Anatomy of the urinary system

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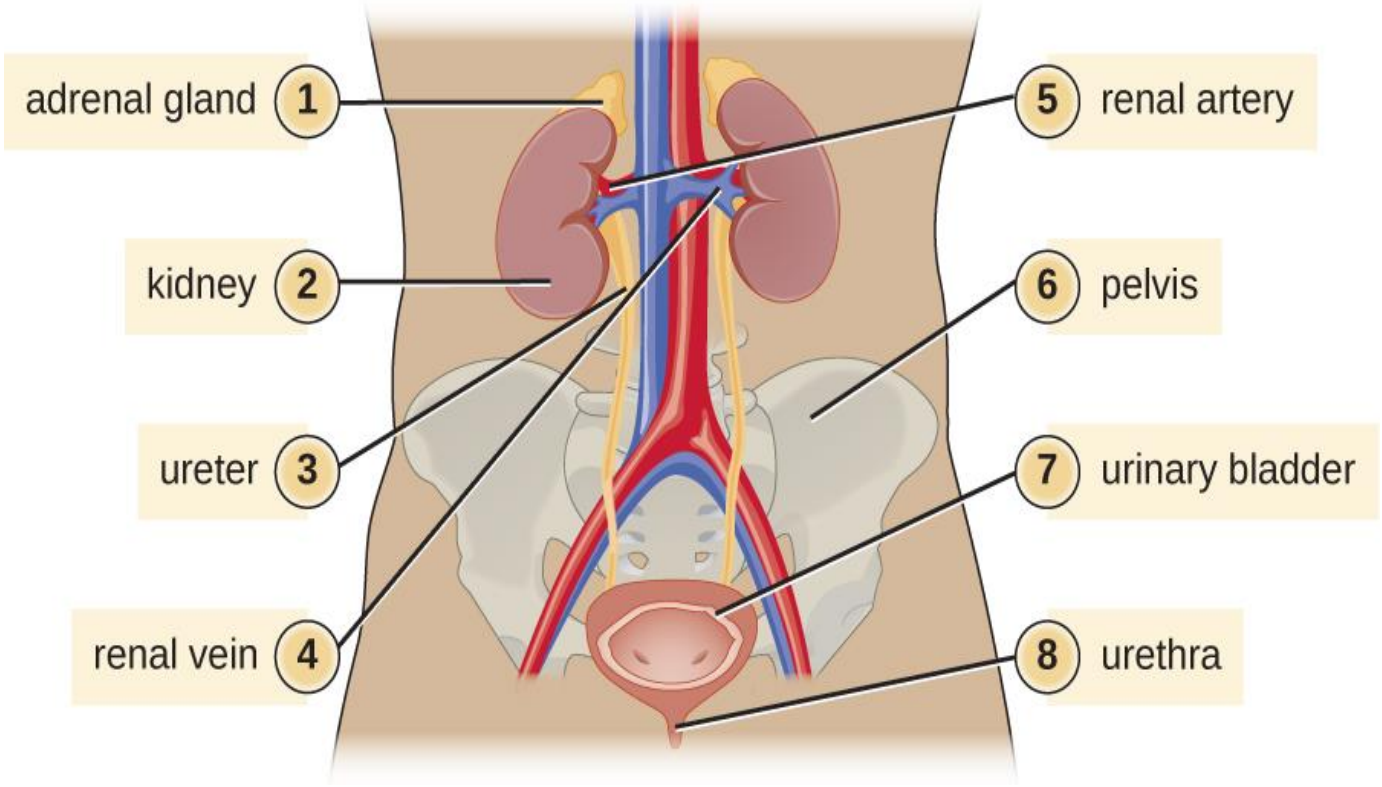
Lecture 6 Mohammed Faris

The objective of this lecture

1. Define the **Urinary System**.
2. Identify the function and major parts of the human urinary system.
3. Describe the kidney, including its gross internal structure and the structure of the nephron.
4. Describe the ureters, the urinary bladder, and the urethra.

The Urinary System

The urinary system's function is to filter blood and create urine as a waste by-product. The urinary system organs include the two kidneys, renal pelvis, two ureters, bladder, and urethra.

