

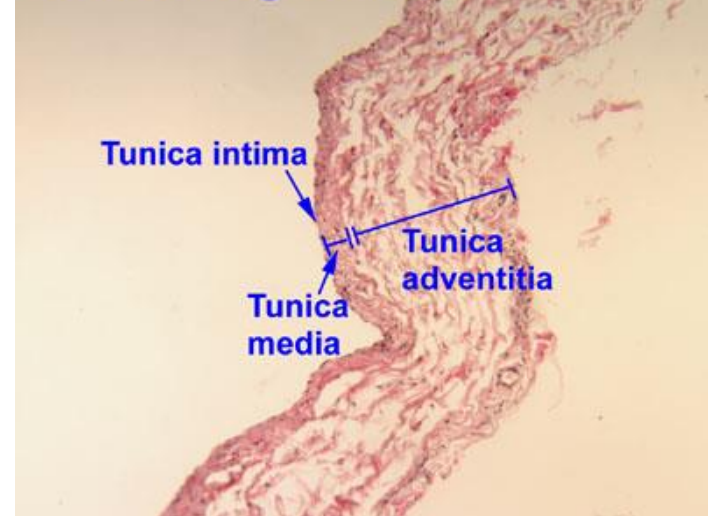
# VEINS

David Kachlík

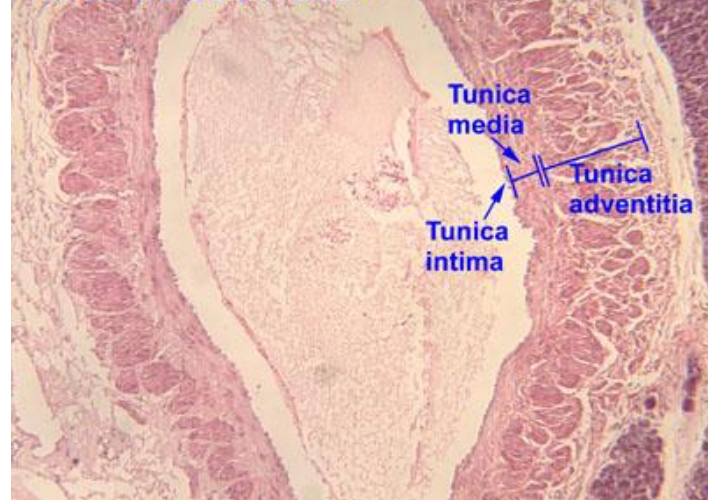
# Venous circulation

- low blood pressure
- blood reservoir
- venules
- veins of small and middle caliber
- large veins

Slide 67 Jugular vein

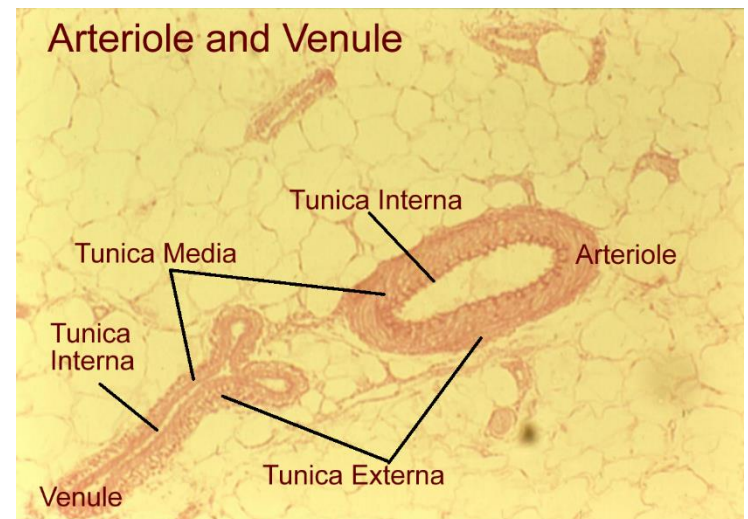
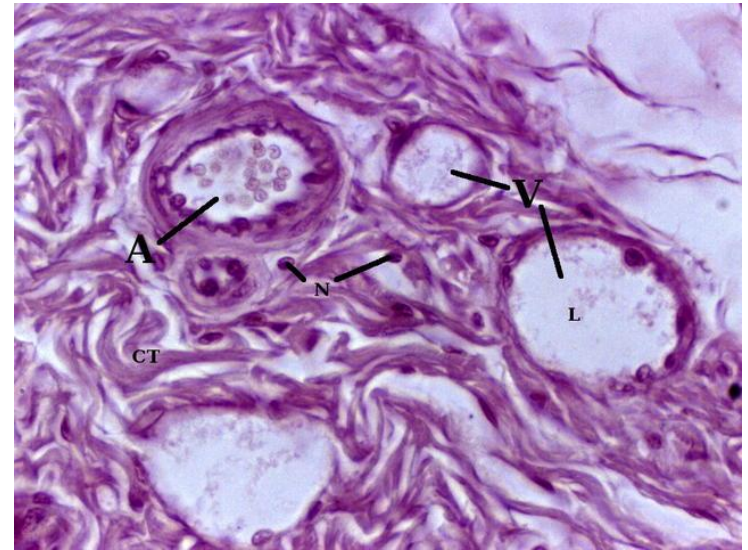


Slide 80 Pancreas



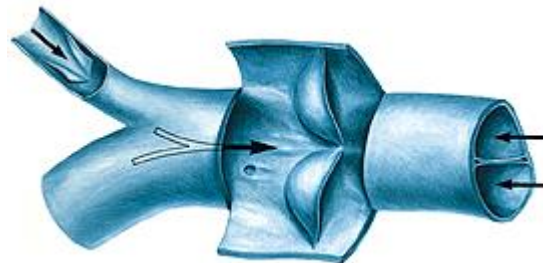
# Venulae = Venules

- caliber 0.2 – 1 mm
- tunica intima
- tunica media – ***thin***
- tunica externa  
(adventitia) – ***thick***



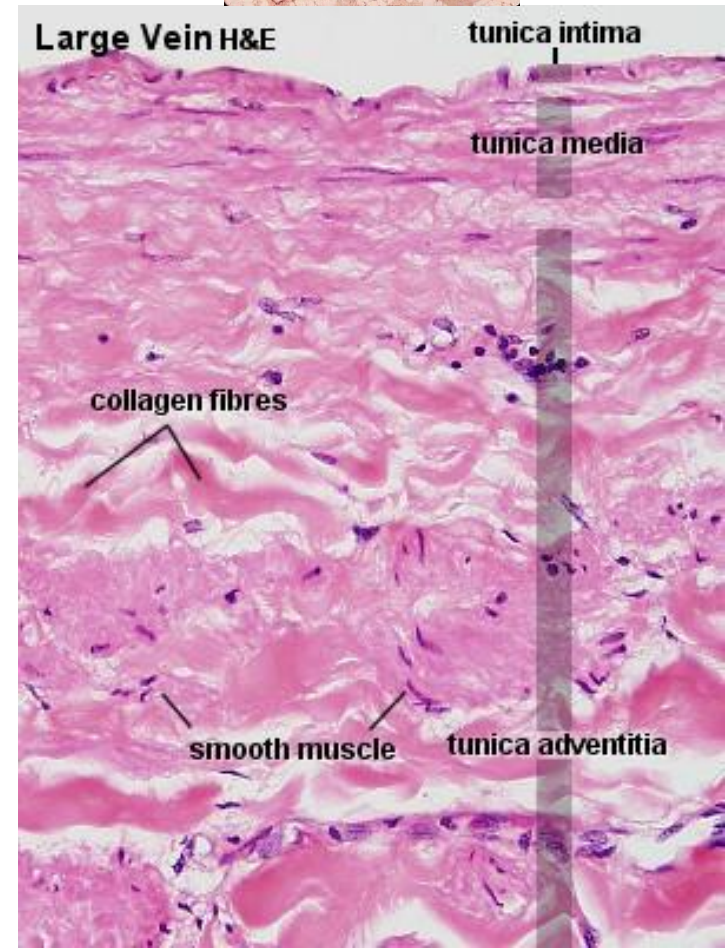
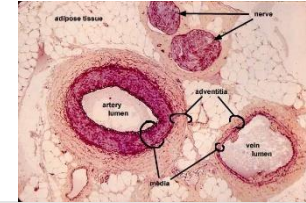
# Veins of small and middle caliber

- all three layers are discernible but ***thin***
- veins of limbs contain **valvulae (valves)**
  - valve is composed of two valvules (cusps)
  - duplication of tunica intima
  - prevent reverse blood flow (reflux)
  - insufficiency → varix, pl. varices



# Veins of large caliber

- **tunica intima**
  - fragmented lamina elastica interna
- **tunica media**
  - several layers of smooth muscle cells
  - relatively large amount of connective tissue
- **tunica adventitia (externa)**
  - best developed layer, connective tissue base
  - longitudinal bands of smooth muscle cells
  - vasa vasorum



# Arrangement of veins within body

## 3 systems:

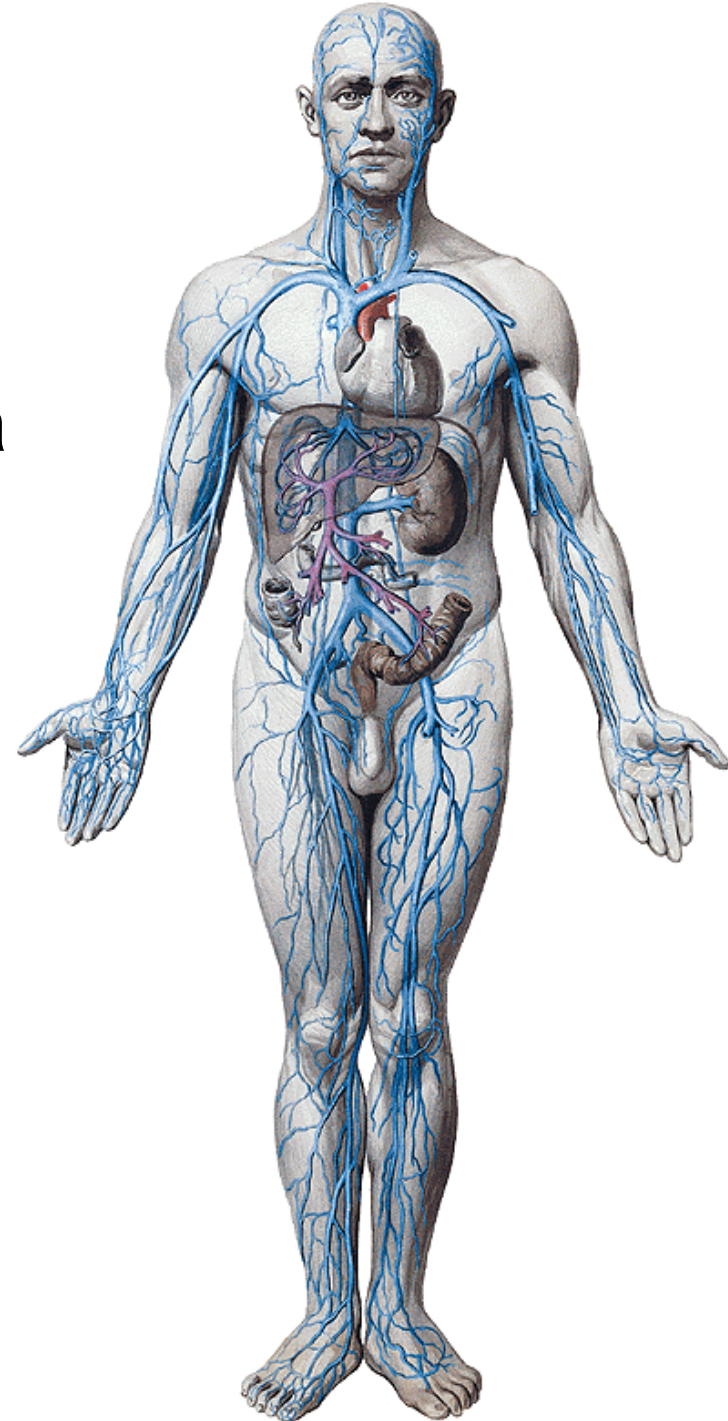
- system of **superior vena cava**
- system of **inferior vena cava**
- system of **vena portae**

## mutual anastomoses:

- porto-caval
- cavo-caval

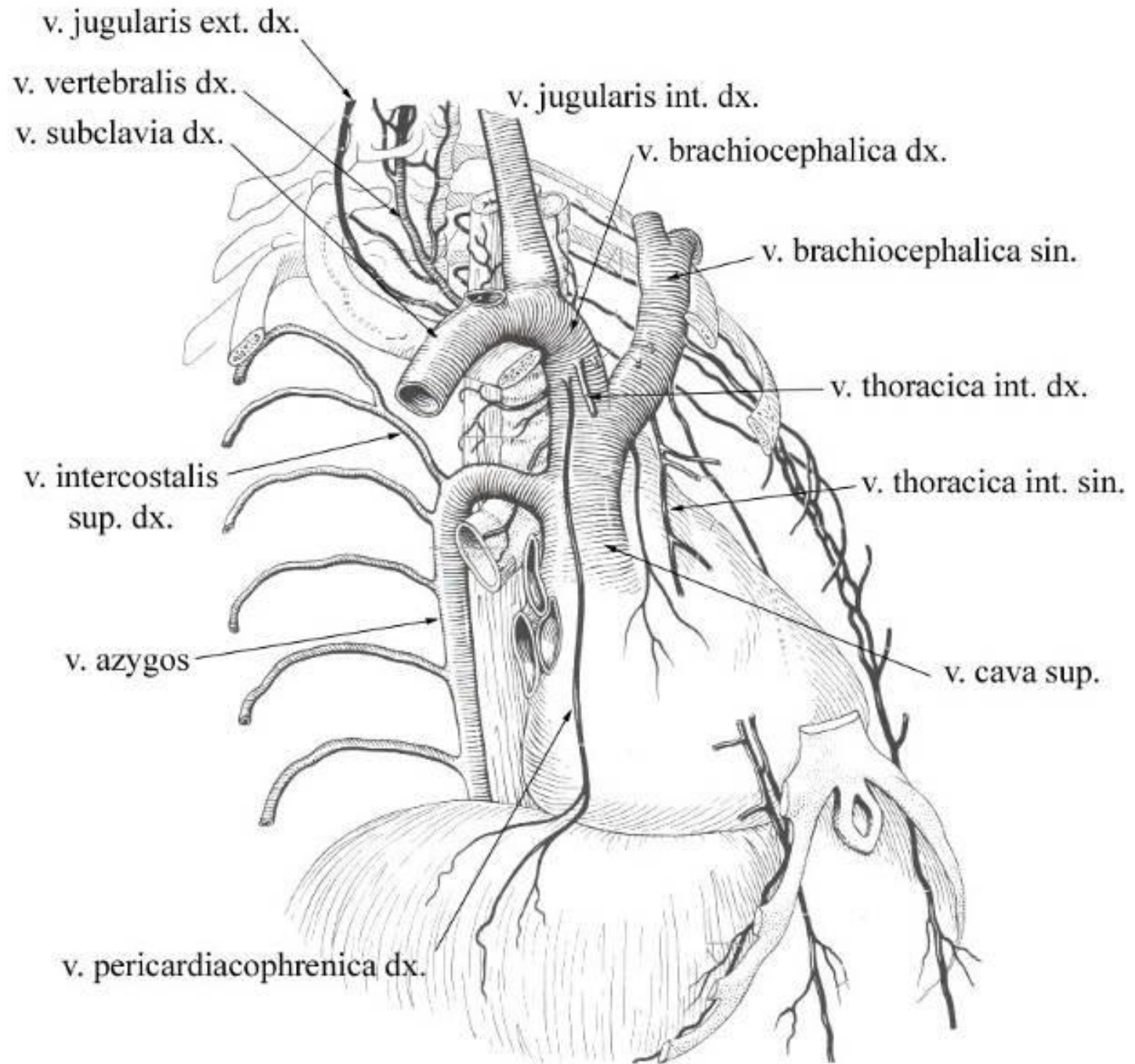
## 2 layers: limbs, neck

- superficial systém
  - no accompanying arteries
- deep system
- perforators



# Vena cava superior

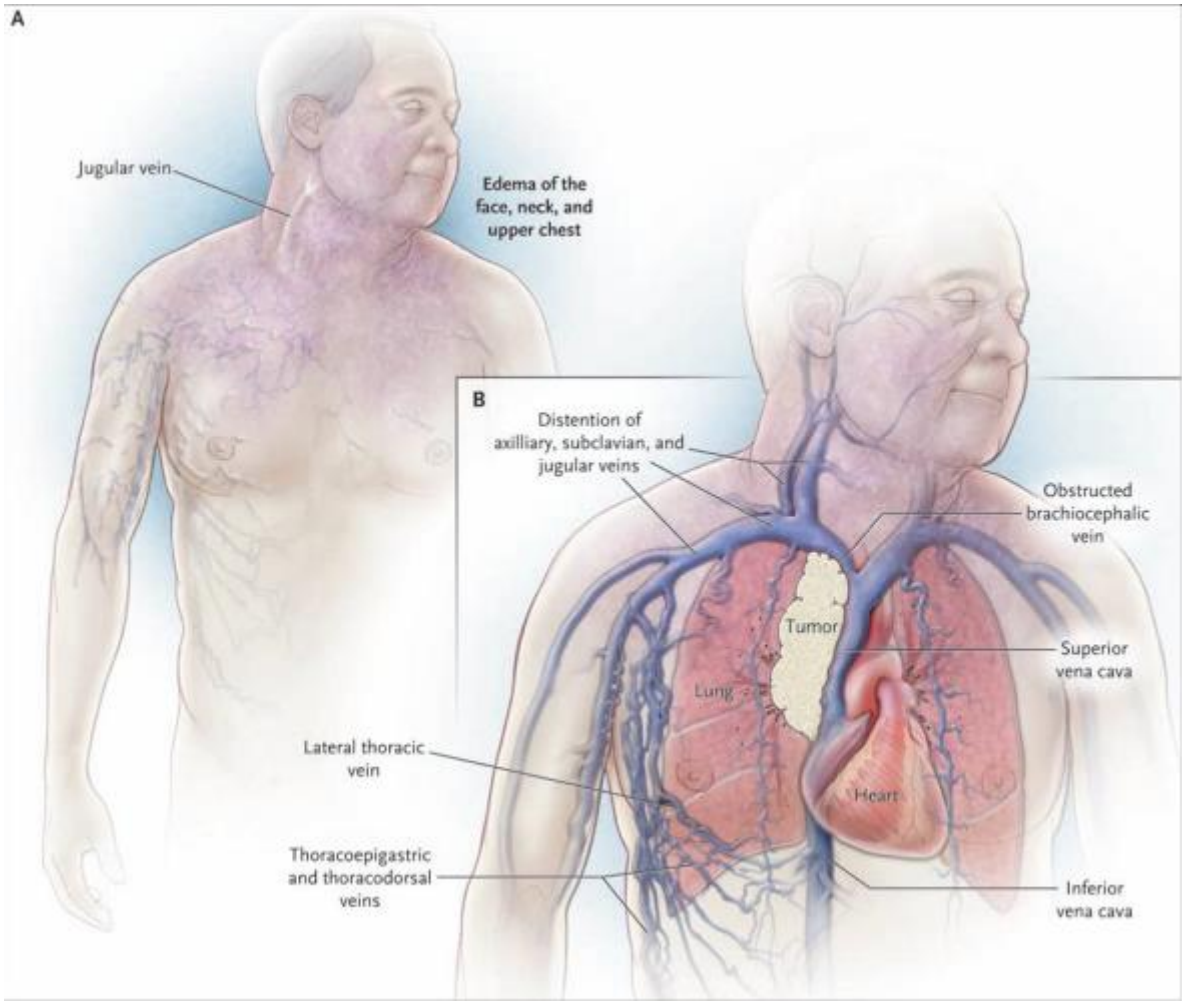
- originally paired, no valves
  - v. precardinalis dx.
  - v. *precardinalis sin.* → v. *obliqua atrii sin. Marshalli*
- vv. brachiocephalicae
  - right perpendicular svislá (2.5 cm) x left oblique(6 cm)
  - v. thyroidea inf. / plexus thyroideus impar + v. laryngea inf.
  - v. vertebralis (v. vertebralis acc., ant.)
  - v. thoracica int. sin.
  - v. intercostalis suprema, intercostalis sup. sin.
- v. azygos
- v. thoracica interna dx.
- visceral branches from superior anterior mediastinal organs



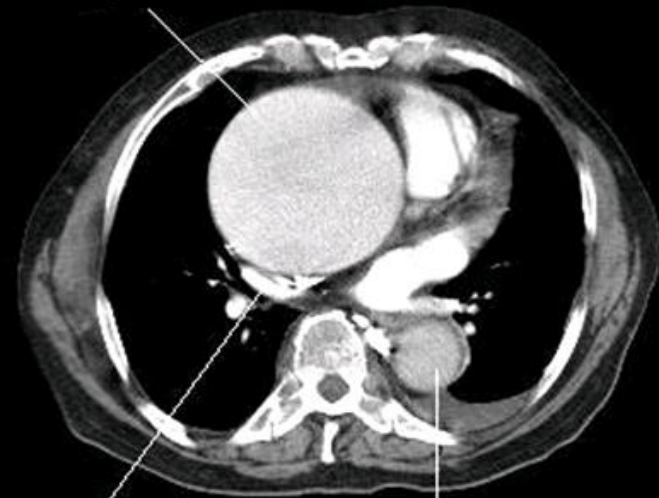


# Syndrome of SVC

- vein closure by thrombus
- veins stenosis by tumour



Ascending Aorta



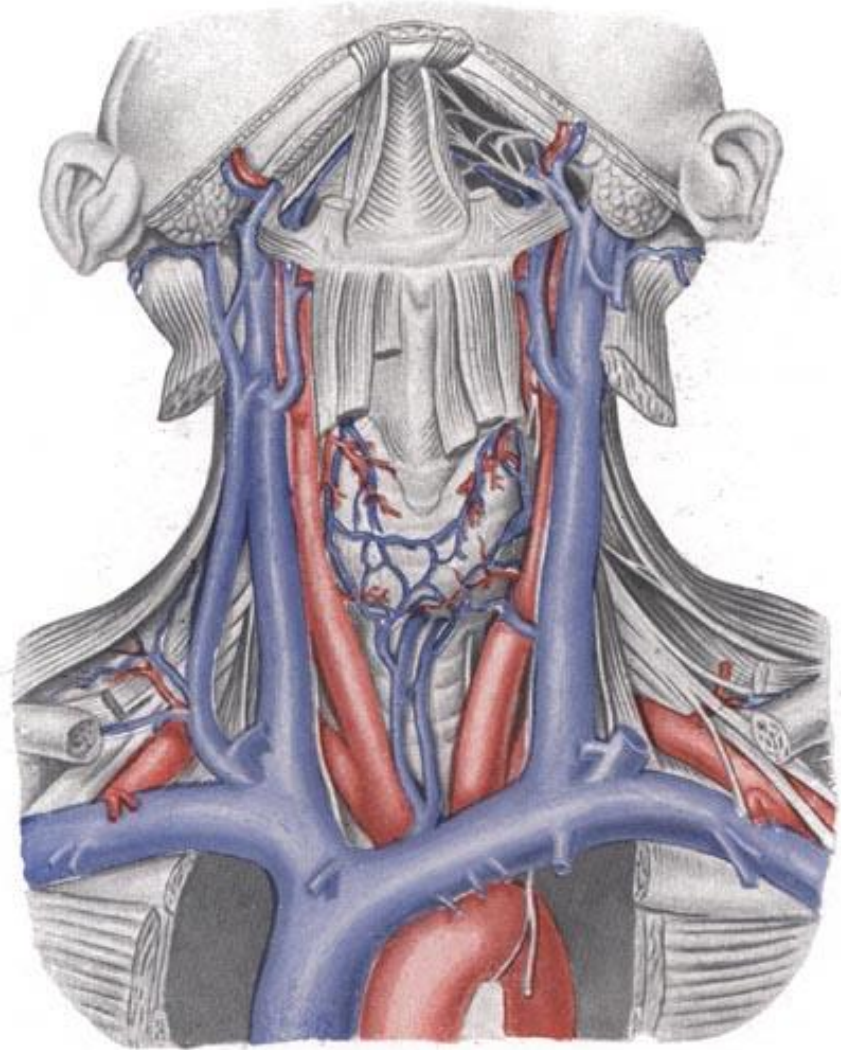
Compressed SVC

Descending Aorta

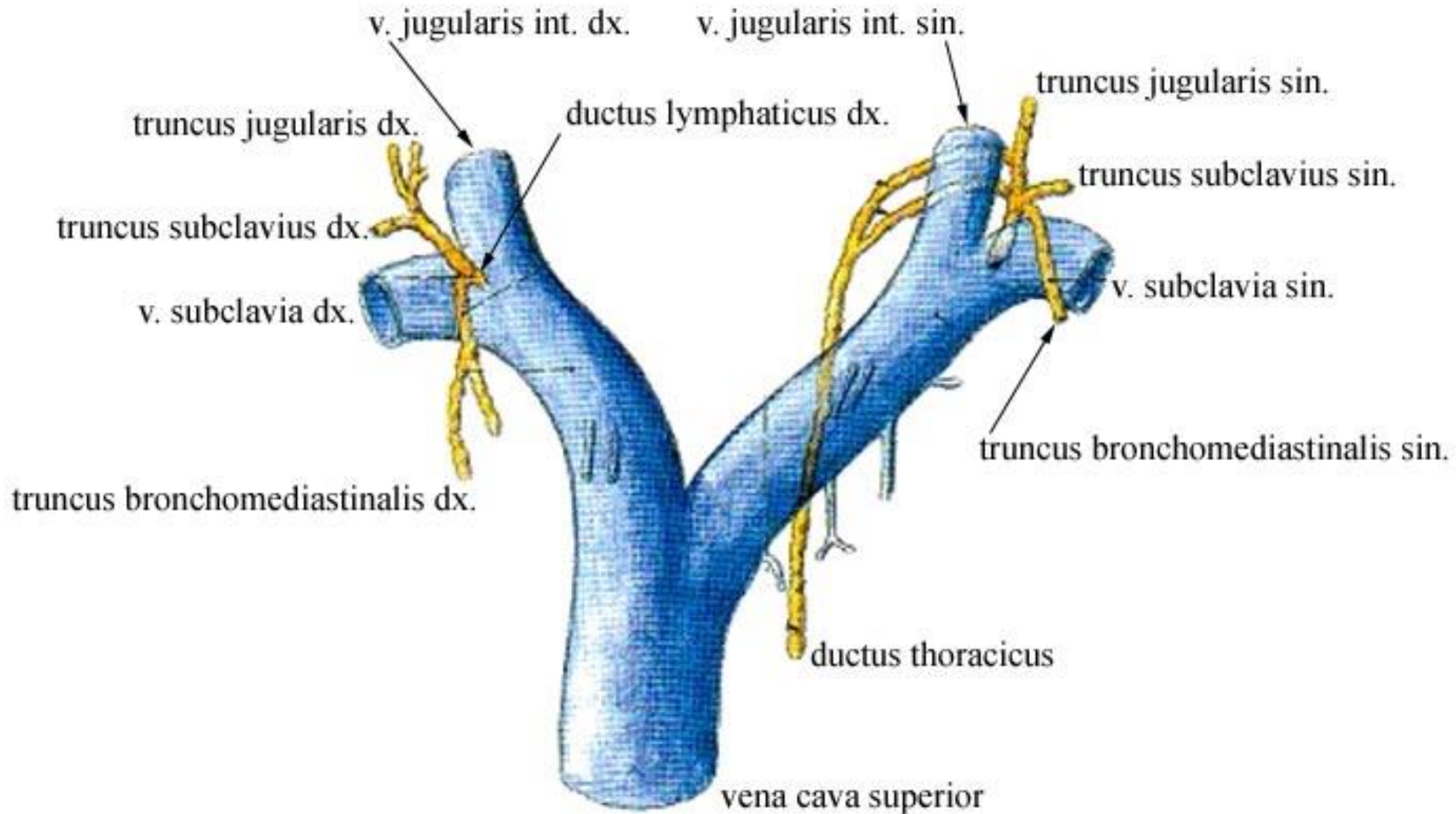


# Vena jugularis interna

- bulbus superior – origin
- bulbus inferior – end
  - into angulus venosus
- vagina carotica
  - part of lamina pretrachealis fasciae cervicalis
- angulus venosus *Pirogovi*
  - *sinister*: ductus thoracicus
  - *dexter*: ductus lymphaticus dexter



# ANGULUS VENOSUS PIROGOVI

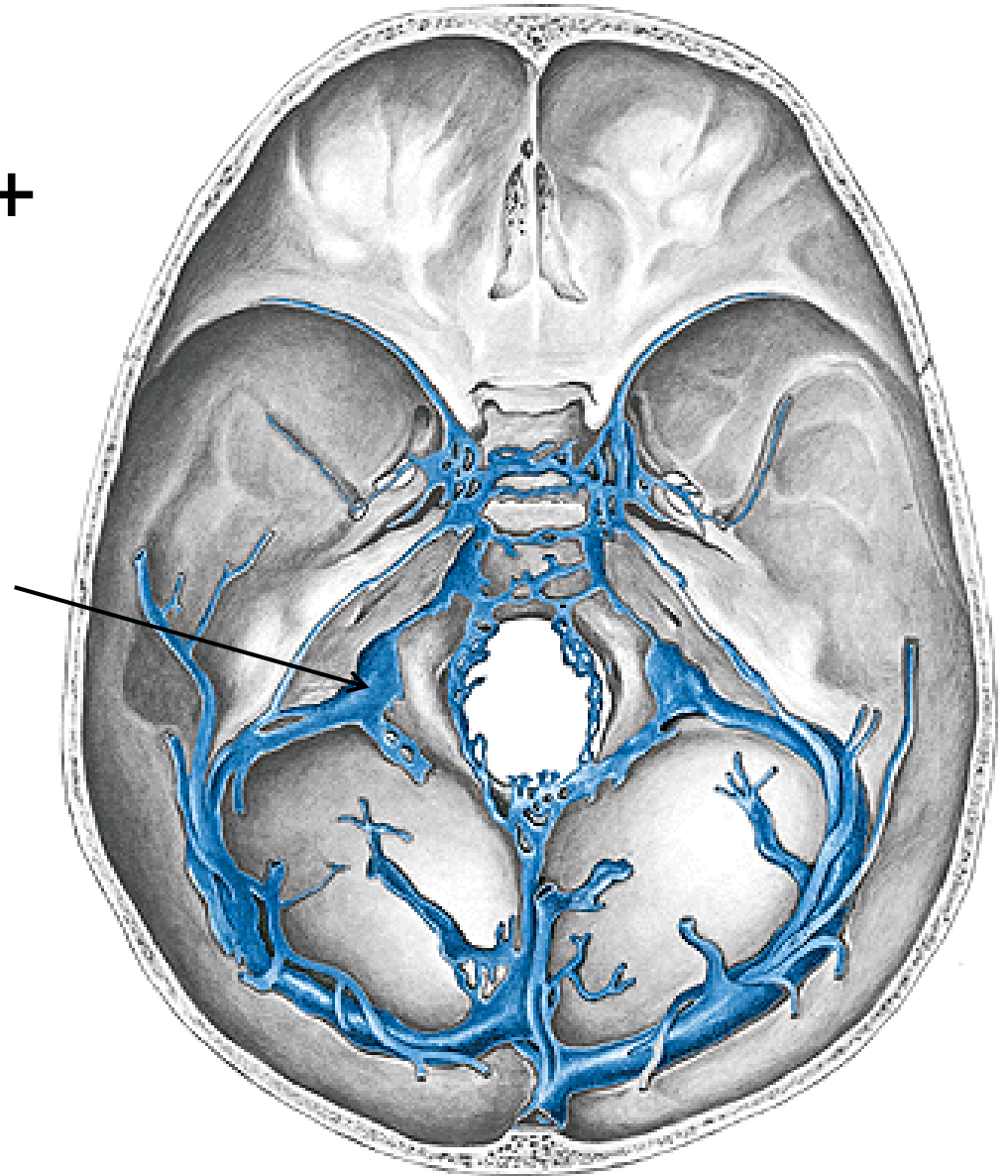


# Vena jugularis interna – origin

- sinus sigmoideus +
- sinus petrosus inferior

→ **bulbus superior**  
**venae jugularis**  
**internae**

*foramen jugulare*  
*- dorsolateral part*





# Vena jugularis interna – tributaries' overview

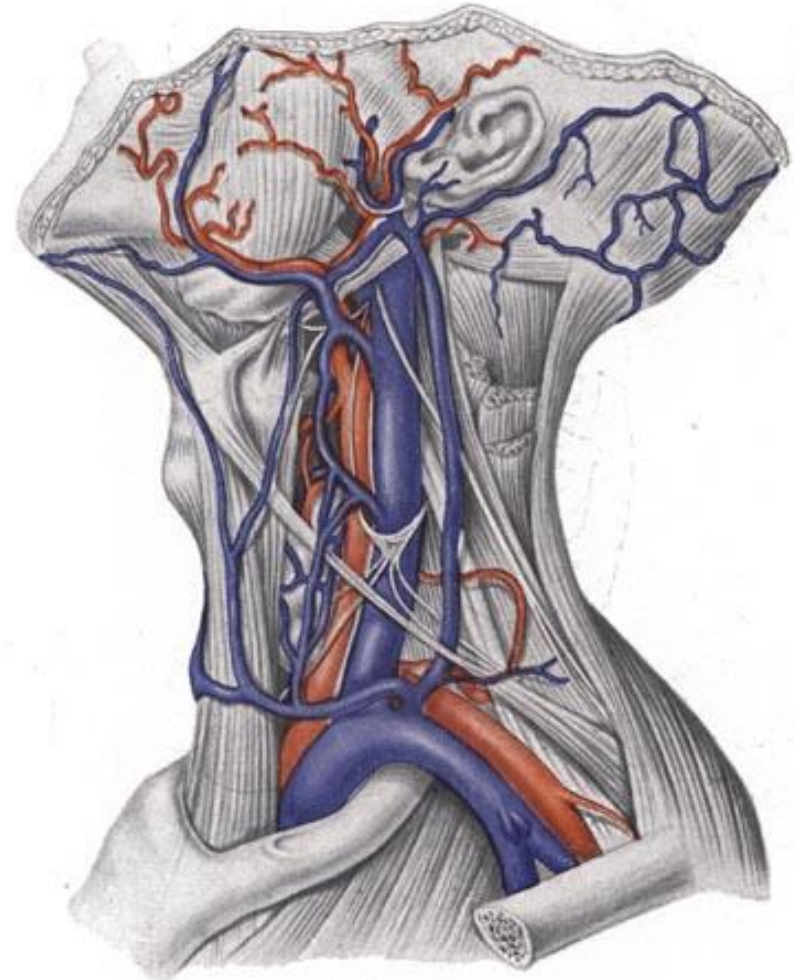
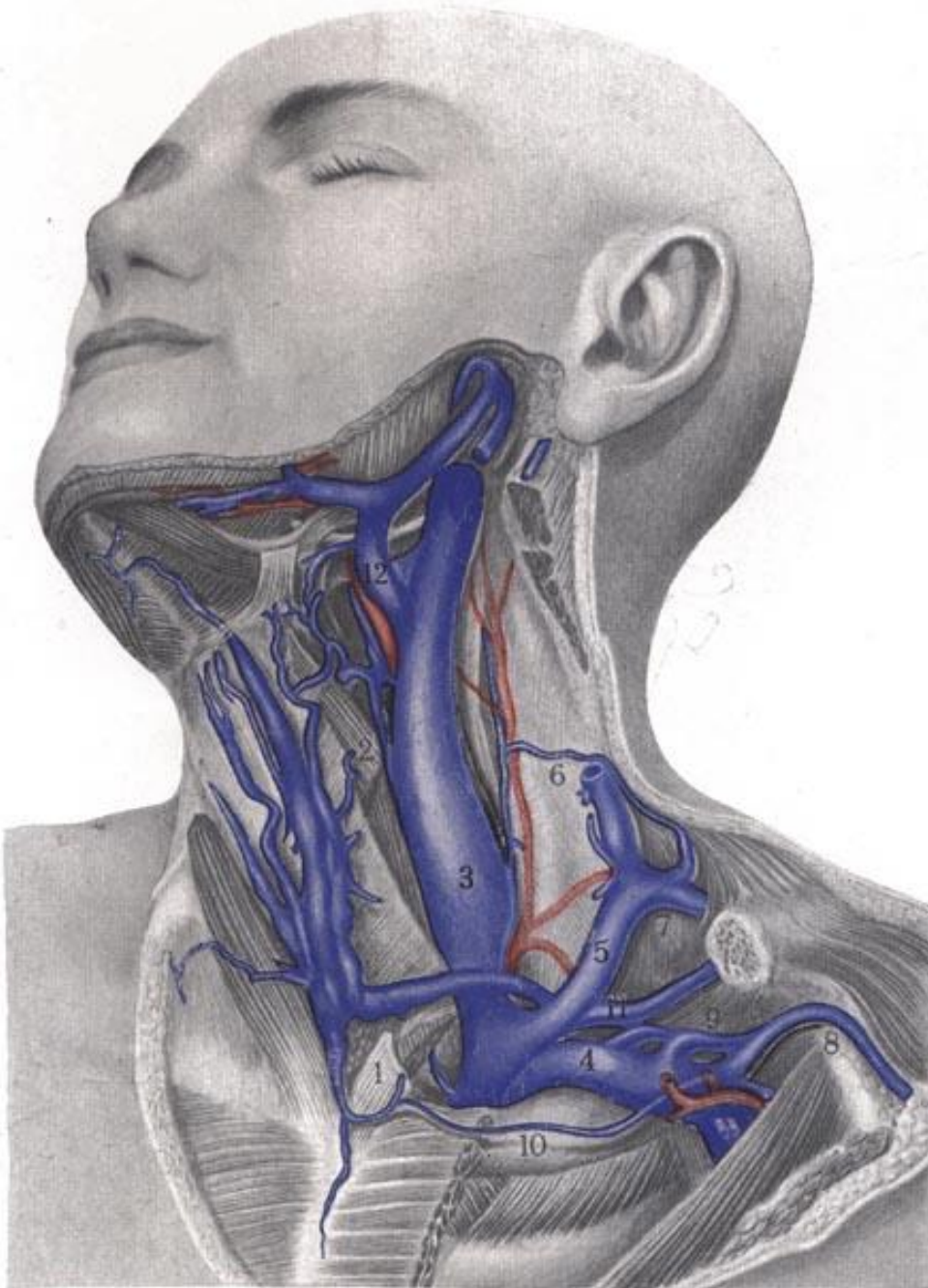
## intracranial tributaries

- *sinus durae matris*
- *vv. cerebri*
- *vv. meningeae*
- *vv. diploicae*
- *vv. labyrinthi*
- *vv. emissariae*
- *vv. ophthalmicae*

## extracranial tributaries

- cranial
  - v. retromandibularis
  - v. facialis
  - v. lingualis
- superficial cervical
  - v. jugularis ext.
  - v. jugularis ant.
- deep cervical
  - vv. pharyngeae
  - vv. thyroideae

# Vena jugularis interna + externa



# Tributaries of vena jugularis interna 1.

- **sinus durae matris**

*!!! wall from dura mater !!!*

confluens sinuum

(= *torcular Herophili*)

chordae Willisii

unpaired:

