

KIDNEY

Anatomy, Embryology & Anomalies

Anatomy

- Site: Retroperitoneal on either side of vertebral column
- Extent:
 - Superiorly: T12
 - Inferiorly: L3Right kidney is slightly inferior

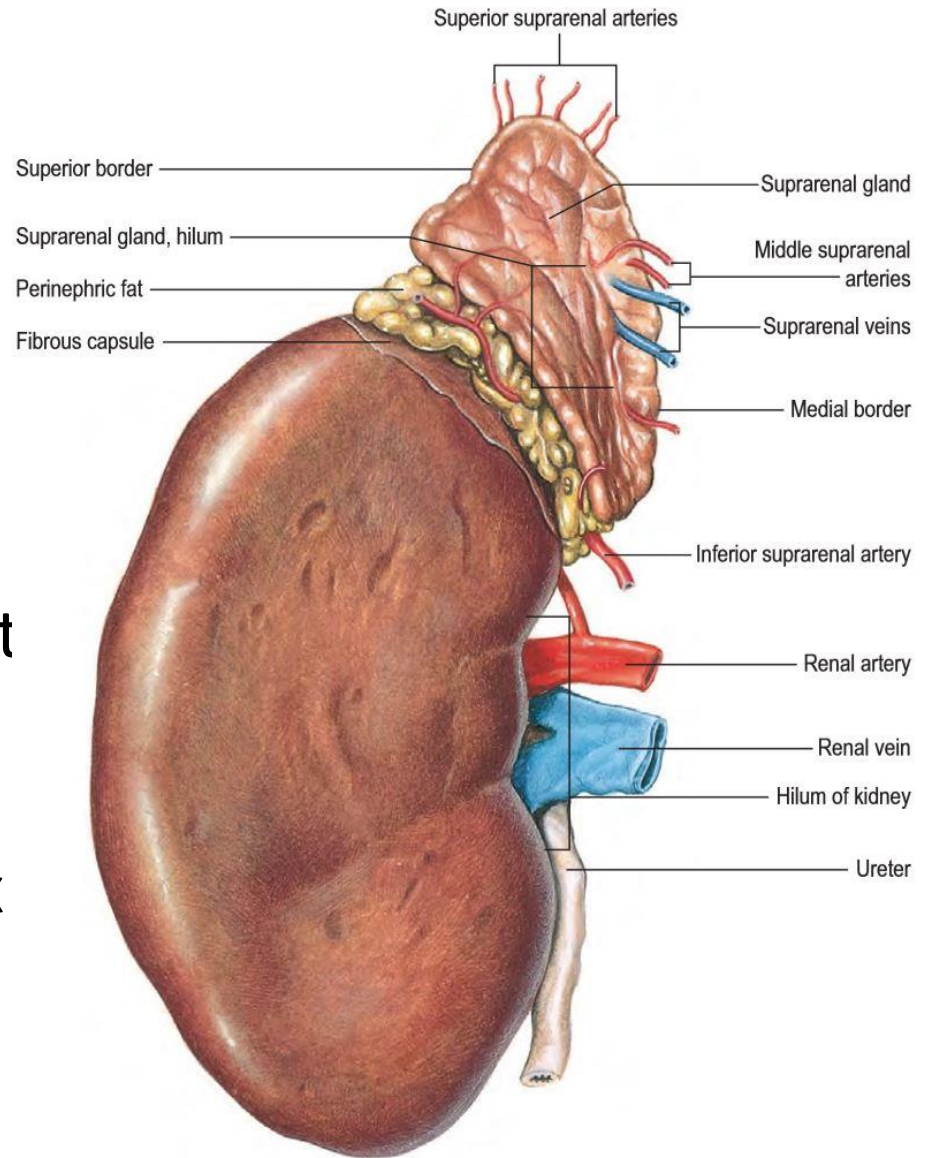
- Size:

- Length: 11cm
- Breadth: 6cm
- Depth: 3cm

- Weight:

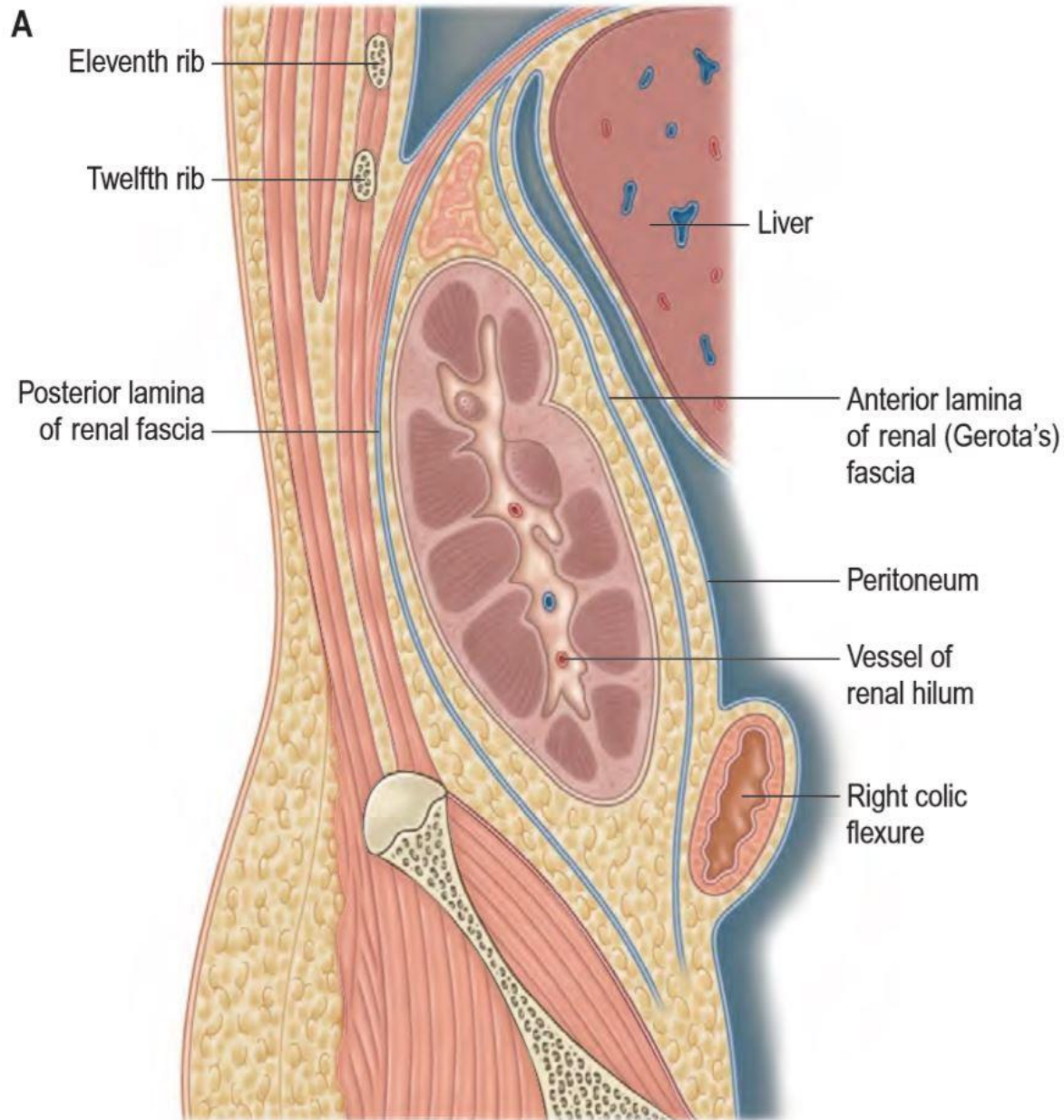
- Men: 150g
- Women: 135g

- Orientation:
 - Superior pole: Thick and round
 - Inferior pole: Thinner
 - Lateral border: Convex
 - Medial border: Convex at the poles, concave in between
 - Anterior Surface: Convex
 - Superomedial: Adrenal gland

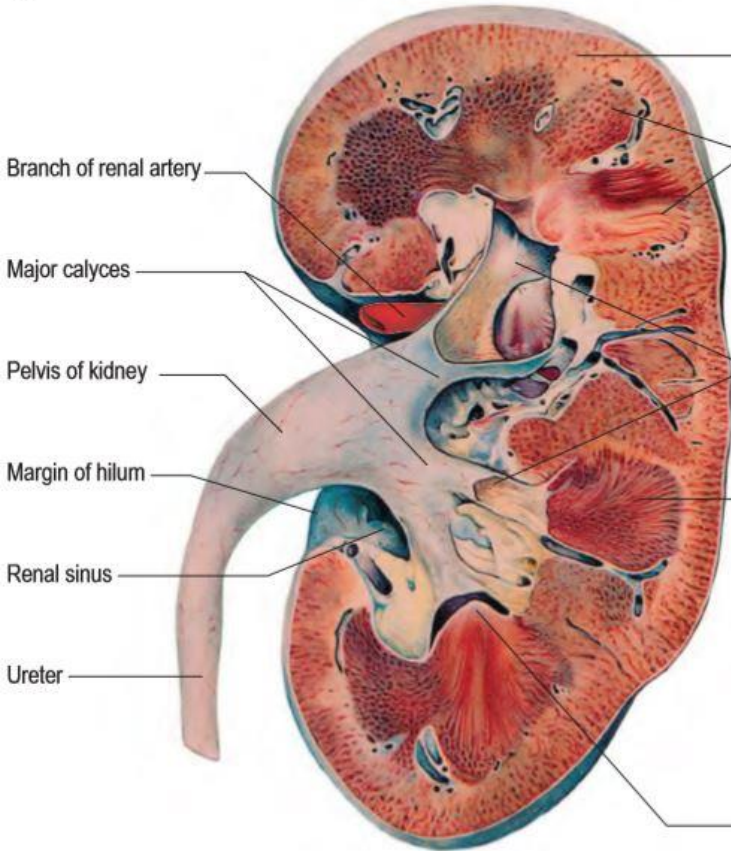


- Hilum: Renal Vein (Anterior)
Renal Artery
Renal Pelvis (Posterior)

- Perirenal fascia:
Bilaminated sheet
Envelops the kidney,
suprarenal gland and
perirenal fat

