



**GUS..**

## **Lecture (2)**

# **Anatomy & Histology of Ureter, Urinary bladder & Urethra**

***Dr. Amany Allam***

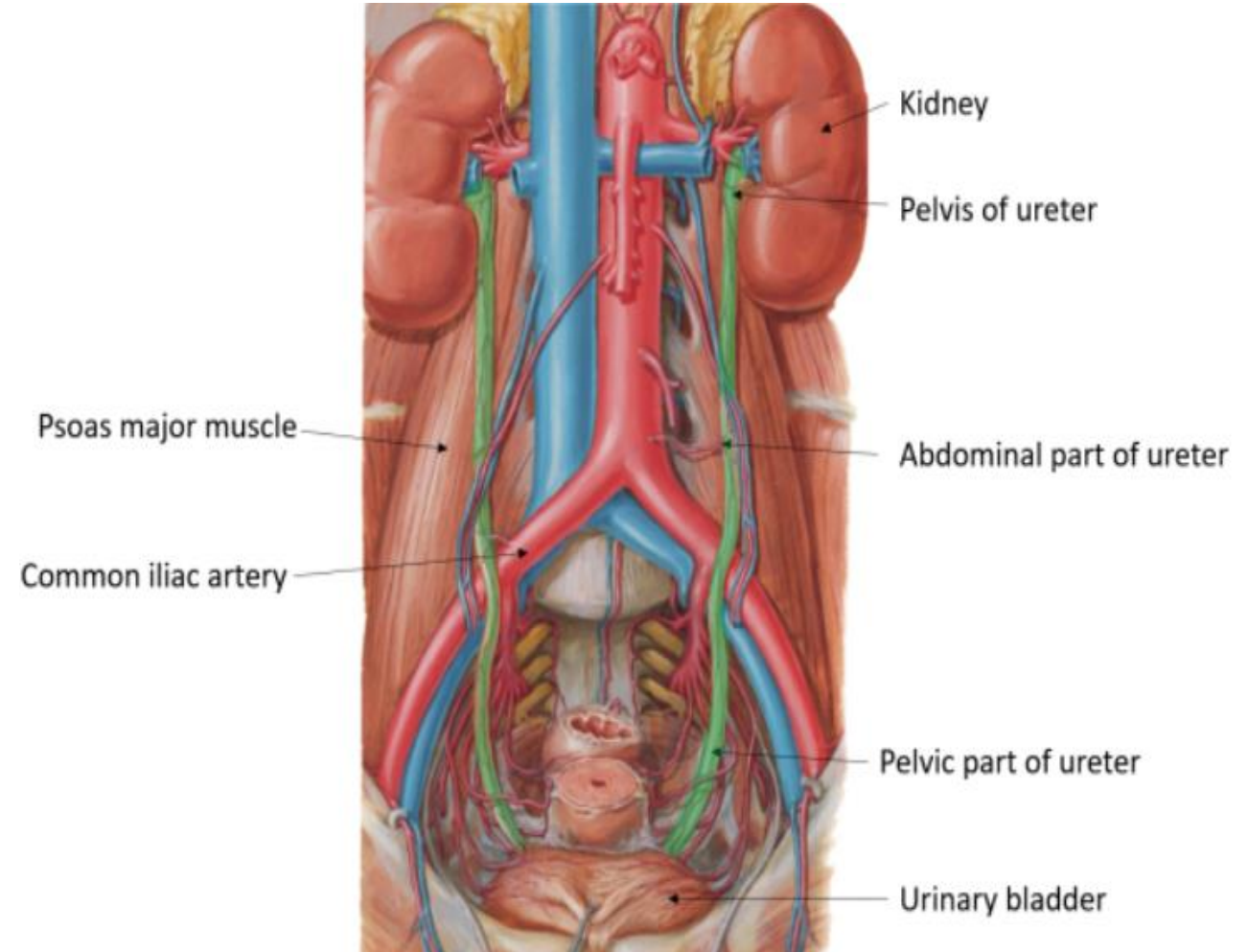
**Assistant professor of Anatomy & Embryology**

# **ILOs**

- 1. Understand the extension, relations, blood & nerve supply, and lymphatic drainage of ureters.**
- 2. Outline the three constrictions of the ureters.**
- 3. Describe the shape, location, surfaces, relations, blood & nerve supply, and lymphatic drainage of urinary bladder.**
- 4. Understand the Intraperitoneal and extraperitoneal rupture of urinary bladder.**
- 5. Describe the gross anatomy of male and female urethra.**
- 6. Describe the histology of the ureter, urinary bladder and urethra**

# Ureter

- The two ureters are retroperitoneal muscular tubes that **extend from** the kidneys to the urinary bladder.
- It is about 25 cm (10 inches) long.
- Its upper part lies in the abdomen (**Abdominal part**).
- Its lower part lies in the lesser pelvis (**Pelvic part**).

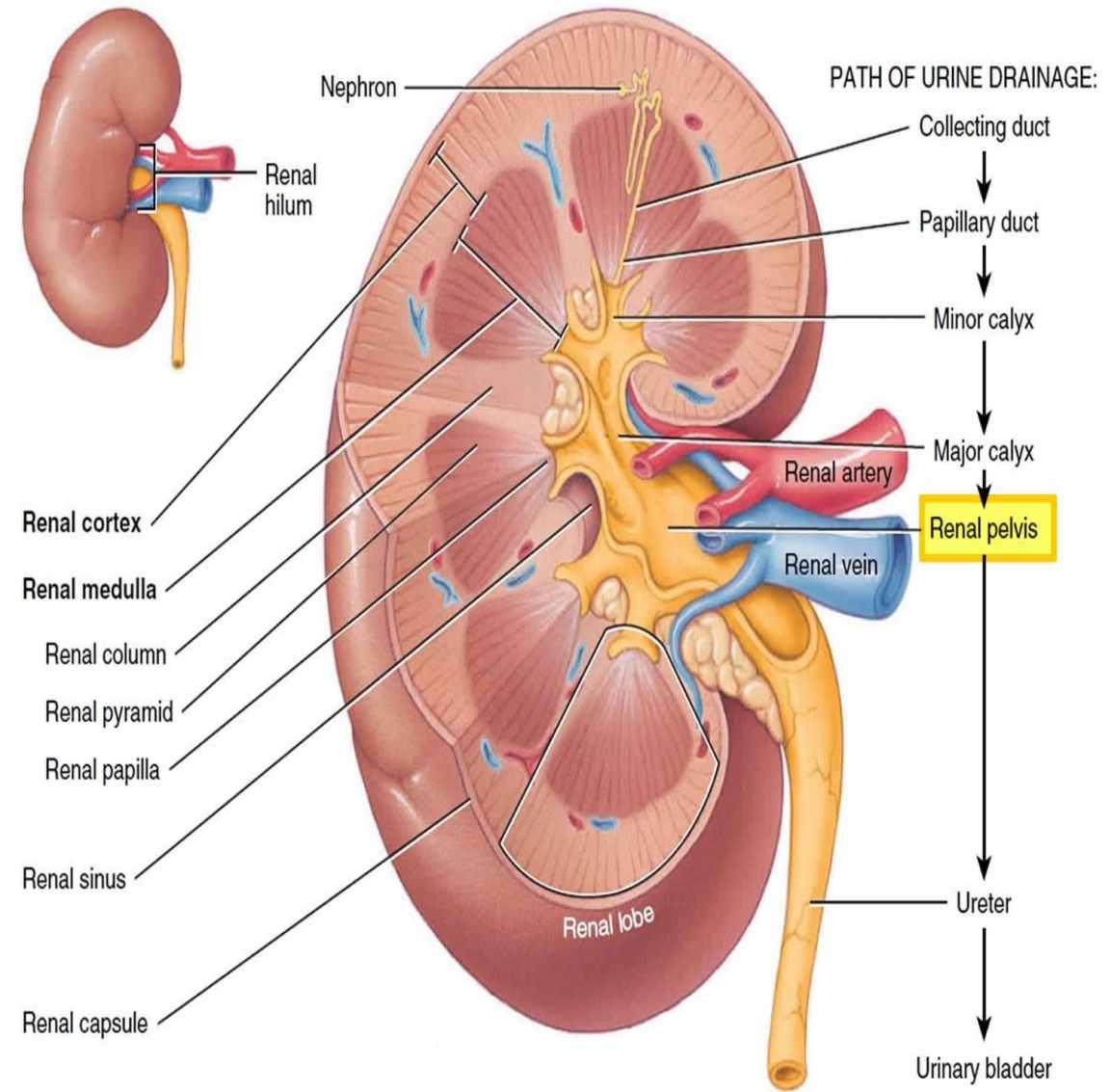


# Abdominal Part of Ureter

- It **continuous superiorly** with the renal pelvis (**Pelvis of the ureter**).

## Pelvis of the ureter:

- It is a funnel-shaped **lies** partly inside the renal sinus and partly outside it.
- It divides into (2- 3) major calyces** each of which divides into (2- 4) minor calyces, each **minor calyx** receives the tips of 1 -3 **renal papillae**.
- It tapers as it passes inferomedially, **traversing** the renal hilum to become continuous with the abdominal part of ureter at the **Pelviureteric junction**.



(a) Anterior view of dissection of right kidney

# Abdominal part of Ureter

## Course:

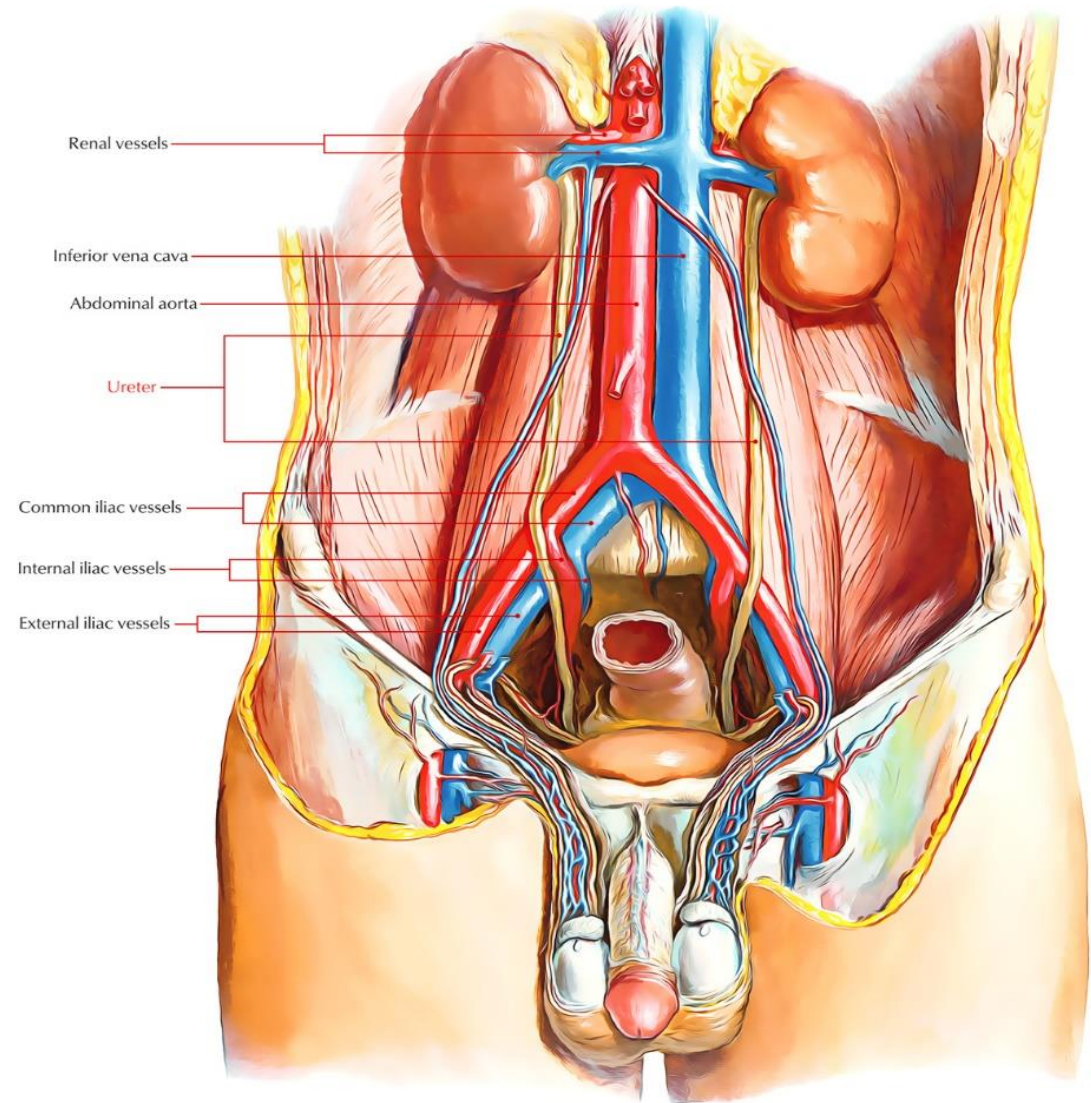
- It runs vertically downward.
- It is continuous with the pelvic part of ureter by crossing the beginning of the external iliac artery.

## Anterior Relations:

Different in both sides

### A-Right Ureter:

- Its upper part covered by the second part of duodenum.
- It is crossed by the following structures:
  - Right colic and ileocolic vessels.
  - Right testicular or ovarian vessels.
  - Terminal part of the ileum.



# Abdominal part of Ureter

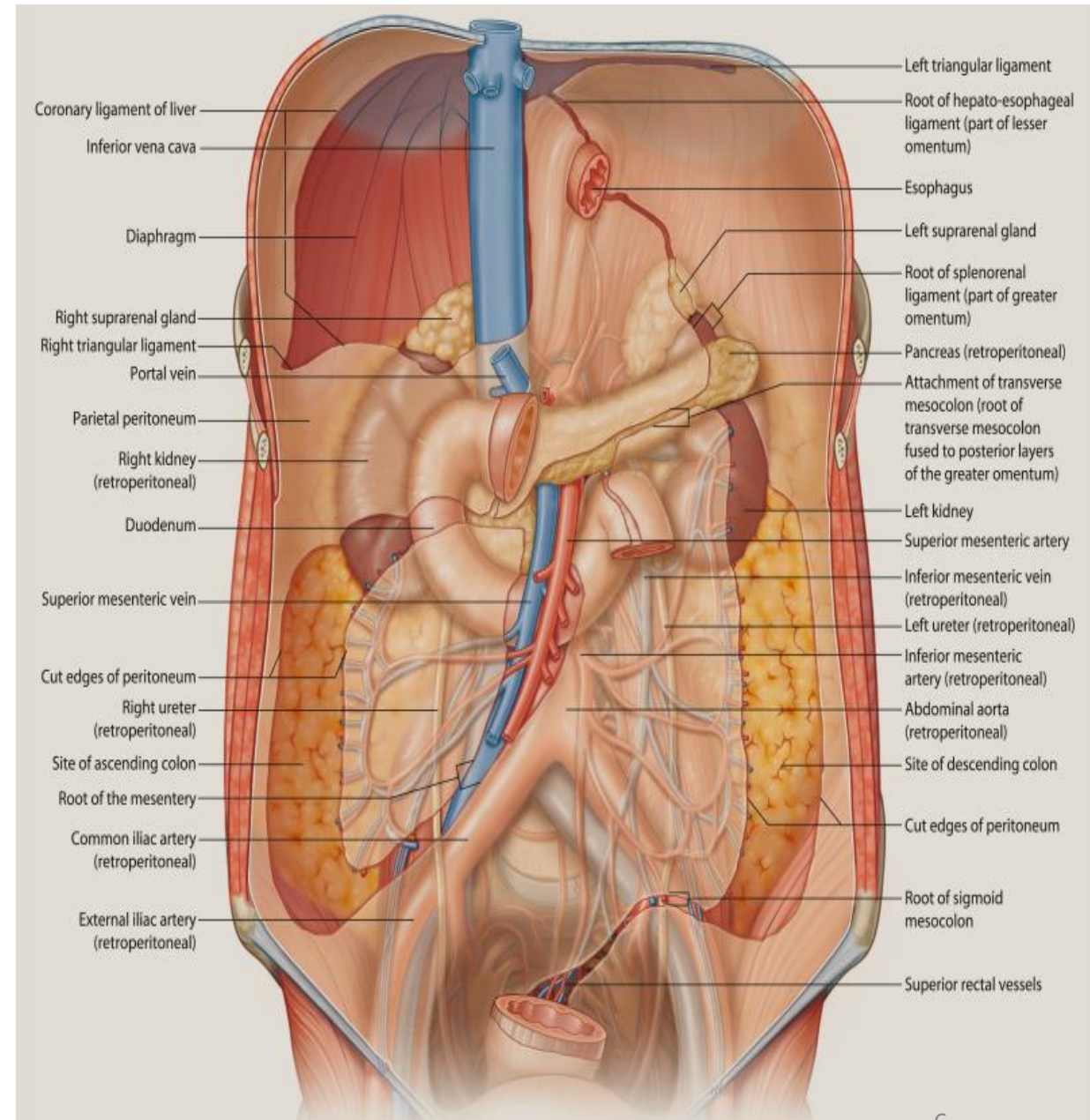
## B- Left Ureter:

▪ **It is crossed by the following structures:**

- Left colic vessels.
- Left testicular or ovarian vessels.

