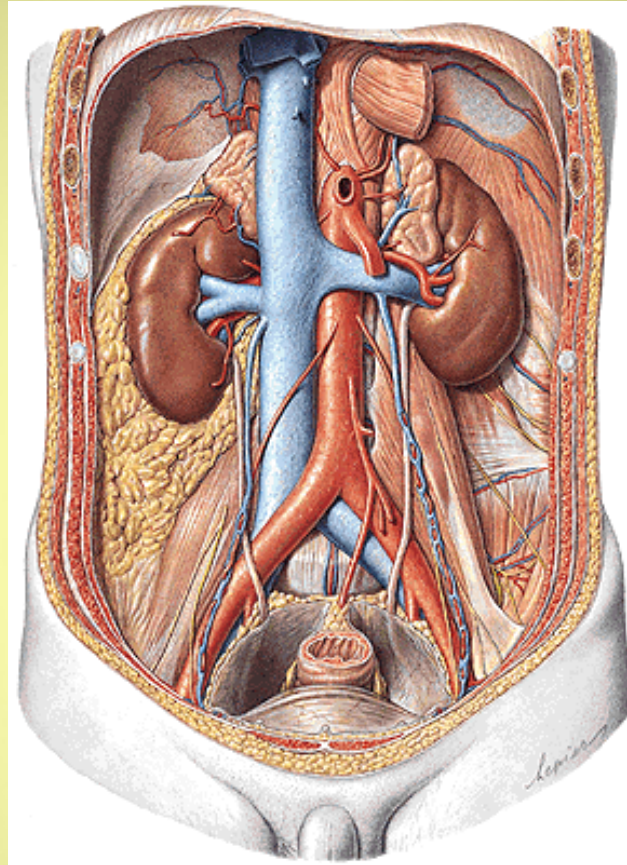


URINARY SYSTEM

FUNCTIONS

- **Removal of waste product from the body**
- **Regulation of electrolyte balance**
- **Regulation of acid-base homeostasis (blood pH)**
- **Controlling blood volume and maintaining blood pressure**



PARTS

Kidney (ren)

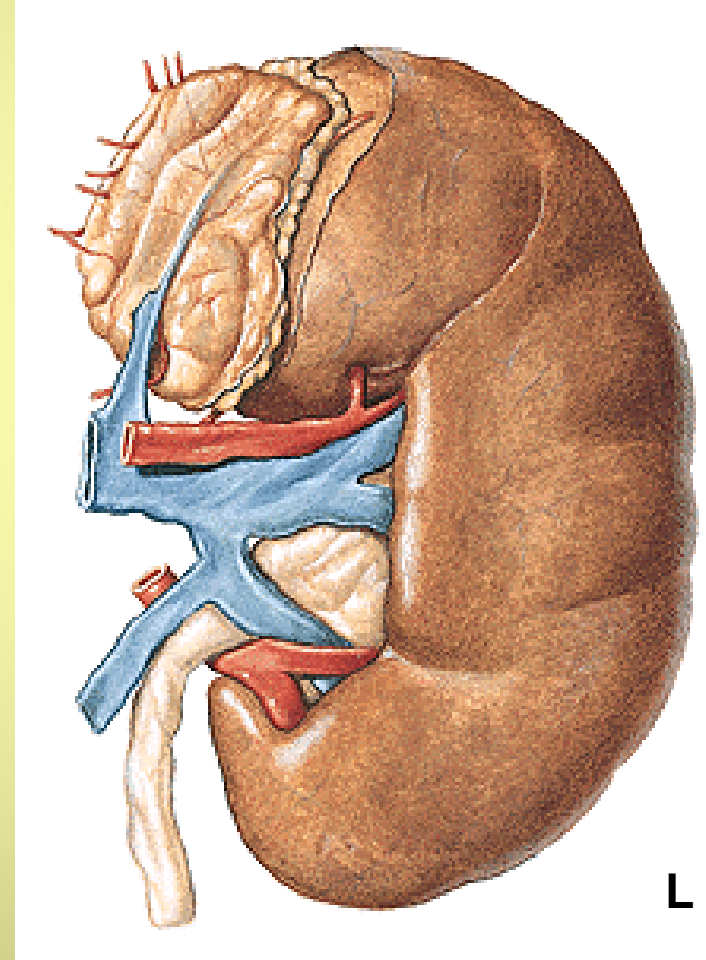
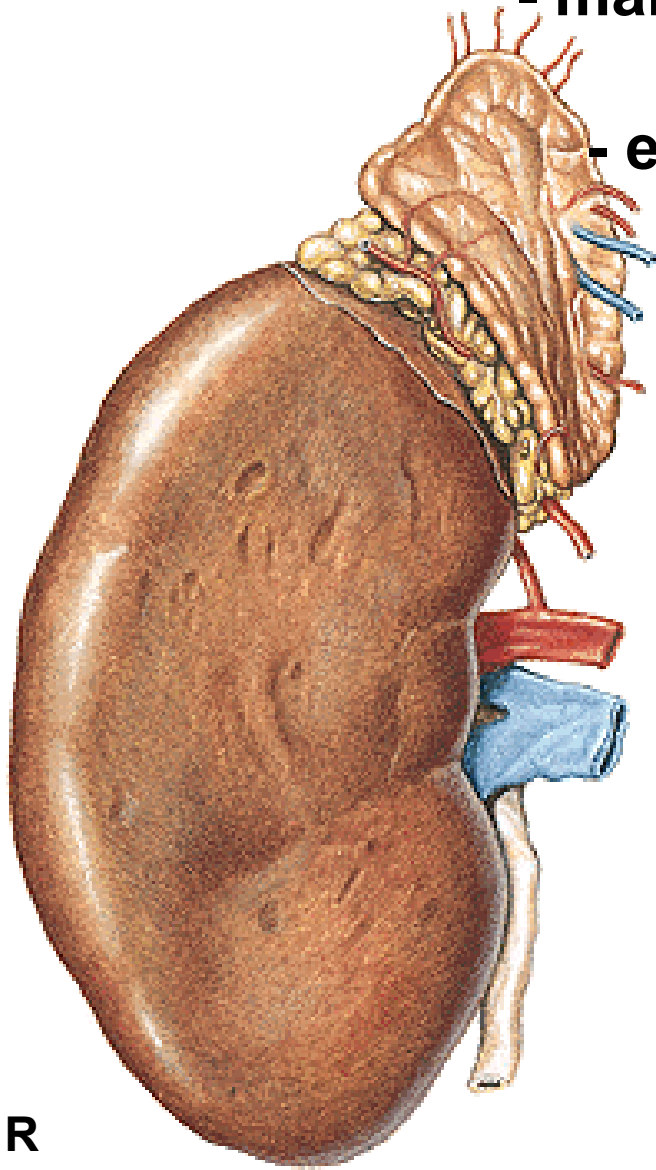
Efferent urinary tract:
renal calices
renal pelvis
ureter
urinary bladder
urethra

REN, NEPHROS - facies anterior et posterior

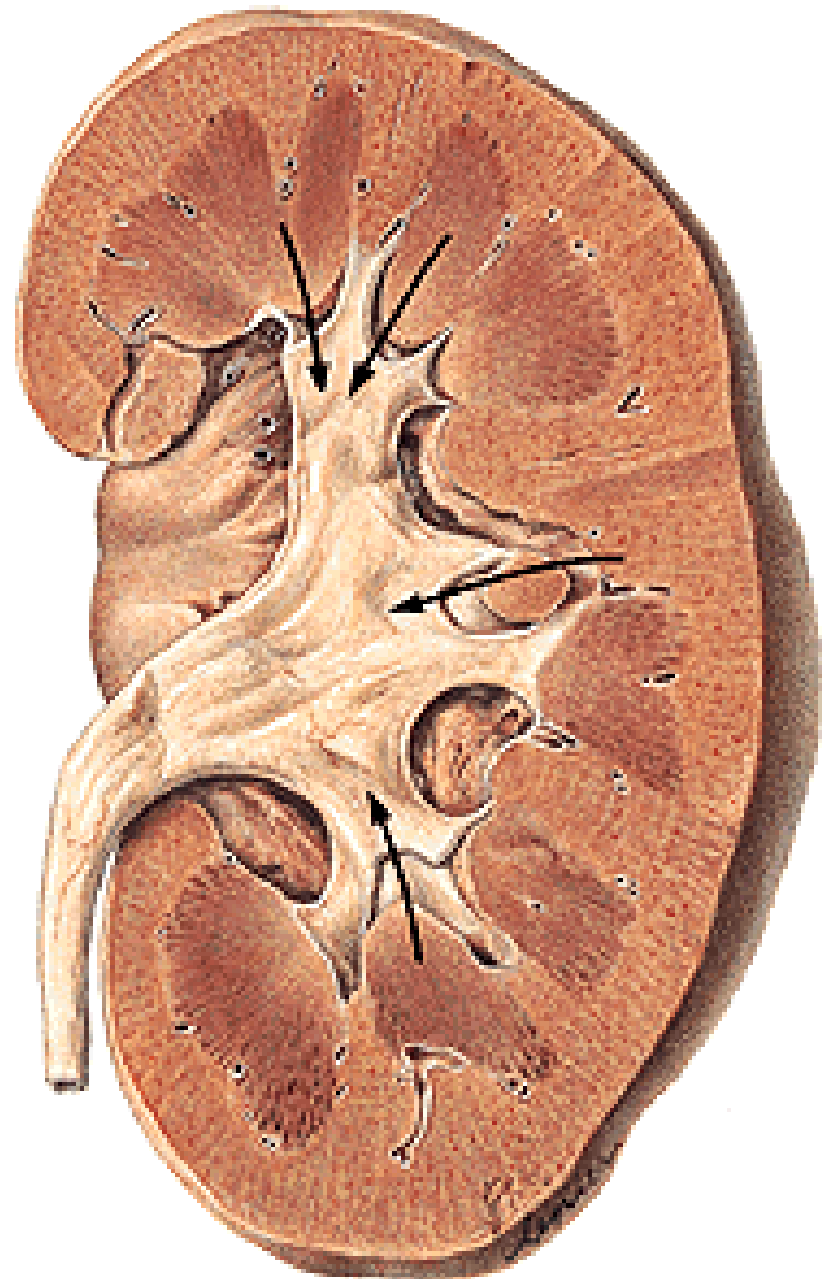
- margo lateralis et medialis - hilum renale

- sinus renalis

- extremitas superior et inferior



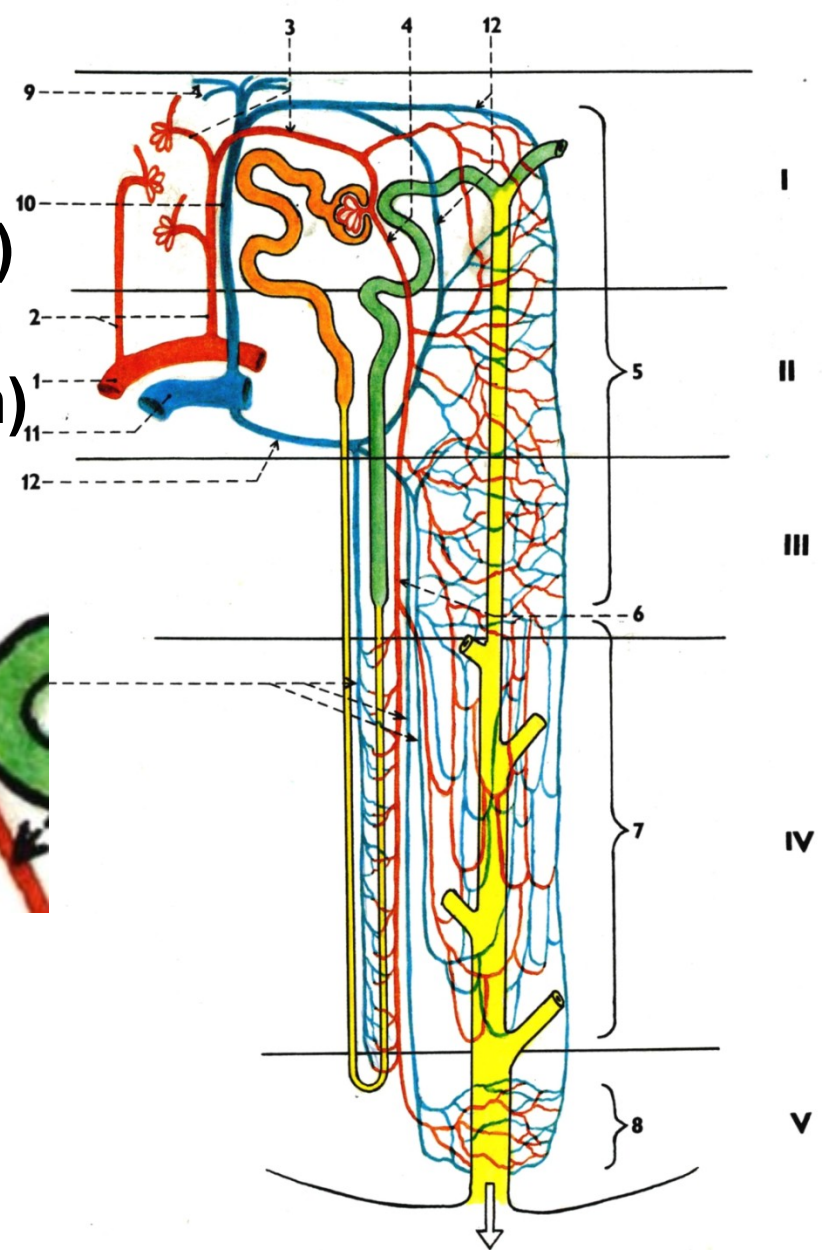
Capsula fibrosa
Sinus renalis
Cortex renalis
Medulla renalis
– 6-20 pyramides renales
Columnae renales
Papilla renalis
Ductus papillares
Foramina papillaria
Area cribrosa
Lobus renalis



NEPHRON

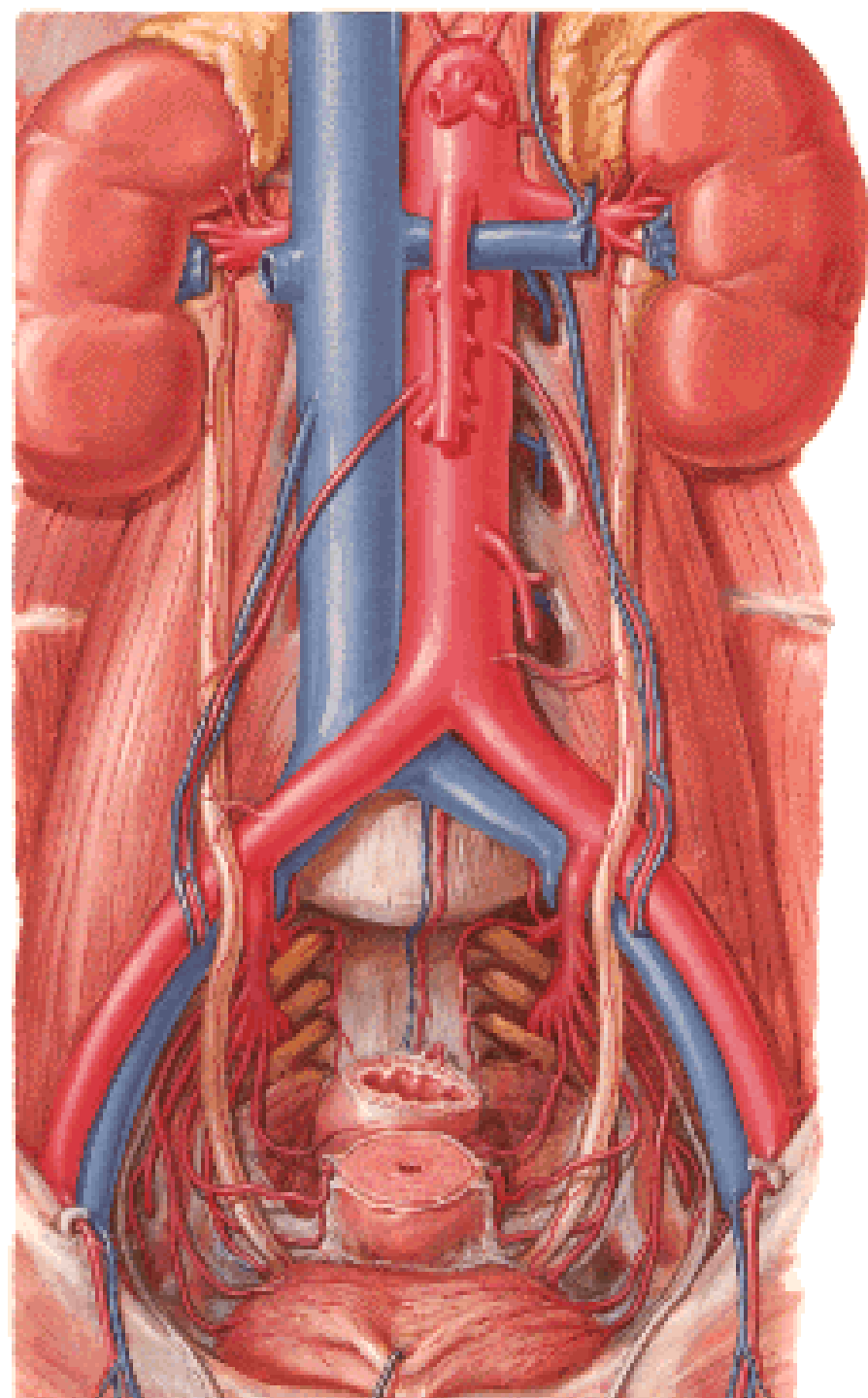
- Corpusculum renale (Malpighi)
 - Glomerulus
 - Capsula glomeruli (Bowman)
- Tubulus proximalis
- Henle's loop
- Tubulus distalis

Tubulus colligens
Ductus papillaris
Foramen papillare



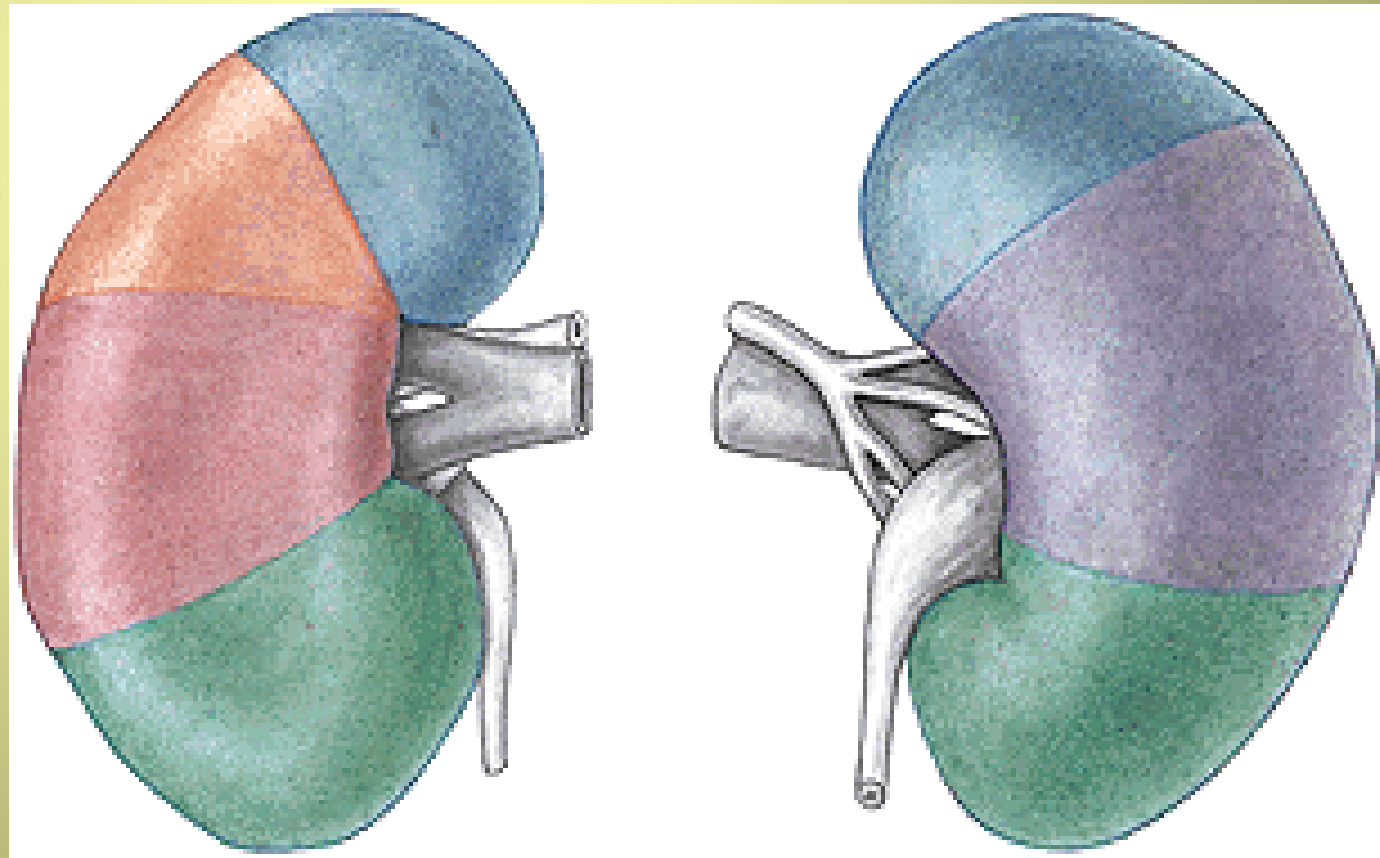
A. renalis

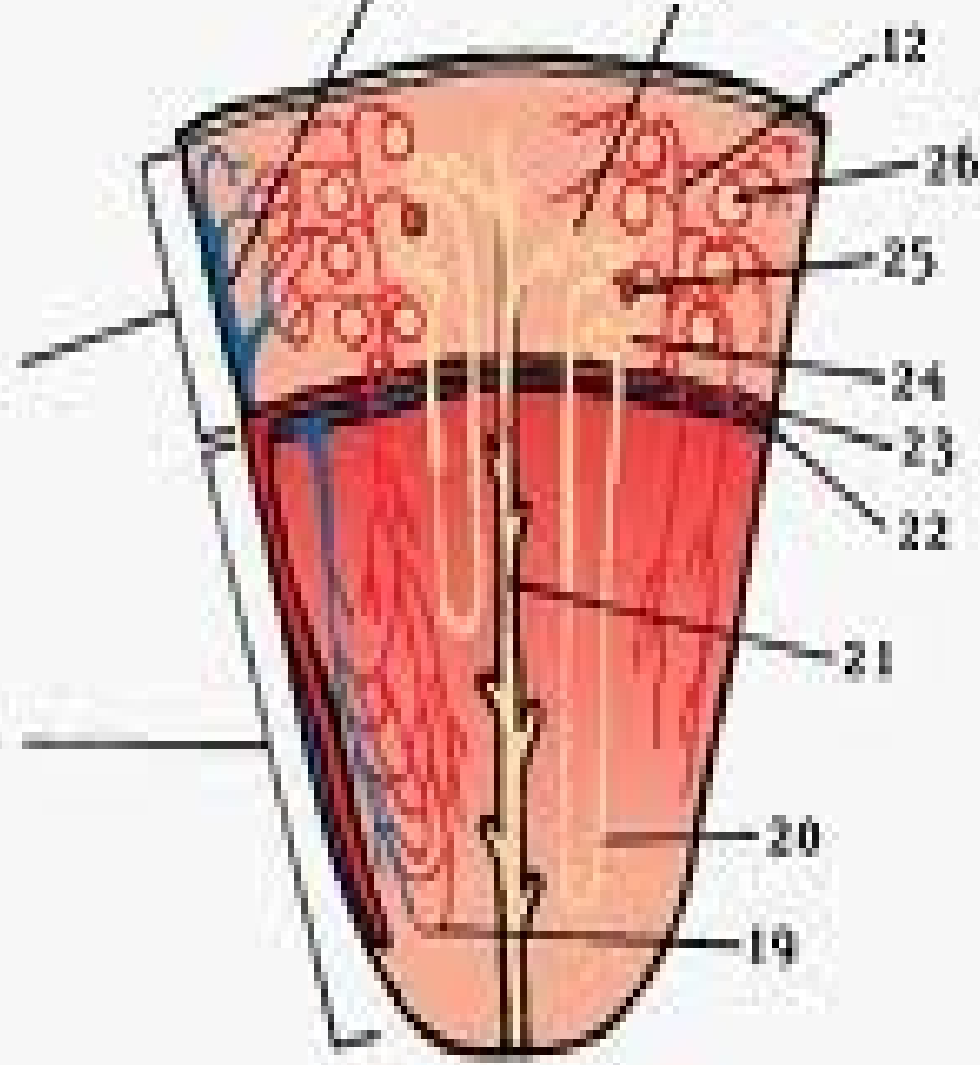
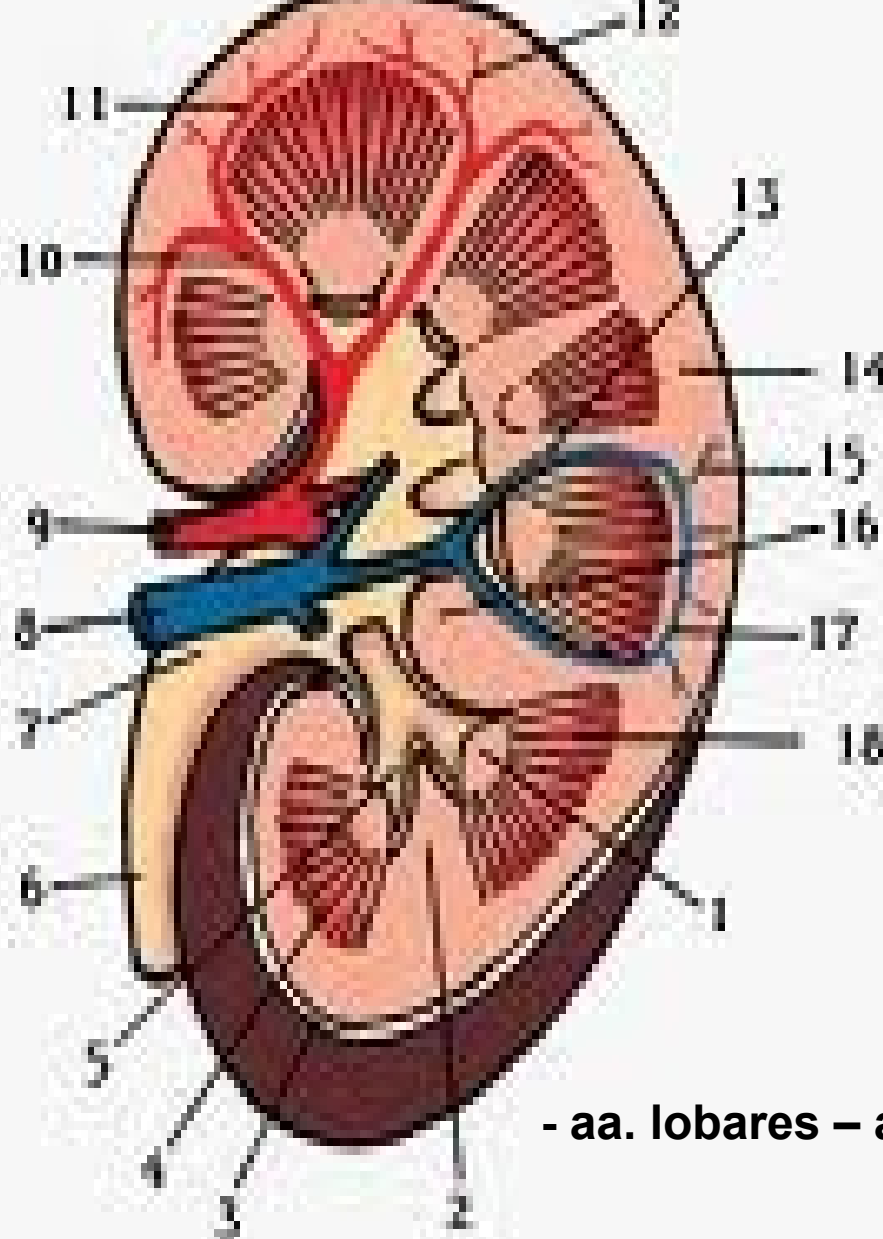
- r. anterior – 4 rr. praepelvici
- r. posterior – r. retropelvicus



Segmenta renalia – s. superius

- s. anterius superius
- s. anterius inferius
- s. inferius
- s. posterius

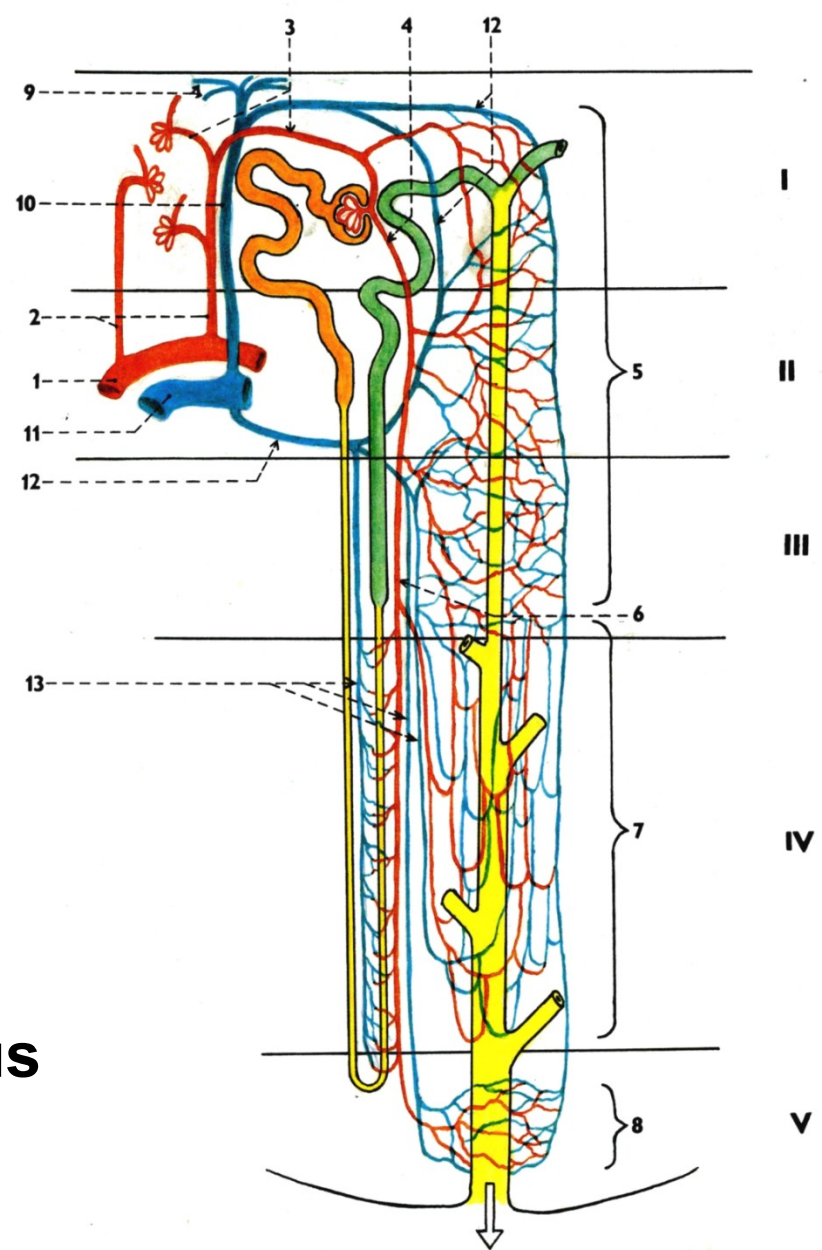




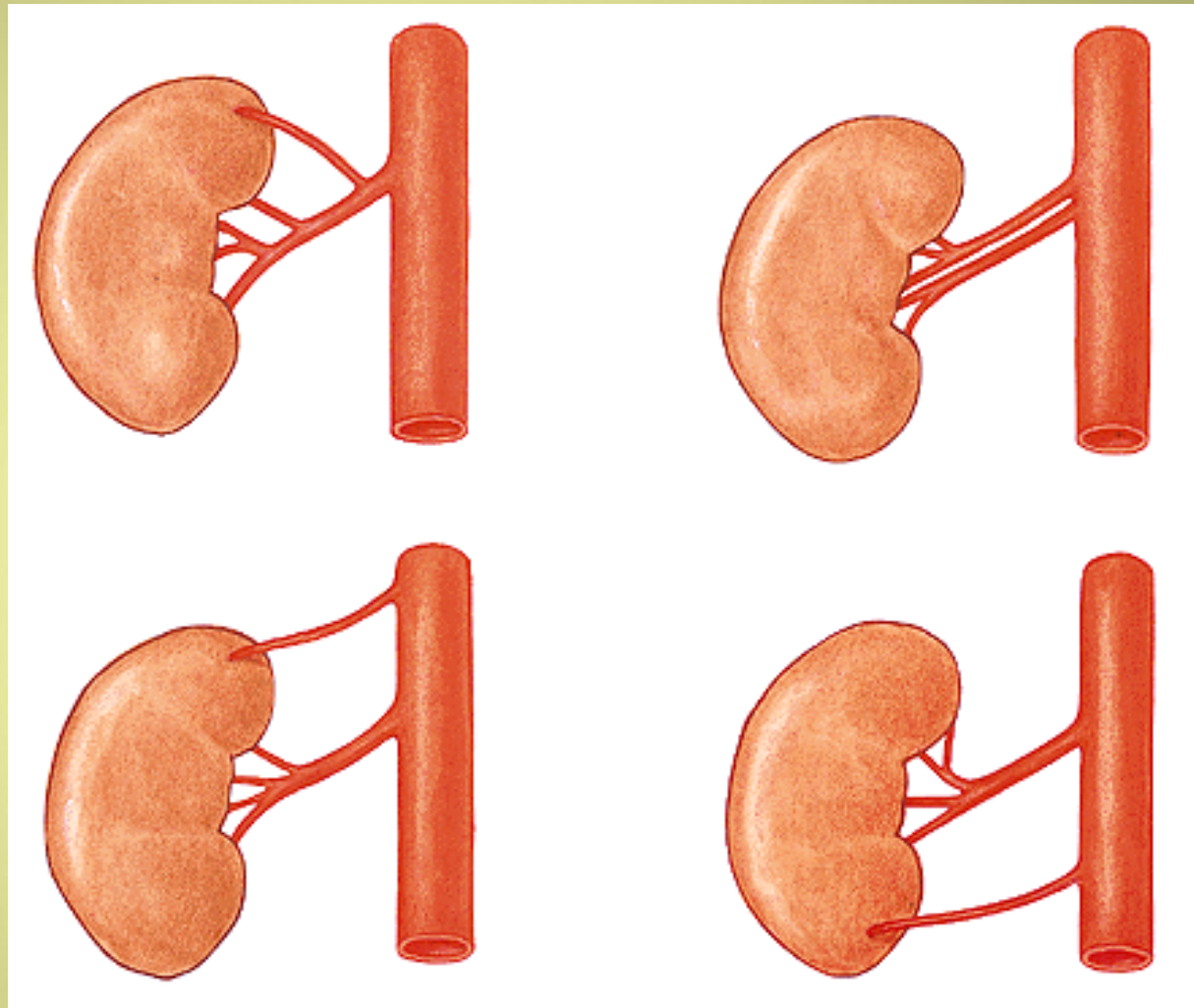
- aa. lobares – aa. interlobares – aa. aruateae