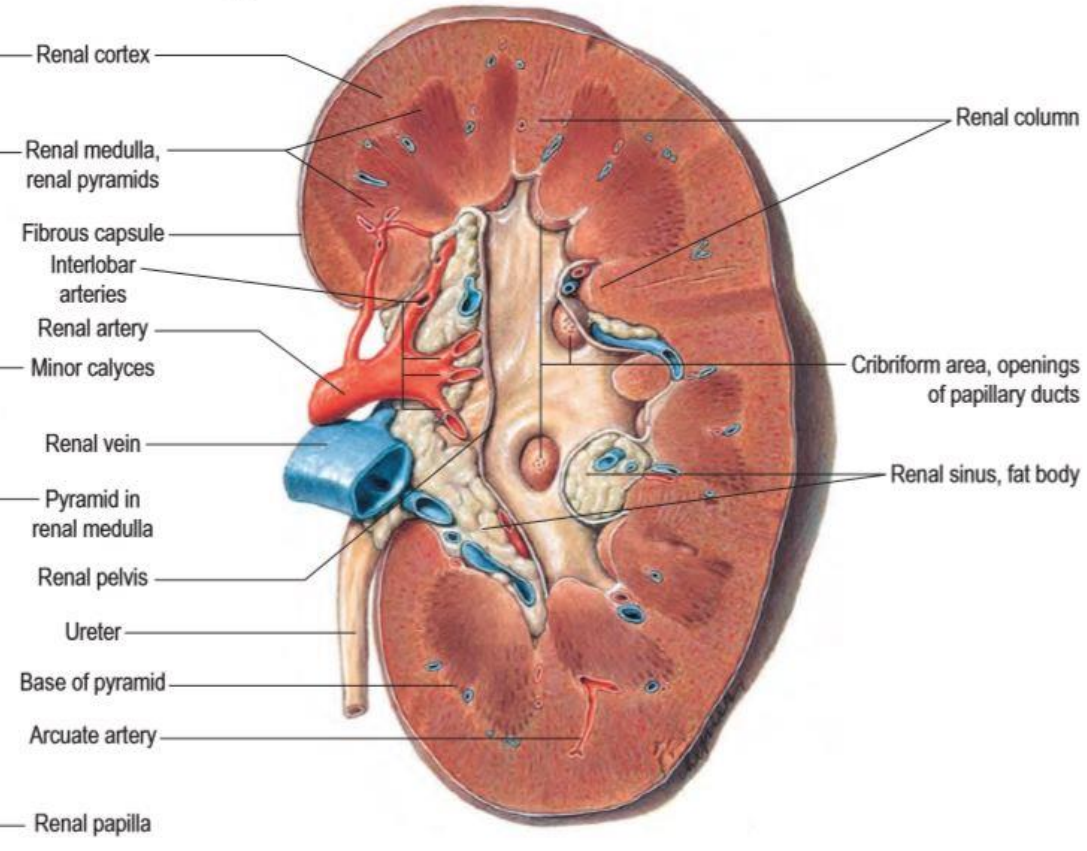


A



- Branch of renal artery
- Major calyces
- Pelvis of kidney
- Margin of hilum
- Renal sinus
- Ureter

