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RENAL HISTOLOGICAL STRUCTURE

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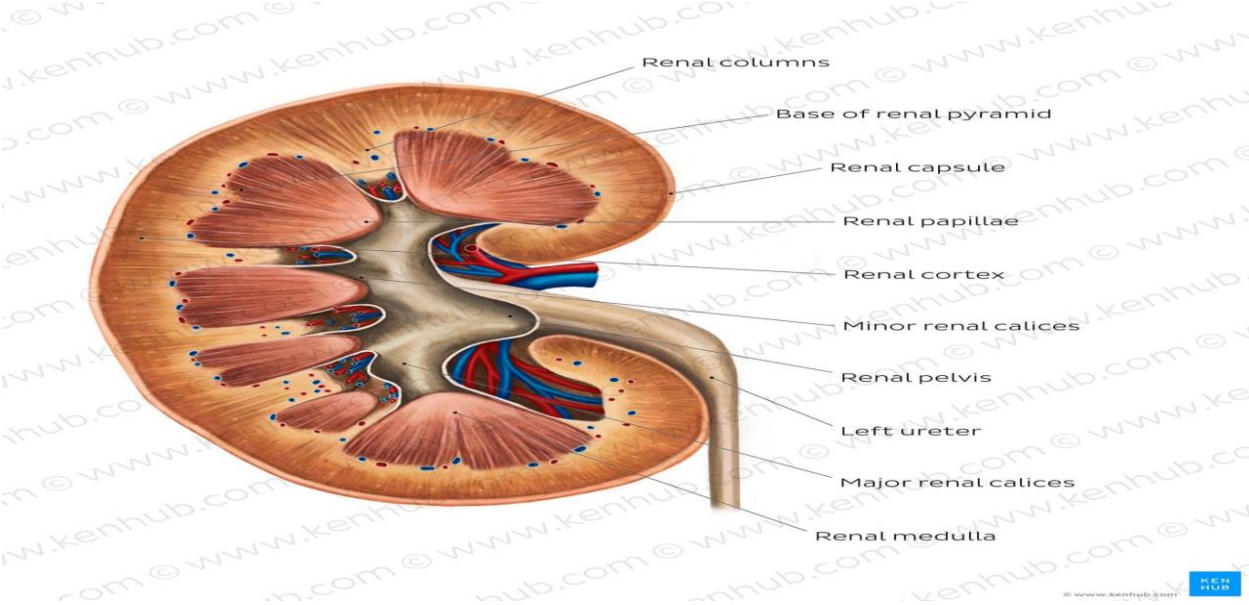
Annotation:
The kidneys are paired retroperitoneal organs of the urinary system. Their function is to filter blood and produce urine. Each kidney consists of a cortex, medulla and calyces. The nephron is the main functional unit of the kidney, in charge of removing metabolic waste and excess water from the blood. In this article we will explore the microanatomy of a nephron and learn how their function relates to their histological features.

Key words: kidney , nephron, histology .

Learning about kidney histology doesn't have to be as painful as kidney stones! We have composed a simple step-by-step guide to help you master this complicated yet fascinating organ. If you need a little jump start, why not refresh your memory with our introduction to histology and gross anatomy of the kidney.



The kidney is a bean shaped organ, with a convex lateral surface, concave medial surface and superior and inferior poles. The medial surface features the **hilum** of the kidney, which is the passageway for the renal vessels and the ureter. A connective tissue capsule (renal capsule) and a layer of perinephric (perirenal) fat protect and cushion the kidney. The **capsule** contains a layer of contractile cells called myofibroblasts, which make the capsule able to adapt to the constant pressure changes within the kidney. The suprarenal (adrenal) gland sits on the kidney's superior pole, separated from it by the perinephric fat. Both the kidney and the suprarenal gland are covered by a layer of renal fascia.

