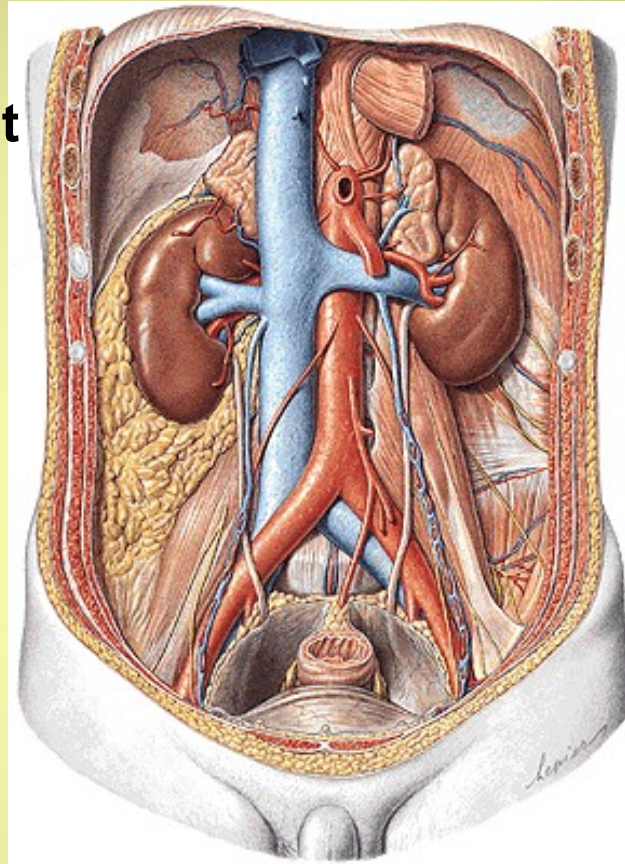


URINARY SYSTEM

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)

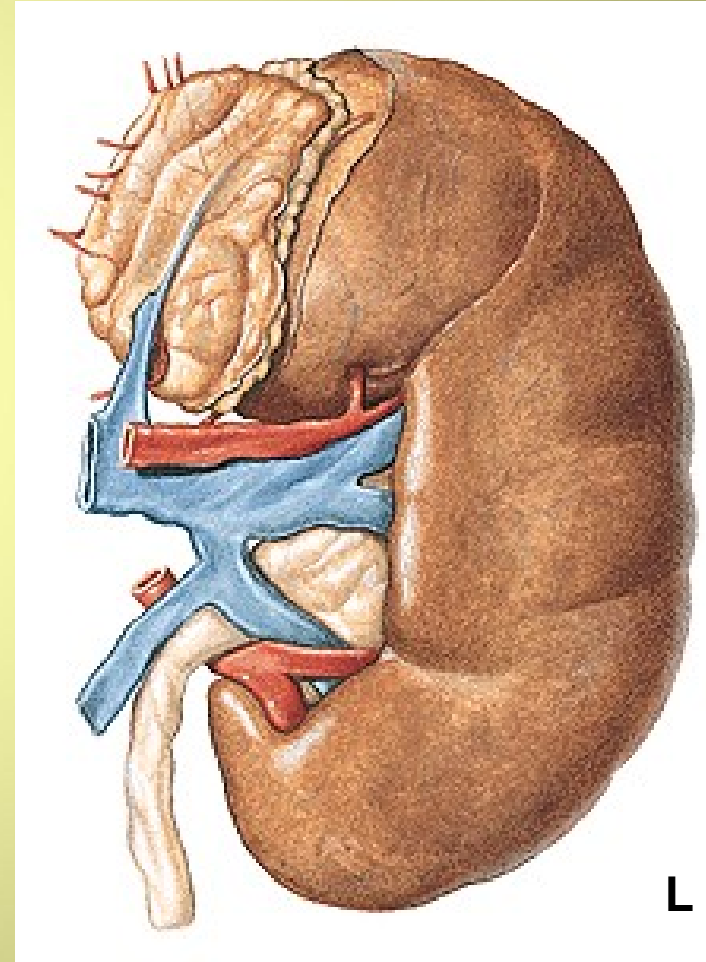
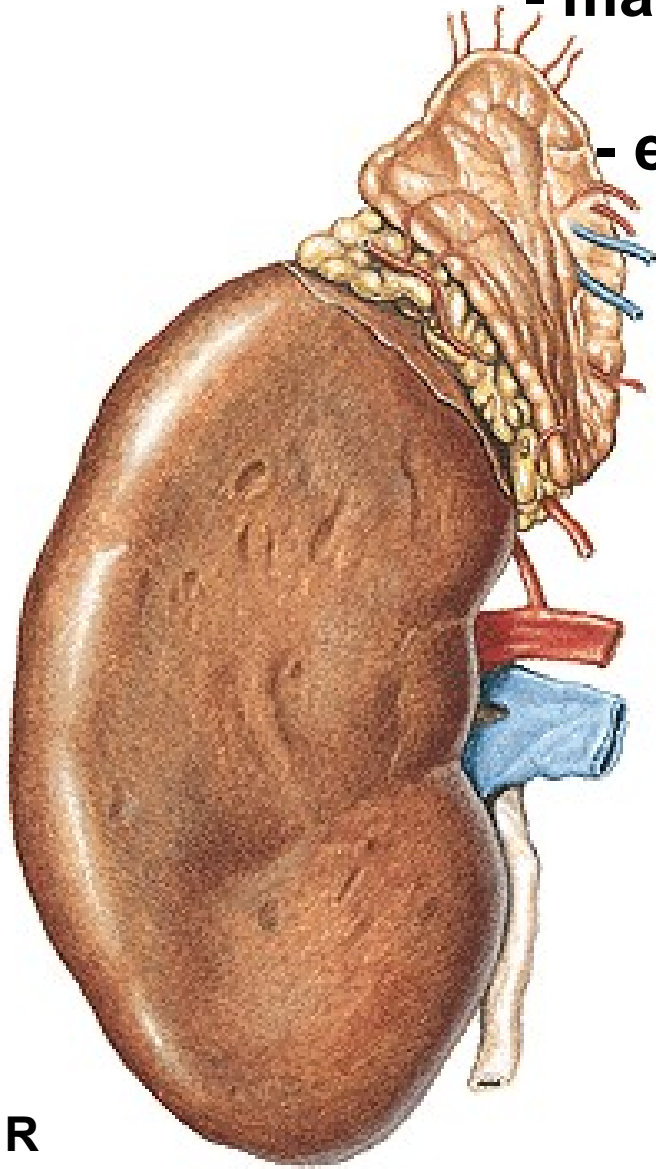
Efferent urinary tract:
renal calices
renal pelvis
ureter
urinary bladder
urethra

REN, NEPHROS - facies anterior et posterior

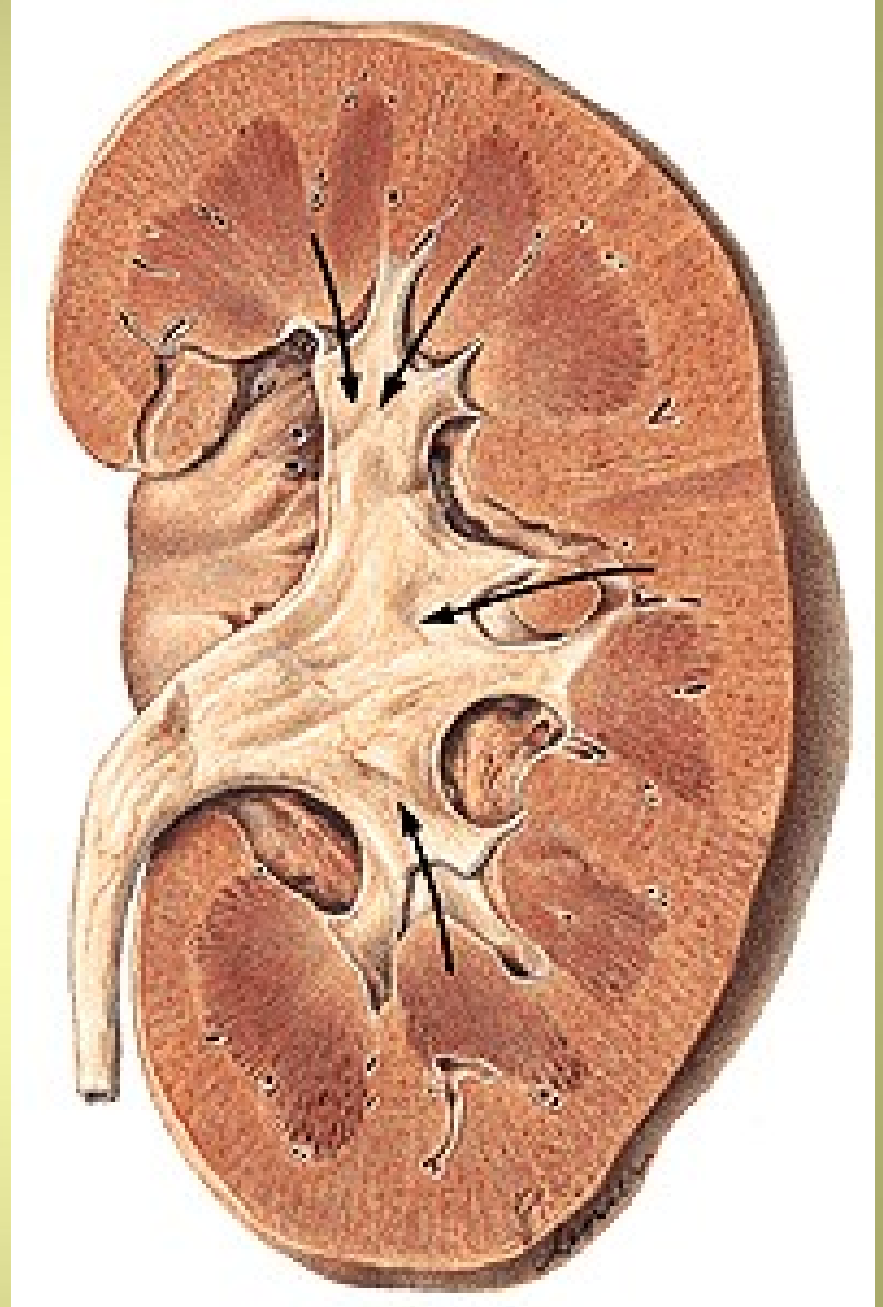
- margo lateralis et medialis - hilum renale

- sinus renalis

- extremitas superior et inferior



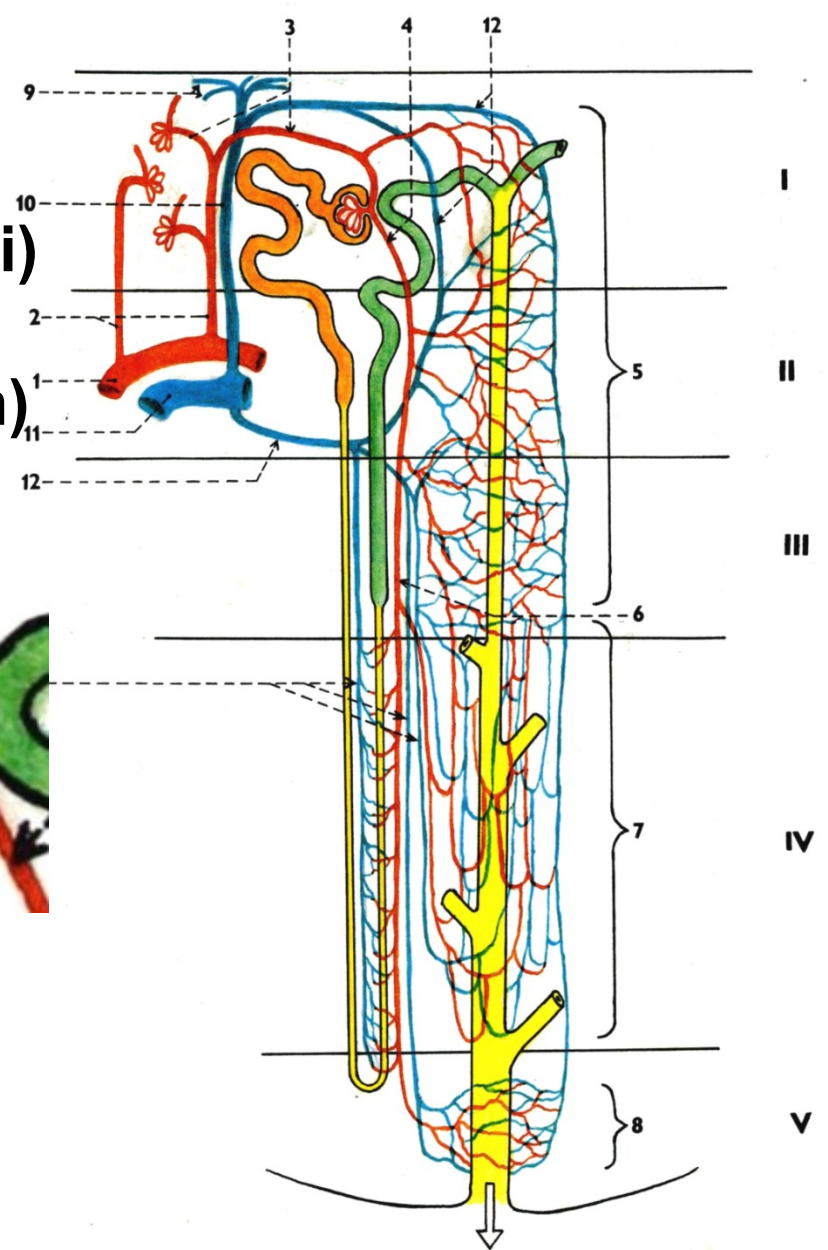
Capsula fibrosa
Sinus renalis
Cortex renalis
Medulla renalis
– 6-20 pyramides renales
Columnae renales
Papilla renalis
Ductus papillares
Foramina papillaria
Area cribrosa
Lobus renalis



NEPHRON

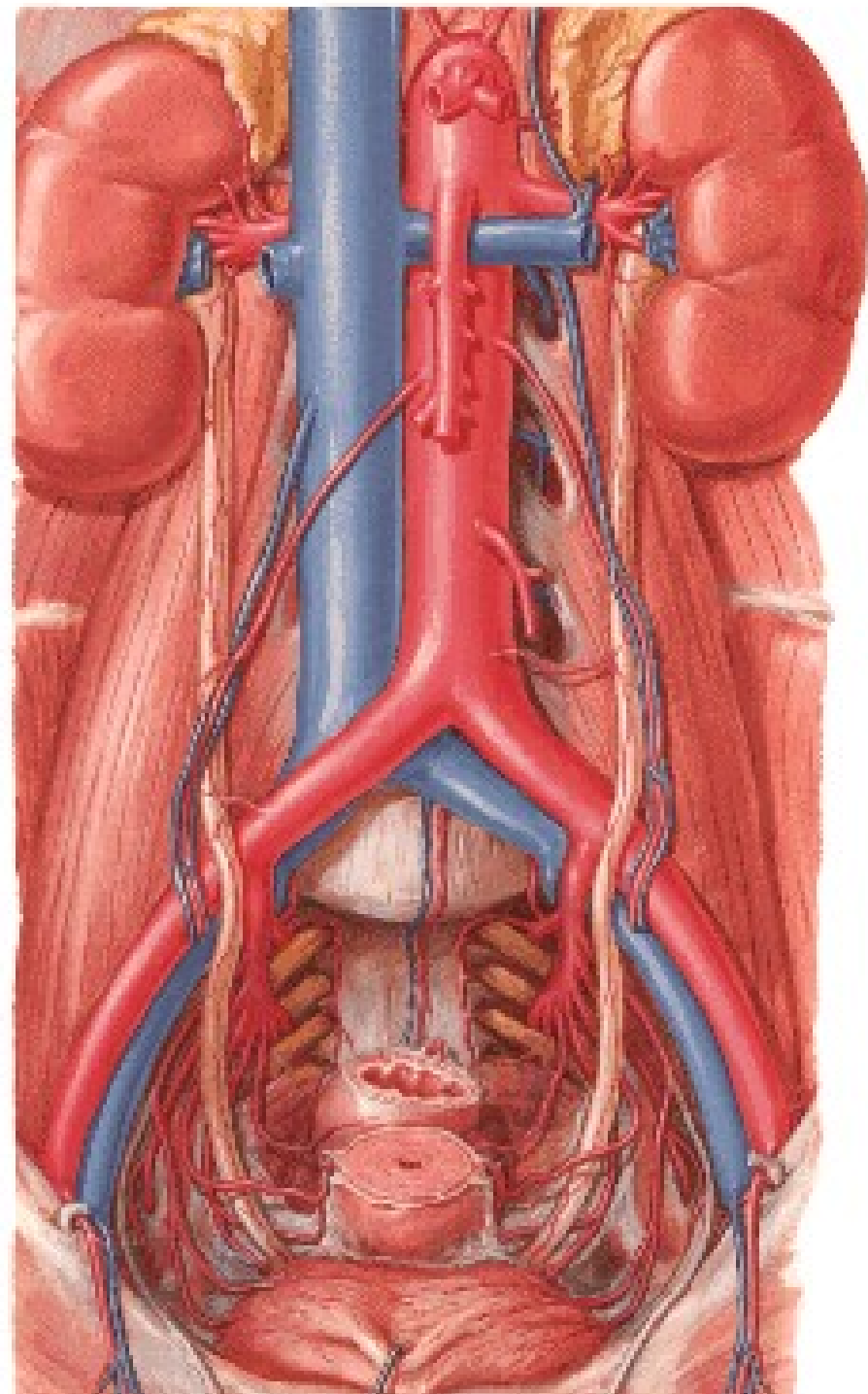
- Corpusculum renale (Malpighi)
 - Glomerulus
 - Capsula glomeruli (Bowman)
- Tubulus proximalis
- Henle's loop
- Tubulus distalis

Tubulus colligens
Ductus papillaris
Foramen papillare



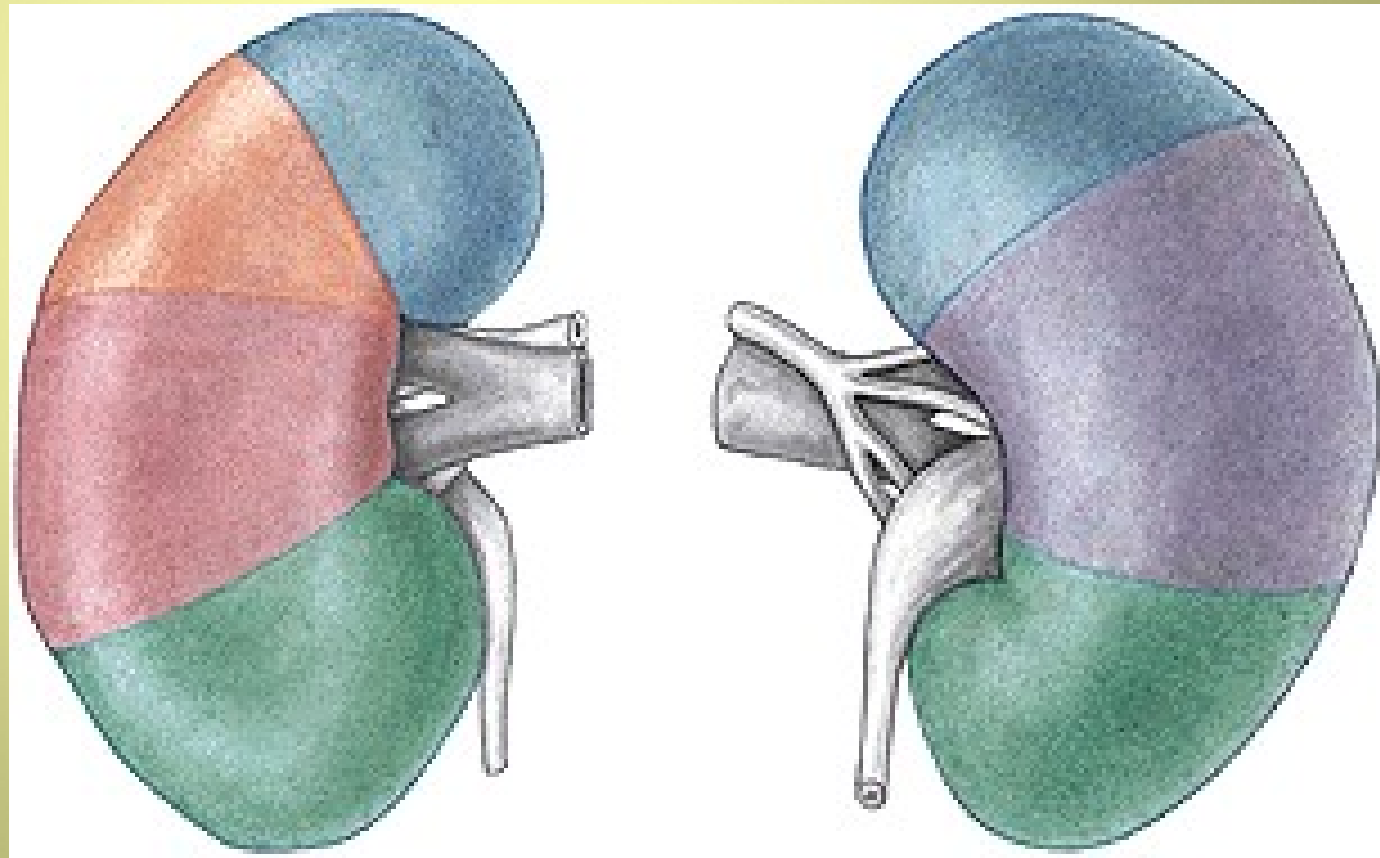
renalis

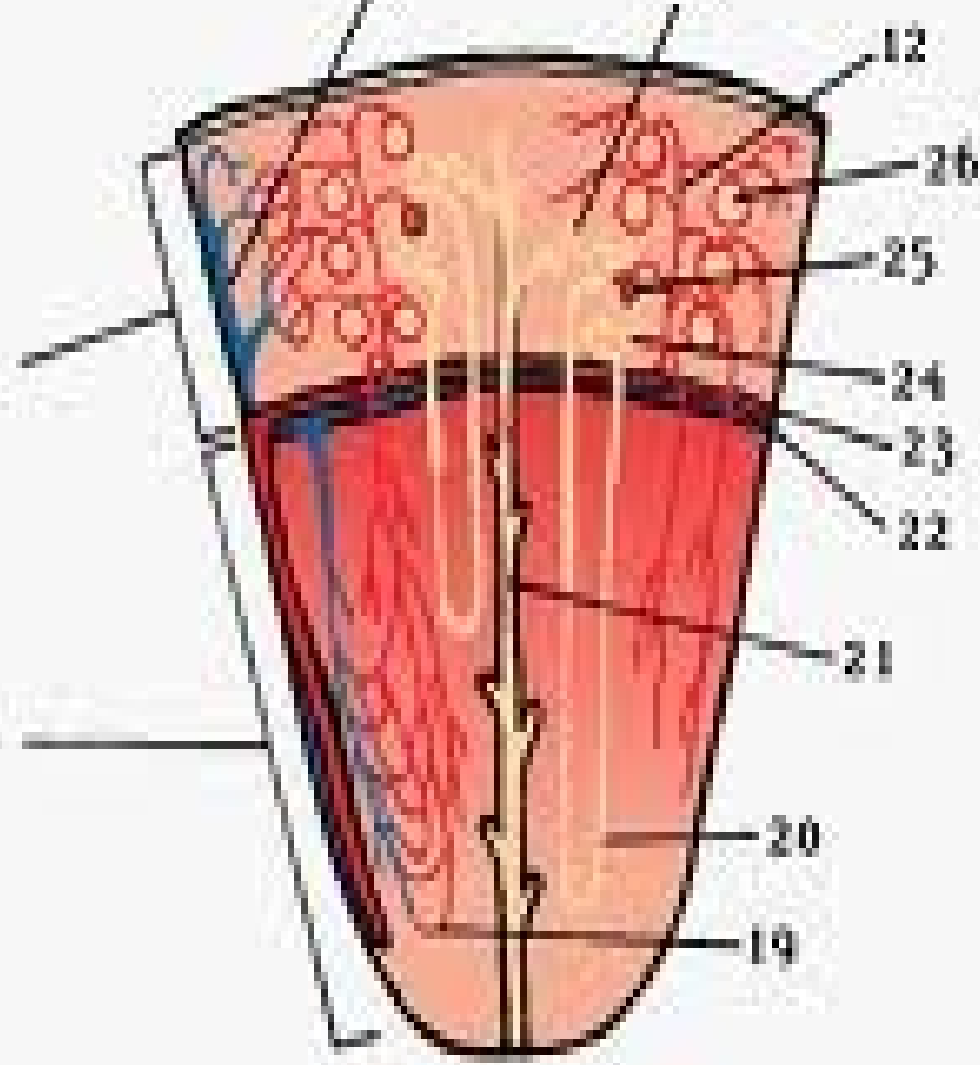
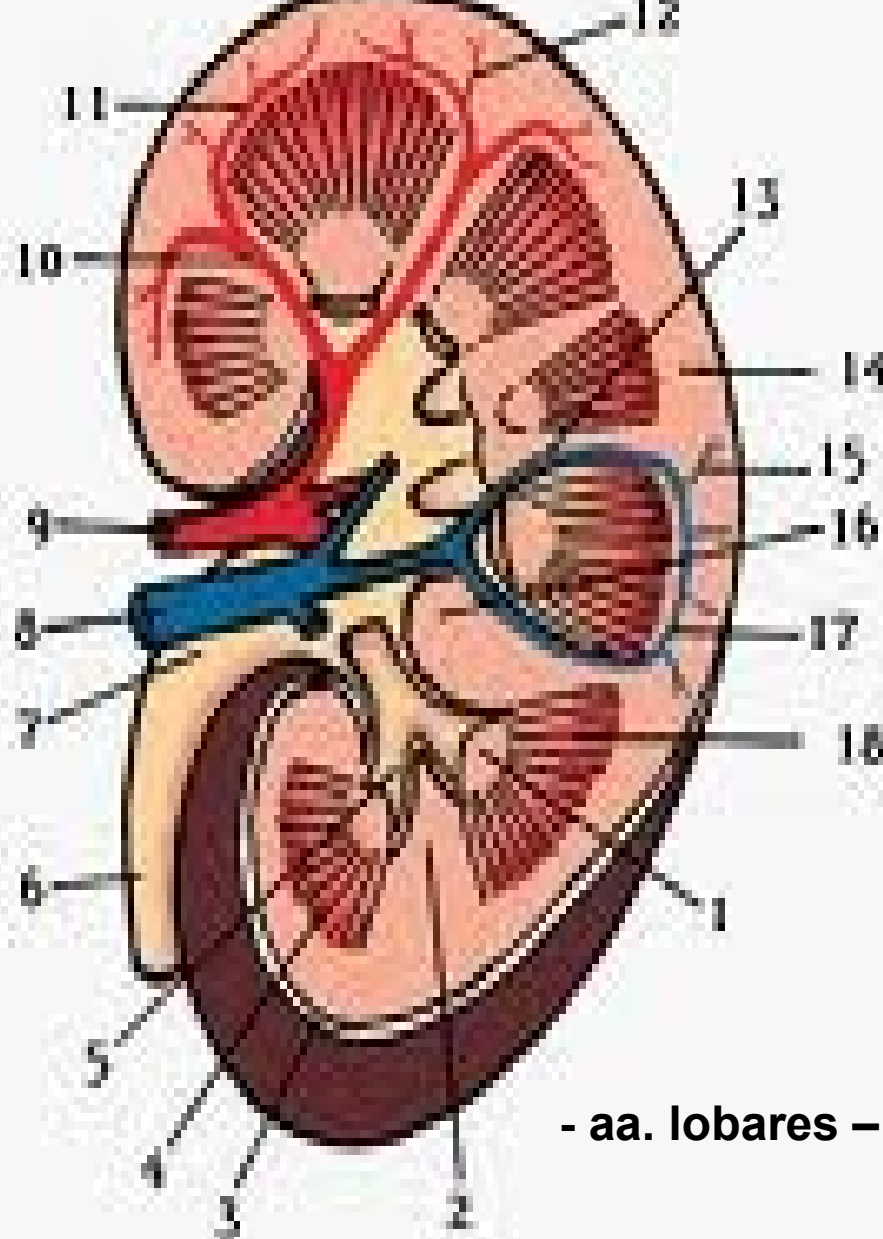
- r. anterior – 4 rr. praepelvici
- r. posterior – r. retropelvicus



Segmenta renalia – s. superius

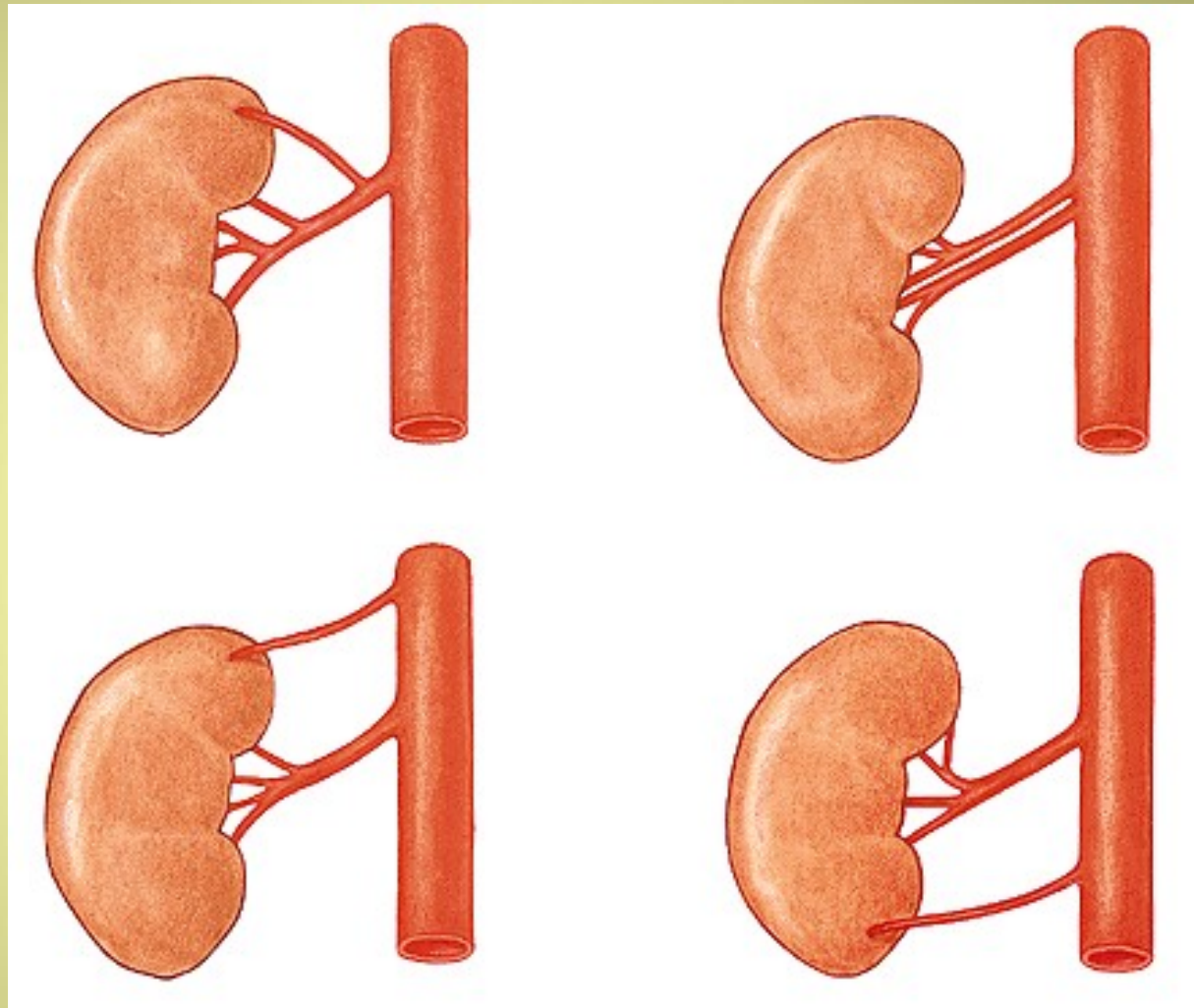
- s. anterius superius
- s. anterius inferius
- s. inferius
- s. posterius

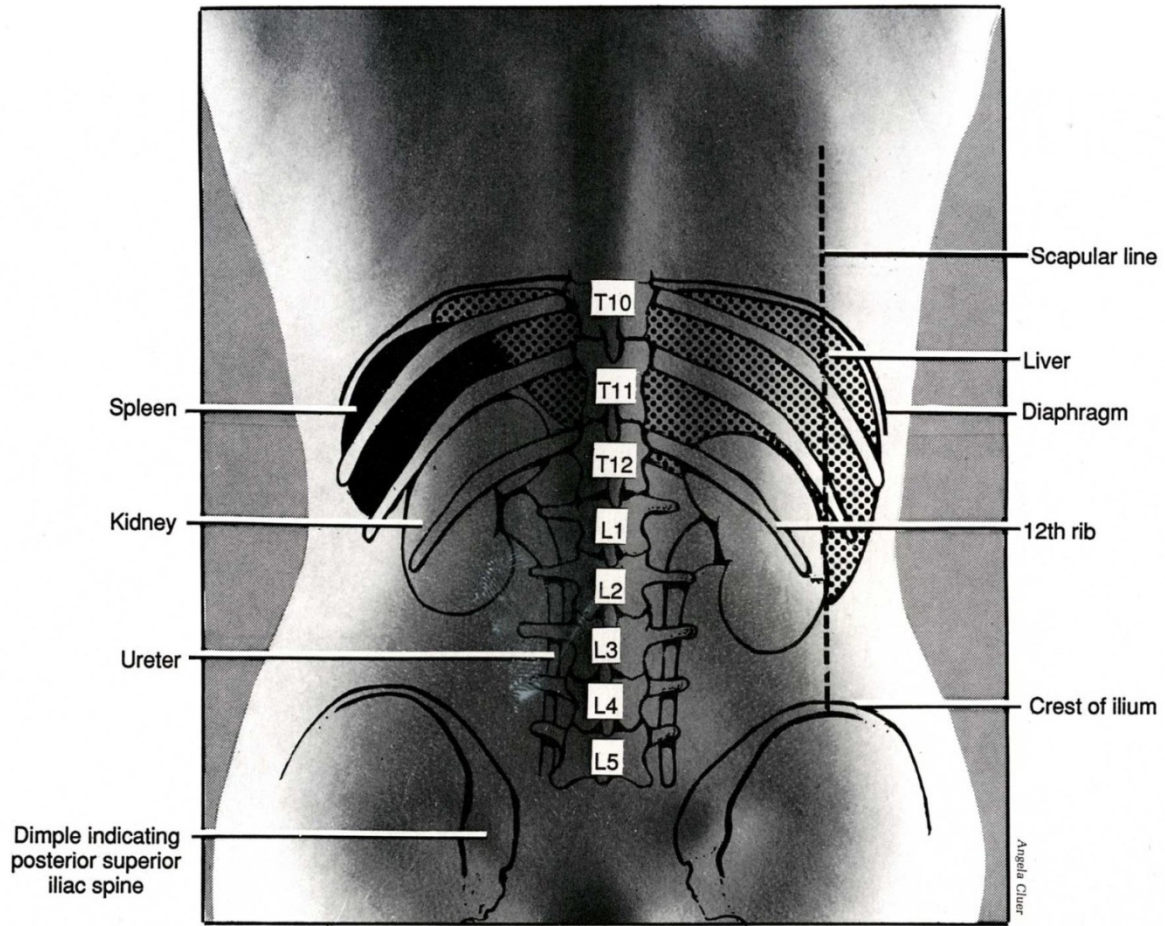
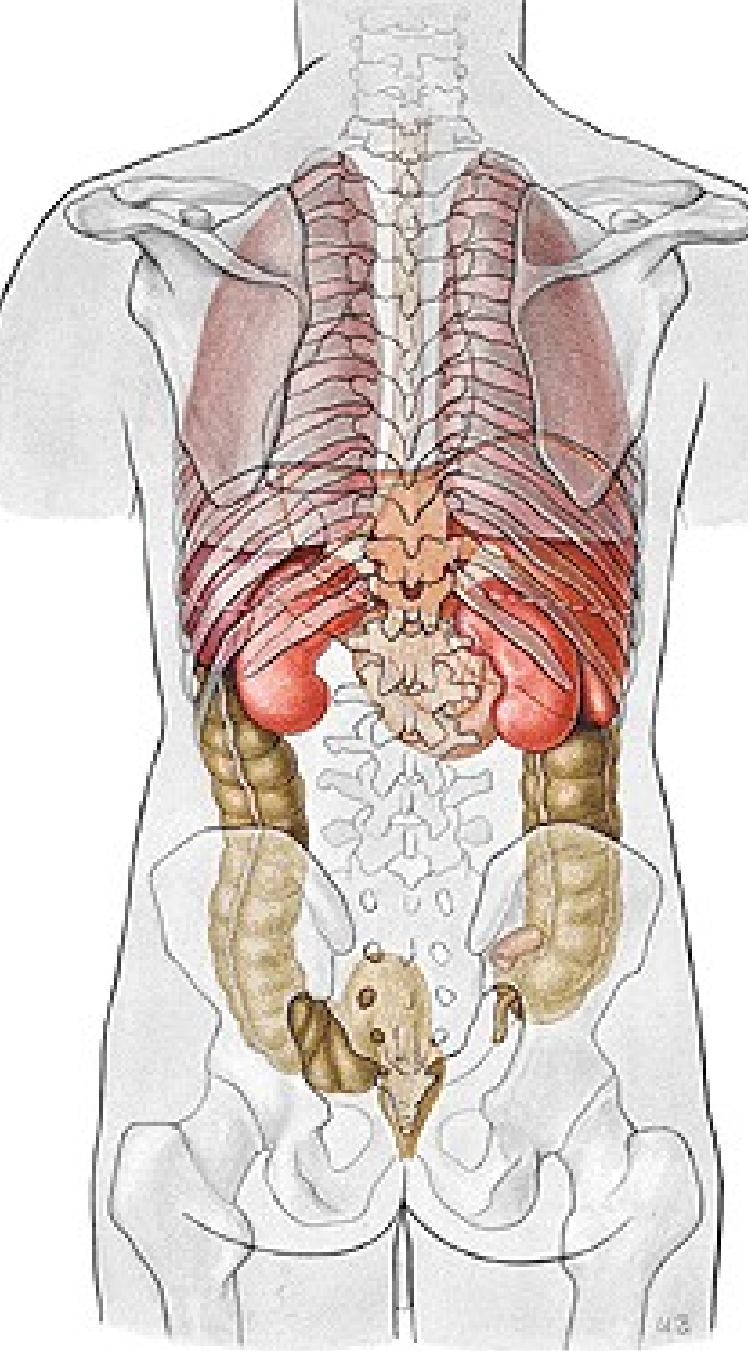




