General Anatomy

Lecture 18: Urinary System

Dr. Mohamed Fathi Elrefai

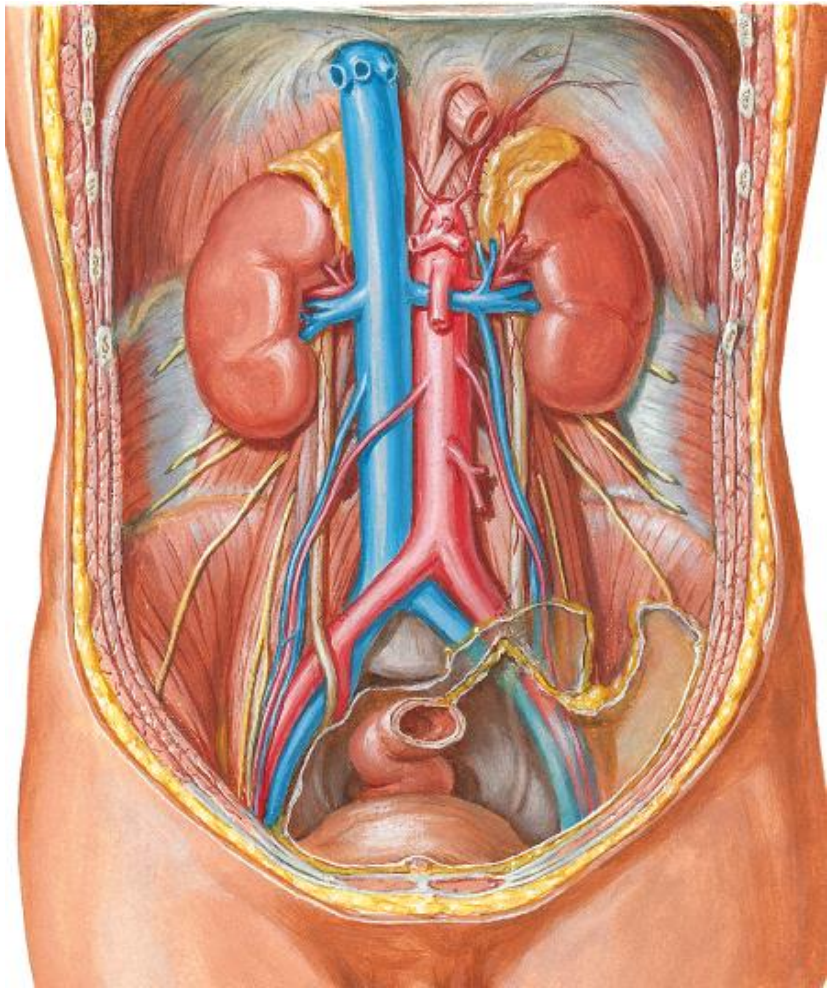
Ass. Professor of Anatomy & Embryology

mohamed@hu.edu.jo

Urinary System

** **The Urinary System includes:**

1. The Kidneys.
2. The Ureter.
3. The Urinary bladder.
4. The Urethra.



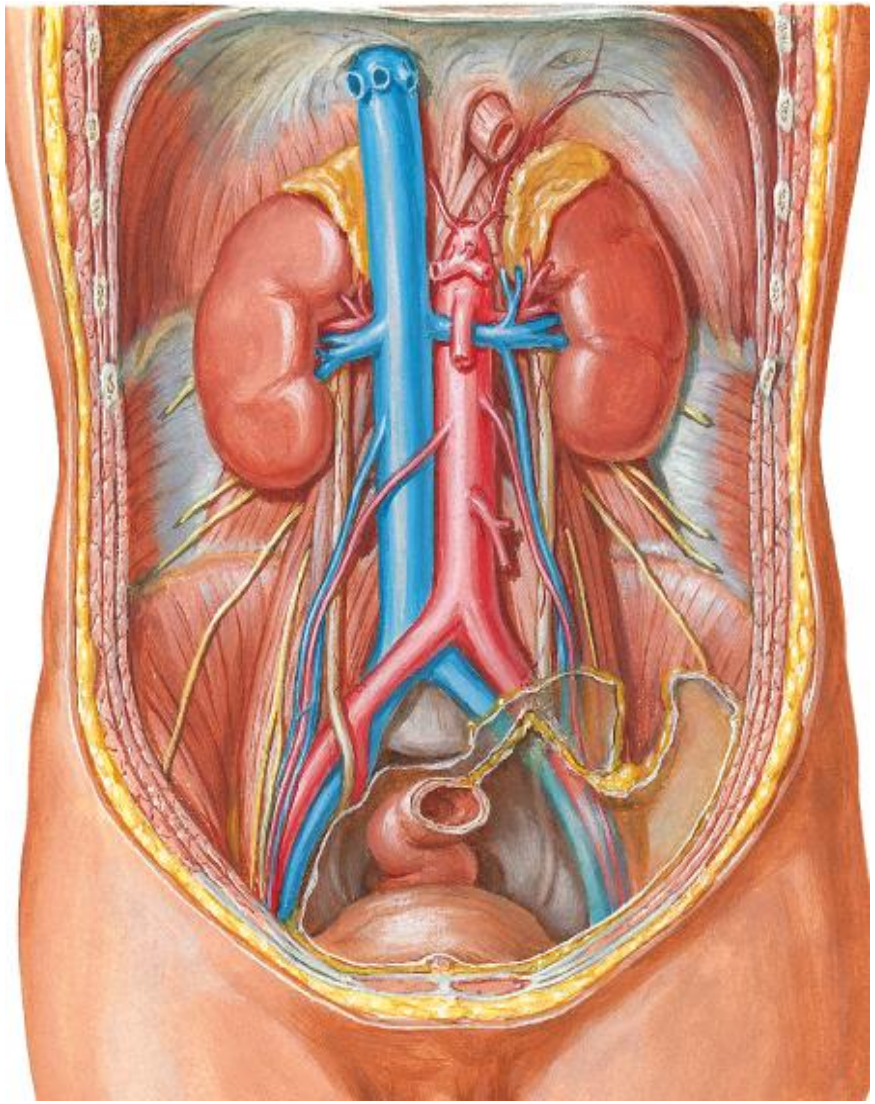
1. The Kidneys

* **Kidneys are retroperitoneal organs.**

* **Site**: They lie opposite T12-L3. The right kidney is pushed by the liver, so it is ½ inch lower than the left; its upper pole reaches 12th rib while that of left kidney reaches 11th rib.

* **Size**: * 12 cm (long).
  * 6 cm (broad).
  * 3 cm (thick).

* **Weight**: * 150 gm (in males).
  * 135 gm (in females).