## □ Posterior Relations:

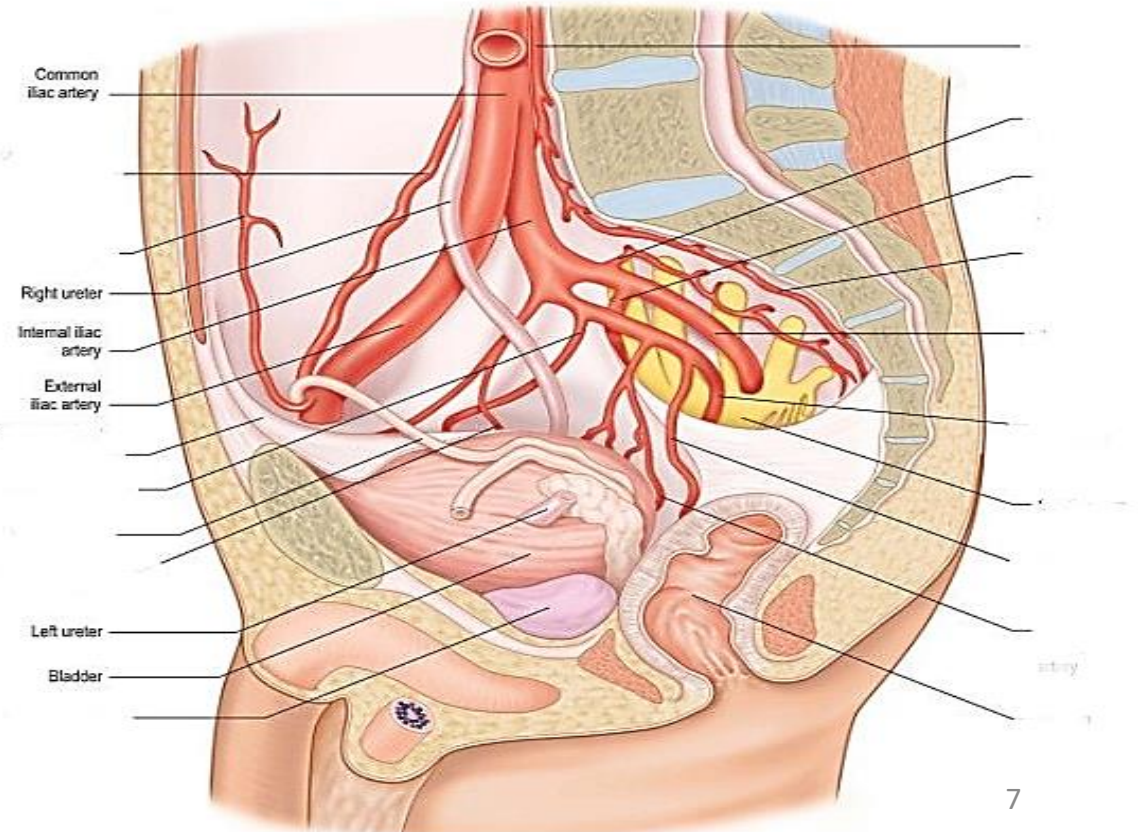
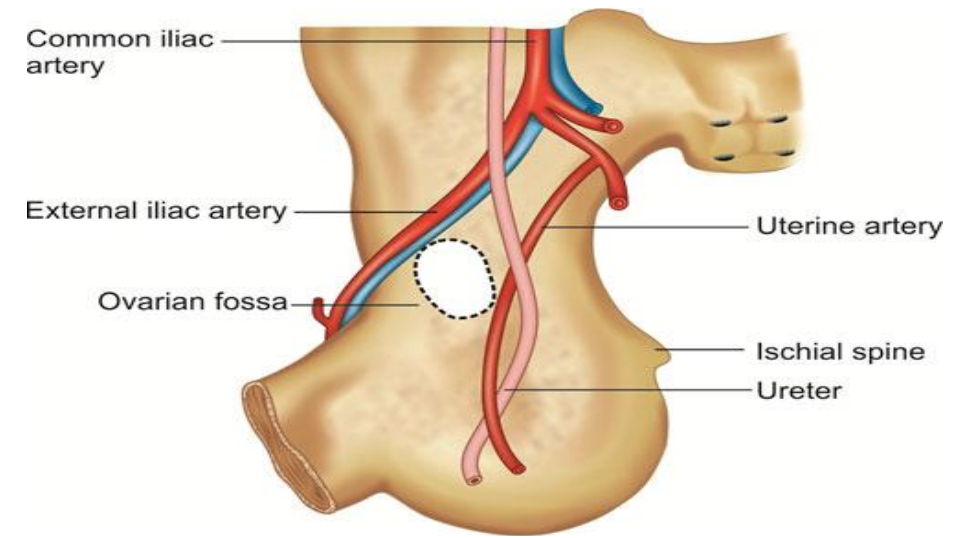
- Corresponding **psoas major muscle**, which separates it from the tips of the transverse processes of the lumbar vertebrae.



# Pelvic part of Ureter

## Course:

- The ureter **enters the pelvis by** crossing the beginning of the external iliac artery.
- Each ureter **then runs** down on the **lateral wall of the pelvis** to the level of the ischial spine.
- **Then turns forward & medially** on the **floor of the pelvis** to open into the base of the urinary bladder.
- The ureter **passes obliquely** through the wall of the bladder (**intramural part of ureter** (1.9 cm) before opening into it. This provides **a valve like action**, which prevents a reverse flow of urine toward the kidneys.



# Relations of pelvic part of ureter

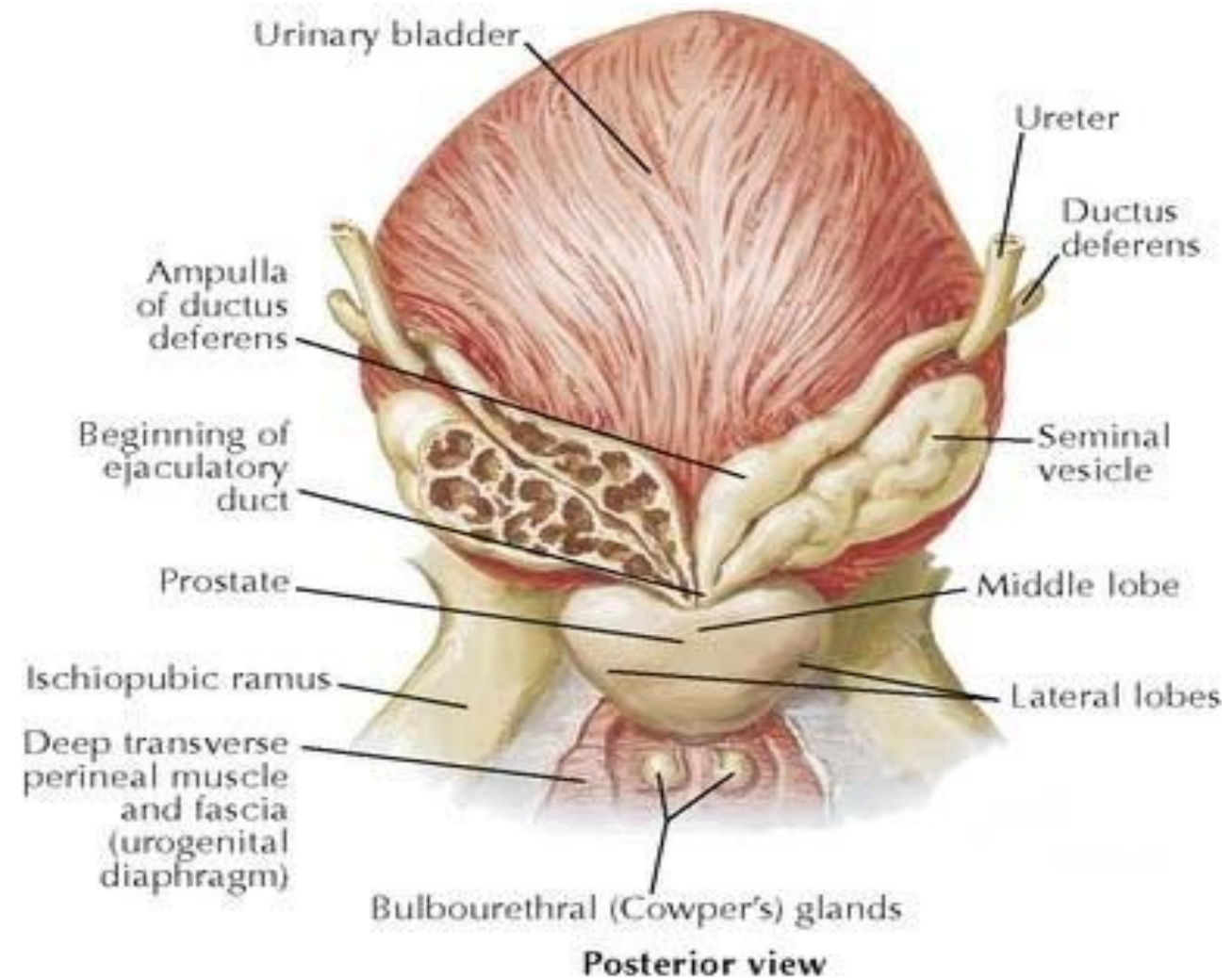
## A- Relations common in both sexes:

- On the side of the pelvis, the ureter descends in front of internal iliac artery and it lies on obturator internus muscle.

## B- Different Relations according to the sex.

### In males:

- **On the base of bladder**, the ureter lies just above the seminal vesicle.
- It is crossed by the vas deferens.





# Relations of pelvic part of ureter

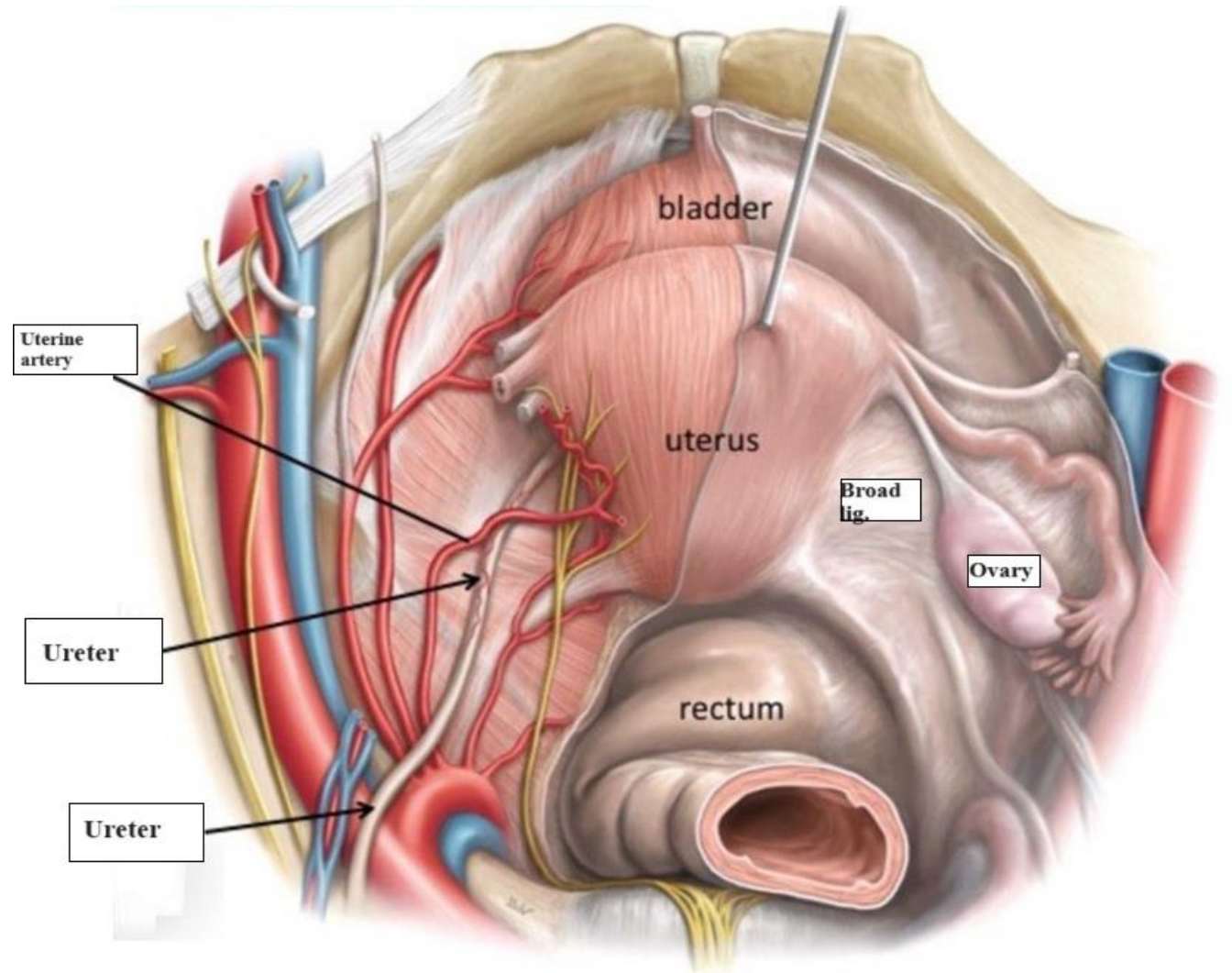
## In females:

### On the lateral wall of pelvis;

- The ureter lies behind the ovary.

### On the floor of the pelvis:

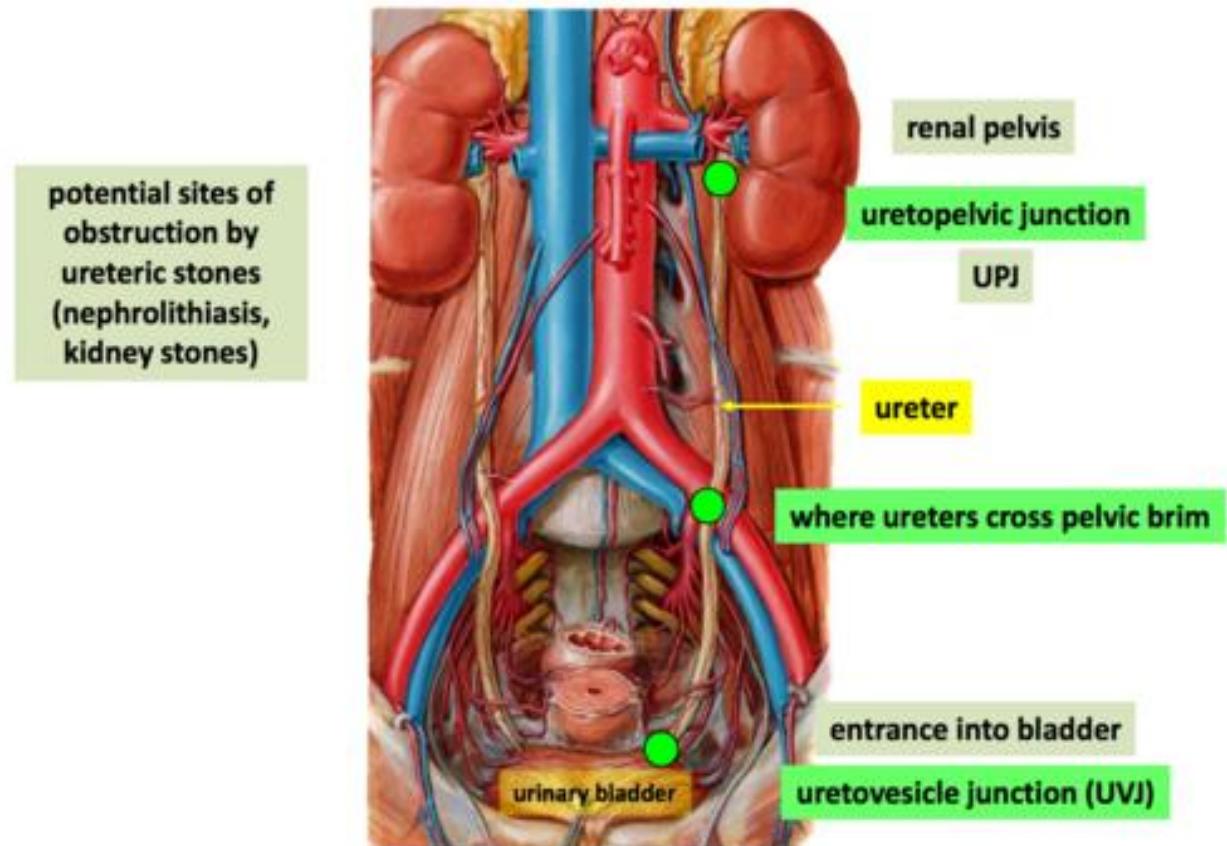
- It runs in the root of the broad ligament.
- It is crossed by the uterine artery.



