

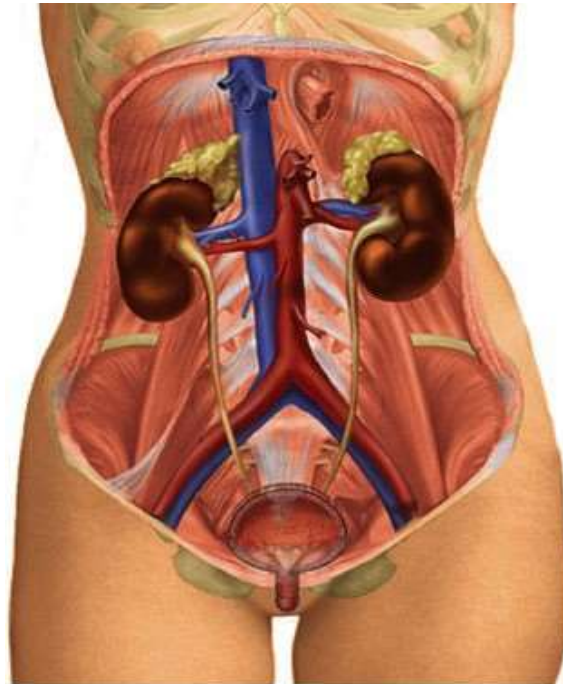
Urinary System

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Urinary System



The Urinary System

- Urinary System is one of the four excretory systems in our body. The other three are bowel, lungs & skin.

Components of Urinary System

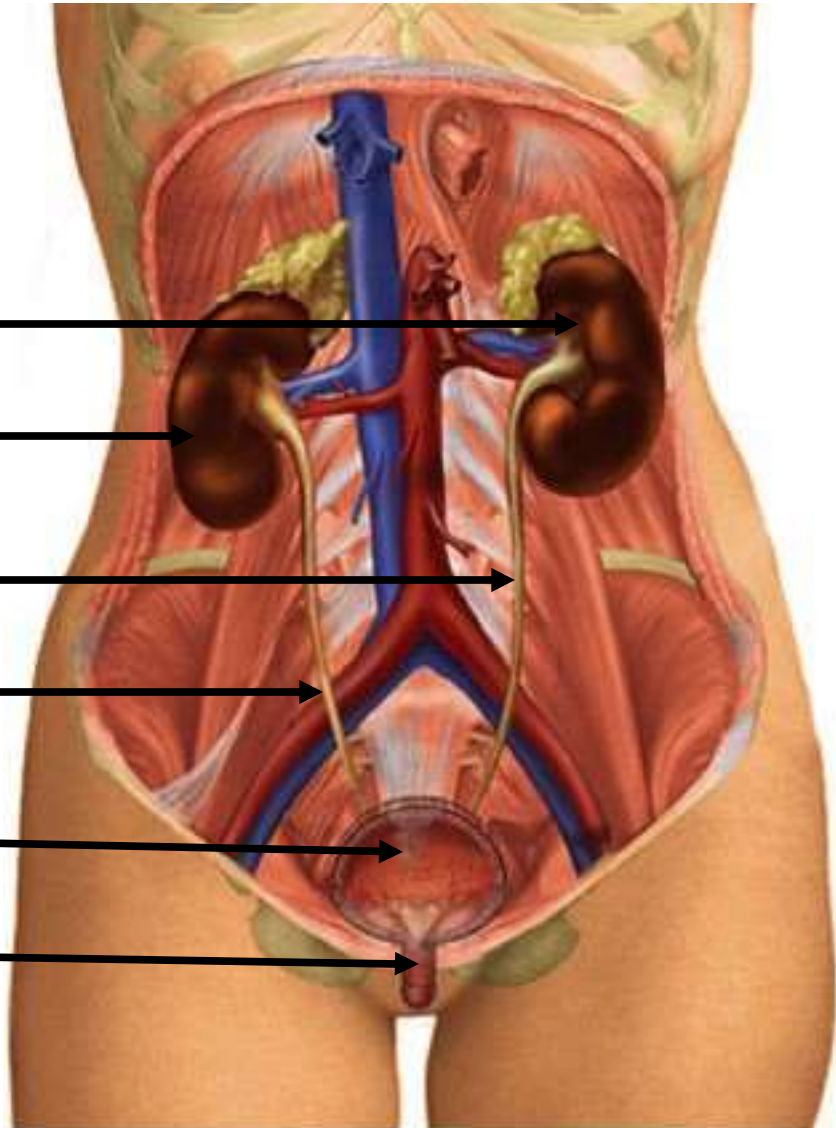
Components of Urinary System

2 Kidneys

2 Ureters

Urinary Bladder

Urethra



The Kidneys

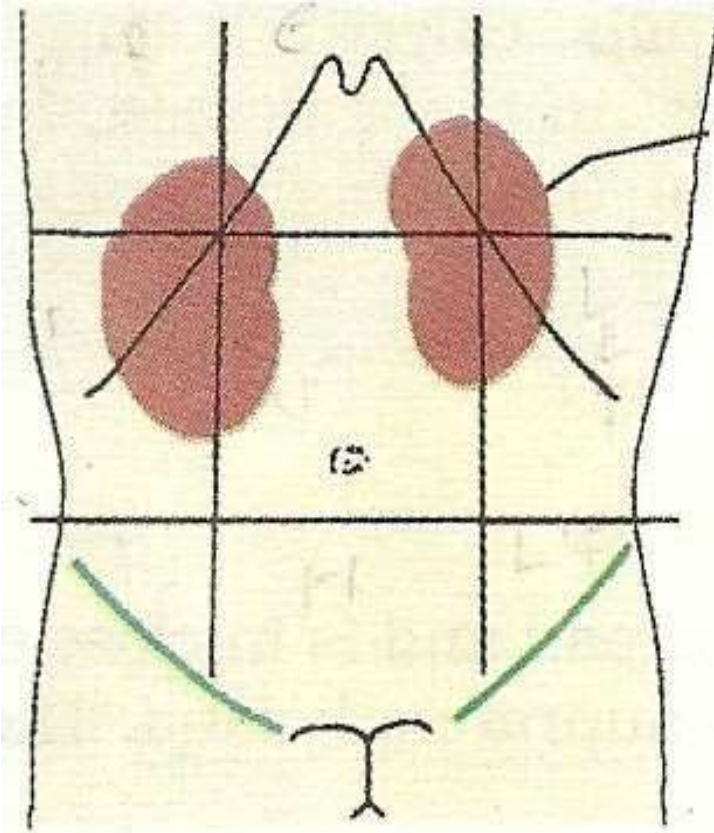
- The **kidneys** remove waste products of metabolism, excess water and salts from blood and maintain the pH .
- **Ureters** convey urine from the kidneys to the urinary bladder.
- The **urinary bladder** is the muscular reservoir of urine.
- **Urethra** is the channel to the exterior.

