

ARTERIAL HYPERTENSION,
ETIO-PATHOGENESIS AND
LABORATORY DIAGNOSTIC
METHODS

Arterial
hypertension



Primary
(essential)



Secondary
(symptomatic)

Obesity

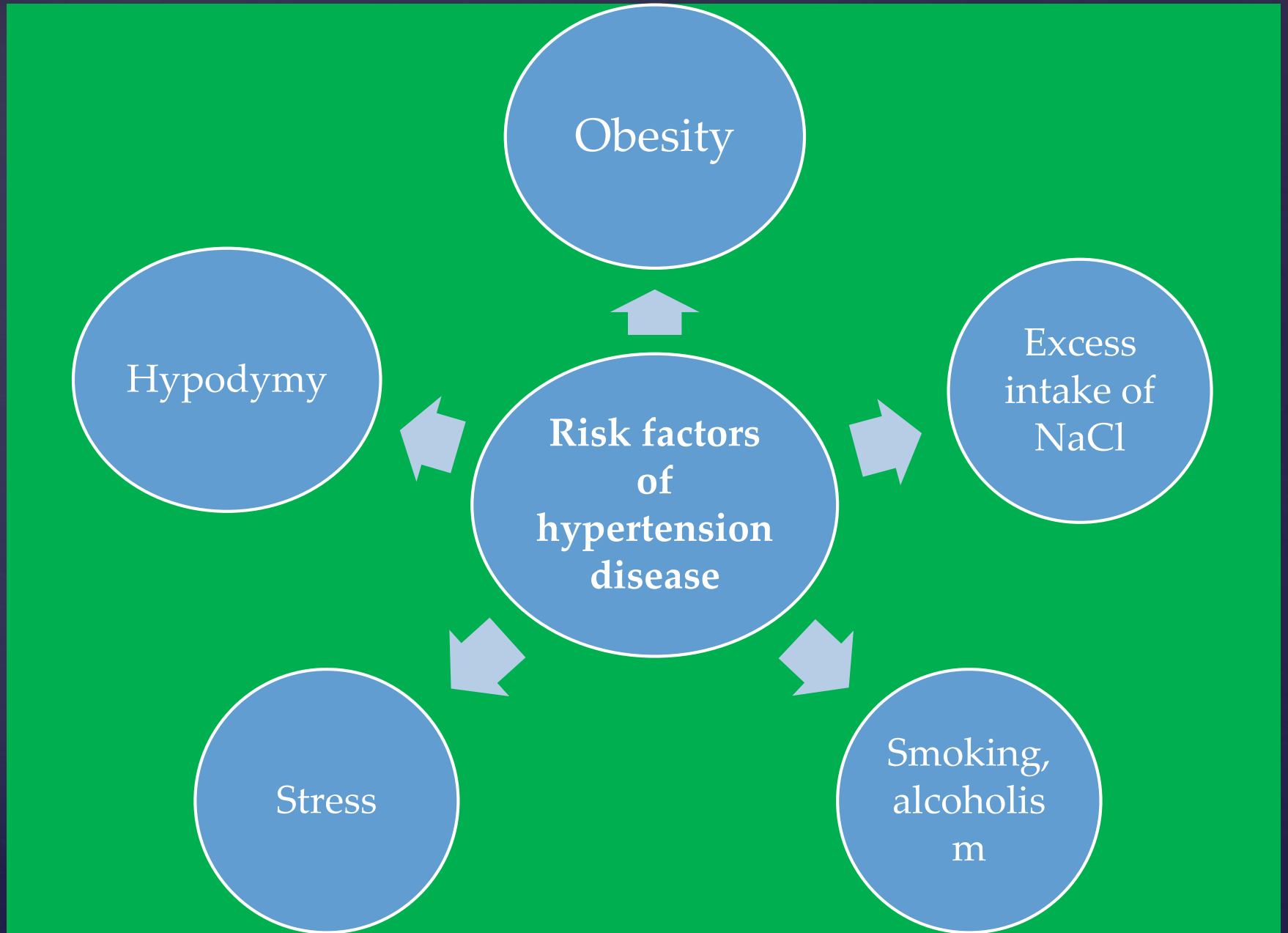
Excess
intake of
NaCl

Risk factors
of
hypertension
disease

Hypodymy

Smoking,
alcoholis
m

Stress



* Pathogenesis of hypertension disease

Psyco-emotional tension

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graph TD; A[Psyco-emotional tension] --> B[Formation of pathological excitation focus in the CNS]; B --> C[Activation of sympato-adrenal system]; C --> D[Activation of renin-angiotensin-aldosteron-vazopressin system]; D --> E[Delay Na and water in the body, hypervvolemey, increasing of peripheral bascular resistance, increasing of arterial pressure];
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Formation of pathological excitation focus in the CNS