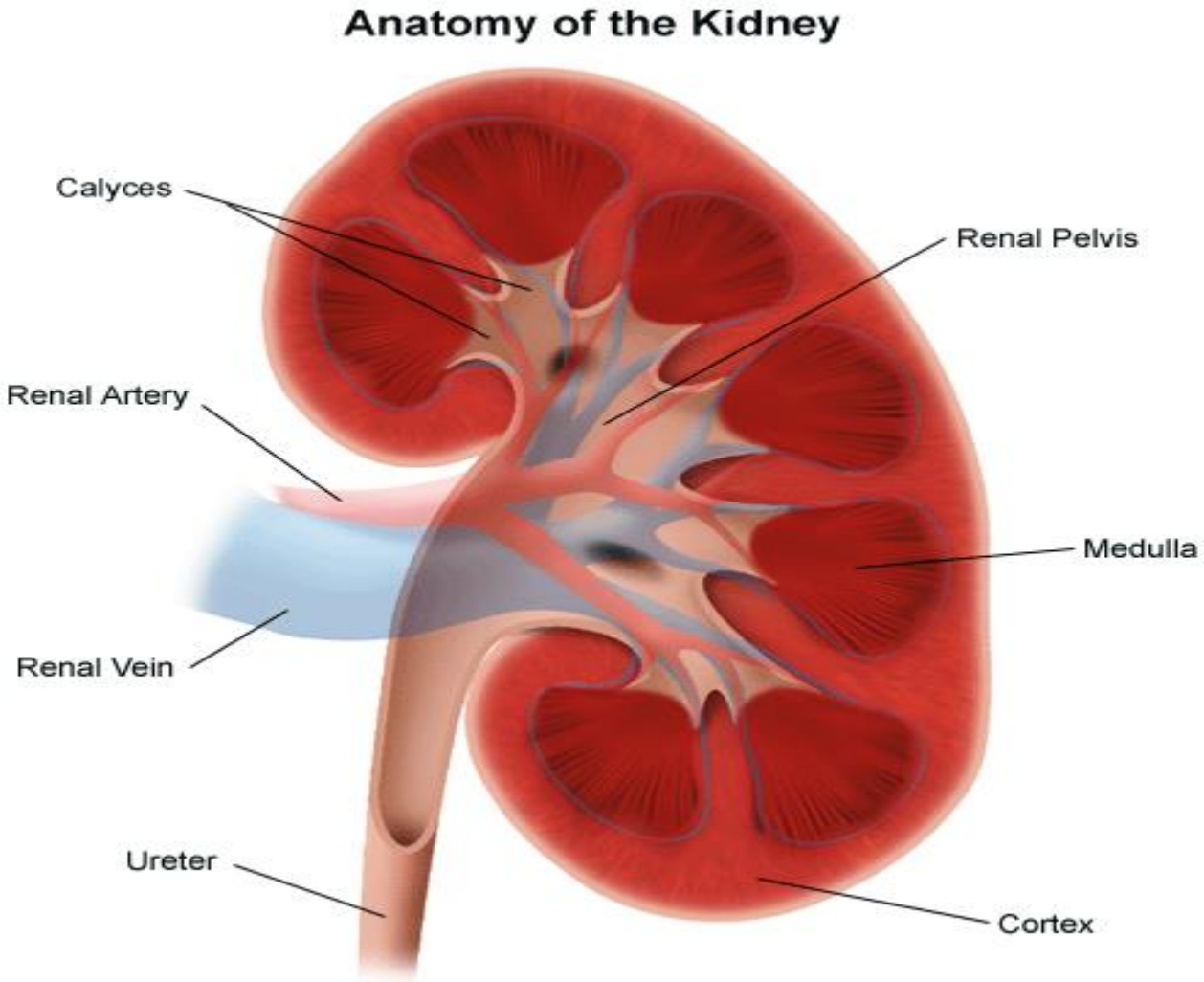


<u>The Kidneys</u>:

- The kidneys are solid, bean-shaped organs.
- Located below the ribs toward the middle of the back.
- The right kidney is positioned slightly lower than the left.
- Each of which is about 11 cm long, 6 cm wide, 3 cm thick.
- The average weight is 150 gm in male & 135 gm in female
- Each kidney has a lateral convex & medial concave border.