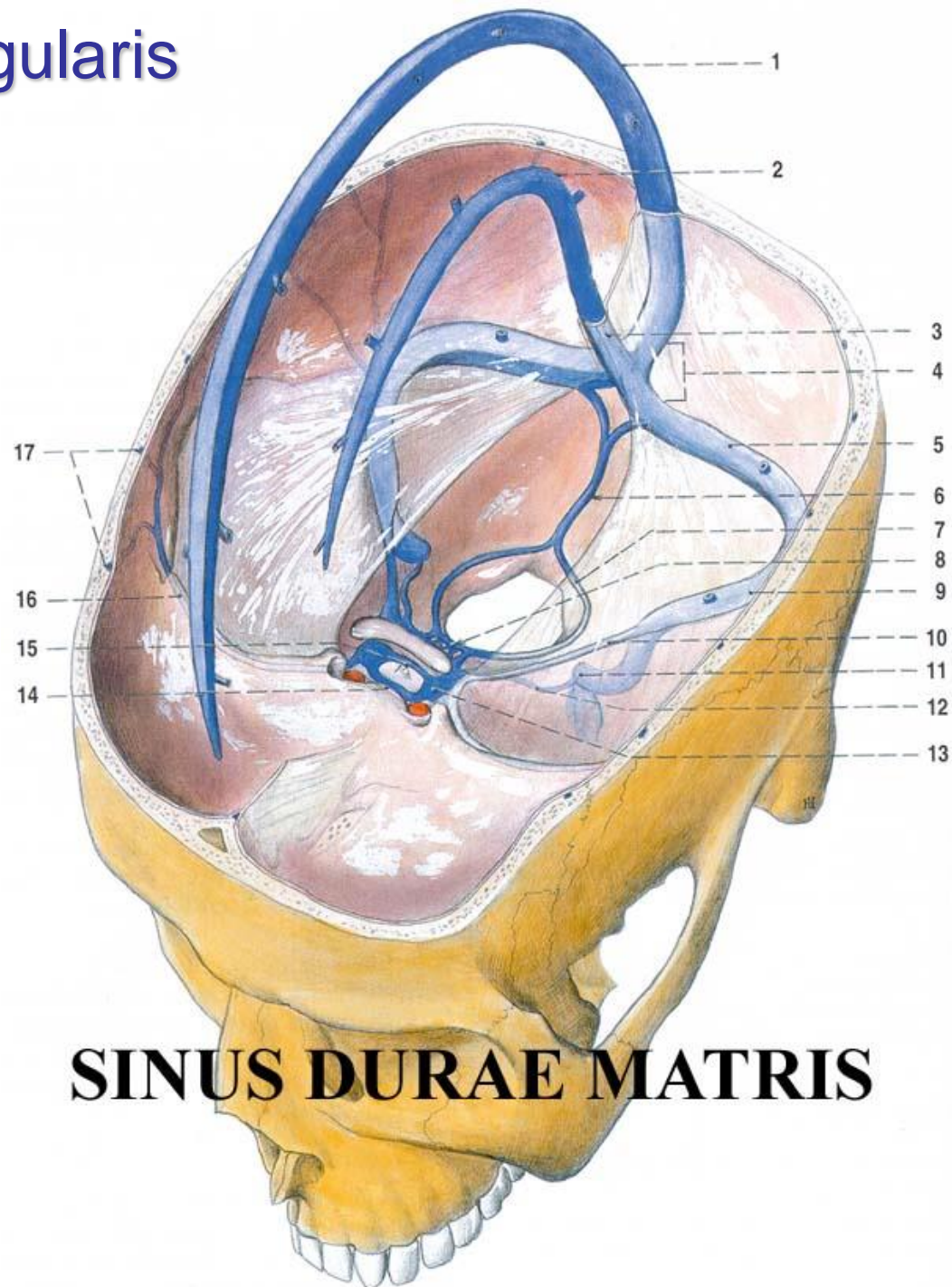
**s. sagittalis sup. (1)**

**s. sagittalis inf. (2)**

**s. rectus (3)**

**s. occipitalis (6)**

**plexus basilaris (8)**



**SINUS DURAE MATRIS**

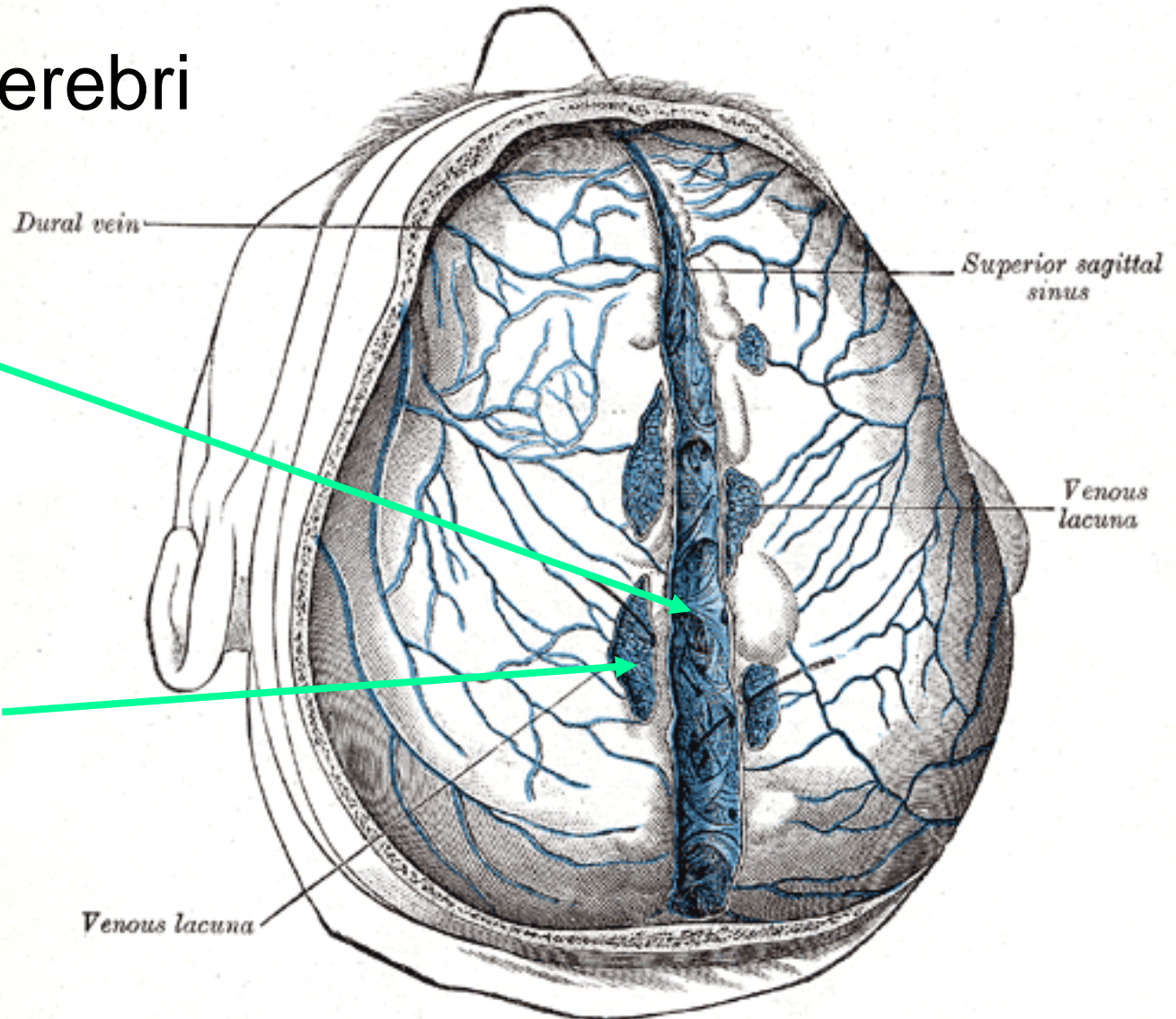


# Sinus sagittalis superior

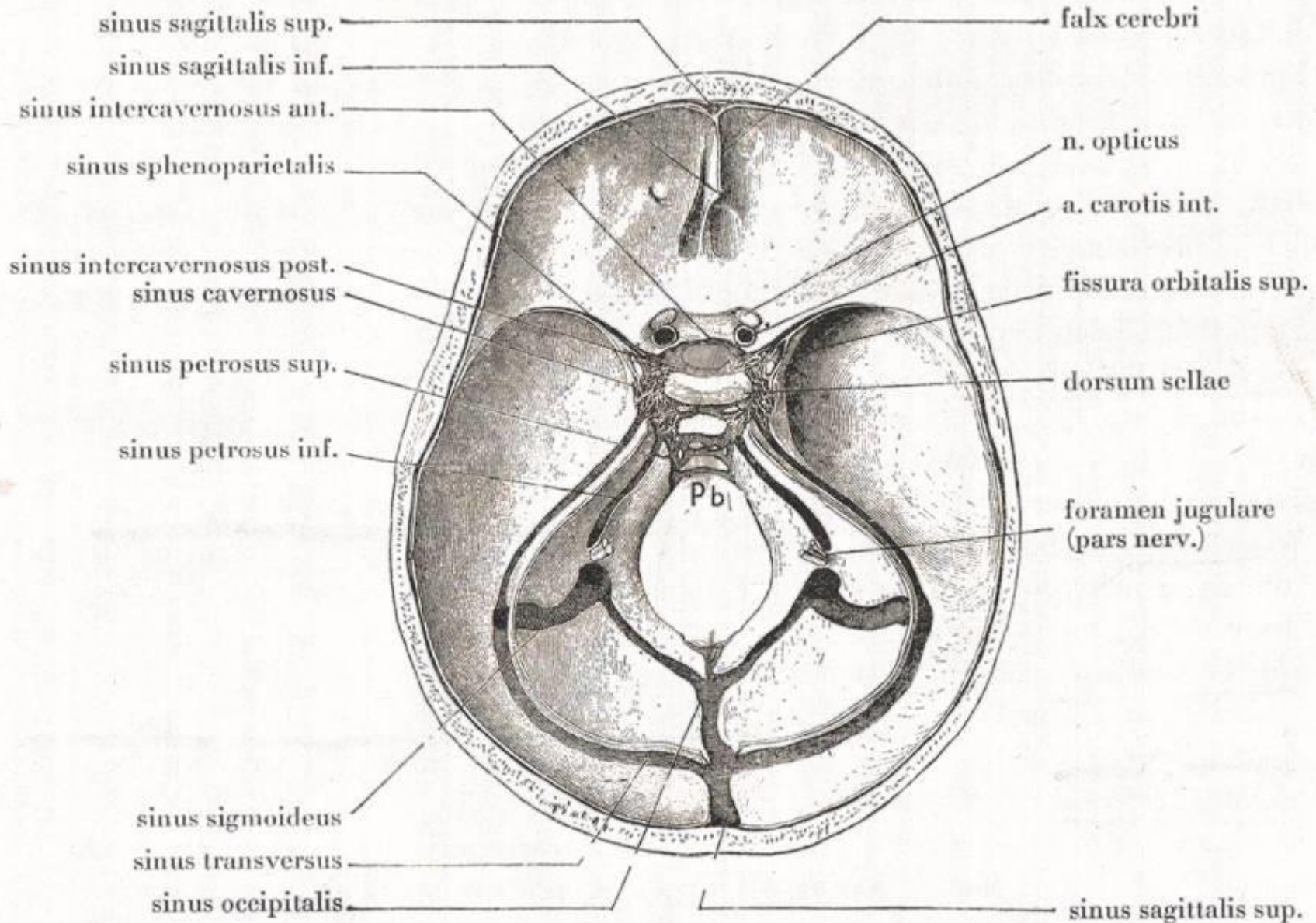
- within falx cerebri

**chordae  
Willisi**

**granulationes  
arachnoideae  
Pacchioni**



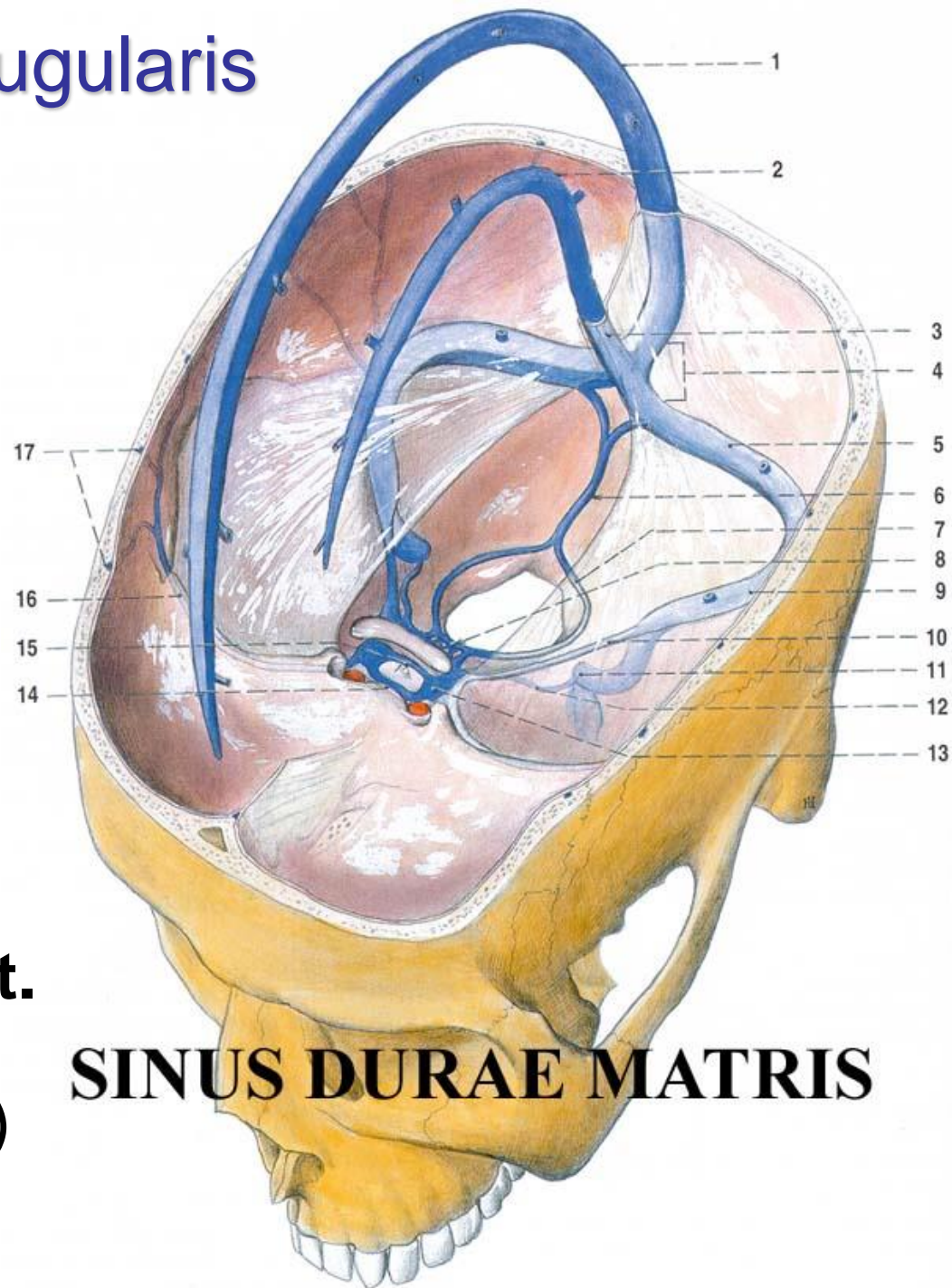
# Sinus durae matris



# Tributaries of vena jugularis interna 2.

paired:

- s. transversus (5)**
- s. sigmoideus (8)**
- s. petrosus sup. (10)**
- s. petrosus inf. (12)**
- s. marginalis (7)**
- s. cavernosus (13)**
- s. intercavernosus ant. (14)**
- s. intercavernosus post. (15)**
- s. sphenoparietalis (16)**
- s. petrosquamosus**



# Sinus cavernosus

- lateral to sella turcica
- little caverns (many chordae Willisi)

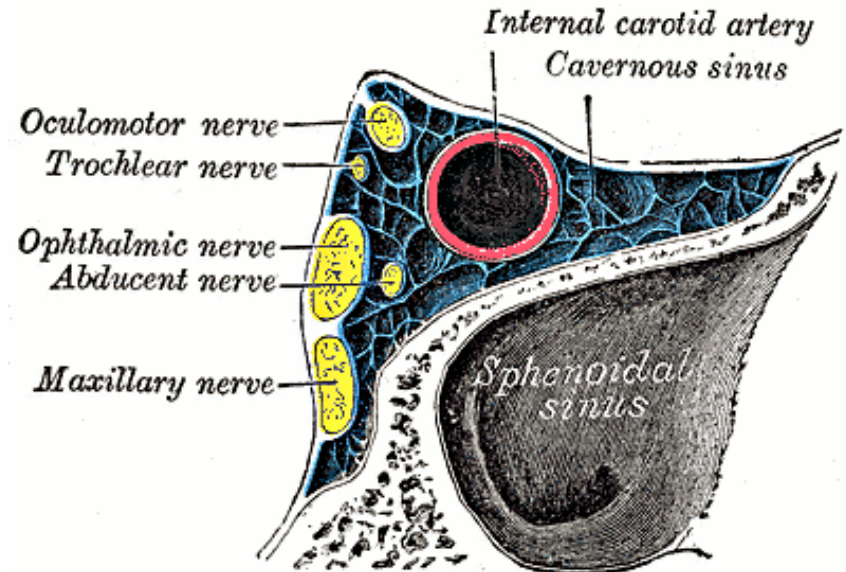
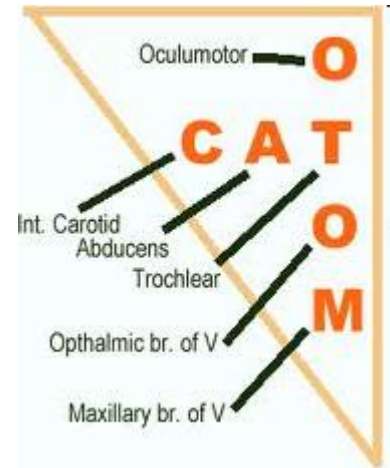
medially:

- a. carotis int. (pars C4)
- n. VI.

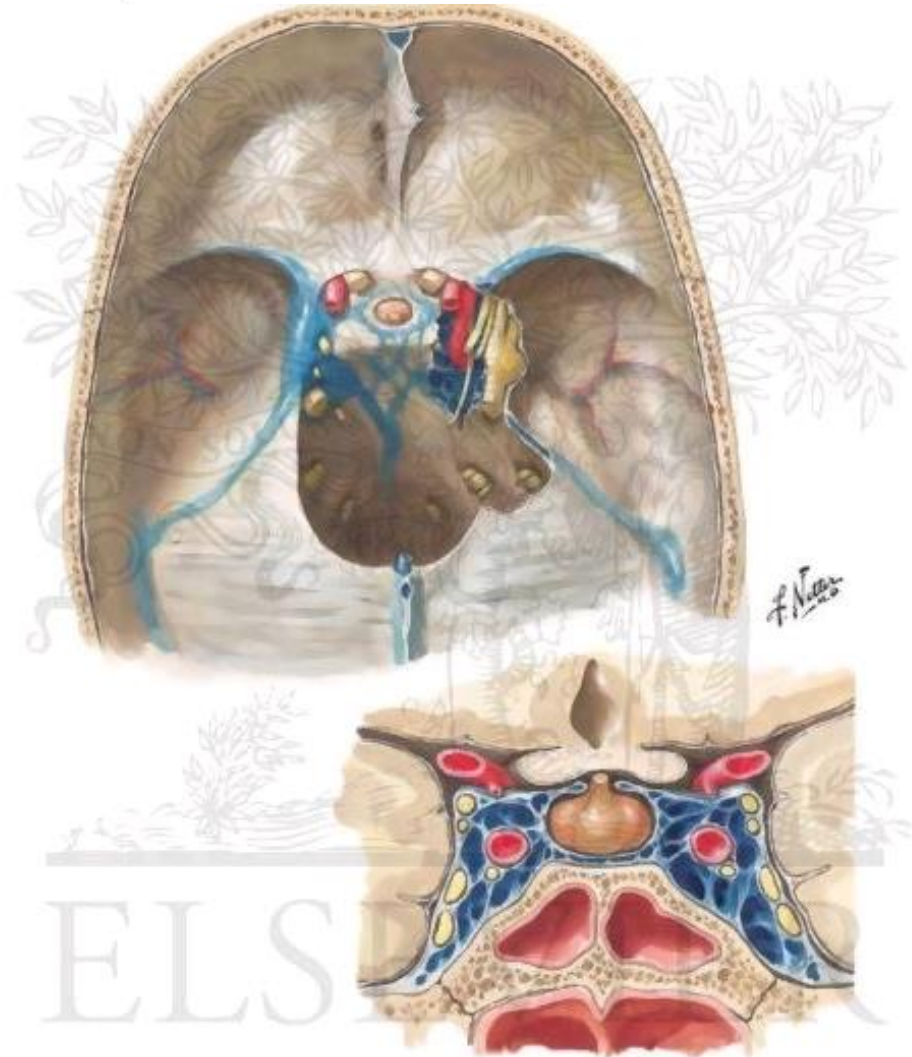
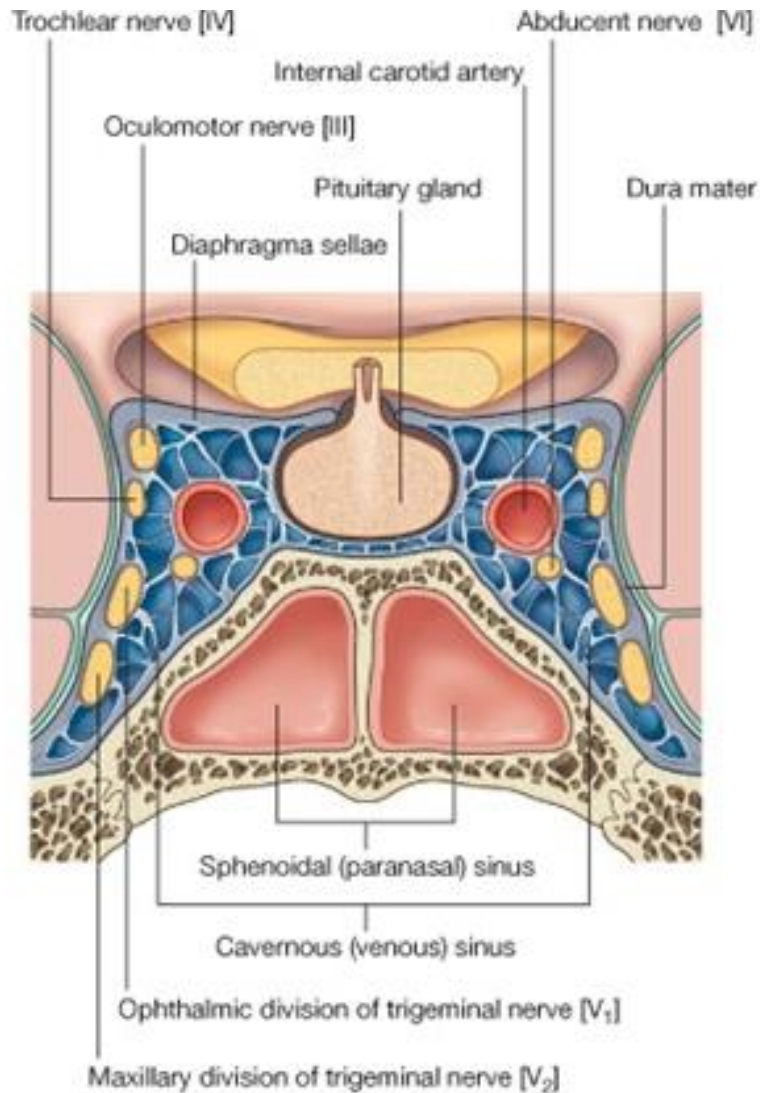
laterally:

- n. III
- n. IV
- n. V1
- n. V2

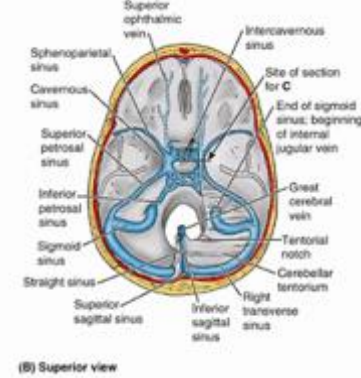
*thrombosis, infection spreading via orbit*



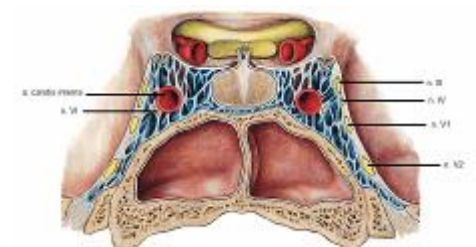
# Sinus cavernosus



# Sinus cavernosus connections and drainage



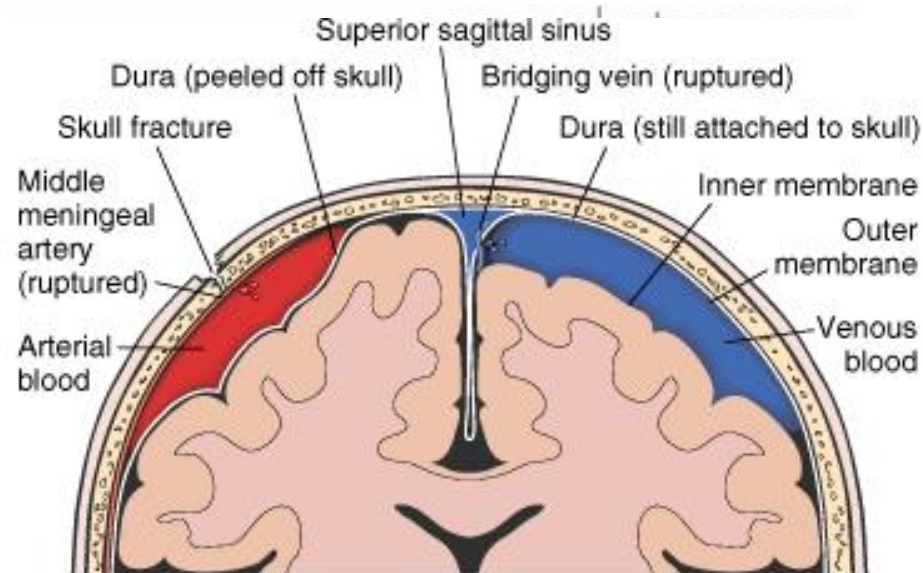
- vv. temporales profundae → v. diploica temp. ant. → sinus sphenoparietalis → SC
- SC → sinus petrosus sup. → sinus transversus
- SC → sinus petrosus inf. → bulbus VJI
- SC → plexus basilaris → sinus marginales → plexus venosus suboccipialis → vv. vertebrales
- SC → plexus venosus caroticus int. → VJI
- **SC → plexus venosus foraminis ovalis → plexus pterygoideus → v. maxillaris → v. retromandibularis**
- **SC → v. ophthalmica sup. → v. angularis → v. facialis**
- *infection spreading in reverse direction*



# Thrombophlebitis of cavernous sinus „danger triangle of the face“



# Tributaries of vena jugularis interna 3.



A. Epidural hematoma

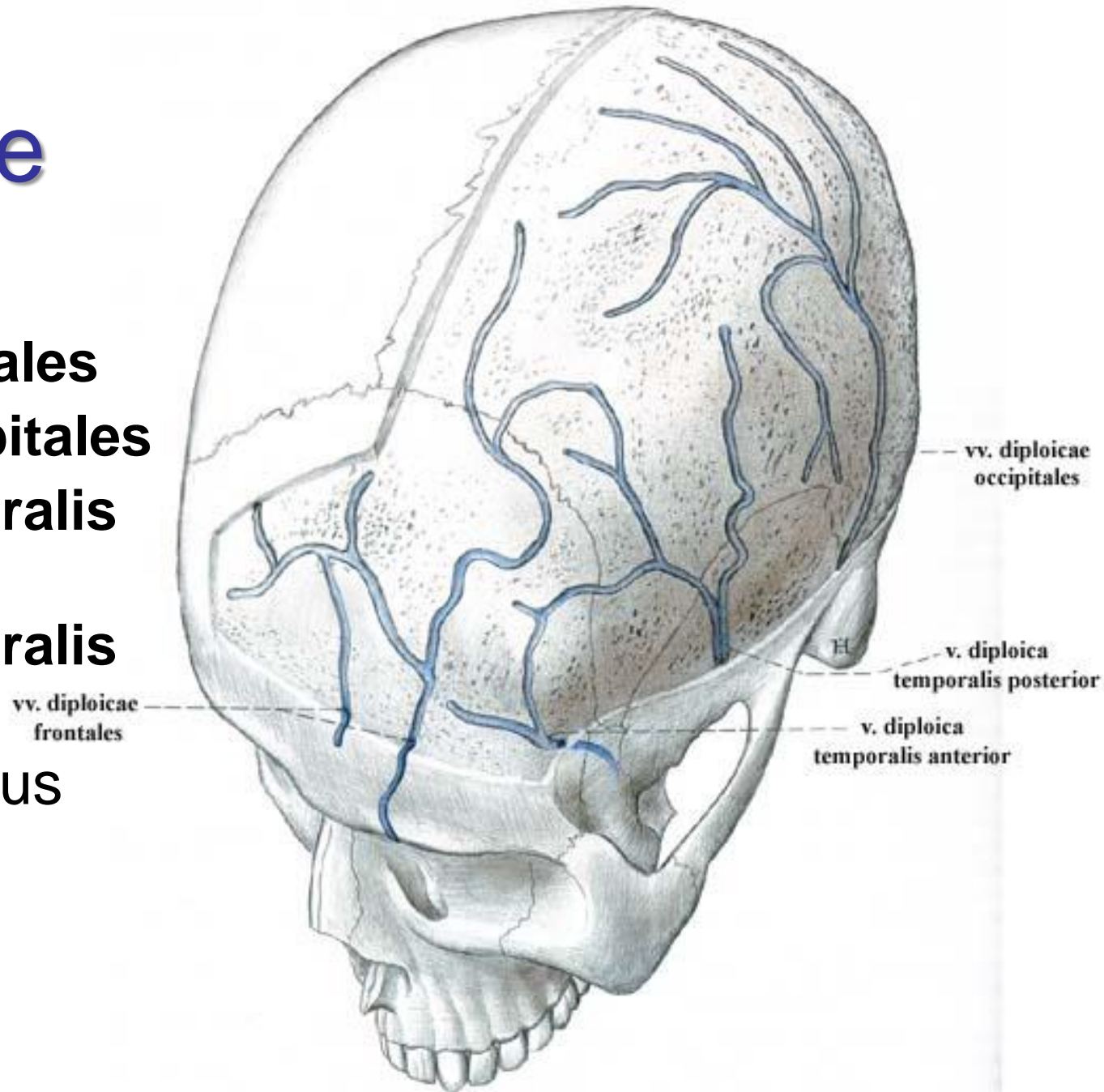
B. Subdural hematoma

- **vv. cerebri**
  - superficial (into sinuses)
    - subdural bleeding
  - deep (into vena cerebri magna *Galenii*)
- **vv. meningeae**
  - correspond to arteries
- **vv. diploicae**
  - 4 groups
  - no true venous wall
- **vv. labyrinthi**
  - correspond to arteries
- **vv. emissariae**
  - connections of intracranial and extracranial veins

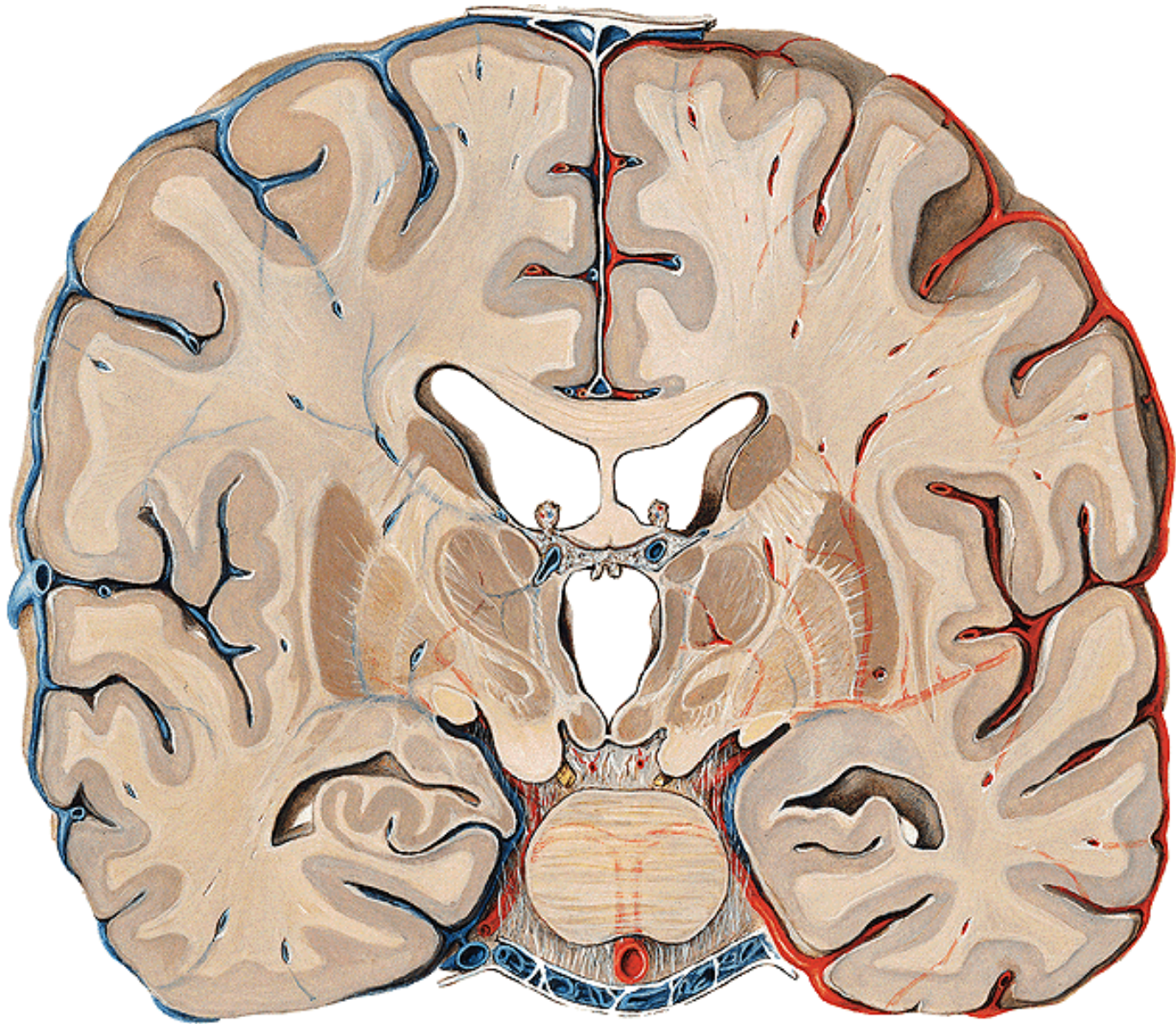


# Venae diploicae

- 4 groups
  - vv.d. frontales
  - vv.d. occipitales
  - v.d. temporalis anterior
  - v.d. temporalis posterior
- no true venous wall

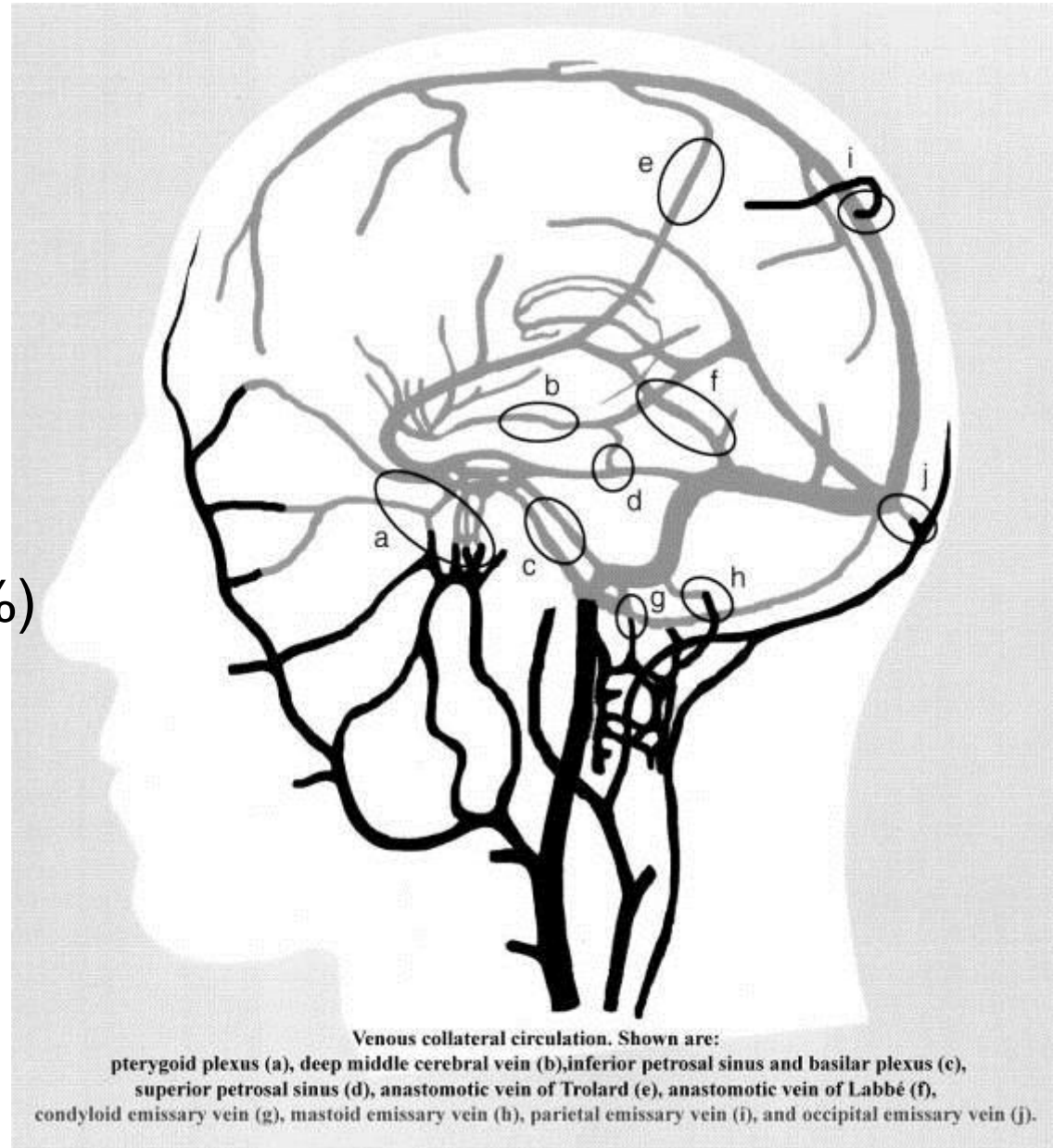


# Venae cerebri

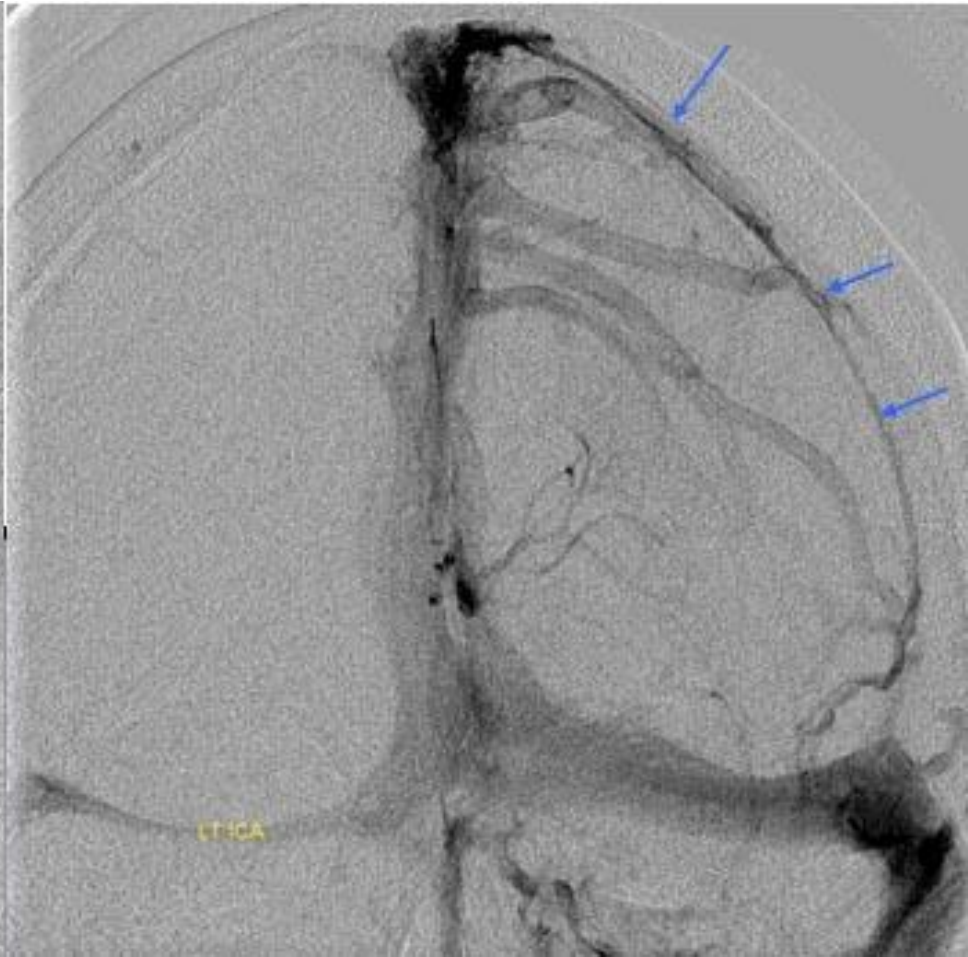
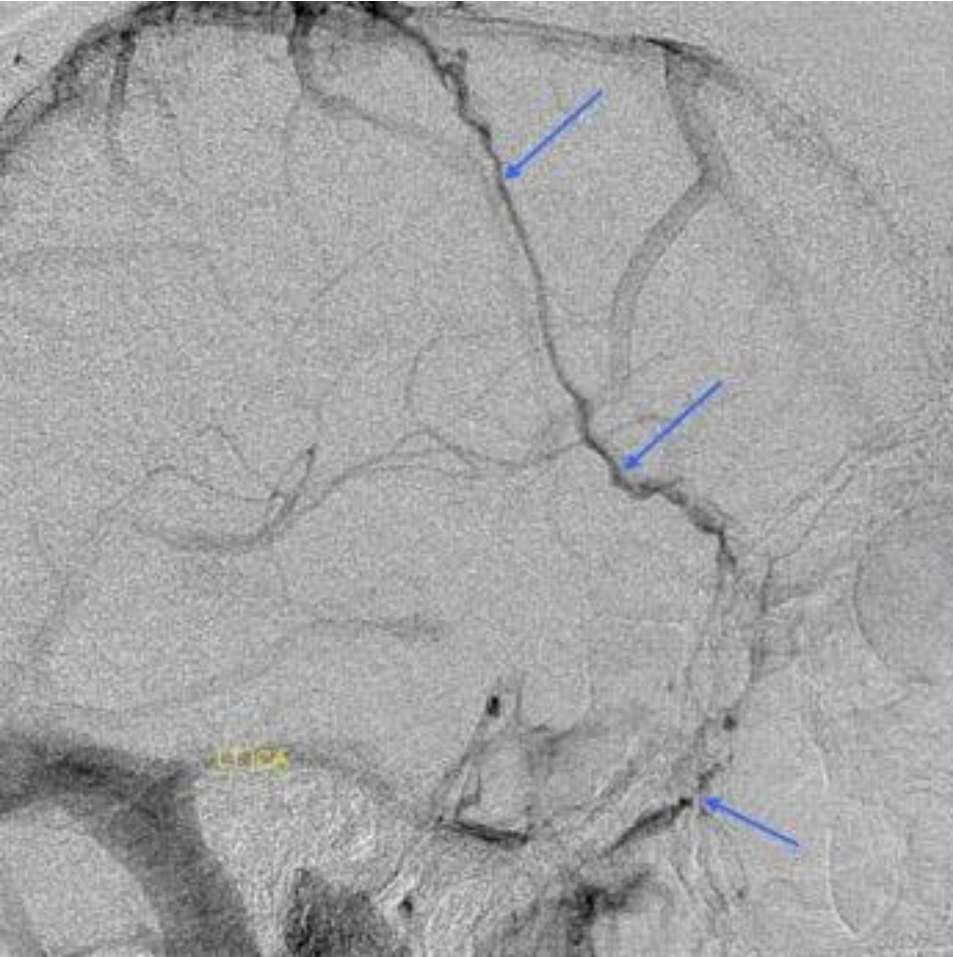
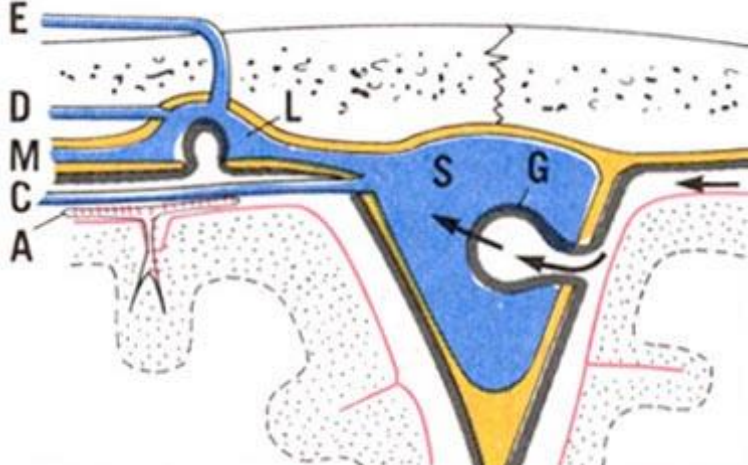


# Tributaries of vena jugularis interna 4. - vv. emissariae

- v. emissaria
  - parietalis
  - mastoidea
  - condylari
  - occipitalis
  - (foraminis venosi Vesalii – 40%)
  - (foraminis caeci – 1%)
- plexus venosus
  - canalis n. hypoglossi
  - foraminis ovalis
  - caroticus internus
- other:
  - vv. ophthalmicae



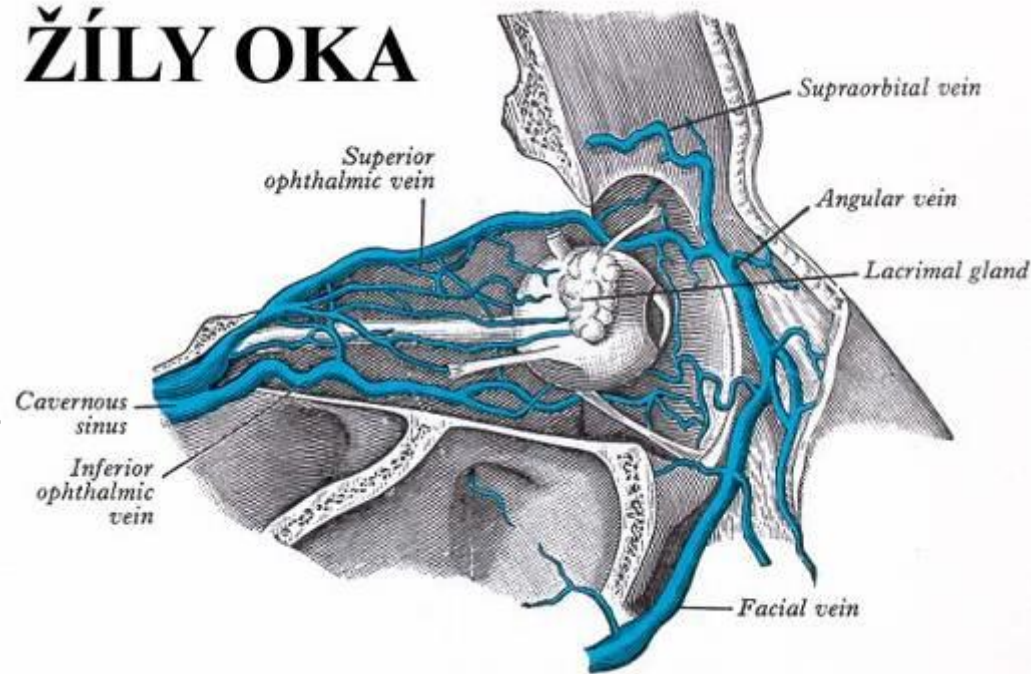
# Vv. emissariae



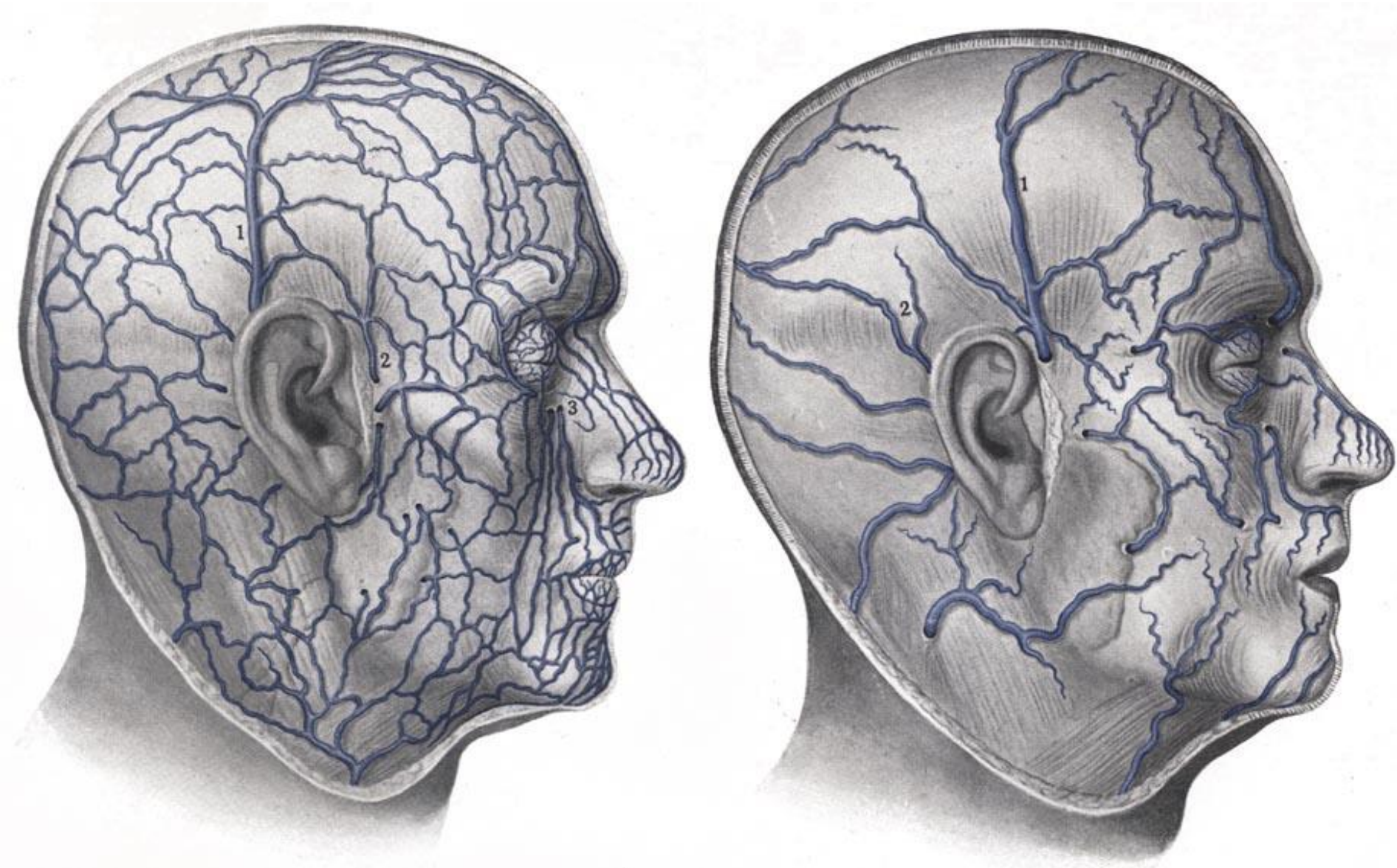
# Tributaries of vena jugularis interna 5.

