



HISTICS

Urinary System

DONE BY

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OVERVIEW

Consists of:-

- Two kidneys
- Urinary Bladder
- Urethra

THE KIDNEY

❖ The kidney consists of:-

1. **Outer cortex** : dark brown and granular, and has:

- Renal corpuscles
- Convuluted tubules
- Medullary rays, which are straight extensions from the medulla into the cortex.

(The portion of the cortex above the base of each pyramid is known as a **cortical arch**)

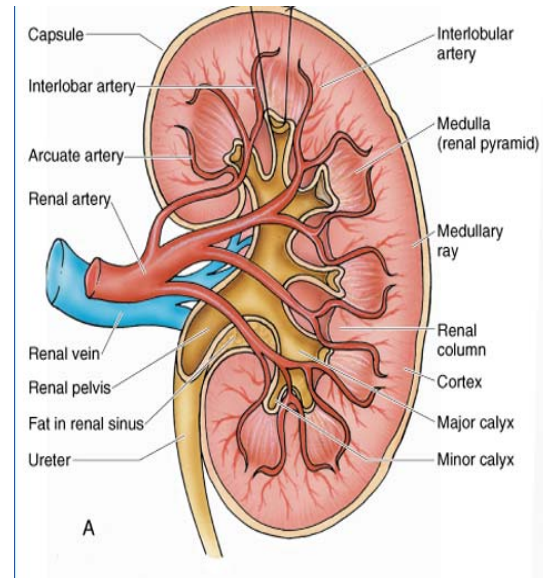
2. **Inner medulla:**

- Divided into 10-18 medullar pyramids by cortical columns,
- Cortical columns, extensions of the cortex

3. **Renal pelvis**

❖ A **renal lobe** consists of

- Renal pyramid
- Renal column
- Cortical Arch



URINIFEROUS TUBULES

❖ **Uriniferous Tubules:** The functional unit of the kidney.

❖ Consists of:

1. **Nephron**
 2. **Collecting duct**
- separated by the stroma and basal lamina

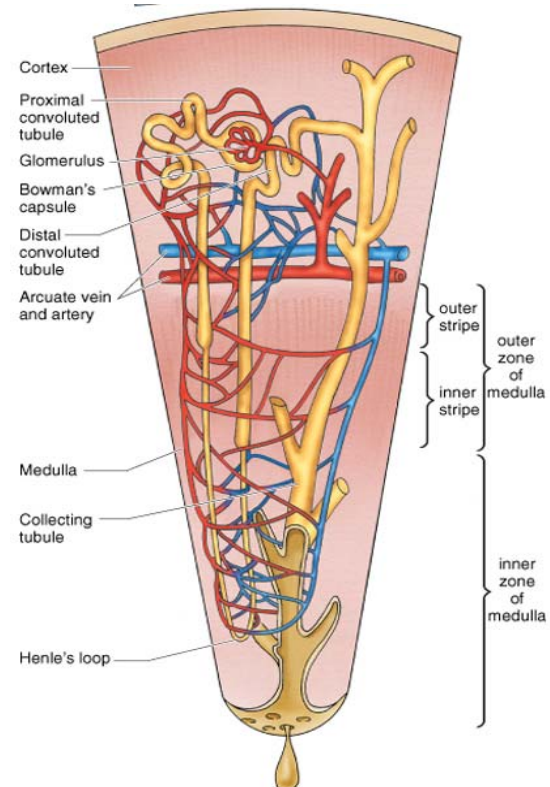
1. THE NEPHRON

❖ **The nephron:** an epithelial tubule consisting of the following parts:-

1. Renal corpuscle (*in cortex*)
2. Proximal convoluted tubule (*in cortex*)
3. Descending thick limb (*in medullary ray*)
4. Descending thin limb (*in medulla*)
5. Loop of Henle (*in medulla*)
6. Ascending thin limb (*in medulla*)
7. Ascending thick limb (*in medullary ray*)
8. Distal tubule (*in cortex*)

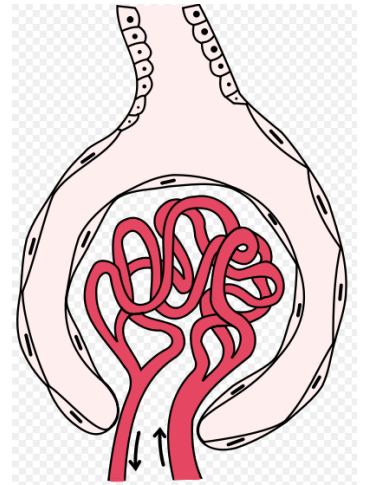
❖ Nephrons are of two types:

- **Cortical nephrons:** renal corpuscle in the outer part of the cortex & short loop of Henle in the medulla.
- **Juxta-medullary nephrons:** renal corpuscle near the corticomedullary junction & long loop of Henle.



