

## Radiographic Positioning of the Skull

Section objectives: Skull Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct a skull and/or sinus series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

### *Standard Skull Series - 4 view series*

- ☒ A-P skull (aka Towne)
- ☒ P-A skull (aka Caldwell)
- ☒ R lateral
- ☒ L lateral
- ☒ Basilar view (optional)

### *Sinus Series - 3 view series*

- ☒ P-A sinus (aka Caldwell)
- ☒ Waters
- ☒ Lateral (side closest to pain or left)

# Radiographic Positioning of the Skull

## A-P Skull (Towne View)

### PREPARE THE ROOM

Cassette: black, 10" x 12", lengthwise (tall, flash up)  
Tube: 40" FFD, 30° caudal tube tilt  
Technique: 80 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: Patient is fully gowned with no jewelry, hairpins, glasses, etc.  
Patient is supine and centered on the table.  
Depress chin to bring canthomeatal line perpendicular to film.  
The sagittal plane should be perpendicular to film.  
Central ray: 6 cm above the superciliary arch at the hairline, through the foramen magnum.  
Collimation: To skull size.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P skull.

- ◆ Entire skull visualized on the radiograph.
- ◆ Equal distance from foramen magnum to lateral edge of skull on both sides.
- ◆ Dorsum sella and posterior clinoids projected into foramen magnum.
- ◆ Symmetrical petrous ridges visualized superior to mastoids.
- ◆ Occipital bone visualized.
- ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.

# Radiographic Positioning of the Skull

## P-A Skull (Caldwell)

### PREPARE THE ROOM

Cassette: black, 10" x 12", lengthwise (tall, flash up)  
Tube: 40" FFD, 15° caudal tube tilt  
Technique: 80 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: Patient is fully gowned with no jewelry, hairpins, glasses, etc.  
Patient prone and centered on table with the canthomeatal line perpendicular to the film.  
The sagittal plane should be perpendicular to film.  
Central ray: Center the cassette to the nasion and the tube to the center of the film.  
Collimation: To skull size.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: P-A skull.

- ◆ Entire skull visualized on the radiograph.
- ◆ Equal distance from oblique orbital line to lateral edge of skull on both sides.
- ◆ Superior orbital fissures symmetrically visualized within orbits.
- ◆ Petrous pyramids projected into lower one third of orbits.
- ◆ Frontal bone visualized.
- ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.

# Radiographic Positioning of the Skull

## Lateral Skull

### PREPARE THE ROOM

Cassette: black, 10" x 12", crosswise (wide, flash up)  
Tube: 40" FFD, no tube tilt  
Technique: 80 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: Patient is fully gowned with no jewelry, hairpins, glasses, etc.  
Patient semi-prone and centered on table with the sagittal plane parallel to the film, side to be examined down.  
The infraorbital meatal line should be perpendicular to the front edge of the cassette.  
Central ray: Approximately 5cm superior to external auditory meatus.  
Collimation: To skull size.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral skull.

- ◆ Entire skull visualized on the radiograph.
- ◆ Cranium is seen without rotation or tilt when mandibular rami, orbital roofs, greater and lesser wings of the sphenoid are superimposed.
- ◆ Parietal bone visualized.
- ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.
- ◆ R and L laterals are routinely performed.

# Radiographic Positioning of the Skull

## Basilar Skull

### PREPARE THE ROOM

Cassette: black, 10" x 12", lengthwise (tall, flash up)  
Tube: 40" FFD, no tube tilt  
Technique: 80 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: Patient is fully gowned with no jewelry, hairpins, glasses, etc.  
Patient in chair approximately 1 foot in front of upright bucky.  
Extend neck so that vertex of skull touches bucky.  
Infraorbital meatal line should be parallel to film.  
Central ray: Midway between angles of mandibles approximately 8cm inferior to  
mandibular symphysis.  
Collimation: To skull size.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Basilar skull.

- ◆ Entire skull visualized on the radiograph.
- ◆ Mandibular symphysis superimposes anterior frontal bone.
- ◆ Distance along coinciding mandibular surface to lateral border of skull are equal.
- ◆ Mandibular condyles projected anterior to petrous pyramids.
- ◆ Foramen ovale and spinosum visualized.
- ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.

# Radiographic Positioning of the Sinuses

## Water's View

### PREPARE THE ROOM

Cassette: black, 8" x 10", lengthwise (tall, flash up)  
Tube: 40" FFD, no tube tilt  
Technique: 80 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: Patient is fully gowned with no jewelry, hairpins, glasses, etc.  
Have patient extend neck so that chin touches bucky and mentomeatal line is perpendicular to the film.  
Midsagittal plane should be perpendicular to film.  
Central ray: Center cassette to acanthion and center tube to cassette.  
Collimation: To skull size.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Water's view.

- ◆ Are sinuses visualized on the radiograph.
- ◆ Distance along lateral orbital margin to lateral border of skull are equal.
- ◆ Petrous ridges below maxillary sinuses.
- ◆ Inferior orbital rim clearly visualized.

Patient identification and R/L marker should be clearly visible without blocking anatomy.

## Radiographic Positioning of the Shoulder

Section objectives: Clavicle Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 2 view clavicle series and ancillary views including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Clavicle Series – 2 view series*

- ◆ AP Clavicle
- ◆ AP Clavicle Axial Projection

# Radiographic Positioning of the Shoulder

## AP Clavicle

### PREPARE THE ROOM

Cassette: black, 10" x 12", CW (flash lateral)  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned with no jewelry, hairpins, glasses, etc. Patient positioned with back flat against bucky, or supine. Center the clavicle to the midline of the table or vertical grid device. Place arms at sides and adjust shoulders to lie in the same horizontal plane  
Central ray: Direct at mid clavicle and center film to this.  
Collimation: Open to cassette size (apex of lung and humeral head should be visible).  
Marker: R or L.

### EXPOSURE

Patient directions: "Take a breath in now blow it all the way out.  
Hold still, don't move" – expose.

### EVALUATION CRITERIA: AP Clavicle

- ◆ Frontal image of the clavicle with the lateral half above the scapula, and the medial half superimposing the thorax when the central ray is perpendicular to film.
- ◆ Coracoid process should be centered on the radiograph.
- ◆ Collimation should include lung apex and humeral head.
- ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.

