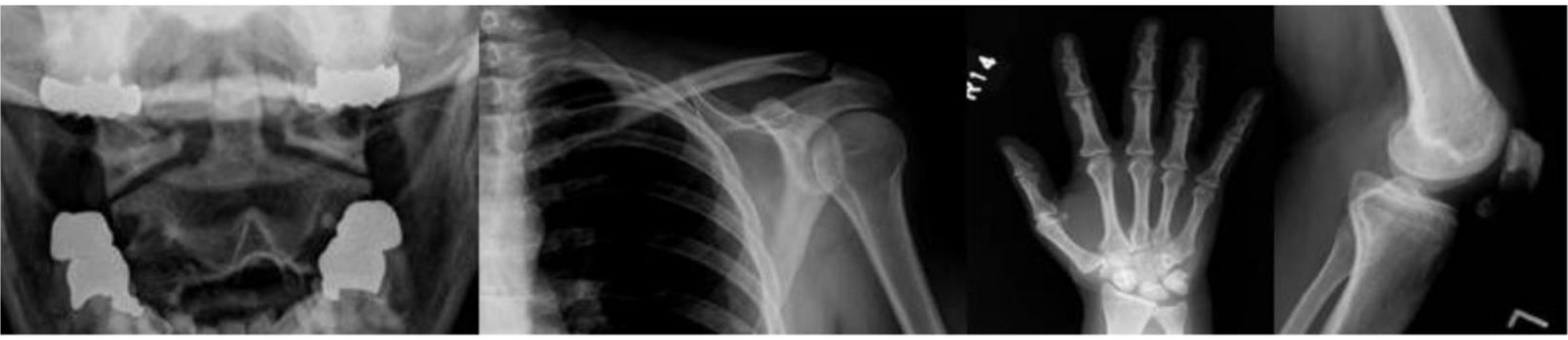


Dartmouth Hitchcock Diagnostic Radiology Protocol

Sixth Revision of original published by Gerald J. Bergen RT(R)

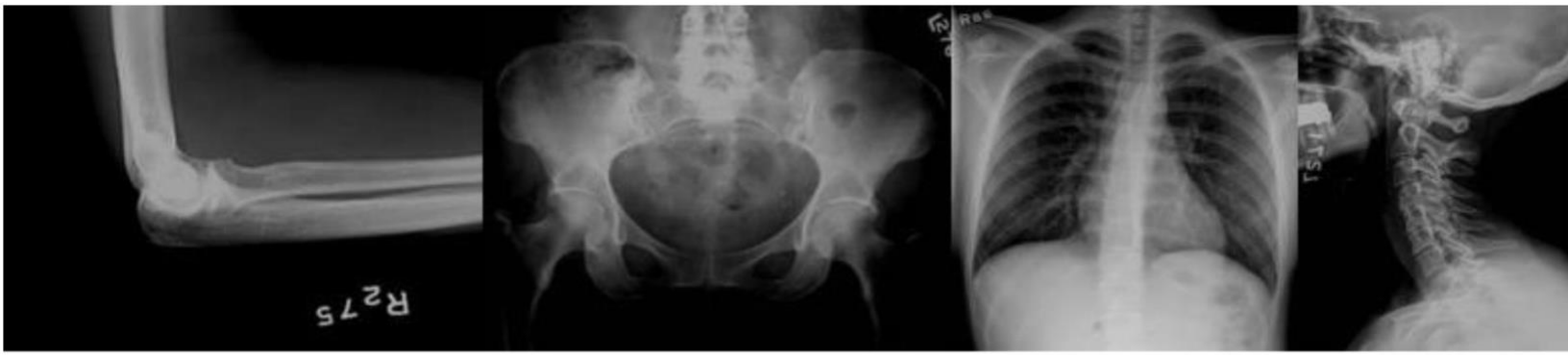
2025

Heather E. LaPorte RT(R), Haley Gaudreault RT(R)

REFERENCES:

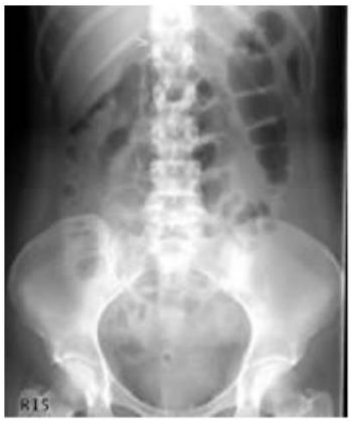
https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria?msclkid=6fc5e89ecfa511ecacc3af666fcf51df

Long, B. W., Merrill, V., Rollins, J. H., & Smith, B. J. (2022). Merrill's Atlas of Radiographic positioning and procedures (15th ed., Vol. 1). Mosby.

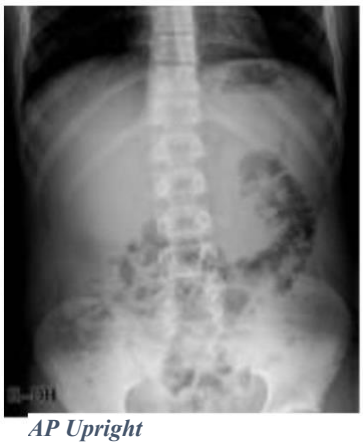


Dartmouth Health

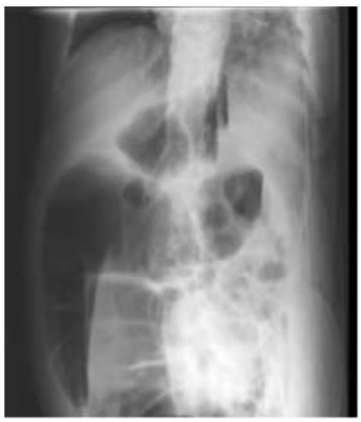
Abdomen



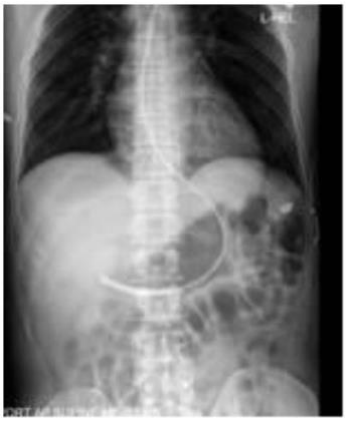
AP Supine



AP Upright



Left Lateral Decubitus



NG/OG Tube Placement

Views:

- **AP Supine**
  - Symphysis pubis to upper abdomen including both hemidiaphragms visible - a second high transverse image may be needed.
  - Spine and pelvis aligned with image midline.
  - No evidence of rotation.
- **AP Upright**
  - Highest point of hemidiaphragms visible.
  - Spine and pelvis aligned with image midline.
  - No evidence of rotation.
  - "STANDING" or "UPRIGHT" annotation visible.
  - Left Lateral Decubitus (done if upright is not achievable)

Protocol:

- Constipation – 1 view (AP)
- Kidney Stones – 1 view (AP)
- Obstruction – 2 views (AP/Upright or decub)
- Ileus – 2 views (AP/Upright or decub)
- Free Air – 2 views (AP/Upright or decub)
- S/P Abdominal Surgery – 2 views (AP/Upright or decub)
- Perforation – 2 views (AP/Upright or decub)
- Nausea – 2 views (AP/Upright or decub)
- Pain – 2 views (AP/Upright or decub)
- Distention – 2 views (AP/Upright or decub)
- NG/OG Tube Placement - 1 view (AP - focus on left side okay)
- Aspiration Precautions – 1 view (AP - Patients head of bed not to be reclined lower than 45 degrees)

Policy - Diagnostic Radiology - Abdomen Imaging. 19322

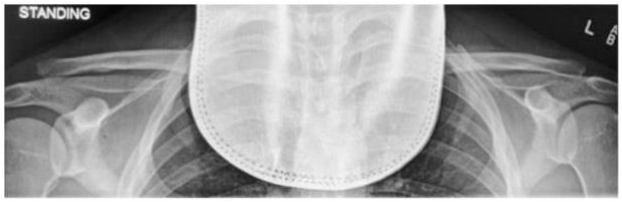
Tips and Tricks:

- NG/OG Tube - top of detector at armpit level
- **Left Lateral Decubitus**
  - done only if AP Erect not possible or if requested
  - Right costophrenic angle and upper half of pelvis visible.
  - Both sides are to be included without sacrificing the skin edge of elevated side.
  - No evidence of rotation.
  - "LEFT LATERAL DECUB" annotation visible.
- **NG/OG Tube Placement**
  - Hemidiaphragms aligned to image center to maximally visualize thorax and abdomen.
  - Carina visible at top of image.
  - If N-G tube not visible or not in proper position, notify requesting clinician.
  - Spine aligned to image midline.

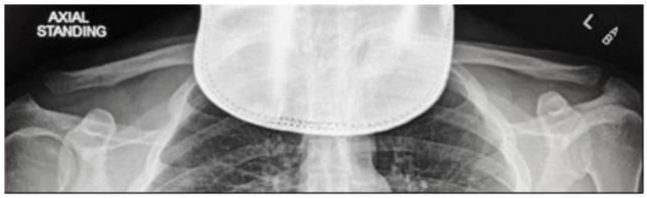
No evidence of rotation

In the event the patient is not able to tolerate more than one view, a note is to be placed upon completion of the examination. Patient condition should be discussed with RN or ordering provider.

Acromioclavicular Joints



AP Bilateral Standing



AP Axial Bilateral Standing

Views:

- **AP Bilateral Standing**
  - A-C joint including distal 1/3 of clavicle, coracoid process and acromion process visible.
  - No rotation of body evident.

- **AP Axial Bilateral Standing**
  - A-C joint including distal 1/3 of clavicle, coracoid process and acromion process visible.
  - 15-30 Degree cephalic angle
  - No rotation of body evident.

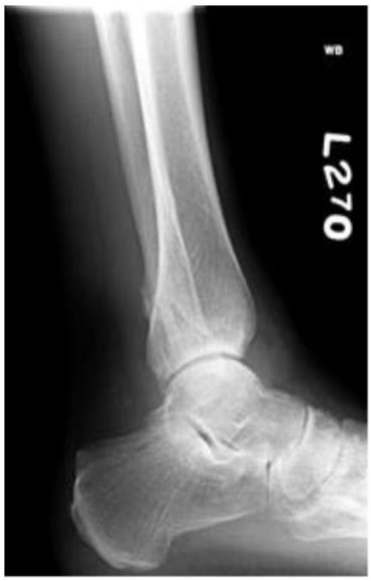
Protocol:

- AP Bilateral Standing
- AP Axial Bilateral Standing

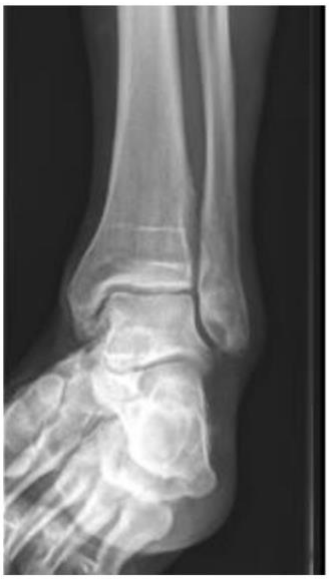
Notes:

- No Shield is necessary

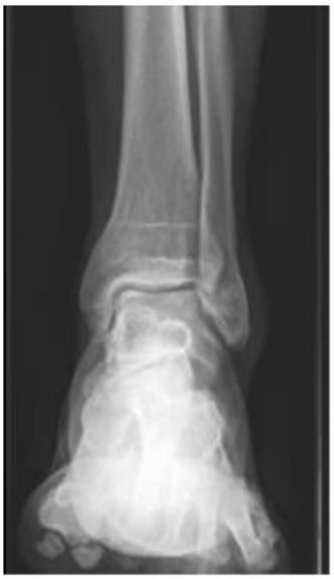
Ankle



AP



Internal Oblique



Lateral

Views:

- **AP**
  - Ankle joint open except near fibula.
  - Distal 1/4 of tibia/fibula visible.
  - Medial and lateral malleoli visible.
  - "STANDING" annotation if patient is able.

