



# GENITOURINARY SYSTEM

SUBJECT : Anatomy

LEC NO. : lec 2

DONE BY : Shefaa' almaaitah

وَقُلْ رَبِّ زِدْنِي عِلْمًا



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**

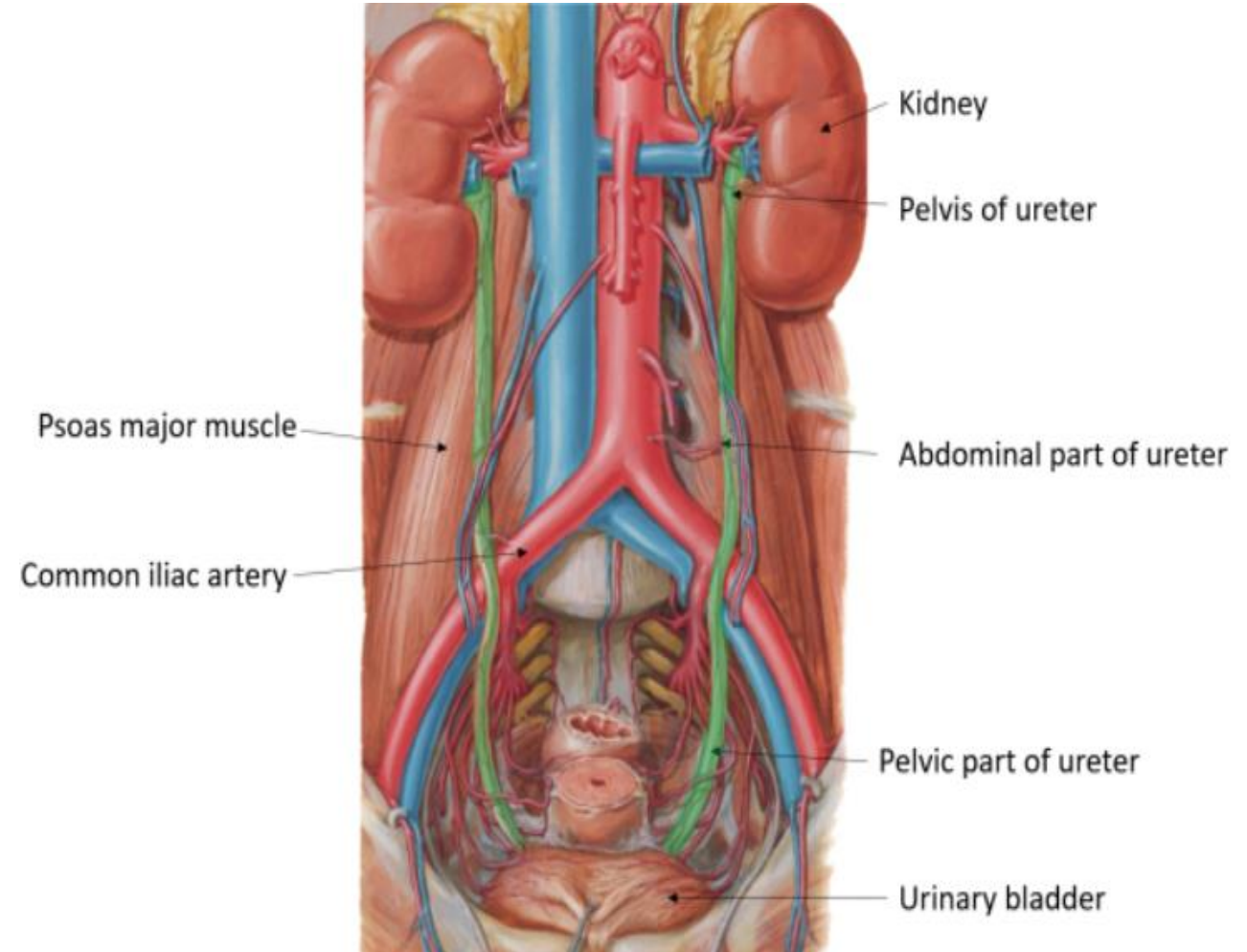
# Ureter

- The two ureters are retroperitoneal muscular tubes that extend from the kidneys to the urinary bladder.

Abdominal organ

Pelvic organ

- It is about 25 cm (10 inches) long.
- Its upper part lies in the abdomen (**Abdominal part**).
- ↳ Continues together
- Its lower part lies in the lesser pelvis (**Pelvic part**).





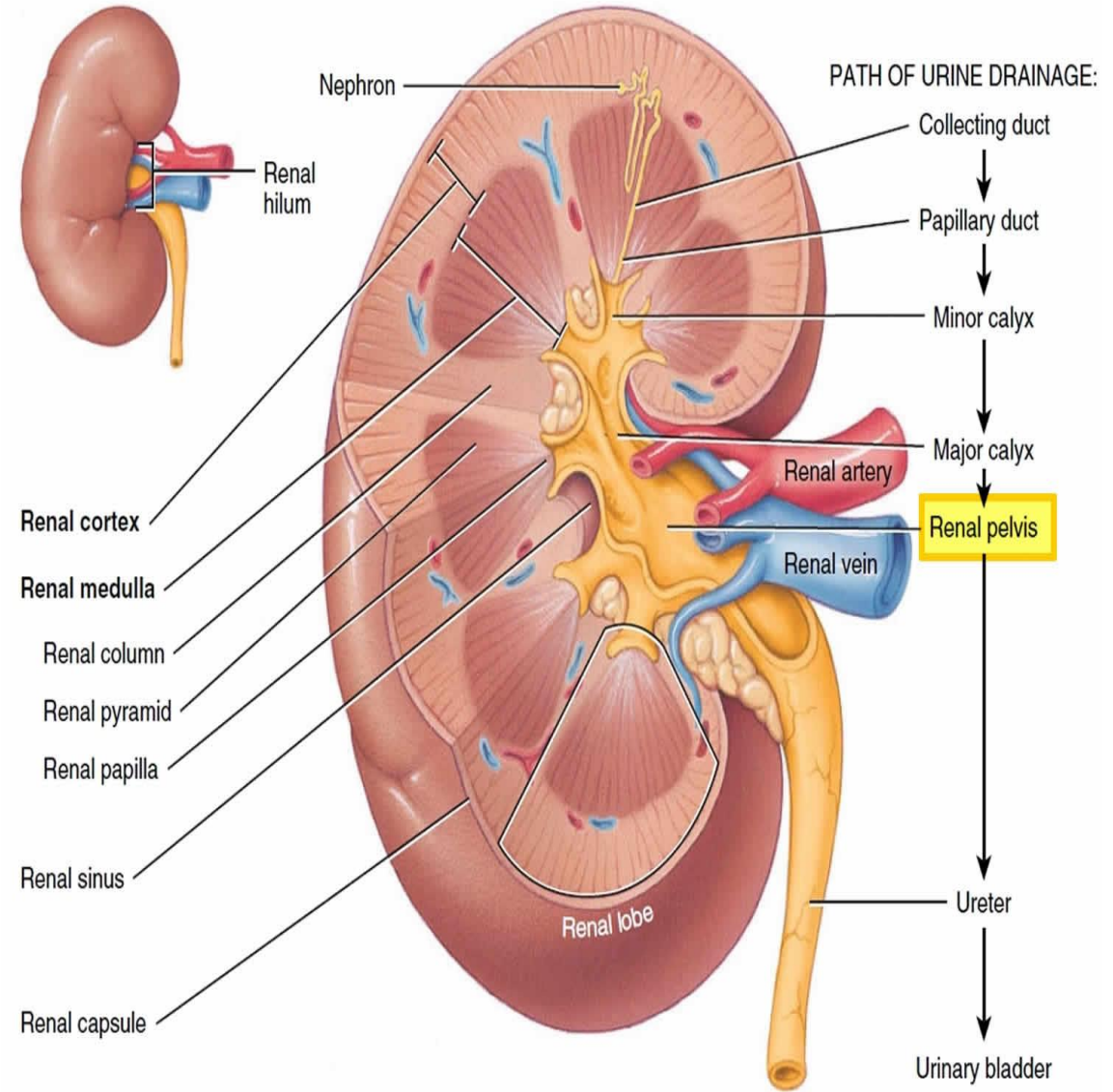
# Abdominal Part of Ureter

- It is 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**.

Between pelvis of ureter and abdominal part of ureter



(a) Anterior view of dissection of right kidney

# Abdominal part of Ureter

kidney زي ال  
anterior relations بختلفو بل  
posterior relations وبتشابهو بل

## Course:

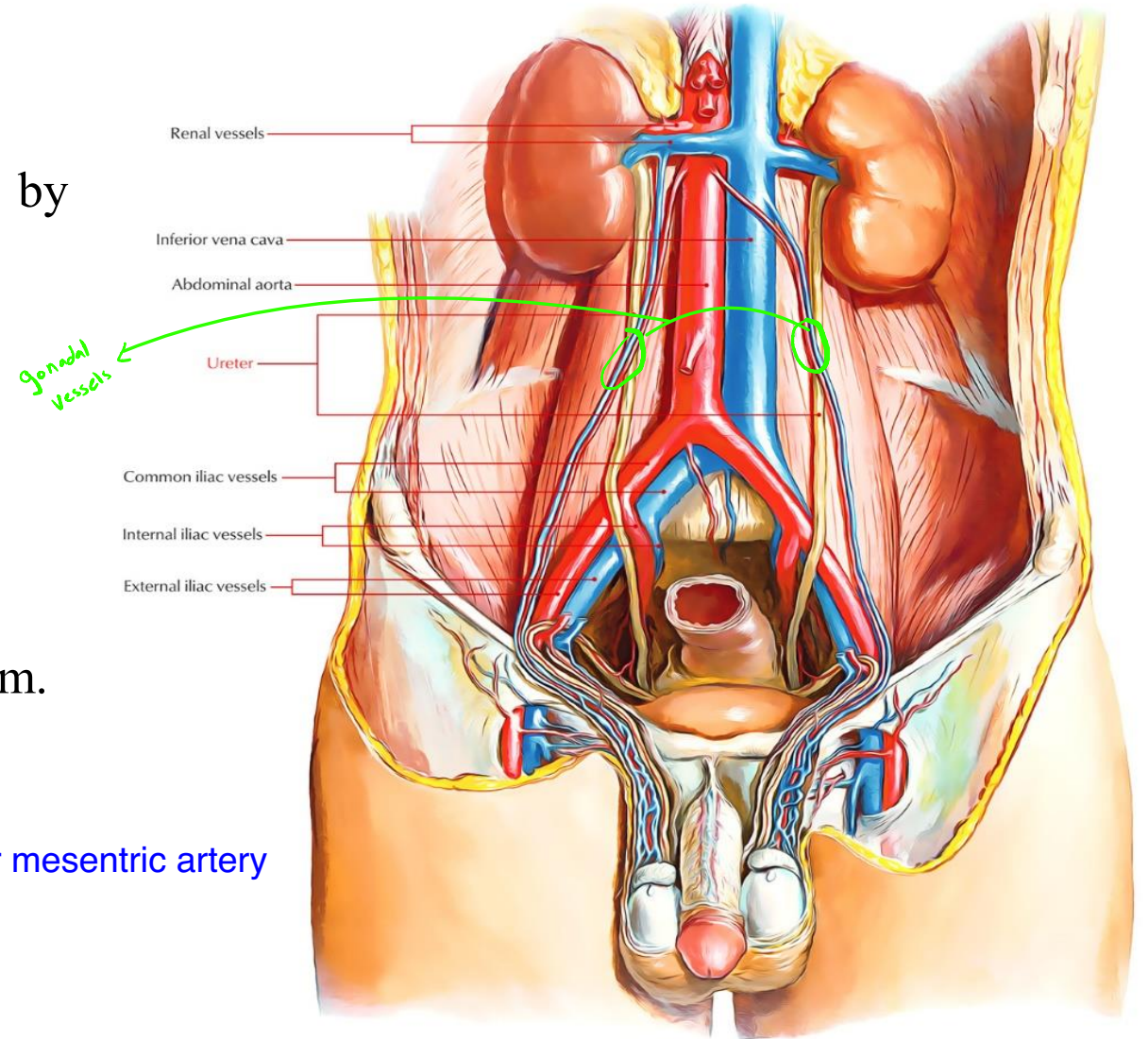
- It runs vertically downward.
- It is continuous with the pelvic part of ureter by crossing the beginning of the external iliac artery.

## 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. → Branches of superior mesenteric artery
  - Right testicular or ovarian vessels. → Gonadal vessels
  - Terminal part of the ileum.





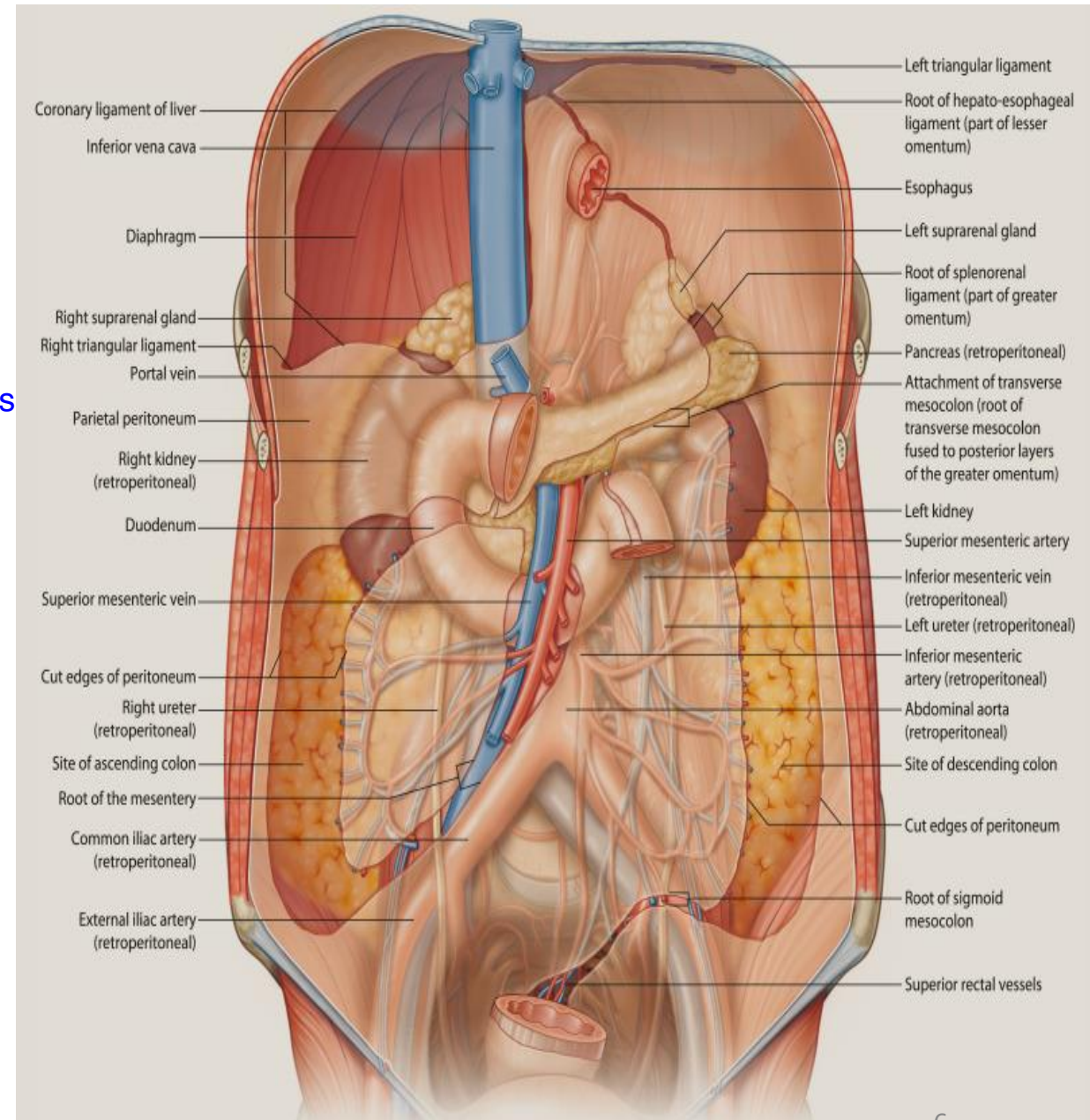
# Abdominal part of Ureter

## B- Left Ureter:

- It is crossed by the following structures:
- Left colic vessels.
- Left testicular or ovarian vessels. → Gonadal 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

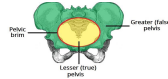
قبل ما نبلش فيه لازم نعرف وين ال abdominal part انتهى وبدأ ال pelvic part

## Course:

Once the ureter crosses external iliac vessels the ureter enter the pelvis why?

