

ARTERIES, VEINS, LYMPHATIC SYSTEM

AORTA THORACICA

Parietal branches

aa. intercostales post. (VAN)

a. subcostalis

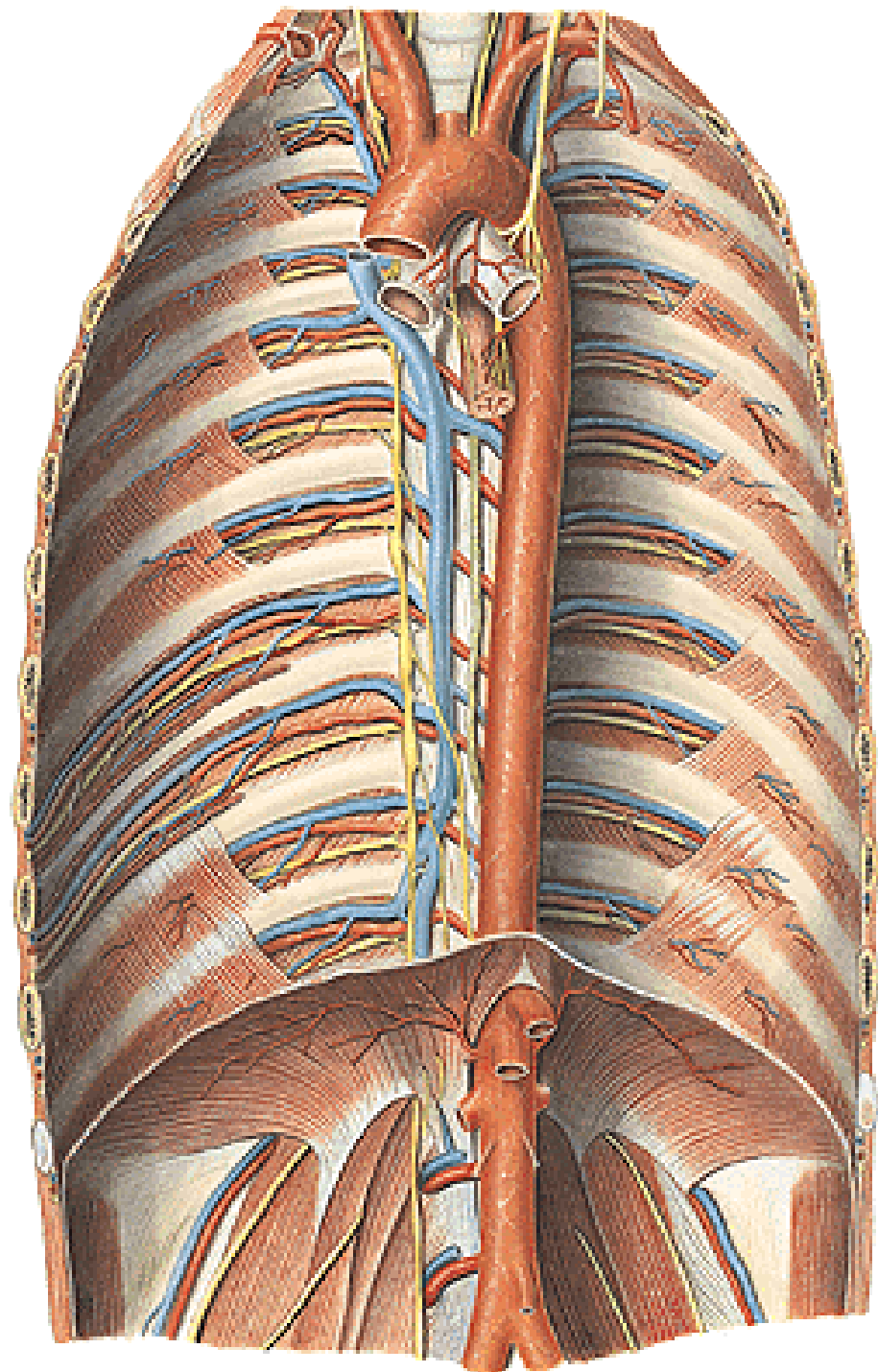
a. phrenica sup.

Visceral branches:

rr. bronchiales

rr. oesophagei

rr. pericardiaci



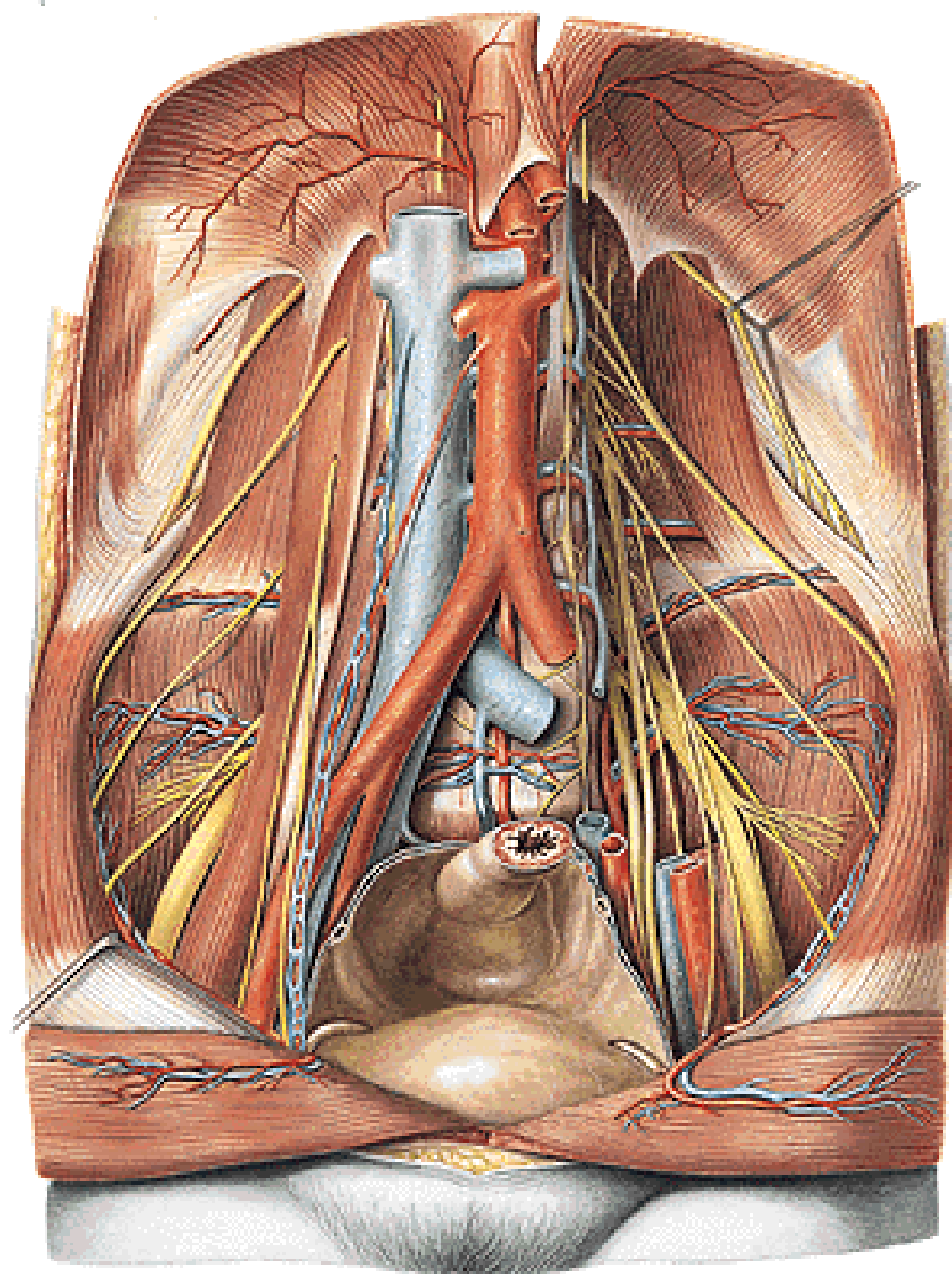
AORTA ABDOMINALIS

Parietal branches

a. phrenica inf.
(a. suprarenalis sup.)

4 aa. lumbales

a. sacralis mediana
(a. lumbalis ima,
rr. sacrales)



AORTA ABDOMINALIS

Visceral branches - paired

a. suprarenalis media

a. renalis

r. uretericus

a. suprarenalis inf.

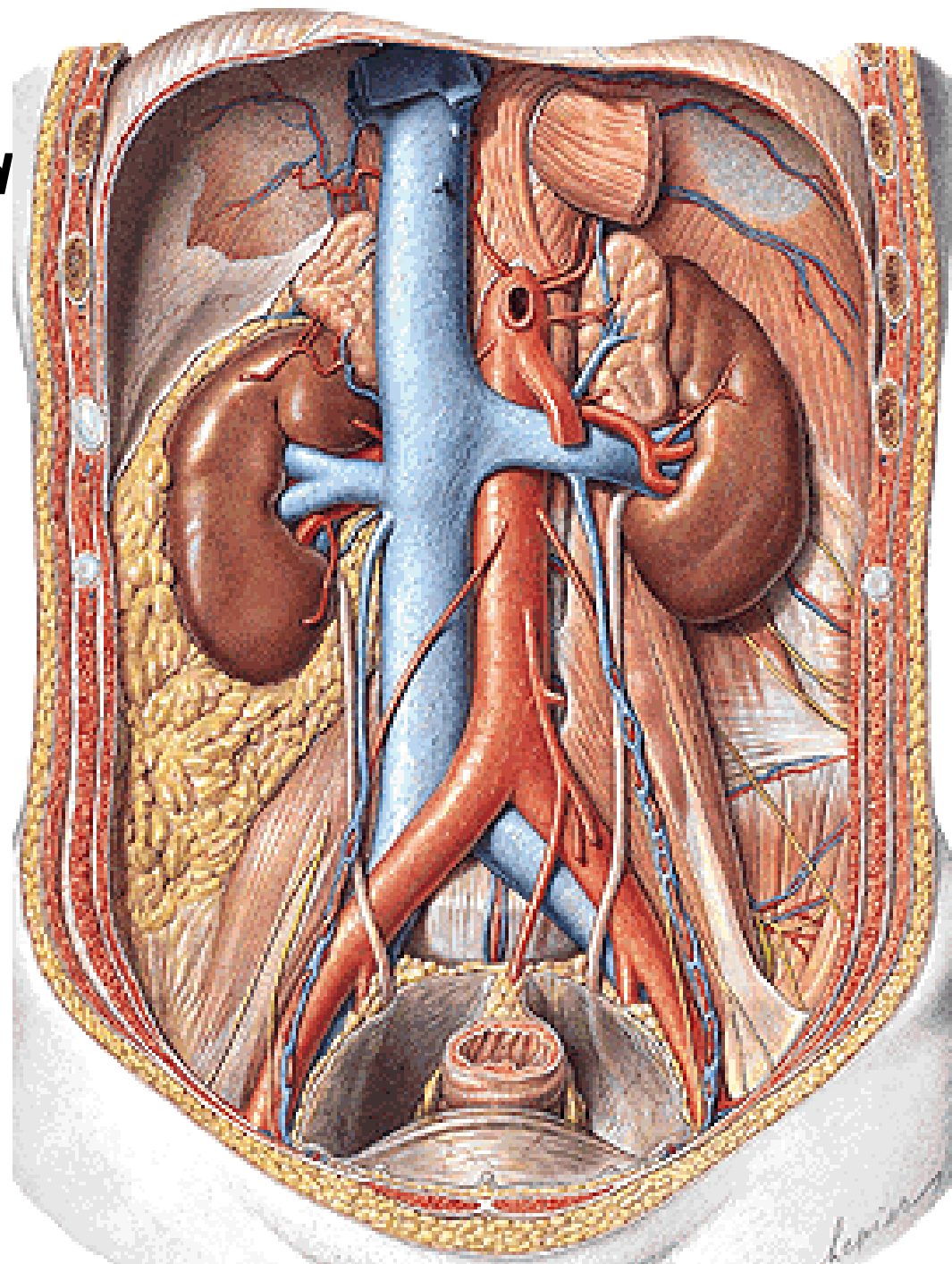
rr. praepelvici

r. retropelvicus

a. testicularis (a. ovarica)

rr. ureterici

(r. tubarius)



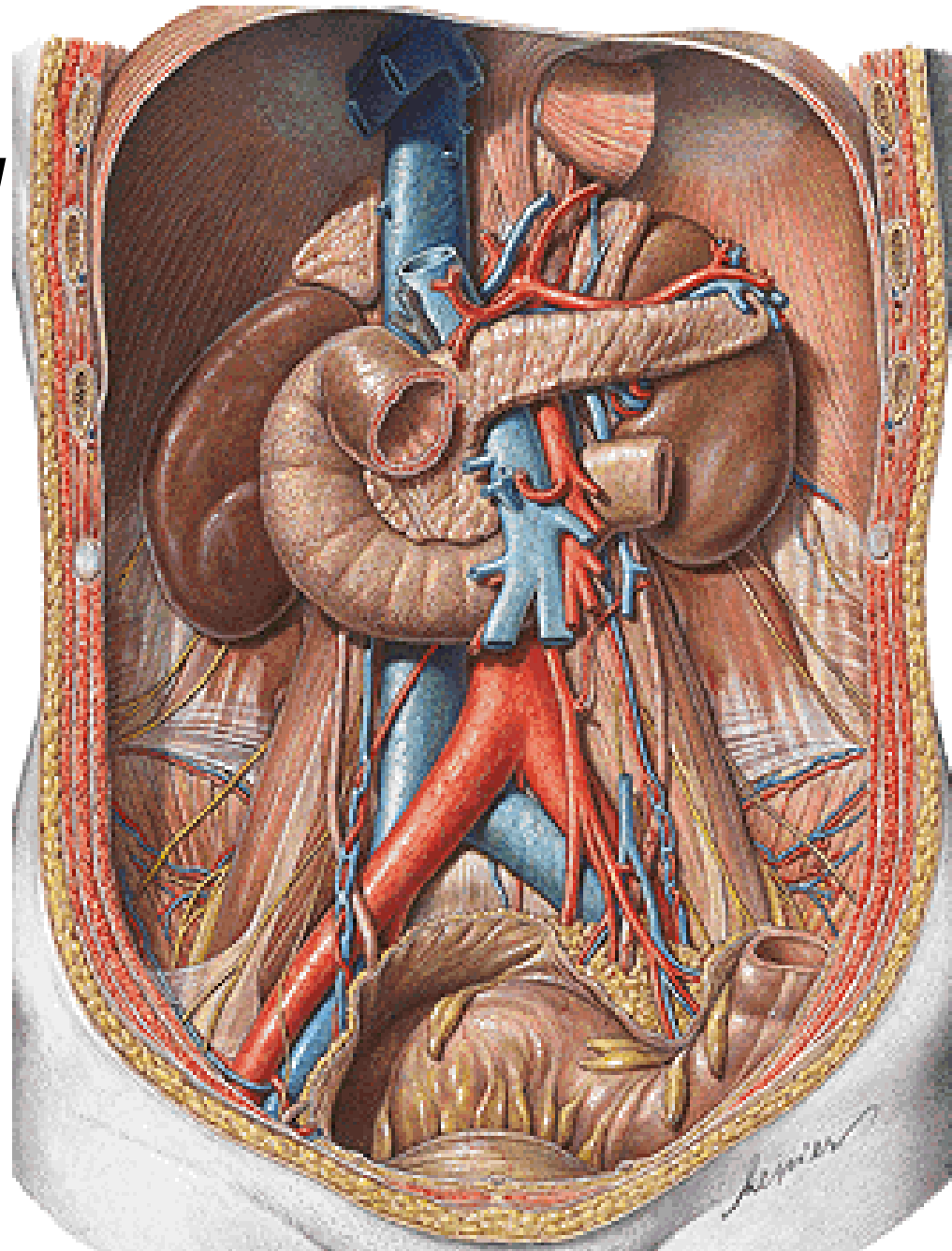
AORTA ABDOMINALIS

Visceral branches – unpaired

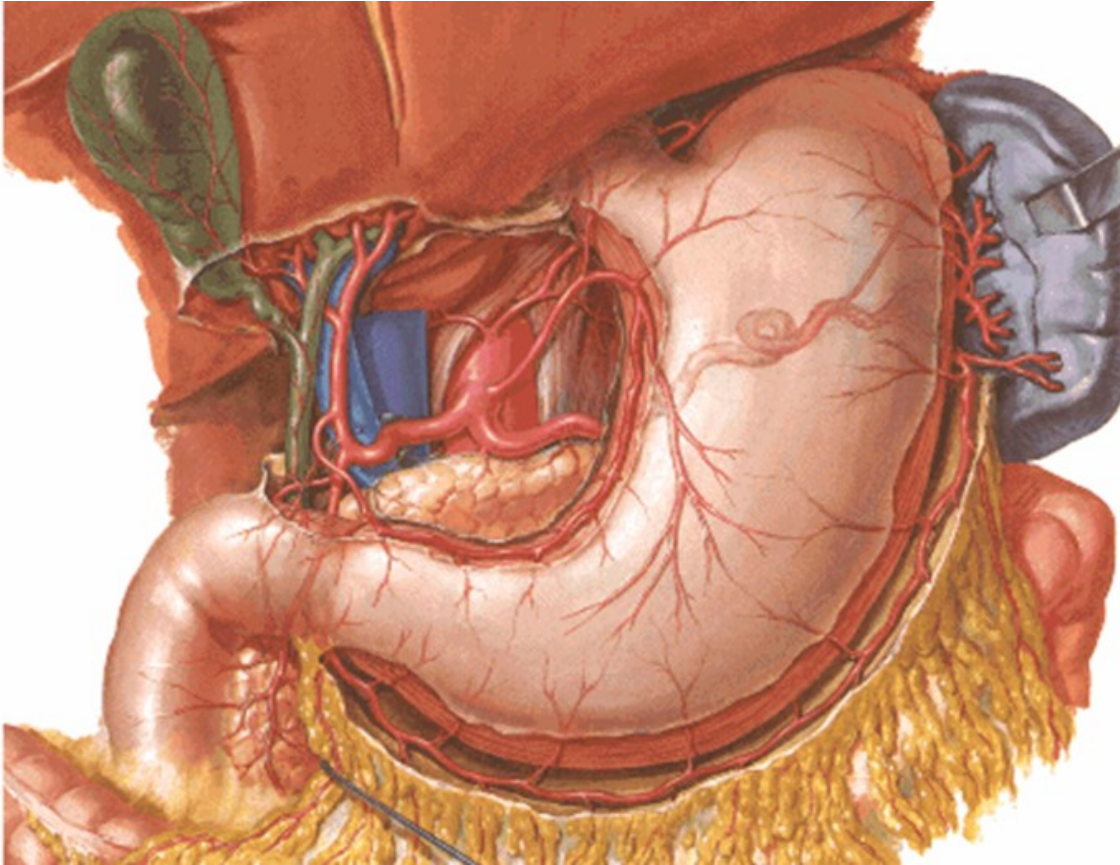
truncus coeliacus Th₁₂

a. mesenterica sup. L₁

a. mesenterica inf. L₃



TRUNCUS COELIACUS



a. gastrica sin.

a. hepatica communis

a. hepatica propria

a. gastrica dx.

r. dexter (a. cystica)

r. sinister

a. gastroduodenalis

a. gastroeiploica dx.

a. pancreatoduodenalis. sup.

a. lienalis

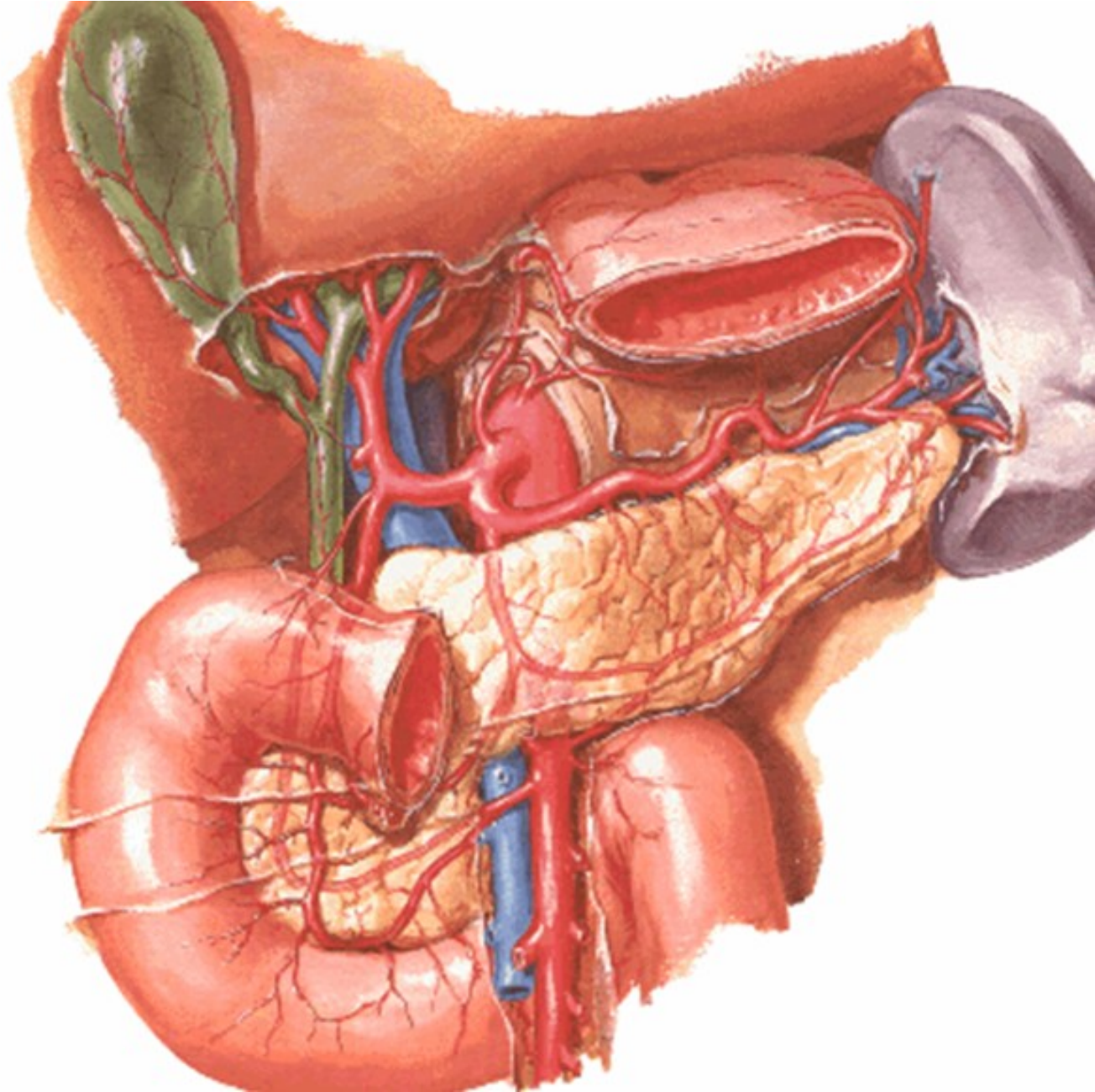
ARTERIA LIENALIS

rr. pancreatici

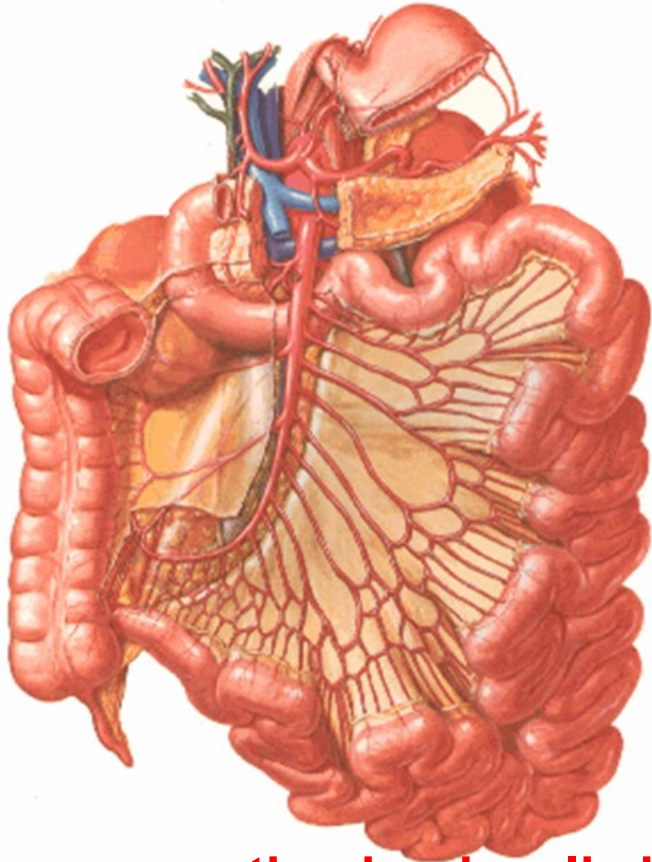
a. gastroepiploica sin.

aa. gastricae breves

rr. lienales



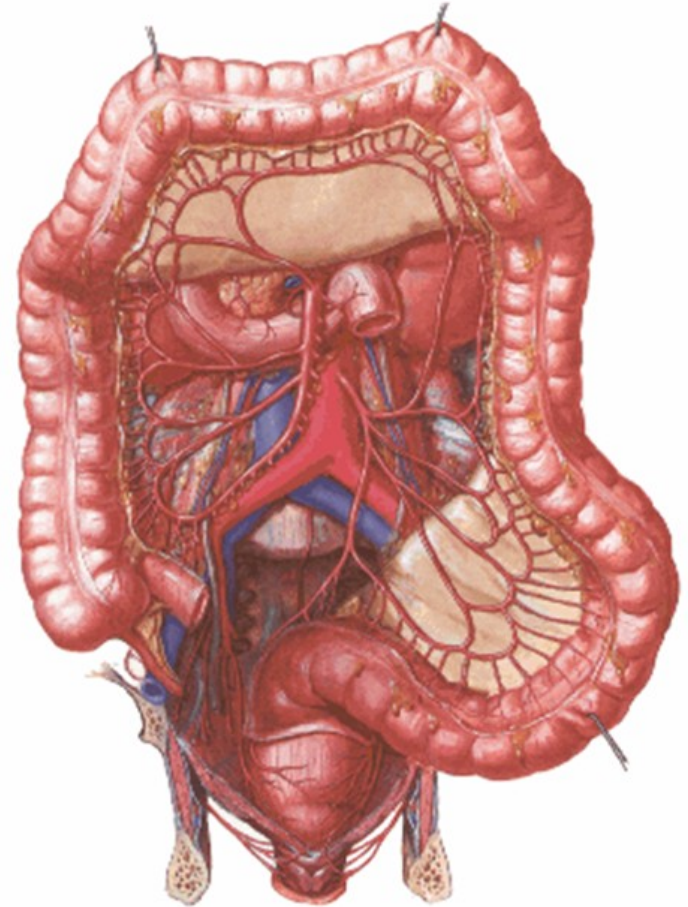
ARTERIA MESENTERICA SUP.



a. pancreaticoduodenalis inf.

aa. jejunales et ilei (10-18)

a. ileocolica



a. colica dx.

a. colica media

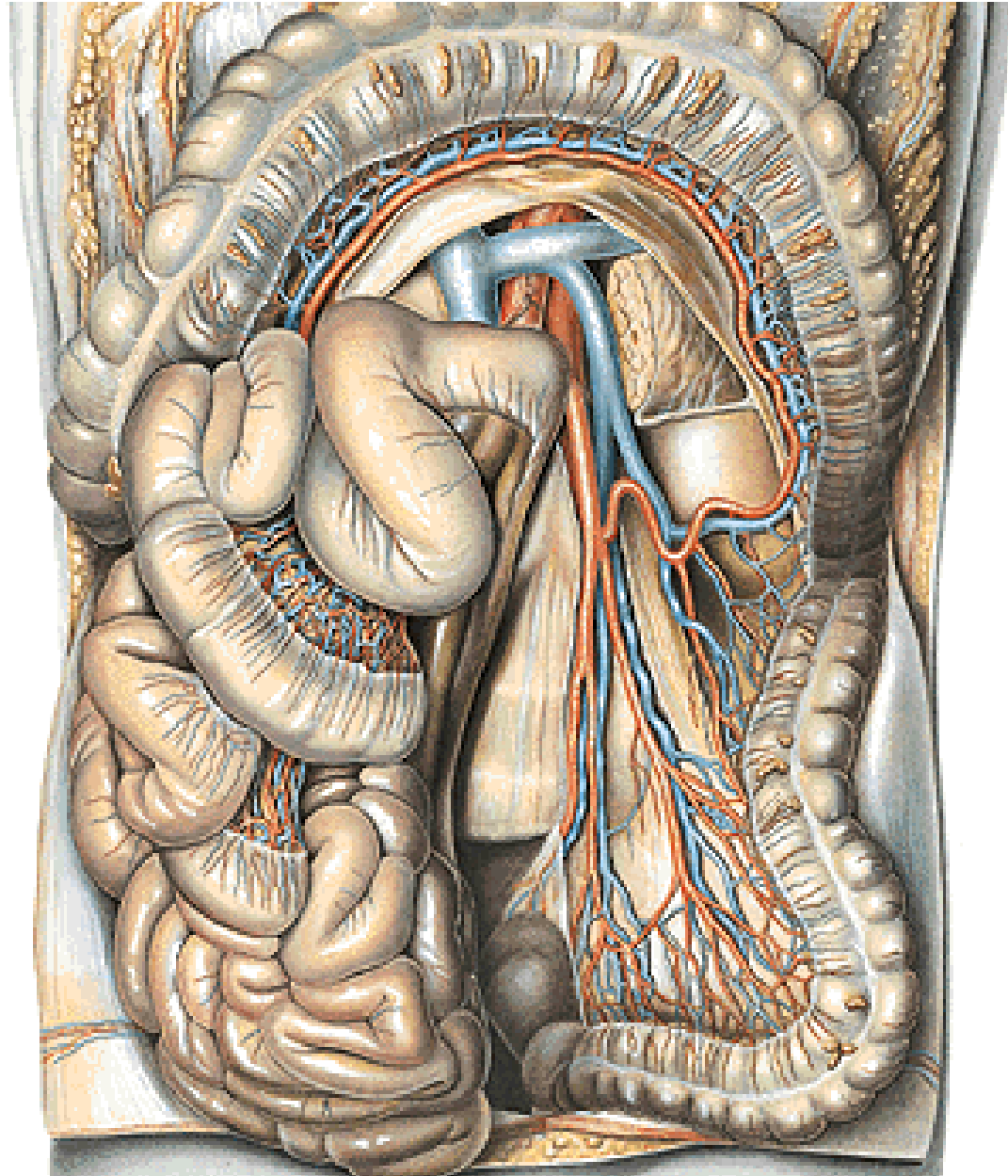
ARTERIA MESENTERICA INFERIOR

a. colica sinistra

aa. sigmoideae

a. rectalis sup.

anastomosis magna
(Halleri)

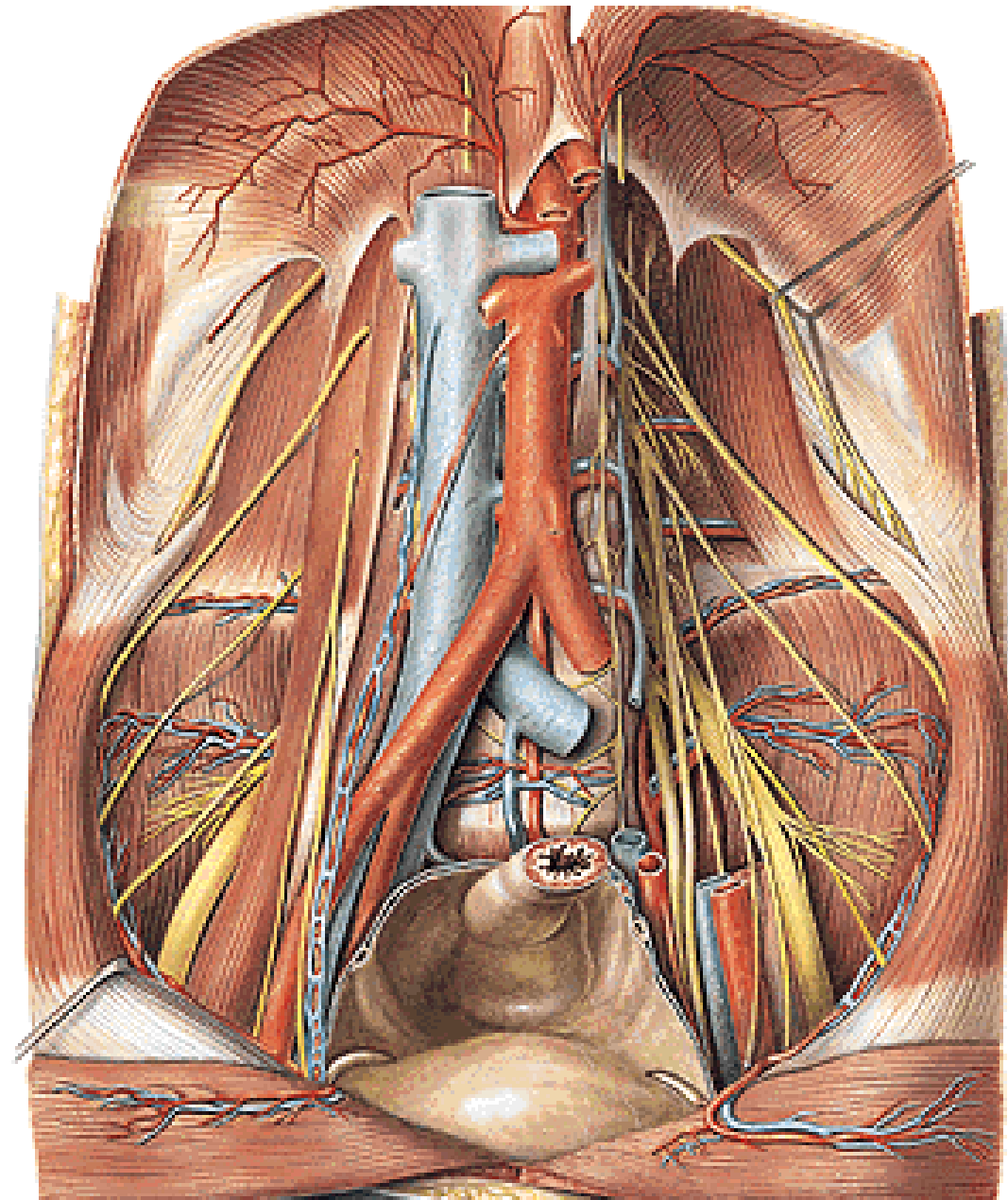


ARTERIA ILIACA COMMUNIS

A. iliaca externa

A. iliaca interna

(bifurcatio aortae L₄)



ARTERIA ILIACA INTERNA

Parietal branches

a. Iliolumbalis

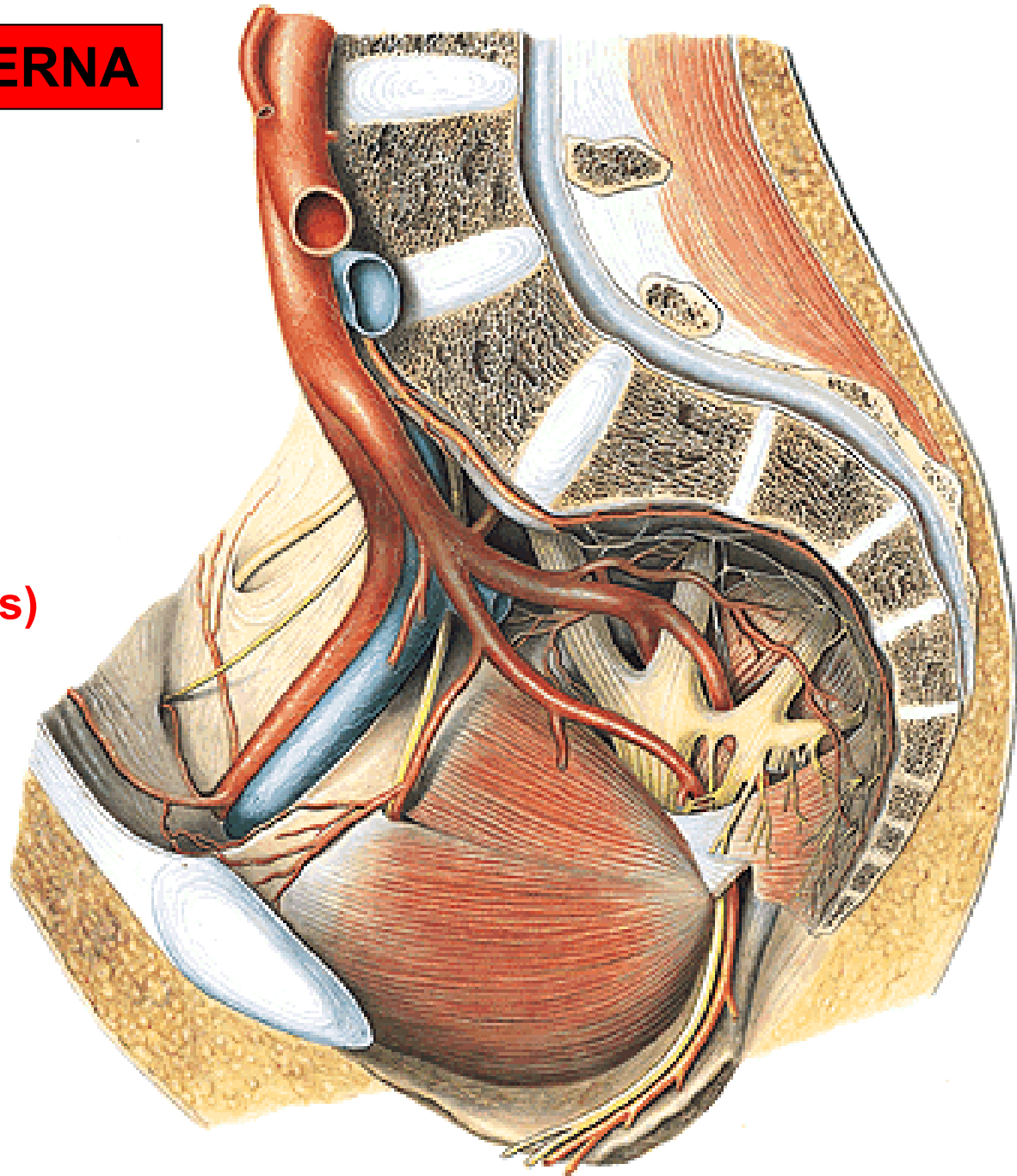
a. sacralis lat.

a. obturatoria
(r. pubicus - corona mortis)

a. glutea sup.

a. glutea inf.

a. pudenda interna



ARTERIA PUDENDA INTERNA

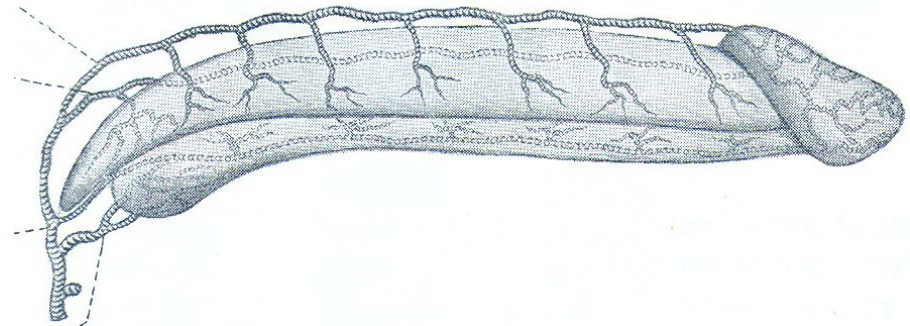
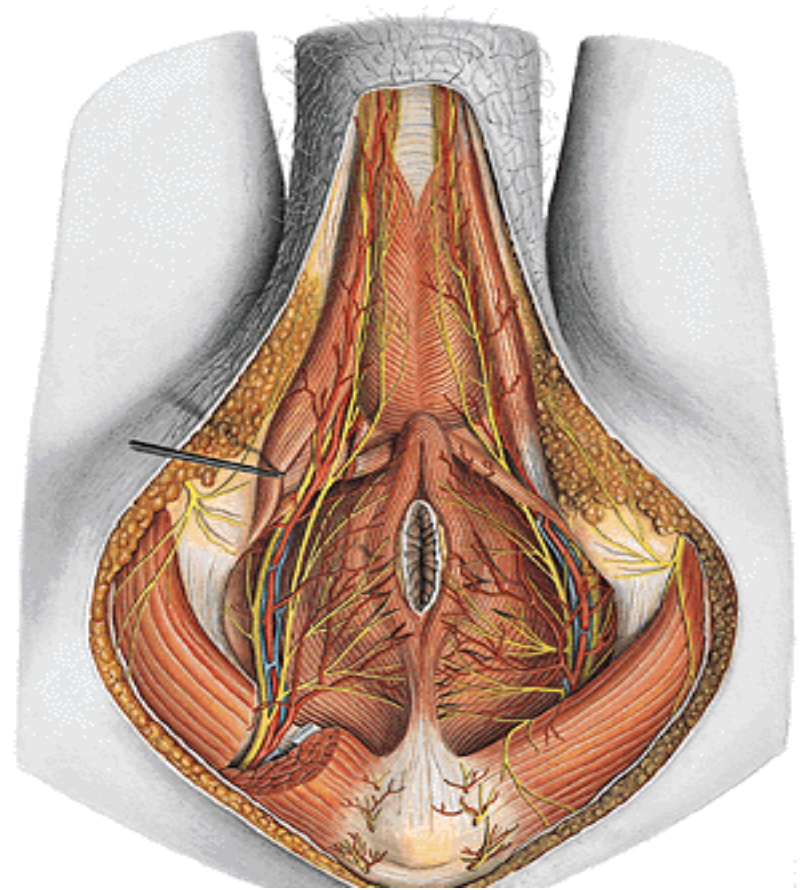
a. rectalis inf.