# Radiographic Positioning of the Shoulder

## AP Clavicle (Axial Projection)

### PREPARE THE ROOM

Cassette:	black, 10" x 12", CW (flash lateral)
Tube:	40" FFD, 15° cephalad tube tilt
Technique:	70 kVp, small focal spot
Measure:	through central ray
Filter/shield:	gonad (½ apron)

### PREPARE THE PATIENT

Position:	R or L, patient is fully gowned with no jewelry, hairpins, glasses, etc. Patient positioned with back flat against bucky, or supine. Center the clavicle to the midline of the table or vertical grid device. Place arms at sides and adjust shoulders to lie in the same horizontal plane
Central ray:	Direct at mid clavicle and center film to this.
Collimation:	Open to cassette size (apex of lung and humeral head should be visible).
Marker:	R or L.

### EXPOSURE

Patient directions: "Take a deep breath in and hold. Hold still, don't move" – expose.

### EVALUATION CRITERIA: AP Clavicle (Axial Projection)

- ◆ An axial image with most of the clavicle projected above the ribs and scapula, the medial end overlapping the first and second ribs.
- ◆ The clavicle in a horizontal placement, including the acromioclavicular and sternoclavicular joints.
- ◆ Collimation should include lung apex and humeral head.
- ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.

**Note:** Standing patient 15-25° of central ray angulation, supine patient 25-30°. Thinner patients require more angulation to project the clavicle off the scapula and ribs.  
This view can also be imaged in a lordotic position standing with no tube tilt

# Radiographic Positioning of the Shoulder

## PA CLAVICLE

Special erect projection of the clavicle

### PREPARE THE ROOM

Cassette: black, 10" x 12", CW (flash lateral)  
Tube: 40" FFD, 10° caudal tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned with no jewelry, hairpins, glasses, no bra. Patient positioned in a PA position facing the bucky. A slight anterior oblique (RAO or LAO) corresponding to the side being imaged will prevent foreshortening of the clavicle. Note: If you wish to image the **right** clavicle have the patient place the **right** A-C joint against the bucky. Rotate the **left** shoulder 10 or 15 degrees **away** from the bucky. Center the right clavicle to the midline of the vertical grid device. Keep right arm down by side, raise left arm up and turn face to left for comfort.

Central ray: Direct at mid clavicle and center film to this.  
Collimation: Open to cassette size (apex of lung and humeral head should be visible).  
Marker: R or L.

## Radiographic Positioning of the Shoulder

Section objectives: Shoulder Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 3 view shoulder series and ancillary views including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

### *Standard Shoulder Series – 3 view series*

- ◆ Internal Rotation                      The 40° patient rotation is known as the GRASHEY position.
- ◆ External Rotation
- ◆ Baby Arm

# Radiographic Positioning of the Shoulder

## Internal Rotation

### PREPARE THE ROOM

- Cassette: black, 8" x 10", LW (flash up)  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through coracoid process  
Filter/shield: gonad (½ apron), stop primary beam leak beyond the shoulder.

### PREPARE THE PATIENT

- Position: R or L, patient is fully gowned with no jewelry, hairpins, glasses, etc. Rotate patient approximately 40° so that affected scapula is flat against bucky. Internally rotate the humerus and place the back of the hand against the thigh, or bend elbow 90° and place forearm on abdomen.  
Central ray: Direct at coracoid process and center film to this.  
Collimation: Open to cassette size (apex of lung should be visible).  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Internal Rotation

- ◆ Proximal 1/3 of humerus, upper scapula and lateral 2/3 of clavicle should be included with collimation visible on all four sides.
- ◆ Coracoid process should be the center of the collimated field.
- ◆ This is the lateral view of the proximal humerus as seen by the lesser tubercle in profile medially, and the greater tubercle superimposed over the humeral head.
- ◆ Optimum exposure should sharply demonstrate bone and trabeculae. Soft tissue should be seen well enough to visualize calcifications.
- ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.

# Radiographic Positioning of the Shoulder

## External Rotation

### PREPARE THE ROOM

- Cassette: black, 8" x 10", LW (flash up)  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through coracoid process  
Filter/shield: gonad (½ apron), stop primary beam leak beyond the shoulder.

### PREPARE THE PATIENT

- Position: R or L, patient is fully gowned with no jewelry, hairpins, glasses, etc. Rotate patient approximately 40° so that affected scapula is flat against bucky. Externally rotate the humerus and place the back of the hand against the thigh, or bend elbow to 90° and externally rotate.  
Central ray: Direct at coracoid process and center film to this.  
Collimation: Open to cassette size (apex of lung should be visible).  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: External Rotation

- ◆ Proximal 1/3 of humerus, upper scapula and lateral 2/3 of clavicle should be included with collimation visible on all four sides.
- ◆ Coracoid process should be the center of the collimated field.
- ◆ This is the frontal view of the proximal humerus with the greater tubercle seen in profile laterally, and the lesser tubercle superimposed over the humeral head.
- ◆ Optimum exposure should sharply demonstrate bone and trabeculae. Soft tissue should be seen well enough to visualize calcifications.

Patient identification and R/L marker should be clearly visible without blocking anatomy.

# Radiographic Positioning of the Shoulder

## Baby Arm

### PREPARE THE ROOM

Cassette: black, 10" x 12", CW (flash lateral)  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through coracoid process  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned with no jewelry, hairpins, glasses, etc. Patient positioned with back flat against bucky. Patient flexes the elbow to 90° then externally rotates and abducts the arm to bring the elbow level with the shoulder.  
Central ray: Direct at coracoid process and center film to this.  
Collimation: Open to cassette size (apex of lung should be visible).  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Baby Arm

- ◆ Proximal 1/3 of humerus, upper scapula and lateral 2/3 of clavicle should be included with collimation visible on all four sides.
- ◆ Coracoid process should be the center of the collimated field.
- ◆ This is the frontal view of the proximal humerus with the greater tubercle seen in profile laterally, and the lesser tubercle superimposed over the humeral head.
- ◆ Optimum exposure should sharply demonstrate bone and trabeculae. Soft tissue should be seen well enough to visualize calcifications.
- ◆ Collimation must include lung apex and C7 to rule out cervical rib.

Patient identification and R/L marker should be clearly visible without blocking anatomy.

