

# Radiology Renal System



# Objectives:

- Modality used for assessment of the urinary system
  - X-ray
  - us
  - Ct
  - MRI
  - Nuclear
- Normal anatomy
- Common pathologies
  - Kidney
  - Ureter
  - Bladder
  - Urethra

# Modalities used:

- **US**

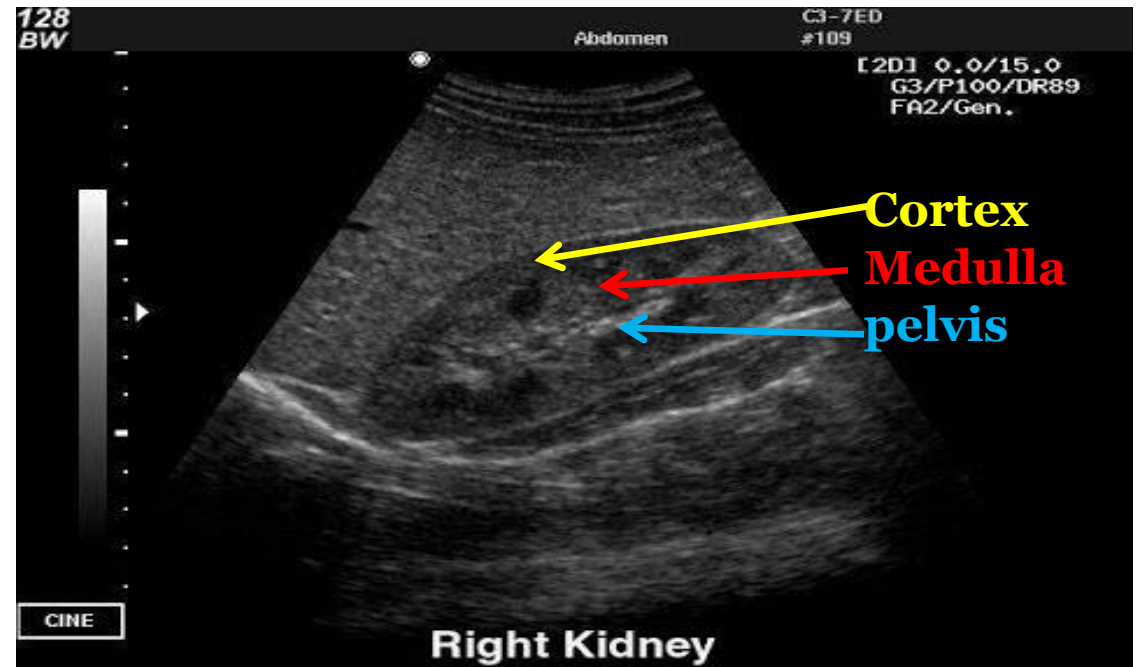
- Pros: ( no ionizing radiation , inexpensive , portable)
- Cons :(operator dependent, time consuming )

**Image Key:**

**White** = stones and calcification.

**Grey** = soft tissue.

**Black** = fluid.



# Modalities used

- **X rays**
  - Pros (inexpensive , quick )
  - Cons ( ionizing radiation , not definitive )

## Image Key:

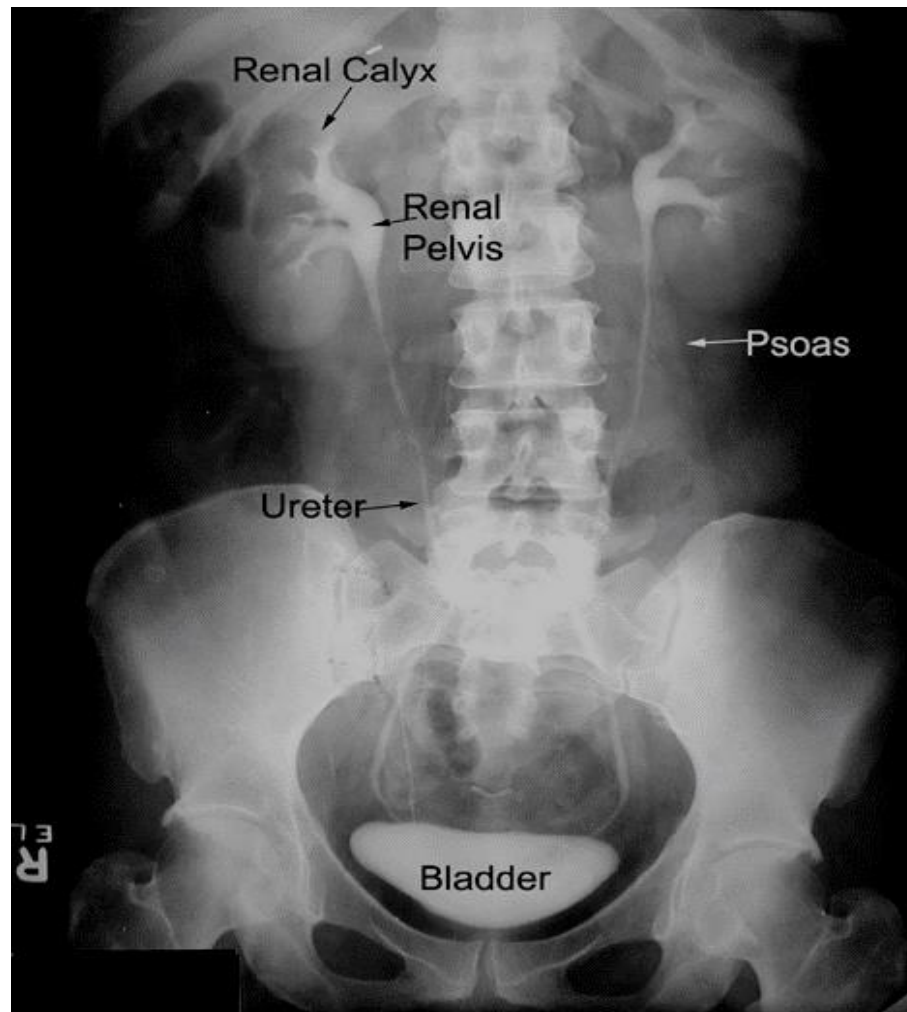
**White** = bone and calcification.

**Grey** = soft tissue.

**Black** = air.



# IVP



# Modalities used

- **CT**
  - Pros ( quick , a lot of information )
  - Cons ( ionizing radiation , expensive )

