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Answer No:01

Basic Projections of Femur for X-Rays: -

Basic Projections for the femur X-Ray are two in number as follow: -

i) Antero-posterior: -

Position of patient and image receptor: -

- The one which is taken from anterior side of the femur.
- The patient lies supine on the table with both legs extended.
- The affected limb is rotated to centralize the patella over the femur.
- Sandbags are placed under the leg for support.
- Image receptor is positioned directly under the limb against the posterior aspect of the thigh.

Direction and centering of the X-ray beam: -

- Center to the middle of the image receptor, with the vertical central ray at 90 degrees to an imaginary line joining both the femoral condyles.

Essential image characteristics: -

- The hip and knee joints should both be included in the X-ray image if possible. Otherwise the nearest joint to the point of injury should be included.

Additional Consideration: -

- In suspected fractures the leg should not be rotated.

ii) Lateral: -**Position of patient and image receptor: -**

- The knee is slightly flexed and the patient is rotated toward the affected side.
- The pelvis is rotated backward to separate the thighs.
- The position of the limb is then adjusted to vertically to superimpose the femoral condyles.
- Pads are used to support the opposite limb behind the one being examined.
- The image receptor is positioned in the Bucky tray under the lateral aspect of the thigh to include the knee joint and as much of the femur as possible.
- Alternatively, the image receptor is positioned directly under the limb against the lateral aspect of the thigh to include the knee joint.
- The image should show from the 'knee up' to the proximal 3rd of the femur.

Direction and centering of the X-Ray beam: -

- Center to the middle of the image receptor, with the vertical central ray parallel to the imaginary line joining the two femoral condyles.

Essential image characteristics: -

- The image should show from the 'knee up' to the proximal third of the femur.

Additional consideration: -

- In some slim patients it is possible to demonstrate up to the femoral head, however, a separate image of this proximal region may be needed if the entire length of the femur is required to be seen.

Answer No: - 02**Chest – Postero-anterior:** -

- 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 aspect of the hands is placed behind and below the hips, with the elbows brought forward and the shoulders rotated anteriorly and press 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 centering of X-Ray beam: -

- The horizontal center beam is directed at right angles to the image receptor at the level of the 8th thoracic vertebra (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 lungs fields with the scapulae projected laterally away from the lung fields and the clavicles symmetrical and equidistant from the spinous processes.
- Sufficient inspiration visualizing either 6 ribs anteriorly or 10 ribs posteriorly.
- The costophrenic angles, diaphragm, mediastinum, lung markings and heart should be defined sharply.

Additional considerations: -

- An expiration radiograph maybe obtained to demonstrate a small apical pneumothorax.

Chest antero-posterior (erect): -

This projection is often used as an alternative in the posterior anterior projects and cannot be formed due to the patient's condition. Frequently the patient is supported sitting erect on a chair.

Position of patient and image receptor: -

- Patient seats with their back against the image receptor, with the upper edge of the image receptor above the lung apices.
- The median sagittal plane is adjusted at right angles to the middle of the image receptor.
- Dependent on the patient's condition the arms are extended forward into the anatomical position and internal related to minimize the superimposition of the scapula on the lung fields.

Direction and centering of X-Ray beam: -

- The horizontal ray is directed first at right angles to the image receptor and towards the sternal notch.
- The central ray is then angled until it is coincident with the middle of the image receptor. This has the effect of confining the radiation field to the image receptor, avoiding unnecessary exposure of the eyes.
- The exposure is taken on normal full inspiration.
- An FRD of at least 120 cm is essential to reduce unequal magnification of intrathoracic structures.

Essential image characteristics: -

- The image should be of comparable quality to that described for the posteroanterior chest projection.

Additional considerations: -

- The heart is moved further from the image receptor, thus increasing magnification and reducing accuracy of assessment of heart size.

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 adjusted to include the apices and the lower lobes to the level of the first lumbar vertebra.

Direction and centering 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 appropriate.

Additional considerations: -

- The projection is useful to confirm position and size of a lesion suspected on the initial projection or the position of leads post pacemaker insertion.
- However, it is not a routine examination because of the additional patient dose and the increasing use of computed tomography to examine the thorax.

Chest - Supine (antero-posterior): -

This projection is usually only utilized when the patient is unable to sit up on a bed.

Position of patient and image receptor: -

- With assistance, the image receptor is carefully positioned under the patient's chest with the upper edge of the image receptor about the lung apices.
- The median sagittal plane is adjusted at right angles to the middle of the image receptor
- The arms are rotated laterally and supported by the side of the trunk. The head is supported on a pillow, with the chin slightly raised. The pelvis is checked for rotation.

Direction and centering of X-Ray beam: -

The same as described above.

Essential image characteristics: -

- The image quality should be compromised due to the patient's condition and the drawbacks of this technique; however, the apices, lateral lung margins and bases should be visualized with optimum image processing and resolution with no evidence of rotation.

Additional Considerations: -

- Maximum lung demonstration is lost due to the absence of the gravity effect of the abdominal organs, which is present in the erect position.
- Plural effusion or a pneumothorax is not as well demonstrated compared with the erect projections.
- An FRD of at least 120 cm is essential to reduce unequal magnification of intrathoracic structures.

Chest Mobile/Trolley (antero-posterior): -

Ward radiography should only be performed when necessary, by properly justifying the examination and checking previous images for consistency.

Position of patient and image receptor: -

- Where possible, the patient should be examined in an erect position, however this may not be achieved due to the patient's condition.
- The image receptor is supported behind the back of the patient, using pads or pillows as required.
- It is very important to avoid/minimize any rotation, which can make interpretation difficult.

Direction and centering of X-Ray beam: -

As described above.

Essential image characteristics: -

As described for the supine chest position.

Additional considerations: -

Radiographer needs to consider issues such as:

- Careful identification of the patient.
- Moving and handling issues.
- Care when handling any patient devices such as drains or lines.
- Infection control.
- Radiation protection.
- Good communication with nursing staff.
- It is good practice to annotate the image with information to assist with consistency of results. This may include the date, time, exposure, patient position and FRD.

Answer No: - 03**Neck X-Ray projections: -**

The basic projections for a patient having pain in the neck region are as follow: -

- It includes usually three different projections.
 - 1) **The anterior – posterior view.**
 - 2) **The lateral view**, which is taken from the side.
 - 3) **The Odontoid view**, which is taken from the front side with mouth opened.

Occasionally, additional pictures like flexion and extension views of the cervical spine might be needed as well.

Preparation: -

- If the patient has a suspected neck injury, a collar or braces will be placed around the neck to limit movement to the neck which helps prevent further injury to the neck.

Procedure: -

- Cervical spine X-rays are performed while in a lying position.
- The technician will position the patient.
- Three X-rays are usually taken.
- Occasionally, additional X-rays are needed also.
- Older patients will be asked to hold their breath and remain still for 2 to 3 seconds while each X-ray is taken.

Answer No: - 04**Projections for Hand: -**

1. Dorsi-palmar
2. Dorsi-palmar Oblique
3. Lateral

Projections for Foot: -

1. Dorsi-plantar
2. Dorsi-plantar oblique
3. Lateral erect.

Projections for abdomen: -

1. Antero-posterior supine
2. Prone
3. Left lateral decubitus.