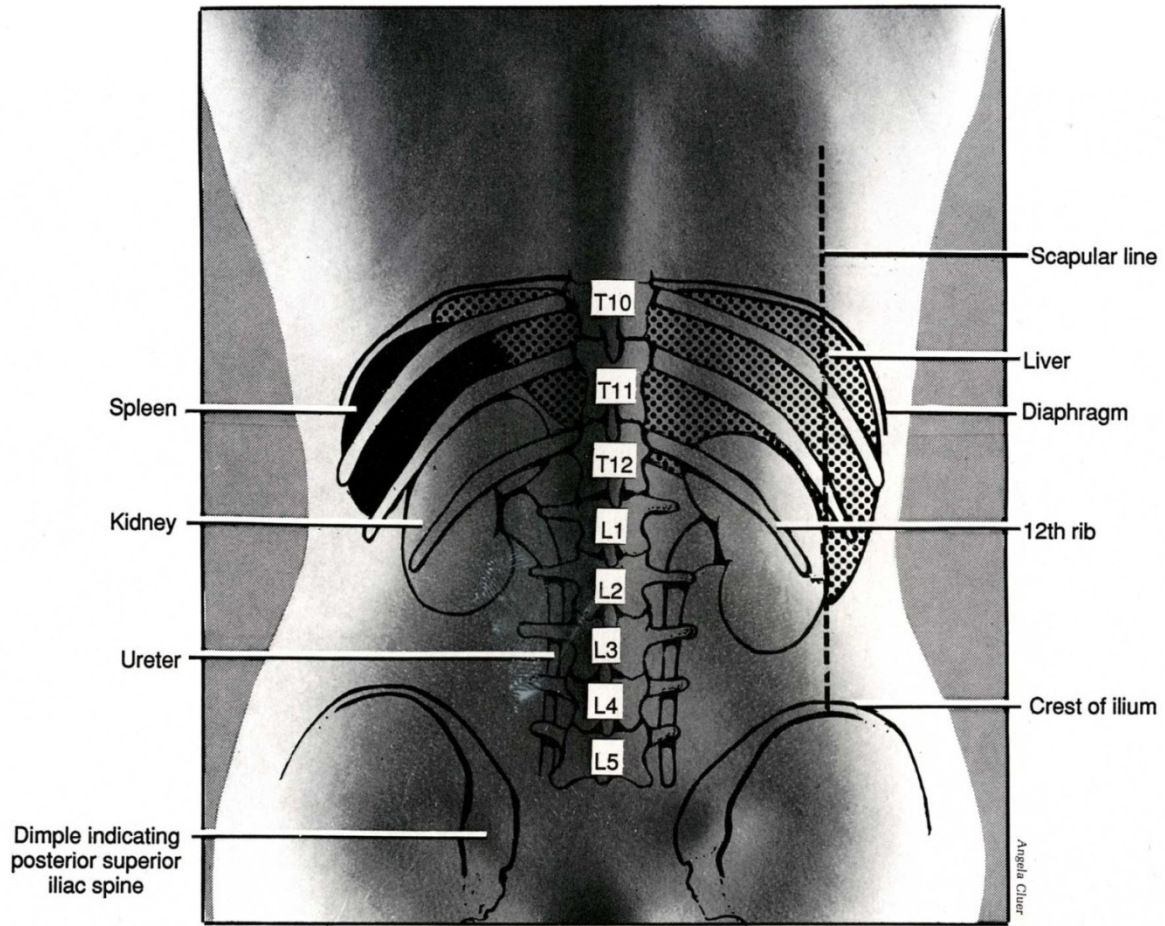
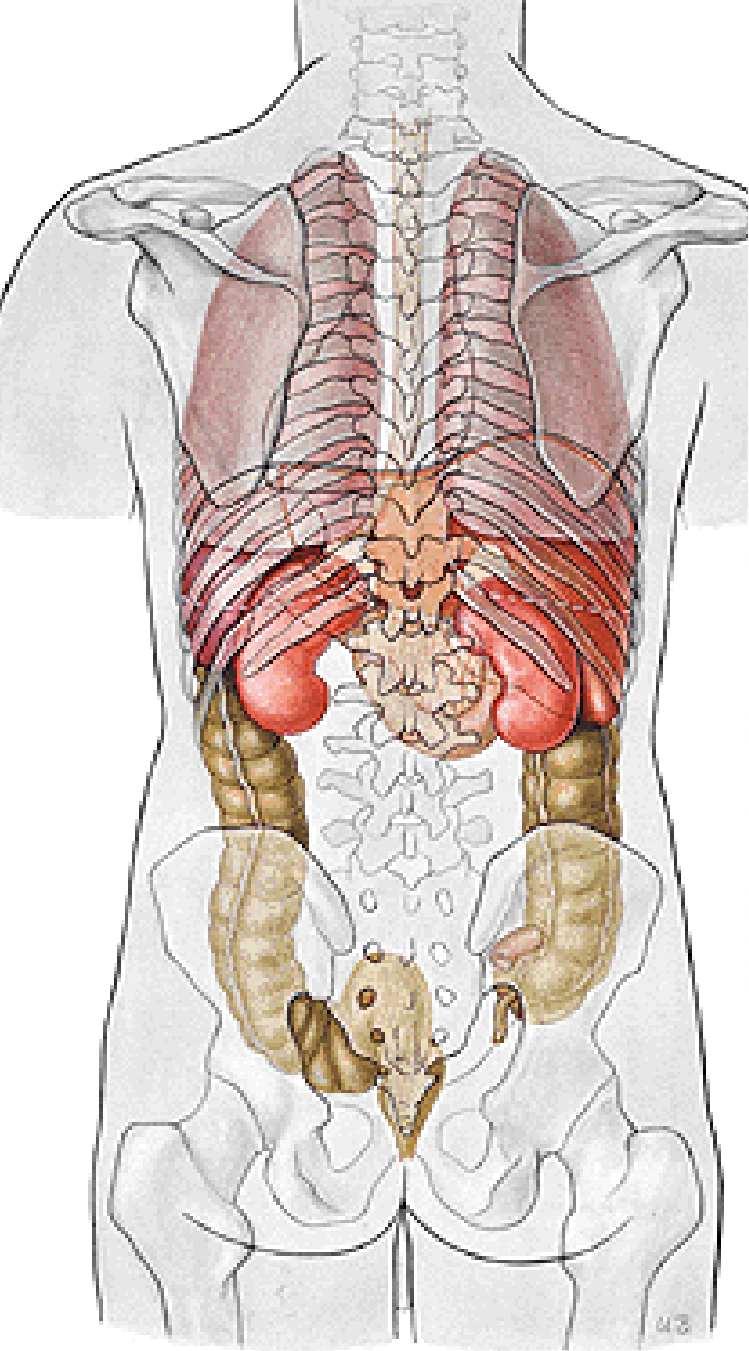
Aa. interlobares:

1. A. arcuata
2. A. interlobularis
3. Vas afferens
4. Vas efferens
5. Peritubular capillary plexus
6. Arteriola recta
7. Capillary plexus in the medulla
8. Capillary plexus around papillary duct
9. Venulae stellatae
10. V. interlobularis
11. V. arcuata
12. Vein from the peritubular plexus
13. Venulae rectae



Aa. renales accessoriae





1. Diaphragma

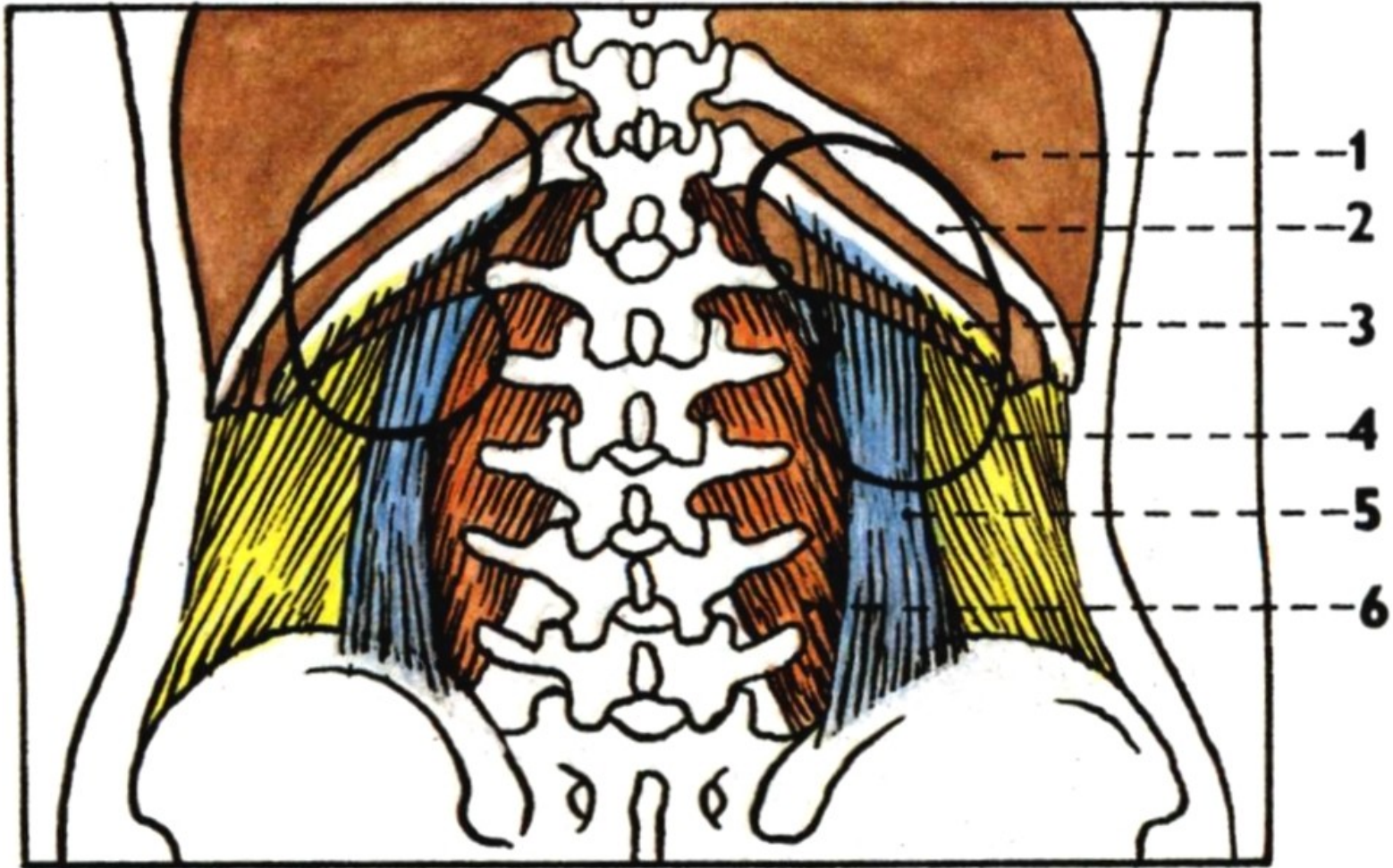
2. 11th rib

3. 12th rib

4. M. transversus abdominis

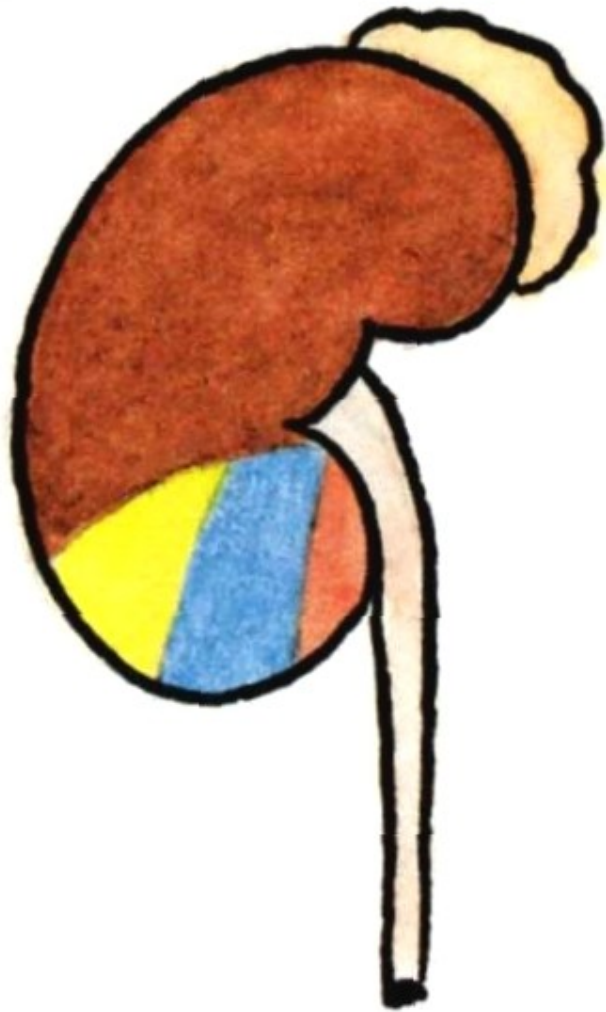
5. M. quadratus lumborum

6. M. psoas major

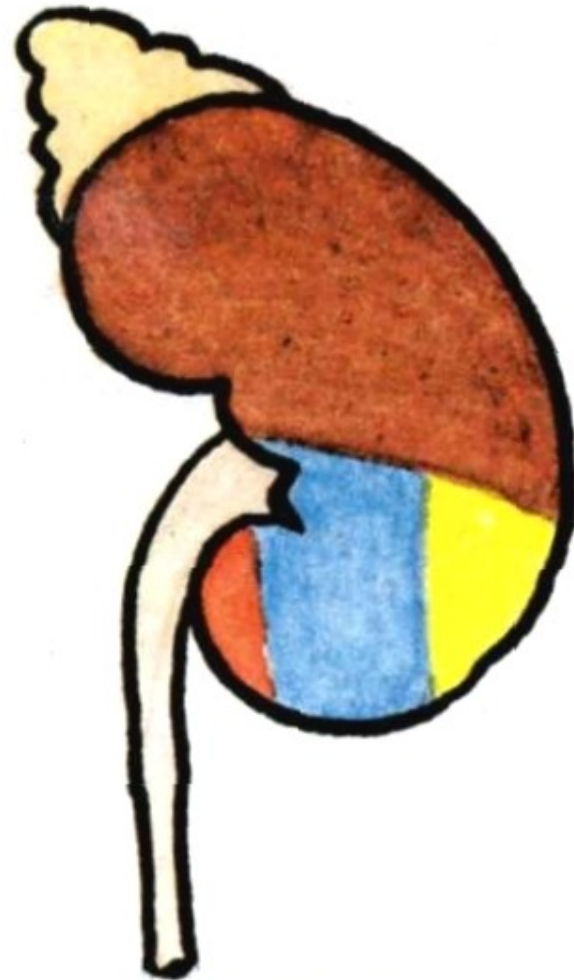


SIN.

DX.

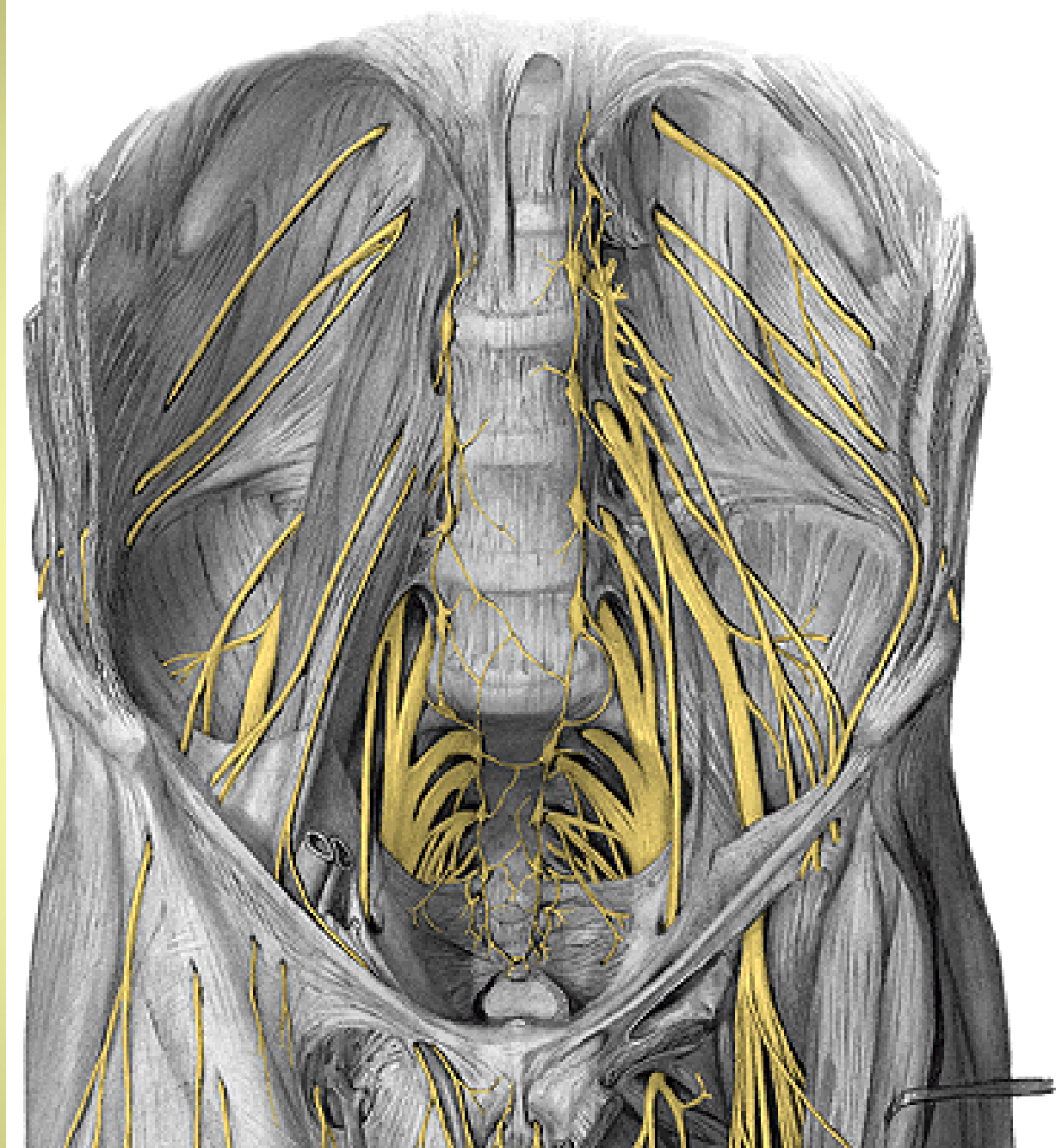


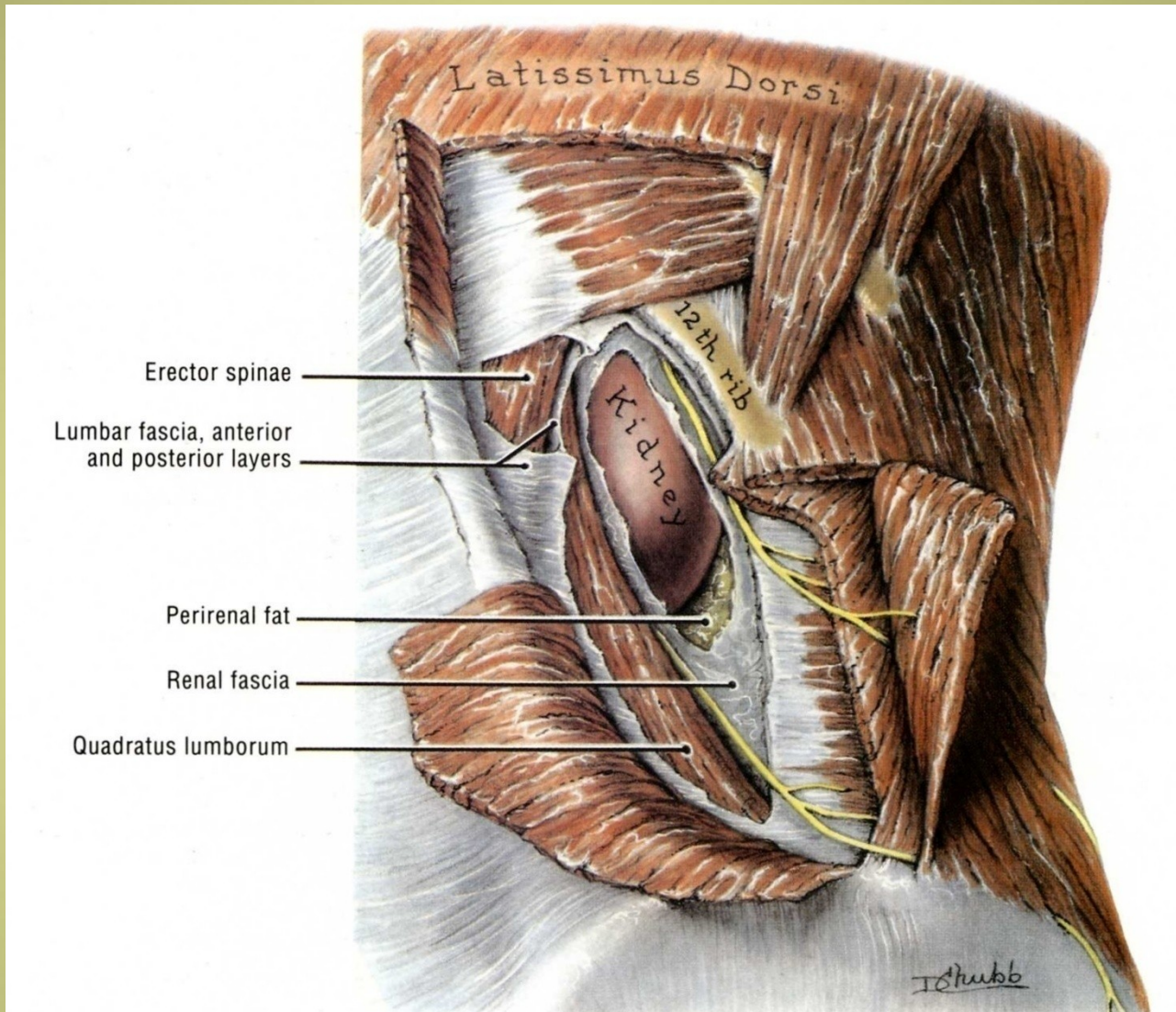
SIN.



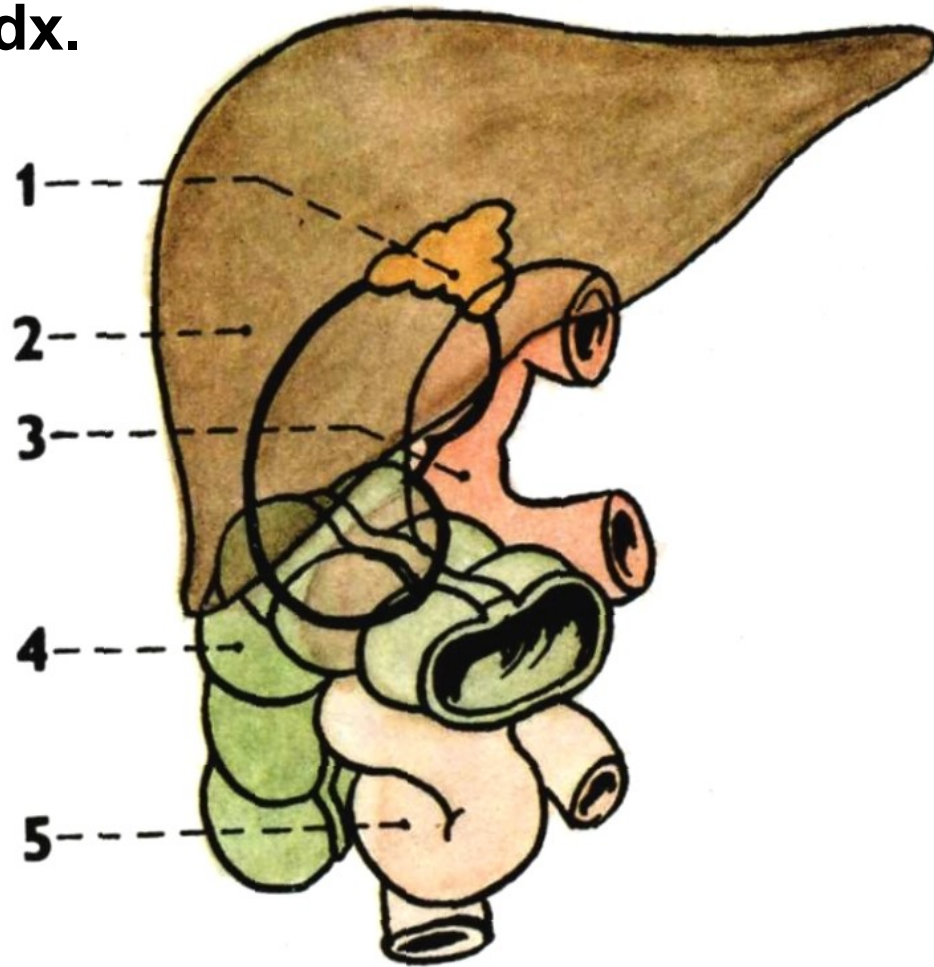
DX.

N. subcostalis
N. iliohypogastricus
N. ilioinguinalis

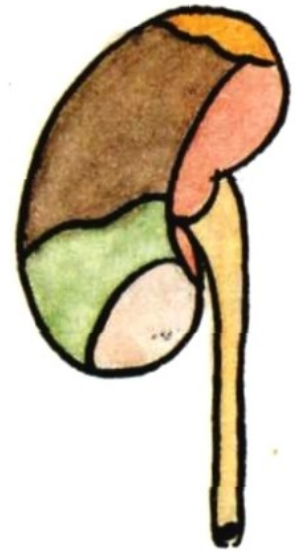




1. Gl. suprarenalis dx.
2. Liver
3. Duodenum
4. Flexura coli dx.
5. Jejunum

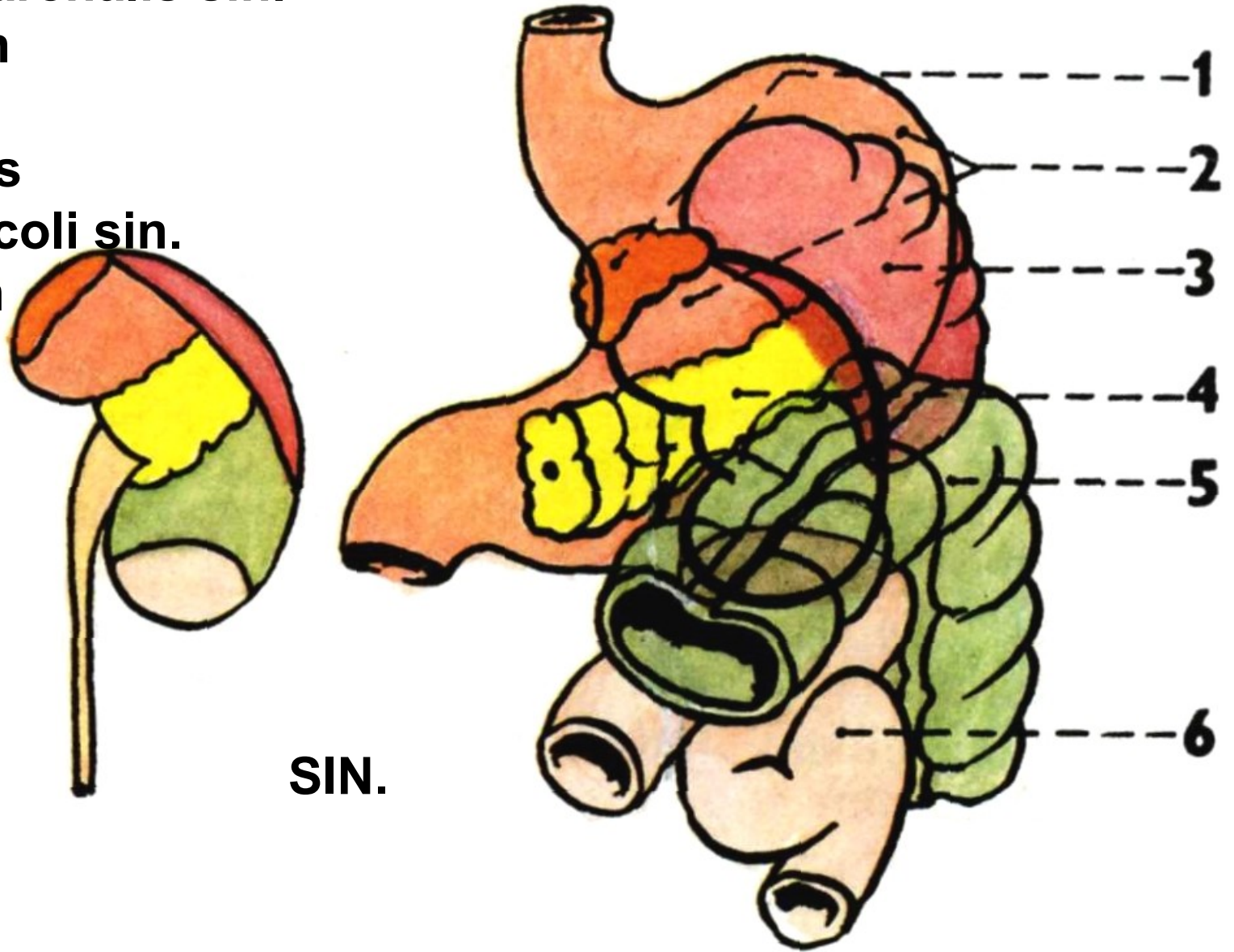


DX.



DX.

