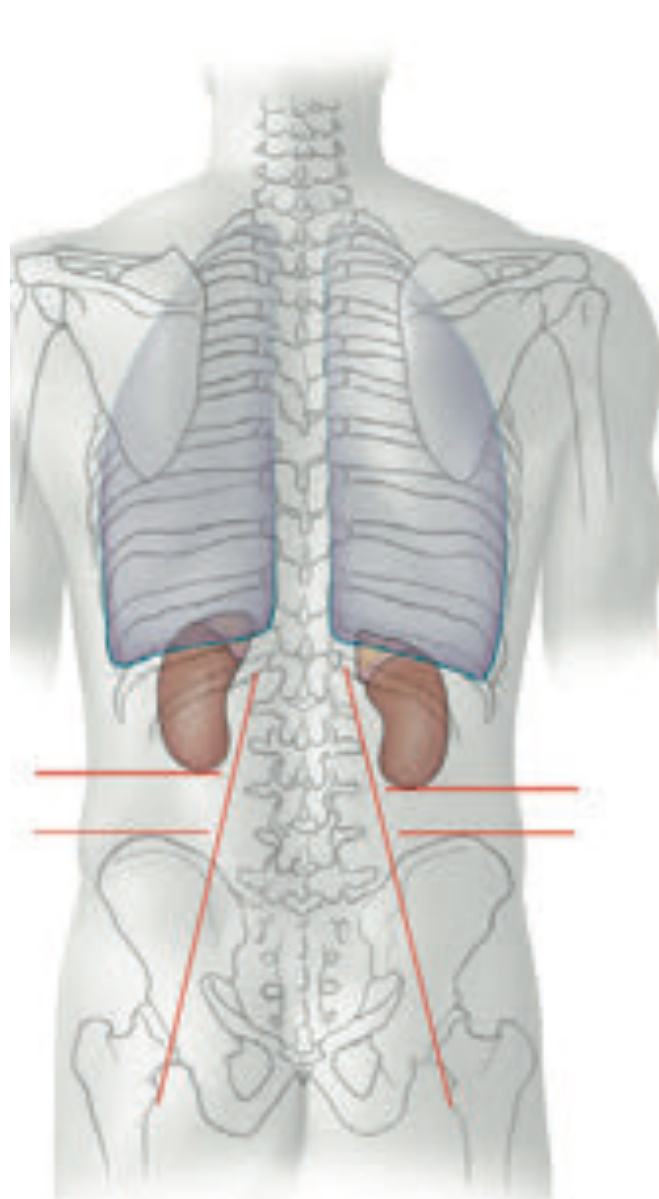
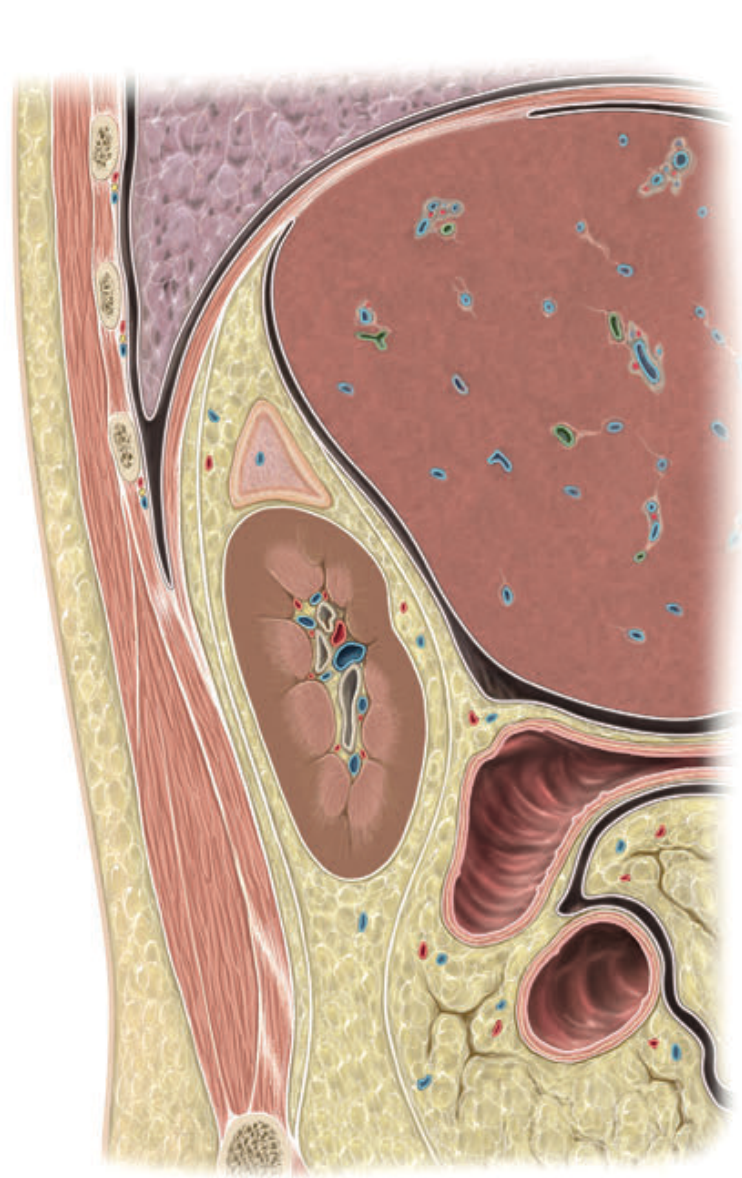


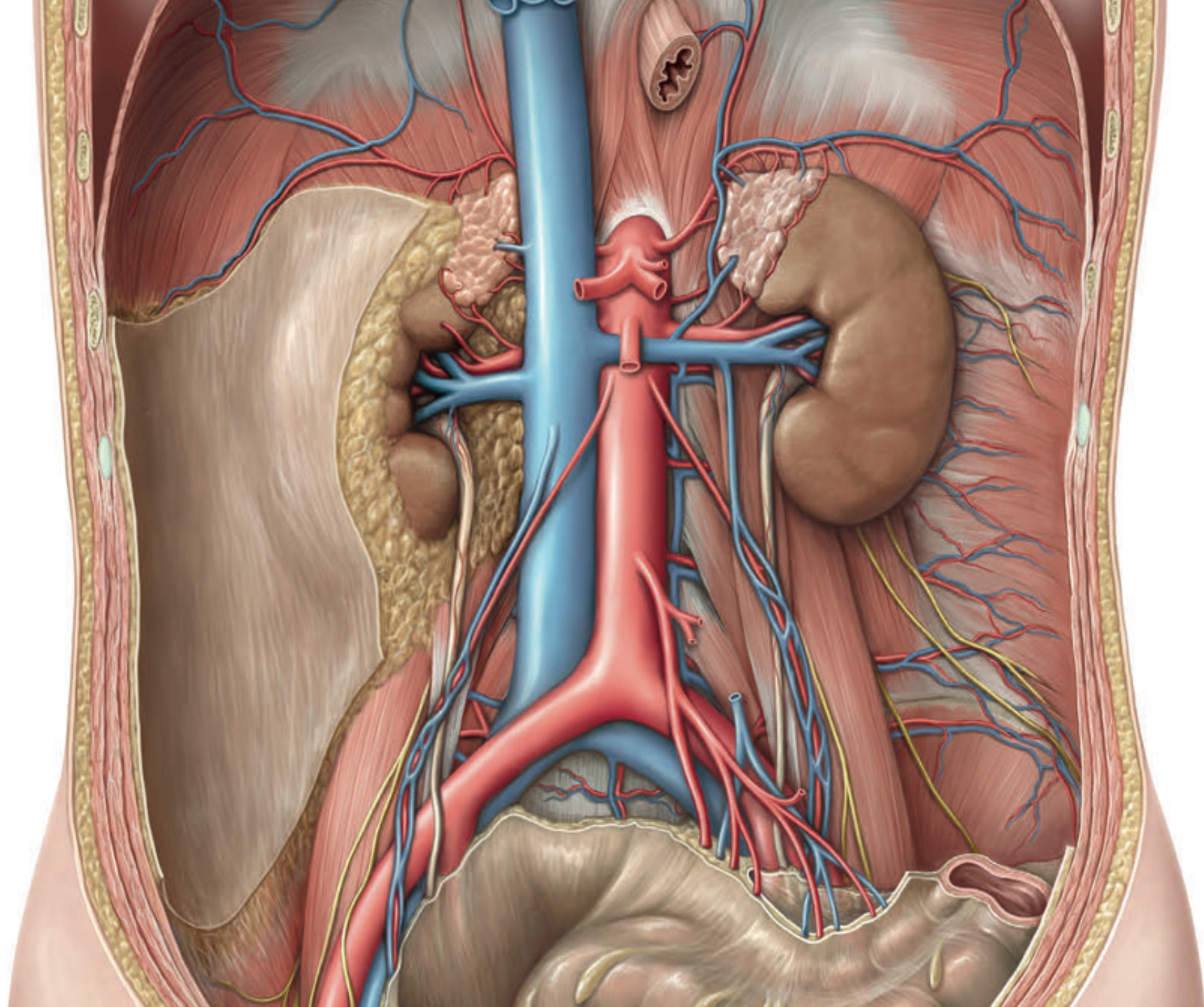
ABDOMEN 4

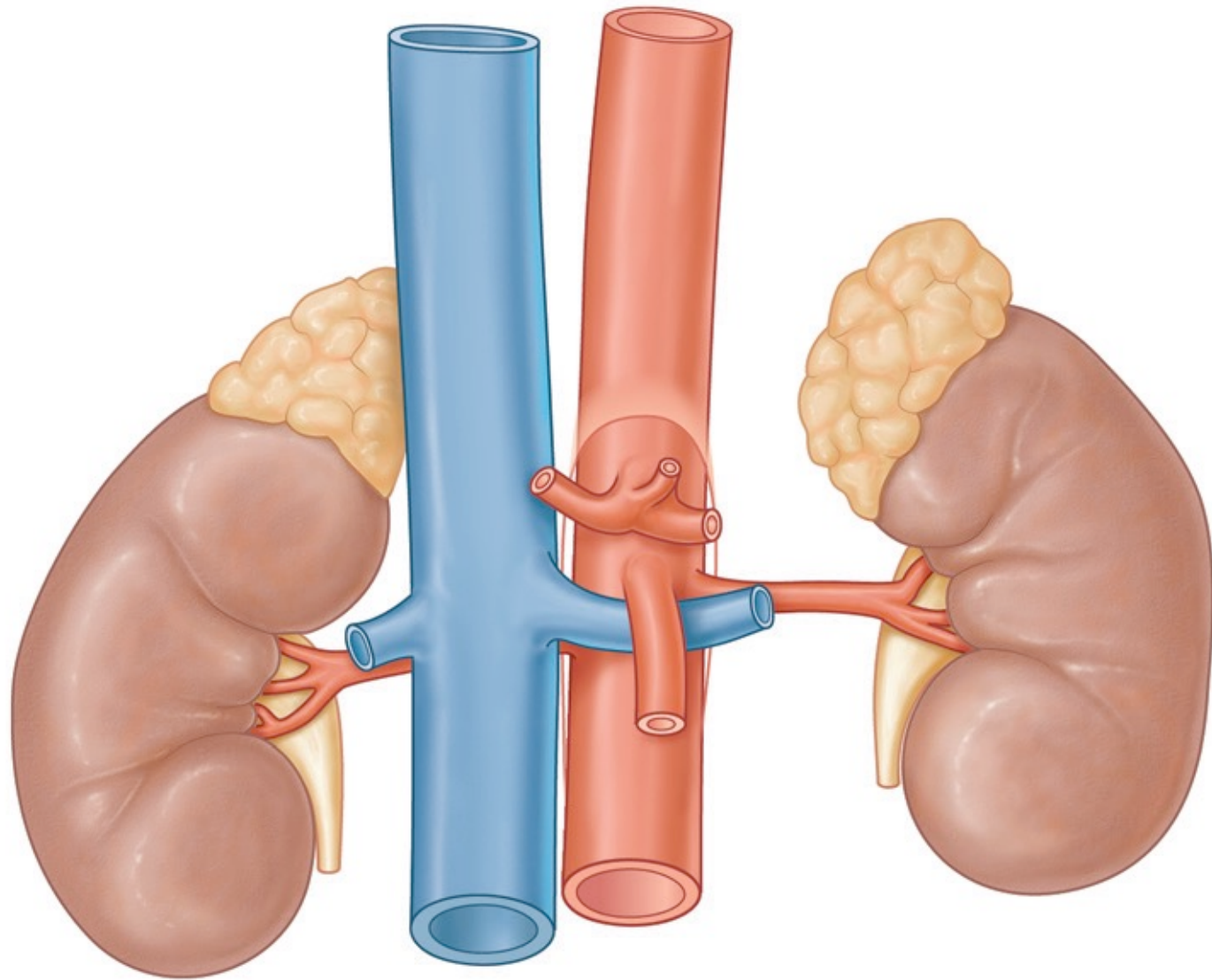
Prof. MUDr. Jiří Ferda, Ph.D.



- ♦ In retroperitoneum
- ♦ Th12 - L3
- ♦ Hilum L1
- ♦ Right kidney lower position - liver
- ♦ upper 1/3 -1/2 touches diaphragm
 - ♦ Pleural dorsal recessus
 - ♦ Infection spread

KIDNEY - REN

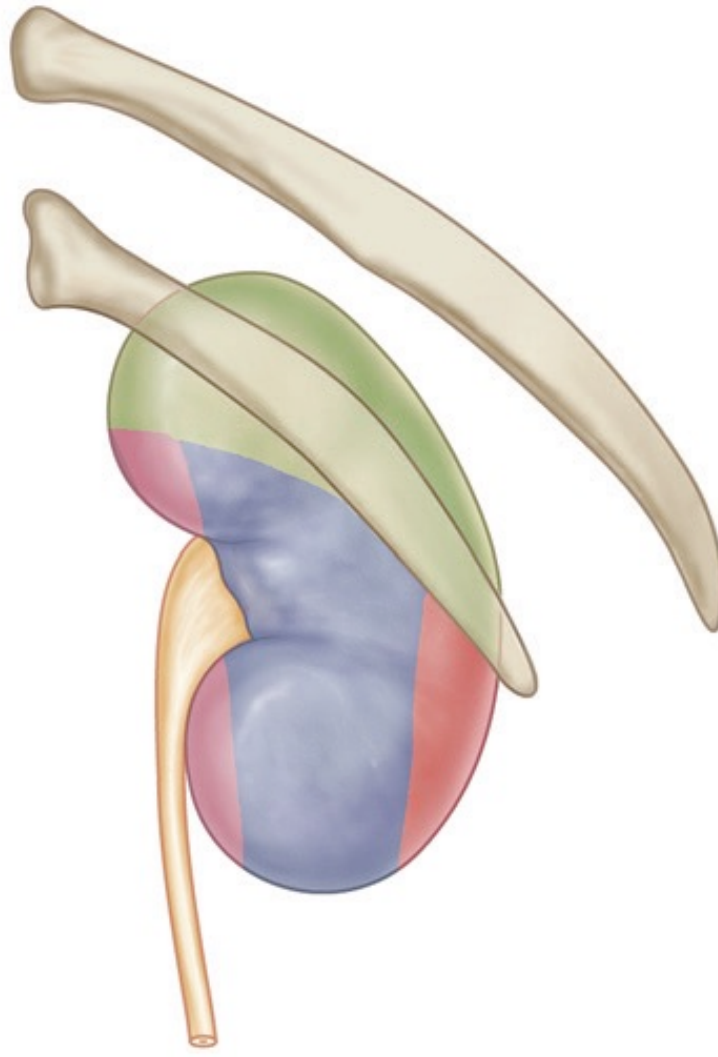
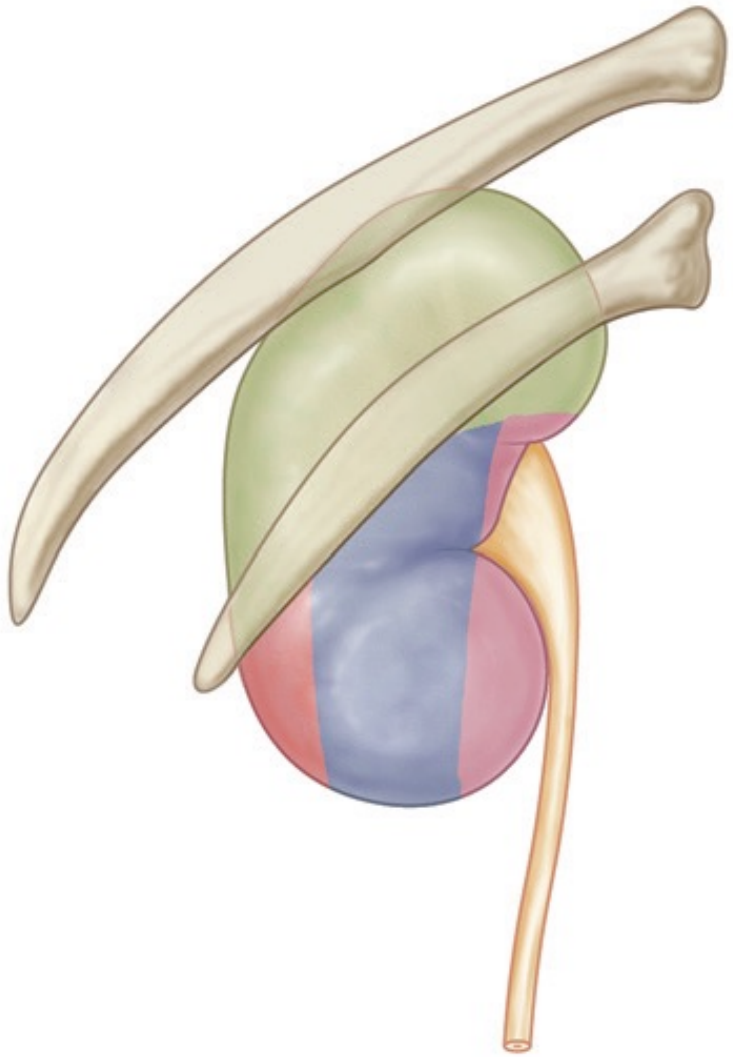




• 12 x 6 x 3 cm

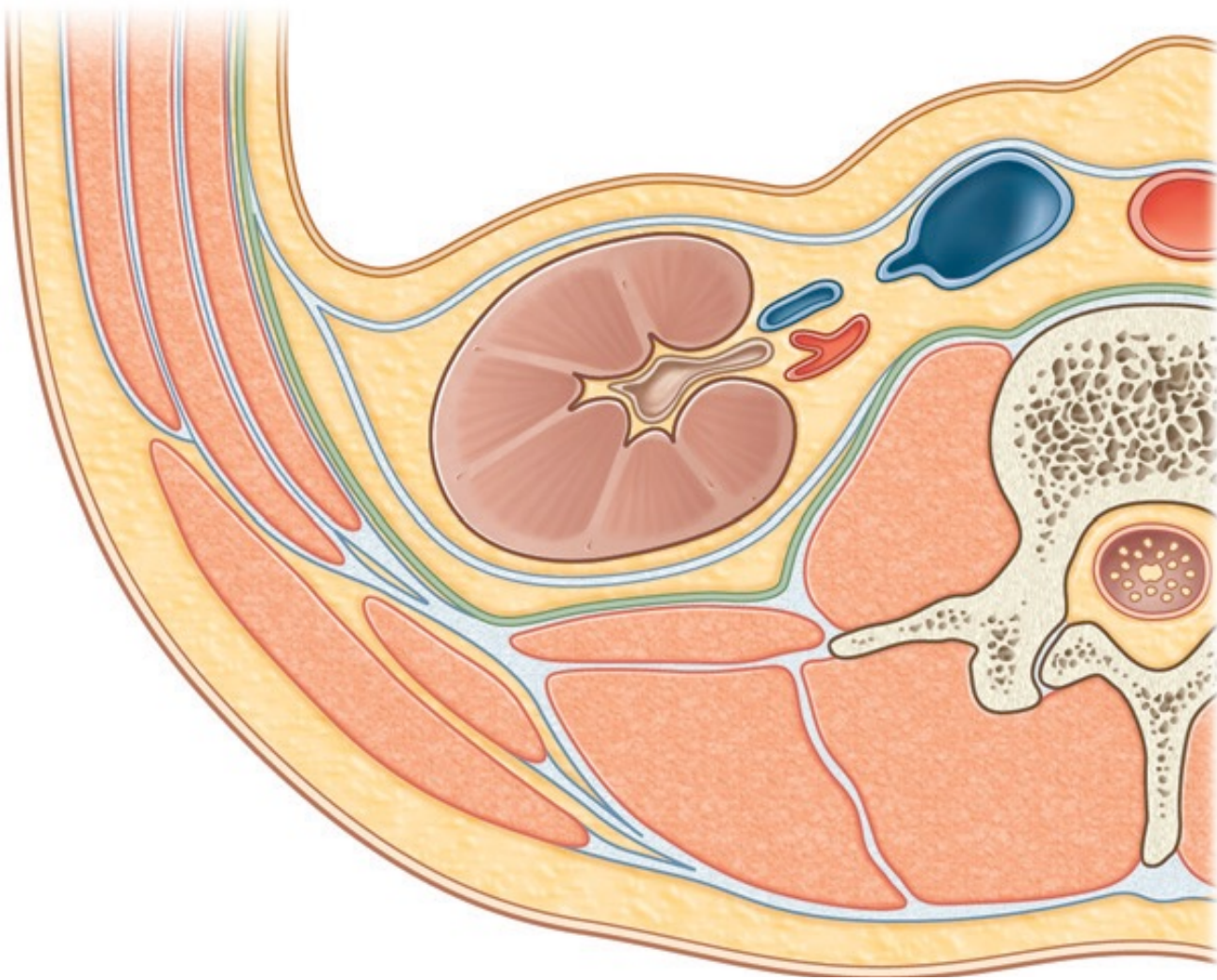
• 150 – 180 g

SIZE AND WEIGHT



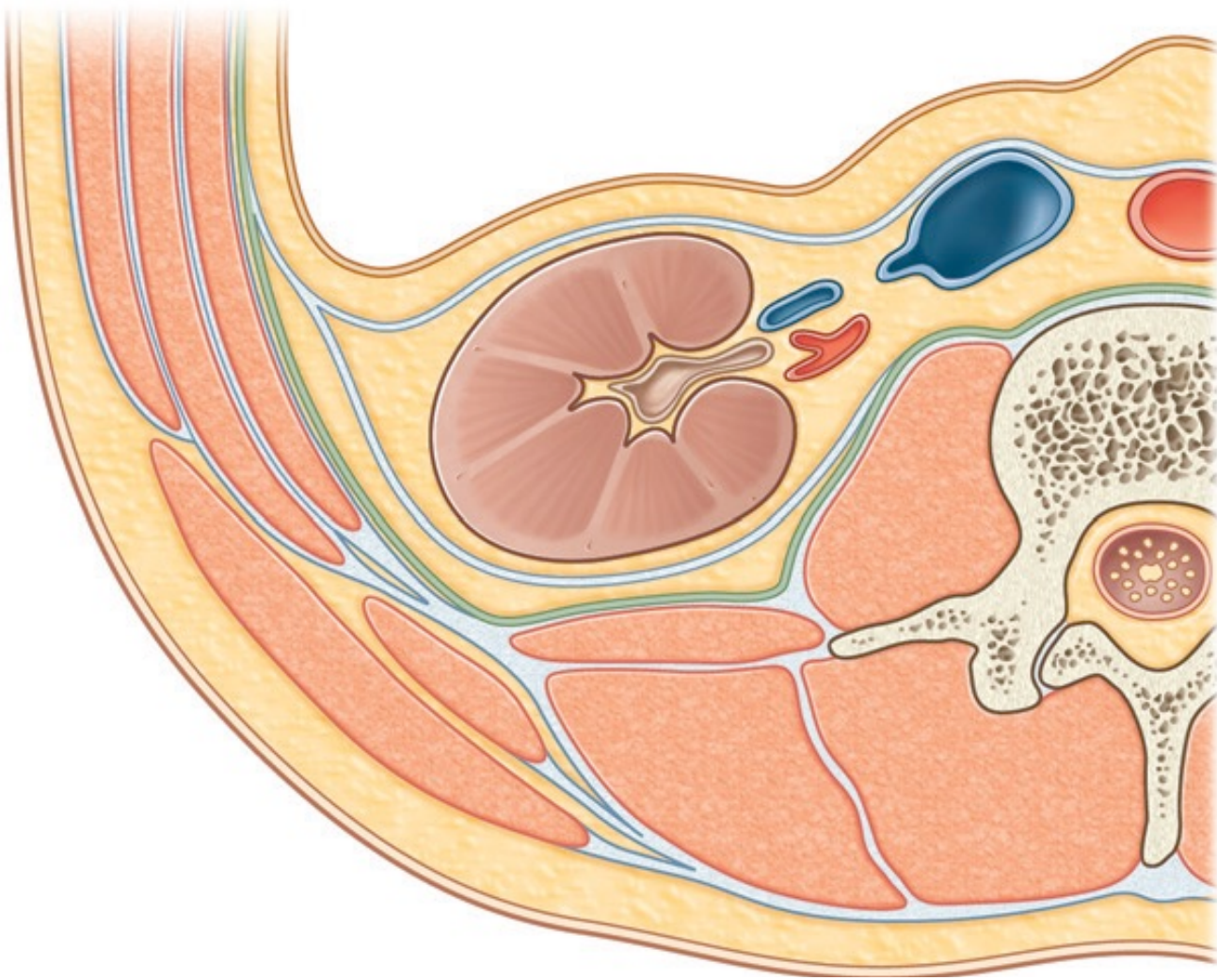
- ♦ Diaphragma
- ♦ M. psoas maior
- ♦ M. quadratus lumborum
- ♦ M. transversus abdominis

KIDENX PROJECTIONS



- ♦ **M. transversus abdominis**
- ♦ **M. quadratus lumborum**
- ♦ **M. psoas major**
- ♦ **Corpus adiposum pararenalis**
- ♦ **Fascia transversalis**
- ♦ **Fascia renalis**
 - ♦ **Pars anterior - Gerota**
 - ♦ **Pars posterior - Zuckerkandel**
- ♦ **Capsula adiposa**
- ♦ **Capsula fibrosa**