- vv. ophthalmicae
  - superior
  - inferior
- v. retromandibularis
  - plexus pterygoideus
- v. facialis
  - v. profunda faciei
- v. lingualis
  - v. comitans n. hypoglossi
- vv. pharyngeae: plexus venosus pharyngeus
- vv. thyroideae sup. + media *Kocheri*

## ŽÍLY OKA



# Superficial veins of head



# Tributaries of vena jugularis interna 6.

superficial veins of neck

between platysma and lamina superficialis fasciae cervicalis

- v. jugularis externa

- v. auricularis post.

- posterior division of v. retromandibularis

- end: angulus venosus

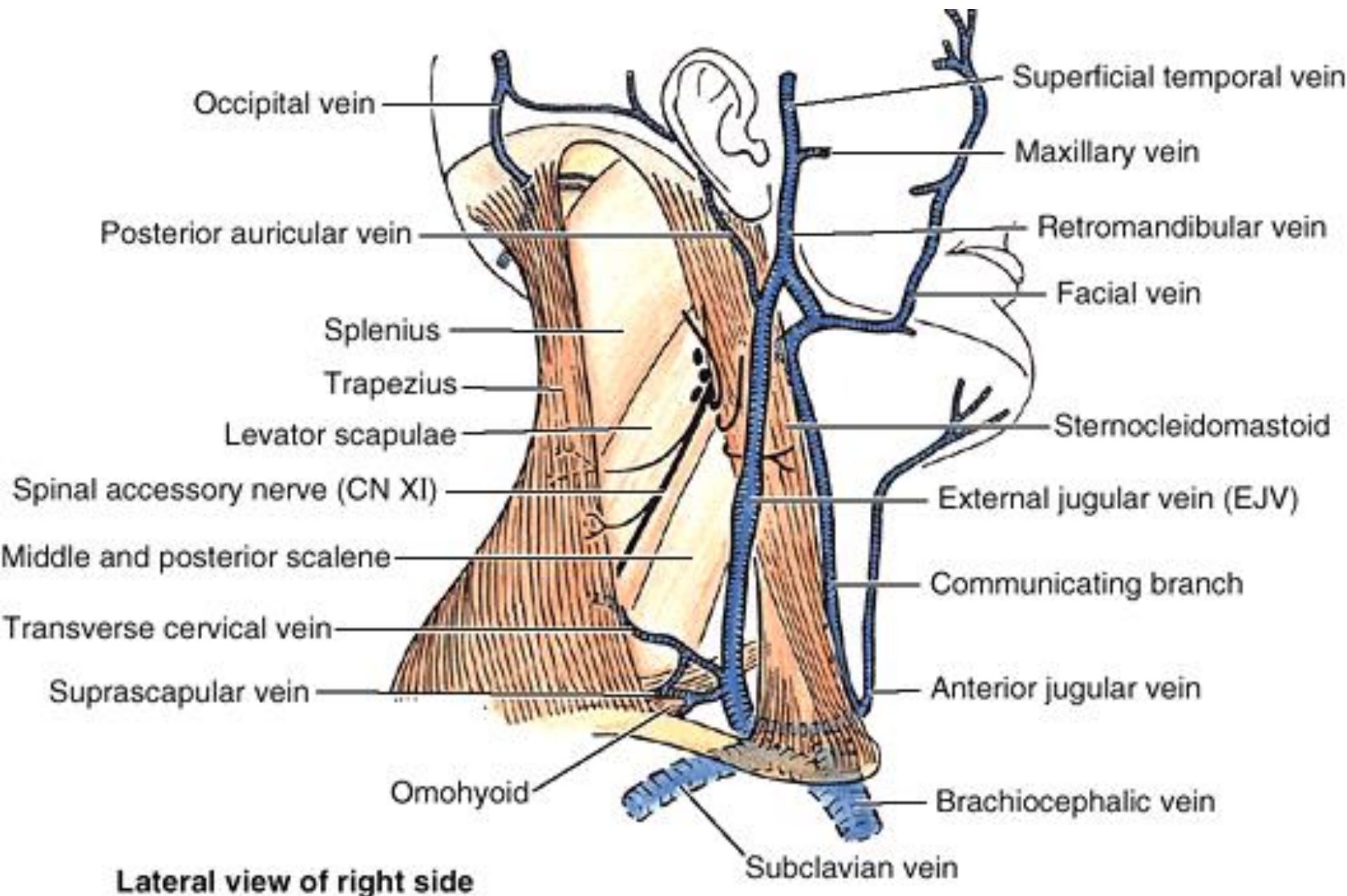
- v. jugularis anterior

- tributary of superficial submandibular veins

- arcus venosus jugularis (! *tracheotomia inferior* !)

- end: v. jugularis ext.

*alternating termination into area of angulus venosus !*





# ŽÍLY HLAVY

# VEINS OF HEAD

v. temporalis superficialis

v. maxillaris

v. occipitalis

v. auricularis post.

v. retromandibularis

v. facialis

v. jugularis int.

*m. platysma*

v. supratrochlearis

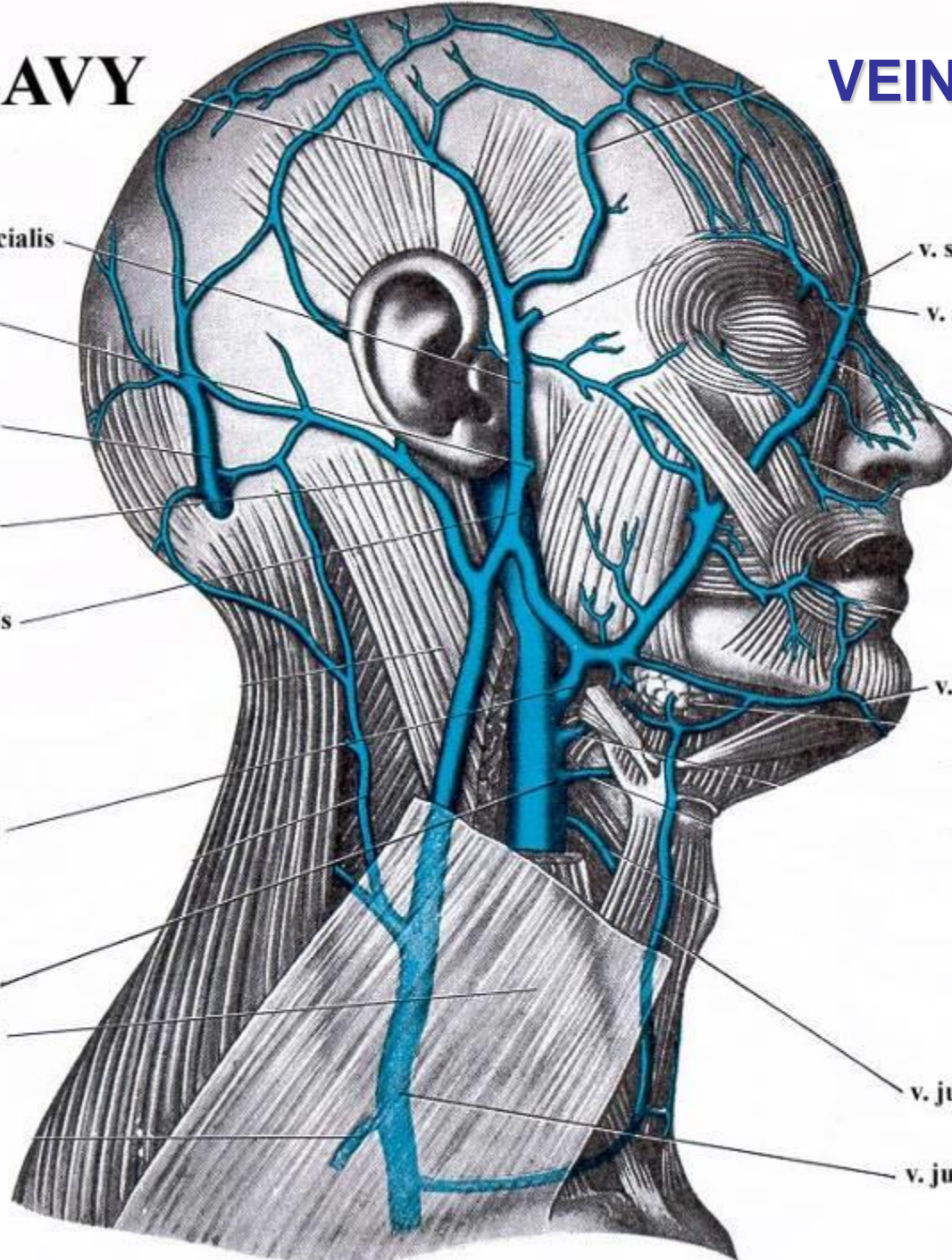
v. supraorbitalis

v. angularis

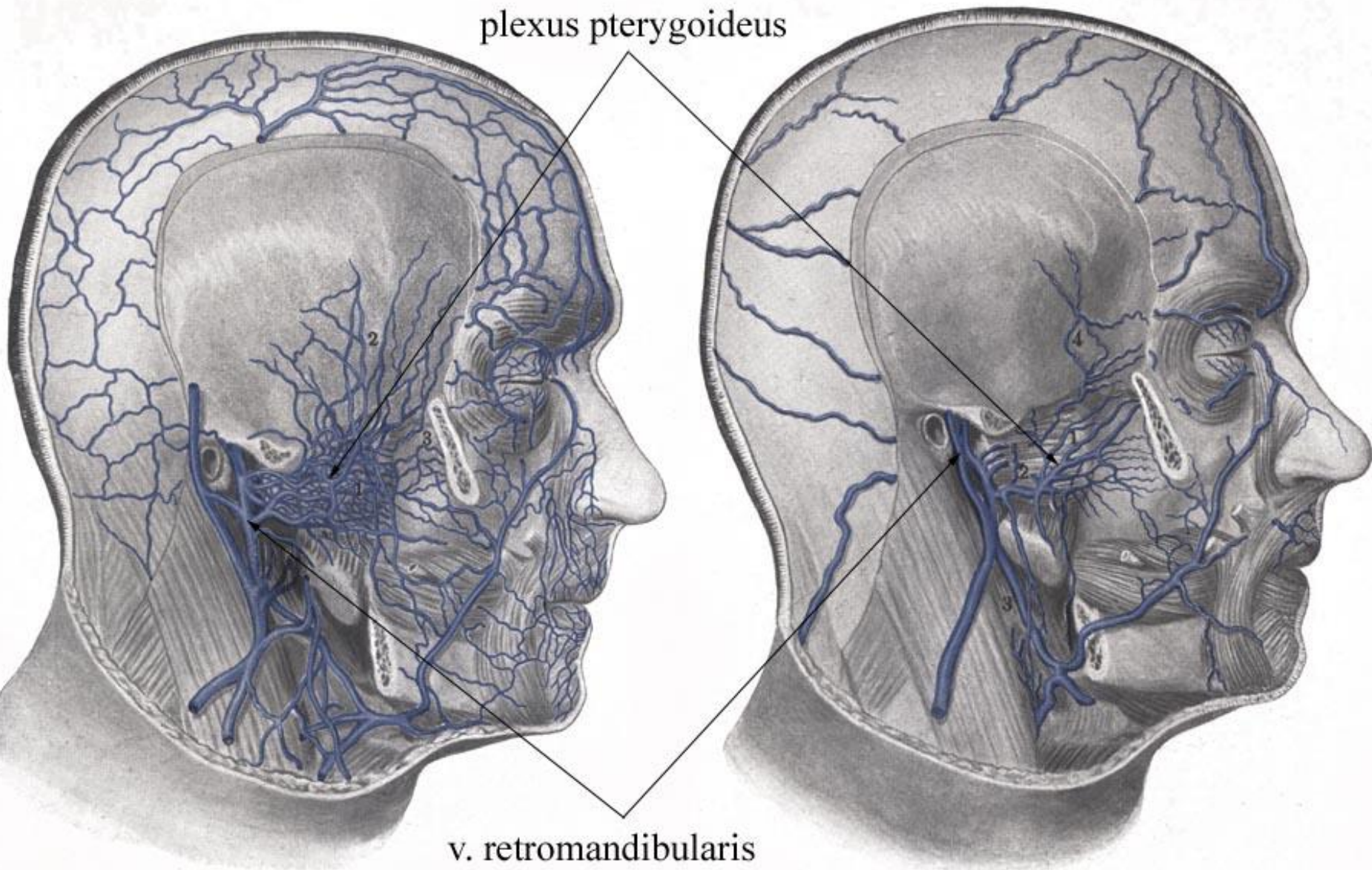
v. submental

v. jugularis ant.

v. jugularis ext.

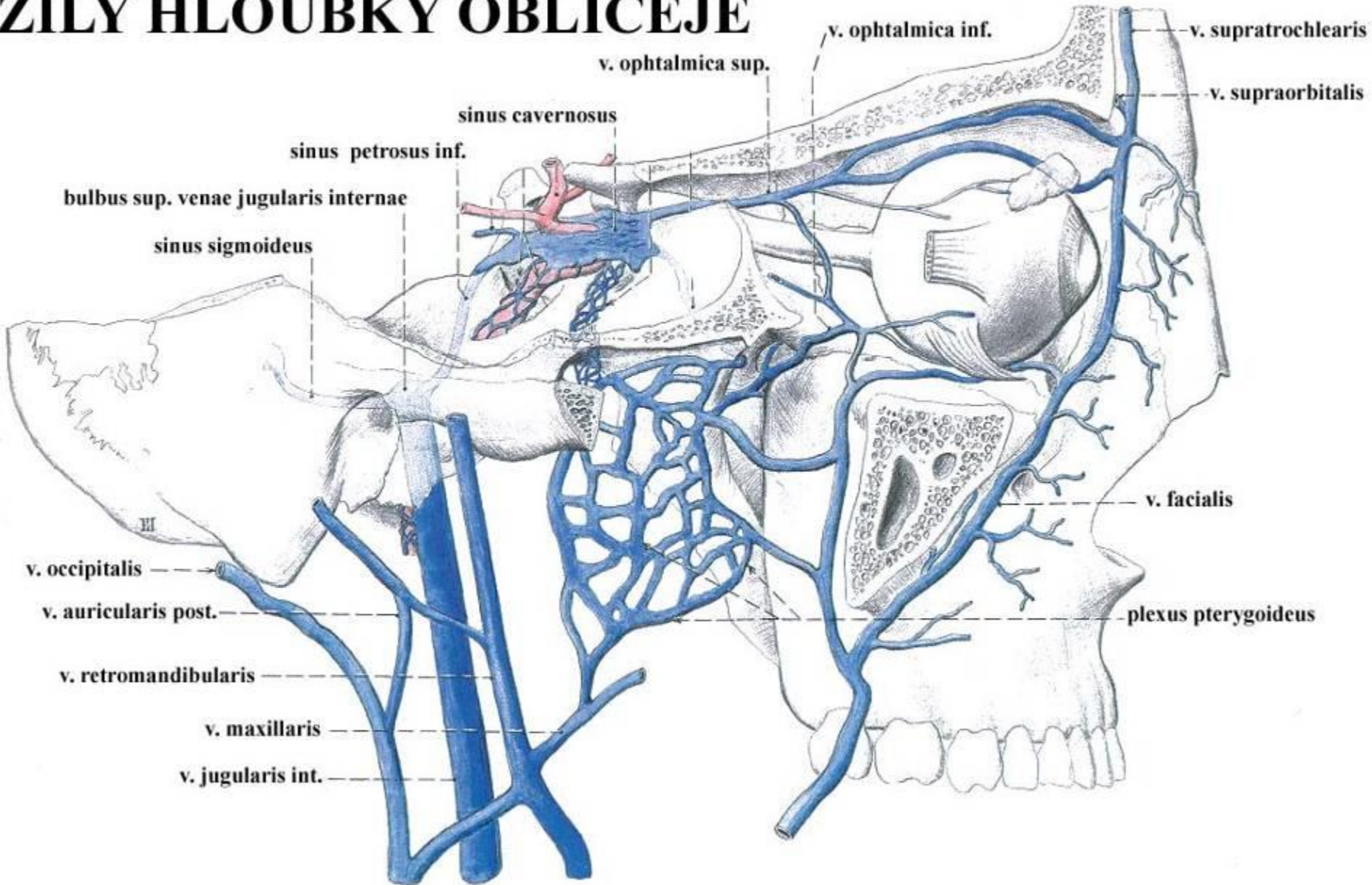


# Deep veins of face



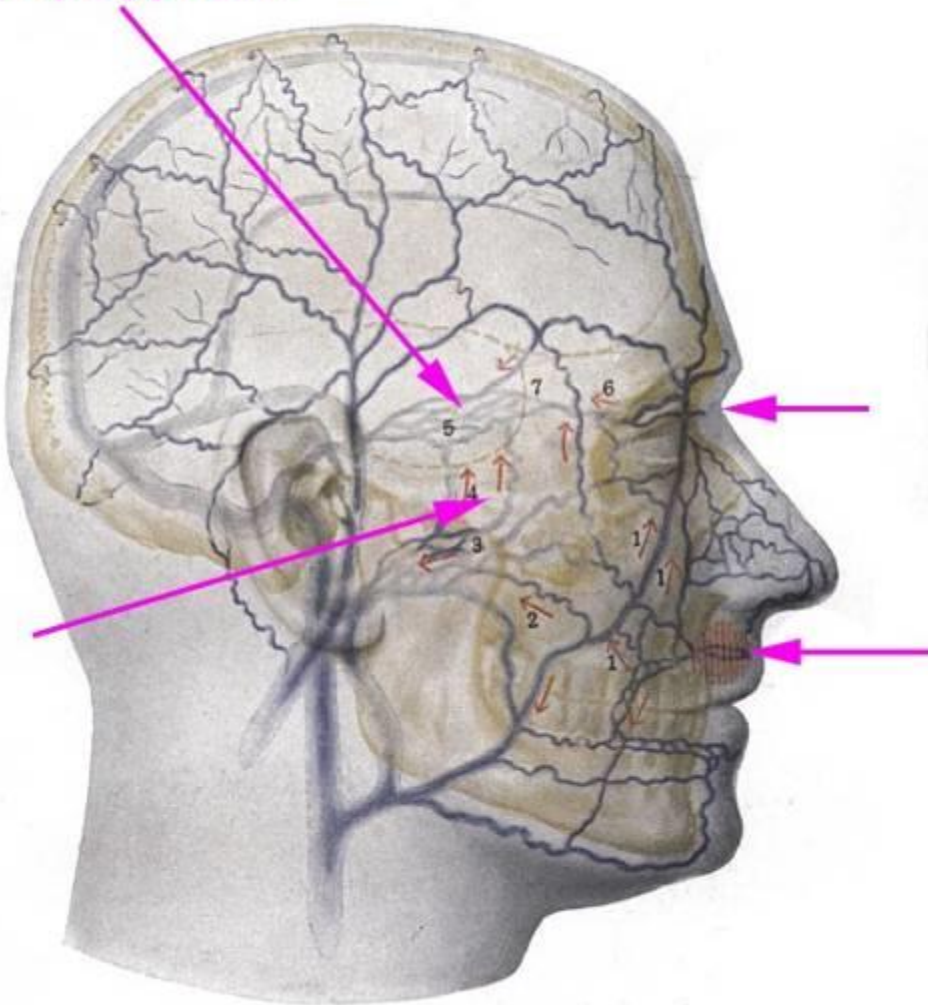
# DEEP VEINS OF FACE

## ŽÍLY HLOUBKY OBLIČEJE

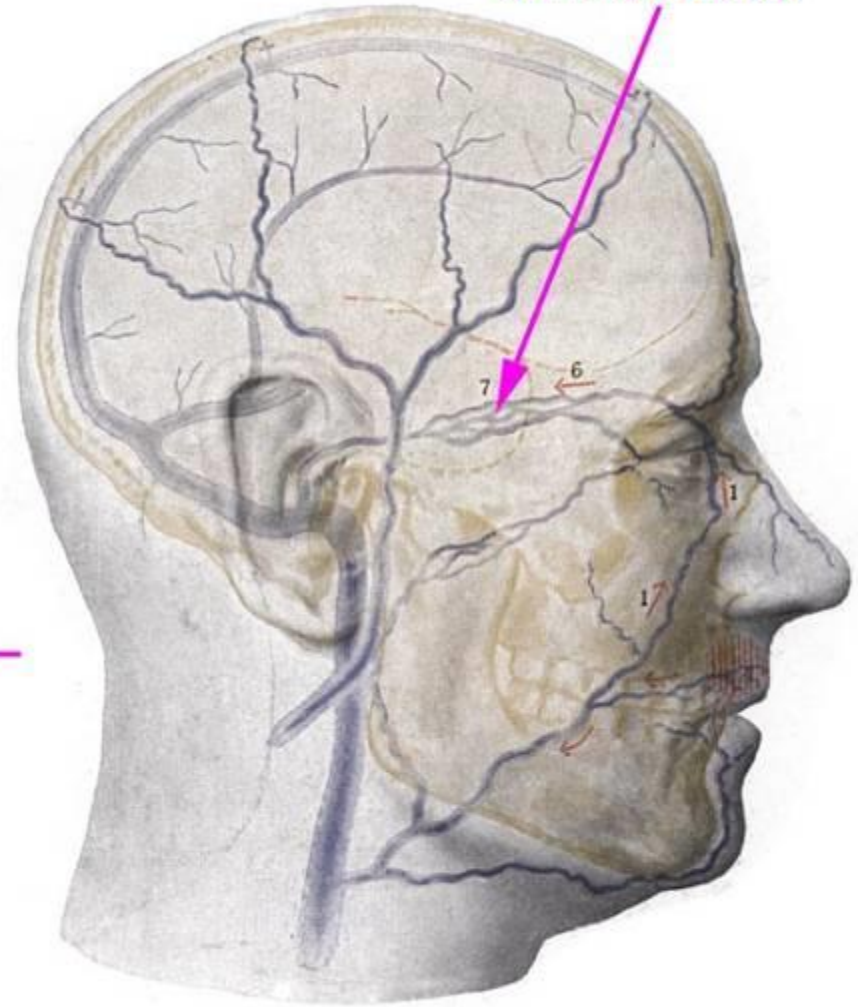


# Ways of infection spreading via head veins

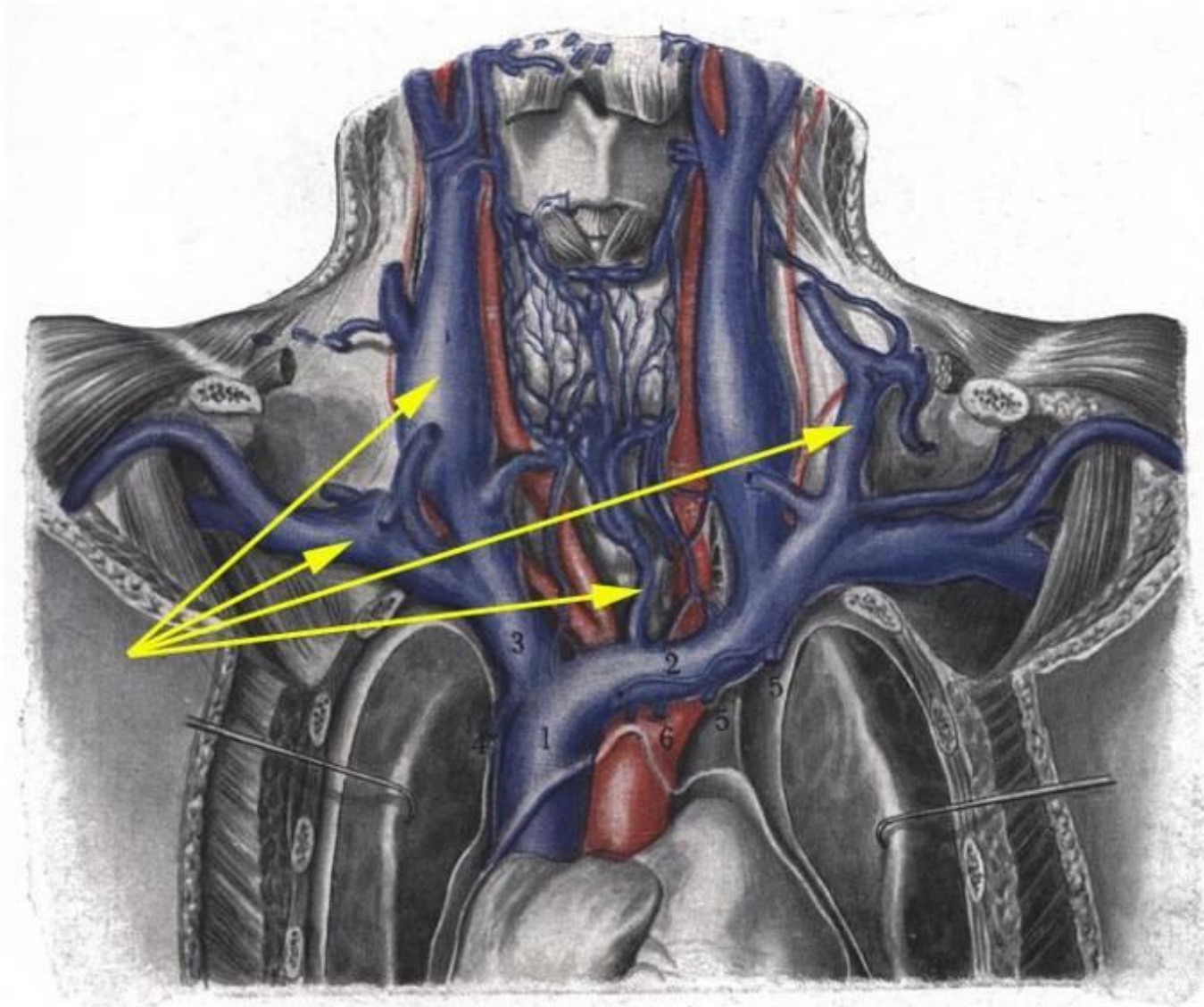
plexus pterygoideus



sinus cavernosus



# Risk of air embolism into neck veins



# Central venous catheterization

- **v. jugularis int.**
- **v. subclavia** – infraclavicular (*less supraclavicular approach*)
- v. femoralis (urgent approach)
- v. axillaris, v. mediana cubiti, v. jugularis ext.
- v. umbilicalis (newborns)
- complications: infection, pneumothorax, hemothorax, plexus brachialis injury, air embolism

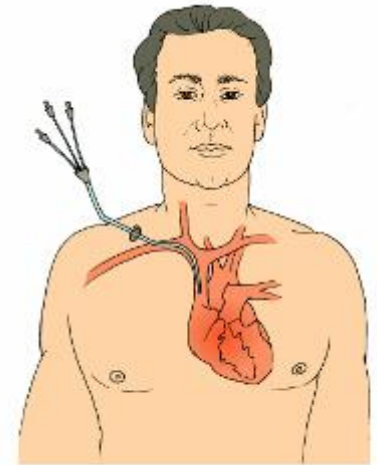


Figure 46-10 Placement of triple-lumen nontunneled percutaneous central venous catheter.

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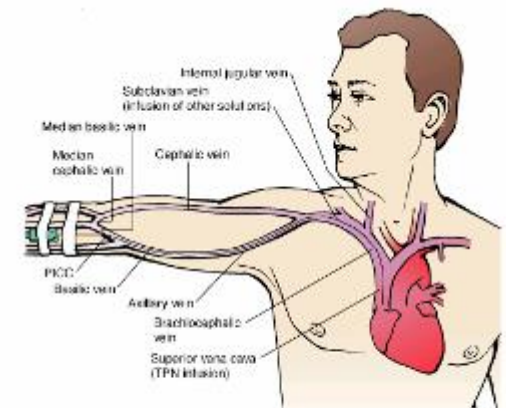


Figure 46-9 Placement of peripherally inserted central catheter (PICC).

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# Central venous catheterization

## **permanent venous approach**

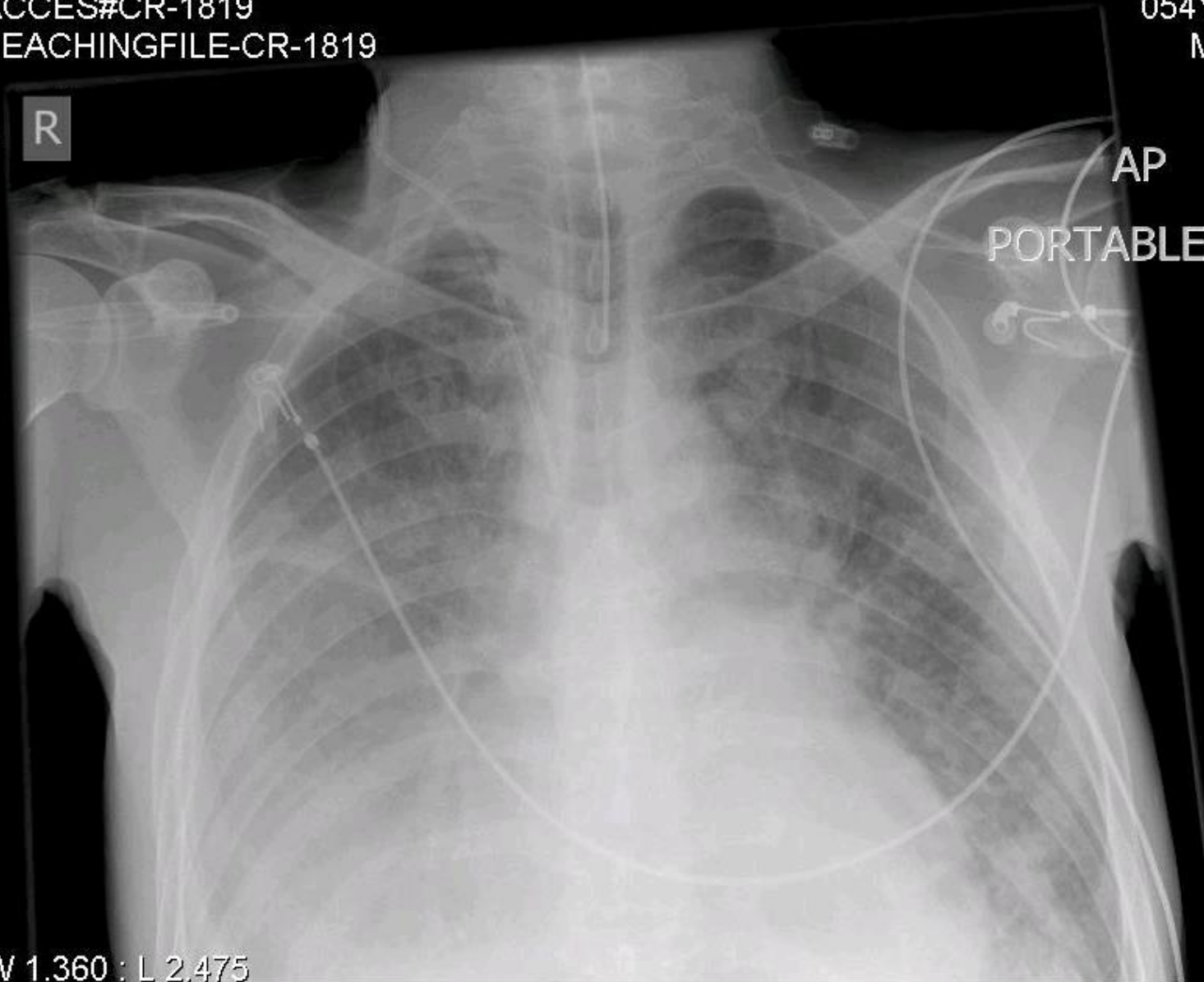
- central veins do not collapse during shock
- monitoring of central venous pressure
- large volume replacement
- application of parenteral nutrition
- application of catecholamines, substances irritating venous wall (cytostatics, glucose), high-osmolar solutions
- dialysis

# Central venous catheterization

ACCES#CR-1819  
TEACHINGFILE-CR-1819

054Y  
M

□ R



AP

PORTABLE

W 1.360 : L 2.475

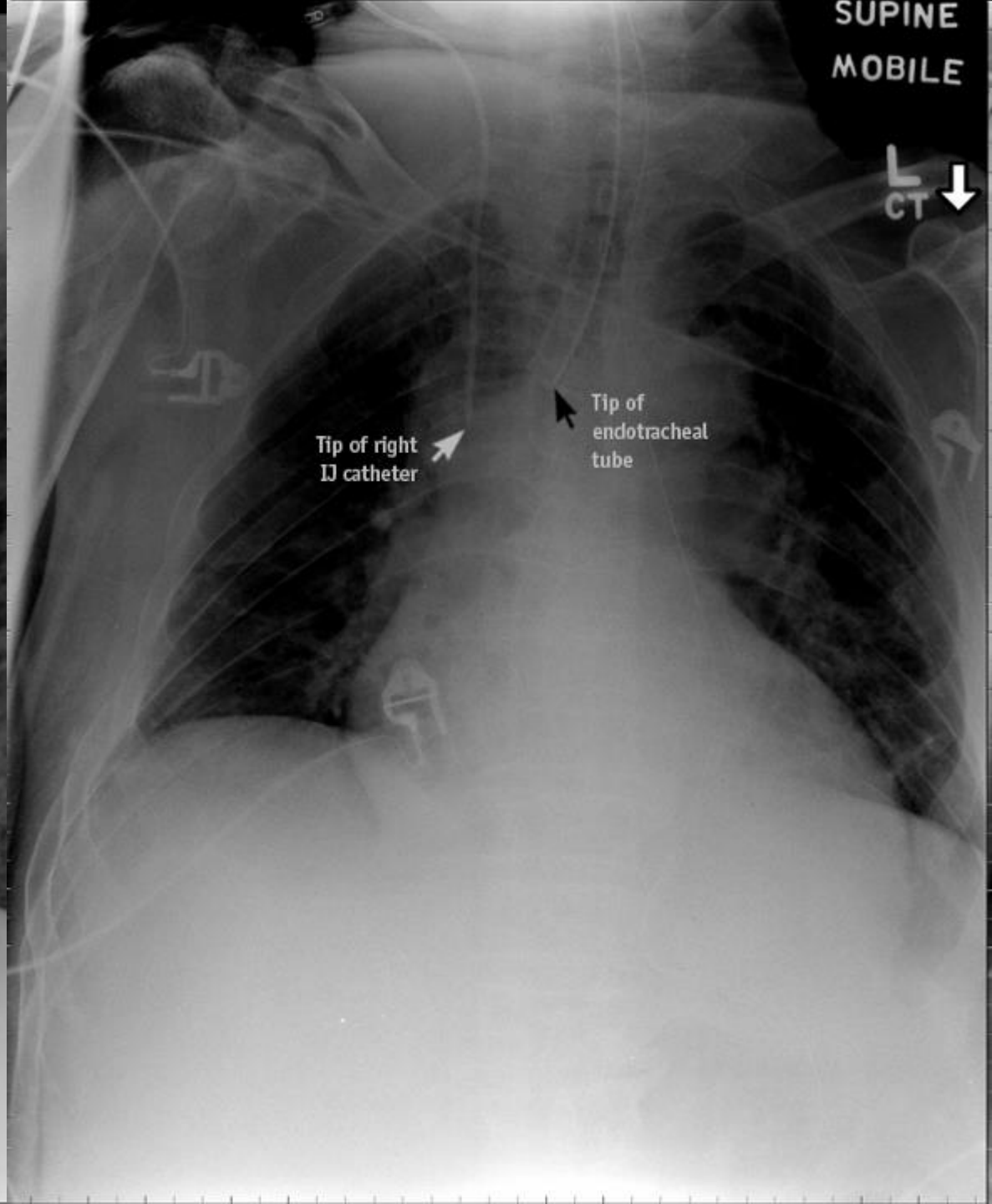


MOBILE

SUPINE

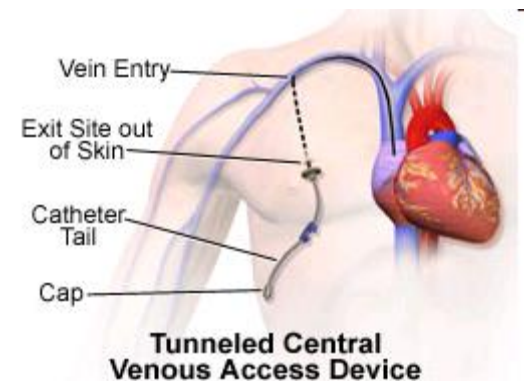
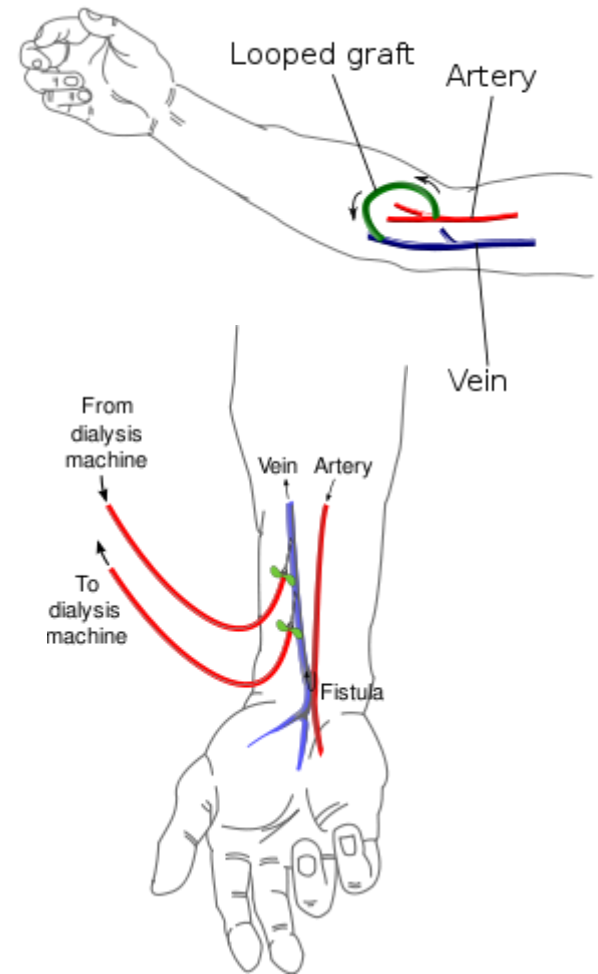
R104

