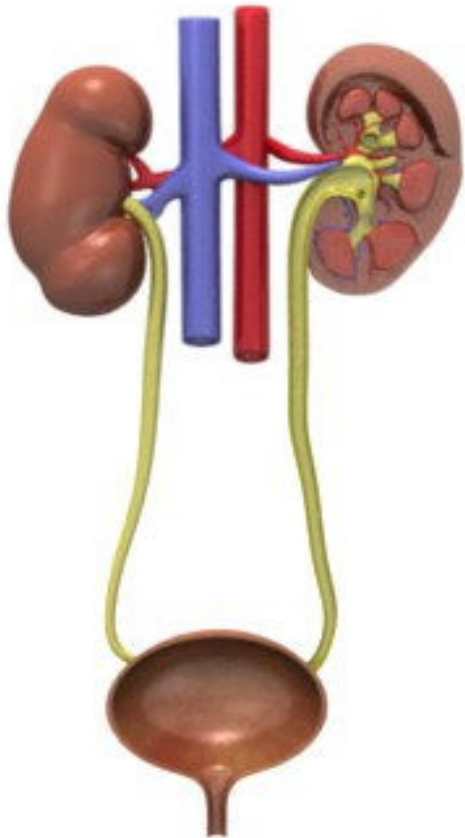


# MOČOVÝ SYSTÉM



- **Ledvina**
- **Vývodní cesty**
  - kalichy
  - pánvička
  - močovod
  - močový mechýř
  - močová trubice

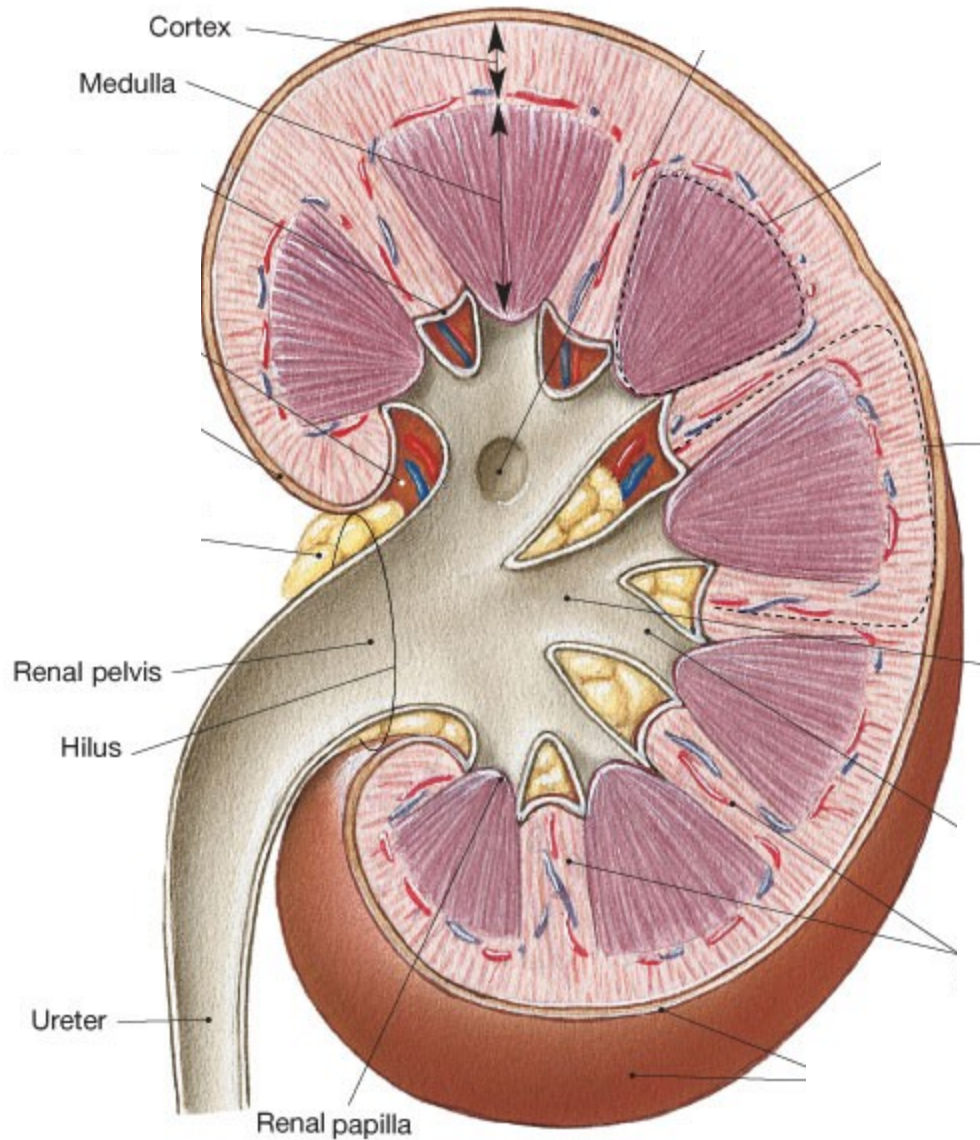
# Ledvina (ren, nephros)

## Kůra:

- „čistá“ kůra
- žíhaná kůra
- sloupce korové

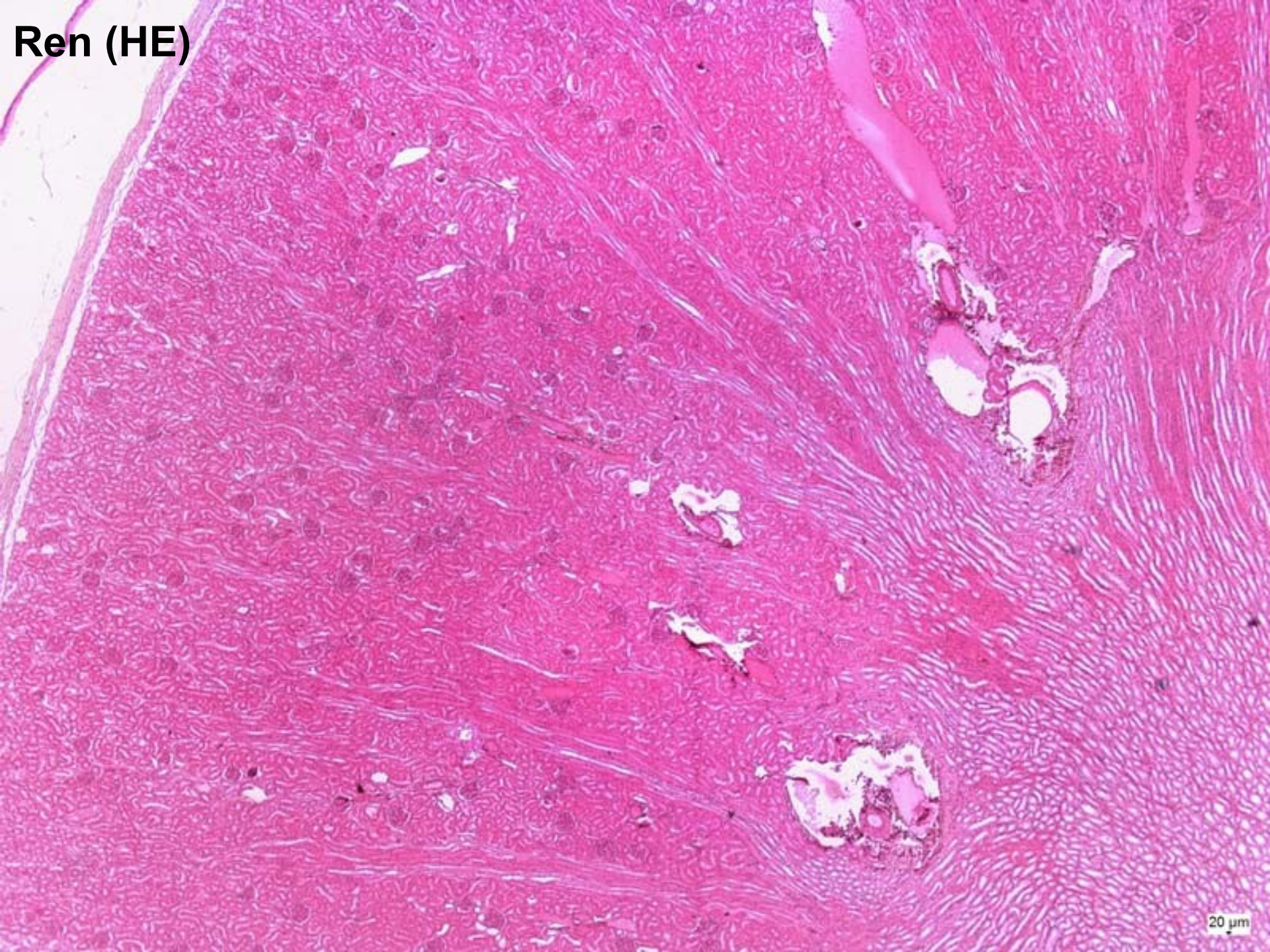
## Dřeň:

- pyramidy (10 – 18)
- papily s otvory

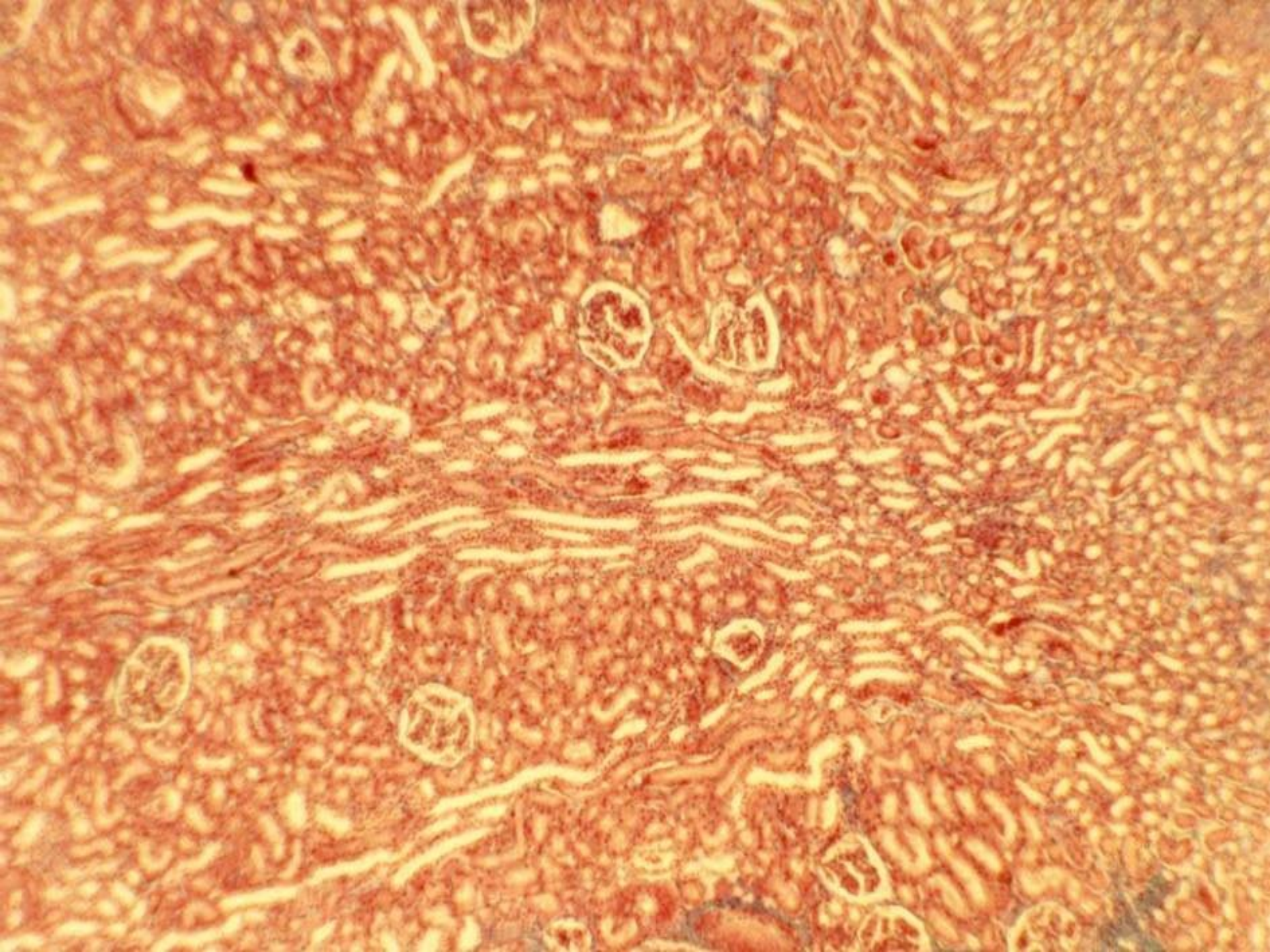


vazivové pouzdro  
tukové pouzdro

Ren (HE)

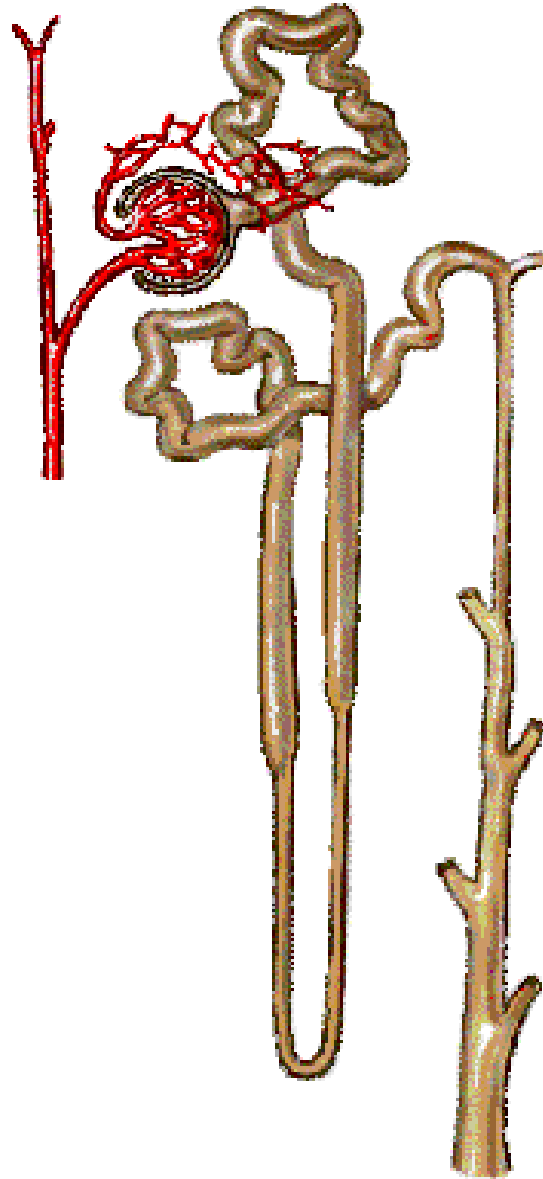


20  $\mu$ m



# NEFRON

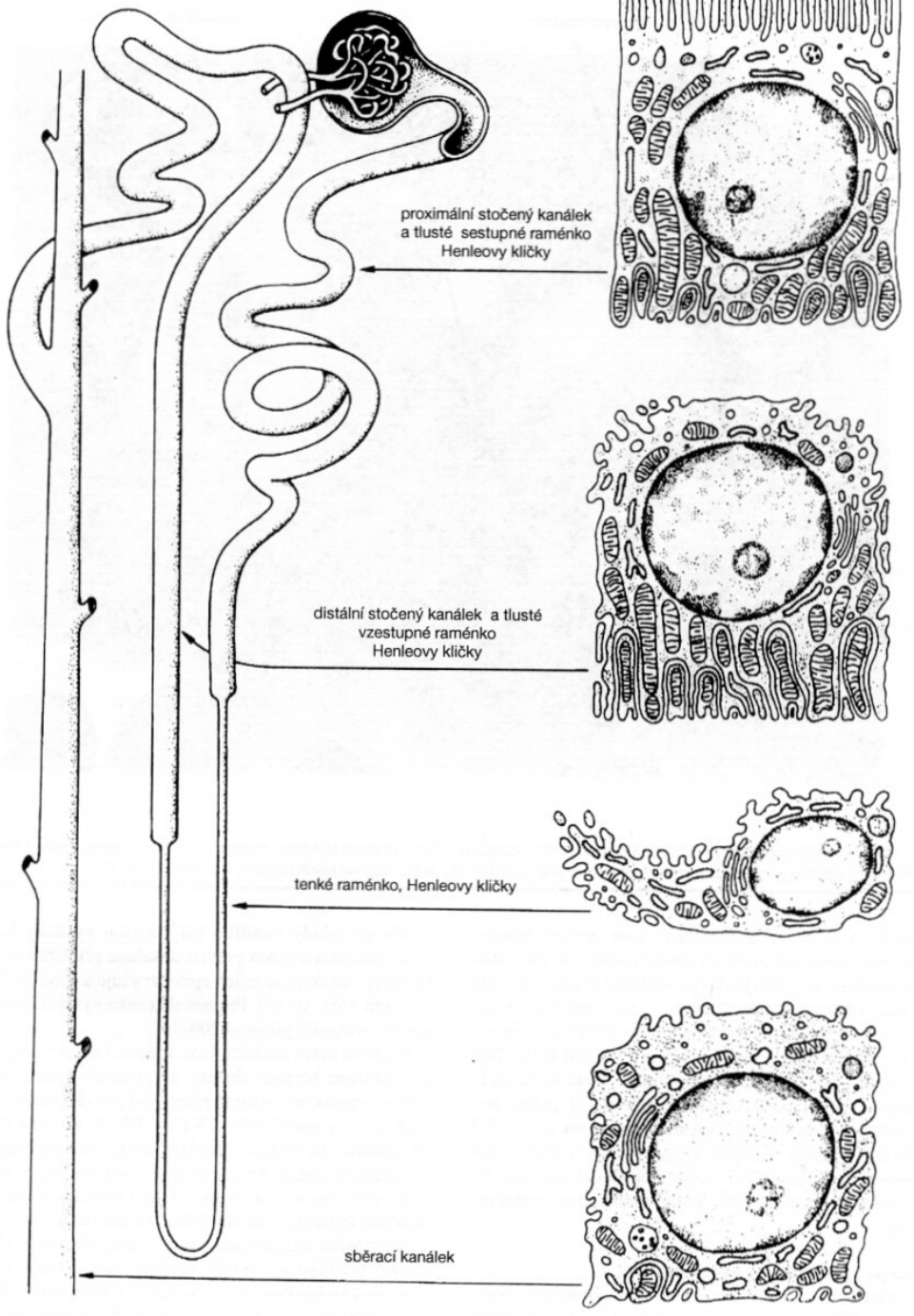
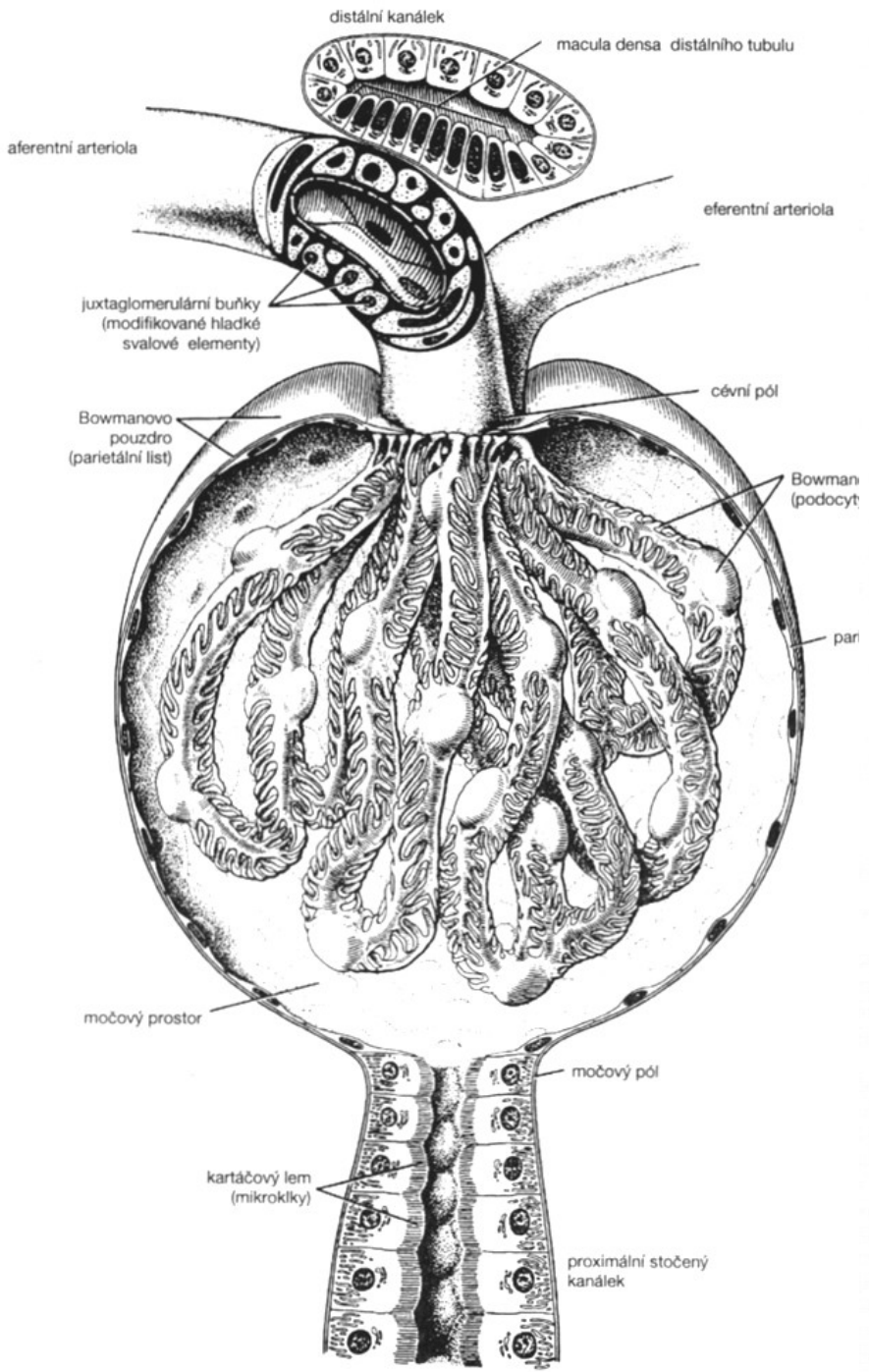
**Ledvinné tělísko**  
corpusculum renis  
(Malpighi)



