Chapter-7 part-I

WARD RADIOGRAPHY

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Objectives

At the end of this lesson you should be able to;

- Identify the ***main areas,*** type of examination & disease condition which need x-ray the patient on the ward.
- Apply ***radiation protection*** measures and ***infection prevention*** techniques.
- Select ***appropriate equipment***.
- Develop good communication skill with staffs in the ward.

Introduction

- When patients are ***too ill to be moved*** to the department, the patient will be x-rayed on the ward using ***mobile x-ray machine.***

- ***Ward radiography*** is ***restricted to the patient whose medical condition is impossible*** for them to be moved to the ***X-ray*** department.

Introduction…

- The ***main areas*** where this is needed are:-
  - ✓**Intensive care unit(ICU)**
  - ✓**Coronary care unit**
  - ✓**Medical assessment unit**
  - ✓**Surgical assessment unit**

Introduction…

- ✓Cardiac surgery unit
- ✓High dependency unit
- ✓Special baby care unit
- ✓Orthopedic ward
- ✓Emergency ward

Radiation protection

- **Minimize exposure to *patient, staff & relatives* by:-**
  - ✓ Ensuring that ***nobody enters*** the controlled area during exposure.
  - ✓ Using ***Lead protective shields*** as backstops to limit the radiation field.
  - ✓ Using of ***inverse square law.***

Cont…

- ***Protecting*** from scatter radiation by the use of a ***lead-rubber apron***.
- ***Design*** of portable environment.
- Consider ***other patients*** on ward.

Infection control

- To prevent the spread of infection, ***local established protocols*** should be followed:-
  - ✓ ***Hand washing*** b/n patients
  - ✓ ***Cleanliness*** of equipment used;
    - ***Cassettes*** should be cleaned and covered with plastic sheets or clean towels before & after use.
  - ✓ ***Wearing gloves & aprons***
  - ✓ ***Facemasks and over-shoes*** before entering these areas.

X-ray equipment

- Depending on ***power output*** and the ***ability to transfer*** equipment, units fall broadly into two groups:-

  - ***Portable***, and
  - ***Mobile x-ray units***.

Cont…

- ***Portable*** **sets** :-
  - Have relatively ***low mA settings***, and
  - Normally can be ***dismantled for transfer***

Cont…

- ***Mobile*** **sets:-**
  - Have ***higher power output***,
  - Are ***larger & heavier*** than portable sets,
  - Need to be ***motorized or pushed*** between locations,
  - Can be either ***mains-independent*** *or* ***mains-dependent***.

Mobile x-ray unit

Components of mobile x-ray set:-

- The ***x-ray tube***
- The ***tube stand***
- The ***high tension generator***
- The ***control unit***
- The radiographic output and the mains requirements.

X-ray equipment

Accessory equipment

- ***Various aids*** **are available that can assist in positioning both the *patient and cassette;***
  - ***Foam pads*** of different sizes and shapes, such as cassette pads.
  - ***Cassette tunnels*** and ***cassette holders*****.**
  - Selection of a ***low-ratio (6 : 1) 30 lines per cm parallel stationary grid*** will reduce the risk of grid cut-off.

Workflow…

1.From the biomedical imaging department…

2.Positioning the patient…
patient care must be the **First Priority**!!!

Examination performed

- **Performed examination's are:-**
  - ✓ ***Chest radiographs(AP)-*** most common.
  - ✓ ***Sometimes extremities***,
    - ***Trauma series***
  - ✓ ***Chest & C-spine:-*** ***lateral***, and
  - ✓ ***Abdomen & pelvis.***

Cont…

- **Examinations are complicated by:-**
  - ✓The patient's medical condition,
  - ✓Degree of consciousness,
  - ✓The patient's treatment; restrictions due to:
    - ✓life support system, ***drips***, and ***chest or abdominal drains;***
  - ✓location of electrocardiogram ***(ECG)*** leads;

Cont…

- ✓Traction apparatus,
- ✓***Physical restrictions*** due to room size & layout of monitoring equipment,
- ✓Adequate ***power supply***, and
- ✓The ***ability*** to move ***mobile or portable X-ray equipment in confined spaces.***

