Team434

Radiology

RADIOLOGY OF THE RENAL SYSTEM

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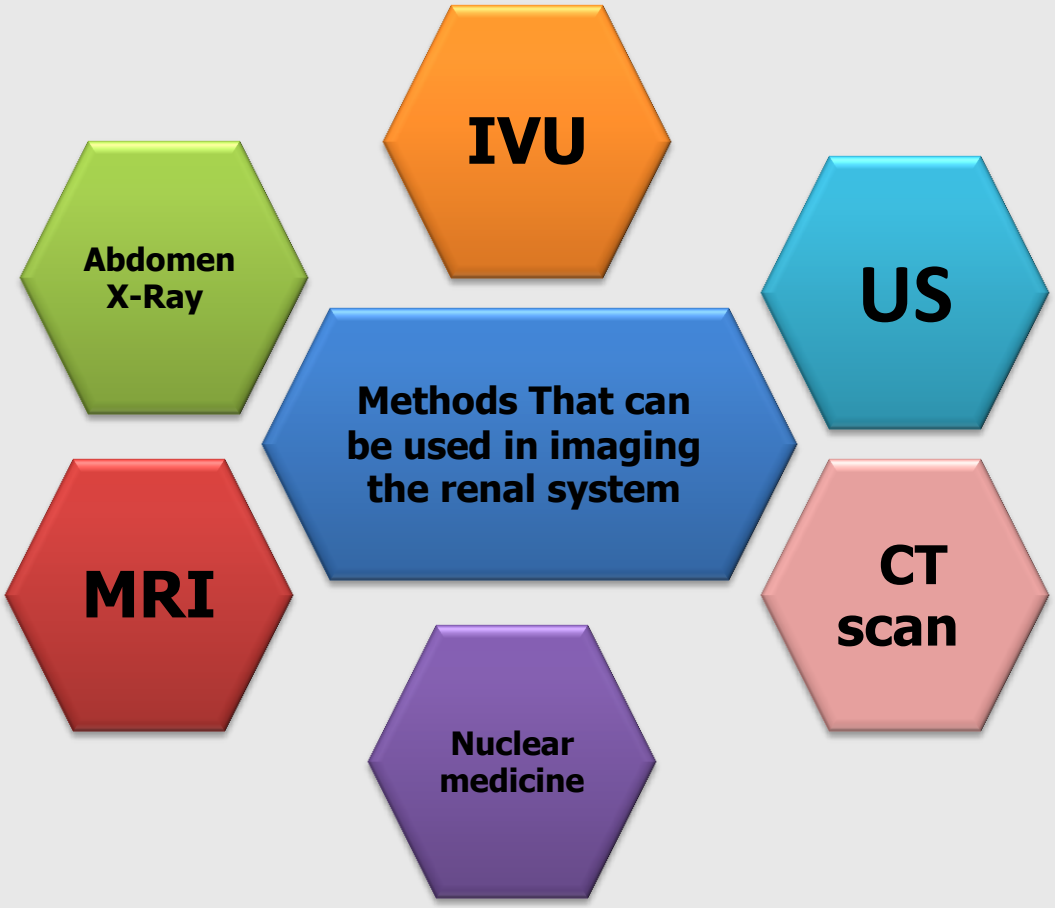
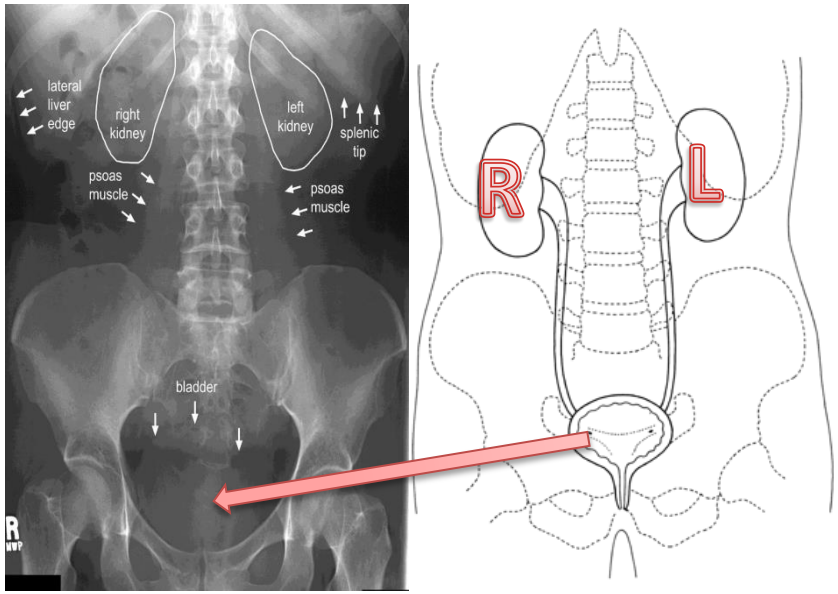
What is radiology?