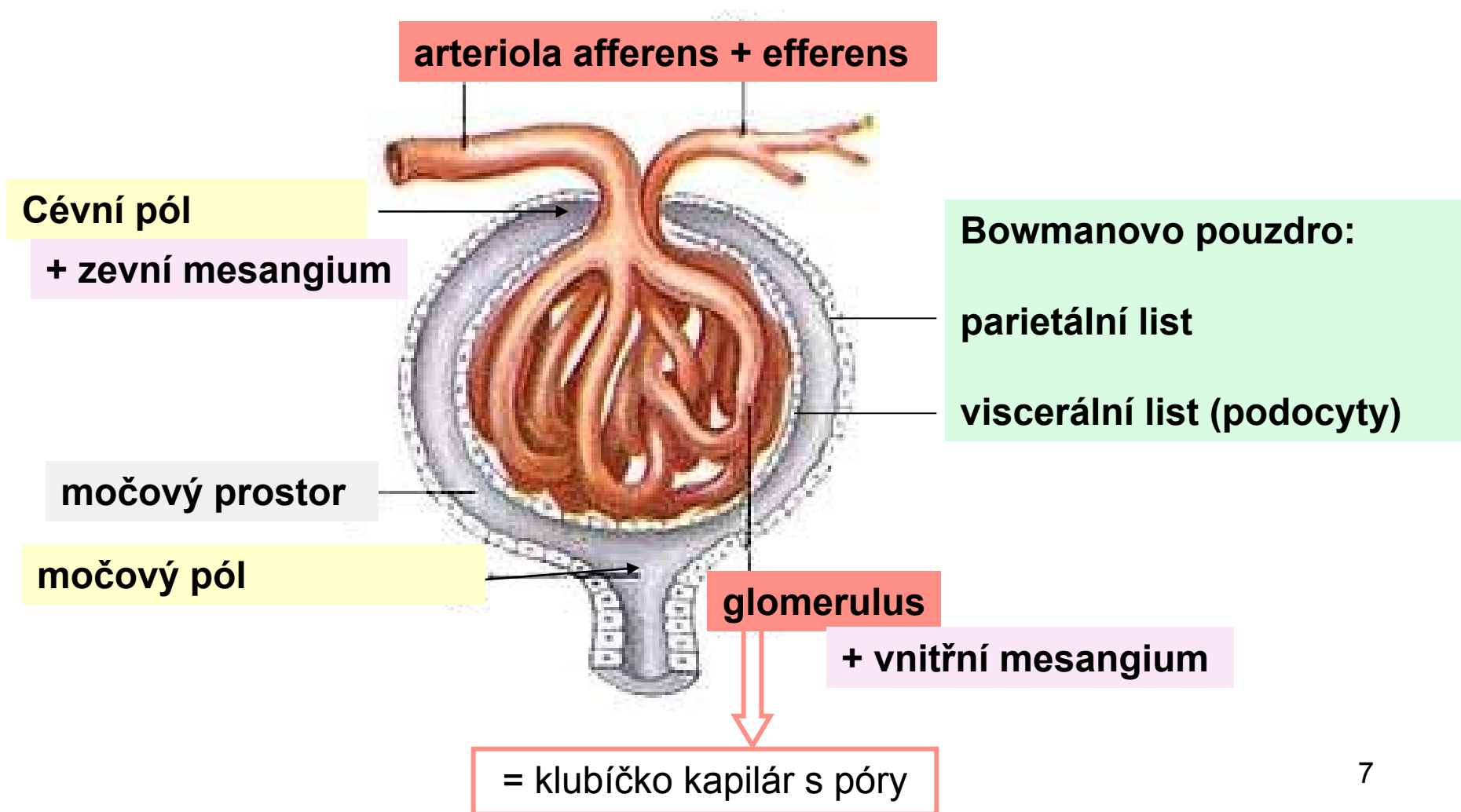
**Glomerulus**  
**Bowmanovo pouzdro**

**Ledvinný kanálek**  
tubulus renis

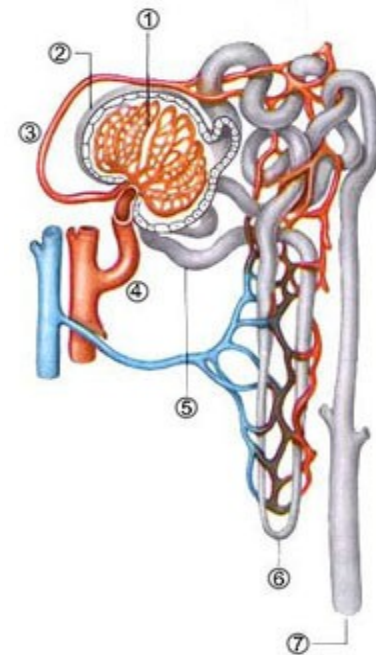
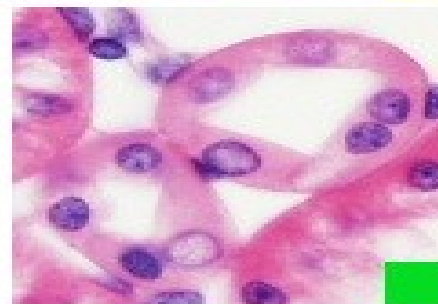
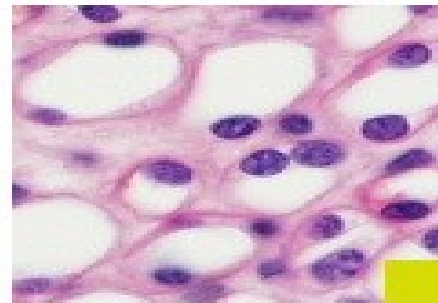
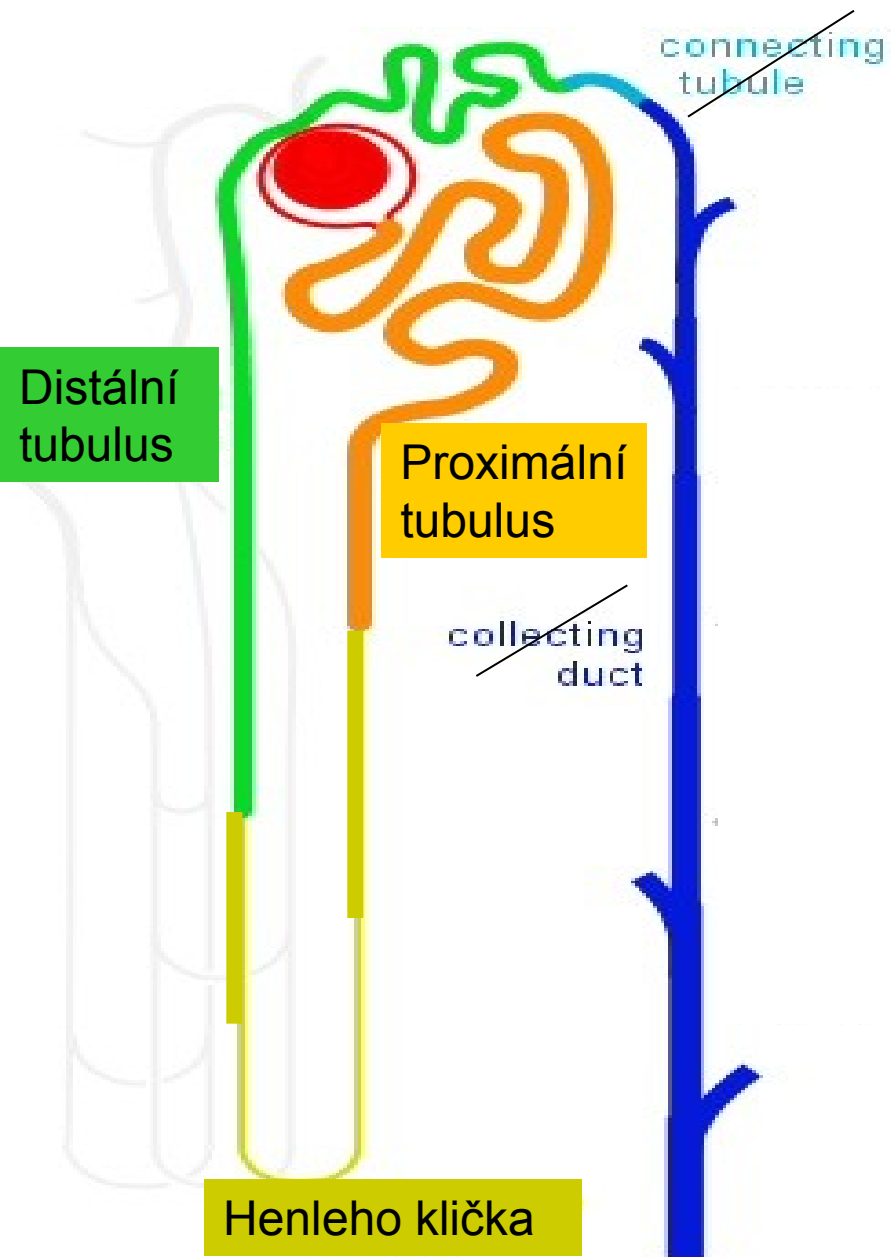
**Proximální tubulus**  
**Henleho klička**  
**Distalis tubulus**



# Ledvinné tělíčko ( $\varnothing$ 200 $\mu\text{m}$ )



# Tubulus renis



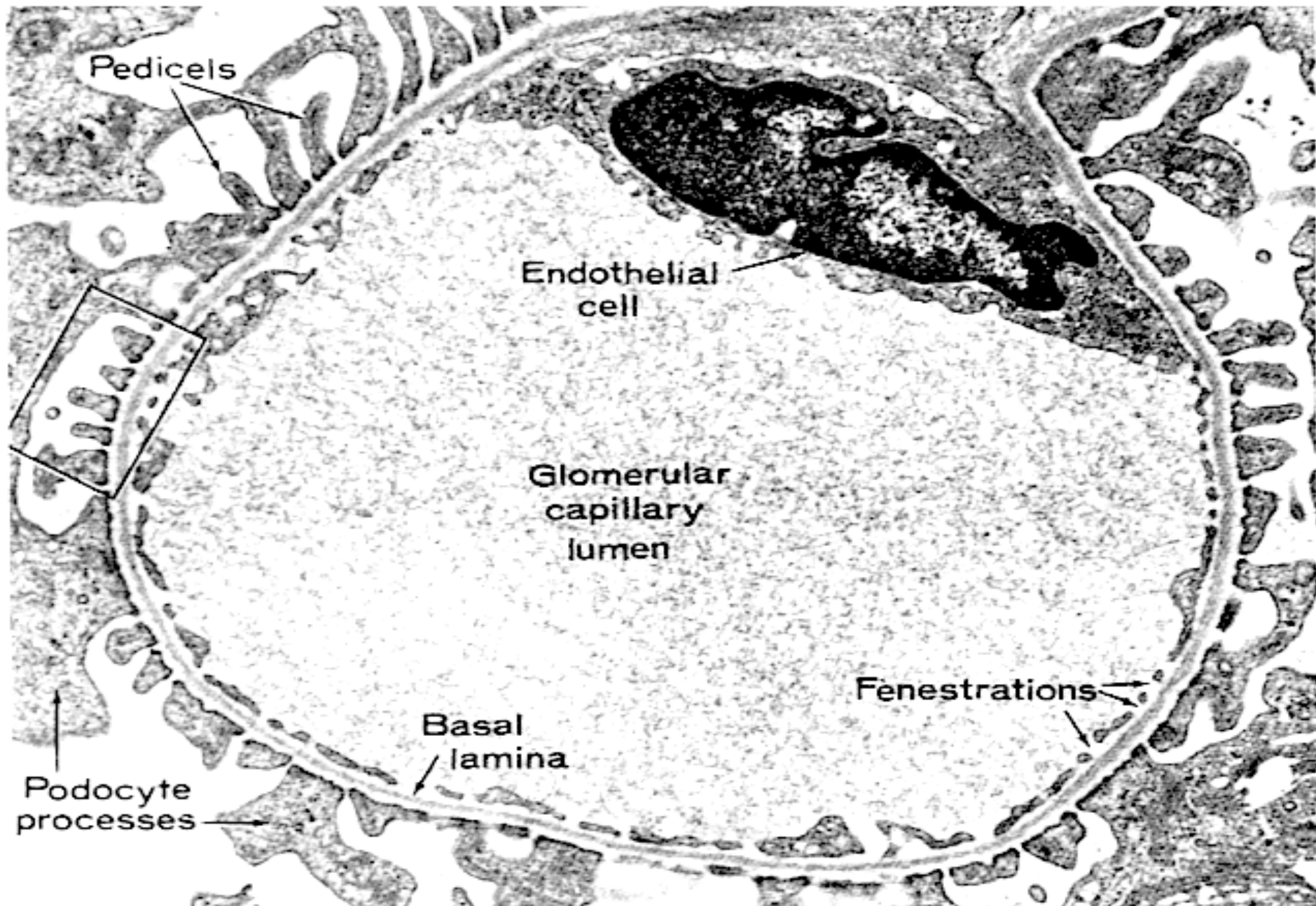


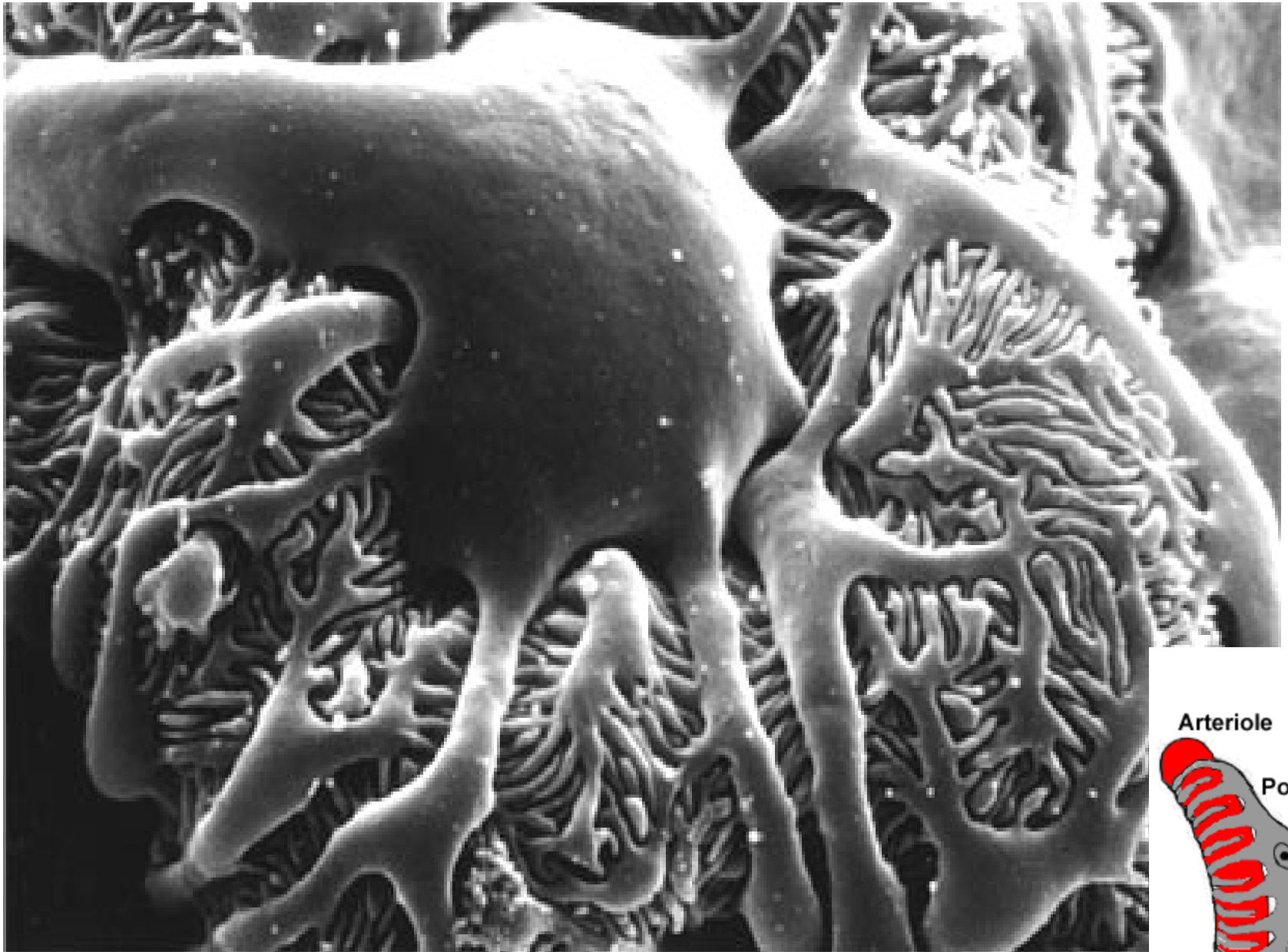
# Filtrační membrána

- endotelové buňky – fenestrace (póry)
- **splynulé laminae basales** endotelu a podocytů:
  1. lamina rara subendothelialis,
  2. lamina densa,
  3. lamina rara subepithelialis

*[l. densa: kolagen IV (fyzikální filtr), l. rariae: heparansulfát (iontový filtr)]*
- podocyty – **diafragma** přepažující štěrbinu mezi pedikly

# Filtrační bariéra

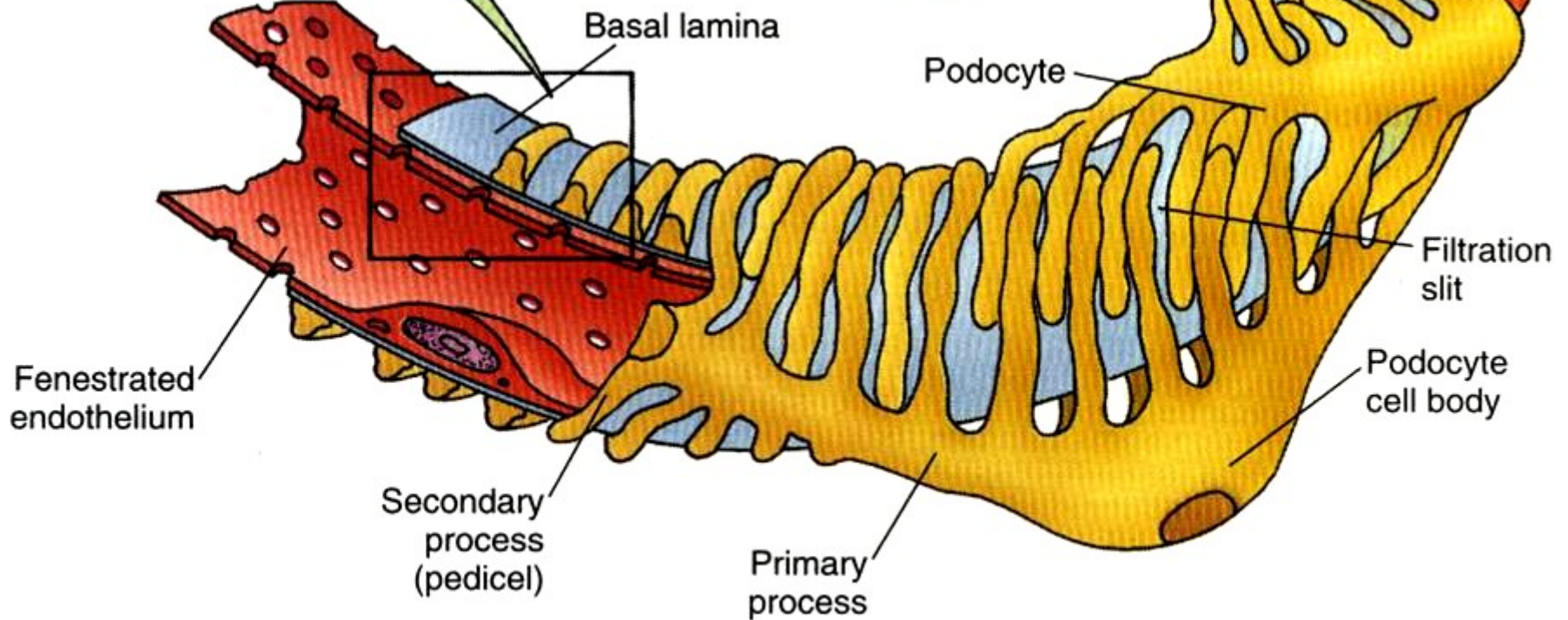
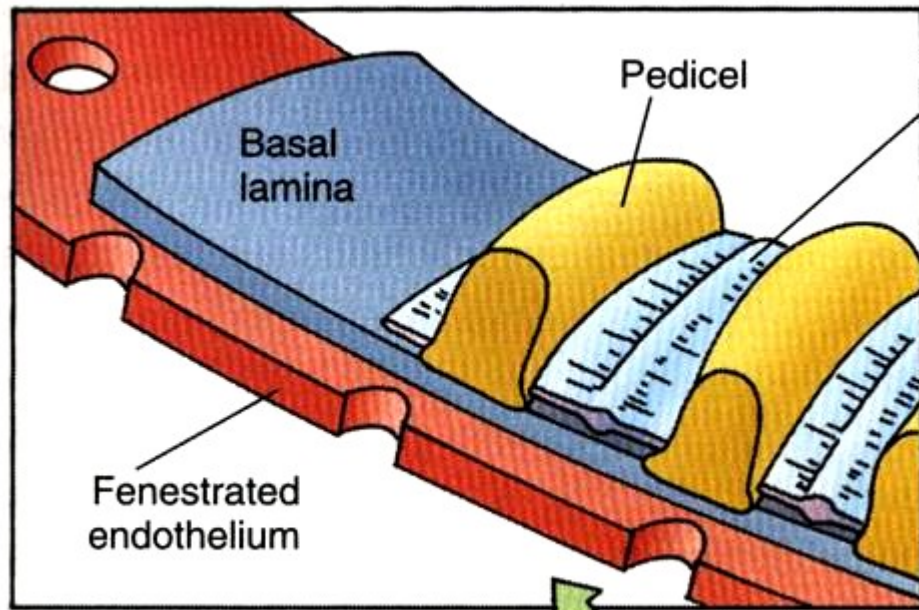


