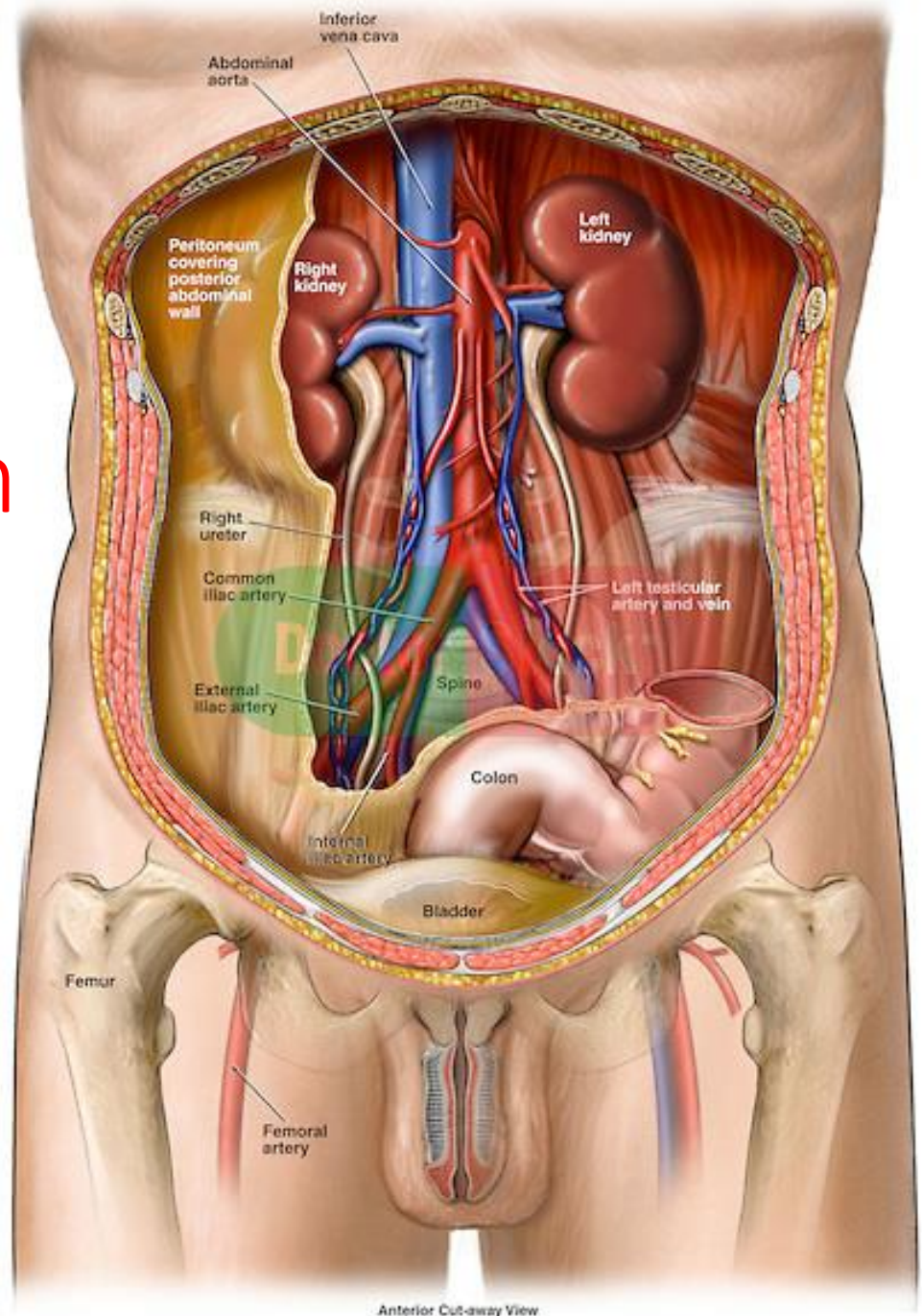
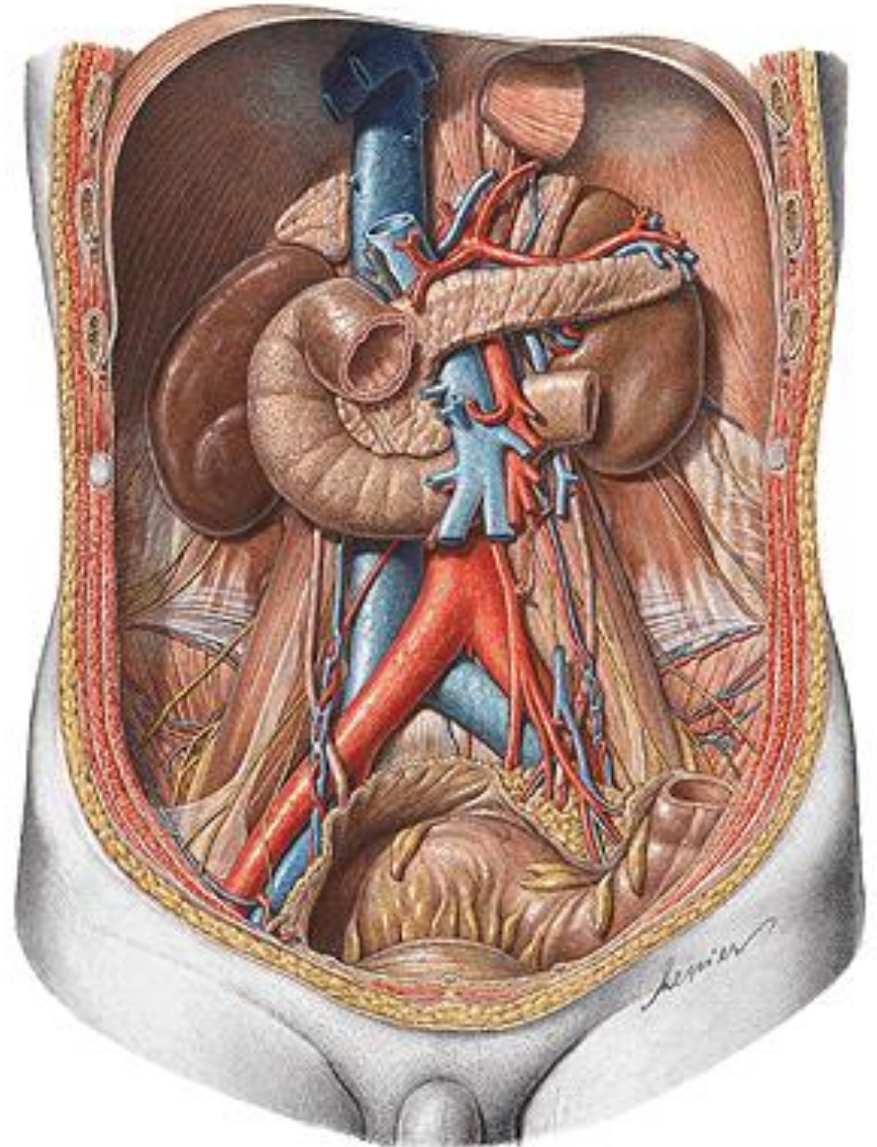
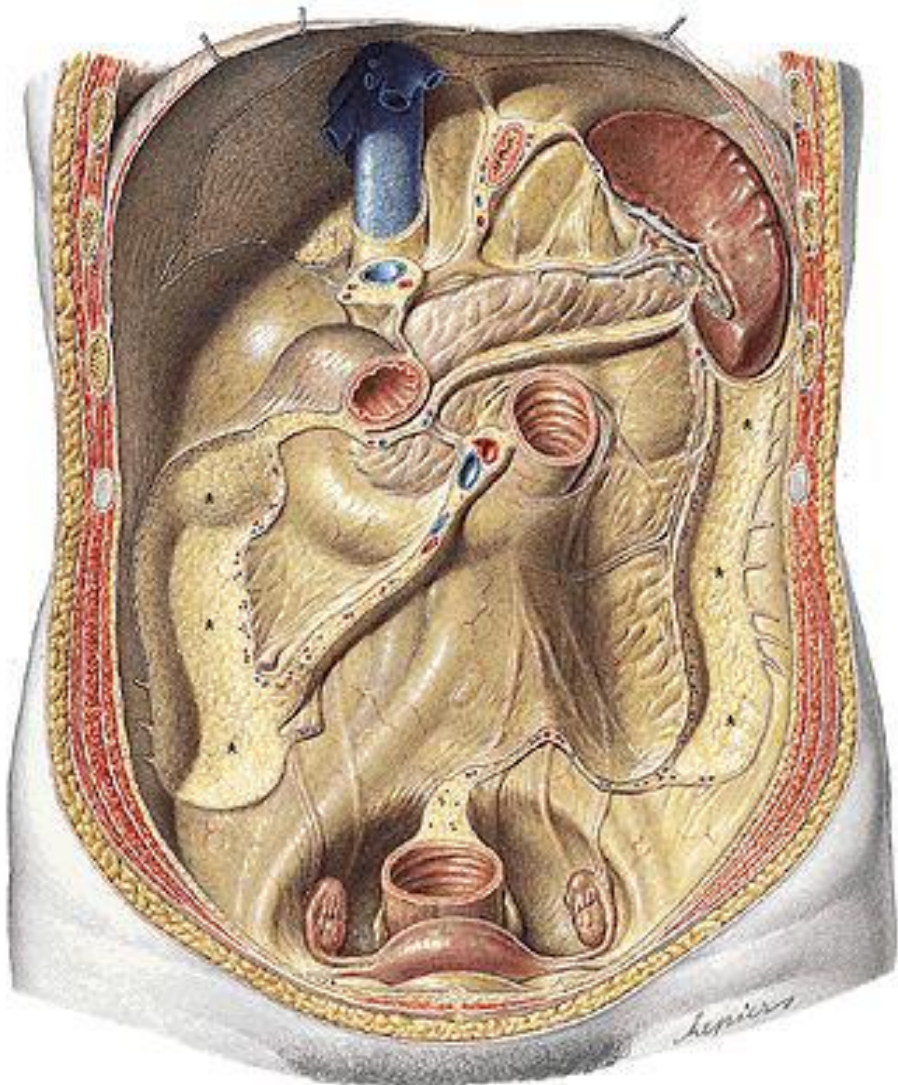


Retroperitoneum

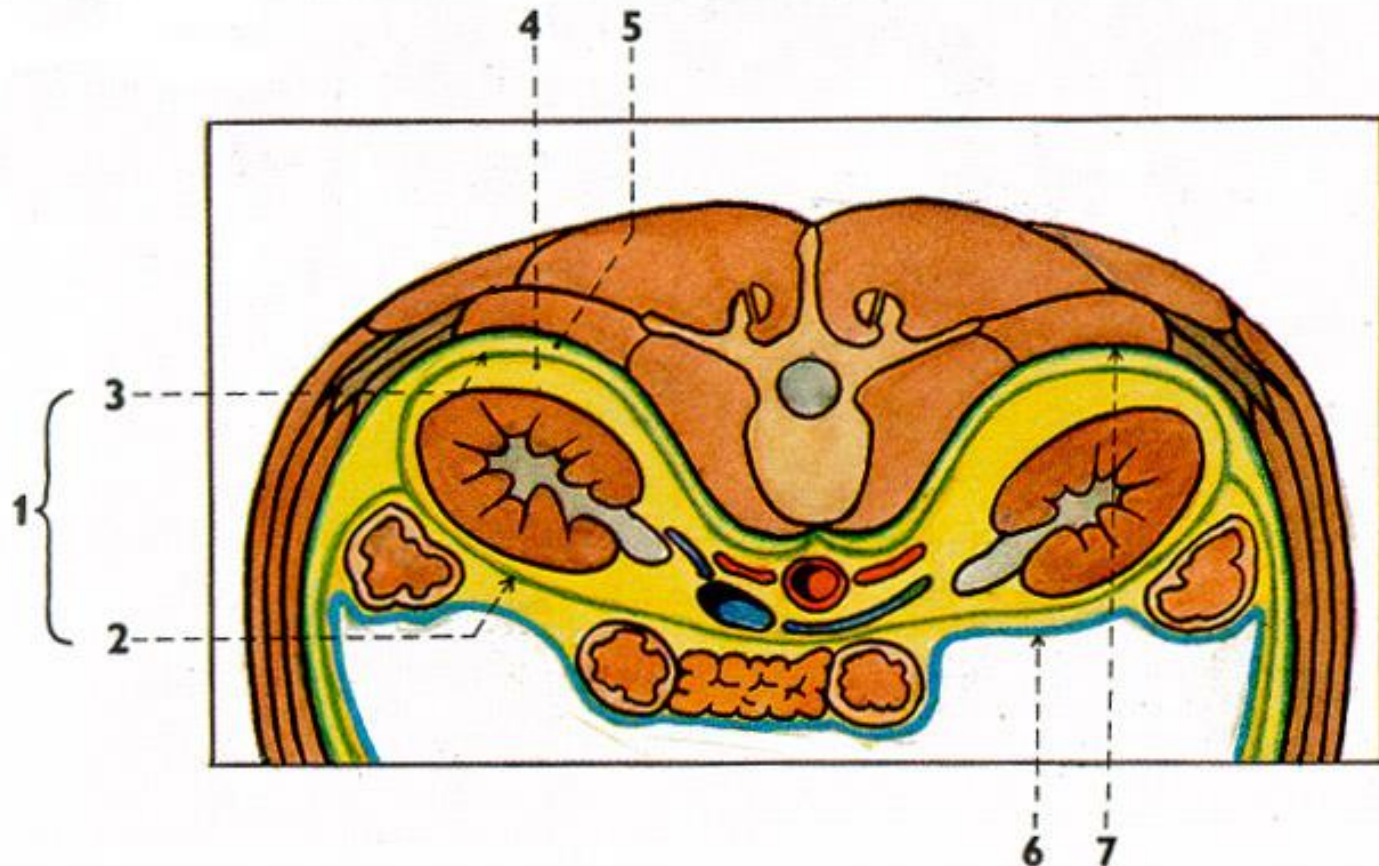


Retroperitoneum



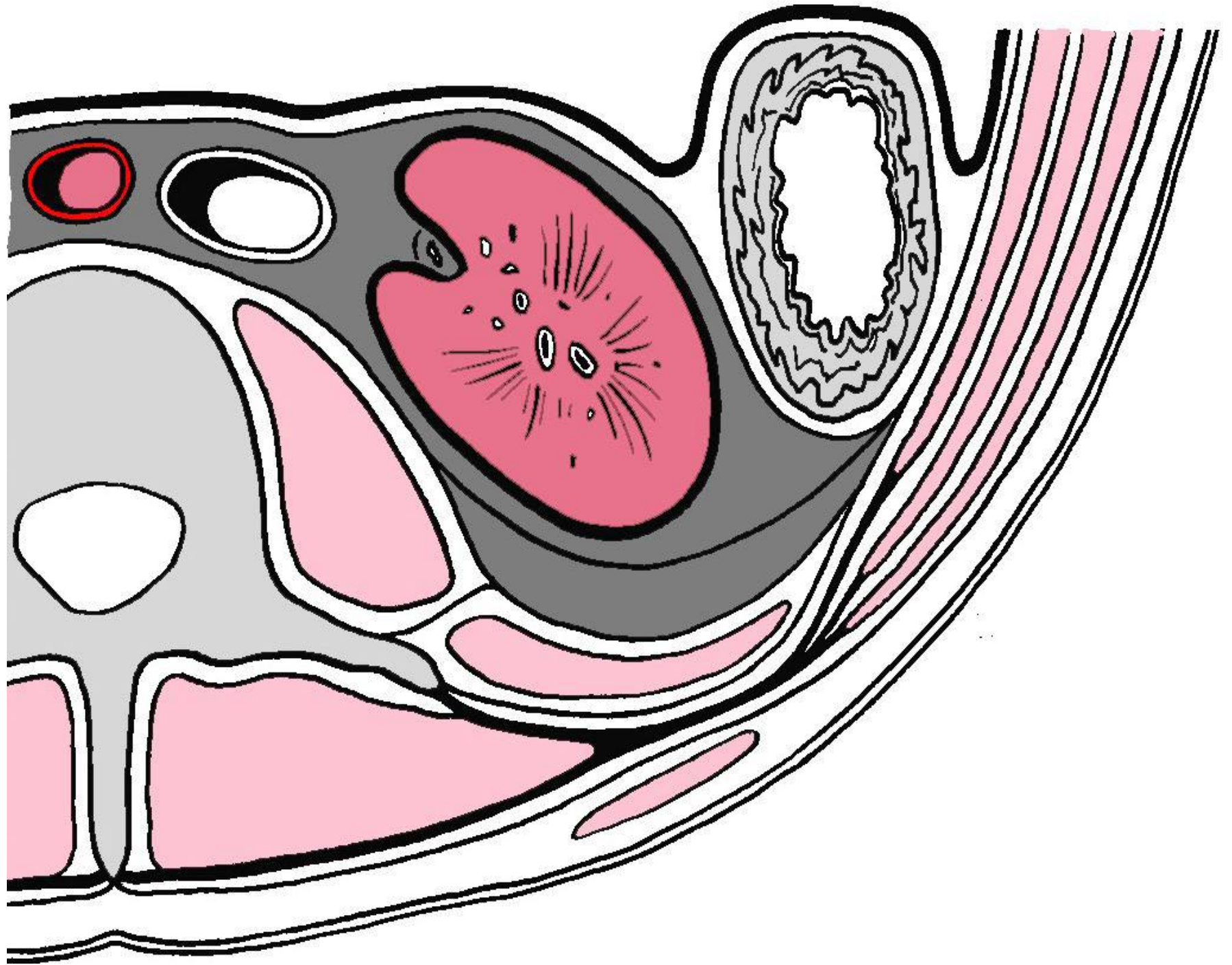
Position, fixation and renal covers

Transverse section at the level of L1



- 1 - fascia renalis *Gerotae*
- 2 - lamina prerenalis *Toldt*
- 3 - lamina retrorenalis *Zuckerkandeli*

- 4 - corpus adiposum perirenale
- 5 - corpus adiposum pararenale
- 6 - peritoneum
- 7 - fascia transversalis

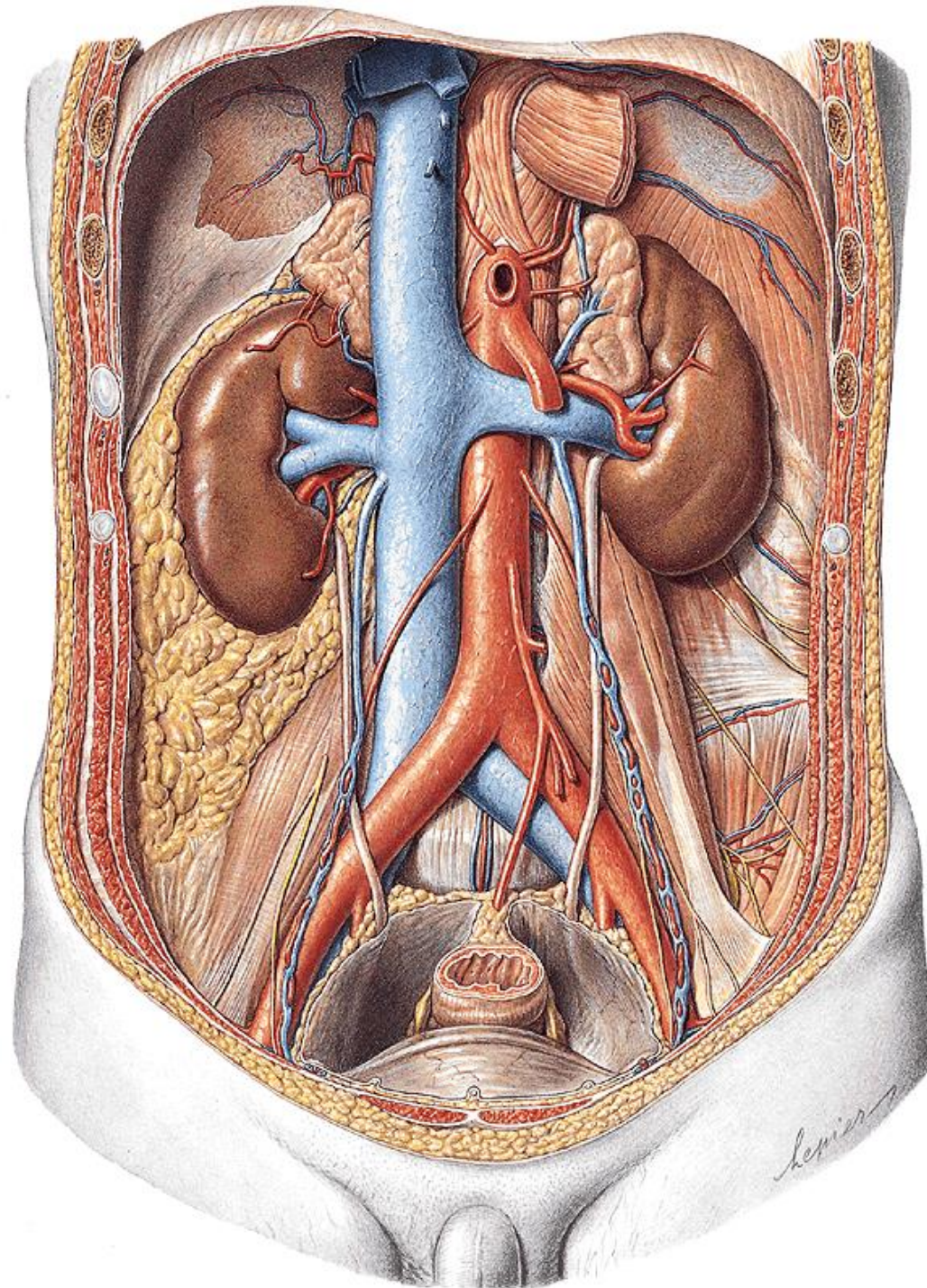


Aorta abdominalis

origin: hiatus oesophageus
diaphragmatis

end: bifurcatio aortae L4

- retroperitoneum, slightly left to vertebral column
- v. cava inferior + ductus thoracicus right to aorta abdominalis



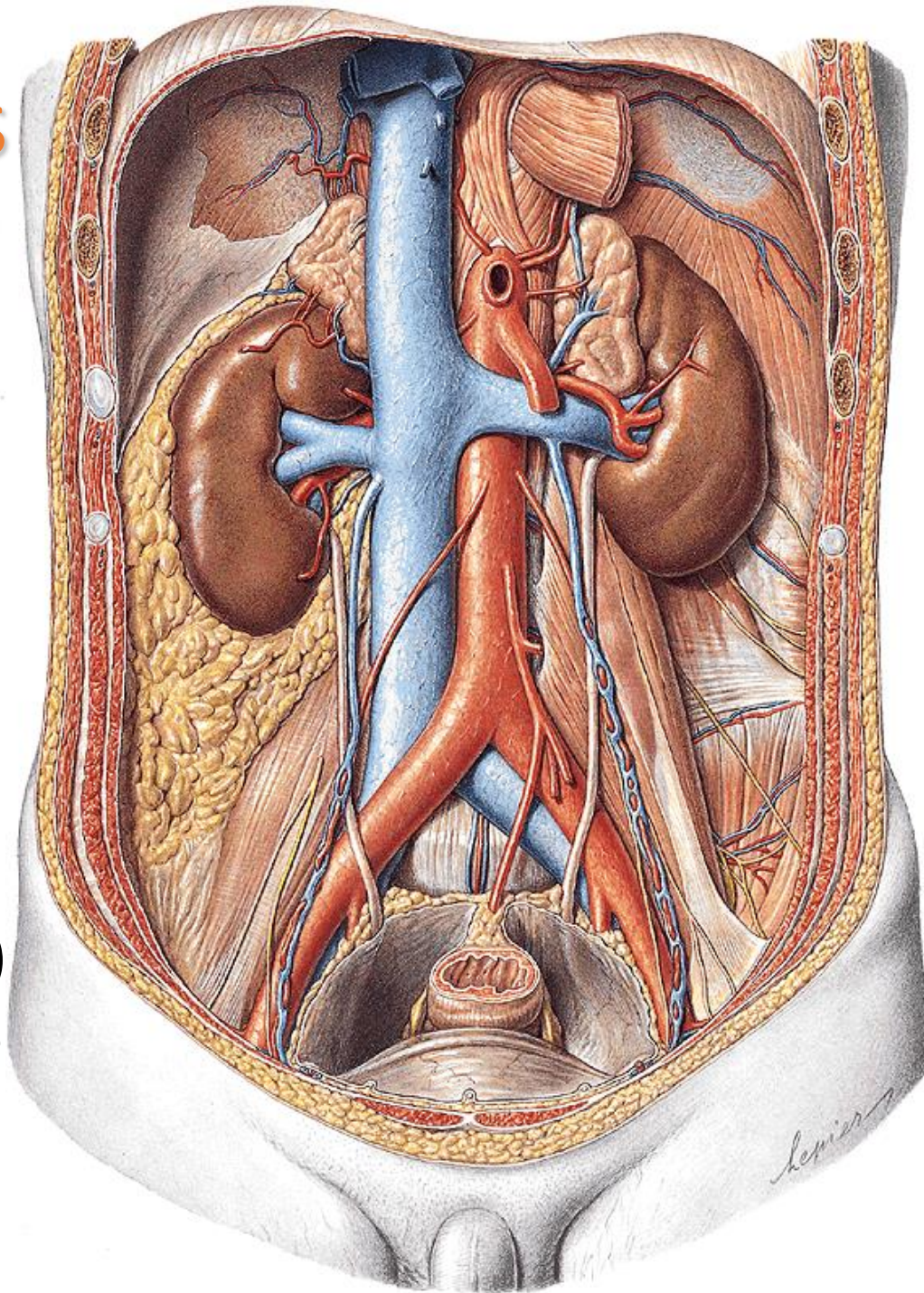
Aorta abdominalis

parietal branches: *paired*

- a. phrenica inf.
- aa. lumbales 1st - 4th
- rr. retroperitoneales (6-7)

visceral branches: *paired*

- a. suprarenalis media
- a. renalis
- a. renalis accessoria (30%)
- a. testicularis♂ / ovarica♀



AORTA ABDOMINALIS

a. suprarenalis sup.

a. suprarenalis media

a. suprarenalis inf.

a. renalis

a. ovarica /
testicularis

a. phrenica inf.

truncus coeliacus

a. mesenterica sup.

a. mesenterica inf.