# Normal sites of constrictions of the ureter

- 1- At the pelvi-ureteric junction.
  - 2- At the pelvic brim (where the ureter crosses the artery).
  - 3- Intramural part of the ureter.
- ❖ A stone may be impacted in the ureter at any one of these sites.

There are several normal sites of **ureteric constriction**



# Ureter

## Blood Supply:

### Arteries:

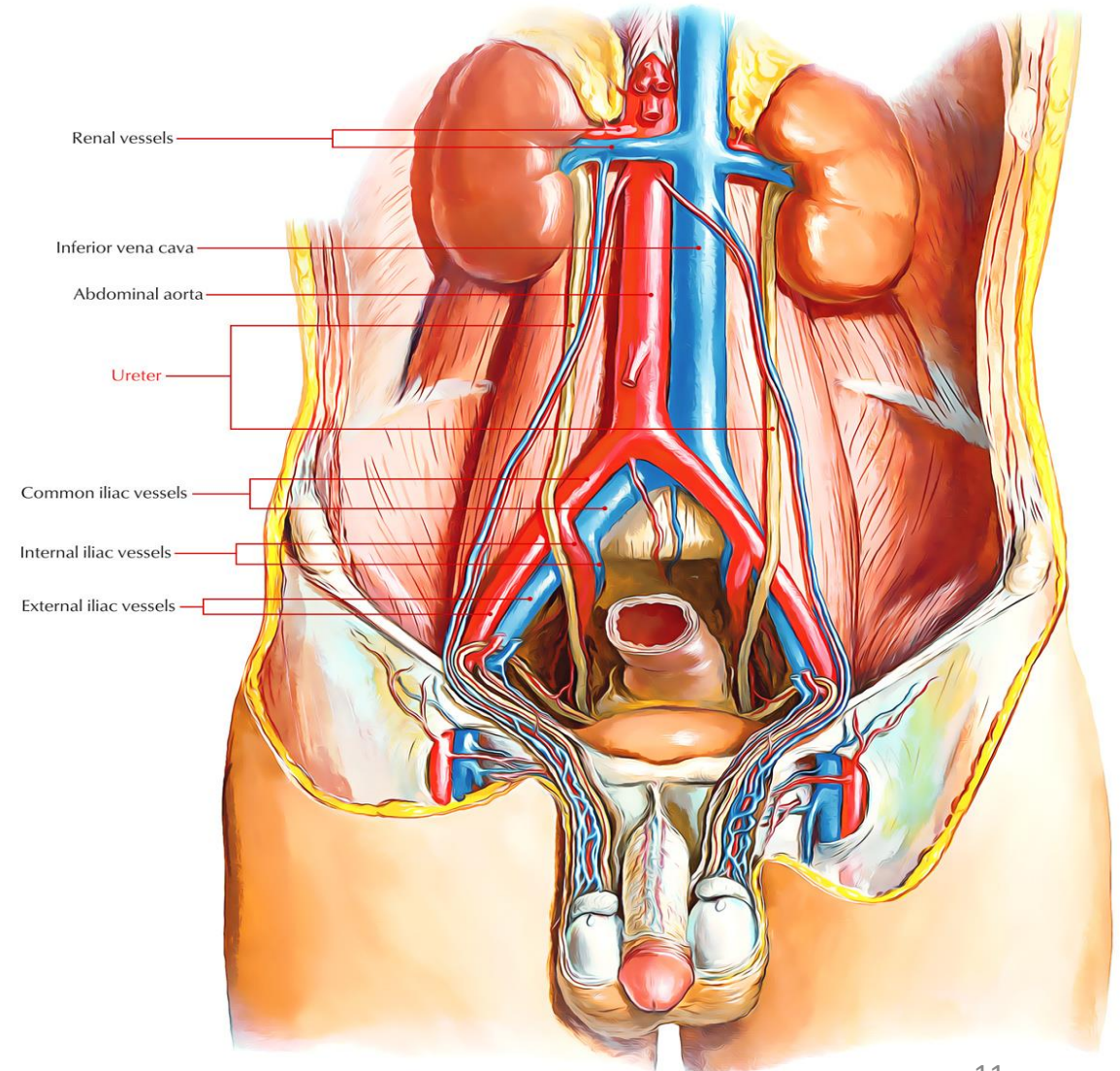
- It is supplied by branches from the **renal, gonadal, the abdominal aorta, common iliac, internal iliac, vesical and uterine arteries.**
- There is longitudinal anastomosis between these branches on the wall of the ureter.

### Veins:

- Into veins that correspond to the arteries.

### Lymph Drainage:

- It drains into the **para-aortic nodes** and the **iliac nodes.**



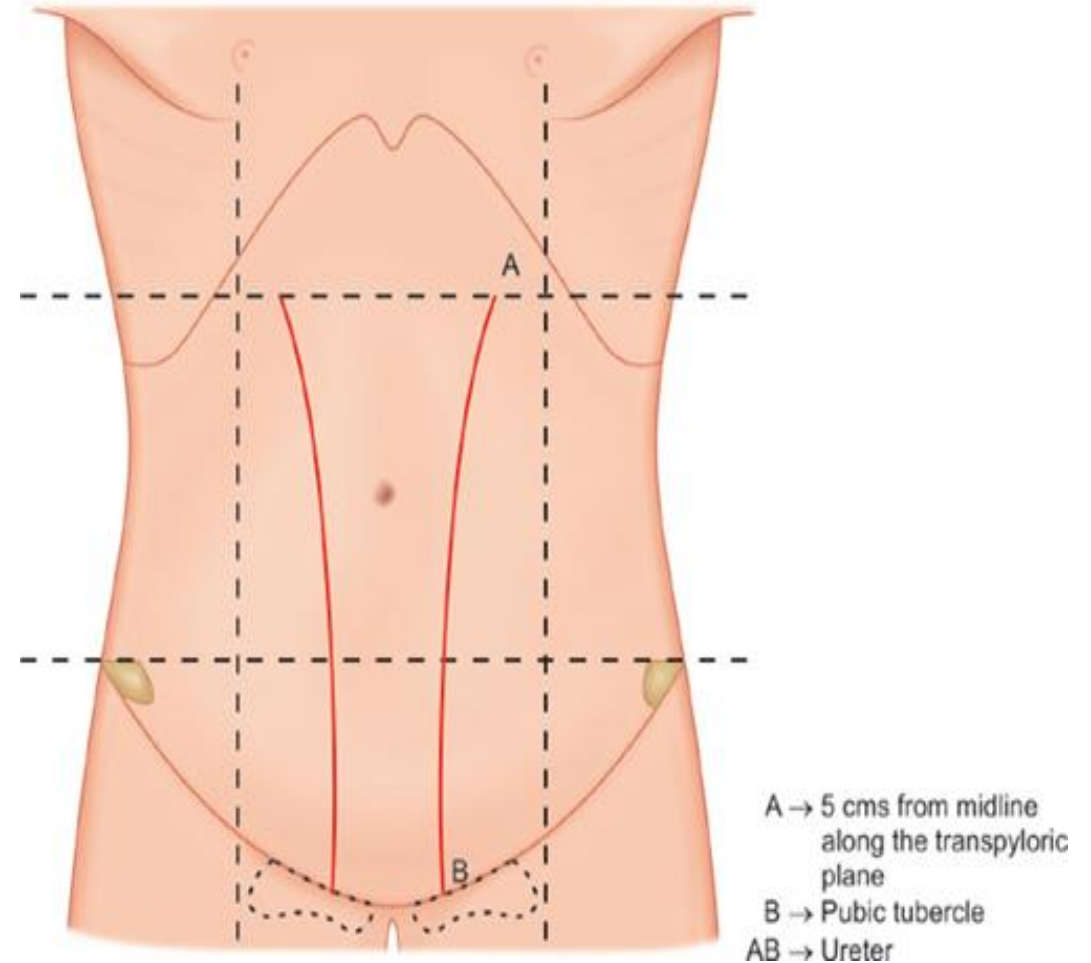
# Ureter

## Identify ureter in operation:

- Thick muscular tube.
- Longitudinal blood vessels.
- Show peristalsis.
- Aspiration of urine.

## Surface anatomy:

- From point at transpyloric plane (L1), 2 inches from median plane.
- To point at pubic tubercle.



# Nerve Supply of Ureter

- The ureter is supplied by **sympathetic fibers** from T10 – L1 spinal segments.
- **Parasympathetic** by pelvic splanchnic nerves.

## Ureteric (Renal) Colic:

- Excessive distension of the ureter or spasm of its muscle may be caused by a stone and gives rise to severe pain (ureteric colic).
- In ureteric colic, strong peristaltic waves of contraction pass down the ureter in an attempt to pass the stone.
- Pain **is referred to** the skin areas that innervated from spinal segments which supply the ureter (loin, groin..
- Pain of ureter radiated to scrotum- thigh due to stimulation of genitofemoral nerve which supply these area.

# Urinary Bladder

- It is a **hollow muscular** organ. It is a **reservoir**.

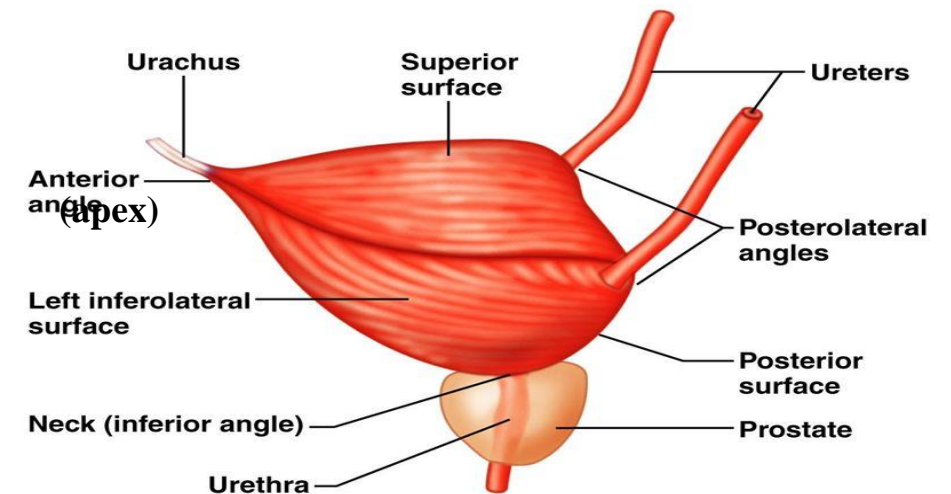
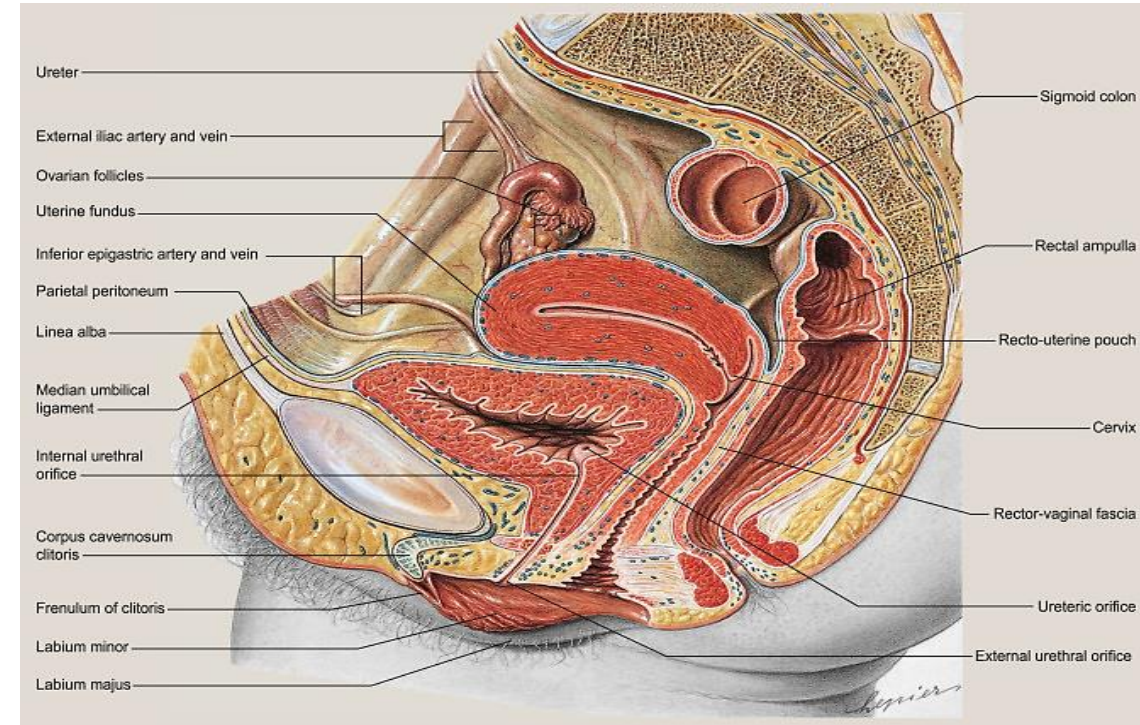
## Site:

- **When the bladder is empty**, it lies entirely in the lesser pelvis, but **as it distends** it expands anterosuperiorly into the abdominal cavity.
- **After birth**, it lies completely in abdominal cavity, as the pelvis enlarge it descends gradually into the lesser pelvis.

**Capacity** of the adult bladder is about 300- 500 ml.

**Shape:** empty bladder has a pyramidal shape with:

- **Base.**
- **Apex.**
- **Neck.**
- **Three surfaces;** superior and two inferolateral surfaces.