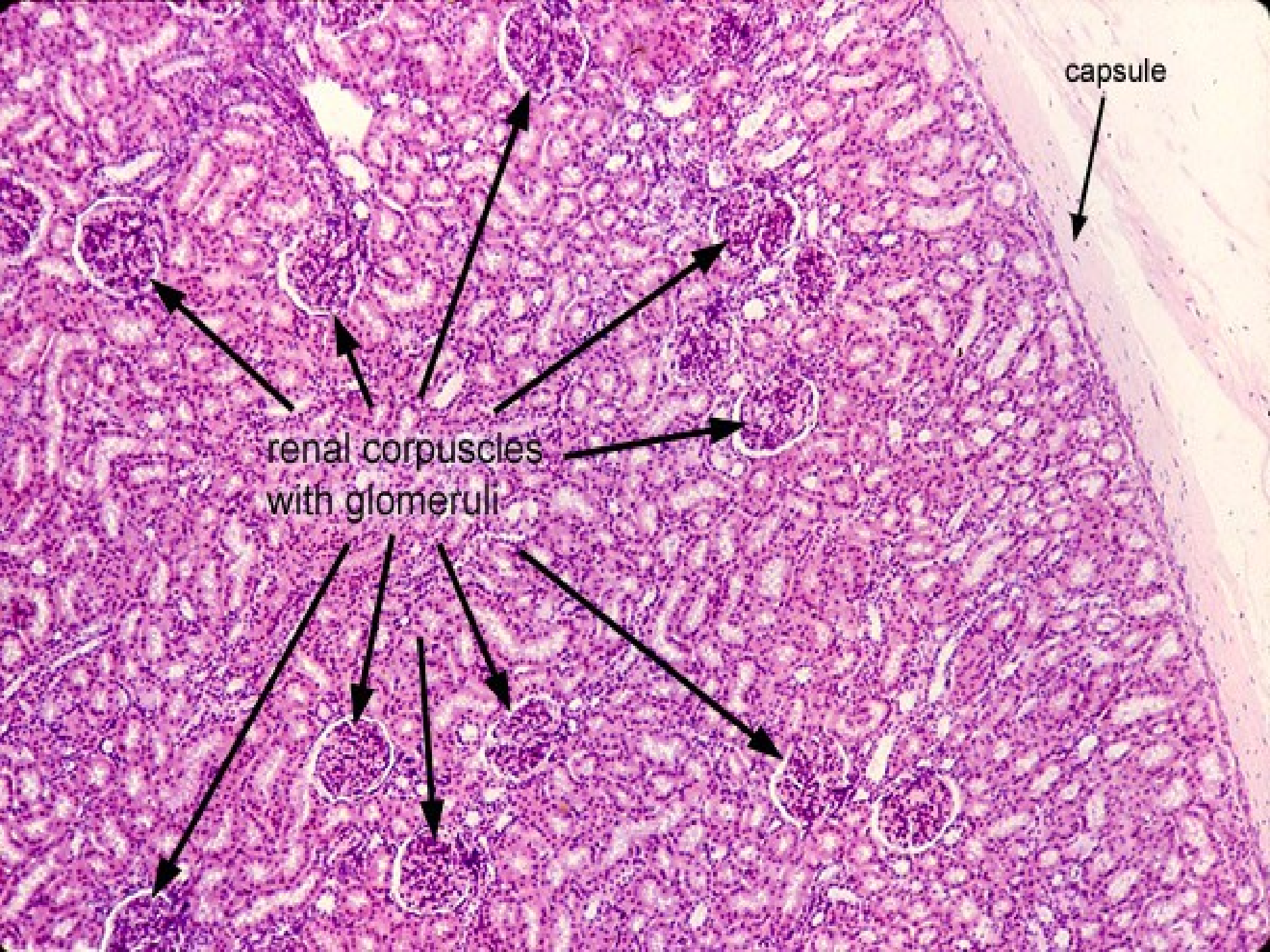


Arteriole

Podocyte

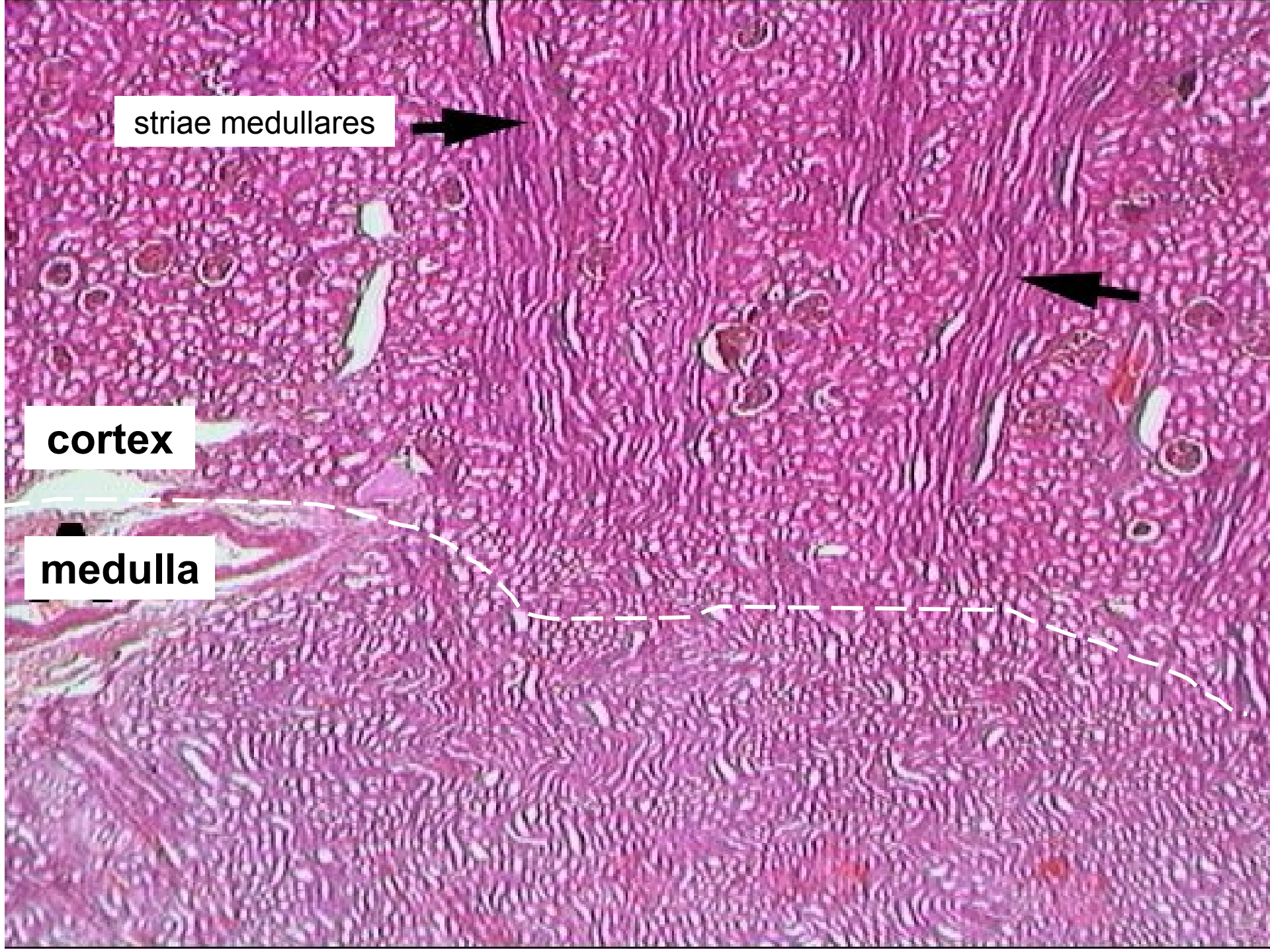






capsule

renal corpuscles  
with glomeruli

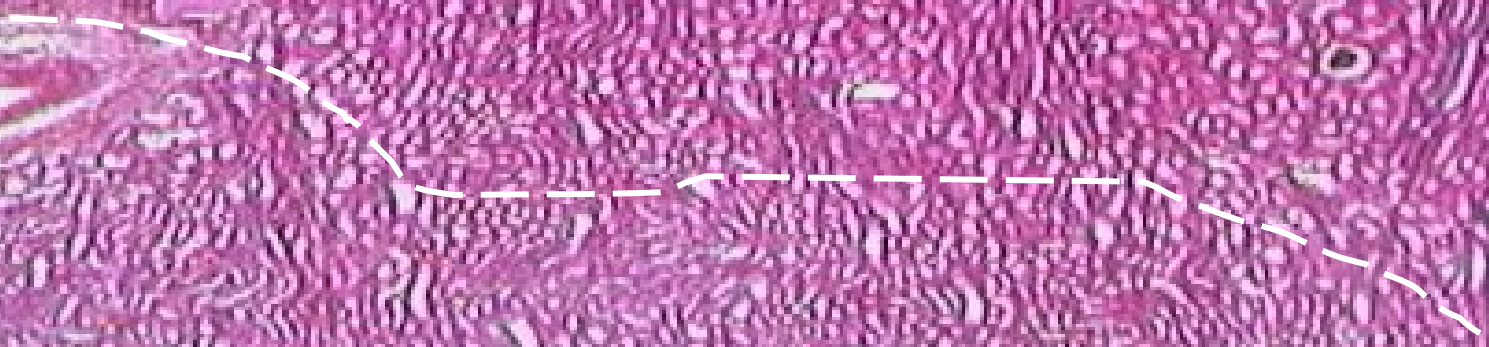


striae medullares

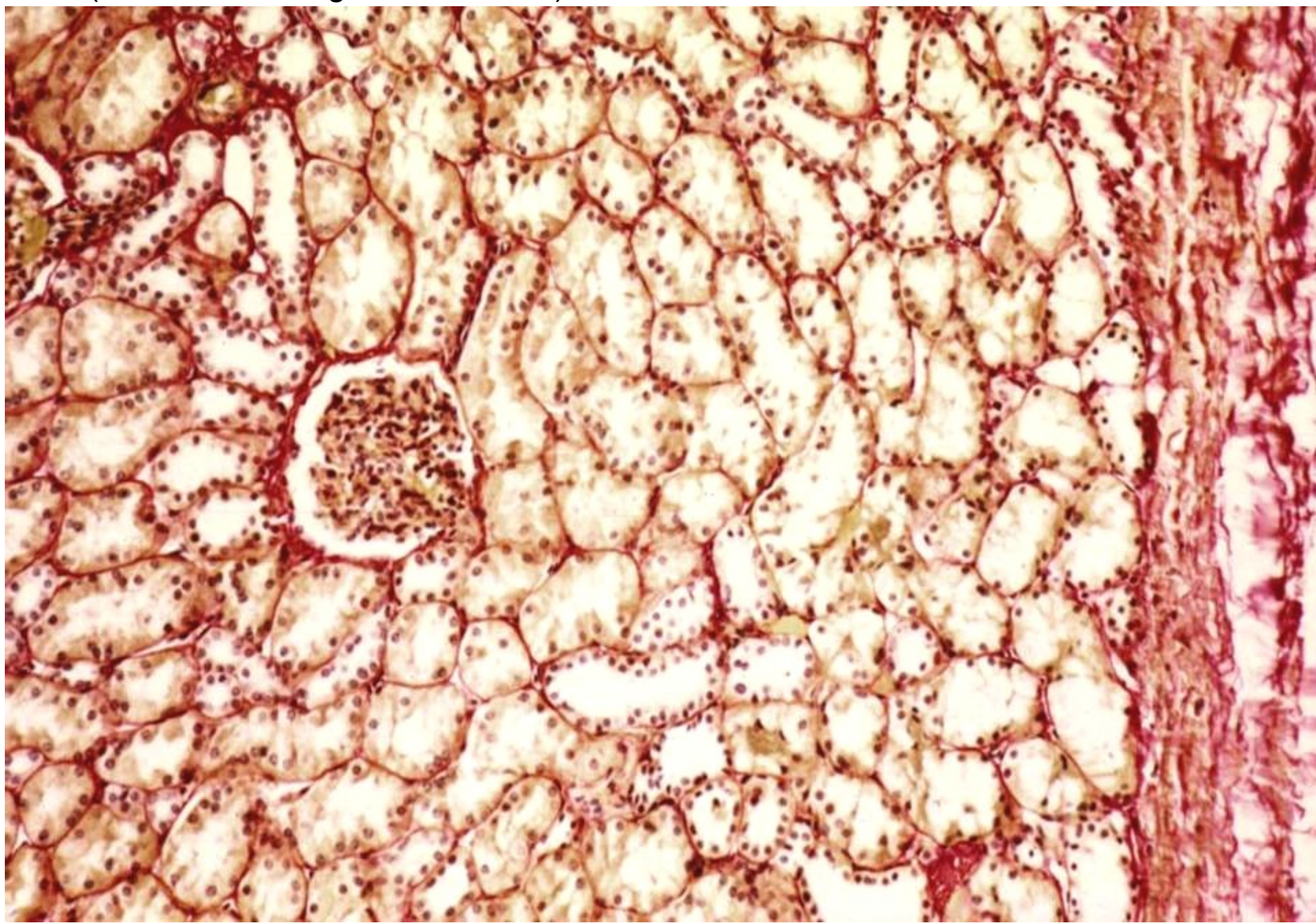


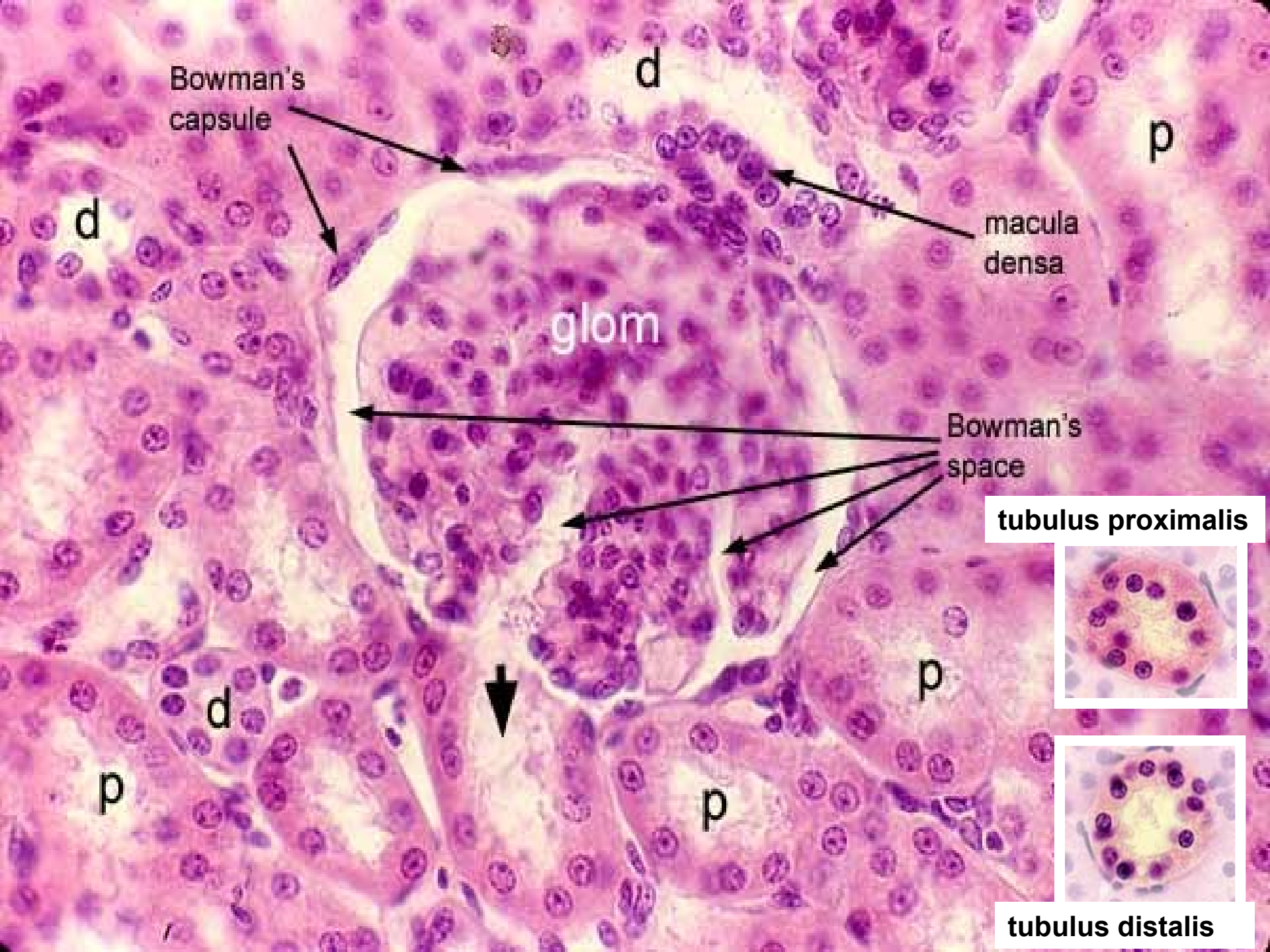
cortex

medulla



Ren (barvení dle Weigert-vanGieson) – červené vazivo





Bowman's capsule

d

p

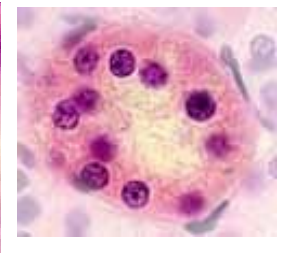
d

macula densa

glom

Bowman's space

tubulus proximalis

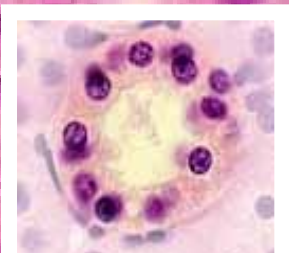


p

d

p

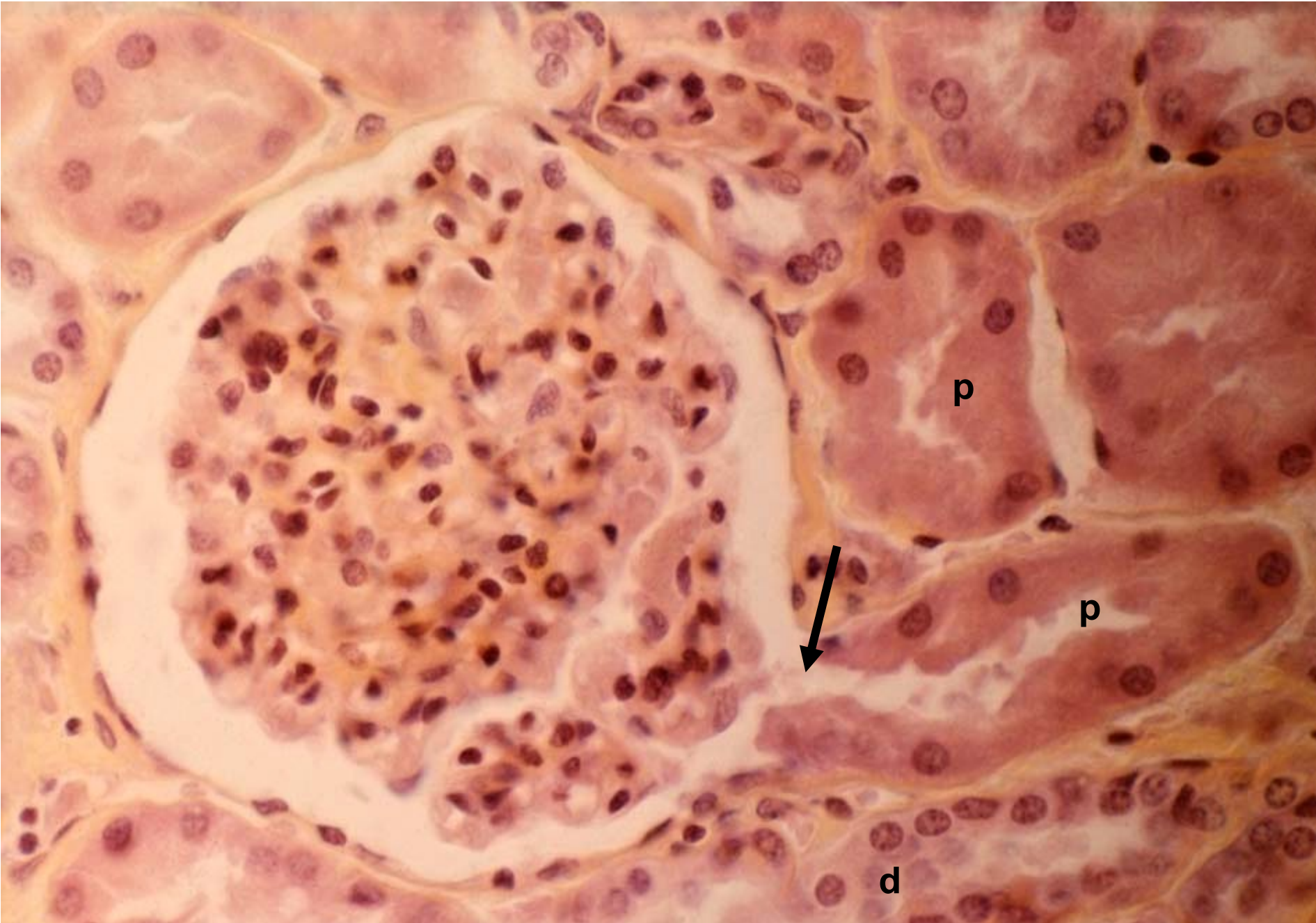
p



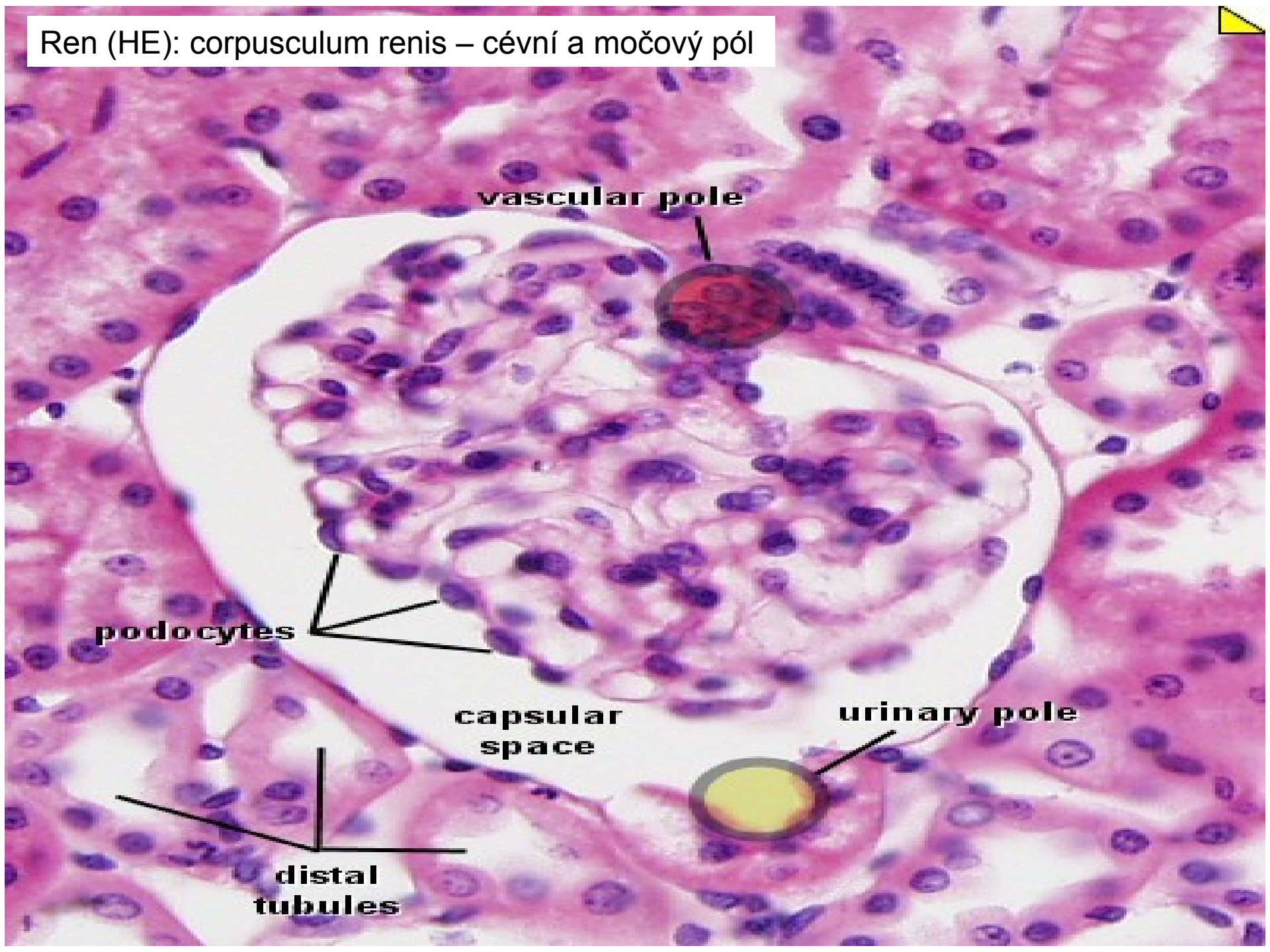
tubulus distalis



Ren (HE) – corpusculum renis, močový pól ↓



Ren (HE): corpusculum renis – cévní a močový pól



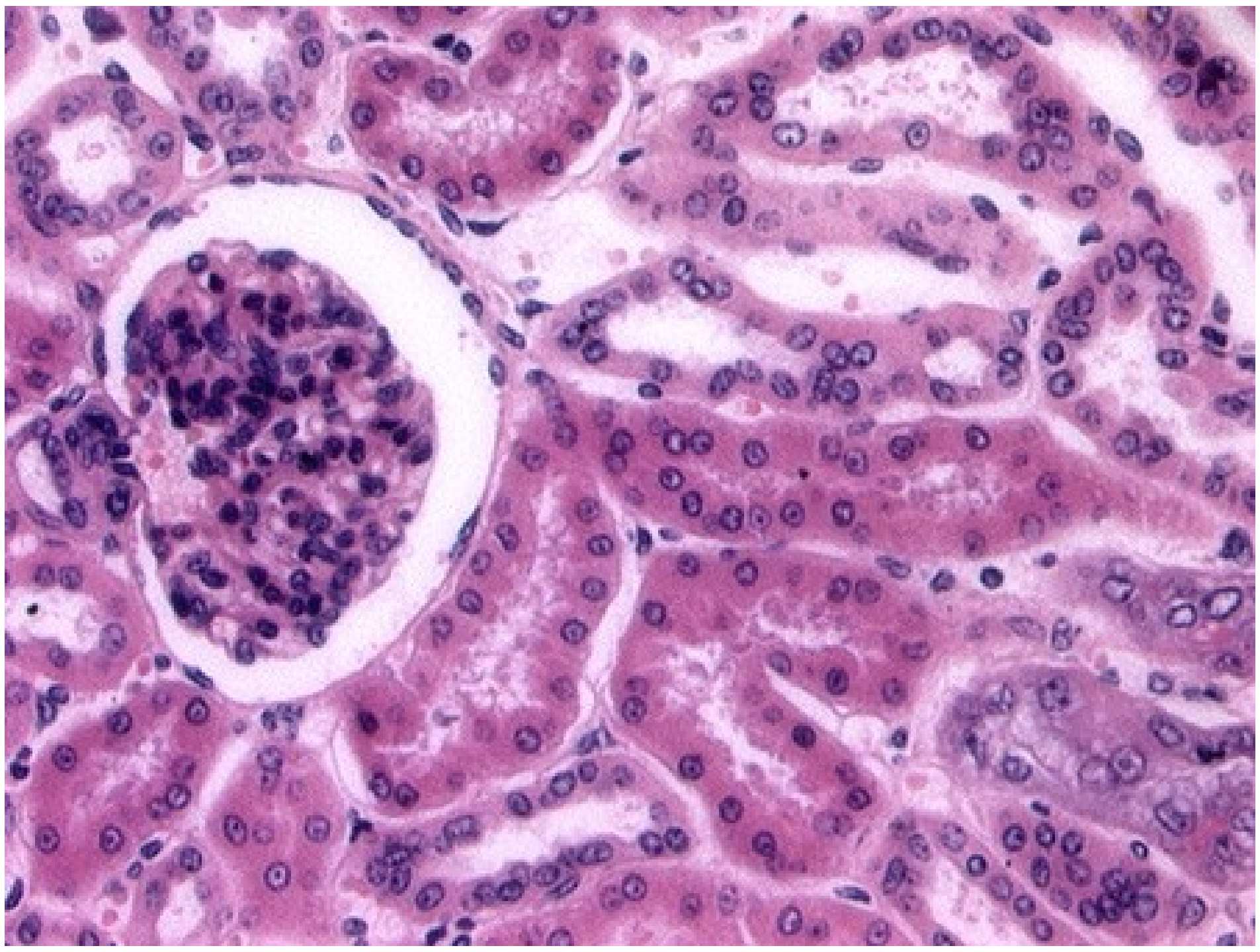
vascular pole

podocytes

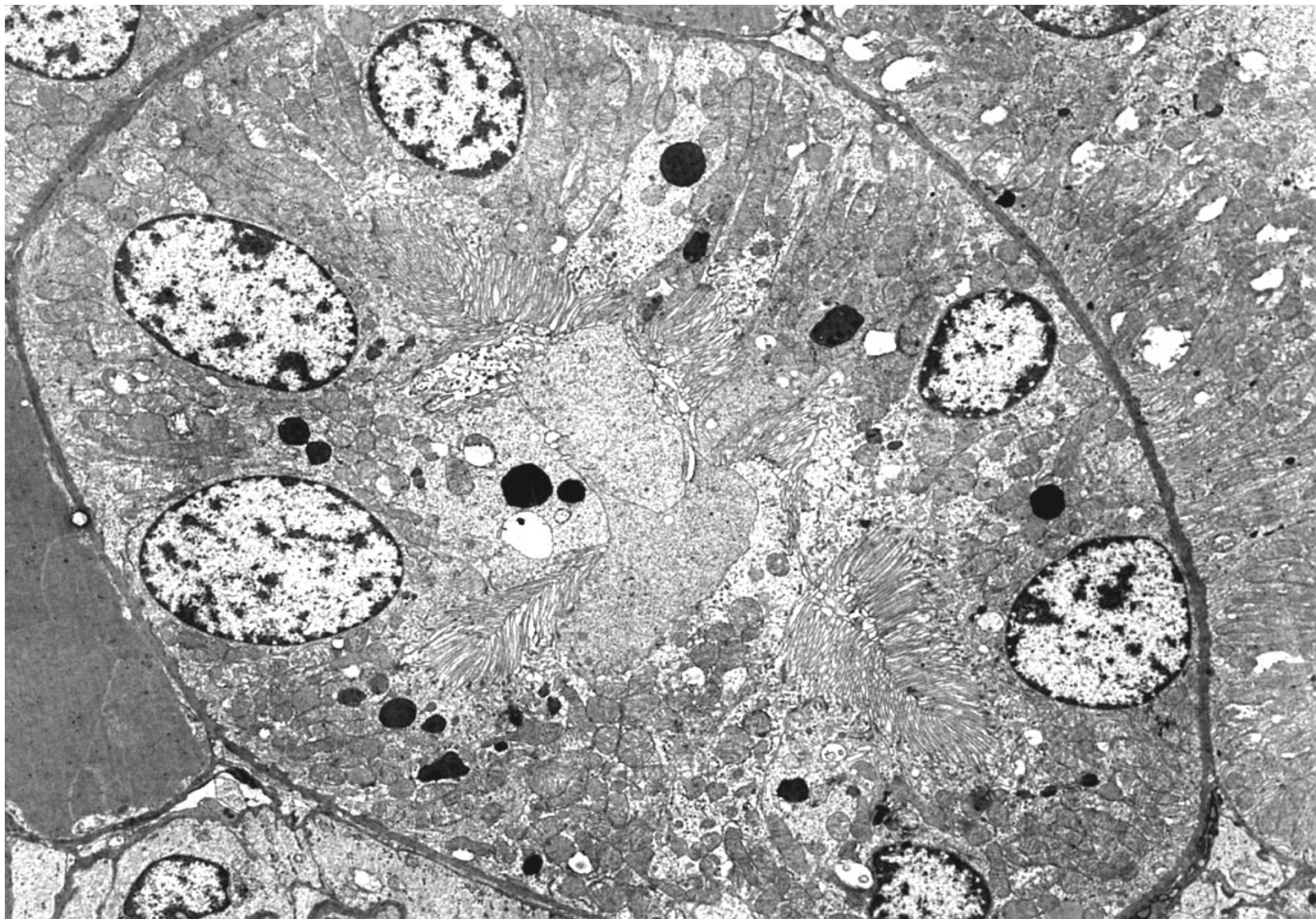
capsular space