## Radiographic Positioning of the Humerus

Section objectives: Humerus Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 2 view humerus series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Humerus Series – 2 view series*

- ◆ AP Humerus
- ◆ Lateral Humerus

# Radiographic Positioning of the Humerus

## A-P Humerus

### PREPARE THE ROOM

Cassette: black/gray, 14" x 17", LW  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned with no jewelry, hairpins, glasses, etc. Patient can be erect or supine. Adjust film so the shoulder and elbow joints are equidistant from the cassette edge. Rotate patient so that the shoulder and proximal humerus are as close to the cassette as possible. Abduct arm slightly and supinate hand until humeral epicondyles are parallel to the film. Arm is in anatomic position.  
Central ray: Perpendicular to the film and midpoint of the humerus.  
Collimation: Open to full cassette vertically, side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P Humerus

- ◆ The entire humerus including elbow and shoulder joints should be included with collimation margins on all four sides.
- A true AP is evidenced by:
- ◆ The greater tubercle seen in profile laterally, the humeral head seen in profile medially with only minimal superimposition of the glenoid cavity.
  - ◆ The outline of the lesser tubercle seen just medial to the greater tubercle, and the lateral and medial epicondyles are seen in profile.
  - ◆ Optimum exposure should demonstrate bone and soft tissue density.
  - ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy.

# Radiographic Positioning of the Humerus

## Lateral Humerus

### PREPARE THE ROOM

Cassette: black/gray, 14" x 17", LW  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned with no jewelry, hairpins, glasses, etc. Patient can be erect or supine (erect may be easier on the patient). If erect, patient should face film, which allows close contact between humerus and the film, flex elbow to 90° and place hand on stomach. Adjust film so the shoulder and elbow joints are equidistant from the cassette edge. Humeral epicondyles should be perpendicular to the film.  
Central ray: Perpendicular to the film and midpoint of the humerus.  
Collimation: Open to full cassette vertically, side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Humerus

- ◆ The entire humerus including elbow and shoulder joints should be included with collimation margins on all four sides.
- A true lateral is evidenced by:
- ◆ The lesser tubercle seen in profile medially partially superimposed by the lower portion of the glenoid cavity.
  - ◆ The lateral and medial epicondyles are directly superimposed.
  - ◆ Optimum exposure should demonstrate both bone and soft tissue density.
  - ◆ Patient identification and R/L marker should be clearly visible without blocking anatomy

## Radiographic Positioning of the Elbow

Section objectives: Elbow Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 4 view elbow series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Elbow Series – 4 view series*

◆ AP Elbow

◆ Medial Oblique Elbow

◆ Lateral Elbow

◆ Tangential Elbow

Optional Elbow View

◆ Radial Head - Capitellum

# Radiographic Positioning of the Elbow

## A-P Elbow

### PREPARE THE ROOM

Cassette: gray, ½ of 10" x 12" (crosswise)  
Tube: 40" FFD, no tube tilt  
Technique: 65 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, cover ½ of film with Pb vinyl for use with medial oblique.  
Patient seated at end of table with arm fully extended, hand supinated.  
The elbow joint should be centered in the middle of the uncovered side of the cassette. Proper position will have shoulder at table level, and both humeral epicondyles equidistant from cassette surface.  
Central ray: Perpendicular to film through cubital fossa (just distal to elbow crease).  
Collimation: Open to full cassette vertically (1/2 being used), side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P Elbow

- ◆ Elbow joint space should be centered on exposed area of film with collimation margins on all four sides.
- ◆ The long axis of the arm should be aligned to the long axis of the half of exposed film.
- ◆ The epicondyles are seen in profile with the medial epicondyle the most prominent.
- ◆ Optimum exposure and penetration with no motion should visualize sharp bone margins.
- ◆ Trabecular marking should appear clear and sharp.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Elbow

## Medial Oblique Elbow

### PREPARE THE ROOM

Cassette: gray, ½ of 10" x 12" (crosswise)  
Tube: 40" FFD, no tube tilt  
Technique: 65 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, cover ½ of film with Pb vinyl used for AP elbow.  
Patient seated at end of table with elbow fully extended, hand pronated.  
The elbow joint should be centered in the middle of the uncovered side of the cassette. Proper position will have shoulder at table level humeral epicondyles 45° to the cassette surface, and hand pronated.  
Central ray: Perpendicular to film through the cubital fossa(just distal to elbow crease).  
Collimation: Open to full cassette vertically (1/2 being used), side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Medial Oblique Elbow

- ◆ Elbow joint space should be centered on exposed area of film with collimation margins on all four sides.
- ◆ The long axis of the arm should be aligned to the long axis of the half of exposed film.
- ◆ The medial epicondyle and the trochlea should appear elongated and in partial profile.
- ◆ Optimum exposure and penetration with no motion should visualize sharp bone margins.
- ◆ Trabecular marking should appear clear and sharp.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Elbow

## Lateral Elbow

### PREPARE THE ROOM

- Cassette: gray,  $\frac{3}{4}$  of 10" x 12", (crosswise)  
Tube: 40" FFD, no tube tilt  
Technique: 65 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

### PREPARE THE PATIENT

- Position: R or L, cover  $\frac{1}{4}$  of film with Pb vinyl to use with tangential elbow. Patient seated at end of table with elbow flexed 90°, thumb pointing to ceiling. The elbow joint should be positioned in the corner of the uncovered cassette. Proper position will have shoulder at table level, both humerus and ulna flat on the cassette with thumb sticking into the air.
- Central ray: Perpendicular to film about 1" distal to the lateral epicondyle of the humerus.
- Collimation: Open to full cassette to image as much of the radius and ulna as possible.
- Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Elbow

- ◆ Elbow joint space should be in the corner on the exposed area of film with collimation margins on all four sides.
- ◆ A true lateral is evidenced by three concentric arcs: the trochlear sulcus, the ridge of the capitellum and the trochlear notch of the ulna.
- ◆ The olecranon process should be visualized in profile, and part of the radial head will be superimposed by the coronoid process.
- ◆ Optimum exposure and penetration with no motion should visualize sharp bone margins.
- ◆ Trabecular marking should appear clear and sharp.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Elbow

## Tangential Elbow (Jones)

### PREPARE THE ROOM

- Cassette: gray,  $\frac{1}{4}$  of 10" x 12", (crosswise)  
Tube: 40" FFD, no tube tilt  
Technique: 65 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

### PREPARE THE PATIENT

- Position: R or L, cover  $\frac{3}{4}$  of film with Pb vinyl used for lateral elbow.  
Patient seated at end of table with elbow fully flexed, fingers resting on shoulder. The elbow joint should be positioned in the corner of the uncovered cassette. Proper position will have shoulder at table level, humerus parallel to film.
- Central ray: Perpendicular to film directed to a point that is midway between the condyles.
- Collimation: Open to soft tissue.
- Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Tangential Elbow (Jones)

