Jordan University
Faculty Of Medicine

Urinary System

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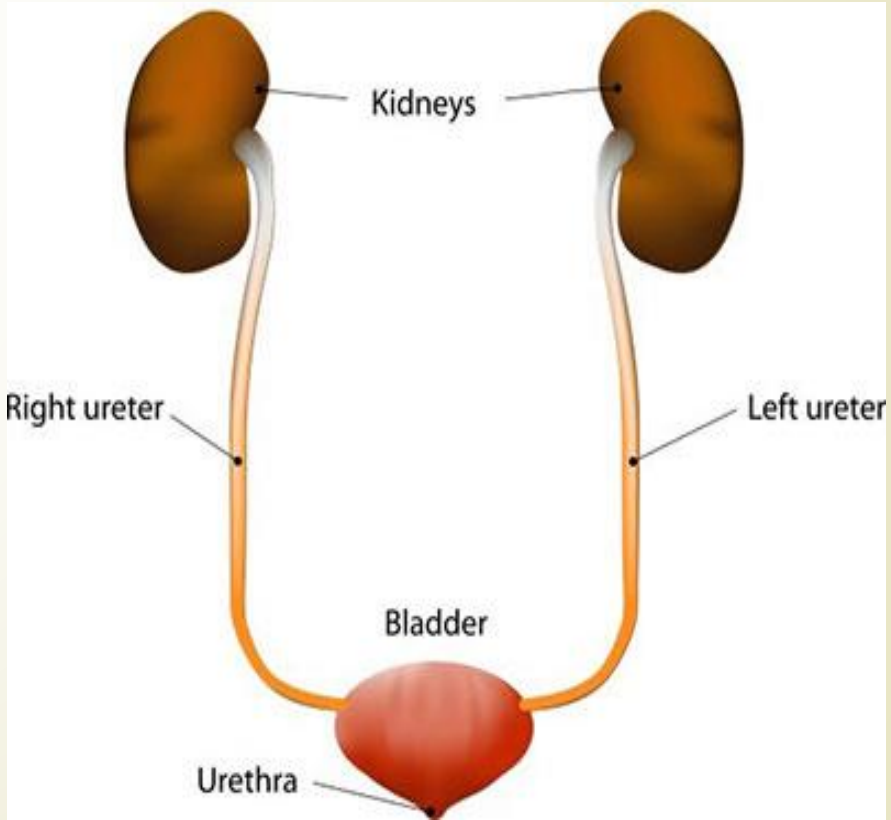
The urinary system is composed of two kidneys ,two ureters ,urinary bladder and urethra

The main function is

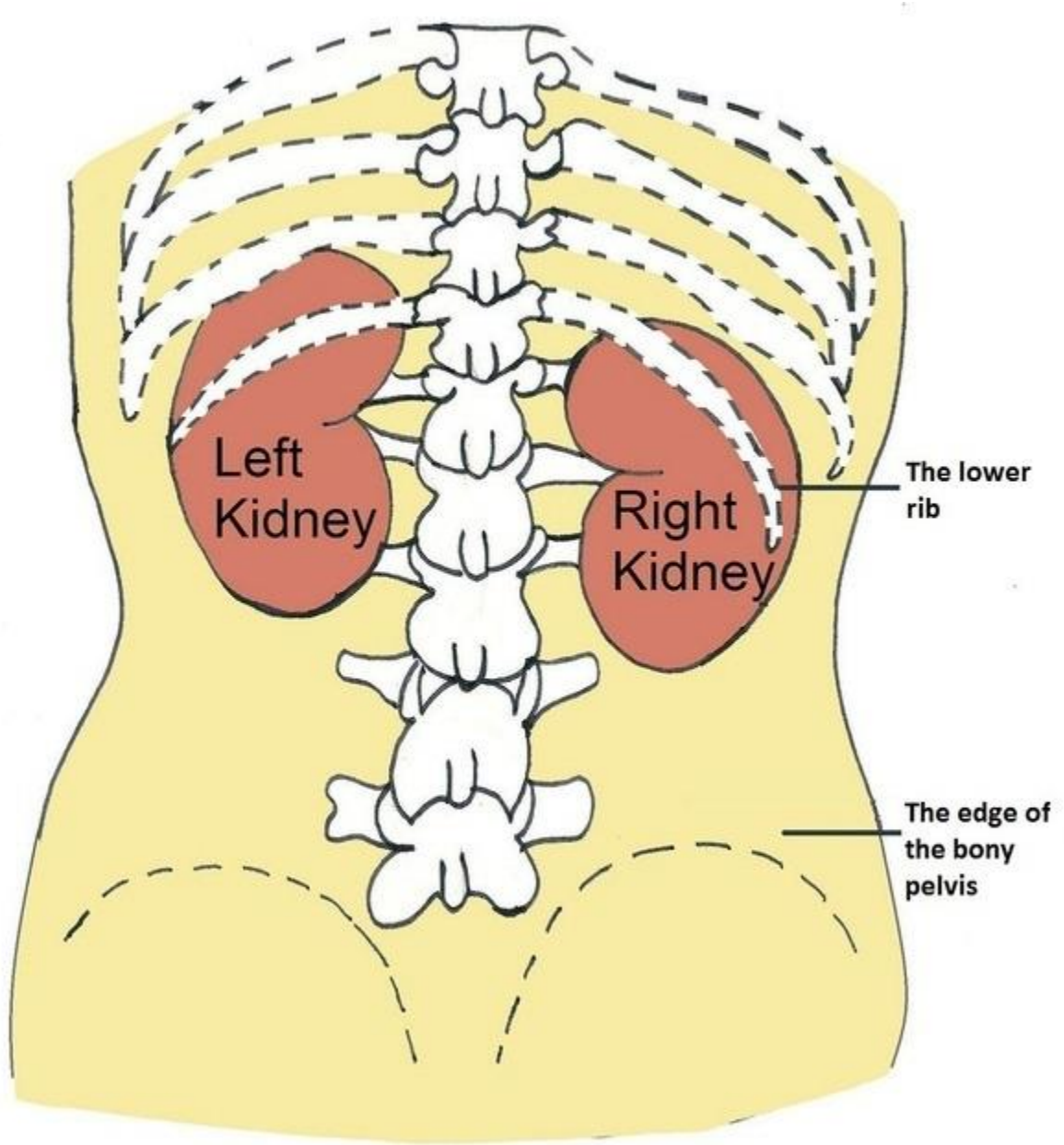
- Excrete most of the waste products of metabolism.
- Control the water and electrolyte balance within the body .
- Maintain the acid–base balance of the blood.



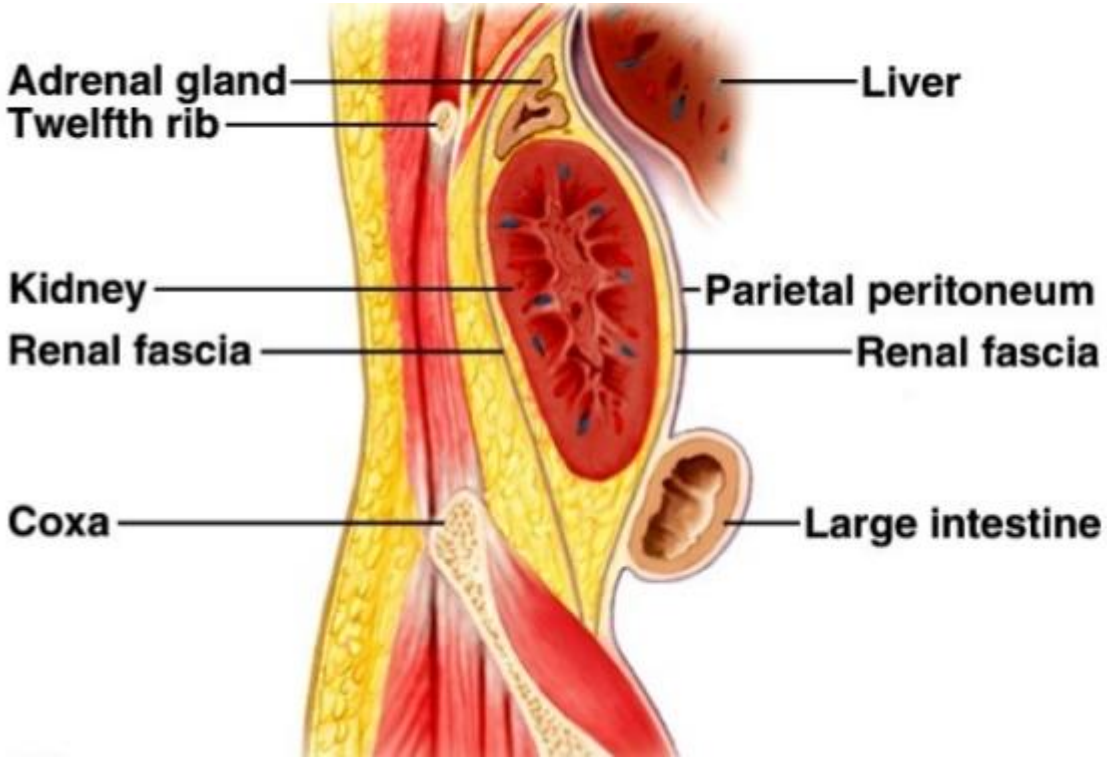
Kidneys

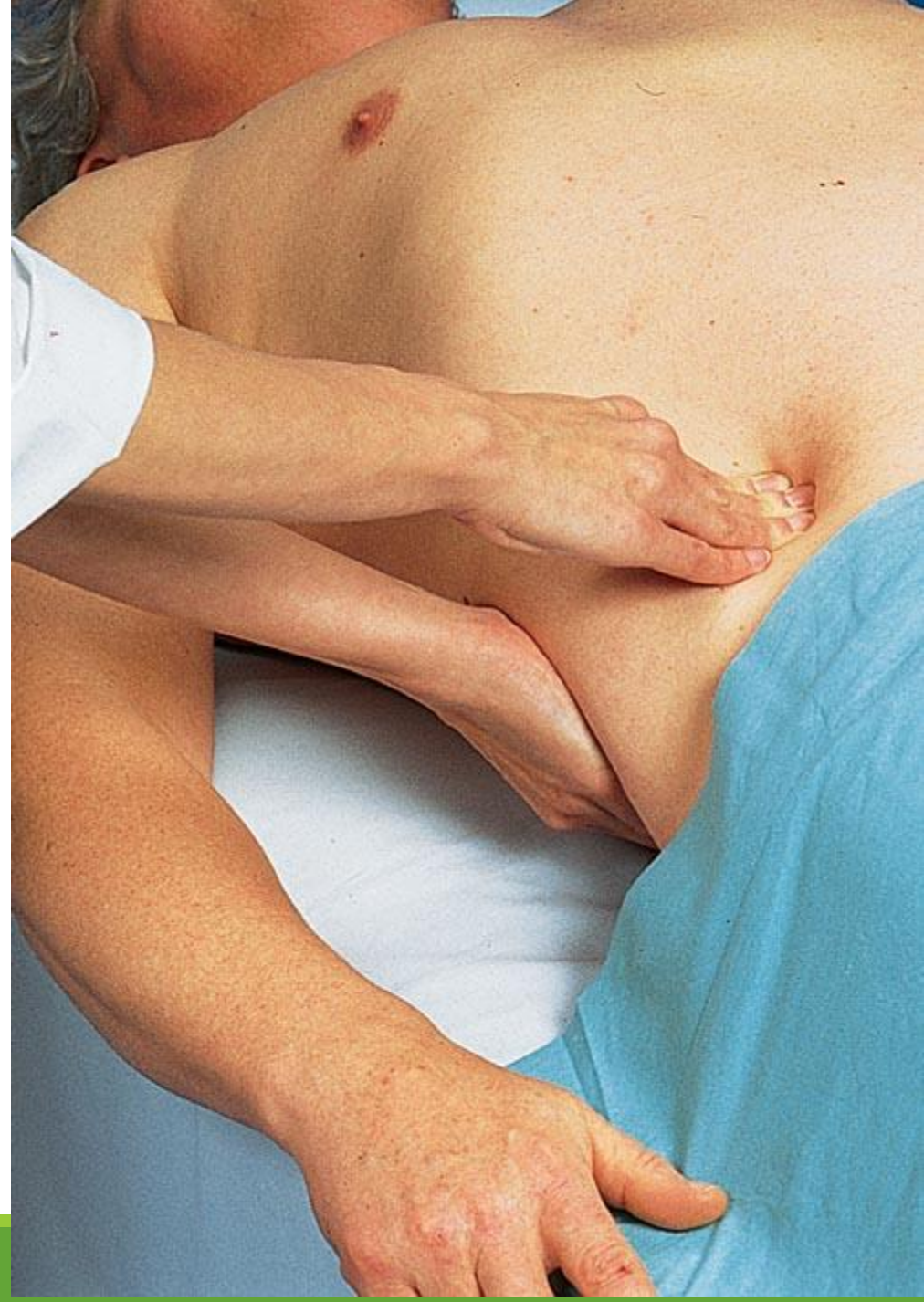
Location:

- The kidneys are retroperitoneal organs, on the posterior abdominal wall .
- They are located at paravertebral gutters opposite T12, L1, L2, L3 vertebrae.
- The right kidney is about 1.25 cm lower than the left.
- The upper pole of the **right kidney** reaches the *12th rib* and that of **left kidney** reaches *11th rib.*
- The hilum of right kidney is just below transpyloric plane (L1), and that of the left kidney is just above it.



- Kidneys Can be palpated in thin people ,By press between 11th and 12th ribs and iliac crest (posteriorly) and below costal margin (anteriorly)

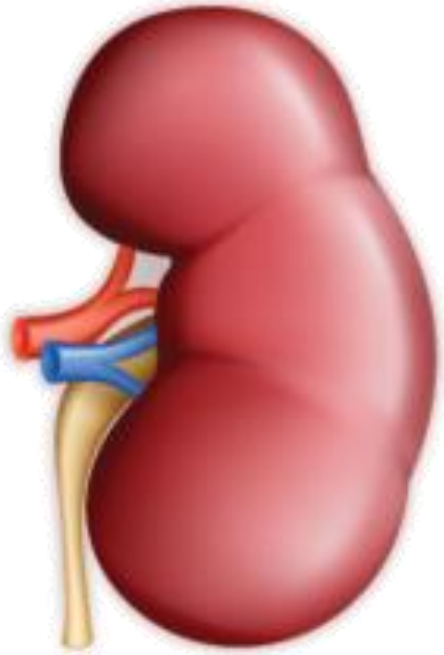




General Features of the Kidneys:

The kidneys has :-

- **Two poles** (upper and lower)
  The upper pole is nearer to the midline than the lower pole.
  The inferior pole of right kidney is about one finger breadth above iliac crest
- **Two borders** (lateral and medial).
  The lateral border is smooth and ***convex***
  the medial is *concave* and presents a ***hilum*** at its middle.
  The hilum leads to a space within the kidney, called the ***sinus*** of the kidney.
  The structures passes through the hilum are renal vein, renal artery, renal pelvis.
  The renal vein is most anterior and renal pelvis is most posterior.
- **Two surfaces** (anterior and posterior).



Coverings of the kidney :-

From the cortex outwards

1- Fibrous capsule; surrounds the kidney all around

2- The perirenal fat; surrounds the kidney all around

3- Renal fascia; it is formed of 2 layers which cover the front and back of the kidneys.

The renal fascia is continuous

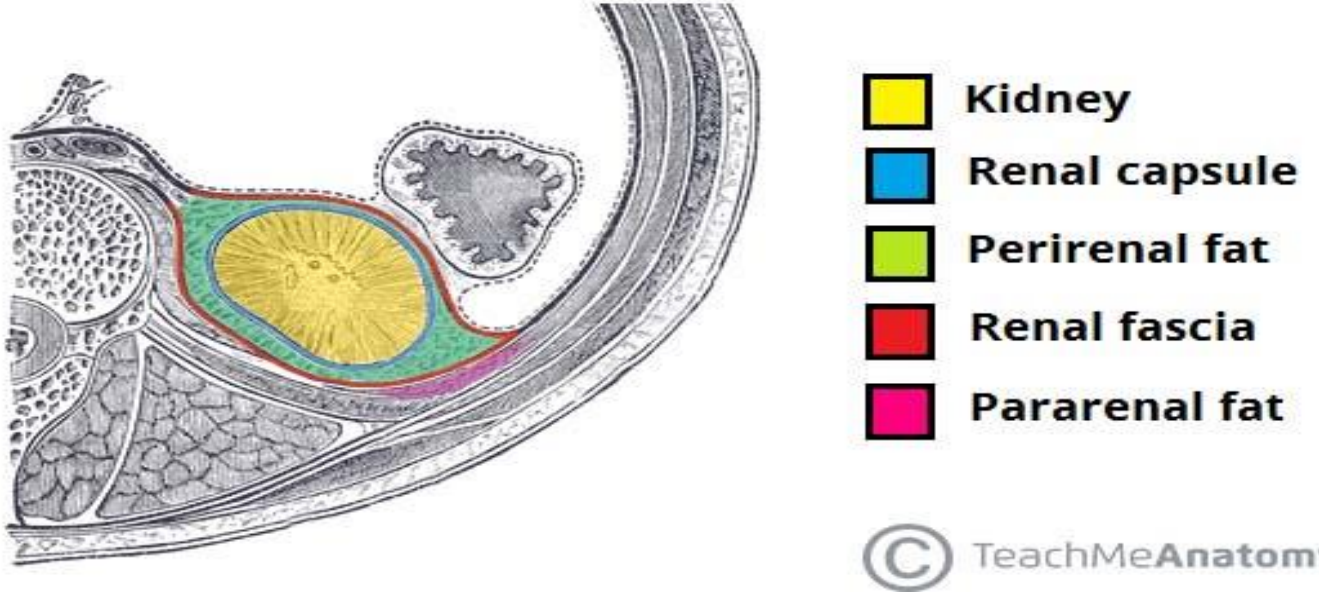
Laterally with fascia transversalis,

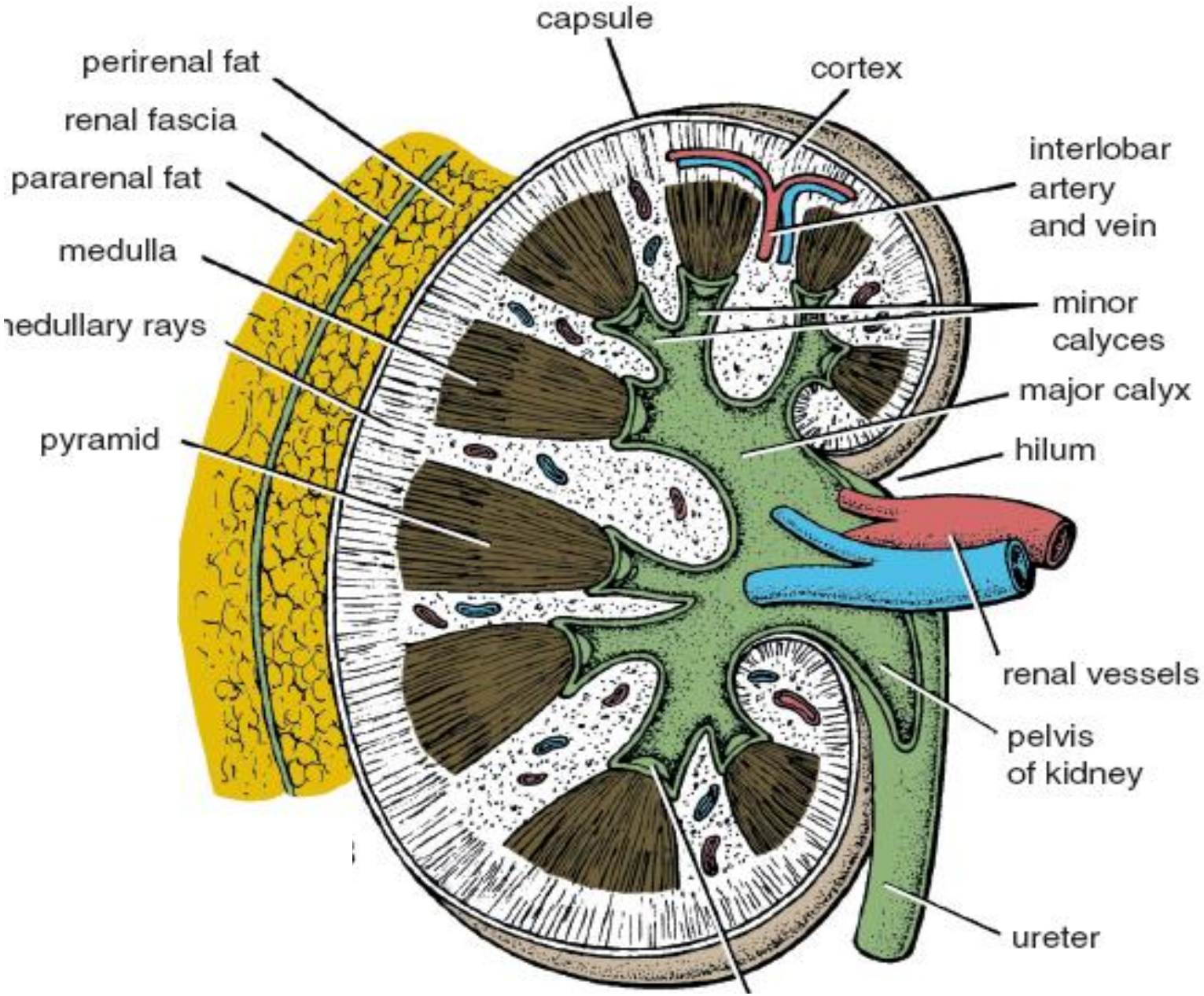
Medially with the fascia around the renal vessels, aorta and IVC.

Superiorly with the diaphragmatic fascia after forming a separate compartment for the suprarenal gland.

Inferiorly it remains separate in front and back of the ureter.

4- Pararenal fat outside the renal fascia, most condensed ***posterior*** to the kidney



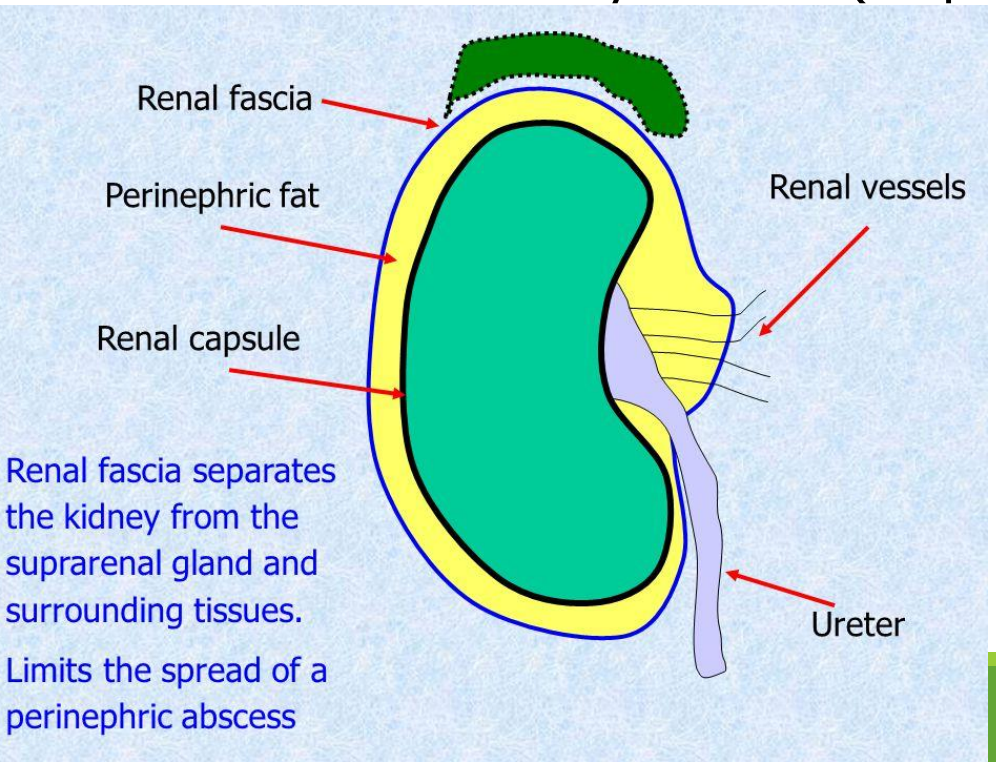

capsule
perirenal fat
cortex
renal fascia
interlobar
artery
and vein
pararenal fat
medulla
minor
calyces
edullary rays
major calyx
pyramid
hilum
renal vessels
pelvis
of kidney
ureter

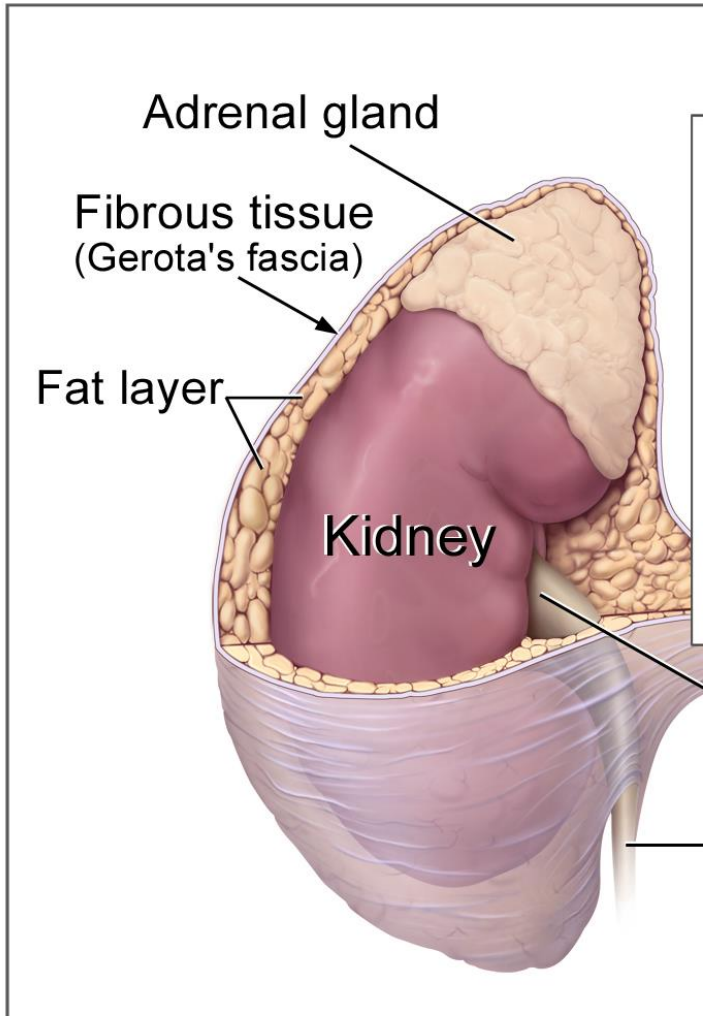
Supporting factors of the kidney :-

The kidney is kept in situ by

- Adjacent organs
- Abdominal pressure
- Perirenal fat
- Renal Fascia
- Pararenal fat
- Renal Blood vessels and ureters

If the fat absorbed, as in rapid weight loss, descent of the kidney occurs (Nephroptosis).