- Each kidney has a fibrous capsule. On the concave, each kidney's medial side is called the hilus, which contains renal blood vessels and nerves.
- Medial to the hilum is the renal pelvis, a flat funnel-shaped structure that continues with the upper end of the ureter.

- The kidneys remove urea from the blood through tiny filtering units called nephrons. Each nephron consists of a ball formed of small blood capillaries, called a glomerulus, and a small tube called a renal tubule.



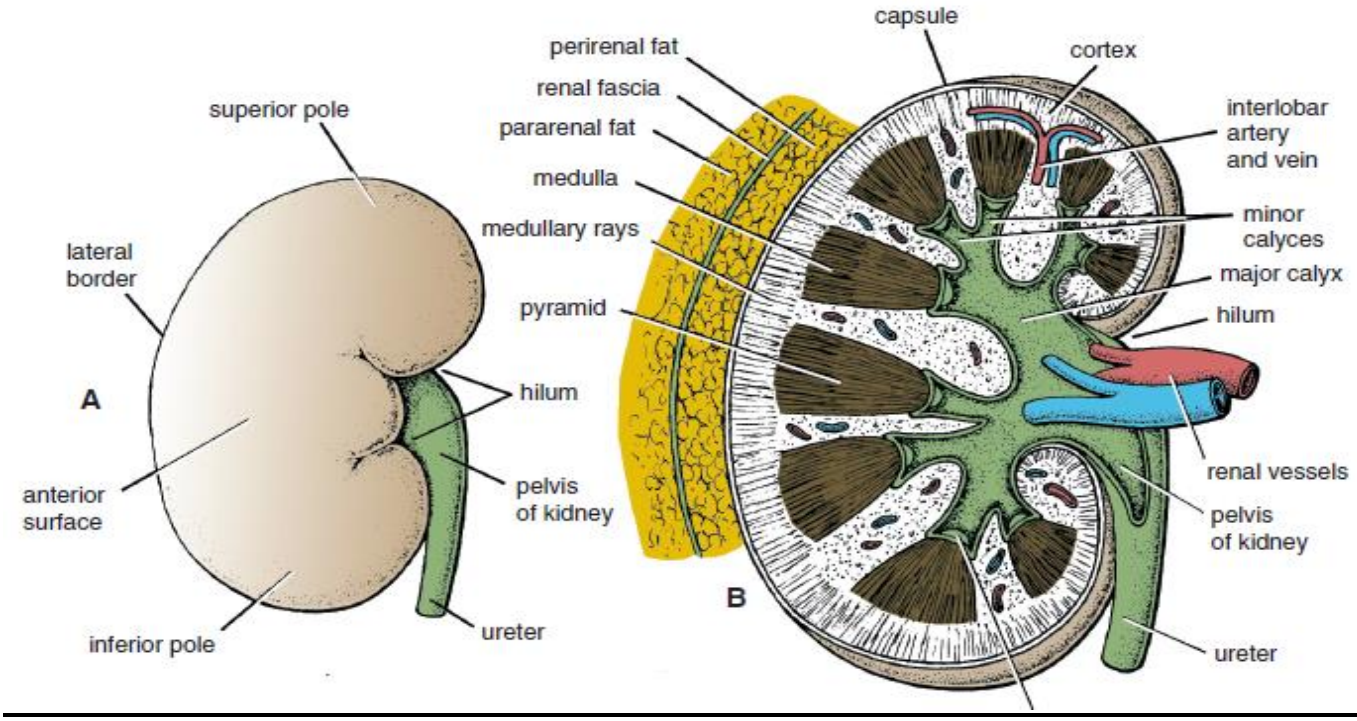
The function of the kidney

- Remove waste products and drugs from the body.
- Balance the body's fluids.
- Release hormones to regulate blood pressure.
- Control production of red blood cells

Coverings of kidneys:

The kidneys have the following coverings:

1. **Fibrous capsule:** This surrounds the kidney and is closely applied to its outer surface.
2. **Perirenal fat:** This covers the fibrous capsule.
3. **Renal fascia:** This is a connective tissue that lies outside the perirenal fat and encloses the kidneys and suprarenal glands.
4. **Pararenal fat:** This lies external to the renal fascia and is often in large quantities.