- Radiology is a medical specialty that employs the use of imaging to both diagnose and treat disease visualized within the human body.



Abdomen X-ray



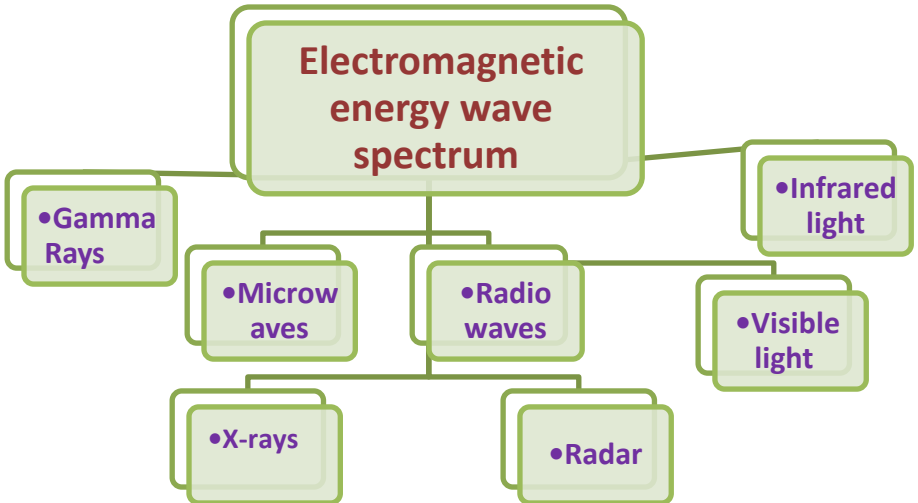
Normal kidney

It is a form of electromagnetic energy that travel at the speed of light

* Discovered and named by Dr. W. C. Röentgen at University of Würzburg, 1895

X-rays are emitted and detected in cassette which generate either a hard copy film or a digital image

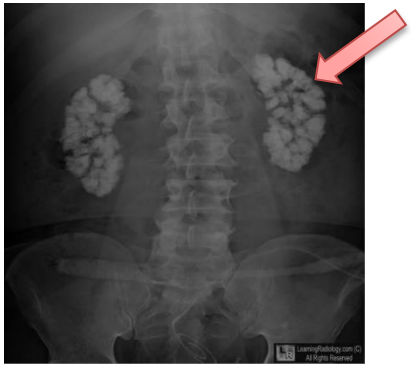
Image key = shades (Densities)
White ----- bone and calcification
Black ----- air
Grey ------ soft tissue



X-ray beam interaction with body tissue can:

- Pass all the way through the body → render the film dark (black)
- Be deflected or scattered
- Be absorbed → render the film light (white)

Advantages:	Disadvantages:	Used For:	Terminologies
▪Cheap & widely available ▪Often used as first choice (abdomen pain) ▪Doesn't require advanced technologist knowledge ▪Can be performed quickly ▪Portable	▪Radiation ▪Limited anatomy	▪Evaluate abdomen pain ▪Some time good for diagnosing kidney stones	Radio lucent → black (air) Air = low atomic = x-rays get through = image is dark Radio opaque → white (bone/stone) Metal=high atomic = x-rays blocked = image is light (white)



Kidneys calcification

Left kidney stone

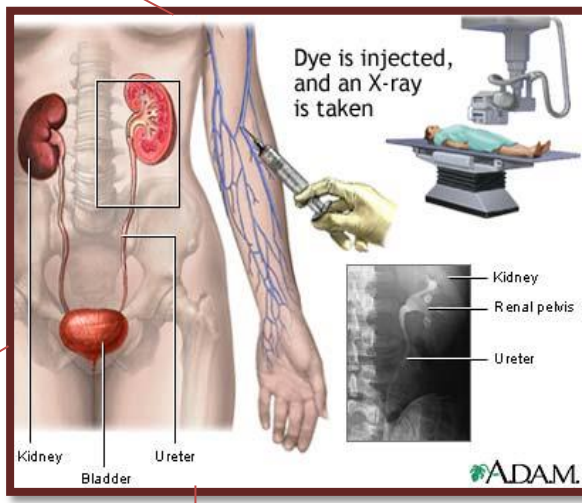
What to look for?
- Soft Tissues
- Stomach & Bowel gas distribution
- Bones & calcifications