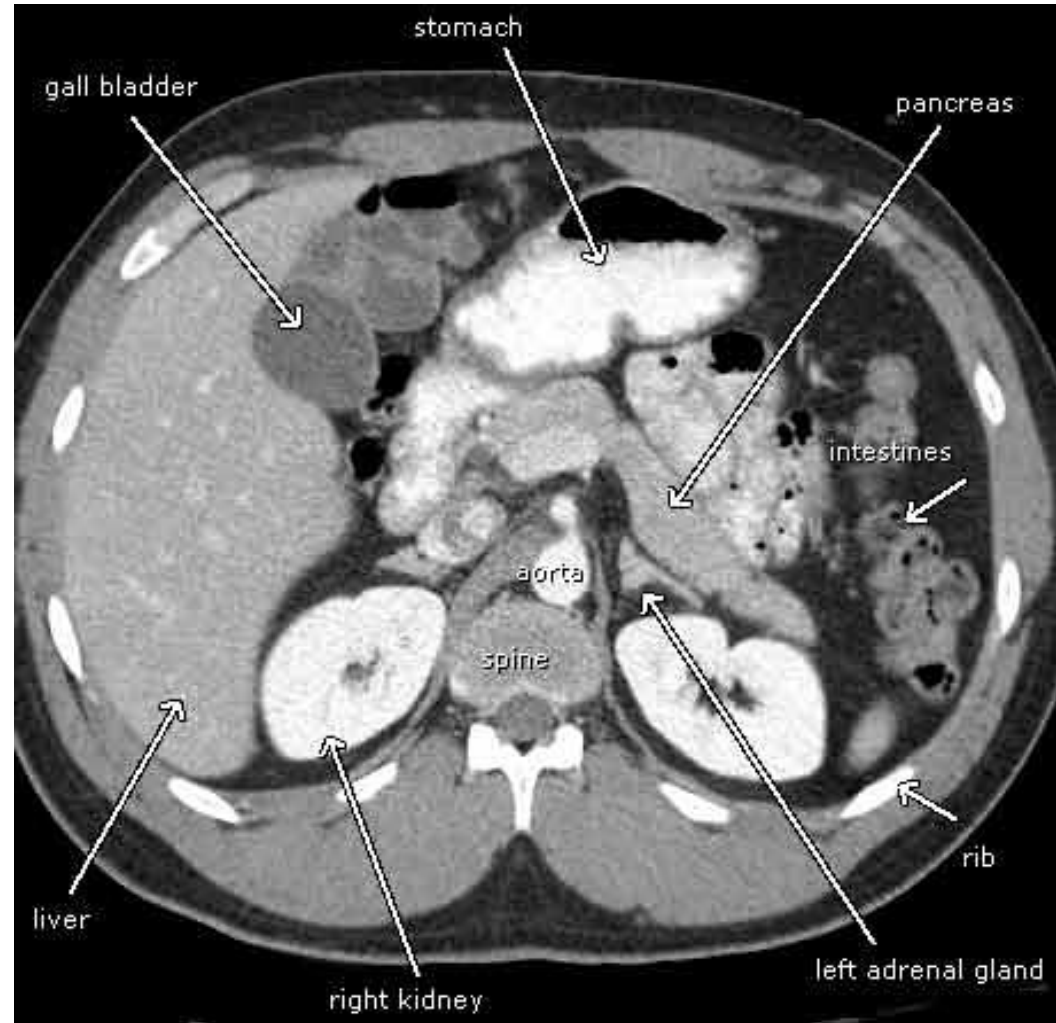
**Image key:**

**White** = bones and calcification.

**Grey** = soft tissue.

**Black** = air.





# Modalities used

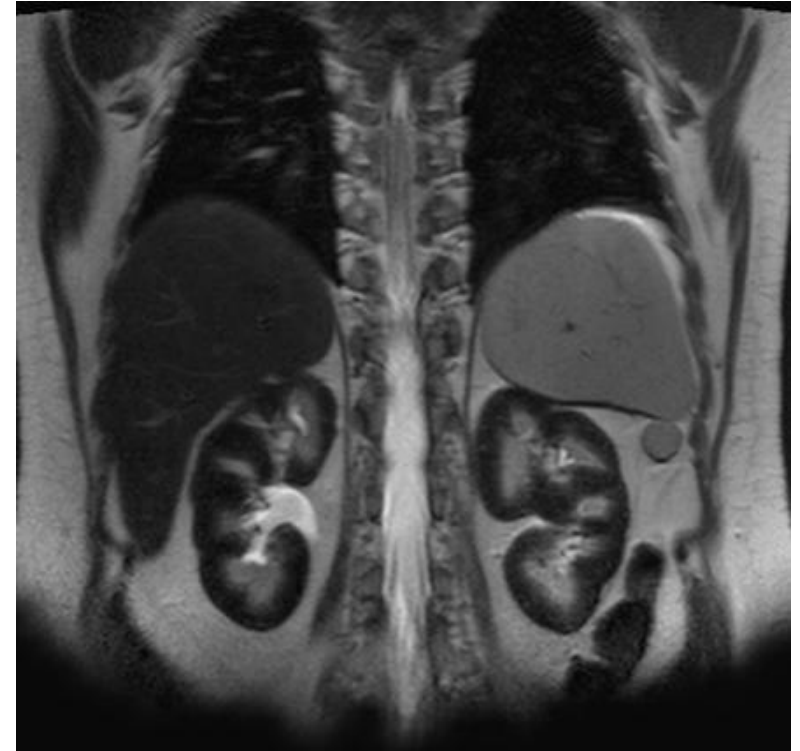
- **MRI**

- Pros (no ionizing radiation , a lot of information )
- Cons ( expensive , time consuming )

**Image key:**

**White** = high intensity.

**Grey to black** = low intensity.





# Modalities used

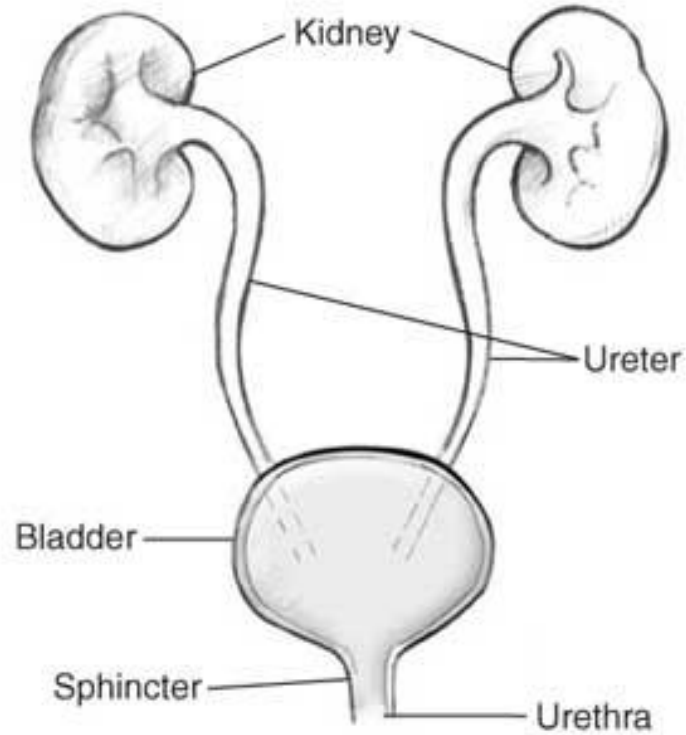
- **Nuclear scans**

- Pros ( assess the function )
- Cons (time consuming , radioactive materials )



modality	US	X-ray	CT	MRI	Nuclear
<b>Pros</b>	<ul style="list-style-type: none"> <li>No Ionized radiation.</li> <li>Cheep.</li> <li>Portable.</li> </ul>	<ul style="list-style-type: none"> <li>Cheep.</li> <li>Quick.</li> </ul>	<ul style="list-style-type: none"> <li>Quick.</li> <li>Gives lots of information.</li> </ul>	<ul style="list-style-type: none"> <li>No Ionized radiation.</li> <li>Gives lots of information.</li> </ul>	<ul style="list-style-type: none"> <li>Assess the function.</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>Operator dependent.</li> <li>Time consuming.</li> </ul>	<ul style="list-style-type: none"> <li>Ionized radiation.</li> <li>Not defective.</li> </ul>	<ul style="list-style-type: none"> <li>Expensive.</li> <li>Ionized radiation.</li> </ul>	<ul style="list-style-type: none"> <li>Expensive.</li> <li>Time consuming.</li> </ul>	<ul style="list-style-type: none"> <li>Time consuming.</li> <li>Radioactive materials.</li> </ul>