Because external iliac vessels run on pelvic rim

واي organ بعدي من ال pelvic rim يعني دخل ال lesser pelvis



- The ureter **enters the pelvis by** crossing the beginning of the external iliac artery.

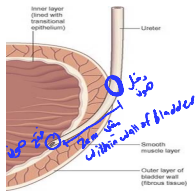
Course: In the beginning it run downward and backwards then run forward and medial

- Each ureter **then runs** down on the **lateral wall of the pelvis** to the level of the ischial spine.

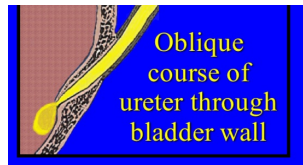
- **Then turns forward & medially** on the **floor of the pelvis** to open into the base of the urinary bladder.

urinary bladder لانه هدفه يوصل ال  
midline organ هي bladder وال  
most anterior organ in lesser pelvis وتعتبر

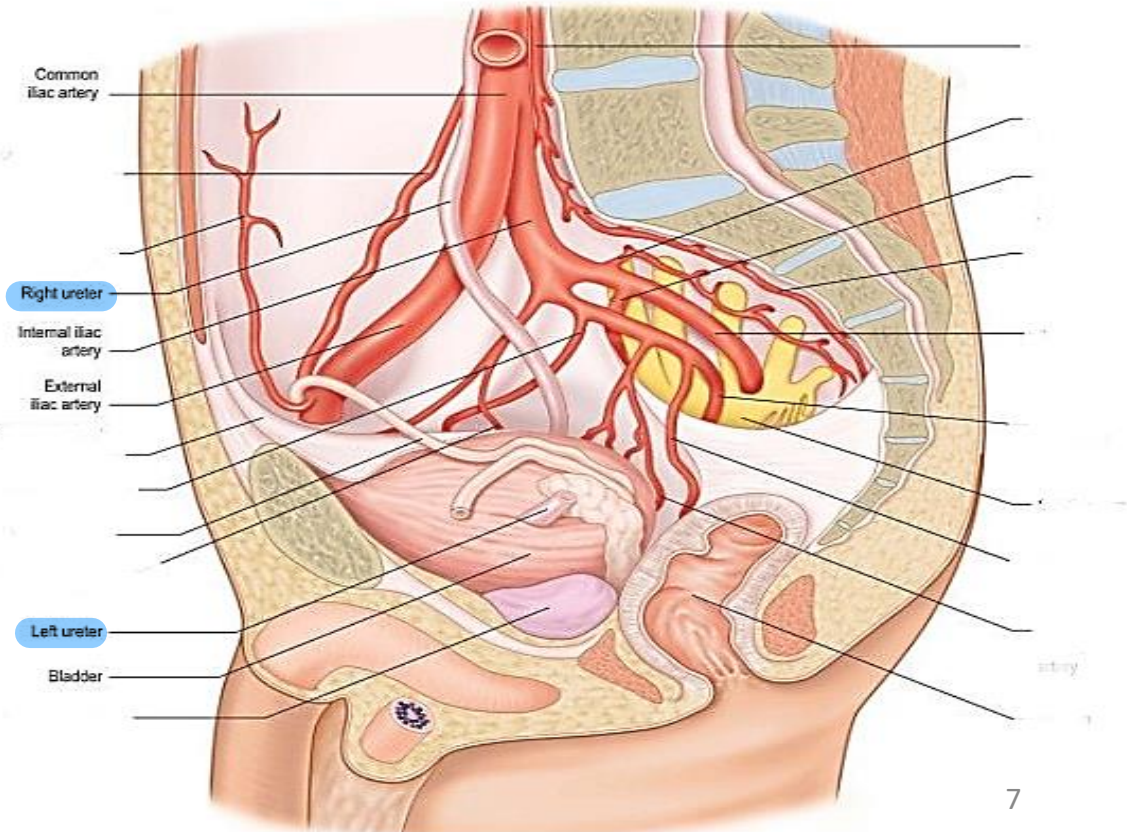
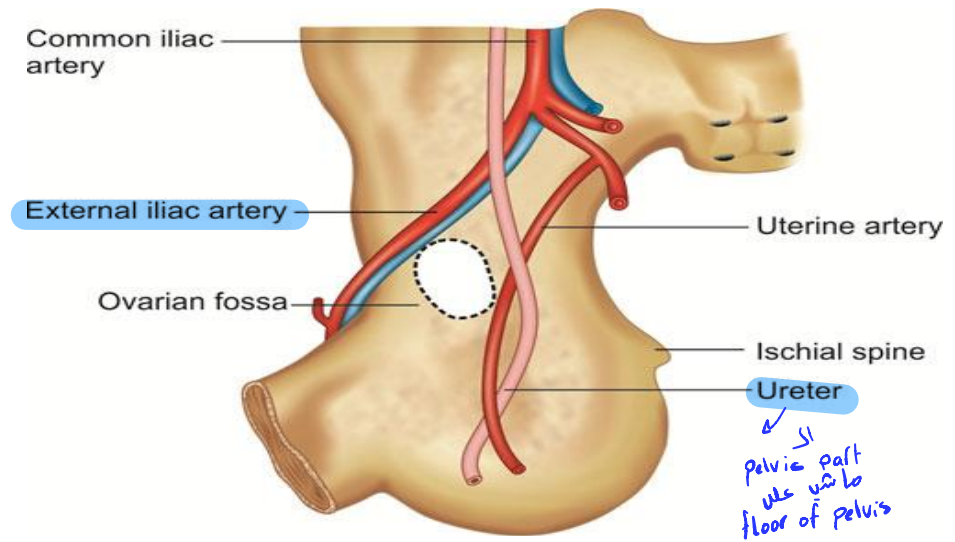
- The ureter **passes obliquely** through the wall of the bladder (**intramural part of ureter** (1.9 cm) before opening into it. This provides a **valve like action**, which prevents a reverse flow of urine toward the kidneys.



يعني ما فتح ب نفس  
المكان الي دخل منه



هسا لما يوصل ال ureter ال  
bladder آخر 2cm منه ماشيين  
within wall of bladder





# Relations of pelvic part of ureter

Same in both side  
Different between male and female

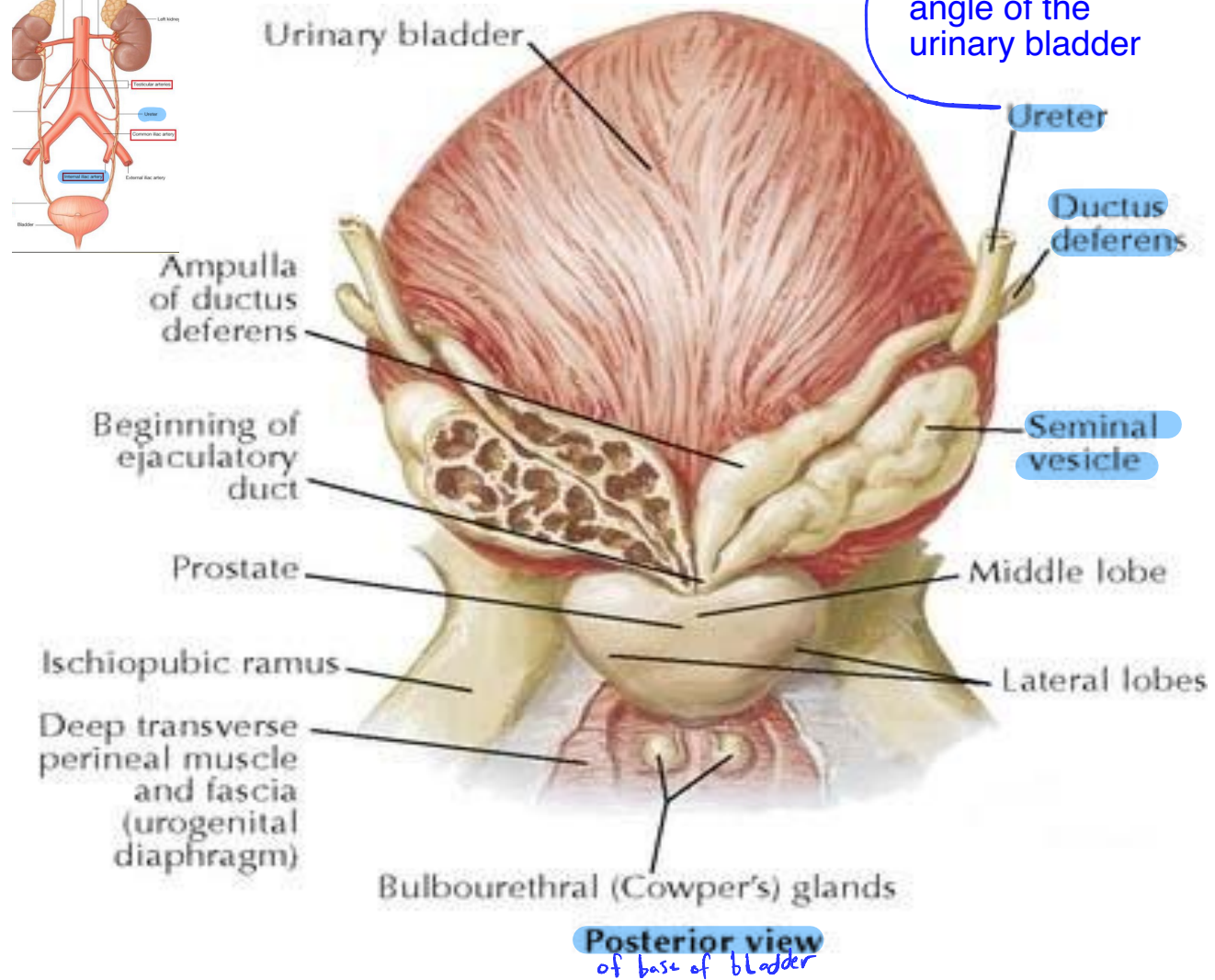
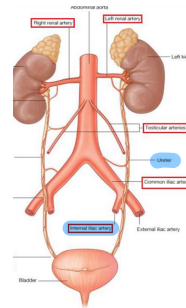
## A- Relations common in both sexes:

- 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 each side*

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



# Relations of pelvic part of ureter

الصورة عبارة عنا transverse section وينطلع عليها من فوق

## In females:

### On the lateral wall of pelvis;

- The ureter lies behind the ovary.

#### Note

ال ureter يكون تحت ال broad legement مش فوقه

### On the floor of the pelvis:

- It runs in the root of the broad

peritoneal fold related to uterus عن عبارة  
Root of this ligament related to the floor of pelvis

### ligament.

تمام حسا عضلة ال floor of lesser pelvis هي levator ani  
ب التالي ال ureter ماشي على levator ani وماشي في ال 'root of broad ligament'

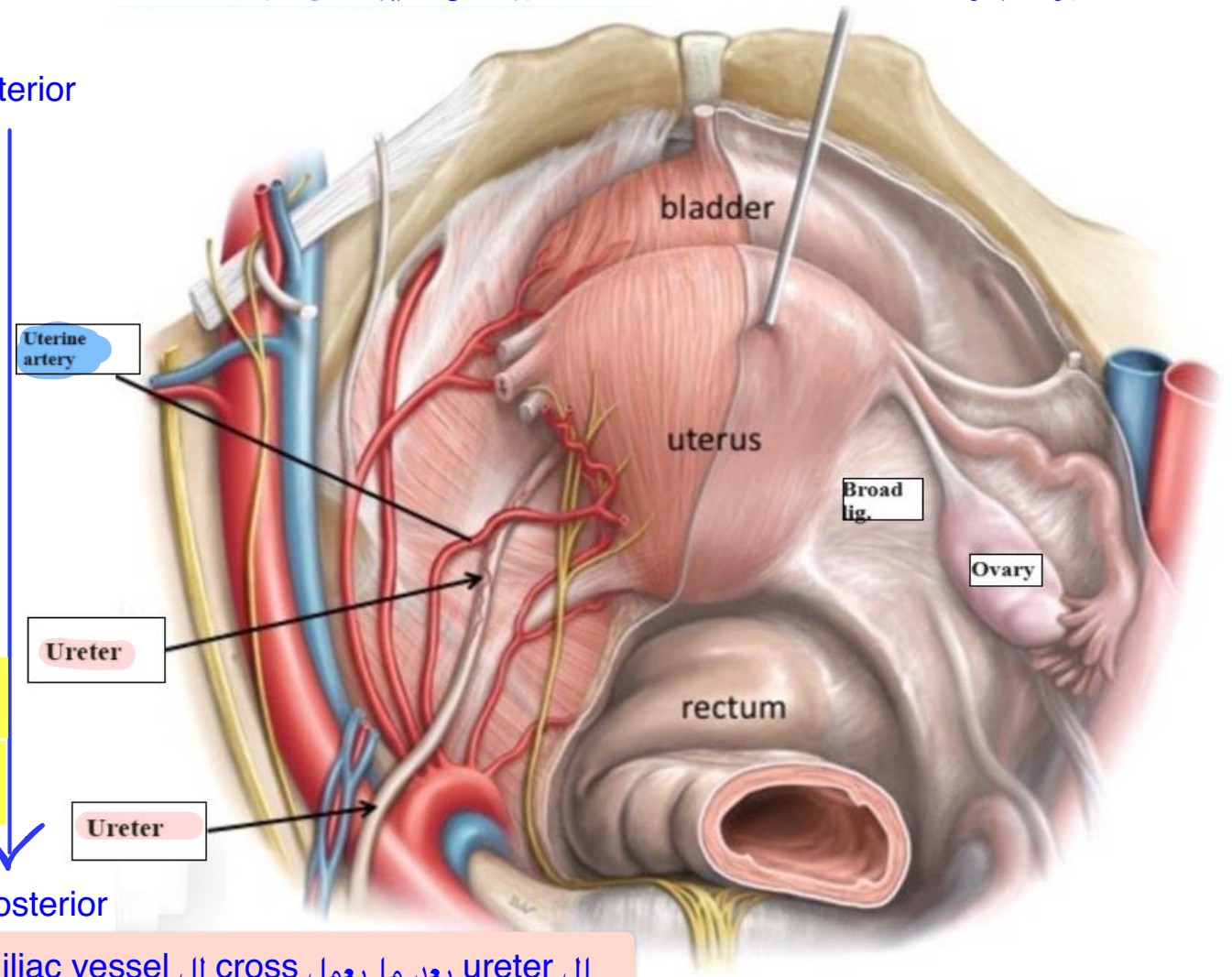
- It is crossed by the uterine artery.

هو branch من internal iliac artery  
وهو blood supply of uterus  
ف هو عمل cross حتى يوصل ال uterus

\* Hysterectomy  
هي عملية ازالة ال uterus ف لما نشيله الجراح  
بيربط ال uterine artery من الجهتين ف لازم  
ينبته وما يربط ال ureter

Anterior

Posterior



ال ureter بعد ما يعمل cross لل external iliac vessel ف هو  
كده ماشي على lateral wall of lesser pelvis يكون  
internal iliac artery بعد كده بيمشي بل floor of pelvis

# Normal sites of constrictions of the ureter

1- At the pelvi-ureteric junction.

↳ Between renal pelvis and abdominal part of ureter

2- At the pelvic brim (where the ureter crosses the artery).

