

eLearning
by  **Dr. M.G.R.** EDUCATIONAL AND RESEARCH INSTITUTE



Dr. M.G.R

EDUCATIONAL AND RESEARCH INSTITUTE

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THE UROGENITAL SYSTEM



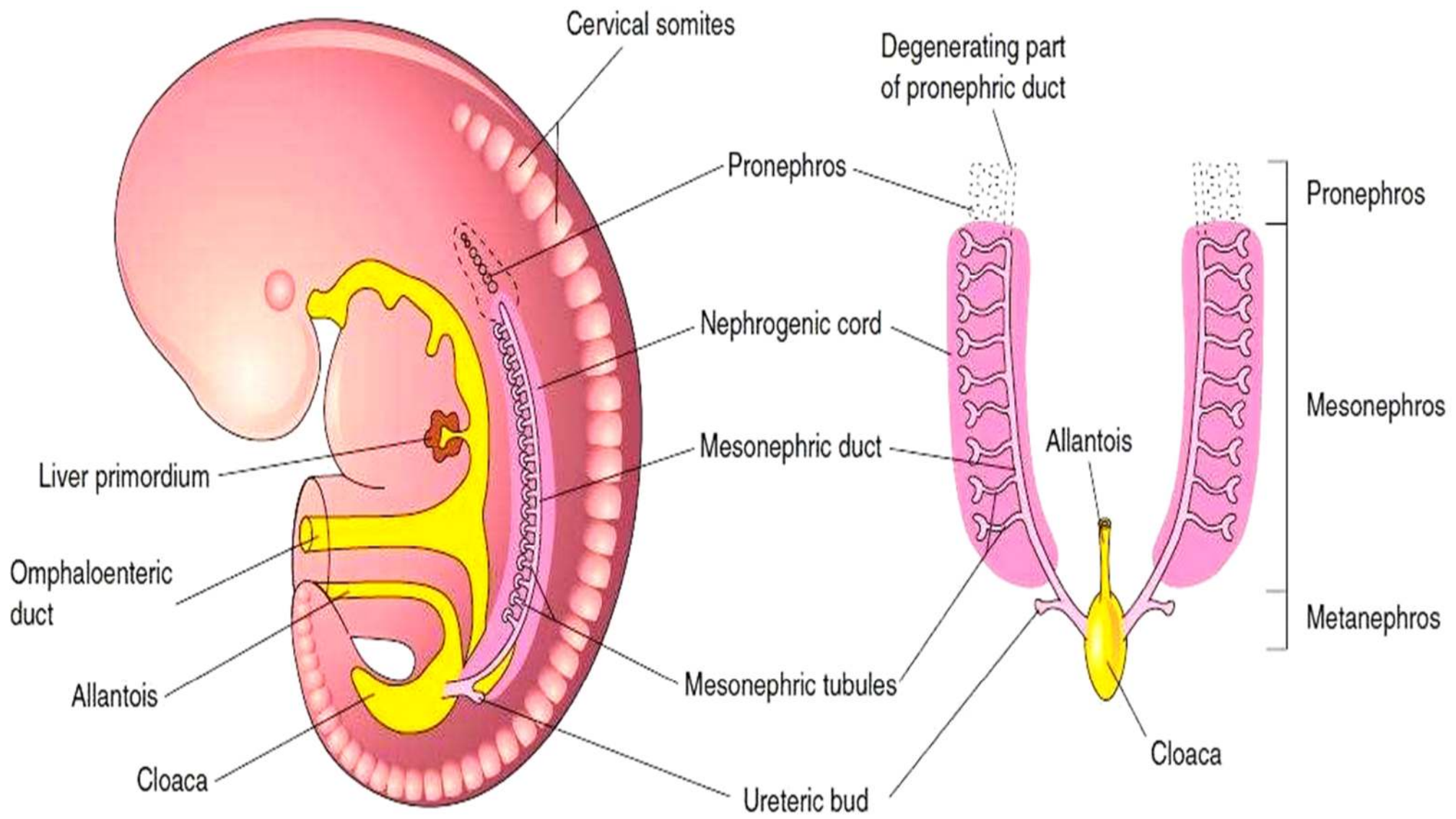
THE UROGENITAL SYSTEM

Two embryonic structures that play an important role in the development of the urogenital system are the **intermediate mesoderm** and the **cloaca**.

DEVELOPMENT OF KIDNEYS AND URETERS

Three sets of successive kidneys develop in human embryos.

- **The first set—pronephro**-is rudimentary and nonfunctional
- **The second set—mesonephro**-is well developed and functions briefly during the early fetal period.
- **The third set—metanephro**-forms the permanent kidneys.