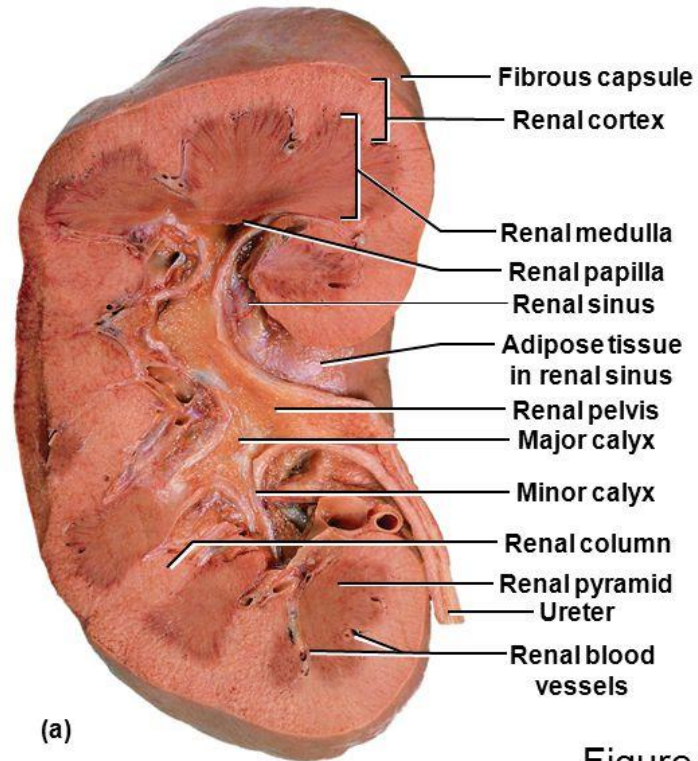
# Anatomy of the urinary system



# Kidneys:

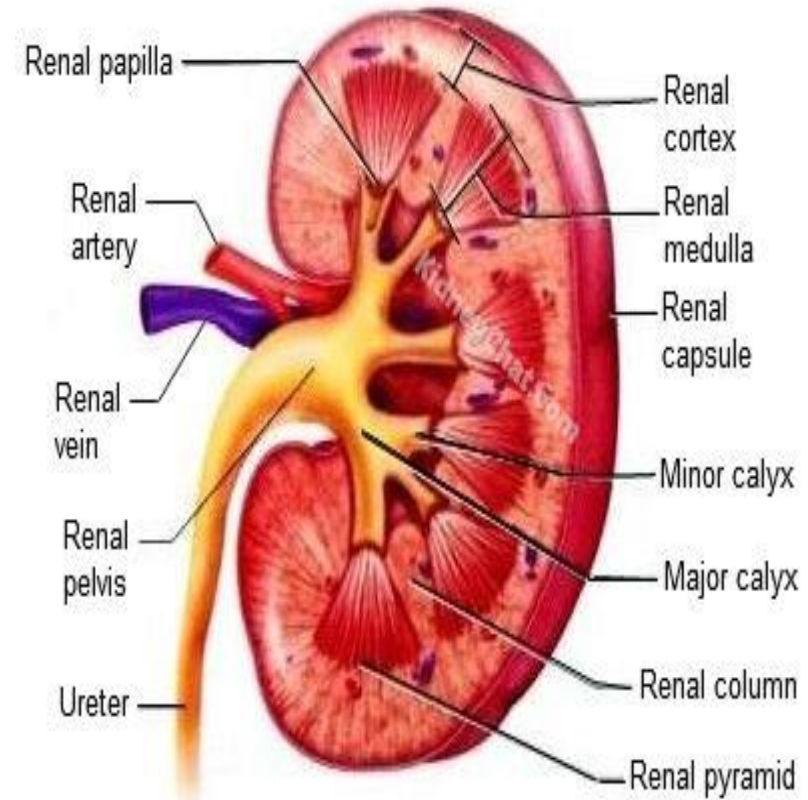
## Gross Anatomy of Kidney

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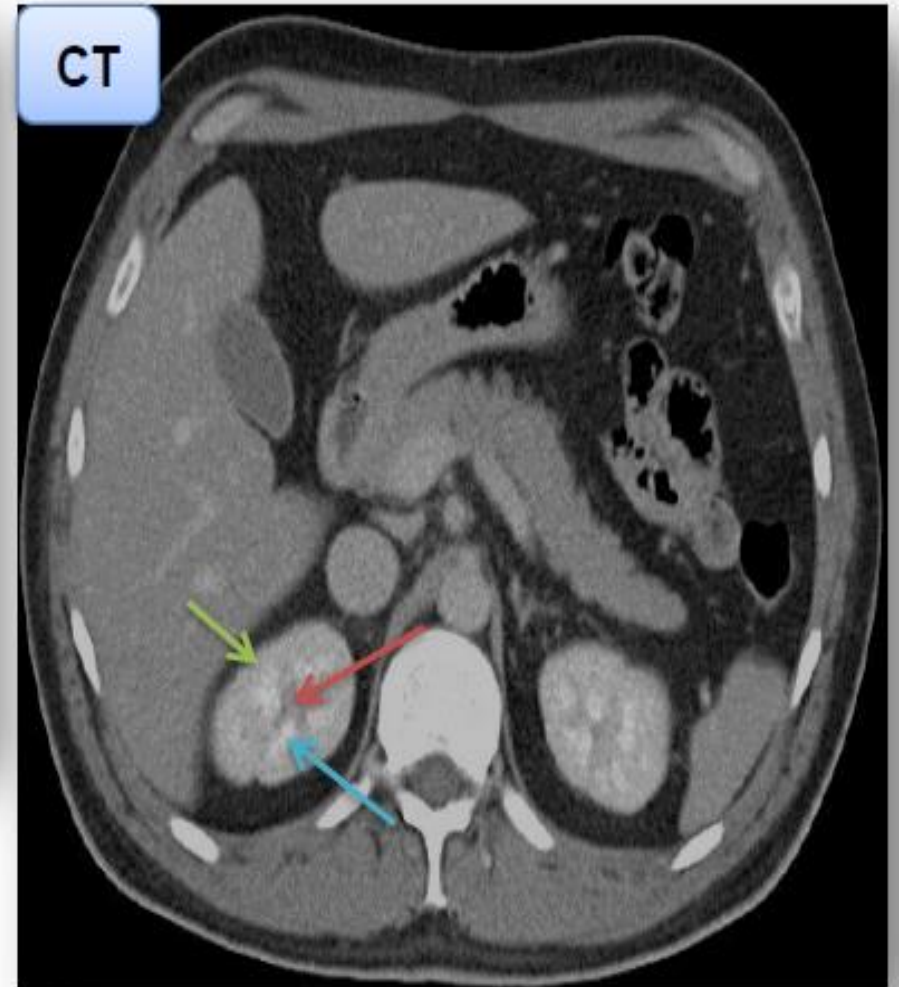
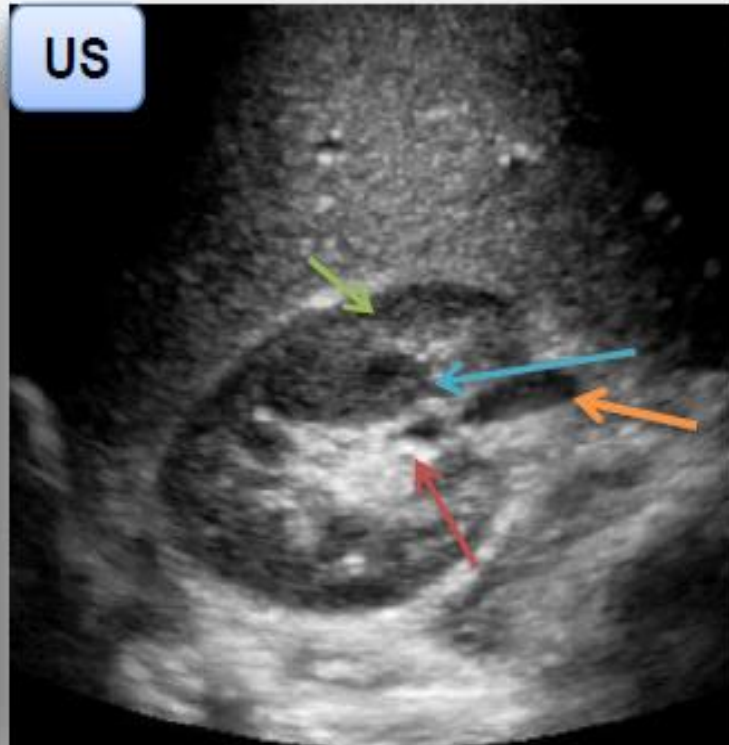
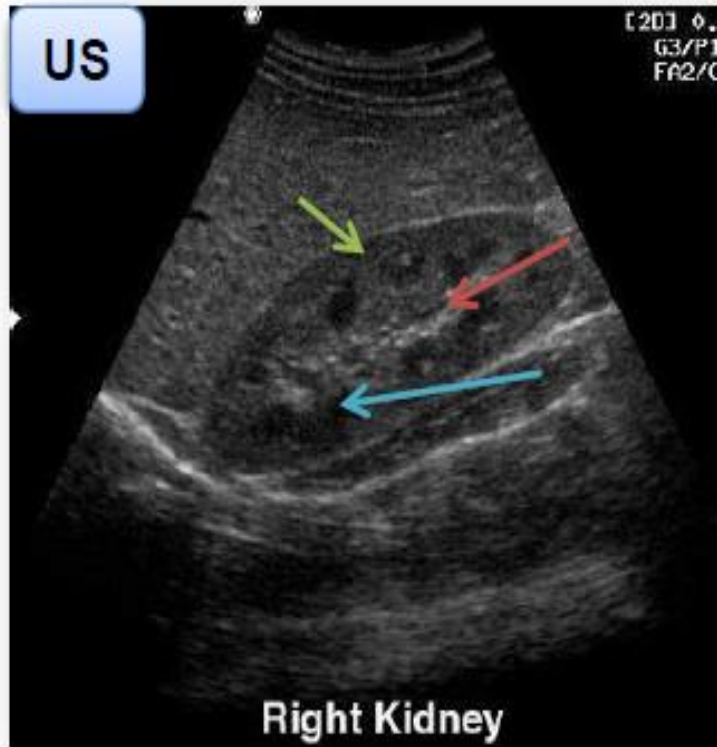


