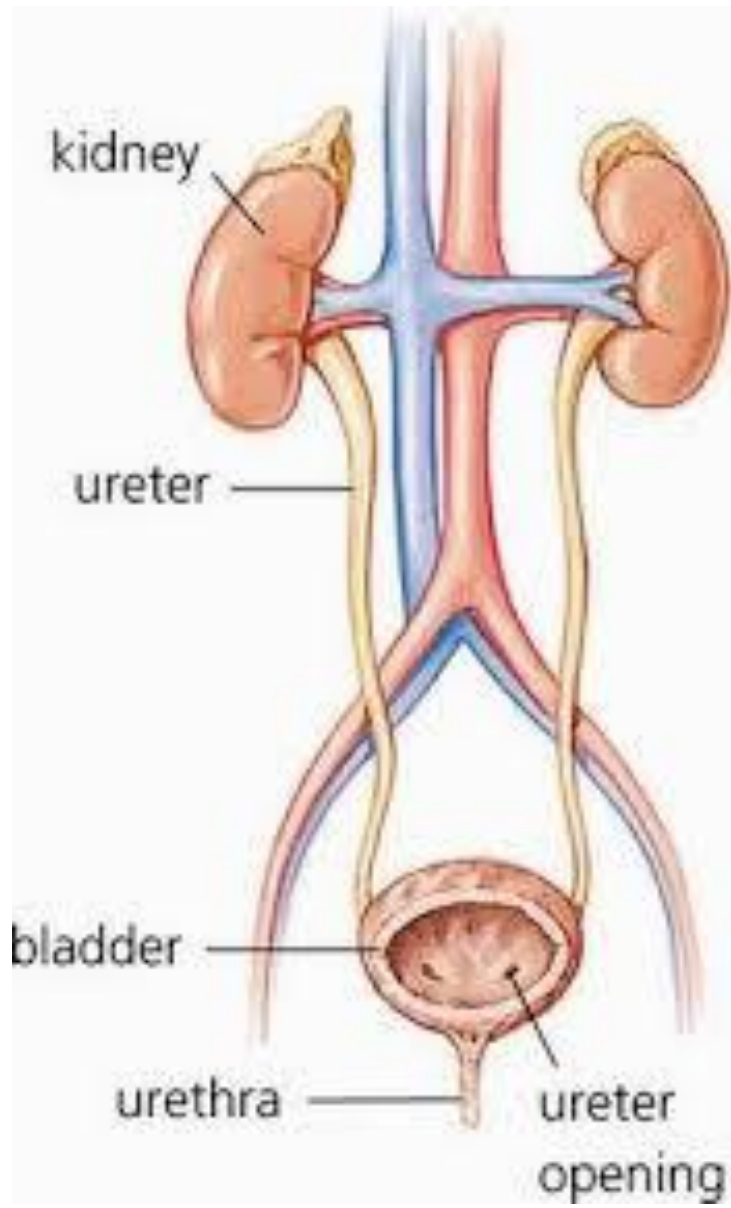


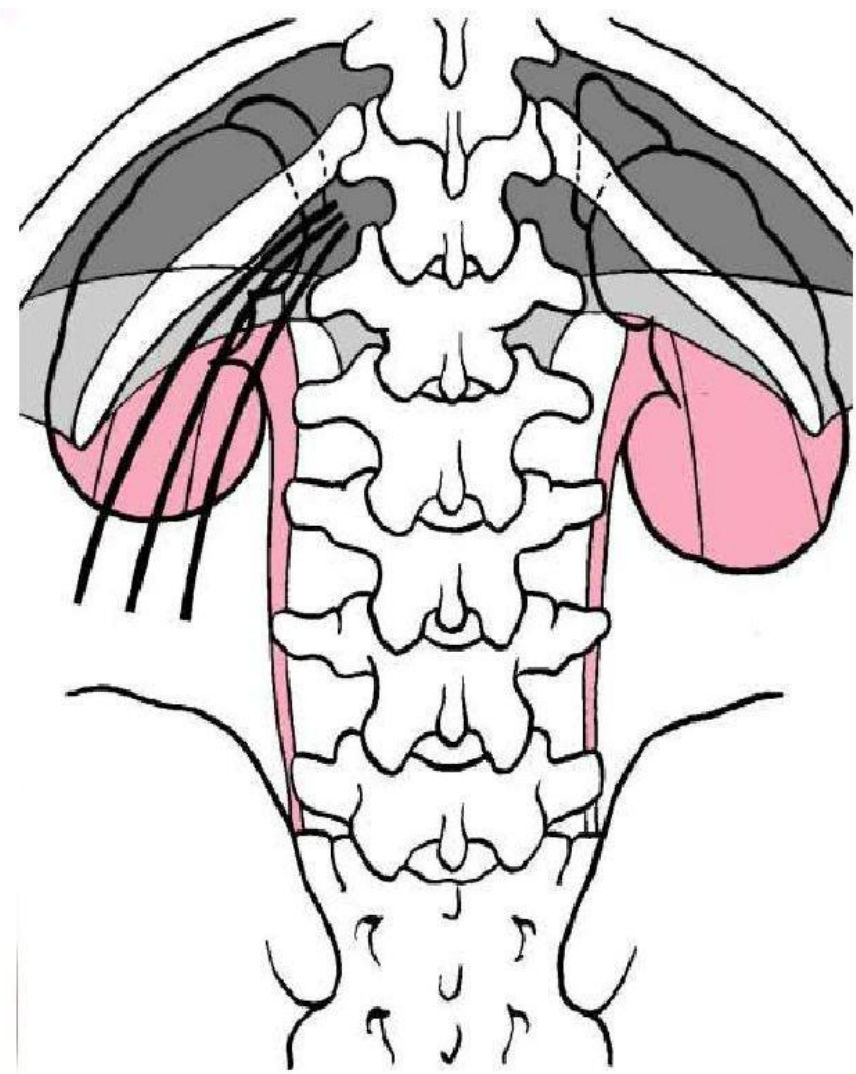
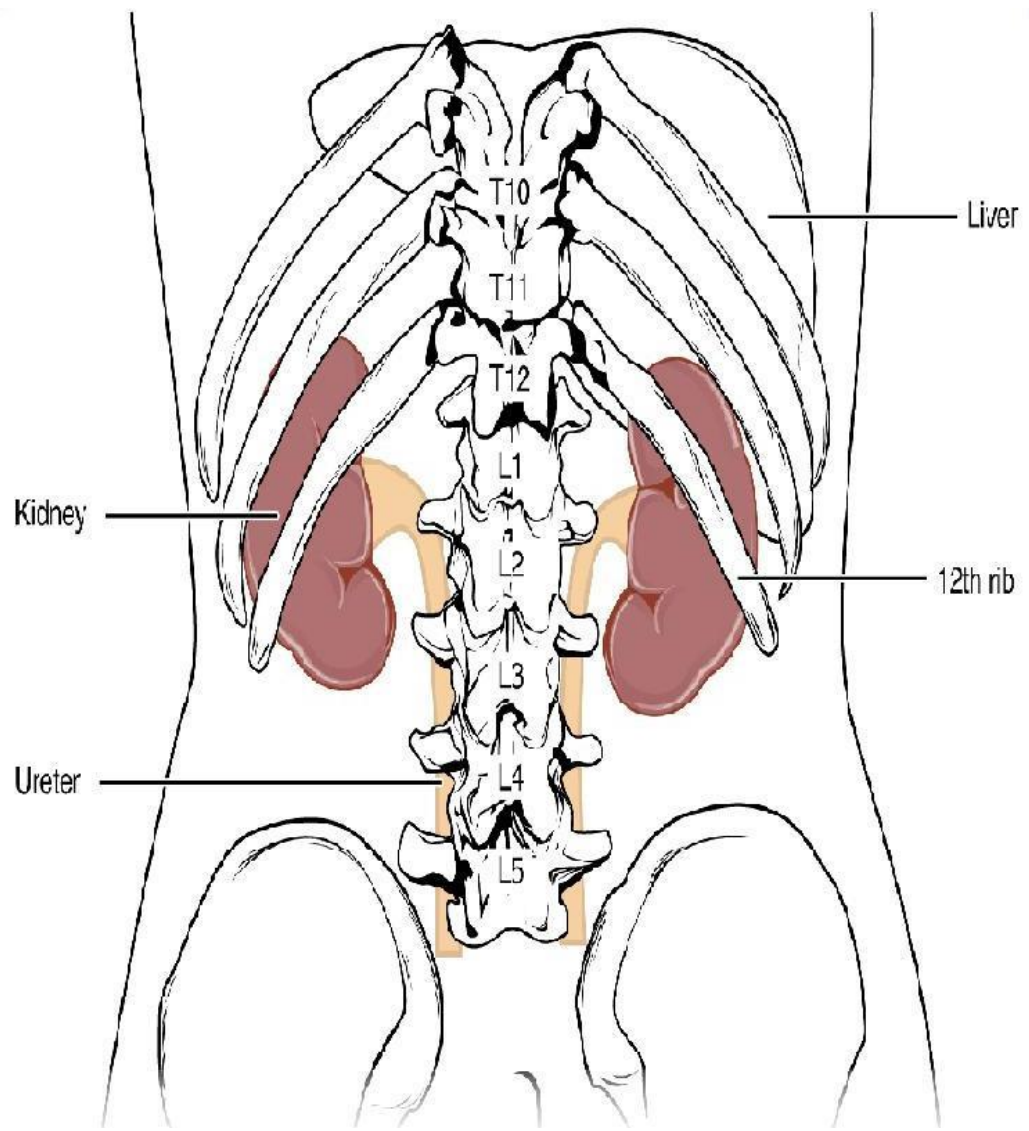
Urinary System

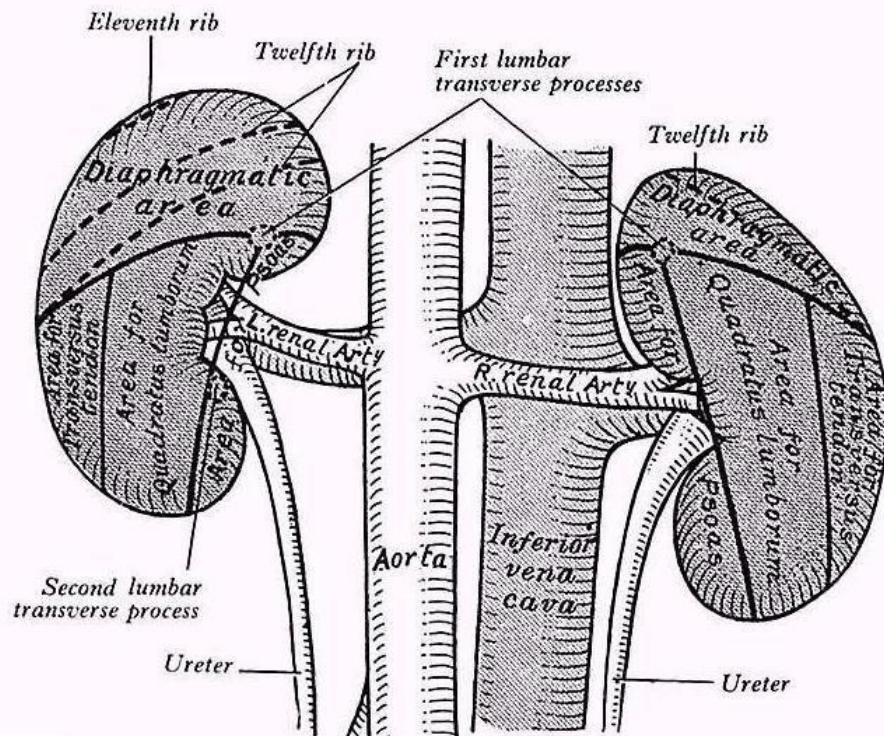
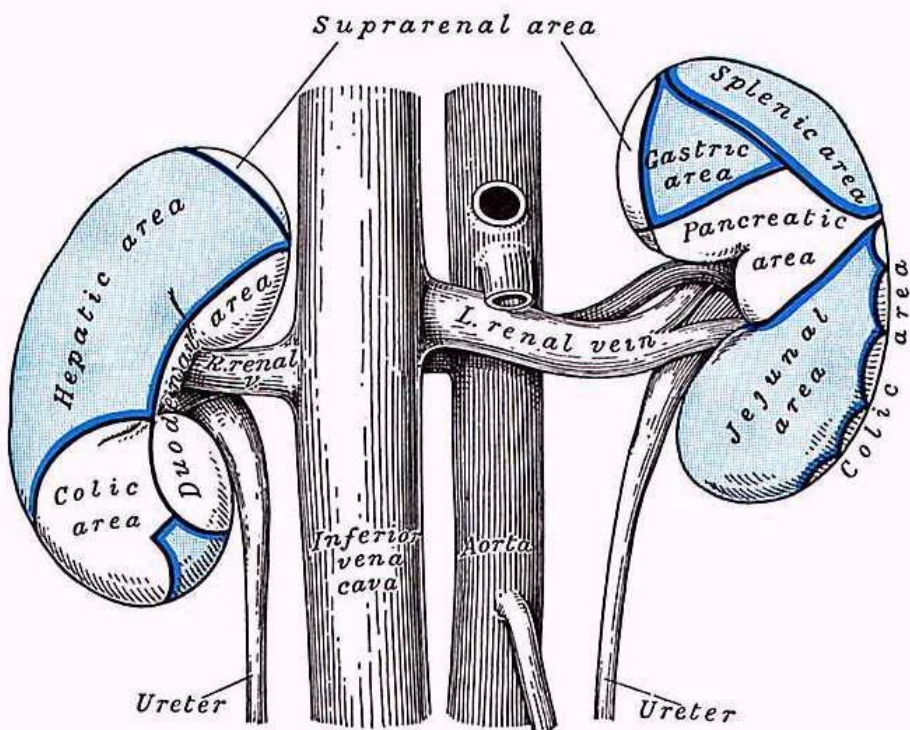
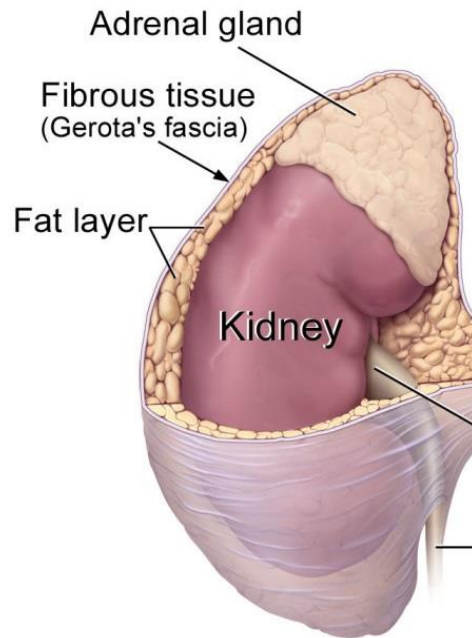
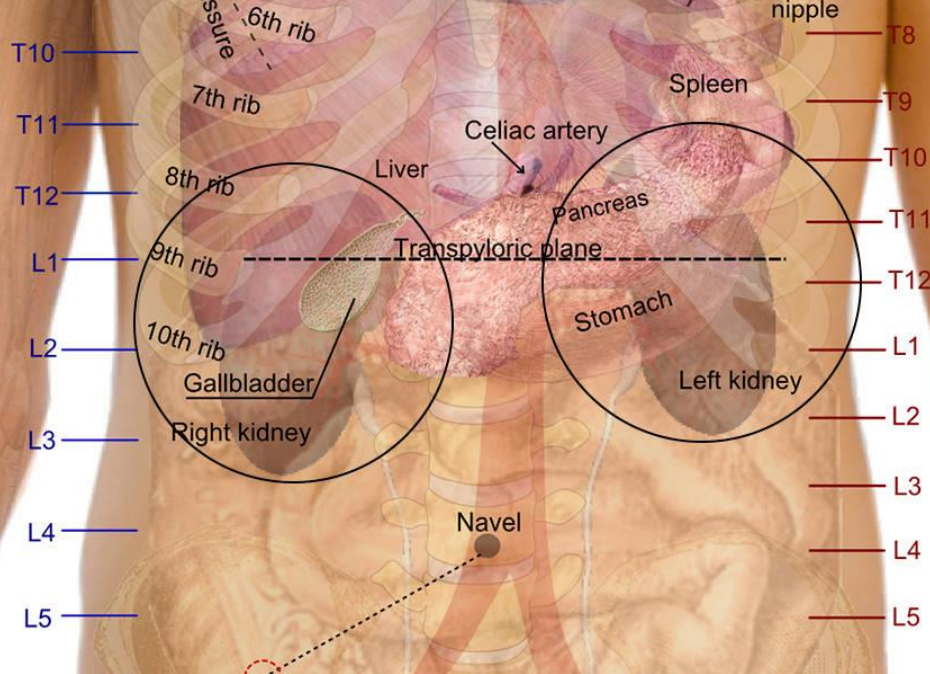