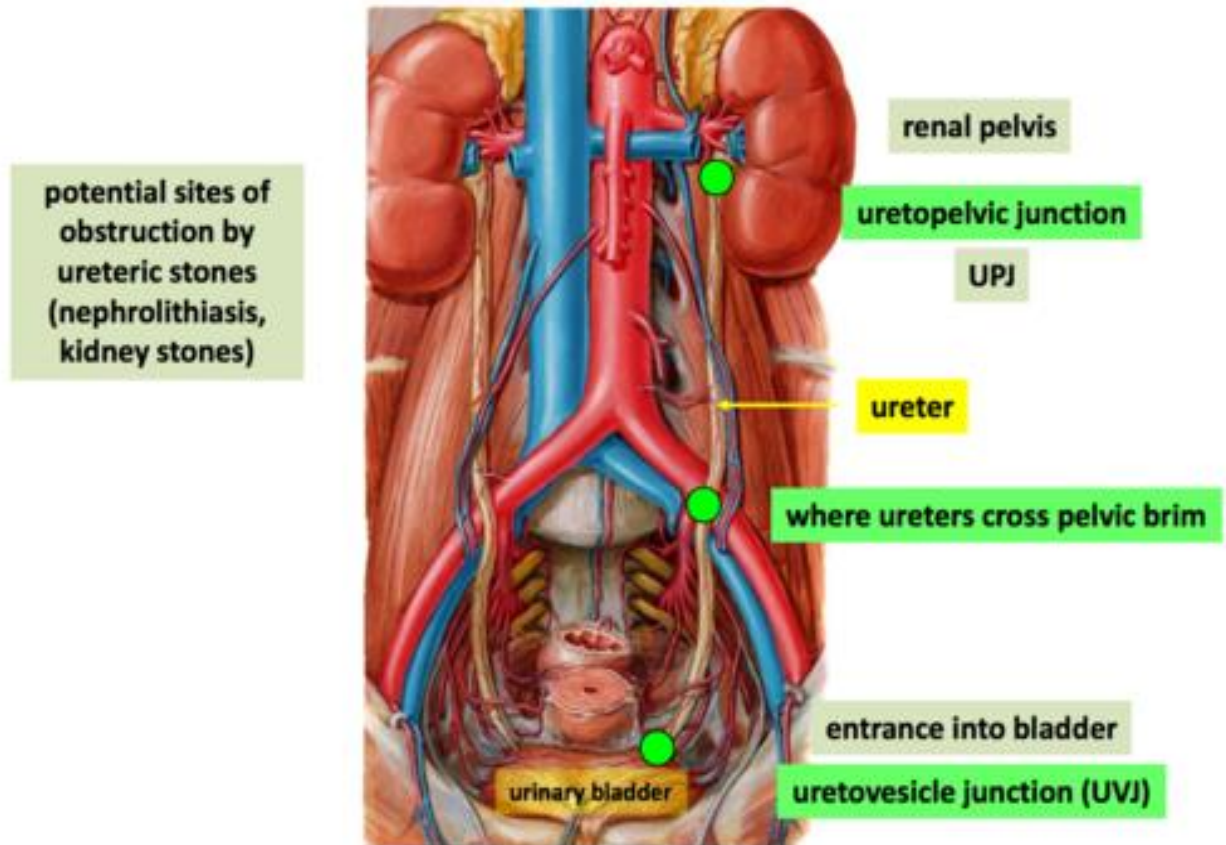
↓  
External iliac vessels

3- Intramural part of the ureter. حكيينا عنه

\* Important of these sites

❖ 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:** لأنه طويل واله اكثر من part ف حياخذ supply من اكثر من artery

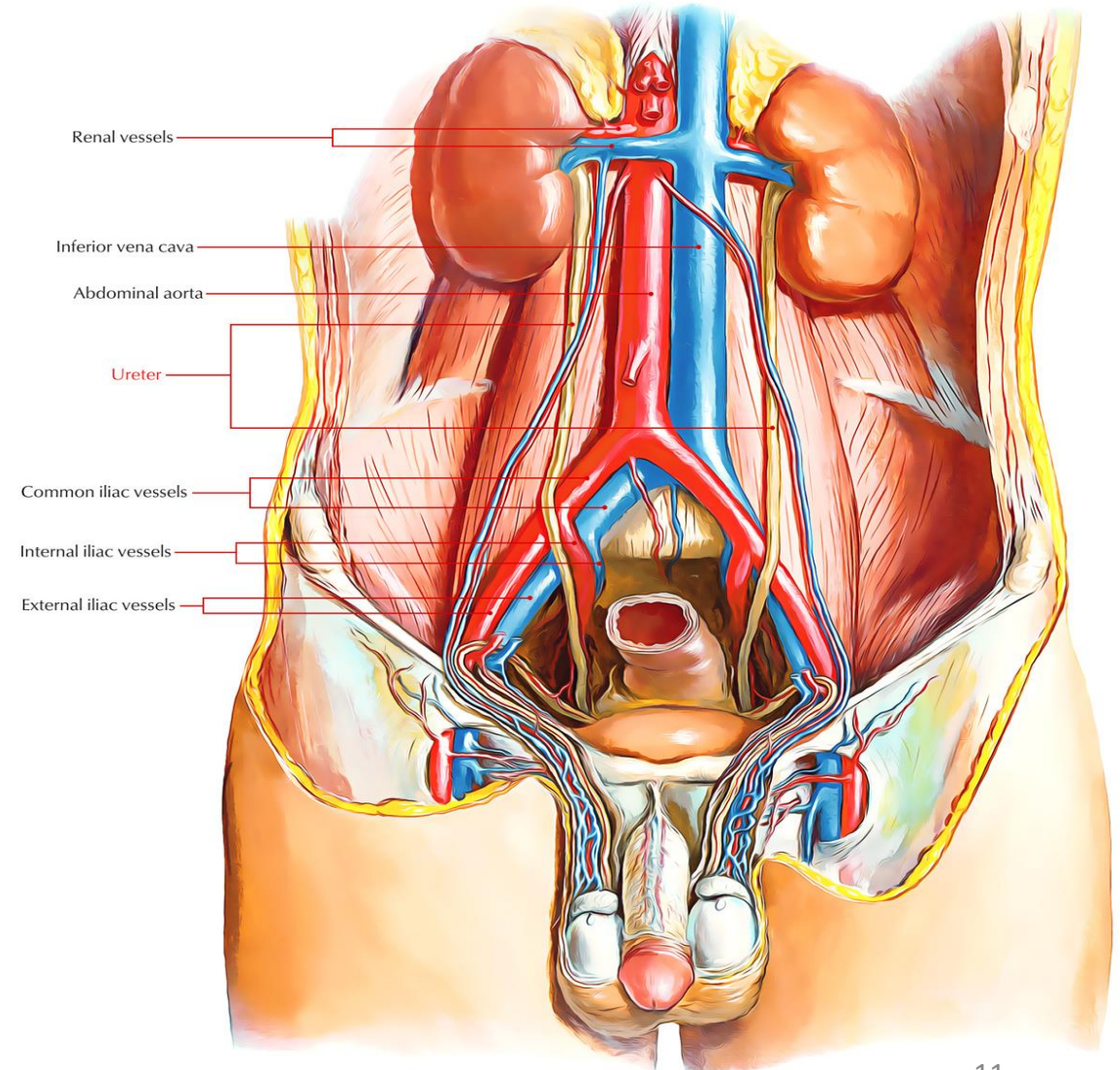
- It is supplied by branches from the **renal, gonadal, the abdominal aorta, common iliac, internal iliac, vesical and uterine arteries.**
- There is longitudinal anastomosis between these branches on the wall of the ureter.

## Veins:

- Into veins that correspond to the arteries.

## Lymph Drainage:

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



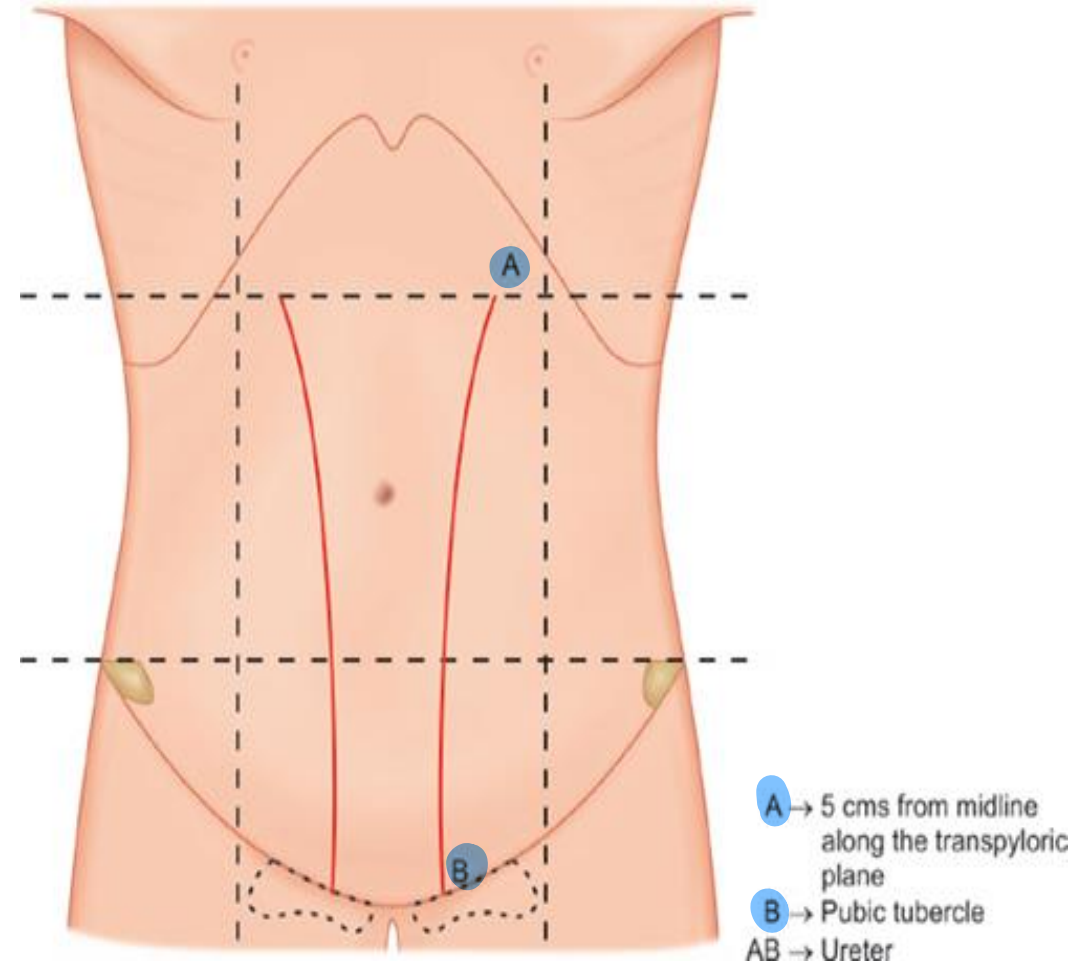
# Ureter

## Identify ureter in operation:

- Thick muscular tube. *of ureter*
- Longitudinal blood vessels. *around ureter*
- Show peristalsis. *Peristalsis movement of ureter*
- Aspiration of urine. *ب سرنجة*

## Surface anatomy: *two points ب*

- 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.

(S<sub>2,3,4</sub>)

## Ureteric (Renal) Colic: المغص الكلوي

- 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.

strong contraction يعمل بصير stone in ureter لما يكون في  
severe pain يعمل distention و spasm ال ف هاد ال

- 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.

Keep going 🙌



In male pain will radiate to scrotum  
in female pain will radiate to labia majora

One of nerve of lumbar plexus  
Runs in front of psoas major

عشان تتأكد  
انه ال  
ureteric  
colic



# Urinary Bladder

هي وحدة مش right and left

- 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.

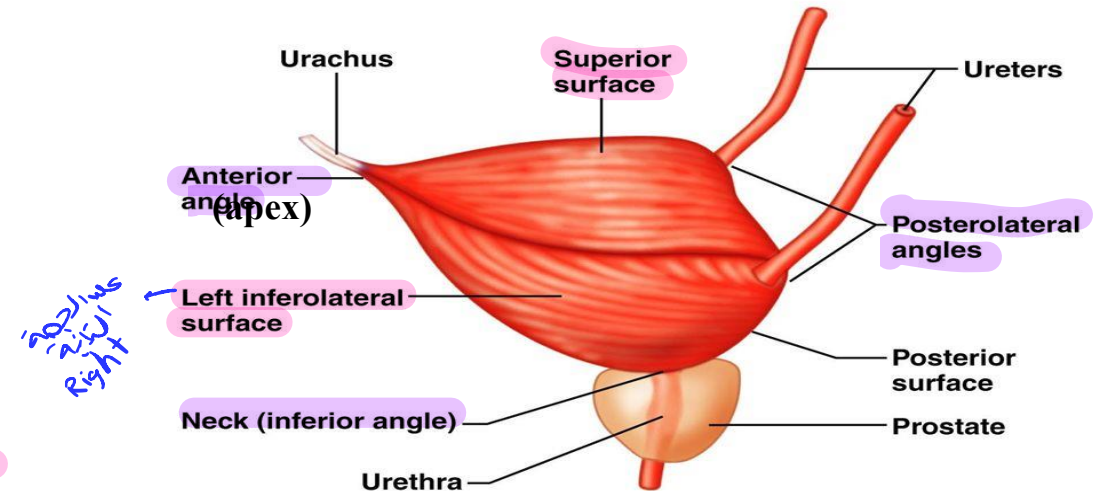
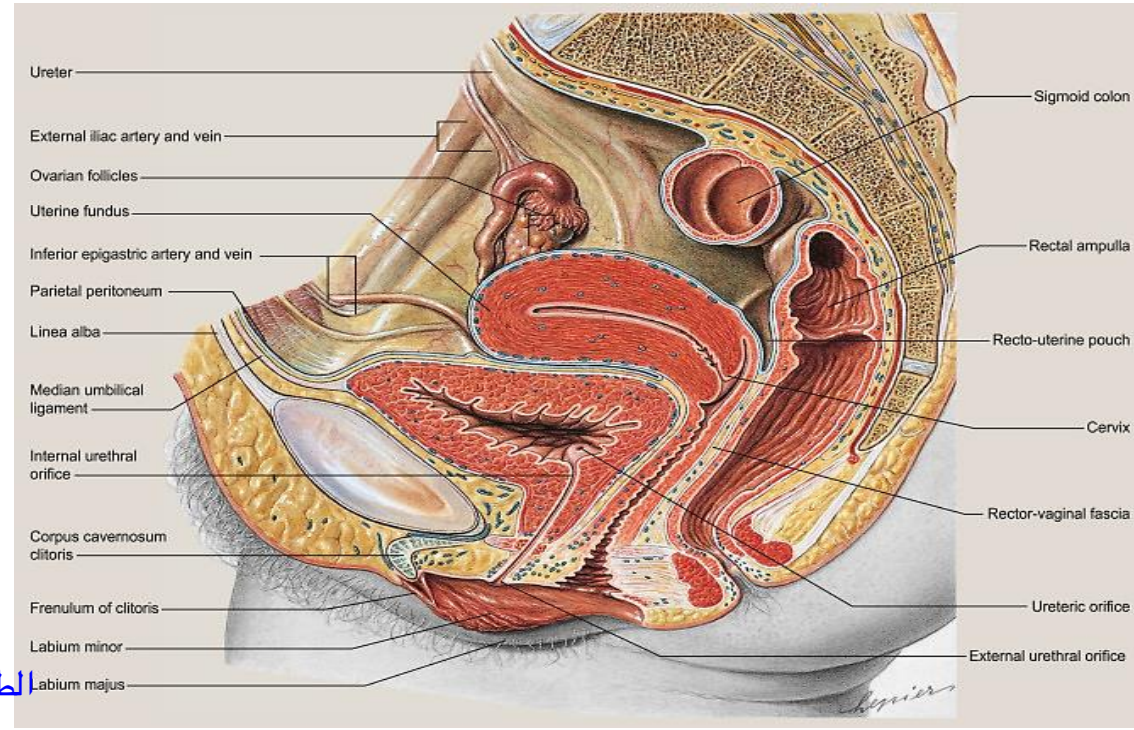
- After birth, it lies completely in abdominal cavity, as the pelvis enlarge it descends gradually into the lesser pelvis.

