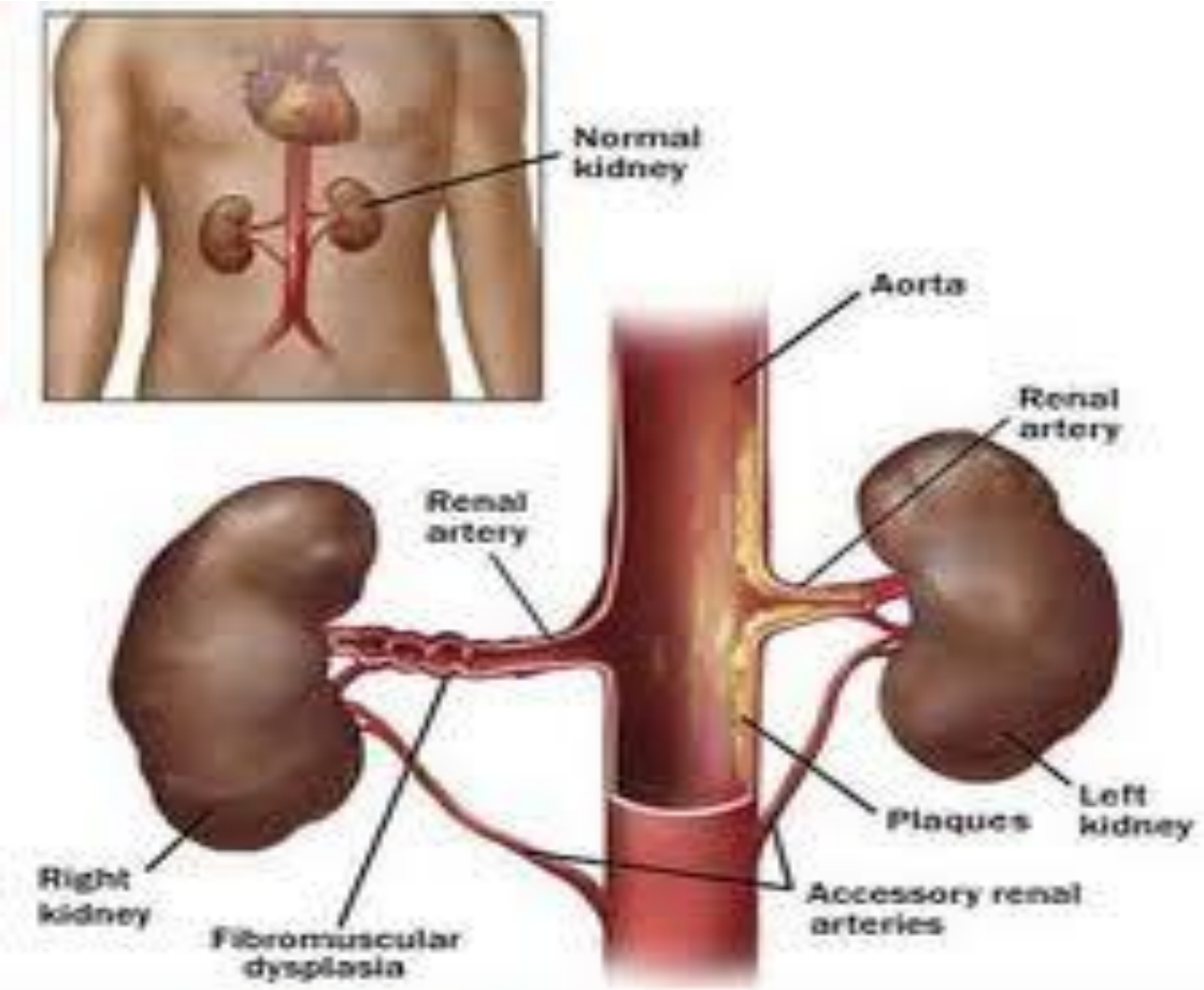
- RENAL - DUPLEX DOPPLER- U/S
- MRA- CTA- shows - STRING OF BEADS- like with multiple little aneurysmal dilations .

KIDNEY AND HTN-

B- Atherosclerotic – BI-LAT. RENAL ARTERY STENOSIS

- Age related disease affecting men
- > 50years old associated with
- Wide-spread- Atherosclerosis-
- Incidence- rises from 5% < 60years
  - >16% > 60years old.
- Ostial lesion within 1 cm of renal artery origin.
- Reduced kidney size > 1 cm difference
- in kidney size unilateral or bilateral
- Asymmetrical kidney size
- C- VASCULITIS -SCLERODERMA- TAKAYASU ARTERITIS.
-

RENAL-ARTERY-STENOSIS



KIDNEY AND HTN-

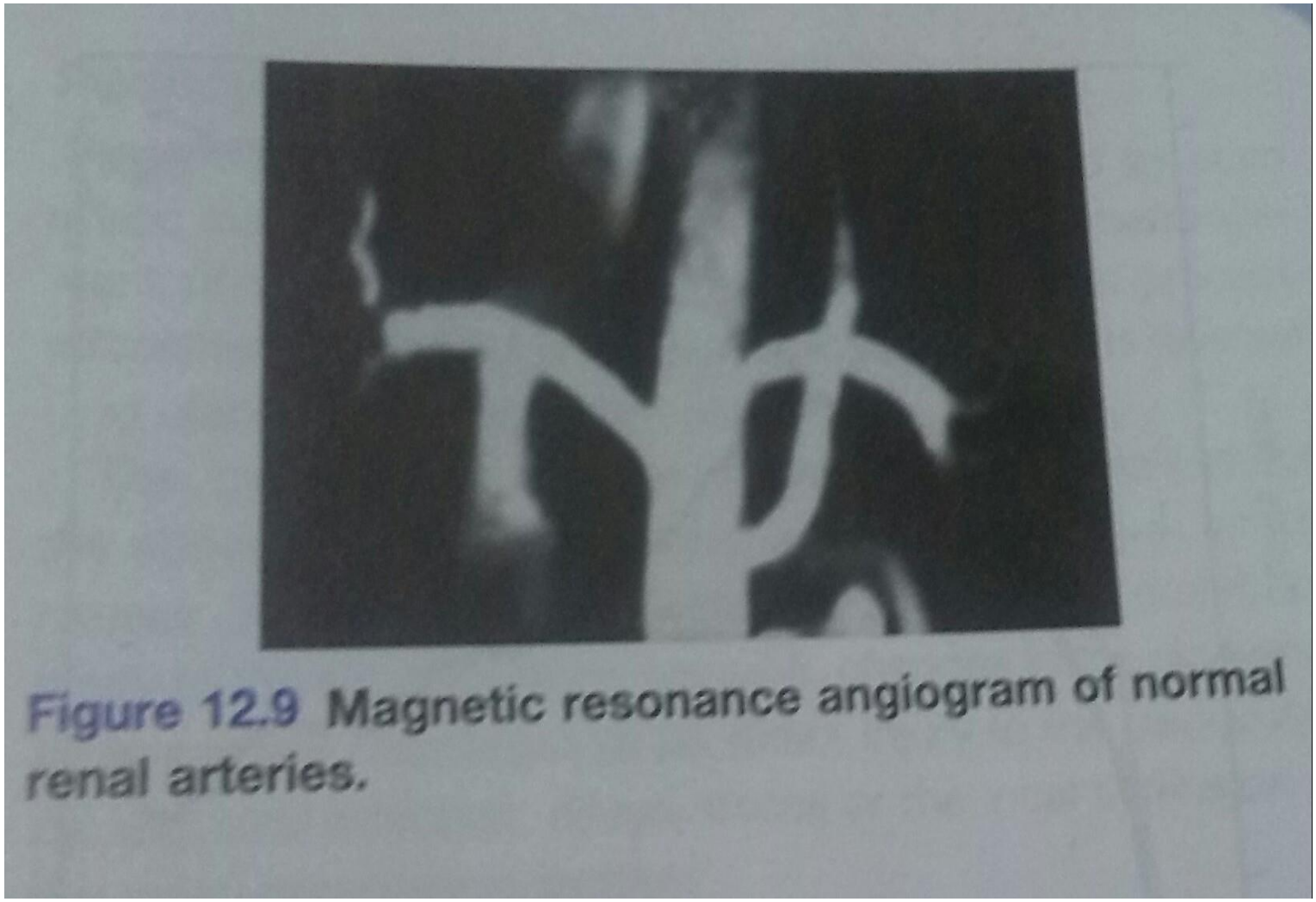


Figure 12.9 Magnetic resonance angiogram of normal renal arteries.

