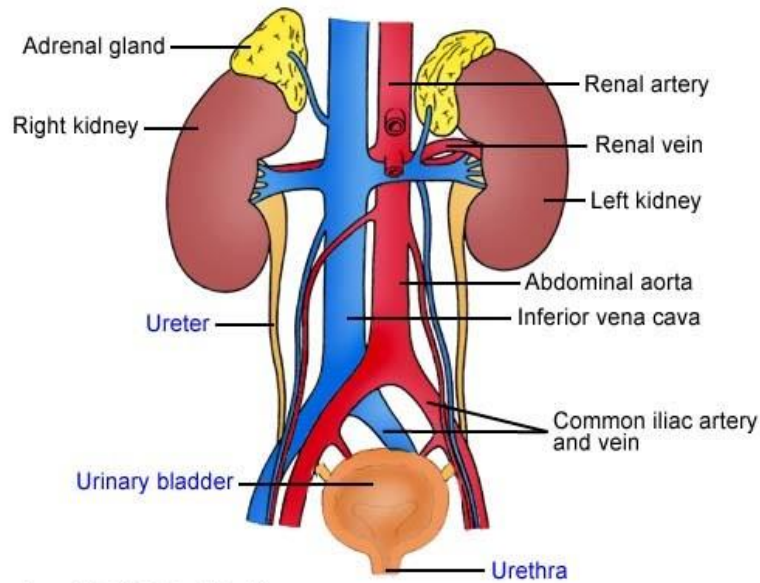


Urinary System

The urinary system consists of the **kidneys, ureters, urinary bladder, and urethra.**



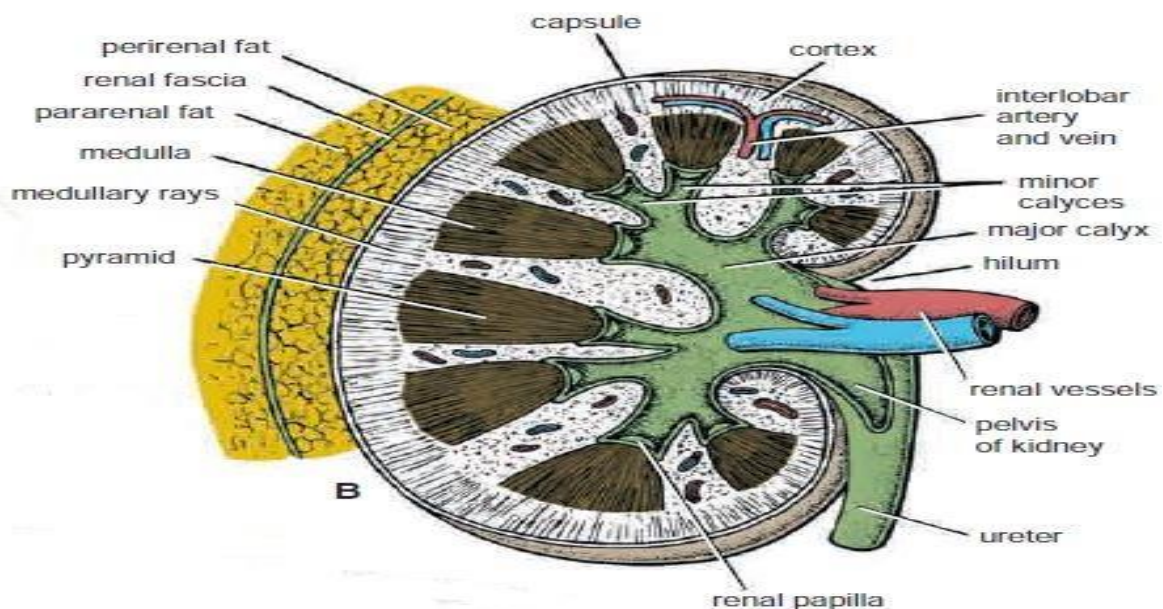
Adapted from ImageLib © 1994 David Proffitt

Kidneys

The kidneys are **reddish brown** and lie in the superior **lumbar region** from **T12 to L3** on either side of the vertebral column. The **right kidney** lies **slightly lower** than the **left kidney**.

External Renal Structures:

- The lateral surface is **convex**. The medial surface is **concave** and has a vertical cleft called the **renal hilum**.
- The **ureter**, renal **artery**, renal **vein**, **lymphatic**, and **nerves** all join each kidney at the hilum.
- Atop each kidney are an **adrenal (or suprarenal) gland** & **four layers** of tissue surrounding each kidney



Internal Renal Structures:

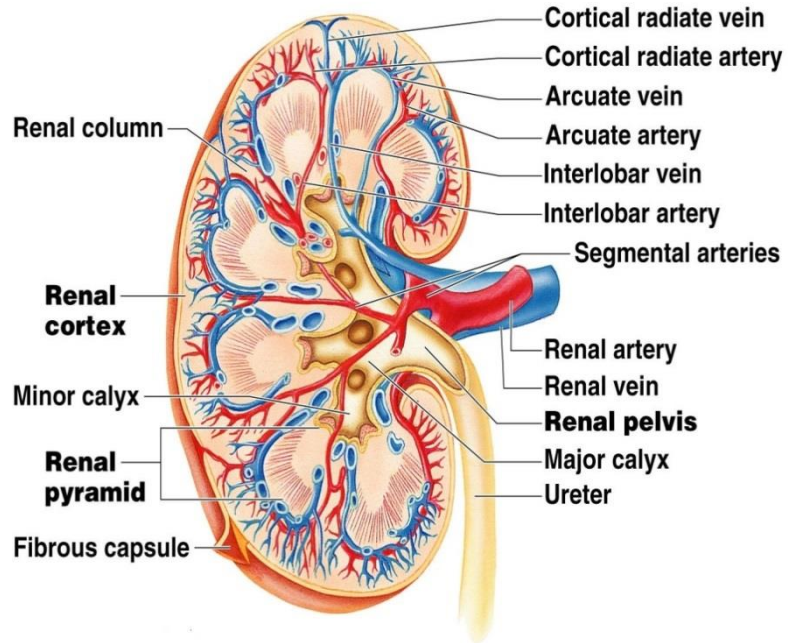
A. cortex: Each kidney has a **dark brown** outer cortex.

B. medulla: is composed of **renal pyramids** and medulla **apex** is form the renal **papilla**.

C. pelvis: is divides into **2 or 3 major calyces** each of one is divides into **2 or 3 minor calyces**

Blood Supply:

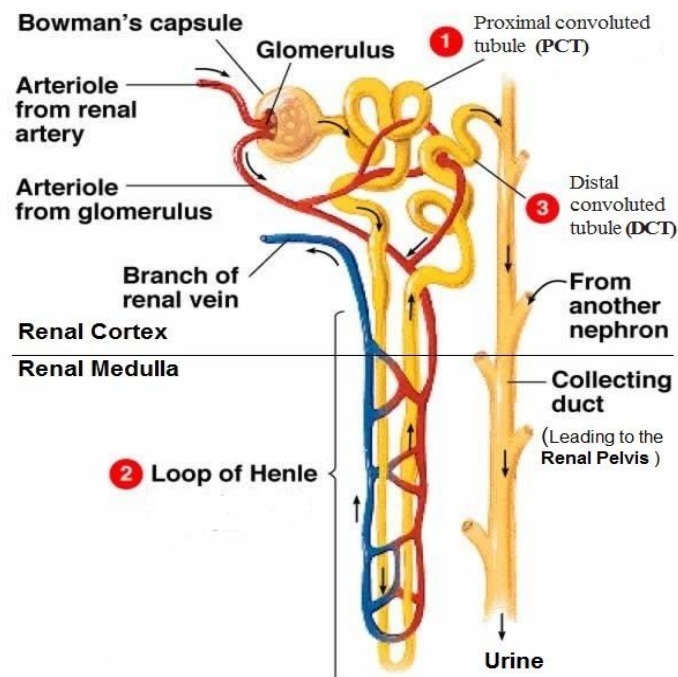
- The **renal arteries** issue from the **abdominal aorta**,
- Each renal artery approaches a kidney; it divides into five **segmental arteries**.
- Each segmental artery branches to several **interlobar arteries**.
- Interlobar arteries branch into the **arcuate arteries** that arch over the bases of the medullary pyramids.
- Small **cortical radiate arteries** to supply the **cortical tissue**.



Nephrons: are the structural and functional units of the kidneys. In addition, there are thousands of **collecting ducts**

- Each **nephron** consists from:
 - 1- Glomerulus:** is stuff of capillaries.
 - 2- Renal tubule:** has a cup-shaped end, the **glomerular capsule** (or **Bowman's capsule**),
 - **Proximal convoluted tubule (PCT).**
 - **Loop of Henle.**
 - **Distal convoluted tubule (DCT).**

Collecting ducts: each of which receives filtrate from **many nephrons**, they fuse together deliver **urine** into the minor calyces via papillae of the pyramids. And the collecting ducts approach the **renal pelvis**.



Location: the **glomerular** and the **convoluted tubules** always lie within the **renal cortex**. The **loop of the nephron** dips down into the **renal medulla**. And **Collecting ducts** are also located in the **renal medulla**.