الطفل بينولد وال bladder تاغته بتكون بل abdomen ف هو يعتبر abdominal organ مش pelvic descend لانه لسا ال pelvic organ تاغته يكون ديق مع الوقت بصيرله enlarge وبتصير تعمل descend

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

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

- Base.** Directed backward
- Apex.** Directed forward
- Neck.** Directed inferiorly
- Three surfaces;** superior and two inferolateral surfaces.





# Relations of Urinary Bladder

لأنها pelvic organ ف relations تابعتها  
 بتختلف بين ال male and female

الدكتورة بتحب ال relations

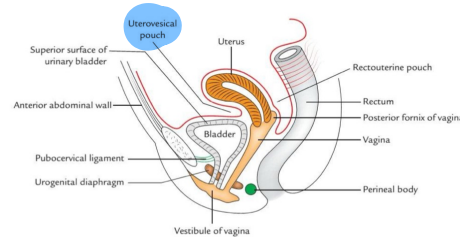


## Superior surface:

- It is triangular in outline.

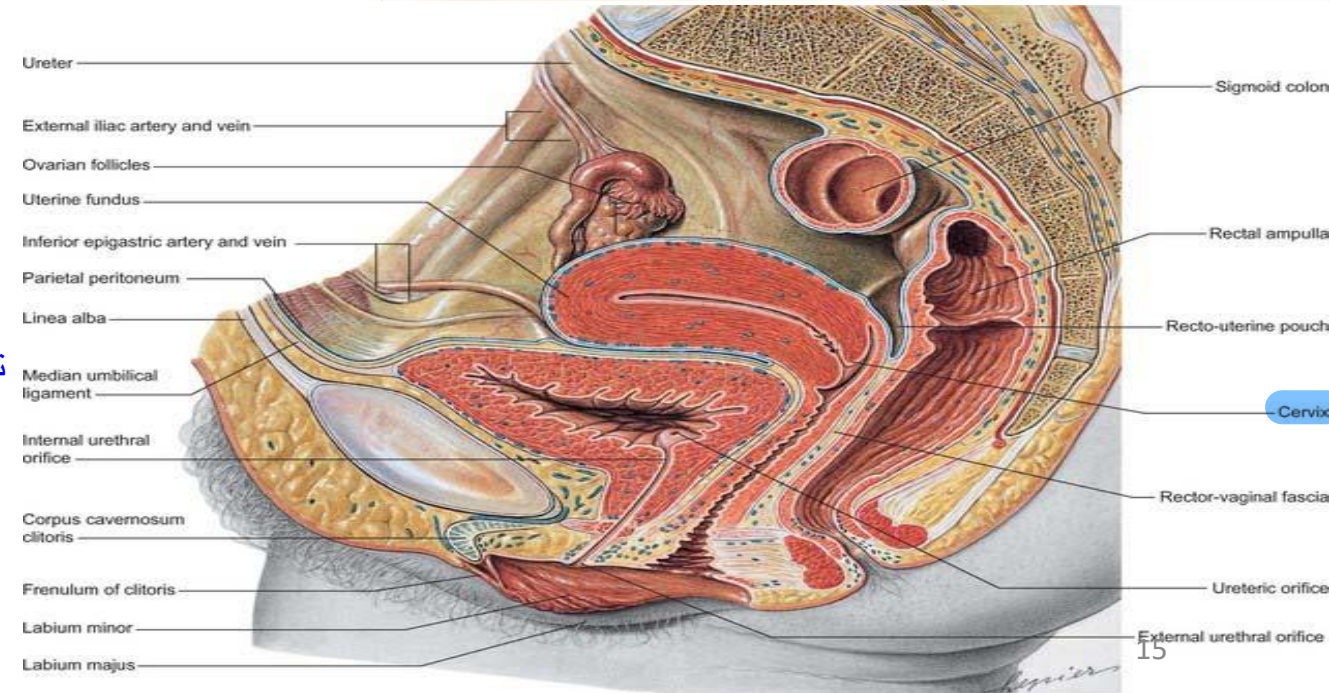
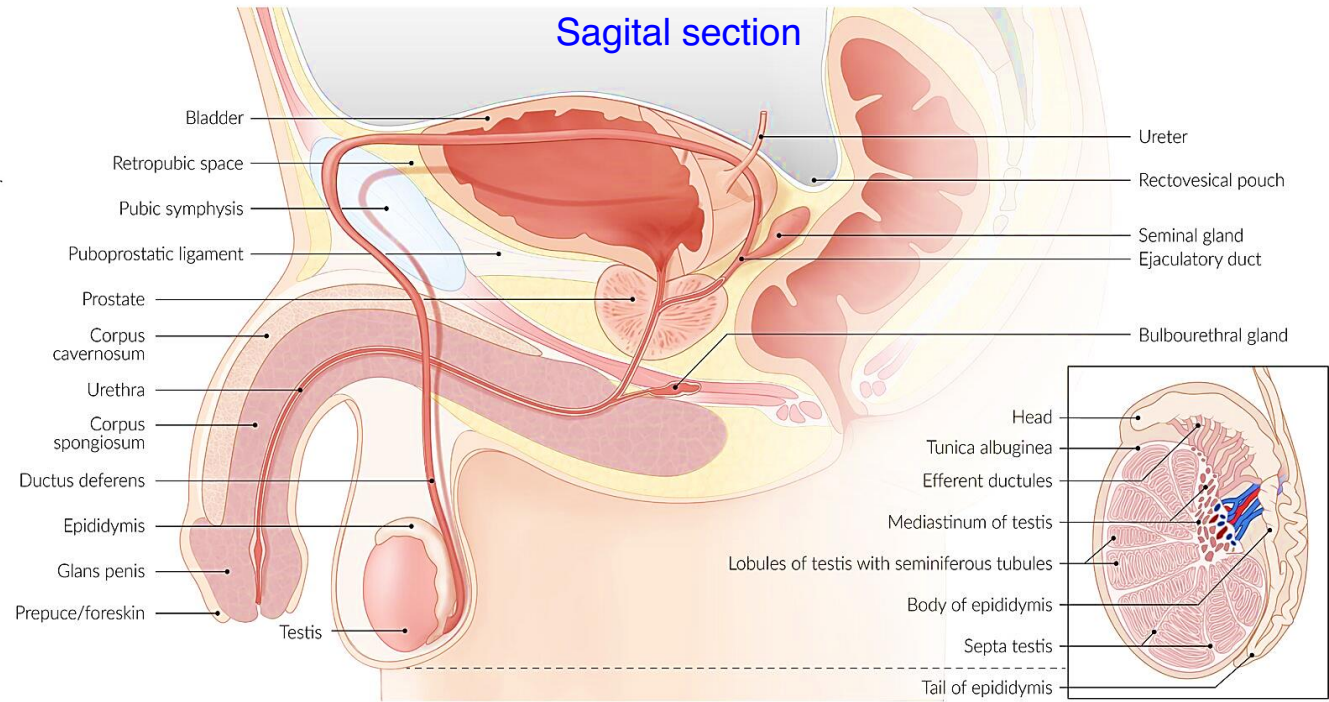
## In males:

- 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. تكون نتيجة ال reflection of peritoneum
- Its posterior 1/3 is not covered by peritoneum and is related to supravaginal part of the cervix.





# Relations of Urinary Bladder

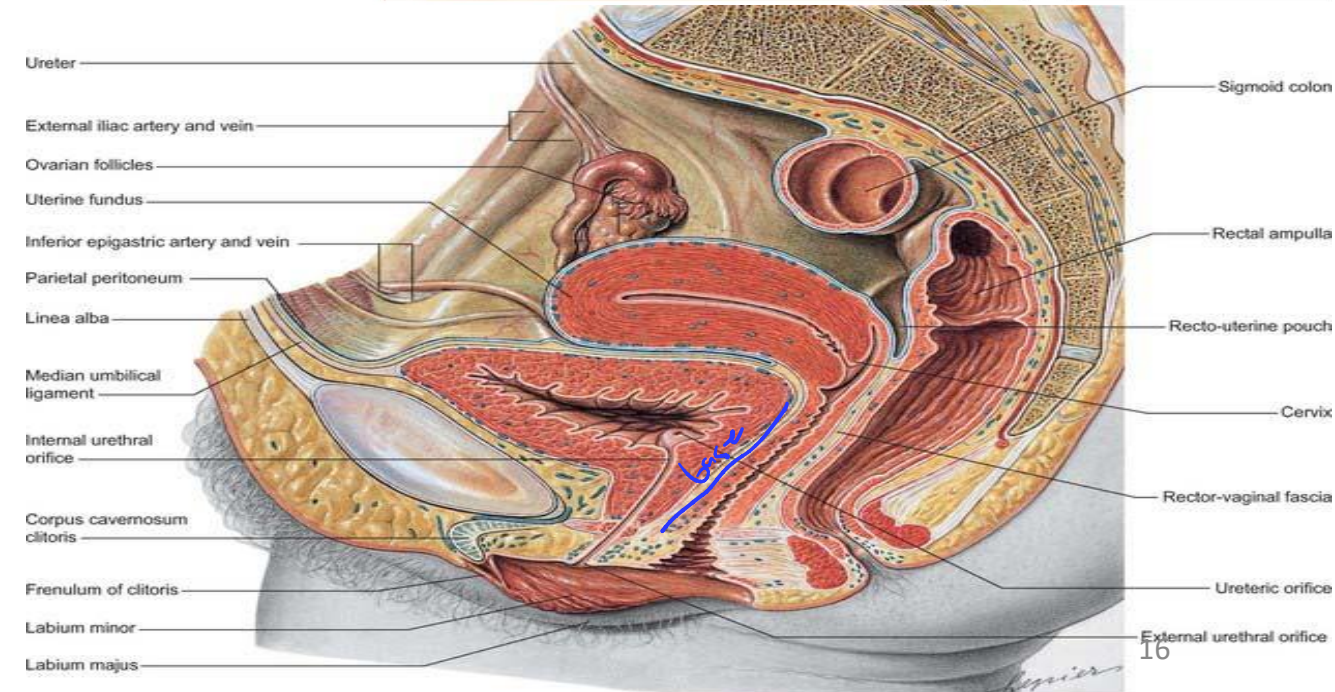
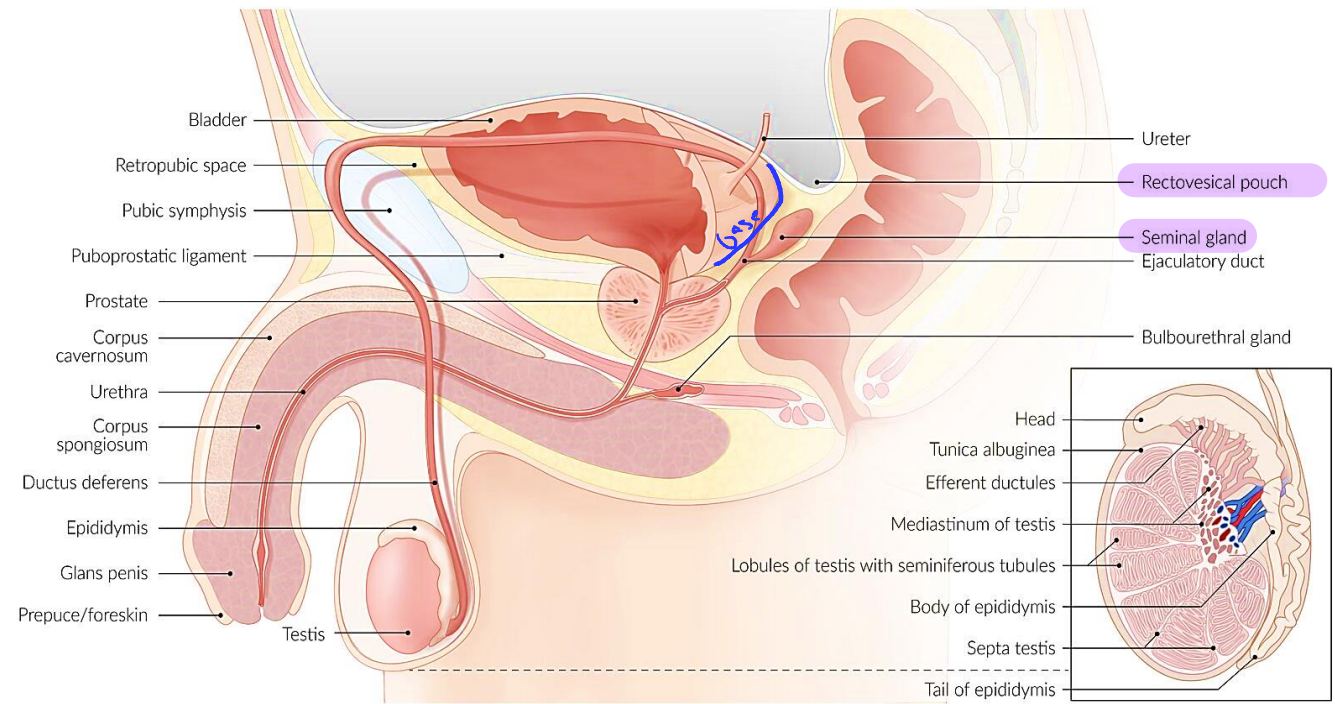
## Base:

### 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

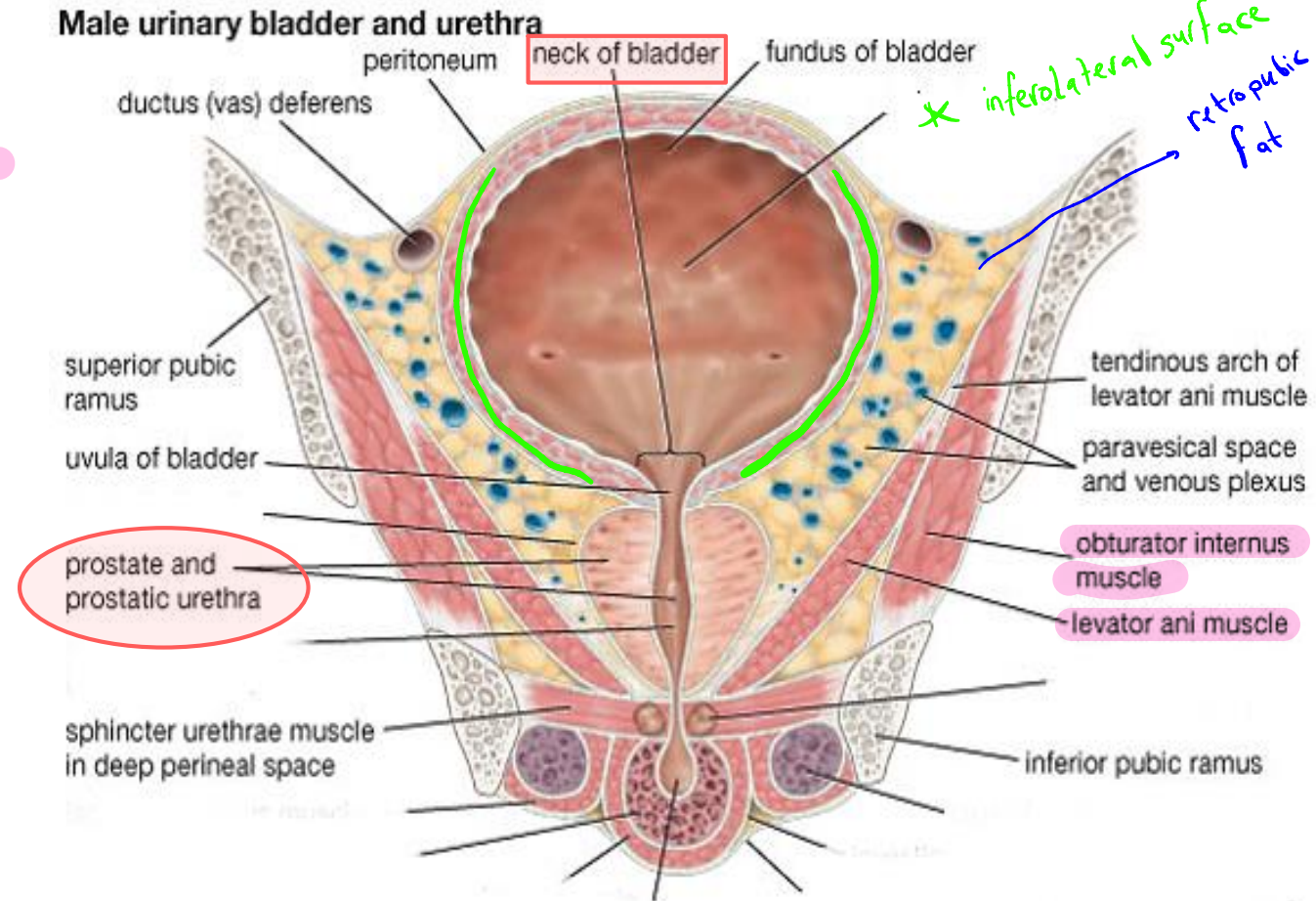
## Inferolateral surface of the bladder: → امشي مع الرسمة