RENAL ARTERY-STENOSIS

Figure 14.118 Digital subtraction angiography, showing typical unilateral atheromatous renal artery stenosis with post-stenotic dilatation (arrow).

RENAL ARTERY-STENOSIS

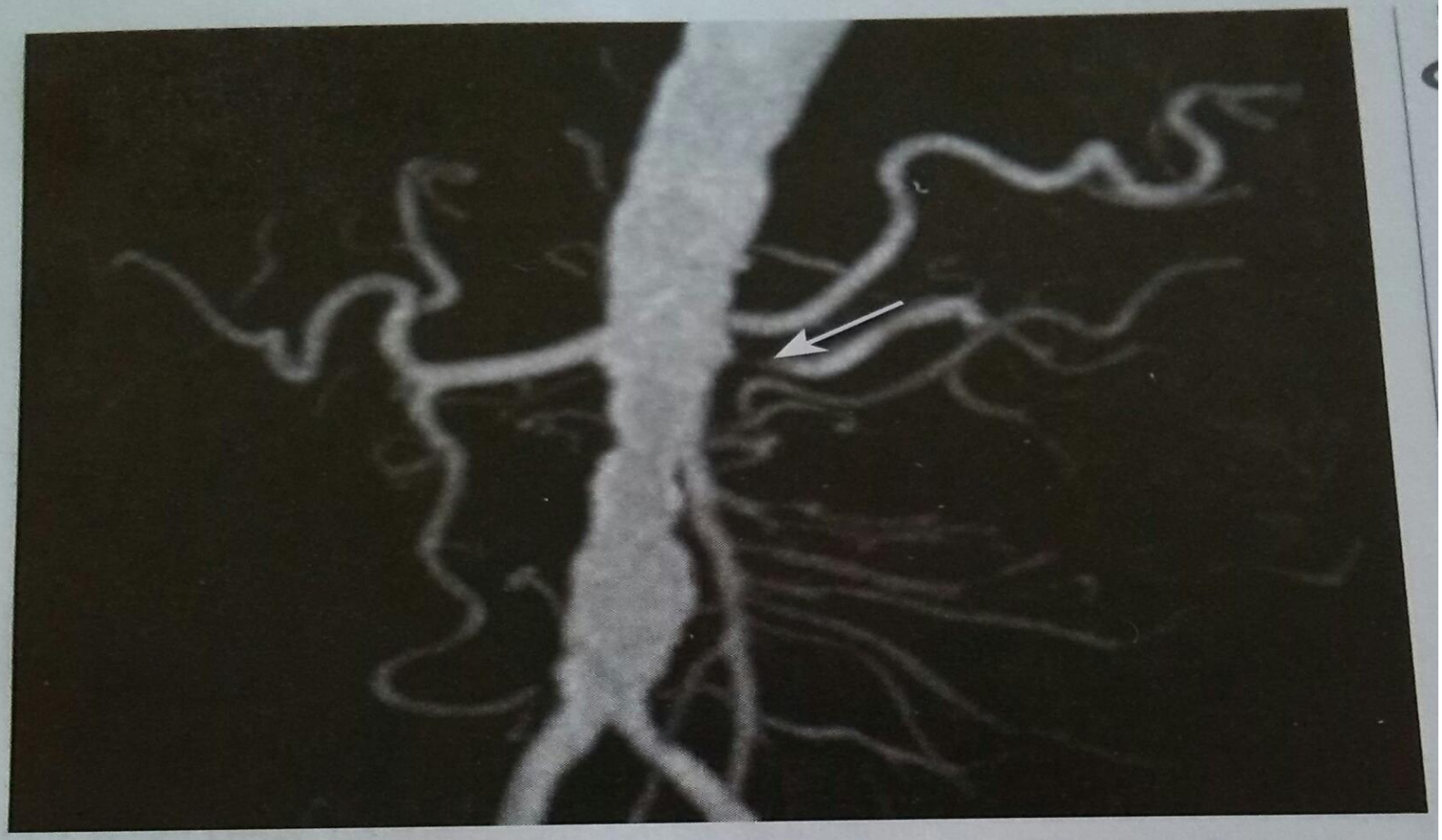


Fig. 17.23 Renal artery stenosis. A magnetic resonance angiogram following injection of contrast. The abdominal aorta is severely irregular and atheromatous. The left renal artery is stenosed (arrow).

RENAL ARTERY DISEASE –should be suspected in the following conditions-

1- Sever uncontrolled HTN.

2- Asymmetrical kidney size by U/S > 1cm difference.

3- Recurrent attacks of acute pulmonary edema .

4- Deterioration of renal function after ACEI or ARBS.

5- Peripheral vascular disease- PVD.

diffuse atherosclerosis - Carotid artery bruits.

- Abdominal bruits or aortic aneurysm.

6- Progressive CKD.

7- Hypokalemia.

RISK-FACTORS for an adverse prognosis in HTN-

- 1- BLACK- AFRICAN
- 2- Male sex.
- 3- Persistent high diastolic BP>115mmHg.
- 4- Smoking- high alcohol- intake.
- 5- DM and Dyslipidaemia.
- 6- Evidence of end organ damage-
- LVH- IHD -CHF- CVA- Retinopathy
- Renal function impairment - CKD.

REFRACTORY- RESISTANT-HTN

1- Failure of medical treatment

RESISTANT HTN

Patients on 3 antihypertensive medication including diuretic still his BP- >130/85

or on 4 antihypertensive drugs and his BP- < 130/85

PSEUDO-RESISTANT- HTN – uncooperative pat.

REFRACTORY HTN-all medications and still high BP.

Failure to diagnose SECONDARY underlying causes-

- Renal artery stenosis
- Pheochromocytoma – CONNS SYN.
- SLEEP APNEA SYN.
-

HTN- ELDERLY-

- More than 50% of people > 60y. are HTN
- HPT- Age related disease. LOW RENIN HTN
  Isolated Systolic HPN is common- Atherosclerosis.
- They are high risk group patients for
- Stroke - IHD- MI- HF-CKD- Peripheral vascular disease.
- Very good response to treatment.
- DRUG of choice
- Hydrochlorthiazide diuretics +
- Calcium channel blockers
- AGE > 80 years
- BP- TARGET -150/90 - Consider CO- Morbidity.

HYPERTENSION IN PREGNANCY

HYPERTENSION IN PREGNANCY

BP-<120/80

1- Chronic -HTN- pre- existing before 20 weeks of gestation.

2- Gestational HTN-is BP >140/90 in 2nd trimester
in previously Normotensive women NO proteinuria.

3- Pre-Eclampsia -HTN-after 20 weeks of gestation+ proteinuria.

4- Eclampsia- HTN + grand mal seizures
leg edema- proteinuria >300mg/24hours .