- **Internal Oblique**
  - Entire ankle joint open.
  - Distal fibula not superimposed over talus
  - Proximal end of 5th metatarsal visible.
  - Distal 1/4 of tibia/fibula visible.
  - Medial and lateral malleoli visible.
  - "STANDING" annotation visible

- **Lateral**
  - Ankle joint open.
  - Fibula superimposed over the posterior half of tibia.
  - Distal 1/4 of tibia/fibula visible.
  - Proximal half of 5th metatarsal to be included.
  - Posterior skin edge included.
  - "STANDING" annotation visible

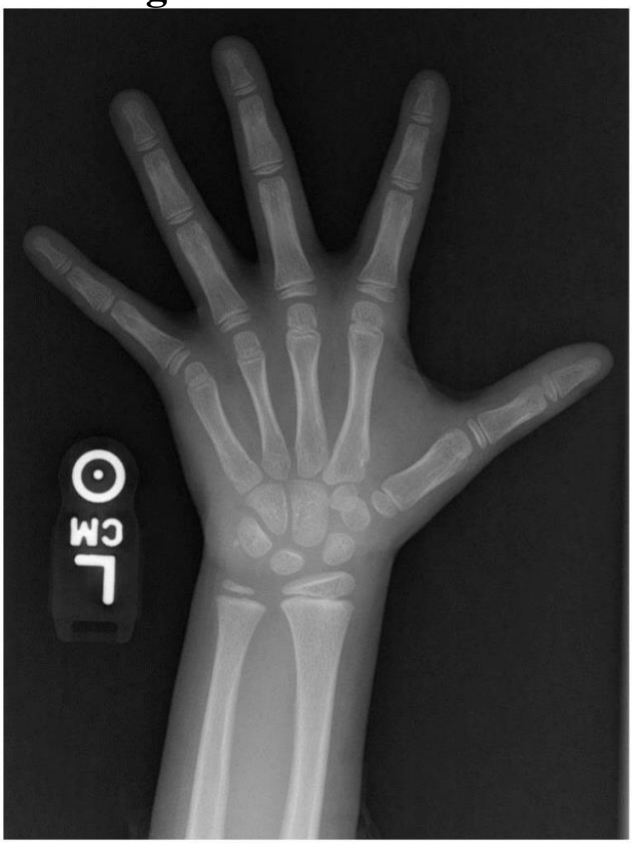
Notes:

- Done weightbearing to tolerance or if requested
- Crosstable lateral can be done if patient cannot lay on their side

Protocol:

- AP
- Internal Oblique
- Lateral

Bone Age



Views:

- **PA of Left Hand**

Notes:

- Include wrist in image
- Always left side for comparison

<u>Protocol</u>:

- PA Left Hand

Bone Survey (Metastatic)

METASTATIC SURVEY
For Adults

Views:

- Lateral Cervical Spine (1 image)
- Lateral Skull (1 image)
- AP and Lateral Thoracic Spine (2 images)
- AP and Lateral Lumbar Spine (2 images)
- AP Pelvis (1 image)
- AP Femurs (AP Hip & AP Knee with overlap) (4 images)
- AP Humeri

Contents

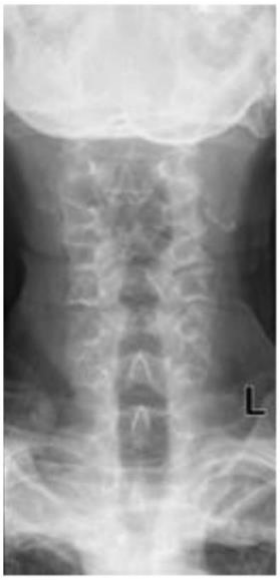
No table of contents entries found.

- (2 images)

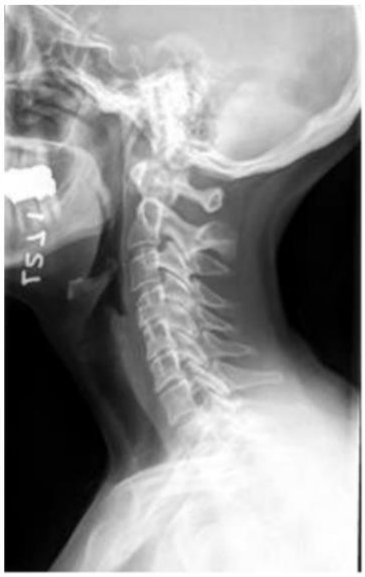
Notes:

- 9 views
- 13 images

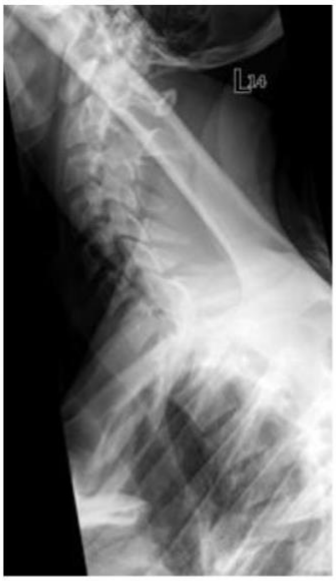
Cervical Spine



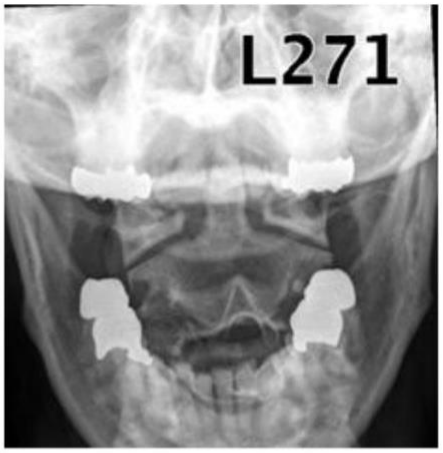
AP



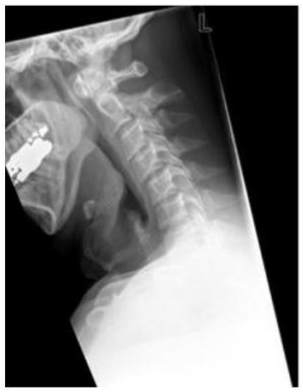
Lateral



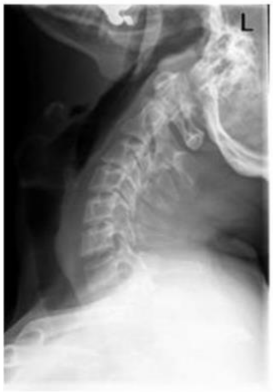
Swimmers



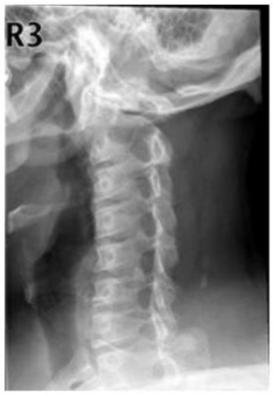
AP Open Mouth



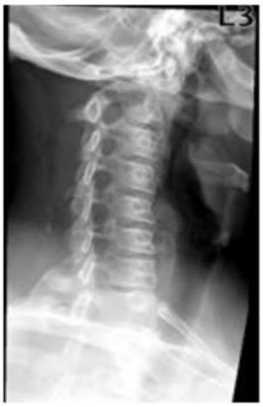
Lateral Flexion



Lateral Extension



RPO



LPO

<u>Protocol</u>:

- Post-Surgery - AP and Lateral
- Trauma - AP, Lateral, AP Open Mouth
- Radiculopathy/Numbness Down Arms/Arthritis - AP, Lateral, Bilateral Obliques
- Instability - Flexion and Extension
- C1/C2,Odontoid Fracture - Include AP Open Mouth unless stated otherwise

Views:

- **AP with 15° Cephalic Angle**
  - Vertebrae from C3 to T2 visible.
  - Intervertebral disc spaces open.
  - No evidence of rotation.

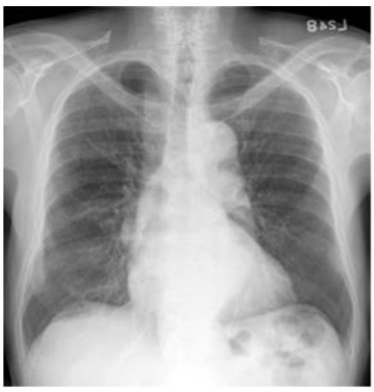
- **Lateral - 72" SID**
  - All seven cervical vertebrae visible including articulation with T1.
  - A separate radiograph of cervicothoracic region (swimmers) is required if C7-T1 articulation not visualized.
  - Sella turcica included to insure visualization of clivus (area between dorsum sellae and foramen magnum).
  - Air filled Pharynx and trachea visible.
  - No evidence of rotation.

- **Swimmers** (Done if C7-T1 is not visualized on lateral or if requested)
  - Vertebrae from C1 to T3 visible especially C7 and T1.
  - Air filled Pharynx and trachea visible.
  - Left arm is raised above head while right is positioned reaching to the floor with the shoulder relaxed.
  - No evidence of rotation.
- **AP Open Mouth**
  - C1 and most of C2 including odontoid process visible within open mouth.
  - Inferior margins of upper teeth and base of skull superimposed.
  - No evidence of rotation.
  - If open-mouth AP unsuccessful, then a Fuchs Method or "Wagging" jaw maneuver is to be done**.**

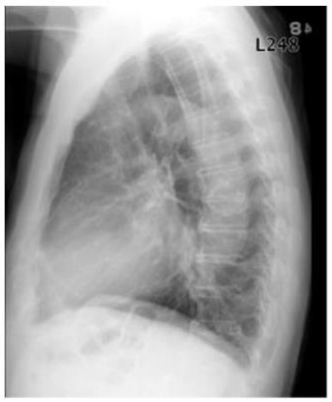
- **Lateral Flexion**
  - Body of mandible perpendicular to lower border of detector.
  - C1 to C7 vertebrae visible. If C7 not visible, do additional flexion image in swimmers position.
  - No evidence of rotation.

- **Lateral Extension**
  - Body of mandible at 45° to border of detector.
  - C1 to C7 vertebrae visible. If C7 not visible, do additional extended image in swimmers position.
  - No evidence of rotation.
- **Obliques**
  - Intervertebral foramina from C1-2 to C7-T1 open. (PA oblique demonstrates those closest to detector and AP oblique those farthest from detector)
  - Intervertebral disc spaces open.
  - Mandible and occipital bone not to overlap C1 and C2.

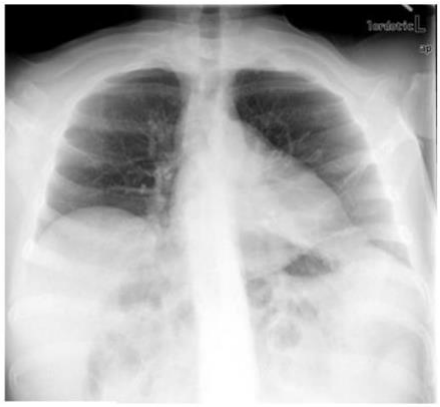
Chest



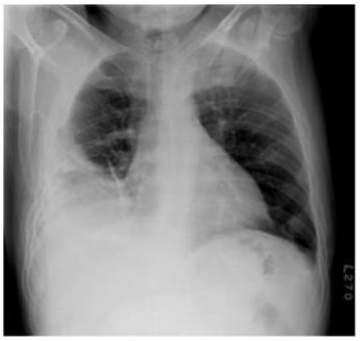
PA Standing



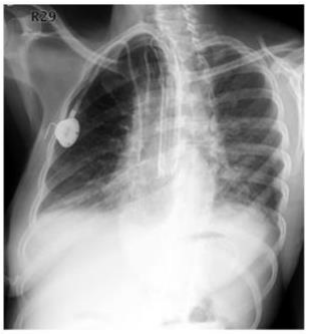
Lateral



Lordotic



Decubitus



Oblique

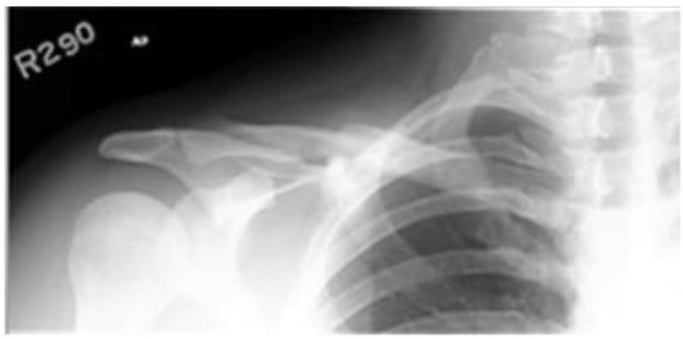
Protocol:

- PA and Lateral - unless additional views specified
- Performed standing if patient can tolerate

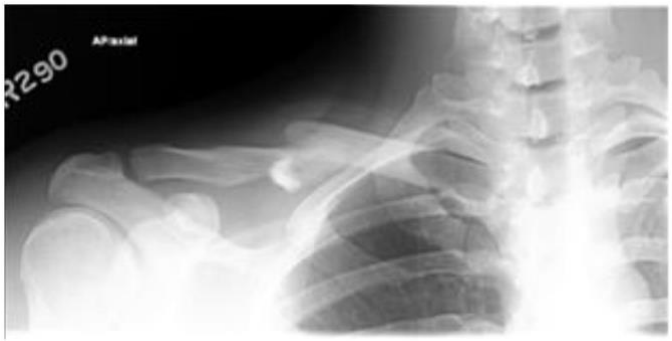
Views:

- **PA Standing - 72" SID**
  - Entire lung fields from apices to both costophrenic angles visible.
  - Ten posterior ribs above diaphragm visible.
  - No evidence of rotation.
  - No blurring of heart or diaphragm.
  - Thorax aligned with image midline.
- **Lateral**
  - Entire lung field from apices to costophrenic angles visible.
  - All of sternum to posterior ribs visible.
  - No evidence of rotation.
  - No blurring of heart or diaphragm.
  - Sent with spine on the right
- **Lordotic**
  - Apices and lungs to costophrenic angles visible.
  - Clavicles projected superior to lungs.
  - Thorax aligned with image midline.
  - No evidence of rotation.
- **Decubitus**
  - Entire side of interest visible.
    - lower side if for pleural effusion,
    - elevated side if for pneumothorax.
  - No evidence of rotation.
  - Annotation indicating side down visible.
- **PA Obliques (RAO or LAO)**
  - Entire lung fields from apices to both costophrenic angles visible.
  - No blurring of heart or diaphragm.

Clavicle



AP Standing



AP Axial Standing

Views:

- **AP Standing**
  - Entire clavicle visible.
  - At least half of the clavicle free of superimposition from ribs.
  - Clavicle aligned to horizontal center of image.

- **AP Axial Standing**
  - Entire clavicle visible.
  - At least 2/3 of the clavicle free of superimposition from ribs.
  - Clavicle aligned to horizontal center of image.