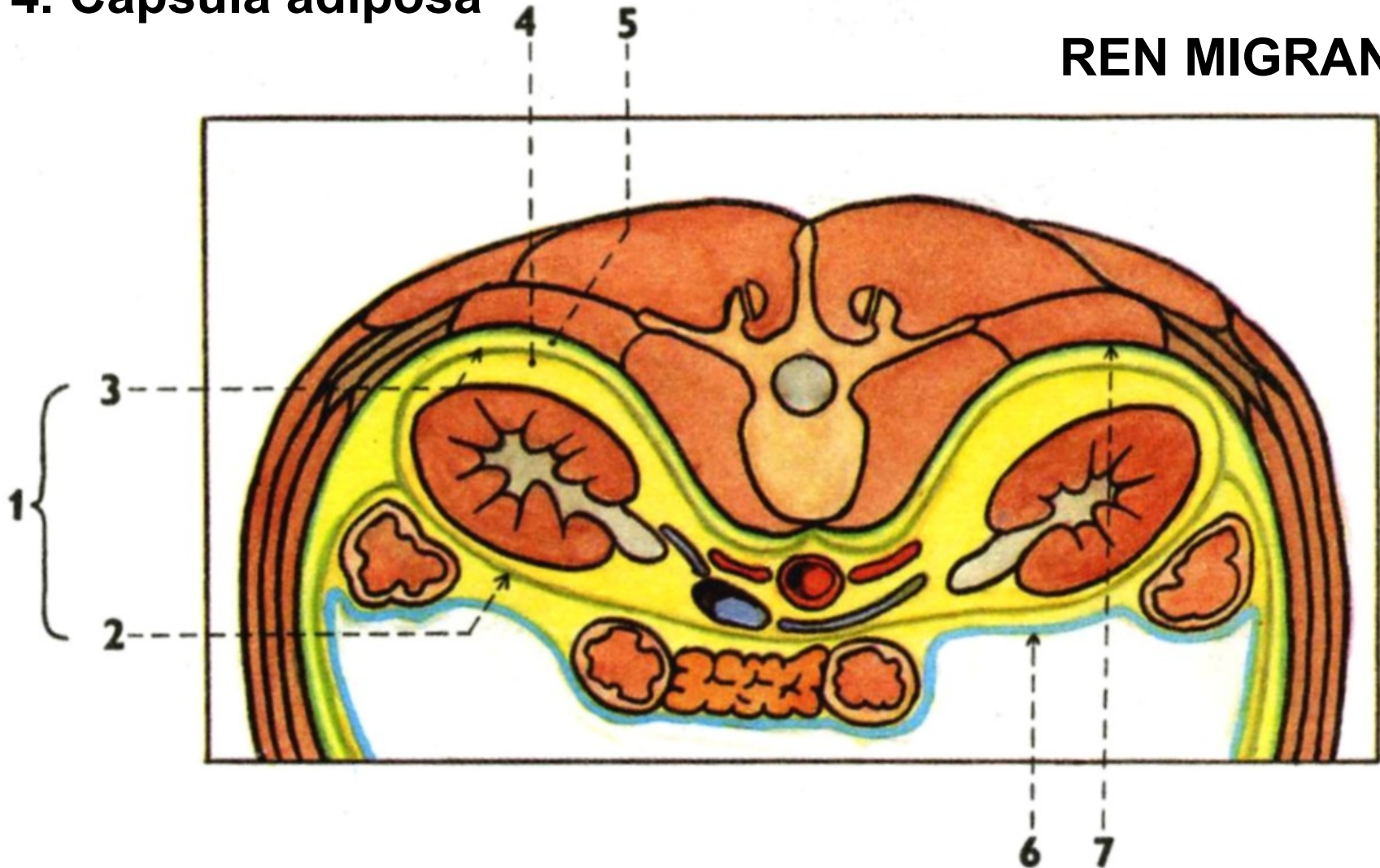
1. Gl. suprarenalis sin.
2. Stomach
3. Spleen
4. Pancreas
5. Flexura coli sin.
6. Jejunum



1. Fascia renalis
2. Lamina praerenalis
3. Lamina retrorenalis
4. Capsula adiposa

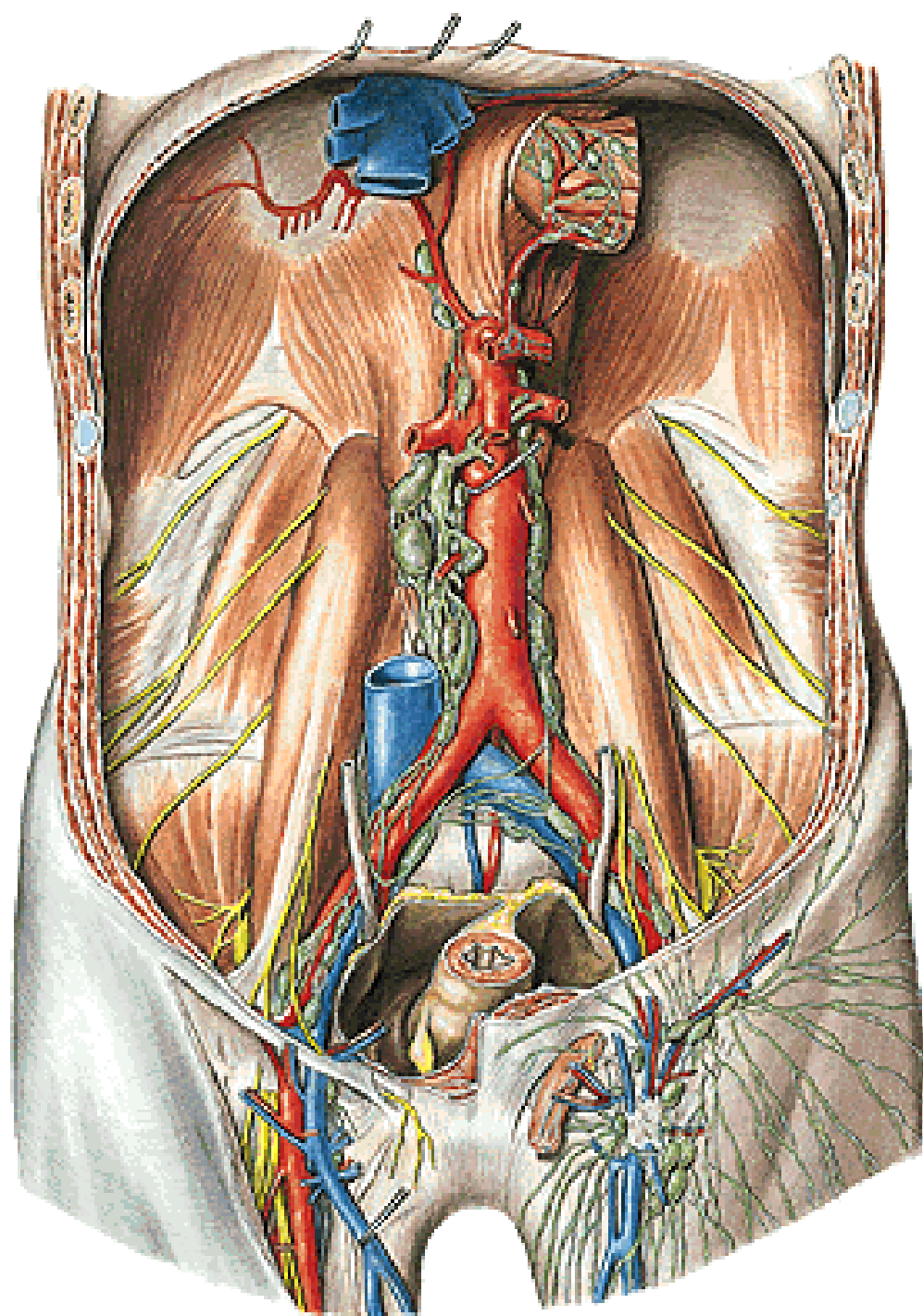
5. Corpus adiposum pararenale
6. Peritoneum
7. Fascia transversalis

REN MIGRANS



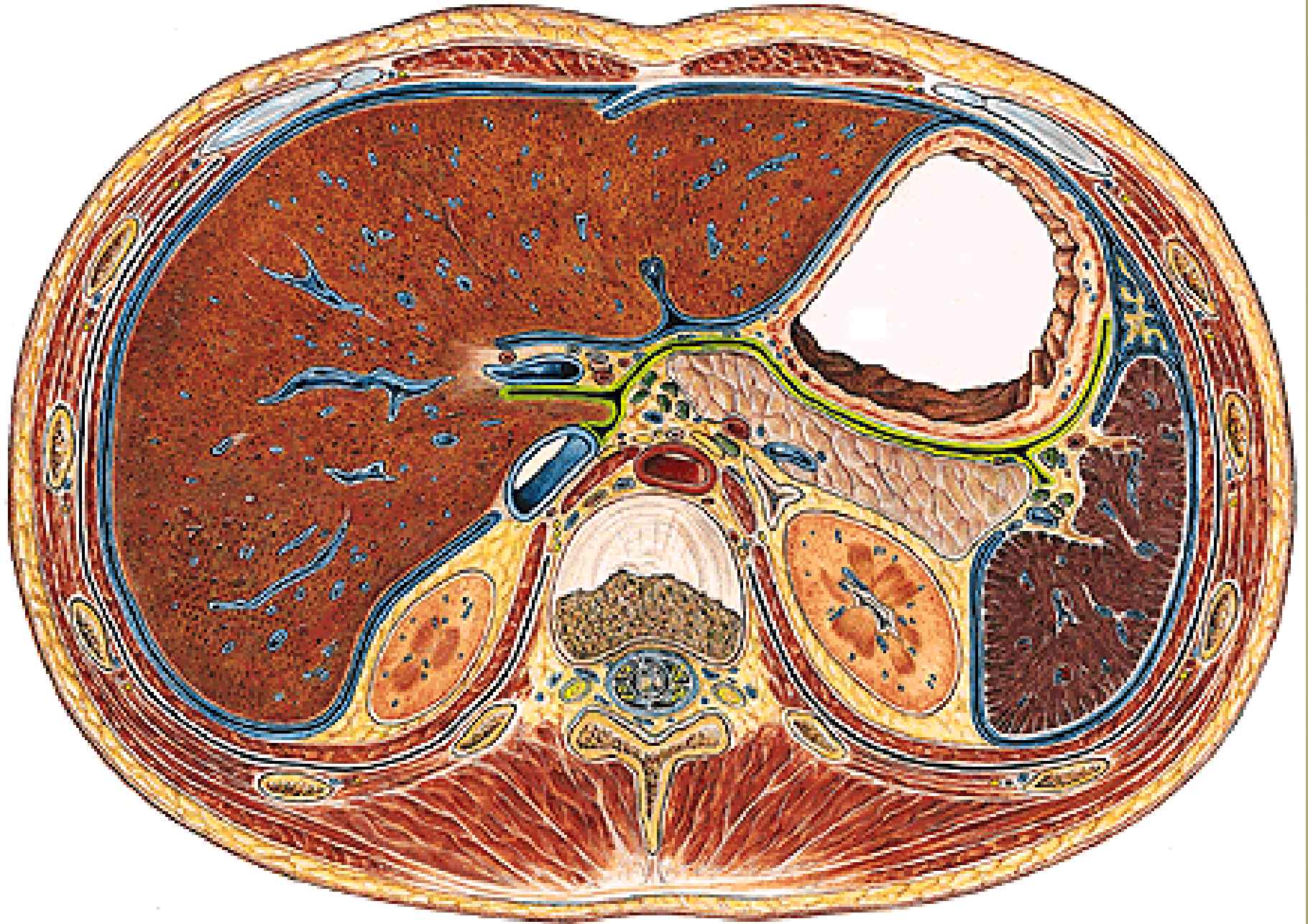
NII. lumbales (paraaortici)

→ tr. lumbalis dx. et sin.





Cross-sectional image through the L1 obtained with CT

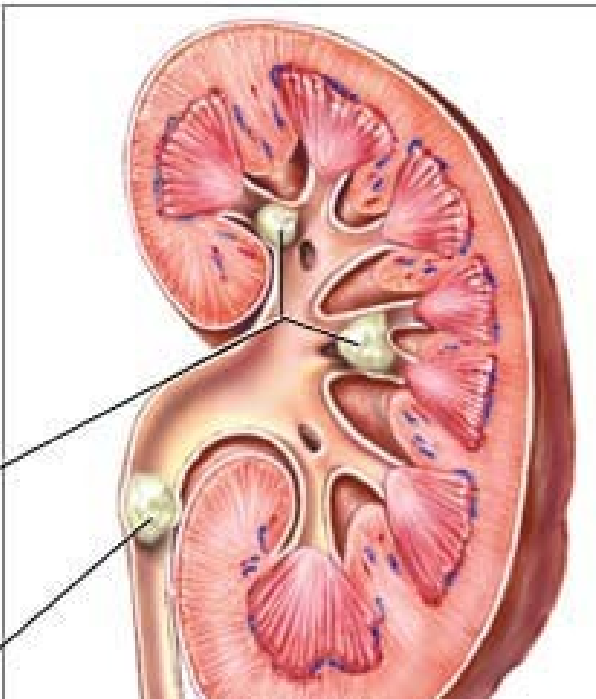
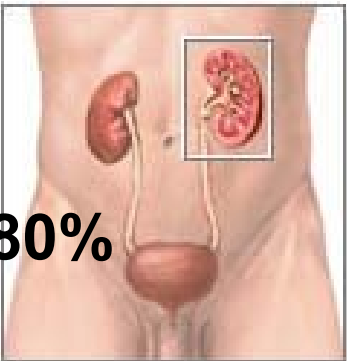


Transverse section through the intervertebral disc between T12 and L1

Nephrolithiasis

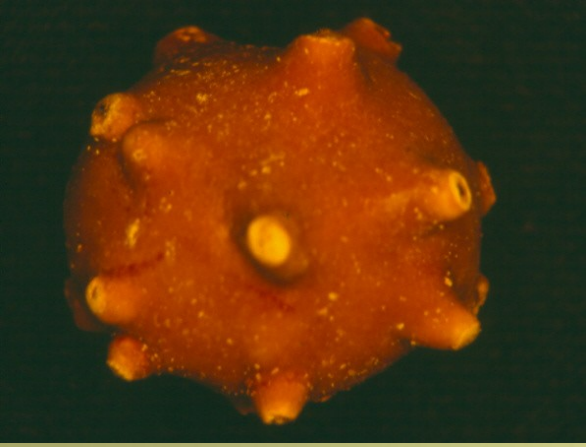
Calcium oxalate crystals – 80%

Uric acid – 5 - 10%



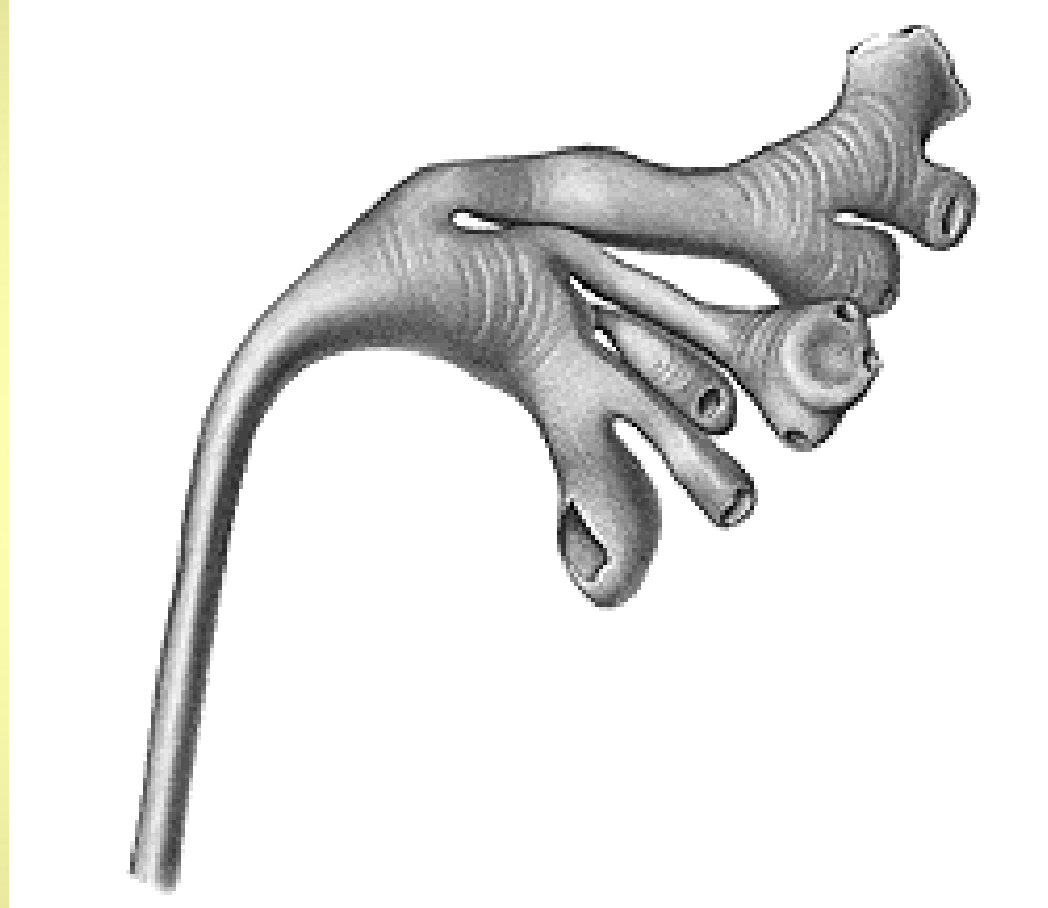
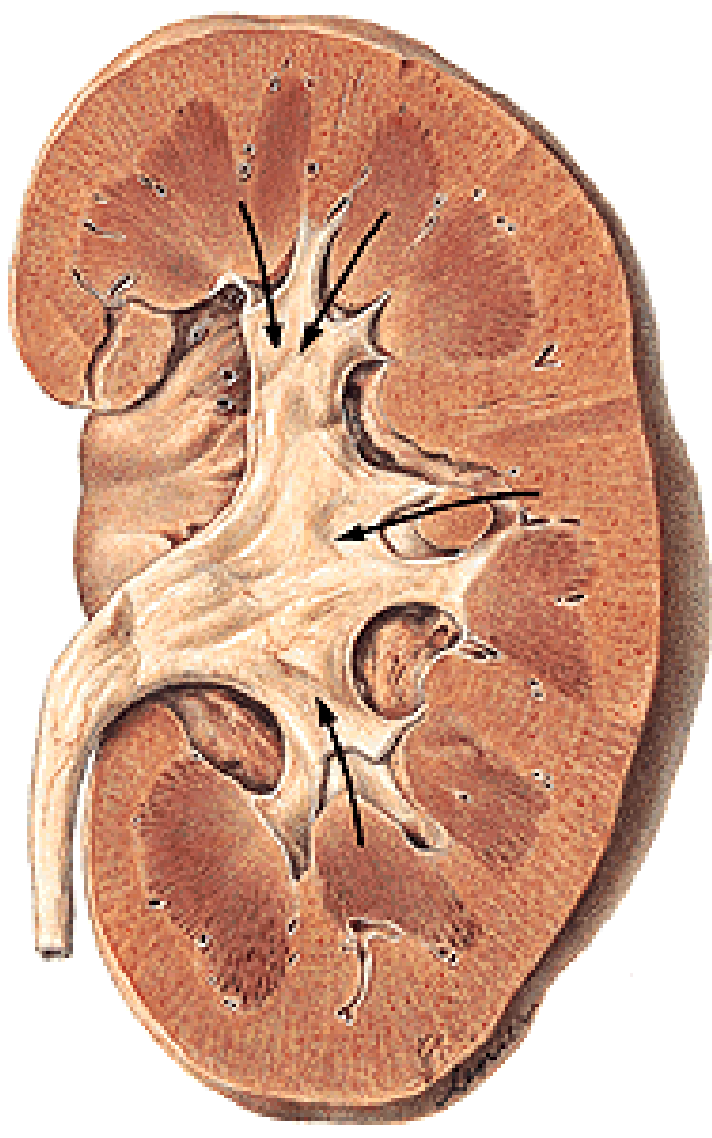
Kidney stones in the minor and major calyces of the kidney

Kidney stone in the ureter



CALICES RENALES – minores et majores

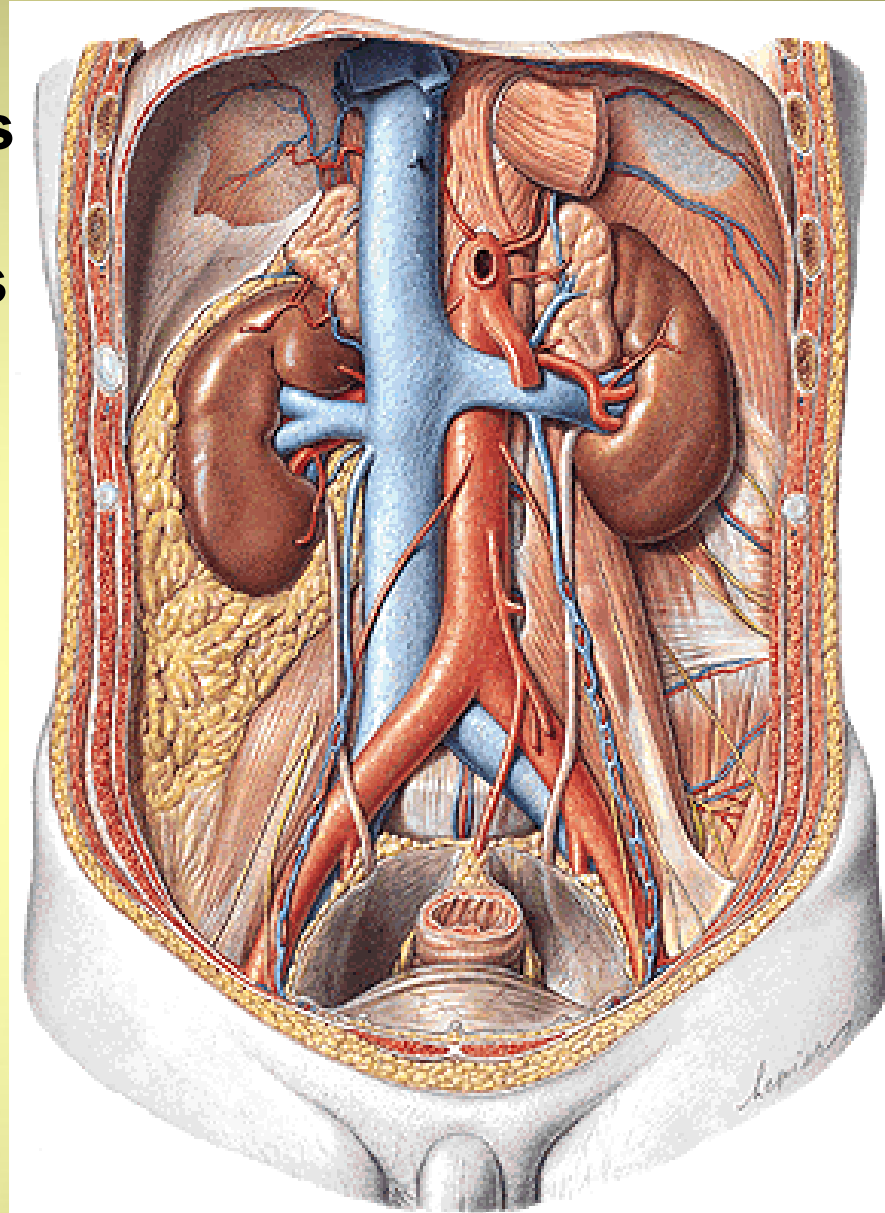
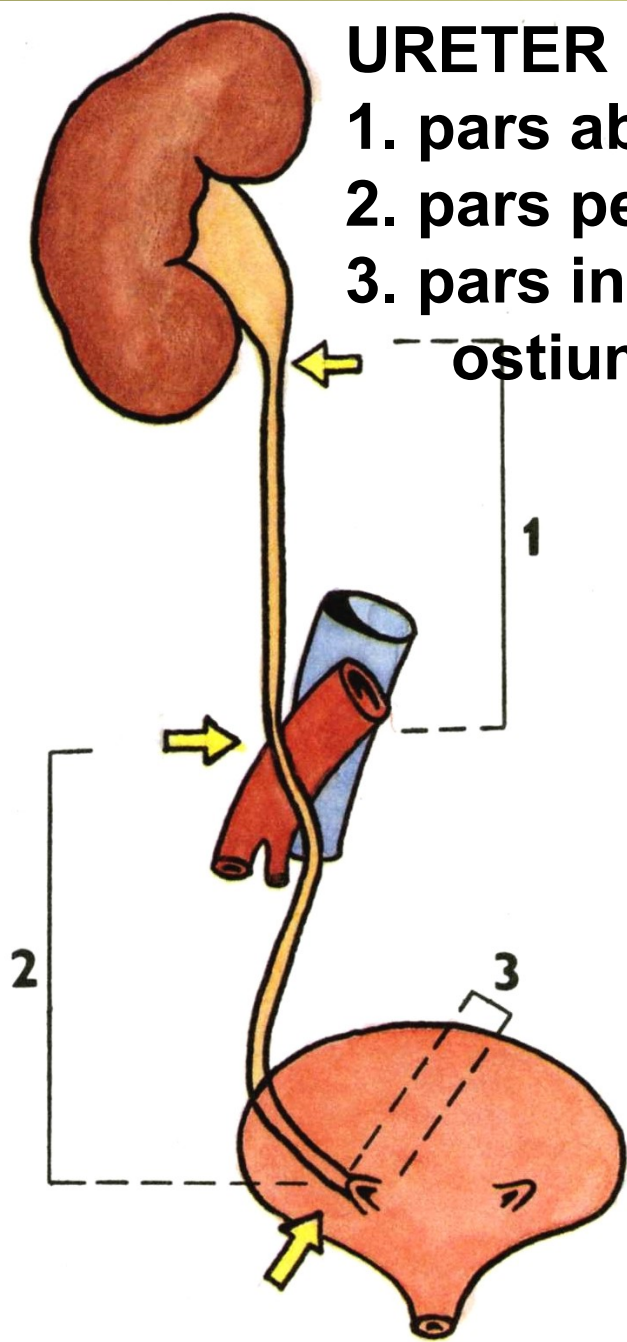
PELVIS RENALIS (PYELUM)

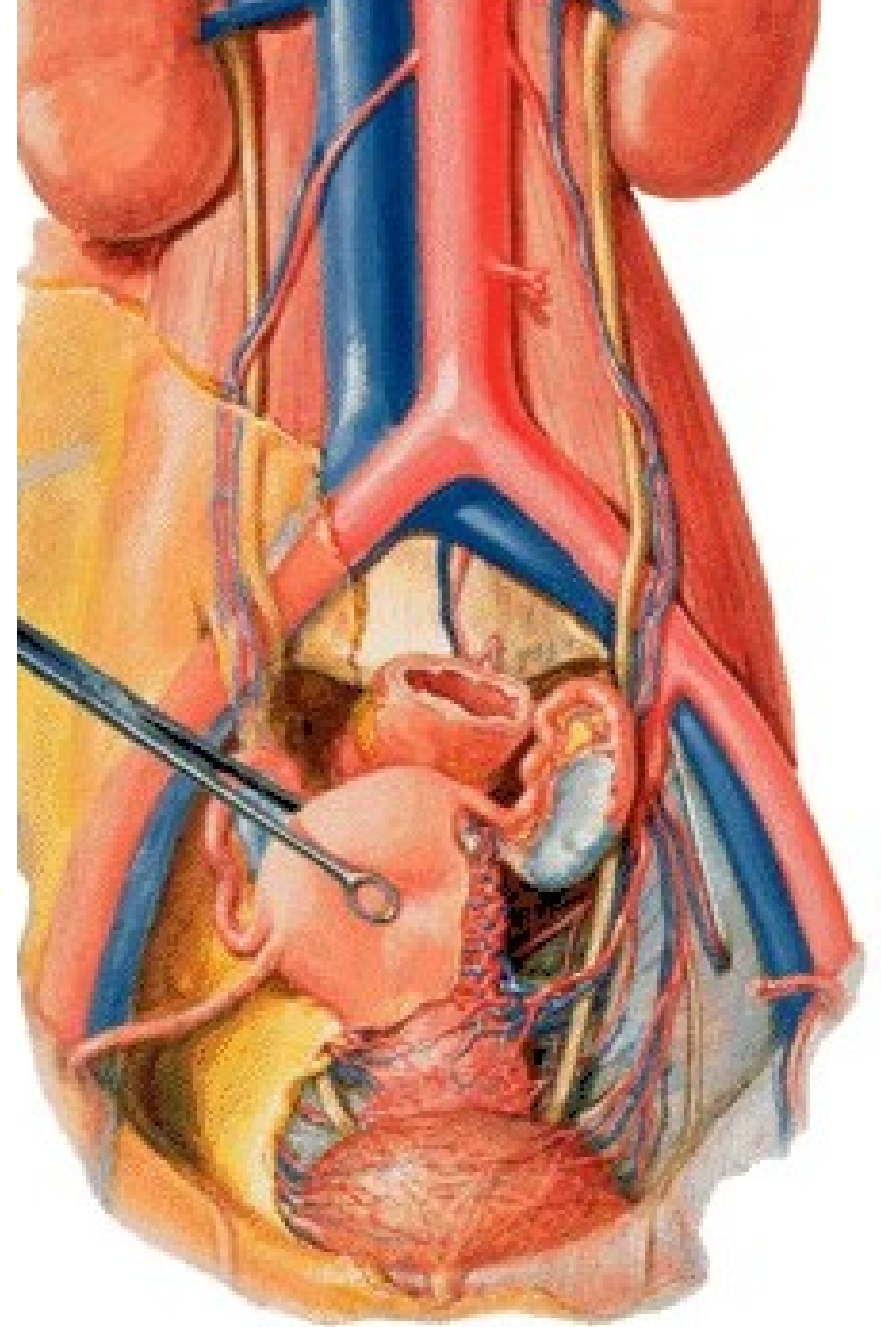
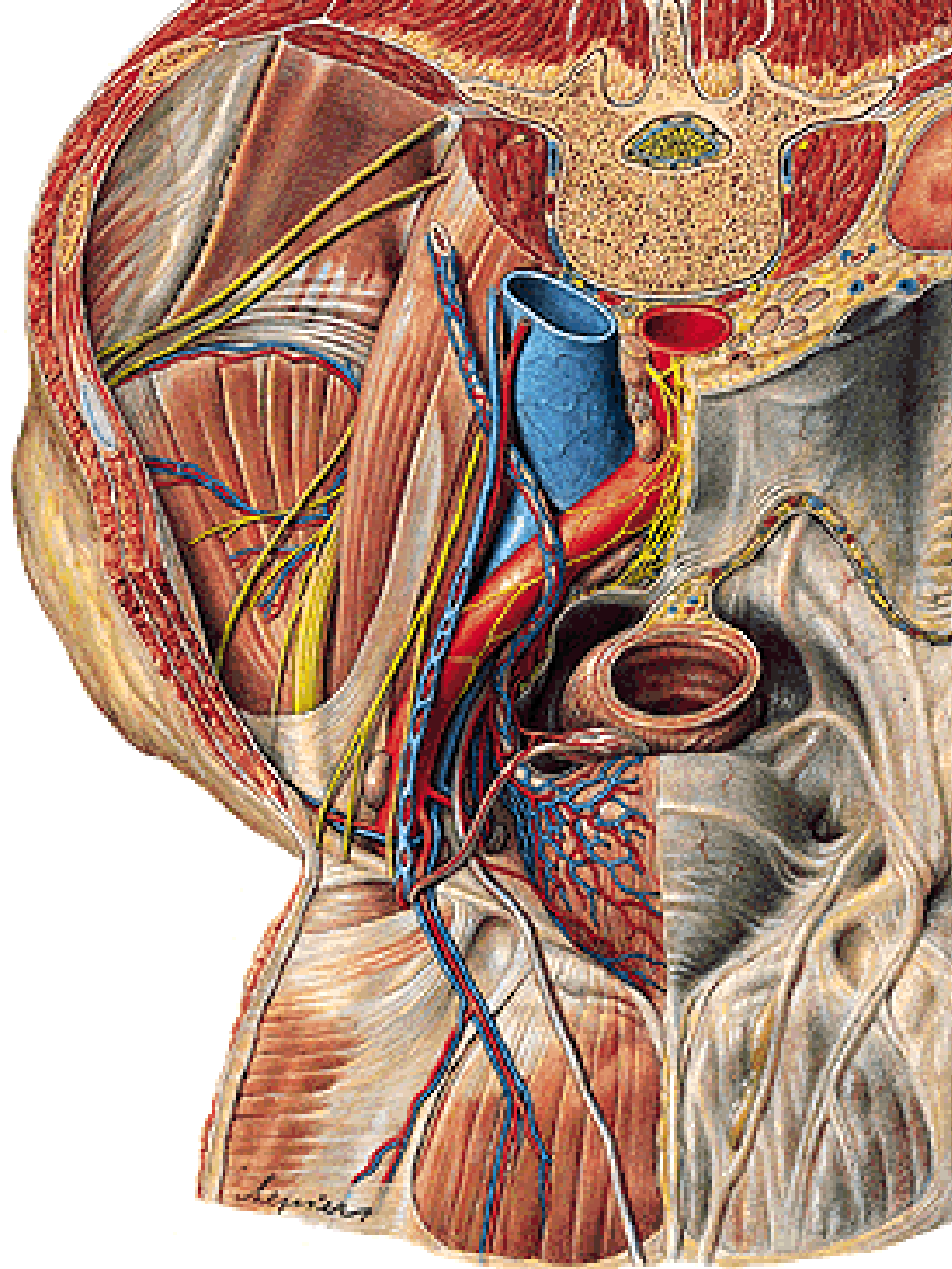


URETER

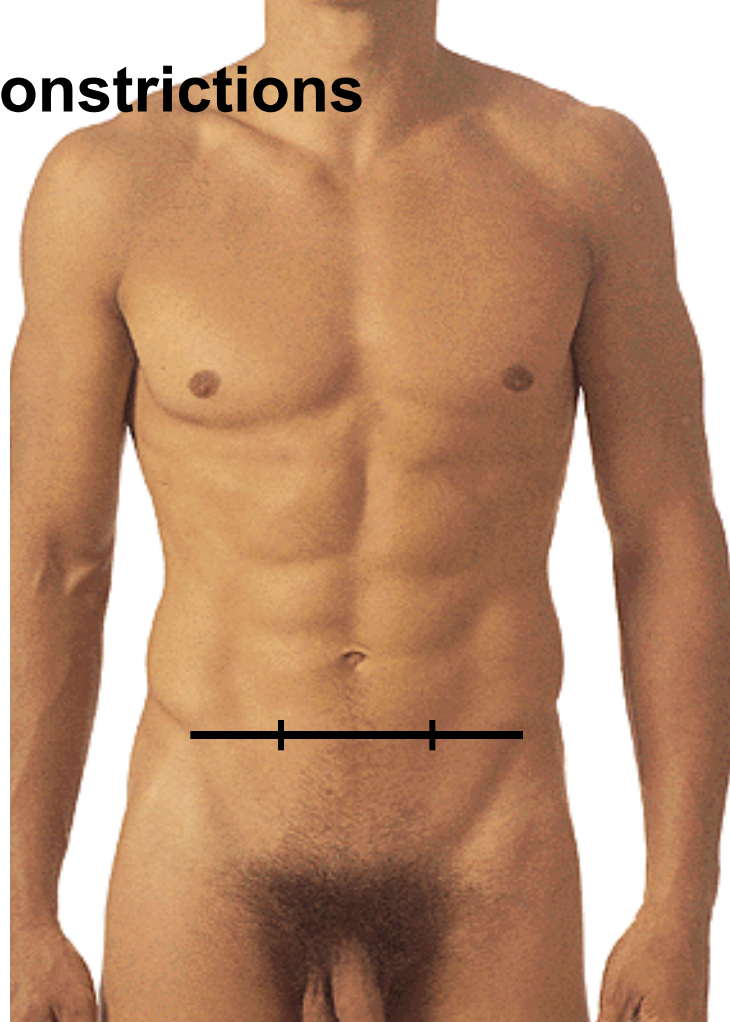
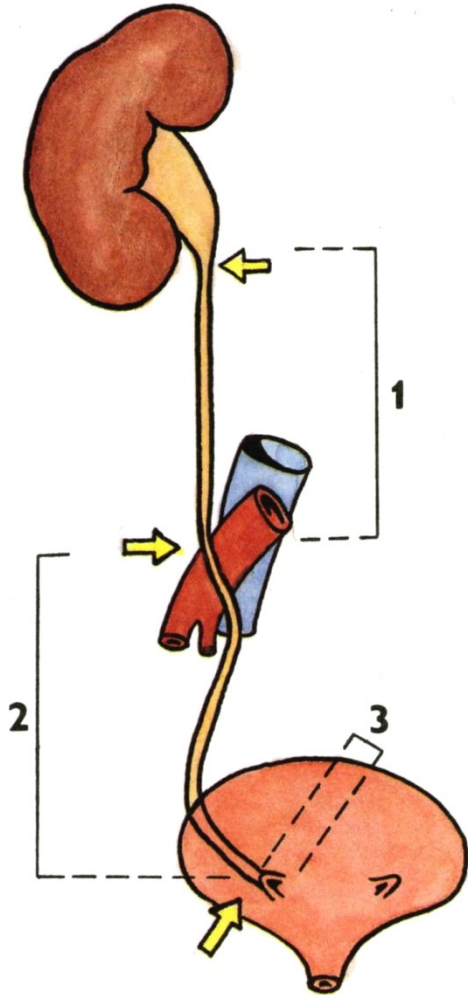
1. pars abdominalis
2. pars pelvina
3. pars intramuralis

