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- SUBJECT : RADIOLOGICAL POSITIONING
- DEPARTMENT (AHS)
- PROGRAMME : BS RAD 6th SEMESTER
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QNI1: Explain the X-ray projection of chest and its radiological consideration for it ?

Chest posterior anterior

Position of Patient and Image Receptor

■ The patient faces the image receptor, with the feet slightly apart for stability and chin extended and placed on the top of the image receptor.

■ The median sagittal plane is adjusted at right-angles to the middle of the image receptor. The dorsal aspects of the hands are placed behind and below the hips, with the elbows brought forward and the shoulders rotated anteriorly and pressed downward in contact with the image receptor.

■ For patients with reduced mobility an alternative is to allow the arms to encircle the image receptor.

Direction and Centring of X-ray Beam

■ The horizontal central beam is directed at right-angles to the image receptor at the level of the eighth thoracic vertebrae (i.e. spinous process of T7 – found by using the inferior angle of the scapula).

■ Exposure is made in full normal arrested inspiration.

■ An FRD of 180 cm should be used to minimize magnification.

Essential Image Characteristics

■ Full lung fields with the scapulae projected laterally away from the lung fields and clavicles symmetrical and equidistant from the spinous processes.

■ Sufficient inspiration – visualizing either six ribs anteriorly or 10 ribs posteriorly.

■ The costophrenic angles, diaphragm, mediastinum, lung markings and heart should be defined sharply Chest lateral.

Position of Patient and Image Receptor

■ This projection may be undertaken with or without a grid,
depending on patient size and local protocols.

■ The patient is turned to bring the side under investigation in contact with the image receptor.

■ The median sagittal plane is adjusted parallel to the image receptor.

■ The arms are folded over the head or raised above the head to rest on a horizontal bar.

■ The mid-axillary line is coincident with the middle of the image receptor, which is then is adjusted to include the apices and the lower lobes to the level of the first lumbar vertebra.

Direction and Centring of X-ray Beam

■ Direct the horizontal central ray at right-angles to the middle of the image receptor at the mid-axillary line.

Essential Image Characteristics

■ The image should include the apices and costophrenic angles and lung margins anteriorly and posteriorly.
■ Image processing should be optimized to visualize the heart and lung tissue, with particular regard to any lesions if apropos.

QNO2: Explain in detail basic projection of neck pain patients, write detail about cervical X-ray ?

inferior border of the symphysis mantis is superimposed over the occipital bone.
The beam is centred in the midline towards a point just below the prominence of the thyroid cartilage through the fifth cervical vertebra.

Servicle spine (anterior posterior)

Position of Patient and Image Receptor
■ The patient lies supine on the Bucky table or, if erect positioning is preferred, sits or stands with the posterior aspect of the head and shoulders against the vertical Bucky.
■ The median sagittal plane is adjusted to be at right-angles to the image receptor and to coincide with the midline of the table or Bucky.
■ The neck is extended (if the patient's condition will allow) so that the lower part of the jaw is cleared from the upper cervical vertebra.
■ The image receptor/Bucky is positioned to coincide with the central ray. The Bucky will require some cranial displacement if the tube is angled.

Direction and Centring of X-ray Beam

■ A 5- to 15-degree cranial angulation is employed, such that the inferior border of the symphysis mentis is superimposed over the occipital bone.
■ The beam is centred in the midline towards a point just below the prominence of the thyroid cartilage through the fifth cervical vertebra.

Essential Image Characteristics

■ The image must demonstrate the third cervical vertebra down to the cervical-thoracic junction.
■ Lateral collimation to soft tissue margins.
■ The chin should be superimposed over the occipital

Cervical spine (lateral)

Position of Patient and Image Receptor

■ The patient stands or sits with either shoulder against the image receptor.
■ The median sagittal plane should be adjusted such that it is parallel with the image receptor.

■ The head should be flexed or extended such that the angle of the mandible is not superimposed over the upper anterior cervical vertebra or the occipital bone does not obscure the posterior arch of the atlas.
■ To aid immobilization, the patient should stand with the feet slightly apart and with the shoulder resting against the image receptor stand.
■ In order to demonstrate the lower cervical vertebra, the shoulders should be depressed. This can be achieved by asking the patient to relax their shoulders downwards. The process can be aided by asking the patient to hold a weight in each hand (if they are capable) and making the exposure on arrested expiration.

Direction and Centring of X-ray Beam

■ The horizontal central ray is centred to a point vertically below the mastoid process at the level of the prominence of the thyroid cartilage.
■ An FRD of 150 cm should be used to reduce magnification.

Essential Image Characteristics

■ The whole of the cervical spine and upper part of TV1 should be included.
■ The mandible or occipital bone should not obscure any part of the upper vertebra.
Angles of the mandible and the lateral portion of the floor of the posterior cranial fossa should be superimposed.
Soft tissue of the neck should be included.