a. perinealis – rr. scrotales post.
(rr.labiales post.)

a. penis (a. clitoridis)

a. profunda penis (clitoridis)

a. dorsalis penis (clitoridis)



ARTERIA ILIACA INTERNA

Visceral branches

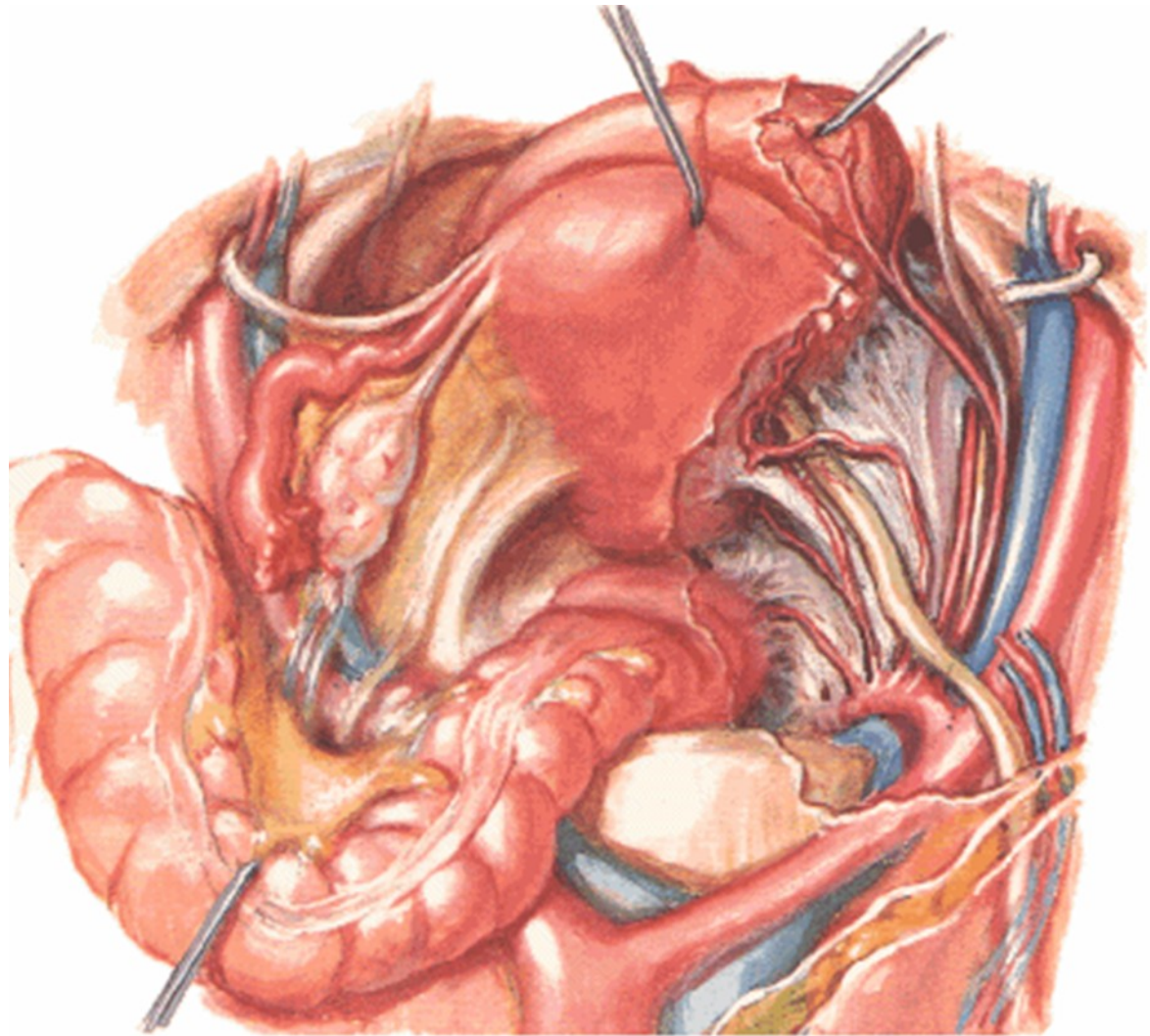
**aa. vesicales sup.
(a. umbilicalis)**

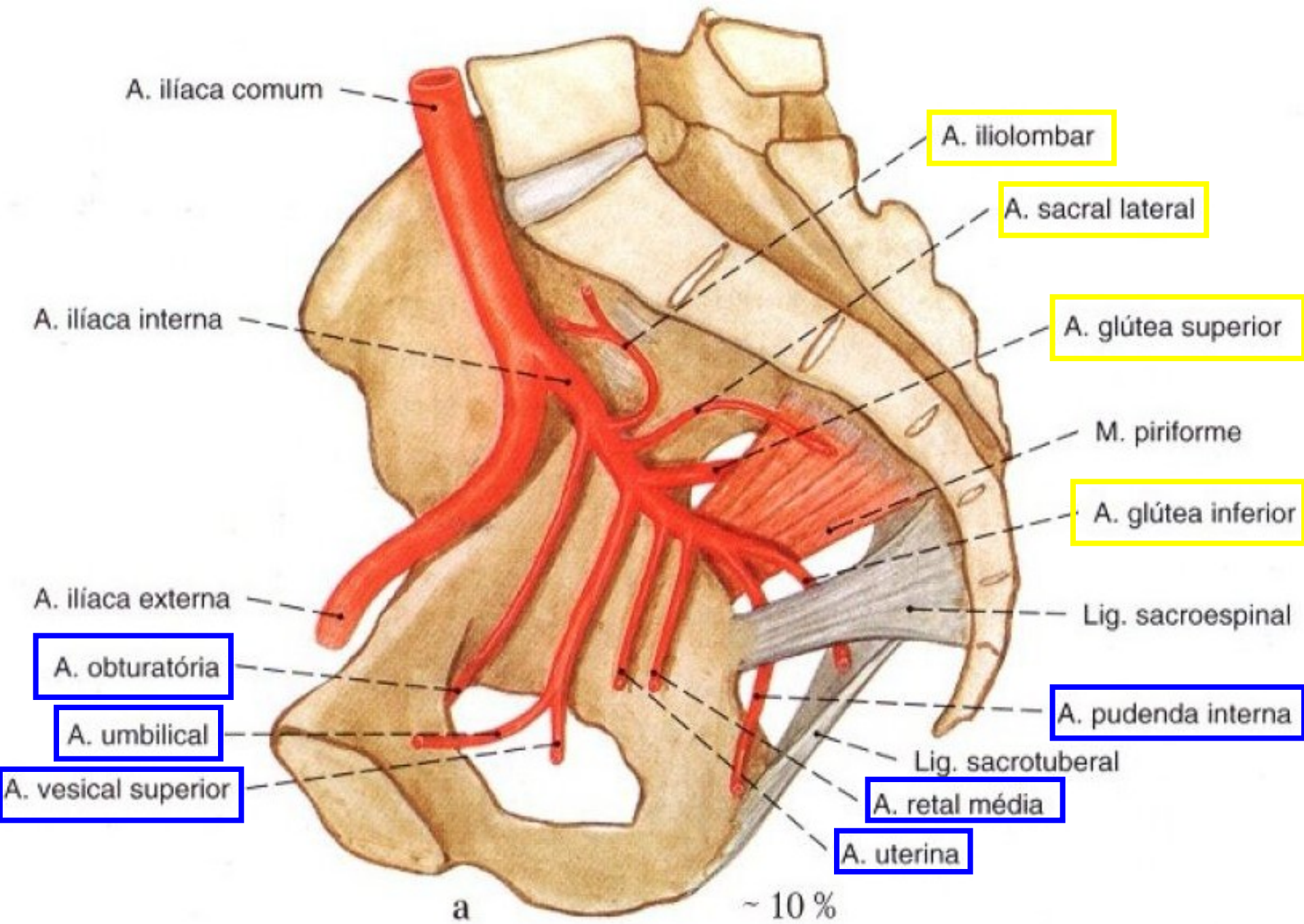
a. vesicalis inf.

a. rectalis media

♂ **a. ductus deferentis**

♀ **a. uterina**





ARTERIA UTERINA

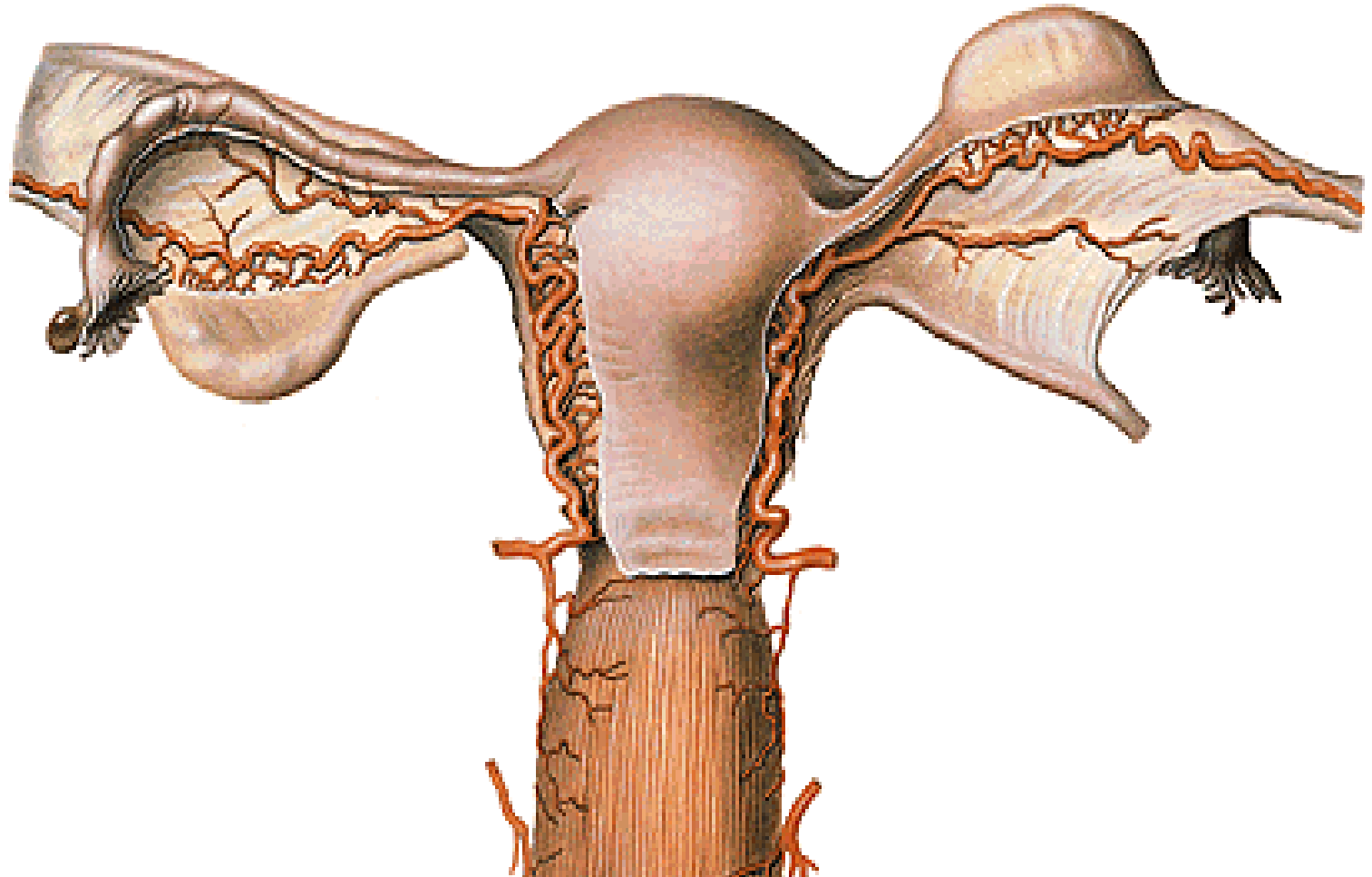
r. uretericus

a. vaginalis ant. et post.

rr. uterini

r. tubarius

r. ovaricus



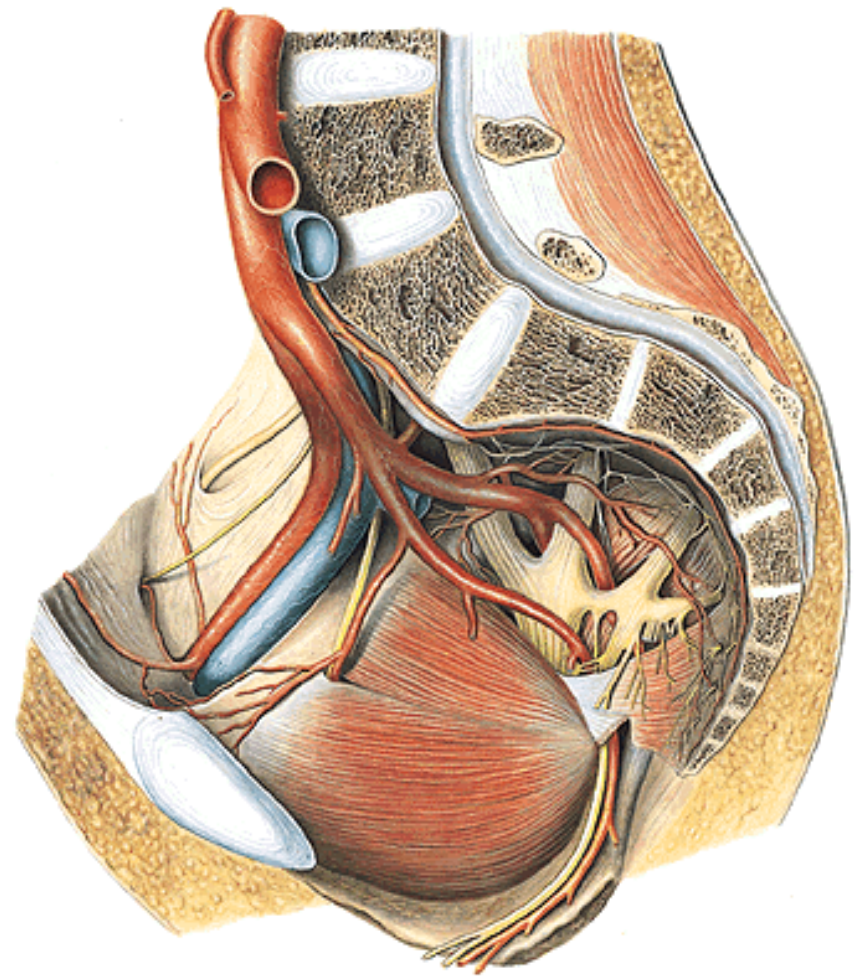
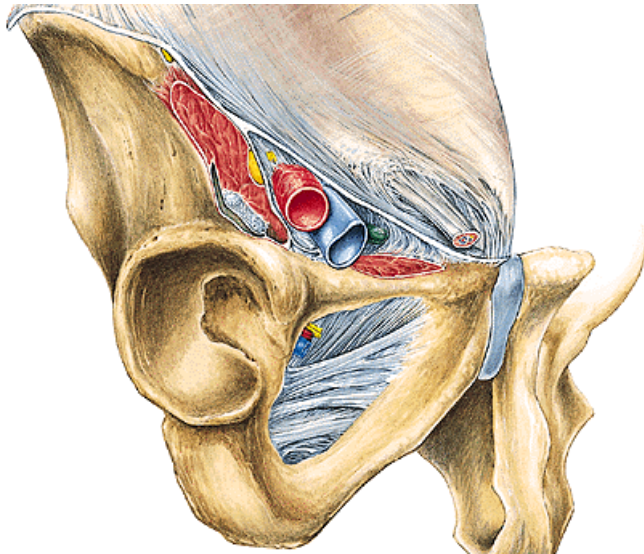
ARTERIA ILIACA EXTERNA

a. epigastrica inf.

r. pubicus (corona mortis)

a. cremasterica
(a. ligamenti teretis)

a. circumflexa ilium profunda



ARTERIES OF THE LOWER EXTREMITY

a. femoralis

(lacuna vasorum, trigonum femorale,
canalis adductorius, hiatus tendineus)

a. poplitea

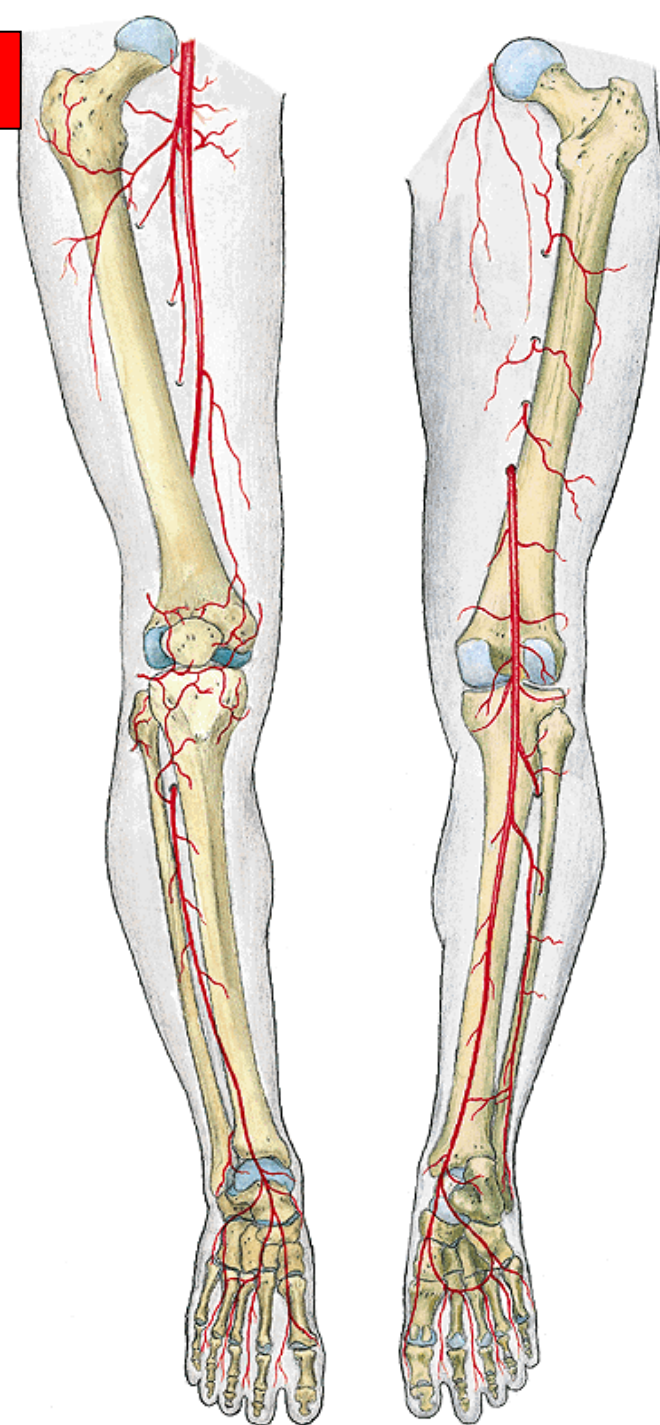
(fossa poplitea)

a. tibialis anterior

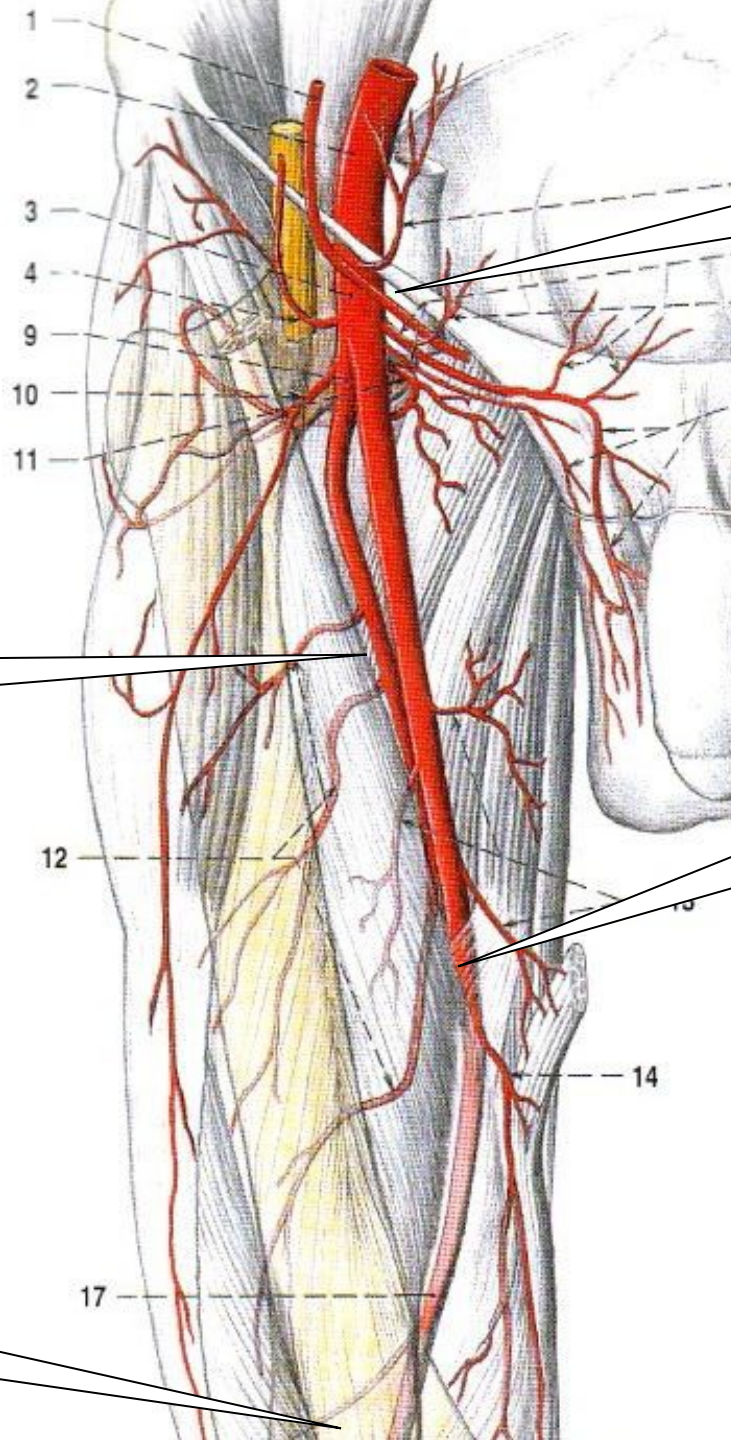
(a. dorsalis pedis)

a. tibialis posterior

(malleolus medialis, **a. plantaris medialis,**
a. plantaris lateralis)



A. femoralis



LACUNA
VASORUM

FOSSA
ILIOPECTINEA

CANALIS
ADDUCTORIUS

FOSSA
POPLITEA

ARTERIA FEMORALIS

A. epigastrica spf.

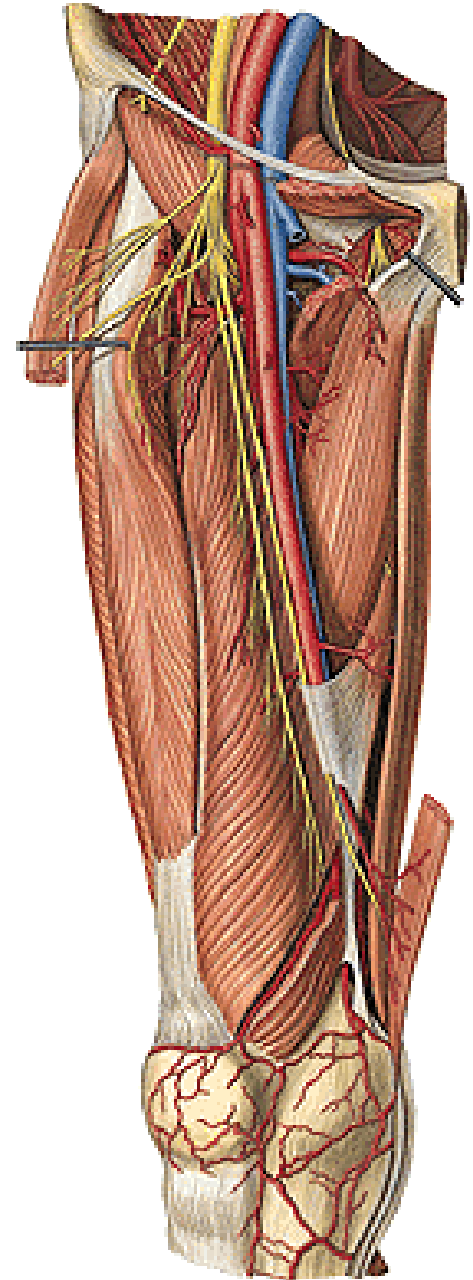
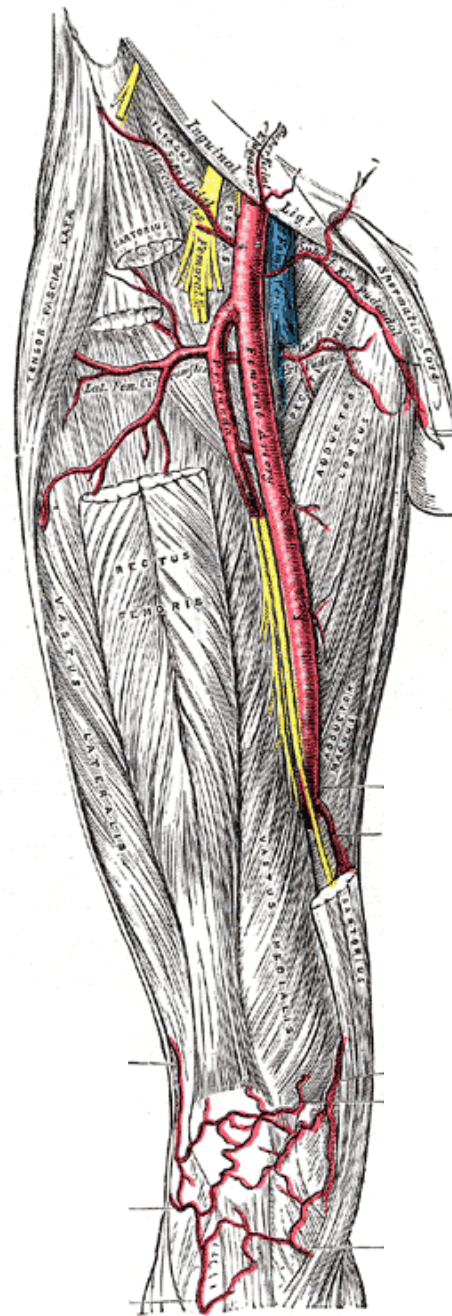
A. circumflexa ilium spf.

Aa. pudendae ext.

A. profunda femoris

Rr. musculares

A. genus descendens



ARTERIA PROFUNDA FEMORIS

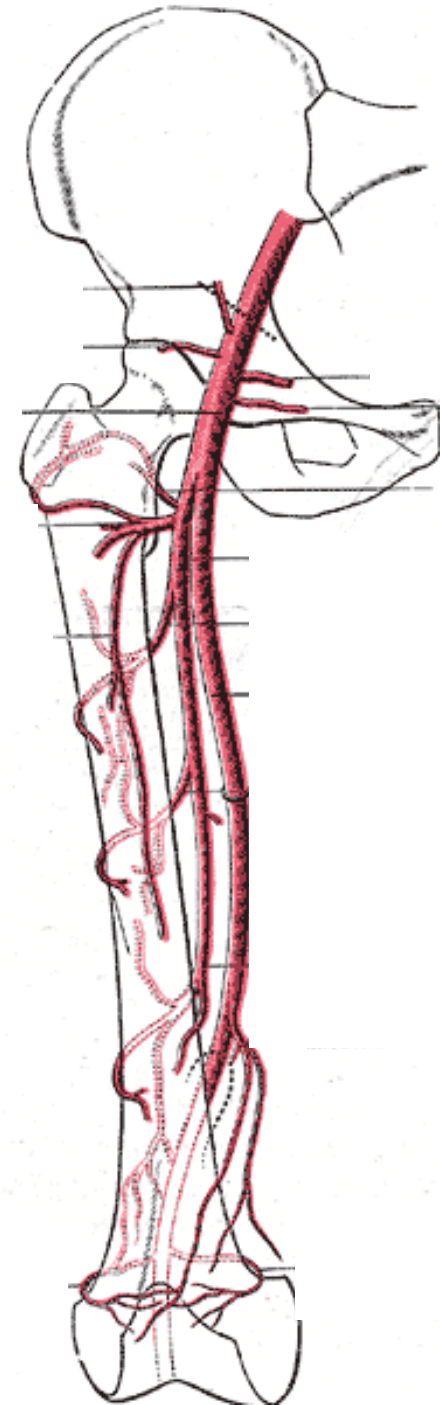
A. circumflexa femoris medialis
(r. superficialis et profundus)

A. circumflexa femoris lat.
(r. ascendens et descendens)

A. perforans prima
(a. nutritia femoris sup.)

A. perforans secunda

A. perforans tertia
(a. nutritia femoris inf.)



ARTERIA POPLITEA

A. suralis medialis et lateralis

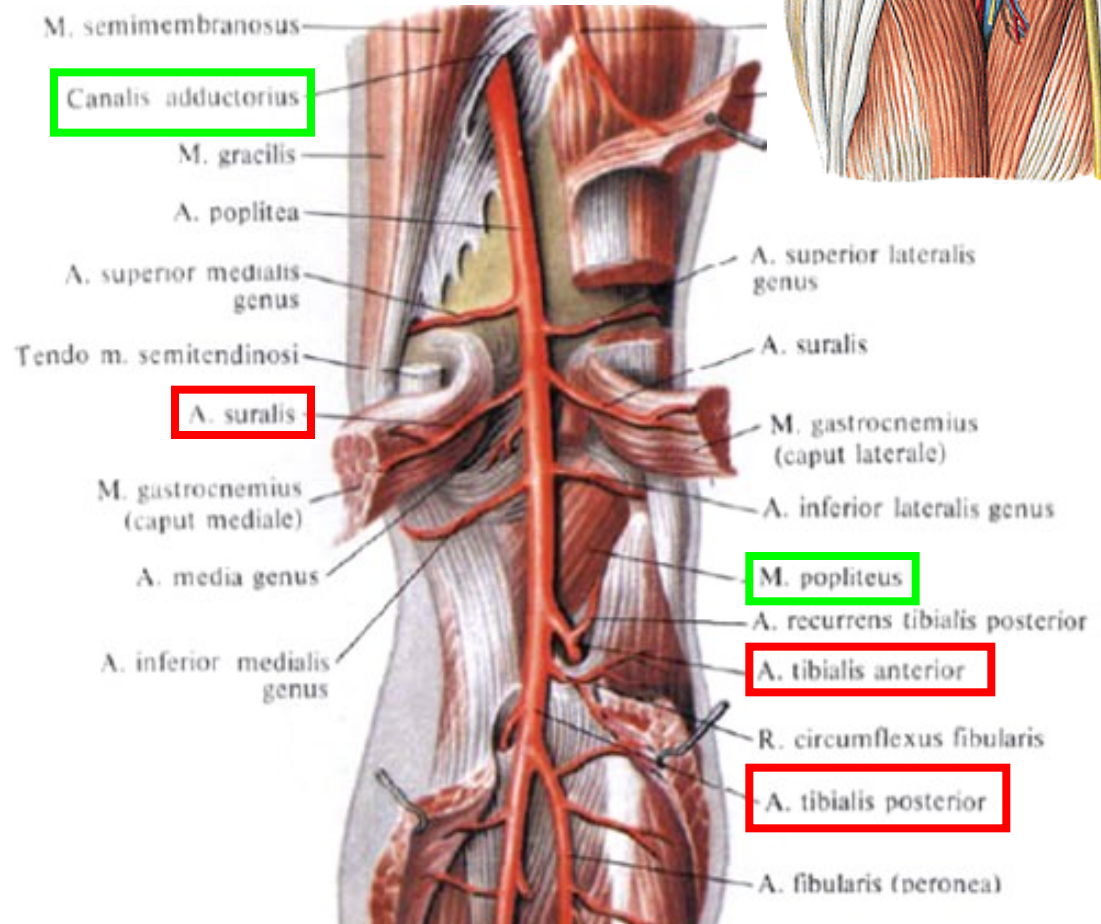
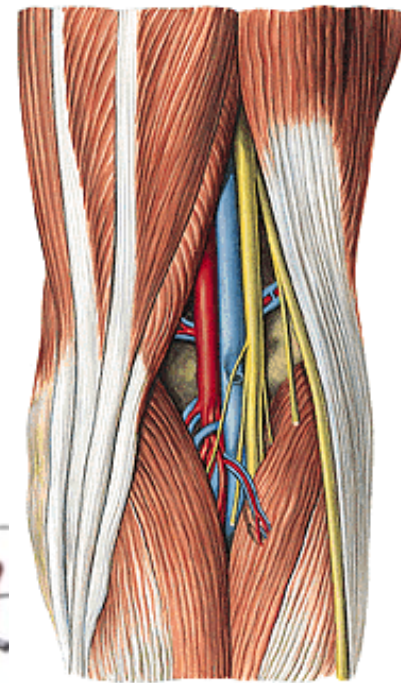
A. genus superior medialis et lateralis

A. genus media

A. genus inferior medialis et lateralis

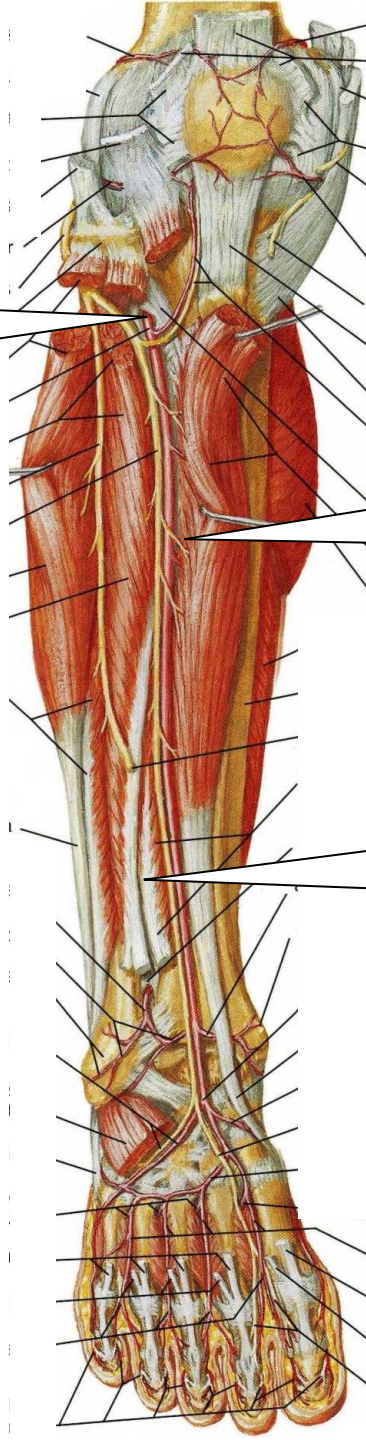
A. tibialis ant.

A. tibialis post.



A. tibialis anterior

**Passes through
*membrana
interossea cruris***



**Between *m. tibialis ant.*
and *m. extensor
digitorum longus***

**Distally between *m. tibialis
ant.* and *m. extensor
hallucis longus***

ARTERIA TIBIALIS ANTERIOR

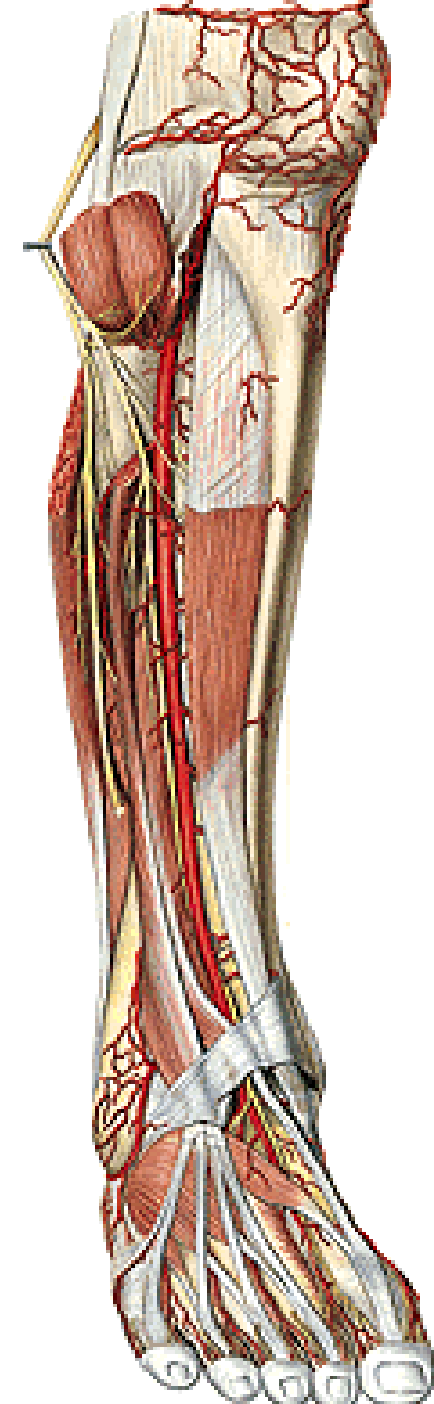
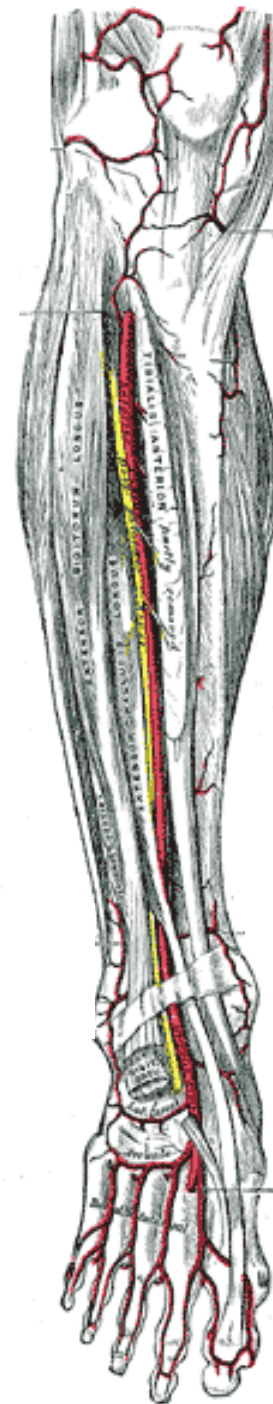
A. recurrens tibialis post.

A. recurrens tibialis ant.

Rr. musculares

A. malleolaris ant. med. et lat.

A. dorsalis pedis



ARTERIA DORSALIS

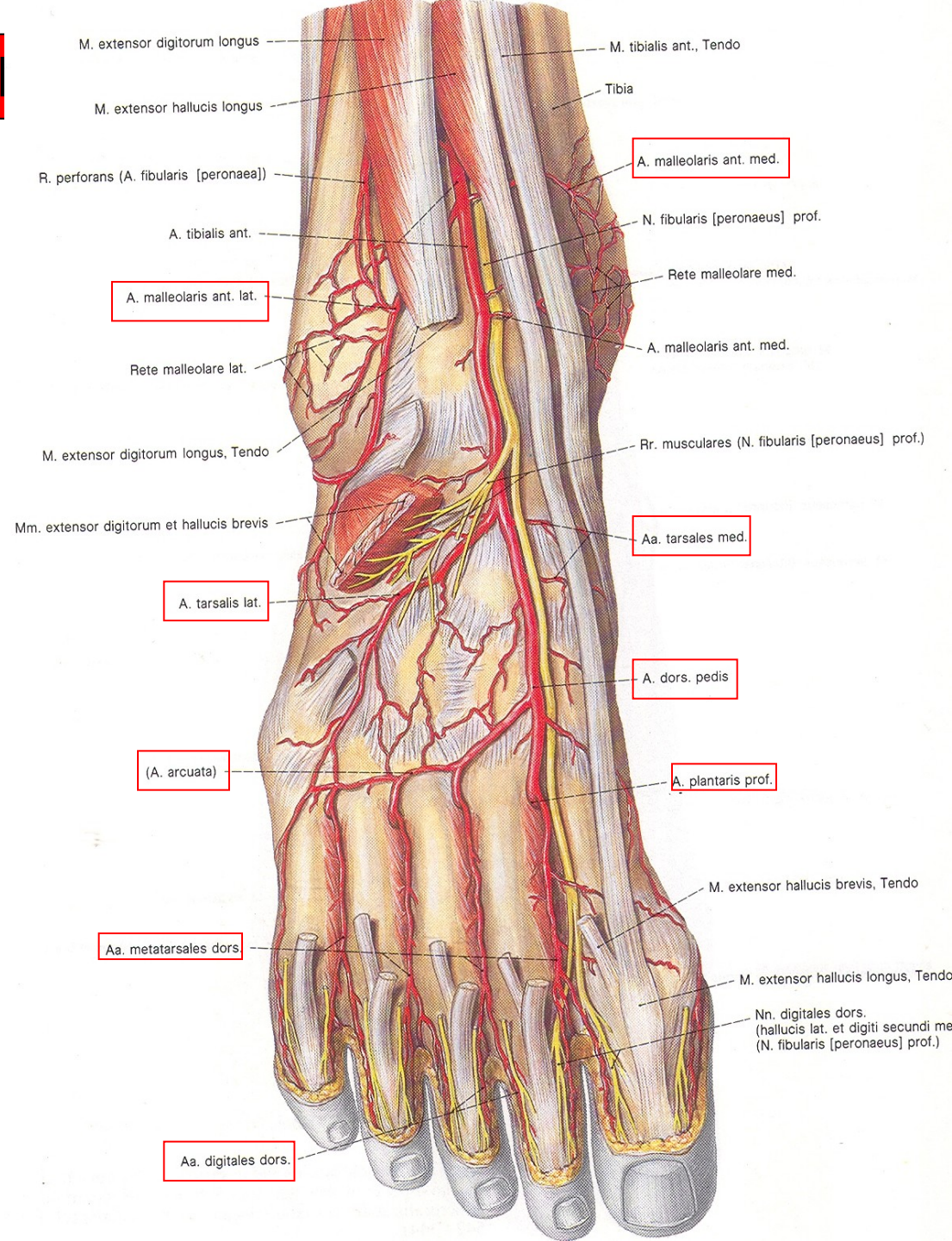
Aa. tarseae med.

