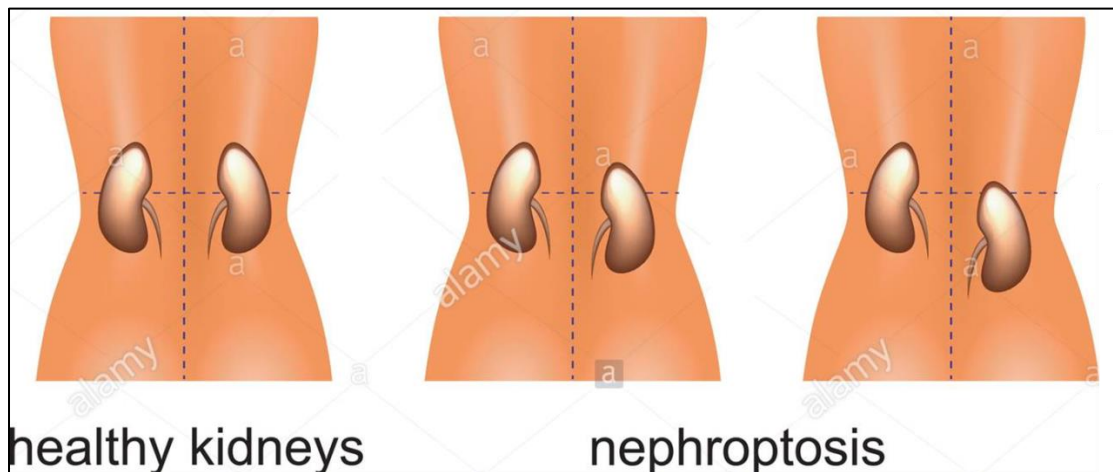


Part I

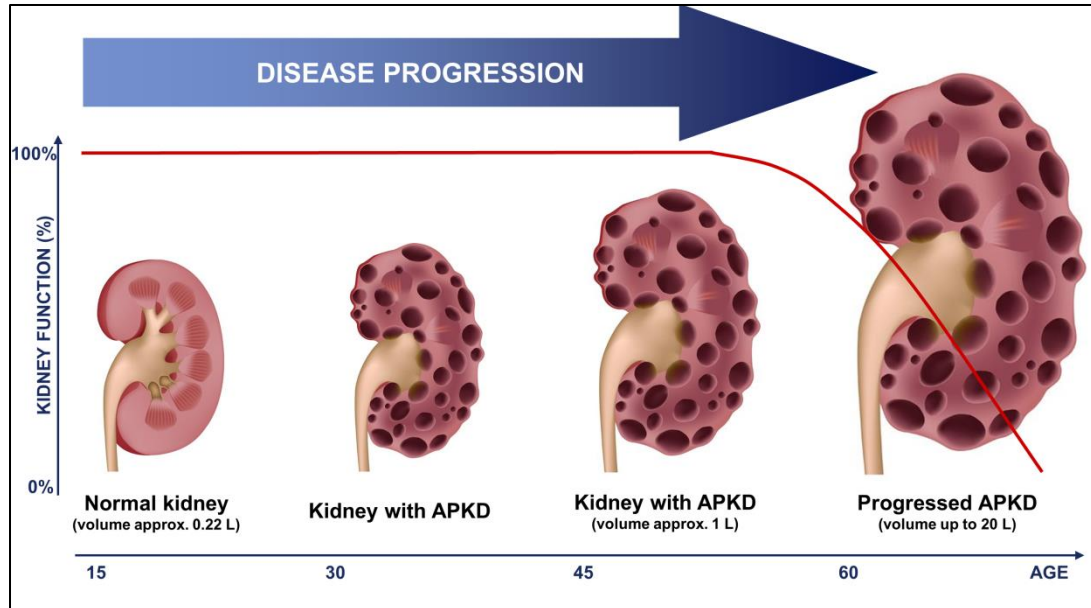
Clinical considerations

Kidney:

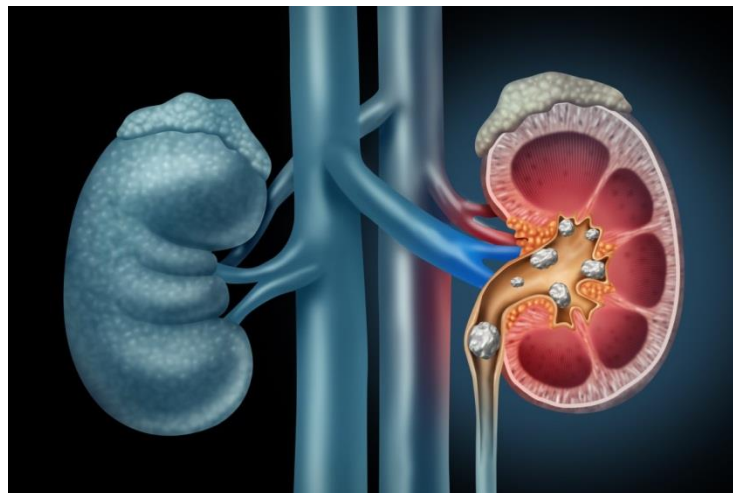
- **Nephroptosis** is downward displacement of the kidney, **dropped kidney**, or **floating kidney** caused by loss of supporting fat. The kidney moves freely in the abdomen and even into the pelvis. It may cause a kink in the ureter or compression of the ureter by an aberrant inferior polar artery, resulting in hydronephrosis.



- **Polycystic kidney disease** is a genetic disorder characterized by numerous cysts filled with fluid in the kidney; the cysts can slowly replace much of normal kidney tissues, reducing kidney function and leading to kidney failure. It is caused by a failure of the collecting tubules to join a calyx, which causes dilations of the loops of Henle, resulting in progressive renal dysfunction. This kidney disease has symptoms of high blood pressure, pain in the back and side, headaches, and blood in the urine. It may be treated by hemodialysis or peritoneal dialysis and kidney transplantation.

