



ANATOMY OF THE KIDNEYS AND URETERS

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Objectives of the Lecture:

By the end of the lecture the student should be able to:

- . What is the color of the kidneys.**
- . Enumerate the organs forming the urinary system.**
- . Where is the kidneys lie?**
- . Describe the coverings of the kidneys.**
- . Describe the normal anatomy of the kidneys (position, dimensions, hilum, renal pelvis and sinus, gross structure, anatomical relations, blood supply, lymphatic drainage, renal vascular segments, nerve supply.**
- . Describe the normal anatomy of the ureters; length, course, anatomical relations, anatomical narrowing's, blood supply, lymph drainage and lymph drainage.**
- . Describe the surface markings of the kidneys.**
- . Describe the surface anatomy of the ureters.**

KIDNEYS

➤ Reddish-brown in colour

Lie: Behind peritoneum on high up on posterior abdominal wall, largely under cover of costal margin.

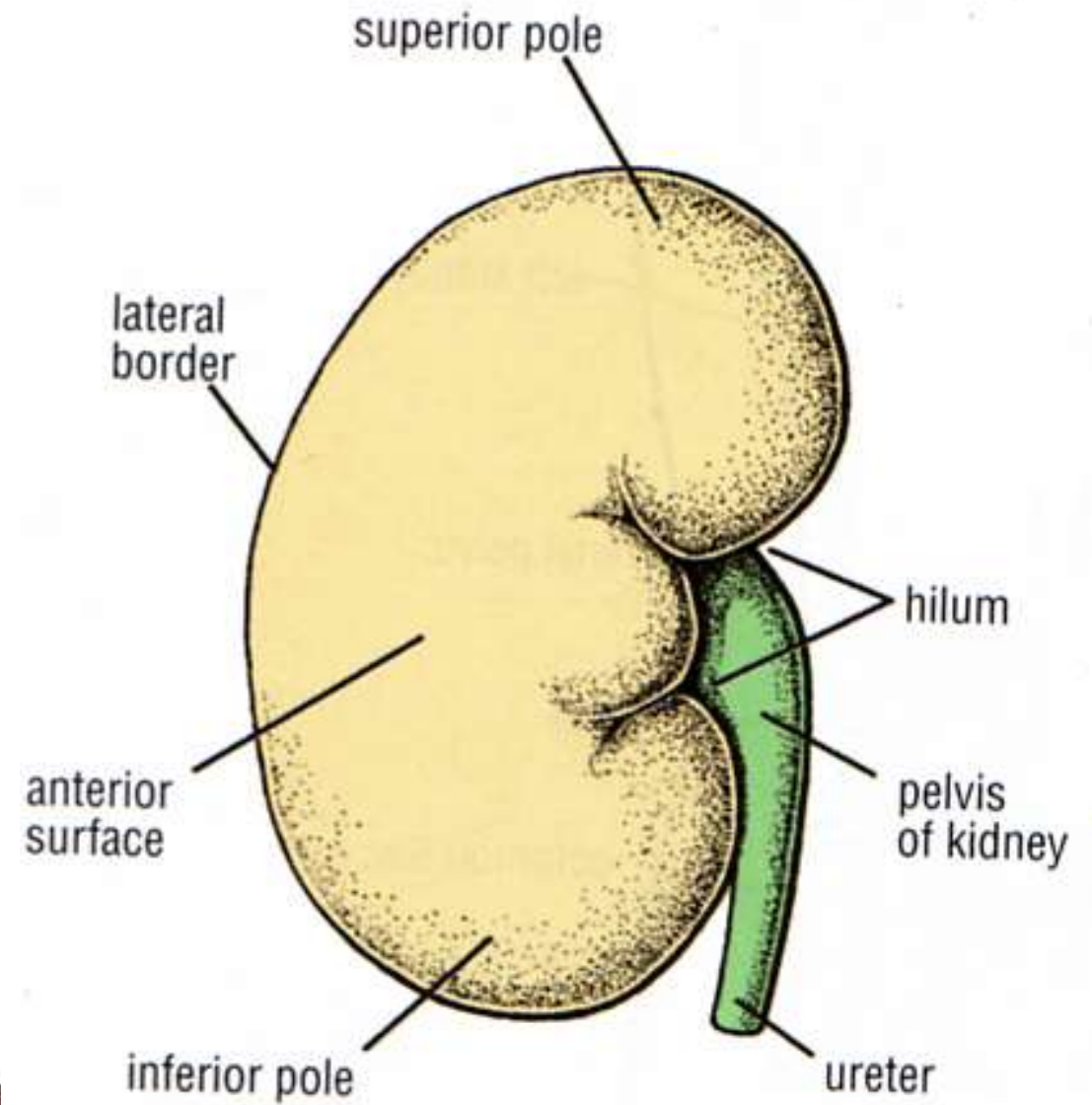
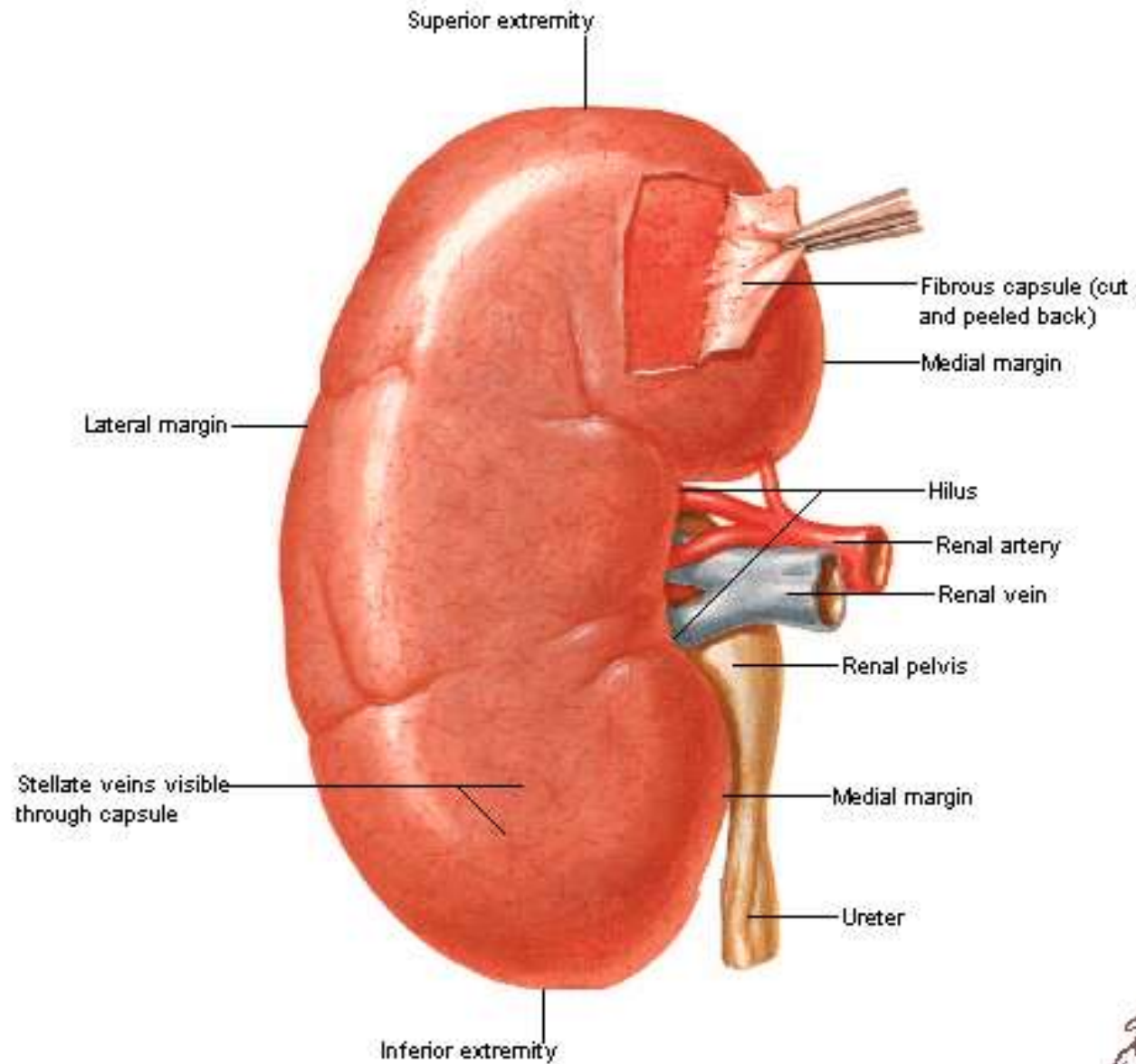
Right kidney:

➤ Lies slightly lower than left kidney due to large size of right lobe of liver.

➤ With contraction of diaphragm during respiration, both kidneys move downward in vertical direction by about 1 inch.

Note: Urinary system consists of kidneys, ureters, urinary bladder and urethra.

Anterior Surface of Right Kidney



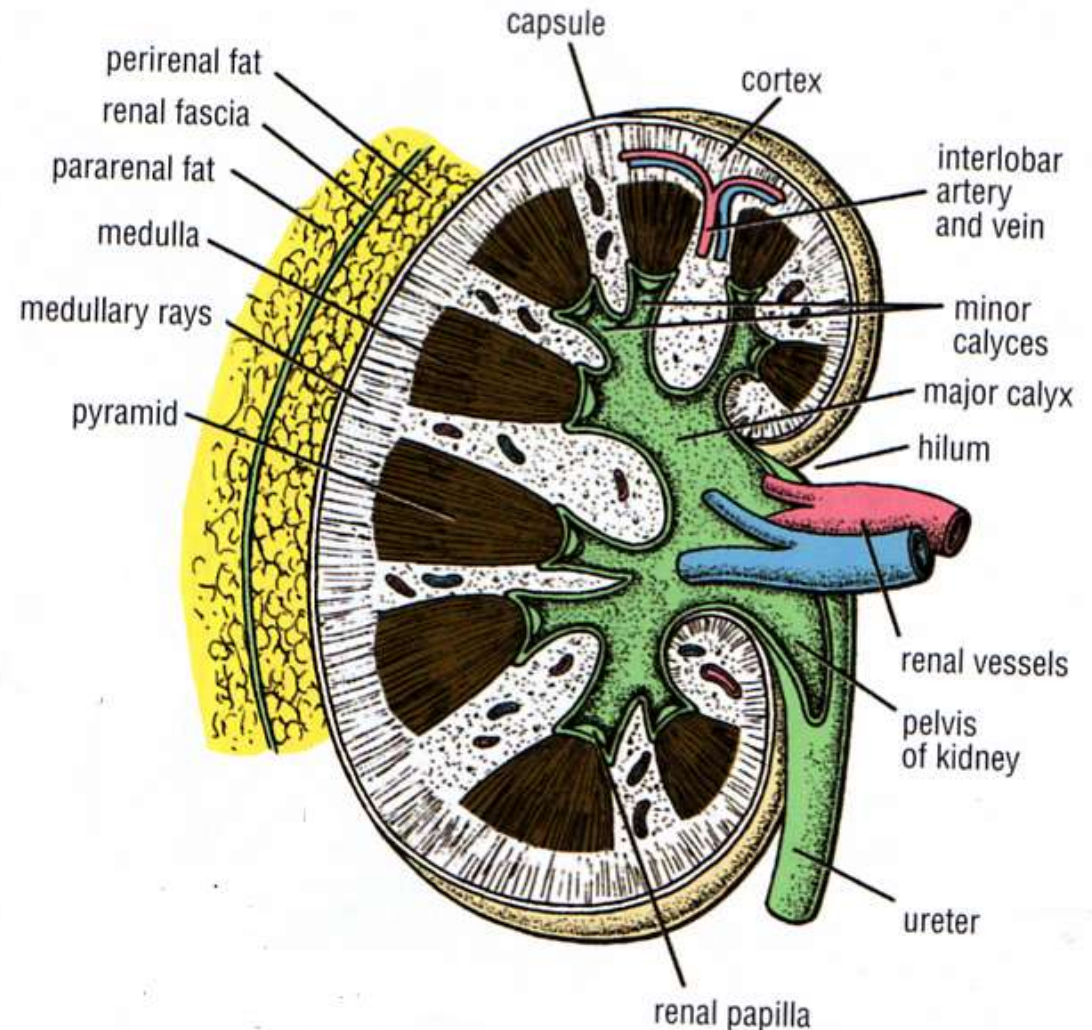
COVERINGS OF KIDNEYS:

1. Fibrous capsule

2. Perirenal fat

3. Renal fascia

4. Pararenal fat



COVERINGS OF KIDNEYS:

1. Fibrous capsule:

- Surrounds the kidney and closely applied to its outer surface.

2. Perirenal fat: Covers fibrous capsule.

3. Renal fascia:

- Condensation of connective tissue outside perirenal fat.
- Encloses kidneys and suprarenal glands.
- Continuous laterally with fascia transversalis.

4. Pararenal fat:

- Lies external to renal fascia
- Often in large quantity
- Forms part of retroperitoneal fat

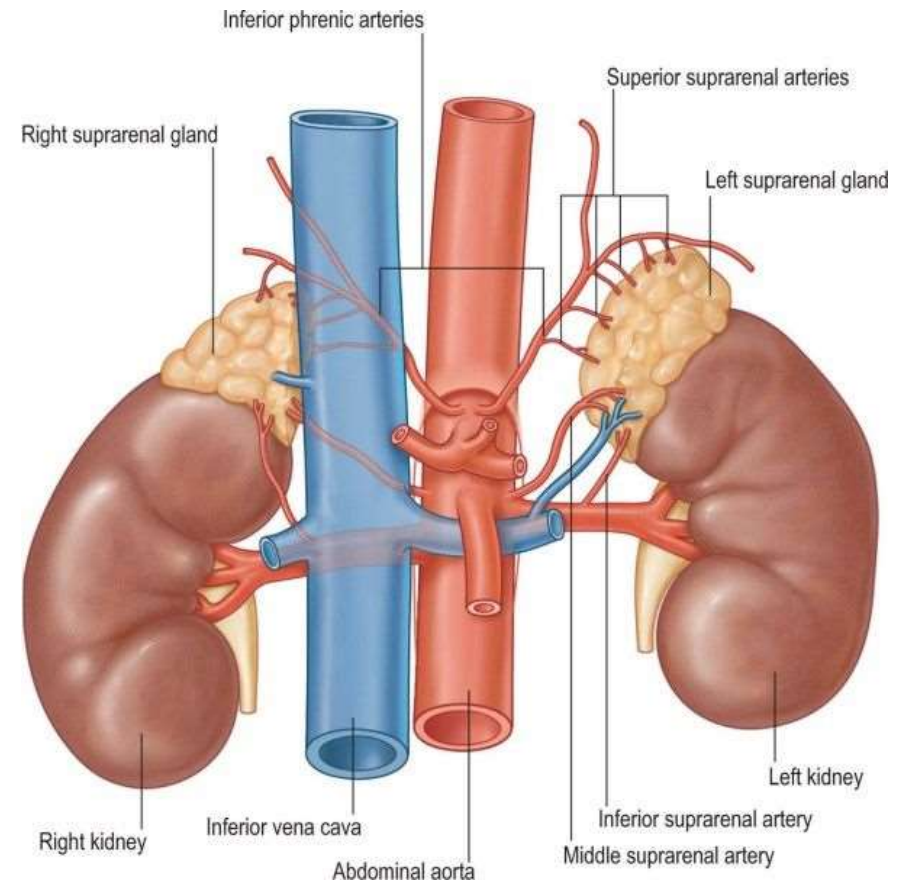
Note: *Perirenal fat, renal fascia and pararenal fat support kidneys and hold them in position on posterior abdominal wall*

HILUM OF KIDNEY:

- Vertical slit on medial concave border of the kidney.
- Bounded by thick lips of renal substances.
- Extends into large cavity called renal sinus.

Transmits (V.A.U.A.):

1. Renal vein
2. Renal artery (2 branches)
3. Ureter
4. 3rd branch of renal artery
5. Lymph vessels
6. Sympathetic fibers



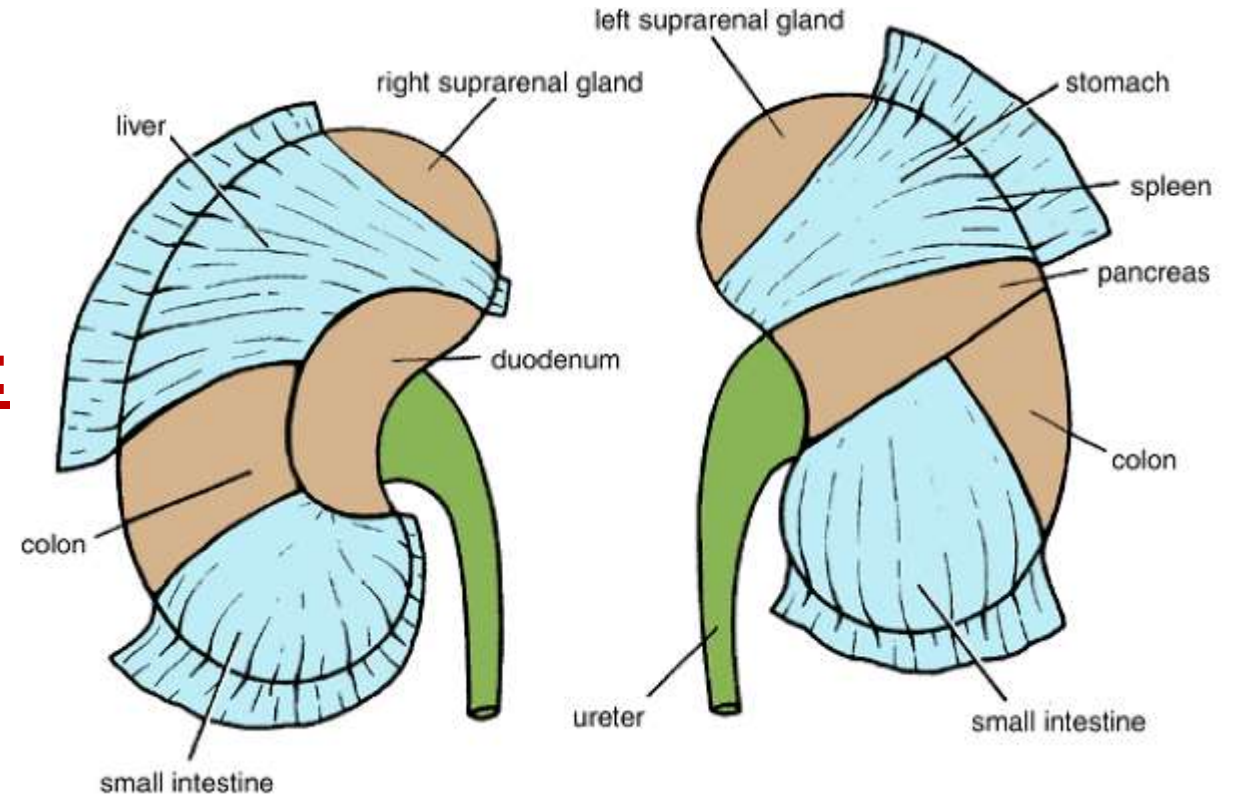
ANTERIOR RELATIONS OF THE KIDNEYS:

Anterior Relations of Right Kidney:

1. Right suprarenal gland
2. Liver
3. Second part of duodenum
4. Right colic flexure

Anterior Relations of Left Kidney:

1. Left suprarenal gland
2. Spleen
3. Stomach
4. Pancreas
5. Left colic flexure
6. Coils of jejunum



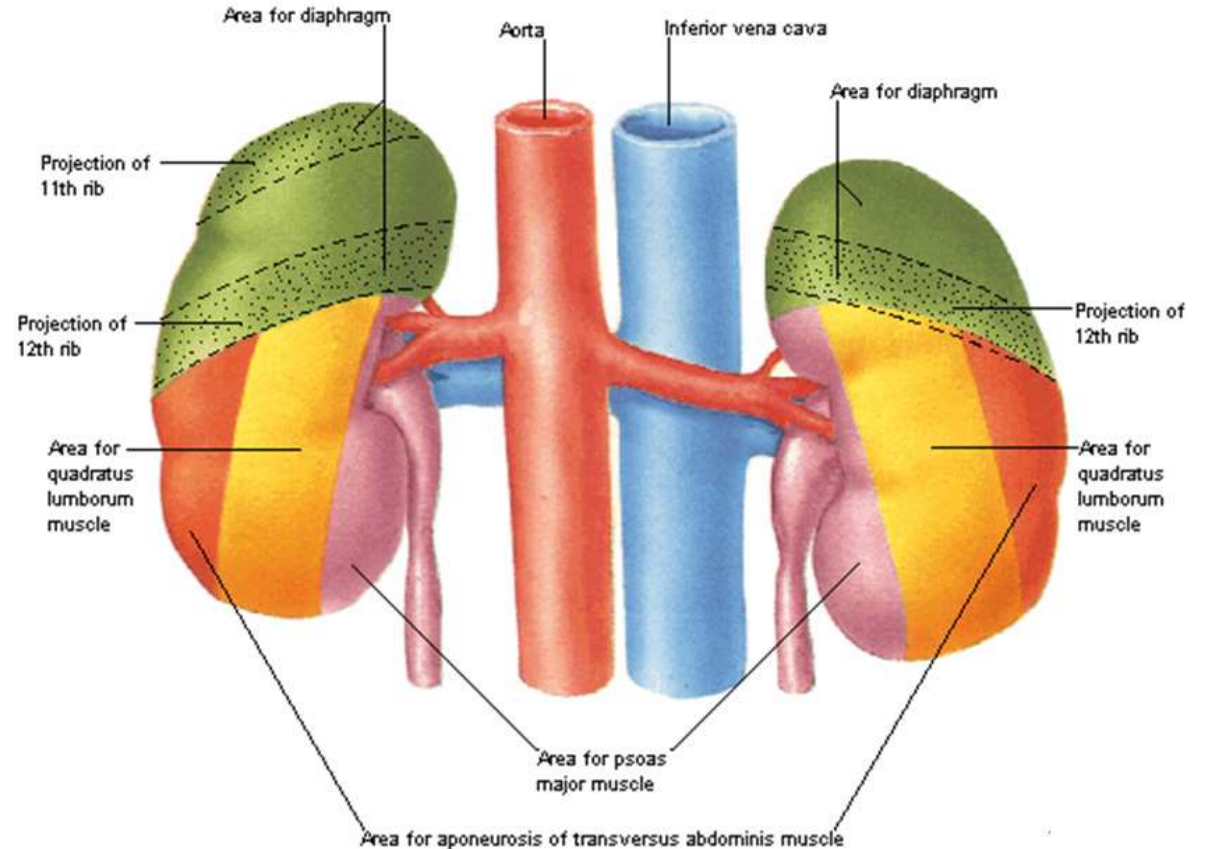
POSTERIOR RELATIONS OF THE KIDNEYS

POSTERIOR RELATIONS OF RIGHT KIDNEY:

1. Diaphragm
2. Costodiaphragmatic recess of right pleura
3. Right 12th rib
4. Right psoas muscle
5. Right quadratus lumborum muscle
6. Right transversus abdominis muscle
7. Right subcostal nerve (T 12)
8. Right iliohypogastric nerve (L 1)
9. Right ilioinguinal nerve (L 1)

POSTERIOR RELATIONS OF LEFT KIDNEY:

1. Diaphragm
2. Costodiaphragmatic recess of left pleura
3. Left 12th rib
4. Left psoas muscle
5. Left quadratus lumborum muscle
6. Left transversus abdominis muscle
7. Left subcostal nerve (T 12)
8. Left iliohypogastric nerve (L 1)
9. Left ilioinguinal nerve (L 1)



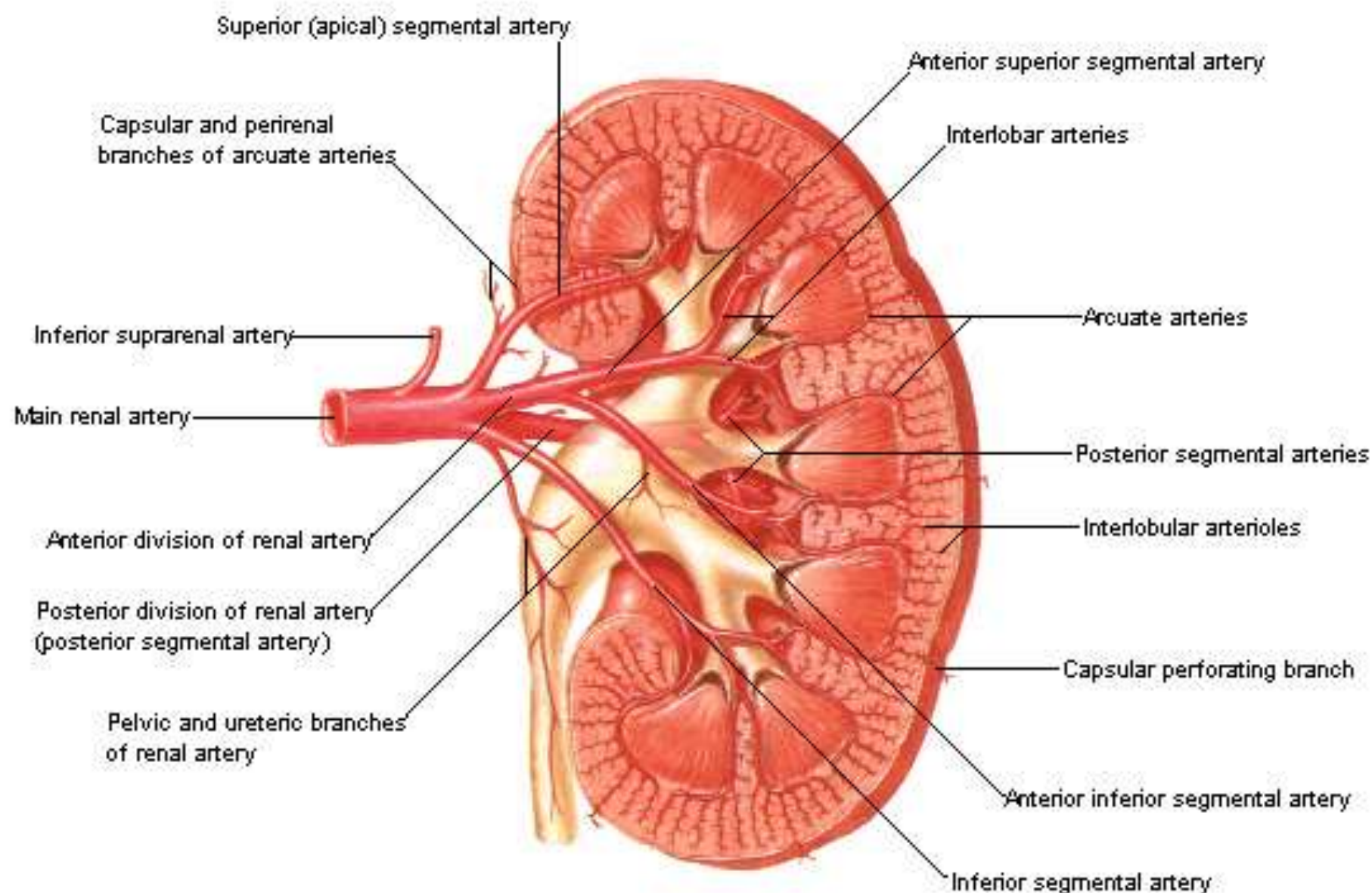
BLOOD SUPPLY OF KIDNEYS:

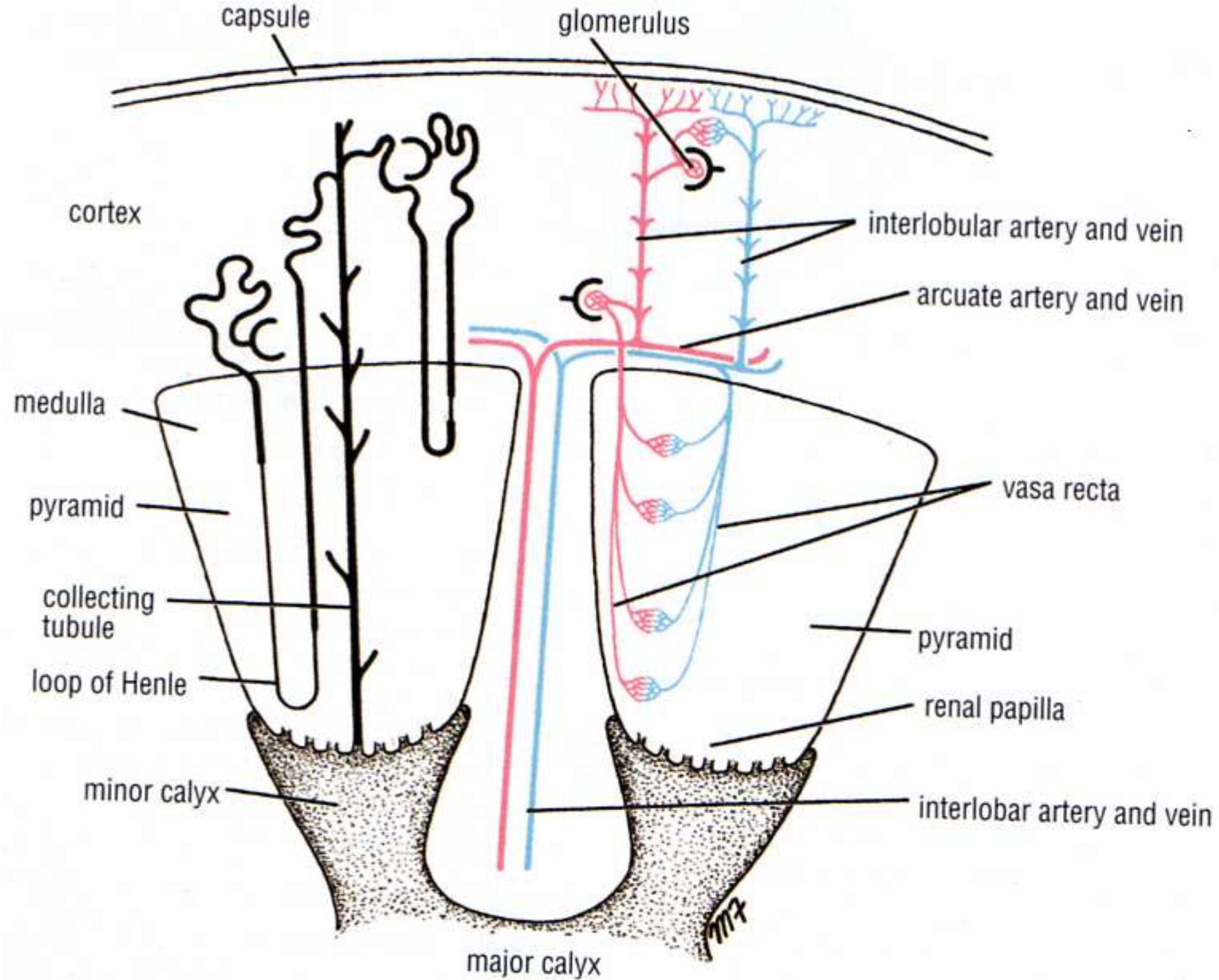
ARTERIES: Renal artery:

- ❖ From aorta at level of 2nd lumbar vertebra
- ❖ Each renal artery divides into: Segmental arteries that enter hilum of kidney, 4 front and 1 behind renal pelvis (distributed to different segments of kidney).
- ❖ Lobar arteries: Arise from each segmental artery, 1 for each renal pyramid.
- ❖ Each lobar artery gives: 2-3 interlobar arteries.
- ❖ Interlobar arteries run toward cortex on each side of renal pyramid, at junction of cortex and medulla they give off arcuate arteries (arch over bases of pyramids).
- ❖ Arcuate arteries gives off: Interlobular arteries that ascend in the cortex.
- ❖ Afferent glomerular arteries: Branches of interlobular arteries.