Department of Anatomy
Second Faculty of Medicine
Charles University

MUDr. Azzat Al-Redouan

ORGAN PROJECTION AND SYNTOPY





Liver

Right Kidney

Hepatic Flexure

Psoas Muscle

Ascending Colon

5th Lumbar Vertebrae

Sacrum

Spleen

Splenic Flexure

Left Kidney

12th Rib

Psoas Muscle

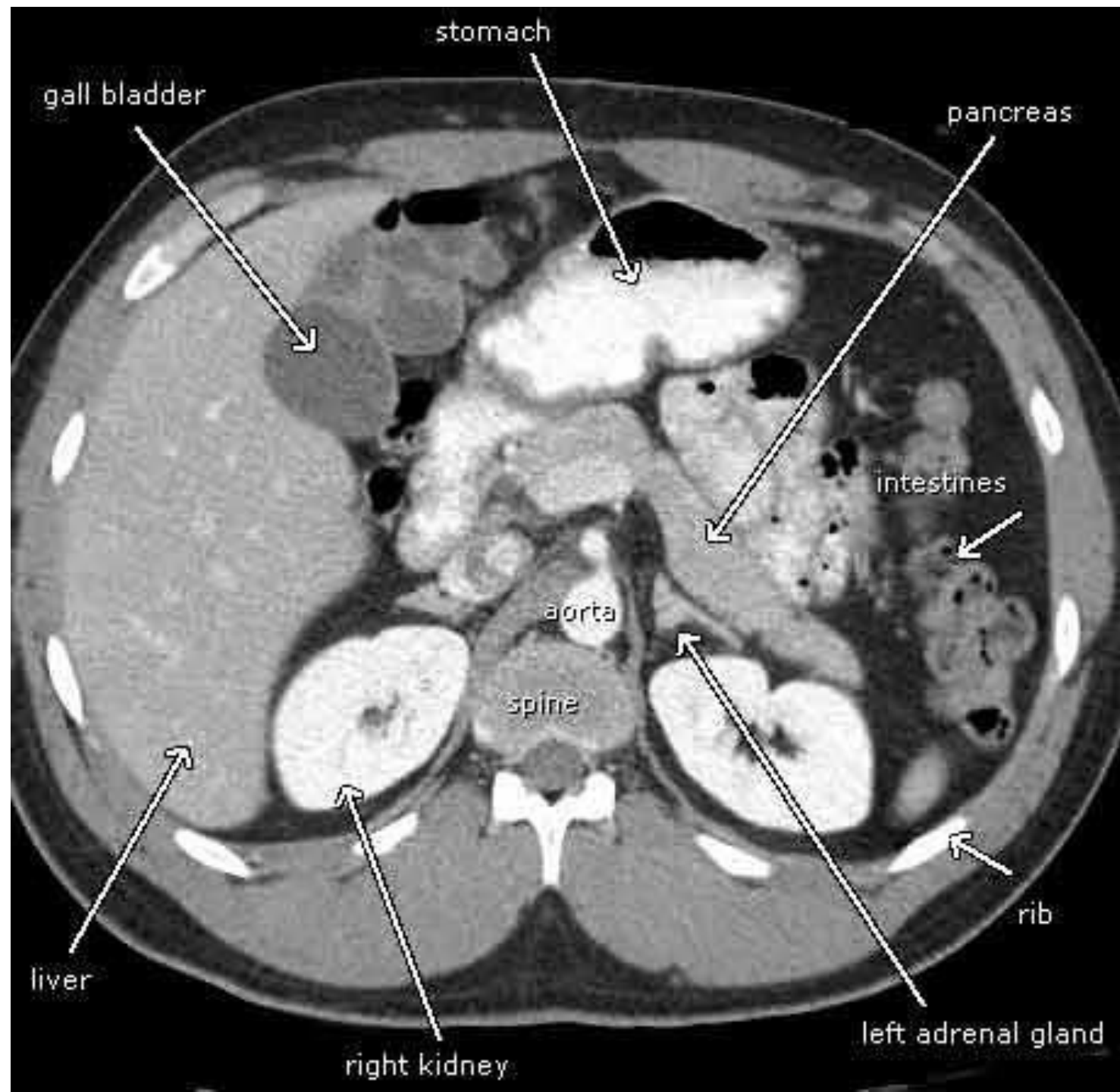
Descending Colon

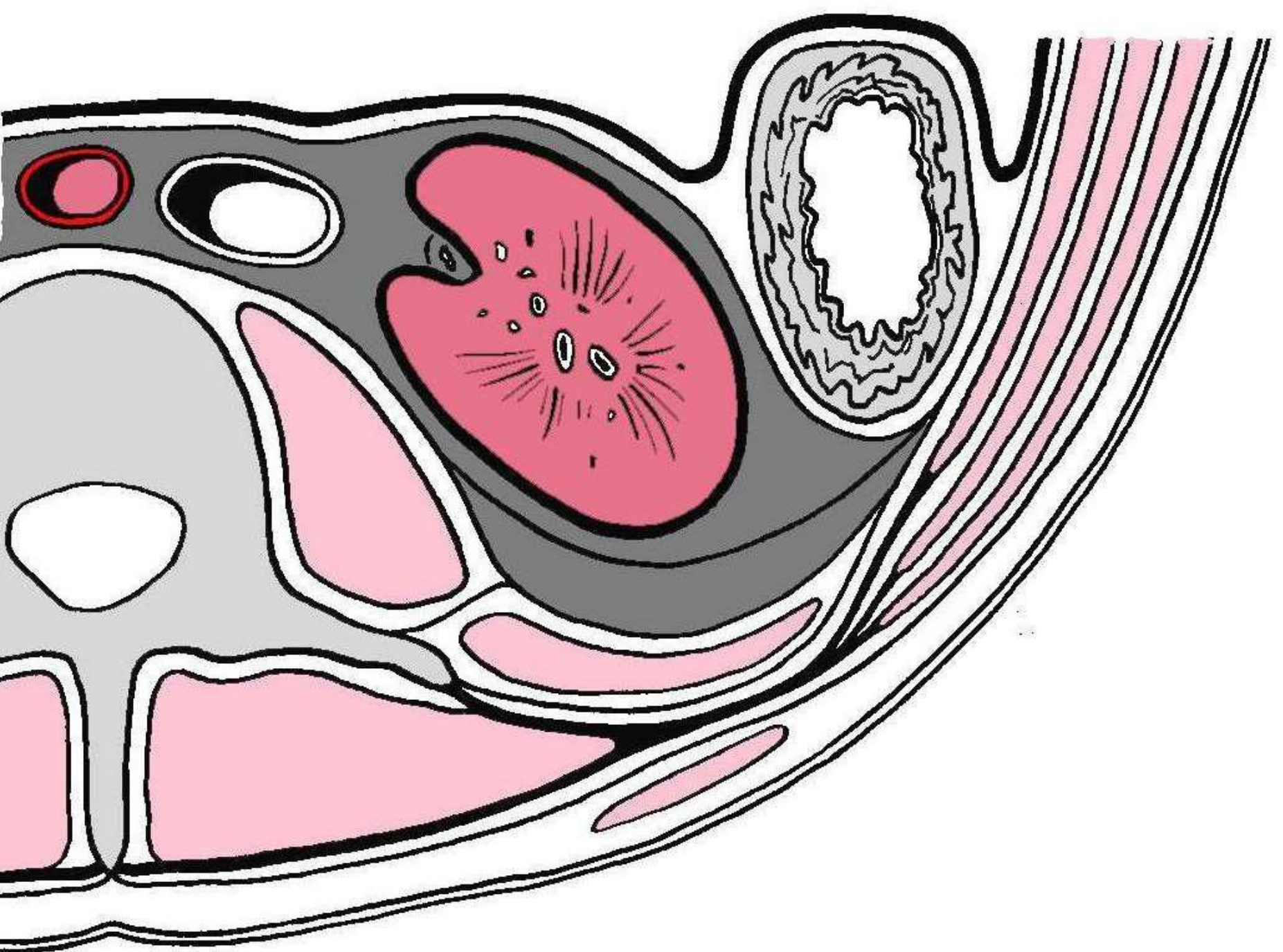
Iliac Wing

Left Femur

Symphysis Pubis

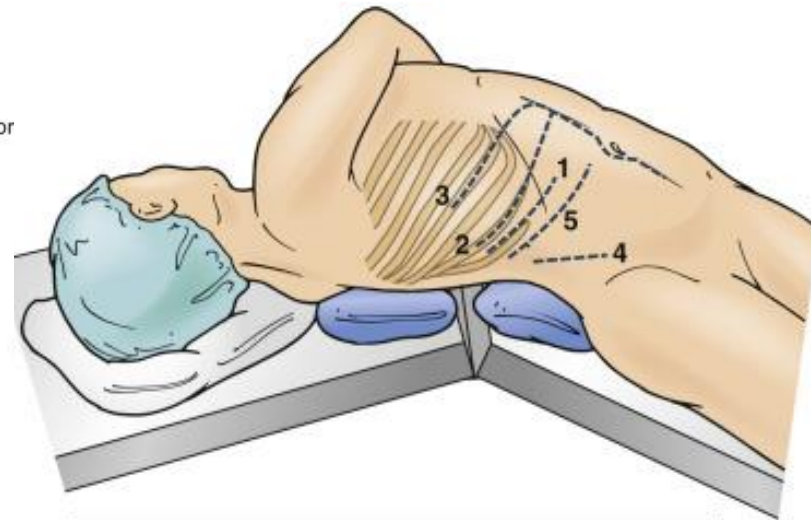
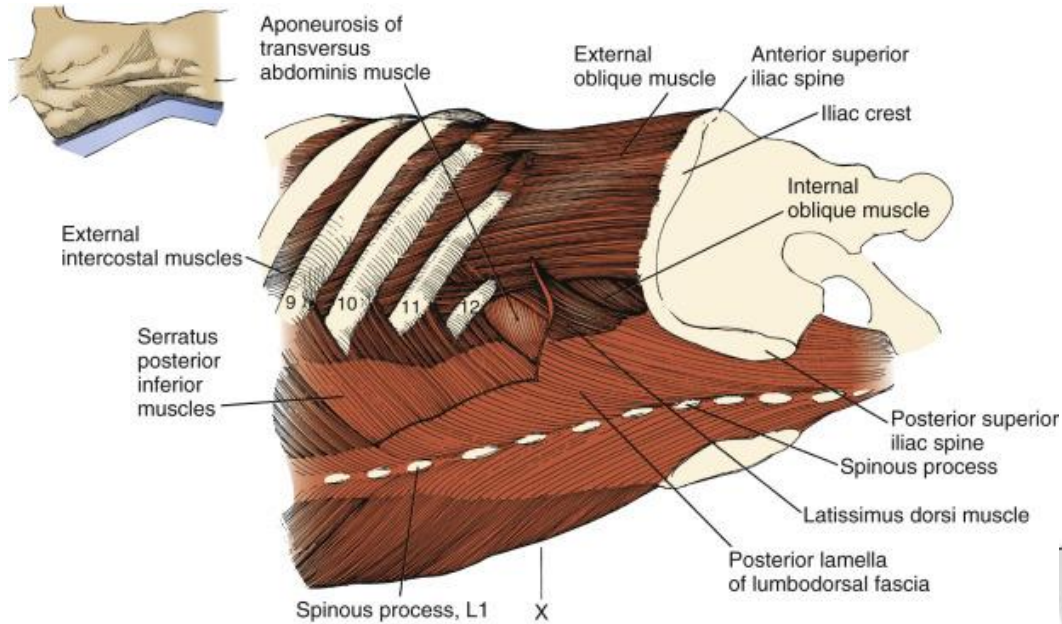
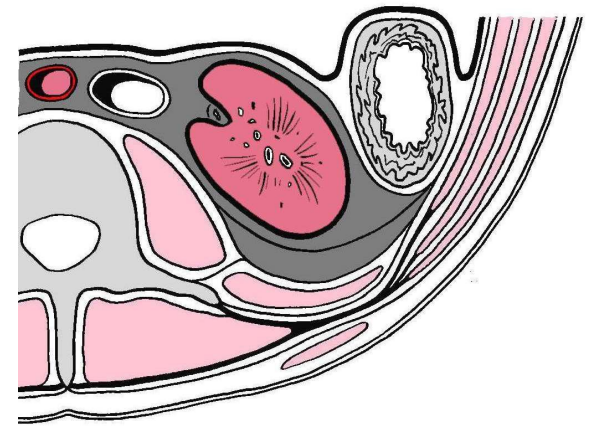






Operational Approach

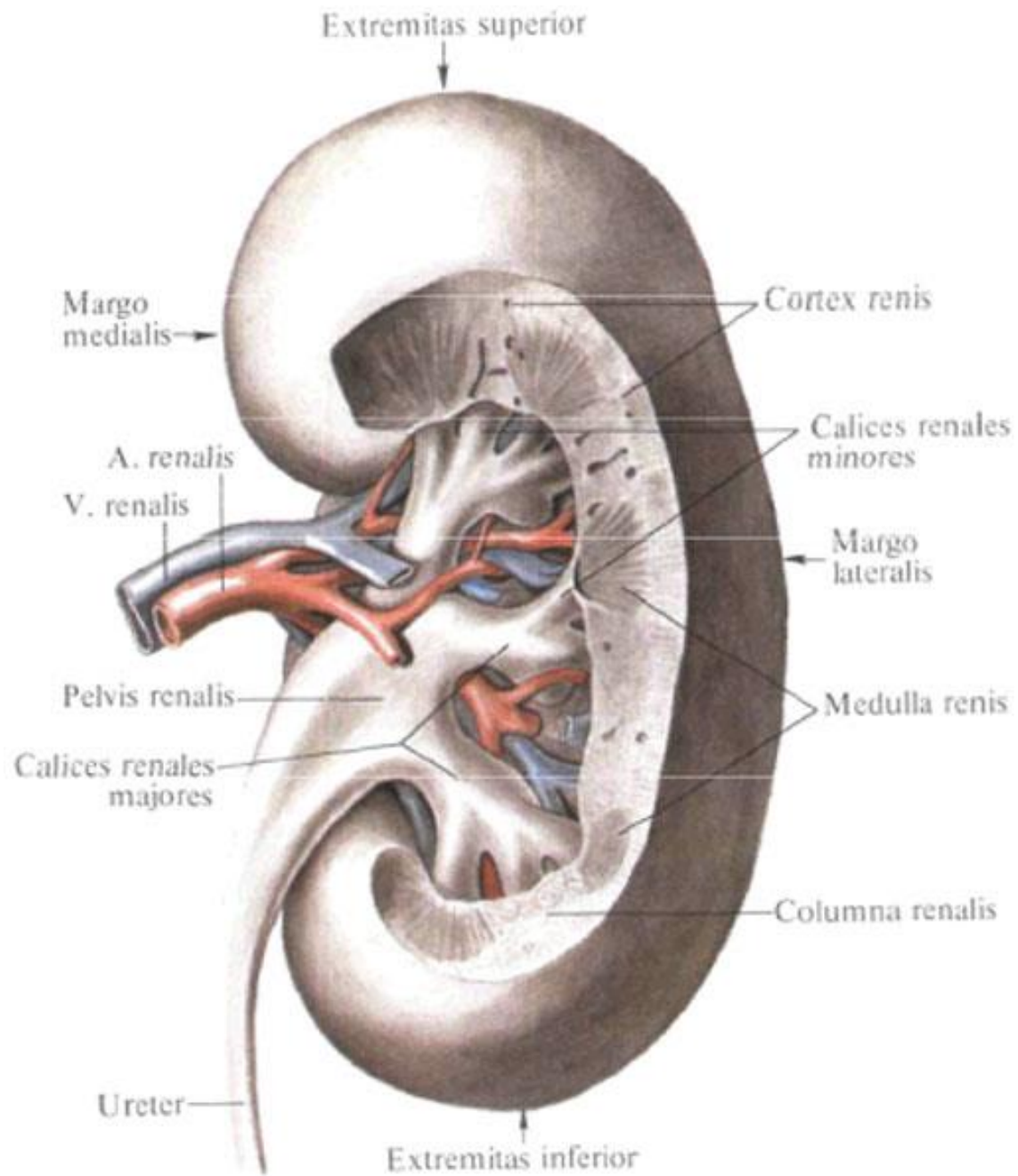
Site- Anatomy

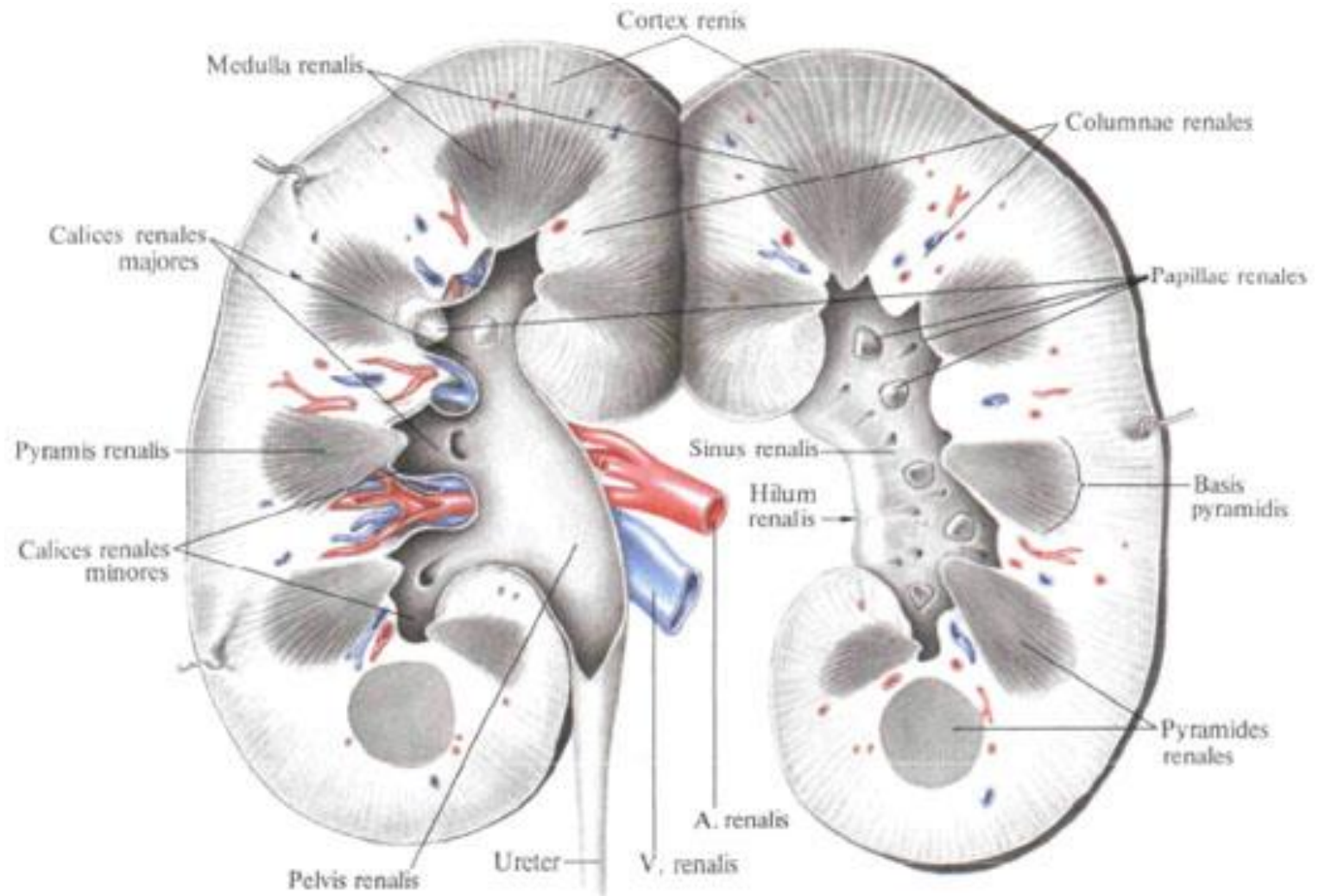


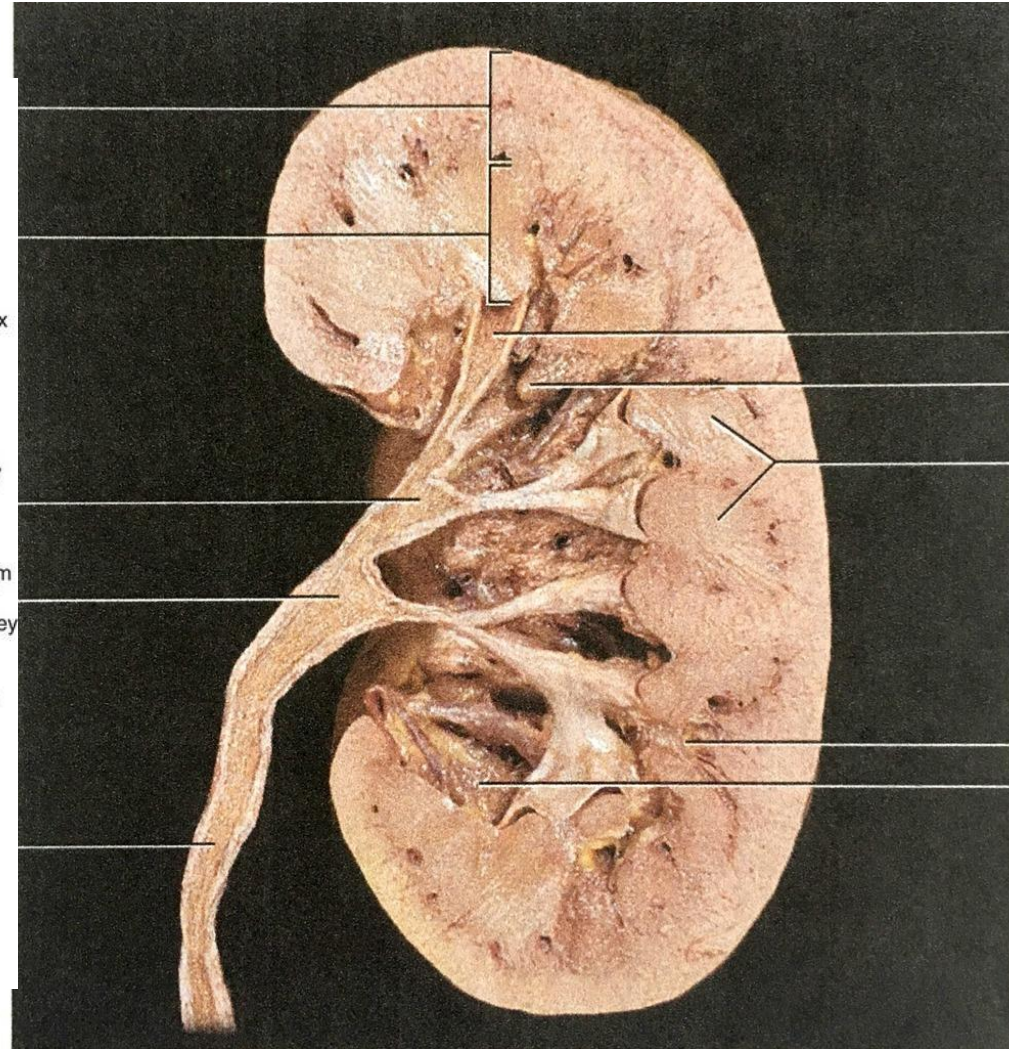
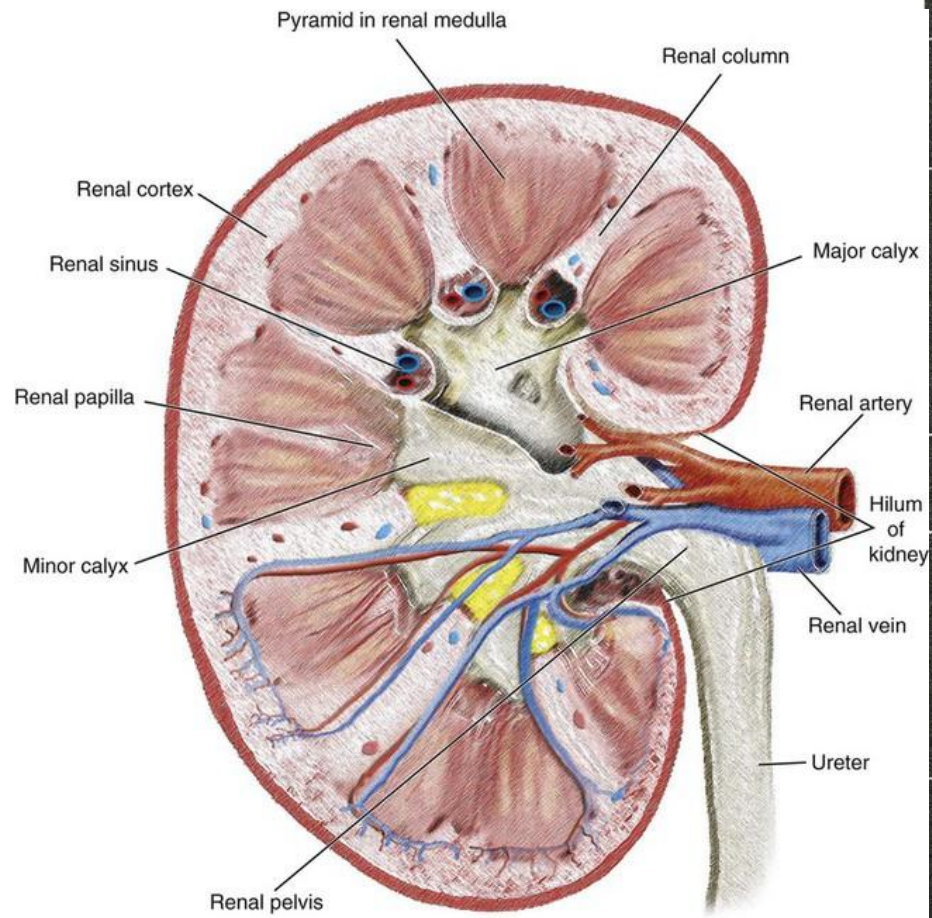
Flank Incisions