- 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

Coronal section



# Relations of Urinary Bladder

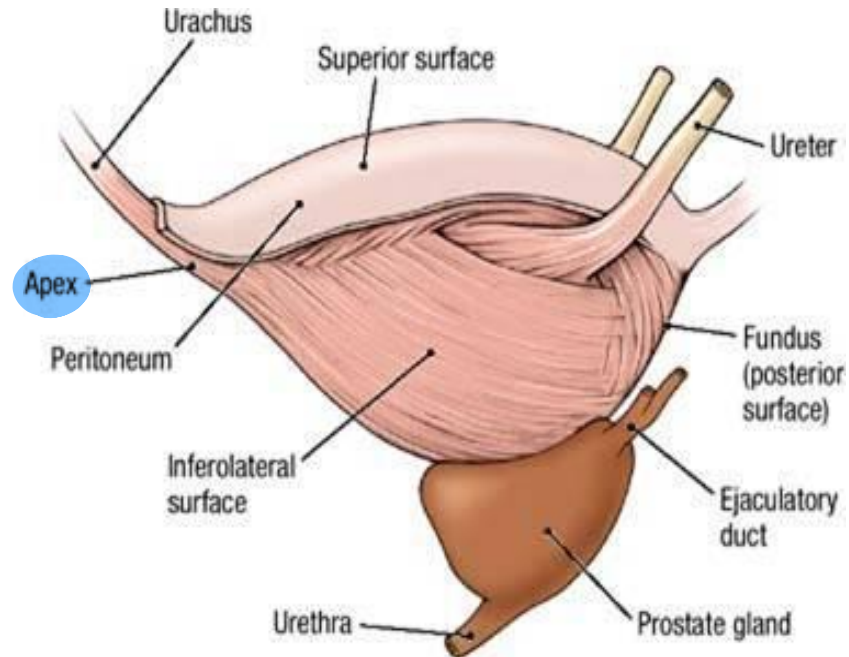
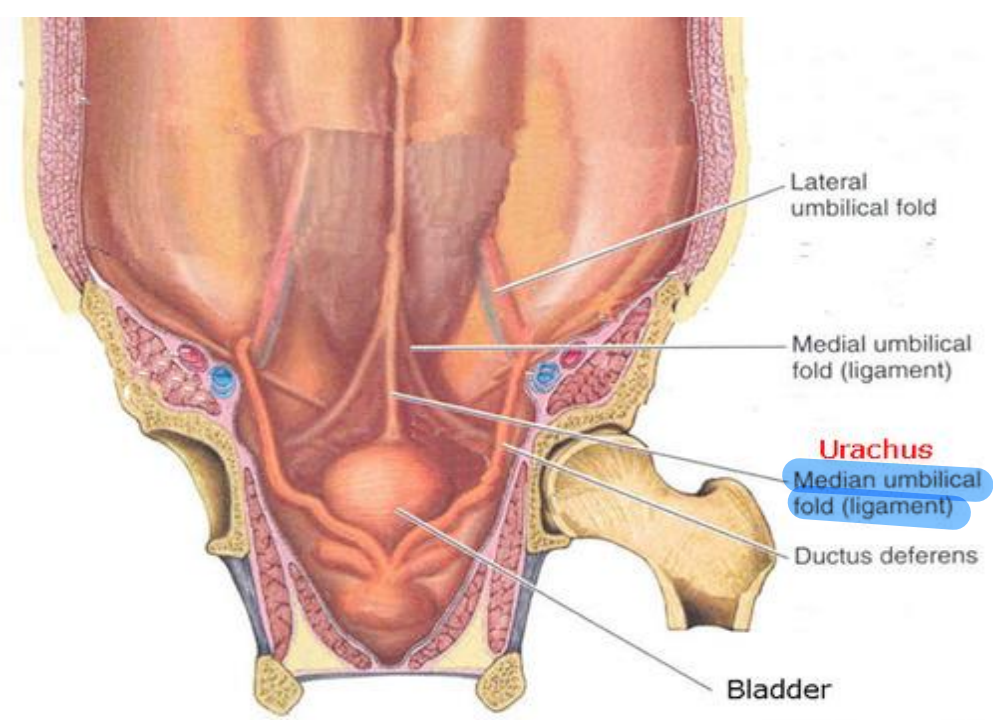
اسم تاني

□ **Apex of the bladder:** anterior angle 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.

Intrauterine structure  
ligament **بِس صَارَ لَهُ تَحْوِيلٌ** obliterated

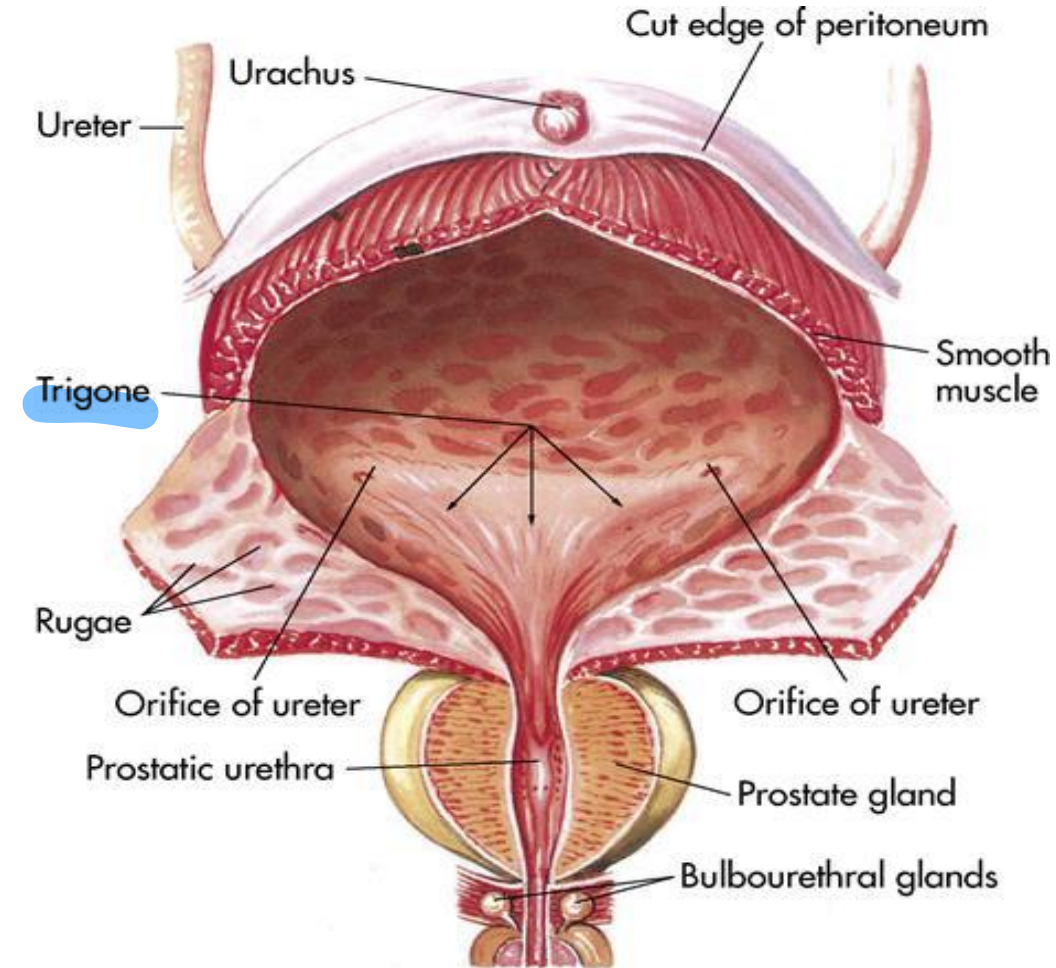


# Cavity of the Bladder (Bladder Interior)

## □ 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.   
*not smooth*
- **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.

ب الصورة احنا فاتحين ال wall of bladder  
ف احنا شايفينه من جوا





# Cavity of the Bladder (Bladder Interior)

## Trigone of the bladder:

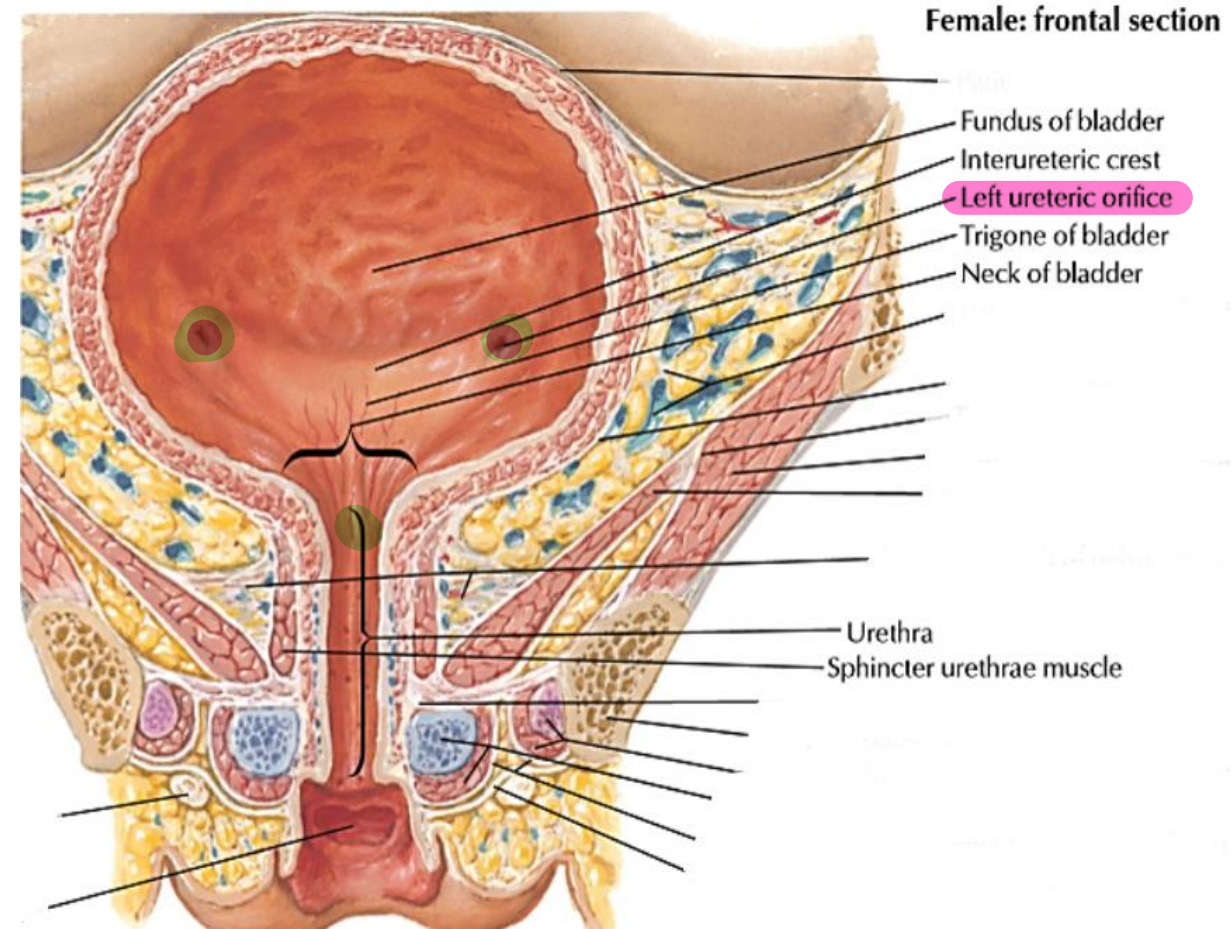
- It is **triangular** area.

- \*Three angles*  
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. *حتى يوصل بسهولة لل ureteric orrifice قسيطرة*



# Ligaments of the Bladder

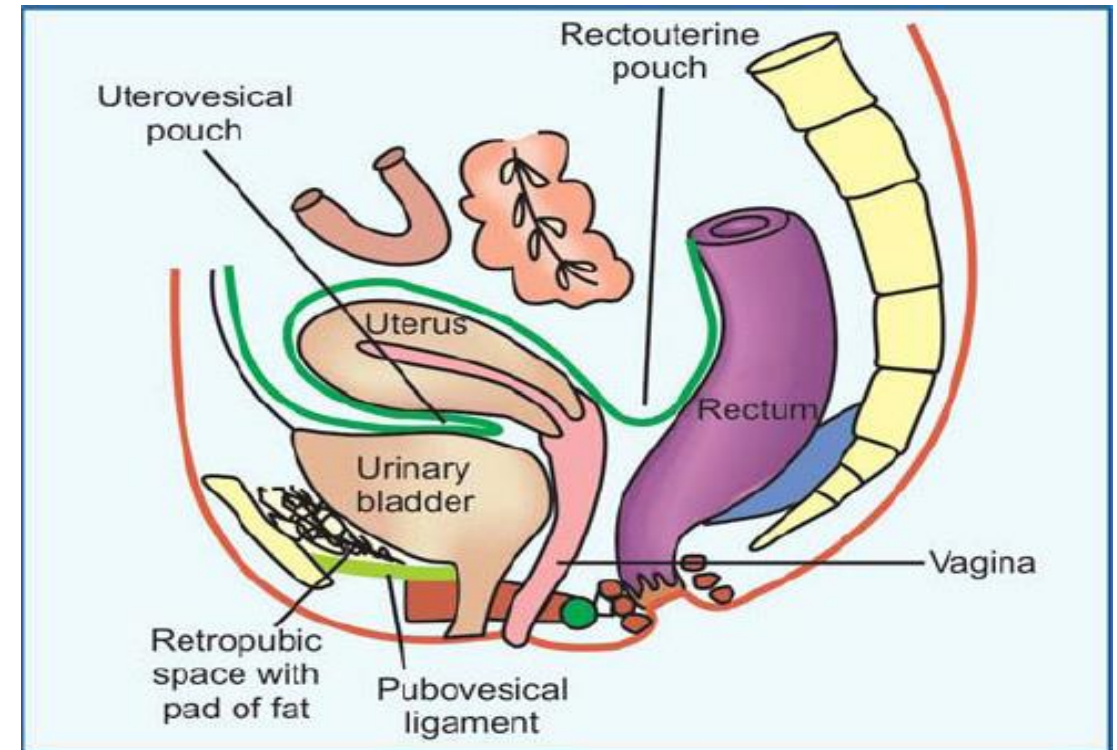
## □ True ligaments:

- **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.