Nephroptosis cause intermittent pain in the renal region, relieved by lying down.

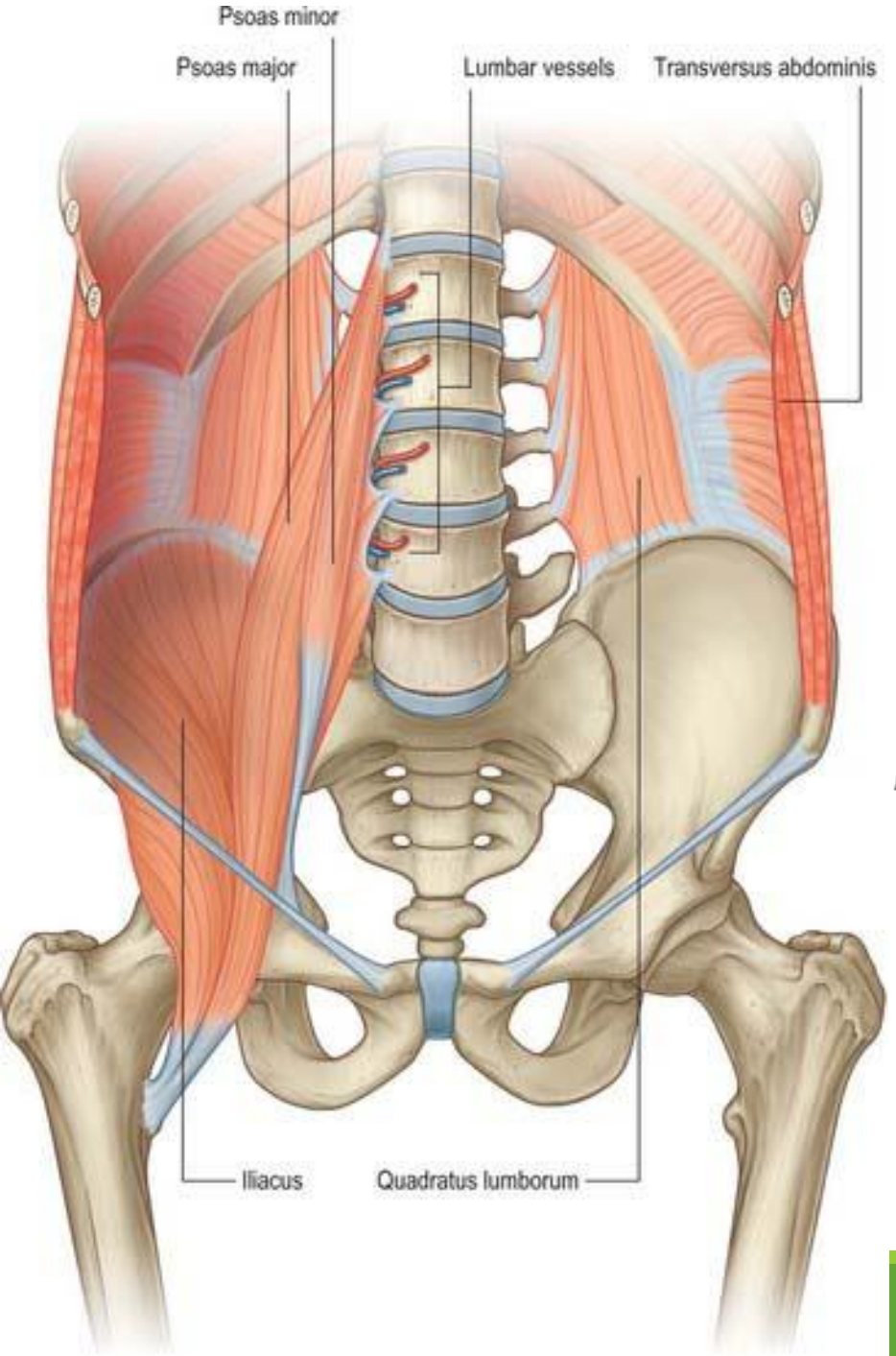
This pain as result of traction on the renal vessels.

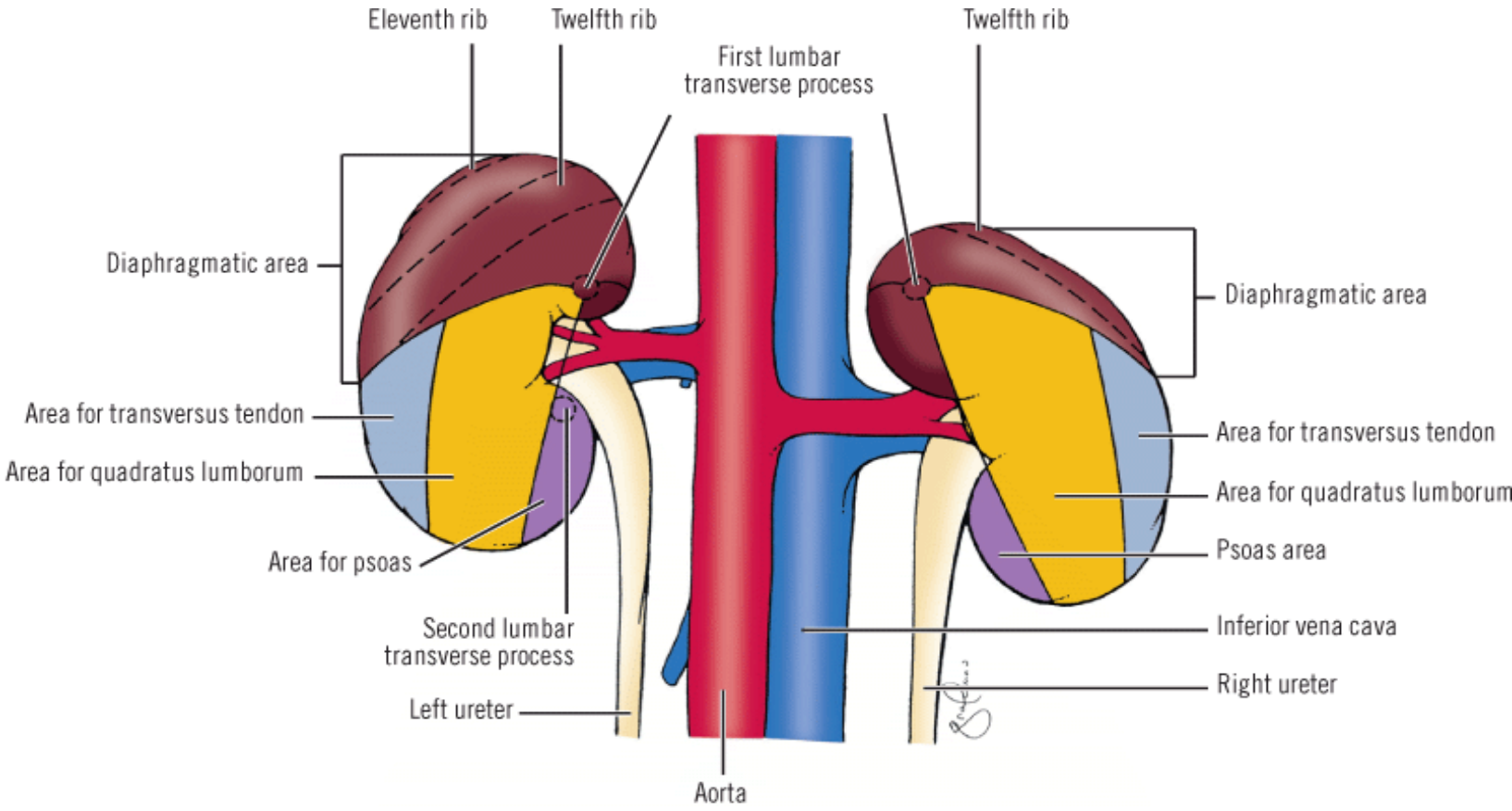
Kidneys Transplantation

The site of renal transplantation is the iliac fossa of the greater pelvis ,due to lack of inferior support for the kidneys in the lumbar region

Perinephric Abscess (pus around the kidney)

- The attachments of the renal fascia to the renal vessels and ureter, usually preventing the spread of pus to the contralateral side.
- Pus from an abscess (or blood from an injured kidney) may spread into the pelvis between the loosely attached anterior and posterior layers of the renal fascia.


Psoas minor
Psoas major
Lumbar vessels
Transversus abdominis
Iliacus
Quadratus lumborum


Eleventh rib
Twelfth rib
First lumbar transverse process
Twelfth rib
Diaphragmatic area
Diaphragmatic area
Area for transversus tendon
Area for quadratus lumborum
Area for psoas
Second lumbar transverse process
Left ureter
Aorta
Area for transversus tendon
Area for quadratus lumborum
Psoas area
Inferior vena cava
Right ureter

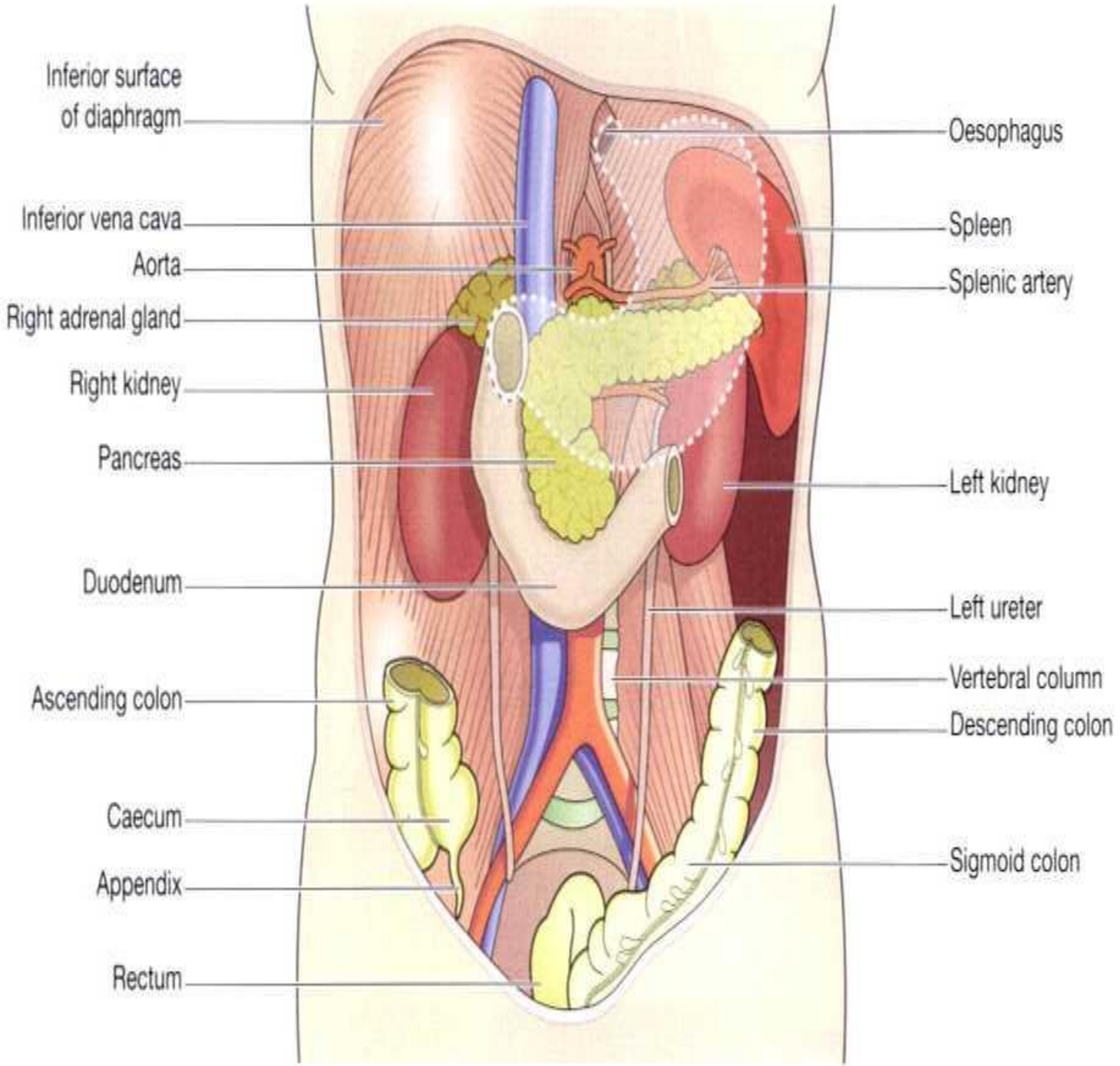
Relation of the Kidneys

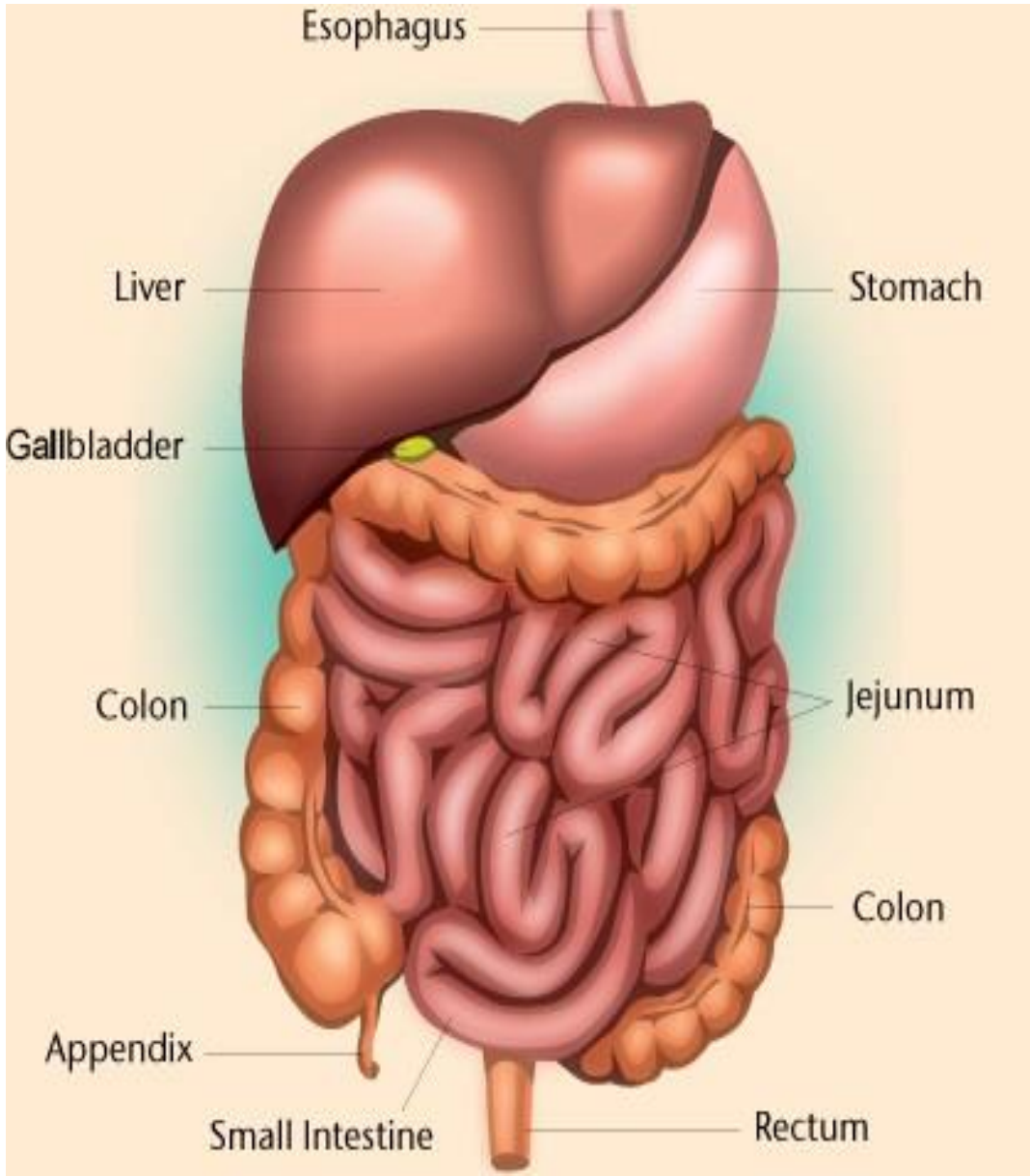
Posterior relations; are nearly similar for both kidneys

1- *Four muscles,* diaphragm (superiorly), psoas major, quadratus lumborum and transversus abdominis.

2-Four neurovascular structures; subcostal vessels, and subcostal, ilioohypogastric, and ilioinguinal nerves.

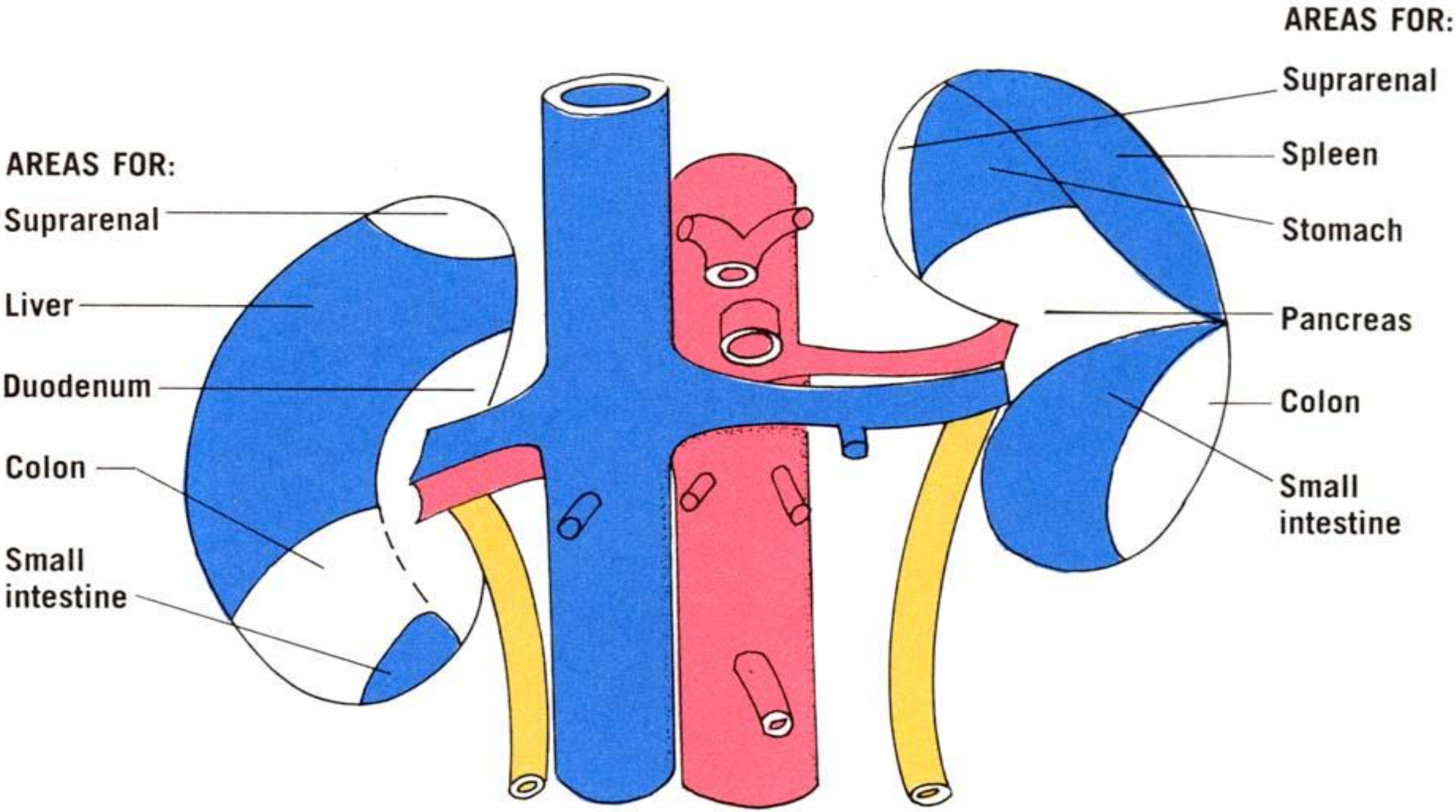
3-Pleura and ribs, the diaphragm separates the upper part of each kidney from the costodiaphragmatic recess of the pleura and 12th rib on right side and 11^{th} and 12^{th} ribs on left side.


