Radiology

- *Means* Science of radioactive substances and high energy radiations.
- Is a branch of medicine concerned with use of radiant energy or radioactive material in the diagnosis and treatment of diseases.

Discovery of X Rays by…

WC Roentgen

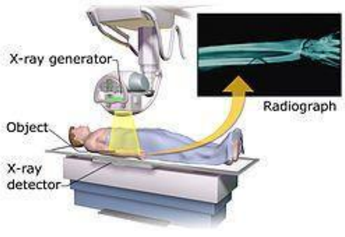
In the year…

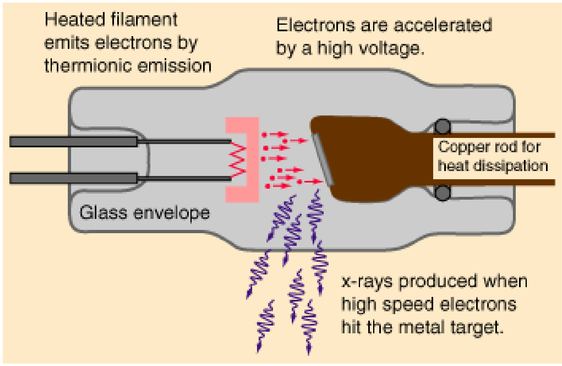
1895

Classification of radiological procedures

- Diagnostic radiology
- Interventional radiology
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Ultrasonography (USG)
- Mammography
- Interventional radiology

X ray generator





Diagnostic radiology

- **Plain radiography**

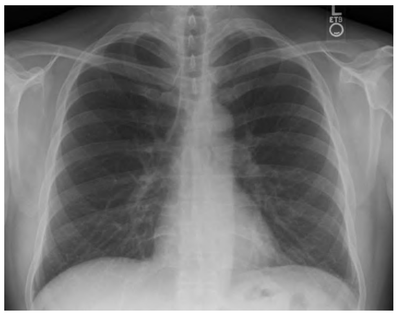
- **Fluoroscopy**
- Observing moving body structures

Plain radiography

- A/k/a X Rays/ Skiagrams/ Radiographs
- Radiosensitive film
- Negative- black and white
- Farther the structure – image is magnified but borders are less sharp.
- Only 2D representation.
- For skeletal system and internal organs.
- Not much use in soft tissue injuries and abnormalities eg. tendon, ligament etc.

Fundamental principles for radiography

- Radio-opacity
- Positioning



- Different body tissues have different capacity to block or absorb X Rays depending on density of structure.

Positioning

P A View

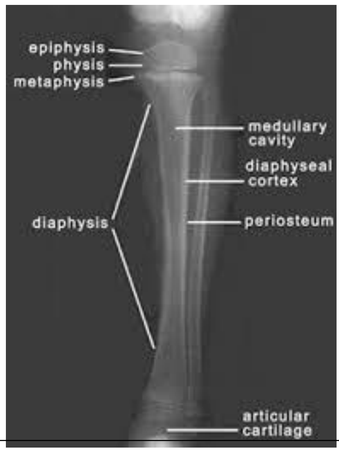
Lateral View

A P View

Radiological features of skeletal system

General features of long bone

- **Compact bone**-- thick , homogenous calcified band
- **Nutrient canal**-- oblique radiolucent line passing through compact bone
- **Cancellous bone**– network with spaces , clear at ends of shaft.
- **In young**-- uncalcified epiphyseal plate- irregular radiolucent band.
- **Metaphysis**– calcified epiphyseal plate and new bone near it.



General features of Joints

- **Articular disc--** not visible.
- **Joint space–** interval between epiphys

  adjacent bones.

Skeletal maturity

- Based on ossification centres and their fusion.
- Varies in sexes, race, geographical location and nutritional status.

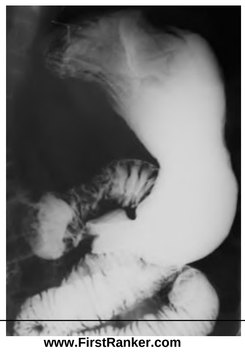

Baby X-ray
At 18 months

Fluoroscopy

- Real time observation of moving organs.
- Image is created by striking X rays on a fluorescent screen coated with phosphor and recorded electronically.
- High radiation exposure and low resolution of image.

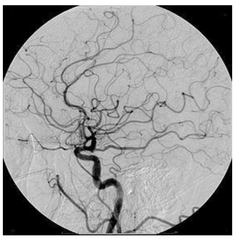
Role of contrasts

- To differentiate structures of same density.
- Barium contrasts for diagnosis of abnormal constrictions and growths of gut tube.
- Intravenous pyelogram
- Hysterosalpingography



Iodinated contrasts for
- arteriograms,
- venograms,
- myelograms.

Digital subtraction angiograms



Vascular interventions

- Peripheral vascular disease– Balloon angioplasty
- Percutaneous Transluminal Coronary Angioplasty
- Stent placement

Prevent Avascularity

- Blood clot dissolving drugs are pushed into the artery through a catheter.

