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## ANATOMICAL STRUCTURE AND FUNCTIONS OF THE KIDNEY. NEPHRON.

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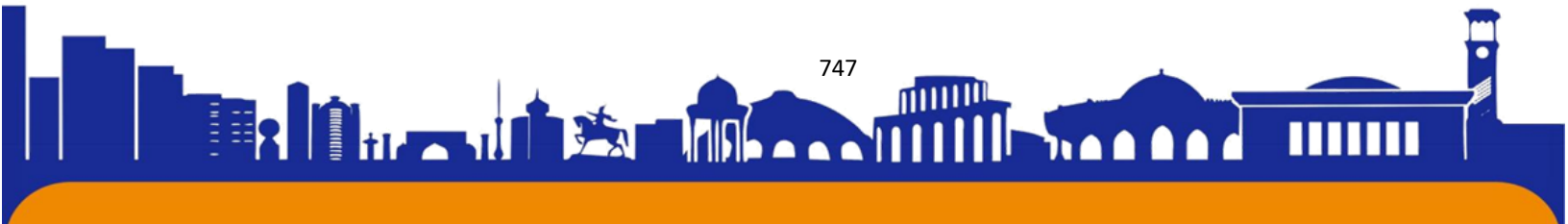
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**Abstract:** This article provides a detailed understanding of kidney anatomy, nephron anatomy. Information about the processes performed by the kidney, as well as its responsibility for the reabsorption of water, glucose and amino acids, and the maintenance of the balance of these molecules in the body. In addition, the kidneys produce hormones, including calcitriol, erythropoietin, and the enzyme renin, which are involved in renal and hematologic physiological processes.

**Key words:** medulla, ring of Genle, nephron, capsule, renal vein, renal papilla, renal pyramids

The kidney is a bean-shaped organ, the outer part of which is called the cortex. The internal area, the renal medulla, consists of seven cone-shaped kidney pyramids (only 3 of which are shown in the picture), from which visible tubes form a set of nephrons. The renal pyramids unite to form the renal pelvis in the center of the kidney, where urine collects before it drains into the ureter and travels to the bladder for storage.

• Paint the medulla area light green. Color the cortex pink, renal pelvis and ureter yellow. Nephrons depicted in the kidney should be orange in color.





- Note the two vessels attached to the kidney, color the artery red and the vein blue.

If you look closely at the nephron as shown in the second picture, you can see that it is a complex structure made up of many tubes, and each kidney has about 1 million nephrons. The main function of the nephron is to filter waste from the blood. The nephron consists of three main parts: the glomerulus, Bowman's capsule, and tubules consisting of the proximal and distal tubules and the loop of Henle.

Blood enters the kidney from the renal artery and passes to the glomerulus, where filtration takes place. Filtration is the process of removing water and dissolved particles from the blood. The resulting fluid, called filtrate, contains many toxic substances (for example, ammonia) that can accumulate in the blood. The glomerulus is surrounded by Bowman's capsule, small molecules and water can pass through this area, but larger molecules cannot. The filtrate is then collected in Bowman's capsule for transport through the nephron.

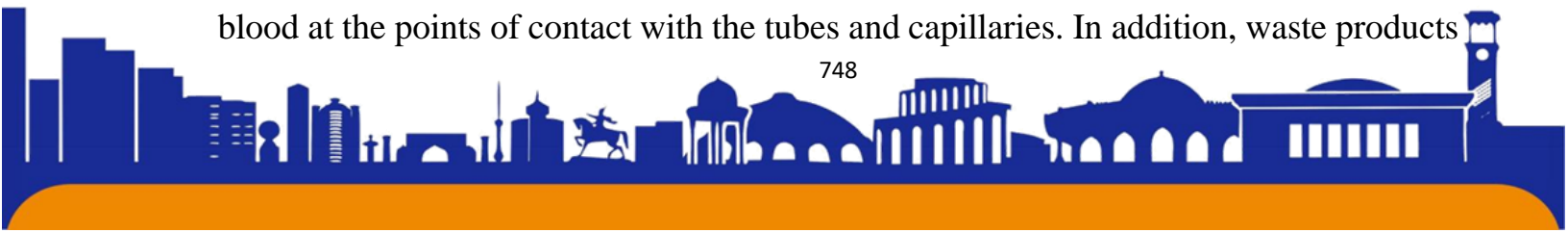
- Color the renal artery red in both pictures. In the second picture, the artery enters the glomerulus and then exits to twist around the larger tubules. Color the renal vein blue, it also wraps around the tubules. These two vessels, the artery and vein, meet near the loop of Henle, staining this area purple.