Inferior surface of diaphragm
Inferior vena cava
Aorta
Right adrenal gland
Right kidney
Pancreas
Duodenum
Ascending colon
Caecum
Appendix
Rectum
Oesophagus
Spleen
Splenic artery
Left kidney
Left ureter
Vertebral column
Descending colon
Sigmoid colon


Esophagus
Liver
Stomach
Gallbladder
Colon
Jejunum
Colon
Appendix
Small Intestine
Rectum

Anterior relations

Right Kidney	Left Kidney
Right suprarenal gland	Left suprarenal gland
Second part of duodenum	Spleen with lienorenal ligament, Body of pancreas with splenic vessels
Right lobe of liver (with **hepatorenal pouch** in between)	Posterior surface of stomach **(with lesser sac** in between**)**
Right colic flexure	Descending colon
Coils of small intestine	Coils of small intestine
Ascending branch of right colic artery	ascending branch of left colic artery

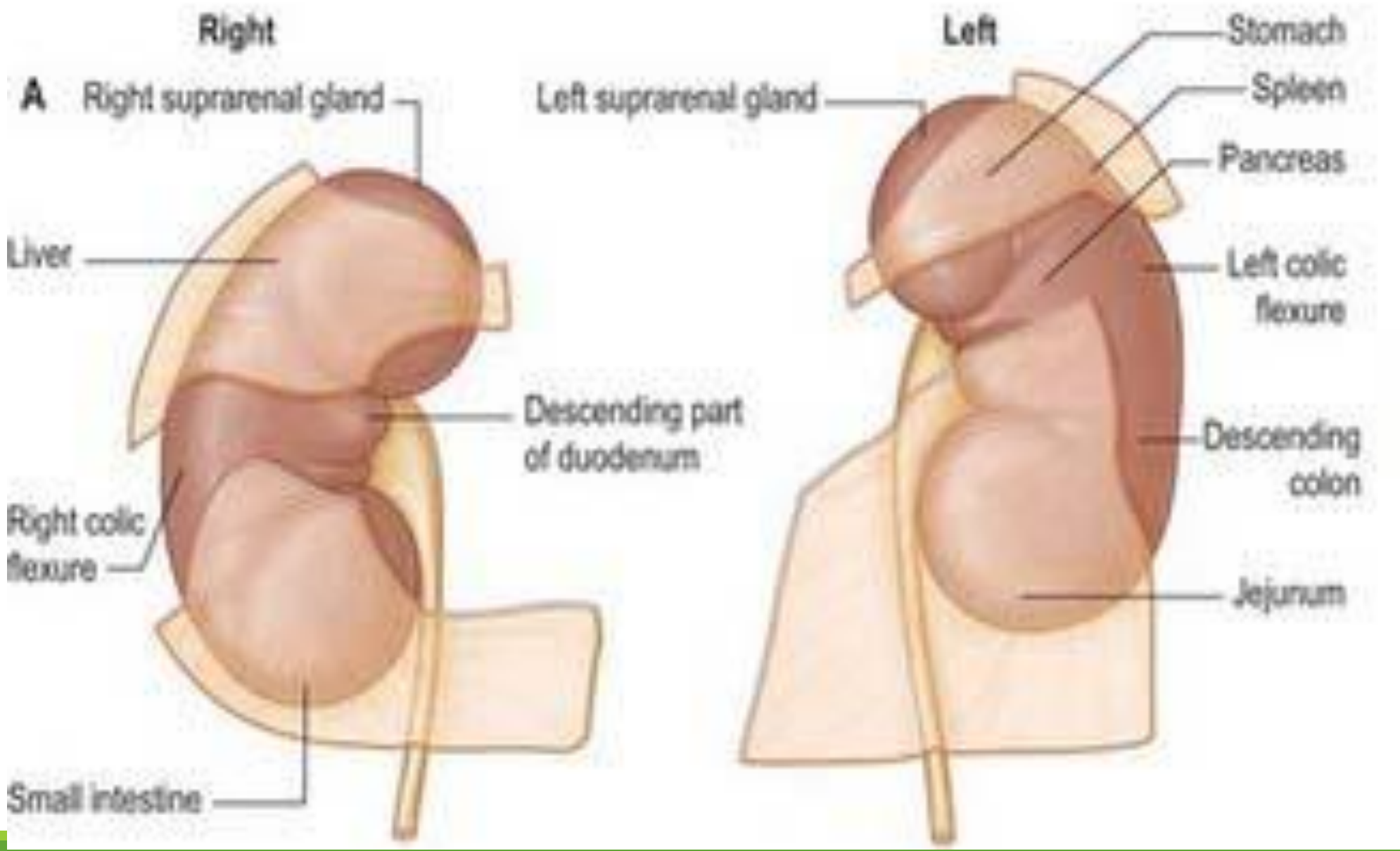

AREAS FOR:
Suprarenal
Liver
Duodenum
Colon
Small intestine
AREAS FOR:
Suprarenal
Spleen
Stomach
Pancreas
Colon
Small intestine

Peritoneal covering of the kidney :-

Although, the kidneys are ***retroperitoneal,*** the anterior surface of each kidney has 3 ***bare areas*** not covered by peritoneum.

The other retroperitoneal structures are interposed between front of kidneys and the parietal peritoneum of posterior abdominal wall.

Bare areas on right kidney	Bare areas on left kidney
Suprarenal area	Suprarenal area
Duodenal area	Pancreatic area
Colic area (hepatic flexure)	Colic area (descending colon)


Right
A
Right suprarenal gland
Liver
Descending part of duodenum
Right colic flexure
Small intestine
Left
Left suprarenal gland
Stomach
Spleen
Pancreas
Left colic flexure
Descending colon
Jejunum

Structure of the kidney :-

The Kidneys has *two* ***zones*** ***(outer*** cortex and ***inner*** medulla) surrounding ***sinus*** of the kidney.

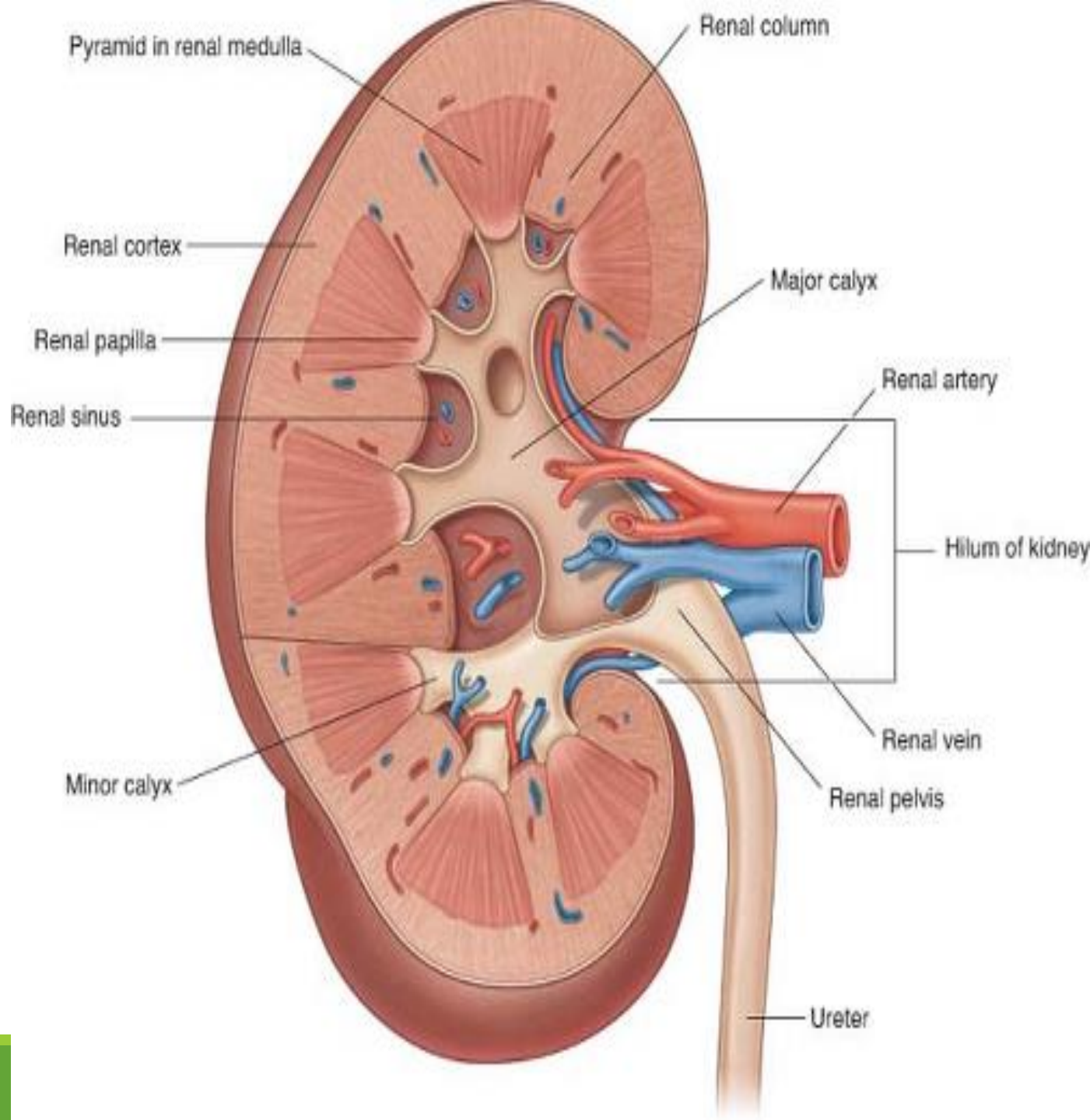
1- Cortex; pale and adjacent to the capsule. It is divided into;

Cortical arches which form caps ***over*** the bases of the medullary pyramids.

2- Medulla; is darker, deep to the cortex.

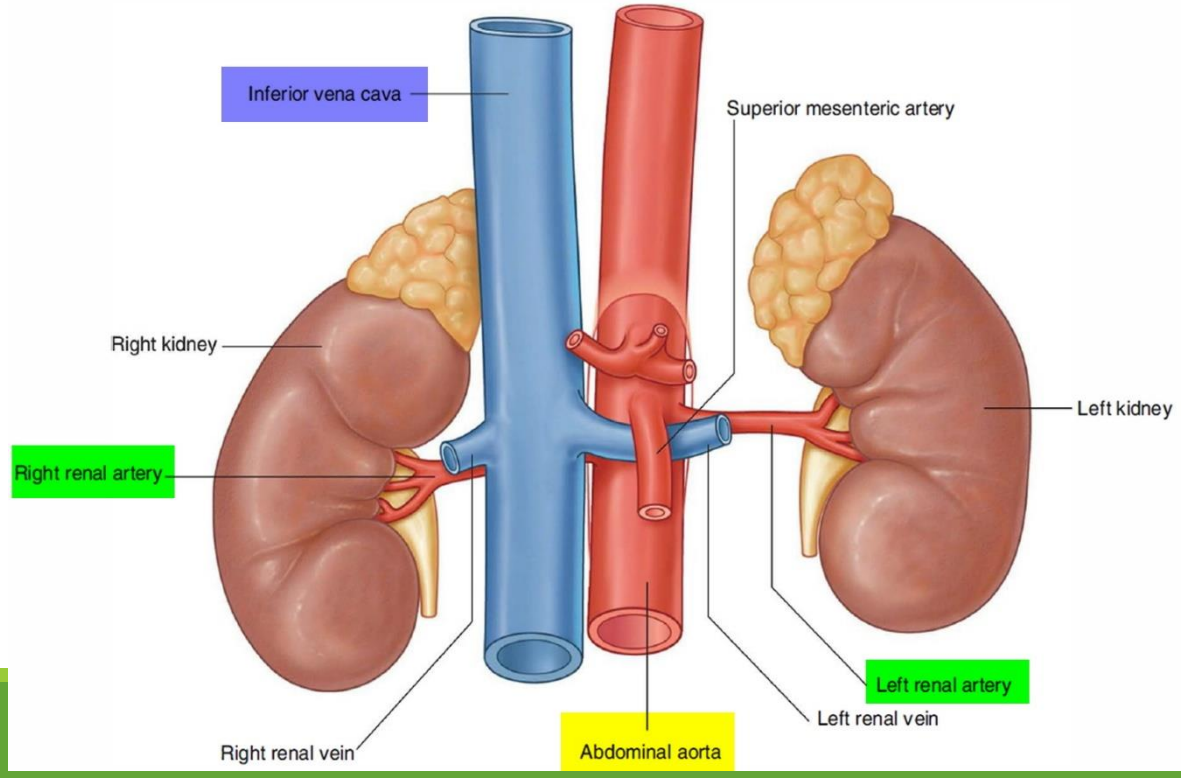
- It is formed of 7-14 pyramids
- Each pyramid has a ***base*** directed towards the cortex and an ***apex*** called renal papilla
- The part of cortex ***between*** the medullary pyramids is called Renal columns
- Each pyramid with its cap of cortex form a *lobe* of the kidney (7-14 lobes)

- The minor calyces are about 5-12 per kidney. Each is a short funnel like tube which receives renal papillae
- The minor calyces unite to form 2-3 major calyces (in each kidney) and these in turn, unite to form the renal pelvis.



Arterial blood supply

- The renal arteries arise from the side of abdominal aorta, opposite the upper border of L2 vertebra.
- The right renal artery is ***longer*** than the left and ***passes posterior*** **to IVC**
- The renal artery gives inferior suprarenal artery,
- It divides into **5 *segmental*** arteries which are ***end*** arteries.



Renal Artery

5 Segmental arteries

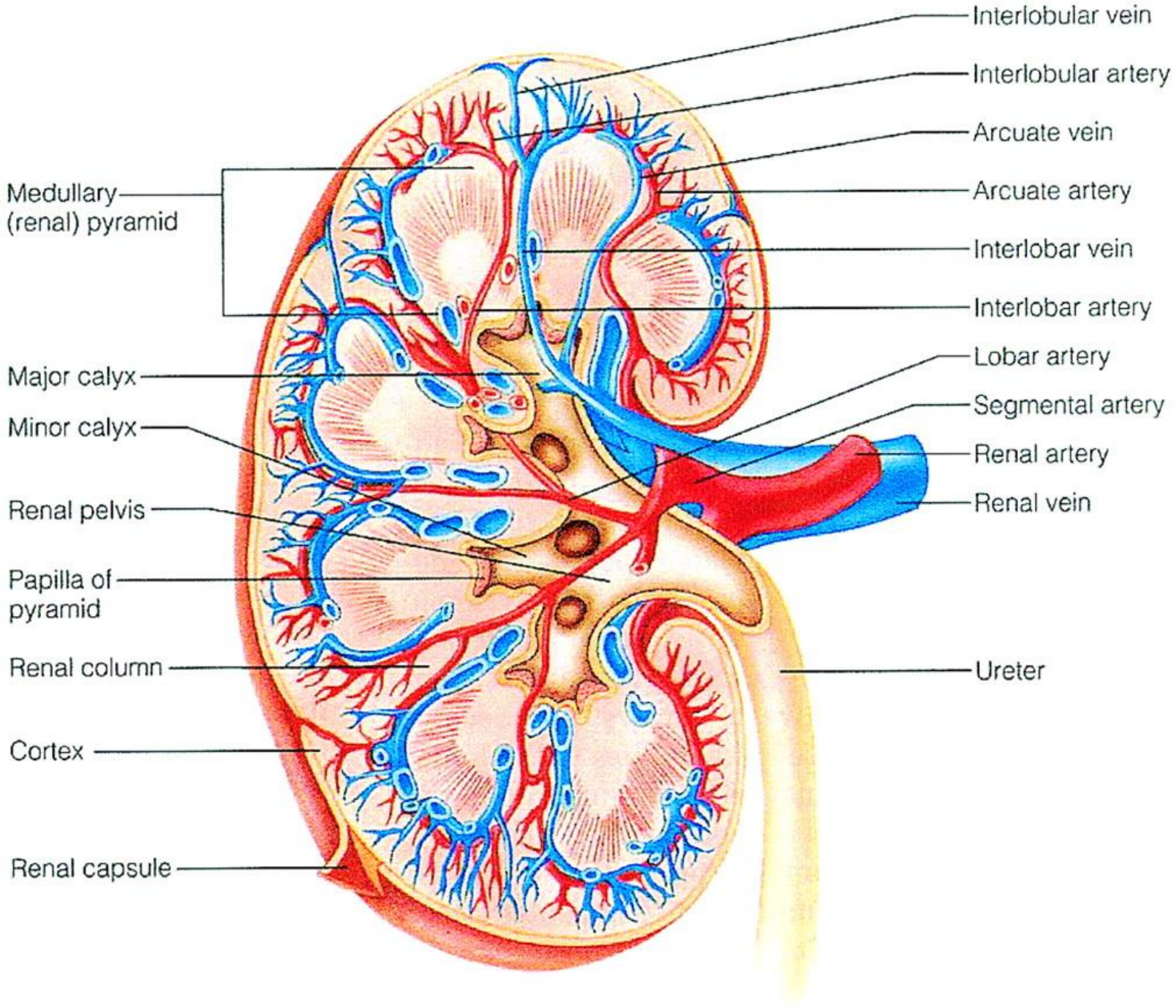
Lobar arteries
one for each renal pyramid

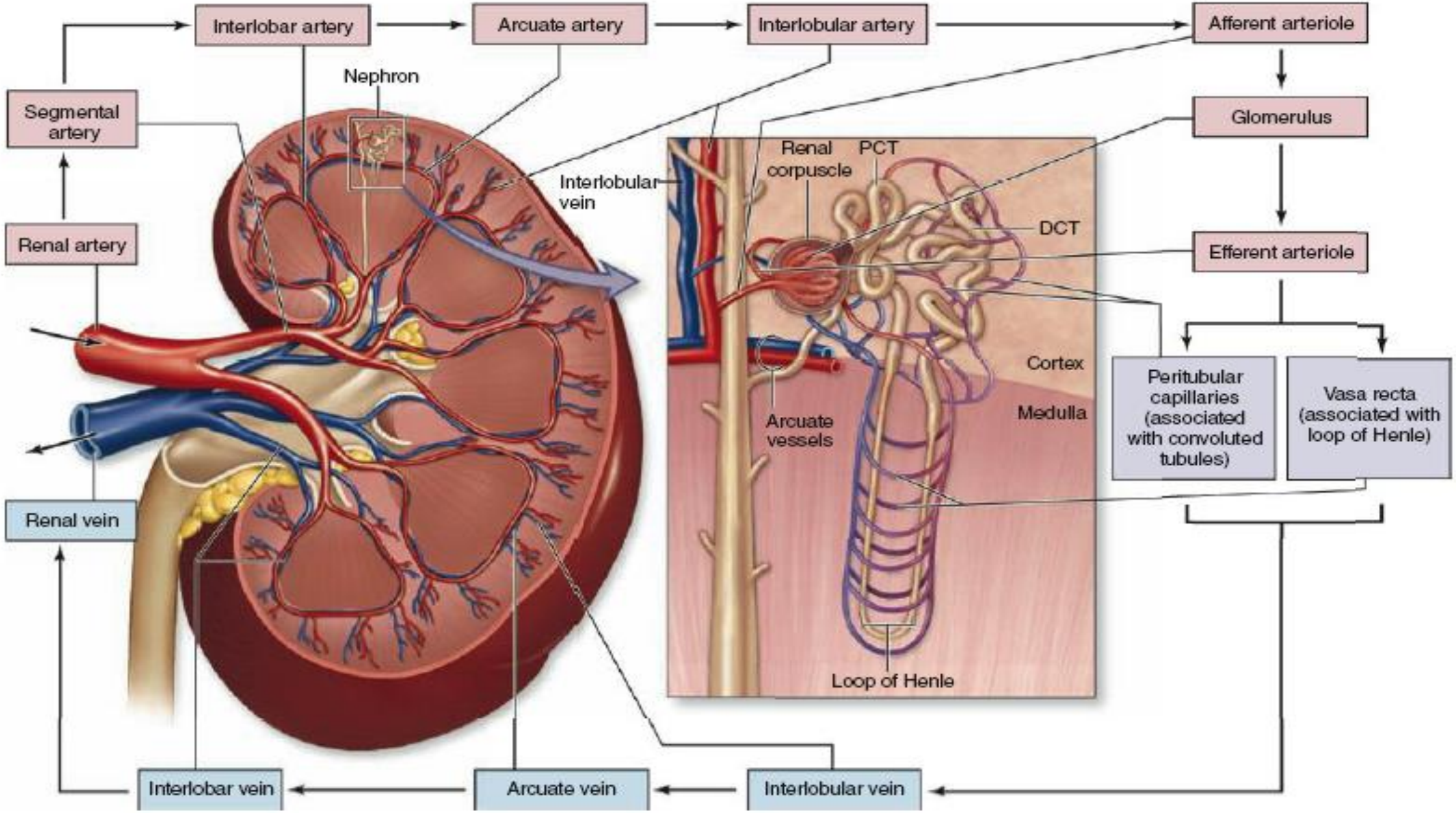
Interlobar arteries
run toward the cortex on each side of the renal pyramid

arcuate arteries
arch over the bases of the pyramids

interlobular arteries
ascend in the cortex

glomerular arterioles




Interlobar artery
Arcuate artery
Interlobular artery
Afferent arteriole
Nephron
Segmental artery
Glomerulus
Renal corpuscle
PCT
Interlobular vein
DCT
Renal artery
Efferent arteriole
Cortex
Medulla
Peritubular capillaries (associated with convoluted tubules)
Vasa recta (associated with loop of Henle)
Arcuate vessels
Renal vein
Loop of Henle
Interlobar vein
Arcuate vein
Interlobular vein

Venous drainage

* *Both* **right and left renal veins open directly into** IVC

- **Left renal vein is** longer than the right and passes anterior to the aorta below origin of the ***superior mesenteric artery***.
- **The-left vein receives** the left suprarenal and left gonadal veins vein.

Lymph drainage

To lateral aortic lymph nodes.

Nerve supply :-

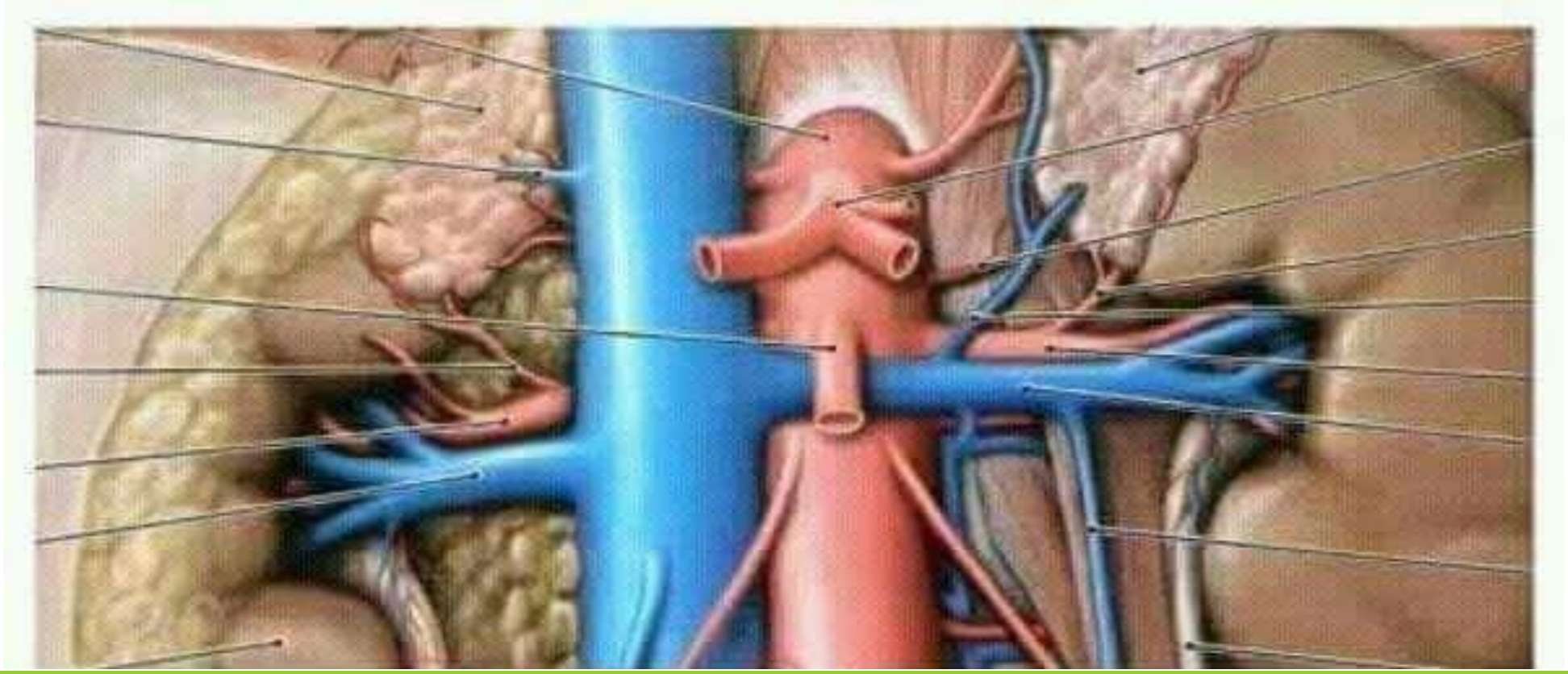
By renal plexus derived from the coeliac plexus and supplemented by the lowest splanchnic nerve. It is mainly vasomotor in function.

Renal Vein Entrapment Syndrome (Nutcracker syndrome)

Compression of left renal vein between the SMA anteriorly and the abdominal aorta posteriorly .