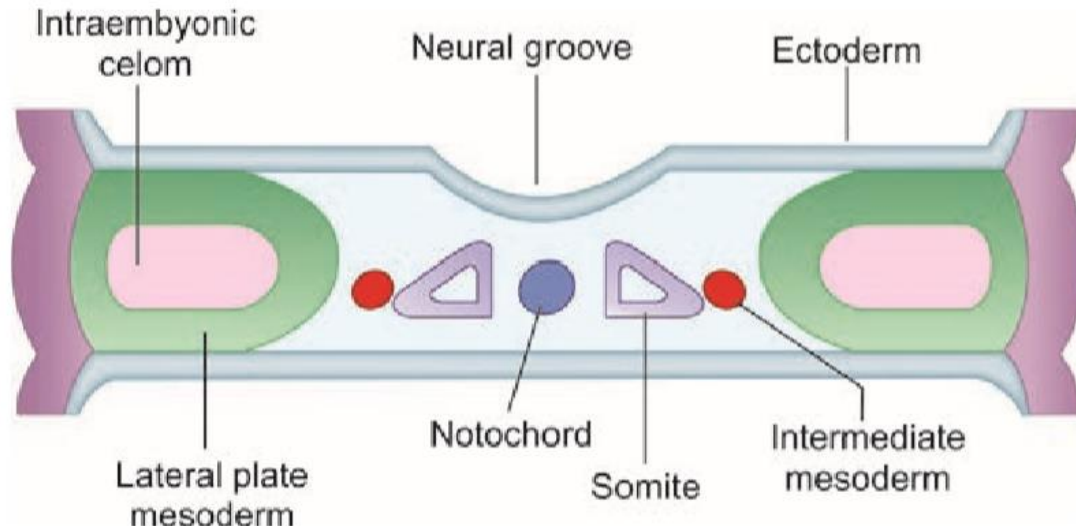
B

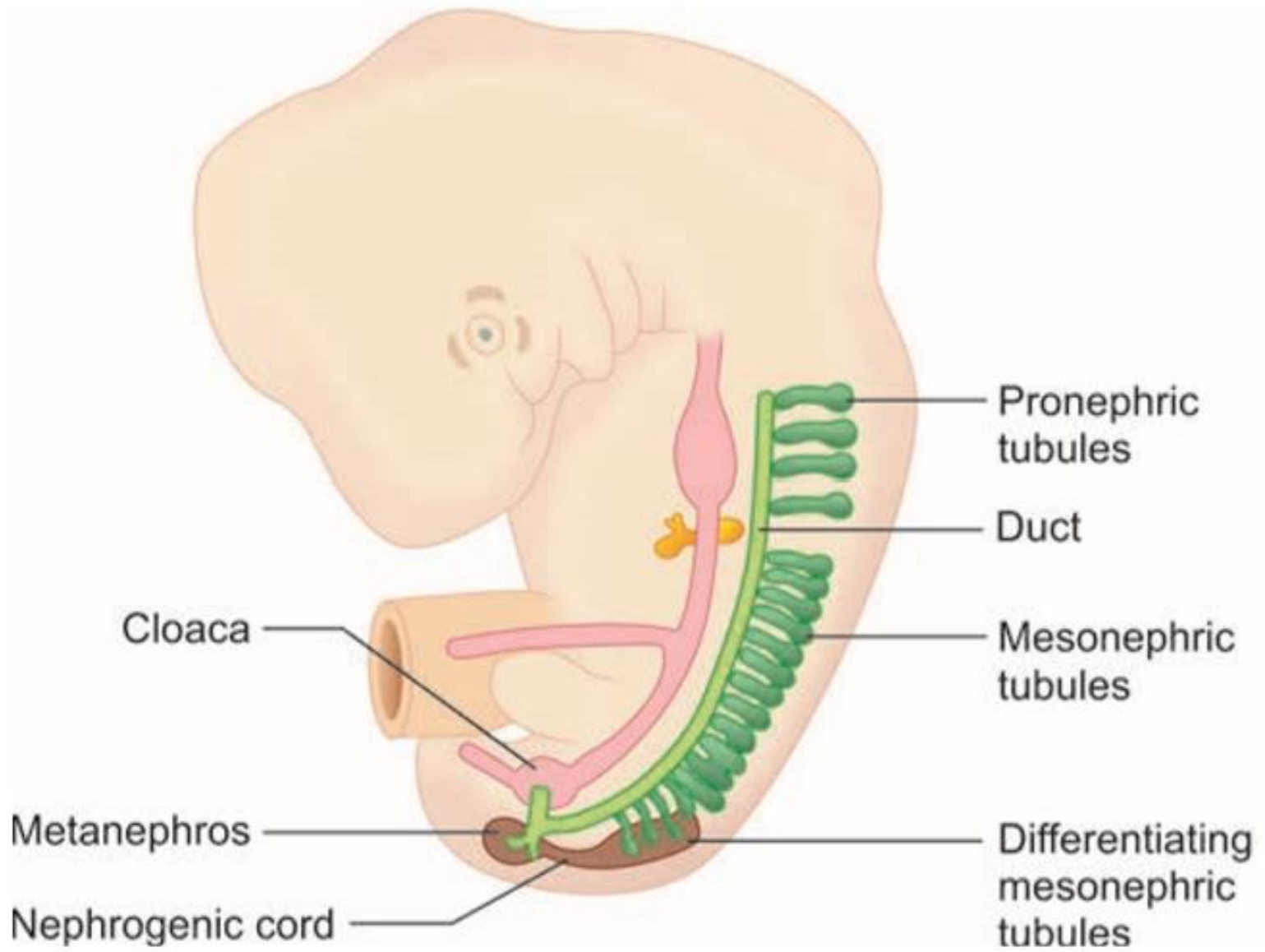


- Renal cortex
- Renal medulla, renal pyramids
- Fibrous capsule
- Interlobar arteries
- Renal artery
- Minor calyces
- Renal vein
- Pyramid in renal medulla
- Renal pelvis
- Ureter
- Base of pyramid
- Arcuate artery
- Renal column
- Cribriform area, openings of papillary ducts
- Renal sinus, fat body