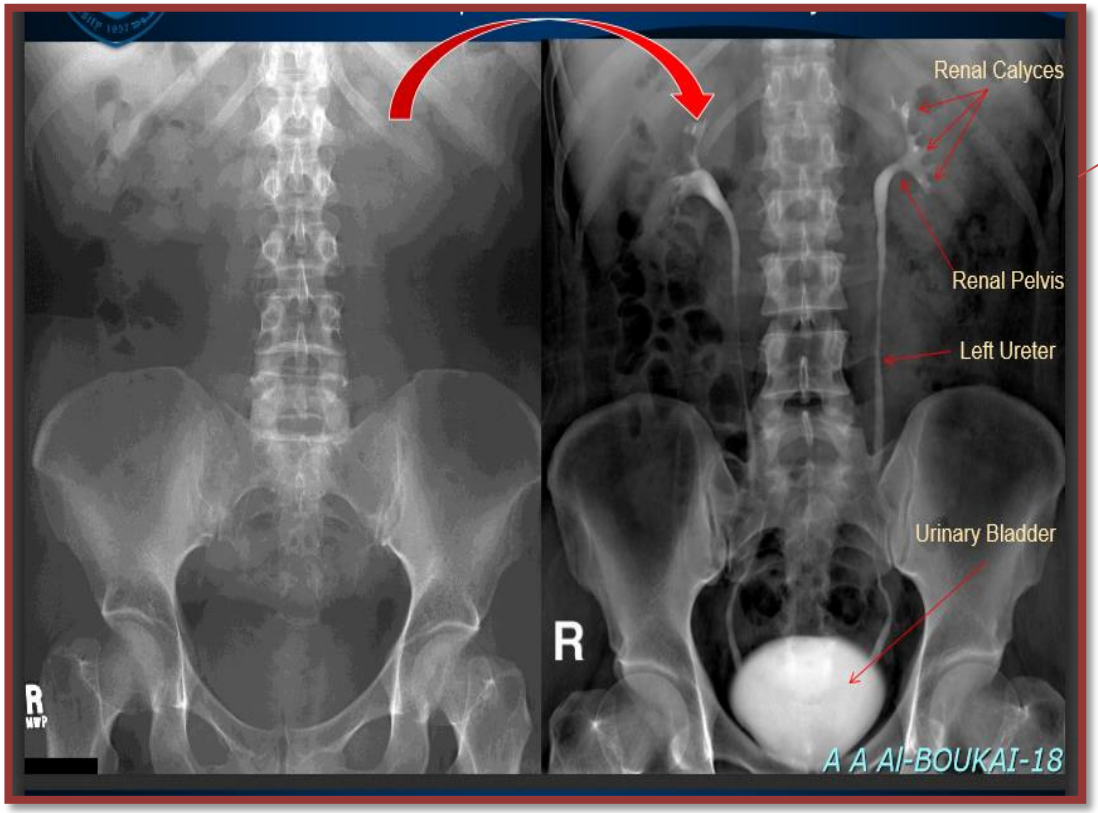
IVU (intra venous urography)

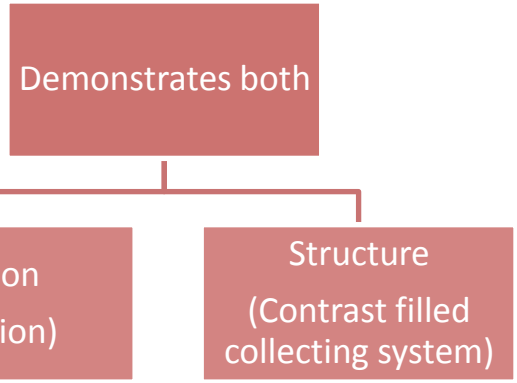
This test uses X-rays to look at the kidneys, bladder, and the tubes that connect them (the ureters)

Also called IVP (intravenous pyelogram)