When a kidney is cut lengthwise, 2- regions become apparent.

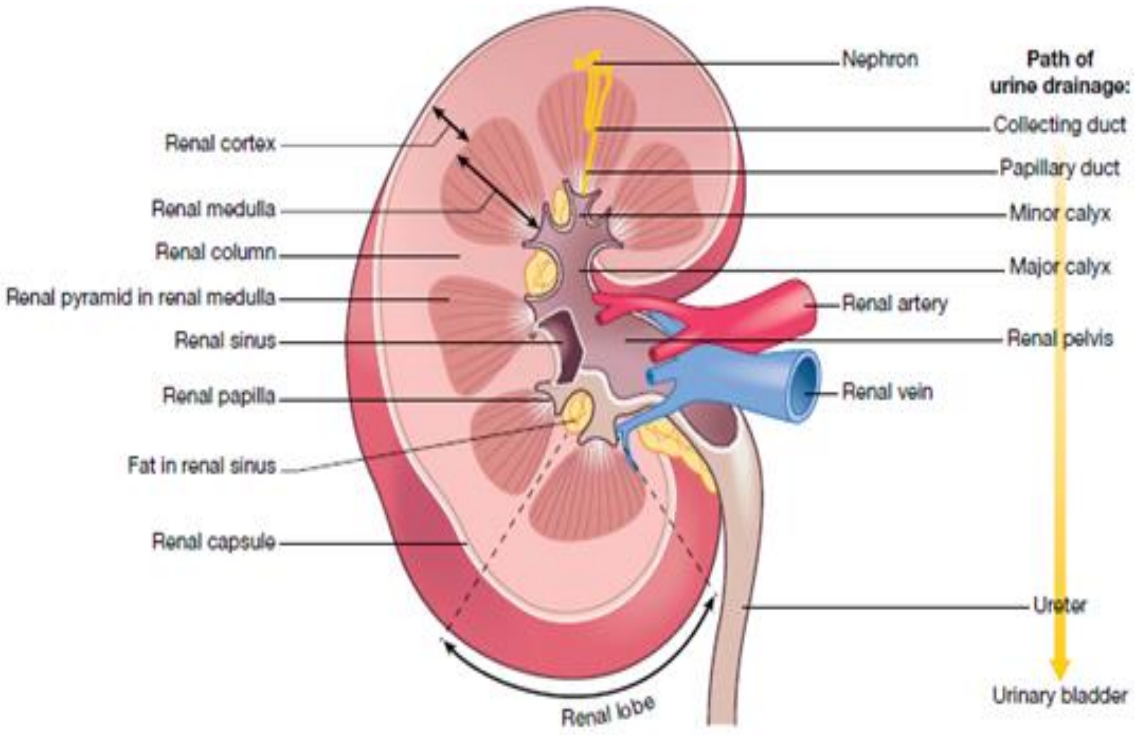
1. **Cortex**: The outer region, which is light in color.
2. **Medulla**: It is a darker reddish-brown area, deep to the cortex.