KIDNEY POSITION

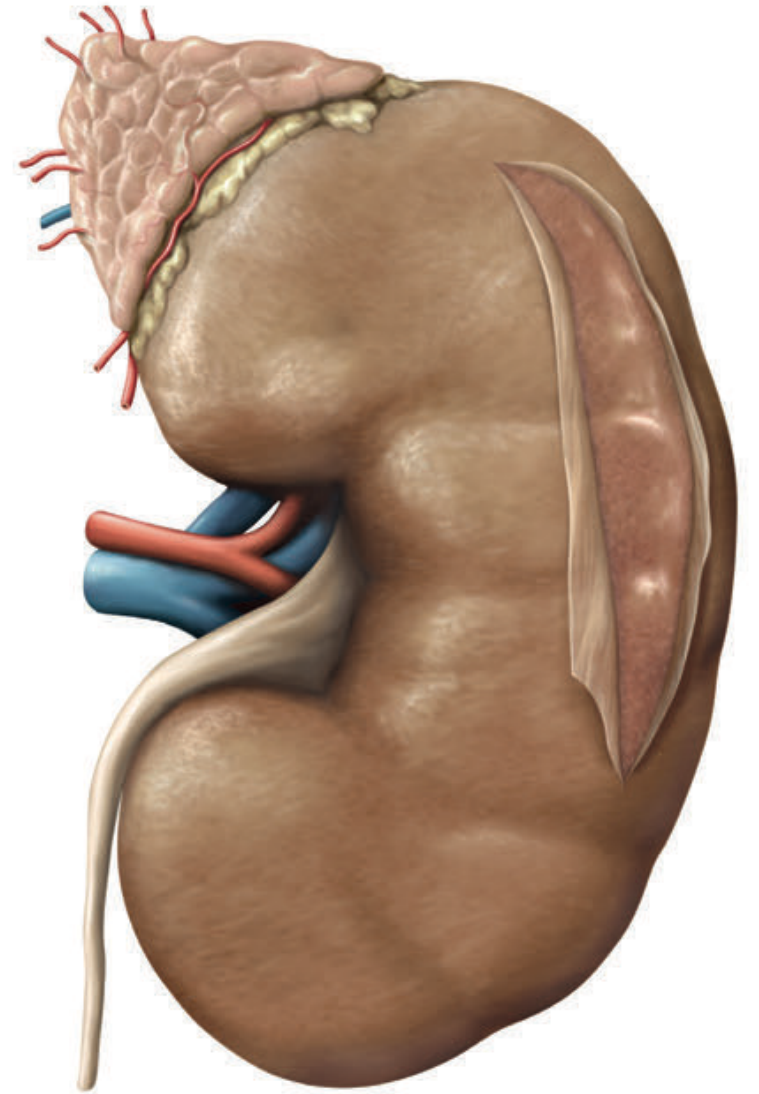
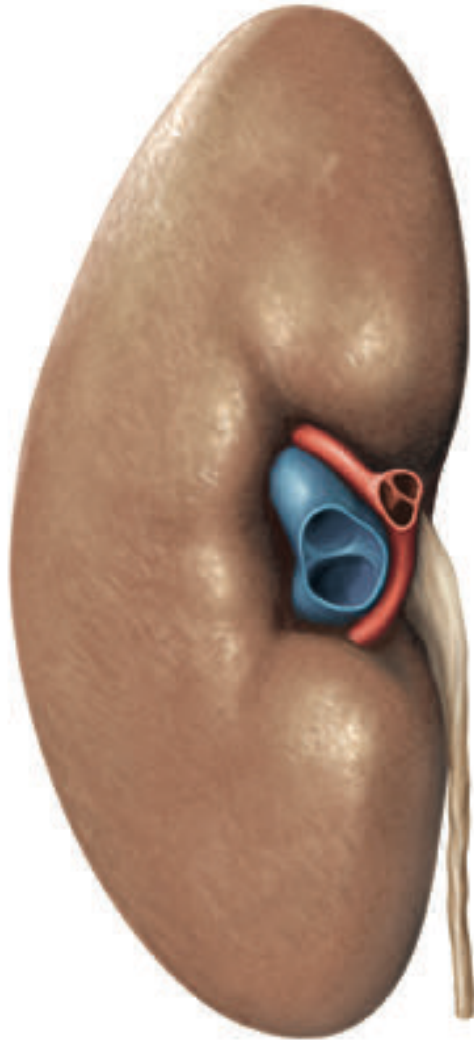
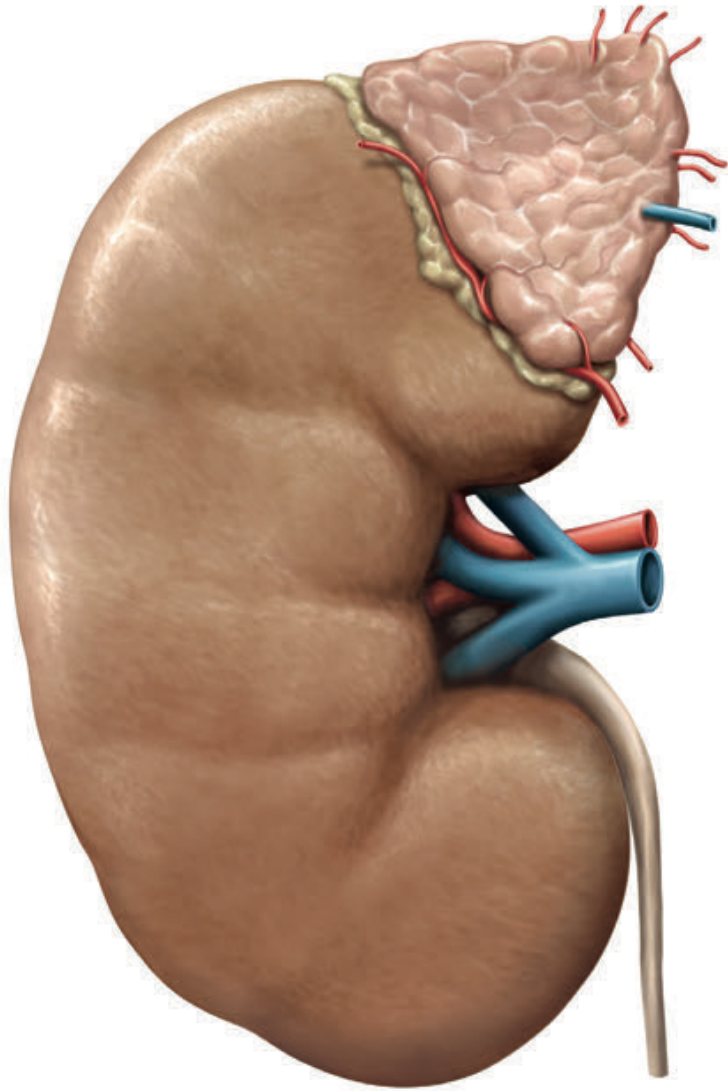


- **Upside-down sac**
- **Cranial diaphragma**
- **Lateral fusion**
- **Medial great vessels**
- **Caudally opened**
- **Ren migrans**

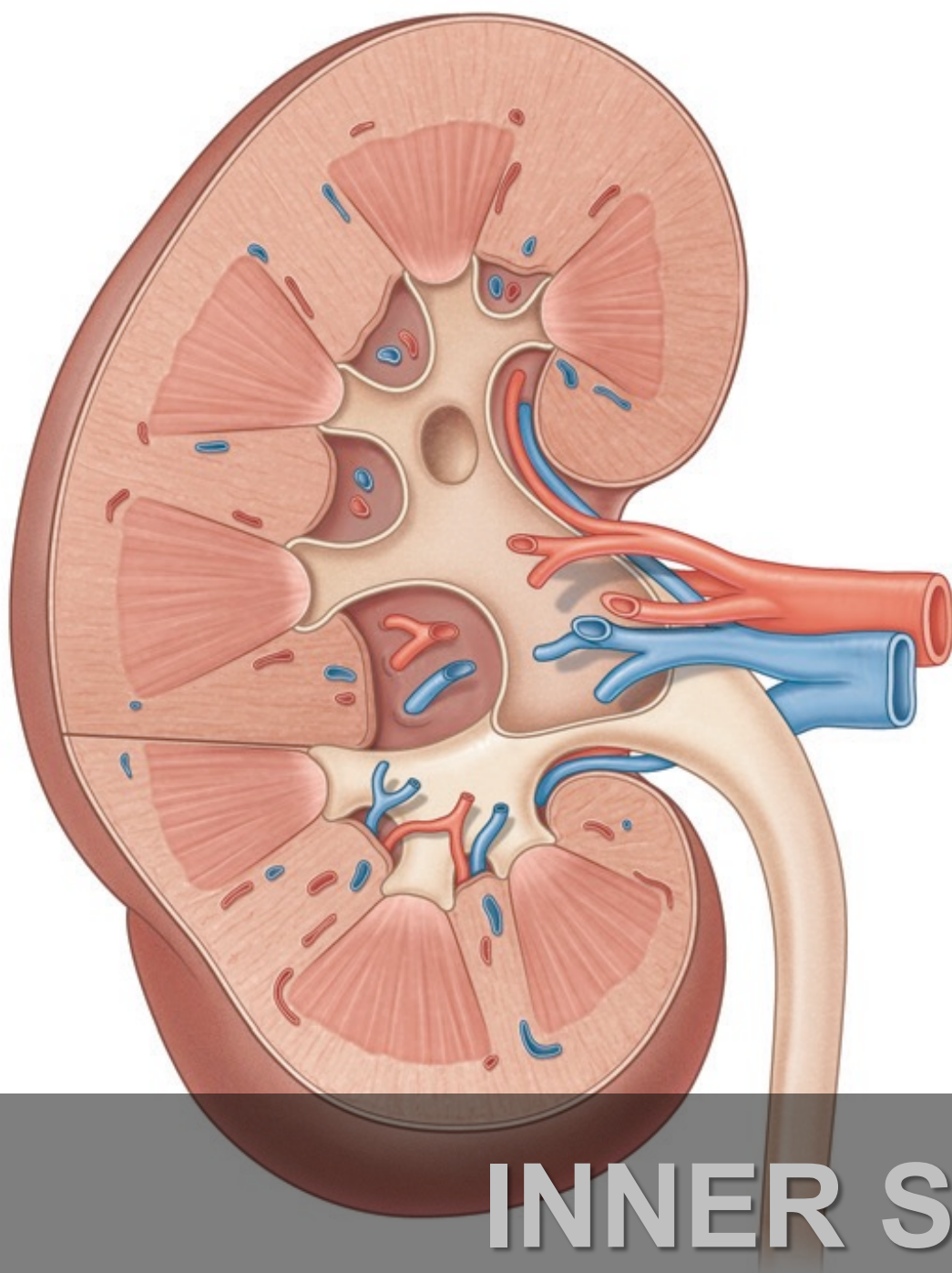
FASCIA RENALIS



KIDNEY POSITION

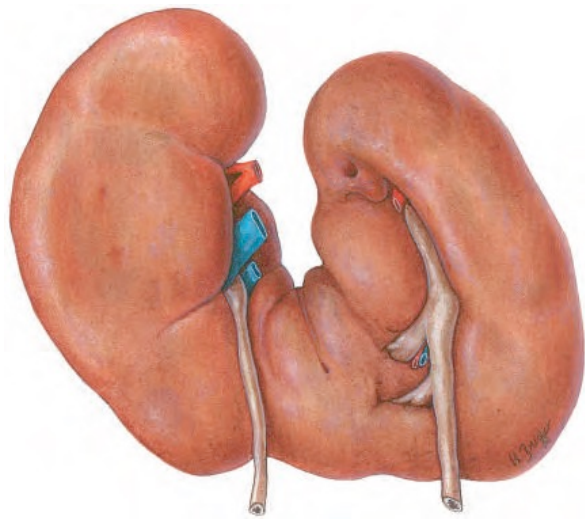


SUPERFICIAL STRUCTURES



- ♦ Capsula
- ♦ Cortex
- ♦ Columna
- ♦ Medulla
- ♦ Pyramis
- ♦ Papilla
- ♦ Calix minor
- ♦ Calix major
- ♦ Pelvis
- ♦ Junctio ureteropelvica

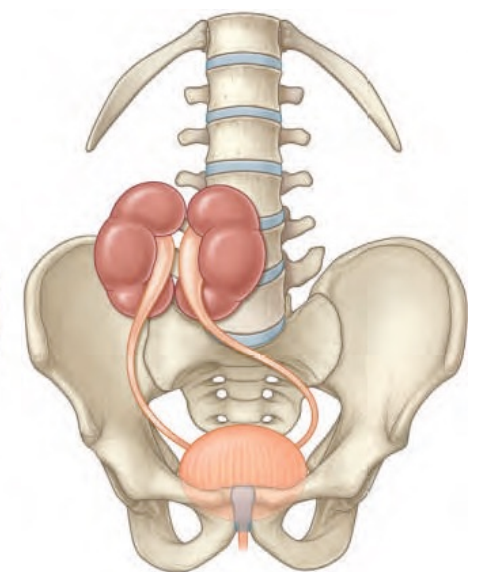
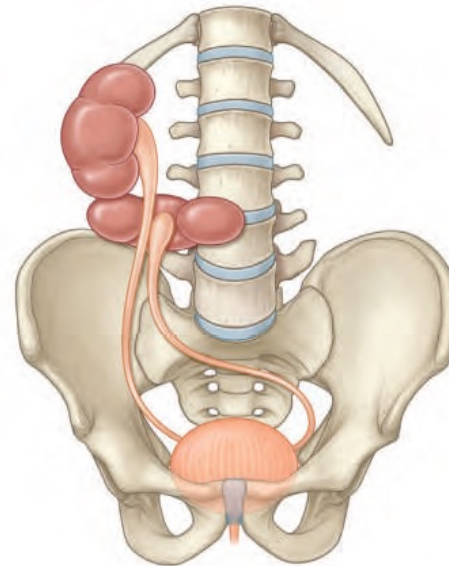
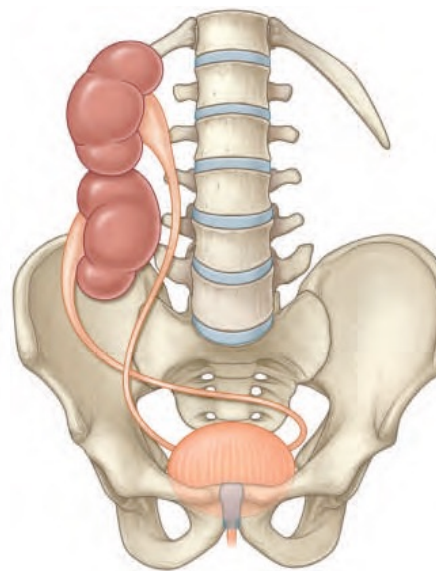
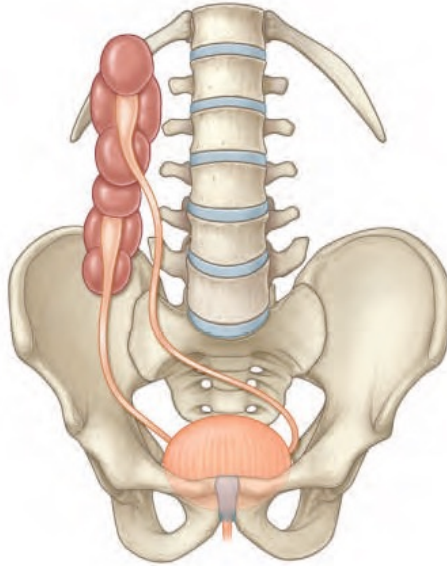
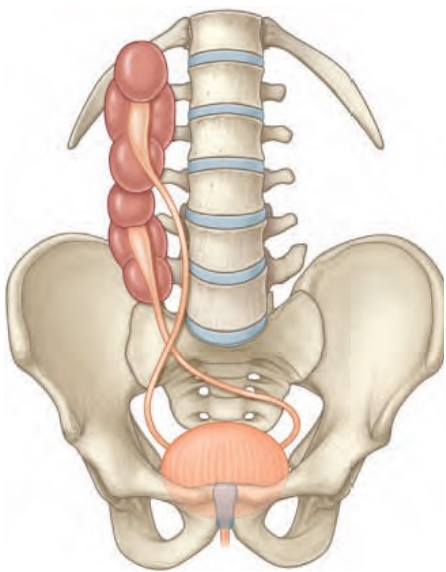
INNER STRUCTURES



🔴 position

🔴 shape

🔴 number

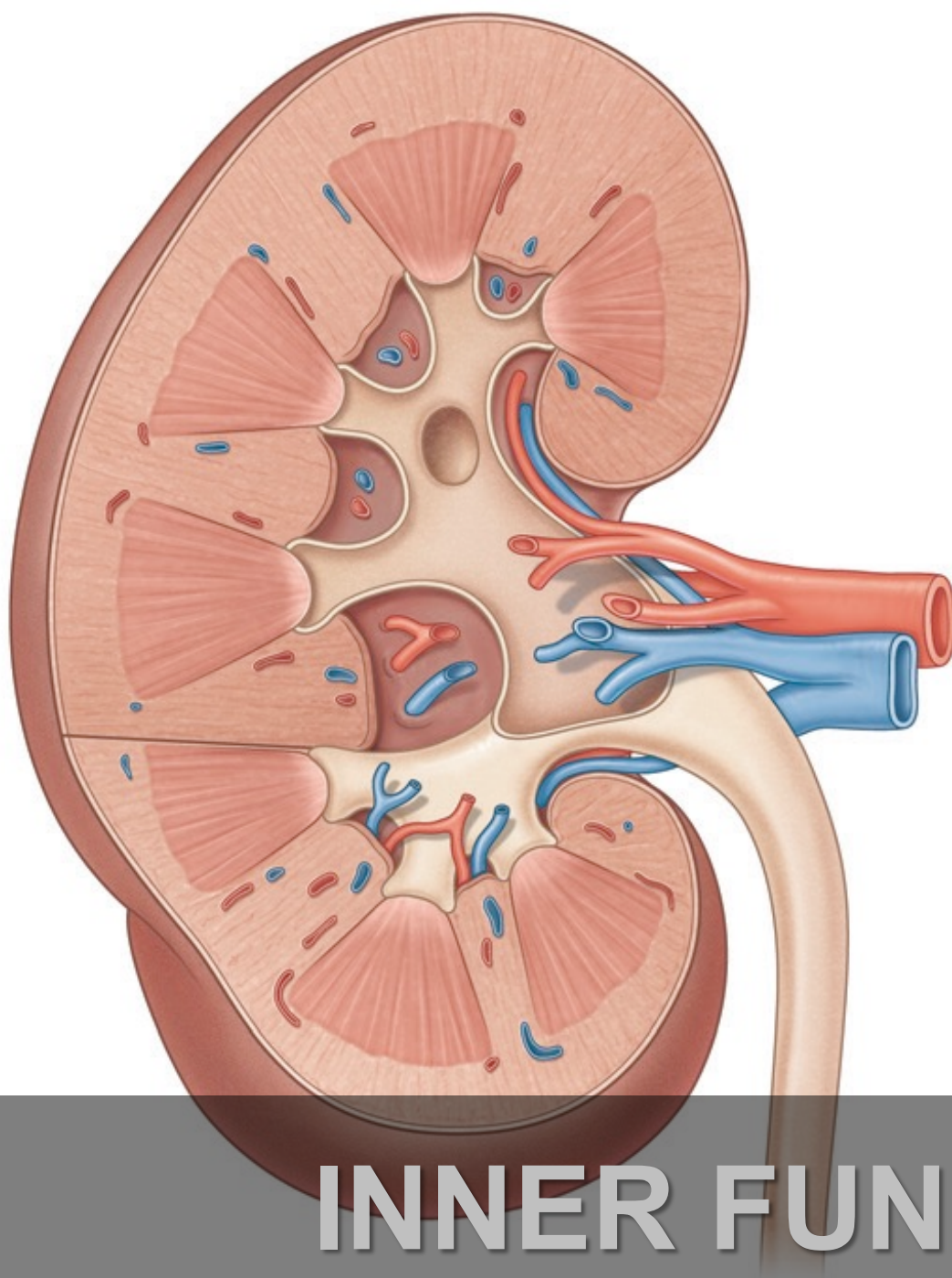


ANOMALOUS KIDNEYS

- Ren duplex
- Ren sigmoideus
- Ren discoides
- Ren arcuatus = horseshoe kidney
- „L-shaped“ kidney

ANOMALOUS SHAPE



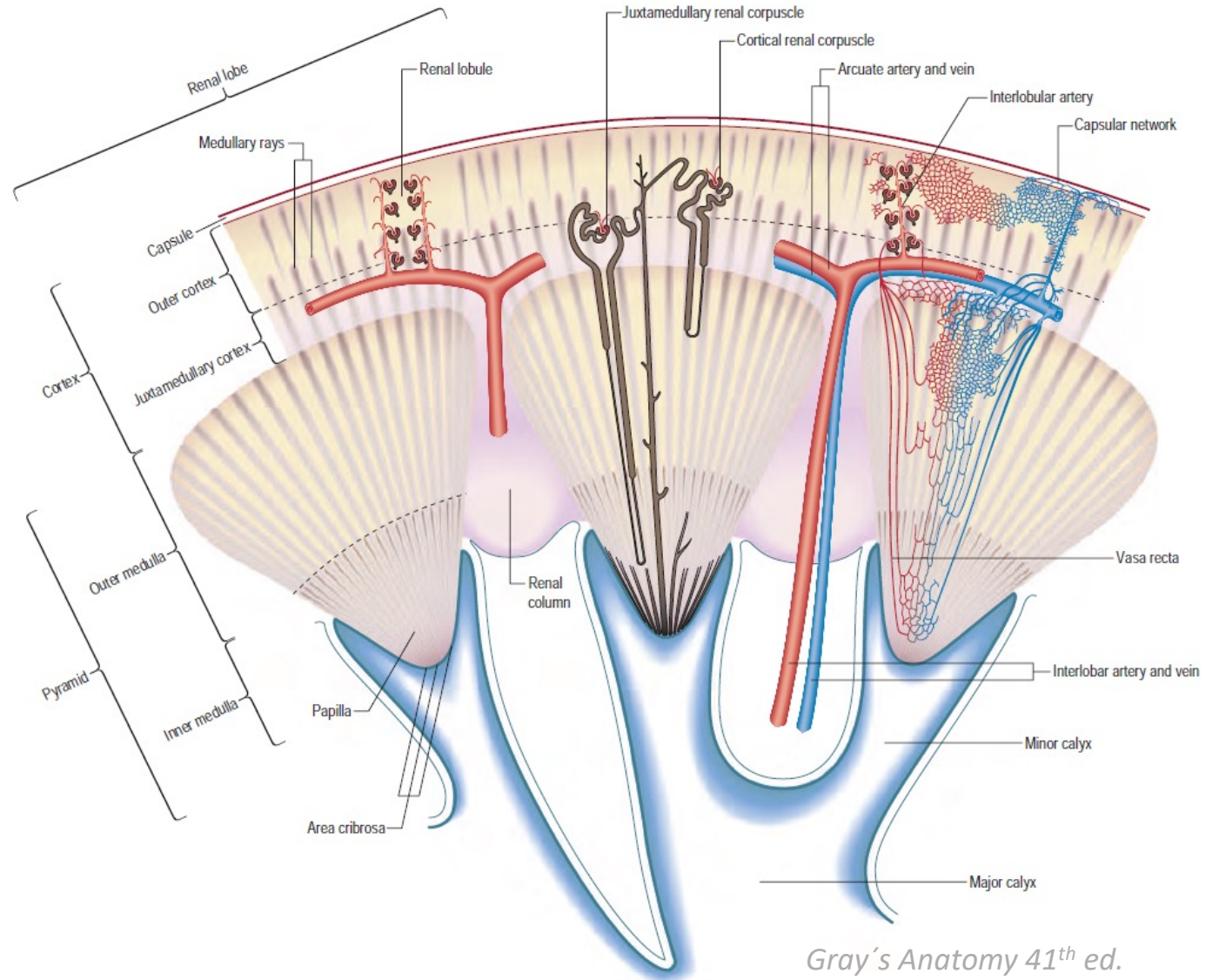


- ♦ **Complex tubulatory gland**
- ♦ **Exkrete - urine**
- ♦ **Lobus renis**
- ♦ **Lobulus renis**
- ♦ **Nephron**
- ♦ *Corpusculum renis Malpighi*
- ♦ *Glomerulus + capsula glomeruli*
- ♦ *Tubulus proximalis*
- ♦ *Henleova klička*
- ♦ *Tubulus distalis*
- ♦ *Tubulus colligens*
- ♦ *Ductus papillaris*

