



ADVANCE DIAGNOSTIC IMAGING TOOLS

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Conventional radiography continues to be mainstay of diagnostic imaging in third world countries. This lecture will deal with alternate imaging tools used for diagnostic purposes.

1. FLOUROSCOPY:

Sometimes incorrectly termed screening is the dynamic radiological study of the body parts. Fluoroscope is a device used to view an X-ray image on a fluorescent screen instead of the film.

The x-rays after passing through the body parts are transformed in to visible light which is observed on a screen coated with filament material, either directly or through an intensifying device.

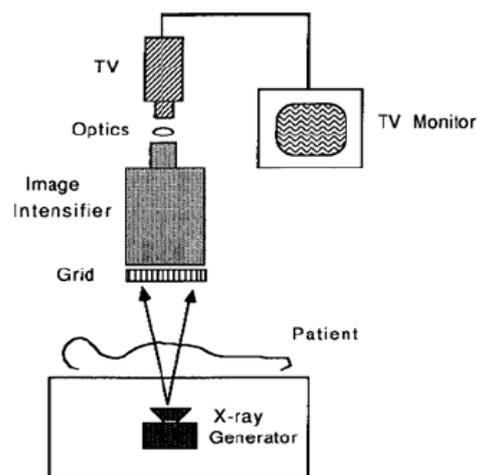


Figure 7-14 Basic components of fluoroscopy

✓ Uses of fluoroscopy:

- 1) Clinical examination of the dynamics of the body such as peristalsis and movement of joints
- 2) Proper placement of catheter in bronchus during broncography.
- 3) Study of birth postures of foetus.
- 4) Position of pins or nails during orthopedic surgery.

✓ Shortcomings and hazards

- 1) Smaller details are escaped as intensity of image is low
- 2) Radiation hazard

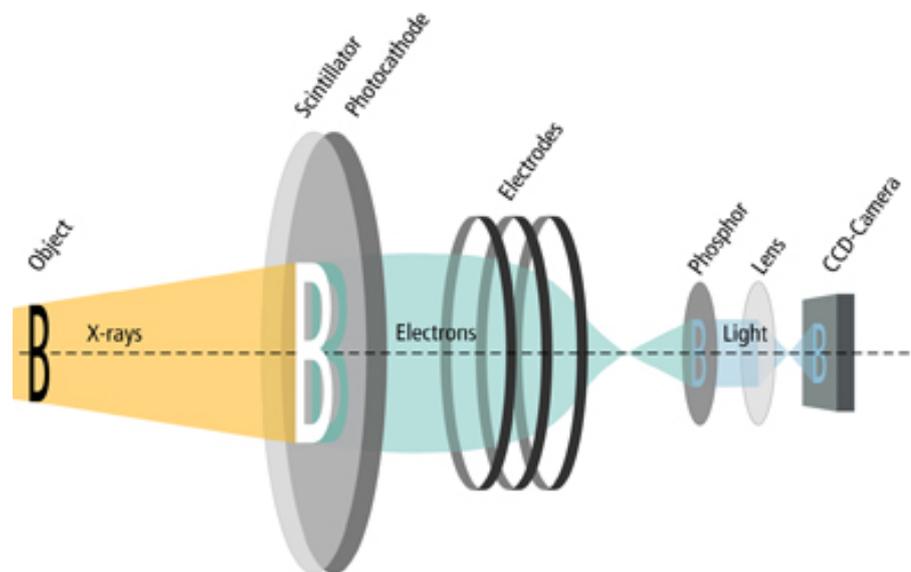


2. IMAGE INTENSIFICATION

Image intensification through an image intensifier overcomes problems to large extent, which were encountered with fluoroscopy like lack of brightness and increased radiation hazard.

✓ **Advantages are.**

- 1) The image produced for viewing is 1000-5000 times brighter than that obtained by conventional fluoroscopic unit.
- 2) Brightness and contrast of the image can be electronically controlled
- 3) It is possible to record the motion of organs through a recording system.
- 4) Spot film camera can be used.
- 5) Lower mA settings- low radiation hazard.
- 6) Image can be viewed on TV.



3. XERORADIOGRAPHY:

It is the method of X-ray imaging in which visible electrostatic pattern is produced on the surface of photoconductor.

Amorphous selenium is used as a photoconductor on a xeroradiographic plate. When exposed to radiation selenium becomes locally conductive and partly dissipates its uniform charge. The remaining charge pattern on the selenium forms a latent electrostatic image, which by certain procedures is converted into a visible image. Selenium does not conduct current shielded from X-ray or light.

✓ **Uses**



Application in soft tissue imaging e.g., in radiographic examination of the mammary glands, muscles, tendons and ligaments.

✓ **Advantage**

Include enhanced visualization of the borders between images of different densities (edge effect), low contrast which enables differentiation between fat, muscles and bones and exposure latitude.