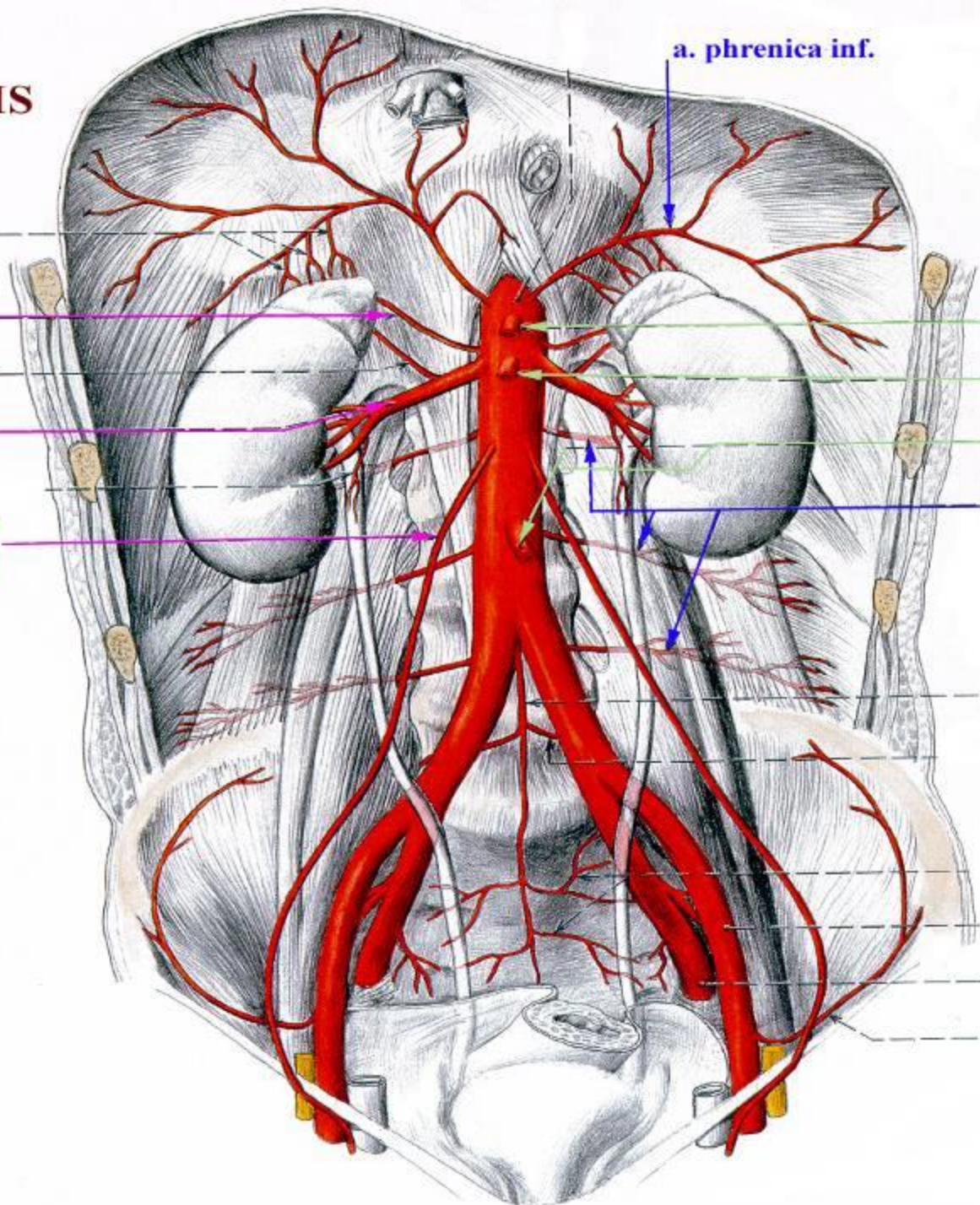
aa. lumbales

a. sacralis media

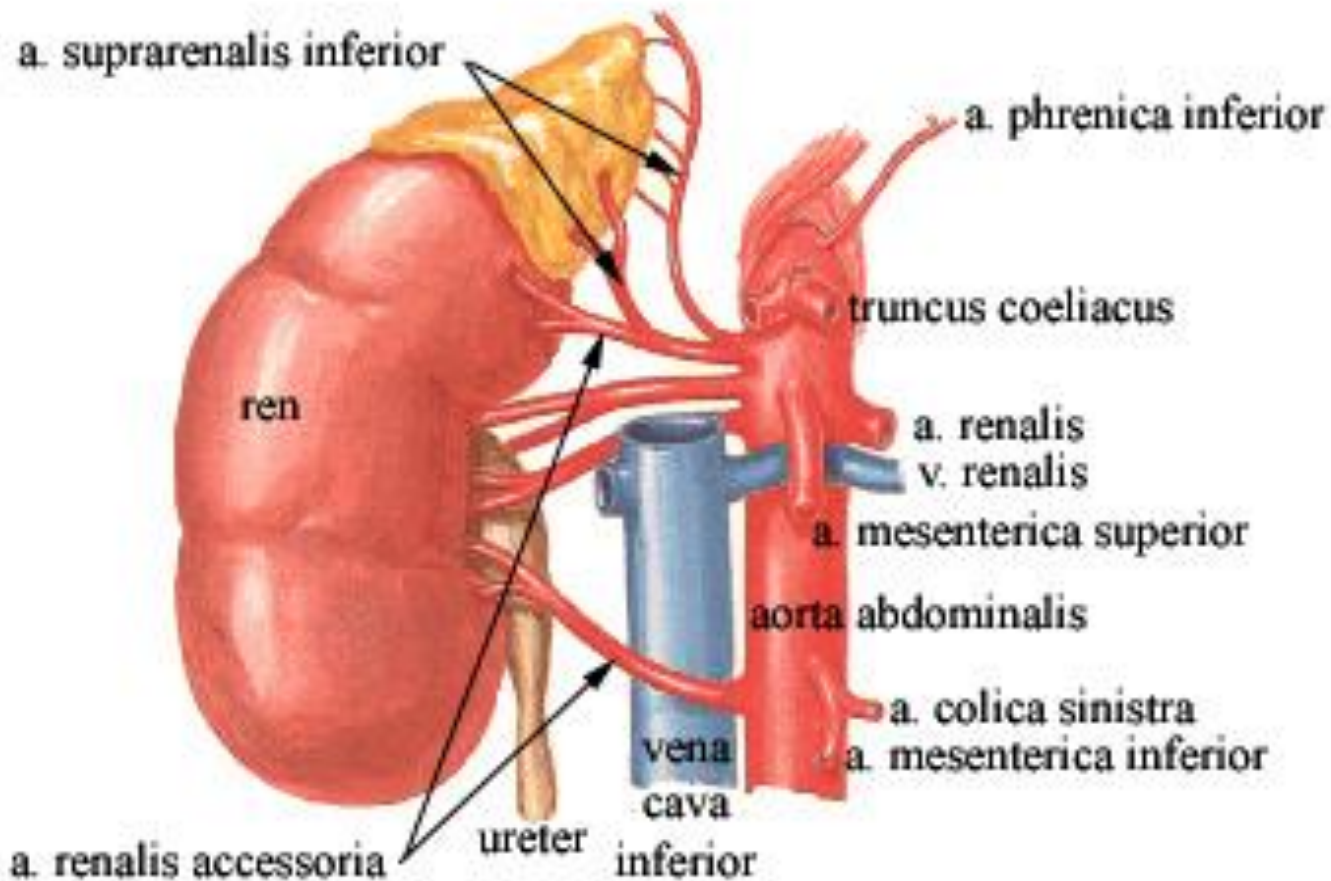
a. iliaca interna

a. iliaca externa

a. circumflexa
ilium profunda



ARTERIA RENALIS ACCESSORIA



- enters upper pole (less), hilum or inferior pole (more) of kidney
- incidence 30%

Aorta abdominalis

terminal branches: *paired*

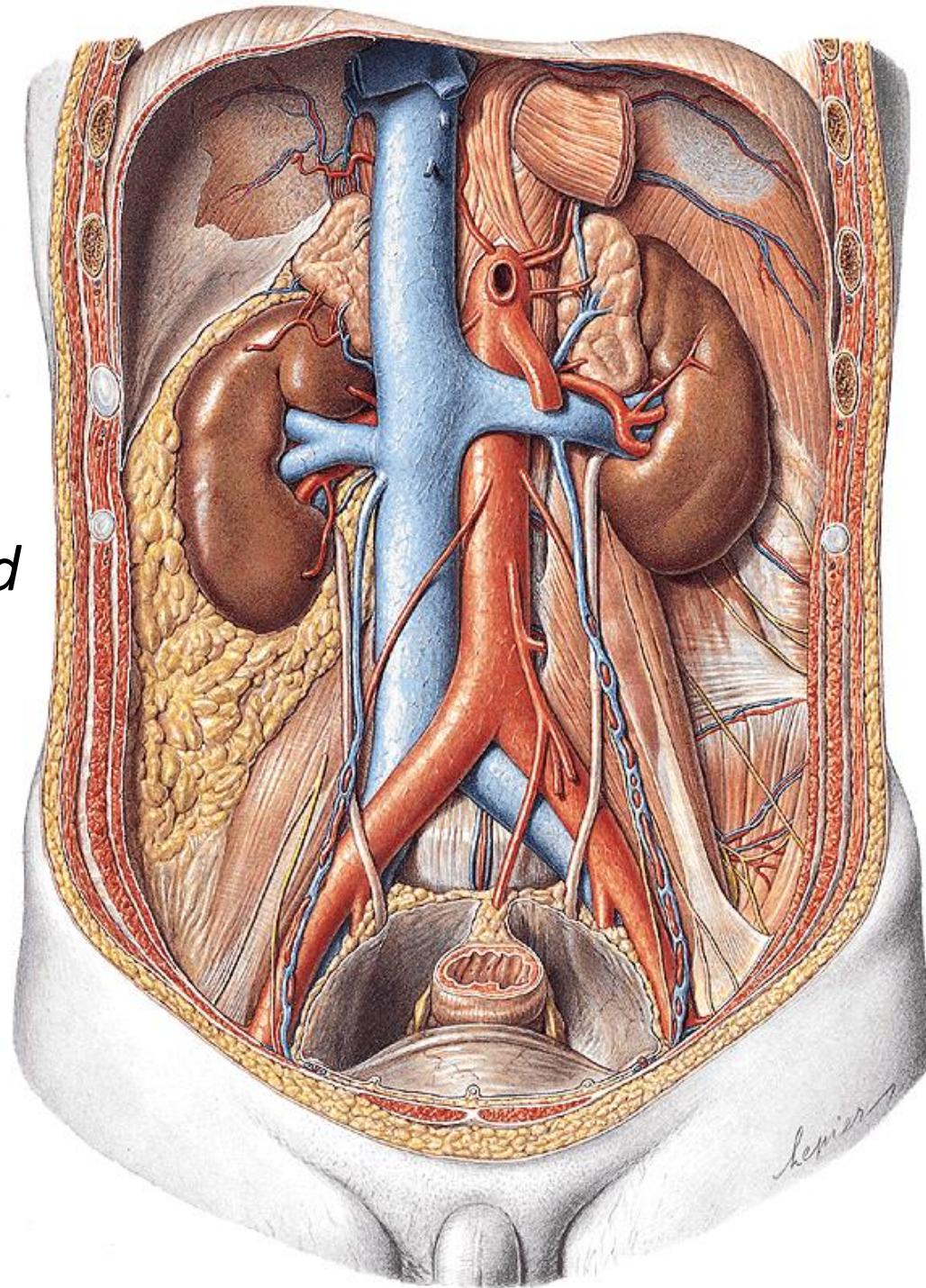
- a. iliaca communis

terminal branches : *unpaired*

- a. sacralis mediana

visceral branches : *unpaired*

- truncus coeliacus
- a. mesenterica superior
- a. mesenterica inferior



Arteria iliaca communis

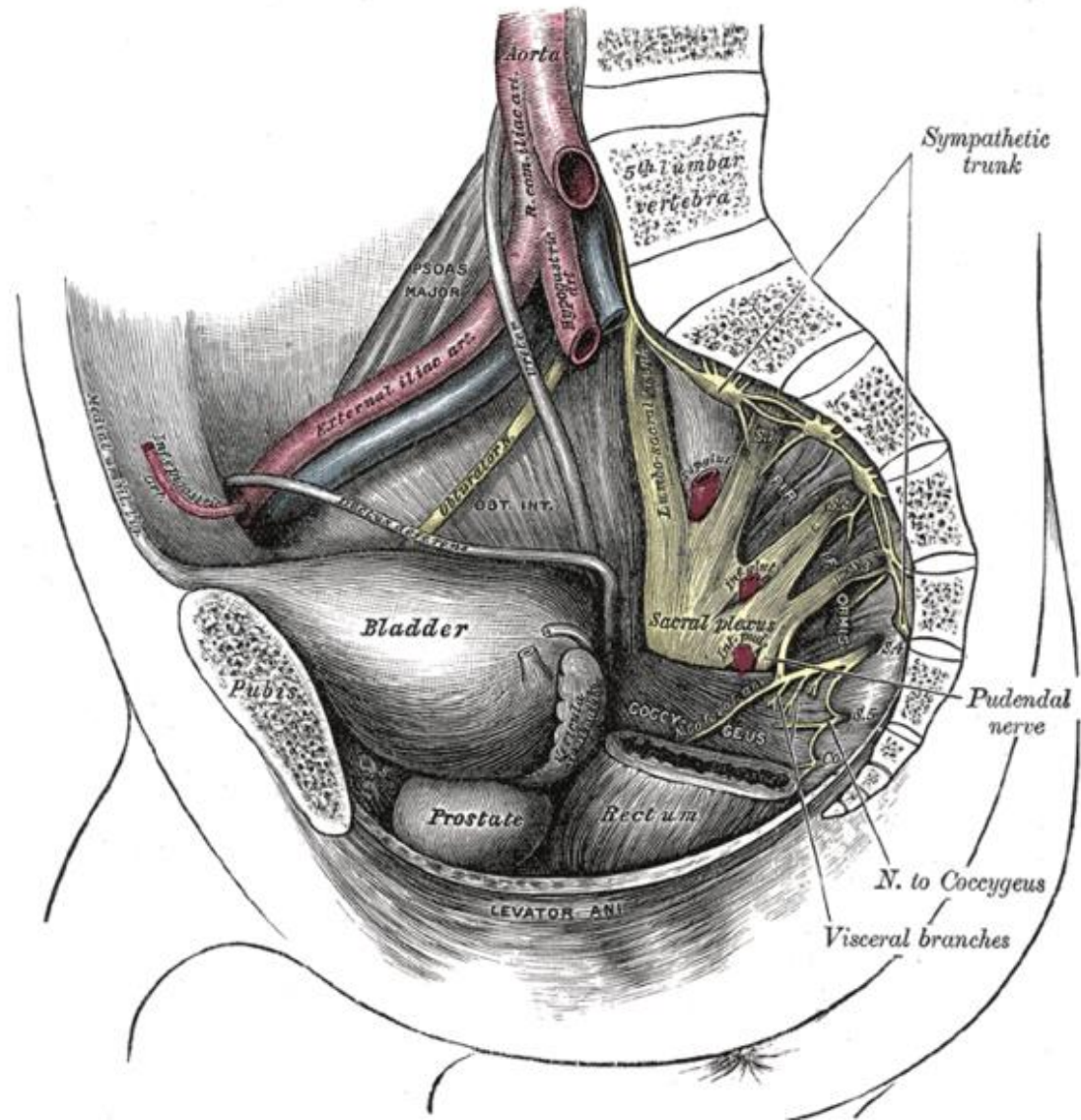
- 4 cm long
- 1 cm wide

origin: L4

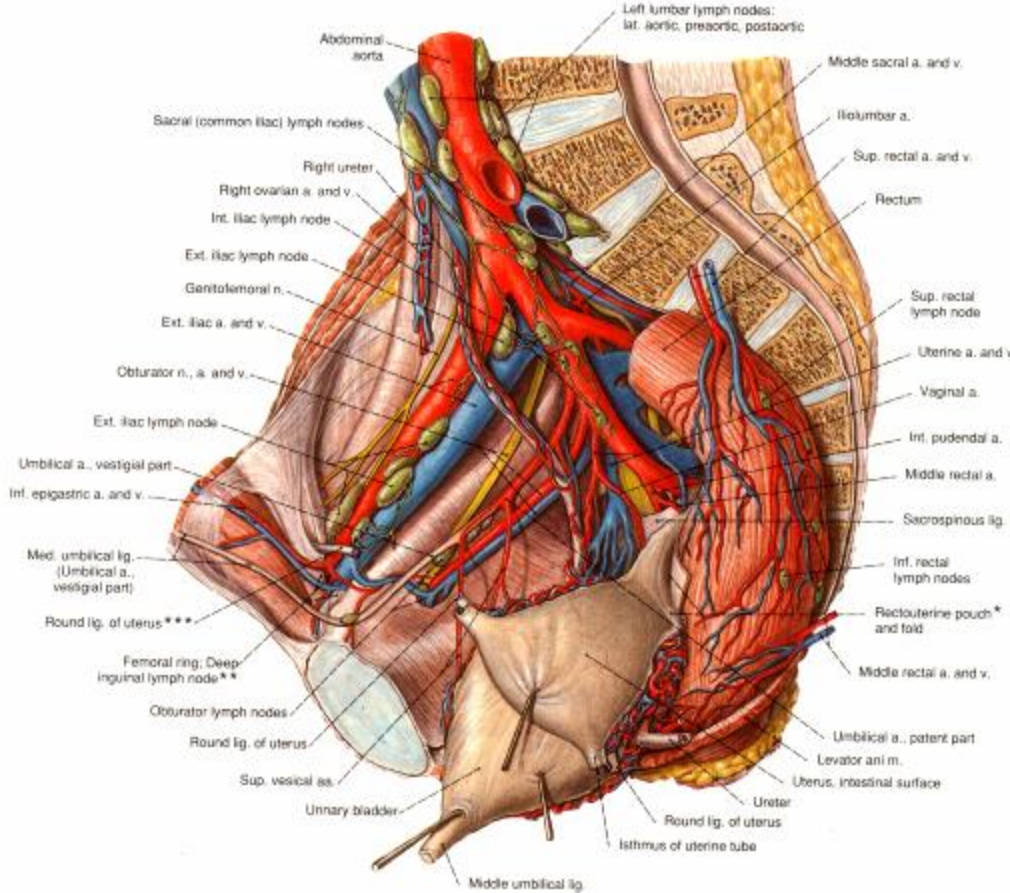
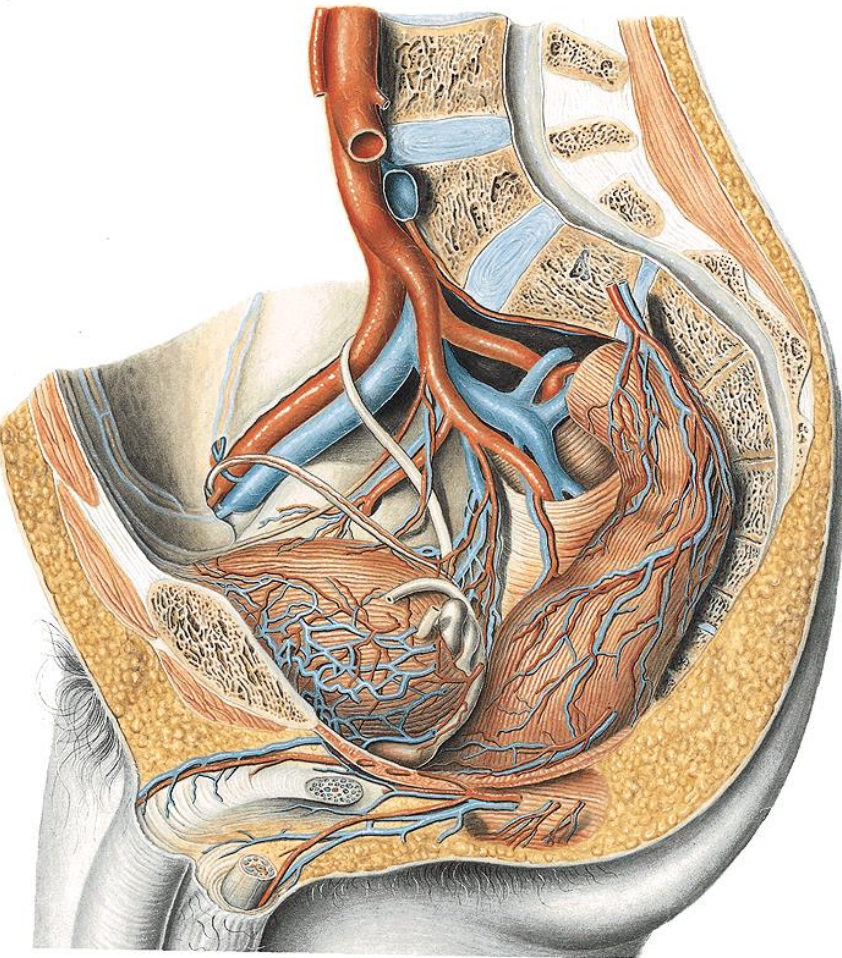
- medial to m. psoas major
- dorsal to ureter

end: bifurcation ventral to articulatio sacroiliaca

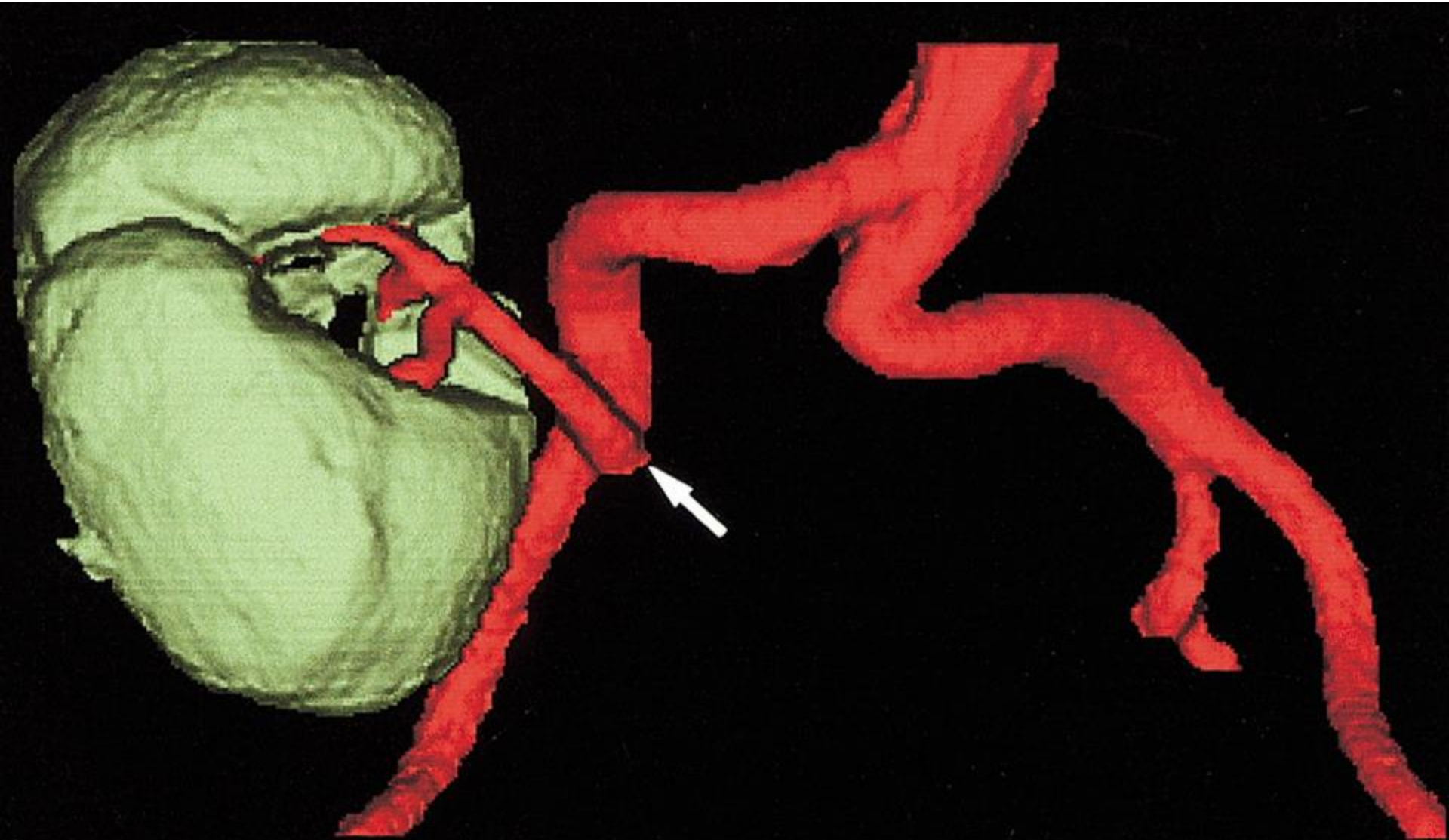
- a. iliaca externa
- a. iliaca interna



Arteriae iliaca



Transplanted kidney to AIC



Arteria iliaca externa

articulatio sacroiliaca → lacuna vasorum →
a. femoralis

dorsal to ureter

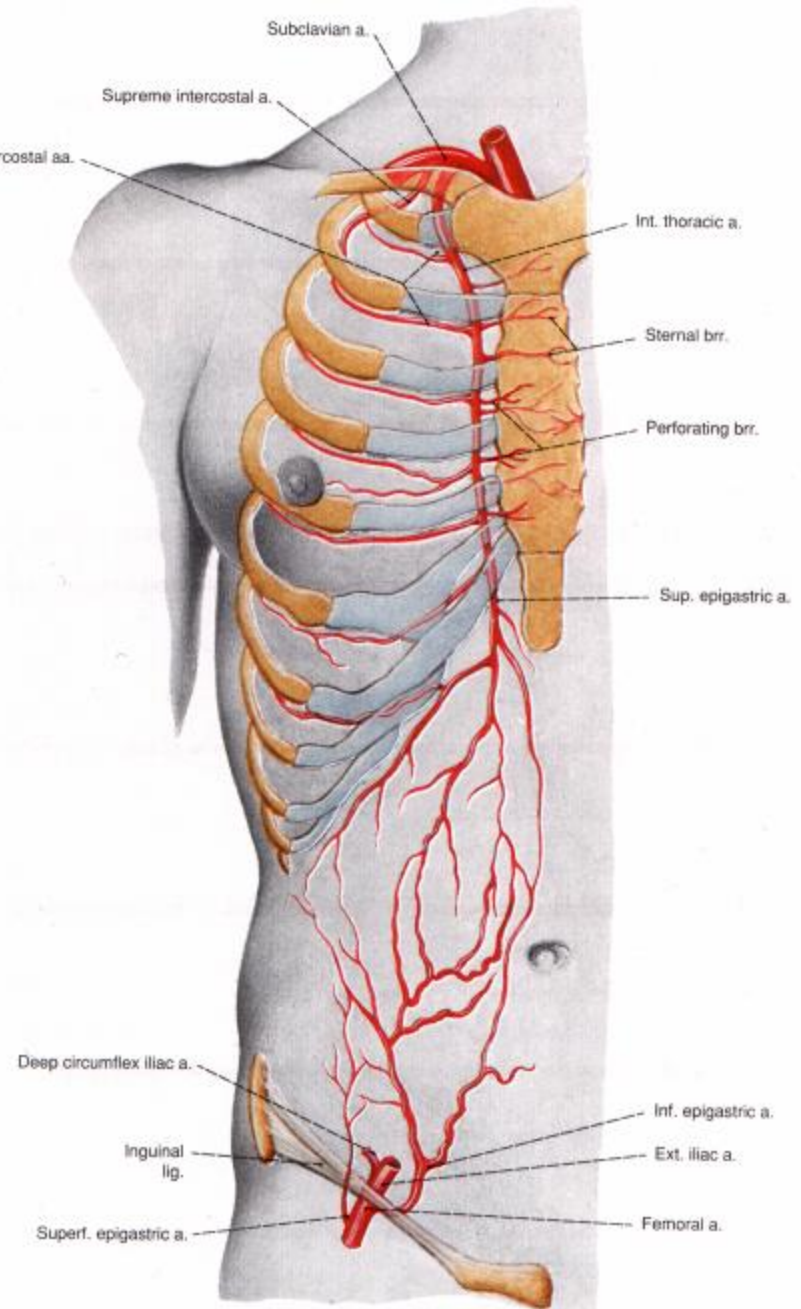
2 branches (located distally)

- a. circumflexa ilium profunda
- a. epigastrica inferior
 - *clinical abbreviation „DIEP“*
 - *cutaneous / musculo-cutaneous flaps*