- aa. lobares – aa. interlobares – aa. arcuatae

Aa. renales accessoriae





1. Diaphragma

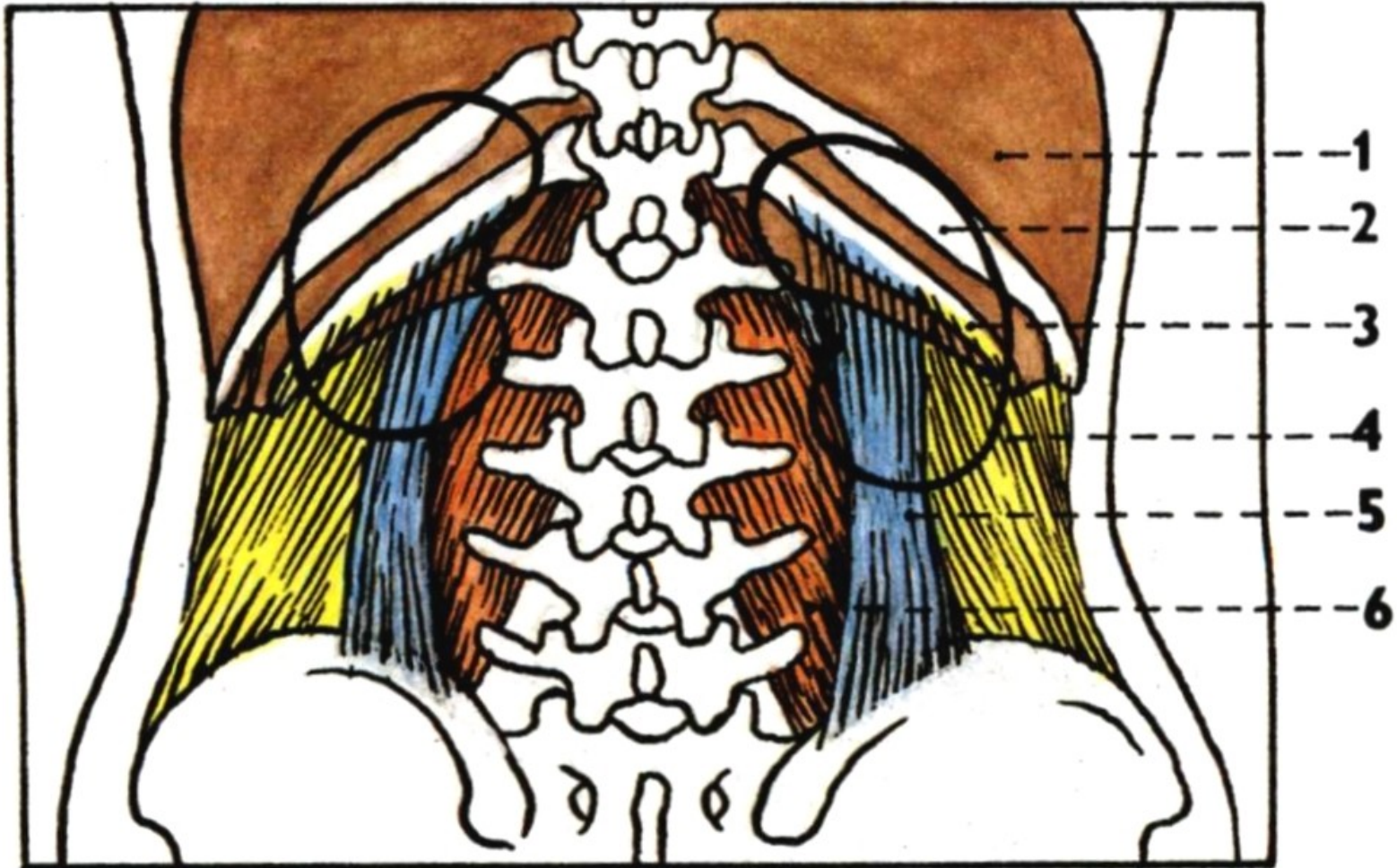
2. 11th rib

3. 12th rib

4. M. transversus abdominis

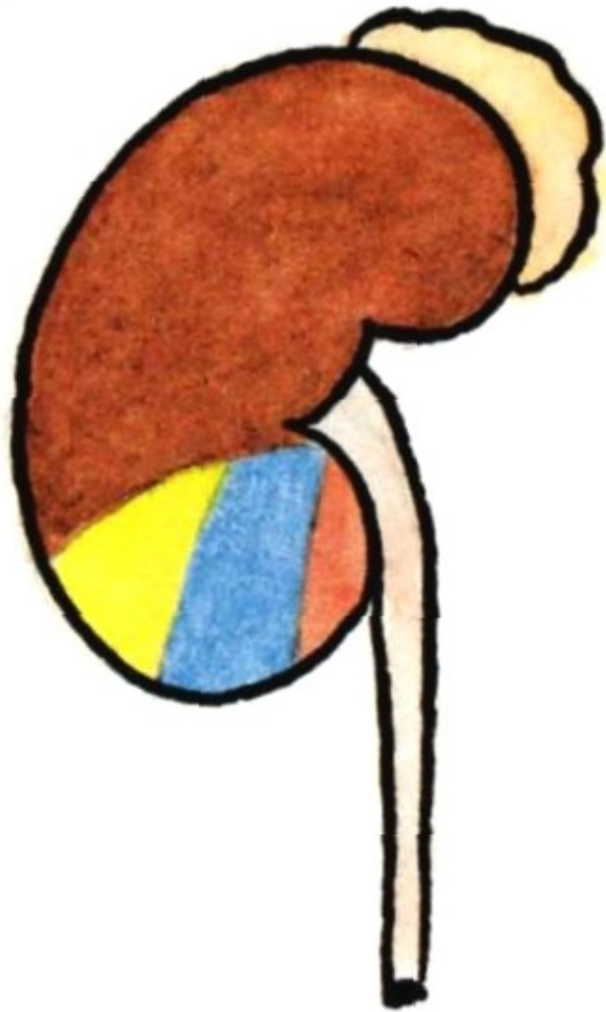
5. M. quadratus lumborum

6. M. psoas major

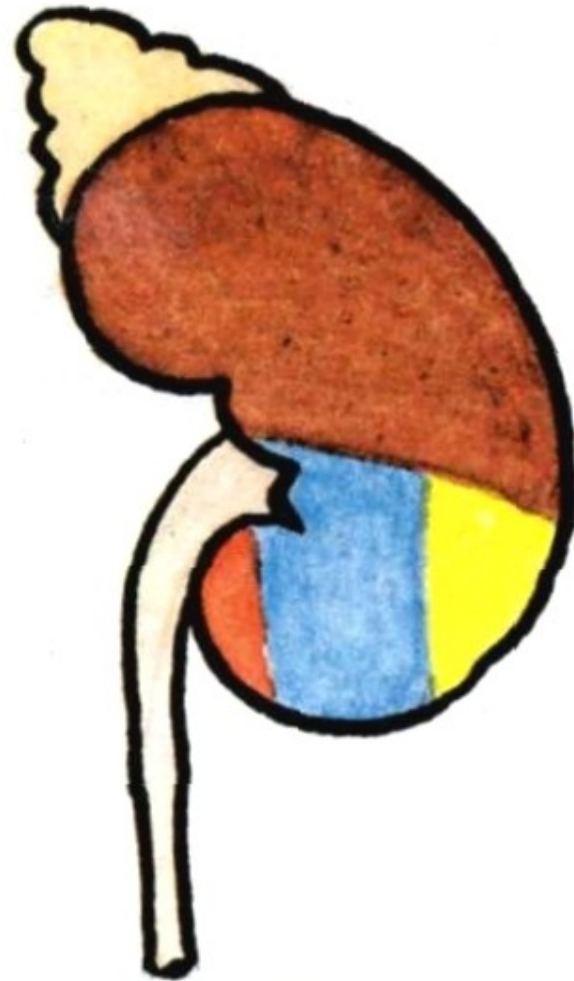


SIN.

DX.

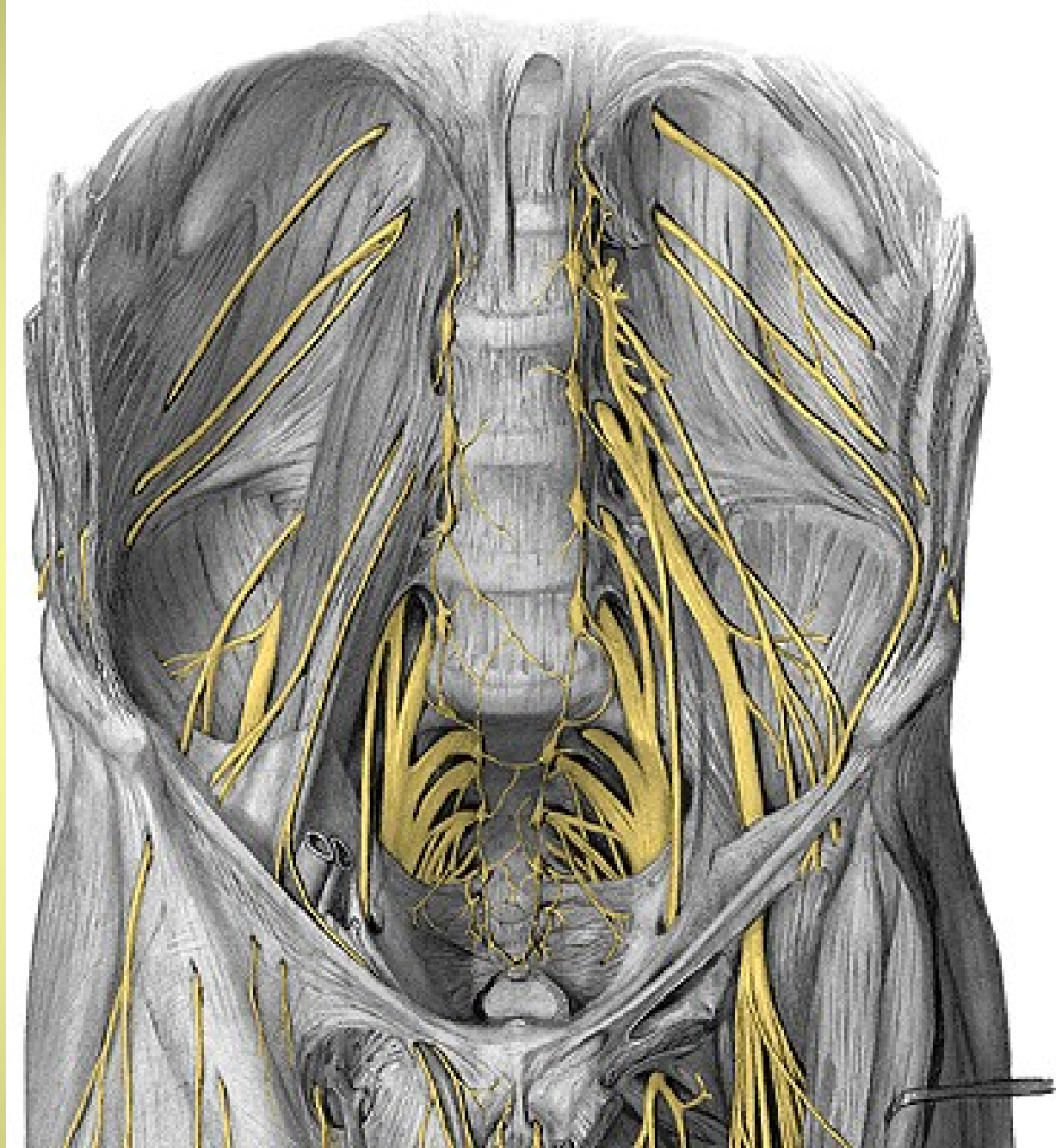


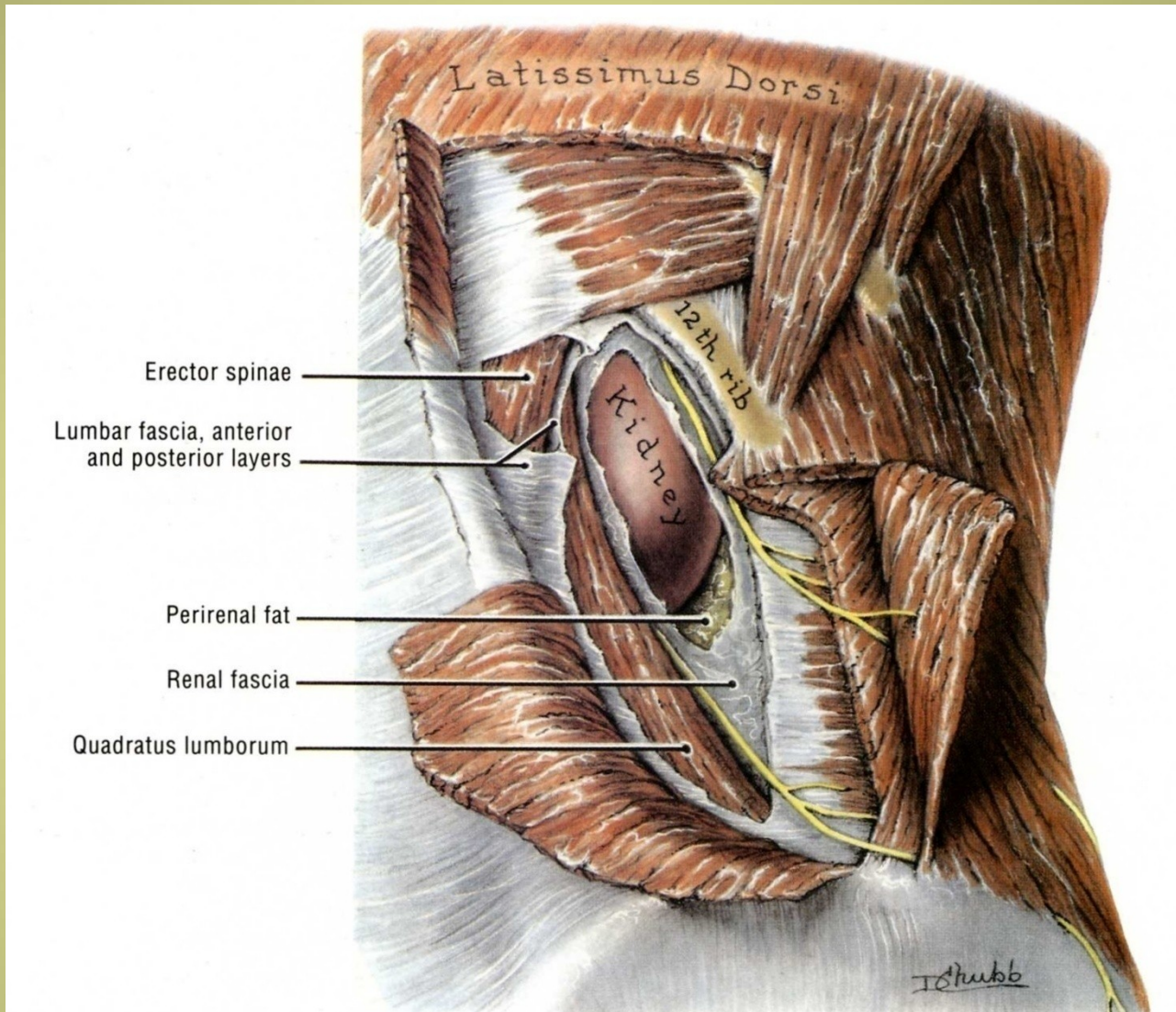
SIN.



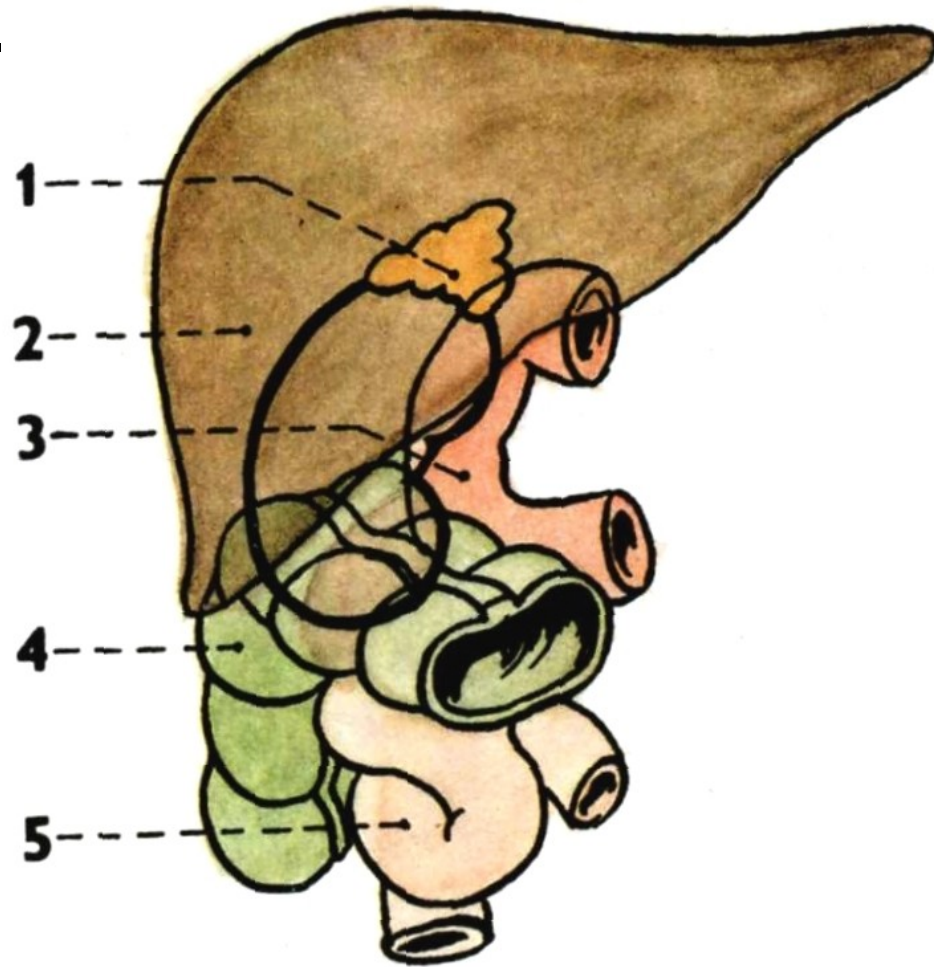
DX.

N. subcostalis
N. iliohypogastricus
N. ilioinguinalis

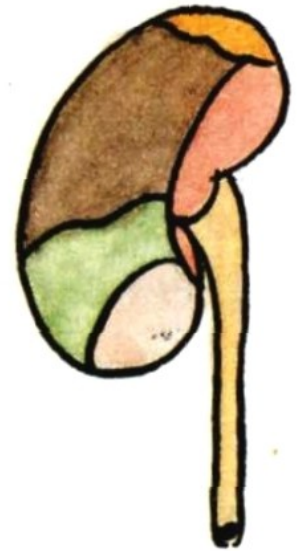




- .Gl. suprarenalis dx.
- .Liver
- .Duodenum
- .Flexura coli dx.
- .Jejunum



DX.



DX.

.Gl. suprarenalis sin.

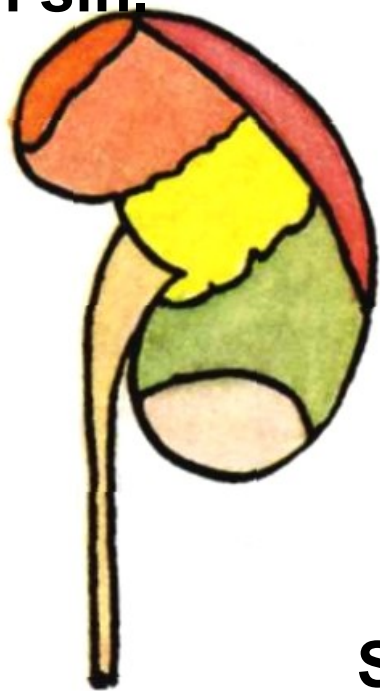
.Stomach

.Spleen

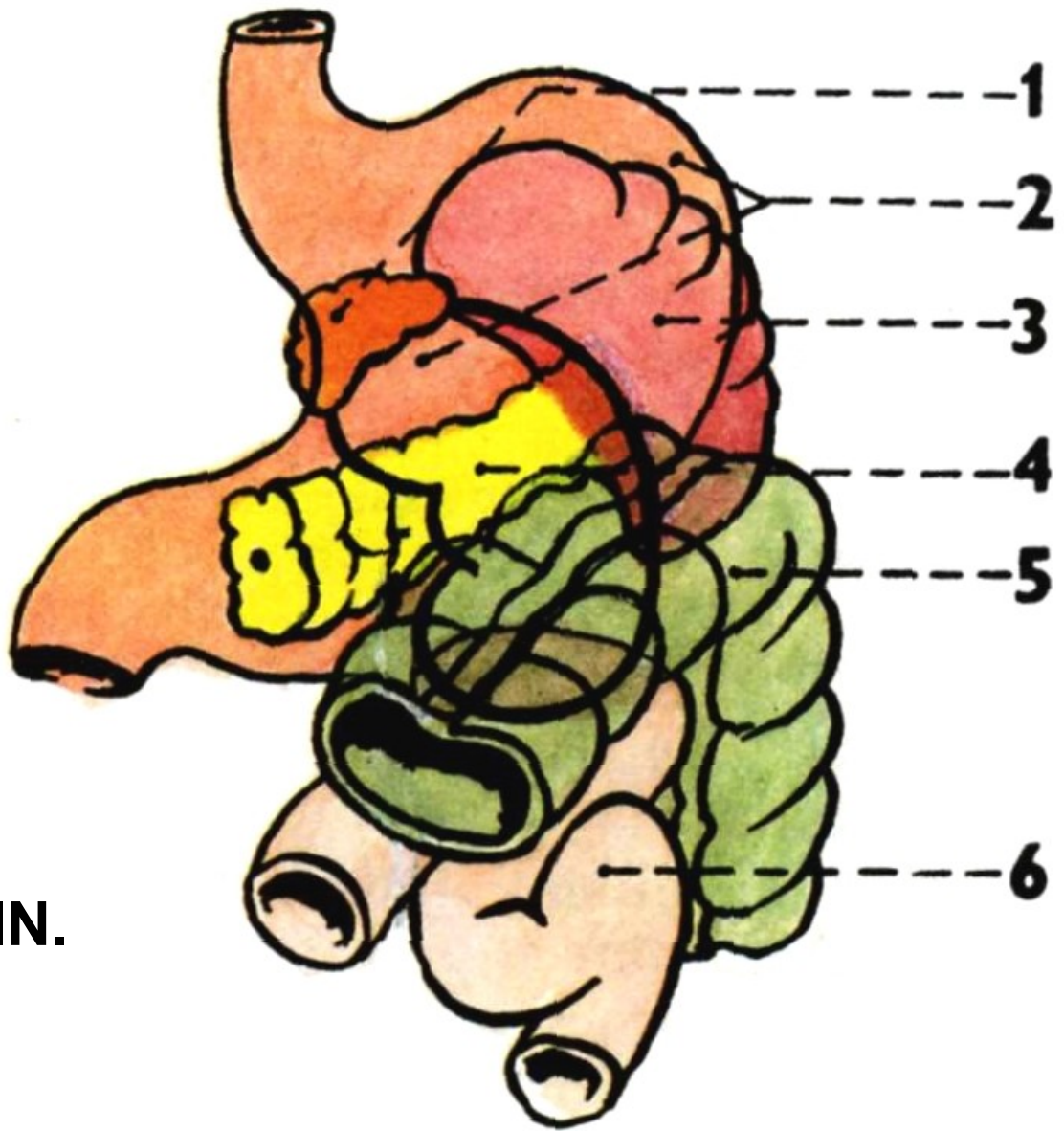
.Pancreas

.Flexura coli sin.

.Jejunum



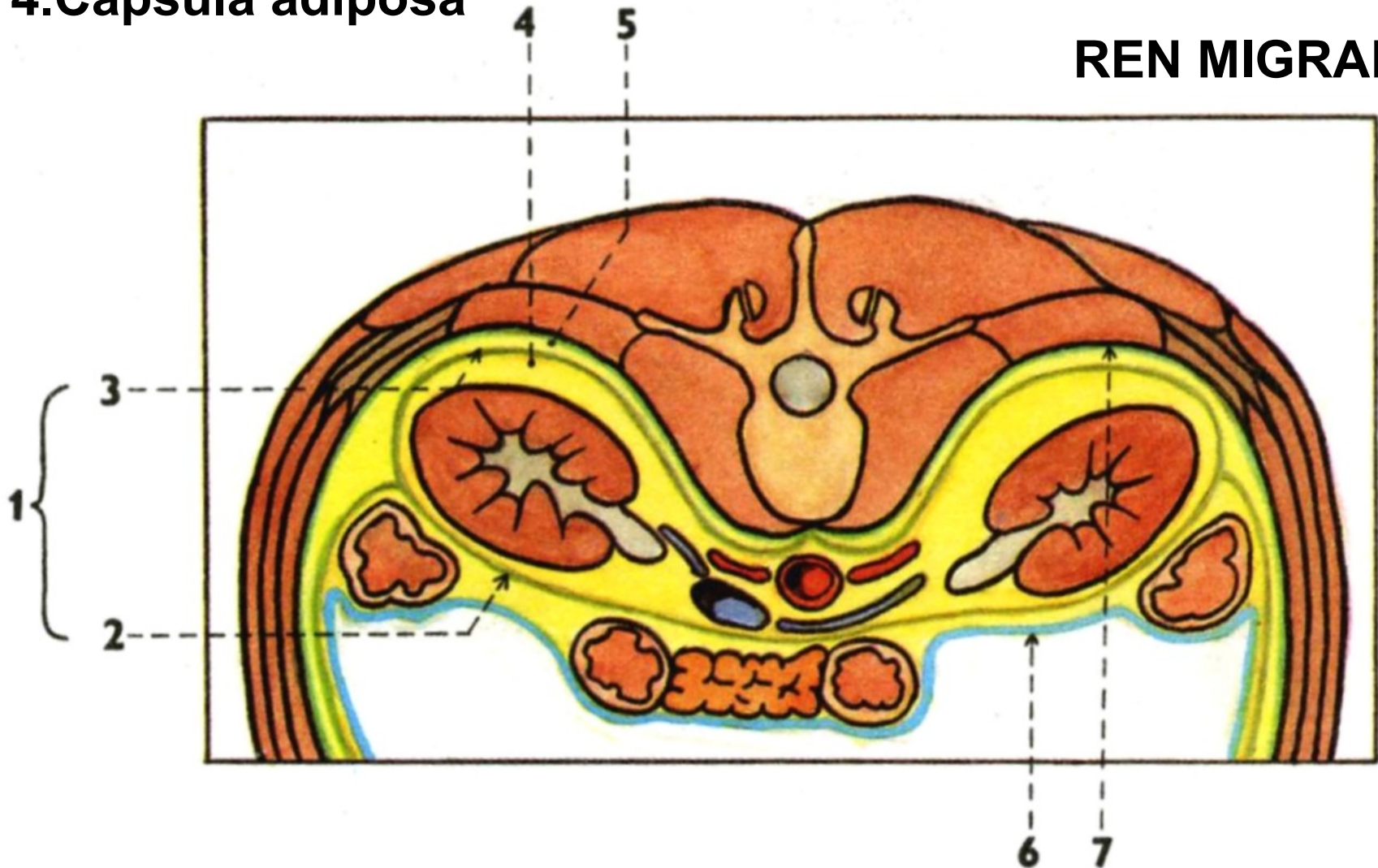
SIN.



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

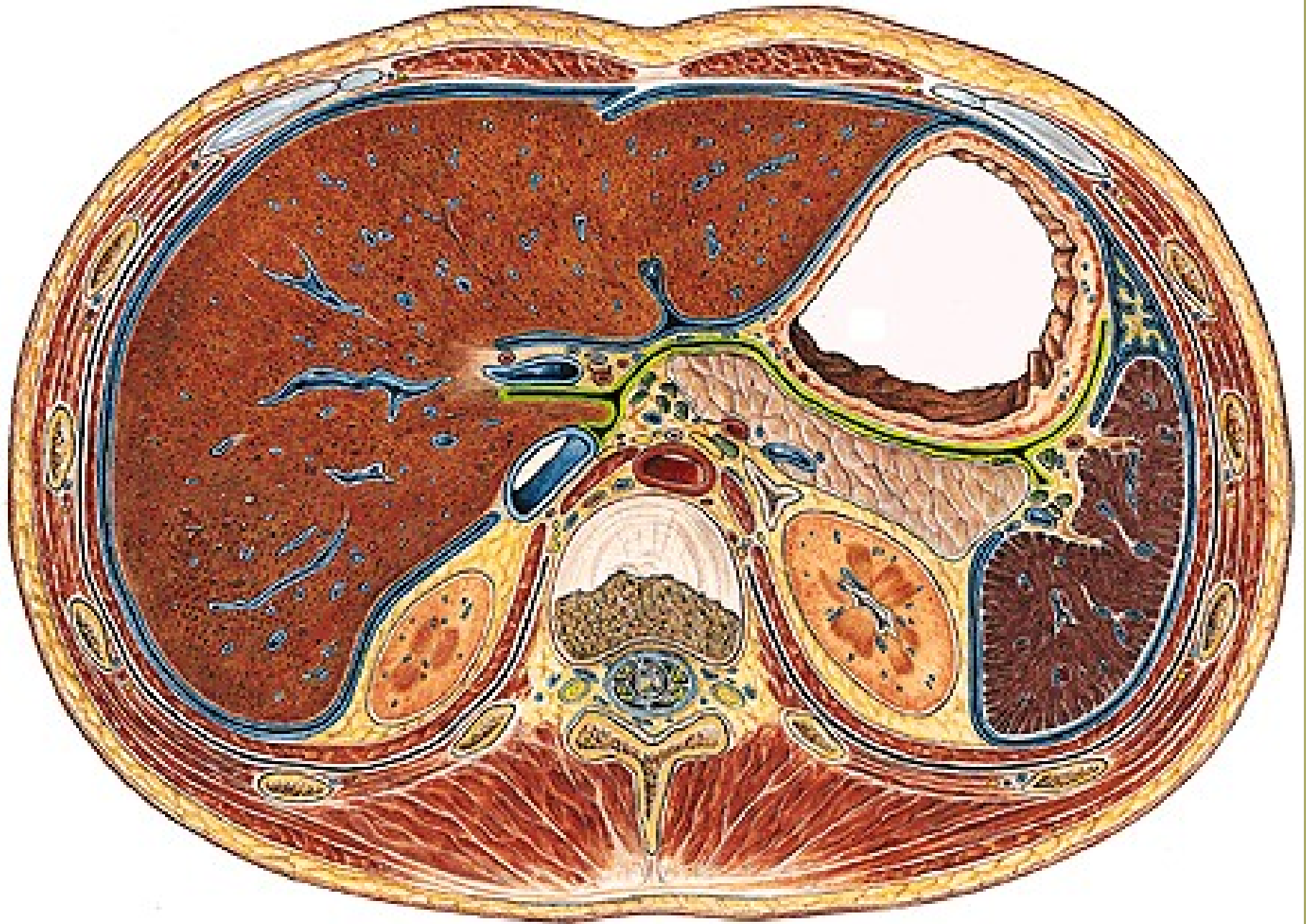
5. Corpus adiposum pararenale
6. Peritoneum
7. Fascia transversalis

REN MIGRANS





Cross-sectional image through the L1 obtained with CT

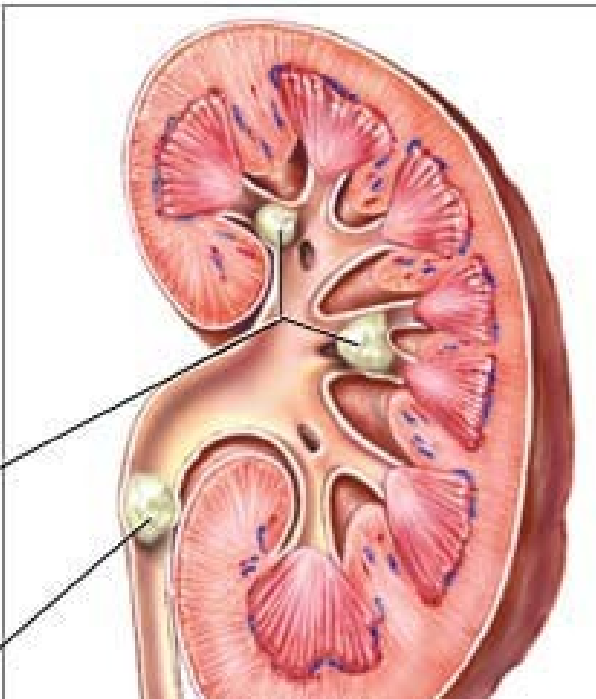
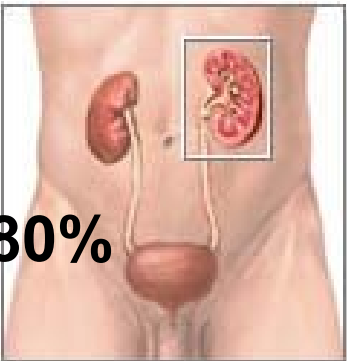


Transverse section through the intervertebral disc between T12 and L1

Nephrolithiasis

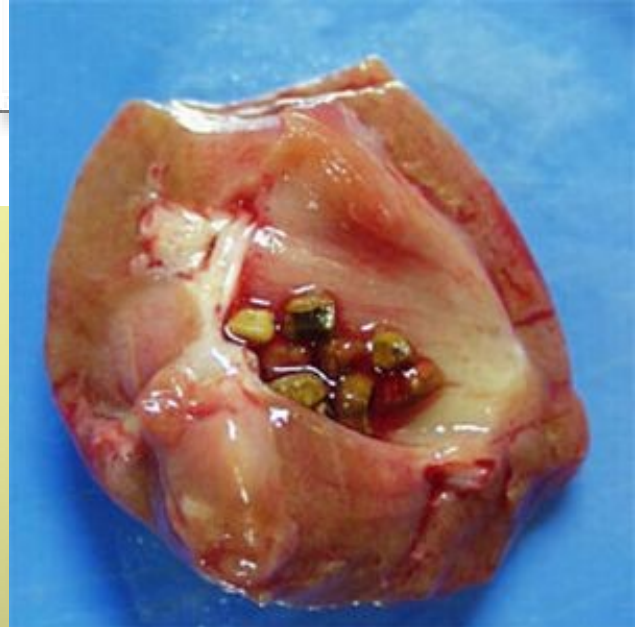
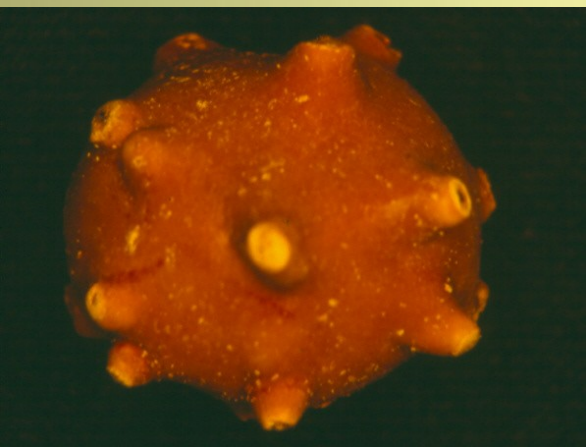
Calcium oxalate crystals – 80%

