

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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PRINCIPLES OF RADIOLOGY

The basic principle of imaging is for anatomical demonstration of a particular part of the body to diagnose the related abnormalities. There are different types of imaging modalities as plain X-rays, ultrasound, computed tomography and magnetic resonance imaging etc. Radiography is an imaging technique that uses electromagnetic radiation to view the internal structure of the human body and is used very extensively for diagnosis and treatment of many diseases.

A small amount of ionizing radiation is used to produce pictures of the body structures. X-rays are commonly used to diagnosed bone fracture and look for injuries, infections and to see foreign objects in the body. An iodine-based contrast material or barium is also used some times to improve the visibility of certain organs in some of the patients.

When an x-ray beam is passed through the body, a portion of x-ray radiation is transmitted to a detector so that an image is recorded for evaluation. The radiation dose is lesser than that received during fluoroscopy and computed tomography procedures. The benefit of radiography far exceeds the small risk of radiations associated with the procedure in most of the patients.

Proper shielding, lower exposure and minimum number of images, can certainly reduce most of possible risks. Abdominal x-ray is one of the commonly used procedures in which a very small dose of ionizing radiation is used to produce pictures of structures in abdominal cavity. The x-ray of kidneys, ureters and bladder is called a KUB. The doctors should be informed about pregnancy or intrauterine devices, jewelry etc.

The **rule of two's** is important guidelines for x-rays required in orthopaedic departments. Example: (a) Two views, the anteroposterior and lateral. It should be noted that in certain cases special views are required. (b) X- rays of 2 joints, the joint above and joint below. (c) X-rays at two different occasions may be required. (d) X-rays of both the limbs may be required.

- **CHEST X-RAY**

- It is the commonly performed x-ray examination to see the images of the heart, lungs, trachea, and local bones. Different parts of the body absorb or reflect the x-rays in different quantities. Dense bone absorbs much of the radiation while soft tissues allow more of the x-rays to pass through them. In this way bones would appear white while the soft tissue and air would appear gray and black respectively.

The ribs and spine appear white or light gray on the image and lung tissue absorbs comparatively little radiation and will appear dark in x-rays. X-ray equipment is inexpensive and widely available which make it convenient for both patients and doctors. No doubt that excessive exposure to radiation can increase the chance of fetal abnormalities in mother exposed to x-rays during pregnancy.

BONE X-RAY

A bone x-ray makes images of bones in the body, including the hand, arm, shoulder, spine, pelvis, thigh, knee, leg and foot. It helps in diagnose of fractured bones or joint dislocation to provide treatment. X-ray is also helpful for post reduction reevaluation of bones as a guideline for orthopedic surgeon. While x-ray images give the clearest and most detailed image of bone but it provide less useful information about soft tissues, for which other types of investigations can be used.

Magnetic resonance imaging (MRI):

Magnetic resonance imaging uses a magnetic field, radio waves and a computer to produce picture of any part of the body. It gives clear, detailed and likely to identify more accurately different diseases of the body. It is used to evaluate the body for a variety of conditions, including tumors and diseases of the liver, heart, and bowel.

MRI is noninvasive and does not use ionizing radiation and therefore more safe as compared to x-rays. The MRI is certainly more useful in identifying spine conditions. It can also detect bone lesions more properly, which are not visible on x-ray images.

Computerized tomography (CT):

It is one of the most important imaging procedures in which a special type of x-ray equipment is used to get the detailed images of different parts. The CT scans is also an important investigation to assess trauma patients in emergency departments. It gives the exact anatomical details of the concerned parts.

The CT scan is comparatively better to study different organs in obese patients unlike the ultrasound imaging, as fat separates the different organs to be visualized clearly. A CT scan can diagnose a complicated fracture, dislocations and osteoporosis more clearly as compared to plain x-rays. The disadvantages are that a high dosage of radiation is required for each examination. It is costly and can obtain images only in the transverse plane.

Ultrasound imaging:

The ultrasound imaging is useful for diagnosis of soft tissue especially in abdomen where the sound waves instead of ionizing radiation are used to create diagnostic images. The ultrasound can also be used in many types of joint conditions and also in evaluating the congenital dislocation hip. It requires high frequency sound waves which travel in the body and are reflected variably due to variable tissues encountered.

The sound reflected from body is converted into electric current which is processed into image. Bone and air are poor conductors of sound which would not be visualized properly. The fluids have excellent transmission of sound waves and therefore, the structures behind the fluid medium could be visualized very properly. Ultrasound abdomen is a common investigation.

