Radiology

Radiology

is the medical specialty that uses medical imaging to diagnose diseases and guide their treatment, within the bodies of humans and other animals.

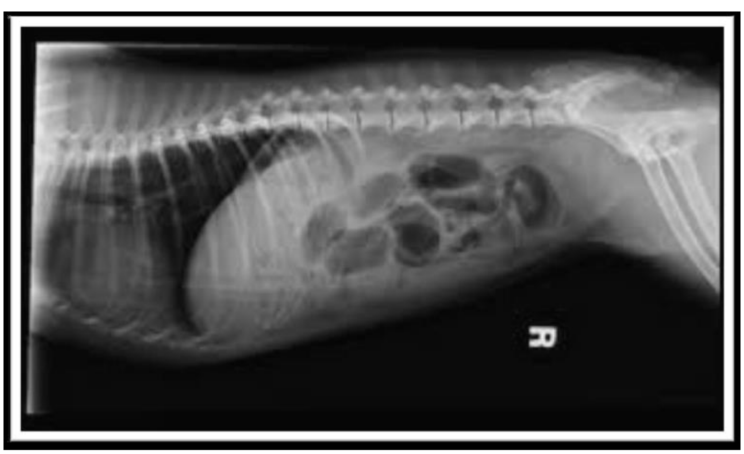
It began with radiography (which is why its name has a root referring to radiation), but today it includes all imaging modalities, including those that use no ionizing electromagnetic radiation (such as ultrasonography and magnetic resonance imaging), as well as others that do, such as computed tomography (CT), and nuclear medicine including positron emission tomography (PET). Interventional radiology is the performance of usually minimally invasive medical procedures with the guidance of imaging technologies such as those mentioned above.

Radiography

is an imaging technique using X-rays, gamma rays, or similar ionizing radiation and non-ionizing radiation to view the internal form of an object.

Applications of radiography include medical ("diagnostic" radiography and "therapeutic").

To create an image in conventional radiography, a beam of X-rays is produced by an X-ray generator and it is projected towards the object. A certain amount of the X-rays or other radiation are absorbed by the object, dependent on the object's density and structural composition.



the denser the object is, the more the radiation will be inhibit the greater the object dense is, the less radiation reach the film

The radiographic opacities can be recognized are:

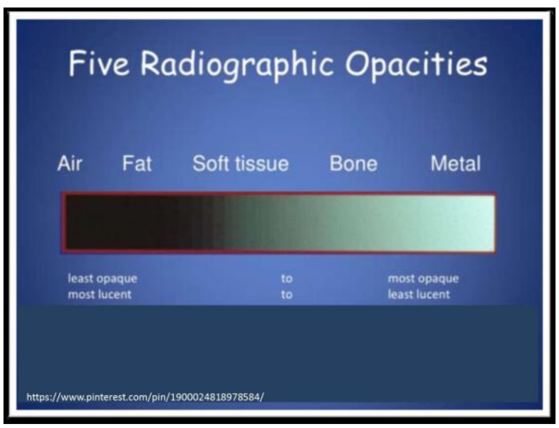
a. Metal

b. Bone

c. soft tissue & fluid

d. fat

e. Air

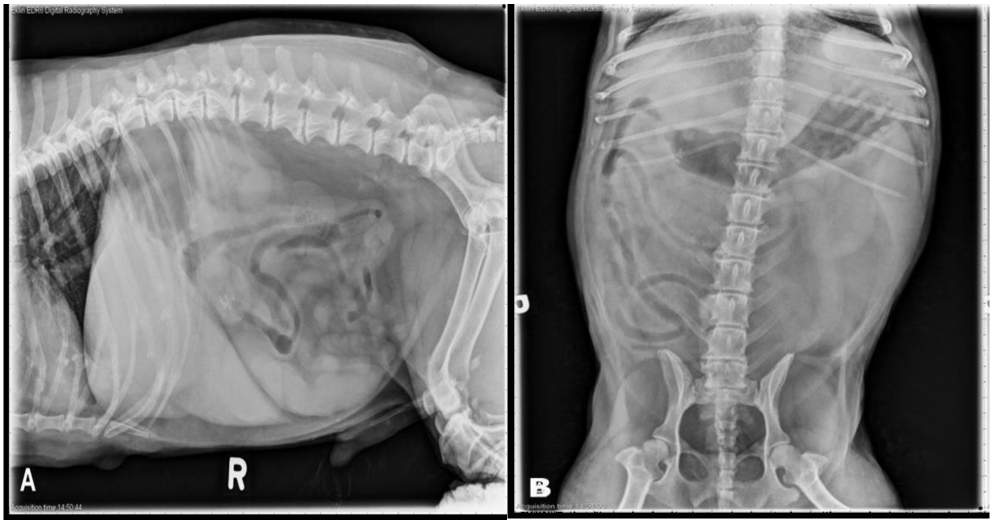


Factors affecting on x-ray quality

1. Motion
2. Film properties
3. Film/screen
4. Object/ film distance
5. Grids
6. Processing
7. Artifact
8. Distortion

How to read an image:

1.Size 2.Shape 3.Number 4.Position 5.opacity



Standard views: views that are essential to get three dimension image:

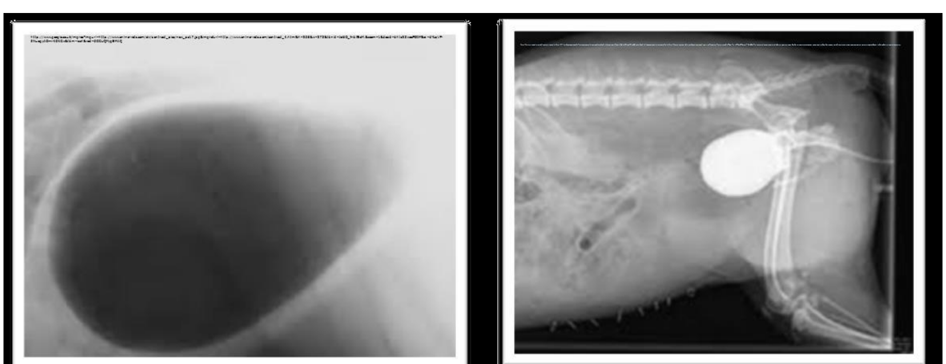
1. Lateral view (left or right)
2. Ventro-dorsal/ Dorso-ventral view
3. Oblique view
4. Skyline view

Contrast agents Contrast medium (contrast agent): is a substance that is used to enhance the contrast of structures or fluids within the body in medical imaging.

Types of contrast medium:

a.Positive contrast medium (Barium sulphate, iodine compounds-ionic & nonionic)

b.Negative contrast medium (air, oxygen, carbon dioxide, and nitrous oxide).



Pneumocystogram   Positive contrast medium

Ultrasound

Medical ultrasonography uses ultrasound (high-frequency sound waves) to visualize soft tissue structures in the body in real time. No ionizing radiation is involved, but the quality of the images obtained using ultrasound is highly dependent on the skill of the person (ultrasonographer) performing the exam and the patient's body size. Examinations of larger, overweight patients may have a decrease in image quality as their subcutaneous fat absorbs more of the sound waves. This results in fewer sound waves penetrating to organs and reflecting back to the transducer, resulting in loss of information and a poorer quality image. Ultrasound is also limited by its inability to image through air pockets (lungs, bowel loops) or bone. Its use in medical imaging has developed mostly within the last 30 years. The first ultrasound images were static and two-dimensional (2D), but with modern ultrasonography, 3D reconstructions can be observed in real time, effectively becoming "4D".

Because ultrasound imaging techniques do not employ ionizing radiation to generate images (unlike radiography, and CT scans), they are generally considered safer and are therefore more common in obstetrical imaging. The progression of pregnancies can be thoroughly evaluated with less concern about damage from the techniques employed, allowing early detection and diagnosis of many fetal anomalies.

CT scan

CT imaging uses X-rays in conjunction with computing algorithms to image the body. In CT, an X-ray tube opposite an X-ray detector (or detectors) in a ring-shaped apparatus rotate around a patient, producing a computer-generated cross-sectional image (tomogram). CT is acquired in the axial plane, with coronal and sagittal images produced by computer reconstruction. Radiocontrast agents are often used with CT for enhanced delineation of anatomy. Although radiographs provide higher spatial resolution, CT can detect more subtle variations in attenuation of X-rays (higher contrast resolution). CT exposes the patient to significantly more ionizing radiation than a radiograph.

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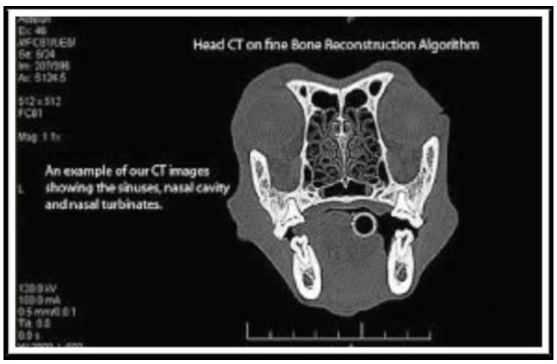

MRI

Strong magnetic fields to align spinning atomic nuclei (usually hydrogen protons) within body tissues, then disturbs the axis of rotation of these nuclei and observes the radio frequency signal generated as the nuclei return to their baseline status.

It gives the best soft tissue contrast but the patient has to hold still for long periods of time in a noisy, cramped space while the imaging is performed.

MRI uses strong magnetic fields to align atomic nuclei (usually hydrogen protons) within body tissues, then uses a radio signal to disturb the axis of rotation of these nuclei and observes the radio frequency signal generated as the nuclei return to their baseline states.[10] The radio signals are collected by small antennae, called coils, placed near the area of interest. An advantage of MRI is its ability to produce images in axial, coronal, sagittal and multiple oblique planes with equal ease. MRI scans give the best soft tissue contrast of all the imaging modalities. With advances in scanning speed and spatial resolution, and improvements in computer 3D algorithms and hardware, MRI has become an important tool in musculoskeletal radiology and neuroradiology.