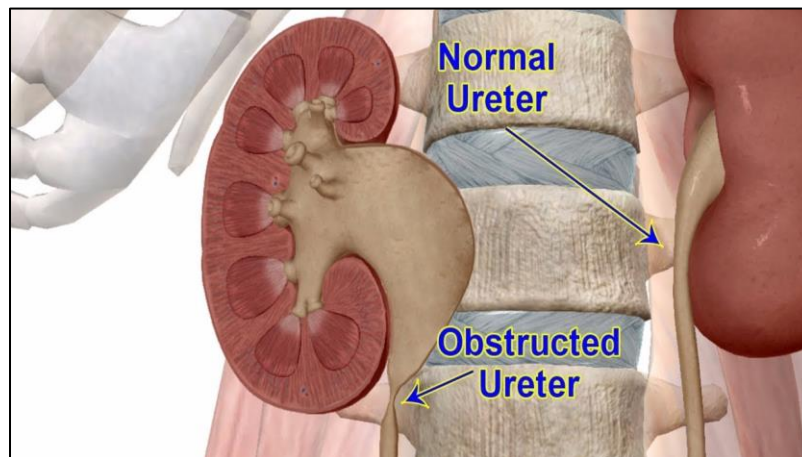


- **Kidney stone (renal calculus or nephrolith)** is formed by combination of a high level of calcium with oxalate, phosphate, urea, uric acid, and cystine. Crystals and subsequently stones are formed in the urine and collected in calyces of the kidney or in the ureter. The kidney stone varies in size from a grain of sand to the size of a golf ball and produces severe **colicky pain** while traveling down through the ureter from the kidney to the bladder. Common signs of kidney stones include nausea and vomiting, urinary frequency and urgency, and pain during urination

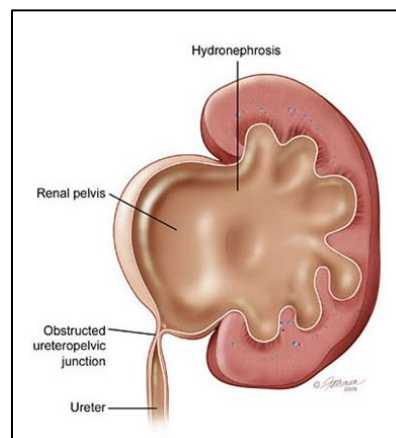


Ureter:

- **Obstruction of the ureter** occurs by renal calculi or kidney stones where the ureter joins the renal pelvis (ureteropelvic junction), where it crosses the pelvic brim, or where it enters the wall of the urinary bladder (ureterovesicular junction). Kidney stones at these narrow points result in hydroureter and hydronephrosis.



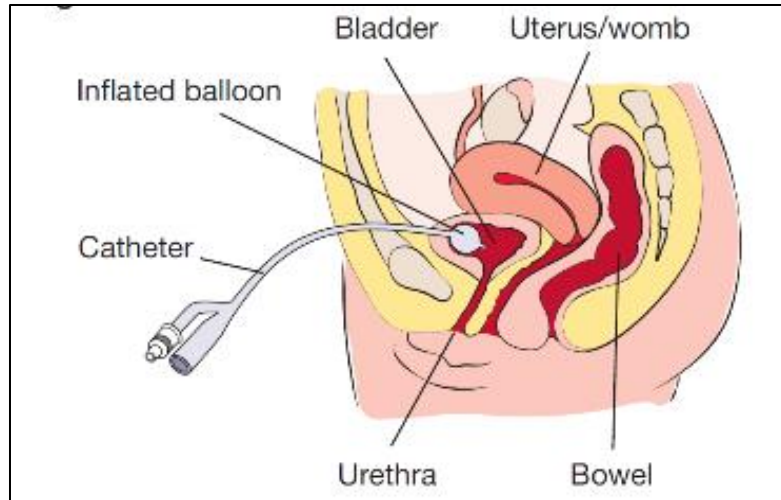
- **Hydronephrosis** is a **fluid-filled enlargement of the renal pelvis and calyces** as a result of obstruction of the ureter. It is due to an obstruction of urine flow by kidney stones in the ureter, by compression on the ureter by abnormal blood vessels, or by the developing fetus at the pelvic brim. It has symptoms of nausea and vomiting, urinary tract infection, fever, dysuria (painful or difficult urination), urinary frequency, and urinary urgency.



Damage of the ureter: in the female, damage may occur during a hysterectomy or surgical repair of a prolapsed uterus because it runs under the uterine artery. The ureter is inadvertently clamped, ligated, or divided during a hysterectomy when the uterine artery is being ligated to control uterine bleeding.

Urinary bladder:

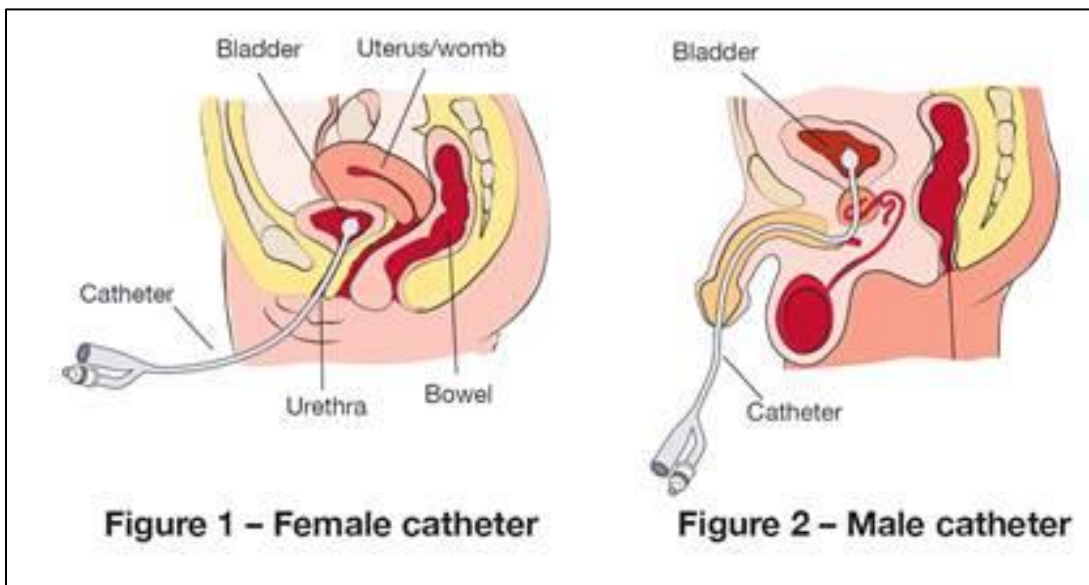
- **Bladder cancer** usually originates in cells lining the inside of the bladder (epithelial cells). The most common symptom is blood in the urine (hematuria). Other symptoms include frequent urination and pain upon urination (dysuria). This cancer may be induced by organic carcinogens that are deposited in the urine after being absorbed from the environment and also by cigarette smoking.
- **Tenesmus** is a constant feeling of the desire to empty the bladder or bowel, accompanied by pain, cramping, and straining due to a spasm of the urogenital diaphragm.
- **Interstitial cystitis** is a chronic inflammatory condition of the bladder that causes frequent, urgent, and painful urination.
- **Suprapubic catheterization:** In certain instances it is necessary to catheterize the bladder through the anterior abdominal wall. For example, when the prostate is markedly enlarged and it is impossible to pass a urethral catheter into the bladder. The bladder is a retroperitoneal structure and when full lies adjacent to the anterior abdominal wall. The procedure of suprapubic catheterization is straightforward and involves the passage of a small catheter through the abdominal wall in the midline above the pubic symphysis. The catheter passes into the bladder without compromising other structures and allows drainage.



Urethra

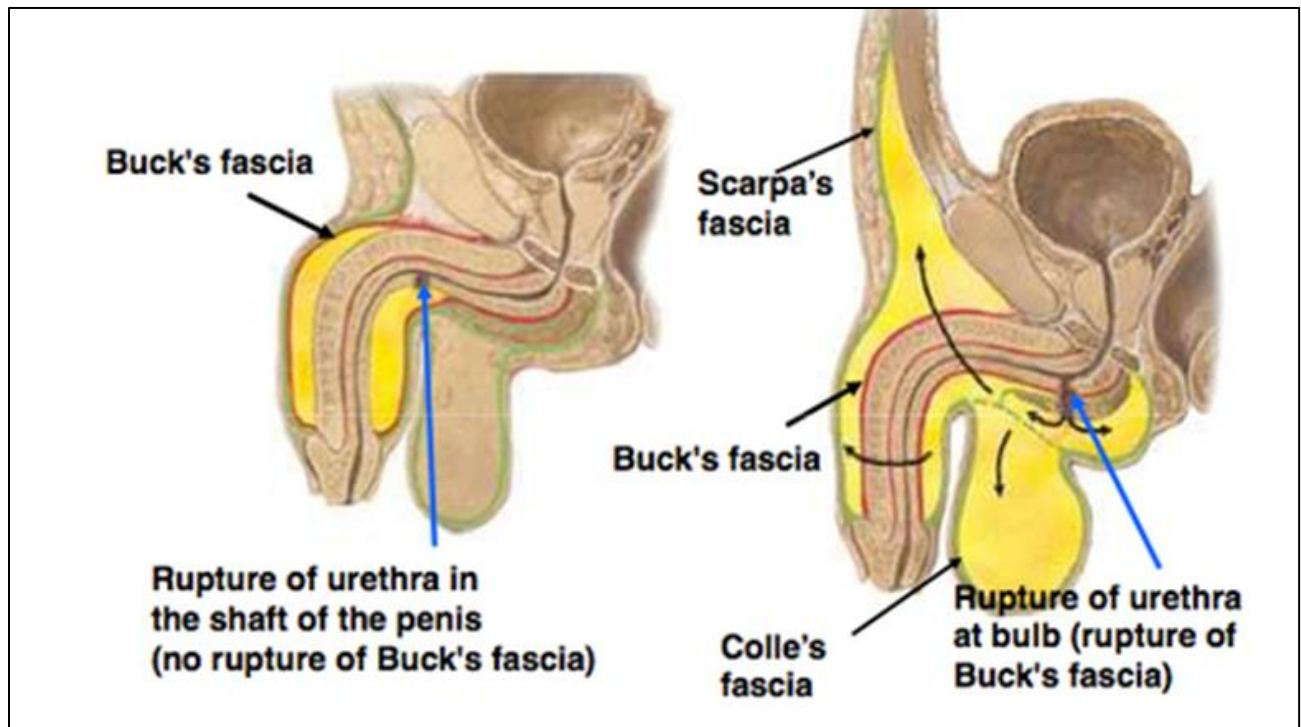
Urethral catheterization: is often performed to drain urine from a patient's bladder when the patient is unable to micturate. When inserting urinary catheters, it is important to appreciate the gender anatomy of the patient.

In men the spongy urethra angles superiorly to pass through the perineal membrane and into the pelvis. Just inferior to the perineal membrane, the wall of the urethral bulb is relatively thin and can be damaged when inserting catheters or doing cystoscopy. In women, these procedures are much simpler because the urethra is short and straight.



