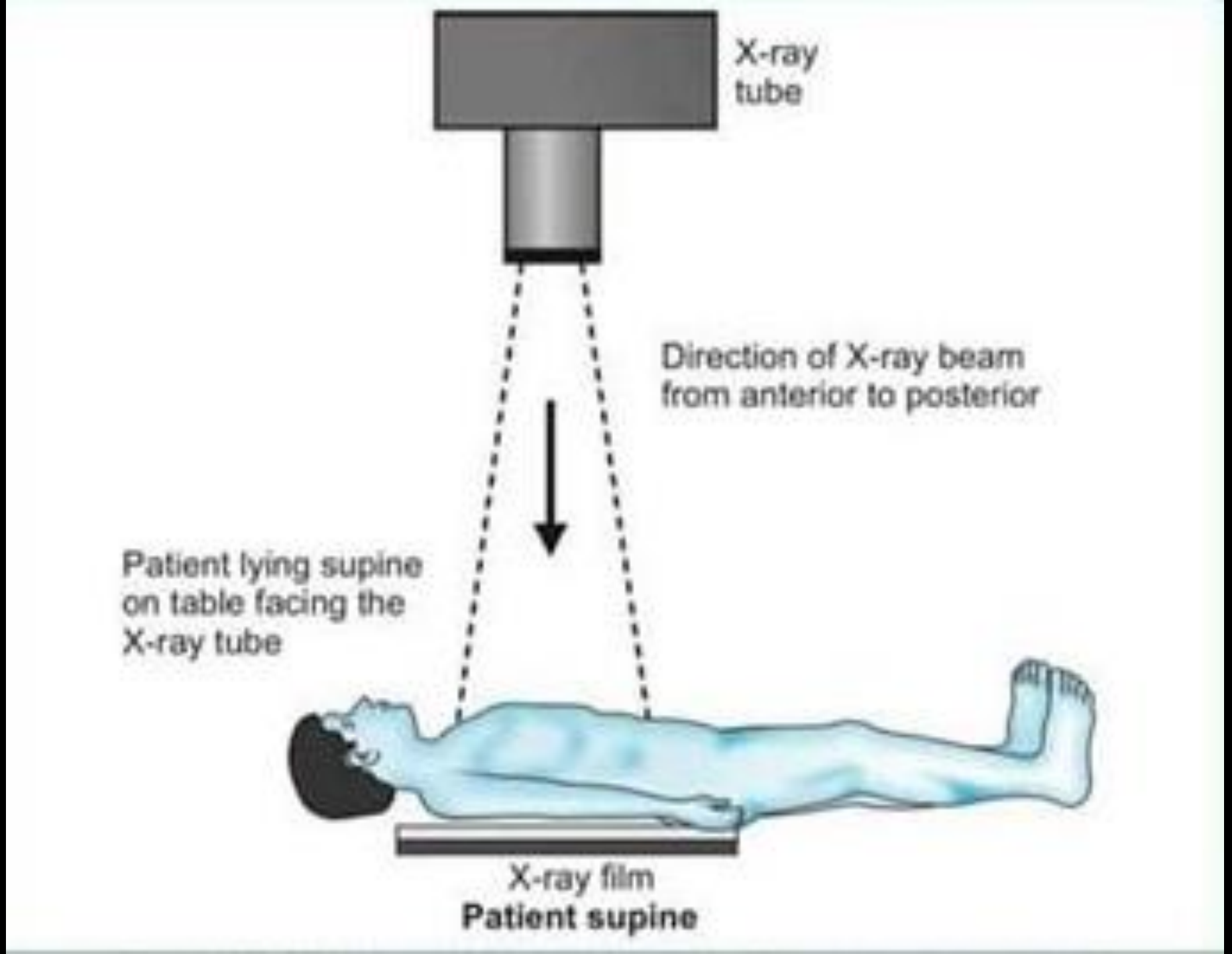
# RADIOLOGY
# MODALITIES OF IMAGING

DR. HANA QUDSIEH

# 1. X-ray film

- X-ray is ionizing radiation  consist of electro photons ( has direction and energy ) coming from x-ray tube and hit the target area of the body (chest, leg, hand,…)  so there will be change in direction of the photon and or energy
- Then the beam that passed through the body will hit the film
- The film will be developed LATER .


X-ray tube
Direction of X-ray beam from anterior to posterior
Patient lying supine on table facing the X-ray tube
X-ray film
Patient supine

- **Advantage OF XRAY :**
- Easily performed
- Available in almost all radiology centers
- Not coasty
- First modality of imaging in many radiopathologies
- Shows bone, metallic object with no artifacts …..

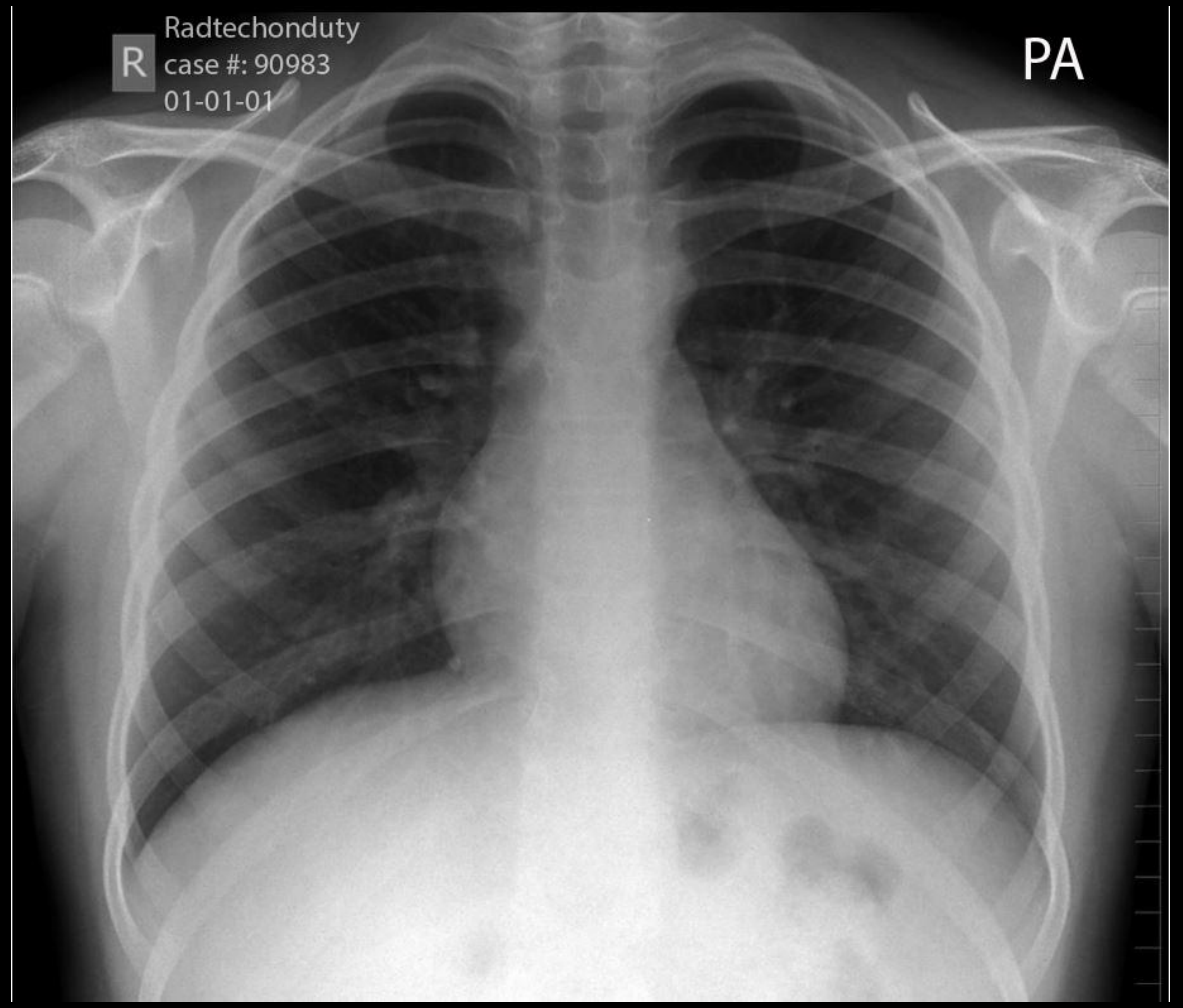
**Disadvantage**

- Almost Not allowed in pregnant .
- Radiation exposure ( but smaller dose than CT scan )
- Limited diagnostic information  in any radiological cases.