This is KUB taken post intravenous contrast injection







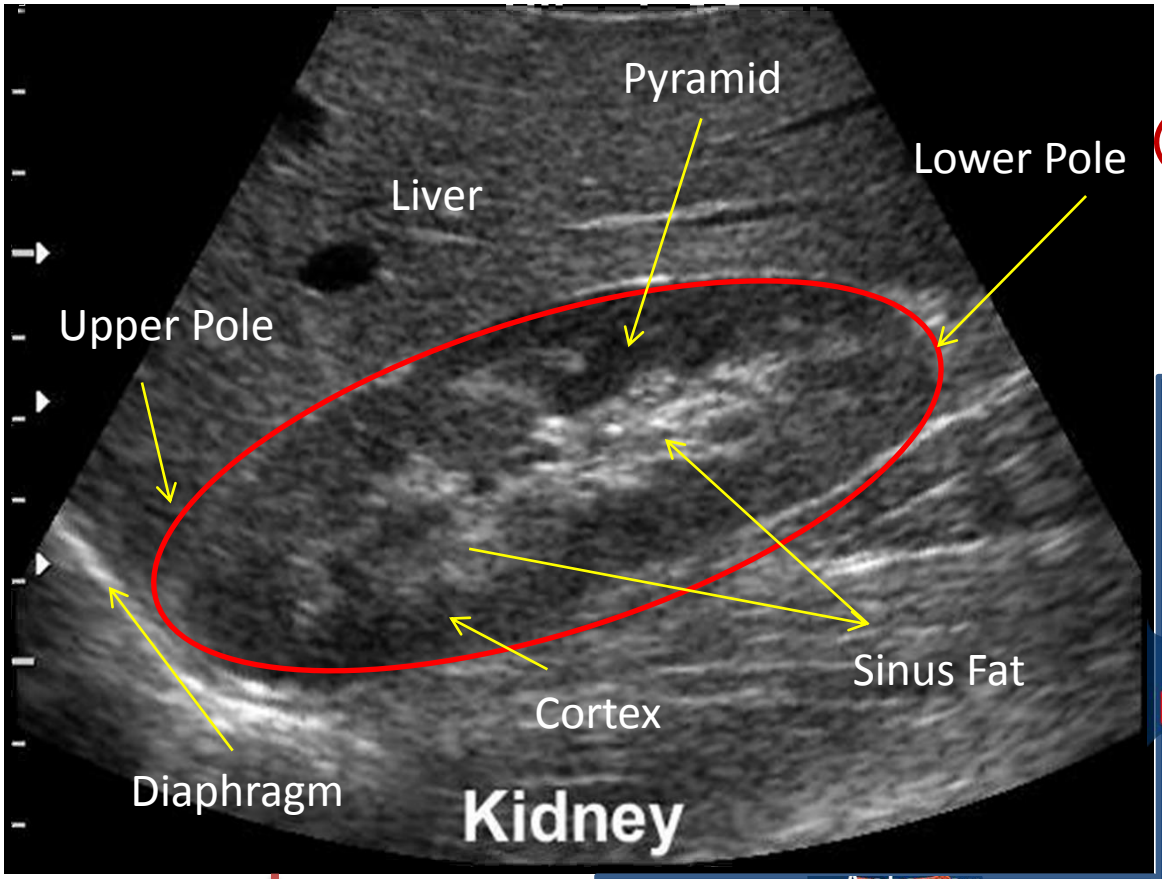
Natural contrast in the body	Added contrast in the body
Air Fat	Barium sulfate Iodine (Water Soluble)

Indications	Contraindications (relative)
•Urolithiasis / calculus •Pyelonephritis •Hydronephrosis •Trauma •Tumour •Renal hypertension •Congenital abnormality	•History of Allergy •Asthma •Cardiovascular disease •Sickle cell disease •Diabetes mellitus

UT (ultrasound)

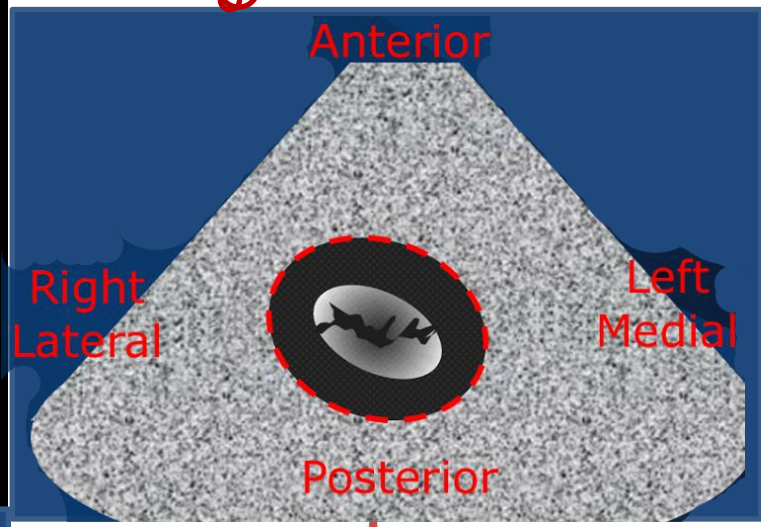
-Use of high frequency sound waves
Contrast between tissue is determined by sound reflection (echoes)