Ureters

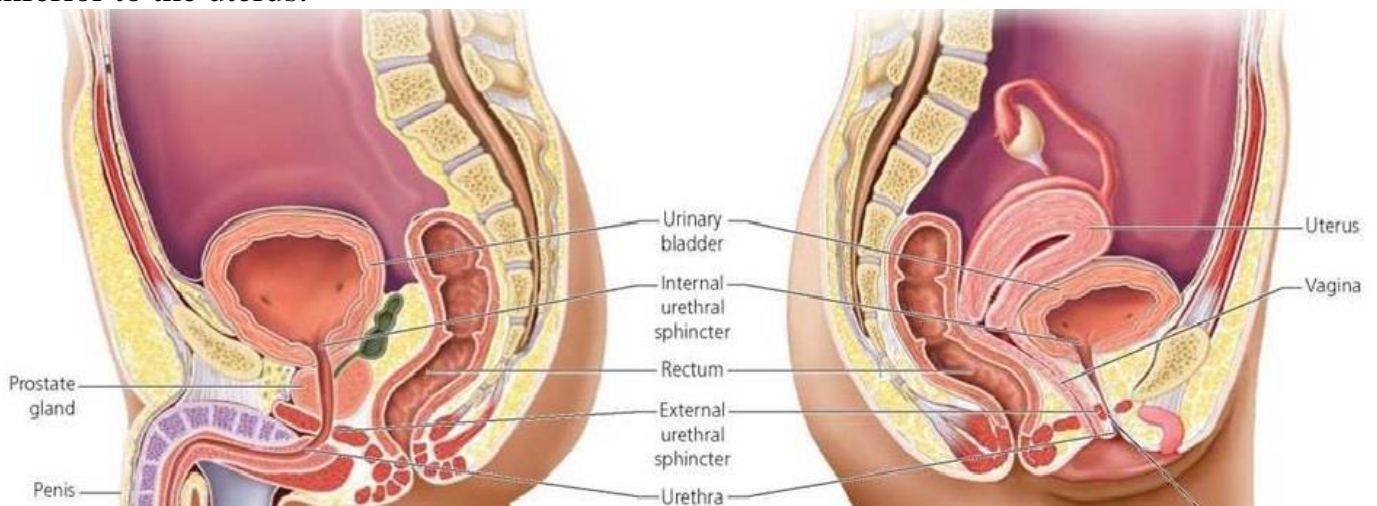
The ureters which extend from the **kidneys** to the **urinary bladder** are small muscular tubes about **25 cm long** and **5 mm** in diameter to enter the urinary bladder **posteriorly** at its inferior surface.

NOTE: This arrangement prevents backflow of urine during bladder filling because any increase in bladder pressure compresses and closes the distal ends of the ureters.

Urinary Bladder

The **urinary bladder** is a smooth, **muscular sac** that **stores urine** temporarily until it is expelled from the body. It is located in the pelvic cavity, posterior to the pubic symphysis.

In males, it is directly anterior to the rectum; **in females**, it is anterior to the vagina and inferior to the uterus.



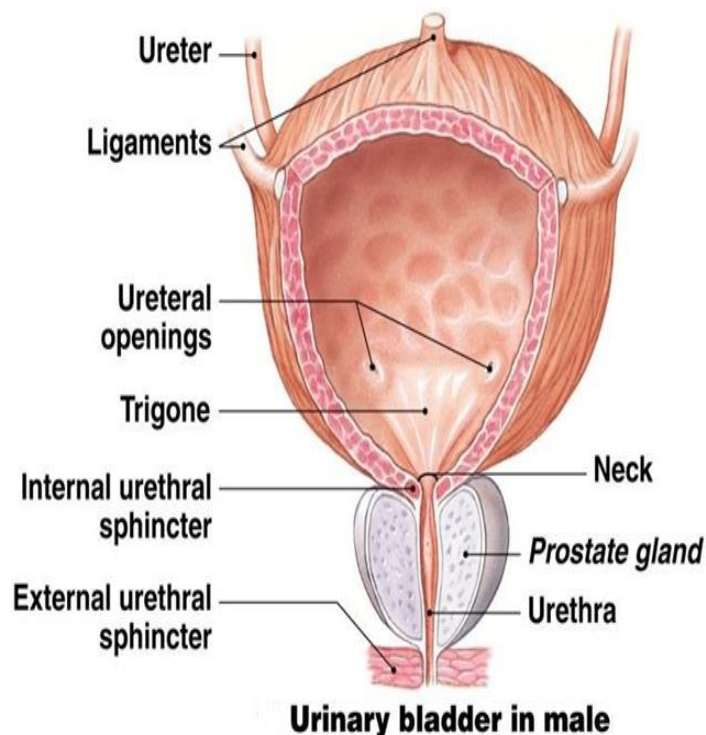
Urethra

The **urethra** is a thin muscular small tube that extends from the urinary bladder to an external opening. Carries **urine** from the bladder to the **outside of the body**. The urethra is a different length in **females** than in **males**:

A. In females, the urethra is only about **4 cm long** lies anterior to the vaginal opening and posterior to the clitoris

B. In males, the urethra averages **20 cm** passes through the prostate gland carries urine.

NOTE: **In females**, the reproductive and urinary systems are **not connected**. **In males**, the urethra carries **urine** during **urination** and **sperm** during **ejaculation**.



A. Pathology, Symptomatic and Related Terms	
Urinary tract infection (UTI)	Infection of bladder and urethra by bacteria
Uremia	Increased level of urea and creatinine in the blood due to renal failure
Renal calculus	stone of urinary tract
Cystitis	Inflammation of urinary bladder
Dysuria	difficulty and painful urination
Renal colic	pain in right or left flank
Hematuria	bloody red urine
B. Diagnostic & Laboratory Procedure Terms	
General urine exam (GUE)	chemical & microscopically test of urine
Proteinuria	excretion of protein in urine
Glucosuria	excretion of Sugar in urine
Pus cells	Neutrophils WBC in urine in acute UTI