uterine ligament  
pubovesical  
sex

## □ False ligaments: (peritoneal folds):

- **Sacrogenital fold.** Directed backward
- **Lateral fold.** Direct laterally



# Blood Supply of the Urinary Bladder

## □ Arterial supply:

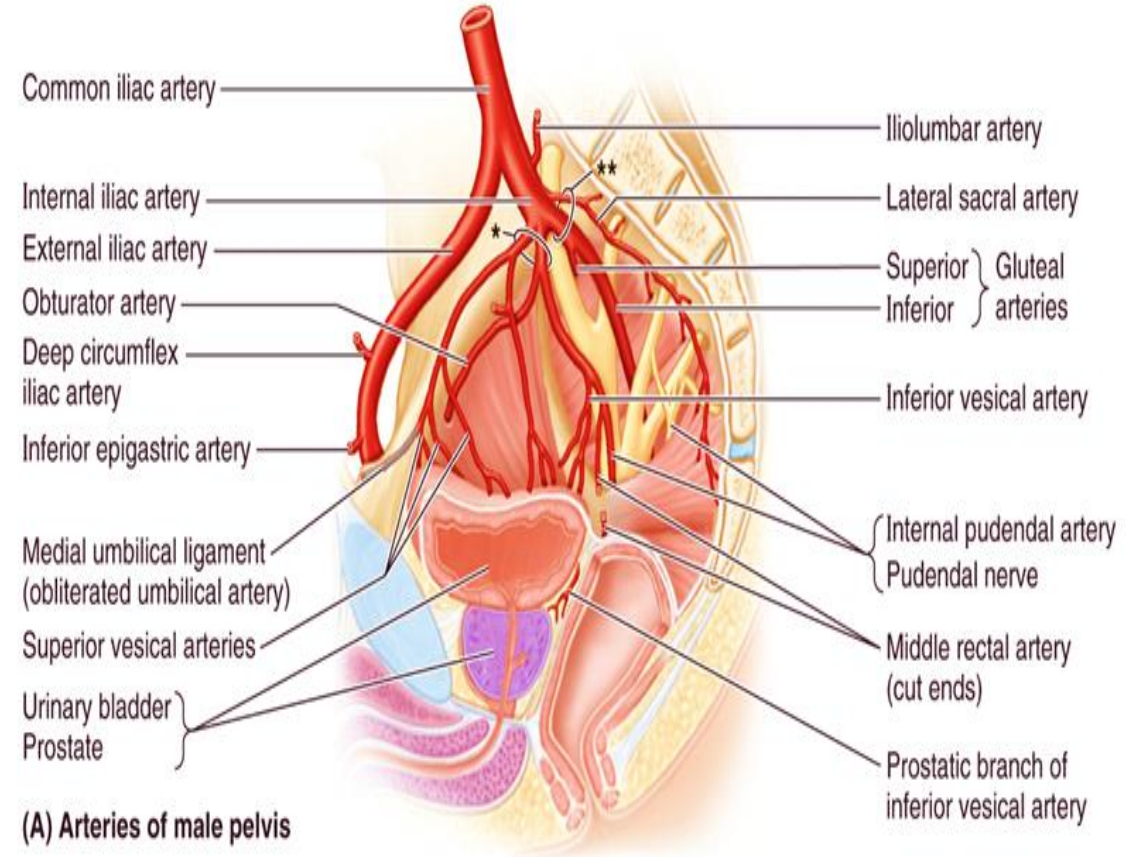
- **Superior vesical artery.** *branches from internal iliac artery*
- **Inferior vesical artery in male or vaginal artery in female.**

## □ Venous Drainage:

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

## □ 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

because urinary bladder is not completely covered by peritoneum  
The peritoneum cover only it's superior surface

	Intraperitoneal Rupture	Extraperitoneal Rupture
<b>Incidence</b>	Less common (20%)	More common (80%)
<b>Cause</b>	Direct blow (Blunt trauma) on <u>distended bladder</u> . <i>قوية صدمة</i>	Penetrating injury/ <b>Pelvic fractures</b> . <i>حادث مثلاً</i>
<b>Part of urinary bladder</b>	It involves superior surface of urinary bladder & its covering peritoneum. <i>صاحبة تجويف البطن abdominal cavity</i>	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. <u>Around the bladder</u>
<b>Imaging findings Cystography</b>	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.	

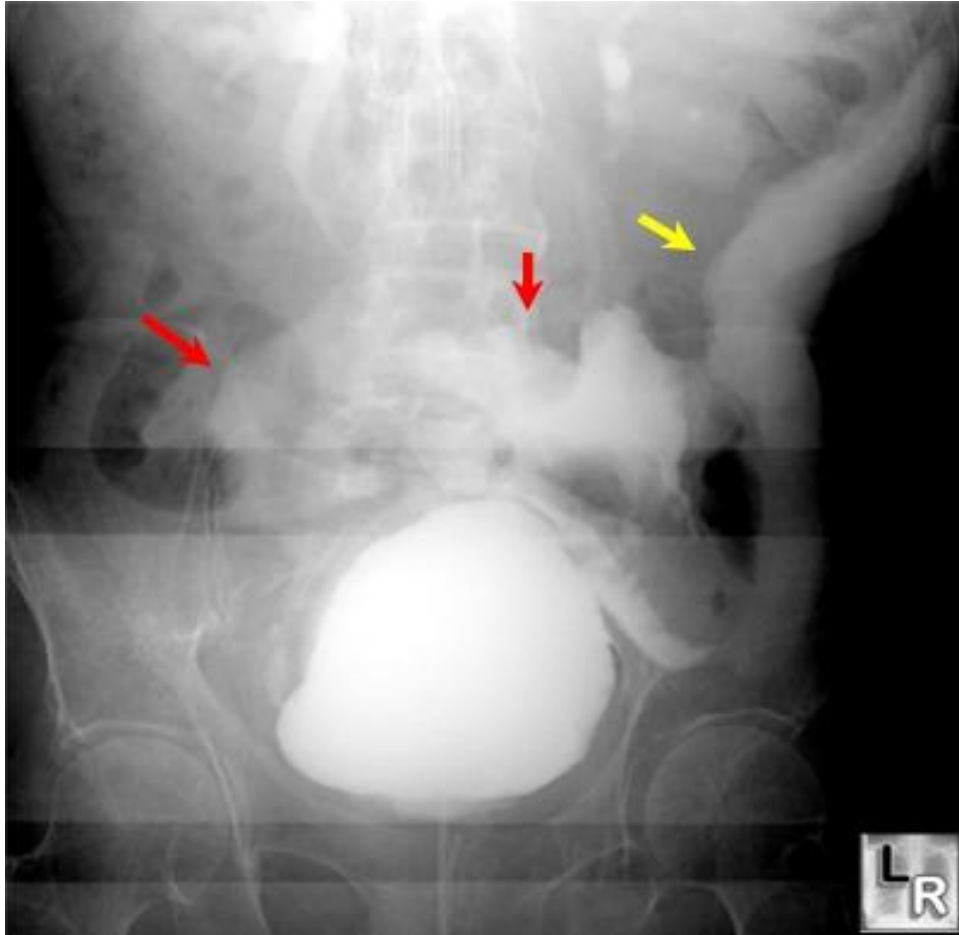
*رؤية المسالك الكلوية*



من عمرو جوجل

Cystography is an imaging test that can help diagnose problems in your bladder

صور cystography تحقق صبغة وتأخذ X ray



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

بجانب  
الجزء  
of bladder



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

adjacent  
to wall  
of urinary  
bladder



# Male Urethra

■ **Male urethra**: a common canal for passage of urine and semen to outside the body.

■ It **measures** about 18-20 cm long.

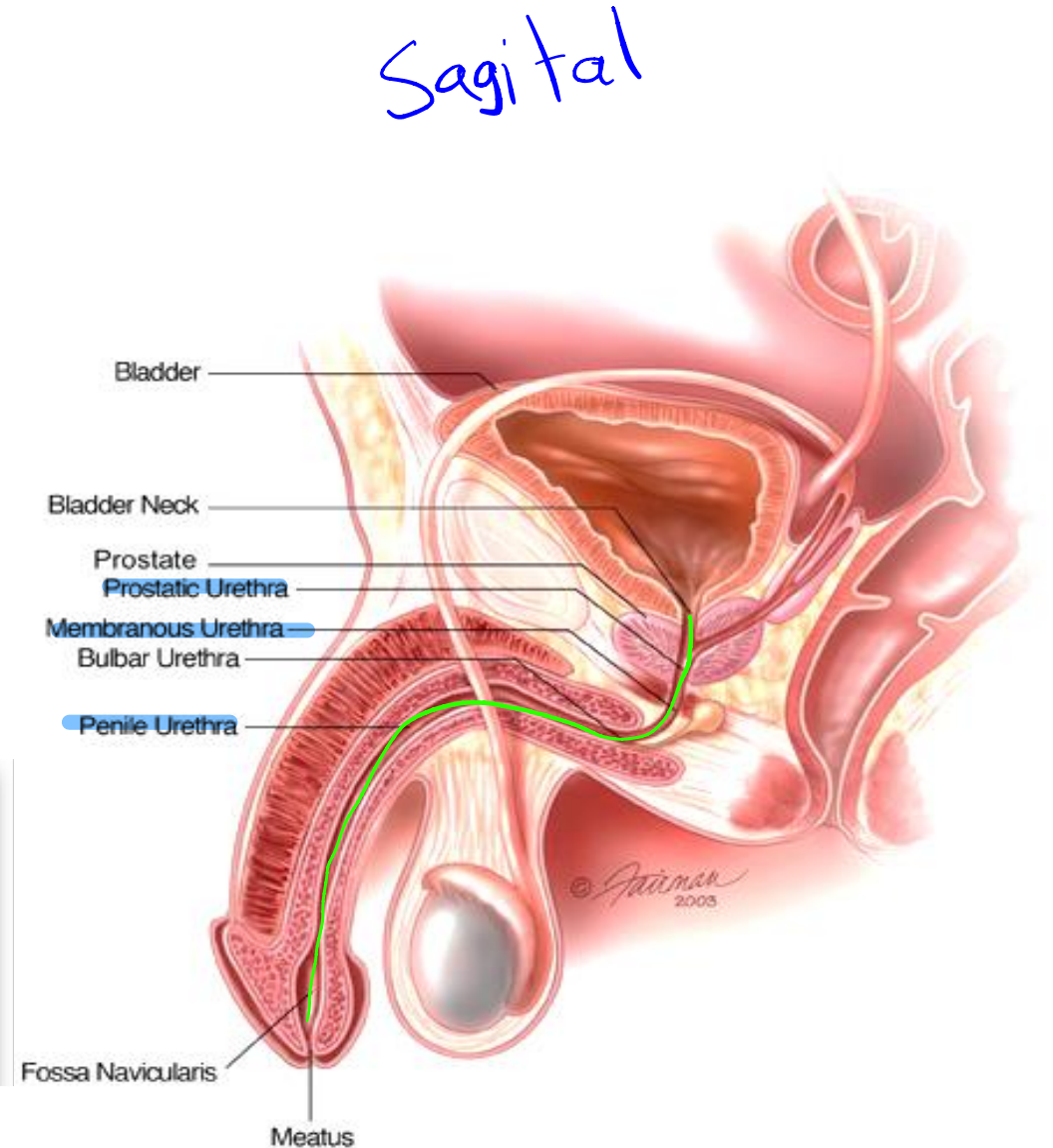
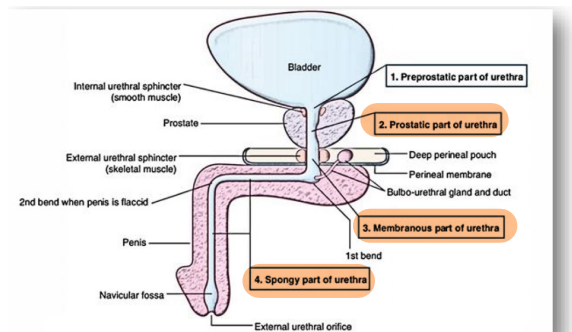
■ It **extends** from the internal urethral orifice at the neck of the bladder **to** the external urethral orifice at the tip of the glans penis.

■ **It is formed of 3 parts;**

✓ **Prostatic urethra.**

✓ **Membranous urethra.**

✓ **Spongy urethra (penile)**



# Male Urethra

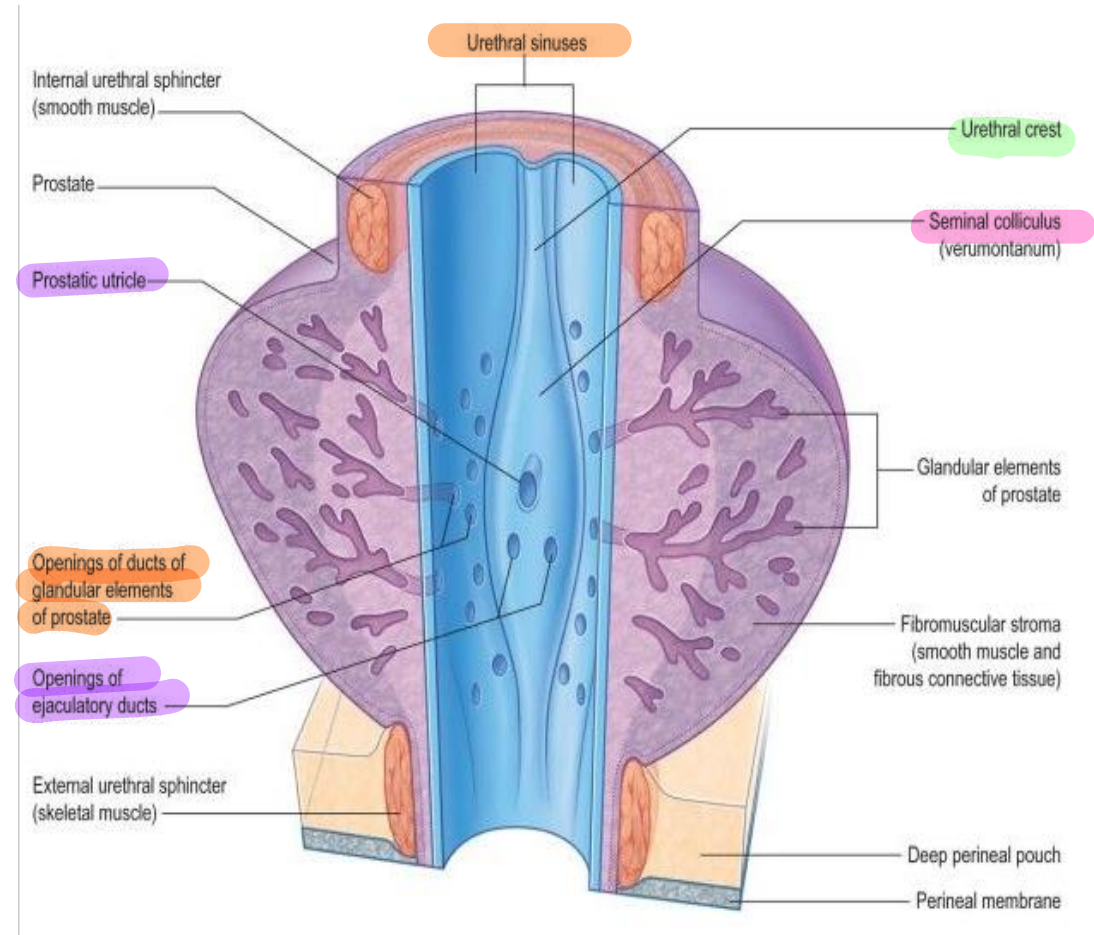
## □ Prostatic Urethra:

- 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.