- Color the Bowman's capsule brown, leaving the glomerulus white, you should have already colored the arteries inside it red.

The nephron itself returns vital nutrients and water to the blood, while storing waste products that the body must eliminate. Two processes perform this task: tubular reabsorption and tubular secretion. During tubular reabsorption, cells in the proximal tubule remove water and nutrients from the filtrate and return them to the blood, while waste products such as urea are stored in the tubules. During tubular secretion, waste products that are not initially filtered in Bowman's capsule are removed from the blood in the distal tubule. During tubular secretion, ammonia and many drugs are removed from the blood.

- Stain the proximal tubule dark green until it reaches the loop of Henle. The loop of Henle should be colored pink, then when it turns into the distal tubule, the distal tubule is colored light green.

Note the veins surrounding the tubes. Water and nutrients are reabsorbed into the blood at the points of contact with the tubes and capillaries. In addition, waste products





left in the blood after filtration pass into the tubules. The filtrate flows through the proximal tubule and enters the loop of Henle. The loop of Henle concentrates the filtrate, removes more water from it, and transports it to the distal tubule. From the distal tubule, it goes to the collecting duct - now called the urethra. The collecting duct prepares the urine to leave the body, where it collects in the renal pelvis, where it enters the ureter. From there it goes to the bladder.

Kidneys are the main functional organ of the renal system. They are important in homeostatic functions such as electrolyte regulation, acid-base balance, and blood pressure regulation (by maintaining salt and water balance). They serve as a natural blood filter for the body and remove waste products that are excreted through urine.

Kidneys are a pair of bean-shaped brown organs about the size of your fist. They are covered by a kidney capsule, which is a hard capsule of fibrous connective tissue. Two layers of fat clinging to the surface of each kidney help soften them.

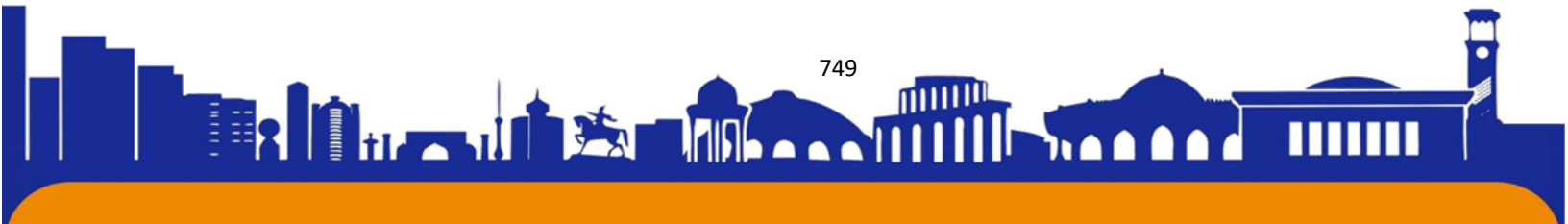
Abdominal asymmetry due to the liver usually places the right kidney slightly lower than the left and the left kidney slightly more medial than the right. The right kidney is under the diaphragm and behind the liver, the left is under the diaphragm and behind the spleen.

Adrenal glands located on top of each kidney (meaning adrenal above the kidney), although they are primarily an endocrine organ, are involved in some processes of the kidney system. The upper parts of the kidneys are partially protected by the lower ribs, and each whole kidney and adrenal gland is surrounded by two layers of fat (perirenal and pararenal fat) and renal fascia.

