24.2B: Internal Anatomy of the Kidneys

The cortex and medulla make up two of the internal layers of a kidney and are composed of individual filtering units known as nephrons.

LEARNING OBJECTIVES

Distinguish between the cortex and medulla in the internal anatomy of the kidney

KEY TAKEAWAYS

Key Points

• The renal cortex, renal medulla, and renal pelvis are the three main internal regions found in a kidney.
• Nephrons, masses of tiny tubules, are largely located in the medulla and receive fluid from the blood vessels in the renal cortex.
• The renal cortex produces erythropoietin.
• The kidneys are made up by three external layers, which include the renal fascia (the outermost layer), the perirenal fat capsule, and lastly, the innermost layer, the renal capsule, which then surround the space of the renal cortex.
• The Bowman’s or renal capsule, located at one end of each nephron in the cortex of the kidney, is the blood-filtering region of the nephron.
• The renal pelvis contains a hilium — the concave site in which the renal artery and vein and nerves enter the kidney and the ureter leaves the kidney.
Key Terms

- **renal medulla**: The inner-most region of the kidney, arranged into pyramid-like structures, that consists of the bulk of nephron structure.
- **renal cortex**: The outer region of the kidney, between the renal capsule and the renal medulla, that consists of a space that contains blood vessels that connect to the nephrons.
- **nephron**: The basic structural and functional unit of the kidney that filters the blood in order to regulate chemical concentrations and produce urine.

There are three major regions of the kidney:

1. Renal cortex
2. Renal medulla
3. Renal pelvis

The renal cortex is a space between the medulla and the outer capsule. The renal medulla contains the majority of the length of nephrons, the main functional component of the kidney that filters fluid from blood. The renal pelvis connects the kidney with the circulatory and nervous systems from the rest of the body.

Renal Cortex

The kidneys are surrounded by a renal cortex, a layer of tissue that is also covered by renal fascia (connective tissue) and the renal capsule. The renal cortex is granular tissue due to the presence of nephrons—the functional unit of the kidney—that are located deeper within the kidney, within the renal pyramids of the medulla.

The cortex provides a space for arterioles and venules from the renal artery and vein, as well as the glomerular capillaries, to perfuse the nephrons of the kidney. Erythropoietin, a hormone necessary for the synthesis of new red blood cells, is also produced in the renal cortex.

Kidney structure: The kidney is made up of three main areas: the outer cortex, a medulla in the middle, and the renal pelvis.
Renal Medulla

The medulla is the inner region of the parenchyma of the kidney. The medulla consists of multiple pyramidal tissue masses, called the renal pyramids, which are triangle structures that contain a dense network of nephrons.

At one end of each nephron, in the cortex of the kidney, is a cup-shaped structure called the Bowman’s capsule. It surrounds a tuft of capillaries called the glomerulus that carries blood from the renal arteries into the nephron, where plasma is filtered through the capsule.

After entering the capsule, the filtered fluid flows along the proximal convoluted tubule to the loop of Henle and then to the distal convoluted tubule and the collecting ducts, which flow into the ureter. Each of the different components of the nephrons are selectively permeable to different molecules, and enable the complex regulation of water and ion concentrations in the body.

Renal Pelvis

The renal pelvis contains the hilium. The hilum is the concave part of the bean-shape where blood vessels and nerves enter and exit the kidney; it is also the point of exit for the ureters—the urine-bearing tubes that exit the kidney and empty into the urinary bladder. The renal pelvis connects the kidney to the rest of the body.