INNER FUNCTIONAL UNITS

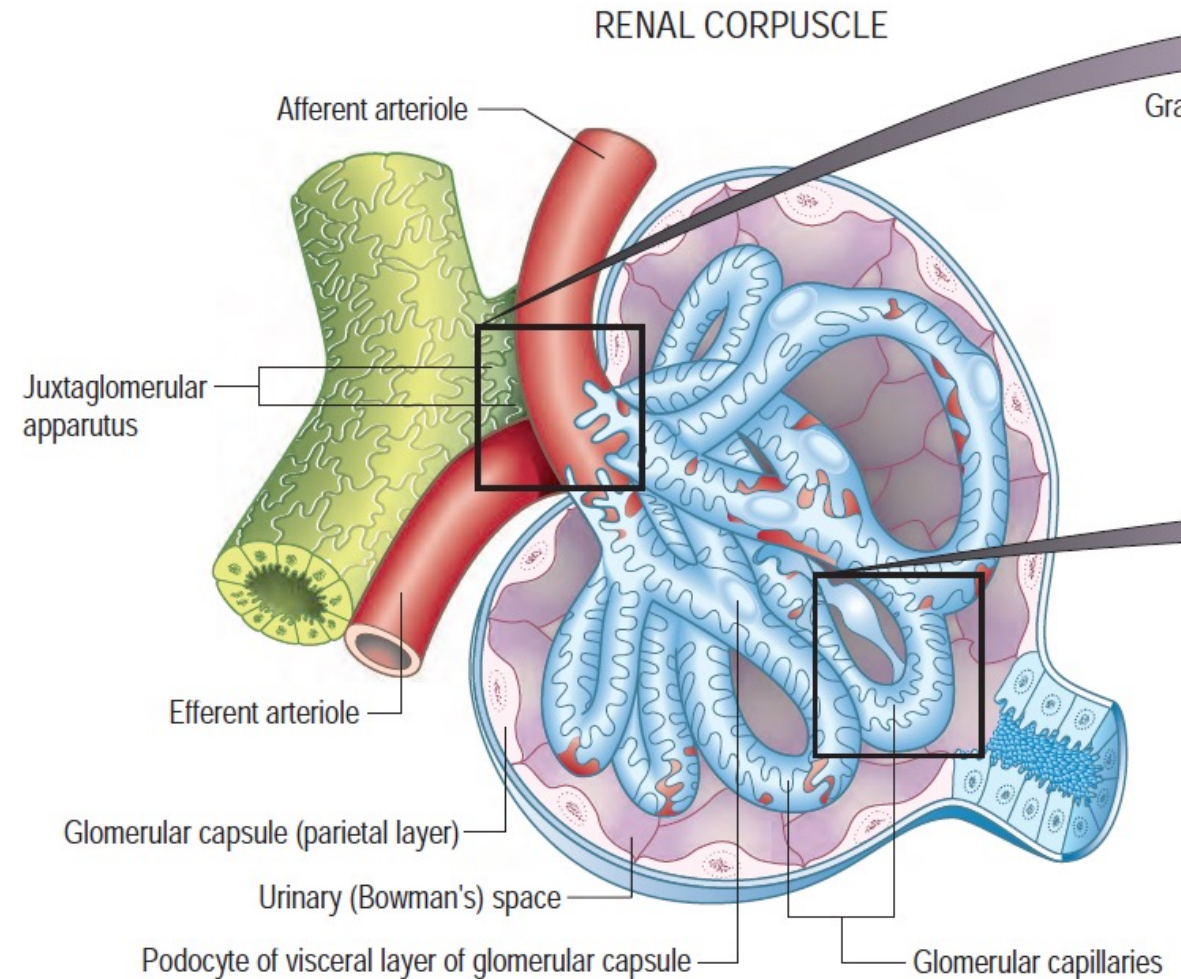
PARENCHYMA RENIS

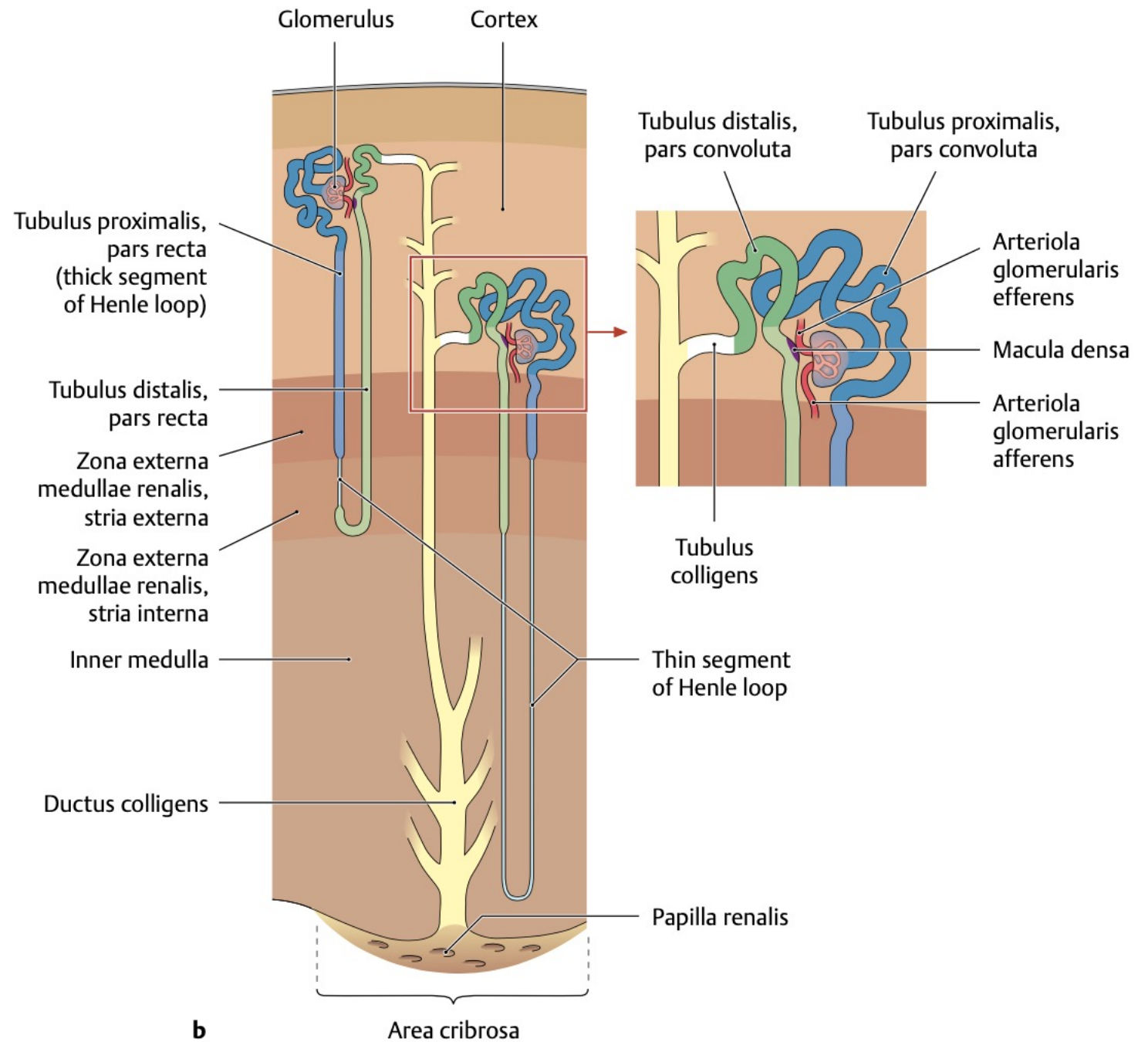
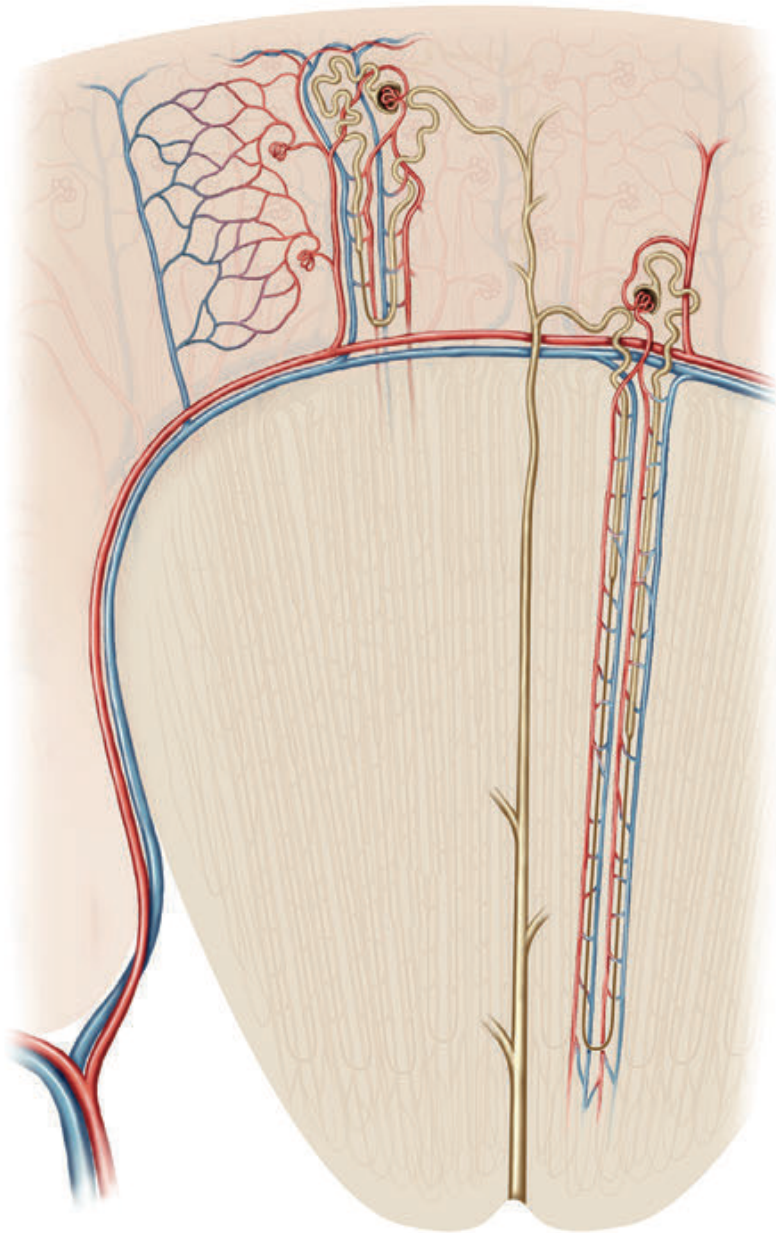
- 🔴 CORTEX
- 🔴 MEDULLA
- 🔴 Glomerulus
- 🔴 Bowman'ssac
- 🔴 Tubulus proximalis - cortex
- 🔴 Henleova klička - medulla
- 🔴 Distální tubulus - cortex
- 🔴 Tubulus colligens - medulla
- 🔴 Ductus papillaris - ad papillam
- 🔴 Calyx renis



CORPUSCULUM RENIS MALPIGHI

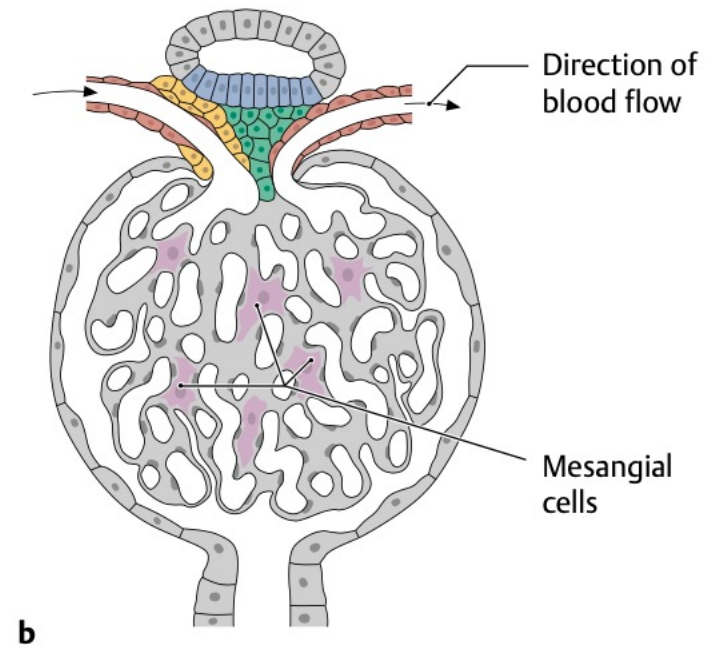
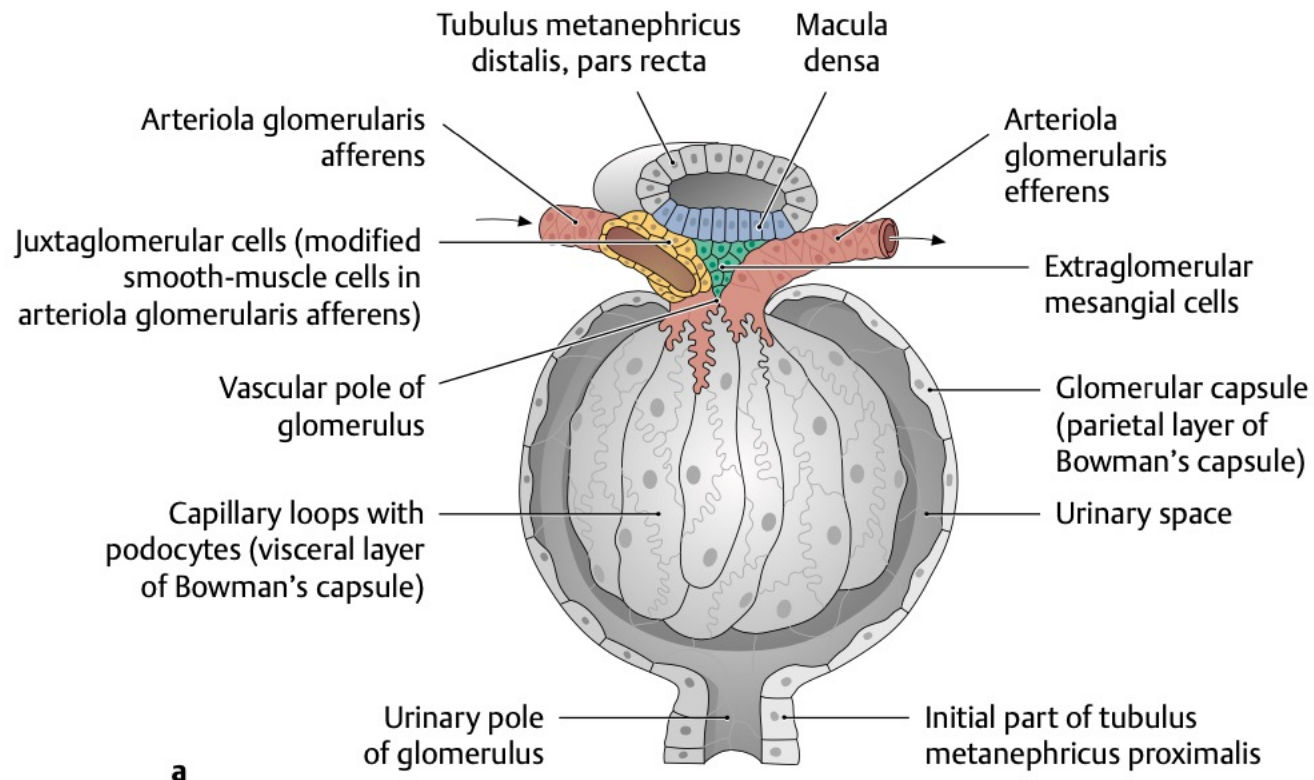
- ♦ Glomerulus + capsula glomeruli
- ♦ Glomerulus - rete mirabile arteriosum
 - ♦ Vas afferens
 - ♦ Pory v endotelu
 - ♦ Vas efferens
- ♦ Capsula glomeruli - inner and outer sheeth
 - ♦ Bowmann's sac – outer sheath
 - ♦ Inner sheath – flat cells - podocytes





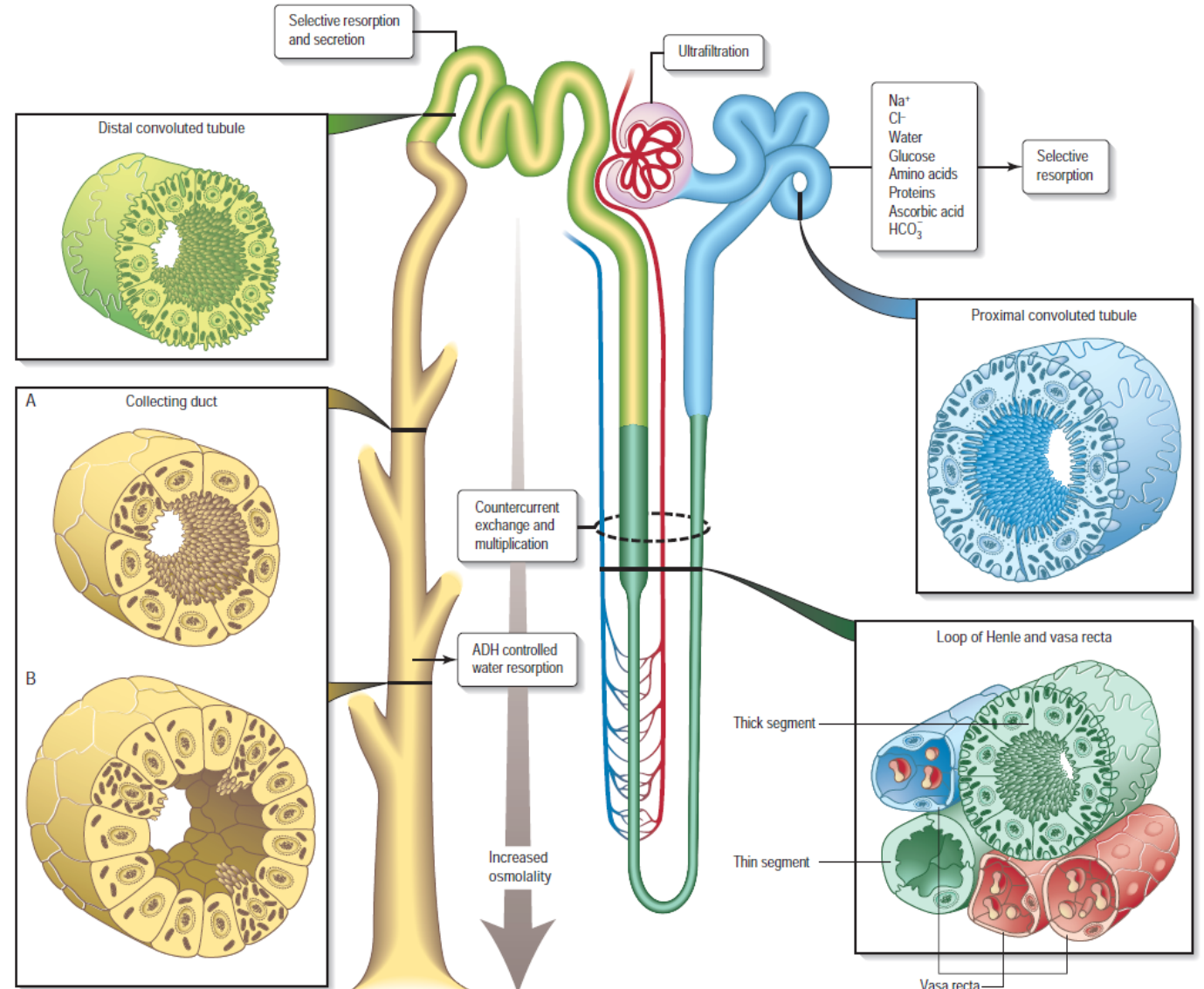
JUXTAGLOMERULAR APPARATUS

- ♦ Juxtaglomerula cells – renin (system renin angiotenzin)
- ♦ Mesangial cells – prostaglandines , peptides etc



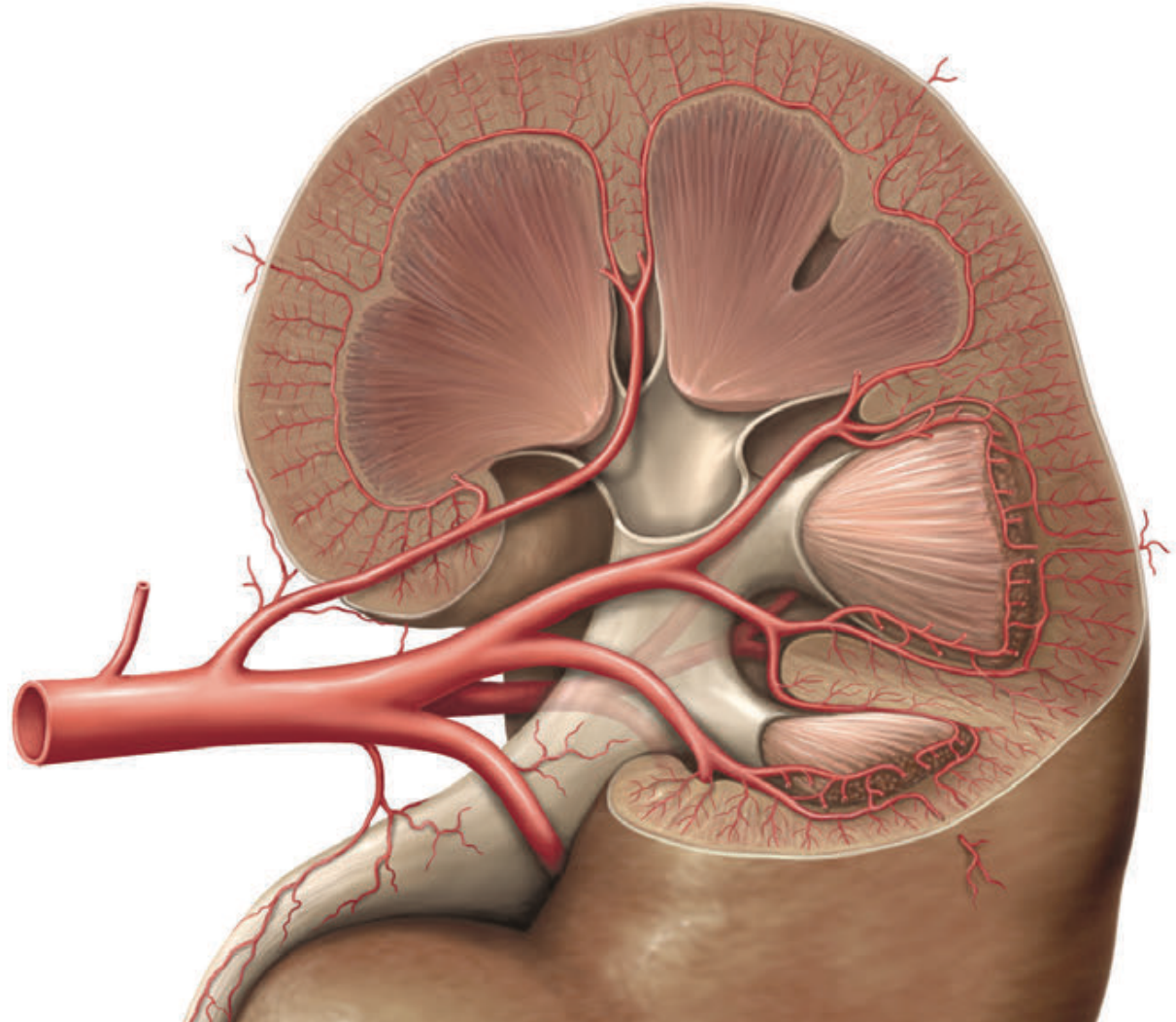
KIDNEY FUNCTION

- ♦ exocrine secretion
- ♦ Corpusculum renis
 - ♦ Filtration of primary urine
 - ♦ 170 -200 ml/day (1 glomerulus)
- ♦ Following sections
 - ♦ Reverse resorption
 - ♦ 99,5%
 - ♦ Aldosteron - Na
 - ♦ Antidiuretic hormone - water
- ♦ endocrine secretion
- ♦ Juxtaglomerular apparatus
 - ♦ Renin (vasoconstriction)
 - ♦ Erythropoietin



KIDNEY VESSELS

- ♦ A. renalis
- ♦ v. renalis
- ♦ A. interlobaris
- ♦ A. arcuata
- ♦ A. interlobularis
 - ♦ glomeruli
 - ♦ A. radiata
 - ♦ Rr. capsulares
- ♦ arteriola recta
- ♦ venula recta