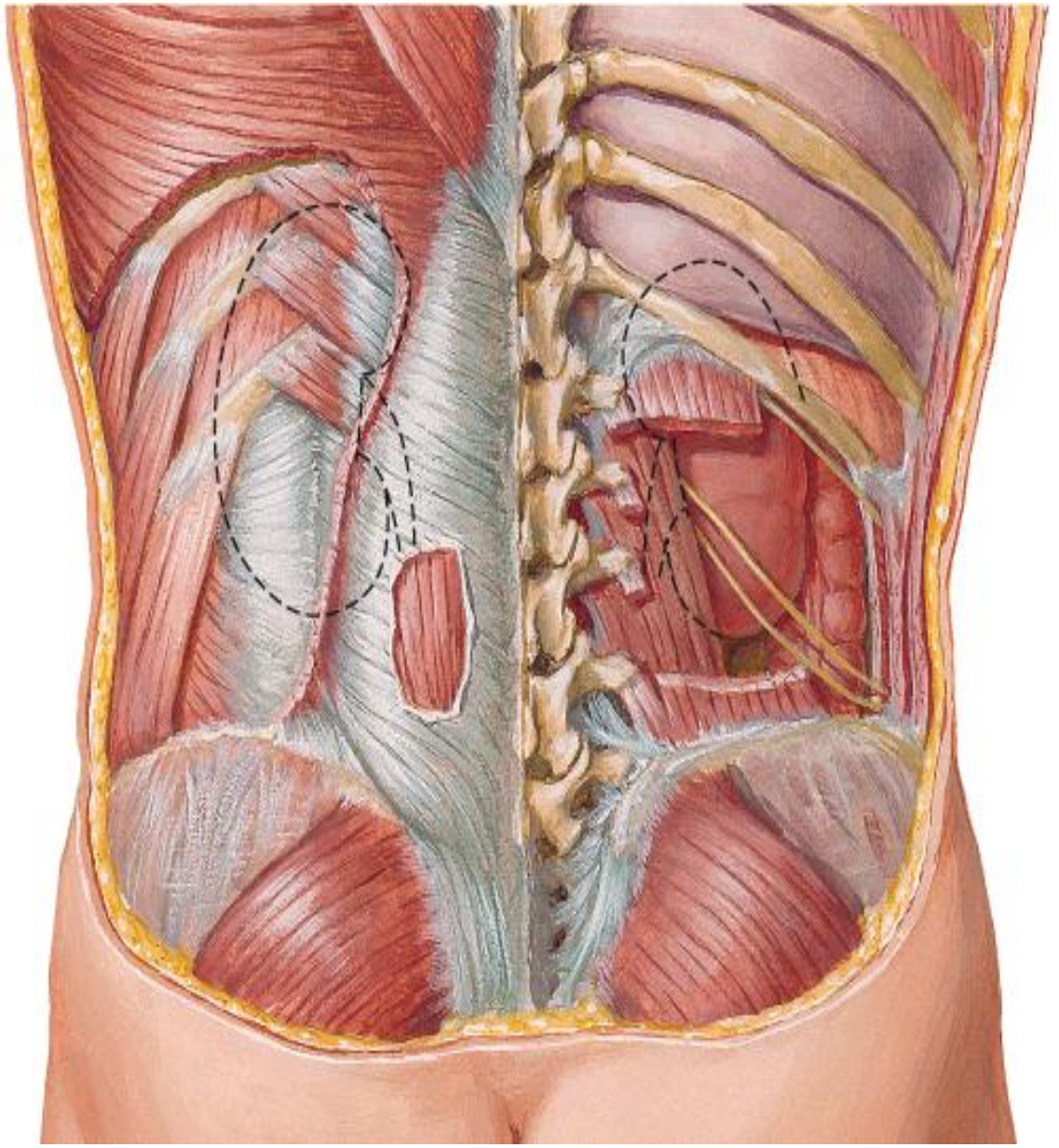


* Each kidney has:

1. TWO poles (upper & lower): upper pole is nearer to the midline than the lower pole.

2. TWO borders (lateral & medial): the lateral is convex & the medial is concave and presents the hilum at the middle.

3. TWO surfaces anterior & posterior.

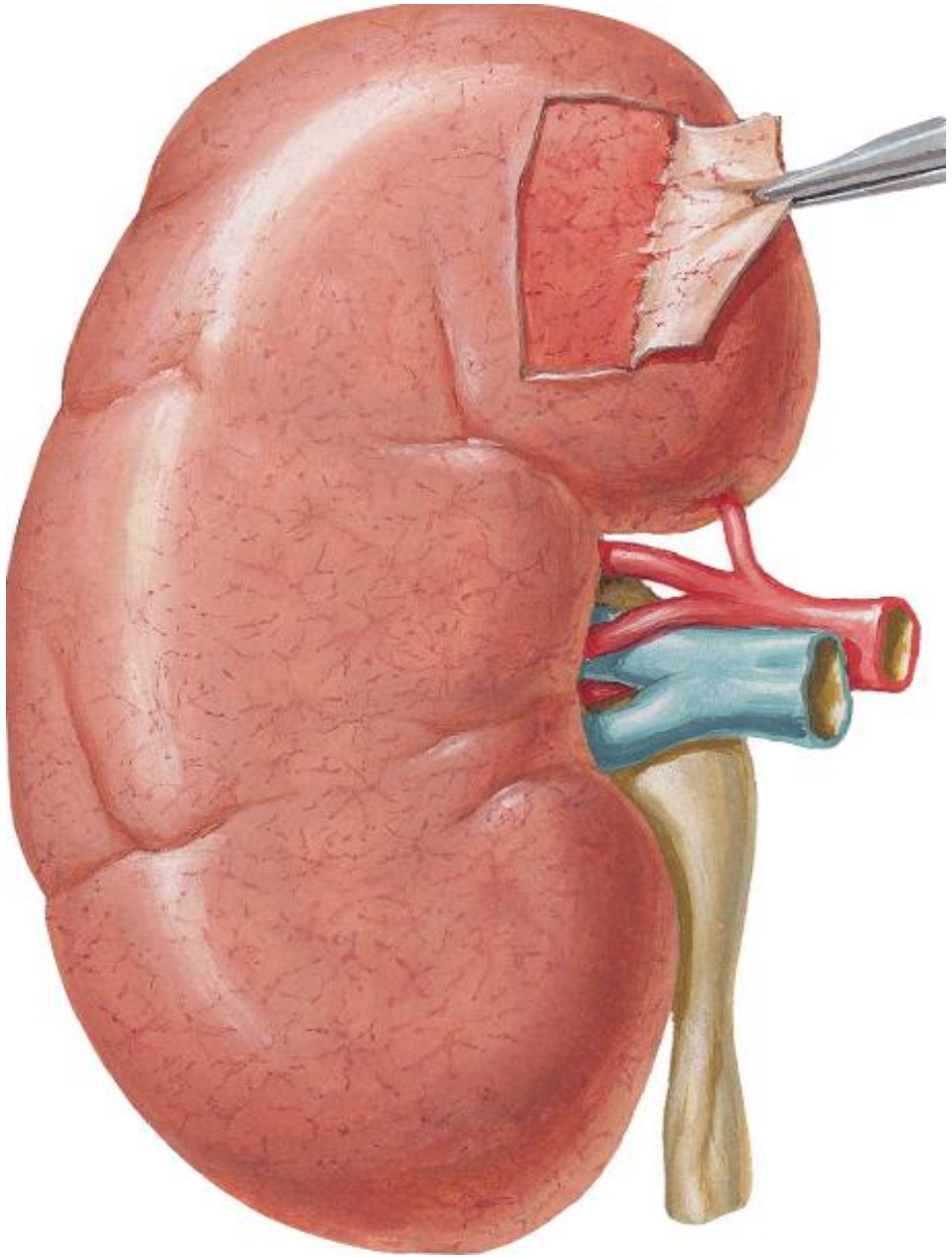


* Identification of the side of the kidney:

*The hilum of the kidney contains 3 structures which are arranged from before backwards:

1. Renal vein
2. Renal artery
3. Ureter.

* So, the ureter lies: medially, posteriorly and is directed downwards.



* Blood supply of kidney:

1. Arterial supply:

* Renal artery from the side of abdominal aorta, at level of L2.

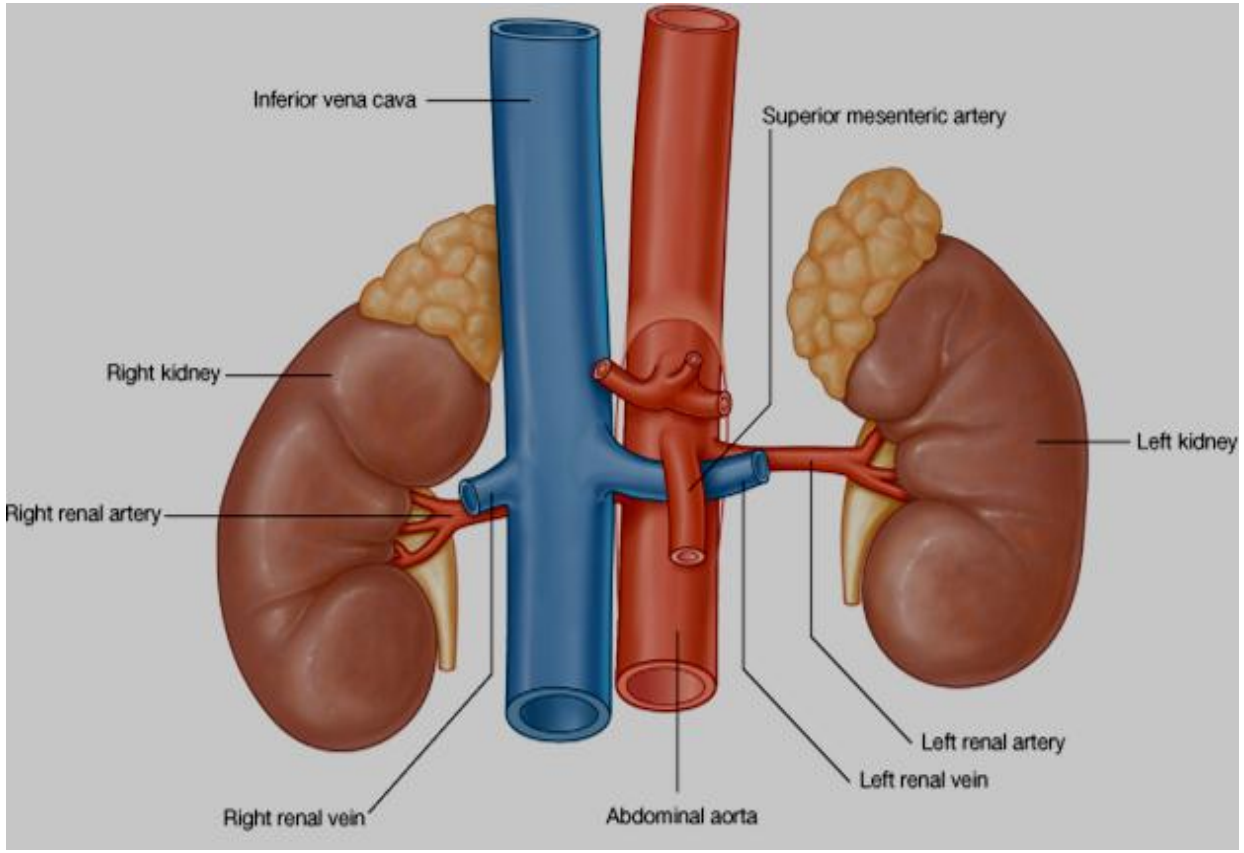
2. Venous drainage:

* Both renal veins open into IVC.

* Supporting factors of kidney:

*The kidney is kept in position by the adjacent organs, but mainly by the peri-renal fat.