A **uriniferous tubule** consists of two **embryologically** different parts:

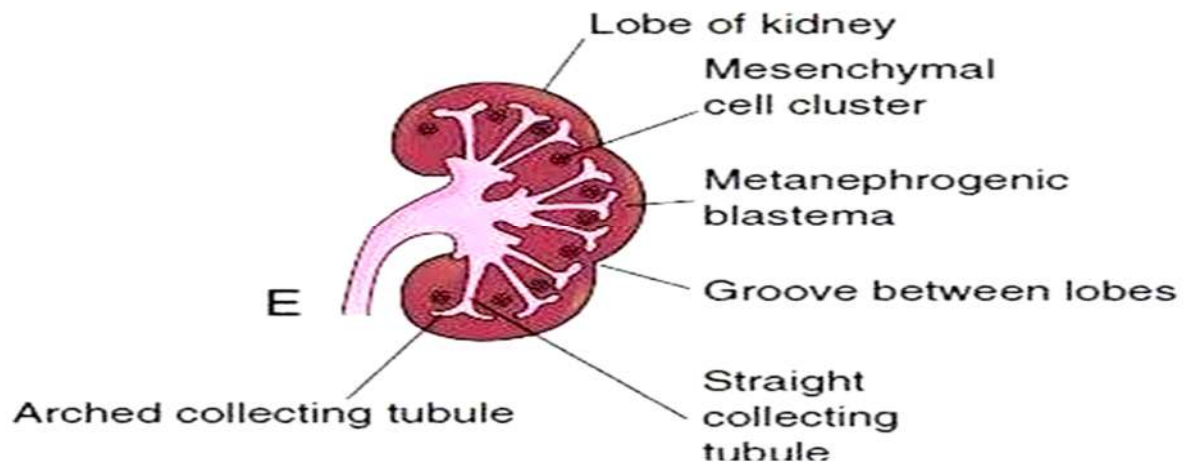
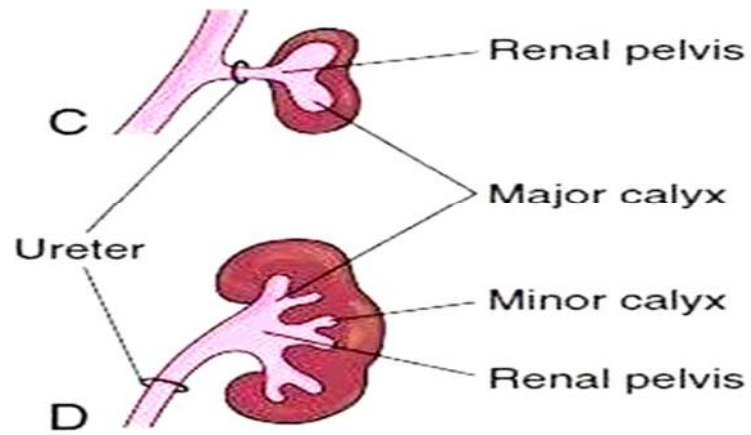
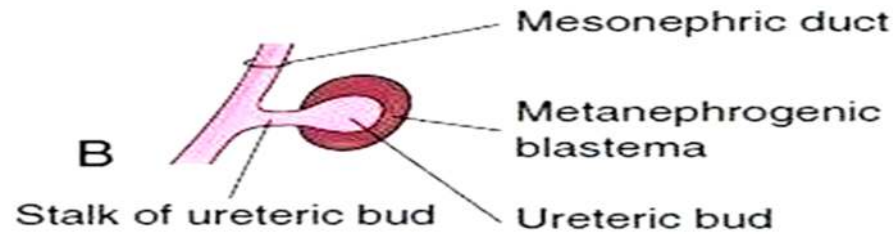
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graph TD; A["A uriniferous tubule consists of two embryologically different parts:"] --> B["A nephron derived from the metanephrogenic blastema"]; A --> C["A collecting tubule derived from the ureteric bud"]; style A fill:#e6f2ff,stroke:#337ab7,stroke-width:2px; style B fill:#e6f2ff,stroke:#337ab7,stroke-width:2px; style C fill:#e6f2ff,stroke:#337ab7,stroke-width:2px;
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A nephron derived from the metanephrogenic blastema