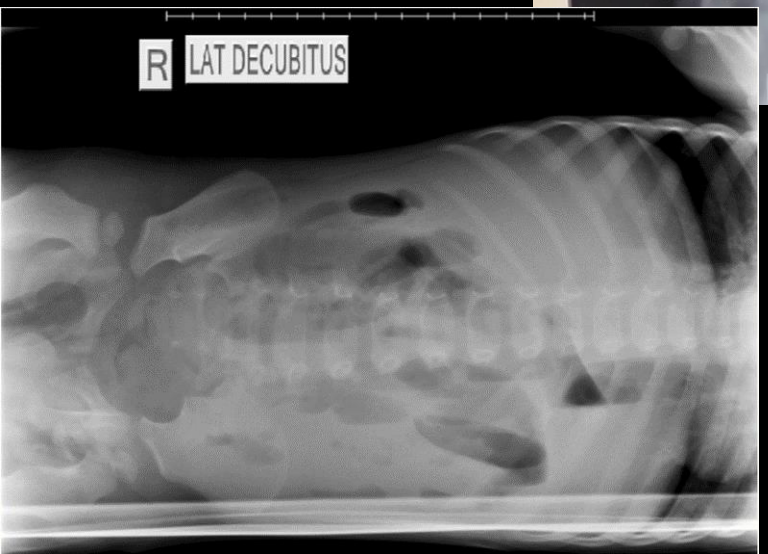
# EXAMPLES OF XRAY:

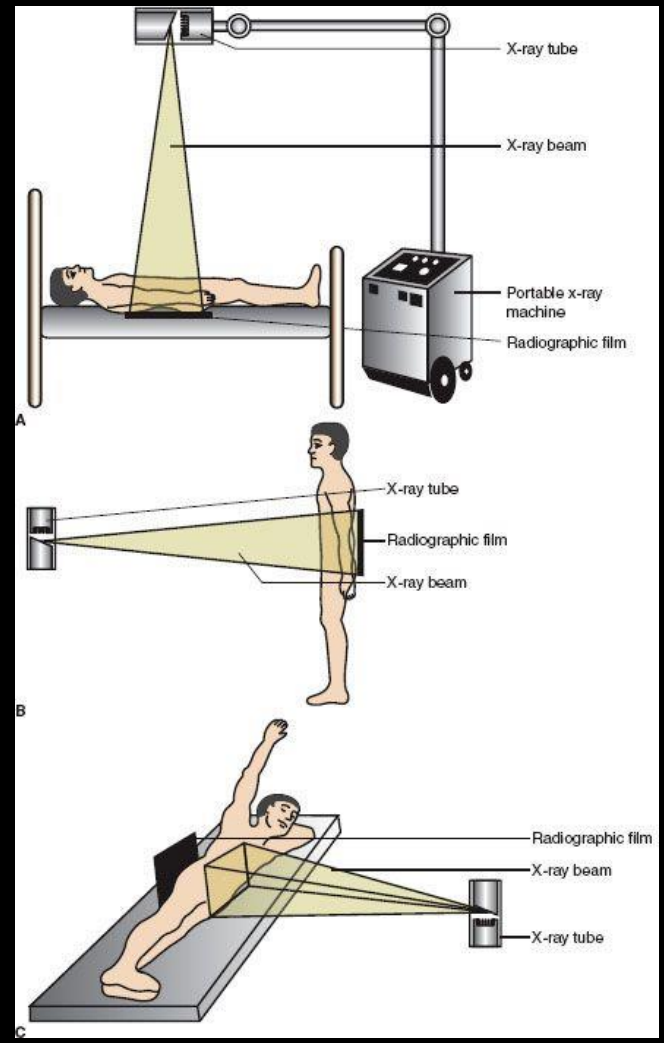
- 1- CHEST XRAY
- 2- ABDOMEN XRAY
- 3-KUB
- 4- WRIST XRAY
- 5- KNEE XRAY
- 6- CERVICAL SPINE XRAY

# CHEST XRAY (ROUTINELY PA)



# ABDOMEN XRAY (ROUTINELY ERECT AND SUPINE )

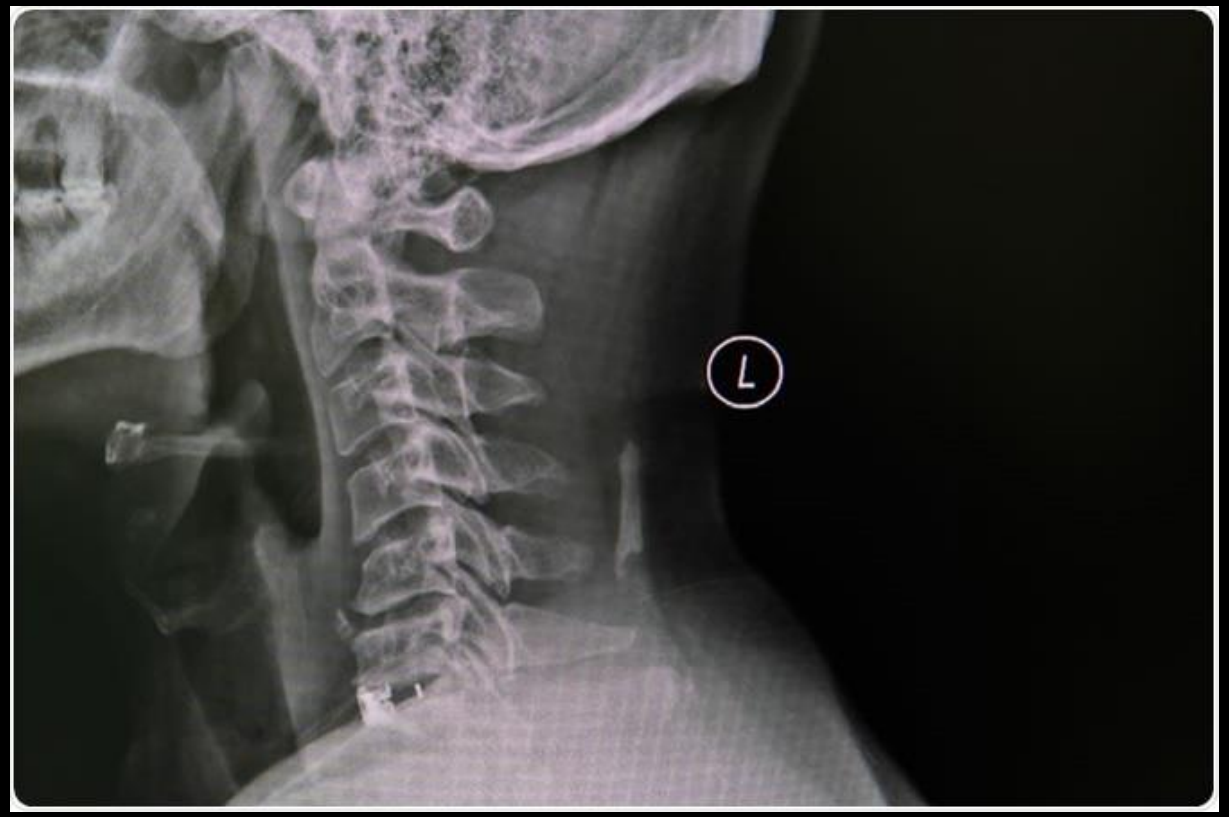



# KUB

- KUB IS : X-RAY OF THE ABDOMEN AND PELVIS FROM LOWER COASTAL MARGIN TO SYMPHASIS PUBIS
( AREA OF KIDNEY ,URETER, BLADDER )
USUALLY AFTER PREPERATION WITH LAXATIVE AND FASTING AT LEAST 6 HOURS
USED TO DETECT ANY RENAL STONE OR BEFORE IVP STUDY (DISCUSS LATER).