Clinical presentation

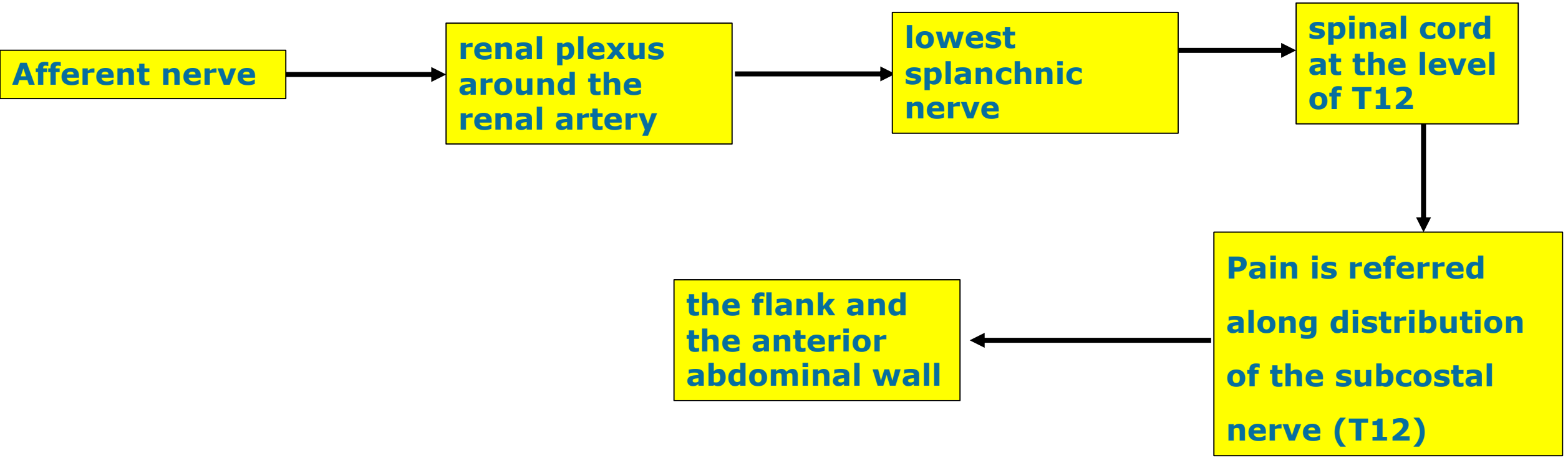
Haematuria due to renal venous hypertension, rupture of thin-walled veins into the collecting system



Renal Pain

Renal pain varies from a dull ache to a severe pain in the flank

Renal pain can result from stretching of the kidney capsule or spasm of the smooth muscle in the renal pelvis.



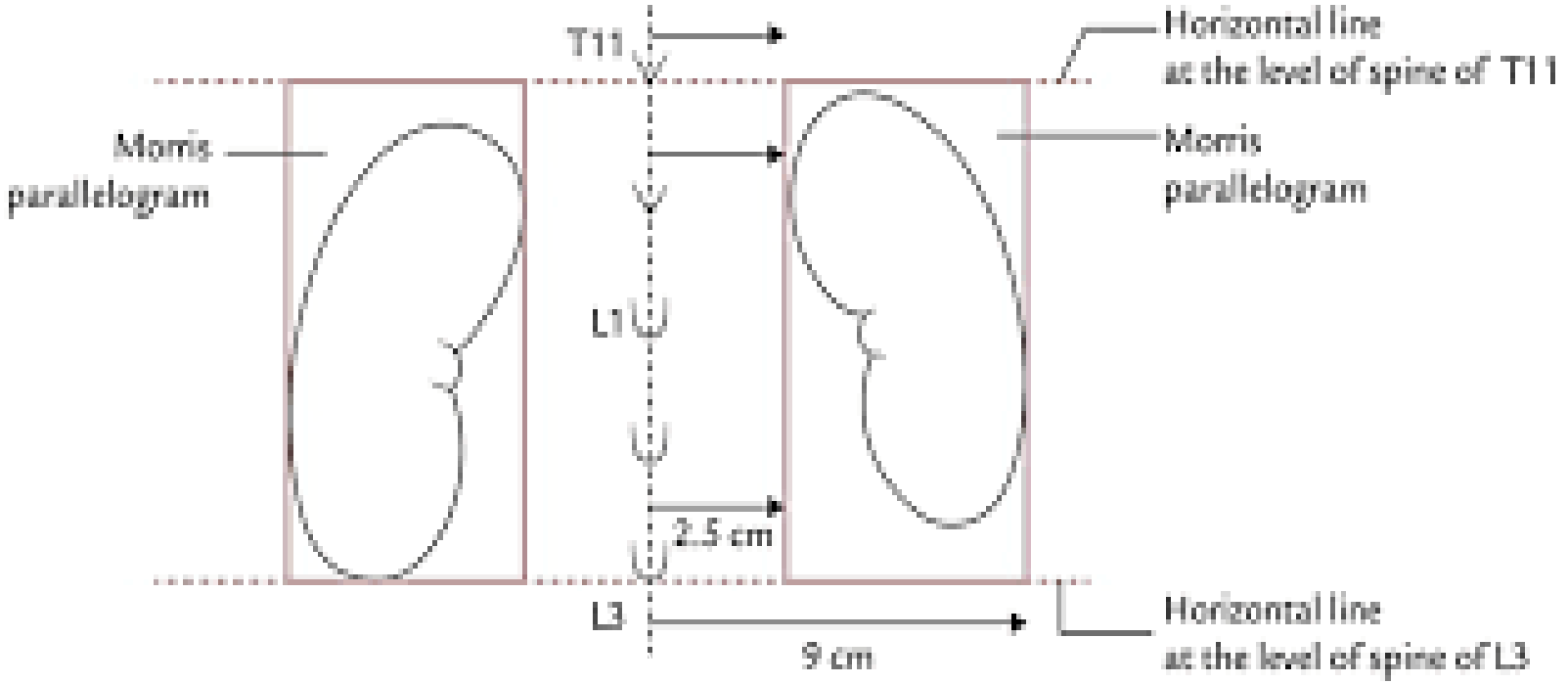
Surface anatomy of the Kidneys

Morris rectangle :

Two vertical lines are drawn; one and three inches from the middle line.

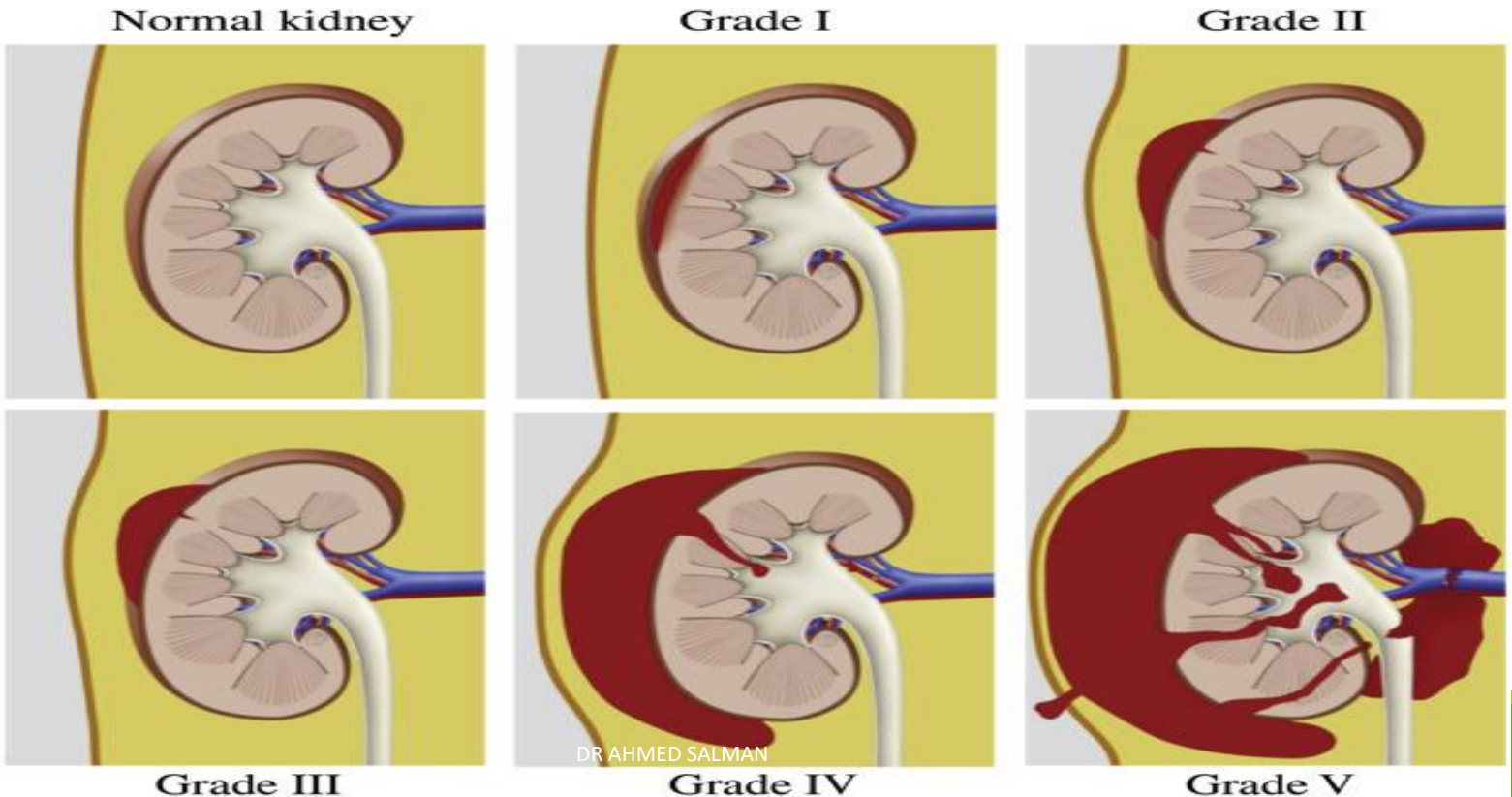
Two horizontal planes are drawn opposite the spines of T11 and L3 .

- *The upper end* lies **1 inch** from midline opposite upper end of **T12 vertebra**.
- *The hilum* is **2 inches** from midline at the **transpyloric plane (L1)**
- *The lower end* is **3 inches** from the midline opposite **L3 vertebra**



Kidney Trauma

- The kidneys are well protected by the lower ribs, the lumbar muscles, and the vertebral column.
- A severe blunt trauma to the abdomen may crush the kidney against the last rib and the vertebral column.
- Depending on the severity of the blow, the injury varies from a mild bruising to a complete laceration
- Because 25% of the cardiac outflow passes through the kidneys, renal injury can result in rapid blood loss



The ureters:

The ureters are muscular tubes which convey urine from kidneys to the urinary bladder.

The ureter lies behind and adheres to the parietal peritoneum of the posterior abdominal wall.

The ureter is about 10 inches (25 cm) and has 2 parts; abdominal and pelvic, each is 5 inches long.

RENAL CALCULI

* ↑Incidence in male over age 40.
* Nausea and vomiting
* Pain radiates in a flank area
* Hematuria
* Sharp, sudden, severe pain: may be intermitent depending on stone movement)

Diagnosis:
UA
Cystoscopy
IVP
Renal
Stone Analysis
KUB (X-ray)
Serum: Calcium
Oxalate
Uric acid

* Risk factors-etiology

Infection
unirary stasis
immobility
hyper calcemia
↑Uric Acid
↑Urinary oxalate level

Dr Ahmed Salman

Course of the ureter

The abdominal part

- Begins from the lower end of the renal pelvis (it is the pelvi-ureteric junction),
- It descends downwards and medially on psoas major muscle towards the pelvic brim.
- It crosses the *end* of the common or beginning of the external iliac artery to become the pelvic part.

The pelvic part

- Descends downwards and backwards along the anterior margin of greater sciatic foramen till the ischial spine. It forms posterior boundary of the ovarian fossa.
- It runs forwards on pelvic floor to open in the wall of the urinary bladder.
- It is crossed by the vas deferens in male and uterine artery in females.
- It pierces the wall of the bladder obliquely to open at the superolateral angle of the trigone.
- This oblique termination of the ureter prevents regurgitation of urine from bladder to the ureter

Relations of the abdominal part of ureter:-

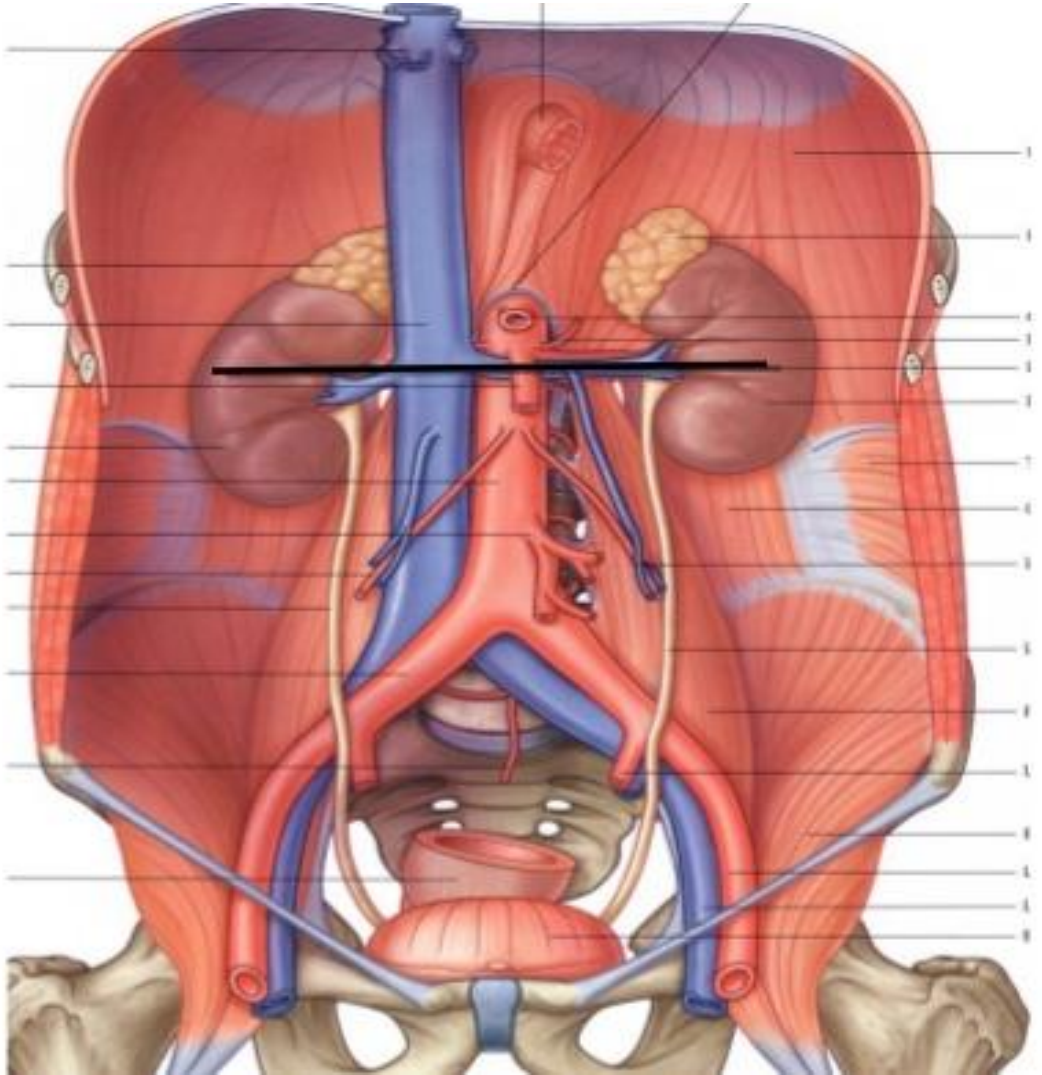
Posterior Relation (BOTH SIDES)

1.Psoas major muscle separating the ureter from the tips of the transverse processes of the lumbar vertebrae (2-5)

2.Genitofernoral nerve

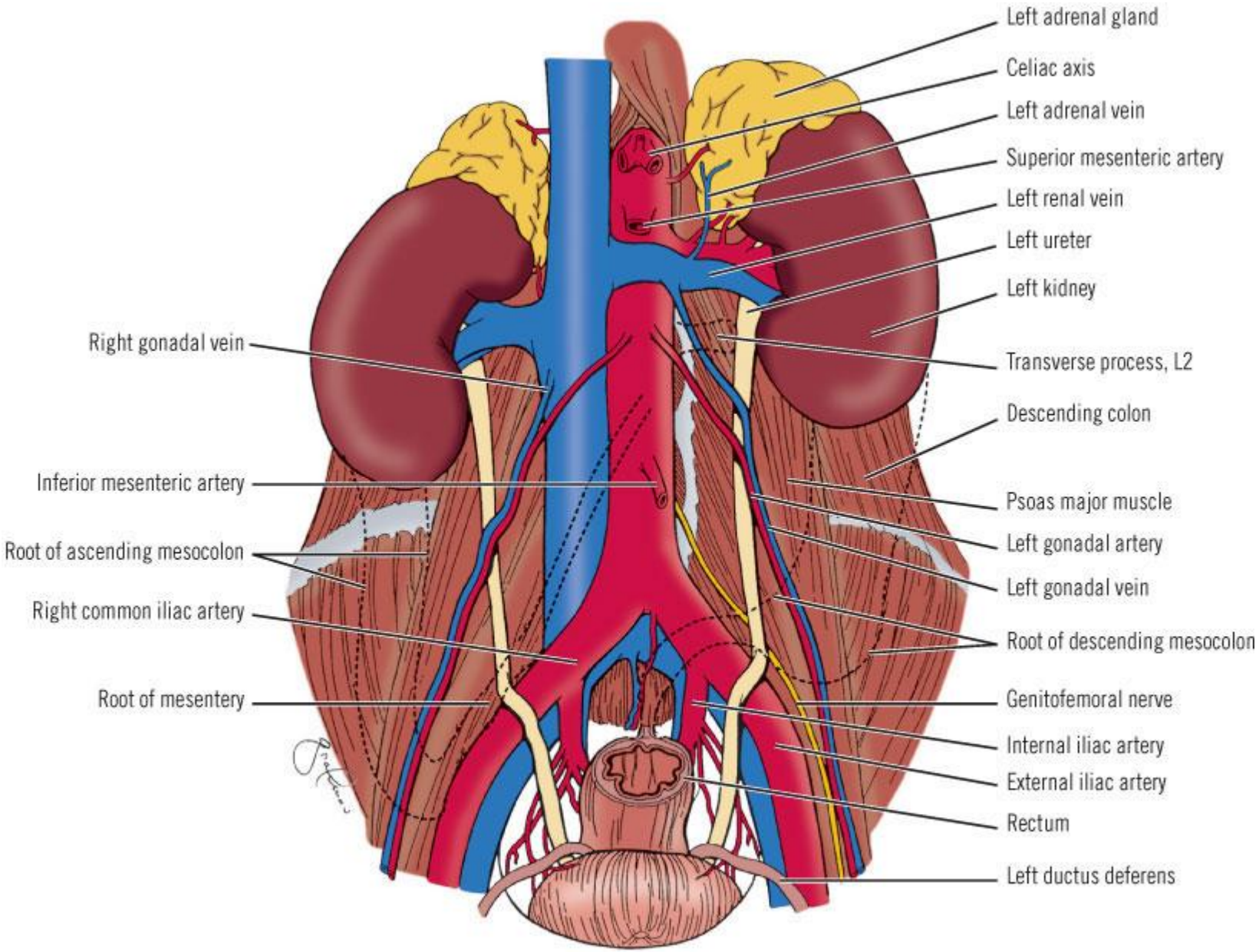
3.Termination of common or

beginning of external iliac artery



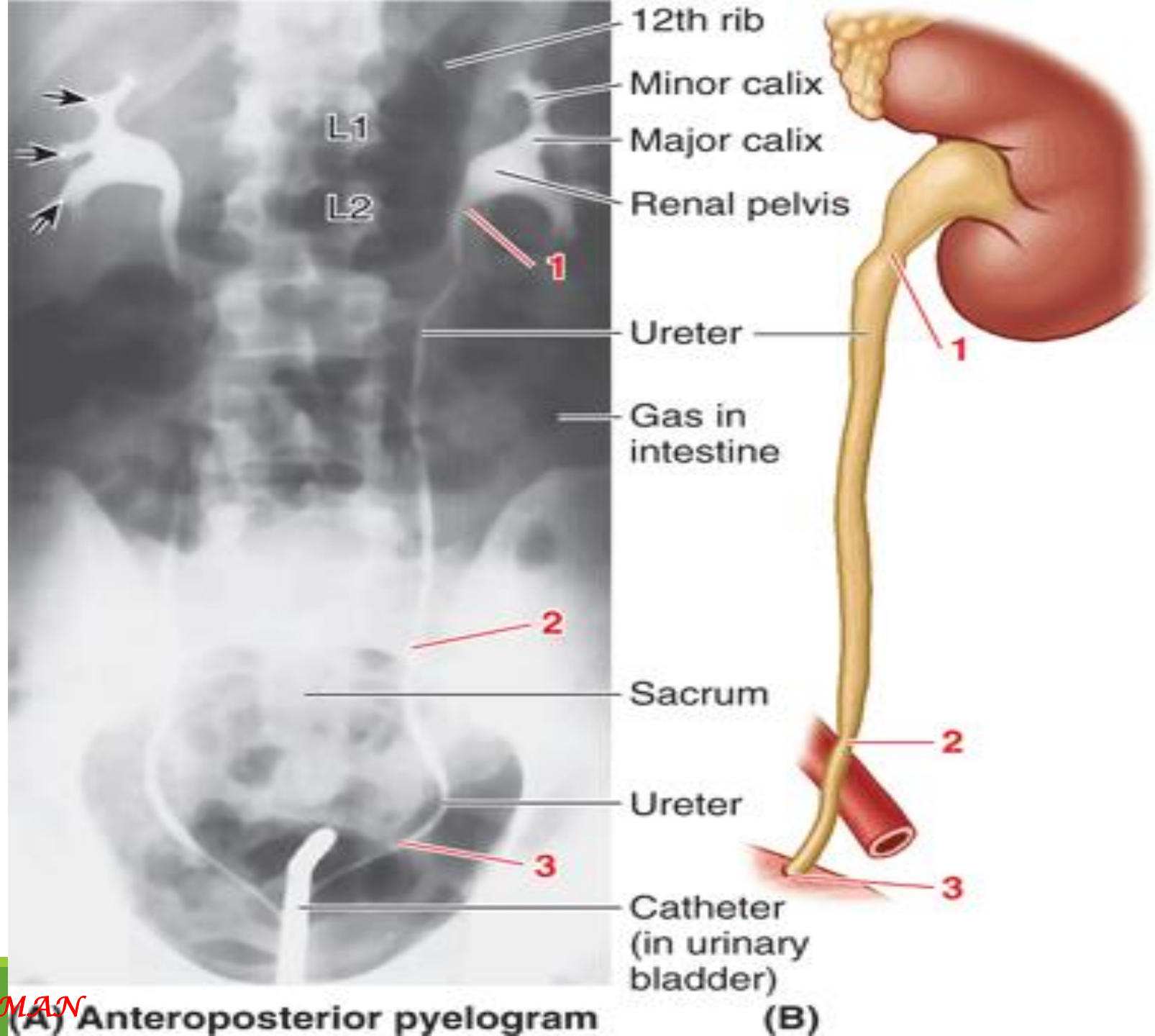
Anterior and medial relations

	Right ureter	Left ureter
Anterior relation ***Intestinal structures***	1. Third part of the duodenum at its beginning 2. Terminal ileum near the pelvic brim	1. Sigmoid colon near the pelvic brim
Peritoneal elements	1. Parietal peritoneum of the posterior abdominal wall 2. Root of the mesentery	1. Parietal peritoneum of the posterior abdominal wall 2. Apex of sigmoid mesocolon with its intersigmoid recess
vessels	1. Right gonadal vessels 2. Superior mesenteric vessels 3. Right colic vessels 4. Ilio-colic vessels	1. Left gonadal vessels 2. Left colic vessels 3. Sigmoid vessels
Medial relation	• ***Inferior*** vena cava	• ***Inferior*** mesenteric vein



Constrictions of the ureters

Site of constriction	Corresponding bony Level
At pelvi-ureteric junction	Near the tip of the transverse process of L2 vertebra
At pelvic brim	In front of sacroiliac joint.
In the wall of the urinary bladder (it is the *narrowest point* of the whole ureter)	Just medial to the ischial spine.


12th rib
Minor calix
Major calix
Renal pelvis
L1
L2
1
Ureter
Gas in intestine
2
Sacrum
Ureter
3
Catheter (in urinary bladder)
1
2
3
(A) Anteroposterior pyelogram
(B)

Arterial blood supply :-

- Abdominal part receives branches from renal artery, abdominal aorta, gonadal and common iliac arteries
- Pelvic part receives branches from vesical, middle rectal and uterine arteries

Lymph drainage:-

To lateral aortic, common iliac lymph nodes.