Tip of right  
IJ catheter

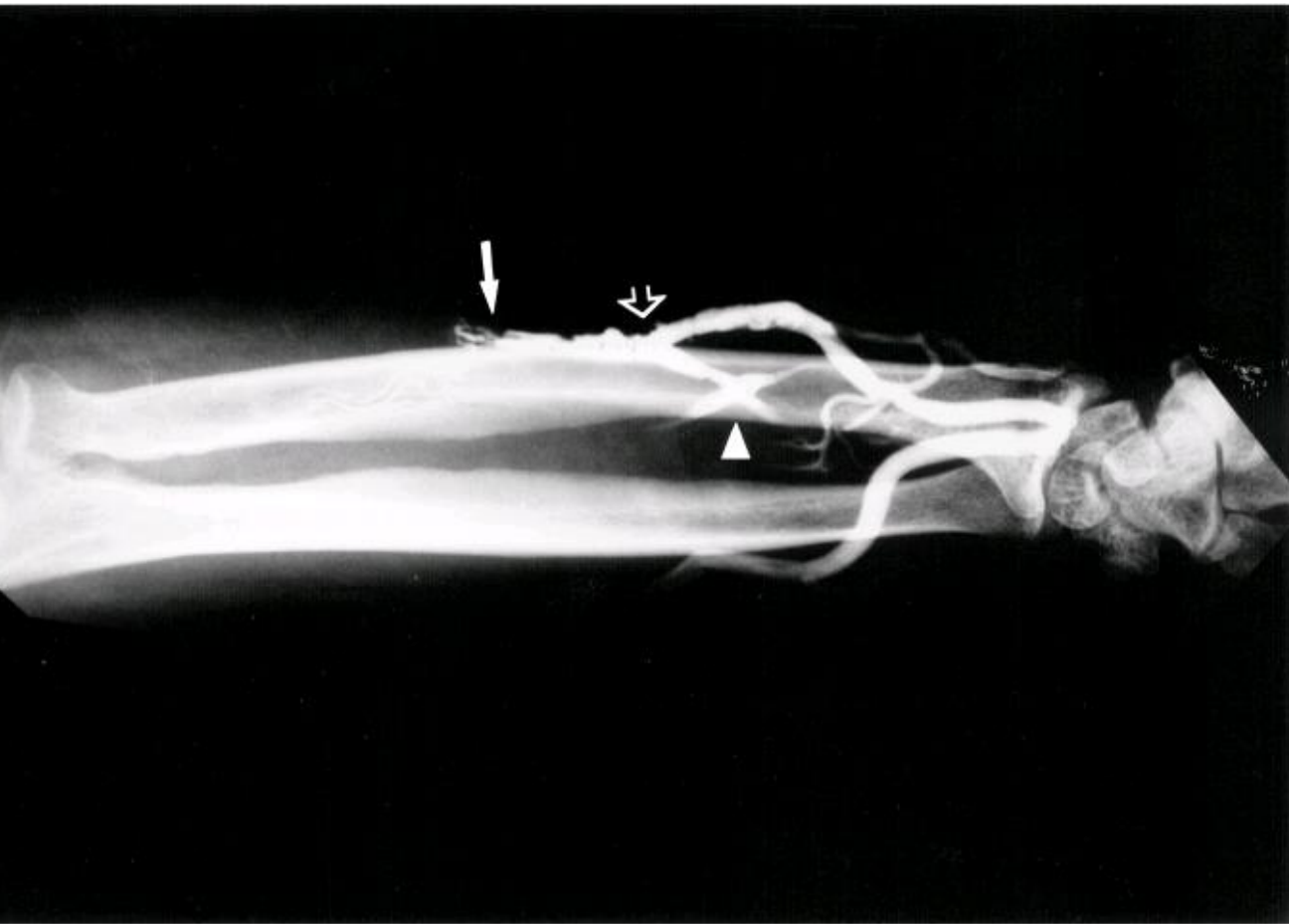


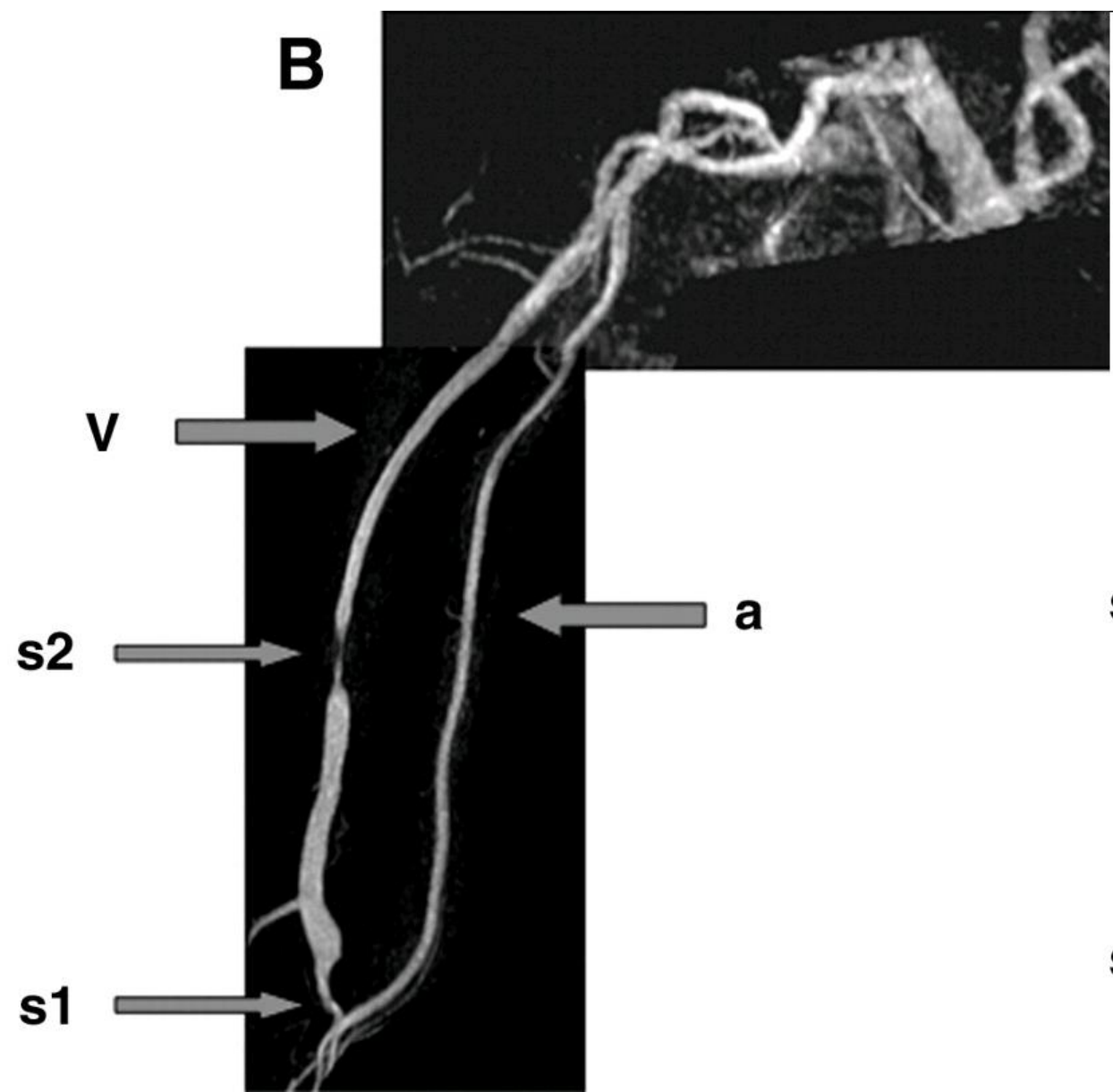
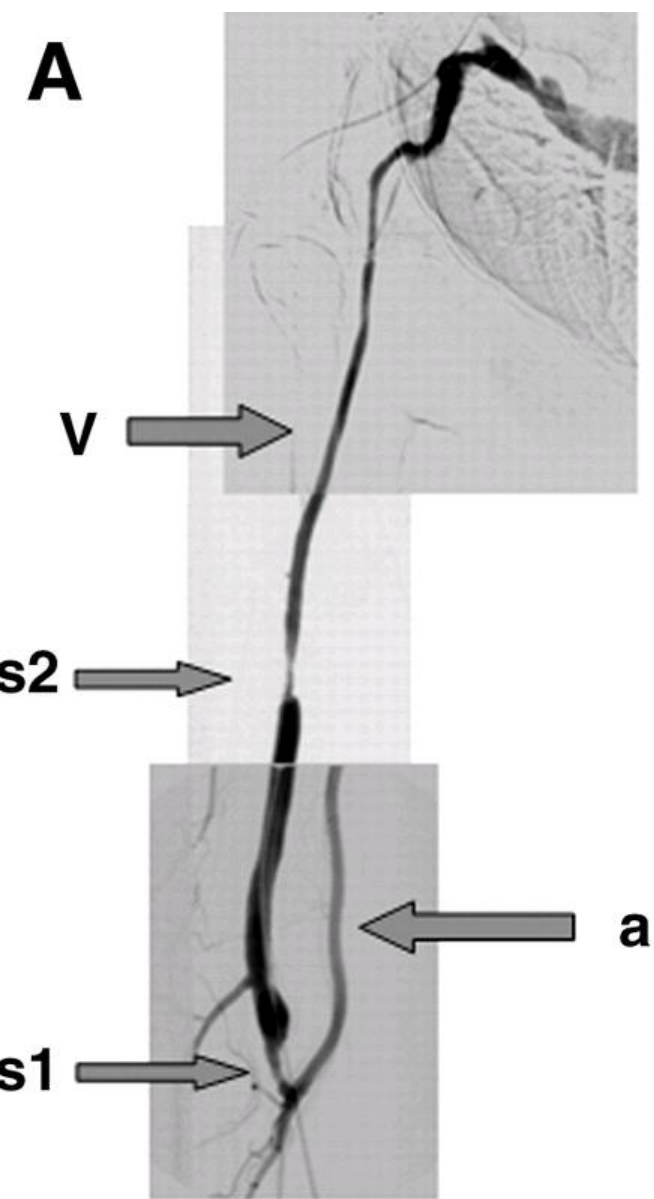
# A-V fistula

- iatrogenous
- dialysis
- radiocephalic
- cubital (Gracz)
- (ulnarocephalic, brachiocephalic, brachiobasilic)
- (LL: tibiosaphenous)
- radiocephalic with graft
- tunneled central



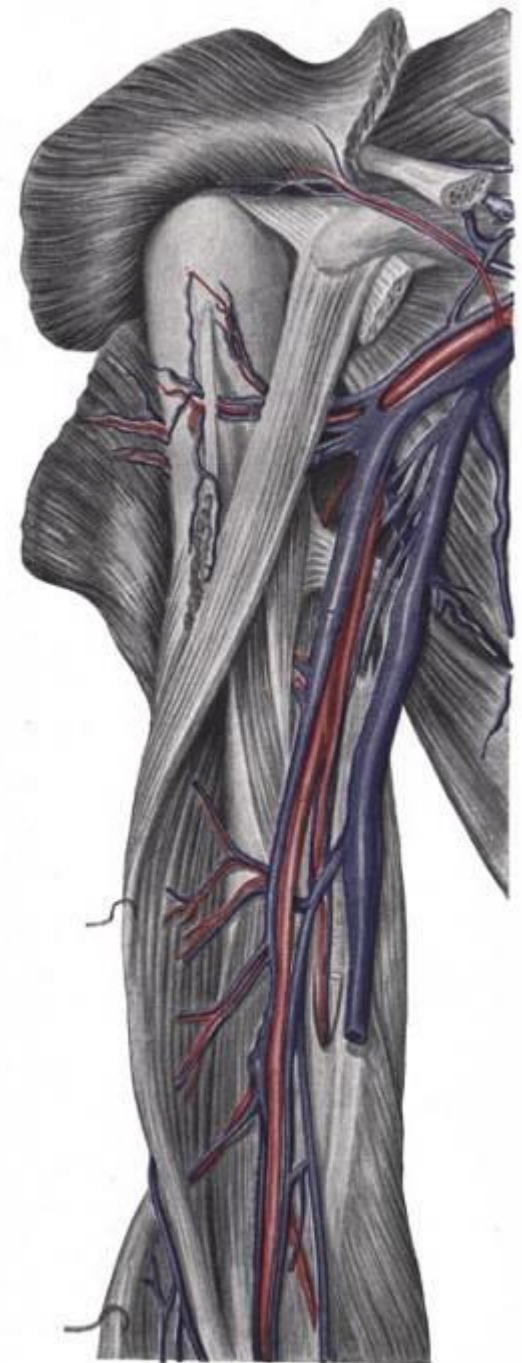
# Radiocephalic A-V fistula





# Veins of UL

- superficial system
- deep system
  - accompany arteries
  - doubled up to axilla
  - frequent connections around artery
  - frequent valves
- v. subclavia
  - small tributaries only



# Superficial veins of UL

- v. axillaris
  - v. cephalica
  - vv. thoracoepigastricae
  - vv. costoaxillares
- v. brachialis (doubled)
  - v. basilica

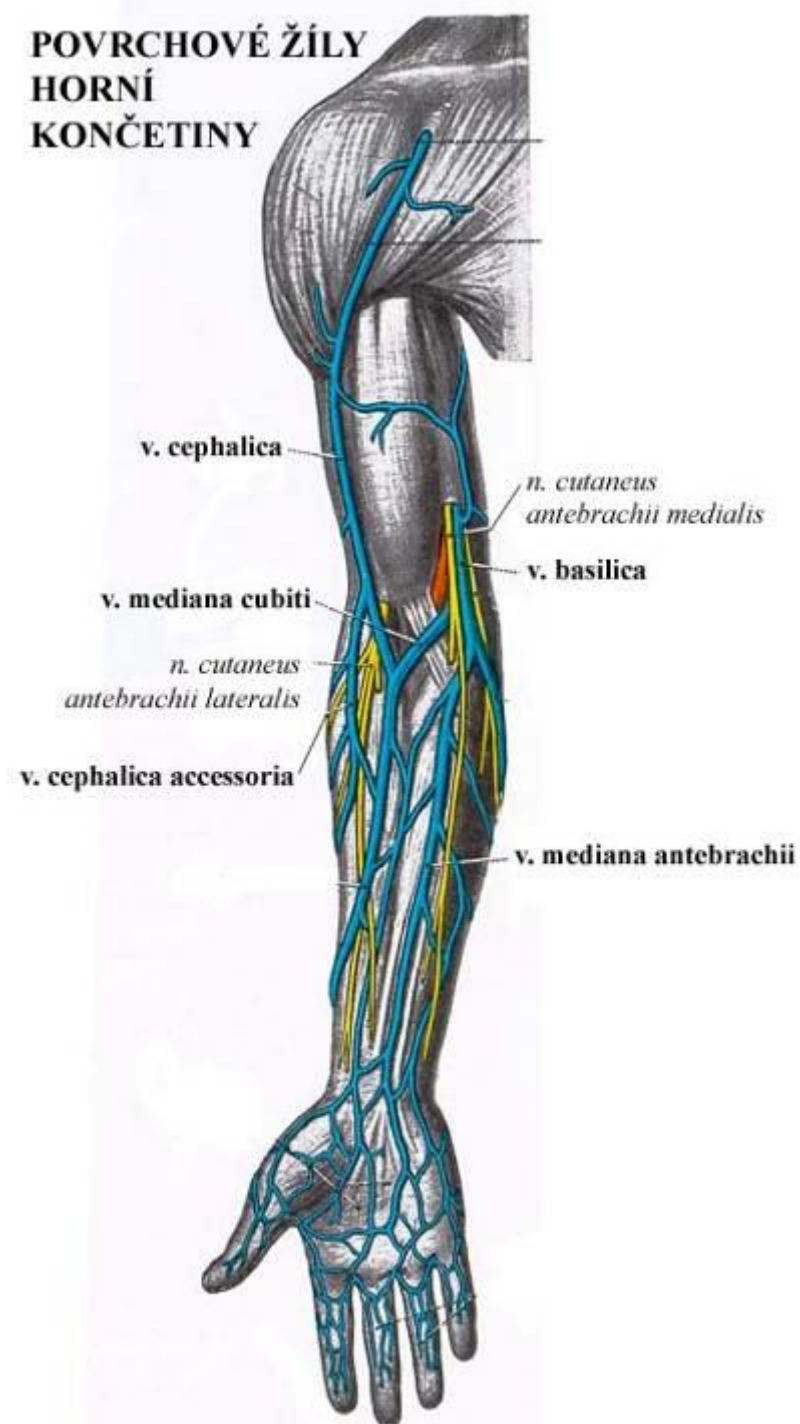
v. mediana cubiti + antebrachii

rete venosum dorsale manus

rete carpi dorsale

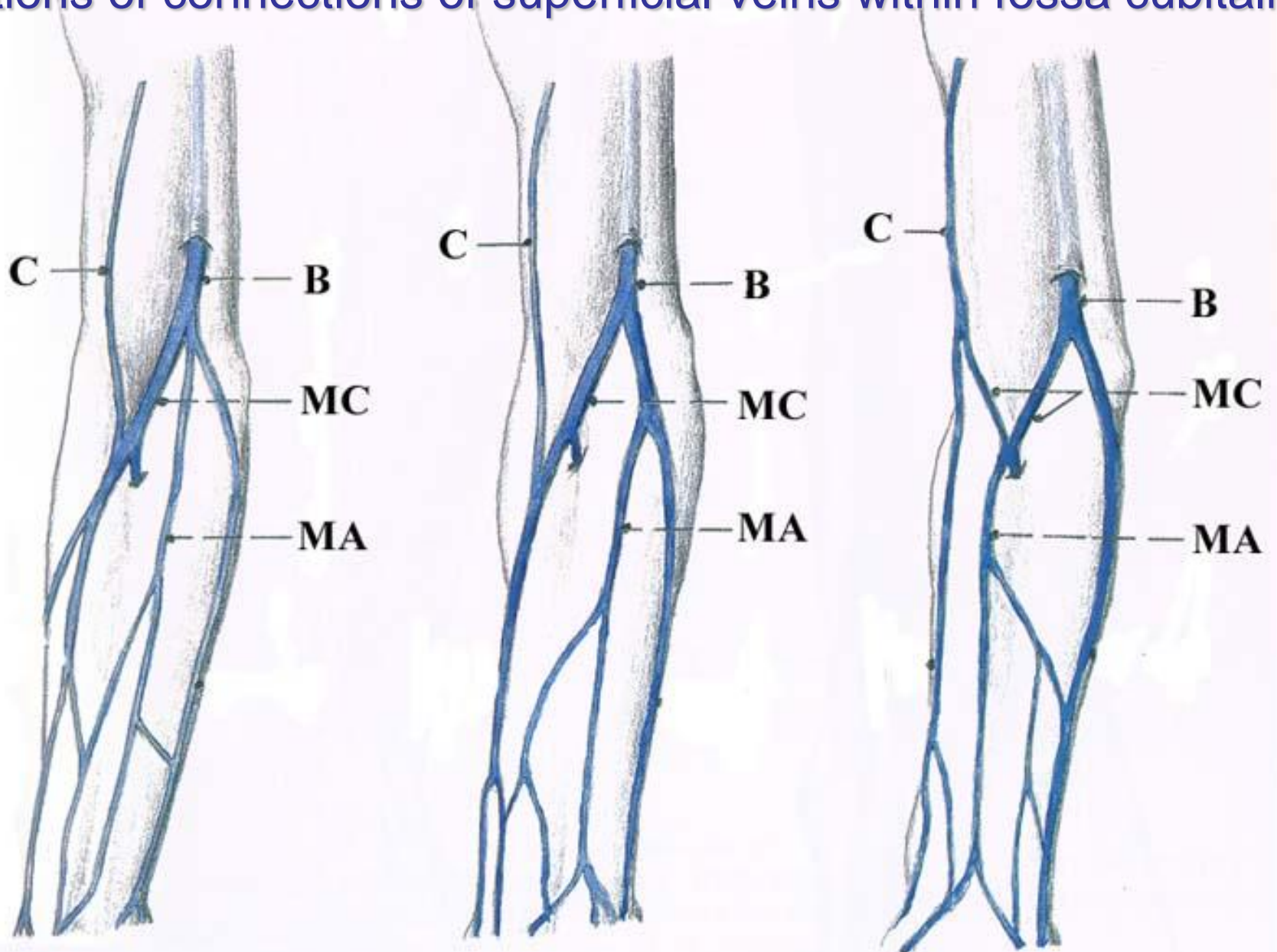
vv. intercapitulares

POVRCHOVÉ ŽÍLY  
HORNÍ  
KONČETINY

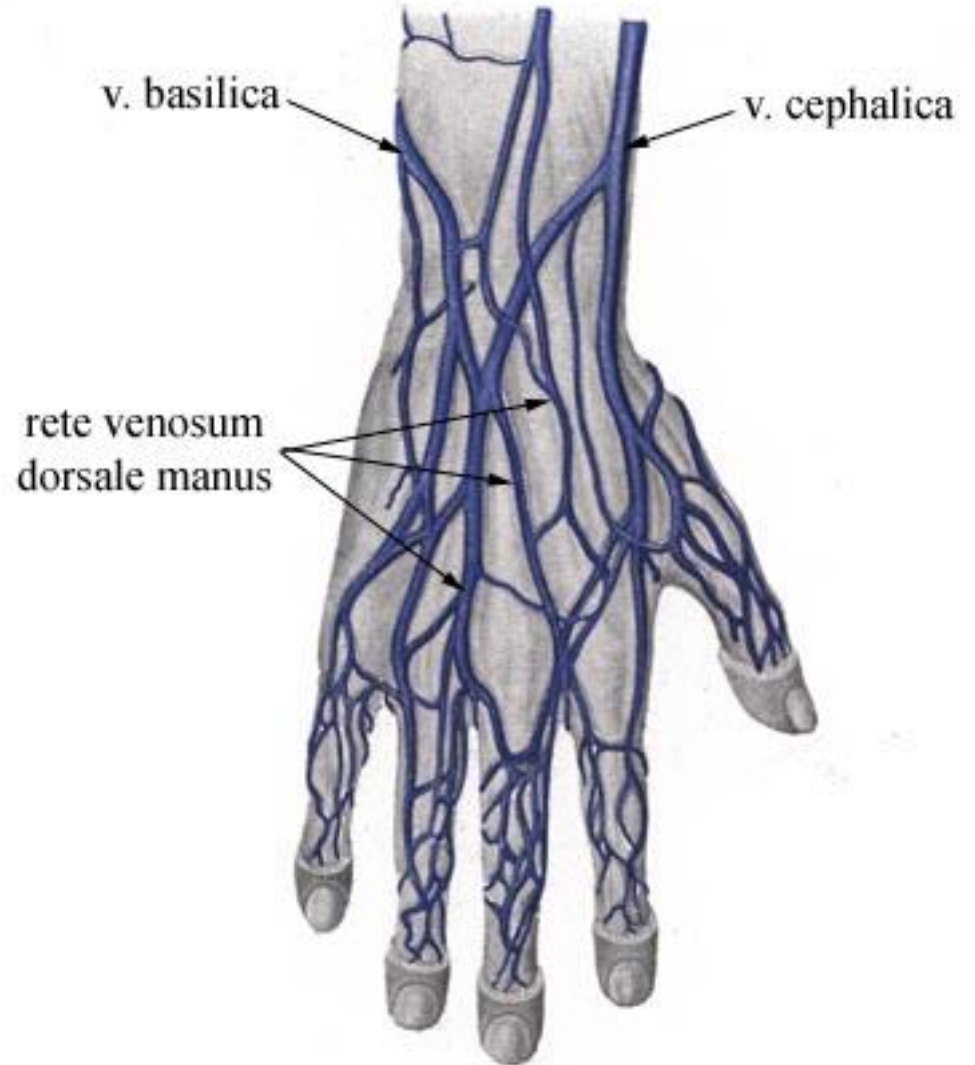
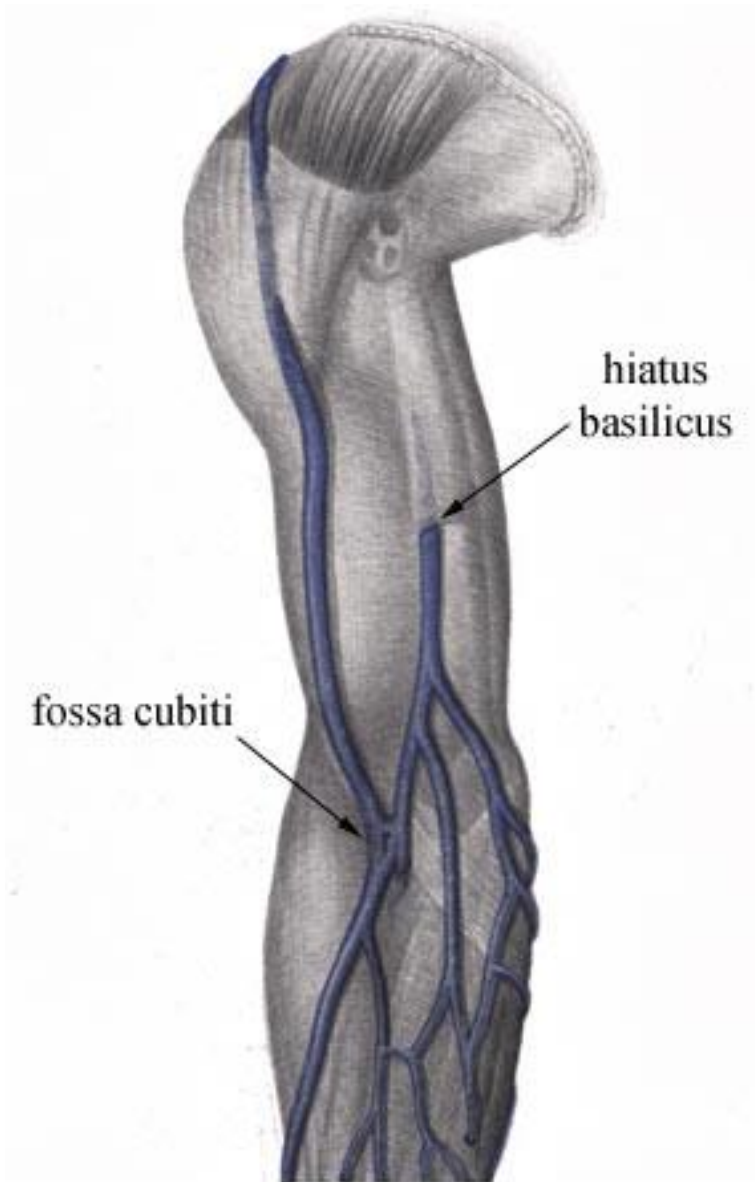


# VARIACE NAPOJENÍ POVRCHOVÝCH ŽIL V LOKETNÍ JAMCE

Variations of connections of superficial veins within fossa cubitalis



# Superficial veins of UL

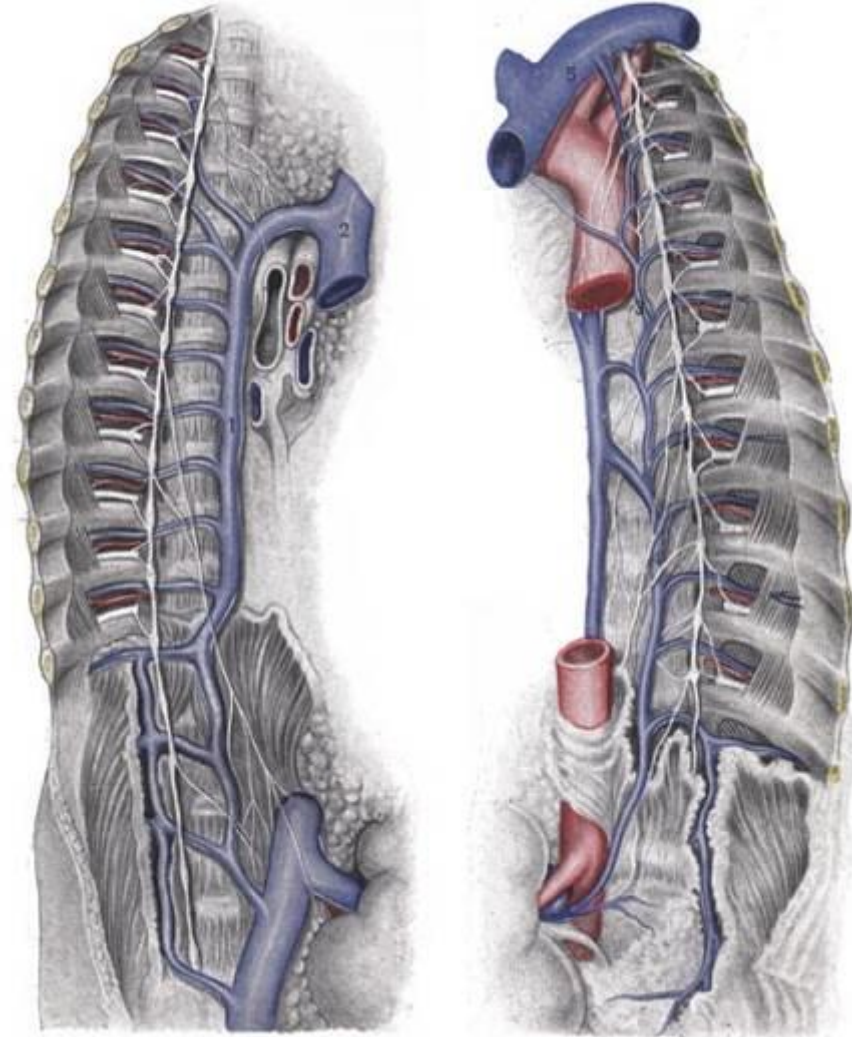




# Vena azygos system

## v. azygos + hemiazygos

- accompany aorta thoracica
- no valves
- mediastinum posterius inferius  
→ mediastinum superius
- origin: v. lumbalis ascendens + v. subcostalis
- pass through diaphragm: via pars lumbalis or hiatus aorticus
- end: v. hemiazygos opens into v. azygos at level of T7-9
- v. azygos opens into VCS
  - arcus v. azygos
  - behind and above hilum pulmonis
  - sulcus venae azygoi pulmonis dx.

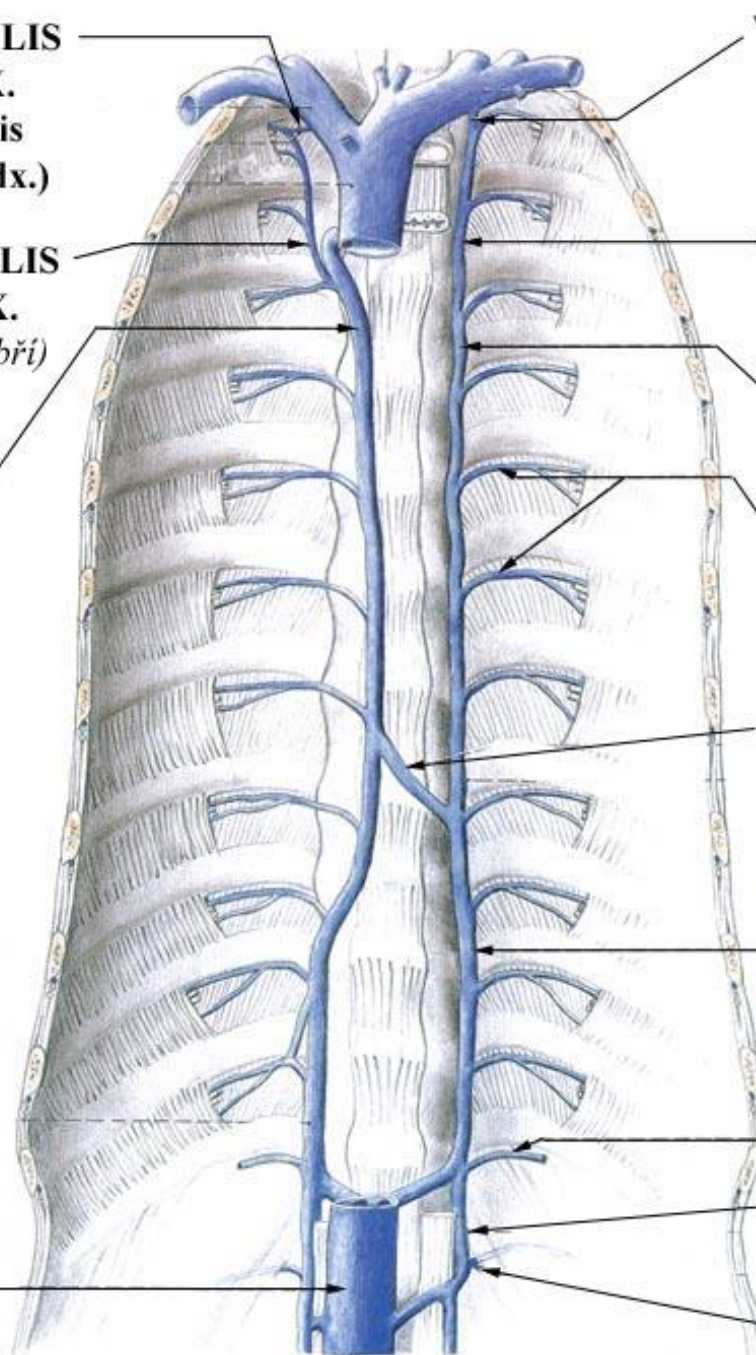


**V. INTERCOSTALIS  
SUPREMA DX.**  
(= v. intercostalis  
posterior prima dx.)

**V. INTERCOSTALIS  
SUPERIOR DX.**  
(pro 2. - 3. mezižebří)

**V. AZYGOS**

**VENA CAVA  
INFERIOR**



**V. INTERCOSTALIS  
SUPREMA SIN.**  
(= v. intercostalis  
posterior prima sin.)

**V. INTERCOSTALIS  
SUPERIOR SIN.**  
(pro 2. - 4. mezižebří)

**V. HEMIAZYGOS  
ACCESSORIA**

**VV. INTERCOSTALES  
POSTERIORES**

**V. HEMIAZYGOS**

**V. HEMIAZYGOS**

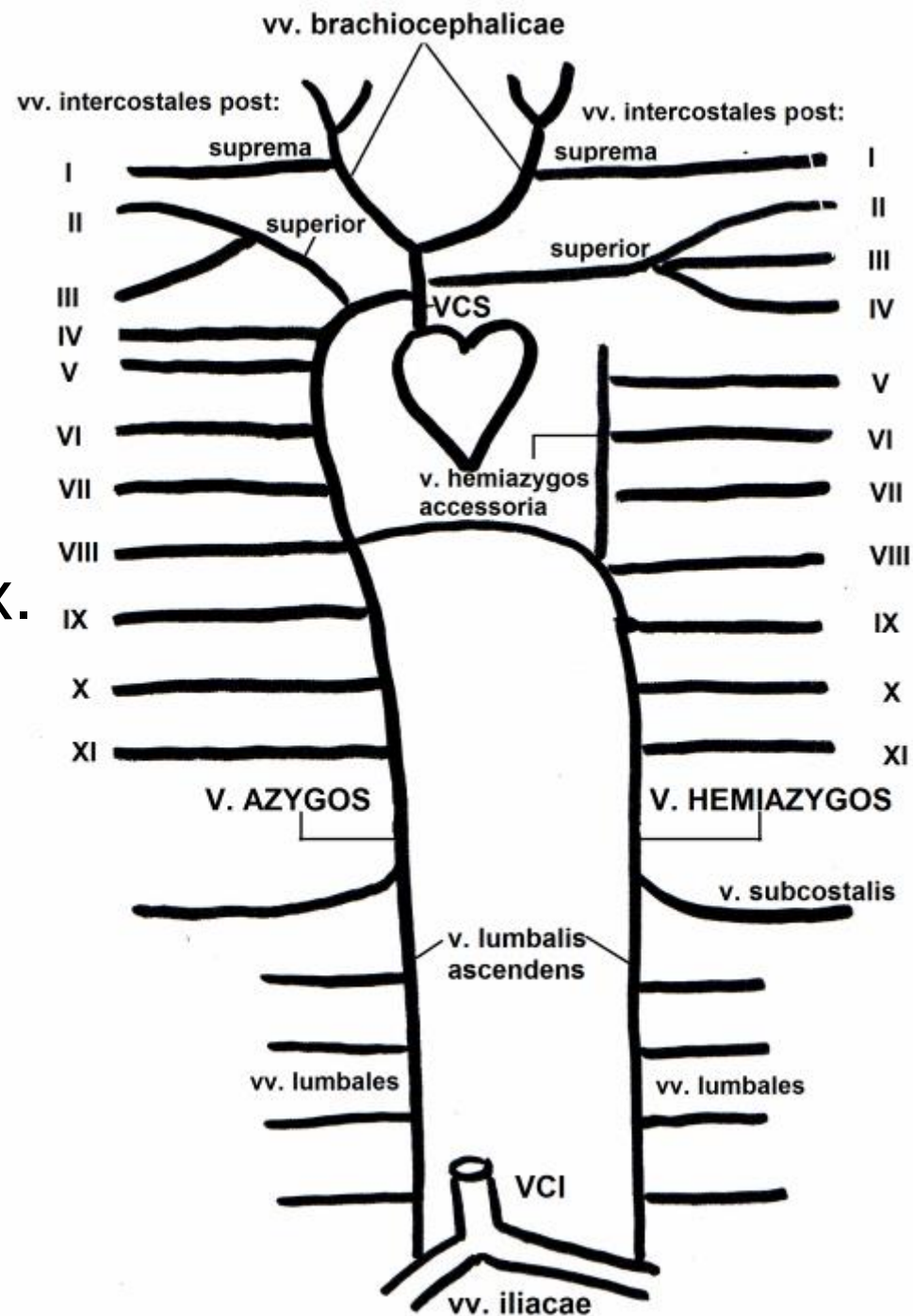
**V. SUBCOSTALIS**

**V. LUMBALIS  
ASCENDENS**

**V. LUMBALIS  
PRIMA**

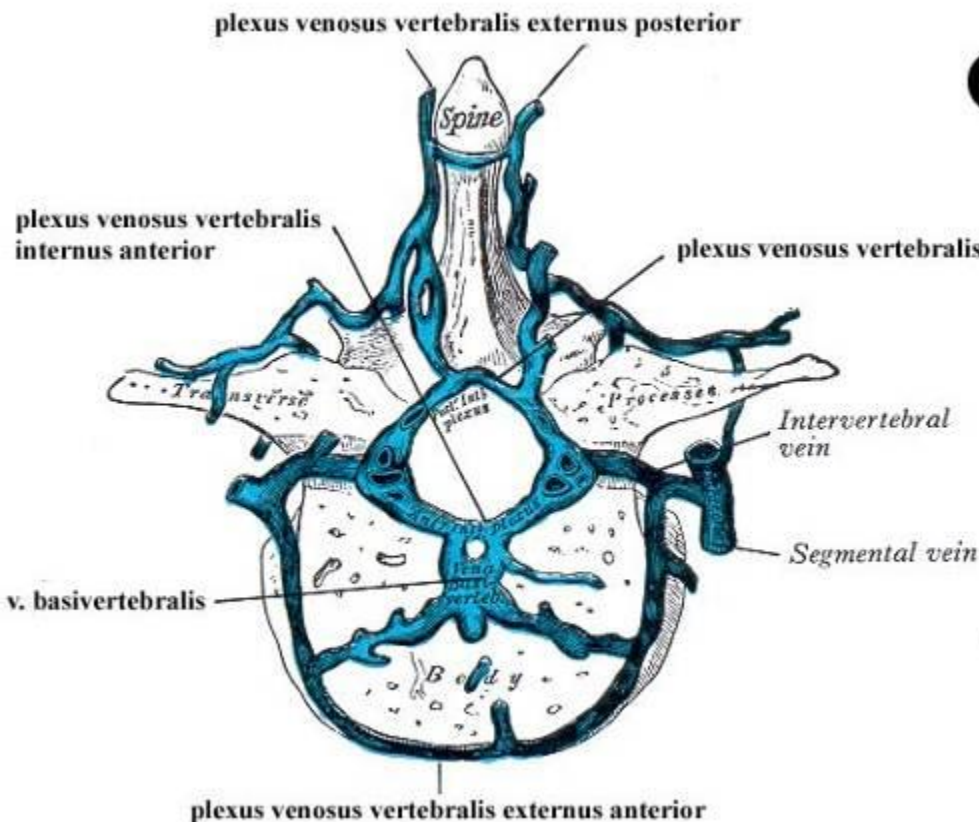
# Tributaries of vena azygos system

- parietal:
  - vv. intercostales posteriores
  - v. intercostales sup. dx.
  - v. hemiazygos accessoria
  - vv. phrenicae sup.
- visceral:
  - vv. oesophageae
  - vv. bronchiales
  - vv. mediastinales



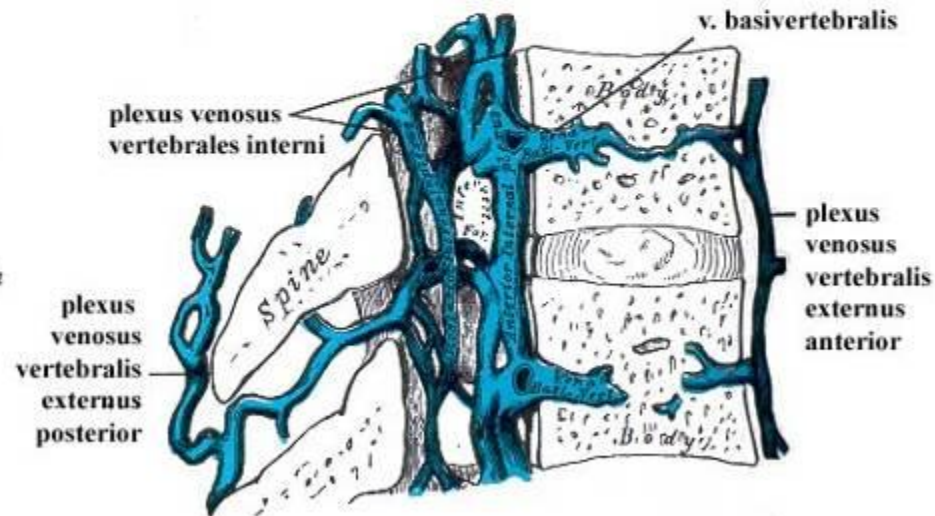
# Veins of vertebral column

- plexus venosi vertebrales
  - externi (ant. + post.)
  - interni (ant. + post.)
  - vv. basivertebrales
  - vv. medullae spinalis