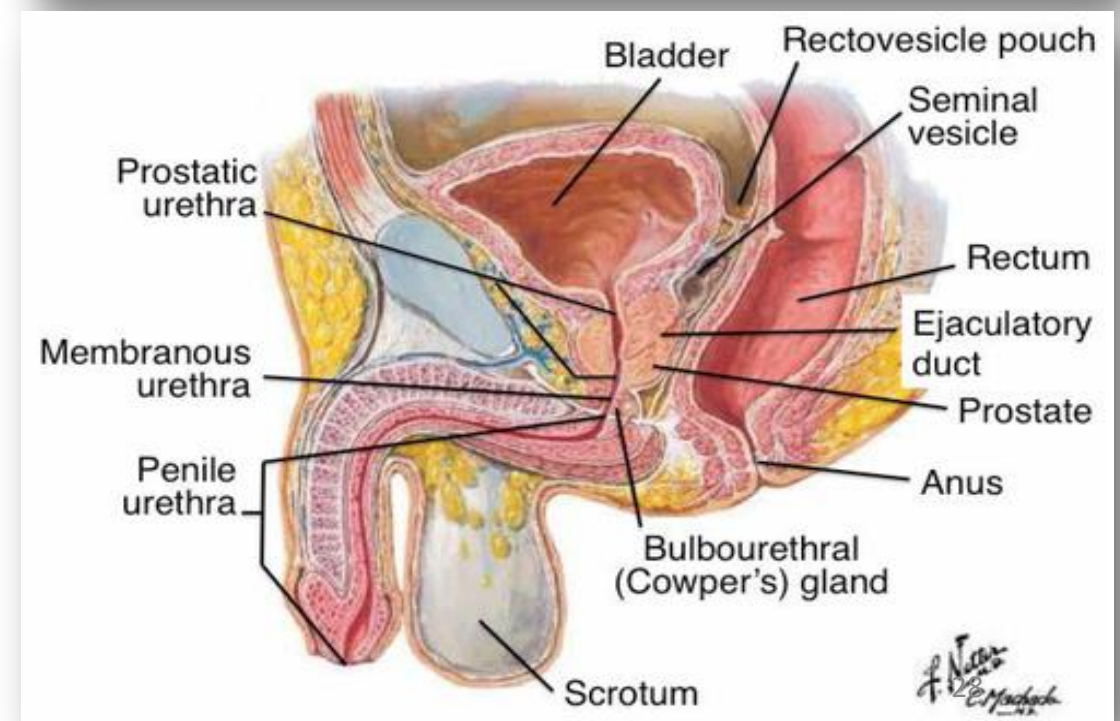
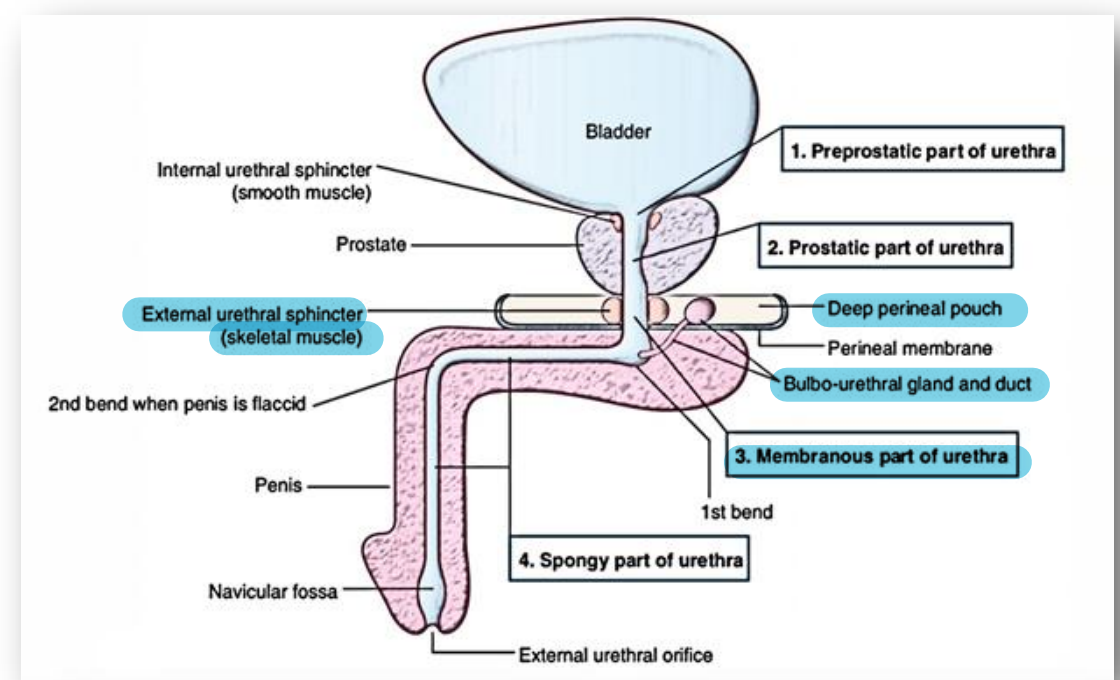
Coronal section



# Male Urethra

## □ Membranous Urethra:

- It is the **narrowest & shortest** part about (2 cm) in length.
  - lesser pelvis ends at the apex of the prostate
- 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.

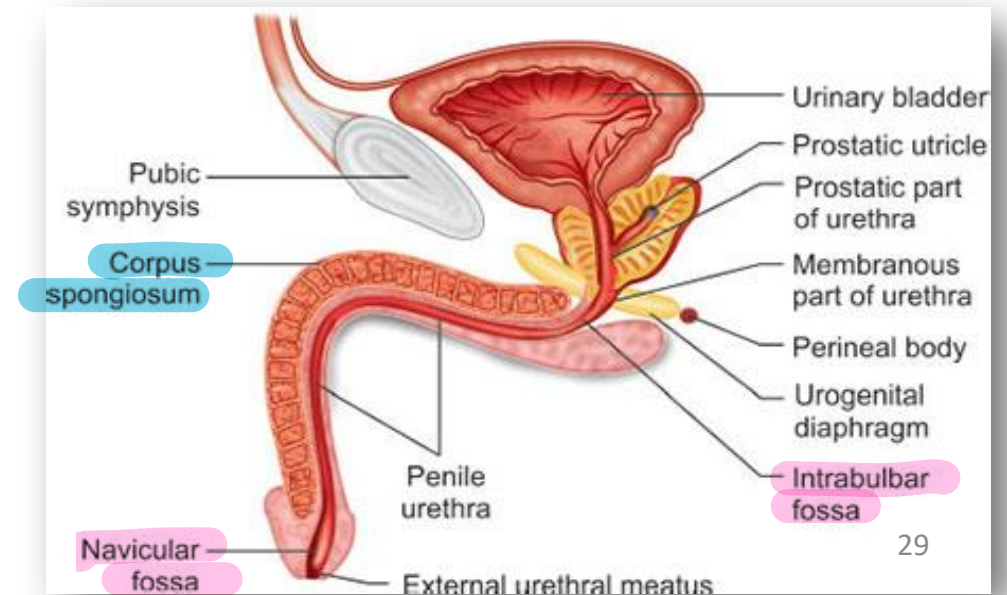
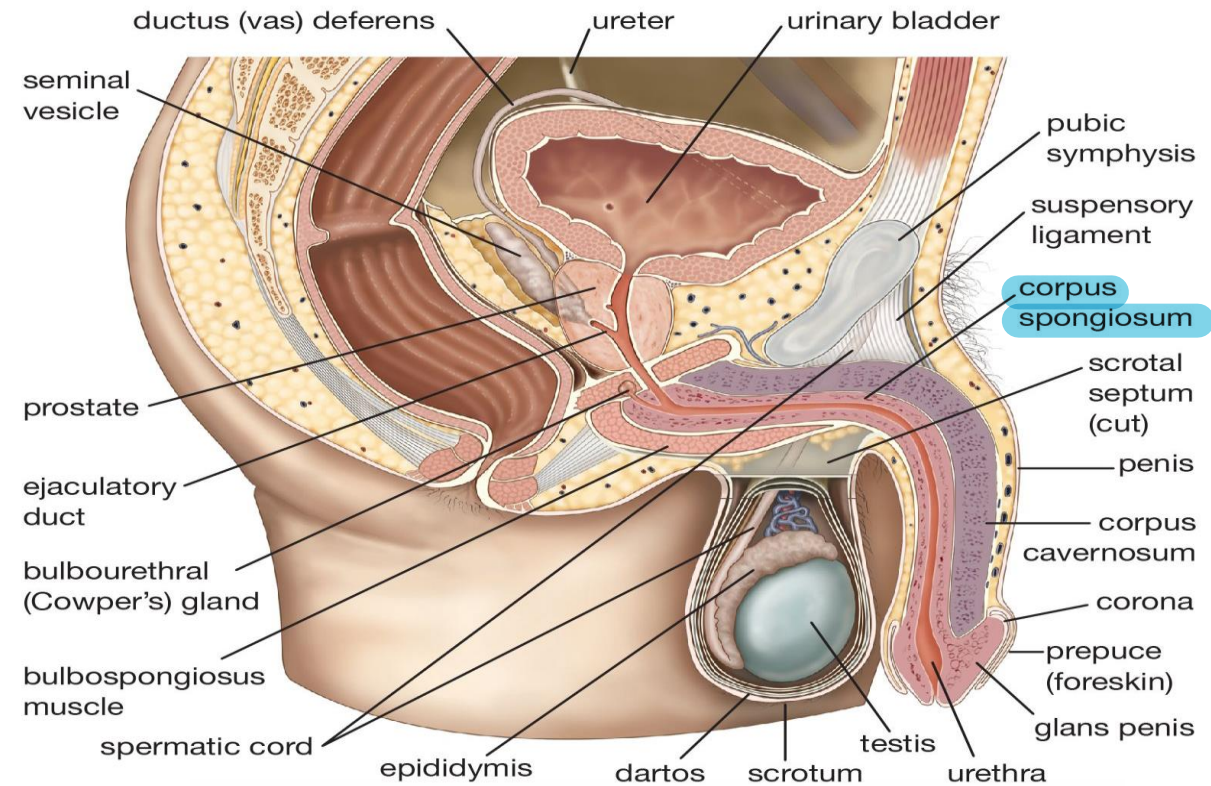




# Male Urethra

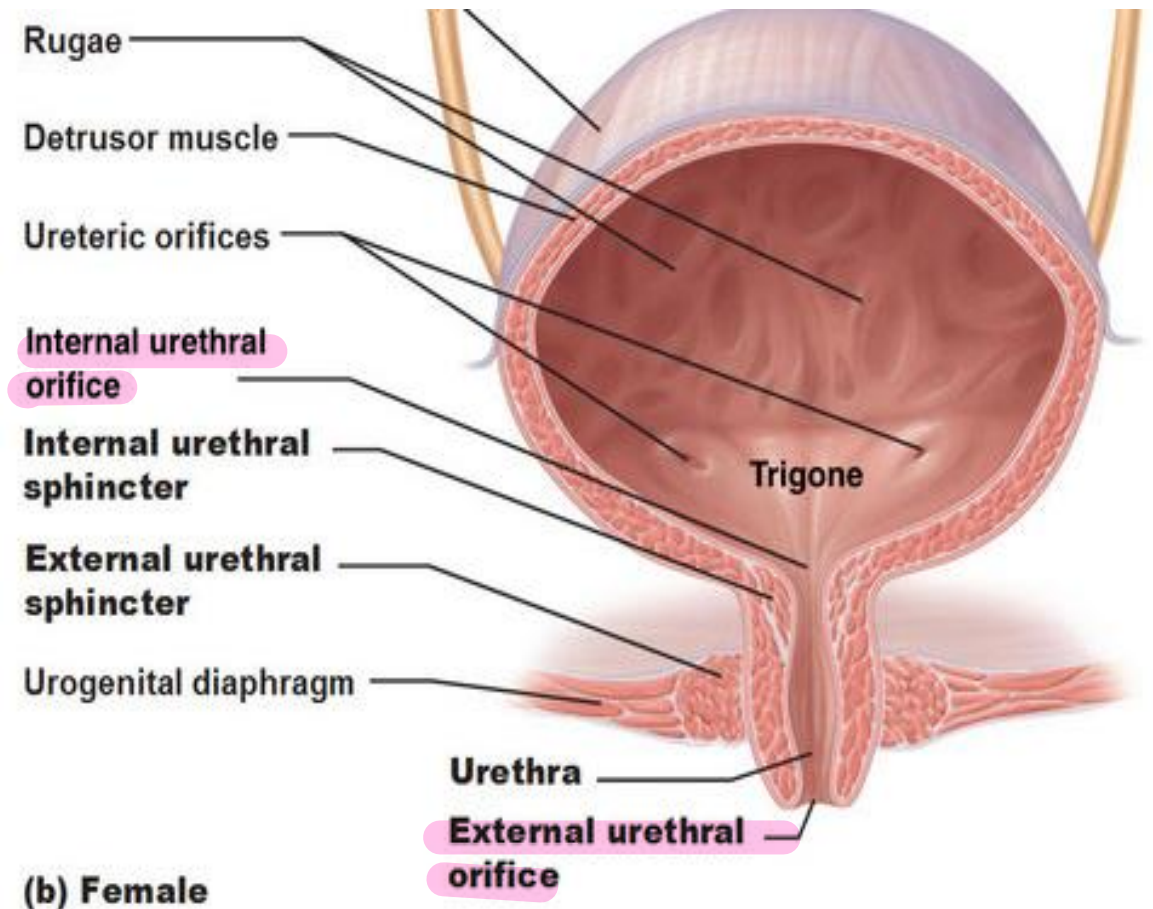
## □ Spongy (Penile) Urethra:

- It is the **longest part** about 15 cm in length.
- It **traverses** the whole length of the **corpus spongiosum of penis**.  
*erectile tissue 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. *related to bulb of penis*
  - **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. Surrounded by skeletal muscle fibers which represent external urethral sphincter



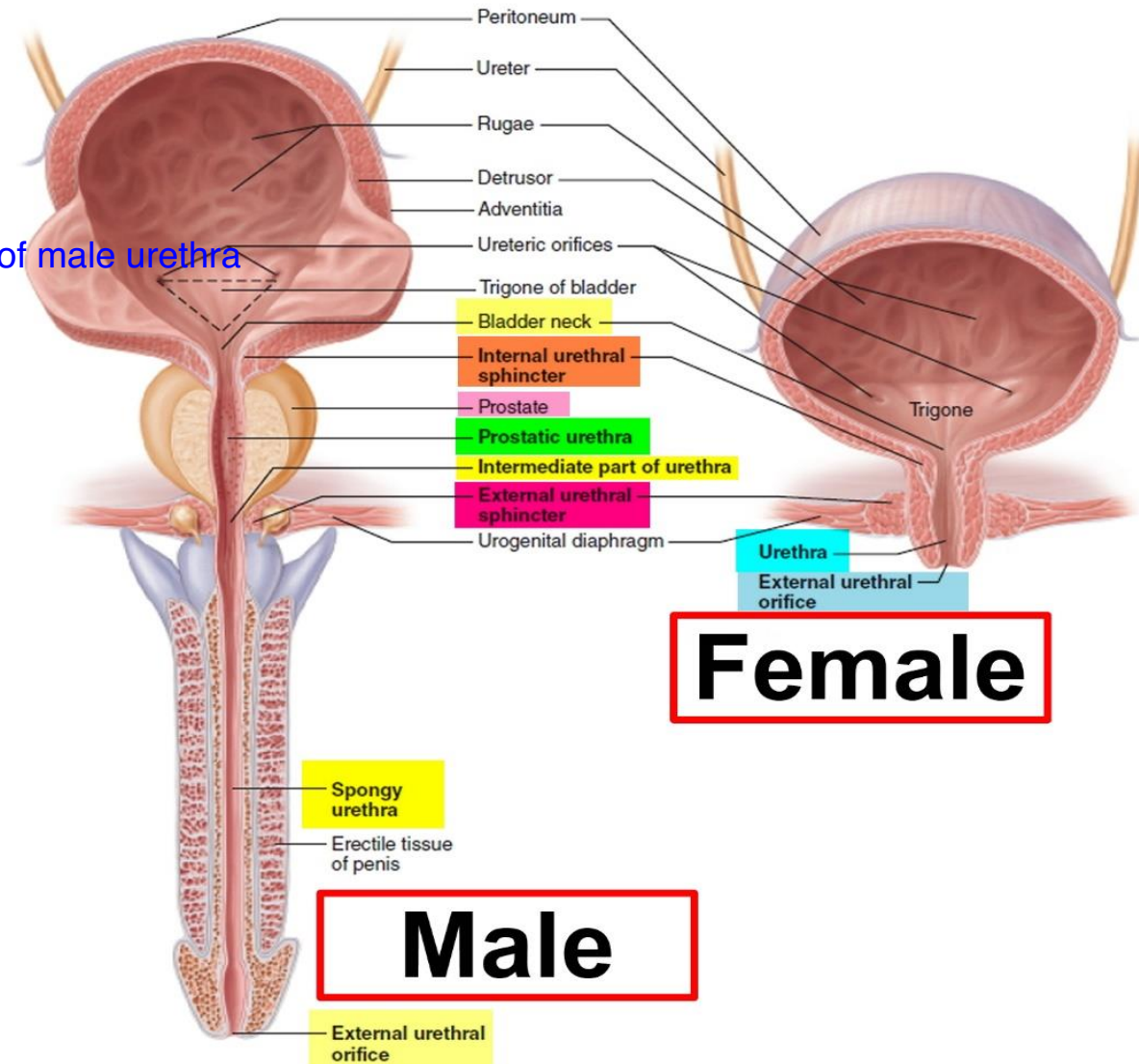
# Urethral Sphincter

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

- It is **voluntary sphincter** filling most of the deep perineal pouch and surround the membranous urethra.   
 In male  
لانه ال urethra عنده مقسمه ل parts ف اعرف انه  
External urethral sphincter surround the membranous part of male 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

