RADIOLOGY
MODALITIES OF IMAGING

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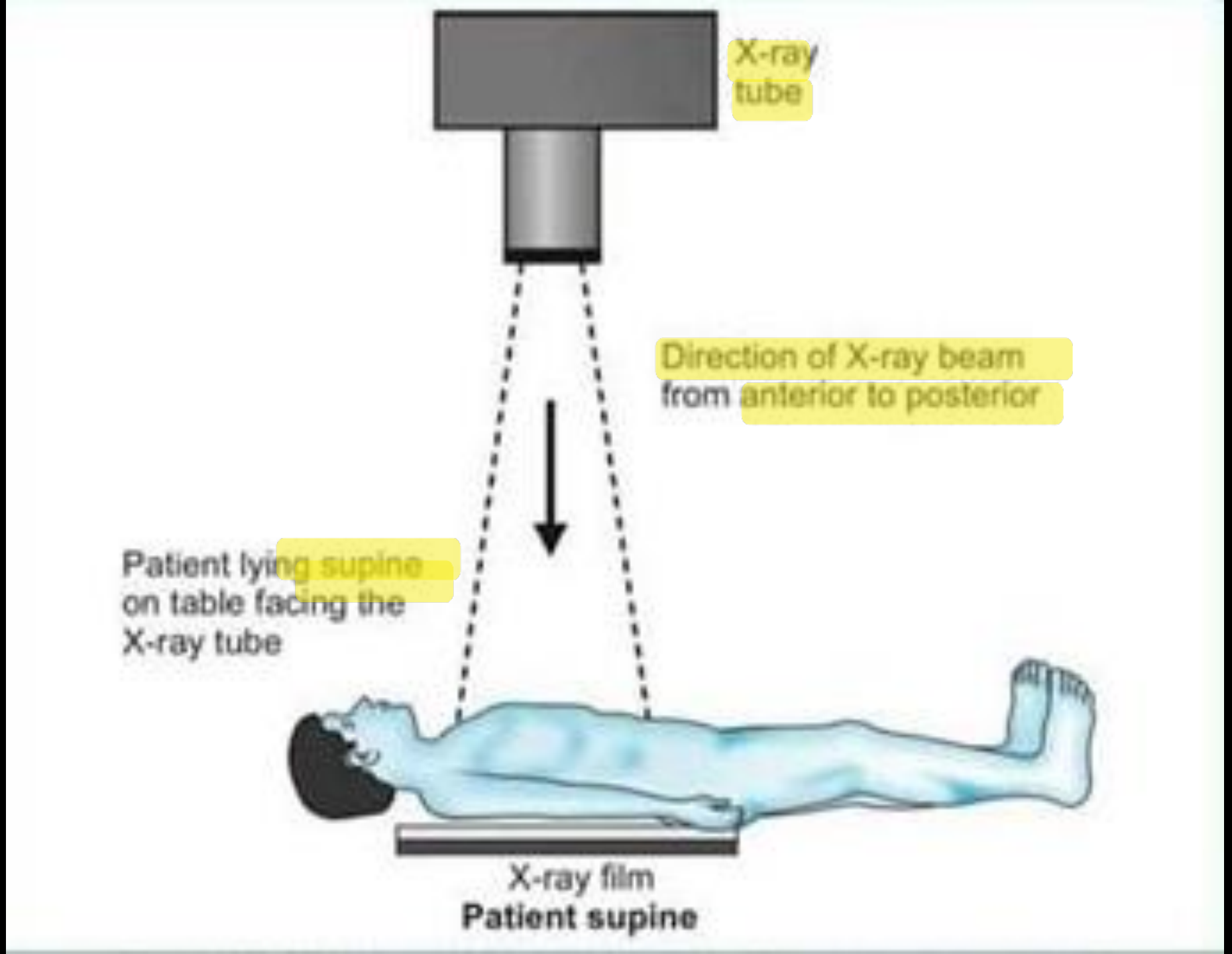
1. X-ray film

- 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 .

Note :-
Xray is ionized beam that may Lead to damage of cells that's why we ① wear suit ② Make the wall leaded.

Ionized
① CT ② KUB
③ Flouroscopy
⇒ Tumour
① Solid → 40 yrs
② Hematogeny
↳ 10 yrs


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 …..

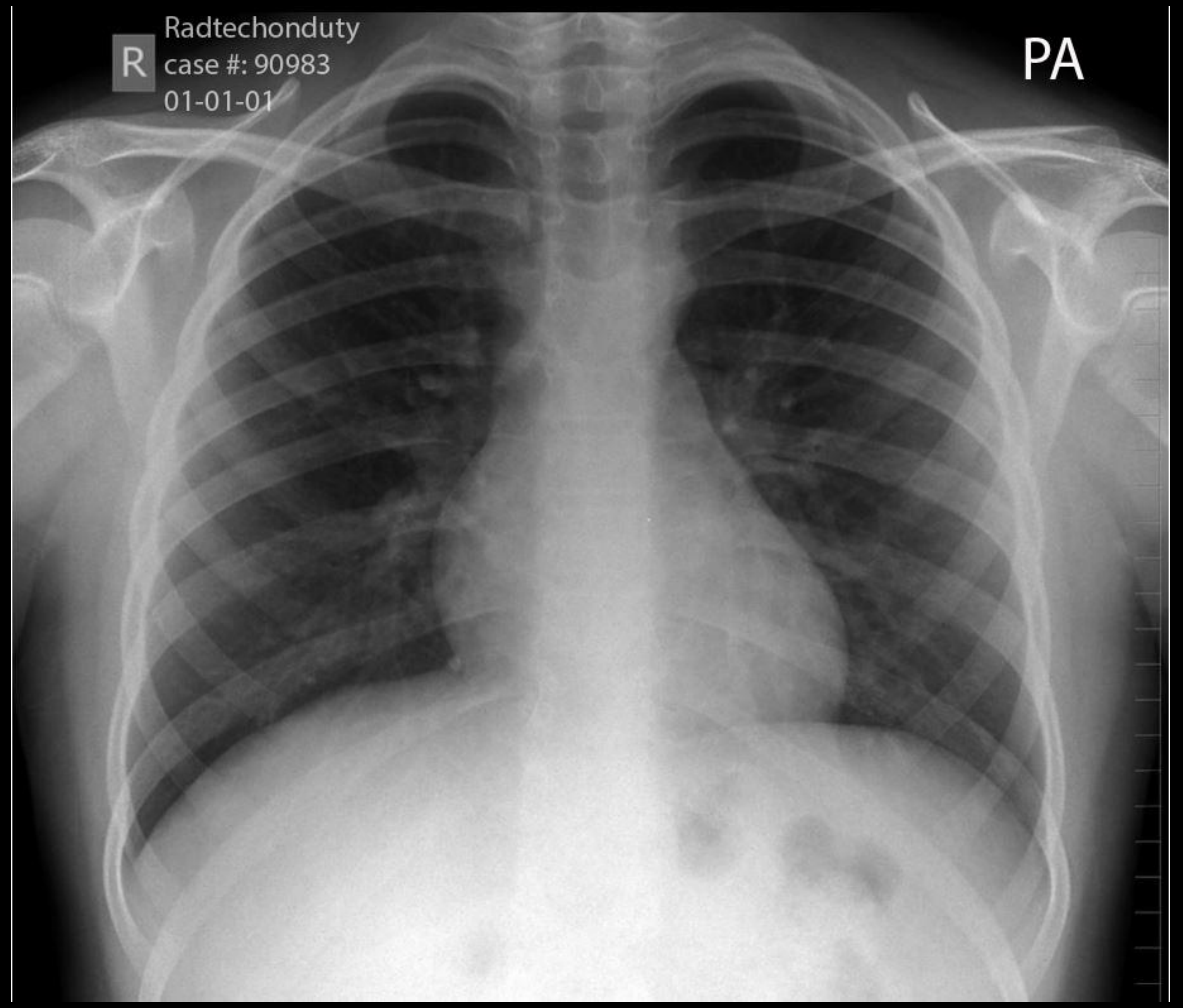
Disadvantage

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

EXAMPLES OF XRAY:

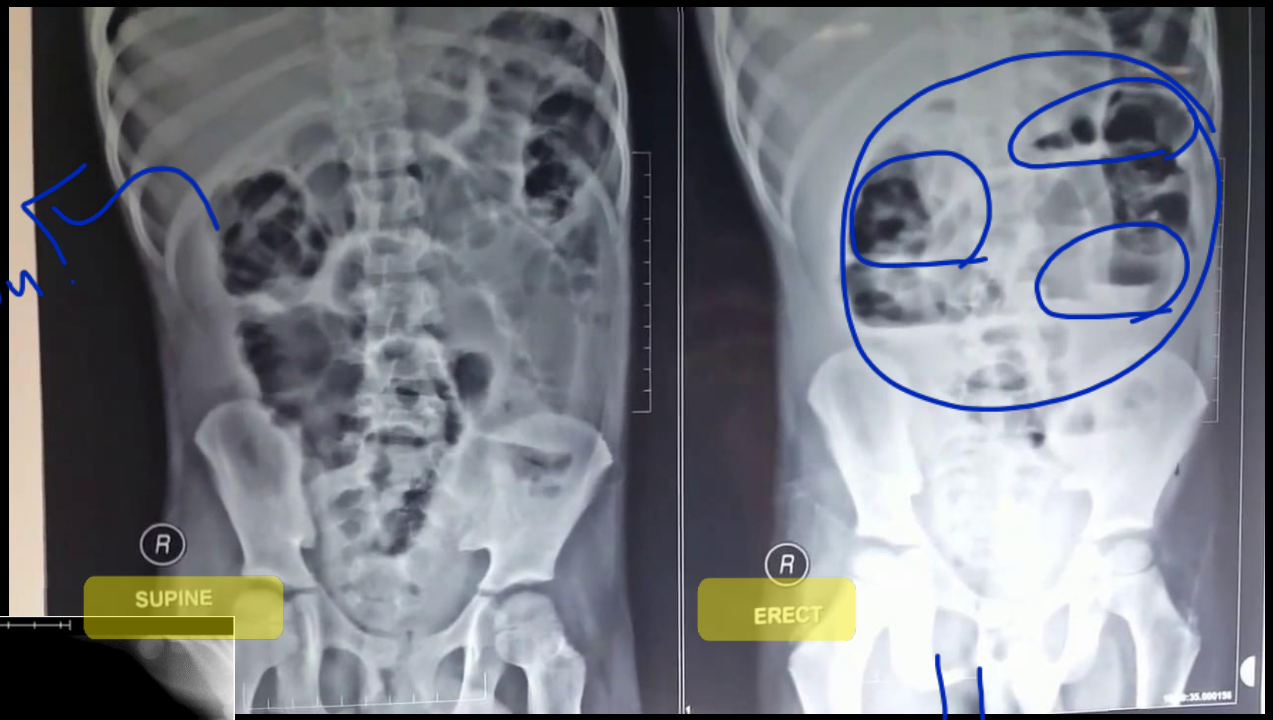
- 1- CHEST XRAY ⇒ M.C.
- 2- ABDOMEN XRAY
- 3-KUB
- 4- WRIST XRAY
- 5- KNEE XRAY
- 6- CERVICAL SPINE XRAY

CHEST XRAY (ROUTINELY PA)

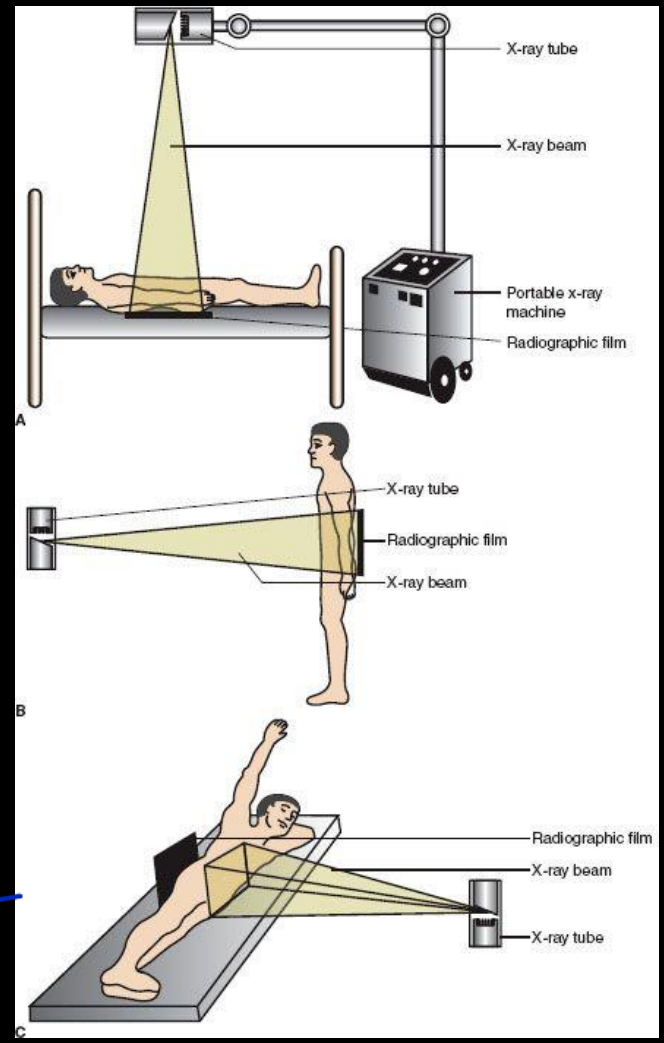


ABDOMEN XRAY (ROUTINELY ERECT AND SUPINE)