# Relations of Urinary Bladder

## □ Superior surface:

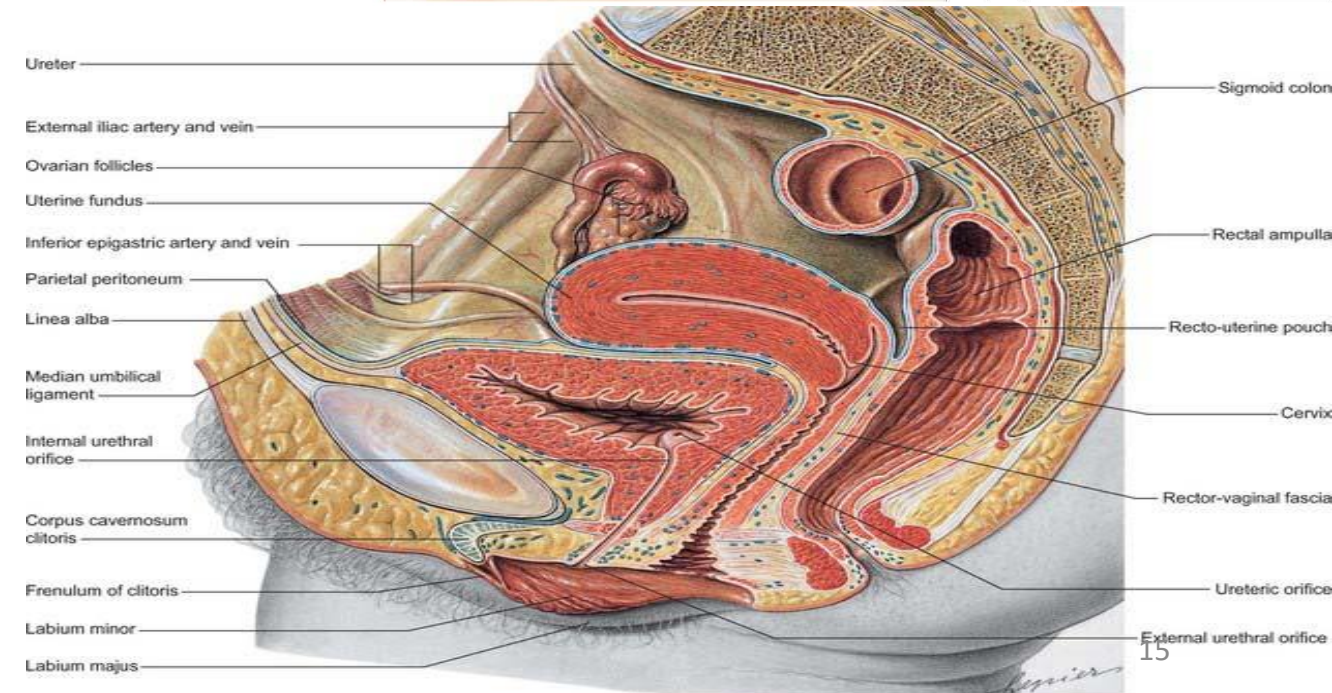
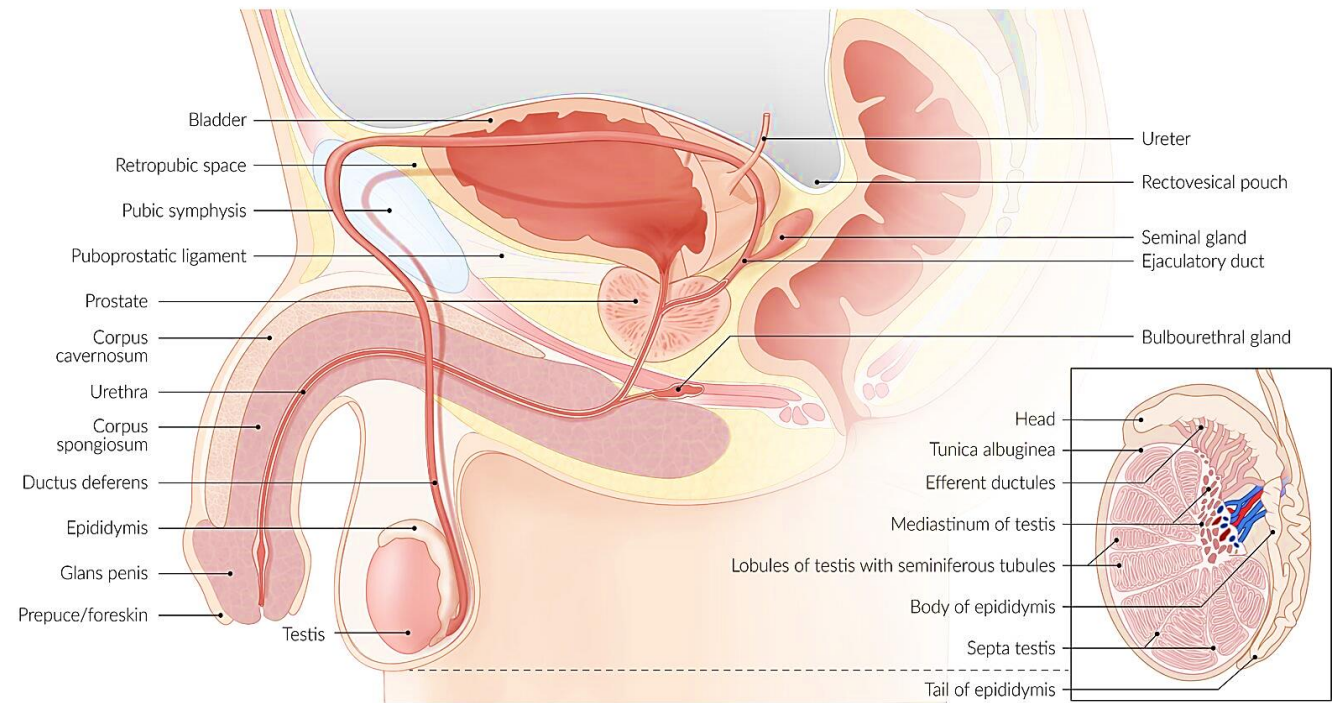
- It is triangular in outline.

## In males:

- It is completely covered by peritoneum and related to sigmoid colon and coils of ileum.

## In females:

- **Its anterior 2/3** is covered by peritoneum and is separated from uterus by uterovesical pouch.
- **Its posterior 1/3** is not covered by peritoneum and is related to supravaginal part of the cervix.



# Relations of Urinary Bladder

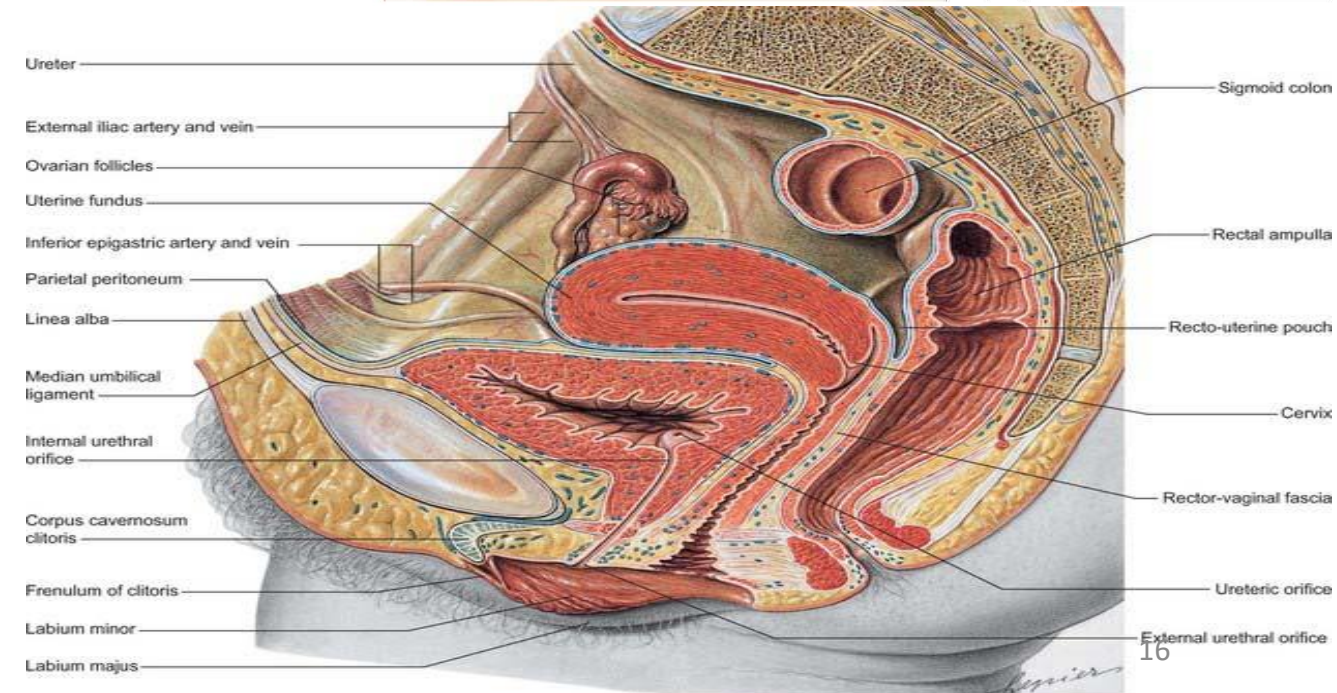
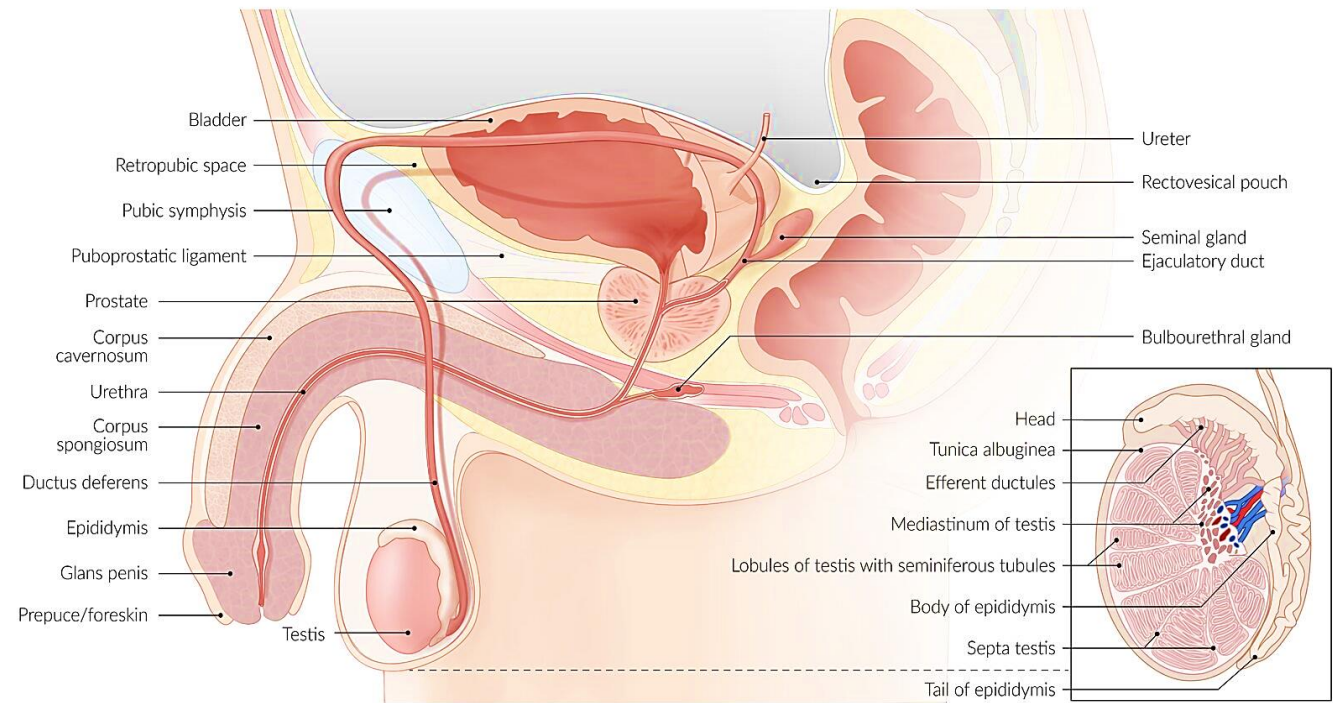
## □ Base:

### In males:

- Upper part is related to rectovesical pouch.
- Lower part is related to two seminal vesicles and two vasa deferentia.
- These structures separates the base from the rectum.

### In females

- It is related to the vagina.





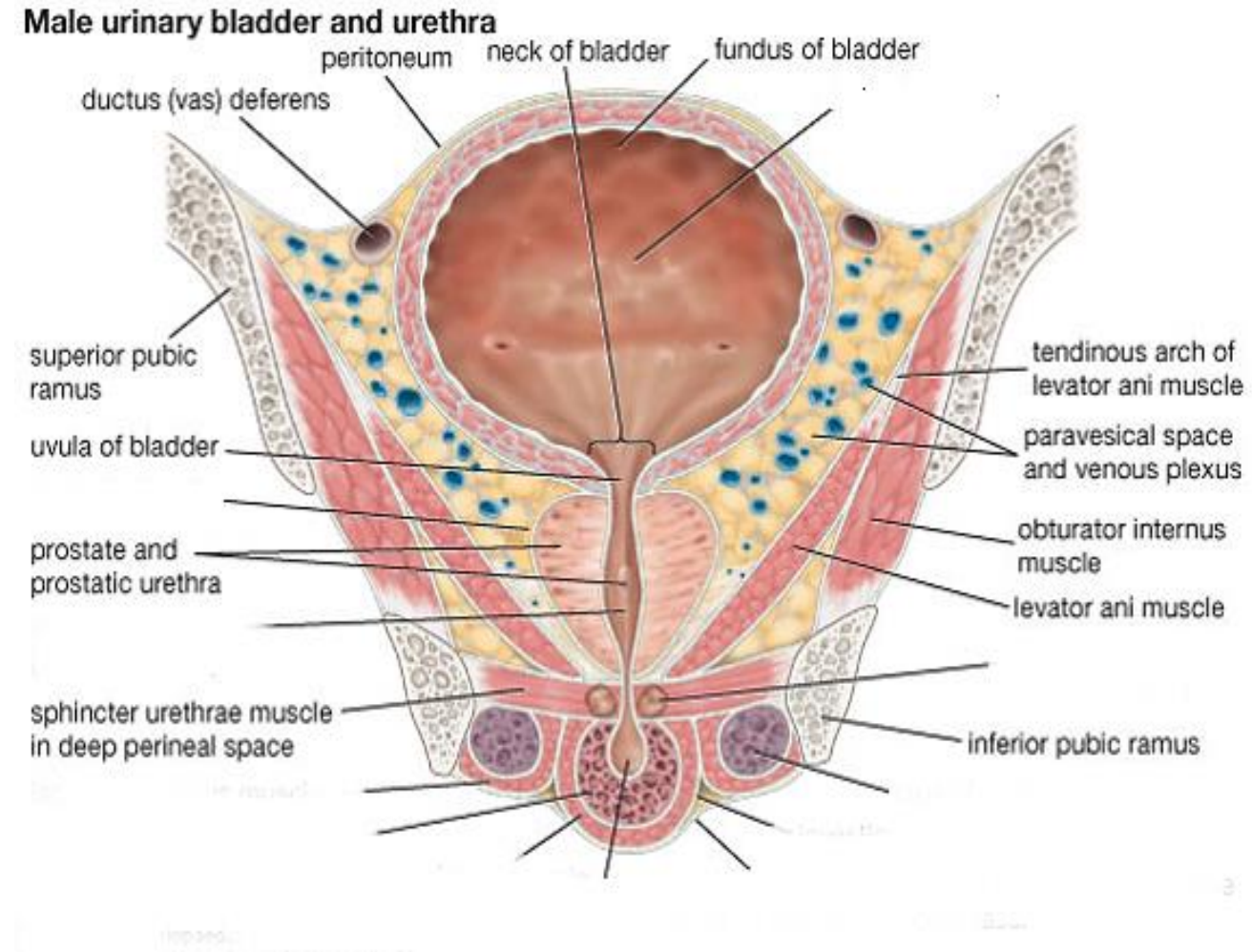
# Relations of Urinary Bladder

## □ Inferolateral surface of the bladder:

- It has no peritoneal covering.
- **It is related to** the retropubic pad of fat which separates the surface from the pubis, obturator internus and levator ani muscle.