The Kidneys

- The kidneys are a pair of excretory organs situated on the posterior abdominal wall, one on each side of the vertebral column, behind the peritoneum.

Location

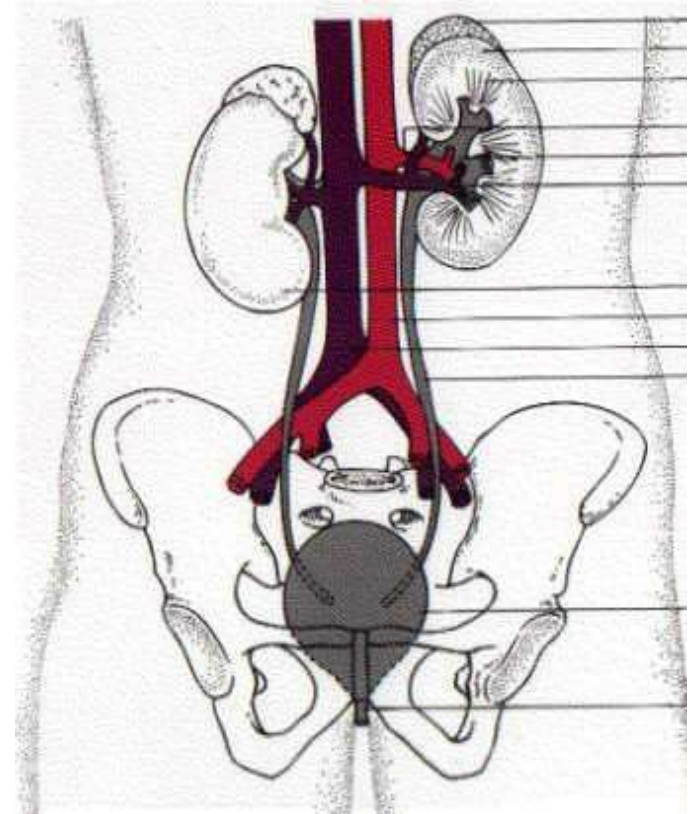
- The kidneys occupies the epigastric, hypochondriac, lumbar and umbilical regions .
- Vertically they extend from the upper border of 12th thoracic vertebra to the center of the body of third lumbar vertebra.
- The right kidney is slightly lower than the left, & the left kidney is little nearer to the median plane than the right.



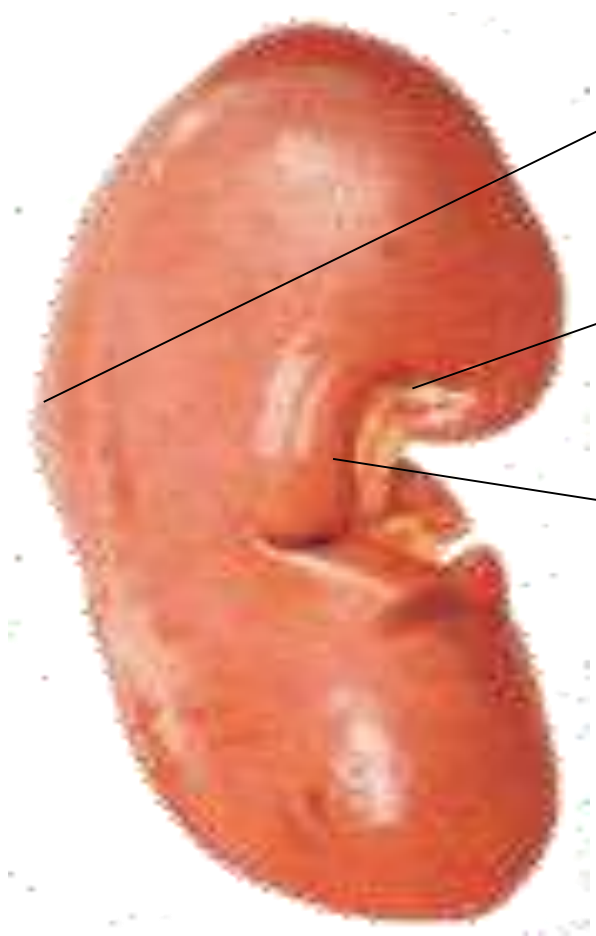
The Kidneys: Surface Anatomy

External Features

- Each kidney is bean shaped.
- It has upper & lower poles, medial and lateral borders, and anterior and posterior surfaces.
- The upper pole is broad & is in close contact with the corresponding suprarenal glands.
- The lower pole is pointed.