# OTHER EXAMPLES (WRIST, KNEE, CERVICAL SPINE )

# 2.IVU (IVP ) INTRAVENOUS PYELOGRAPHY OR UROGRAPHY

- IT IS STUDY FOR THE PELVIS OF KIDNEYS, URETERS AND URINARY BLADDER

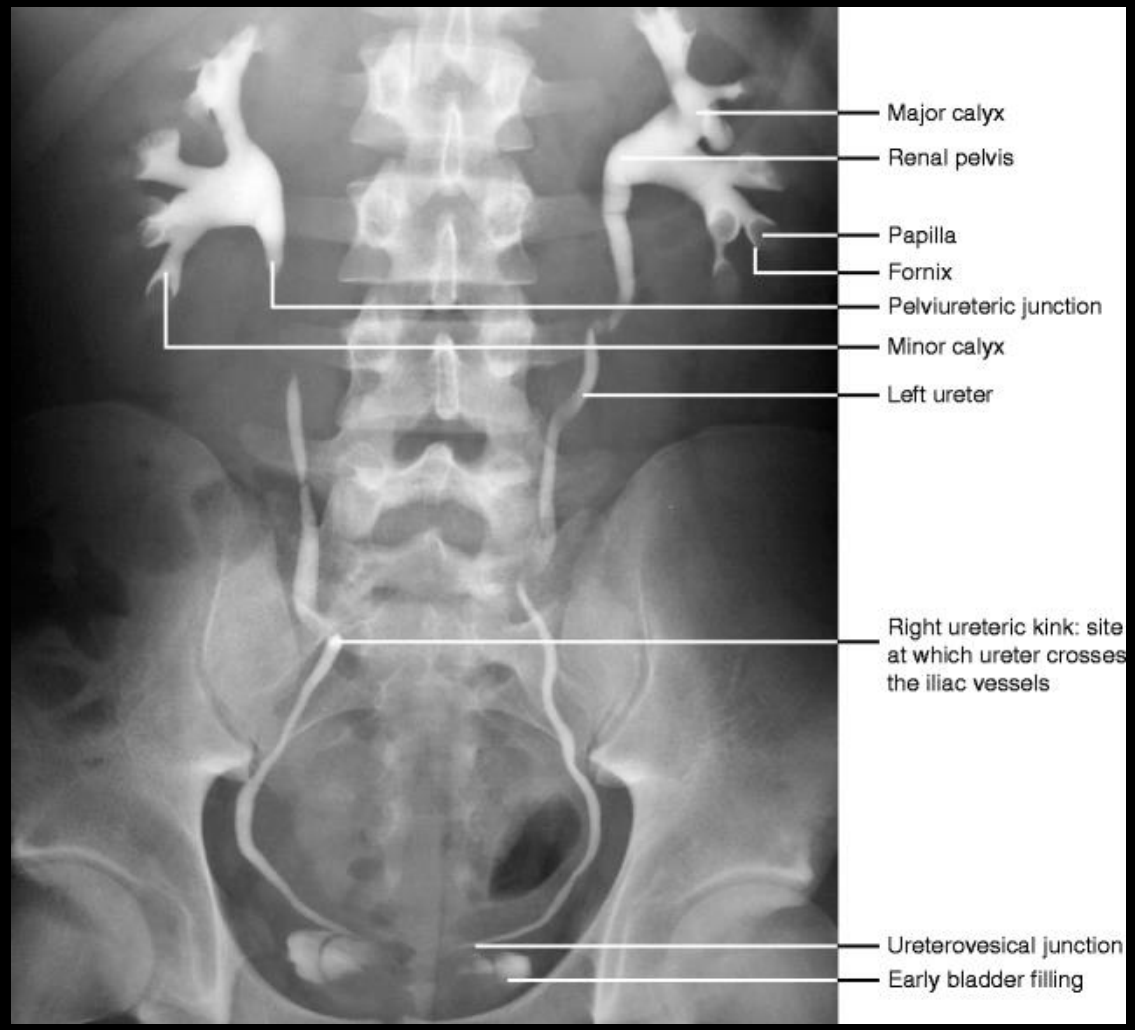
PROCEDURE:

- WE START WITH KUB
- AND THEN GIVE THE PATIENT CONTRAST MEDIA I.V .(INTRAVENOUSLY)
- THEN DO XRAY AT DIFFERENT TIME ( IMMEDIATE, 5MIN , 10MIN,… )

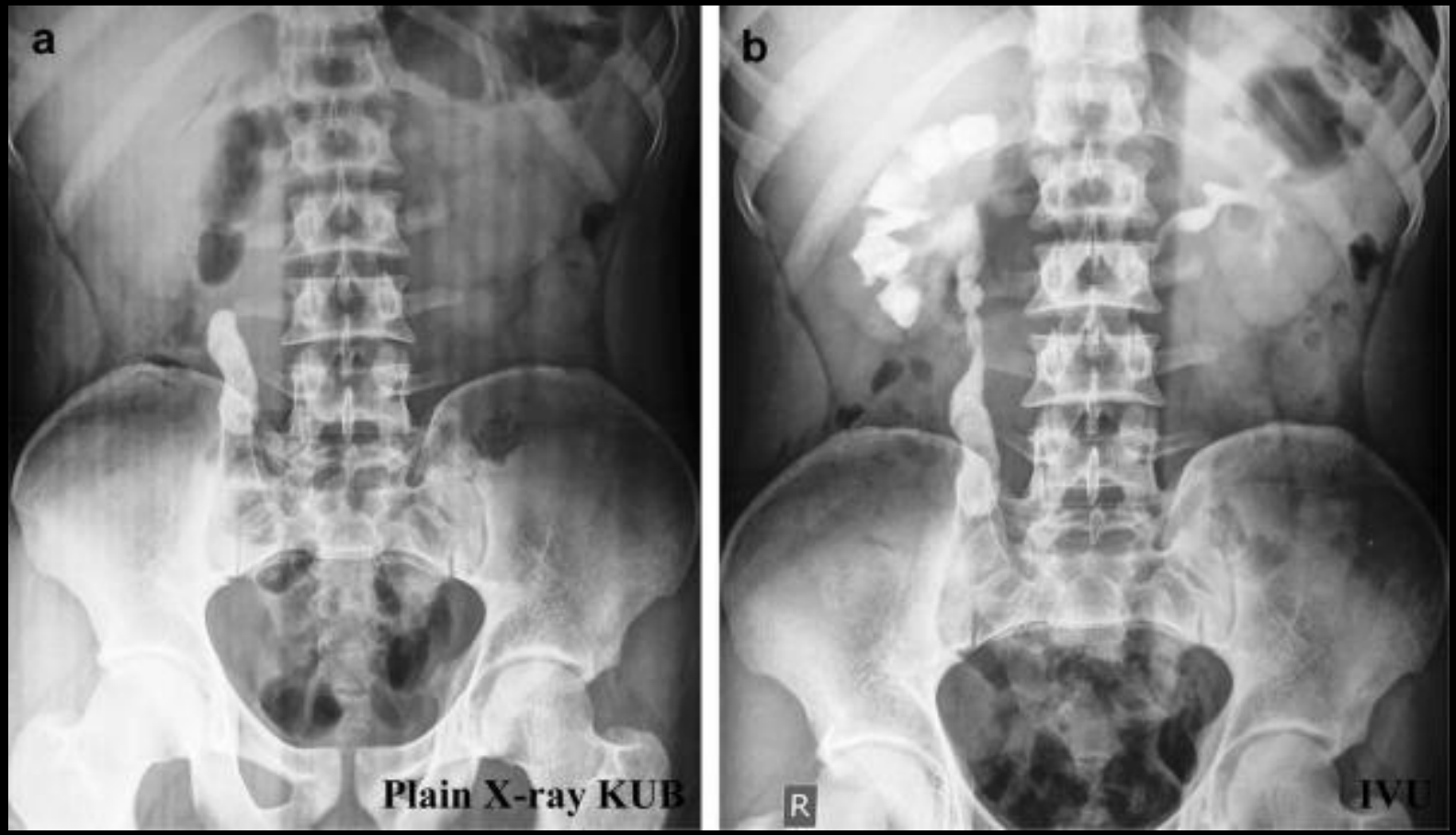
AND CONTINUE AS  EACH CASE REQUIRED.