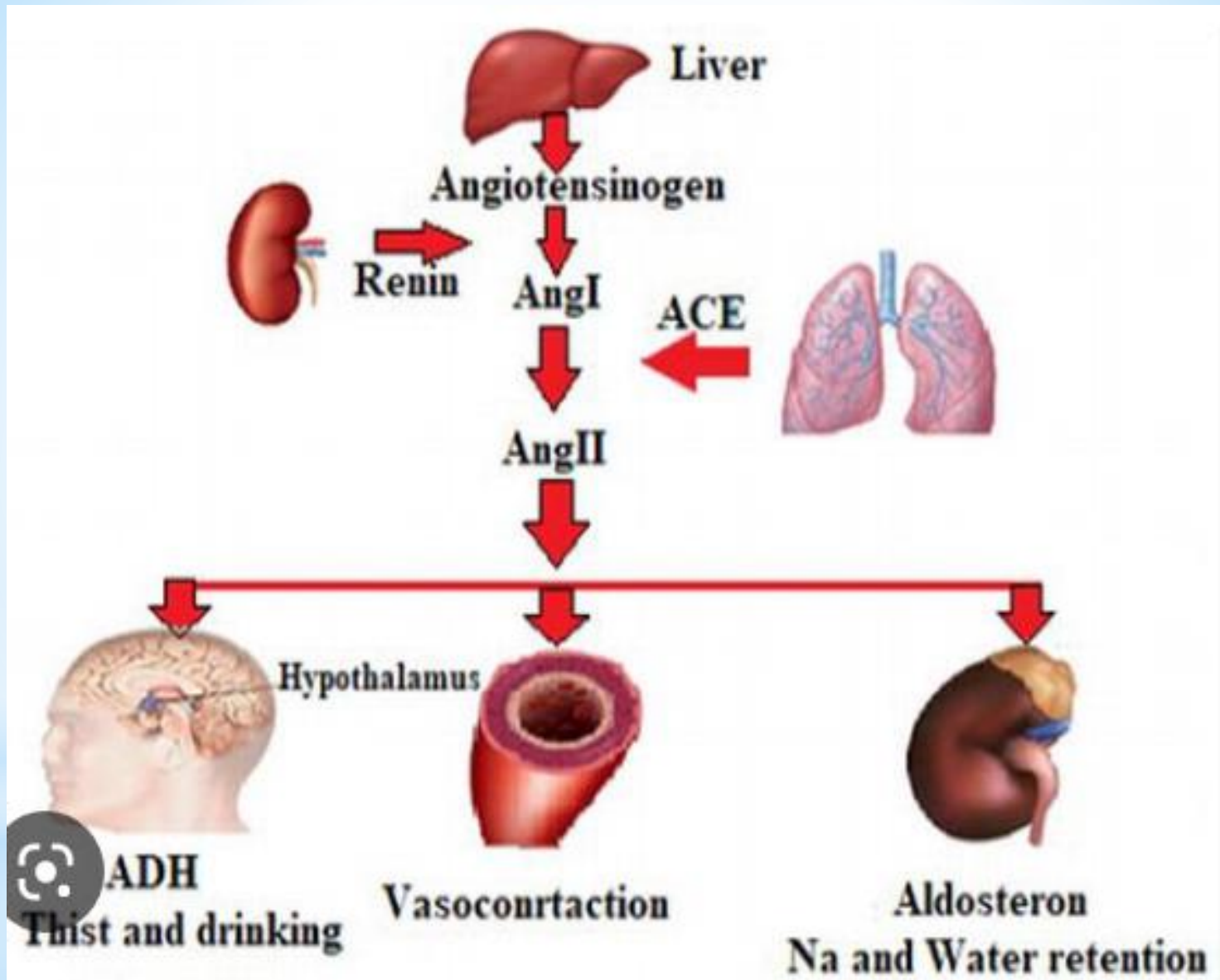
Activation of sympato-adrenal system

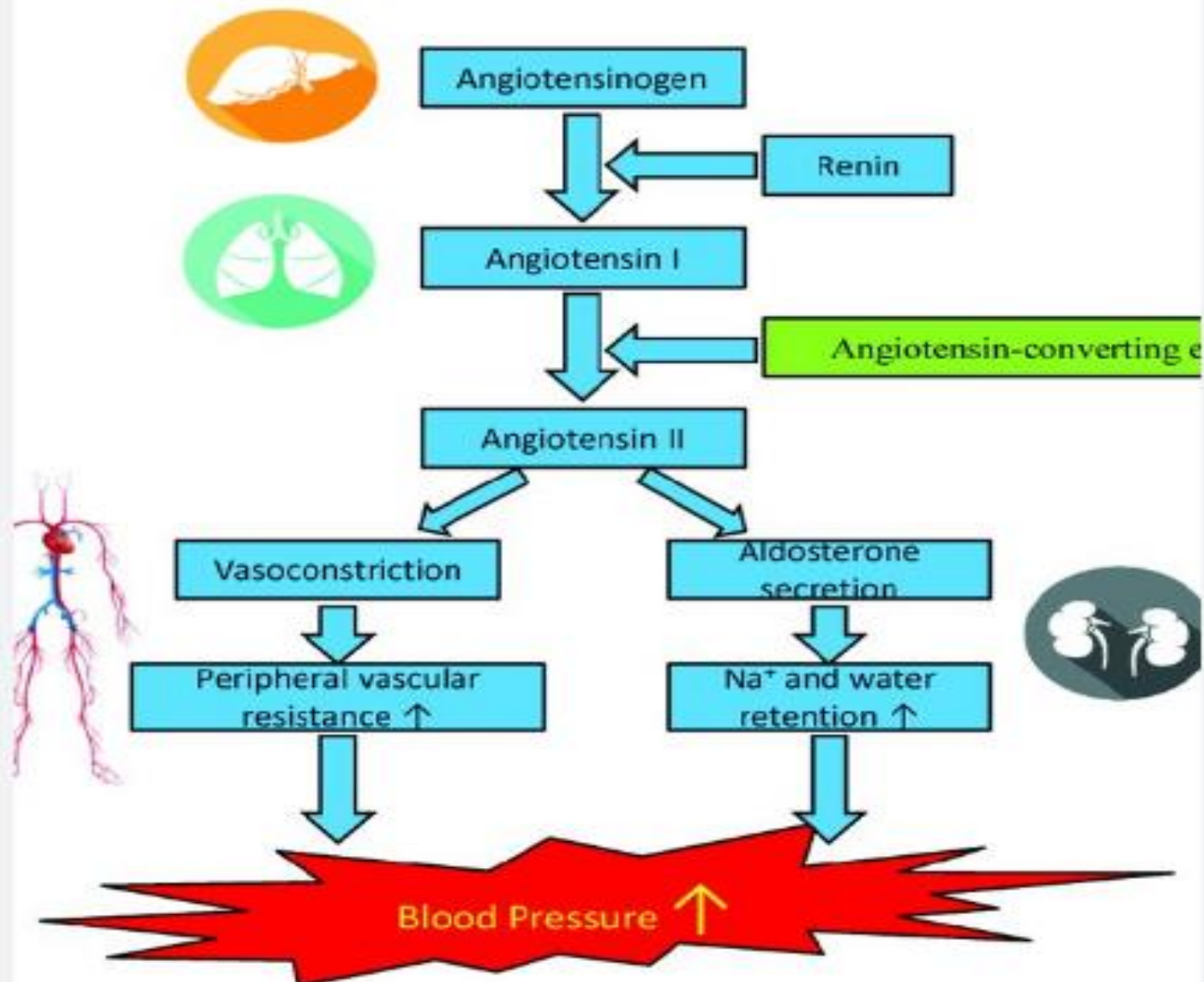
Activation of renin-angiotensin-aldosteron-vazopressin system

Delay Na and water in the body, hypervvolemey, increasing of peripheral bascular resistance, increasing of arterial pressure



videoplayback.mp4





Classification level of arterial pressure in the people high than 18 age

Category	Systolic AP, mm.Hg.	Diastolic AP, mm.Hg.
Optimal	<120	<80
Normal	<130	<85
High normal	130-139	85-89
I level AH	140-159	90-99
II level AH	160-179	100-109
III level AH	>180	>110
Special form:	>140	<90

Stages of hypertension disease:

I	Minor and unstable change of arterial pressure is observed, functional disturbances in the cardio-vascular system does not observed.
II	Stable change of arterial pressure and hypertrophy of left ventricle in the patient is observed.
III	Constant high pressure, changes in the heart, kidneys, eyes, brain is observed.