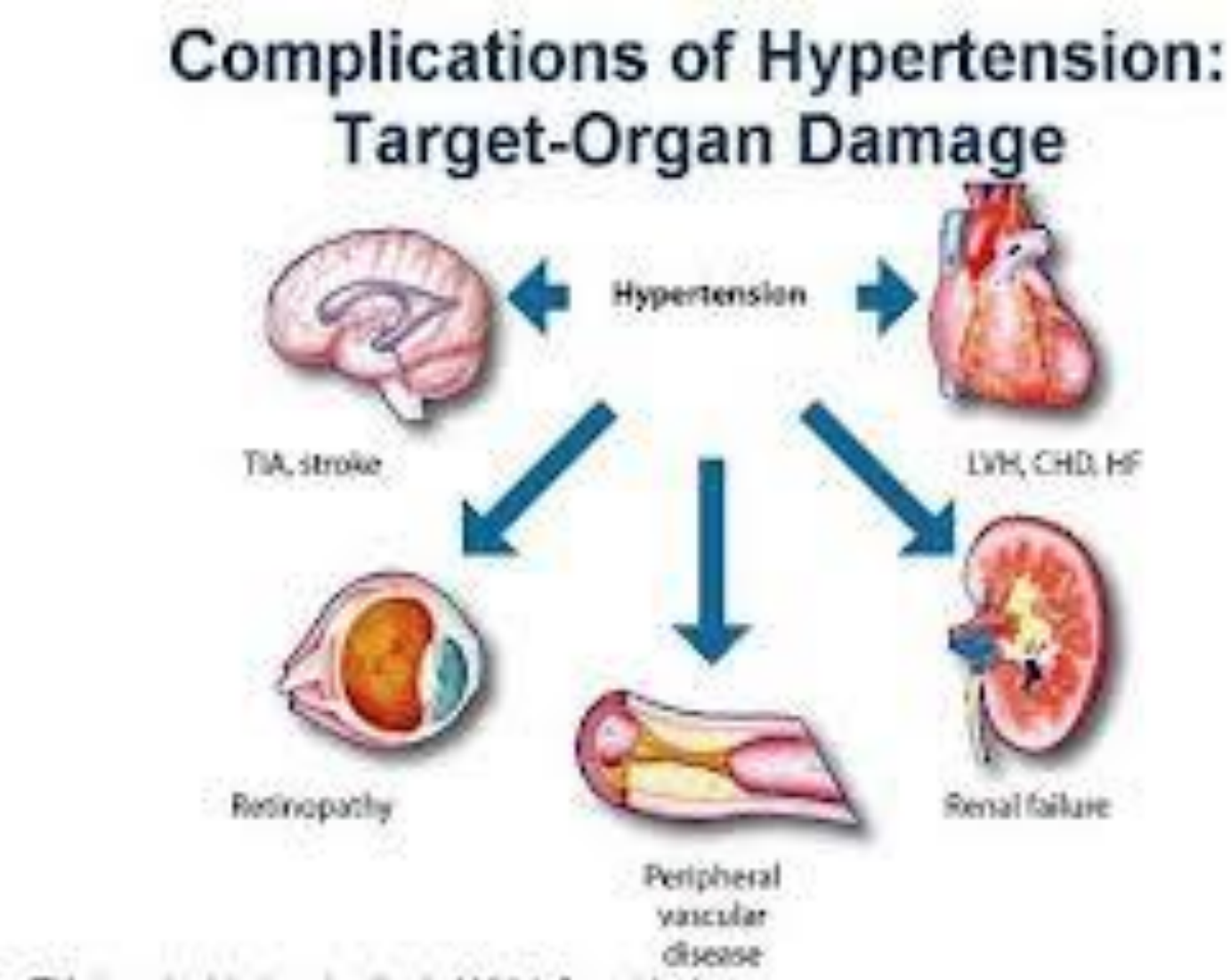
5- HELLP syndrome – sever pre-eclampsia +
Hemolytic anemia - Elevated liver enzymes- Low plat.

ACEI- ARABs – TERATOGENIC- CONTRA-INDICATED.

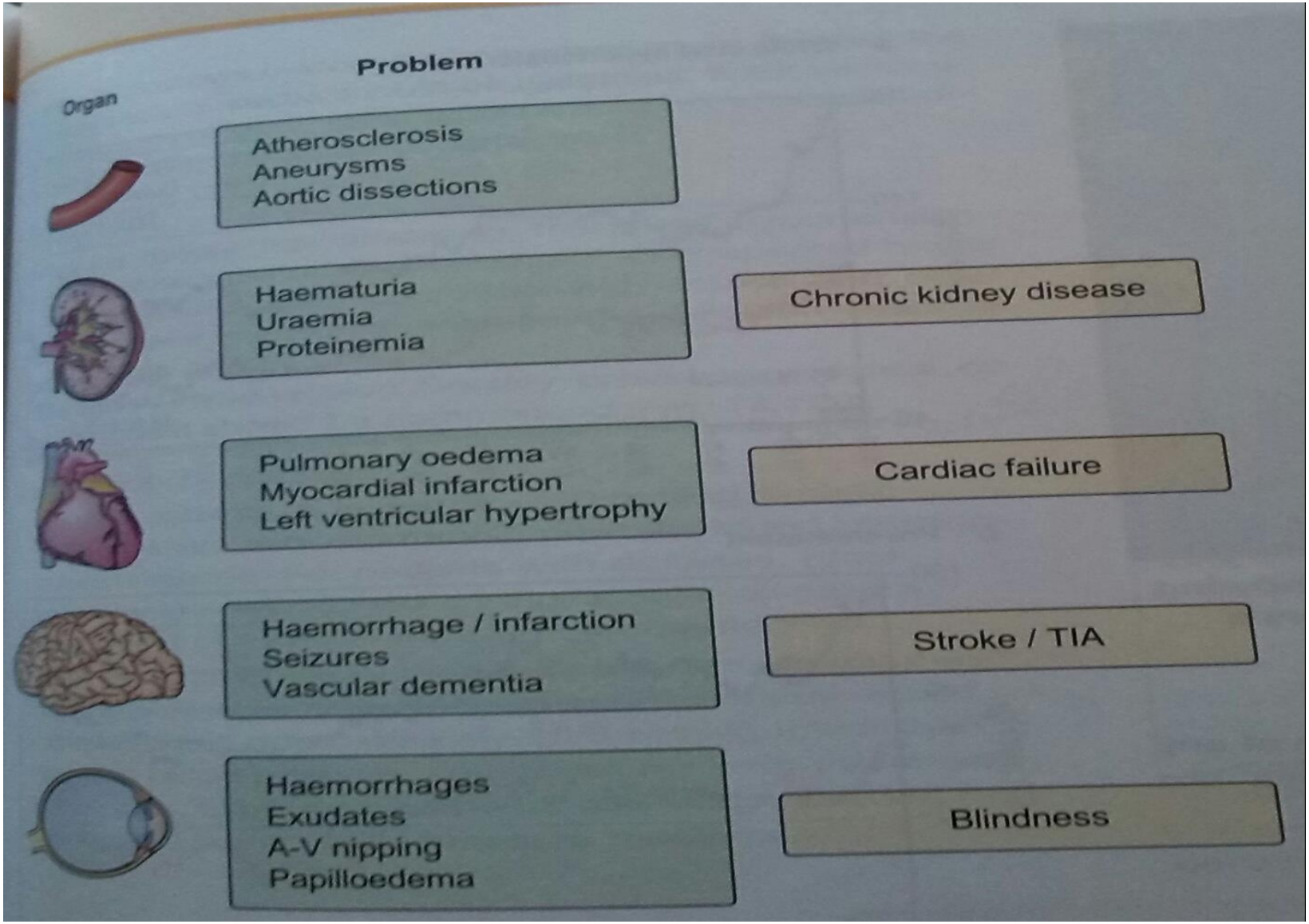
First line Methyldopa.

Second line- Nifedipine - Labetalol- THIAZIDE.

