



Radiology

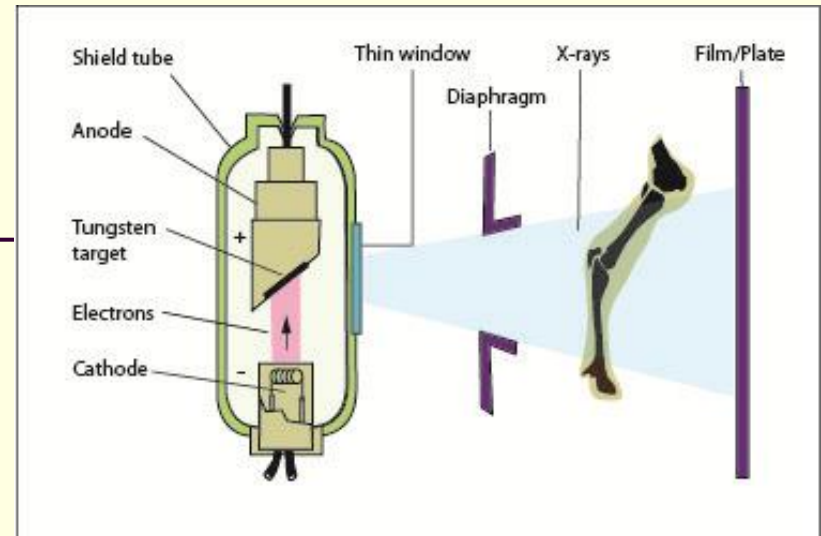
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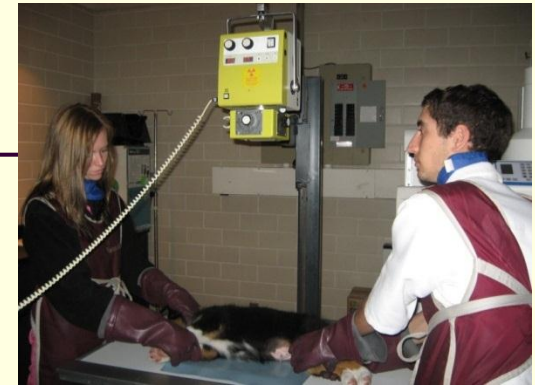
Objectives

- Determine the appropriate machine settings for making a radiograph
- Describe essential radiograph accessories
- Describe the positions used to perform radiographs from different views
- Describe safety precautions and discuss their importance

Terminology

- X-ray tube of radiograph machine
 - Vacuum tube
 - Cathode emits electrons
 - Anode collects electrons
 - Metal target on anode
 - Electron beam (electrical current) perpendicularly directed
 - X-rays (photons, radiation) emitted
 - Patient's tissues absorb
 - Strike patient and redirect (scatter radiation)
 - High voltage power source
 - 30-150 kilovolts (kV)





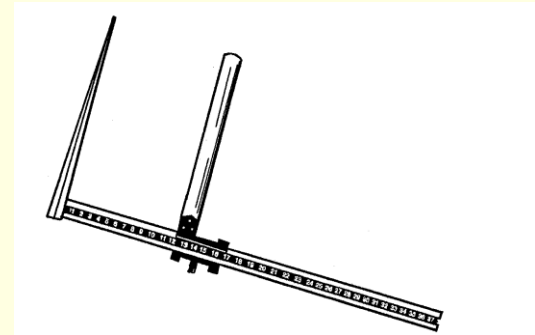
- Milliamperage (mA)
 - Unit of measure
 - Controls amount of emitted x-rays
 - $\text{mA} \times \text{exposure time (S)} = \text{mAs}$
- Kilovoltage peak (kVp)
 - Value of voltage
 - Controls radiographic contrast of image
 - High mAs and low kVp = black and white image
 - Too high mAs = black image (over-exposed)
 - Too low kVp = white image (under-exposed)
 - Low mAs and high kVp = gray image

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- Source to image distance (SID)
 - Distance from anode to receptor (film, plate)
 - Increase distance = decreases beam intensity
 - Lightens images
 - Requires increasing mAs settings
 - Decrease distance = increases beam intensity
 - Darkens images
 - Requires reducing mAs settings
 - Reduces radiation exposure to patient