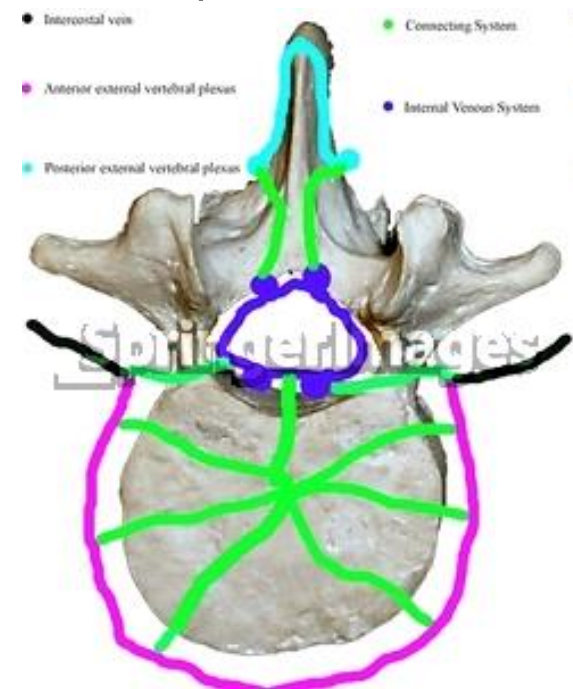
## OBRATLOVÉ ŽÍLY

### Veins of vertebrae

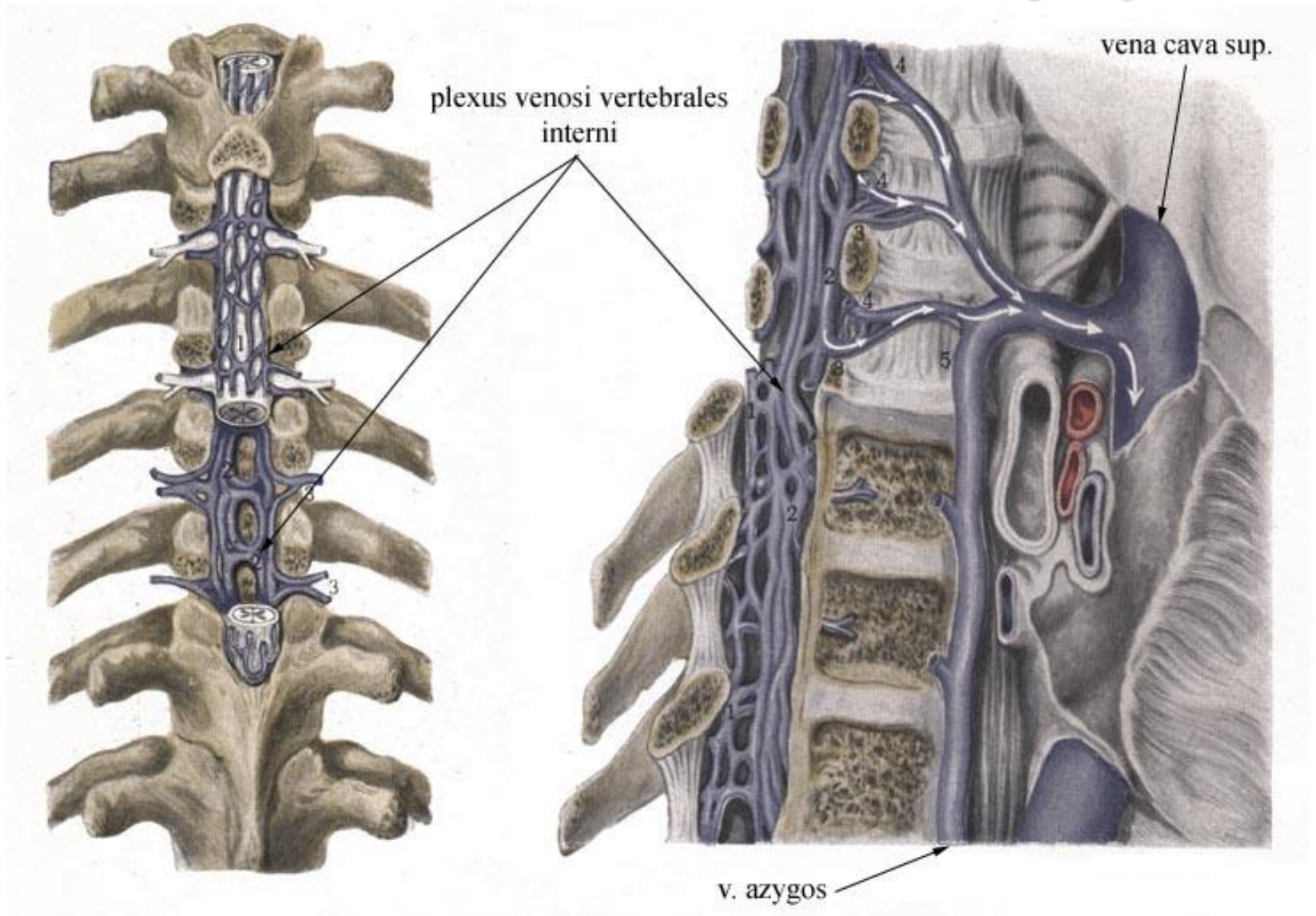


# Veins of vertebral column

- epidural space (internal plexuses)
- true venous wall unlike sinuses
- no valves
- connection with plexus basilaris (emissarium),
- drain into:
  - v. vertebralis
  - v. cervicalis prof.
  - vv. intercostales post.
  - a. azygos/hemiazygos
  - vv. lumbales
  - vv. sacrales laterales
- *Batson's plexus*
- metastasis (from lungs rectum, breast, prostate) and infection spreading

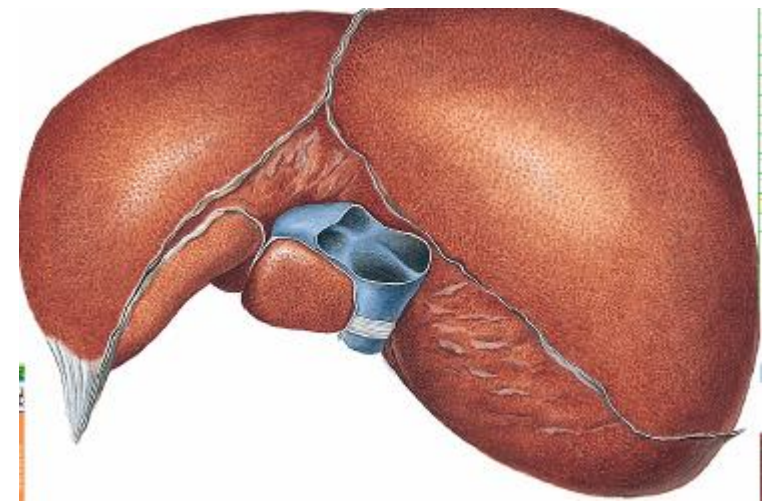
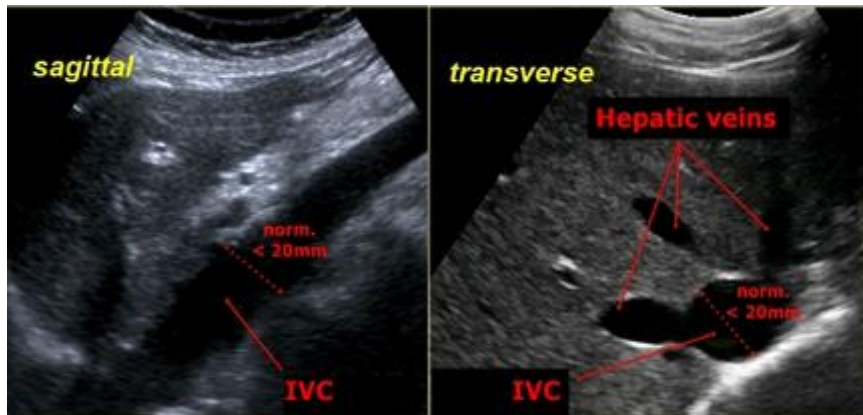


# Ways of air embolism spreading in vertebral canal veins injury

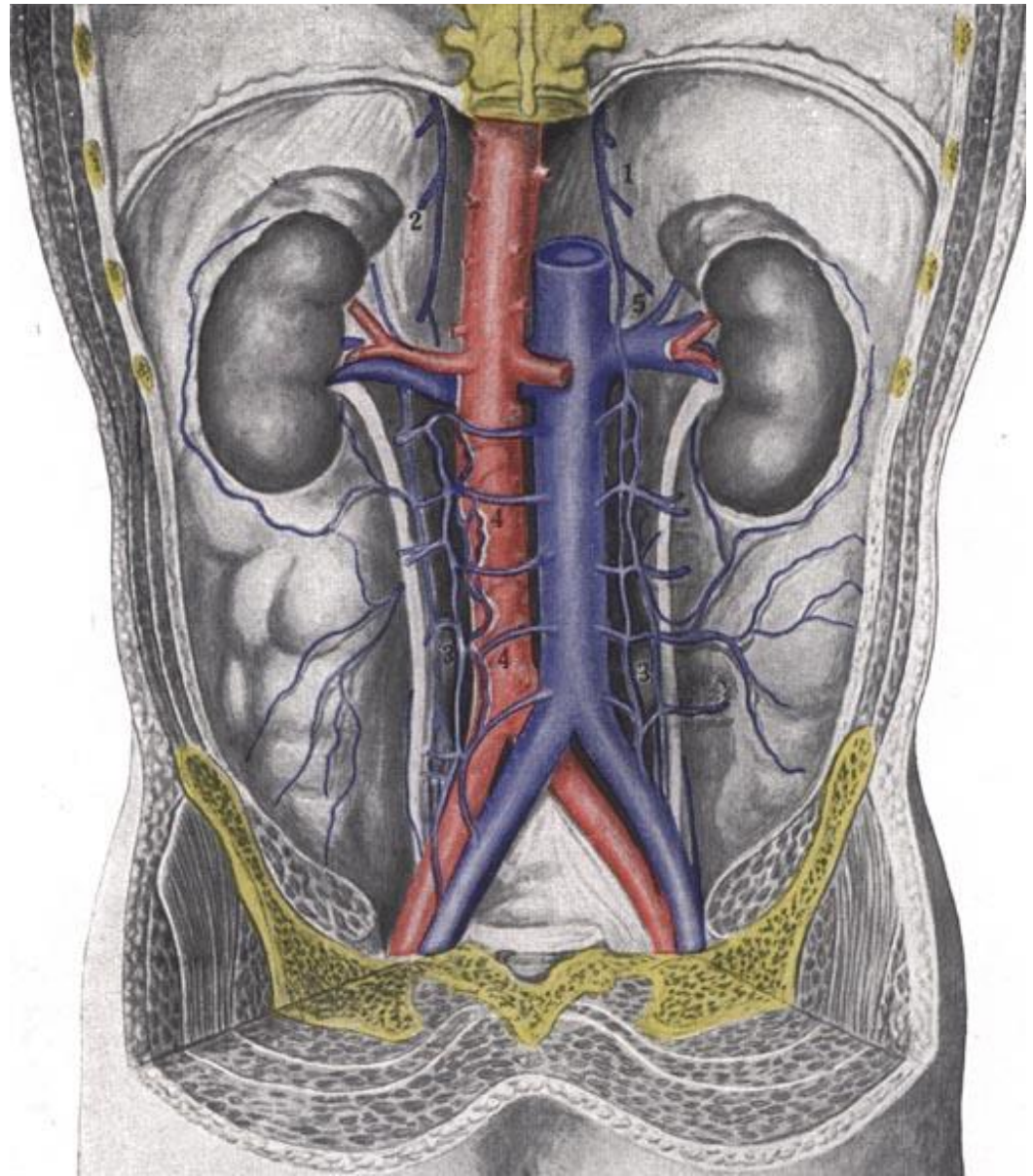
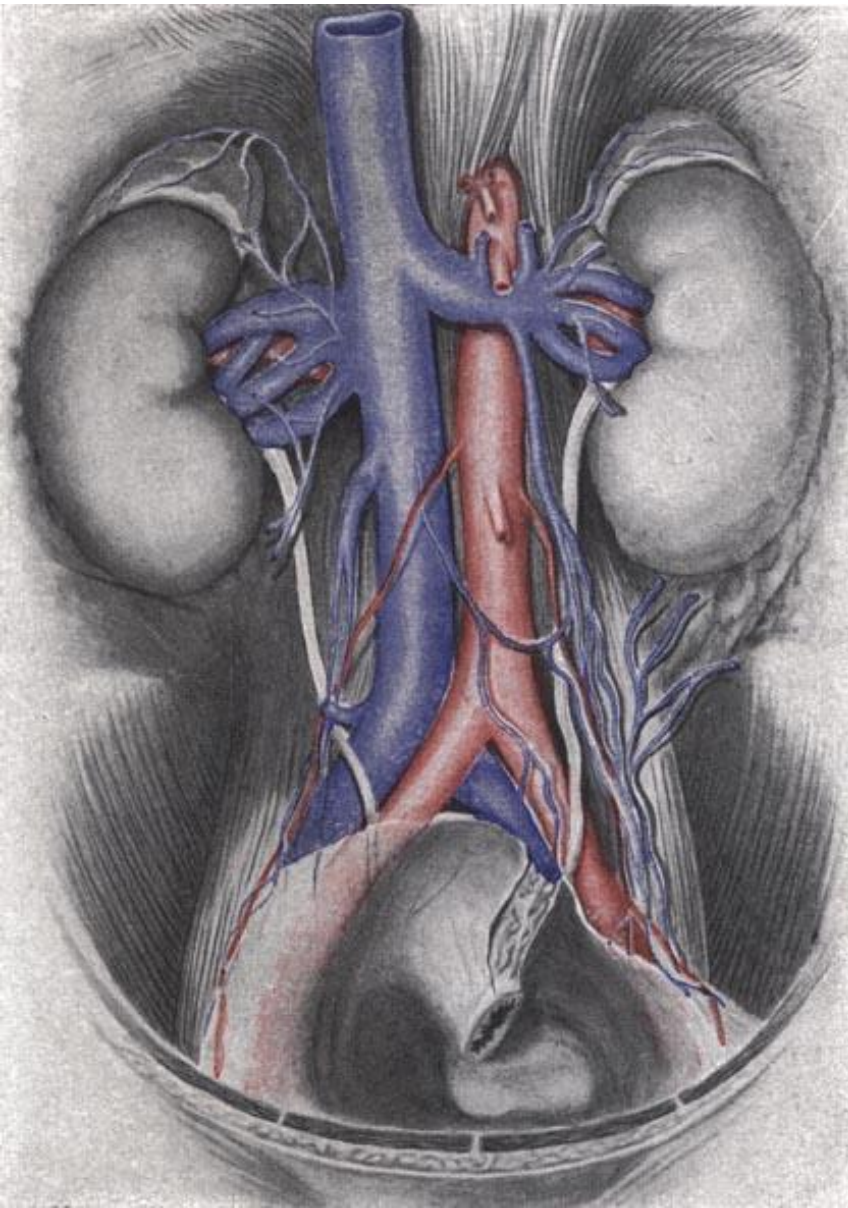


# Vena cava inferior

- origin: confluence of vv. iliacaes communes (L4)
- right to aorta abdominalis, in retroperitoneum
- no valves, rarely doubled
- sulcus venae cavae hepatis
- foramen venae cavae diaphragmatis
- caliber: 2 cm at liver, 3.5 cm at heart
- end: atrium dextrum (T8)



# Vena cava inferior

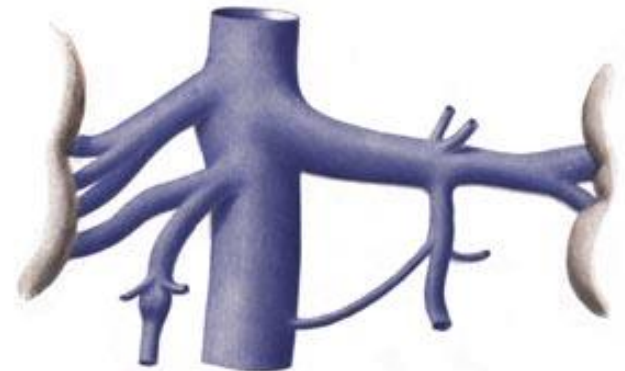
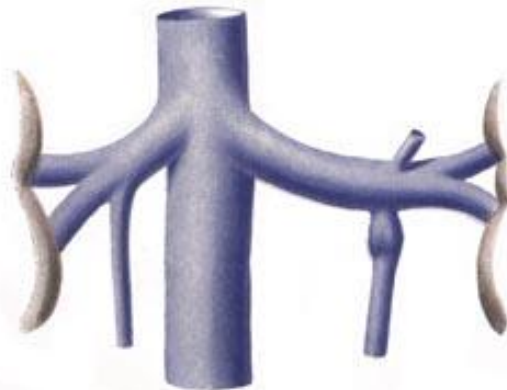
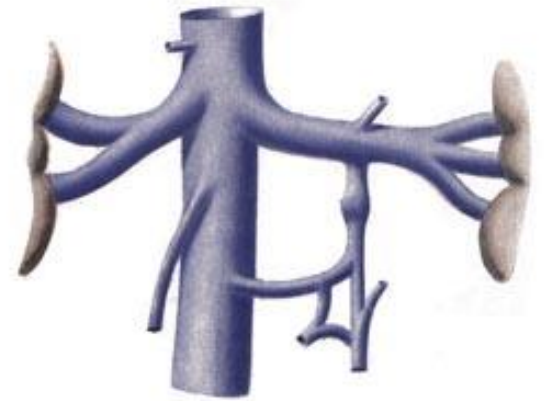
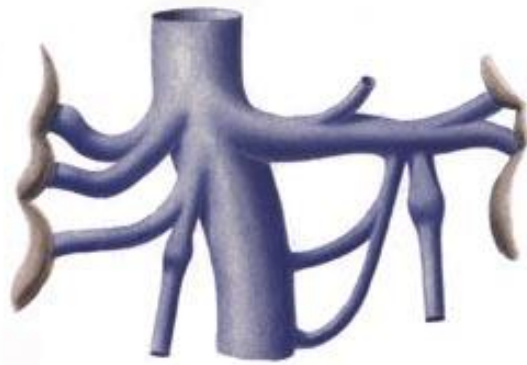




# Vena cava inferior - tributaries

- variation of VCI course, arrangement and tributaries
- parietal:
  - vv. iliacae communes, vv. lumbales I-IV (*interconnected with v. lumbalis ascendens*), vv. phrenicae inf., v. sacralis mediana
- visceral:
  - vv. renales
  - v. testicularis ♂/ ovarica dx. ♀ (begins as plexus pampiniformis)
  - v. suprarenalis dx.
  - vv. hepaticae dextra, intermedia, sinistra (ductus venosus *Aranzii*)

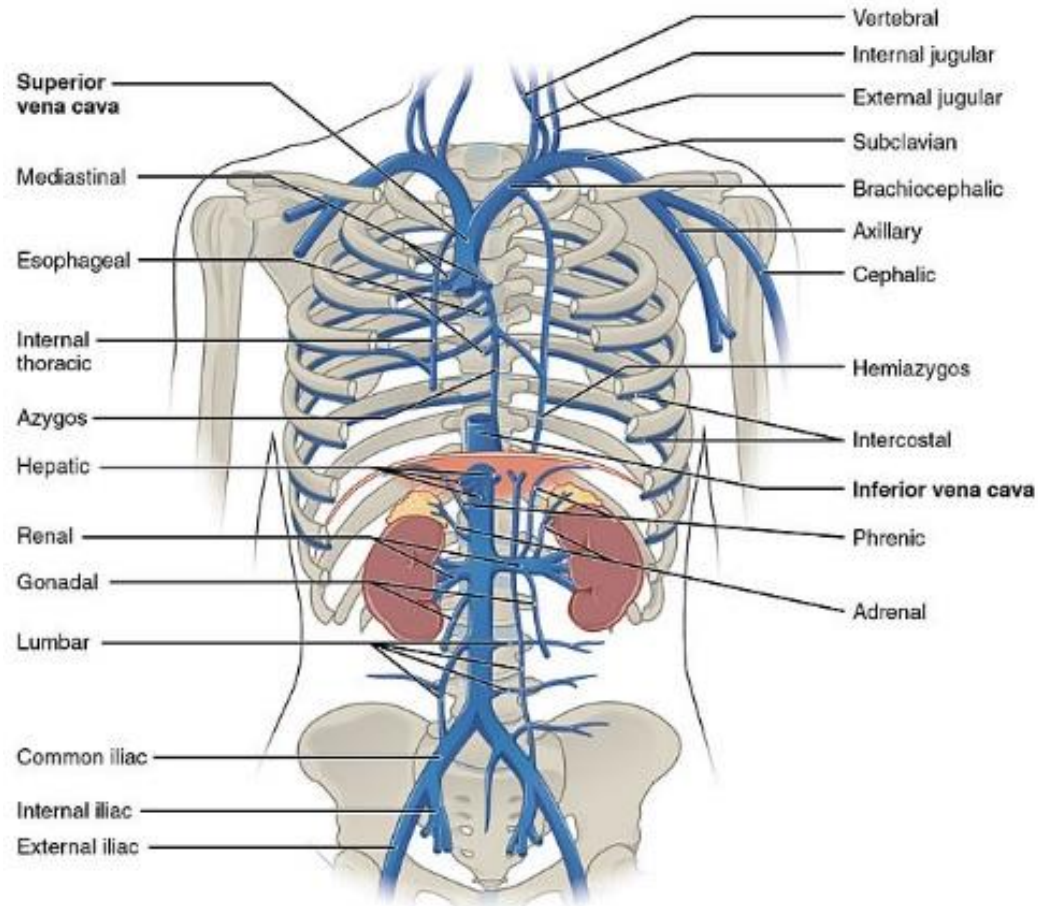
Variability  
of  
formation  
of  
VCI  
visceral  
tributaries



# Vena cava inferior – 5 parts

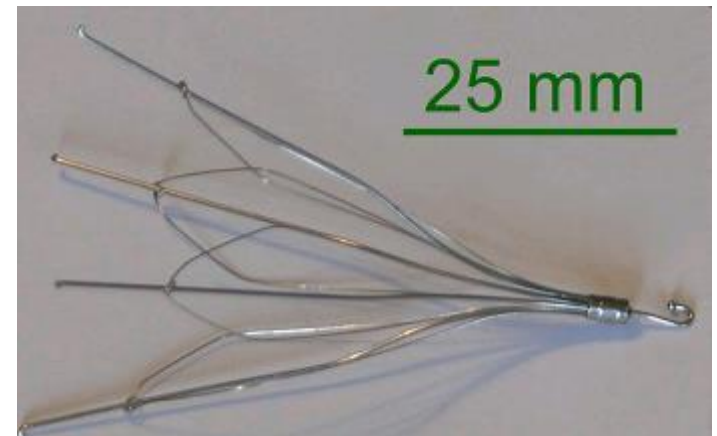
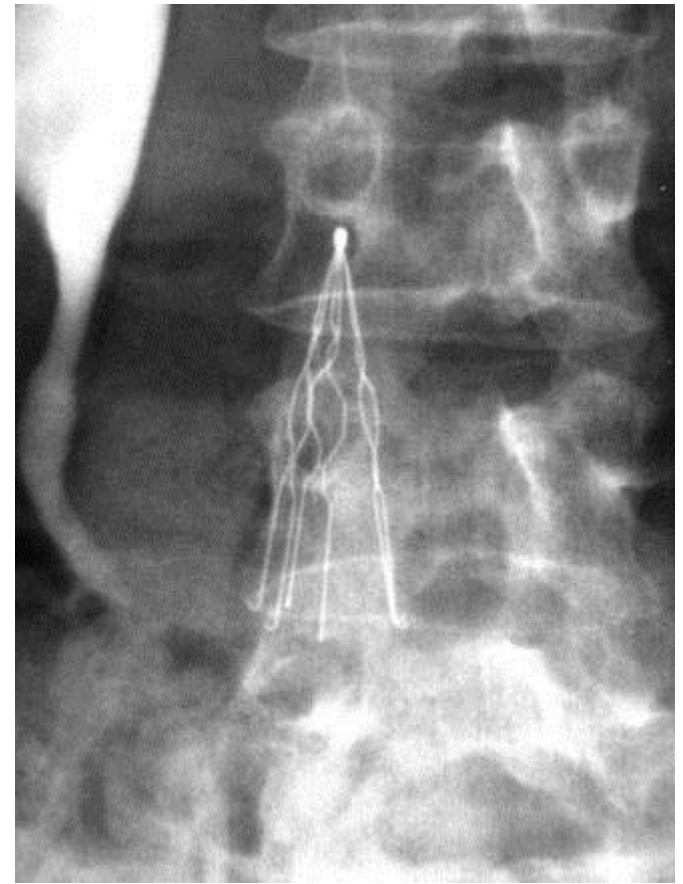
segmentum:

- **infrarenale**
- **renale** – in the extent of orifice of vv. renales
- **suprarenale**
- **hepaticum** – sulcus v. cavae hepatis
- **thoracicum**



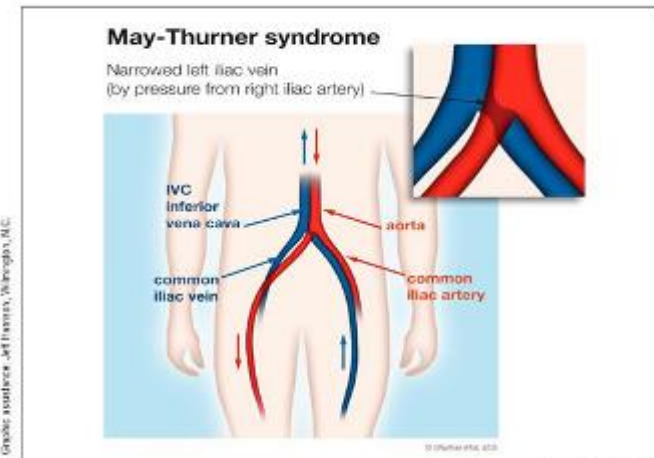
# VCI – clinical relevance

- compression
  - aortal aneurysm
  - pregnant uterus
  - abdominal tumours
- thrombosis
- prevention of fatal pulmonary embolism – Greenfield's filter
  - in venous thromboembolic disease + contraindication of anticoagulation treatment

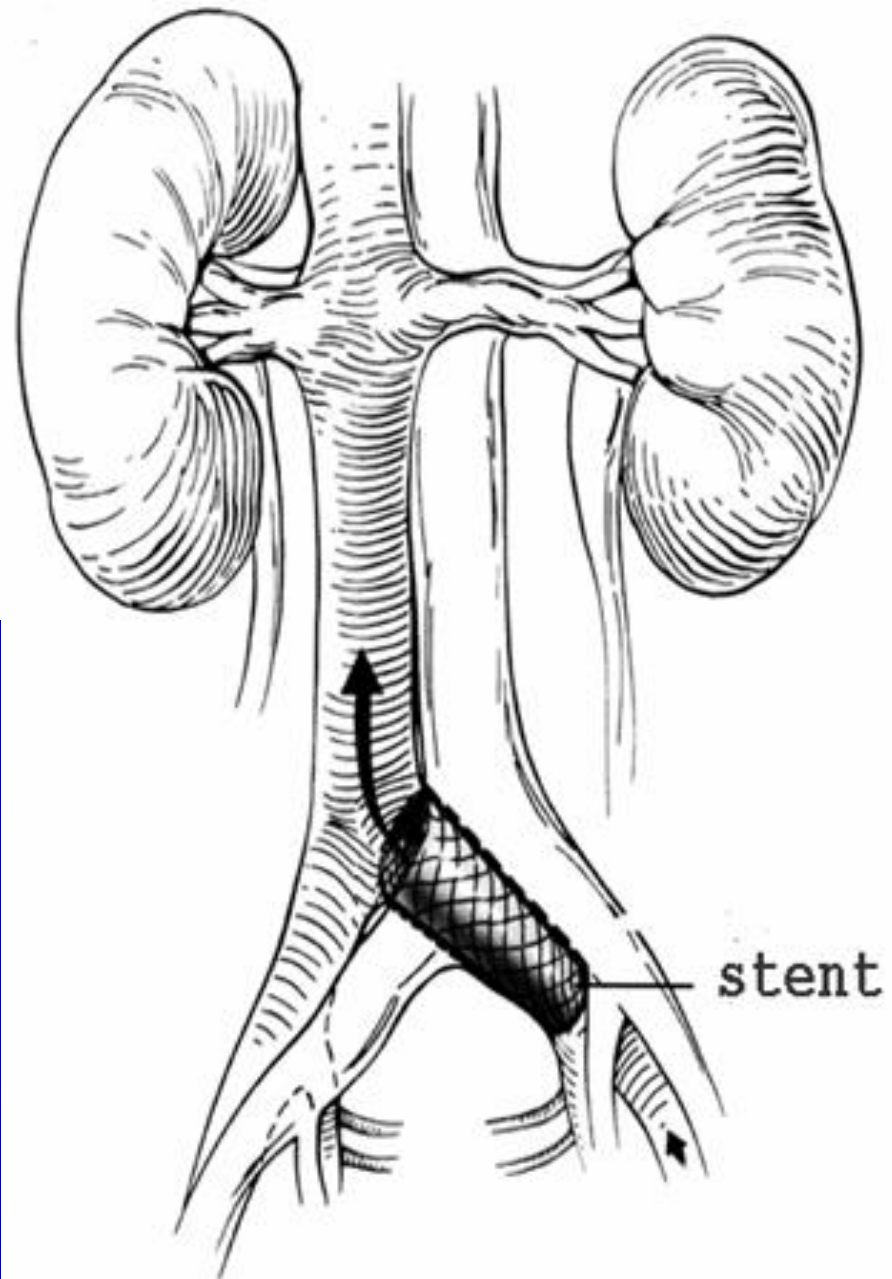
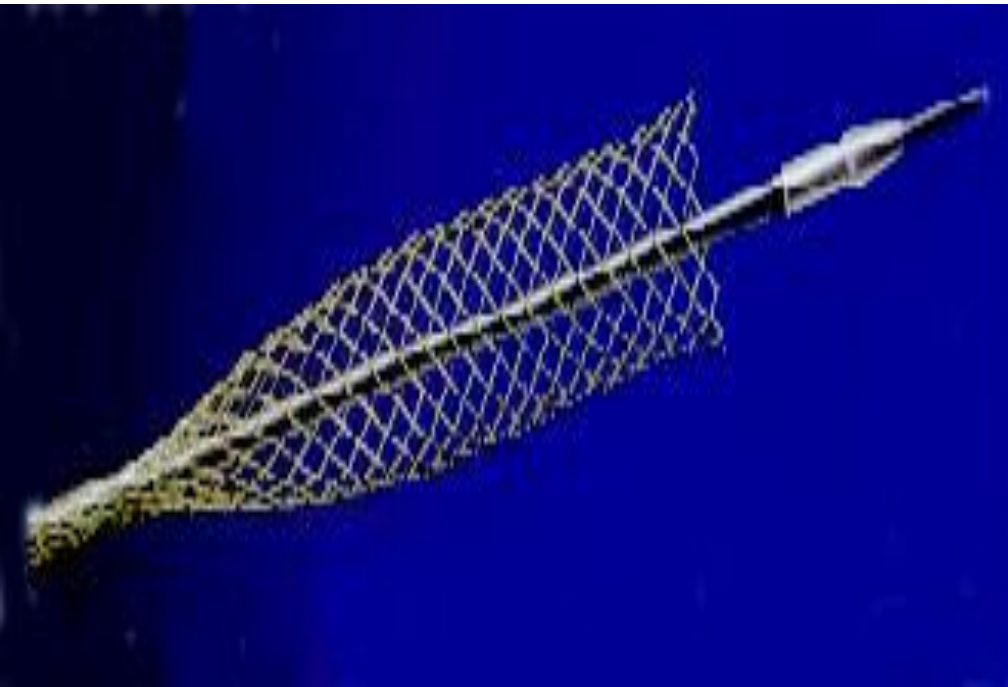


# Vena iliaca communis

- course corresponds to artery
- tributaries:
  - v. lumbalis ascendens
  - v. sacralis mediana into VICsin.
- May-Thurner's syndrome
  - compression of VICsin. by artery (AICdx.)
  - thrombosis follows
  - treatment: stent

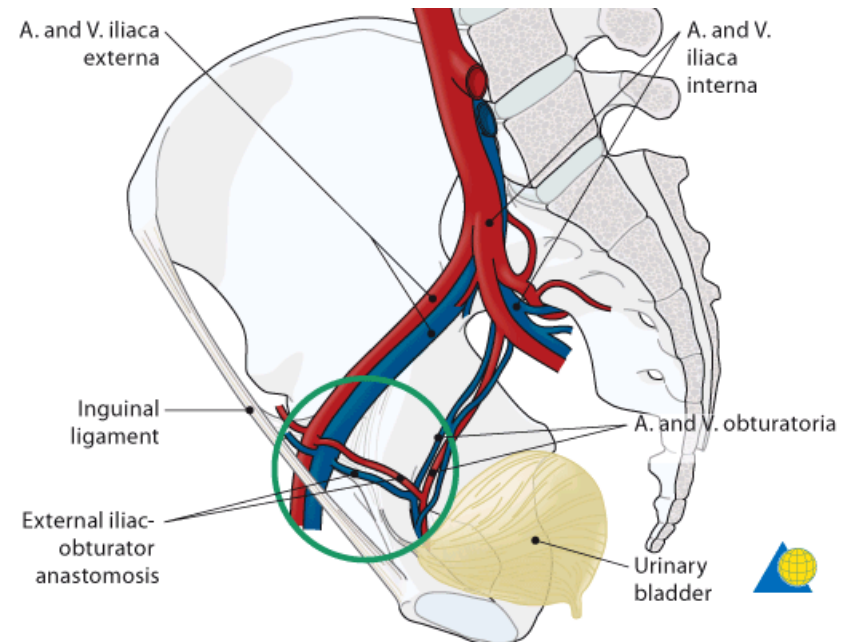


# May-Thurner syndrome – treatment



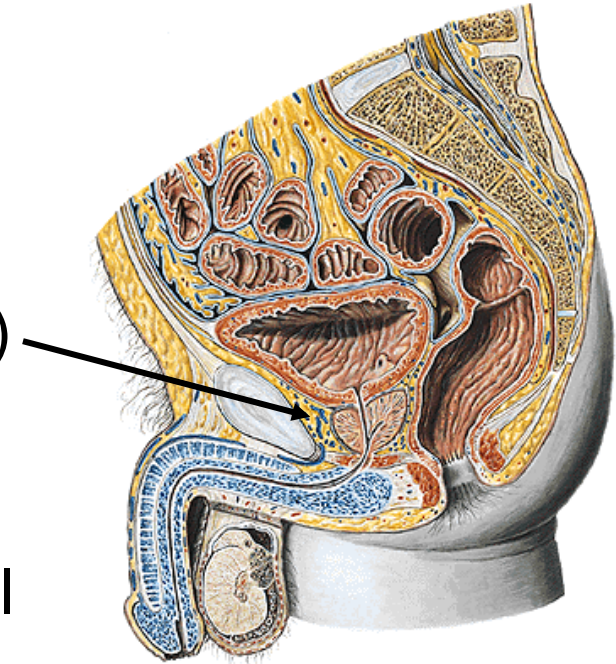
# Vena iliaca externa

- branches correspond to arterial
- venous corona mortis present in 75%
- valves present in 20%
  - usually rudimentary



# Vena iliaca interna – pelvic veins

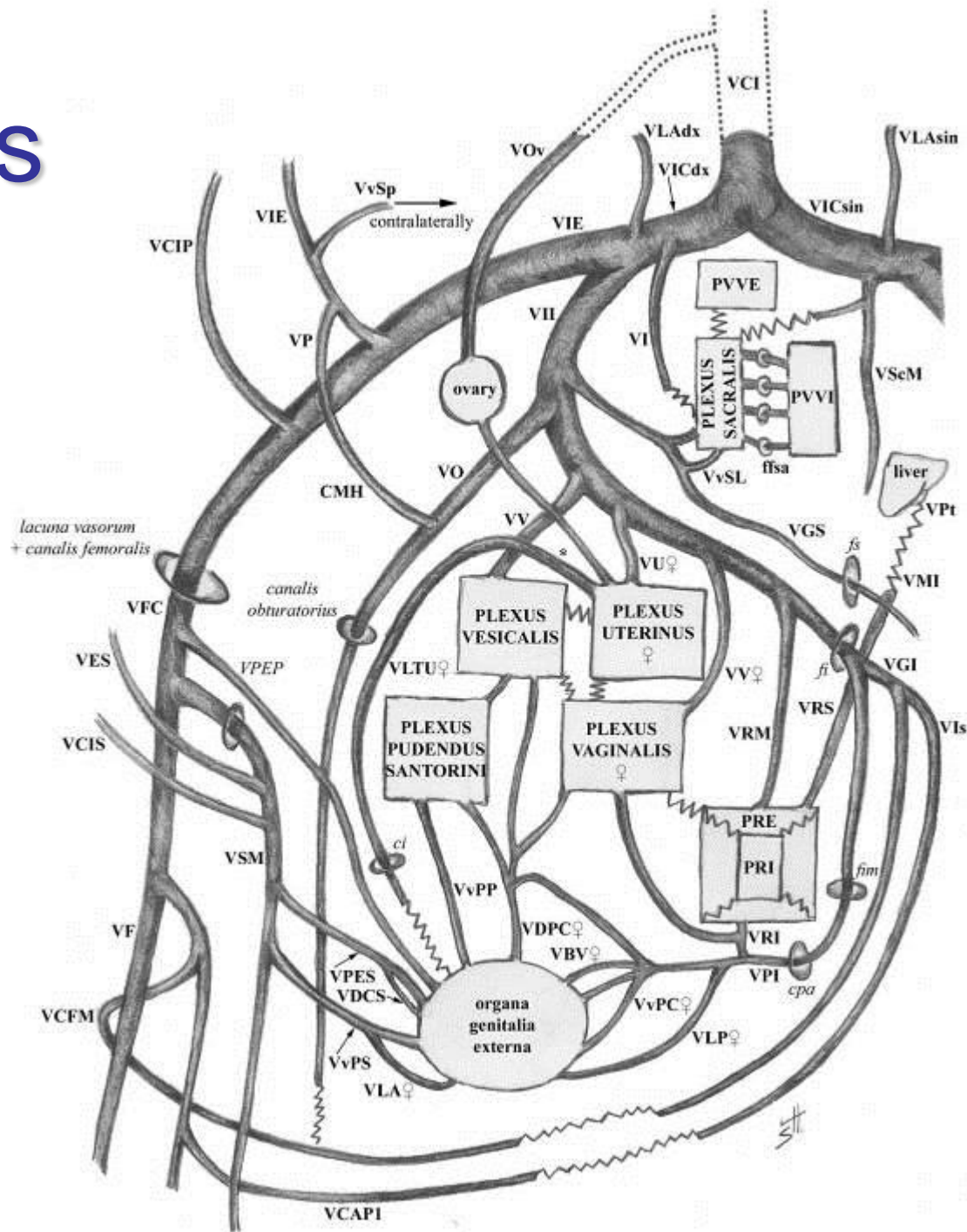
- *parietal*: correspond to arteries
- *visceral*: plexuses
  - plexus venosus pudendus (*Santorini*)
    - within spatium retropubicum (*Retzii*)
  - p.v. vesicalis + prostaticus
  - p.v. uterinus + vaginalis (uterovaginal)
  - p.v. rectalis
    - p.v. rectalis externus (within tunica adventitia)
    - p.v. rectalis internus = p. haemorrhoidalis (within tunica submucosa)
  - p.v. sacralis (interconnected with vv. sacrales lat. + mediana)

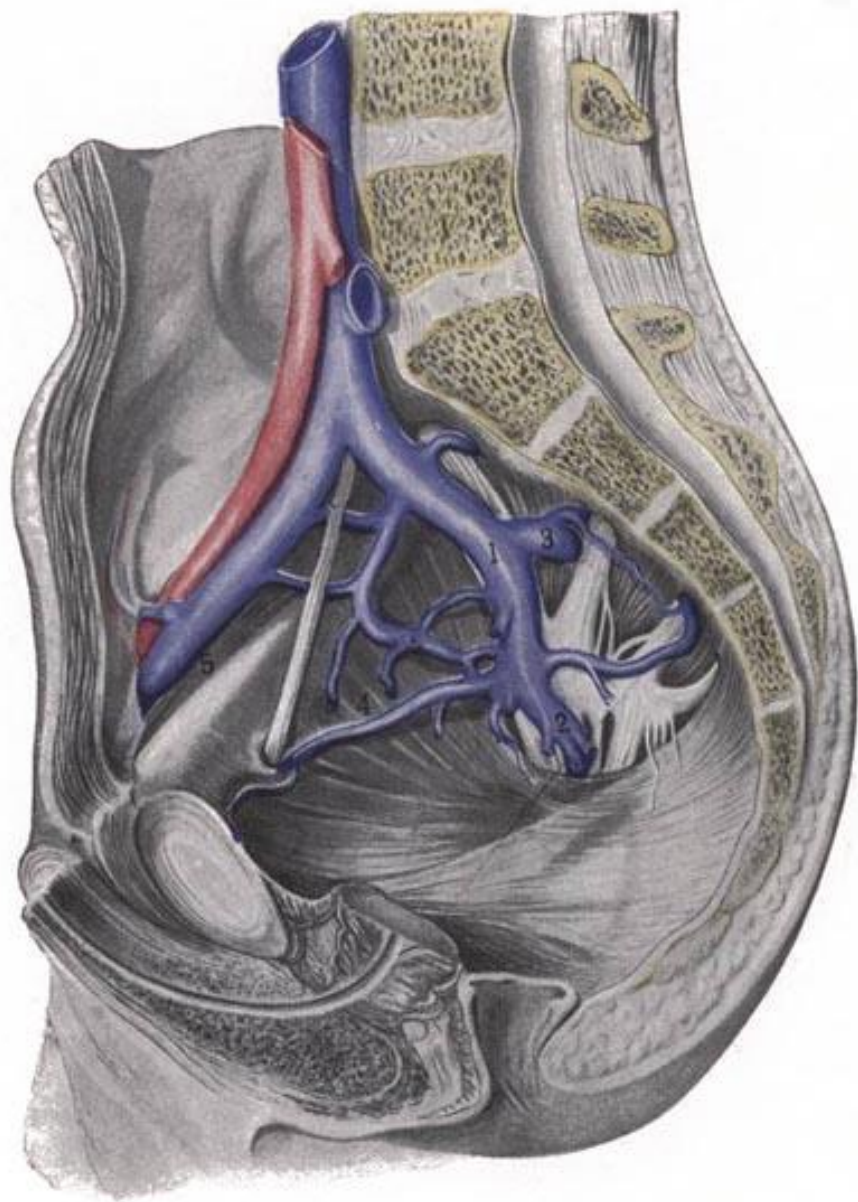
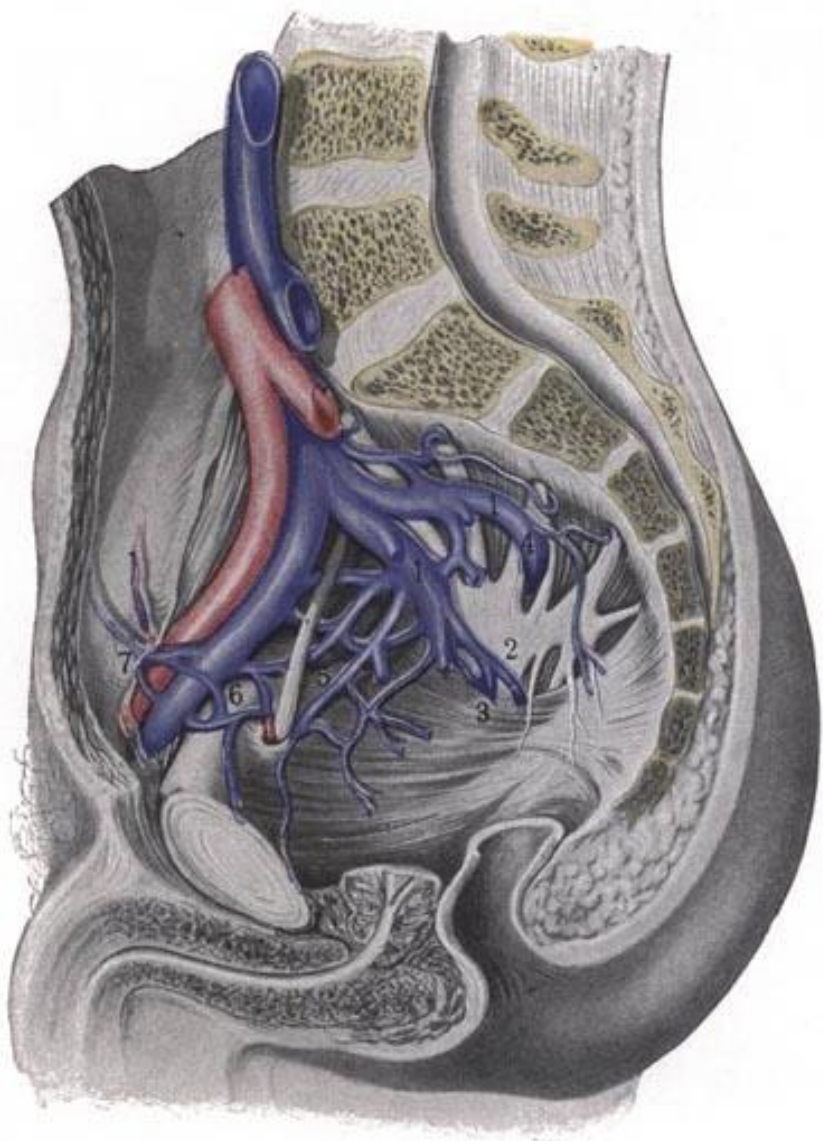