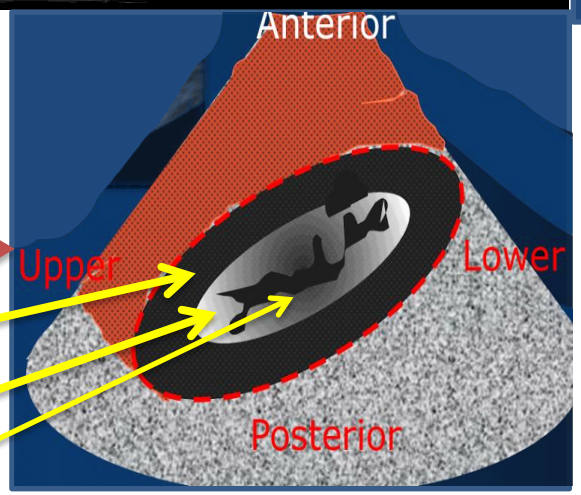
Advantages:	Disadvantages:	Used For:	Image key = shades (echoes)
Available No radiation Good anatomy	Operator dependent	1/good for kidney stones 2/ Excellent for hydronephrosis 3/ Excellent for focl lesion e.g. cysts ,masses	Hyper-echoes" high reflection "-> white (stones , air, calcification) An-echoic"no reflection"-> black(fluid) Hypo-echoes"soft reflection "->gray (soft tissue)



SCAN USUALLY PERFORMED IN BOTH LONGITUDINAL & TRANSVERSE PLANES

* Transfer= rounded shape
*longitudinal=Oval shape
*Upper is the right said

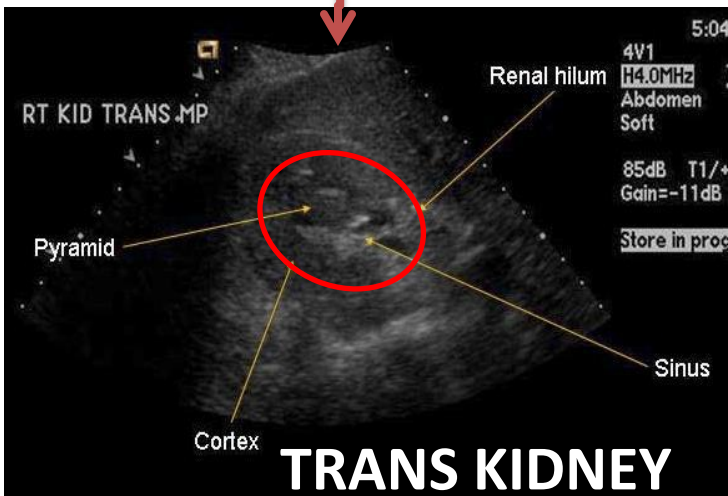




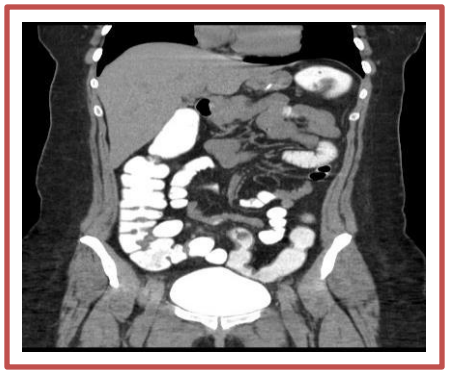
Cortex->Hypoechoic

Medulla->Hyperechoic

(Fat)Collecting system anechoic



Computed Tomography scan (CT scan)

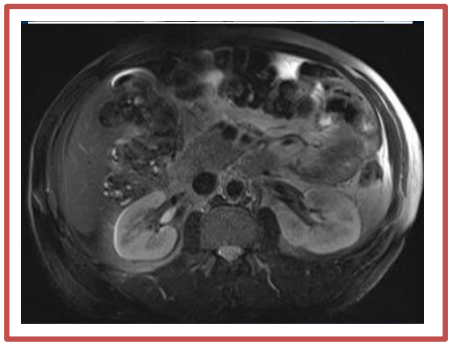


- **Cross Sectional imaging modality**
- **Mobile X-ray tube that rotates around a patient.**
- **Data displayed in multiple window settings (lungs parenchyma, bone, etc.)**