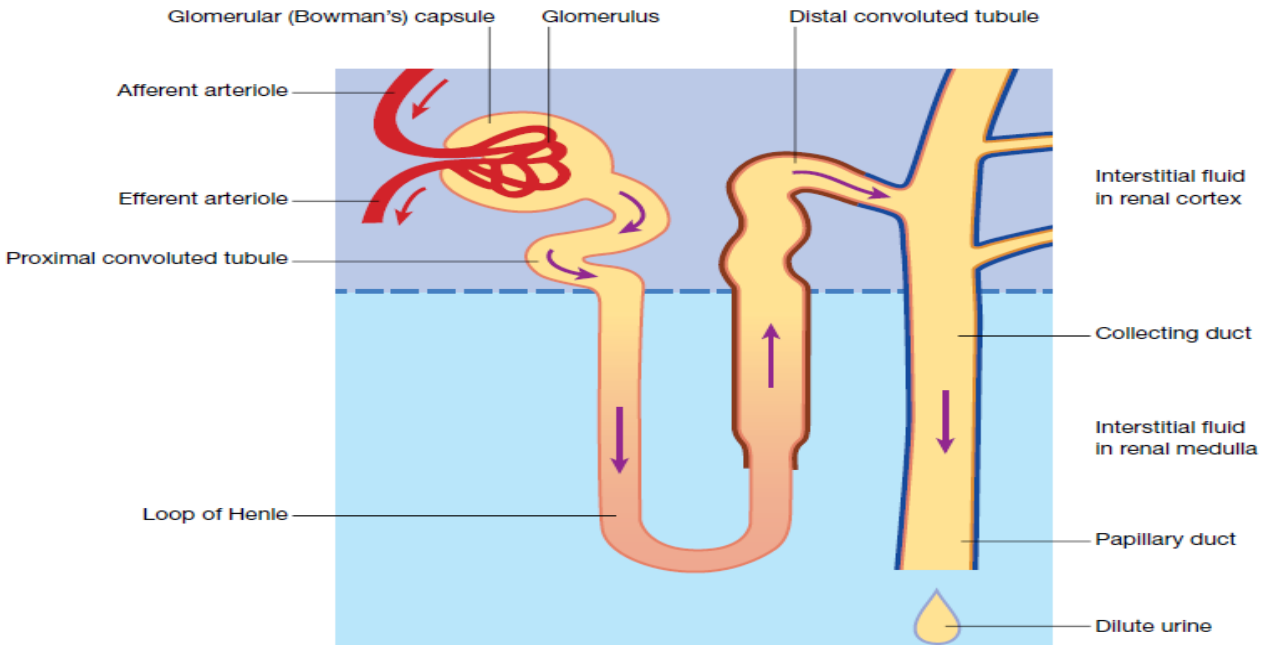
The parenchyma of the kidney consists of renal tubules.