**A. tarsea lat.
(a. digitalis dorsalis V.)**

**A. arcuata
(3 aa. metatarsae dorsales,
aa. digitales dorsales)**

R. plantaris prof.

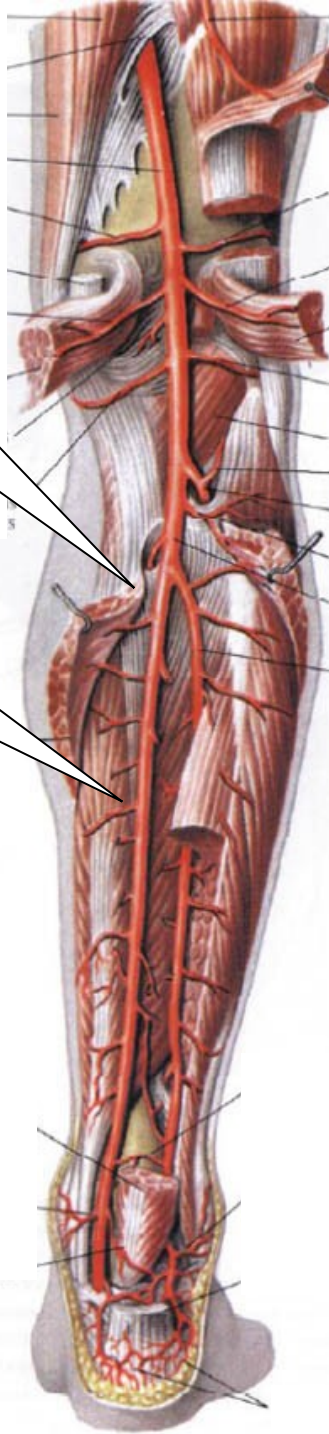
**A. metatarsa dorsalis prima
- aa. digitales dorsales**



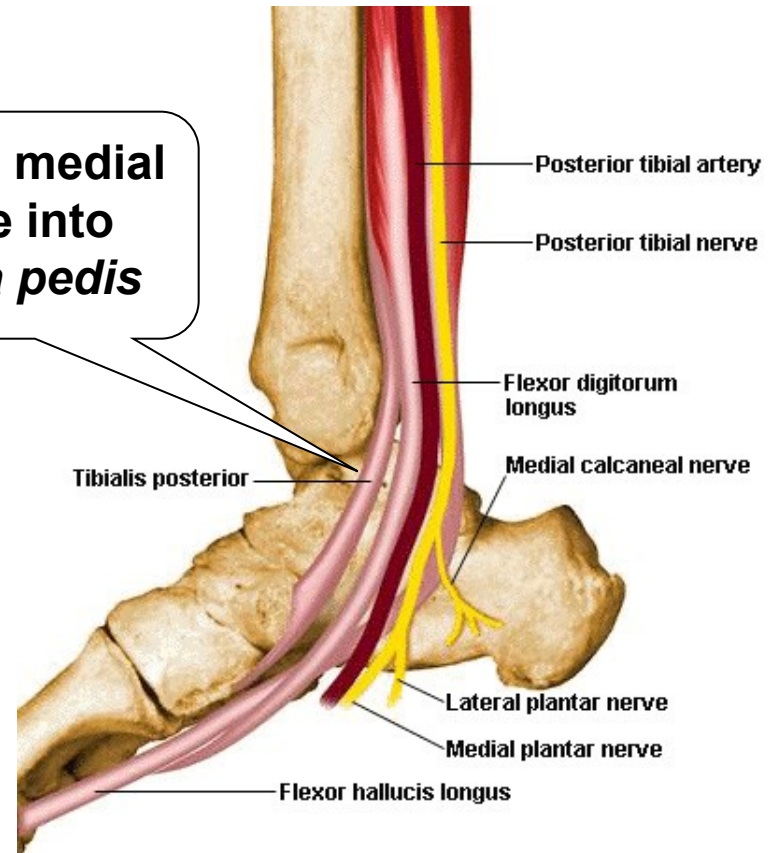
A. tibialis posterior

under *arcus tendineus m. solei*

On the deep group of flexors



Behind medial ankle into *planta pedis*



ARTERIA TIBIALIS POSTERIOR

R. circumflexus fibulae

A. peronea (fibularis)

Rr. musculares

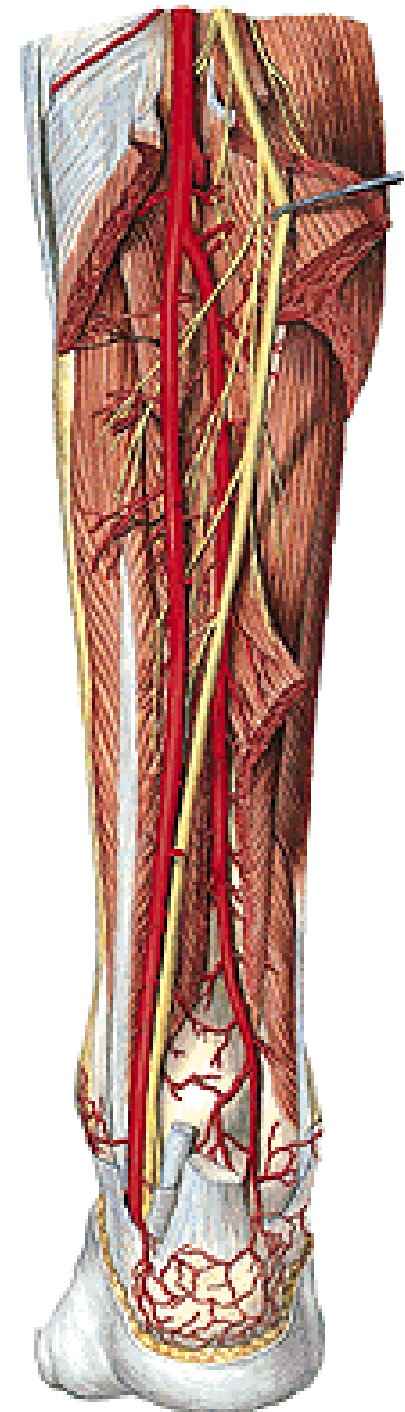
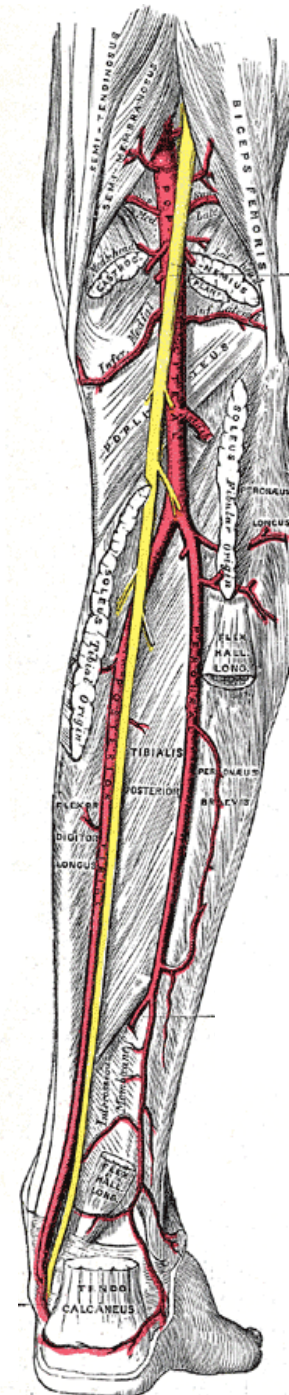
A. nutritia tibiae

Rr. malleolares med.

Rr. calcanei med.

A. plantaris lat.

A. plantaris med.

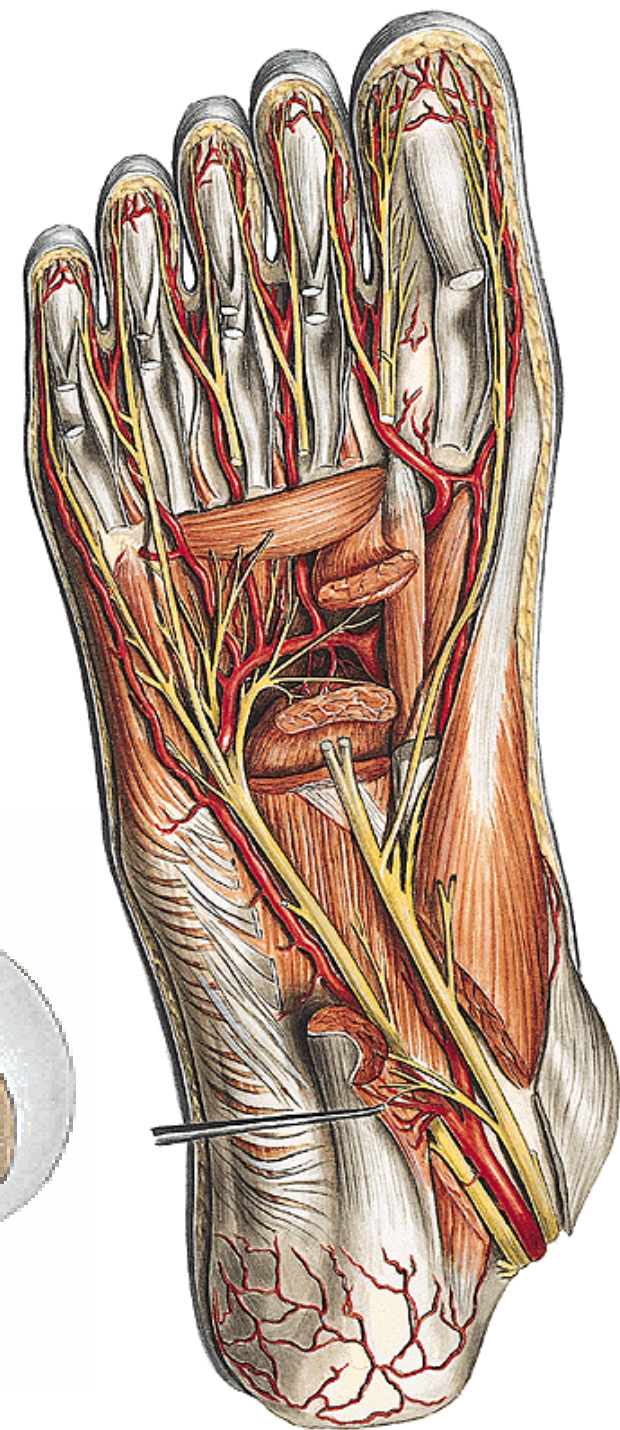
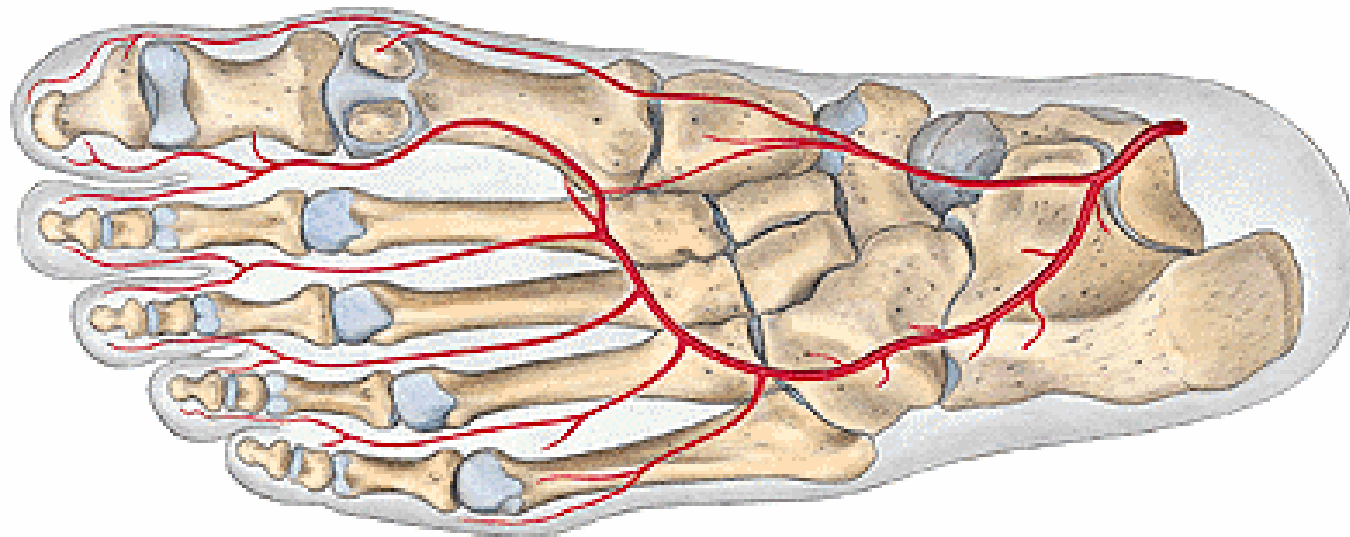


A. PLANTARIS LATERALIS

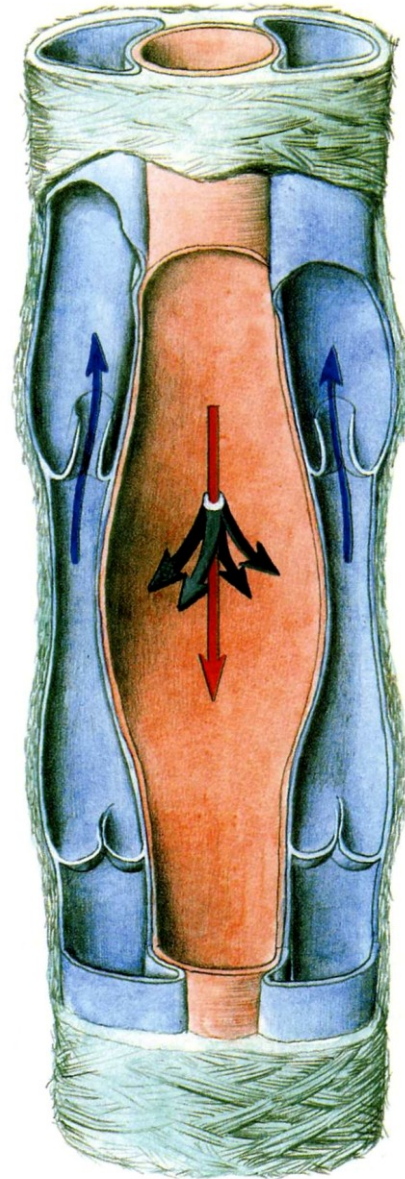
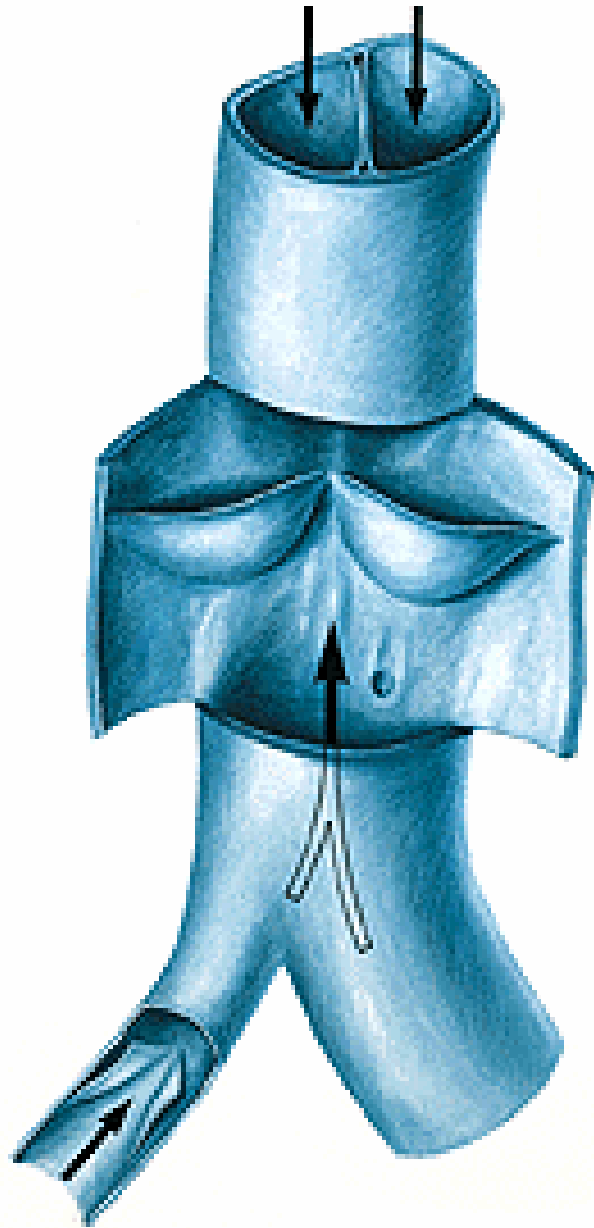
arcus plantaris
(4 aa. metatarsae plantares,
aa. digitales plantares)

ARTERIA PLANTARIS MEDIALIS

ramus superficialis et profundus



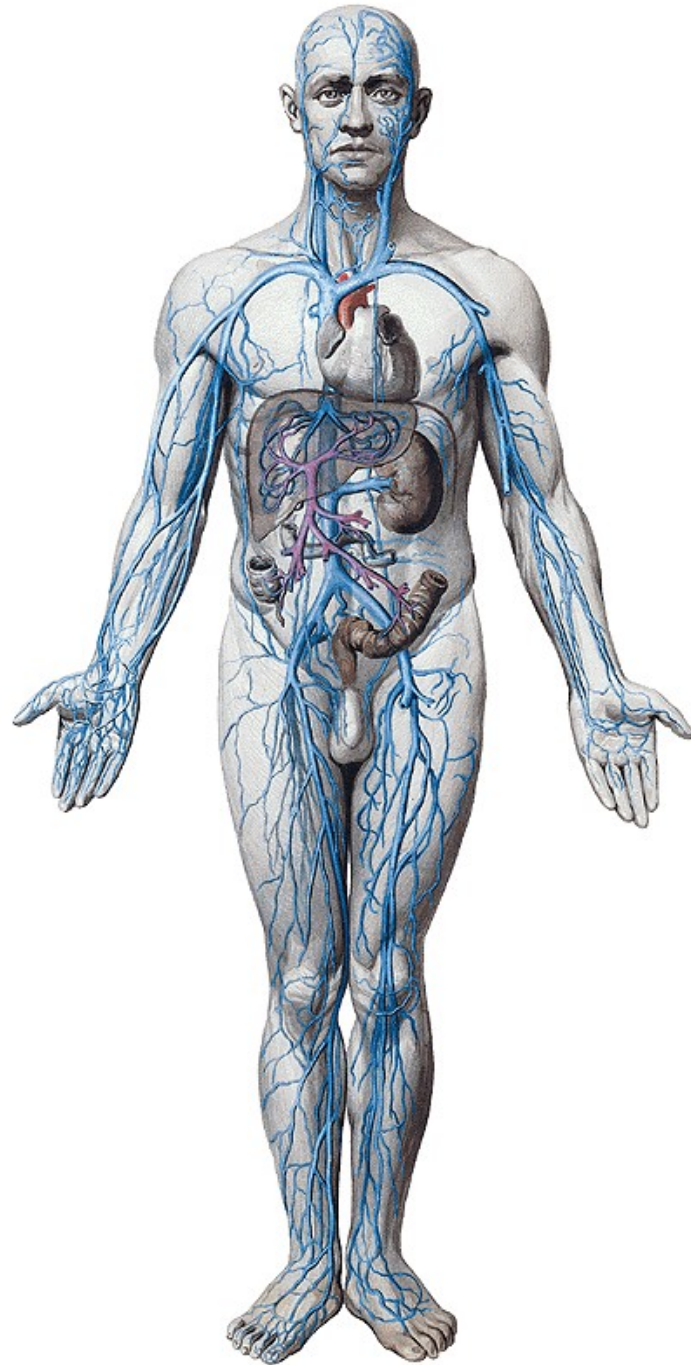
Veins



v. cava superior



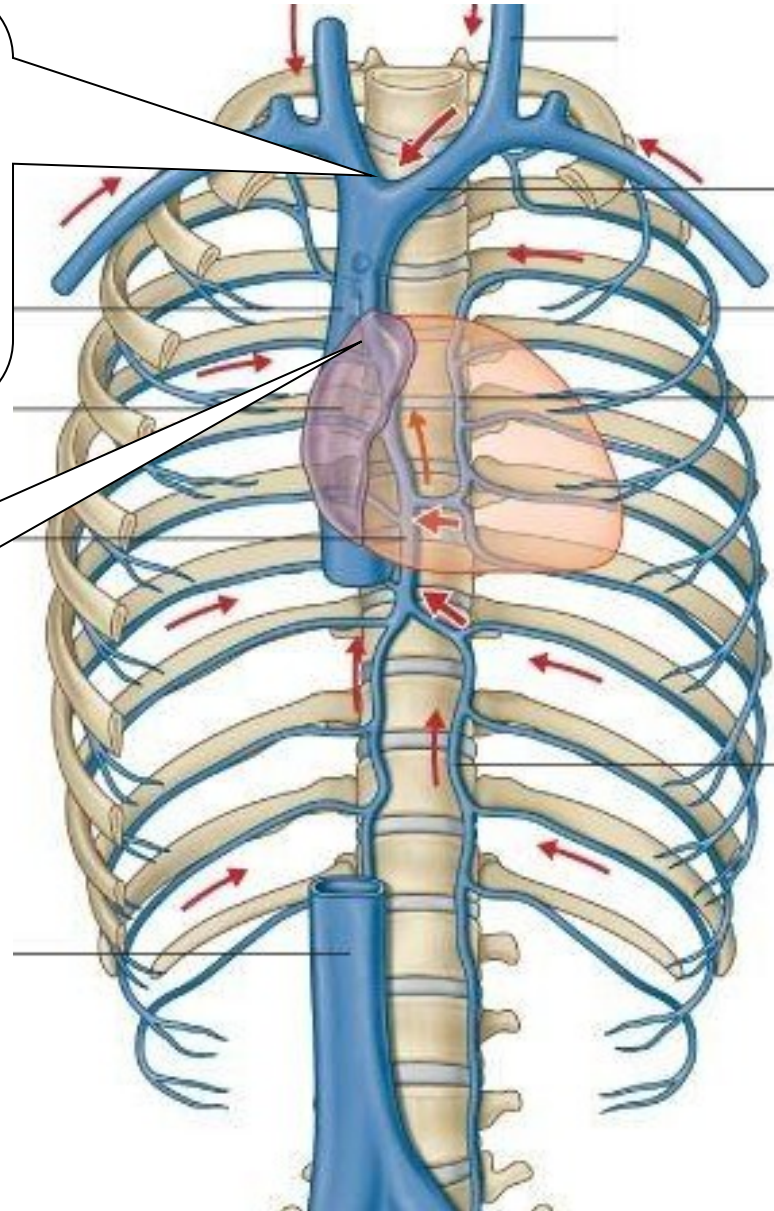
v. cava inferior



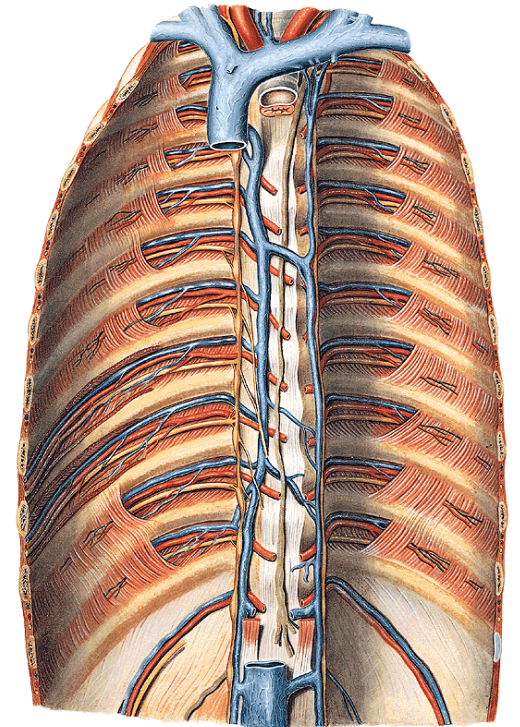
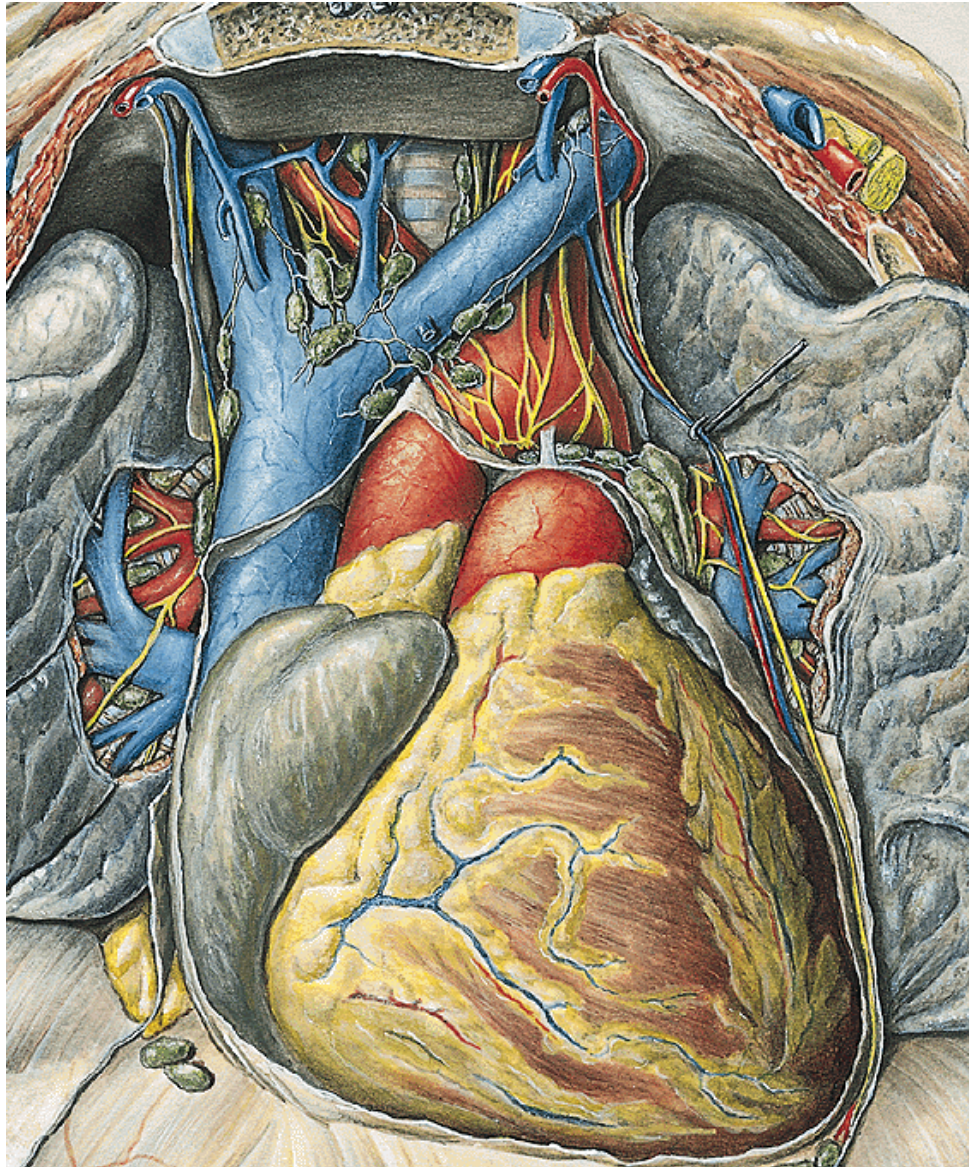
VENA CAVA SUPERIOR

Is created by venae brachiocephalicae in the level of the 1st sternocostal right joint

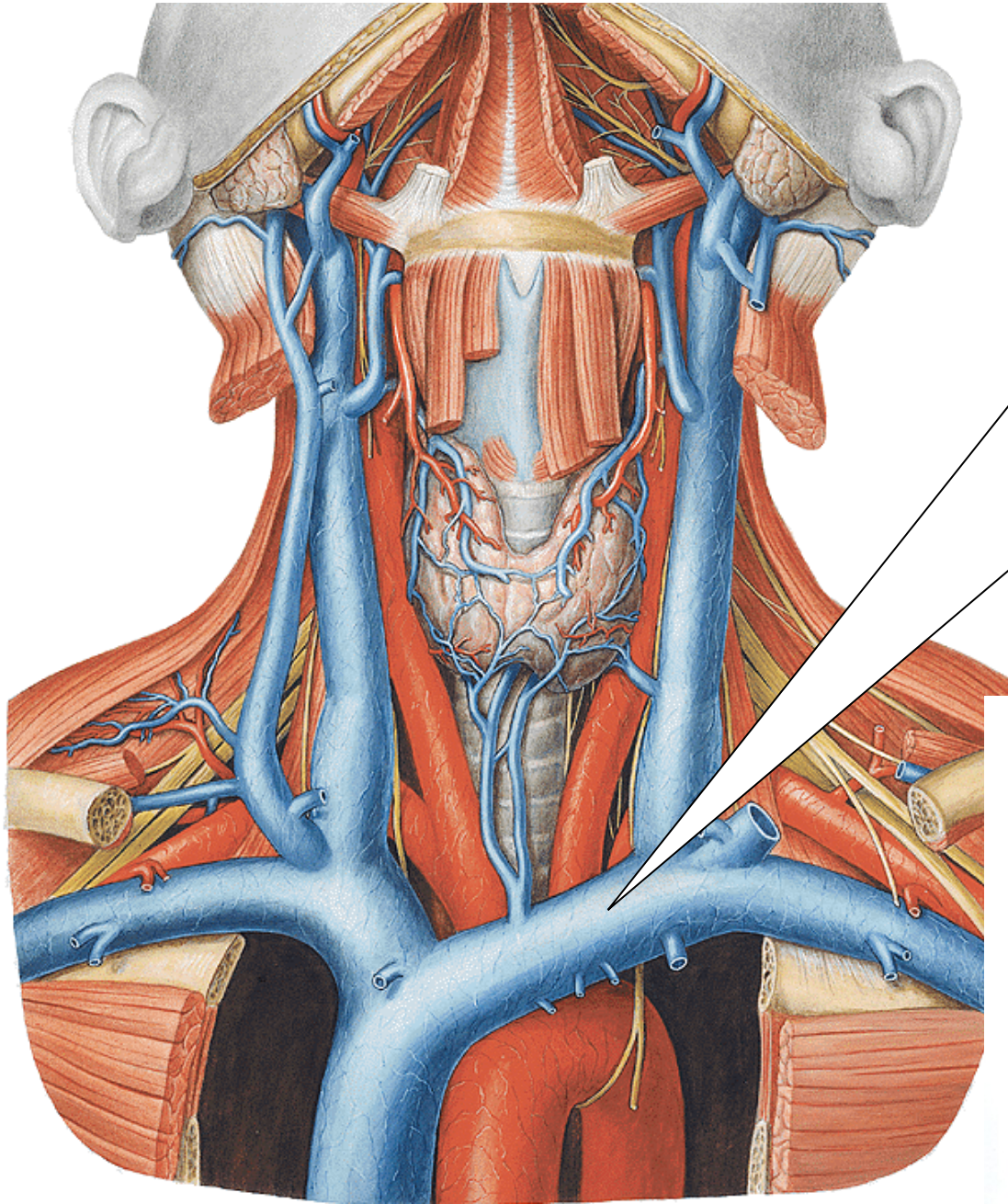
Behind the 3rd sternocostal joint is opened into the right atrium



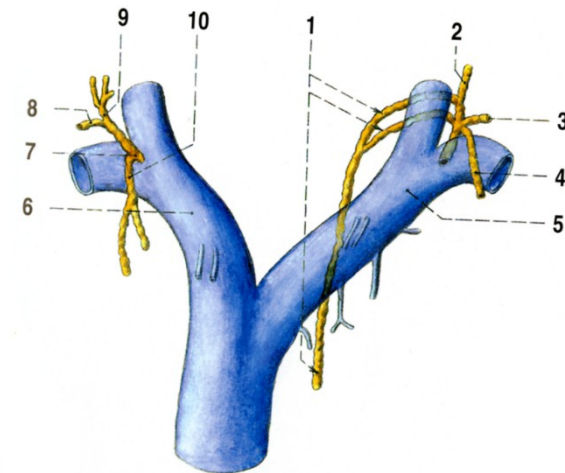
Descends caudally in the superior mediastinum

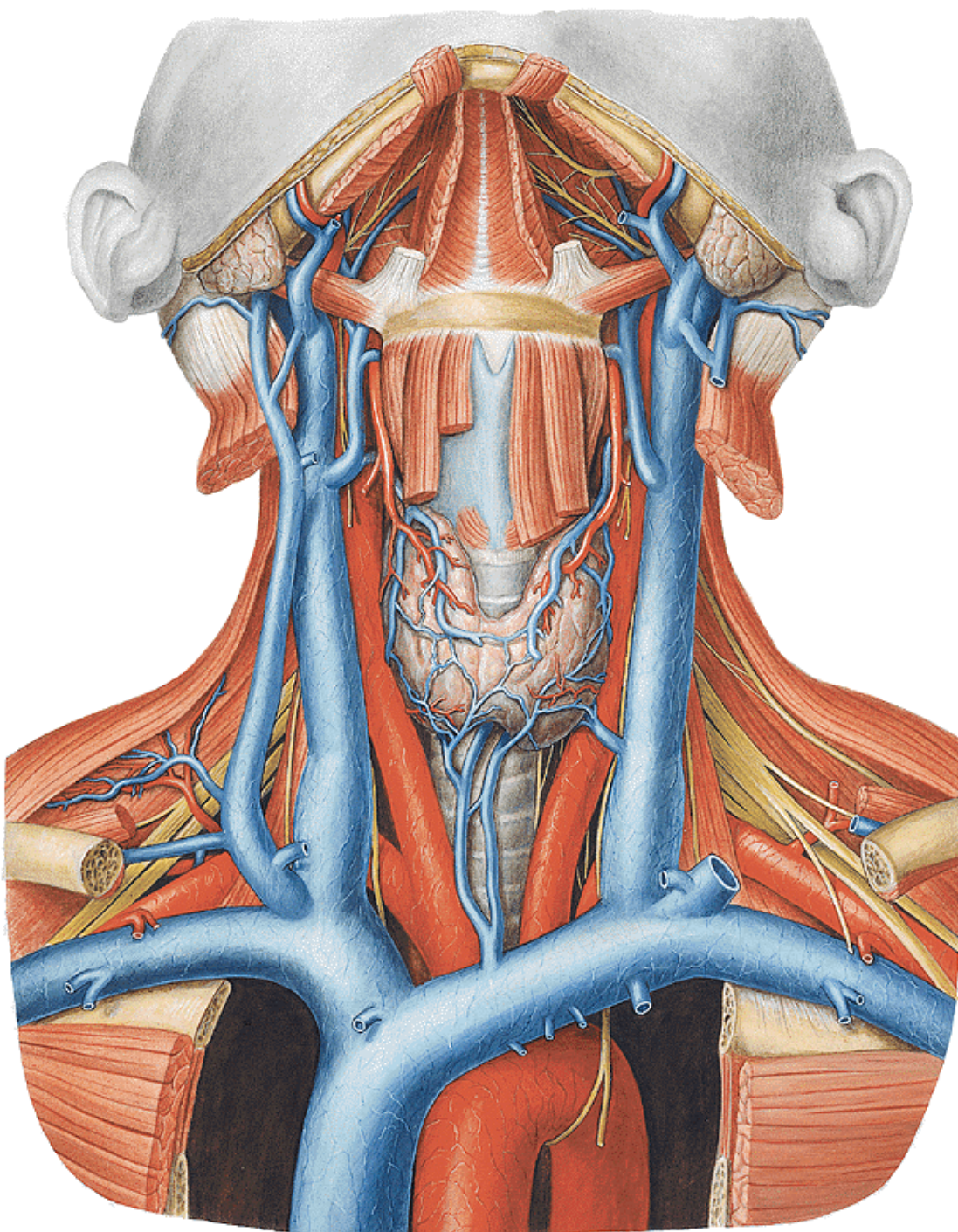


VENA BRACHIOCEPHALICA



Is created by the confluens *vena jugularis interna* and *vena subclavia* behind *articulatio sternoclavicularis* (*angulus venosus*). On both sides open the big lymphatic ducts here (on the left *ductus thoracicus*, on the right *ductus lymphaticus dexter*).