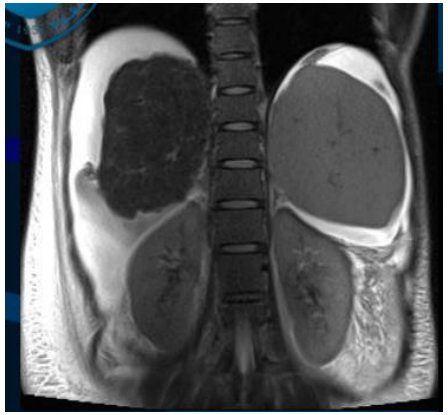
Advantages:	Disadvantages:	Used For:	Terminologies
• Better evaluation of soft tissue than x-ray.	• Radiation • Sometimes IV contrast is used	• trauma, stones, tumor, infection.	Image key = shades (Densities) White → bone and calcification Black → air Dark Grey → Fat

Image contrast determined by tissue density +/- contrast.

Magnetic Resonance Imaging (MRI)



Advantages:	Disadvantages:	Used For:	Terminologies
Best for soft tissue imaging There is no ionization Images can be directly taken in any plane Excellent anatomy details	Expensive Time consuming (30 to60Min) Patients fear it and dislike it because it is a narrow space Since it is magnetic no metals can be allowed Patient has to keep still during scanning procedure Not used to diagnosed kidney Stone .	Useful for soft tissue pathology (Tumor, infection) It can be done for pregnant women with caution Good for hydronephorsis	Image key = shades (Intensities) Hyper-intense (white) Hypo-intense (grey to black)



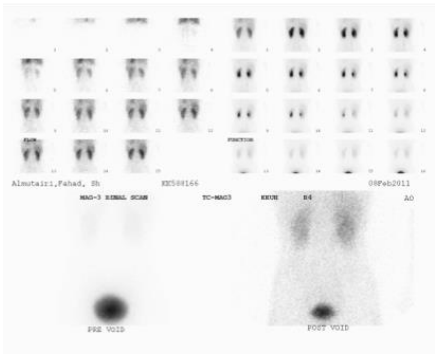
Nuclear medicine

the difference of Nuclear medicine from other modalities :
is all other modalities the source of image is **outside** the patient while in the Nuclear medicine the source of image is **inside** the patient

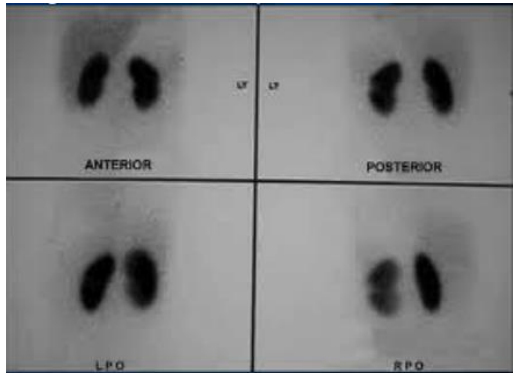
Functional & Structural test.
Useful for evaluation of function, obstruction and scarring.

How it work ?
Utilizes a gamma camera and radioactive isotopes.

Image key = shades (Isotope count)



RENAL CORTICAL STUDY



RENAL DYNAMIC STUDY

	image contrast determine by :	Used For:
RENAL CORTICAL STUDY	tissue uptake	split function and cortical scaring as a result of previous infections
RENAL DYNAMIC STUDY	organ blood perfusion, tissue uptake and clearance.	renal perfusion, function and obstruction.

Examples

Case 1

Young Adult presented with right loin pain and hematuria. Ultrasound Exam was performed. Which of the following is the likely finding?

a- Hydronephrosis

b- Normal.

c- Renal mass.

d- Upper pole renal stone.

Case 2

Adult patient presents with hematuria. An intravenous urogram examination was performed.
Which of the following is the likely cause of his presentation?