A collecting tubule derived from the ureteric bud

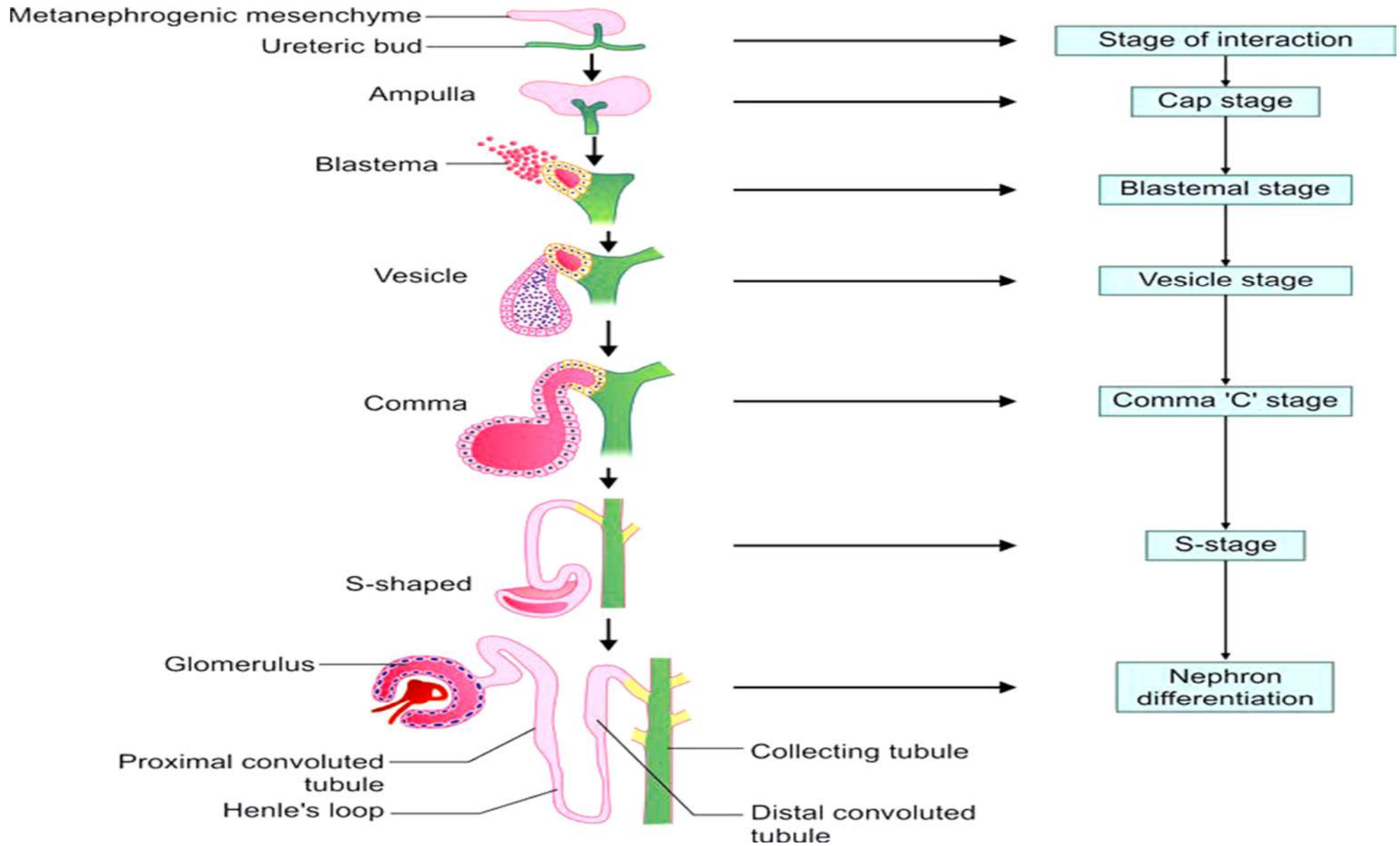
DEVELOPMENT OF KIDNEYS AND URETERS

- The stalk of the ureteric bud becomes the ureter.
- The cranial part of the bud undergoes repetitive branching, forming branches which differentiate into the collecting tubules of the metanephros.
- The first four generations of tubules enlarge and become confluent to form the major calices, and the second four generations coalesce to form the minor calices.
- The end of each arched collecting tubule induces clusters of mesenchymal cells in the metanephrogenic blastema to form small metanephric vesicles.



DEVELOPMENT OF KIDNEYS AND URETERS

- The proximal ends of the metanephric tubules are invaginated by **glomeruli**.
- **The tubules differentiate into proximal and distal convoluted tubules, and the nephron loop (Henle loop),** together with the glomerulus and its capsule, constitute a **nephron**.
- Each distal convoluted tubule contacts an arched collecting tubule, and the tubules become confluent.



- Between the 10th and 18th weeks, the number of glomeruli increases gradually and then increases rapidly until the 32nd week.
- The increase in kidney size after birth results mainly from the elongation of the proximal convoluted tubules as well as an increase of interstitial tissue.
- Nephron formation is complete at birth except in premature infants. Although glomerular filtration begins at approximately the ninth fetal week, functional maturation of the kidneys and increasing rates of filtration occur after birth.