Uric acid – 5 - 10%

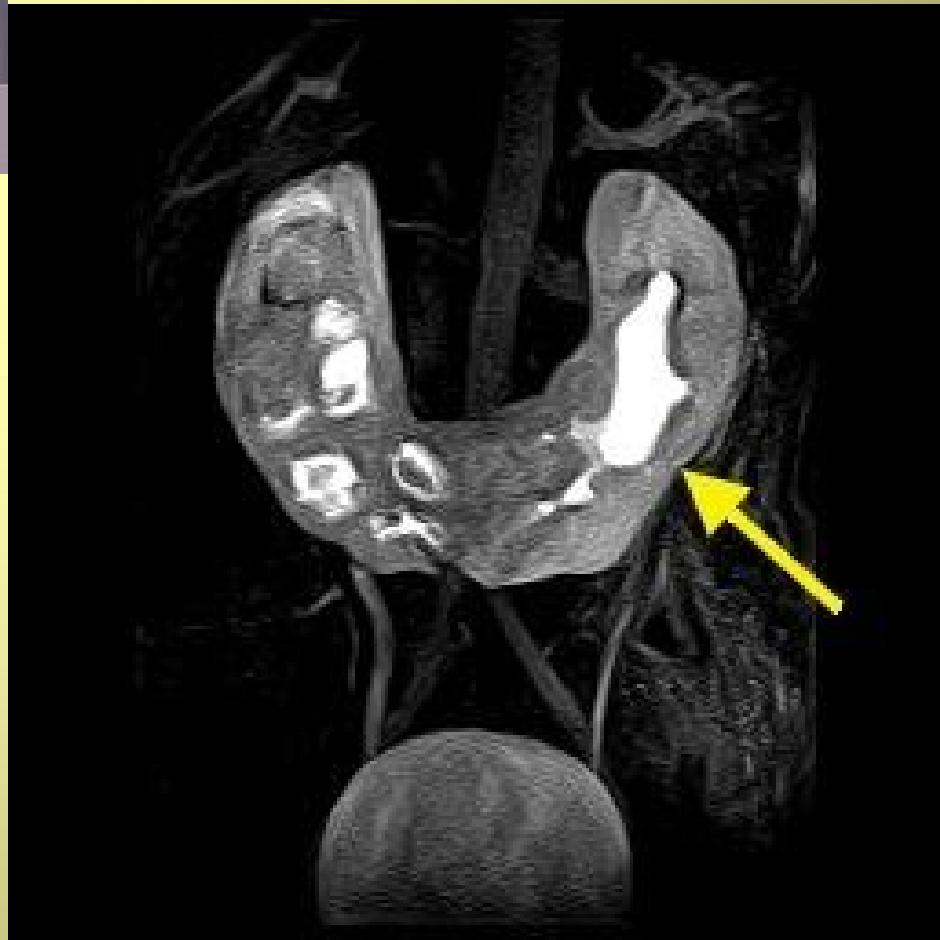
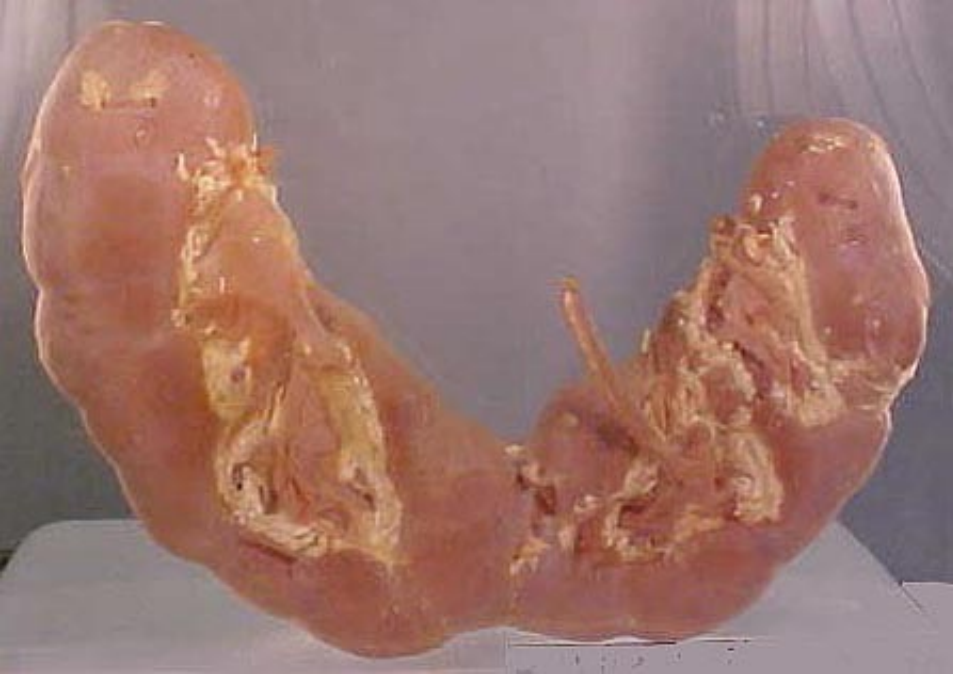


Kidney stones in the minor and major calyces of the kidney

Kidney stone in the ureter

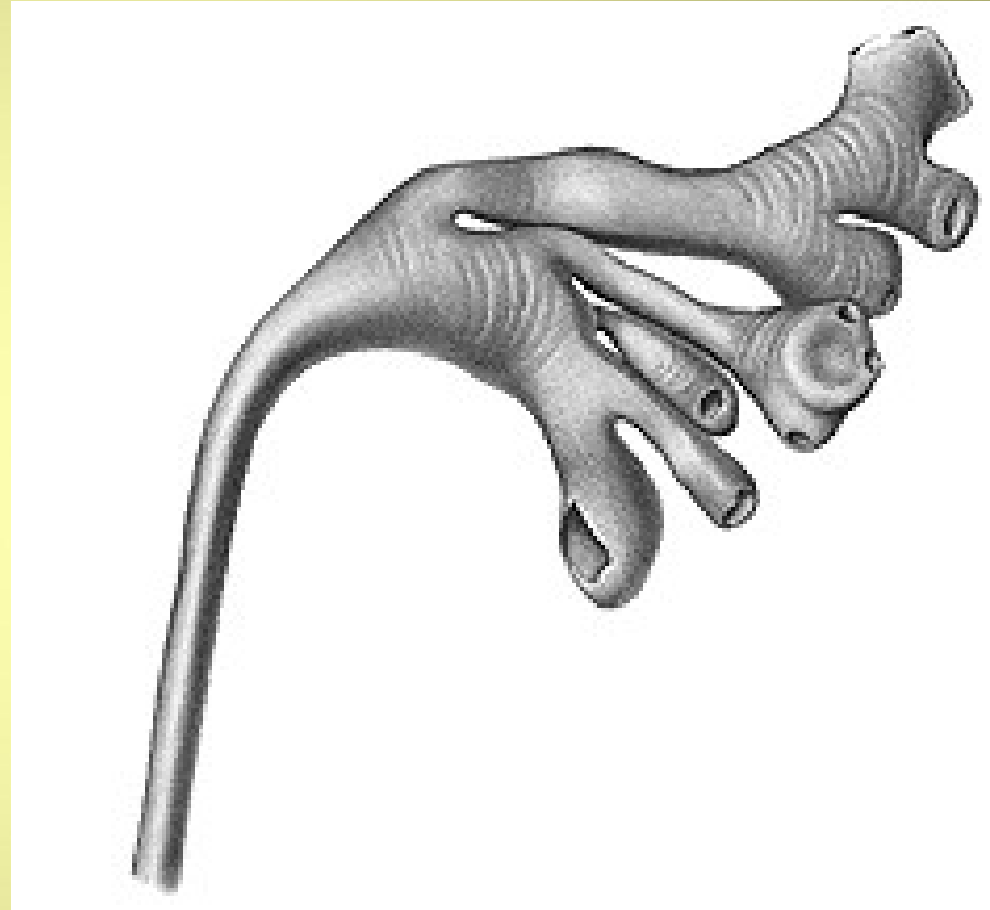
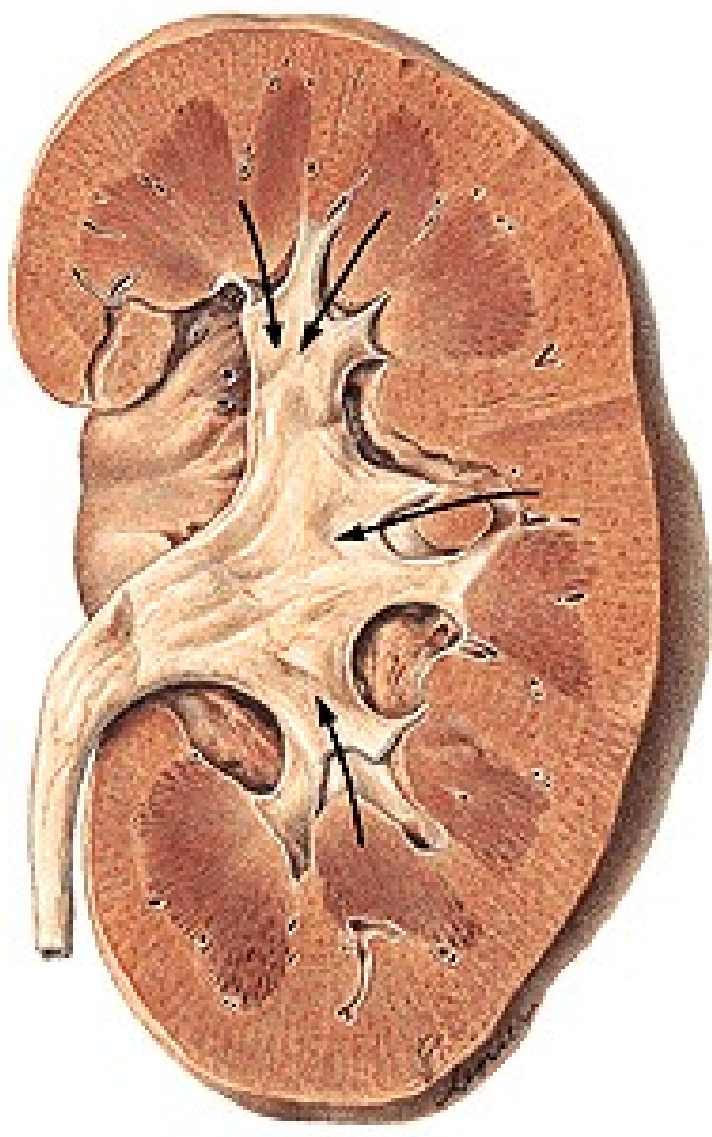


Horseshoe kidney



CALICES RENALES – minores et majores

PELVIS RENALIS (PYELUM)



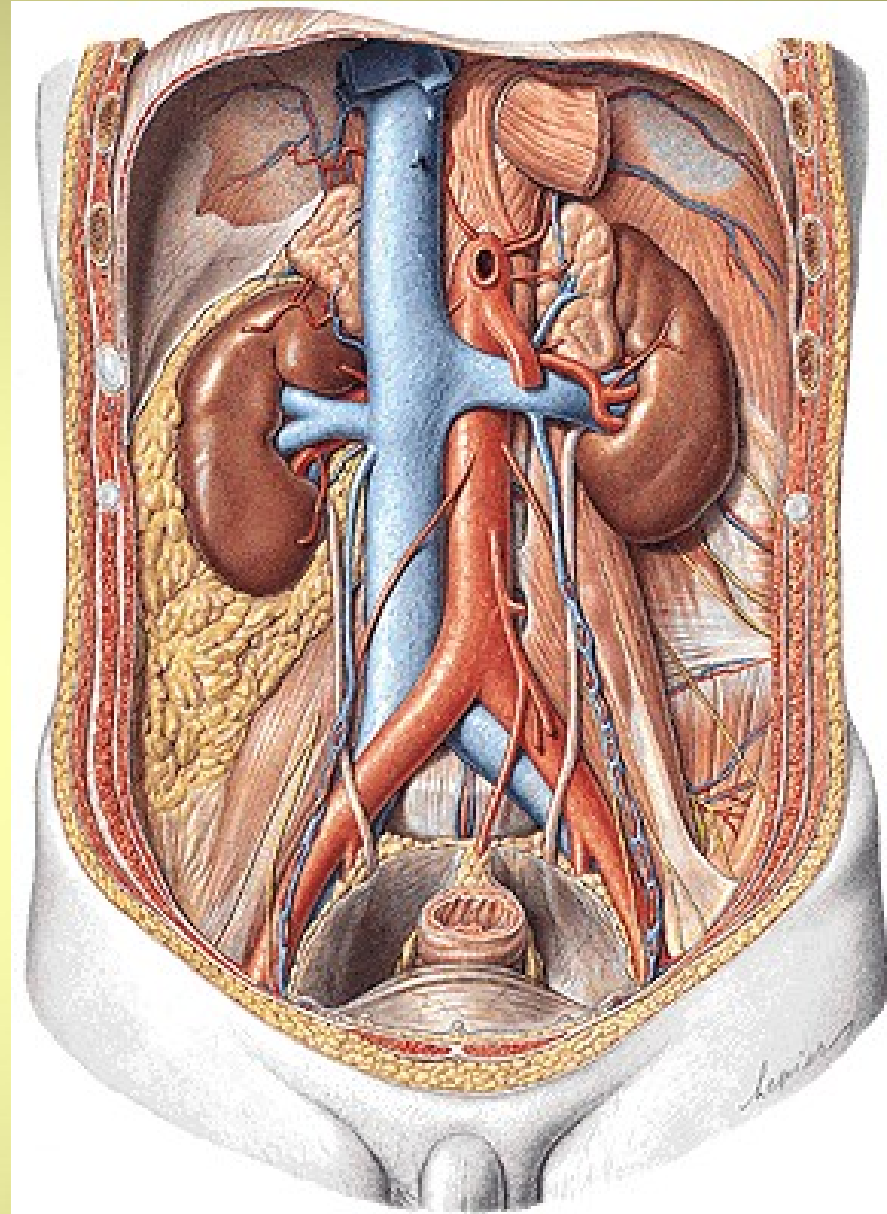
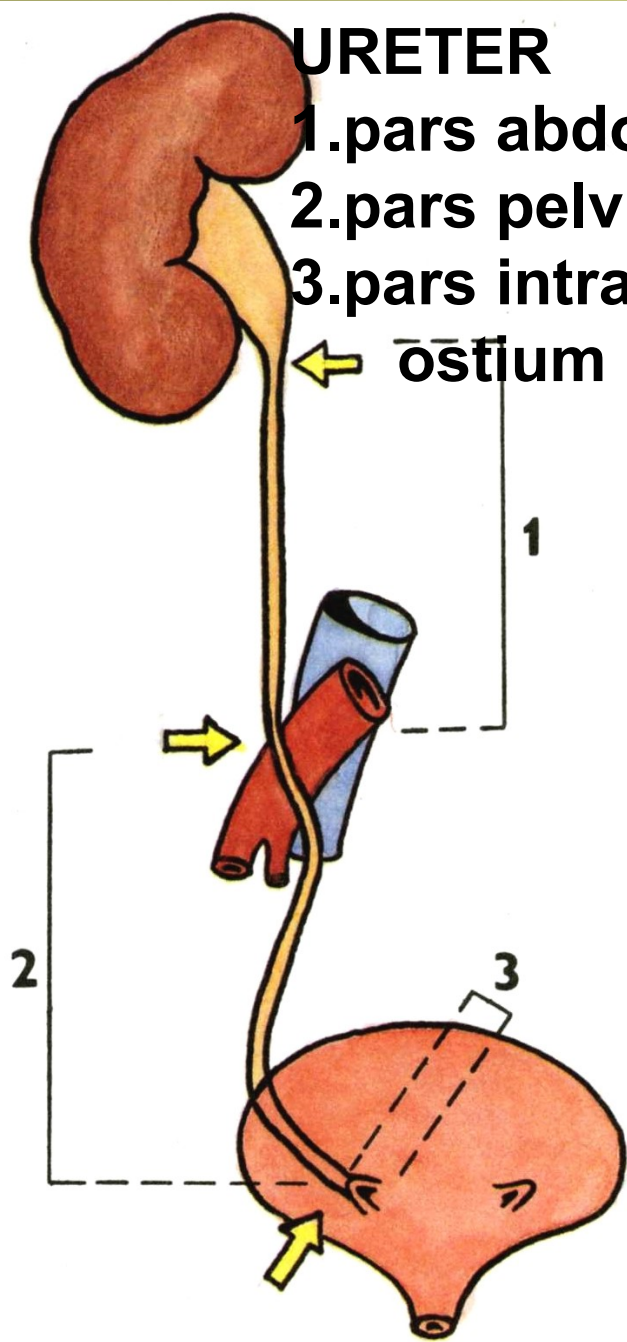
URETER

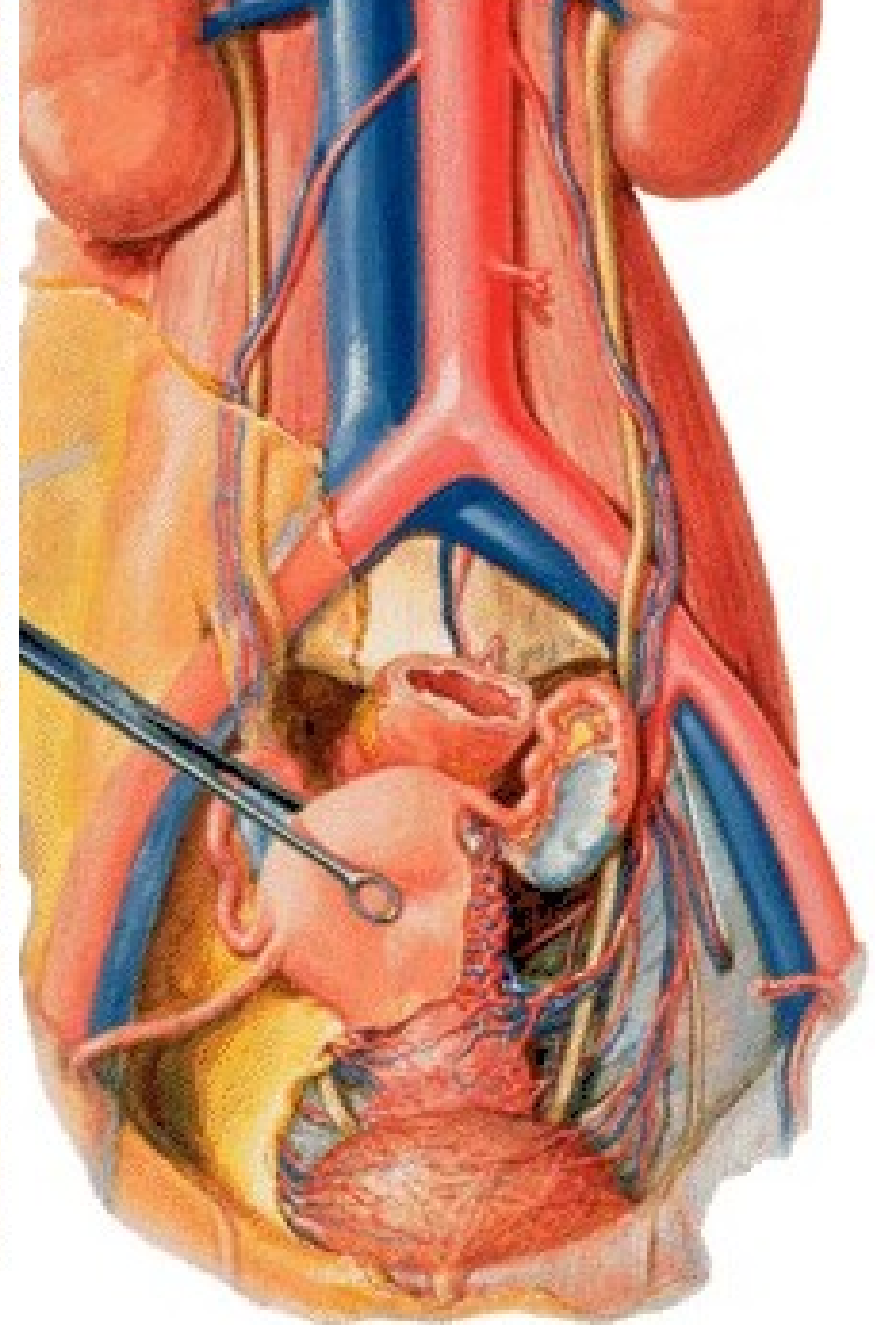
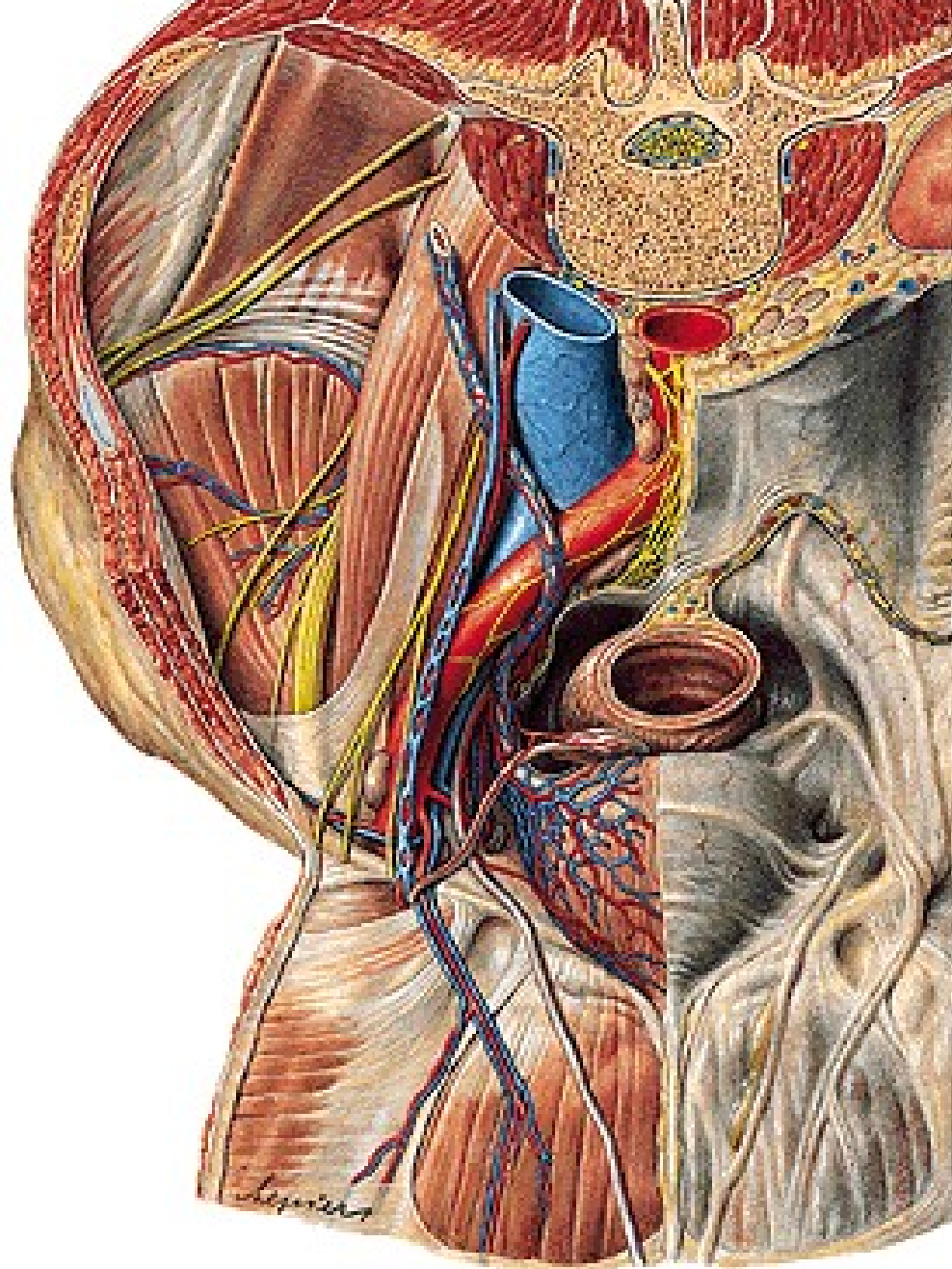
1.pars abdominalis

2.pars pelvina

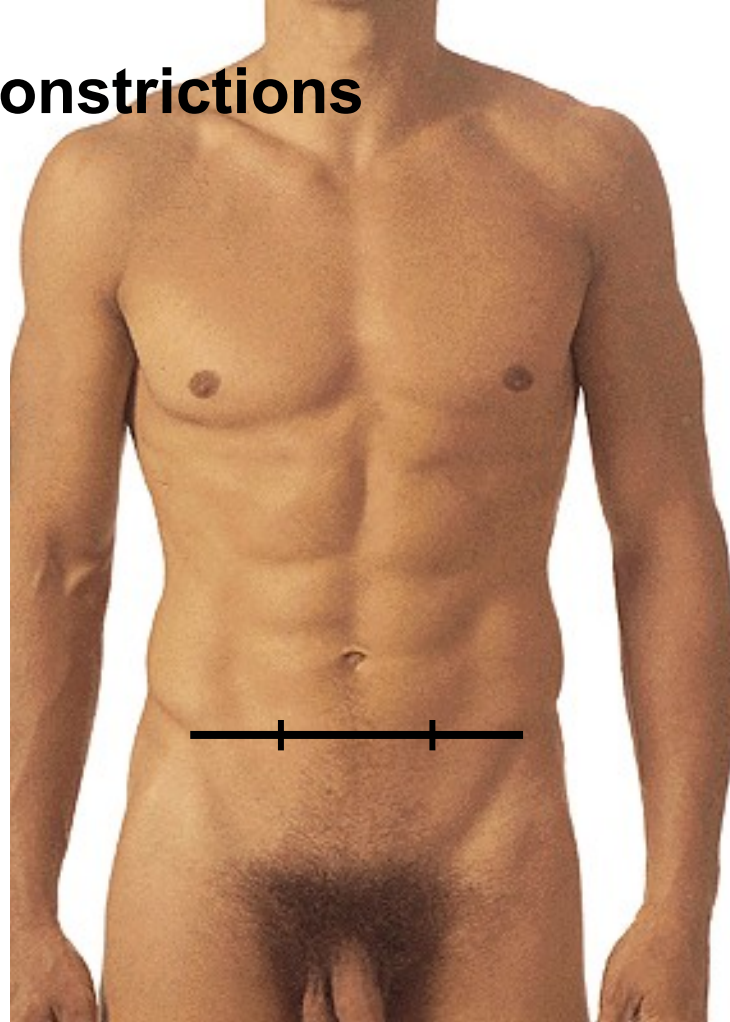
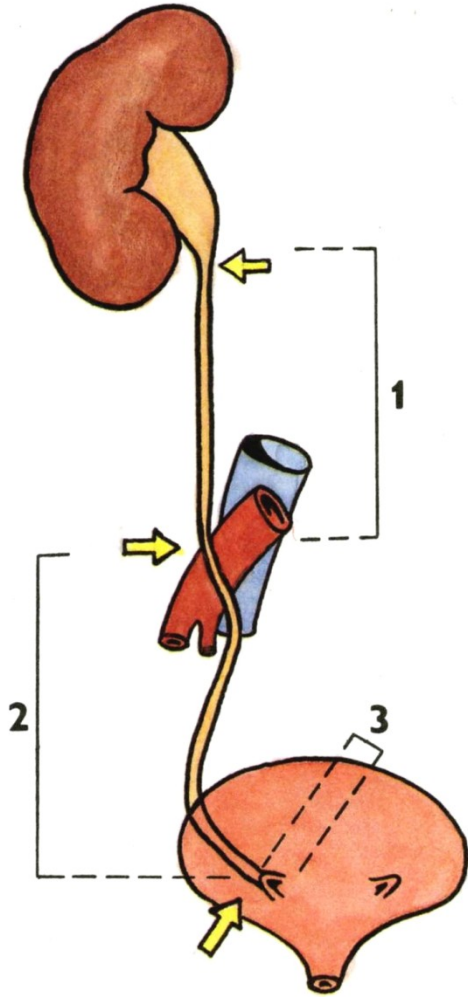
3.pars intramuralis

← ōstium ureteris

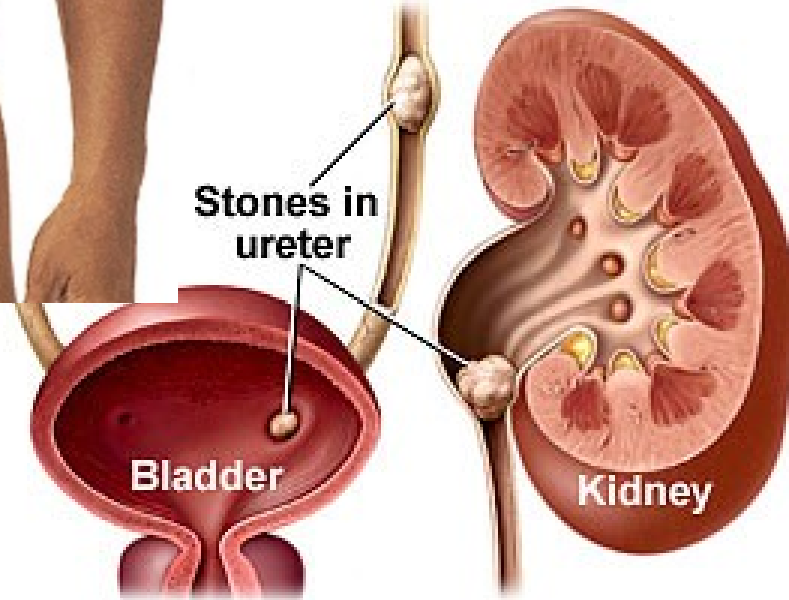




3 physiological constrictions



**Point of LANZ
(appendix
vermiformis)**





Adventitia

Fibrous tissue

*Longitudinal
muscular fibers*

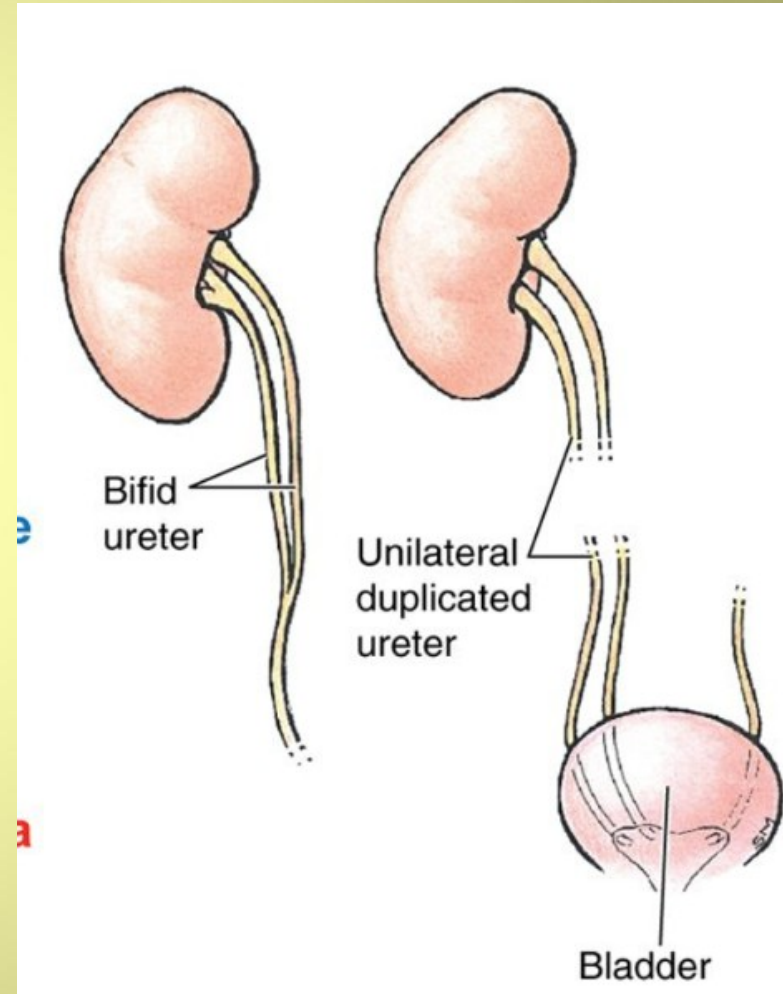
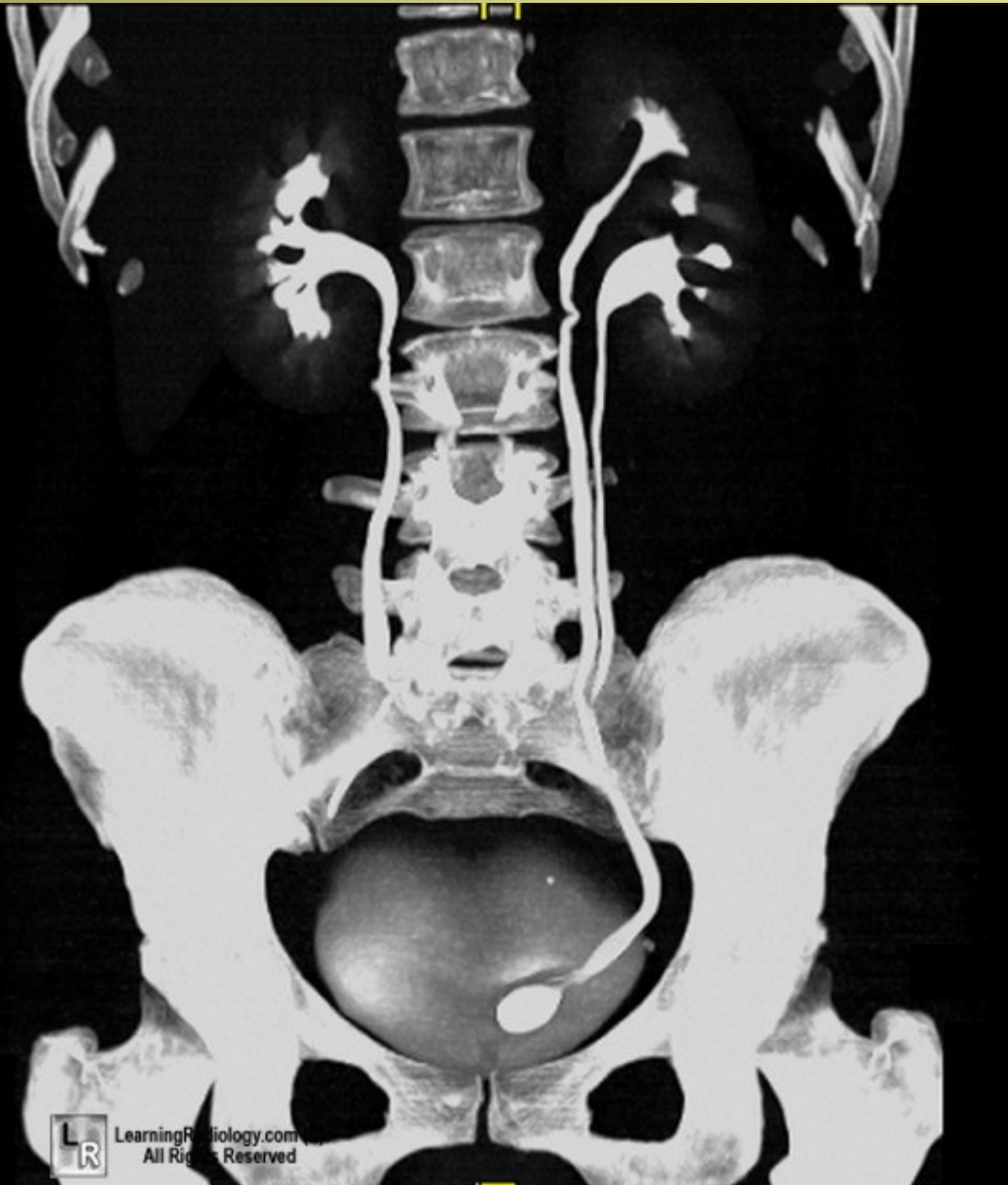
*Circular muscular
fibers*

