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Paper: Radiological positioning

**Q NO 1: ANSWER..........**

Two projections are taken routinely, preferably with both the knee and hip joints included on the image. The images are acquired using a large 35 × 43 cm CR cassette or alternatively within the field of view of a DDR detector. If this is impossible to achieve, then the joint nearest the site of injury should be included. A grid may be used so that the effects of scatter are reduced. However, should only an image of the distal aspect of the femur be required, (AP) then the use of the grid can be eliminated in order to reduce patient dose..

**Antero-posterior : Position of patient and image receptor**

The patient lies supine on the X-ray table, with both legs extended and the affected limb positioned to the centre line of the table. The affected limb is rotated to centralise the patella over the femur Sandbags are placed below the knee to help maintain the position.

**Direction and location of the X-ray beam.**

The collimated vertical beam is centred to the mid-shaft of the femur, with the central ray at 90° to an imaginary line joining both femoral condyles.

**Essential image characteristics**

Ideally, the length of the femur should be visualised, including the hip and knee joints. This may be difficult to obtain and an additional projection of the knee or hip joint may be required if coverage is not initially achieved; however, this will depend on the clinical information required. The patella should be centralised to indicate rotation has been minimised.

**Lateral : Position of patient and image receptor**

From the antero-posterior position, the patient rotates on to the affected side with the knee is slightly flexed and the patient adjusted so that the thigh is positioned to the centre line of the table.The pelvis is rotated backwards to separate the thighs.The position of the limb is then adjusted to superimpose the femoral condyles vertically. Pads are used to support the opposite limb behind the one being examined.

**Direction and location of the X-ray beam**

The collimated vertical beam is centred to the middle of the femoral shaft, with the central ray parallel to the imaginary line joining the femoral condyles.

**Essential image characteristics**

The length of the femur should be visualised, including the hip and knee joints.Often, an additional projection of the hip joint using a grid may be required if coverage is not initially achieved or the image quality is affected by scatter and/or noise in the proximal femur; however, this will depend on the clinical information required and the patient size.

**Q No 2: ANSWER................CHEST RADIOGRAPH**

Radiographic examination of the lungs is performed for a wide variety of medical conditions, including primary lung disease and pulmonary effects of diseases in other organ systems. Such effects produce significant changes in the appearance of the lung parenchyma and may vary over time, depending on the nature and extent of the disease.Imaging may also be performed using a variety of imaging modalities, notably CT and radionuclide imaging.

Examination is performed by means of the following projections:

Basic PA – erect

Alternative AP – erect

AP – supine

AP – semi-erect

Supplementary Lateral

PA – expiration

The choice of erect or decubitus technique is governed primarily by the condition of the patient, with the majority of patients positioned erect. Very ill patients and patients who are immobile are X-rayed in the supine or semi-erect position With the patient erect, positioning is simplified, control of respiration is more satisfactory, the gravity effect on the abdominal organs allows for the disclosure of the maximum area of lung tissue, and fluid levels are defined more easily with the use of a horizontal central ray.The postero-anterior projection (PA) is generally adopted in preference to the antero-posterior (AP) because the arms can be arranged more easily to enable the scapulae to be projected clear of the lung fields. Heart magnification is also reduced significantly compared with the AP projection.This projection also facilitates compression of breast tissue with an associated reduction in dose to the breast tissue. Additionally, the dose to the thyroid is reduced.The mediastinal and heart shadows, however, obscure a considerable part of the lung fields, and a lateral radiograph may be necessary in certain situations.Supplementary projections may be required for specific indications at the request of a clinician or radiologist.

**Direction and location of the X-ray beam:**

The collimated horizontal beam is directed at right-angles to the receptor and centred at the level of the 8th thoracic vertebrae (spinous process of T7) which is coincident with the lung midpoint. The surface marking of T7 spinous process can assessed by using the inferior angle of the scapula before the shoulders are pushed forward.Exposure is made in full normal arrested inspiration.In a number of automatic chest film-changer devices the central beam is automatically centred to the middle of the receptor.

**Essential image characteristics:**

Full lung fields with the scapulae projected laterally away from the lung fields.No rotation, the anterior rib ends should be equidistant from the spine and the medial ends of the clavicles should overlap the transverse processes of the spine.The lungs well inflated, i.e. it should be possible to visualise either six ribs anteriorly or ten ribs posteriorly. Inferior to the costophrenic angles and diaphragm clearly outlined.The mediastinum and heart central and sharply defined.The fine demarcation of the lung tissues should be demonstrated from the hilum to the periphery.

**Q NO 3 :ANSWER..............**

Many centres perform an antero-posterior (AP) and a lateral projection, with the addition of a further AP image to demonstrate the C1/2 region if the patient has a history of trauma.Each image is acquired using a computed radiography (CR) image receptor or alternatively within the field of view of a direct digital radiography (DDR) detector system. For CR, 18 × 24 cm image receptor size cassettes are employed routinely, but 24 × 30 cm cassettes are often used in difficult cases.

**Lateral erect (Basic) .Position of patient and image receptor**

The patient stands or sits with either shoulder against the CR cassette or vertical Bucky digital detector system (a grid may be employed dependent on department protocols).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.

**Direction and location of the X-ray beam**

The collimated horizontal beam is centred over a point vertically below the mastoid process at the level of the prominence of the thyroid cartilage.

**Essential image characteristics**

The whole of the cervical spine should be included, from the atlanto-occipital joints to the top of the first thoracic vertebra.The mandible or occipital bone does not obscure any part of the upper vertebra.Angles of the mandible and the lateral portions of the floor of the posterior cranial fossa should be superimposed. Soft tissues of the neck should be included.The contrast should produce densities sufficient to demonstrate soft tissue and bony detail.

**Antero-posterior – cervical vertebra(open mouth**

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 detector system.The medial sagittal plane is adjusted to coincide with the midline of the image receptor, such that it is at right-angles to the image receptor.The neck is extended, if possible, such that a line joining the tip of the mastoid process and the inferior border of the upper incisors is at right-angles to the cassette. This will superimpose the upper incisors and the occipital bone, thus allowing clear visualisation of the area of interest. The receptor is centred at the level of the mastoid process.

**Direction and location of the X-ray beam**

The collimated beam is directed with a 5–15° cranial angulation, such that the inferior border of the symphysis menti 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.

**Radiological considerations**

A unifacet dislocation can be diagnosed by loss of continuity of the line of spinous processes .This is made more difficult if the patient is rotated or the image is underexposed.Common faults and solutions Failure to demonstrate the upper vertebra an increase in the tube angle or raising the chin should provide a solution.

**Q NO 4 :ANSWER............**

**HANAD PROJRCTION**:

Two projections are routinely taken, a dorsi-palmar (DP) and an anterior oblique (DP oblique). Each image is acquired using a CR image receptor. An 18 cm × 24 cm size cassette is used for CR imaging

**FOOT PROJECTION:**

Two projections are routinely taken a dorsi-plantar (DP) and DP oblique. Each image is acquired using a computed radiography (CR) image detector or alternatively within the field of view of a direct digital radiography (DDR) detector.

**ABDOMEN PROJECTION**:

Examination is performed by means of the following:

1)Basic.Antero-superior - supine

2)Alternative .Postero –anterior – prone

3)Supplementary . Antero-posterior – erect, Antero-posterior or Postero-anterior – left lateral decubitus

• Lateral – dorsal decubitus

• Posterior obliques.