✓ **Disadvantage**

This tech cannot be used for very thick parts a very high exposure is required.

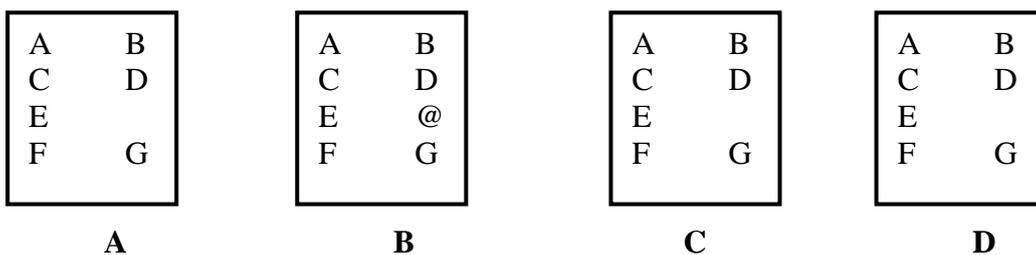
4. SUBTRACTION TECHNIQUE:

It is photographic method that eliminates unwanted images and makes it easier to visualize important radiographic information on the radiograph.

✓ **Principle is**

[A] and [B] radiographs are similar except [B] has additional information { @ }. To identify these letters a negative (C) of [A] is made. When (C) is superimposed on [B], black density of letters in (C) merges with black density of [B] except for additional { @ }. Print finally shows added { @ }.

It is mostly employed to delete bone and surrounding densities from an angiogram in order to clearly visualize the pattern and changes in vascular supply. E.g., Cerebral angiogram.



5. NUCLEAR SCINTIGRAPHY (NS):

Nuclear scintigraphic imaging is a highly sensitive advanced procedure in which radioisotopes are used to detect functional abnormalities of the body system.

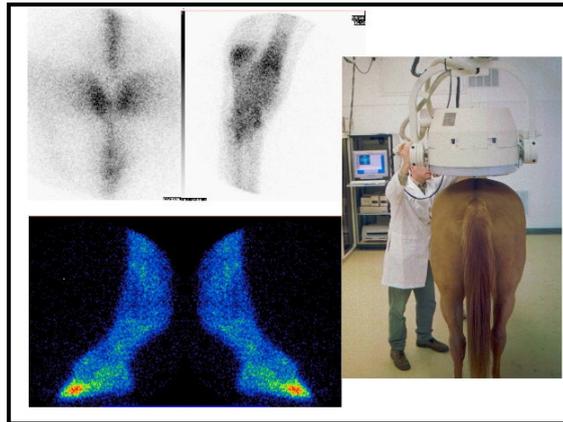
✓ **Principle of NS**

Is based on the use of pharmaceutical which after entry into the blood streams gets localized in a particular tissue or organ. Before the pharmaceutical is injected it is labeled



with a radioisotope. Thus localization of the isotope can then be detected by using detector or camera due to emission of gamma rays from the area of interest. A computer system is usually attached to the camera for gathering data and its display and quantification.

The scan appears as a image formed of dots. The interpretation is based on the appearance of increased (hot spots) or decreased (cold spots) radioactivity regions. The physiological or pathological disorder can be easily detected.



✓ Uses

- 1) Used in diagnosis of lameness and arthritis.
- 2) Brain lesions
- 3) Renal and cardiac functions
- 4) Lung ventilation and perfusion
- 5) Bone tumors.

6. COMPUTED AXIAL TOMOGRAPHY (CAT SCAN):

CT is a diagnostic modality that is fundamentally different X-ray method in which an organ is scanned in successive layers by a narrow beam of X-rays, in such a way that the transmission of X-ray photons across a particular layer can be measured and by means of a computer, used to construct a picture of the internal structures.

✓ Principle

Based on the fact given by mathematician J. Radon who proved that a two or three-dimensional object can be reconstructed uniquely from the infinite set of all of its projections. The aim of the system is to produce a series of images by a tomographic method.



CT SCAN

7. MAGNETIC RESONANCE IMAGING (MRI):

MRI is a highly sensitive and non-invasive tech., which provides accurate and detailed anatomic images with a good contrast and spatial resolution. It has a multiplanner compatibility and no radiation burden.

✓ Principle:

Certain atomic nuclei will absorb and reemit radio waves when placed under strong magnetic field. This phenomenon is called nuclear magnetic resonance (NMR). Radio waves reemitted can be used to construct a diagnostic anatomic image through a computer assisted technique is termed as MRI.

✓ Its uses are

- 1) Musculoskeletal disorders such as arthritis.
- 2) Navicular disease, osteochondrosis etc.
- 3) Inflammatory process of neoplastic mass.
- 4) Affection of vertebral column.