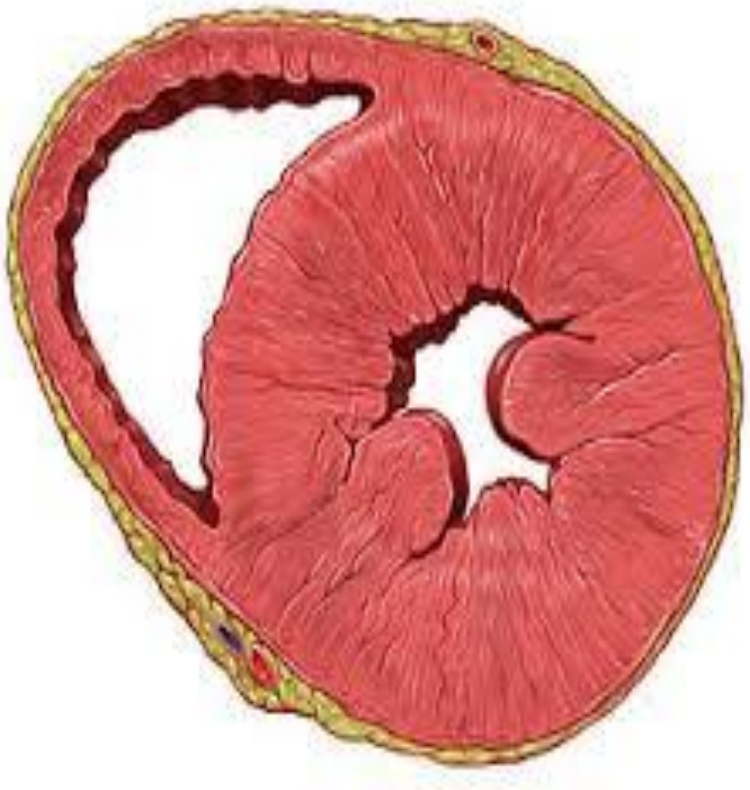
Target organ damage in hypertension



Target organ damage in hypertension



LVH-HTN