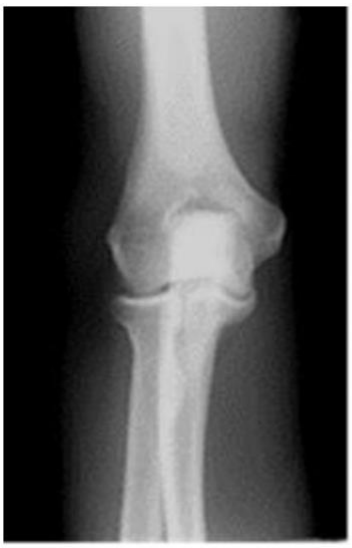
Notes:

- Standing if tolerated

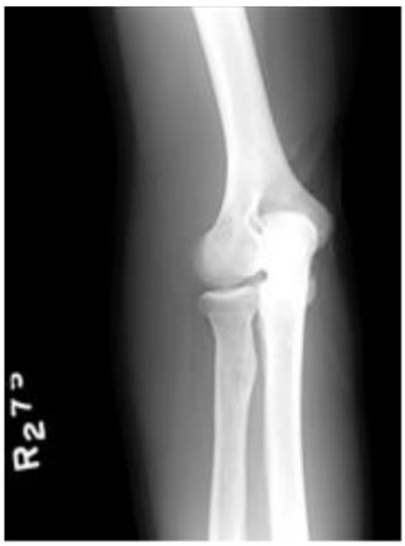
<u>Protocol</u>:

- AP
- AP Axial

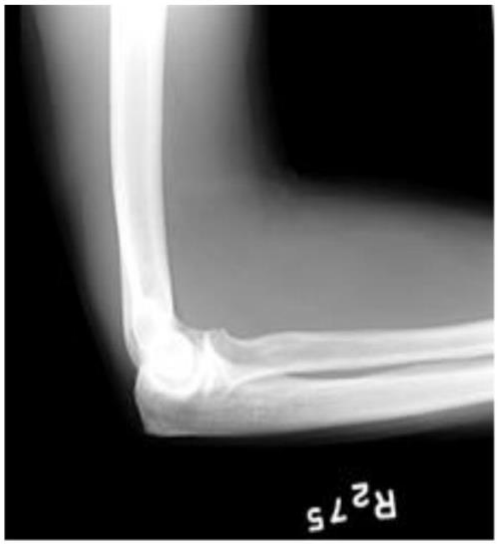
Elbow



AP



External Oblique



Lateral

Views:

- **AP**
  - Elbow joint aligned to center of image.
  - Forearm/ humerus aligned to vertical center of image.
  - Both epicondyles are parallel to the IR.
  - Elbow joint space open.

- **External Oblique**
  - Radial head free of superimposition with ulnar coronoid process.
  - Forearm and humerus aligned to vertical center of image.

- **Lateral**
  - Elbow joint open and centered to central ray.
  - Elbow joint flexed 90°.
  - Humerus parallel to vertical plane and forearm parallel to horizontal plane of image.

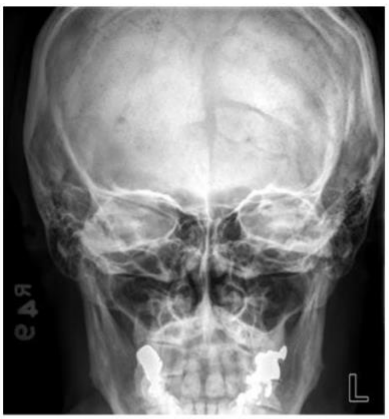
Notes:

- Radial Head View can be done if external oblique is not achievable due to movement restrictions

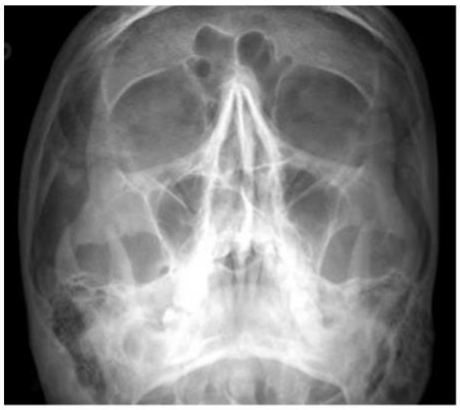
Protocol:

- AP
- Oblique
- Lateral

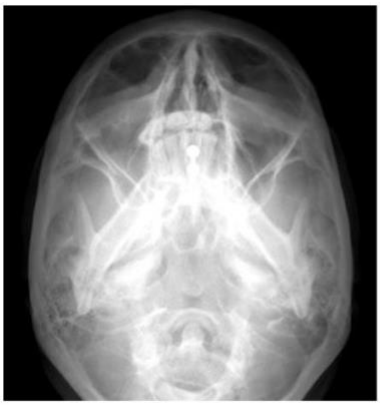
Facial Bones



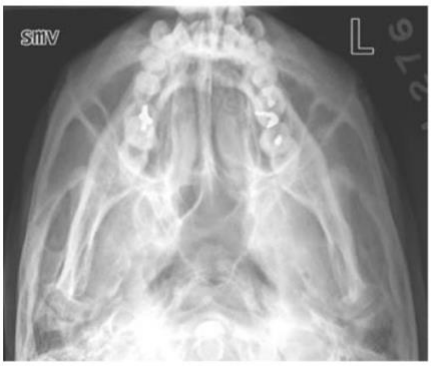
PA



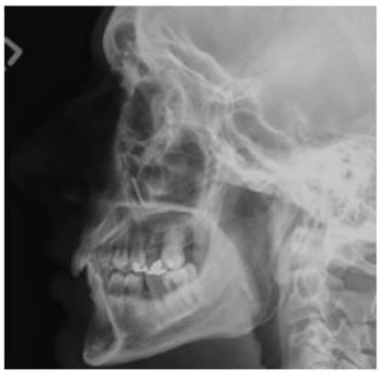
PA Waters



60° SMV



90° SMV



Lateral

Protocol:

- ☐ PA
- ☐ PA Waters
- ☐ 60° SMV
- ☐ 90° SMV
- ☐ Lateral

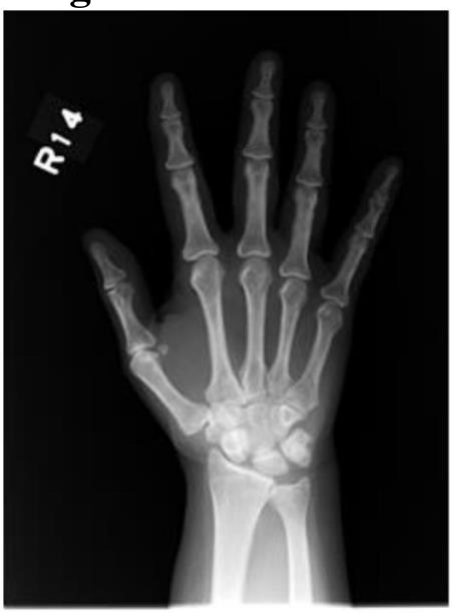
Views:

- ☐ **PA**
  - No evidence of head rotation visible.
  - Petrous bones fill orbits.
  - Midsagittal plane aligned to vertical center of image.
- ☐ **Waters**
  - Entire frontal and maxillary sinuses, margin of both orbits and zygomatic arches visible.
  - Petrous ridges projected immediately below maxillary sinuses.
  - No evidence of head rotation visible.
  - Nasal spine aligned to vertical center of image.
- ☐ **60° SMV**
  - Zygomatic arches, maxillary sinuses, nasal spine and infraorbital margins visible.
  - No evidence of head rotation visible.
  - Nasal spine aligned to vertical center of image.
- ☐ **90° SMV**
  - Zygomatic arches visible.
  - No evidence of head rotation visible.
  - Symphysis menti uppermost and aligned to vertical center of mage.
- ☐ **Lateral**
  - Frontal sinuses, all of mandible and sella turcica visible.
  - No evidence of head rotation visible.
  - If not done erect, lateral must be exposed with beam projected horizontally.

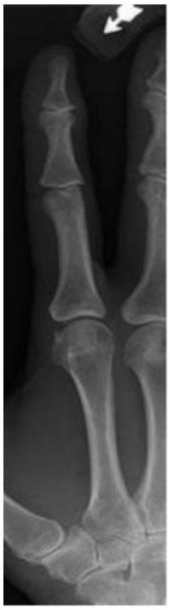
Notes:

- ☐ All images done upright if possible
- ☐ Lateral faces to the left

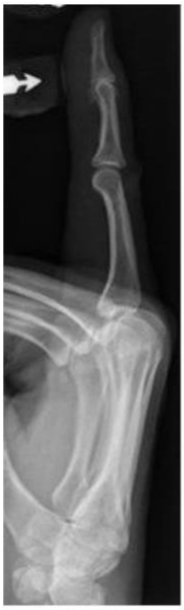
Finger



PA Hand



Oblique



Lateral

<u>Protocol</u>:

□ PA Hand

□ Oblique of affected finger

□ Lateral of affected finger

Views:

- □ **PA Hand**
  - Include wrist and distal ends of radius and ulna.
  - No rotation of hand.
  - No soft tissue overlap from adjacent fingers.
  - Interphalangeal and metacarpophalangeal joint spaces open.
  - Hand aligned to vertical center of image with fingers uppermost.

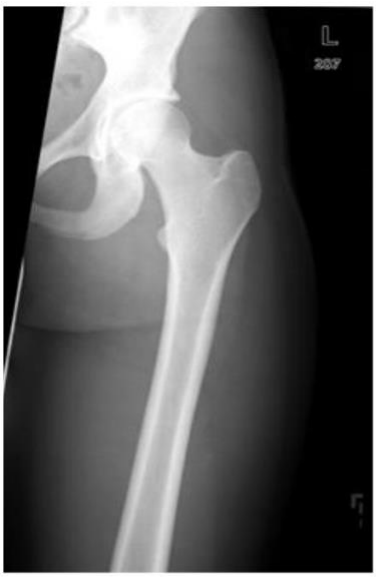
- □ **Oblique of affected finger**
  - Include distal 1/3 of adjacent metacarpal. If for thumb, include all of first metacarpal.
  - No soft tissue overlap from adjacent fingers.
  - Interphalangeal and metacarpophalangeal joint space open.
  - Finger aligned to vertical image plane with distal phalanx uppermost**.**

- □ **Lateral of affected finger**
  - Include distal 1/3 of adjacent metacarpal. If for thumb, include all of first metacarpal.
  - No soft tissue overlap from adjacent fingers.
  - Interphalangeal and metacarpophalangeal joint space open.
  - Finger aligned to vertical image plane with distal phalanx uppermost.

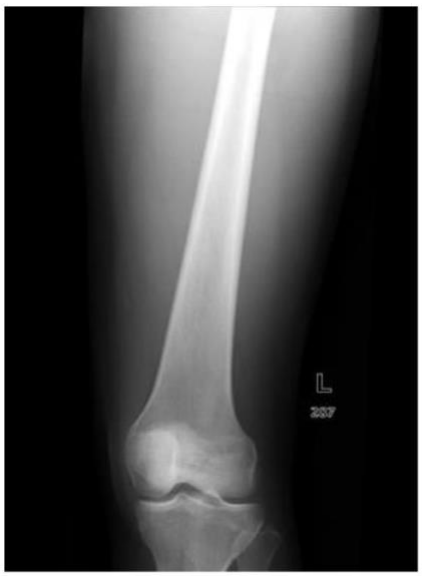
Notes:

□ 1st Digit : PA Hand (Oblique of digit), Lateral of digit, and AP/PA of digit

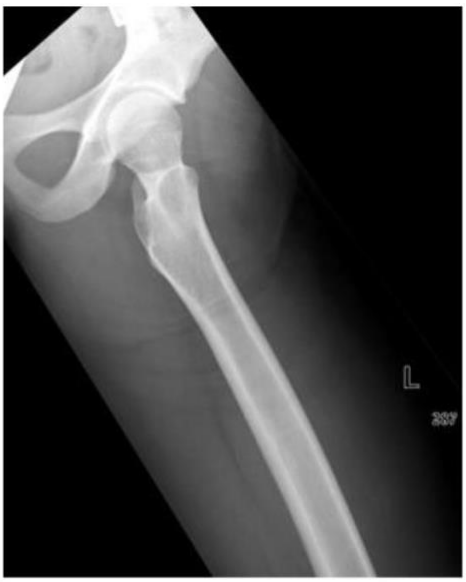
Femur



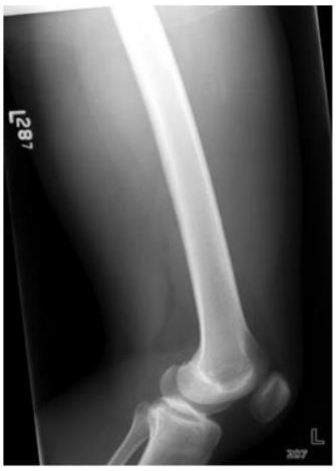
AP Hip



AP Hand



Lateral Hip



Lateral Knee

<u>Protocol</u>:

- AP Hip
- Lateral Hip
- AP Knee
- Lateral Knee

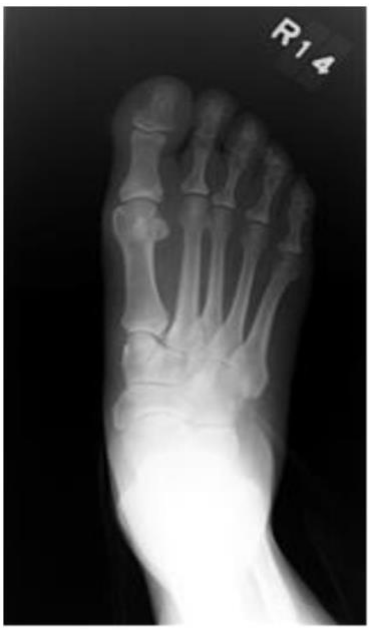
Notes:

- Crosstable hip should be done if requested
- In PACU, a <u>Clements-Nakayama View</u> should be done to visualize the proximal anatomy in lateral position
- Marker ball should be included on all images if possible

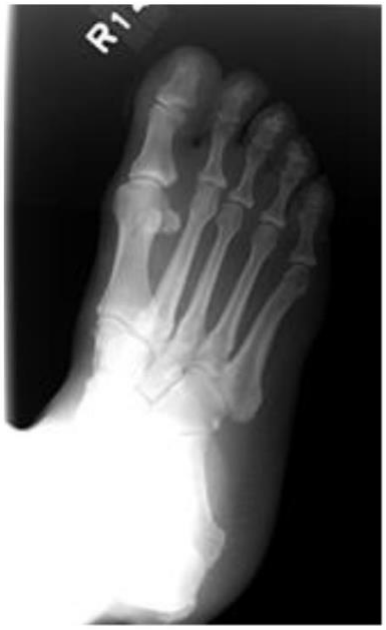
Views:

- **AP**
  - Most of femur and joint nearest area of interest to be included - a second image to include opposite end is to be done if femur not imaged in its entirety.
  - Femoral neck visible without foreshortening.
  - Gonadal shielding evident.
  - Demonstrate complete orthopedic device if present.
- **Lateral**
  - Most of femur and joint nearest area of interest to be included - a second image to include opposite end is to be done if femur not imaged in its entirety.
  - Greater trochanter superimposed over femoral neck.
  - Space between distal femur and patella open.
  - Gonadal shielding evident.
  - Demonstrate complete orthopedic device if present.