Rupture of the membranous urethra leads to accumulation of urine in the deep perineal pouch which is closed all around

Rupture of the penile urethra leads to escape of urine into the superficial perineal pouch. Urine escapes into the scrotum, penis and ascends into the interval between membranous layer of superficial fascia of the anterior abdominal wall and external oblique aponeurosis. Urine does not descend into the thigh due to fusion of Scarpa's fascia of the anterior abdominal wall to the fascia lata of the thigh below the inguinal ligament.



Part II

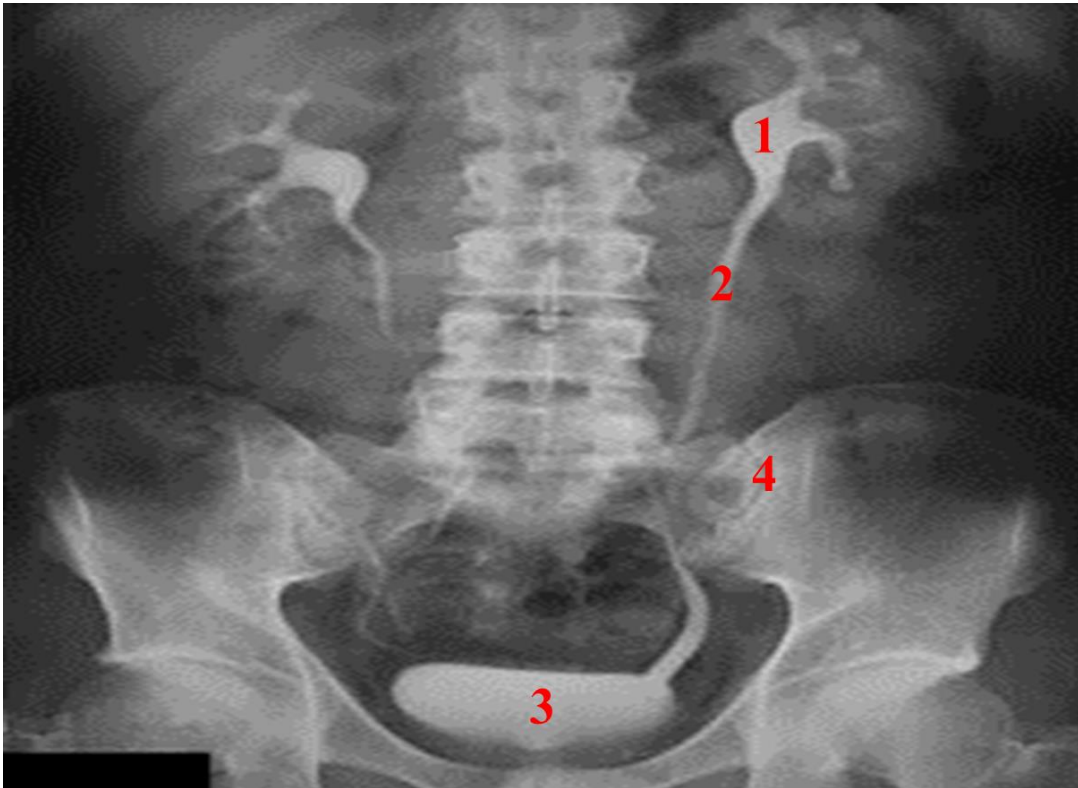
Radiology



Kidney IVU AP view:

- 1- Upper pole of left kidney.
- 2- Lower pole of left kidney.
- 3- Minor calyx.
- 4- Major calyx.
- 5- Renal pelvis
- 6- Pelviureteric junction.
- 7- Ureter.

Urinary system IVU



Urinary system IVU AP view:

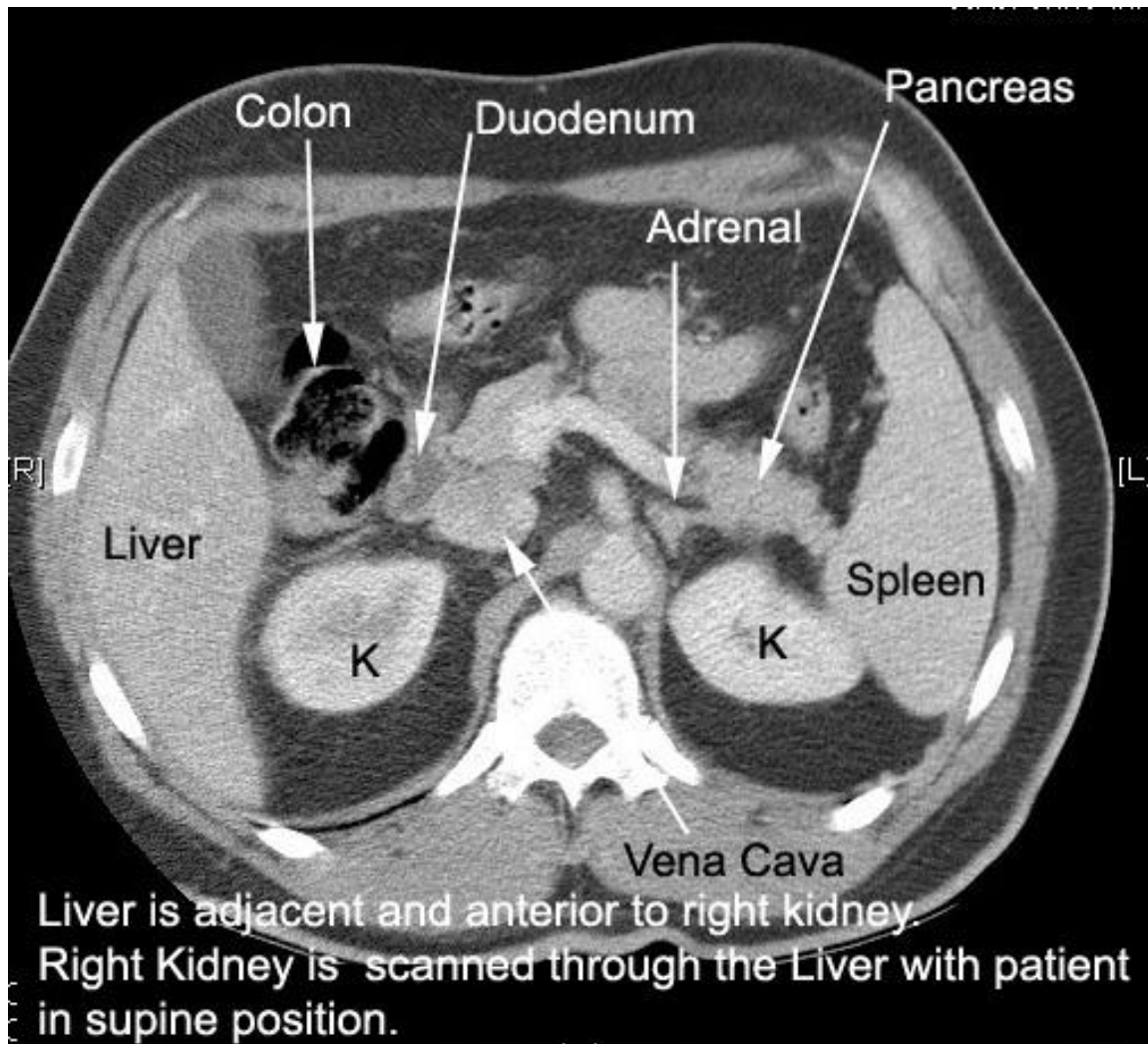
- 1- Renal pelvis.
- 2- Ureter.
- 3- Urinary bladder.
- 4- Sacroiliac joint.