LVH-HTN

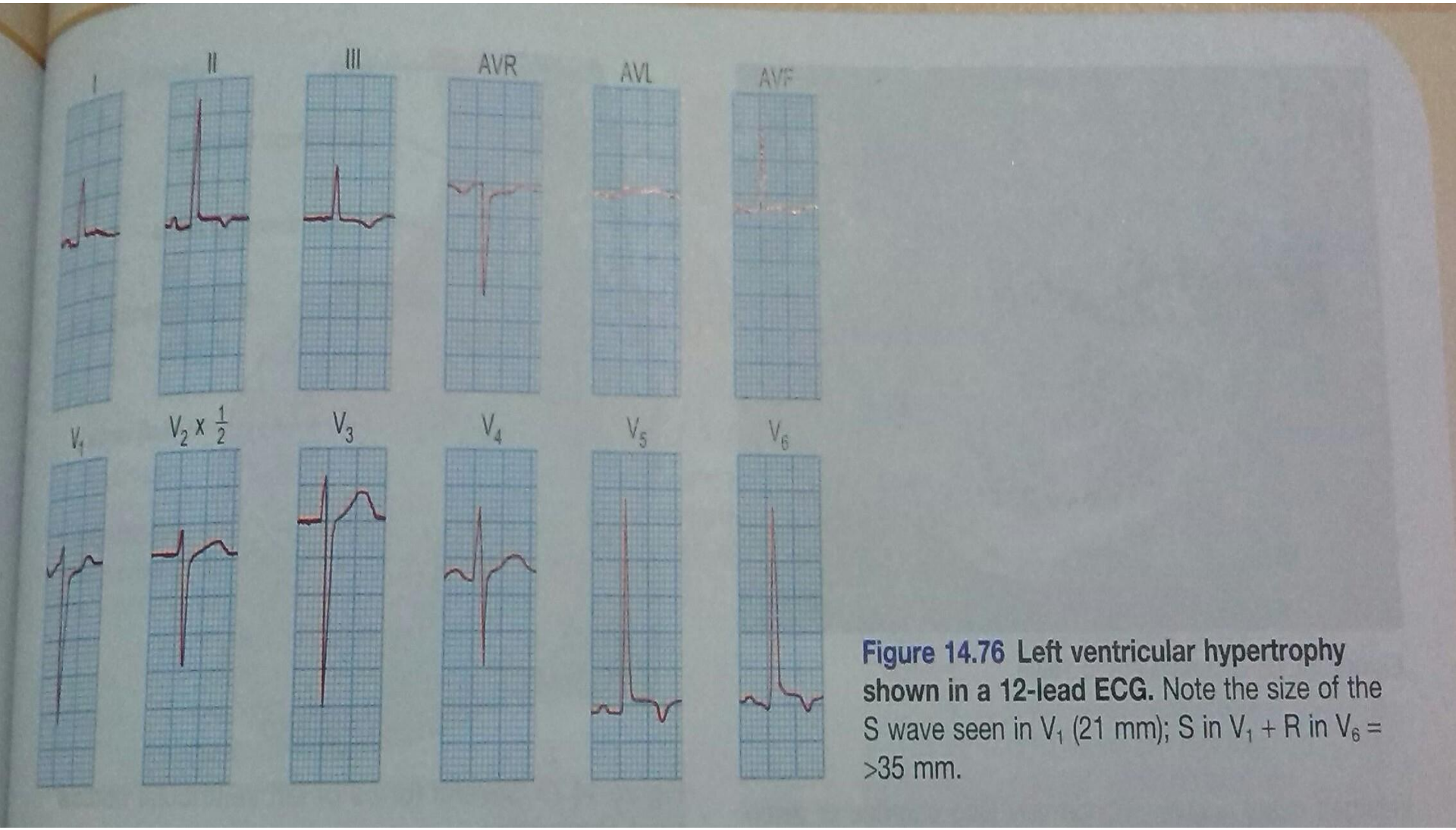
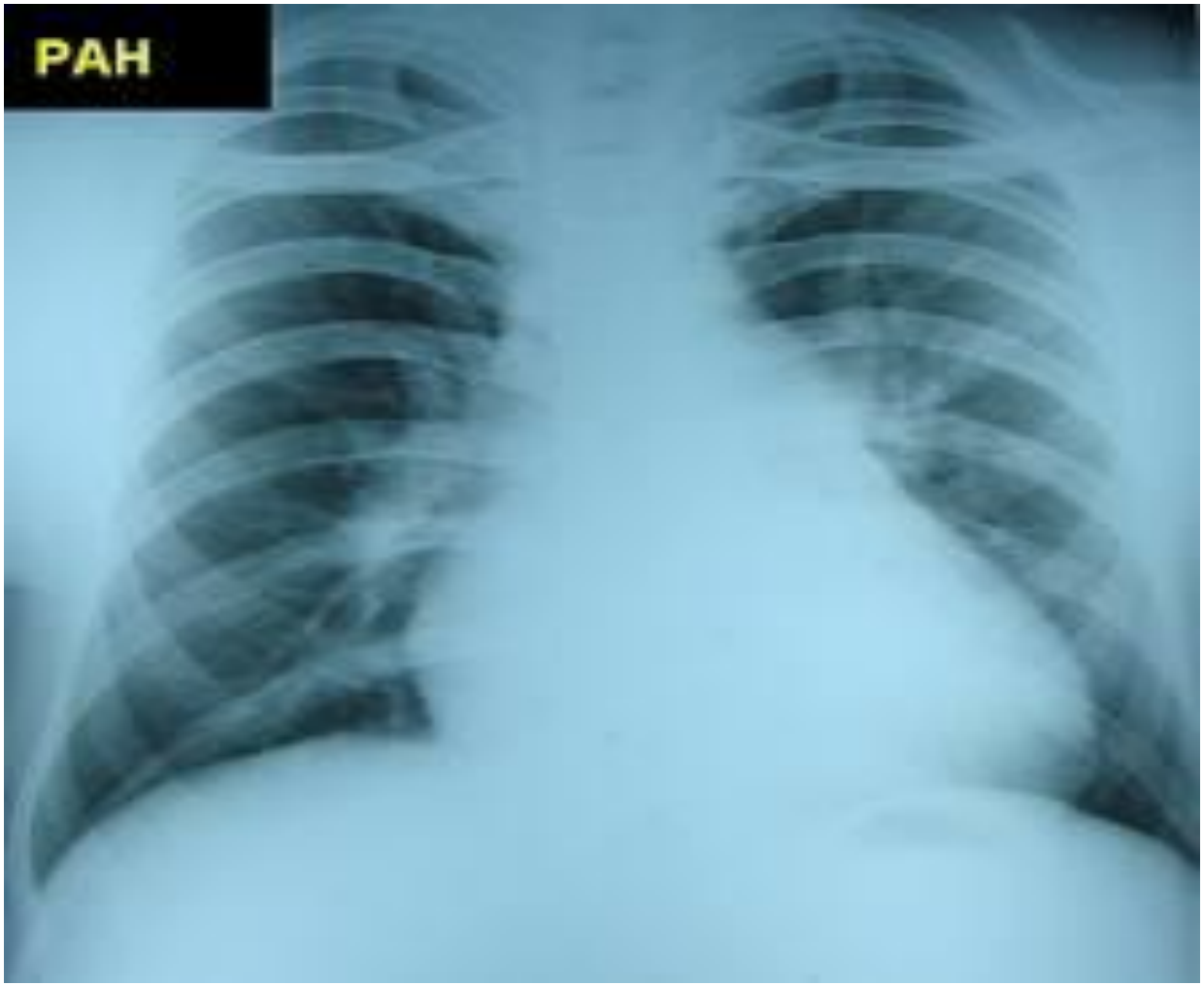
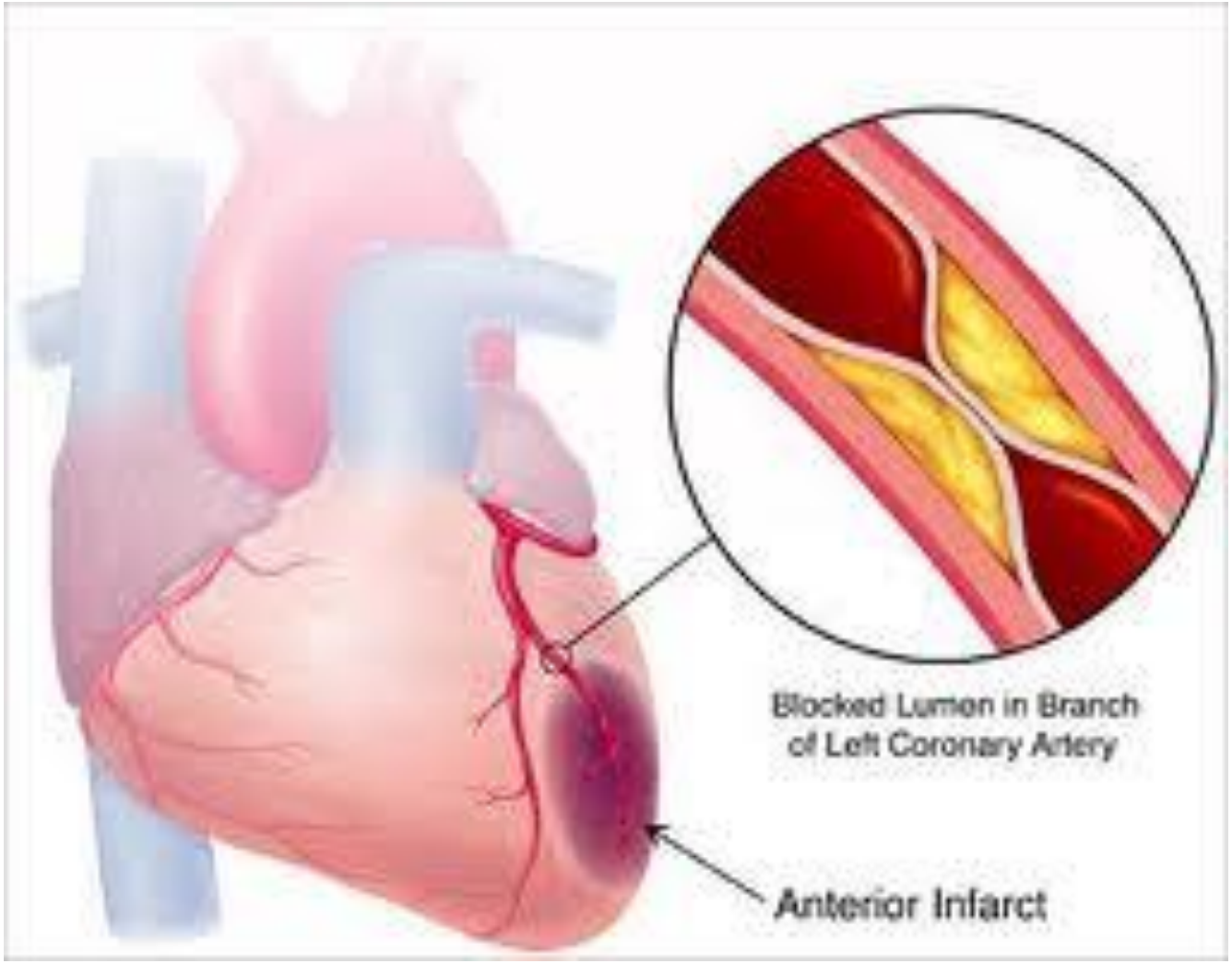