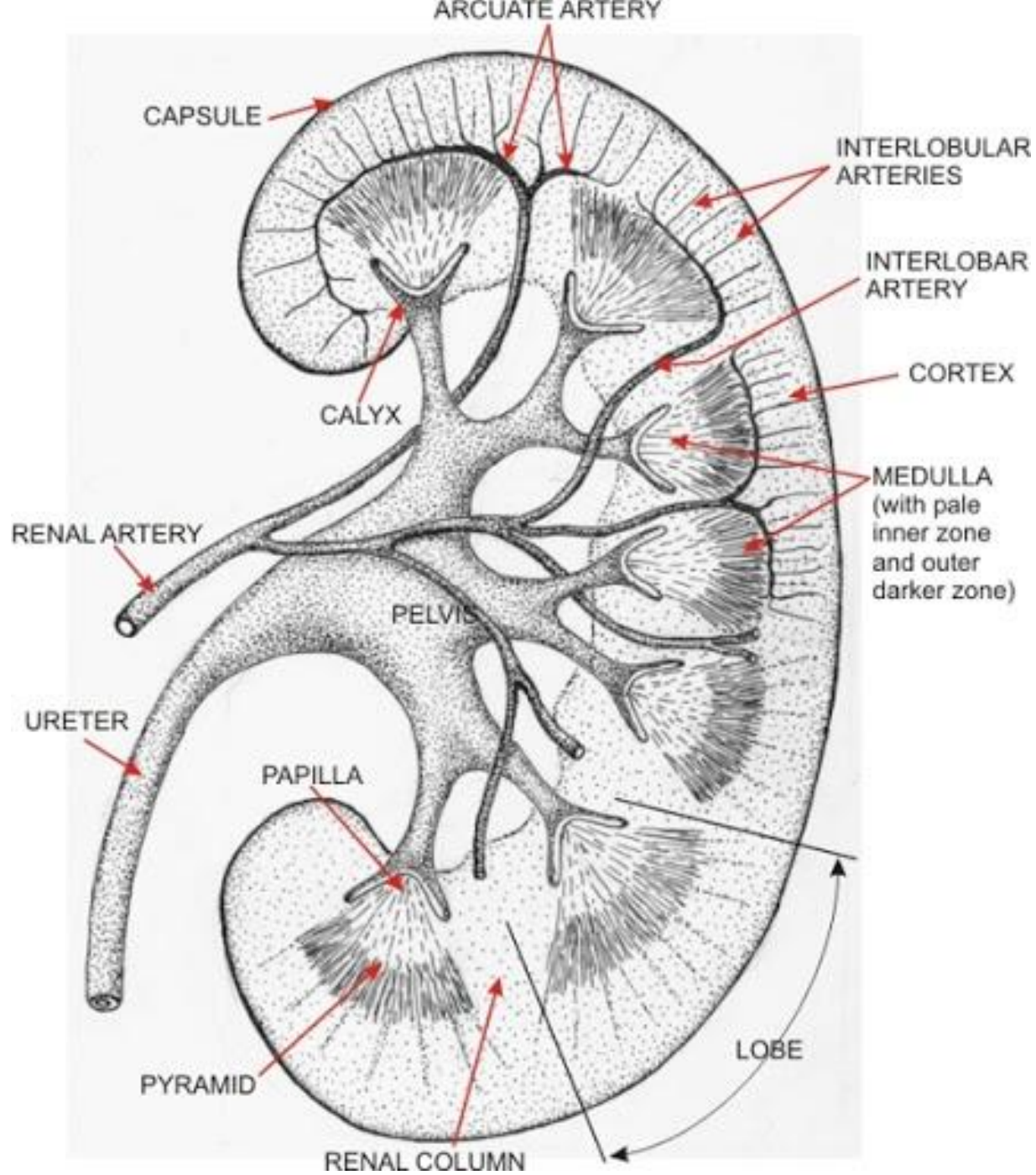
1. 12th rib supracostal
2. 11th rib transcostal
3. Thoracoabdominal
4. Foley muscle splitting
5. Flank subcostal

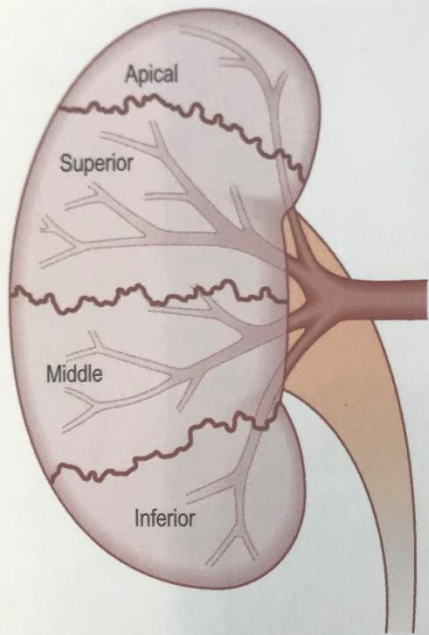
KIDNEY GROSS ANATOMY



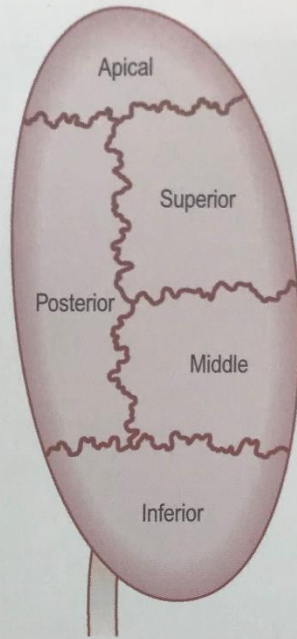




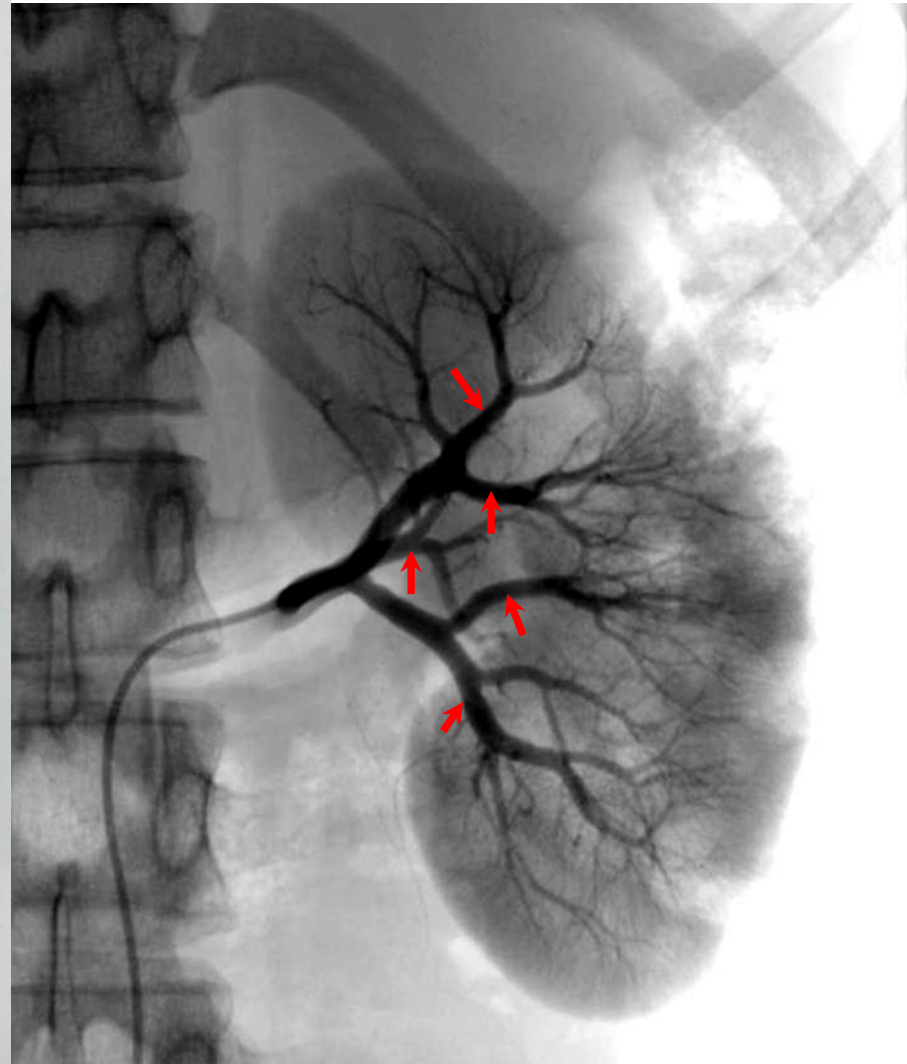
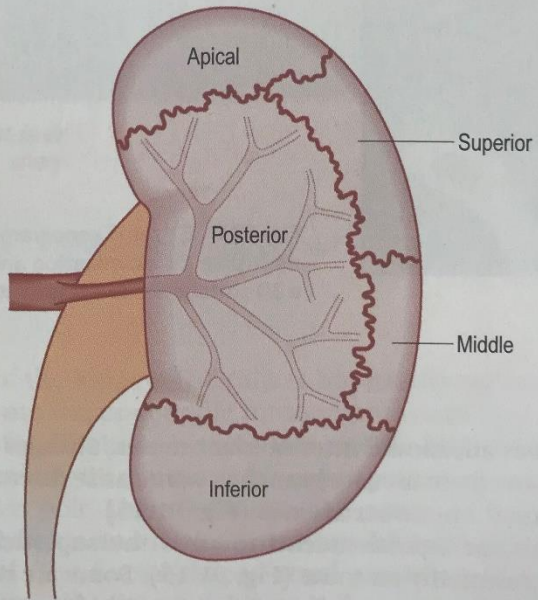




Anterior

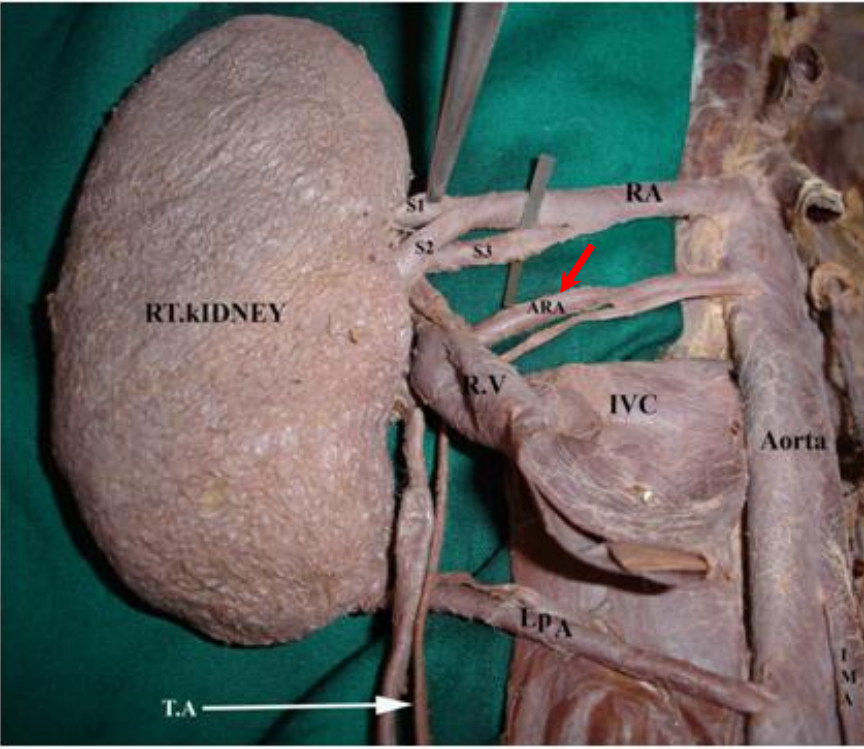
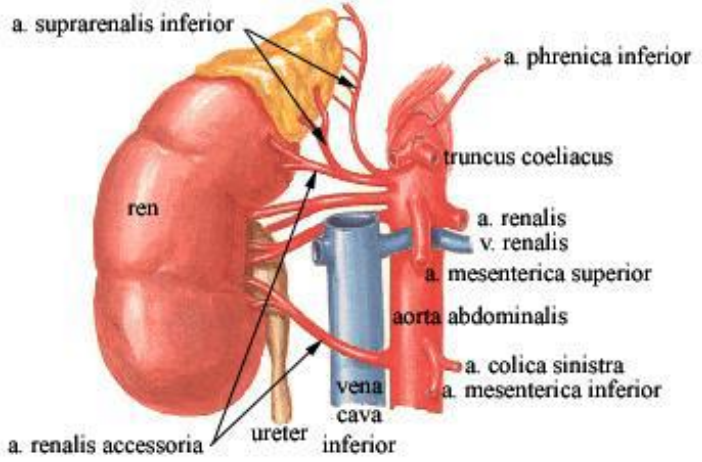


Lateral



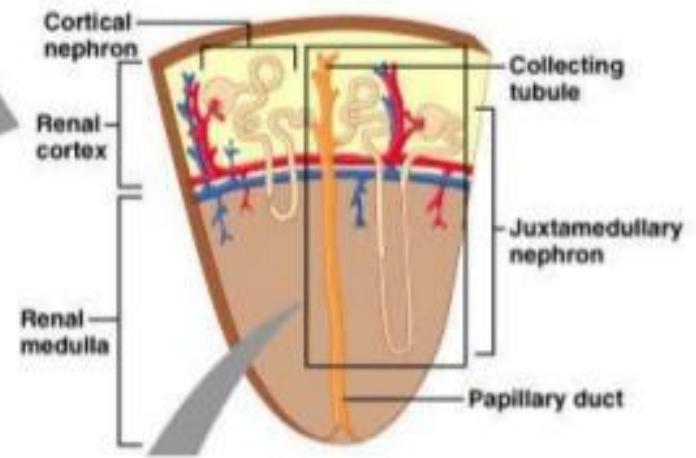
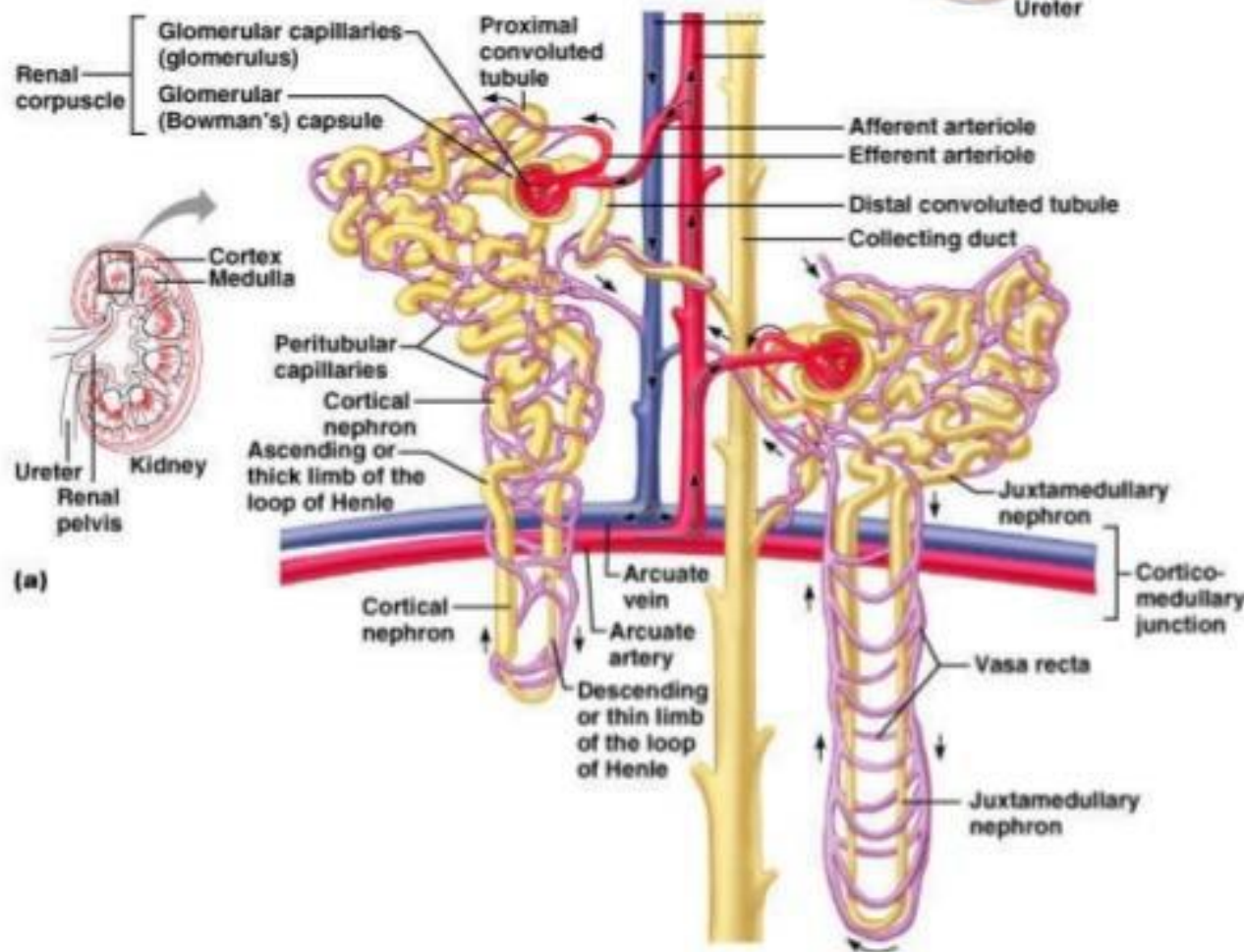
Accessory renal a.