Positional Changes of Kidneys

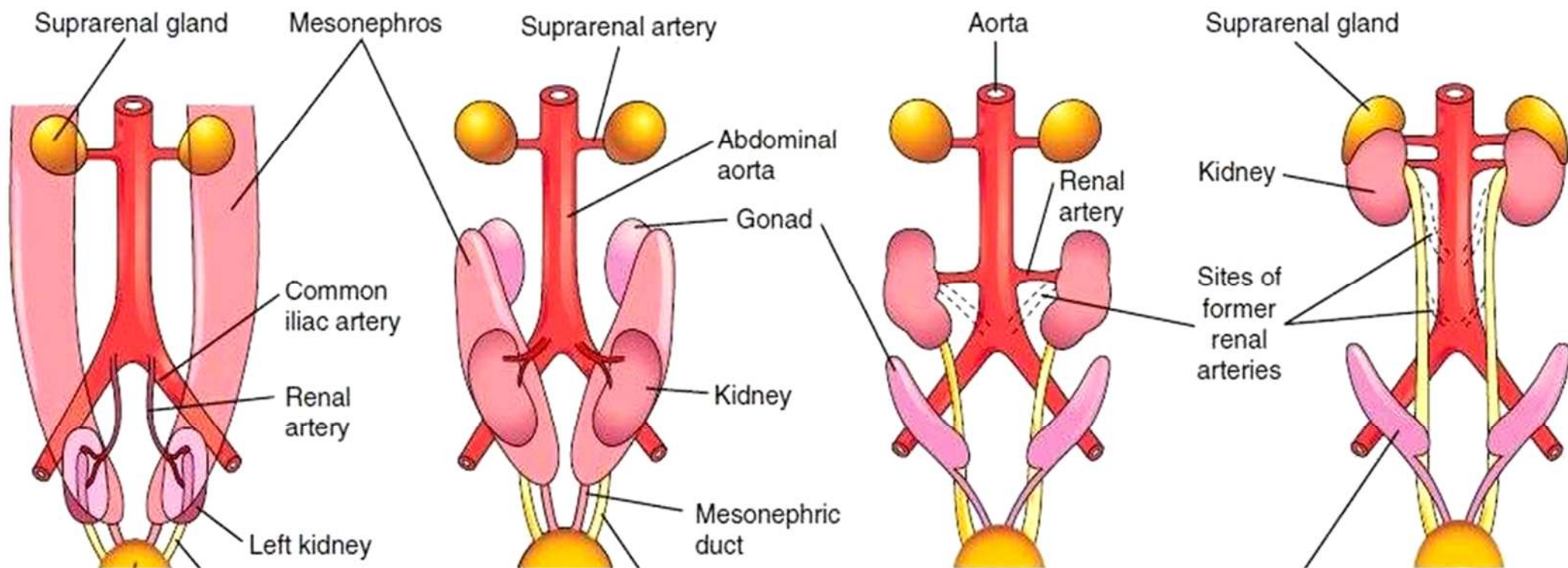
Initially the primordial permanent kidneys lie close to each other in the pelvis.

As the abdomen and pelvis grow, the kidneys gradually relocate to the abdomen and move farther apart. They attain their adult position by the ninth week (contact with the suprarenal glands).

~~This "ascent" results mainly from the growth of the embryo's body caudal to the kidneys~~

Initially the hilum of each kidney, where blood vessels, the ureter, and nerves enter and leave, face ventrally; ~~however, as the kidneys relocate ("ascend"), they rotate medially almost 90 degrees.~~

By the ninth week, the hila are directed anteromedially. Eventually the kidneys become retroperitoneal (external to the peritoneum) on the posterior abdominal wall.