Figure 14.76 Left ventricular hypertrophy shown in a 12-lead ECG. Note the size of the S wave seen in V_1 (21 mm); S in V_1 + R in V_6 = >35 mm.

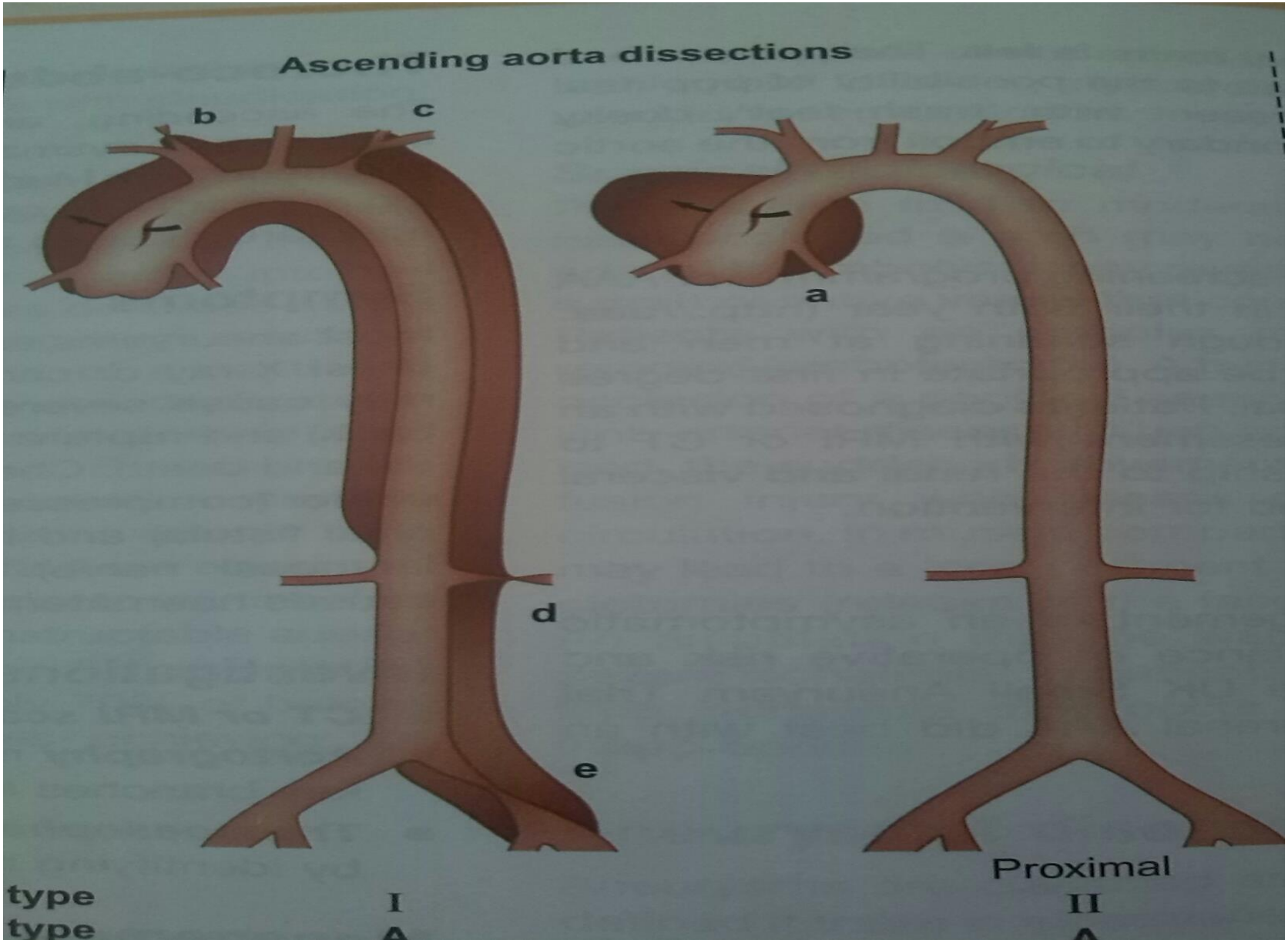
LVH-HTN



IHD-ACUTE-MI-HTN

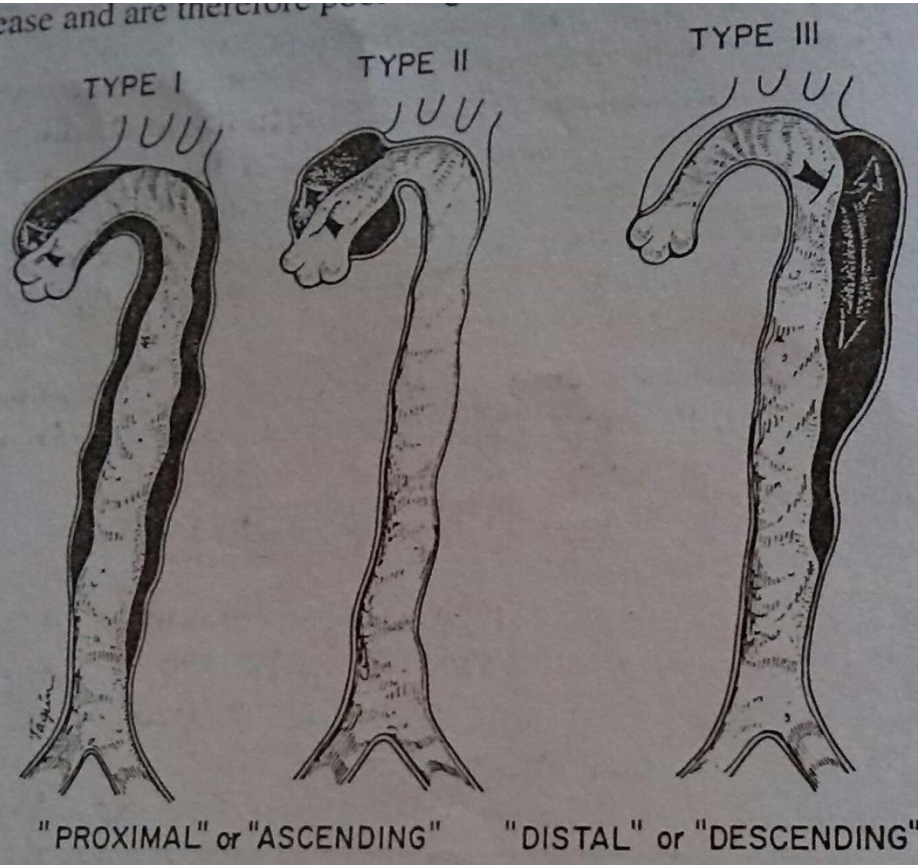


MALIGNENT- HTN



EMERGENCY-MALIGNENT- HTN
AORTIC-DISSECTING ANEURYSM

diopulmonary disease and are therefore p

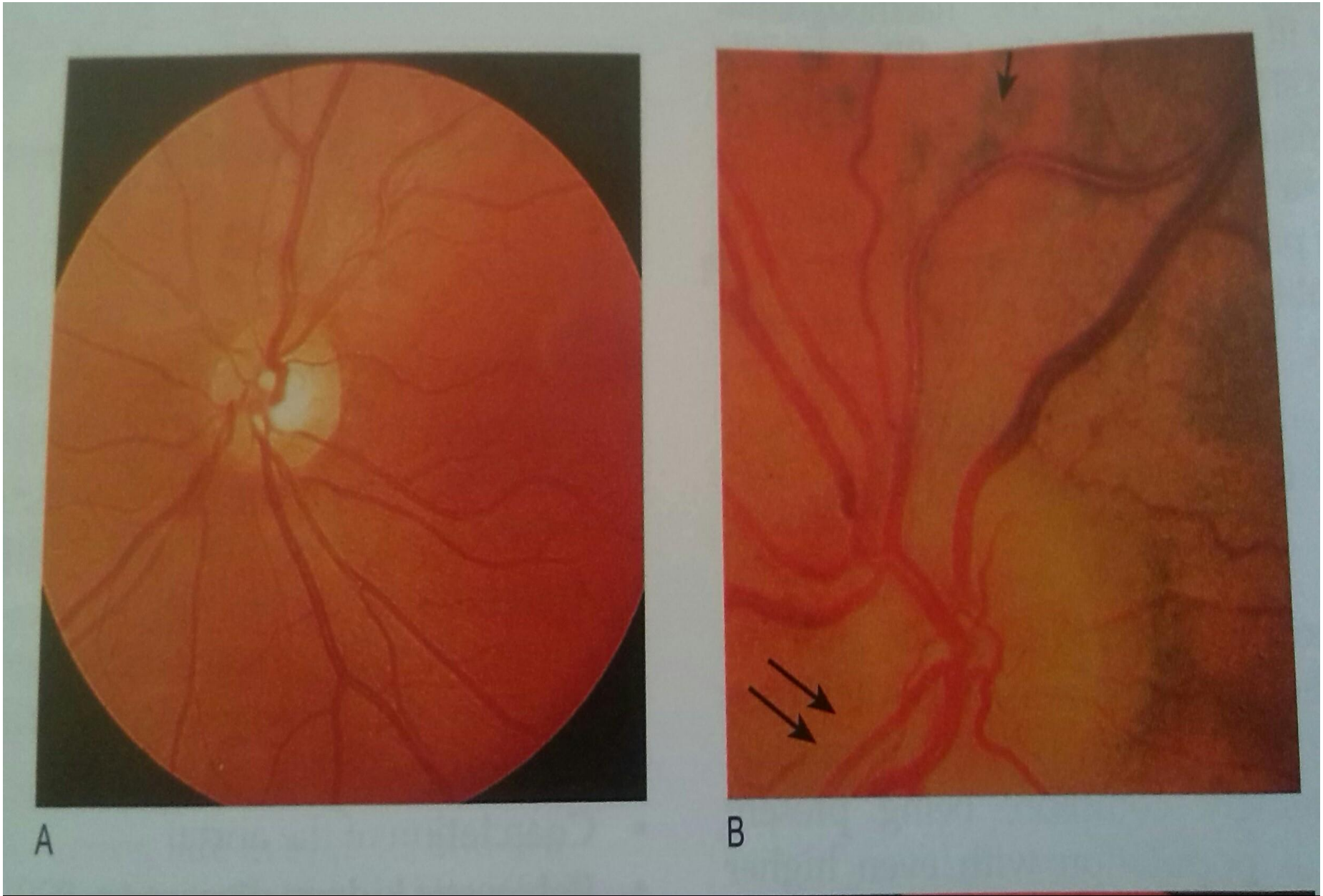


From Braunwald E (ed): Heart Disease: A Textbook of Cardiovascular Medicine, 3rd ed. Philadelphia, W.B. Saunders, 1988, p 1554; with permission.

Hypertensive retinopathy

Grade 1	Arteriolar thickening, tortuosity and increased reflectiveness (“silver wiring”).
Grade 2	Grade 1 plus constriction of veins at arterial crossings (“arteriovenous nipping”).
Grade 3	Grade 2 plus evidence of retinal ischaemia (flame – shapped or bolt haemorrhages and “cotton wool “ exudates).
Grade 4	Grade 3 plus papilloedema.

HTN-RETINOPATHY



HTN-RETINOPATHY

Figure 14.117 **Fundus showing hypertensive changes: Grade 4 retinopathy with papilloedema, haemorrhages and exudates.**

HTN-RETINOPATHY
PAPILLOEDEMA

EMERGENCY-MALIGNENT- HTN

- Constitutes >1% of HTN-
- ACUTE RAPID RISE BP-
- Accelerated Micro-vascular damage and occlusion.
  MULTI organs ISCHAEMIA - Heart- Kidney-Brain-Eyes.
- Splits in the intima of small blood vessles wall.
- Vascular wall Fibrinoid Necrosis.

  Intra-vascular fibrin deposition and thrombosis.

  Micro- Angiopathic Haemolytic Anaemia-

  THROMBOTIC MICRO-ANGIOPATHY

  RBC- fragmentation- Thrombocytopenia.