Gases distribution

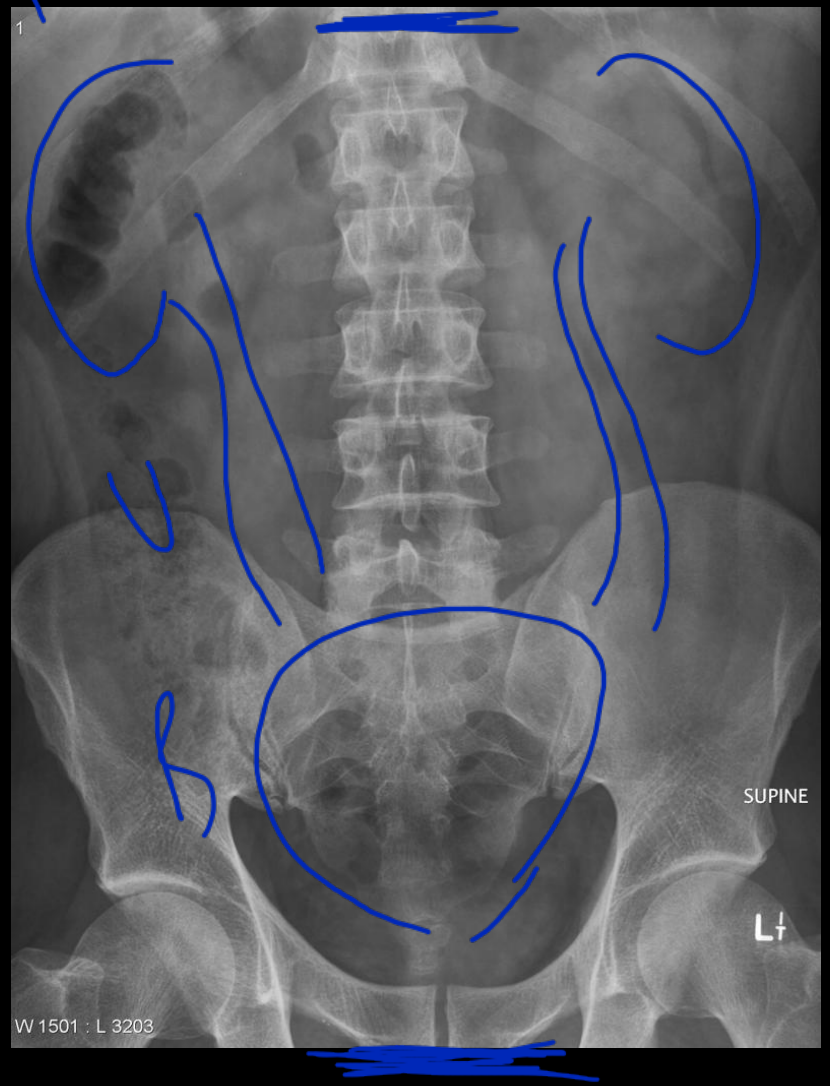


Air-fluid level = obst

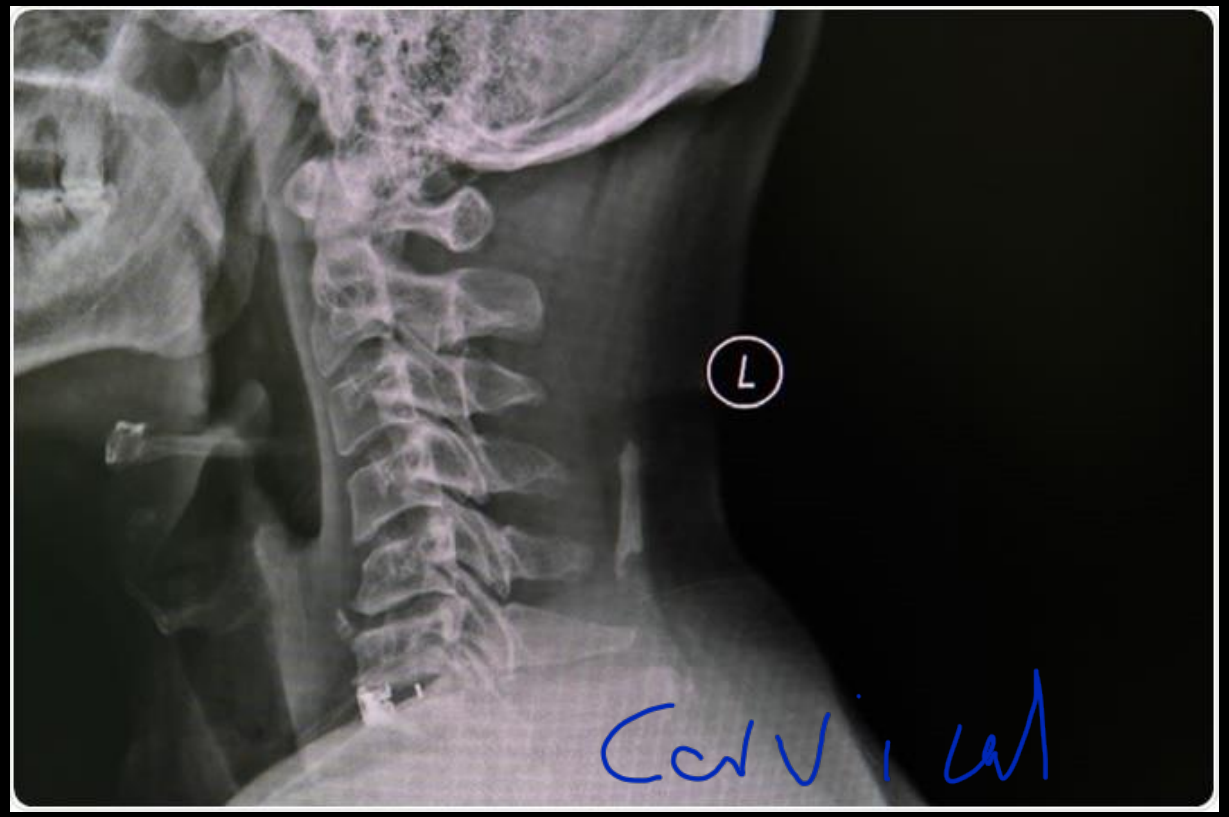


KUB

- 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

① "Functional test"

② Ionizing

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

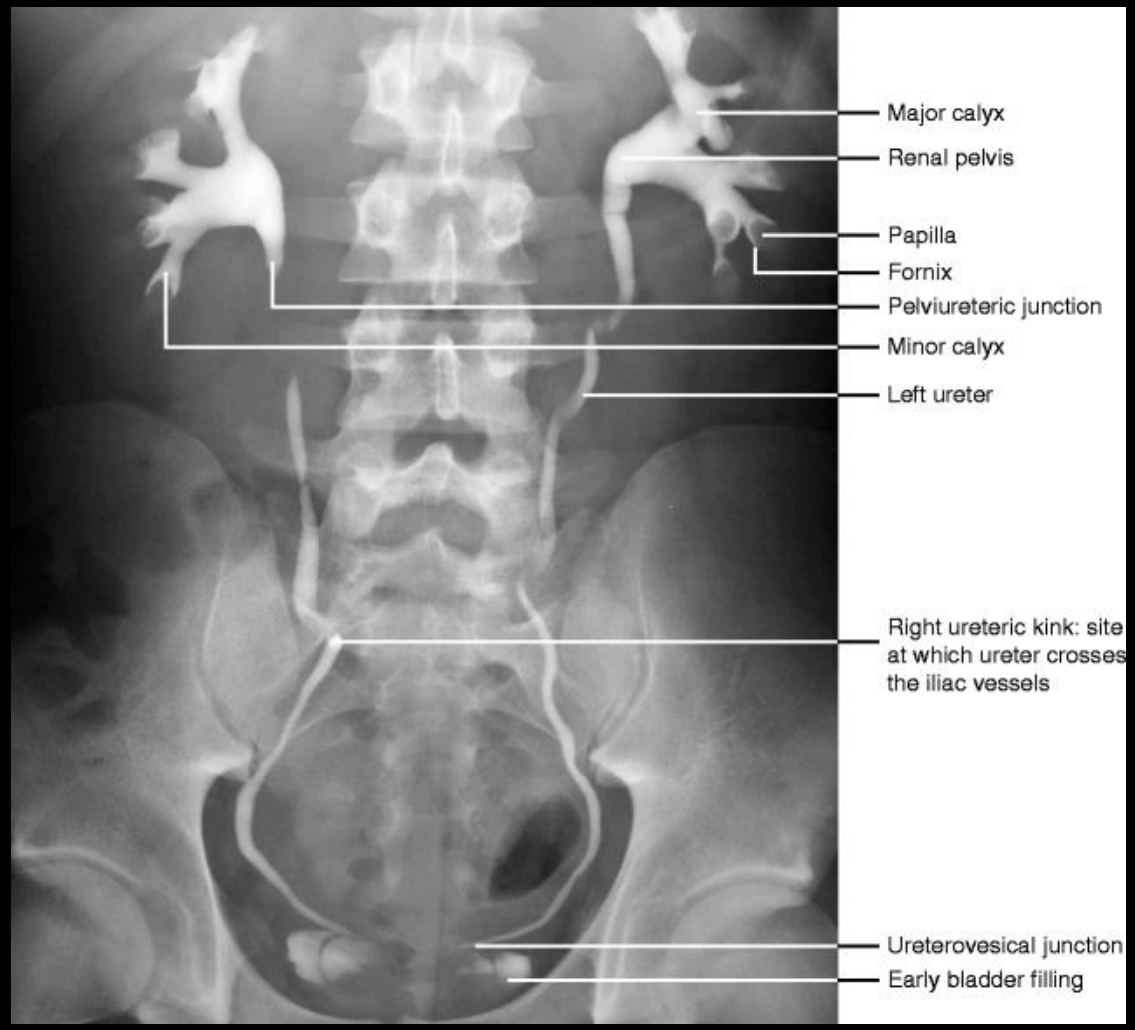
PROCEDURE:

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

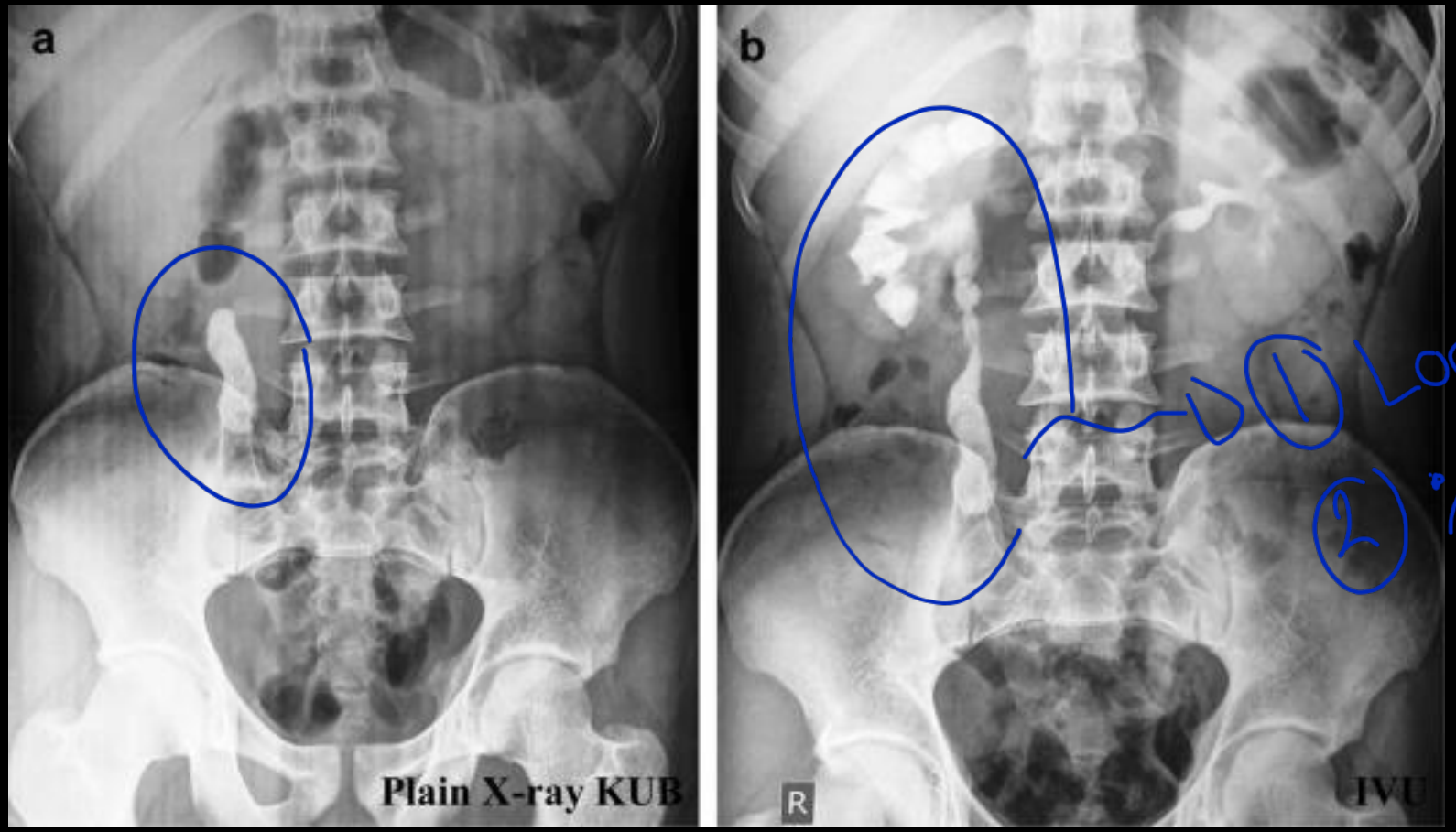
AND CONTINUE AS EACH CASE REQUIRED.

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

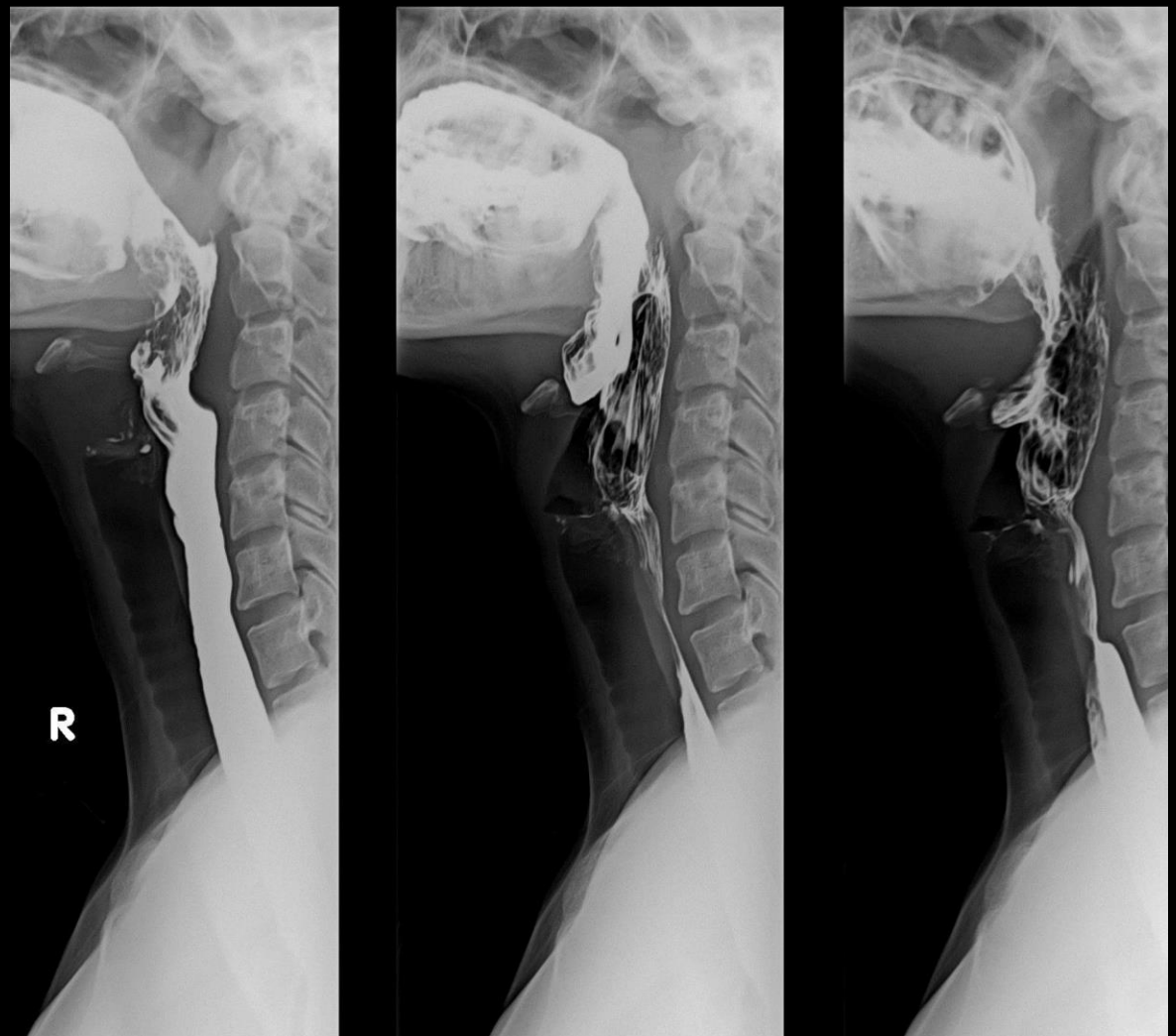
EXAMPLES:

- 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

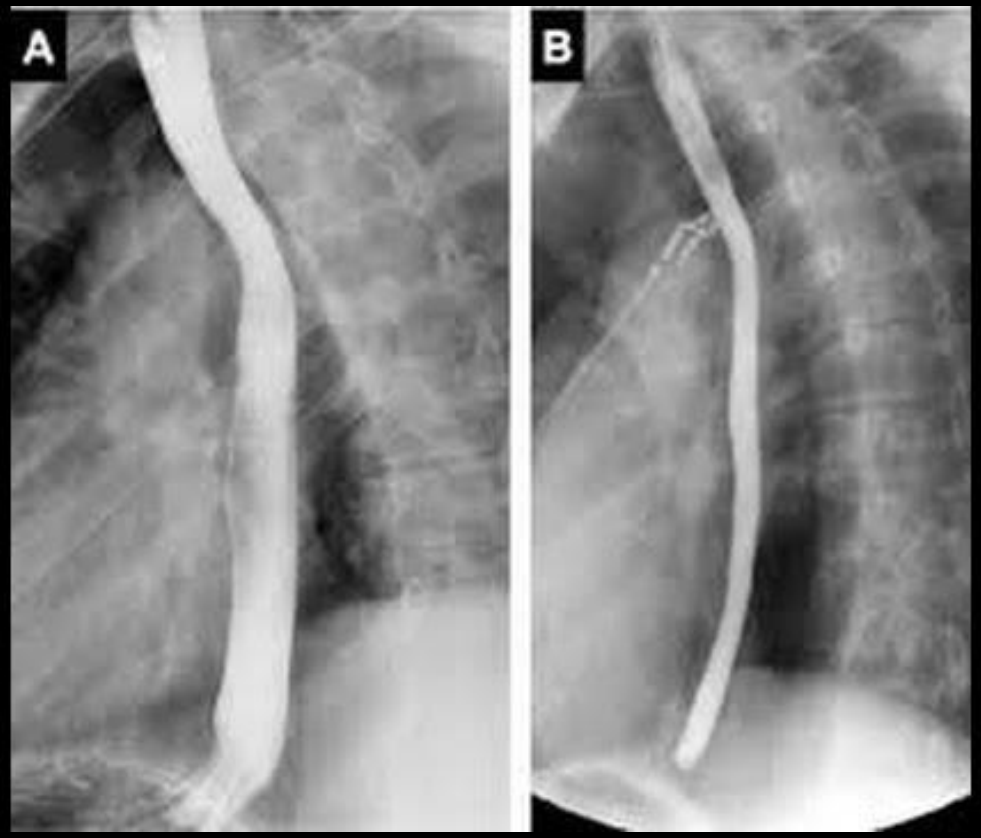
BA SWALLOW

TAKING IMAGES WHILE THE PATIENT IS SWALLOWING THE ORAL CONTRAST MEDIA

UPPER (LATERAL AND AP):