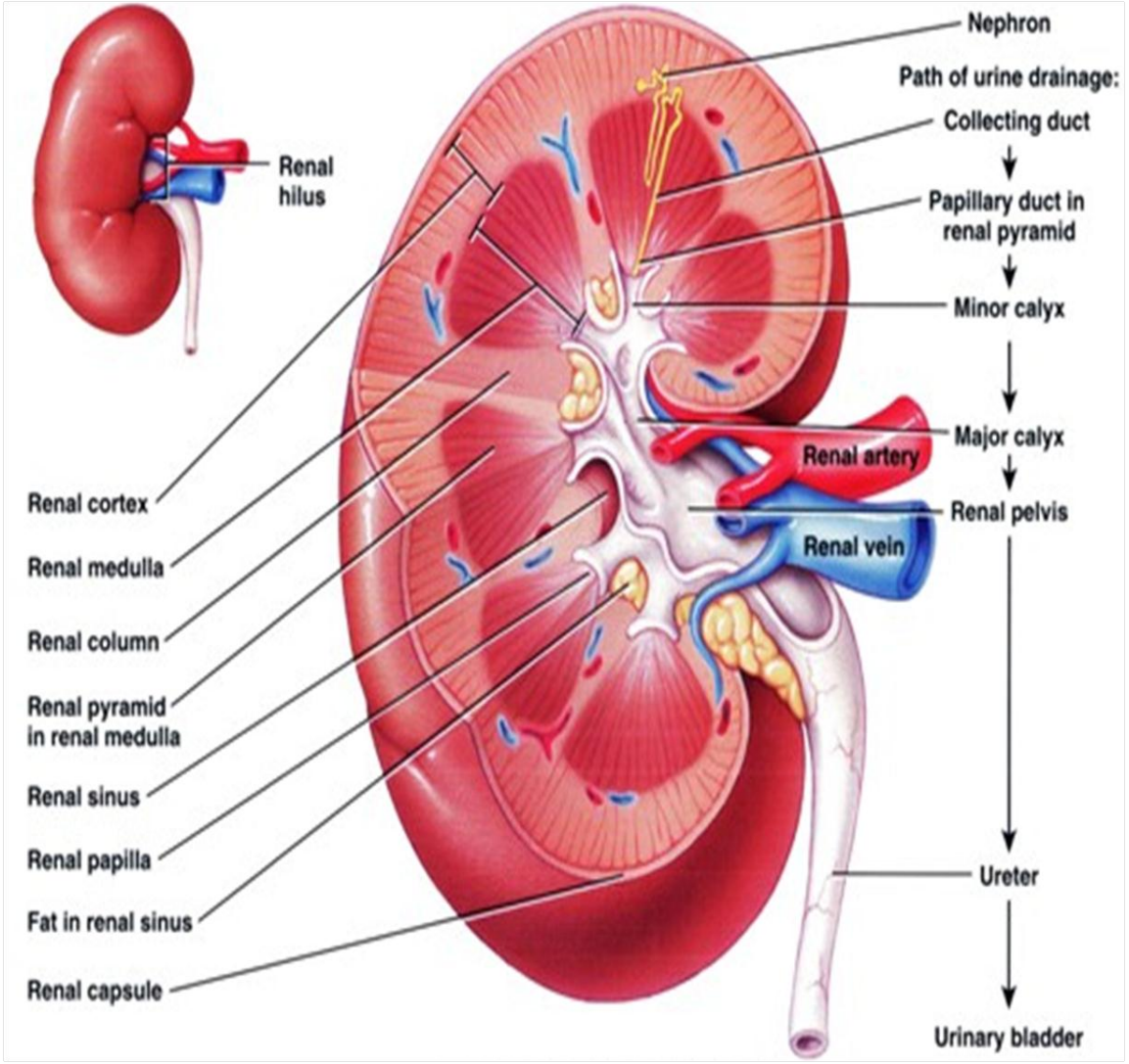
*Absorption of this fat results in descent of the kidney (ptosis of kidney).



* A sagittal section through the kidney reveals two distinct regions: a superficial region called the **cortex** and a deep area called the **medulla**.

* The medulla is composed of about 12 – 20 conical masses termed the **renal pyramids**, each having its base oriented towards the cortex, and its apex, the **renal papilla,** projects medially into the interior of a minor calyx.

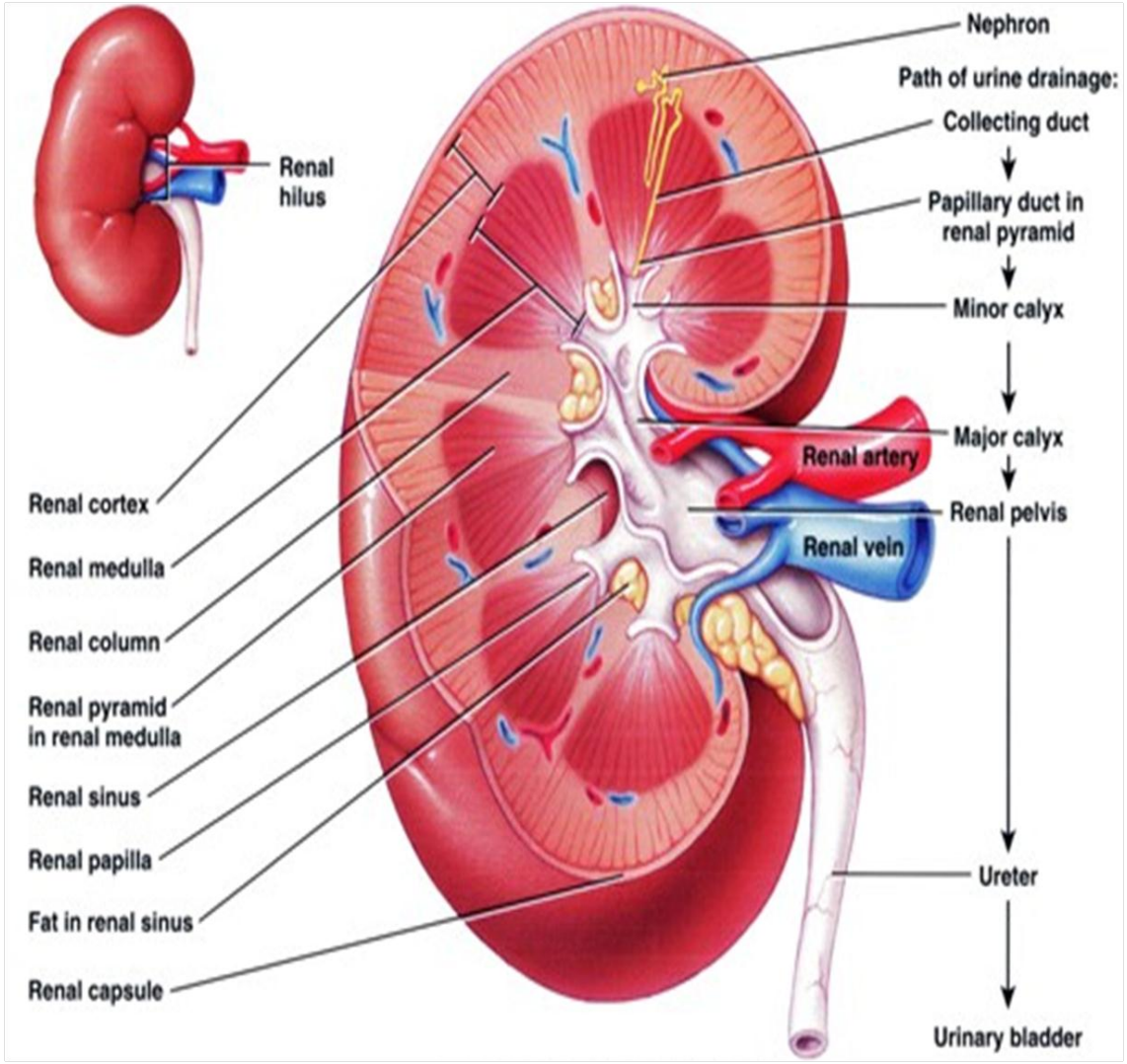
* The renal pyramids are separated by cortical tissue.



* The hilum of the kidney leads into a large cavity in the kidney devoid of renal tissue called the **renal sinus.**

***** The renal sinus is occupied by the **renal pelvis**, (the dilated upper part of ureter).

* Renal pelvis is divided into 2–3 **major calyces**, each of which divides into 2–3 **minor calyces**.