- ◆ Collimation margins on all four sides.
- ◆ The medial and lateral epicondyles, distal margin of the trochlea, capitellum and olecranon process should appear in profile.
- ◆ Optimum exposure and penetration with no motion should visualize sharp bone margins.
- ◆ Trabecular marking should appear clear and sharp.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Elbow

## Radial Head - Capitellum

### PREPARE THE ROOM

Cassette: gray, 8" x 10", CW  
Tube: 40" FFD, 45° medial tube tilt  
Technique: 65 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, cover  $\frac{3}{4}$  of film with Pb vinyl used with lateral elbow.  
Patient seated at end of table with elbow flexed, thumb pointing to ceiling.  
The elbow joint should be positioned in the center of the cassette. Proper position will have shoulder at table level, both humerus and ulna flat on the cassette with thumb sticking into the air.  
Central ray: Pointing at the radial head.  
Collimation: Open to soft tissue vertically, side-to-side to area of interest.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Radial Head - Capitellum

- ◆ Collimation margins on all four sides.
- ◆ The radial head should appear without superimposition by the ulna.
- ◆ Optimum exposure and penetration with no motion should visualize sharp bone margins.
- ◆ Trabecular marking should appear clear and sharp.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Forearm

Section objectives: Forearm Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 2 view forearm series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Forearm Series – 2 view series*

- ◆ A-P Forearm
- ◆ Lateral Forearm

# Radiographic Positioning of the Forearm

## A-P Forearm

### PREPARE THE ROOM

Cassette: gray, ½ of 11" x 14", LW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, cover ½ of film with Pb vinyl.  
Patient seated close to the table with forearm resting on cassette, hand supinated, with humeral epicondyles equidistant from the film. Entire arm parallel to film plane.  
Central ray: Perpendicular to film directed to midpoint of the forearm.  
Collimation: Include elbow joint and proximal carpals if possible, side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P Forearm

- ◆ View should demonstrate the elbow joint, the radius and ulna, the proximal row of carpals slightly distorted, and the distal humerus.
- ◆ Slight superimposition of the radial head, neck, and tuberosity over the proximal ulna.
- ◆ No elongation or foreshortening of the humeral epicondyles.
- ◆ Soft tissue densities and bony trabeculation of the proximal and distal forearm.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Forearm

## Lateral Forearm

### PREPARE THE ROOM

Cassette: gray, ½ of 11" x 14", LW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, cover ½ of film with Pb vinyl.  
Patient seated close to the table with forearm resting on cassette, with shoulder joint and elbow in the same plane. This permits the ulna to rotate to the lateral position.  
Flex the elbow 90°, with the thumb directed toward the ceiling.  
Central ray: Perpendicular to film directed to midpoint of the forearm.  
Collimation: Include elbow joint and proximal carpals if possible, side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Forearm

- ◆ View should demonstrate the elbow joint, the radius and ulna, the proximal row of carpals slightly distorted, and the distal humerus.
- ◆ Superimposition of the radius and ulna at their distal ends.
- ◆ Superimposition by the radial head over the coronoid process.
- ◆ Superimposed humeral epicondyles.
- ◆ Radial tuberosity facing anteriorly.
- ◆ Elbow flexed to 90 degrees.
- ◆ Soft tissue densities and bony trabeculation of the proximal and distal forearm.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Wrist

Section objectives: Wrist Series

At the conclusion of this course the student doctor should;

3. Be able to efficiently conduct all parts of a 4 view wrist series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
4. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Wrist Series – 4 view series*

◆ 4 ◆ Lat	3 Ulnar flexion
1 PA	2 OBL

- ◆ PA Wrist
- ◆ Medial Oblique Wrist
- ◆ Ulnar Flexion Wrist
- ◆ Lateral Wrist

10x12 wide  
flash up

# Radiographic Positioning of the Wrist

## P-A Wrist

### PREPARE THE ROOM

Cassette: gray,  $\frac{1}{4}$  of 10" x 12", CW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

### PREPARE THE PATIENT

Position: R or L, cover  $\frac{3}{4}$  of film with Pb vinyl.  
Patient seated at end of table with wrist resting on cassette, palm down.  
Patient should make a loose fist to lower carpal arch to the cassette.  
Forearm parallel to film plane.  
Central ray: Perpendicular to film directed into the mid-carpal area.  
Collimation: Open 2" proximal and distal of wrist, side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: P-A Wrist

- ◆ The distal radius, ulna and all carpals at least to mid-metacarpal area should be visualized, centered to the mid-portion and to the long axis on unmasked area of film, with collimation margins on all four sides.
- ◆ A true PA is evidenced by equal concavity shapes on each side of shafts of proximal metacarpals.
- ◆ The scaphoid fat stripe will be evidenced lateral to the scaphoid and trabecular detail will be evident.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Wrist

### Pronated or Medial Oblique Wrist (Tea Cup View)

#### PREPARE THE ROOM

Cassette: gray,  $\frac{1}{4}$  of 10" x 12", CW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

#### PREPARE THE PATIENT

Position: R or L, cover  $\frac{3}{4}$  of film with Pb vinyl.  
Patient seated at end of table with little finger resting on the cassette, thumb side of hand raised to 45°.  
Central ray: Perpendicular to film directed into the mid-carpal area.  
Collimation: Open 2" proximal and distal of wrist, side-to-side to soft tissue.  
Marker: R or L.

#### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

#### EVALUATION CRITERIA: Medial Oblique Wrist

- ◆ The distal radius, ulna and all carpals at least to mid-metacarpal area should be visualized, centered to the mid-portion and to the long axis on unmasked area of film, with collimation margins on all four sides.
- ◆ The soft tissue and trabecular detail will be evident.
- ◆ The trapezium in its entirety should be well visualized as well as the scaphoid which only has slight superimposition of the other carpals.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Wrist

## Lateral Wrist

### PREPARE THE ROOM

- Cassette: gray,  $\frac{1}{4}$  of 10" x 12", CW (use quadrant containing flash ID)  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

### PREPARE THE PATIENT

- Position: R or L, cover  $\frac{3}{4}$  of film with Pb vinyl.  
Patient seated at end of table with medial portion of the wrist resting on the cassette in the corner with the flash. Patient should have radial and ulnar styloids exactly perpendicular to the film, wrist in neutral position.  
Central ray: Perpendicular to film directed into the mid-carpal area.  
Collimation: Open 2" proximal and distal of wrist, side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Wrist

- ◆ The distal radius, ulna and all carpals at least to mid-metacarpal area should be visualized, centered to the mid-portion and to the long axis on unmasked area of film, with collimation margins on all four sides.
- ◆ The soft tissue and trabecular detail will be evident.
- ◆ A true lateral will be evidenced by the ulnar head being directly superimposed by the radius, and superimposition of the metacarpals.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Wrist