Practical:

Write demerits and merits of X-rays. Show me the heart and lungs shadows in X-ray chest.

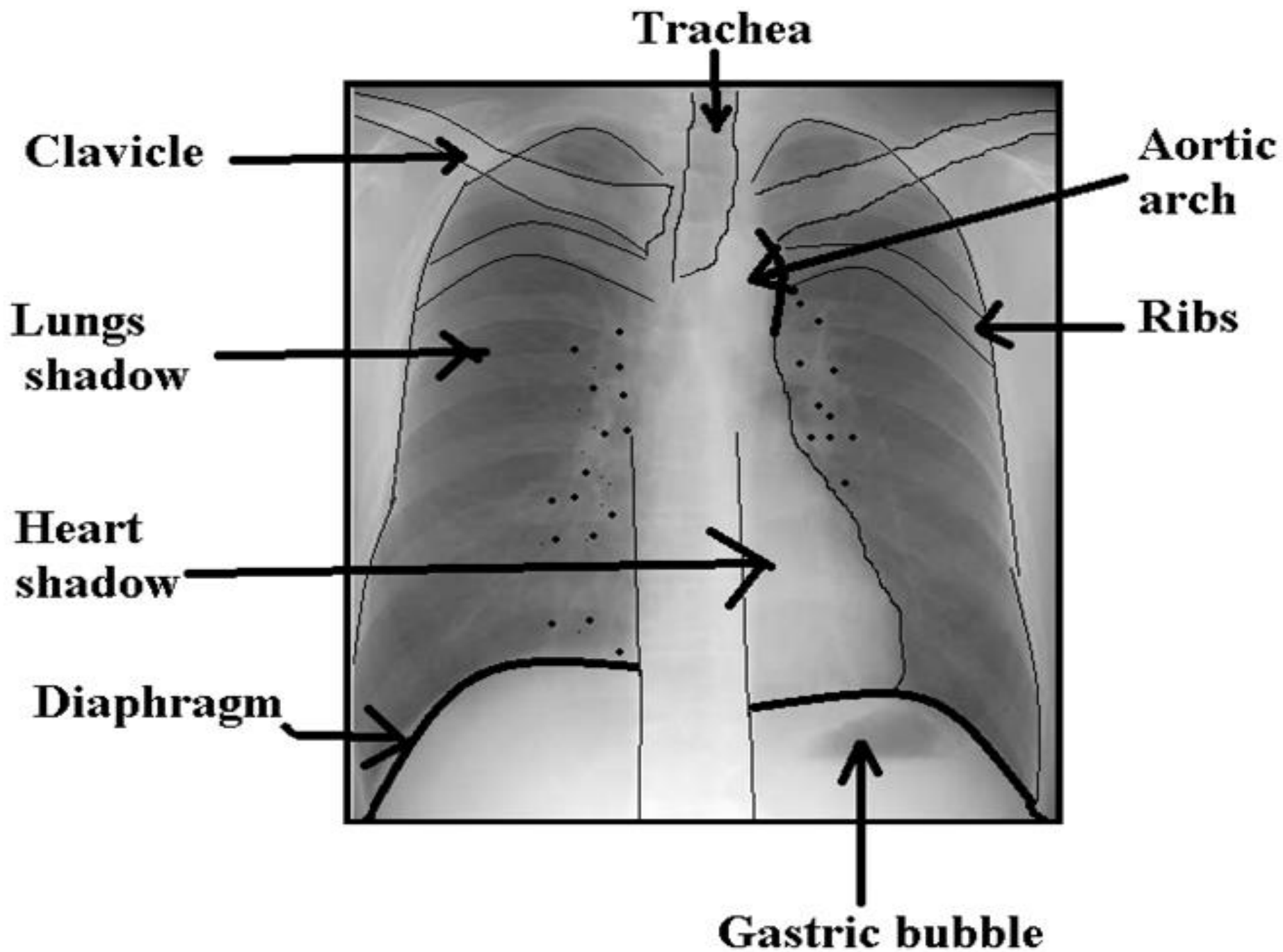
is comparatively a safe investigation for many conditions.

Answer;

Ultrasound

Look at the X-ray chest and know the important structures. Draw a label diagram of X-ray chest.

Heart is central in baby less than 2 years of age while it deviate more towards left side in adults. In baby below 2 years heart is 65 % of total breadth of chest cavity. In adults heart occupy about 50% of total diameter of chest cavity.



THANKS