ARTERIA RENALIS ACCESSORIA

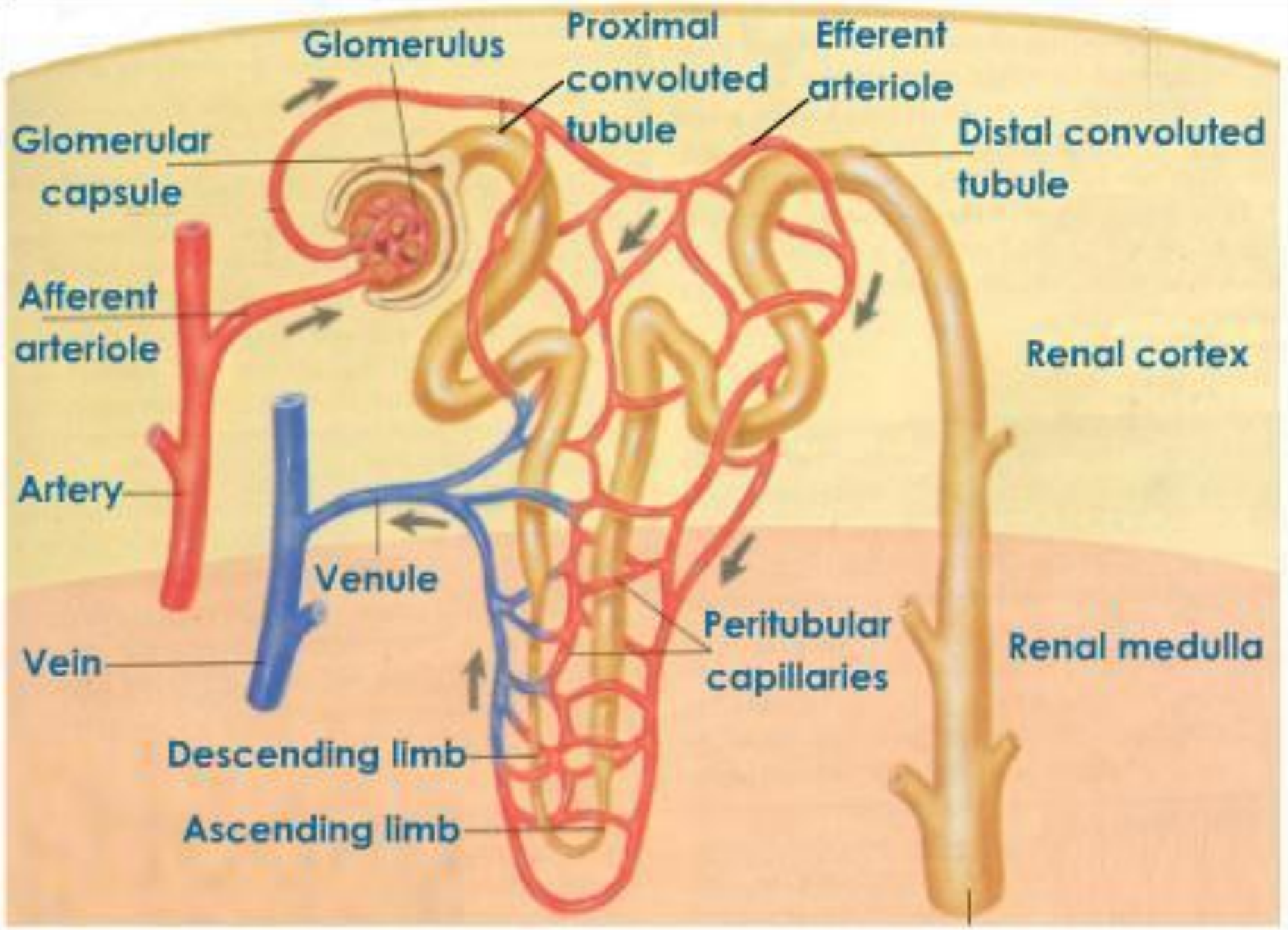


KIDNEY FUNCTIONAL ANATOMY

Classes of nephrons



- Cortical nephrons
 - 85% of all nephrons
 - Almost entirely within cortex
- Juxtamedullary nephrons
 - Renal corpuscles near cortex-medulla junction



2. Proximal convoluted tubule:

reabsorbs ions, water, and nutrients; removes toxins and adjusts filtrate pH

1. Glomerulus:

filters small solutes from the blood

5. Distal tubule:

selectively secretes and absorbs different ions to maintain blood pH and electrolyte balance

6. Collecting duct:

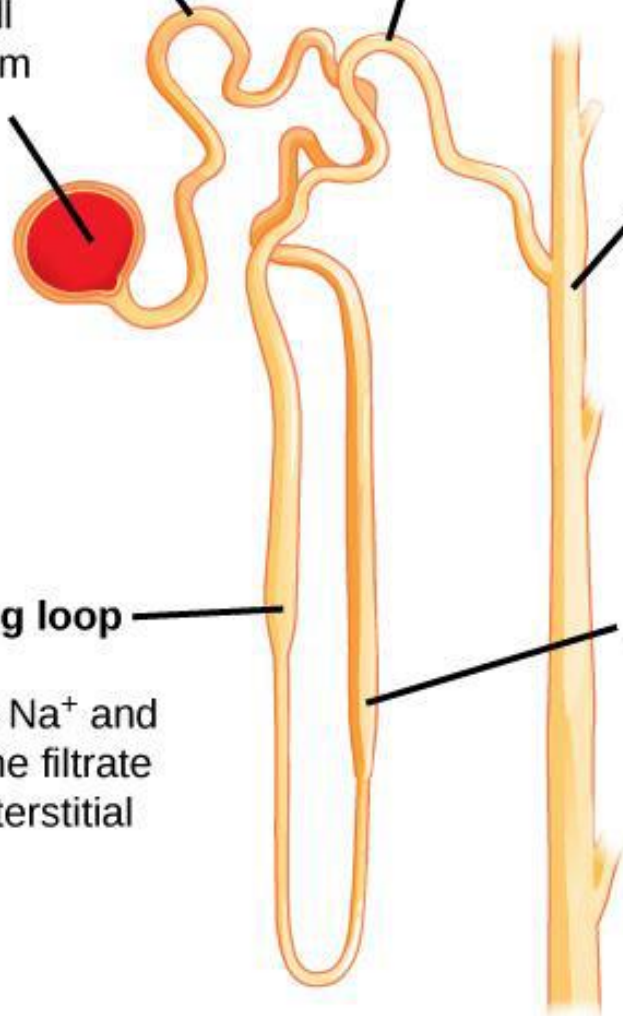
reabsorbs solutes and water from the filtrate

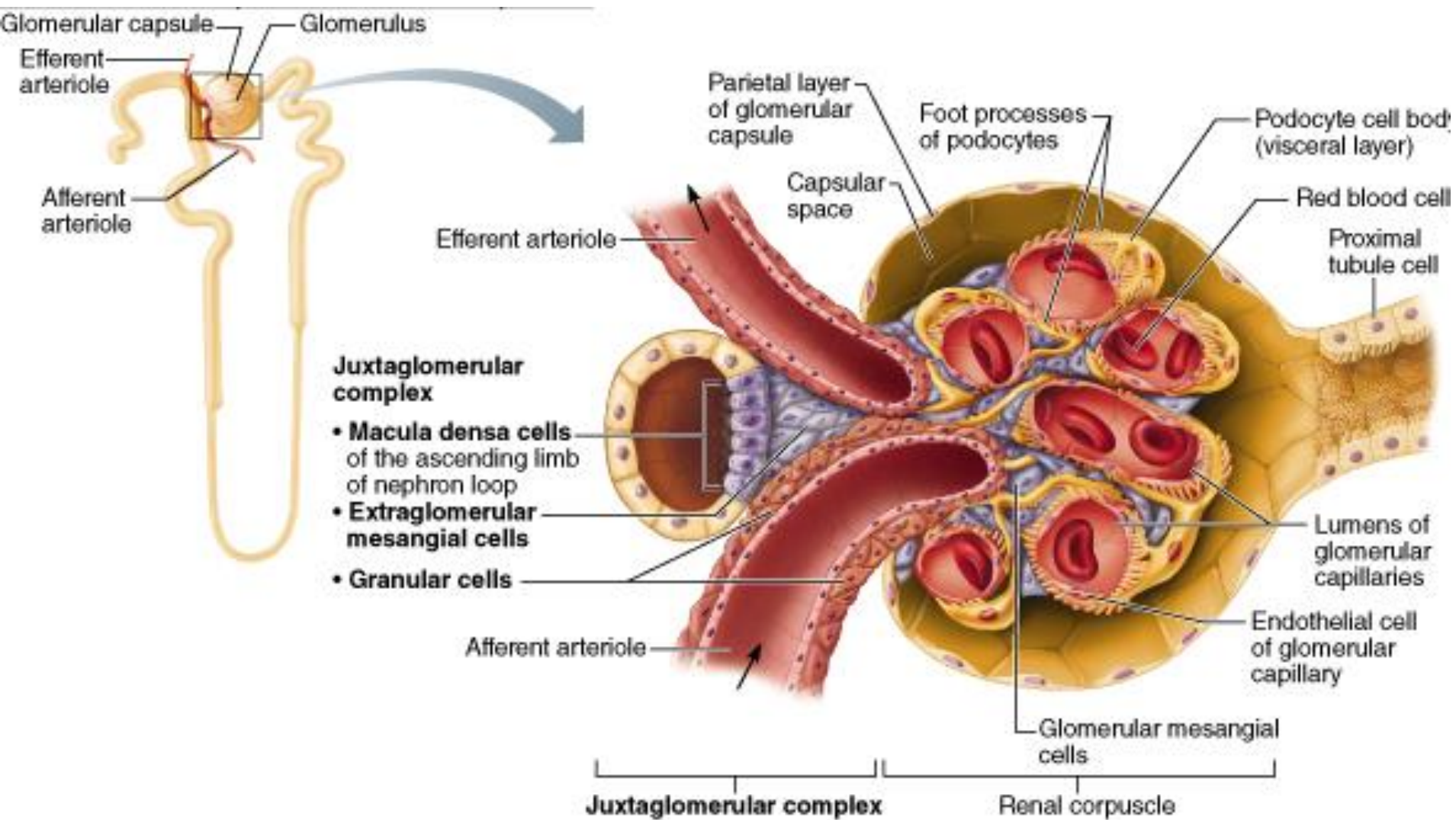
4. Ascending loop of Henle:

reabsorbs Na^+ and Cl^- from the filtrate into the interstitial fluid

3. Descending loop of Henle:

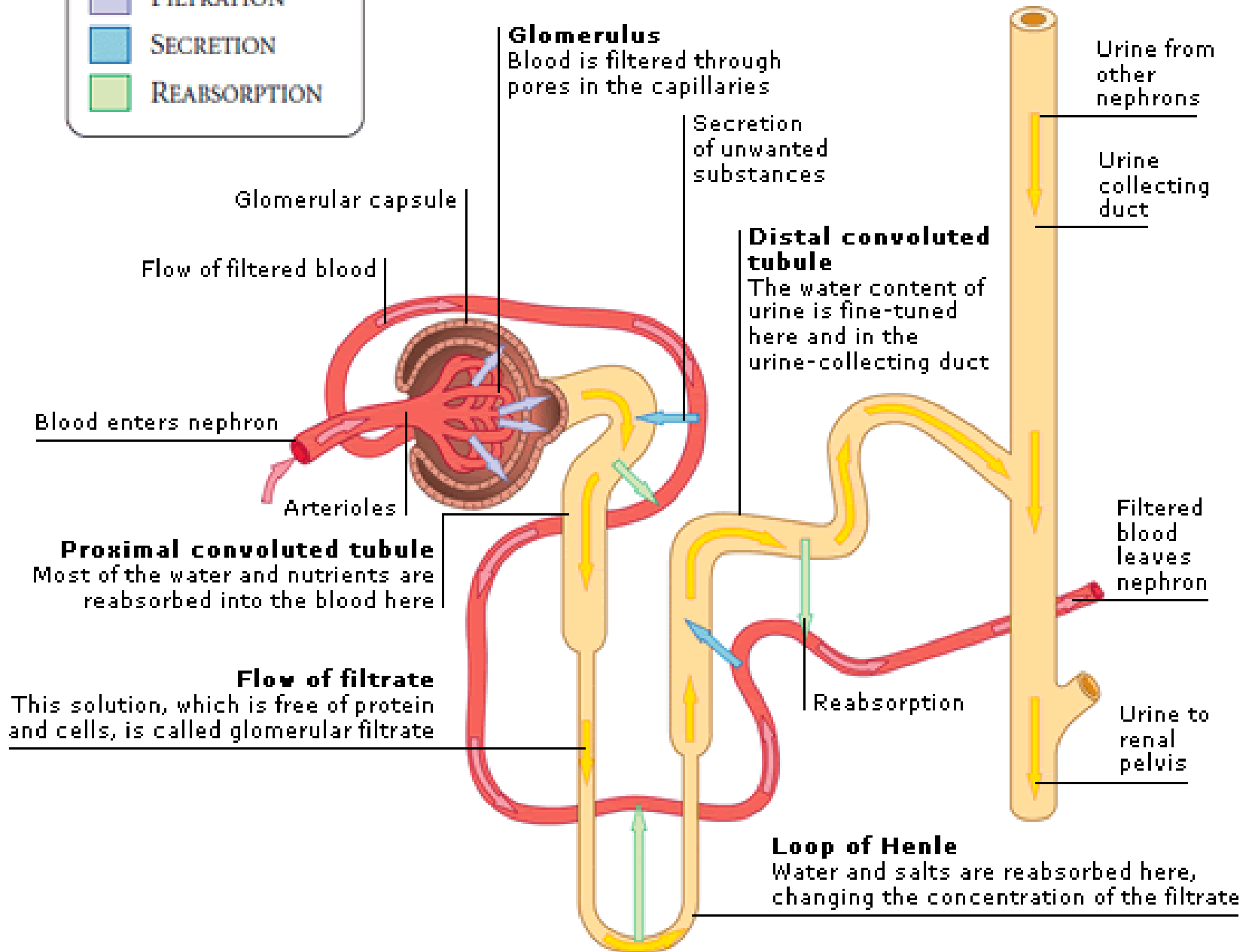
aquaporins allow water to pass from the filtrate into the interstitial fluid

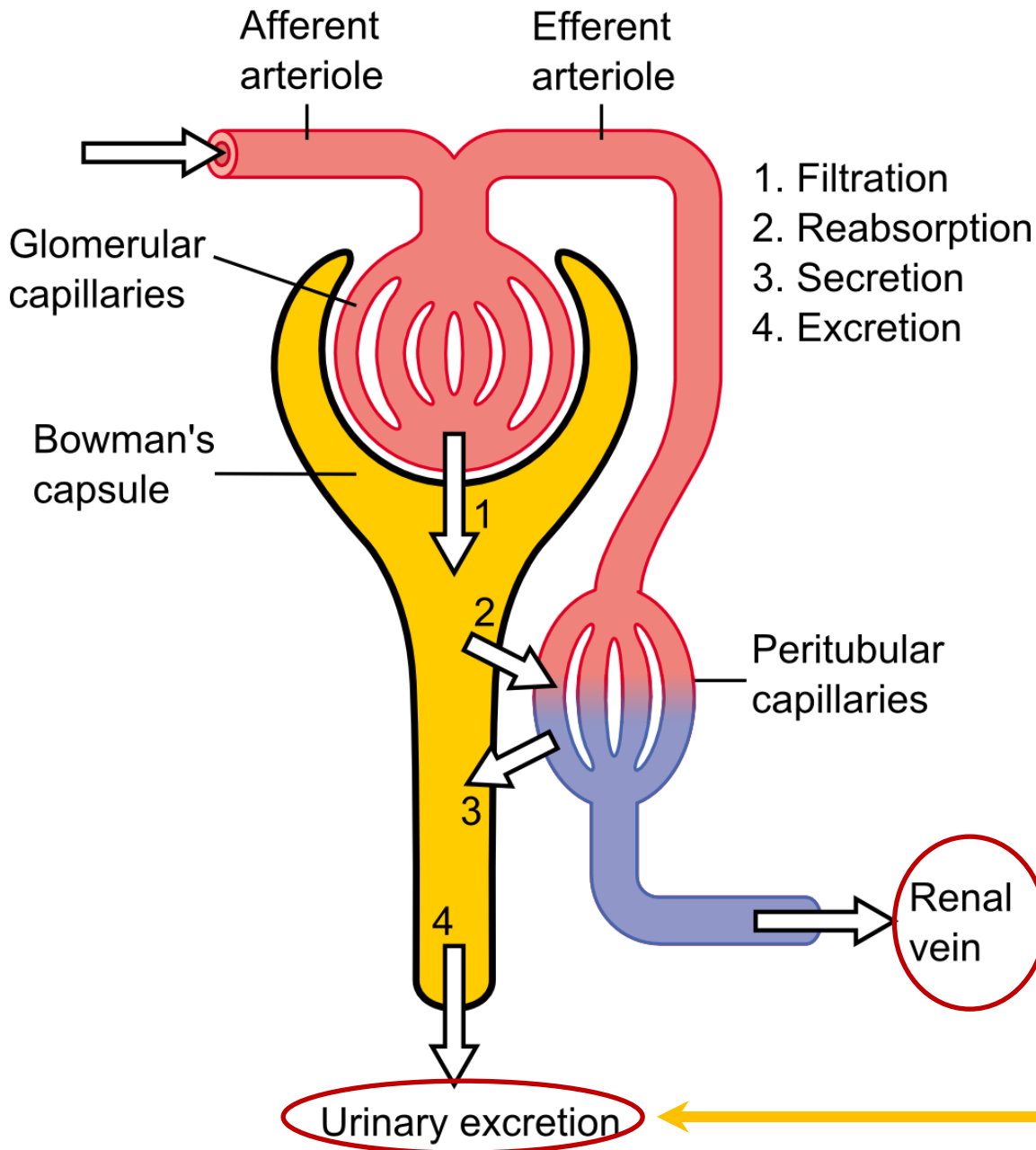




KEY

- FILTRATION
- SECRETION
- REABSORPTION





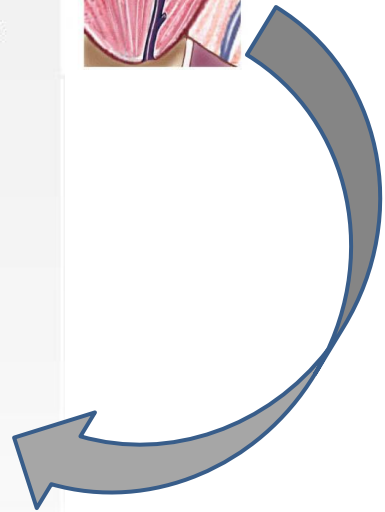
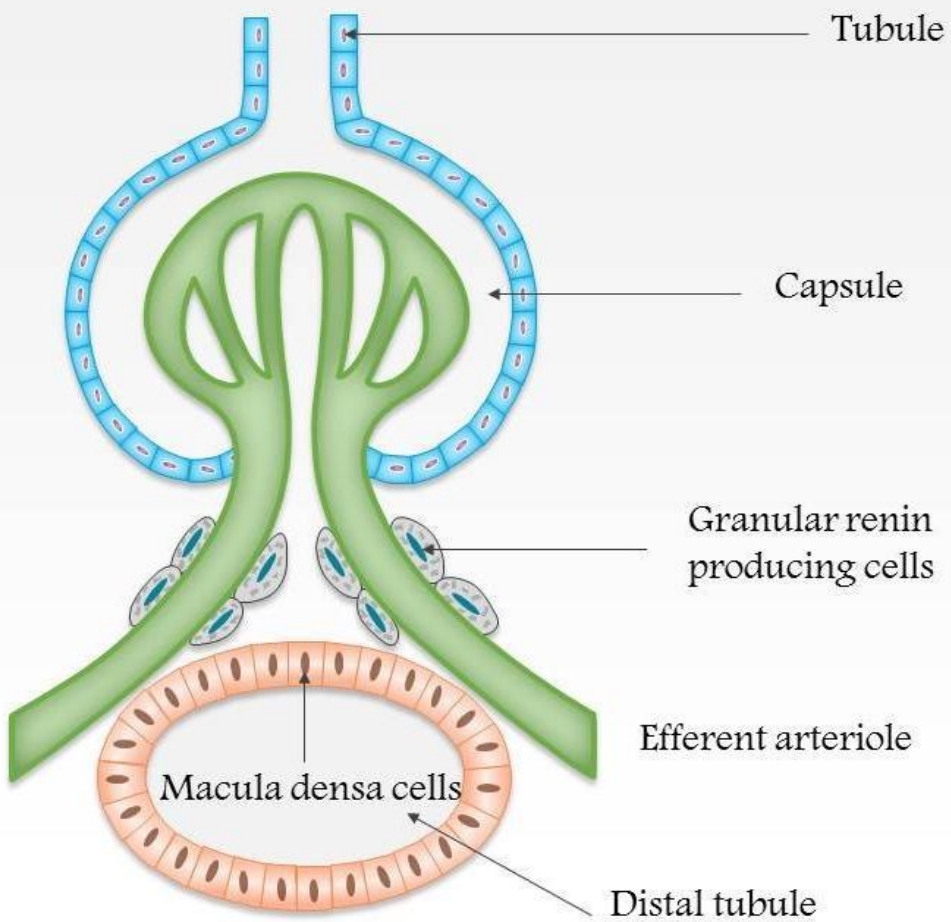
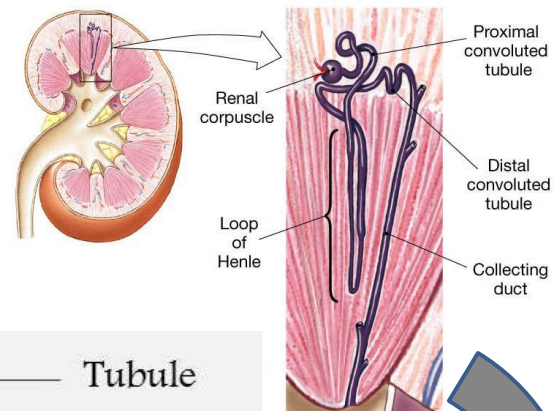
Clinical Application