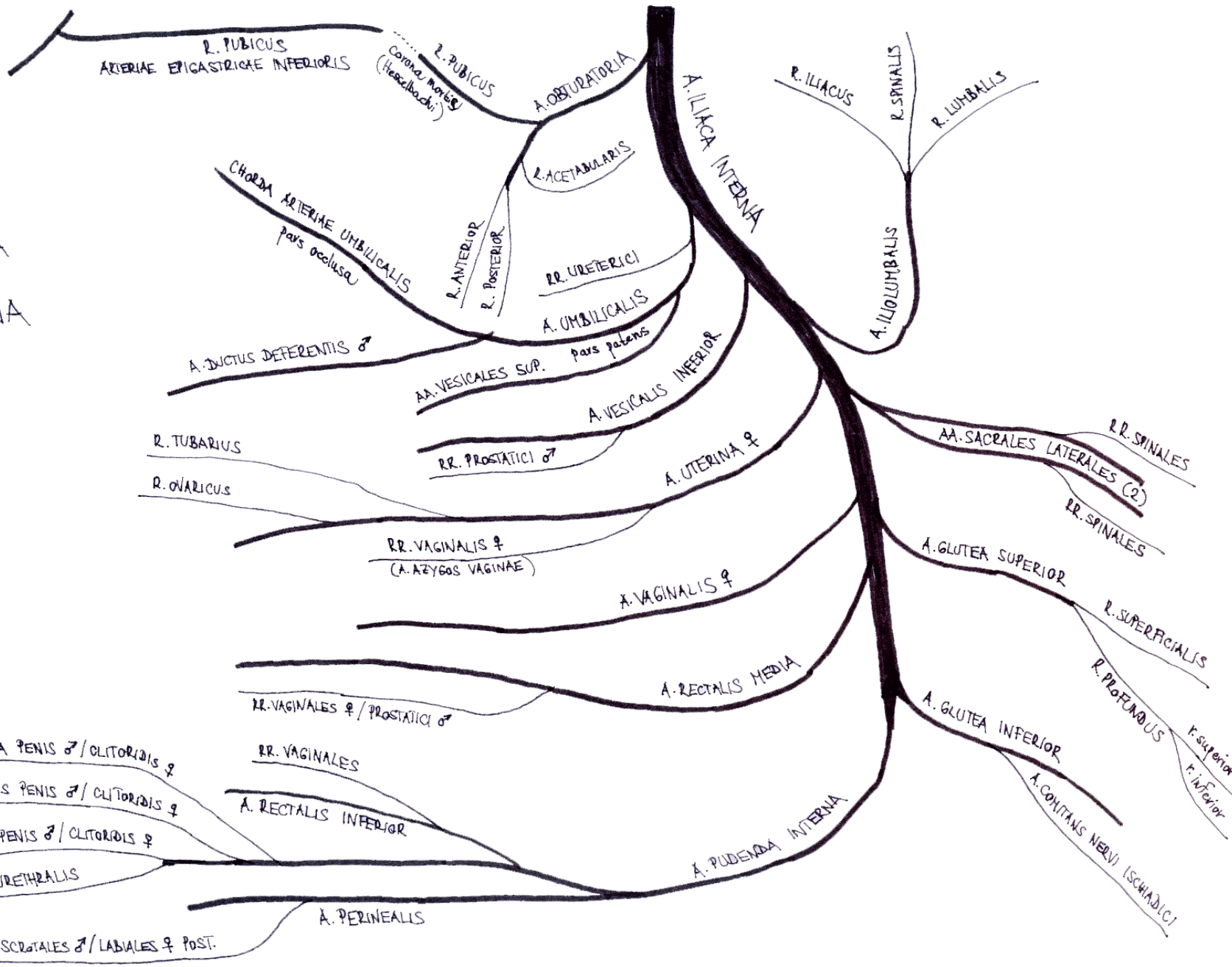


A. epigastrica inferior

- r. pubicus
- *a. obturatoria accessoria/aberrans = corona mortis Hesselbachi*
- a. cremasterica ♂ / a. lig. teretis uteri ♀
- r. medialis + lateralis
- *cutaneous perforators*



V
 VEVE
 ARTERIA
 ILIACA
 INTERNA



R. PUBICUS
 ARTERIAE EPICASTRICAE INFERIORIS

R. PUBICUS
 Corona mortis
 (Herschbach)

A. OBTURATORIA

R. ACETABULARIS

RR. URTERICI

A. UMBILICALIS

R. ANTERIOR
 R. POSTERIOR

CHORDA ARTERIAE UMBILICALIS
 pars oclusa

A. DUCTUS DEFERENTIS ♂

AA. VESICALES SUP.

RR. PROSTATICI ♂

A. VESICALIS INFERIOR

A. UTERINA ♀

RR. VAGINALIS ♀
 (A. AZYGOS VAGINAE)

A. VAGINALIS ♀

A. RECTALIS MEDIA

RR. VAGINALES ♀ / PROSTATICI ♂

RR. VAGINALES

A. RECTALIS INFERIOR

A. PUDENDA INTERNA

A. PERINEALLIS

A. PROFUNDA PENIS ♂ / CLITORIDIS ♀

A. DORSALIS PENIS ♂ / CLITORIDIS ♀

A. BULBI PENIS ♂ / CLITORIDIS ♀

A. URETHRALIS

RR. SCROTALIS ♂ / LABIALES ♀ POST.

R. ILIACUS

R. SPINALIS

R. LUMBALIS

A. ILIOLUMBALIS

AA. SACRALES LATERALES (2)

RR. SPINALES

RR. SPINALES

A. GLUTEA SUPERIOR

R. SUPERFICIALIS

R. PROFUNDUS

r. superior

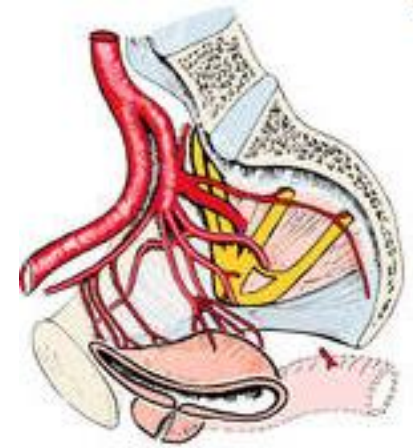
r. inferior

A. GLUTEA INFERIOR

A. CONTINENS NERVI ISCHIADICI

Arteria iliaca interna

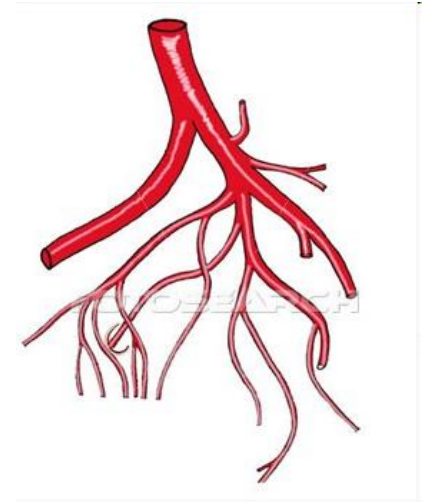
- lesser pelvis + buttocks
- obsolete term „a. hypogastrica“
- short (3-4 cm)
 - anterior division
 - 3 branches
 - posterior division
 - all organs of lesser pelvis
 - *ligation in postpartal haemorrhage*



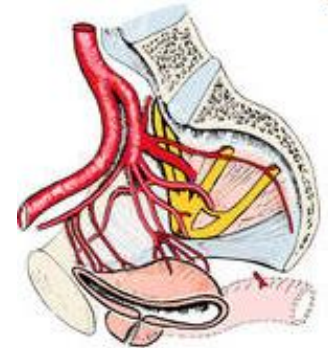
Arteria iliaca interna - branches

parietal branches: 5

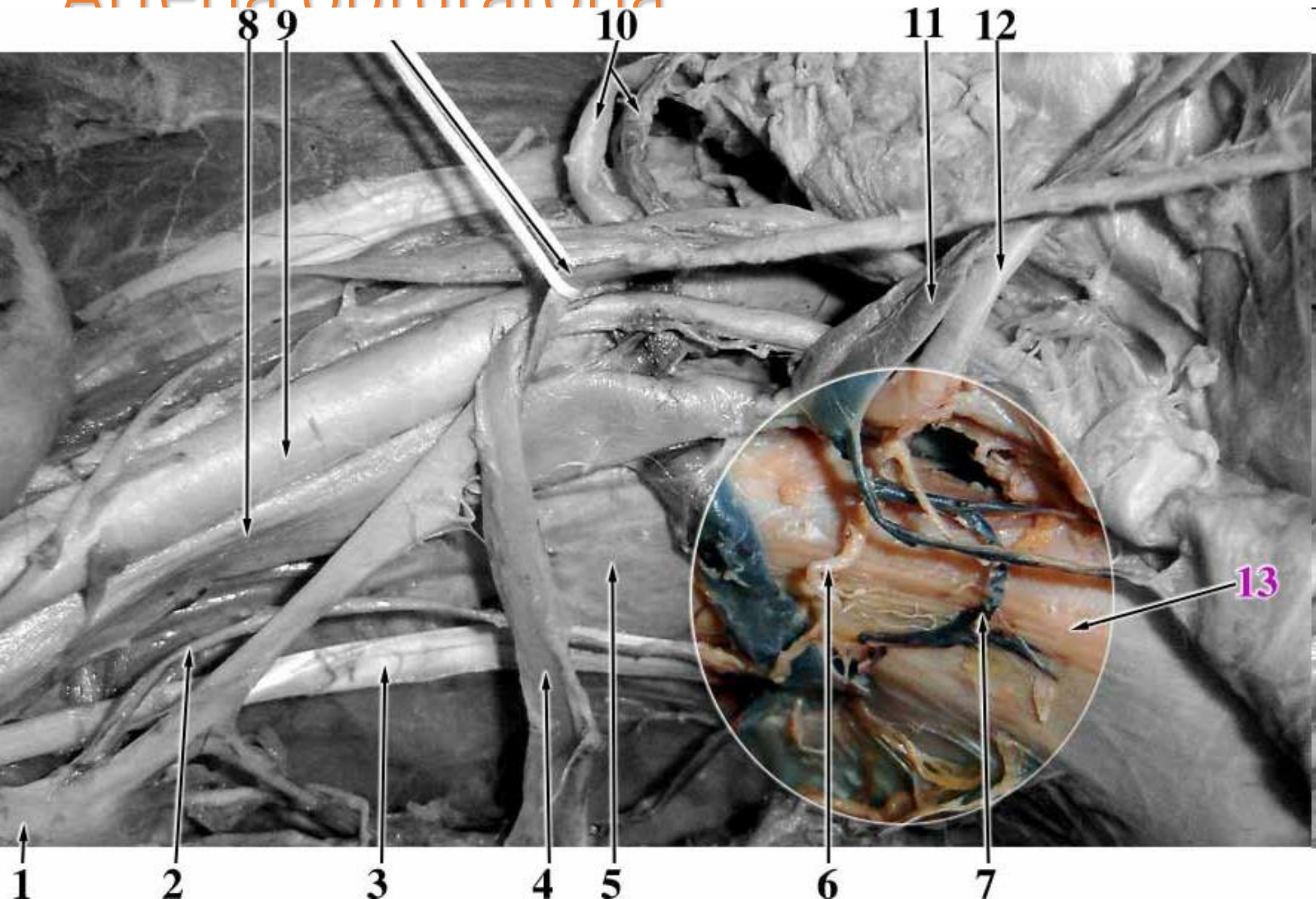
- a. iliolumbalis
 - r. iliacus, lumbalis, spinalis
- a. obturatoria
 - *canalis obturatorius*
- aa. sacrales laterales sup. + inf. (→2)
 - *foramina sacralia anteriora*
 - rr. spinales
- a. glutea superior
 - *foramen suprapiriforme*
 - r. superficialis + profundus
- a. glutea inferior
 - *foramen infrapiriforme*
 - a. comitans nervi ischiadici



gd304006 www.fotosearch.com



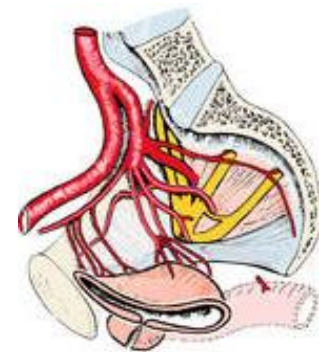
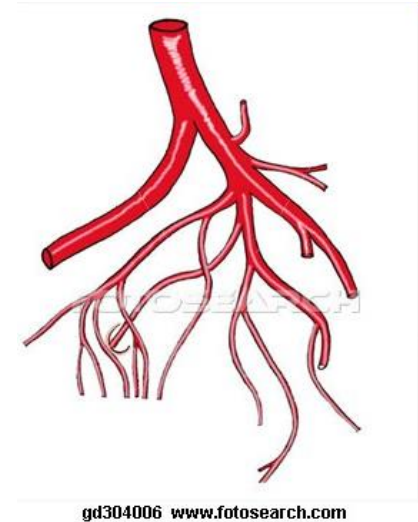
Arteria obturatoria



Arteria iliaca interna – branches

visceral branches: 6

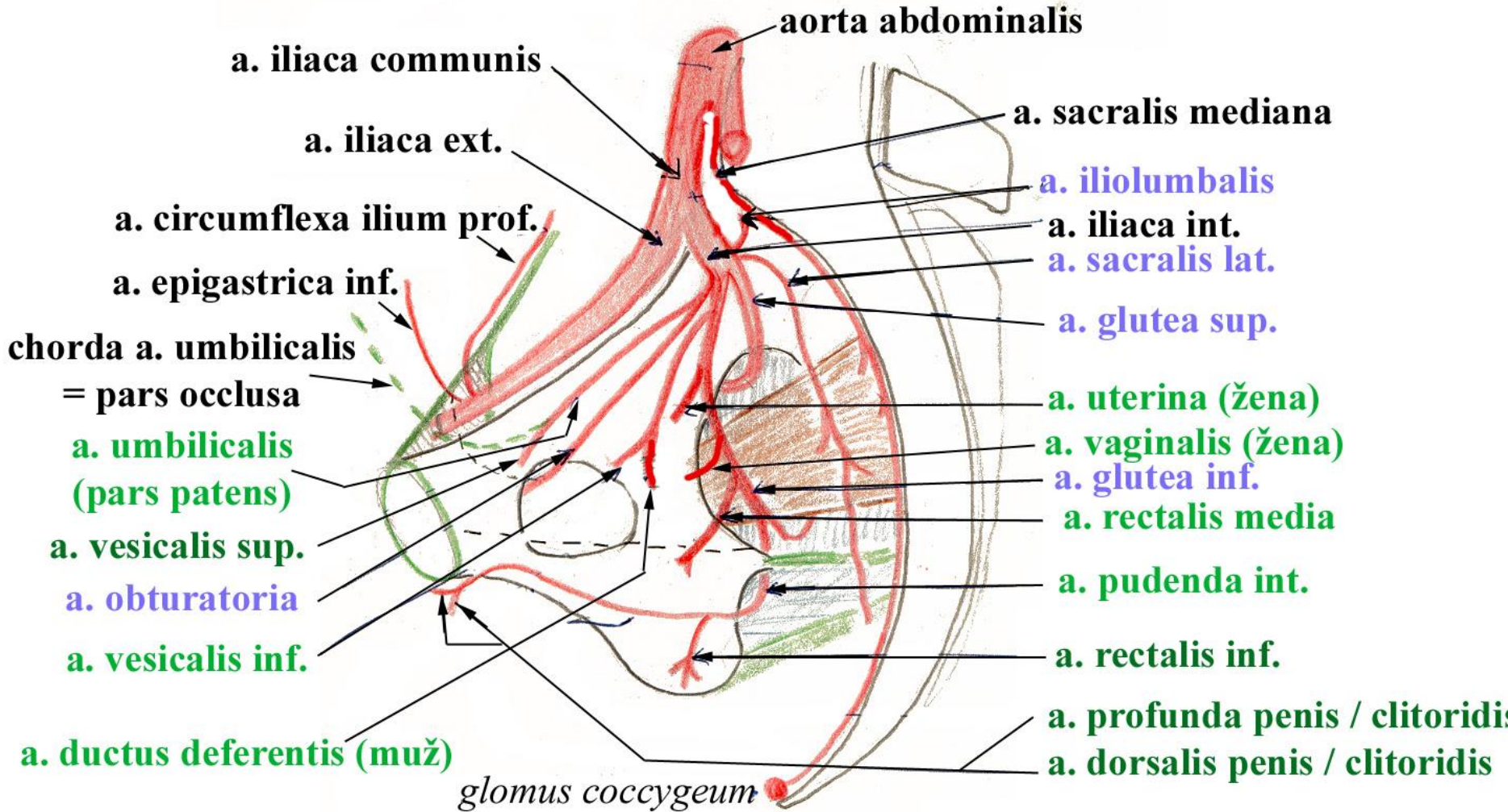
- a. umbilicalis
 - aa. vesicales superiores
 - a. ductus deferentis ♂
- a. vesicalis inferior
 - rr. prostatici ♂
- a. uterina ♀
 - ventral to ureter
 - r. vaginalis
 - r. ovaricus
 - r. tubarius
- a. rectalis media
 - rr. prostatici ♂ / rr. vaginales ♀
- a. vaginalis ♀
- a. pudenda interna



parietální větve

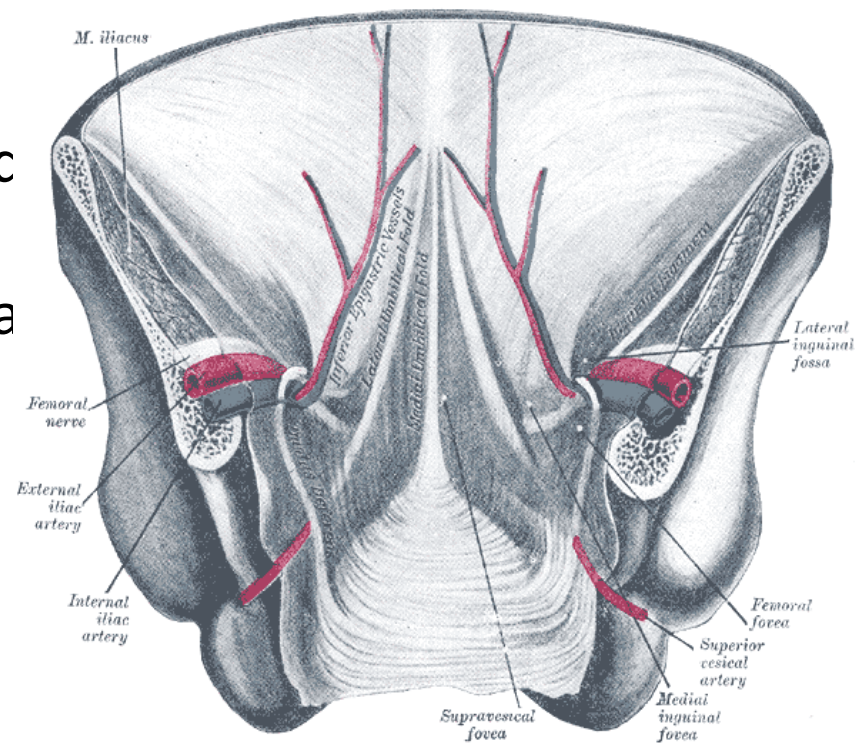
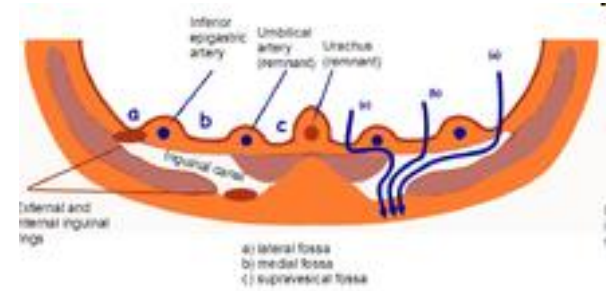
TEPNY PÁNVE

viscerální větve



Arteria umbilicalis

- pars patens
 - aa. vesicales superiores
 - a. ductus deferentis ♂
- pars occlusa
 - fetal vessel with unoxygenated blood leading to placenta
 - lig. umbilicale mediale (chorda a. umbilicalis)
 - fascia vesicoumbilicalis



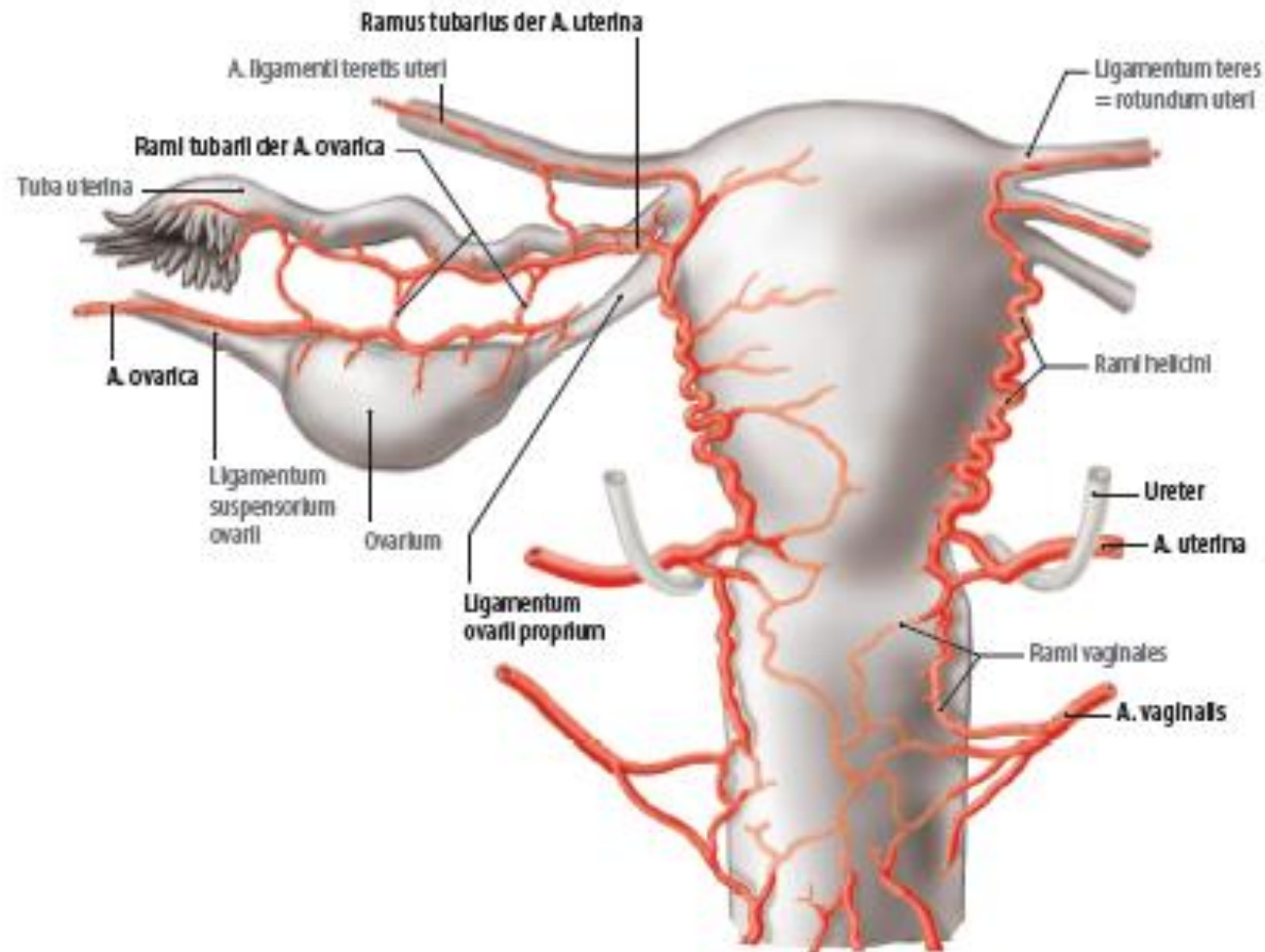
Arteries of female internal genital organs

Ao. abdominalis:

- a. ovarica

A. iliaca interna:

- a. uterina
- a. vaginalis
- (a. pudenda int.)