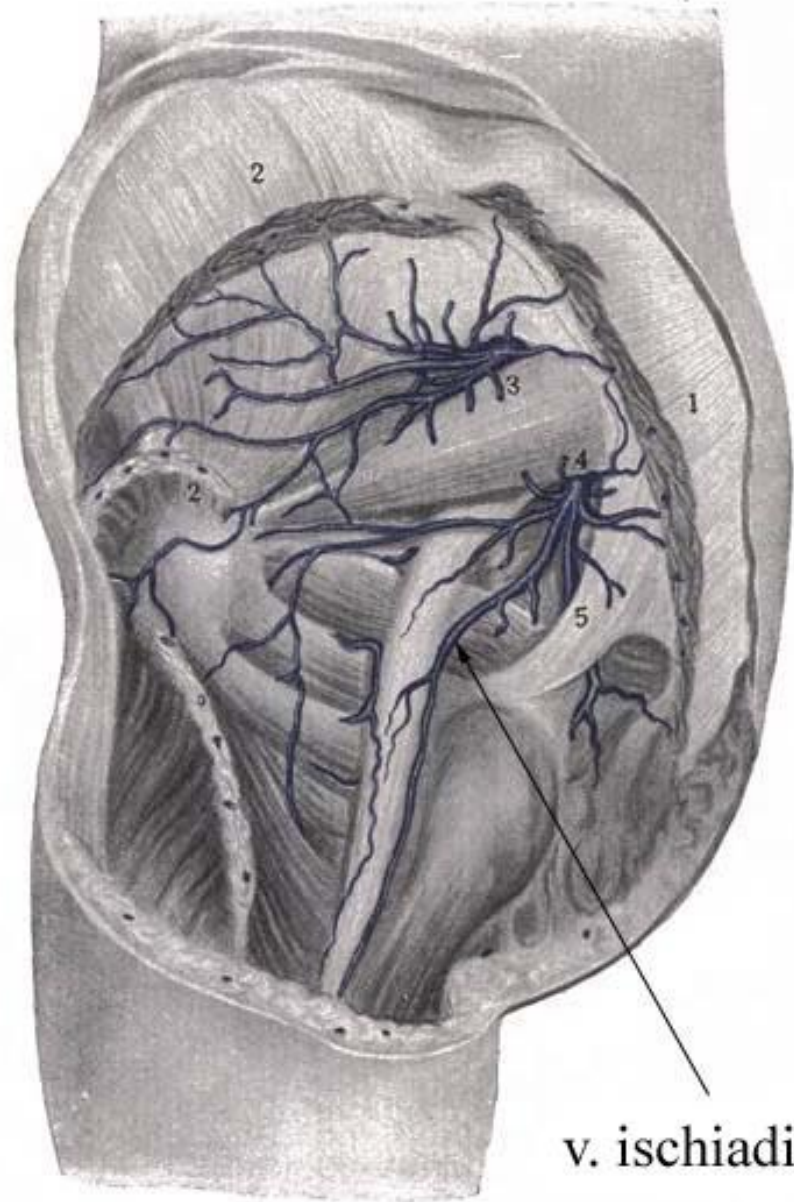
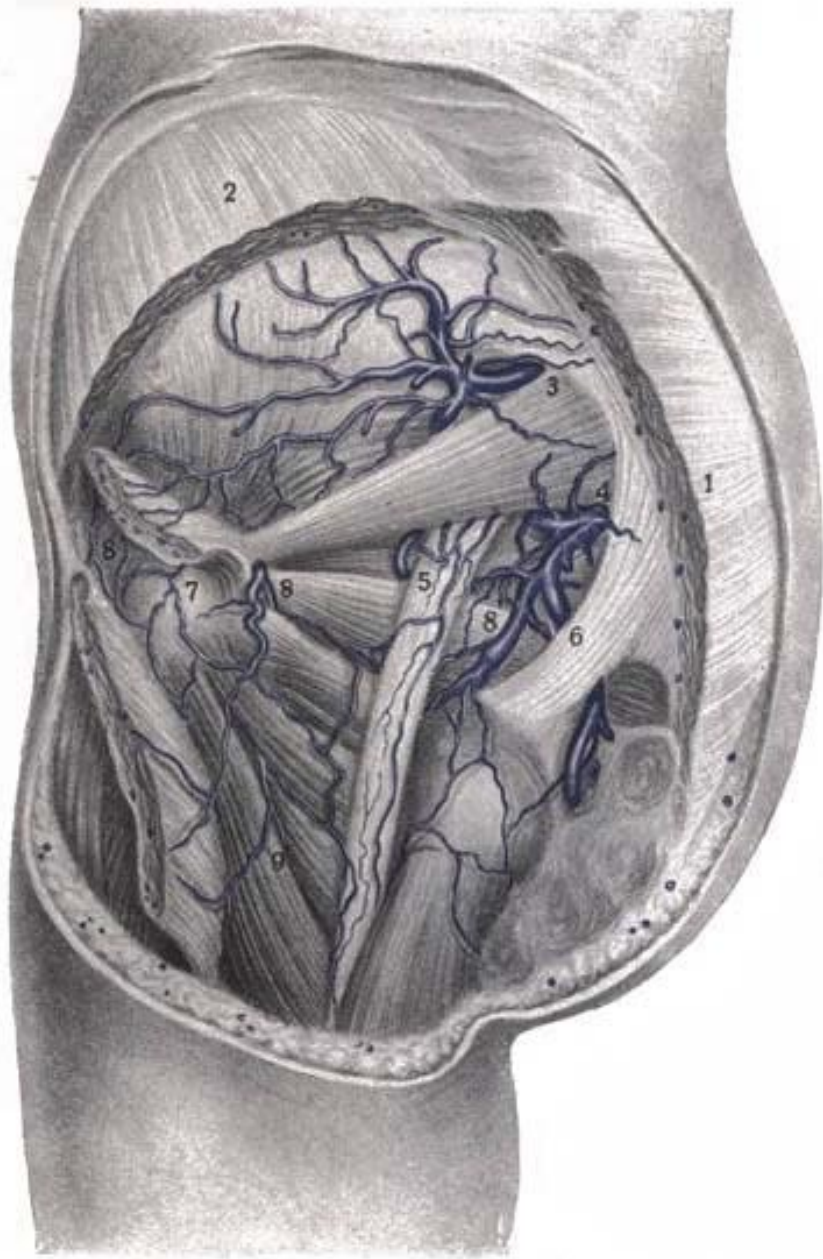


# Veins of pelvis

- v. lig. teretis uteri ♀
- vv. lig. lati uteri ♀
- vv. suprapubicae
- v. ischiadica

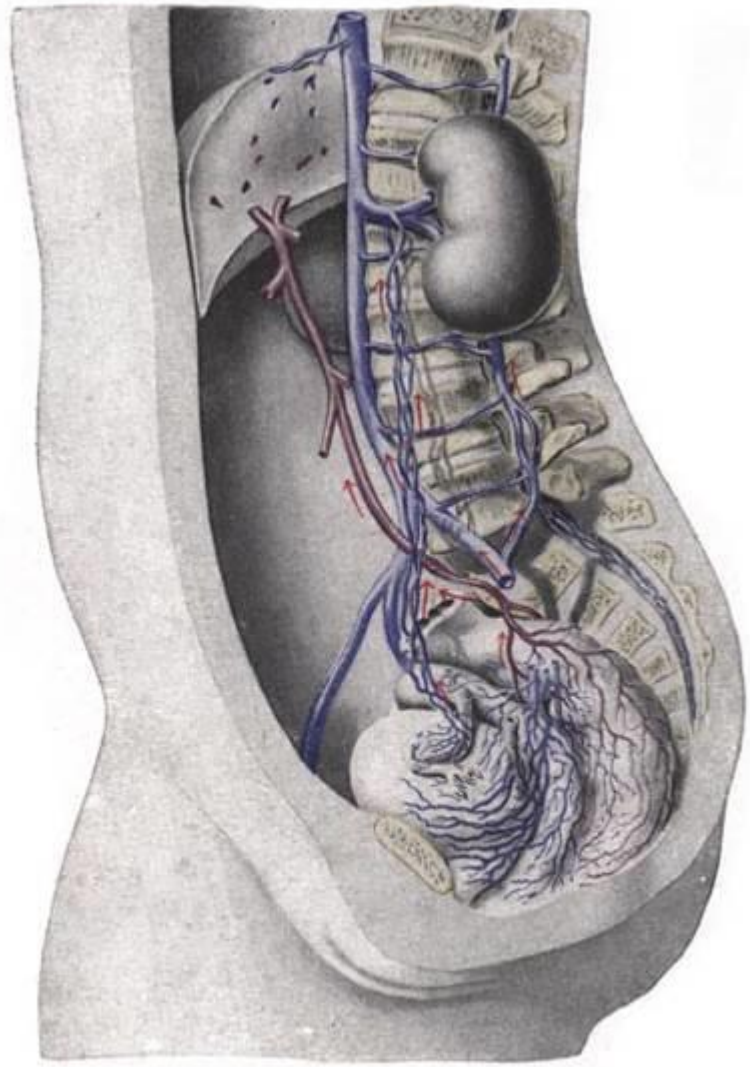
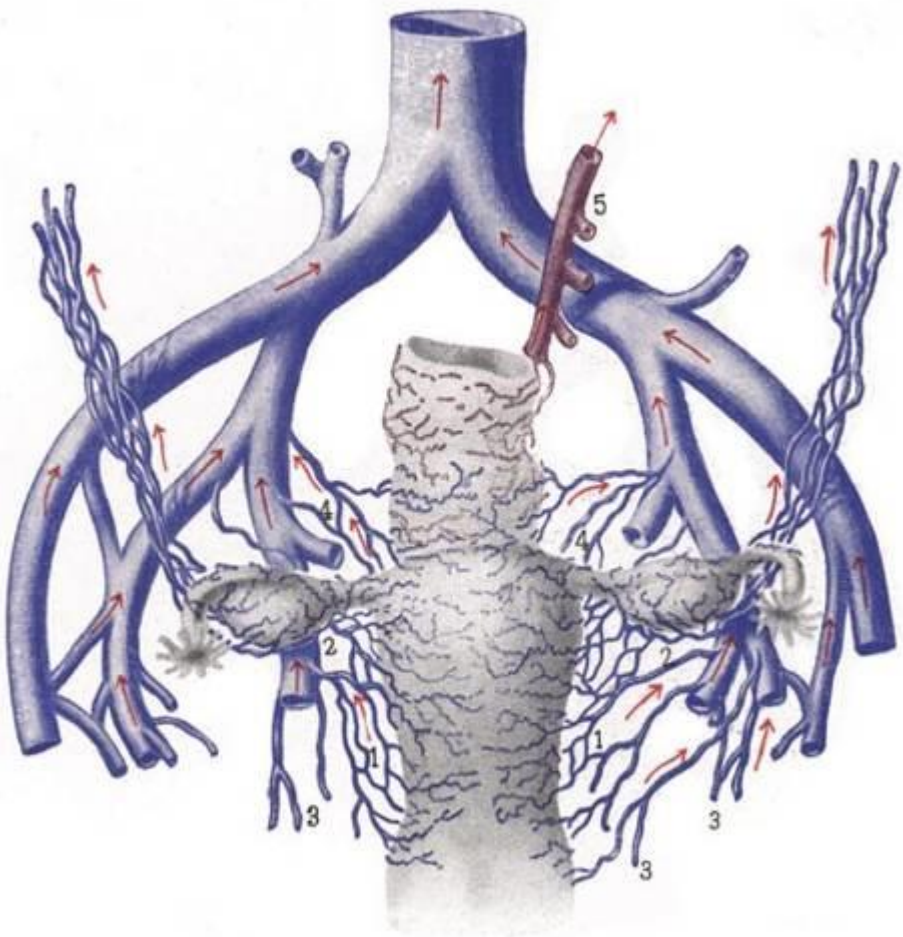






v. ischiadica

# Direction of venous outflow from pelvis

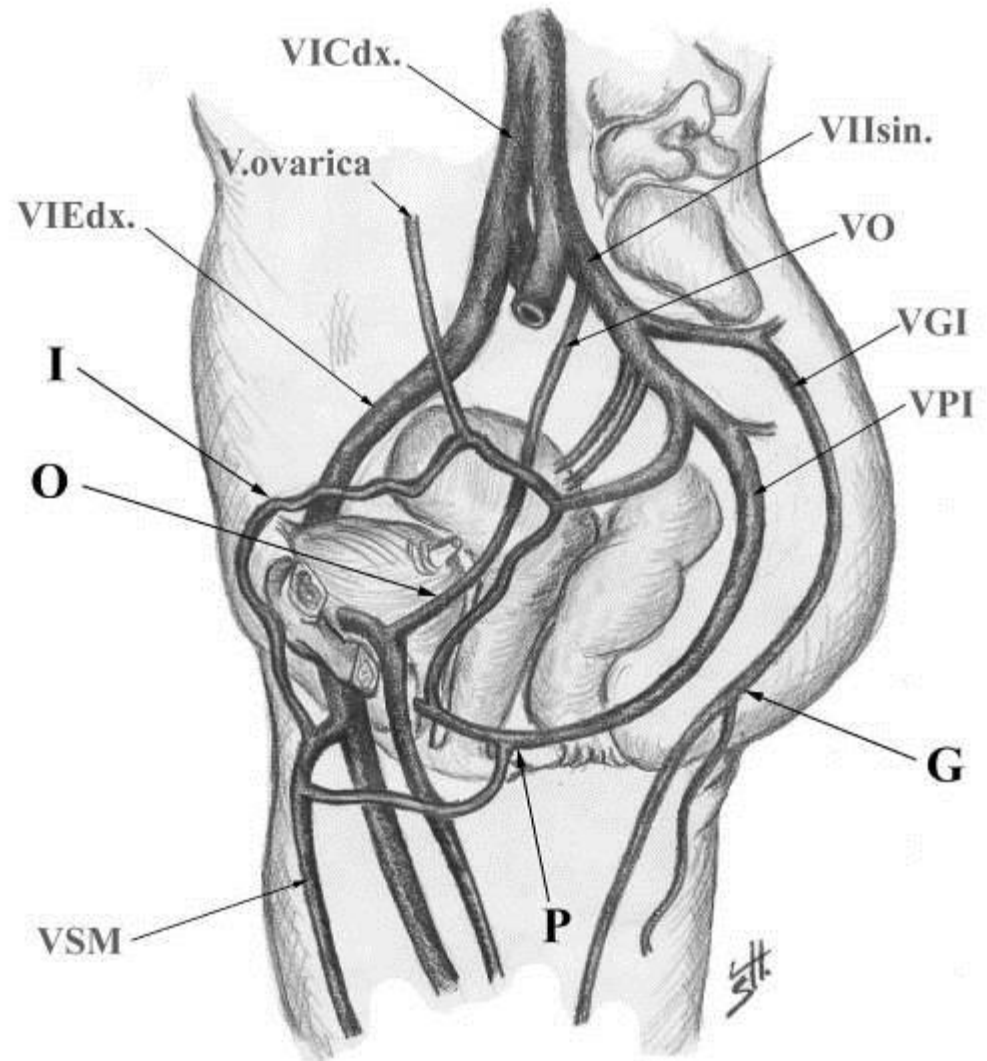


# Veins of pelvis – clinical relevance

- pelvis fractures → heavy bleeding
- slowed blood flow → thrombosis → embolism
- uptake of calcium in thrombi → phleboliths (visible in X-ray snaps)
- pelvic varices – connections with LL veins
- v. iliaca int. and its tributaries are not moveable → easy bleeding and difficult closure in surgery

# Site of connections between pelvic and LL veins

- canalis inguinalis
- canalis obturatorius
- foramen infrapiriforme
- perineum
- *change of flow direction in varices*



# Vena portae hepatis = Hepatic portal vein

collects blood from unpaired abdominal organs

no valves

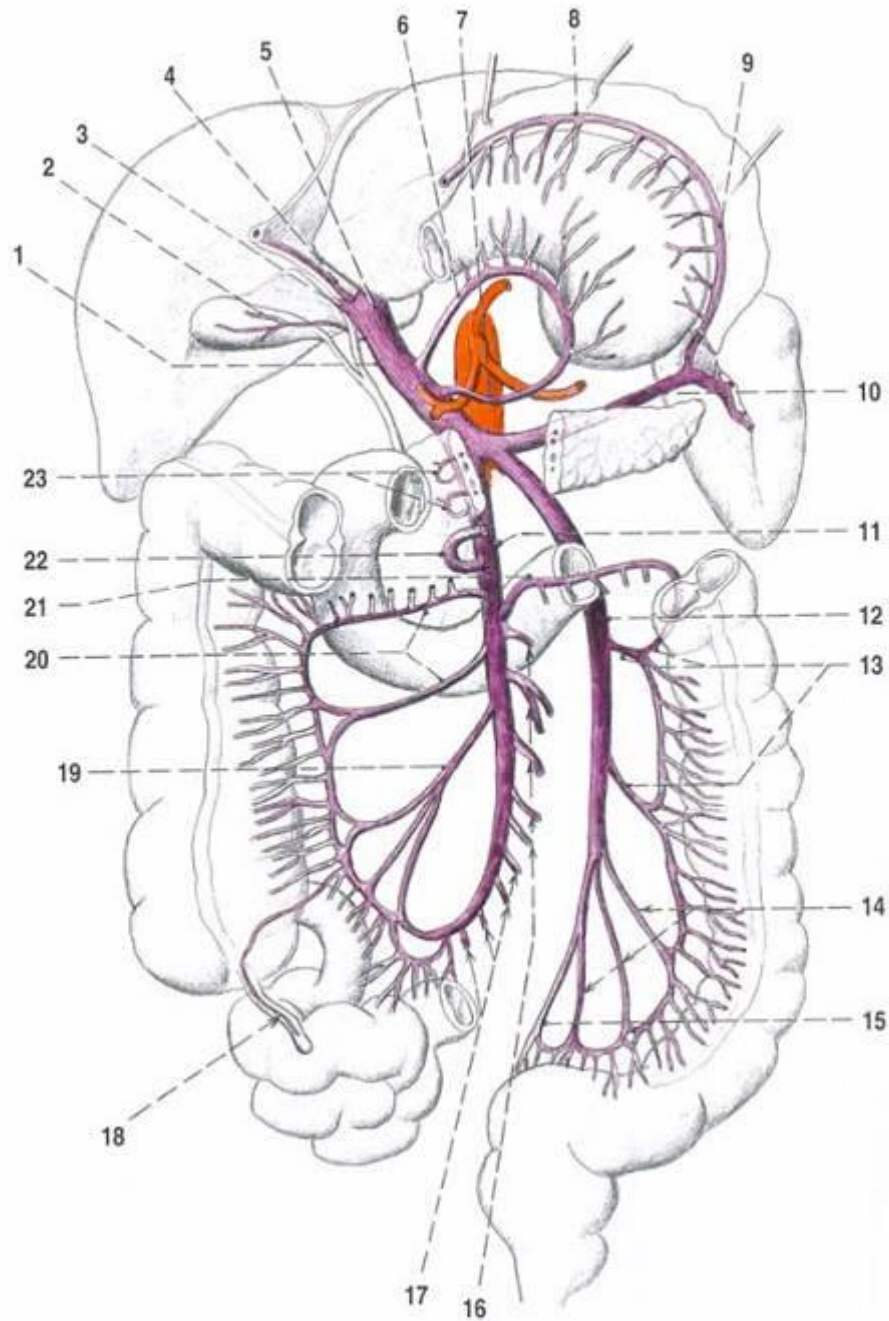
origin: confluens of v. splenica + v. mesenterica sup.

- v. mesenterica inf. empties in v 50% into VS, in 40% into VMS and in 10% into the confluens
- v. prepylorica (*Mayo*)
- vv. gastricae dx. + sin.
- v. cystica
- vv. paraumbilicales (*Sappey*)

end: within porta hepatis, it bifurcates into r. dx. + sin. and further into hepatic segments

**porto-caval anastomoses: 7 principle**

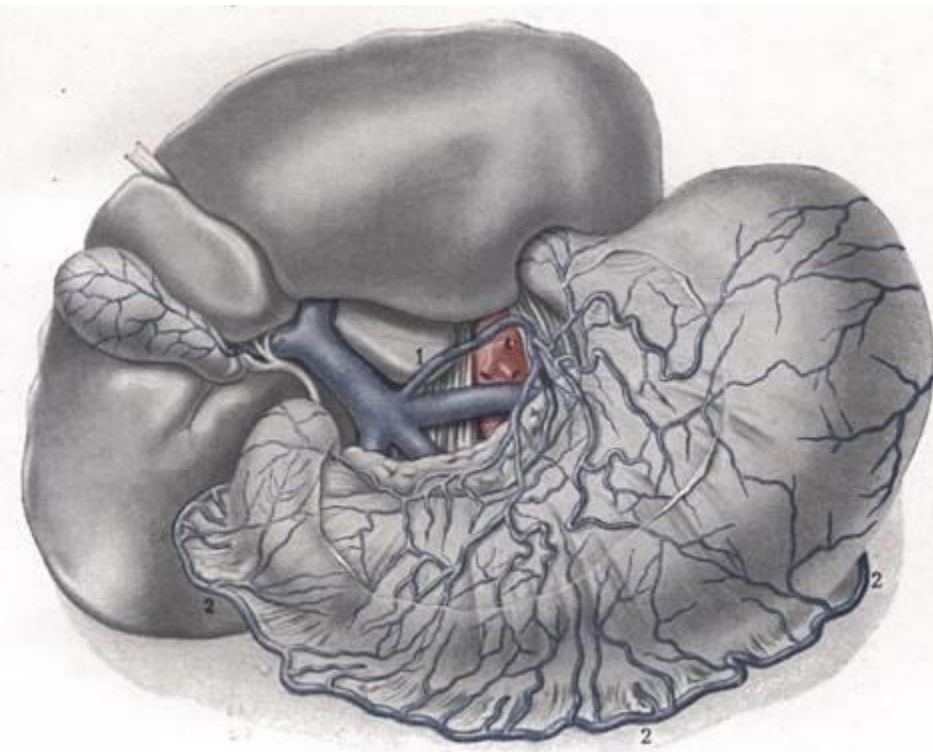
# SOUSTAVA VRÁTNICOVÉ ŽÍLY



Vena portae hepatis



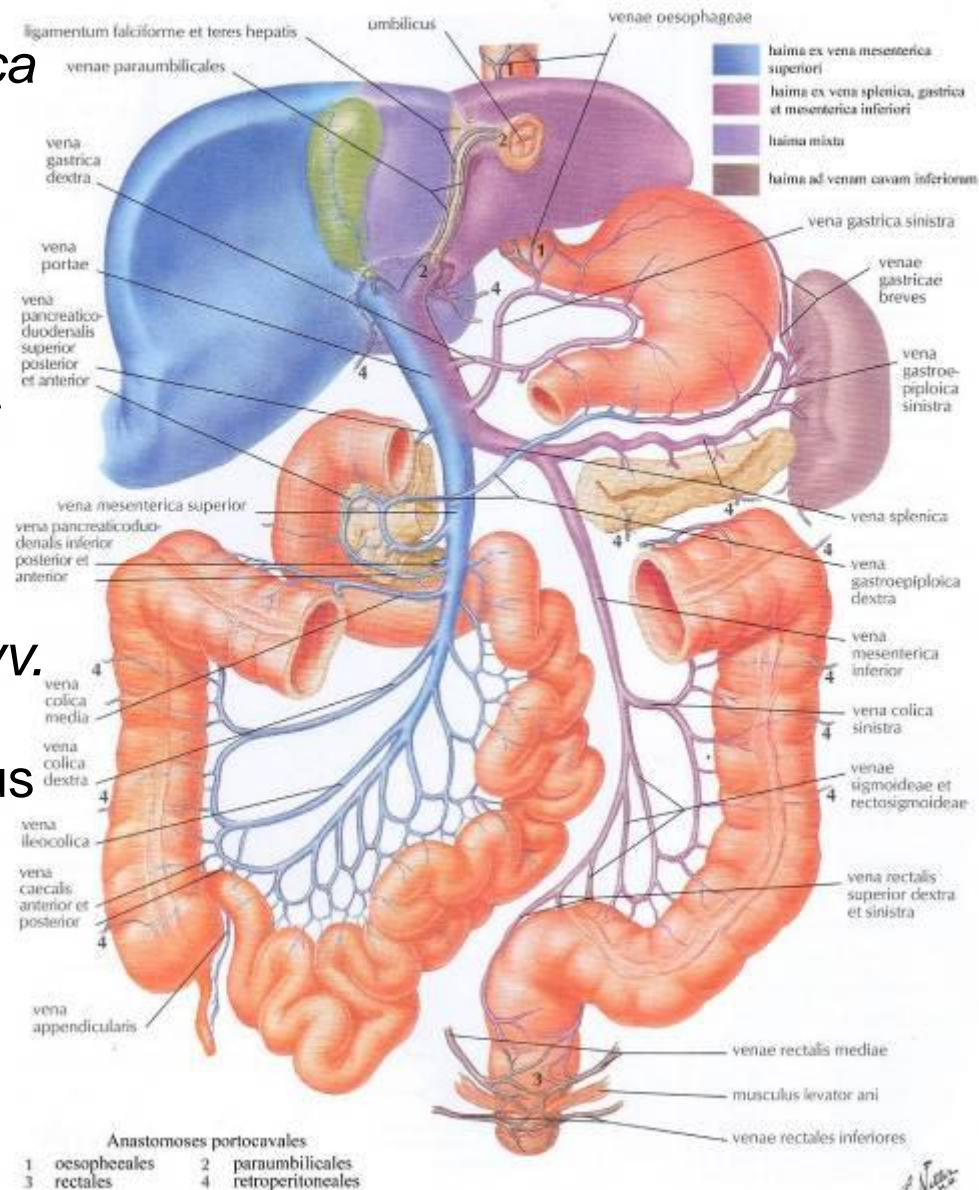
# Vena portae hepatis

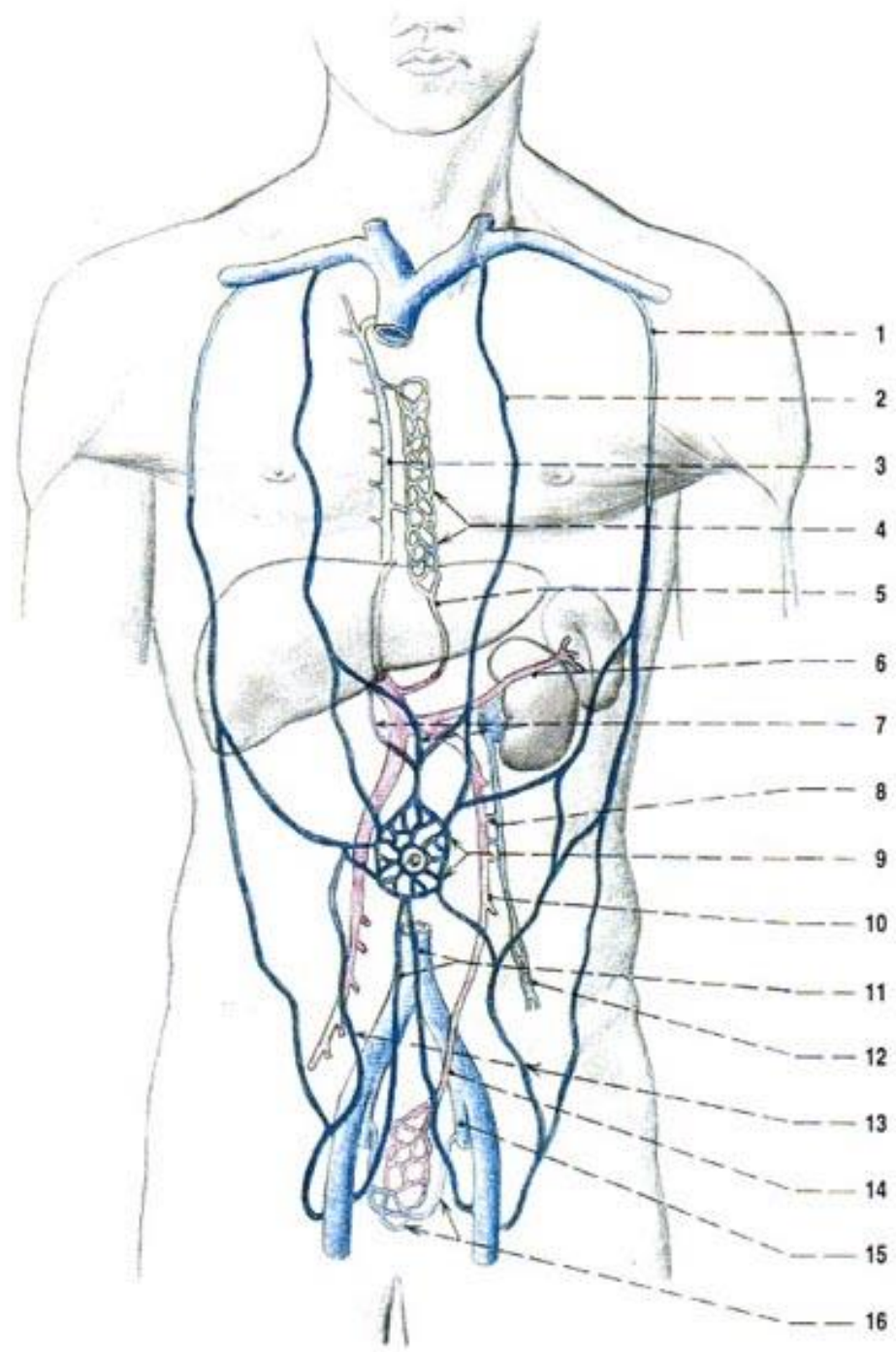
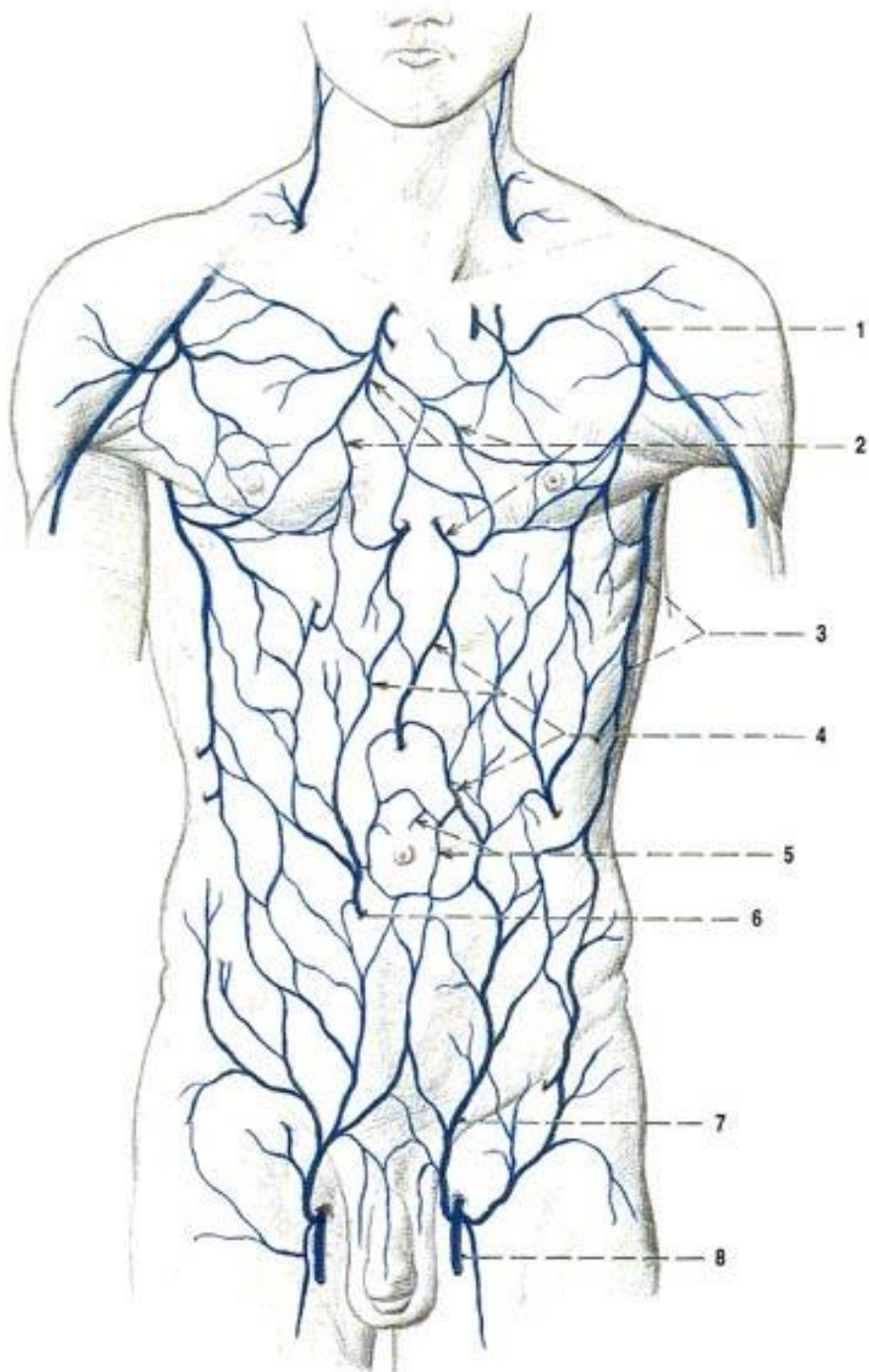


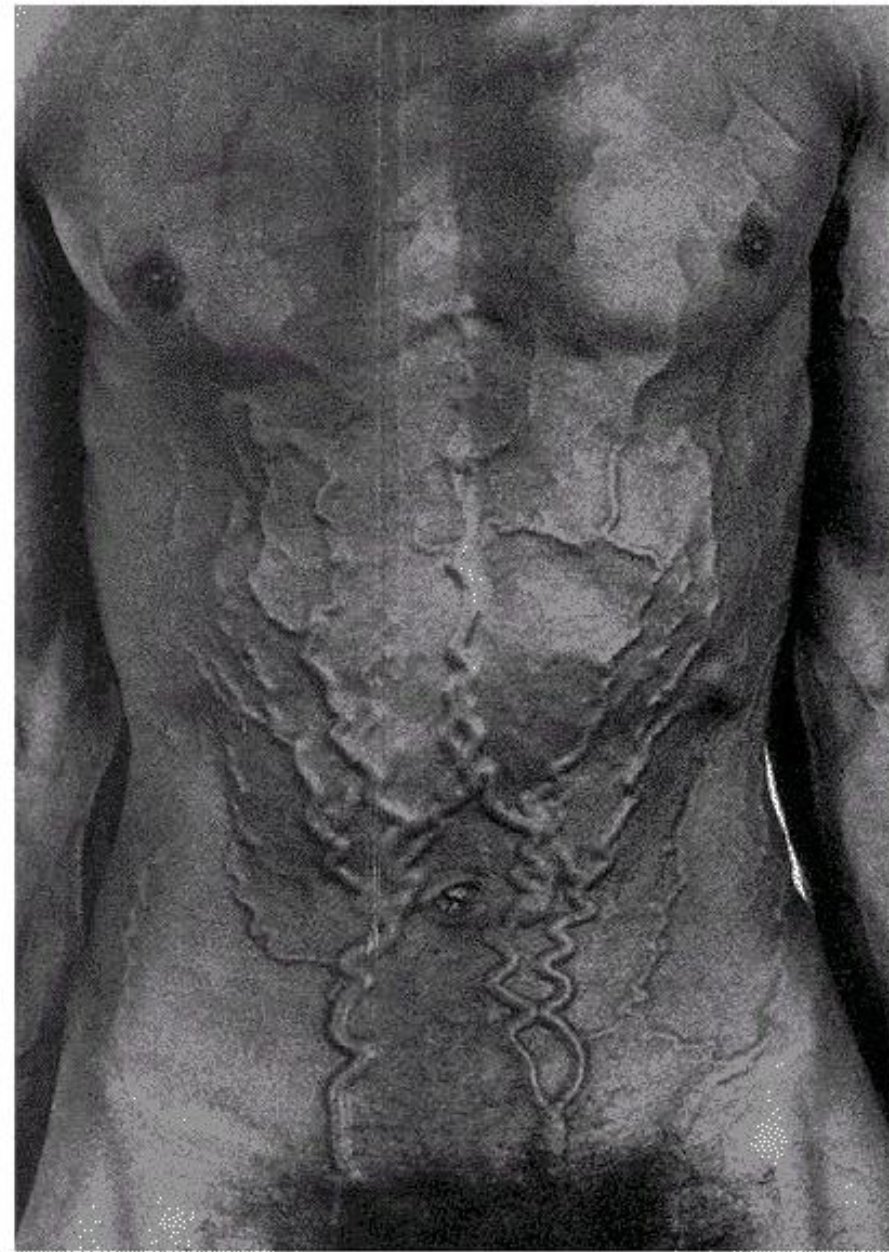
# Porto-caval anastomoses

## VENA PORTAE et ANASTOMOSES PORTOCAVALES

- vv. gastricae – vv. oesophageales (*oesophageal varices*) – *within tunica submucosa*
- vv. gastricae – vv. paraoesophageales – *within tunica adventitia*
- plexus venosus rectalis
- vv. paraumbilicales – *subcutaneous vein around umbilicus (caput Medusae) and further:*
  - v. epigastrica sup. + inf.
  - v. epigastrica superficialis + vv. thoracoepigastricae
- vv. paraumbilicales – plexus venosus vesicalis (*Burow's veins*)
- subcapsular veins of liver – veins of diaphragm
- connections in retroperitoneum (*Retzius' veins*)
- recanalized ductus venosus





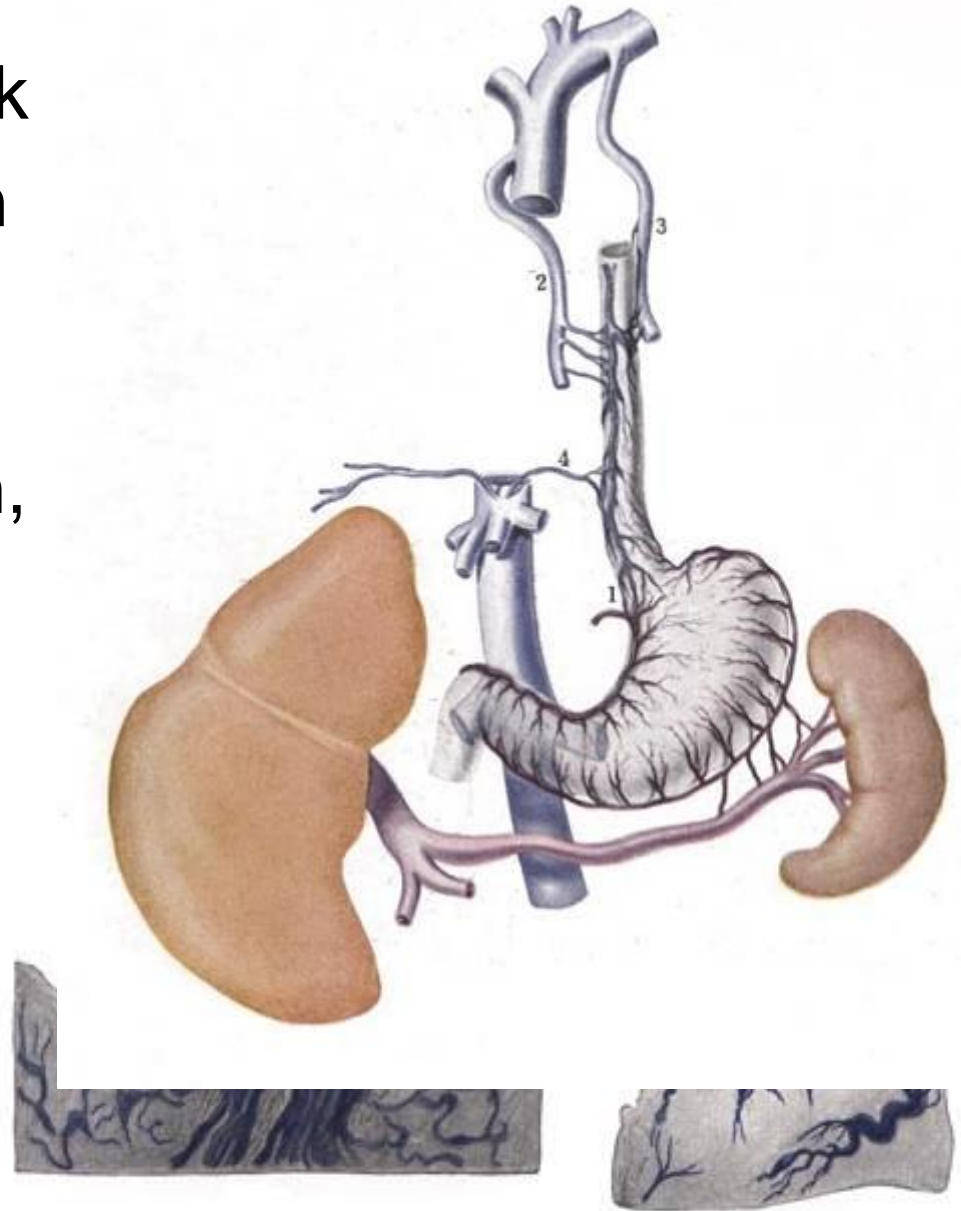
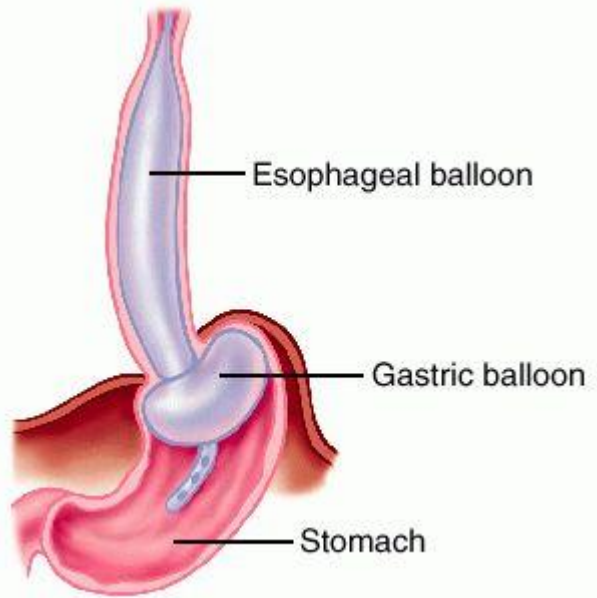