## Ulnar Flexion Wrist

### PREPARE THE ROOM

Cassette: gray,  $\frac{1}{4}$  of 10" x 12", CW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

### PREPARE THE PATIENT

Position: R or L, cover  $\frac{3}{4}$  of film with Pb vinyl.  
Patient seated at end of table with wrist resting on the cassette, palm down. Patient should point fingers toward ulnar side as far as possible, and make a loose fist to lower the carpal arch to the cassette.  
Central ray: Perpendicular to film directed into the mid-carpal area.  
Collimation: Open 2" proximal and distal of wrist, side-to-side to soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Ulnar Deviation Wrist

- ◆ The distal radius, ulna and all carpals at least to mid-metacarpal area should be visualized, centered to the mid-portion and to the long axis on unmasked area of film, with collimation margins on all four sides.
- ◆ The soft tissue and trabecular detail will be evident.
- ◆ The scaphoid should be evident without distortion, with adjacent carpal interspaces open.
- ◆ There should only be minimal superimposition of the radioulnar joint.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Hand

Section objectives: Hand Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 3 view hand series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Hand Series – 3 view series*

- ◆ PA Hand
- ◆ Medial Oblique Hand
- ◆ Lateral Hand

# Radiographic Positioning of the Hand

## P-A Hand

### PREPARE THE ROOM

Cassette: gray, ½ of 10" x 12", CW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, cover ½ of film with Pb vinyl for use with the medial oblique.  
Patient seated with the hand pronated, wrist in a neutral position.  
Patient should have fingers slightly spread.  
Central ray: Perpendicular to film directed to the third metacarpophalangeal joint.  
Collimation: Open to soft tissues.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: P-A Hand

- ◆ Entire hand, wrist and distal forearm should be included with collimation margins on all four sides.
- ◆ Center of collimation field should be the third MCP joint.
- ◆ No rotation should be evidenced by symmetrical appearance of both sides, or concavities of the shafts of the metacarpals and phalanges (except 1<sup>st</sup>).
- ◆ The digits should be slightly separated with soft tissues not overlapping.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Hand

### Pronated or Medial Oblique Hand

#### PREPARE THE ROOM

Cassette: gray, ½ of 10" x 12", CW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

#### PREPARE THE PATIENT

Position: R or L, cover ½ of film with Pb vinyl for used with the PA.  
Patient seated with the ulnar side of the hand in contact with the cassette and rotated to 45°. The fingers can support the rotation if a positioning block is not used.  
Central ray: Perpendicular to film directed to the third metacarpophalangeal joint.  
Collimation: Open to soft tissues.  
Marker: R or L.

#### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

#### EVALUATION CRITERIA: Medial Oblique Hand

- ◆ Entire hand, wrist and distal forearm should be included with collimation margins on all four sides.
- ◆ Center of collimation field should be the third MCP joint.
- ◆ Correct rotation should be evidenced by mid-shafts of 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> metacarpals not overlapping, but some overlap of the distal heads of these metacarpals.
- ◆ The MCP, PIP and DIP joints should be open.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Hand

## Lateral Hand

### PREPARE THE ROOM

- Cassette: gray, 8" x 10", LW  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

- Position: R or L, patient seated on the anode end of tube with the ulnar side of the hand in contact with the cassette. The hand should be in a true lateral so that metacarpals 2-5 will stack one upon the other.  
The fingers should be spread as in the "OK" sign, or placed on the appropriate steps of a positioning wedge.  
Central ray: Perpendicular to film directed to the second metacarpophalangeal joint.  
Collimation: Open to soft tissues.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Hand

- ◆ Entire hand, wrist and distal forearm should be included with collimation margins on all four sides.
- ◆ Center of collimation field should be the first MCP joint.
- ◆ A true lateral position should be evidenced by the distal radius and ulna, and the metacarpals directly superimposed.
- ◆ The digits should be equally separated with minimal soft tissue overlap.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy. **Note:** A radiographic technique suitable for the fingers will underexpose the metacarpals. A technique that exposes the metacarpals properly will overexpose the fingers.

## Radiographic Positioning of the Femur

Section objectives: Femur Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 2 view femur series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Femur Series – 2 view series*

- ◆ AP Femur
- ◆ Lateral Femur (requires 2 separate images)

# Radiographic Positioning of the Femur

## A-P Femur

### PREPARE THE ROOM

Cassette: black; 14" x 17", LW (flash up, use bucky)  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned and supine on the table (preferred), or standing. The affected femur is centered to the midline of the table. Leg is rotated 15° medially to provide true AP of femur. The anode of the x-ray tube should be toward the patient's feet.

Central ray: If the entire femur will fit in one shot, center the femur to the cassette. If not, include as much of the femur as possible and the joint closest to the site of injury. You will then need an AP knee or AP hip to complete the AP femur.

Collimation: Open to full cassette vertically, side-to-side soft tissue.

Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P Femur

- ◆ The femur should be centered to the area of collimation with the entire knee and/or hip joint visible.
- ◆ Optimum exposure should demonstrate both bone and soft tissue density and make good use of the anode heel effect.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Femur

## Lateral Femur

In most instances, this requires 2 views; a frogleg lateral hip and a lateral femur shot as indicated below. If the patient is very short, a frogleg lateral can be obtained by placing the central ray in the middle of the femur shaft.

### PREPARE THE ROOM

Cassette: black; 14" x 17", LW (flash up, use bucky)  
Tube: 40" FFD, no tube tilt  
Technique: 70 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned and in a decubitus position with the affected femur closest to the table.  
The affected femur is centered to the midline of the table and the anode of the x-ray tube should be toward the patient's feet.  
The patient lies with the affected leg's knee slightly flexed and the opposite hip flexed to 90°.  
Support the opposite knee to limit rotation of the femur.

Central ray: If the entire femur will fit in one shot, center the femur to the cassette.  
If not, include as much of the femur as possible and the joint closest to the site of injury. You will then need a lateral knee or frogleg hip to complete the femur.