ostium ureteris

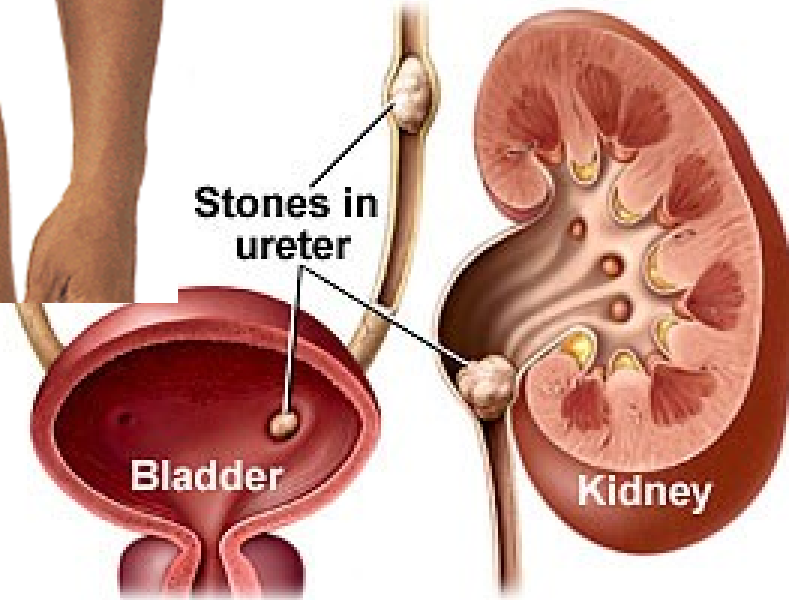


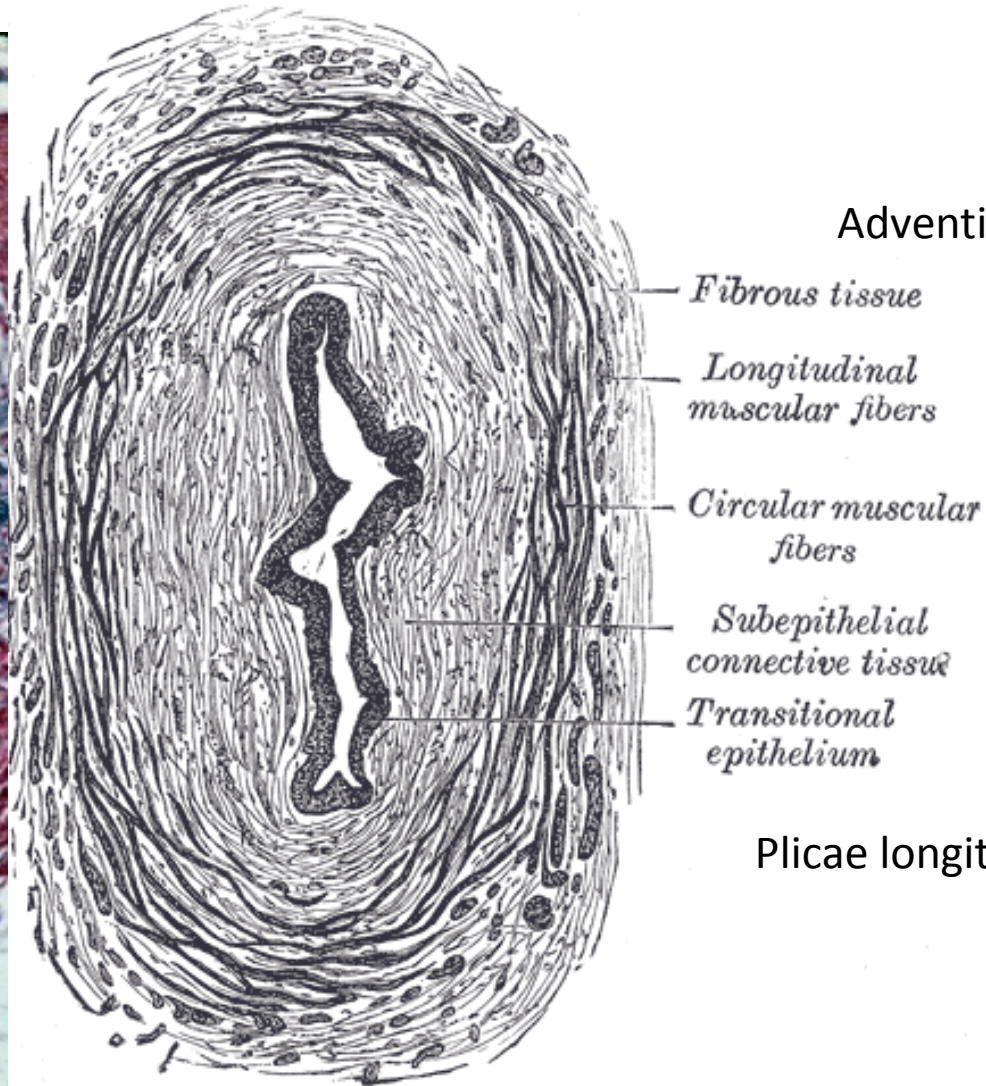


3 physiological constrictions



Point of LANZ





Adventitia

Fibrous tissue

*Longitudinal
muscular fibers*

*Circular muscular
fibers*

*Subepithelial
connective tissue*

*Transitional
epithelium*

Plicae longitudinales

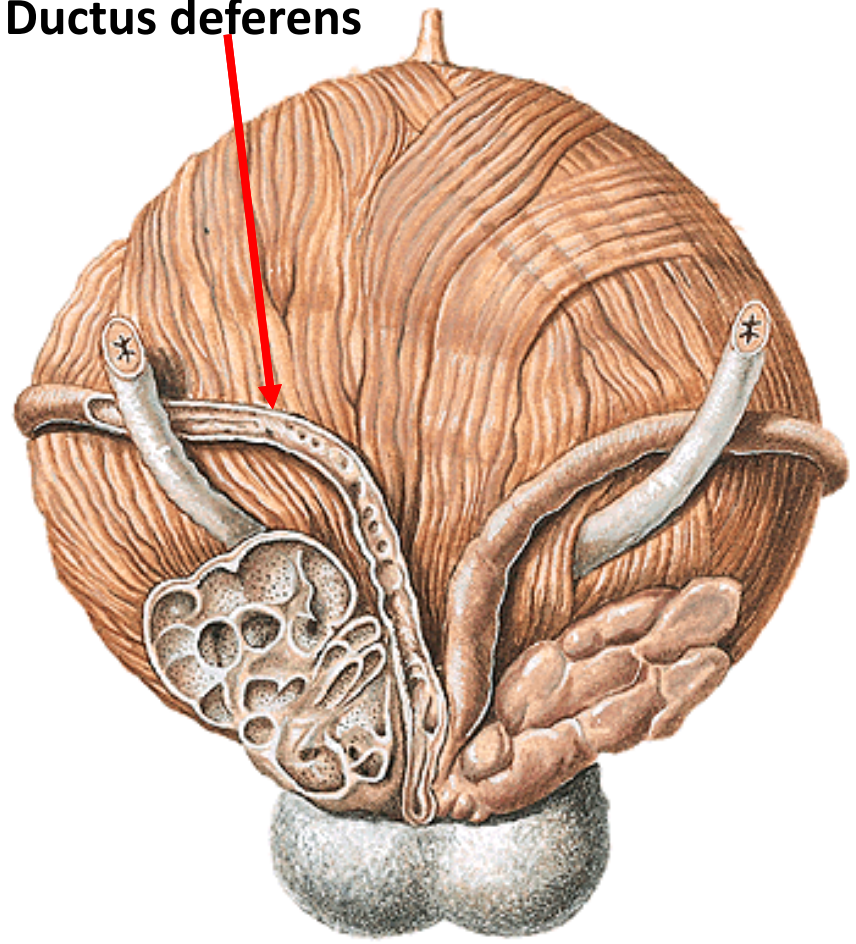
VESICA URINARIA

- fundus vesicae
- corpus vesicae
- apex vesicae
 - lig. umbilicale medianum
- cervix vesicae

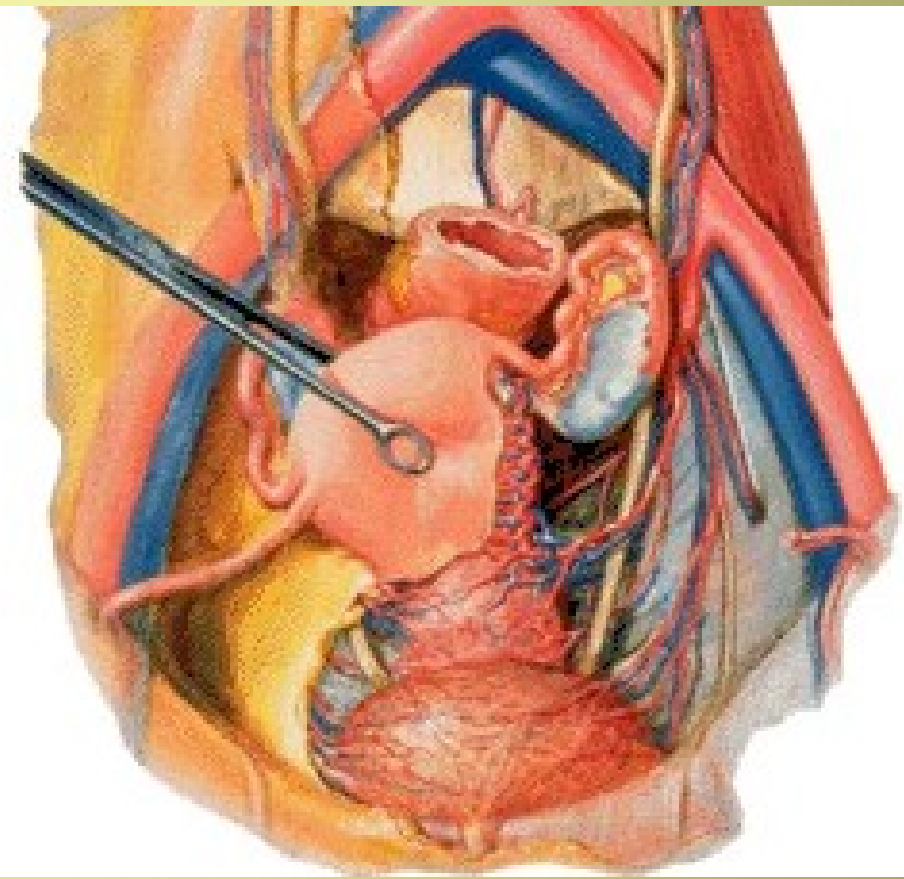


Male - dorsal aspect of urinary bladder

Ductus deferens

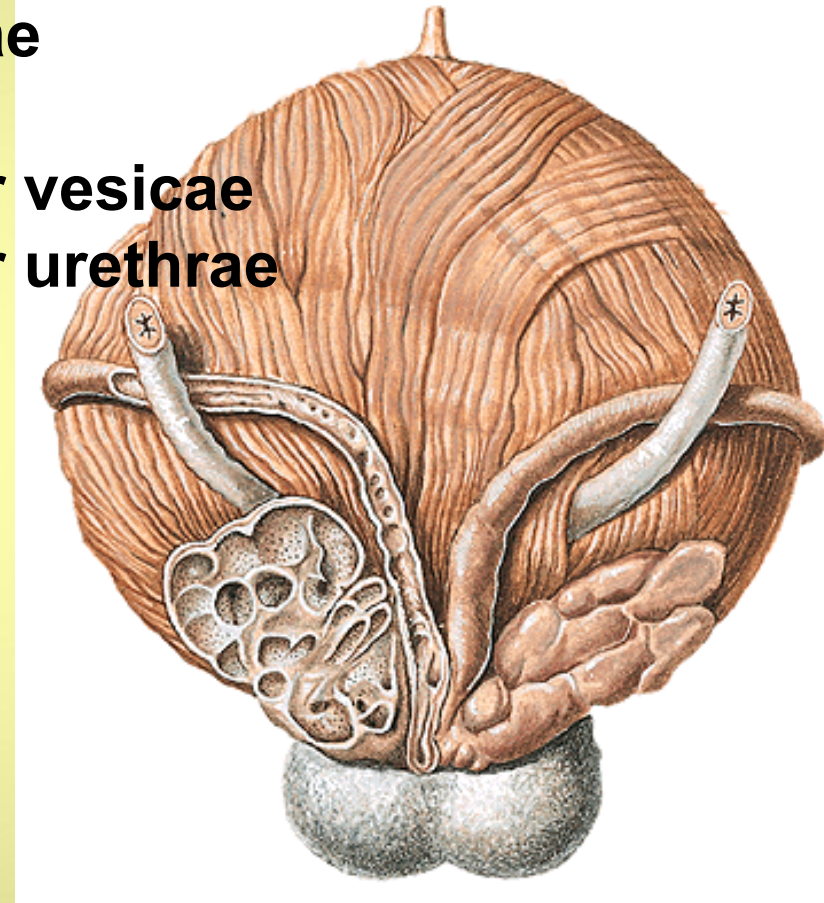
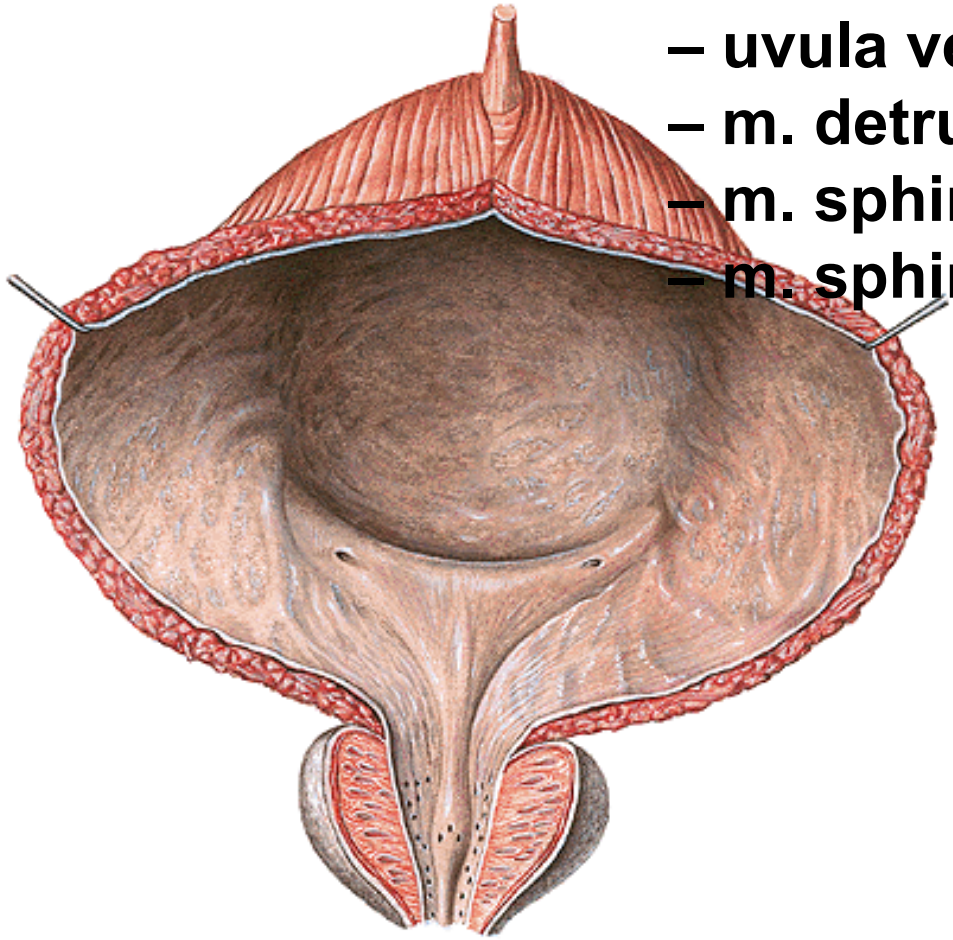


Female – ventral aspect



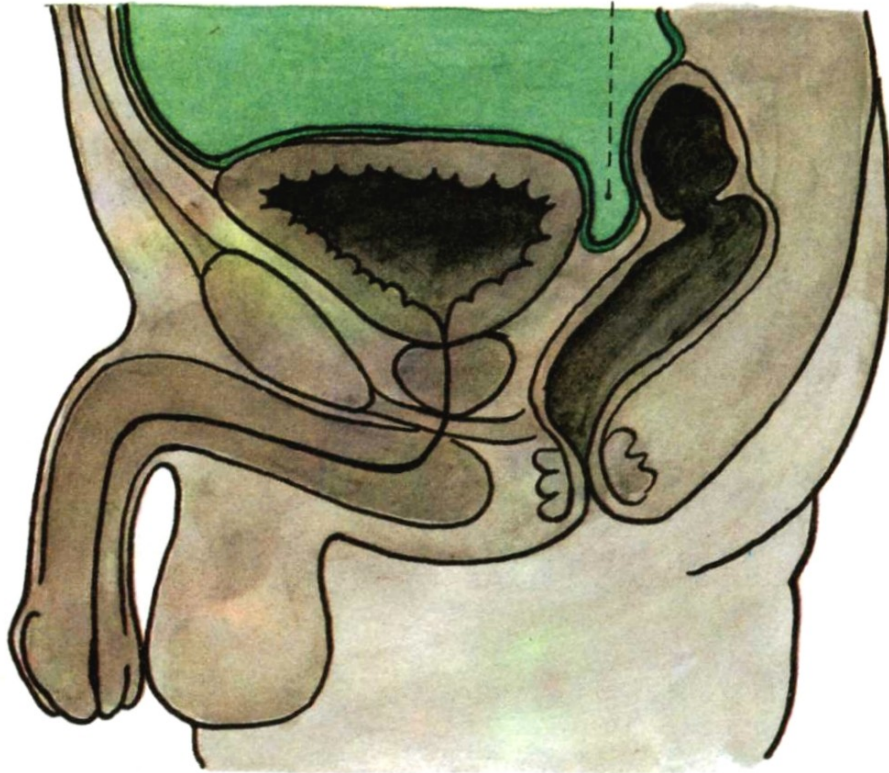
Trigonum vesicae – ostia ureterum

- ostium urethrae internum
- plica interureterica
- fossa retrotrigonalis
- uvula vesicae
- m. detrusor
- m. sphincter vesicae
- m. sphincter urethrae



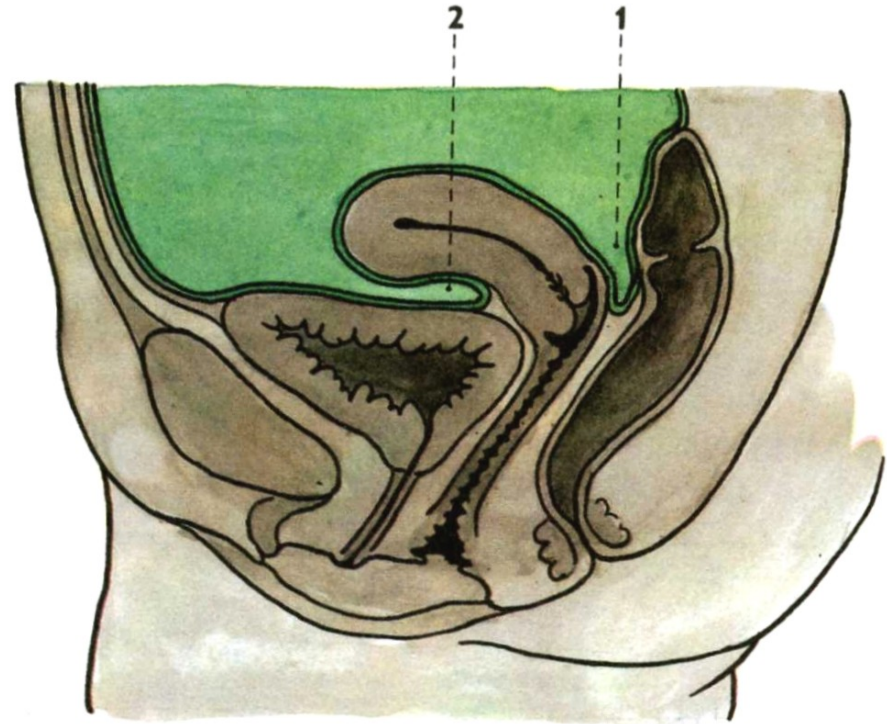
Median section through the male pelvis

1. Excavatio rectovesicalis



Median section through the female pelvis

1. Excavatio rectouterina
2. Excavatio vesicouterina



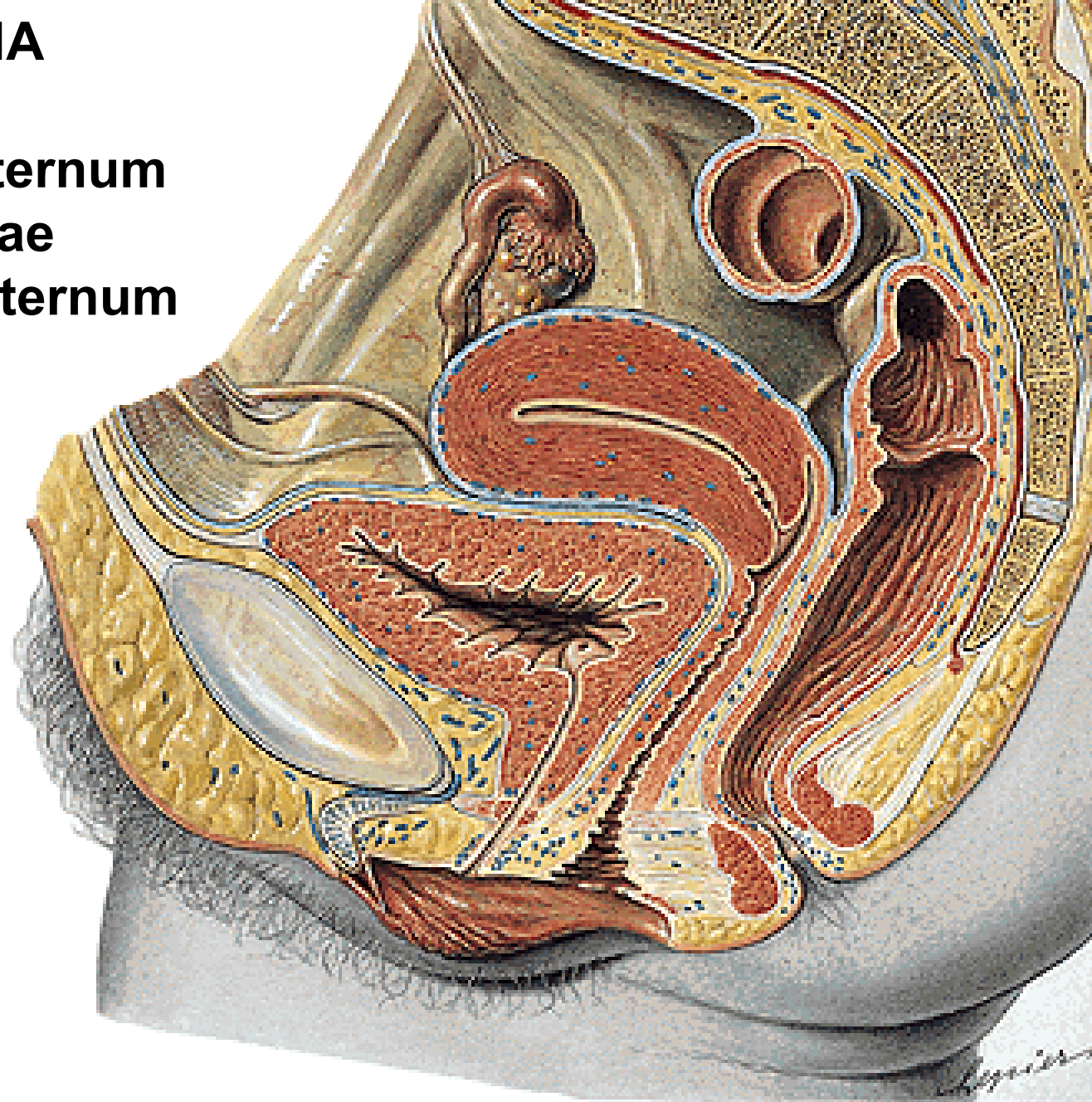
Paracystium

URETHRA FEMININA

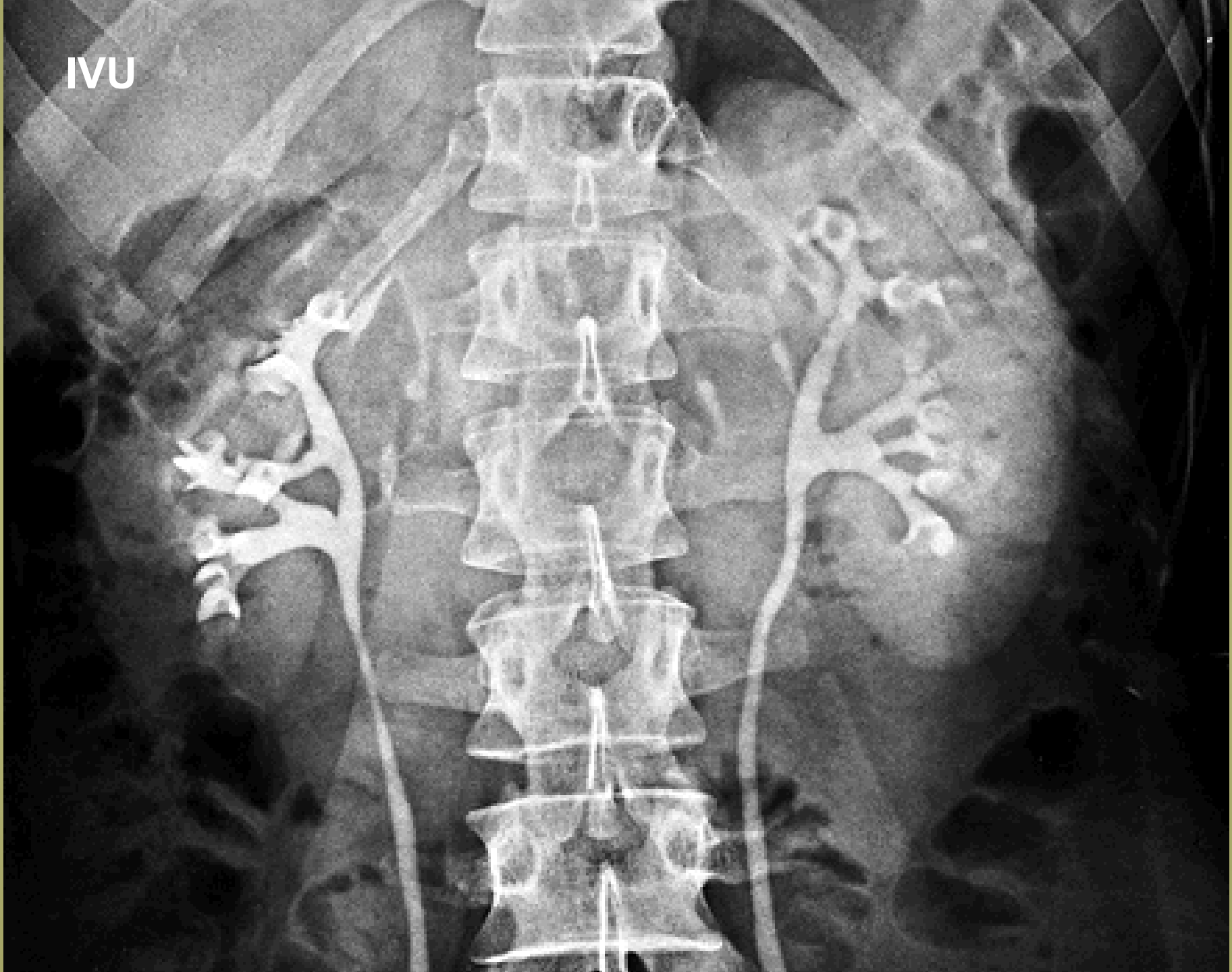
Ostium urethrae internum

M. sphincter urethrae

Ostium urethrae externum



IVU

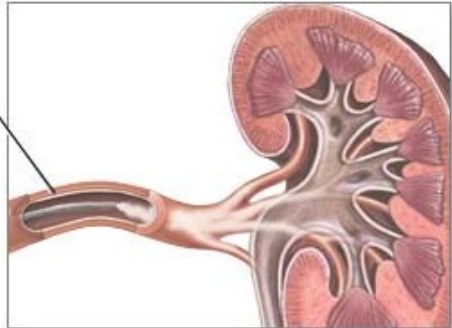


Retrograde pyelography

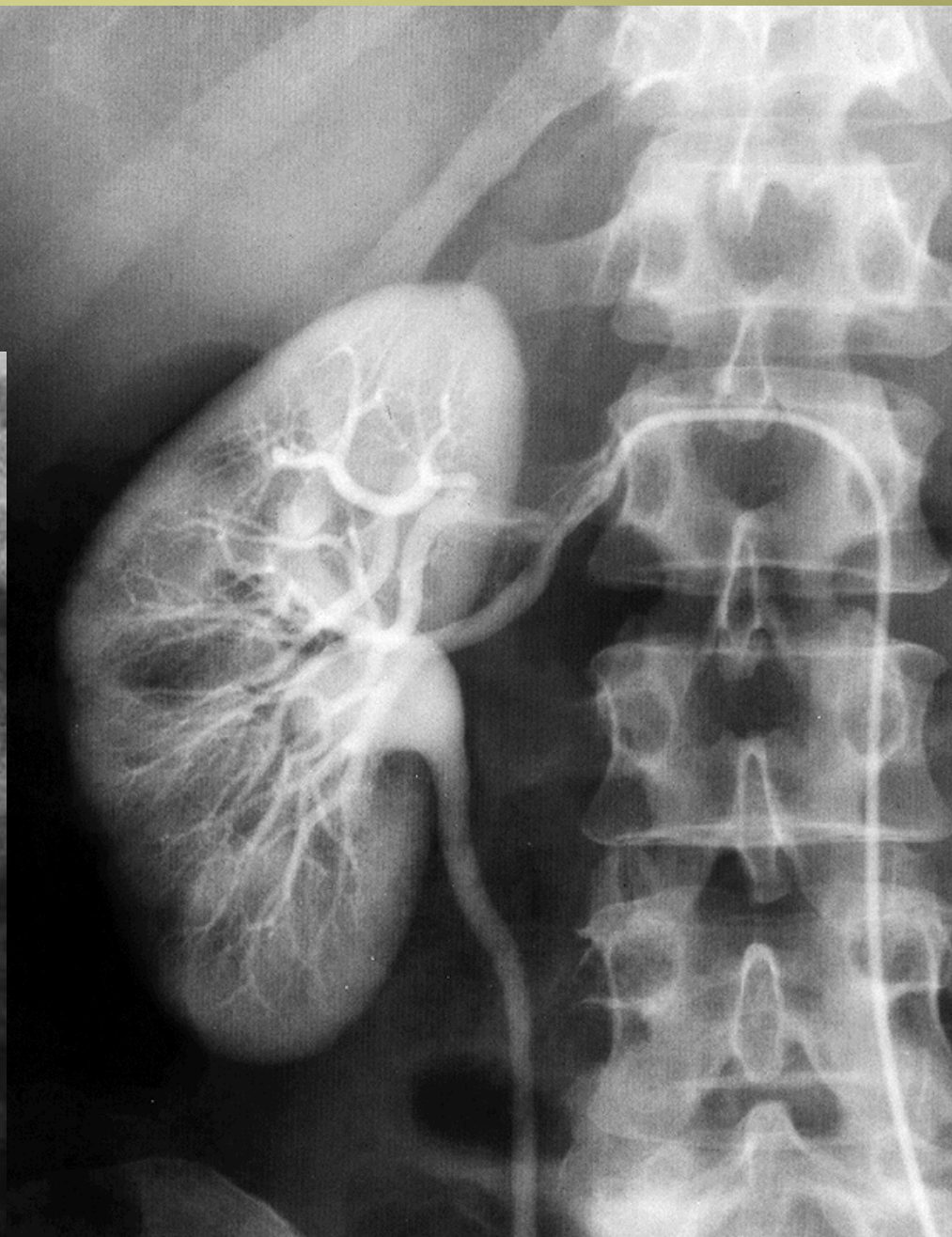
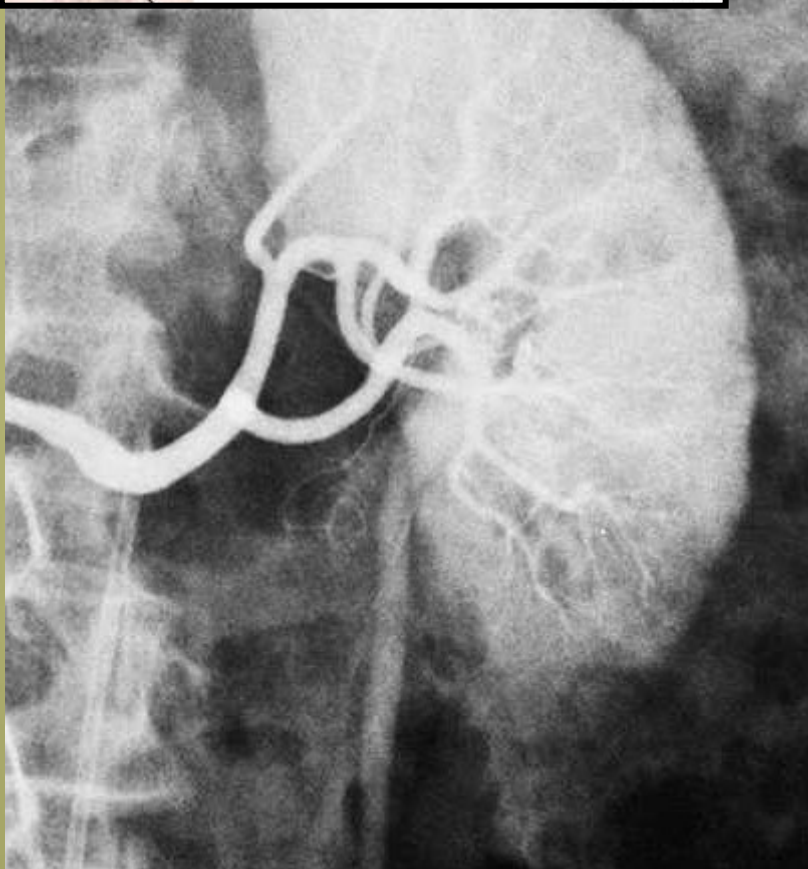
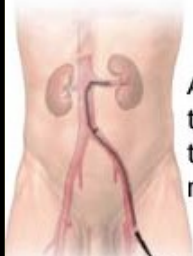


ASHMOLE, IN
DR. S. COMITER
M-F

Renal artery



A catheter is inserted into the artery and threaded through until it is placed in the renal (kidney) artery. The contrast medium is then injected into the artery



**MALE GENITAL ORGANS
(ORGANA GENITALIA
MASCULINA)**

Organa genitalia interna:

Testis

Epididymis

Ductus deferens

Urethra masculina

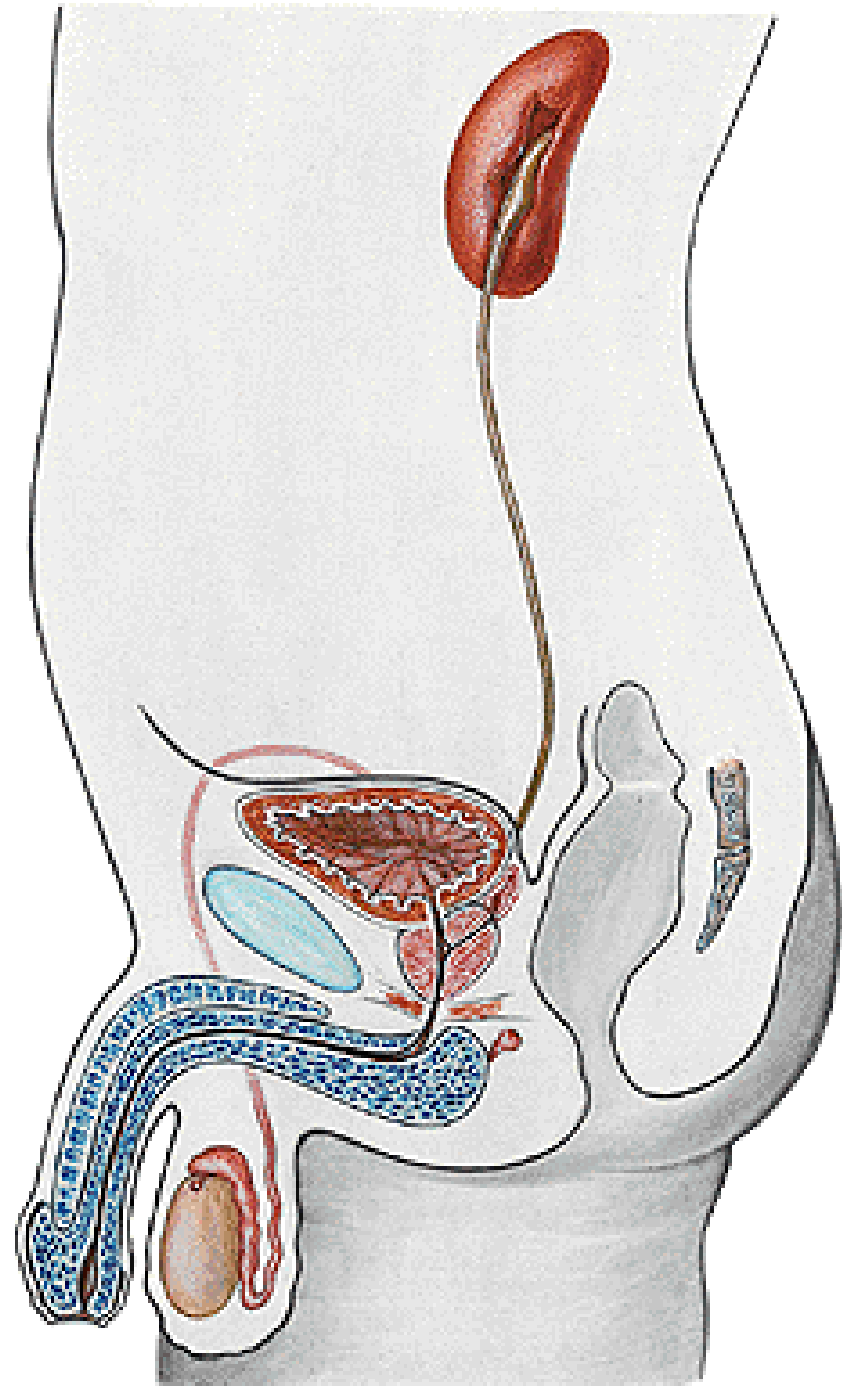
Vesicula seminalis

Prostata

Organa genitalia externa:

Penis

Scrotum



TESTIS

Facies medialis

Facies lateralis

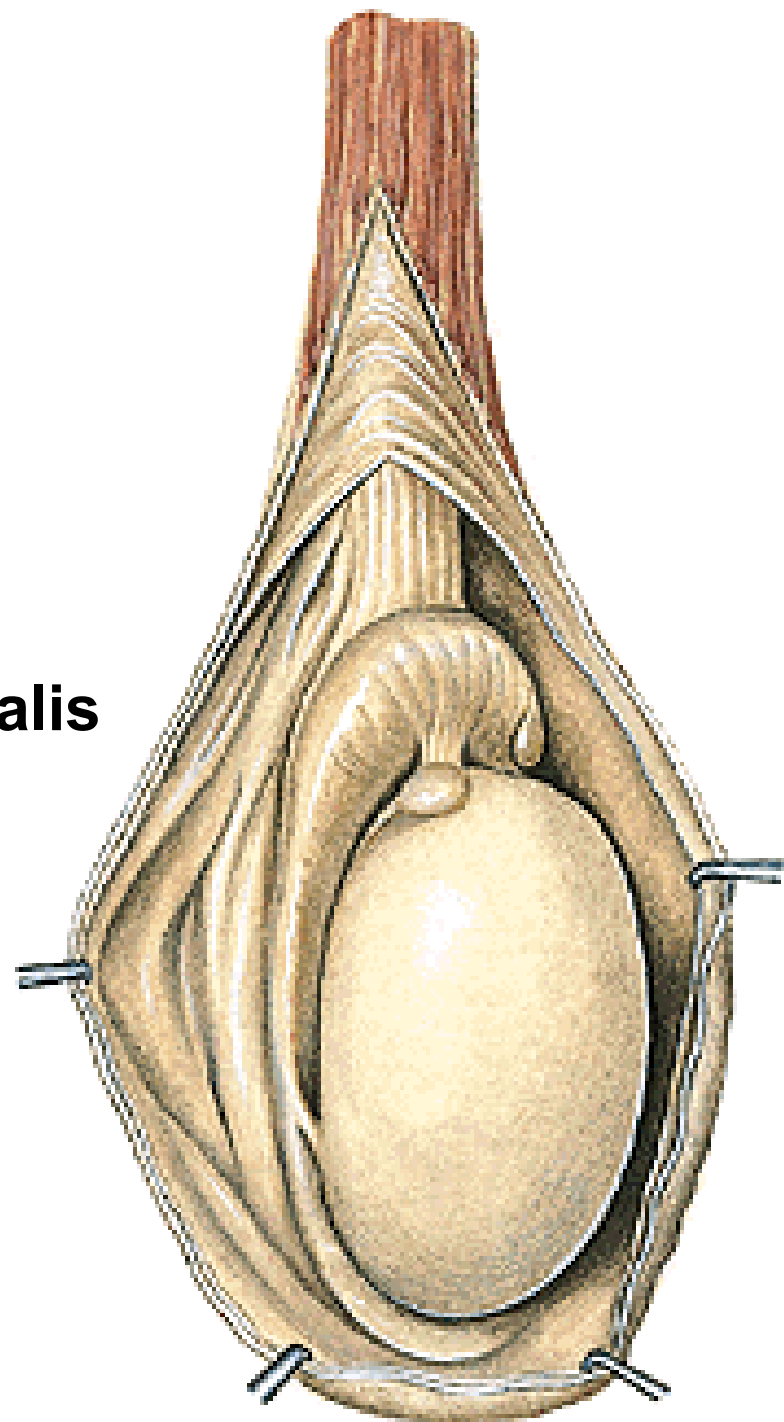
Extremitas superior

Extremitas inferior

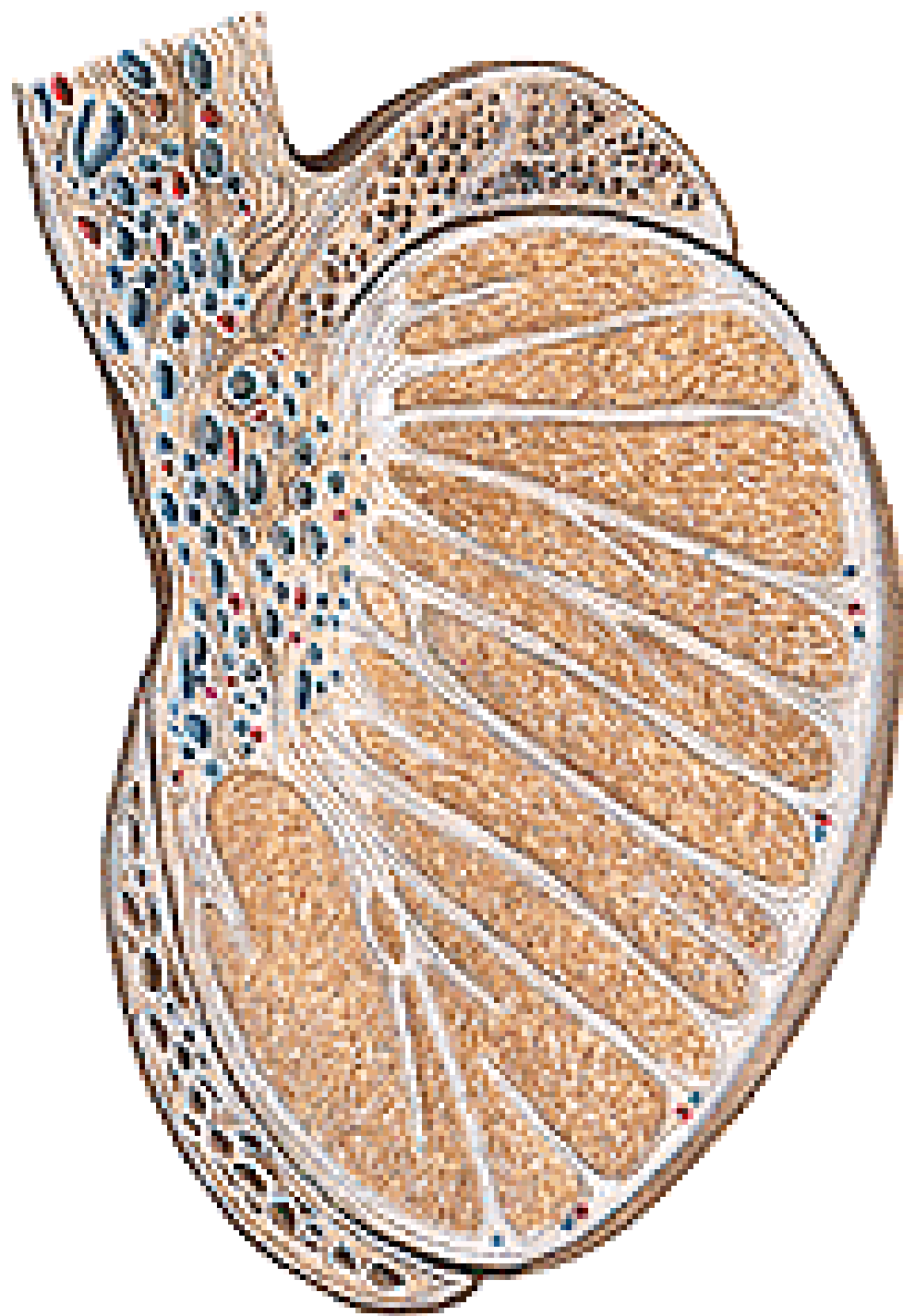
Margo anterior

Margo posterior

**Lamina visceralis tunicae vaginalis
(Epiorchium)**



Tunica albuginea
Mediastinum testis
Septula testis
Lobuli testis
Hilum testis
Tubuli seminiferi contorti
Spermatozoa
Interstitial cells of Leydig
Tubuli seminiferi recti
Rete testis
Ductuli efferentes testis



EPIDIDYMIS

Caput epididymidis

Corpus epididymidis

Cauda epididymidis

Sinus epididymidis

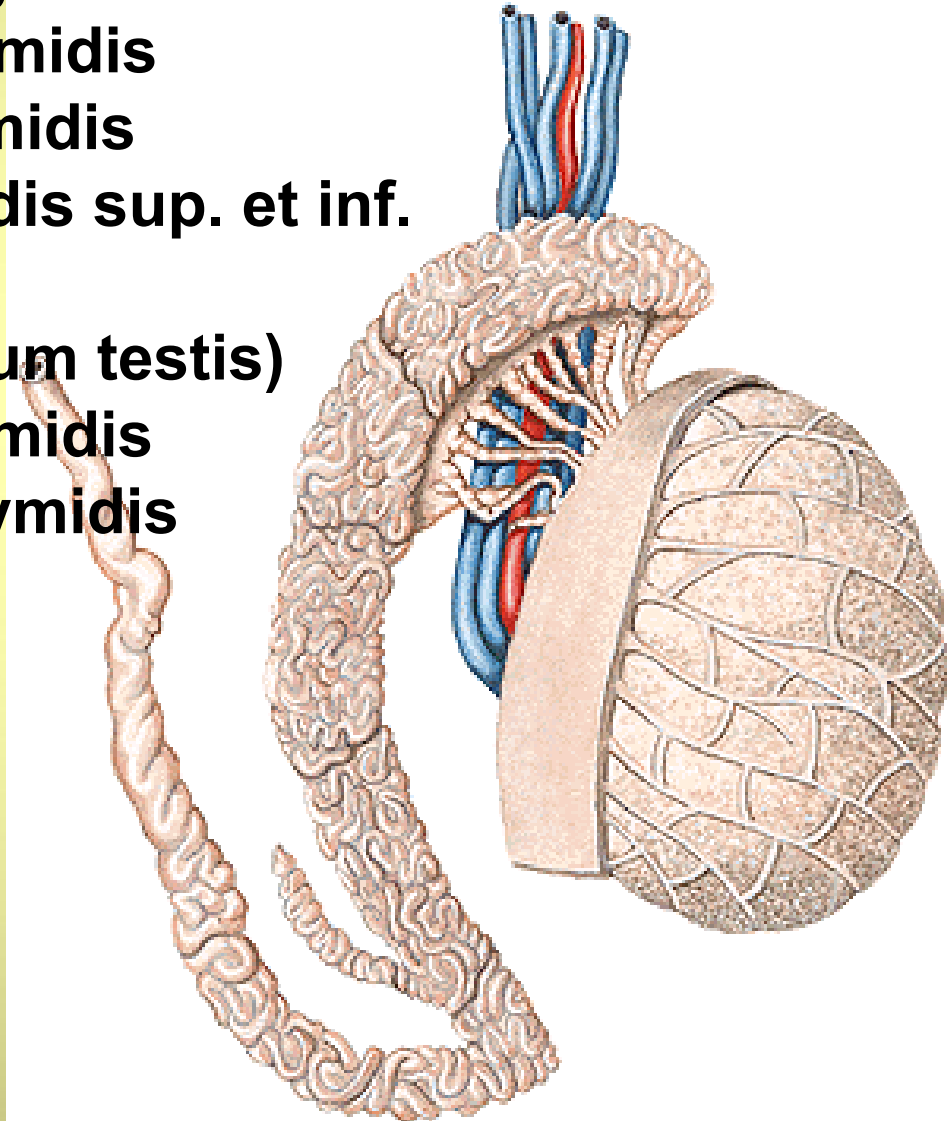
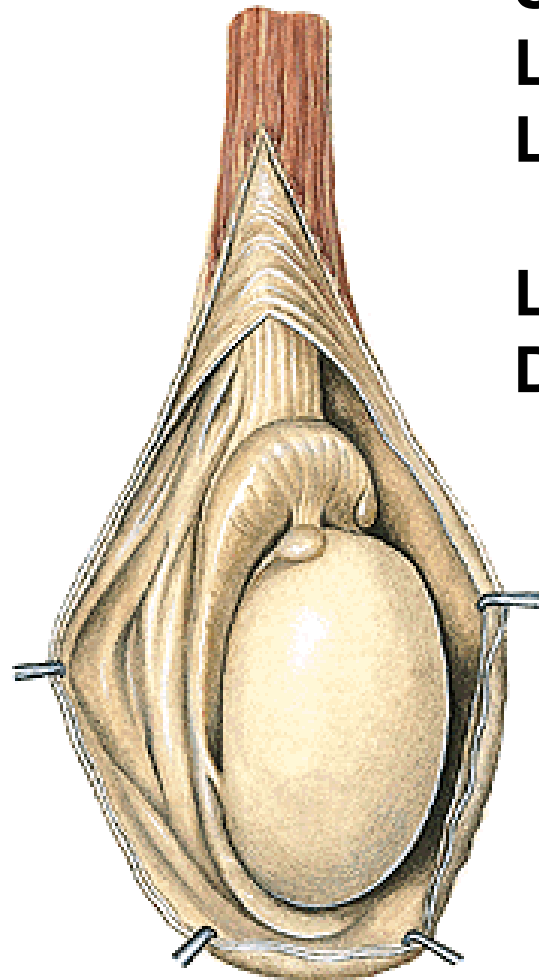
Lig. epididymidis sup. et inf.

Lig. scrotale

(Gubernaculum testis)

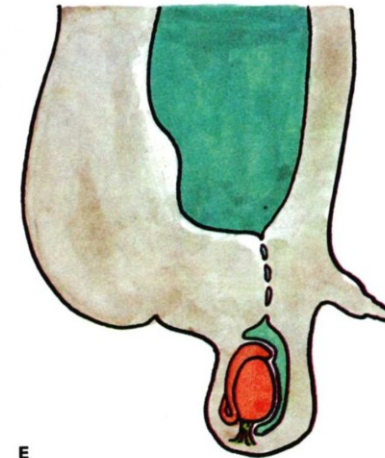
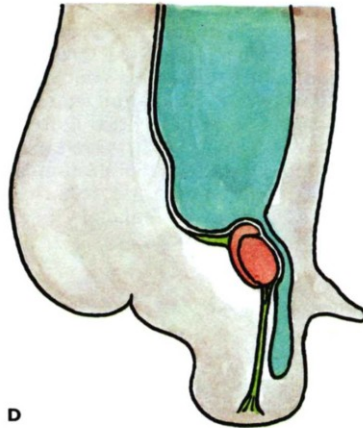
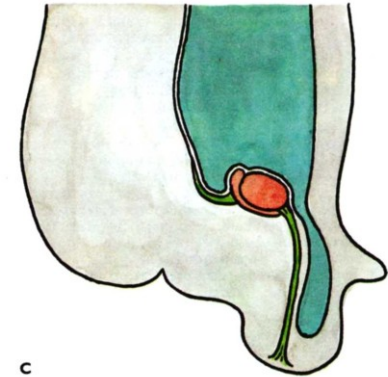
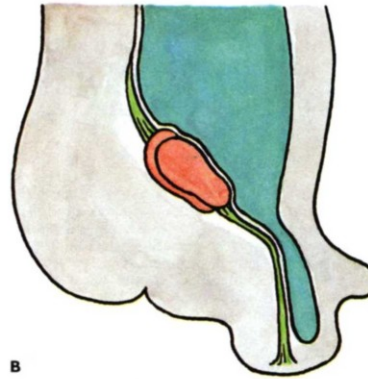
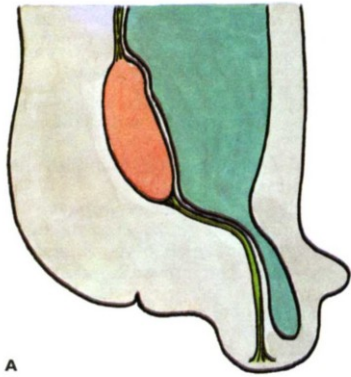
Lobuli epididymidis

Ductus epididymidis



DESCENSUS TESTIUM

Gubernaculum testis → Lig. scrotale
Processus vaginalis → Tunica vaginalis
Lig. vaginale



Retentio testis (cryptorchidism). Ectopia testis.

DUCTUS DEFERENS (VAS DEFERENS)

Pars epididymica

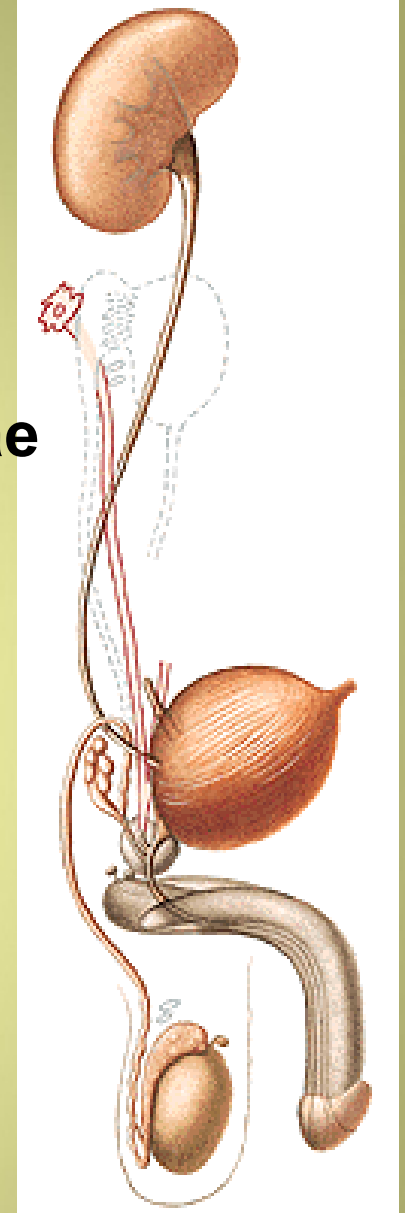
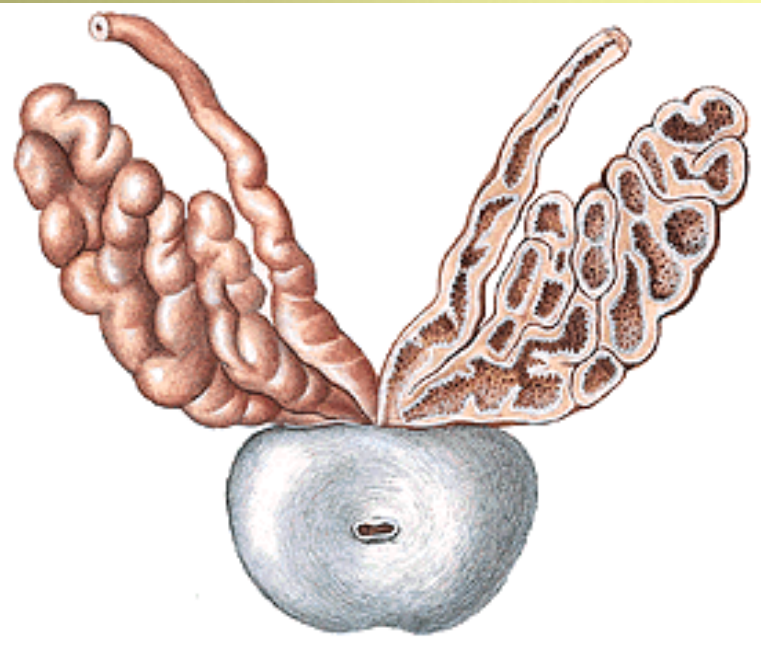
Pars funicularis

Pars inguinalis

Pars pelvina

Ampulla ductus deferentis - diverticula ampullae

Ductus ejaculatorius – colliculus seminalis



FUNICULUS SPERMATICUS: A. testicularis

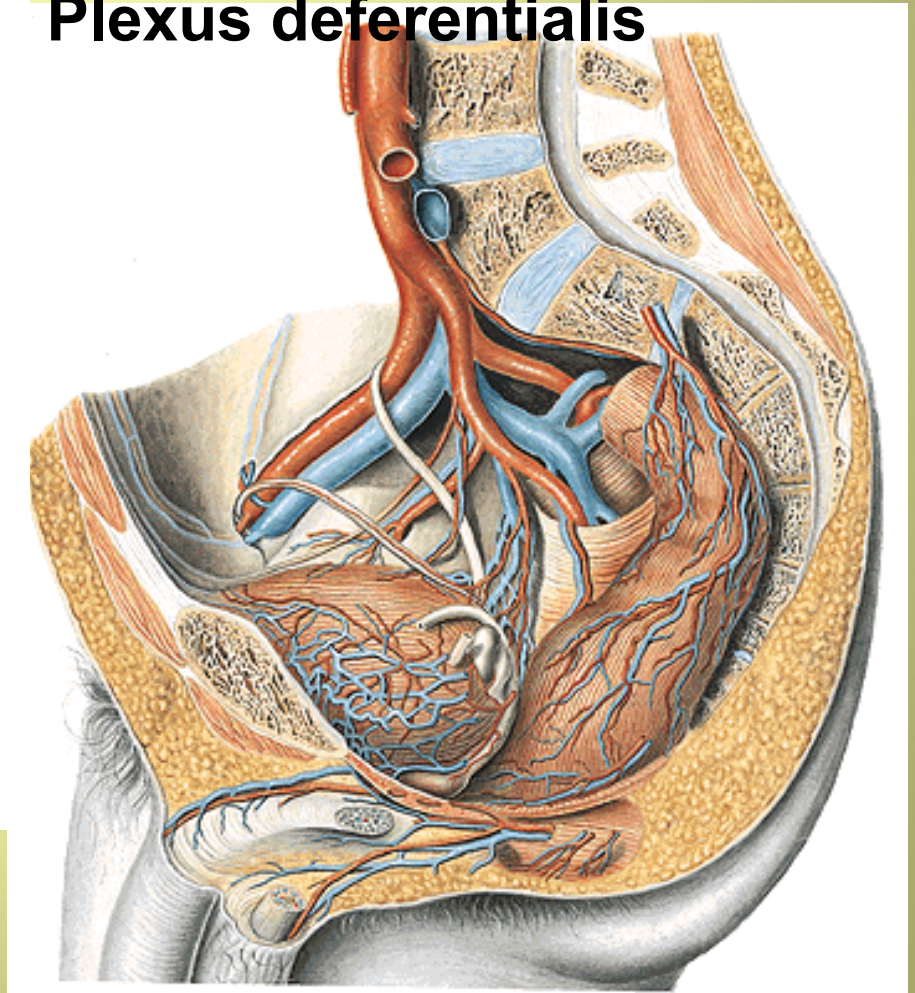
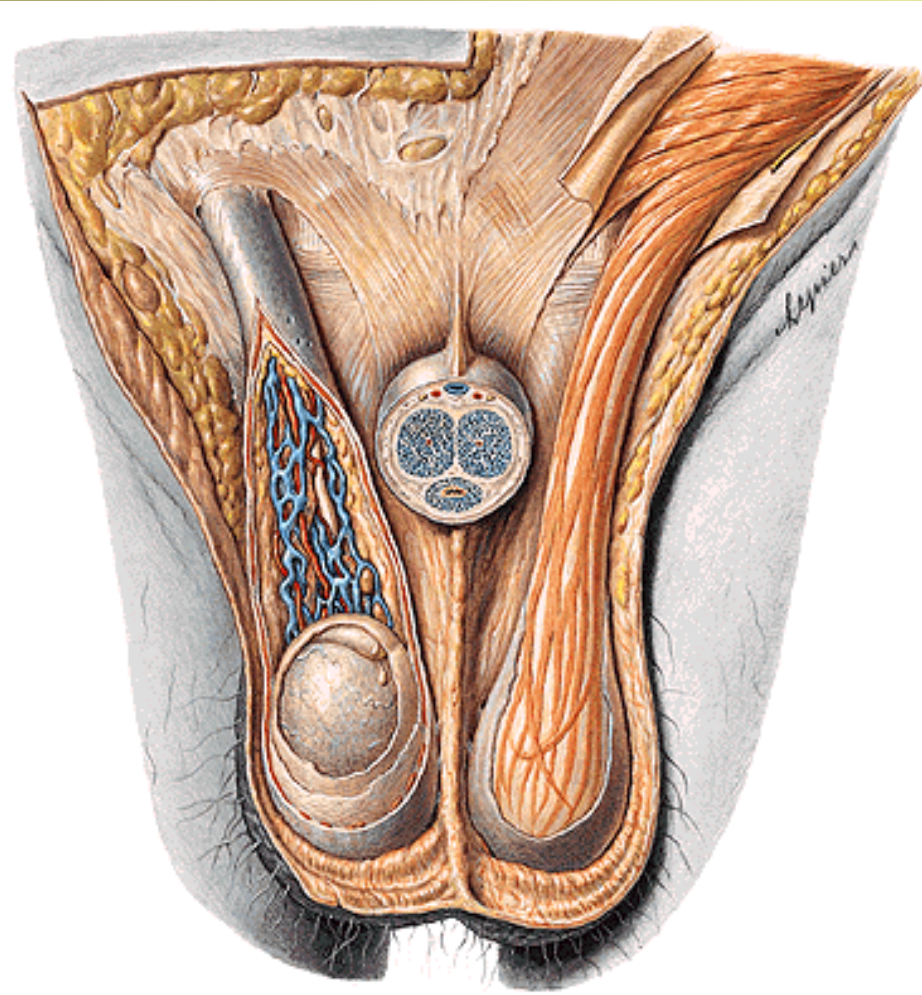
Plexus testicularis

Plexus pampiniformis

Ductus deferens

A. ductus deferentis

Plexus deferentialis

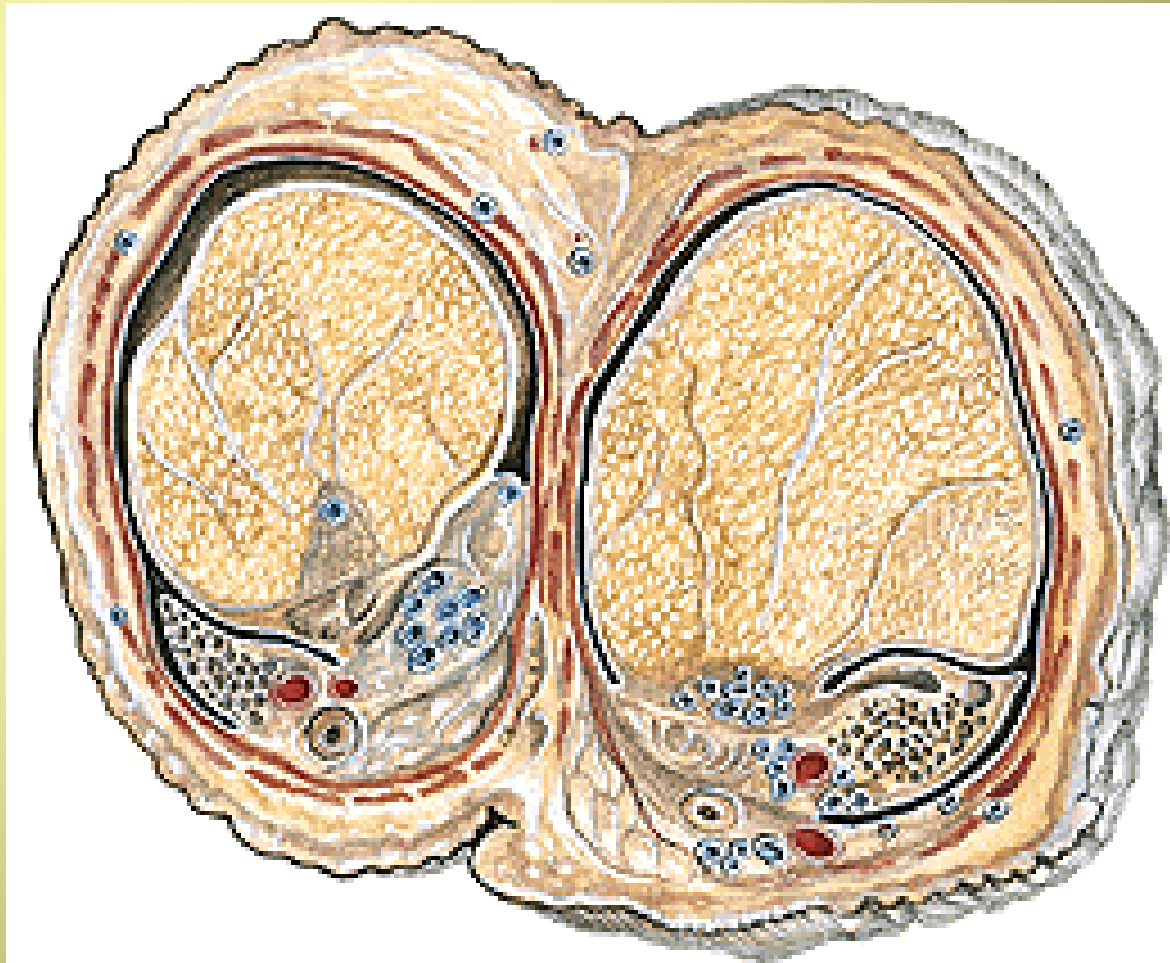


COVERINGS OF THE TESTIS, EPIDIDYMIS AND SPERMATIC CORD

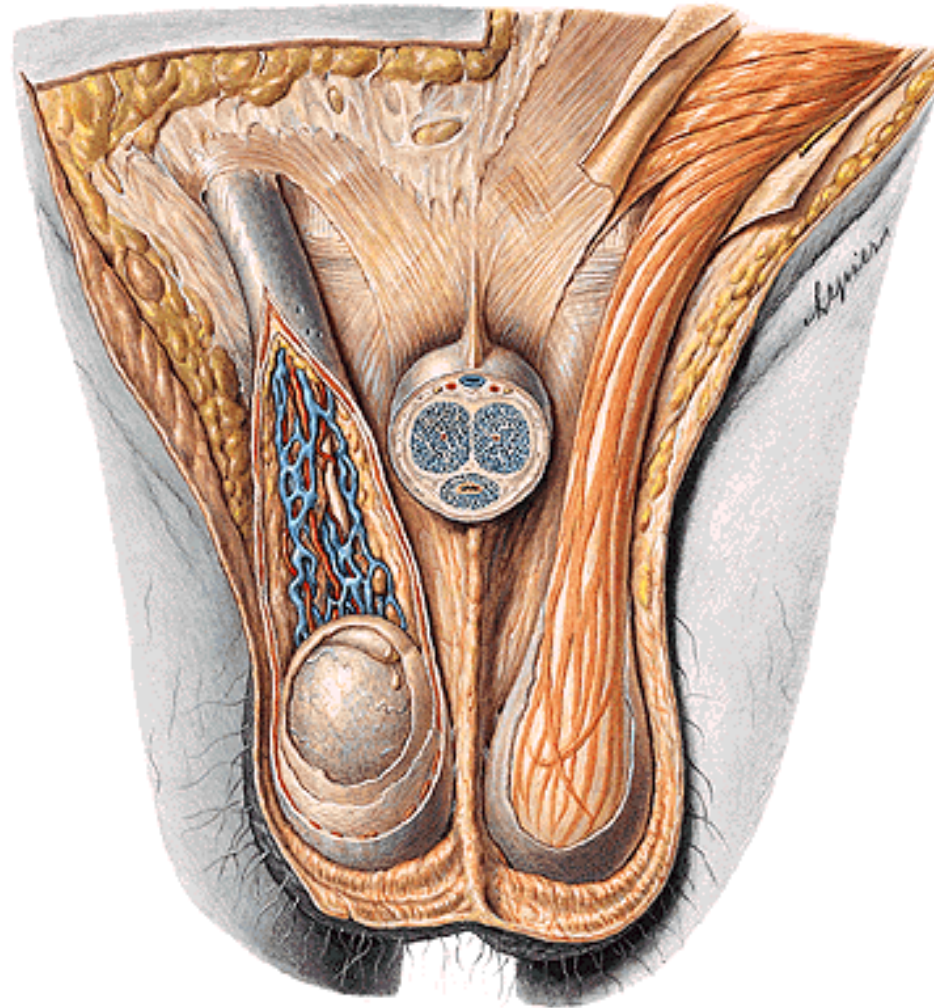
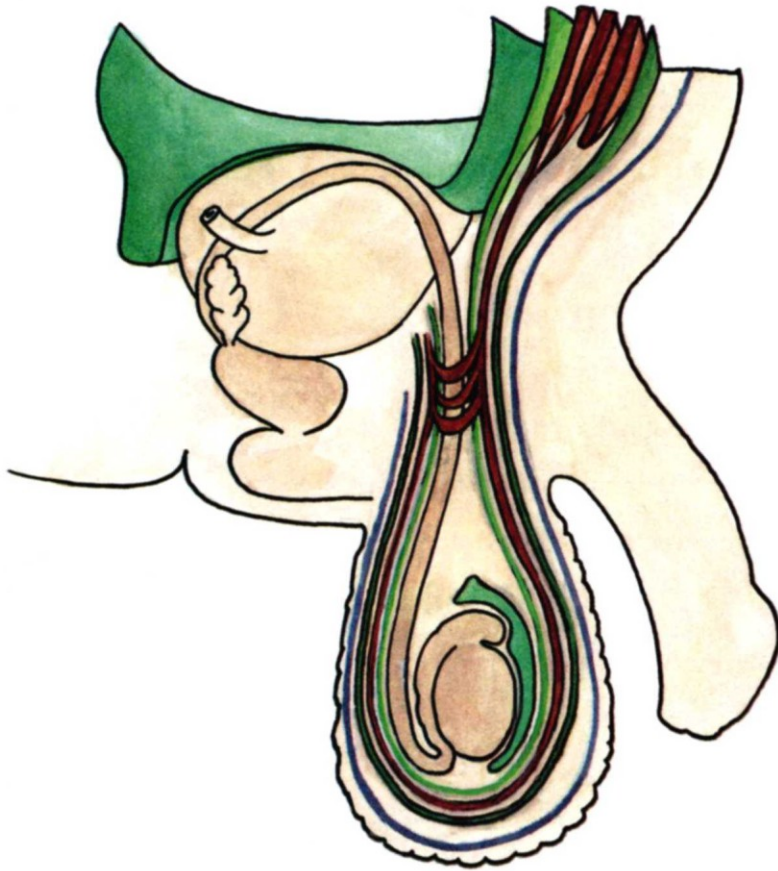
Epiorchium (Lamina visceralis tunicae vaginalis)