EMERGENCY-MALIGNENT- HTN

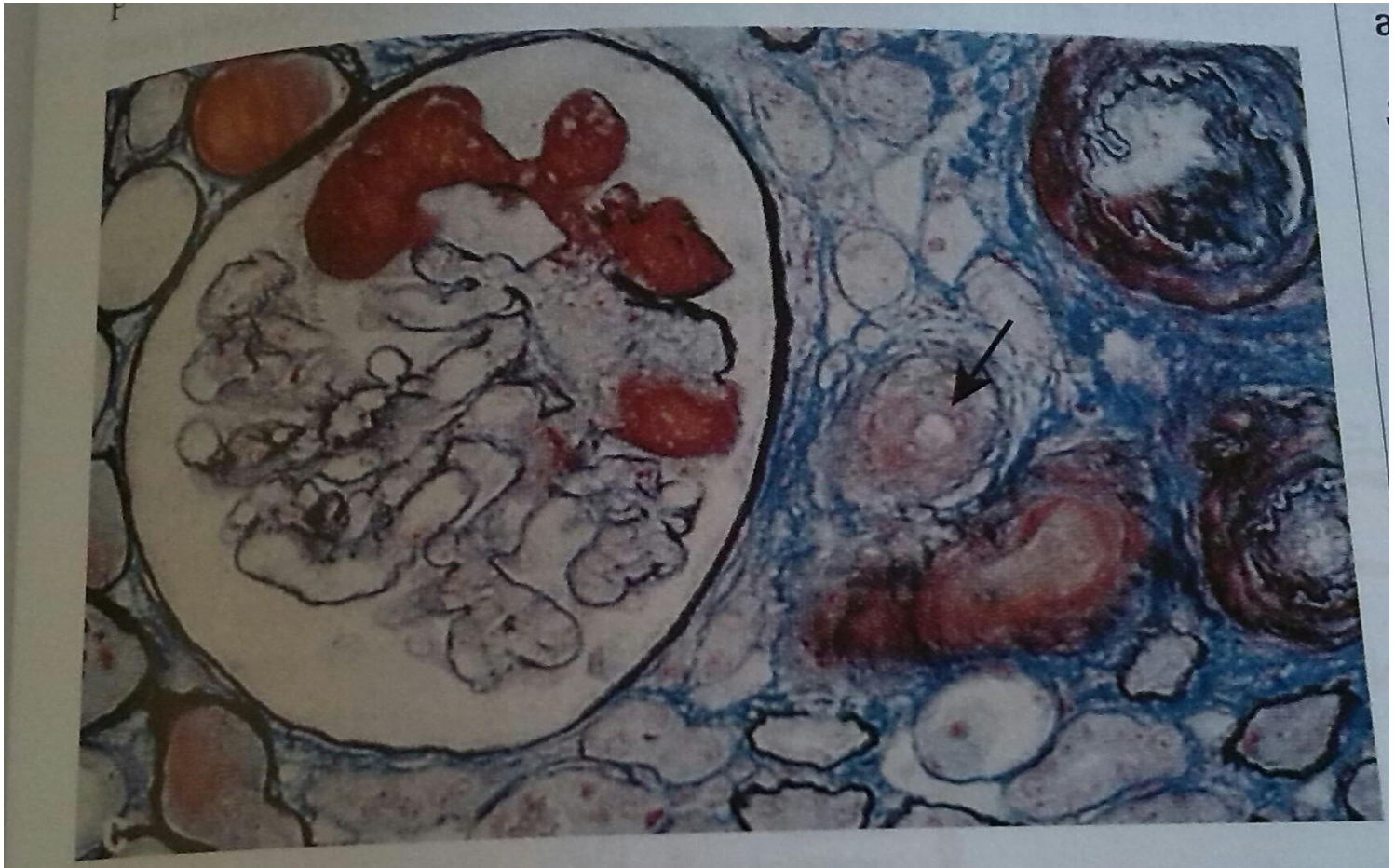


Fig. 17.24 Glomerular capillary thrombosis in malignant hypertension. Similar changes occur in thrombotic microangiopathy. The adjacent arteriole (arrow) shows gross intimal thickening.

EMERGENCY-MALIGNENT- HTN

- Clinically presented
- ACUTE-SEVER- HTN- diastolic BP>120-140mmHg,
- Progressive renal failure- AKI
- ACUTE Aortic- dissecting aneurysm-
  Acute pulmonary odema.
- Encephalopathy- SEVER HTN- Cerebral odema
- brain hemorrhage -convulsion.
- PAPILLEDEMA- almost always present.
- COMA- Death.

EMERGENCY-MALIGNENT- HTN

- MANAGEMENT-

1- HOSP. ADMISSION- ICU

2- Slowly reduce BP-

To avoid cerebral – renal- and cardiac ischemia because loss of autoregulation.

- TARGET- BP
- diastolic BP-100-110mmHg -Over 24- 48 h.
- Then control and normalize BP Over next 2-3days

3- IV- Na - Nitroprusside-

Labetolol-

Glycerin trinitrate - Hydralazine

CLINICAL APPROCH-EXAM.HTN

- DIGNOSIS-PTN-

1- Medical-History-

COMMONLY Asymptomatic- discovered by routine exam.

SYMPTOMES-

occiptal headache - dizzness - vertigo- tinnitus-

TARGET ORGAN DAMADE -IHD-MI-ARRHYTHMIA-HF-PVD-CKD.

- Drug history- NSAID- Alcohol -STEROID-PILLS –LICURICE-DIET.
- Family history- RENAL DISEASES-HTN-DM-LIPIDS PROBLEM.

2- Clinical physical examination-

GENERAL exam. VITAL SIGNS- CARDIOVASCULAR system

- Looking for SECONDARY underling causes.

Target end organs damage-CNS -EYES-RENAL.

CLINICAL APPROCH-EXAM.HTN

CLINICAL APPROCH-EXAM.HTN

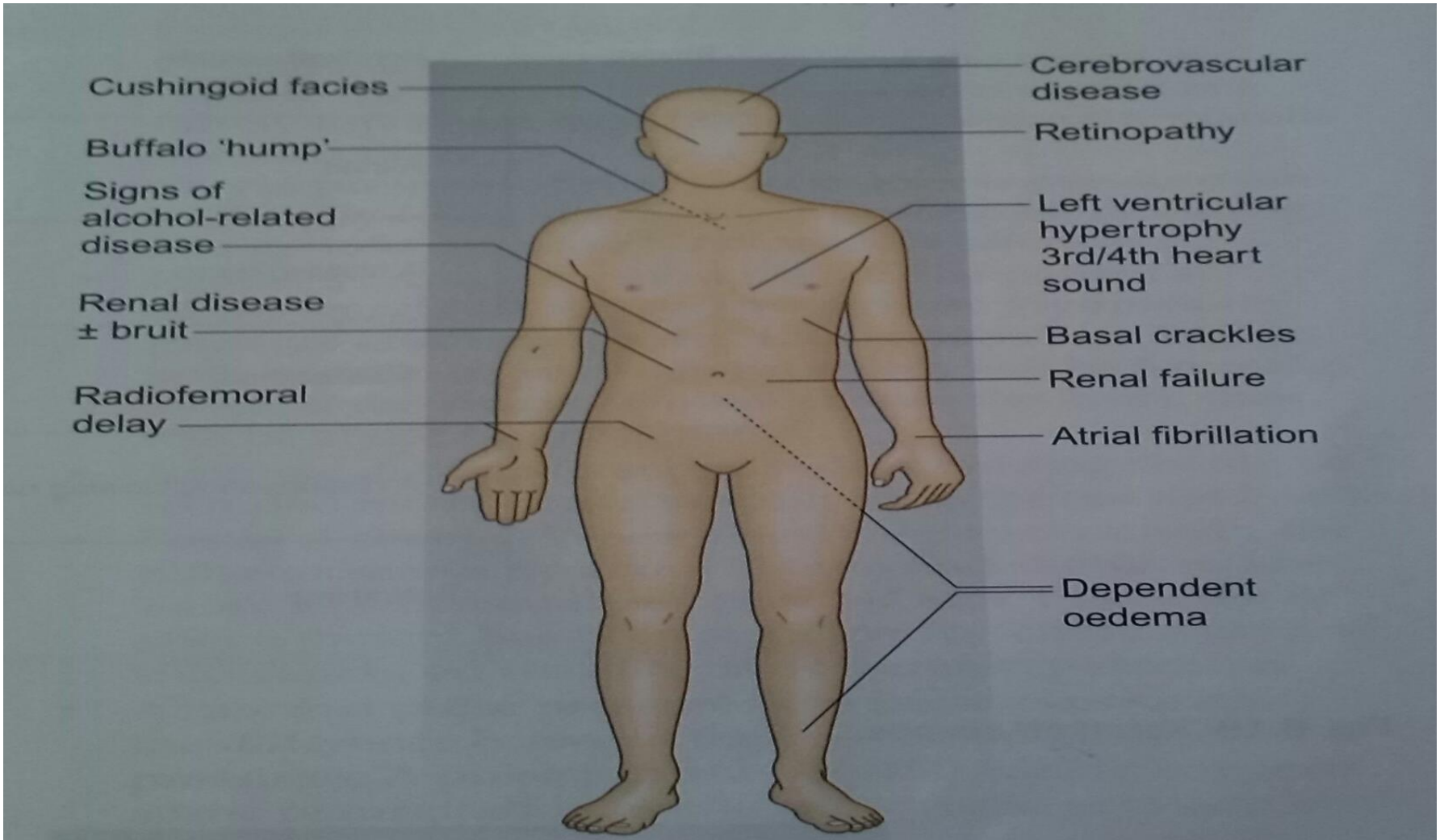


Fig. 6.18 Physical signs associated with hypertension.