*Subepithelial
connective tissue*

*Transitional
epithelium*

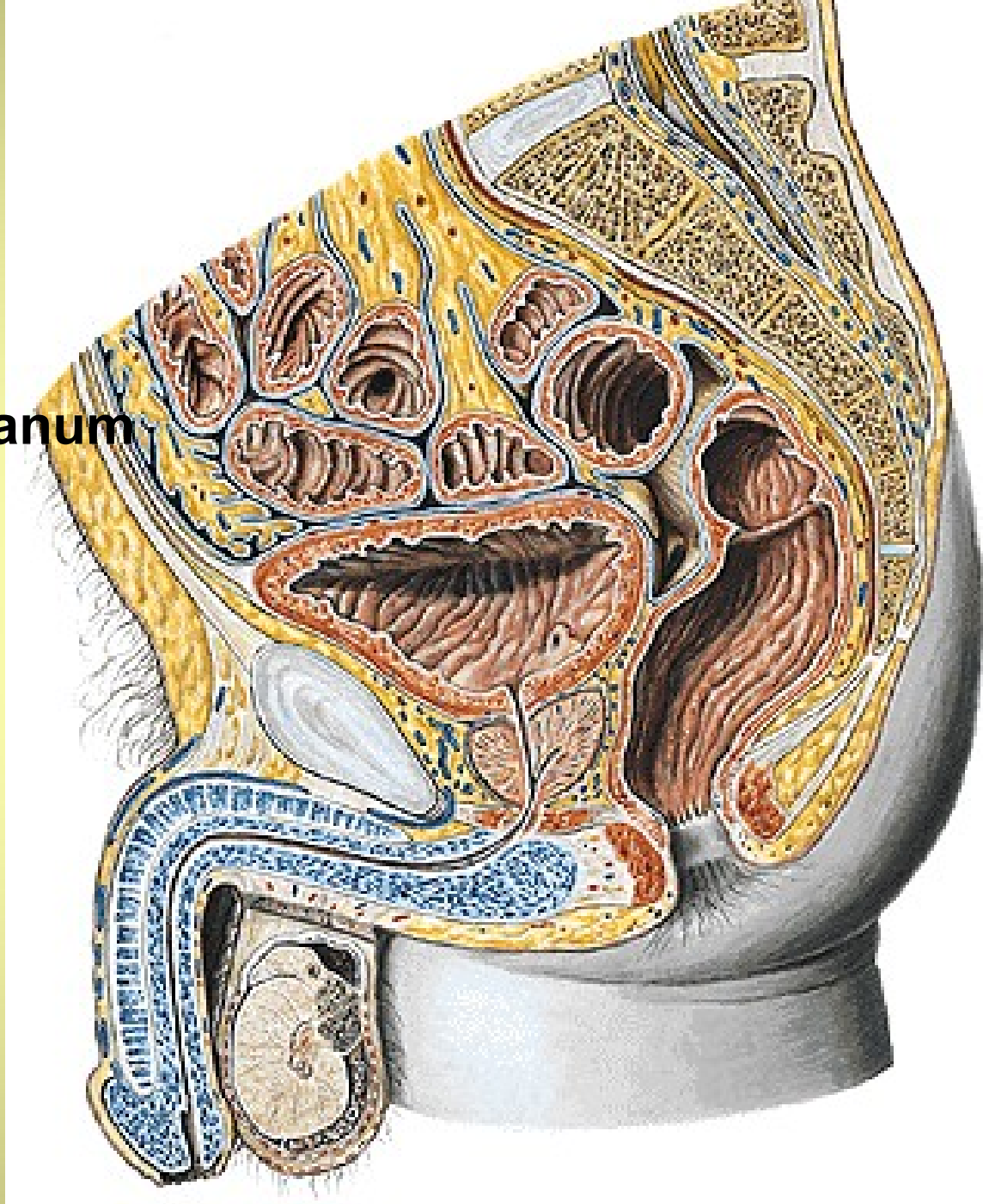
Plicae longitudinales

Duplicated ureter

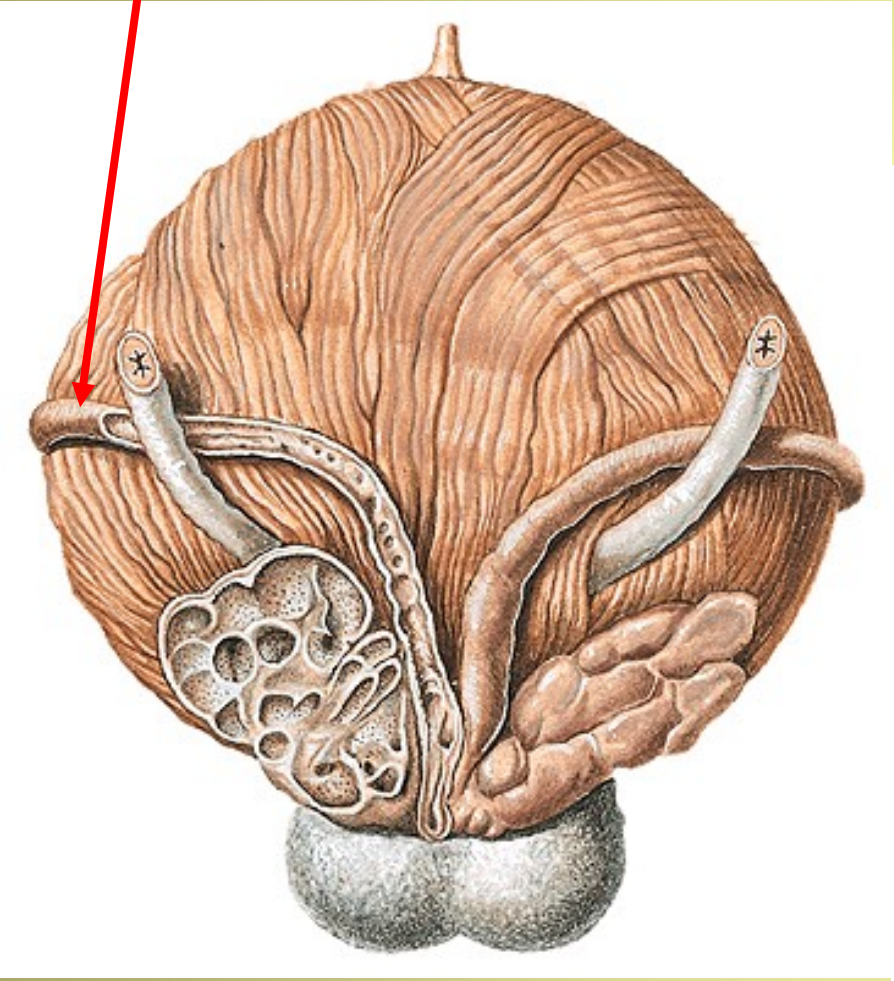


VESICA URINARIA

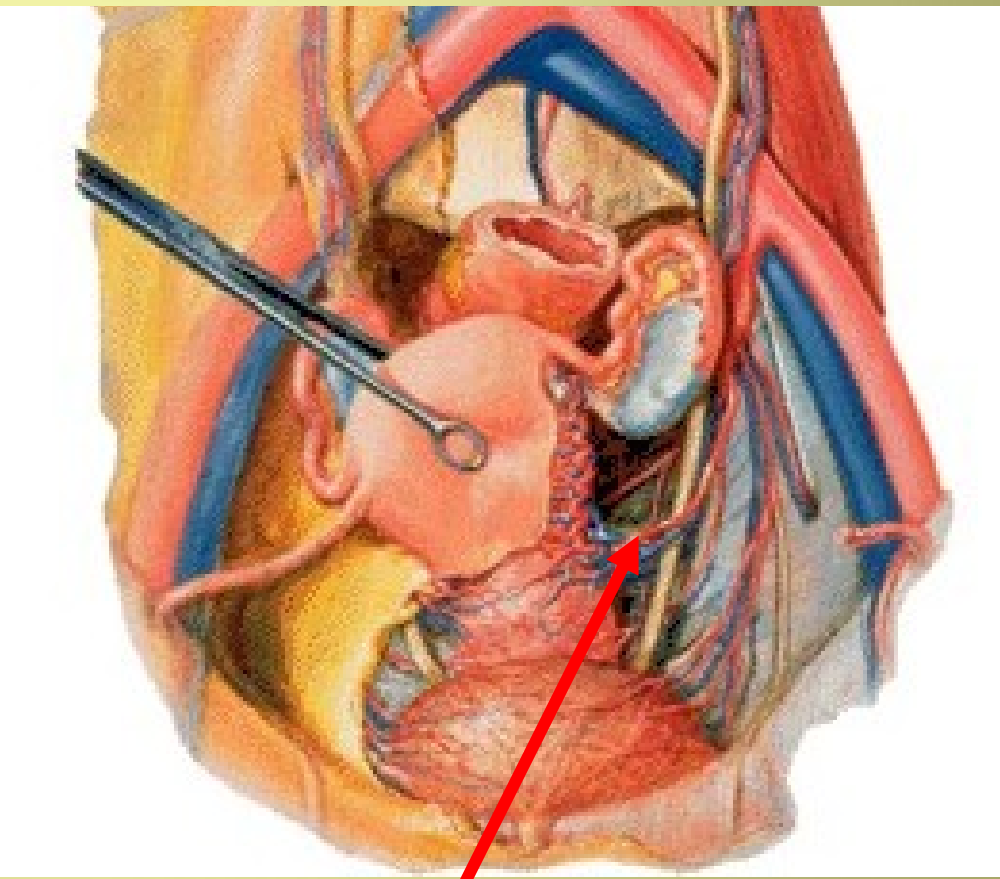
- fundus vesicae
- corpus vesicae
- apex vesicae
 - lig. umbilicale medianum
- cervix vesicae



Male - dorsal aspect of urinary bladder
Ductus deferens



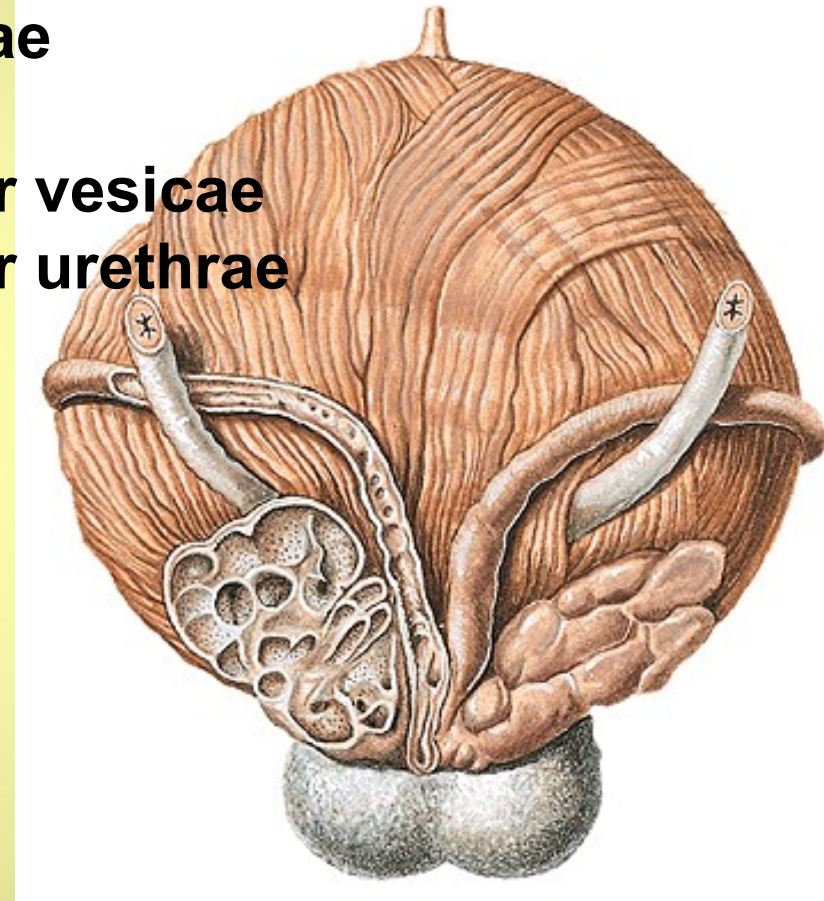
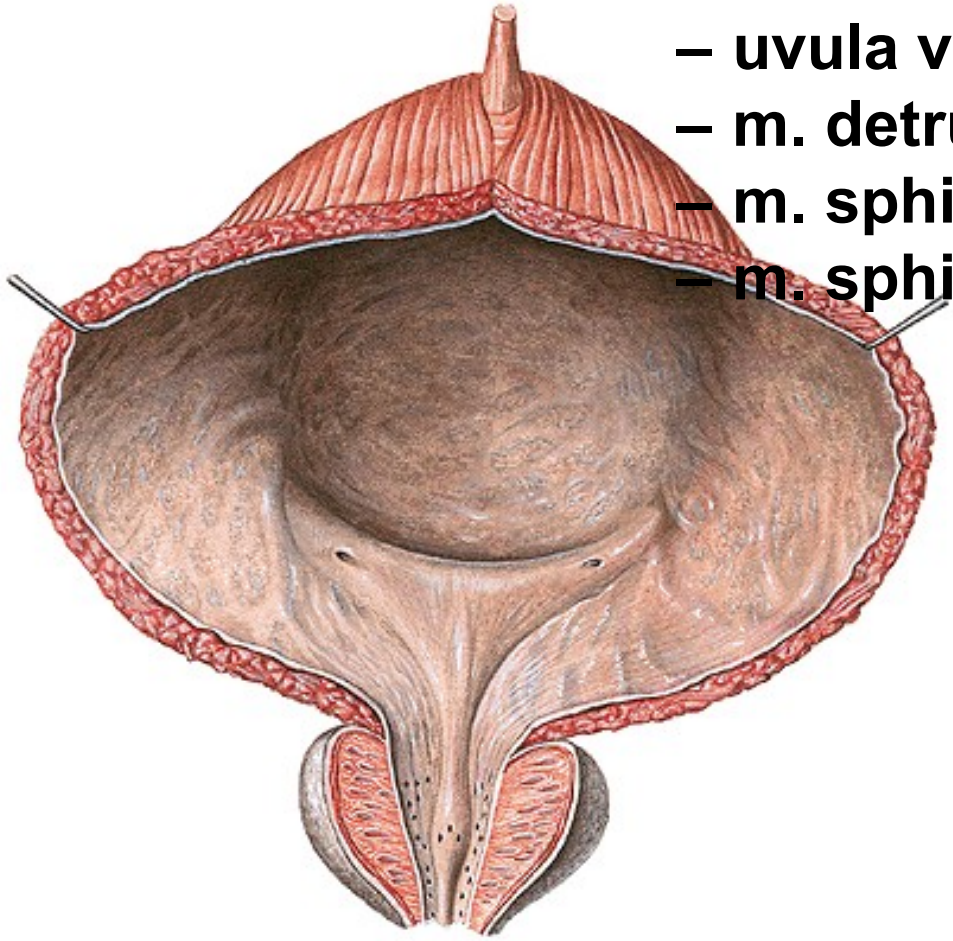
Female – anterosuperior aspect



A. uterina

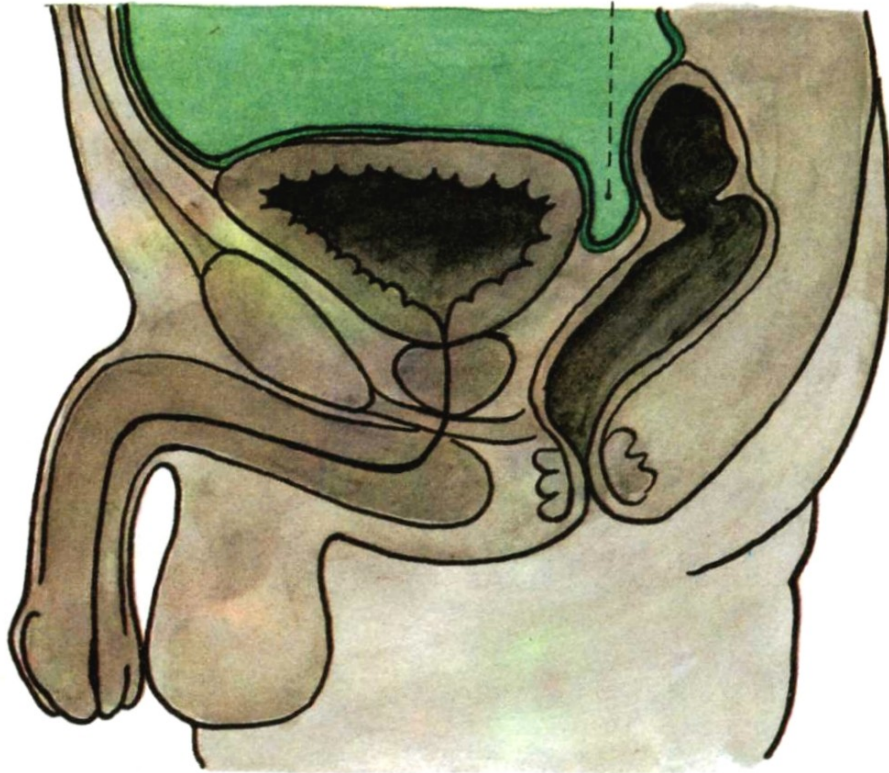
Trigonum vesicae – ostia ureterum

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



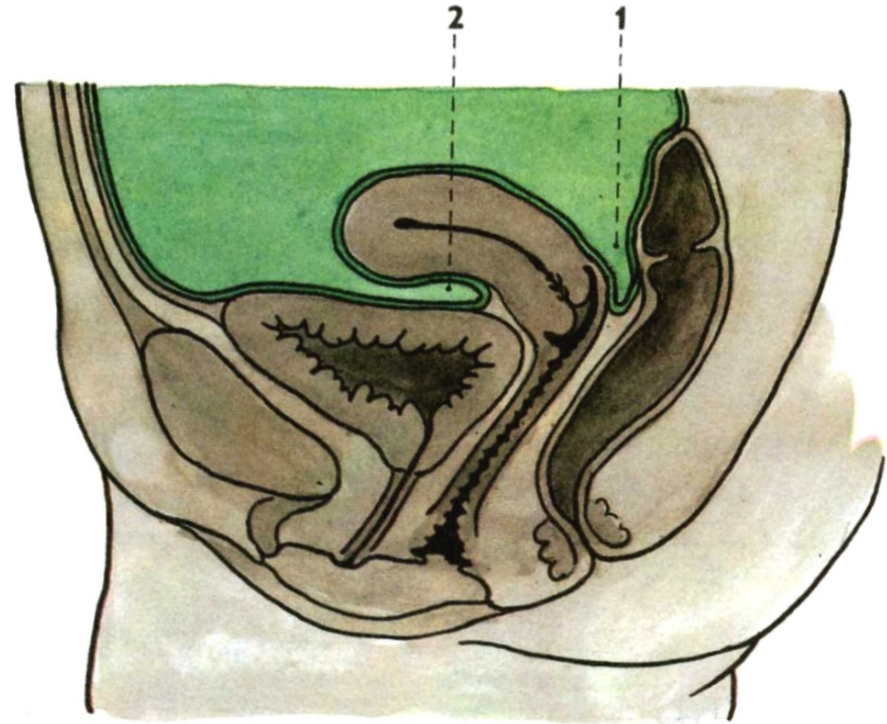
Median section through the male pelvis

1. Excavatio rectovesicalis



Median section through the female pelvis

1. Excavatio rectouterina
2. Excavatio vesicouterina



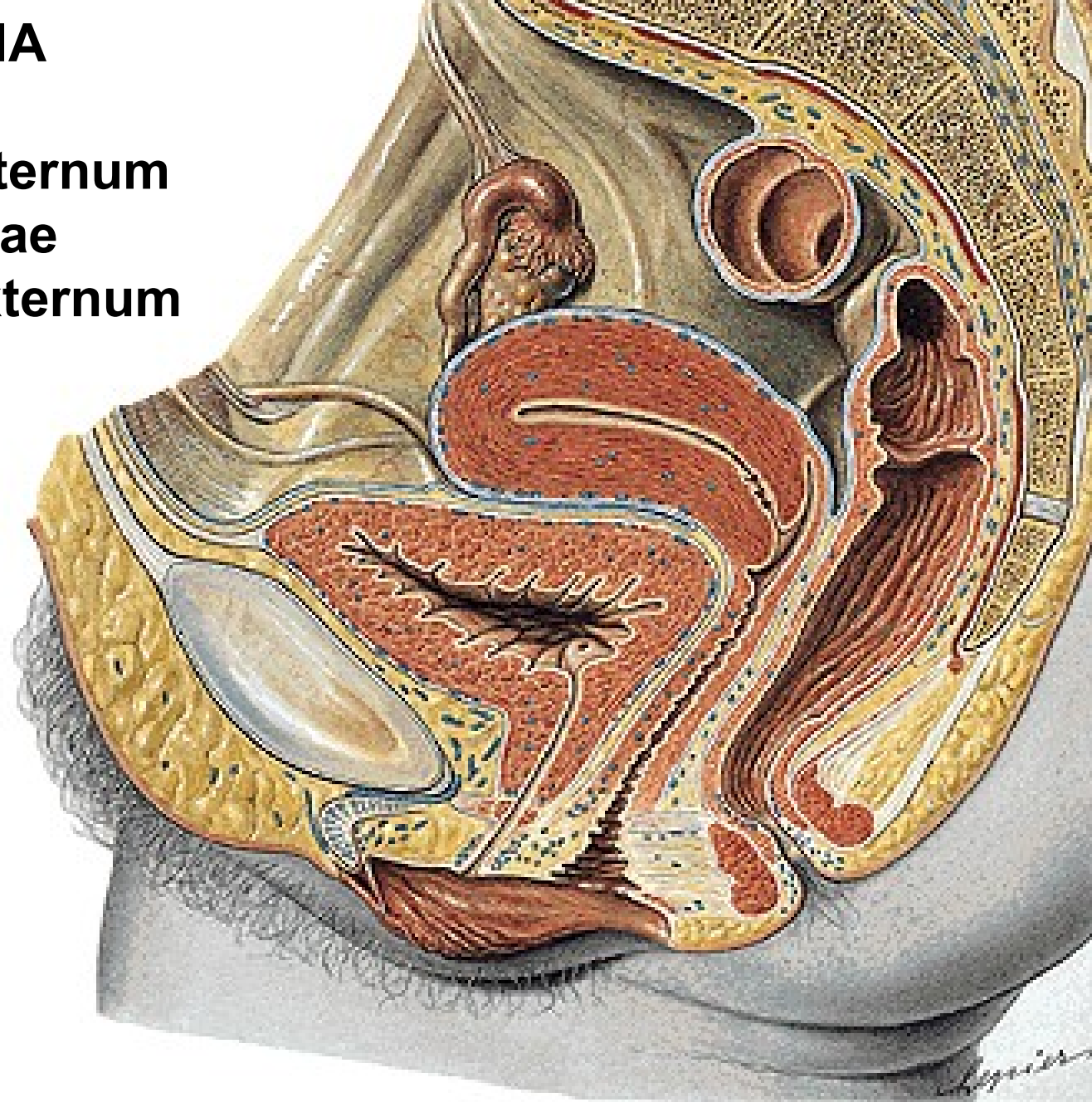
Paracystium

URETHRA FEMININA

Ostium urethrae internum

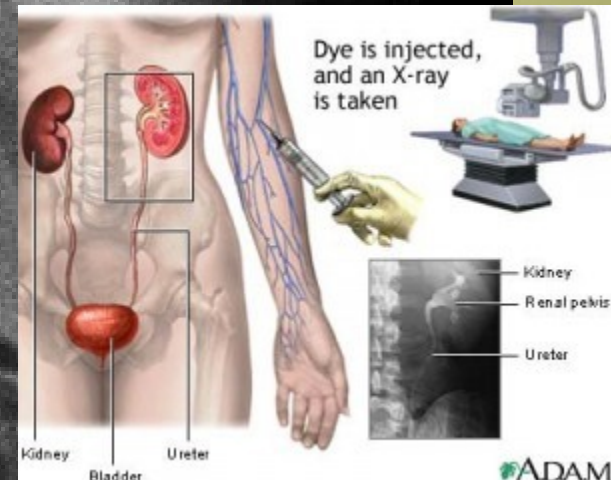
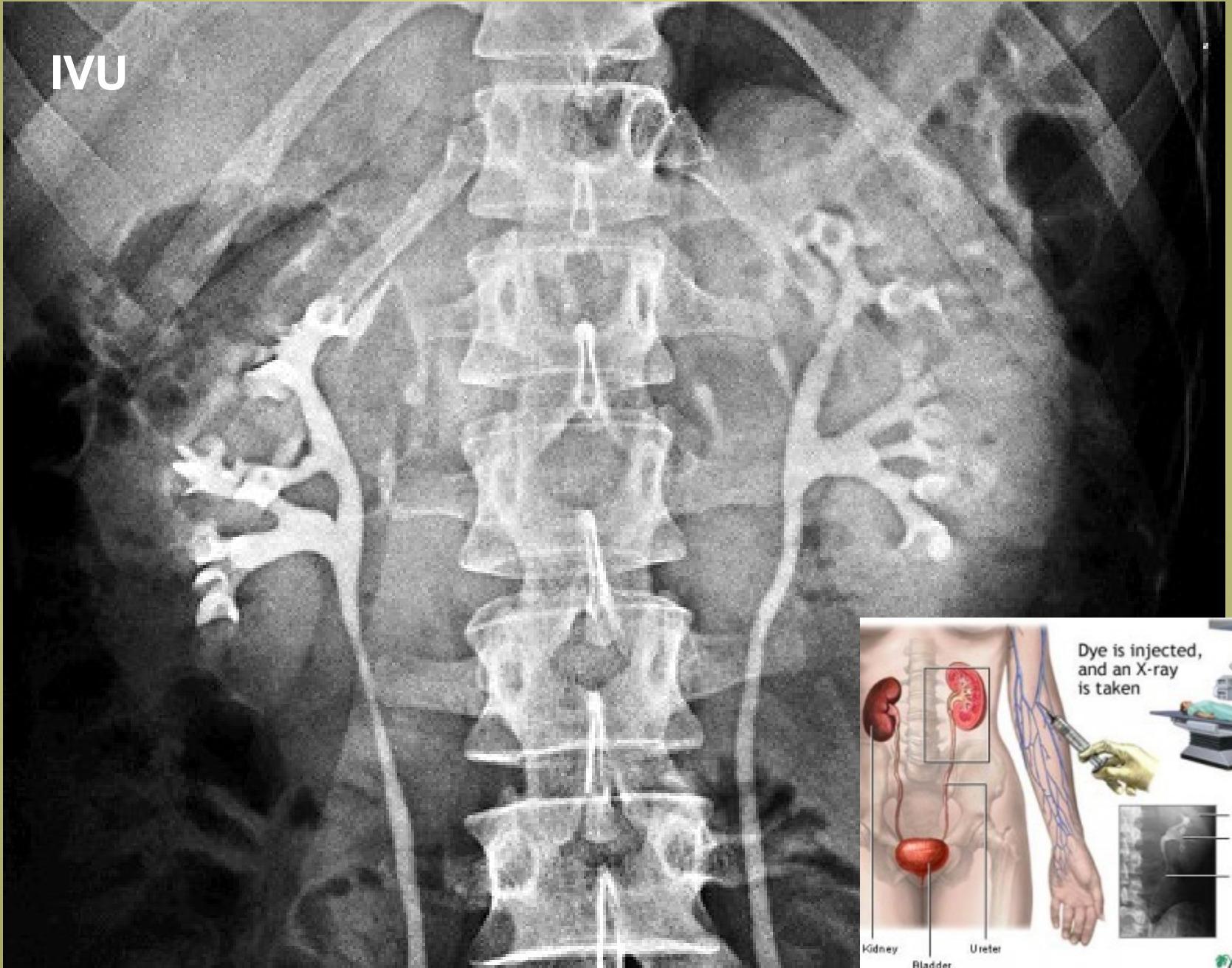
M. sphincter urethrae

Ostium urethrae externum



Intravenous urography

IVU



Retrograde pyelography

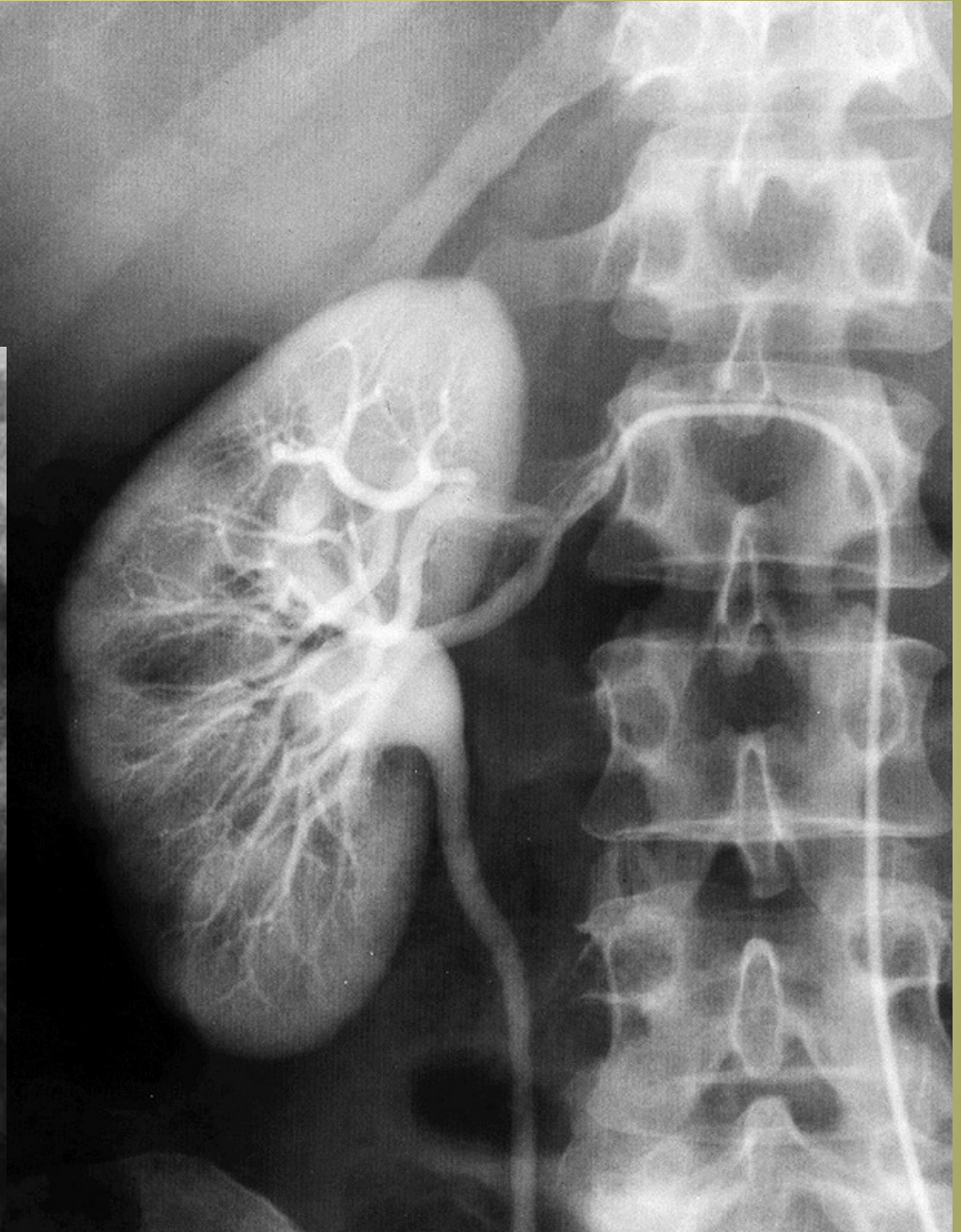
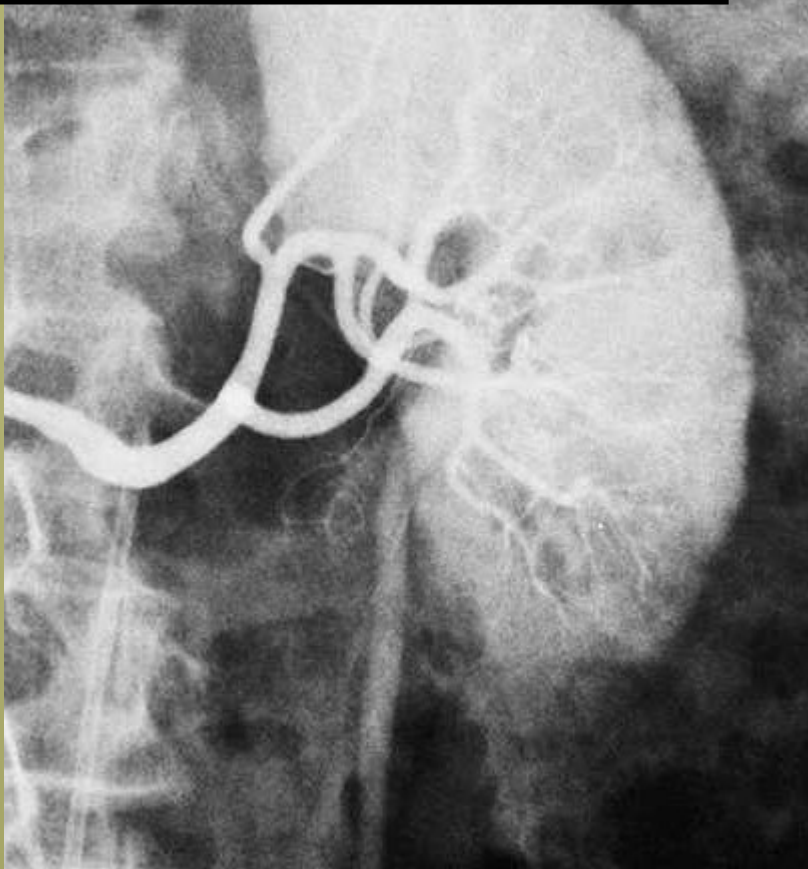
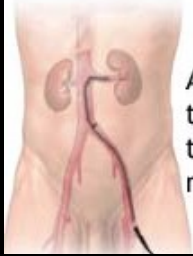
Medscape® www.medscape.com



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



Cystography



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

Organa genitalia interna:

Testis

Epididymis

Ductus deferens

Urethra masculina

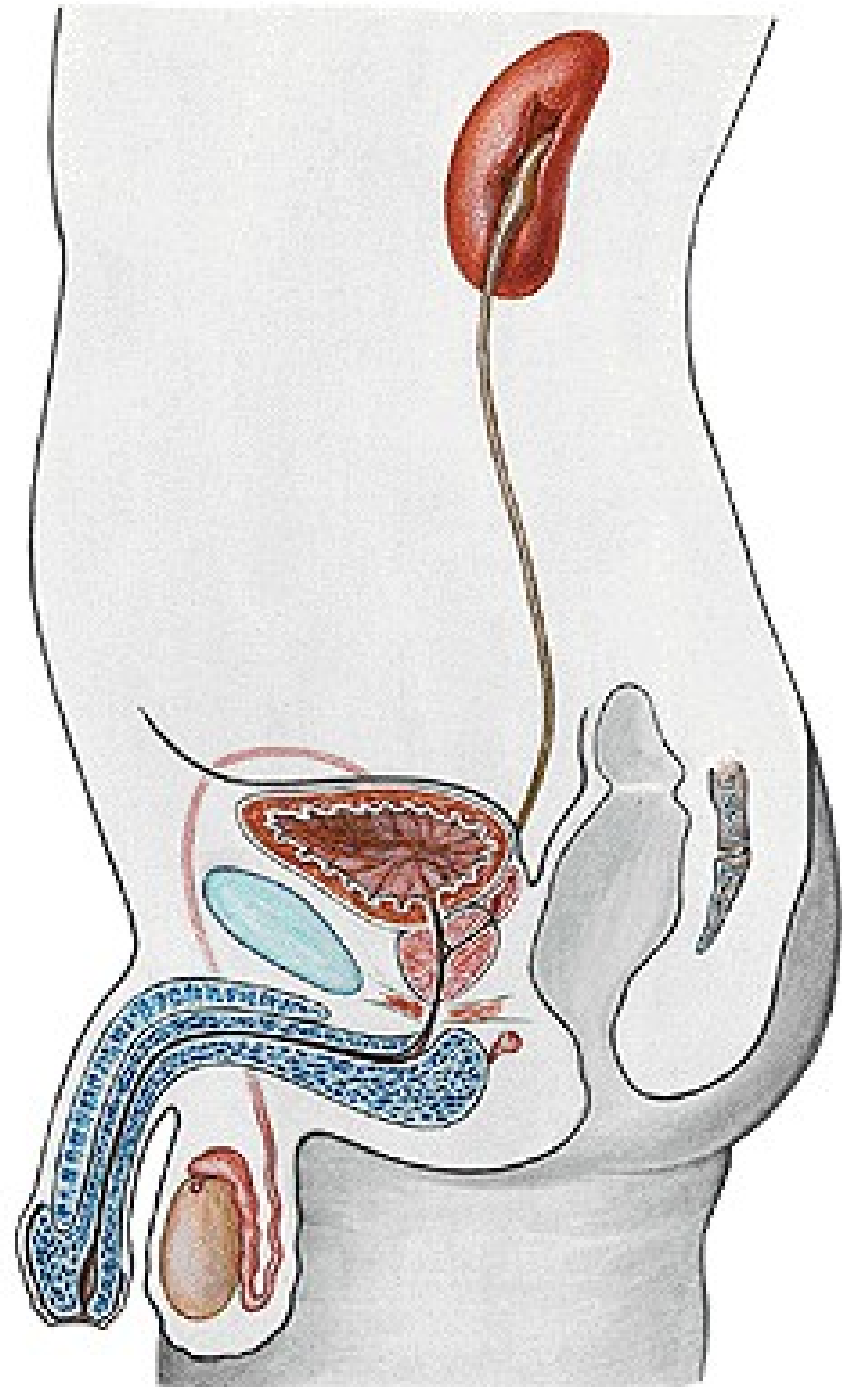
Vesicula seminalis

Prostata

Organa genitalia externa:

Penis

Scrotum



TESTIS

Facies medialis

Facies lateralis

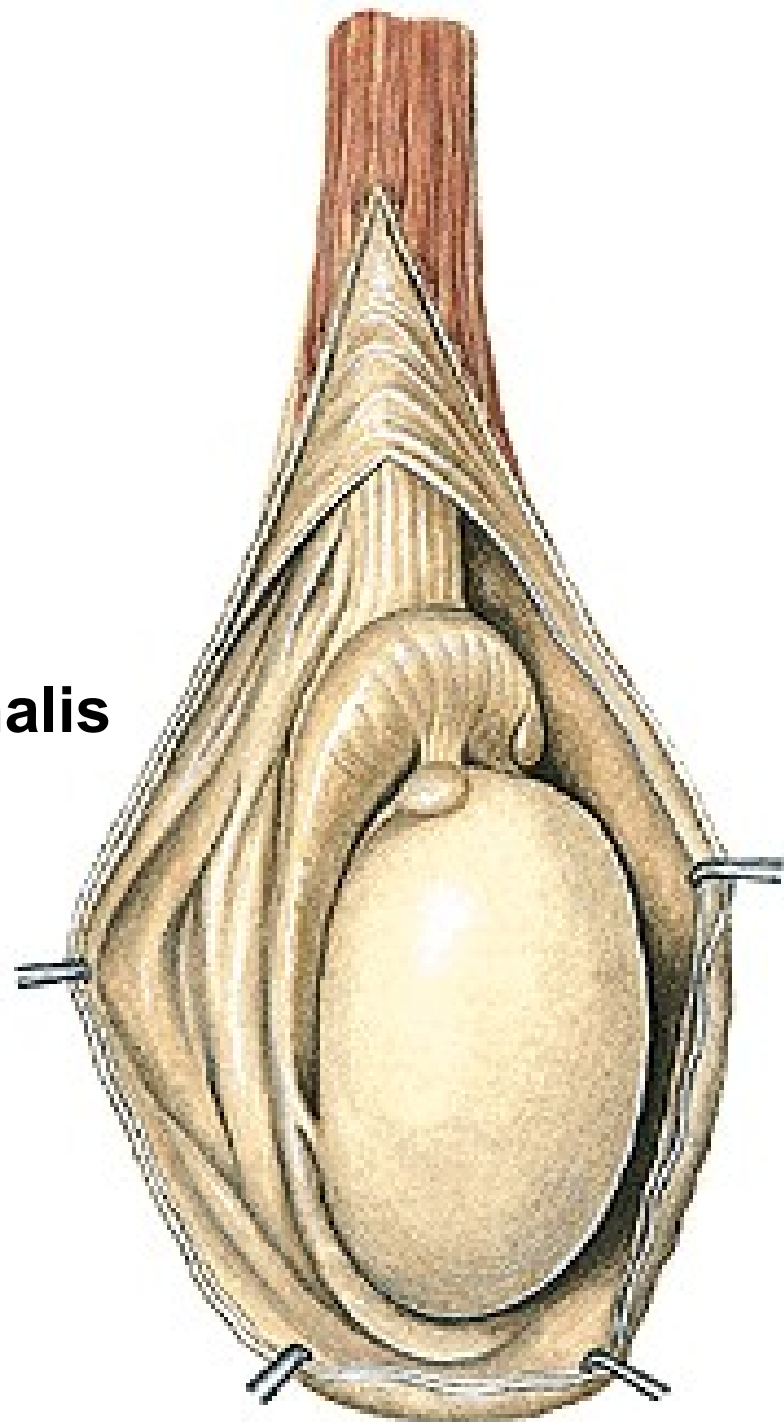
Extremitas superior

Extremitas inferior

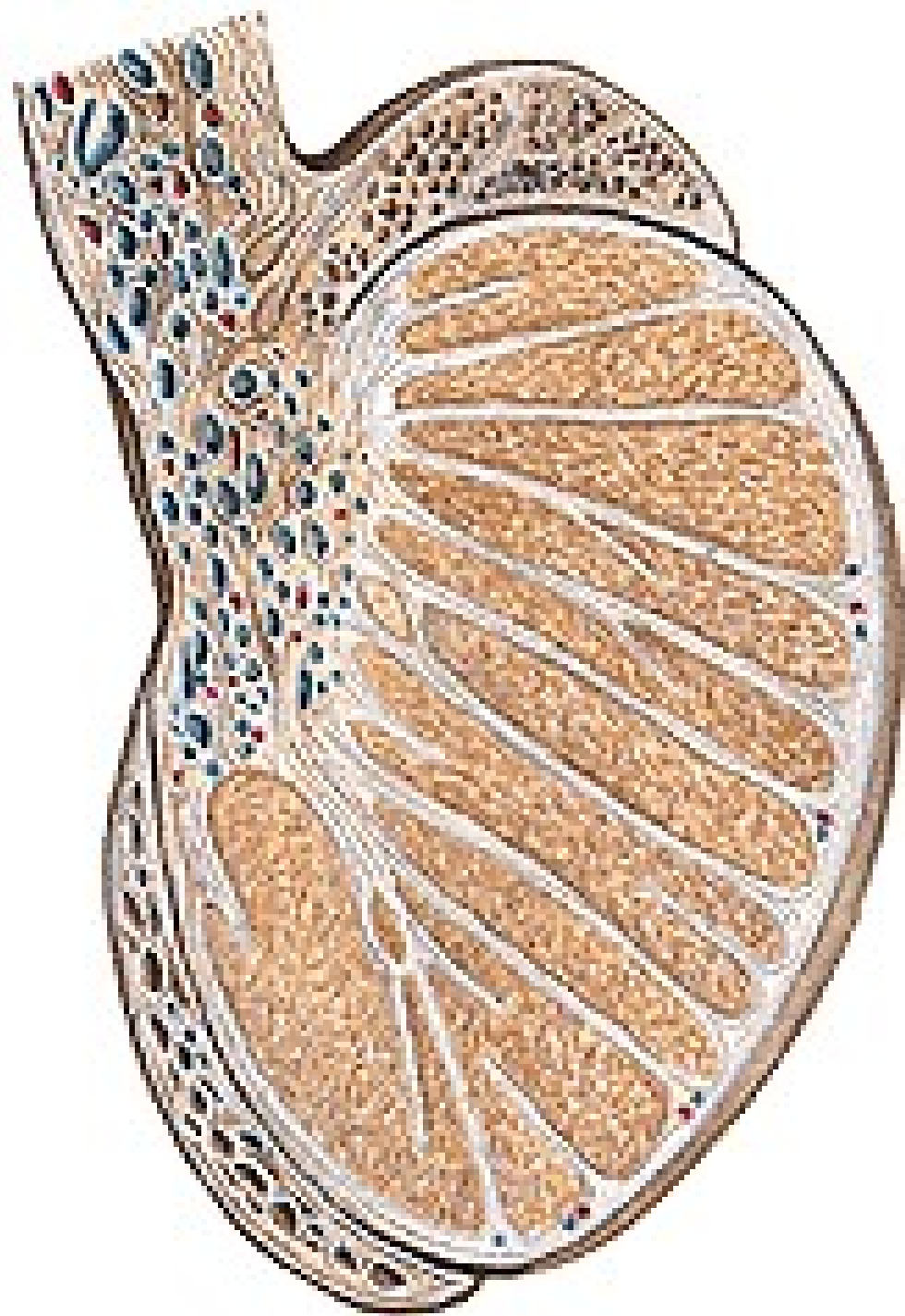
Margo anterior

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

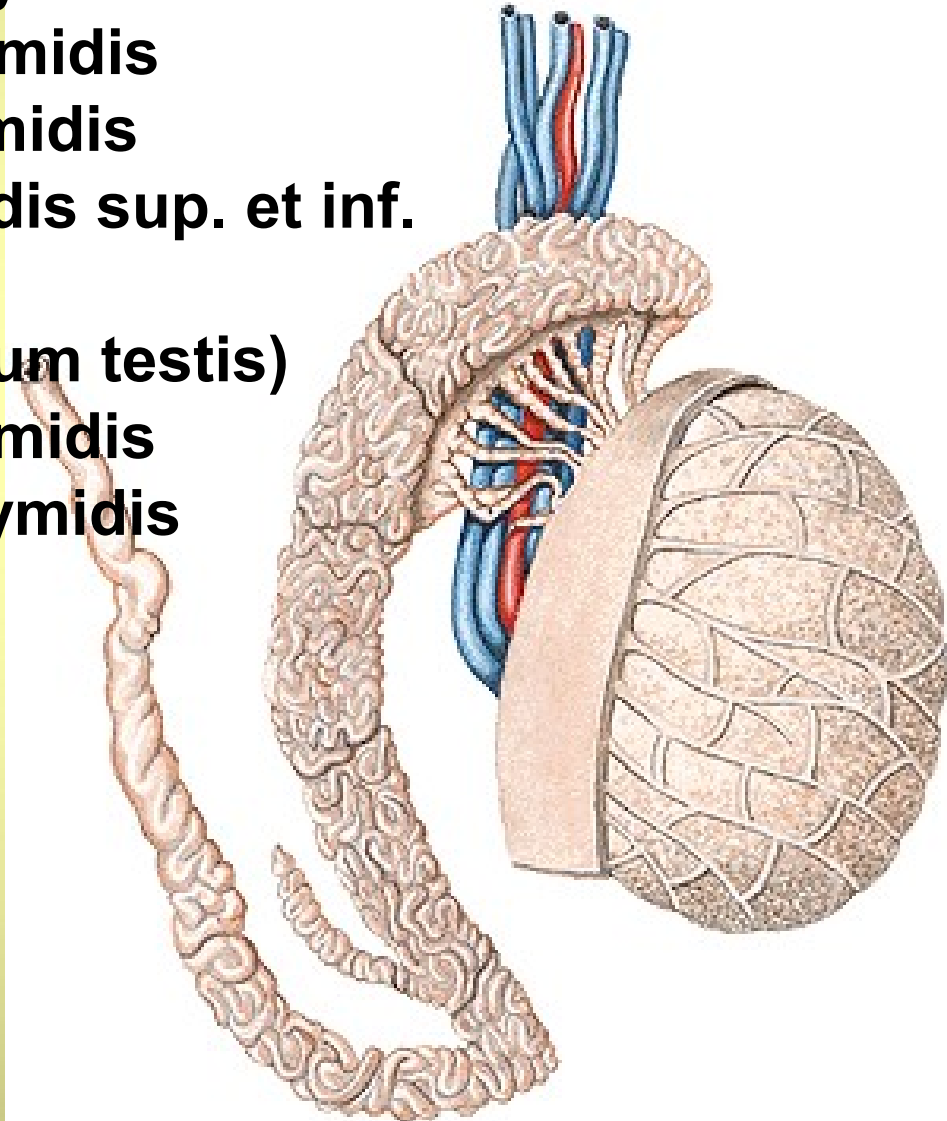
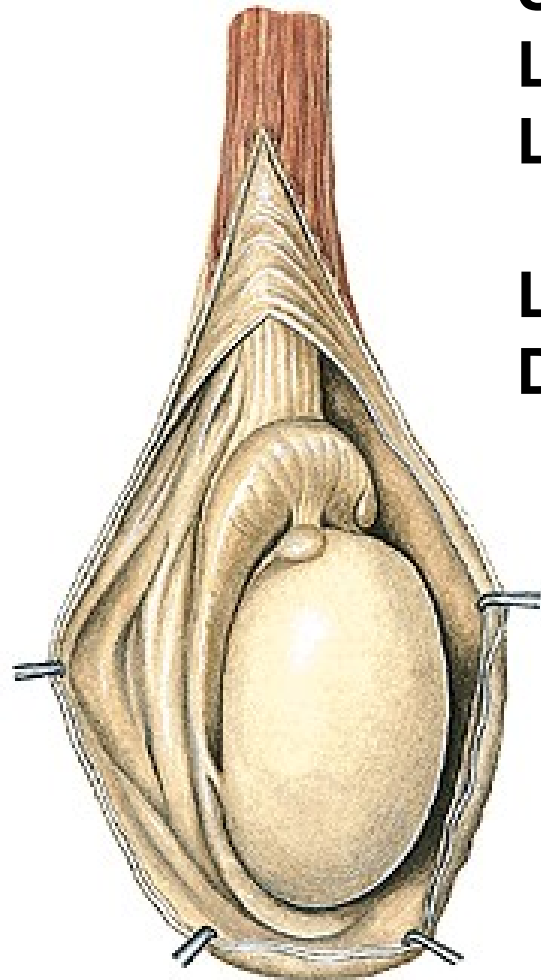
Lig. epididymidis sup. et inf.

Lig. scrotale

(Gubernaculum testis)

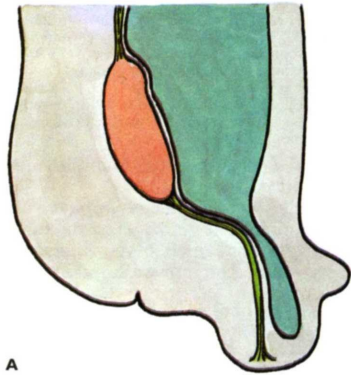
Lobuli epididymidis

Ductus epididymidis

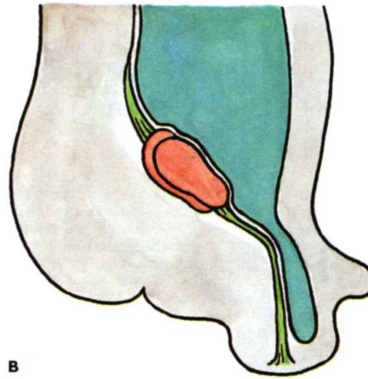


DESCENSUS TESTIUM

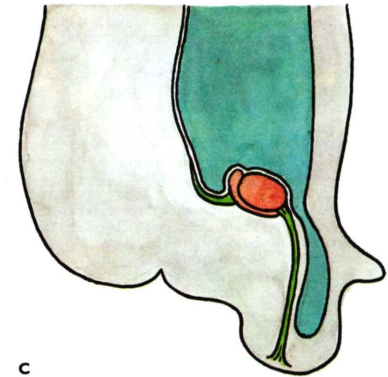
Gubernaculum testis → Lig. scrotale
Processus vaginalis → Tunica vaginalis



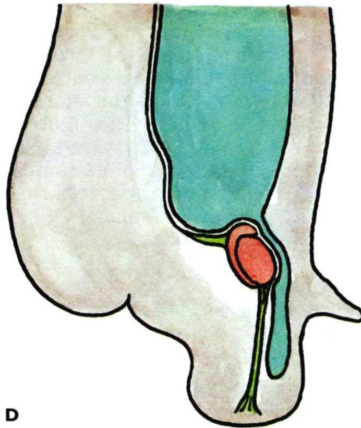
A



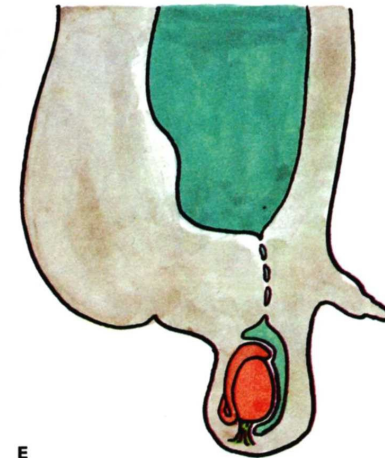
B



C



D



E

Retentio testis (cryptorchidism). Ectopia testis.

DUCTUS DEFERENS (VAS DEFERENS)

Pars epididymica

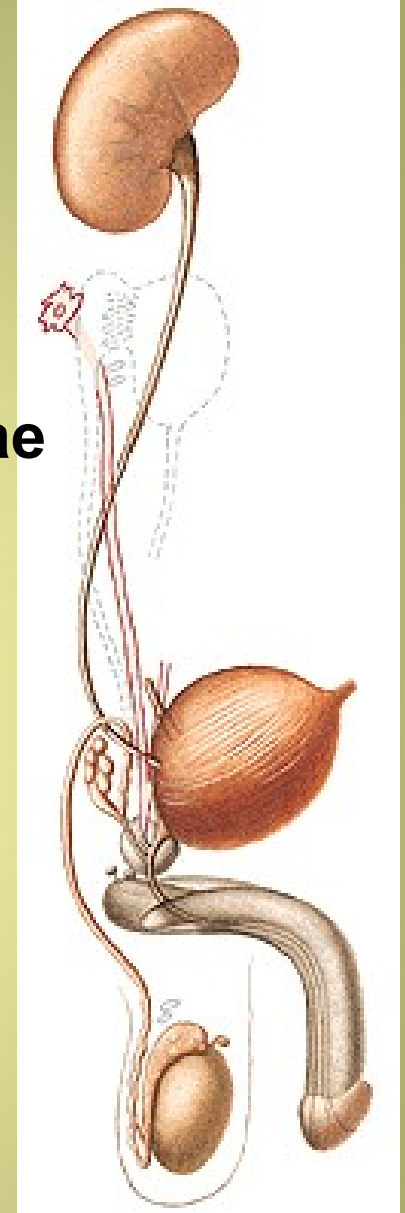
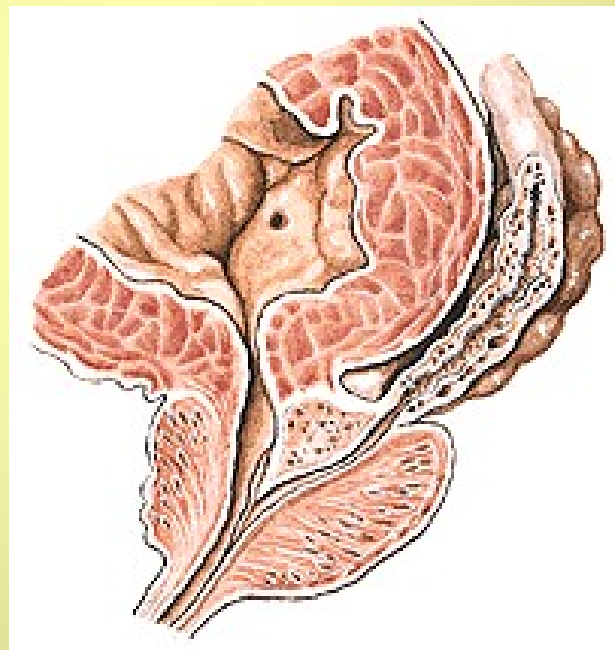
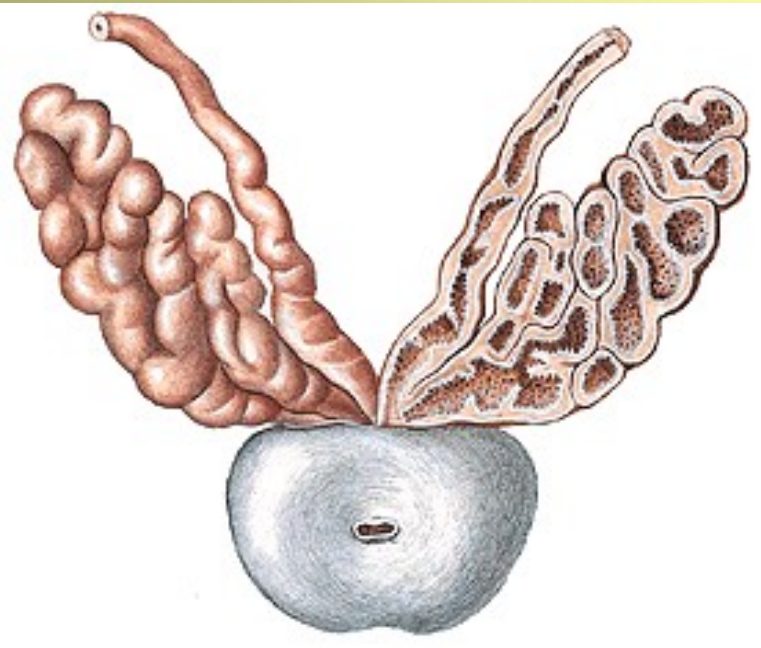
Pars funicularis

Pars inguinalis

Pars pelvina

Ampulla ductus deferentis - diverticula ampullae

Ductus ejaculatorius – colliculus seminalis



FUNICULUS SPERMATICUS: A. testicularis

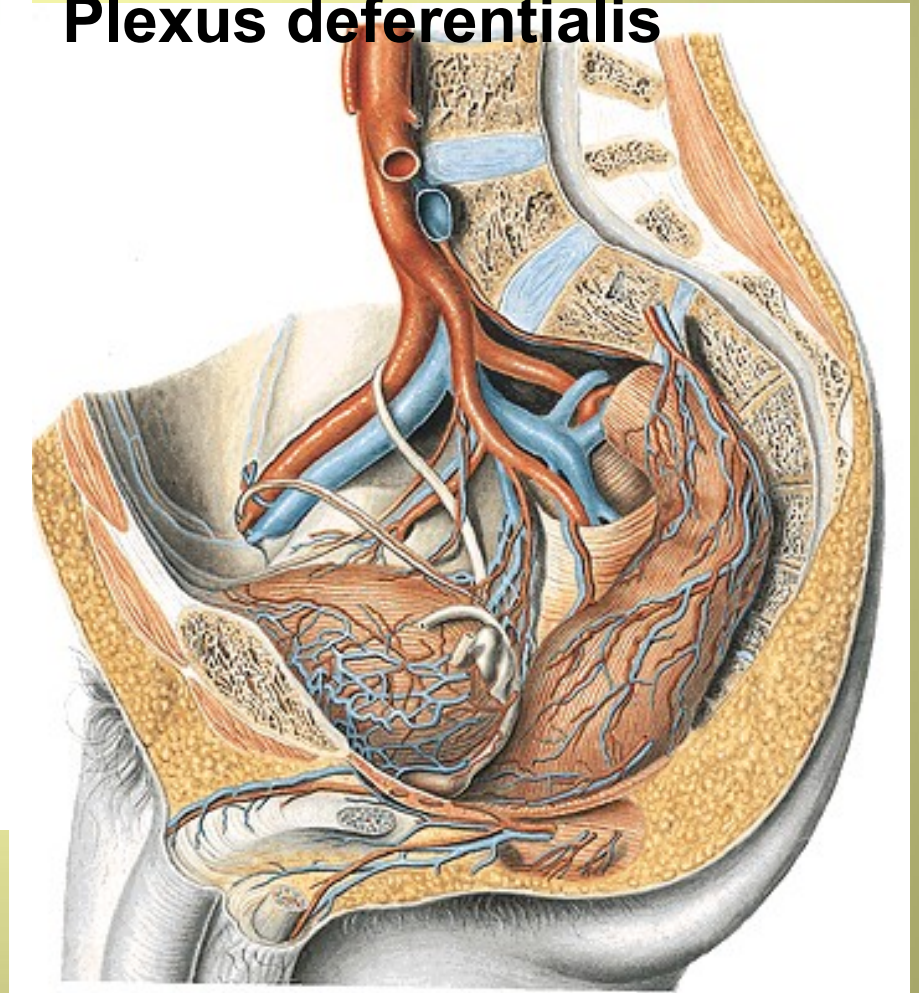
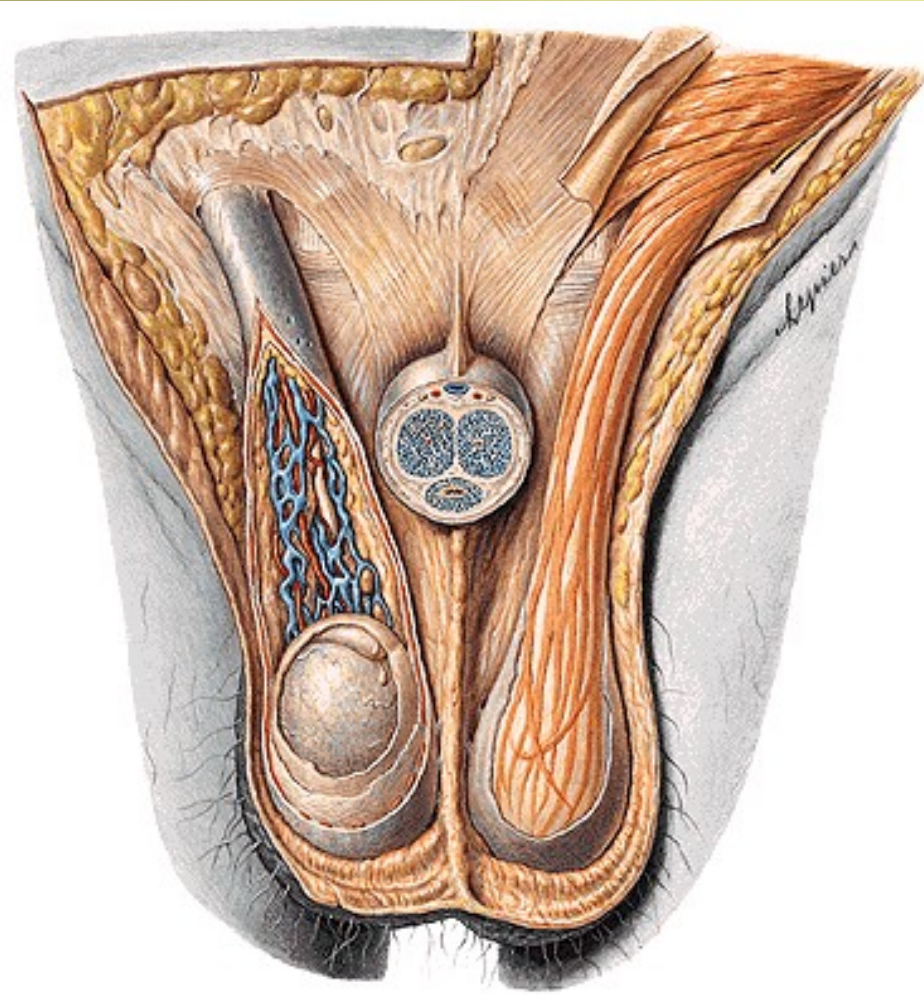
Plexus testicularis

Plexus pampiniformis

Ductus deferens

A. ductus deferentis

Plexus deferentialis

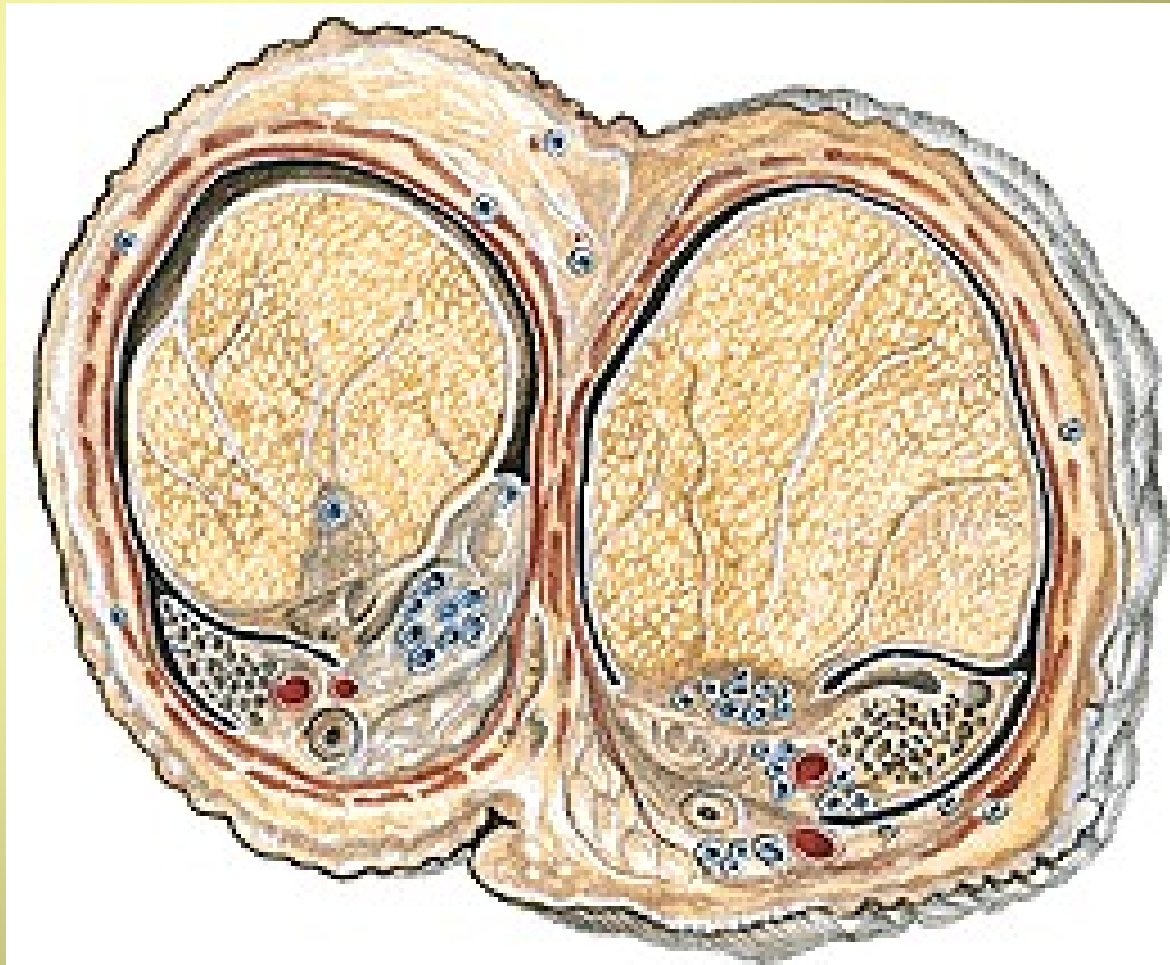


COVERINGS OF THE TESTIS, EPIDIDYMIS AND SPERMATIC CORD

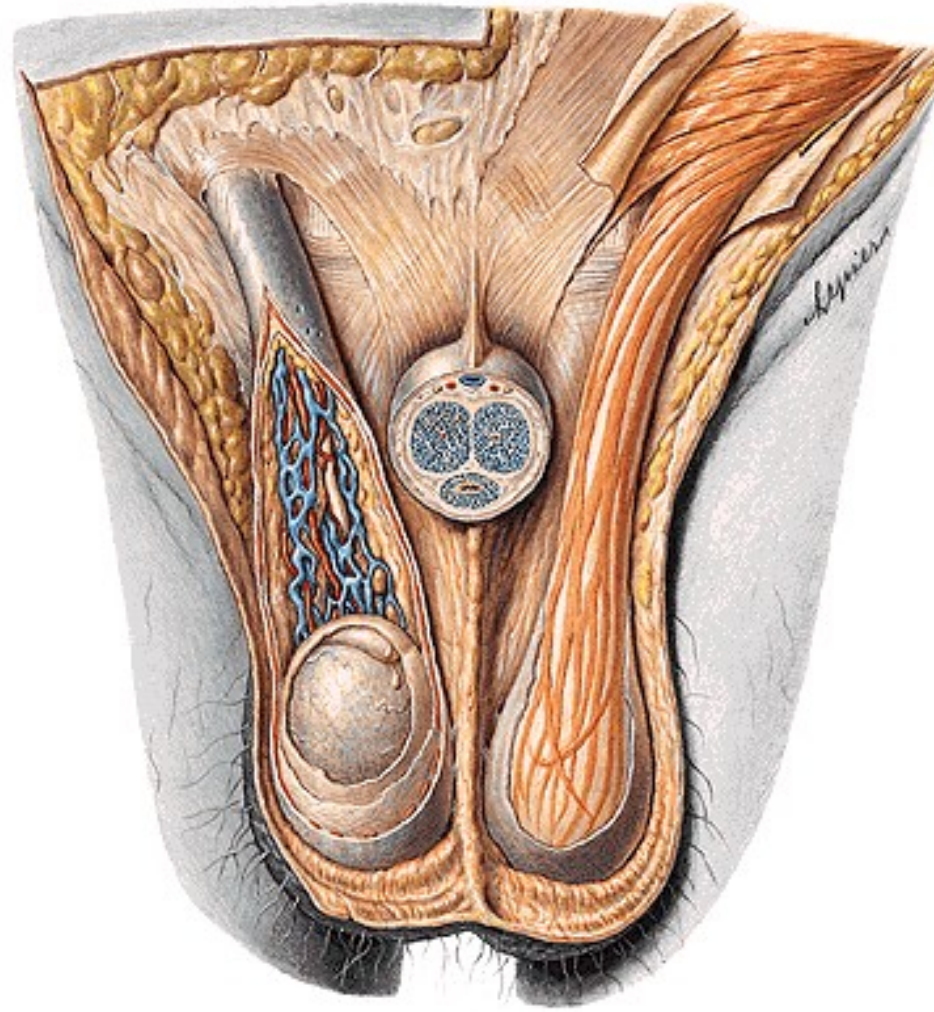
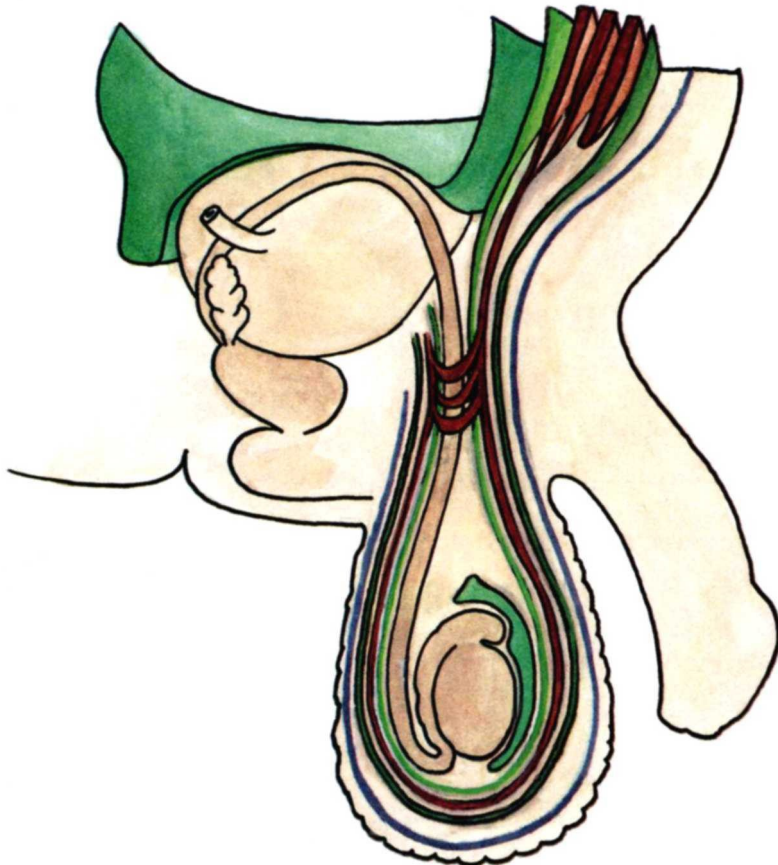
Epiorchium (Lamina visceralis tunicae vaginalis)

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

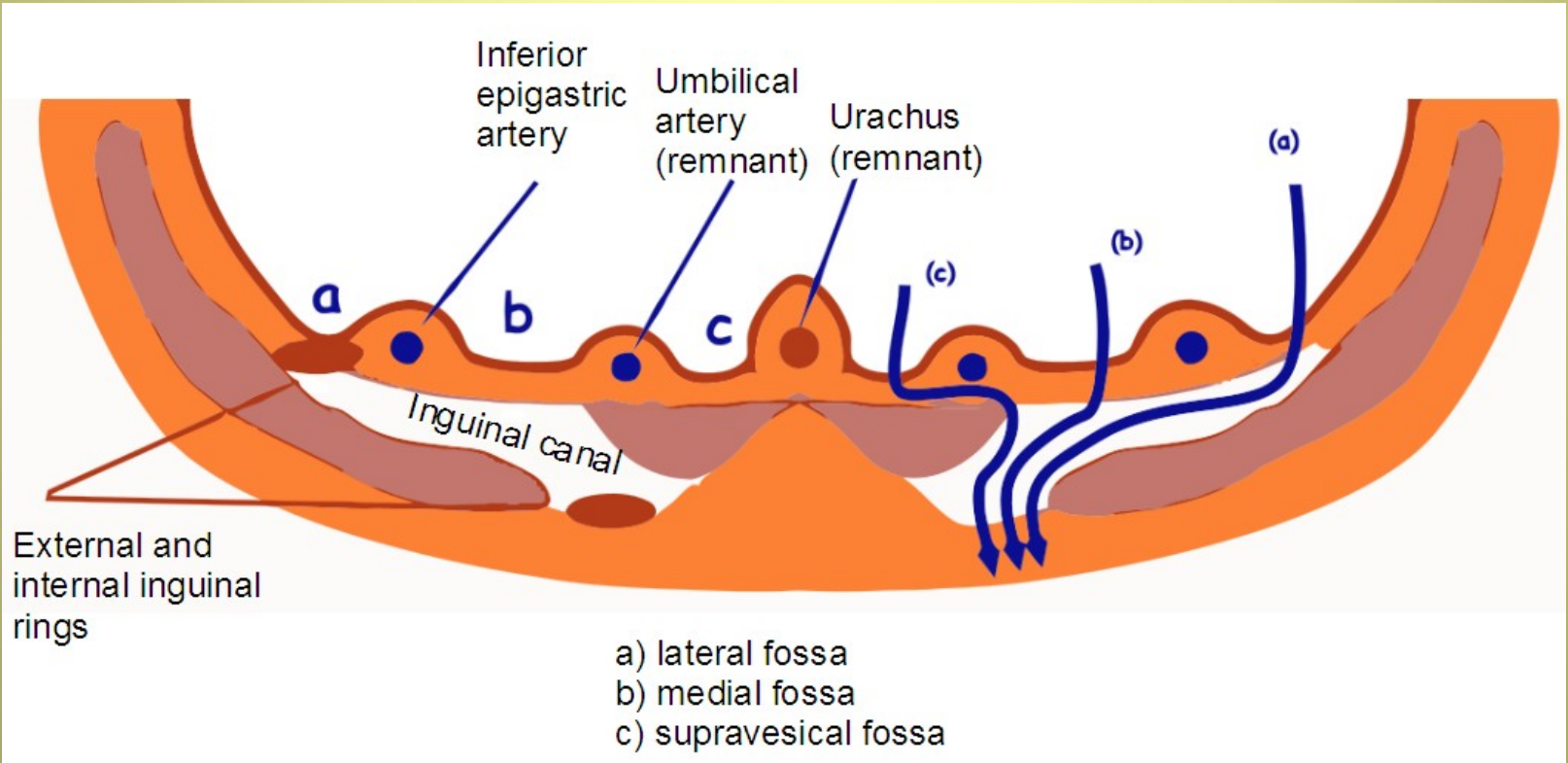
- hernia supravesicalis (c)