Surface Anatomy



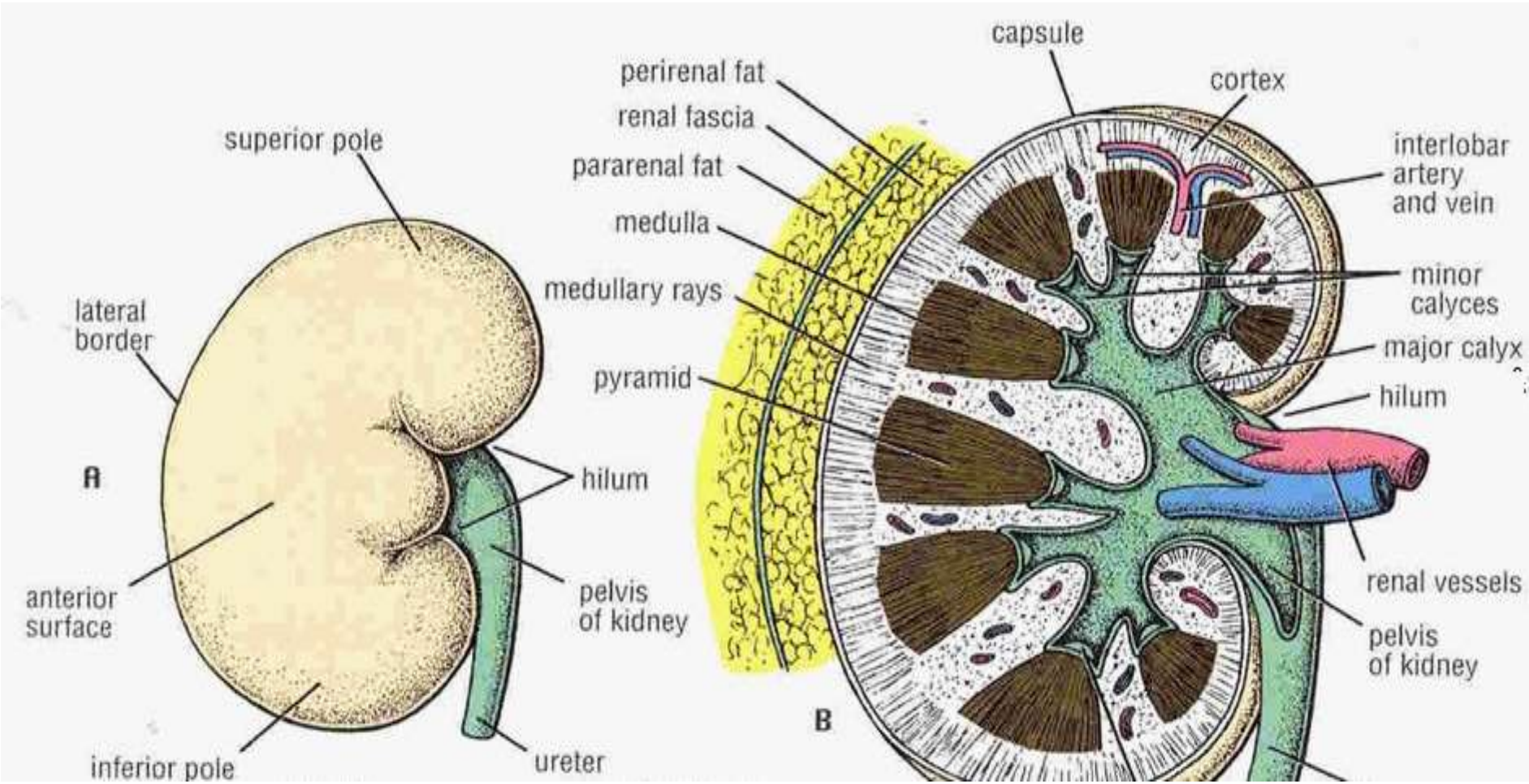
- The lateral border is convex.
- The medial border is concave.
- The middle part of the medial border is depressed and is known as hilum (hilus).

Coverings

The kidneys has following coverings

- **Innermost fibrous capsule**: Surrounds the kidneys and closely attached to the outer surface.
- **Perirenal fat**: Middle fatty capsule it is a collection of fatty tissue, covers the fibrous capsule. (It acts as a shock absorber & helps to maintain the kidney in its position)
- **Renal fascia** : It lies external to perirenal fat and encloses the kidneys and suprarenal glands.
- **Pararenal fat**: External to pararenal fascia and it forms part of retroperitoneal fat.