Excretion = Filtration – Reabsorption + Secretion

Interoception – Osmoreceptors

juxtaglomerular apparatus



Afferent arteriole

Efferent arteriole

Macula densa cells

Distal tubule

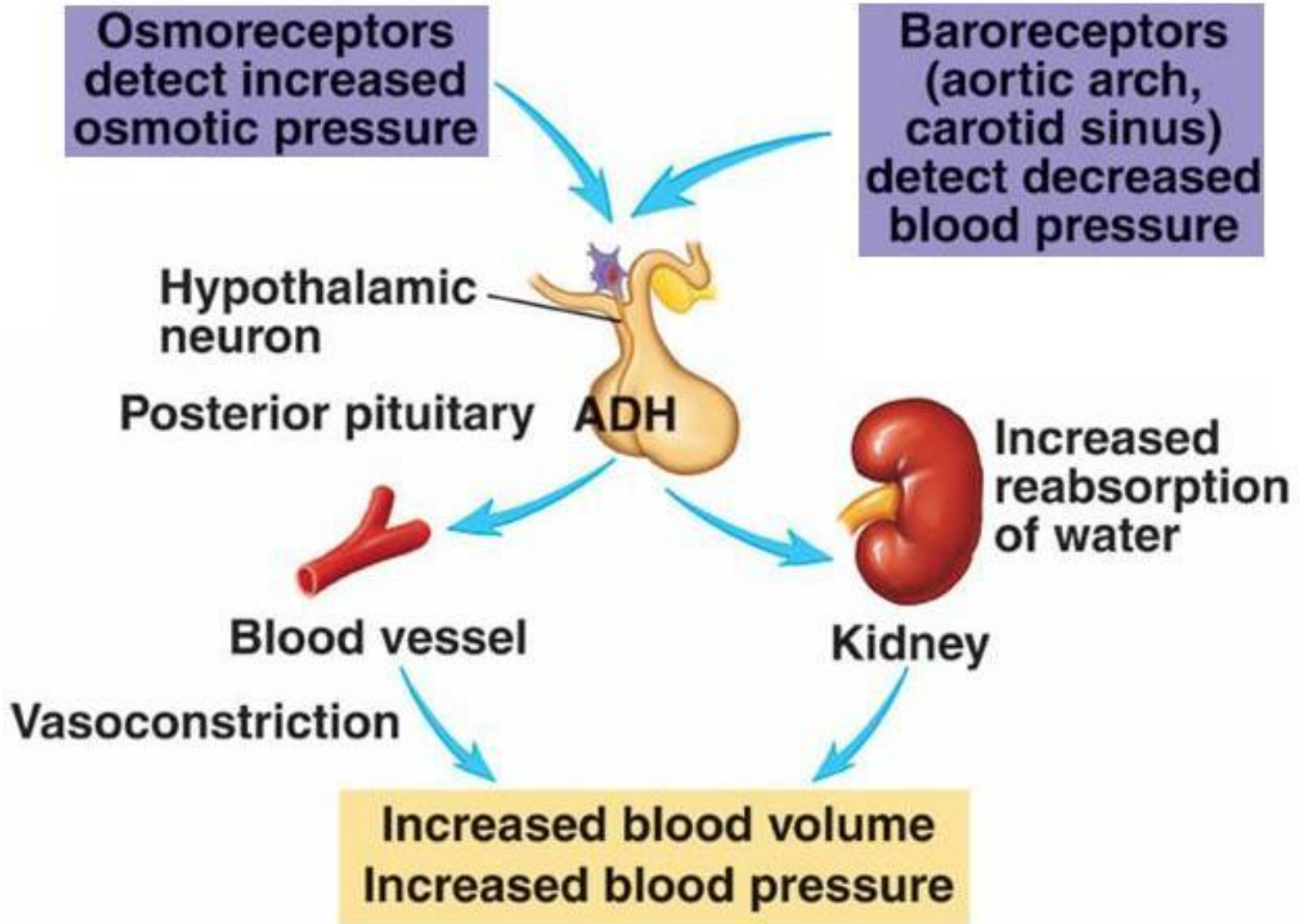
Tubule

Capsule

Granular renin producing cells

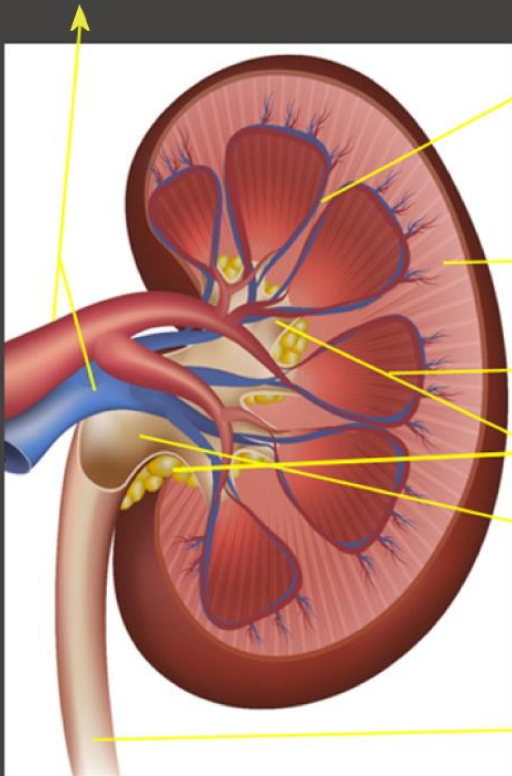
Renal corpuscle
Proximal convoluted tubule
Distal convoluted tubule
Loop of Henle
Collecting duct

Interoception – Osmoreceptors



KIDNEY ULTRASONIC ANATOMY

Renal artery and vein



Column of Bertin

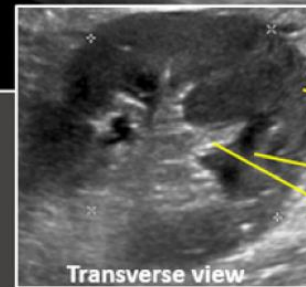
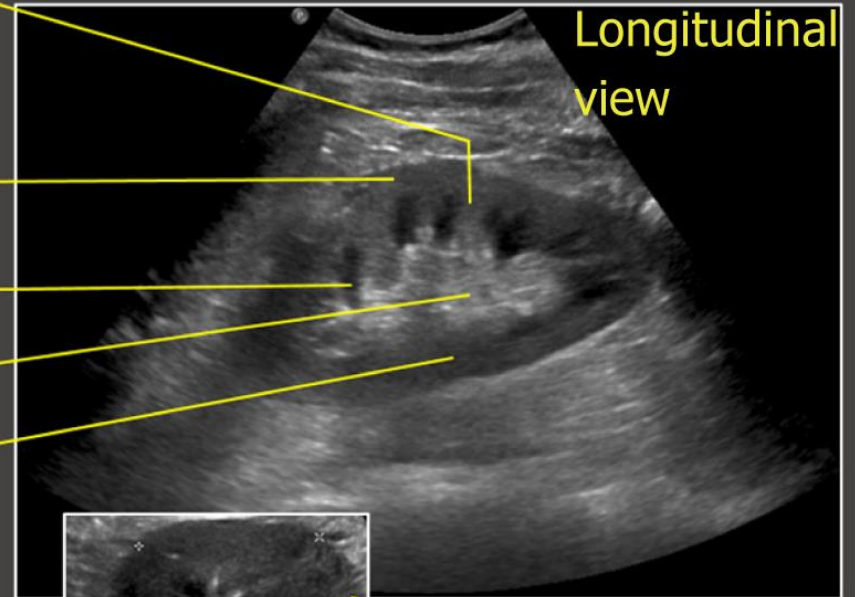
Cortex