## □ Neck of the bladder:

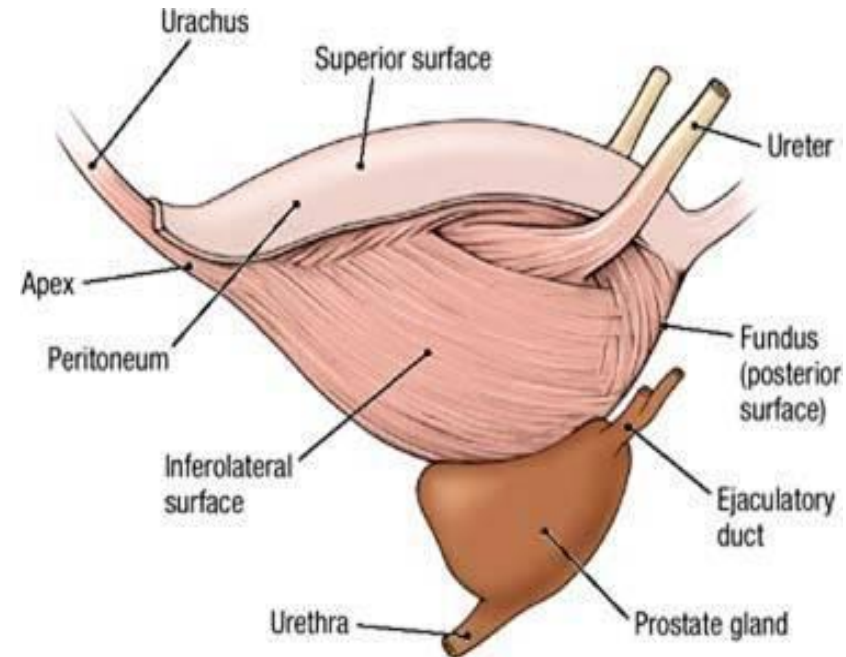
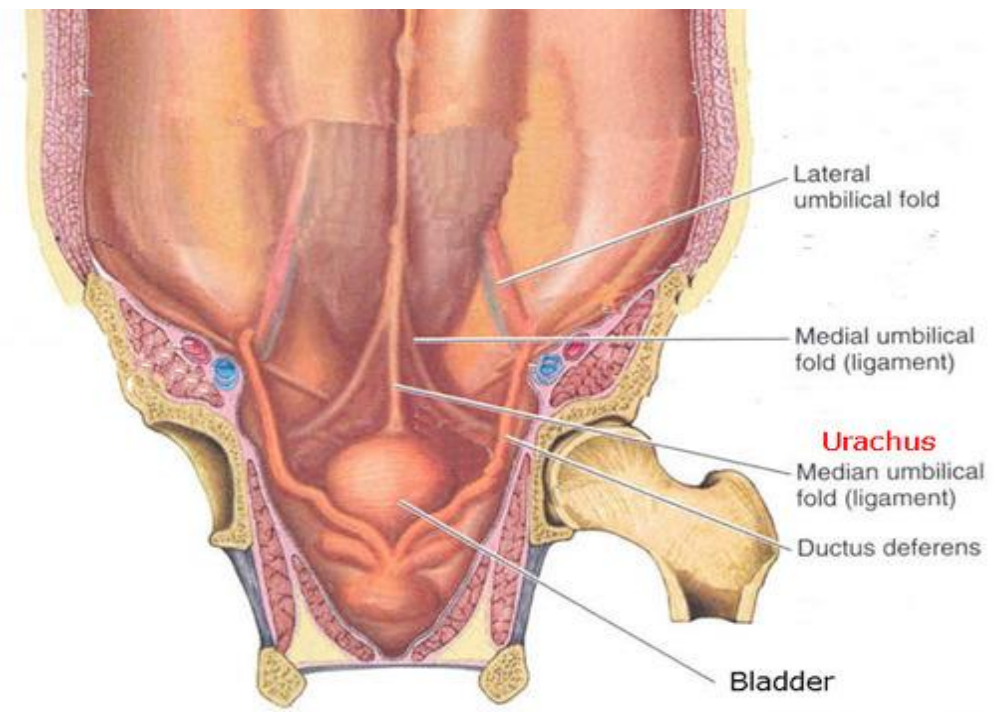
- **It lies** most inferiorly.
- **It is continuous** with the urethra at the internal urethral orifice.
- **In males;** it is surrounded by the base of the prostate



# Relations of Urinary Bladder

## □ Apex of the bladder:

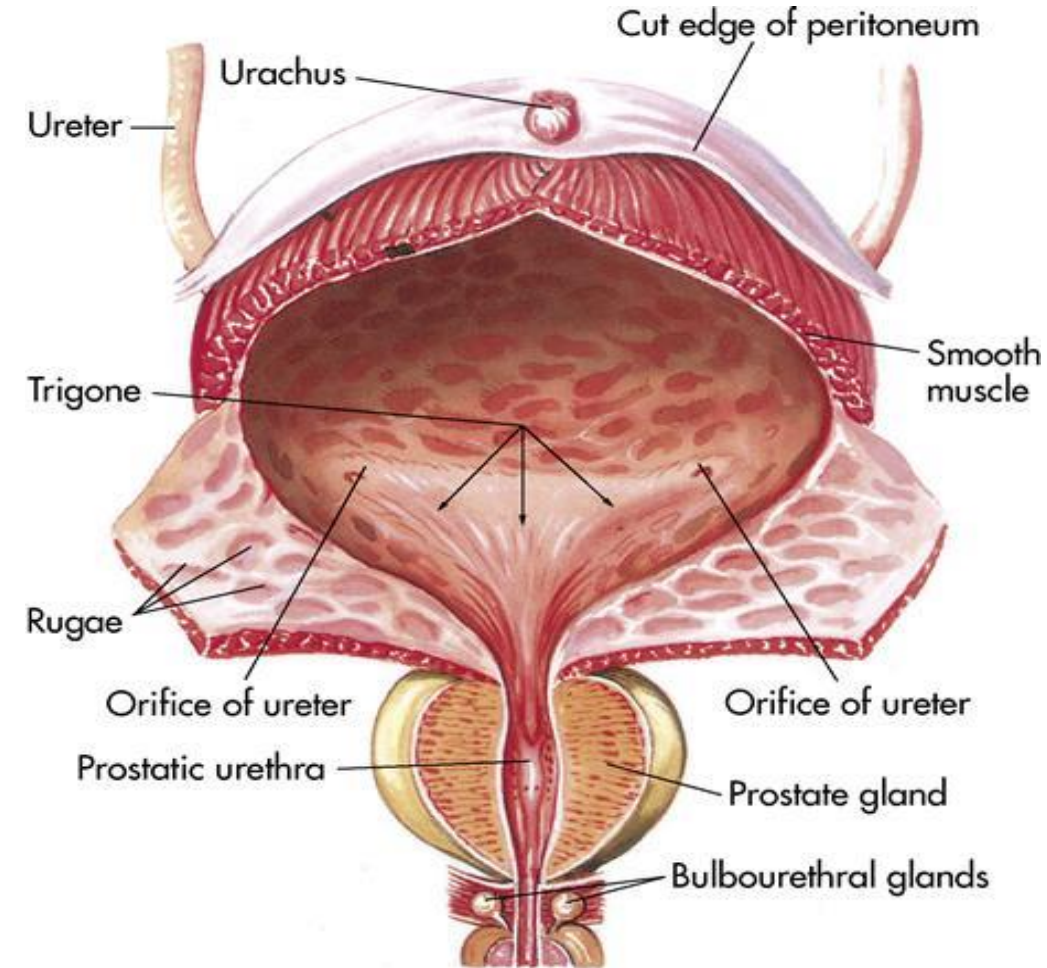
- **It is directed** forwards towards the upper border of symphysis pubis.
- **Median umbilical ligament** extends from apex to the umbilicus, this ligament represents the obliterated urachus.



# Cavity of the Bladder (Bladder Interior)

## □ Examination in the living using cystoscopy.

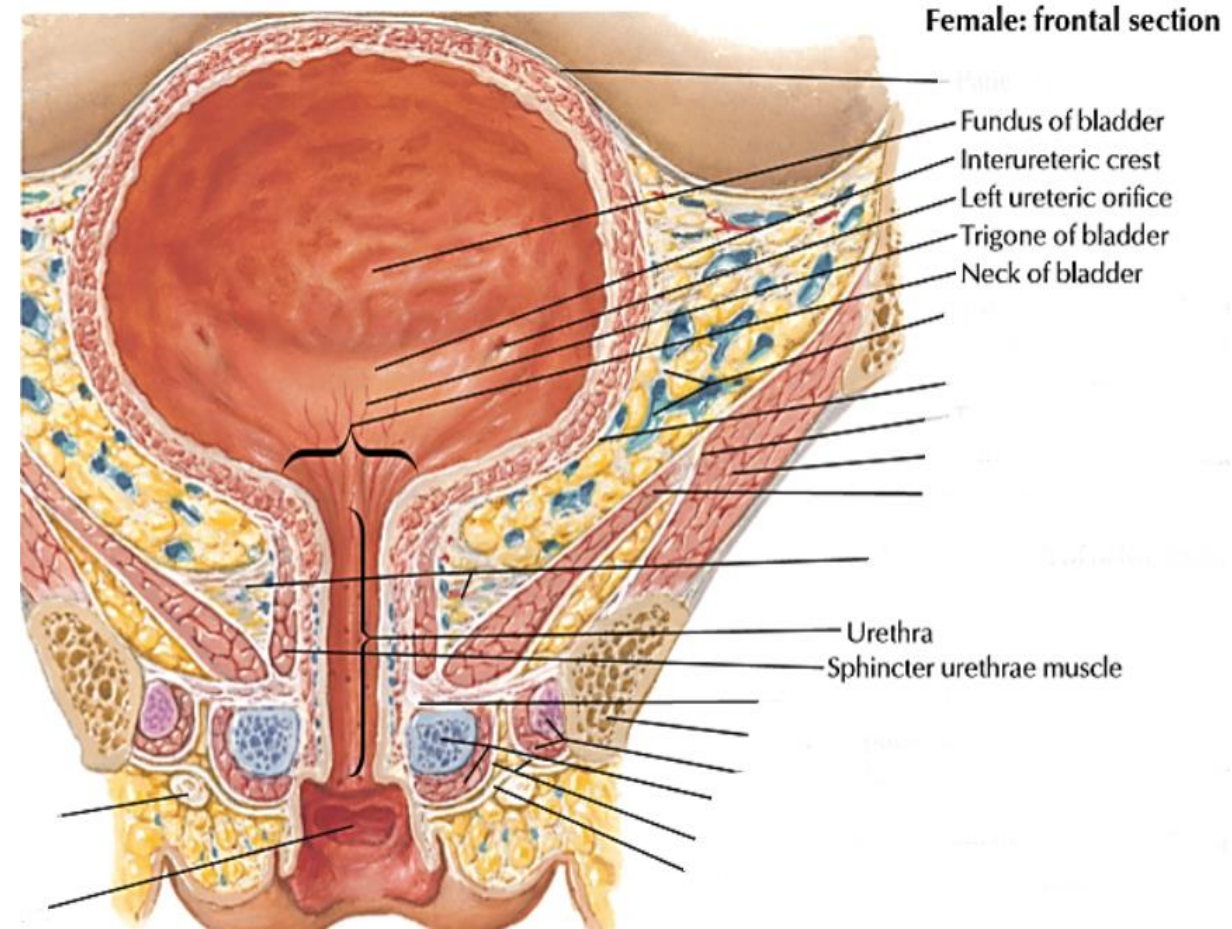
- The mucous membrane of the greater part of the empty bladder is thrown into folds that disappear when the bladder is full.
- **The area of mucous membrane covering the internal surface of the base of the bladder is called the trigone**, Here, the mucous membrane is always **smooth**, even when the bladder is empty, because the mucous membrane is firmly adherent to the underlying muscular coat.



# Cavity of the Bladder (Bladder Interior)

## Trigone of the bladder:

- It is **triangular** area.
- The **superior angles** of the trigone correspond to the two **ureteric orifices**.
- The **inferior angle** (apex of trigone) is formed by the **internal urethral orifice**.
- **Base of trigone** is directed upward and is formed by a muscular ridge (**interureteric ridge**) which extends between the two ureteric orifices.
- The **interureteric ridge** forms a guide during the introduction of catheter into the ureter.



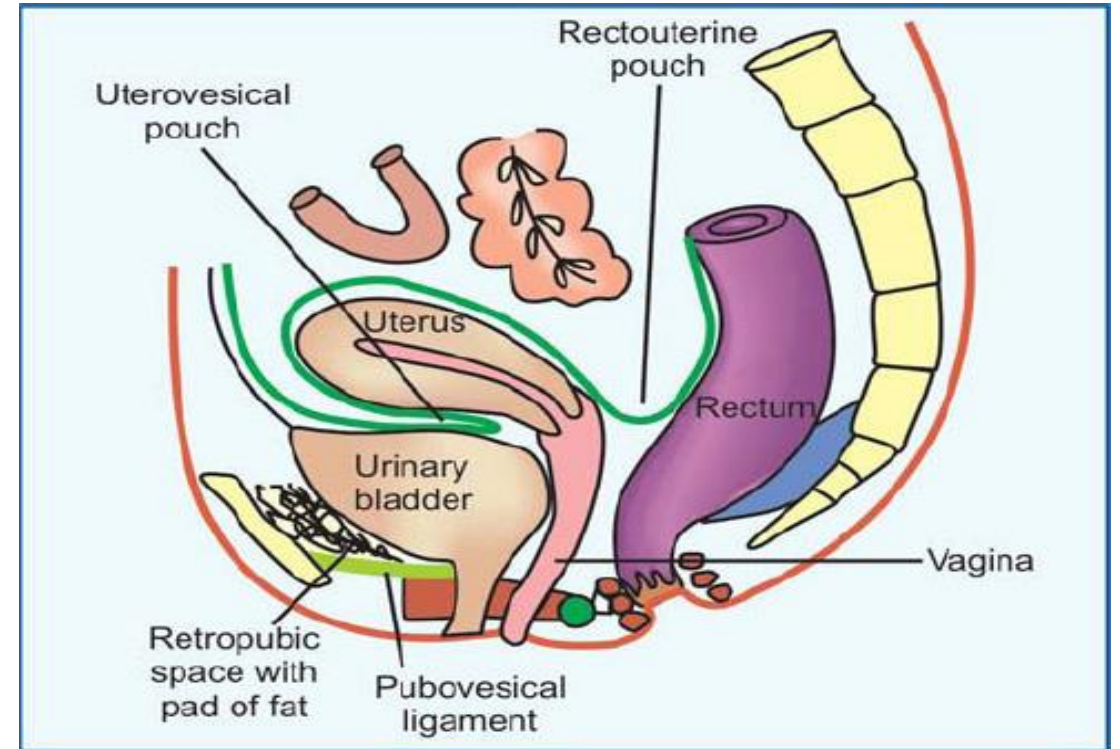
# Ligaments of the Bladder

## □ True ligaments:

- **Median umbilical ligament:** Between apex of bladder & umbilicus.
- **Pubo-prostatic ligament in male:** Between prostate & pubis.
- **Pubovesical ligament in female:** Between neck of bladder & pubis.
- **Lateral ligament:** Between side of bladder & tendinous arch of obturator fascia.

## □ False ligaments: (peritoneal folds):

- Sacrogenital fold.
- Lateral fold.



# Blood Supply of the Urinary Bladder

## □ Arterial supply:

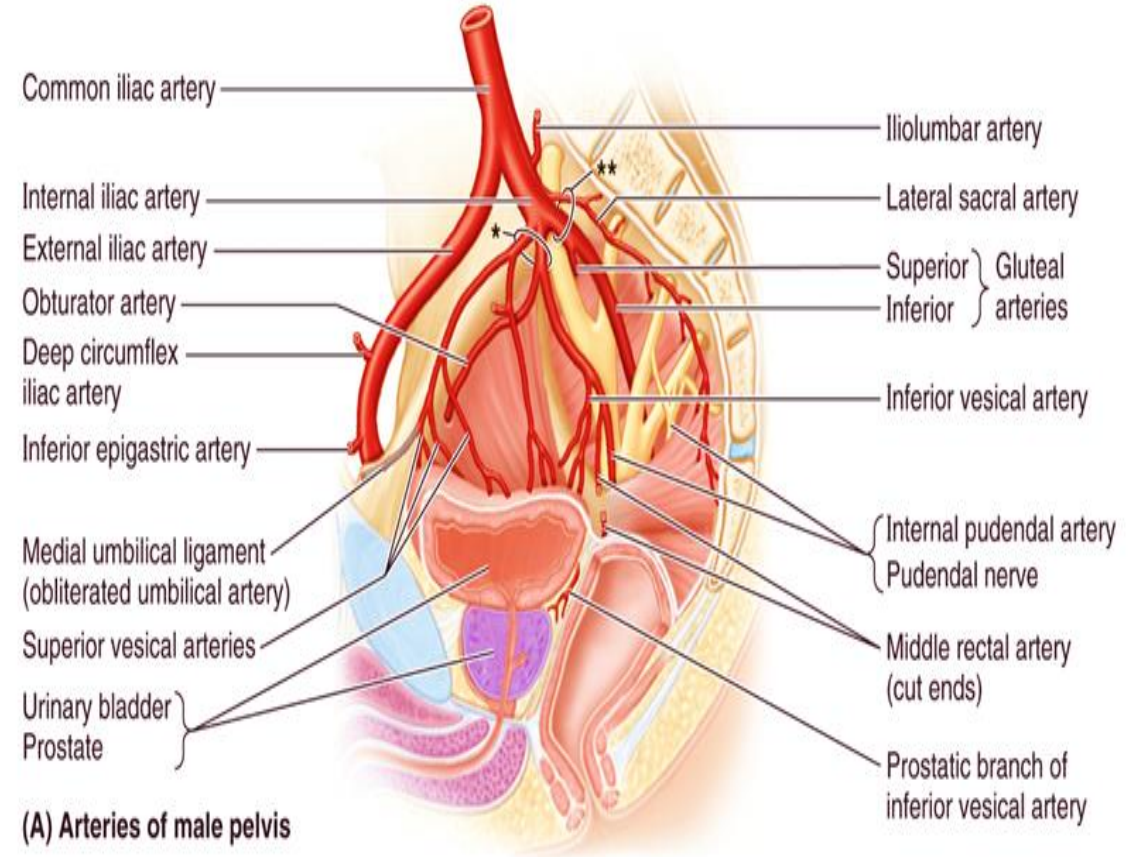
- Superior vesical artery.
- Inferior vesical artery in male or vaginal artery in female.