**1) Collateral tributaries
from thyroid gland**

Vena vertebralis

Vena thoracica interna

**Veins from
mediastinum**

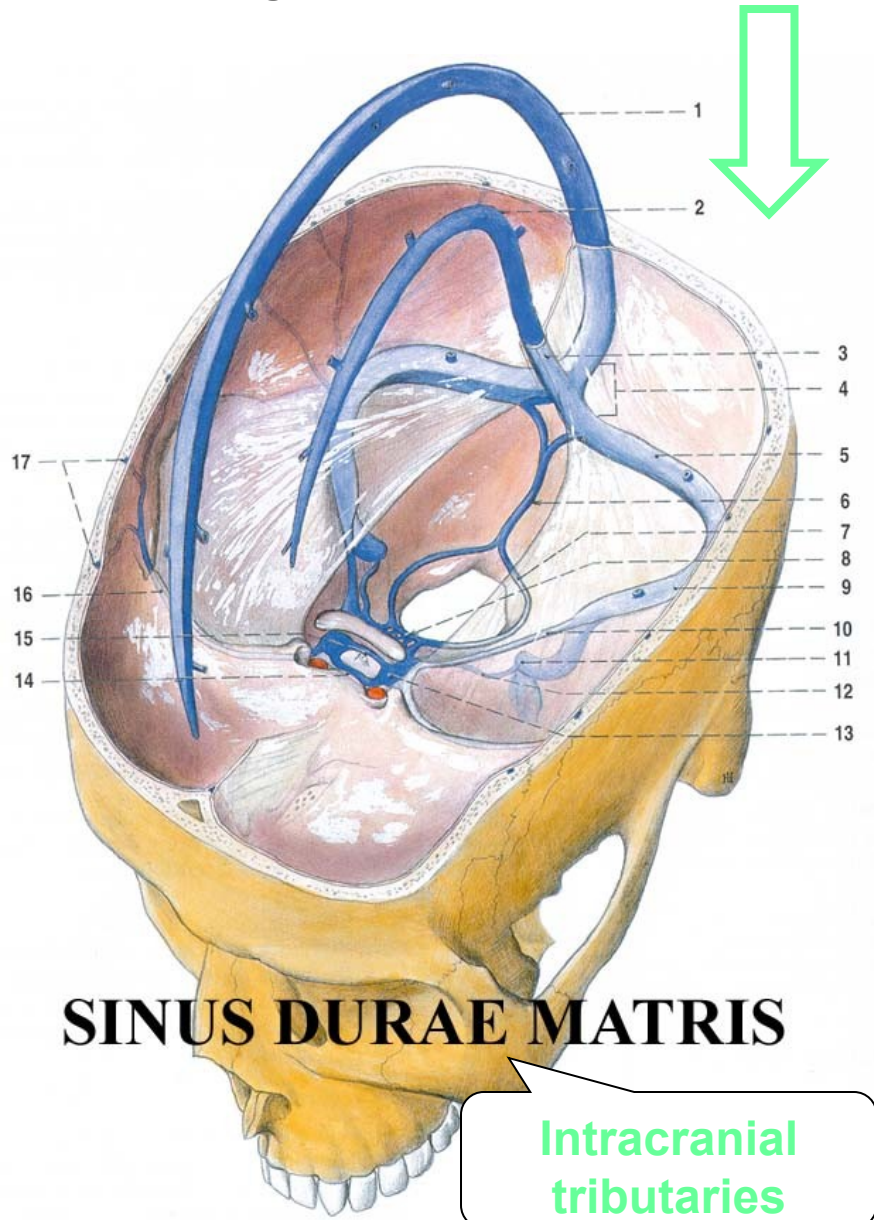
2) Main tributaries

Vena jugularis interna

Vena subclavia

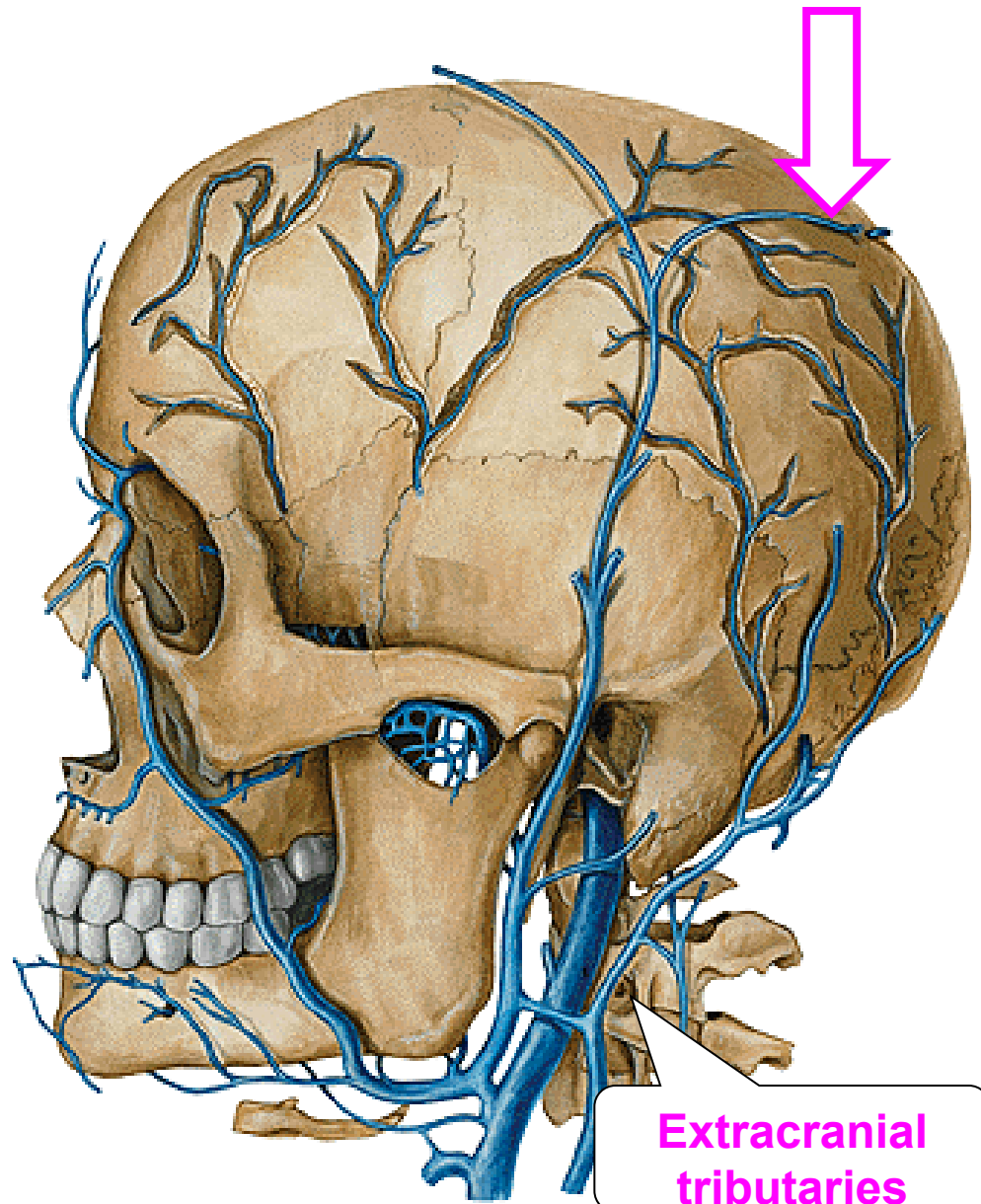
VENA JUGULARIS INTERNA

Brings the blood from **basis cranii interna**, **facial part of the head and neck**



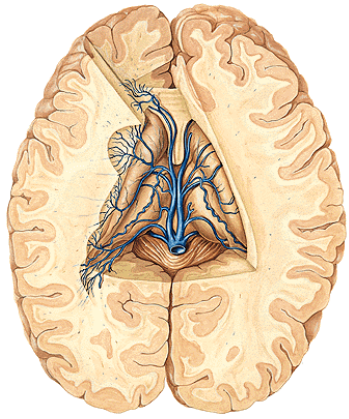
SINUS DURAE MATRIS

Intracranial
tributaries

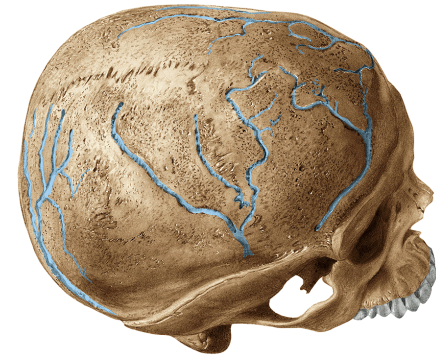
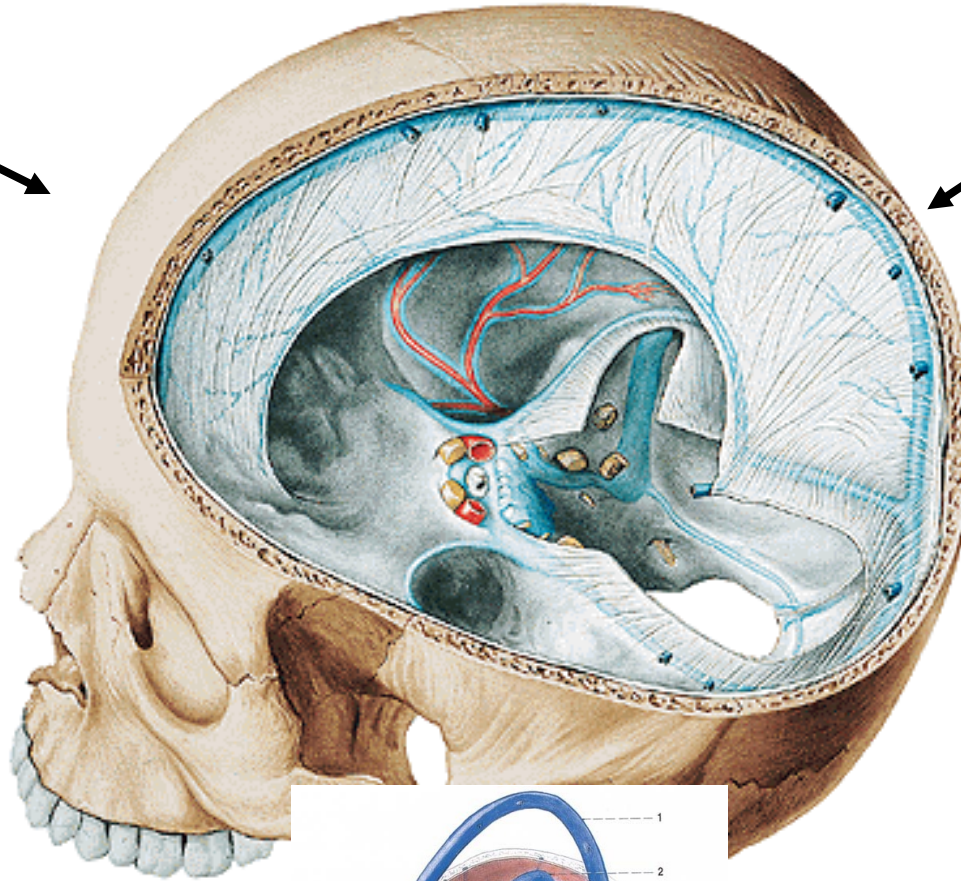


Extracranial
tributaries

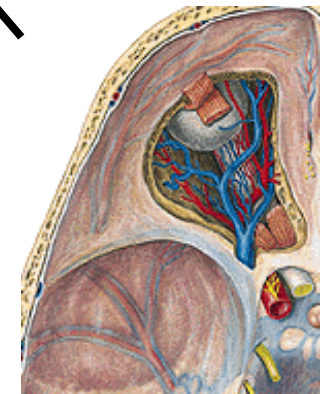
Intracranial tributaries



venae cerebri



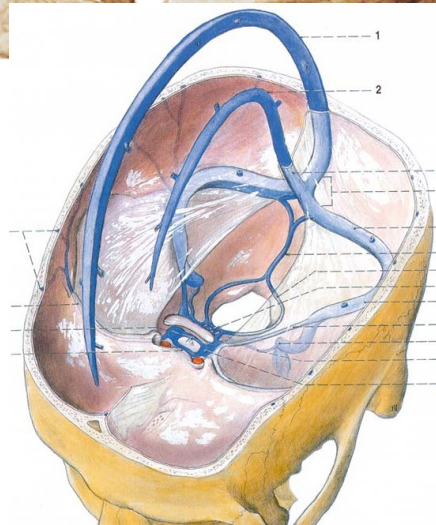
venae diploicae

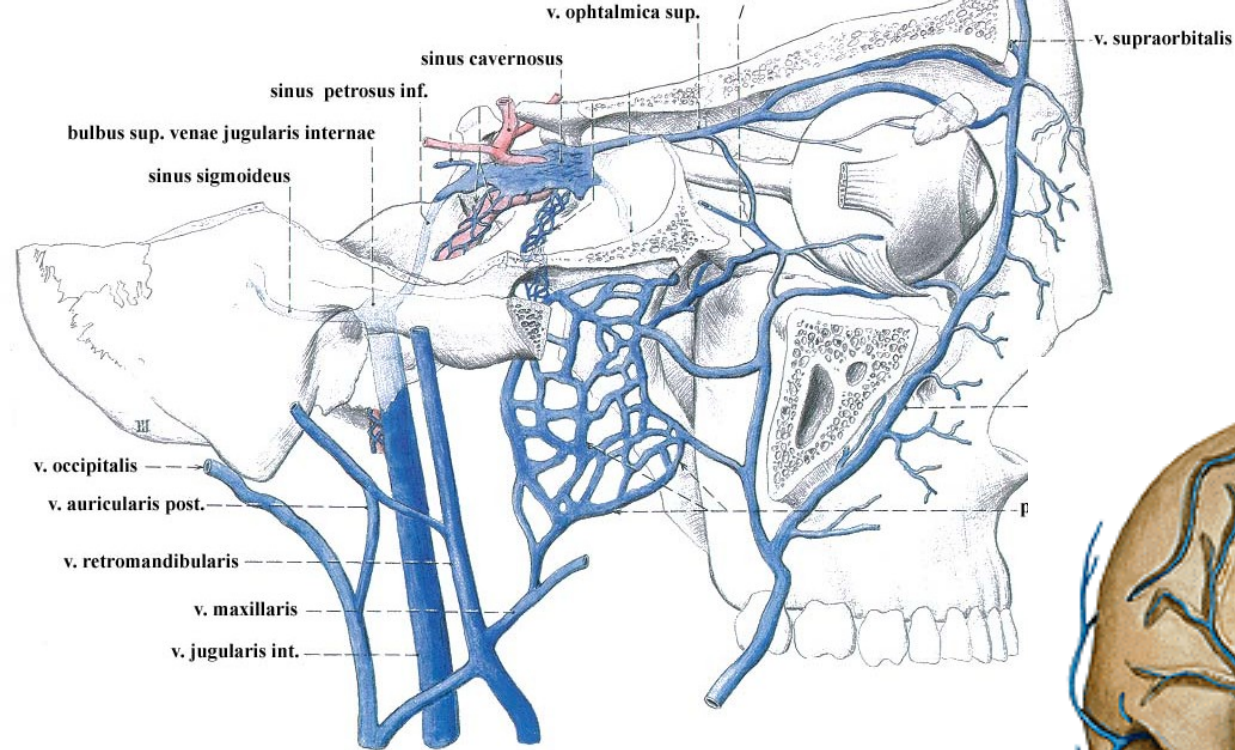


venae ophtalmicae



venae emissariae



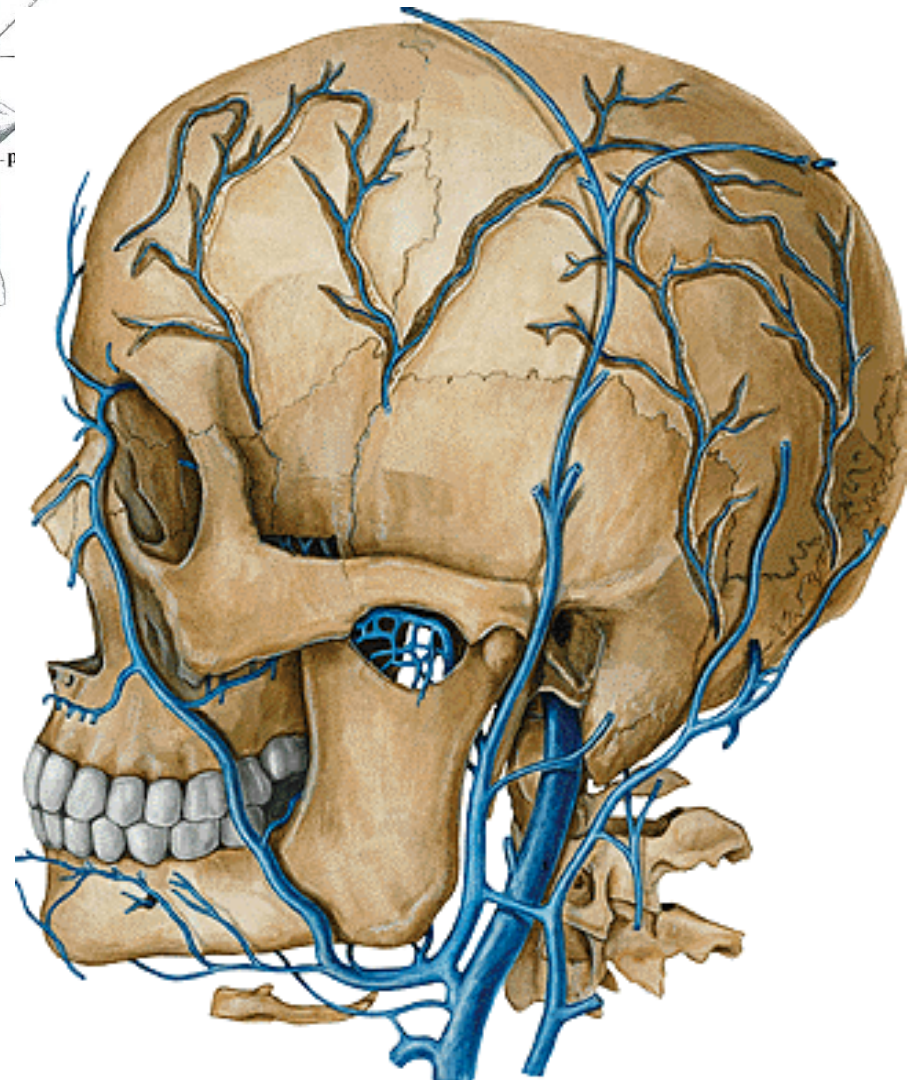


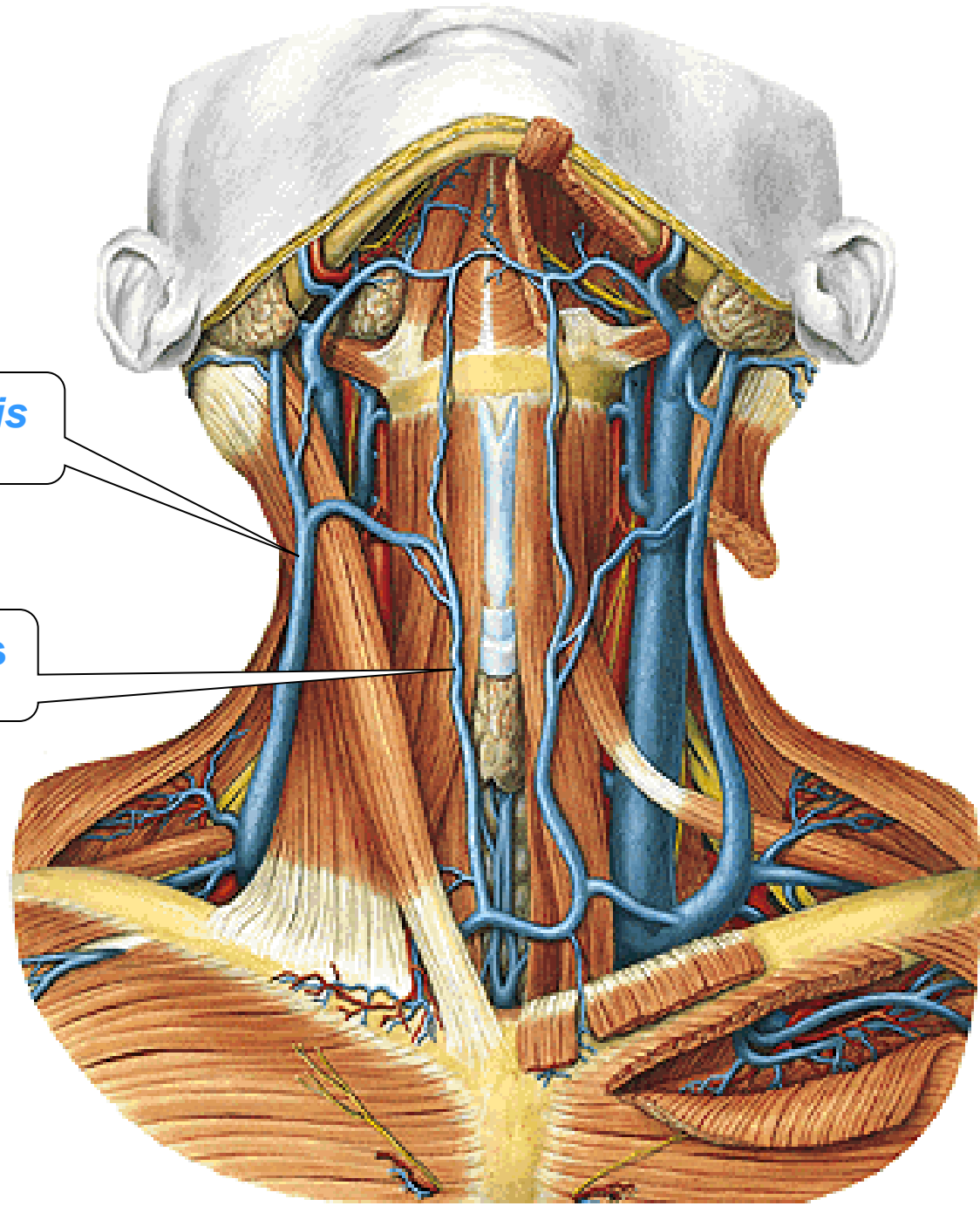
Extracranial tributaries

Vena facialis

Vena lingualis

Vena retromandibularis is created by confluens *vena temporalis superficialis* and *vena maxillaris plexus pterygoideus*



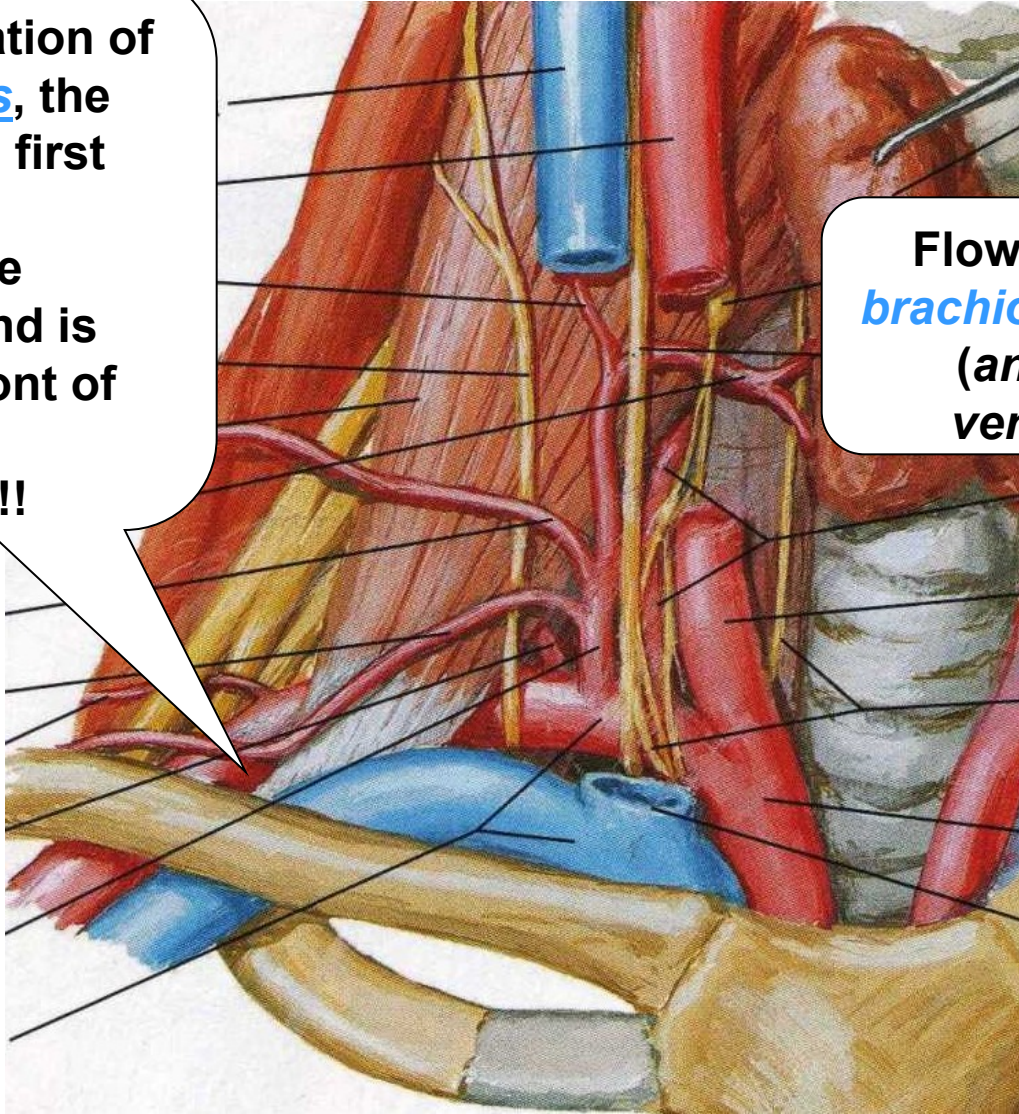


vena jugularis externa

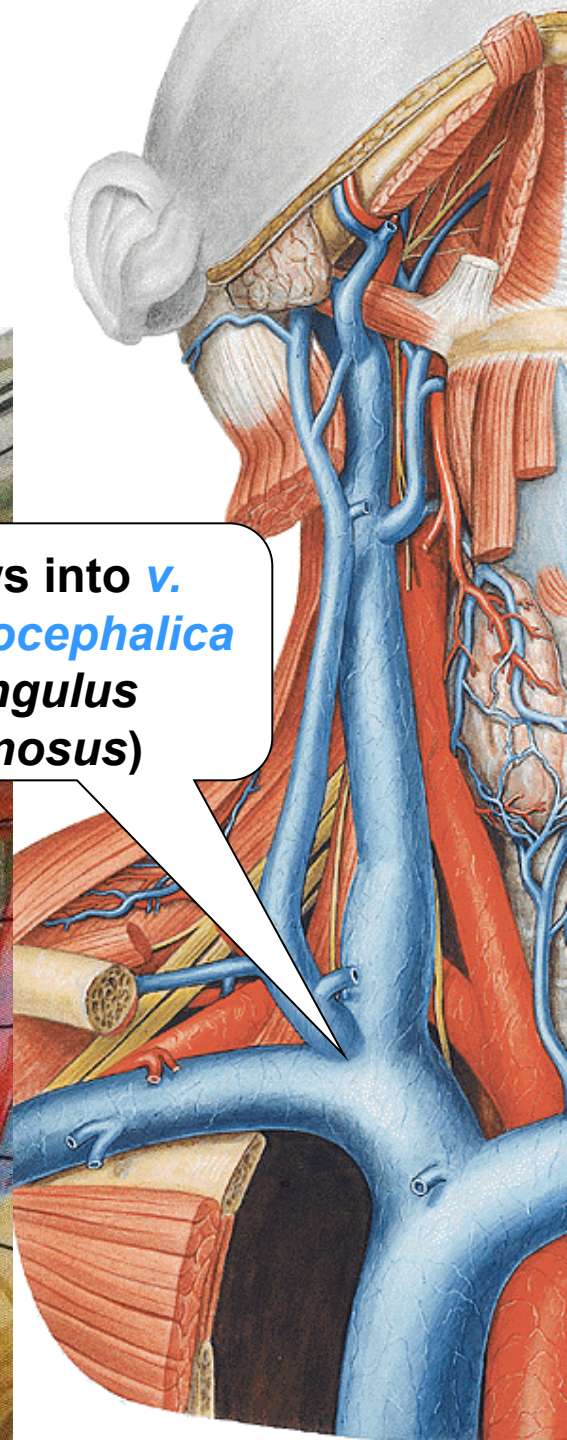
vena jugularis anterior

VENA SUBCLAVIA

It is continuation of ***vena axillaris***, the border is the first rib, Has only little tributaries and is located in front of the *fissura scalenorum*!!!



Flows into ***v. brachiocephalica*** (*angulus venosus*)



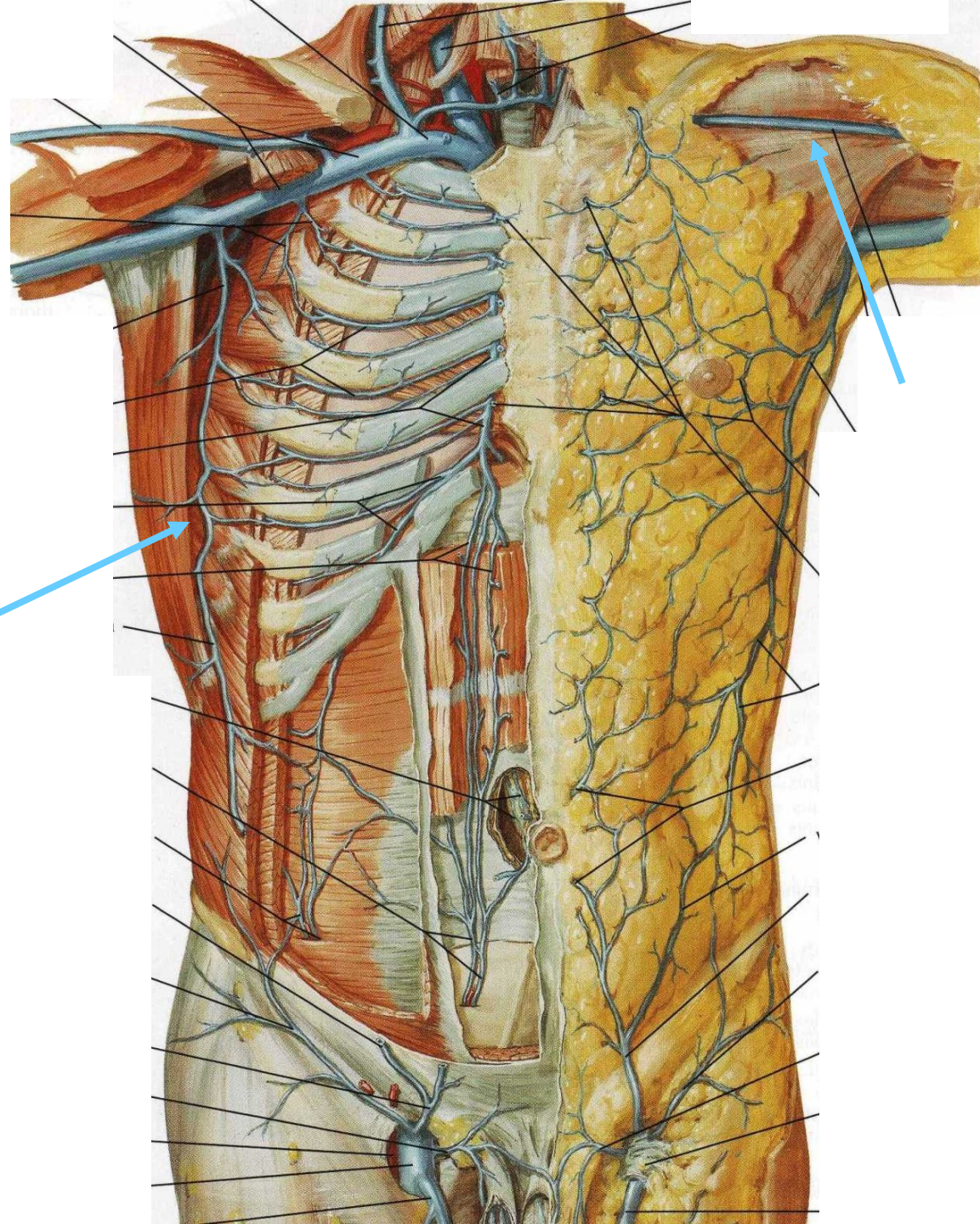
VENA AXILLARIS

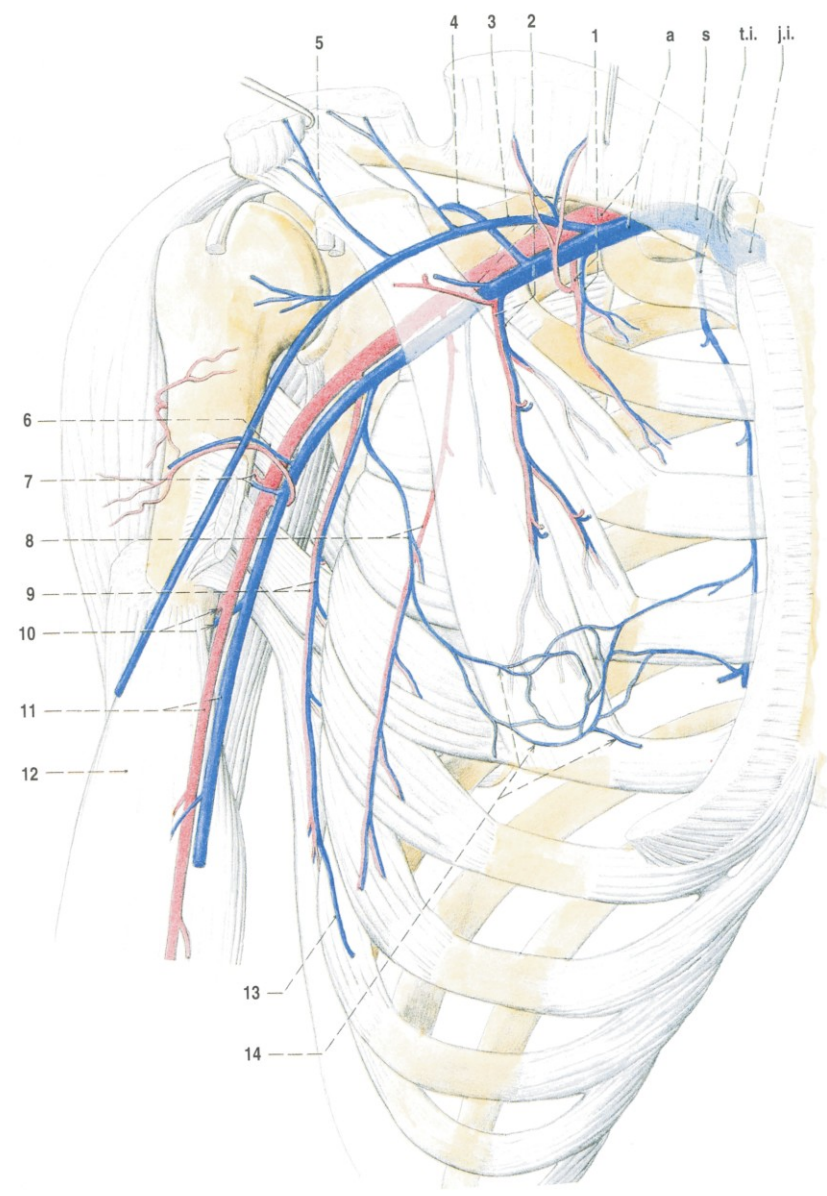
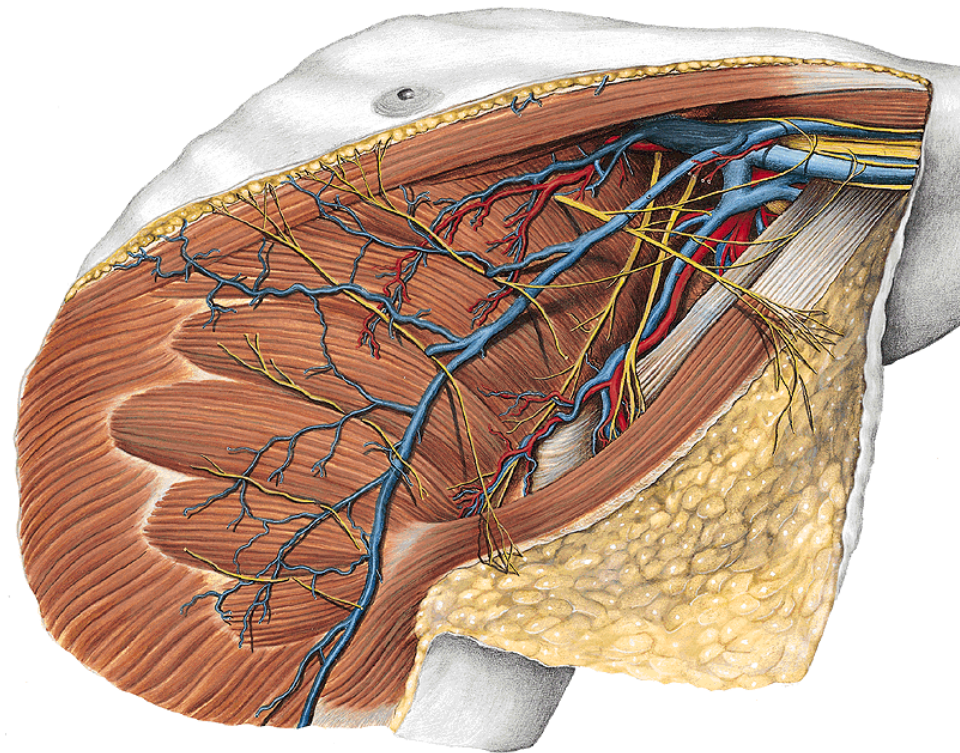
It is the continuation at the level of the attachment of *musculus pectoralis major* (*collum chirurgicum humeri*) of paired **vena brachialis**

Has a lot of collateral tributaries:

Venae thoracoepigastricae

Vena cephalica (in *sulcus bicipitalis lateralis* and in *trigonum deltoideopectorale*)

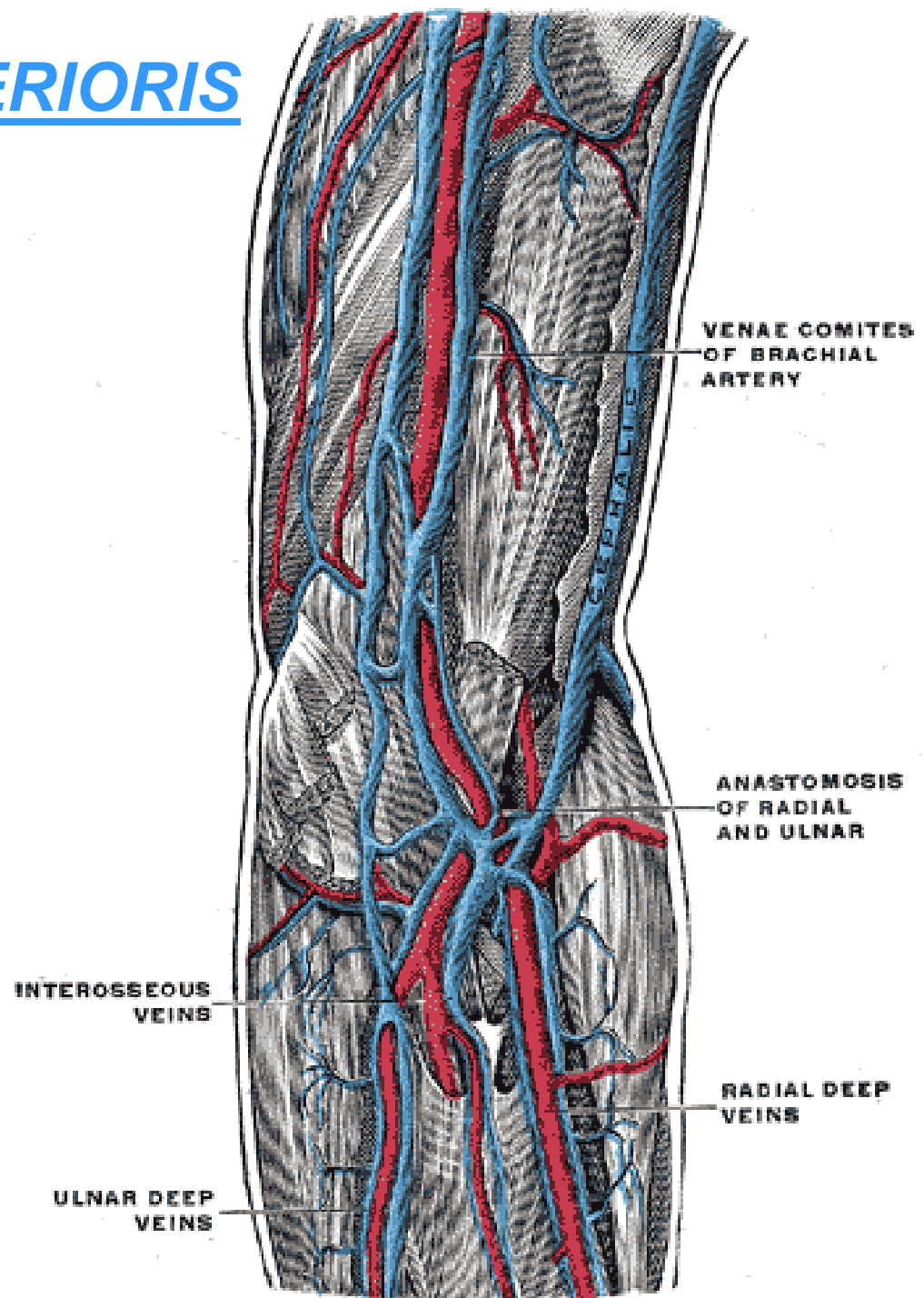




VENAE MEMBRI SUPERIORIS

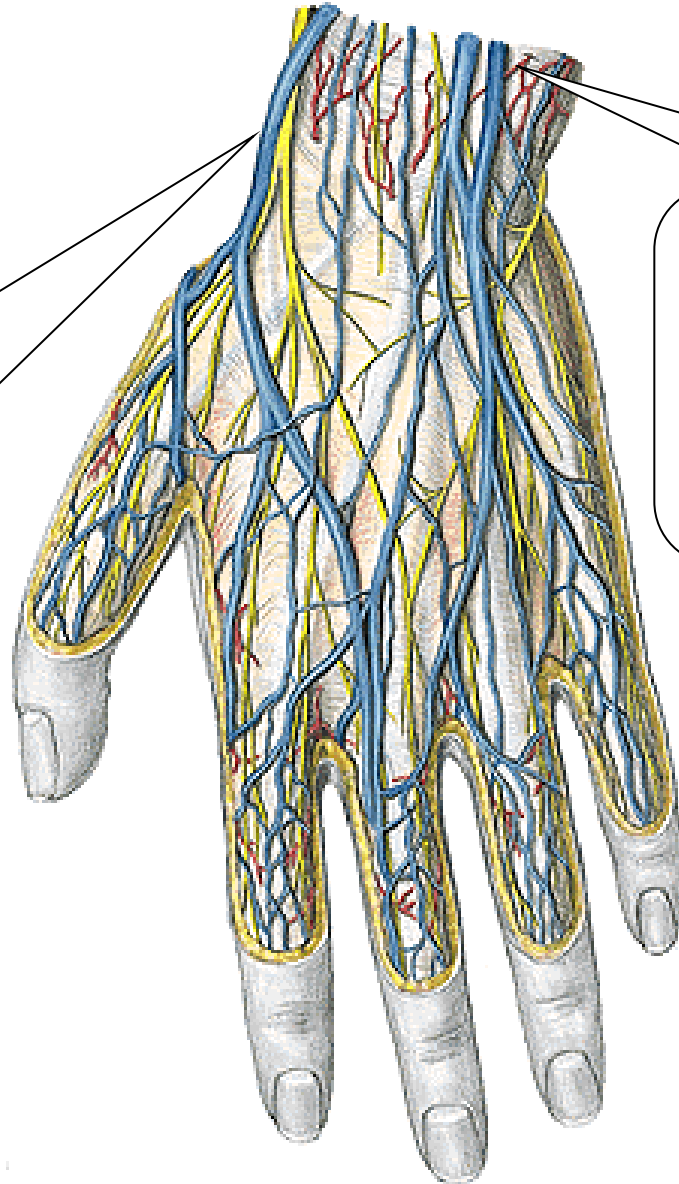
Two venous systems—
deep and superficial

1) Deep veins:
Are paired
Are located along arteries
Are named according to these
arteries



2) Superficial veins:

(rete venosum dorsale et palmare manus)