Range of patients

- Pediatrics
- Elderly patients
- Confused patients
- Unconscious patients
- Abusive patients
- Trauma patients
- Very ill patients
- Immunosuppressed
- Immobile

EXAMINATIONS

- **Possible reasons for portable examination-chest:-**
  - **Chest pain**
  - **Pneumothorax & haemopneumothorax**
  - **Chest drain**
  - **Cardiac arrest**
  - **Acute pulmonary embolism**
  - **Chest trauma (i.e. stabbing)**

Cont…

- Positioning of NG tube
- ARDS
- Acute asthma/shortness of breath
- Aortic aneurism(+portable abdomen)
- As part of a trauma series

Heart & lungs

- Common conditions include:-
  - ***Congestive heart failure***
  - ***Coronary heart disease***
  - ***Left ventricular failure***
  - ***Pulmonary oedema***
  - ***Pulmonary embolus***
  - ***Pneumothorax and pleural effusion***
  - ***pneumonia***

Heart & lung radiography
1. AP-chest

Position of patient & cassette

- Assist the ***patient to setting/erect*** position facing the x-ray tube.
- The cassette is supported against the back using pillows.
  - If this is not possible, the patient may be positioned supine
- The ***msp*** is centered to the midline of the cassette.

Cont…

AP chest…

- ✓Rotation of the patient is prevented by the ***use of foam pad.***

- **CR:-**
  - ✓**Central ray is directed perpendicular to *sternal angle.***

- ***Notes:***
  - For supine, the ***FFD may be restricted*** due to the ***height of the bed.***
  - The FFD should be **higher than 120 cm**,

Cont…

Fig:- AP-chest

Heart & lungs- fluid levels

2. PA or AP - lateral decubitus

- **Position of patient & cassette:-**
  - ✓ The patient is ***turned to the unaffected side***
  - ✓ A cassette is supported vertically against the anterior chest wall,
    - ✓ The ***msp*** is adjusted at ***right angle to the midline of the cassette***
  - ✓ The patient's ***arms are raised & folded over the head*** to ***clear the chest wall***.

Cont…

- **CR:-**
  - ✓Direct the central ray ***horizontally perpendicular to T_7*** & directed at right angle to the cassette.