Periorchium (Lamina parietalis tunicae vaginalis)

Cavum serosum scroti



Fascia spermatica interna (Fascia transversalis)
Fascia cremasterica - M. cremaster
(M. obliquus abdominis internus, M. transversus abdominis)
Fascia spermatica externa (Fascia abdominis superficialis)



Fossa supravesicalis

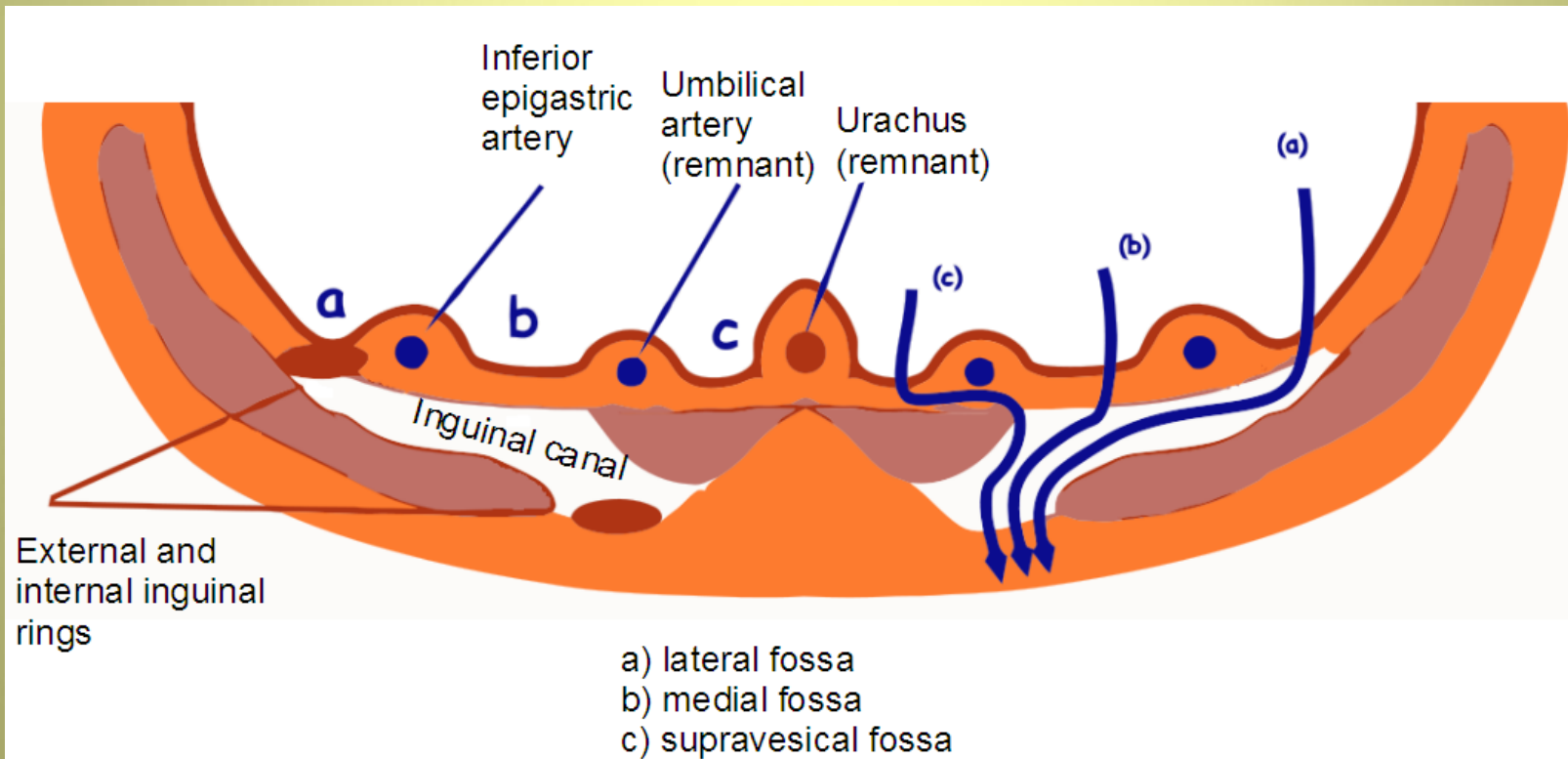
- hernia supravesicalis (c)

Fossa inguinalis medialis

- hernia inguinalis directa (b)

Fossa inguinalis lateralis

- hernia inguinalis indirecta (a)



VESICULA SEMINALIS

Ductus excretorius

Ductus ejaculatorius

PROSTATATA

Basis

Apex

Facies anterior

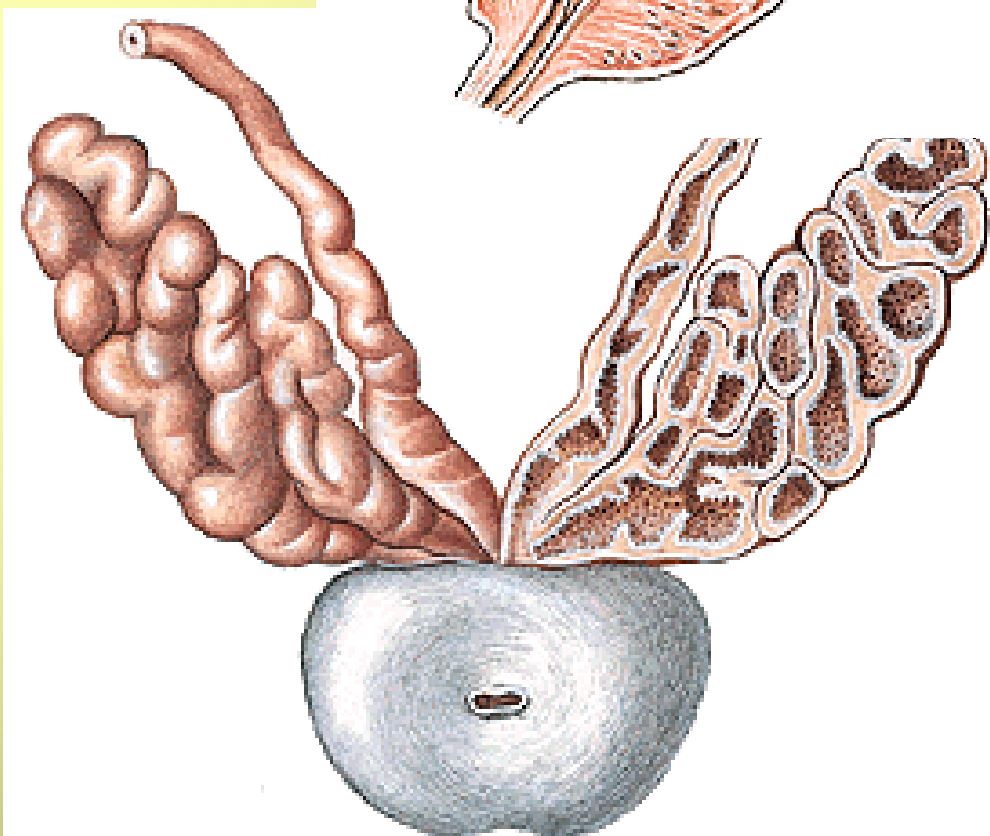
Facies posterior

Facies inferolaterales

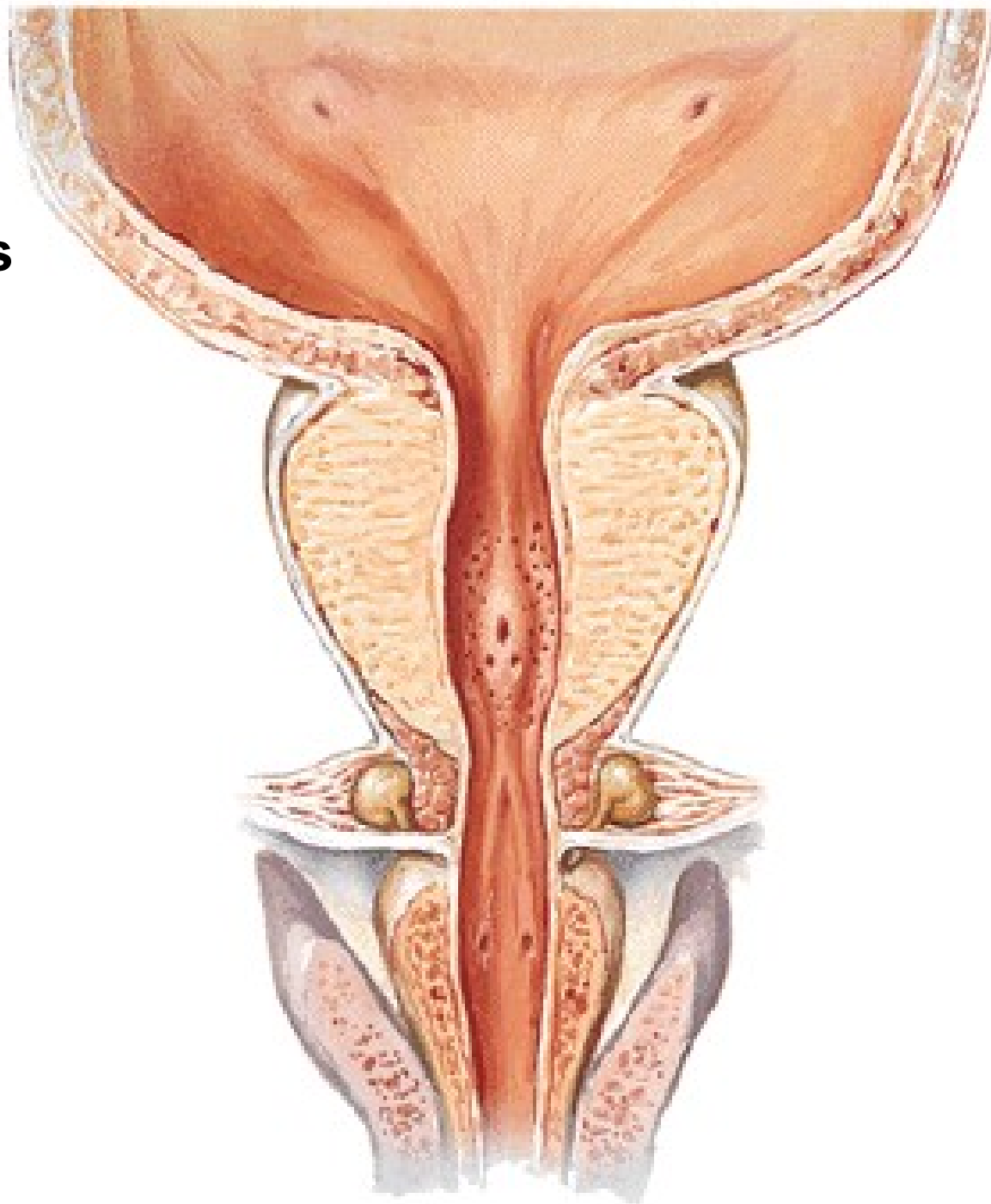
Lobus medius

Lobus dexter et sinister

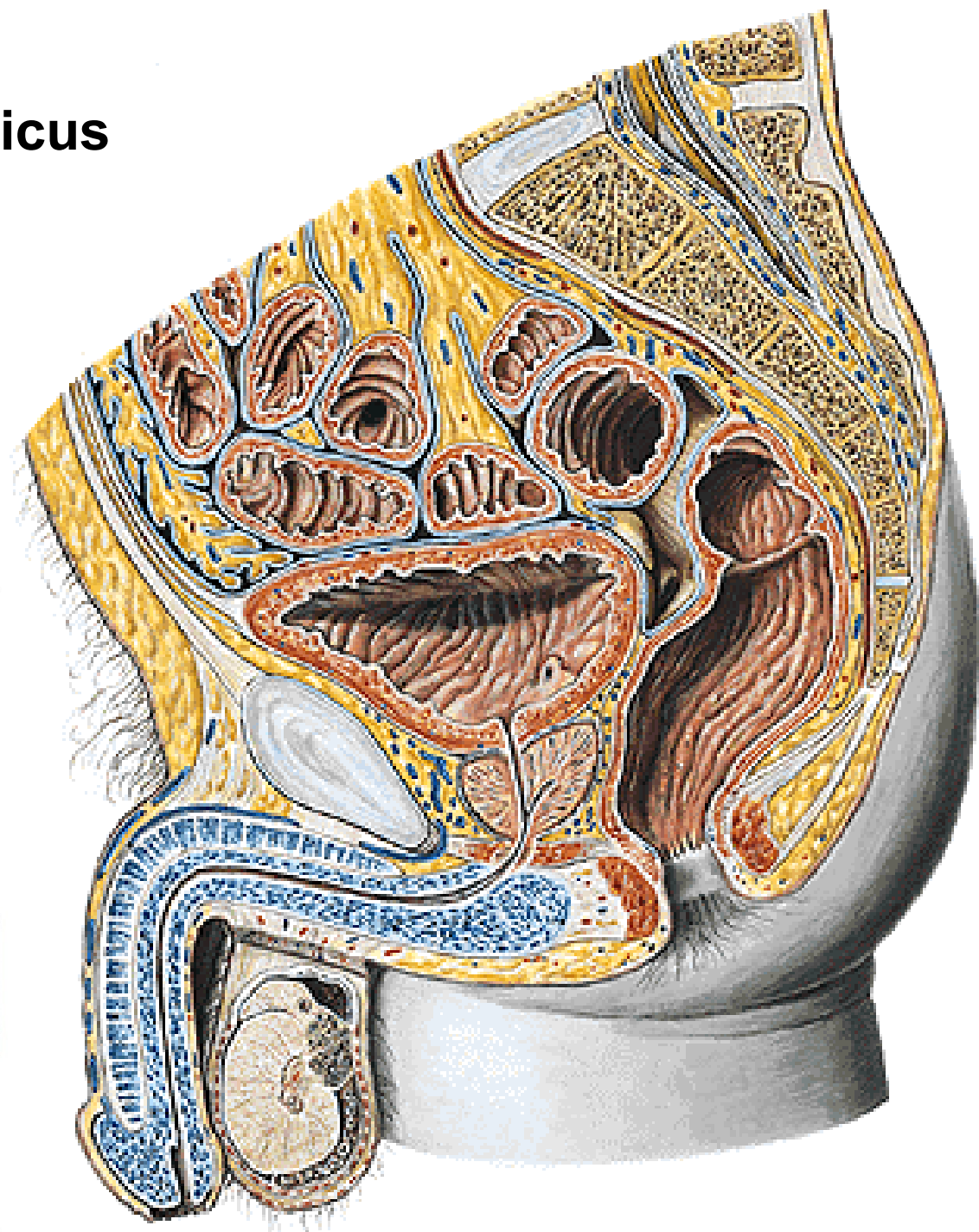
Isthmus



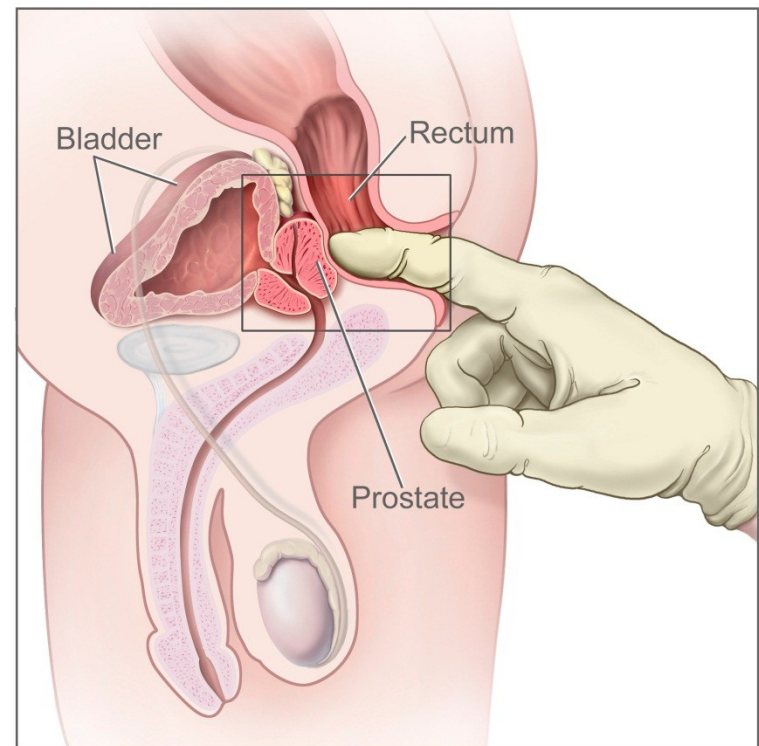
Crista urethralis
Colliculus seminalis
Utriculus prostaticus
Ductus ejaculatorii
Sinus prostatici

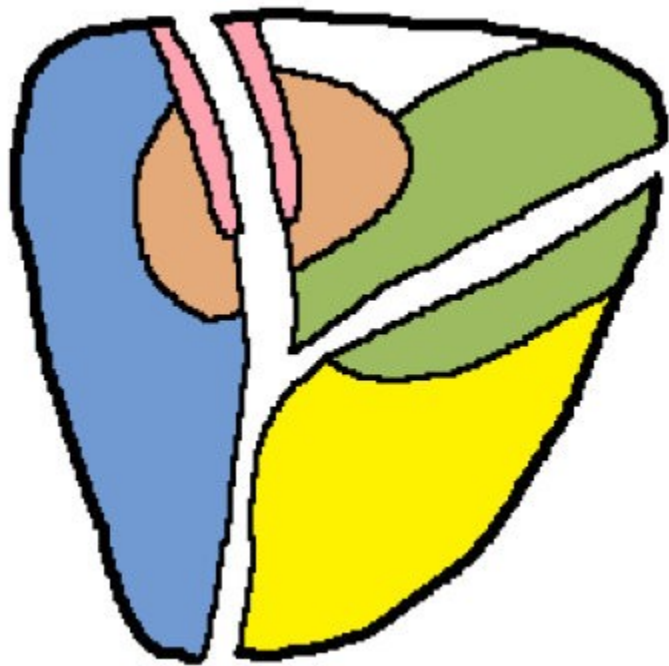


Capsula propria
Plexus venosus prostaticus
Fascia periprostatica
Lig. puboprostaticum
Lig. sacrogenitale
Septum rectovesicale
(Denonvilliers' fascia)

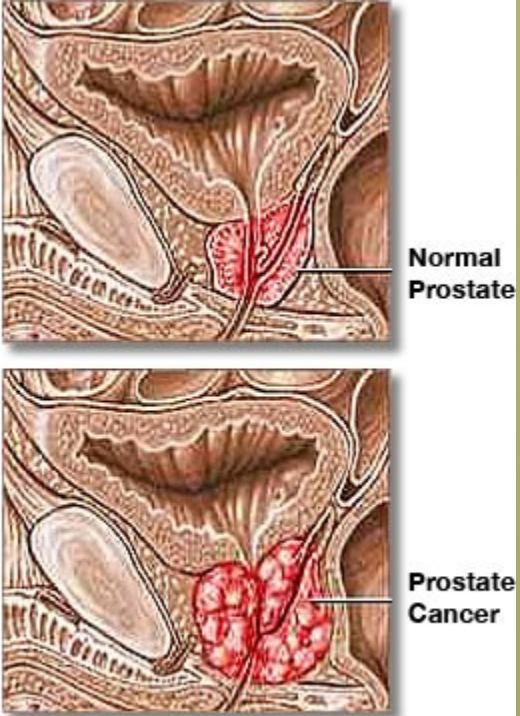
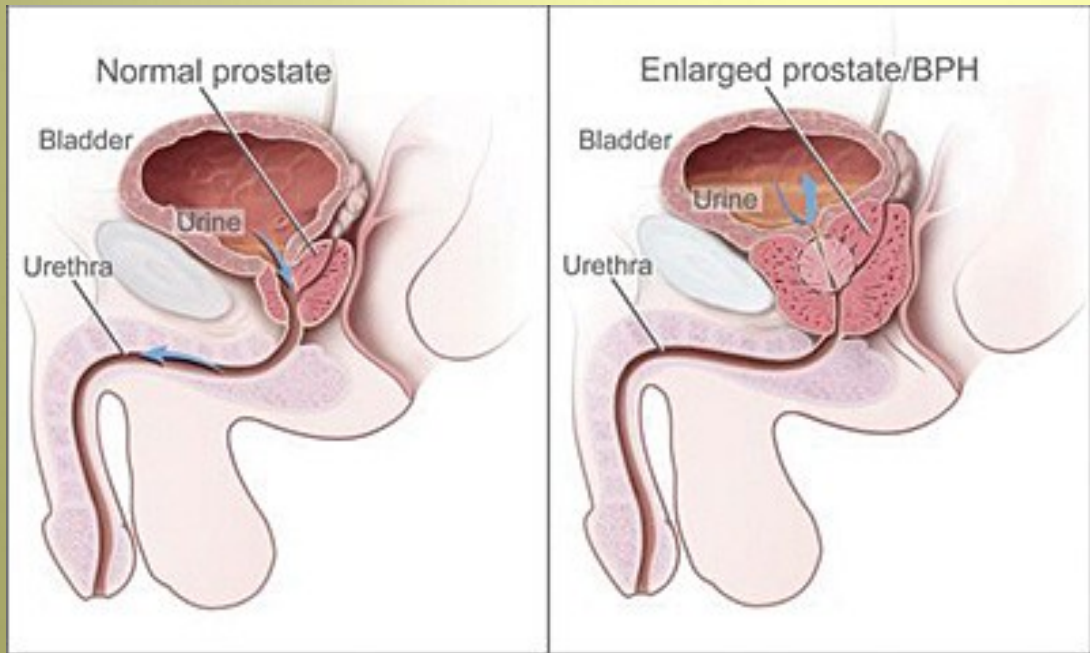


Bladder
Rectum
Prostate





- Anterior Fibromuscular Zone
- Preprostatic Sphincter
- Transitional Zone
- Central Zone
- Peripheral Zone



Prostate Illustration courtesy MaleCare.com

GLANDULAE BULBOURETHRALES

Ductus gl. bulbourethralis

URETHRA MASCULINA

Ostium urethrae internum

Ostium urethrae externum

Pars intramuralis – M. sphincter vesicae

Pars prostatica

Pars membranacea – M. sphincter urethrae

Pars spongiosa – Ampulla urethrae

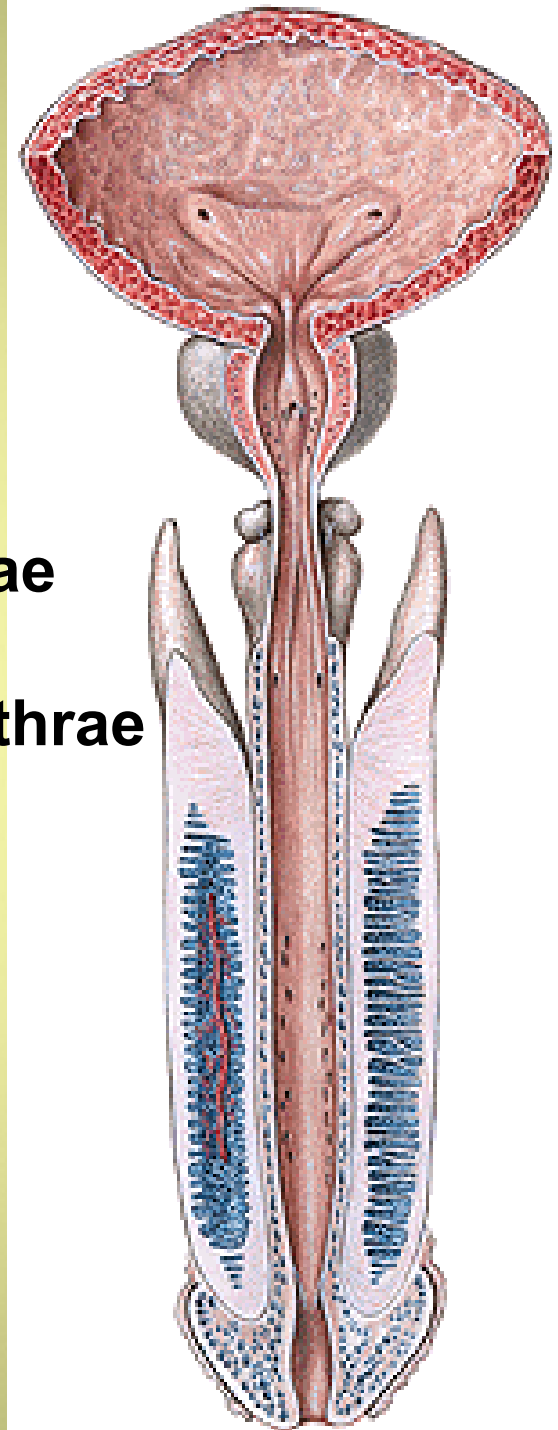
Corpus spongiosum penis

Fossa navicularis

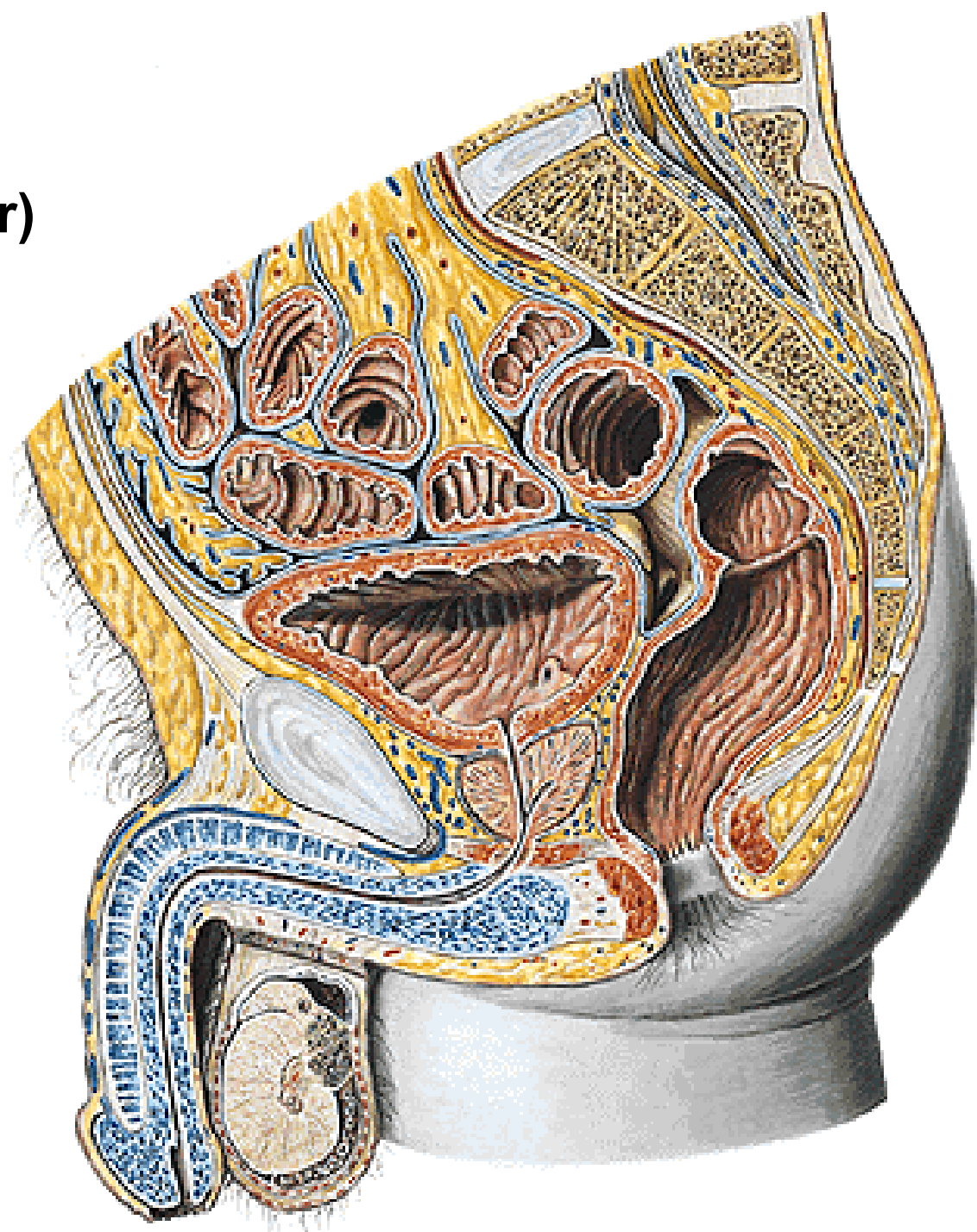
Valvula fossae navicularis

Glandulae urethrales

Lacunae urethrales



Curvatura subpubica
Curvatura praepubica
Urethra mobilis (anterior)
Urethra fixa (posterior)



EXTERNAL GENITAL ORGANS

PENIS: Radix

Corpus

Glans

Praeputium

SCROTUM



PENIS

Glans penis

Collum glandis

Corona glandis

Dorsum penis

Facies urethralis

Raphe penis

Praeputium

Ostium praeputii

Glandulae praeputiales

Smegma praeputii

Frenulum praeputii

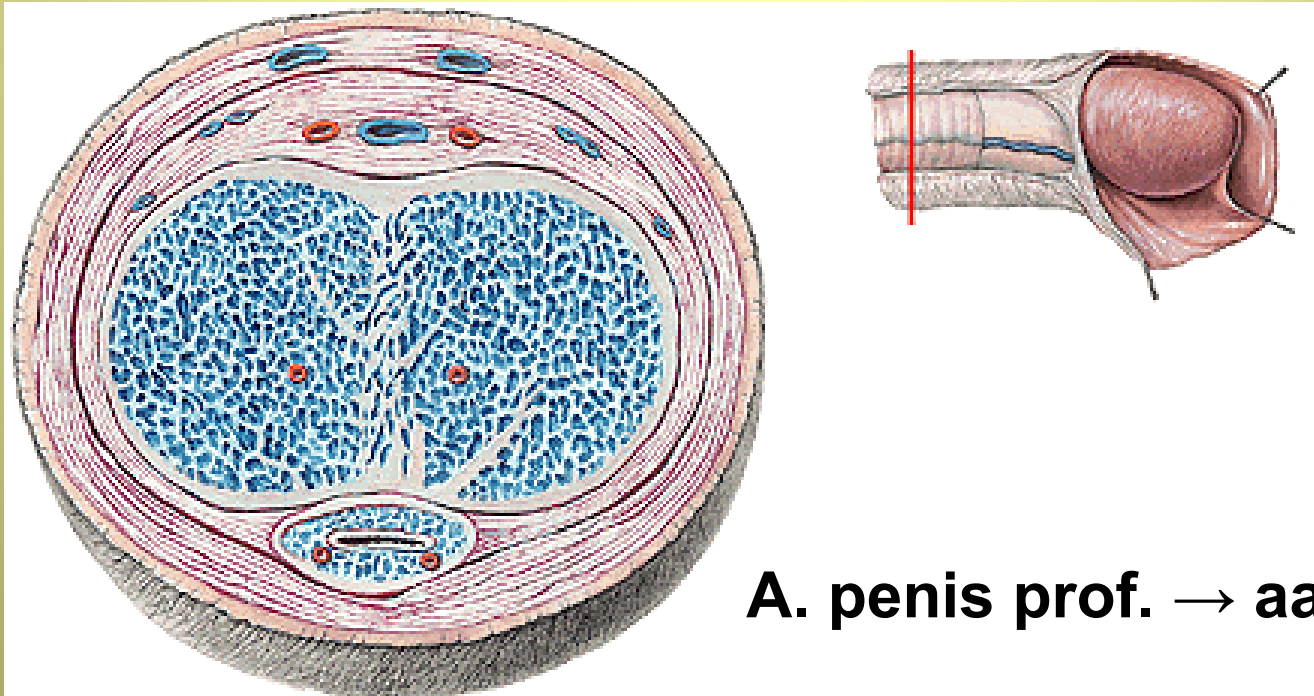
Corpus cavernosum

Corpus spongiosum

Tunica albuginea

Trabeculae

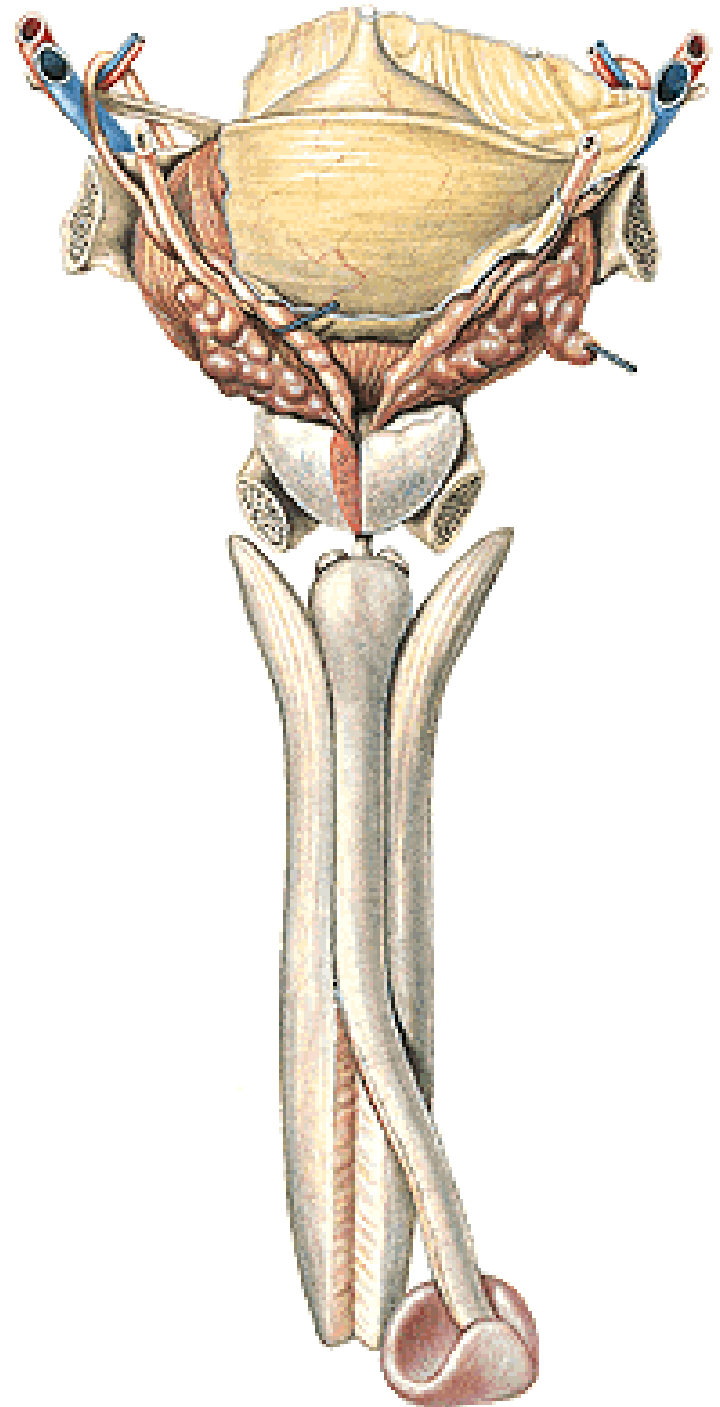
Cavernae



A. penis prof. → aa. helicinae

Corpus cavernosum
- crura penis - crista phallica
A. profunda penis

Corpus spongiosum
- bulbus penis
- glans penis



COVERINGS OF PENIS:

Fascia penis profunda

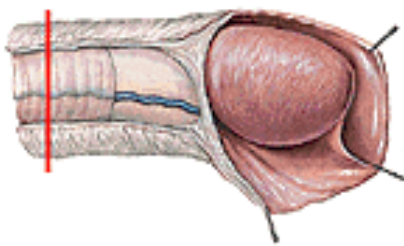
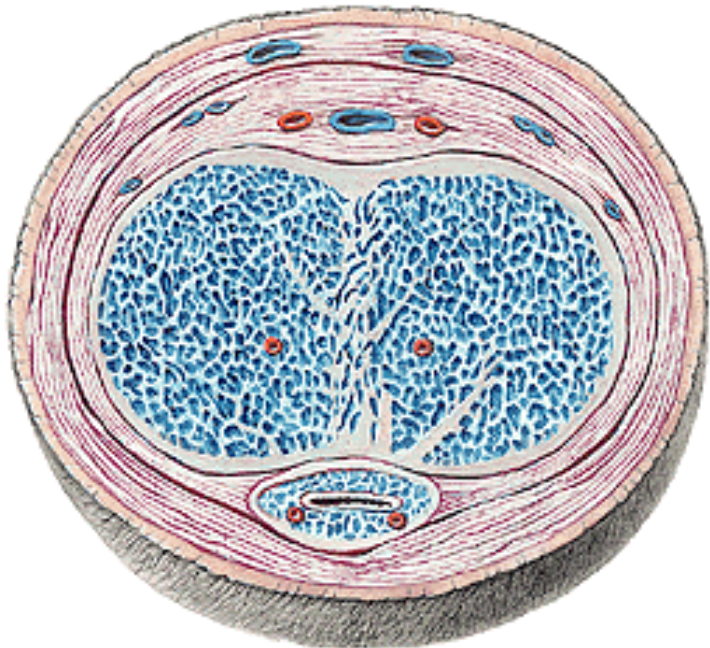
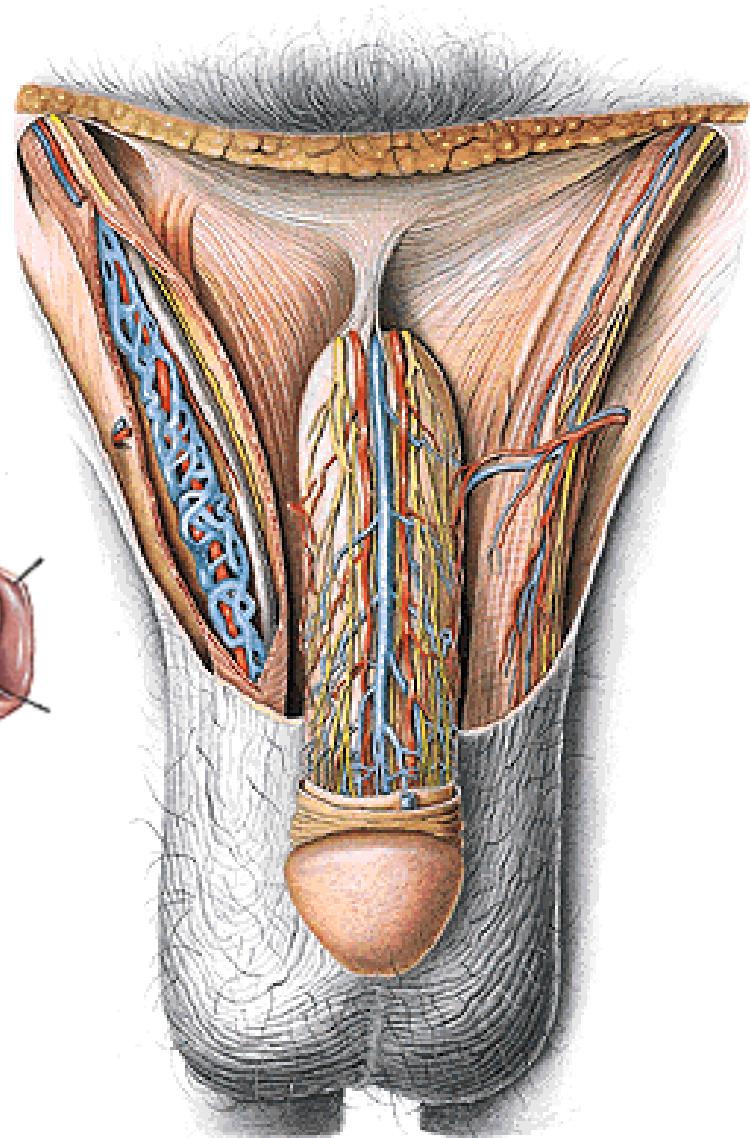
(Aa., Nn. dorsales penis, V. dorsalis penis profunda)

Fascia penis superficialis

(Vv. dorsales penis spf.)