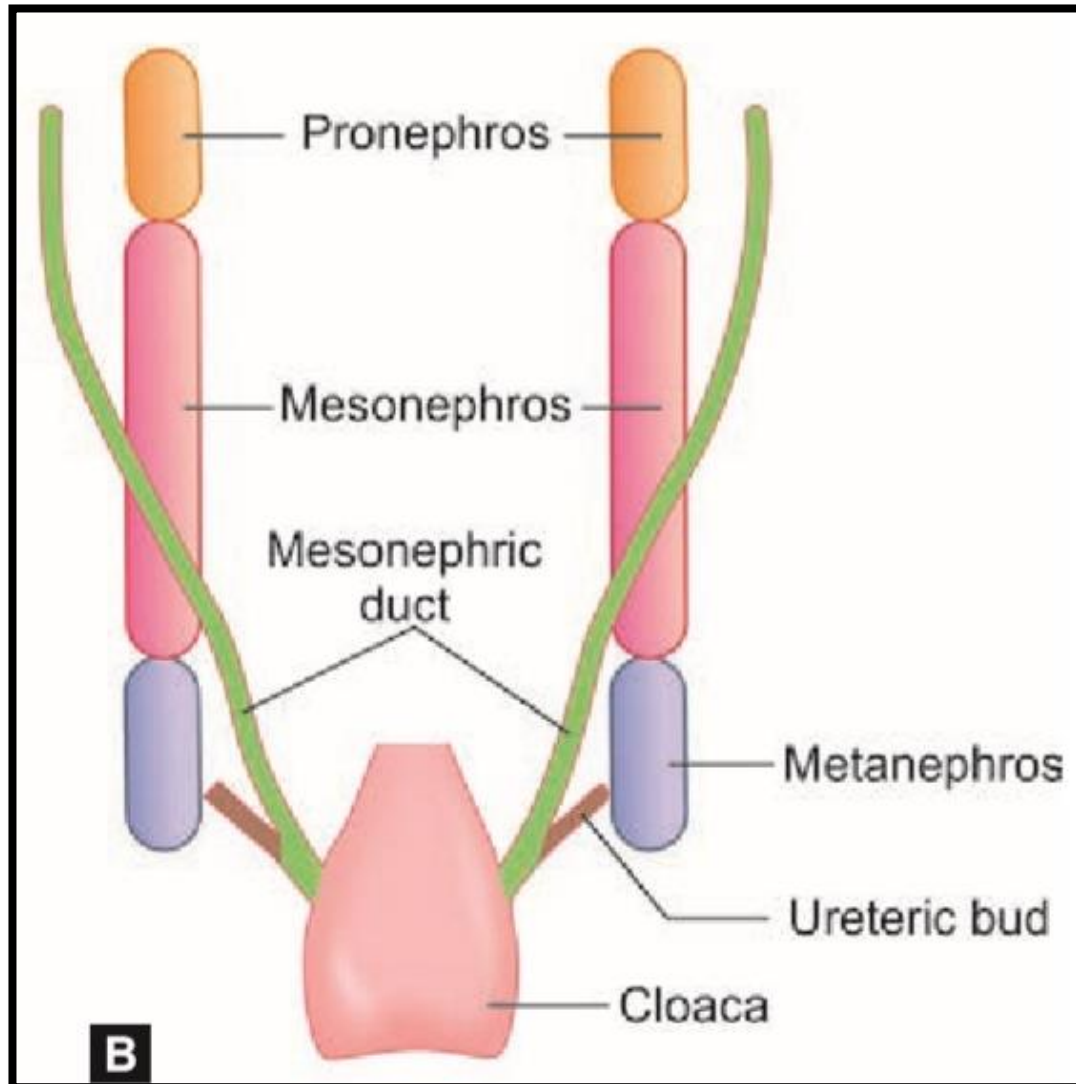
Embryology

- Kidney arises from 2 sources:
 - Secretory part: Excretory tubules (nephrons) from nephrogenic cord
 - Collecting part: from the ureteric bud arising from the mesonephric duct