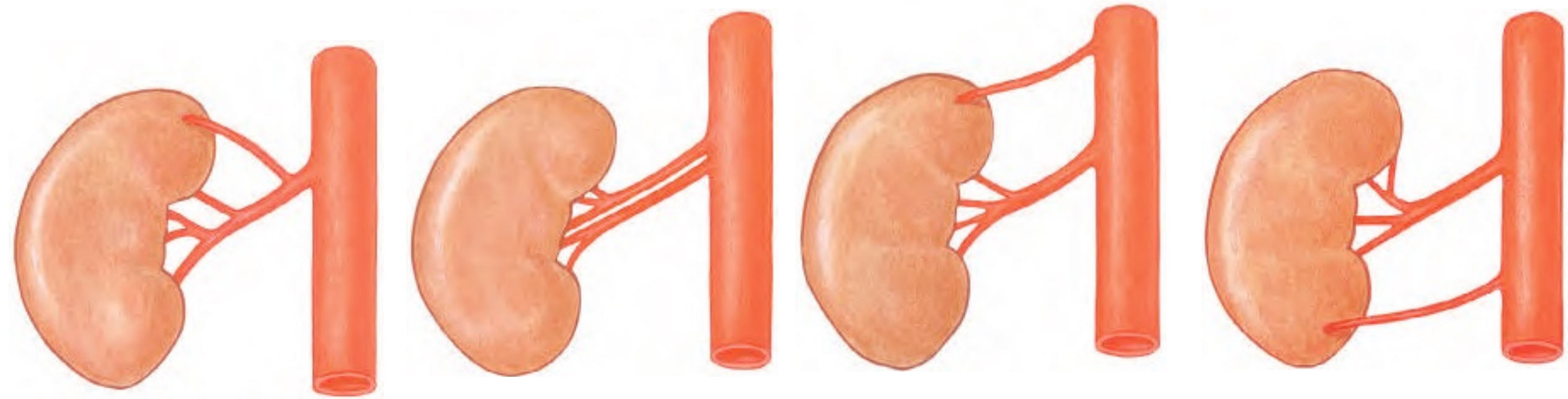


13%

10%

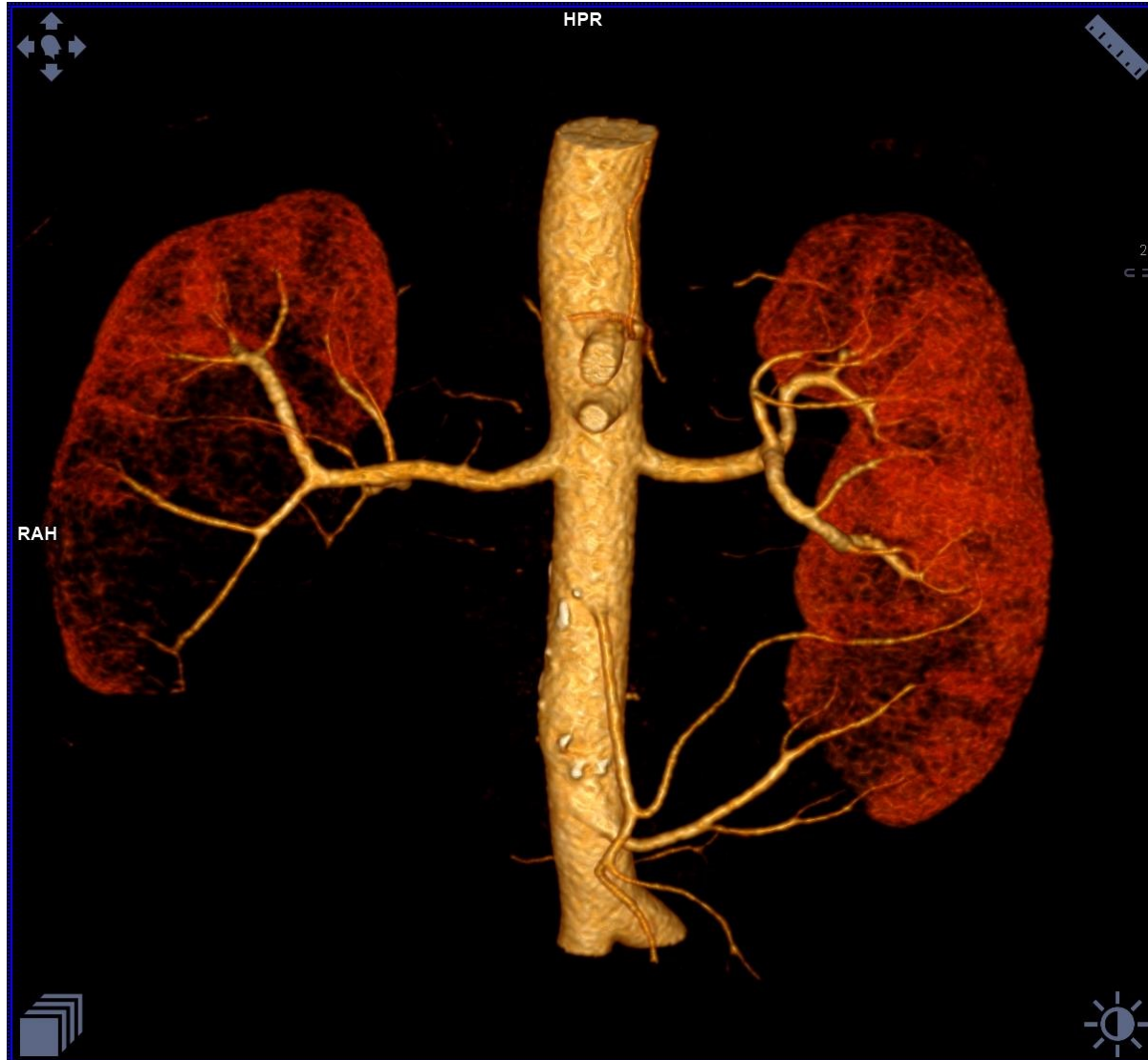
7%

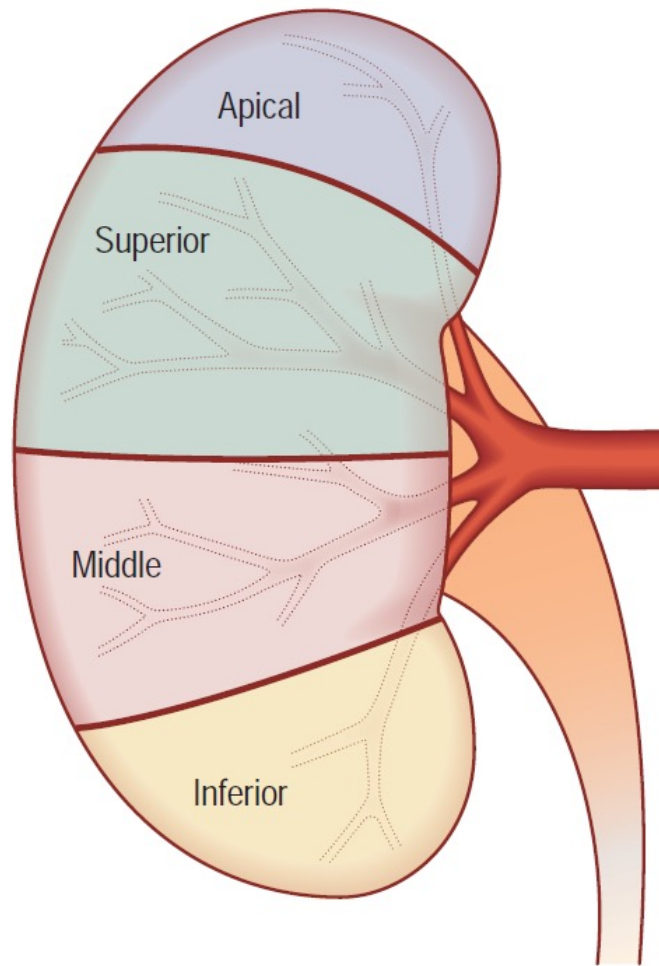
5%



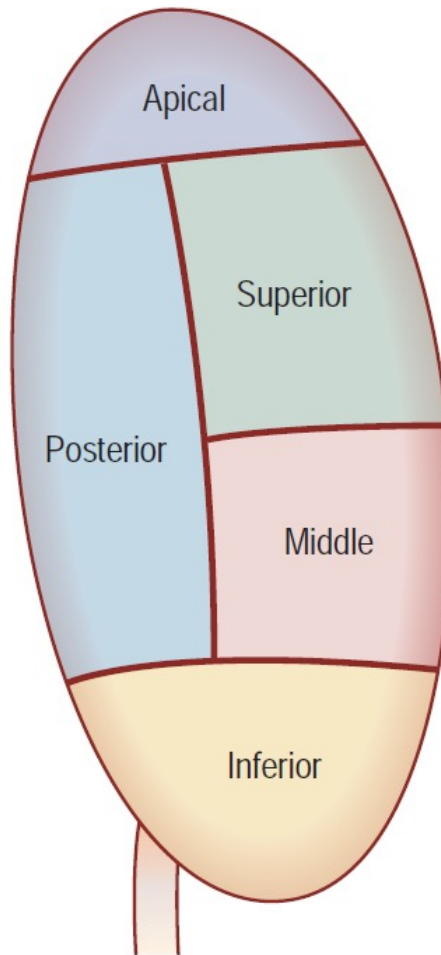
VARIABILITY OF THE ARTERIES

Variability of vessels

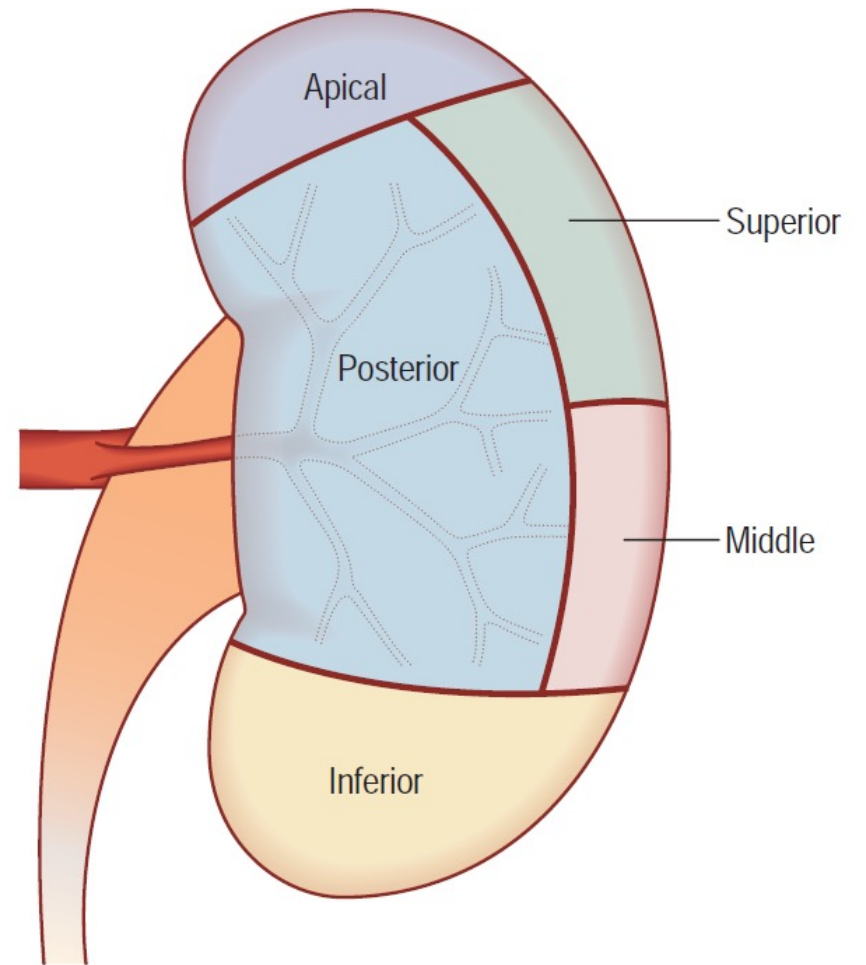




Anterior



Lateral

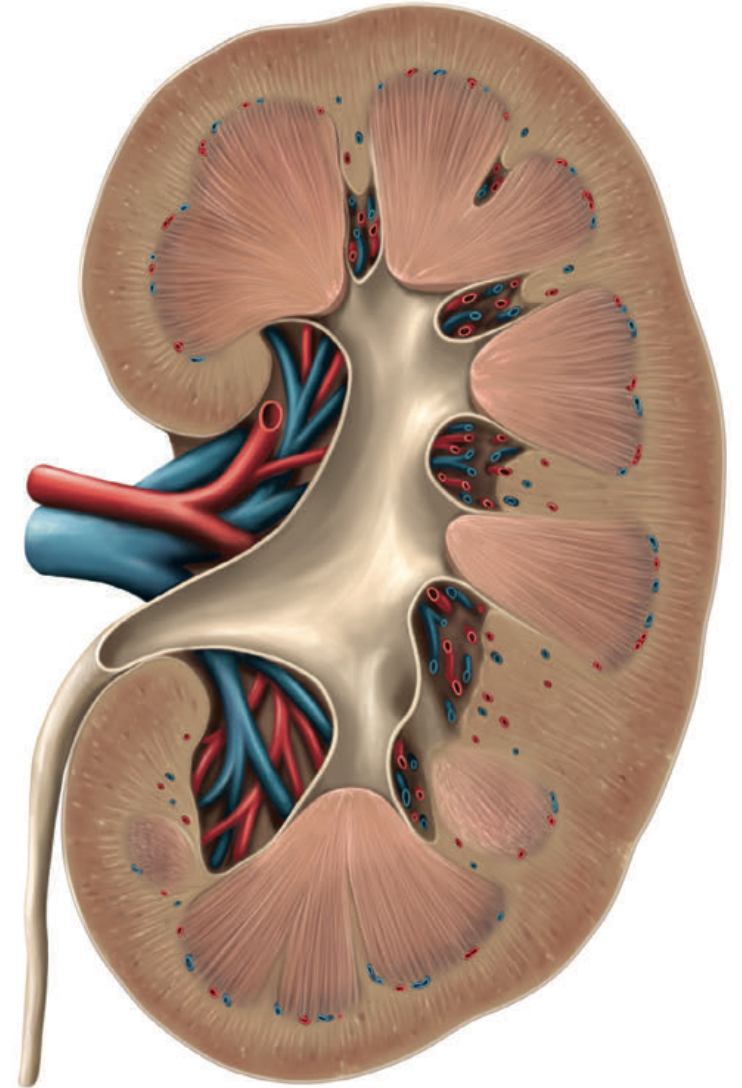
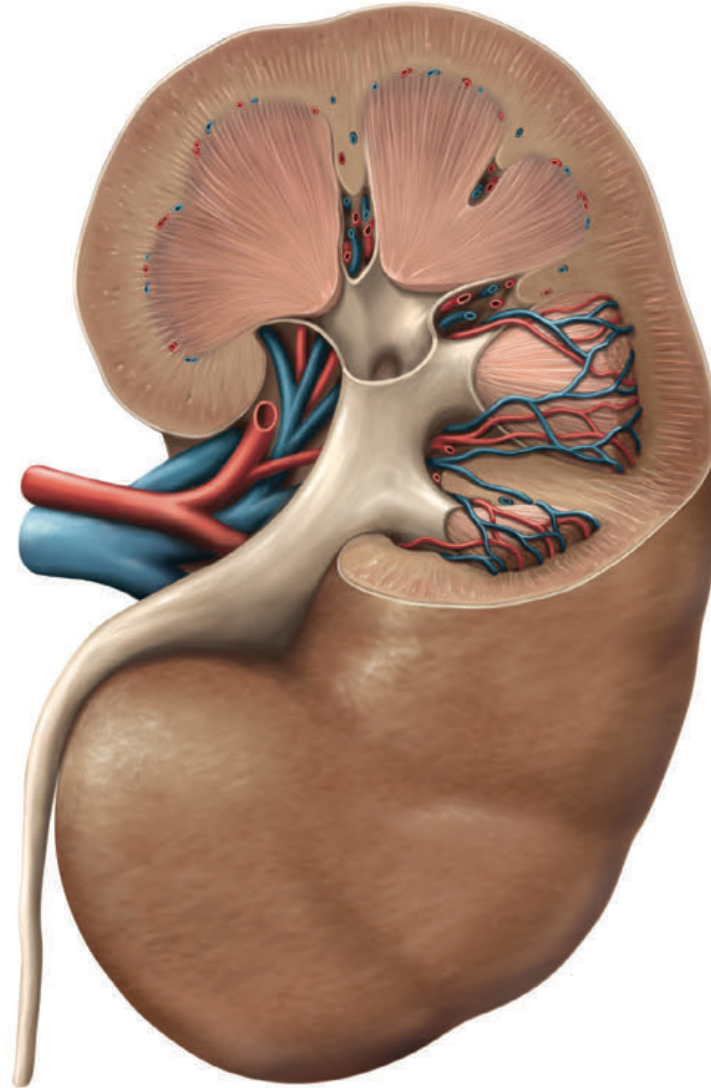


Posterior

RENAL SEGMENTS

COLLECTING SYSTEM

- ♦ Calices renales
 - ♦ Calyx minor
 - ♦ Calyx major
- ♦ Pelvis renalis
- ♦ Dorsal to vessels
 - ♦ surgery
 - ♦ Retroperitoneal approach



COLLECTING SYSTEM

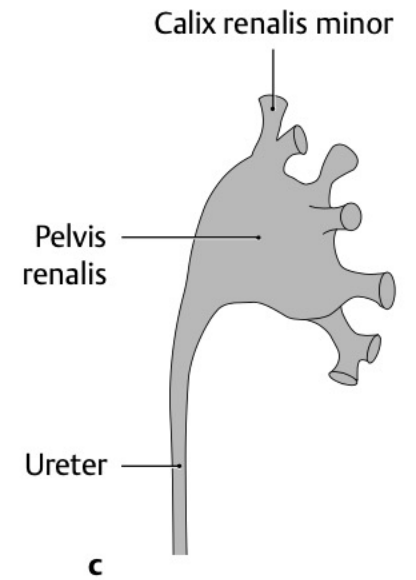
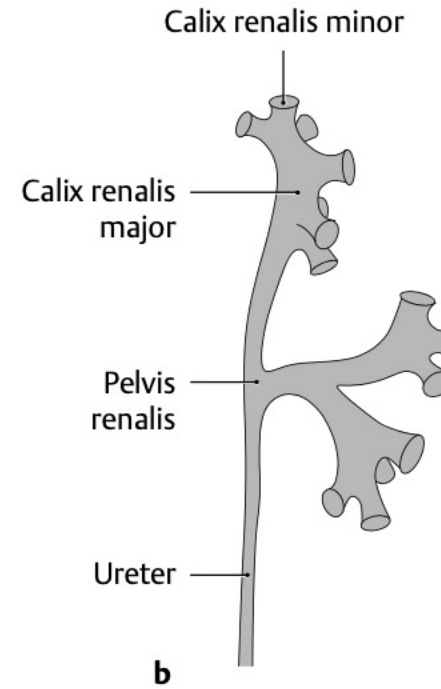
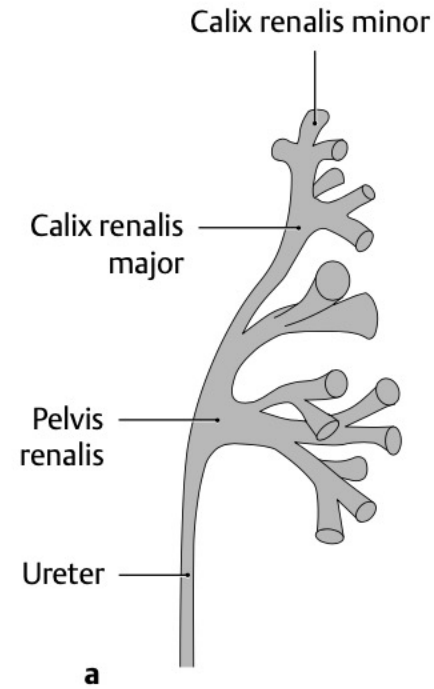
- Calices renales
- Pelvis renalis
- Hydronephrosis
- Tumors





🔴 Dendritic type

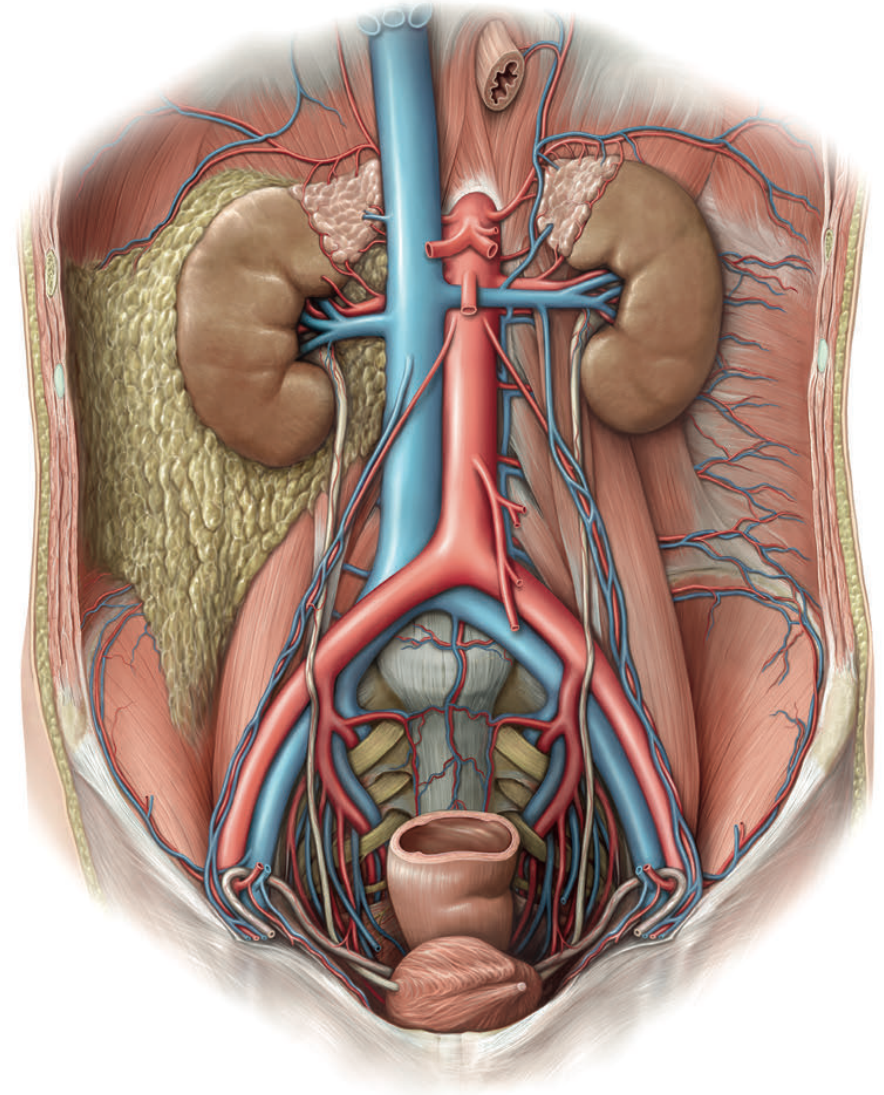
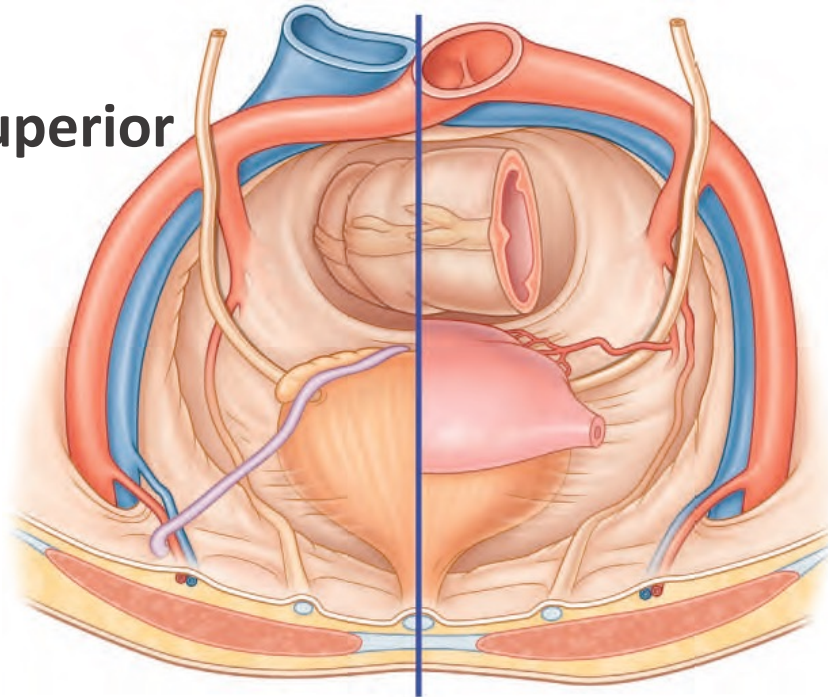
🔴 Ampullary type



RENAL PELVIS

URETER

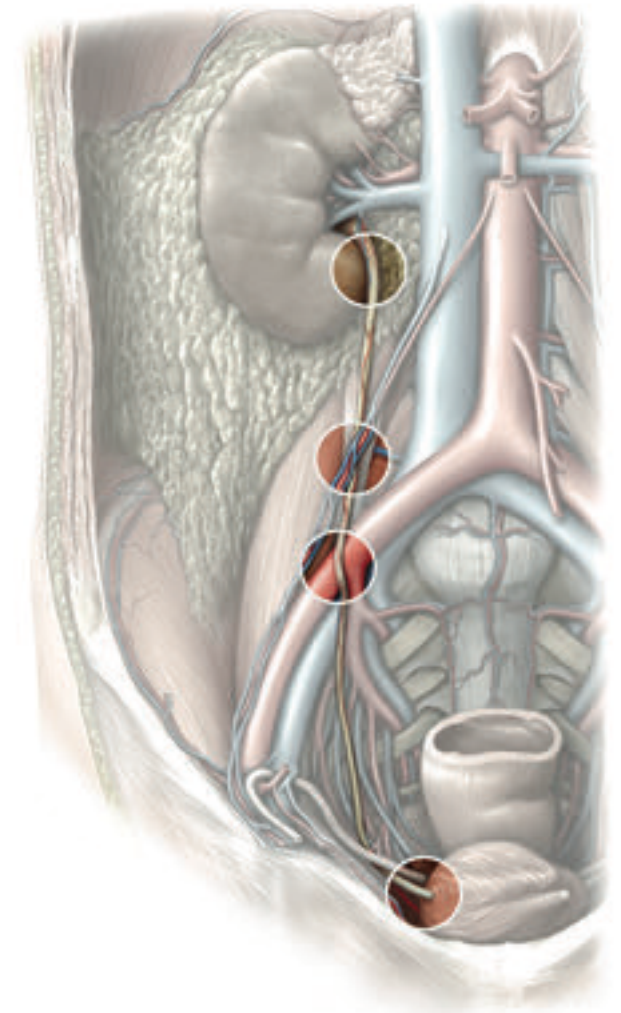
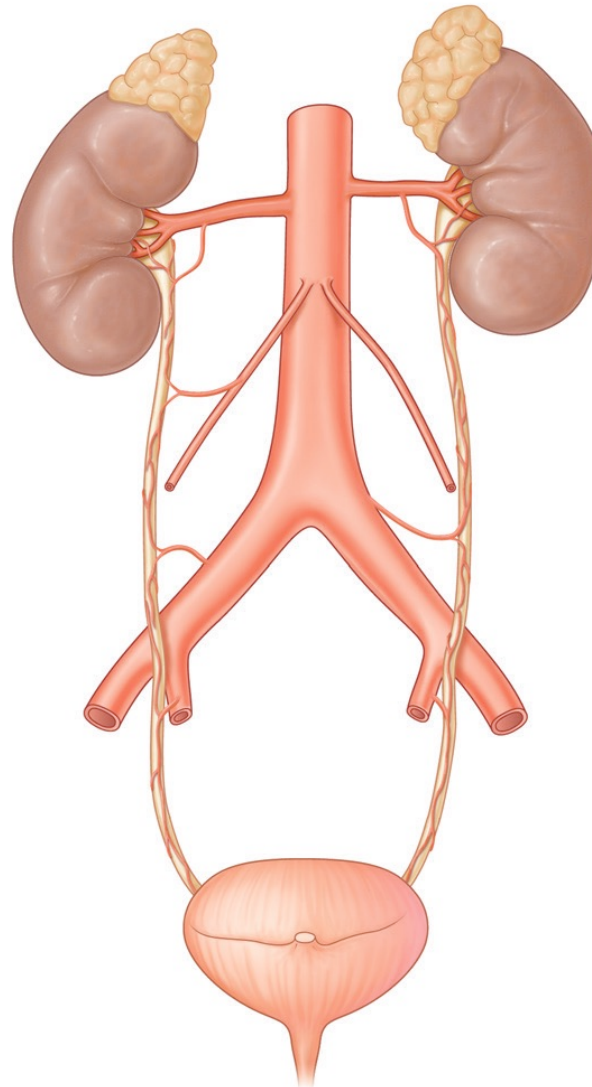
- ♦ length 25 - 30 cm
- ♦ width 5- 6 mm
- ♦ Pars abdominalis
 - ♦ Apertura pelvis superior
 - ♦ Vasa iliaca
 - ♦ Thinner parts
- ♦ Pars pelvica
- ♦ Portio parietalis

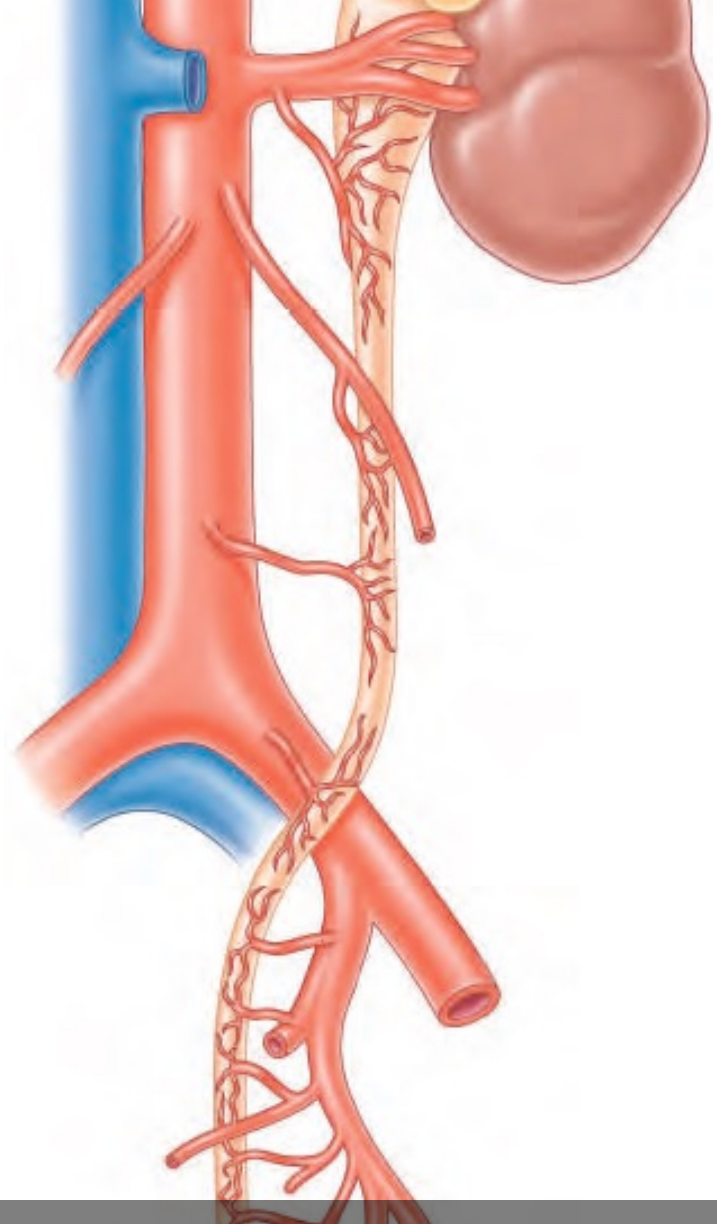


Gray's Anatomy 41th ed.