Target organs during hypertension disease

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graph TD; A[Target organs during hypertension disease] --> B[Heart]; A --> C[Kidneys]; A --> D[Brain]; A --> E[Vessels]
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Heart

Kidneys

Brain

Vessels

The groups of complications developing in target organs

Complications are divided into 4 groups

Cardiac

Early atherosclerosis of coronary vessels

Acute heart failure on the background of hypertonic crisis

Vascular

Disturbance of vision

Early atherosclerosis of cerebral vessels

Functional and organic disturbance of cerebral blood circulation

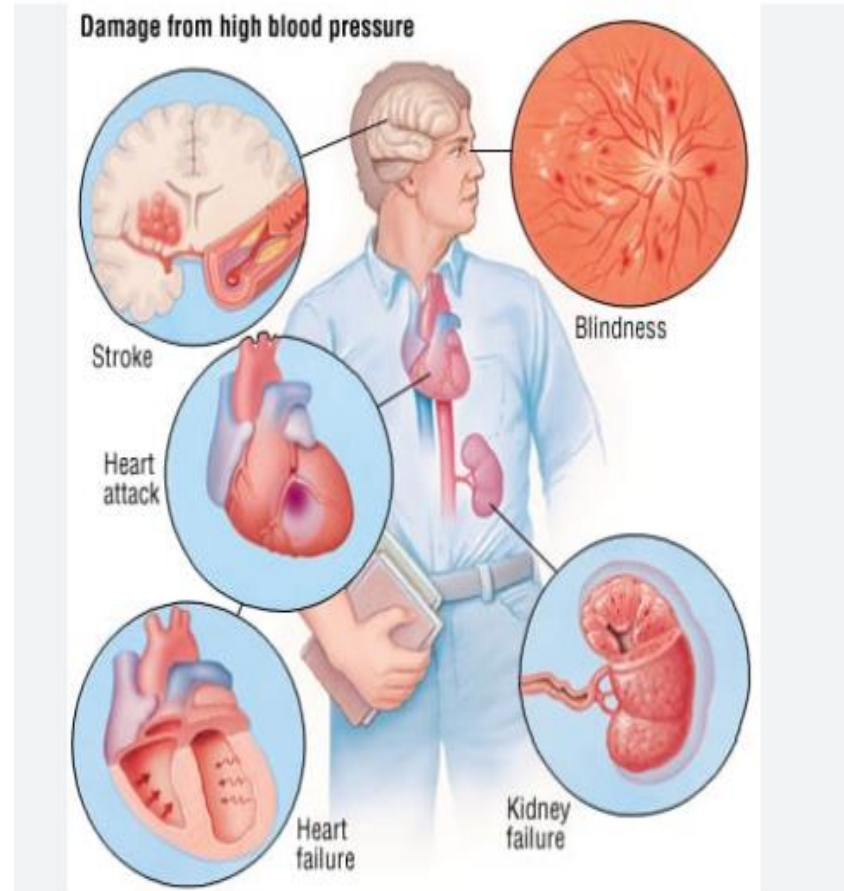
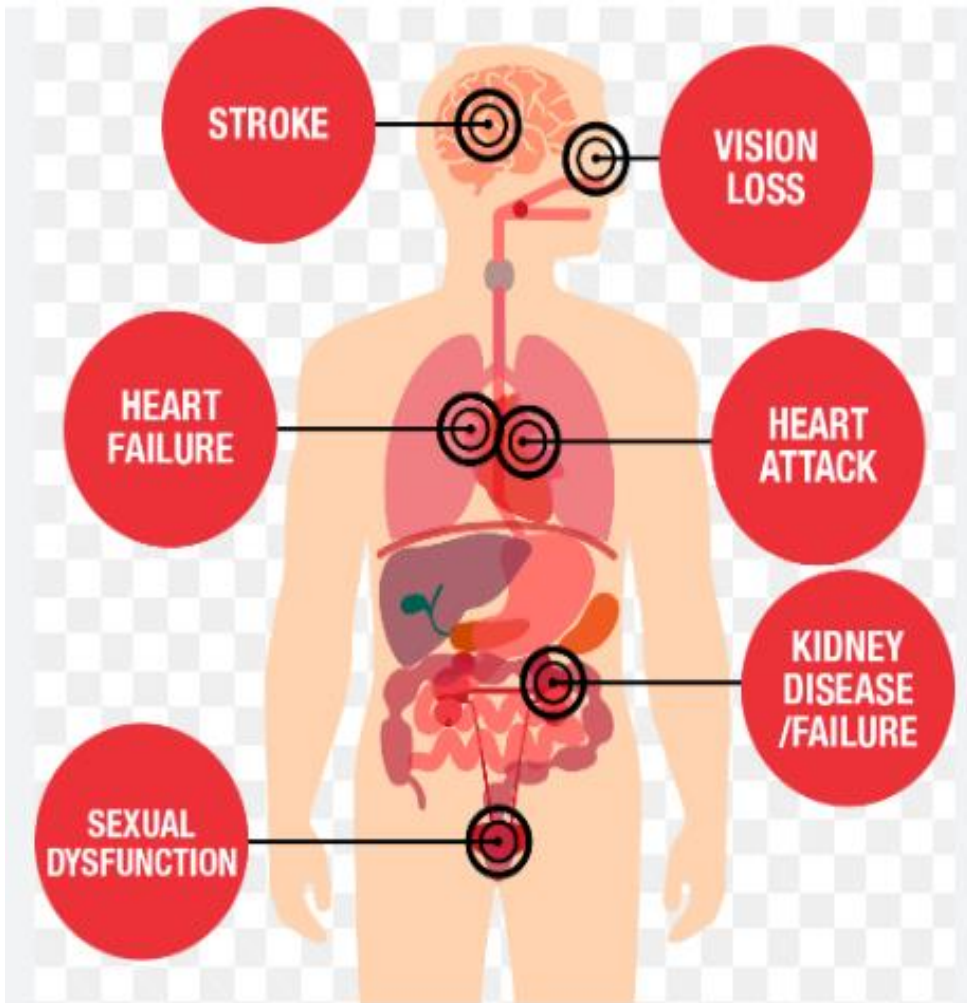
Kidney