## □ Venous Drainage:

- It is through the vesical plexus which drains into the **internal iliac veins**.

## □ Lymphatic drainage:

- Into the iliac lymph nodes.



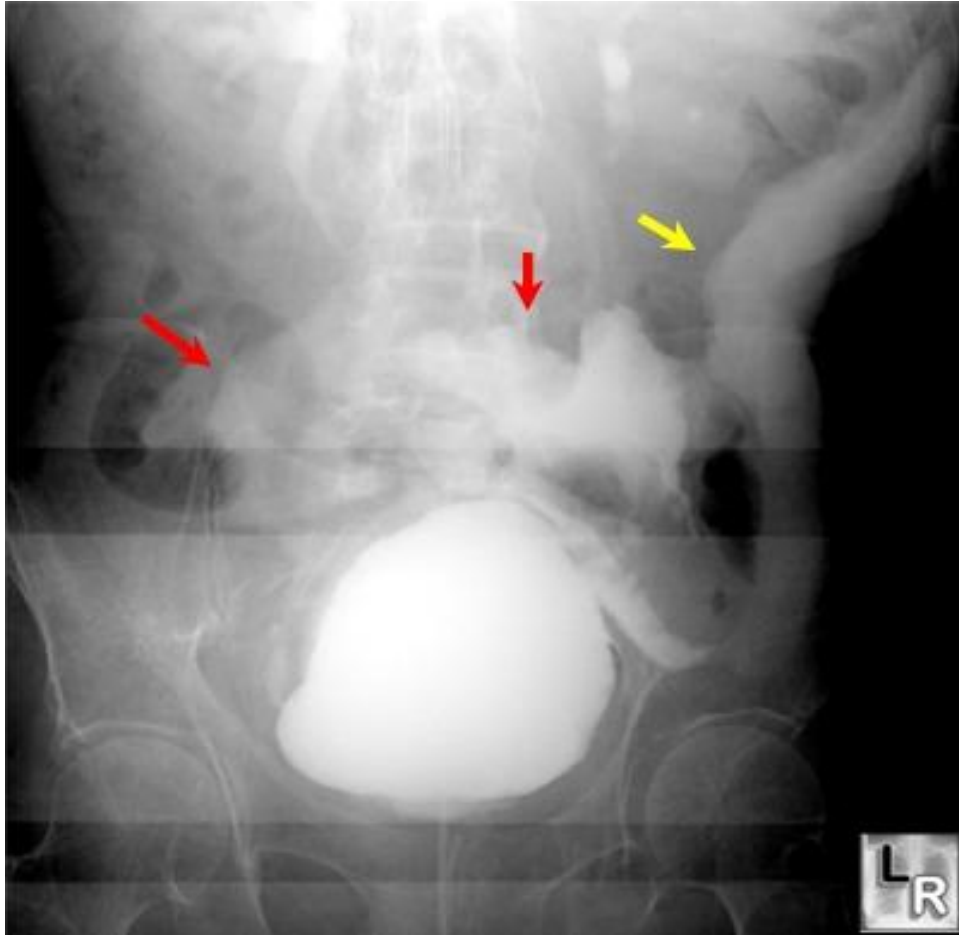
# Nerve Supply of Urinary Bladder

- **Sympathetic fibers** are derived from L.1&2 segments of the spinal cord.
- **Parasympathetic fibers** by the pelvic splanchnic nerve.

# Intraperitoneal and Extraperitoneal Rupture of Urinary Bladder

	<b>Intraperitoneal Rupture</b>	<b>Extraperitoneal Rupture</b>
<b>Incidence</b>	Less common (20%)	More common (80%)
<b>Cause</b>	Direct blow (Blunt trauma) on distended bladder.	Penetrating injury/ <b>Pelvic fractures.</b>
<b>Part of urinary bladder</b>	It involves superior surface of urinary bladder & its covering peritoneum.	It involves the anterior part of the bladder wall below the level of the peritoneal reflection.
<b>In this case</b>	Urine & blood escape freely into the peritoneal cavity.	Urine extravasate to the perivesical space.
<b>Imaging findings</b> Cystography	Extraluminal contrast extends into paracolic gutters & around bowel loops.	Extraluminal contrast limited to perivesical space.
	Highest morbidity and mortality is associated with intraperitoneal rupture because of development of peritonitis.	





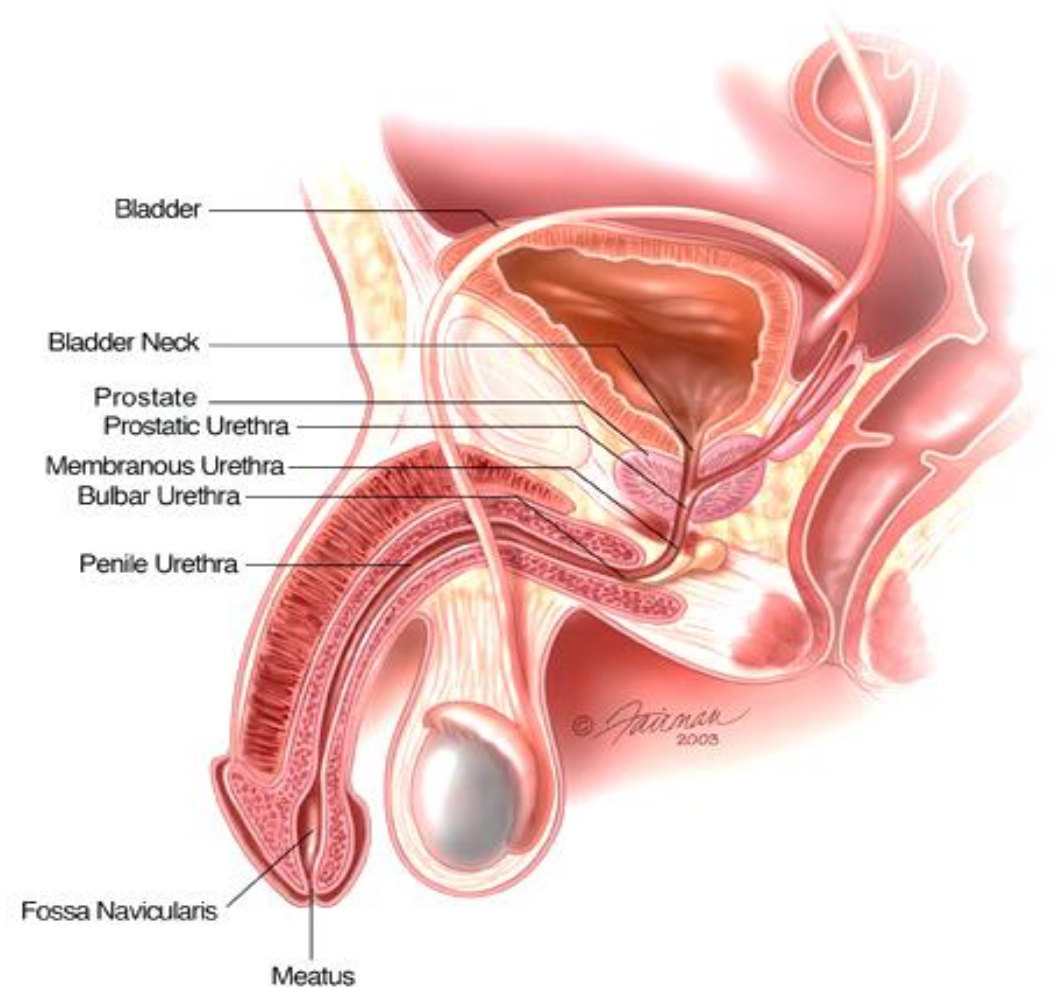
In intraperitoneal bladder rupture. Note the extraluminal contrast (red arrows) outside the confines of the normal bladder and spreading into the peritoneal cavity. There is contrast in the left paracolic gutter (yellow arrow).



In extraperitoneal bladder rupture, shows a flame-shaped density adjacent to right lateral wall of bladder representing extra-peritoneal contrast from a bladder rupture.

# Male Urethra

- **Male urethra:** a common canal for passage of urine and semen to outside the body.
- It **measures** about 18-20 cm long.
- It **extends** from the internal urethral orifice at the neck of the bladder **to** the external urethral orifice at the tip of the glans peins.
- **It is formed of 3 parts;**
  - ✓ Prostatic urethra.
  - ✓ Membranous urethra.
  - ✓ Spongy urethra



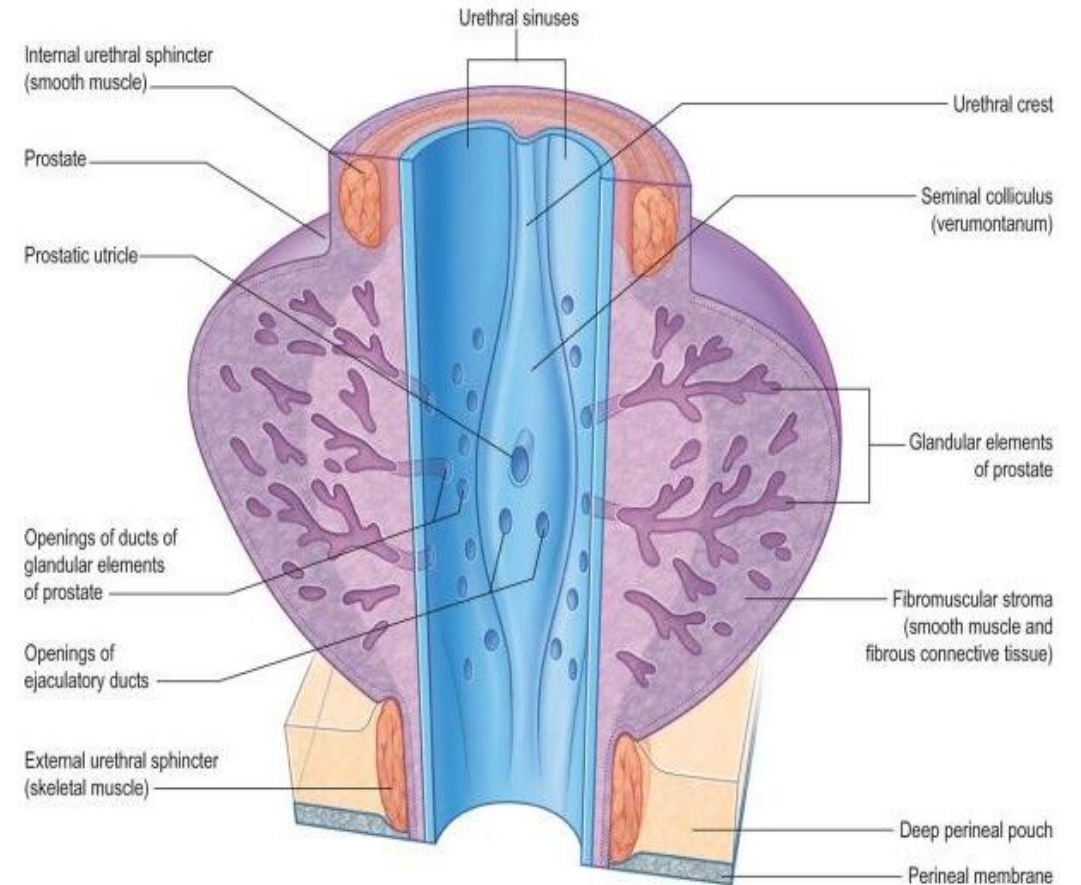
# Male Urethra

## □ Prostatic Urethra:

- It is the widest part & about (3cm) in length.
- It **runs through** the prostatic gland.

## Posterior wall of the prostatic urethra shows;

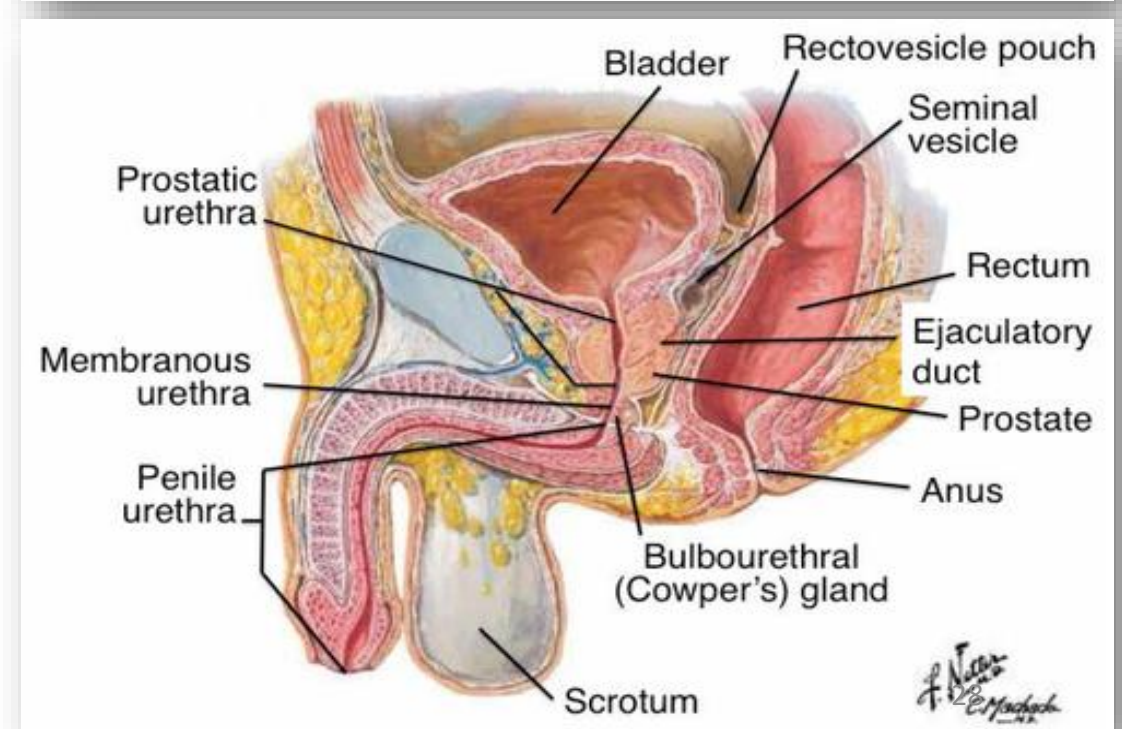
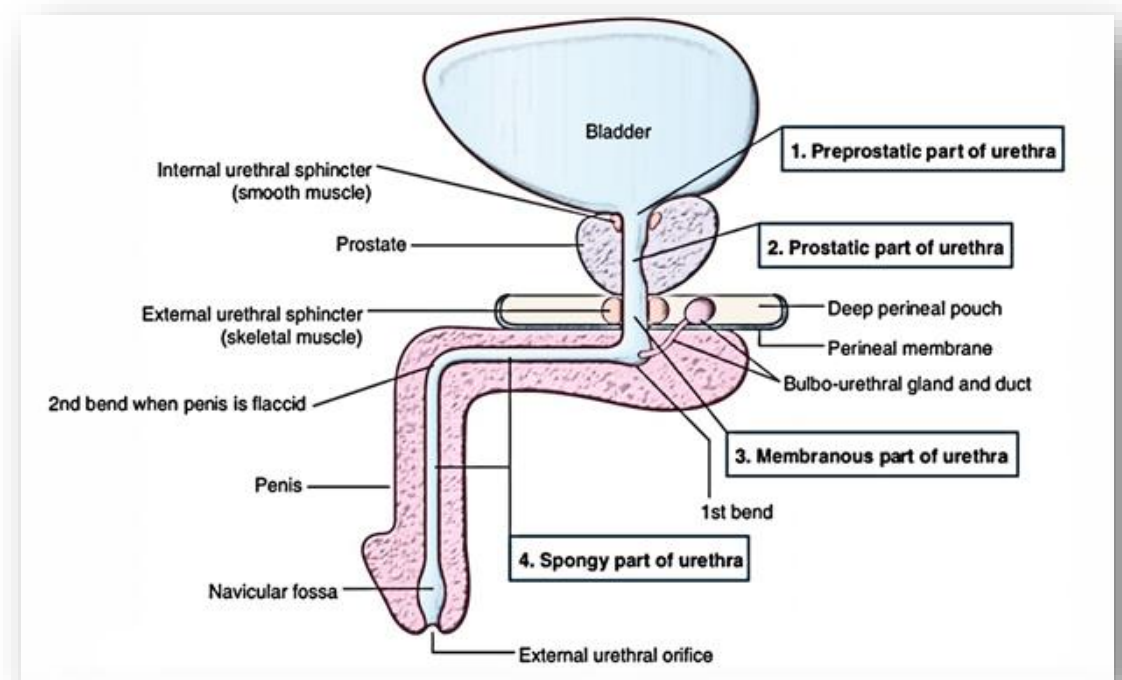
- A narrow longitudinal elevation in the midline called the **urethral crest**.
- A small circular elevation of the urethral crest called **seminal colliculus** which have 3 orifices;
  - ✓ Central one for the **prostatic utricle**.
  - ✓ Two orifices for the two ejaculatory ducts.
- A depression is formed on each side of the urethral crest called the **urethral sinus** which perforated by the prostatic gland orifices.