Ralph Hutchings/Visuals Unlimited

Figure 23.4a



23-10

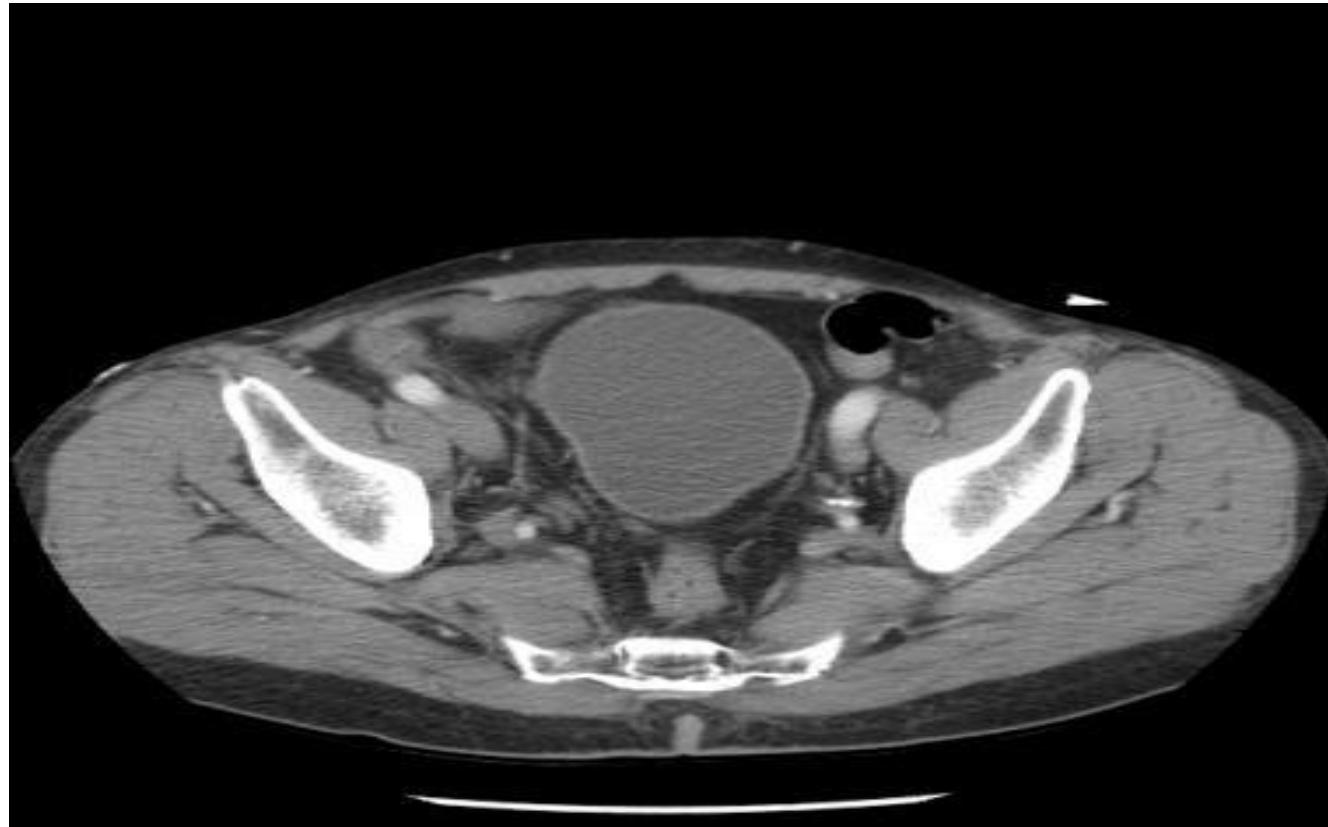


- **Renal Cortex.**
- **Renal Permed or Medulla.**
- **Hilum or Pelvis.**
- **Ureter**

# Urinary bladder



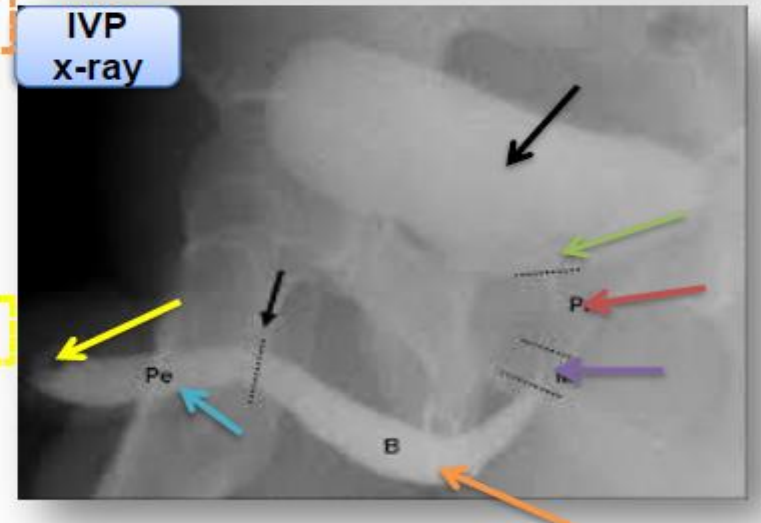
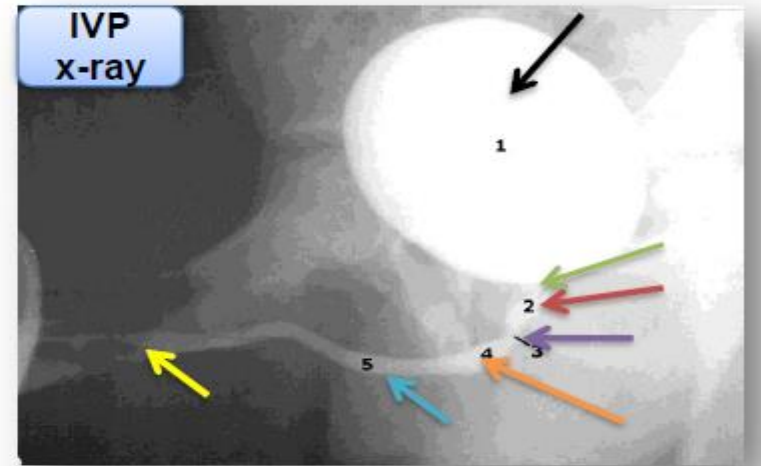
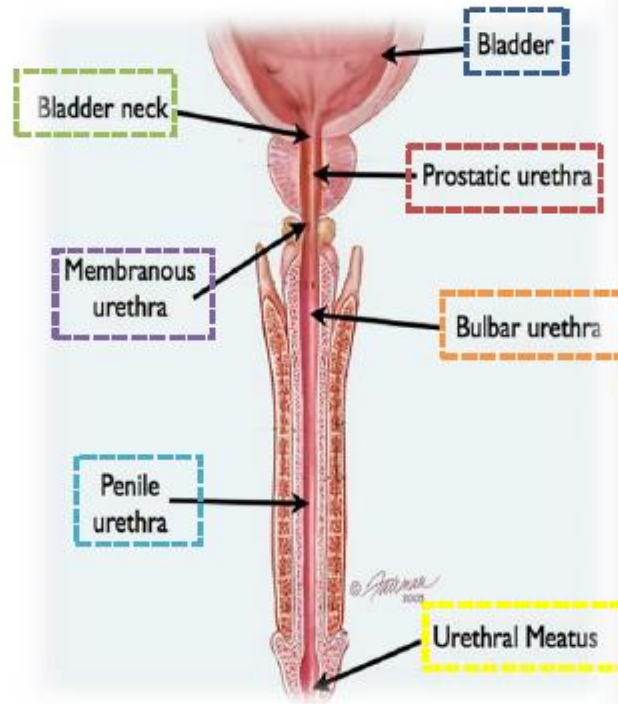
# Urinary bladder