BA SWALLOW
LOWER LEVEL (AP AND LATERAL)



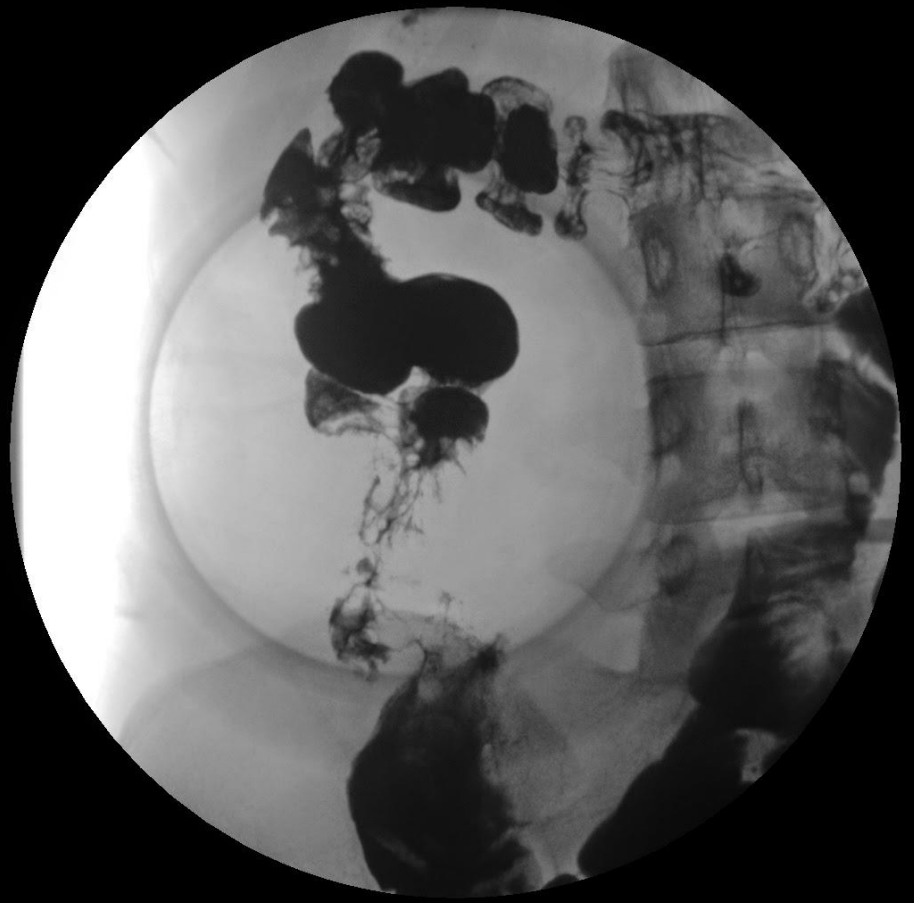
BARUIM MEAL:

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



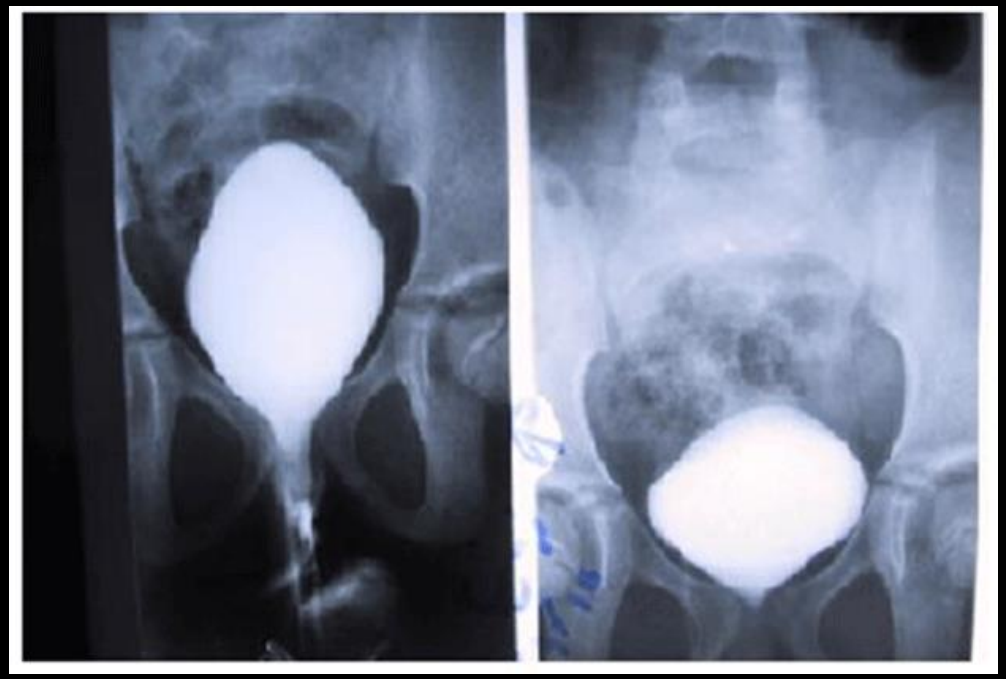
BARUIM ENEMA :THROUGH RECTAL TUBE WE INTRODUCE BARUIM CONTRAST UNDER FLOUROSCOPY GUIDANCE TO LARGE BOWEL ONLY

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)

① Ascending → urethra to bladder
② Descending → bladder to urethra.
↳ to detect posterior urethral stenosis

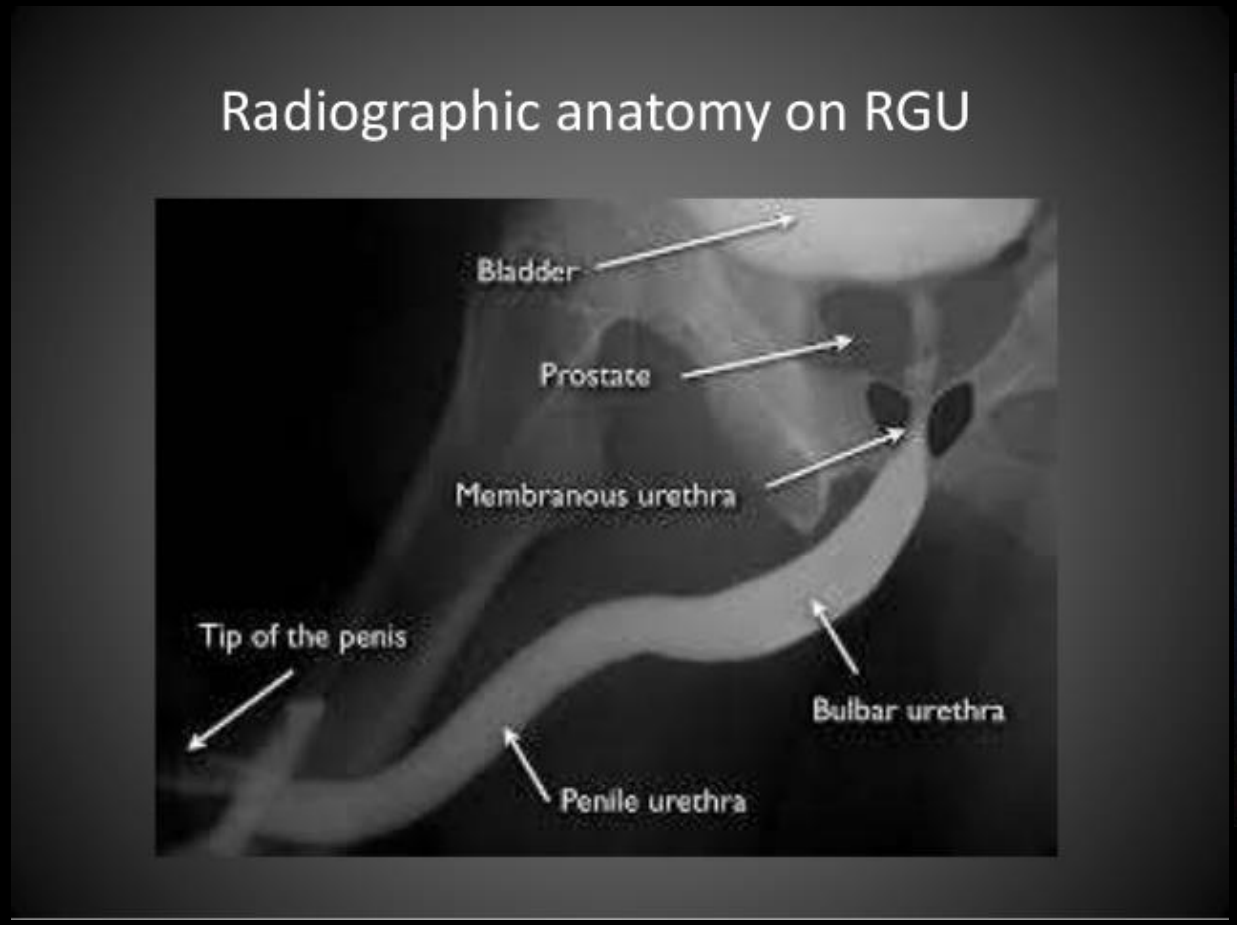
which may lead to scaring ⇦ tckD.