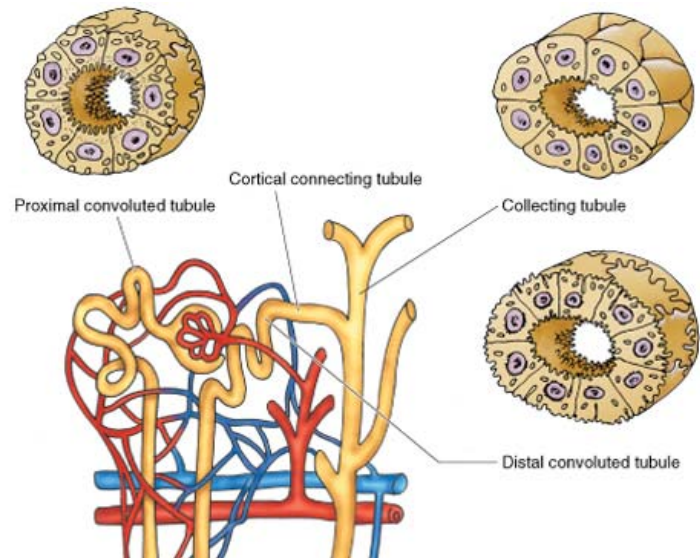
RENAL CORPUSCLE

- ❖ Composed of a **glomerular capillaries** surrounded by **Bowman's capsule**
 - **Glomerulus:** fenestrated blood capillaries supplied by afferent arteriole and drained by efferent arteriole
 - Glomerulus is composed of:
 - Fenestrated capillaries (fenestration without diaphragm)
 - Basal lamina (filtration barrier)
 - Cells (**podocytes** and **mesangial cells**)
 - ◆ **podocytes** surround the basal lamina of the glomerular capillaries.
 - They have primary (*major*) & secondary (*minor*) cytoplasmic processes
 - Between the processes are the filtration slits covered with diaphragm.
 - ◆ **Mesangial Cells:** Located between the endothelium & the basal lamina of the glomerular capillaries.
 - They are supporting, contractile and phagocytic.
 - They can be extraglomerular or intraglomerular.



PROXIMAL CONVOLUTED TUBULES (PCT)

- ❖ Sections of PCT are more than those of distal tubule because PCT is longer than the distal tubule DCT.
- ❖ **Acidophilic** large simple cuboidal cells with **microvilli** (brush border) forming irregular lumen.
- ❖ Few nuclei appear in section of PCT because the cells are larger.
- ❖ lateral cell membrane is indistinguishable

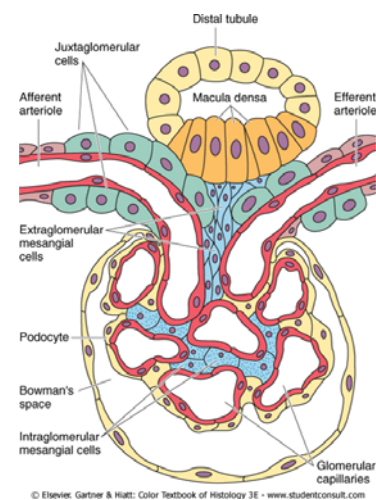


DISTAL CONVOLUTED TUBULES (DCT)

- ❖ Simple cuboidal epithelium.
- ❖ Smaller cells and more nuclei in sections than PCT.
- ❖ Clearly defined lumen without brush border.

JUXTAGLOMERULAR APPARATUS

- ❖ Found near Bowman's capsule & Consists of 3 types of cells:-
 - **Juxtaglomerular cells:** modified smooth muscle cells of the afferent arteriole secreting the enzyme rennin
 - **Macula densa:** cells of DCT in contact with juxtaglomerular cells without a basal lamina
 - **Extraglomerular mesangial cells:** supporting cells between the afferent & efferent arterioles & macula densa



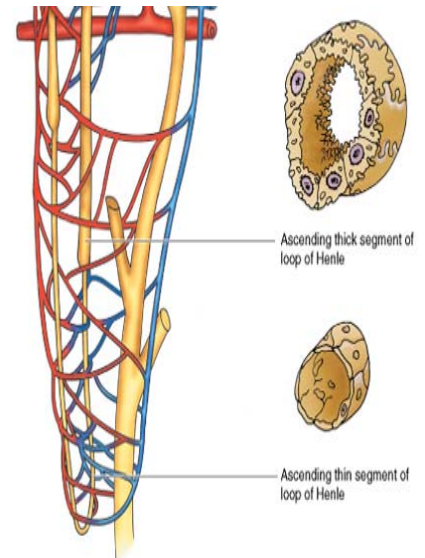
2. COLLECTING TUBULES

- Cortical collecting tubules (*in medullary ray*), which join to form:
- Medullary collecting tubules (*in the medulla*), which join to form:
- Papillary collecting duct of Bellini (*in the deep part of the medulla called renal papilla*)
- ❖ Ducts of Bellini open into the renal pelvis .
- ❖ Simple cuboidal epithelium with 2 types of cells: **Principal** and **Intercalated** cells.
 - Impermeable to water except with ADH

MEDULLA

1. **Ascending and descending thin limbs of loop of Henle** (*simple squamous epithelium*).
2. **The medullary collecting tubules** (similar to the cortical collecting tubules (*simple cuboidal epithelium with clear cell boundaries*)).
3. **Papillary collecting ducts of Bellini** (*tall columnar epithelium with clear cell boundaries*)
4. **Vasa recta:** descending arterioles and ascending venules :(*simple squamous epithelium*).