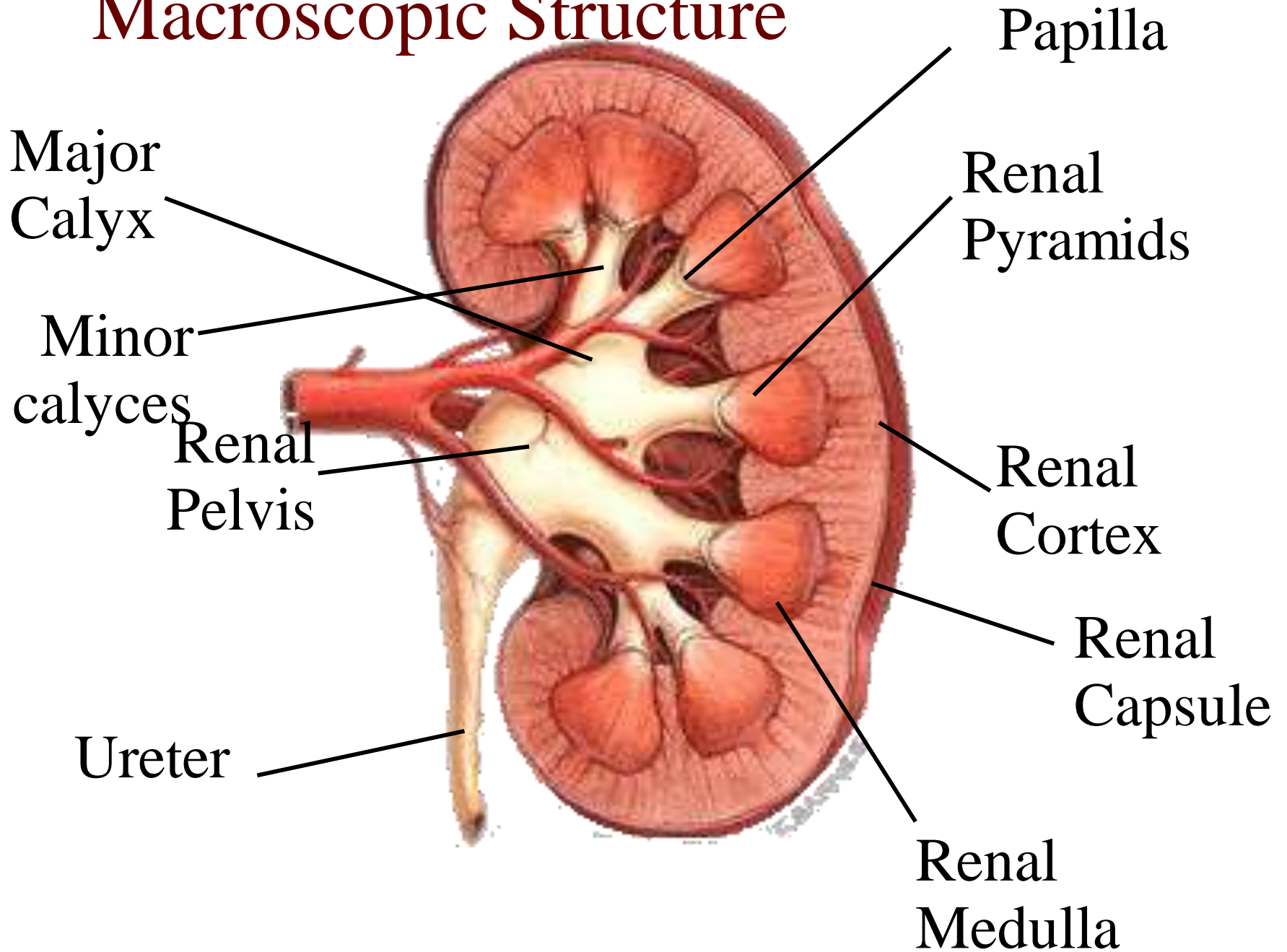
Coverings



Renal Structure

- Each kidney is a large bean shaped organ located retroperitoneally.
- On naked eye, an outer reddish brown granular zone called **cortex** and inner lighter striated zone known as **medulla**.
- The **cortex** appears granular because it contains renal corpuscles and convoluted parts of renal tubules.
- The reddish brown colour is due to that 90% blood passing through cortex.
- The **medulla** gives striated appearance because it contain straight parts of renal tubules and parallelly arranged blood vessels.

Macroscopic Structure



Adrenal Cortex



Adrenal Medulla



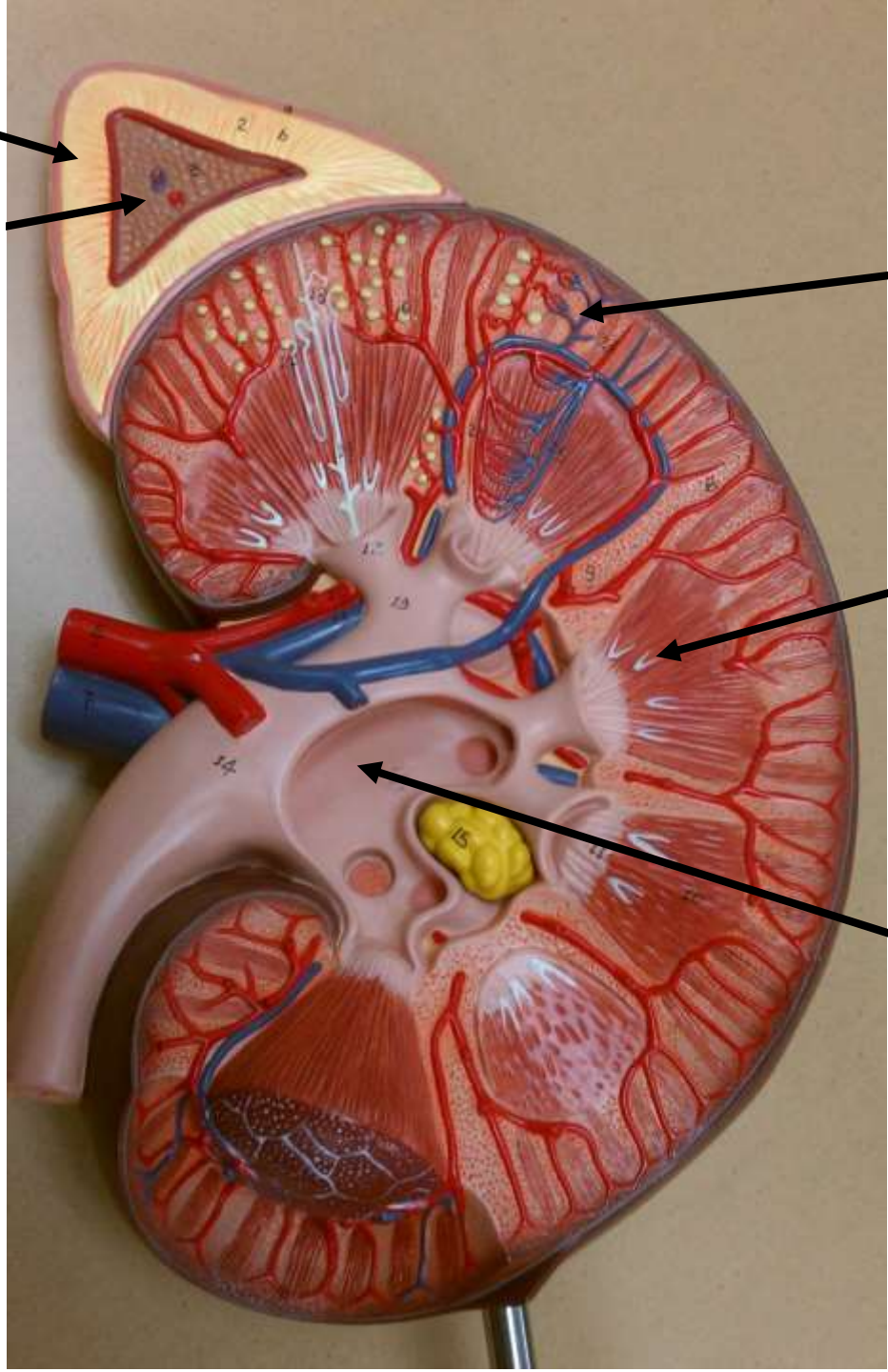
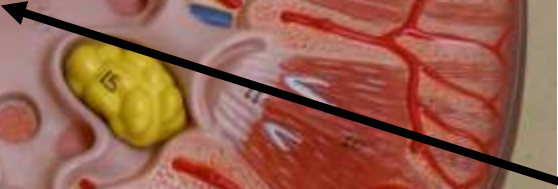
Renal Cortex