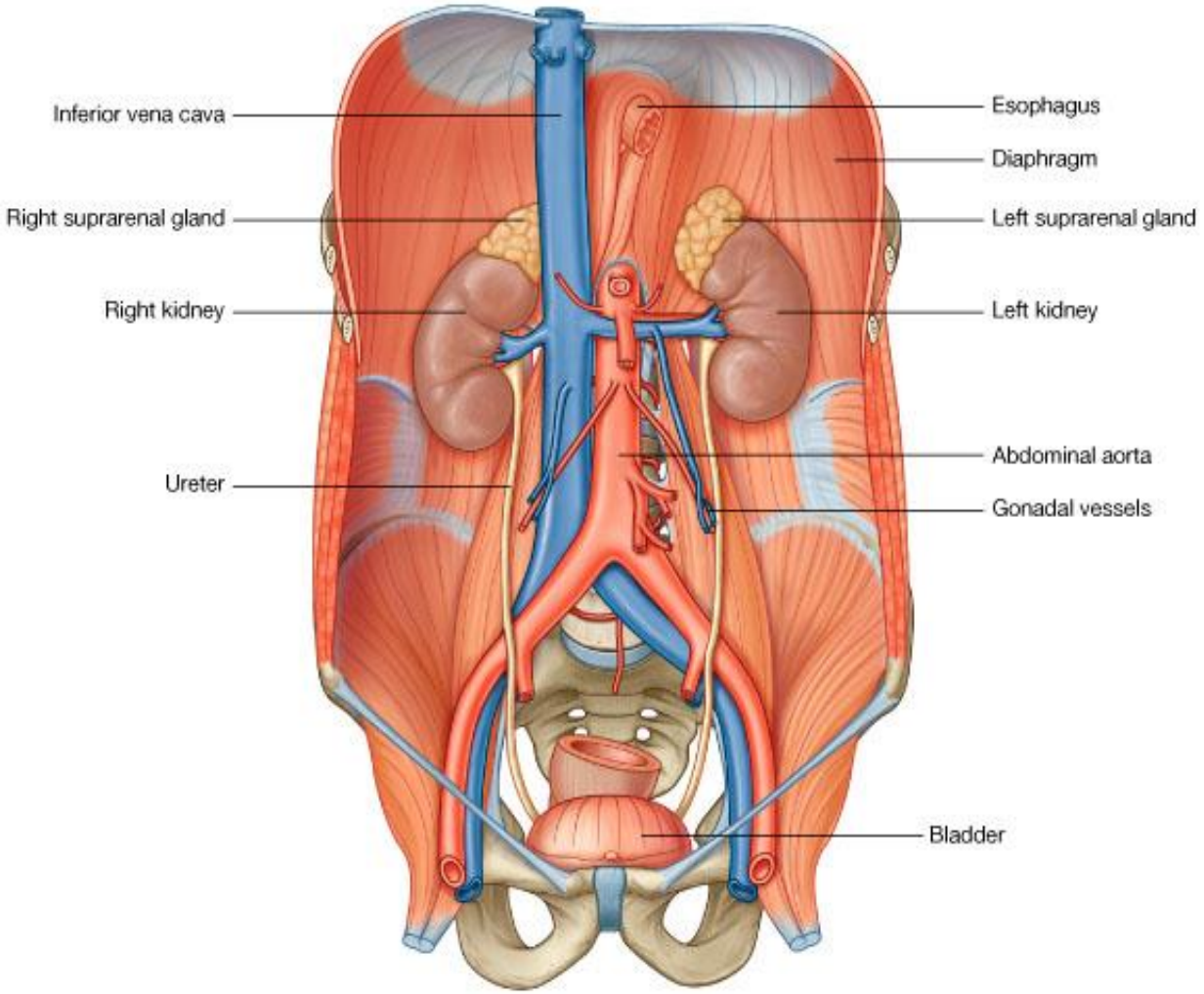


2. The Ureters

* The ureters (right and left) are muscular tubes which convey urine from kidneys to the urinary bladder.

* The ureter is about 10 inches (25 cms) and has 2 parts; abdominal and pelvic, each is 5 inches long. It is about 3 mm in diameter, but narrows at 3 sites.

* Penetrates posterior wall of bladder and runs obliquely through its wall for about 2 cms before opening into the lumen of the bladder.