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

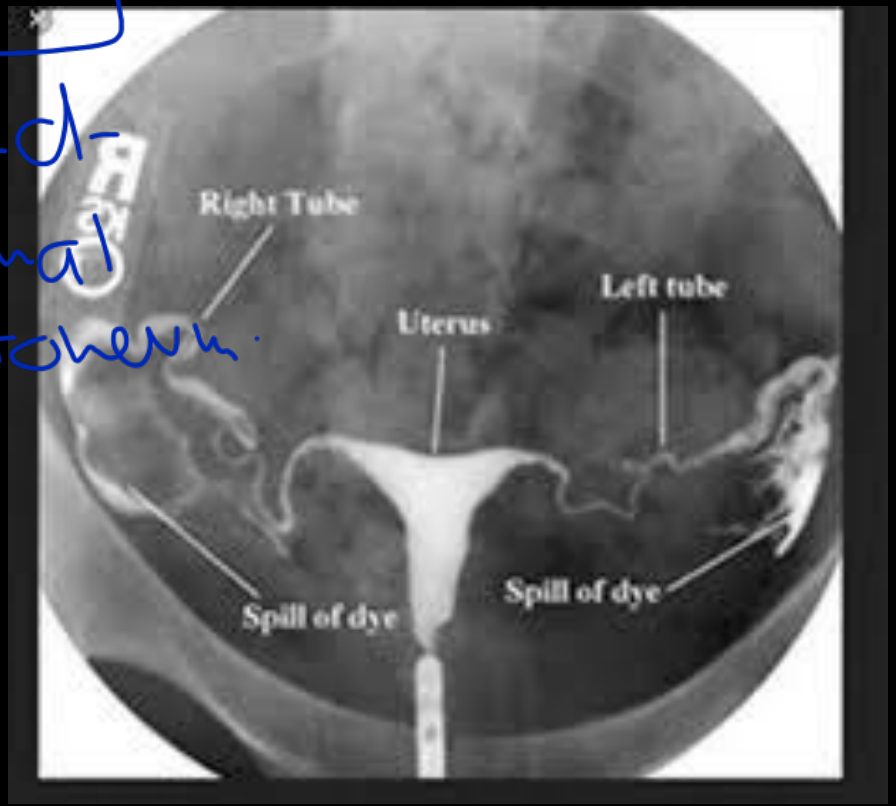


HYSTEROSALPINGOGRAPHY

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

① No filling defect

* ② There is minimal spill to peritoneum.



4-ULTRASOUND

ULTRASOUND MACHINE

ULTRASOUND

ADVANTAGES

NO HARMFULL RADIATION EXPOSURE

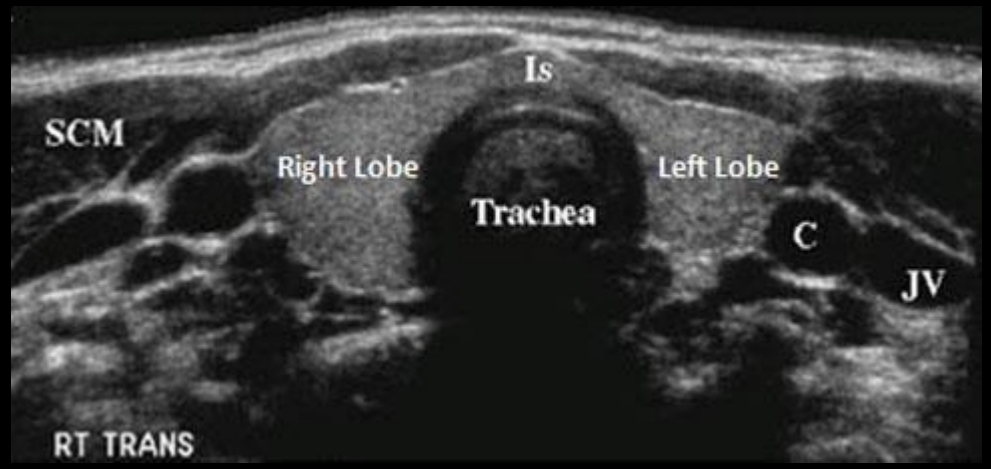
- AVAILABLE
- NOT COASTY
- BEST METHOD FOR HYDROEPHROSIS AND GALL BLADDER STONE

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

EXAMPLES:

Adv:- We can assess different plane.

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

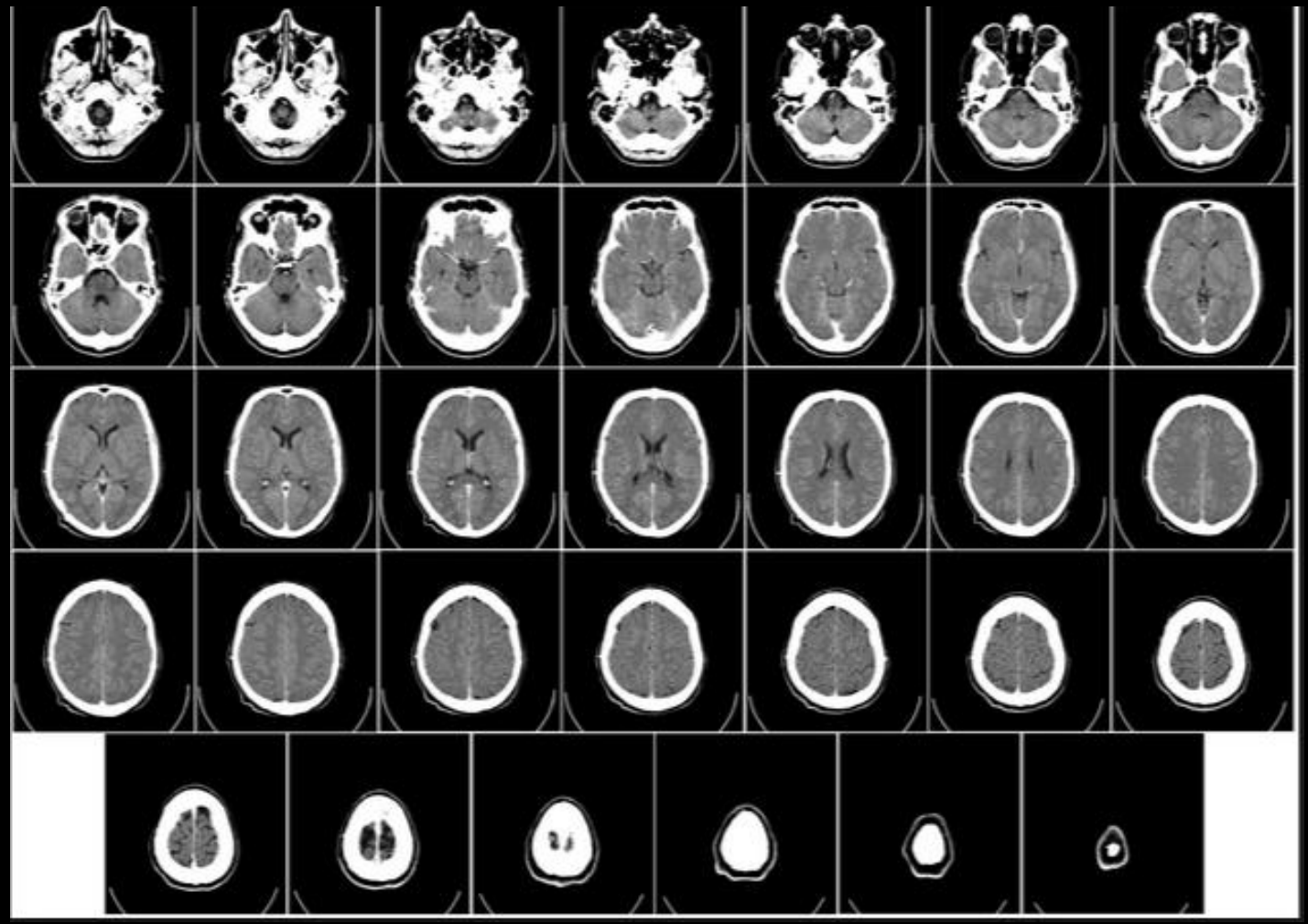
3D image => By reconstruction.