Changes in Blood Supply of Kidneys

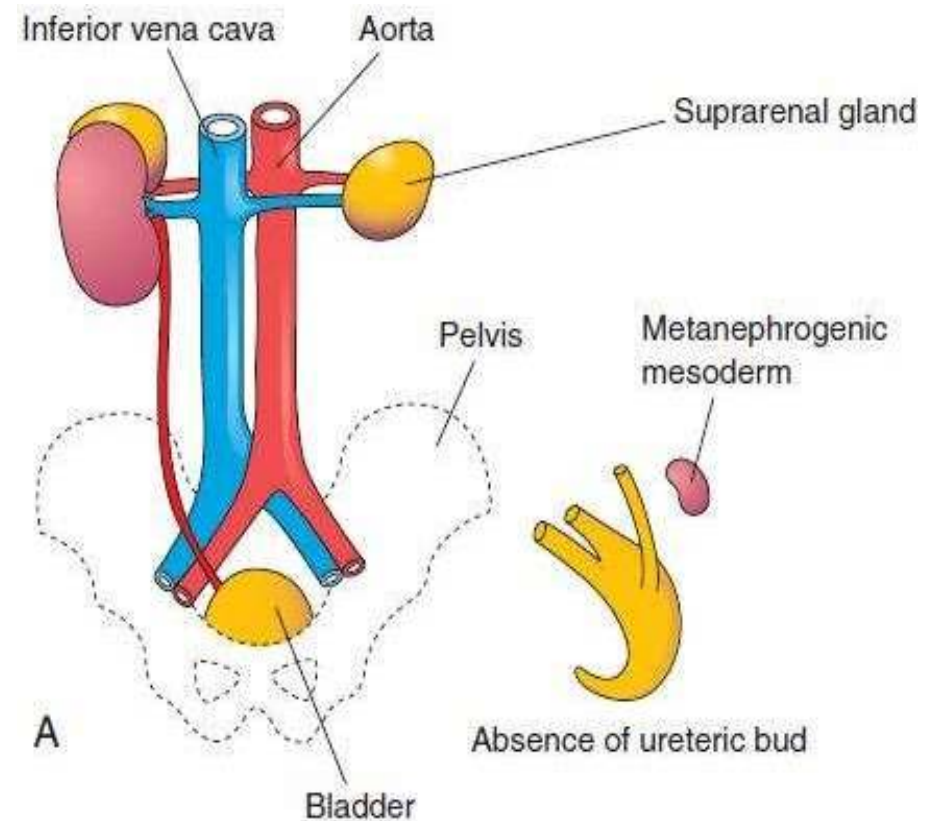
During the changes in the kidneys position, they receive their blood supply from vessels that are close to them:

- Initially, the renal arteries are branches of the common iliac arteries.
- Later, the kidneys receive their blood supply from the distal end of the aorta. When they are located at a higher level, they receive new branches from the aorta.
- The kidneys receive their most cranial arterial branches from the abdominal aorta; these branches become the permanent renal arteries.

CONGENITAL ANOMALIES OF KIDNEYS AND URETERS

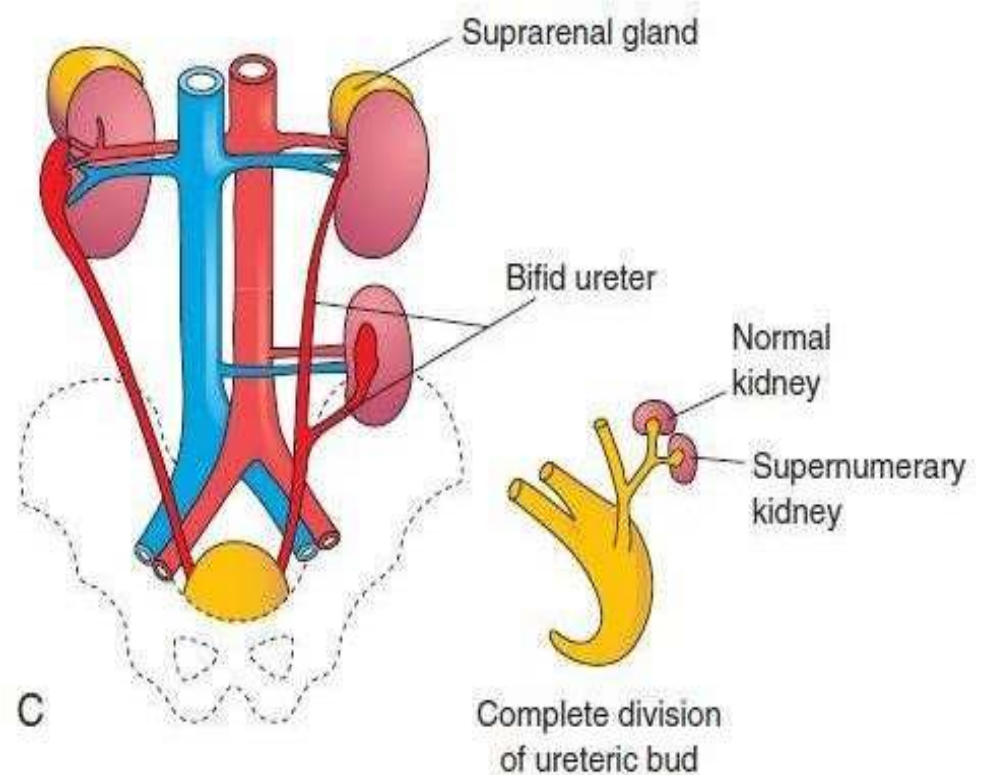
Renal Agenesis

- Renal Agenesis (absence): Can be unilateral or bilateral
- Renal agenesis results when the ureteric buds do not develop or the primordia (stalks of buds) of the ureters degenerate.