Collimation: Open to full cassette vertically, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Femur

- ◆ The femur should be centered to the area of collimation with the entire knee and/or hip joint visible.
- ◆ Optimum exposure should demonstrate both bone and soft tissue density and make good use of the anode heel effect.
- ◆ Anterior and posterior margins of the femoral condyles should be superimposed and aligned.
- ◆ Patellofemoral joint space should be open, it is distorted because it is not at the central ray.
- ◆ Patient identification should be clear and legible; R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Knee

Section objectives: Knee Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 4 view knee series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Knee Series – 4 view series*

- ◆ AP Knee
- ◆ Lateral Knee
- ◆ Intercondylar (Tunnel) Knee
- ◆ Tangential Patella (Sunrise)

# Radiographic Positioning of the Knee

## A-P Knee

### PREPARE THE ROOM

Cassette: black/gray; 8" x 10", LW (flash up)  
Tube: 40" FFD, 5° cephalad tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned and supine on the table with the affected knee centered to the table in full extension.  
The lower leg is rotated 15° medially.  
Central ray: 1 cm distal to the apex of the patella.  
Collimation: Open to full cassette vertically, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P Knee

- ◆ The center of the collimation field should be the mid-knee joint space.
- ◆ The femorotibial joint space should be open with the articular facets of the tibia seen tangentially with only minimal surface area visualized.
- ◆ Optimum exposure will outline the patella through the distal femur and the fibular neck will not be overexposed.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Knee

## Lateral Knee

### PREPARE THE ROOM

- Cassette: black/gray; 8" x 10", LW (flash up)  
Tube: 40" FFD, 5° cephalad tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron), stop primary beam leak anterior to thigh and lower leg using lead vinyl.

### PREPARE THE PATIENT

- Position: R or L, patient is fully gowned and in a lateral decubitus position on the table with the affected knee centered to the table.  
The knee should be flexed 30° and the knee in a true lateral position with the femoral epicondyles directly superimposed, and the plane of the patella perpendicular to the film.
- Central ray: 1 cm distal to the medial epicondyle of the femur.  
Collimation: Open to full cassette vertically, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Knee

- ◆ The center of the collimation field should be the mid-knee joint space.
- ◆ The tibiofemoral joint space should be open with only the pointed intercondyloid eminence (tibial spines) superimposed by the femoral condyles.
- ◆ The patella should be seen in profile with the patellofemoral joint space open.
- ◆ Optimum exposure will outline the patella through the distal femur and the fibular neck will not be overexposed.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Knee

## Intercondylar (Tunnel or Notch View) Knee

### PREPARE THE ROOM

- Cassette: black/gray; 8" x 10", LW (flash up)  
Tube: 40" FFD, 45° caudad tube tilt (remember: decrease tube height 1" for every 5° of tilt, 31")  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

- Position: R or L, patient is fully gowned and prone on the table with the affected knee centered to the table.  
The affected knee should be flexed 45°, support the foot.  
Central ray: To mid-popliteal crease and center the film to this. Be certain to allow for the tube tilt!  
Collimation: Open to full cassette vertically, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Intercondylar (Tunnel) Knee

- ◆ The center of the collimation field should be the mid-knee joint space.
- ◆ The intercondyloid fossa should be open without superimposition of the patella.
- ◆ No rotation will be evidenced by the symmetrical appearance of the femoral and tibial condyles and the joint space.
- ◆ Optimum exposure will visualize soft tissue in the knee joint space and an outline of the patella through the femur.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Knee

## Tangential Patella (Sunrise)

### PREPARE THE ROOM

Cassette: black/gray; 8" x 10", LW (flash up)  
Tube: 40" FFD, 5° cephalad tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is fully gowned and prone on the table with the affected knee centered to the table and in full flexion.  
It will help to loop a strap around the foot. Allow the patient to hold the strap keeping the knee in full flexion.  
Central ray: Directly through the patellofemoral joint space.  
Collimation: Open to include area of interest.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Tangential Patella (Sunrise)

- ◆ Four sided collimation should be limited to the patella and anterior femoral condyles.
- ◆ The intercondyloid sulcus (trochlear groove) and patella of each femur should be visualized in profile.
- ◆ The patellofemoral joint space should be open with the bony margins of condyles and patella clearly defined.
- ◆ Optimum exposure will clearly visualize soft tissue, joint space margins and trabecular markings of the patella.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Lower Leg

Section objectives: Leg Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 2 view leg series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Leg Series – 2 view series*

- ◆ A-P Lower Leg
- ◆ Lateral Lower Leg

# Radiographic Positioning of the Lower Leg

## A-P Lower Leg

### PREPARE THE ROOM

- Cassette: gray; ½ of 14" x 17", lengthwise or entire 14" x 17" diagonally if patient has a long leg.  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

- Position: R or L, ½ of cassette is masked to be used for lateral leg or opposite leg. Patient is supine with affected extremity toward the anode end of the table. The leg is rotated 15° medially (so the femoral condyles are parallel to the film) and foot flexed to 90°. No rotation of the pelvis. Center the affected leg to the unmasked portion of the cassette.  
Central ray: Perpendicular to the film to a point mid-shaft on the leg.  
Collimation: Vertically include knee joint and distally the ankle joint, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P Lower Leg

- ◆ Visualization of the tibia, fibula, and adjacent joints on one or more A-P views.
- ◆ Ankle and knee joints without rotation.
- ◆ Proximal and distal articulations of tibia and fibula moderately overlapping.
- ◆ Trabecular detail and soft tissue for the entire leg.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Lower Leg

## Lateral Lower Leg

### PREPARE THE ROOM

- Cassette: gray; ½ of 14" x 17", lengthwise or entire 14" x 17" diagonally if patient has a long leg.  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

- Position: R or L, ½ of cassette is masked to be used for A-P leg or opposite leg. Patient on side with affected extremity toward the anode end of the table. Adjust the rotation of the patient to place the patella perpendicular to the cassette, ensuring a line drawn through the femoral condyles is perpendicular to the film. Center the affected leg to the unmasked portion of the cassette.  
Central ray: Perpendicular to the film to a point mid-shaft on the leg.  
Collimation: Vertically include knee joint and distally the ankle joint, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Leg

- ◆ Visualization of the tibia, fibula, and adjacent joints on one or more lateral views.
- ◆ Distal fibula lying over the posterior half of the tibia.
- ◆ Slight overlap of the tibia on the proximal fibular head.
- ◆ Ankle and knee joints are not rotated.
- ◆ Possibly no superimposition of femoral condyles due to beam divergence.
- ◆ Moderate separation of the tibial and fibular shafts seen, except at their articular ends.
- ◆ Trabecular detail and soft tissue for the entire leg.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Ankle

Section objectives: Ankle Series

At the conclusion of this course the student doctor should;

3. Be able to efficiently conduct all parts of a 3 view ankle series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
4. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Ankle Series – 3 view series*

- ◆ A-P Mortise Ankle
- ◆ Medial Oblique Ankle
- ◆ Lateral Ankle

# Radiographic Positioning of the Ankle

## A-P Ankle

### PREPARE THE ROOM

Cassette: gray; ½ of 10" x 12", crosswise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, ½ of the cassette is masked to be used for the medial oblique. Patient is supine with affected extremity toward the anode end of the table. The foot is rotated 5° medially (so the intermalleolar plane is parallel to the film) and slightly dorsiflexed. Center the affected ankle to the unmasked portion of the cassette.  
Central ray: Perpendicular to the film to a point midway between the malleoli.  
Collimation: Open to full, unmasked cassette vertically, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P Ankle

- ◆ The center of the four-sided collimation field should be the mid-ankle joint.
- ◆
- ◆ There should be minimal overlap at the distal tibiofibular joint space.
- ◆ Optimum exposure should demonstrate both bone and soft tissue density.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

Note: Mortise refers to a type of carpenter's joint.