# 5 MIN FILM

# IVU 15 MIN FILM ( REVIEW ANATOMY )




# EXAMPLES OF PATHOLOGY OF IVP ( NO DETAILS)



# 3- FLOUROSCOPY

- IT IS A DYNAMIC XRAY (VIDEO LIKE ) WITH CONTRAST MEDIA GIVEN TO THE PATIENT

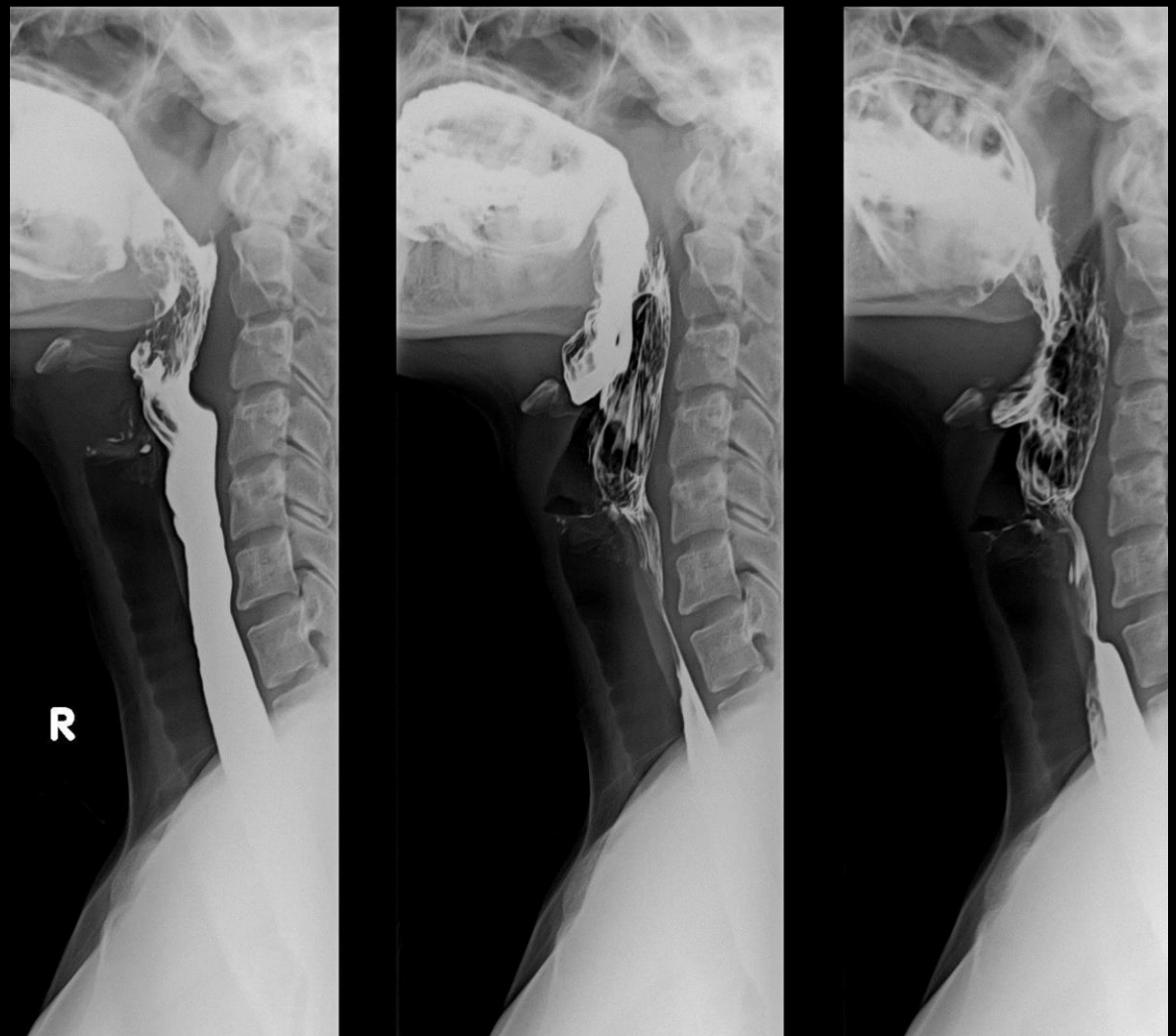
EXAMPLES:

- BARUIM SWALLOW ( ESOPHAGUS )
- BARUIM MEAL ( STOMACH)
- BARUIM FOLLOW THOUGH ( SMALL BOWEL )
- BARUIM ENEMA ( LARGE BOWEL )
- HYSTEROSALPINGOGRAPHY ( UTERUS )
- URETHROGRAPGY ( URETHRA)
- MCUG ( MICTURATION CYSTO URETHROGRAM ) URINARY BLADDER

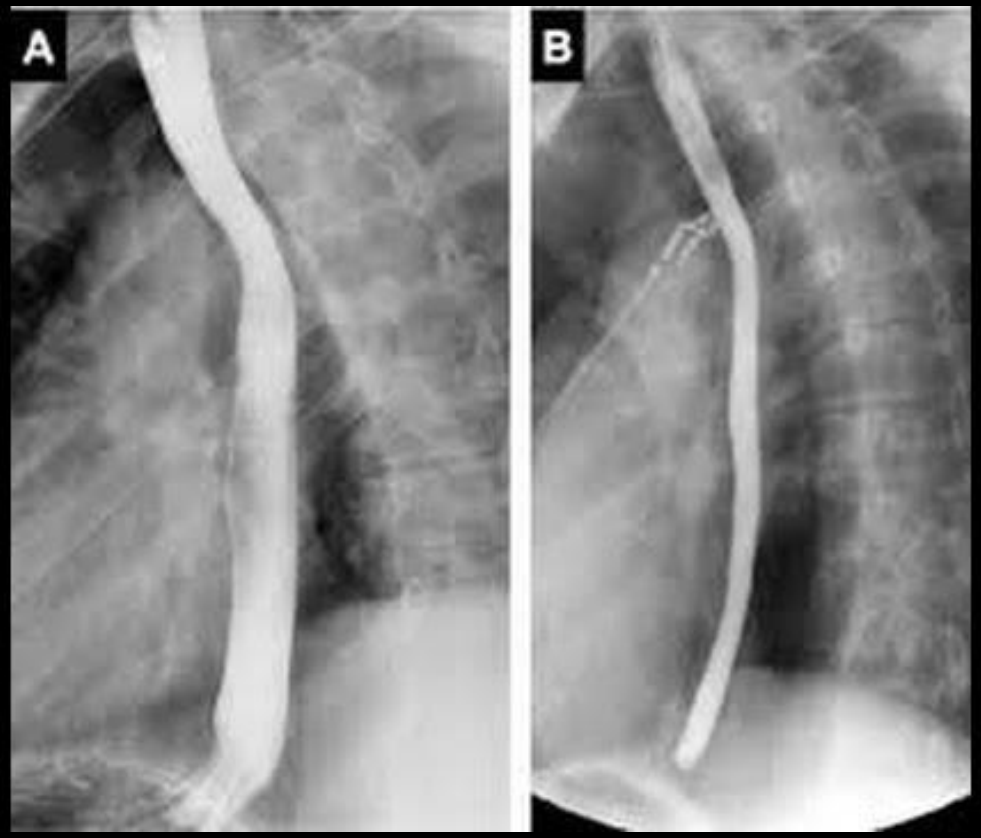
# BA SWALLOW

TAKING IMAGES WHILE THE PATIENT IS SWALLOWING  THE ORAL CONTRAST MEDIA

UPPER  ( LATERAL AND AP):




# BA SWALLOW
## LOWER LEVEL (AP AND LATERAL )



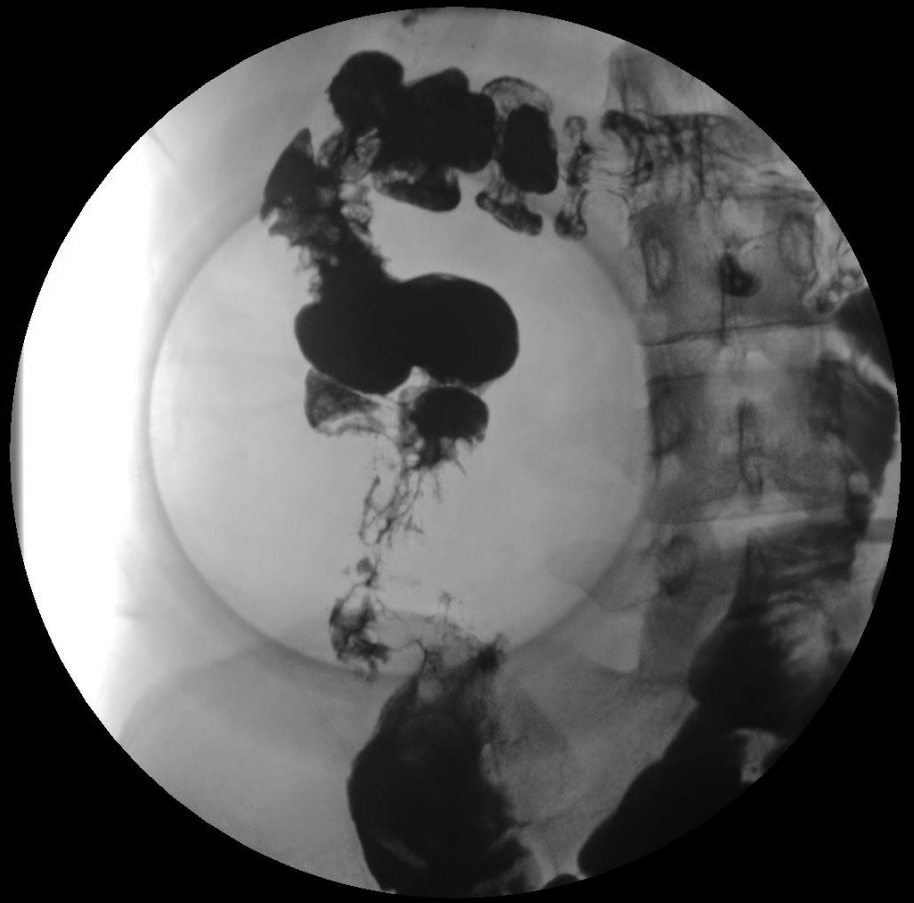
# BARUIM MEAL:

TAKING IMAGES WITH DIFFERENT VIEWS WHILE THE ORAL CONTRAST IN THE STOMACH

# FOLLOW THROUGH

WE GIVE ORAL ONTRAST BARUIM AND WE TAKE XRAY FILMS ON DIFFERENT TIMES FOR EXAMPLE :
EVERY 20 MINUTES IN THE FIRST HOUR ,
EVERY 30 MINUTES IN THE SECOND HOUR
EVERY 60 MINUTES TILL REACHING THE TERMINAL ILEUIM ,
THEN WE DO COMPRESSION VIEW UNDER
FLOUROSCOPE GUIDANCE TO EXAMINE TERMINAL ILEUIM

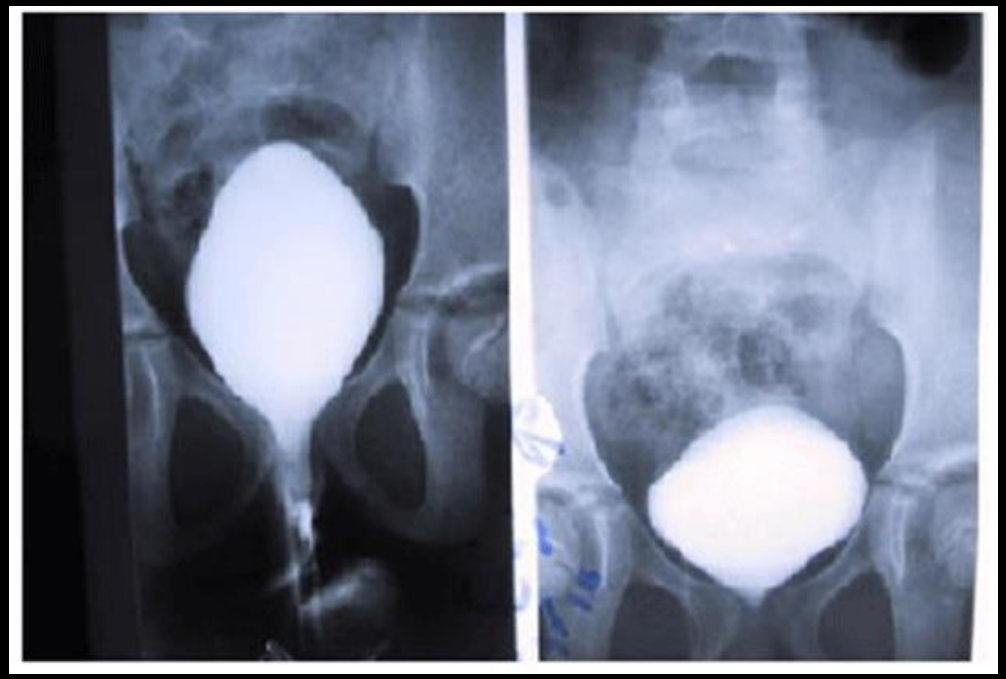
# COMPRESSION VIEW BARUIM FOLLOW THROUGH



**BARUIM ENEMA :** THROUGH RECTAL TUBE WE INTRODUCE BARUIM CONTRAST UNDER FLOUROSCOPY GUIDANCE TO LARGE BOWEL ONLY

# MCUG (MICTURATION CYSTO URETHROGRAM)

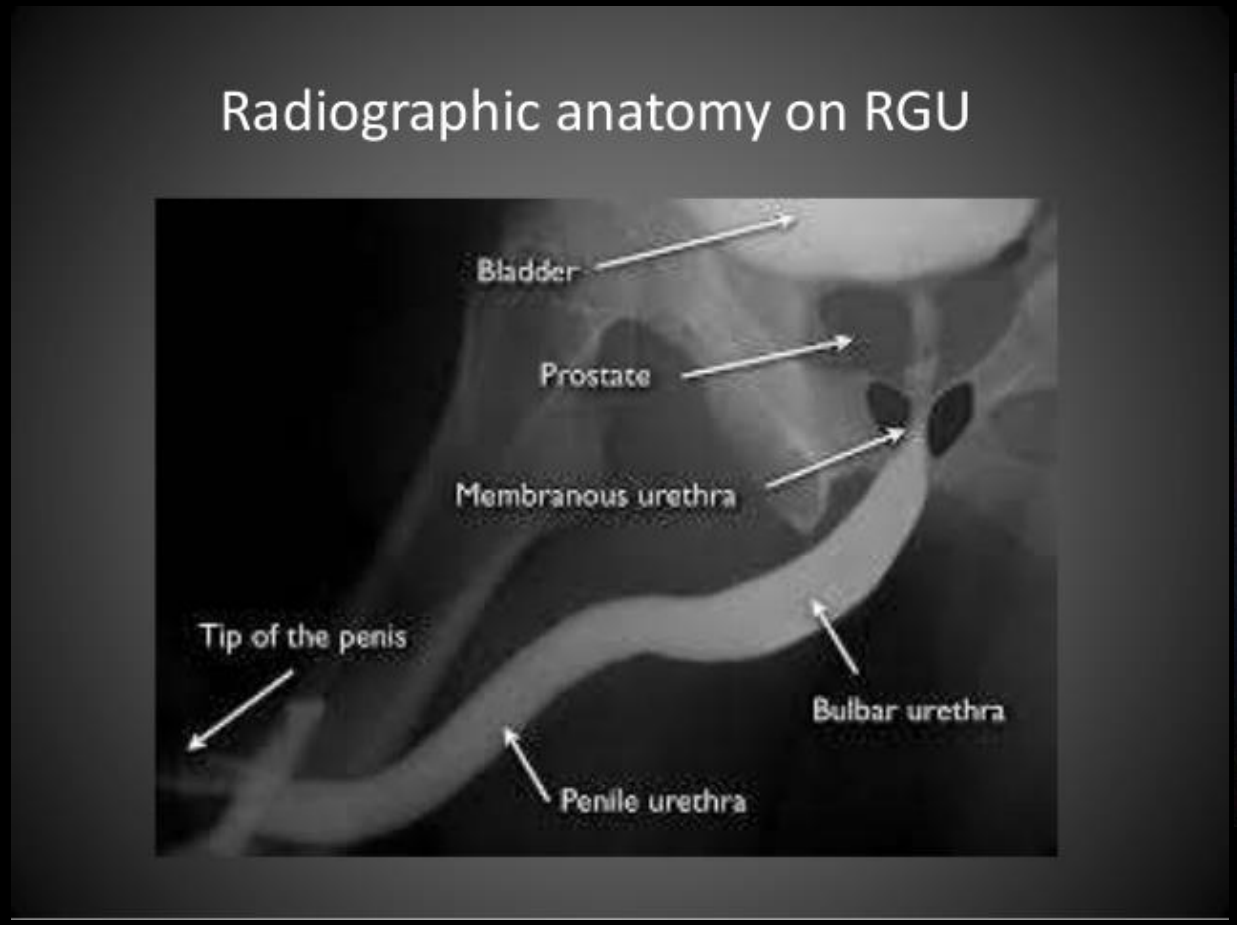
- USUALLY USED TO DETECT VUR (VESICO URETERIC REFLUX )
- WE INTRODUCE NICM (NON IONISED CONTRAST MEDIA ) THROUGH FOLYES CATHETER TO THE  URINARY BLADDER.
- THE CONTRAST MEDIA SHOULD FILL THE URINARY BLADDER WITHOUT RETROGRADE PASSAGE TO THE URETERS
- IF THERE IS INFLUX OF CONTRAST MEDIA TO URETERS IT IS CALLED VUR ( VESICO URETERIC REFLUX)