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

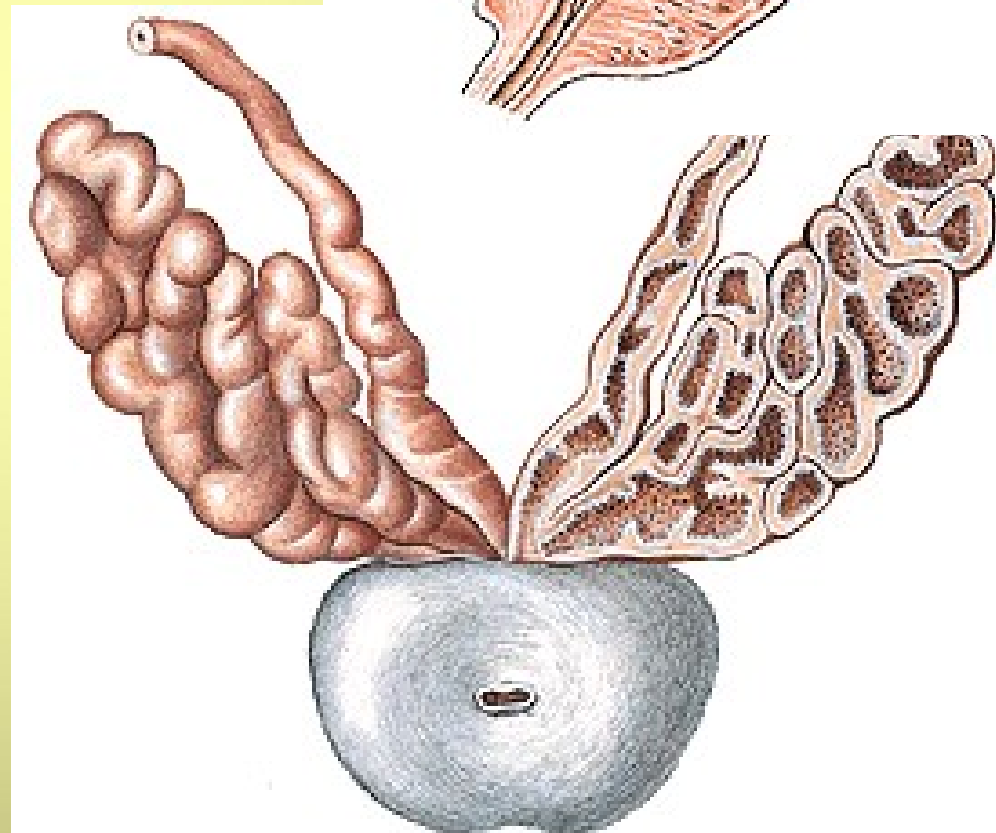
Facies posterior

Facies inferolaterales

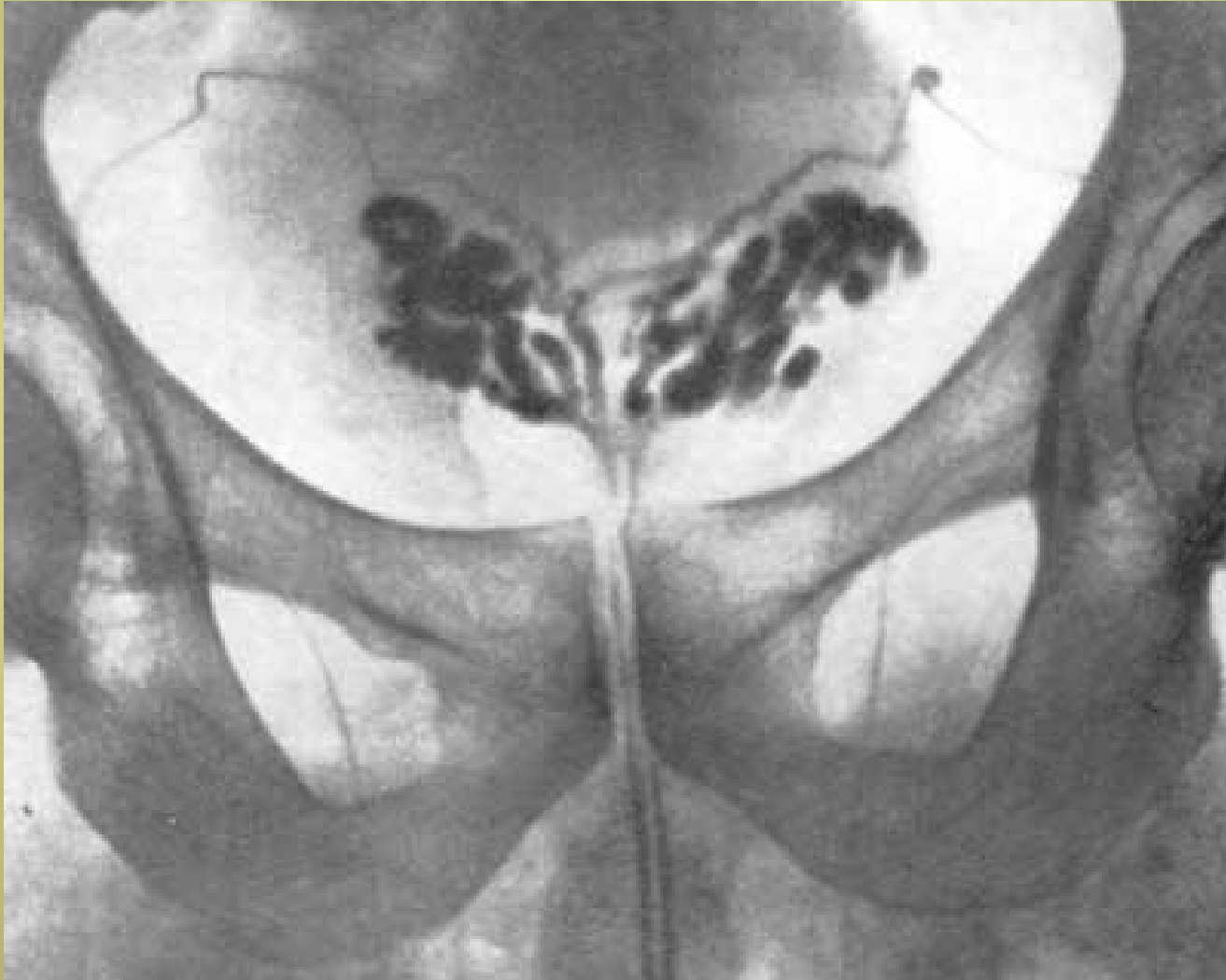
Lobus medius

Lobus dexter et sinister

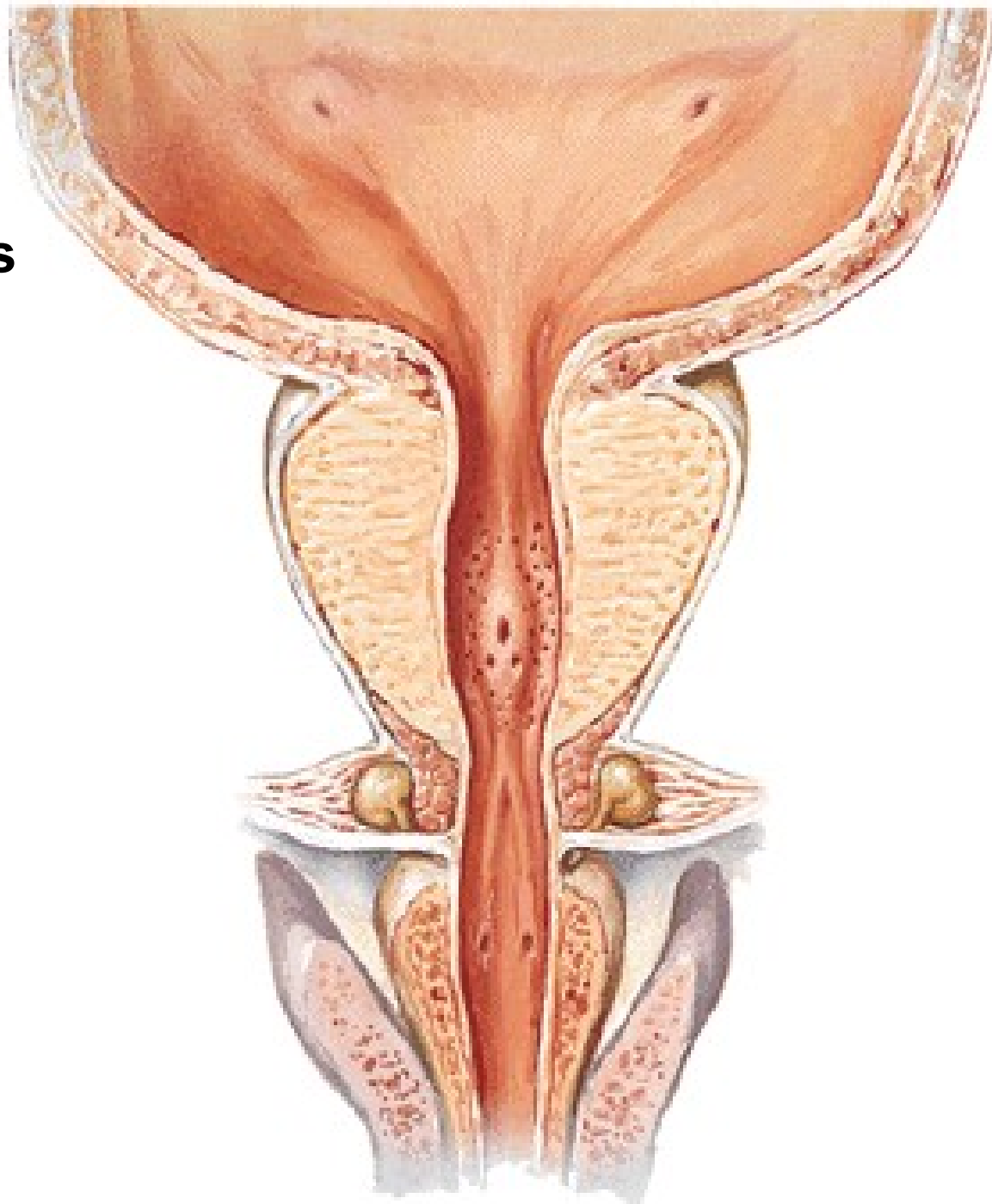
Isthmus



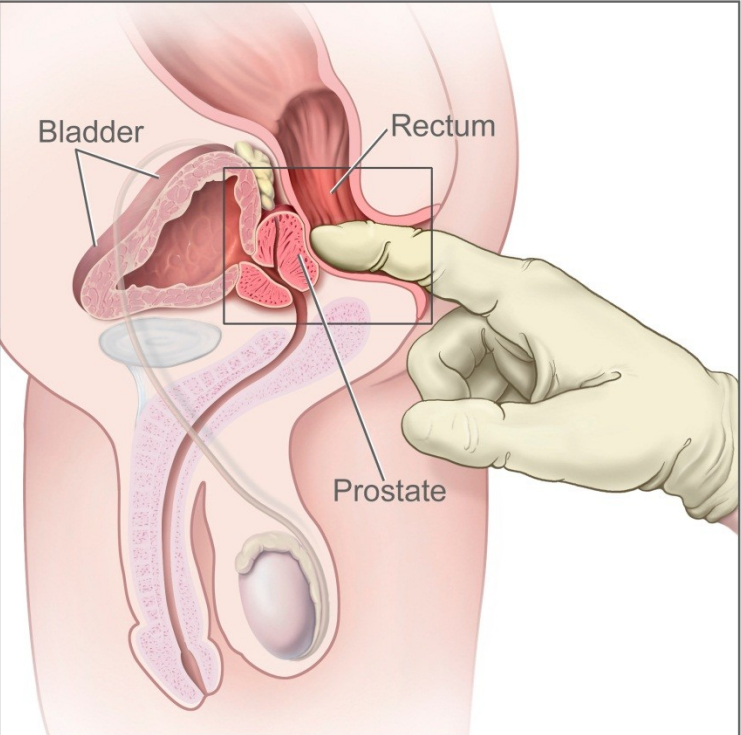
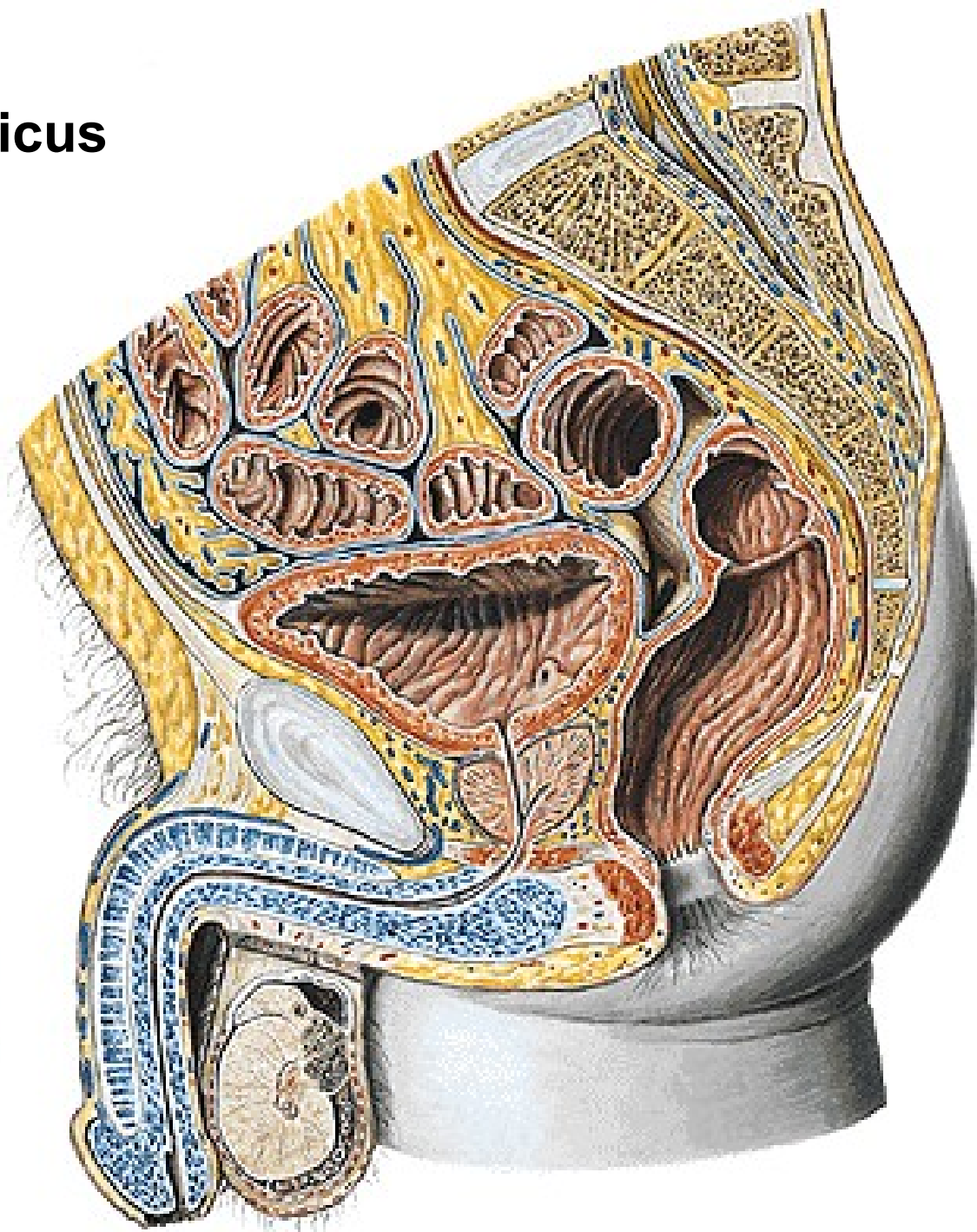
Seminal vesiculography

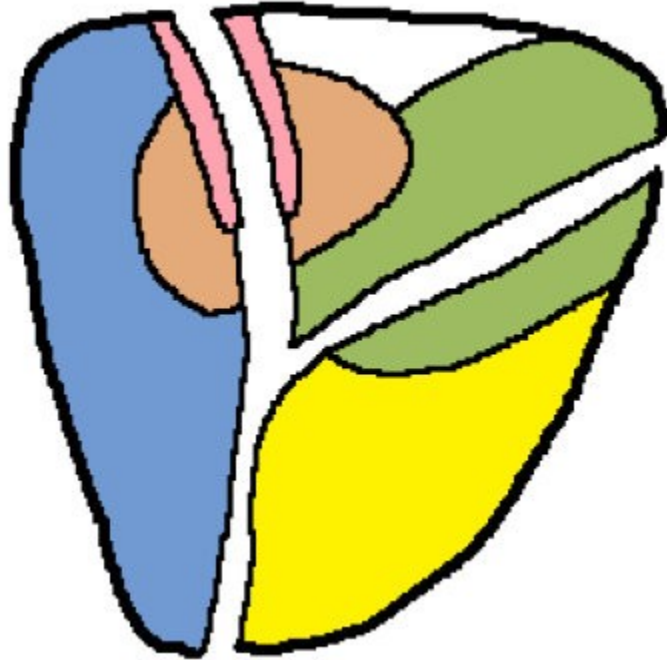


Crista urethralis
Colliculus seminalis
Utriculus prostaticus
Ductus ejaculatorii
Sinus prostatici

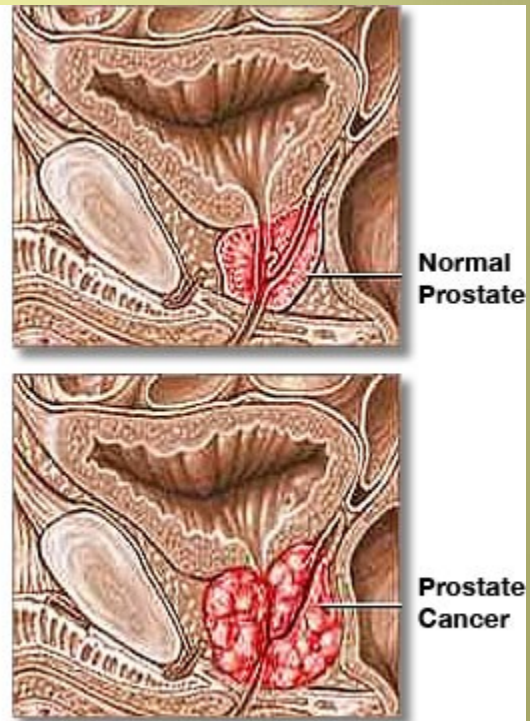
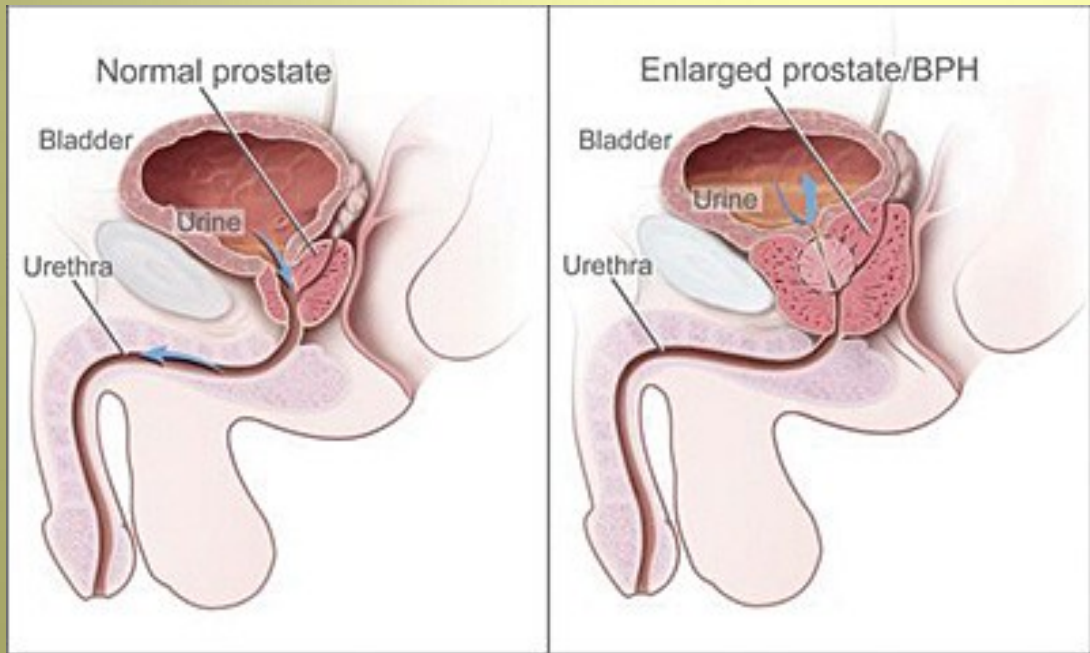


Capsula propria
Plexus venosus prostaticus
Fascia periprostatica
Lig. puboprostaticum
Lig. sacrogenitale
Septum rectovesicale
(Denonvilliers' fascia)





- 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

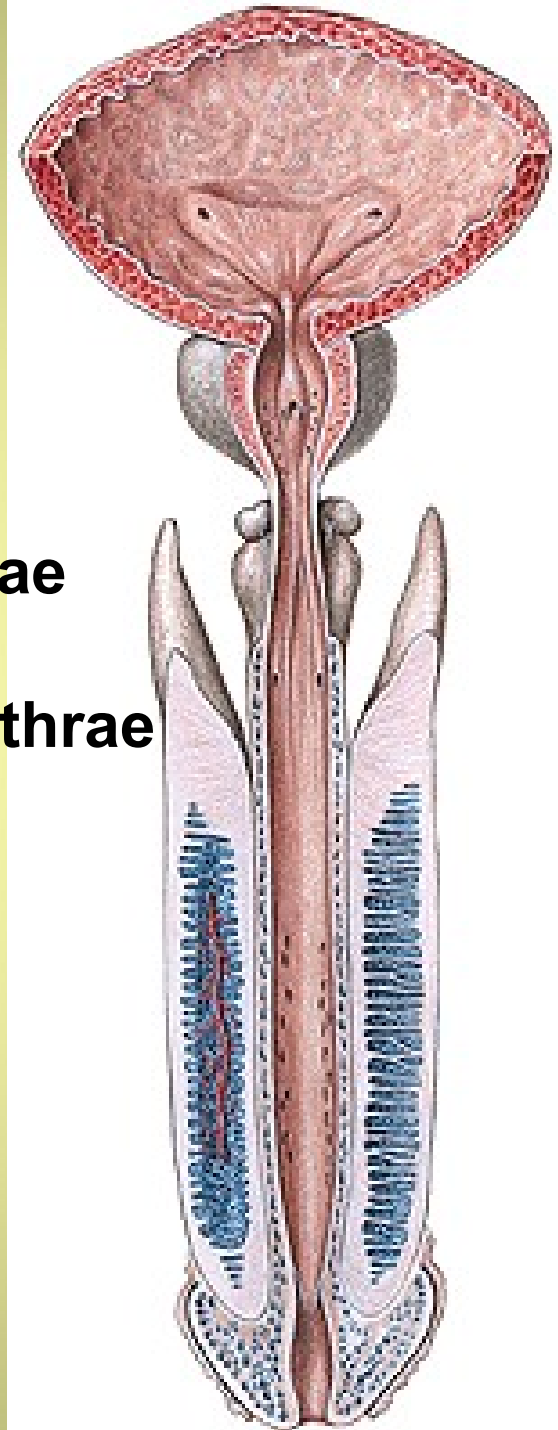
Corpus spongiosum penis

Fossa navicularis

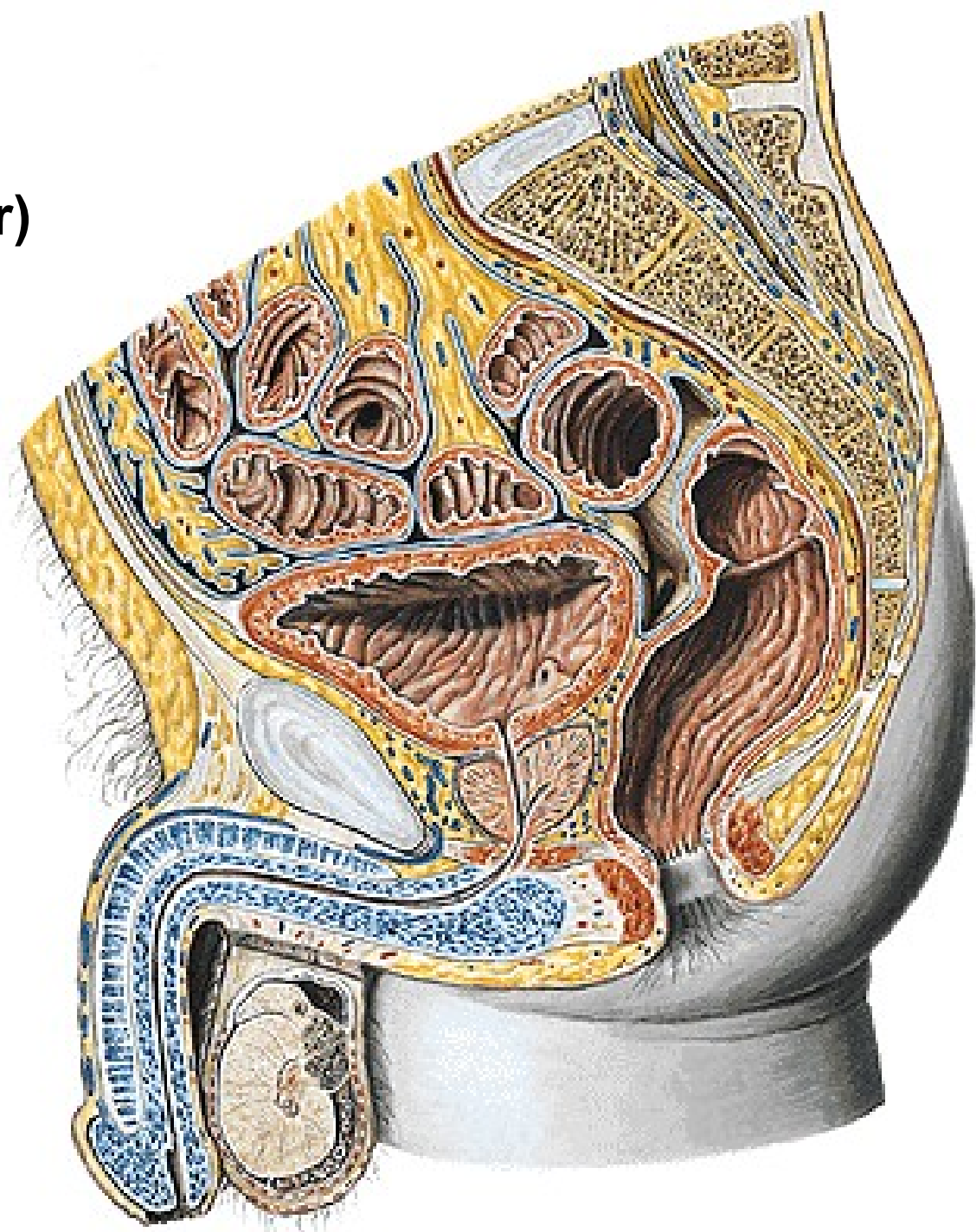
Valvula fossae navicularis

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

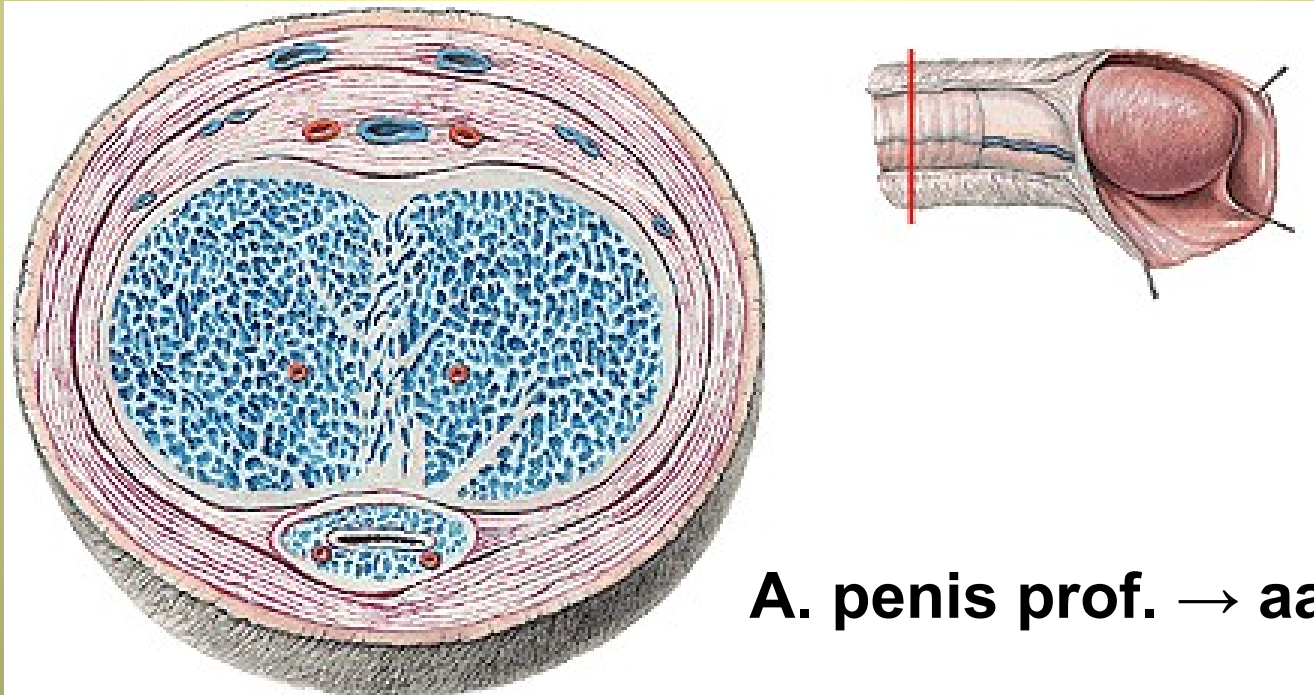
Corpus cavernosum

Corpus spongiosum

Tunica albuginea

Trabeculae

Cavernae



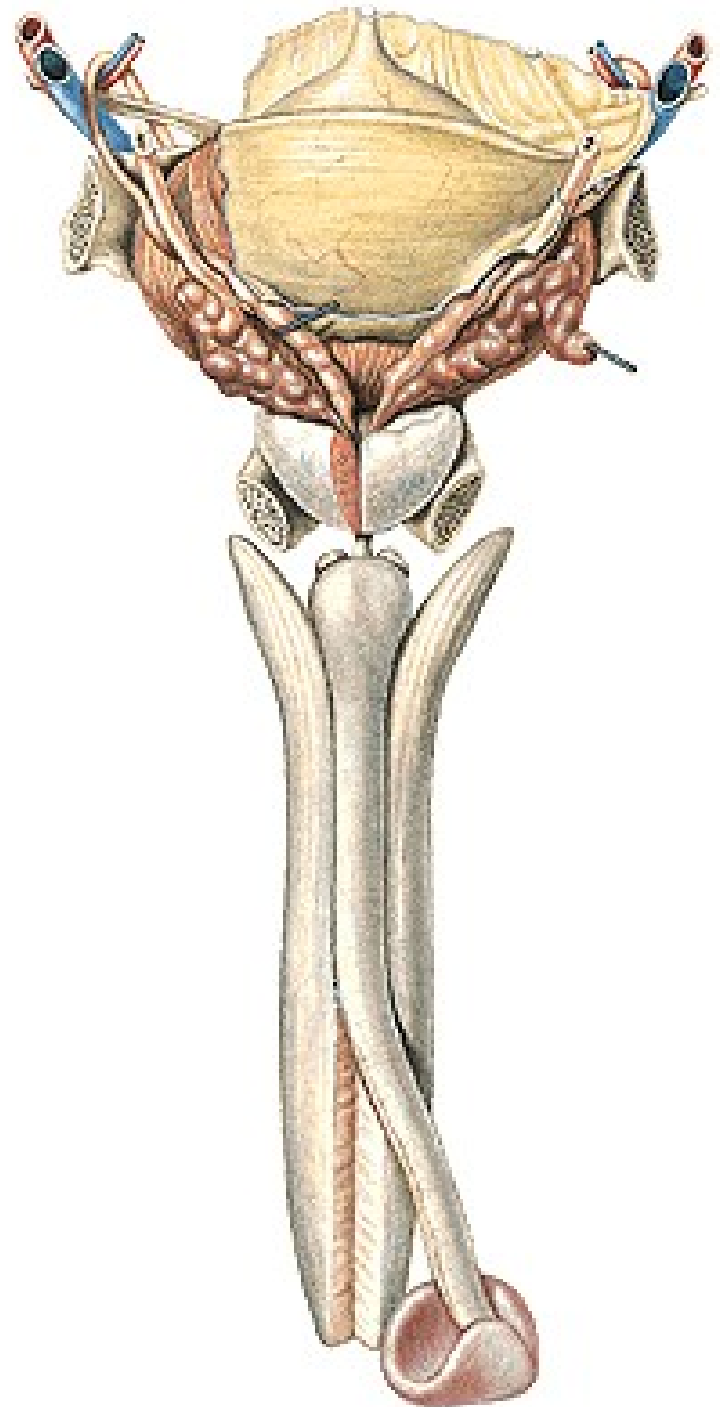
A. penis prof. → aa. helicinae

Corpus cavernosum

- crura penis - crista phallica
- ### **A. profunda penis**

Corpus spongiosum

- bulbus penis
- glans penis



COVERINGS OF PENIS:

Fascia penis profunda

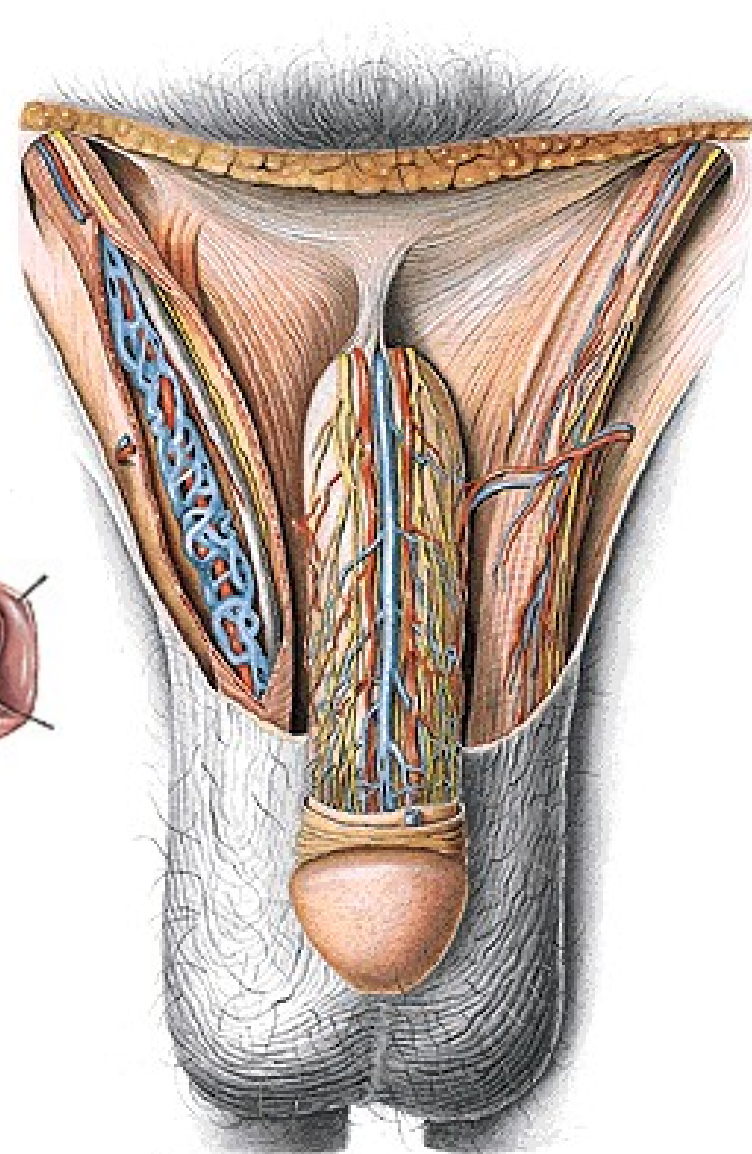
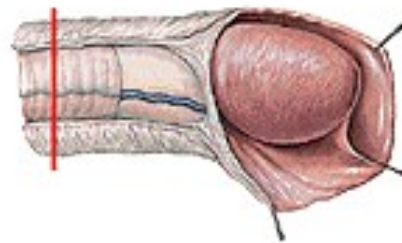
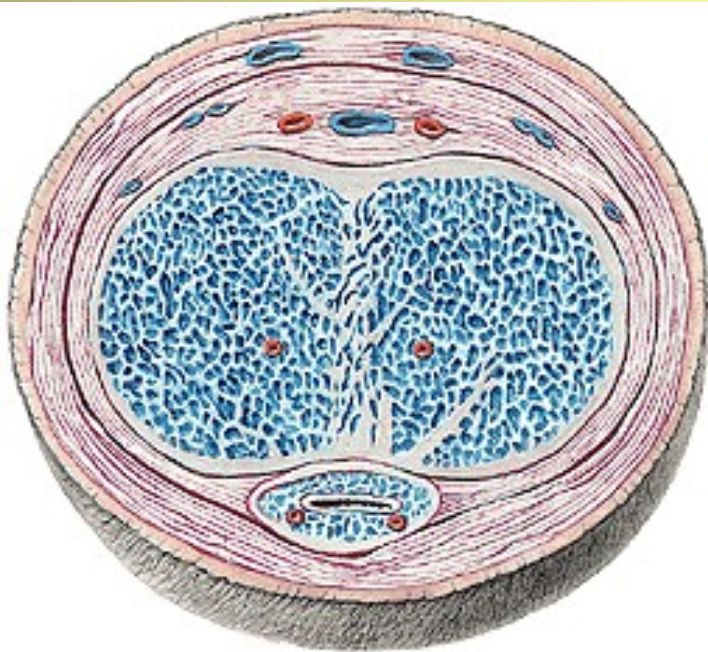
(Aa., Nn. dorsales penis, V. dorsalis penis profunda)

Fascia penis superficialis

(Vv. dorsales penis spf.)

