Renal system contains(2kidneys ,2ureters , urinary bladder and urethra)

- two kidneys:- which control the electrolyte composition of the blood and eliminate dissolved waste products and excess amounts of other substances from the blood; the latter substances are excreted in the urine, which passes from the kidneys to the bladder by way of two thin muscular tubes called the ureters. The bladder is a sac that holds the urine until it is eliminated through the urethra.

The kidneys also remove urea from the blood through tiny filtering units called nephrons. Each nephron consists of a ball formed of small blood capillaries, called a glomerulus, and a small tube called a renal tubule. Urea, together with water and other waste substances, forms the urine as it passes through the nephrons and down the renal tubules of the kidney.

Kidneys balance the body's fluids .

Release hormones to regulate blood pressure , control production of red blood cells .

Two ureters. These narrow tubes carry urine from the kidneys to the bladder. Muscles in the ureter walls continually tighten and relax forcing urine downward, away from the kidneys. If urine backs up, or is allowed to stand still, a kidney infection can develop. About every 10 to 15 seconds, small amounts of urine are emptied into the bladder from the ureters.

U.Bladder:- This triangle-shaped, hollow organ located in the pelvis. It is held in place by ligaments that are attached to other organs and the pelvic bones. The bladder's walls relax and expand to store urine, and contract and flatten to empty urine through the urethra. The typical healthy adult bladder can store up to two cups of urine for two to five hours.
Two sphincter muscles. These circular muscles help keep urine from leaking by closing tightly like a rubber band around the opening of the bladder.

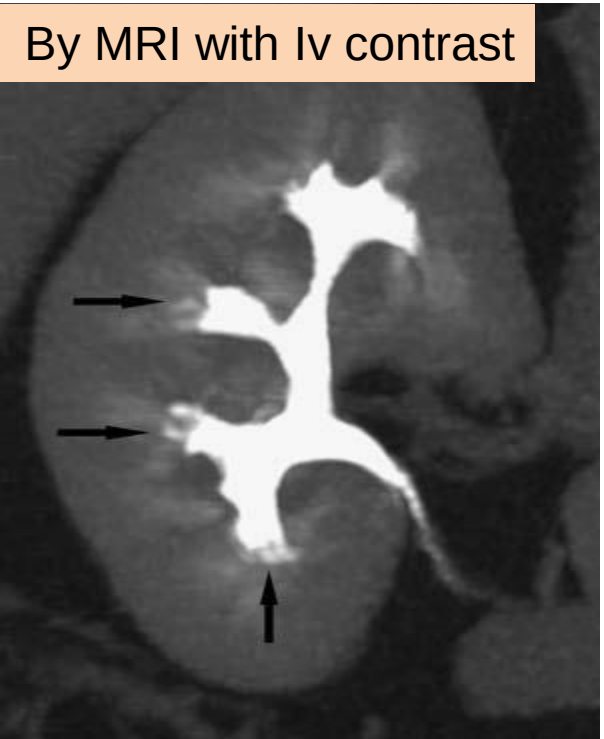
Urethra.:- This tube allows urine to pass outside the body. By the brain signals the bladder muscles to tighten, which squeezes urine out of the bladder. At the same time, the brain signals the sphincter muscles to relax to let urine exit the bladder through the urethra. When all the signals occur in the correct order, normal urination occurs.