CT

# Urethra

- **Bladder.**
- **Bladder neck.**
- **Prostatic urethra.**
- **Membranous urethra.**
- **Bulbar urethra.**
- **Penile urethra.**
- **Urethral meatus.**





# Common Renal system Pathologies

# Common Kidney pathologies:

- **Cysts** (benign , common)



ANECHOIC circular mass ,  
clear borders



Hypo-dense clear border mass in right  
kidney

# Common Kidney pathologies:

- **Stones :**
  - Radio-opaque (calcium , struvite )
  - Radio-lucent (uric acid , cysteine )



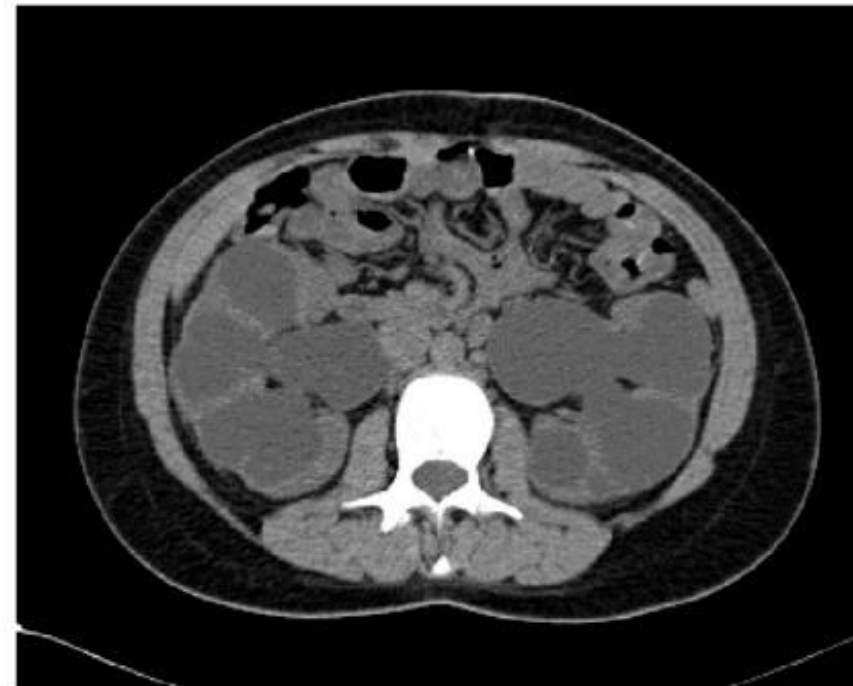
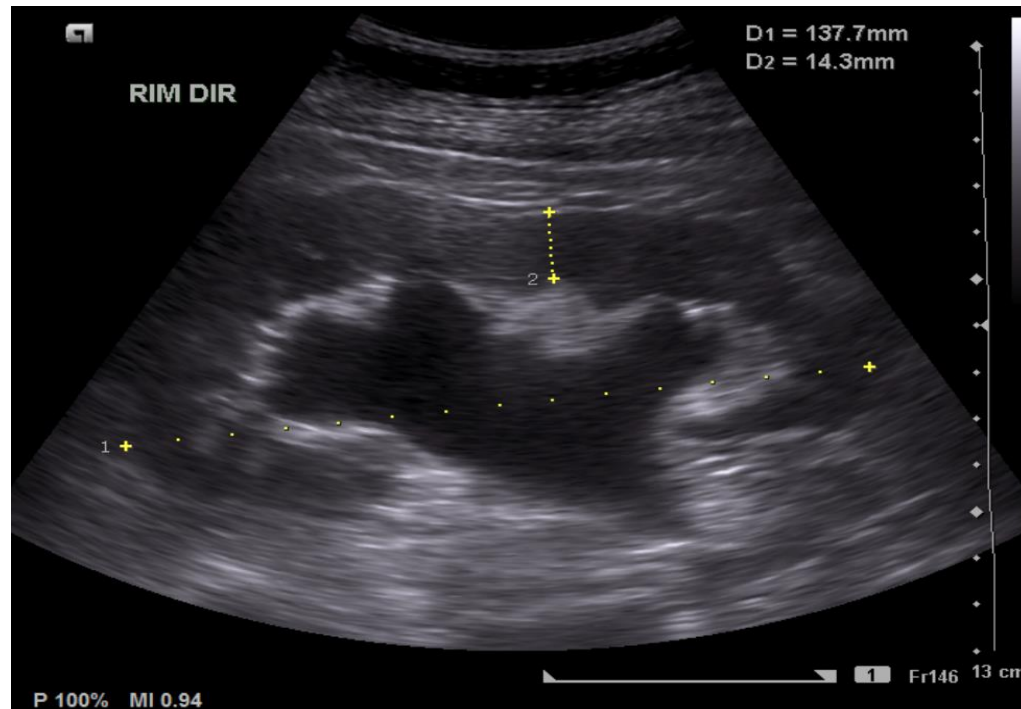
# CT

The best modality for diagnosis of renal stones is non-contrast CT



# Common Kidney pathologies:

- **Hydronephrosis**



# Common Kidney pathologies:

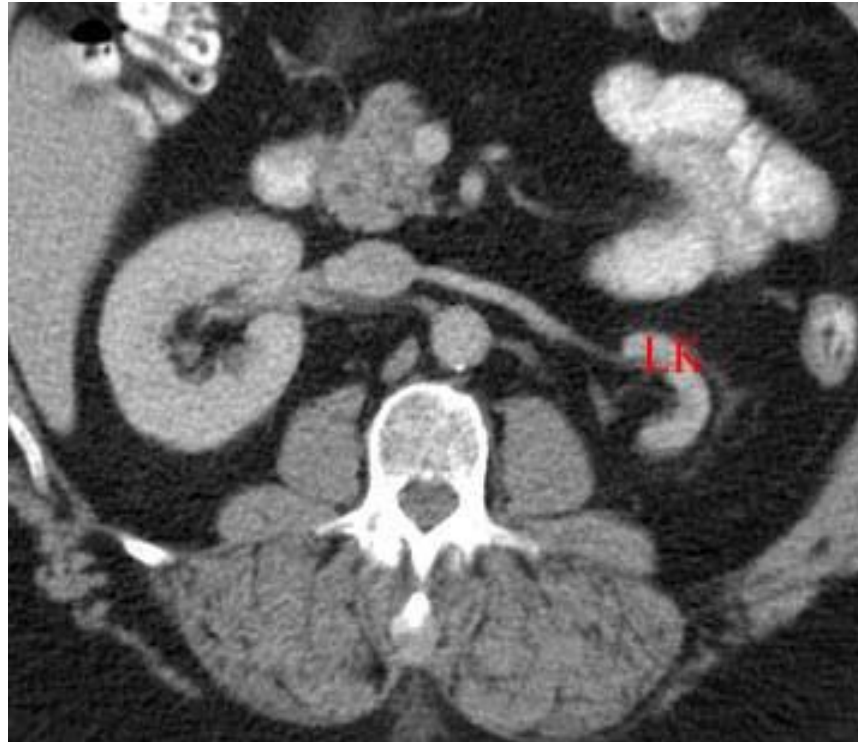
- **Pyelonephritis:**

- is the infection of the kidney.
- Acute pyelonephritis results from bacterial invasion of the renal parenchyma. Bacteria usually reach the kidney by ascending from the lower urinary tract.
- CT scan for a patient with pyelonephritis, we do it only if the patient doesn't respond to the treatment or he had a recurrent pyelonephritis.