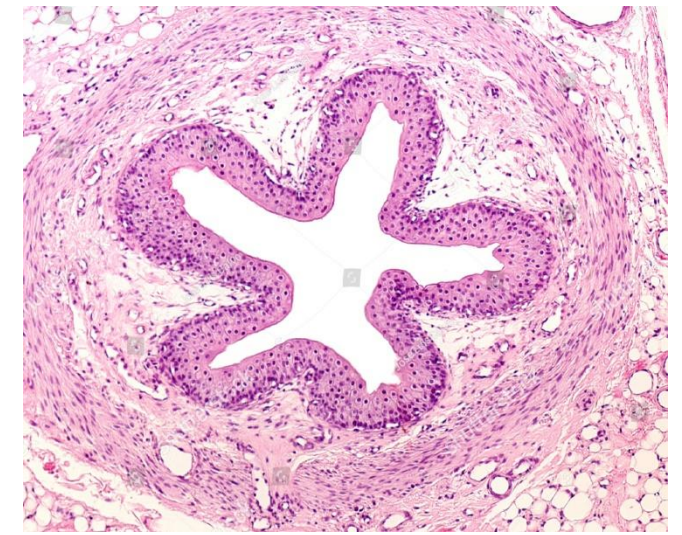
## Blood supply:

- **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. instead of حكيثا بكون  
inferior vesicles 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.**

نوع من ال epithelium خاص بل urinary system بسموه  
uroepithelium بحيث انه ال cells arranged in many  
layers لكن ال layers بتغير عددها حسب ال state ازا  
كانت ال bladder فاضية او مليانه

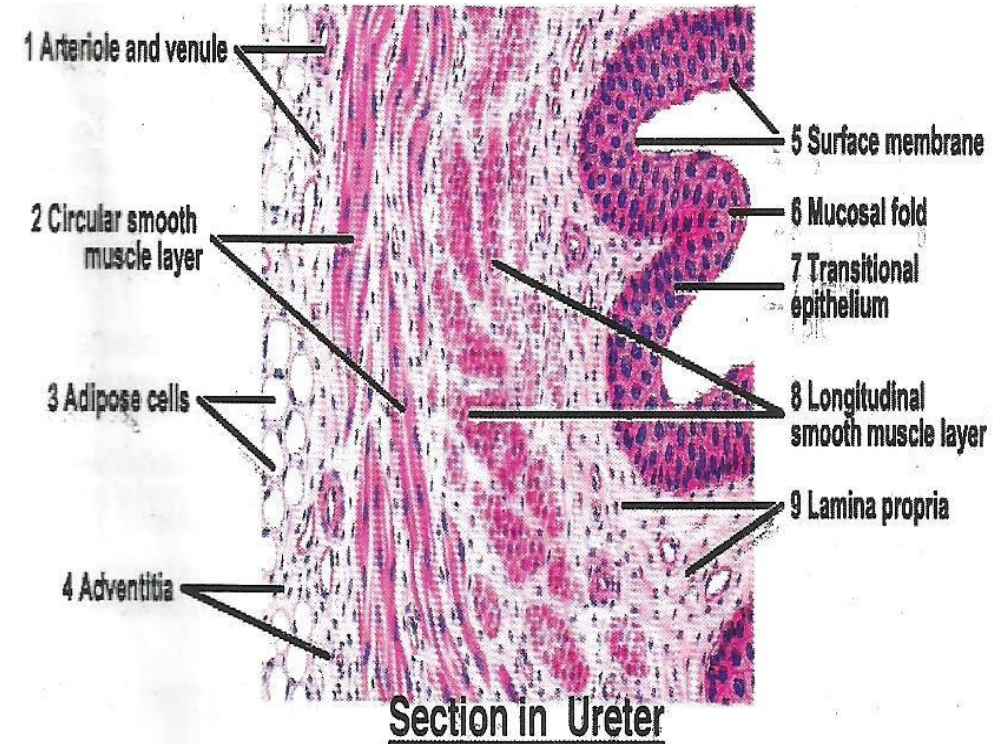
- **Lamina propria:** areolar connective tissue rich in **elastic fibers.**

### Musculosa:

Smooth muscle fiber

- **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**.

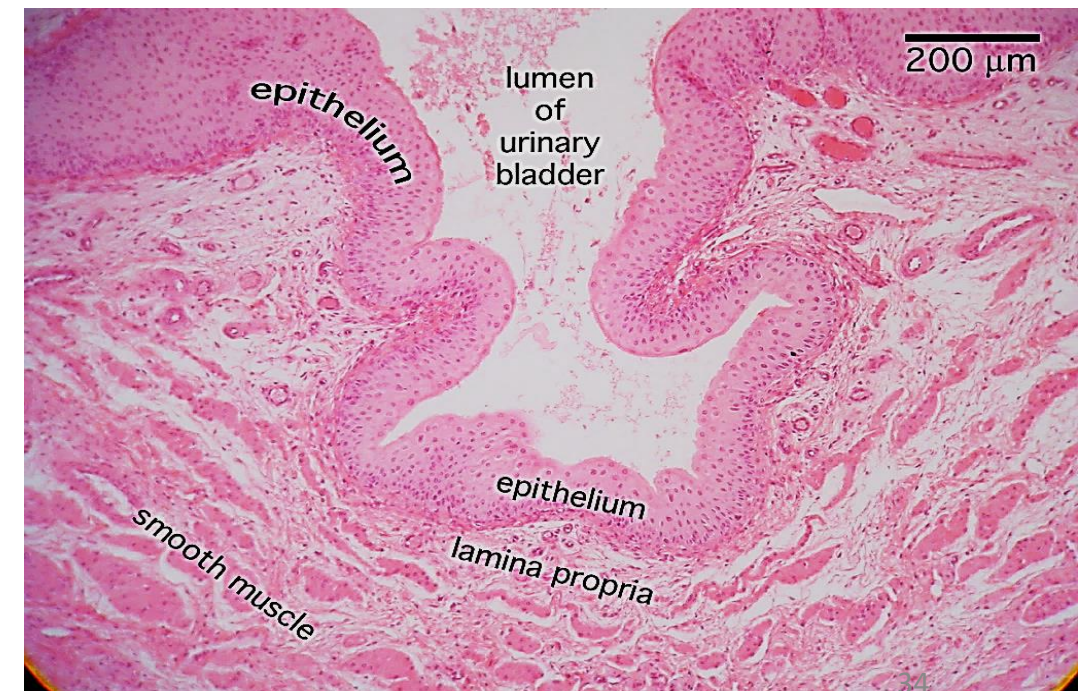
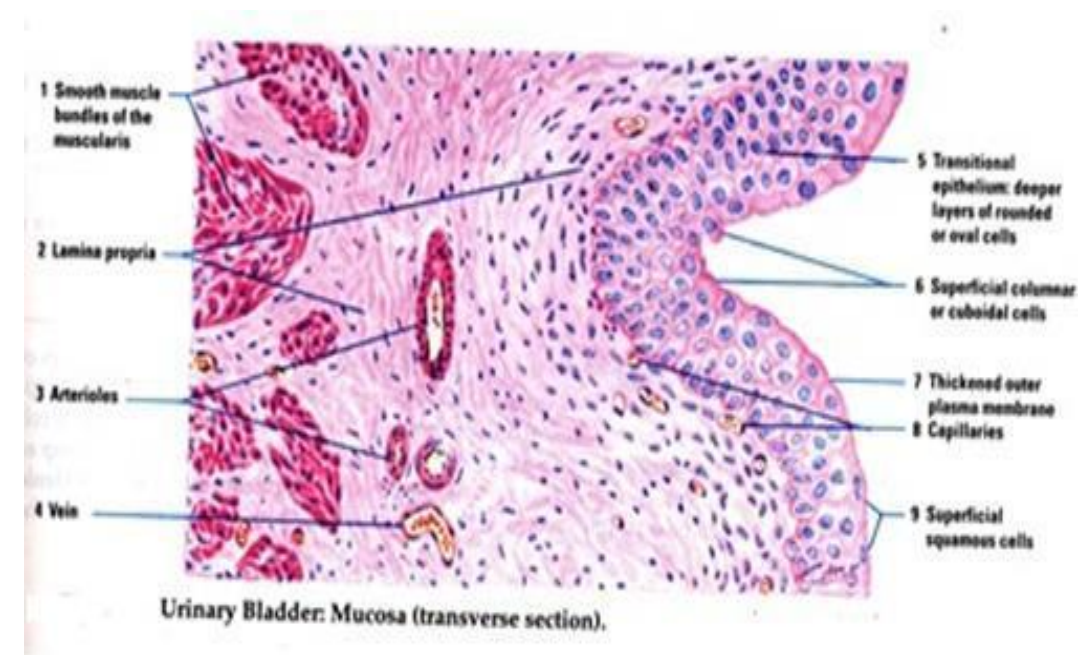
## Mucosa:

- **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.







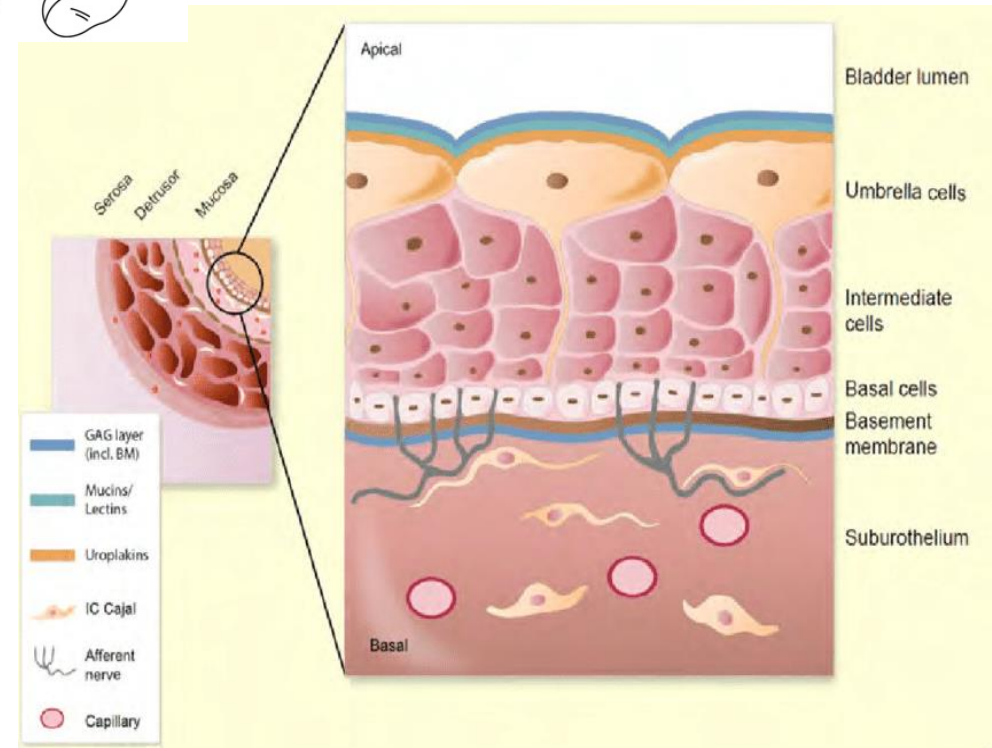
للاطلاع

## 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

ال epithelium بضل يتغير

## Prostatic urethra:

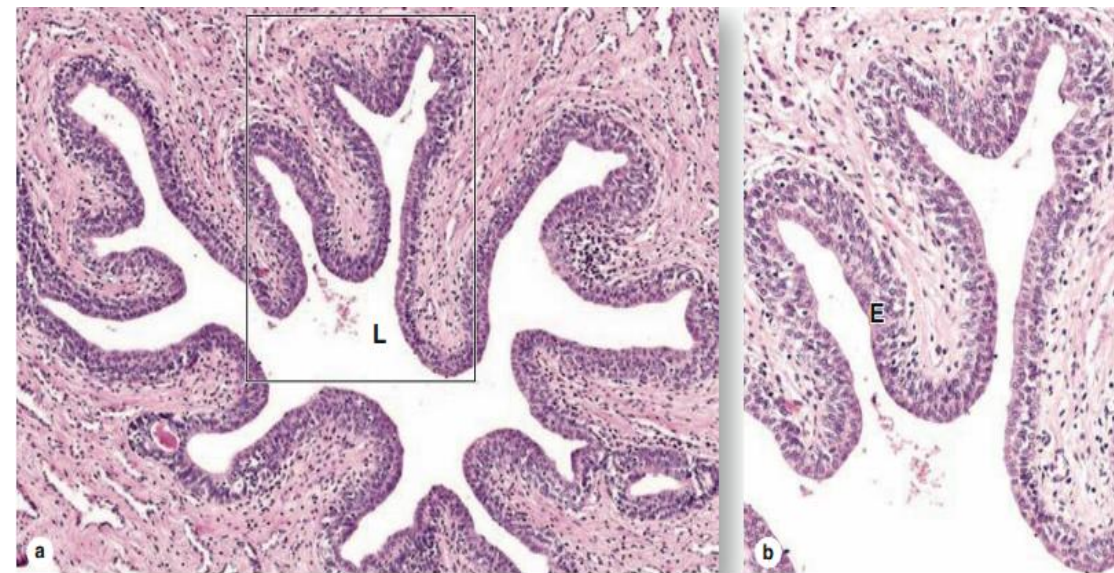
- Lined with **transitional epithelium**.

## Membranous urethra:

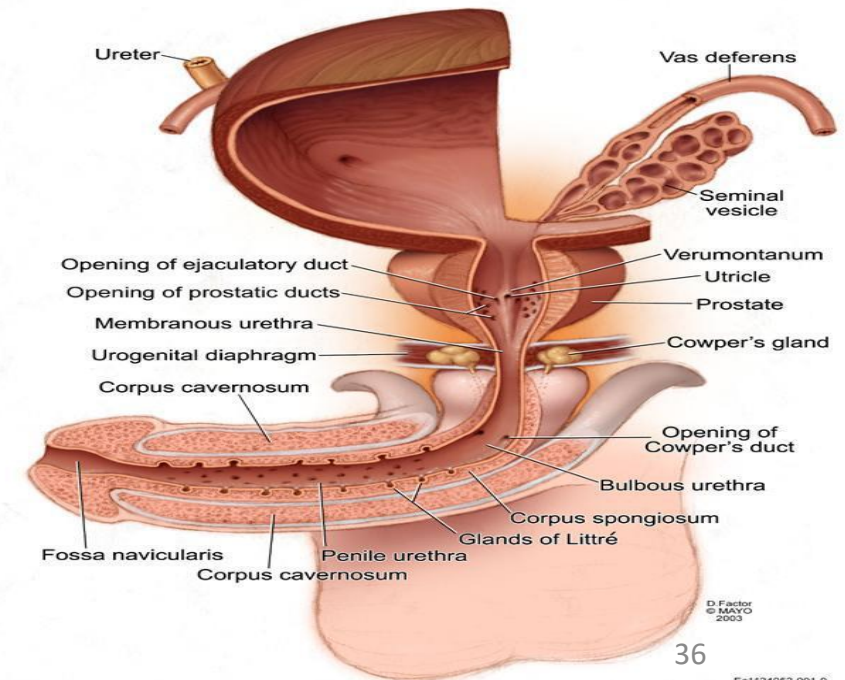
- Lined with **pseudostratified columnar epithelium**.
- Surrounded by striated muscle fibers (external sphincter).

## 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:

برضو بضل يتغير

- It is lined with **Transitional, pseudostratified columnar epithelium, stratified squamous epithelium.**

فضفا  
اضر جزاء

- There are numerous shallow invaginations of the epithelium lined with **mucous cells.**

between  
epithelial cell

يعطيكم الف عافية  
لا تنسوني من الدعاء  
ب التوفيق ❤️