Lig. fundiforme penis

Lig suspensorium penis



SCROTUM

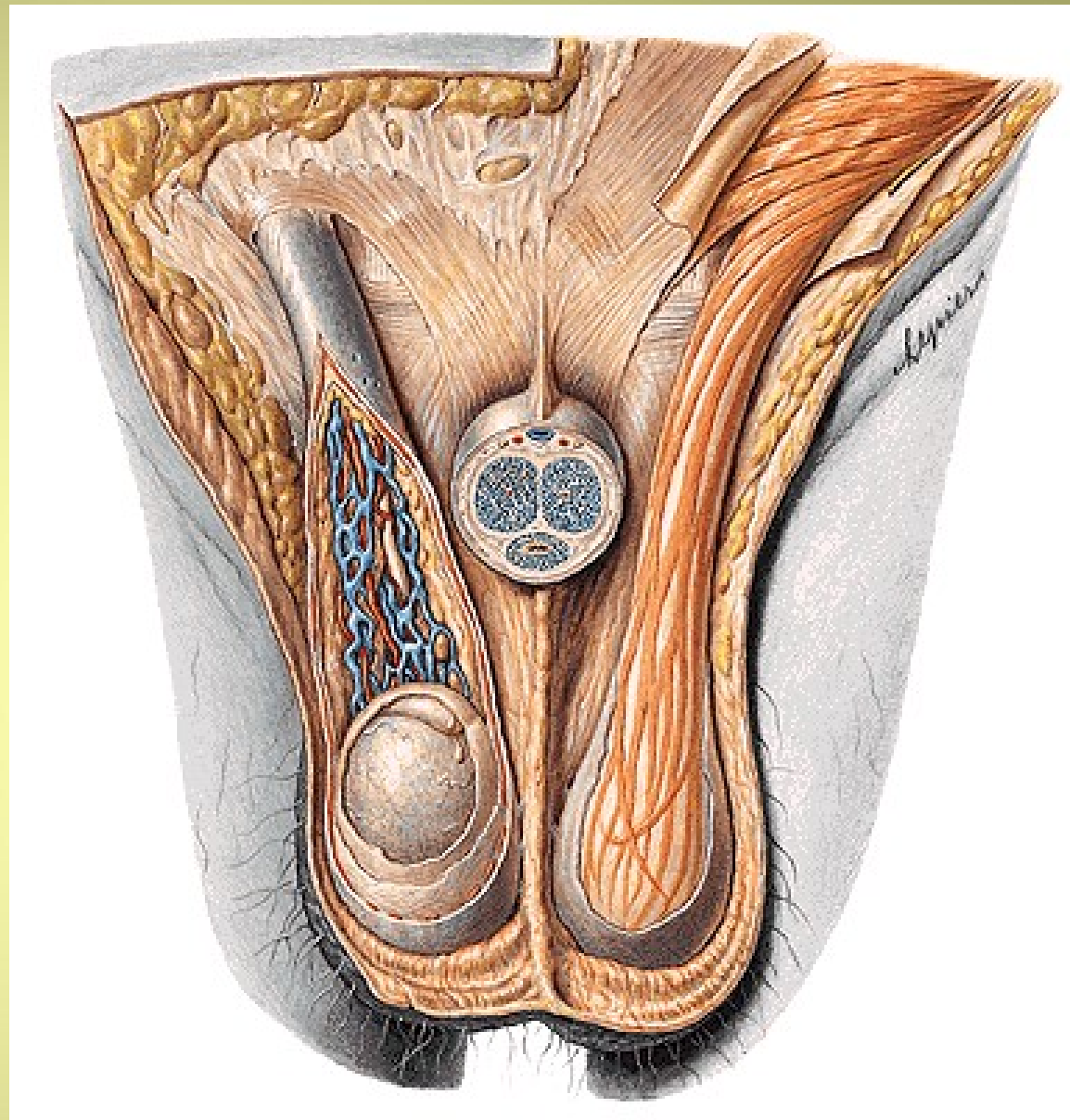
Raphe scroti

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 bulbospongious and ischiocavernous muscles → erection**

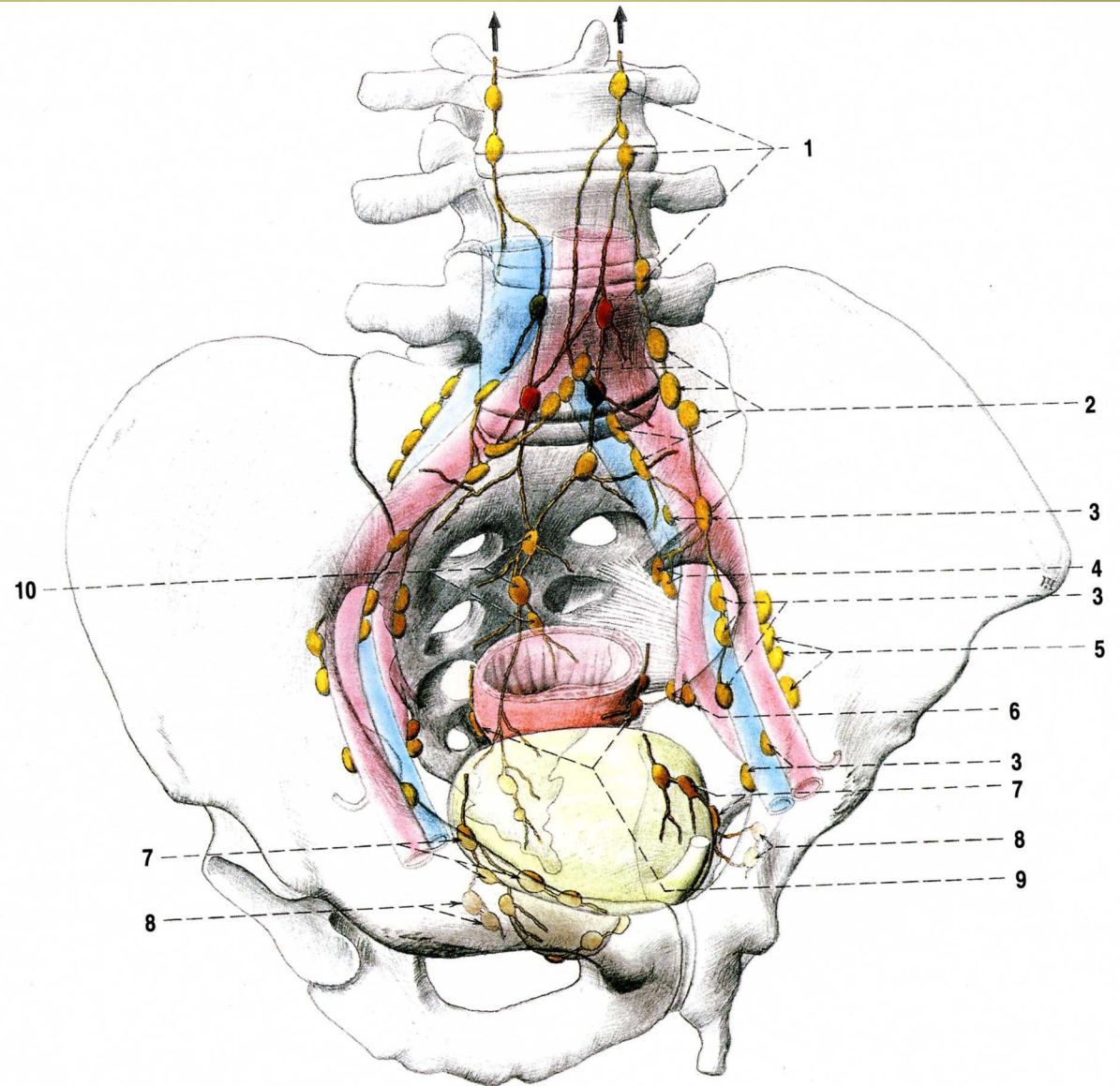
Sympathetic stimulation

- contraction of smooth muscle of aa. helicinae, relaxation of bulbospongious and ischiocavernous 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



Obr. 139. NODI SACRALES A MÍZNÍ UZLINY PÁNEVNÍCH
ORGÁNŮ MUŽE
1 nodi lumbales
2 nodi iliaci communes
3 nodi iliaci interni
4 nodi glutaeci superiores

5 nodi iliaci externi
6 nodi glutaeci inferiores
7 nodi paravesciales
8 nodi obturatorii
9 nodi pararectales
10 nodi sacrales

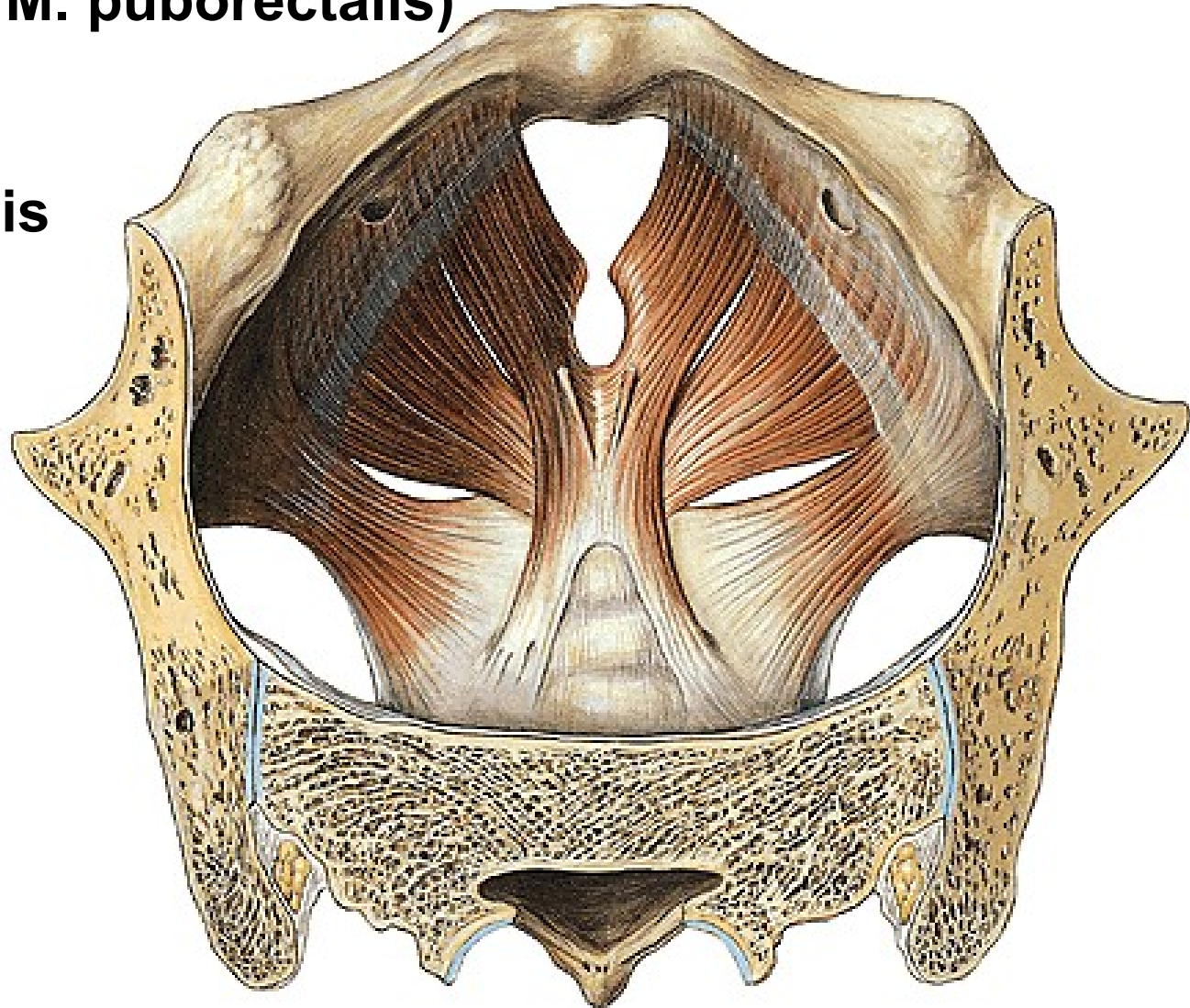
PELVIC FLOOR

DIAPHRAGMA PELVIS

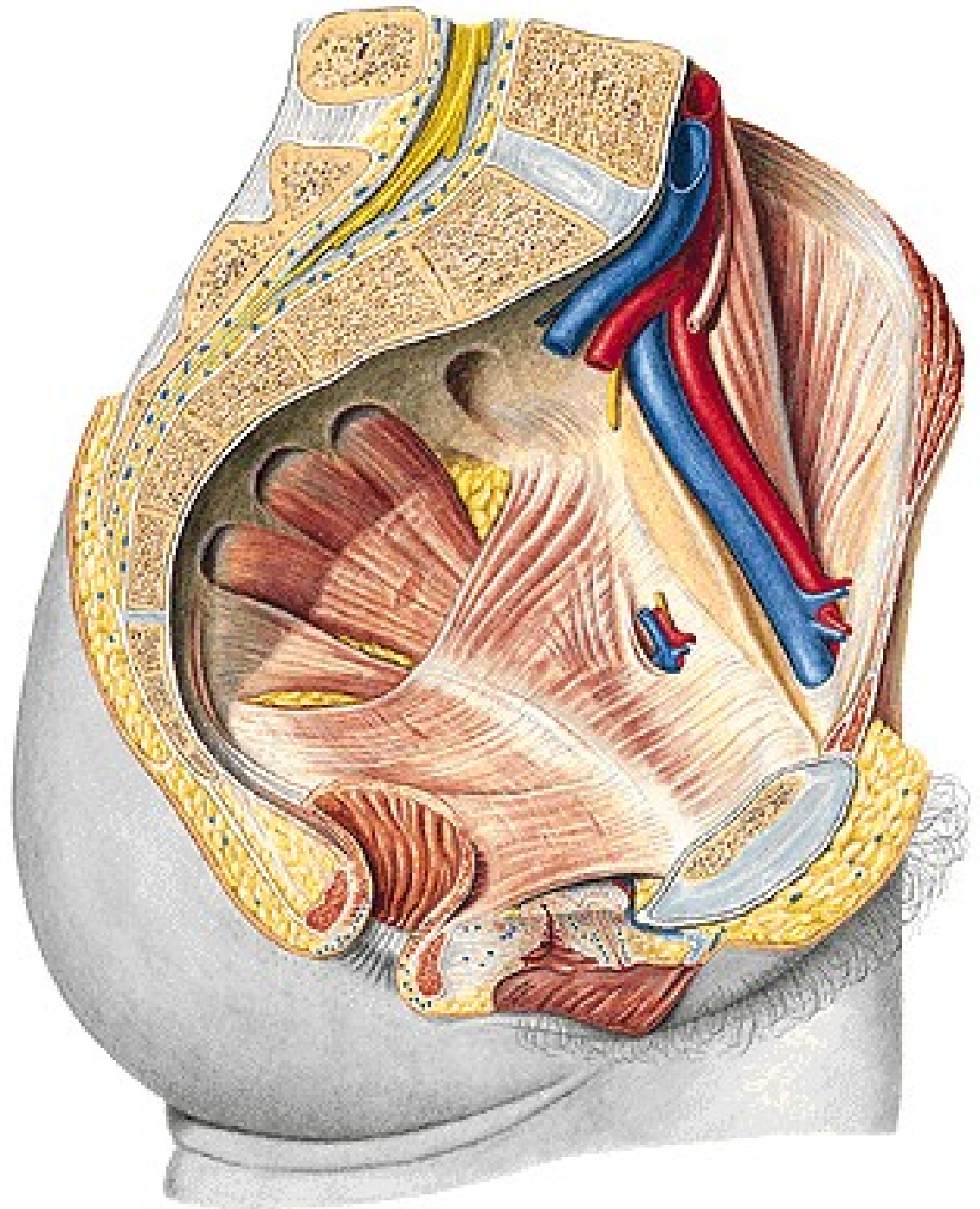
M. levator ani – pars iliaca (M. iliococcygeus)
- pars pubica (M. pubococcygeus)
(- M. puborectalis)

M. coccygeus

Hiatus urogenitalis



**Arcus tendineus m.
levatoris ani**

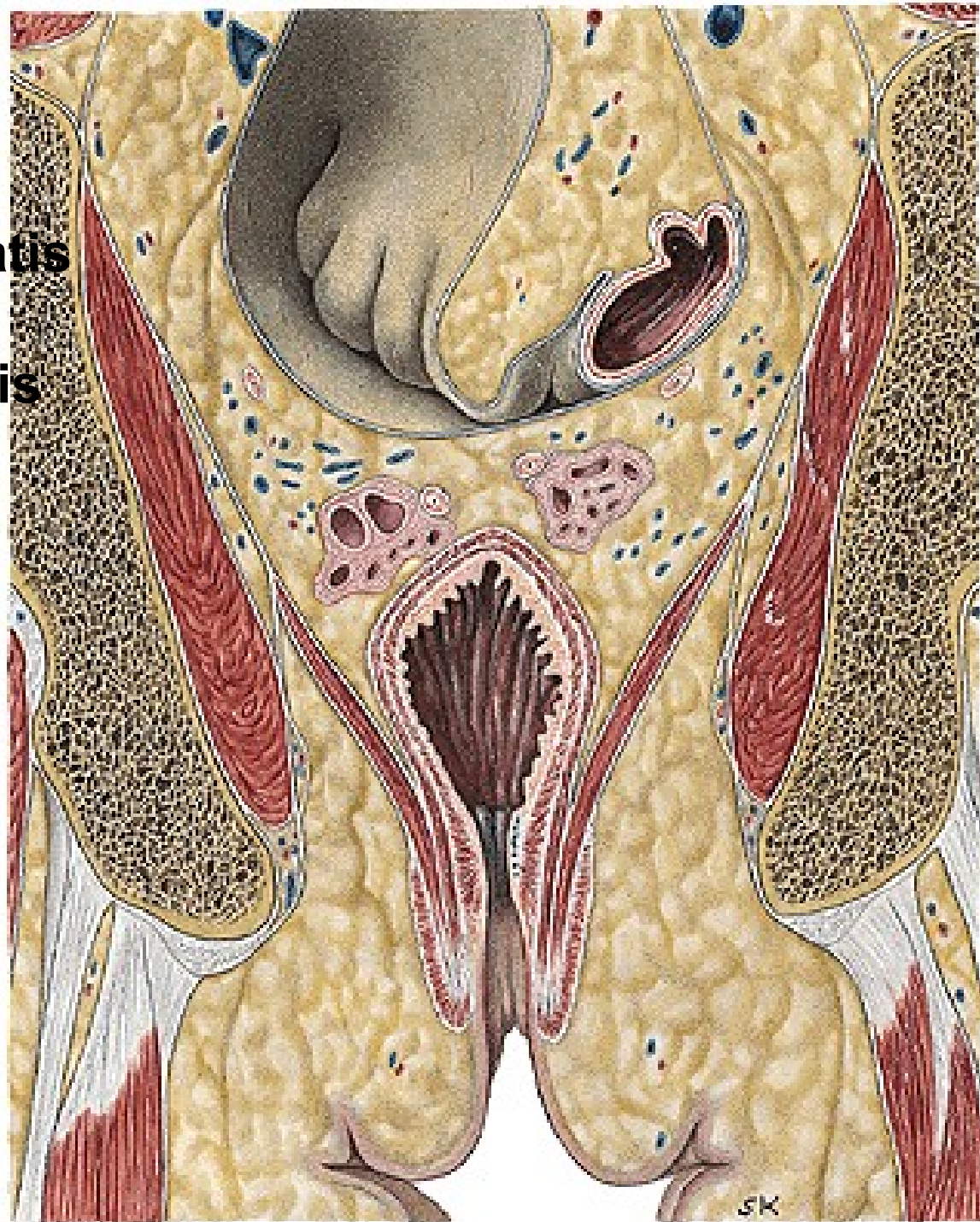


Fascia obturatoria
Canalis pudendalis
(Alcock)

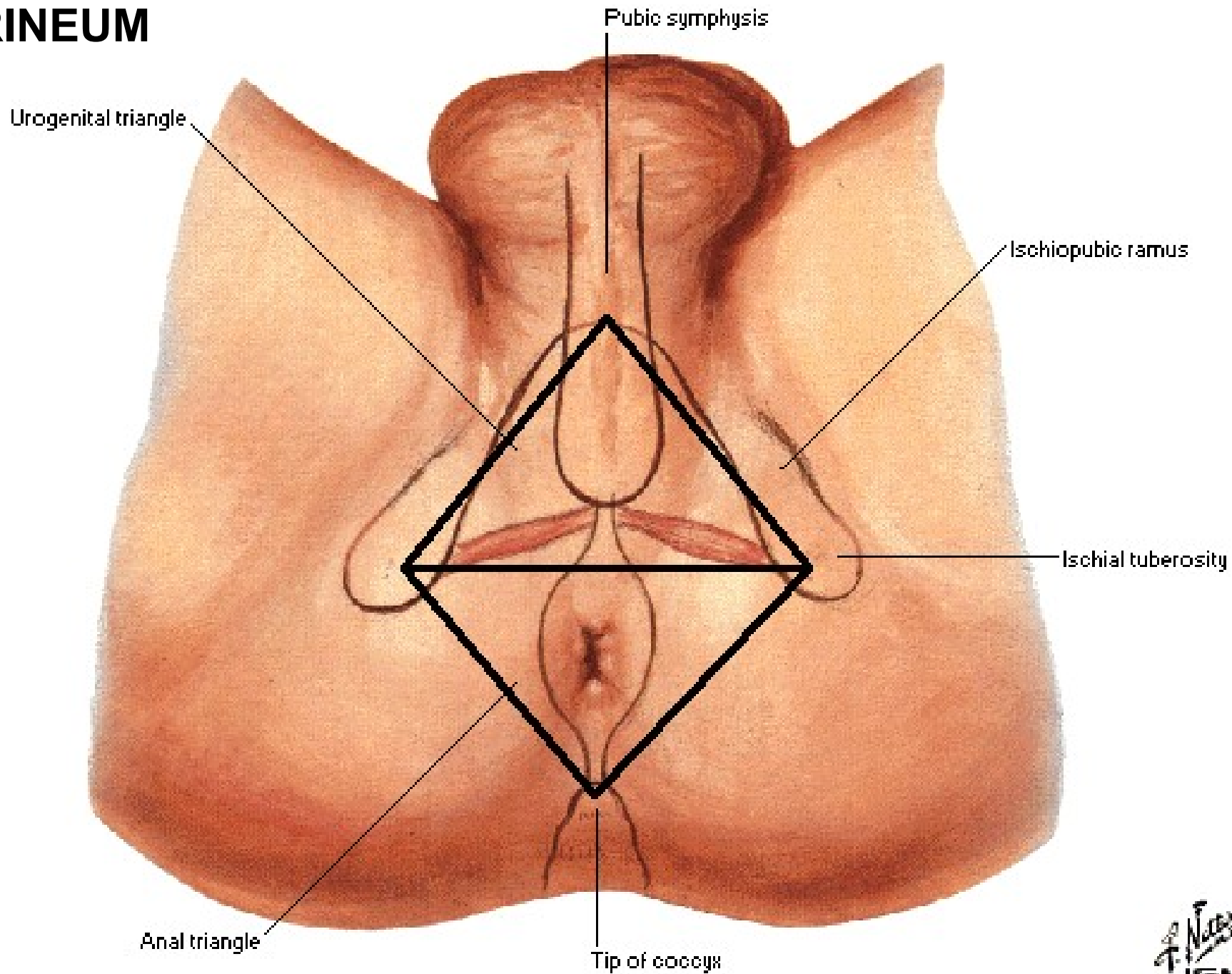
Fascia sup. diaphragmatis
pelvis

Fascia inf. diaphragmatis
pelvis

Fossa ischioanalis/
- rectalis



PERINEUM



Fossa ischioanalis/-rectalis

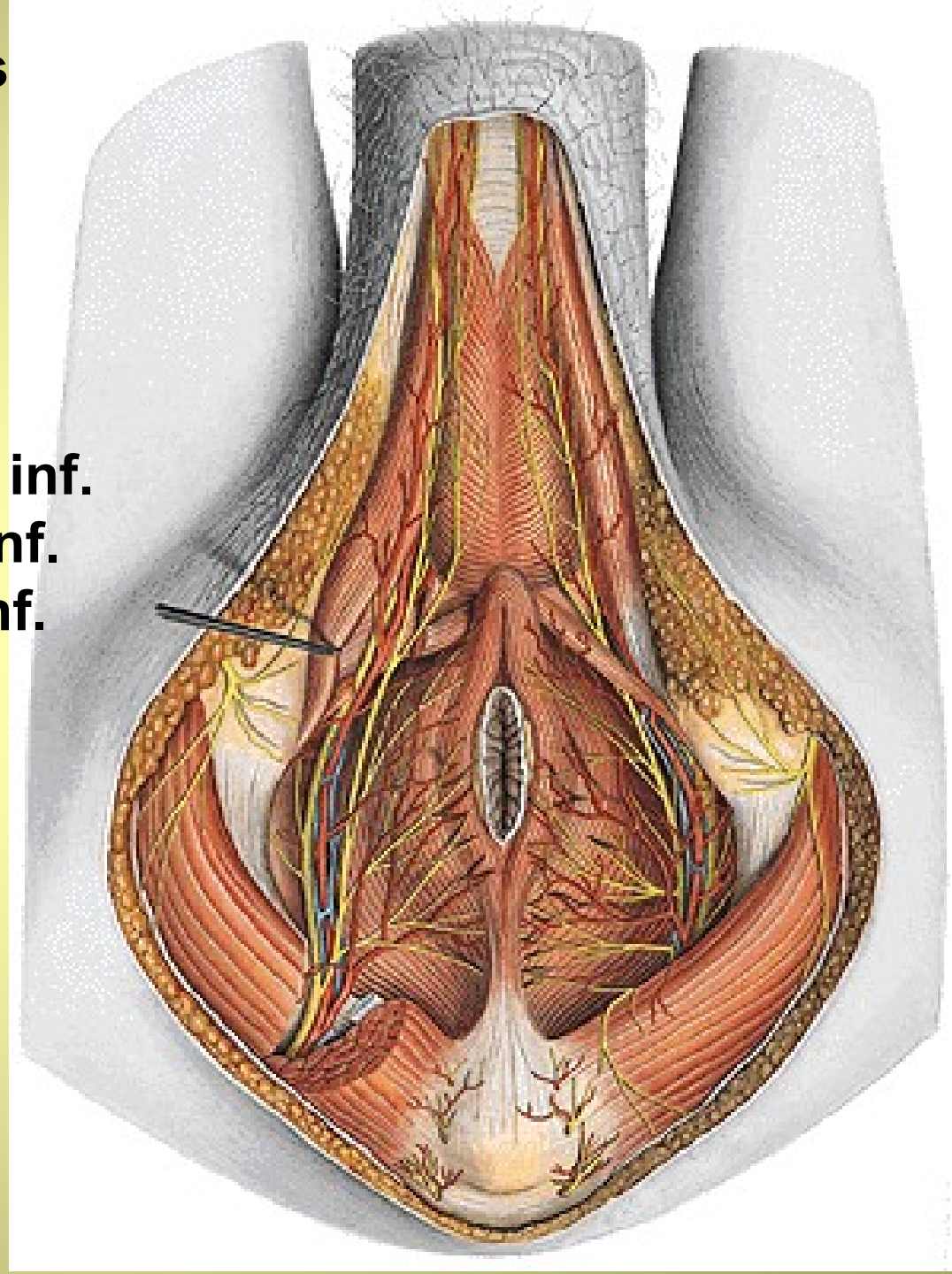
M. sphincter ani externus

Lig. anococcygeum

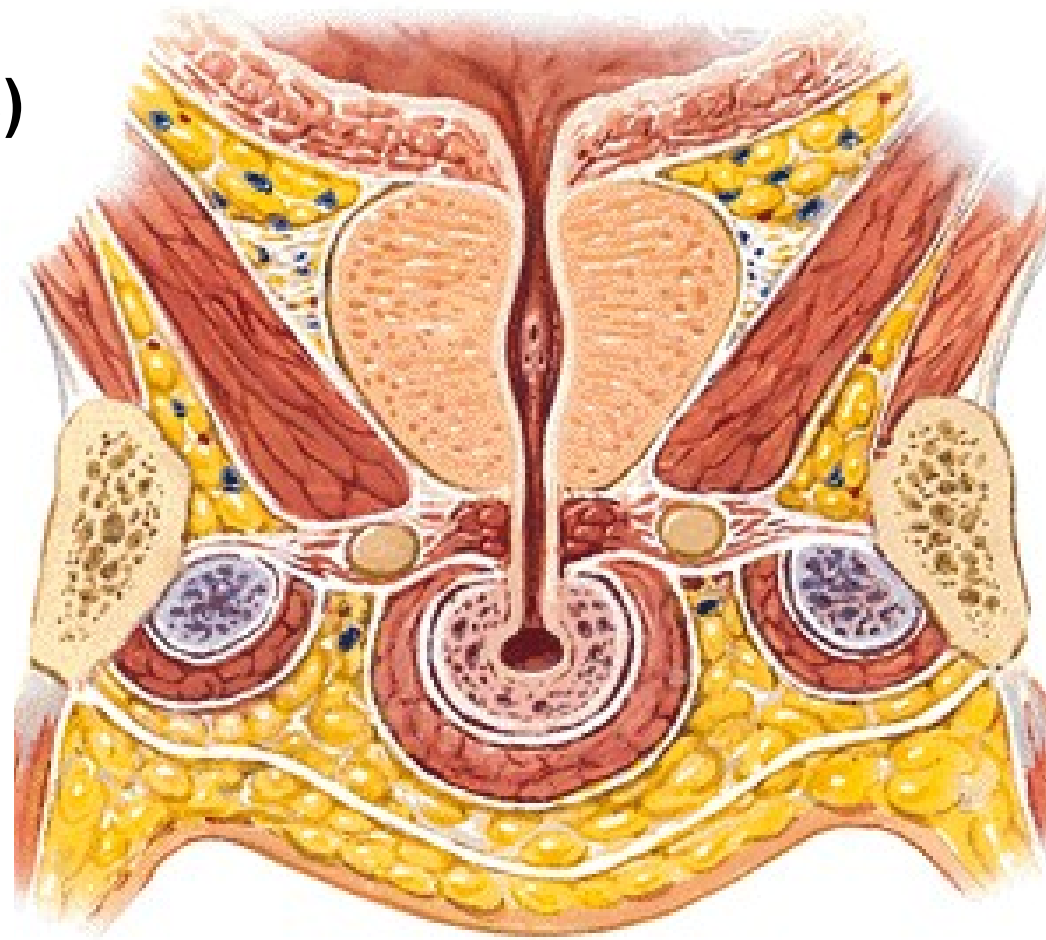
N. pudendus – nn. rectales inf.

A. pudenda int. – aa. rect. inf.

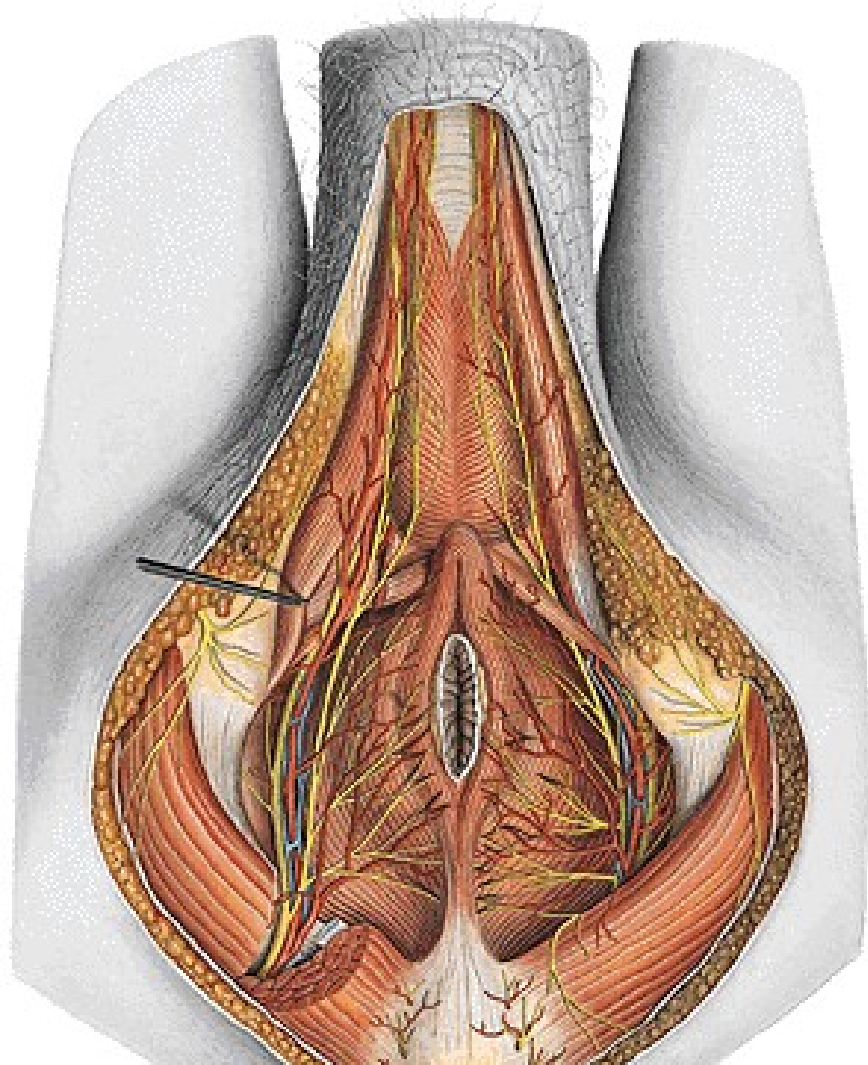
V. pudenda int. – vv. rect. inf.