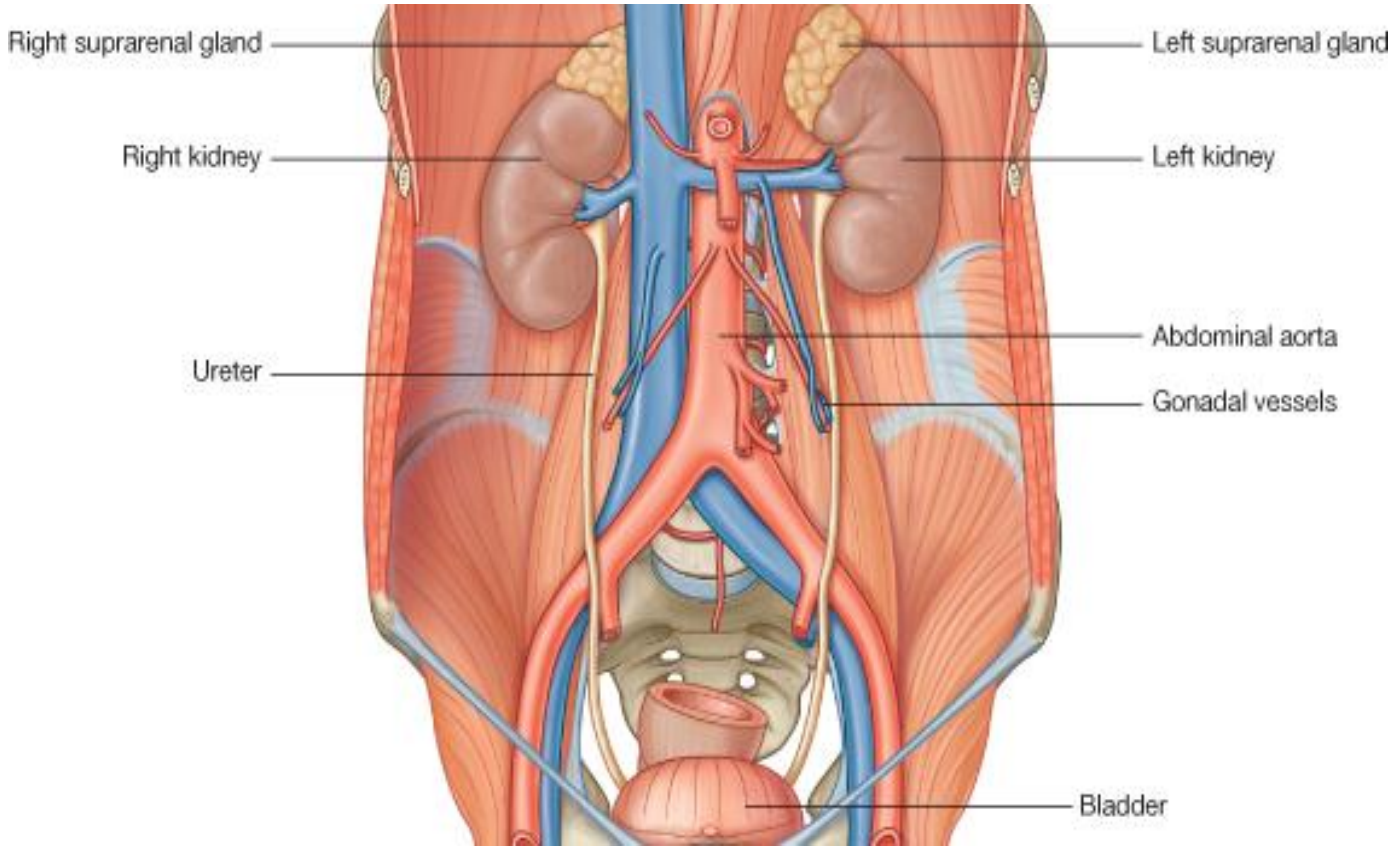


*** Normally there are three constrictions along the course of the ureter, where stones may be arrested, namely:**

a. At pelvi-ureteric junction.

b. Where it crosses common iliac artery.

c. Where it passes through the muscular wall of the bladder.

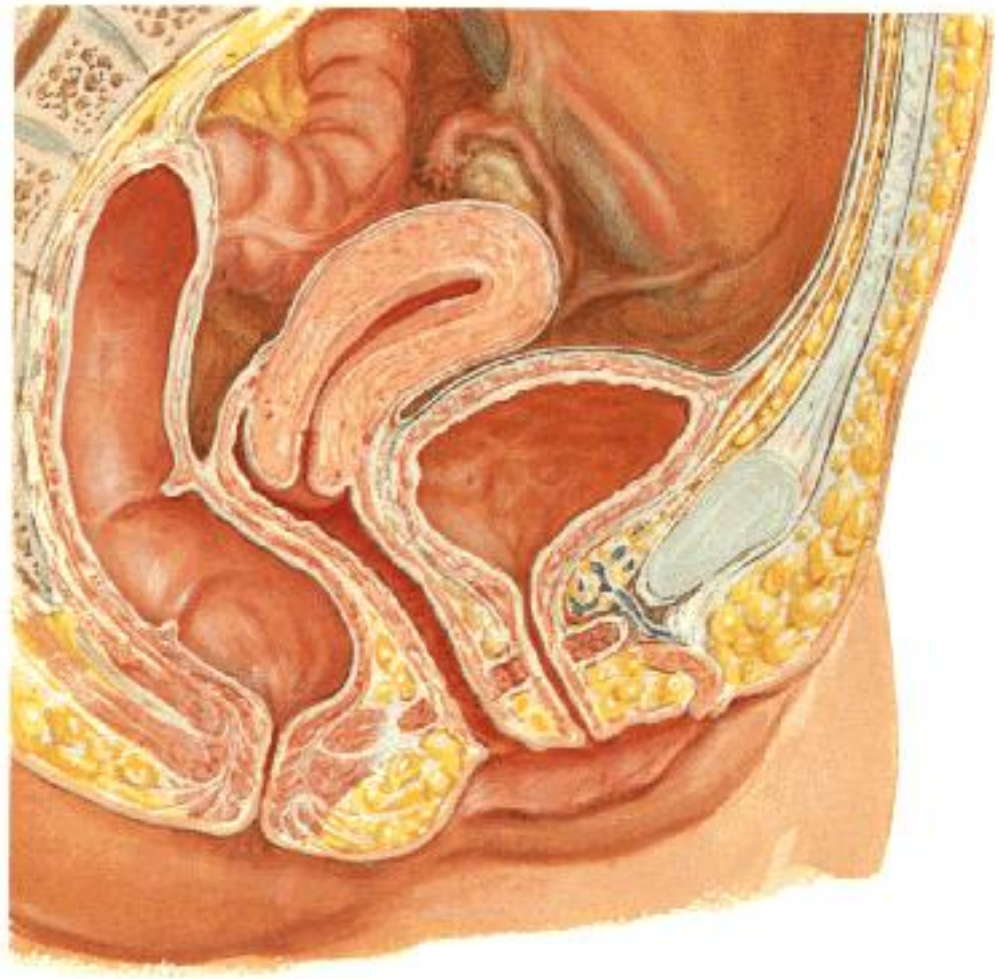


* **Bony relation of the ureter in a radiograph:**

In a plain radiograph, the ureter is expected to run on the tips of the transverse processes of L 2 – L 5 vertebrae.

3. Urinary Bladder

* At birth → it lies in the abdominal cavity (due to small size of pelvis).
* In children → it is a pelvi-abdominal organ.
* At puberty → It is a pelvic organ (due to enlargement of pelvic cavity).



* Size of urinary bladder:

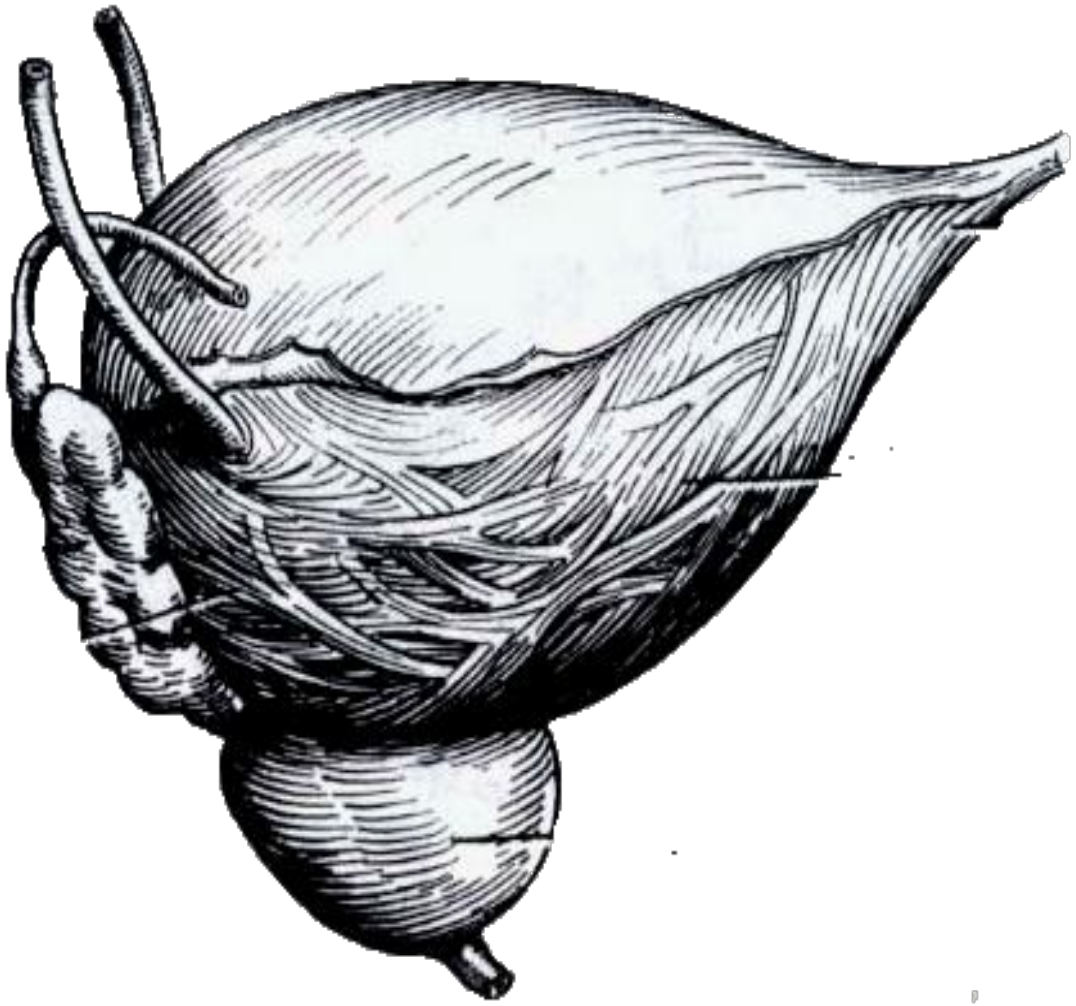
* Mean capacity → 220 c.c.

* Can accommodate up to 500 c.c. without discomfort.

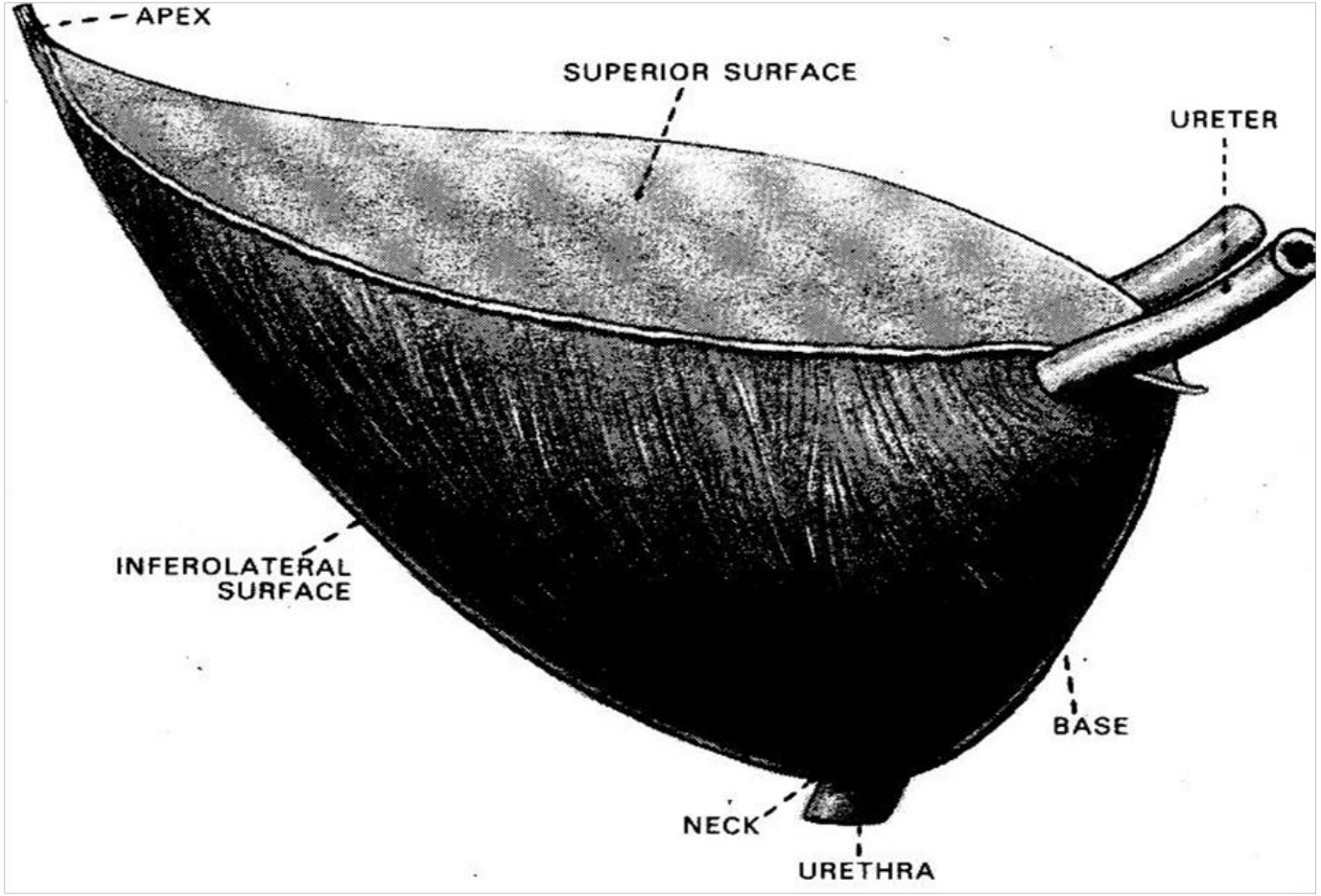
* 3 ducts are related to the angles of the bladder:

* 2 ureters open into postero-superior angles of bladder.

* Urethra comes out from inferior angle of bladder.