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- X-ray scatter control (reduces x-ray dose exposure to patient and x-ray scatter)
 - Filtration device on x-ray tube
 - Filtration device of lead strips (x-ray grid)
 - Between anode and receptor (film, plate)
 - Requires increasing mAs settings
 - Requires increasing kVp setting for large animal thorax

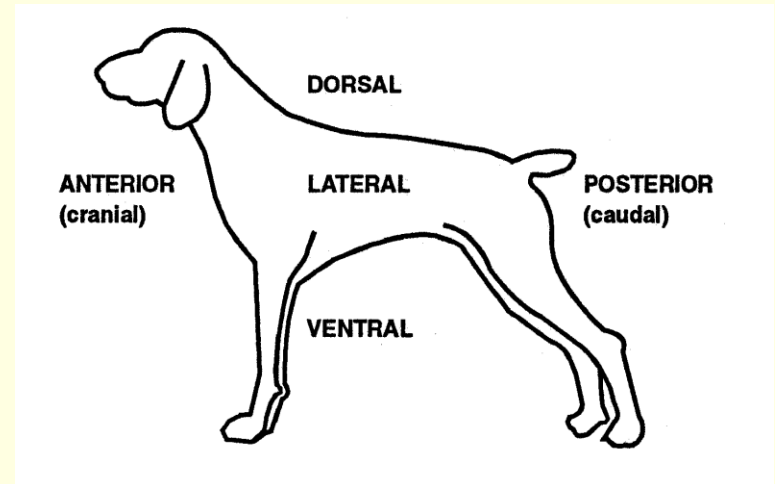
Determination of Machine Settings

- Measure thickness of patient's part
 - Caliper instrument in centimeters
- Use technique chart for thickness measurement
- Position machine settings
 - kVp
 - mA
 - Exposure time
- Set distance
- Set needle of voltage line meter
 - 1/16 inch above center line
 - Insures constant voltage coming into machine



Radiographic Positions

- Head, neck, body, tail
 - Dorsal – top view
 - Ventral – bottom view
 - Lateral – side view
- Leg
 - Anterior – front view
 - Posterior – back view
 - Lateral – outer side view
 - Medial – inner side view
- Two views
 - One plane
 - 90° angle to first view



Imaging Modalities

- Film/Screen Combinations
 - Cassette – holds film inside
 - Image produced on film – x-ray image (not visible)
 - Film development – image visible
 - Chemical, water, and drying times
- Computer Radiology (CR) or Digital Radiography (DR)
 - Cassette – holds phosphor plate
 - Image produced on plate – x-ray image (not visible)
 - Plate development – image visible
 - Plate in reader – laser reads and digitizes into digital image
 - Digital image – sent to computer for viewing and storing
 - Plate erased and refreshed for reuse – by exposure to light

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- Computerized Axial Tomography (CAT) or Computerized Tomography (CT) Scan
 - Utilizes x-rays
 - Produces cross-sectional images of soft tissue and bone
 - Ultrasonography (Ultrasound)
 - Utilizes sound waves
 - Produces images (sonograms) of soft tissues
 - Motion images
 - Still images
 - Magnetic Resonance Imaging (MRI) Scan
 - Utilizes radio waves
 - Produces images in any plane of body

Images and Tissue Density

- Black image – air
- Gray image – soft tissue
- White image – bone, minerals, sand, metal, dental enamel