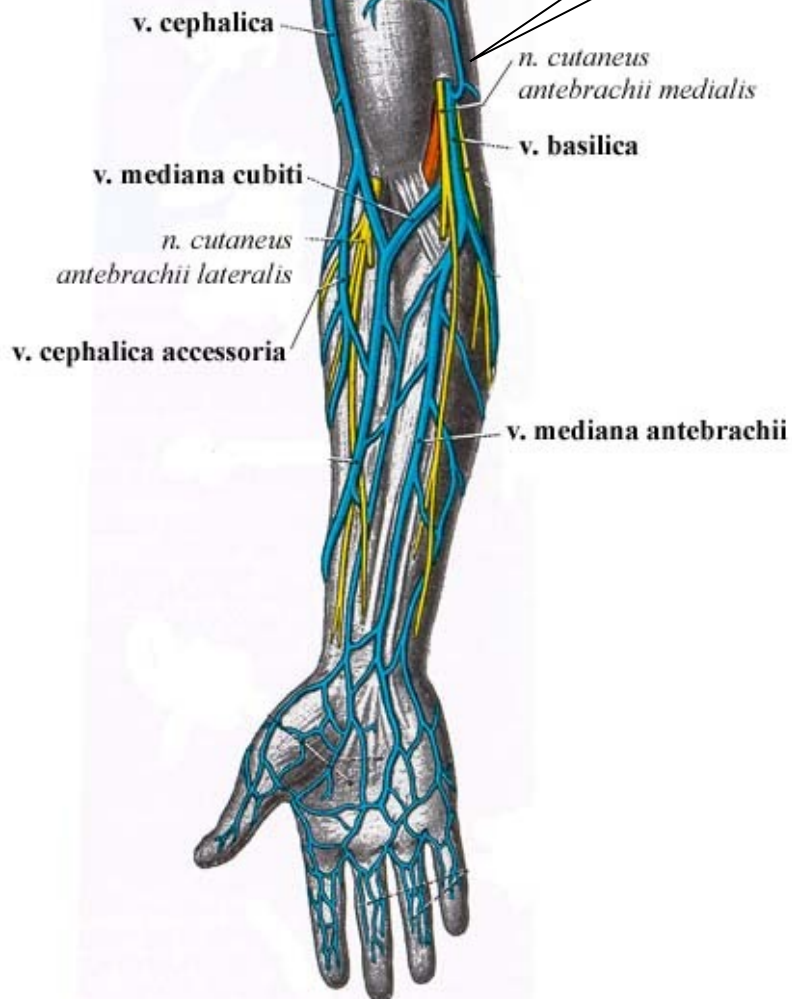
Vena cephalica
On the thumb side
rete venosum
dorsale manus as
vena cephalica
pollicis

Vena basilica
from rete venosum
dorsale manus as vena
salvatella

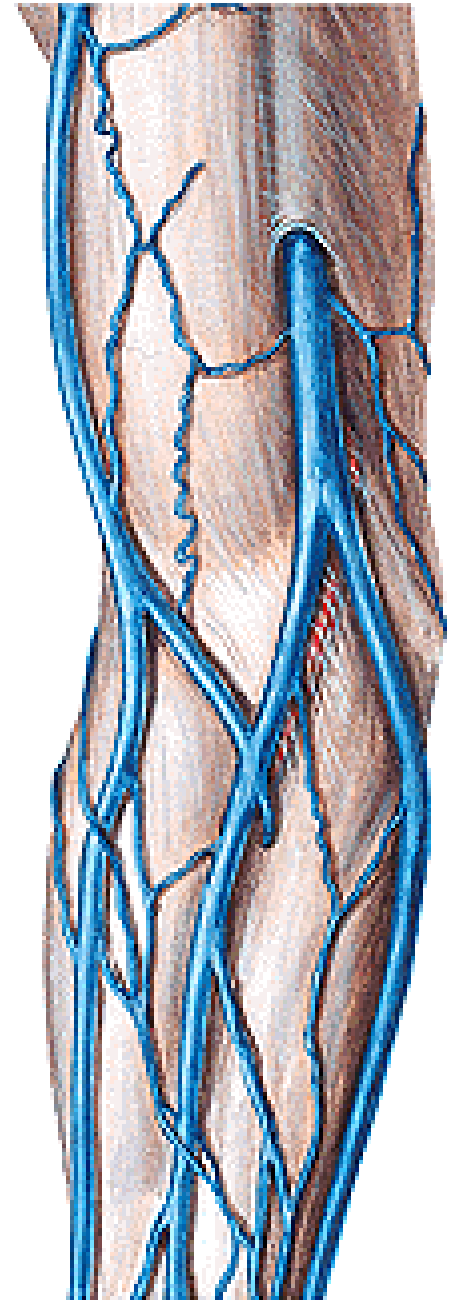
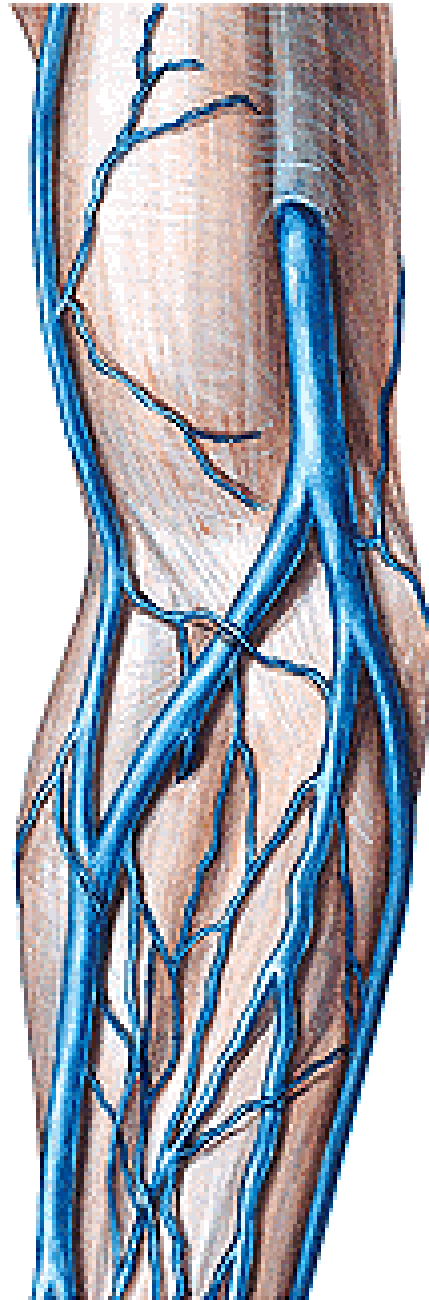
POVRCHOVÉ ŽÍLY
HORNÍ
KONČETINY

[vena cephalica](#)
On the radial side
into [vena axillaris](#)

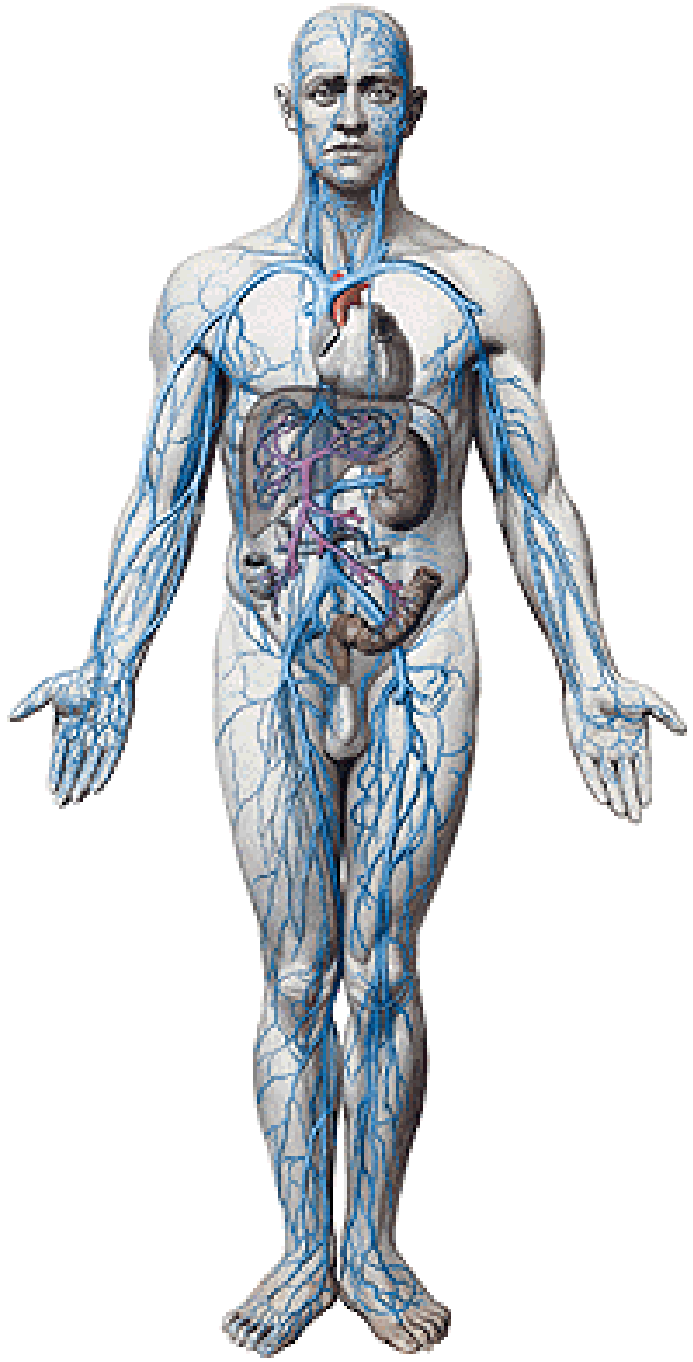
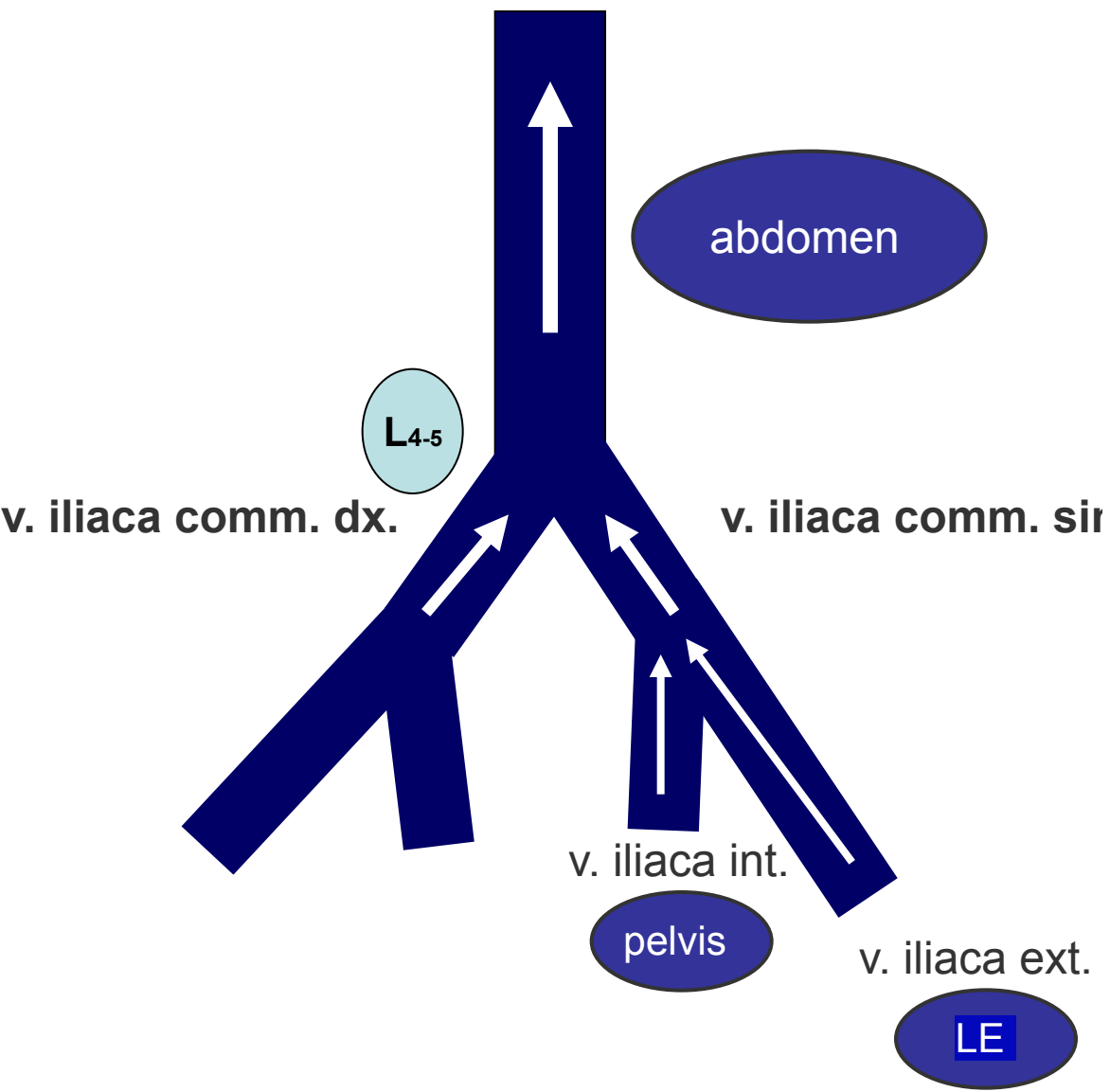
[vena basilica](#)
On the ulnar side
into [vena brachialis](#)



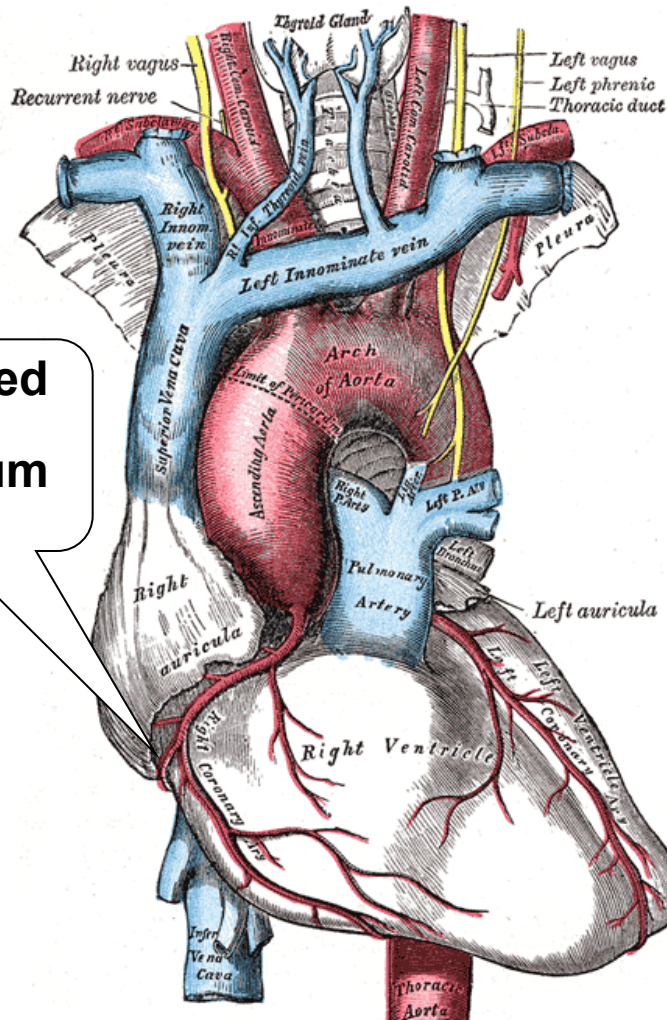
vena mediana cubiti



v. cava inferior

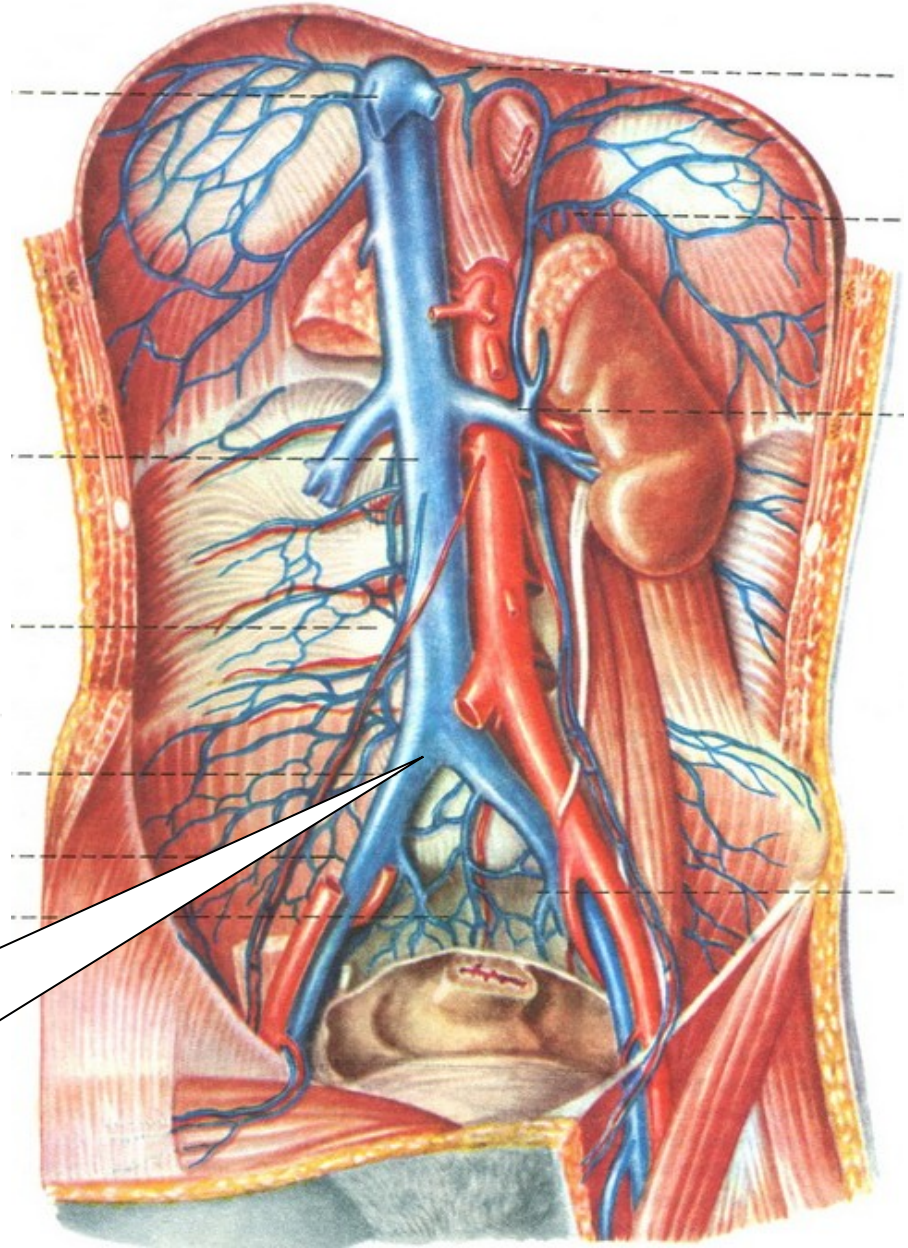


VENA CAVA INFERIOR



It is opened into the right atrium

Is created on the right side of L4 by *vena iliaca communis dextra et sinistra*



a) Parietal
tributaries

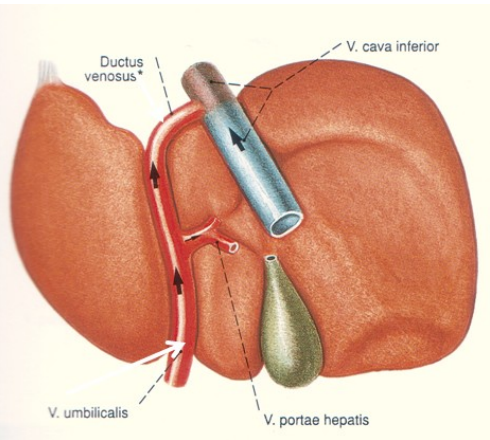
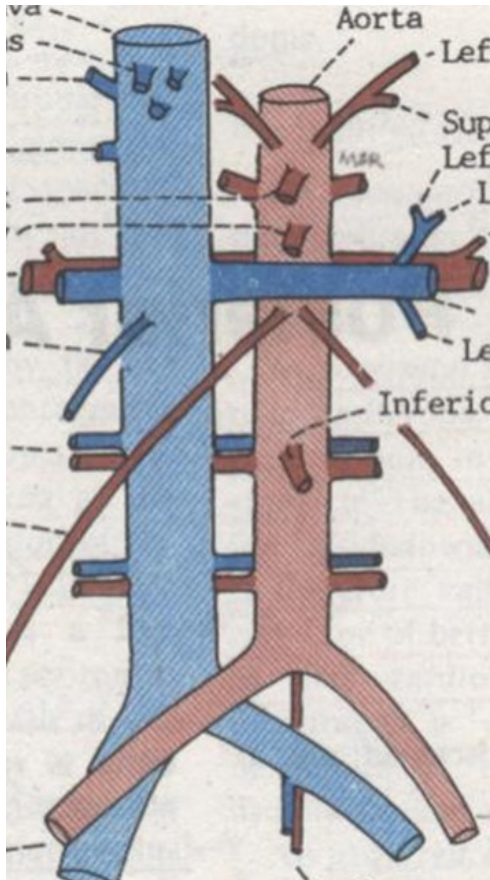
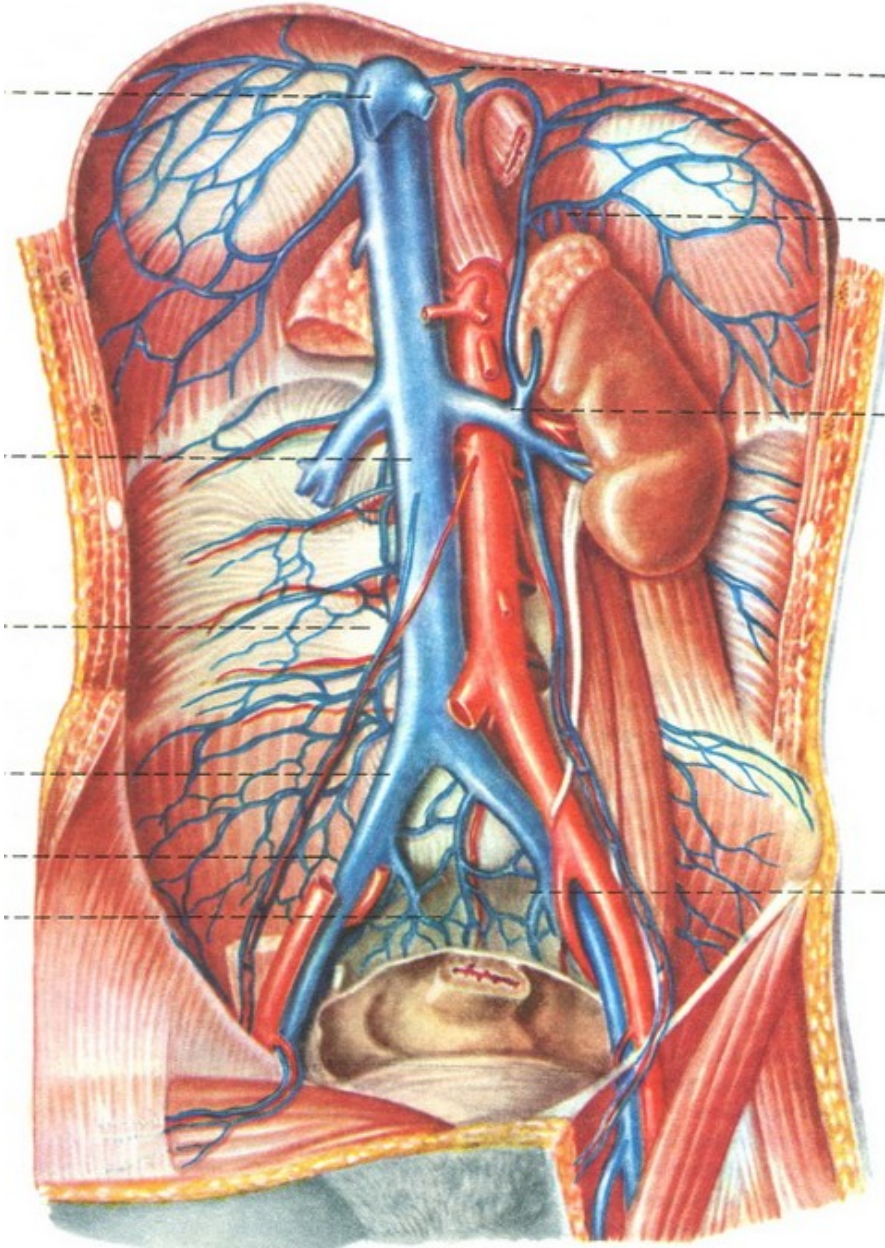
Venae iliacae
communes

From the
abdominal wall
From the
diaphragma

b) Visceral
tributaries

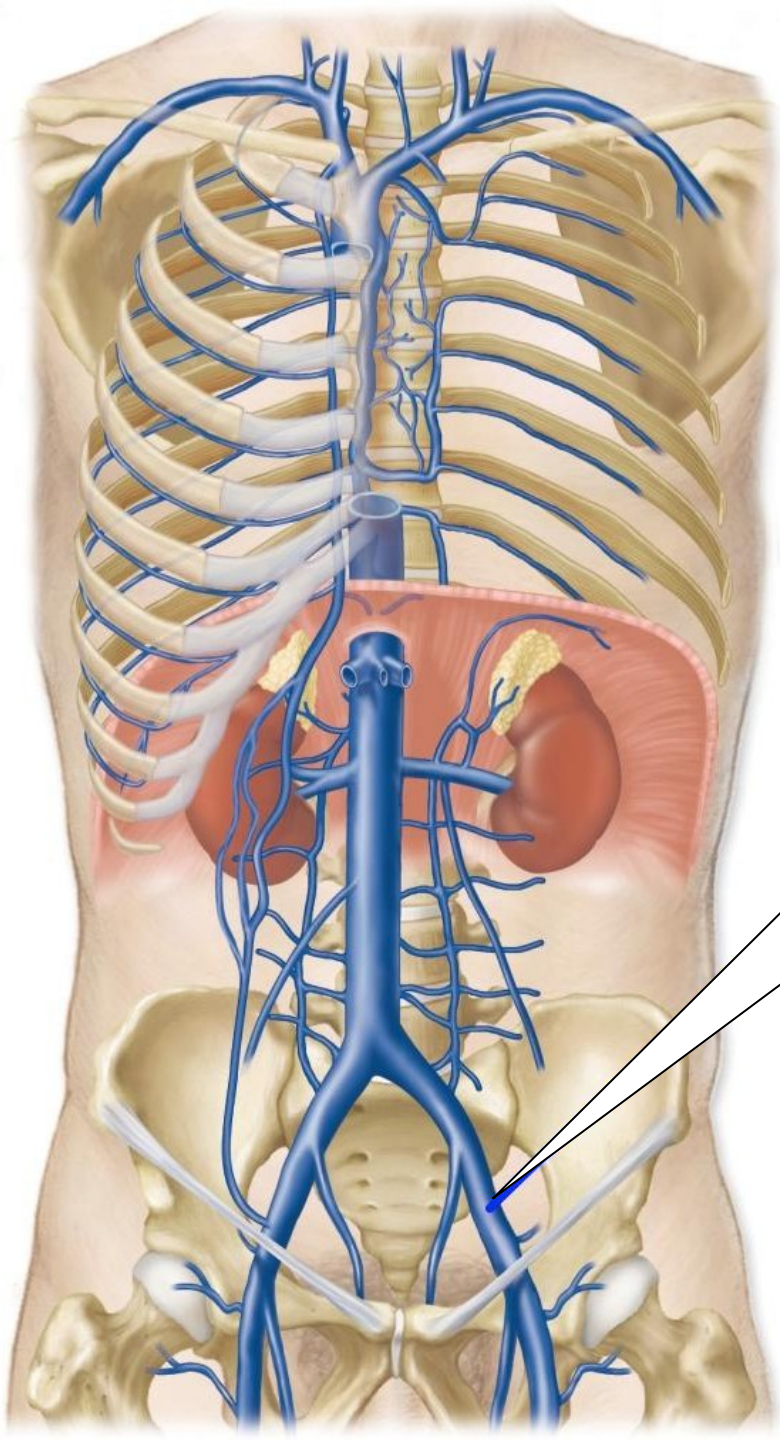
From
testes(ovaries)
From kidneys and
suprarenal glands

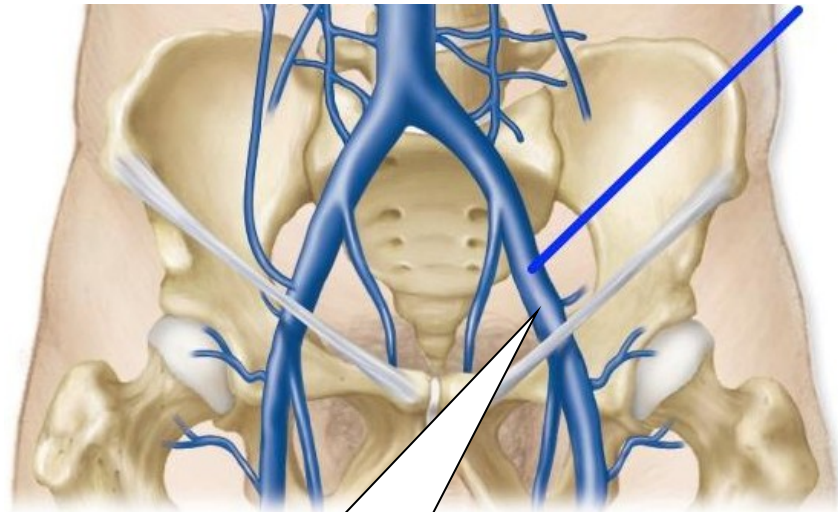
Venae hepaticae



VENAE ILIACAE COMMUNES SINISTRA ET DEXTRA

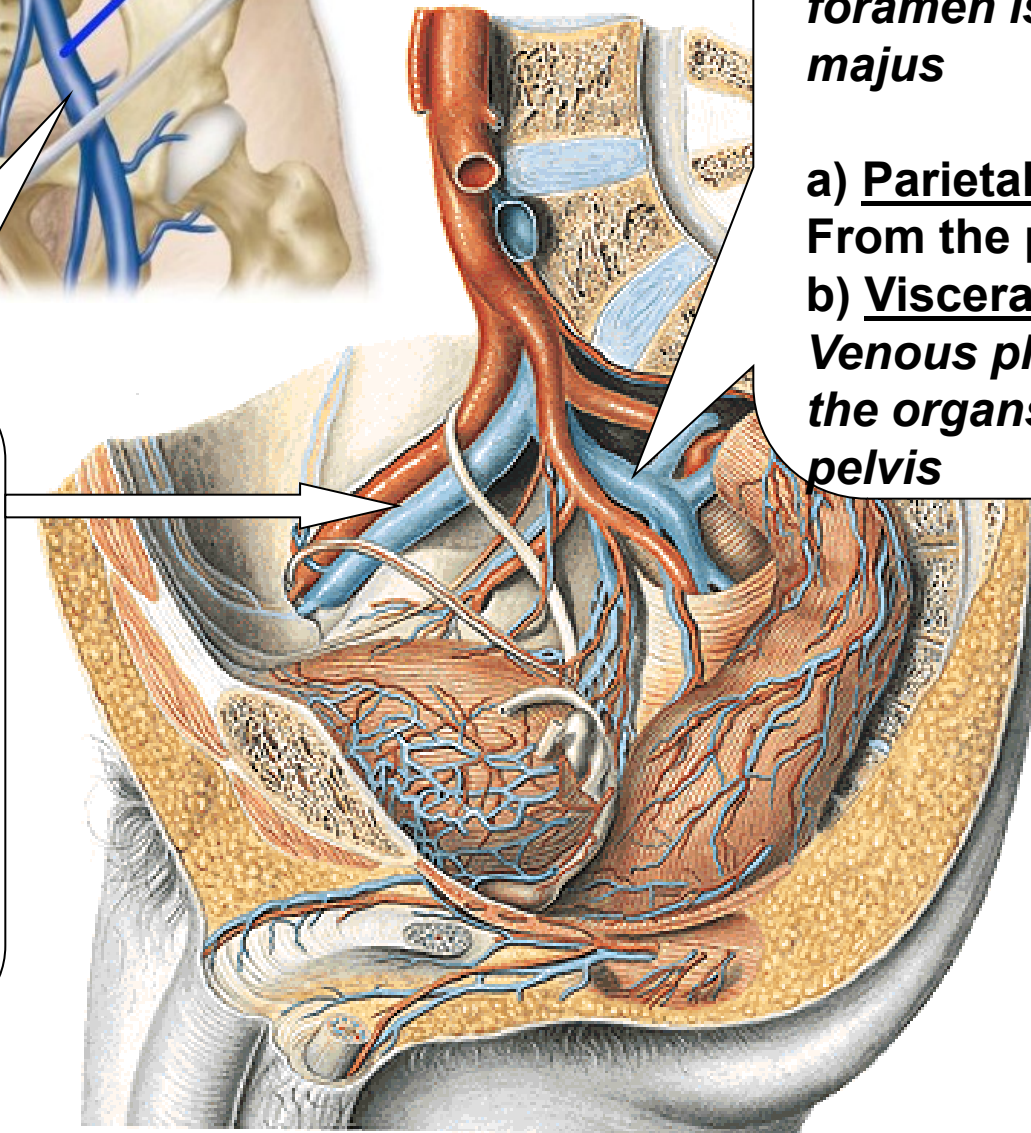
**Is created in front of the left
and right *articulatio*
sacroiliaca by confluence
vena iliaca interna and *vena*
*iliaca externa***





Vena iliaca externa

Is the continuation of ***vena femoralis***
Starts under the medial part of ***ligamentum inguinale*** in ***lacuna vasorum***



Vena iliaca interna

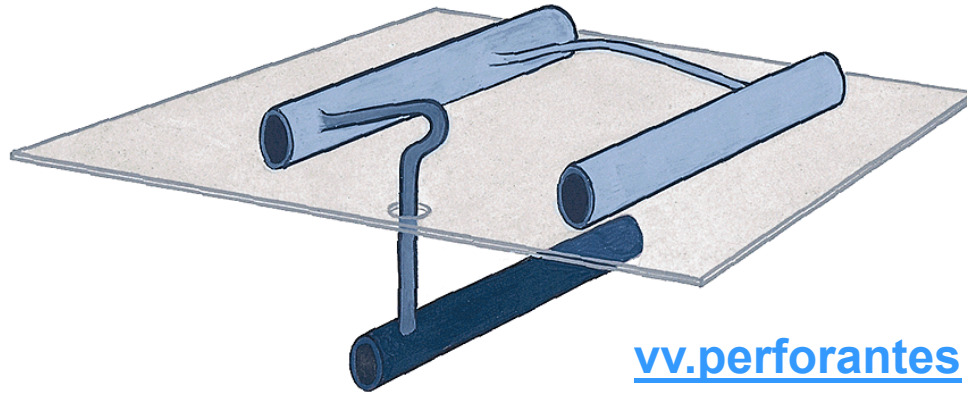
Is created from the venous plexuses of the lesser pelvis over ***foramen ischiadicum majus***

- a) **Parietal tributaries**
From the pelvic wall
- b) **Visceral tributaries**
Venous plexuses around the organs in the lesser pelvis

VENAE MEMBRI INFERIORIS

Two systems – deep and superficial veins

Both systems are connected through



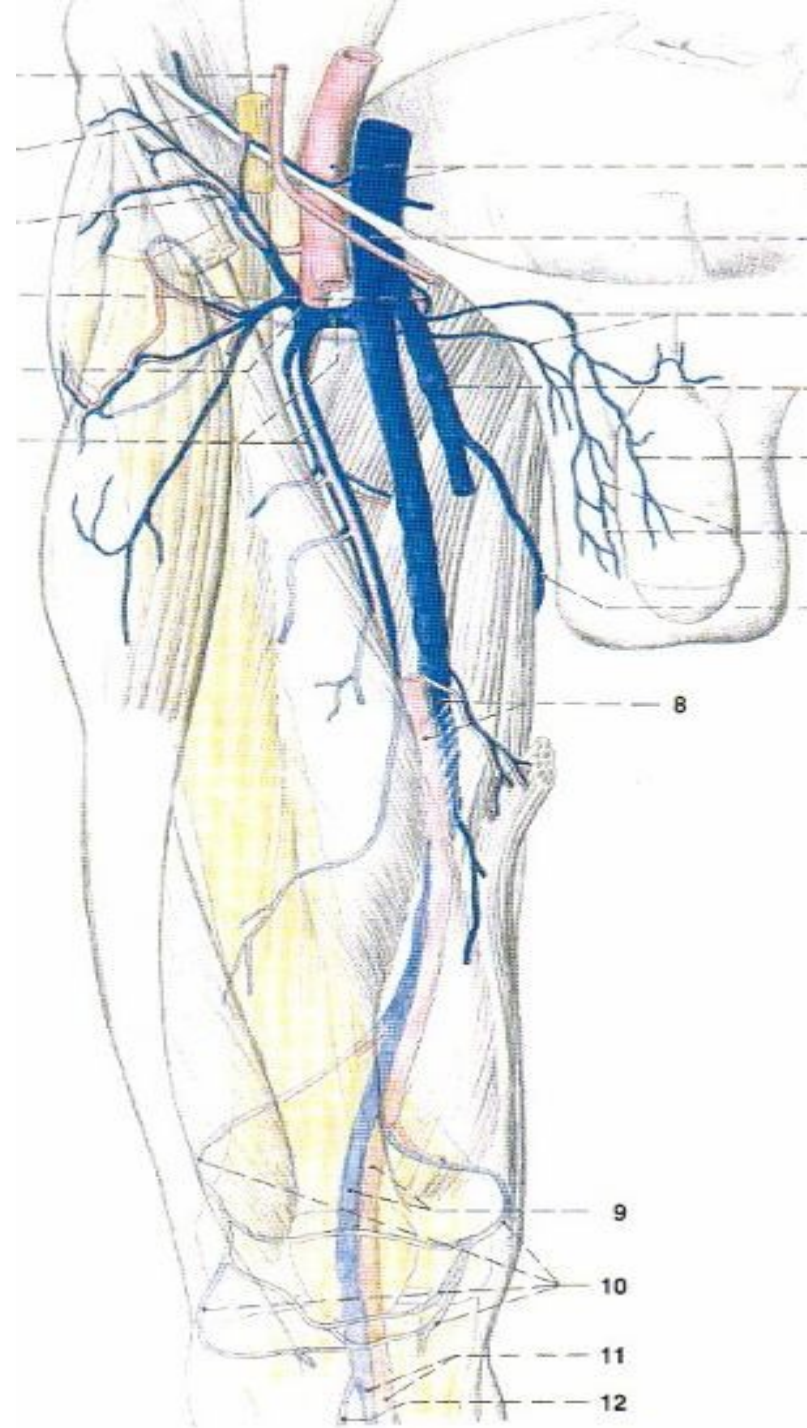
Deep veins

Accompany same named arteries,
Are paired.