NORMAL
MCUG

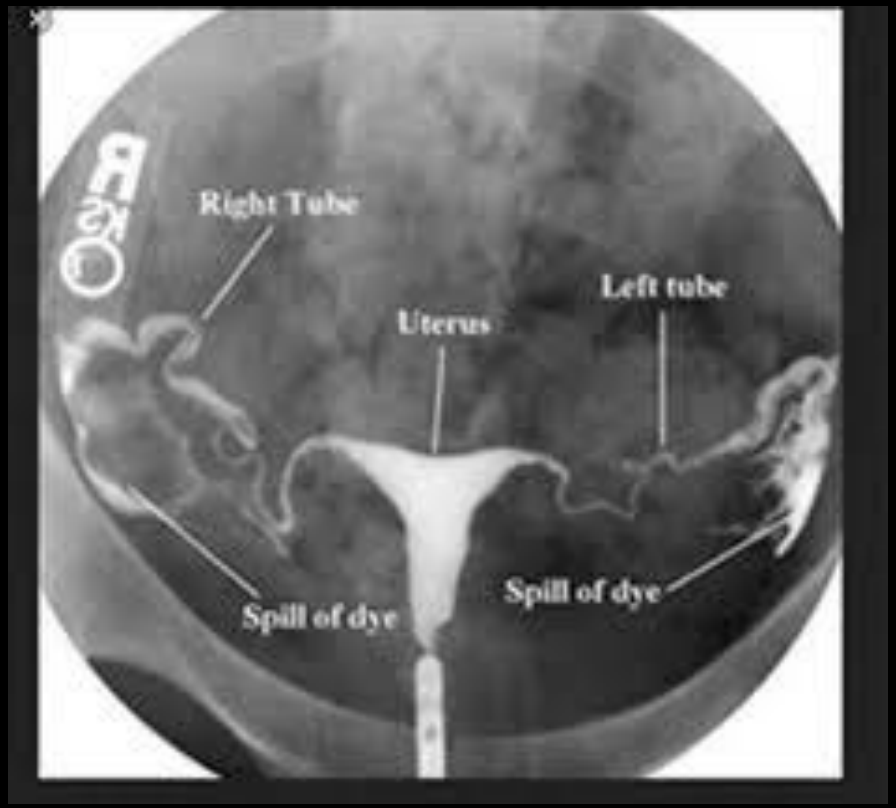
VUR IN MCUG
ABNORMAL

# URETHROGRAM : WE INTRODUCE NICM THROUGH FOLYES CATHETER (IT'S BALLON IN THE TIP OF THE PENIS) TO SEE IF THERE IS ANY STRICTURE OR RUPTURE IN THE URETHRA




# HYSTEROSALPINGOGRAPHY

- INTRODUCE NICM THROUGH CATHETER OR LONG CANULA TO THE UTERUS , MAINLY TO DETECT ANY BLOCKAGE OF FALLOPIAN TUBES



# 4-ULTRASOUND

# ULTRASOUND MACHINE

# ULTRASOUND

ADVANTAGES

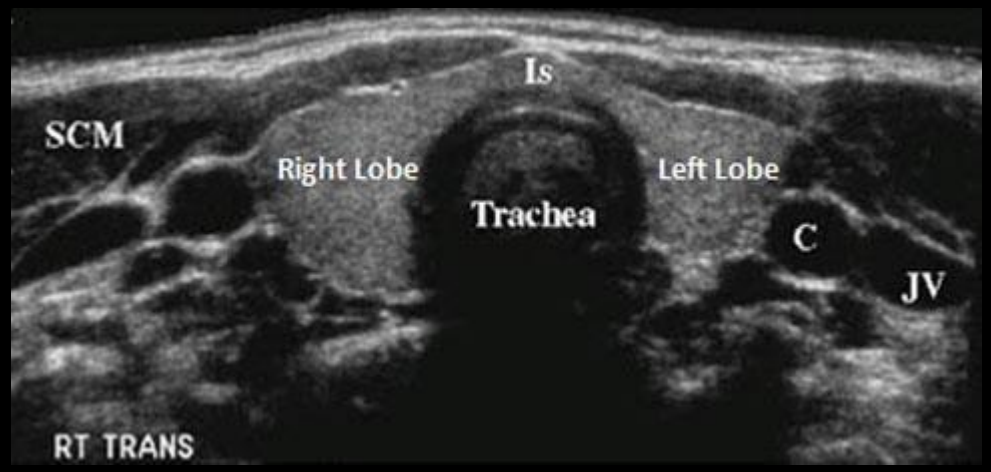
NO HARMFULL RADIATION EXPOSURE

- AVAILABLE
- NOT COASTY
- BEST METHOD FOR HYDROEPHROSIS  AND GALL BLADDER STONE

- DISADVANTAGE
- OPERATOR DEPENDANT
- LIMITATION TECHNICAL FACTORS BY OPACITY ,INCOOPEARTVE PATIENT, EXESSIVE GASES,…..