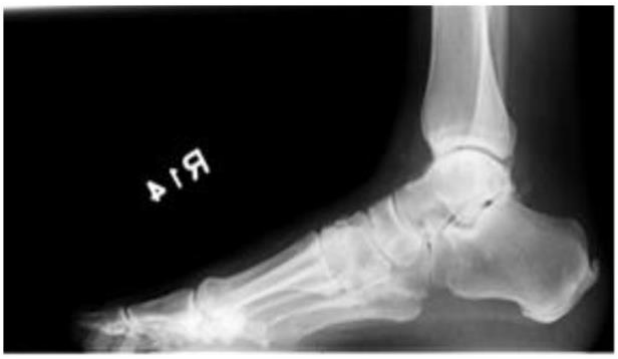
Foot



AP



AP Medial Oblique



Lateral

<u>Protocol</u>:

- ☐ AP
- ☐ Medial Oblique
- ☐ Lateral

Notes:

- ☐ Done weight bearing to tolerance

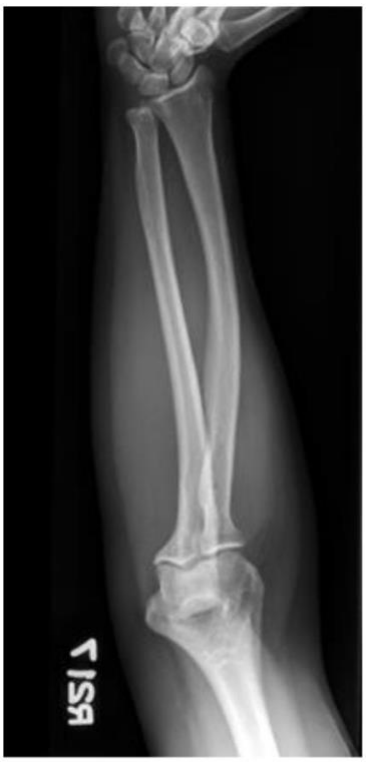
Views:

- ☐ **AP**
  - Metatarsal-phalangeal joint spaces open.
  - Overlapping of metatarsals only at proximal ends.
  - Cuneiforms, cuboid and navicular visible.
  - Foot aligned with vertical center of image with toes uppermost.
  - "STANDING" annotation visible (if applicable).

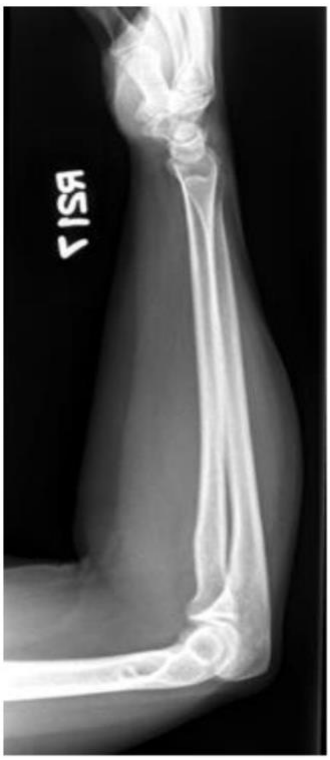
- ☐ **AP Medial Oblique**
  - 5th metatarsal tuberosity visualized in profile.
  - Cuboid-os calcis joint space visible.
  - 3rd cuneiform-cuboid joint space open.
  - Foot aligned with vertical center of image with toes uppermost.
  - "STANDING" annotation visible (if applicable).

- ☐ **Lateral**
  - Superimposition of metatarsals will vary according to transverse arch of foot.
  - Ankle joint and distal tibia/fibula visible.
  - Plantar surface parallel with horizontal plane with ankle uppermost.
  - "STANDING" annotation visible (if applicable).

Forearm



AP



Lateral

Views:

- **AP**
  - Carpal bones and humeral epicondyles visible with no rotation.
  - Forearm aligned to vertical center of image with wrist uppermost.

- **Lateral**
  - Carpal bones and distal 1/4 of humerus visible.
  - 90° flexion of elbow.
  - Distal ulna and radius superimposed.
  - Forearm aligned to vertical center of image with wrist uppermost.

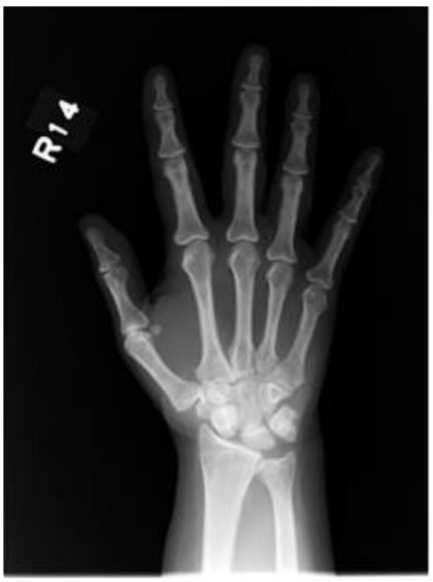
Notes:

- AP can be done PA if patient is in cast
  -

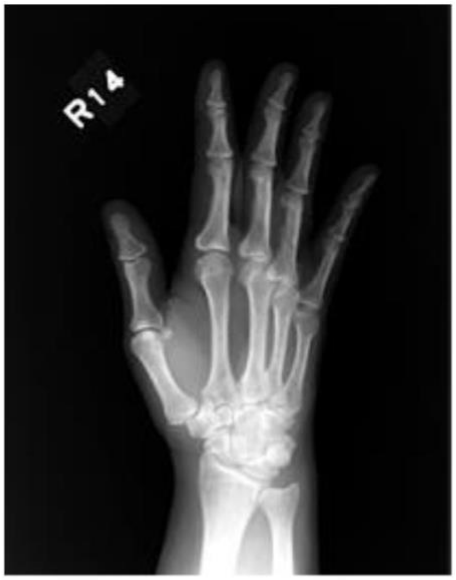
Protocol: If done, ensure AP/PA and Lateral of both joints are present

- AP
- Lateral

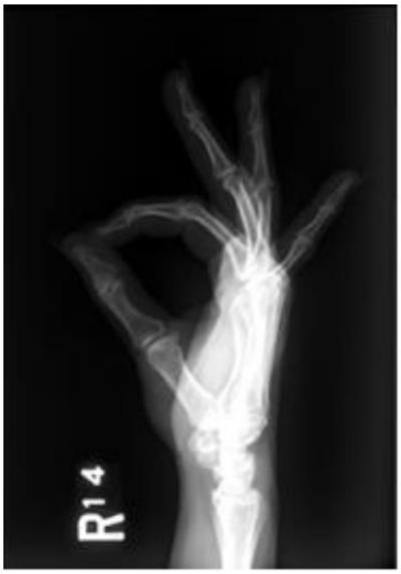
Hand



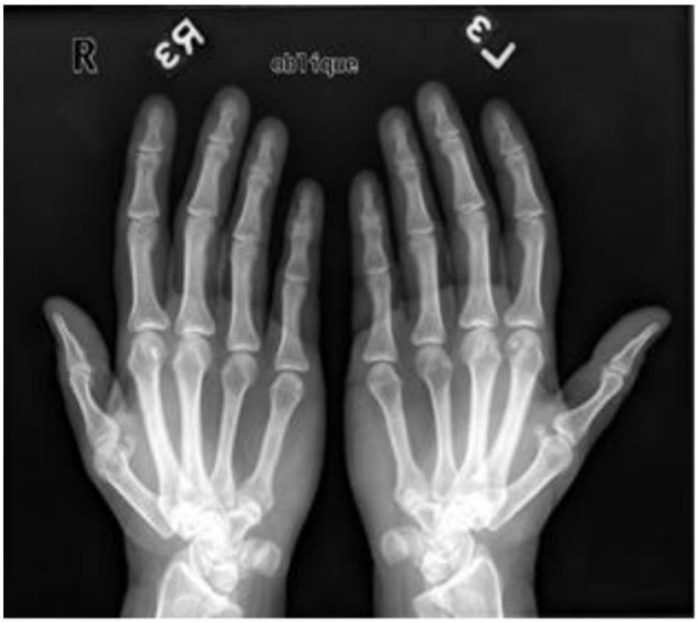
PA



Oblique



Lateral



Ballcatchers (for Arthritis)

Protocol:

- Arthritis - PA, Oblique, Lateral, Ball Catchers
- Pain - PA, Oblique, Lateral
- **Warhold Protocol:**
- **Bilateral Hands for Pain**
  - PA, Oblique, Lateral - 6 images
- **Unilateral Hand Pain or Arthritis**
  - PA, Oblique, Lateral - 3 images
- **Bilateral Hands For Arthritis**
  - PA, Oblique, Lateral, Ball catchers - 4 images

Views:

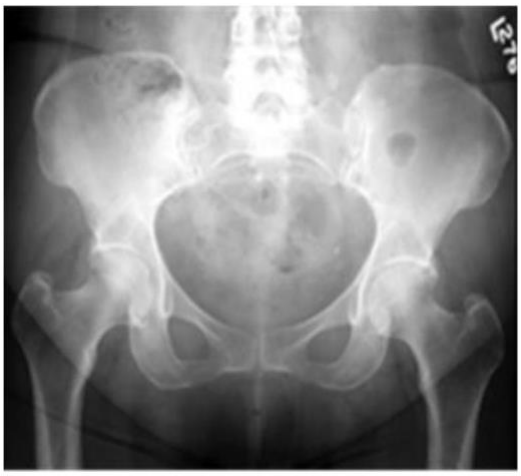
- **PA**
  - Include wrist and distal ends of radius and ulna.
  - No rotation of hand.
  - No soft tissue overlap from adjacent fingers.
  - Interphalangeal and metacarpophalangeal joint spaces open.
  - Hand aligned to vertical center of image with fingers uppermost.

Hand Continued…

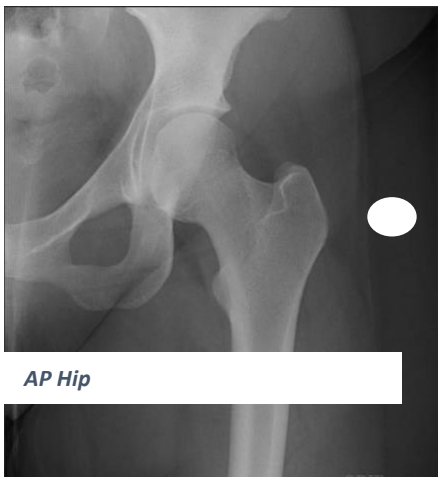
- **Oblique**
  - Include wrist and distal ends of radius and ulna.
  - Fingers extended so interphalangeal joint spaces are open and phalanges are not foreshortened.
  - 2nd and 3rd metacarpals free of overlap and minimal overlap of 3rd through 5th metacarpals.
  - No soft tissue overlap from adjacent fingers.
  - Hand aligned to vertical center of image with fingers uppermost.
- **Lateral**
  - Include wrist and distal ends of radius and ulna.
  - Phalanges individually demonstrated on fan lat.
  - 2nd to 5th metacarpals superimposed.
  - 2nd to 5th metacarpals in alignment with long axis of radius.
  - Distal radius and ulna superimposed.
  - Hand aligned to vertical center of image with fingers uppermost.

- **Ball catchers (Done if reason for exam is arthritis)**
  - Both hands included from distal tips of fingers to distal ulna and radius.
  - Degree of obliquity must be so metacarpal heads and the pisiform bone are free of superimposition.
  - Medial aspect of hands aligned to vertical center of image with fingers uppermost.