urinary pole

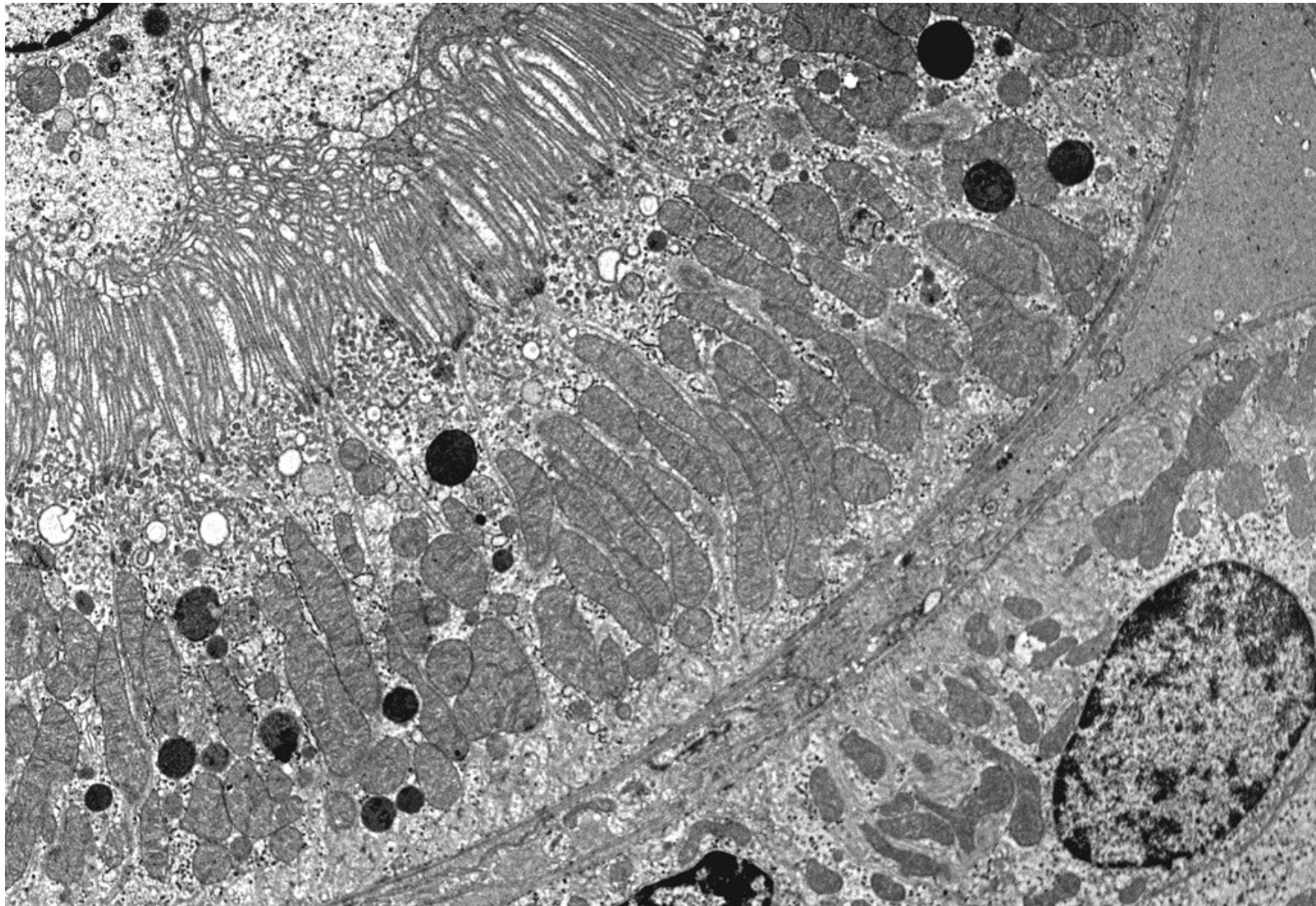
distal tubules



Ren – proximální tubulus (ELM): kartáčový lem, bazální labyrint



Ren – proximální tubulus (ELM): kartáčový lem, bazální labyrint

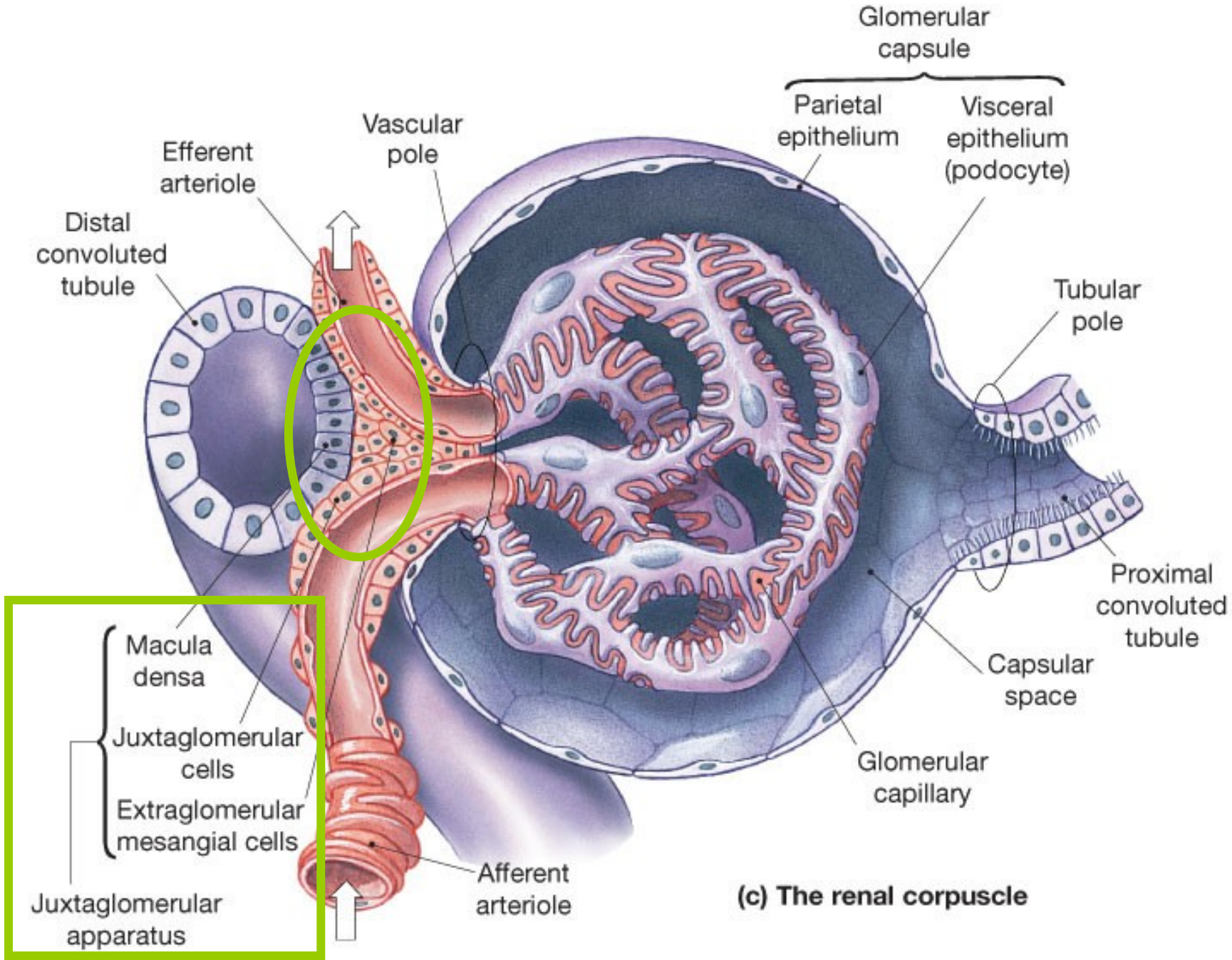


# Juxtaglomerulární aparát

(produkce reninu a erythropoetinu)

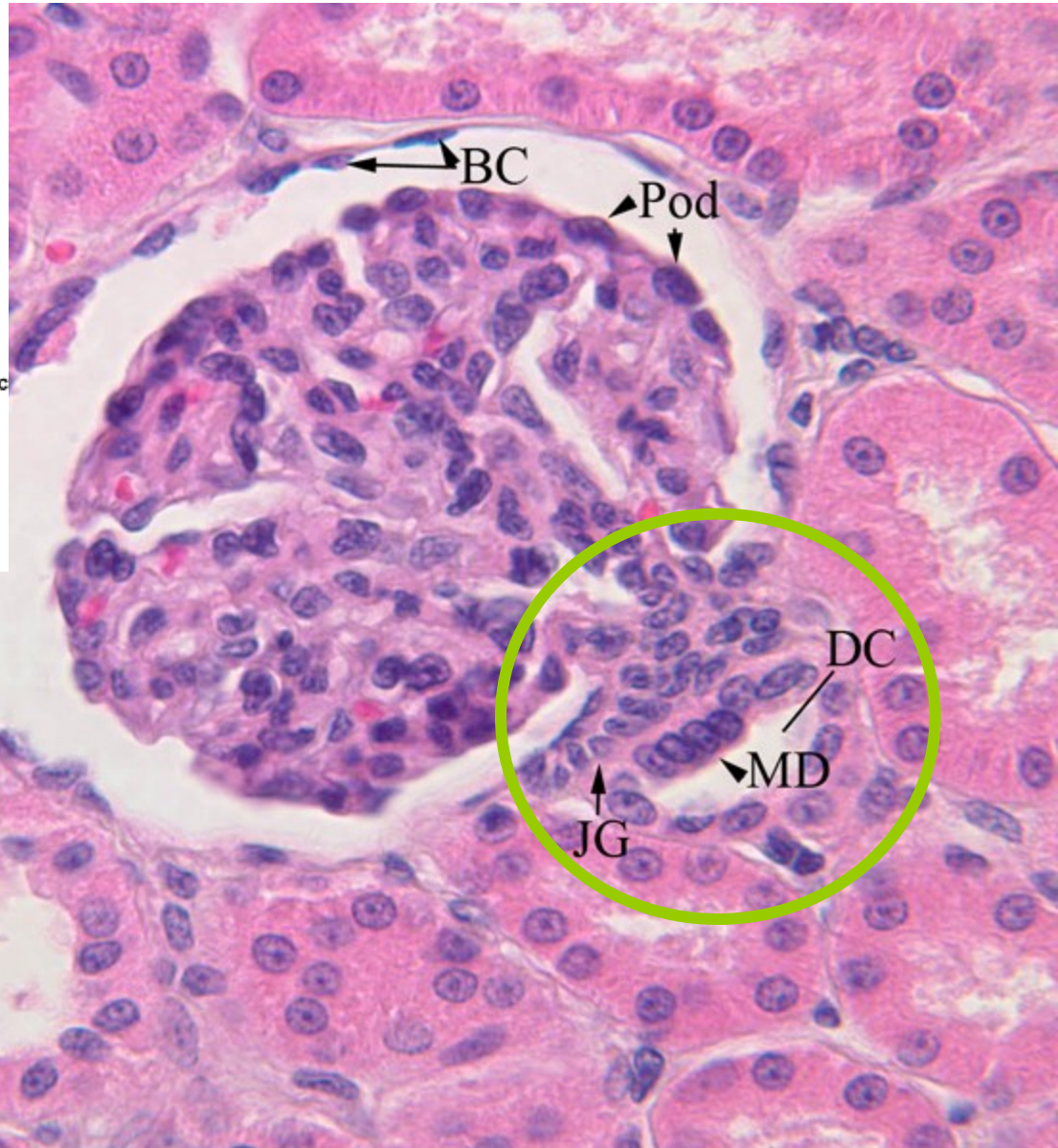
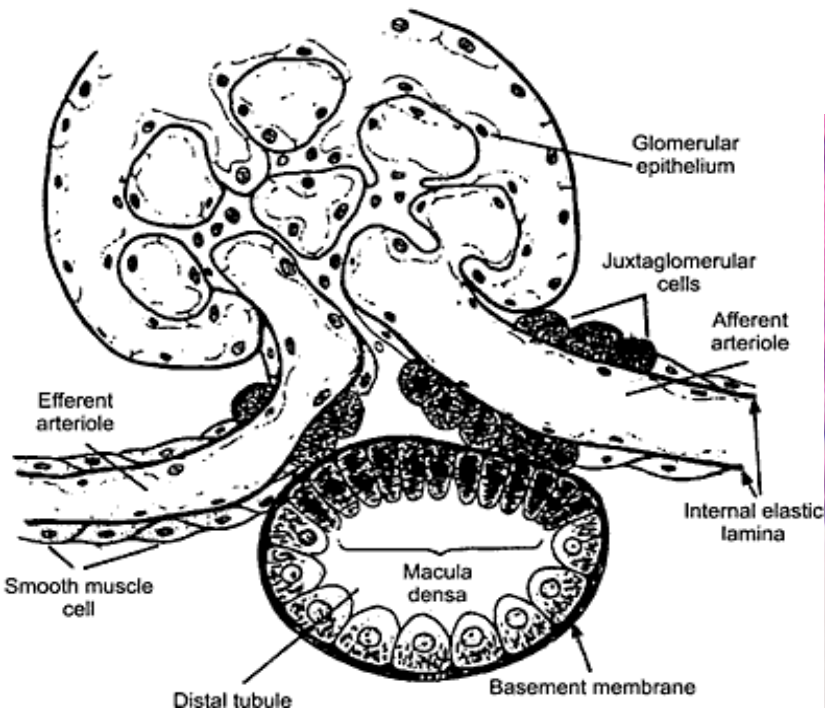
## Endokrinní buňky ledviny

- **juxtaglomerulární buňky** (přeměněné hladké svalové buňky ve stěně vas afferens)
- **macula densa** (bb. distálního tubulu)
- **mesangiální buňky** (extraglomerulární mesangium – přeměněné fibroblasty vmezeřené mezi kapiláry na vaskulárním pólu)



**(c) The renal corpuscle**

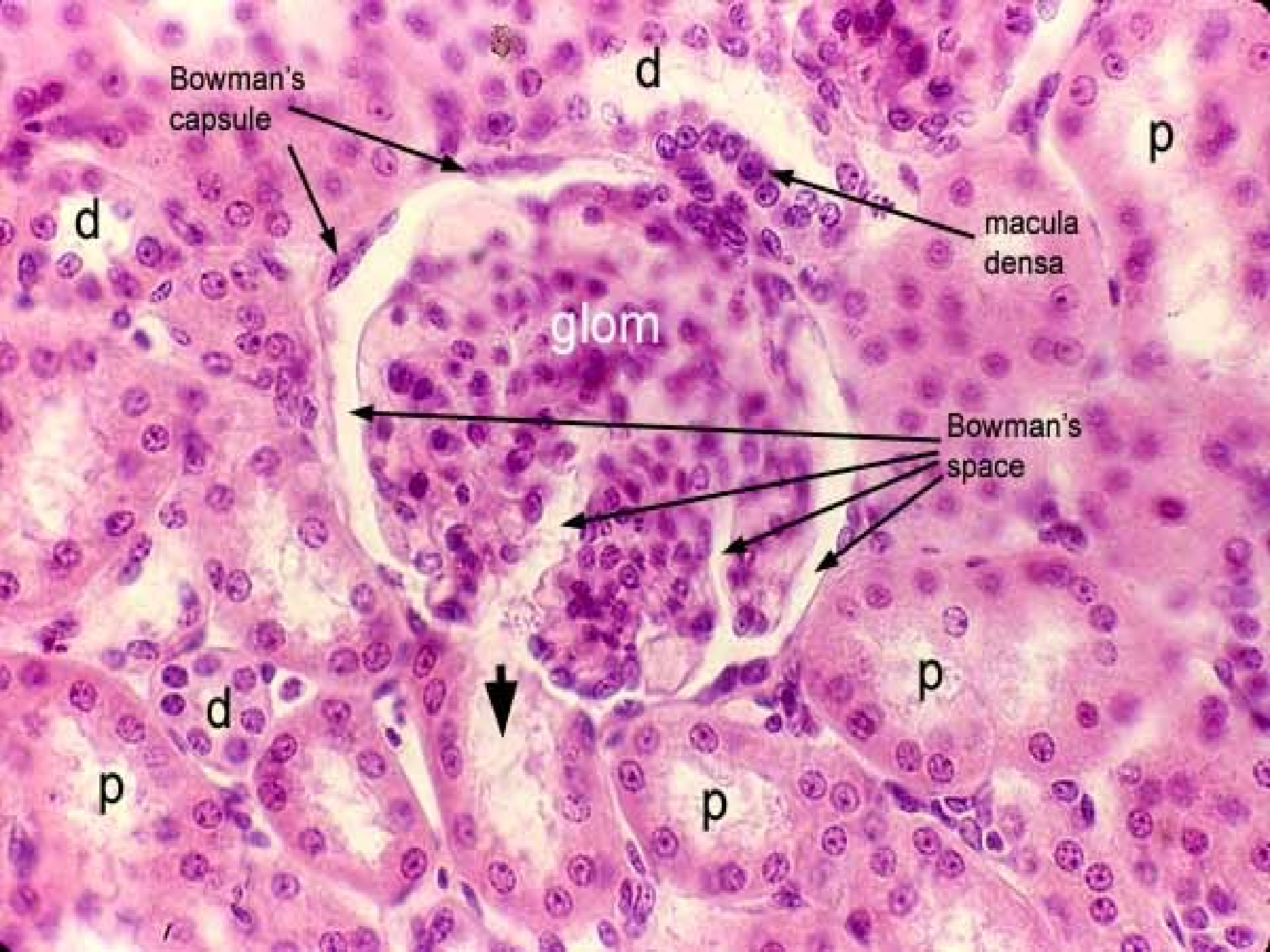
# Juxtaglomerulární aparát



BC - Bowman's capsule (parietal layer) Pod - podocyte (visceral layer of Bowman's capsule)