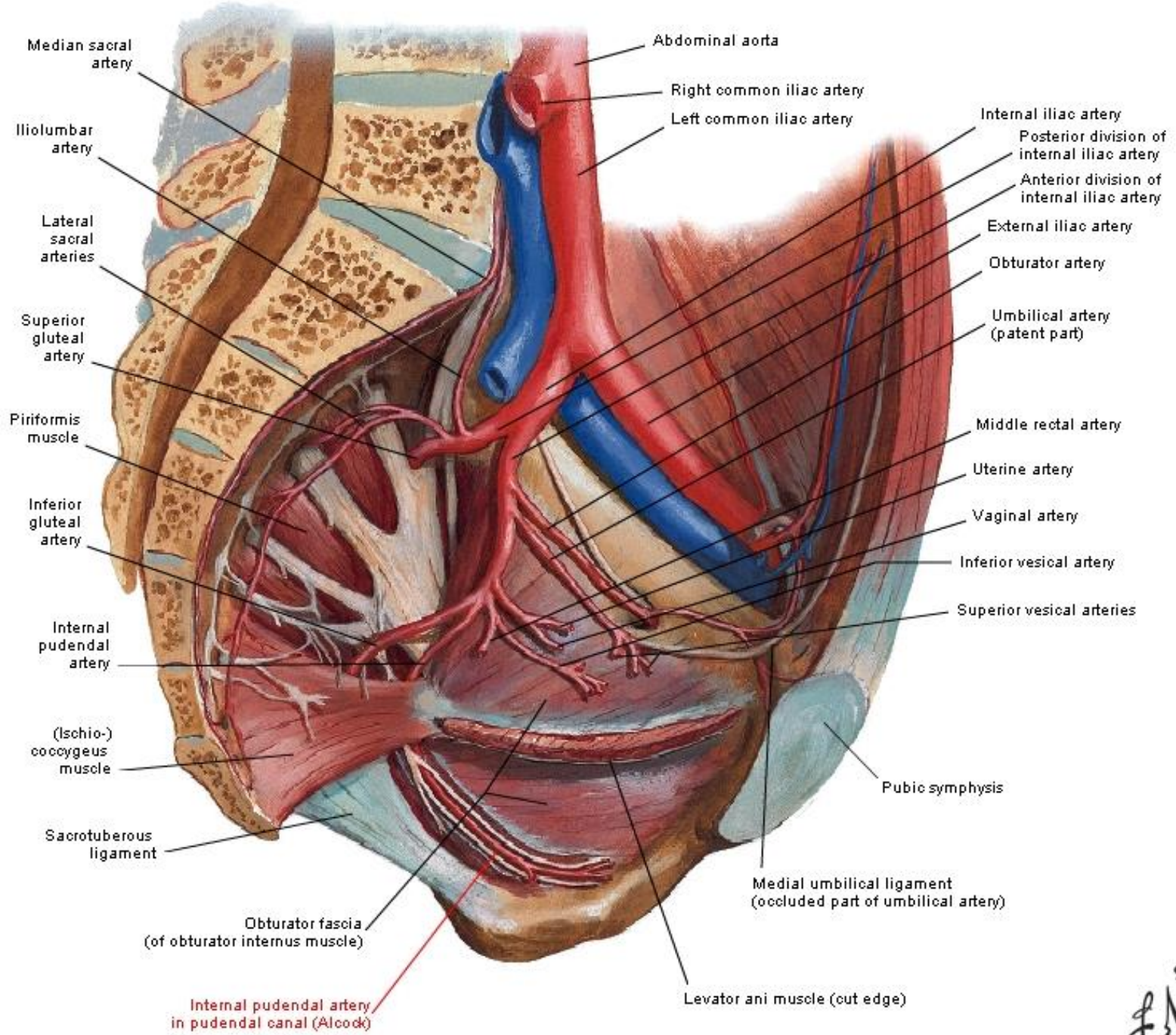


Arteria pudenda interna

topography: foramen infrapiriforme → foramen ischiadicum minus → fossa ischioanalis (canalis pudendalis *Alcocki*)

branches:

- a. rectalis inferior
 - rr. vaginales ♀
- a. perinealis
- rr. scrotales ♂ / labiales ♀ anteriores
- a. urethralis
- a. bulbi penis ♂ / vestibuli ♀
- a. dorsalis penis ♂ / clitoridis ♀
- a. profunda penis ♂ / vestibuli ♀



Median sacral artery

Iliolumbar artery

Lateral sacral arteries

Superior gluteal artery

Piriformis muscle

Inferior gluteal artery

Internal pudendal artery

(Ischio-)coccygeus muscle

Sacrospinous ligament

Obturator fascia (of obturator internus muscle)

Internal pudendal artery in pudendal canal (Alcock)

Abdominal aorta

Right common iliac artery

Left common iliac artery

Internal iliac artery

Posterior division of internal iliac artery

Anterior division of internal iliac artery

External iliac artery

Obturator artery

Umbilical artery (patent part)

Middle rectal artery

Uterine artery

Vaginal artery

Inferior vesical artery

Superior vesical arteries

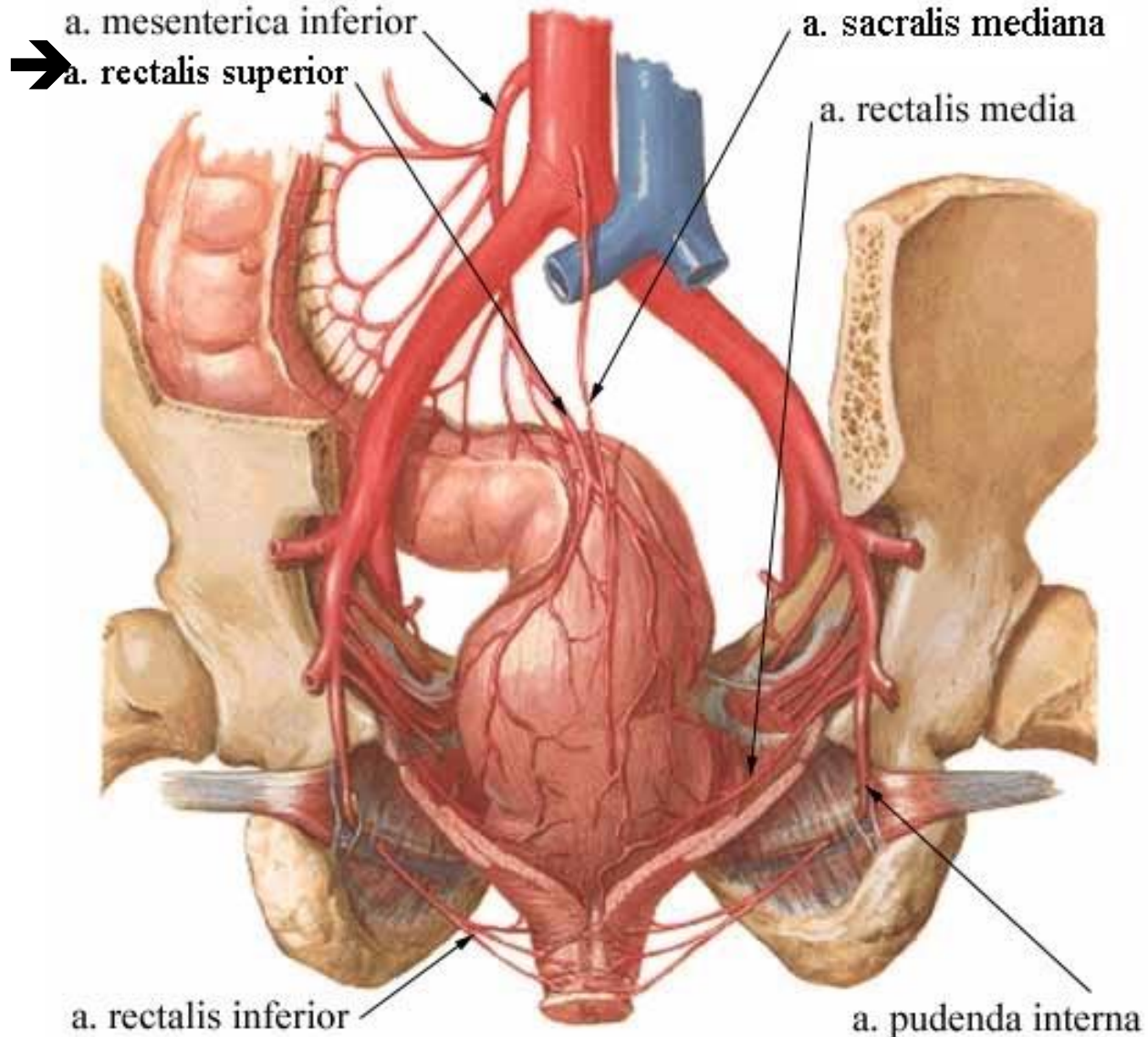
Pubic symphysis

Medial umbilical ligament (occluded part of umbilical artery)

Levator ani muscle (out edge)

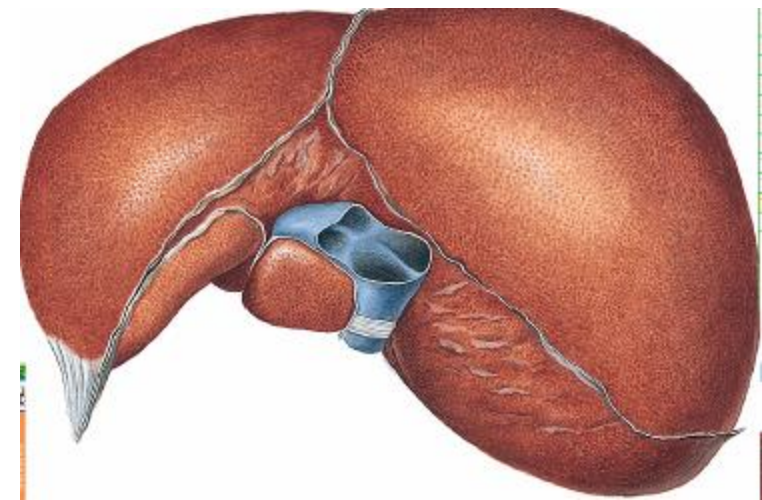
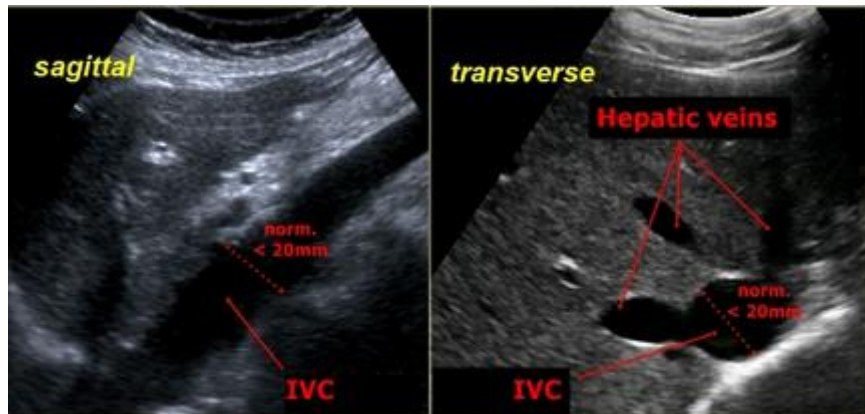
Rectum

- a. mesenterica inf. → a. rectalis sup.
- a. iliaca int. → a. rectalis media
 - present in 50%, insignificant for rectum
- a. iliaca int. → a. pudenda int. → a. rectalis inf

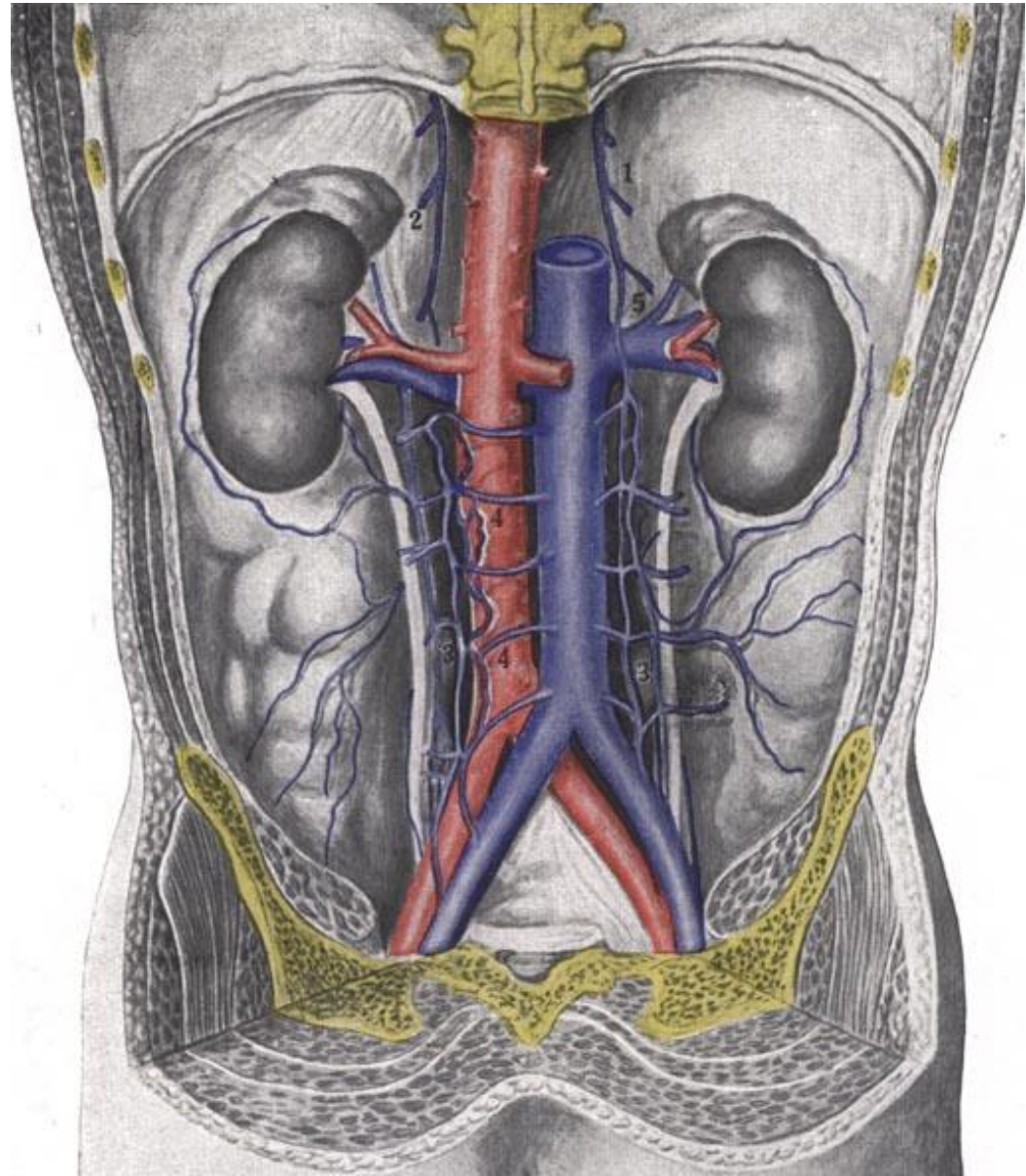
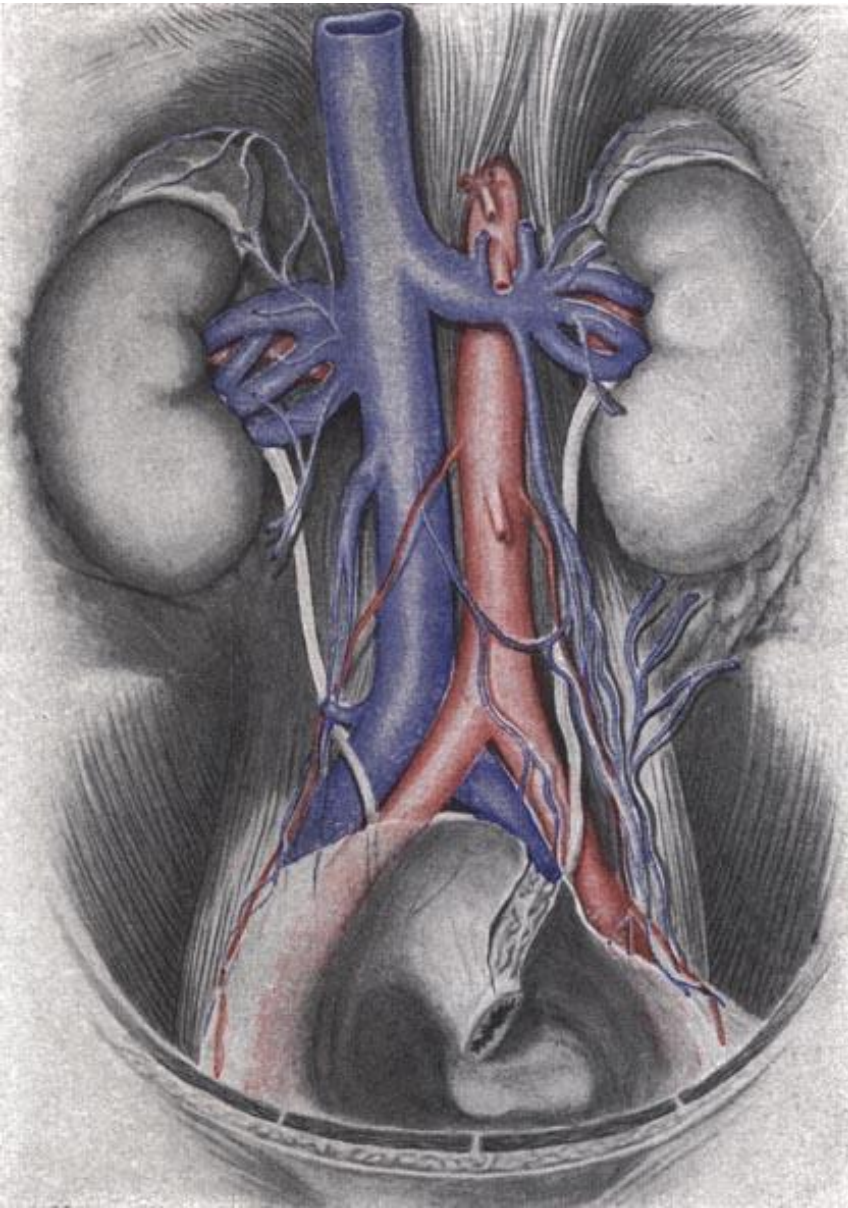


Vena cava inferior

- 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)



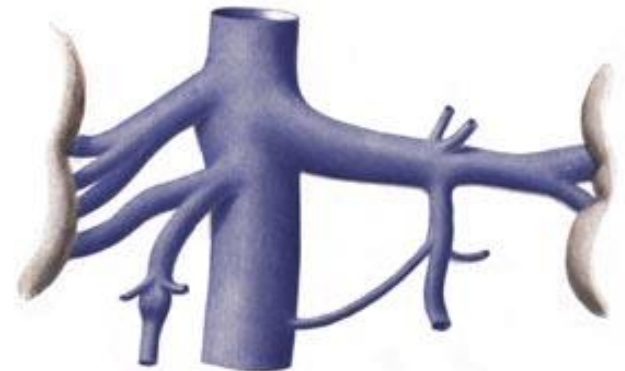
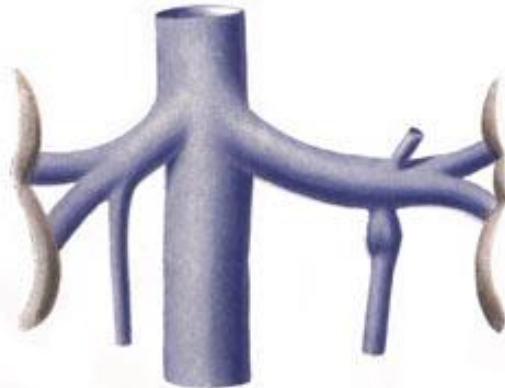
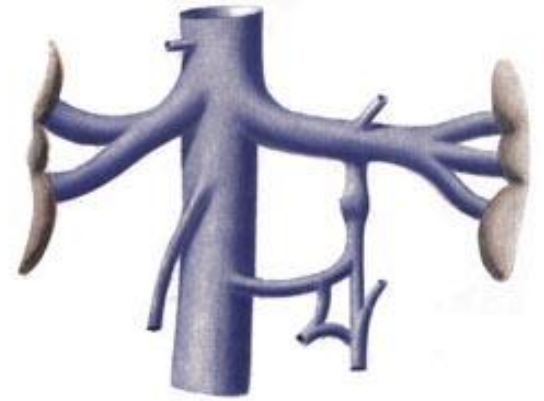
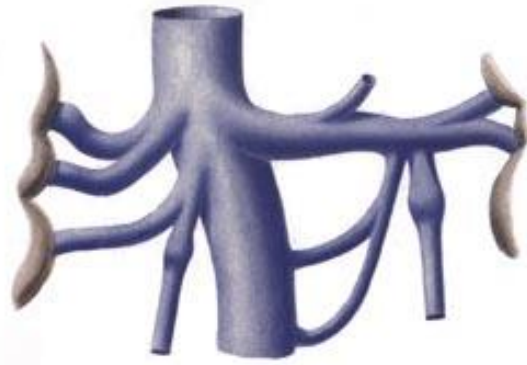
Vena cava inferior



Vena cava inferior - tributaries

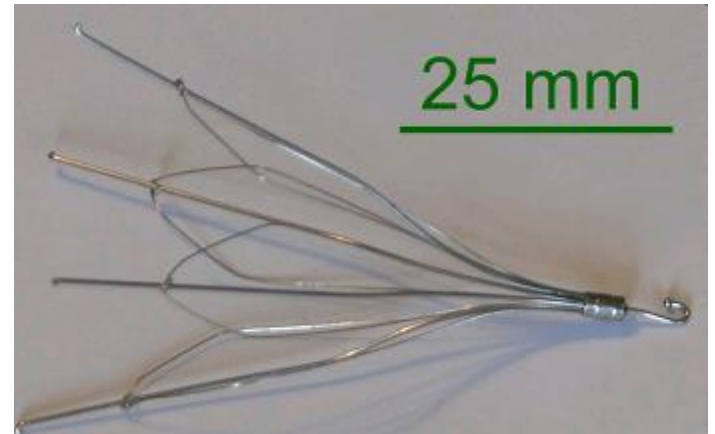
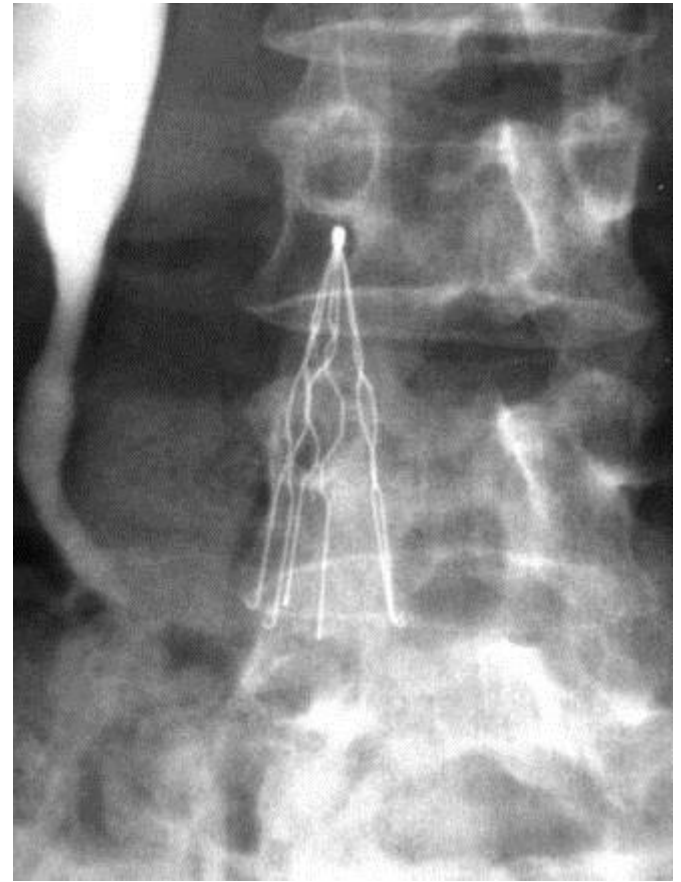
- variation of VCI course, arrangement and tributaries
- parietal:
 - vv. iliacaes communes, vv. lumbales I-IV (*interconnected with v. lumbalis ascendens*), vv. phrenicae inf., v. sacralis mediana
- visceral:
 - vv. renales
 - v. testicularis ♂ / ovarica dx. ♀ (begins as plexus pampiniformis)
 - v.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

Variability of formation of VCI visceral tributaries



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



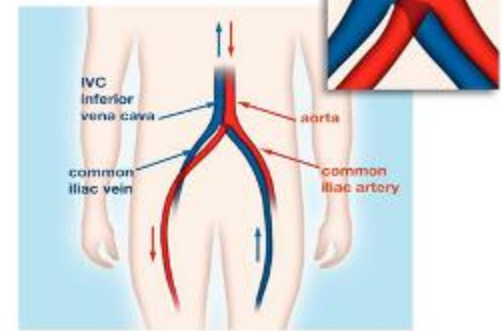
(AICdX.)

- thrombosis follows
- treatment: stent



May-Thurner syndrome

Narrowed left iliac vein
(by pressure from right iliac artery)