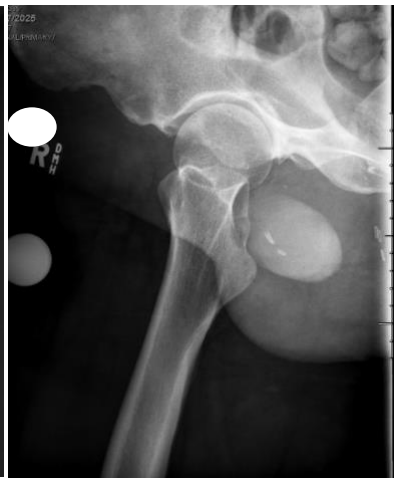
Hip (Non-trauma)



AP Pelvis Standing



AP Hip



Views:

- **AP Pelvis Standing**
  - Entire iliac bones visible.
  - Spine and pubic symphysis aligned with image midline.
  - Lower extremities internally rotated to prevent foreshortening of femoral neck.
  - Greater trochanter prominently demonstrated.
  - Obturator foramina equal in size and shape.
  - Any orthopedic device seen in its entirety.
- **AP Hip**
  - Hip joint, ilium and adjoining pubic symphysis visible.
  - Proximal 1/3 of femur visible.
  - Femoral head, penetrated and seen through the acetabulum.
  - Entire long axis of the femoral neck not foreshortened.
  - Greater trochanter in profile.
- **Lauenstein Lateral**
  - Hip joint, acetabulum, and femoral neck visible.
  - Proximal 1/4 of femoral shaft visible.
  - Femoral neck overlapped by the greater trochanter
  - Any orthopedic device seen in its entirety.

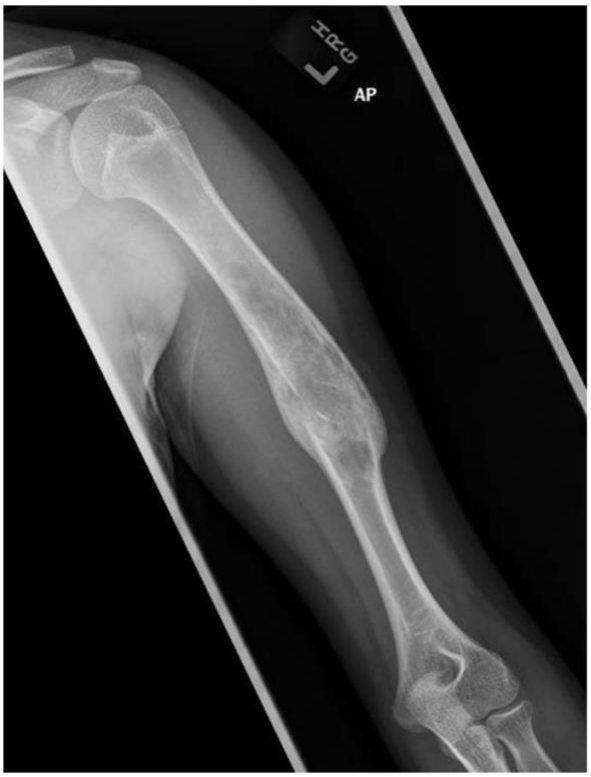
Notes:

- Routine views for orders put in by non-orthopedic providers (GIM, Rheumatology, Etc.)
- If hardware is present to knee on previous, contact provider to see if femur is needed
- Marker ball demonstrated on all images.

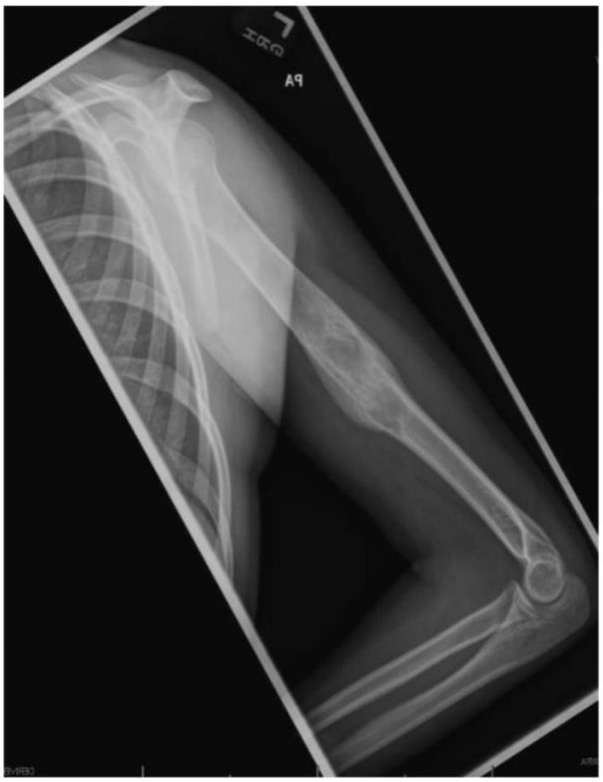
Protocol:

- AP Pelvis
- AP Hip
- Frog Lateral

Humerus



AP



Lateral

Views:

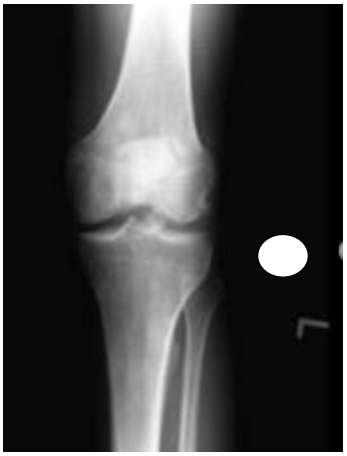
- **AP**
  - Proximal ulna and radius, shoulder and A-C joints visible.
  - Epicondyles prominent with no rotation.
- **Lateral**
  - Proximal ulna and radius, shoulder and A-C joints visible
  - 90° flexion of elbow with either internal or external rotation of arm.

Notes:

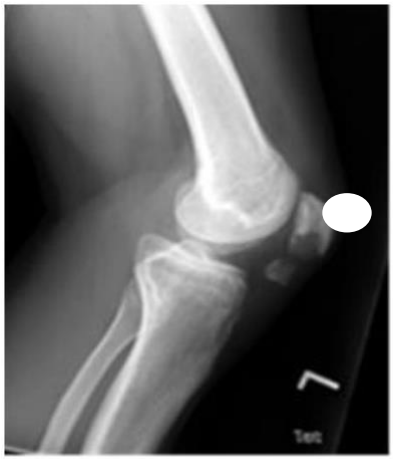
<u>Protocol</u>:

- AP
- Lateral

Knee



AP Standing



Lateral

Views:

- **AP Unilateral Standing**
  - Knee joint aligned to horizontal center of image.
  - Knee joint space open.
  - Patellar edge should not extend beyond edge of femur.
  - Distal 1/4 of femur and proximal 1/4 of tib/fib visible.
  - Any orthopedic device seen in its entirety.
  - "STANDING" annotation visible (if applicable).
- **Lateral**
  - Knee joint aligned to center line of image.
  - Superimposed femoral condyles evident.
  - Space between distal femur and patella open.
  - Knee joint flexed 20° to 30°.
  - Distal 1/4 of femurs and proximal 1/4 of tib/fib visible.
  - Any orthopedic device seen in its entirety.

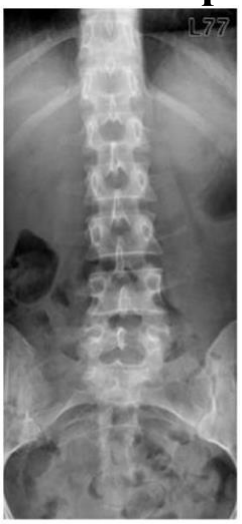
Notes:

- Marker ball present on images
- In the event a bilateral knee is ordered, an AP Bilateral Standing may be performed.

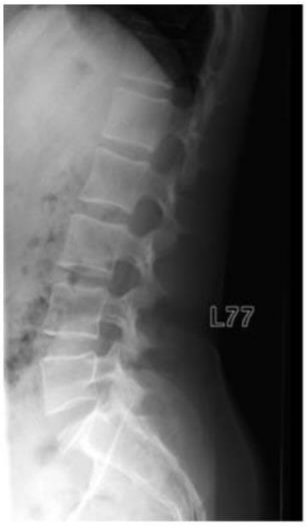
<u>Protocol</u>:

- AP Unilateral Standing
- Lateral

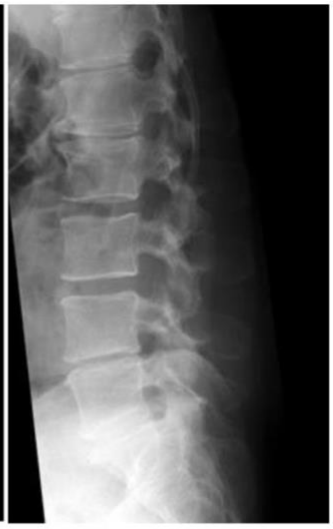
Lumbar Spine



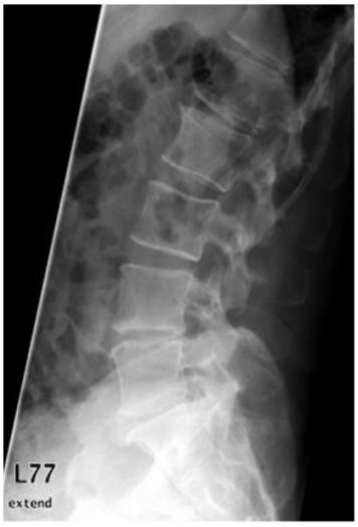
AP



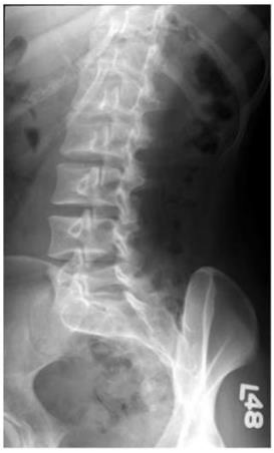
Lateral



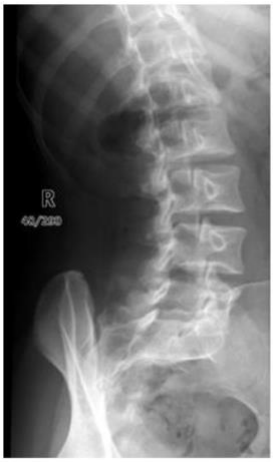
Lateral



Lateral Extension



LPO



RPO

- **Protocol:**
  - Routine - AP and Lateral
  - Post-Surgery - AP and Lateral
  - Trauma - AP, Lateral
  - Instability - Flexion and Extension

Views:

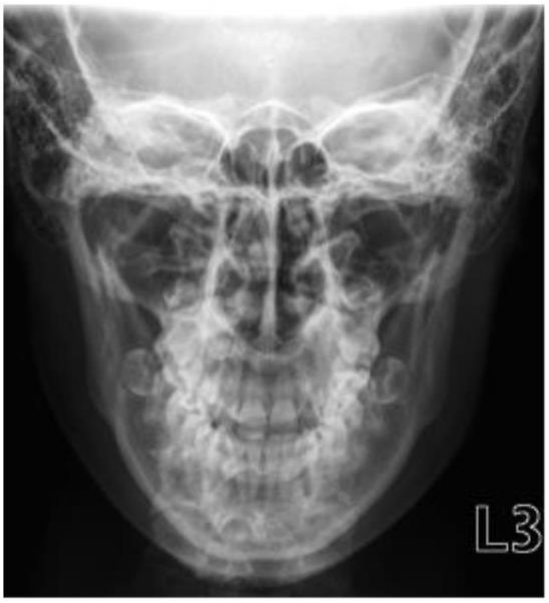
- **AP**
  - Vertebrae from T12 to lower sacrum visible.
  - Intervertebral disc spaces open.
  - Sacroiliac joints visible.
  - No evidence of rotation.
  - Spine aligned to vertical midline of image.

- **Lateral**
  - Vertebrae from T12 to lower sacrum visible.
  - Intervertebral disc spaces open.
  - Spinous processes visible.
  - Posterior margins of each vertebral body superimposed

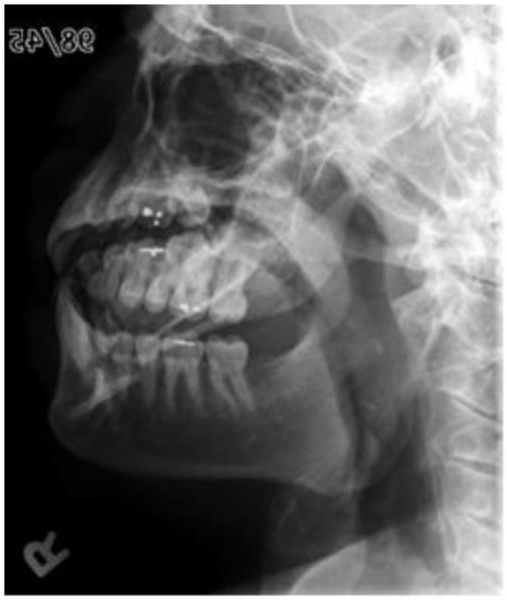
- **Lateral Flexion/Extension**
  - Vertebrae from T12 to lower sacrum visible.
  - Intervertebral disc spaces open.
  - Spinous processes visible.
  - Posterior margins of each vertebral body superimposed.