Renal Medulla



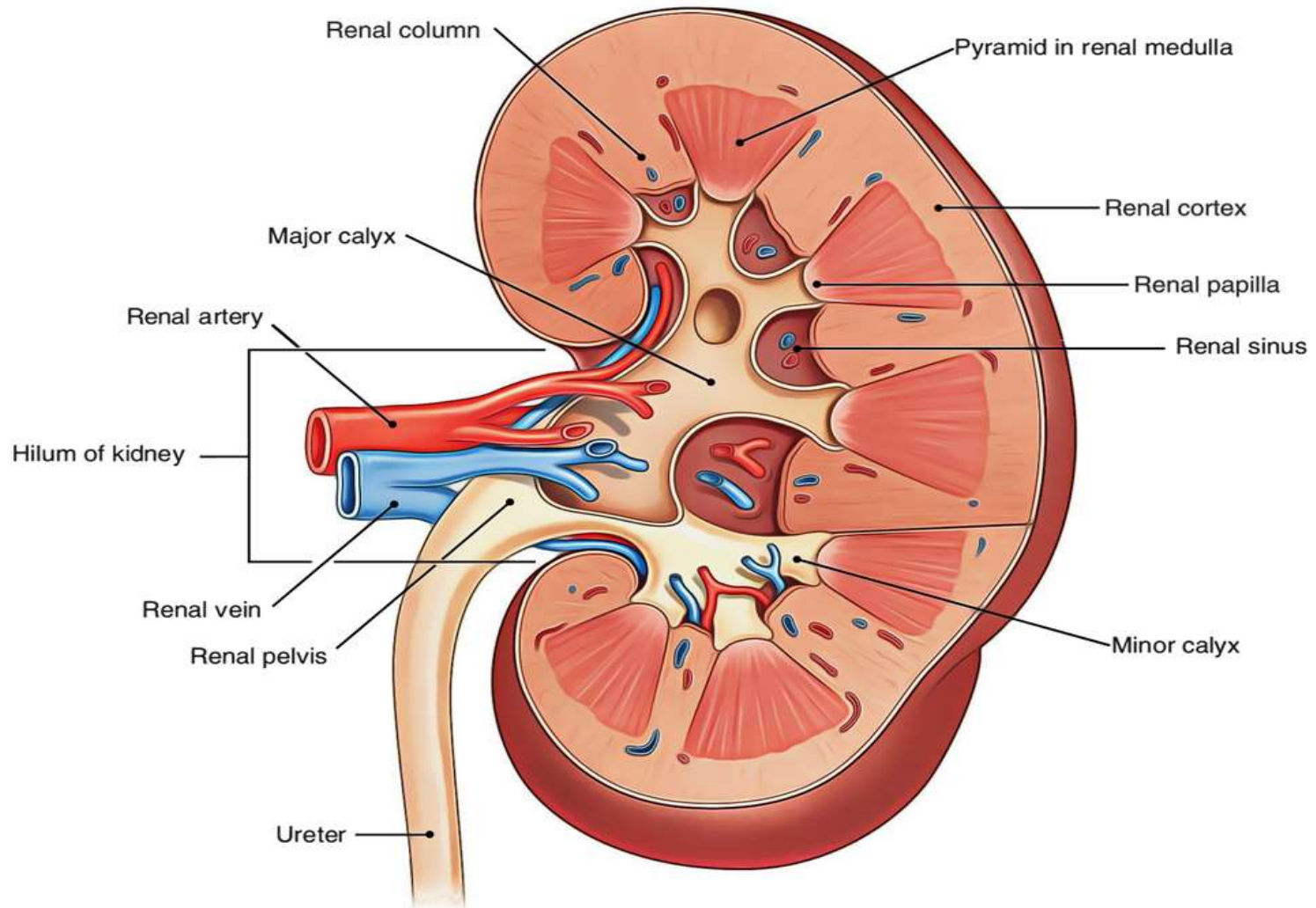
Renal pelvis



Renal Structure

- A dozen renal pyramids having base towards the cortex and apex known as **Renal papilla** towards medially.
- Medullary pyramids have striped appearance due to presence of many collecting tubules.
- Tissue between pyramids is also a part of cortex and is known as **RENAL COLUMNS.**