Cont…

Fig; PA-chest lateral-decubitus

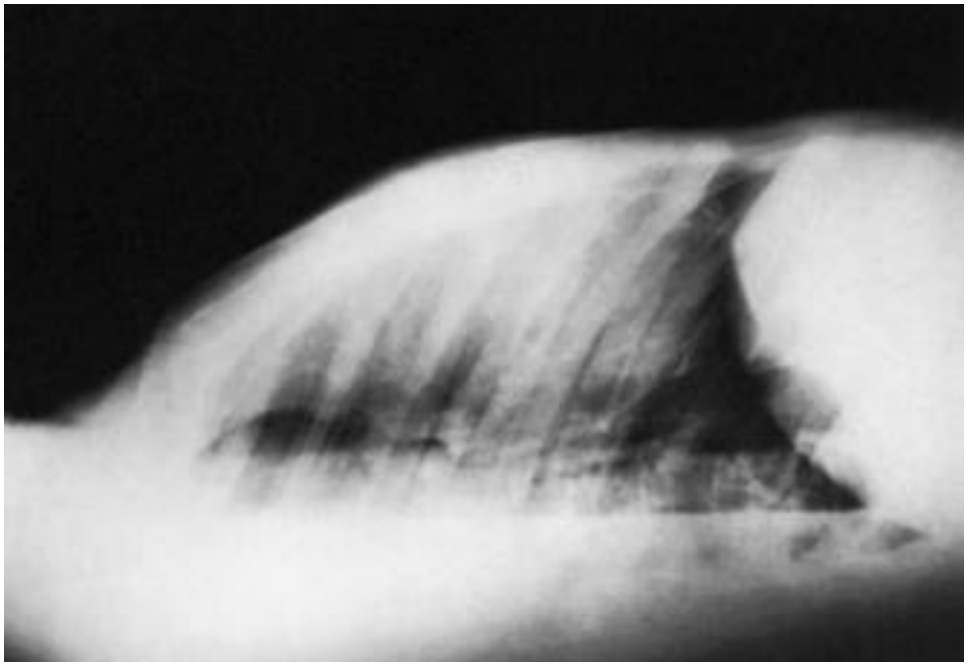
Cont…

3. Lateral (dorsal-decubitus)

- **Position of patient & cassette:**
  - ✓Assist the patient to **supine position**
  - ✓The **arms are extended & supported above the head**
  - ✓A cassette is supported vertically against the lateral aspect of chest of the affected side
- **CR**:
  - ✓Directed ***horizontally perpendicular to axilla*** & directed right angle to the cassette.

Cont…

Fig; lateral-chest (dorsal decubitus)



Heart & lung-temporary pacemaker

- Patients suffering from ***heart block*** are often ***treated with an electrical pacemaker.***
- The procedure may be performed in a ***cardiac catheter laboratory.***
- This procedure of inserting a temporary pacemaker use a ***mobile image intensifier***.

Cont…

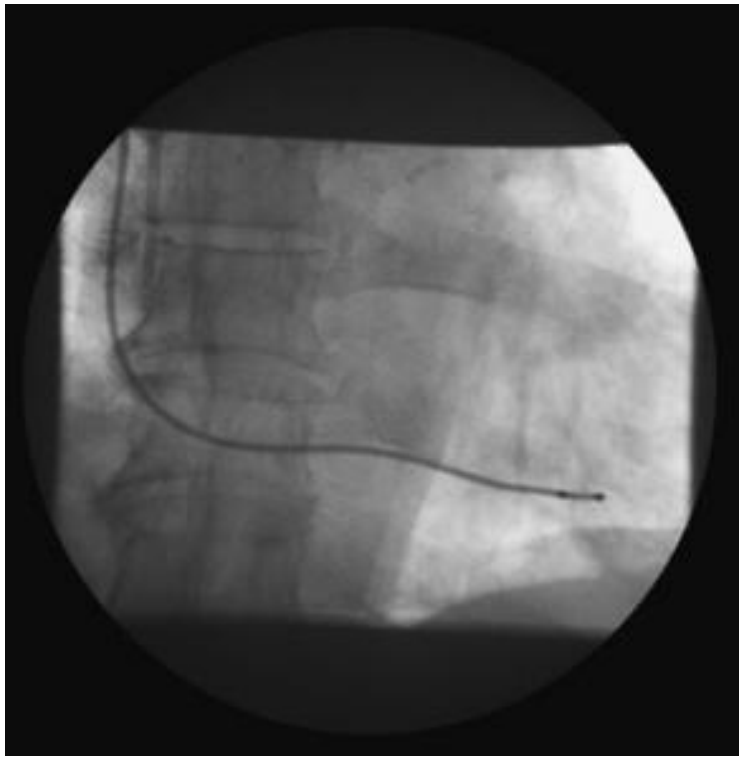
Mobile image intensifier

- The patient lies on a trolley or bed with a radiolucent top, which can accommodate the ***C-arm of the intensifier***.
- The intensifier is positioned on the ***opposite side*** of the operating position.
- **Control** of the ***screening factors***, ***screening time*** and ***radiation protection*** is our responsibility.

Cont…

Mobile image intensifier…

Fig; Fluoroscopic image showing location of pacemaker wire



Cont…

Mobile image intensifier…

Heart & lungs - postoperative radiography

- A ***series of radiographs*** may be required during ***post-operative care***, shortly after surgery, this includes:-
  - ✓ **Endotracheal tube(AP chest)**
  - ✓ **Central venous pressure line(AP chest)**
  - ✓ **Chest drain insertions(AP erect chest)**

Cont…

Endotracheal tube

- **AP-chest** is used to assess position of an endotracheal tube.
- Exposure is made with ***enough penetration***
- The position of the tube is checked to **ensure that its distal end is not lying in the right bronchus**.