The biggest one is *vena femoralis*

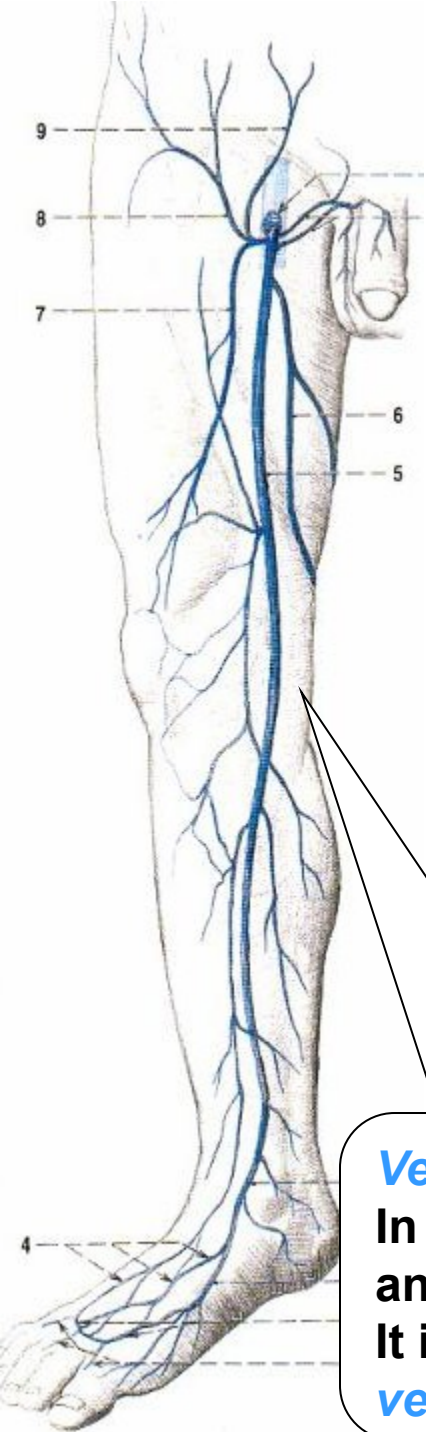
Its continuation in the pelvis is

vena iliaca externa



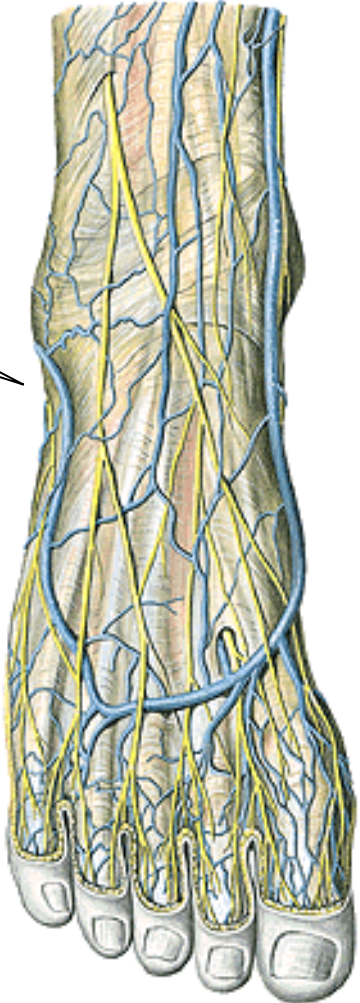
Varices



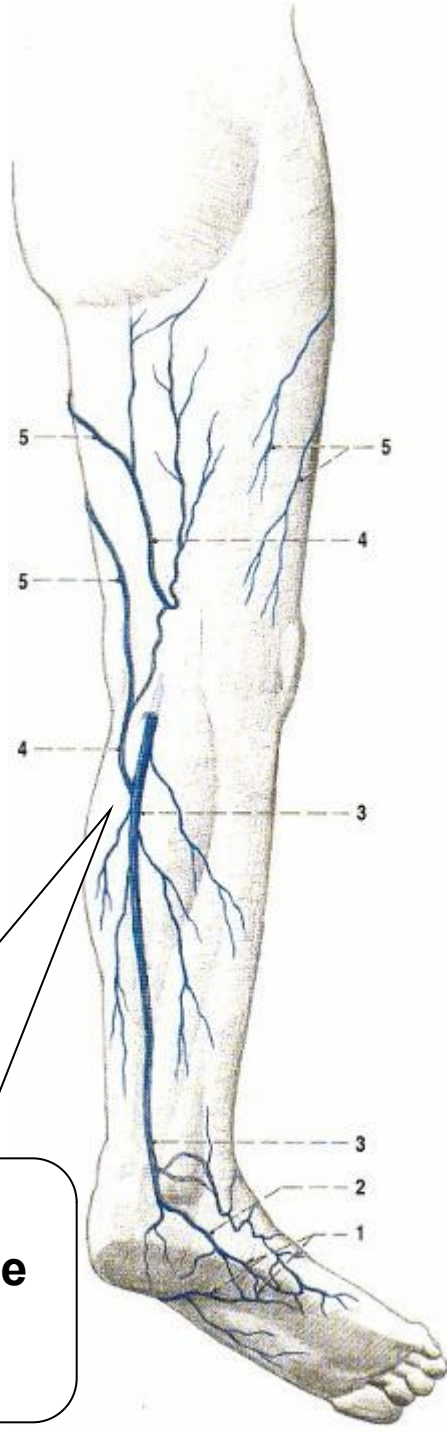


*rete venosum
plantare et
dorsale pedis*

Vena saphena magna
In front of the medial
ankle
It is the tributary of
vena femoralis



Vena saphena parva
Behind the lateral ankle
It is the tributary of
vena poplitea

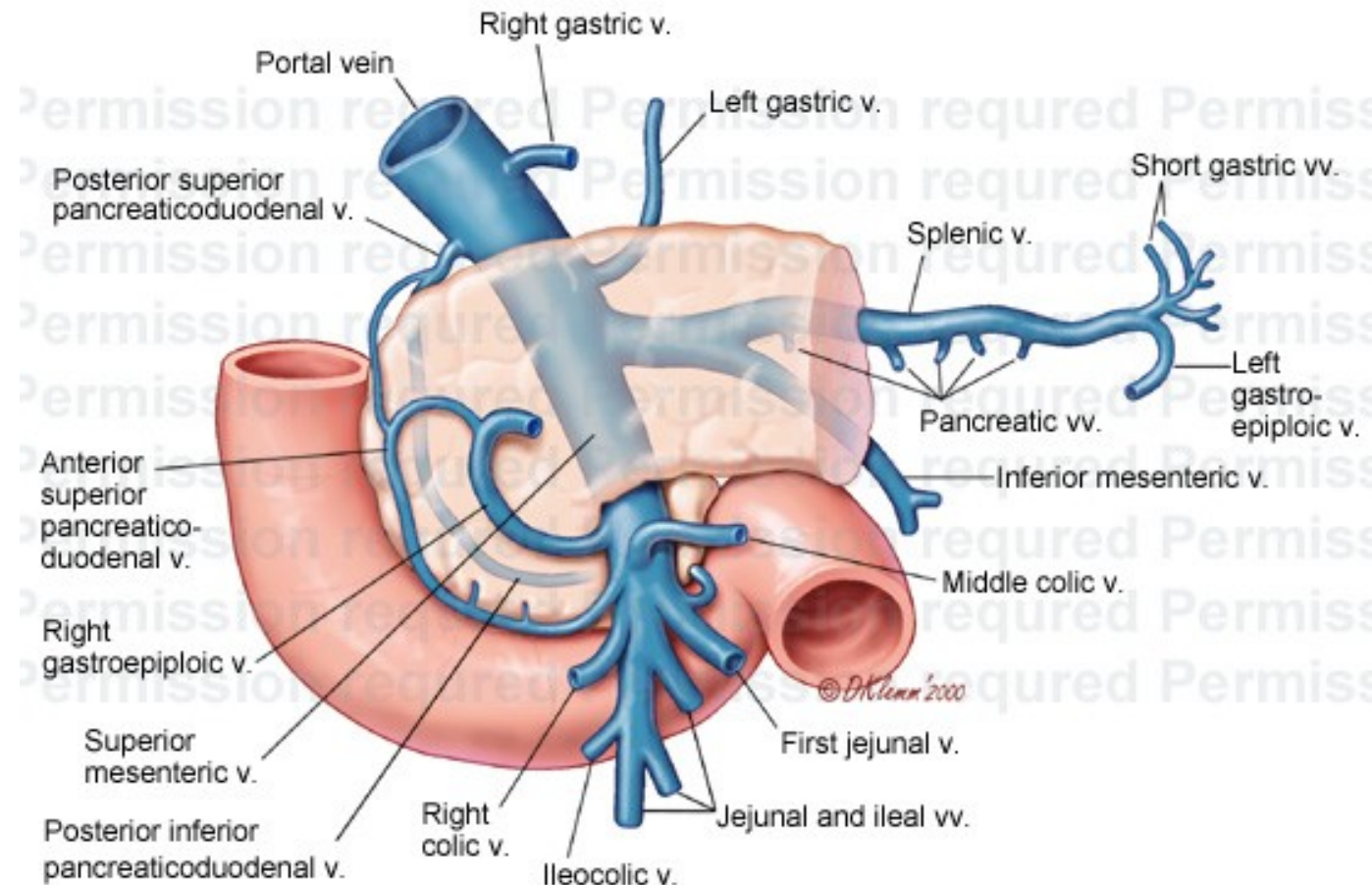


VENA PORTAE

Function portal circulation

Blood flows from the unpaired organs of the abdominal cavity into the liver

Confluence of *vena mesenterica superior* and *vena lienalis* behind caput pancreatis at the level of the body of L2



Tributaries:

a) main tributaries

Vena mesenterica superior

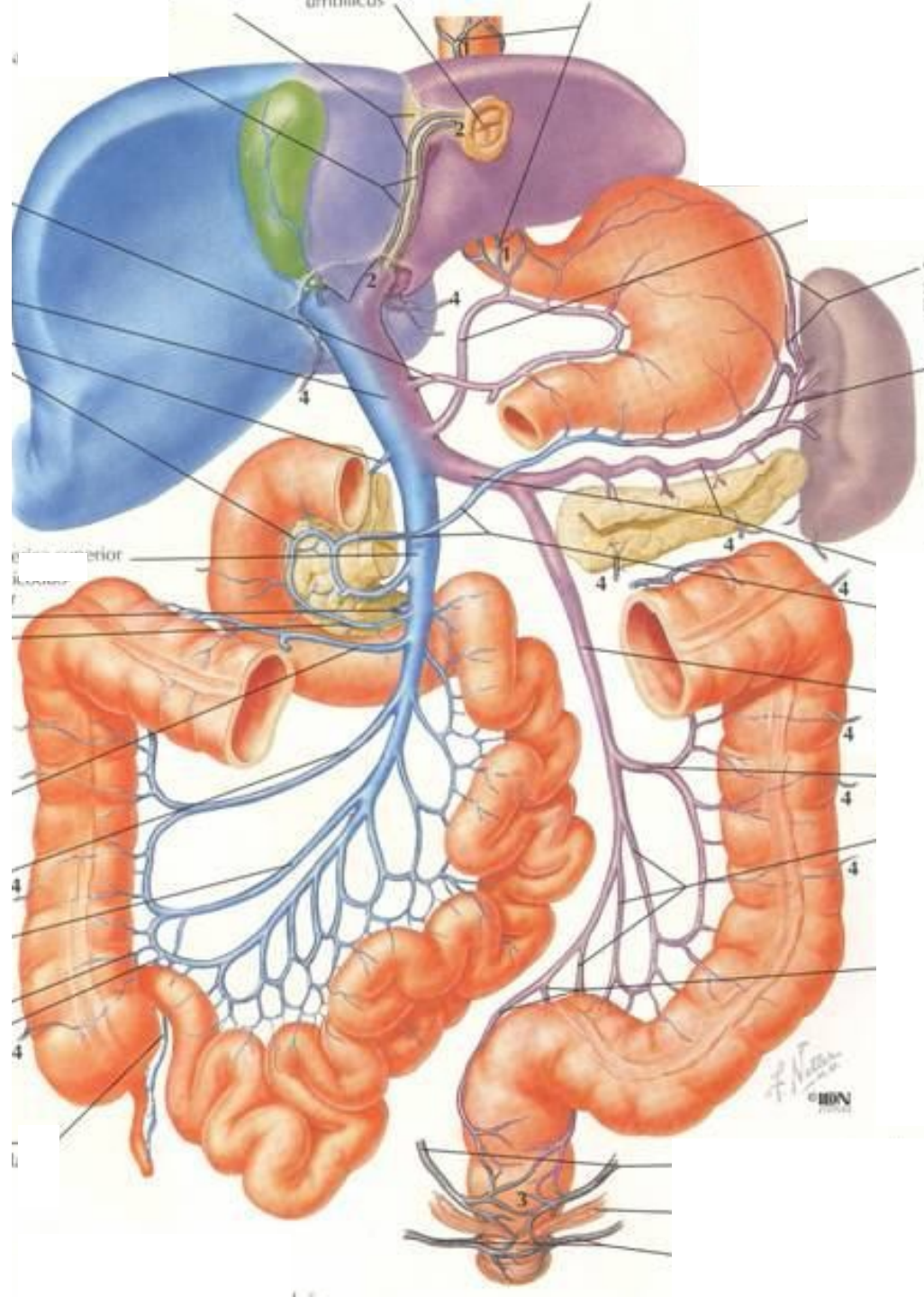
Vena lienalis

vena mesenterica inferior

b) Other tributaries

**From the gaster and
esophagus**

Venae paraumbilicales

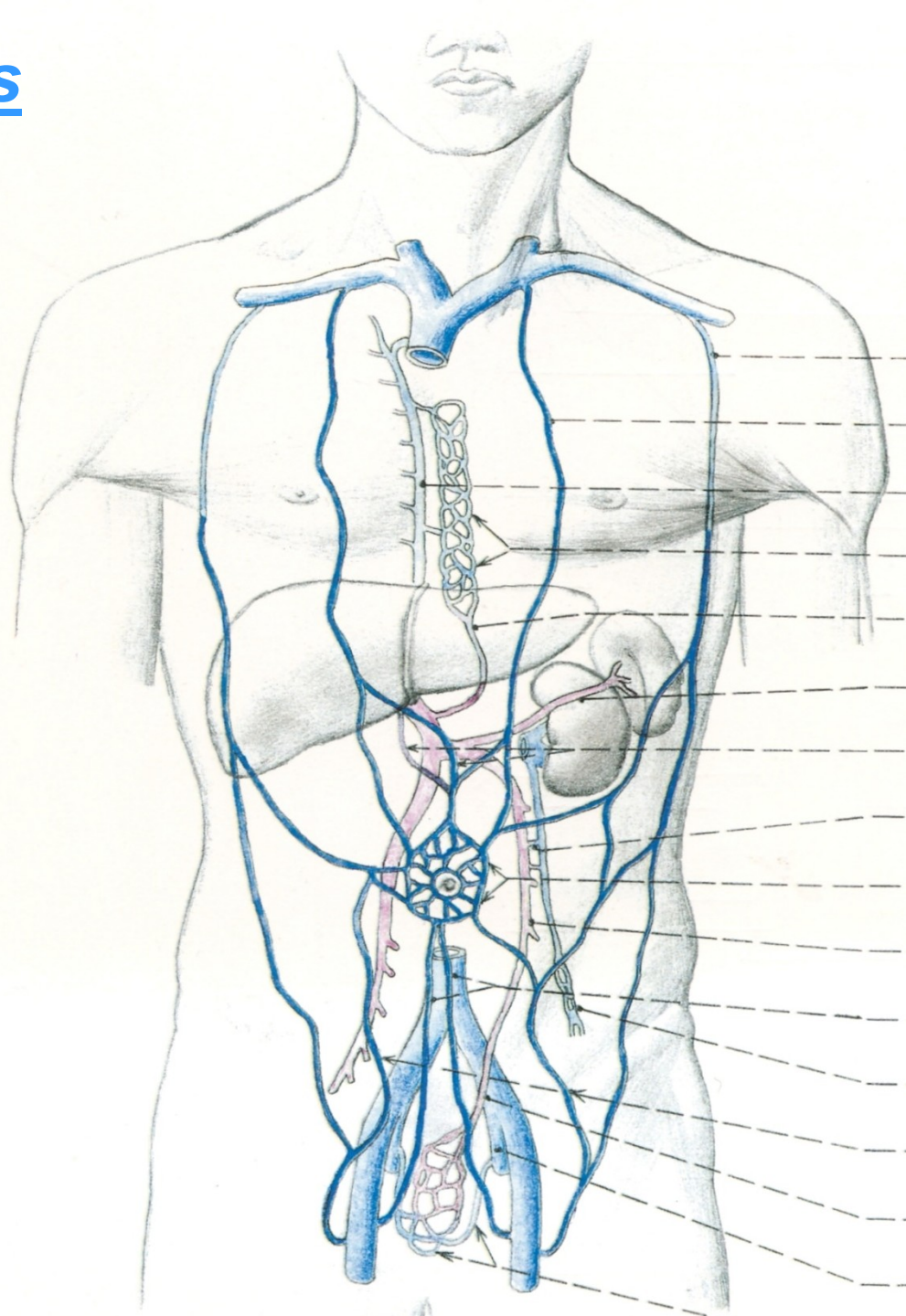


Portocaval anastomoses

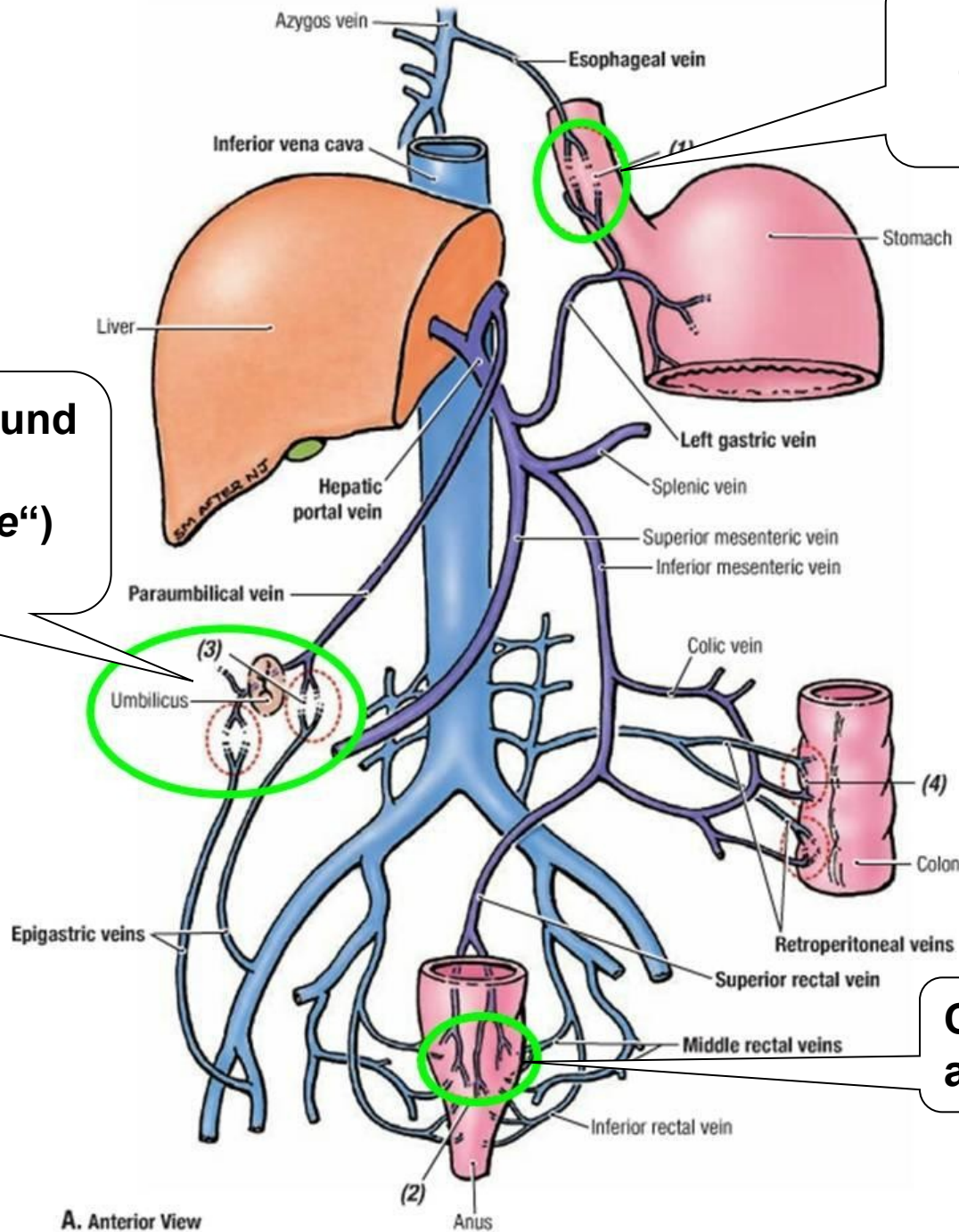
Small connections between *vena portae* and *venae cavae sup. et inf.*,

They are important during the pathological states when is the higher blood pressure in the *vena*

portae , they are wider and serve for blood flow from *vena portae* into caval veins



**Between the
esophagus and
stomach**

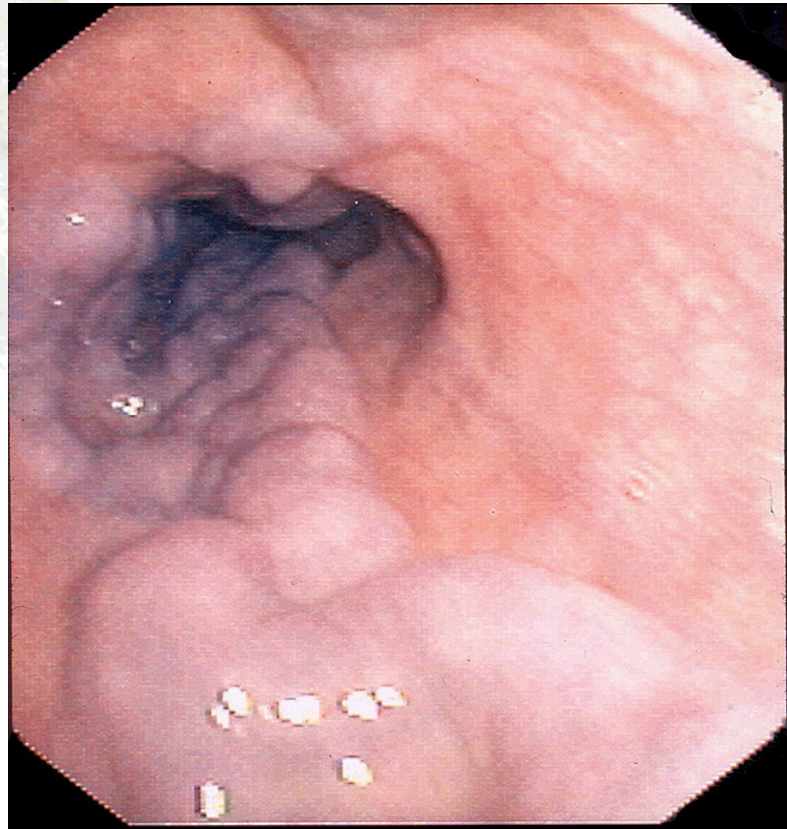
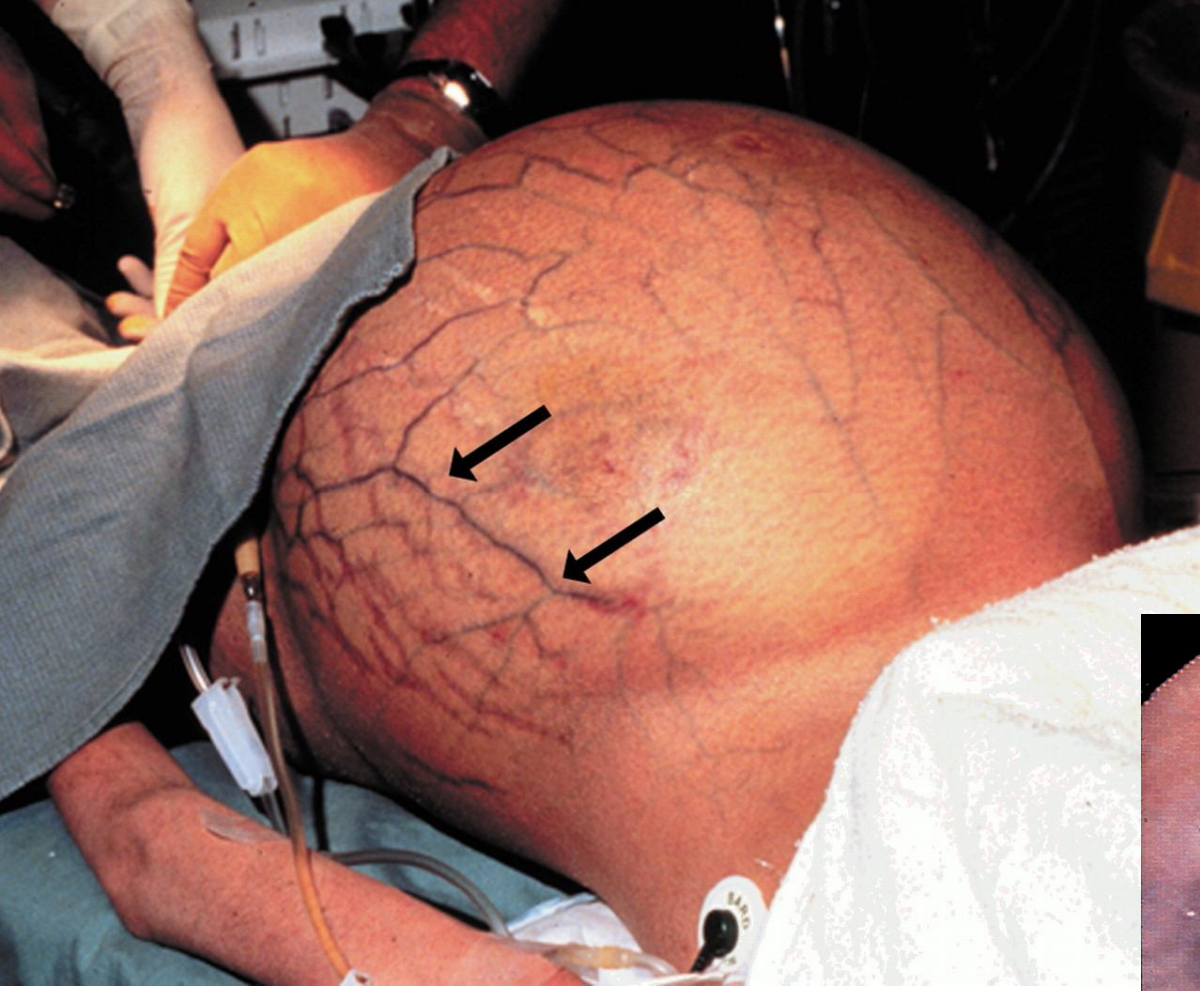


**Connections around
the umbilicus
(„caput Medusae“)**

**Connections
around rectum**

A. Anterior View

Anus



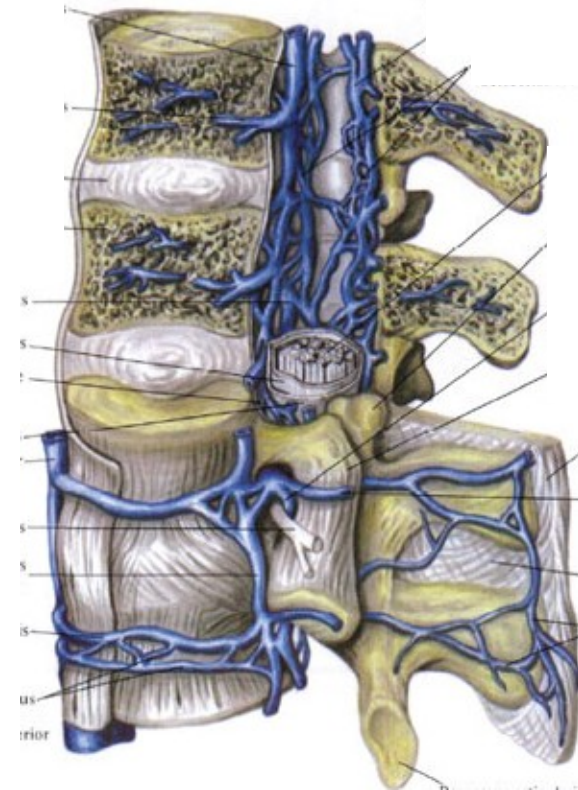
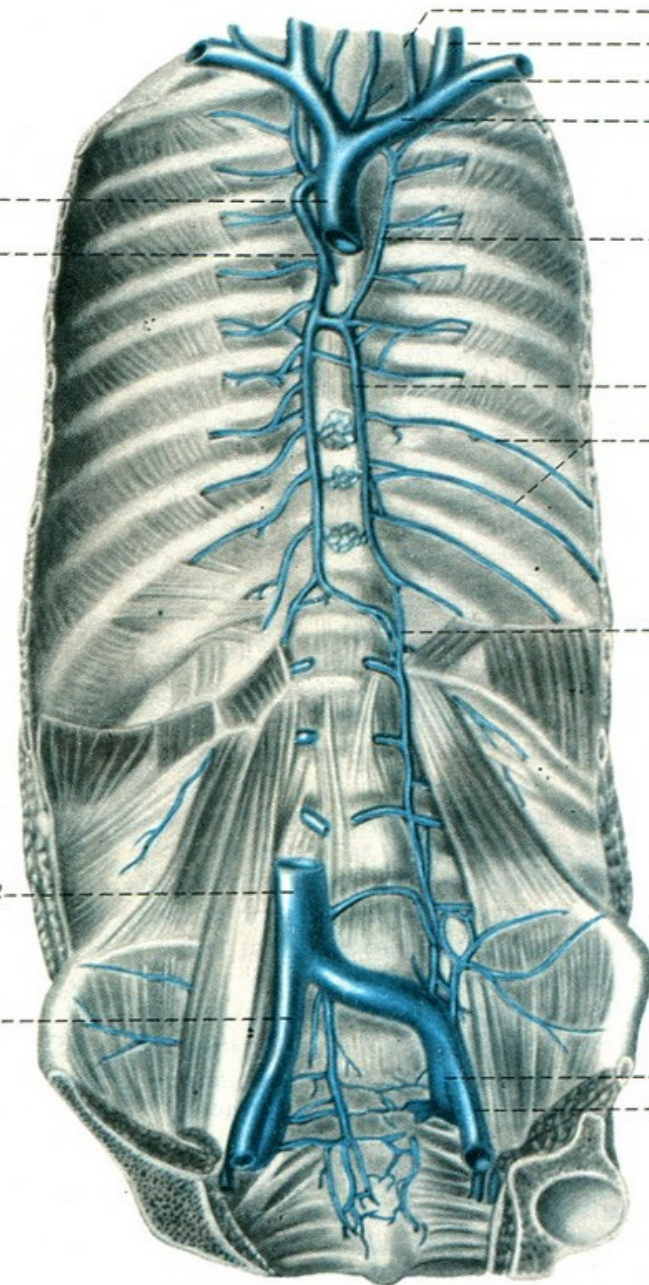
<https://www.youtube.com/watch?v=24slqqkwOFg>

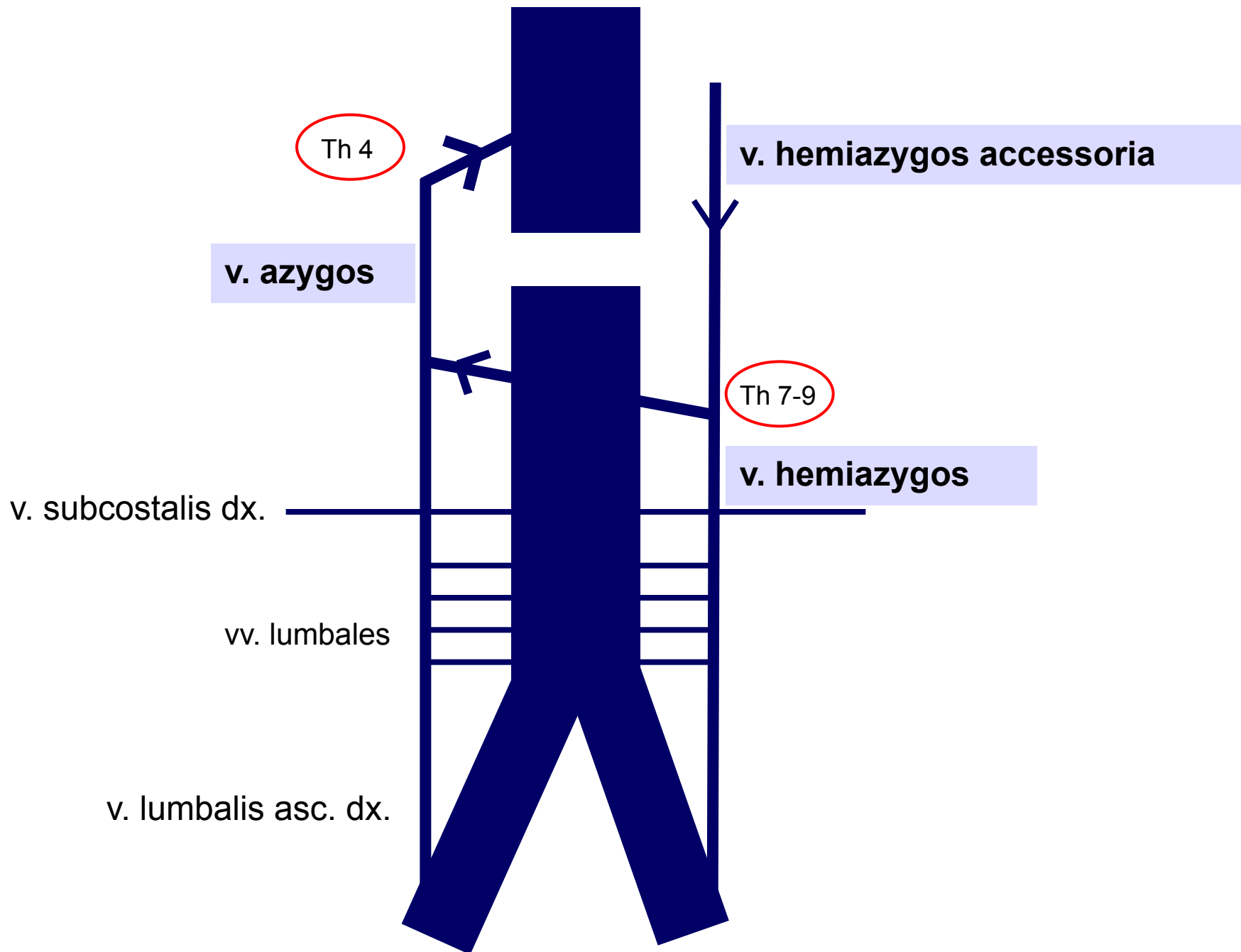
Cavocaval anastomoses

Vena cava superior and inferior are connected with the special venous systems, which are along the vertebral column. These veins receive the blood from the retroperitoneum, posterior abdominal wall, intercostal spaces, vertebral column and posterior mediastinum. They have imperfectly developed valves – blood can flow in both directions

1. *Vena azygos (vena hemiazygos)*
- into *vena cava superior*

2. *Plexus venosi vertebrales*





Fetal circulation

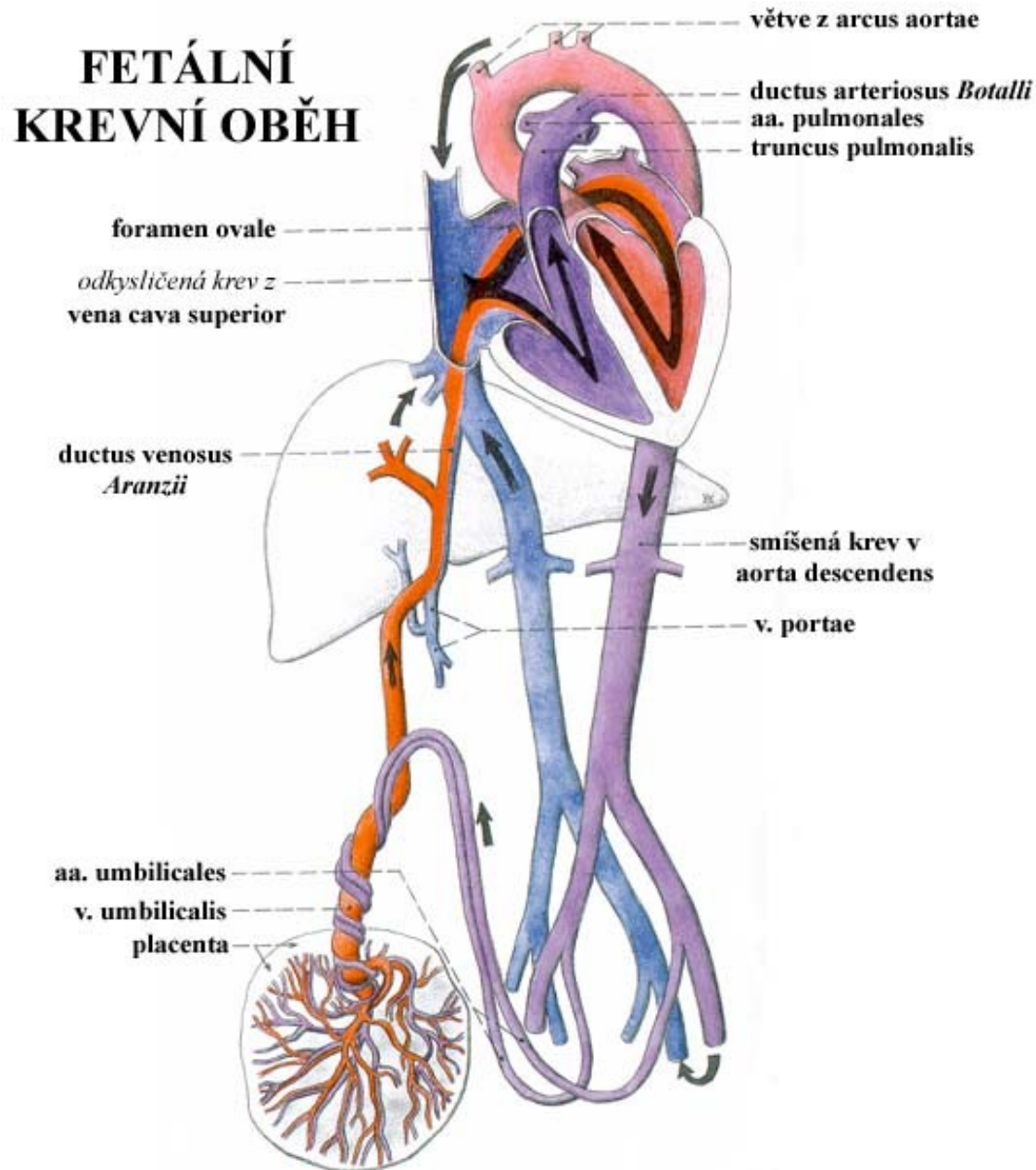
V.umbilicalis – its a tributary of **v.portae** and through **ductus venosus** of **v.cava inferior**

Aa.umbicales – branches of **a.illiaca interna**

Foramen ovale

Ductus arteriosus

Maternal blood and blood of the foetus do not mix!!!!