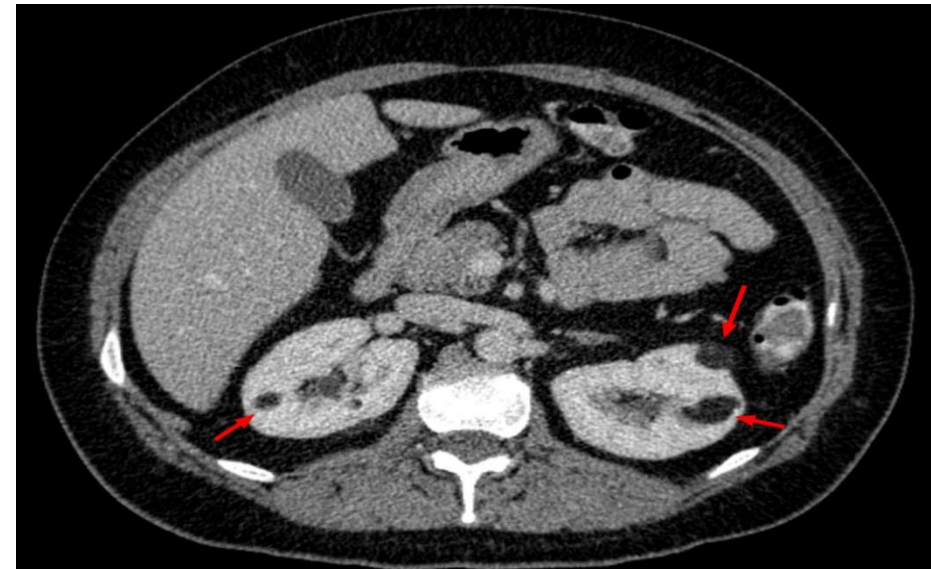
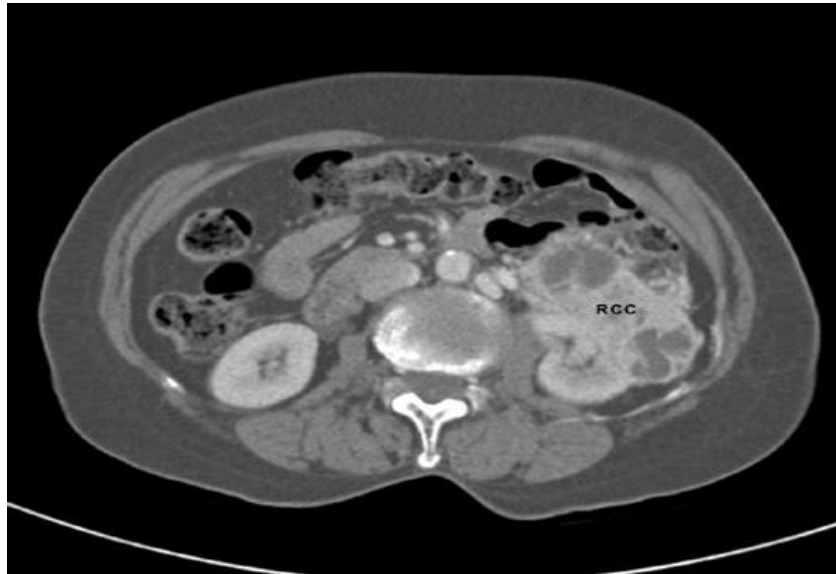
# Common Kidney pathologies:

- ESRD



# Common Kidney pathologies:

- Tumors:
  - Benign, most common benign is angiomyolipoma
  - Malignant, most common type is renal cell carcinoma





# Common Kidney pathologies:

- Congenital

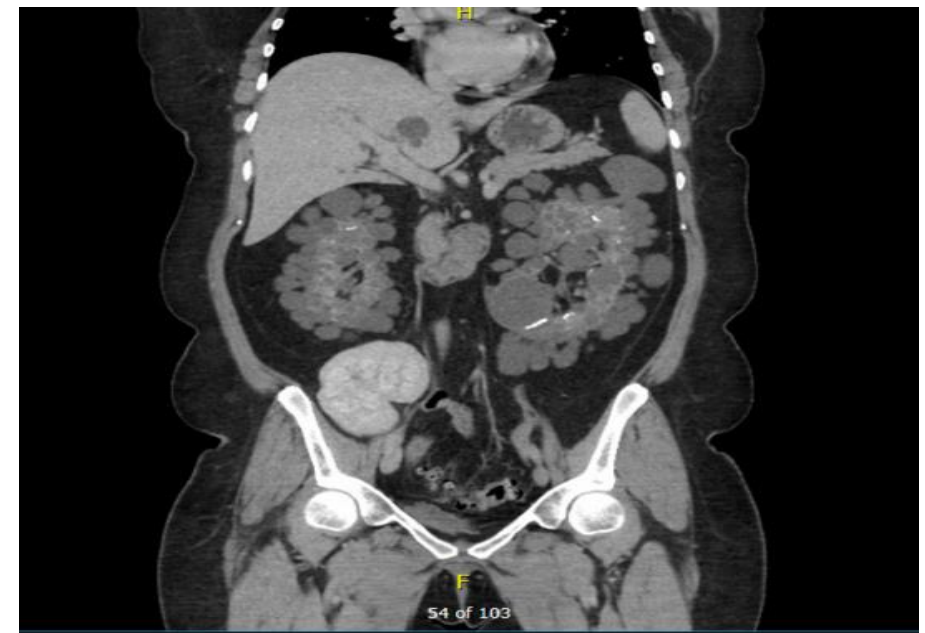
Horseshoe Kidney



Ectopic Kidney



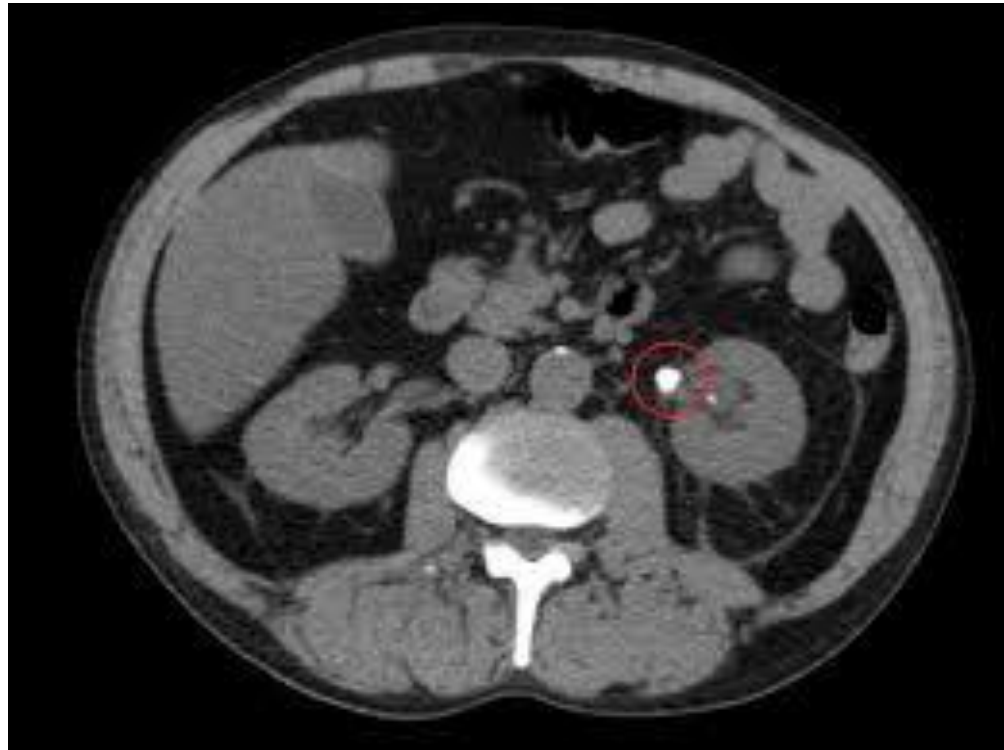
Polycystic Kidney Disease



# Common Ureter Pathologies:

- **Ureteric Stone:**

stones in the ureter will make a obstruction and block the urines way to the bladder, which may cause Hydronephrosis.