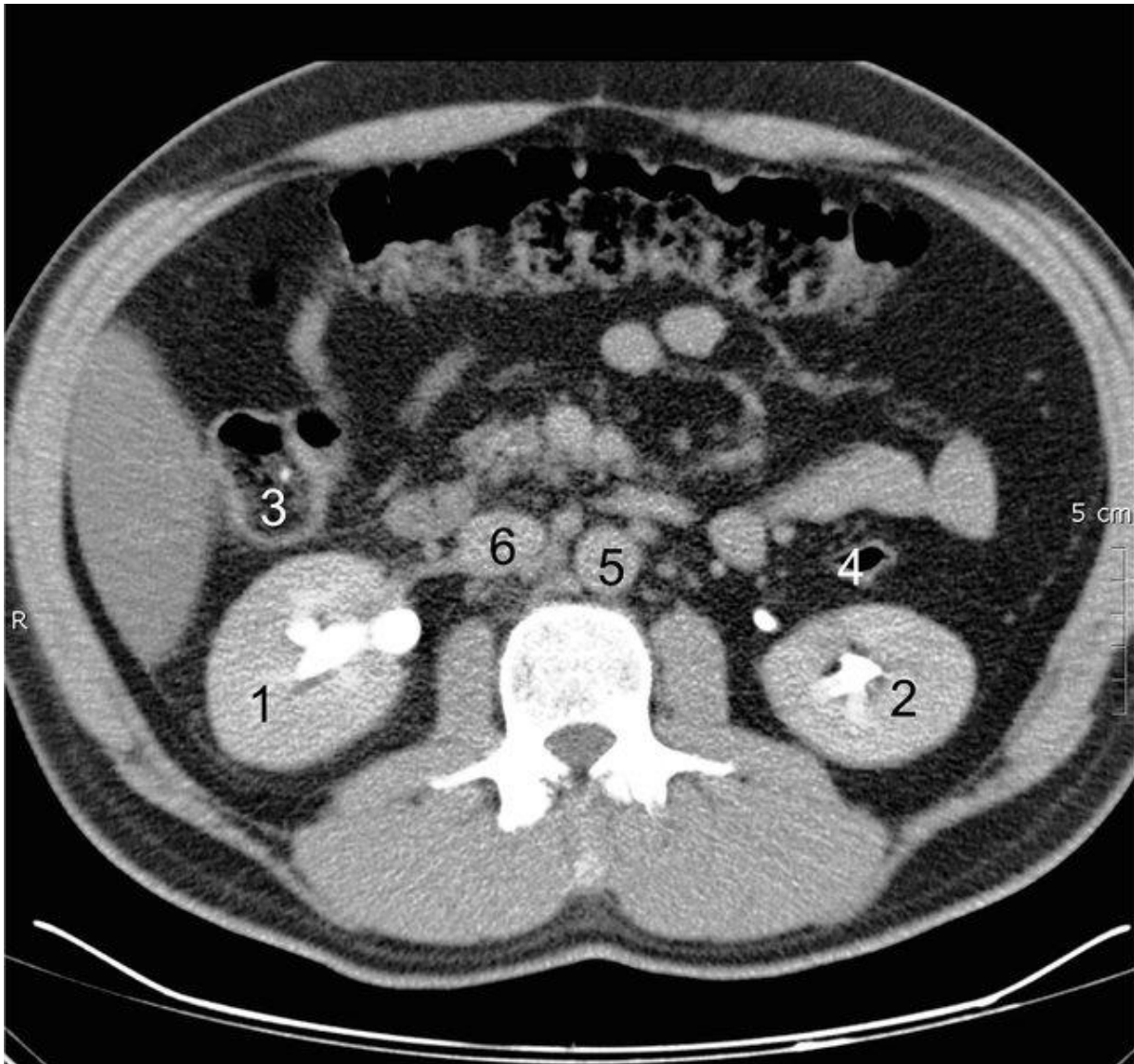


Urinary bladder IVU AP view:

- 1- Ureter.
- 2- Urinary bladder.
- 3- Symphysis pubis.
- 4- Obturator foramen.