- **LPO/RPO**
  - Vertebrae from T12 to lower sacrum visible.
  - SI joint area visible.
  - Apophyseal joints closest to detector on AP oblique and apophyseal joints furthest from detector on PA oblique open.
  - Done if requested by the provider

Mandible



PA (Nose/ Forehead position)



Bilateral Axiolateral Obliques

Views:

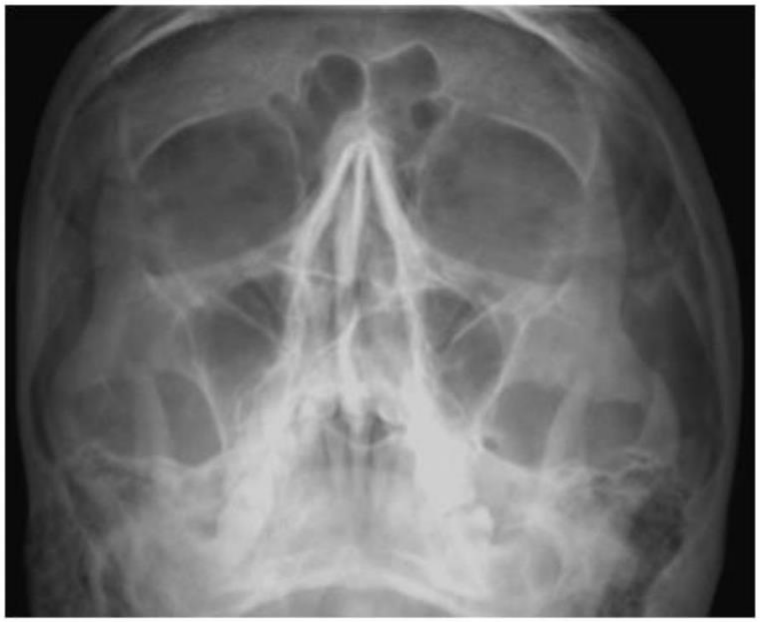
- **PA**
  - Entire mandible visible
  - No evidence of head rotation visible.

- **Bilateral Axiolateral Obliques**
  - Mandibular condyle to symphysis menti visible.
  - Condyle not superimposed by cervical vertebra.
  - Angle of opposite side slightly above coronoid process of side closest to imaging plate/detector

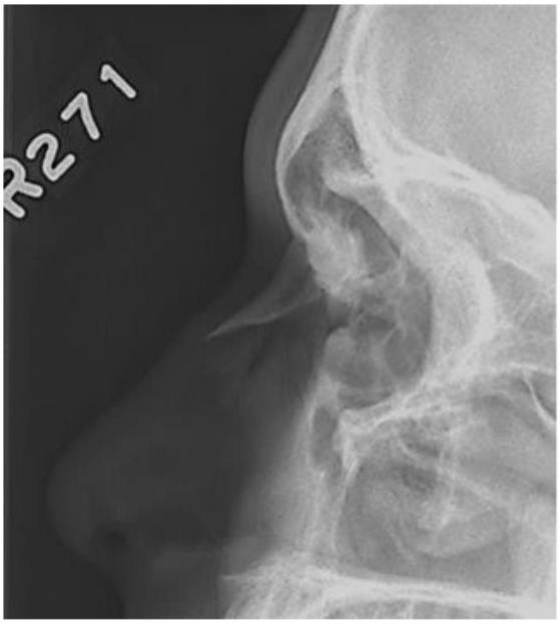
Protocol:

- PA
- Bilateral Axiolateral Obliques

Nasal Bones



Waters (Parietoacentheal)



Lateral

Views:

- **Waters**
  - Entire frontal and maxillary sinuses, margin of both orbits and zygomatic arches visible.
  - Petrous ridges projected immediately below maxillary sinuses.
  - No evidence of head rotation visible.
  - Nasal spine aligned to vertical center of image.
- **Lateral (Bilateral)**
  - Nasal bone, anterior nasal spine and soft tissue of nose visible.

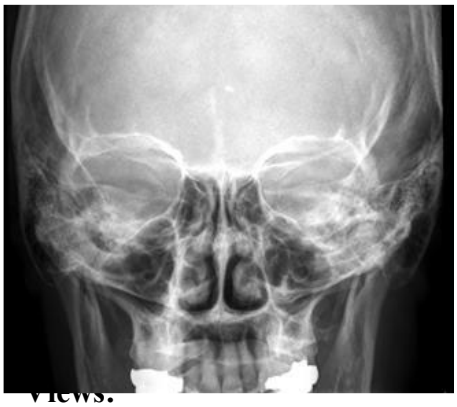
Notes:

- Bilateral laterals to visualize both nasal bones

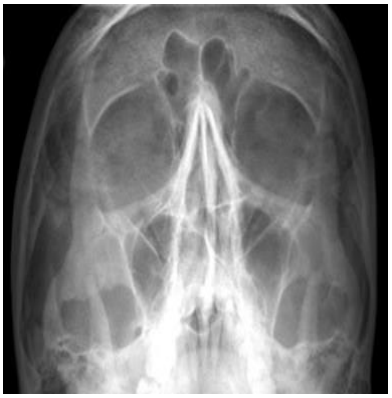
Protocol:

- Waters
- Bilateral Laterals

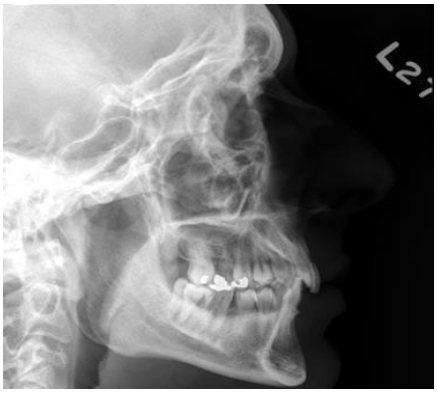
Orbits



PA Caldwell



Waters



Lateral

Views:

- **PA Caldwell (PA with 15° Caudal Angle)**
  - No evidence of head rotation visible.
  - Entire orbital rim visible bilaterally.
  - Petrous bone in lower portion of orbits.
  - Midsagittal plane aligned to vertical center of image.

- **Waters**
  - Entire frontal and maxillary sinuses, margin of both orbits and zygomatic arches visible.
  - Petrous ridges projected immediately below maxillary sinuses.
  - No evidence of head rotation visible.
  - Nasal spine aligned to vertical center of image.

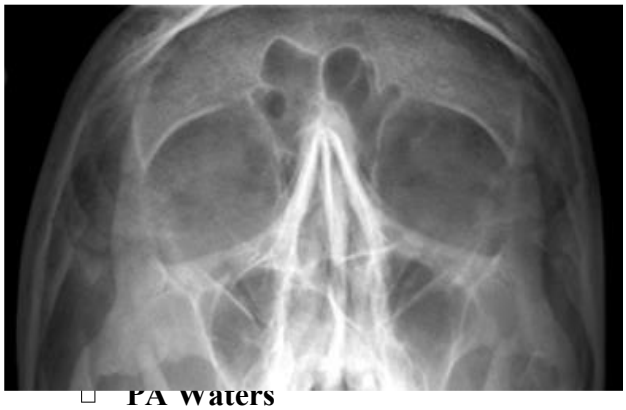
- **Lateral**

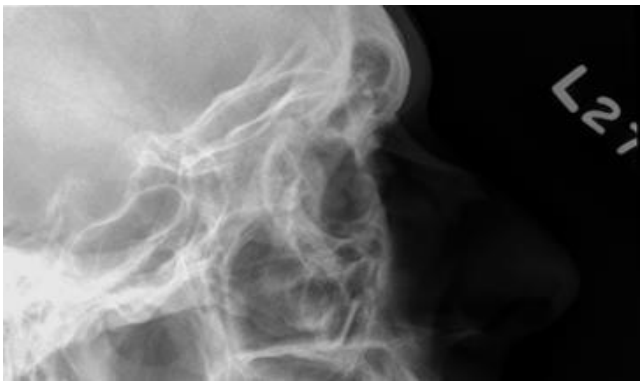
  Frontal sinuses, all of mandible and sella turcica visible.
  No evidence of head rotation visible.
  If not done erect, lateral must be exposed with beam projected horizontally.

Protocol:

- PA Caldwell
- Waters
- Lateral

Pre MRI Orbits





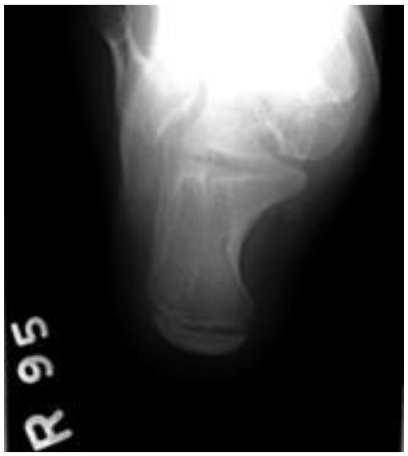
- **PA Waters**
  - Entire frontal and maxillary sinuses, margin of both orbits and zygomatic arches visible.
  - Petrous ridges projected immediately below maxillary sinuses.
  - No evidence of head rotation visible.
  - Nasal spine aligned to vertical center of image.

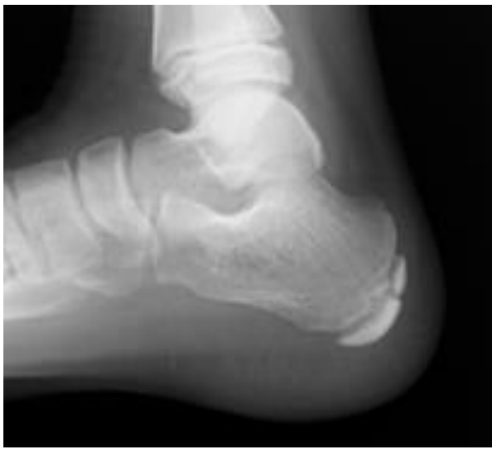
- **Lateral**
  - Frontal sinuses and sella turcica visible.
  - No evidence of head rotation visible.
  - If not done erect, lateral must be exposed with beam projected horizontally.

Protocol:

- PA Waters
- Lateral

Os Calcis



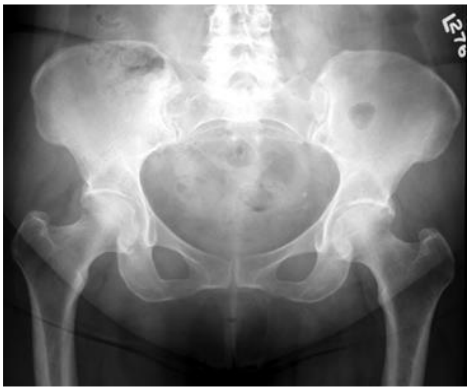
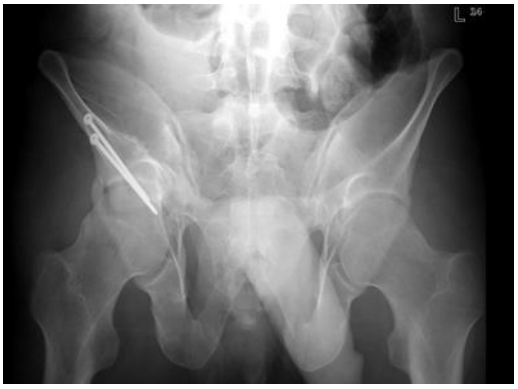
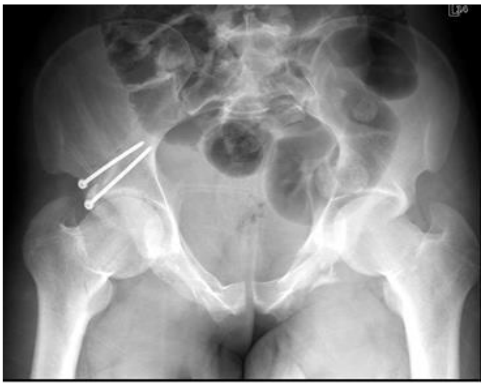
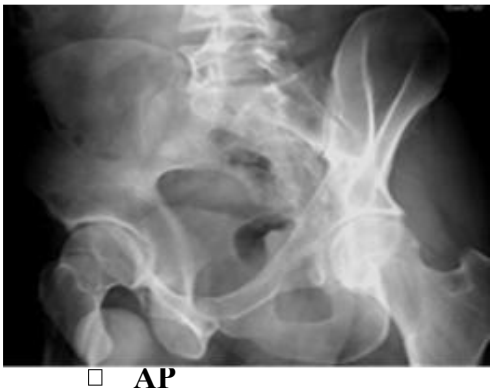
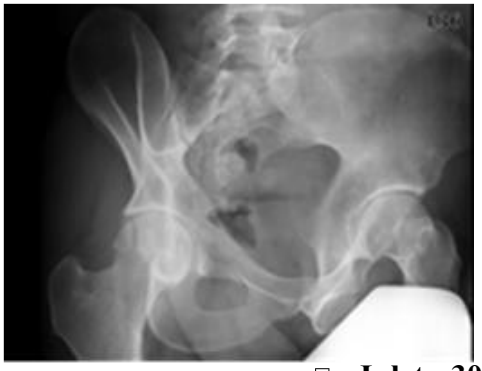


- **Plantodorsal Semi-axial**
  - Entire os calcis visualized from medial and posterior subtalar joints anteriorly to tuberosity posteriorly.
  - Plane of os calcis aligned with vertical midline of image with anterior surface uppermost.
  - "STANDING" annotation visible if done weightbearing.
- **Lateral**
  - Sinus tarsi visualized (space between talus and calcaneus). Ankle joint visible.
  - Tarsals anterior to os calcis visible.
  - Achilles tendon included by visualizing posterior skin edge.
  - "STANDING" annotation visible if done weightbearing.