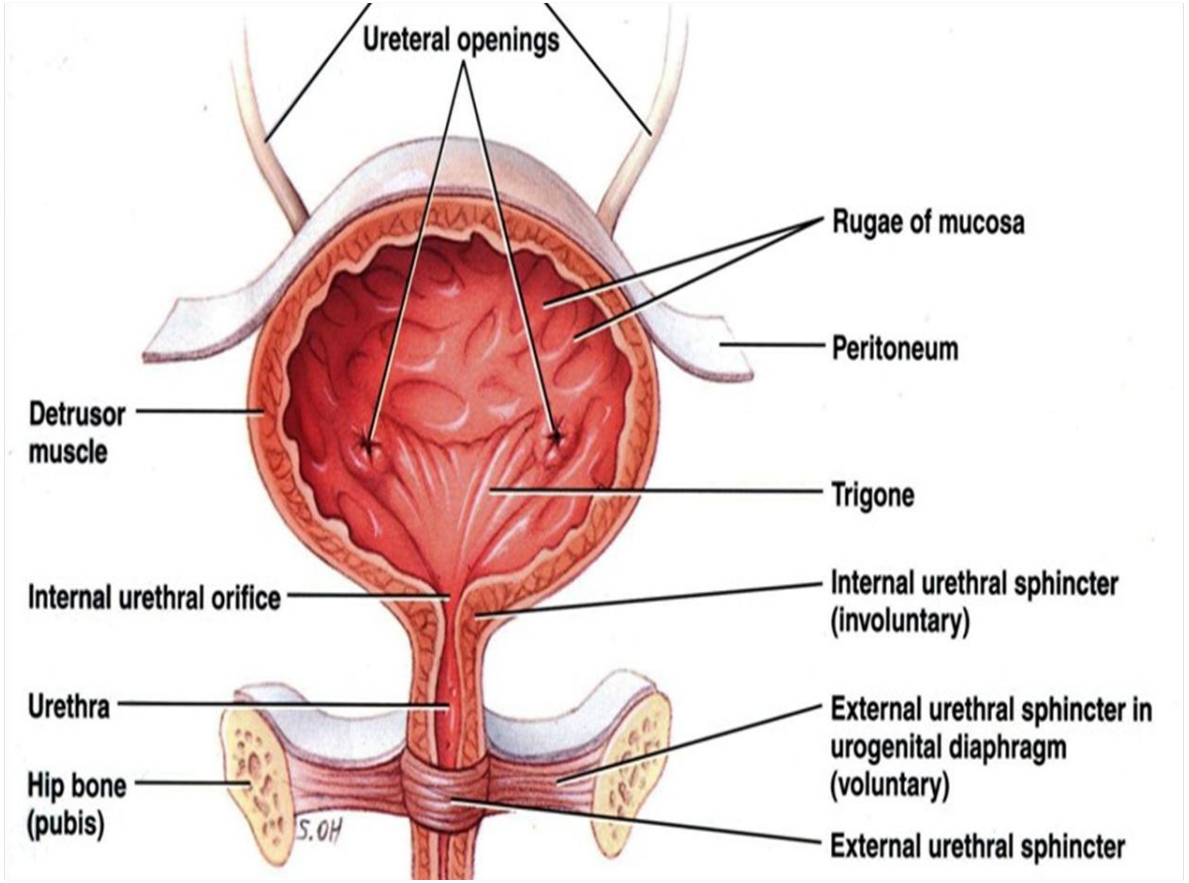
*** Has an apex, a neck and four surfaces: superior surface, posterior surface (or base of the bladder) and two inferolateral surfaces.**



* The lining mucous membrane of an empty bladder is thrown into folds that disappear when the bladder is full.

* The area of the mucous membrane covering internal surface of the base of the bladder is known as the trigone of bladder. Here the mucous membrane is always smooth even when the bladder is empty.

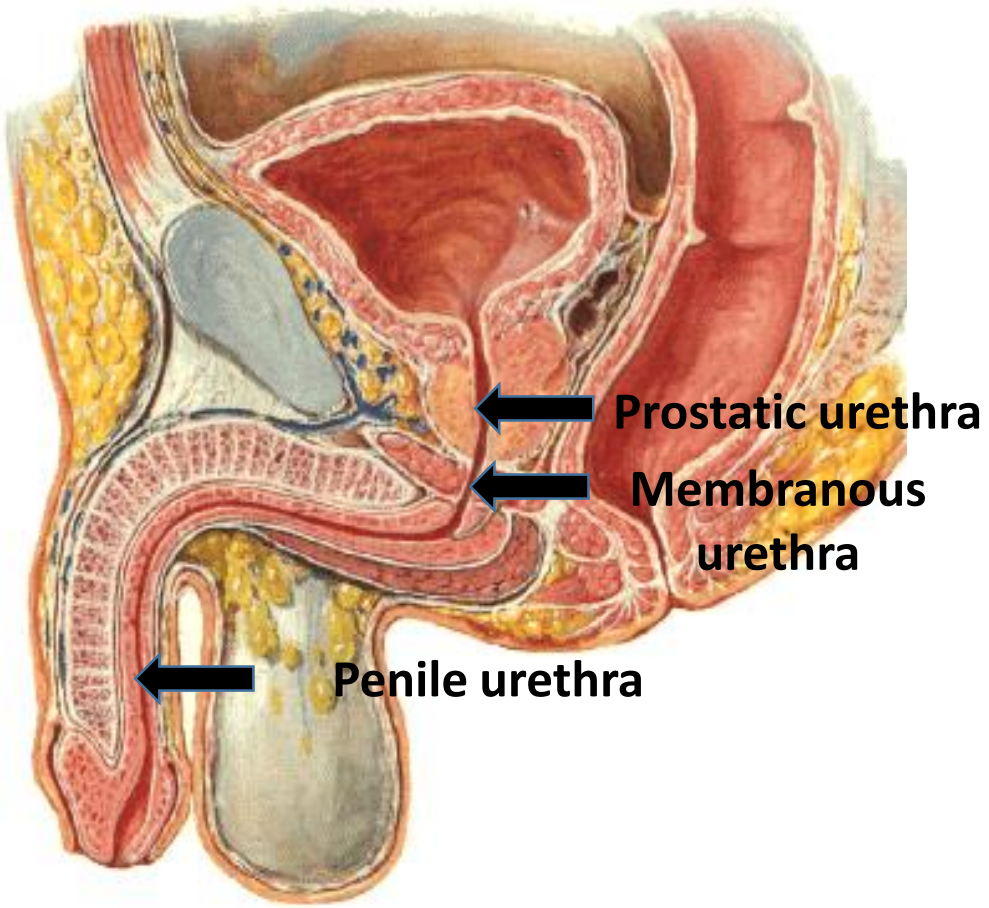
* The two postero-lateral angles of the trigone show the two ureteral openings; while the opening of the urethra (internal urethral opening), lies at the neck of the bladder.



4. Urethra

A. Male Urethra

* Length → 8 inches (20 cm).
* Extends from internal urethral meatus to external urethral meatus.
* 3 parts→ prostatic urethra (3 cms), membranous urethra (1 cm)& penile urethra (16 cms).
* Penile urethra: extends from membranous urethra till external urethral meatus.



B. Female Urethra

* It is about 4 cms in length.

* It descends in front of vagina from internal urethral orifice at neck of bladder, to external orifice which is situated just in front of vaginal orifice.