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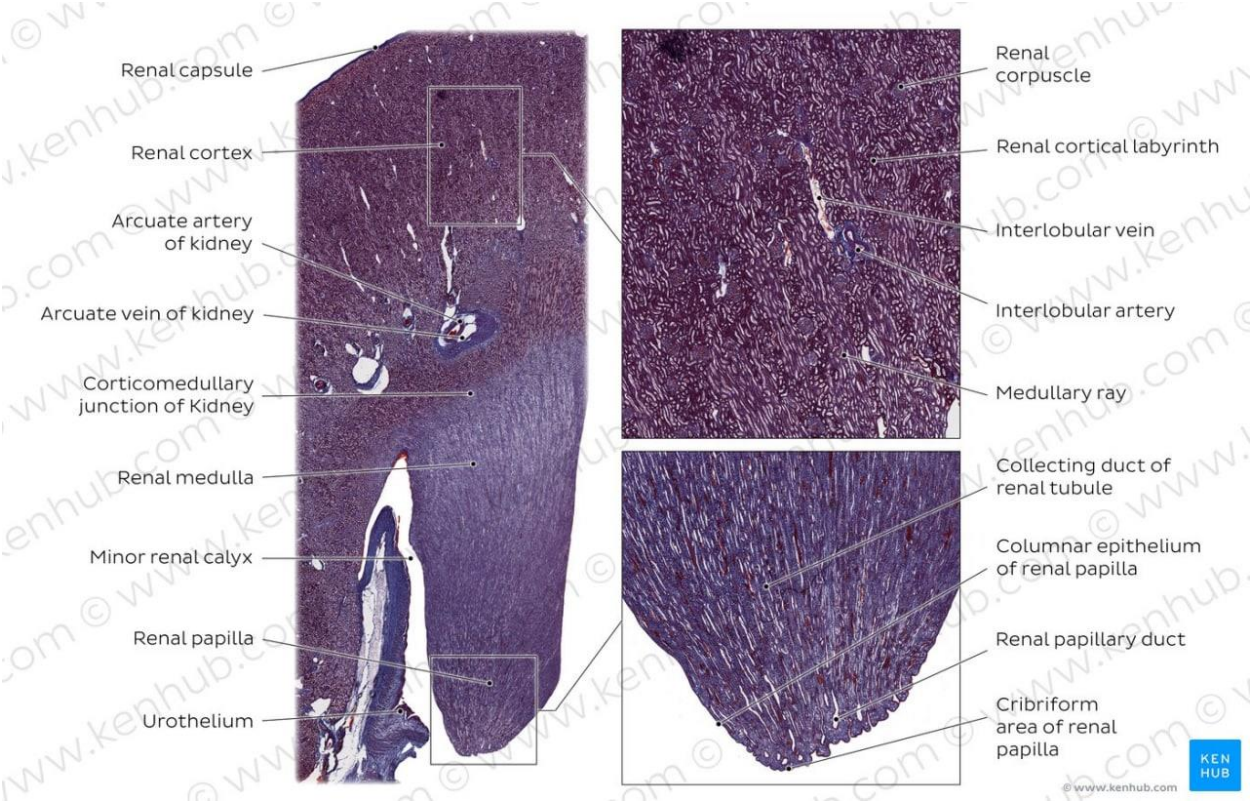
The kidney parenchyma consists of two layers; an outer **cortex** and inner **medulla**. They comprise around one million urine-producing nephrons. Urine is collected into a system of renal calyces, which is a series of distinctive chambers within a kidney. **Calyces** gradually increase in size, starting with the minor calyces, which open into larger major calyces, which empty into the renal pelvis. From the **renal pelvis**, the urine passes into the ureter. The portion of the kidney which contains the calyces, renal pelvis, ureter and renal vessels is called the **renal sinus**.



Now let's take a closer look at the parenchyma layers. The **renal cortex** is the outer layer of the kidney tissue. It is darker than its underlying renal medulla because it receives over 90% of the kidney blood supply. The cortex has a grainy appearance, as it mostly contains ovoid and coiled parts of the nephrons (renal corpuscles and convoluted tubules). The **renal medulla** appears striped, as it contains vertical nephron structures (tubules, collecting ducts). It consists of renal (medullary) pyramids separated by projections of the renal cortex (renal columns). The apices of the pyramids project towards the renal pelvis and open into the minor calyces via perforated plates on their surfaces (area cribrosa). Each renal pyramid, with its surrounding cortical tissue, forms a **renal lobe**. Renal lobes are further divided into **renal lobules**. Each lobule consists of a group of nephrons emptying into one collecting duct. These structures can be observed in a coronal section of the kidney.