Hypertonic nephroangi sclerosis

Chronic renal insufficiency

Aortic

bulging aneurism of aorta



Indices of “subclinical damage of target organs”

ECG signs:

Hypertrophy of left ventricle

Sokolov-Layton index ($S_{V_1} + R_{V_5} / R_{V_6}$) > 38 mm

EXO -signs:

Mass index of myocardium of left ventricle - ≥ 125 gr/m² in men, ≥ 110 gr/m² in women

Thicken of the wall of carotid artery (thicken of “intima-media” complex >0.9 mm)

Velocity of pulse wave between carotid and femoral artery >12 m/s

Ankle-brachial index- <0.9

Minor increasing level of kreatinin in the blood: 115-133 mkmol/l for men, 107-124 mkmol/l- for women

Decreasing of glomerular filtration < 60 ml/min./1.73 m²

Microalbuminuria: 30-300 mg/ daily or ≥ 22 mg/gr for men, ≥ 31 mg/gr for women albumin/creatinin in urine

≥ 7.0 mmol/l of glucose in plasma on an empty stomach

≥ 11.0 mmol/l of glucose in the plasma after sugar stress test

Risk factors participating in the development of complication in the heart

The level of systolic and diastolic arterial pressure

The level of pulse pressure

Age (men- ≥ 55 , women- ≥ 65)

Smoking

Dislipoproteinemia:

- Total cholesterol - >5.0 mmol/l

- Cholesterol of LDLP - >3.0 mmol/l

- Cholesterol of HDLP - <1.0 mmol/l (in men), <1.2 mmol/l (in women)

- Triglycerides - >1.70 mmol/l

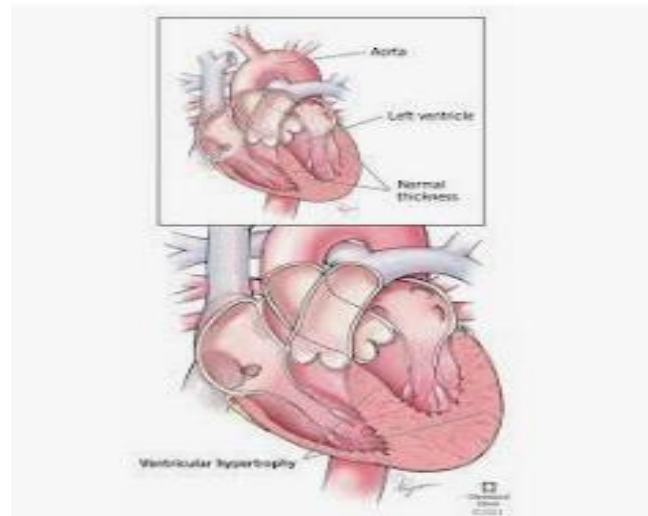
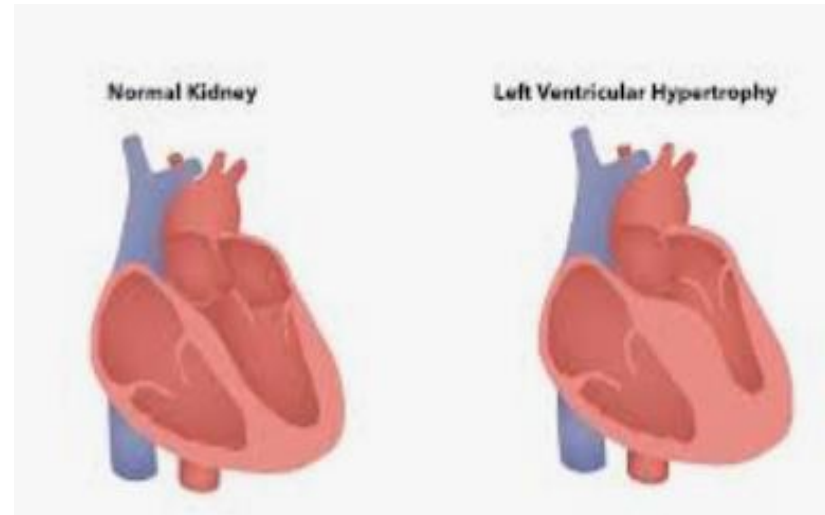
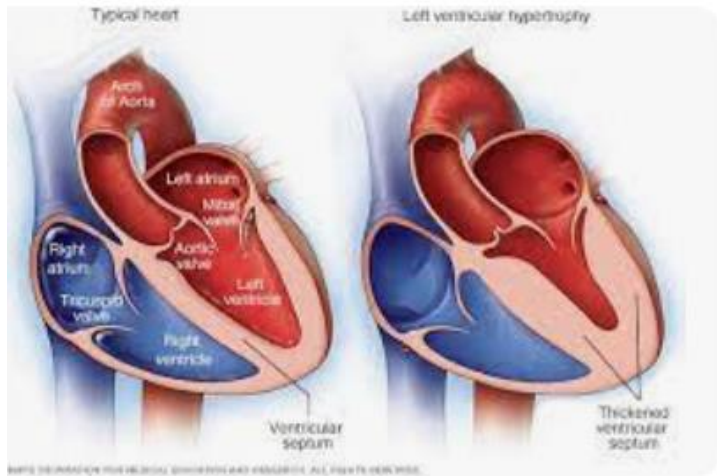
Glucose of the plasma on an empty stomach - 5.6- 6.9 mmol/l