Protocol:

- Plantodorsal Semi-axial
- Lateral

Pelvis

- AP
- Rami Fracture - Inlet/Outlet
- Acetabular Fracture- Judet

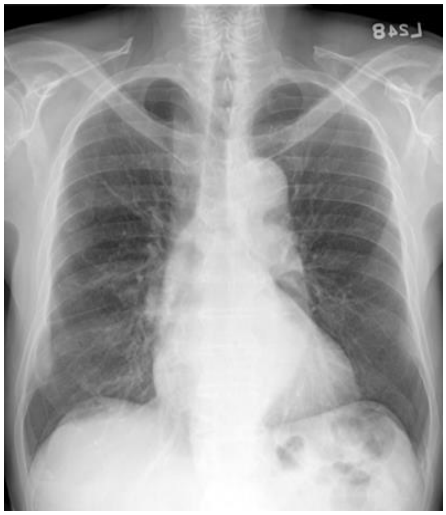
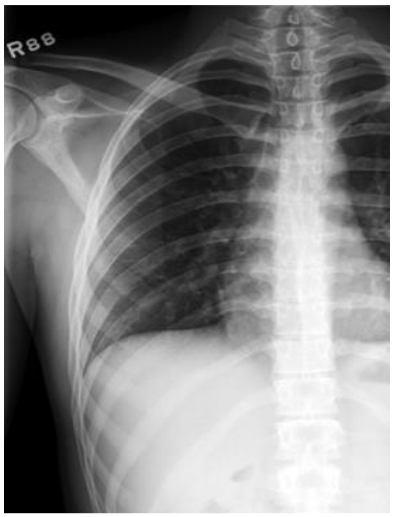
- **AP**
  - Entire iliac bones visible.
  - Spine and pubic symphysis aligned with image midline.
  - Lower extremities internally rotated to prevent foreshortening of femoral neck.
  - Greater trochanter prominently demonstrated.
  - Obturator foramina equal in size and shape.

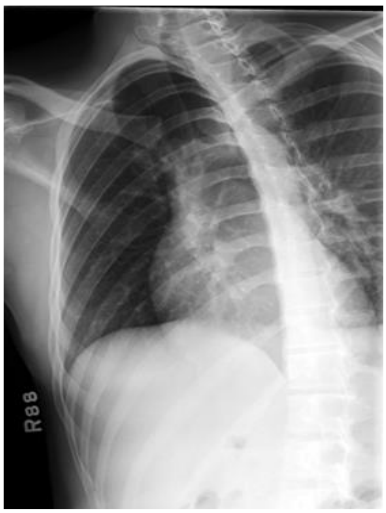
- **Outlet - 45° Cephalad**
  - No rotation as evident by obturator foramina and bilateral ischia equal in size and shape.
  - Inferior and superior pubic rami and ischia rami demonstrated with minimal foreshortening or superimposition.
  - Spine and pubic symphysis aligned with vertical center of image.

- **Inlet - 30° Caudal**
  - No rotation as evident by the ischial spines fully demonstrated and equal in size.
  - All of pelvic ring (inlet) including S-I joints and pubic symphysis visible.
  - Spine and pubic symphysis aligned with vertical center of image.

- **Bilateral Judets - 45° Obliques**
  - Entire iliac bones visible.
  - Both hip joints visualized on each image.
  - Downside acetabulum and femoral head demonstrated in profile.
  - Posterior rim of acetabulum should superimpose mid-way through femoral head on downside hip joint.
  - Acetabulum and femoral head almost completely superimposed on upside.

Ribs

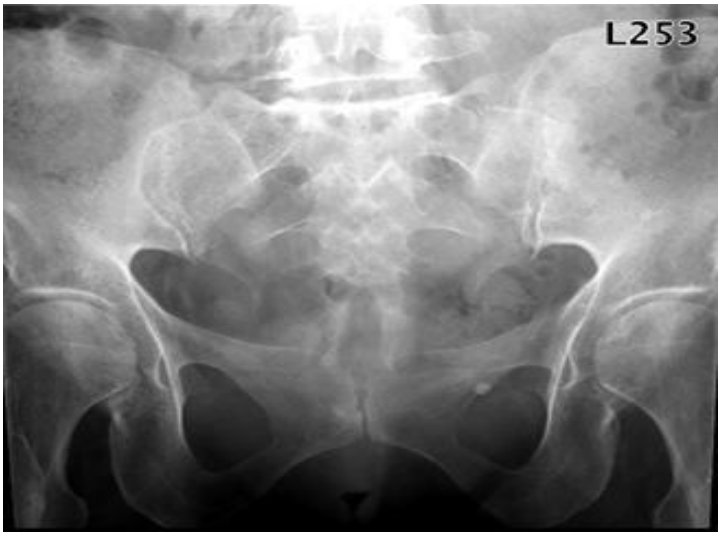


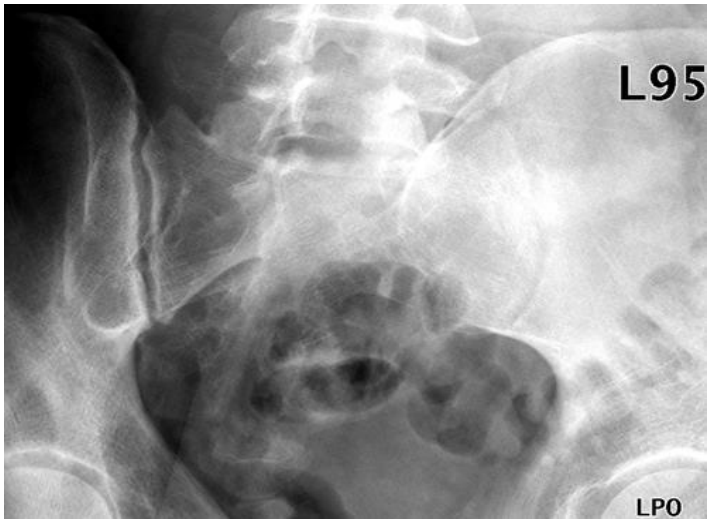
- **PA Chest**
  - Entire lung fields from apices to both costophrenic angles visible.
  - Ten posterior ribs above diaphragm visible.
  - No evidence of rotation.
  - No blurring of heart or diaphragm.
  - Thorax aligned with image midline.
- **AP or PA**
  - Ribs of affected side visible from spine to lateral rib margins.
  - Ribs visible through lungs or abdomen according to region of interest.
  - Ribs 1-12 visible
- **AP or PA Oblique**
  - Ribs of affected side visible from spine to lateral rib margins.
  - Ribs visible through lungs or abdomen according to region of interest.
  - Ribs 1-12 visible

- **Protocol:**

  - BB marker to be placed on patients skin where pain is located
  - Chest is always included in rib series
  - **PA** - if patients pain is anterior - LAO or RAO for oblique
  - **AP** - if pain is posterior - LPO or RPO for oblique

Sacroiliac Joints





<u>Protocol</u>:

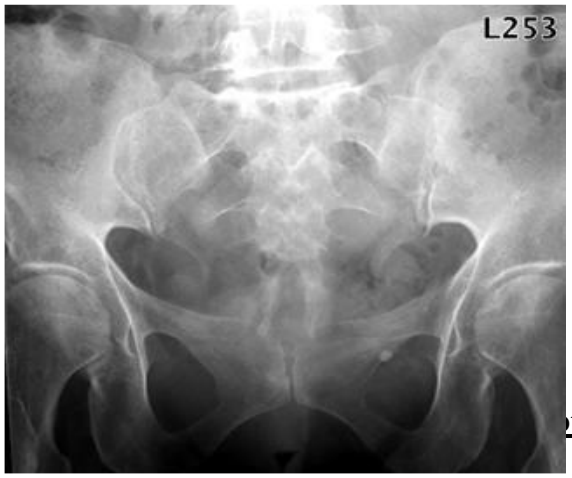
- AP Sacrum with 15° Cephalic Angle
- 25° to 30° RPO <u>and</u> LPO

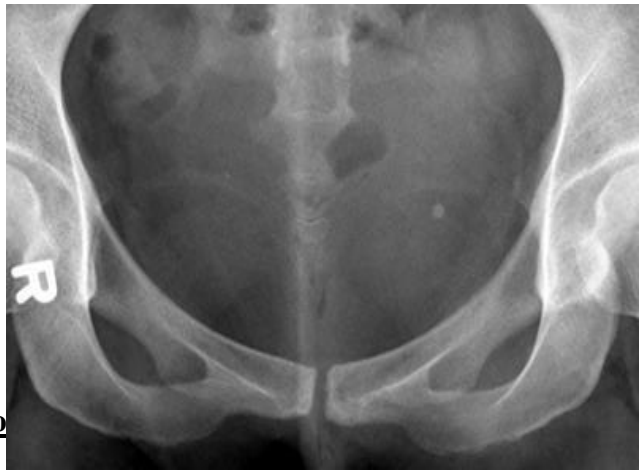
Views:

- **AP Sacrum with 15° Cephalic Angle**
  - Portion of L5 vertebra to coccyx visible.
  - SI joints visible.
  - No evidence of rotation.
  - Sacrum centered to midline of image.

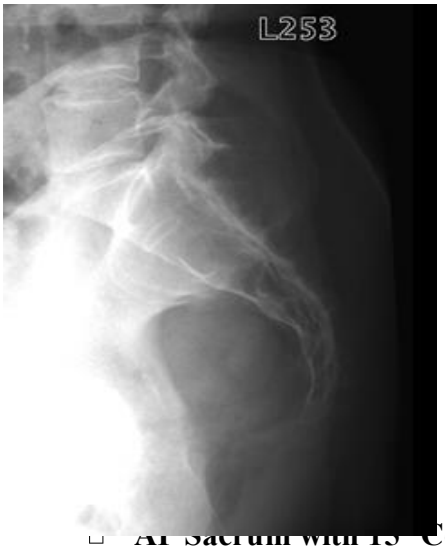
- **25° to 30° RPO and LPO**
  - SI joint space open on <u>elevated</u> side.
  - Both sacroiliac joints visible.

Sacrum and Coccyx





Photo

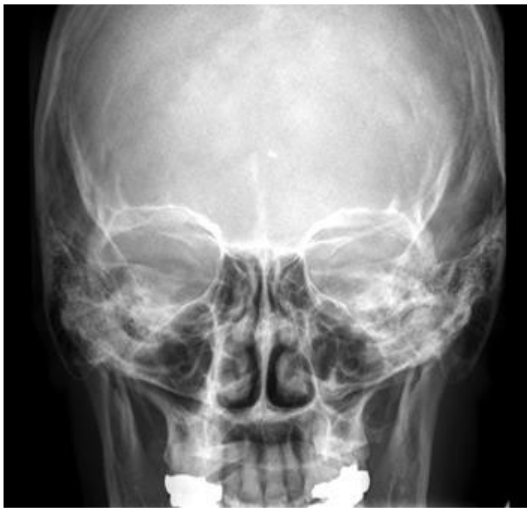
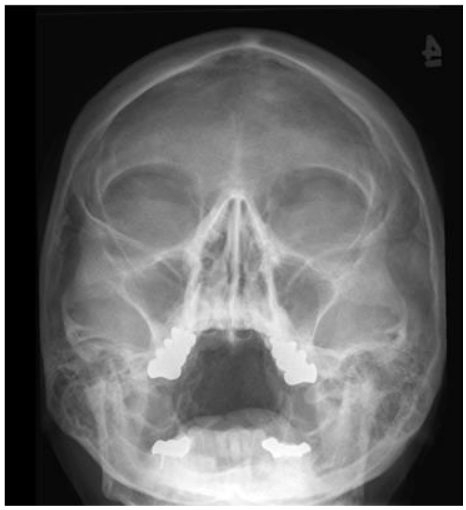
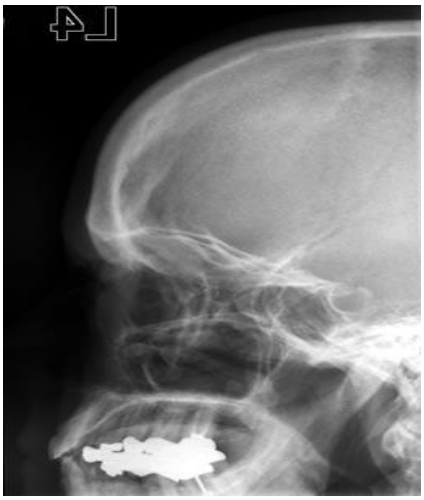


- AP Sacrum with 15° Cephalic Angle
- AP Coccyx with 10° Caudal Angle
- Lateral

Notes:
- Lateral is to include both sacrum and coccyx on one image
- 3 images total

- **AP Sacrum with 15° Cephalic Angle**
  - Portion of L5 vertebra to coccyx visible.
  - SI joints visible.
  - No evidence rotation visible.
  - Sacrum centered to midline of image.
- **AP Coccyx with 10° Caudal Angle**
  - Separation of coccygeal segments visible.
  - No evidence of rotation.
  - Coccyx centered to midline of image.
- **Lateral**
  - Portion of L5 vertebra to last coccygeal segment visible.
  - Posterior margins of L5 vertebral body and Iliac bones superimposed.

Sinuses

- **PA Caldwell (PA with 15° Caudal Angle)**
  - No evidence of head rotation visible.
  - Entire orbital rim visible bilaterally.
  - Petrous bone in lower portion of orbits.
  - Midsagittal plane aligned to vertical center of image.

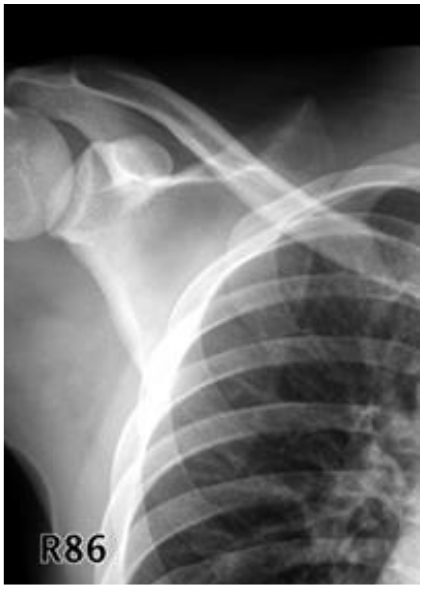
- **Open Mouth Waters Erect**
  - Entire frontal and maxillary sinuses, margin of both orbits and zygomatic arches visible.
  - Petrous ridges projected immediately below maxillary sinuses.
  - No evidence of head rotation visible.
  - Nasal spine aligned to vertical center of image.