MD - macula densa JG - juxtaglomerular cells DC - distal convoluted tubule





Bowman's capsule

d

p

d

macula densa

glom

Bowman's space

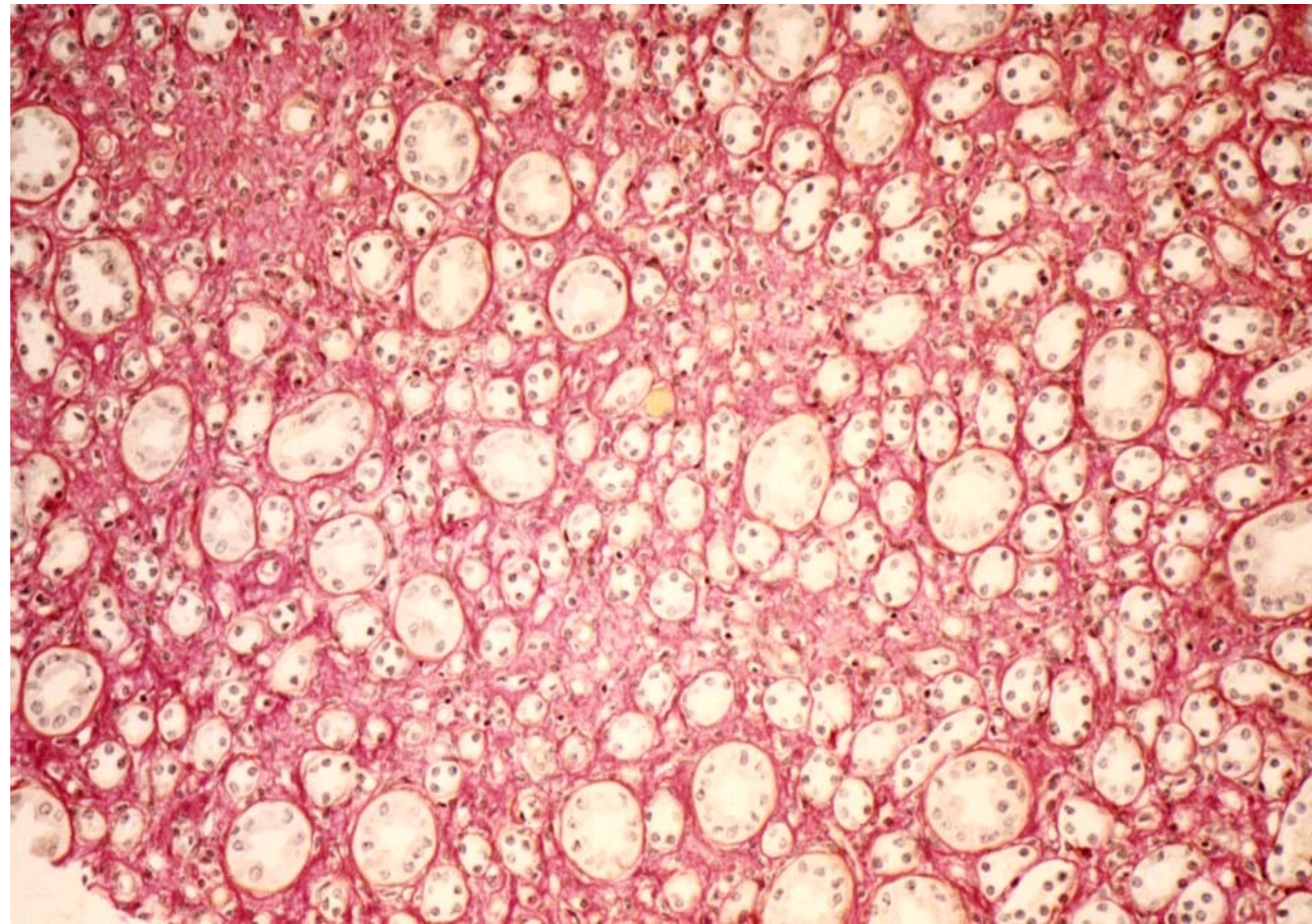
d

p

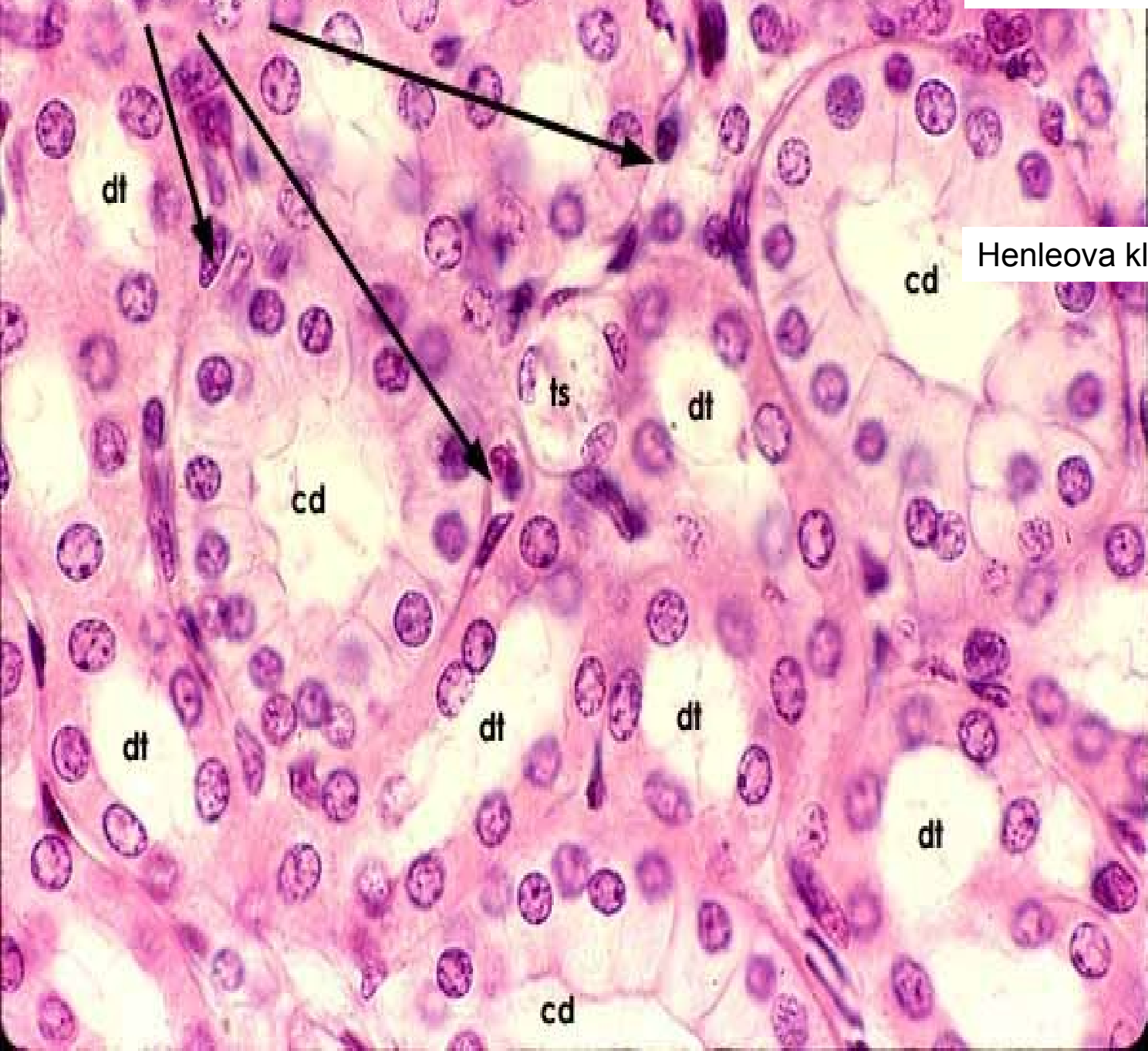
p

p

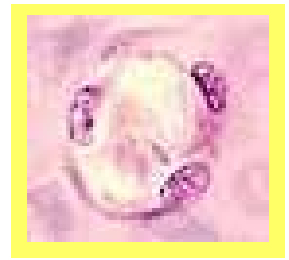
# Ren (Weigert-van Gieson) - medulla



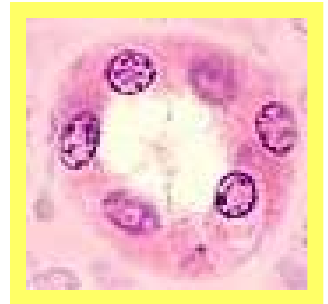
**stroma (medullary capillaries) Ren (HE): medulla**



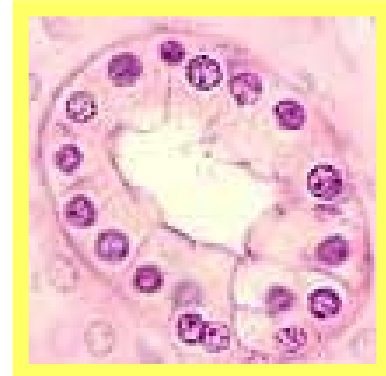
Henleova klička – tenký segment



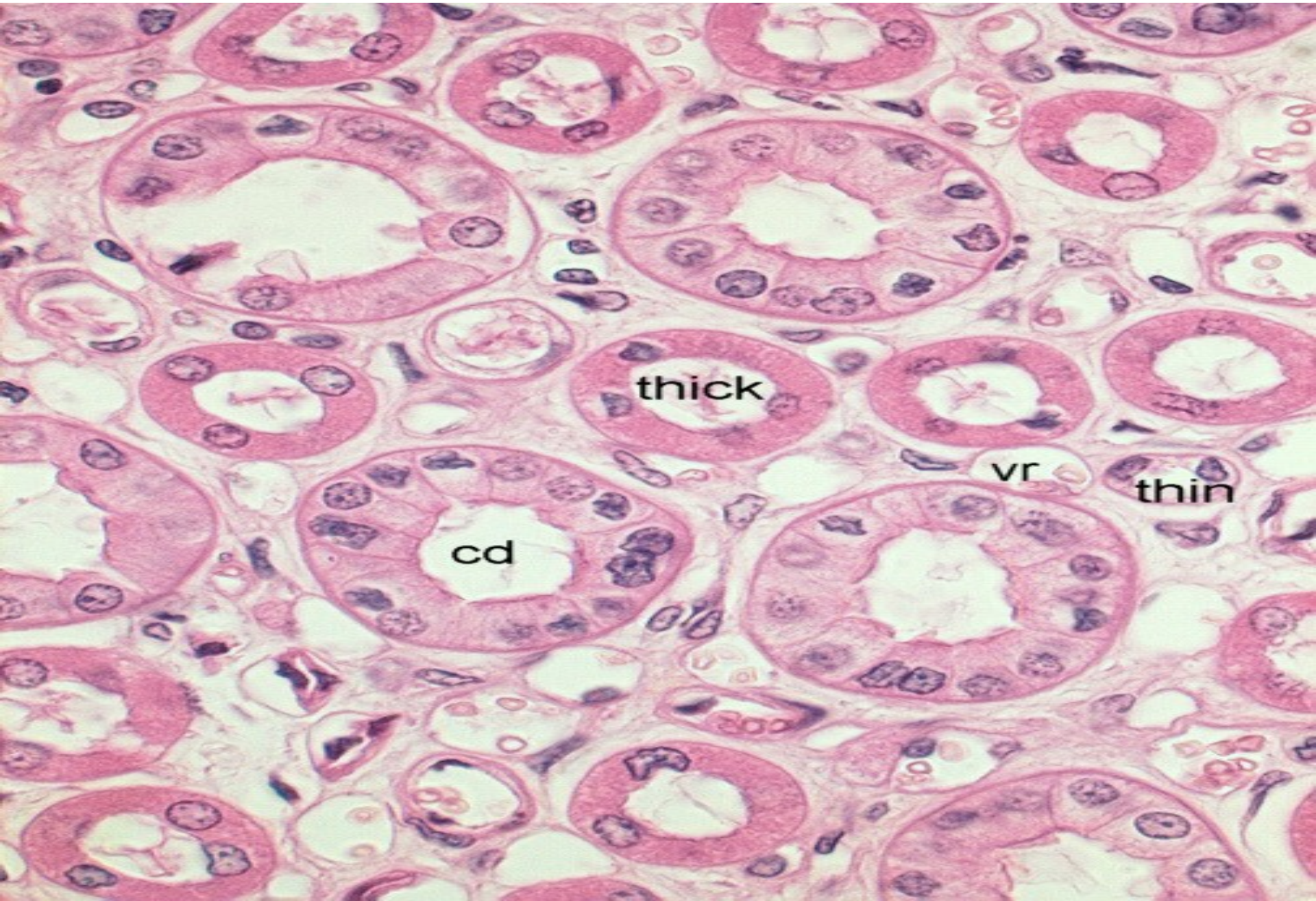
Henleova klička – tlustý segment



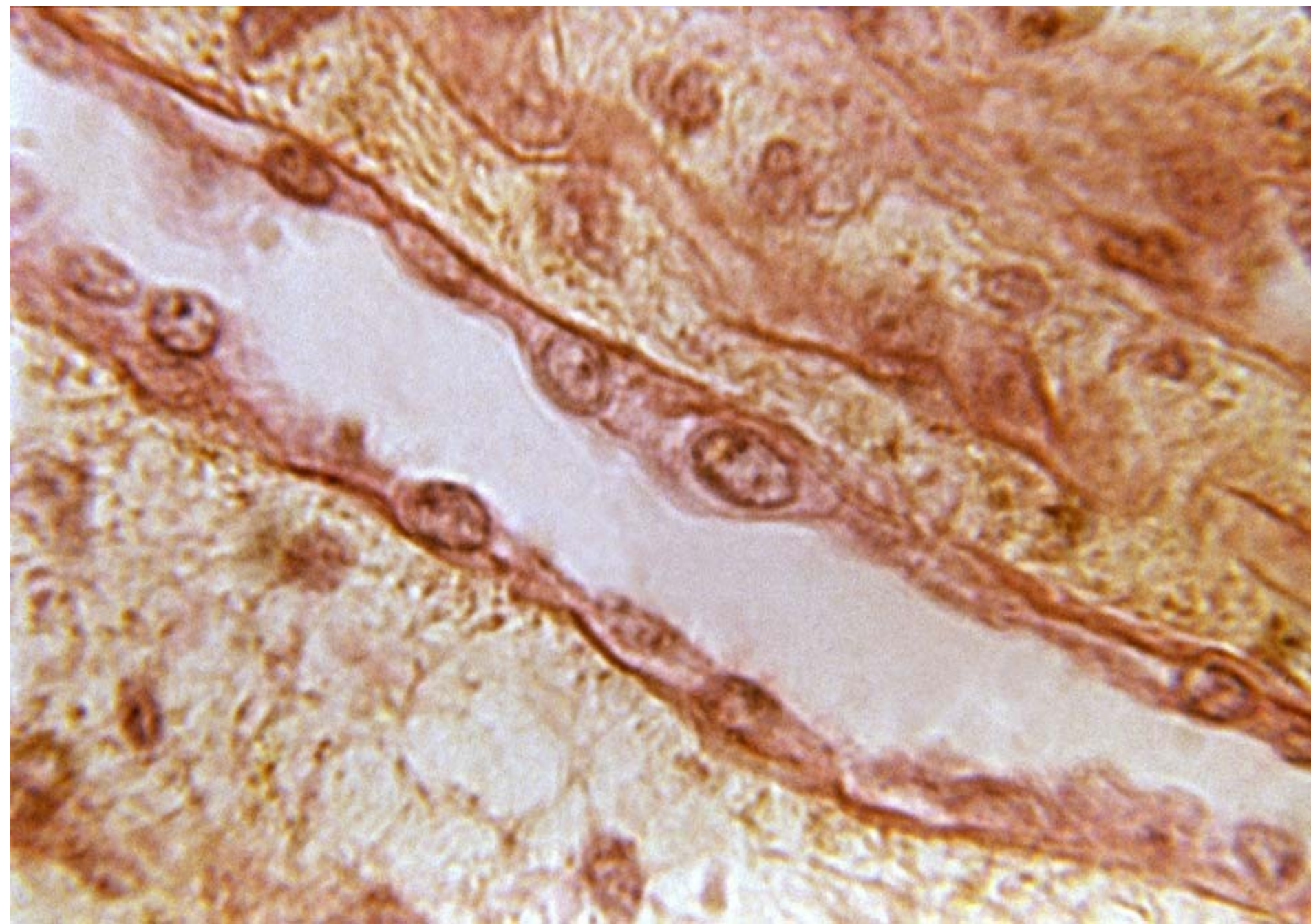
ductus colligens

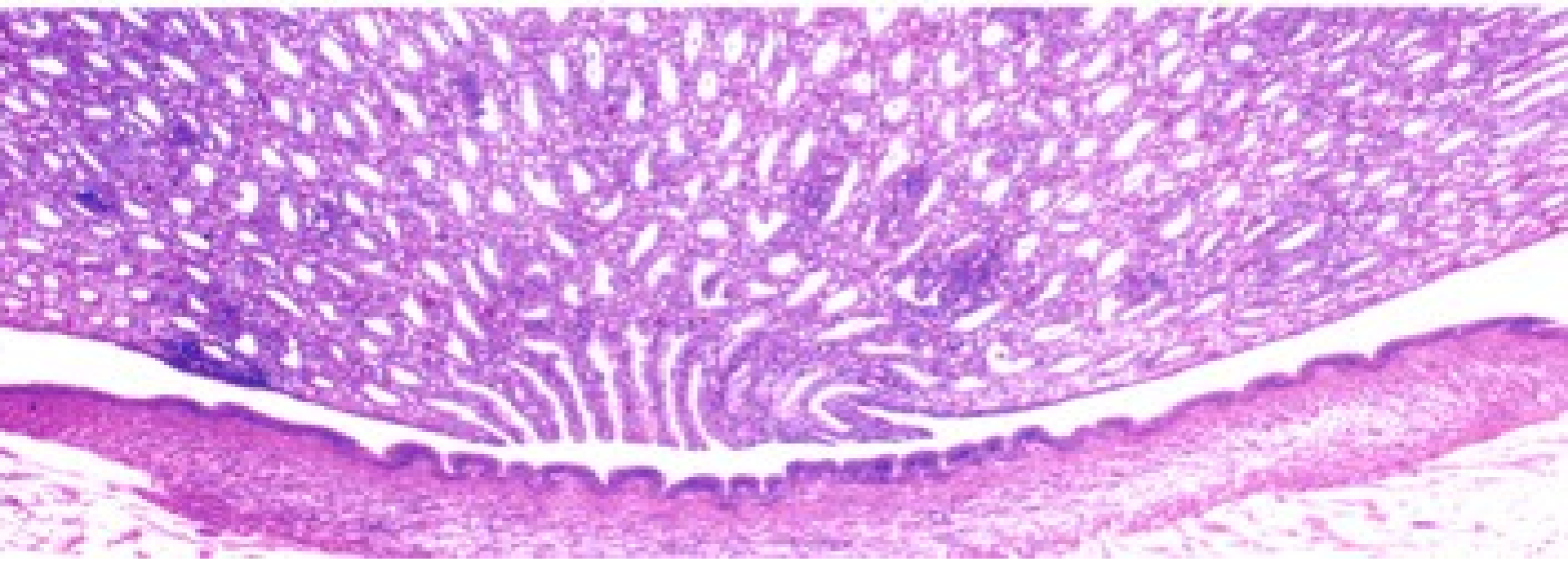
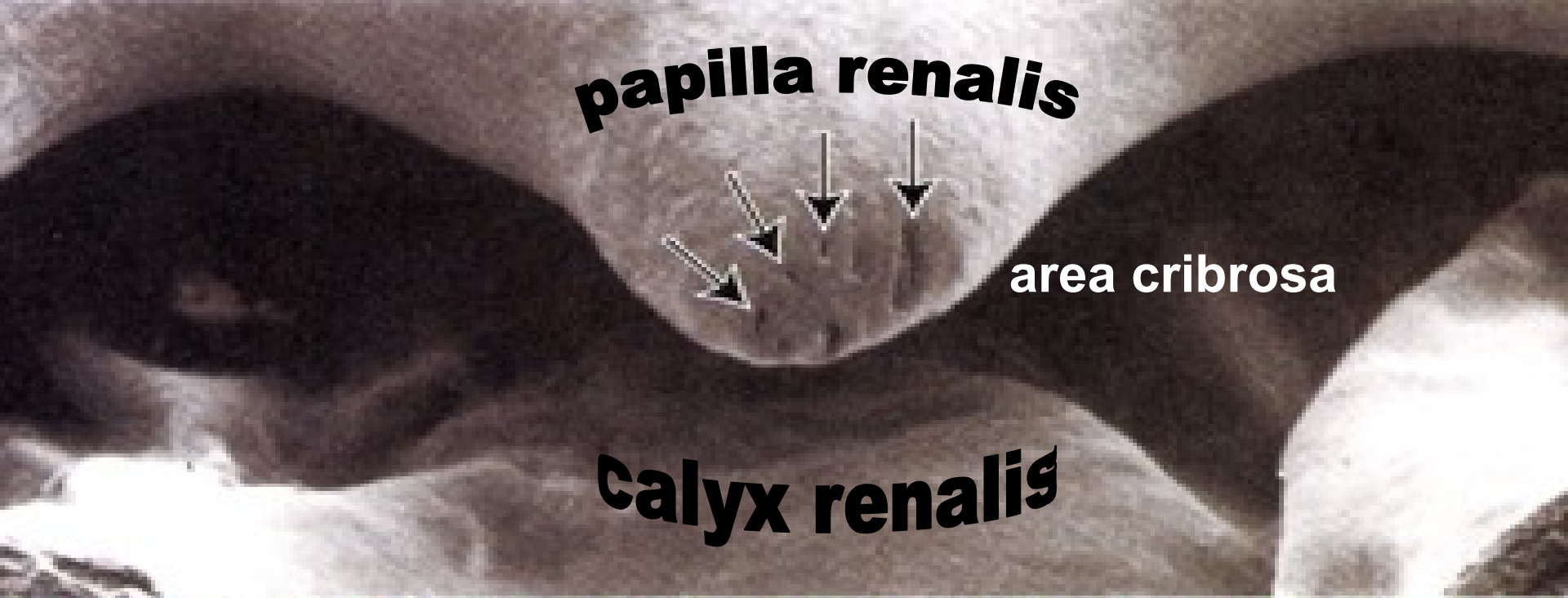


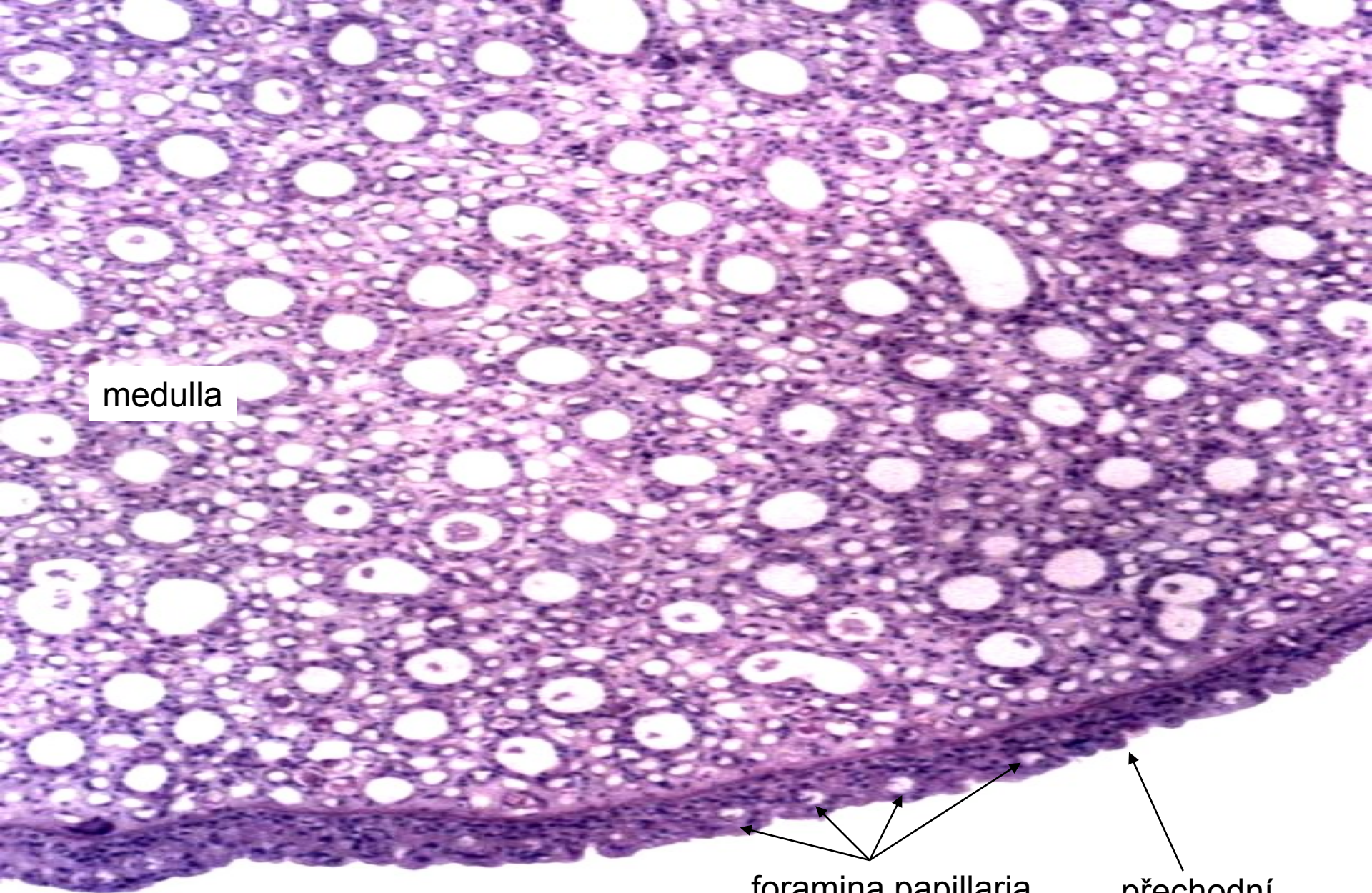
# Ren – medulla (HE)



Ren (HES) – medulla: tenký segment Henleovy kličky (*podélně*)







medulla

foramina papillaria

přechodní  
epitel  
[urotel]