CT scan

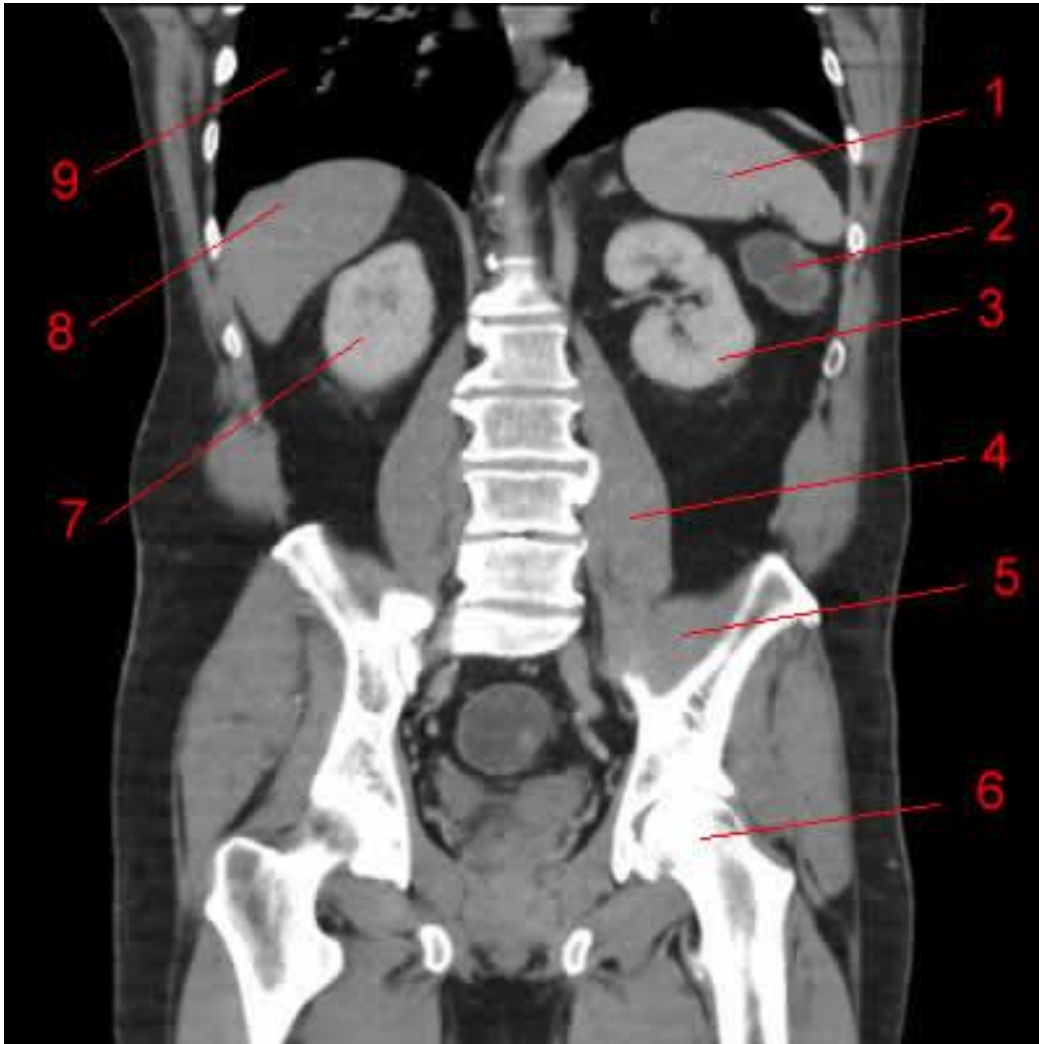




Abdominal CT scan at the level of kidneys in a patient in the supine position.

- 1: Right kidney
- 2: Left kidney
- 3: Ascending colon
- 4: Descending colon
- 5: Abdominal Aorta
- 6: Inferior Vena Cava.

CT abdomen coronal section



- 1- Spleen
- 2- Left colic flexure
- 3- left kidney
- 4- Left psoas muscle
- 5- Left iliac muscle
- 6- Femoral head
- 7- Right kidney
- 8- Right kidney
- 9- Liver
- 10- Right lung

Part III

Clinical cases

CASE (1)

A 55-year old male continues with high fever and flank pain despite 3 days of broad spectrum I.V antibiotic therapy. The urine isolate of E. coli demonstrates in vitro sensitivity to the antibiotics used. Renal ultrasound shows fluid around the left kidney. The physician diagnosed it as a case of perinephric abscess.

- 1- In this case the pus in the perinephric abscess tends to spread downward. Why?
- 2- Describe the bare areas of the left kidney?
- 3- Enumerate the venous drainage of that kidney?
- 4- Name the vascular segments of the kidney?
- 5- List the supporting factors of the kidney?

CASE (2)

35- year old male patient comes to the outpatient clinic with repeated attacks of severe colicky pain that begins in the loin and is referred to the groin. On examination and investigations, ureteric stones were detected.

- 1- Name narrowest points in the ureter?
- 2- Name its corresponding bony level?
- 3- The ureteric pain referred to the groin, explain?
- 4- Name the surface marking of the ureter?

CASE (3)

Male patient 40 years old, after cathetrization they are swelling of the scrotum, penis and anterior abdominal wall by complete clinical examination, investigation he is diagnosed as rupture urethra.

- 1- Which part of the male urethra is injured?
- 2- The urine reached the anterior abdominal wall, give reason.
- 3- The urine doesn't reach the thigh, explain.
- 4- Name the other parts of male urethra.
- 5- Name the length of male urethra.