<https://www.youtube.com/watch?v=75fj1eoUZco>

Lymphatic system

lympha 1,5-2l/day

■ **lymphatic vessels (vasa lymphatica)**

capillaries (vasa lymphocapillaria)

Lymphatic net (rete lymphocapillare)

collector vessels (collectores lymphatici)

trunks (trunci lymphatici)

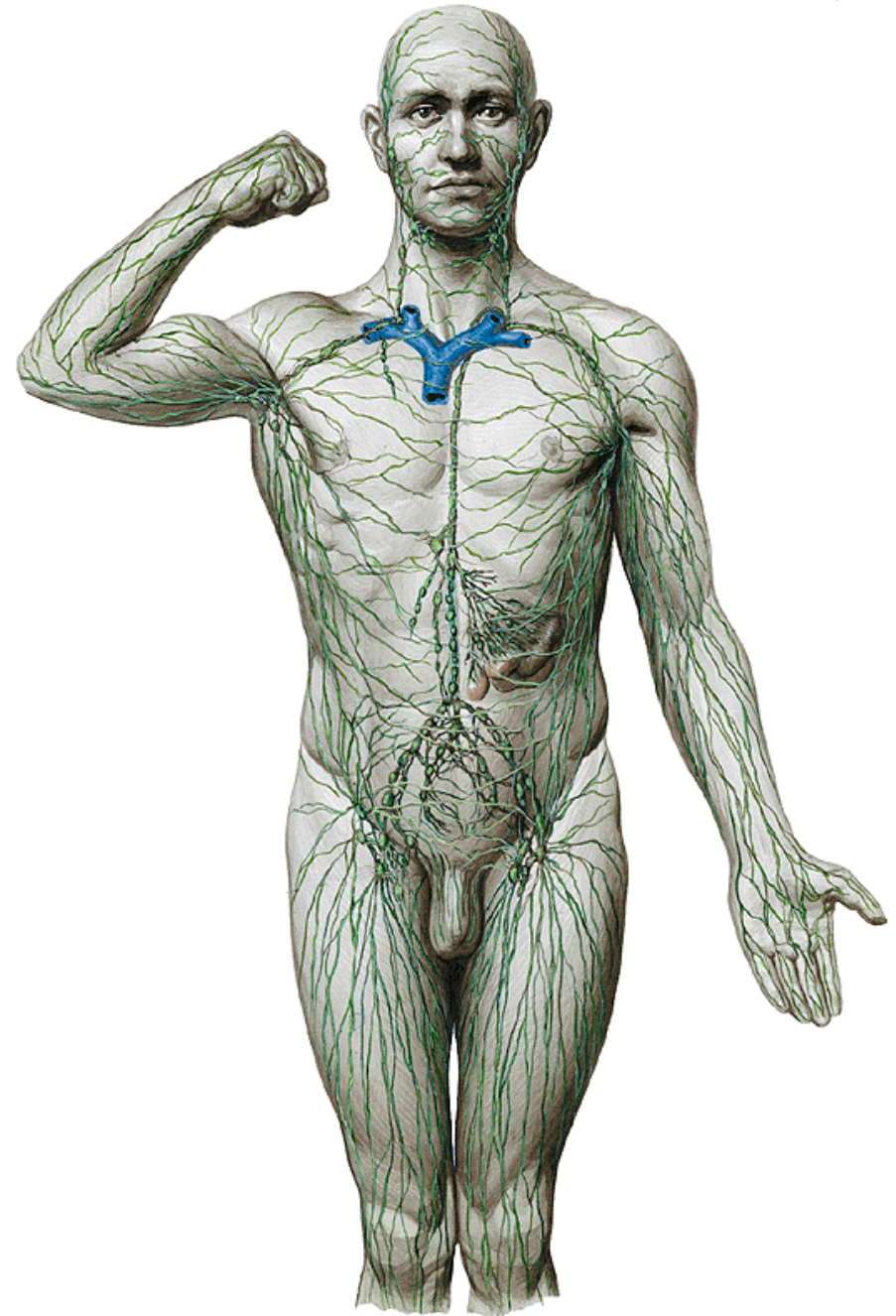
■ **lymphatic nodes (nodi lymphatici)**

■ **lymphatic organs**

tonsillae

lien

thymus



Lymphatic system

Starts on periphery

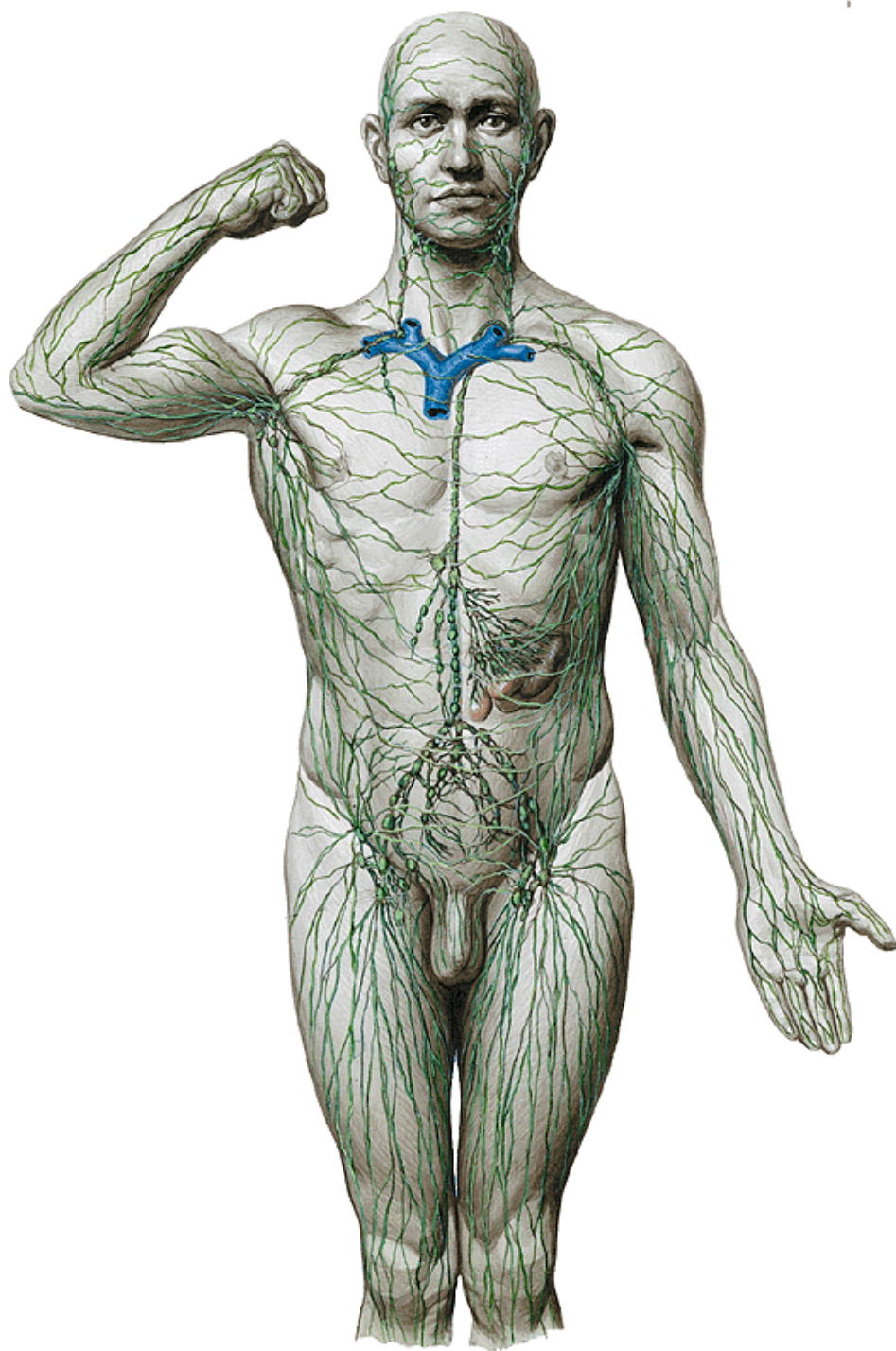
Directs only centripetally

**V organismu - okolo in the body -
450 lymphatic nodes**

**Serves for the transport of water
and metabolites from the tissues
back to the blood**

**System - superficial
- deep**

**Function – drainage-transport
- immunological**



Lymph vessels

Starts blindly on the periphery

Thinner wall than veins

More valves

Lymph nodes

Vasa lymphocapilaria

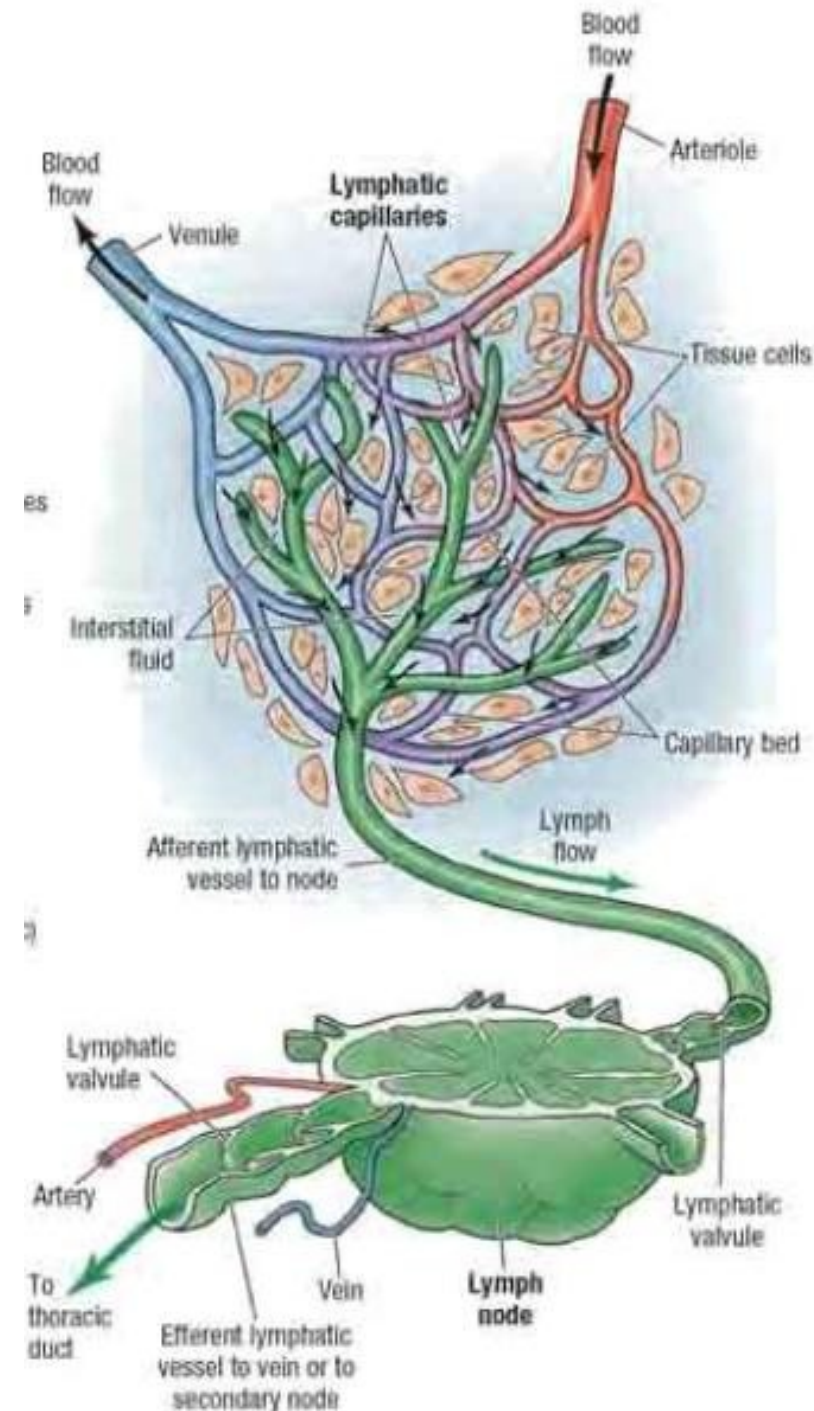
Rete lymphocapilare

Vasa lymphatica

Truncus lymphaticus

Tissues without lymphatic system:

Hair, nails, epidermis, cornea, corpus vitreum, lens, cartilages, nerve tissue, bone marrow



nodi lymphatici

hilus

cortex

medulla

Convex part- „afferent“

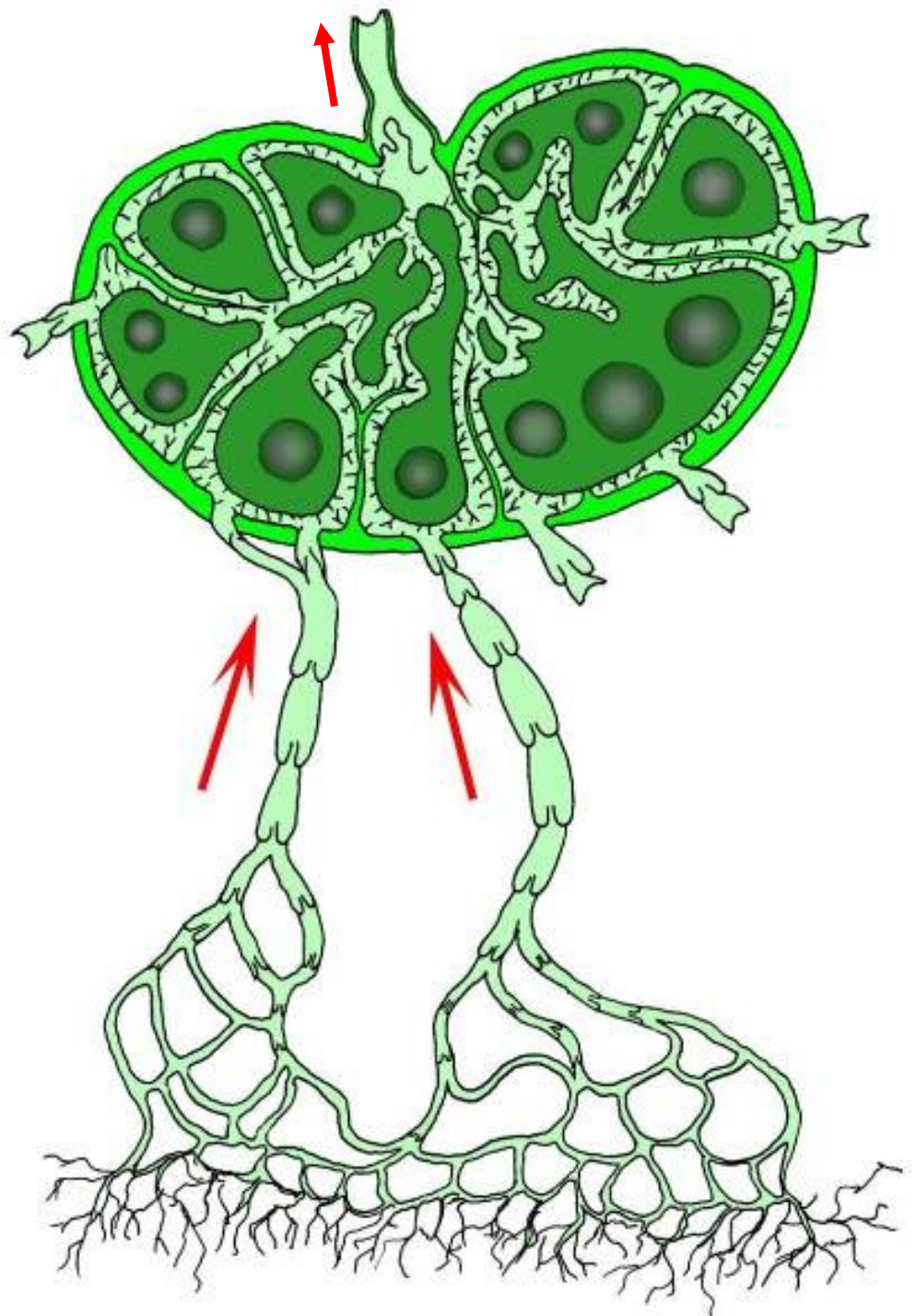
– *vasa afferentia*

Concave hilus- „eferent“

– *vas efferens*

inflammation – swelling with
pain

tumor – swelling without pain



- a) production of lymphocytes,**
- b) filtration of lymph,**
- c) through production of T and B lymphocytes nodes protect body**





When the lymph can't flow is created

lymphedema

Elefantiasis

2 ducts:

(irregular division of the body)

ductus thoracicus

pars abdominalis

pars thoracica

pars cervicalis

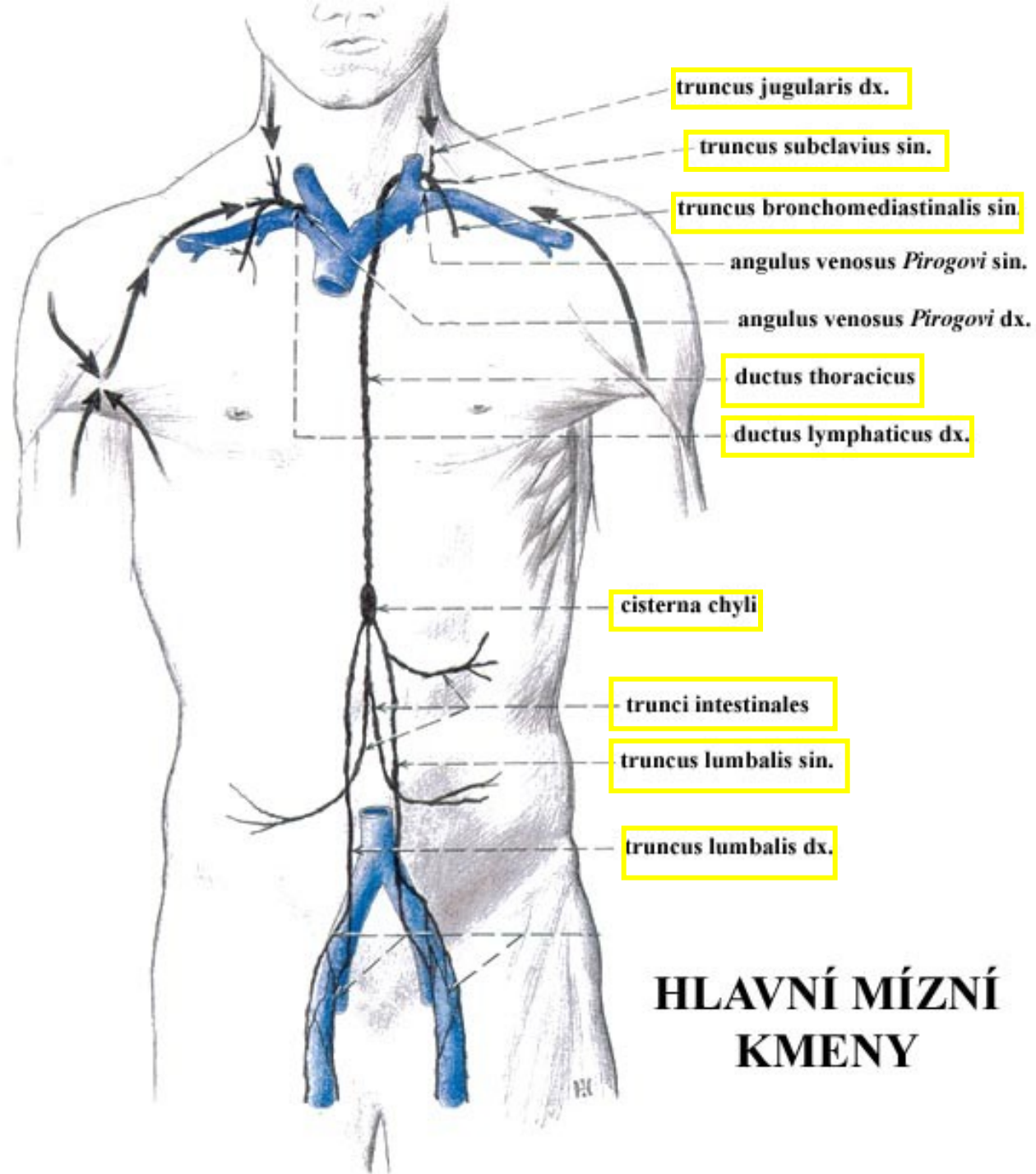
(*sinister*)

$\frac{3}{4}$ of the body

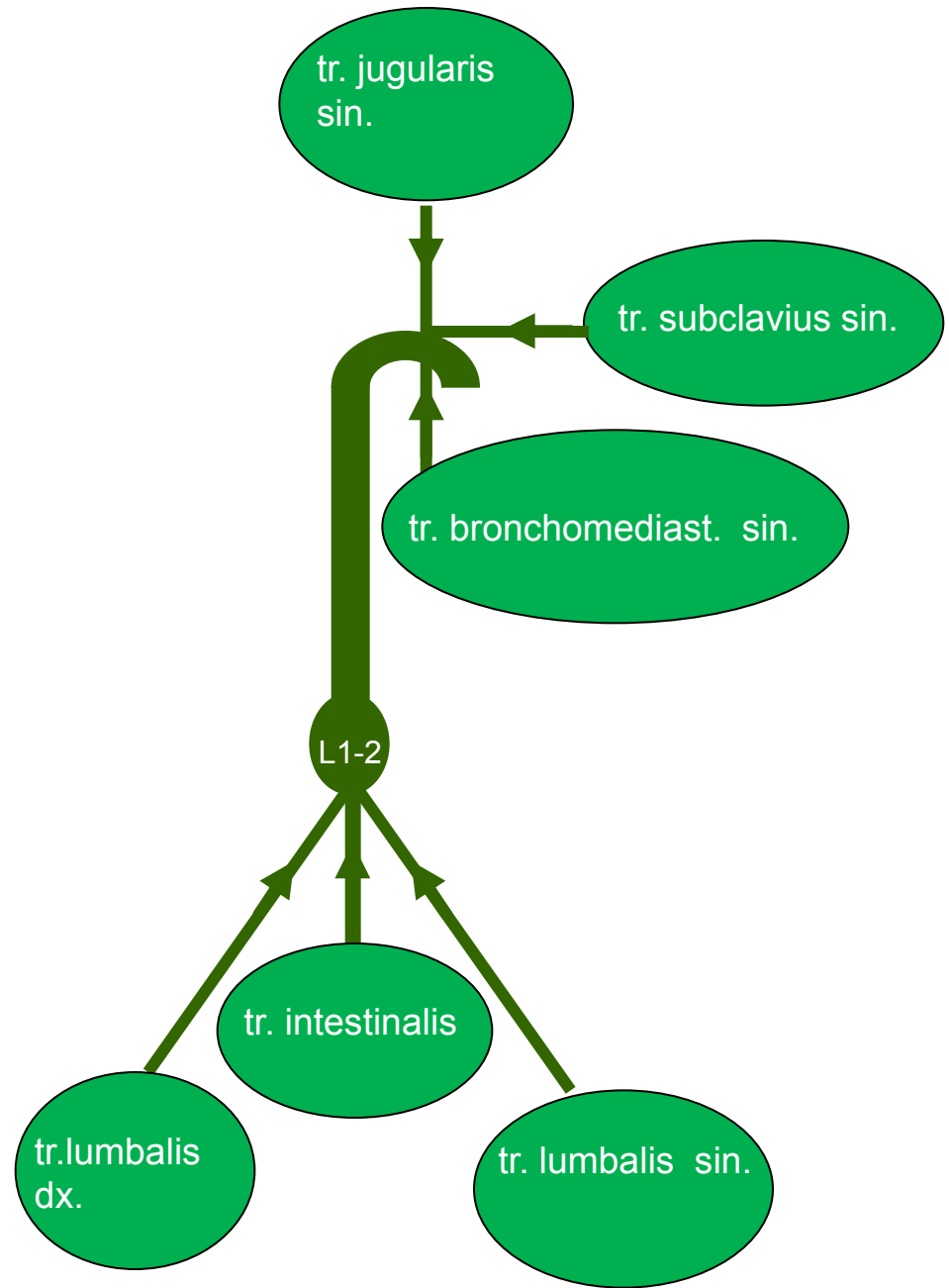
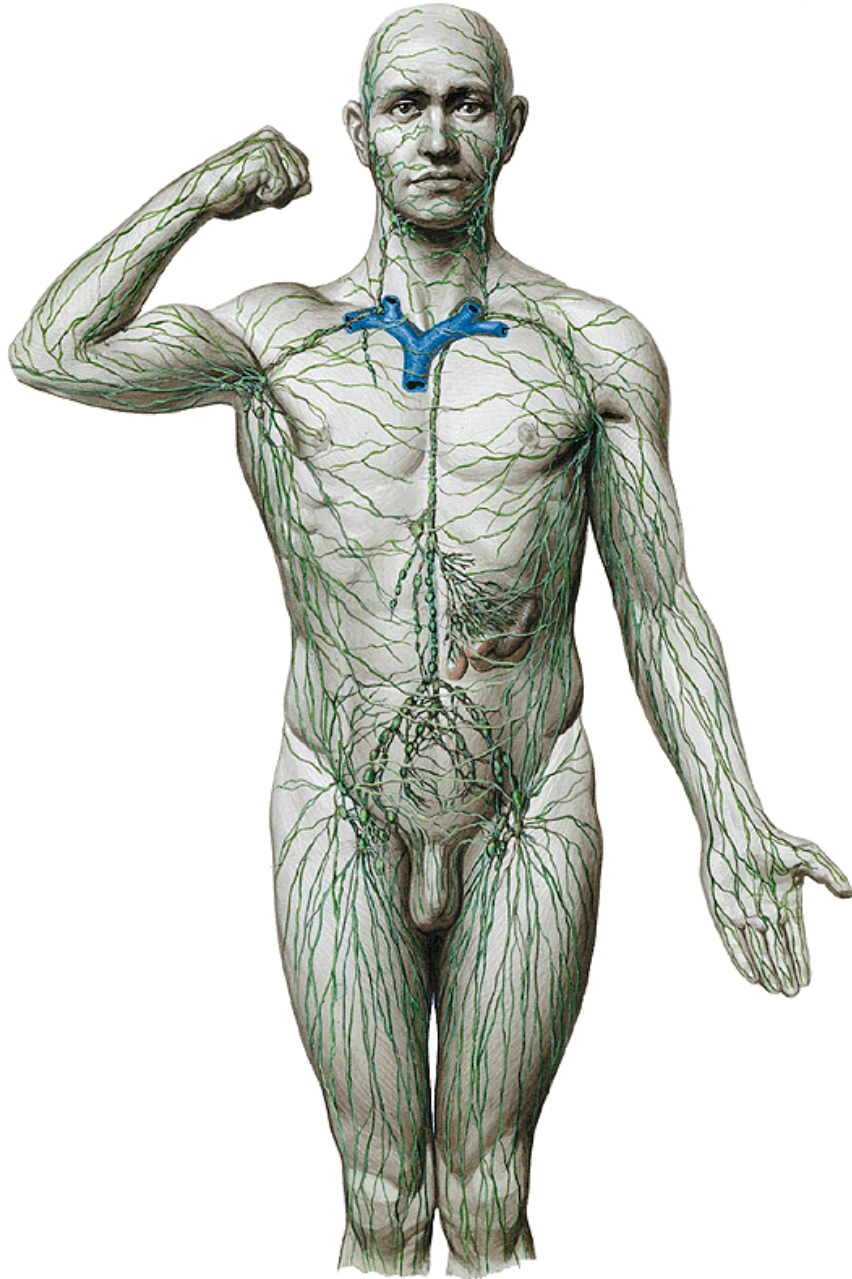
ductus lymphaticus dx.

$\frac{1}{4}$ of the body

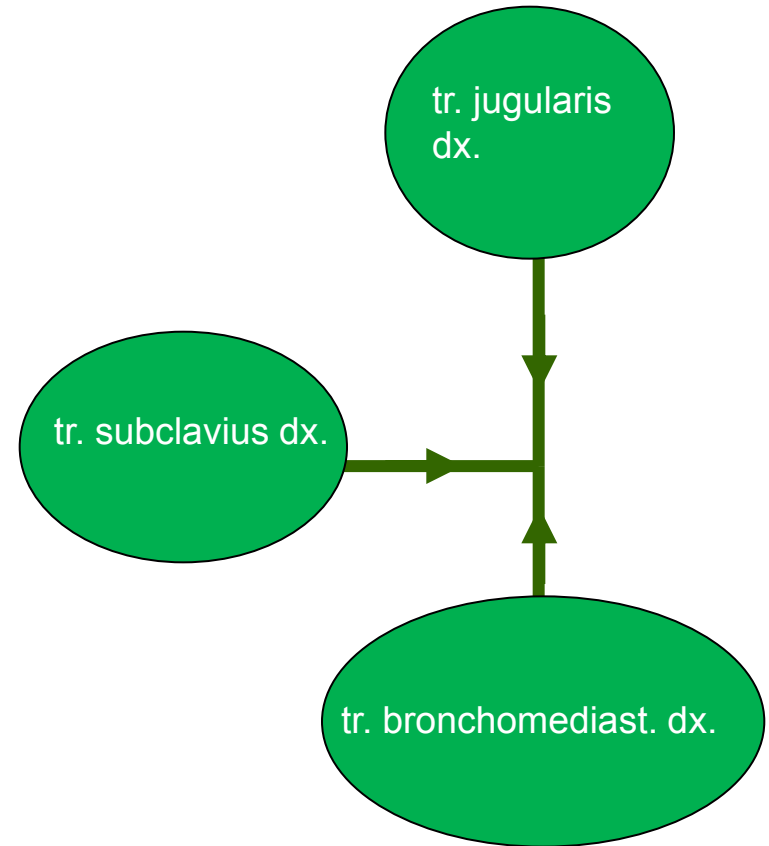
cisterna chyli



ductus thoracicus

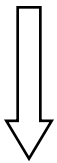


ductus lymphaticus dx.

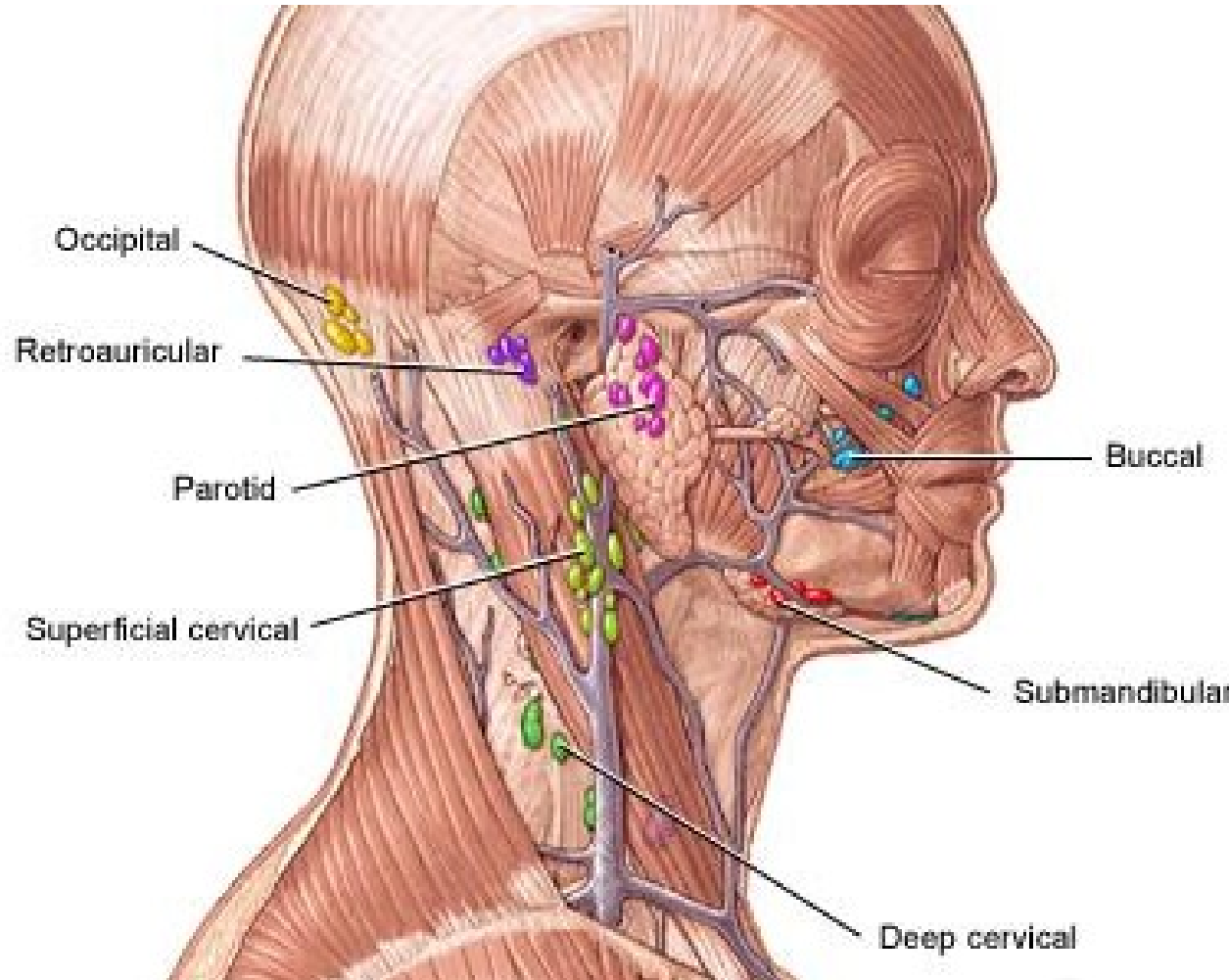


Lymphatic nodes of the head

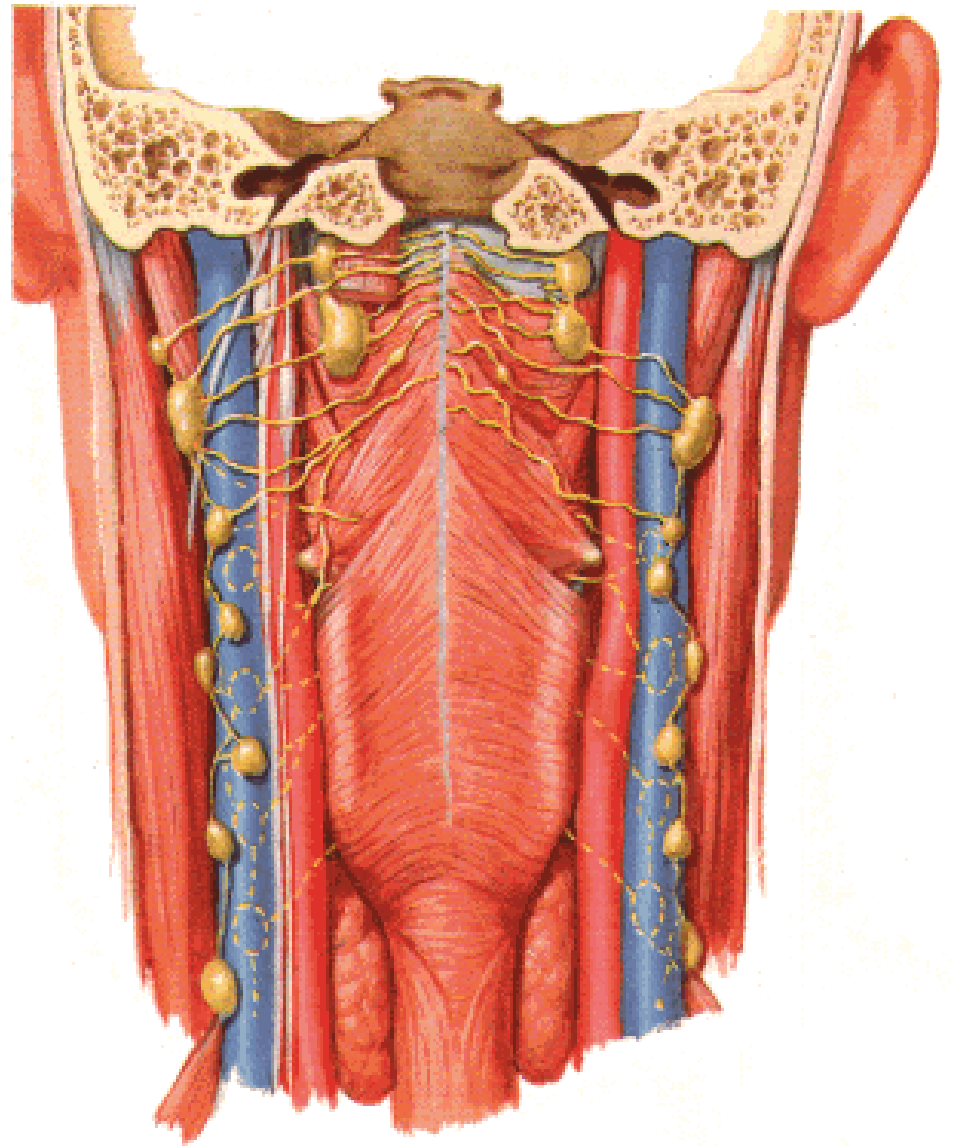
- **N. l. parotidei**
- **N.l. retroauriculares**
- **N.l. occipitales**
- **N.l. submandibulares**
- **N.l. submentales**



**N.l. cervicales profundi
et superficiales**



nodi lymphatici retropharyngei



Lymphatic nodes of the neck

- n.l. cervicales
 - anteriores
 - laterales:

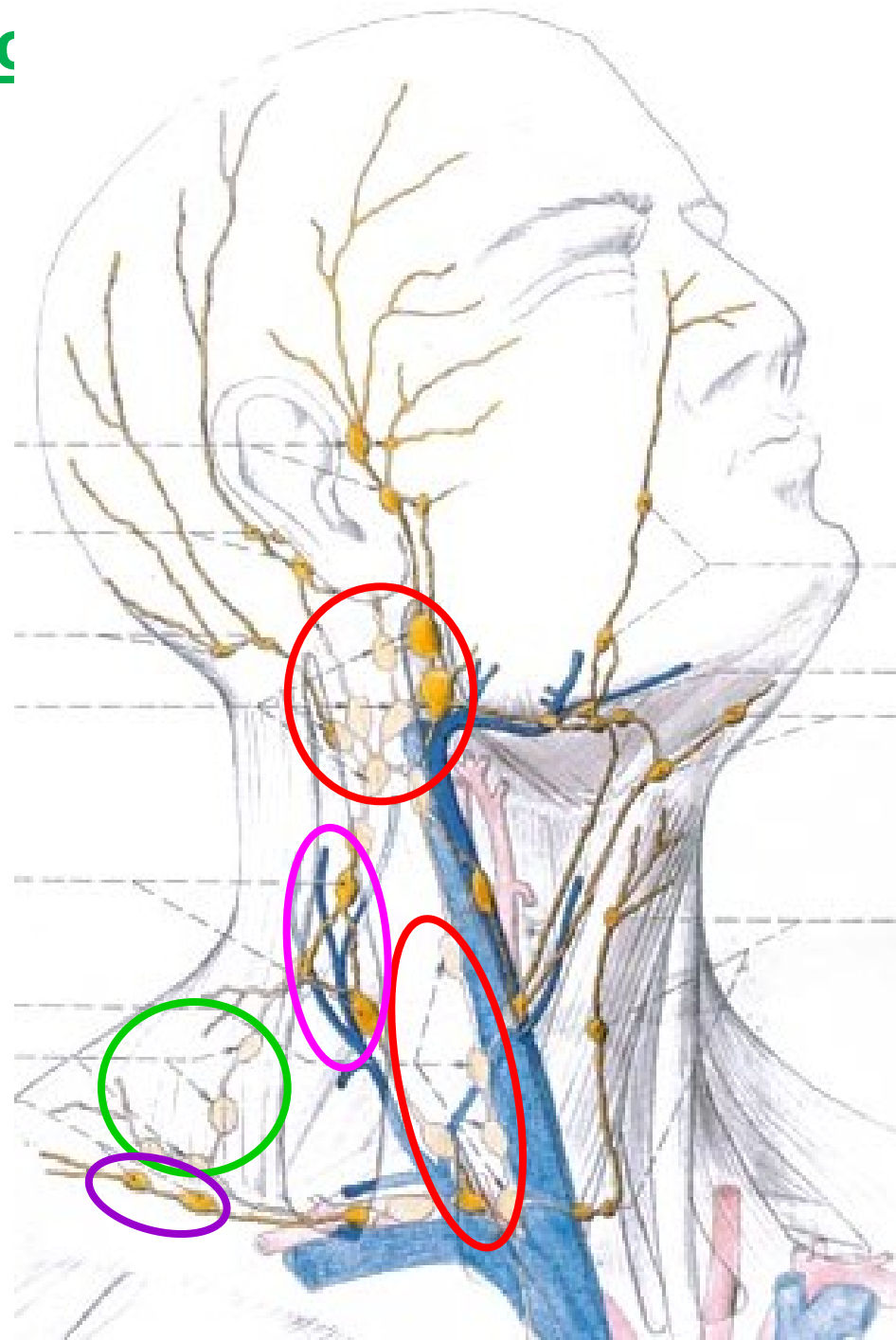
n.l.cervicales superficiales

- along v.jugularis externa

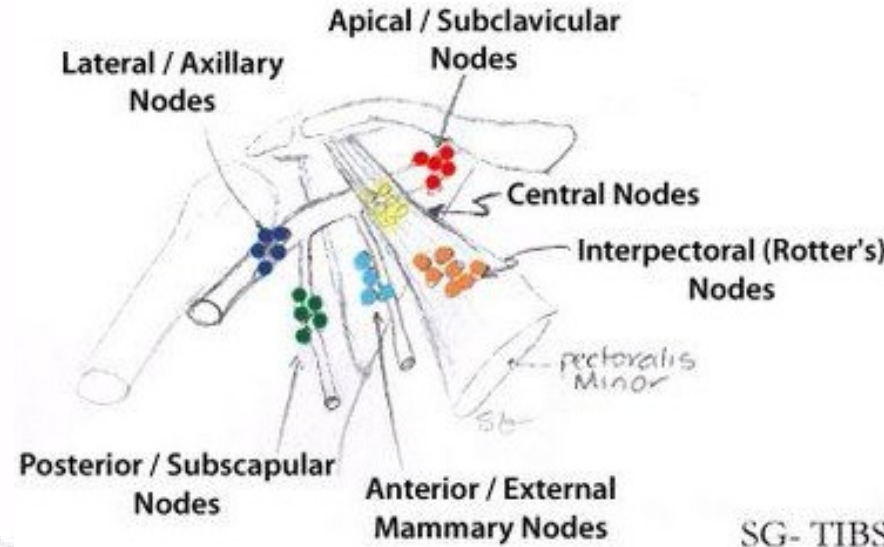
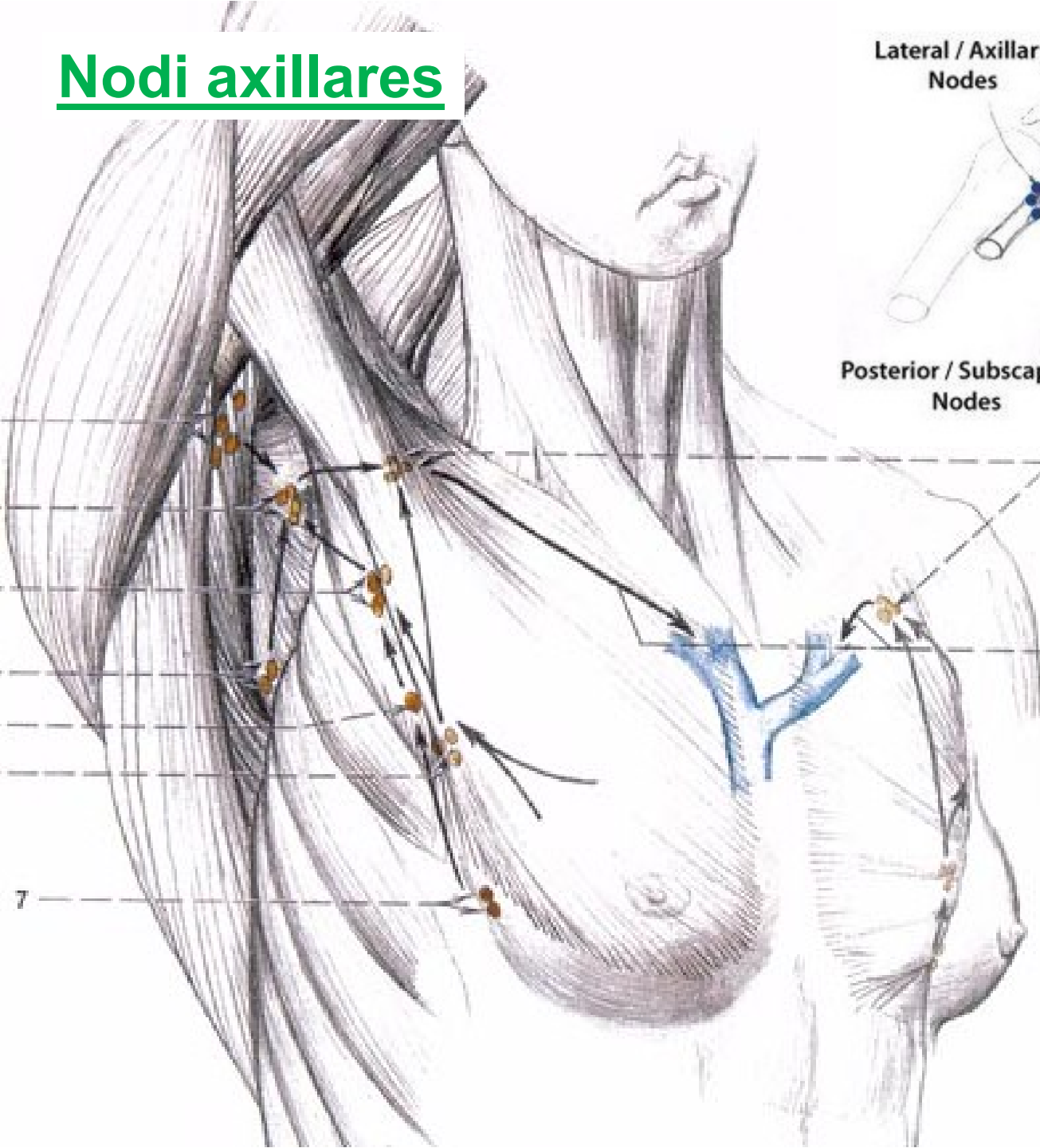


n.l.cervicales profundi

- along v. jugularis int.
(Woodova uzlina)
- along n. accessorius
- Along a.transversa colli
(supraclavicular)