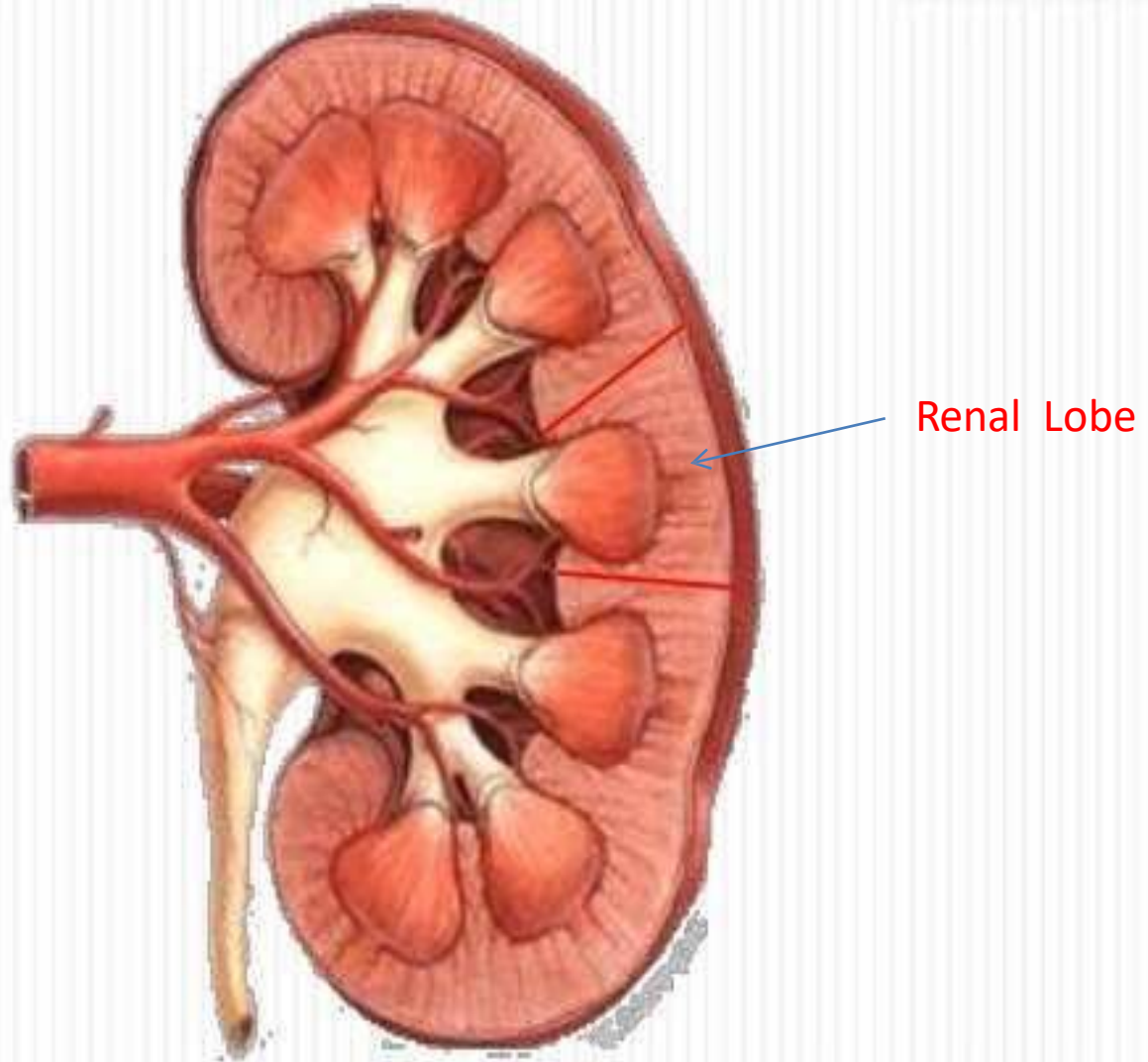
Renal Structure



Renal Structure

- Tissue between base of pyramid and surface of kidney is known as **CORTICAL LOBULE.**
- Cortical lobules show striations are called **MEDULLARY RAYS.**
- Pyramid and the cortex around it constitute **LOBE OF KIDNEY.**
- Each kidney has *8-18 lobes.*

RENAL LOBE



Relations of Right Kidney

Anteriorly

- The suprarenal gland
- Liver
- Second part of duodenum
- Right colic flexure.

Posteriorly

- The diaphragm,
- 12th rib
- Psoas, quadratus lumborum and transversus abdominis muscles.
- Subcostal, iliohypogastric and ilioinguinal nerves run downward and laterally