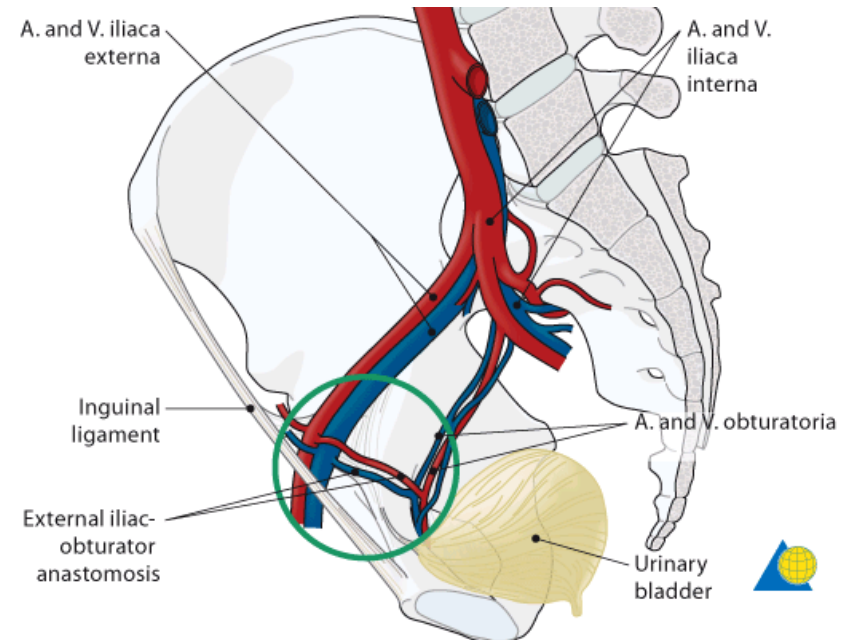


Graphic courtesy of Hansen, Birmingham, AL

© 2004 Medline

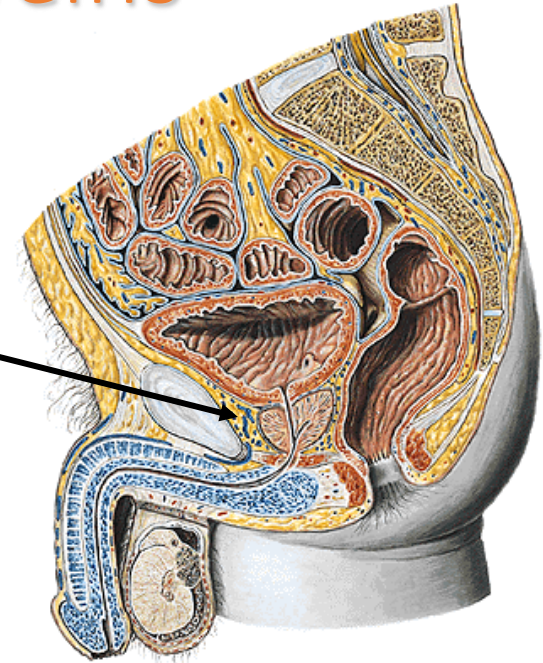
Vena iliaca externa

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



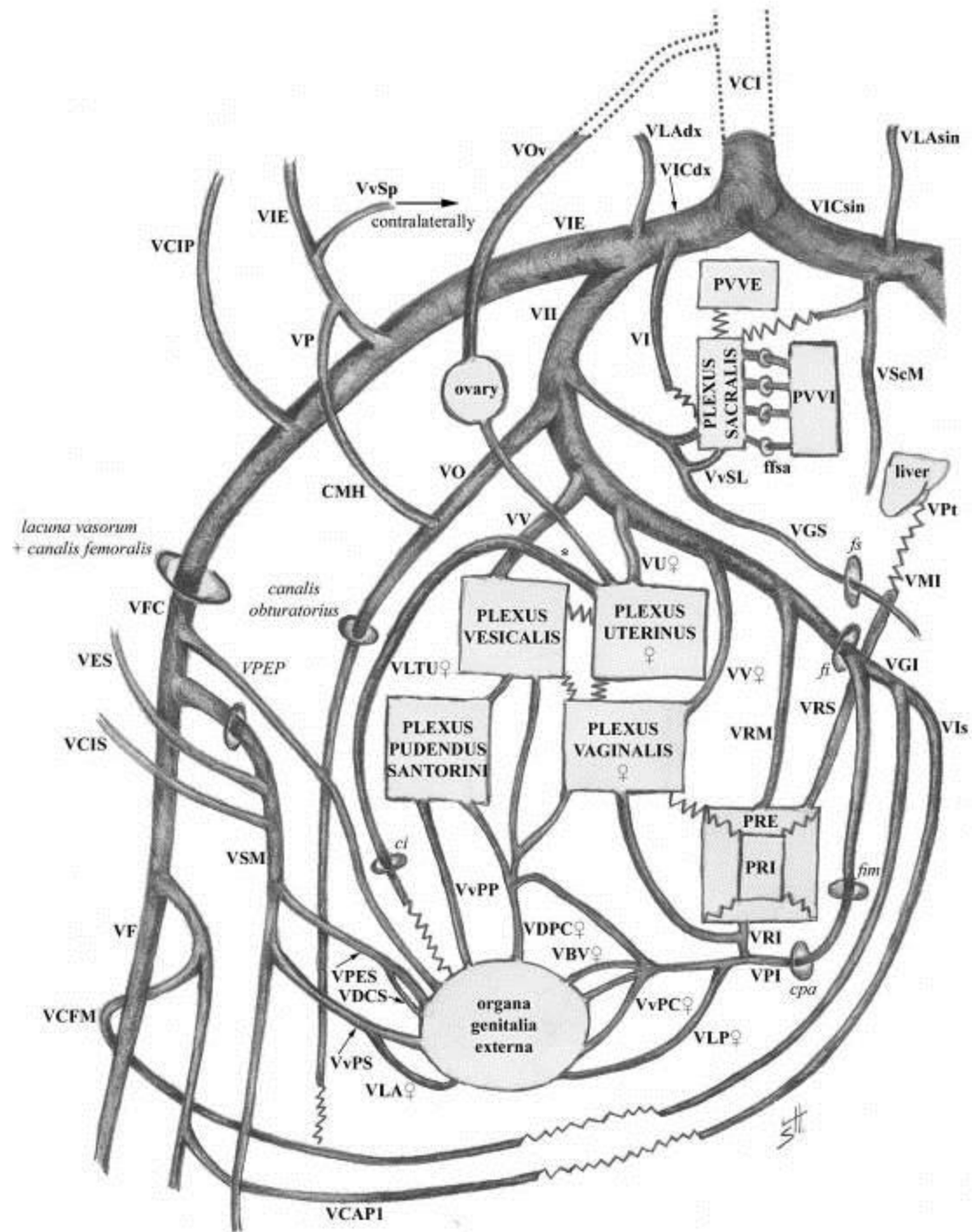
Vena iliaca interna – pelvic veins

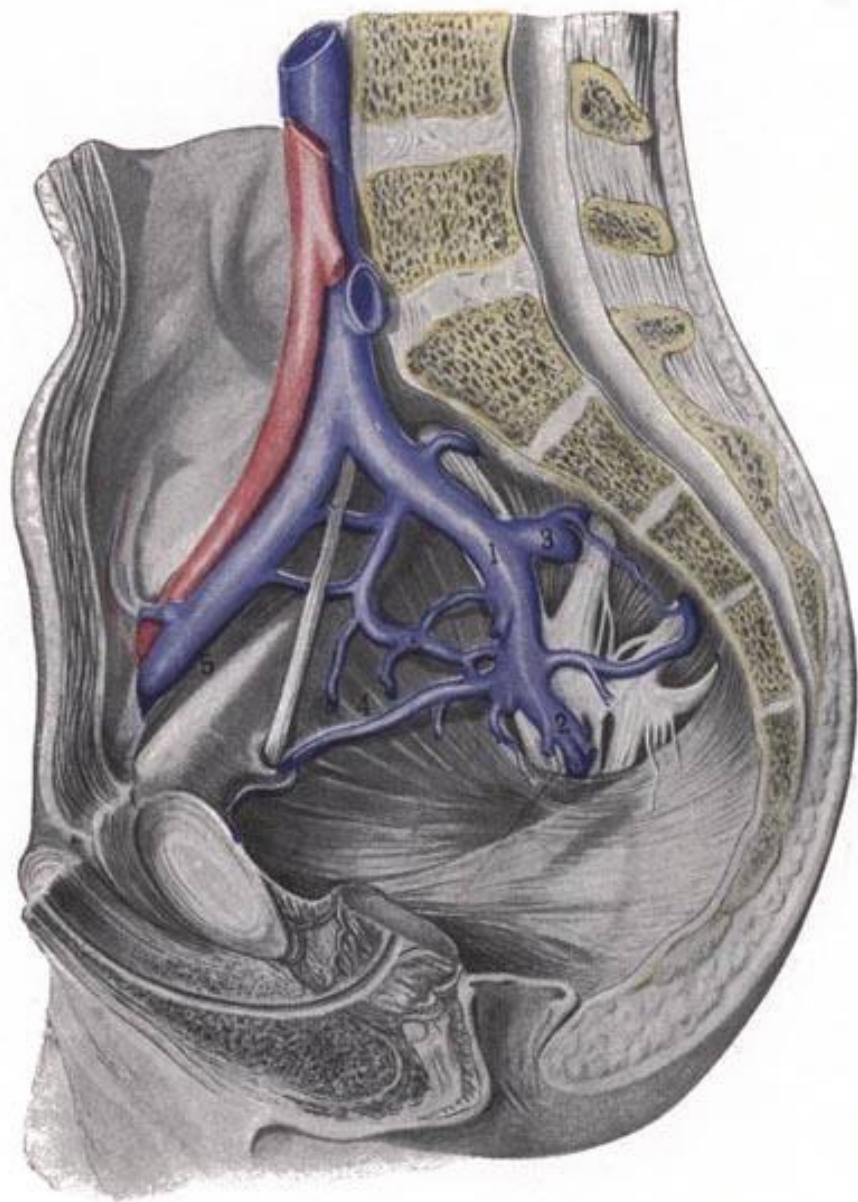
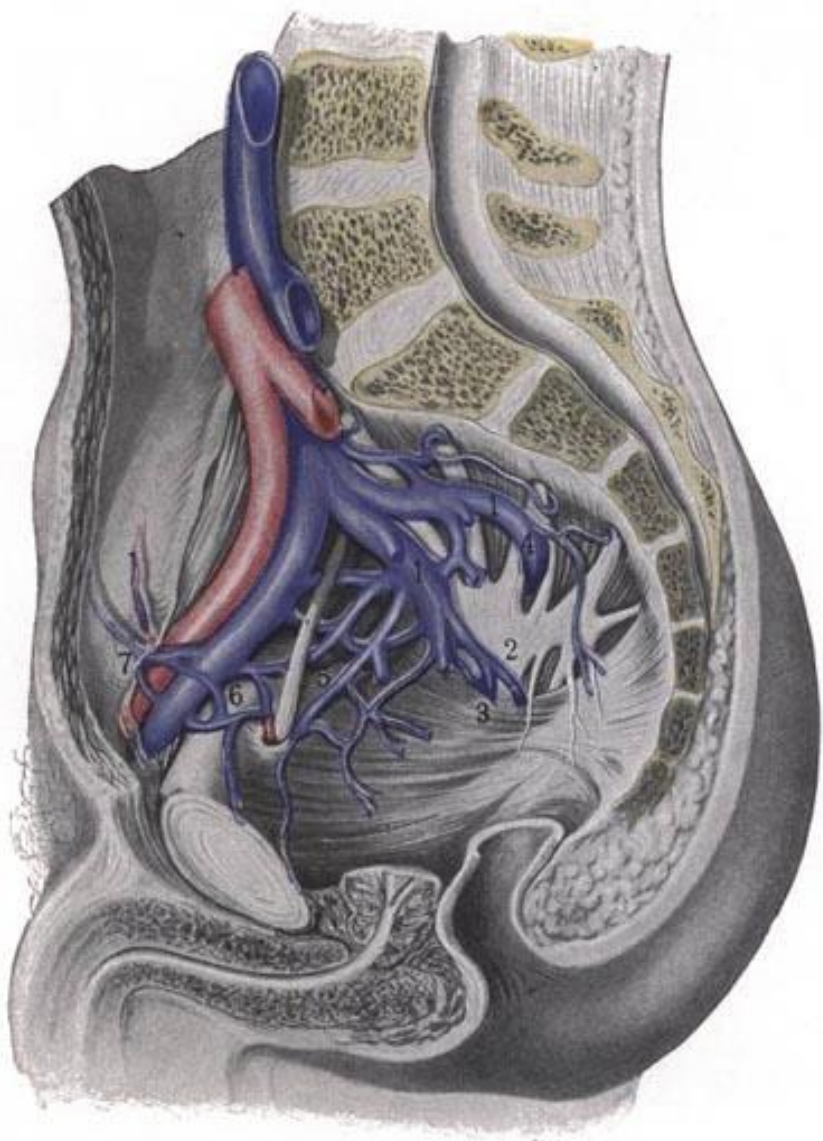
- *parietal*: correspond to arteries
- *visceral*: plexuses
 - plexus venosus pudendus (*Santorini*)
 - within spatium retropubicum (*Retzii*)
 - p.v. vesicalis + prostaticus
 - p.v. uterinus + vaginalis (uterovaginalis)
 - p.v. rectalis
 - p.v. rectalis externus (within tunica adventitia)
 - p.v. rectalis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

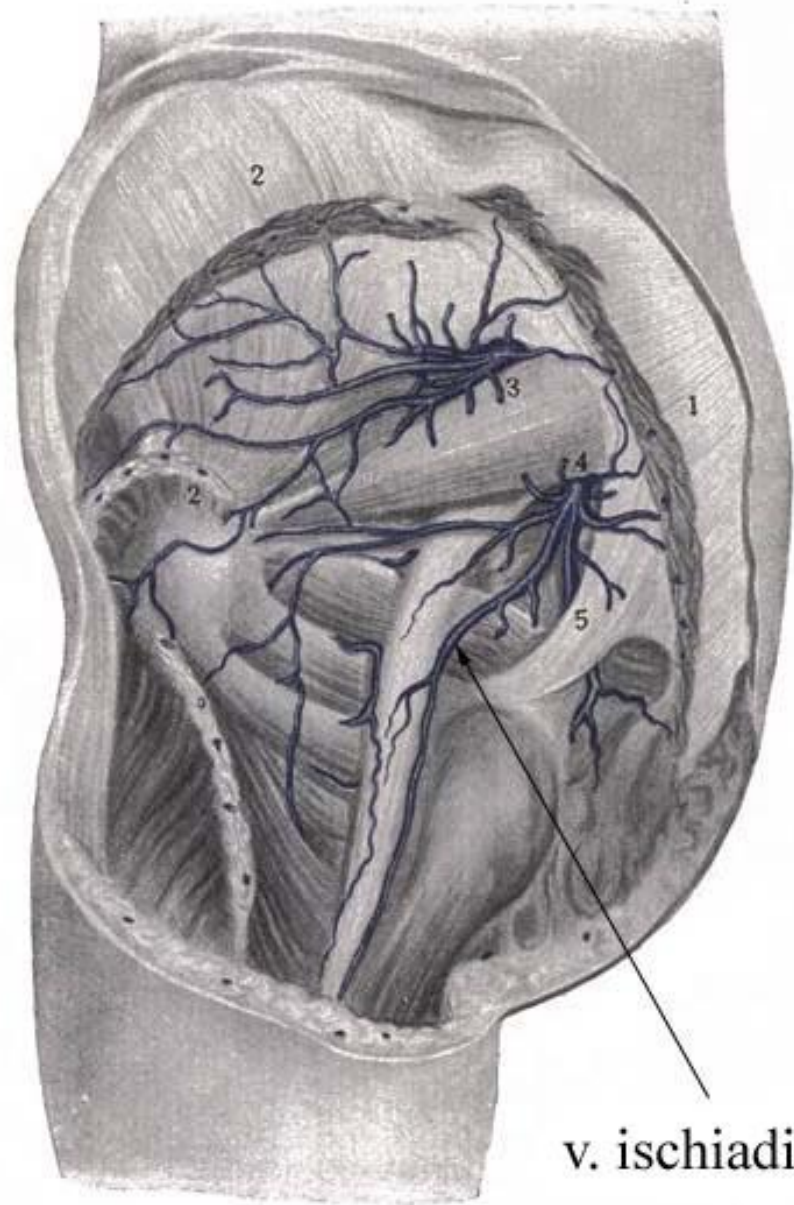


Veins of pelvis

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

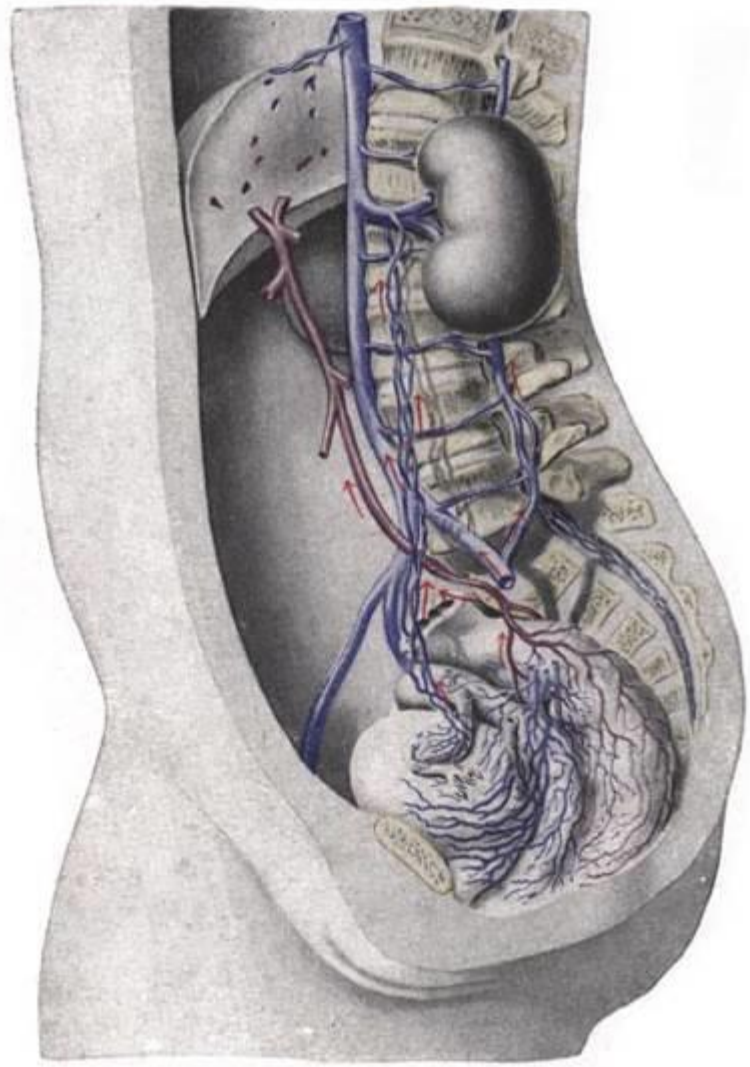
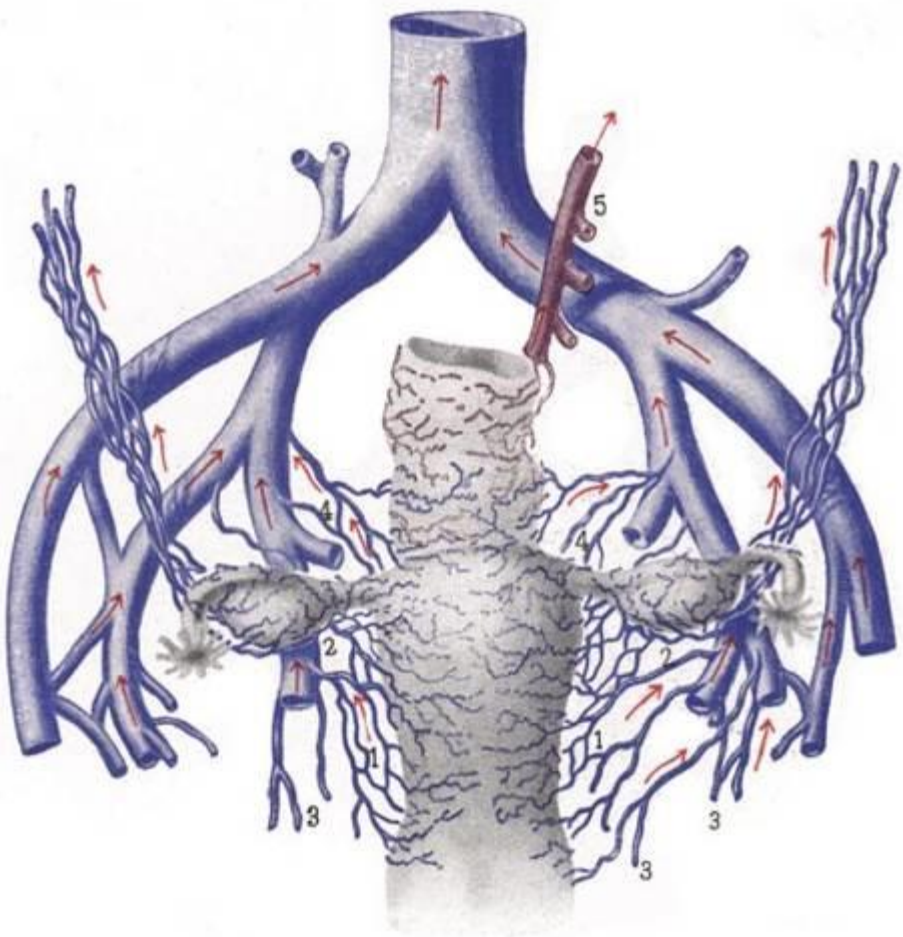






v. ischiadica

Direction of venous outflow from pelvis

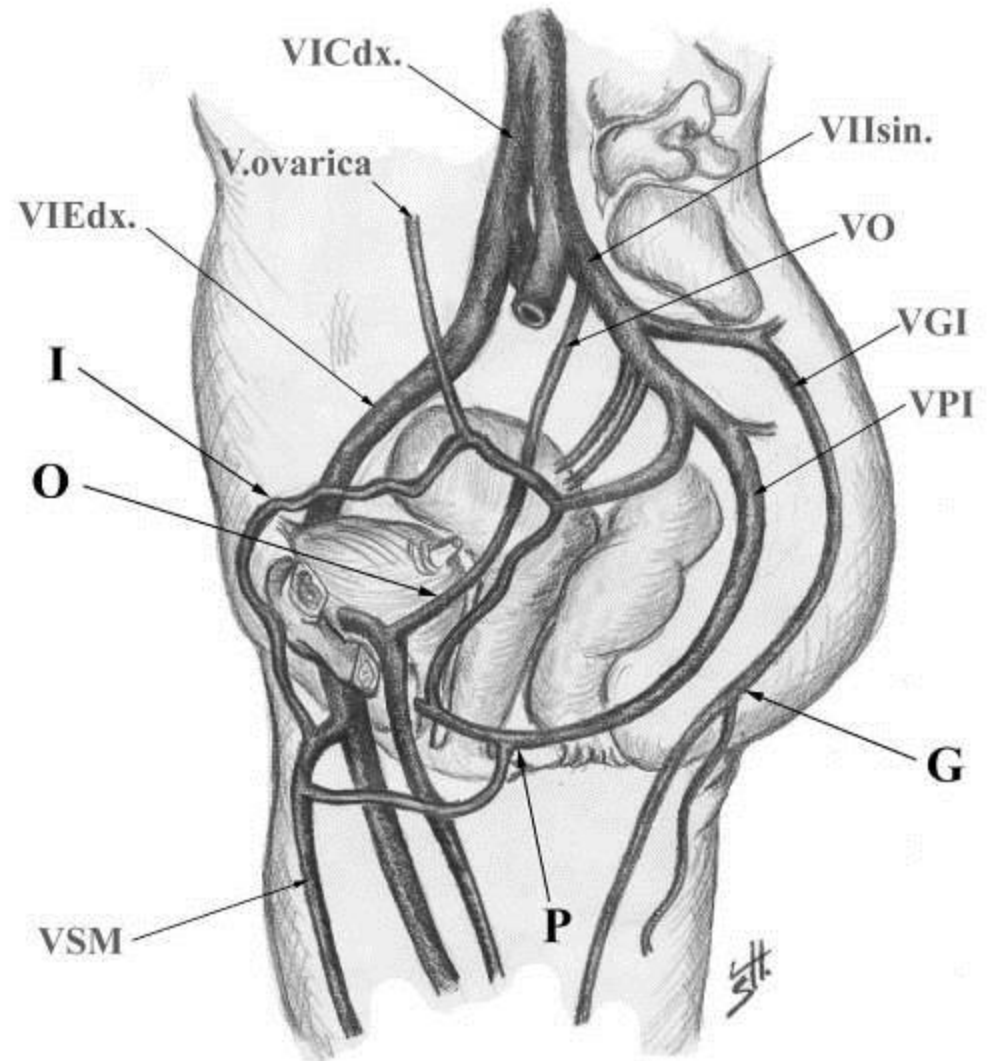


Veins of pelvis – clinical relevance

- 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 lower limb veins

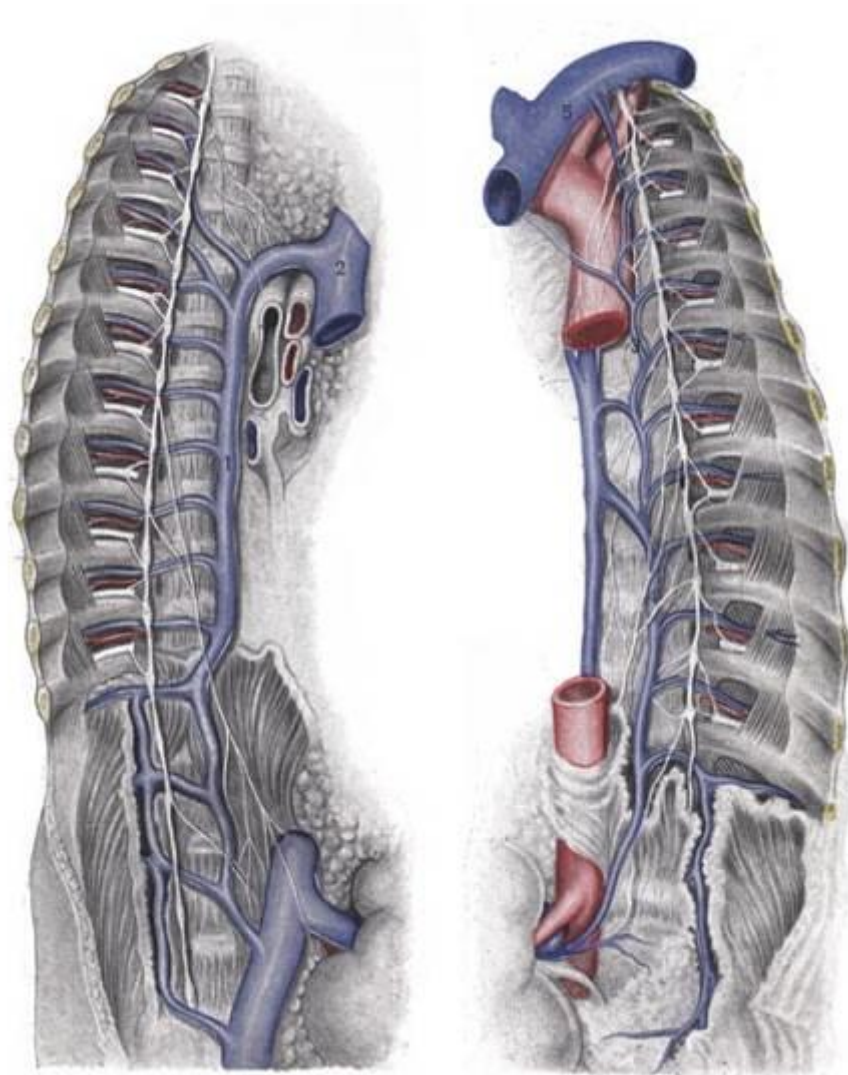
- canalis inguinalis
- canalis obturatorius
- foramen infrapiriforme
- perineum
- *change of flow direction in varices*



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 do v. azygos at level of T7-9
- v. azygos opens into VCS
 - arcus v. azygoi