Unusual glucose tolerance test

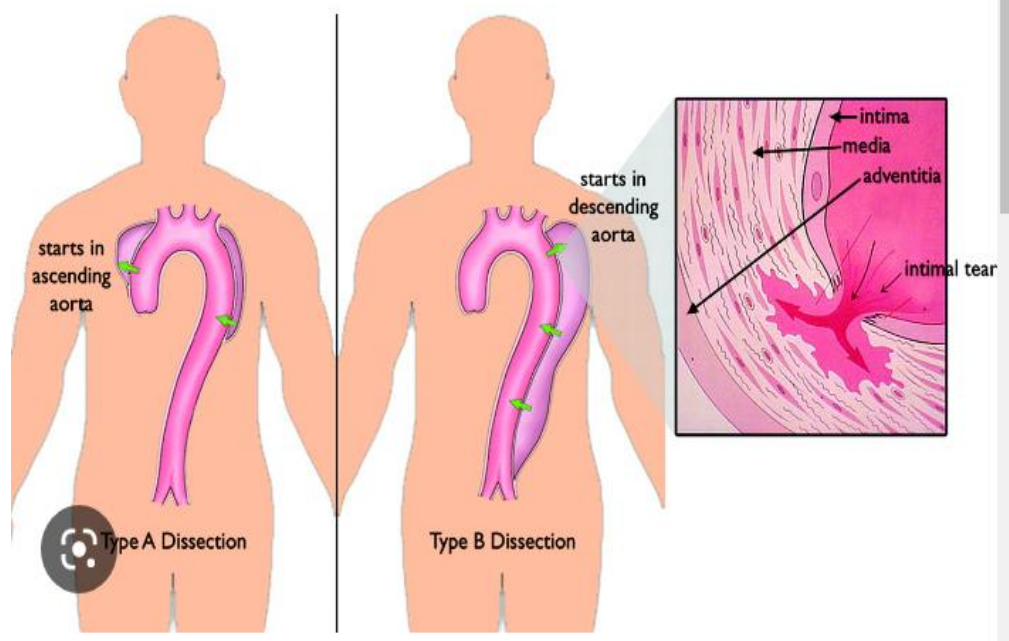
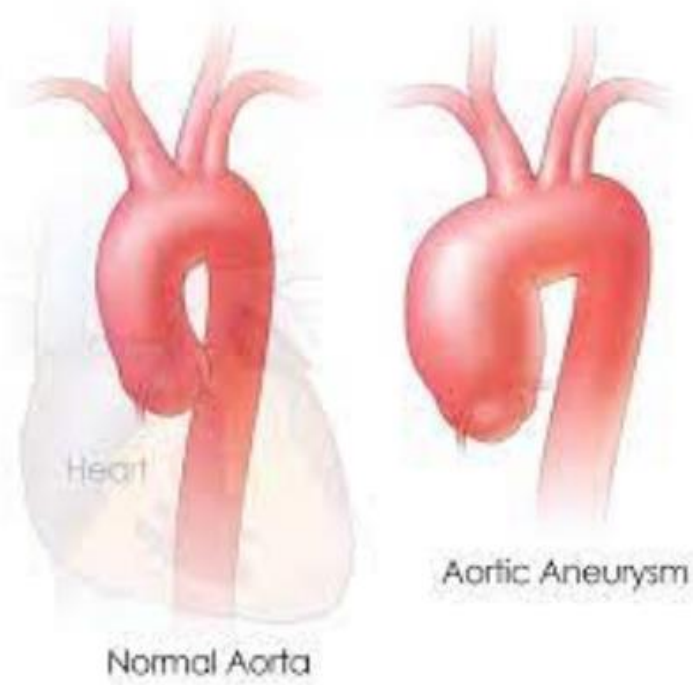
Abdominal obesity: waistline- > 102 sm for men, > 88 sm for women.

Early cardio-vascular diseases in family analysis (in men - <55 age, in women - <65 age)

Hypertrophy of left ventricle during hypertension disease



Aneurism and dissection of aorta



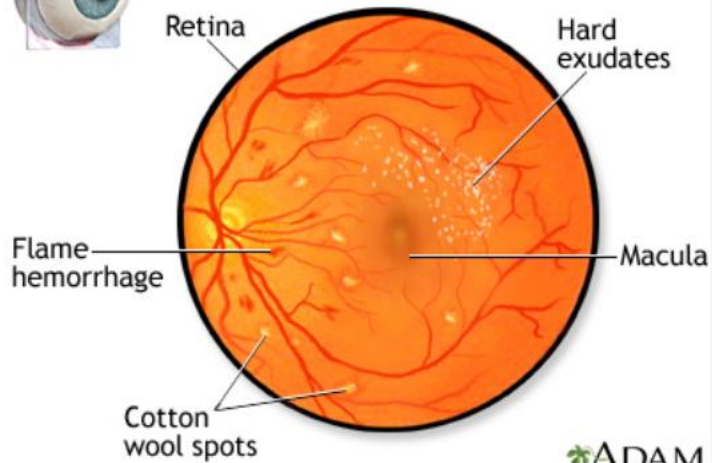
Aortic Dissection | Circulation

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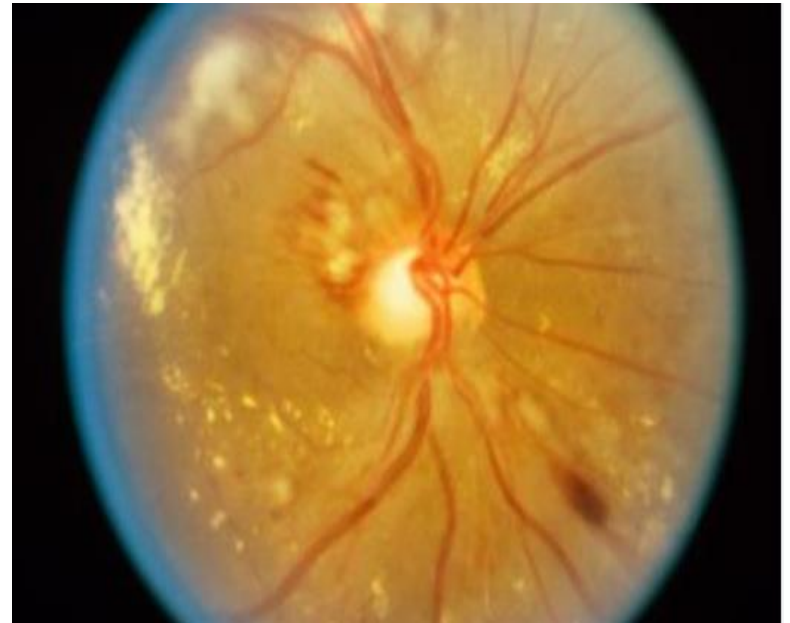
Changes in the retina during hypertension disease