Medullary pyramid

Sinus fat

Renal pelvis

Ureter



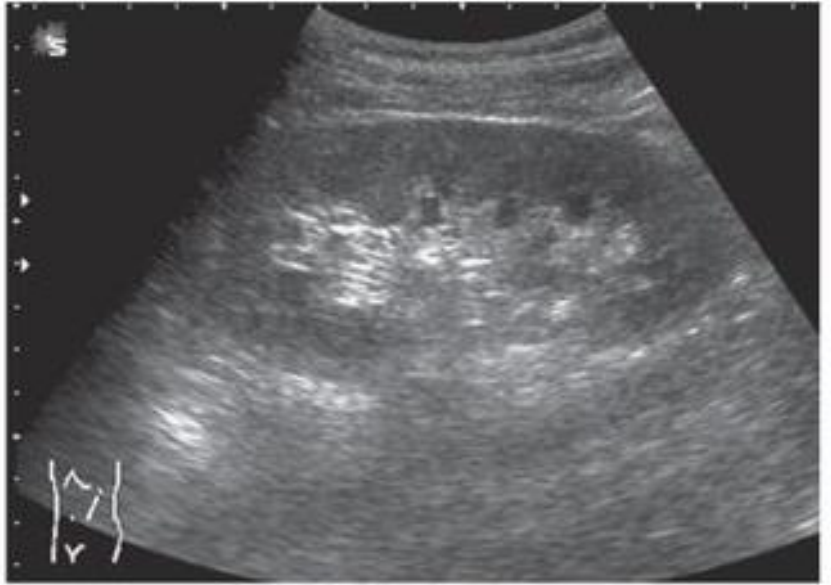
Cortex

Medullary pyramid

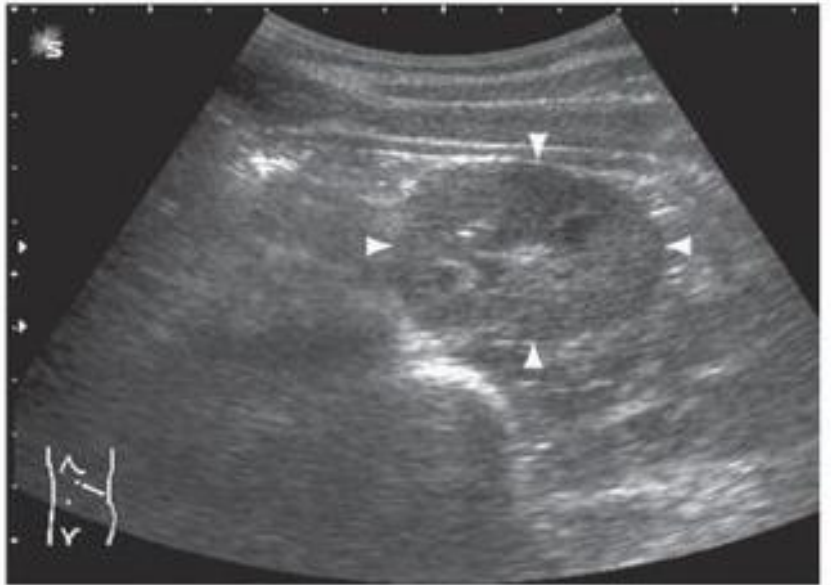
Sinus fat

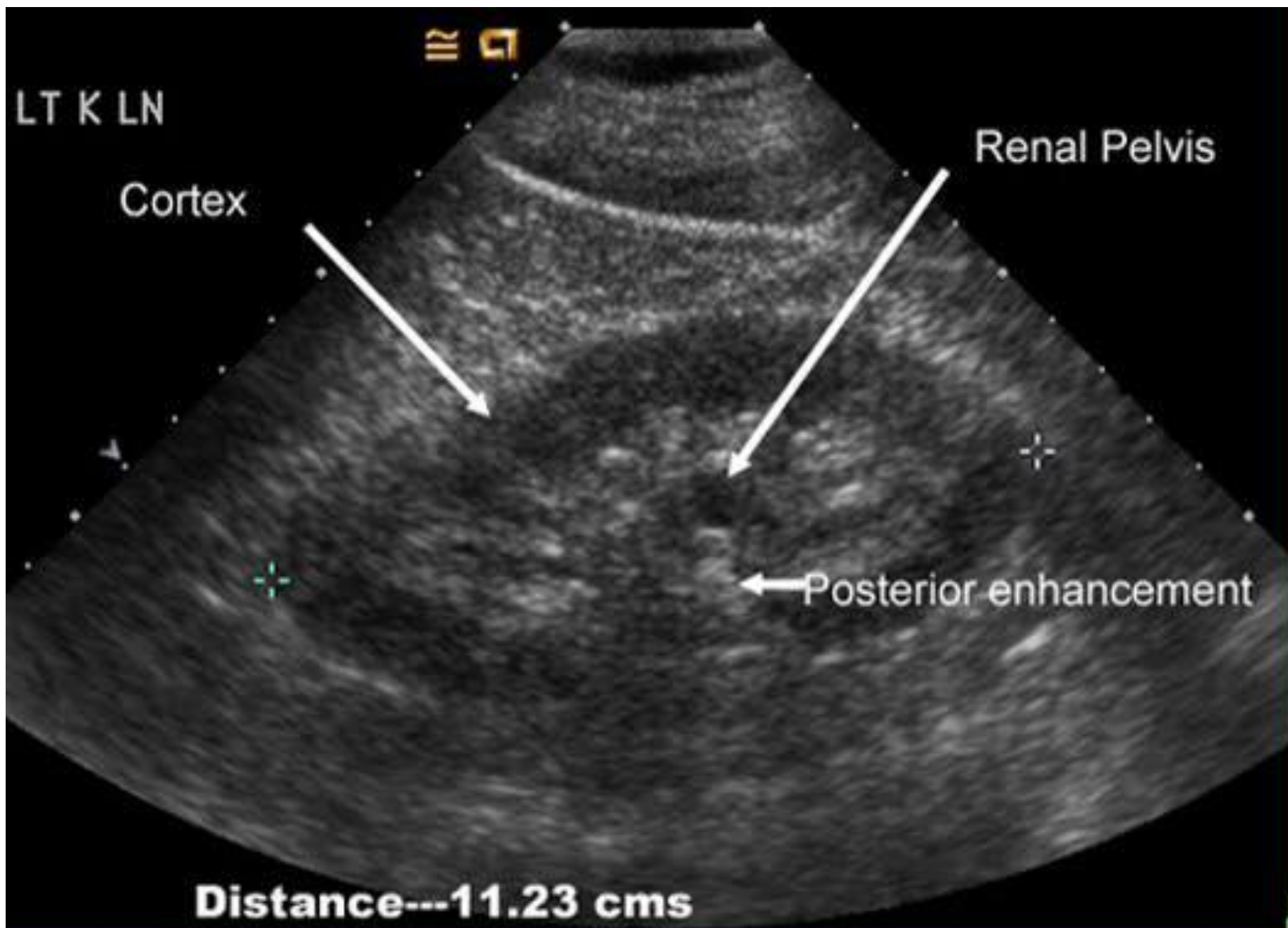


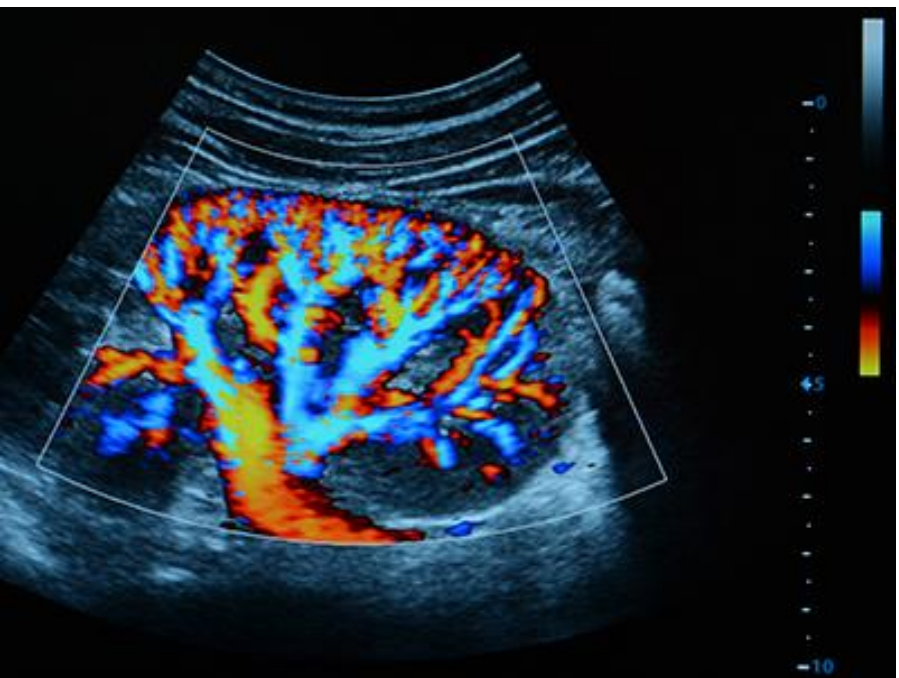
A



B



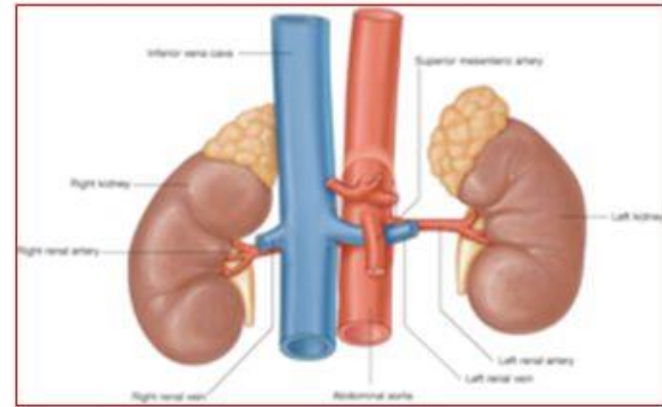




SUPRARENAL GLANDS ANATOMY

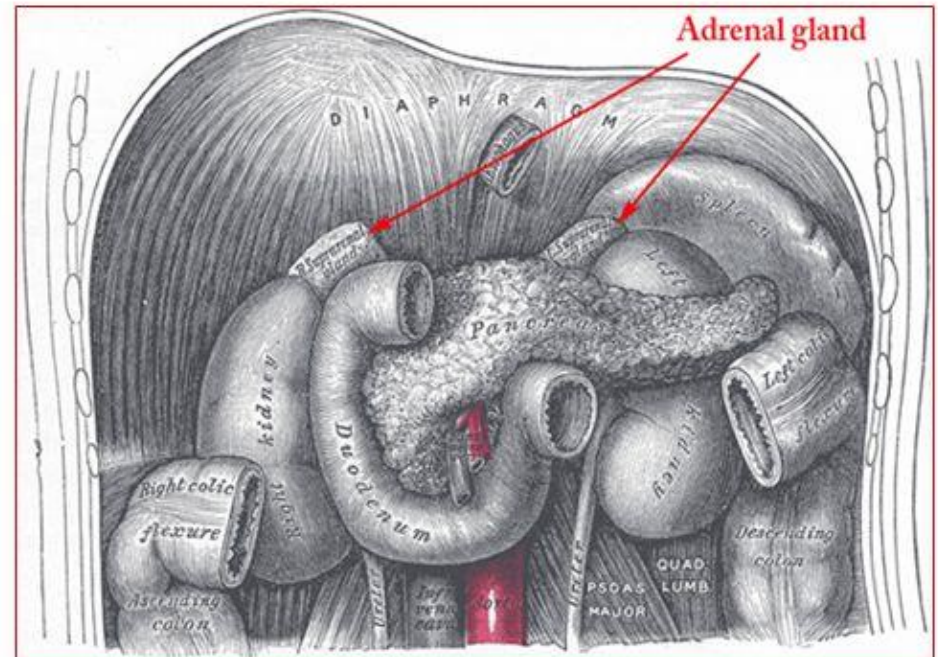
❑ The **right suprarenal gland**

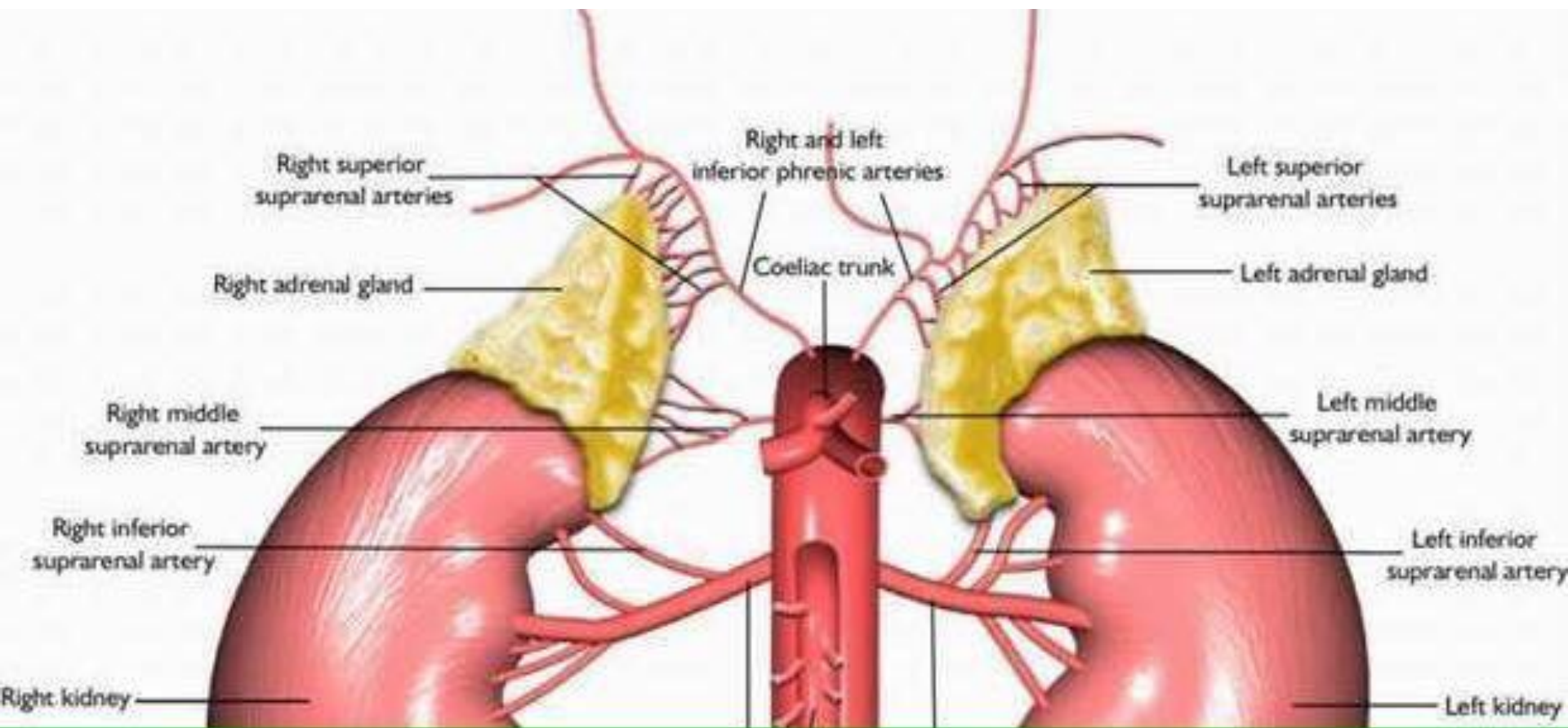
- Is **pyramid** shaped.
- Caps the upper pole of the right kidney.
- Relations:
 - **Anterior:** right lobe of the liver and inferior vena cava.
 - **Posterior:** diaphragm.



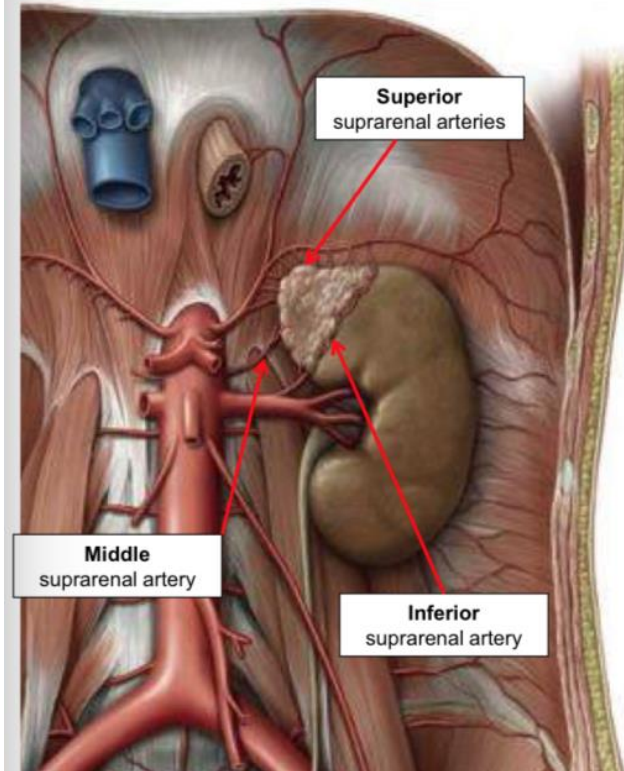
❑ The **left suprarenal gland**

- Is **crescentic** in shape
- Extends along the medial border of the left kidney from the upper pole to the hilus.
- Relations:
 - **Anterior:** pancreas, lesser sac, and stomach
 - **Posterior:** diaphragm.



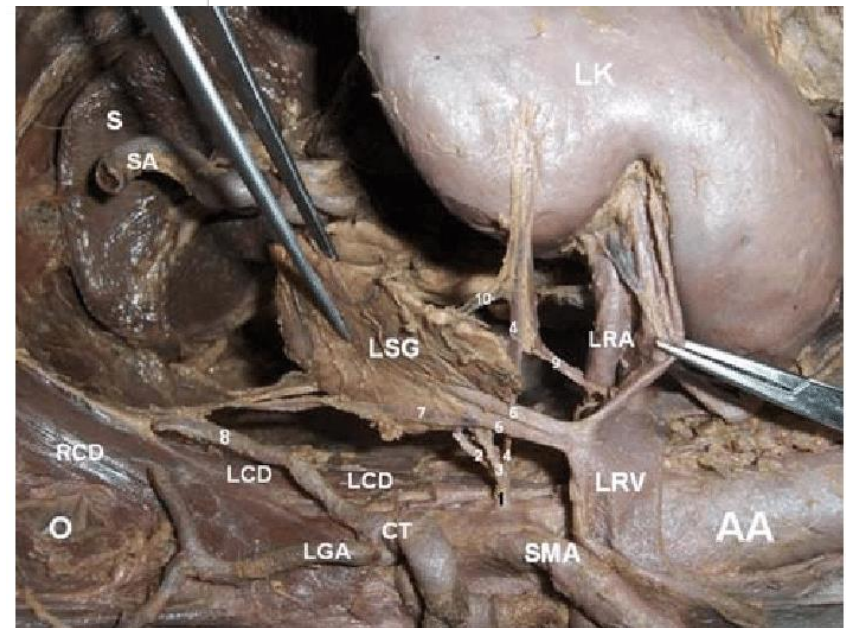


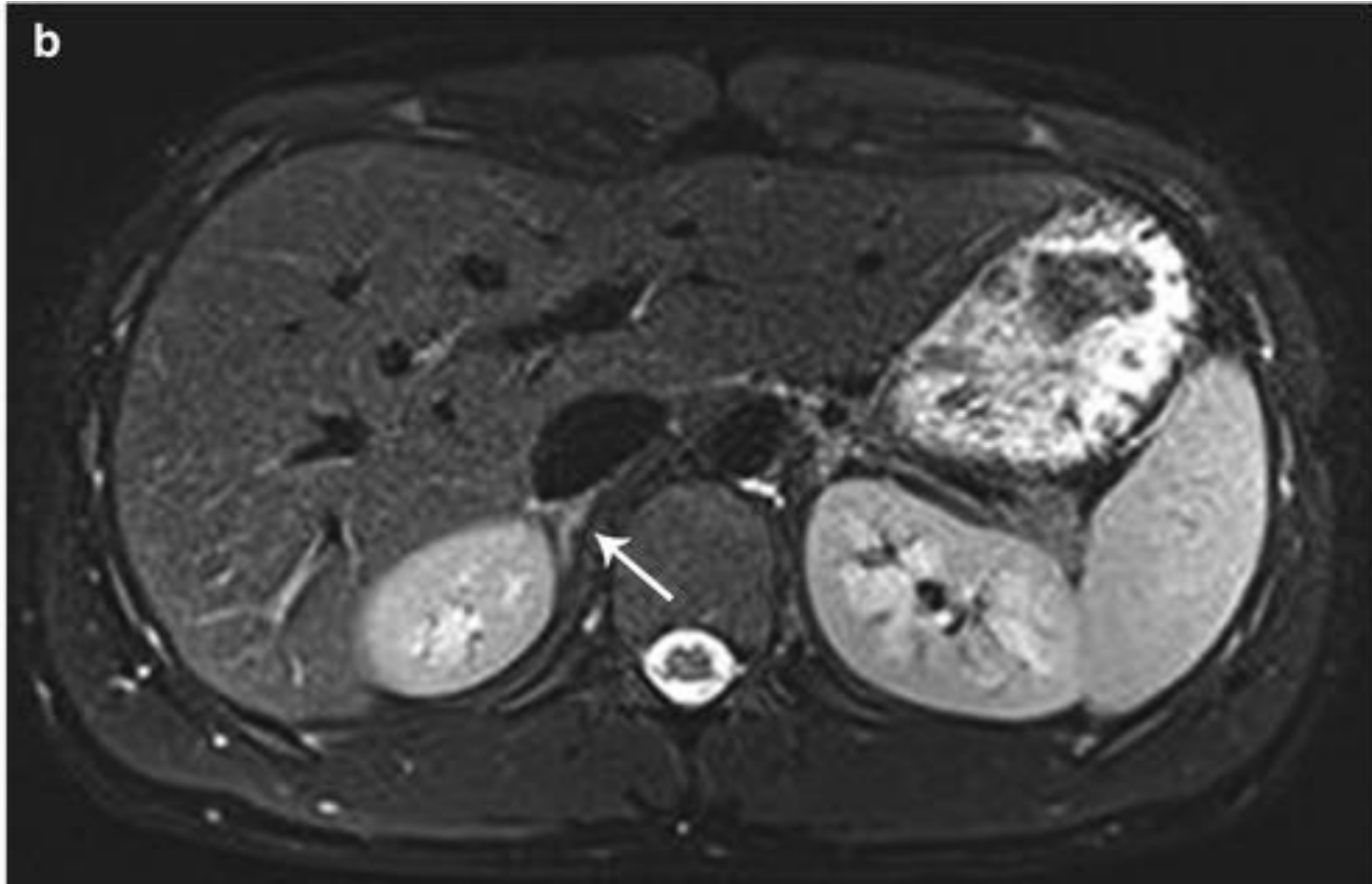
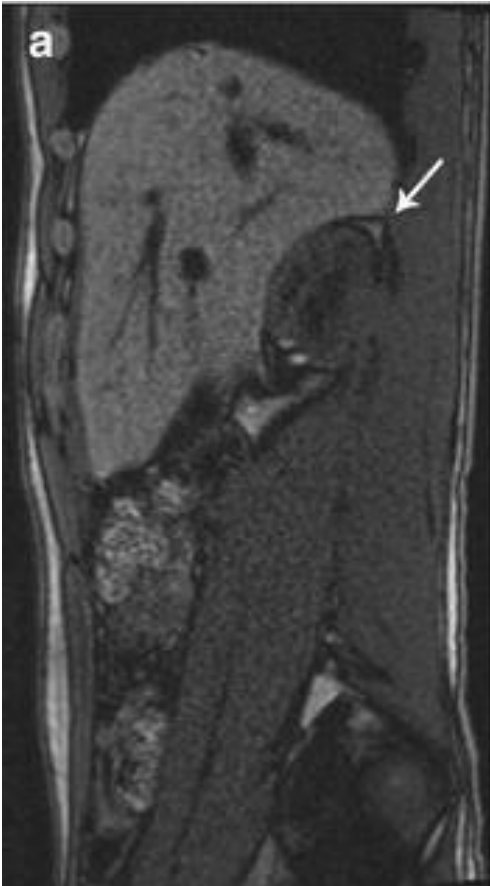
Suprarenal Gland: Arterial Supply



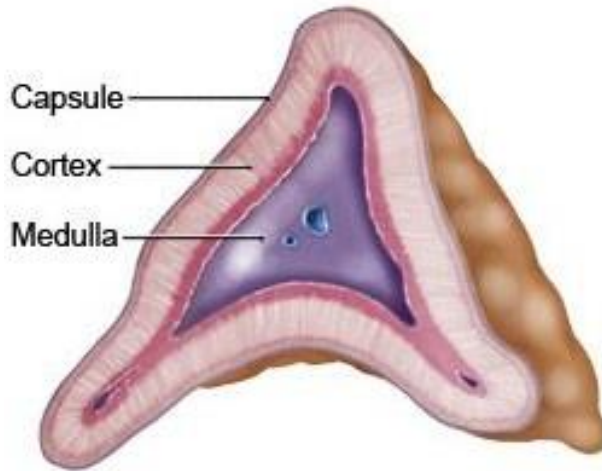
Suprarenal arteries:

1. **Superior** — arises from the **inferior phrenic** artery
2. **Middle** — arises from the **abdominal aorta**
3. **Inferior** — arises from the **renal** artery

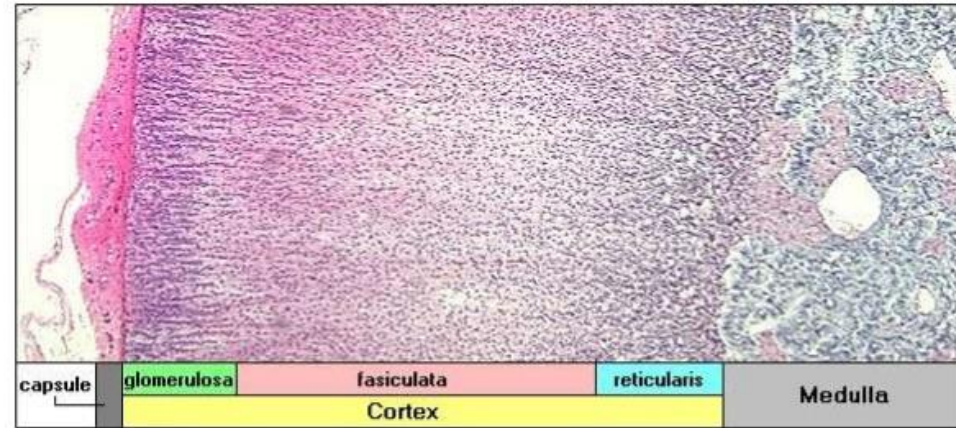
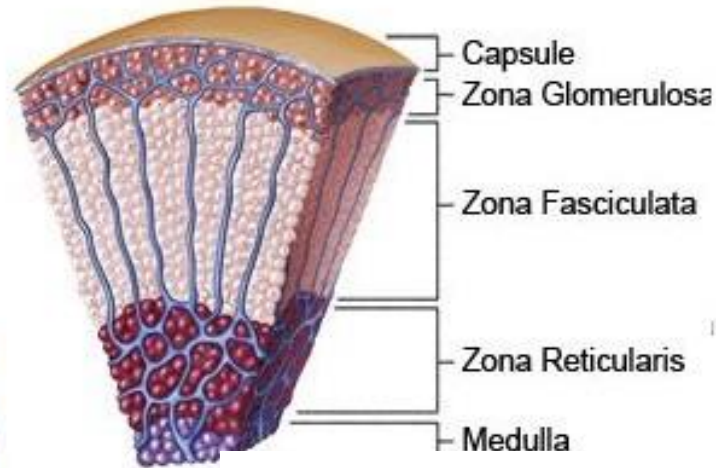