MANAGEMENT -THRESHOLDS OF HTN
CLINICAL -APPROCH

- 1- BP -130/85- RE-ASSESS IN 2-3- YEARS.
- 2- BP 130-139/85-89- RE-ASSESS – YEARLY-life style
- 3- BP 140-159/90-99-
- A- TARGET ORGAN DAMAGE OR
- CARDIOVASCULAR COMPLICATIONS - OR DM
- Confirm high BP- Then treat - 2-3-weeks.
- B- IF NOT MONTHLY BP-
- OBSERVE AND CHECK CARDIOVASCULAR SYS.
- TREAT IF BP- LEVEL ARE MAINTAINED HIGH.

MANAGEMENT -THRESHOLDS OF HTN
CLINICAL -APPROCH

- 4- BP-160/100
- IF THERE IS
- DM- CARDIOVASCLAR COMPLICATION
- OR END ORGAN DAMAGE
- TREATE WITHIN 1-2 WEEKS

- 5- BP-180/110
- WORK UP IMMEDIATLY

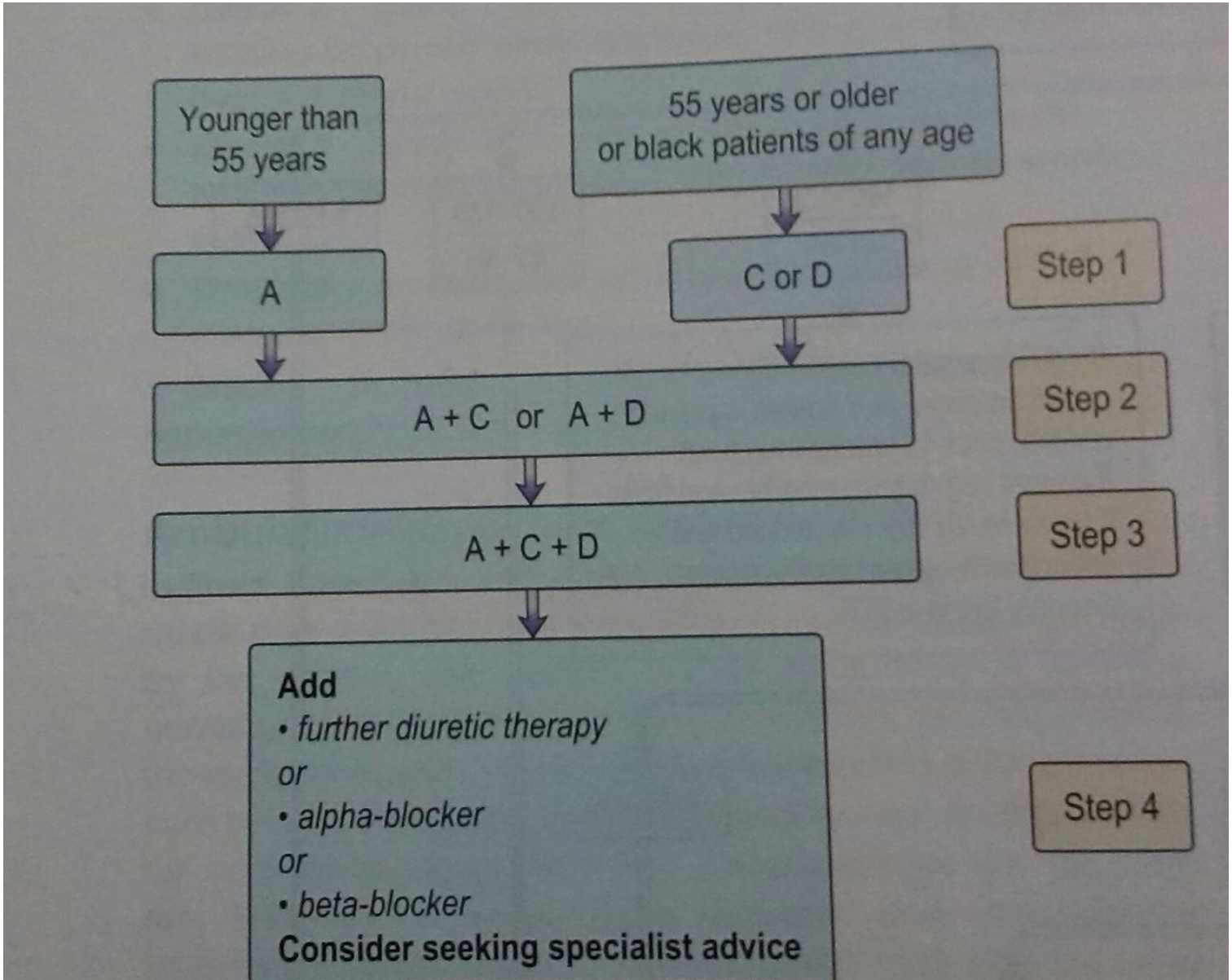
Lifestyle Modification

PREVENTION OF HPN-	
1- Body weight	Maintain normal body weight (BMI 20-25kg/m)
2-Aerobic exercise	>30 min brisk walk most days/week
3- Diet	Reduce intake of fat and saturated fat Reduce salt intake <6 g NaCl /day ,increase fish oil
4- Cardiovascular risk reduction	Avoid cigarette smoking –high alcohol

Lifestyle Modification

Lifestyle Modification

MANGMENT-HTN



ANTI-HYPERTENSIVE DRUGS

- Reduce cardiovascular events
- 30% reduction - stroke- 20% IHD- MULTIPHARMACY

1- AECI- GROUP-

- ENALOPRIL- LISINOPRIL- RAMIPRIL- PERINDOPRIL
- INDICATED –
- YOUNG -HF - POST-MI- DMT2-NEPHROPATHY- STROKE.

2- ARBs- GROUP-

- LOSARTAN- CANDESARTAN- VALSARTAN
- OLMISARTAN- TELMISARTAN-
- INDICATED-
- AECI- INTOLERANCE

- HF -LVH- IHD- POST-MI- DMT2- NEPHROPATHY.

ANTI-HYPERTENSIVE DRUGS

3- THIAZIDES- OLD PT. SYSTOLIC HTN- HF- STROKE.

4- CALCIUM CHANNEL BLOCKERS GROUP-

- DIHYDROPYRIDE-GROUP
- AMLODPINE - NIFEDIPINE-
- NON-DIHYDROPYRIDINE-GROUP
- - DILTAIZEM - VERAPAMIL-
- Old pt. SYSTOLIC- HTN- ANGINA- ARRHYTHMIA

5- B-BLOCKERS GROUP

- ATENOLOL- BISOPROLOL-NEBIVOLOL
- CARVIDOLOL METOPROLOL
- HTN- HF- ANGINA- ARRHYTHMIA- AF

ANTI-HYPERTENSIVE DRUGS

6- ALPHA-BLOCKER GROUP

- \- PHENTOLAMINE-PHENOXYBENZAMINE
- DOXAZOSIN- HTN- BPH

7- ALPHA- B- BLOKERS-

- LABETOLOL- Pregnancy-Emergancy-IV.

8- VASODILATORS- GROUP-

Hydralazine- Minoxidl- Na-nitroprusside- GTN.

9- Centrally acting-methyldopa

- Pregnancy – lactating-

10- STENT- RENAL ARTERY STENOSIS

11-SURGERY-ADRENAL MASS- CO-ARCTATION OF AORTA- RENAL DENERVATION.

- **Key points**
- Well CALBRATED -BP- MACHINE-measurement-BP- is important for diagnosing and managing hypertension.
- Management of hypertension begins with an accurate assessment of total risk of cardiovascular disease before complication.
- It is important to consider secondary hypertension.
- Changes in lifestyle may delay or avoid the need for drug treatment.
- You should offer patients in whom the clinic blood pressure is greater than 140/90mm Hg- 24 hour
- (ABPM) to confirm the diagnosis OR (HBPM) .
  - You should start antihypertensive drug treatment in patients after confirmation and life style change.
  - BP>140/90 mm Hg on ABPM.
  - BP- ≥135/85 mmHg (using ABPM) where target organ damage is present OR DM .
  - **or the** 10-year cardiovascular risk > 20%.

SILENT KILLER