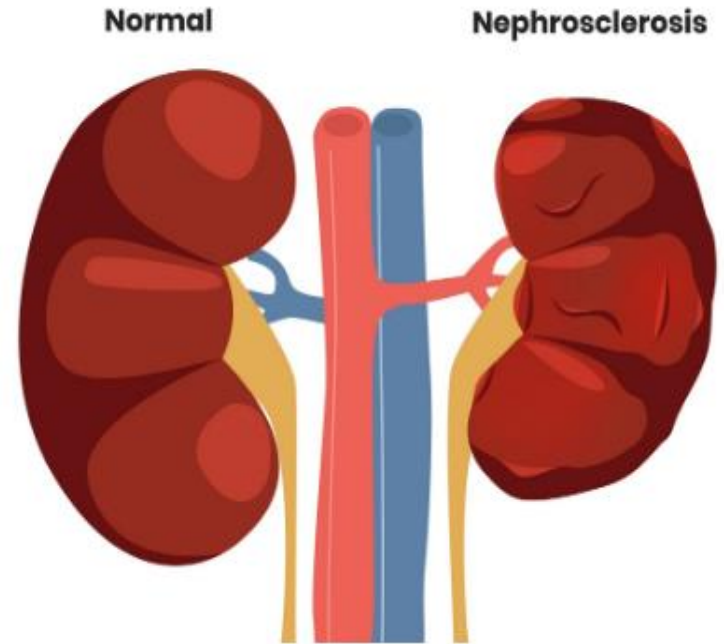
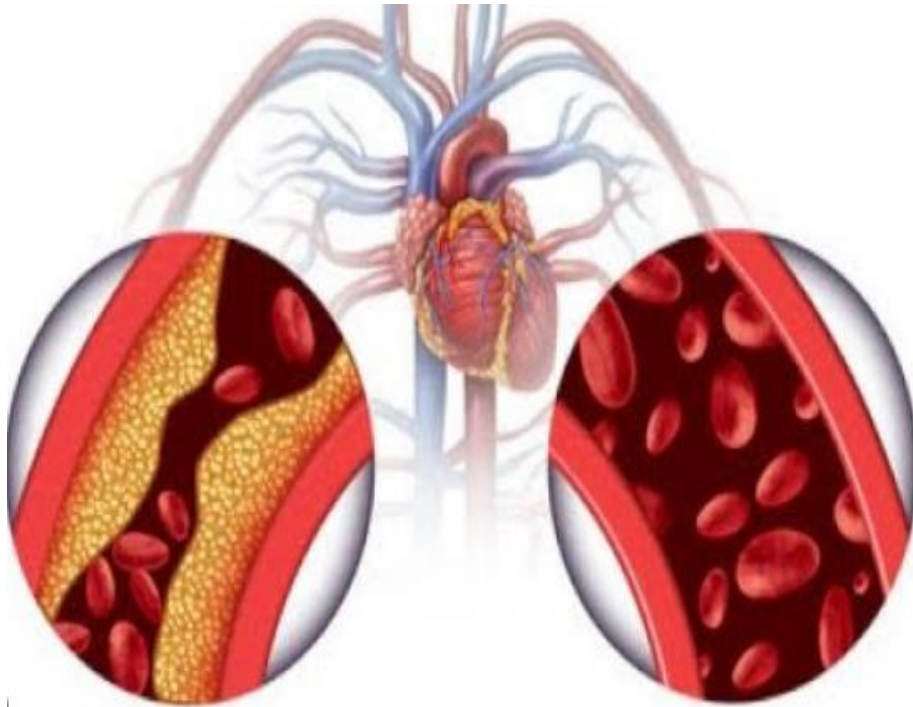
Hypertension can cause damage to the retina of the eye



ADAM.

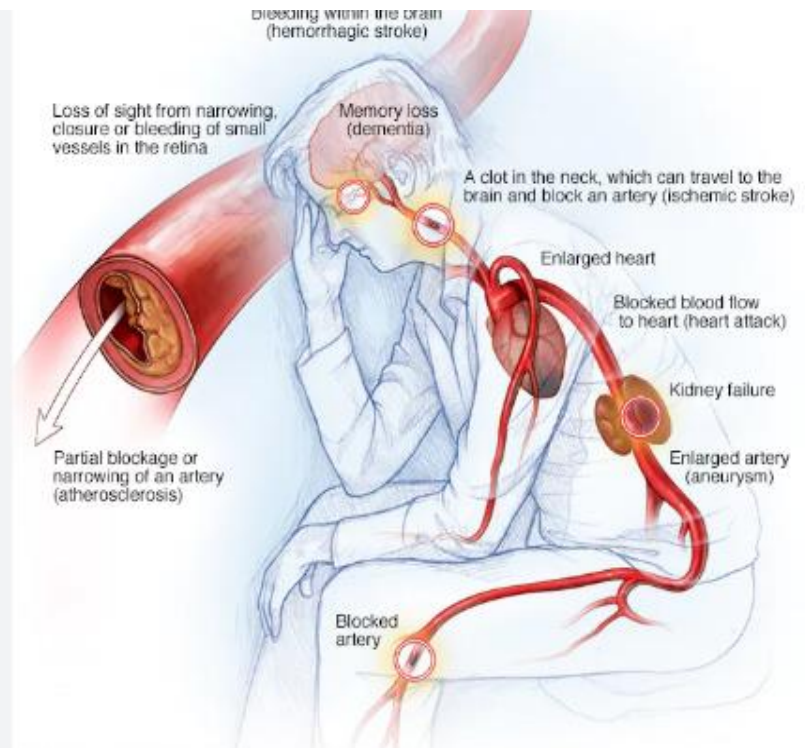
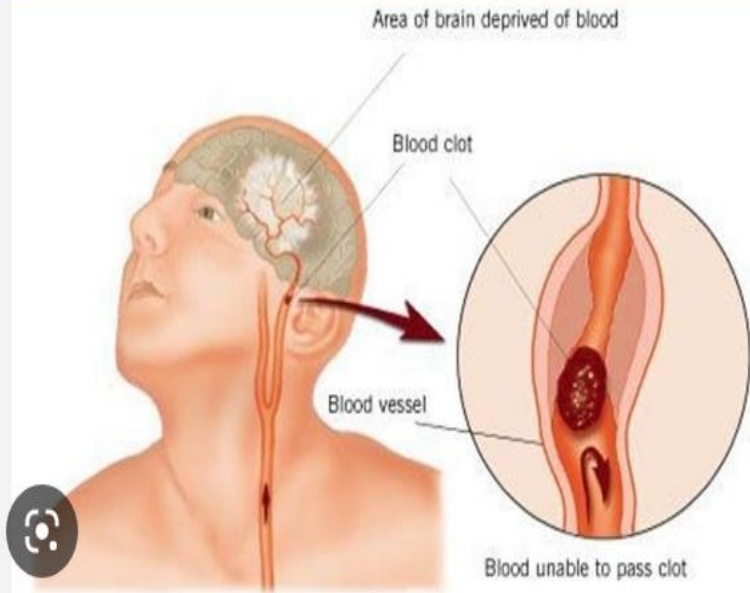