The nephron is the functional unit of the kidney. It produces concentrated urine by creating an ultrafiltrate from blood. A nephron consists of two main parts: a renal corpuscle and its associated renal tubule system.

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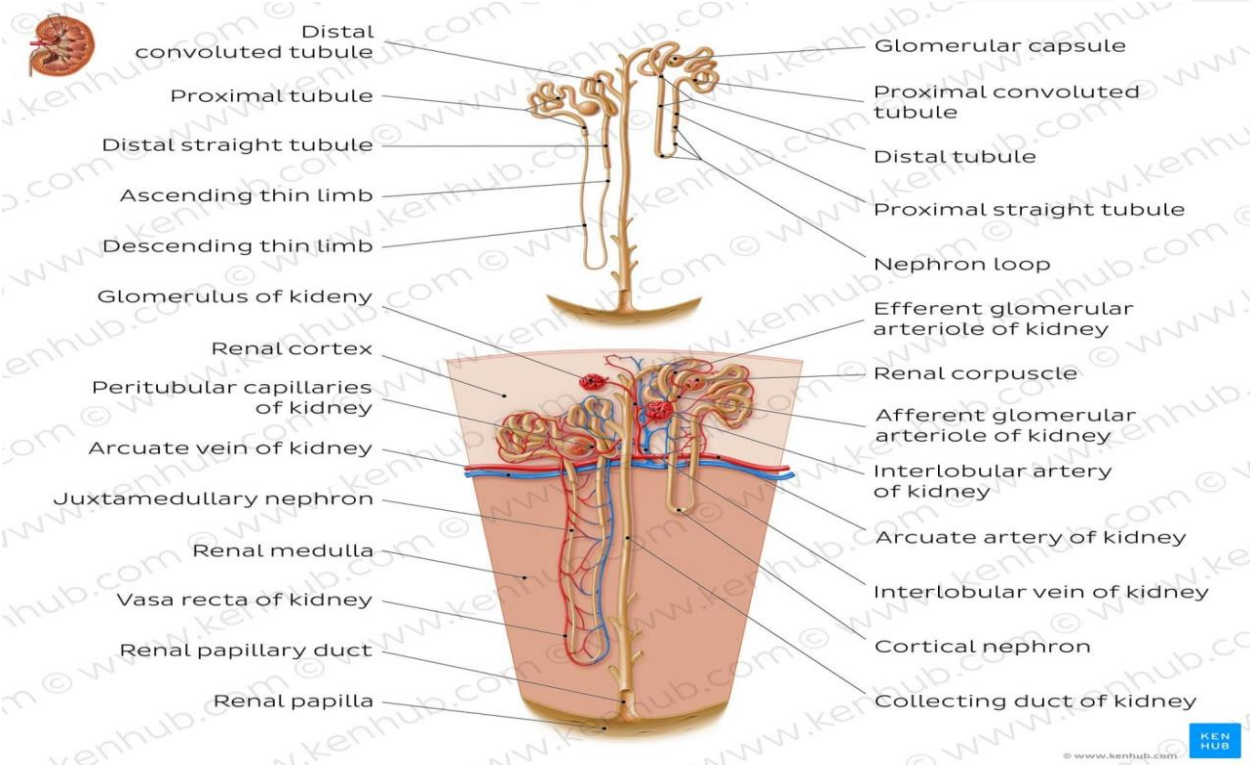

Renal corpuscles are located in the renal cortex, while their tubular systems extend into the medulla. Depending on their distribution and morphology, there are two main types of nephrons in the kidney; cortical and juxtamedullary. Cortical nephrons have their corpuscles close to the kidney capsule.

Their tubules are very short, extending only into the upper medulla. The corpuscles of the juxtamedullary nephrons are located close to the corticomedullary border. Their tubular systems are much longer, extending deep into the medulla.

Each nephron is surrounded by a network of capillaries. Branches from the renal interlobular arteries enter a nephron as the **afferent arteriole**, form a capillary tuft (glomerulus) then exit the nephron as the **efferent arteriole**. The capillary network then continues to surround the nephrons renal tubule system as peritubular capillaries, forming the vasa recta around the nephron loop. Did you know that these peritubular capillaries secrete erythropoietin (EPO)? A hormone that regulates red blood cell production.

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