- ❖ **Renal intersitium:** very flimsy, scanty amount of C.T. that contains:
 1. **fibroblast**
 2. **macrophage**
 3. **interstitial cell:** secrete medullin I, which is converted to medullin II in the liver. It lowers the blood pressure



RENAL PELVIS

- ❖ **Renal pelvis:** a central branched chamber which receives the urine & opens into the ureter through 3 or 4 major calyces which drain each into 3 or 4 minor calyces
- ❖ The renal pelvis is lined by **transitional epithelium**.

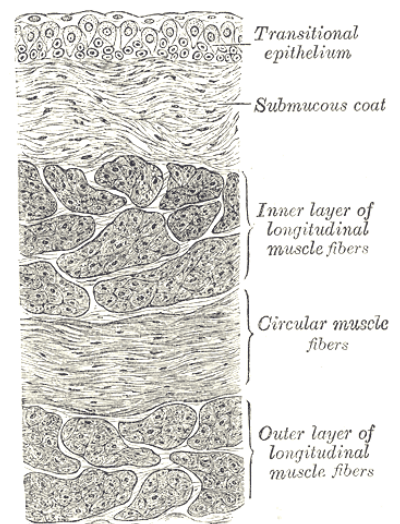
THE URETER

- ❖ **Mucosa:**
 - **Transitional epithelium.**
 - Lamina propria
- ❖ In the *upper* part, the **muscularis externa** has 2 layers of **smooth muscle**
 - inner longitudinal
 - outer circular.
- ❖ In the *lower* part it has 3 layers
 - inner longitudinal
 - middle circular
 - outer longitudinal.
- ❖ **Adventitia** is outer most CT layer.



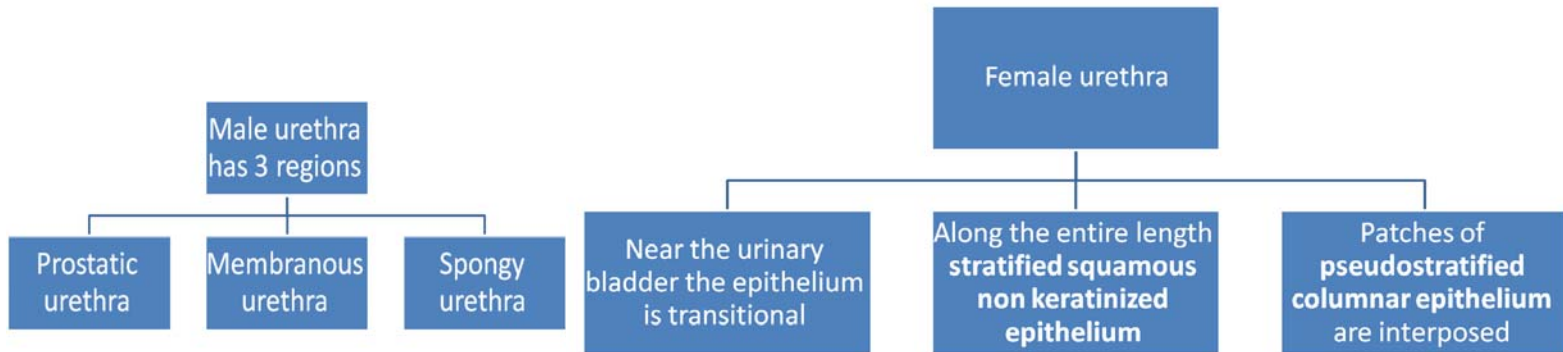
THE URINARY BLADDER

- ❖ **Mucosa:**
 - **Transitional epithelium.**
 - **Lamina propria** may contain mucous glands near the opening of the urethra .
 - ❖ Smooth muscle of the **muscularis externa** forms the internal urethral sphincter
 - 3 muscular layers
 - ❖ **Adventitia** is the outermost CT layer (serosa on the superior surface)
- So same structure as ureter except:
- dome shaped cell have plaques,
 - between plaques there are normal cell membrane



THE URETHRA

- As the urethra pierces the perineum skeletal muscle fibers form **external sphincter muscle**.
- **smooth muscle layers:**
 - inner longitudinal
 - outer circular
- Subepithelial fibroelastic CT that contains glands of Littre (mucos secreting gland)



- ❖ **Prostatic Urethra:** Transitional epithelium
- ❖ **Spongy urethra (penile urethra)**
 - Stratified columnar epithelium.
 - patches of pseudostratified columnar epithelium
 - Enlarged terminal part in the glans penis (navicular fossa) lined by stratified squamous non keratinized epithelium.
- ❖ Lamina propria for all of them is loose fibroelastic connective tissue with glands of Littre