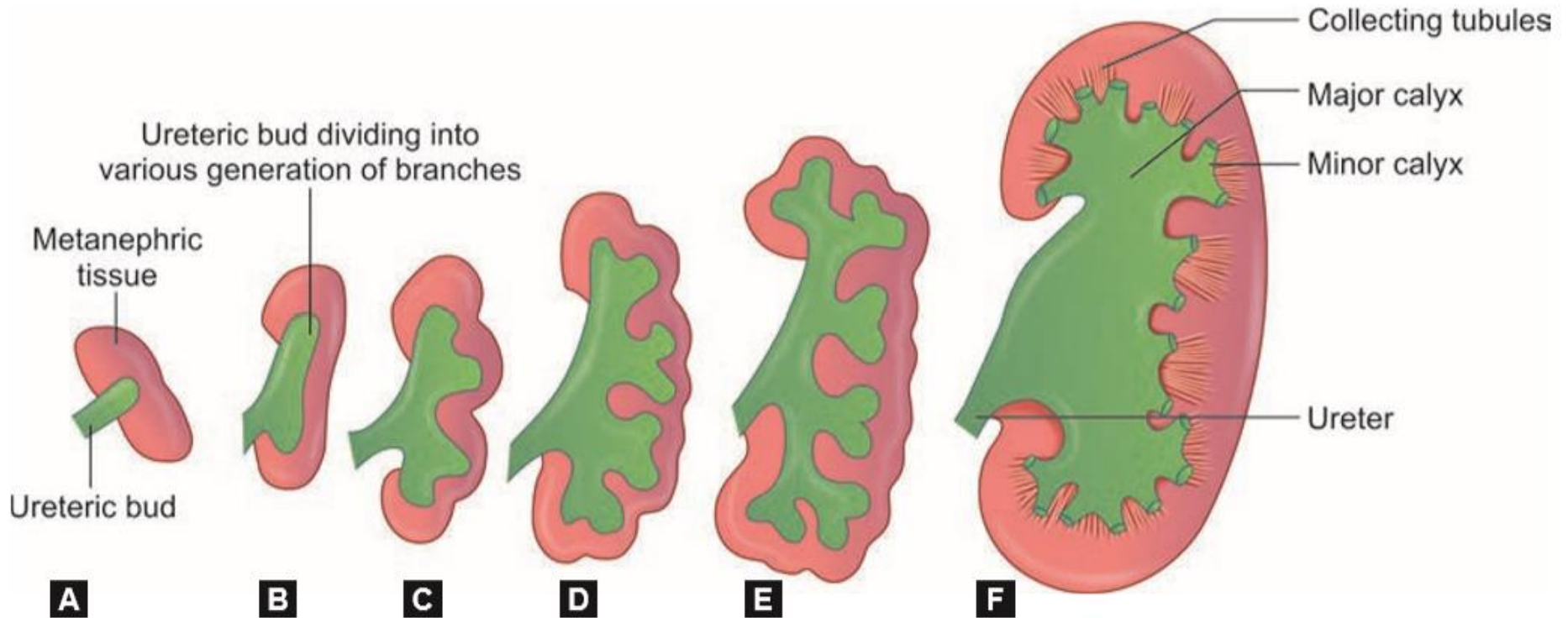




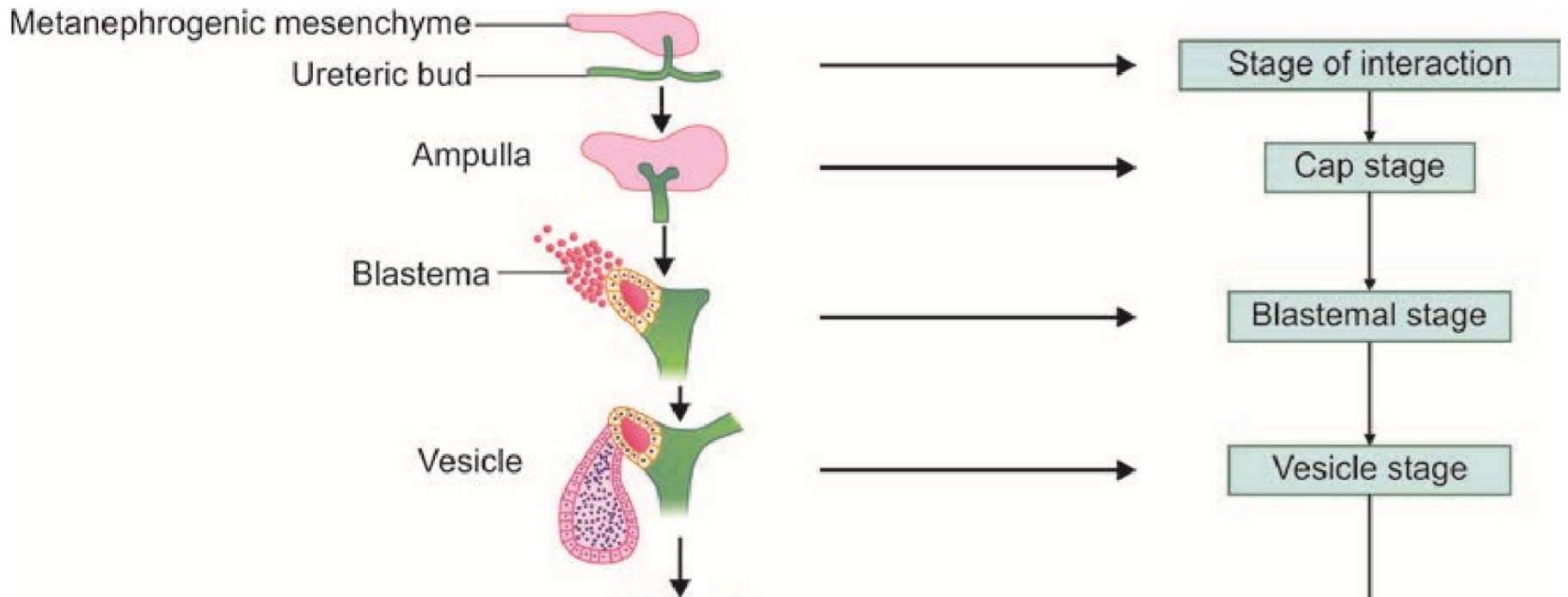
3 Stages of evolution



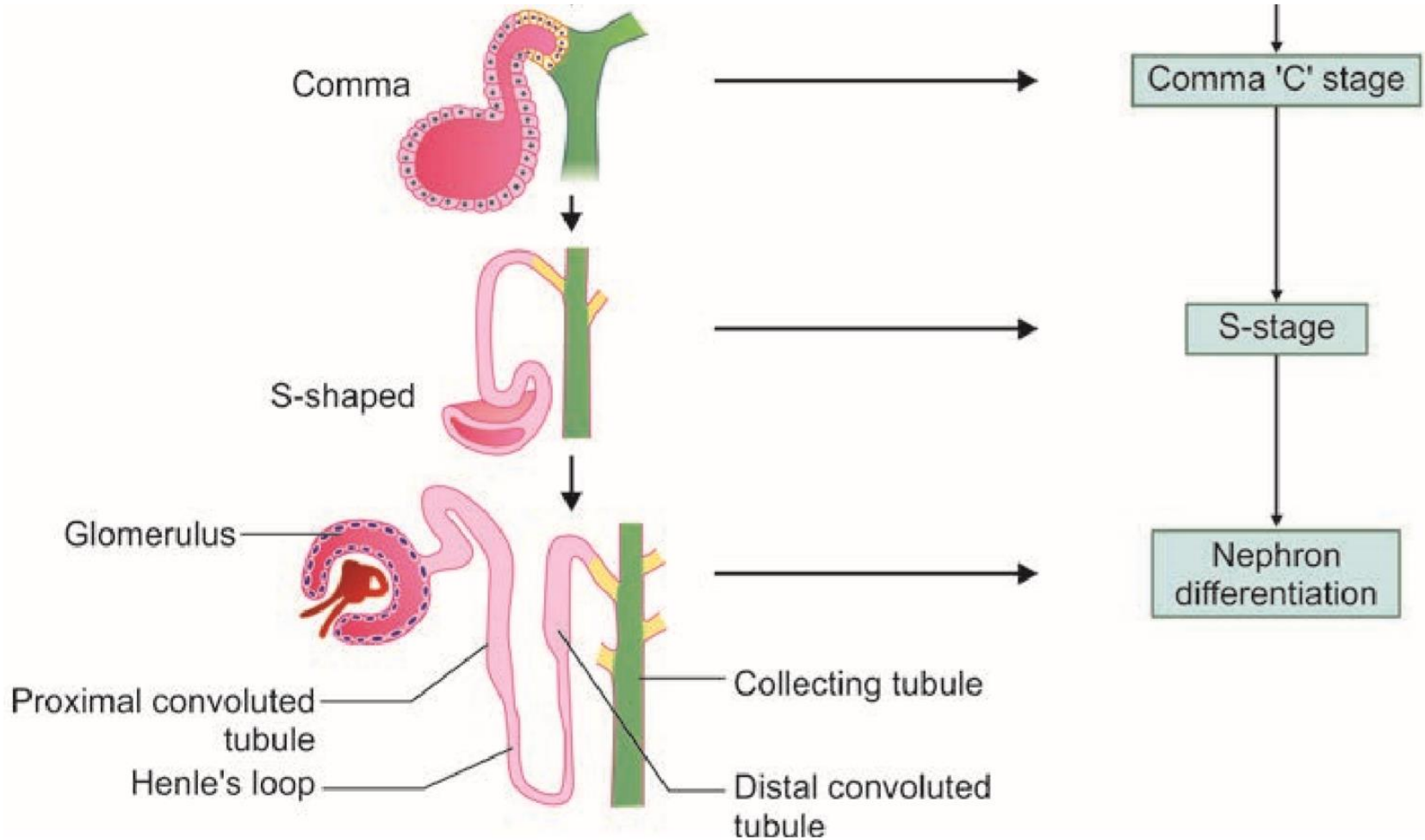
Formation of Collecting system



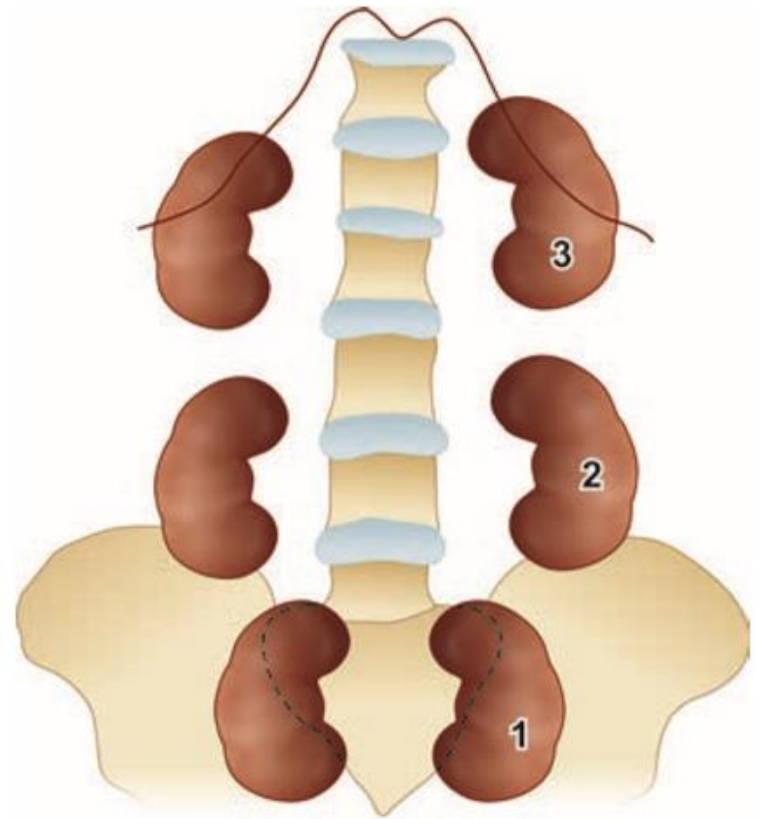
Development of Nephron



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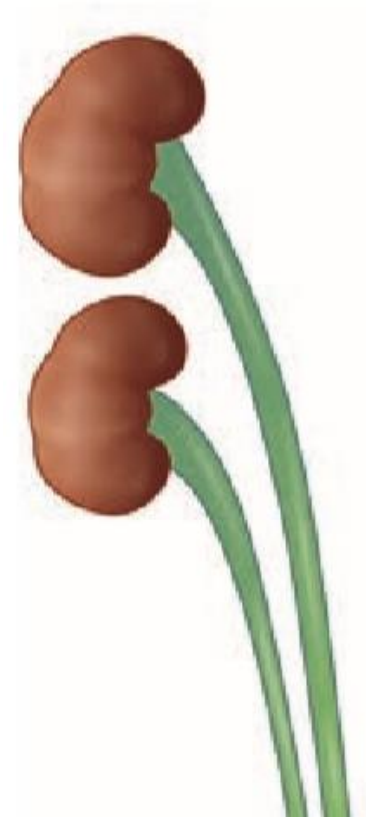


- Ascent of the kidney:
Due to differential growth of abdominal wall
- Rotation of kidney:
 - Initially, hilum is anteriorly
 - Gradually rotates medially



Anomalies of Kidney

- Agenesis: One or both kidneys
- Hypo/Hyperplasia
- Duplication: Extra kidney one side
 - Can be separate or fused