Nodi axillares



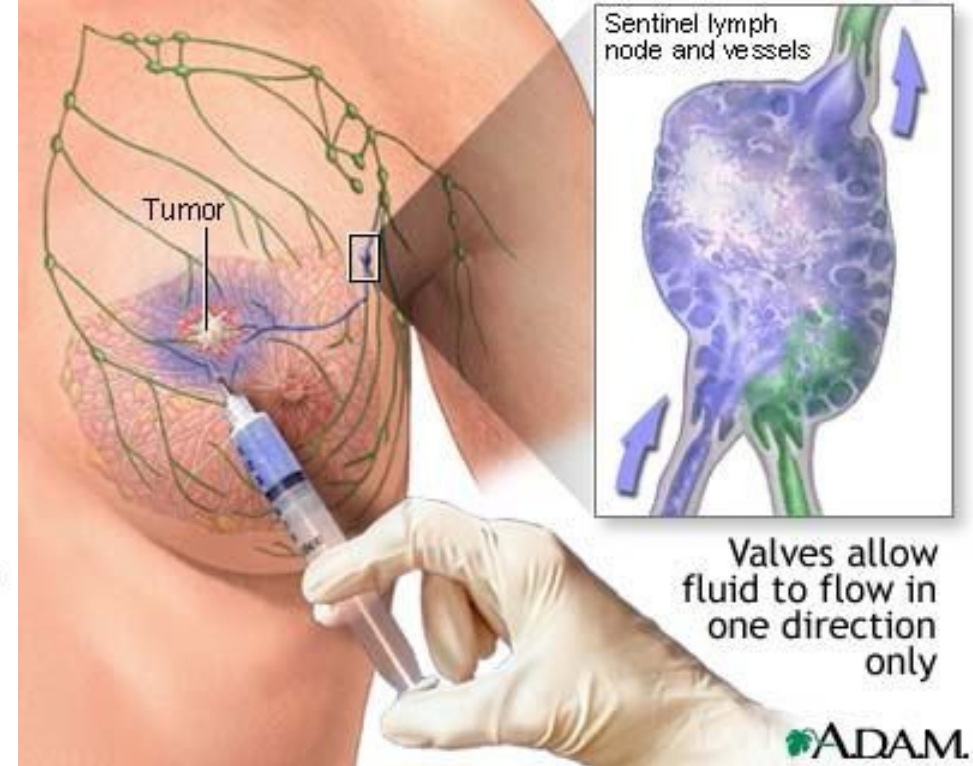
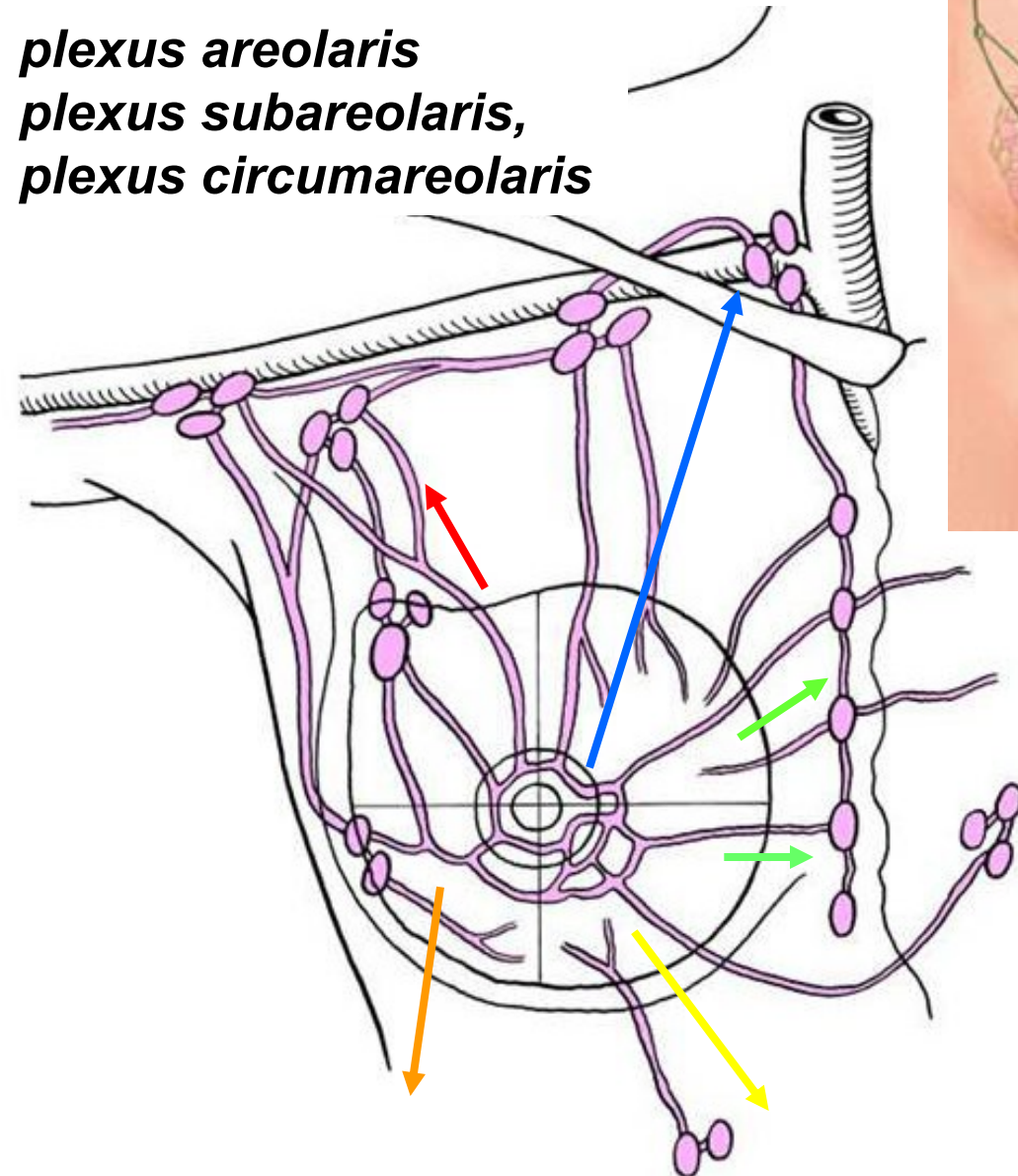
SG- TIBS

40 nodes
6 groups

- nodi lymphatici**
- centrales**
- laterales**
- subscapulares**
- pectorales (Sorgius)**
- interpectorales**
- apicales**
(infraclaviculares)

Mammary lymphatic drainage

plexus areolaris
plexus subareolaris,
plexus circumareolaris



Several directions:

nodi lymph. axillares

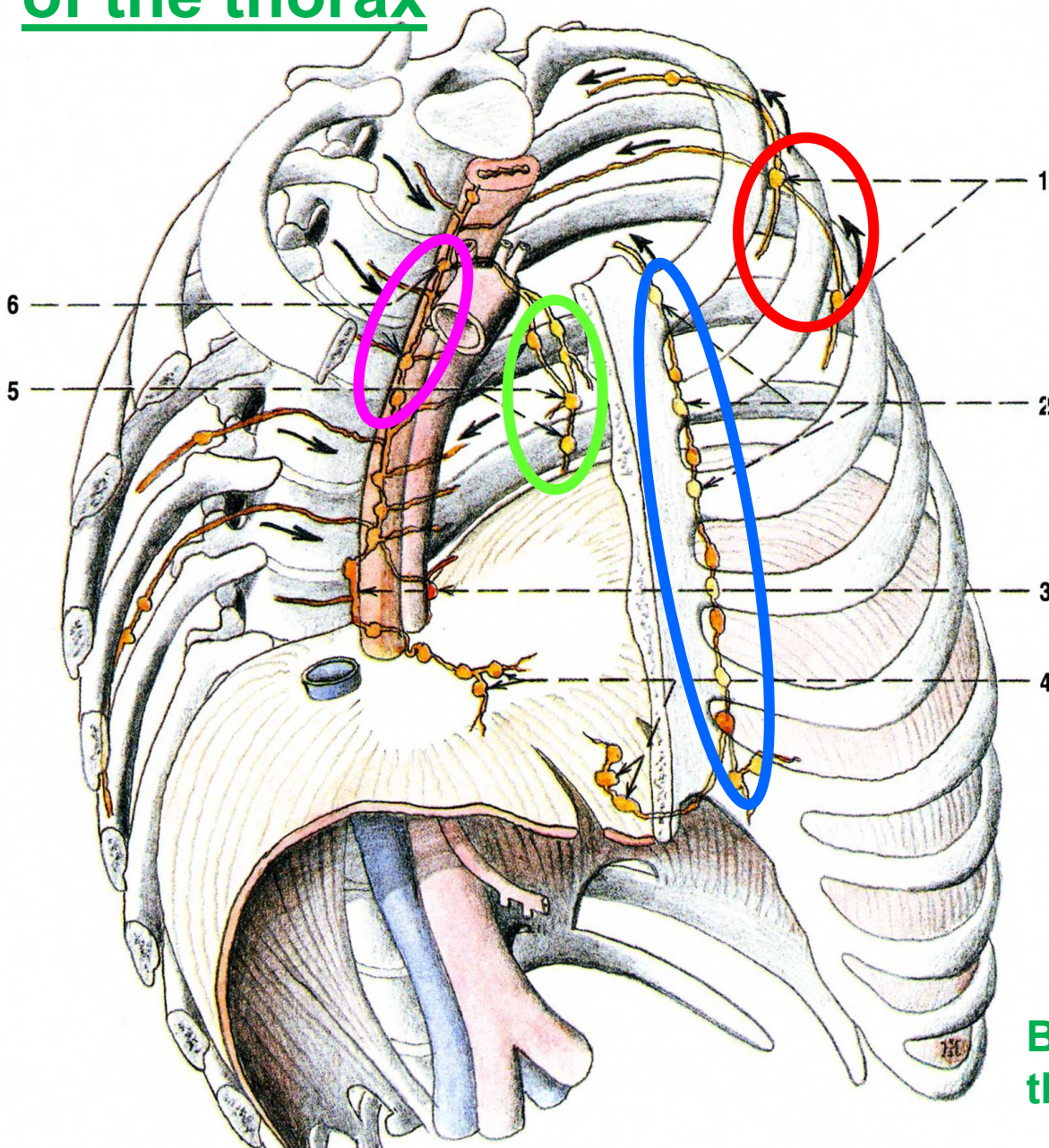
nodi parasternales

nodi supraclaviculares

Epigastric pathway

Intercostal pathway

Lymphatic nodes of the thorax



n.l. mediastinales
anteriores et posteriores

(heart, perikardium, lungs,
esophagus, diaphragma,
hepar)

n.l. parasternales

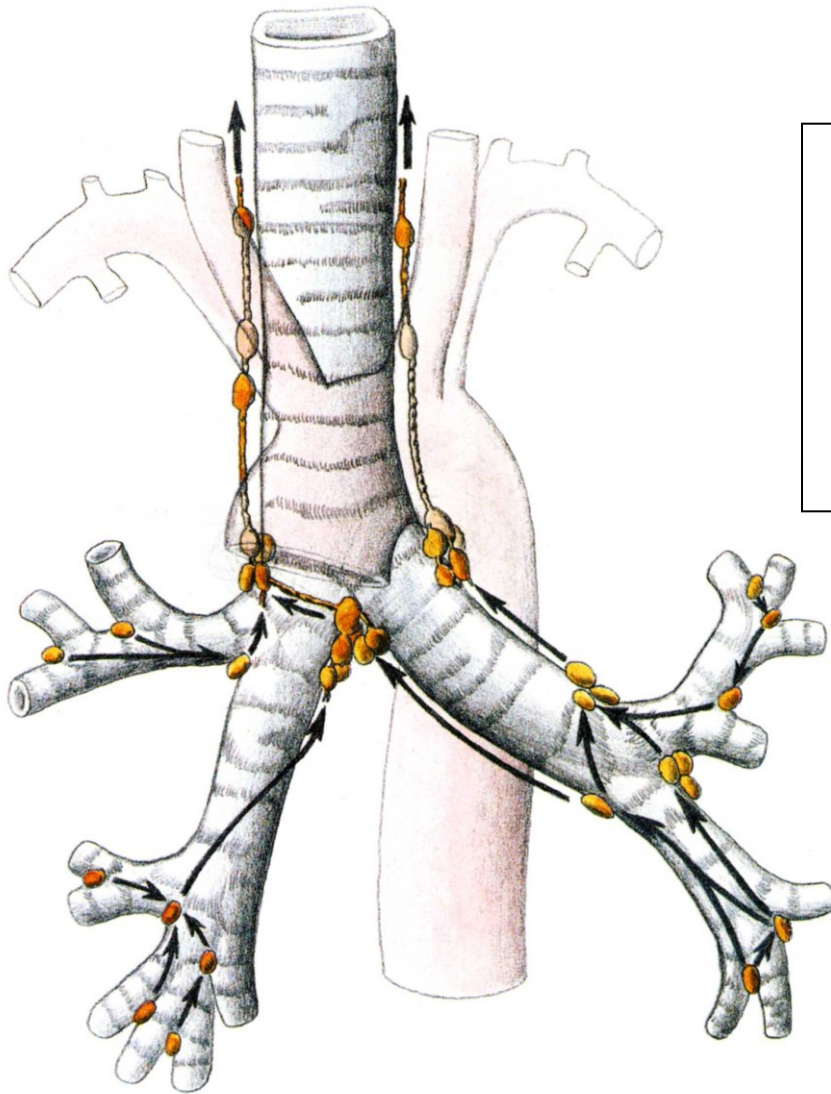
(thoracic wall,
diaphragma, abdominal
wall)

n.l. intercostales

(intercostal spaces, spinal
canal)



**Bronchomediastinal trunk,
thoracic duct (right lymph duct)**

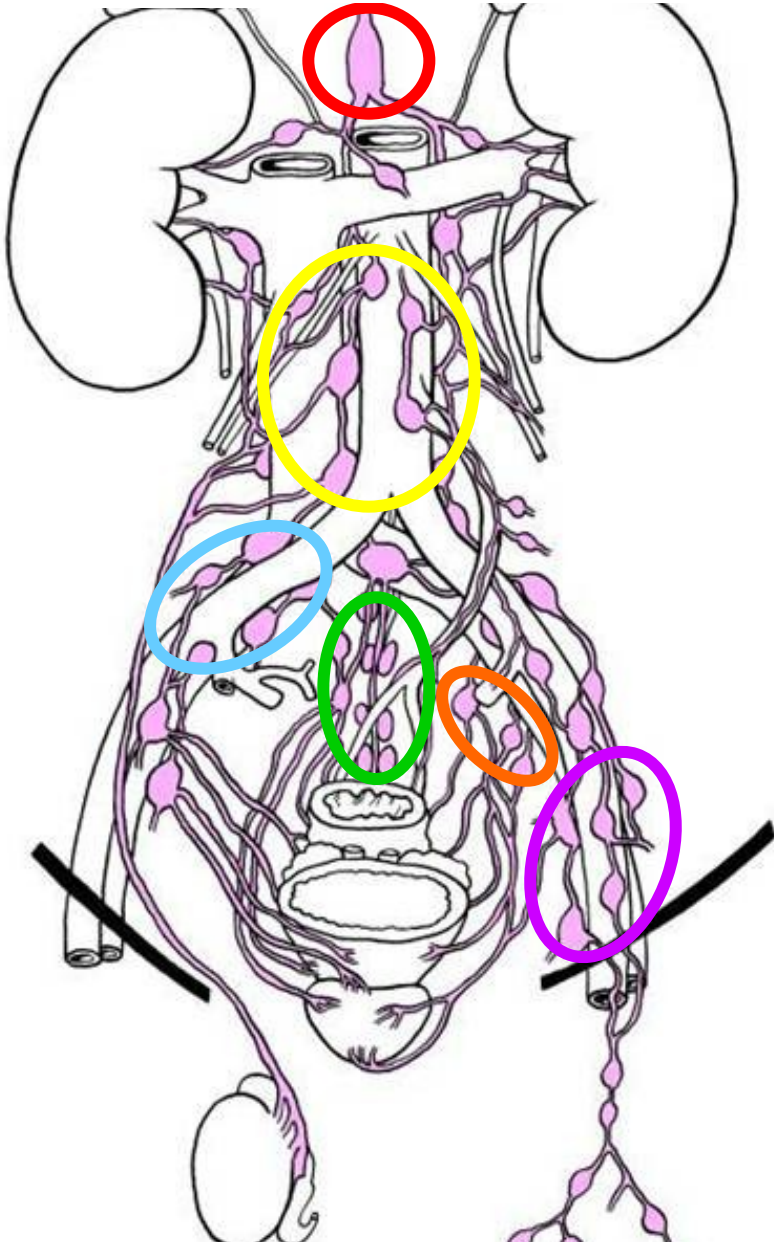


Lungs

All lymph flows to the right—
truncus bronchomediastinalis dx.
(ductus lymphaticus dexter)

To the left side only superior lobe of the
left lung

Lymphatic nodes of the abdomen and pelvis



Nodi iliaci ext.

urinary bladder, penis, clitoris, wall of the pelvis)

Nodi iliaci int.

wall of pelvis, organs- parauterini, paravesicales, pararectales)

Nodi iliaci sacrales

(rectum, prostate, cervix uteri, fornix vaginae)

Nodi iliaci comm.

Nodi lumbales

abdominal wall, paired abdominal organs, ovary, testes)

Truncus lumbalis dx.et sin.

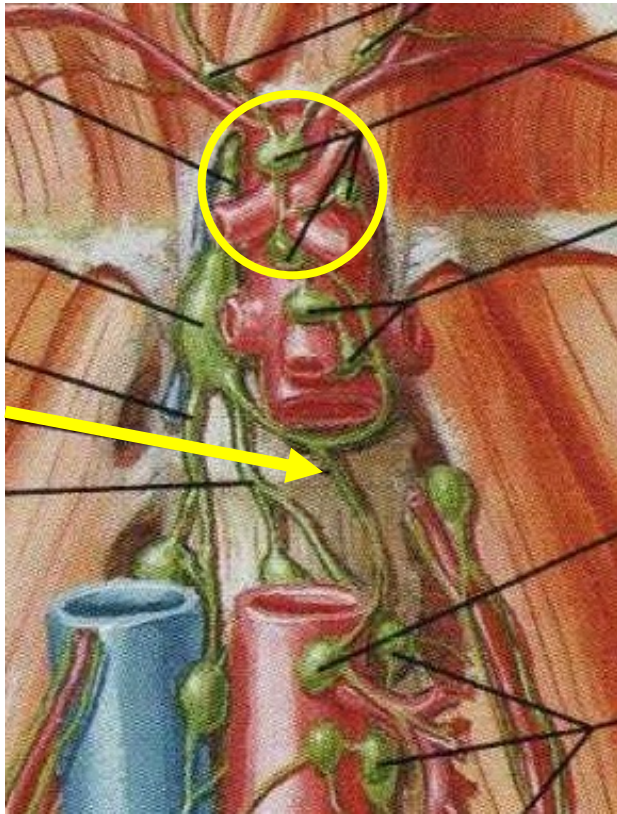
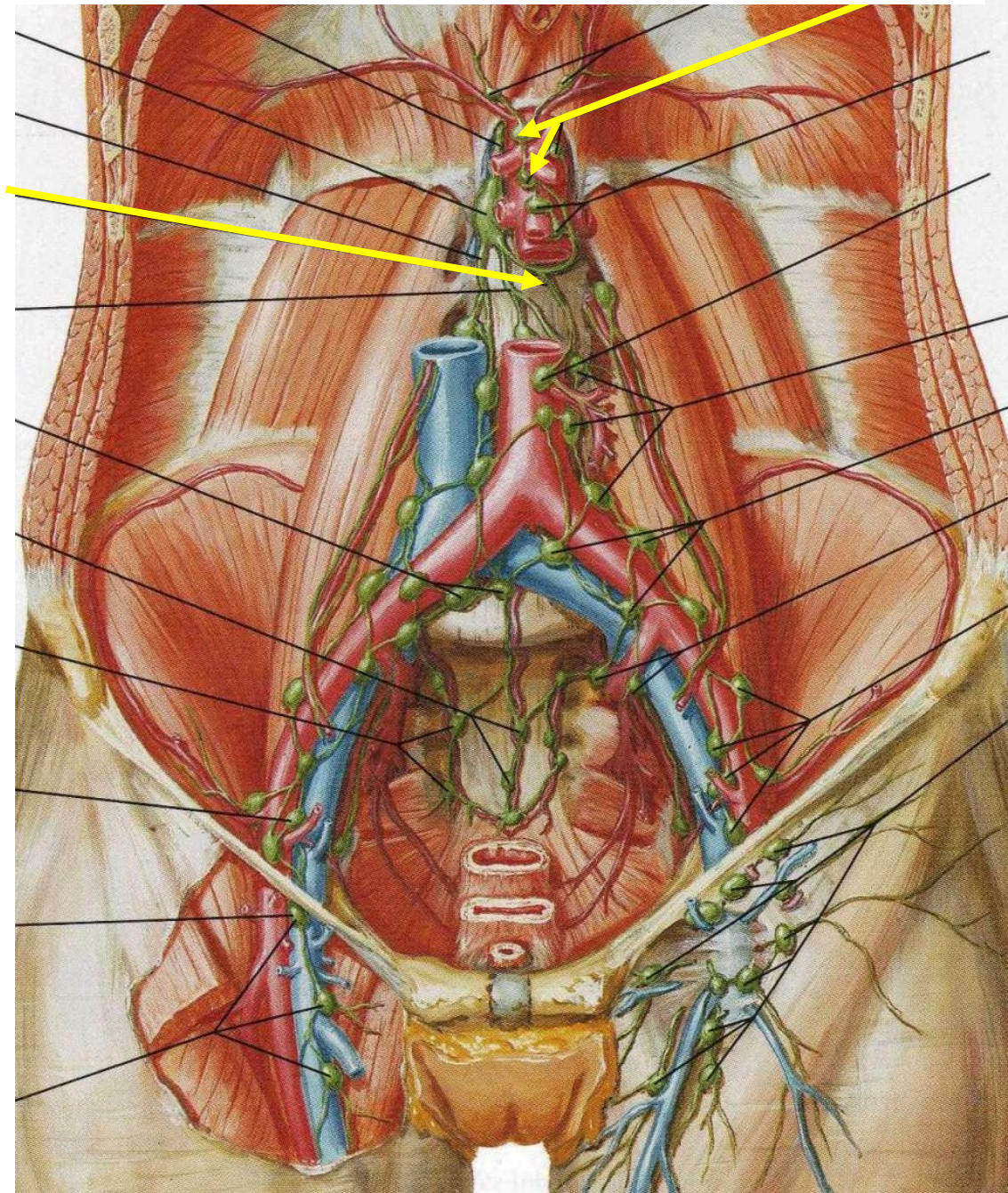
Cisterna cyli

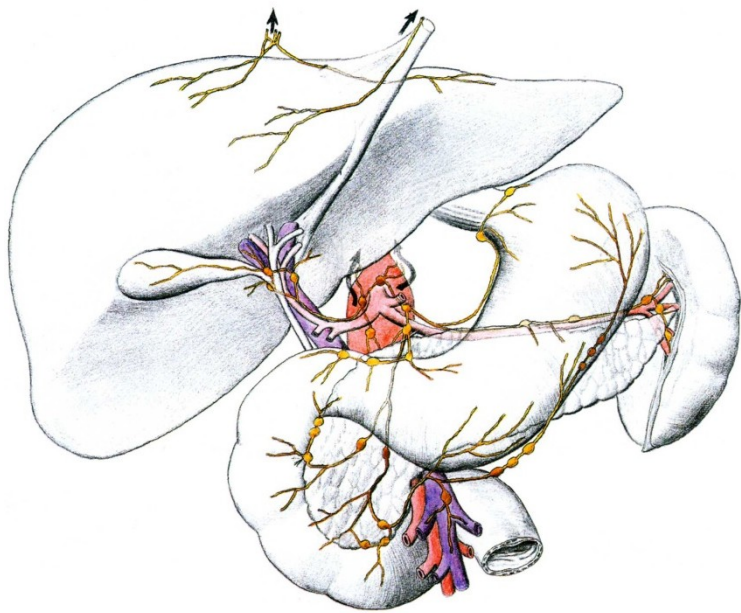
Lymphatic nodes of the unpaired abdominal organs

Nodi lymphatici coeliaci



Truncus intestinalis

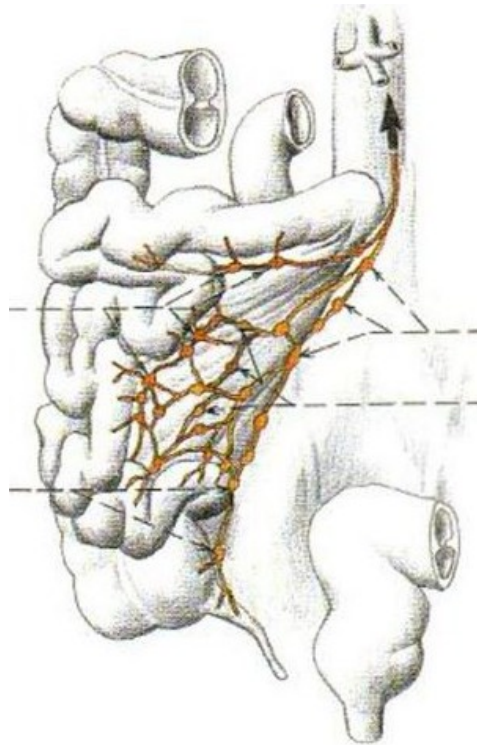
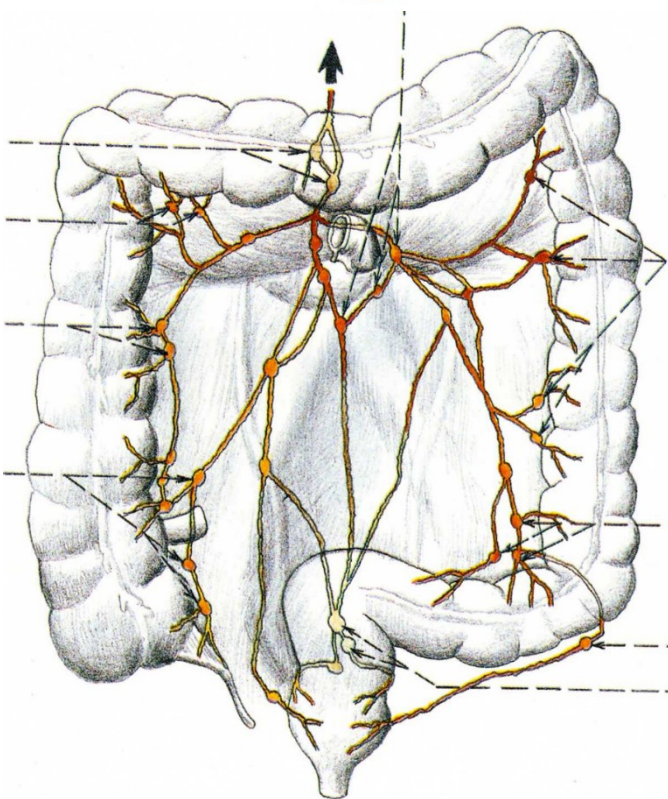




**truncus
intestinalis**



nodi lymphatici coeliaci



- gastrici
- gastroepiploici
- hepatici
- pancreaticoduodenales
- pancreatici
- lienales
- mesenterici
- ileocolici
- colici
- mesenterici inferiores

Lymphatic system of the upper limb

Superficial system

Collectors:

medial

*(nodi lymf. cubitales
superf.)*

lateral

anterior

Deep system- alongside arteries

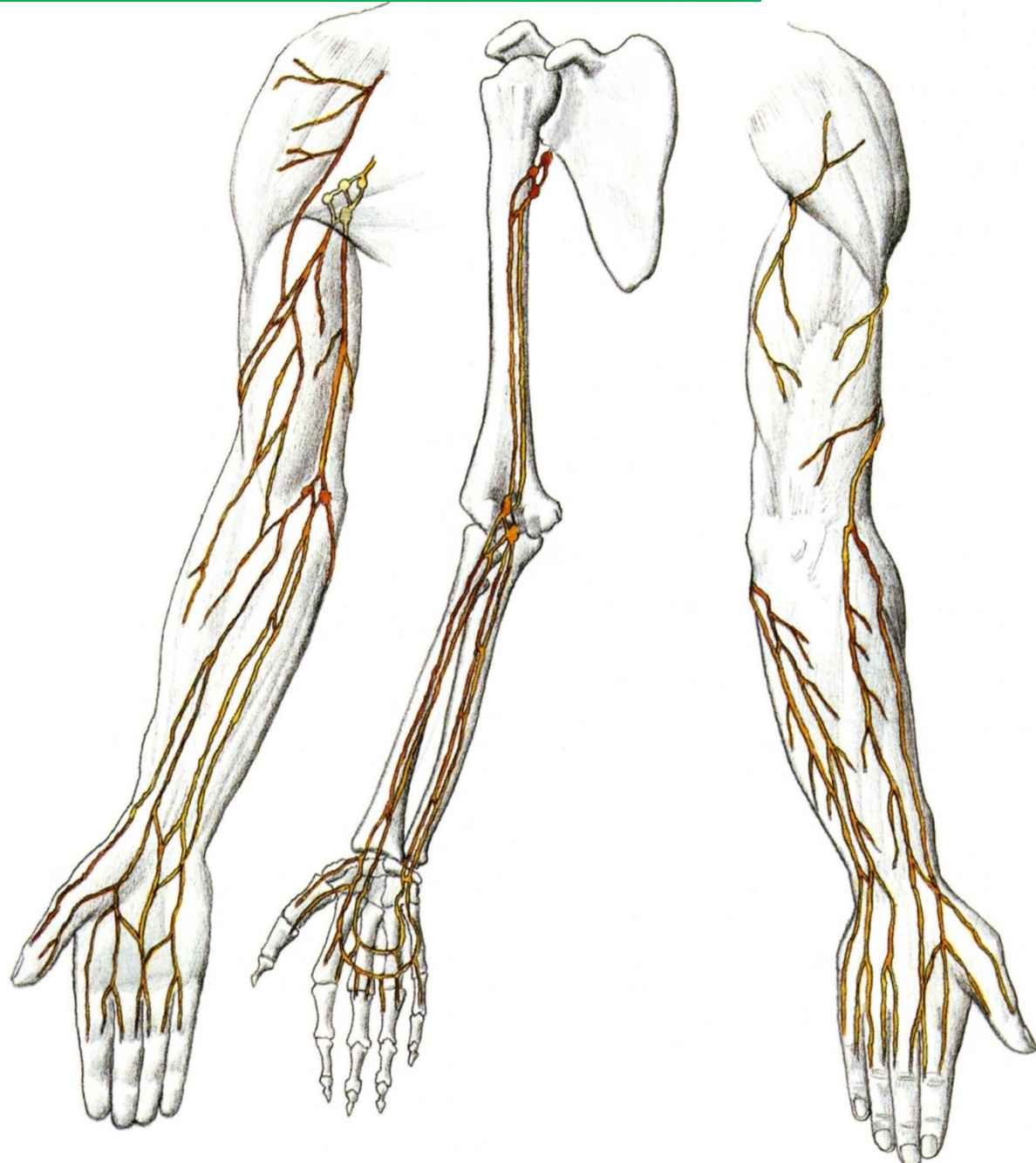
arcus lymphaticus

palmaris spf. et prof.

*nodi lymf. cubitales prof.,
brachiales*



nodi axillares



Lymphatic system of lower limb

Superficial – collectors:

lateral

medial (*nodi lymf.inguinales
spf.*)

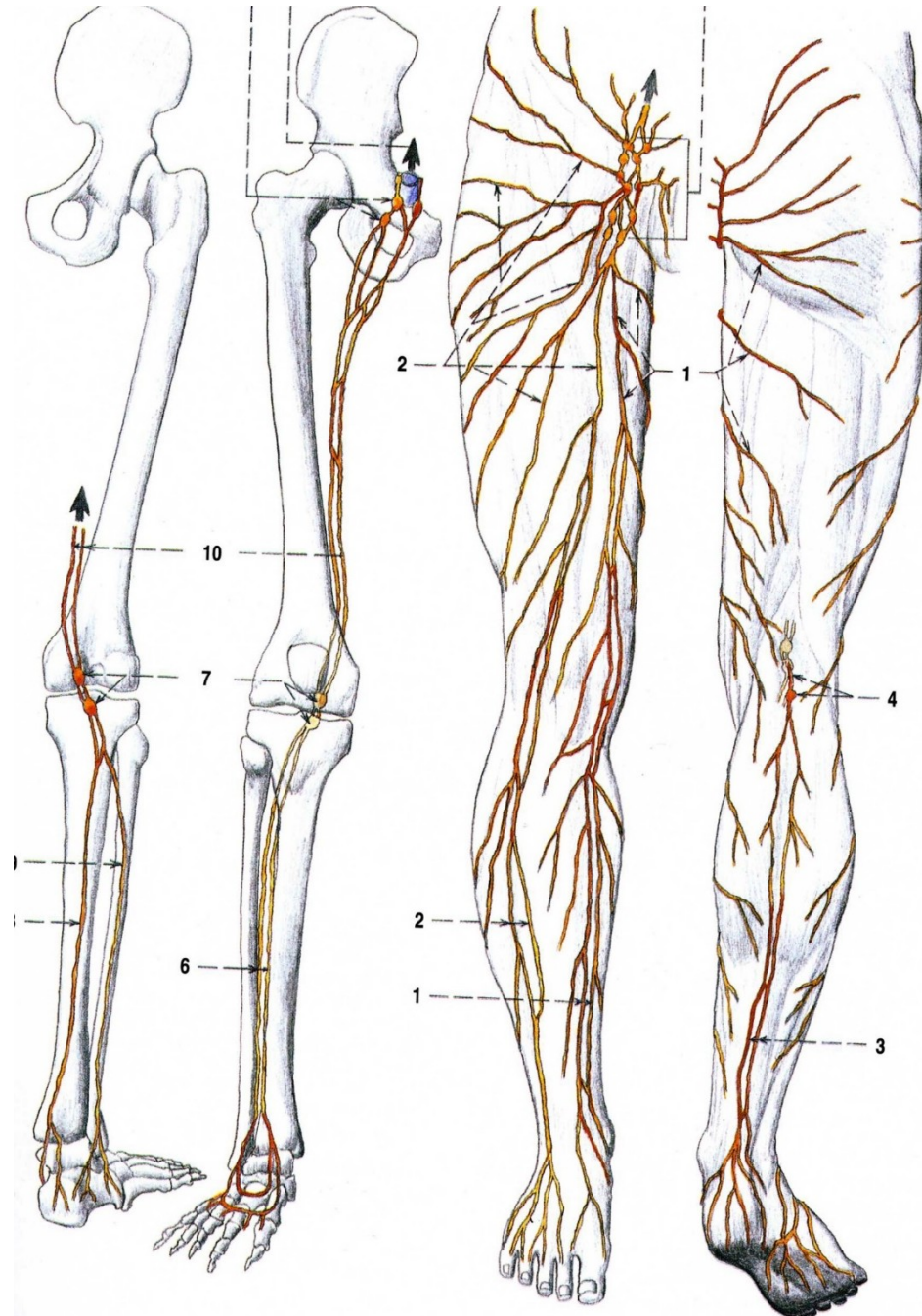
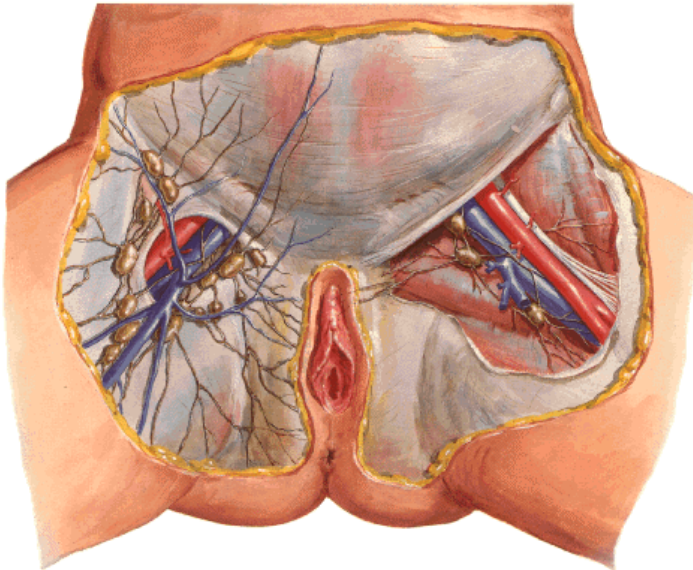
posterior (*nodi lymf.poplitei*)

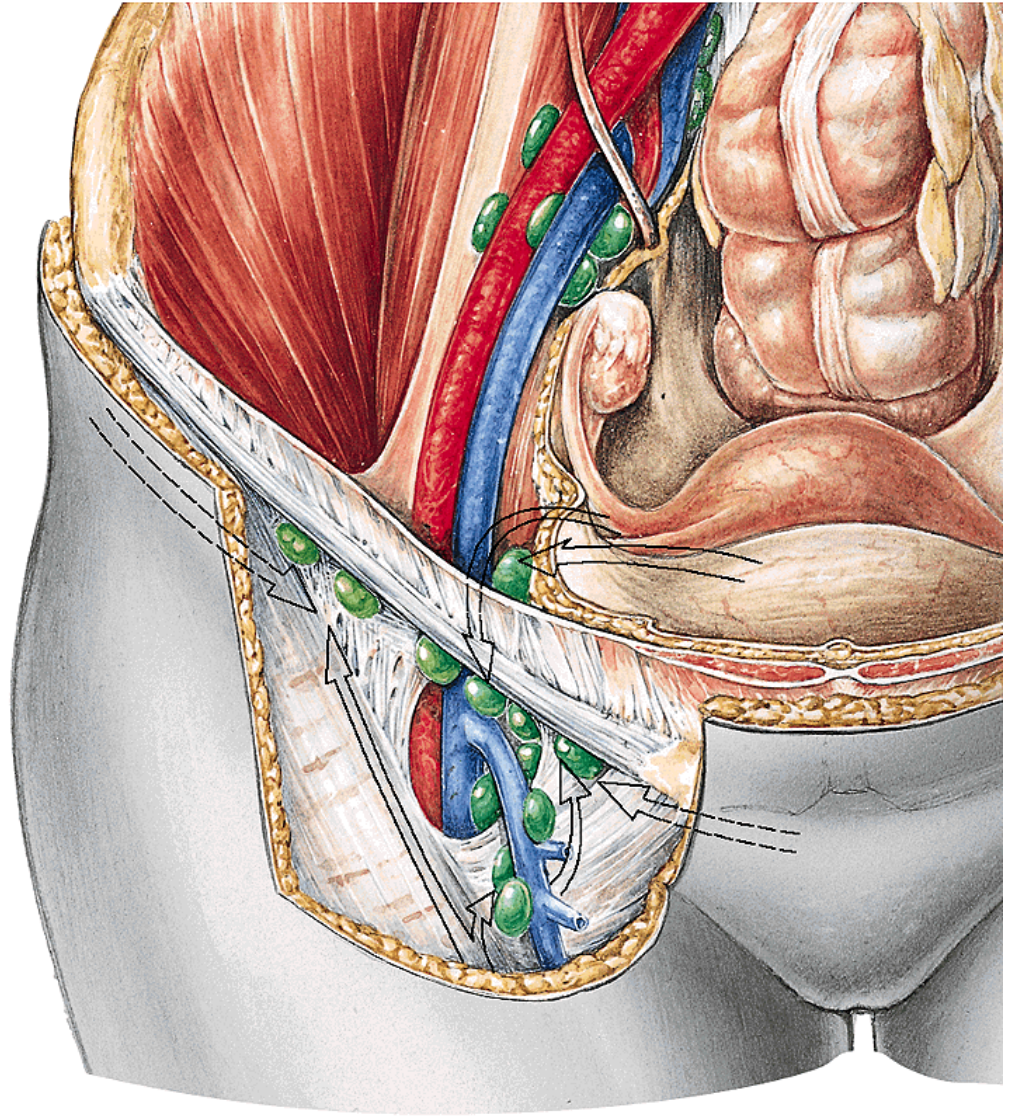
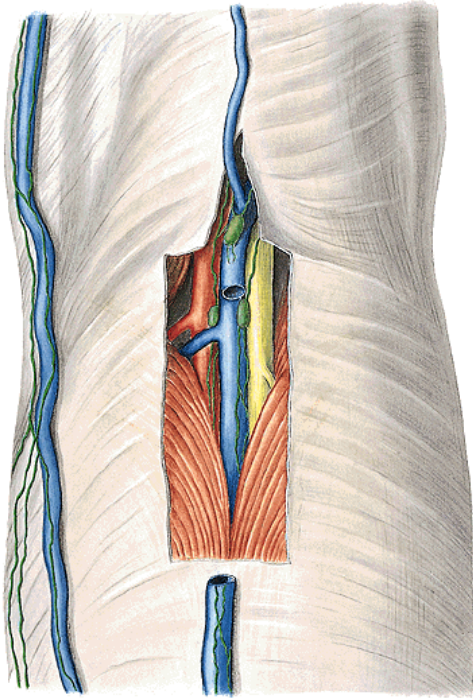
Deep – alongside arteries

nodi lymf.inguinales prof.



nodi lumbales





Thank you for your attention