* axial to

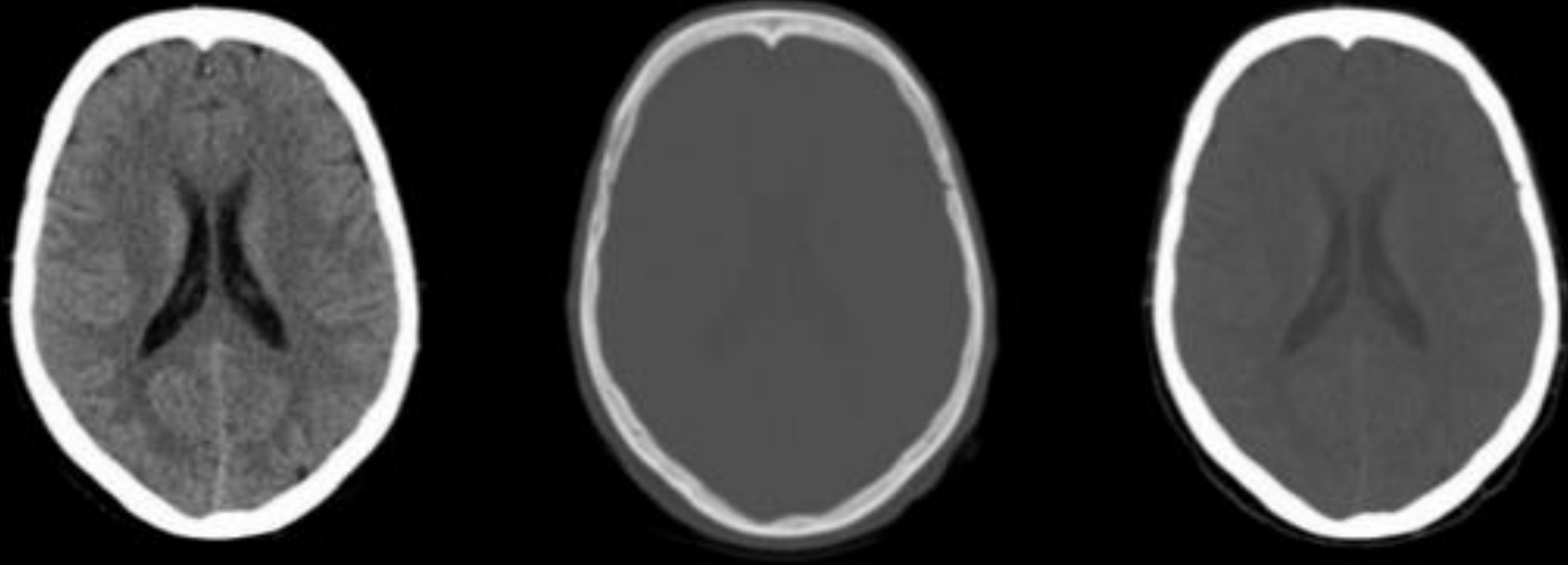
- ADVANTAGES :
- RAPID SCAN
- FIRST CHOICE FOR TRAUMA CASES ,AND BRAIN INSULT
- BEST METHOD FOR CALCIFICATION AND FRACTURES