Cont…

Central venous pressure line

- A fine catheter is positioned in the ***superior vena cava*** as a means of:-
  - ✓***measuring central venous pressure*** ***and***
  - ✓***injecting drugs***.

- The position of a catheter can be assessed from the **AP- chest** projection.

Cont…

Central venous pressure line,,,

- The **position of the catheter** is checked to ensure that **its distal end has *not been directed into the right internal jugular vein or the right atrium of the heart.***

Cont…

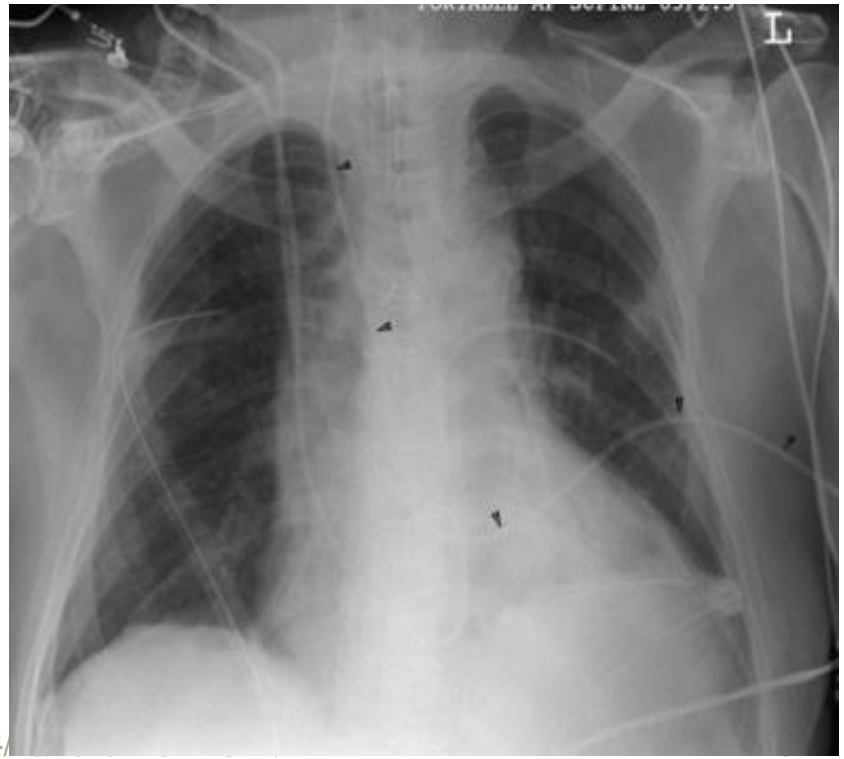
Chest drain insertions

- ***Chest drains*** are used for ***drainage of pneumothorax*** or ***pleural effusion***,
  - either **spontaneous** or **following surgery.**
- An ***AP-erect image*** is required to show:-
  - ✓ the ***position of the tube***, and
  - ✓ any ***residual air*** within the thorax.

Cont…

Fig; ***AP-supine radiograph show:-***

- *bilateral basal chest drains,*
- *endotracheal tube,*
- *right jugular central venous catheter and a pulmonary artery catheter.*



Abdomen

- **AXR** is required in cases of ***acute abdominal pain*** or ***following surgery***, to determine:-
  - ✓ **Gaseous distension** of any part of the GIT
  - ✓ **Free gas or fluid** in the peritoneal cavity
  - ✓ ***Fluid levels*** in the intestine
  - ✓ ***Localization*** of radio-opaque ***foreign body***
  - ✓ ***Evidence of aortic aneurism***

Cont…

- **Recommended projections:-**
  - **Free gas** in the peritoneal cavity;
    - ✓ **AP chest**, patient erect
    - ✓ **AP abdomen**, patient supine
    - ✓ **AP/PA left lateral decubitus**
  - **Fluid levels;**
    - ✓ **AP abdomen**, patient erect

Cont…

- ***Radio-opaque foreign bodies;***
  - ✓**AP abdomen**, patient supine
- ***Aortic aneurism:-***
  - ✓**AP abdomen,** patient supine
  - ✓**Lateral**(dorsal dicubitus)