Relations of Left Kidney

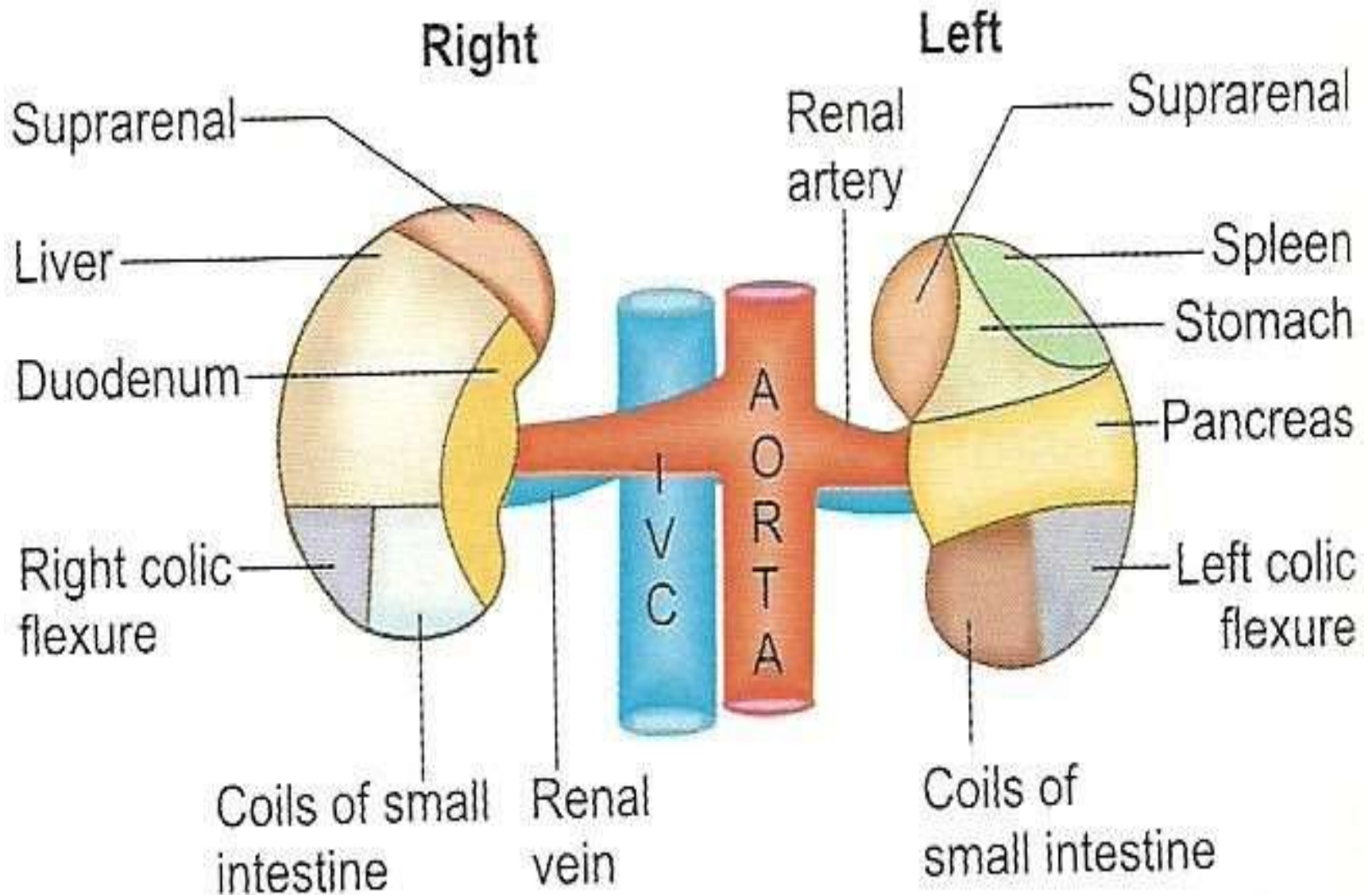
Anteriorly

- The suprarenal gland
- Spleen
- Stomach
- Pancreas
- Left colic flexure
- Small intestine

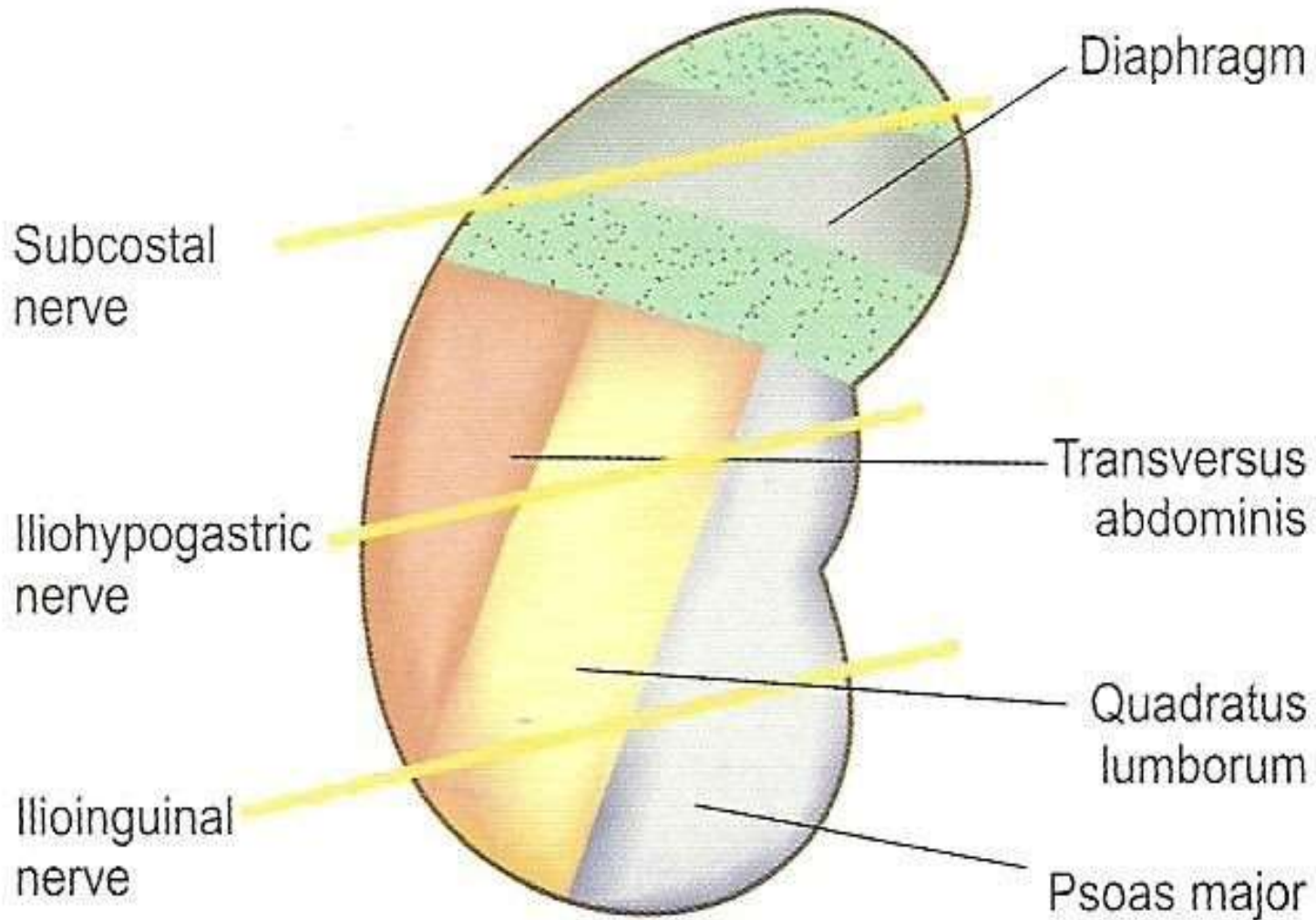
Posteriorly

- The diaphragm,
- 11th and 12th rib
- Psoas, quadratus lumborum and transversus abdominis muscles.
- Subcostal, iliohypogastric and ilioinguinal nerves run downward and laterally