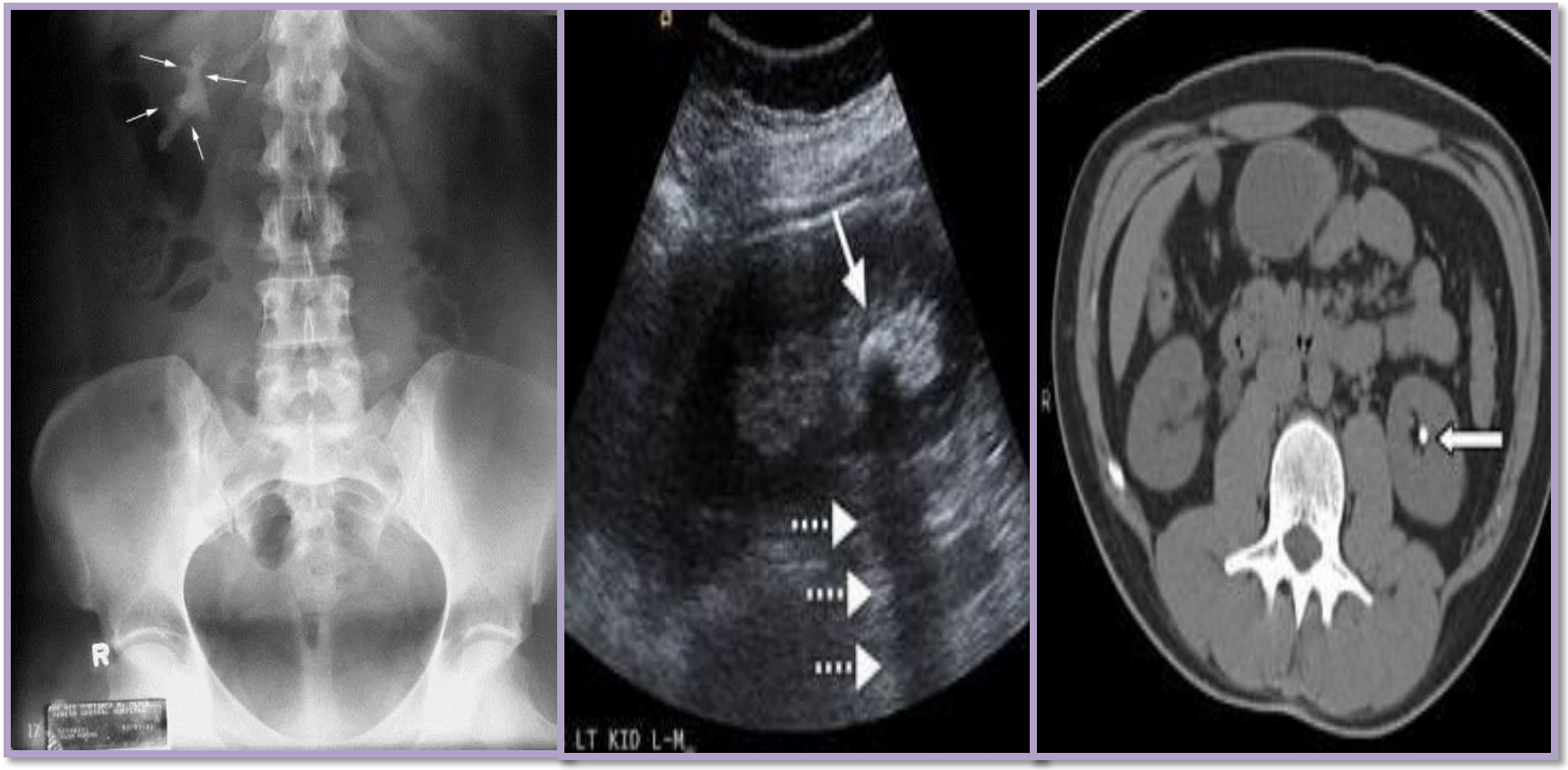
a- Non-functioning kidneys

b- Renal stones.

c- Renal mass.

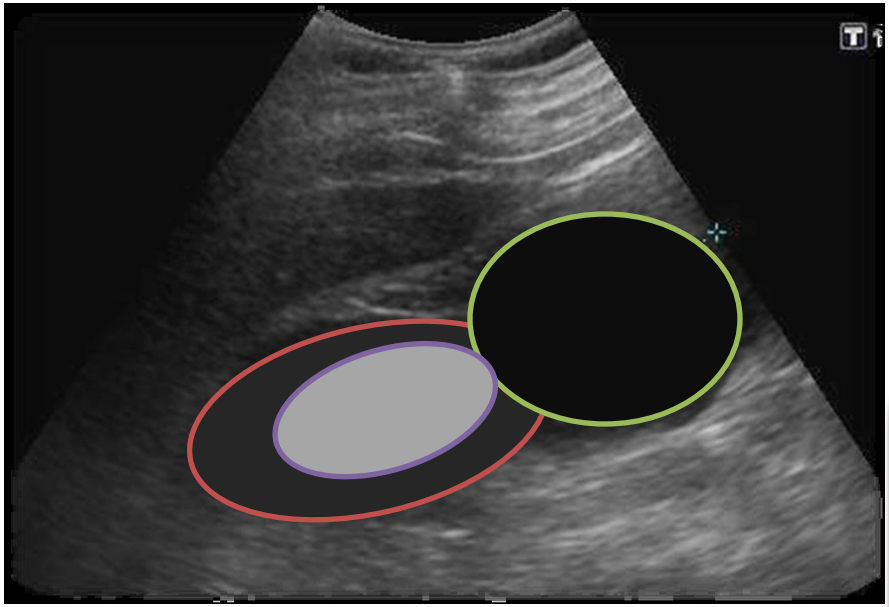
d- Uretric stricture

Urinary Tract Stones



Case 3

Young Adult presented with right loin pain and hematuria.
Ultrasound Exam was performed.
Which of the following is the likely finding?