URETER

- ♦ Tunica mucosa
- ♦ Tela submucosa
- ♦ Tunica muscularis
 - ♦ Outer circular
 - ♦ Inner longitudinal
- ♦ Tunica adventitia
- ♦ Natural stenoses
 - ♦ Juxtapelvic
 - ♦ (vasa testicularia - ureter dorsally)
 - ♦ Vasa iliaca
 - ♦ juxtavesical
- ♦ Passage of stone - colica renalis



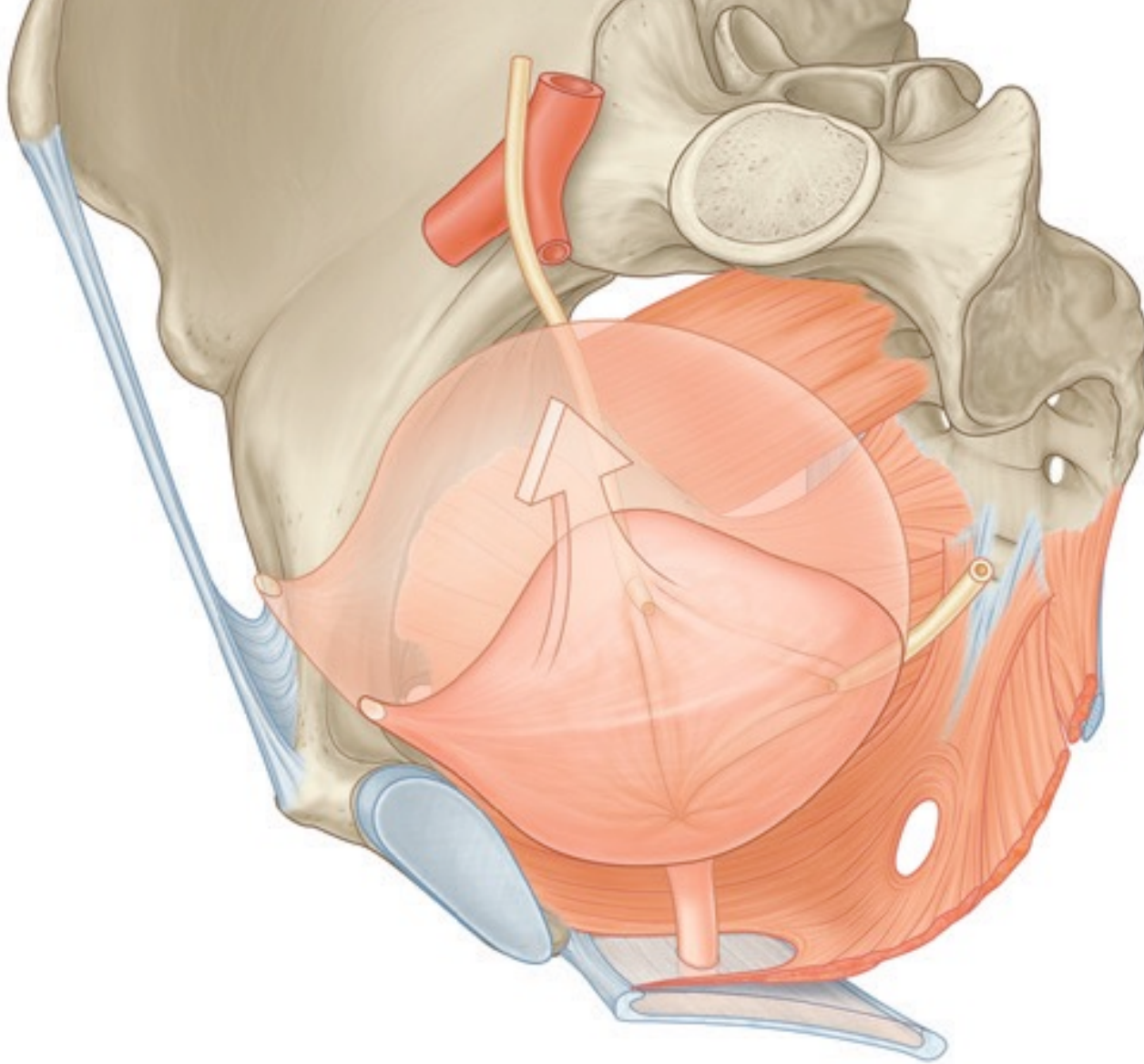
- 
- The diagram illustrates the abdominal aorta and its major branches. The aorta is shown as a large red vessel on the left, with blue vessels representing the inferior vena cava. Branches include the renal arteries (A. renalis) leading to the kidneys, the ovarian/testicular arteries (A. ovarica/testicularis), the superior mesenteric artery (A. mesenterica superior), the celiac trunk (A. coeliacus), the superior mesenteric artery (A. mesenterica inferior), the common iliac arteries (A. iliaca communis), and the internal iliac arteries (A. iliaca interna). The inferior mesenteric artery (A. mesenterica inferior) is also shown. The diagram highlights the multiple levels at which the aorta gives off branches, which is important for understanding the vascular supply of the ureter.
- Multiple levels with multiple vessels
 - A. renalis
 - A. ovarica/testicularis
 - Aorta abdominalis
 - A. iliaca communis
 - A. iliaca interna
 - A. vesicalis superior
 - Etc
 - Possible to cut and to make anastomosis

VASCULAR SUPPLY OF THE URETER

- Pelvis duplex
- Ureter duplex
- Ureter fissus

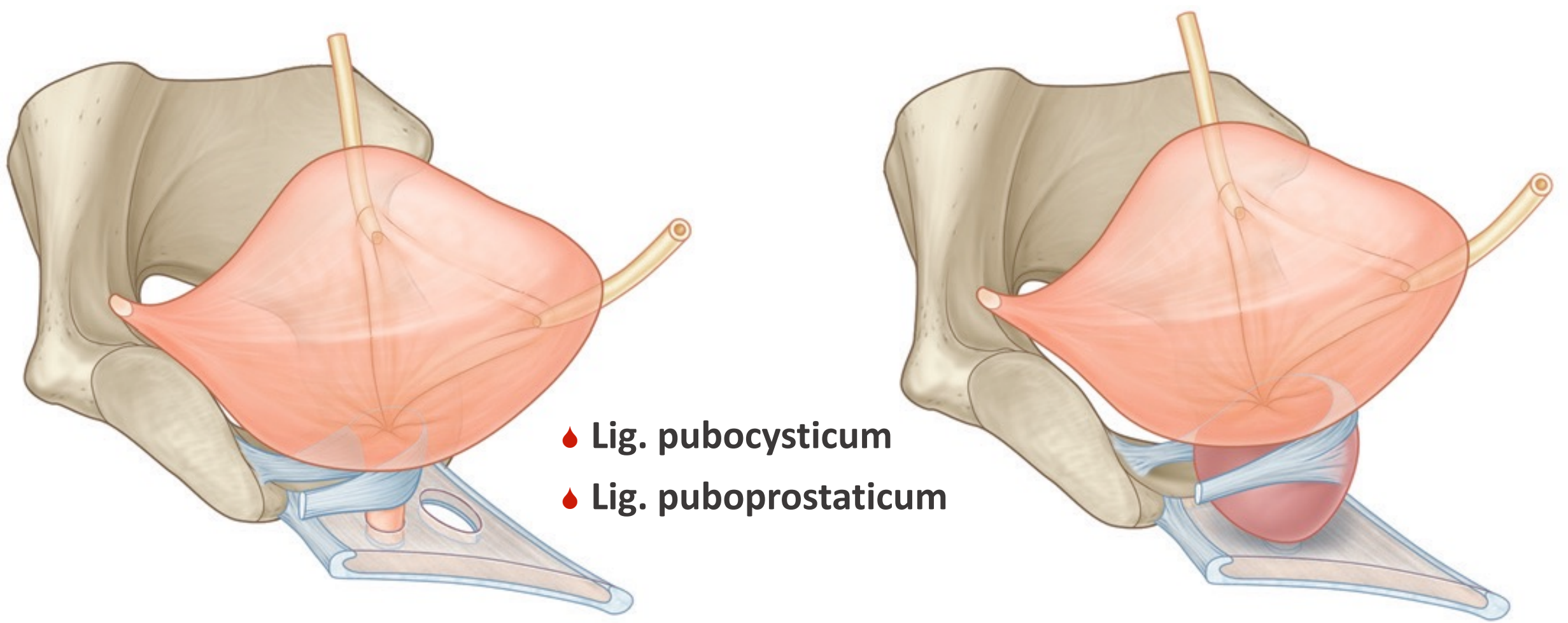


VARIETIES OF COLLECTING SYSTEMS



- ♦ **capacity 250 - 300 ml**
 - ♦ Preperitoneal position
 - ♦ Behind symphysis
 - ♦ Sectio alta
 - ♦ Without opening of peritoneal cavity
 - ♦ Over symphysis
 - ♦ Excavatio retrovesicalis
- ♦ **Ligamentum umbilicale medianum**
- ♦ **Apex**
- ♦ **Corpus**
- ♦ **Fundus**

VESICA URINARIA



VESICA URINARIA

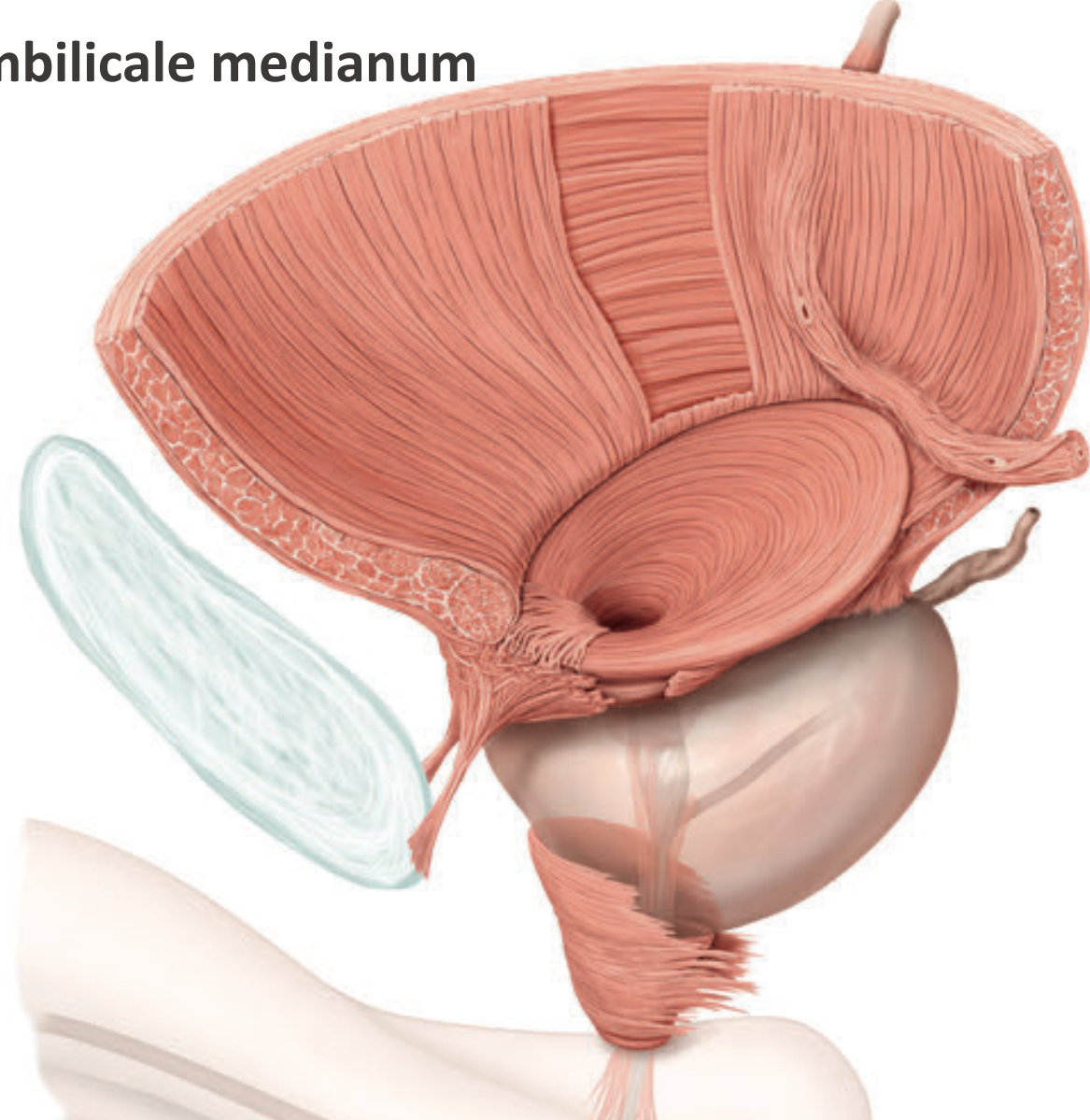
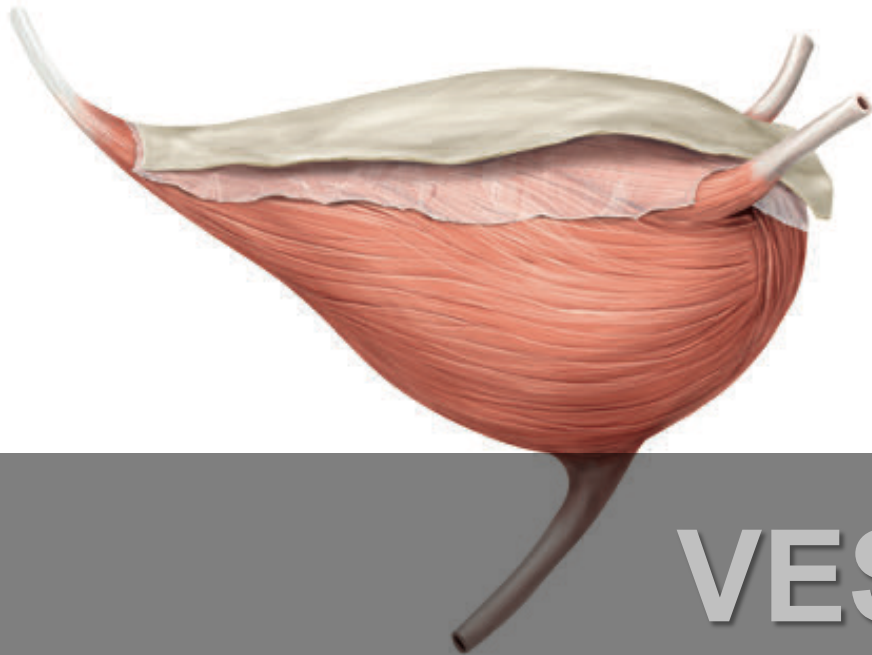


• Ligamentum umbilicale medianum

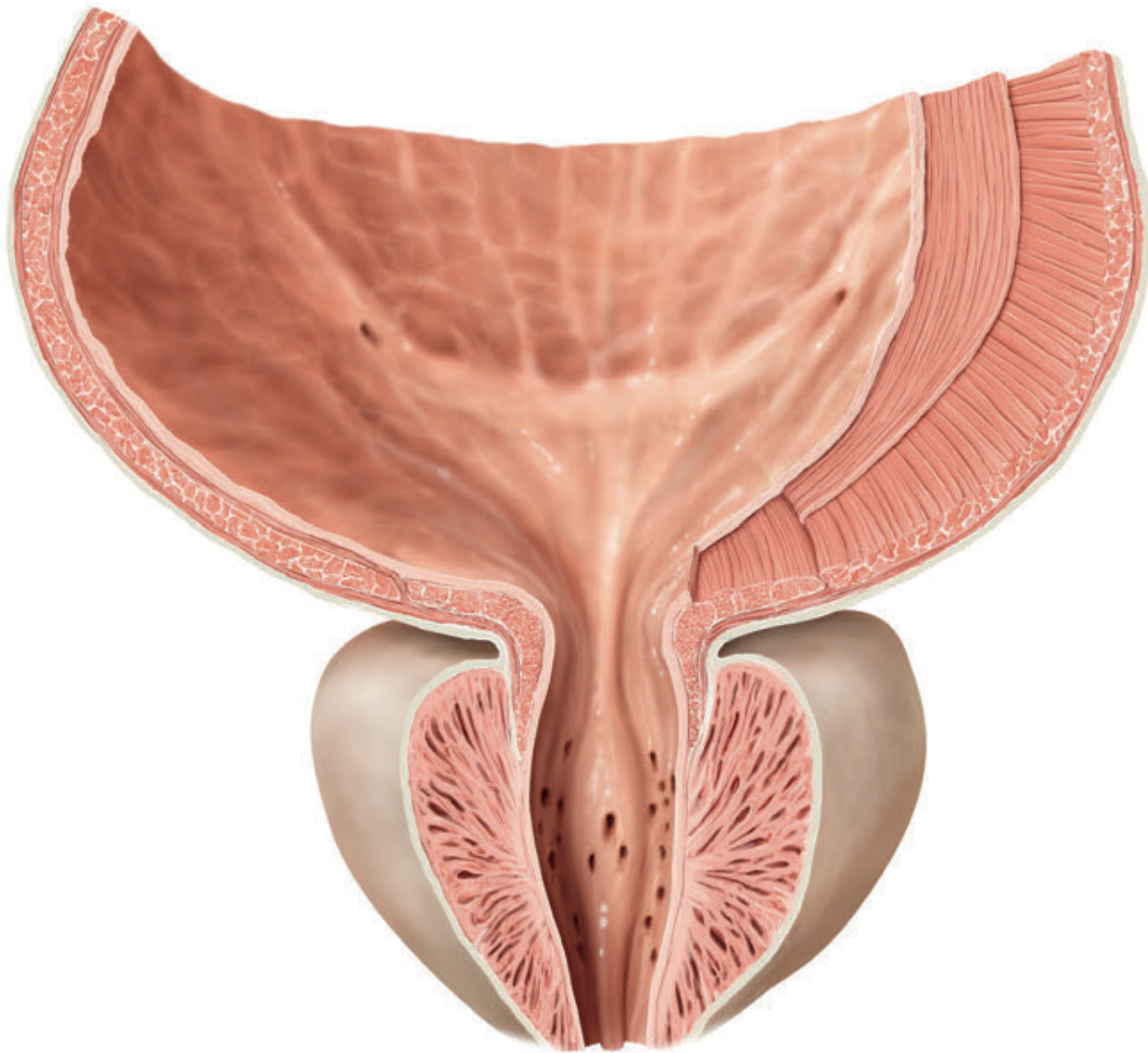
• Apex

• Corpus

• Fundus



VESICA URINARIA

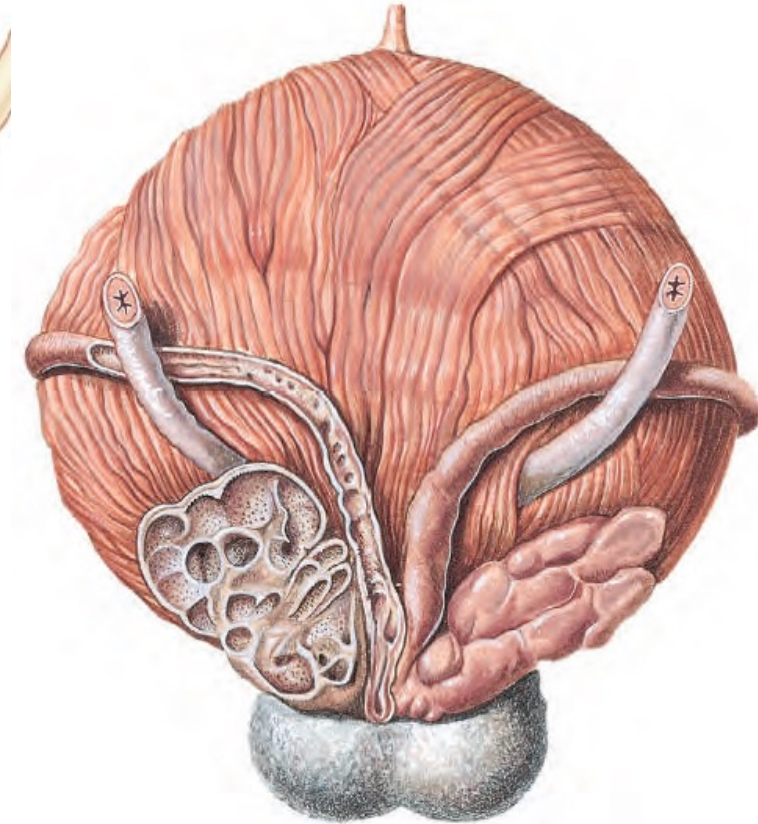
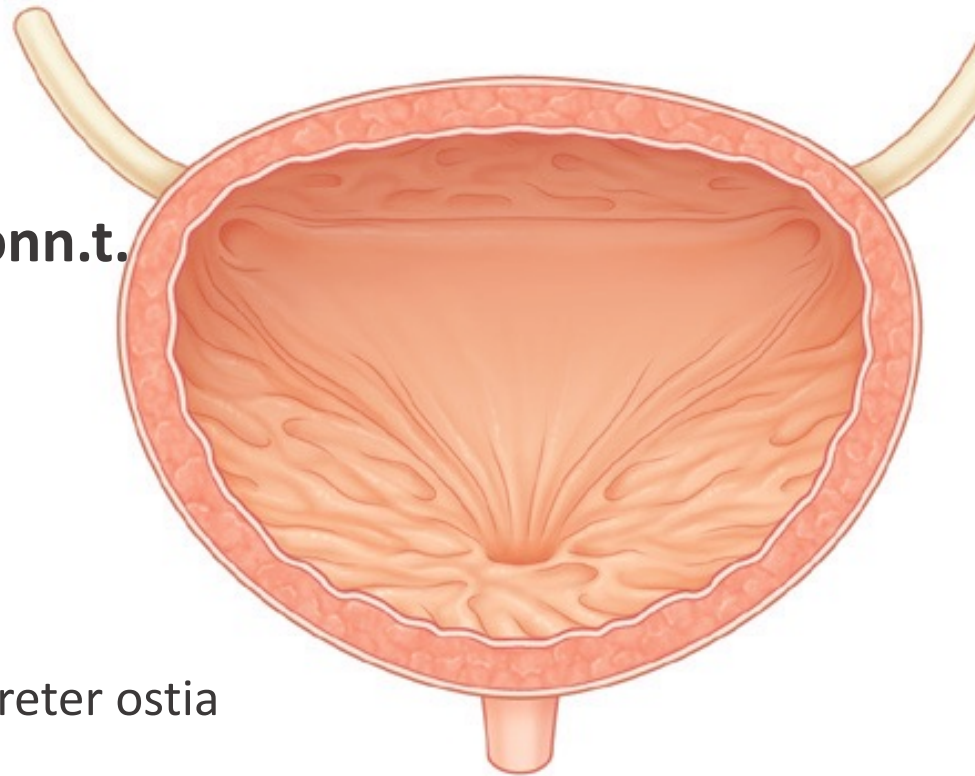


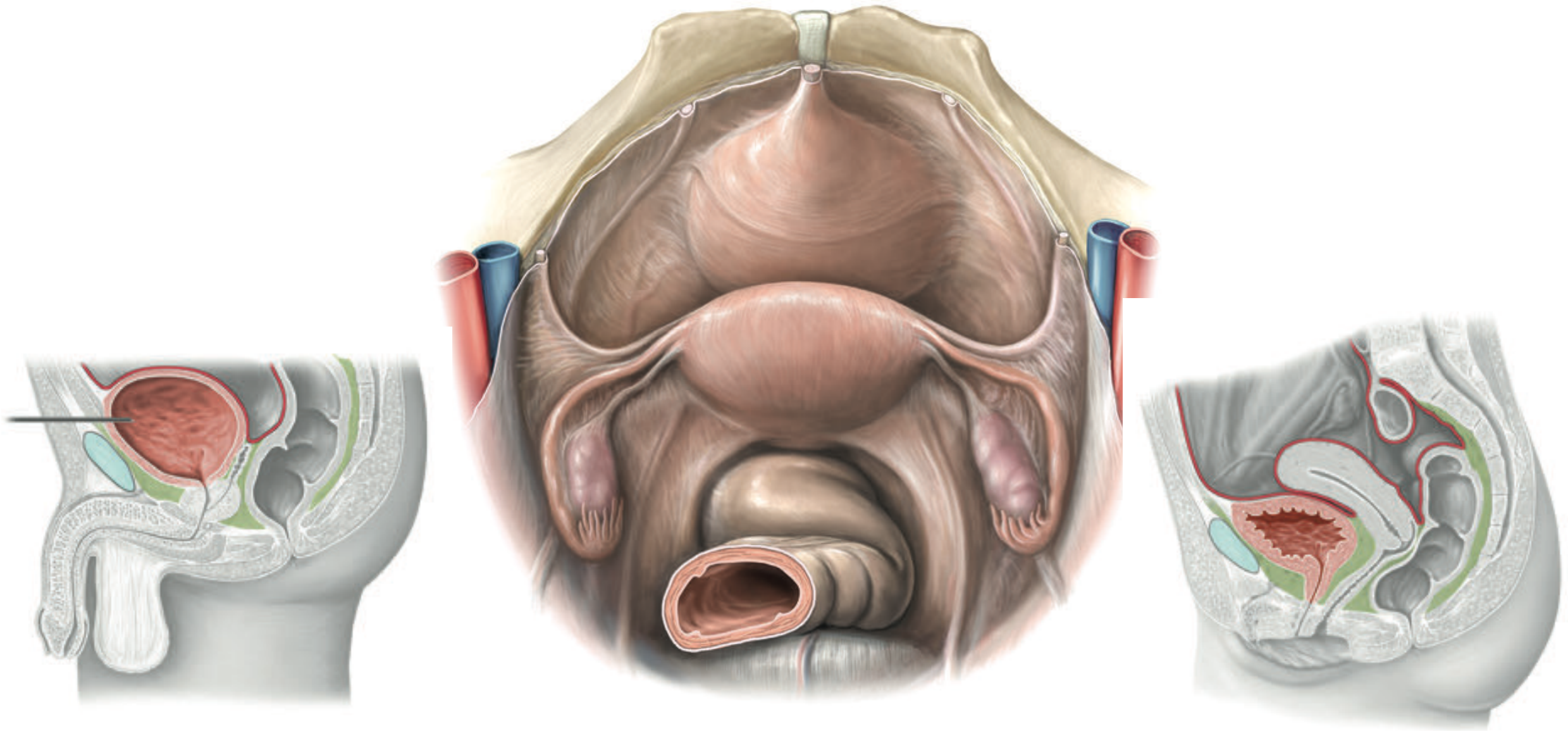
- ♦ **Trigonum vesicae**
 - ♦ *Ostium ureteri dx.*
 - ♦ *Ostium ureteri sin.*
 - ♦ *Ostium urethrae*
- ♦ **Plica interureterica**
 - ♦ *Fossa retrotrigonalis*

VESICA URINARIA

VESICA URINARIA

- ♦ **Tunica mucosa**
 - ♦ Transitional epithelium
 - ♦ folds
- ♦ **Tela submucosa – loose conn.t.**
- ♦ **Tunica muscularis**
 - ♦ 3 layers
 - ♦ M. detrusor
 - ♦ M. sphincter vesicae
 - ♦ spiral
 - ♦ Ventile mechanism in the ureter ostia
- ♦ **Tunica adventicia**
 - ♦ Follows to paracystium



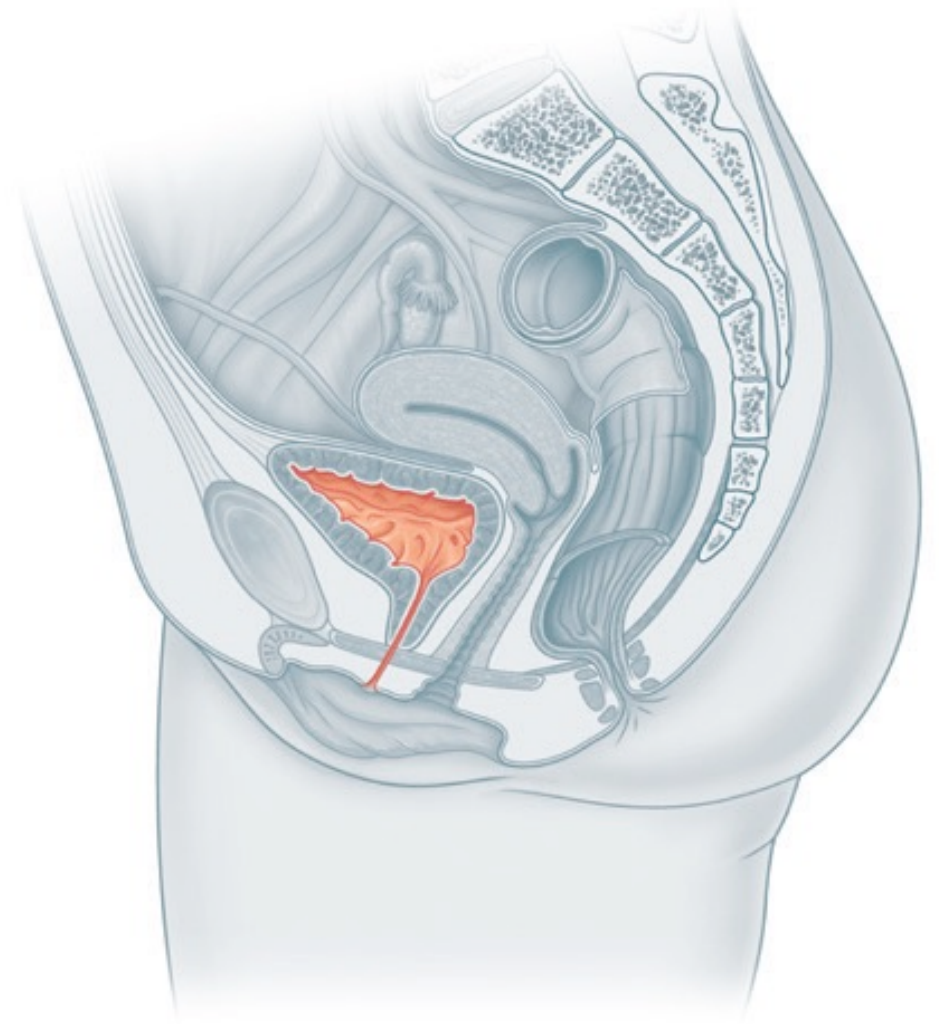
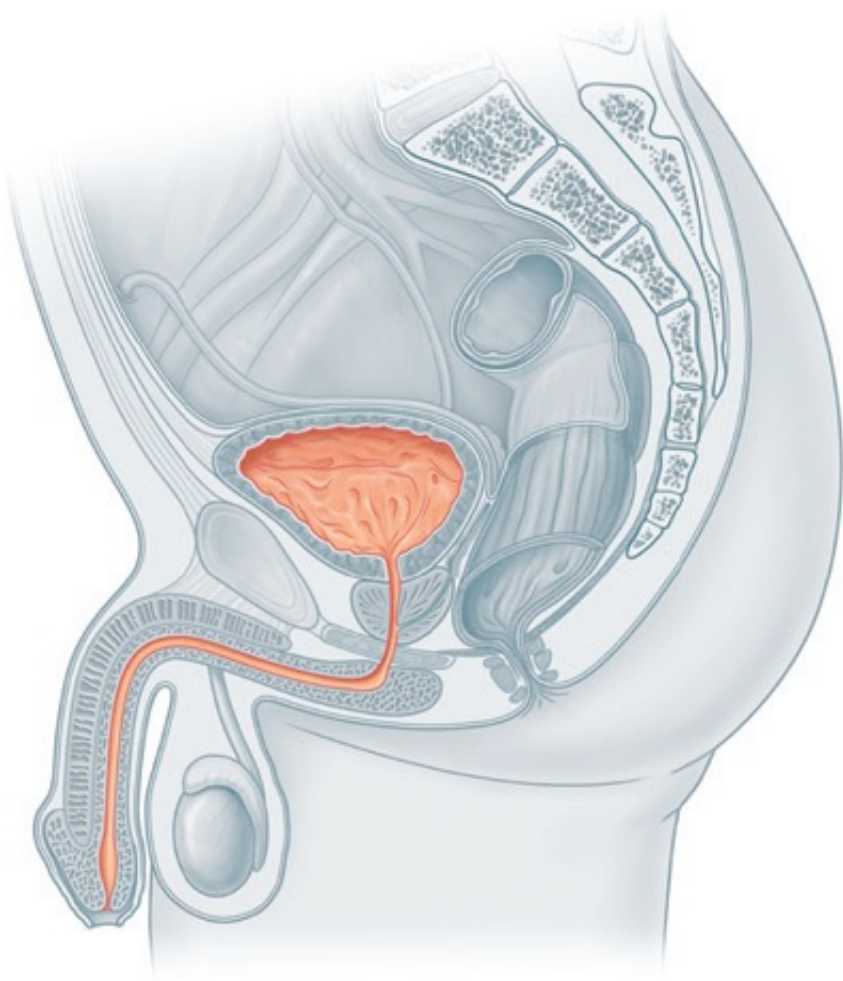