# Oesophageal varices

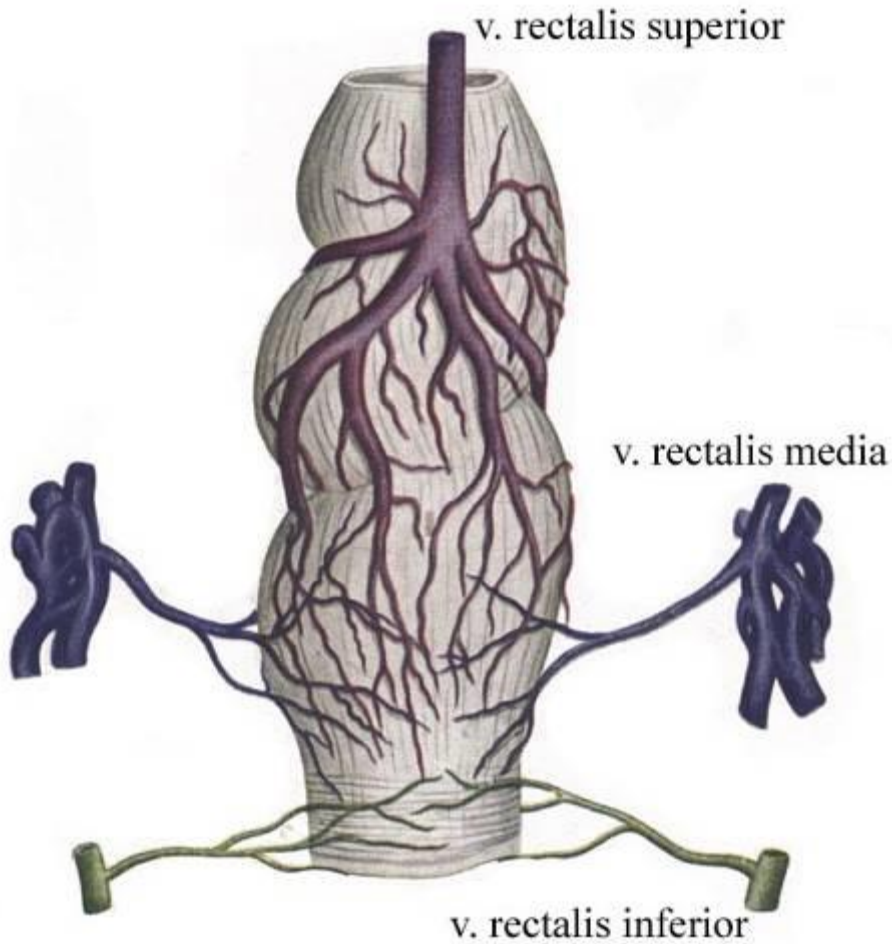


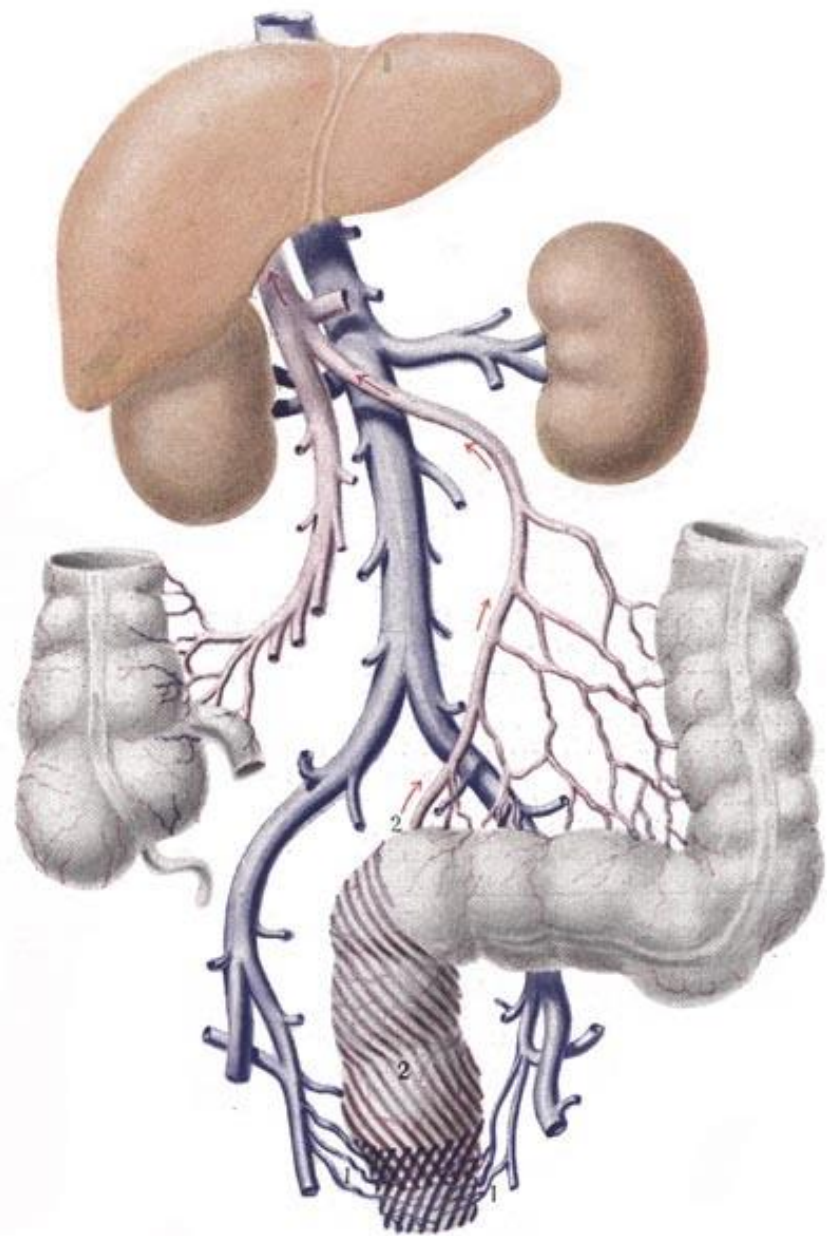
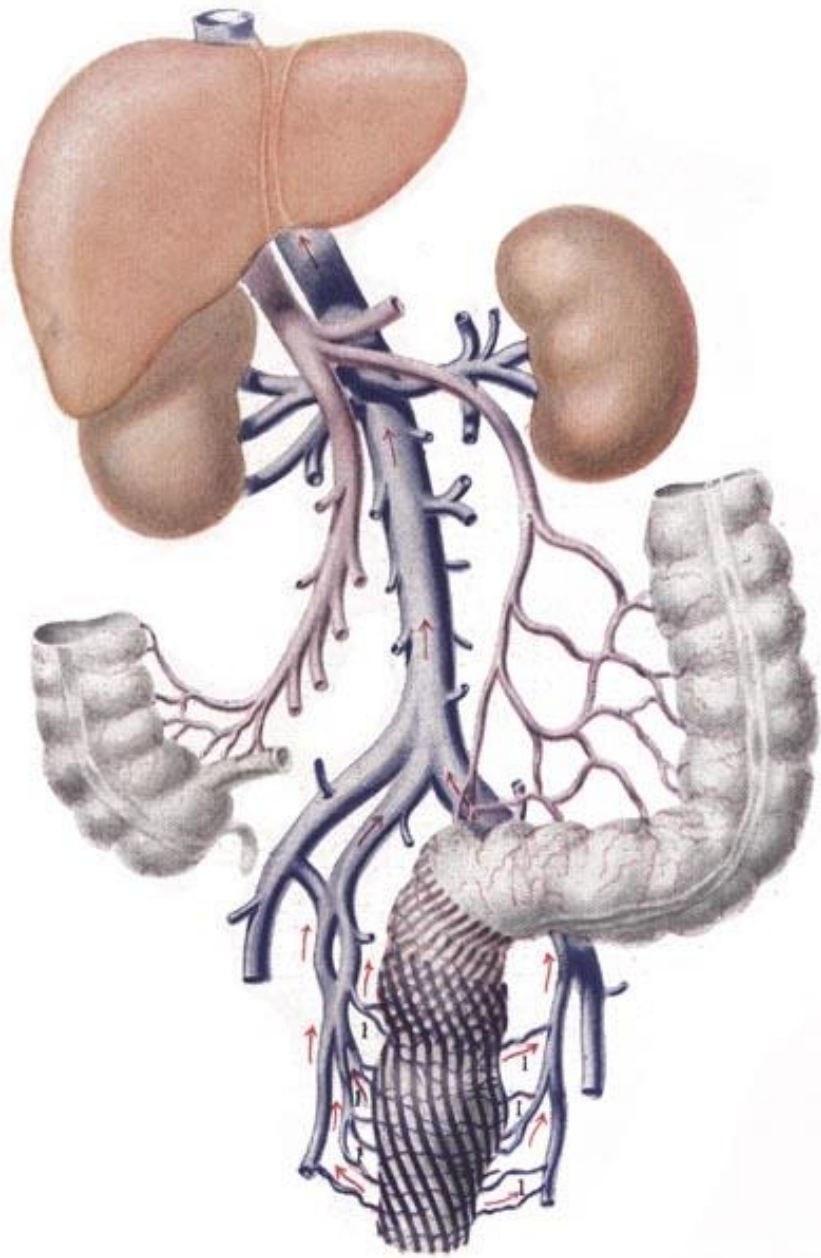
mortality: 30-50% per attack

- three-way, double-balloon tube (*Sengstaken-Blackmore*)
- endoscopic sclerotization, ligation at 3,7,11



# Konečníkové žíly





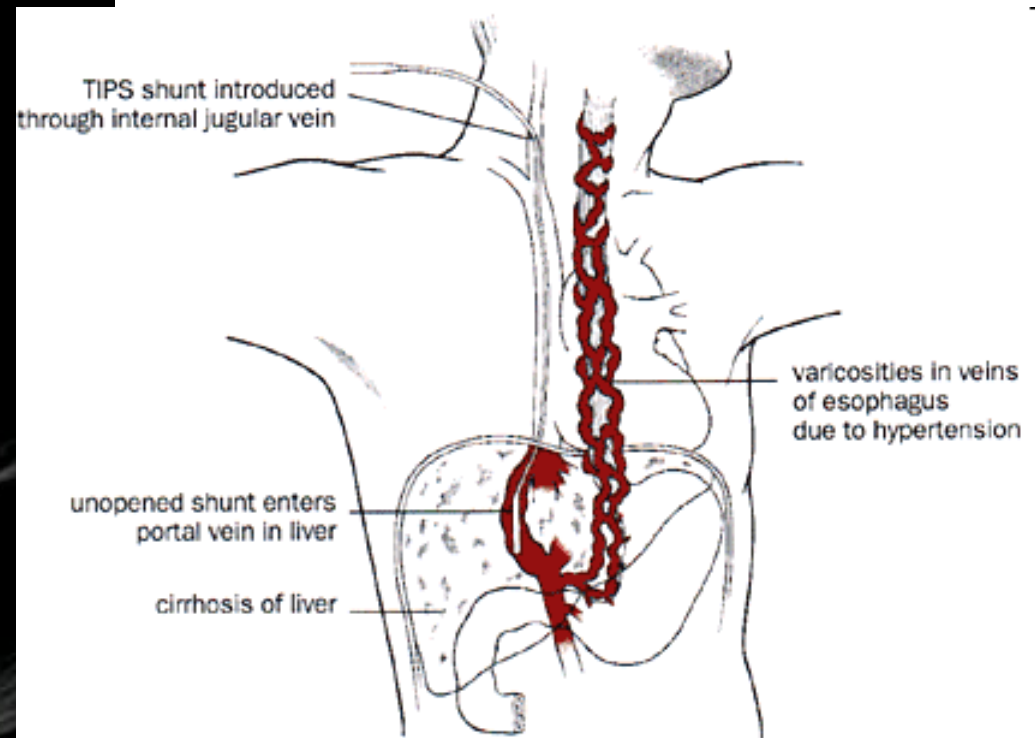
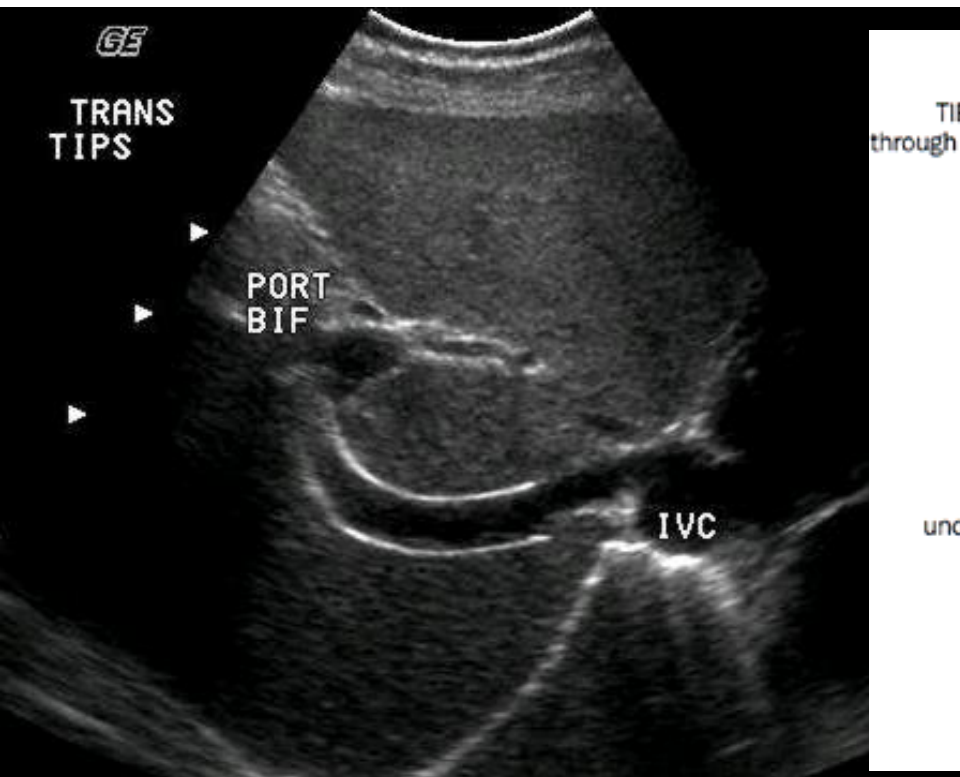
# Porto-caval anastomoses – clinical relevance

- portal hypertension (prehepatic – thrombosis; hepatic – cirrhosis; posthepatic – thrombosis)
- collateral circulation
- oesophageal varices – bleeding
- caput Medusae – rare (children: around umbilicus, adults: sides)
- haemorrhoids
- ascites
- splenomegaly
- hepatic encephalopathy (ammonium in CNS)
- *treatment*: TIPS (transjugular intrahepatic portosystemic shunt)





# Porto-caval anastomoses – clinical relevance

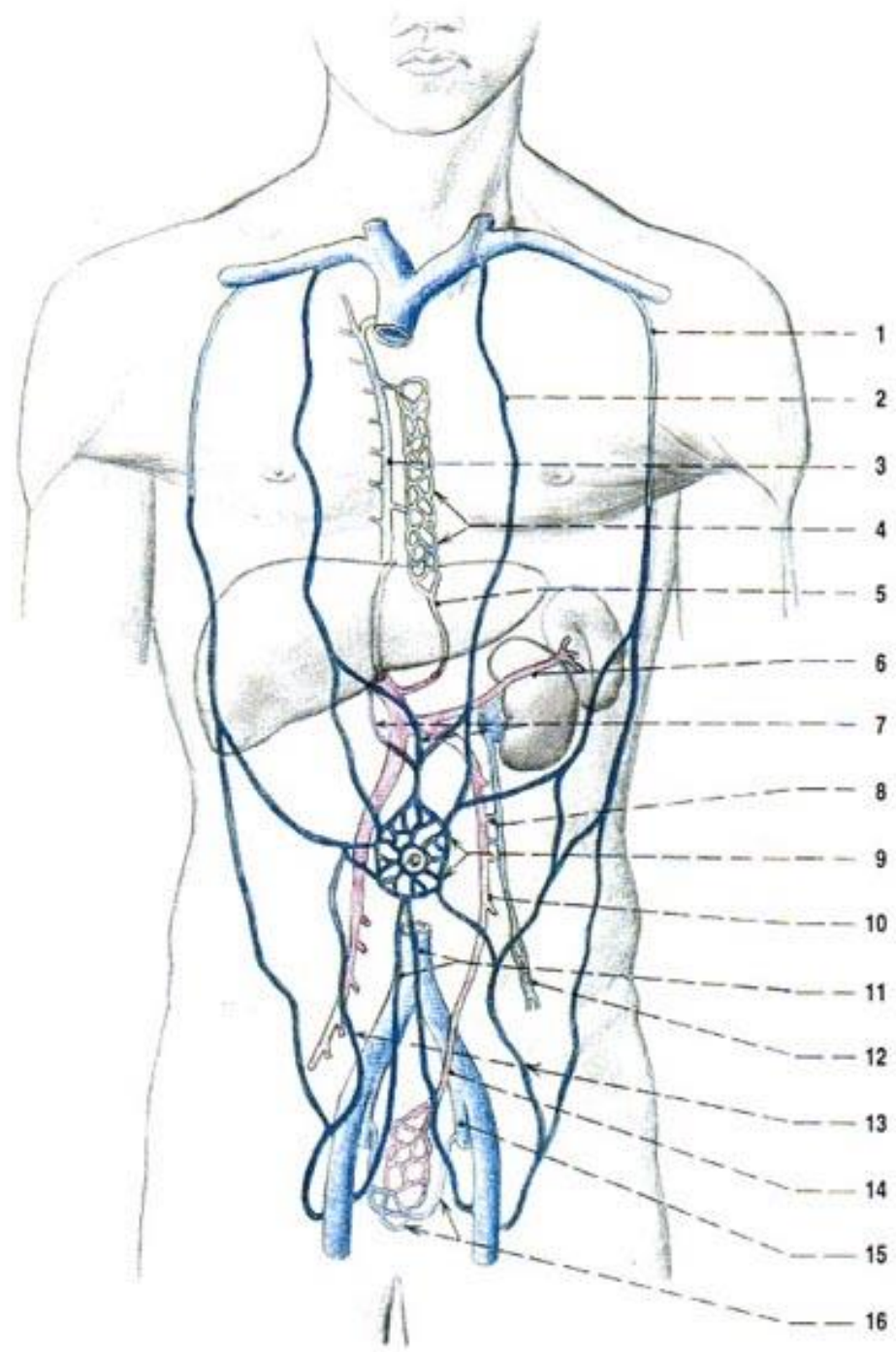
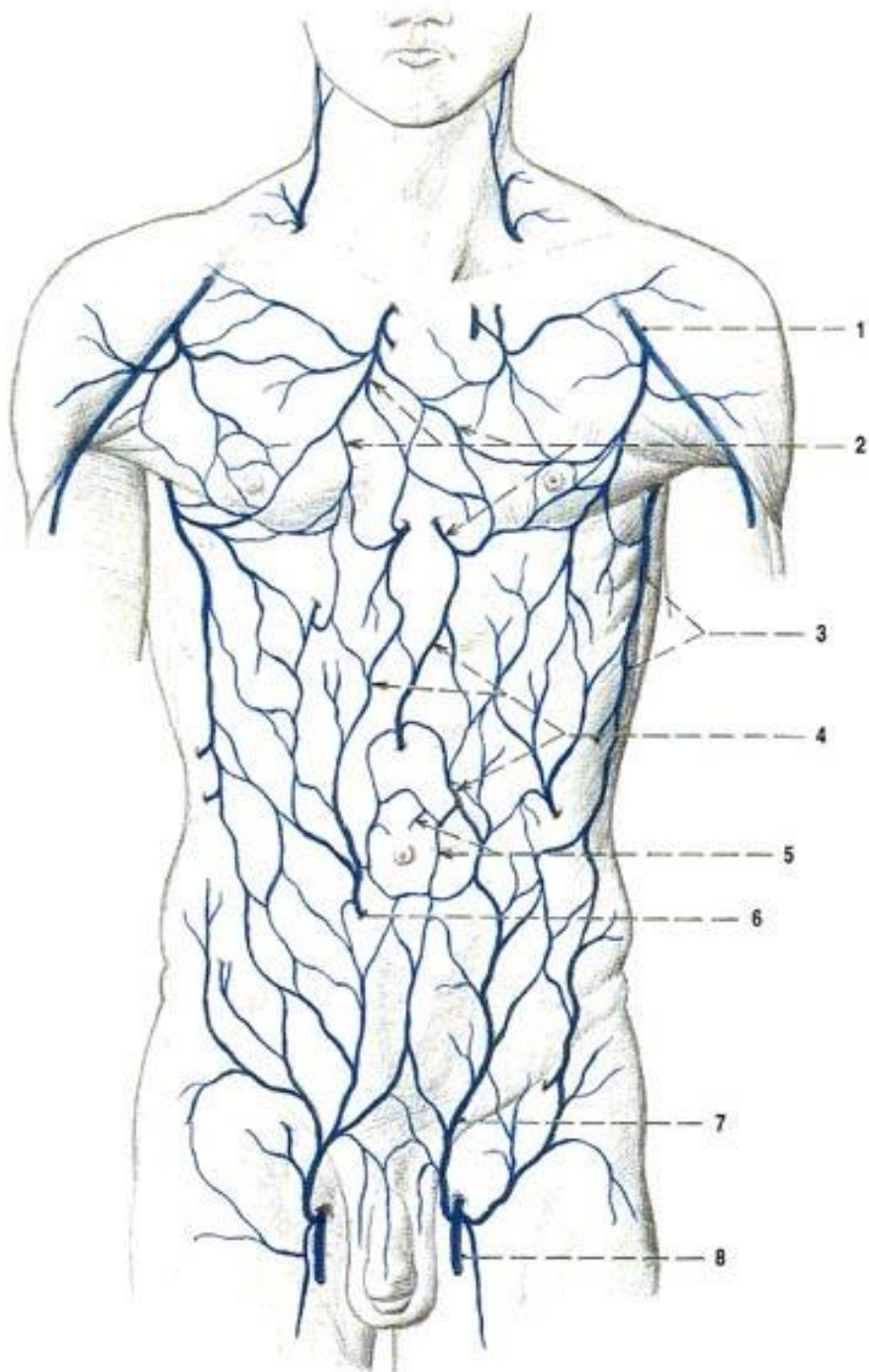


# Cavo-caval anastomoses

## VCI

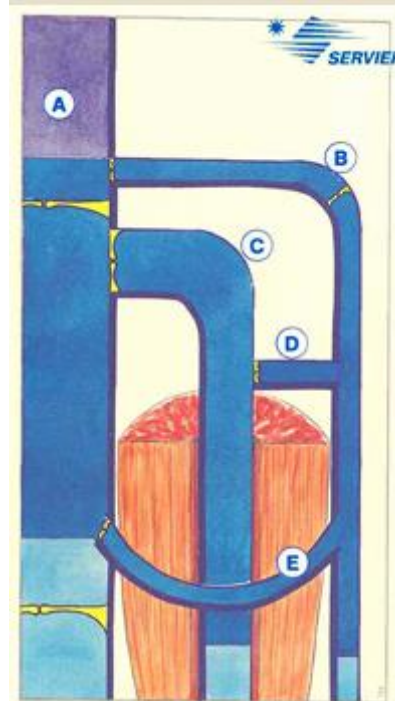
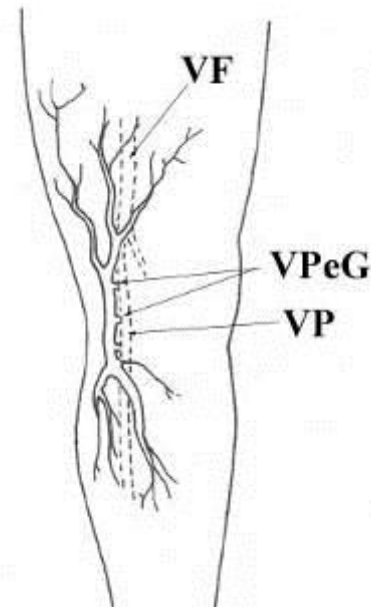
## VCS

- vv. lumbales – v. azygos + hemiazygos
- v. epigastrica inf. – v. epigastrica sup.
- v. epigastrica spf. – vv. thoracoepigastricae
- plexus venosi vertebrales (*Batson's*)



# Veins of lower limb

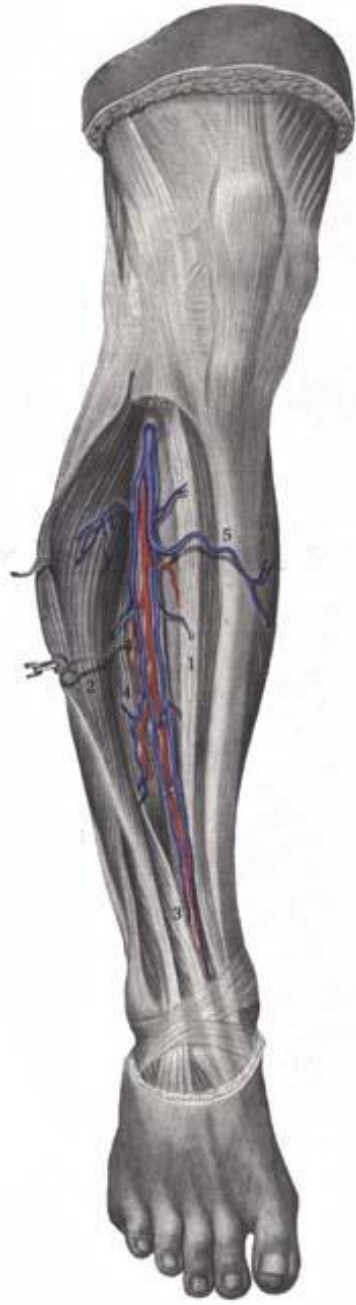
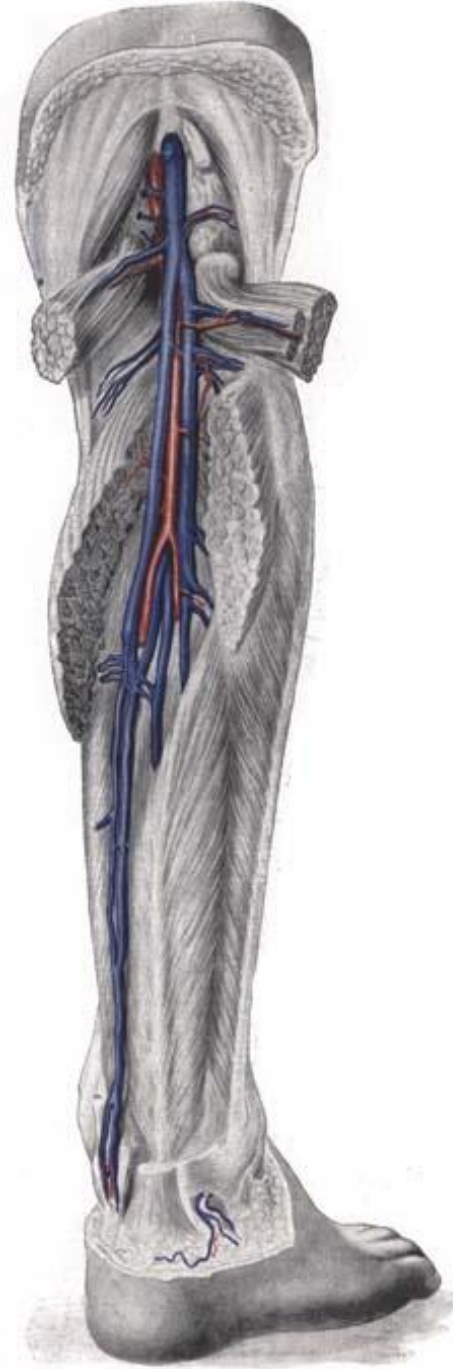
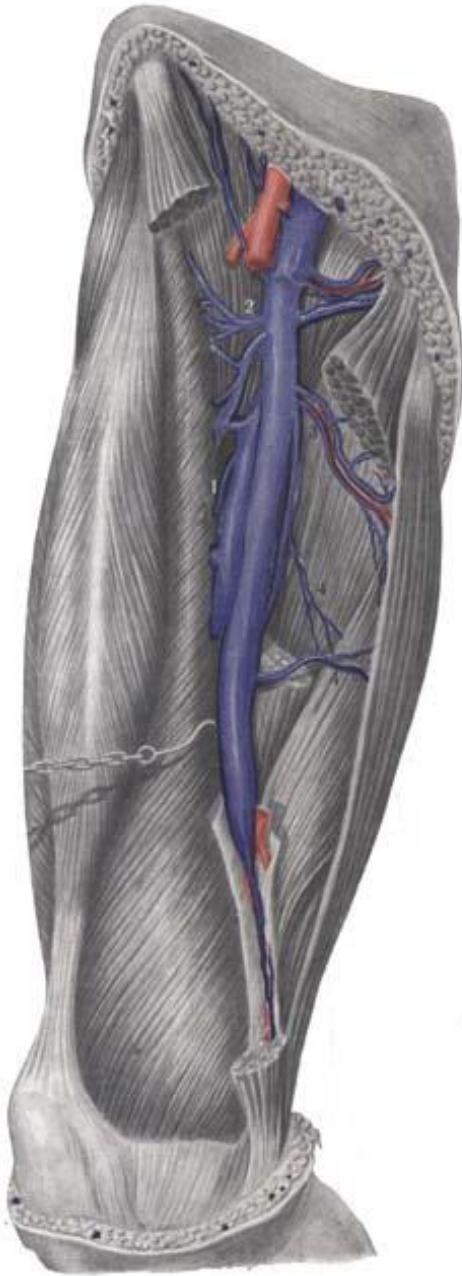
- superficial system
  - compartimentum saphenum
- deep system
  - accompany arteries
  - doubled up to fossa poplitea
  - frequent connections around artery
  - frequent valves
- systema venosum laterale (*Albanesei*)



# Deep veins of lower limb

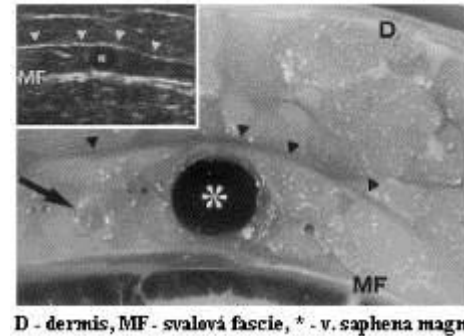
- vena femoralis communis
- venae comitantes arteriarum perforantium
- plexus venosus genicularis
- venae soleales + venae gastrocnemii
- vena ischiadica
  - rare
  - often connected with Klippel-Trenaunay-Weber's syndrome
    - veins with varices, skin hemangiomas, hypertrophy of soft tissues and bones)



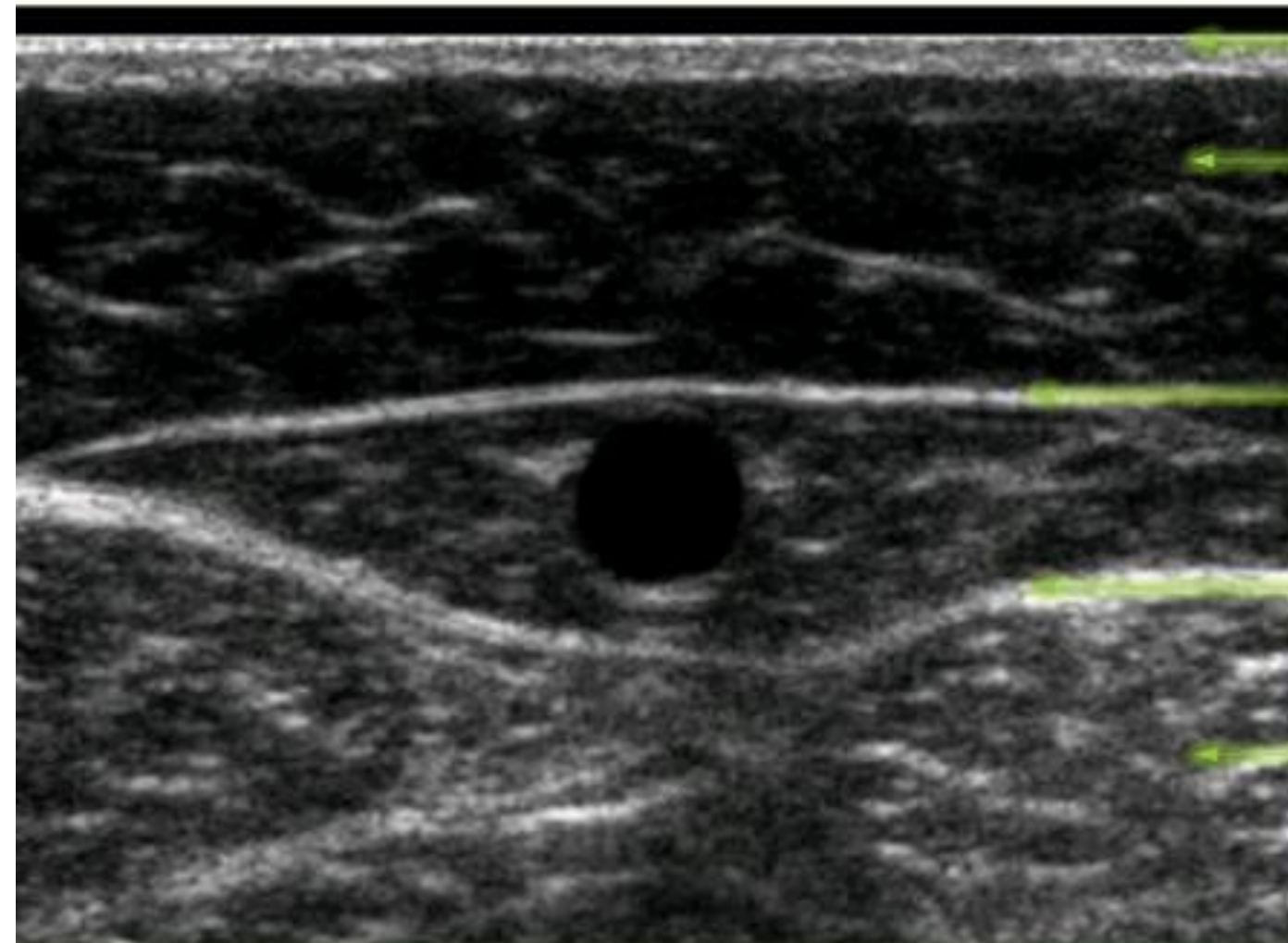


# Vena saphena magna

- confluens venosus subinguinalis
- valvula terminalis + preterminalis
- v. s. m. accessoria
  - ant., post., superficialis
- v. circumflexa femoris ant., post.
- runs with n. saphenus
- *ultrasound: „Egyptian / Cleopatra’s eye“*