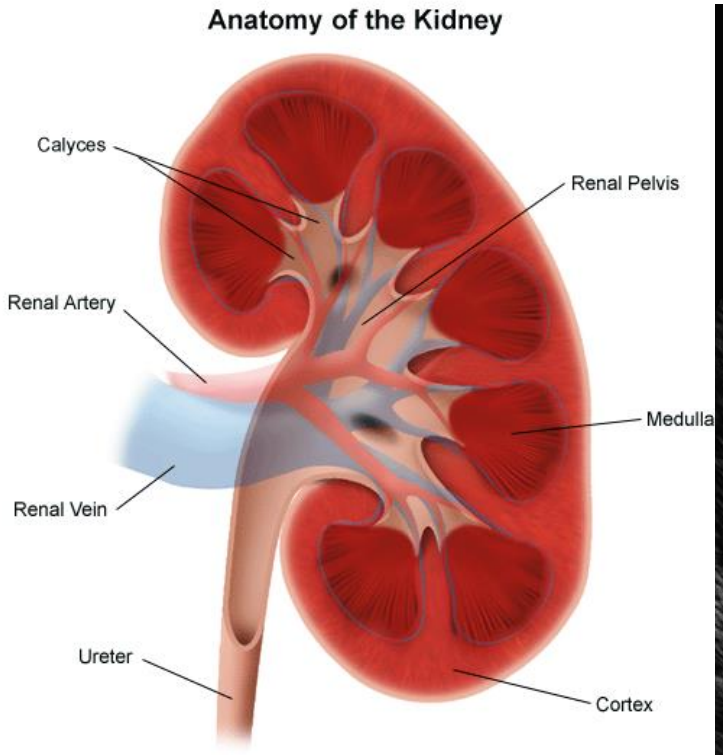
Blood supply of the kidneys

The renal arteries normally arise from the aorta at L1/L2level. The right renal artery is longer and lower than the left , Within the hilum, the renal arteries divide inconsistently into five segmental branches which cross the renal sinus anterior and posterior to the pelvis and pierce the medulla in between the pyramids .

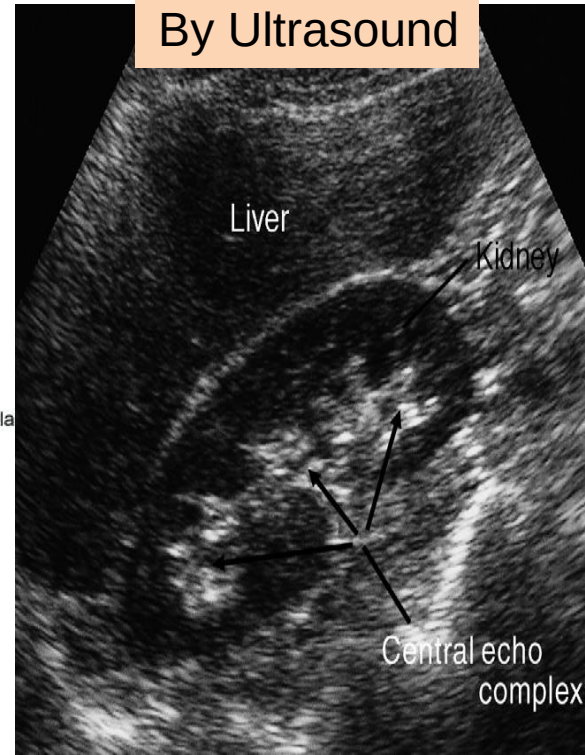
The kidneys are bean-shaped, reddish brown paired organs, concave on one long side and convex on the opposite. They are normally located high in the abdominal cavity and against its back wall, lying on either side of thevertebral column between the levels of the 12th thoracic (D12) and third lumbar vertebrae (L3), and outside the peritoneum (the membrane that lines the abdomen) .