# Male Urethra

## □ Membranous Urethra:

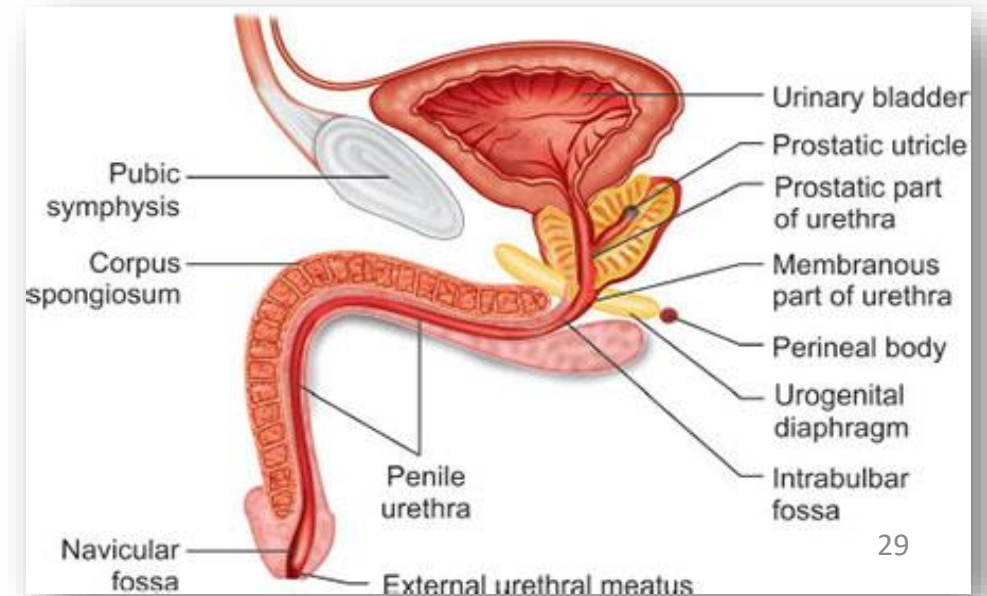
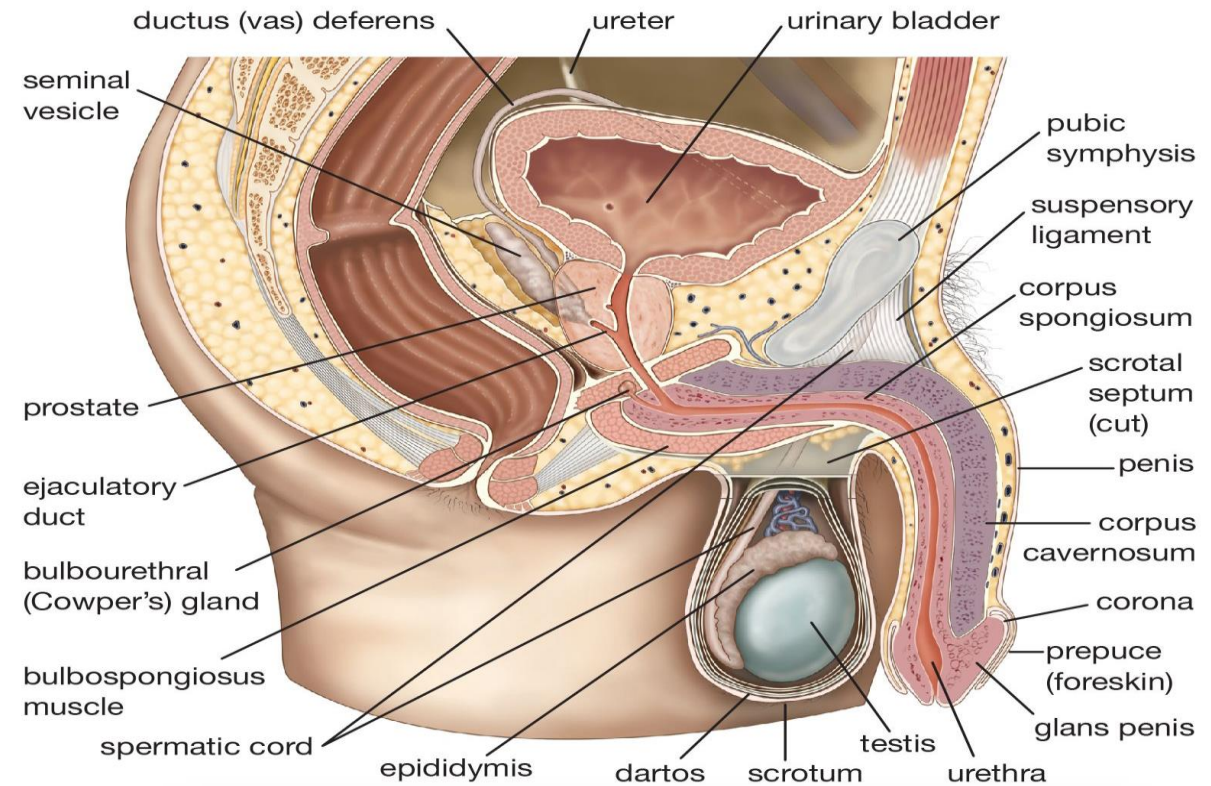
- It is the **narrowest & shortest** part about (2 cm) in length.
- It **extends** from apex of prostate to the bulb of penis.
- **Site:** It **traverses** the deep perineal pouch.
- It is **surround by** the external urethral sphincter.
- Two small **bulbourethral glands** on each side of the membranous urethra.



# Male Urethra

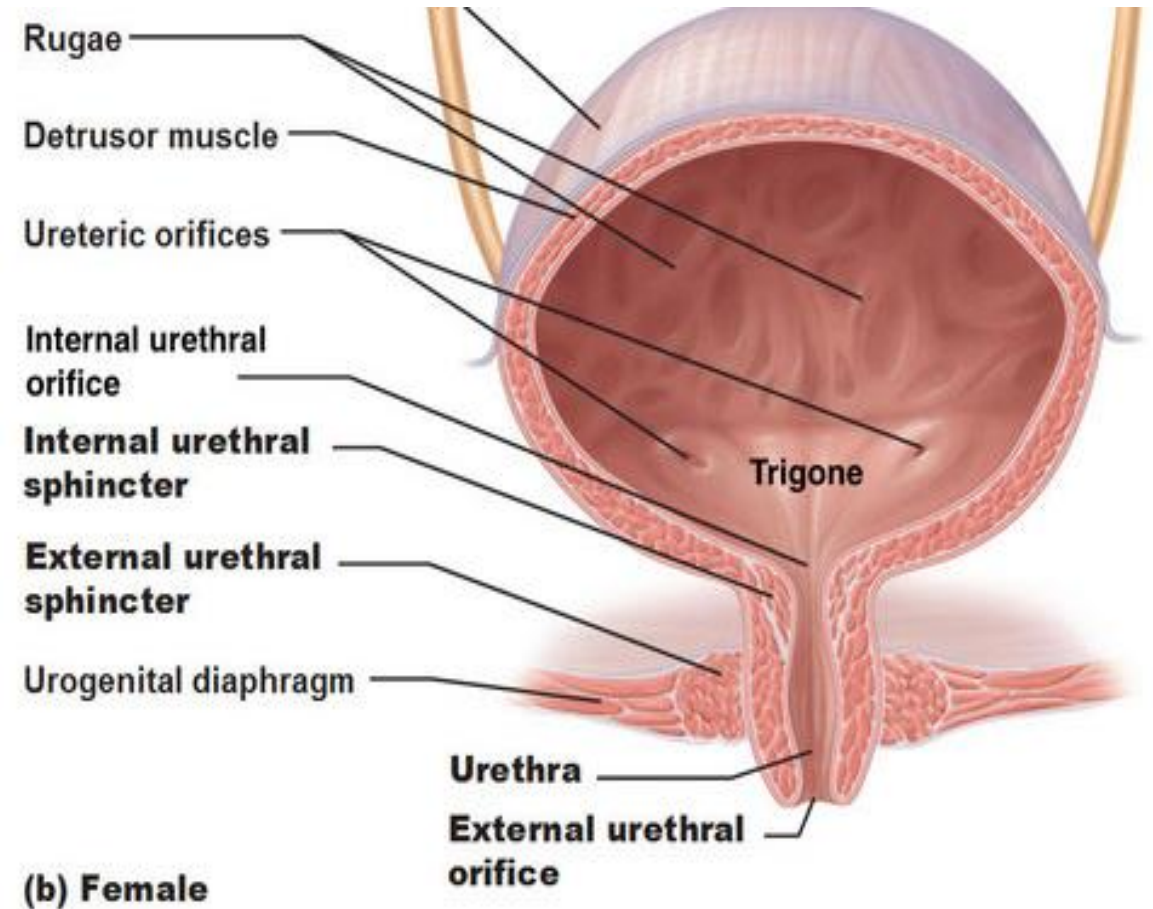
## □ Spongy (Penile) Urethra:

- It is the **longest part** about 15 cm in length.
- It **traverses** the whole length of the corpus spongiosum of penis.
- It **extends** from the end of the membranous urethra to the external urethral orifice on the glans penis.
- It has 2 dilatations;
  - **Intrabulbar fossa** at its beginning.
  - **Navicular fossa** at its termination.
- It **receives** the opening of ducts of bulbourethral glands.



# Female Urethra

- Female urethra is **short** measure about 4– 5 cm in **length**.
- It **extends from** the internal urethral orifice at the neck of the bladder, **to ends at** the external urethral orifice in the vestibule between the clitoris and the vaginal opening.
- It **traverses** deep perineal pouch.



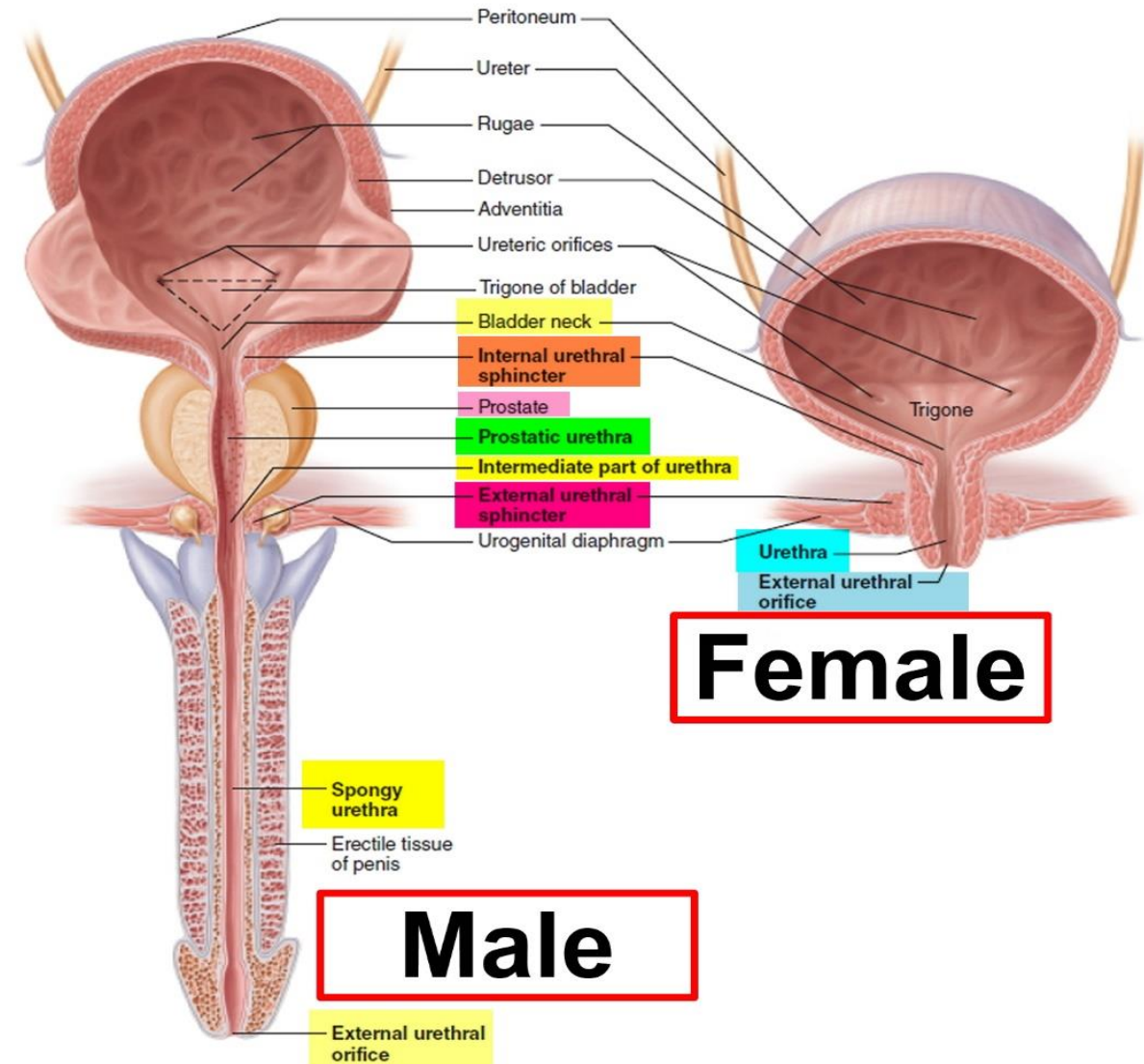
# Urethral Sphincter

## 1-Sphincter Urethrae (External urethral sphincter):

- It is **voluntary sphincter** filling most of the deep perineal pouch and surround the membranous urethra.
- It is **formed of two parts:** superficial & deep parts.
- It is **supplied by the pudendal nerve.**

## 2-Sphincter Vesicae (Internal urethral sphincter)

- It is **thickened circular component** of smooth muscle fibers at the bladder neck.
- It **prevents** retrograde flow of ejaculate into bladder in male.
- It is **supplied by autonomic fibers.**



# Urethra

## □ Blood supply:

- **Prostatic and membranous parts of male urethra** supplied by inferior vesical and internal pudendal artery.
- **Spongy part of male urethra** by urethral artery from internal pudendal artery.
- **Female urethra** by the vaginal artery.

## □ Lymphatic drainage:

- **Prostatic and membranous parts of the male urethra- Female urethra** drain into the internal iliac lymph nodes.
- **Spongy part of male urethra** into deep inguinal lymph node.



# Histology of the Ureter

It has narrow **stellate-shaped** lumen.