Lig. fundiforme penis

Lig. suspensorium penis



SCROTUM

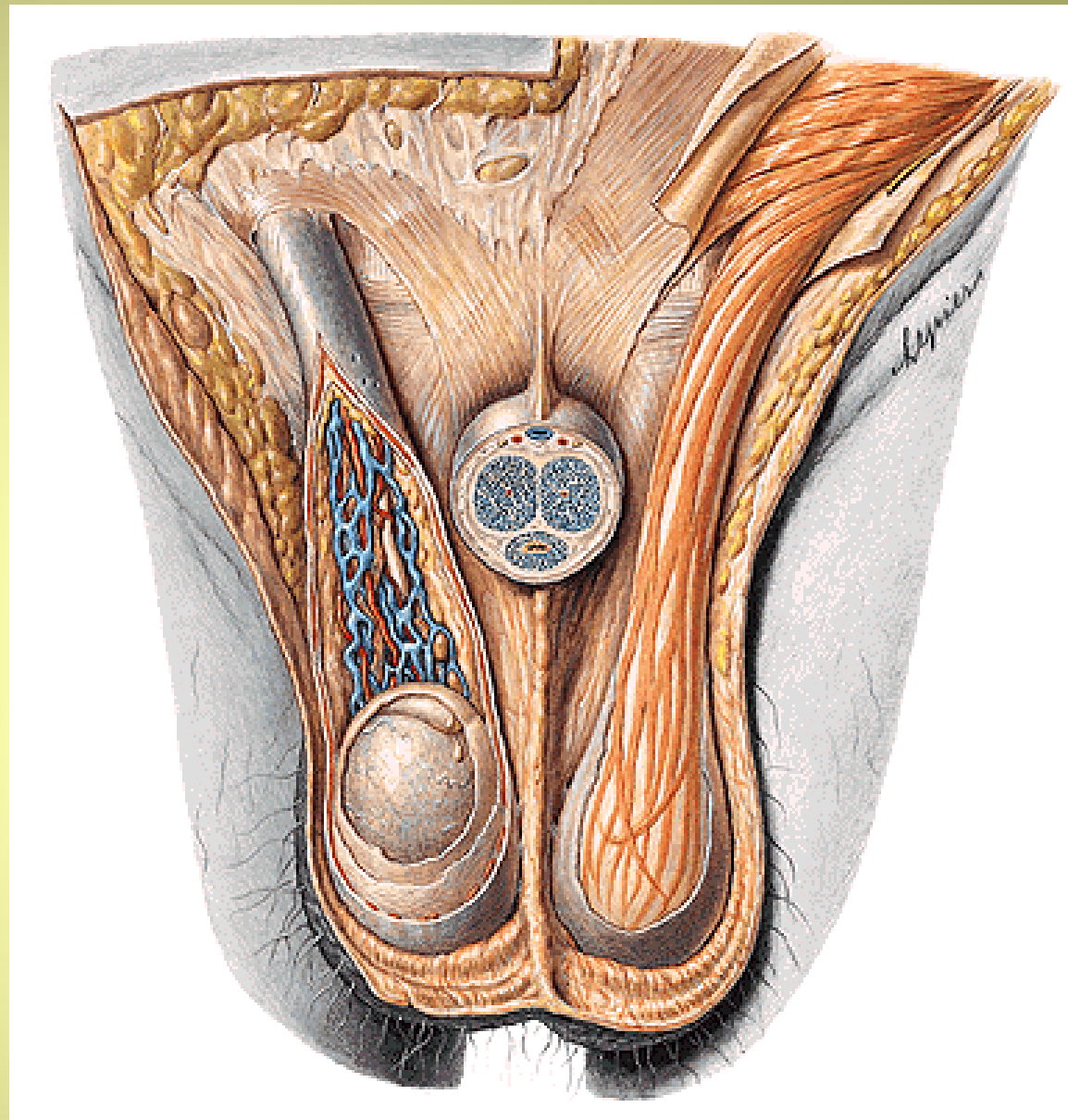
Raphe scroti

Pubes

Tunica dartos scroti

Septum scroti

Cavitas scroti



ANATOMICAL BASIS OF ERECTION

Parasympathetic stimulation

- relaxation of smooth muscle in cavernae and aa. helicinae, compression of venous plexuses by bulbospongiosus and ischiocavernosus muscles → erection**

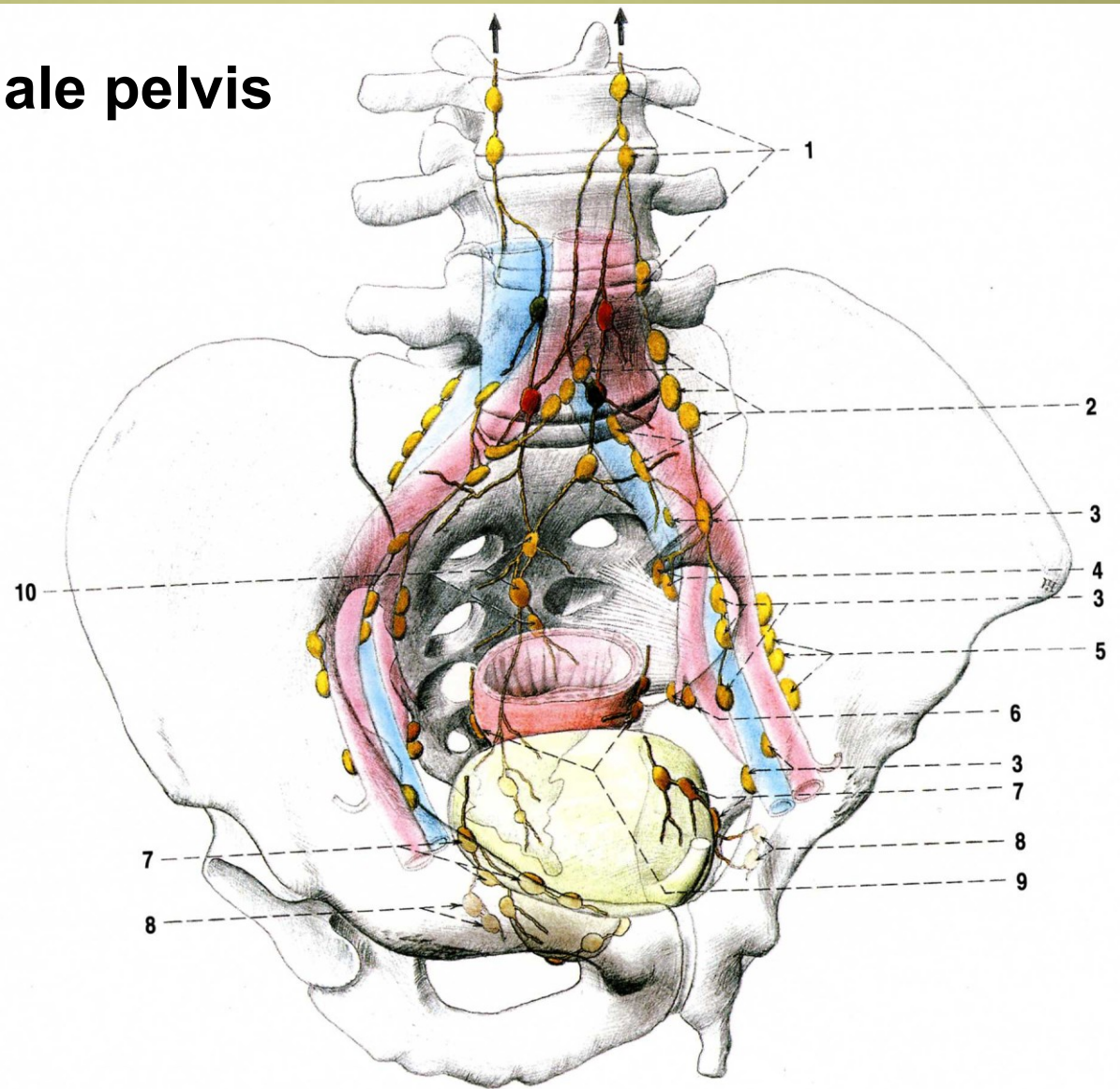
Sympathetic stimulation

- contraction of smooth muscle of aa. helicinae, relaxation of bulbospongiosus and ischiocavernosus muscles, drainage of blood into v. dorsalis penis prof. → detumescence**

EJACULATION OF THE SEMEN

- 1. Emission of sperms and genital glands secretion
- sympathetic stimulation**
- 2. Expulsion of the semen from the spongy urethra (ejaculation) – parasympathetic stimulation**

Drainage of the male pelvis



Obr. 139. NODI SACRALES A MÍZNÍ UZLINY PÁNEVNÍCH
ORGÁNŮ MUŽE

- 1 nodi lumbales
- 2 nodi iliaci communes
- 3 nodi iliaci interni
- 4 nodi glutaei superiores

- 5 nodi iliaci externi
- 6 nodi glutaei inferiores
- 7 nodi paravesicales
- 8 nodi obturatorii
- 9 nodi pararectales
- 10 nodi sacrales

PELVIC FLOOR

DIAPHRAGMA PELVIS

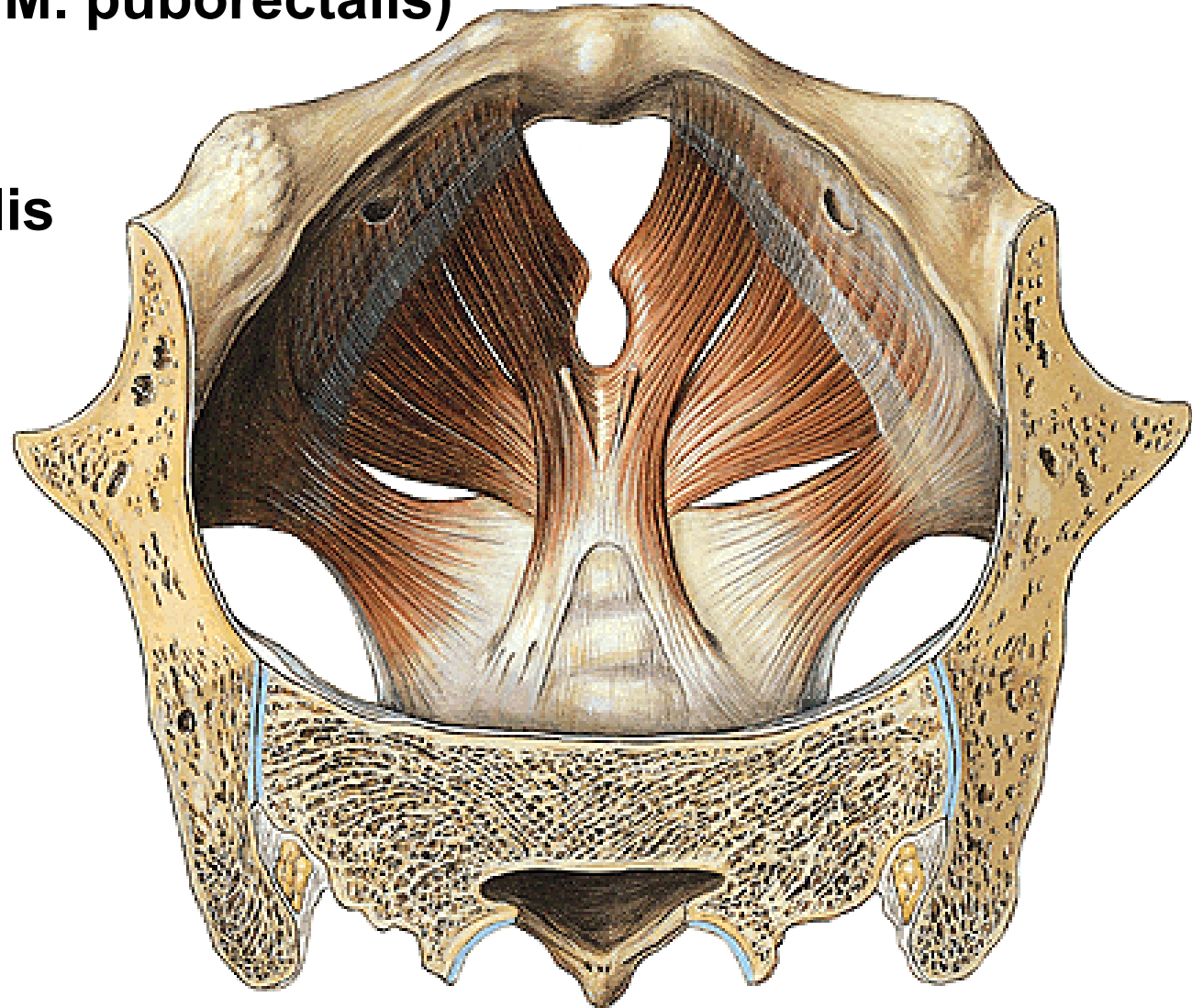
M. levator ani – pars iliaca (M. iliococcygeus)

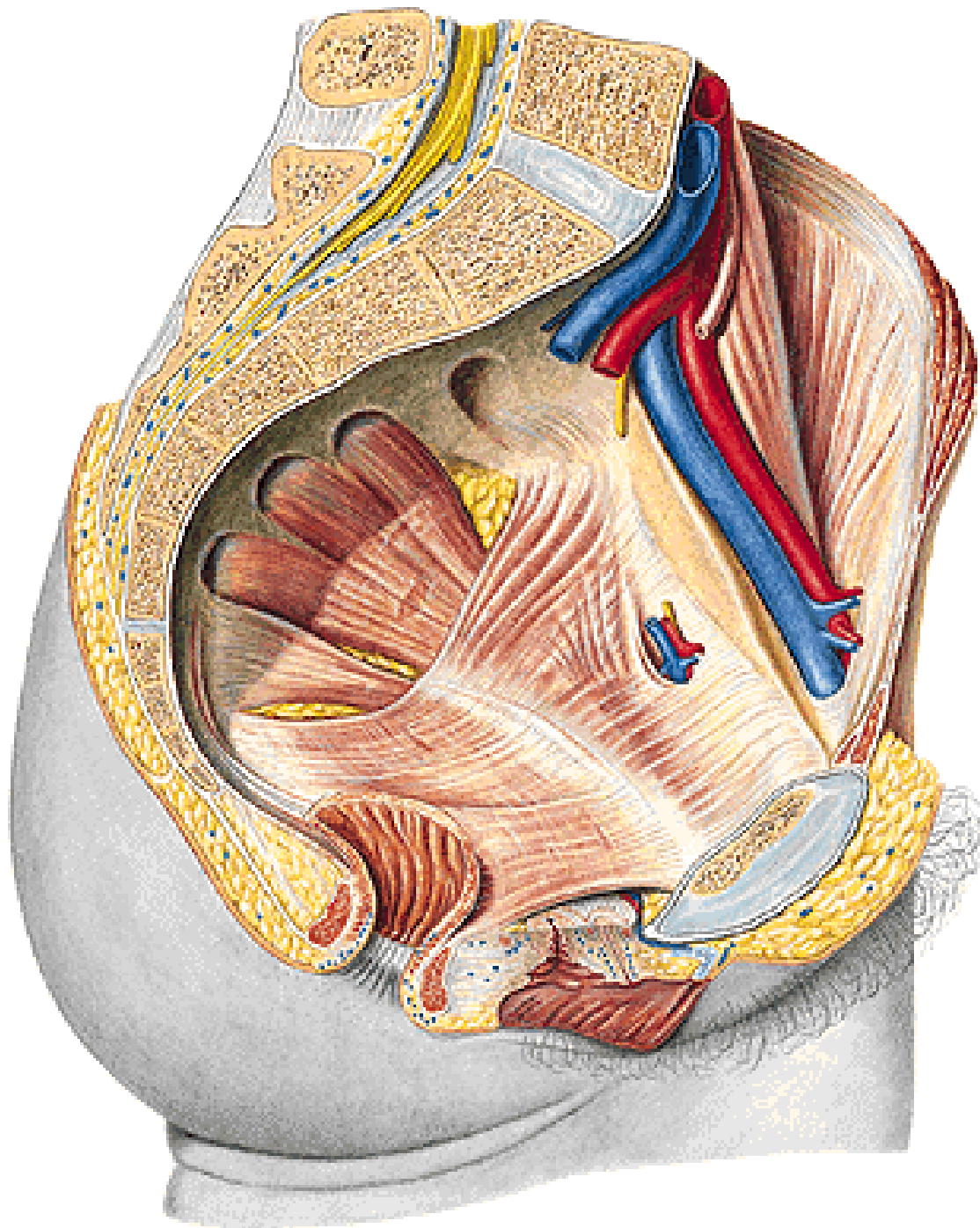
- pars pubica (M. pubococcygeus)

(- M. puborectalis)

M. coccygeus

Hiatus urogenitalis





Fascia obturatoria
Canalis pudendalis
(Alcock)

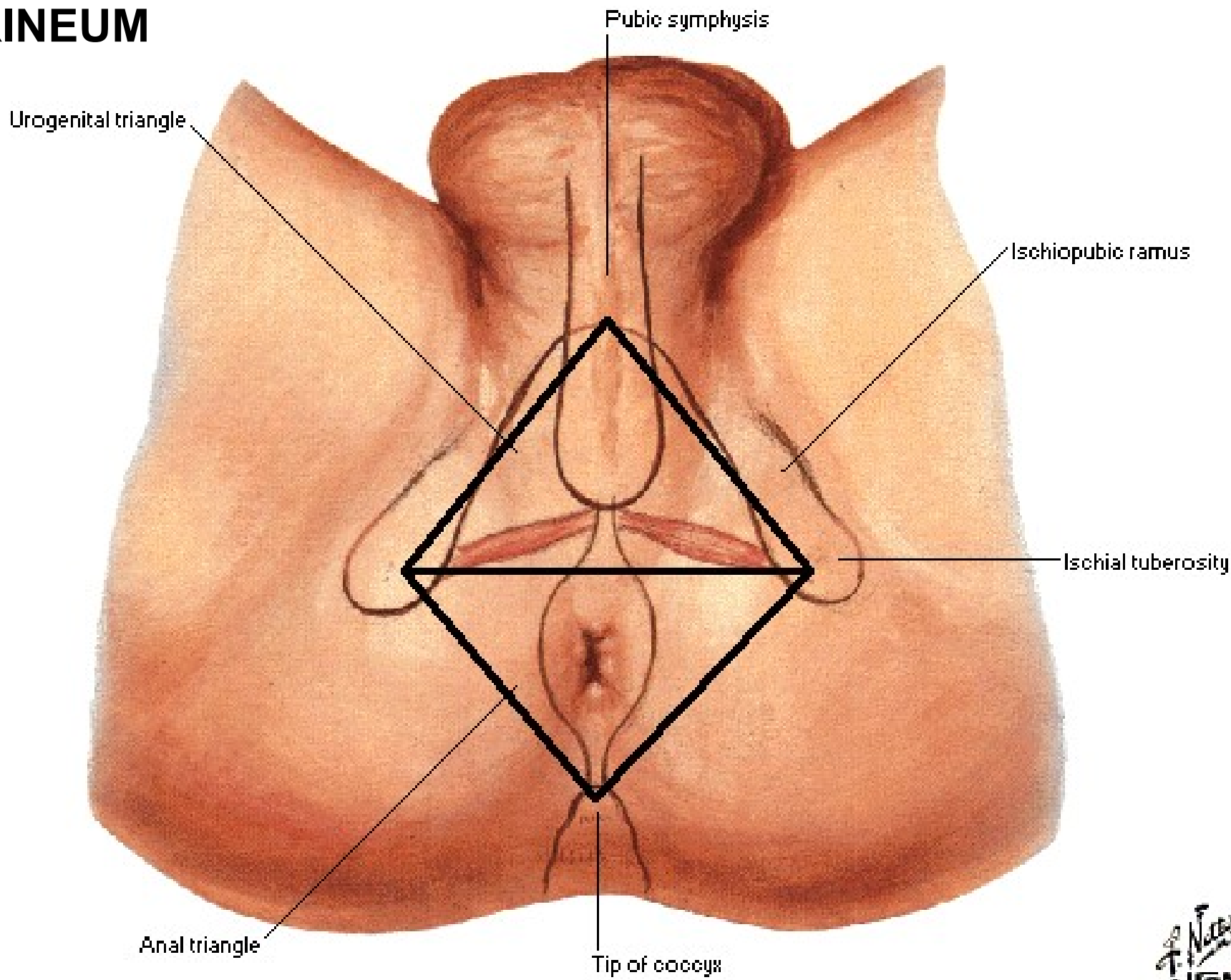
Fascia sup. diaphragmatis
pelvis

Fascia inf. diaphragmatis
pelvis

Fossa ischioanalis/
- rectalis



PERINEUM



Fossa ischioanalis/-rectalis

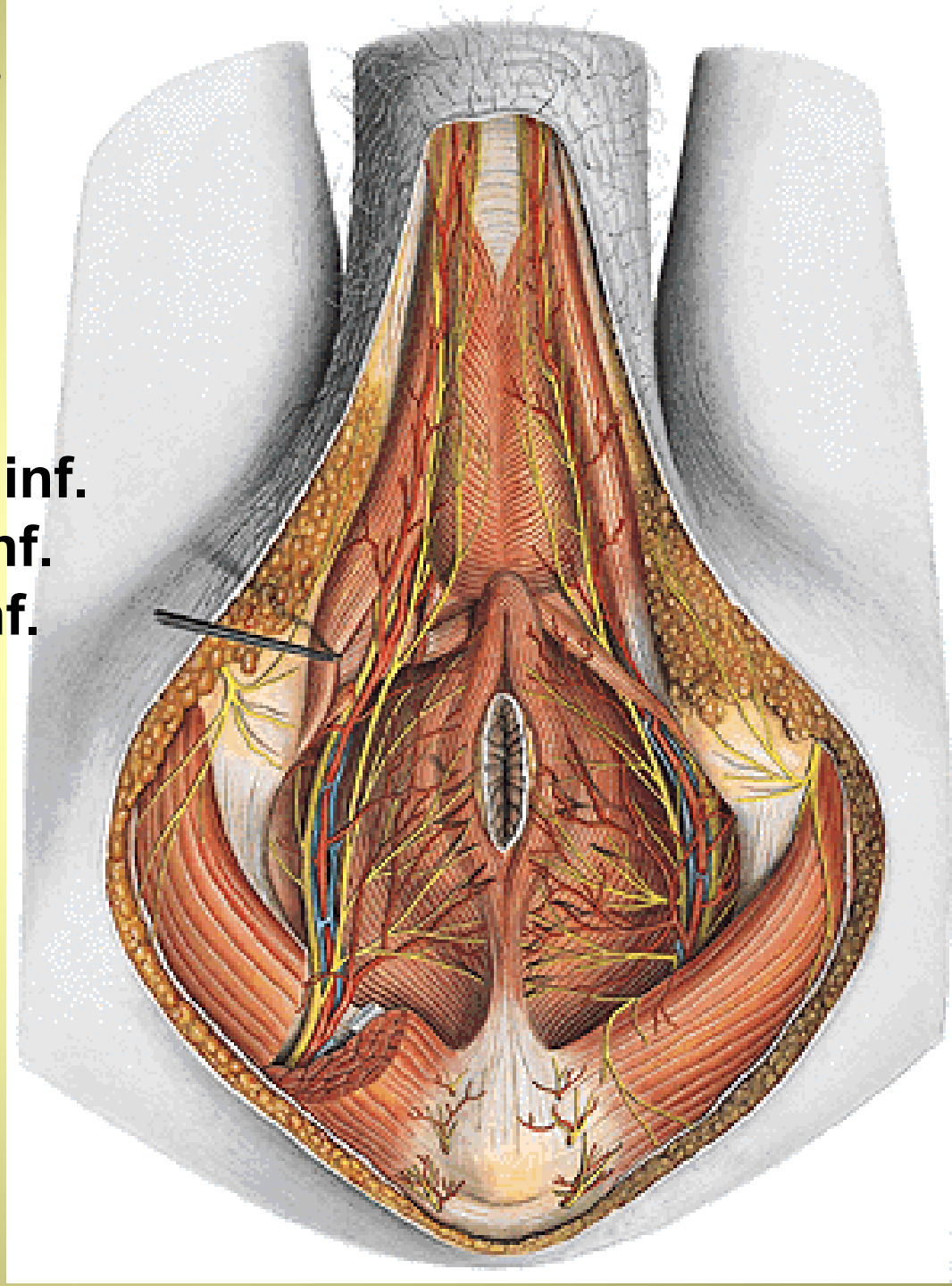
M. sphincter ani externus

Lig. anococcygeum

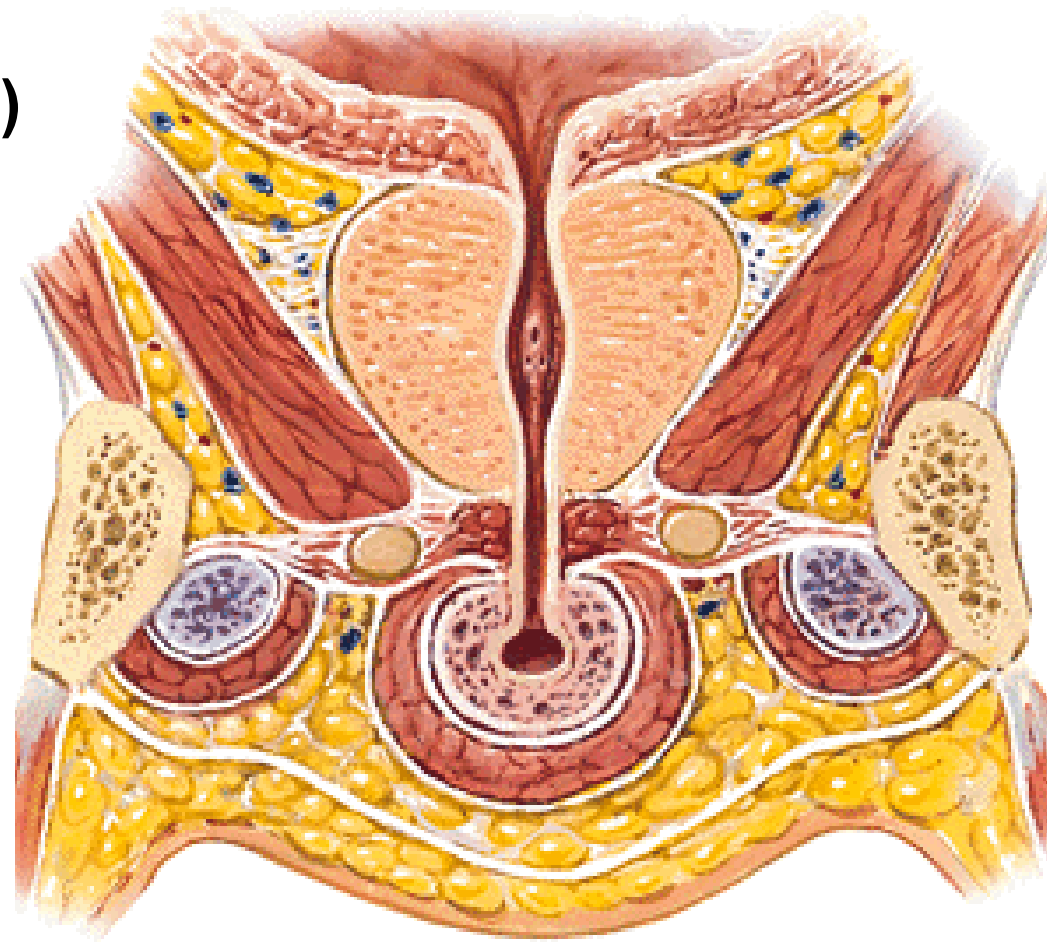
N. pudendus – nn. rectales inf.

A. pudenda int. – aa. rect. inf.

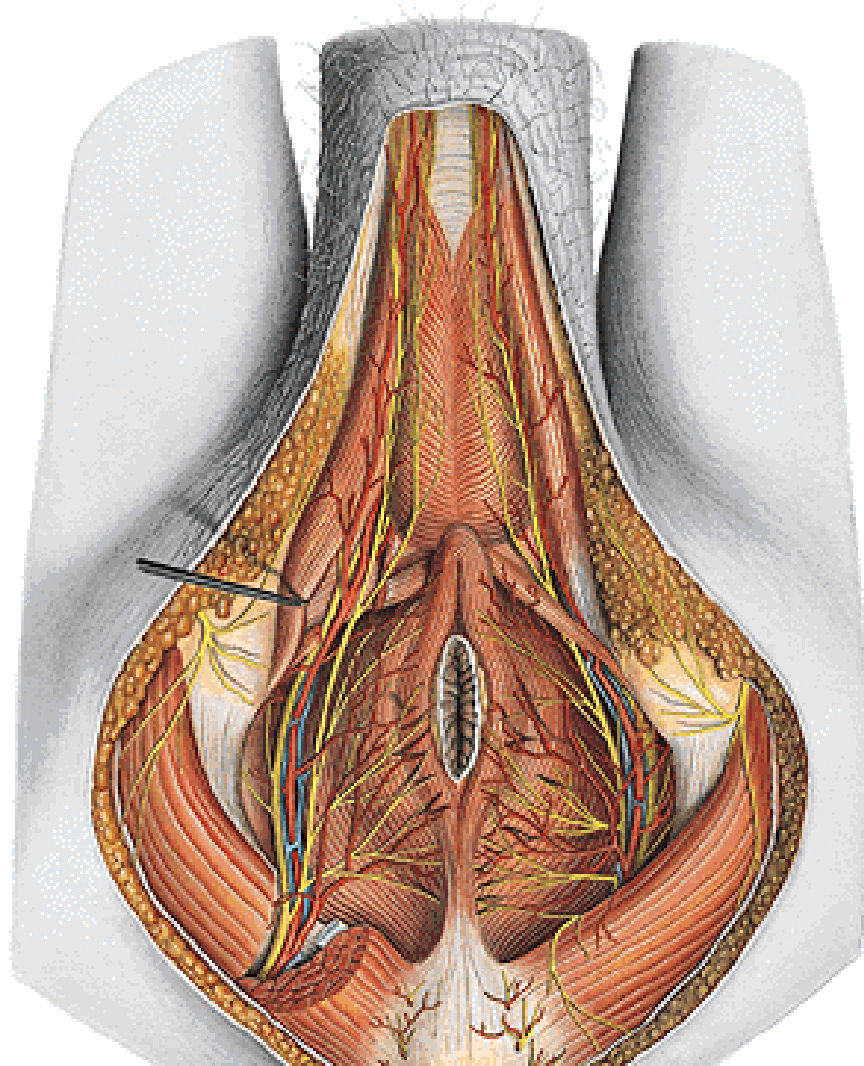
V. pudenda int. – vv. rect. inf.