By MRI with Iv contrast



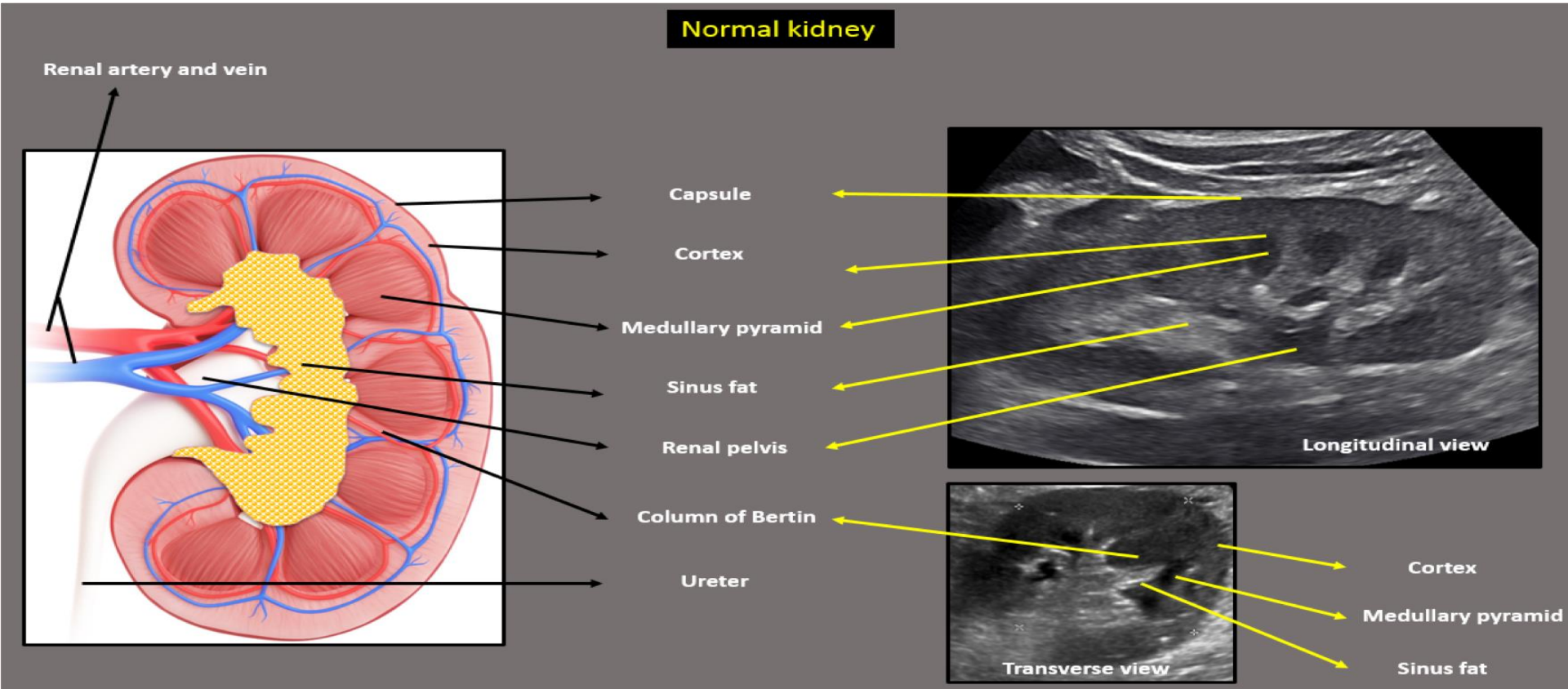


By Ultrasound



At ultrasound, the kidneys should be smooth in outline. The parenchyma surrounds a central echo-dense region, known as the central echo complex (the renal sinus).

The normal adult renal length, measured by ultrasound is 9–12 cm. Renal length varies with age, being maximal in the young adult. There may be a difference between the two kidneys, normally of less than 1.5 cm.



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Normal ureters A tube approximately 6 to 7 inches long attached to each kidney
Made up of three layers of tissue
-smooth muscle
-fibrous tissue
-mucous layer
Peristalsis, a rhythmic contraction of the ureter smooth muscle which helps to move the urine into the bladder

Slender tubes attaching the kidney to the bladder Enter the posterior aspect of the bladder at a slight angle

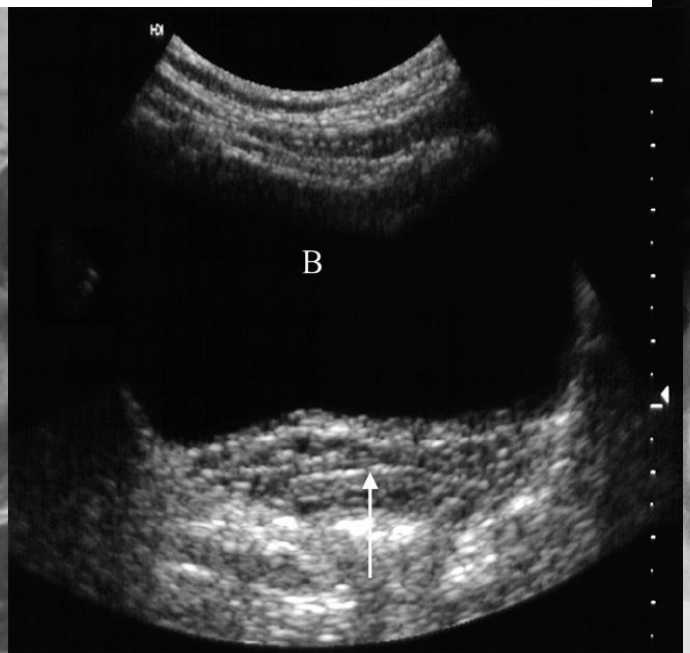
There is a valve-like fold of bladder mucosa that flap over the ureter openings to prevent backflow.