Transverse Section



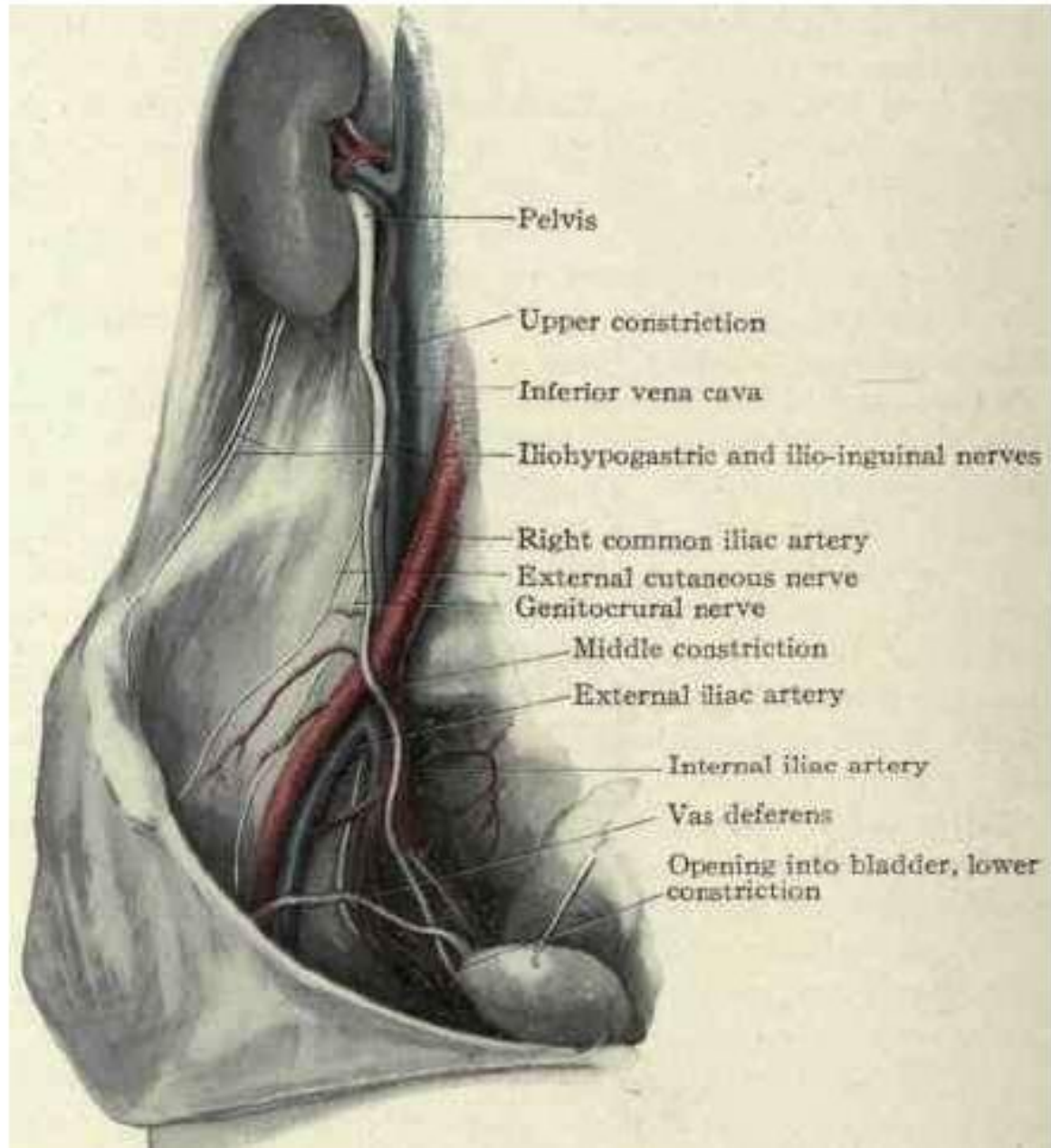
Microscopic Section

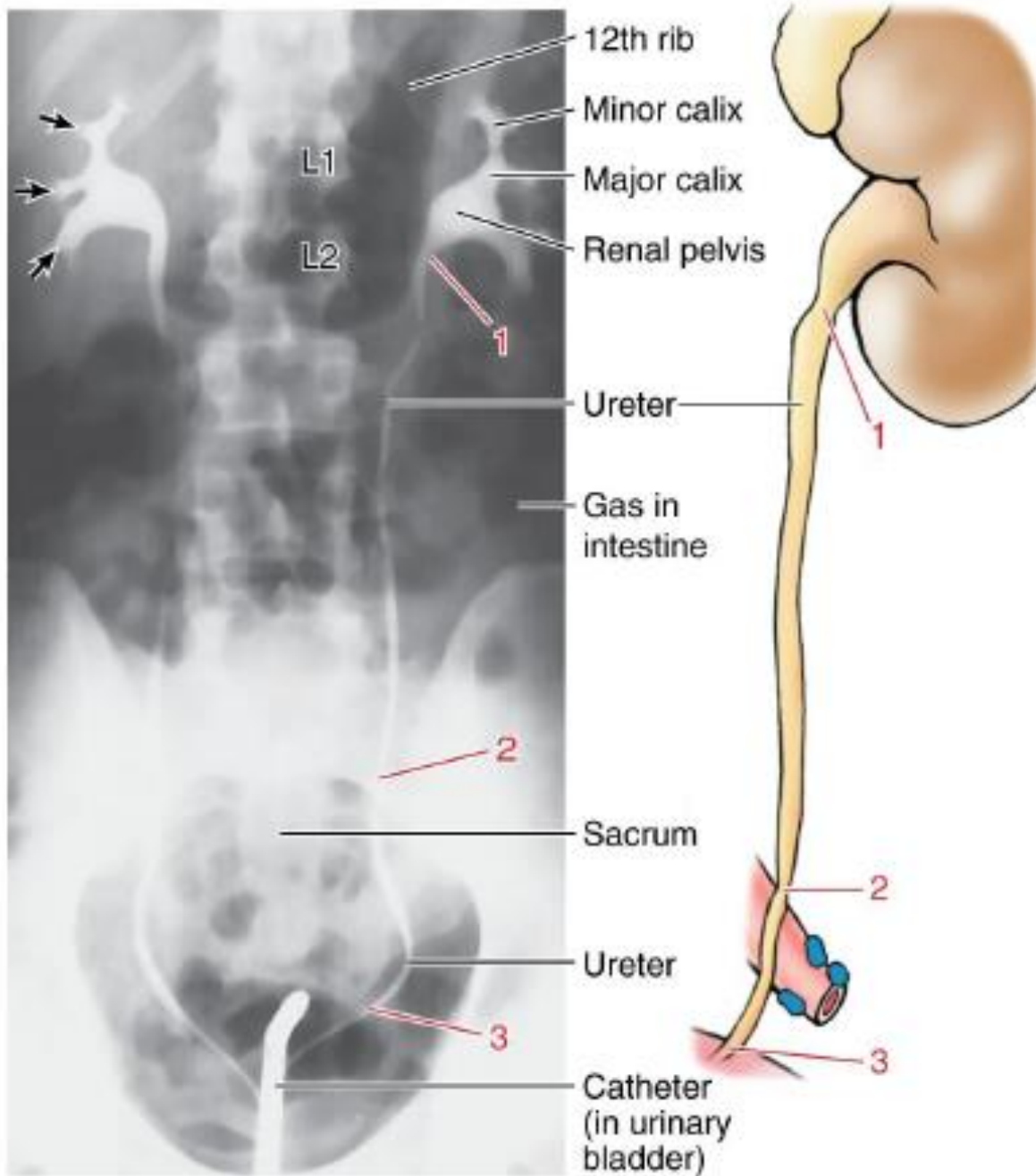


Cortex	Zona glomerulosa	mineralocorticoids (aldosterone)
	Zona fasciculata	glucocorticoids (cortisol)
	Zona reticularis	Androgens (dehydroepiandrosterone(DHEA))
Medulla		catecholamines (epinephrine & norepinephrine)

URETER TOPOGRAPHY

ORIGIN, COURSE & RELATIONS

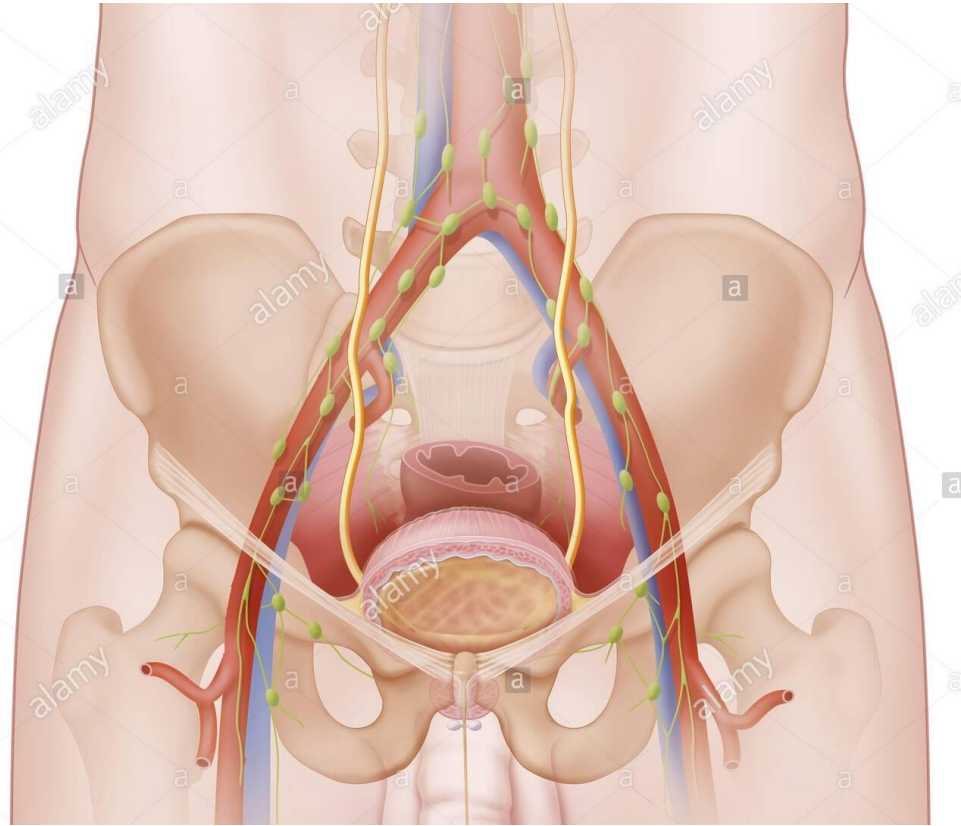
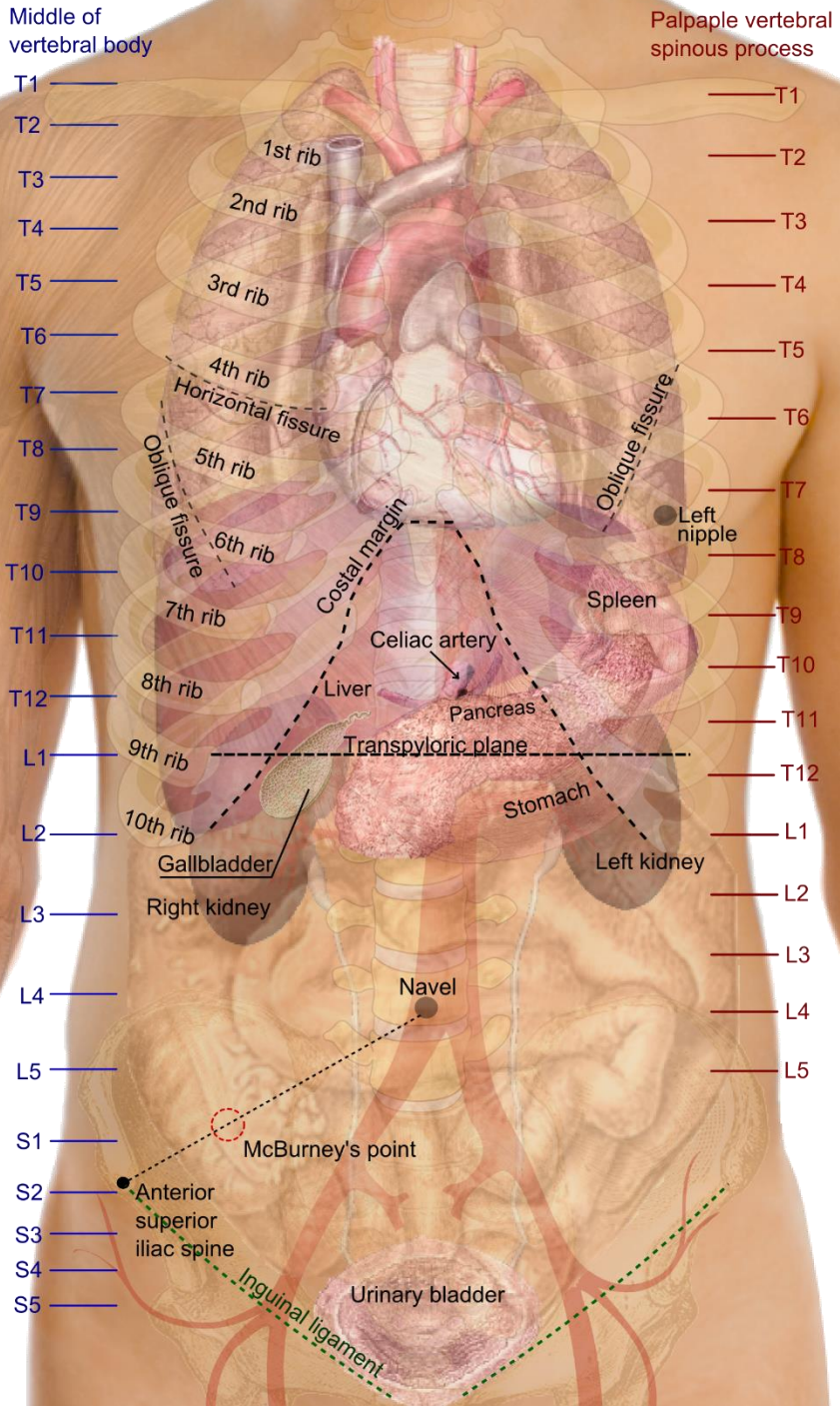


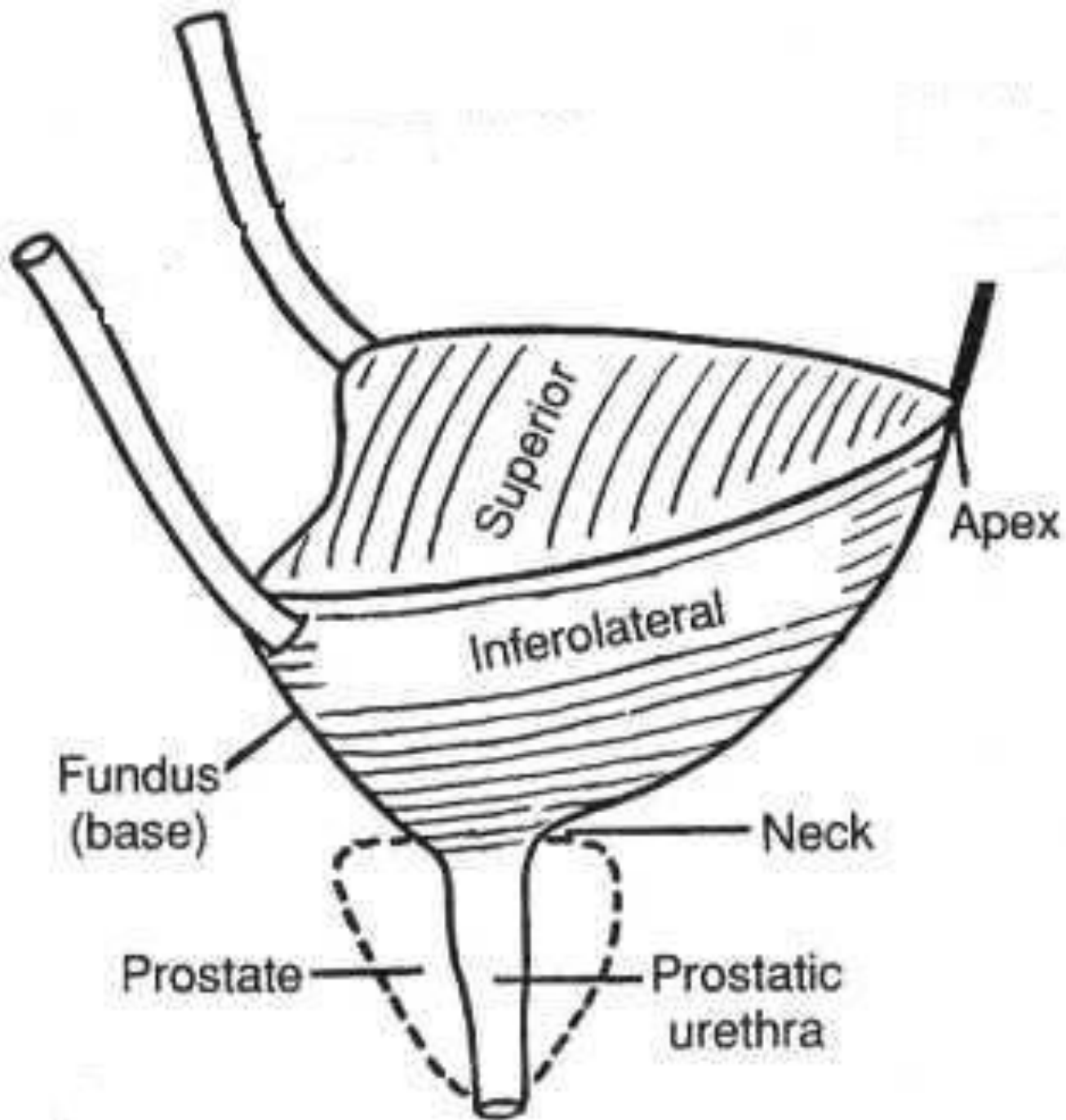


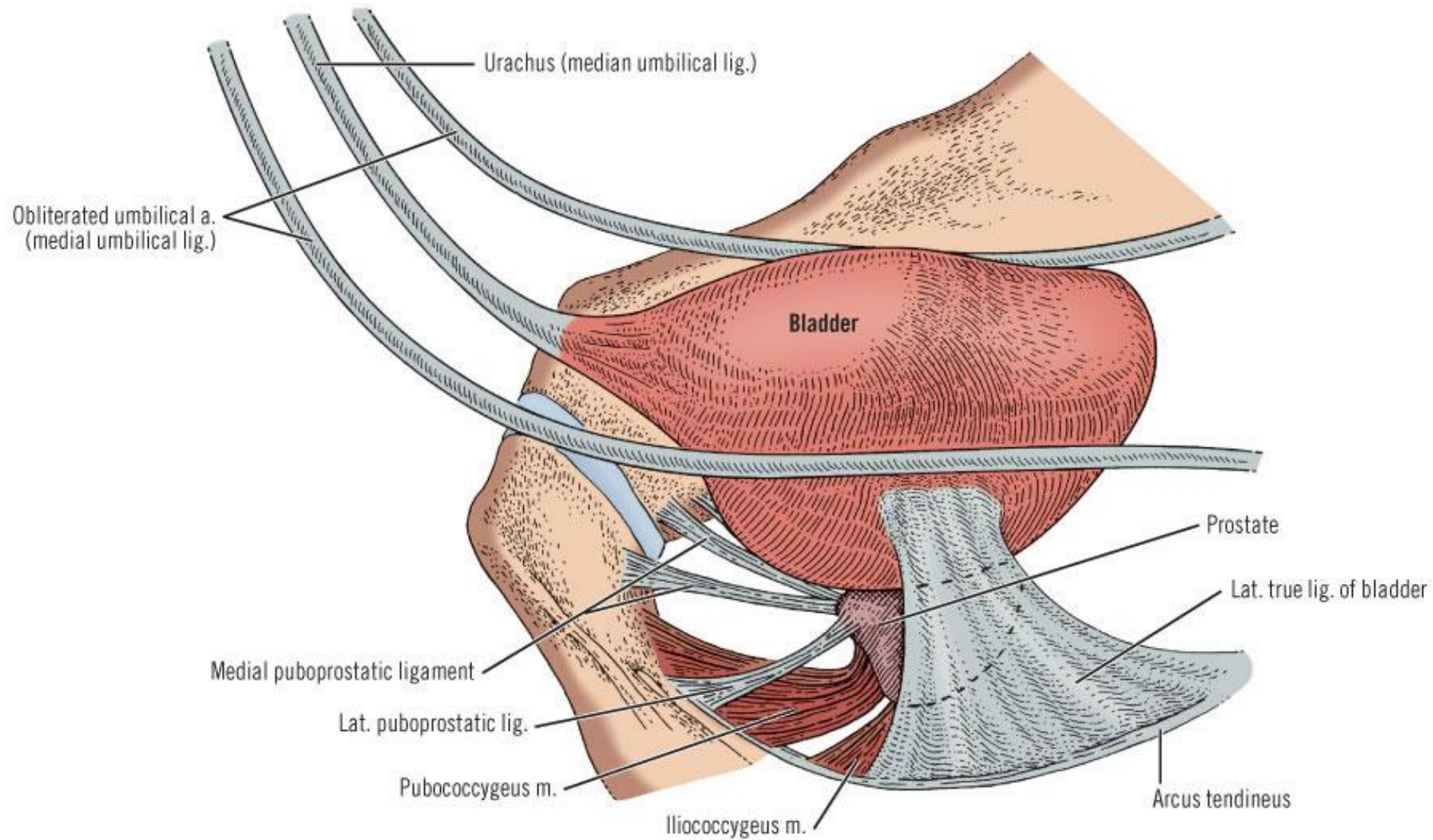
(A) Anteroposterior radiogram

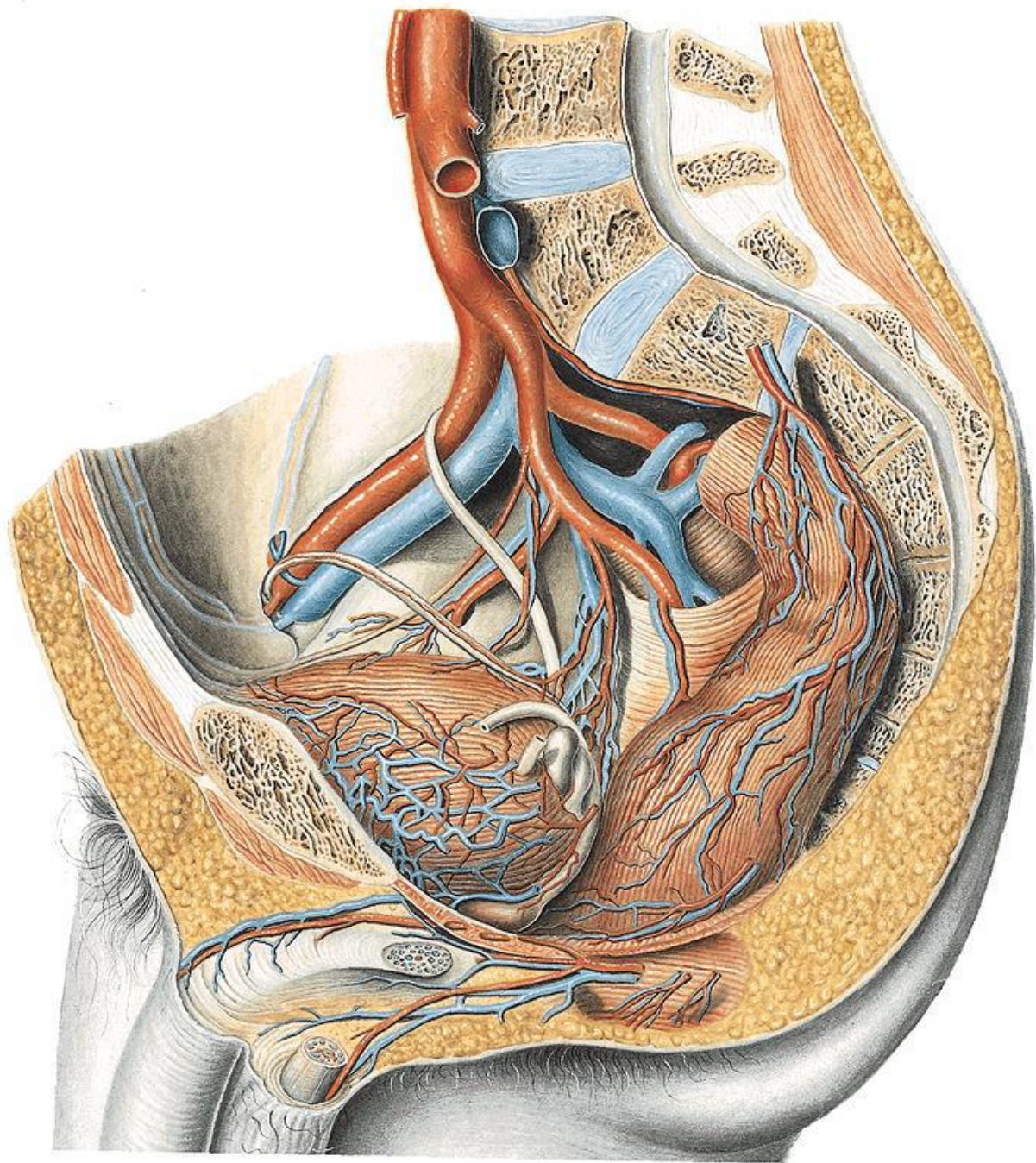
(B)