- 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

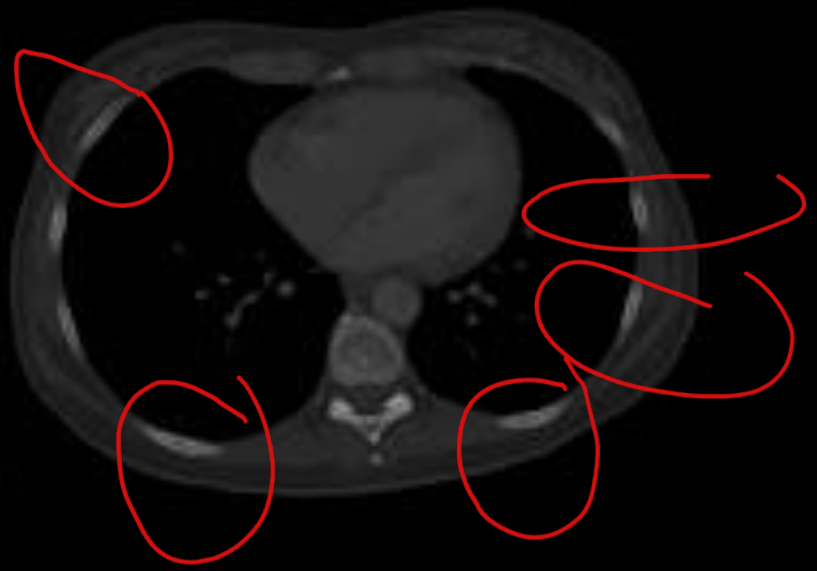
SUBDURAL window

W:350 L:90

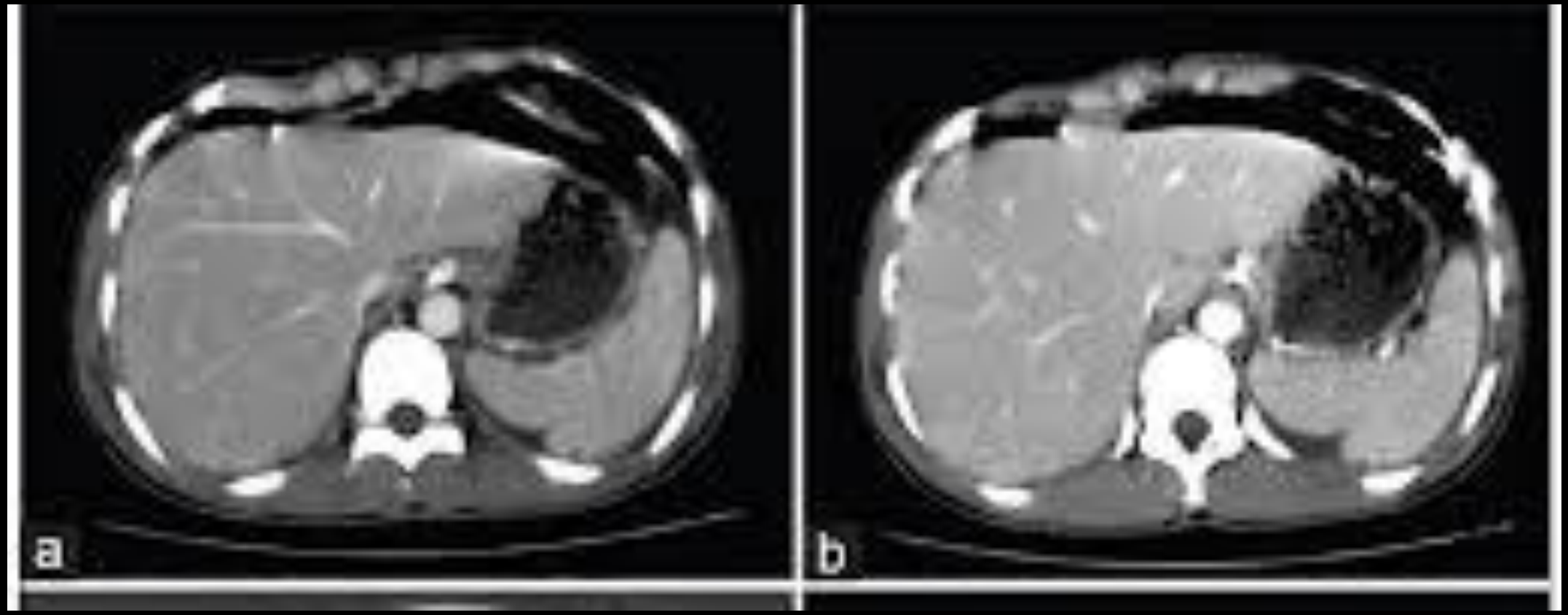
MEDIASTINAL WINDOW

LUNG WINDOW

OF CHEST CT



LIVER (SOFT TISSUE) WINDOW



6- MRI

① Non ionizing

② Deep gantry

- 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

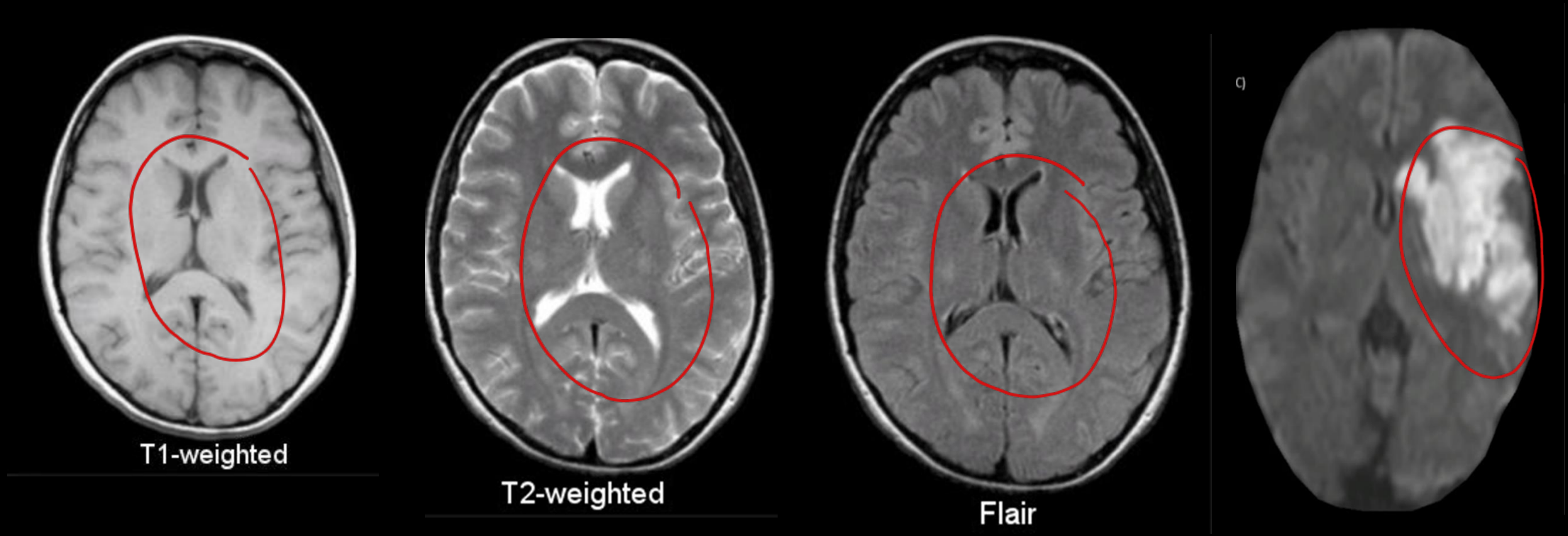
- IT IS RELATIVELY LONG TIME FOR SCANNING 15 MIN – 1 HOUR
- NOT ALLOWED FOR PATIENT WITH (NON MRI COMPITABILE PROSTHESIS)
- NOT OPTIMUM FOR CALCIFICATION .
- THE MACHINE HAS LONG CLOSED TUBE THAT MAY TRIGGER CLAUSTROPHOBIA FOR SOME PATIENTS
- THE MACHINE HAS VERY VERY LOUD NOISE.
- COSTY

ADVANTAGES OF MRI

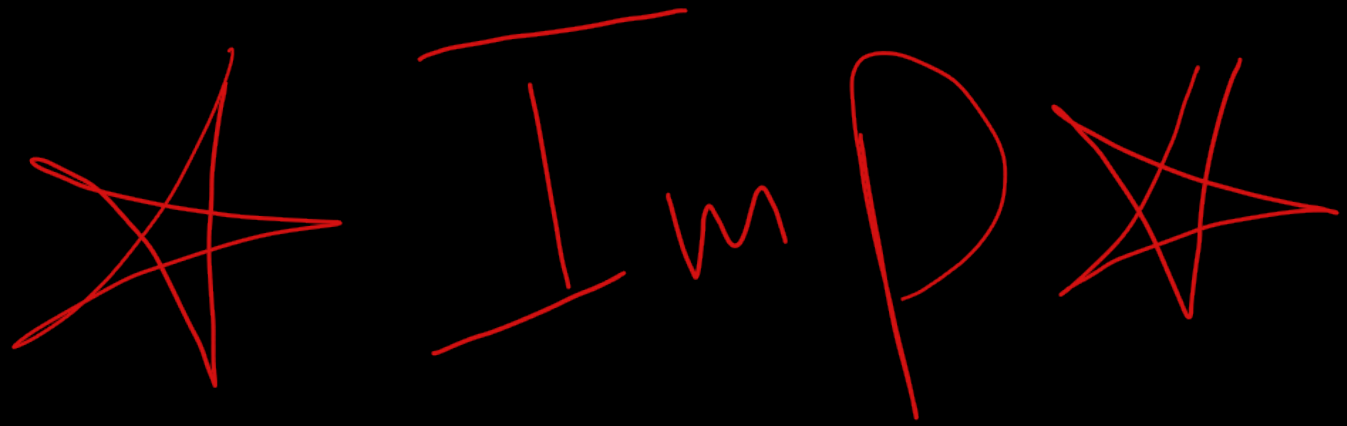
- NO RADIATION EXPOSURE ,HOWEVER PREGNANTS IN THE FIRST TRIMESTER ARE NOT ALLOWED TO HAVE MRI BECAUSE OF LACK OF ENOUGH SAFTEY RESEARCH
- HIGH DIAGNOSTIC INFORMATION .
- VERY SENSITIVE FOR EARLY BRAIN ISCHEMIA DIAGNOSIS .

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.



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)

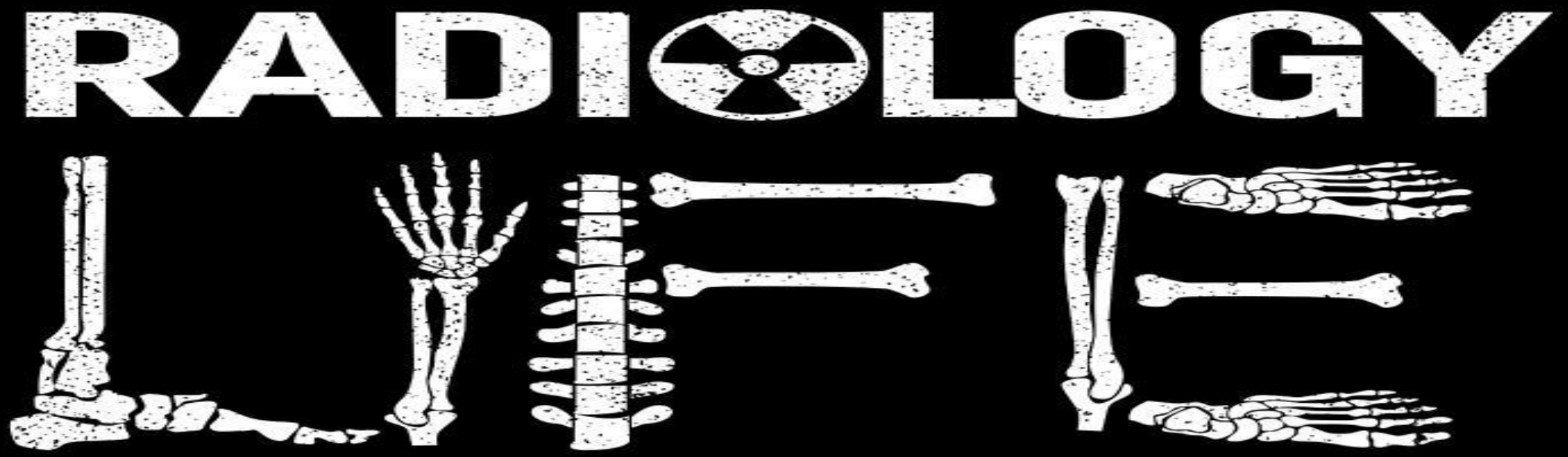
-HISTORY OF ALLERGY MUST BE TAKEN CARFULLEY ,IF THERE IS A HISTORY OF ALLERGY LIKE ASTHMA OR PENCILLIN USE ANOTHER IMAGE MODALITY OR PREPARE THE PATIENT WITH ORAL OR IV CORTICOSTEROID

-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