Renal calculi= calculus means little stone; result of precipitated uric acid salts created by bacterial infections, urinary retention, and alkaline urine. Drugs , Lithotripsy or surgery are common treatments.

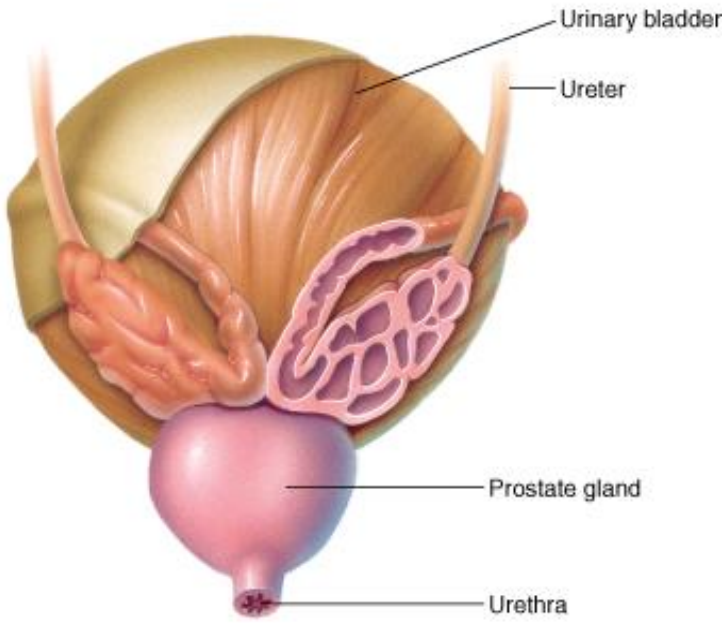
Bladder

The bladder is a centrally located structure that should have a smooth outline. It often shows normal smooth indentations from above owing to the uterus or the sigmoid colon, and from below by muscles of the pelvic floor .

The urinary bladder should be examined in the distended state: the walls should be sharply defined.The bladder may also be assessed following micturition, to measure the post micturition residual volume of urine.



Urinary Bladder



In males, prostate gland surrounds the neck of the bladder where it empties into the urethra

Hollow, muscular organ that stores urine

Sphincter muscles hold the urine in place

Walls contain epithelial tissue that stretch to allow the bladder to hold twice its capacity

The trigone is a triangular area at the base of the bladder where the ureters enter and the urethra exits

Located retroperitoneally in the pelvis posterior to the pubic symphysis

A moderately full bladder can hold ~500mL (1 pint) of urine.