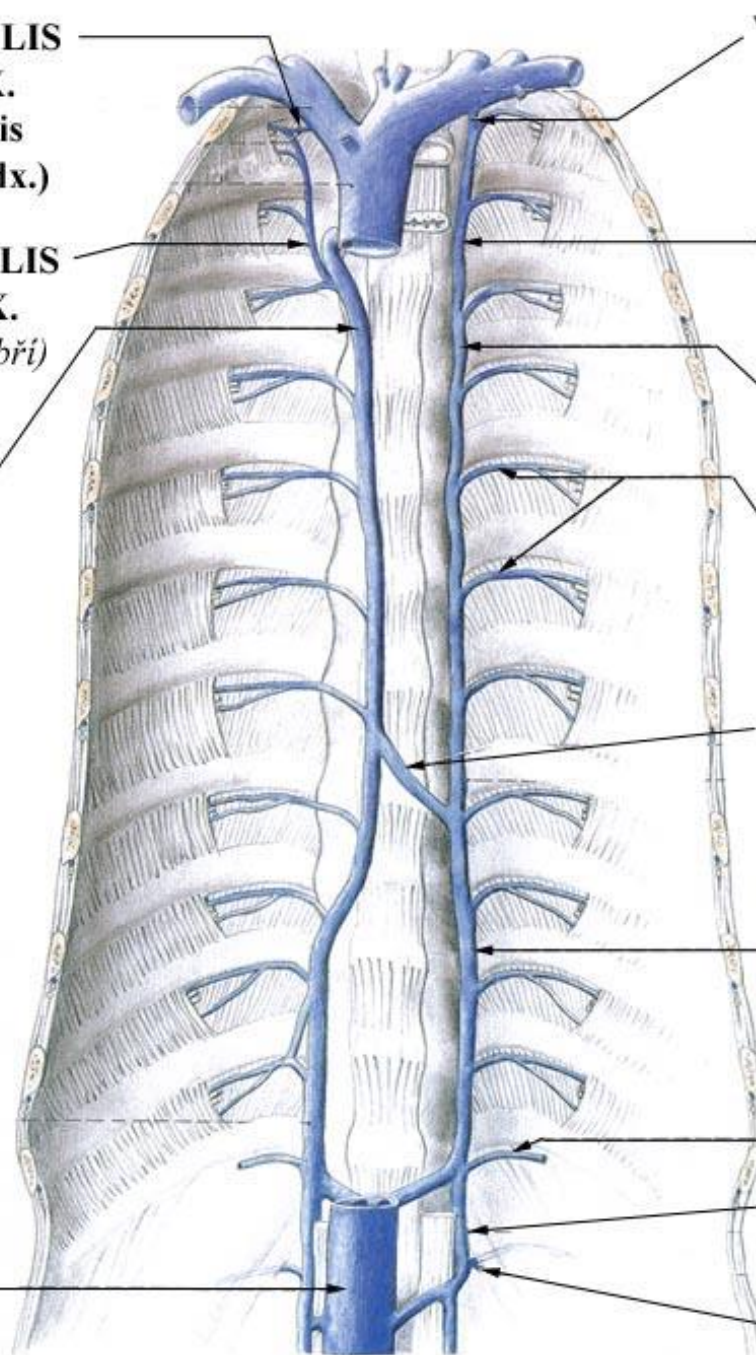


**V. INTERCOSTALIS
SUPREMA DX.**
(= v. intercostalis
posterior prima dx.)

**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**

Cavo-caval anastomoses

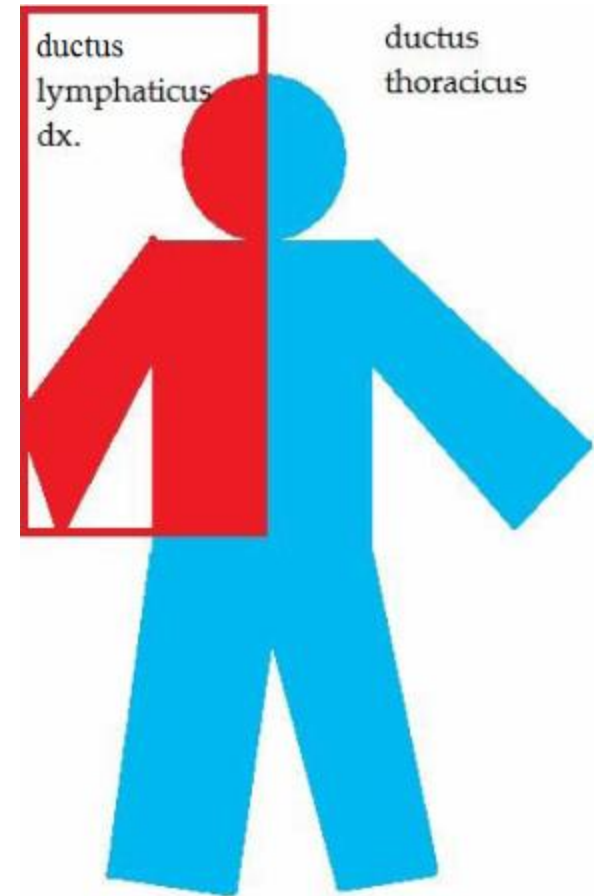
VCI

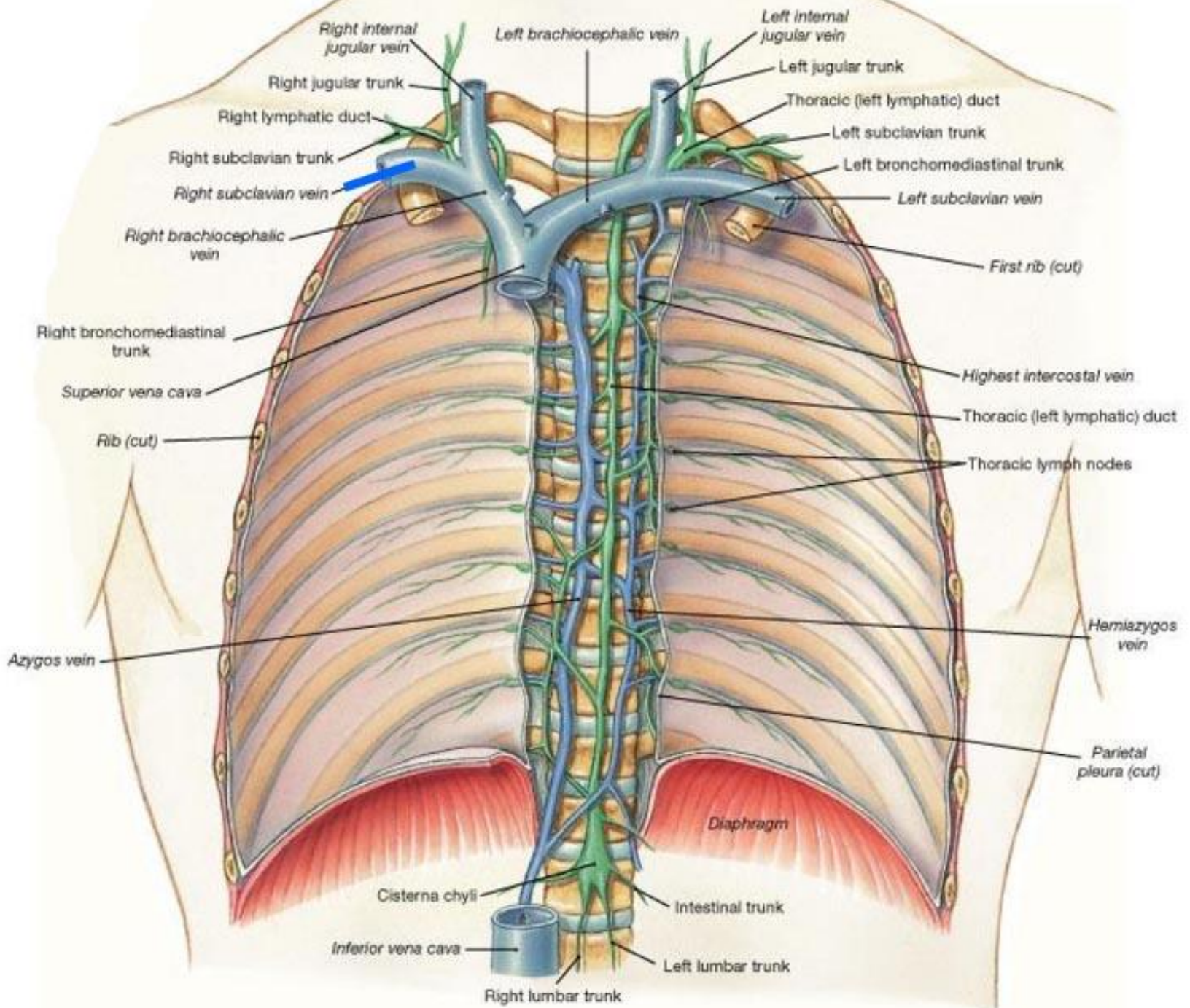
VCS

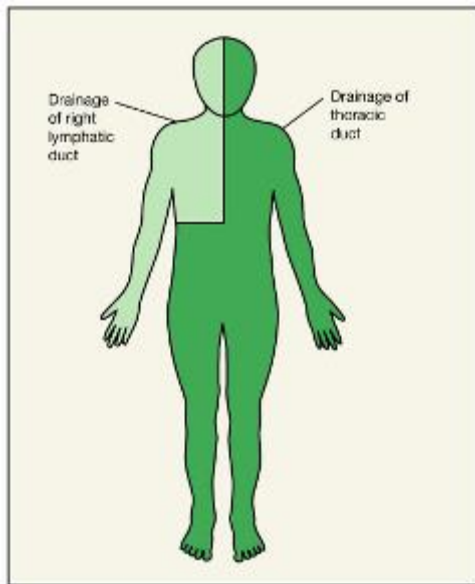
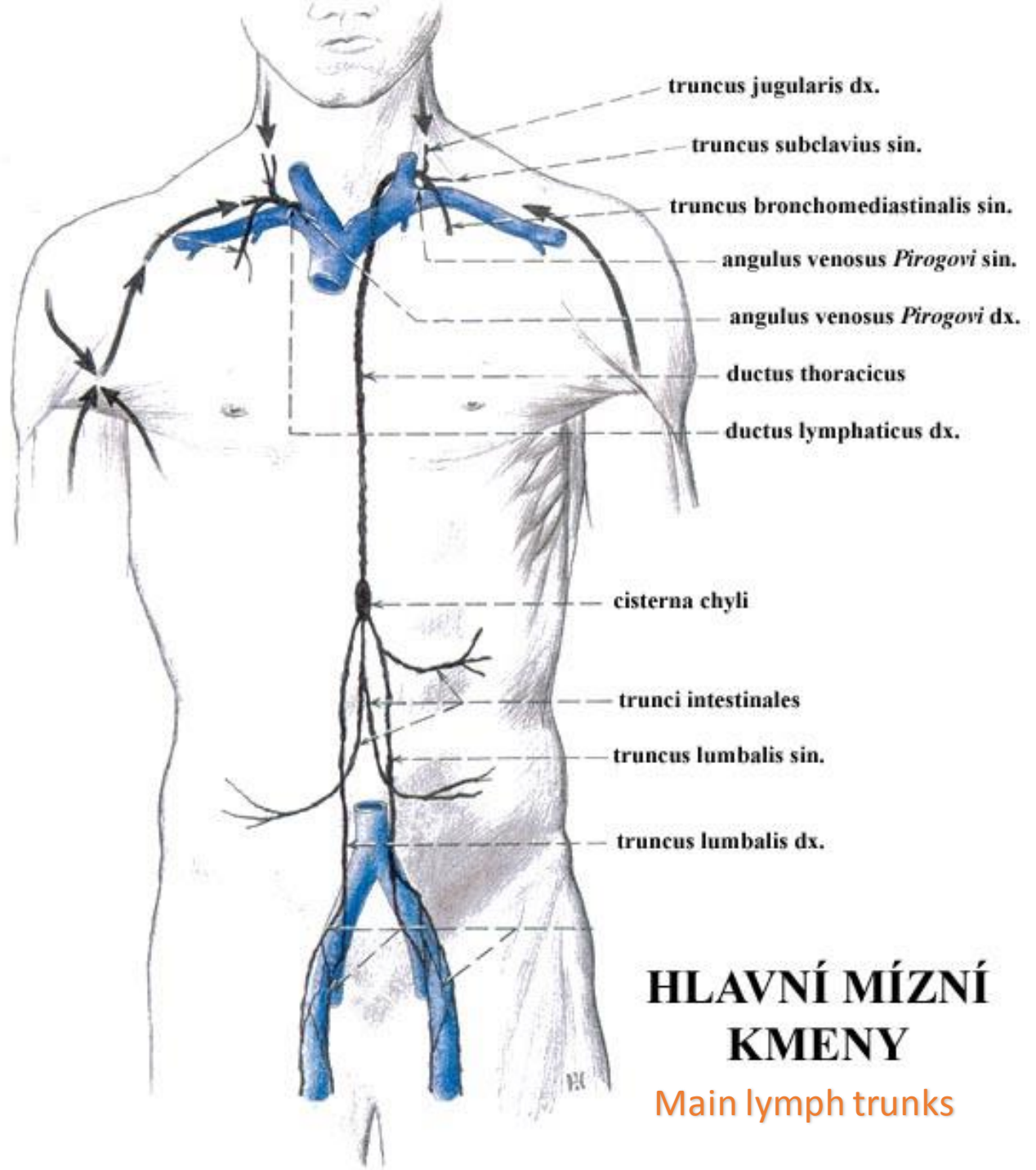
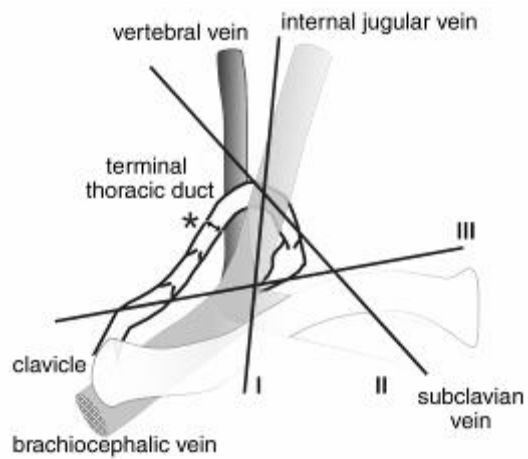
- vv. lumbales – v. azygos + hemiazygos
- v. epigastrica inf. – v. epigastrica sup.
- v. epigastrica spf. – vv. thoracoepigastricae
- plexus venosi vertebrales (*Batson's*)

Lymph vessels general arrangement

- lymph capillaries → lymph vessels
- limbs (collectors): superficial → deep vessels
- organs: plexuses (subcapsular + deep) → lymph trunks → lymph ducts
- lymph nodes put in vessels



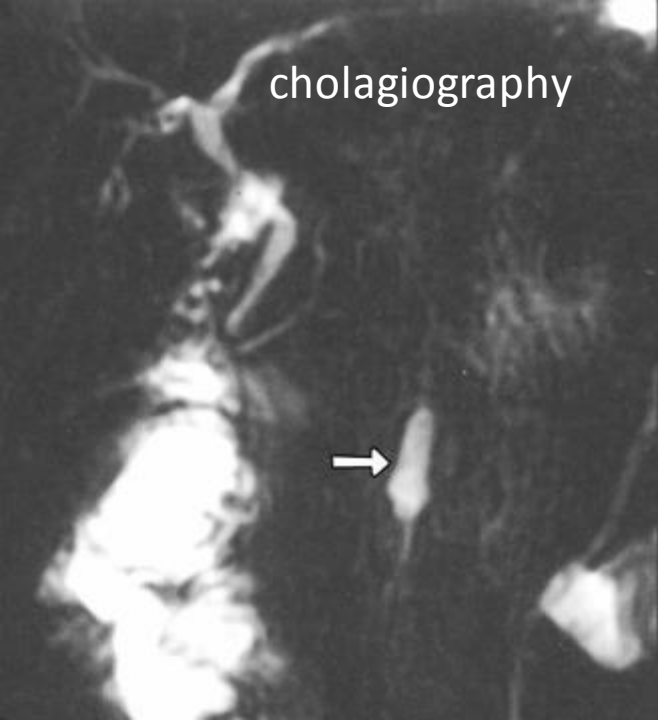




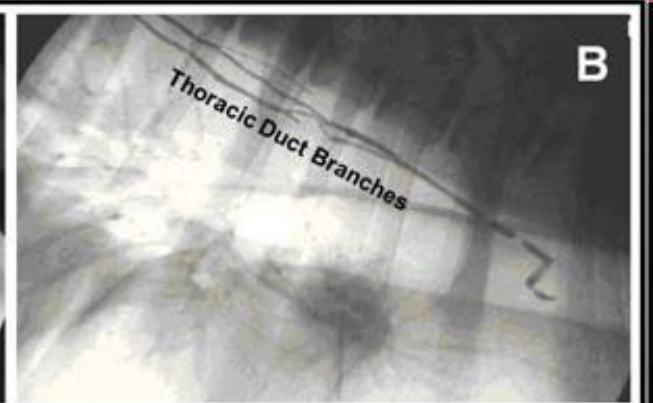
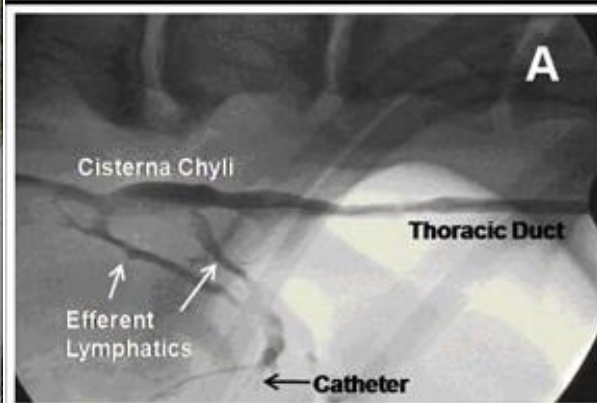
(a)

HLAVNÍ MÍZNÍ KMENY

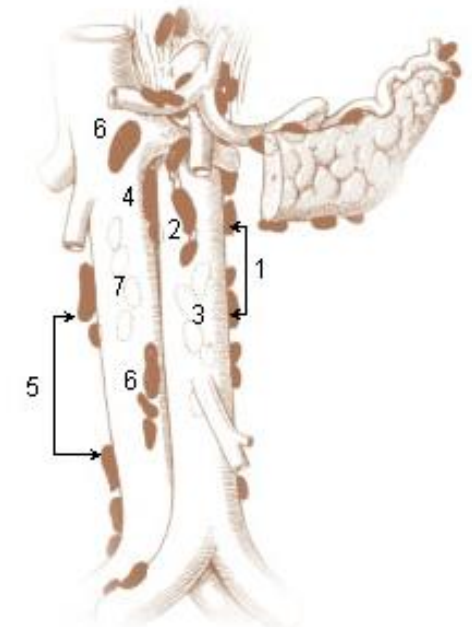
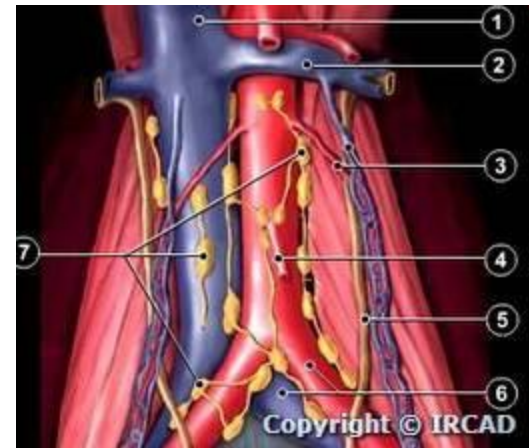
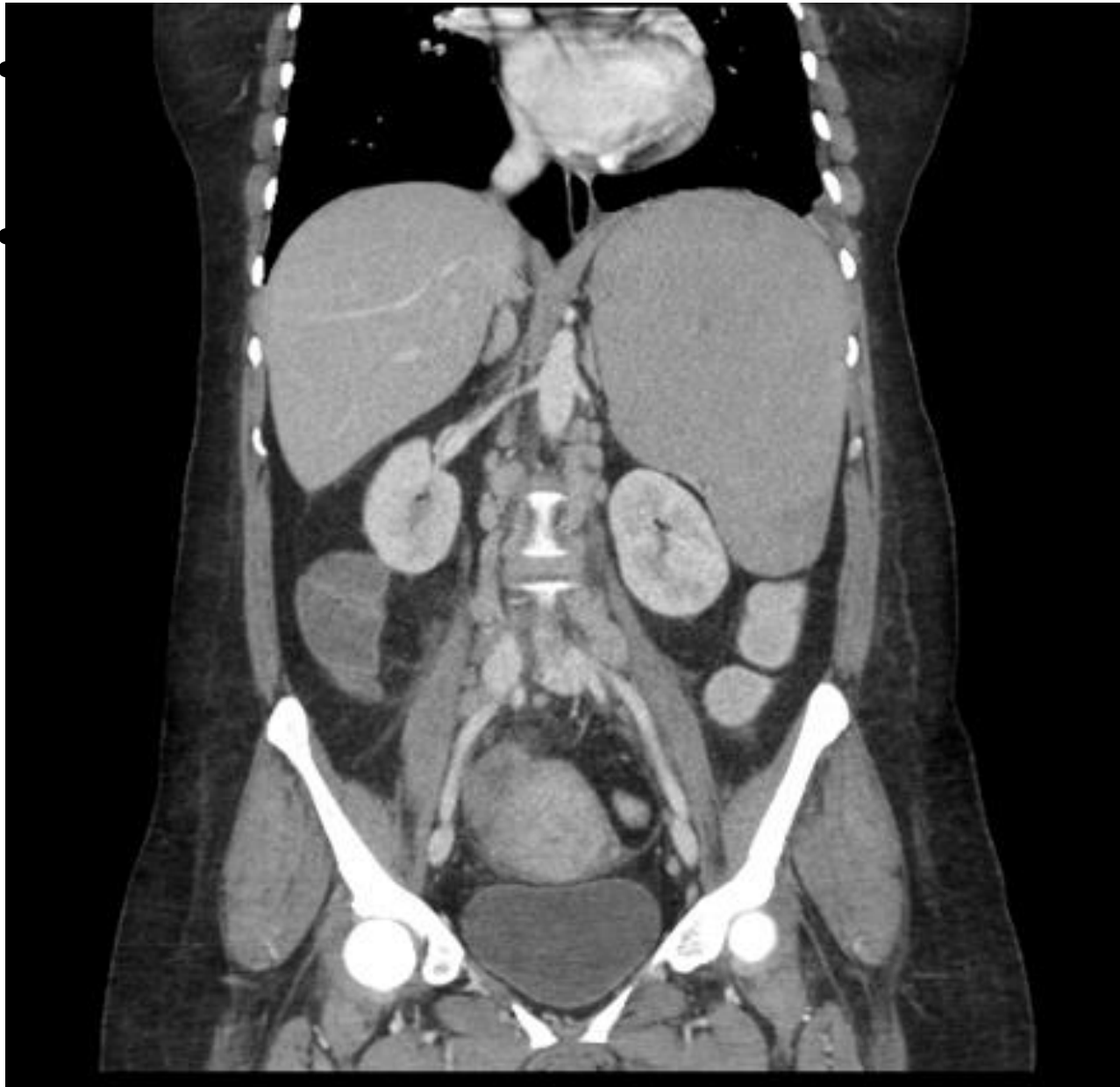
Main lymph trunks



CISTERNA
CHYLI



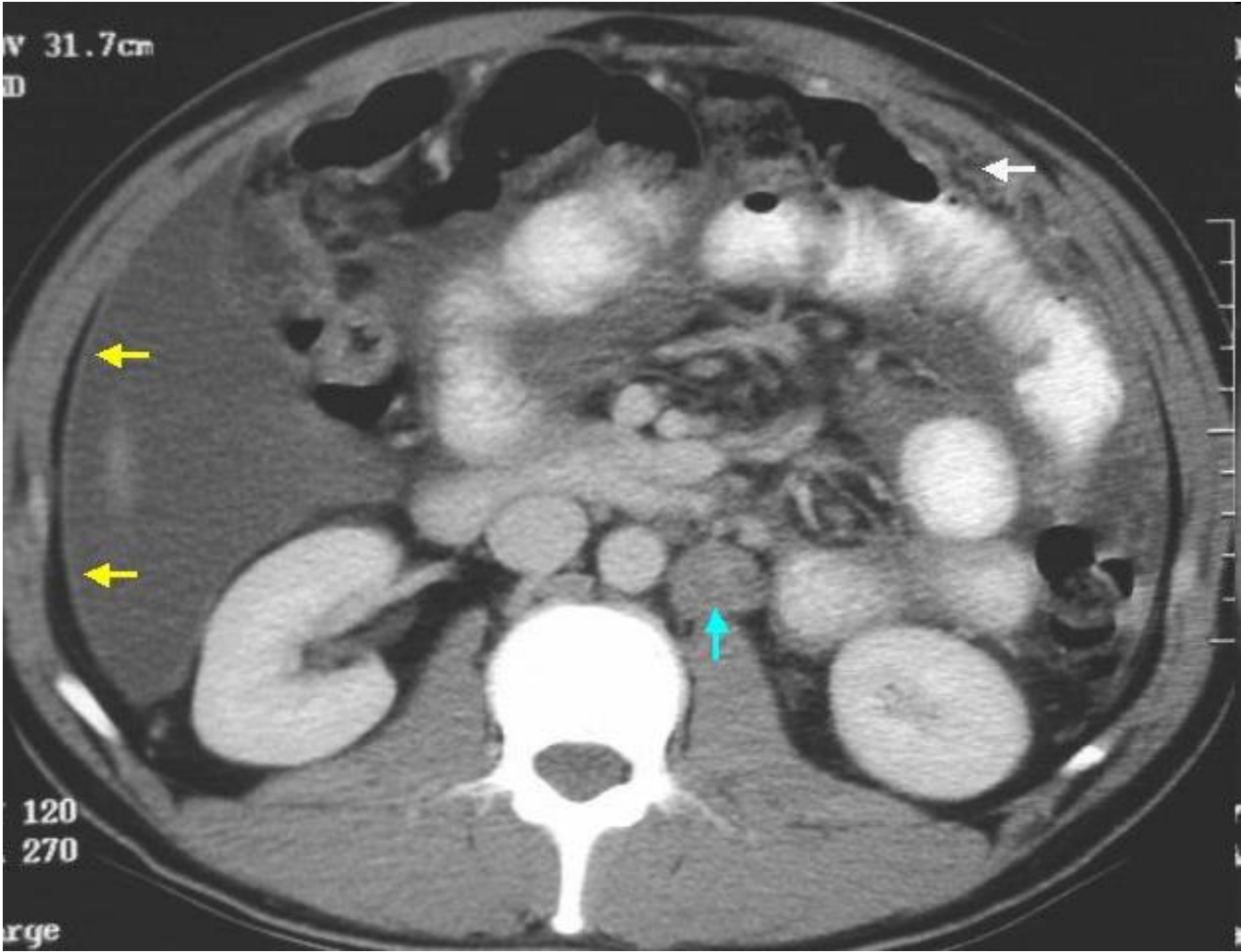
Abdomen



Colorectal metastasis



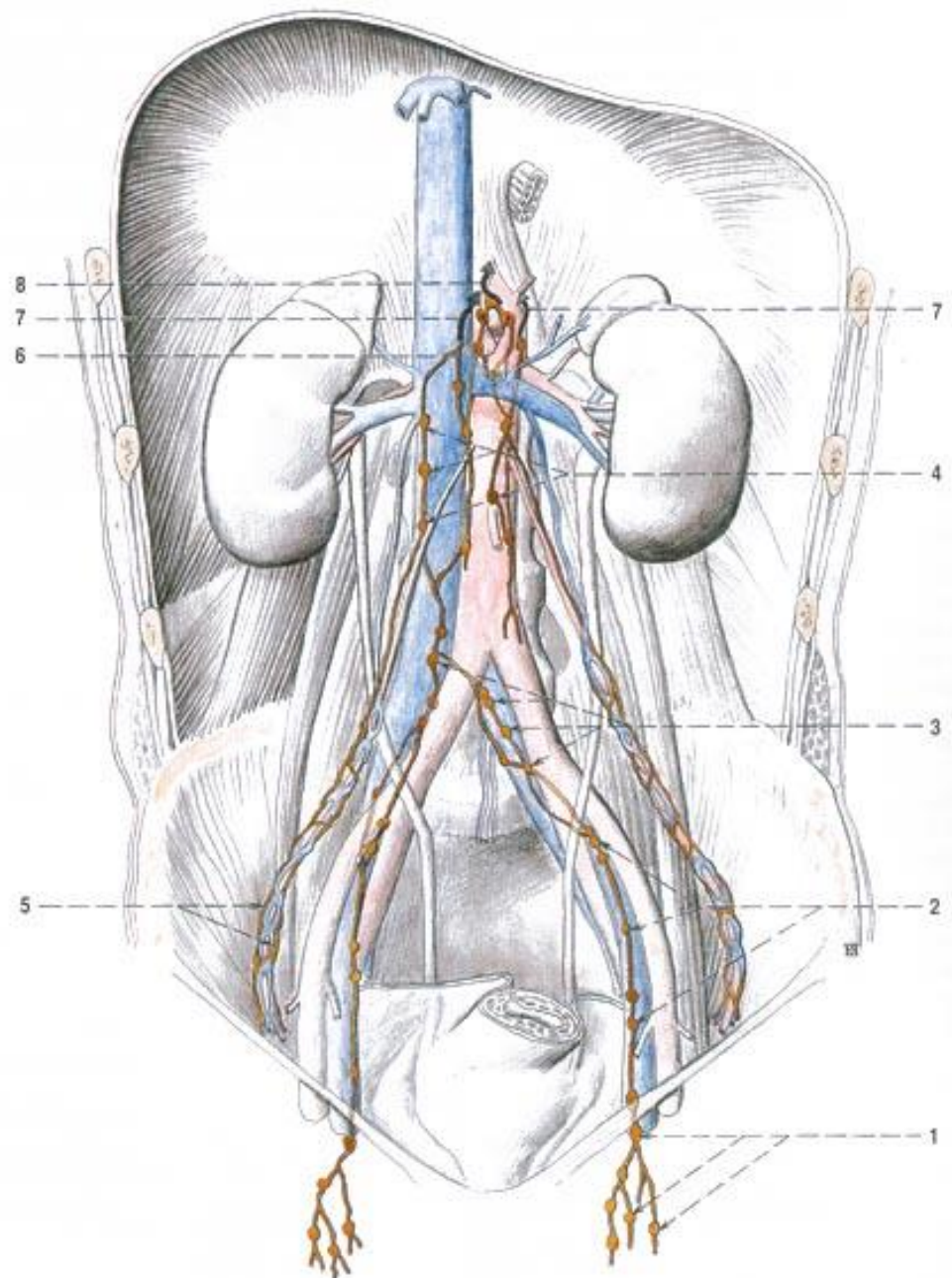
Tuberculosis



Testis ♂

Ovary ♀

- n.l. lumbales
- *L2 – development*
- *scrotum → n.l. inguinales superficiales*
- *! no puncture !*



Obr. 138. NODI ILIACI EXTERNI ET NODI LUMBALES

- 1 nodi inguinales superficiales et profundi
- 2 nodi iliaci externi
- 3 nodi iliaci communes
- 4 nodi lumbales

- 5 mizni kolektory z varle / ovaria, jdoucí podél vasa testicularia / ovarica do nodi lumbales
- 6 nodi coeliaci
- 7 odtok mízy cestou truncus lumbalis do cisterna chyli
- 8 odtok mízy cestou truncus lumbalis do cisterna chyli

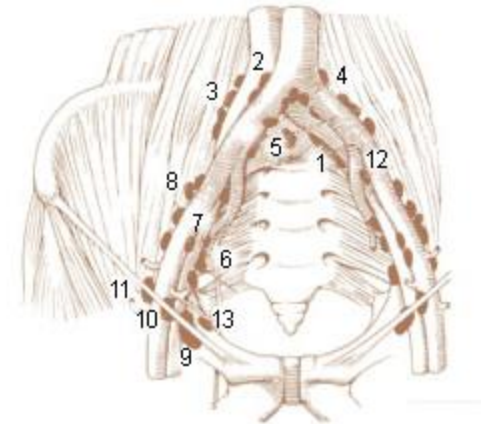
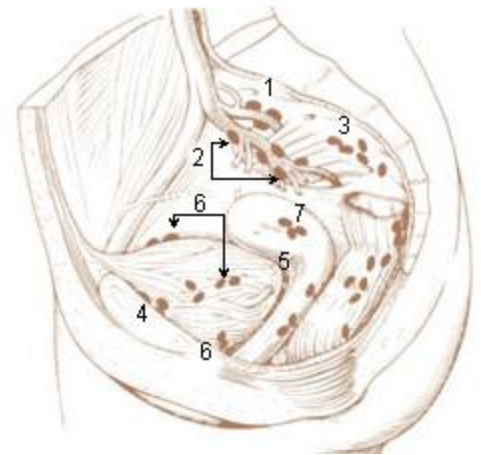
Pelvis