These renal tubules are consisting of

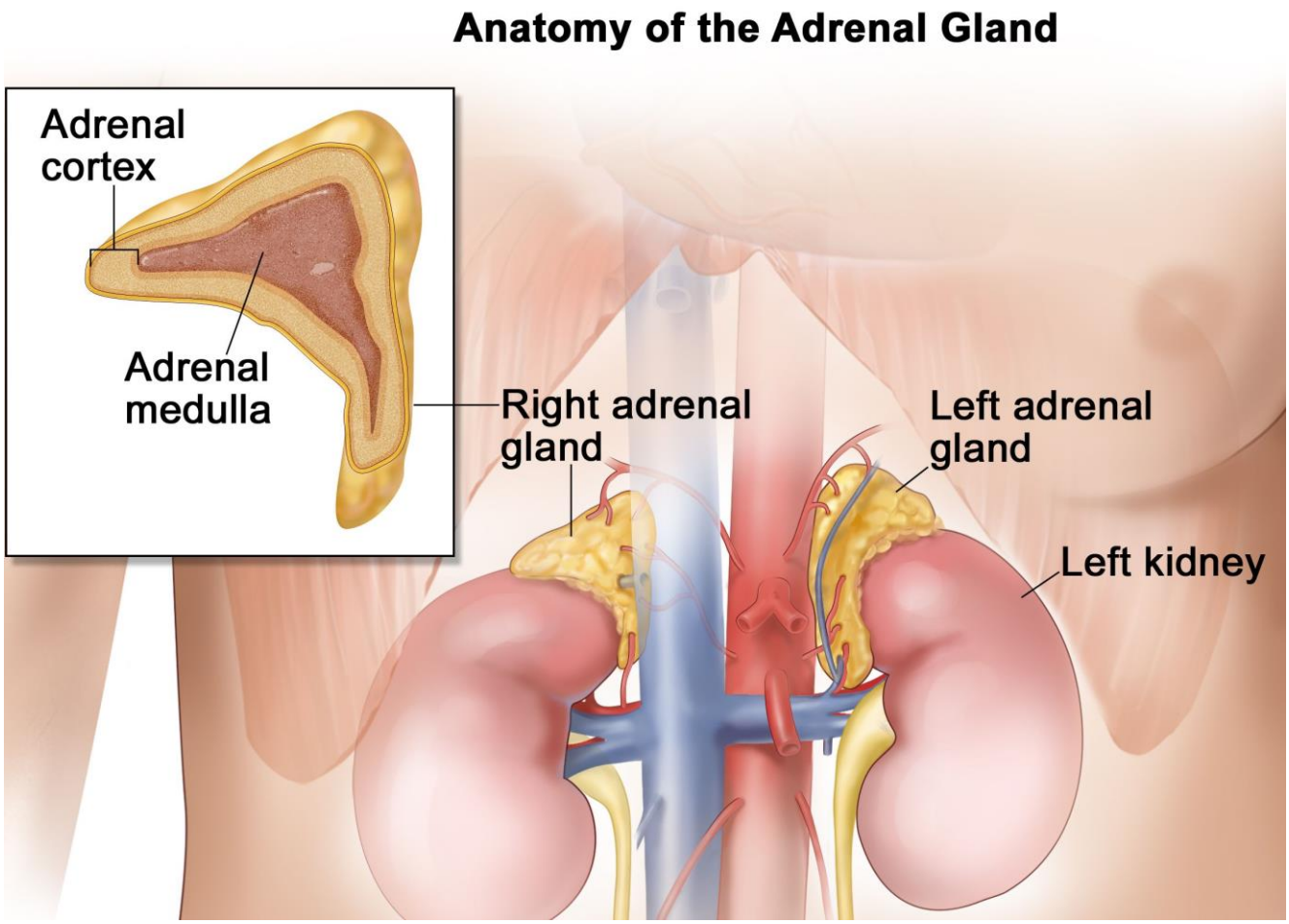
1. Secretory tubules (Nephron): its function is the formation of urine.
2. Excretory tubules: These are ducts that collect urine and carry it to the pelvis.

- **Each nephron consists of:**
  1. The renal corpuscle consists of two parts (Glomerulus, Bowman's capsule)
  2. Proximal convoluted tubule.
  3. Loop of Henle.
  4. distal convoluted tubule





The Suprarenal glands (Adrenal glands): The adrenal glands are small glands located on top of each kidney. They produce essential hormones, including sex hormones and cortisol.



The Ureter:

Narrow slender tubes carry urine from the kidneys to the bladder. The ureters are tubes, 25-30 cm long and 6 mm in diameter. Muscles in the ureter walls continually tighten and relax, forcing urine downward away from the kidneys. If urine backs up or is allowed to stand still, a kidney infection can develop. About every 10 to 15 seconds, small amounts of urine are emptied into the bladder from the ureters.

Functions: The ureters carry urine from the kidneys to the bladder.

Urinary Bladder:

It is a smooth, collapsible muscular sac that stores urine temporarily.

Three openings are seen in the bladder- the two ureter openings and the single opening of the urethra, which drain the bladder.

- In males, the prostate gland surrounds the bladder's neck, where it empties into the urethra.
- The empty bladder is 5-7.5 cm long, while the full bladder is about 12.5cm long and holds about 500ml of urine, but it is capable of holding more than twice that amount (1500ml).
- It is the reservoir for urine received from the kidneys.
- **Two sphincter muscles.** These circular muscles help keep urine from leaking by closing tightly like a rubber band around the bladder's opening.
- **Nerves in the bladder.** The nerves alert a person when it is time to urinate or empty the bladder.

The Urethra:

The urethra is the canal transmission of the urine from the bladder to the outside. It differs between the two genders. The female urethra is short 4 cm long, while in the male, it is roughly 15-**25 cm** long in the adult. The external or urethral sphincter surrounds it.

The male urethra is a channel it has three parts:

1. Prostatic portion
2. Perineal & membranous portion
3. Penile or spongy portion