# Radiographic Positioning of the Ankle

## Medial Oblique Ankle (Mortise view)

### PREPARE THE ROOM

Cassette: gray; ½ of 10" x 12", crosswise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, ½ of the cassette is masked, it was used with the A-P view.  
Patient is supine with affected extremity toward the anode end of the table.  
The foot is rotated 30° medially and slightly dorsiflexed.  
Center the affected ankle to the unmasked portion of the cassette.  
Central ray: Perpendicular to the film to a point midway between the malleoli.  
Collimation: Open to full, unmasked cassette vertically, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Medial Oblique Ankle

- ◆ The center of the four-sided collimation field should be the mid-ankle joint.
- ◆ The distal tibiofibular joint space should be primarily open with only minimal "touching" on an average ankle. The entire ankle mortise should appear open with no overlap between distal fibula and talus, or between tibia and talus.
- ◆ Both the distal fibula and tibia may have some overlap with the talus.
- ◆ No rotation.
- ◆ Optimum exposure should demonstrate both bone and soft tissue density.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Ankle

## Lateral Ankle

### PREPARE THE ROOM

Cassette: gray; 8" x 10", lengthwise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient is lying on the affected side with the extremity toward the anode end of the table.  
Place support under the knee if ankle is not in contact with the film, so as to place the ankle in a true lateral position.  
The leg and foot should be perpendicular to each other.  
Central ray: Perpendicular to the film to medial malleolus.  
Collimation: Open to full cassette vertically, side-to-side soft tissue.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Ankle

- ◆ The center of the four-sided collimation field should be the mid-ankle joint.
- ◆ The upper arch of the tibiotalar joint should appear open with a uniform joint space.
- ◆ The talus and calcaneus should be seen in their entirety, as well as portions of the adjoining tarsal bones.
- ◆ Optimum exposure should demonstrate distal fibula as well as soft tissue detail.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Calcaneus

Section objectives: Calcaneus Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 2 view calcaneus series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Calcaneus Series – 2 view series*

- ◆ Plantodorsal (Axial) Calcaneus
- ◆ Lateral Calcaneus

# Radiographic Positioning of the Calcaneus

## Plantodorsal (Axial) Calcaneus

### PREPARE THE ROOM

- Cassette: gray; ½ of 10" x 12", or one 8" x 10", lengthwise  
Tube: 40" FFD, 40° cephalad tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

- Position: R or L, ½ of the cassette is masked to be used with the lateral calcaneus. Patient is supine with affected extremity toward the anode end of the table. Dorsiflex the foot so the plantar surface is near perpendicular to the film. Loop a strap around the foot and ask the patient to pull gently but firmly and hold the plantar surface as near perpendicular as possible (be fast as this may be very uncomfortable for the injured patient).
- Central ray: To the joint space between the calcaneus and cuboid/navicular.  
Collimation: Closely to area of the calcaneus.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Plantodorsal (Axial) Calcaneus

- ◆ The entire calcaneus should be visualized from the tuberosity posteriorly, to the talocalcaneal joint anteriorly.
- ◆ No rotation; the bases of the 1<sup>st</sup> and 5<sup>th</sup> metatarsals should **NOT** be visible on either side. A portion of the sustentaculum tali should appear in profile laterally.
- ◆ Optimum exposure should faintly visualize the talocalcaneal joint without overexposing the distal tuberosity.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Calcaneus

## Lateral Calcaneus

### PREPARE THE ROOM

Cassette: gray; ½ of 10" x 12", or one 8" x 10", lengthwise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, ½ of the cassette is masked as it was used with the plantodorsal (axial) calcaneus.  
Patient is on their side with affected extremity toward the anode end of the table. Place support under the knee so that the calcaneus is in a true lateral position, lateral portion of the foot is in contact with the cassette.  
Dorsiflex the foot so the plantar surface is near perpendicular to the leg (use a sandbag or some support to hold the foot in this position).  
Central ray: 2cm distal to the medial malleolus.  
Collimation: To outer skin margins to include about 2cm proximal to ankle joint.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Calcaneus

- ◆ Four-sided collimation should include the ankle joint proximally and talonavicular joint anteriorly.
- ◆ The calcaneus and talus should be visualized without rotation as evidenced by lateral malleolus superimposed over the posterior half of the tibia and talus.
- ◆ The tarsal sinus and calcaneocuboid joint space should appear open.
- ◆ Optimum exposure should visualize soft tissue as well as the more dense portions of the calcaneus and talus.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Foot

Section objectives: Foot Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 3 view foot series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Foot Series – 3 view series*

- ◆ A-P (Dorsiplantar) Foot
- ◆ Medial Oblique
- ◆ Lateral Foot

# Radiographic Positioning of the Foot

## A-P (Dorsiplantar) Foot

### PREPARE THE ROOM

- Cassette: gray; ½ of 10" x 12", lengthwise  
Tube: 40" FFD, 10° cephalad tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: foot filter to cover distal metatarsals and toes (thick portion over toes)  
For clear lead, #1 or #2 for Nolan filters  
gonad (½ apron)

### PREPARE THE PATIENT

- Position: R or L, ½ of the cassette is masked to be used with the medial oblique foot.  
Patient is supine, flex the knee and place the planter surface of affected foot flat on cassette.  
Align the center long axis of the foot to long axis of unmasked portion of film.  
Central ray: To the base of the third metatarsal.  
Collimation: Include outer margins of skin on four sides (include toes).  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P (Dorsiplantar) Foot

- ◆ The center of the four-sided collimation should be the base of the third metatarsal.
- ◆ The entire foot, including the phalanges, should be well visualized.
- ◆ Optimum exposure should demonstrate the sesamoid bones (if present) through the head of the first metatarsal.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Foot