QNO3: Patient of old age came in the department with a complaint of knee pain, what view should be done.

KNEE – ANTERO-POSTERIOR

Position of Patient and Image Receptor
■ For computed radiography (CR), an 18 24-cm image receptor is generally used.
■ The patient is either supine or seated on the X-ray table, with both legs extended.
■ The affected limb is rotated to centralize the patella between the femoral condyles, and sandbags are placed against the ankle to help maintain this position.
■ The image receptor should be in close contact with the posterior aspect of the knee joint, with its centre level with the upper borders of the tibia condyles.

Direction and Centring of X-ray Beam

■ Centre 2.5 cm below the apex of the patella through the joint space, with the central ray at 90 degrees to the long axis of the tibia.

Essential Image Characteristics

■ The patella must be centralized over the femur.
■ The distal third of femur and proximal third of tibia are included.

KNEE – LATERAL

Position of Patient and Image Receptor
■ The patient lies on the side to be examined, with the knee flexed at 45 or 90 degrees.

■ The other limb is brought forward in front of the one being examined and supported on a sandbag.
■ A sandbag is placed under the ankle of the affected side to bring the long axis of the tibia parallel to the image receptor.
■ The position of the limb is now adjusted to ensure that the femoral condyles are superimposed vertically.
■ The centre of the image receptor is placed level with the medial tibial condyle.

Direction and Centring of X-ray Beam

■ Centre to the middle of the superior border of the medial tibial condyle, with the central ray at 90 degrees to the long axis of the tibia.

Essential Image Characteristics

■ The patella should be projected clear of the femur.
■ The femoral condyles should be superimposed.
■ The proximal tibio-fibular joint is not clearly visible.

QNO4:Write about the positioning and technique of pelvic X-ray.

PELVIS – ANTERO-POSTERIOR

Position of Patient and Image Receptor

■ The patient lies supine with their median sagittal plane perpendicular to the tabletop.
■ The midline of the patient must coincide with the centred primary beam and table Bucky mechanism.
■ To avoid pelvic rotation, the anterior superior iliac spines must be equidistant from the tabletop.
■ The limbs are slightly abducted and internally rotated to bring the femoral necks parallel to the image receptor.

Direction and Centring of X-ray Beam

■ Centre in the midline, with a vertical central beam to the centre of the image receptor.
■ The centre of the image receptor is placed midway between the upper border of the symphysis pubis and anterior superior iliac spine for the whole of the pelvis and proximal femora. The upper edge of the image receptor should be 5 cm above the upper border of the iliac crest to compensate for the divergent beam and to ensure that the whole of the bony pelvis is included.

Essential Image Characteristics

■ Iliac crests and proximal femora, including the lesser trochanters, should be visible on the image.
■ No rotation. The iliac bones and obturator foramina should be the same size and shape.

QNO5:How you see the importance of KVP and MAS setting in your X-ray machine.

Importance of Kilovoltage peak

Kilovoltage peak (kVp) is the peak potential applied to the x-ray tube, which accelerates electrons from the cathode to the anode in radiography or computed tomography. Tube voltage, in turn, determines the quantity and quality of the photons generated. An increase in kVp extends and intensifies the x-ray emission spectrum, such that the maximal and average/effective energies are higher and the photon number/intensity is higher.

Along with the mAs (tube current and exposure time product) and filtration, kVp (tube voltage) is one of the primary settings that can be adjusted on x-ray machines to control the image quality and patient dose.

Important of mAs:

Milliampere-seconds more commonly known as mAs is a measure of radiation produced (milliamperage) over a set amount of time (seconds) via an x-ray tube. It directly influences the radiographic density, when all other factors are constant.

An increase in current (mA) results in a higher production of electrons that are inside the x-ray tube which will, therefore, increase the quantity of radiation; more radiation will cause more photons reaching the detector and hence apparent structural density will decrease, yet the signal intensity will increase. The time factor (s) is a measure of the electrons production duration in the tube; meaning 's' prescribes how long mA will last.

For example:

mA x t = mAs

600 mA x 0.1 sec. = 60 mAs

Increasing either the current or time will increase the quantity of radiation; therefore the amount of radiation in an examination is represented as mAs.

The reciprocity law

The reciprocity law states that a reaction of a photogenic emulsion to light will be equal to the products of the intensity of that light and the time of the exposure 1. This law pertains to mAs in the sense that all combinations of mA x T that amount to an equal quantity will produce the same amount of density.

50 mA x 1/5 sec. = 10 mAs is equal to 300 mA x 1/30 sec. = 10 mAs

It is due to this law that radiographers will have to take into consideration all other factors (mA, focal spot, SID, kVp) to reduce time to avoid motion blur.

THE END.....