- n.l. parietales

- communes
- externi (obturatorii)
- interni
 - gluteales sup.+inf.
 - sacrales (rectum, prostata, cervix uteri, fornix vagi)

- n.l. viscerales

- paravesicales
- parauterini ♀, paravaginales ♀
- pararectales



Abdomen and pelvis clinical relevance



Uterus

anatomical classification:

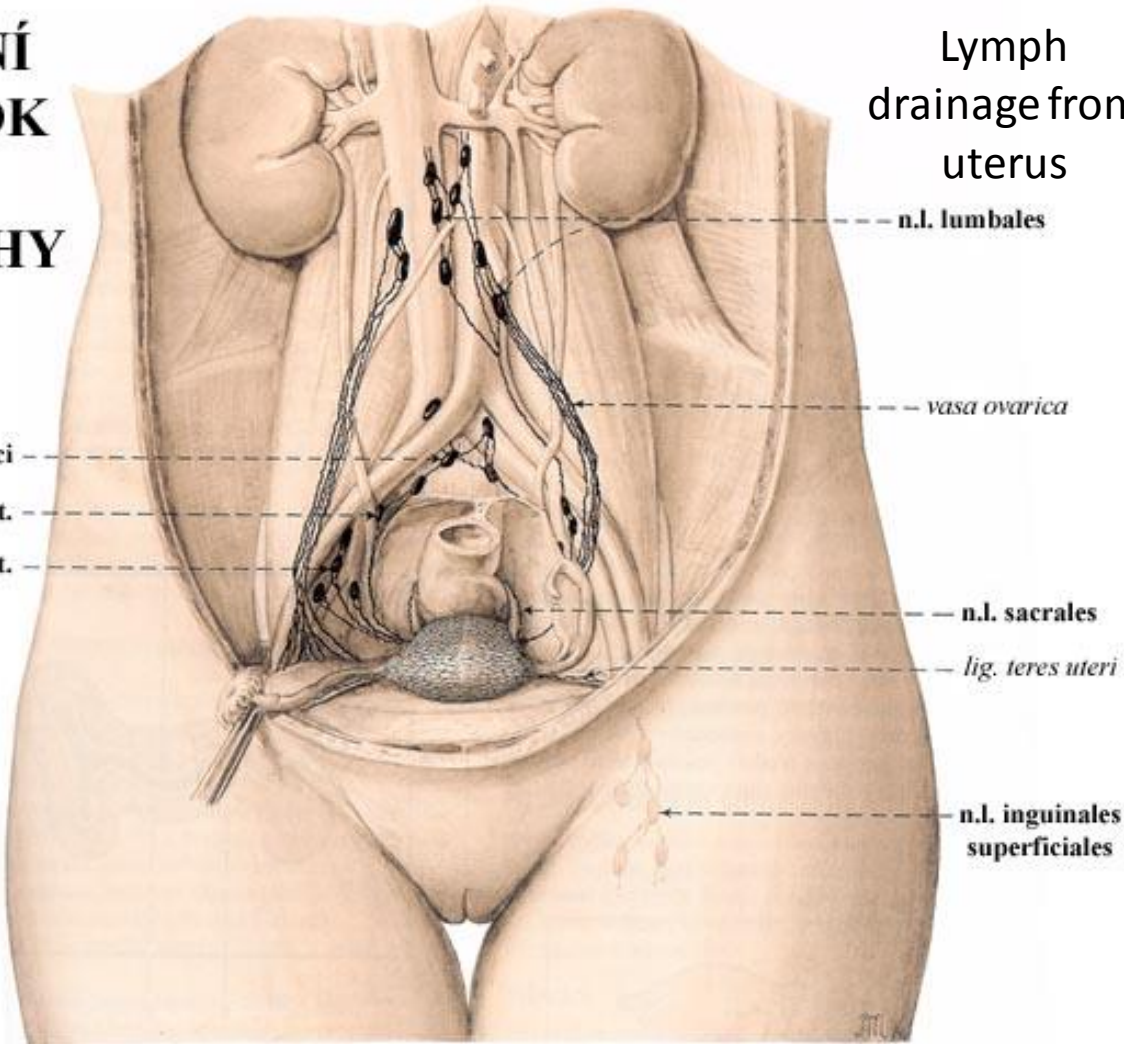
- n.l. lumbales ← fundus + corpus
- n.l. iliaci interni (iliaci externi, iliaci communes, obturatorii) ← corpus, isthmus + cervix
- n.l. sacrales ← isthmus, cervix
- n.l. inguinales superficiales ← margines + cornua (*exceptionally!*)

clinical classification: according to corpus and cervix cancer

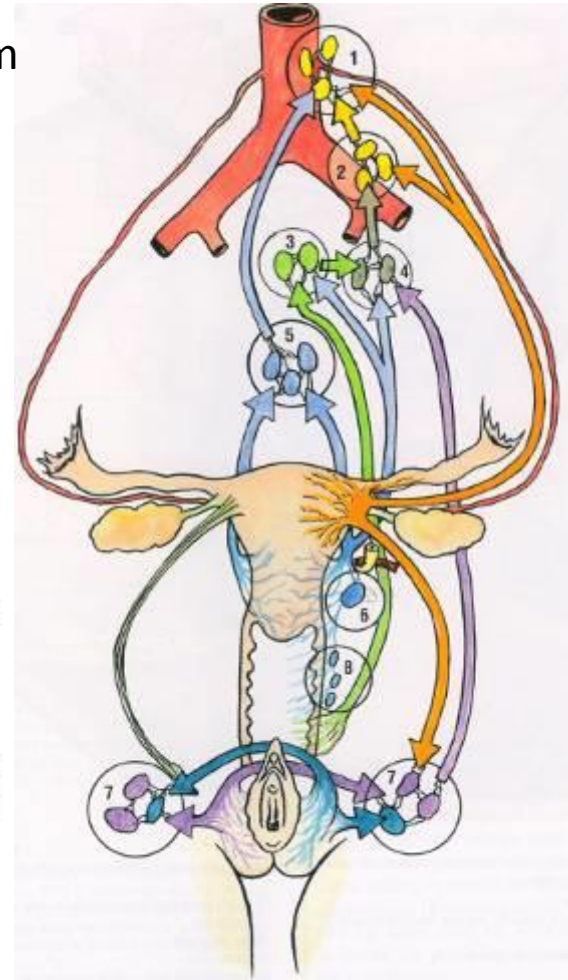
- corpus uteri → n.l. iliaci int.+ lumbales + (inguinales superficiales)
- cervix uteri → n.l. iliaci int.+ sacrales

Uterus

MÍZNÍ ODTOK Z DĚLOHY

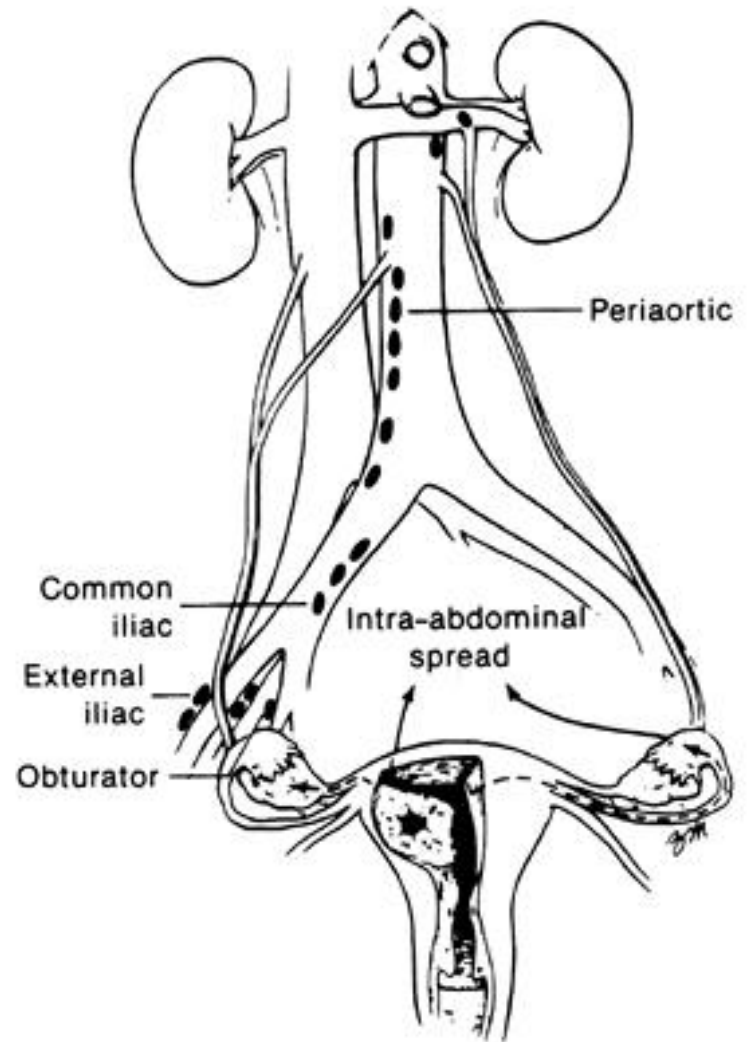
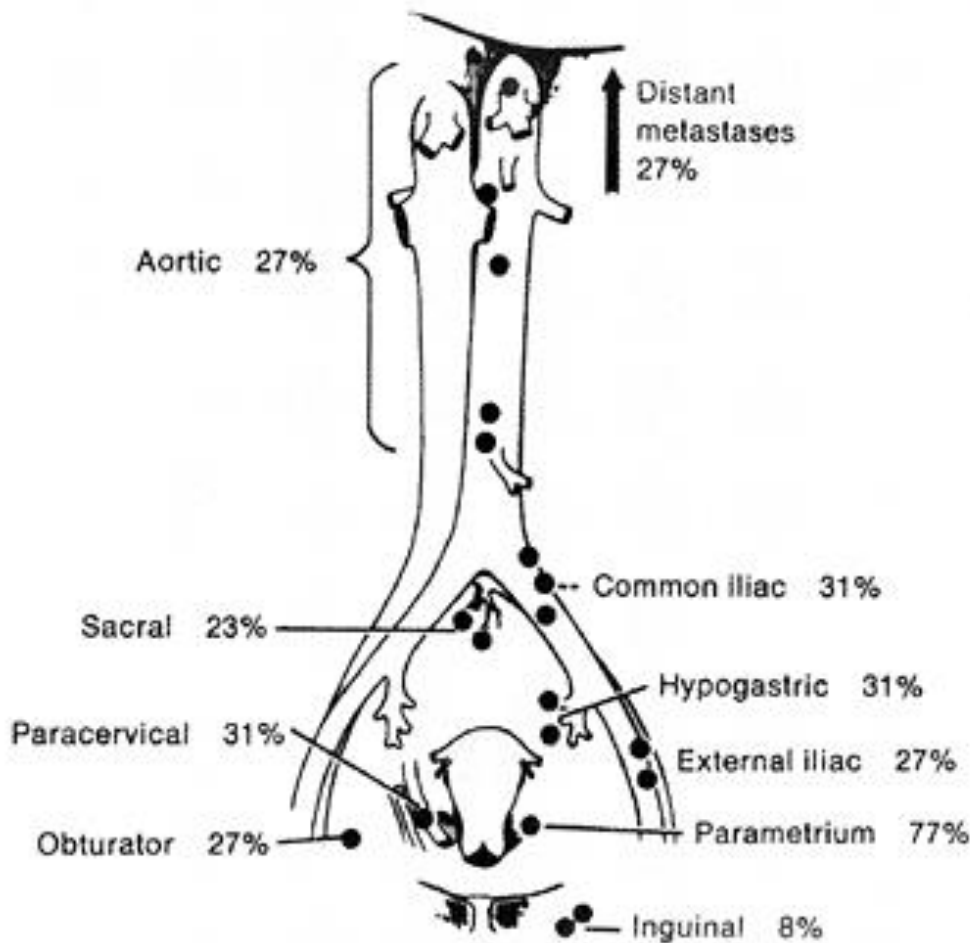