Cont…

AP- supine abdomen

- **Position of patient & cassette:-**
  - ✓With the ***patient supine***, a grid cassette is carefully positioned under the abdomen.
  - ✓Include the ***symphysis pubis on the lower edge of the image***.
- **CR:-**
  - ✓Direct the central ray ***perpendicular to iliac crest*** & right angle to the cassette
  - ✓Exposure made on ***arrested expiration***

AP-supine abdomen…

AP-supine abdomen…

A) Supine abdomen x-ray showing ***small bowel obstruction***

B) Supine abdomen x-ray showing ***distal colonic obstruction***

Cont…

AP erect abdomen

- **Position of patient & cassette:-**
  - ✓ Depending on the ***patient's medical condition***, assist the patient to adopt an ***erect or semi-erect position.***
  - ✓ The **patient's thighs are moved out** of the beam
  - ✓ A **35x43-cm grid cassette** is placed against the posterior aspect of the patient,

Cont…

AP erect abdomen…

- **CR:-**
  - ✓Direct the central ray ***horizontally to the center of the cassette,***
  - ✓With ***care taken to avoid grid cut-off***

AP erect abdomen…

- **AP-erect** radiograph of abdomen showing ***small bowel obstruction.***

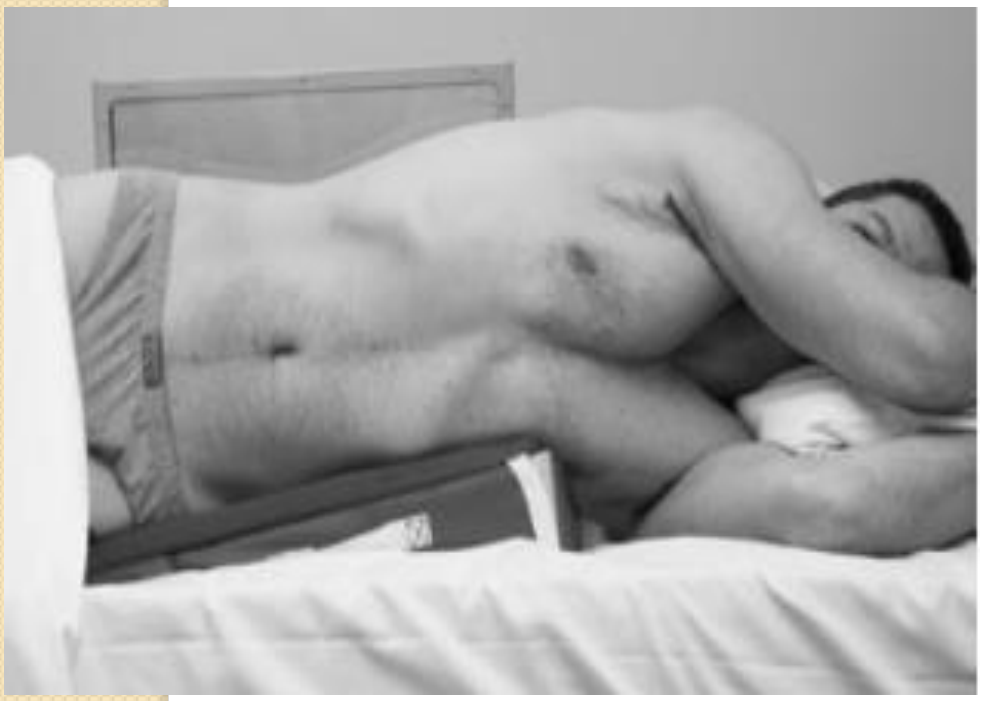
Cont…

AP (left lateral decubitus)

- **Position of patient & cassette:-**
  - ✓ The patient is turned ***on to the left side***, ideally ***for 20 minutes.***
  - ✓ The ***grid cassette*** is supported vertically against the posterior aspect of the patient
- **CR:-**
  - ✓ Directed ***horizontally at right angle to the center of a 35x43 cm cassette.***

AP (left lateral decubitus)…

- **AP-**left lateral decubitus image of the abdomen showing ***free air*** in the abdominal cavity.