RECESSUS RETROVESICALIS

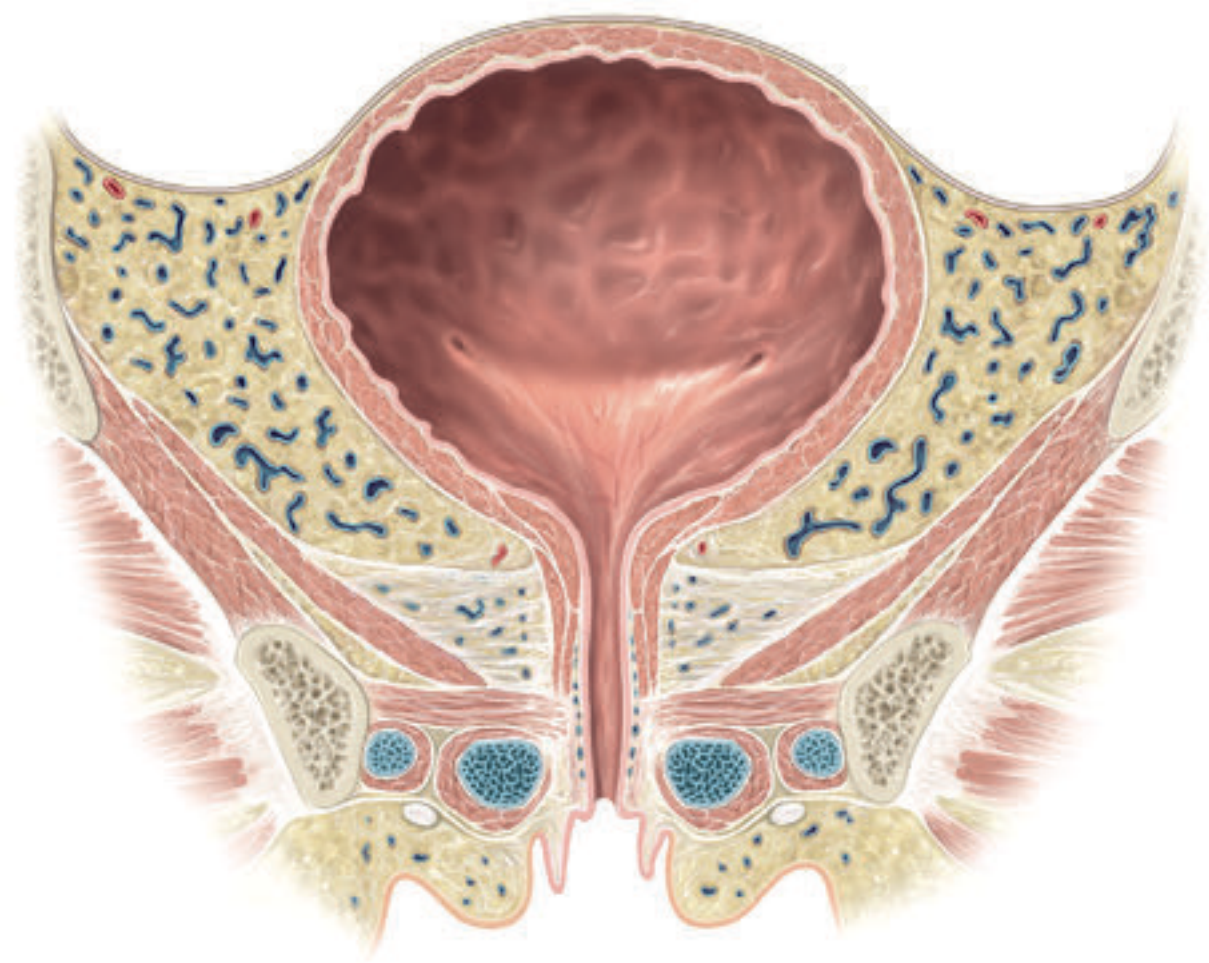
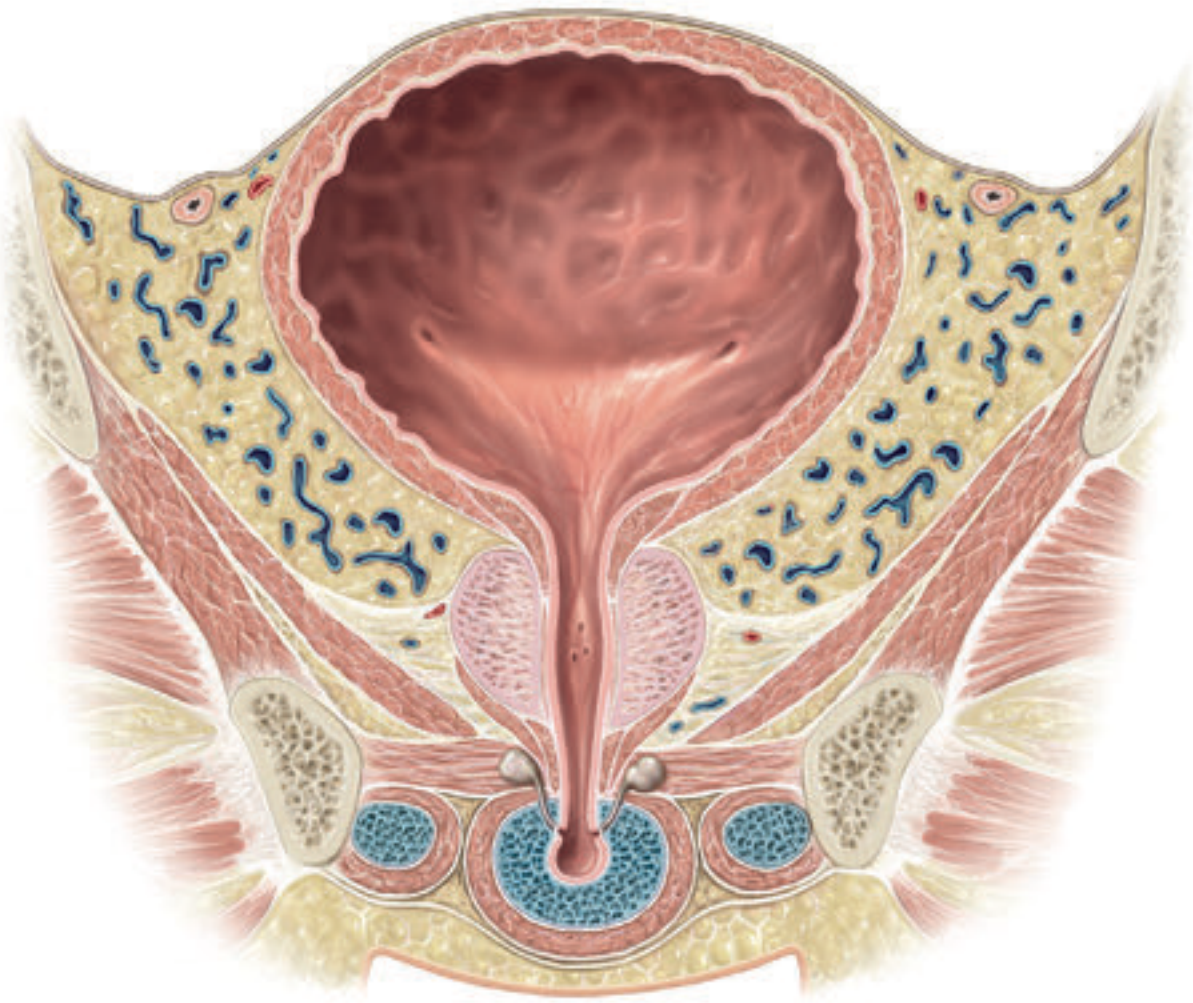
URETHRA

- ♦ Ostium urethrae internum
- ♦ Ostium urethrae externum
- ♦ Tunica mucosa
 - ♦ Transitional epithelium – upper part
 - ♦ Multilayered squamous – lower part
- ♦ Tela submucosa
- ♦ Tunica muscularis
- ♦ Connective tissue - periurethrium





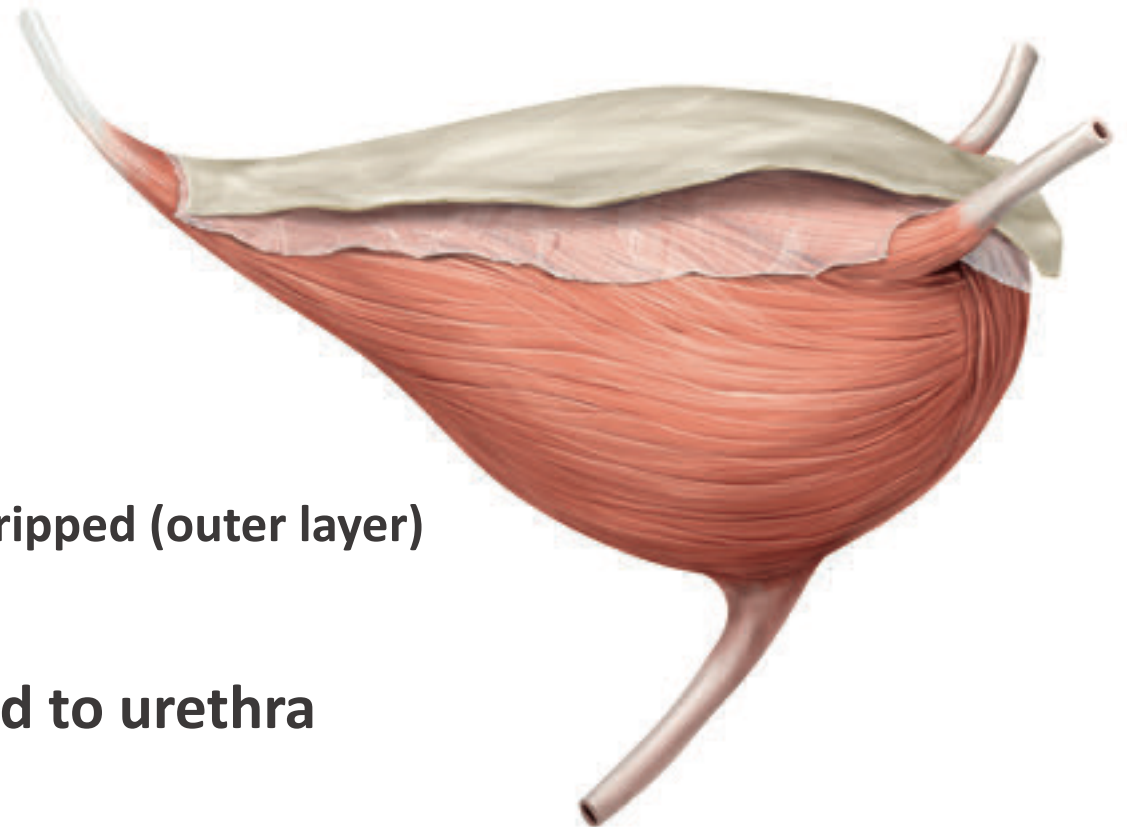
URETHRA FEMININA ET MASCULINA



URETHRA FEMININA ET MASculINA

URETHRA FEMININA

- ♦ Urethra feminina
 - ♦ 3-4 cm
 - ♦ 8 mm
 - ♦ Pars intramuralis
 - ♦ M sphincter vesicae urinariae - smooth
 - ♦ Pars pelvina
 - ♦ Pars perinealis
 - ♦ M. sphincter urethrae – smooth (inner layer) stripped (outer layer)
- ♦ Glandulae urethrales – mucinous glands
- ♦ Ductus paraurethralis - 1-2 cm long, opened to urethra





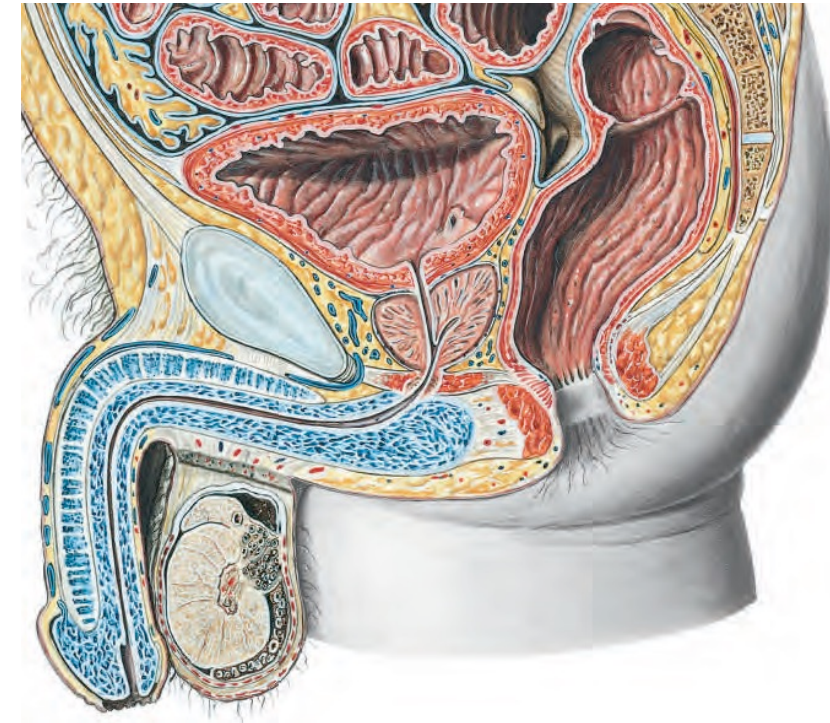
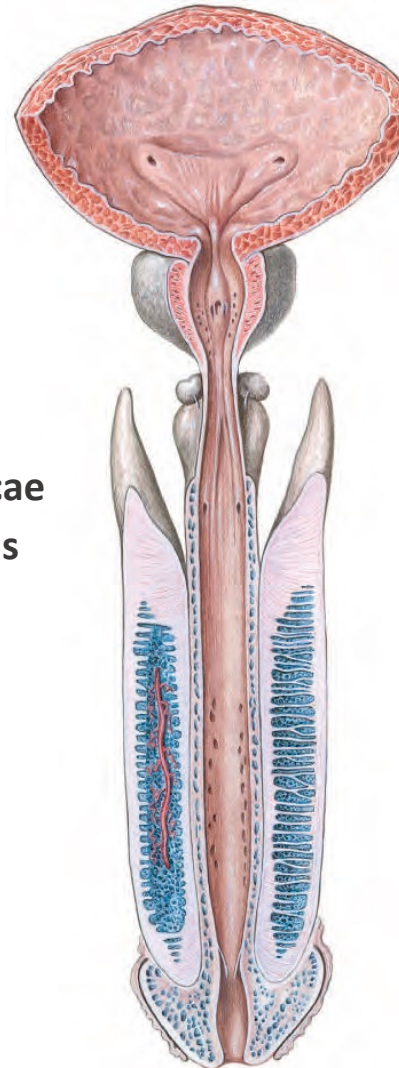
- **M. sphincter urethrae internus**
- **M. sphincter urethrae externus**
 - Inner - smooth
 - Outer - striated
- **M. dilatator urethrae**

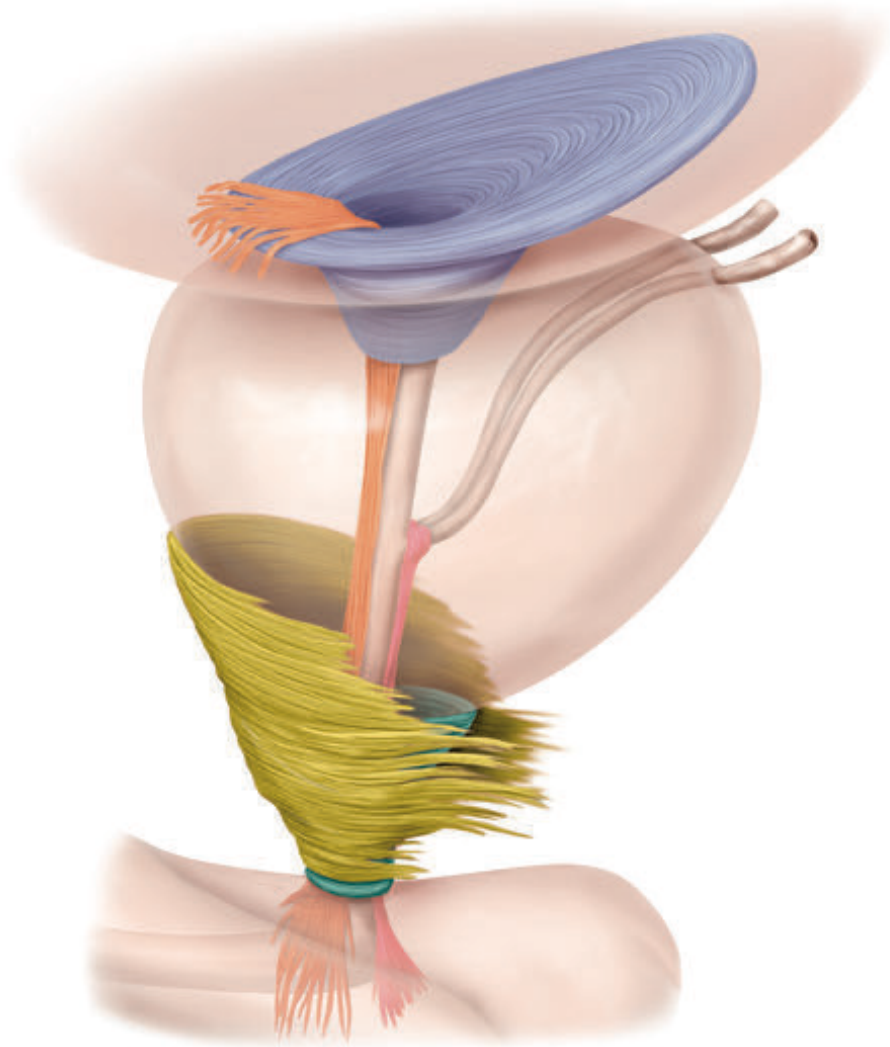
URETHRAL SPHINCTERS

URETHRA MASKULINA / VIRILIS

♦ Urethra masculina

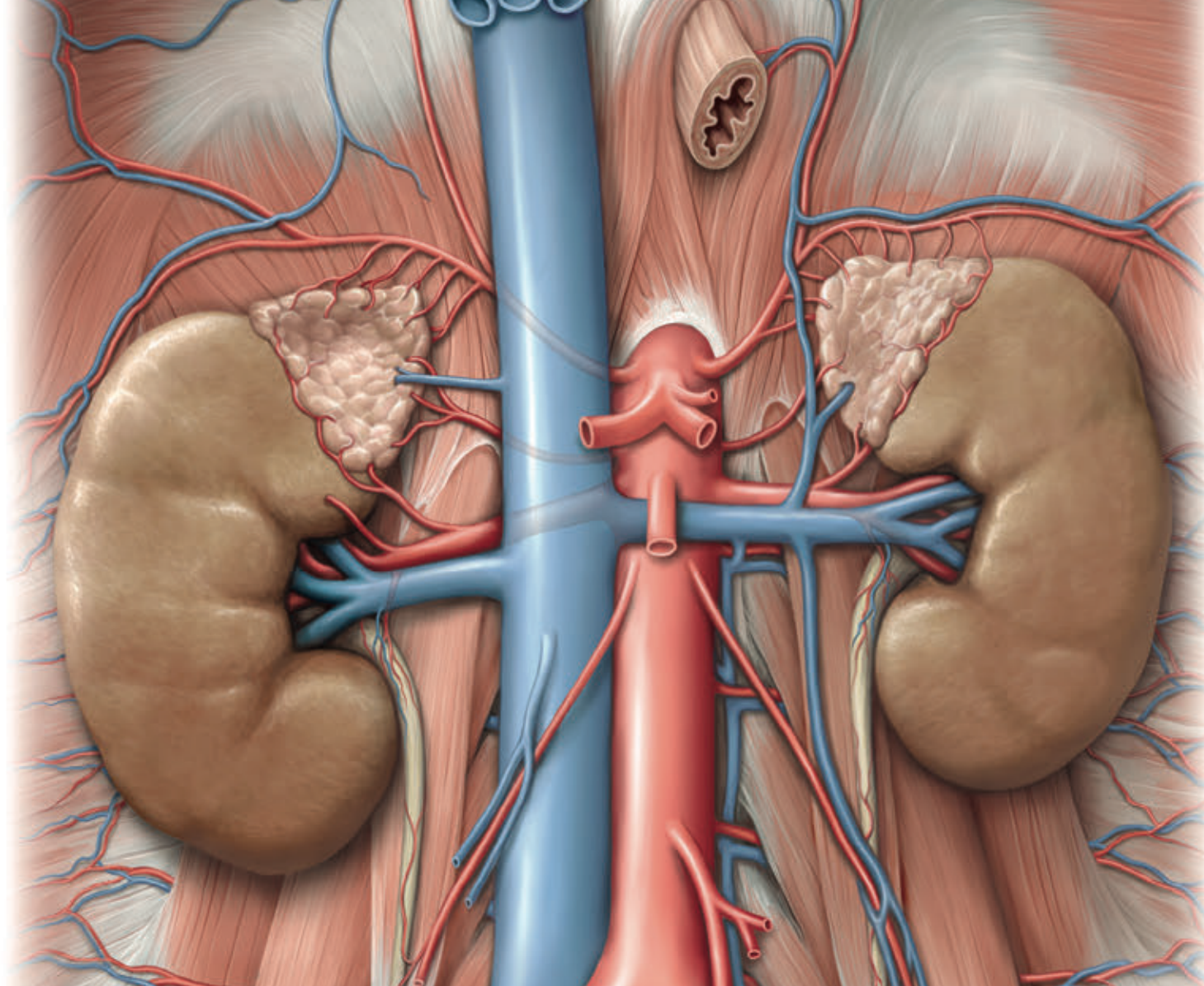
- ♦ 20 -25 cm
- ♦ 2x bowed
- ♦ **Pars intramuralis**
 - ♦ M sphincter vesicae urinariae - smooth
- ♦ **Pars prostatica**
 - ♦ Colliculus seminalis - ductus eiaculatorius + gl prostaticae
 - ♦ Ductus eiaculatorius - dc. deferens et vesicula seminalis
 - ♦ Utriculus prostaticus – remnant of ductus Muelleri
- ♦ **Pars mebranacea**
 - ♦ M. sphincter urethrae - smooth (inner) + stripped
- ♦ **Pars spongiosa**
 - ♦ Gl. bulbourethrales
 - ♦ Gl. urethrales





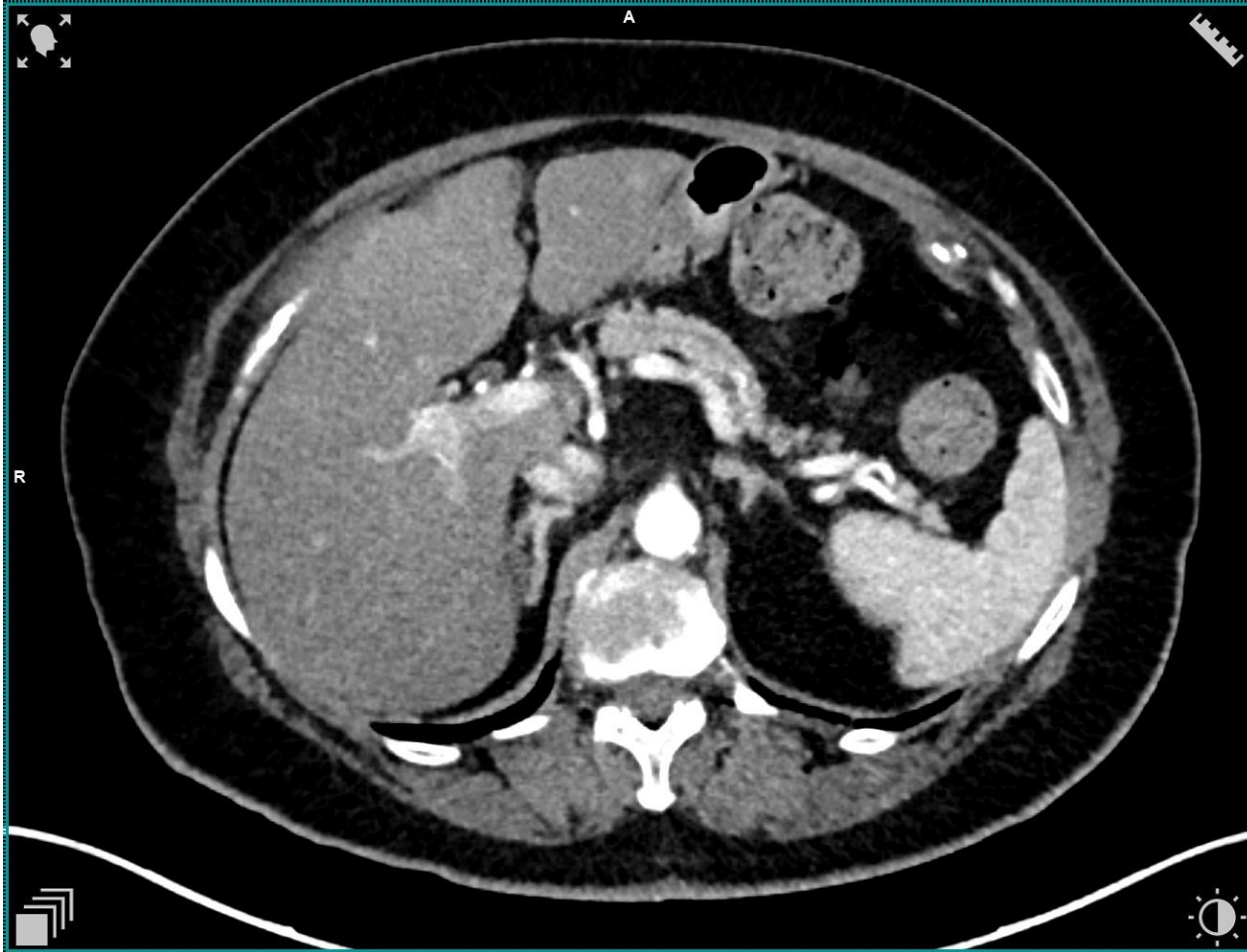
- **M. sphincter urethrae internus**
- **M. sphincter uretrae externus**
 - Inner - smooth
 - Outer - stripped
- **M. dilatator urethrae**
- **M. ejaculatorius**