URINARY BLADDER GROSS ANATOMY

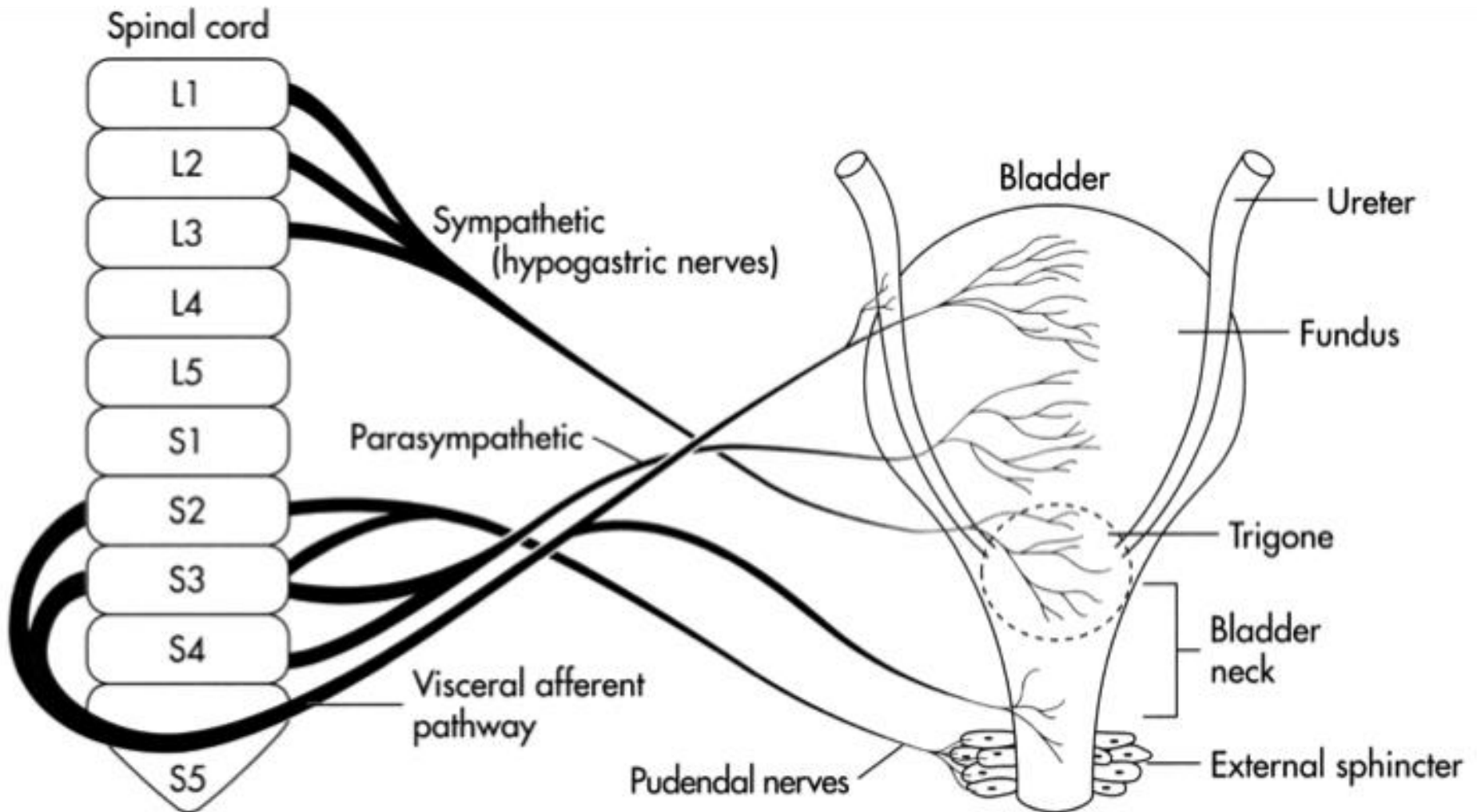


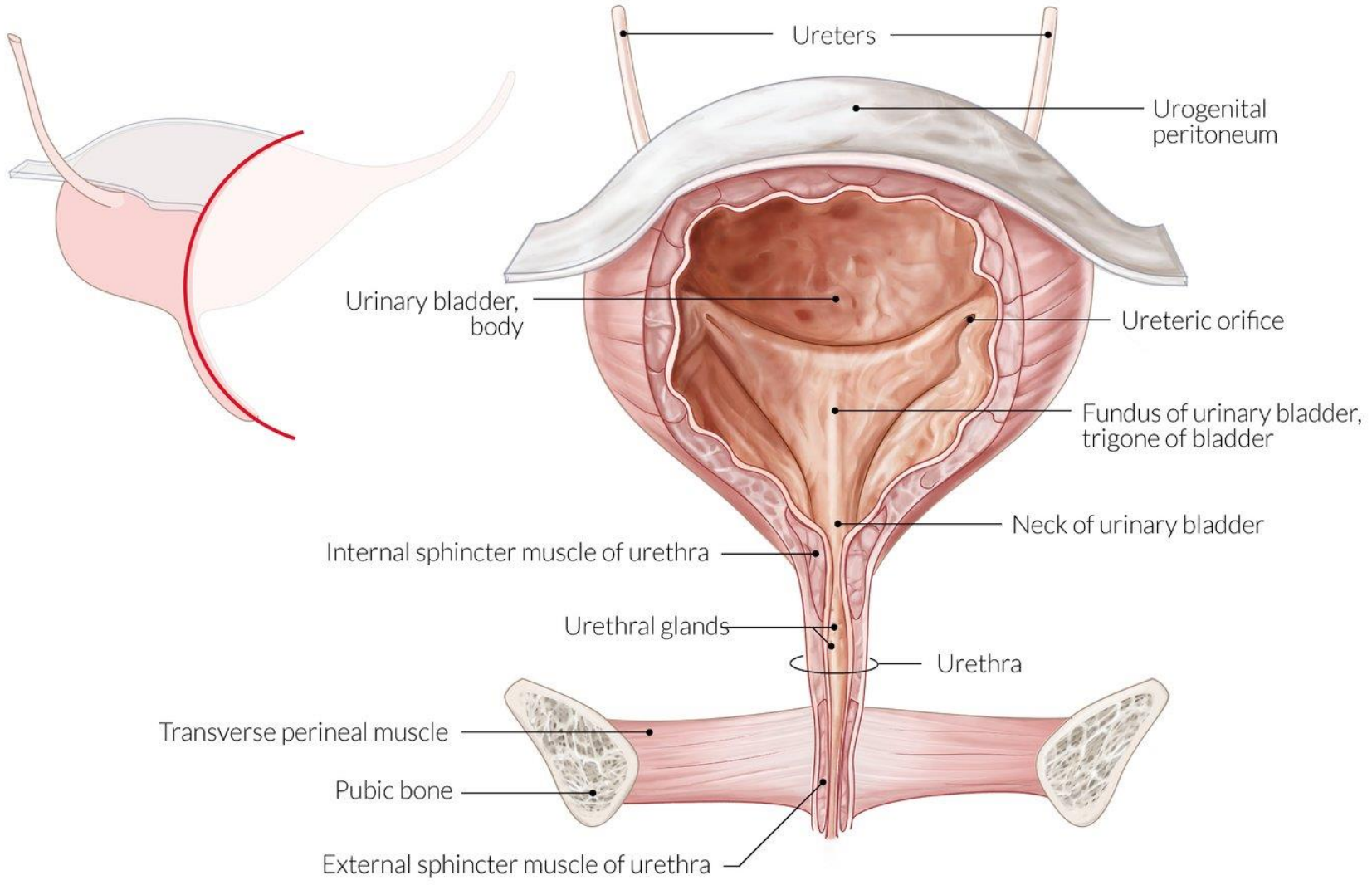






Innervation & Micturition Reflex





A grayscale ultrasound image showing a cross-section of the bladder and psoas muscles. The bladder is a dark, anechoic region in the center. The psoas muscles are the bright, echogenic structures on either side of the bladder. A green light is visible at the top center of the image.

Psoas

Bladder

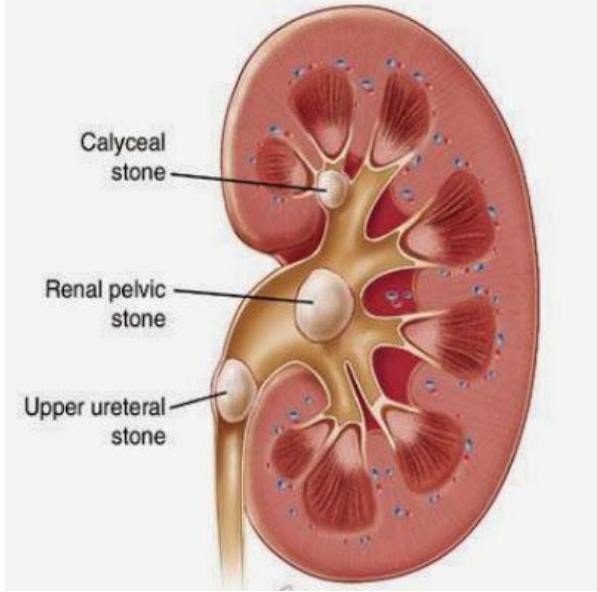
Psoas



KIDNEY ANOMALIES

EXAMPLES

Nephrolithiasis

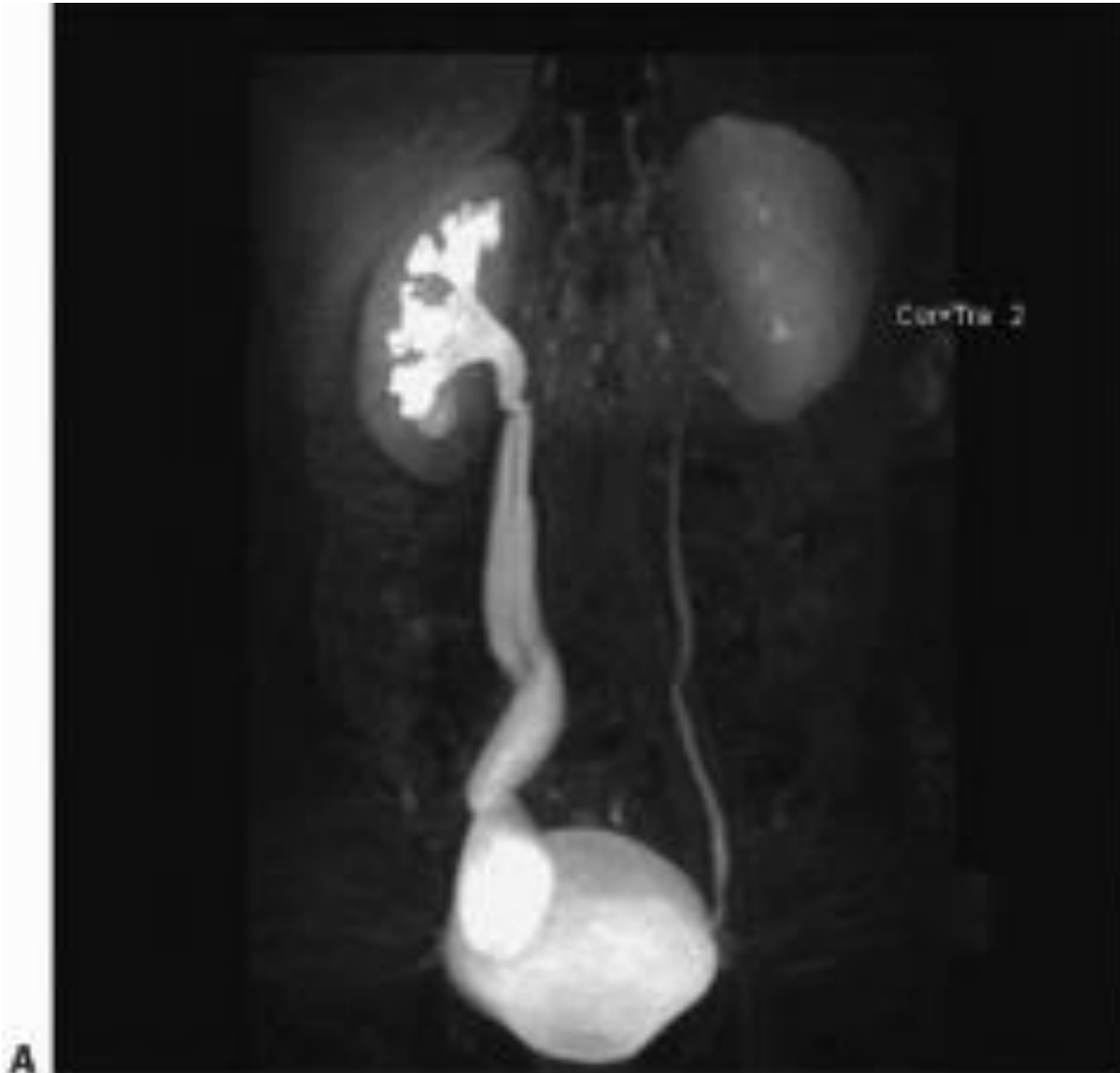


Patient history: kidney stones.

Patient chief complain: extreme pain, difficulty urinating, and oliguria.

X-ray results: attached

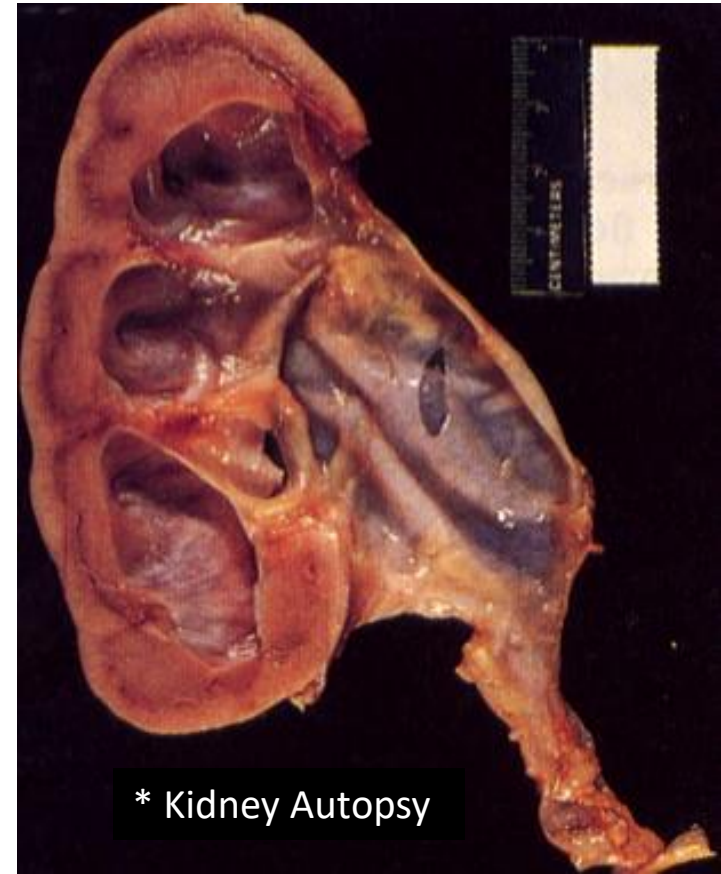
Explain the clinical anatomy of this image?



Hydronephrosis



* X-ray Urography

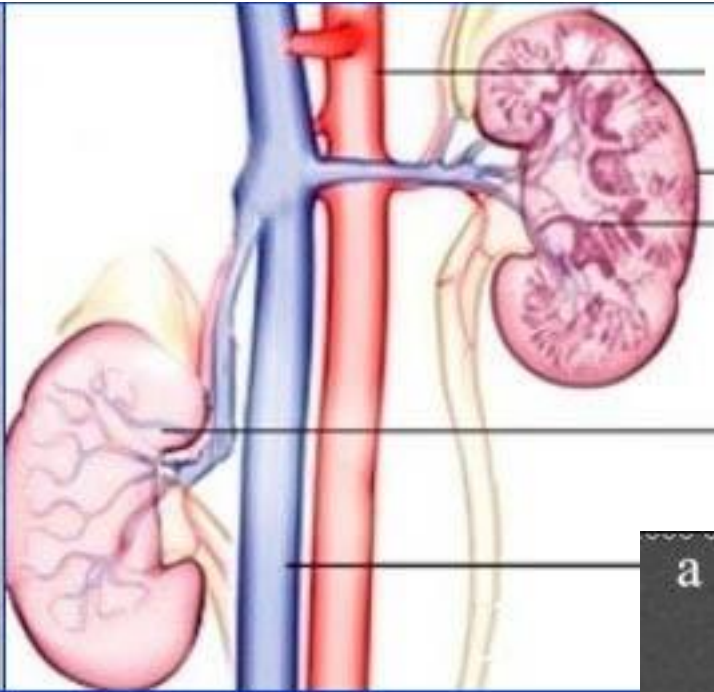


* Kidney Autopsy

* Kidney Ultrasound



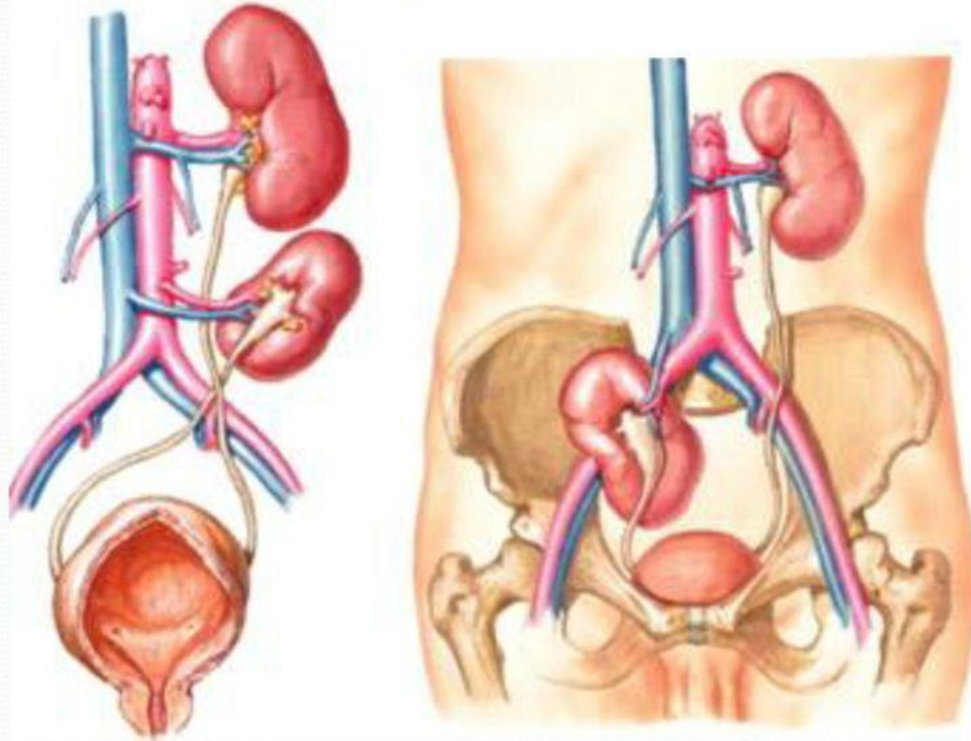
Floating Kidney (*ren migrans* / *nephroptosis*)



Ectopic Kidney

2-Ectopic Kidney

A- Pelvic Kidney



Kidney Transplant Position

**Do not confuse it with “ectopic Kidney”*