Cont…

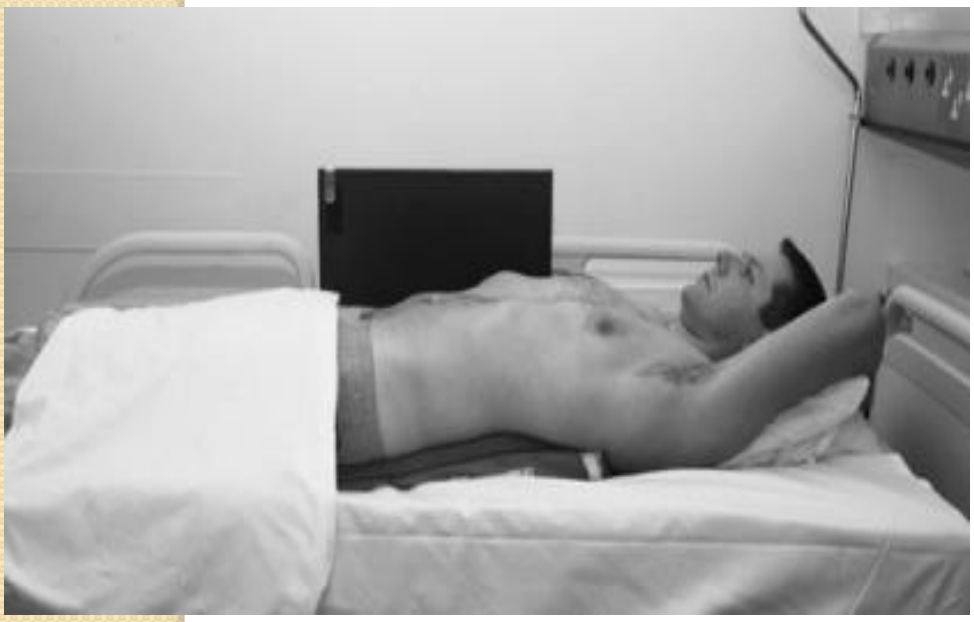
Lateral-dorsal decubitus-supine

- **Position of patient and cassette:-**
  - ✓ The patient lies ***supine position***
  - ✓ The ***arms are extended and supported above the head***
  - ✓ A grid cassette is supported vertically against the lateral aspect of the abdomen
- **CR:**
  - ✓ Direct the ***central ray horizontally perpendicular to the center of the cassette***

Cont…

Lateral dorsal decubitus…

- image of the abdomen showing ***free air*** in the peritoneal cavity lying adjacent to the anterior abdominal wall