Nerve supply :-

- ✓ The ureter receives sympathetic fibers from T11 – L2 segments of spinal cord.
- ✓ Sensory fibers from the ureter enter the spinal cord through the same segments.
- ✓ Ureteric colic begins in the loin and is referred to groin, Anterior aspect of the thigh through genitofemoral nerve (L1,L2) and scrotum or labium majora

Surface markings :-

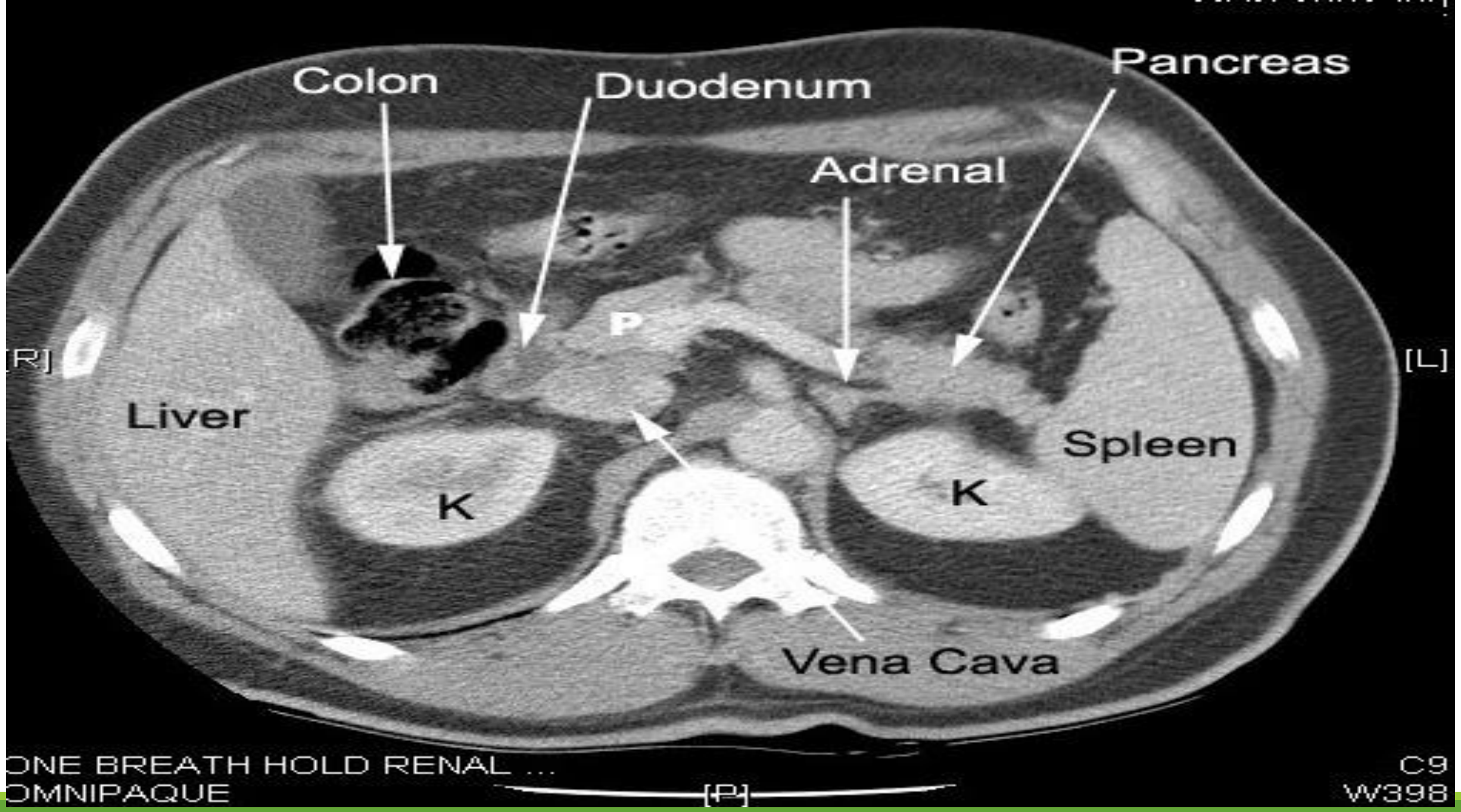
The ureter begins at a point on the transpyloric plane, 5 cm from the midline

It enters the bladder at the pubic tubercle.

Intra Venous Urogram
IVU

IVU

KUB


Colon
Duodenum
Pancreas
Adrenal
P
[R]
[L]
Liver
K
K
Spleen
Vena Cava
ONE BREATH HOLD RENAL ...
OMNIPAQUE
[P]
C9
W398

Urinary Bladder

The urinary bladder is a hollow viscus with strong muscular walls which acts as a reservoir for urine.

Site of Urinary Bladder

In infants: the bladder lies in the abdomen

At about 6 years of age : the bladder begins to enter the enlarging pelvis.

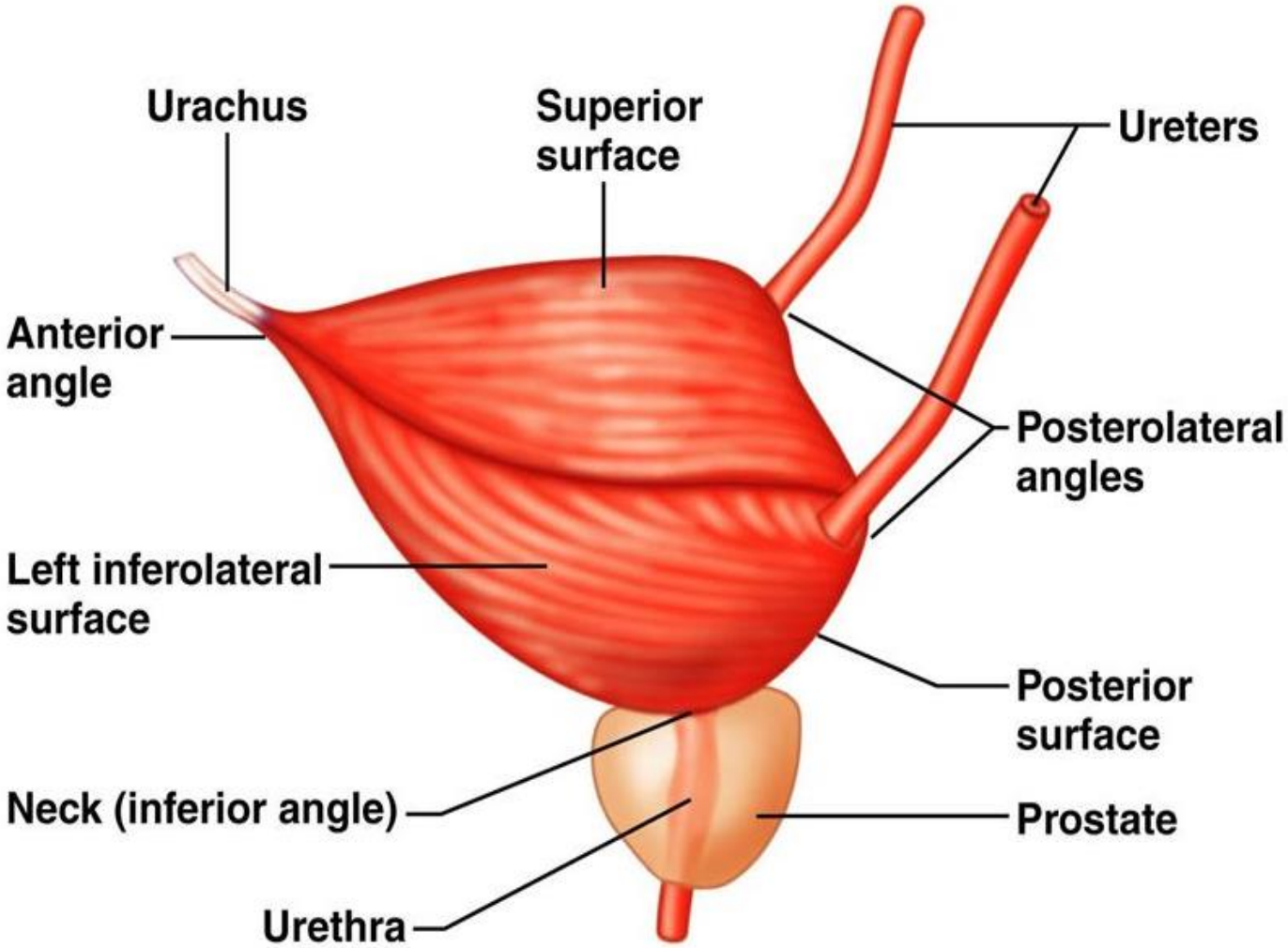
After puberty : the bladder lies within the lesser pelvis .

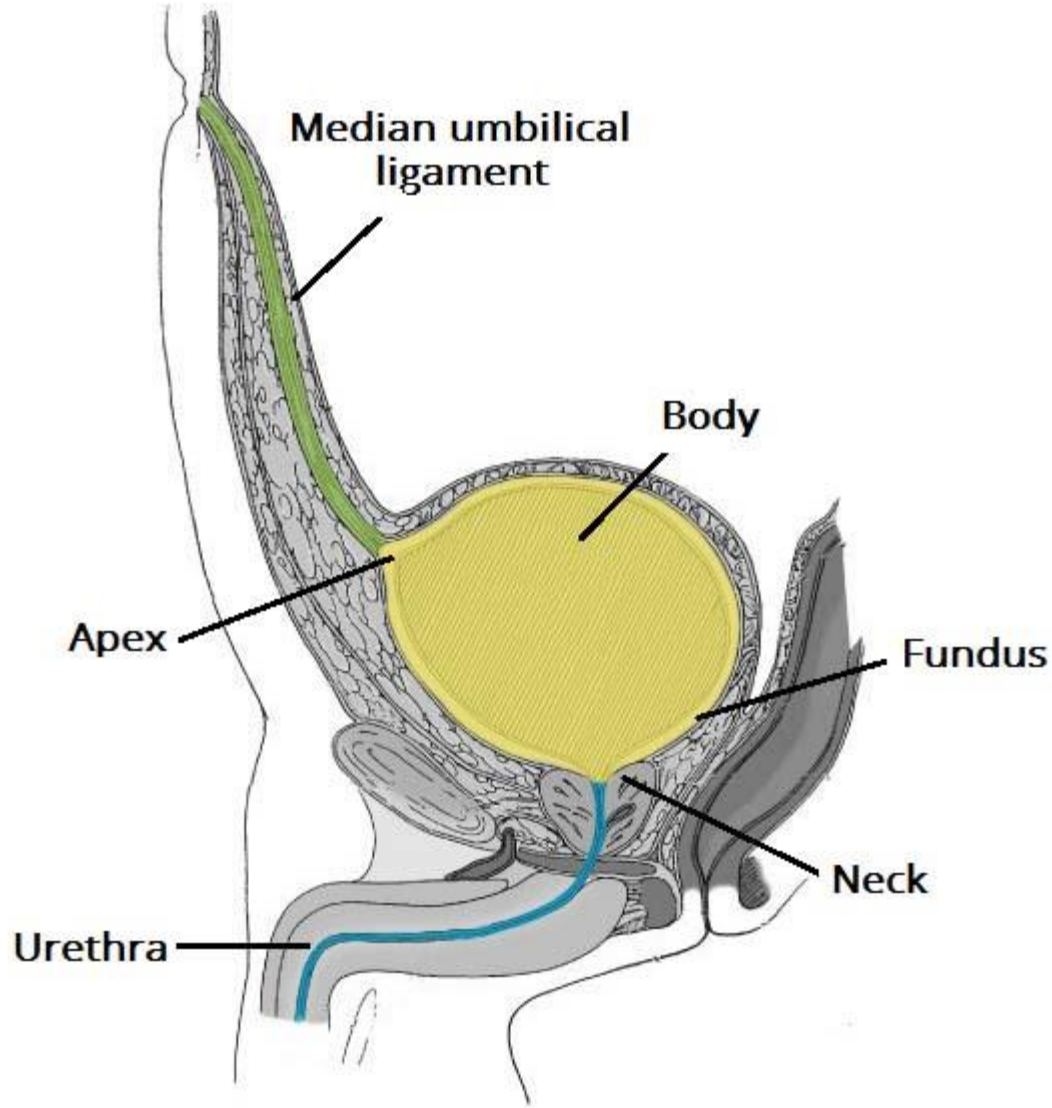
In the adult: an empty bladder lies in lesser pelvis and as it fills, it ascends to the greater pelvis.

Capacity of the Bladder:

- Average capacity of adult bladder is about 300 ml.
- Distension of the bladder by 500 ml may be tolerated. Beyond this, distension of the bladder is painful

The bladder is enveloped in loose connective tissue called vesical fascia in which vesical venous plexus is embedded.


Urachus
Superior surface
Ureters
Anterior angle
Posterolateral angles
Left inferolateral surface
Posterior surface
Neck (inferior angle)
Prostate
Urethra


Median umbilical ligament
Body
Apex
Fundus
Neck
Urethra

Description and Relations of the Urinary Bladder :

• The empty bladder has; Apex, base, 3 surfaces (superior, right and left inferolateral) and neck .

1- Apex of the bladder:

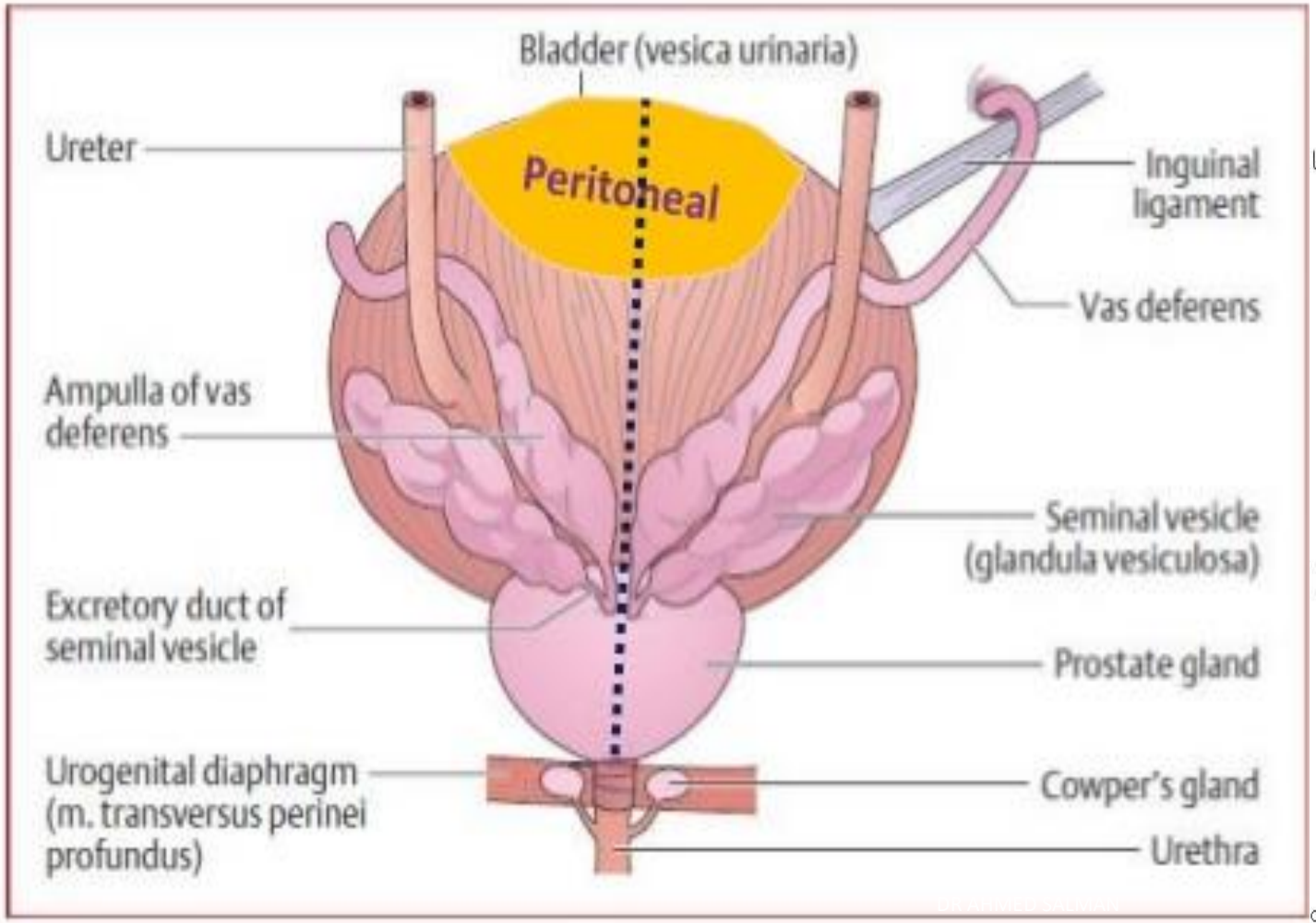
- Is continuous with the median umbilical ligament which raises the median-umbilical fold of peritoneum.
- The ligament is the remnant of the embryonic urachus.

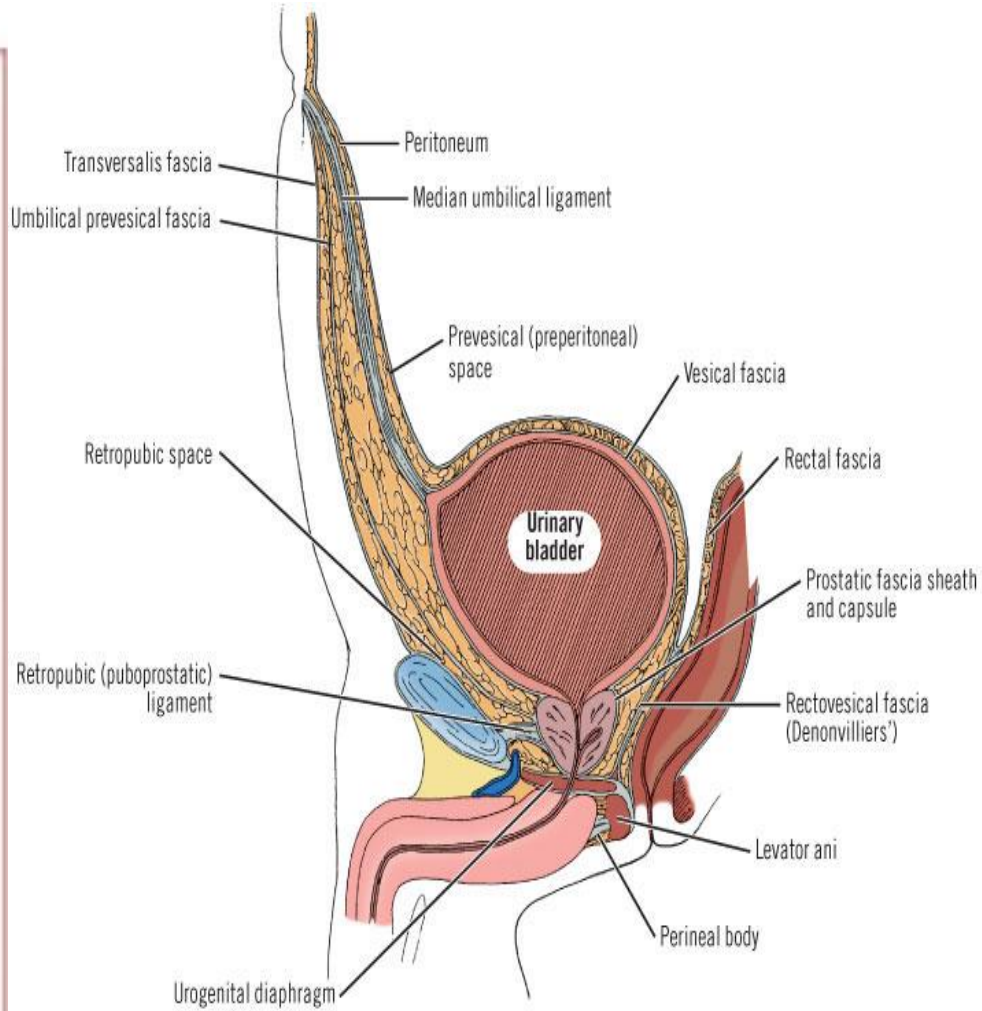
2- Base of the bladder (fundus) :

- It is directed posteroinferiorly
- Its superolateral angles receive the ureters
- Relations :

Male	female
• Base is related to **rectum**, but separated from it by ▪ Rectovesical pouch ▪ 2 seminal vesicles ▪ Ampullae of the deferent ducts.	The base is related to upper part of anterior wall of **vagina.**

Base of Bladder in male





3-Superior Surface:

is covered by peritoneum and is related to

Male	female
❖ Sigmoid colon, ❖ Loops if ileum	❖ Vesical surface of uterus. ❖ Supravaginal part of cervix with uterovesical pouch in between

4-Inferolateral surface:

It is ***not*** covered by peritoneum.It is related to:

- ✓ Body of pubis with retropubic pad of fat in the retropubic space of Retzius.
- ✓ Levator ani.
- ✓ Obturator internus.

5-Neck of the bladder:

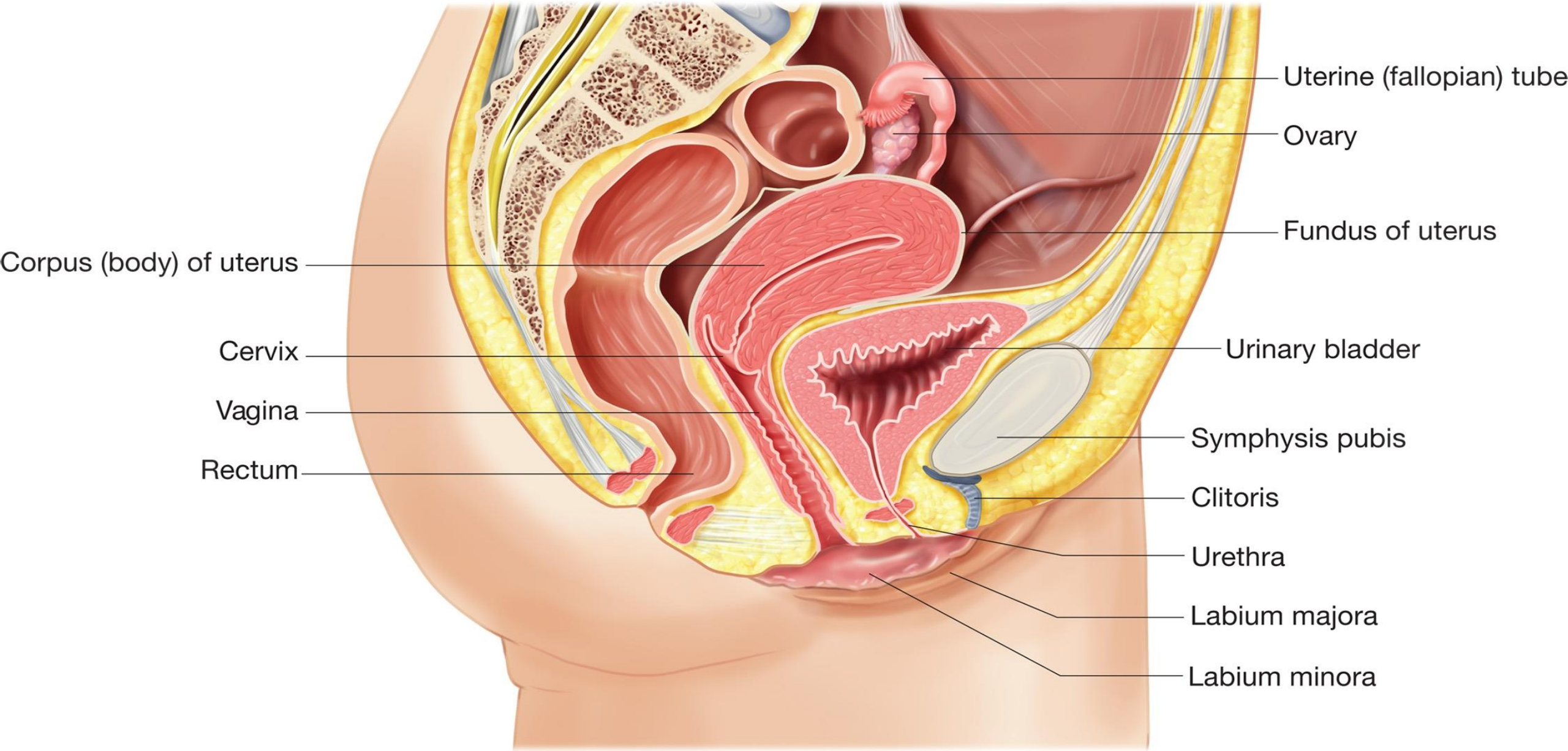
It is the lowest and most fixed pan of the bladder.