Area cribrosa na papilla renalis

# Vývodné močové cesty

- **intrarenální:**

  - sběrací kanálky**

  - papilární kanálky**

- **extrarenální:**

  - kalíšky a kalichy**

  - pánvička ledvinná**

  - močovod (ureter)**

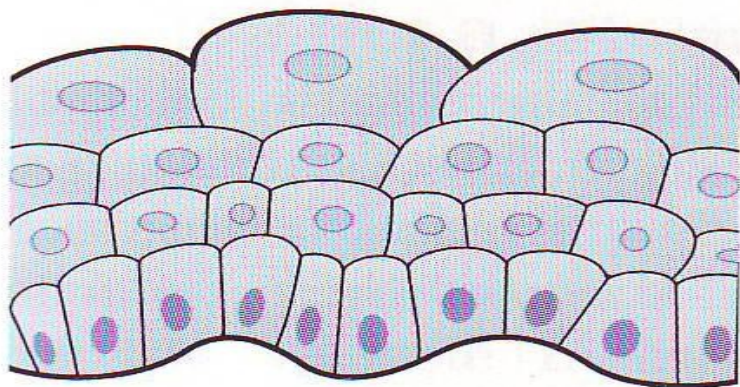
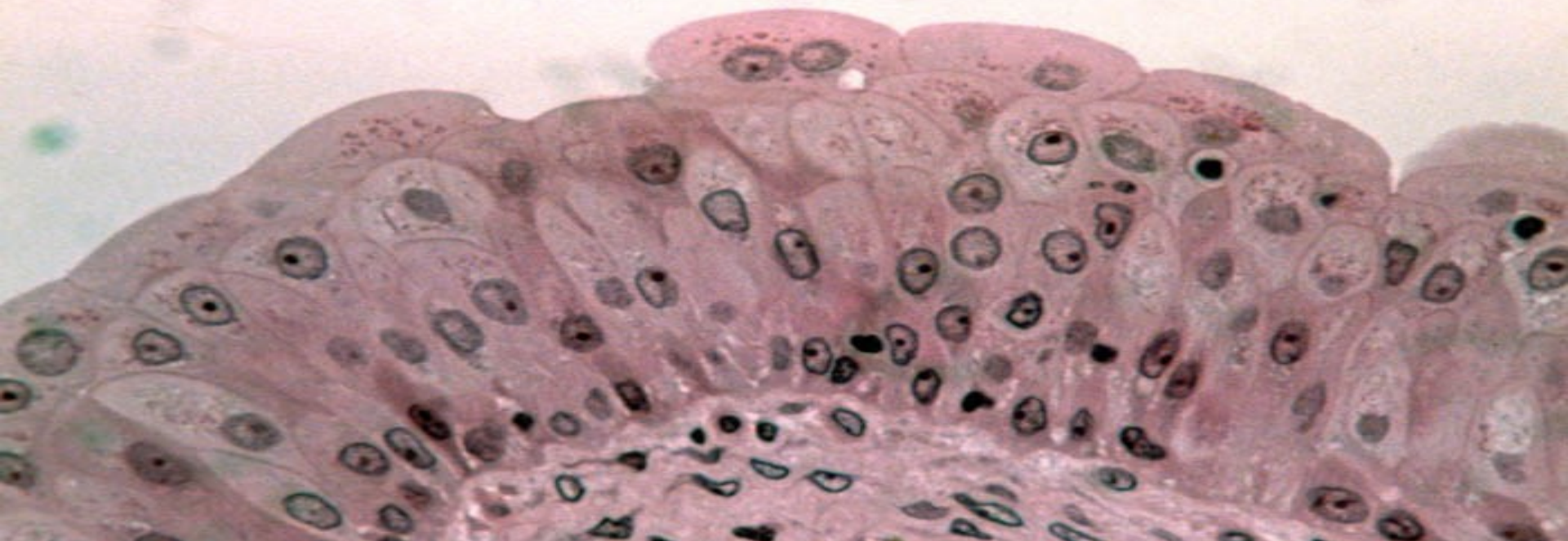
  - močový měchýř (vesica urinalis)**

  - močová roura (urethra) (ženská, mužská)**

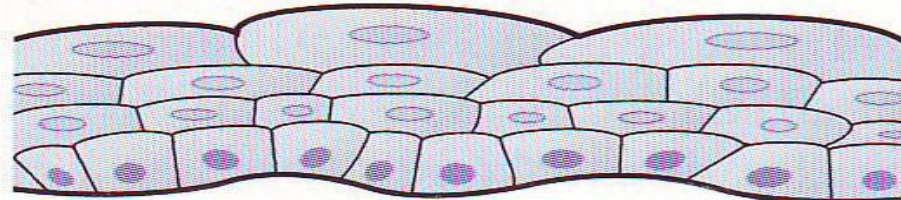


# Extrarenální vývodné cesty

- **sliznice:** epitel, lamina propria mucosae
- **tunica muscularis:** hladká svalová tkáň uspořádaná do 2 (nebo 3 – dolní 1/3 ureteru, močový měchýř) vrstev
- **adventicie**  
(močový měchýř – částečně seróza)



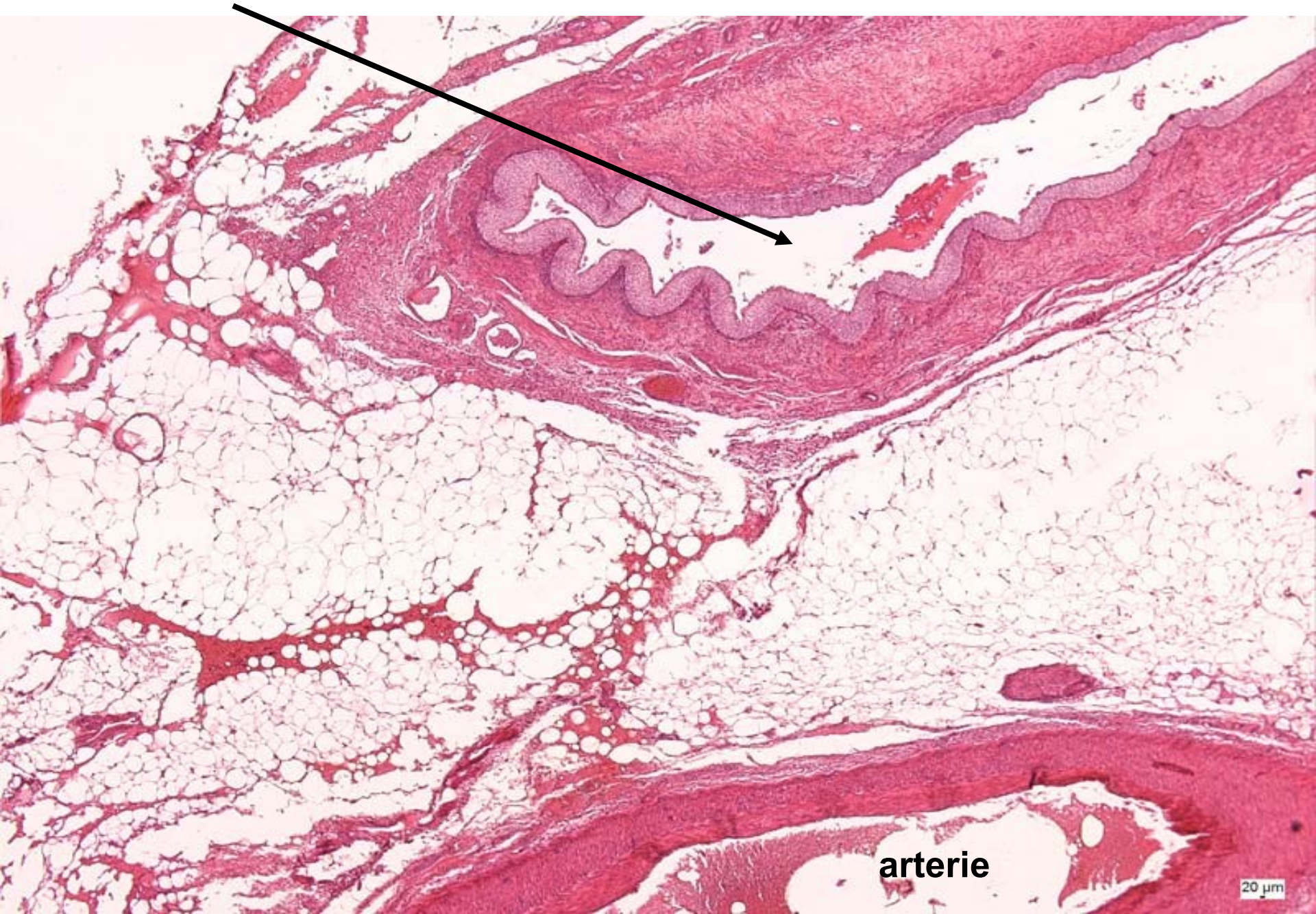
A - prázdný orgán



B - plný orgán

Přechodní epitel (kalichy a pánvička, močovod, moč. měchýř)

# Calyx renalis (HE)



arterie

20 µm

# Ureter: podélné řasy

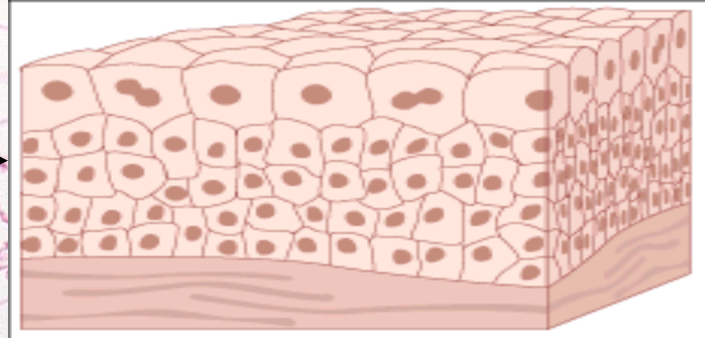
Sliznice – přechodní epitel

l. propria

Podslizniční vazivo

Zevní vrstva svalová – long., cirk., (long.)

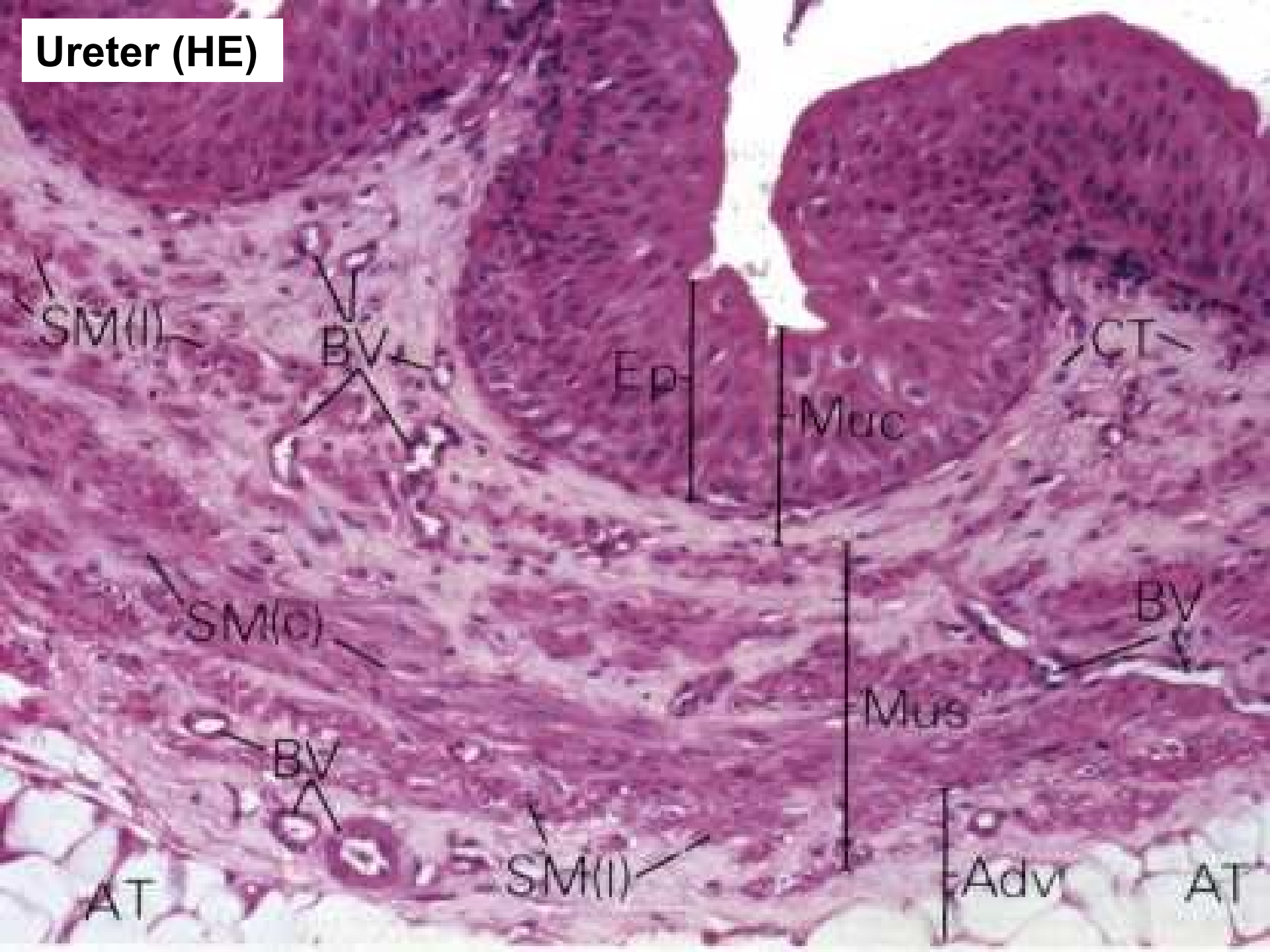
Adventicie



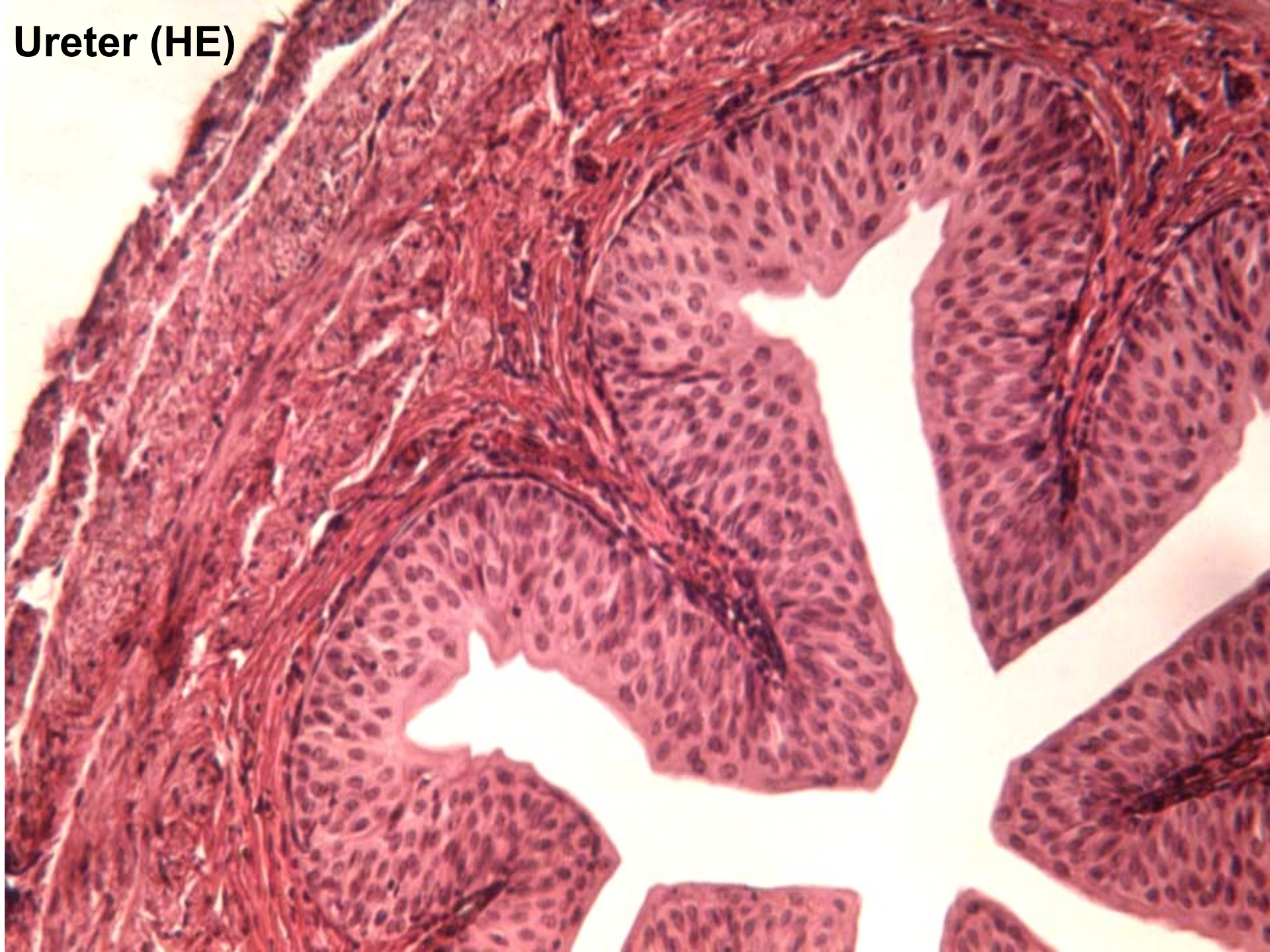
# Ureter (HEŠ)



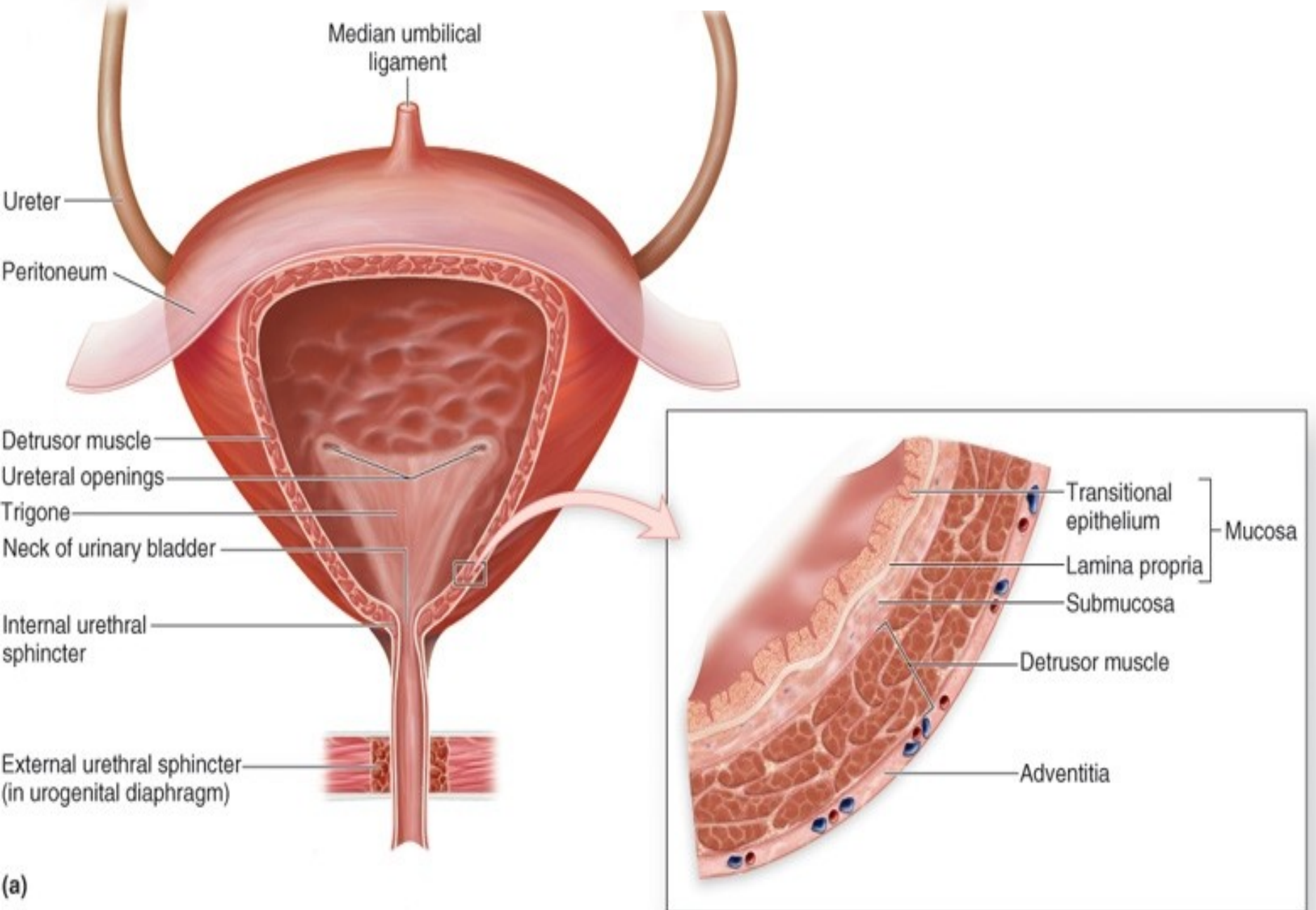
# Ureter (HE)