URETRÁLNÍ SFINKTERY

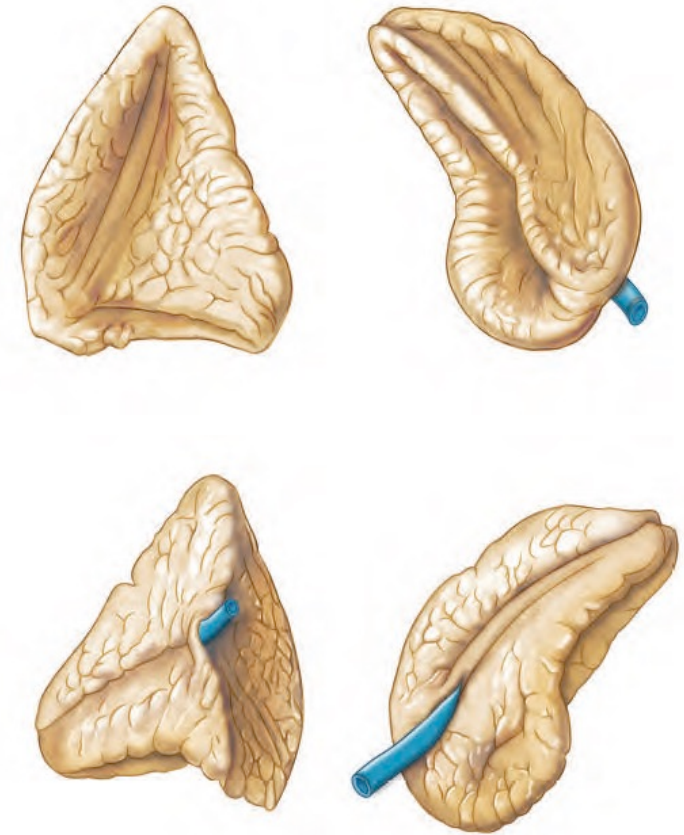


- ♦ **In retroperitoneum**
- ♦ Inside of renal capsula
- ♦ Surrounded by fatty tissue
- ♦ Between kidney and adrenal gland
- ♦ Thin layer of connective tissue

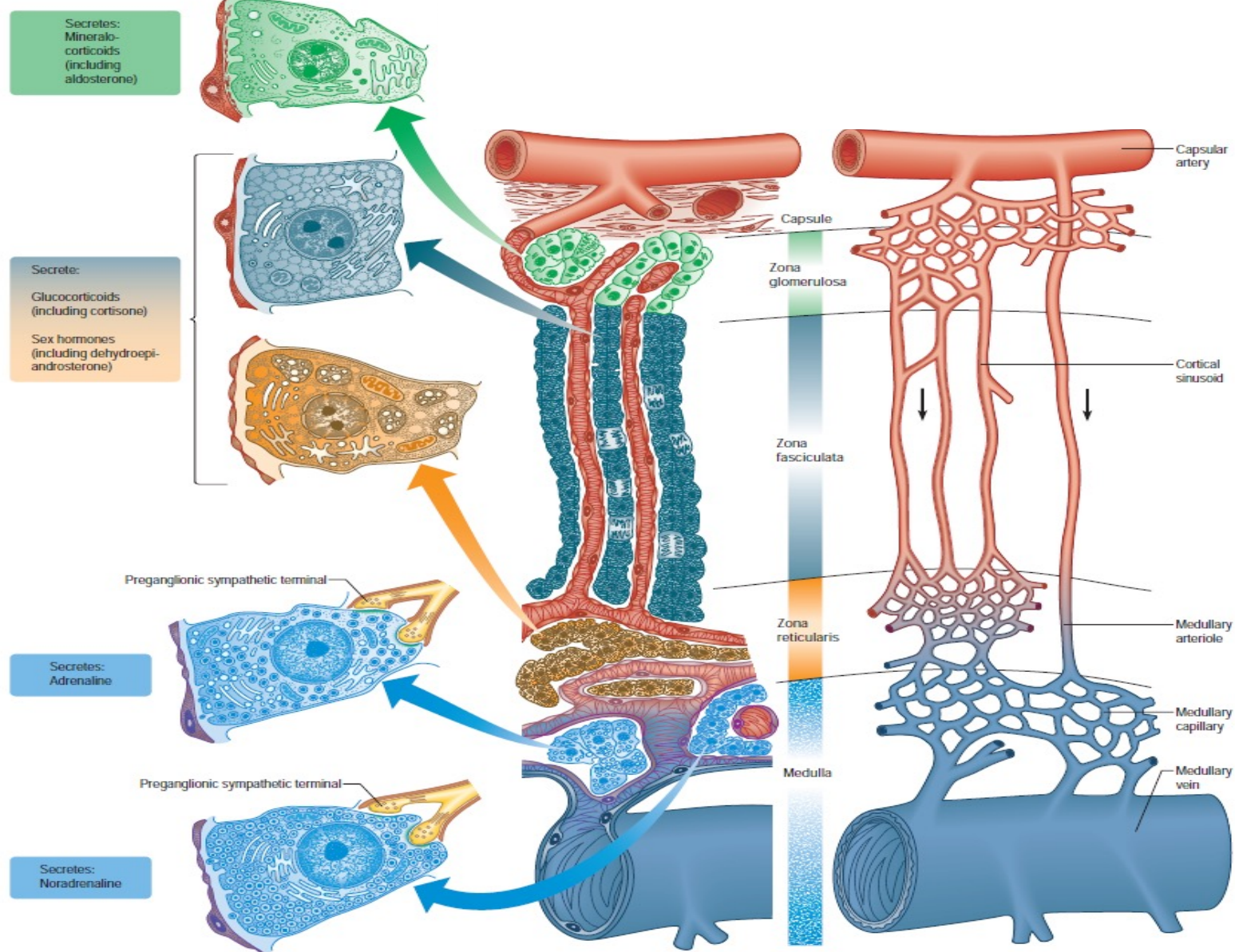
GLANDULAE SUPRARENALES



- right
- V-shape
- left
- shape

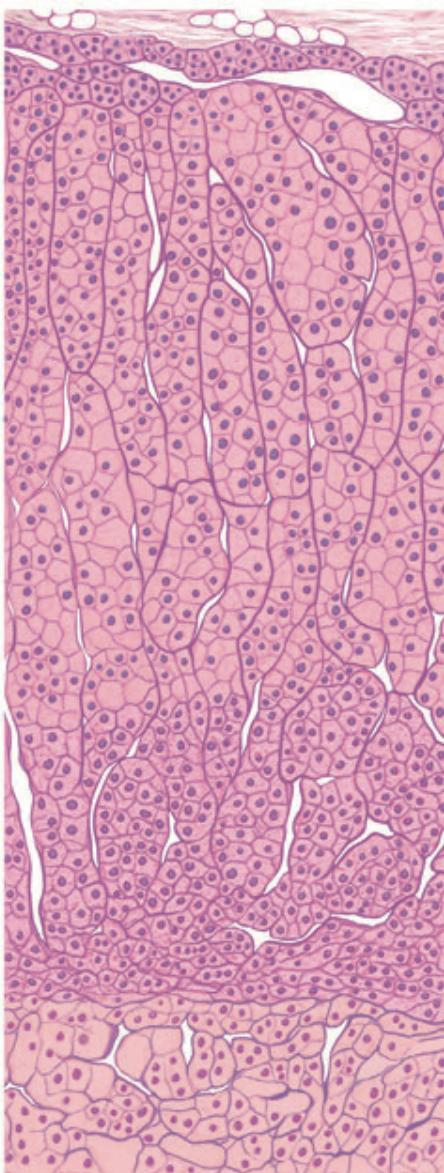


LEFT AND RIGHT ADRENAL GLAND



Grey's Anatomy, 41th ed.

GLL. SUPRARENALES / ADRENALES



💧 Cortex

💧 *Zona glomerulosa - mineralocortikoids*

💧 *Zona fasciculata - glukosortikoids*

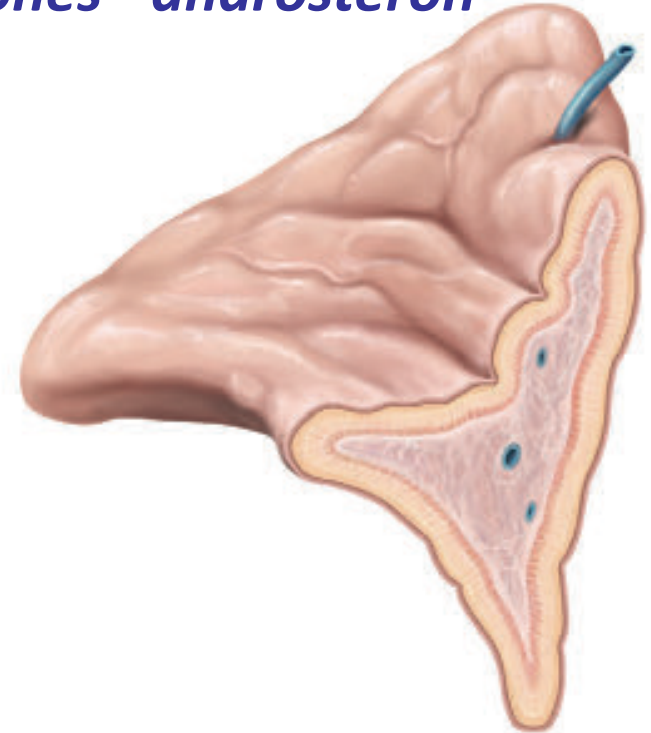
💧 *Zona reticularis – sexual hormones - androsteron*

💧 Medulla

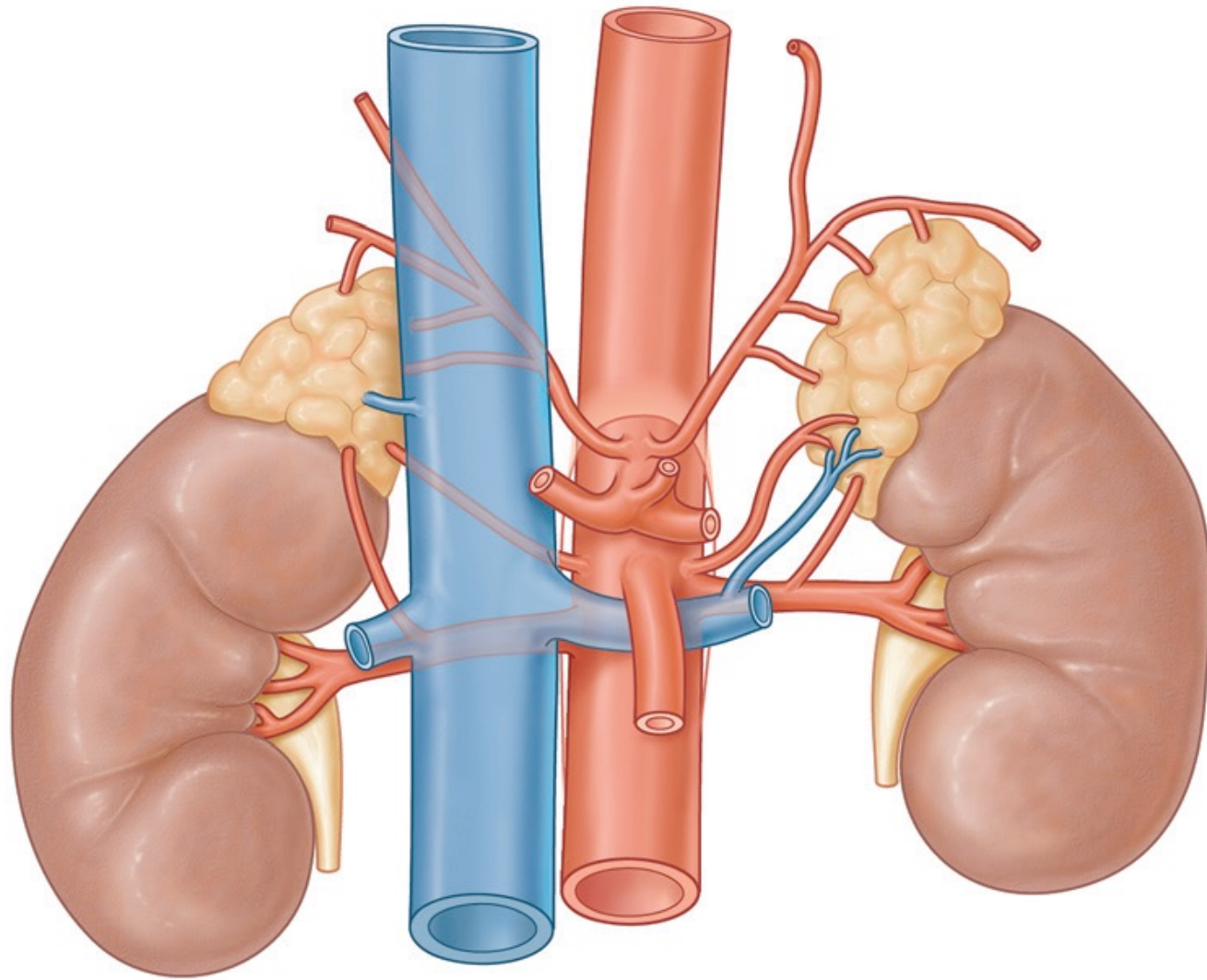
💧 *adrenalin, noradrenalin*

💧 *epinephrine, norepinephrine*

💧 *Sympathetic paraganglion*



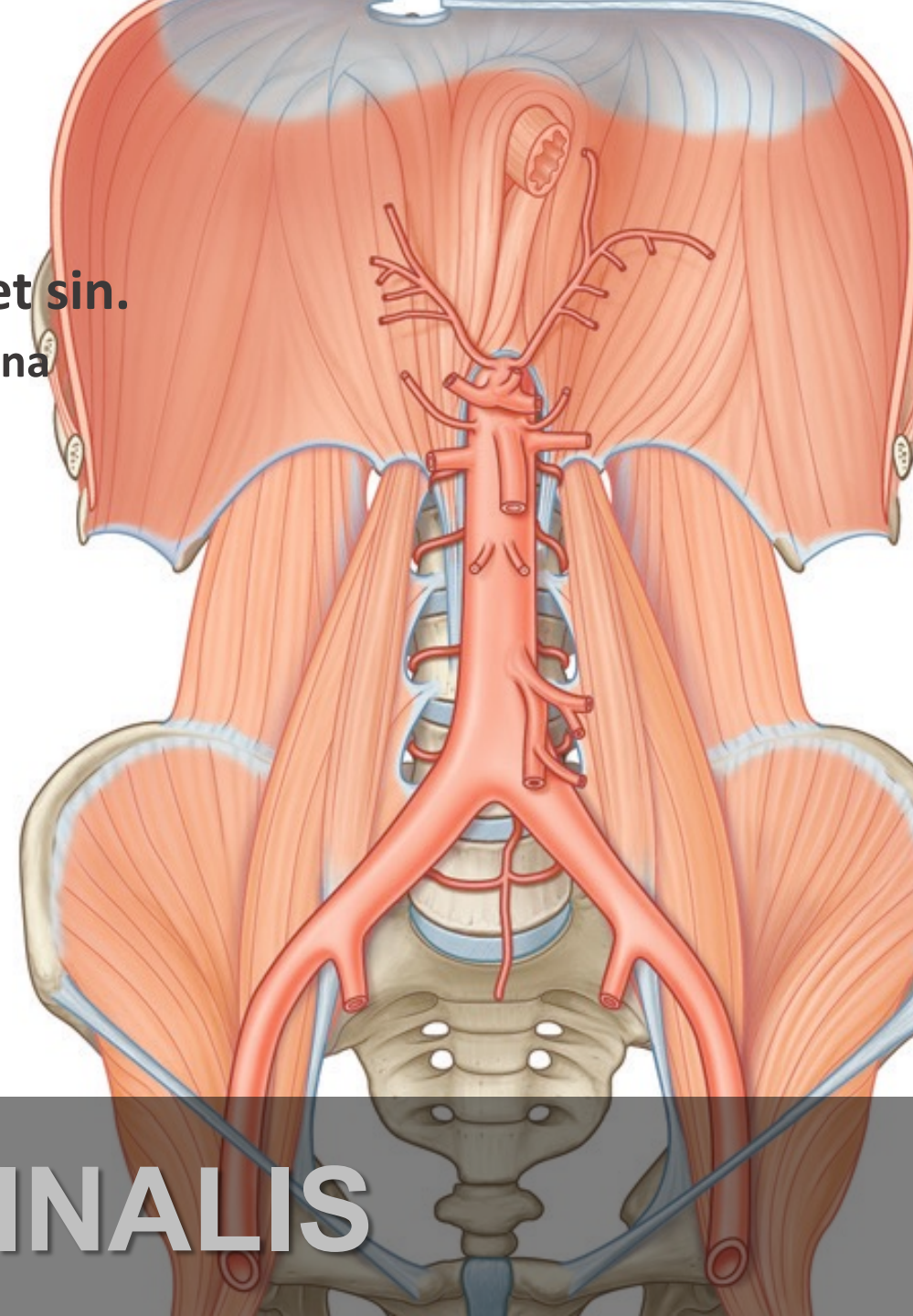
GLL. SUPRARENALES / ADRENALES



- ♦ **Aa. suprarenales superiores**
 - ♦ A. phrenica inferior
- ♦ **A. suprarenalis media**
- ♦ **A. suprarenalis inferior**
 - ♦ A. renalis.
- ♦ **V. suprarenalis dx.**
 - ♦ V. cava inferior
- ♦ **V. suprarenalis sin.**
 - ♦ V. renalis sin.

VASA SUPRARENALIA

- Hiatus aorticus
- Bifurcatio aortae
 - L4
- A. iliaca communis dx. et sin.
 - A. iliaca interna et externa
- A. sacralis mediana
 - Aorta caudalis



AORTA ABDOMINALIS

♦ Tr. coeliacus

♦ A. hepatica communis

- ♦ A. gastroduodenalis
- ♦ A. hepatica propria

♦ A. gastrica sinistra

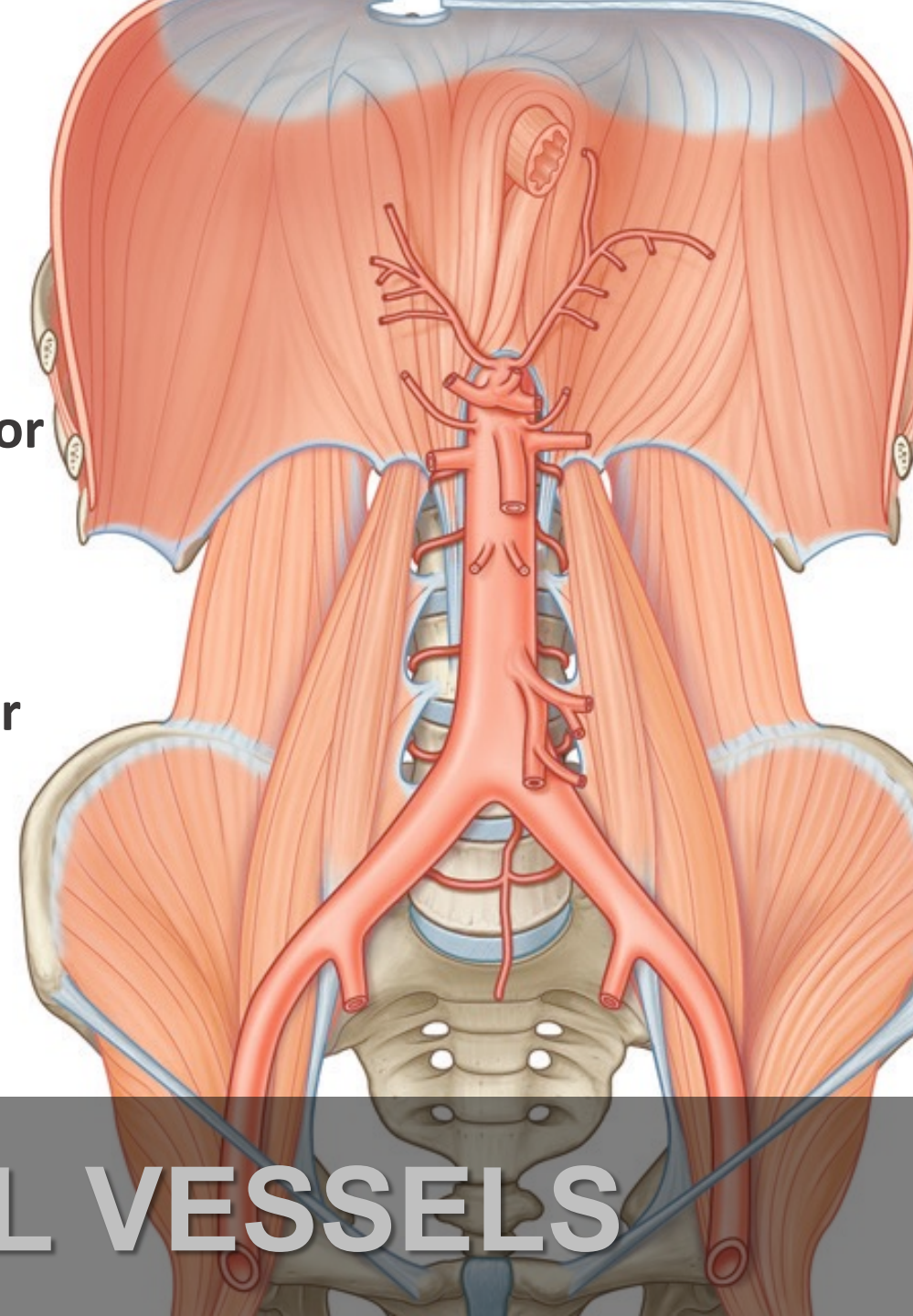
♦ A. lienalis

♦ A. mesenterica superior

- ♦ Rr. jejunaes, ileales
- ♦ A. ileocolica
- ♦ A. colica dx., media

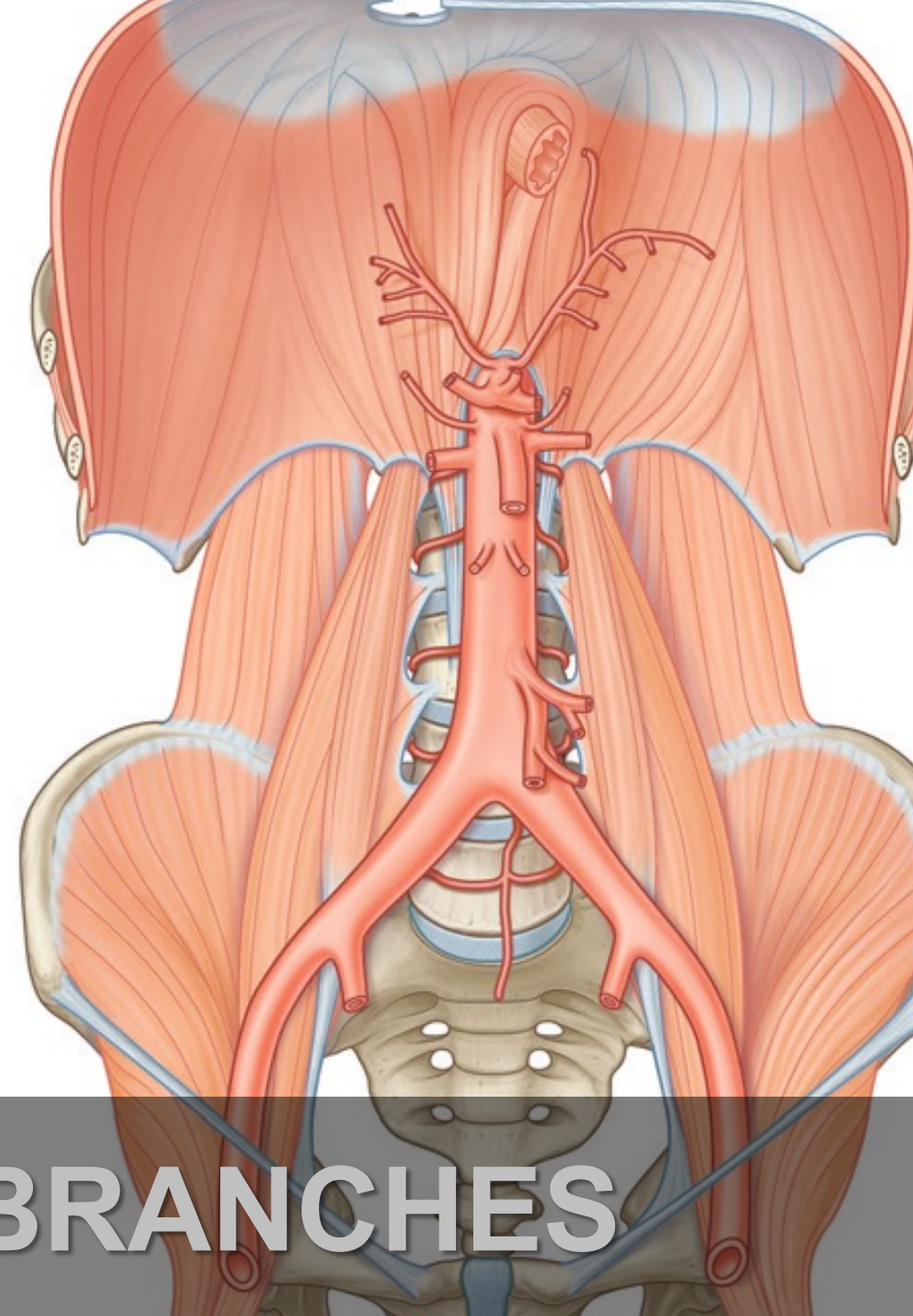
♦ A. mesenterica inferior

- ♦ A. colica sinistra
- ♦ A. sigmoidea
- ♦ A. rectalis superior



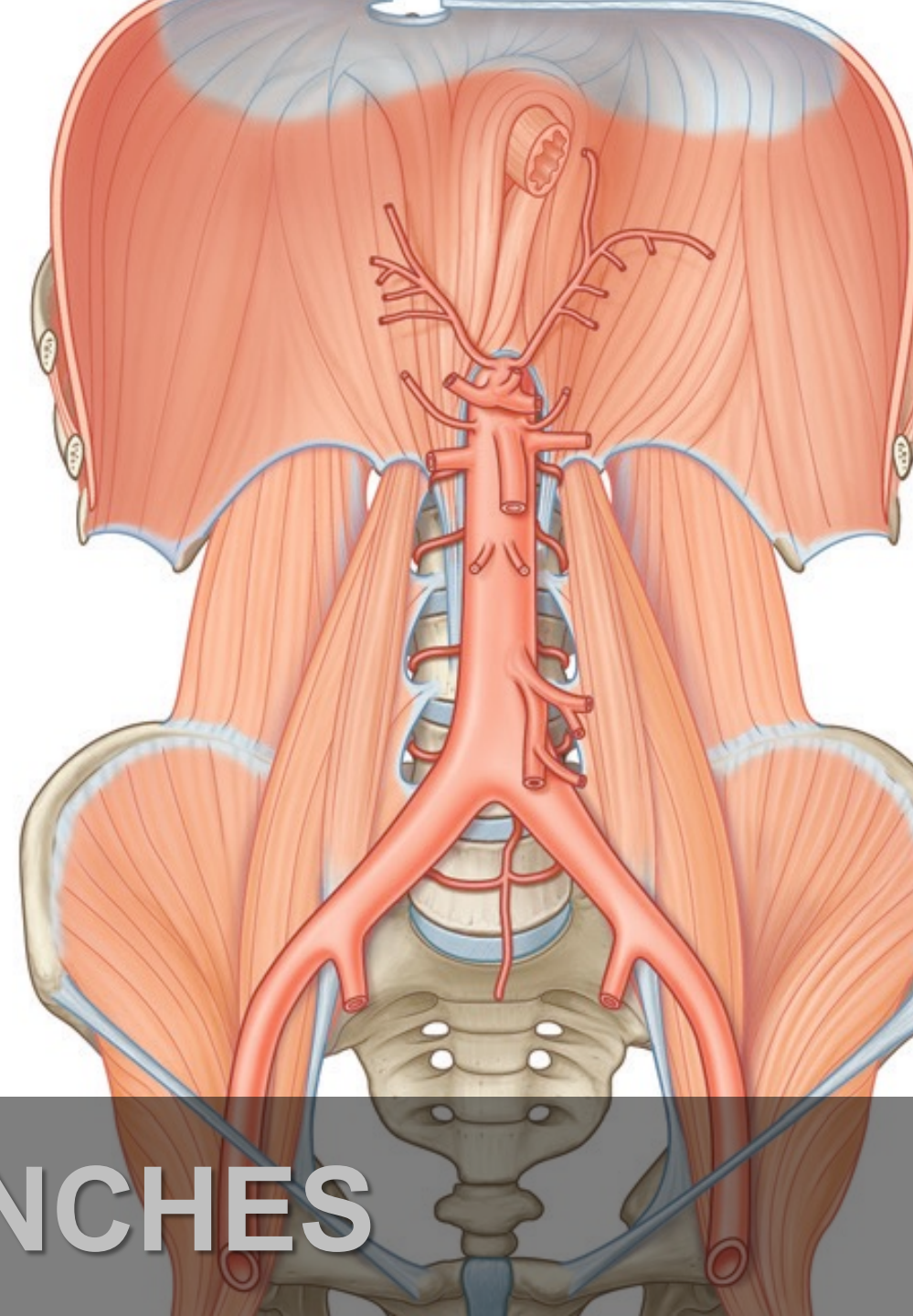
IMPAIRED VISCERAL VESSELS

- **Dextra et sinistra**
- **A. suprarenalis**
- **A. renalis**
- **A. gonadalis**
 - **A. ovarica**
 - **A. testicularis**



PAIRED VISCERAL BRANCHES

- ♦ aa. phrenicae inf.
- ♦ aa. lumbales
- ♦ a. sacralis mediana
- ♦ aa. iliolumbales



PARIETAL BRANCHES

- ♦ **Foramen venae cavae inferioris**

- ♦ **V. iliaca communis sin.**

- ♦ a. iliaca communis dx.