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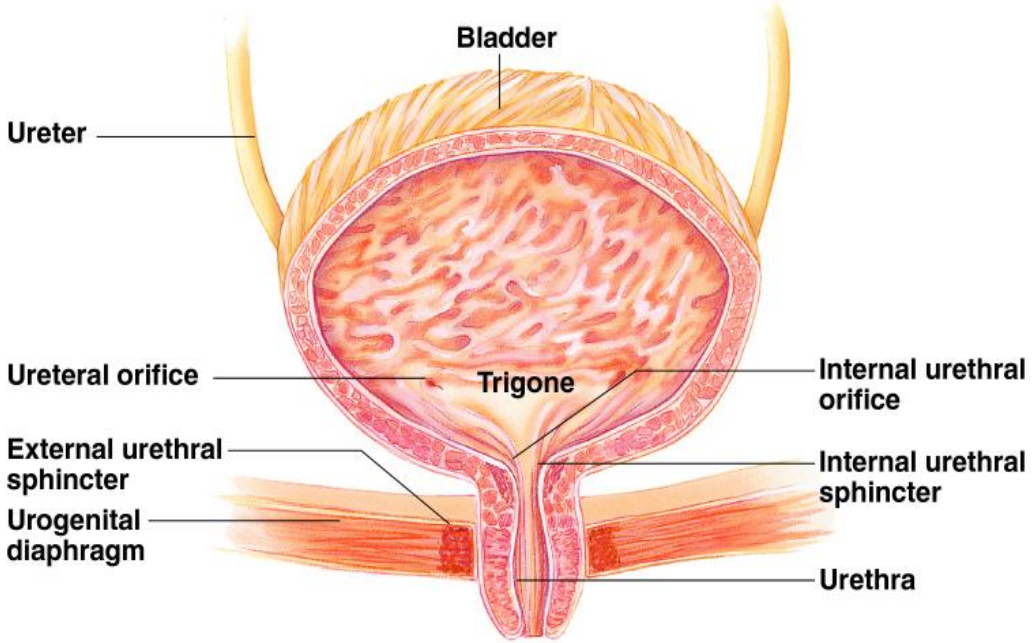


Urethra

A tube of smooth muscle with a mucous lining that carries urine from the bladder to the outside of the body.

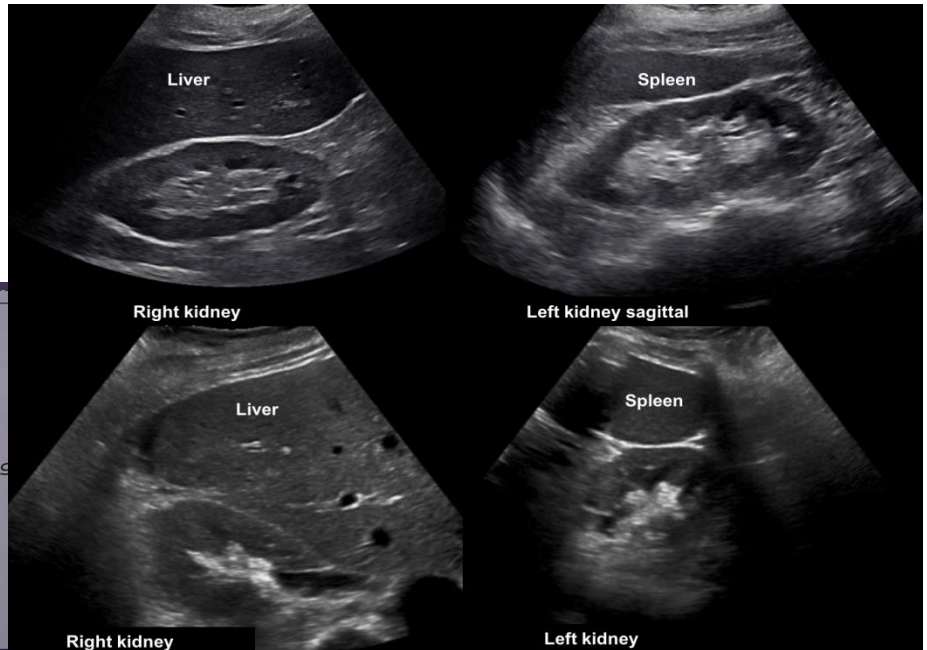
Release of urine is controlled by two sphincters

Internal urethral sphincter (involuntary) – a thickening of smooth muscle at the bladder-urethra junction . keeps urethra closed when urine is not being passed.

External urethral sphincter (voluntary) -- skeletal muscle that controls urine as the urethra passes through the pelvic floor.

LengthFemales – 3–4 cm (1-1.5 inches) Males – 20 cm (7-8 inches)

- **Modality used for assessment of the urinary system**
  - X-ray
  - US
  - CT
  - MRI
  - Nuclear



- **Urography**

Urography is the term used to describe the imaging of the renal tract using intravenous iodinated contrast medium. **There are 2 types :**

- 1. Intravenous urogram (IVU)
- 2. CT urography .