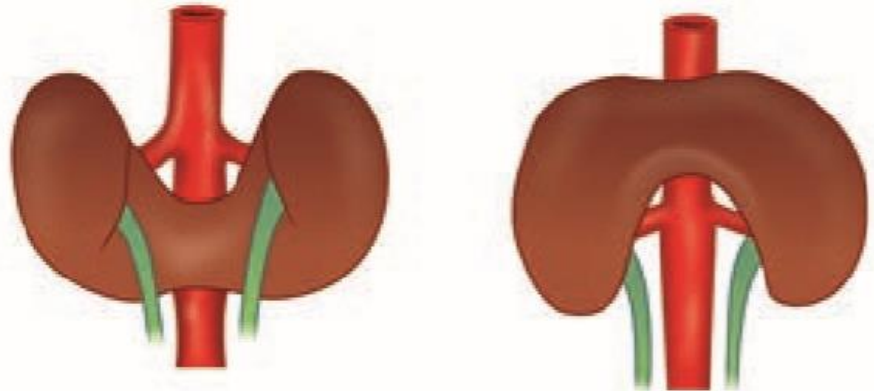
Anomalies of shape:

- Horseshoe kidney

Due to fusion of upper or lower poles

May lie in front or behind the aorta

Inferior mesenteric artery prevents its ascent

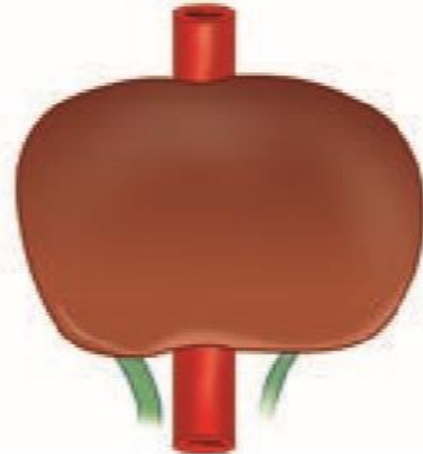


Anomalies of shape:

- Pancake kidney

The two kidneys form one mass

May lie in the midline or on one side



Anomalies of shape:

- Lobulated kidney

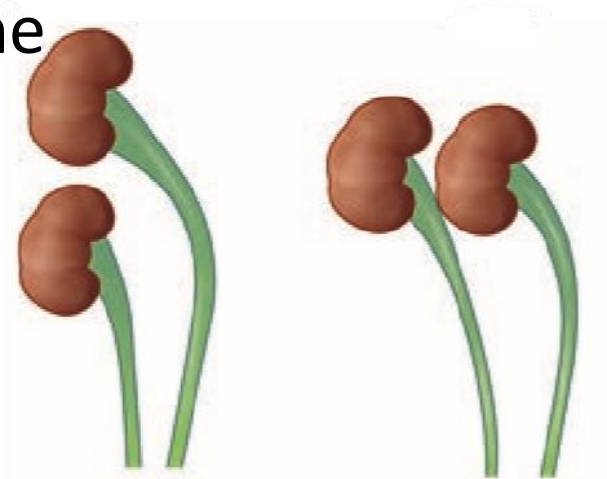
Persistence of lobulation of fetal kidney



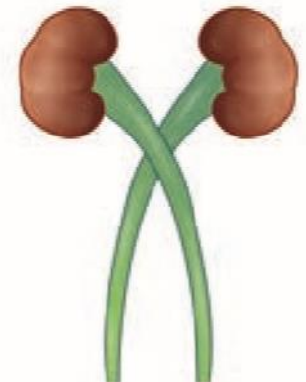
Anomalies of position:

- Kidneys may fail to ascend
- Ascent may be incomplete (lower lumbar)
- Ascends too far (thoracic cavity)

- Both kidneys may lie on the same side of midline



- Both kidneys may be displaced to the opposite side

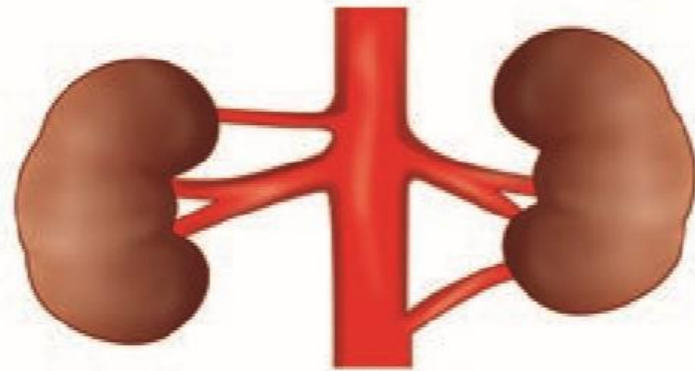


- Abnormal rotation:
 - Non-rotation- Hilum is directed forward
 - Incomplete rotation: Hilum faces anteromedially
 - Reverse rotation: Hilum faces anterolaterally

- Congenital polycystic kidney:
 - Due to failure of contact of metanephros with collecting tubules
 - Leads to formation to cysts



- Aberrant renal arteries:
 - Arteries arising at abnormal levels
 - Common in cases of non-ascent or incomplete ascent
 - These can press upon the ureter leading to hydronephrosis



- Multiple anomalies: Two or more anomalies may co-exist