**Ureter (HE)**

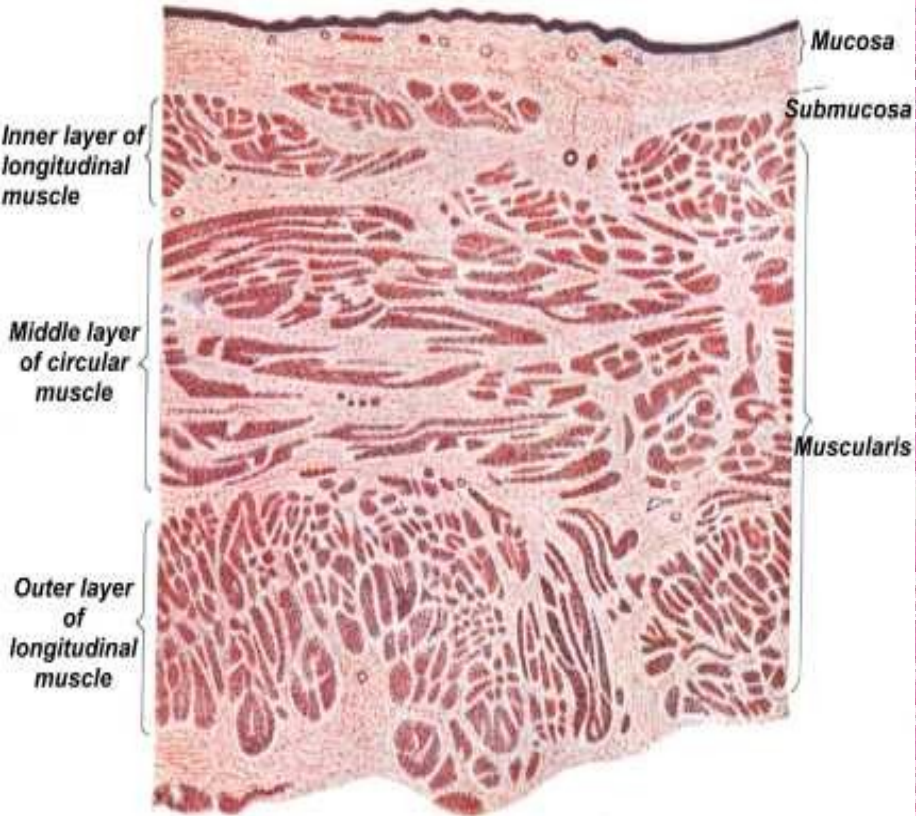


# Vesica urinialis



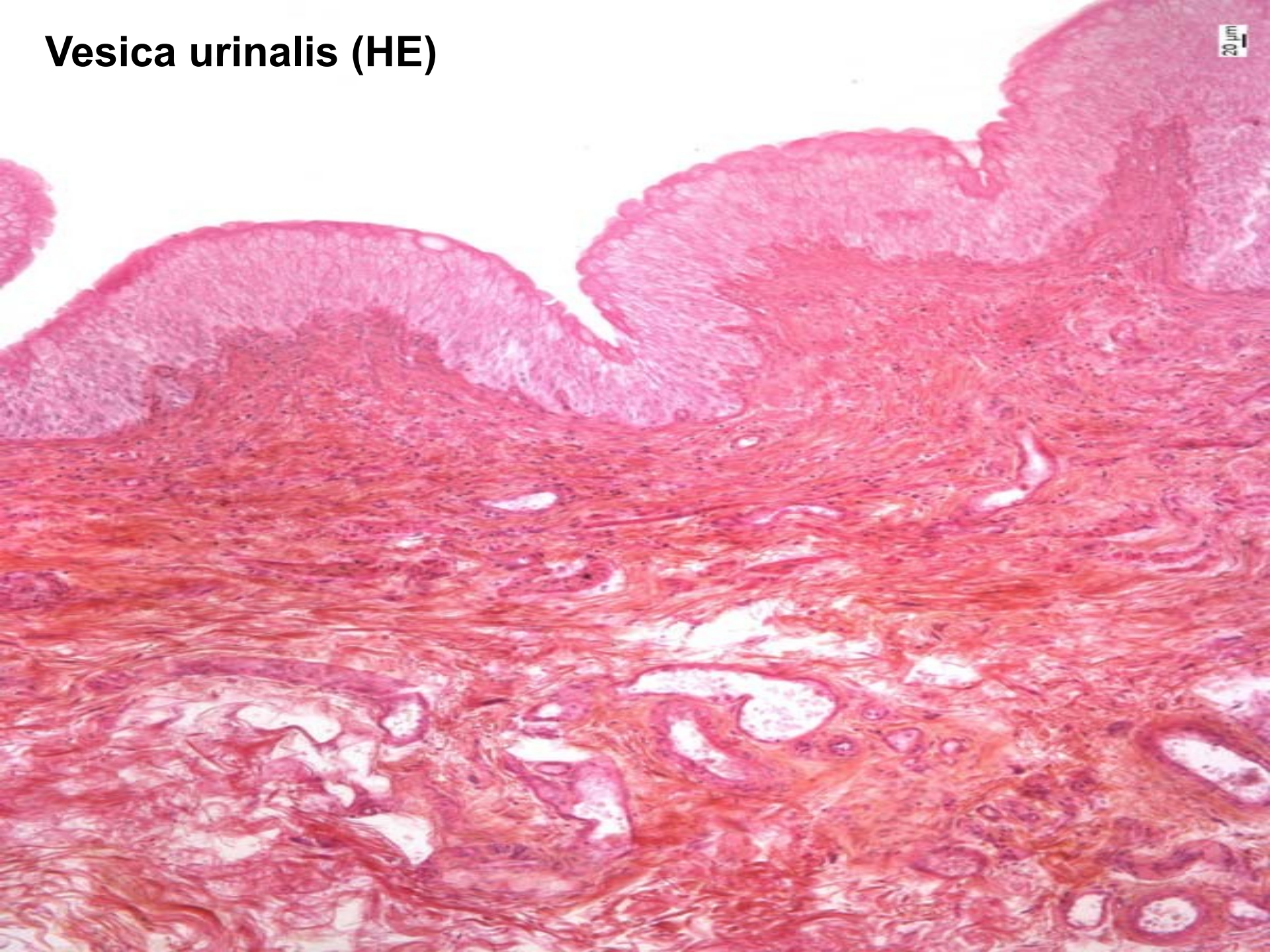


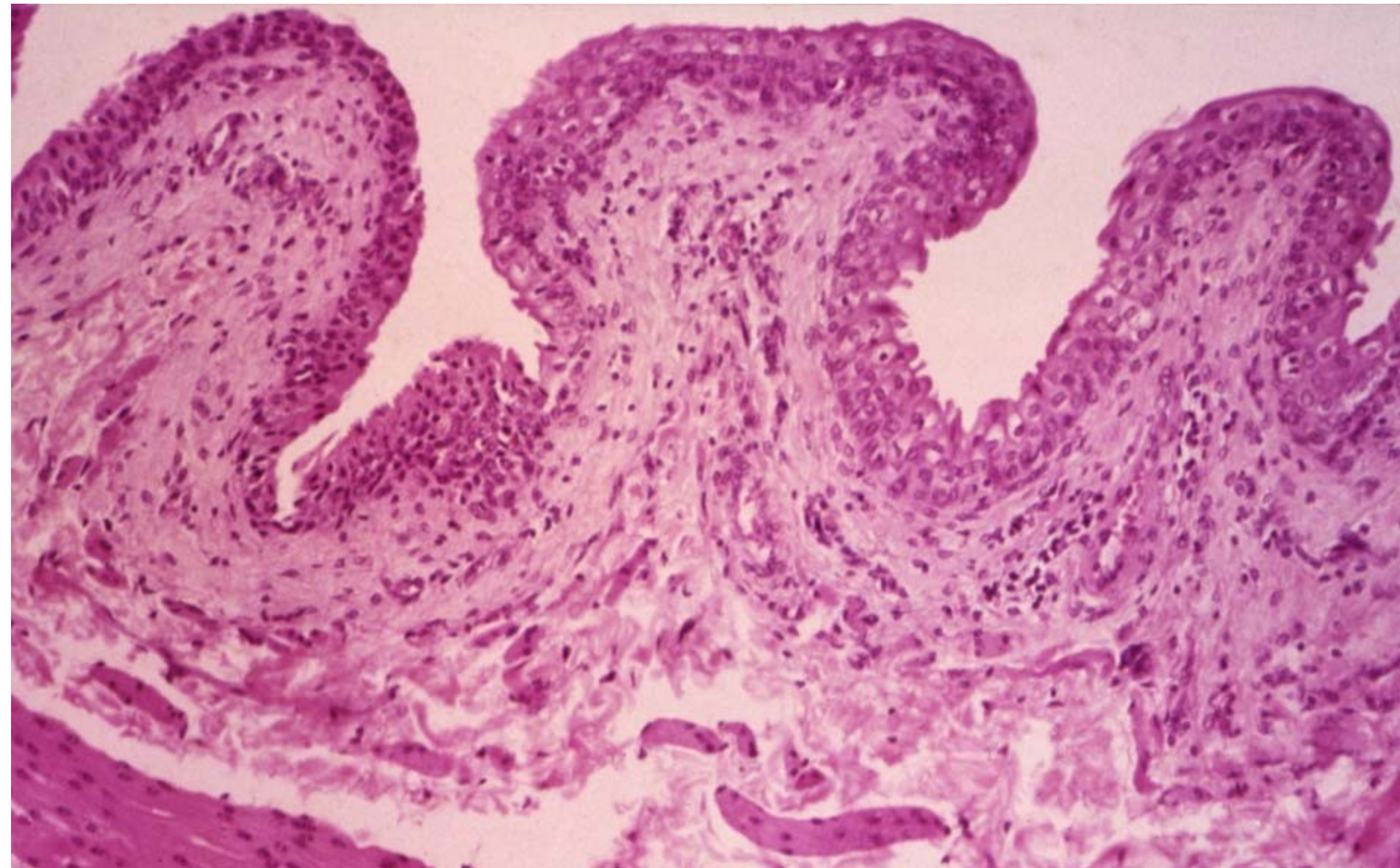
# Močový měchýř



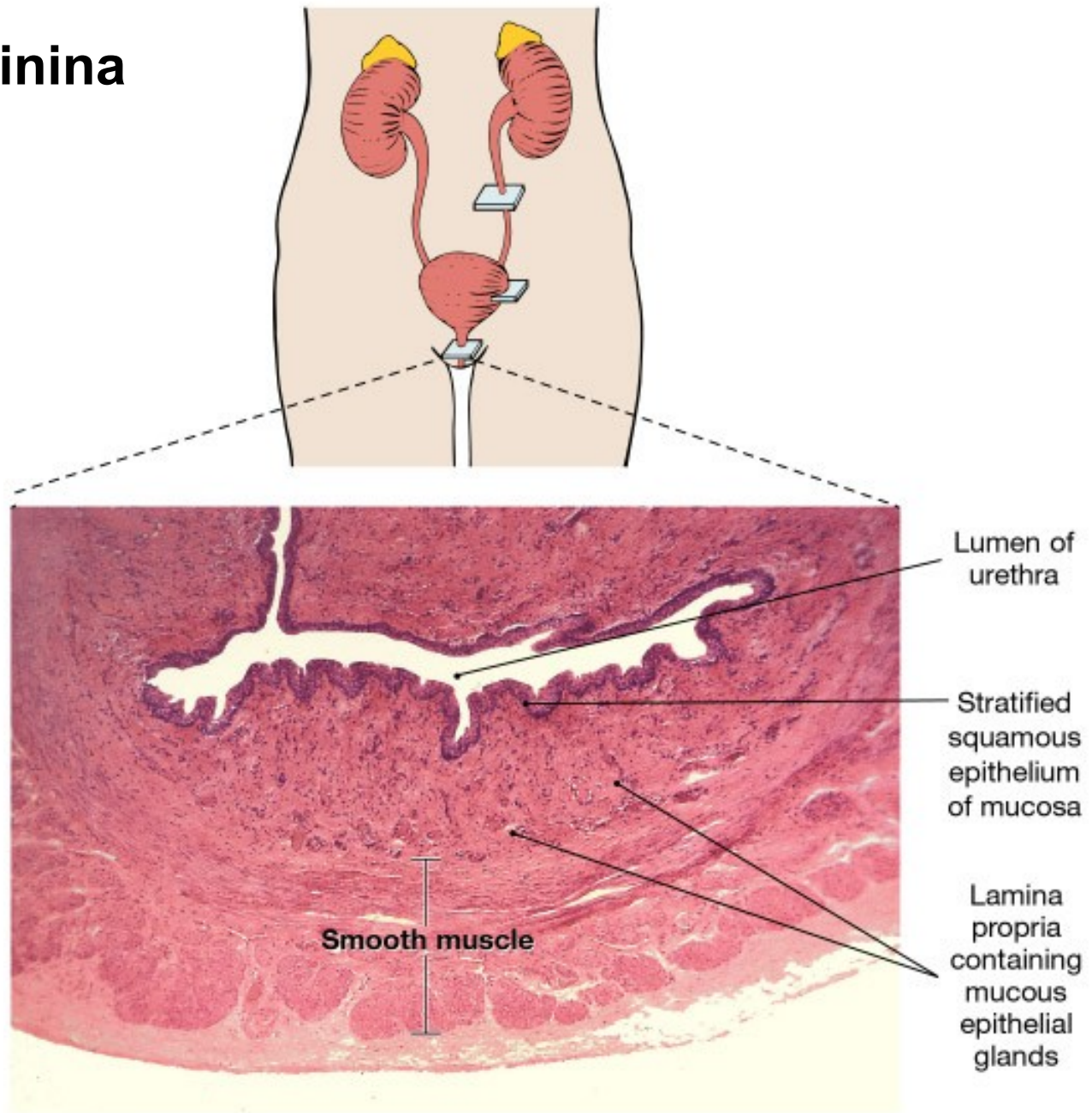
# Vesica urinalis (HE)

20  $\mu$ m



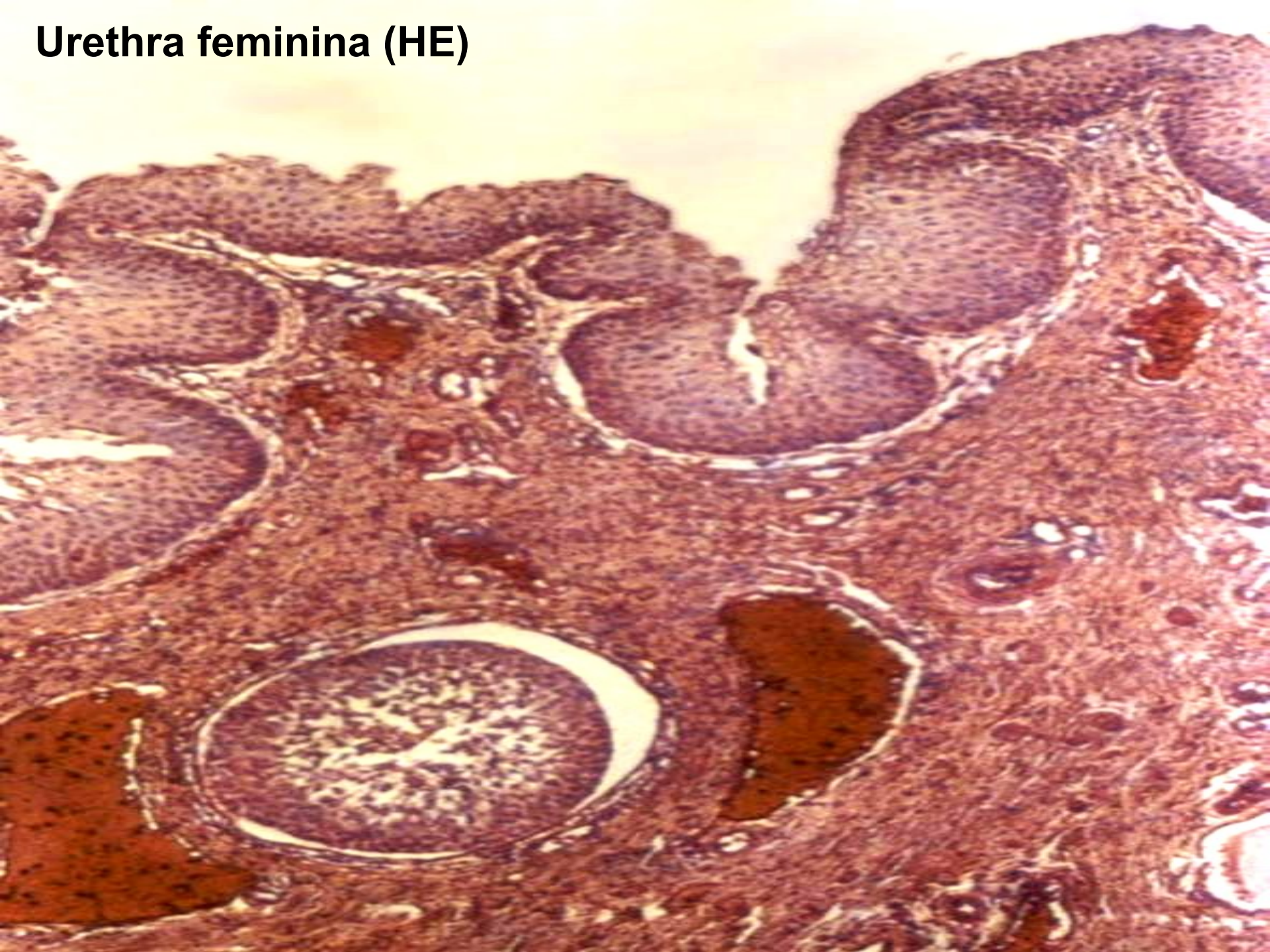


# Urethra feminina

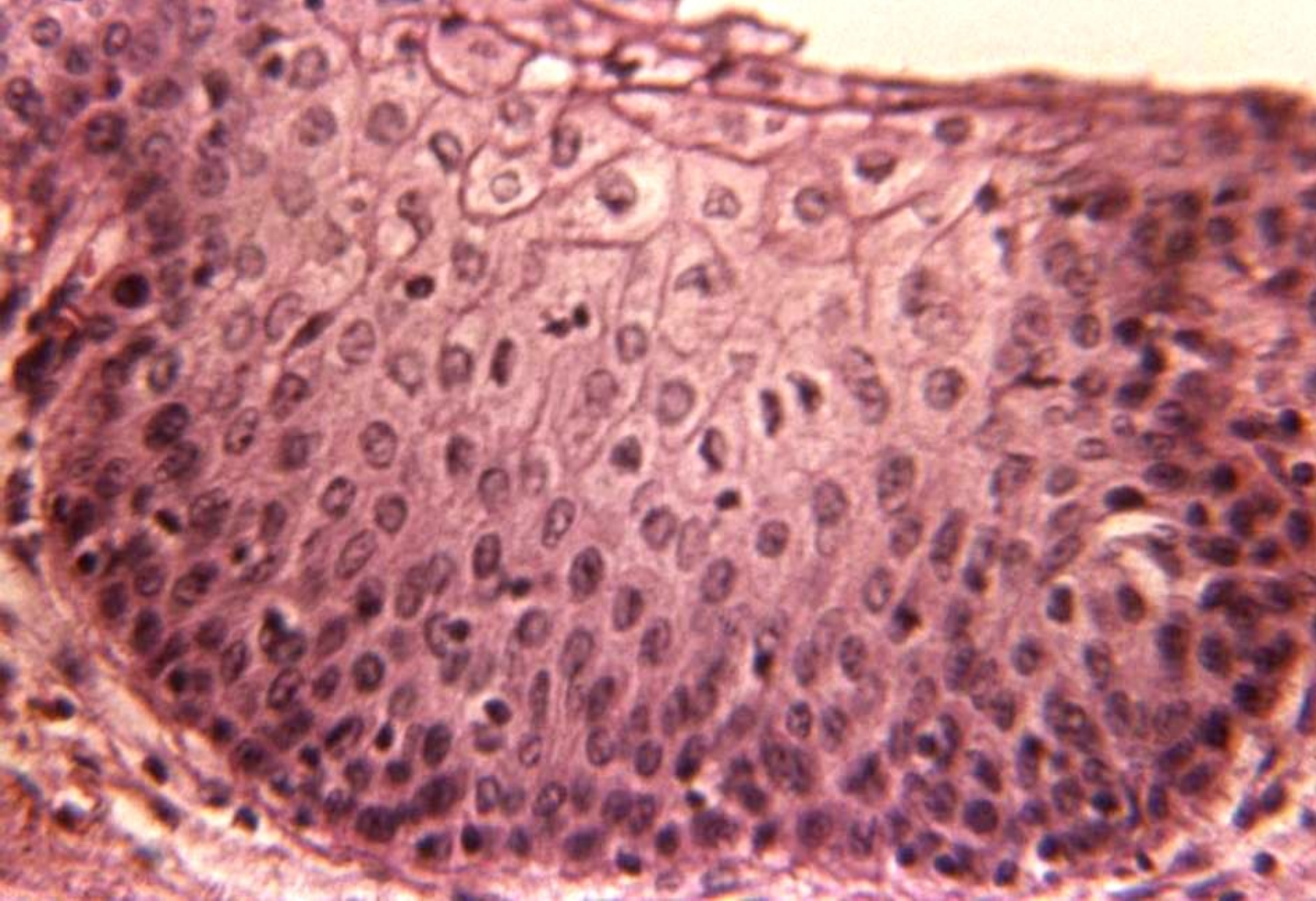


(c) Female urethra (LM × 61)

# Urethra feminina (HE)

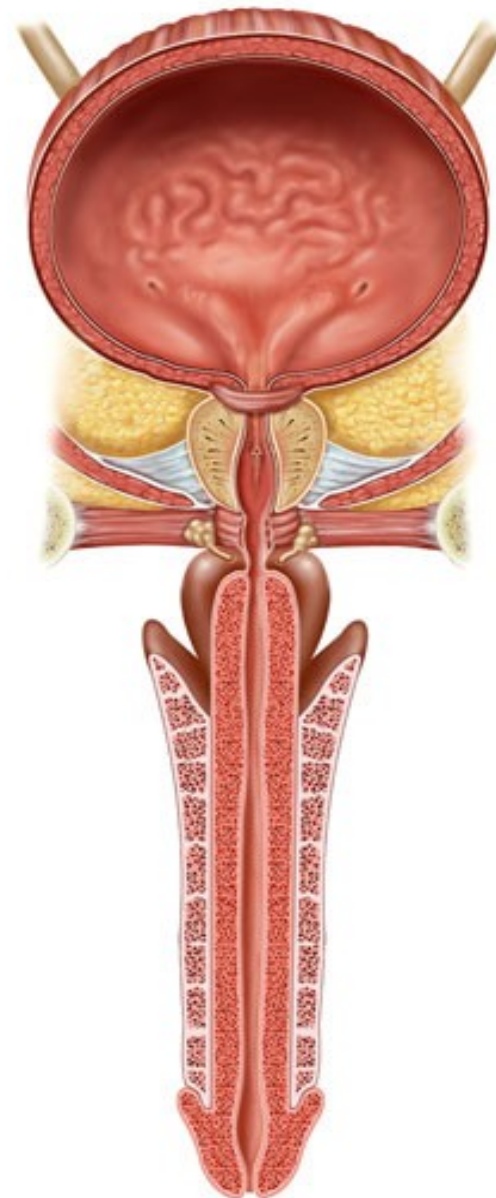


**Urethra feminina - epitel**



# Urethra masculina

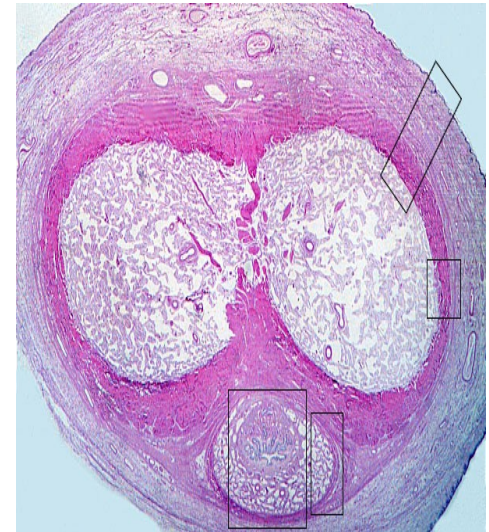
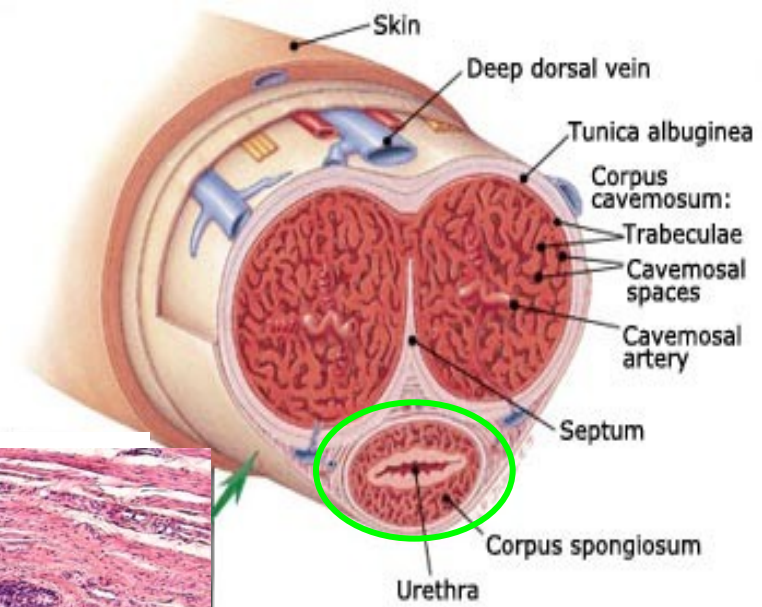
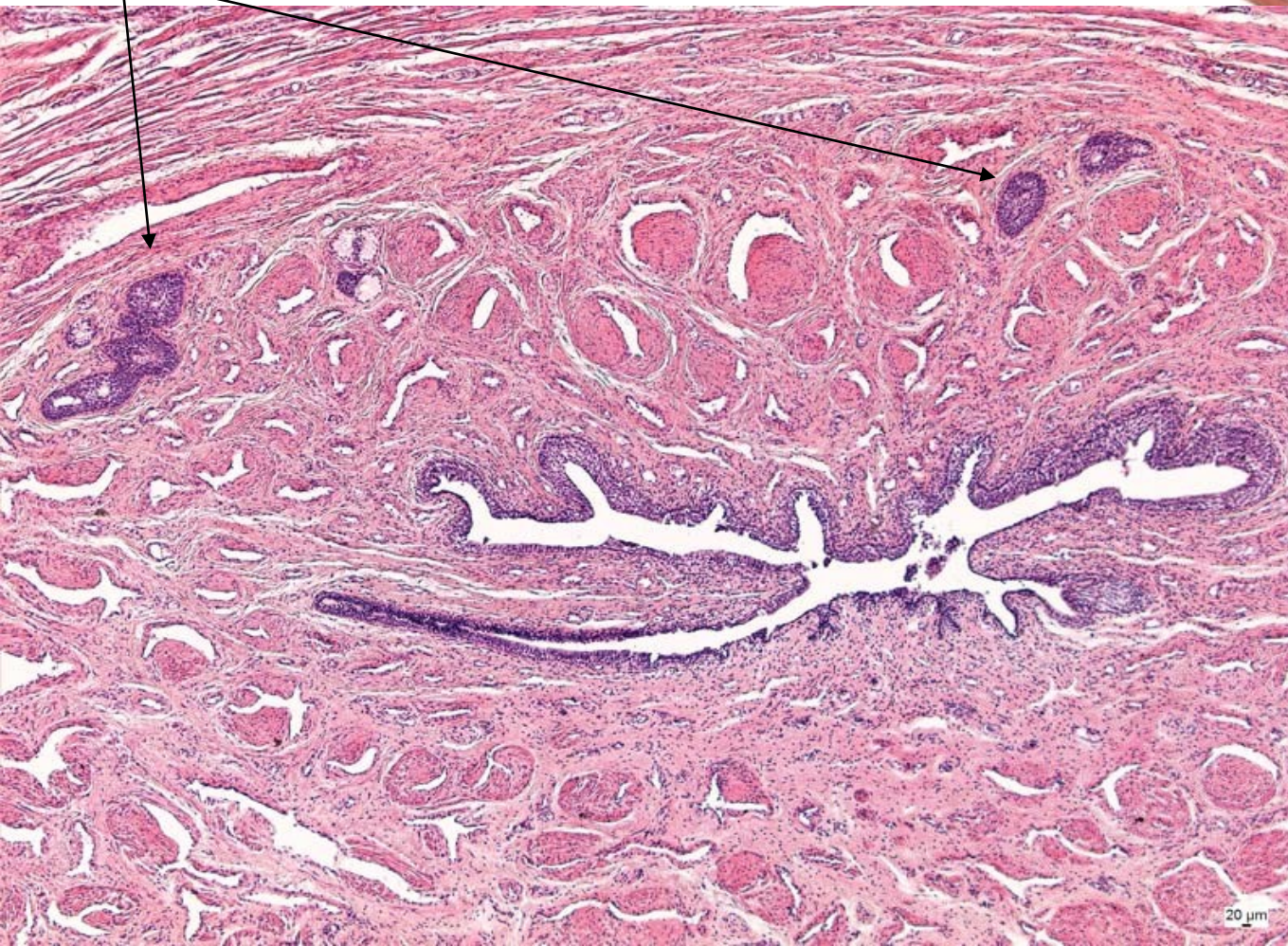
- Pars intramuralis
  - přechodní ep.
- Pars prostatica
  - přechodní ep.
  - od colliculus seminalis:
    - víceřadý cyl.ep.
- Pars diaphragmatica
  - vrstevnatý cyl. ep.
  - Tunica musc: *m. sphincter urethrae ext.*
- Pars spongiosa
  - vrstevnatý cyl. ep.
  - ve fossa navicularis:
    - vrstevnatý dlaždicový