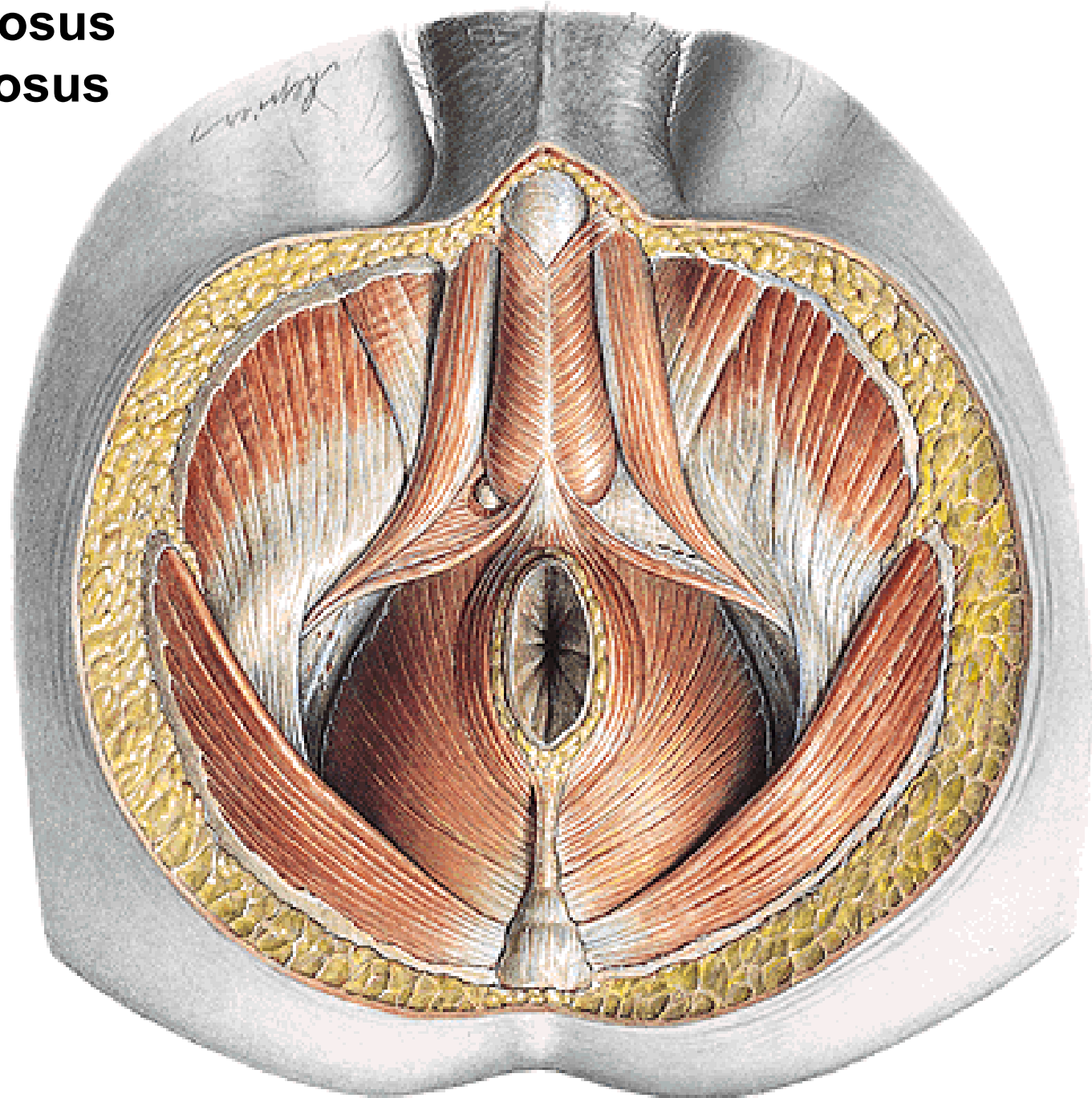
Fascia perinei (superficialis)



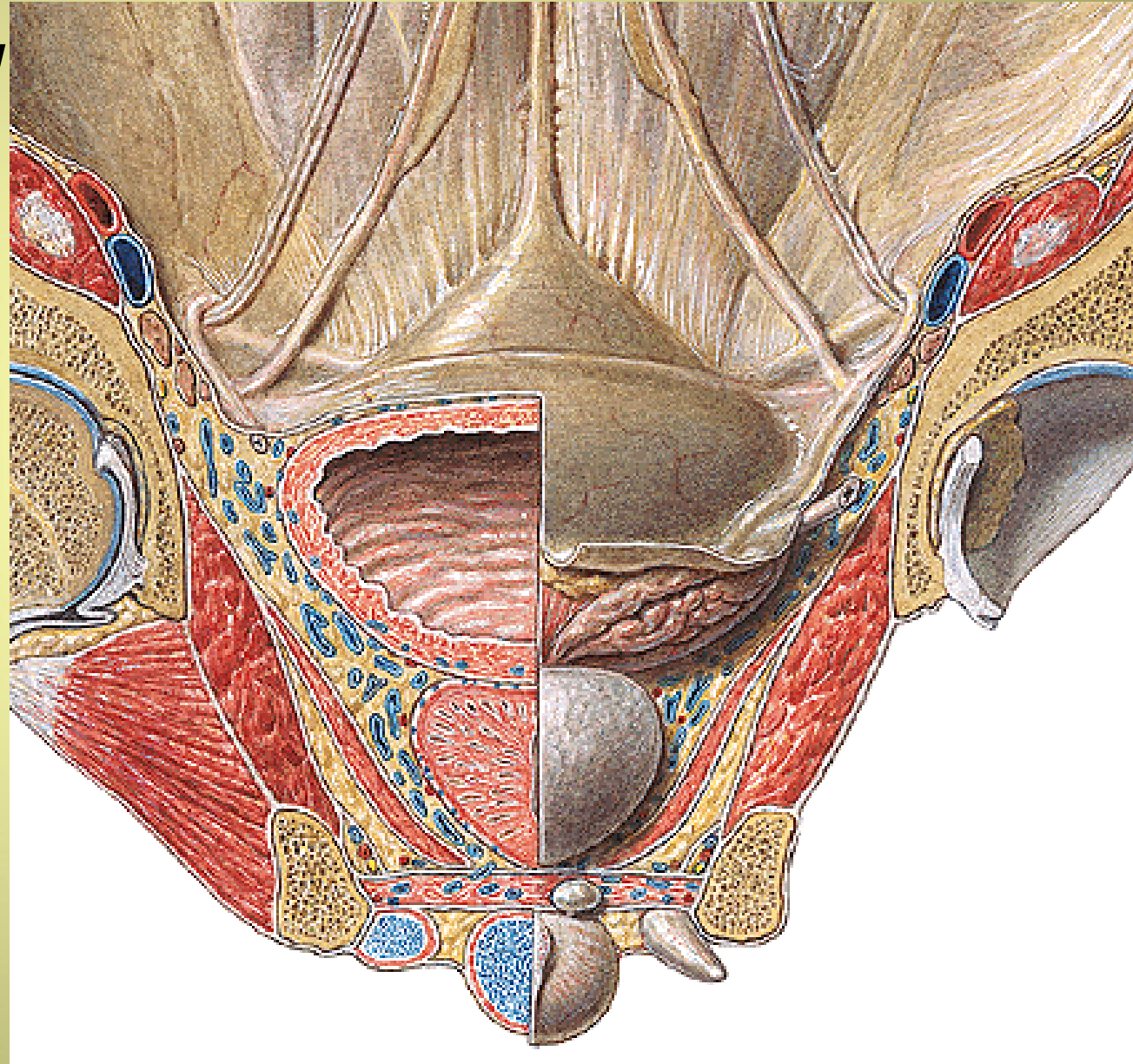
Spatium superficiale perinei



M. ischiocavernosus
M. bulbospongiosus



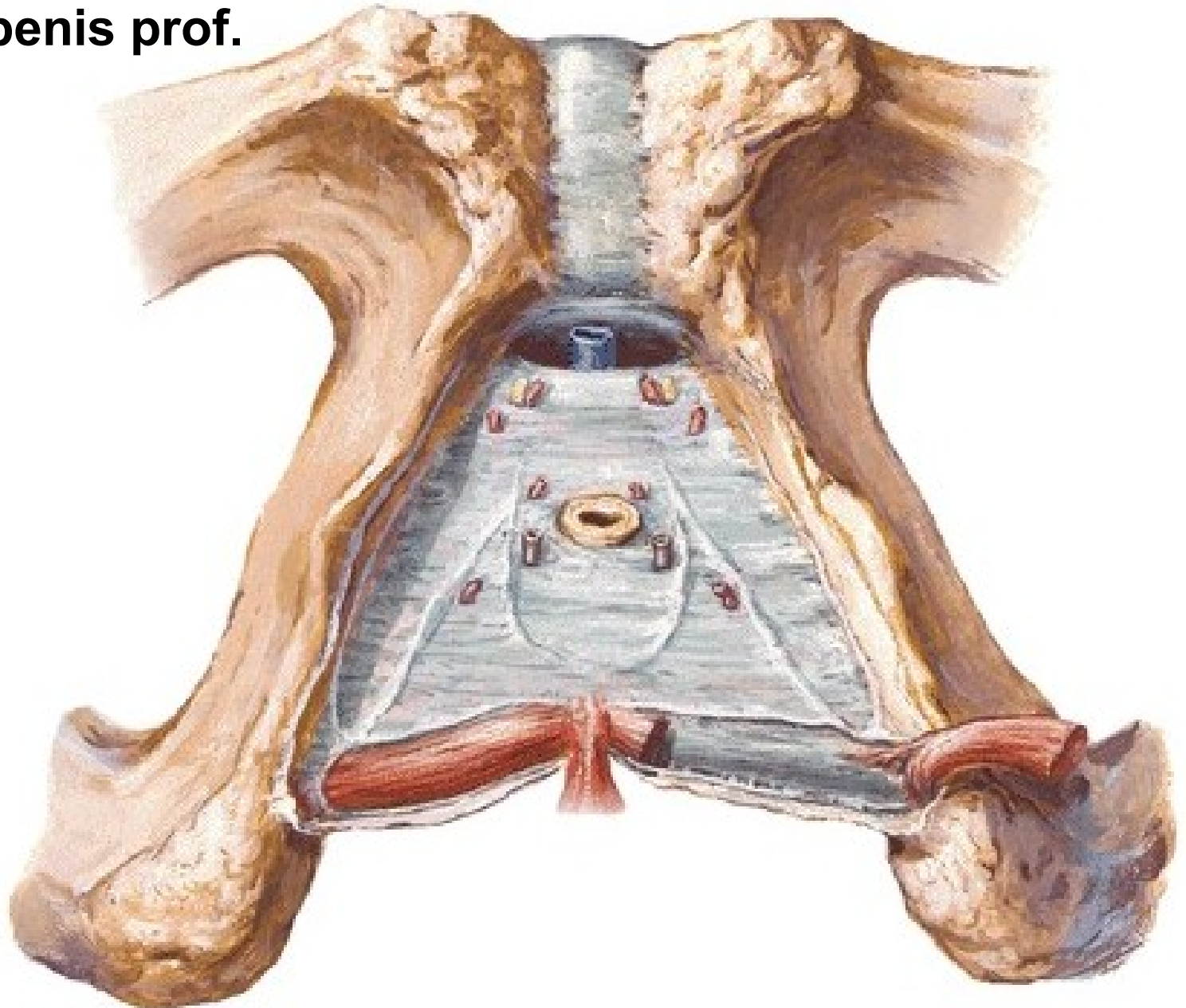
Membrana perinei
Saccus profundus perinei/diaphragma urogenitale
Recessus pubicus
**fossae ischioanalis/
- rectalis**



M. transversus perinei spf.

Membrana perinei/Fascia inf. diaphragmatis urogenitalis

V. dorsalis penis prof.



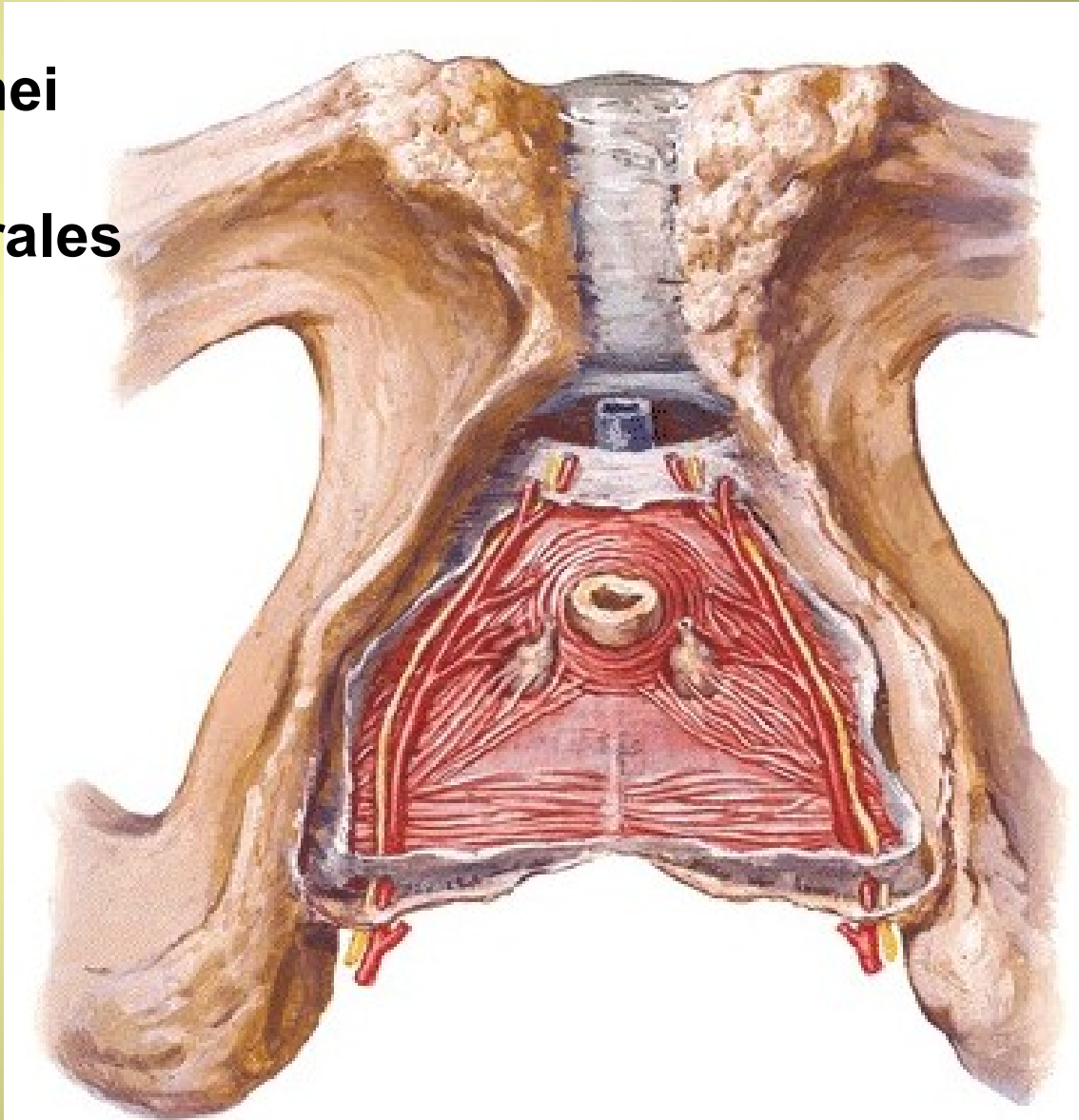
SACCUS PROF. PERINEI

M. transversus perinei profundus – Centrum perineale

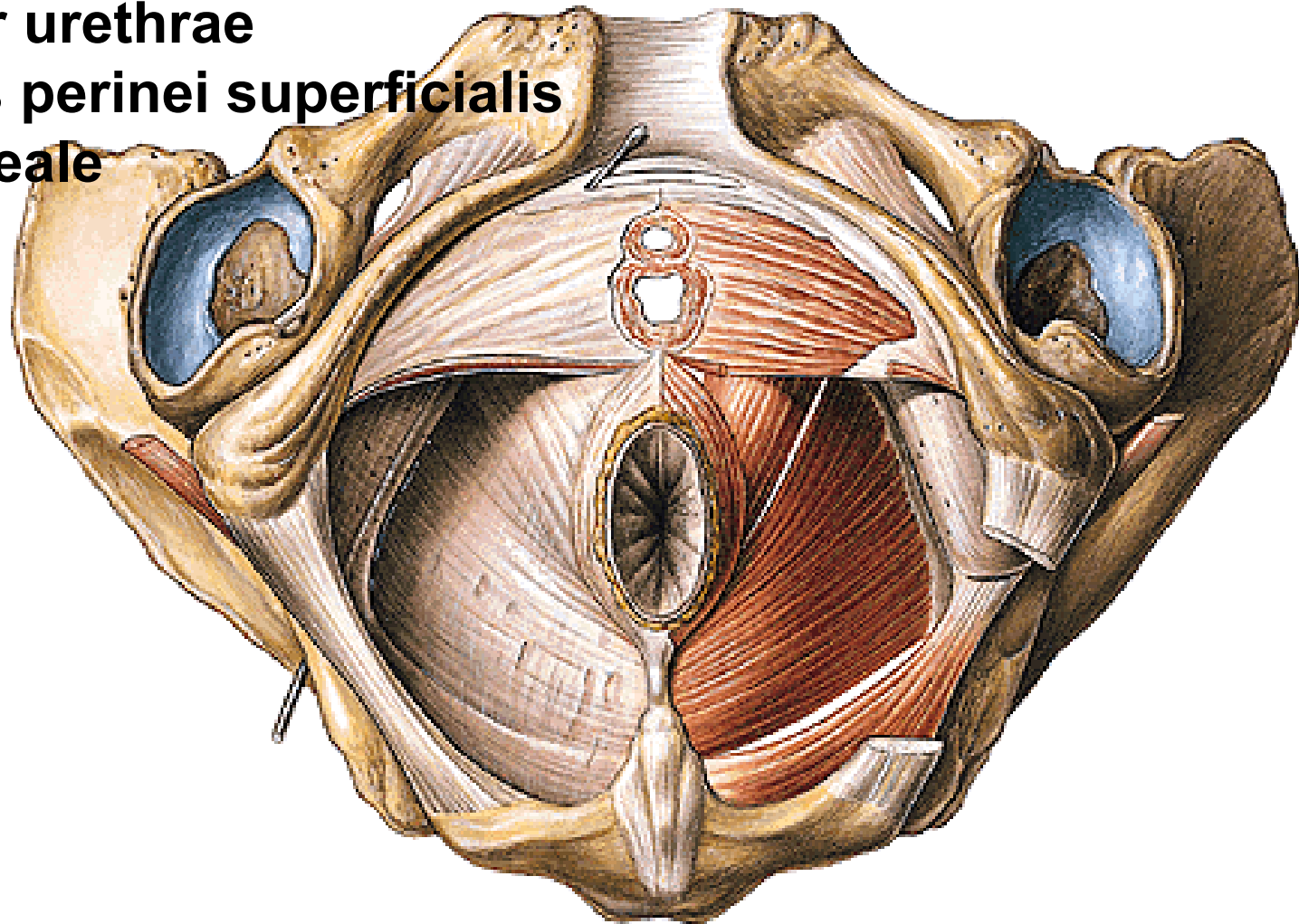
M. sphincter urethrae

Lig. transversum perinei

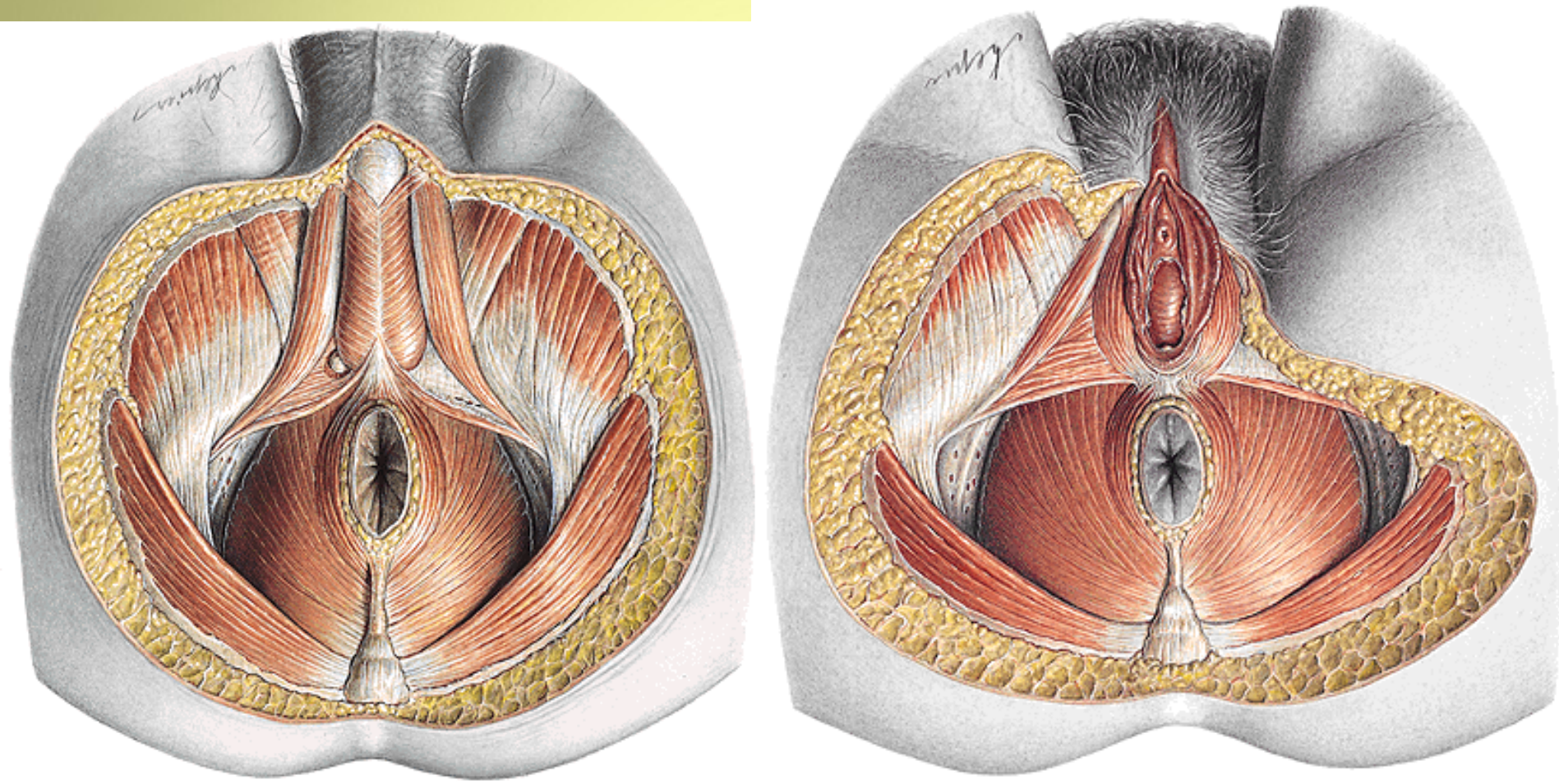
Glandulae bulbourethrales



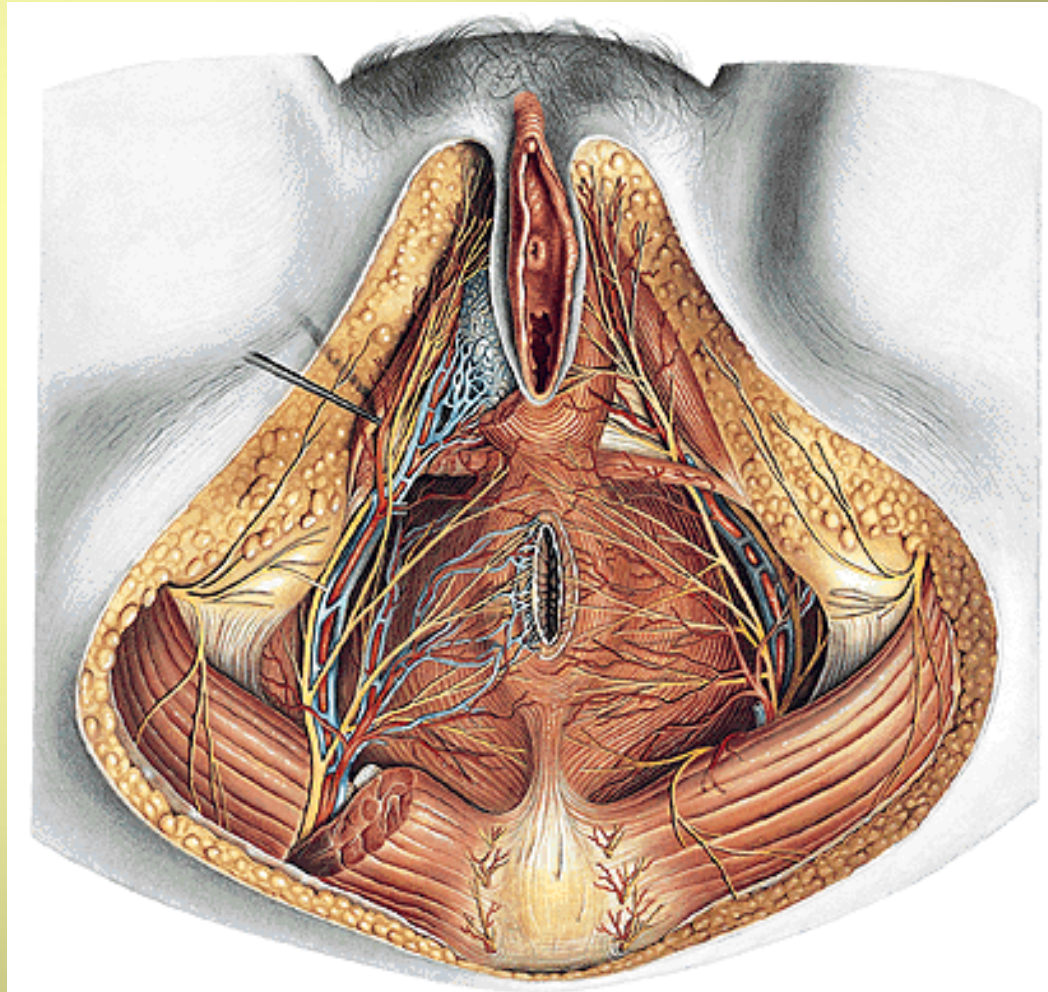
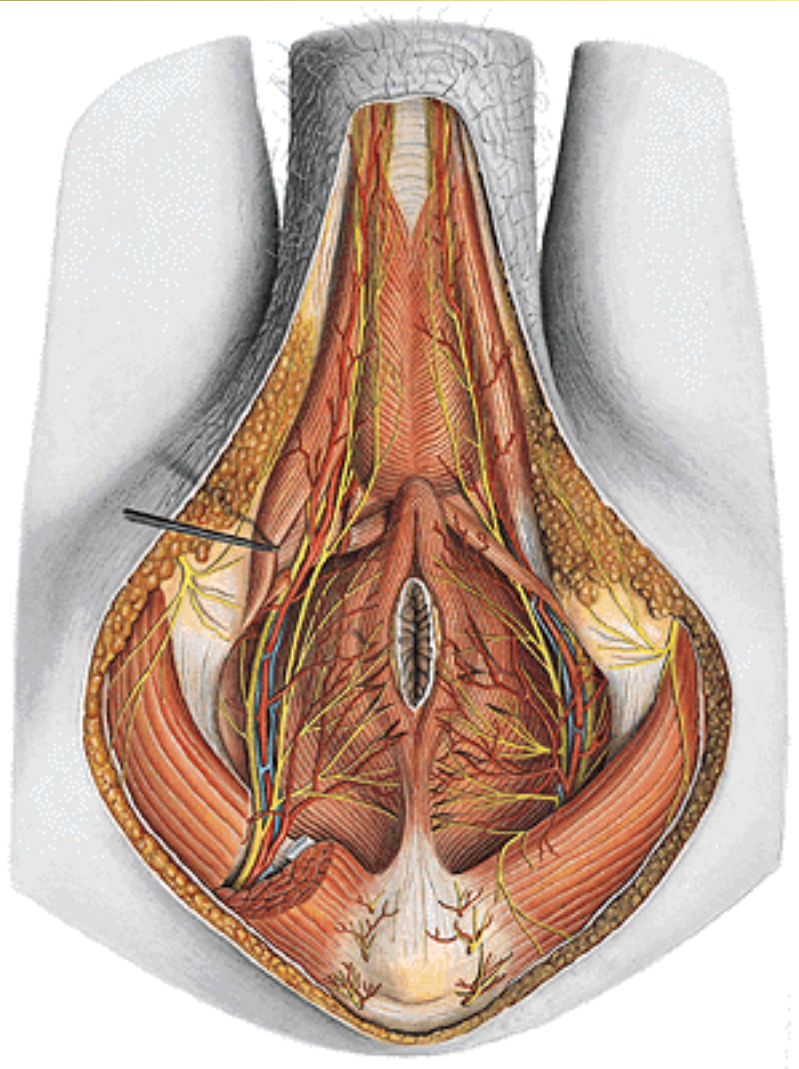
FEMALE SACCUS PROF. PERINEI
(M. transversus perinei profundus)
Lig. transversum perinei
M. sphincter urethrae externus
(M. sphincter urethrovaginalis)
M. compressor urethrae
M. transversus perinei superficialis
Centrum perineale



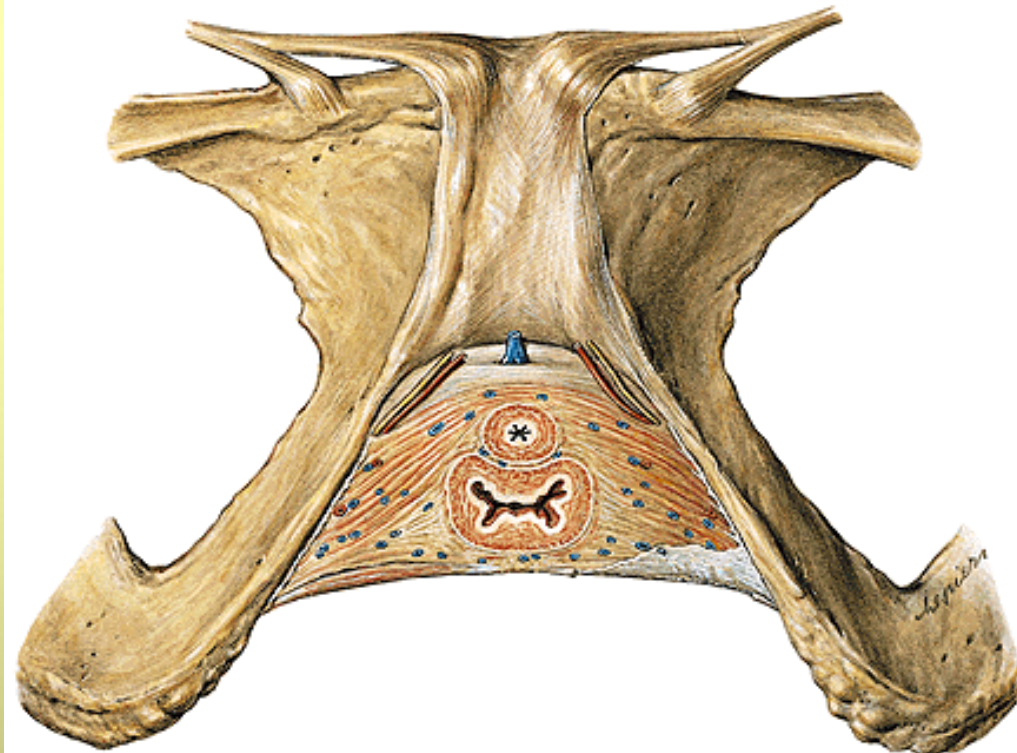
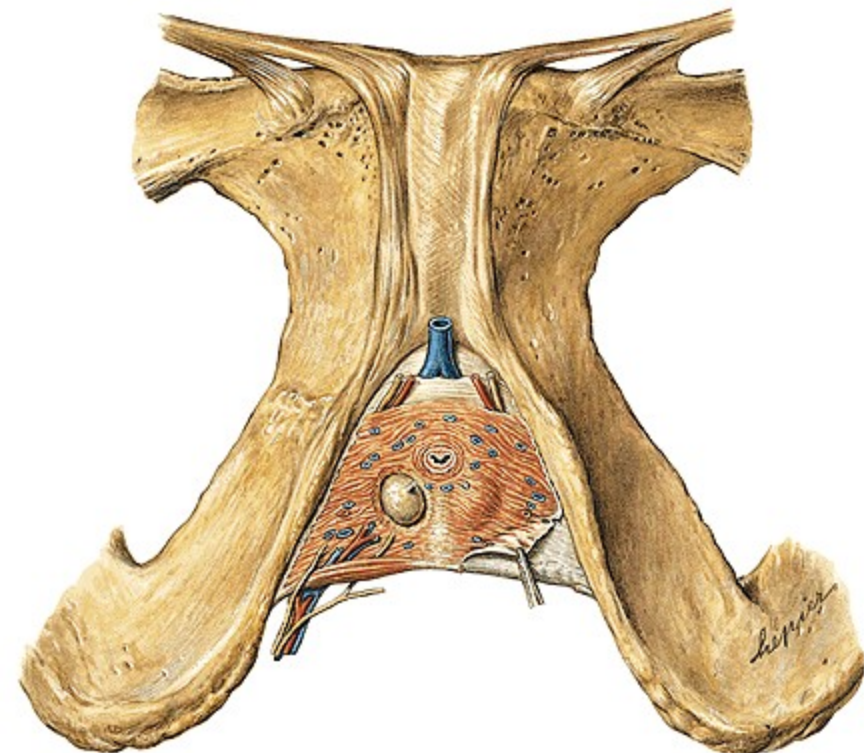
M. ischiocavernosus
M. bulbospongiosus (M. constrictor cunni)
M. sphincter ani externus
Lig. anococcygeum



**A. et v. pudenda interna, n. pudendus – canalis pudendalis -
aa., vv. et nn. rectales inf.**



A. dorsalis penis (clitoridis)
N. dorsalis penis (clitoridis)
V. dorsalis penis (clitoridis) profunda
A.,v. et n. perinealis
Gl. bulbourethralis



Illustrations were copied from:

**Atlas der Anatomie des Menschen/Sobotta.
Putz,R., und Pabst,R. 20. Auflage. München:
Urban & Schwarzenberg, 1993)**

**Netter: Interactive Atlas of Human Anatomy.
Windows Version 2.0**

**Čihák R: Anatomie 2 (Splanchnologia). Avicenum,
zdravotnické nakladatelství, Praha, 1988.**