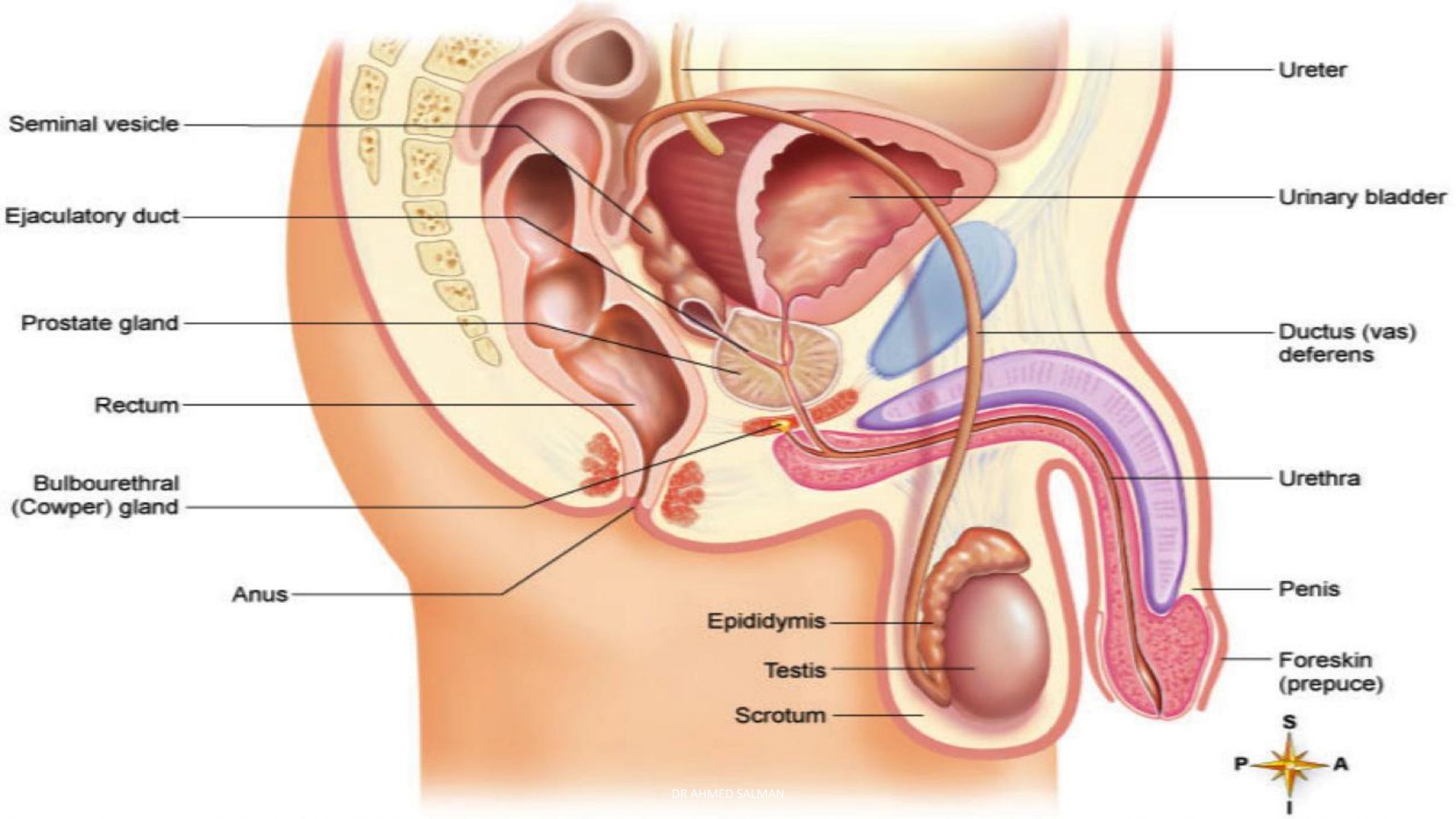
- In the **male**: it is continuous with the urethra at the internal ureteral meatus and rests on the upper surface of the prostate.
- In **female**: it is continuous with the urethra and rests in the pelvic fascia which surrounds the urethra.

At the junction of the neck and urethra, sphincter vesicae is present.

Muscular coat of the bladder

is composed of smooth muscle and is arranged as three layers known as the detrusor muscle.


Uterine (fallopian) tube
Ovary
Fundus of uterus
Corpus (body) of uterus
Cervix
Urinary bladder
Vagina
Symphysis pubis
Rectum
Clitoris
Urethra
Labium majora
Labium minora



Peritoneal Covering of the Bladder :

- In **male,** the superior surface and the superior part of its base is covered by peritoneum,
- In **females,** only the superior surface is covered by peritoneum.

The peritoneum leaving the bladder is loosely attached to the suprapubic part of abdominal wall.

The distended bladder lifts this peritoneum from the abdominal wall.

➡ In case of suprapubic cystostomy instruments could be introduced into the distended bladder to avoid injury of the peritoneum

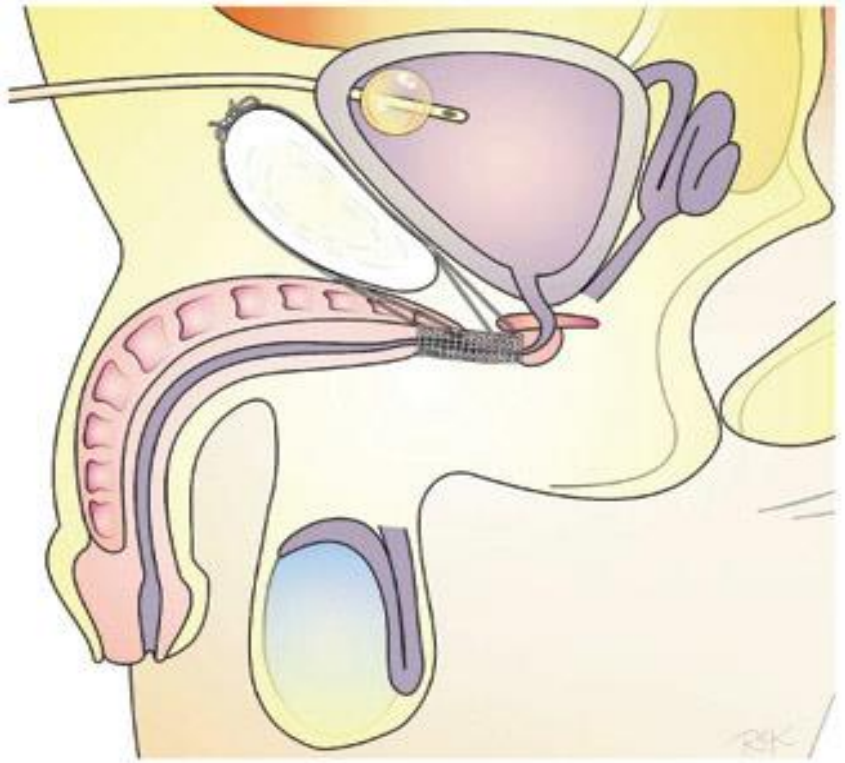
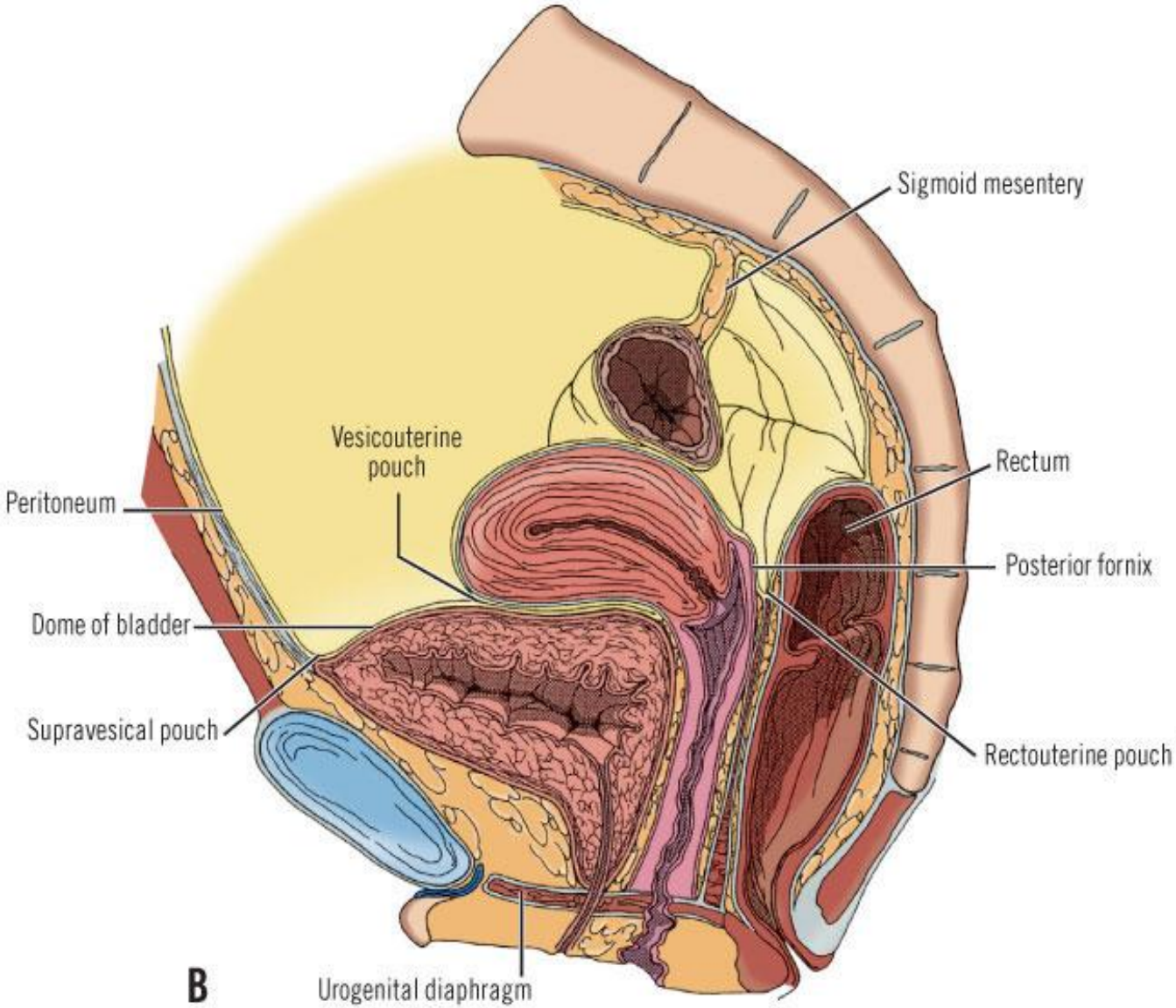
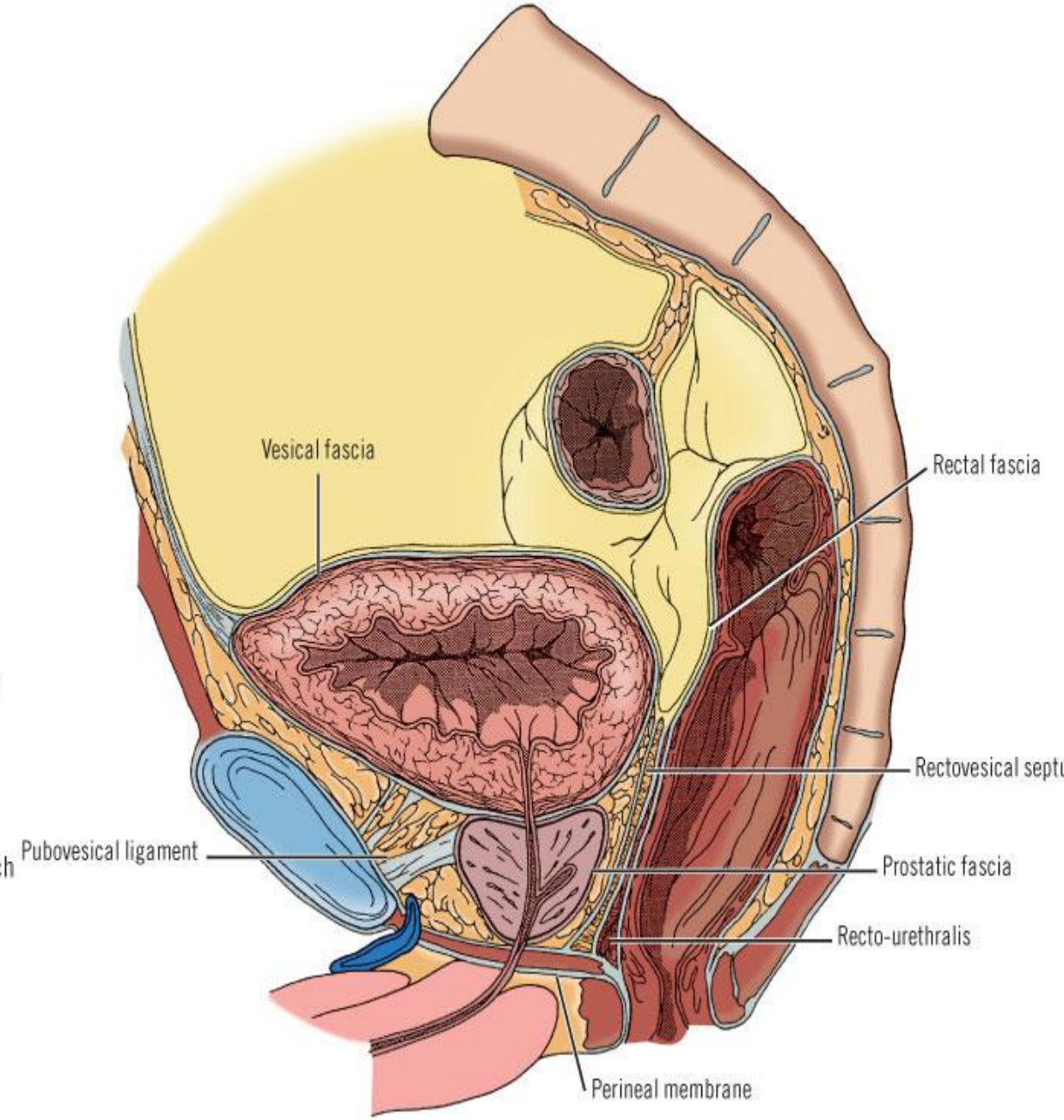


***Figure 3** – Schematic drawing of a schematic sagital section showing how the sutures are passed and fixed anteriorly and posteriorly to the pubis*





The ligaments of the bladder:

1-Median umbilical ligament:

Continuous with apex of the bladder (it is the embryonic urachus)

2-Puboprostatic and pubovesical ligaments:

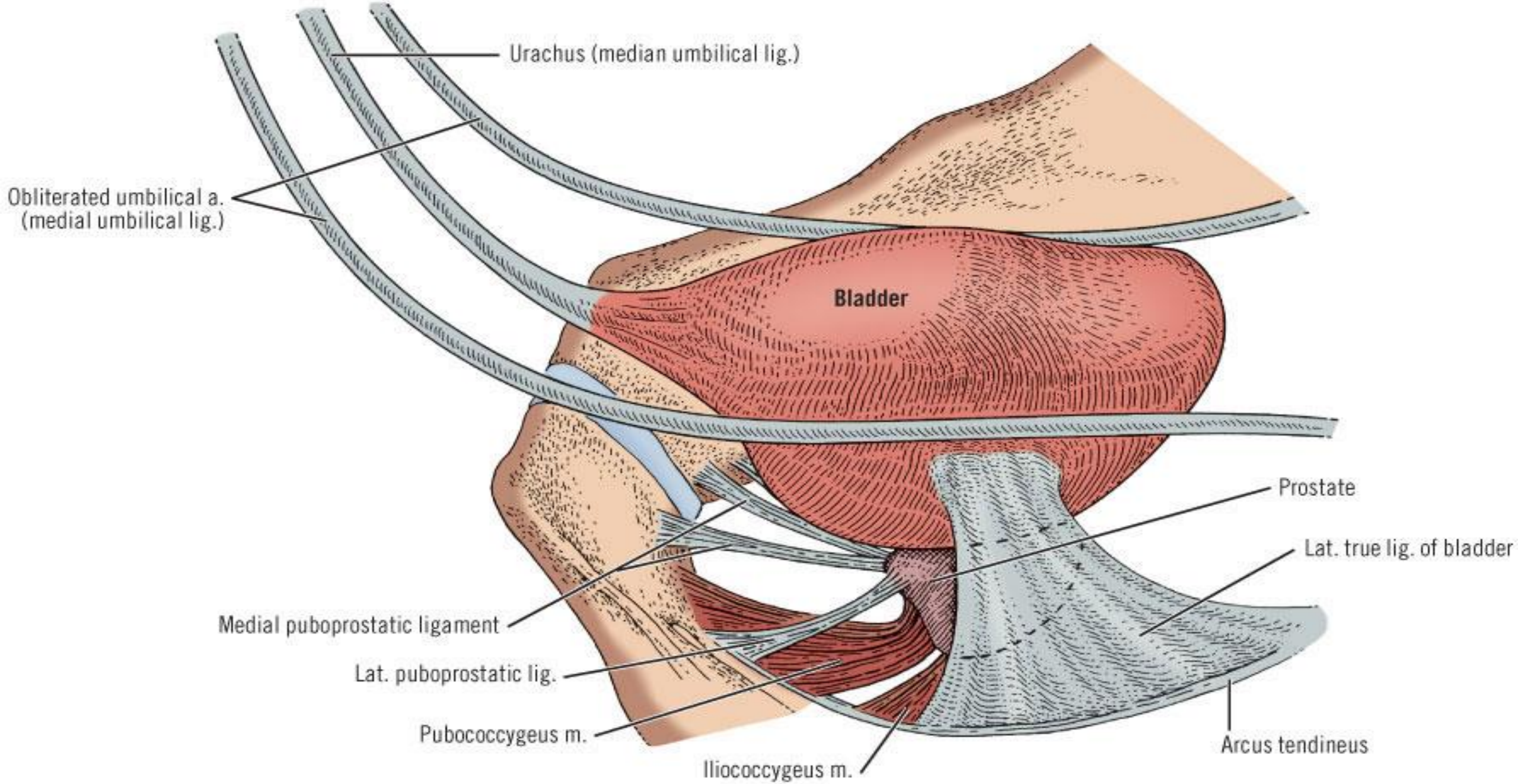
- In the **male,** the puboprostatic ligaments extend from back of the bodies of pubic bones to the anterior surface of the sheath of the prostate and neck of the bladder.
- In the **female**, the pubovesical ligaments extend from pubic bones to the urethra and neck of the bladder.

3-Lateral ligaments of the bladder:

- Each extends laterally from the side of the base of the bladder across the pelvic floor to the tendinous arch in side wall of the pelvis.
- These ligaments enclose arteries and autonomic nerves of the bladder.

4-Posterior ligaments:

- Each extends backwards from the base of the bladder to the corresponding internal iliac vein.
- They enclose vesical veins in their way to the internal iliac vein.



Interior of the Urinary Bladder :

- The mucous membrane over most of the bladder is loosely attached to the underlying muscular layer (detrusor muscle).
- The mucous membrane is folded in empty bladder, but in distended bladder, the folds disappear.

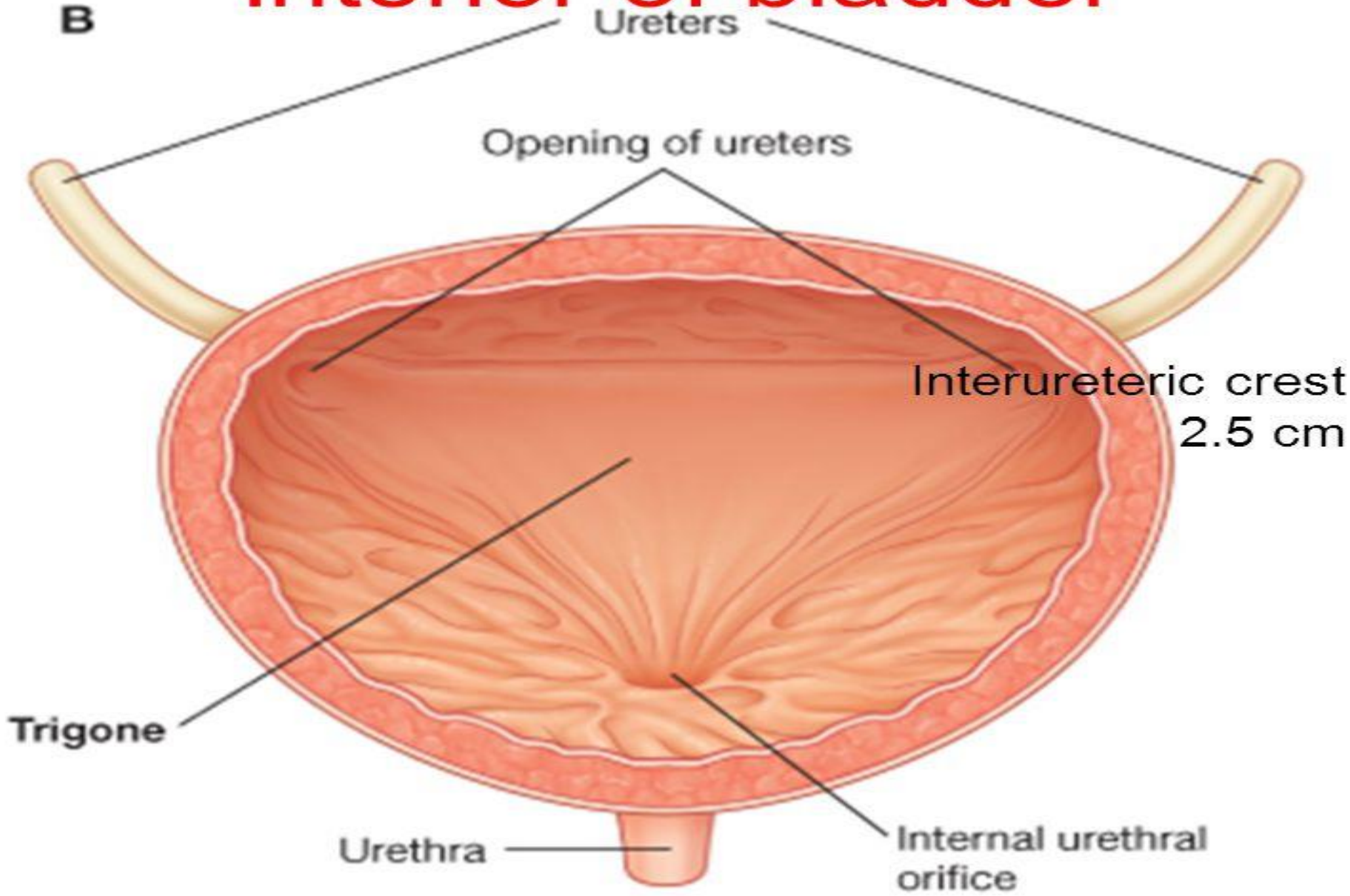
Trigone of the bladder:

It is the small triangular area which lies between the orifices of the ureters and the internal urethral meatus. (it is mesodermal in origin).

It has the following special features:

- Its superior boundary is formed by the interureteric crest (ridge) which connects the two ureteric orifices.
- Its mucous membrane is always smooth and firmly adherent to the underlying muscle. It is very sensitive and vascular, so that, in cystoscope it appears red violet in colour
- In the male, the trigone overlies the median lobe of the prostate.
- After the middle age, the enlarged prostate elevates the mucous membrane behind the internal urethral orifice producing what is known as uvula vesicae of the bladder

Interior of bladder



Arterial Blood Supply:

In the **male**: superior and inferior vesical arteries.

In the **female**: superior vesical and vaginal arteries.