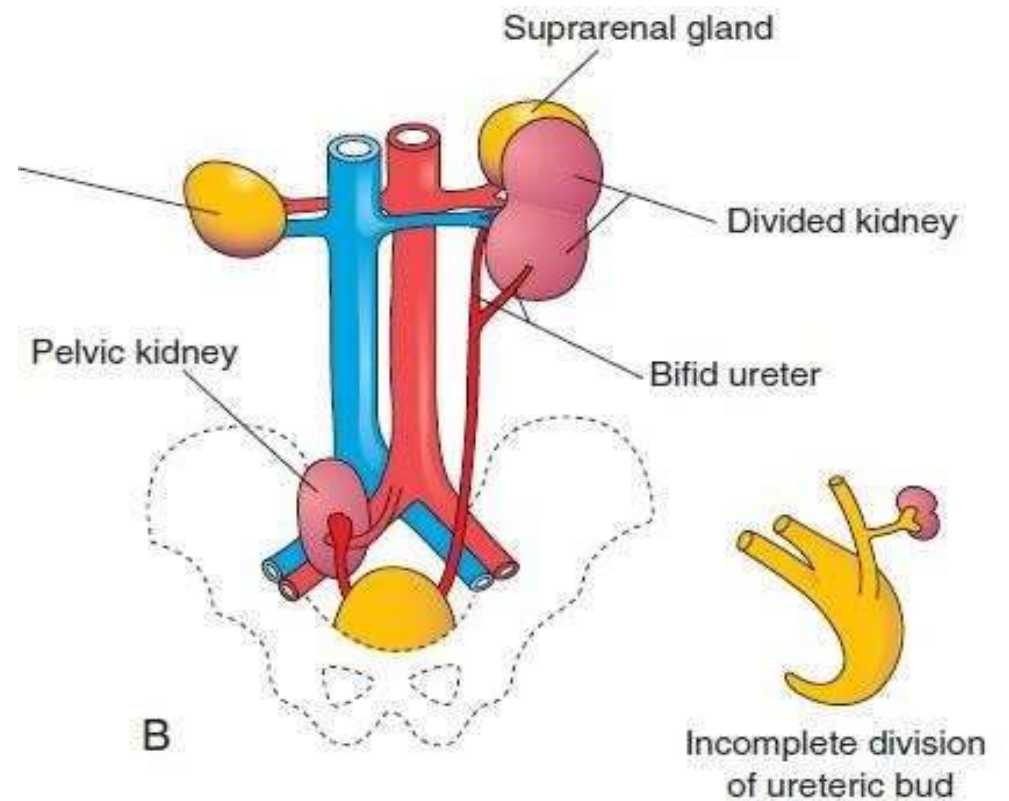
Malrotated Kidney

- If a kidney fails to rotate, the hilum faces anteriorly; that is, the fetal kidney retains its embryonic position
- Abnormal rotation of the kidneys is often associated with ectopic kidneys.