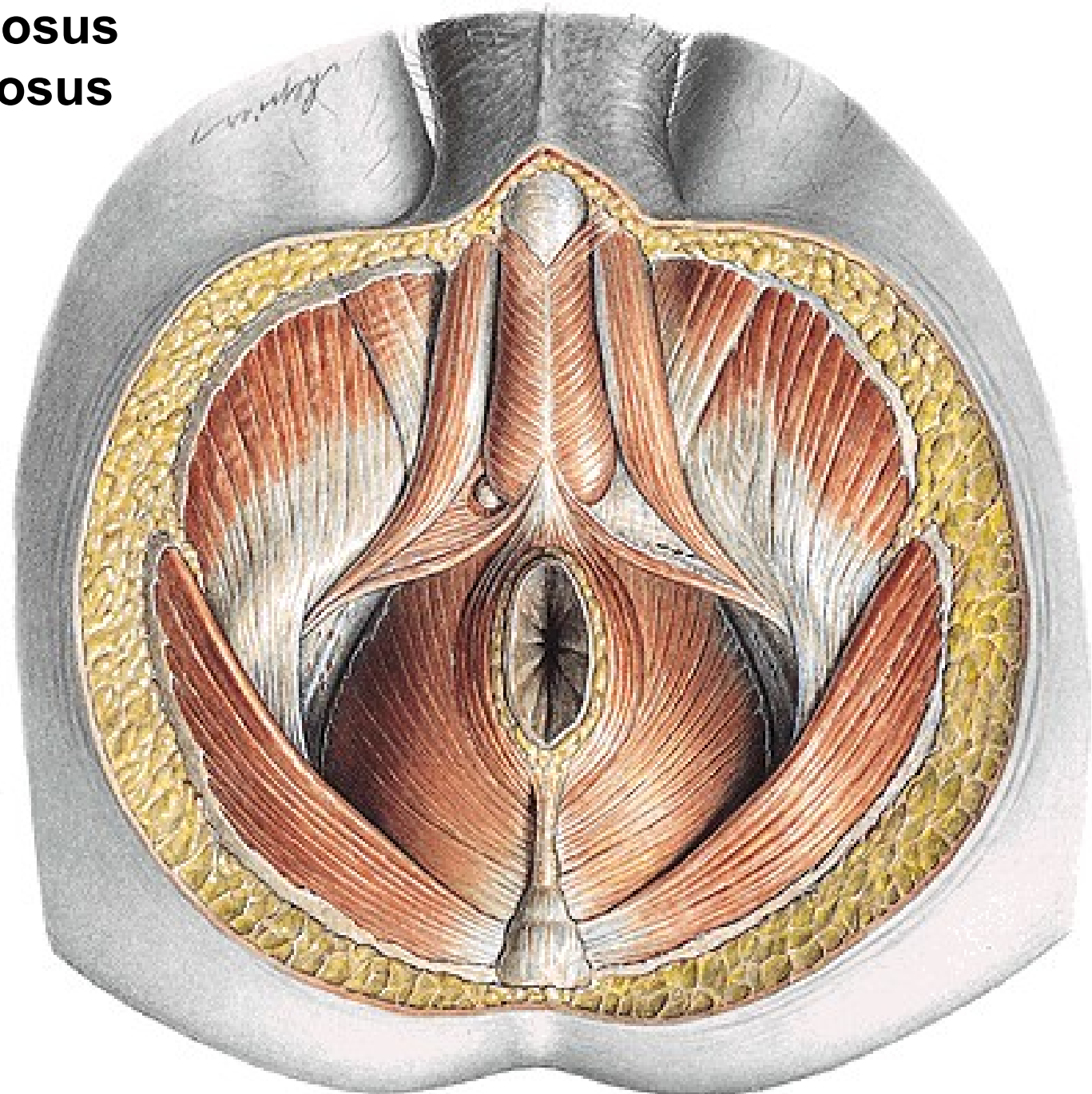
Fascia perinei (superficialis)



Spatium superficiale perinei



M. ischiocavernosus
M. bulbospongiosus



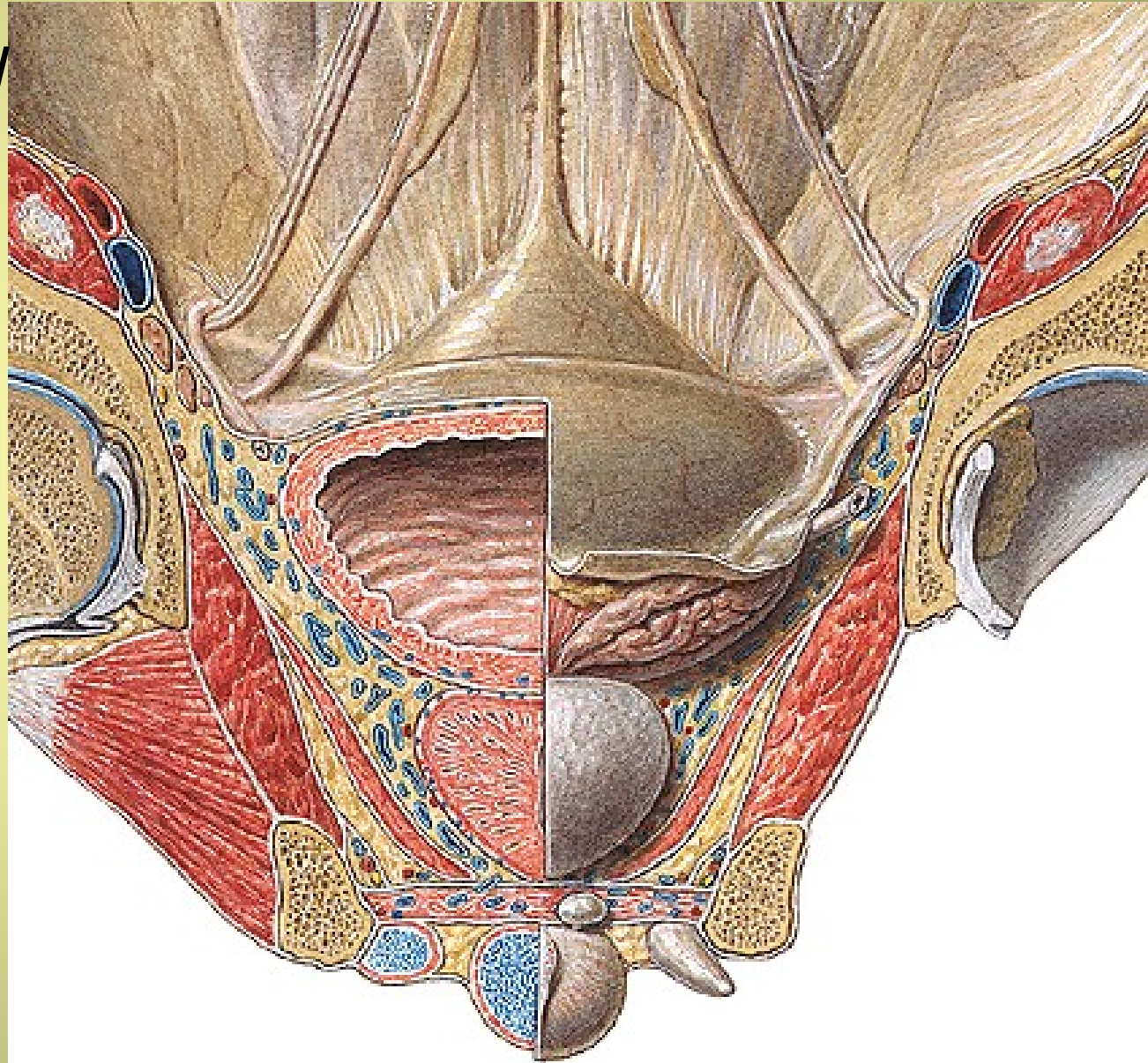
Membrana perinei

Saccus profundus perinei/diaphragma urogenitale

Recessus pubicus

fossae ischioanalis/

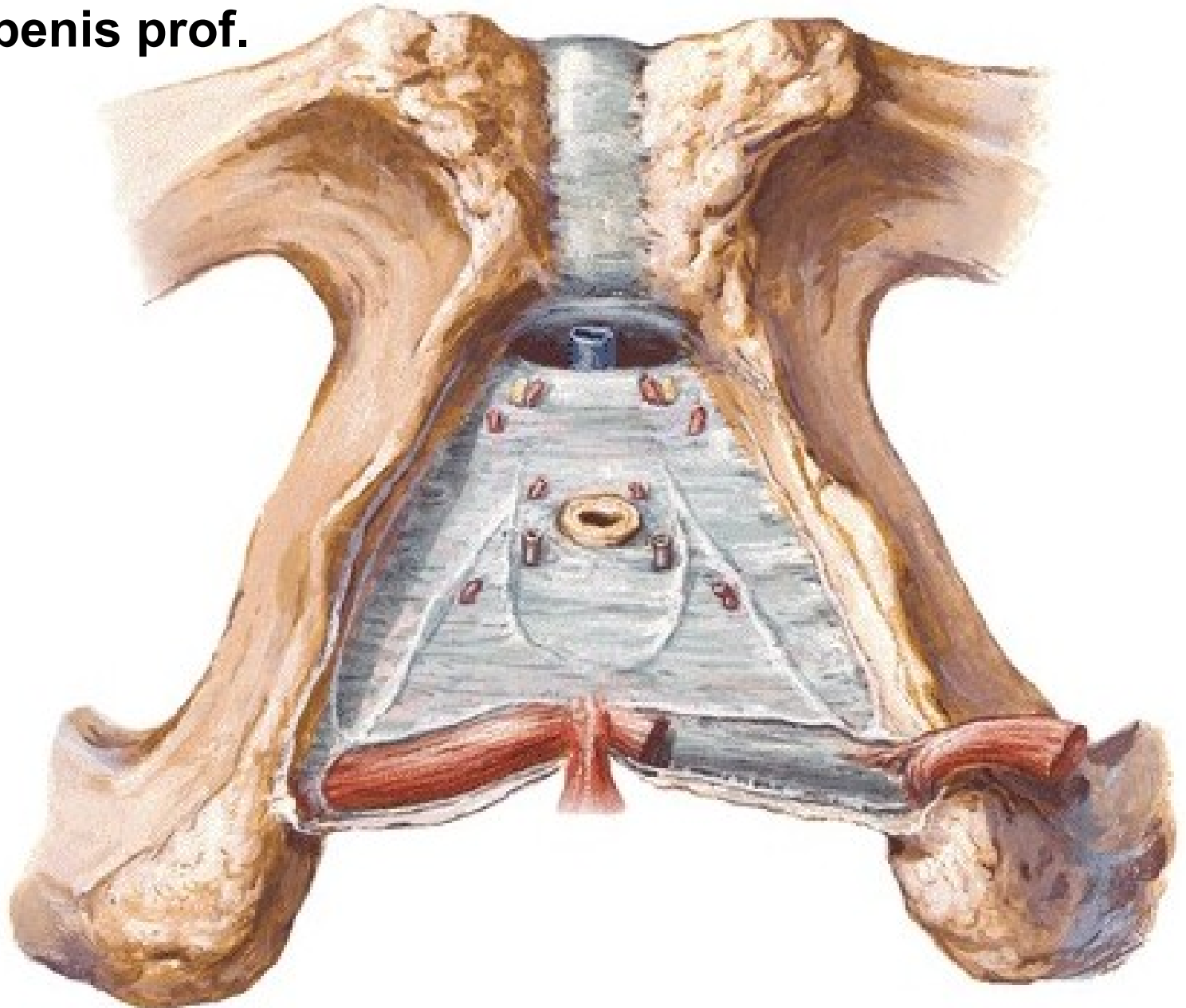
- rectalis



M. transversus perinei spf.

Membrana perinei/Fascia inf. diaphragmatis urogenitalis

V. dorsalis penis prof.



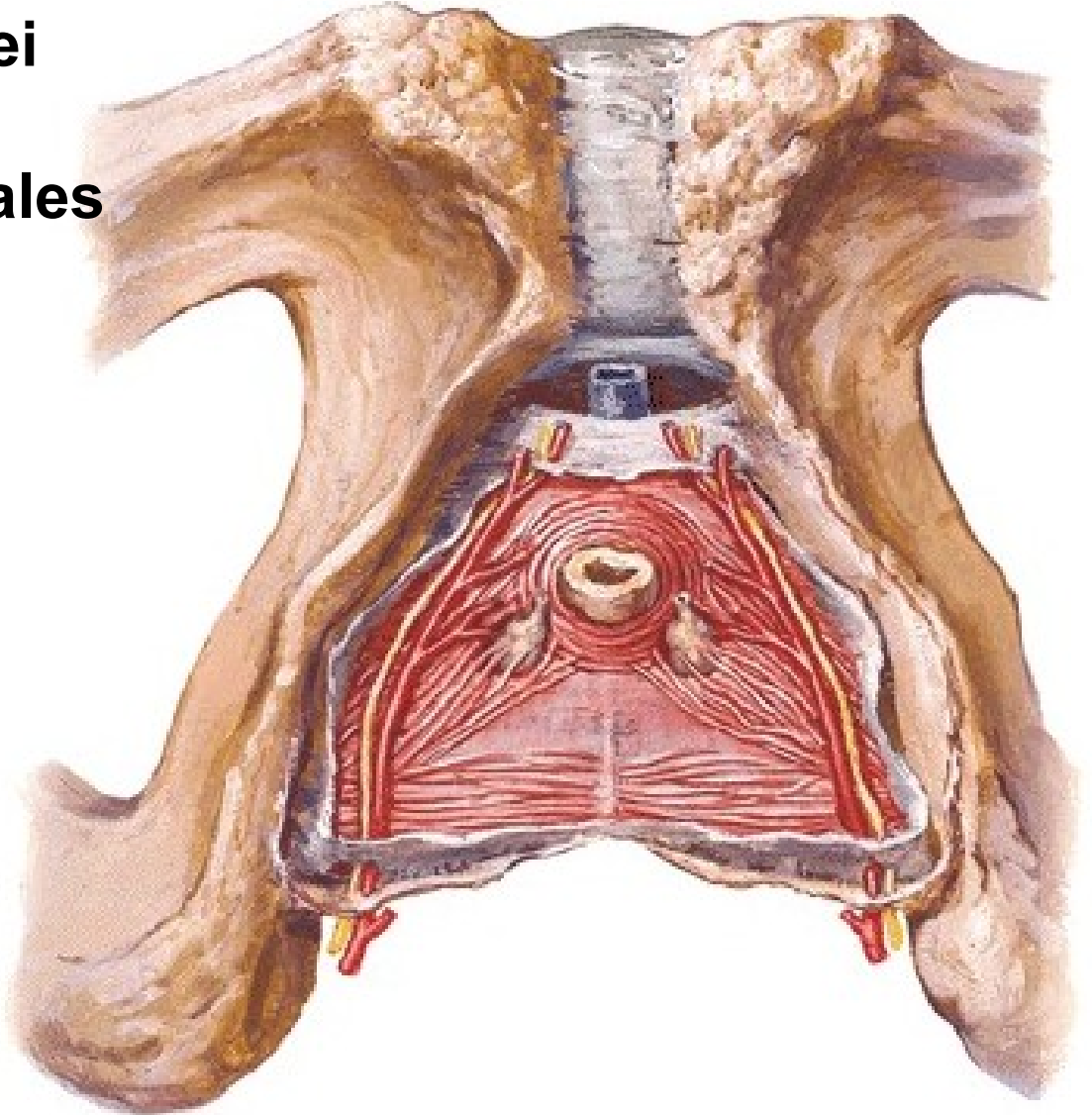
SACCUS PROF. PERINEI

M. transversus perinei profundus – Centrum perineale

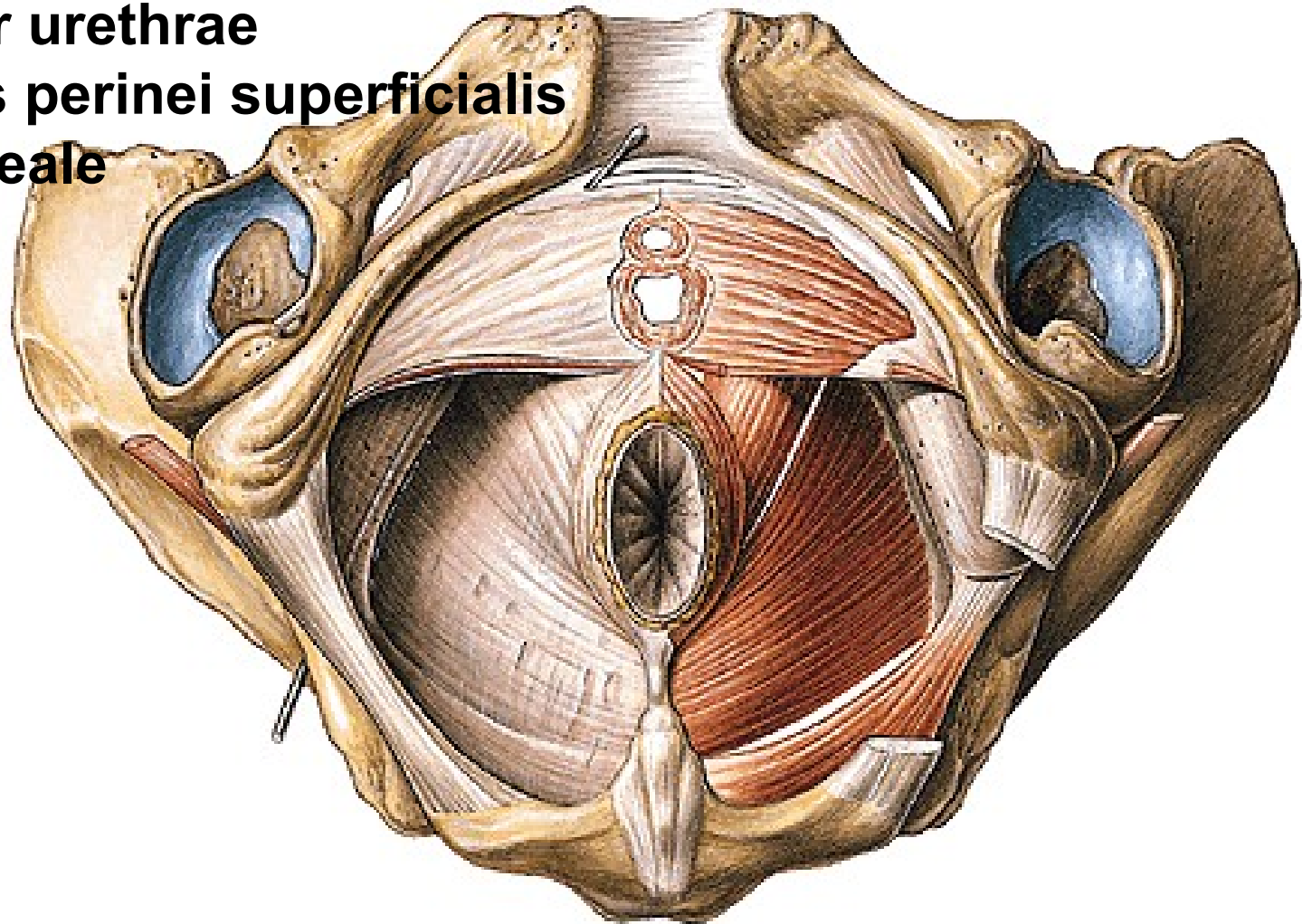
M. sphincter urethrae

Lig. transversum perinei

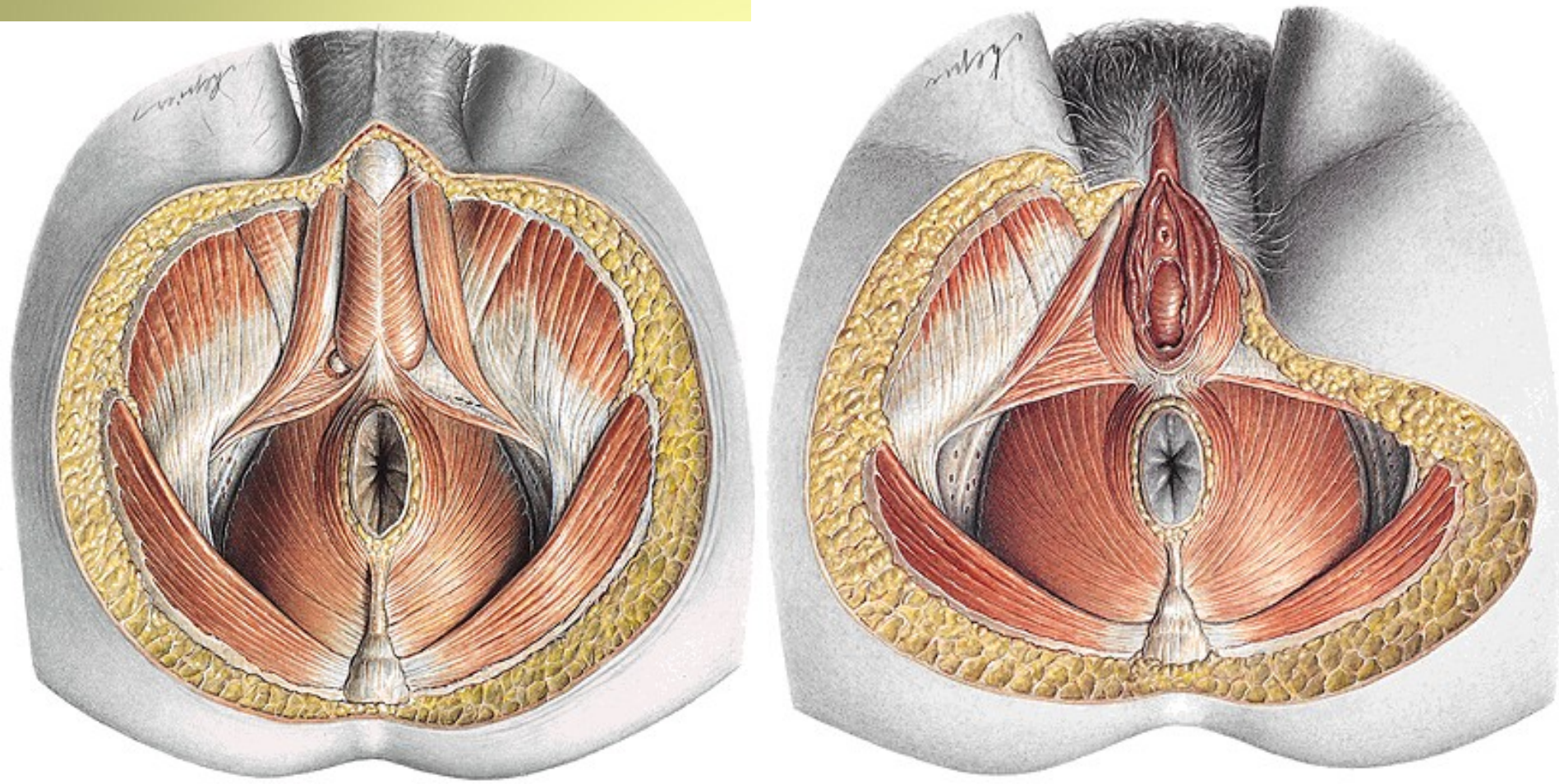
Glandulae bulbourethrales



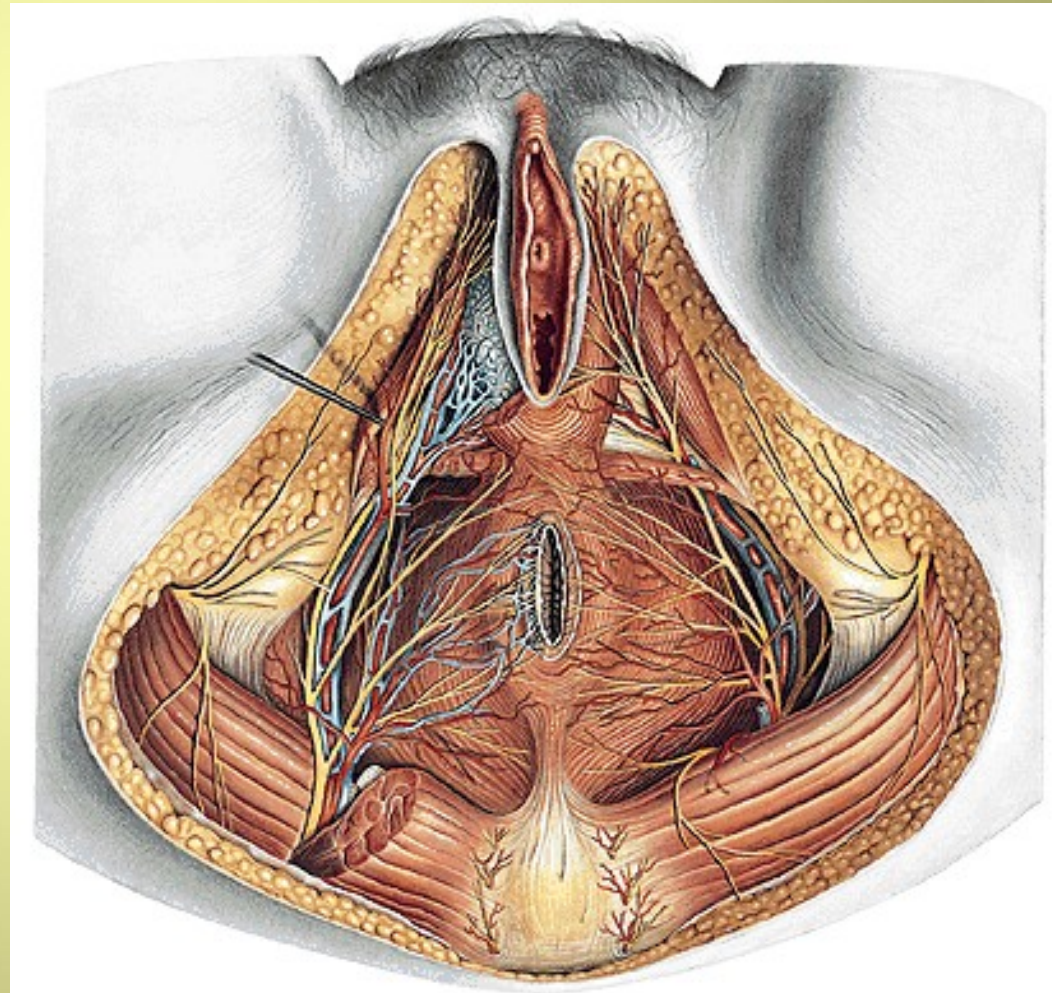
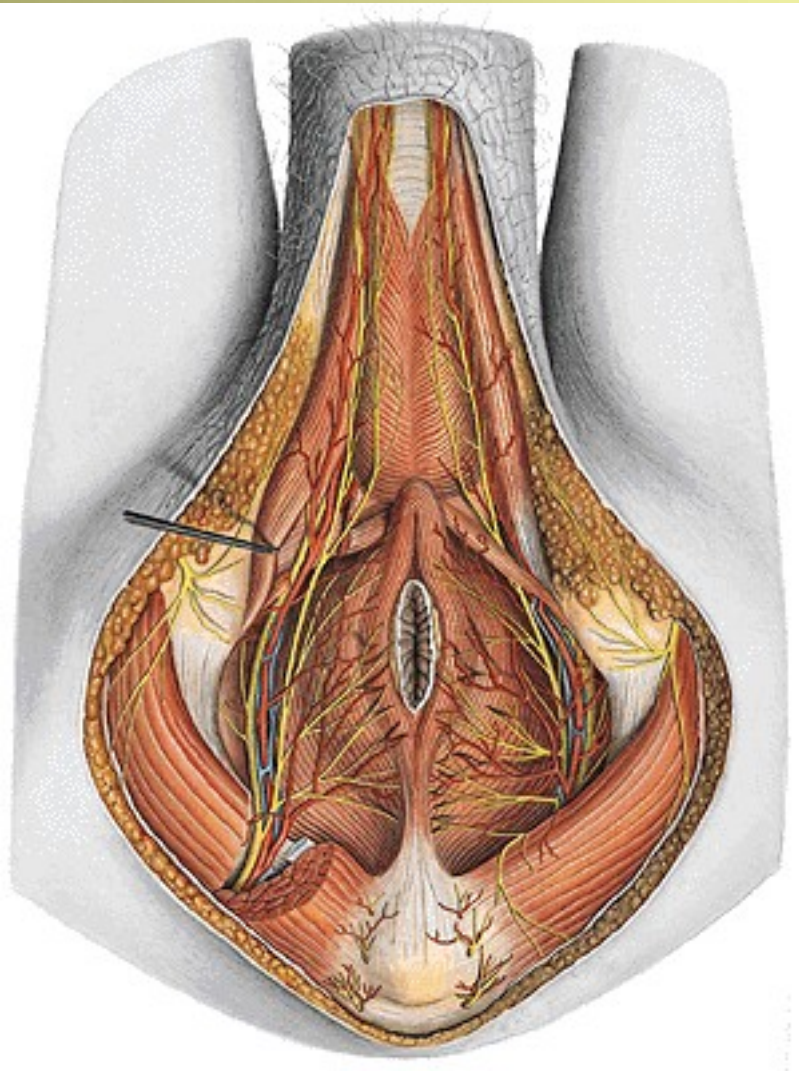
FEMALE SACCUS PROF. PERINEI
(M. transversus perinei profundus)
Lig. transversum perinei
M. sphincter urethrae externus
(M. sphincter urethrovaginalis)
M. compressor urethrae
M. transversus perinei superficialis
Centrum perineale



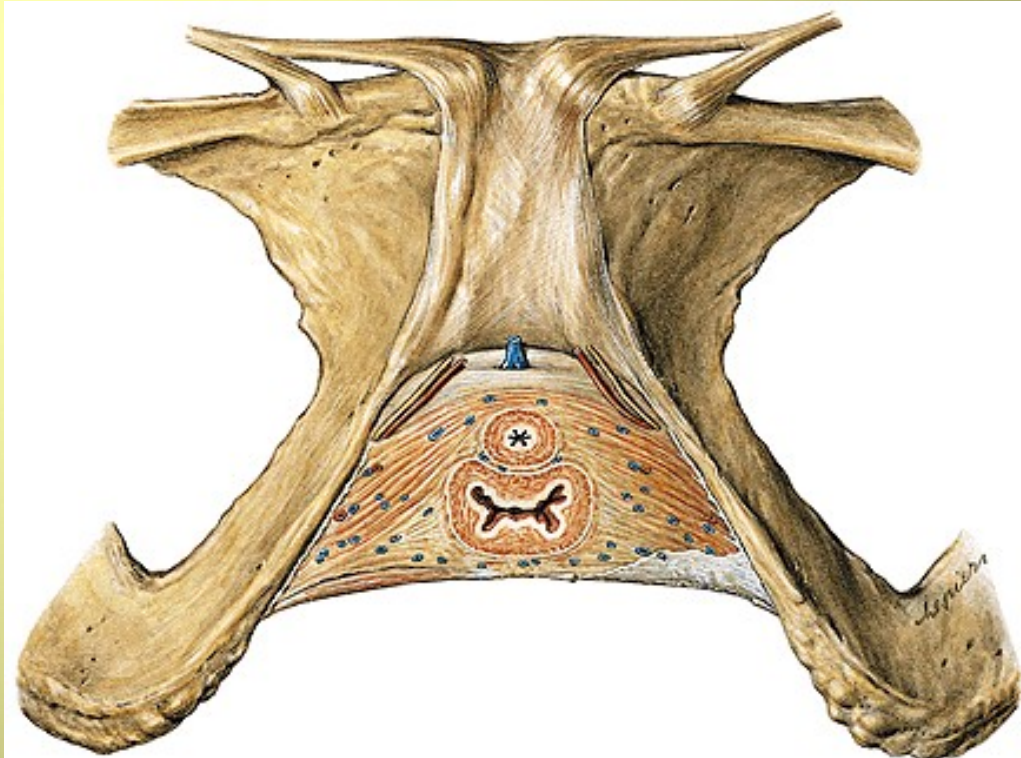
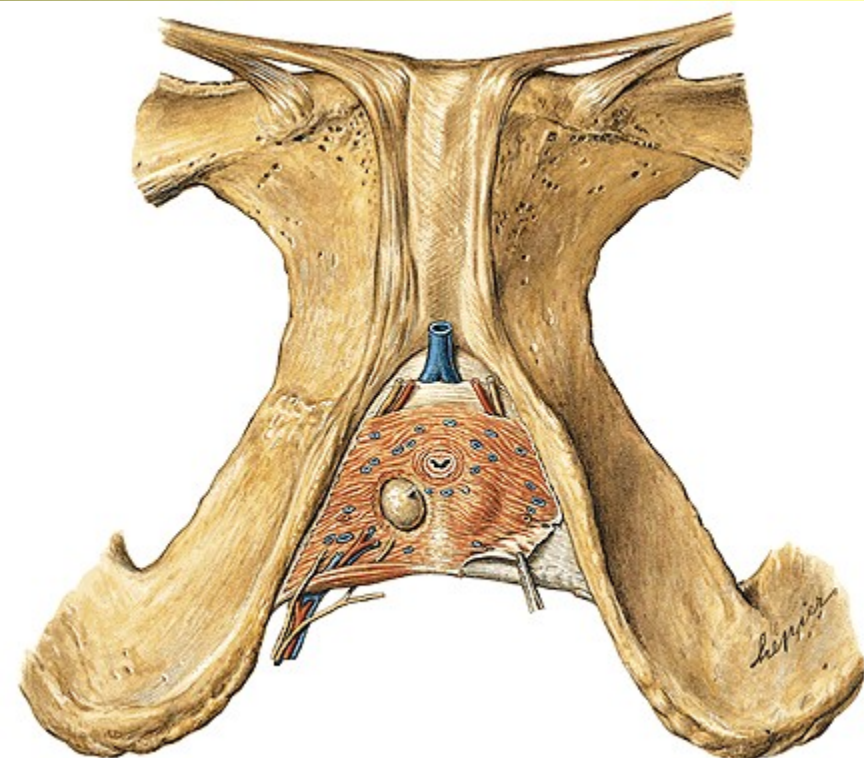
M. ischiocavernosus
M. bulbospongiosus (M. constrictor cunni)
M. sphincter ani externus
Lig. anococcygeum



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

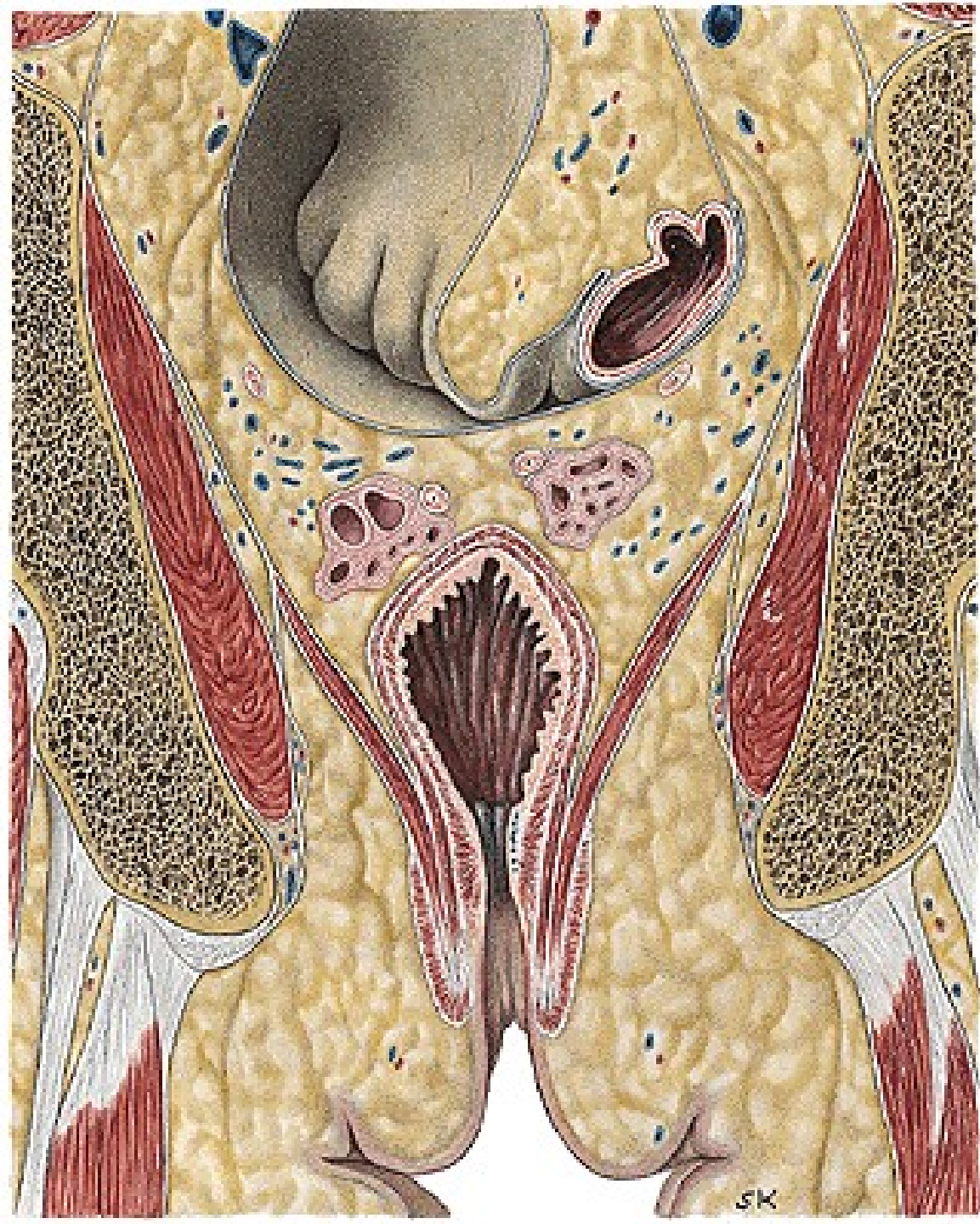


A. dorsalis penis (clitoridis)
N. dorsalis penis (clitoridis)
V. dorsalis penis (clitoridis) profunda
A.,v. et n. perinealis
Gl. bulbourethralis



**Fascia sup.
diaphragmatis
pelvis
Arcus tendineus
fasciae pelvis**

**Fascia inf.
diaphragmatis
pelvis**



Illustrations were copied from:

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

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

**Šihák R: Anatomie 2 (Splanchnologia). Avicenum,
Lékařská a dravotnické nakladatelství, Praha, 1988.**