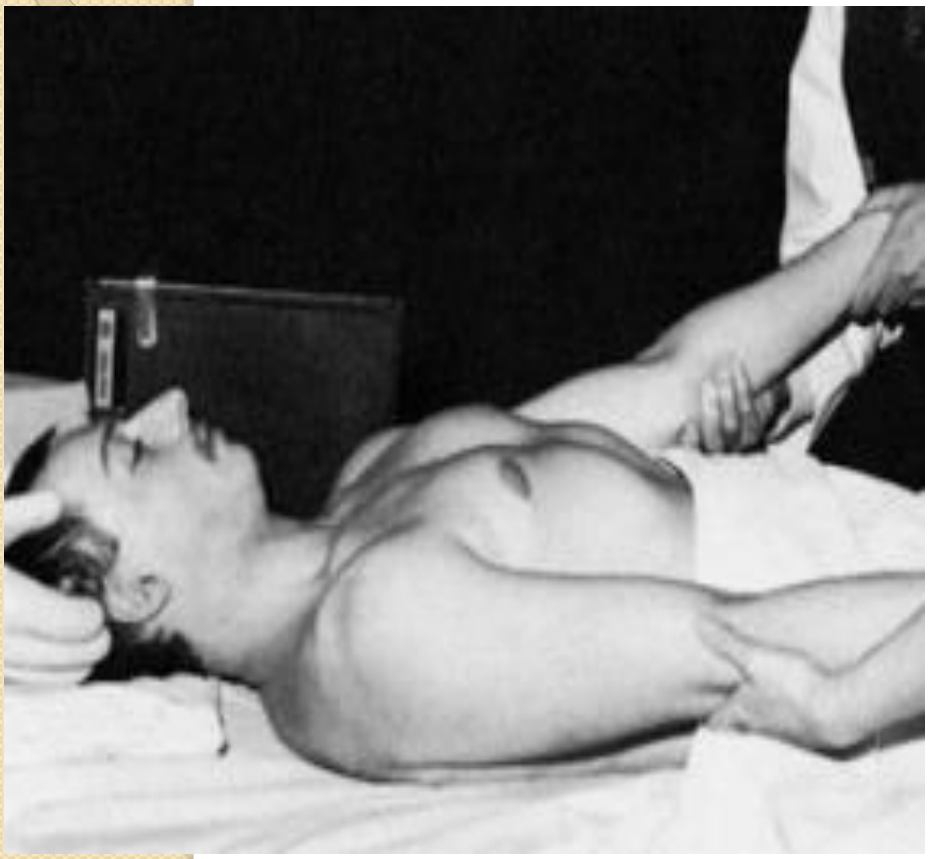


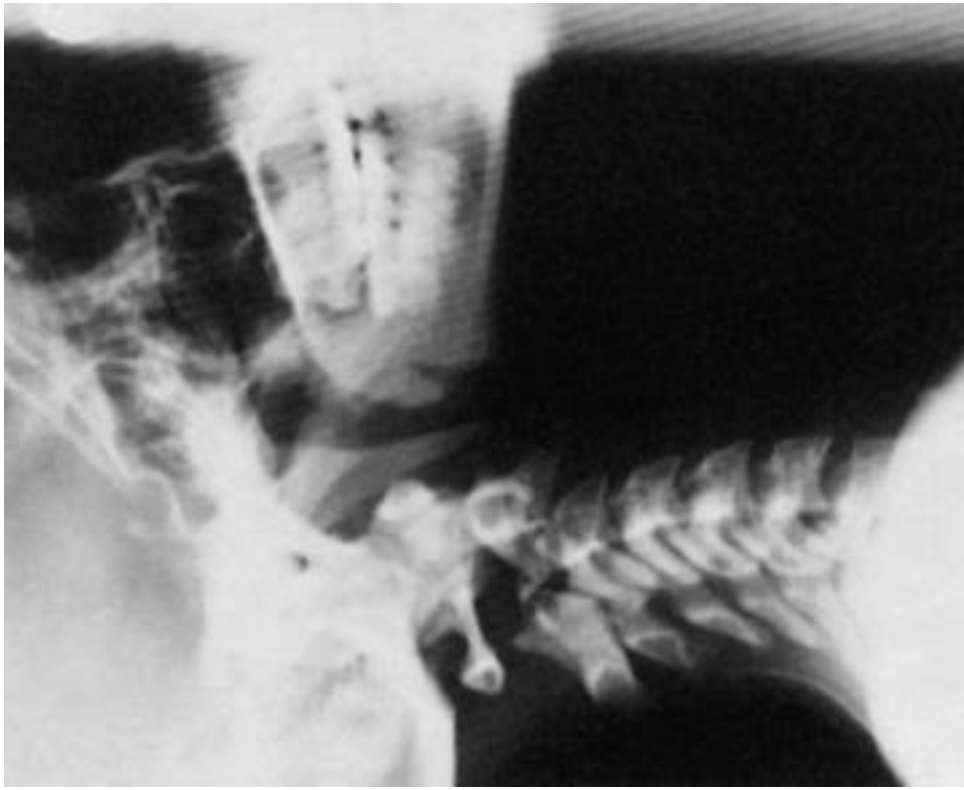
Cervical spine

Lateral-supine

- **Position of patient and cassette**
  - With the patient in the **supine position**, cassette is supported vertically against either shoulder.
  - The cassette is secured in position using a holder.
  - The ***patient's shoulders must be depressed***.
- **CR:**
  - Direct the ***horizontal central ray perpendicular to C_4.***

Cont…
Lateral spine





Fractured lower limbs and pelvis

- For the limbs, ***two radiographs*** are taken at right angles to each other to:-
  - ✓ ***Check on the position***, and
  - ✓ ***Alignment of fractured bones.***

- Using **weights** and a **metal pulley rope** structure that is ***connected to the patient's bed.***

Cont…

AP

- **<u>Position of patient and cassette</u>:-**
  - The cassette is carefully positioned under the femur or lower leg.
  - The cassette is supported parallel to the femur or lower limb by the use of non-opaque pads.