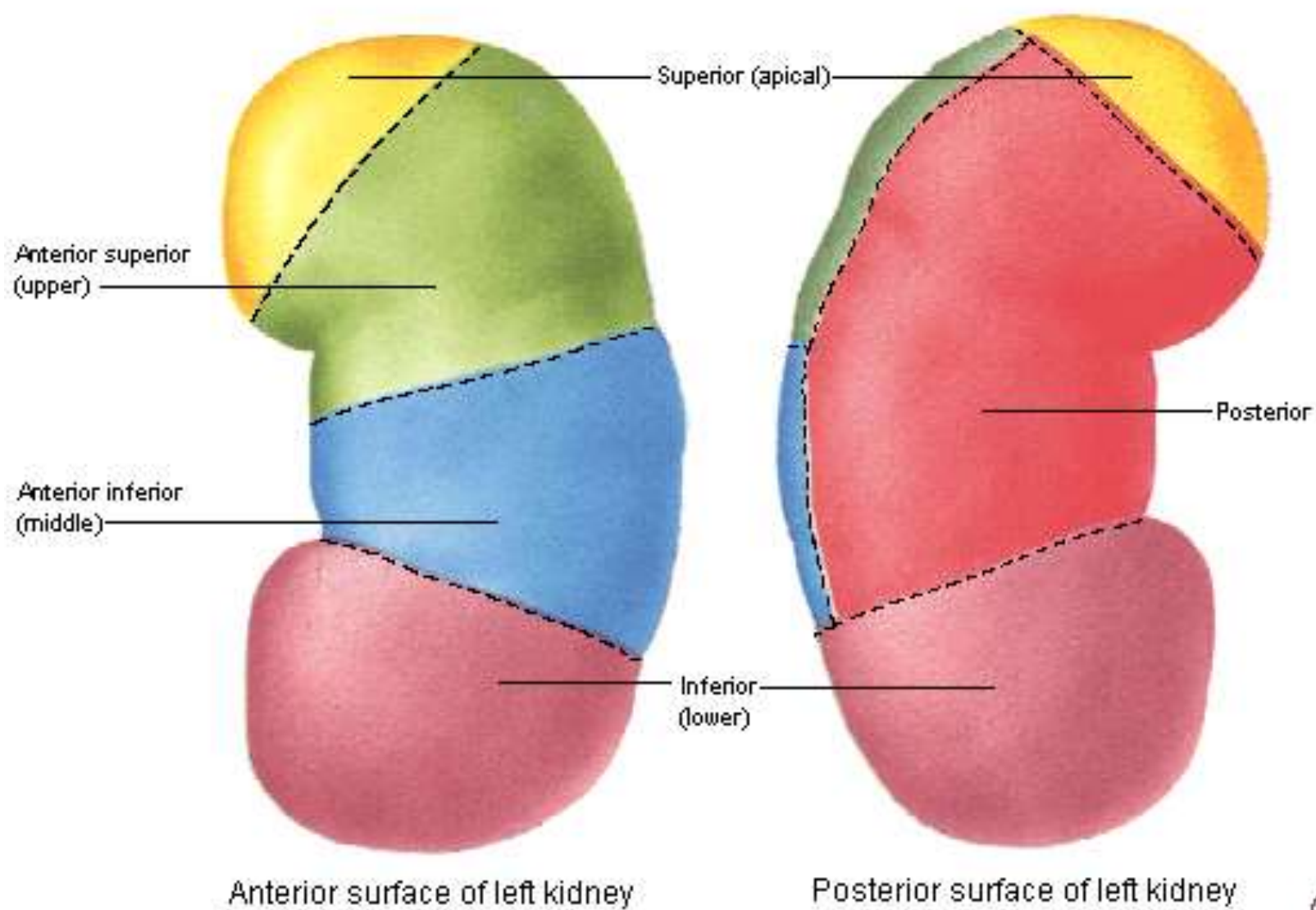
Intrarenal Arteries

Frontal Section of Left Kidney - Anterior View





Vascular Renal Segments



BLOOD SUPPLY OF KIDNEYS:

1. ARTERIES:

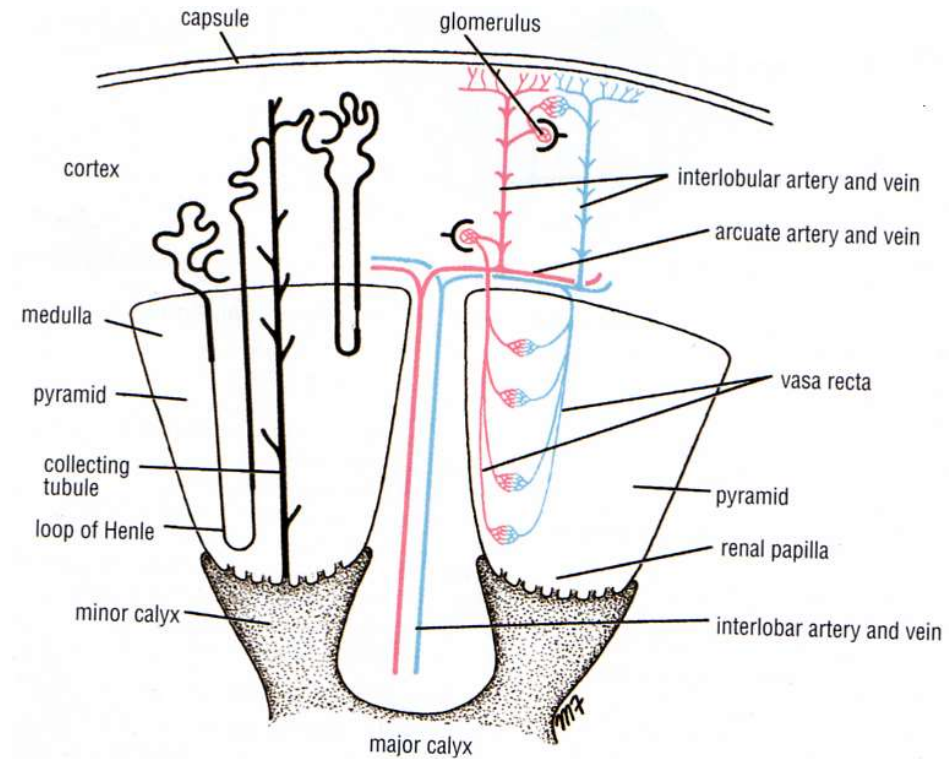
(right and left renal arteries; branches of abdominal aorta)

Renal artery

- **Segmental arteries**
- **Lobar arteries**
- **interlobar arteries**
- **Arcuate arteries**
- **Interlobular arteries**
- **Afferent glomerular arteries**

2. VEINS OF THE KIDNEYS:

Renal veins (right and left): ends in inferior vena cava



VEINS OF THE KIDNEYS:

Renal vein:

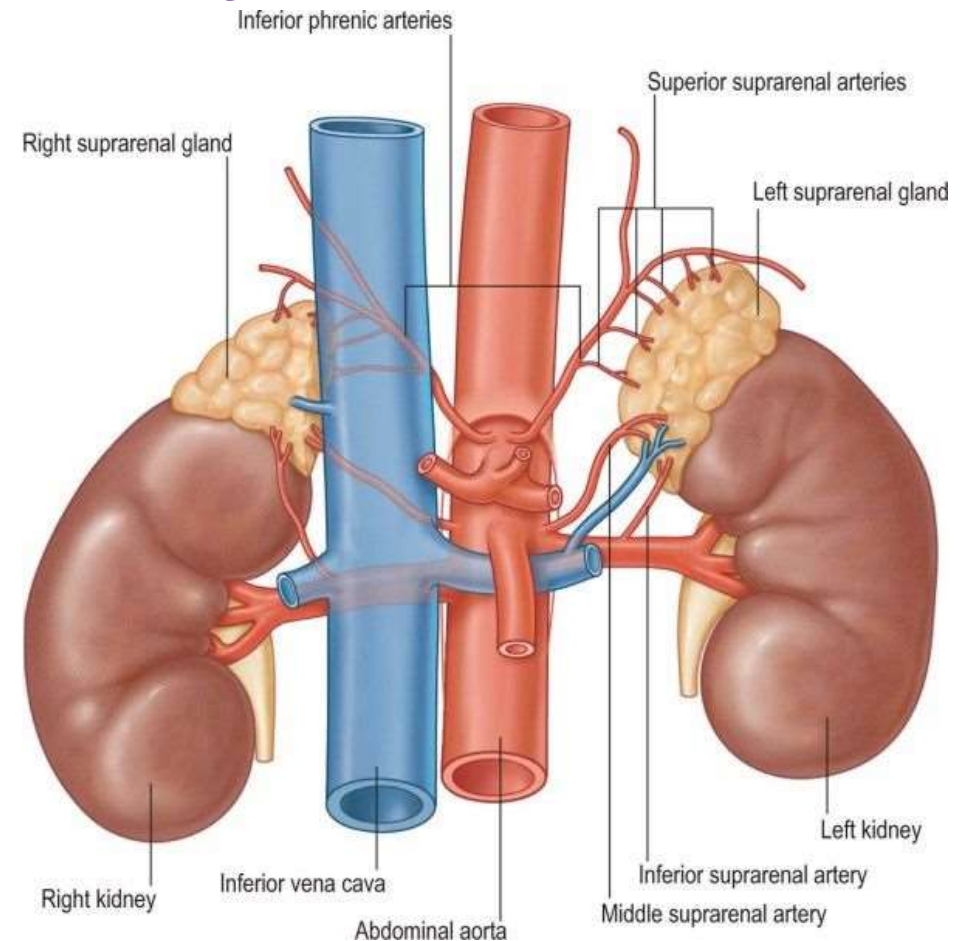
- Emerges from hilum front renal artery
- Drains into inferior vena cava

Left renal vein:

- Longer than right renal vein as it crosses the median plane

Receives:

1. Left gonadal vein
2. Left suprarenal vein
3. Inferior hemiazygos vein

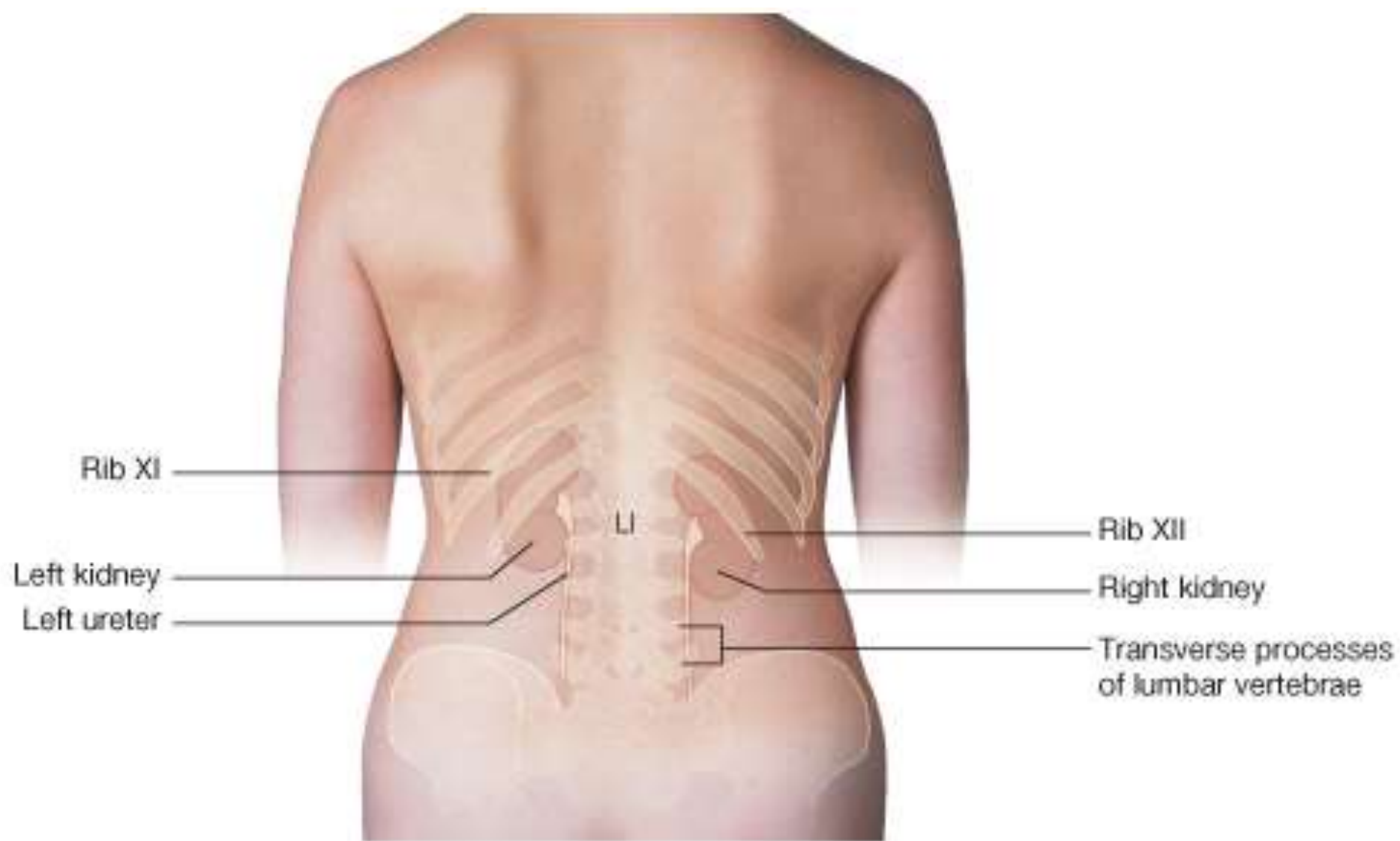


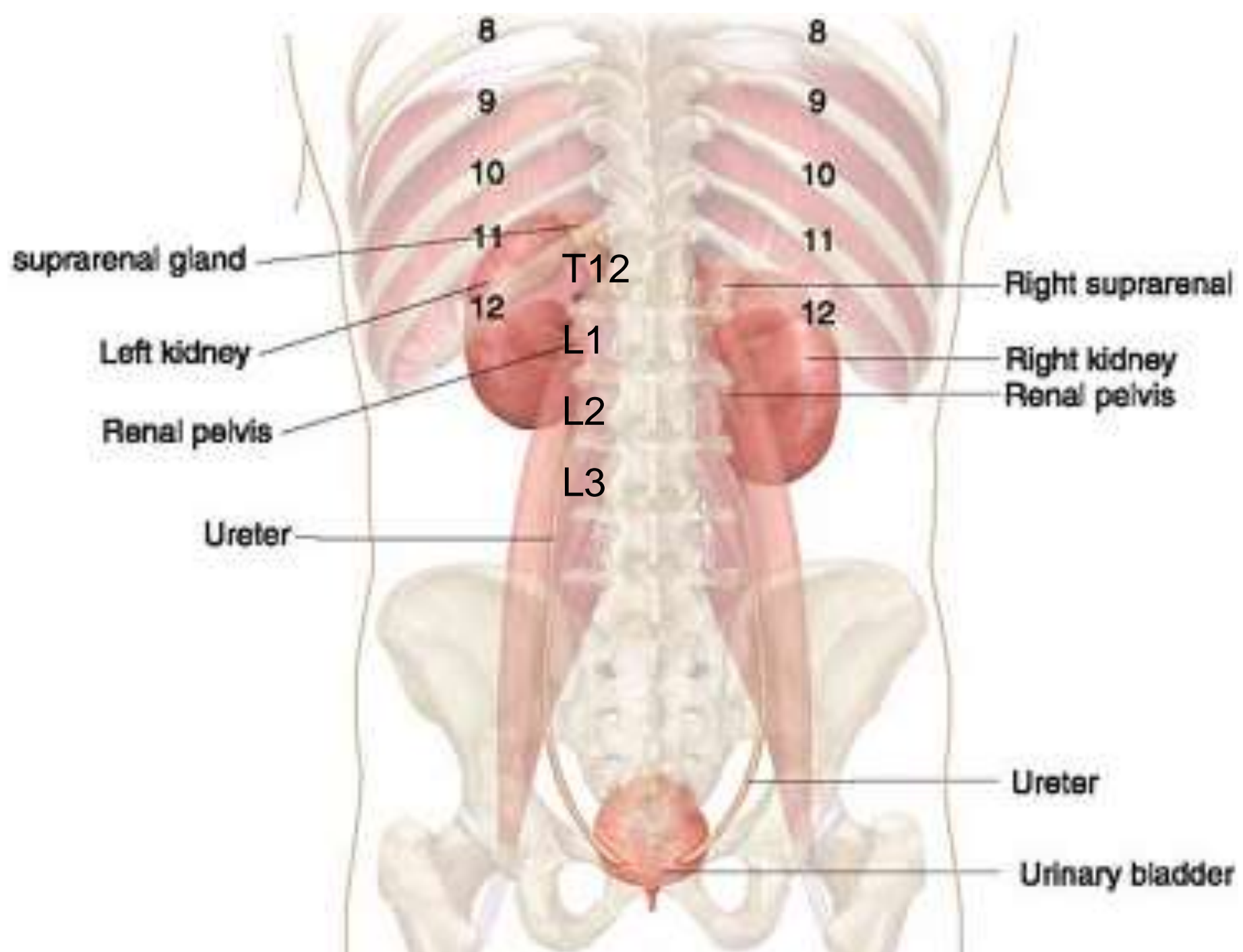
LYMPH DRAINAGE OF THE KIDNEY:

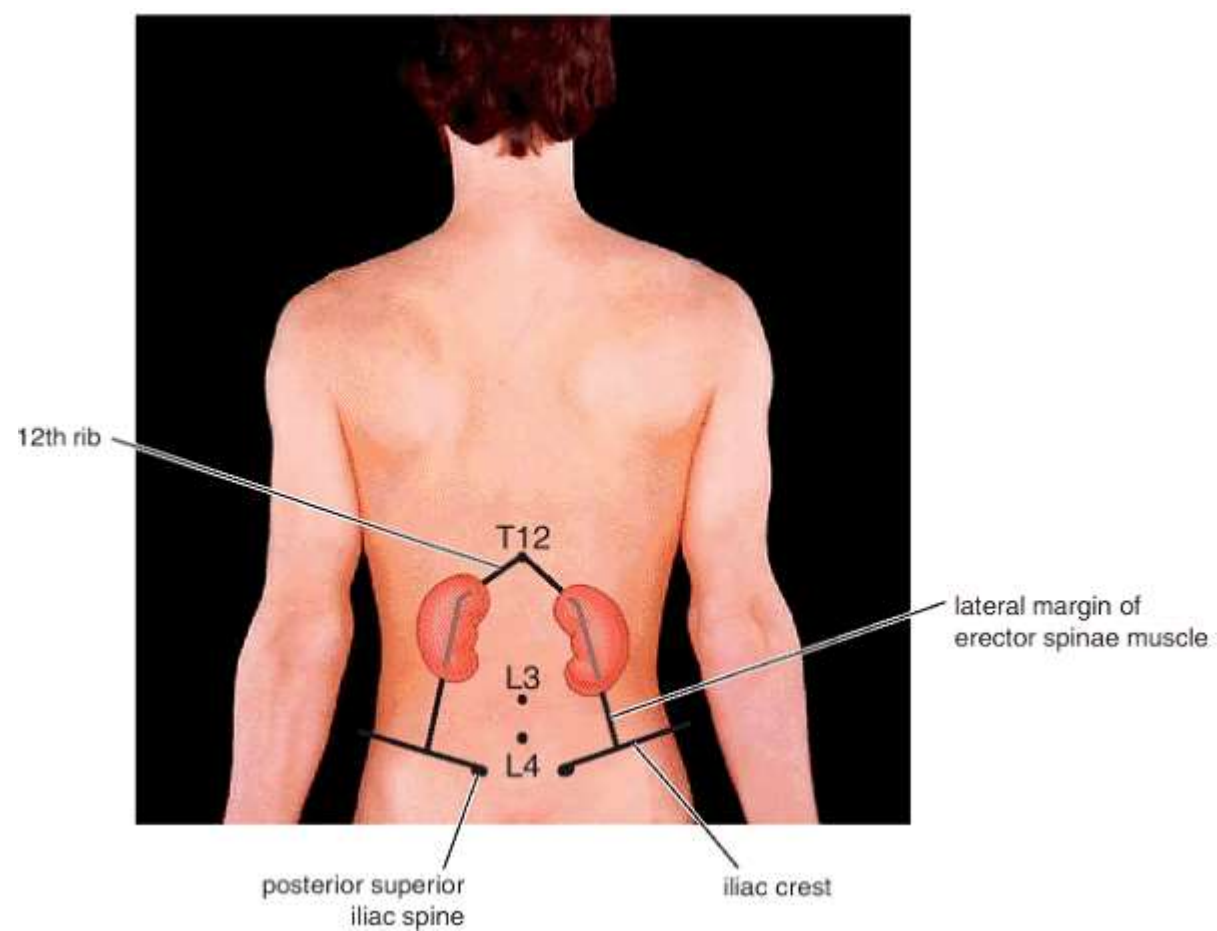
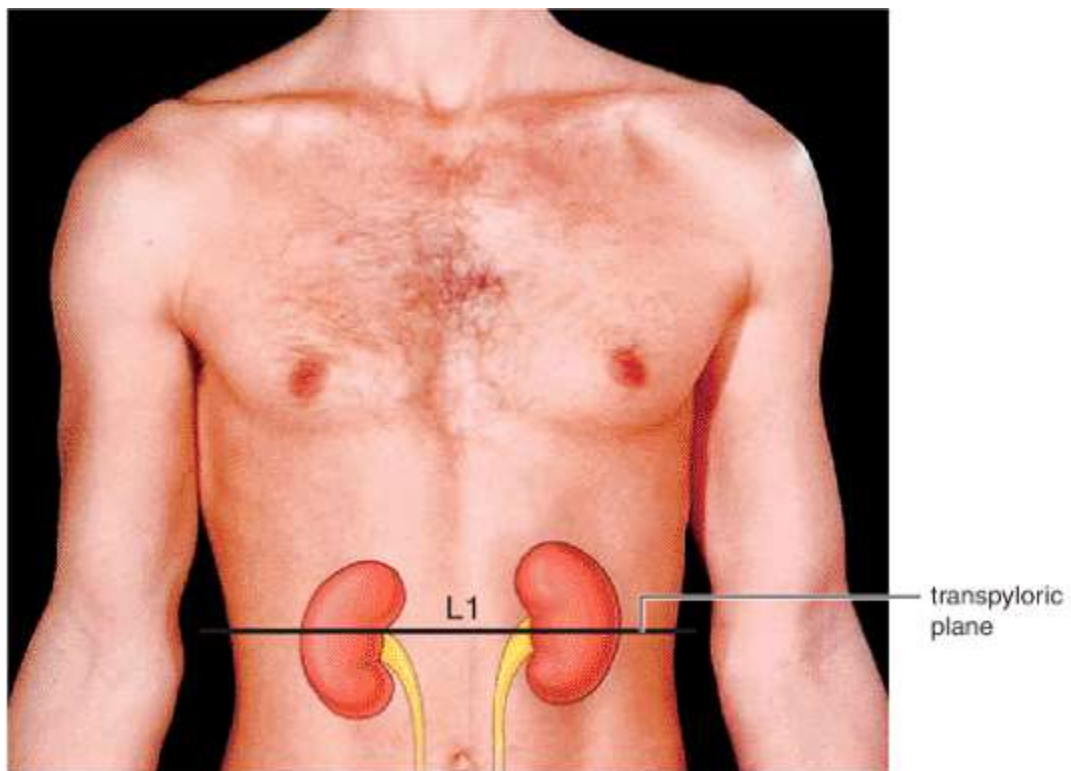
- Lymph vessels follow renal artery to **lateral aortic lymph nodes** around origin of renal artery