Relations - Anterior



Relations - Posterior



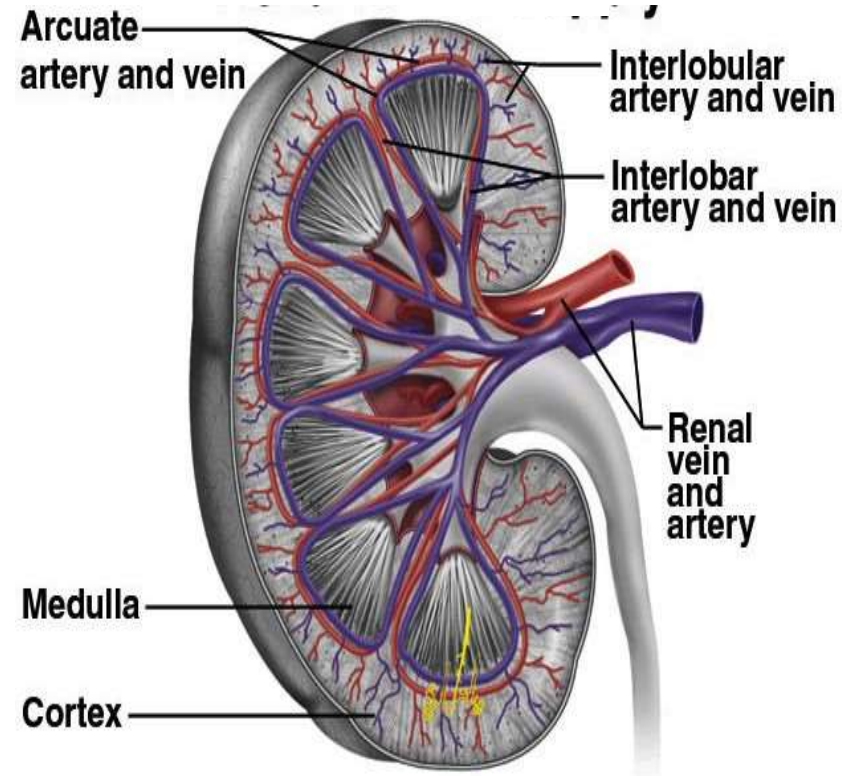
Blood Supply

Arterial Supply:

- Renal arteries which are the direct branches of abdominal aorta & are large in size arises at the level of 2nd lumbar vertebra.

Venous Drainage:

- Renal veins, ends in inferior vena cava. The left renal vein is longer than the right.



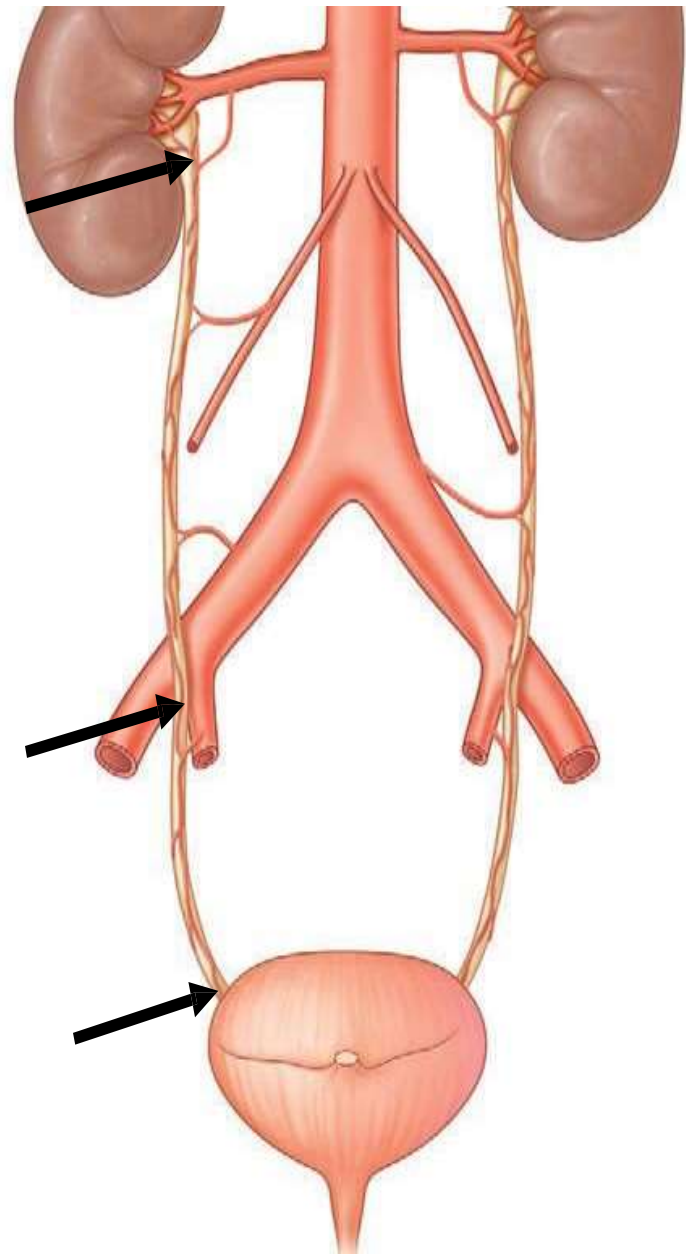
- **Nerve Supply:** Sympathetic fibers derived from T₁₀, L₁ segments and parasympathetic fibers from vagus nerve.
- **Lymphatic drainage:** into lateral aortic nodes.

Ureter

- The ureters are pair of narrow thick walled muscular tubes which convey urine from the kidneys to urinary bladder.
- Each ureter measures about 25 cm long.
- The upper half lies in the abdomen and the lower half in the pelvis.
- It measures 3 mm diameter, but it slightly constricted at three places.

Ureteric constrictions sites

1. Ureteropelvis junction
2. Pelvic brim
3. Entrance to bladder



Parts

- For the purpose of description, ureter is divided into 2 parts
 - From the site of origin to pelvic brim- abdominal part
 - From pelvic brim to entry into urinary bladder- pelvic part

Relations of Right Ureter

Anteriorly

- Duodenum
- Terminal part of ileum
- Right colic and ileocolic vessels
- Right testicular or ovarian vessels

Posteriorly

- Right psoas muscle
- Bifurcation of right common iliac artery.

Relations of Left Ureter

Anteriorly

- The sigmoid colon
- Left colic vessels
- Right testicular or ovarian vessels

Posteriorly

- Left psoas muscle
- Bifurcation of left common iliac artery

Blood Supply

The arterial supply is as follow

- **Upper end**: the renal artery
- **Middle portion**: the testicular or ovarian artery
- **In pelvis** : superior vesical artery
- **Venous blood** drains into veins that correspond to the arteries.

- Lymph drain into the lateral aortic nodes and the iliac nodes.
- Nerve supply is the renal , testicular or ovarian and hypogastric plexuses