(a) Male

# Urethra masculina – pars spongiosa

Gll. paraurethrales (Littre)

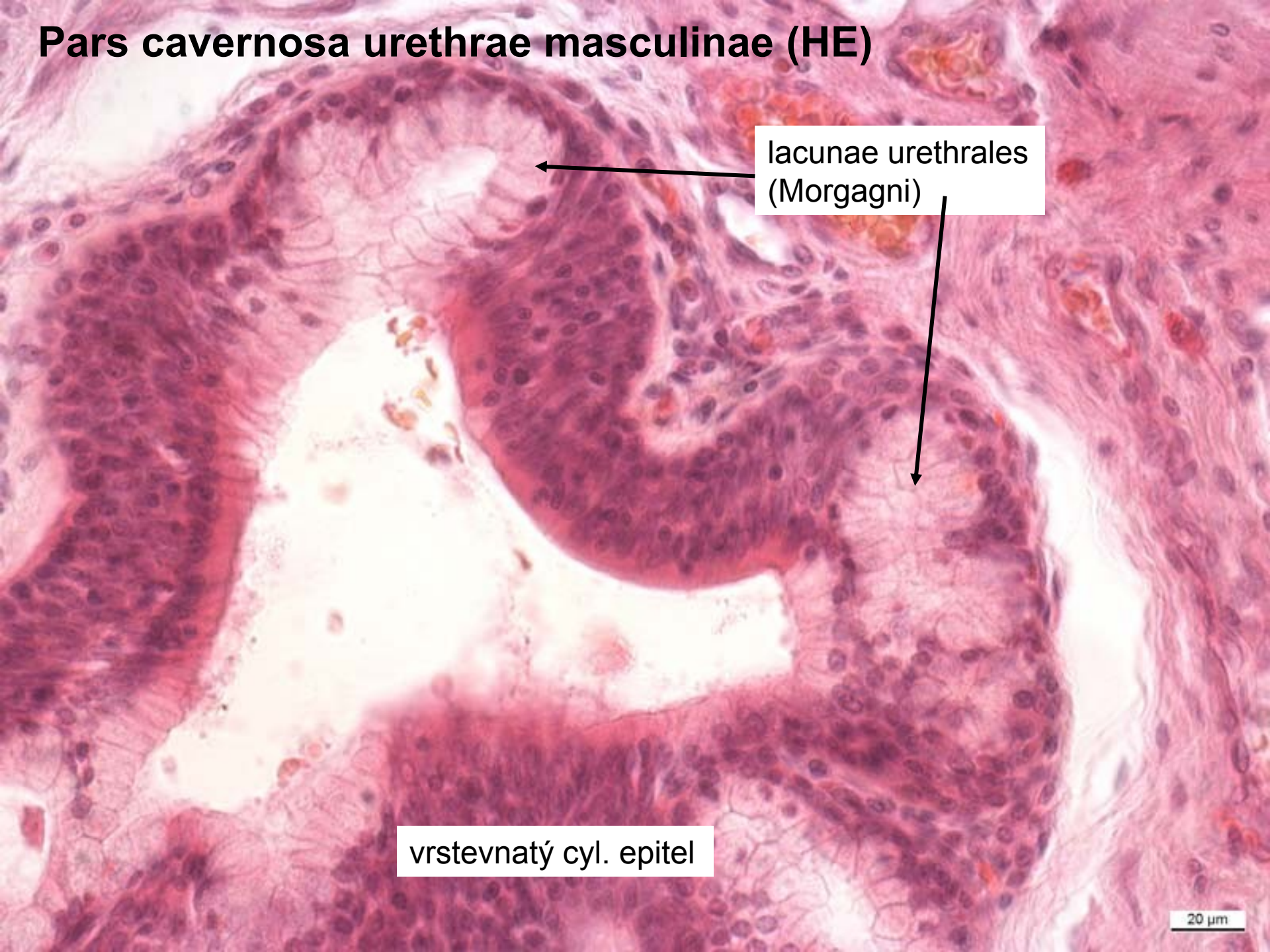


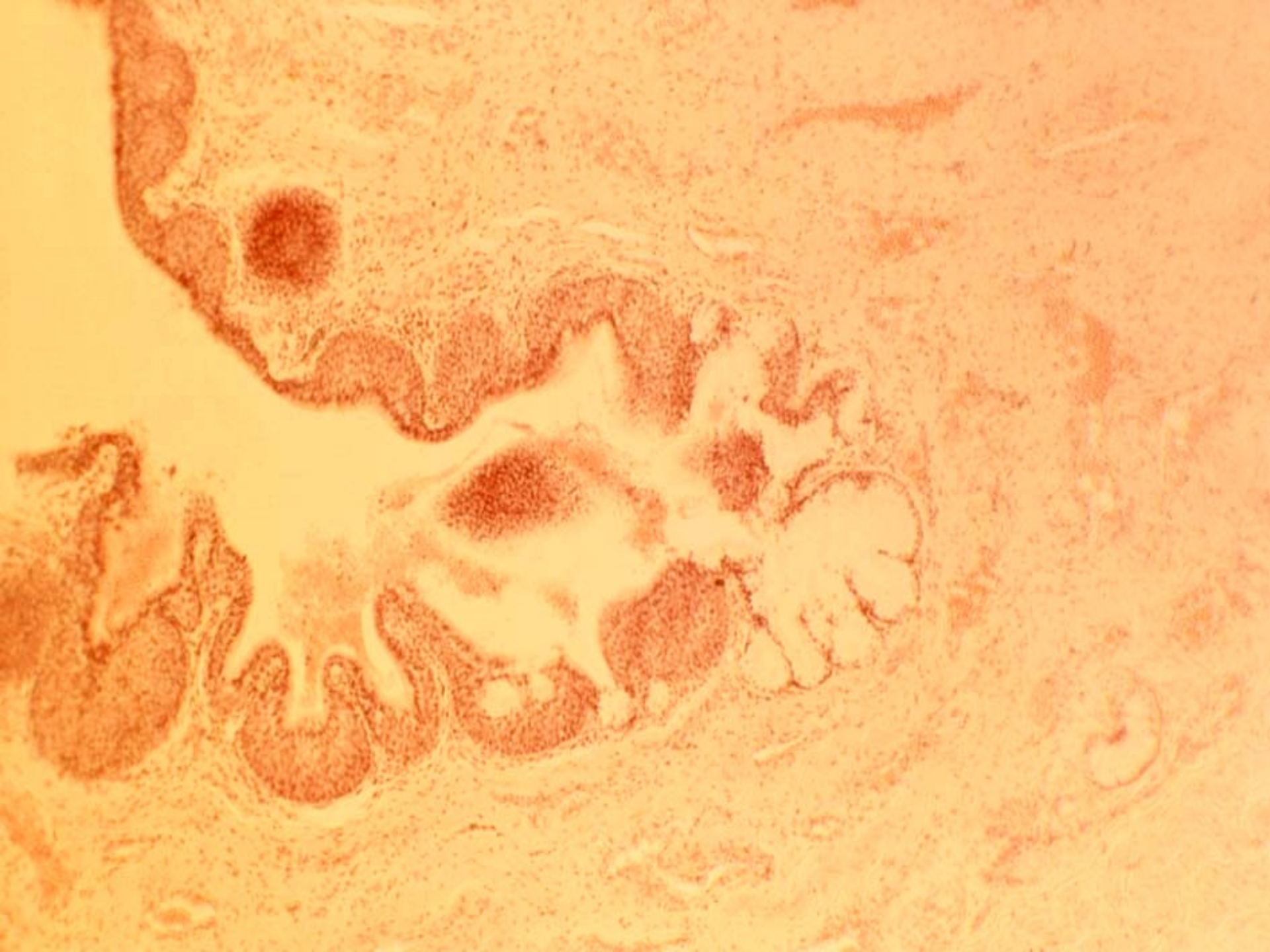


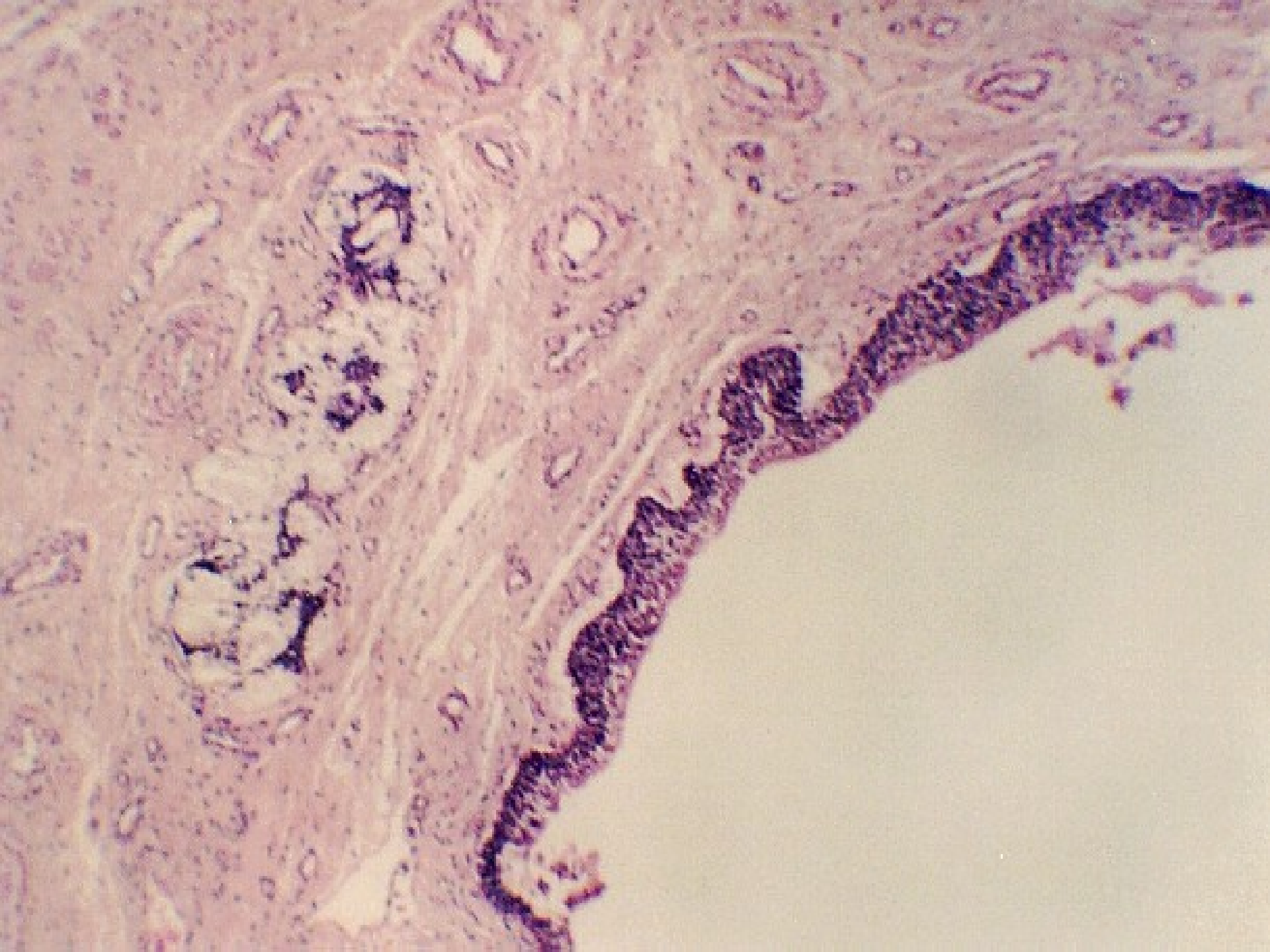
# Pars cavernosa urethrae masculinae (HE)

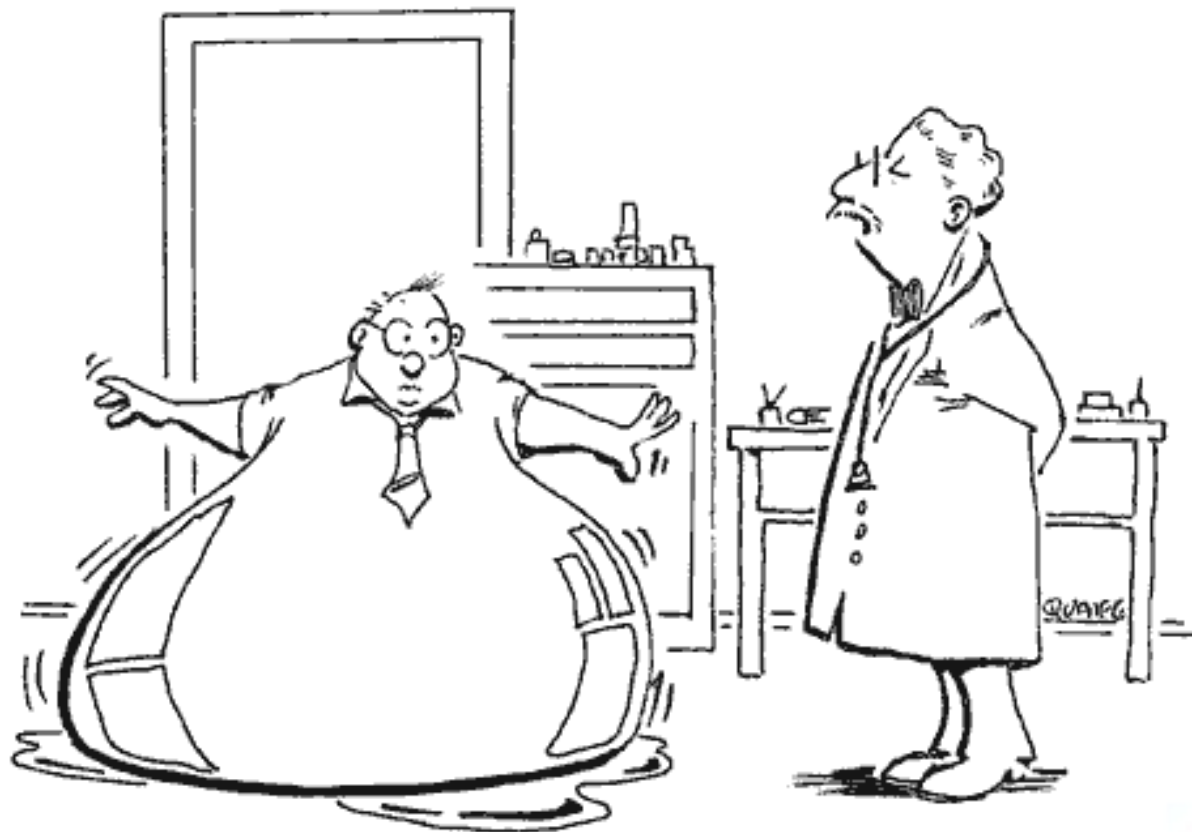
lacunae urethrales  
(Morgagni)

vrstevnatý cyl. epitel





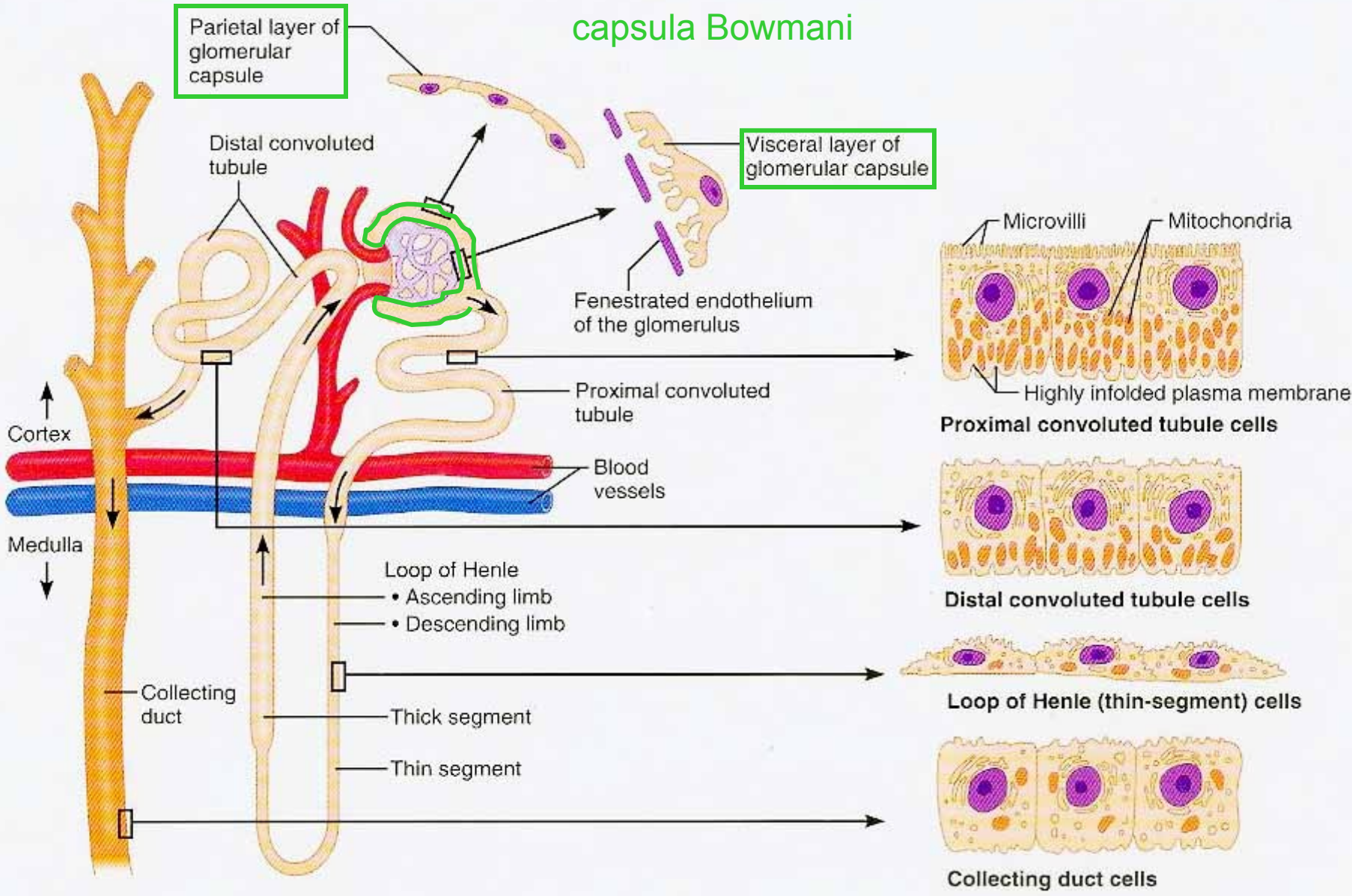




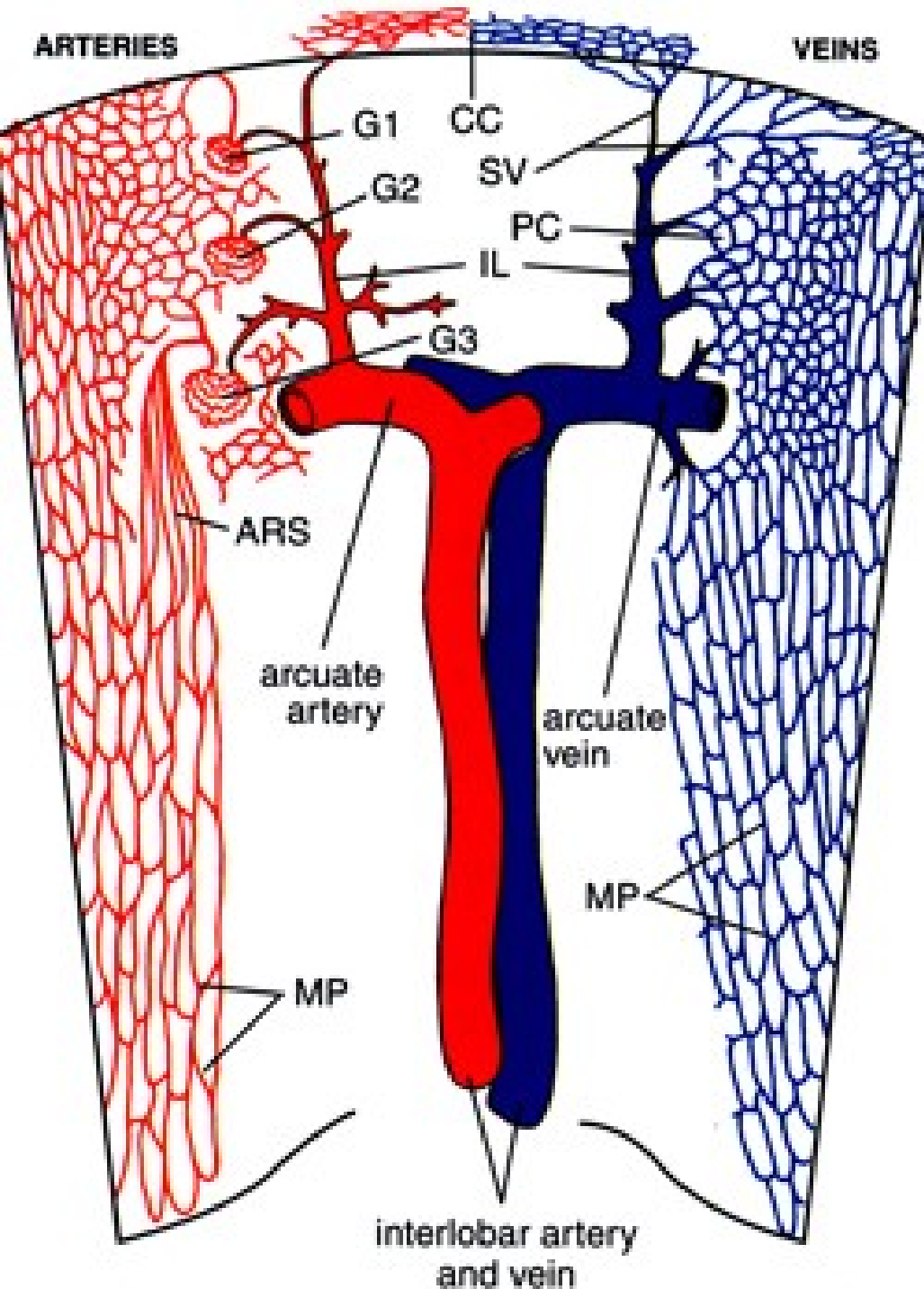
Your tests reveal that  
you are retaining fluids!

*End*

Figure 26.4b: Location and structure of nephrons, page 1008



(b)



## Krevní oběh v ledvině:

a. renalis

aa. segmentales

aa. interlobares

aa. arcuatae

aa. interlobulares

aferentní arteriola

\* glomerulus

eferentní arteriola

\* peritubulární kapilární

síť + vasa recta

vv. interlobulares

vv. arcuatae

vv. interlobares

vv. renales

(\* portální oběh)