## Medial Oblique Foot

### PREPARE THE ROOM

- Cassette: gray; ½ of 10" x 12", lengthwise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray at appropriate angle  
Filter/shield: foot filter to cover distal metatarsals and toes (thick portion over toes) for clear lead, #1 or #2 for Nolan filters.  
gonad (½ apron)

### PREPARE THE PATIENT

- Position: R or L, ½ of the cassette is masked to be used with the A-P (dorsiplantar) foot.  
Patient is supine, flex the knee and place the plantar surface of foot on cassette.  
Align and center long axis of foot to long axis of unmasked portion of film.  
Rotate the foot medially to place the plantar surface 45° to plane of film (use a 45° radiolucent block if available).  
Central ray: To the base of the third metatarsal.  
Collimation: Include outer margins of skin on four sides (include toes).  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Medial Oblique Foot

- ◆ The center of the four-sided collimation should be the base of the third metatarsal.
- ◆ The third through the fifth metatarsals should be completely free of superimposition.
- ◆ The tuberosity at the base of the fifth metatarsal should be well visualized.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Foot

## Lateral Foot

### PREPARE THE ROOM

Cassette: gray; 10" x 12", crosswise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, patient in lateral recumbent position with the affected side down. Flex the knee of the affected side, position opposite leg out of the way so it does not interfere with the image.  
Center long axis of foot to long axis of film.  
Central ray: To the first (medial) cuneiform.  
Collimation: Include outer margins of skin on four sides (include toes).  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Lateral Foot

- ◆ The center of the four-sided collimation should be the first (medial) cuneiform.
- ◆ The entire foot, including the phalanges, should be well visualized.
- ◆ The distal fibula should be superimposed over a posterior portion of the tibia.
- ◆ The tibiotalar joint space should be clearly visualized.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

## Radiographic Positioning of the Toes

Section objectives: Toe Series

At the conclusion of this course the student doctor should;

1. Be able to efficiently conduct all parts of a 3 view toe series including determining the cassette size and orientation, setting of technical factors, patient positioning, placement of filters/shields, and giving patient instructions.
2. Be able to identify the significant anatomy demonstrated on each view of the series.

*Standard Toe Series – 3 view series*

- ◆ A-P (Dorsiplantar) Toe
- ◆ Oblique Toe
- ◆ Lateral Toe

# Radiographic Positioning of the Toes

## A-P (Dorsiplantar) Toe

### PREPARE THE ROOM

Cassette: gray; ¼ of 10" x 12", crosswise  
Tube: 40" FFD, 15° cephalad  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad (½ apron)

### PREPARE THE PATIENT

Position: R or L, ¾ of the cassette is masked to be used with the oblique toe and lateral toe.  
Patient is supine, flex the knee and place the planter surface of affected toe(s) flat on cassette.  
Align center long axis of toe(s) to long axis of unmasked portion of film.  
Central ray: To the proximal interphalangeal joint of the affected digit(s). For the great toe the interphalangeal joint.  
Collimation: If a general evaluation is required all of the toes should be exposed.  
If a specific toe is being evaluated appropriate collimation demonstrated.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: A-P (Dorsiplantar) Toe

- ◆ Center of the four-sided collimation field should be the PIP of the digit being examined.
- ◆ Distal metatarsal heads should be demonstrated.
- ◆ Each phalanx is examined noting their diaphyseal constriction, expanded articular ends, unguis tufts, and open interphalangeal and metatarsophalangeal joint spaces.
- ◆ Optimum exposure should demonstrate soft tissue outlines of each digit, and bony trabecular detail.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Toes

## Oblique Toe

### PREPARE THE ROOM

Cassette: gray;  $\frac{1}{4}$  of 10" x 12", crosswise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

### PREPARE THE PATIENT

Position: R or L,  $\frac{3}{4}$  of the cassette is masked ( $\frac{1}{4}$  used with A-P toe and  $\frac{1}{4}$  to be used with lateral toe).  
Patient is supine, flex the knee and place the planter surface of affected foot on cassette.  
Center and align the long axis of digit(s) in question to long axis of unmasked film.  
Rotate the foot 30° medially if 1<sup>st</sup> through 3<sup>rd</sup> toe, or laterally if 4<sup>th</sup> or 5<sup>th</sup> toe, using a radiolucent block if available.  
Central ray: Perpendicular to the third metatarsophalangeal (MTP) joint.  
Collimation: Include phalanges and MINIMUM of 2/3 of metatarsals. Include at least one digit on each side of the digit in question.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Oblique Toe

- ◆ Four-sided collimation should include the digit in question and at least 2/3 of metatarsals without overlap.
- ◆ Correct obliquity should be evident by increased concavity on one side of shafts and by overlapping of soft tissues and digits.
- ◆ Heads of metatarsals should appear directly side by side with no overlapping.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.

# Radiographic Positioning of the Toes

## Lateral Toe

### PREPARE THE ROOM

Cassette: gray;  $\frac{1}{4}$  of 10" x 12", crosswise  
Tube: 40" FFD, no tube tilt  
Technique: 60 kVp, small focal spot  
Measure: through central ray  
Filter/shield: gonad ( $\frac{1}{2}$  apron)

### PREPARE THE PATIENT

Position: R or L,  $\frac{3}{4}$  of the cassette is masked ( $\frac{1}{4}$  used with A-P toe and  $\frac{1}{4}$  to be used with oblique toe).  
Rotate the foot medially if 1<sup>st</sup> or 2<sup>nd</sup> toe, or laterally if 3<sup>rd</sup> through 5<sup>th</sup> toe.  
Center and align the long axis of digit(s) in question to long axis of unmasked film.  
Use tape, gauze or tongue blade to flex and separate unaffected toes to prevent superimposition.  
Central ray: Perpendicular to interphalangeal joint if first toe, or proximal interphalangeal (PIP) joint if second through fifth toe.  
Collimation: Closely on four sides to affected digit.  
Marker: R or L.

### EXPOSURE

Patient directions: "Hold still, don't move" – expose.

### EVALUATION CRITERIA: Oblique Toe

- ◆ Four-sided collimation should include the digit in question in lateral position free of superimposition by other digits.
- ◆ The interphalangeal joints should all appear open and unobstructed.
- ◆ The metatarsophalangeal joint should be visualized even if superimposed.
- ◆ Patient identification should be clear and legible, R/L marker should be clearly visible on lateral border without superimposing anatomy.