- ♦ nutcracker

- ♦ **Přítoky**

- ♦ **V. testicularis/ovarica dx.**

- ♦ *Left-sided to v. renalis sin.*

- ♦ **Vv. lumbales**

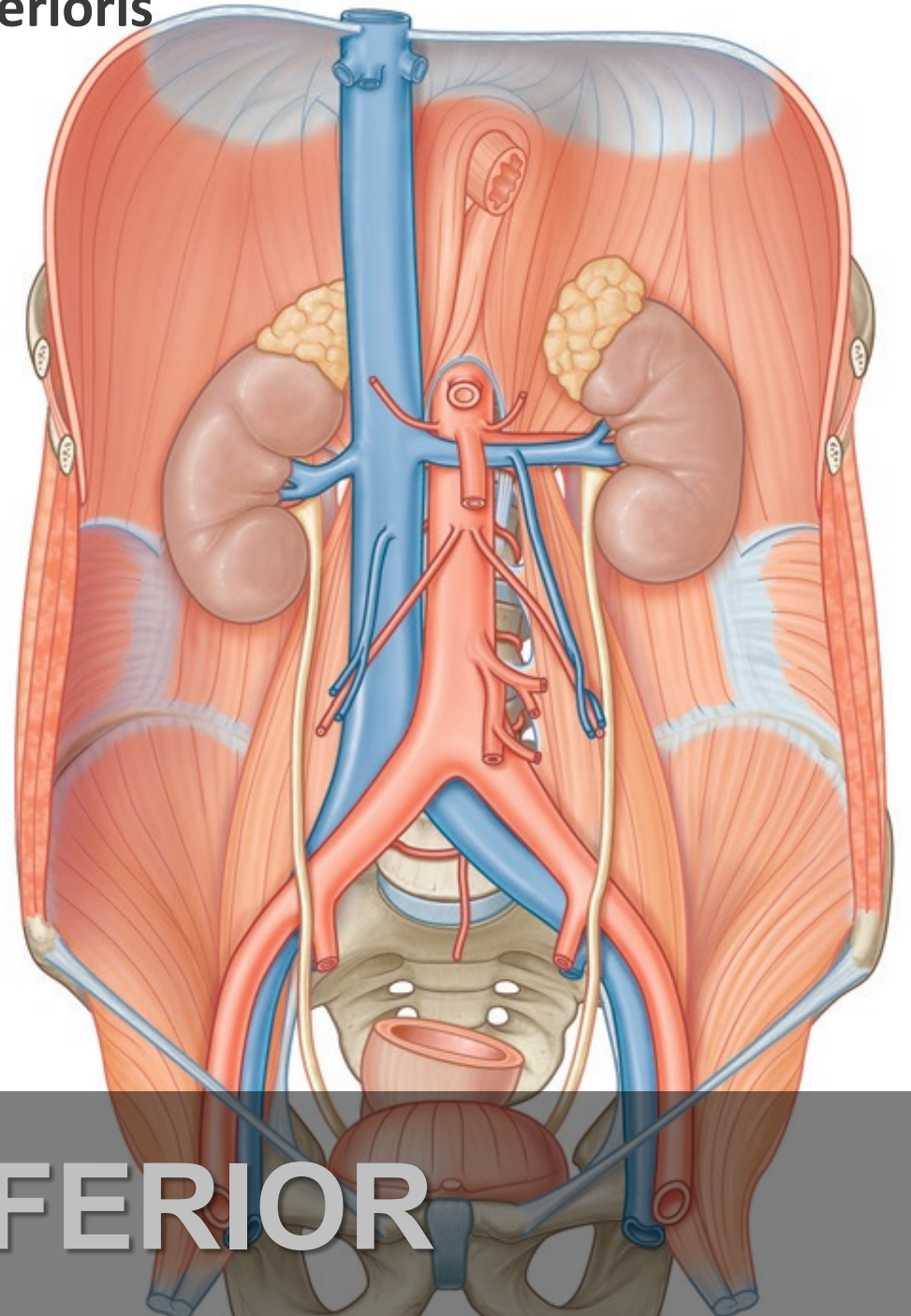
- ♦ **Vv. renales**

- ♦ **Rami ureteralis dx.**

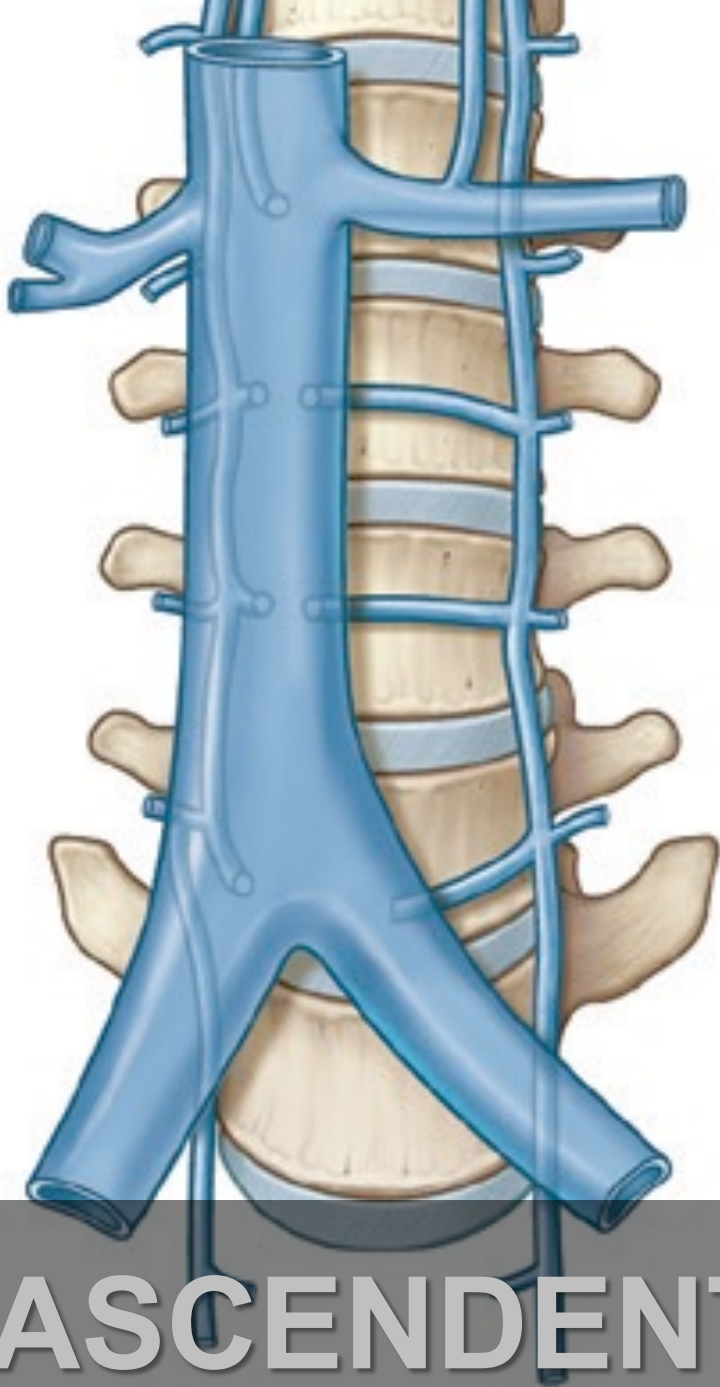
- ♦ **V. suprarenalis dx.**

- ♦ *Left-sided to v. renalis sin.*

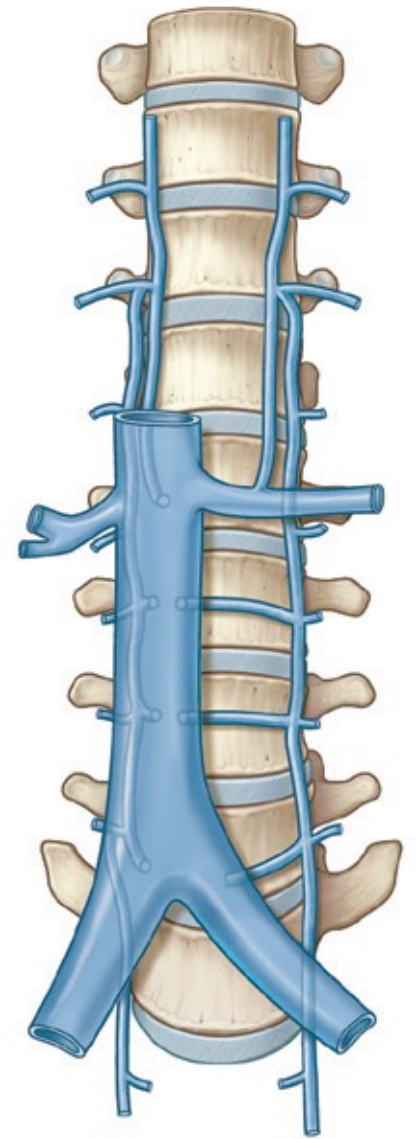
- ♦ **Vv. hepaticae**



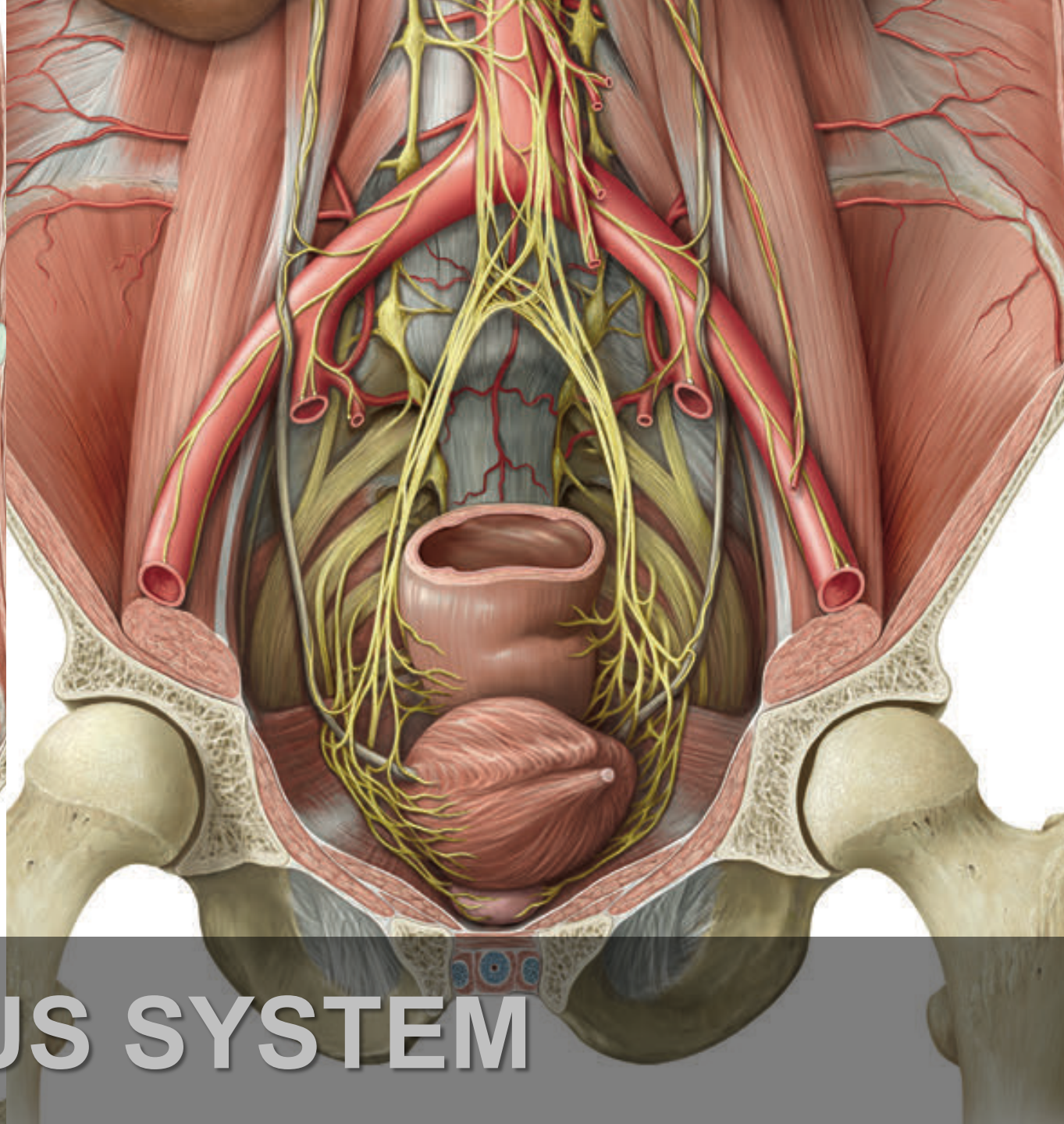
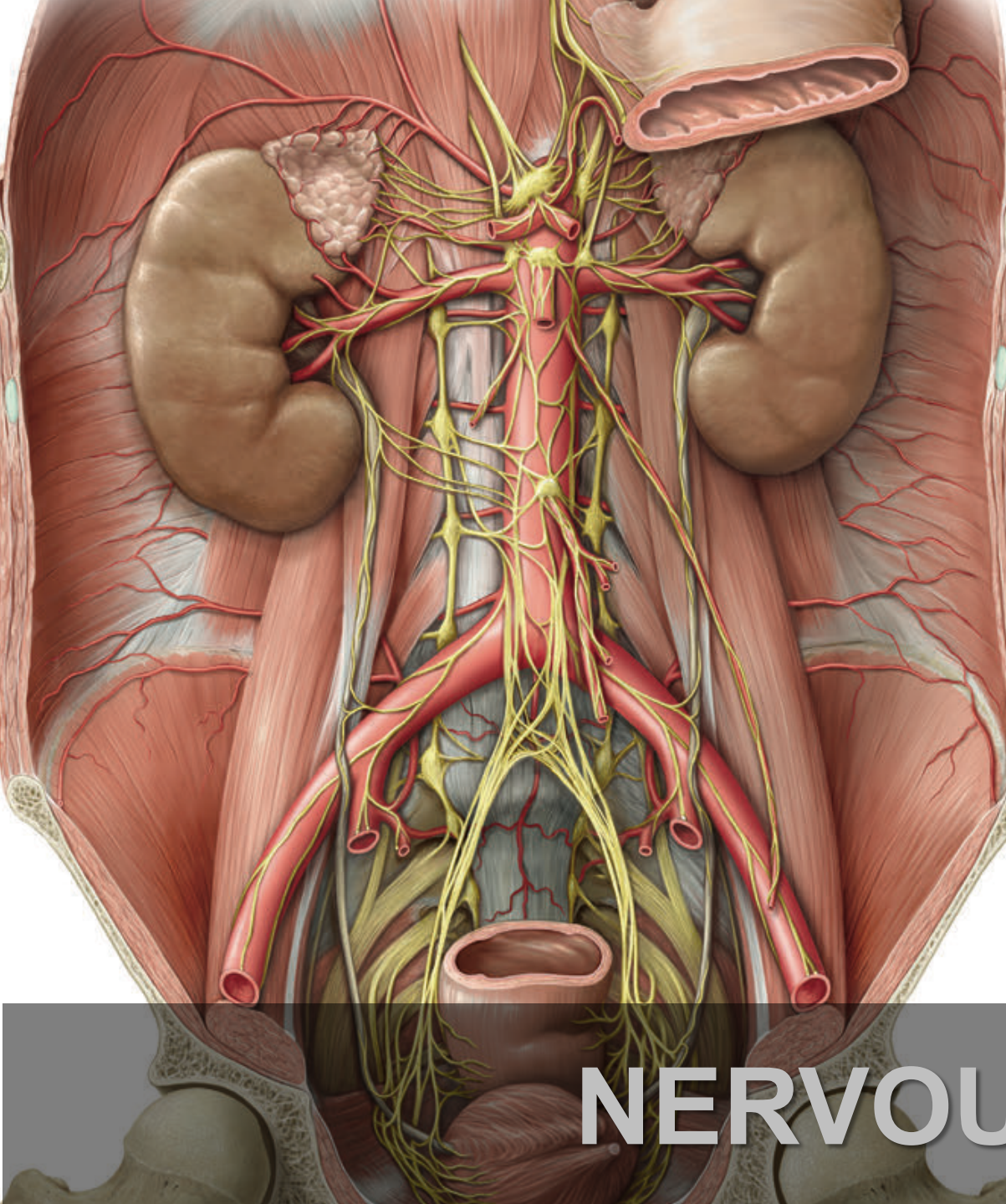
VENA CAVA INFERIOR



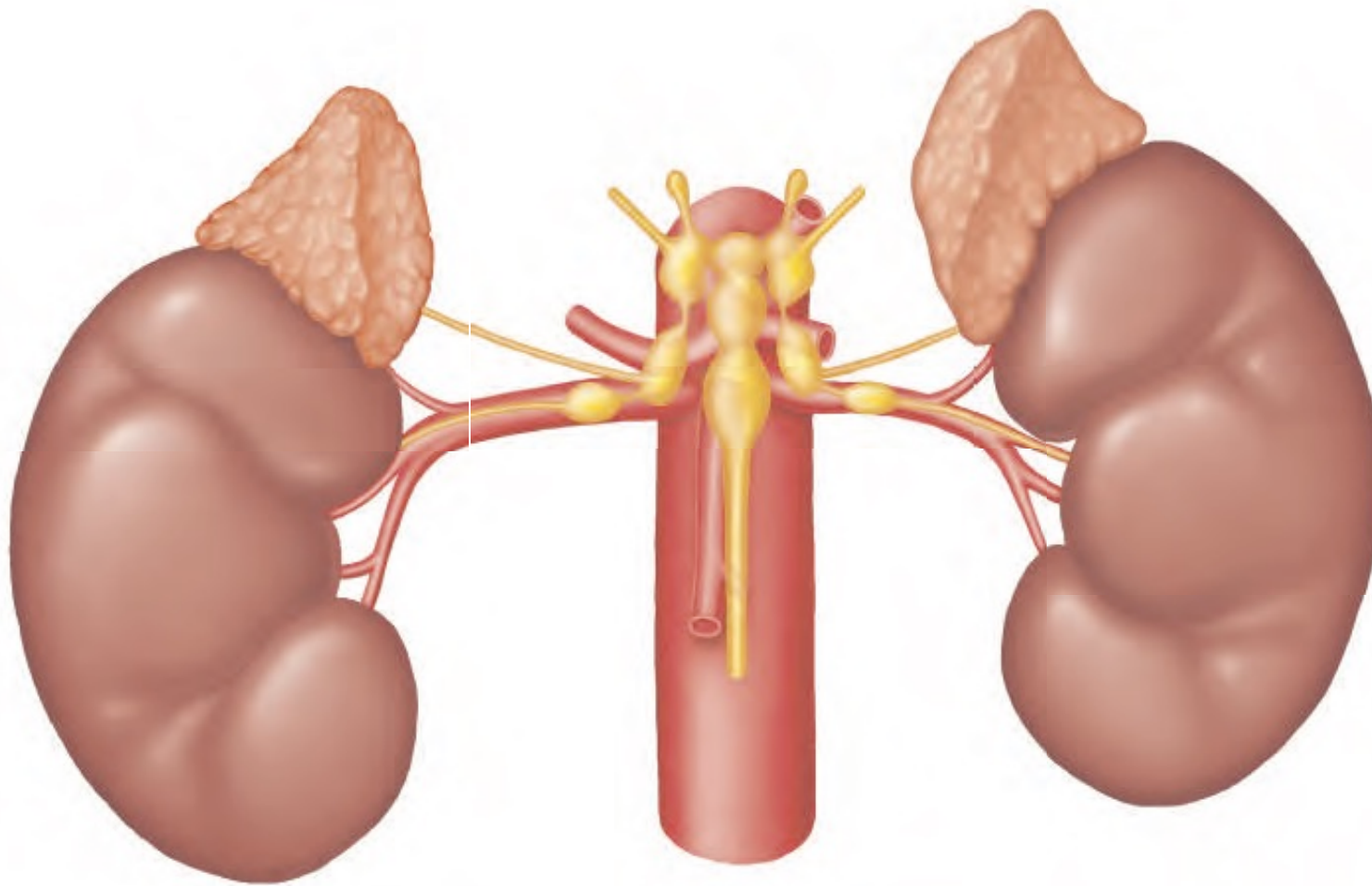
- ♦ Horizontal connections to v. cava inferior
 - ♦ Below L1/L1
- ♦ Vertical connections
 - ♦ In between
 - ♦ v. iliolumbalis (opens to v. iliaca comm.)
 - ♦ v. renalis sinistra
 - ♦ Continuation to v. azygos/hemiazygos



ASCENDING LUMBAR VENOUS SYSTEM



NERVOUS SYSTEM

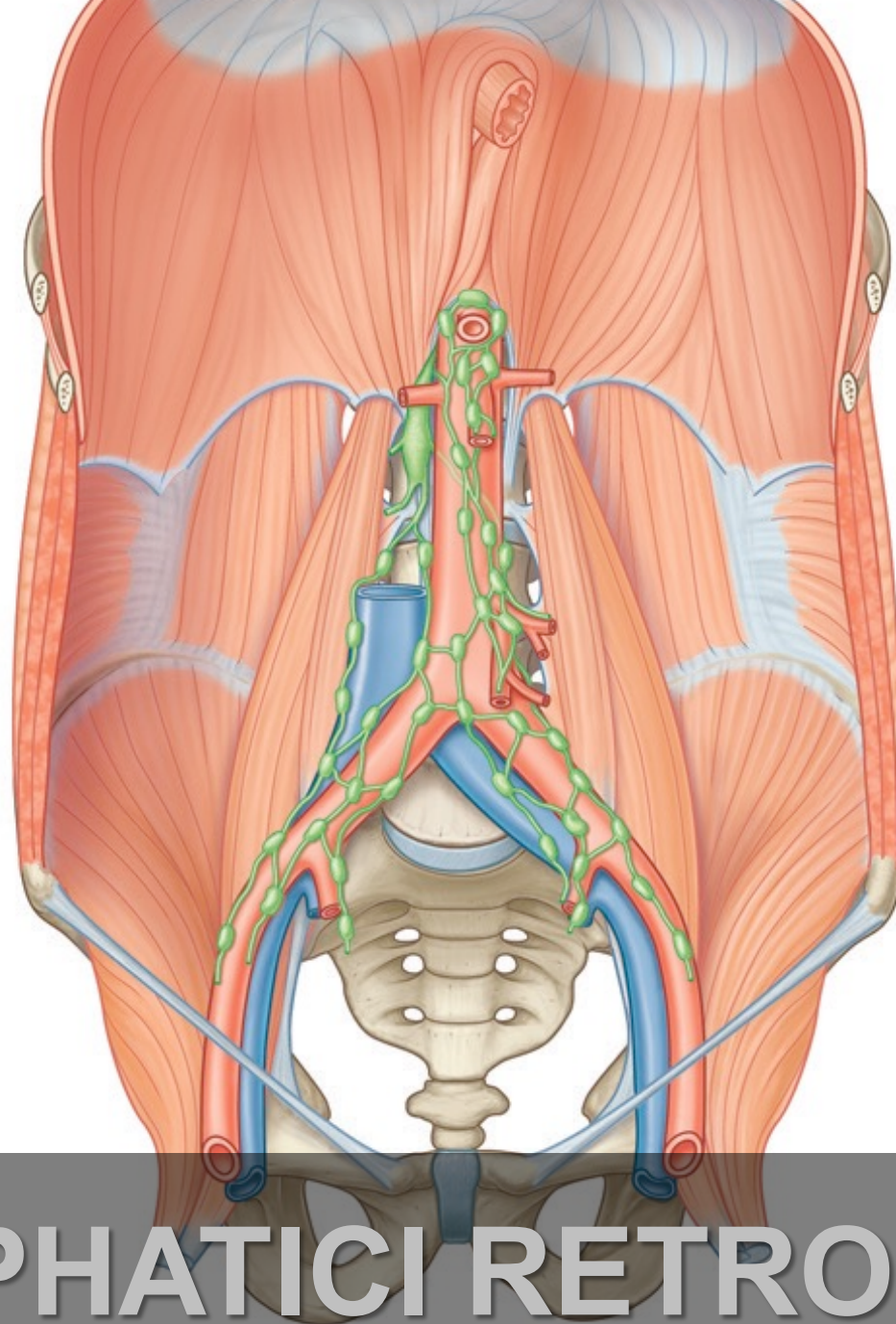


- ♦ **Plexus phrenicus**
- ♦ **N. splanchnicus major**
- ♦ **N. splanchnicus minor**
- ♦ **Ggl. coeliaca dx/sin**
- ♦ **plexus solaris**
- ♦ **Ggl. mesentericum superius**
- ♦ **Ggl. aorticorenales**
- ♦ **Plexus mesentericus superius**
- ♦ **Plexus aorticus**

PLEXUS PERIVASCULARES

- Nodi lateris dextri
- Nodi iliaci externi
- Nodi iliaci communes
- Nodi ovarici (testiculares)
- Nodi paracavales dx.
- Nodi interaortocavales

- Cisterna chyli
- Ductus thoracicus



- Nodi lateris sinistri
- Nodi iliaci externi
- Nodi iliaci communes
- Nodi ovarici (testiculares)
- Nodi paraaortales sinistri
- Nodi preaortales
- Nodi coeliaci

NODI LYMPHATICI RETROPERITONEI



ABDOMEN 4

Prof. MUDr. Jiří Ferda, Ph.D.