Cont…

AP

- **CR:-**
  - **Direct the central ray *at right angle to the midline of the cassette*.**
  - With the ***central ray at right angles to the long axis of the bones*** in question.

Cont…

AP

Fig; AP postoperative image of hip joint following ***arthroplasty.***

Cont…

Fractured femur - Lateral

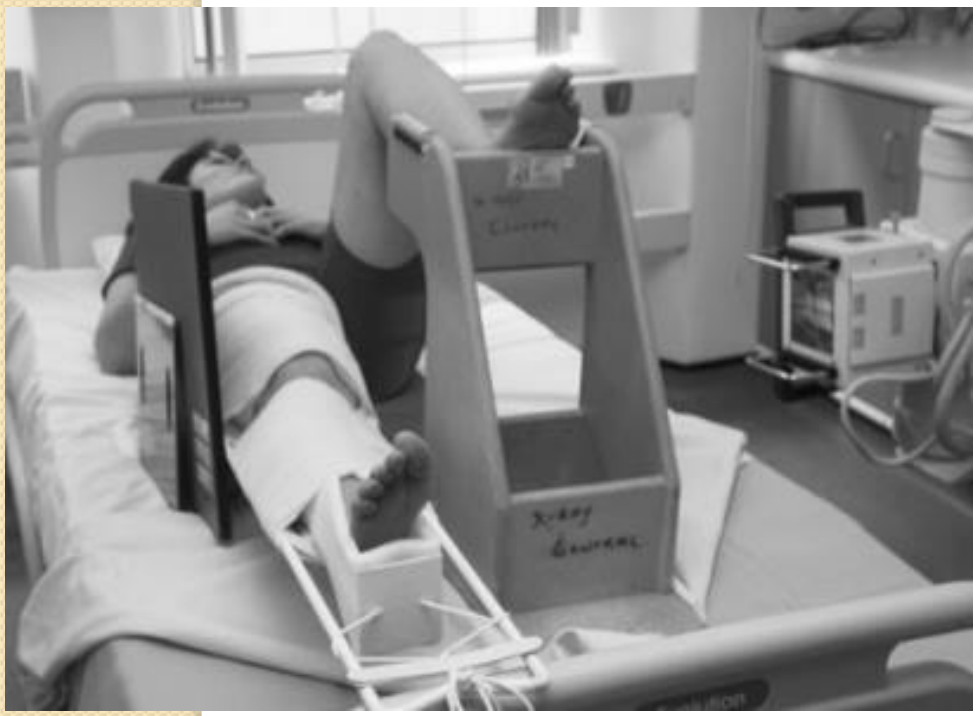
- **Position of patient and cassette:-**
  - When the examination is ***for the distal two-thirds of the femur***,
    - the **cassette** may be positioned **vertically against the medial side.**
  - When the proximal part of the ***shaft or the neck of the femur*** is being examined,
    - the cassette is positioned ***vertically against the lateral side of the thigh.***

Cont…

- **CR: -**
  - **For the distal two-thirds of the femur,**
    - **the horizontal central ray is *centered to the middle of the cassette.***
  - **For the neck of femur,**
    - **direct the CR perpendicular to *midway between the femoral pulse and greater trochanter.***

Fractured femur – Lateral…

- Patient positioned for ***lateral femur*** (knee up).
- Patient positioned for ***lateral hip*** with pelvis raised resting on a cassette tunnel device



Fractured femur – Lateral…

- Lateral image of a right fractured femur

- Lateral image of the knee following joint replacement

The end…

THANK YOU