Venous Drainage:

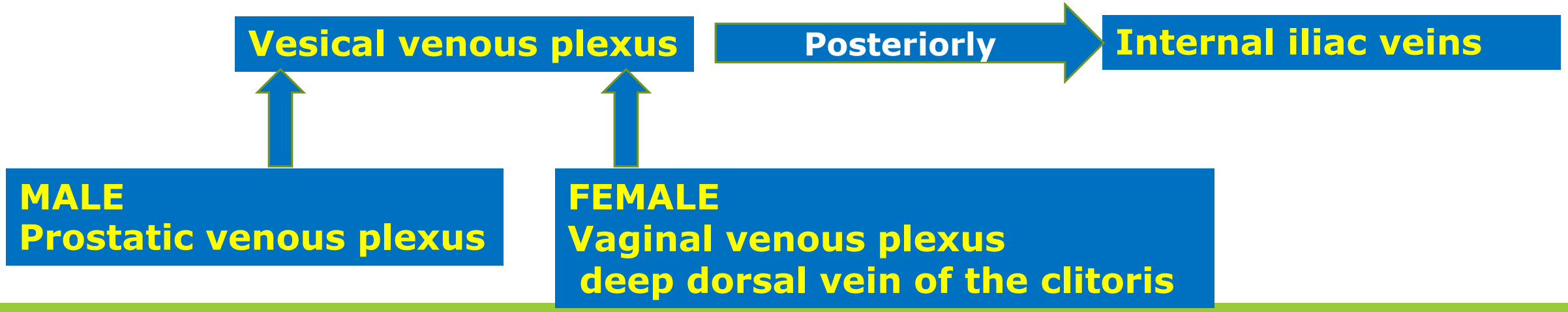
Begins by the vesical venous plexus, embedded in the visceral fascia on the inferolateral surfaces of the bladder.

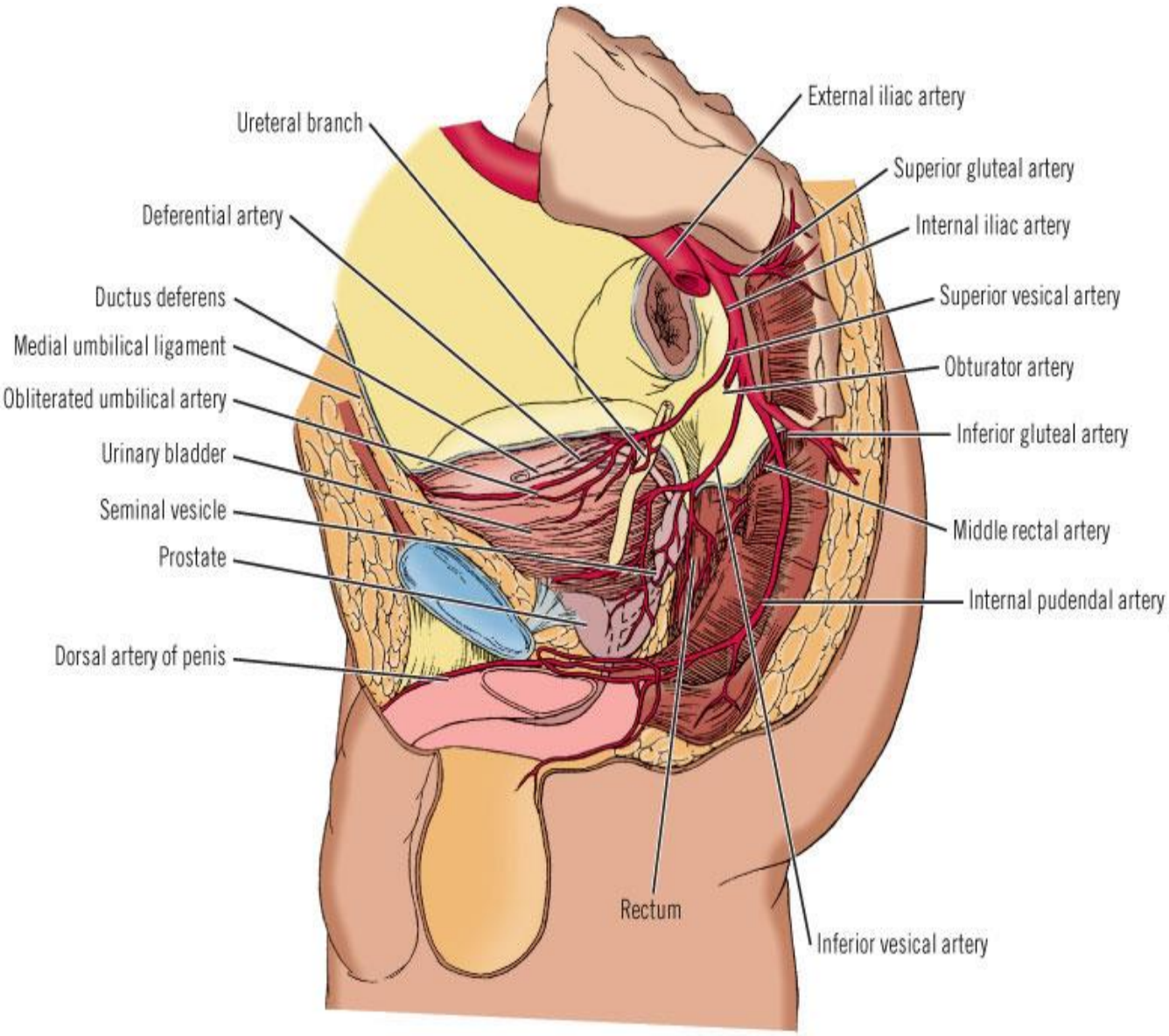
Inferiorly:

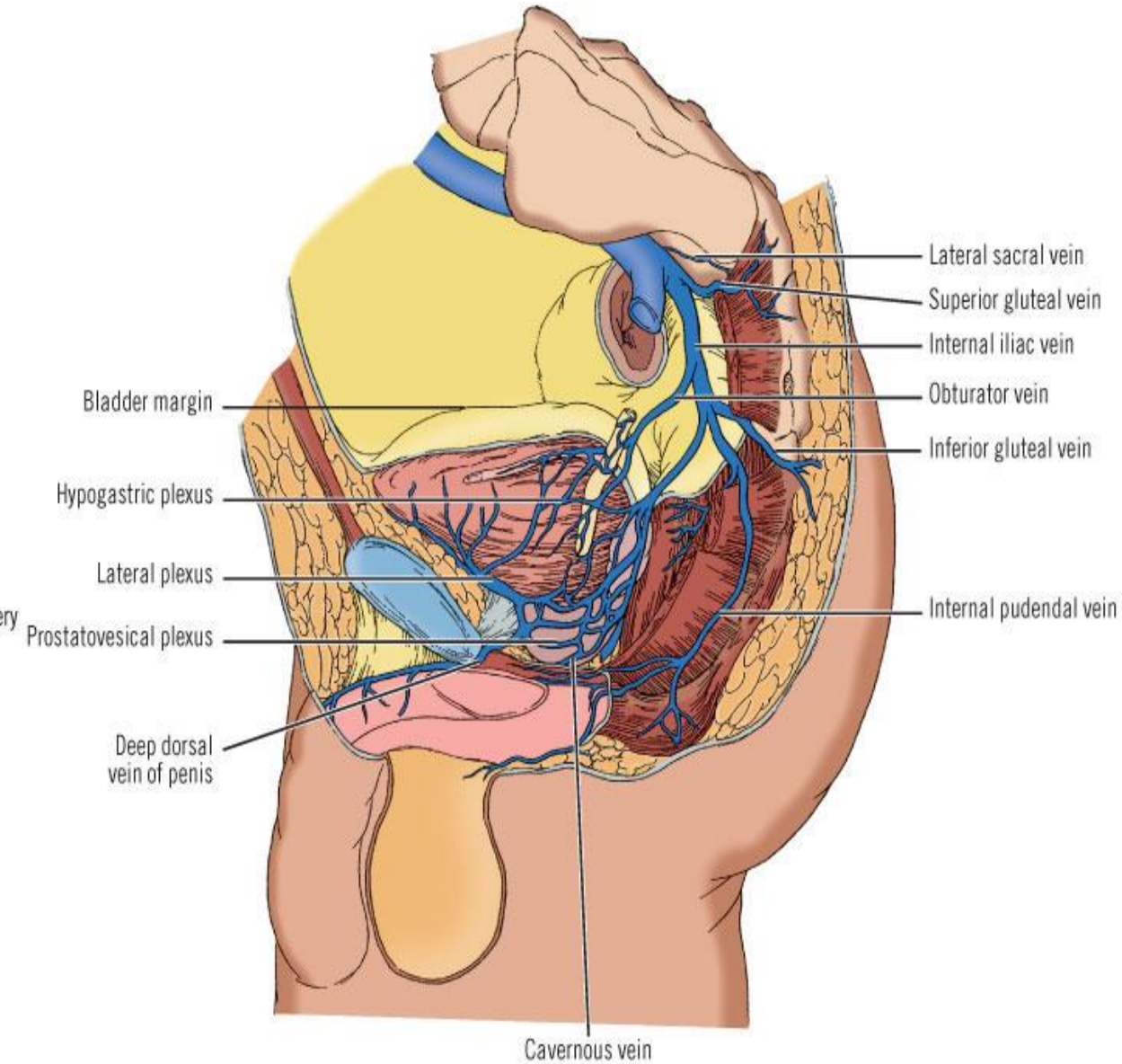
In the **male:** it communicates with the prostatic venous plexus.

In the **female:** it communicates with the vaginal venous plexus and receives the deep dorsal vein of the clitoris.

Posteriorly: the plexus is drained by numerous vesical veins which run in the posterior ligaments of the bladder to end in the internal iliac veins.







Lymphatic Drainage:

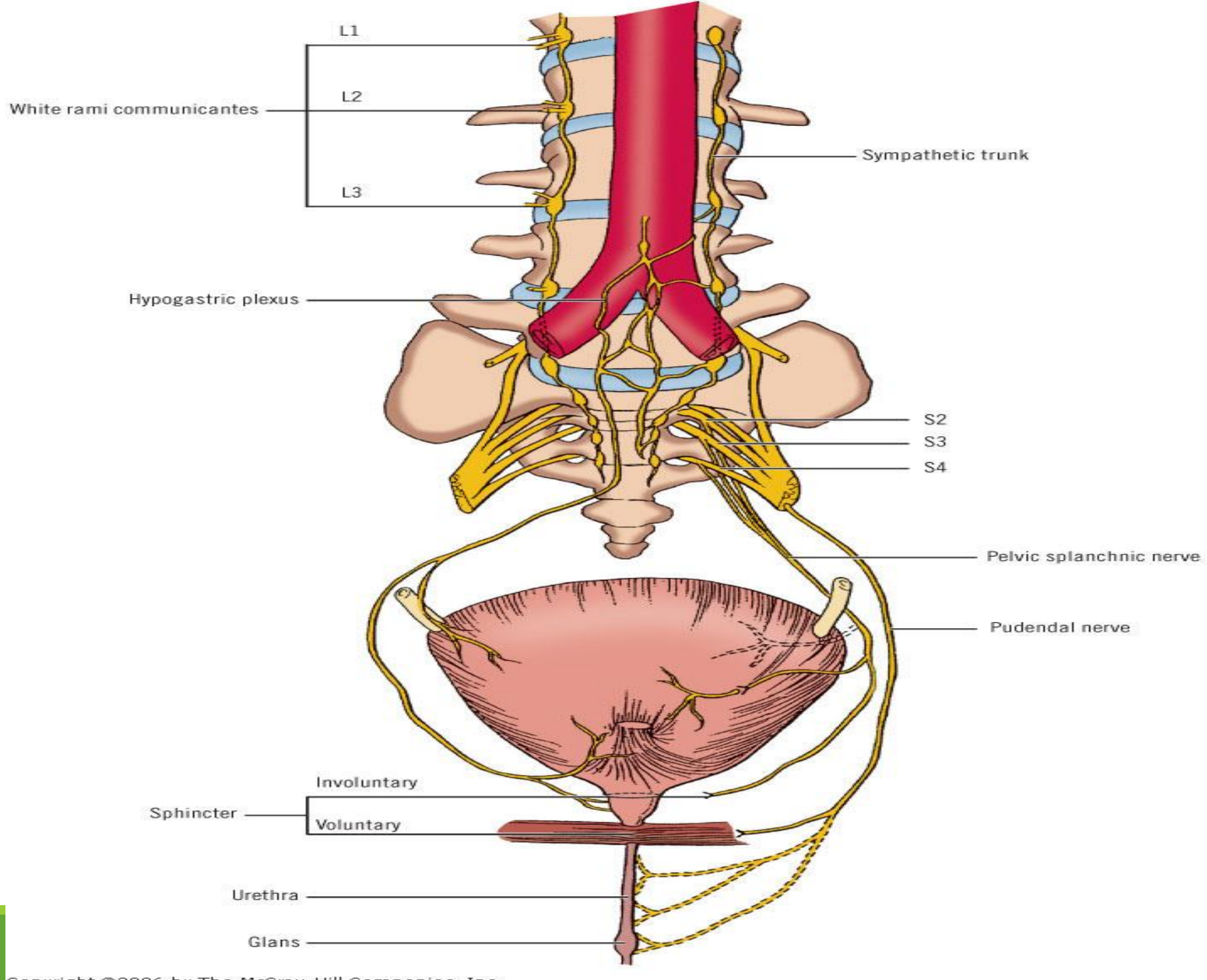
- To internal and external iliac lymph nodes.
- From the bladder neck, lymphatics drain directly to the sacral lymph nodes.

Nerve Supply:

- By vesical nerve plexus, derived from the **inferior hypogastric plexus**, it contains t following fibers :
  - **Parasympathetic efferents** (pelvic splanchnic nerves) (S_2, S_3, S_4): motor to the detrusor muscle, inhibitory to sphincter vesicae (they produce micturition).
  - **Sympathetic efferents**: (L1 ,L2) are inhibitory to detrusor and stimulant to sphincter vesicae .
  - **Sensory afferents:** Reach central nervous system through pelvic splanchnic nerves or Sympathetic fibers

    It record bladder distension and pain sensation.

Nerve Supply:



Bladder Injuries

Intraperitoneally	Extraperitoneally
Usually involves the superior wall of the bladder	Usually involves the anterior part of the bladder wall below the level of the peritoneal reflection
Most commonly when the bladder is full	it most commonly occurs in fractures of the pelvis
Urine and blood escape freely into the peritoneal cavity	The patient complains of lower abdominal pain and blood in the urine (hematuria)

Urethra:

Male Urethra

- The male urethra is about 20 cm long.
- It extends between 2 meatuses.
  - ***Internal urethral meatus*:** at its junction with the neck of the bladder
  - **External urethral meatus:**is a vertical slit, about 6 mm long.
    It is the narrowest part of urethra, and a calculus may lodge there.

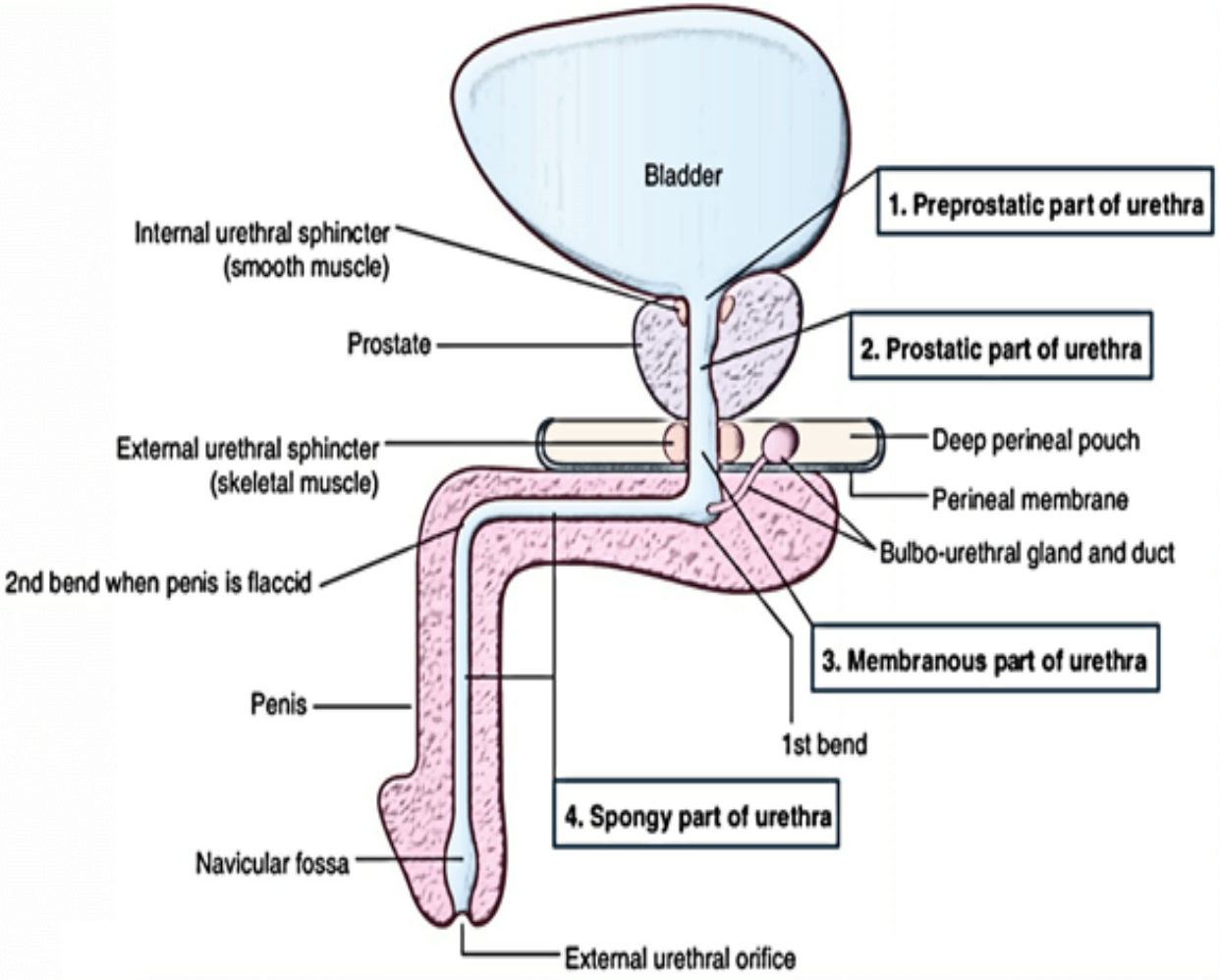
- It is divided into 4 parts: the first and the second parts are in the pelvis, the third and fourth parts are in the perineum .

- It has 2 sphincters:
  Internal urethral sphincter (or sphincter vesicae), surrounds the neck of urinary bladder and the ***first*** (preprostatic) part of the urethra.

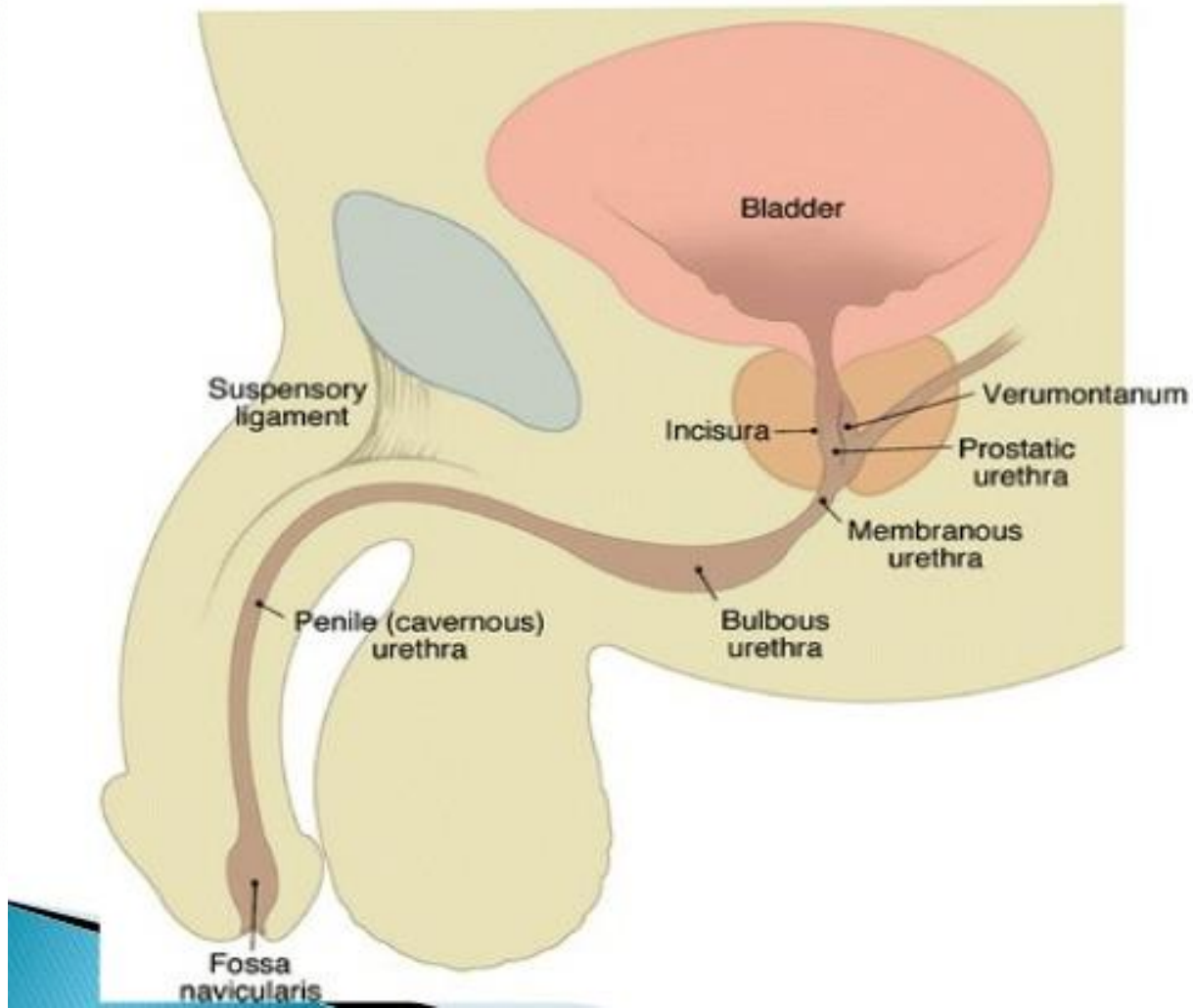
  External urethral sphincter (or sphincter urethrae), surrounds the ***third*** (membranous) part of the urethra

Parts of the Urethra

	First part: preprostatic part of urethra	**Second part:** prostatic part of urethra	**Third part :** membranous part of urethra	**Fourth : spongy** part of urethra
Length	1-15 cm	3 cm	2 cm	15 cm
Site	between neck of the bladder and the base of the prostate	traverses prostate from base to apex	runs in deep perineal pouch	bulb of penis and corpus spongiosum(Superficial Perineal Pouch)
Size		it is the widest part of urethra	it is the least dilatable part	
Special features	It is surrounded by internal sphincter	Urethral crest Seminal colliculus Prostatic sinuses	surrounded by external urethral sphincter	-Dilated at its beginning to form to form **intrabutbar fossa** and at termination in glans penis to form the **navicular fossa.** -The bulbourethral glands open into its beginning



Men



DR AHMED SALMAN

Special features of prostatic part of urethra

Urethral crest:

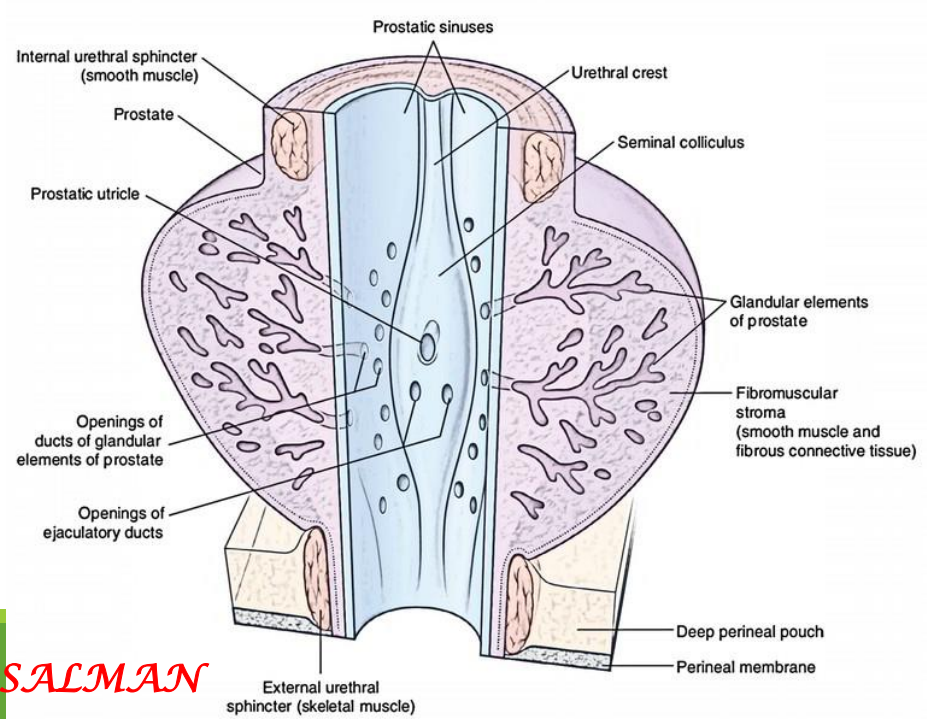
is a median longitudinal elevation in the mucous membrane of its posterior wall.