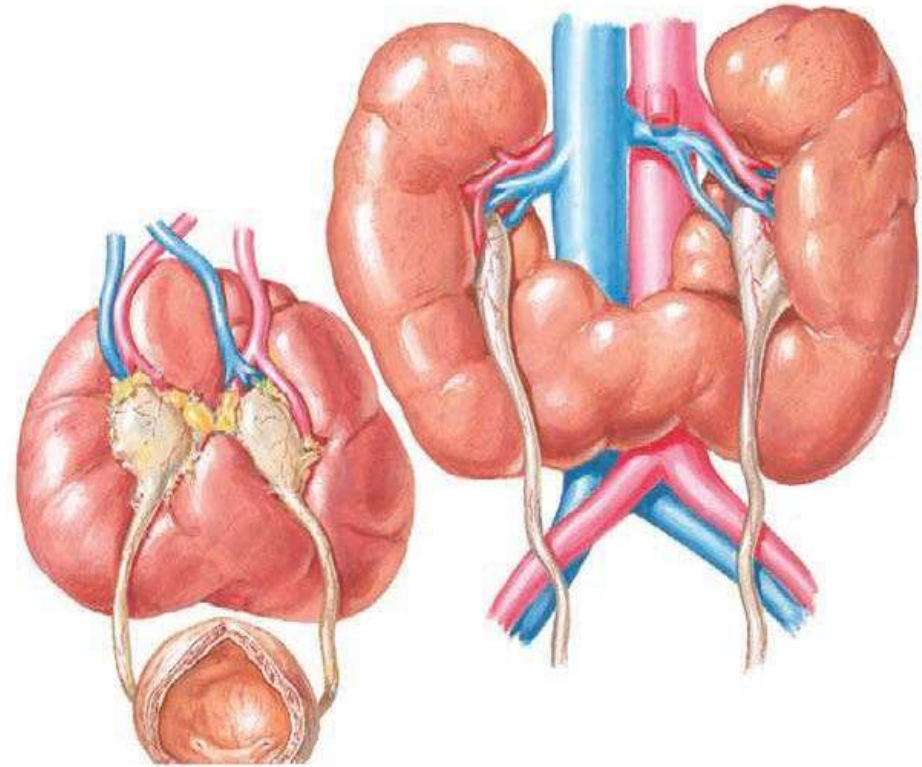
Ectopic Kidneys

- One or both kidneys may be in an abnormal position.
- Most ectopic kidneys are located in the pelvis, but some lie in the inferior part of the abdomen.