Its wall consists of:

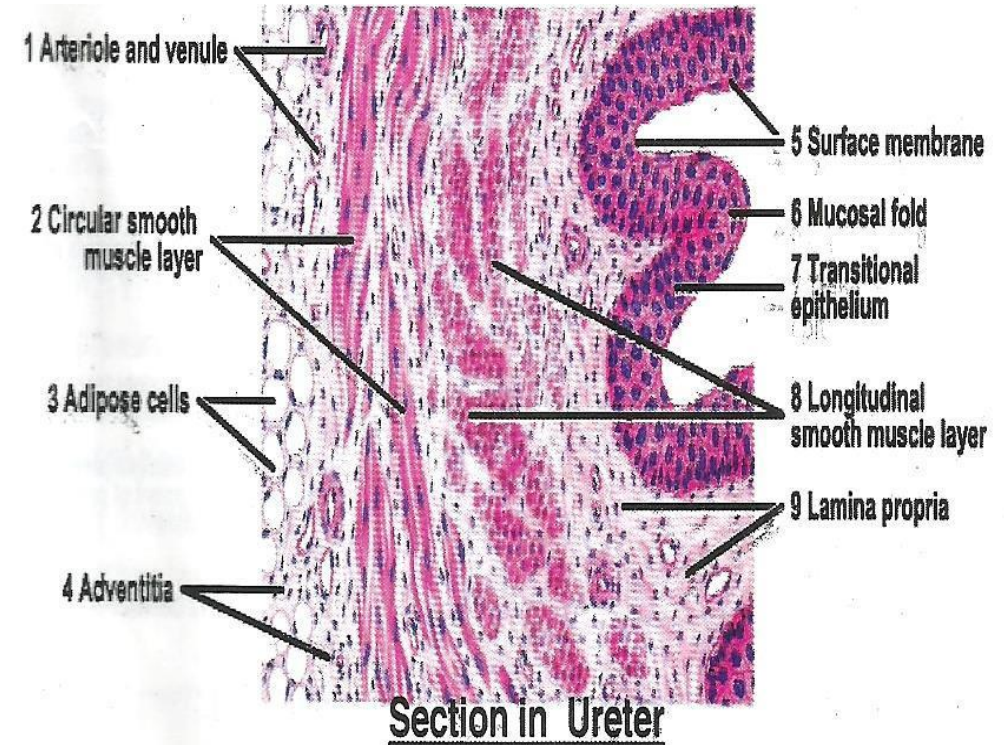
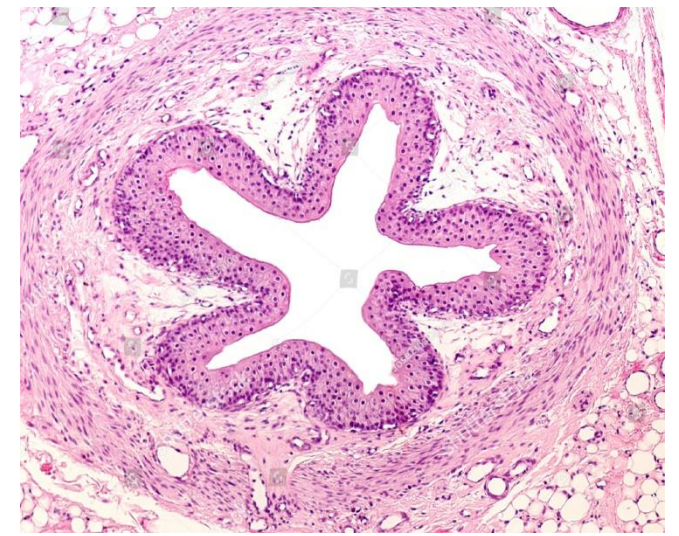
## Mucosa:

- **Transitional Epithelium.**
- **Lamina propria:** areolar connective tissue rich in **elastic fibers.**

## Musculosa:

- **Upper 2/3:** inner longitudinal, outer circular smooth muscle fibers.
- **Lower 1/3:** Inner longitudinal, middle circular, outer longitudinal smooth muscle fibers.

Adventitia: Fibro elastic C.T.



# Histology of the Urinary Bladder

The wall of the urinary bladder is thicker than that of the ureter and its lumen is wider.

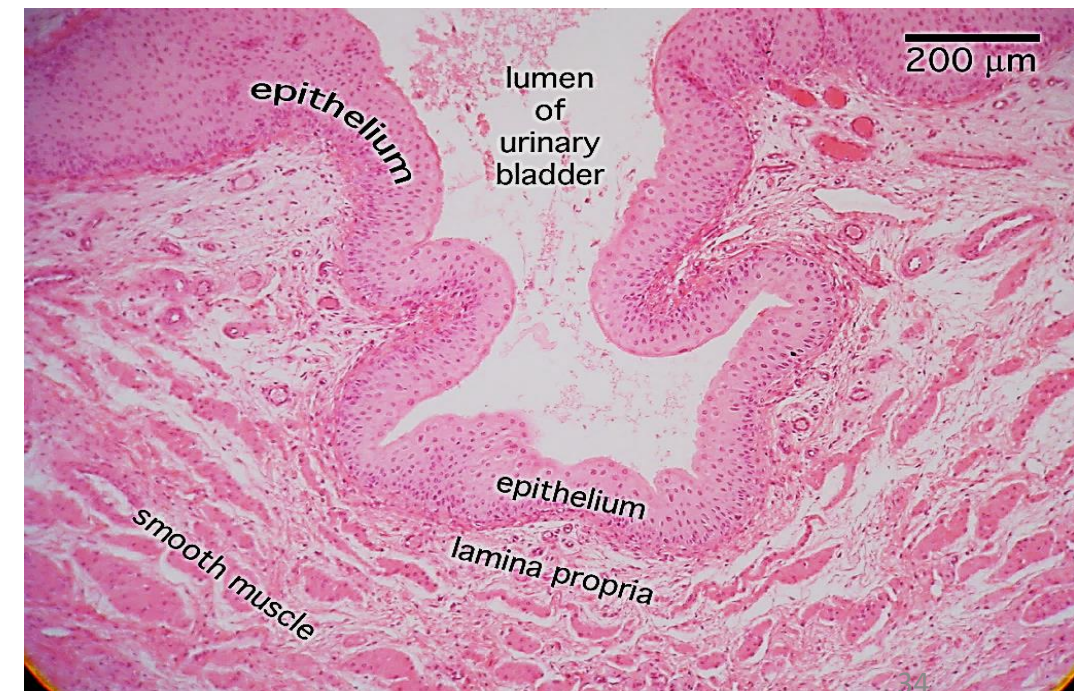
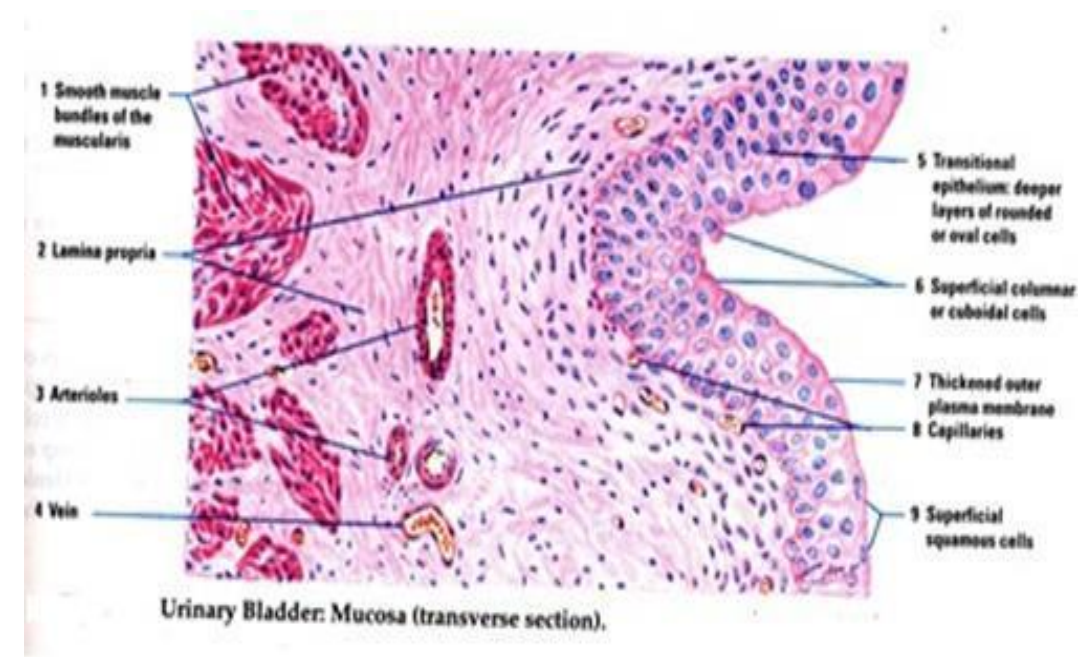
## Mucosa:

- **Transitional Epithelium.**
- **Lamina propria:** areolar connective tissue rich in elastic fibers.

## Musculosa:

- **Detrusor smooth muscle,** fibers are arranged in:
  - Inner longitudinal, middle circular& outer longitudinal.

**Adventitia:** Fibro elastic C.T.

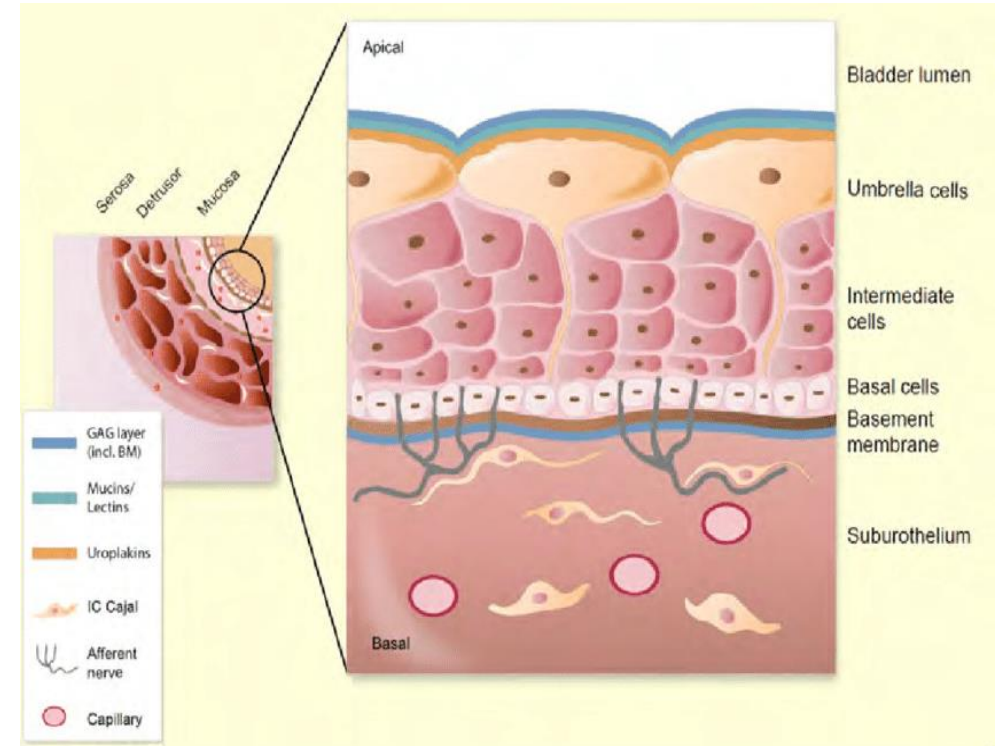


## Urinary bladder barrier:

- Thickened apical membrane of the dome-shaped cells (umbrella cells).
- Occluding junction between these cells.

## Function:

- Protect the epithelium from toxic wastes in urine.
- Prevent leakage of urine into the extracellular spaces.
- Prevent dilution of hyperosmotic urine by the capillaries in lamina propria.



# Histology of Male Urethra

## Prostatic urethra:

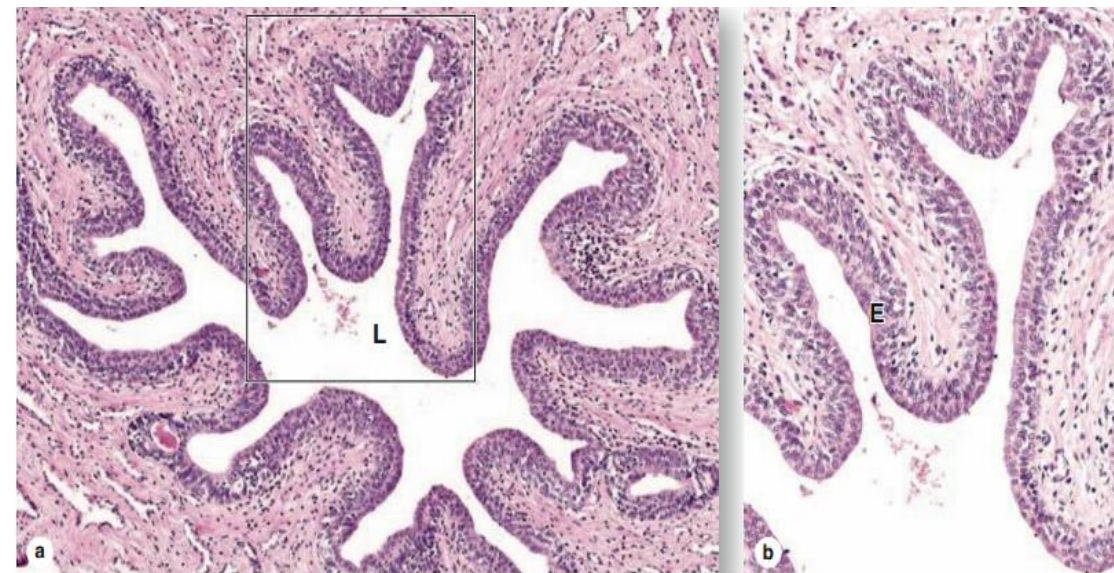
- Lined with **transitional epithelium**.

## Membranous urethra:

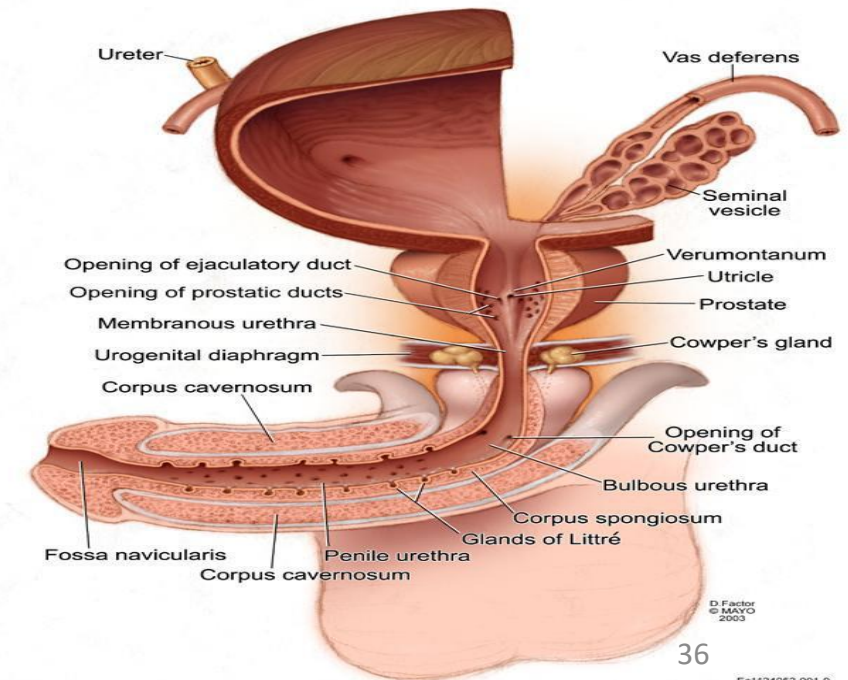
- Lined with **pseudostratified columnar epithelium**.
- Surrounded by striated muscle fibers (external sphincter).

## Penile urethra:

- **Lined with stratified columnar epithelium** and stratified squamous at its end.
- Mucus secreting cells interspersed in epithelial lining.
- Glands of Littre (urethral mucous glands): present in the connective tissue of the penile urethra.



(a) A transverse section shows that the mucosa has large longitudinal folds around the lumen (L). (b) A higher magnification shows the stratified columnar epithelium (E).



# Histology of the Urethra

## Female urethra:

- It is lined with **Transitional, pseudostratified columnar epithelium, stratified squamous epithelium.**
- There are numerous shallow invaginations of the epithelium lined with **mucous cells.**

*Thank You*