Lymph drainage from uterus



Cervix cancer

– lymph nodes involvement



Prostate

- n.l. iliaci int. + ext.
- n.l. sacrales



Lymph vessels and nodes of pelvis

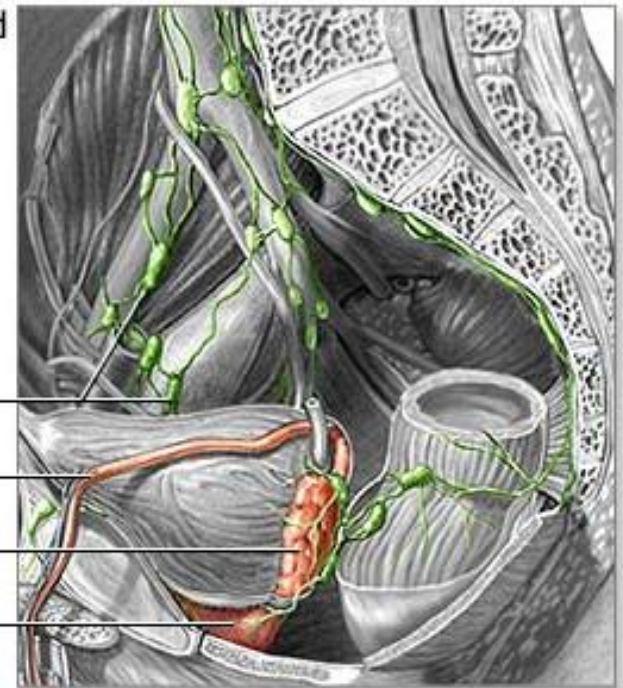


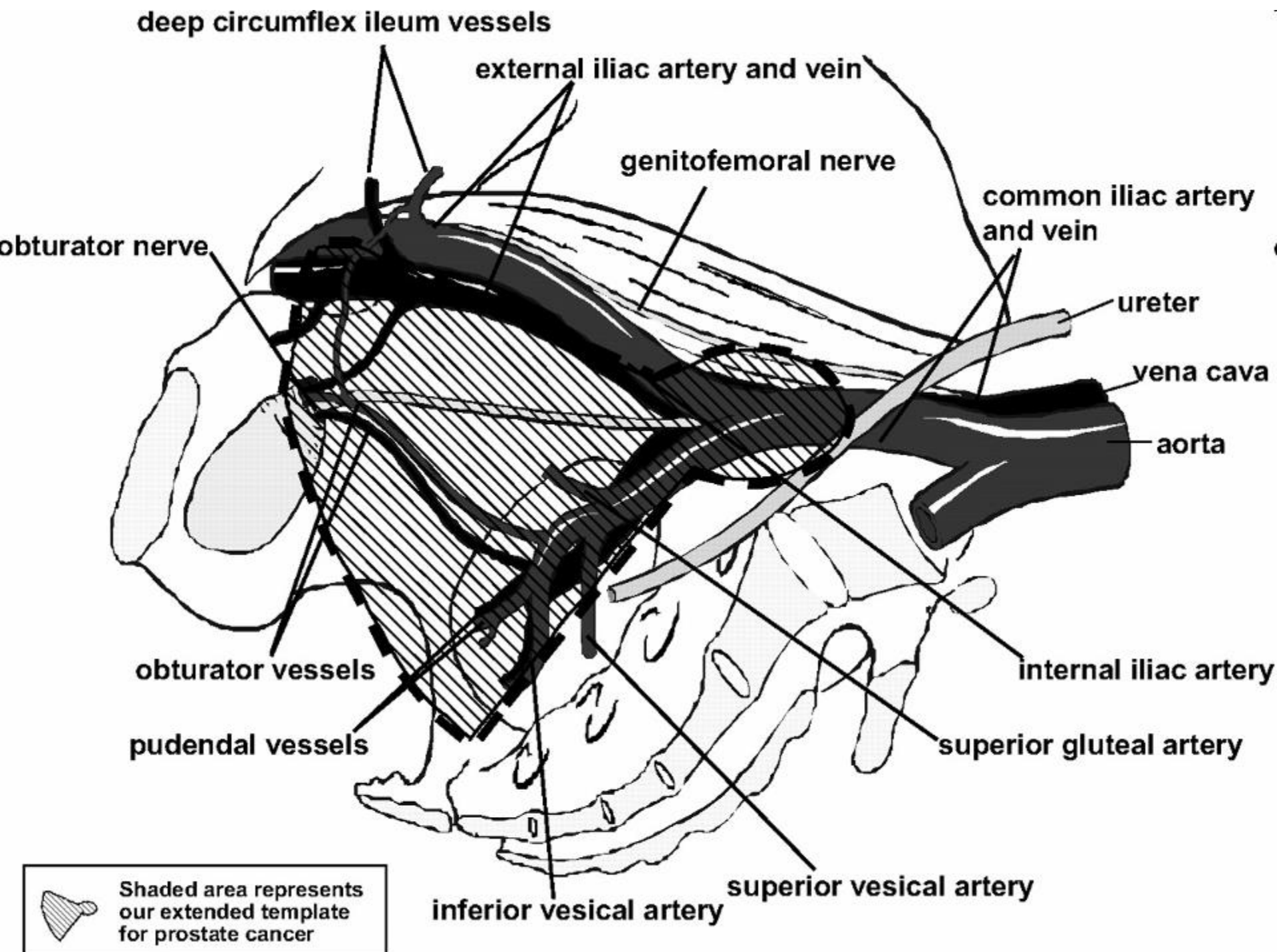
Lymph nodes

Vas deferens

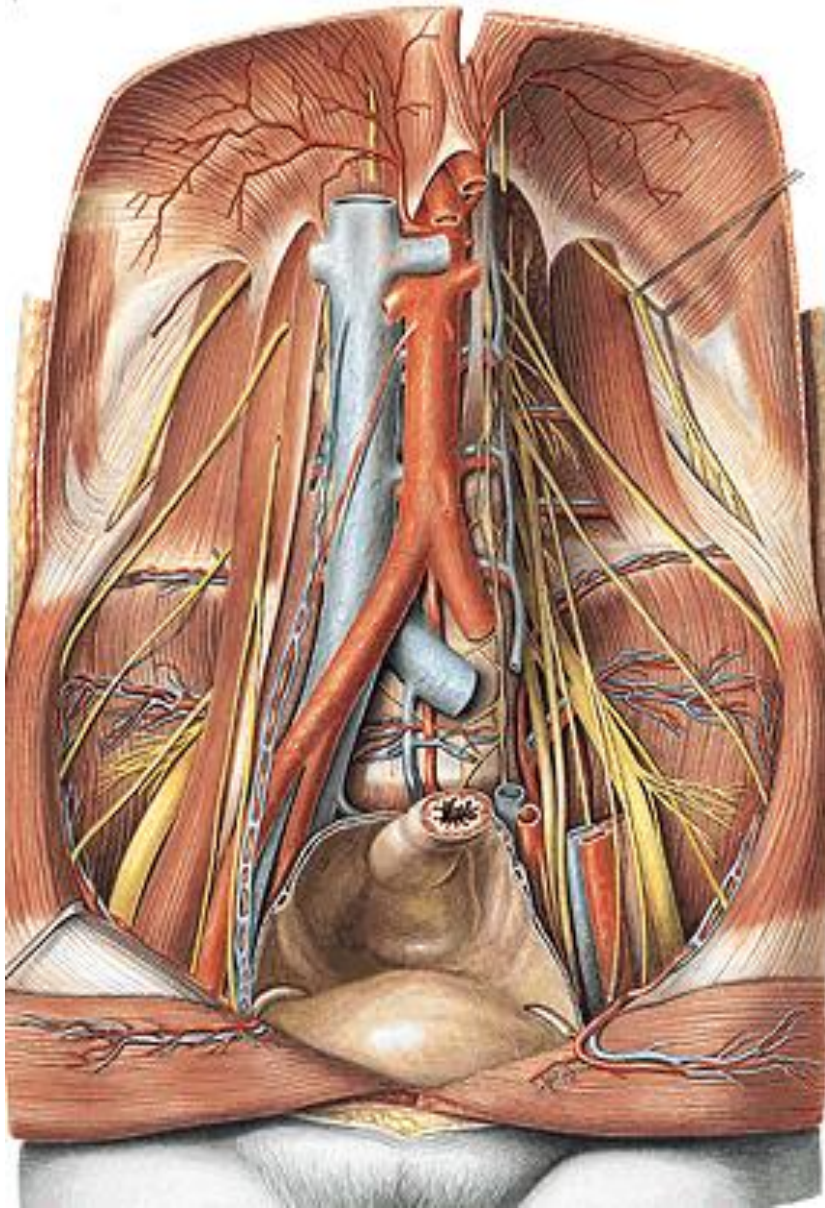
Seminal vesicle

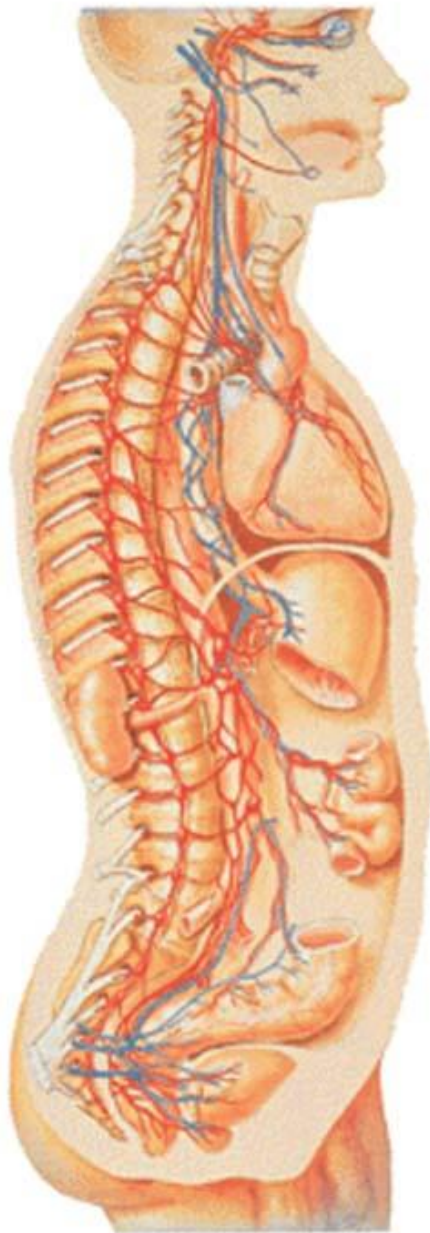
Prostate gland



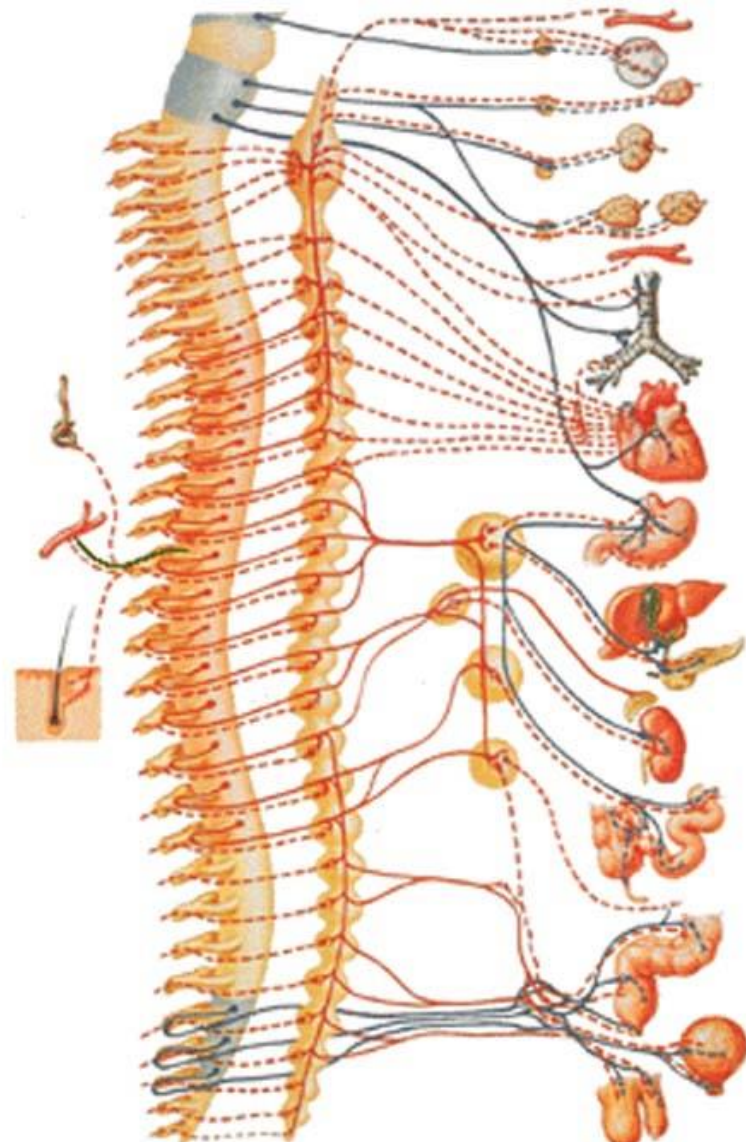


Nerves of retroperitoneum



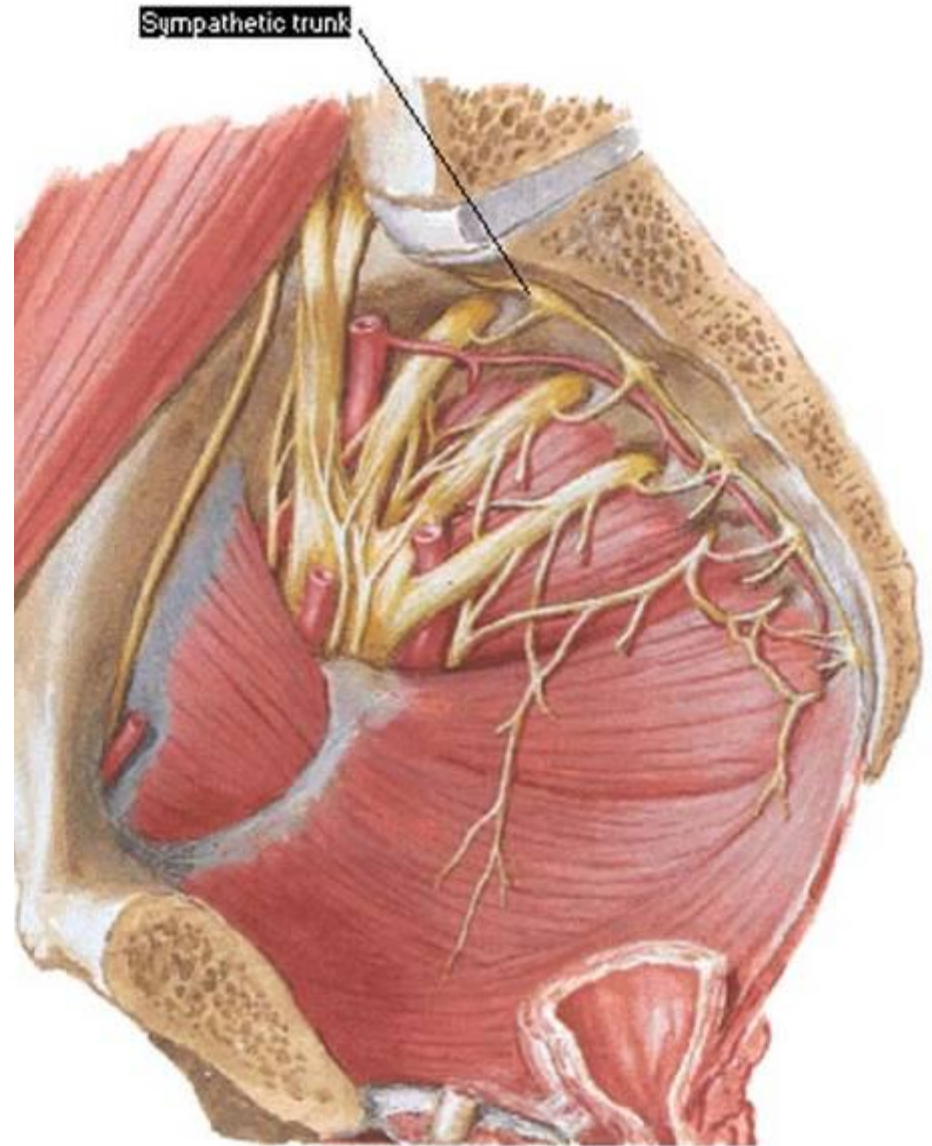
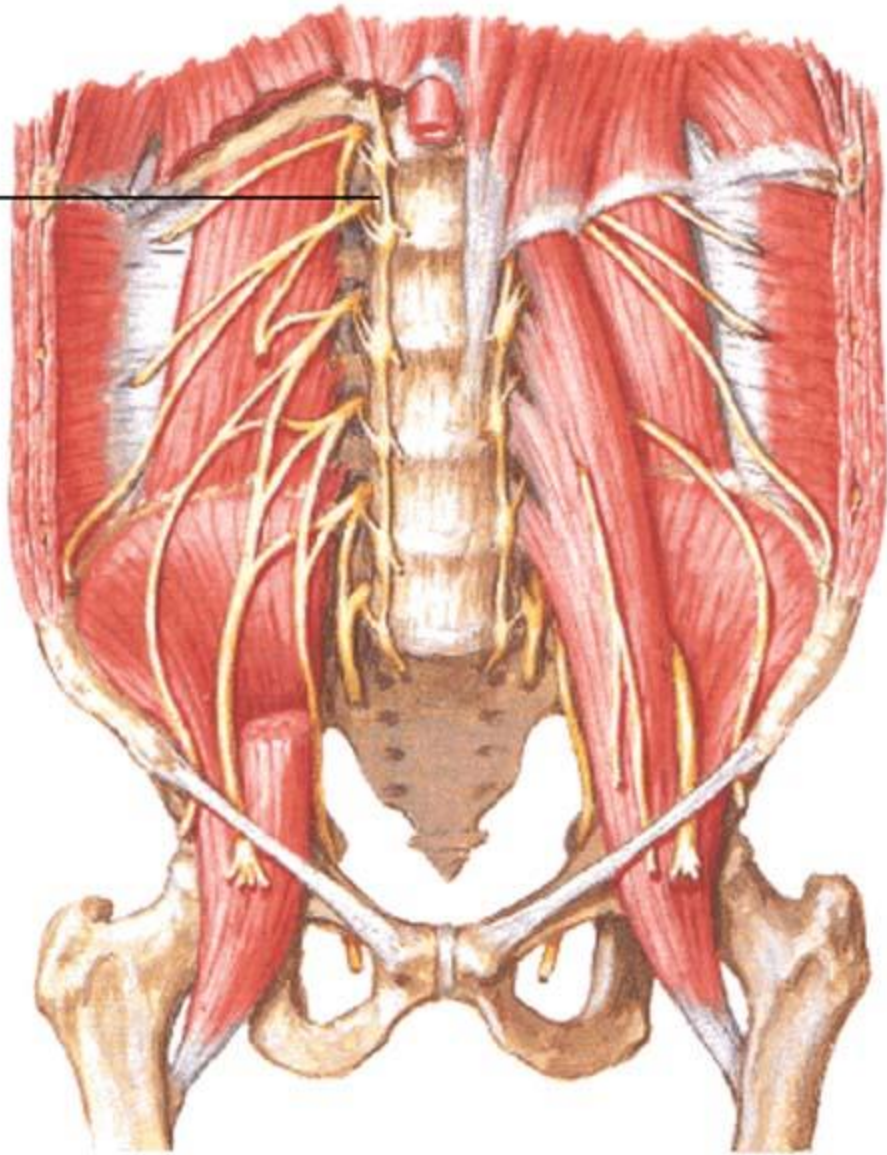


— Sympathetic fibers
— Parasympathetic fibers



Sympathetic fibers	Presynaptic	—
	Postsynaptic	- - -
Parasympathetic fibers	Presynaptic	—
	Postsynaptic	- - -
	Antidromic conduction	—

Sympathetic trunk



Plexus aorticus abdominalis

sympathetic fibers: nn. splanchnici thoracici (major, minor, imus), lumbales 1-3

parasympathetic fibers: rr. coeliaci nn. vagorum

mixed plexus around aorta abdominalis + prevertebral ganglia

- paired **ggl. coeliacum** + **ggl. aorticorenale**

- unpaired **ggl. mesentericum sup. + inf.**

→ along arteries → homonymous plexuses

- stomach → oral majority of rectum (**enteric system**), pancreas, liver

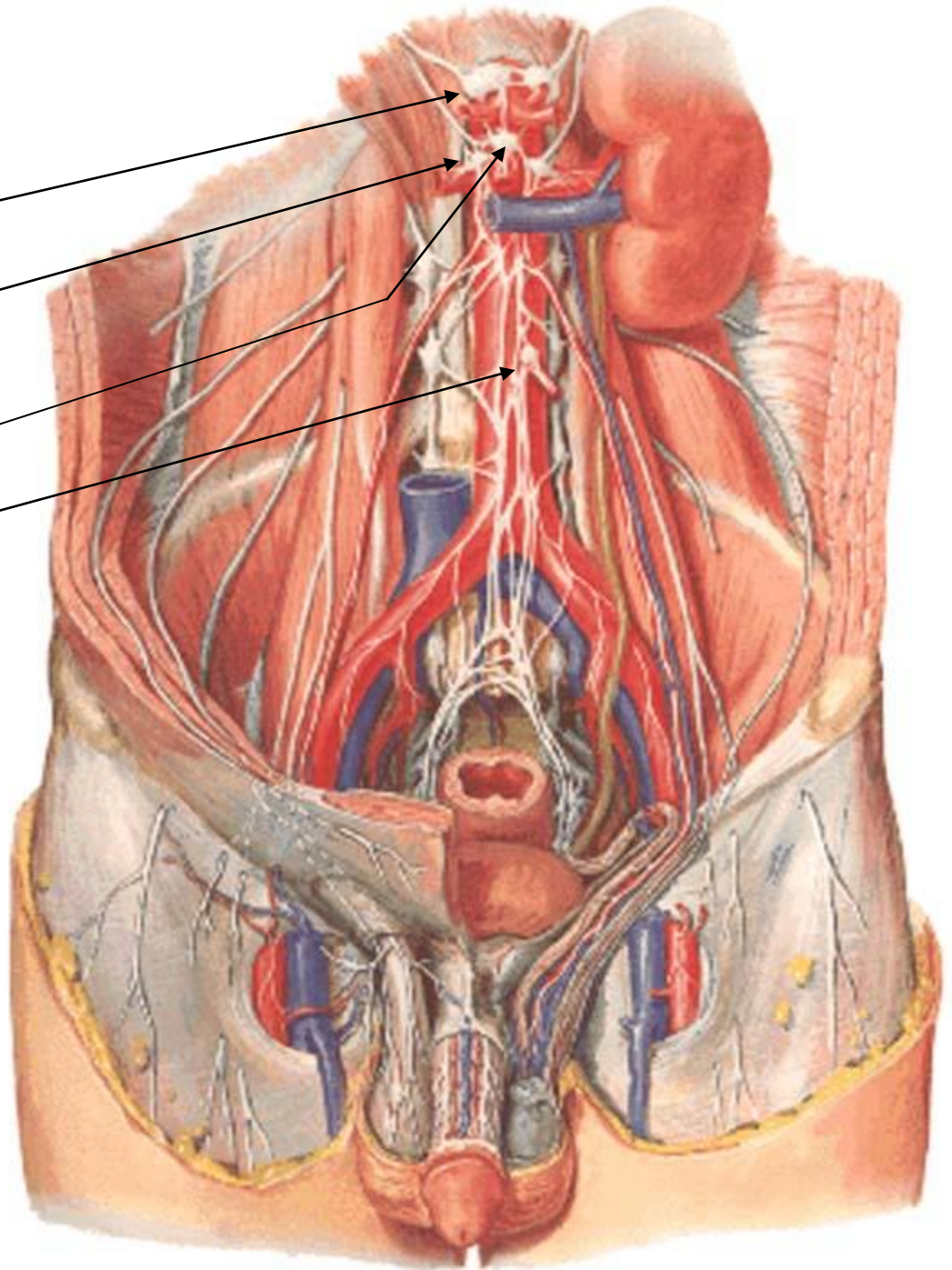
- spleen, suprarenal glands, kidneys, ureters, testes♂ / ovaries♀, uterine tubes (1/2) ♀

ggl. coelicum

ggl. aorticorenale

ggl. mesentericum sup.

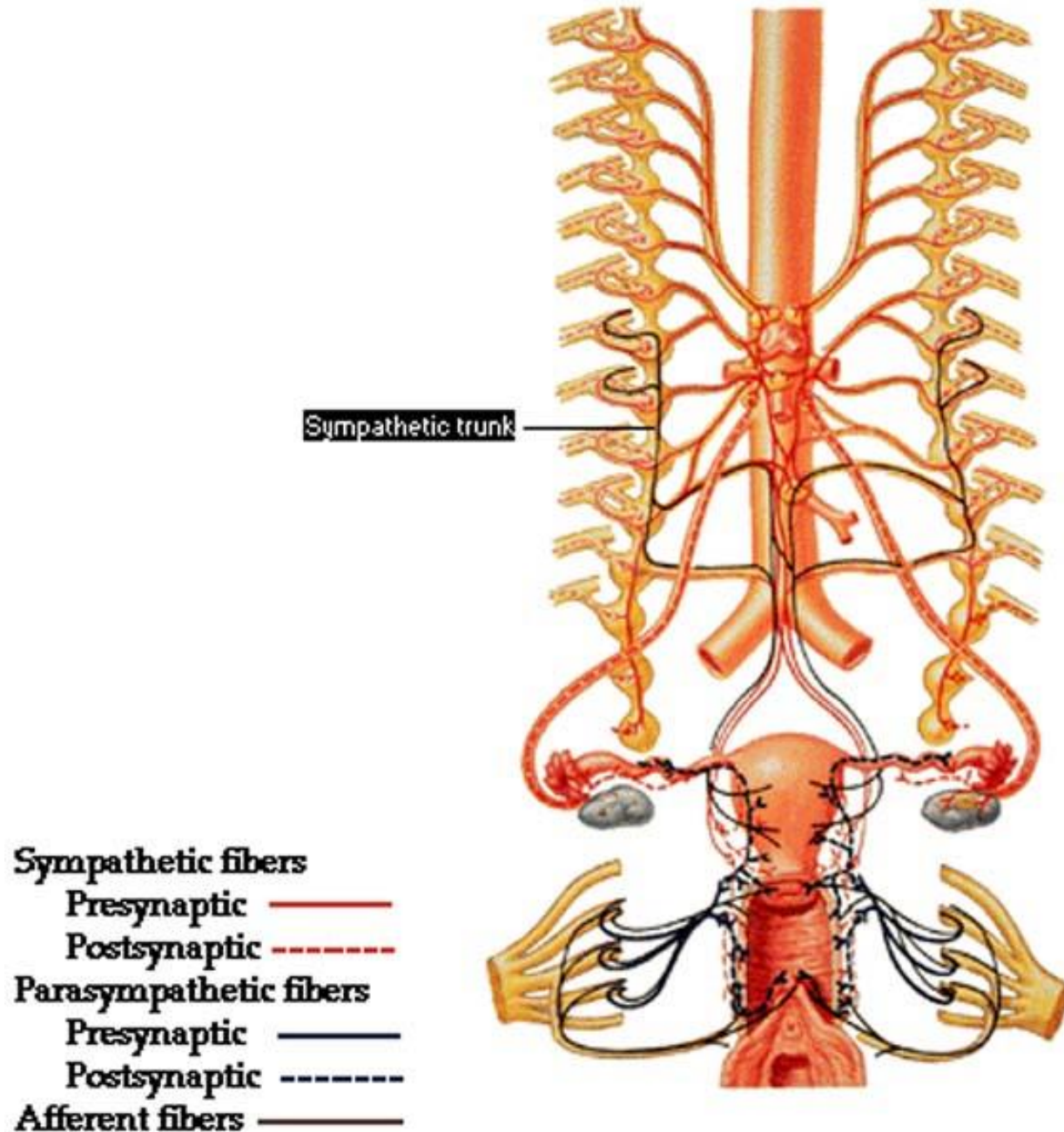
ggl. mesentericum inf.

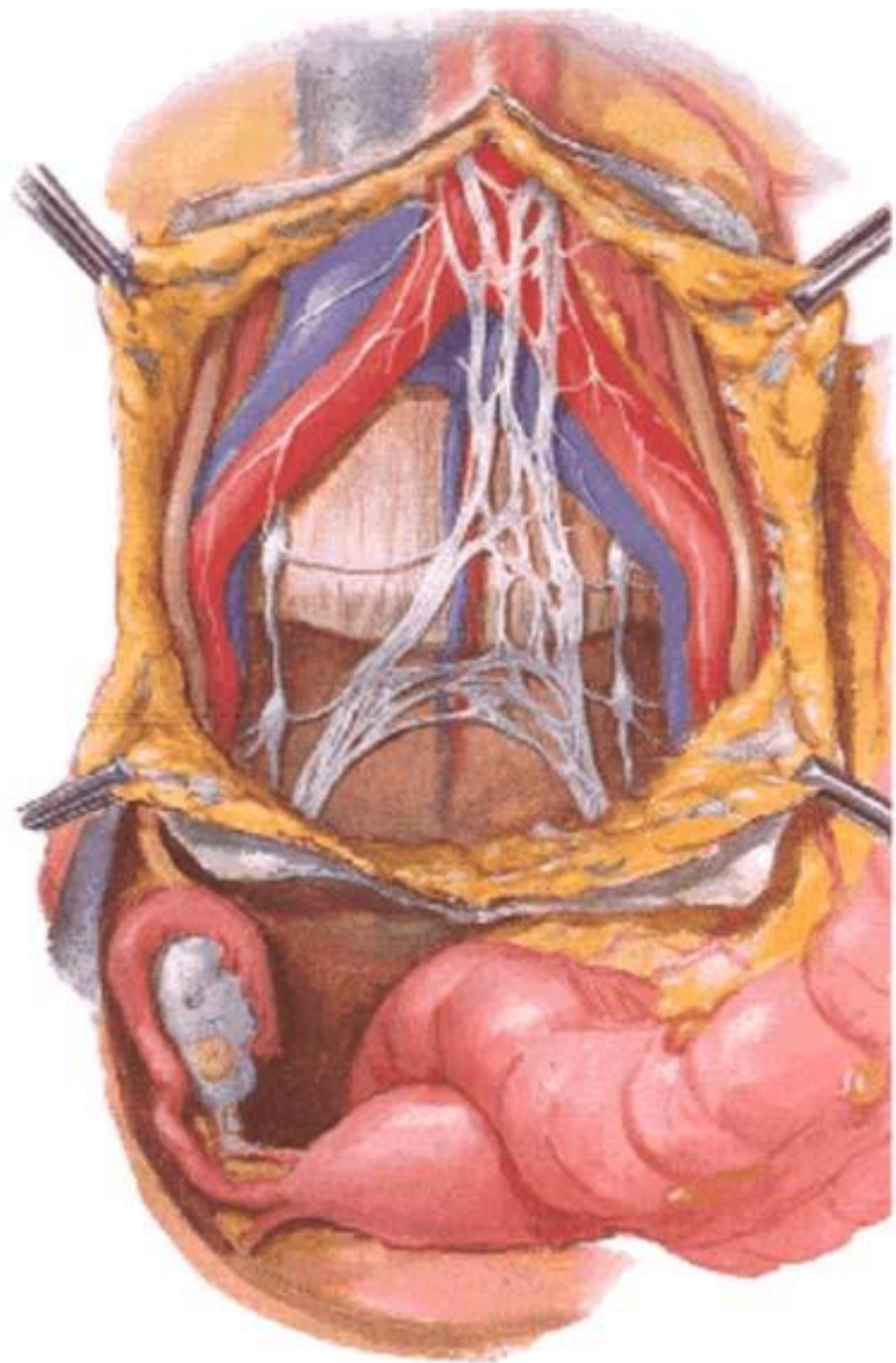
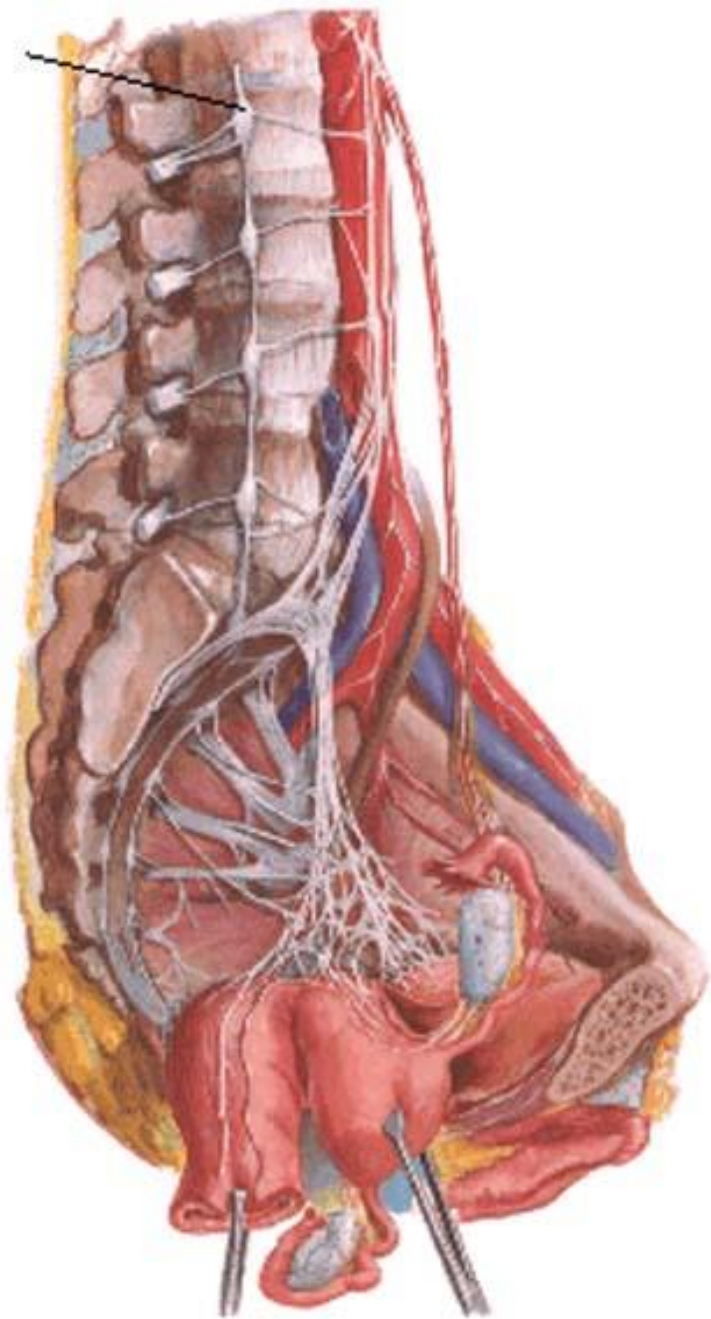


Plexus aorticus abdominalis and its continuation

- **plexus hypogastricus superior** (pure sympathetic (from bifurcatio across promontorium))
 - n. hypogastricus dx. + sin. → **plexus hypogastricus inferior** s. pelvicus (mixed plexus) → pelvic organs except ovaries♀, uterine tubes (1/2)♀, fundus uteri♀ and urinary bladder
- **plexus iliacus** dx. + sin. (pure sympathetic) → lower limb

Innervation of Female Reproductive Organs





Plexus hypogastricus inferior s. pelvicus

mixed plexus

AF-PS: nn. splanchnici pelvici S2-4 (*obsoletely nn. erigentes*)

AF-S: truncus sympathicus → plexus aorticus abdominalis → plexus hypogastricus superior → nn. hypogastrici

AF-S: truncus sympathicus → ganglia sacralia → nn. splanchnici sacrales

- pelvic organs except ovaries ♀, uterine tubes (1/2) ♀, fundus of uterus ♀ and fundus of urinary bladder

EF (mixed): → plexus rectalis (aboral minority of rectum)

→ parasympathetic fibers ascend as orally as *Cannon-Böhm's point* = hindgut

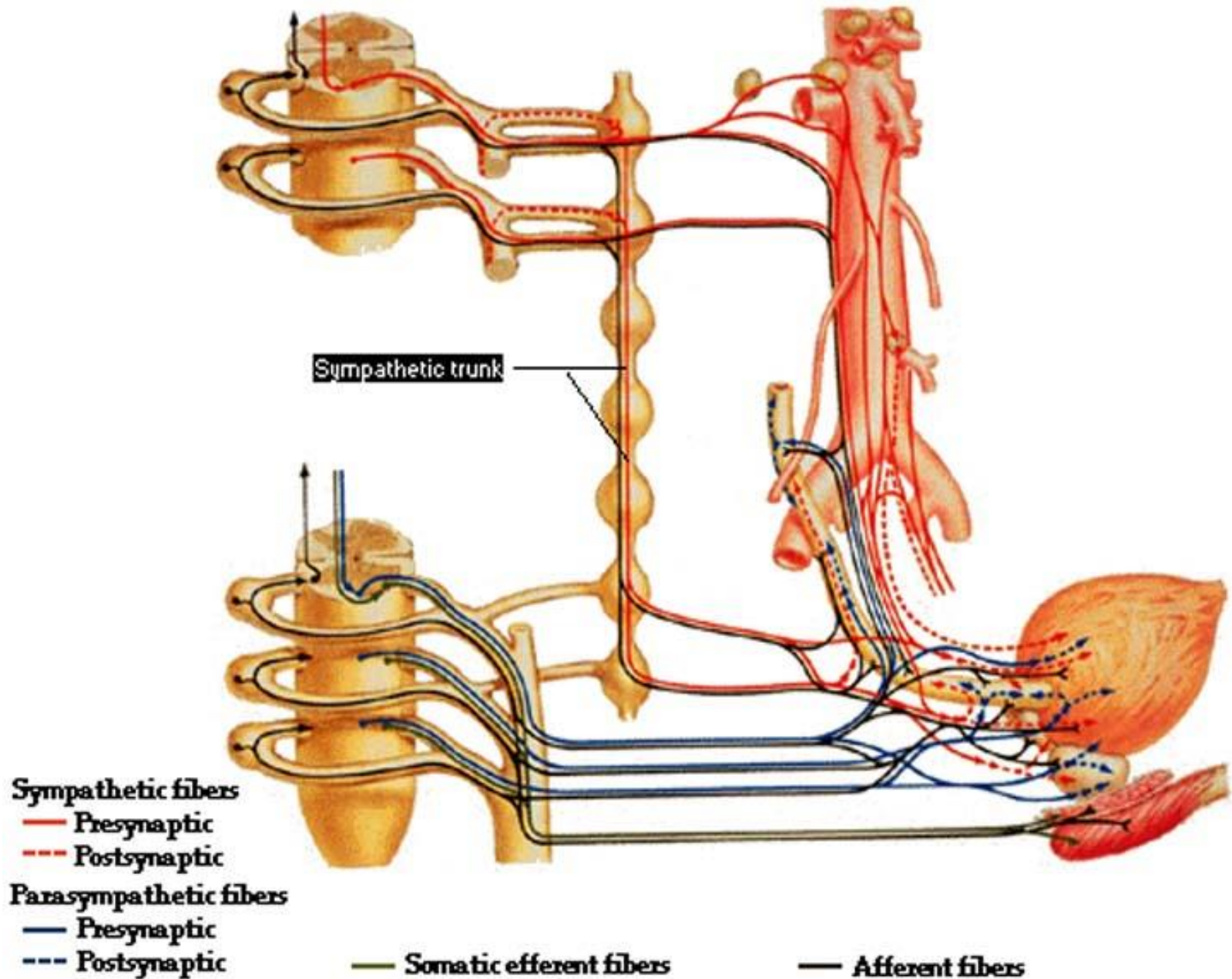
→ plexus prostaticus + deferentialis ♂ / uterovaginalis ♀

→ plexus vesicalis

- m. sphincter urethrae (nucleus n. pudendi *Onufi* in spinal cord segments S2-4)

→ n. cavernosus penis ♂ / clitoridis ♀ (erectile bodies)

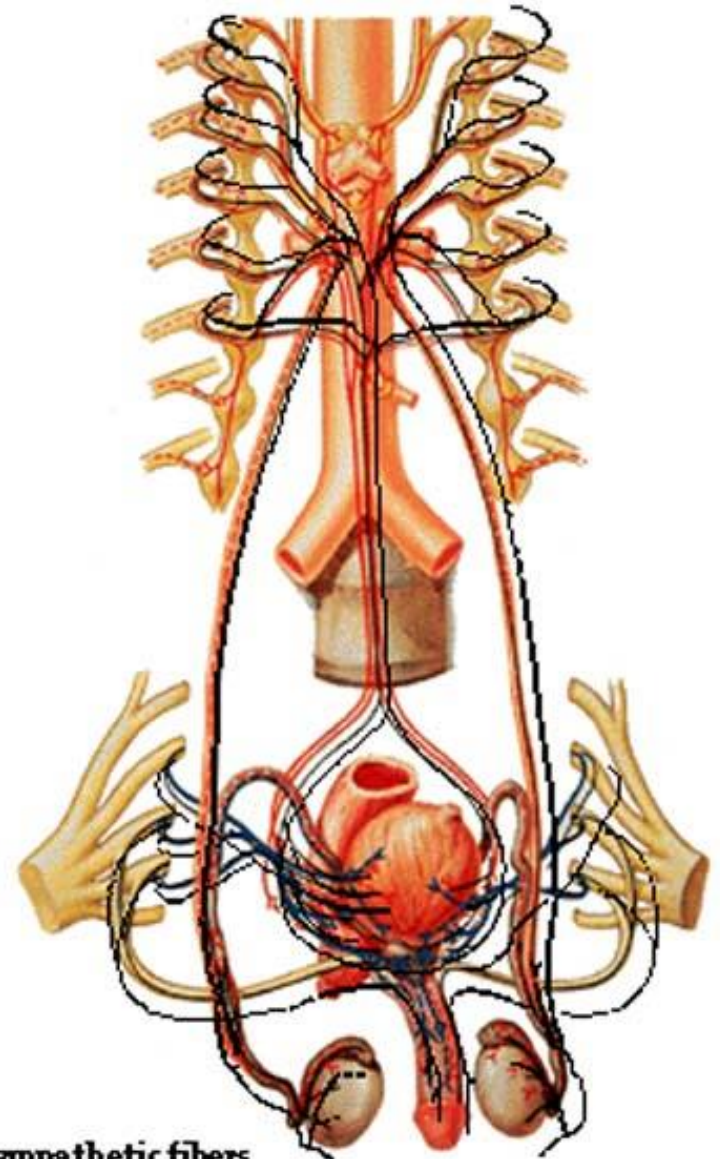
Innervation of Urinary Bladder



Innervation of Male Reproductive Organs



Plexus hypogastricus inferior s. pelvicus



Sympathetic fibers

— Presynaptic

- - - Postsynaptic

Parasympathetic fibers

— Presynaptic

- - - Postsynaptic

— Afferent fibers