Changes in the kidneys during hypertension disease

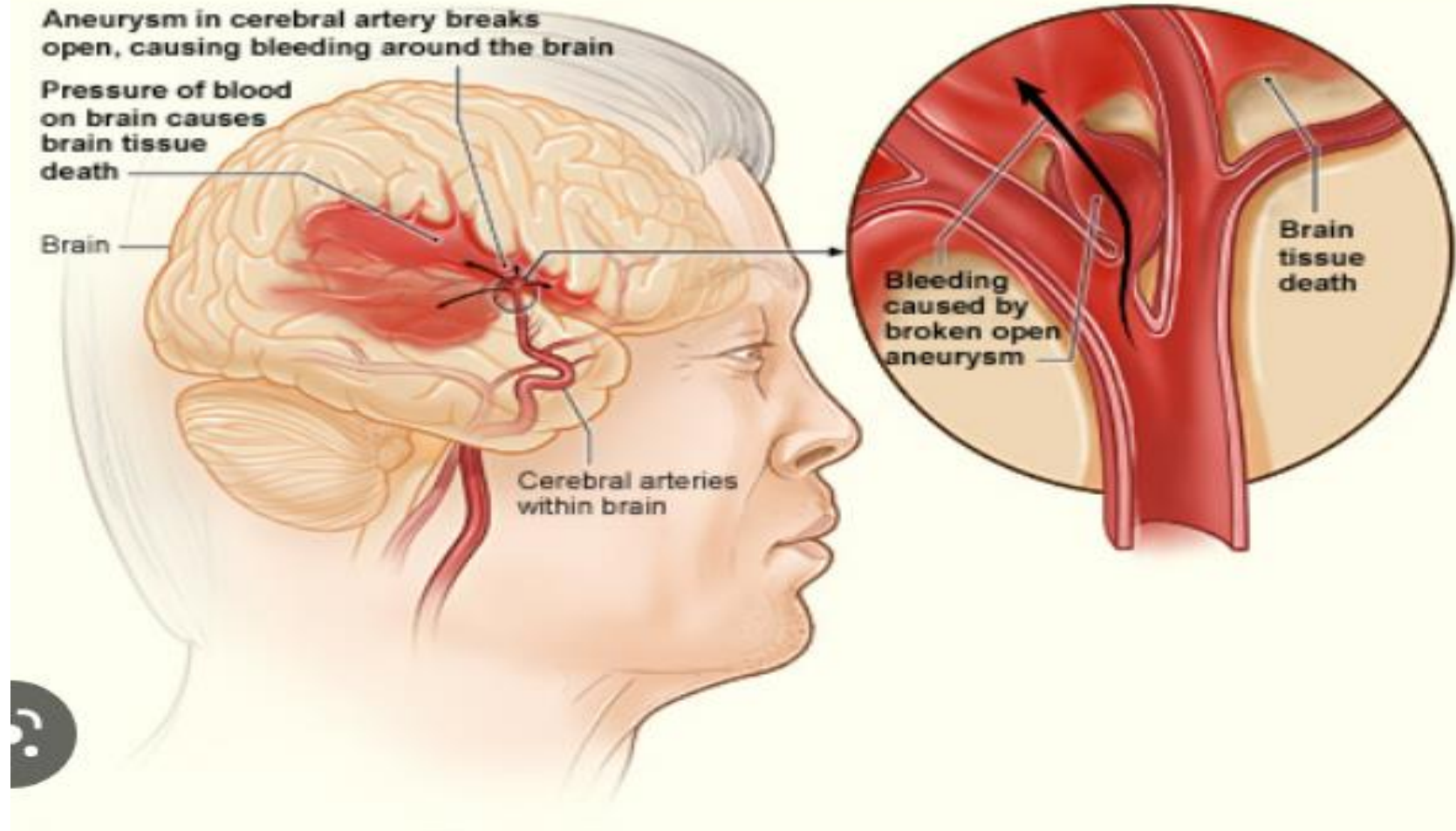


Ischemic stroke during hypertension disease

stroke



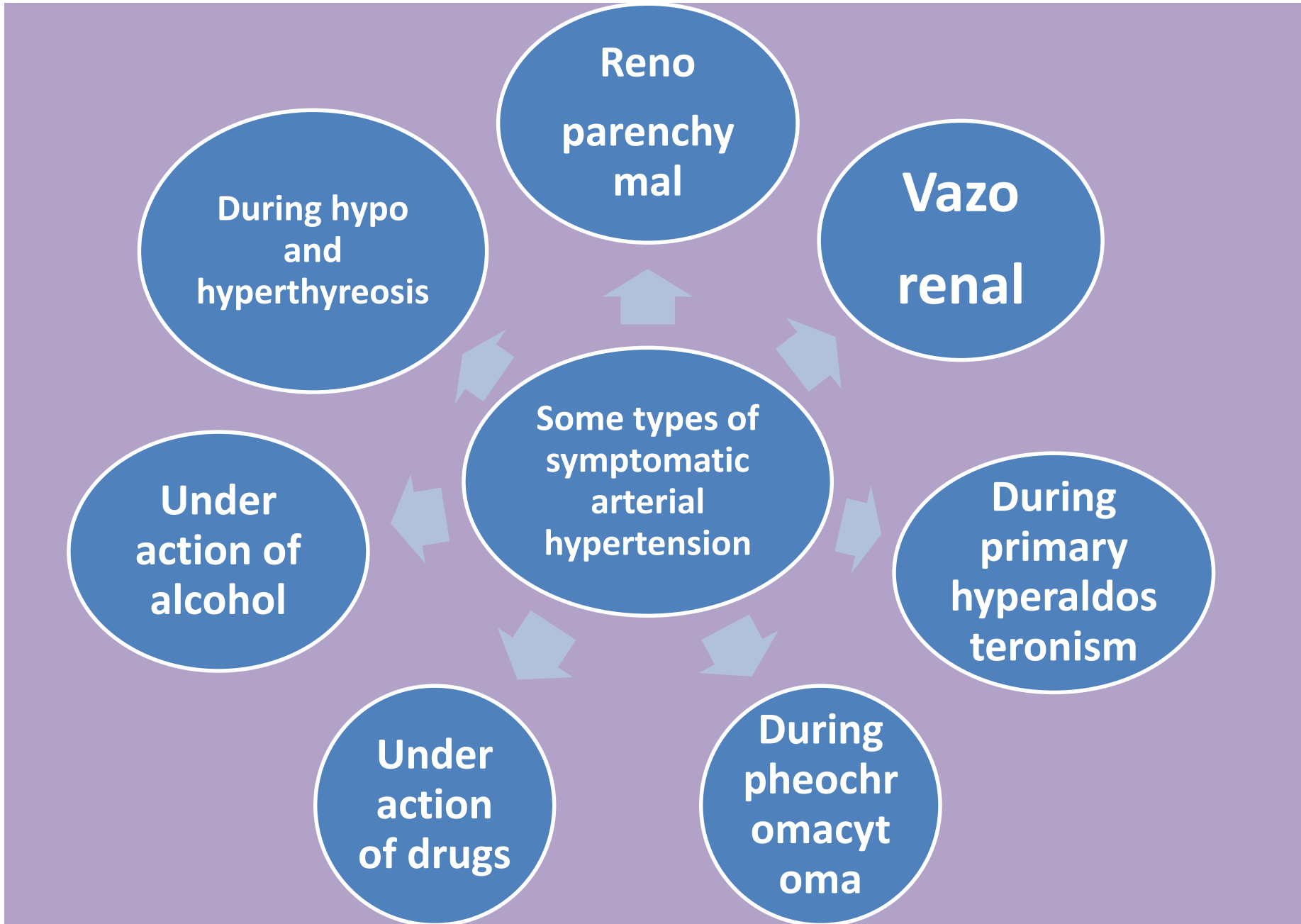
Hemorrhagic stroke during hypertension disease