# Egyptian / Cleopatra's eye



Skin

Subcutaneous  
Fat

Saphenous  
Fascia

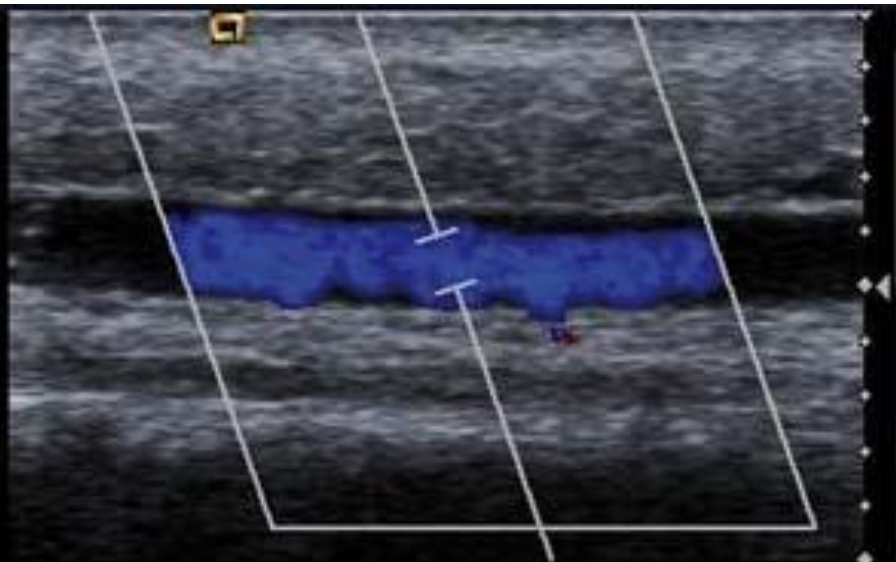
Investing Fascia  
of the Thigh

Thigh Muscle



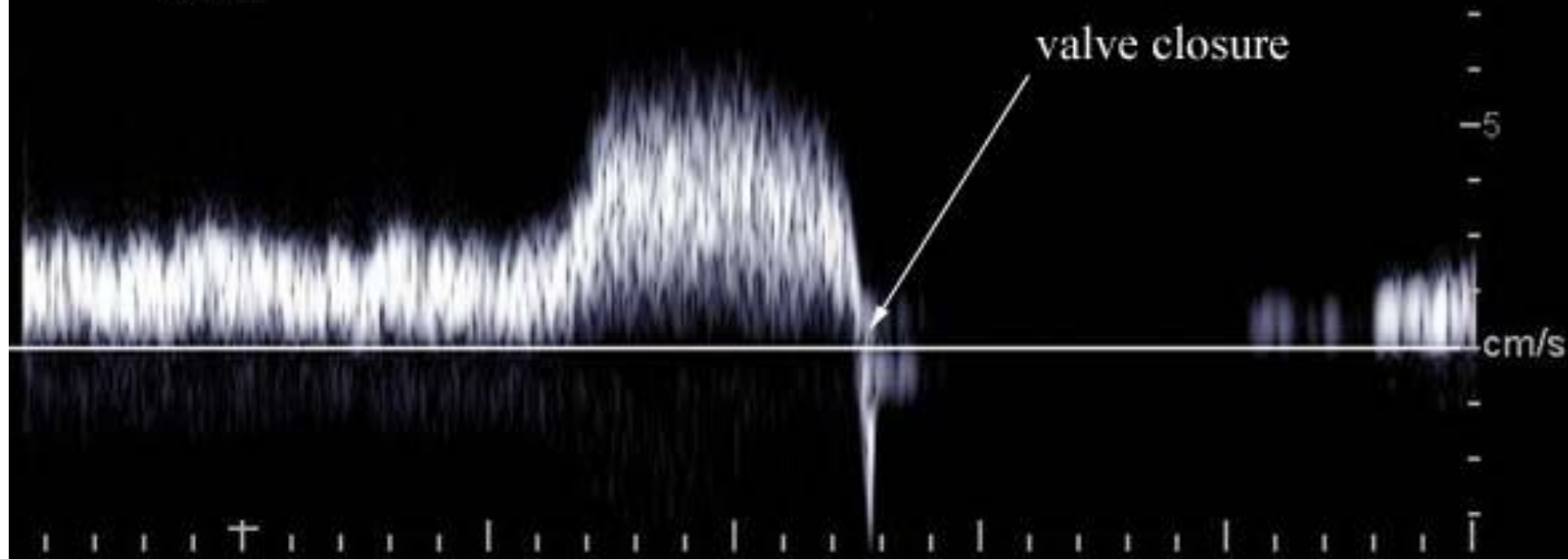
TIB: 1.0

superficial vein



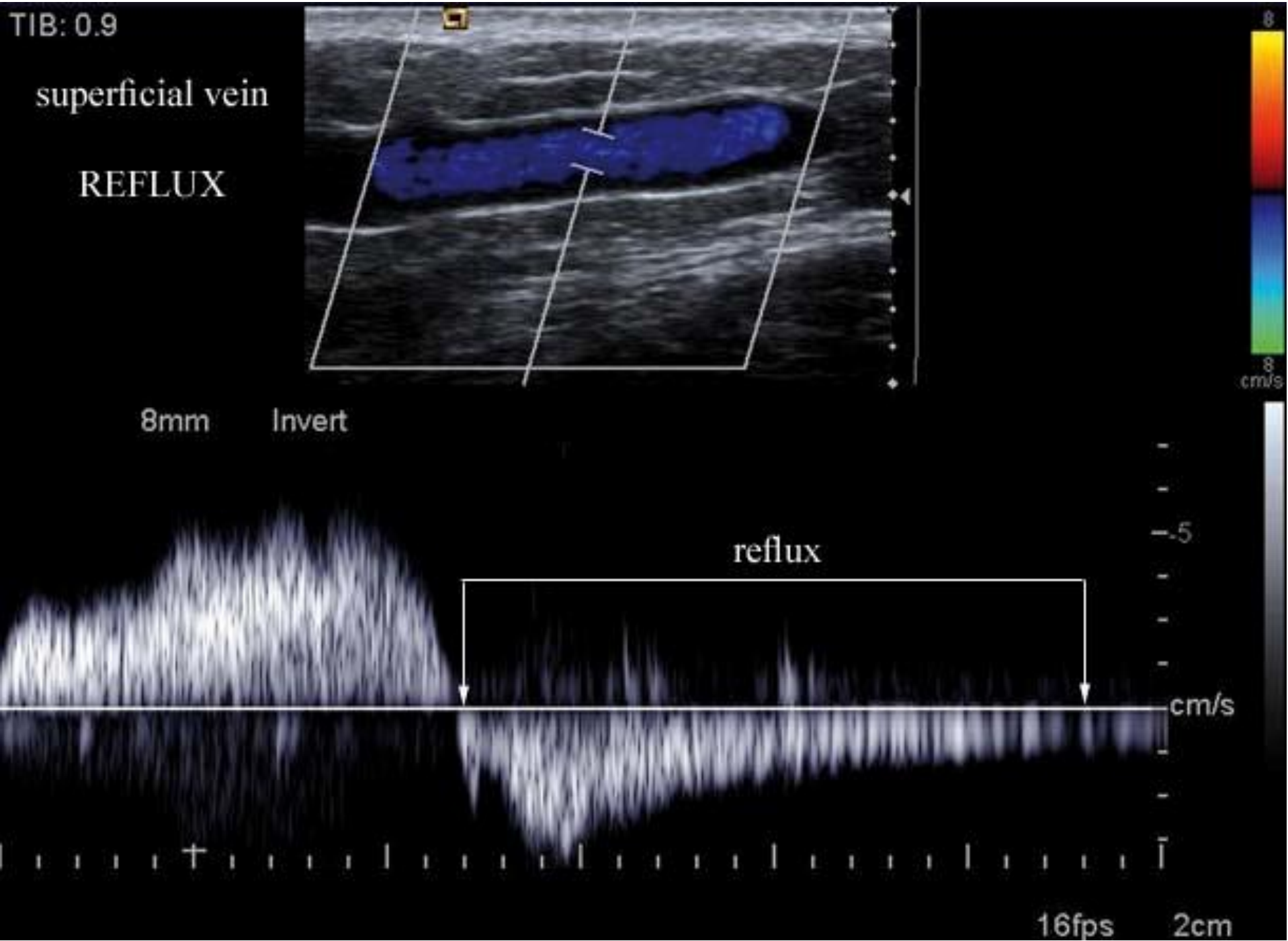
9mm

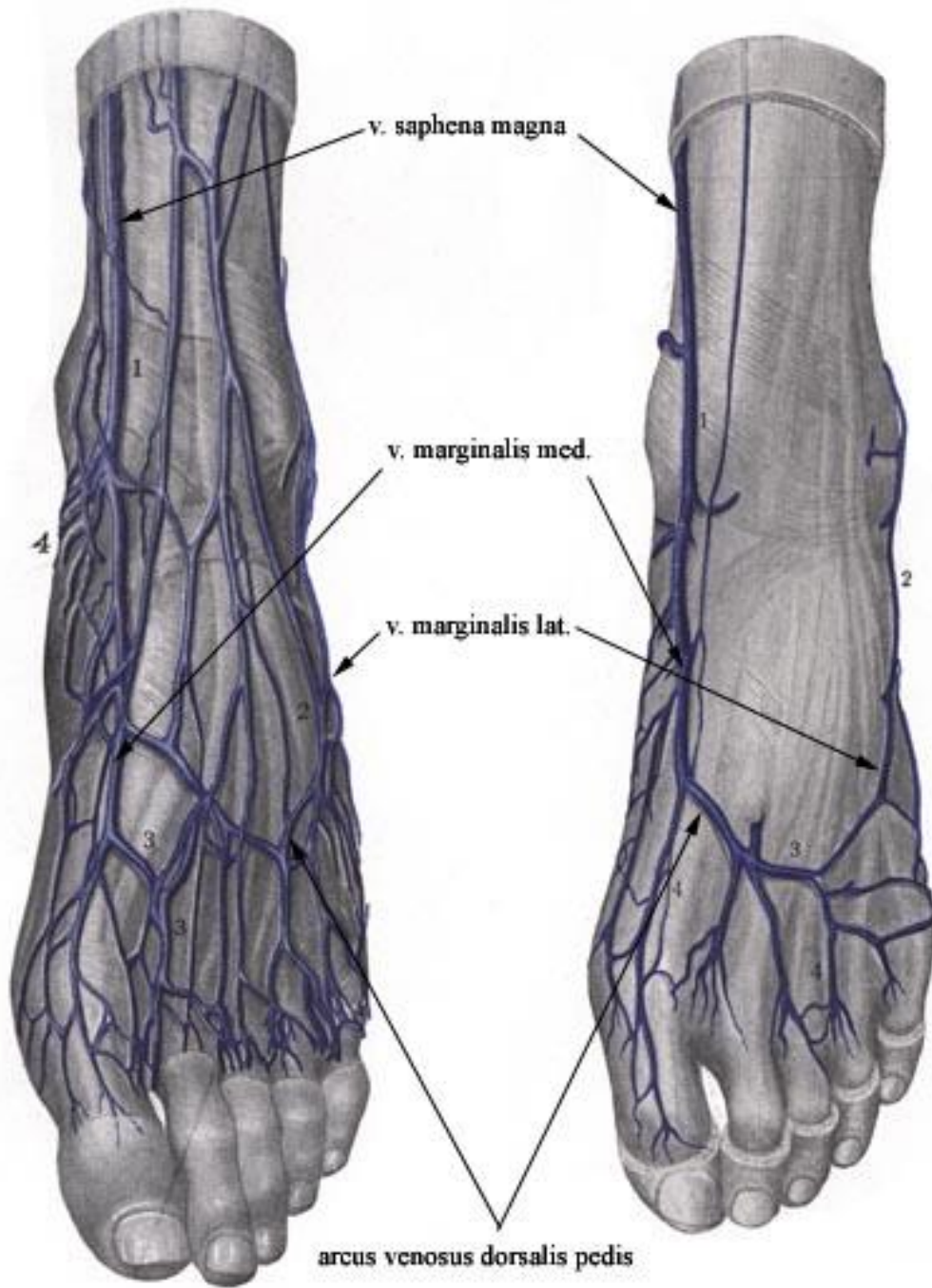
valve closure

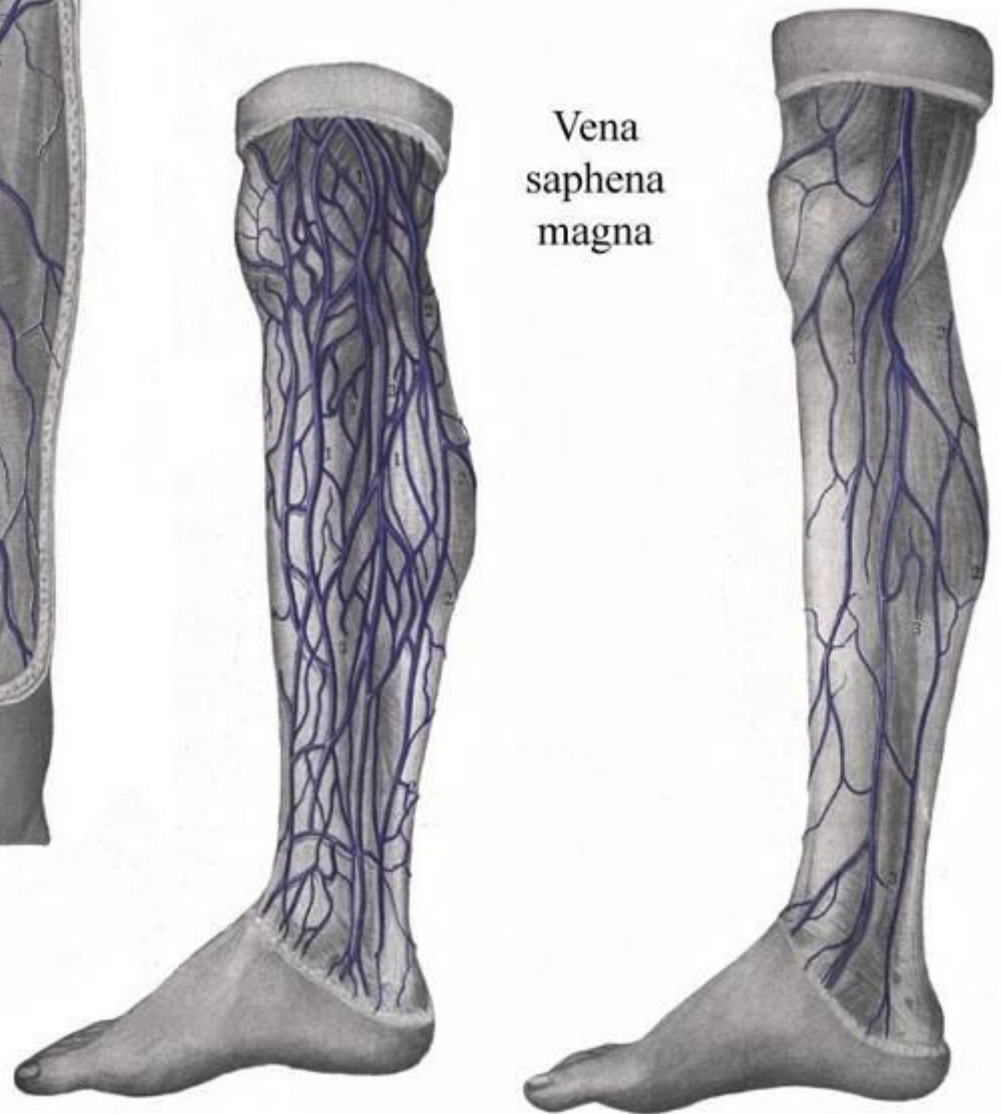
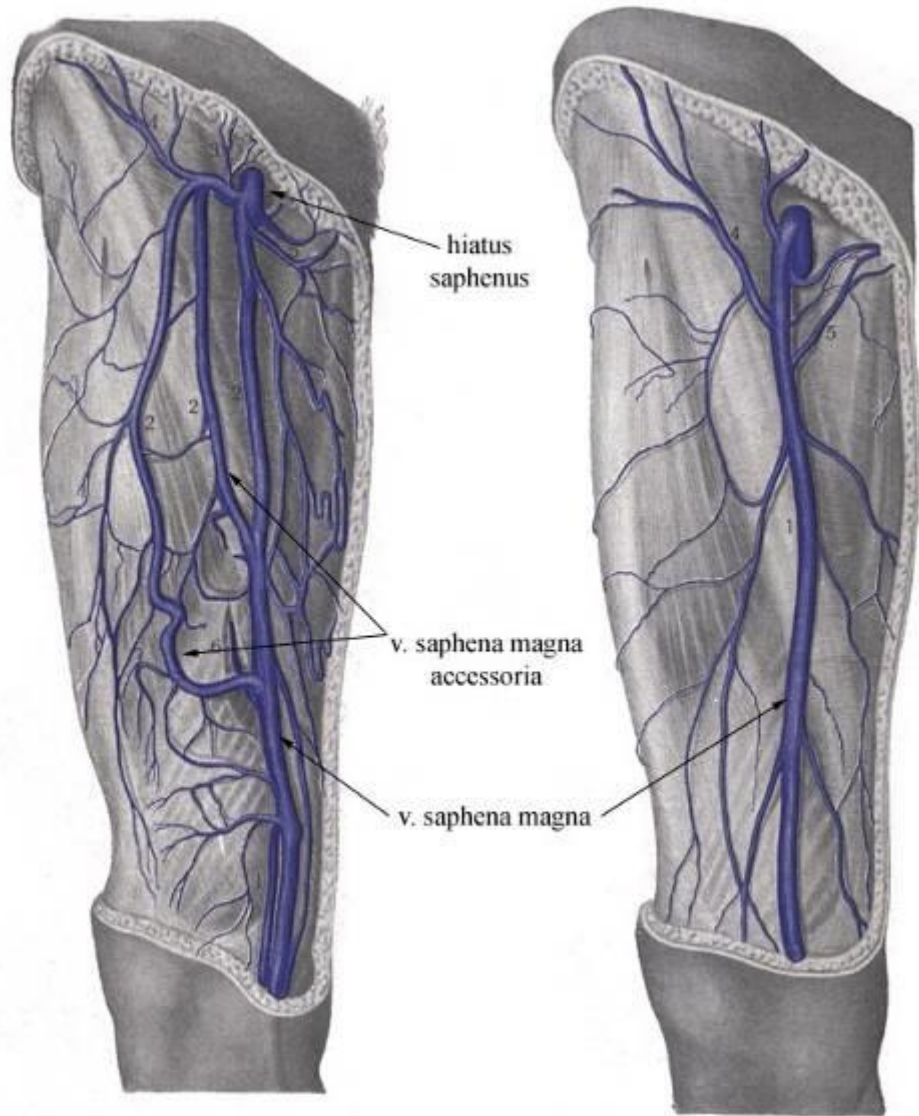


18fps

2cm







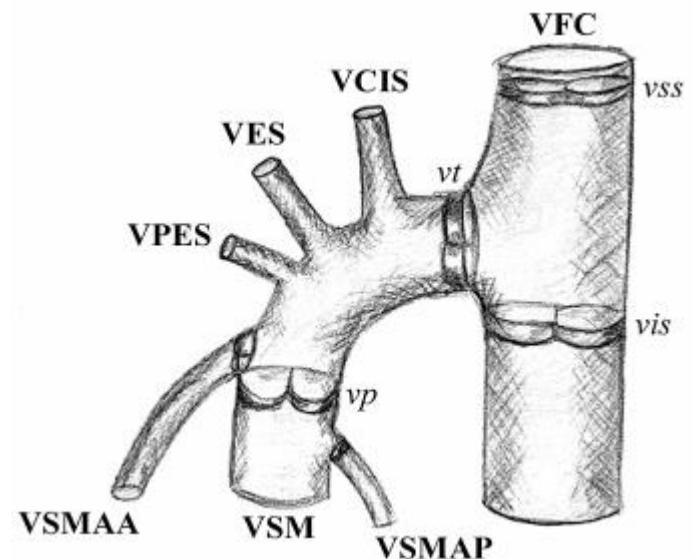
# Confluens venosus subinguinalis

clinical term „Crosse“

= terminal portion of VSM bordered with valves

- v. epigastrica superficialis
- v. circumflexa ilium superficialis
- v. pudenda externa superficialis
- v. saphena magna accessoria anterior et posterior

- *crossectomy*

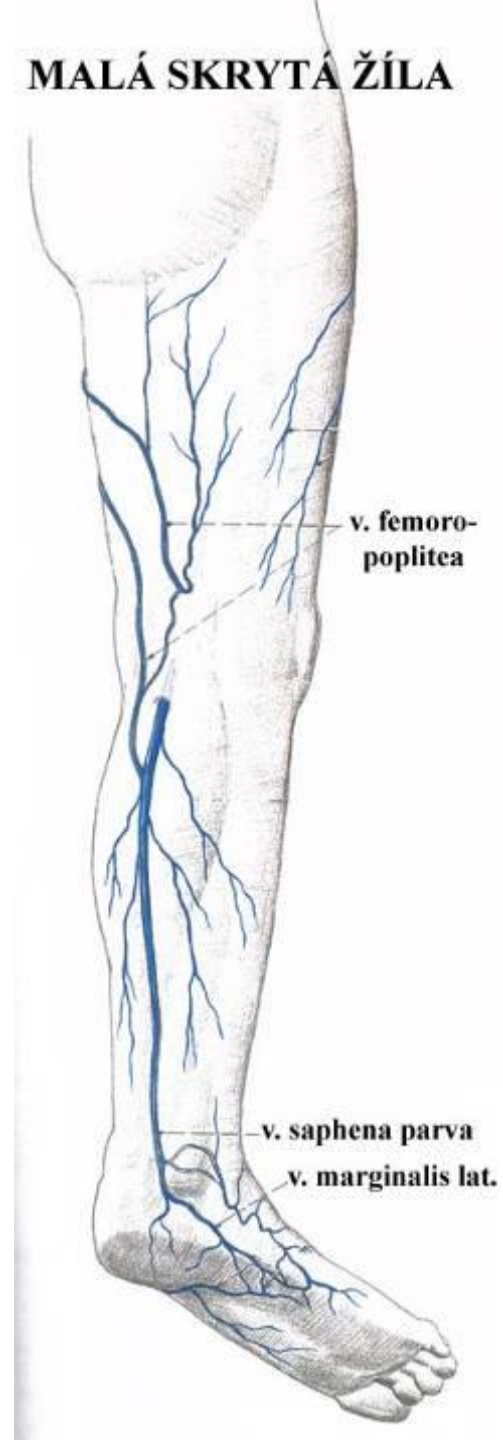
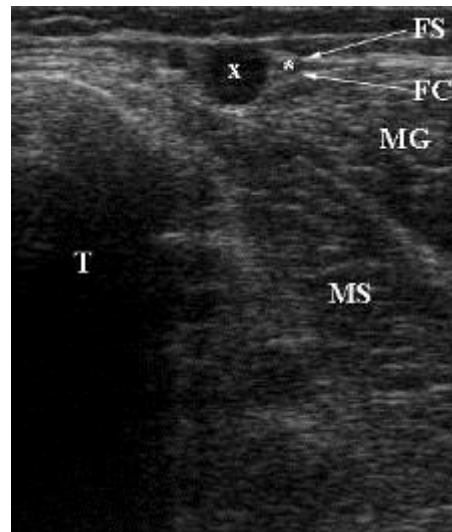




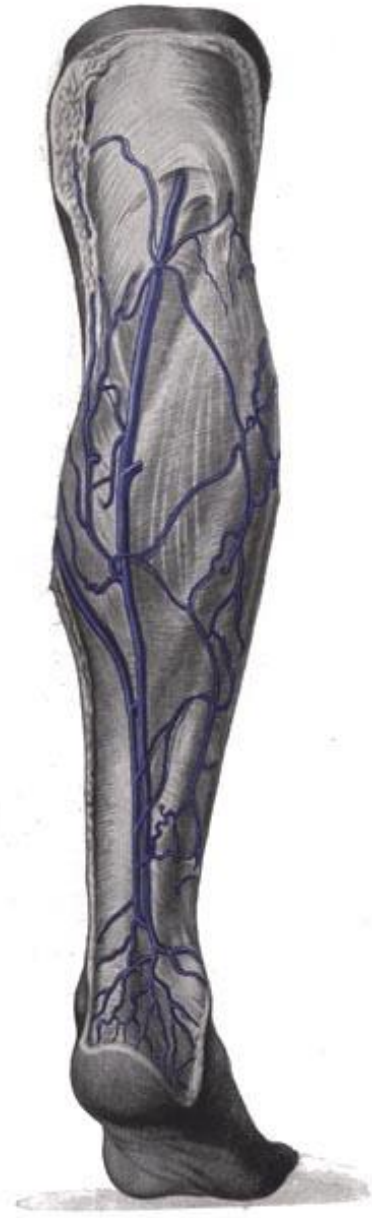
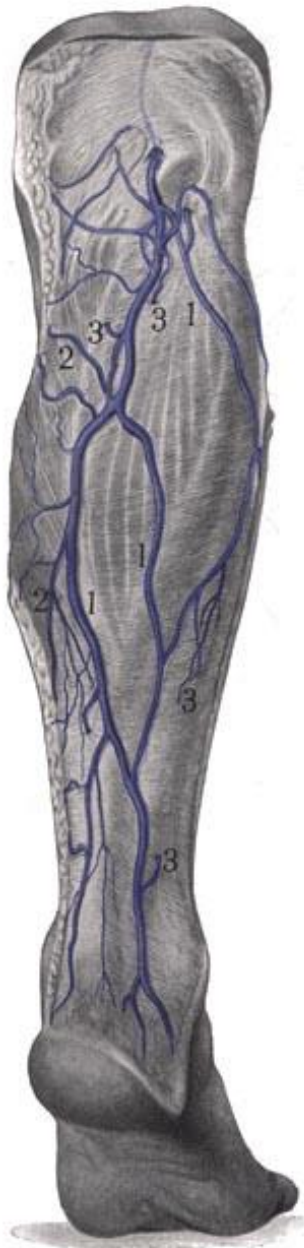
# Vena saphena parva

- valvula terminalis + preterminalis
- v.s.p. accessoria superficialis
- extensio cranialis venae saphenae parvae (obsolete „v. femoropoplitea“)
- runs with n. suralis

*venae intersaphenae*



vena saphena parva

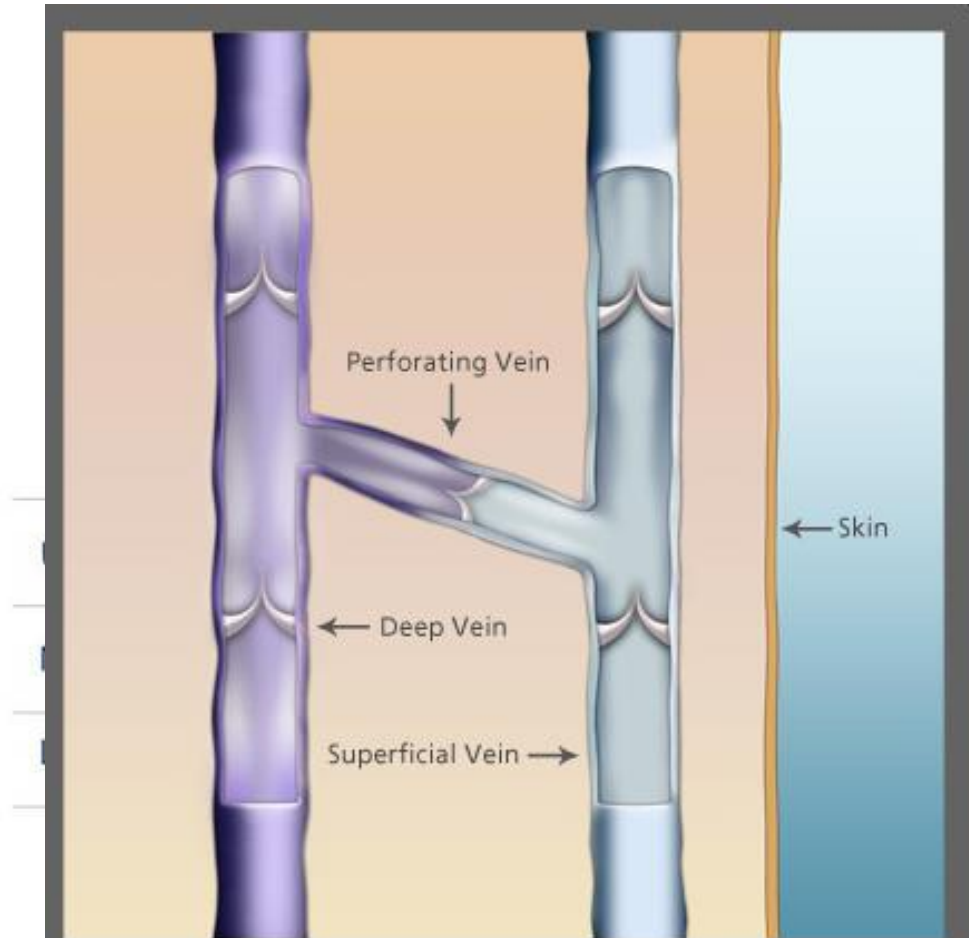




# Venae perforantes

## Transfascial connections = Perforators

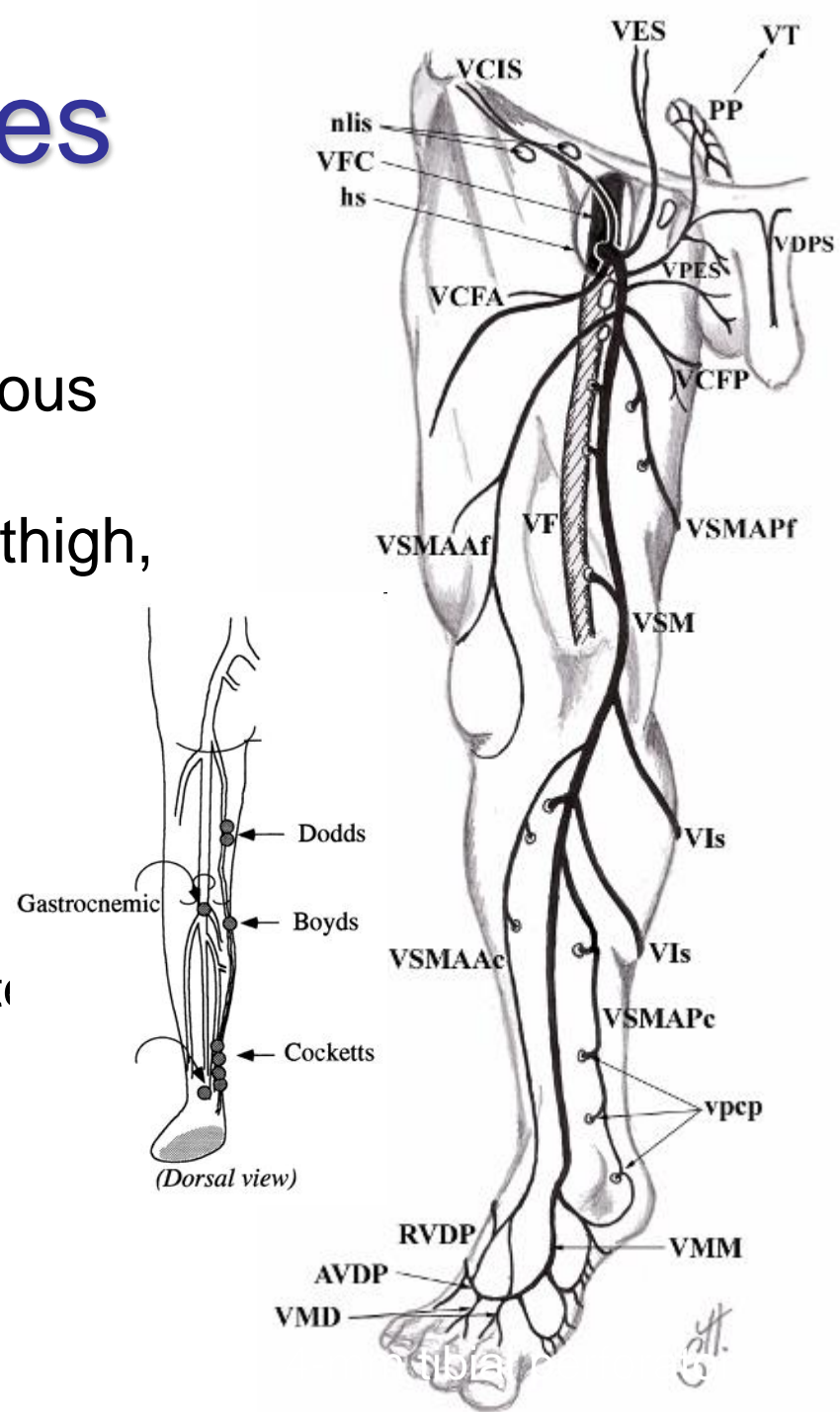
- interconnect deep (80% of blood) and superficial systems
- contain valves
- insufficient valves → varices
- 6 groups according to position

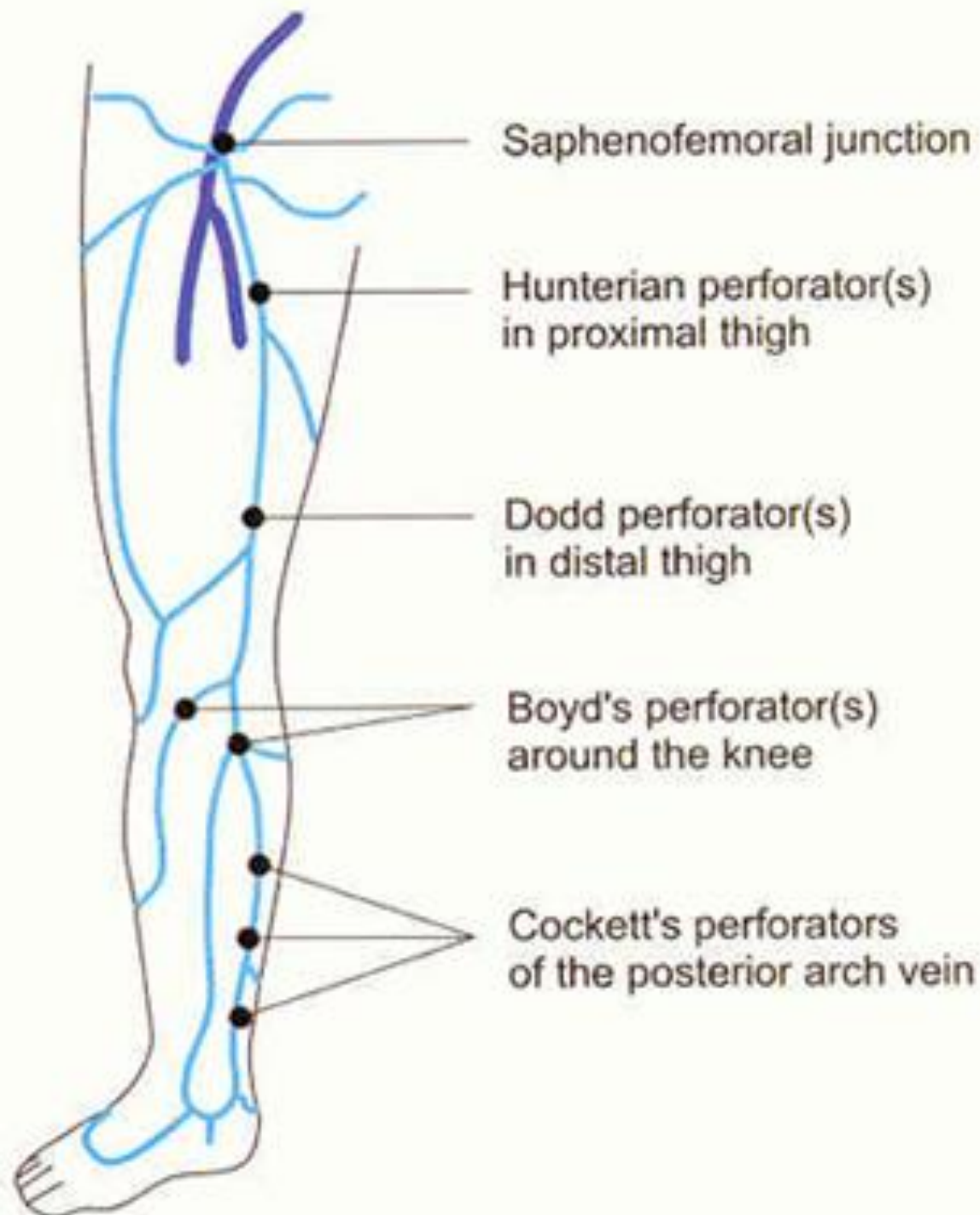


Perforating veins connect the deep system with the superficial system

# Venae perforantes

- simple, double or multiple
- run with small artery and cutaneous nerve (Staubesand's triad)
- 6 groups: foot, ankle, leg, knee, thigh, buttocks
- eponyms: Cockett, Boyd, Dodd
- e.g.: *venae perforantes cruris posteriores tibiales* = *Cockett's perforators*
  - interconnect v.s.m. accessoria posterior and venae tibiales posteriores
  - 18.5, 13.5 a 7 cm proximal to sole





FR 32Hz  
P1  
2D  
44%  
C 52  
P Med  
Gen  
CF  
60%  
1313Hz  
WF 78Hz  
Med



PW  
8%  
WF 60Hz  
SV2.0mm  
M3  
4.0MHz  
1.6cm



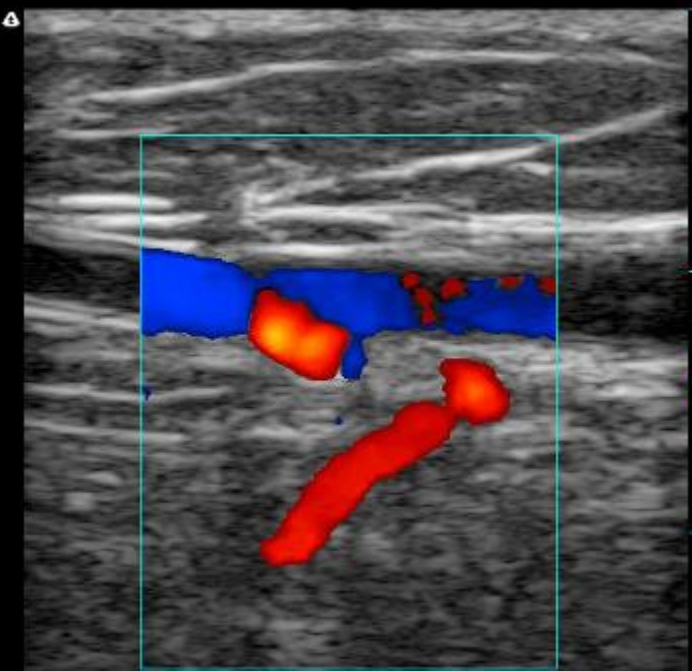
COCKETT PERF

RELEASE

-40

cm/s

18



12HL7  
A/3/B/H/TV2  
Depth 3 cm  
Color  
PRF 0.90kHz  
WF 40Hz  
Freq 6.0MHz



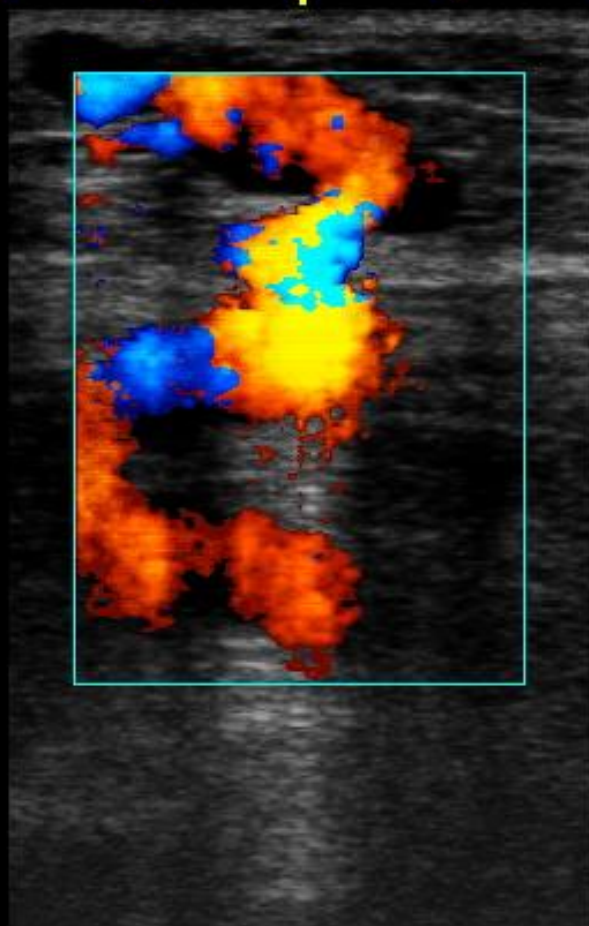
4-mm tibiální perforátor

ID: →

L38 26-10-2010  
VEN 08:53:39

FR: 8  
10 / 37

PERFORANTE



F: 9.0 MHz  
G: 76 dB  
CG: 55 %

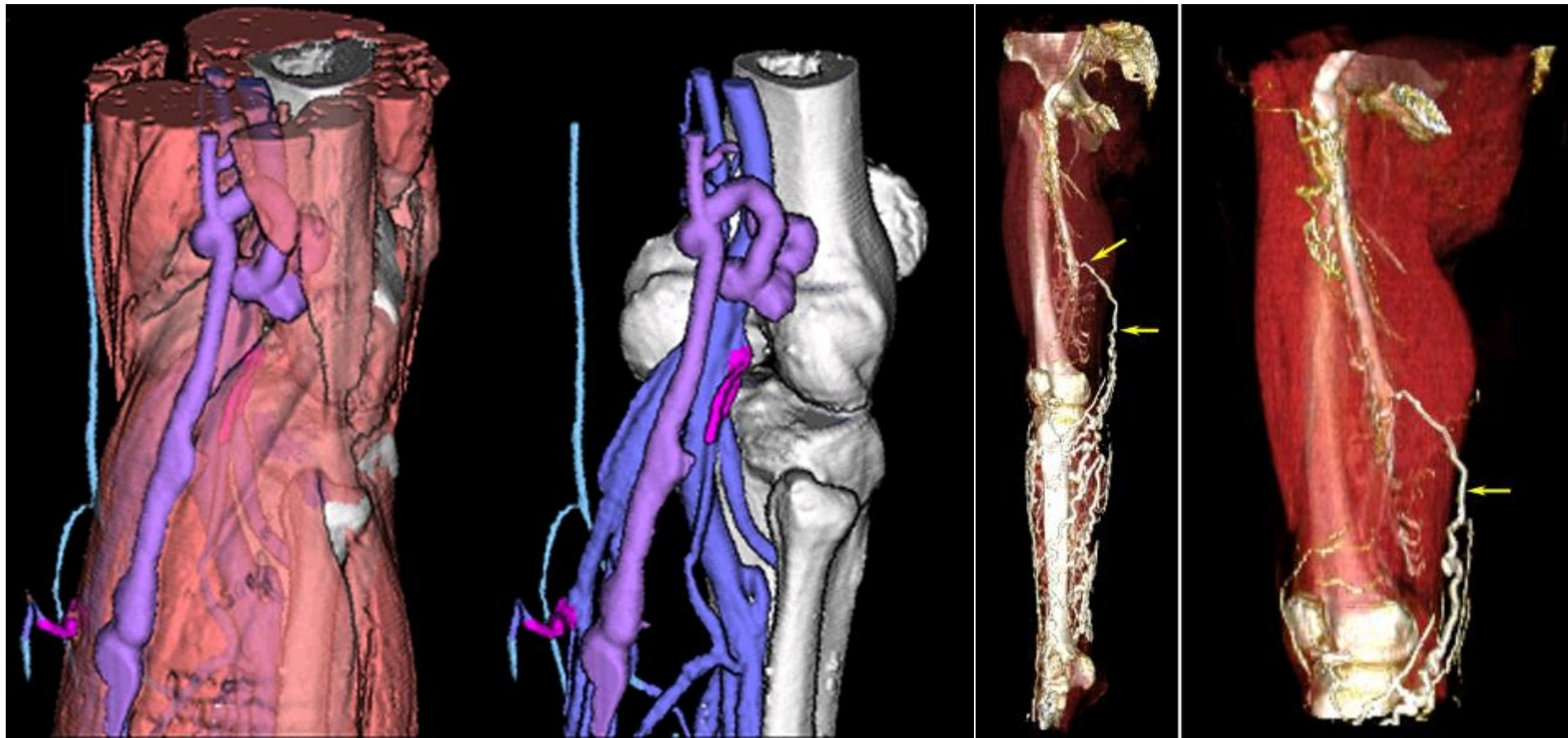
6.0 2.0kHz

DR: 45 dB  
SM: 4  
VF: 2  
CF: 2

MENU PAGE CD-1

1: [ ] 2: [ ] 3: [ ] 4: [ ] 5: [ ] 6: [ ]

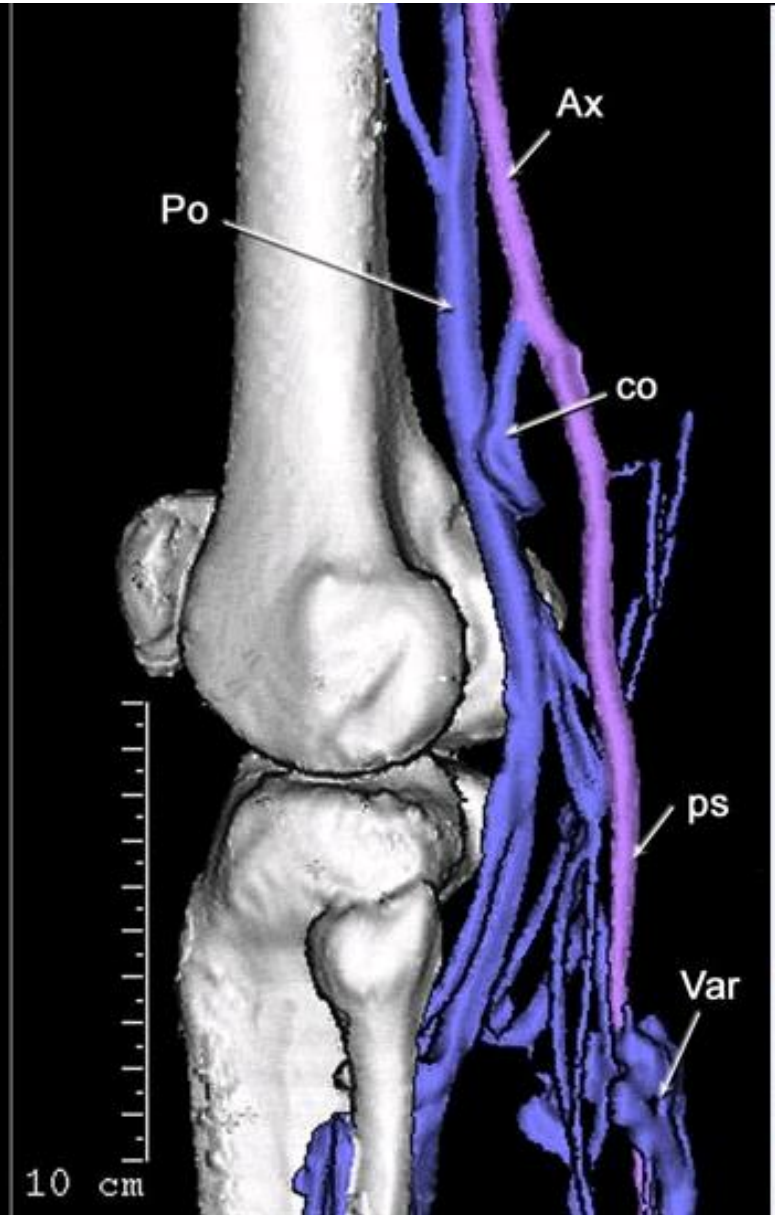
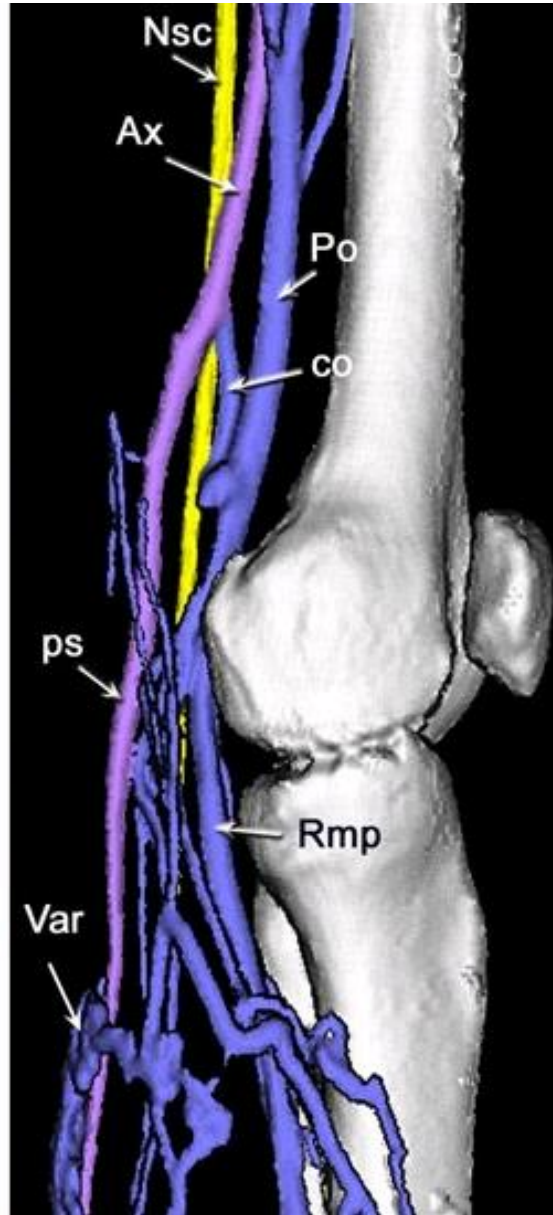
# Vein of LL – 3D-fleboCT



VSP varices

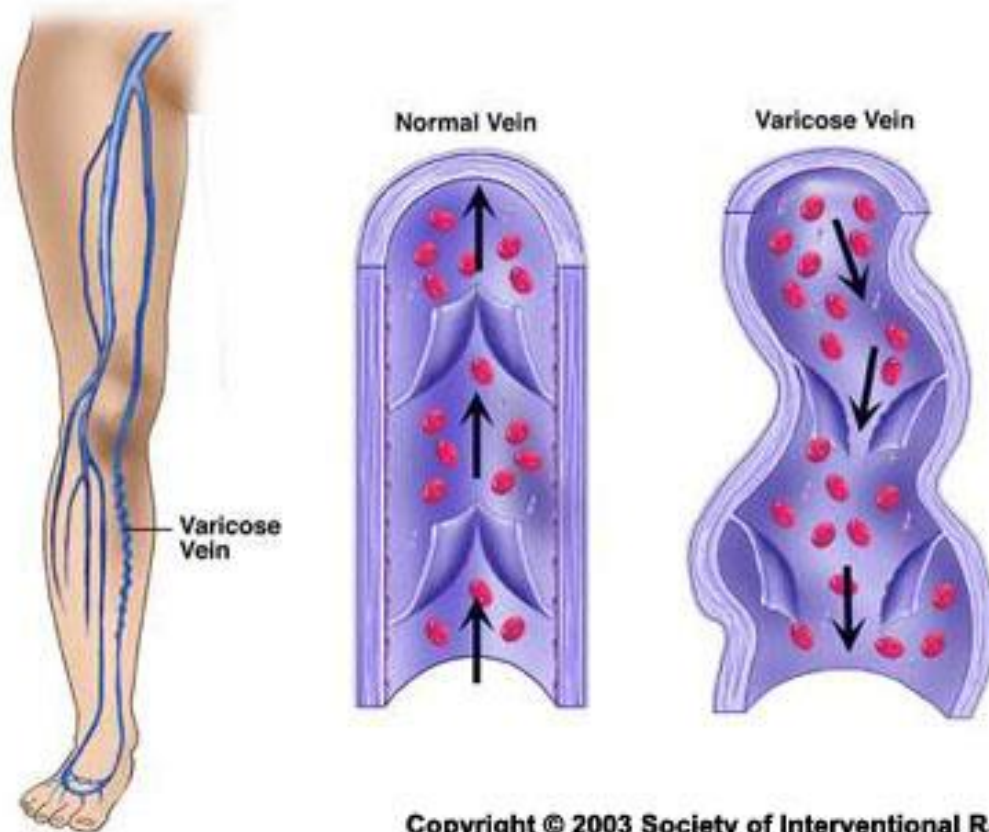
Dodd

# V. axialis – embryonal vein



# Varices

- change of blood flow direction → venous hypertension → ischaemia





# Veins of LL – clinical relevance

- chronic venous insufficiency
- superficial thrombophlebitis
- deep venous thrombosis – thromboembolic disease
- varices
  - primary (collagen disorder), secondary
  - treatment: phlebectomy (stripping) + crosssection, mini-invasive operation (CHIVA – La **C**ure **H**émodynamique de l'Insuffisance **V**eineuse en **A**mbulatoire), endovenous laser (EVLT), sclerotization, radiofrequency endoluminal ablation
- venous leg ulcer
- lung embolia