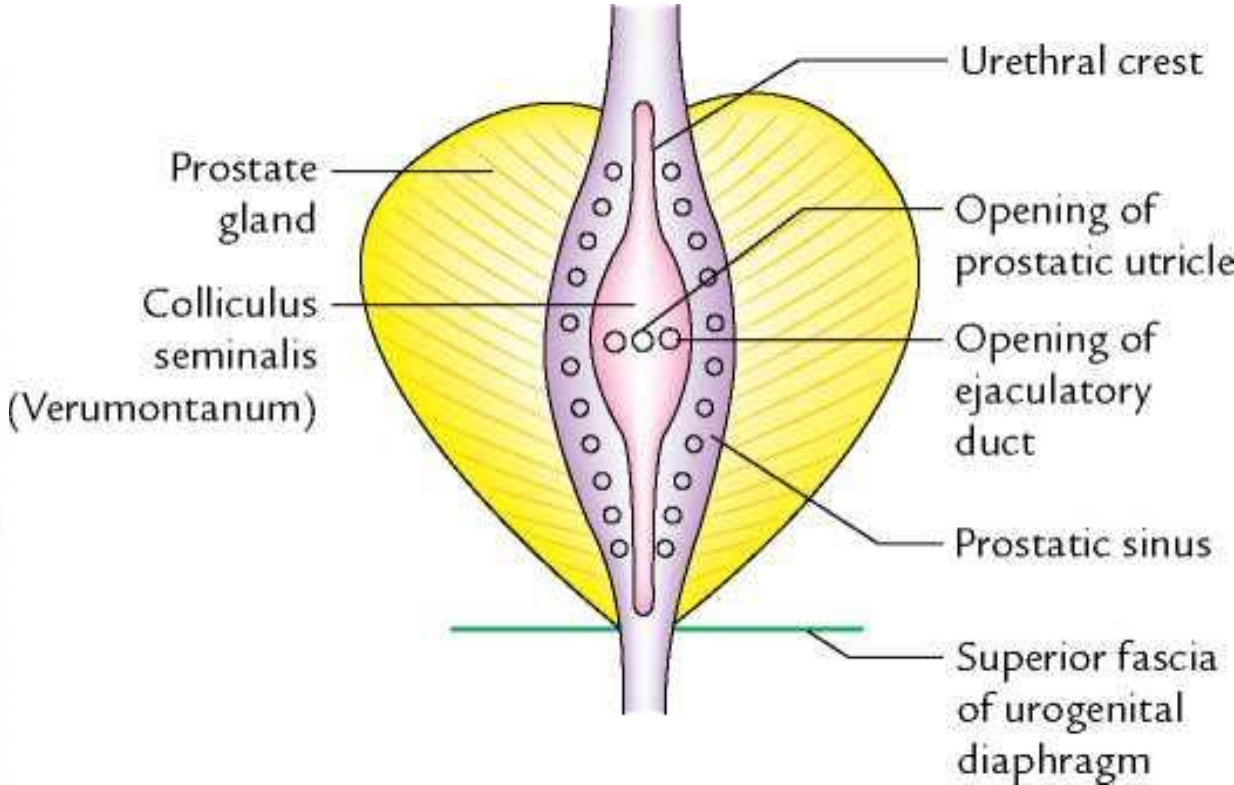
Seminal colliculus (verumontanum):

- ✓ Is a prominence at the middle of the crest.
- ✓ It has three openings ; the opening of the prostatic utricle in its middle, and the openings of the two ejaculatory ducts on the sides.

Prostatic sinuses :

- ✓ Each is a shallow depression on the side of the urethral crest.
- ✓ Each receives 15-20 prostatic ducts.

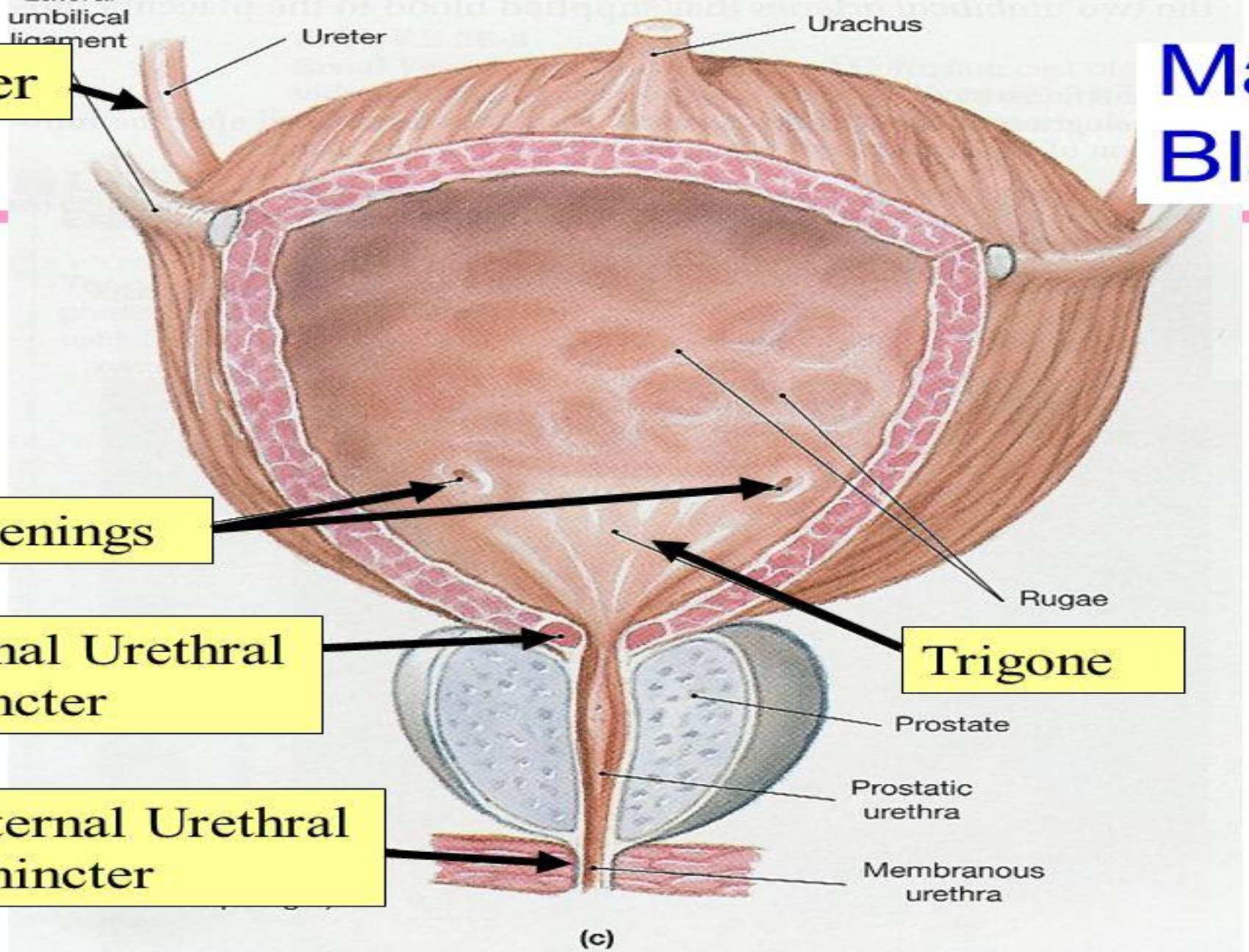




Sphincters of the Urethra

	Internal Urethral sphincter	External Urethral sphincter
Site	It lies in pelvis around neck of the bladder and preprostatic part of the urethra.	It lies in the perineum, surrounds the membranous urethra in the deep perineal pouch.
Structures	It is formed of smooth muscle fibers	It is formed of striated muscle fibers
Nerve Supply	Autonomic fibers from the inferior hypogastric plexus	Somatic : from the perineal branch of pudendal nerve of the sacral plexus
Functions	❖ It acts Involuntarily. ❖ It is well-developed in both male and female. ❖ It maintains continence of urine. **In the male**: it has a genital function, it prevents reflux of semen into the urinary bladder during ejaculation	❖ It acts voluntarily. ❖ It is well-developed in the male ❖ It maintains continence of urine.

Male Bladder



Vessels Nerves and Lymphatics of the urethra :

Urethra receives its blood and nerve supply from those of prostate and penis.

Lymphatics:

From the prostatic and membranous parts to internal and external iliac lymph nodes

From the spongy part to deep and superficial inguinal lymph nodes.

→ **Urinary Retention**

It is more common in **male** due to a benign or malignant enlargement of the prostate or acute urethritis or prostatitis .

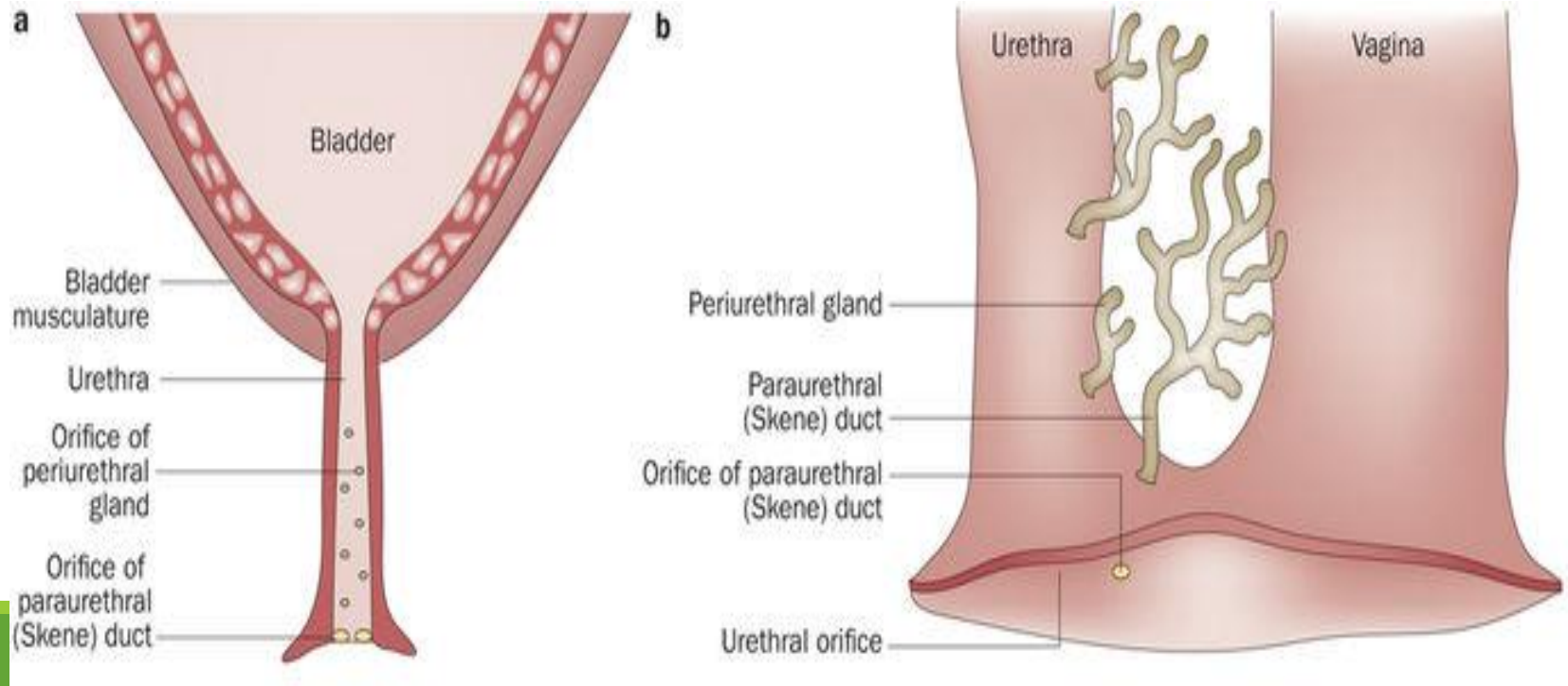
The only anatomic cause of urinary retention in **females** is acute inflammation around the urethra (e.g., from herpes).

Female Urethra :

length : 4 cm.

Course. Relations:

- It begins at the internal urethral meatus at the neck of the bladder.
- It traverses the deep perineal pouch to end at the external urethral orifice in the vestibule anterior to the vaginal orifice.
- It is embedded in the anterior wall of the vagina.
- On each side of the urethra, the mucous membrane of the urethra presents a number of small mucous glands called the paraurethral glands which correspond to the prostate in the male.



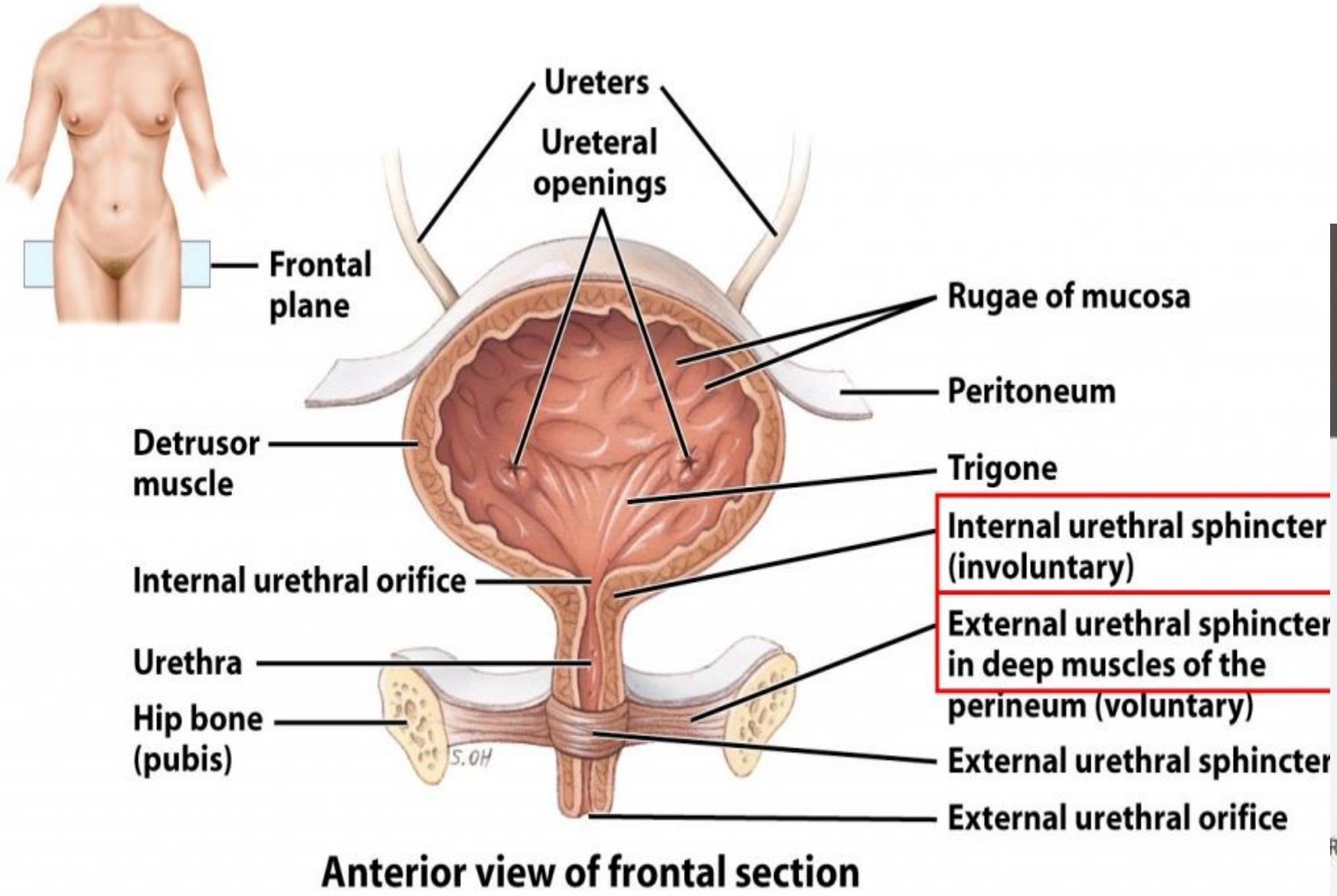


Figure 26-21 Principles of Anatomy and Physiology, 11/e

FEMALE URETHRA

Clinically Significant Differences Between Male and Female Urethrae:

- The female urethra is distensible because it contains considerable elastic tissue, as well as smooth muscle.
- It can be easily dilated without injury.
- Infections of the urethra, and bladder, are more common in women because the female urethra is short, more distensible, and is open to the exterior.

Anatomy of the Procedure of Catheterization

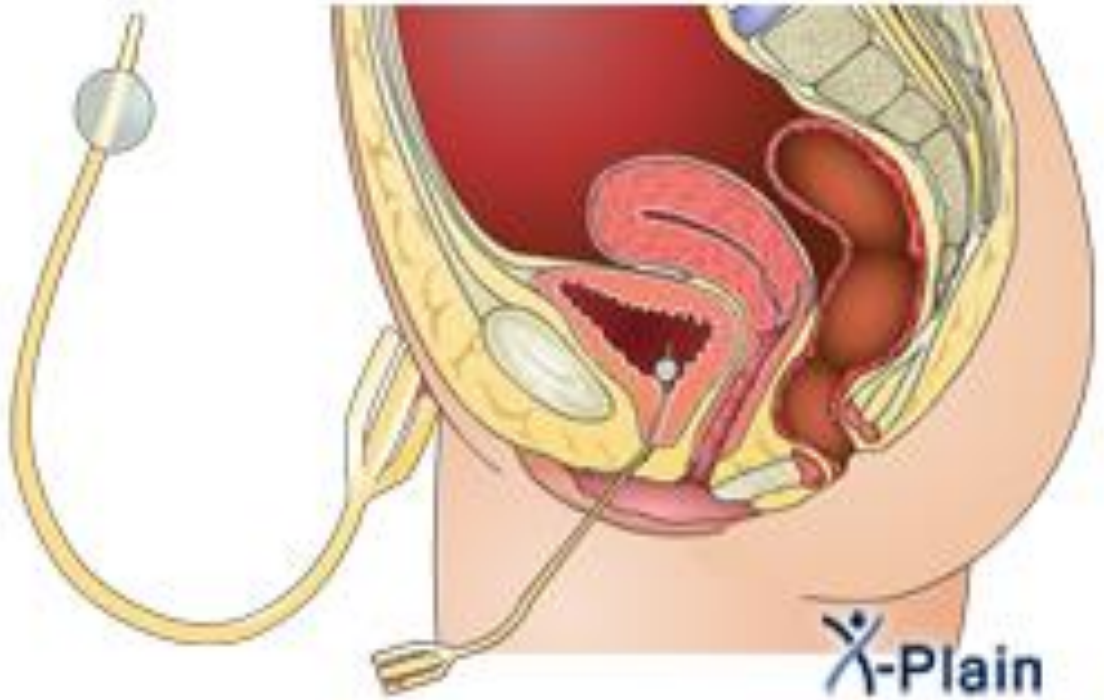
1. The patient lies in a supine position.

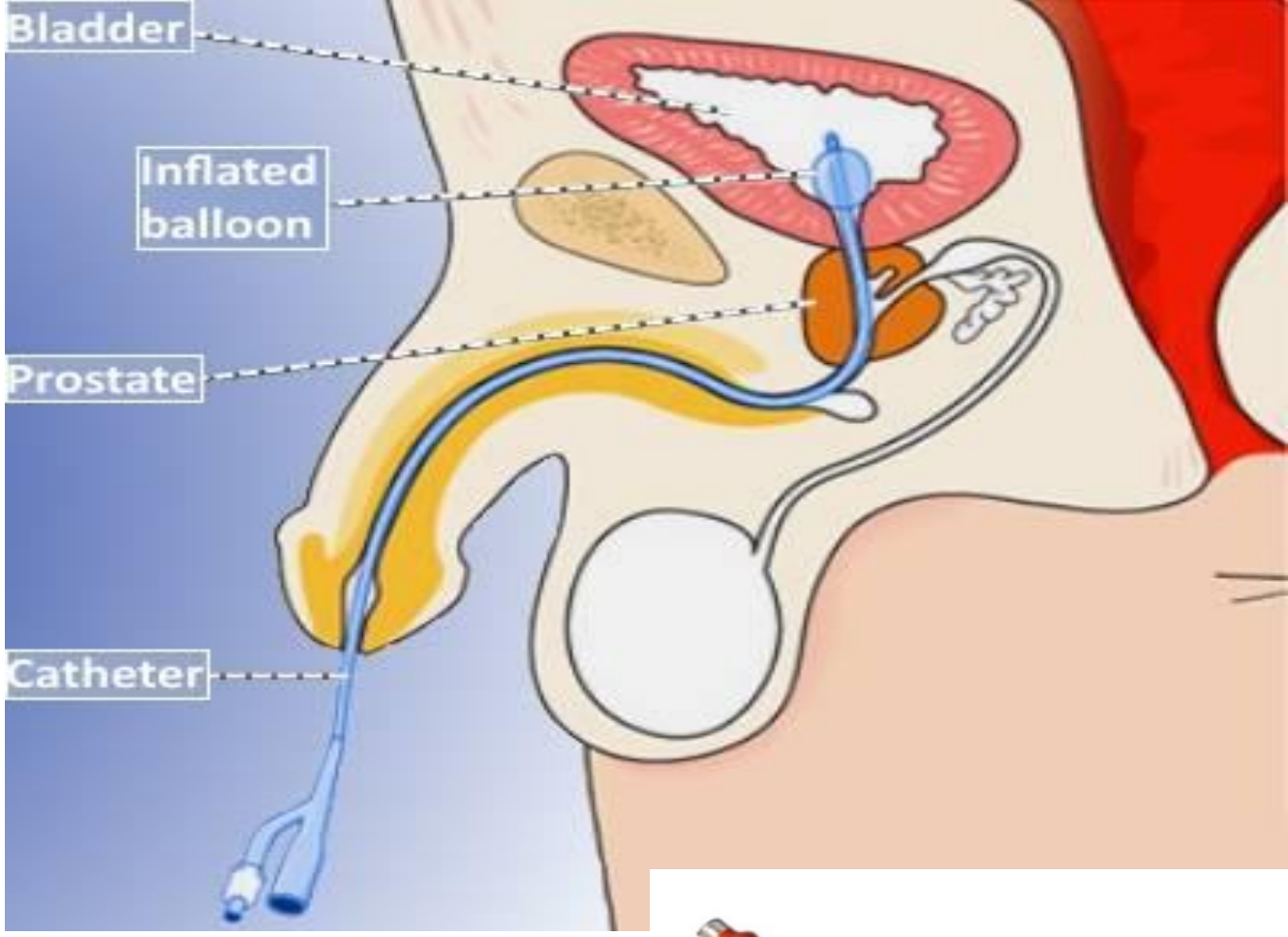
2. With gentle traction, the penis is held erect at right angles to the anterior abdominal wall. The lubricated catheter is passed through the narrow external urethral meatus.

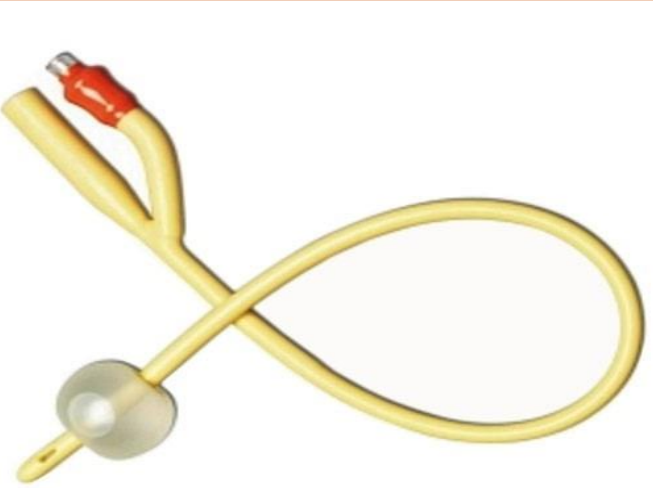
On reaching the membranous part of the urethra, a slight resistance is felt because of the tone of the urethral sphincter and the surrounding rigid perineal membrane.

3. The penis is then lowered toward the thighs, and the catheter is gently pushed through the sphincter

4-Passage of the catheter through the prostatic urethra and bladder neck should be easily.


X-Plain


Bladder
Inflated balloon
Prostate
Catheter




THANK YOU