NERVE SUPPLY:

- Originate in renal sympathetic plexus and distributed along branches of renal vessels.
- Afferent fibers that travel through renal plexus enter spinal cord in **10th, 11th and 12th thoracic nerves**





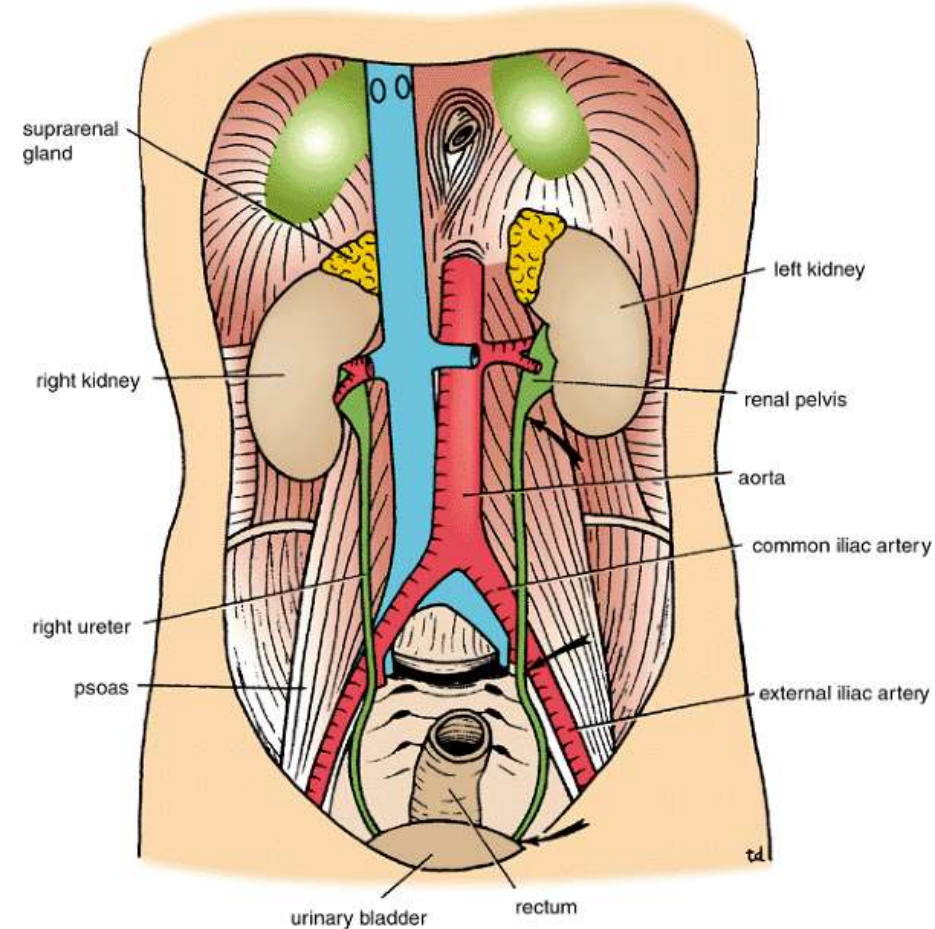


URETERS

- Muscular tubes that extend from kidneys to posterior surface of urinary bladder
- Each ureter is about 10 inches (25 Cm) long

Constrictions of the ureter (3):

1. Where renal pelvis joins the ureter
2. Where it is kinked as it crosses pelvic brim
3. Where it pierces the bladder wall