CASE (4)



- 1- What is the complaint of this patient?
- 2- Explain why the patient take this position?
- 3- List the blood supply of the kidney.

CASE (5)



This is intravenous pyelography (I.V.P) showing right ureter stone:

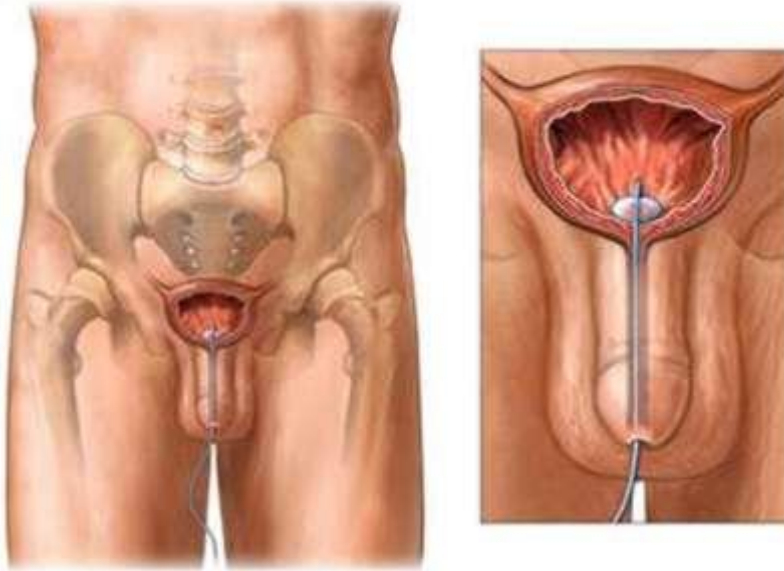
- 1- Enumerate the sites of ureteric constrictions?
- 2- The ureter has two partsa..... &.....b....
- 3- The ureter receives sympathetic supply from.....a.....,....b..... &
c.....segments of the spinal cord.

CASE (6)



- 1- Distention of the urinary bladder beyond.....ml is painful.
- 2- Arterial blood supply of male bladder by...a....and.....b.....
- 3- Is nerve supply is by.....plexus

CASE (7)



A Foley catheter is inserted through the penis into the urethra to drain urine into a collection bag. A water-filled balloon on the end in the bladder keeps the catheter in place.

- 1- The male urethra is about.....cm long
- 2- The widest part of male urethra is....a... and the narrowest part is....b.....
- 3-sphincter maintains continence of urine.

CASE (8)

A 4-year-old girl was still in diapers because she was continually wet. The pediatrician saw urine coming from the infant's vagina. An intravenous urogram showed two renal pelves and two ureters on the right side. One ureter was clearly observed to enter the bladder, but the termination of the other one was not clearly seen. A pediatric urologist examined the child under general anesthesia and observed a small opening in the posterior wall of the vagina. She passed a tiny catheter into it and injected contrast media. This procedure showed that the opening in the vagina was the orifice of the second ureter.

1. What is the embryologic basis for the two renal pelves and ureters?
2. Describe the embryologic basis of an ectopic ureteric orifice.
3. Explain on anatomic basis the continual dribbling of urine into the vagina?

CASE (9)

A 25 –year-old woman visits her gynecologist for routine ultrasound examination. He reveals unilateral renal agenesis

- 1-What is the cause of this anomaly?
- 2-Describe the developmental source of the kidney?

CASE (10)

A 4 – month –old male infant is admitted to the pediatric clinic because he was passing the urine near the scrotum. The physical examination reveals that the patient has hypospadias.

- 1-Interpret the cause of this anomaly?
- 2-Describe the developmental source of male urethra?

CASE (11)

A 2 – month – old infant has the bladder mucosa is exposed to the outside on the anterior abdominal wall above the symphysis pubis.

- 1-What is the name of this anomaly?
- 2-Interpret the cause of this anomaly?
- 3-Describe the developmental source of the urinary bladder?

CASE (12)

A – 25 –year -old female complains of pain in left iliac fossa. Ultrasonic examination reveals that the left kidney lies in the left iliac region.

- 1-What is the name of this anomaly?
- 2-Interpret the cause of this anomaly?
- 3-What is the cause of migration of kidney?

CASE (13)

A 15 –year –old male has signs of renal failure .Ultrasound examination reveals many cysts in both kidneys.

- 1-What is the name of this anomaly?
- 2-Interpret the cause of this anomaly?

CASE (14)

A seriously injured young man suffered a cardiac arrest. After cardiopulmonary resuscitation, his heart began to beat again, but artificial respiration was instituted, there was no electroencephalographic evidence of brain activity. After 2 days, the man's family agreed that there was no hope of his recovery and asked that his kidneys be donated for transplantation. The radiologist carried out femoral artery catheterization and aortography (radiographic visualization of the aorta and its branches). This technique showed a single large renal artery on the right, but two renal arteries on the left, one medium in size and the other small. Only the right kidney was used for transplantation because it is more difficult to implant small arteries than large ones. Grafting of the small accessory renal artery into the aorta would be difficult because of its size, and part of the kidney would die if one of the arteries was not successfully grafted.

1. Are accessory renal arteries common?
2. What is the embryologic basis of the two left renal arteries?
3. In what other circumstance might an accessory renal artery be of clinical significance?

Part IV

Single best answer

1- A 53-year-old woman with known kidney disease presents to a hospital because her pain has become increasingly more severe. A physician performing kidney surgery must remember which one of the followings?

- (A) The left kidney lies a bit lower than the right one
- (B) The perirenal fat lies external to the renal fascia
- (C) The renal fascia does not surround the suprarenal gland
- (D) The left renal vein runs anterior to both the aorta and the left renal artery
- (E) The right renal artery is shorter than the left renal artery

2- A 3-year-old boy is admitted to the children's hospital with complaints of restlessness, abdominal pain, and fever. An MRI examination reveals that he has a double ureter. Which of the following embryonic structures is most likely failed to develop normally?