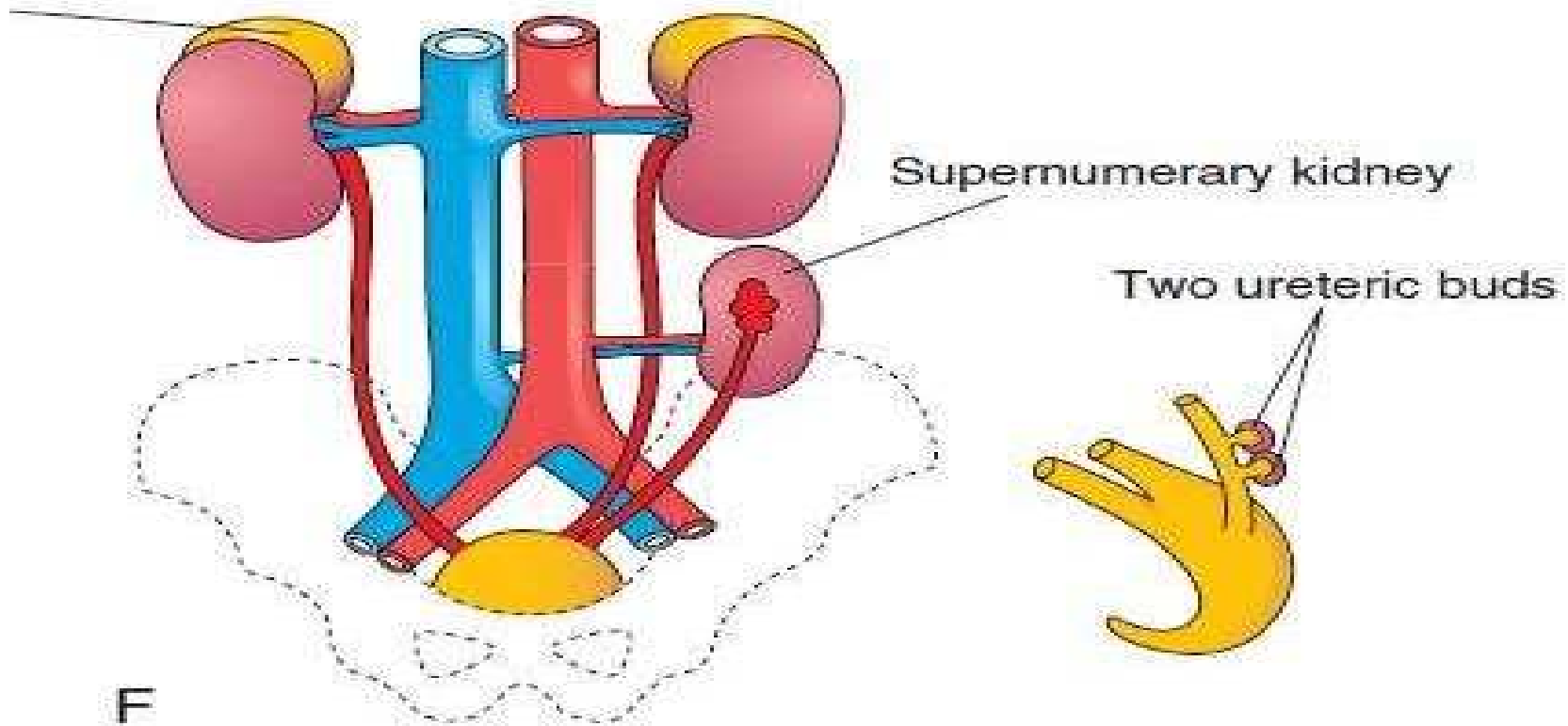


Horseshoe Kidney

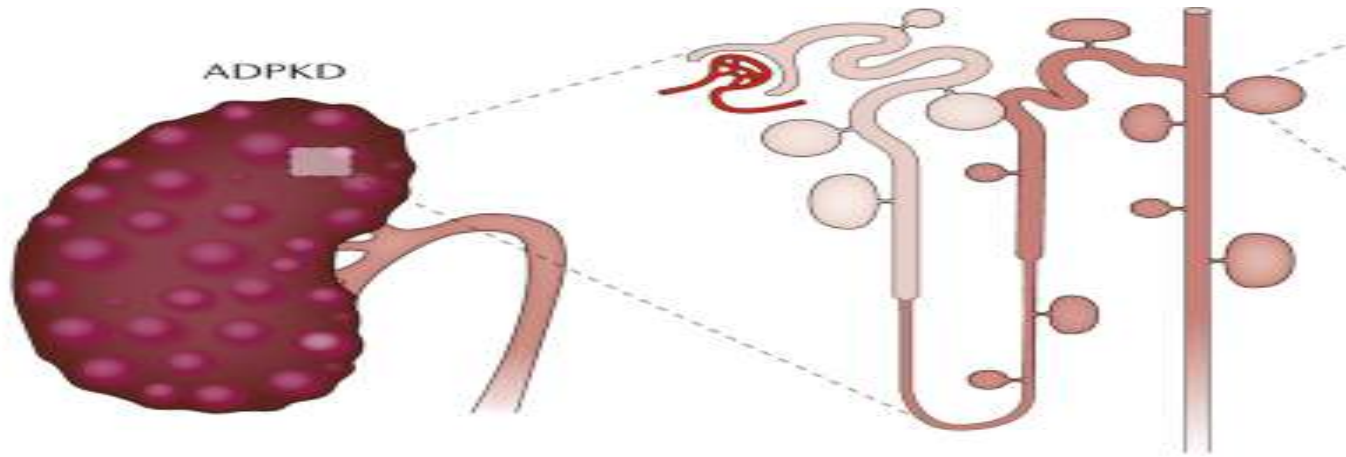
- In 0.2% of the population, the poles of the kidneys are fused; usually it is the inferior poles that fuse.
- The large U-shaped kidney usually lies in the pubi region.
- Normal ascent of the fused kidneys is prevented because they are held down by the root of the inferior mesenteric artery.
- A horseshoe kidney usually produces no symptom because its collecting system develops normally and the ureters enter the bladder.



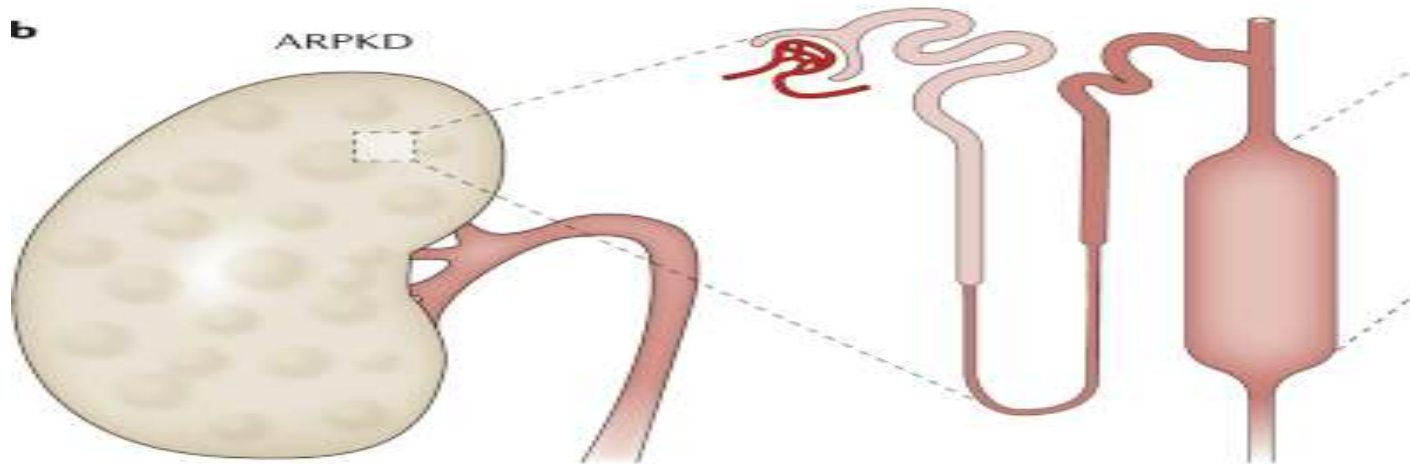
- A supernumerary kidney with its own ureter, which is rare, probably results from the formation of two ureteric buds.



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Thank
you!



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