suprarenal
gland

right kidney

right ureter

psoas

urinary bladder

rectum

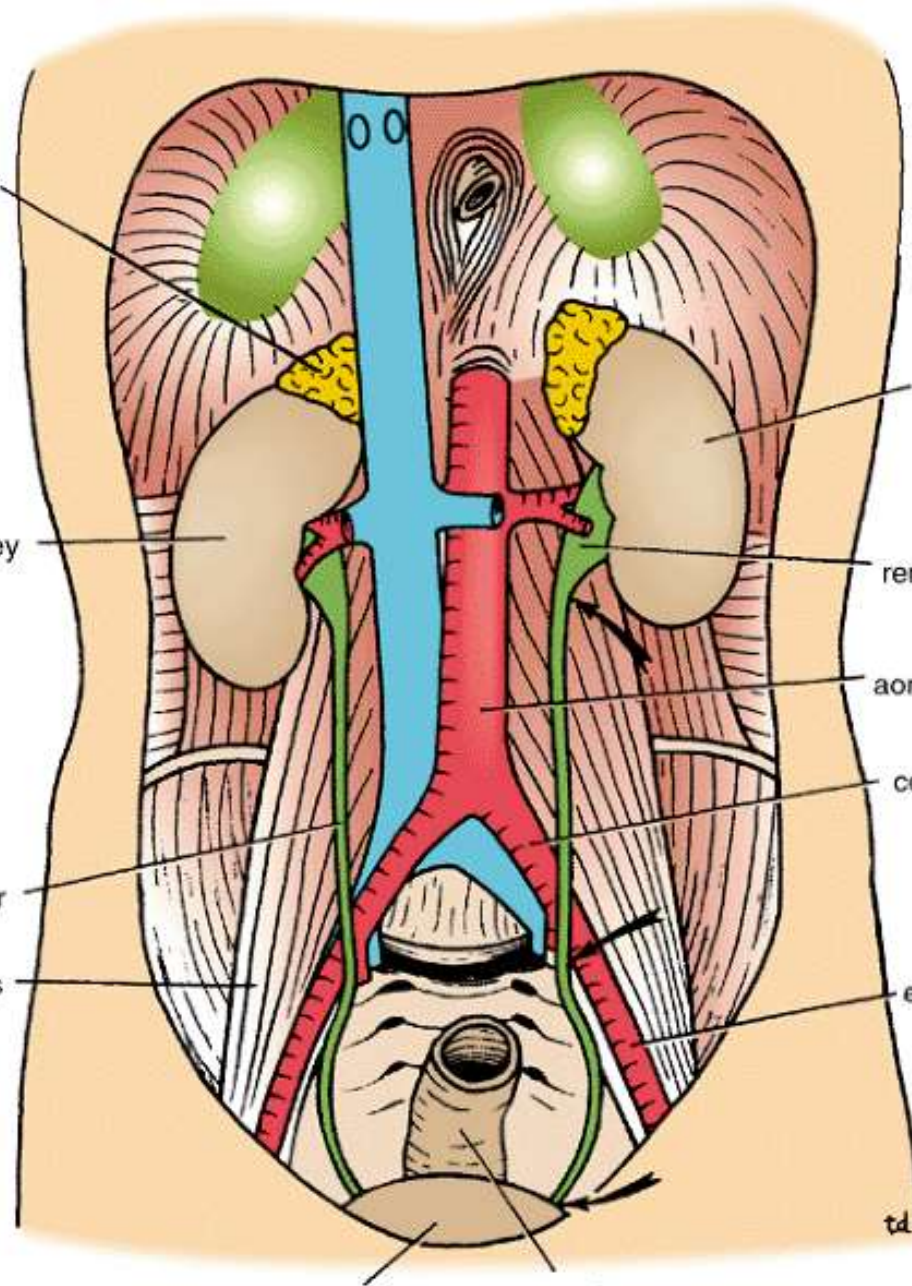
left kidney

renal pelvis

aorta

common iliac artery

external iliac artery

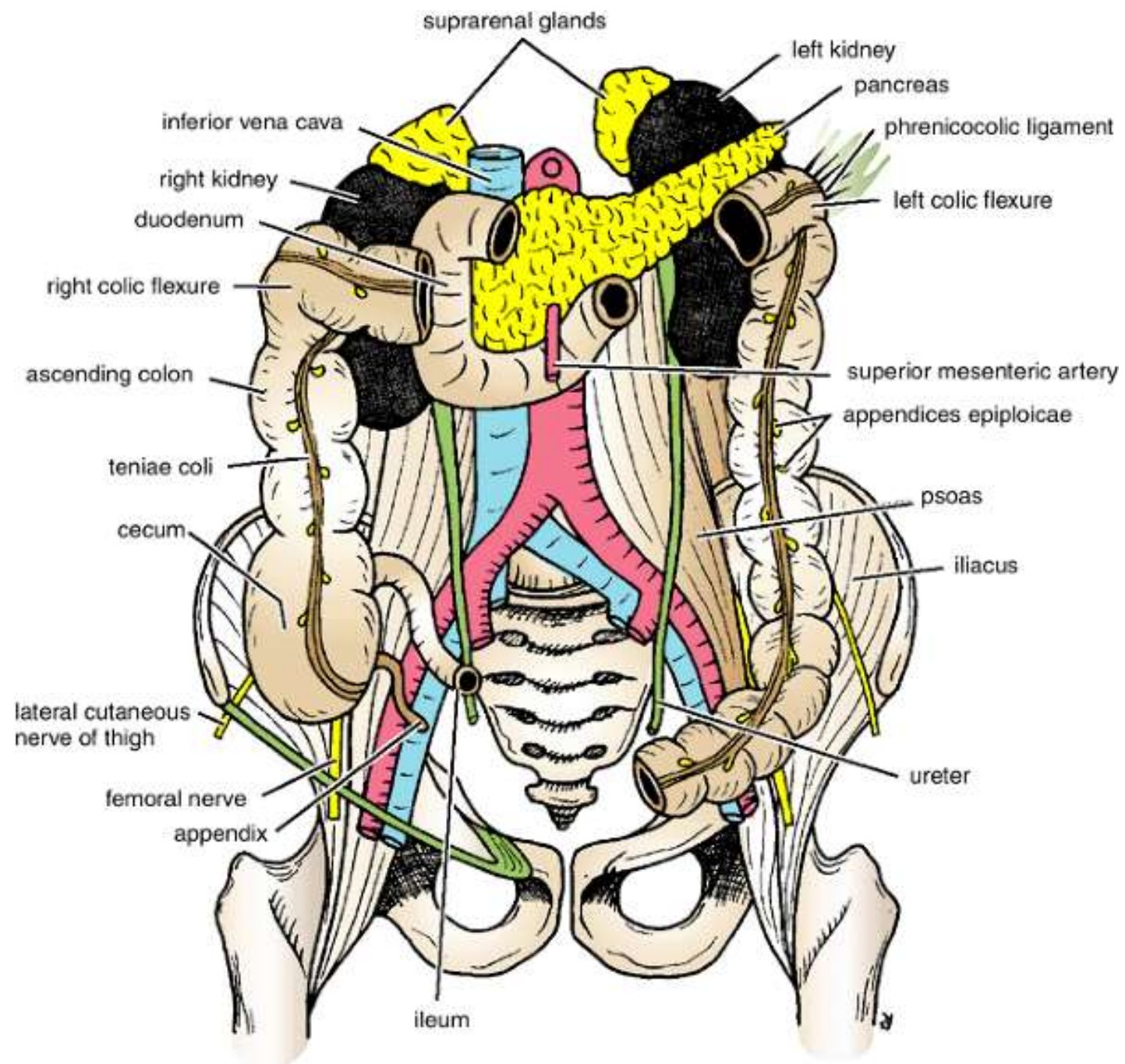


Renal pelvis (pelvis of the ureter):

- ❖ Funnel-shaped expanded upper end of ureter.
- ❖ Lies within hilum of the kidney.
- ❖ Receives major calyces.

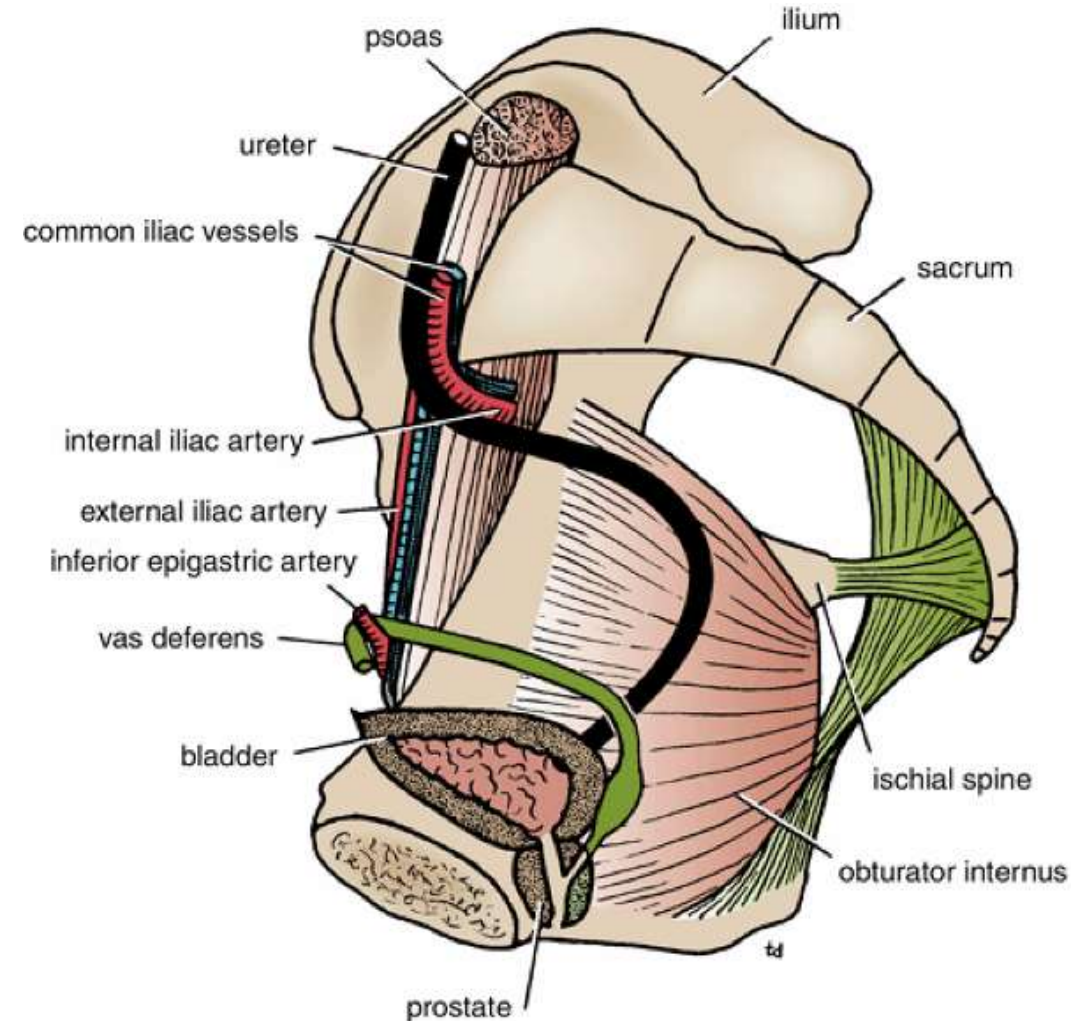
Course of the ureter:

- ❖ Ureter emerges from hilum of kidney.
- ❖ Runs vertically downward behind peritoneum on psoas muscle (separates it from tips of transverse processes of lumbar vertebrae).
- ❖ Enters the pelvis by crossing bifurcation of common iliac artery front sacroiliac joint.
- ❖ Then, runs down lateral wall of the pelvis to region of ischial spine and turns forward to enter lateral angle of the bladder.



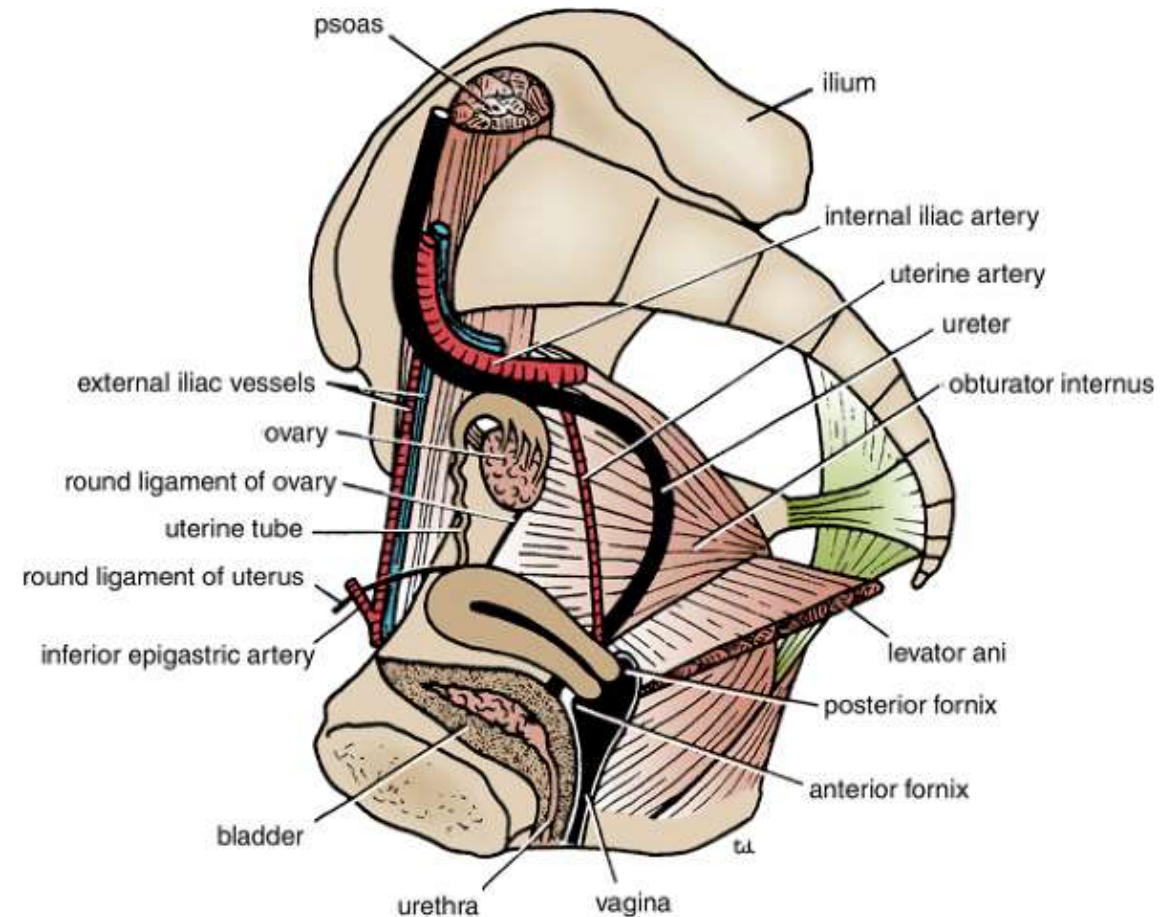
PELVIC PART OF URETER IN MALE:

- ❖ Near its termination, crossed by vas deferens.
- ❖ Passes obliquely through wall of the bladder for about $\frac{3}{4}$ inches (1.9 Cm) before opening into the bladder.
- ❖ This provides valve like action which prevents reverse flow of urine toward the kidneys as the bladder fills.



PELVIC PART OF URETERS IN FEMALE

- Runs downward and backward in front of internal iliac artery and behind ovary until reaches region of ischial spine.
- turns forward and medially beneath base of the broad ligament.
- Crossed by the uterine artery.
- Runs forward lateral to lateral fornix of vagina to enter the bladder.