- (A) Mesonephric (Wolffian) duct
- (B) Paramesonephric (Müllerian) duct
- (C) Ureteric bud
- (D) Metanephros
- (E) Pronephros

3- A 68-year-old woman is admitted to the hospital with severe pain radiating from her lower back toward her pubic symphysis. Ultrasound examination reveals that a renal calculus (kidney stone) is partially obstructing her right ureter. At which of the following locations is the calculus most likely to lodge?

- A. Major calyx**
- B. Minor calyx**
- C. Pelvic brim**
- D. Mid portion of the ureter**
- E. Between the pelvic brim and the uterine cervix**

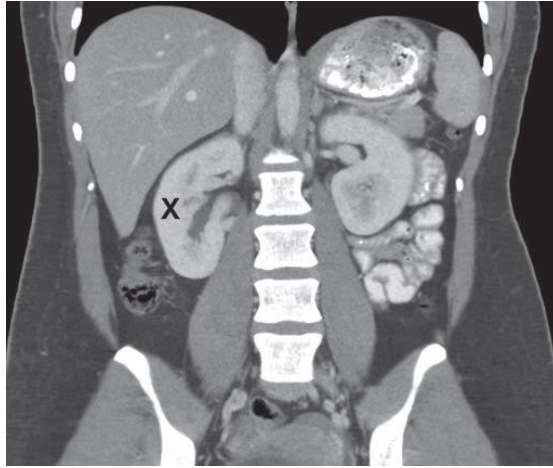
4- A 23-year-old pregnant woman visits her gynecologist for her routine ultrasound checkup. Ultrasonographic examination reveals unilateral renal agenesis and oligohydramnios. Which of the following conditions most likely occurred?

- A. Polycystic kidney disease**
- B. Degeneration of the mesonephros**
- C. Ureteric duplication**
- D. Failure of a ureteric bud to form**
- E. Wilms tumor**

5- A 15-year-old is admitted to the emergency department 2 days after crashing his bicycle. MRI examination reveals severe edema of the boy's scrotum and abdominal wall and extravasated urine. Which of the following structures is most likely ruptured?

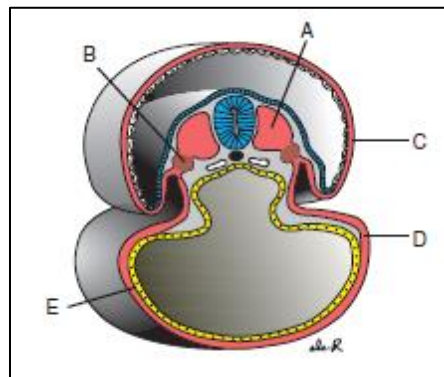
- A. Spongy urethra**
- B. Preprostatic urethra**
- C. Prostatic urethra**
- D. Urinary bladder**
- E. Ureter**

6- Which of the following structures is indicated with the letter “X” in this coronal CT?



- (A) Right kidney
- (B) Liver
- (C) Stomach
- (D) Spleen
- (E) Psoas major

7- The urinary system develops from which of the embryonic sources labeled in the given diagram?

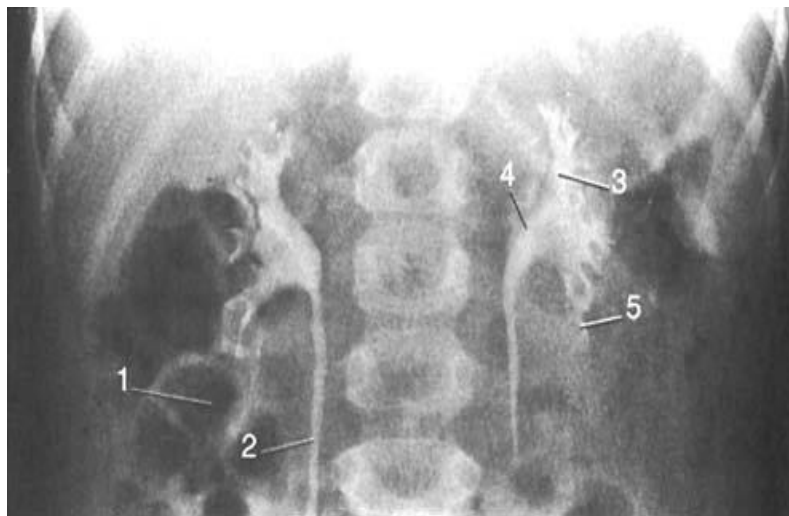


- a- A
- b- B
- c- C
- d- D
- e- E

8- A 16-year-old boy, who was riding his skateboard down a stair railing, falls and impacts his perineum on the railing, causing a straddle injury. He presents in the ER with discoloration and swelling in the scrotum, penis, and anterior abdominal wall, which is characteristic of extravasation of urine. Which of the following structures is most likely compromised?

- (A) Ureter
- (B) Urinary bladder
- (C) Prostatic urethra
- (D) Intermediate urethra
- (E) Spongy urethra

Match the numbered structures shown on the anteroposterior radiograph of both kidneys after intravenous injection of an iodine-containing compound with the appropriate lettered structure.



- | | |
|-----------------|-----------------------------------|
| 9- Structure 1 | A. Pelvis of the left kidney |
| 10- Structure 2 | B. Pedicle of the lumbar vertebra |
| 11- Structure 3 | C. Minor calyx |
| 12- Structure 4 | D. Gas in the intestine |
| 13- Structure 5 | E. Major calyx |
| | F. Right ureter |
| | G. pelvis of the right kidney |