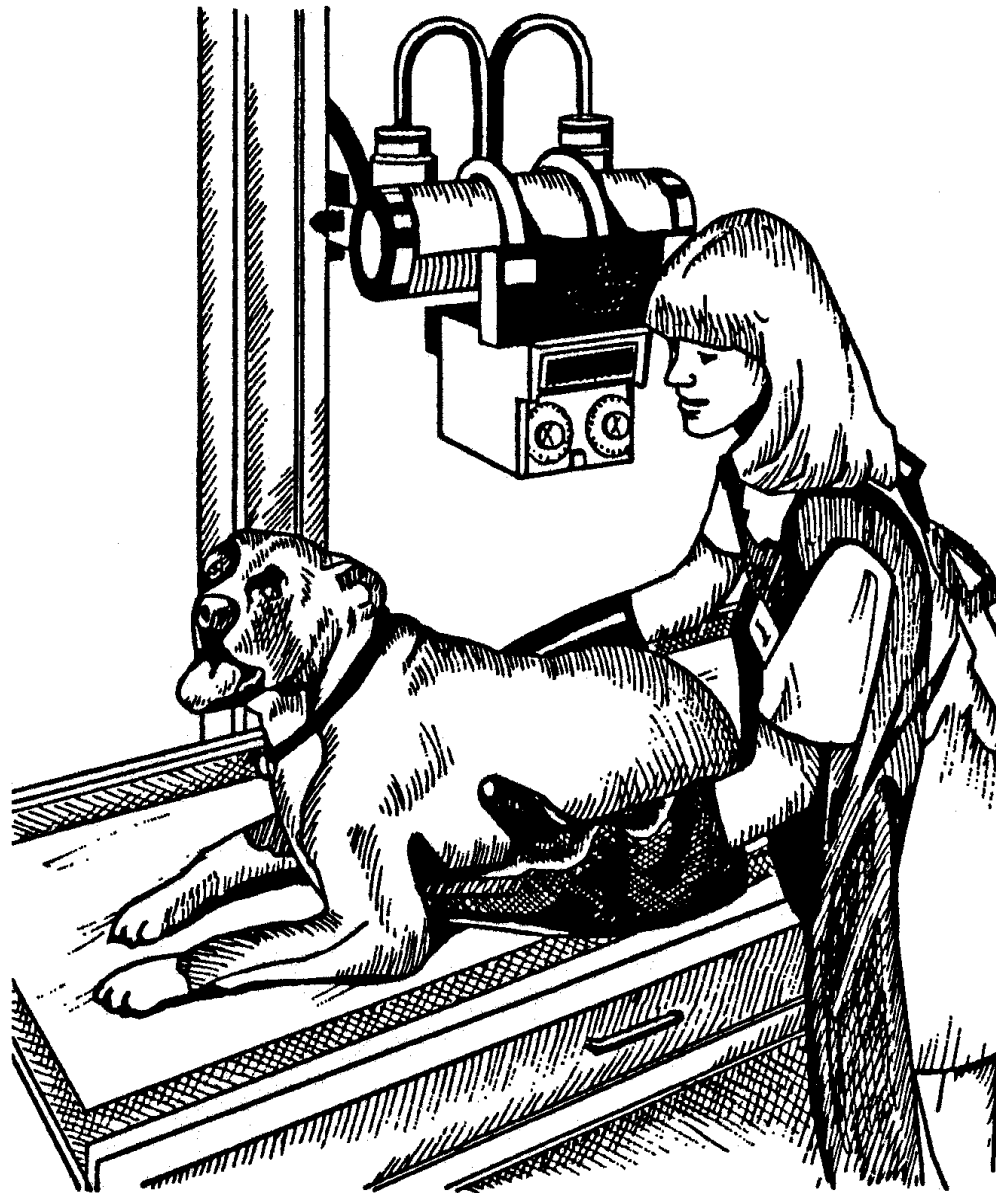
Patient Motion

- Voluntary motion (controlled motion) – restraint necessary
 - Looking around
 - Moving away
 - Moving extremities
 - Paddling
 - Pushing away
- Involuntary motion (uncontrolled motion) – reduce exposure time, increase mA
 - Heart beating
 - Breathing
 - Panting
 - Discomfort moving

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- Heart, lungs, and thorax images
 - Animal inhales – make exposure
 - Abdomen, pelvis, and spine images
 - Animal exhales – make exposure

Safety Devices and Precautions

- Remove anyone from the x-ray room that is not needed.
- Every person should wear a lead apron and lead gloves when holding the x-rayed animal.
- Check the condition of gloves and aprons periodically by using radiography to determine if they allow x-rays to pass through.
- Limit the beam to the size of the film with a cone or lead diaphragm.
- Do not direct the x-ray beam into another room or work area.
- Install an aluminum filter (1 to 2 mm thick) at the tube housing opening to eliminate radiation from useless wave lengths.
- Cover the bottom side of the x-ray table with lead to protect the feet.
- The hands should not be placed in the path of the direct beam.
- Do not use fluoroscopy when radiography will do the job. Fluoroscopy is more hazardous and requires additional safety precautions.



Lead Gloves and Aprons

- To help prevent deterioration of lead gloves and lead aprons:
 - Roll or drape apron over curved surface rather than folding it.
 - Store gloves by hanging or by placing cans with both ends open inside gloves to keep the gloves open and to allow moisture to evaporate.