# EXAMPLES:

## KIDNEY ULTRASOUND,THYROID ULTRASOND, LIVER ULTRASOUND


# 5- CT SCAN

# CT SCAN MACHINE

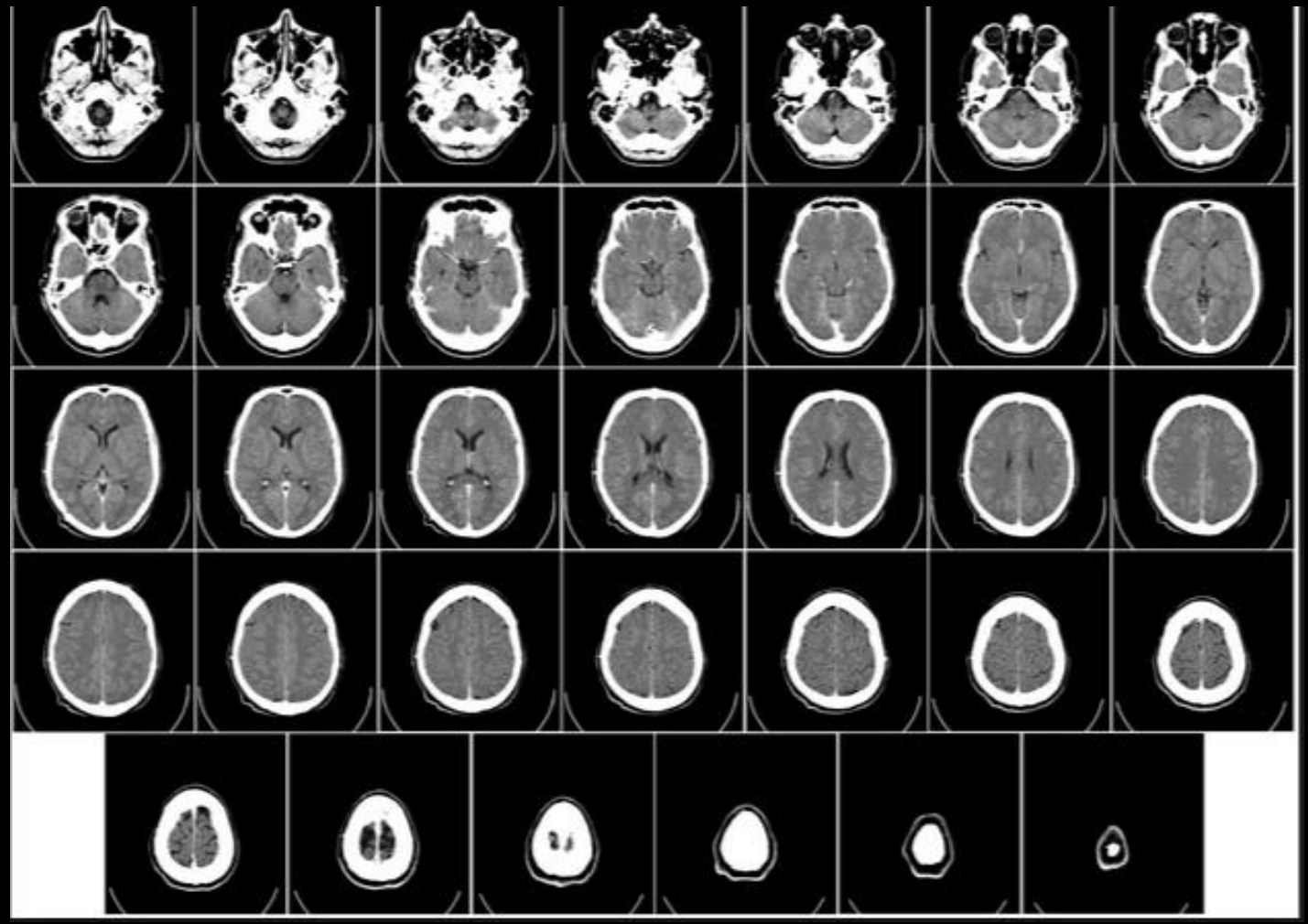
# CT SCAN

- IT IS MULTIPLE **X-RAYS** BEAM THAT PENETRATE THE SCANNED AREA AND RECEIVED BY DETECTORS AND THEN ANALYSED BY COMPUTER

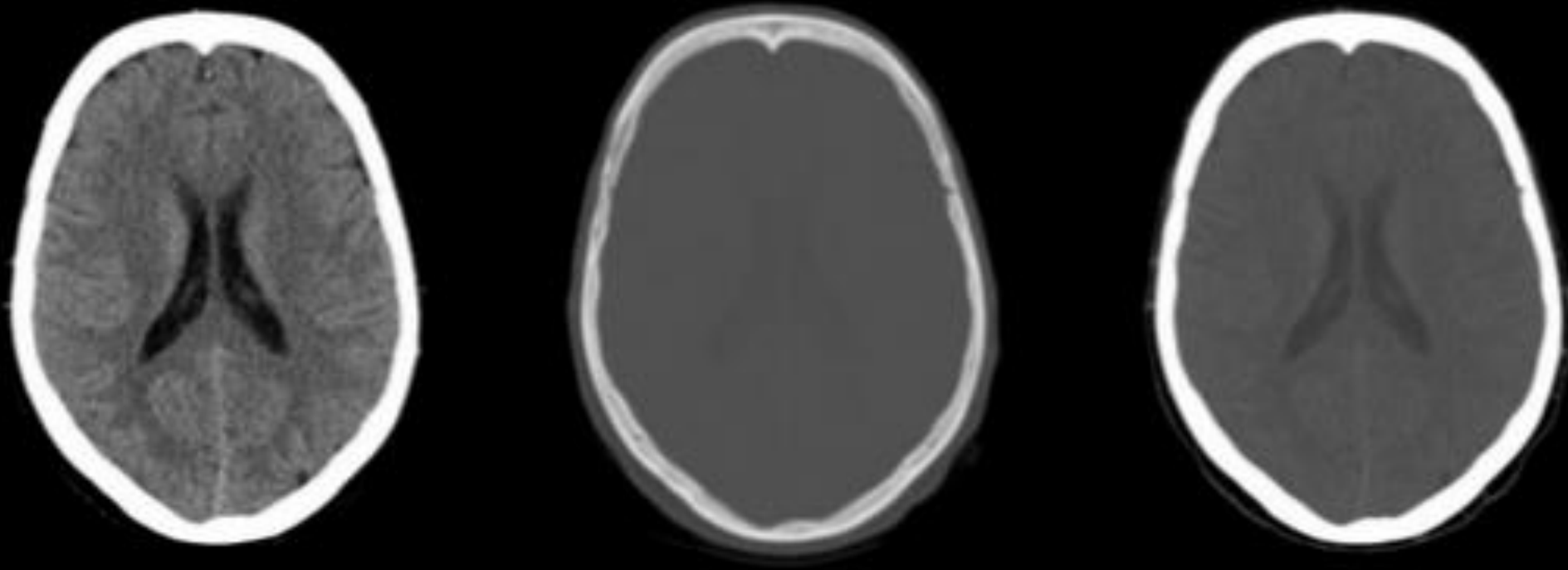
- ADVANTAGES :
- RAPID SCAN
- FIRST CHOICE FOR TRAUMA CASES ,AND BRAIN INSULT
- BEST METHOD FOR CALCIFICATION AND FRACTURES

- DISADVANTAGES
- HIGH EXPOSURE DOSE
- COSTY
- LESS DIAGNOSTIC INFORMATION THAN MRI
- NOT ALLOWED FOR PREGNANTS

# IT IS NOT ONE IMAGE IT IS A FILM OF MANY IMAGES IN DIFFERENT LEVEL



# WINDOWS ( IT IS TECHNICAL OPTION , WE SCAN THE PATIENT ONLY ONCE)



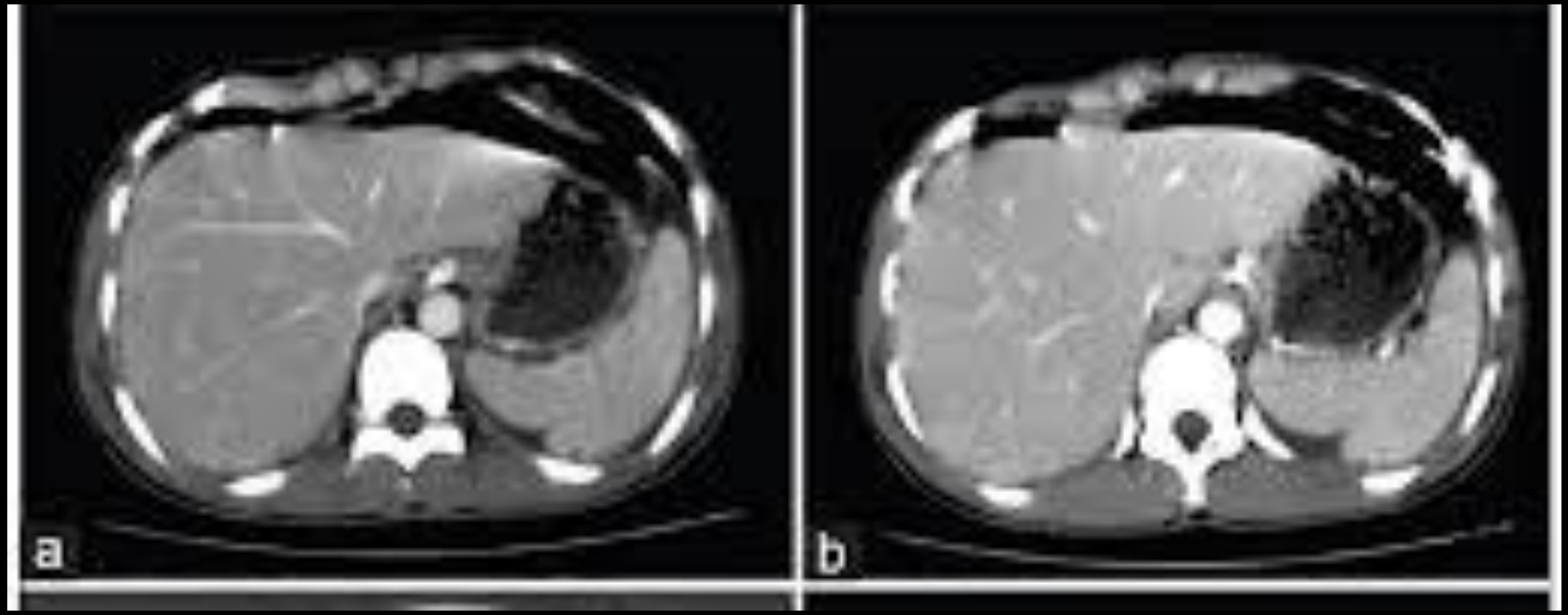
BRAIN window
W:80 L:40

BONE window
W:2500 L:480

SUBDURAL window
W:350 L:90

MEDIASTINAL WINDOW LUNG WINDOW OF CHEST CT

# LIVER ( SOFT TISSUE ) WINDOW



# 6- MRI

- MRI IS A LARGE VERY STRONG MAGNATIC FIELD

-IT IS NOT ALLOWED TO ENTER ANY FERROMAGNATIC  OBJECT TO MRI ROON AT ALLLLLLLLLLLLLLL

YOU HAVE TO TAKE GOOD HISTORY FROM THE PATIENT WITH HIS DOCUMENTED SIGN  THAT HE HAS NO “MRI NON COMPTABILE “ PROSTHESIS OR PACEMAKER  ( DOCUMENTED)