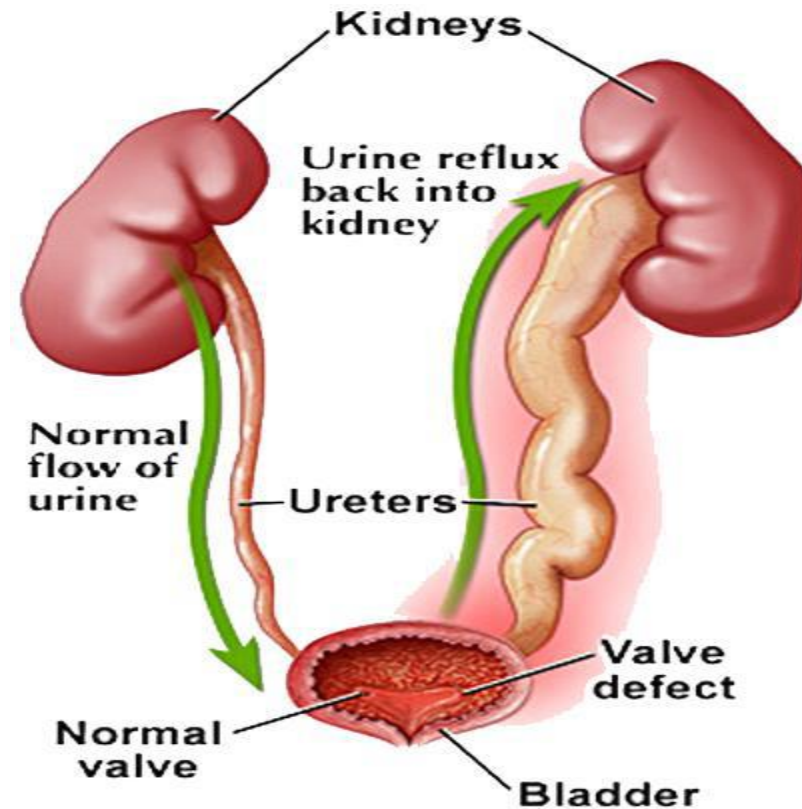
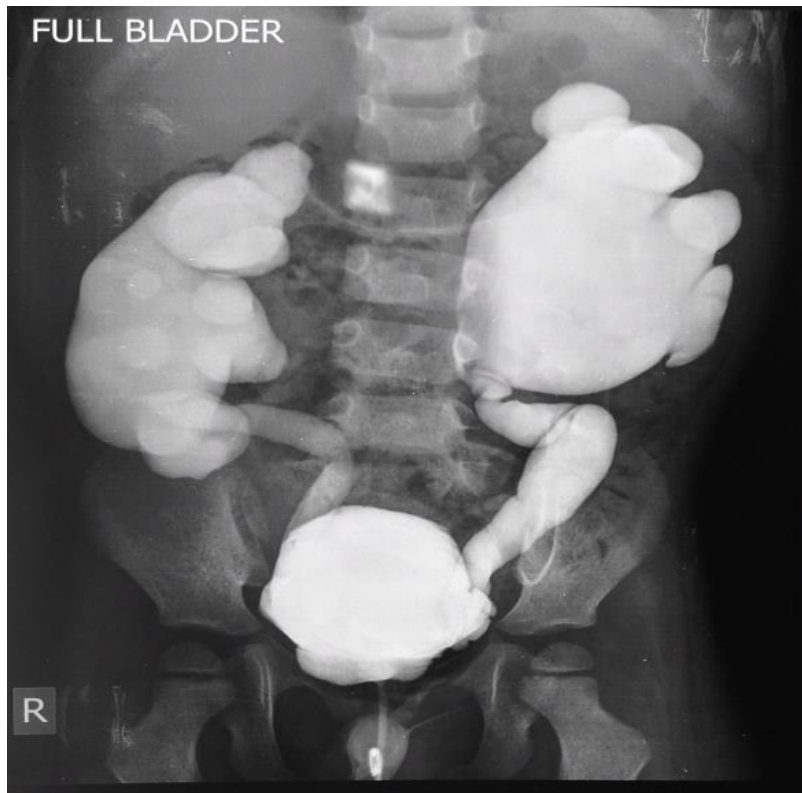
Uretropelvic junction



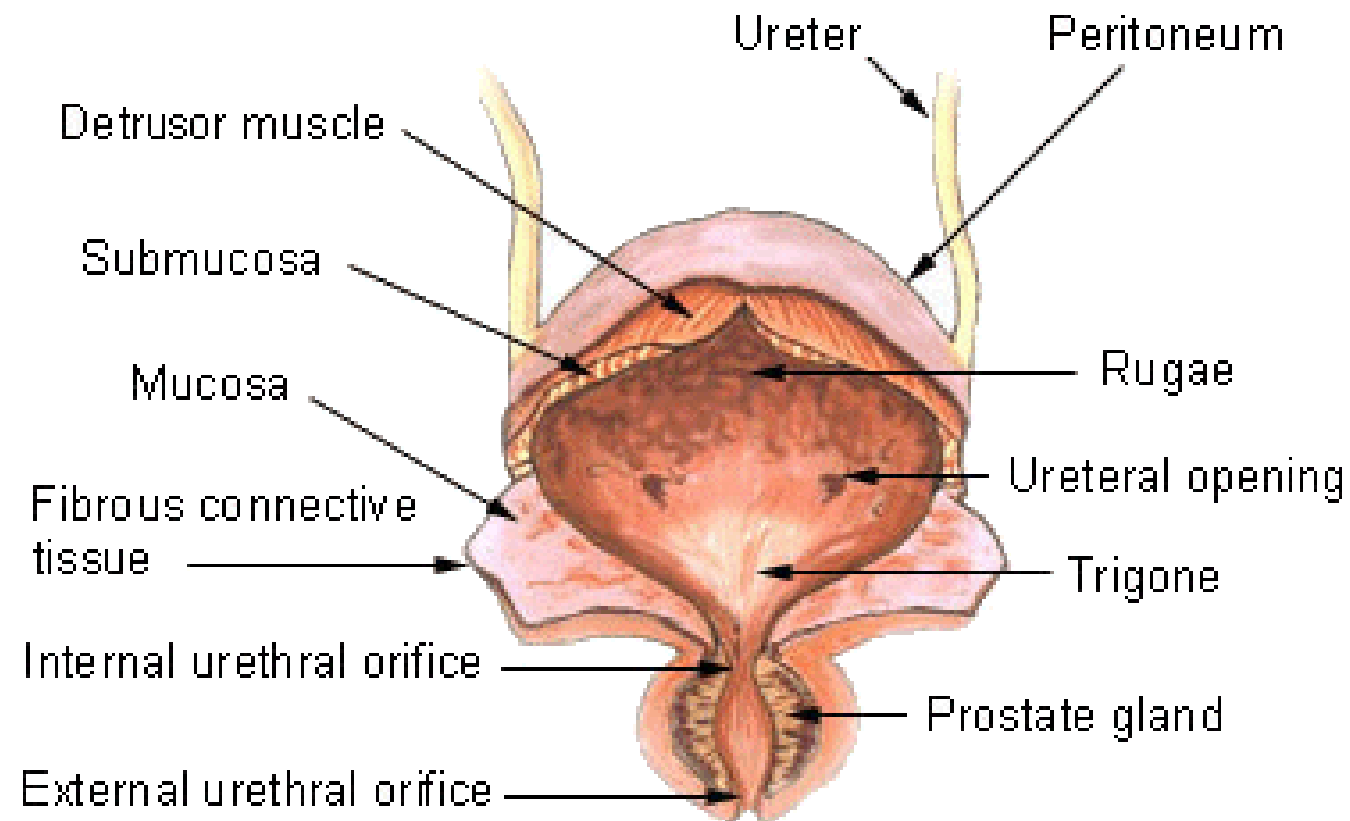
Pelvic brim junction:  
intersection of iliac arteries  
and ureter