The kidneys are located on the back wall of the abdomen just above the waistline and are protected by the ribs. They are considered retroperitoneal, meaning they lie behind the peritoneum, in the membranous layer of the abdominal cavity.

There are a number of important external structures that connect the kidneys to the rest of the body. The renal artery branches from the lower part of the aorta and supplies blood to the kidneys. The renal veins carry blood from the kidney to the inferior vena cava. The ureters are structures that carry urine from the kidneys to the bladder.

Based on the location and the length of the loop of Henle, mammalian nephrons are divided into the following two types:





1. Cortical nephron: Makes up 85% of the nephrons in the human kidney. Cortical nephrons originate from above in the cortex, which do not penetrate deep into the medulla, and have a characteristic short Henle's loop.

2. Juxtamedullary Nephrons: Make up the remaining 15% of nephrons in the human kidney, they originate from below in the cortex near the medulla and are found to have a long loop of Henle. They are found only in birds and mammals.

Blood supply:

Renal artery: Receives fresh oxygenated blood from the heart to the kidneys for filtering. It then branches around the renal columns and becomes arterioles (afferent/efferent) and then peritubular capillaries in the renal cortex.

Renal vein: return filtered blood to the heart to oxygenate it and pump it around the body. It originates from efferent arterioles.

Renal pyramids: Located in the medulla of the kidney, it contains parts of the loop of henle and the collecting duct.

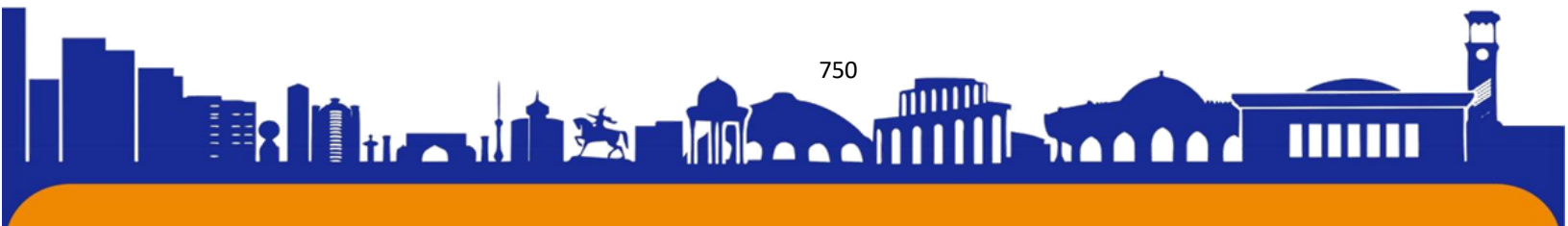
Renal papilla: Shown projection of the renal pyramid is the lesser calyx and the greater calyx

Nephrons: the functional part of the kidney that filters blood (renal corpuscles), reabsorbs minerals/water and excretes wastes (renal tubules), and produces a substance called urine, which flows into the ureters, is stored in the bladder, and is released. excreted through the urethra.

—In the renal cortex and medulla: parts of the nephron are located in the renal cortex, particularly the glomerulus and Bowman's capsule, and the proximal convoluted tubule. It then descends into the renal medulla, specifically the loop of henle. Then the distal convoluted tubule, together with parts of the collecting duct, descends back to the renal cortex, then back to the renal medulla, and directly attaches to the renal papilla, where urine begins.

Anatomy of the nephron in the kidney. The kidney corpuscle consists of a bundle of capillaries called a glomerulus and Bowman's capsule, which contains it. It consists of renal corpuscle and renal tubule. The function of the renal tubules is to reabsorb and separate substances in or out of the filtrate using peritubular capillaries.

The renal tubule emerges from the capsule. Blood is mechanically filtered to remove fluids waste electrolytes acids and bases leaving the blood cells in the tubular





system. Cortical nephrons have short loops of Henle, while juxtamedullary nephrons have long loops extending into the medulla.

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