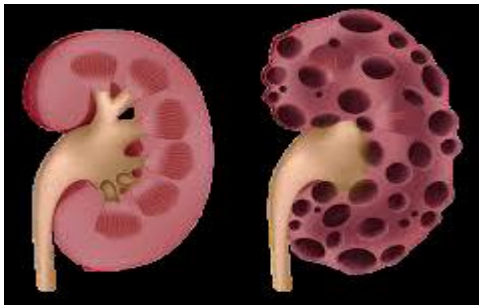
a- Normal.
b- Hydronephrosis.
c- Renal cyst.
d- Lower pole renal stone.

Information needed

Echo texture:
- Black => Sonolucent, echo void= Fluid.
- Grey => Hypoechoic = ST lesion
- White => Hyperechoic = Stone….

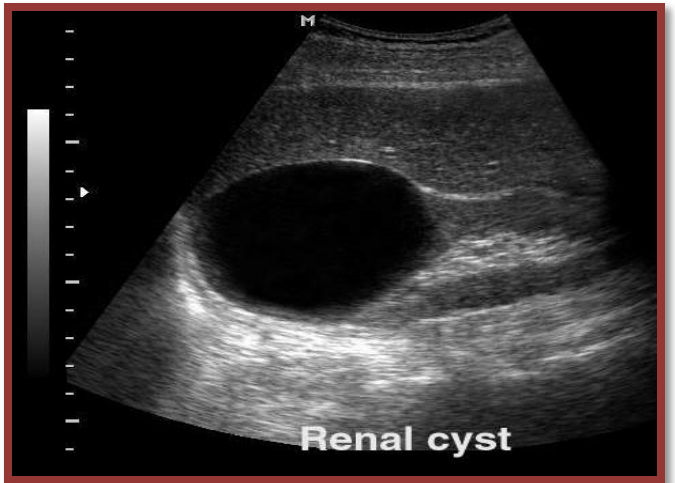
Posterior shadow:
- Acousting enhancement. White-> Fluid
- Acousting shadowing. Black->Stone….

Renal cyst “ polycystic kidney disease “



N PCK

hyprphenosis will have dark area within the kidney in the hilum of kidney while renal cyst is a dark area in the margin of kidney



Case 4

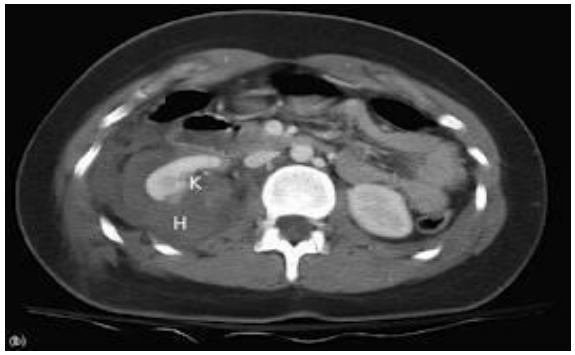
49 Adult patient smoker for 30 years presented to PHC with hematuria and weight loss

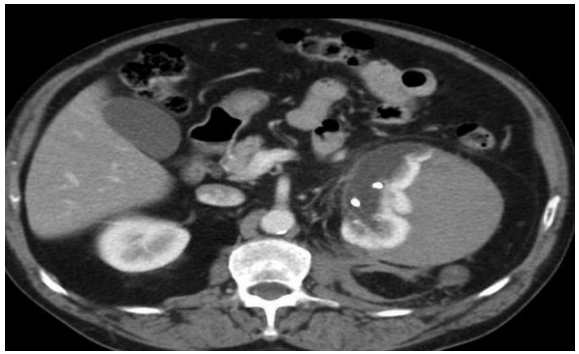
Renal cell carcinoma

Transitional cell carcinoma

Case 5

54 YO presented with aggravating left flank pain and gross hematuria after ESWL" Extracorporeal Shock Wave Lithotripsy "**. Which of the following is the likely cause of his presentation?**





a- Hydronephrosis

b- Renal cyst.

c- Renal mass.

d- Renal hematoma.

Congenital
Horseshoe kidney