CT has the advantage of being highly sensitive for the detection of stones, including those that may be radiolucent on plain film, allows the characterization of renal lesions and the detection of ureteric lesions, and demonstrates the surrounding retroperitoneal and abdominal tissues. In addition , CT overcomes the overlap of superimposed tissues, which can cause difficulty when interpreting traditional IVU. ***IVU study (intravenous urogram)***

used to Identify all calcifications , renal outlines ,. left kidney is usually higher than the right

Magnetic resonance imaging (MRI) gives similar anatomical information to CT, with the advantage of being able to obtain scans directly in multiple planes. It is generally used in selected circumstances , including :

-To demonstrate renal artery stenosis .

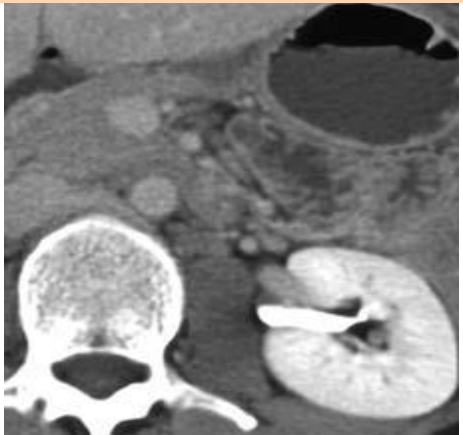
- Inferior vena caval extension of renal tumours.

- To clarify problems not solved by ultrasound or CT.

-To assess the extent of bladder or prostate cancer prior to consideration for surgery.

IVU showed left sided calculus in the vicinity of left ureter. However, the left ureter was not visualized till the post void film even on postural changes

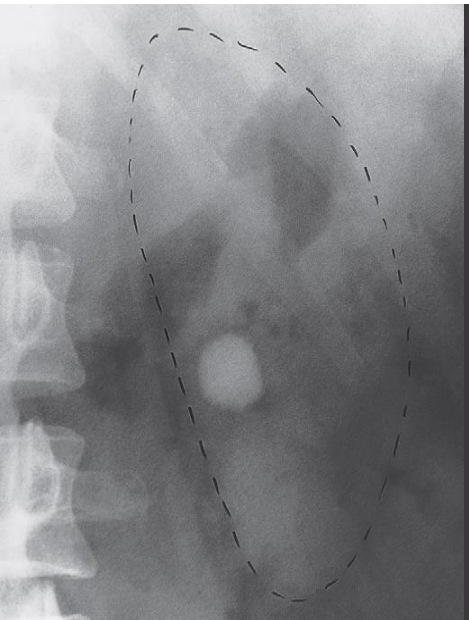
Iv contrast series

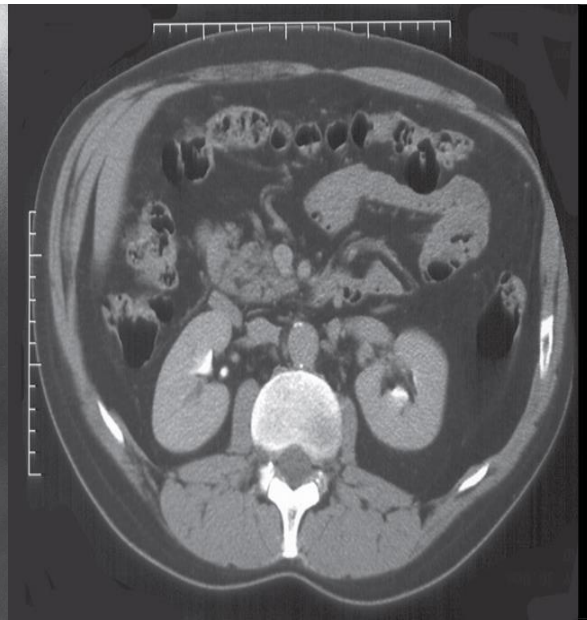


Native CT scan

- ***Normal magnetic resonance imaging***
- As with CT and ultrasound, the renal contours should be smooth. Corticomedullary differentiation is best seen on T1-weighted images and T2WIsimmediately following intravenous contrast enhancement with gadolinium .

1. Right kidney
2. Right renal sinus
3. liver
4. Spleen
5. Descending colon
6. L. vertebral body






thank
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