# Common Ureter Pathologies

- **vesicoureteral reflux disease**



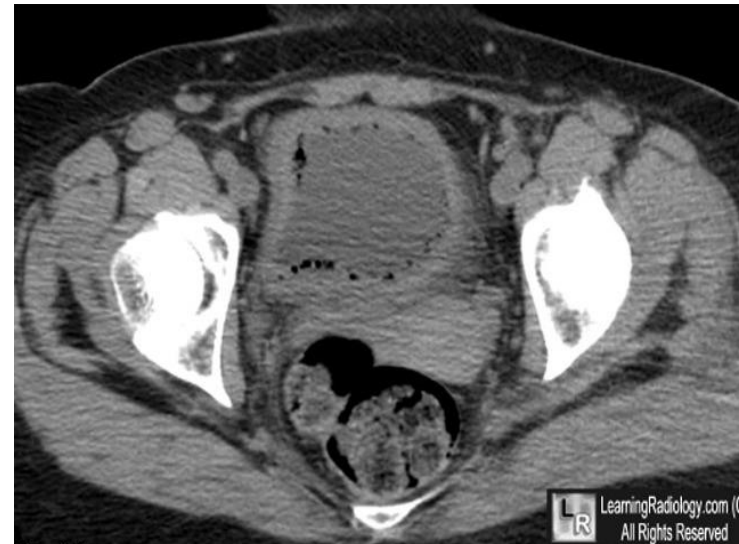
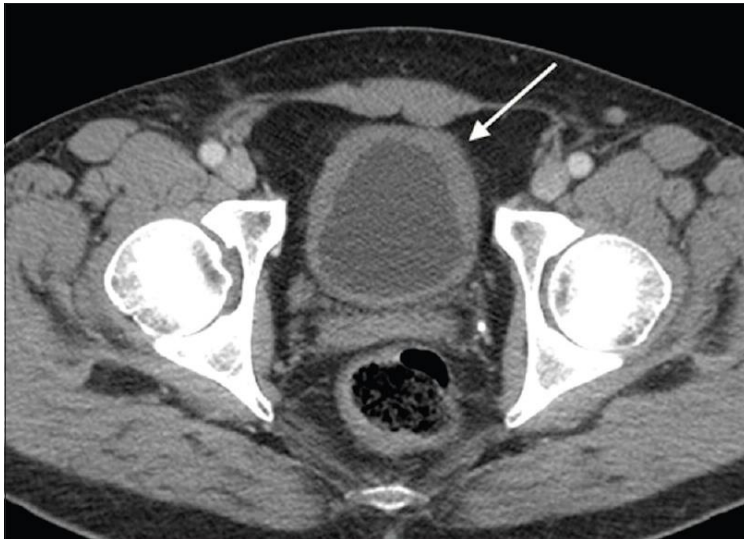
# Common Urinary Bladder Pathologies



# Common urinary bladder pathologies

- **Cystitis:**

- Image 1: an inflamed urinary bladder (thick surrounding walls)
- Image 2: This bladder has gas bubbles that could be due to inflammation or infection from 'gas producing' bacteria.



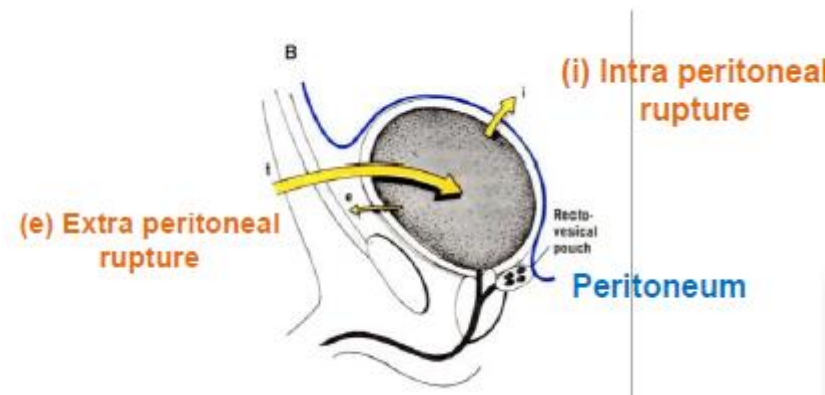
# Benign Prostate Hypertrophy



# Common Urinary Bladder Pathologies

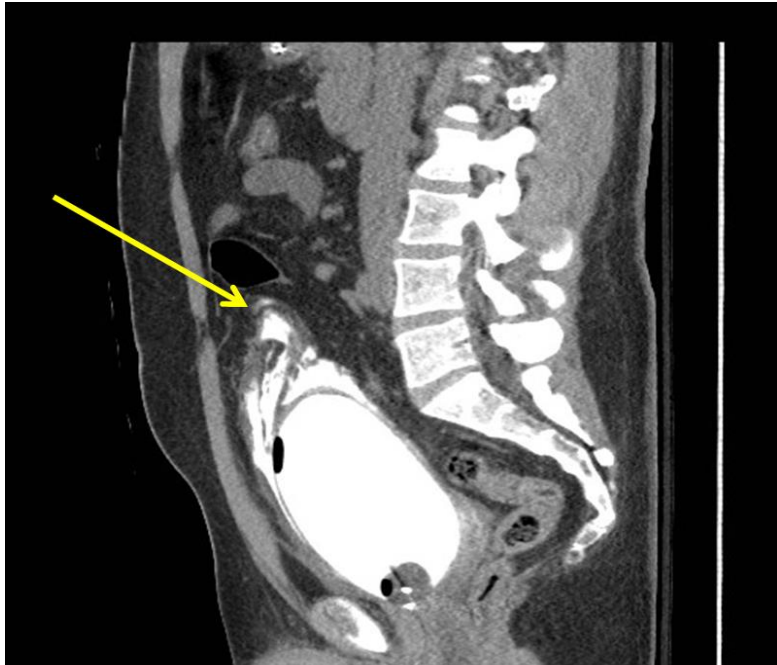
- **Bladder rupture:**

- The abdomen is lined with the peritoneum from inside.
- The bladder is located below the membrane of the peritoneum.

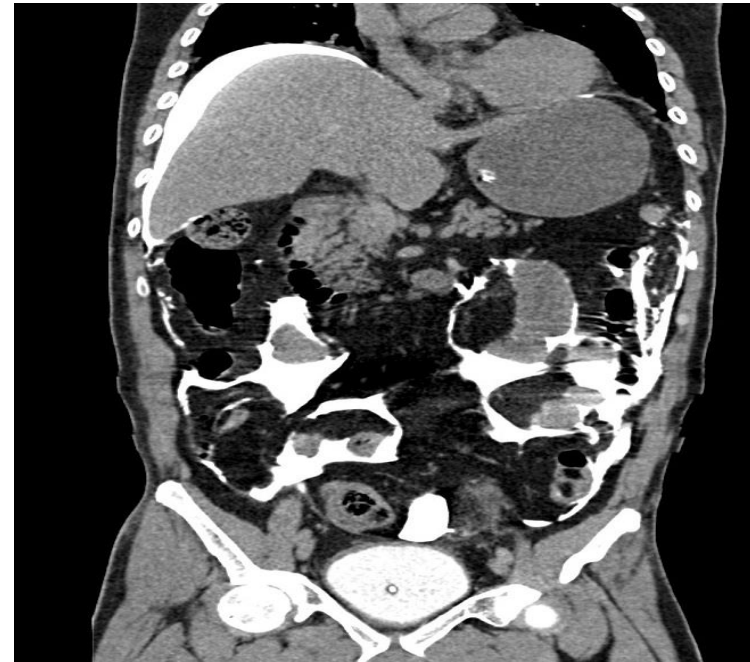




# Common urinary bladder pathologies



**Extra peritoneum:** any rupture or leakage to the content of the bladder does not enter the peritoneum. Patient does not need surgery.



**Intra peritoneum:** there is a rupture in both bladder and peritoneum. In this case, patient will need surgery.