# MRI ACCIDENTS

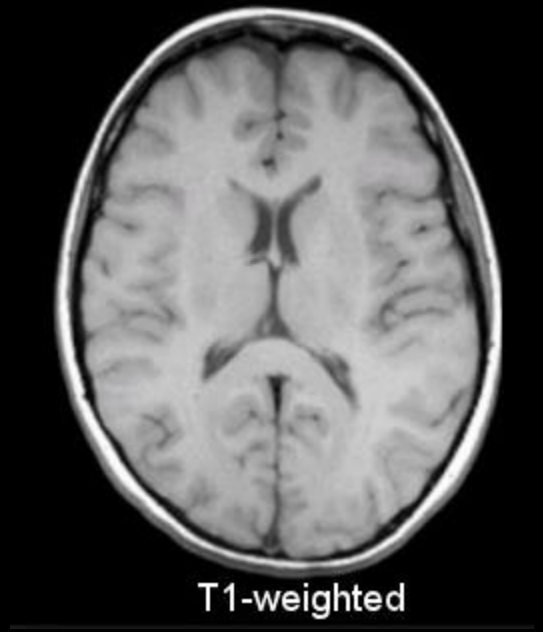

# DISADVANTAGES OF MRI

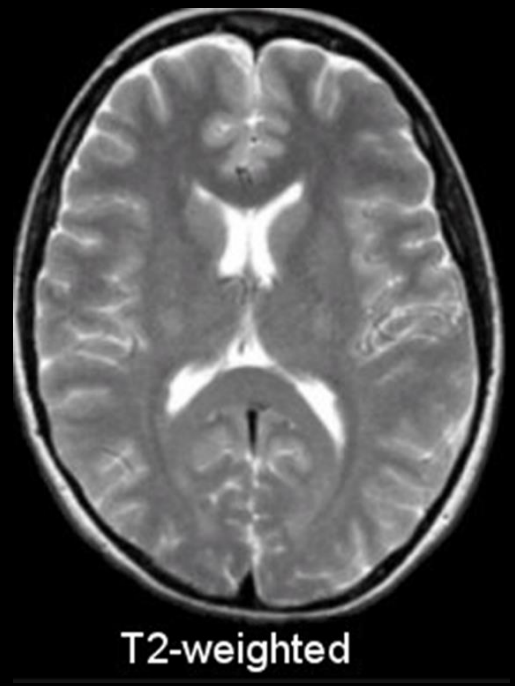
- IT IS RELATIVELY LONG TIME FOR SCANNING 15 MIN – 1 HOUR
- NOT ALLOWED FOR PATIENT WITH (NON MRI COMPITABILE PROSTHESIS)
- NOT OPTIMUM FOR CALCIFICATION .
- THE MACHINE HAS LONG CLOSED TUBE THAT MAY TRIGGER CLAUSTROPHOBIA FOR SOME PATIENTS
- THE MACHINE HAS VERY VERY LOUD NOISE.
- COSTY

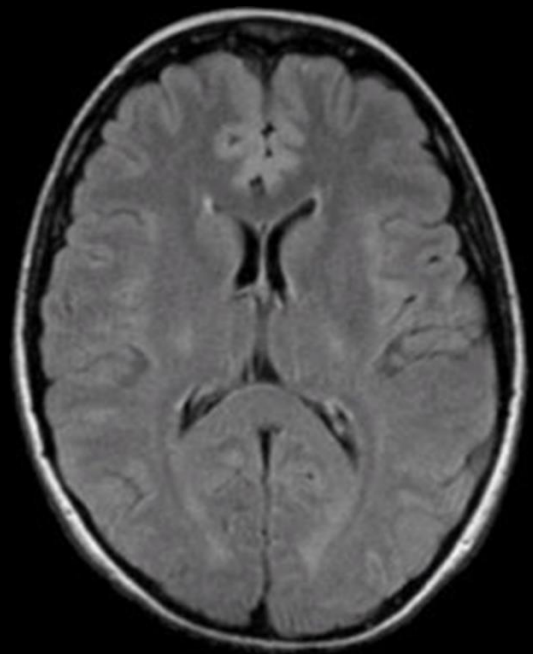
# ADVANTAGES OF MRI

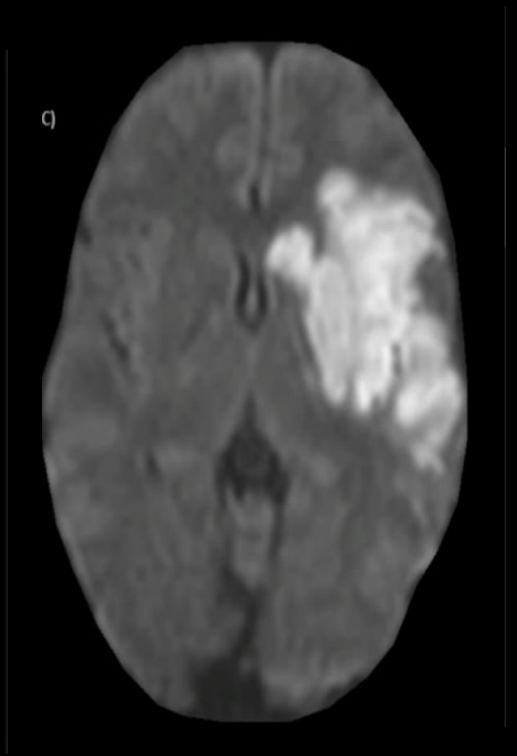
- NO RADIATION EXPOSURE ,HOWEVER PREGNANTS IN THE FIRST TRIMESTER ARE NOT ALLOWED TO HAVE MRI BECAUSE OF LACK OF ENOUGH SAFTEY RESEARCH
- HIGH DIAGNOSTIC INFORMATION .
- VERY SENSITIVE FOR EARLY BRAIN ISCHEMIA DIAGNOSIS .

IN MRI WE SCAN THE PATIENT WITH THREE DIFFERENT PLANES AXIAL CORONAL AND SAGITTAL
ALS  IN MANY DIFFERENT SEQUANCES , SO IT TAKES LONG TIME , EXAMPLES OF SEQUANCES IN AXIAL PLANE.


T1-weighted


T2-weighted


Flair


DIFFUSION

# CONTRAST MEDIA

# CONTRAST MEDIA :IT IS MATERIAL GIVEN ORALLY TO OPACIFY BOWEL OR IV TO OPACIFY VESSELS OR SOME LINDS OF TUMOR

- ORAL :
- BARUIM SULFATE : USED FOR SWALLOW ,MEAL, FOLLOW THROUGH AND ENEMA , AND IN DILUTED FORM FOR ABDOMEN CT
- IF IT ENTER THE PERTITONEAL CAVITY IT MAY CAUSE SEVERE PERITONITIS SO IT IS NOT USED WHEN THERE IS SUSPECION OF PERFORATION OR LEAK.

- NICM ( NON IONISED CONTRAST MEDIA )
- USED AS ORAL CONTRAST FOR CT ABDOMEN TO OPACIFY OWEL
- AND WHEN THERE IS SUSPECION OF PERFORATION OR LEAK

- I.V CONTRAST
- NICM (NON IONISED CNTRAST MEDIA )

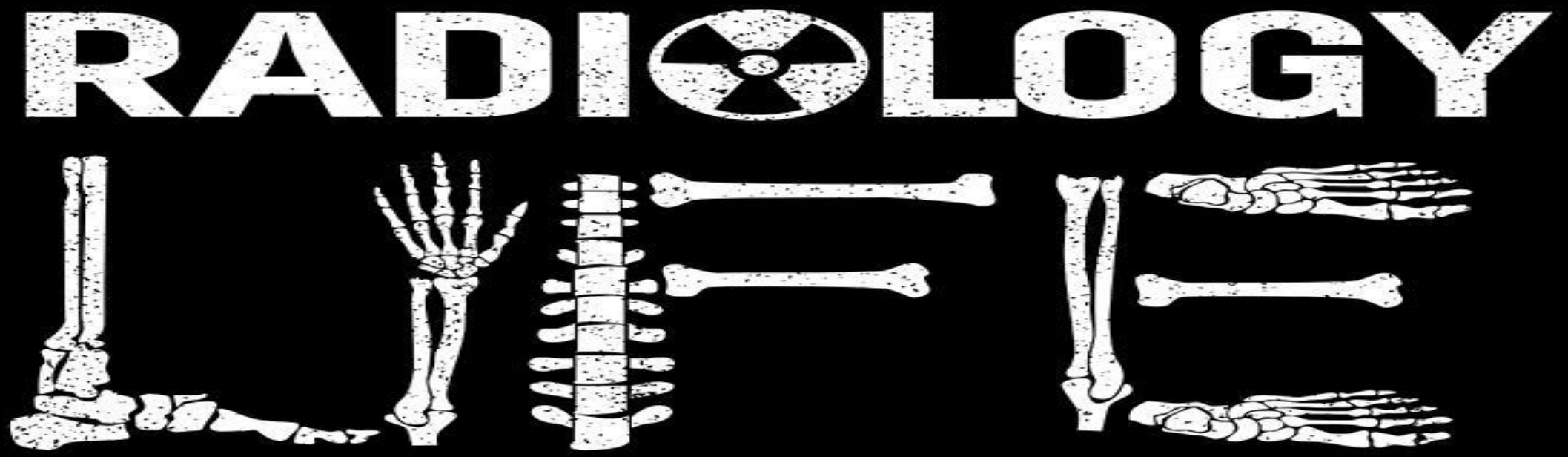
-HISTORY OF ALLERGY MUST BE TAKEN CARFULLEY ,IF THERE IS A HISTORY OF ALLERGY LIKE ASTHMA OR PENCILLIN USE ANOTHER IMAGE MODALITY OR PREPARE THE PATIENT WITH ORAL OR IV CORTICOSTEROID

-CHECK THE KIDNEY FUNCTION TEST

IT IS USED IN CT SCAN AND IVP

GADALUNUIM USED FOR MRI

- OTHERS
- INTRAUTERINE CONTRAST IN HYSTEROSALPINGOGRAM WE USE NICM
- IN URETHROGRAM AND MCUG WE USE NICM


RADIOLOGY
LIFE