Vascular interventions

- Aneurysms- Coils, Stents
- Haemorrhage- Embolisation- eg. gelfoam
- Varicose veins :RF Ablation
- Thrombectomy – pulmonary embolus

Non-Vascular interventions

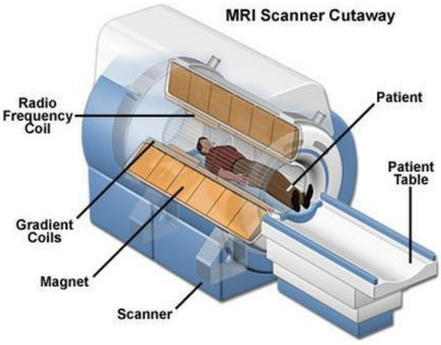
- Drainage of pus/fluids from thorax or abdomen.
- Insert feeding tubes- gastrostomy, jejunostomy
- Uterine fibroids, heavy bleeding (DUB): PVA, glue, Gelfoam
- Renal and Gall stones fragmentation followed by drainage.
- Tumour ablation RF
- Pressure relief from cancer masses.

Computerized Axial Tomography (CT Scan)

- Principle: construction of cross sectional image by passing Xrays in multiple directions along a 36 degree arc.
- 3mm -1cm slice
- Patient can not move
- High radiation
- Uses :
    - Trauma- fractures, clots,
    - Rupture of vessel in brain.

Magnetic Resonance Imaging (MRI)

- Alignment of polarised molecules in the body when placed in strong magnetic field.

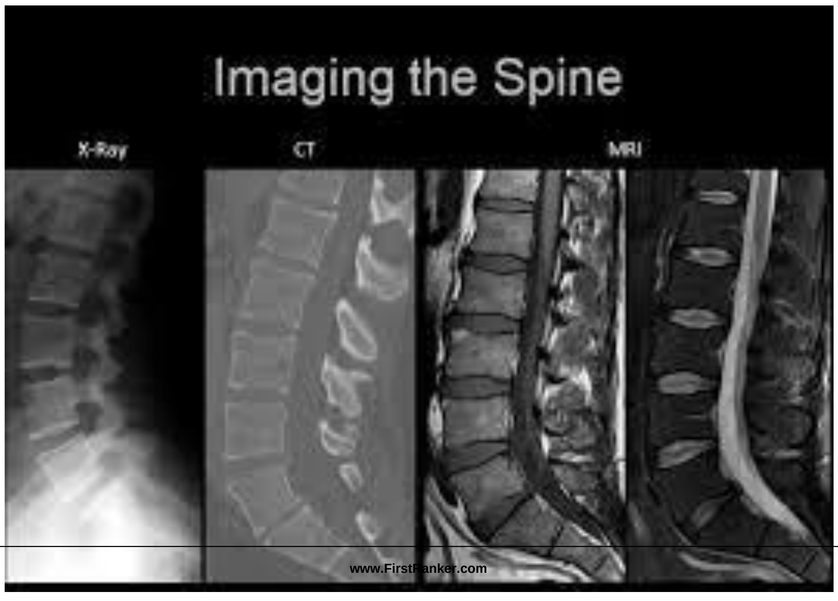


Magnetic Resonance Imaging (MRI)

- Subjected to radio waves- alignment is displaced (depends on chemical environment).
- When returning to aligned position the energy emitted is detected.
- Series of images is collected by computer application.

Drawbacks

- Pacemakers, stents etc. contraindicated
- Patient movement degrade quality of image,



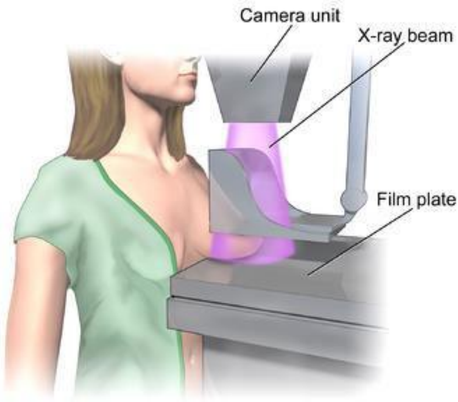
Ultrasonography

- Short bursts of high frequency sound waves.

- Uses:
- Evaluation of organs such as kidney, pancreas, GB, spleen etc.
- Obstetrics
- Heart
- Needle biopsy
- Drainage tube insertion
- Doppler studies

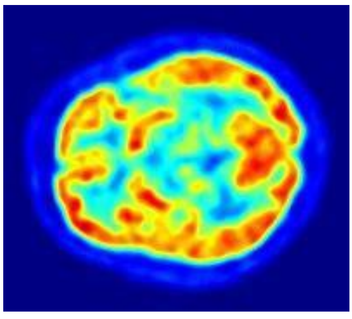
Mammography

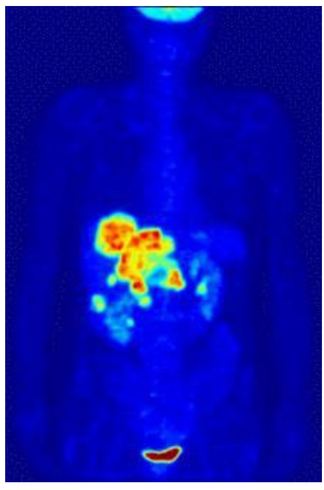
- Parallel-plate compression
- evens out the thickness of breast tissue
- increase image quality
- reducing amount of x-rays to penetrate,
- decreasing the amount of scattered
- holding the structure to prevent motion blur.



Mammogram

Positron emission tomography (PET) scan





Some ques..

1. Ultrasonography works on principle of….
piezoelectric effect

2. X rays are electromagnetic radiation of …… wavelength
Short

An area on a scan has an associated measurement of 900HU, it is most likely to be composed of

A. Bone
B. Fat
C. Air
D. Water