**Hypertonic
crisis**

**is characterised by high
level of systolic and
diastolic pressure and
deepens of clinical signs
in target organs.**



Examinations for
determination of
AH -

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graph TD; A[Examinations for determination of AH -] --- B[Absolute]; A --- C[Dilated]; A --- D[Deep];
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Absolute

Dilated

Deep

Absolute examinations (for all patients)

1. Determination of glucose in the plasma on an empty stomach
2. Determination of total cholesterol
3. Determination of HDLP, LDLP, triglycerides in the blood.
4. Determination of creatinin, K^+ , uric acid in plasma
5. Determination of glomerular filtration rate
6. Determination of hemoglobin
7. Determination of hematocrit
8. Microscopic analysis of urine sediment and determination of microalbuminuria
9. ECG

Dilated (for the people with low and middle risk group)

1. ECHO-cardiography
2. USM of carotid artery
3. Quantitative and qualitative index of microalbuminuria
4. Uncle-brachial index
5. Examination of ocular fundus
6. Glucose tolerance test (if the level of glucose in plasma on an empty stomach > 5.6 mmol/l)
7. Monitoring of A/P
8. Speed of pulse wave

Deep (during suspicion to secondary A/H)

1. Determination signs of damage of brain, heart, kidneys, vessels.
2. During suspicion to the secondary A/H, anamnesis, physical examination, routine examination:
 - a) determination of renin,
 - b) aldosterone,
 - c) glucocorticoid,
 - d) catecholamines in the blood and urine
3. arteriography;
4. USM, CT and MRT of kidneys, adrenal glands

Laboratory-instrumental methods during A/H

General analysis of blood

General analysis of urine

Biochemical analysis of blood :

-Total cholesterol

-HDLP

-LDLP

- VLDLP

-triglycerides

- Protromin index

-PT

-Creatinin

-Fibrinogen

-Renin

-Angiotensin

-Aldosteron

EKG

EChO

X-ray examination of thoratic organs

Examination of ocular fundus

Indicies	Norm
Hematocrit	40-54%-in men, 36-42% in women
MCHC-	30-48%.
MCH	27-33 pgr.
Hypersegmentation of neutrophiles	Absent in norm
Basophilic granularity of erythrocytes	Absent in norm
Kebot ring	Absent in norm
Reticulocytes	2.0-10 %.
Macro və megalocytes	Absent in norm
Plasmatic cells	Absent in norm
Trombocytes	180-320 $10^9/l$.
Color index	0.9-1.1
Erythropoietin	25-75 mED/ml
MCV	80-96 femtolitrdir
Jolli body	Absent in norm

Types of leukocytes	Norm %
Myelocytes	-
Metamyelocytes	-
Sticnuclear neutrophils	1-5
Segmented neutrophiles	40-70
Lymphocytes	20-45
Monocytes	3-8
Eosinophils	1-5
Basophils	0-1
Plasmocytes	-

1. HDLP -in norm: 0.8-2.2 mmol/l
2. VLDLP- in norm: 0.13-1.0 mmol/l
3. LDLP- in norm: 1.3-3.5 mmol/l
4. Triglycerides- in norm:0-1.71 mmol/l
5. Total lipids- in norm 4.5-7.0 gr/l.
6. Chylomicrons- absent in norm
7. Protrombin time- in norm: 11-13.3 second
8. Protrombin index- in norm: 80-120%
9. Total cholesterol in norm in blood is 3.5-5.0 mmol/l,
moderate level is 5.0-6.0 mmol/l,
high level is >6.0 mmol/l .

- 1. Uric acid** 214 - 488 $\mu\text{mol/l}$ in plasma in norm.
- 2. Creatinin-** 80-120 $\mu\text{mol/l}$ in plasma in norm
- 3. Fibrinogen--** 2.0-4.0 g/l . in plasma in norm.
- 4. Renin normada** 1.6-4.5 mkg/lhour in plasma in norm.
- 5. Aldosteron normda :**
15-70 nmol/l in plasma, 4.5-17.7 mkg/day in urine.
- 6. Concentration of K^+ in plasma** is 3.3-5.3 mmol/l , in erythrocytes is 78-97 mmol/l , in urine is 80-100 mmol/l in norm.

Indicies	Norm
Ammonia in urine	0.044 - 0.141 mmol/l.
Atypical cells	Absent in urine in norm
Acetone in urine	Absent in urine in norm
Total protein	Less than 0.033 gr/l.
Bilirubin	Does not observe in norm
Glucose	Does not observe, or a <0.3 gr/daily
Ketone bodiees	does not observe in norm
The amount of urine	800-1500 ml.
Leukocytes	up to 5- in vision area
Special mass of urine	1018-1025 gr/ml.
Reaction of urine	5.0-7.5
Color of urine	Transparent
Erythrocytes	Does not observe or single