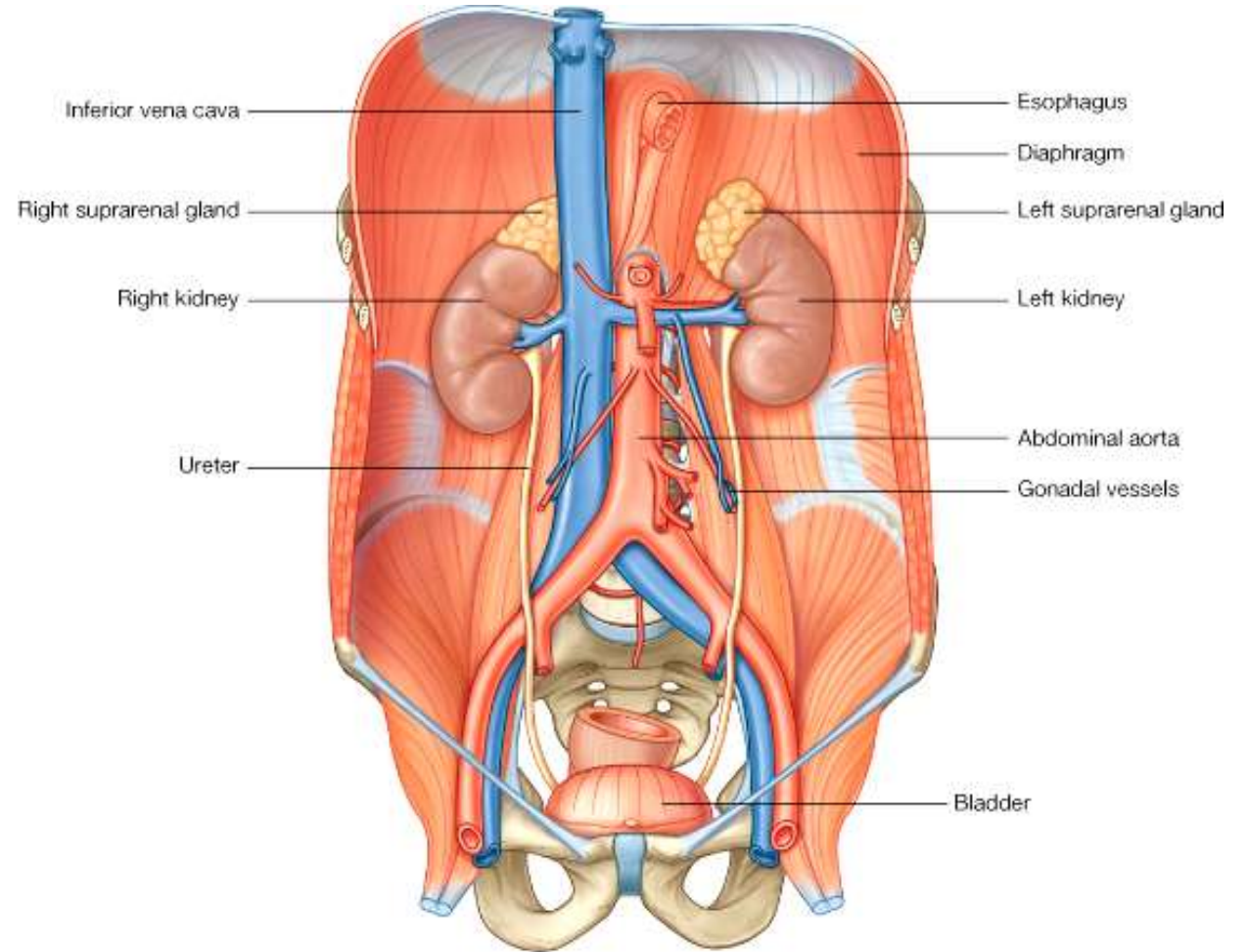
RELATIONS OF THE RIGHT URETER:

Anteriorly:

1. Duodenum
2. Terminal part of ileum
3. Right colic vessels
4. Ileocolic vessels
5. Root of mesentery of small intestine

Posteriorly:

1. Right psoas muscle
2. Lumbar transverse processes
3. Bifurcation of common iliac artery



RELATIONS OF THE LEFT URETER

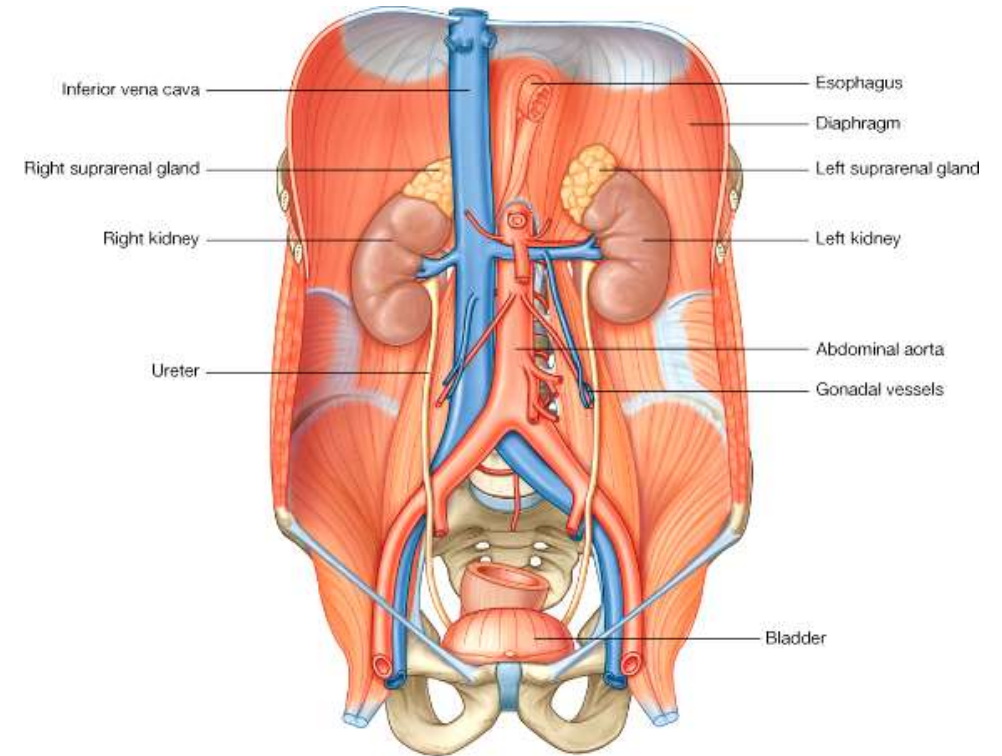
Anteriorly:

1. Sigmoid colon
2. Sigmoid mesocolon
3. Left colic vessels
4. Left gonadal vessels

Posteriorly:

1. Left psoas muscle
2. Lumbar transverse processes
3. Bifurcation of left common iliac artery

Note: *Inferior mesenteric vein lies along medial side of the left ureter*



BLOOD SUPPLY OF THE URETER

ARTERIES:

Upper end: Renal artery

Middle part: Testicular (ovarian) artery

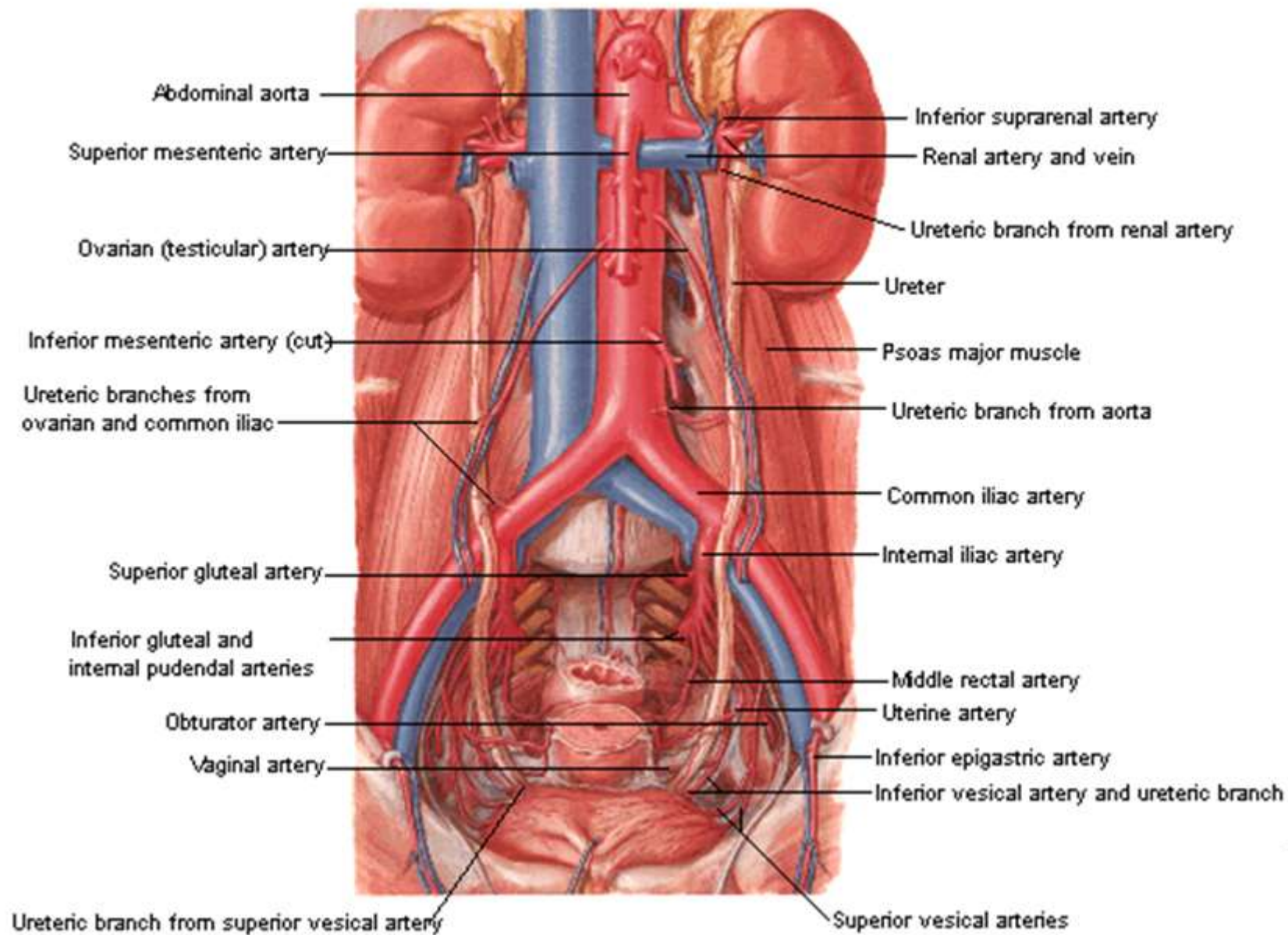
In pelvis: Superior vesical artery

VEINS:

Upper end: Renal vein

Middle part: Testicular (ovarian) vein

In pelvis: Superior vesical vein



LYMPH DRAINAGE OF URETER

The lymph vessels drain into:

- 1. Lateral aortic lymph nodes**
- 2. Iliac lymph nodes**

NERVE SUPPLY OF URETER

Nerves of ureter are derived from:

Upper end: Renal plexus

Middle part: Testicular (ovarian) plexus

In pelvis: Superior vesical plexus

- ❖ Afferent fibers travel with sympathetic nerves**
- ❖ Enter spinal cord in 1st and 2nd lumbar segments**

THANK YOU