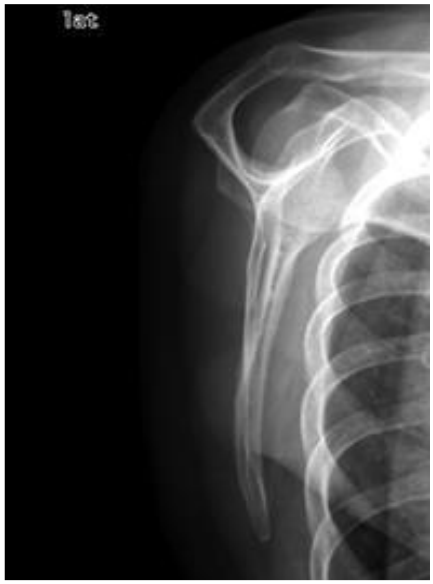
- **Lateral**
  - Frontal sinuses, all of mandible and sella turcica visible.
  - No evidence of head rotation visible.
  - If not done erect, lateral must be exposed with beam projected horizontally.

Protocol:

- PA Caldwell (PA with 15° Caudal Angle)
- Open Mouth Waters Erect
- Lateral

Scapula





Views:

- **AP**
  - Humeral head, acromion process and all of scapula visible.
  - Axillary border not superimposed by ribs.

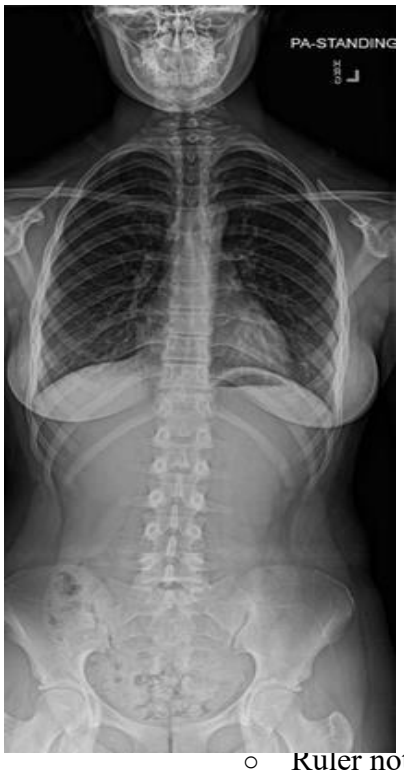
- **Lateral**
  - Acromion process and distal end of clavicle visible.
  - Axillary and vertebral borders of scapula superimposed.
  - Ribs and humerus not superimposed over body of scapula.

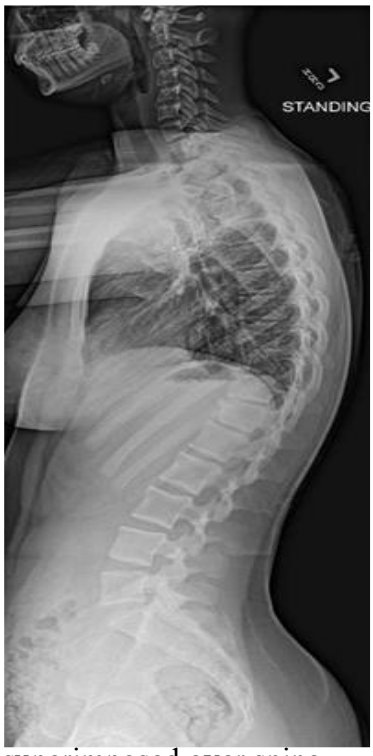
<u>Protocol</u>:

- AP

- Lateral

Scoliosis





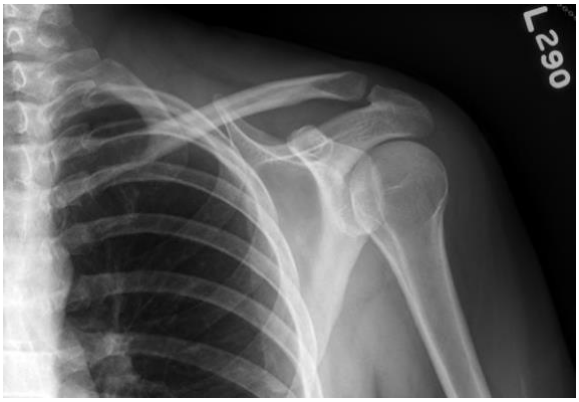
Protocol:

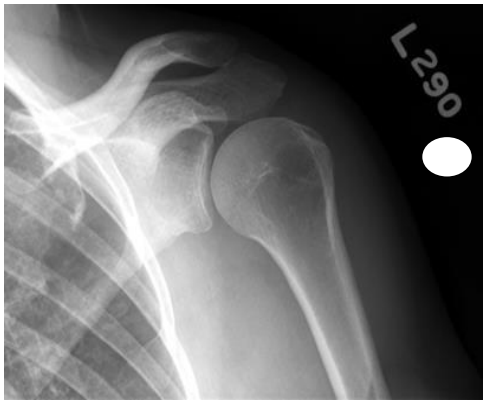
- New patients - 2 views
- Hardware - 2 views
- Done PA Standing if possible
  - Can be done AP sitting/standing if needed

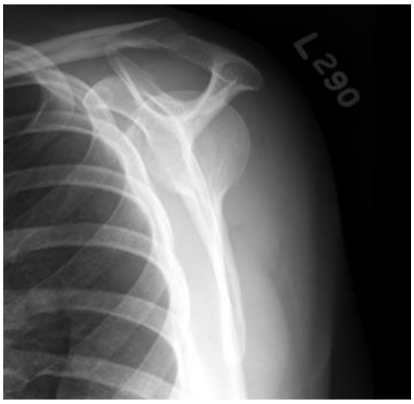
Views:

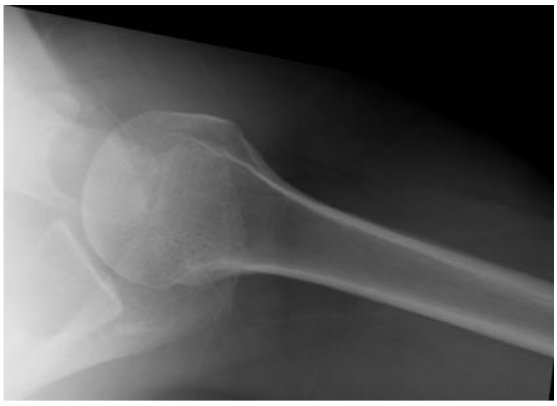
  - Ruler not superimposed over spine.
  - 2mm or less of anatomy shift visible at stitch level.
  - Iliac crest growth centers bilaterally visible.
  - Lower portion of skull to upper half of sacrum visible.
  - End plates of vertebrae at upper and lower extremes of curvature(s) visible for calculation of Cobb's angle(s).
  - No evidence of rotation.
- **Lateral**
  - Ruler not superimposed over spine.
  - 2mm or less of anatomy shift visible at stitch level.
  - Lower portion of skull to upper half of sacrum visible.
  - End plates of vertebrae at upper and lower extremes of curvature(s) visible for calculation of Cobb's angles(s).

Shoulder









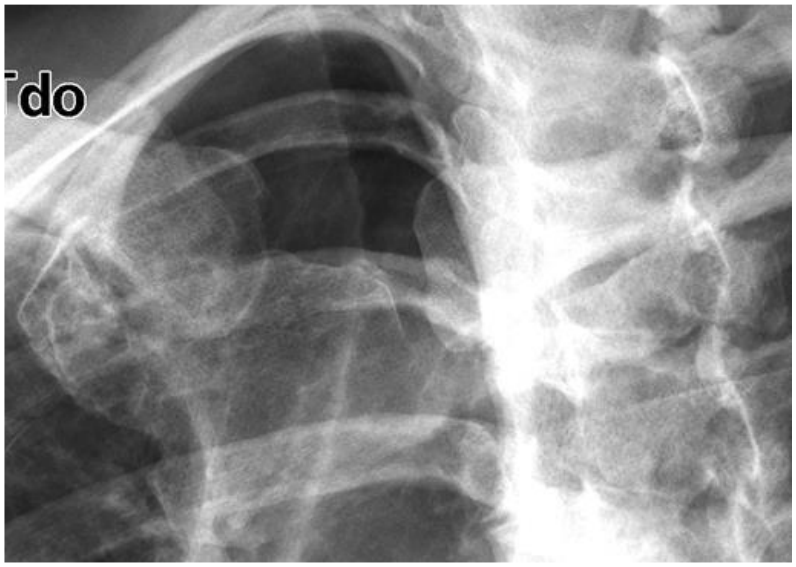
- AP Internal
- AP External Rotation
- Scapular "Y"
- Axillary

Notes:

- Velpeau View can be attempted if patient is in sling and has abduction restrictions for axillary view.
- Marker ball present on AP External (Grashey) View

- **AP Internal Rotation**
  - Proximal humerus, scapula and clavicle visible.
  - Humeral head not superimposed by acromion process.
- **AP External Rotation**
  - Shoulder joint space open.
  - Anterior and posterior rim of glenoid fossa superimposed.
  - Greater tuberosity in profile on lateral aspect of humerus.
  - Acromion process and distal end of clavicle visible.
- **Scapular Y**
  - Acromion process and distal end of clavicle visible.
  - Axillary and vertebral borders of scapula superimposed.
  - Humerus superimposed over scapular body.
  - Glenoid fossa in center of humeral head.
- **Axillary**
  - Shoulder joint space open.
  - Inferior and superior rim of glenoid fossa superimposed.
  - A-C joint demonstrated through humeral head.
  - Humerus aligned to horizontal image center.
  - Anterior surface uppermost (coracoid process projected upward)

Sternoclavicular Joints

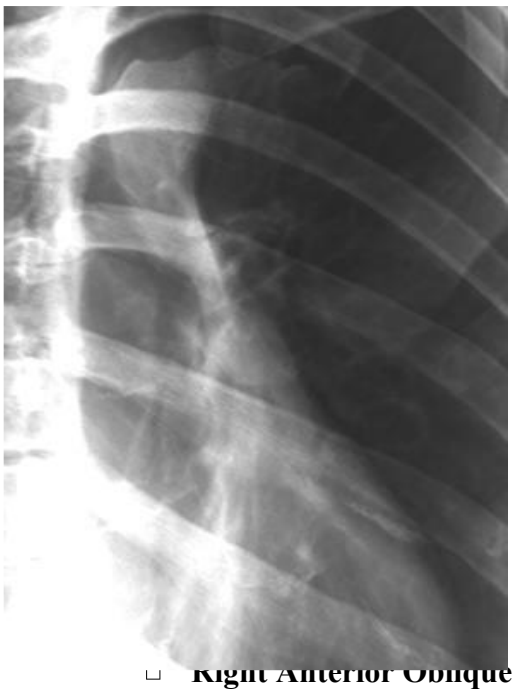


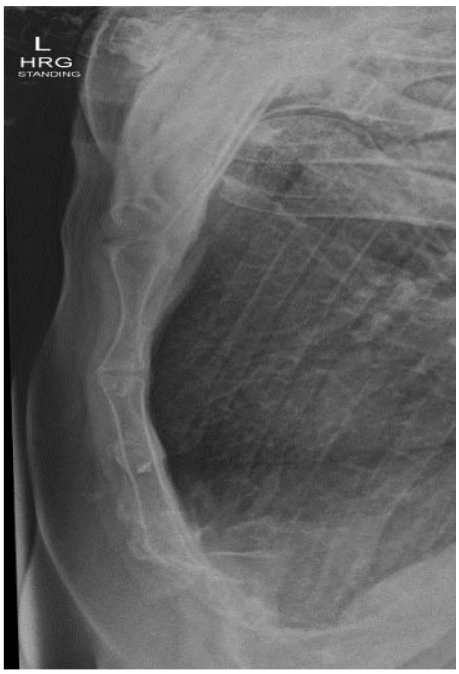
- **PA Obliques (RAO and LAO)**
  - S-C joint of interest (joint closest to detector during
  - exposure) in center of image.
  - Manubrium and medial end of clavicle articulating with joint of interest visible.
  - S-C joint space open.

Protocol:

- PA Obliques (RAO and LAO)

Sternum





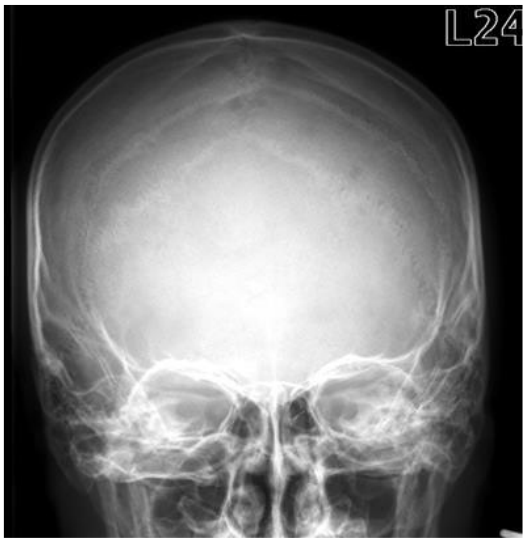
- **Right Anterior Oblique**
  - Entire manubrium to tip of xiphoid visible.
  - Sternum and thorax obliqued minimally:
  - Sternum and sterno-clavicular joint free of superimposition from vertebral column.
  - Visibility of sternum through thorax can be improved by:
    - blurring lung markings through shallow breathing
    - magnifying posterior rib shadows with short S.I.D. (28").

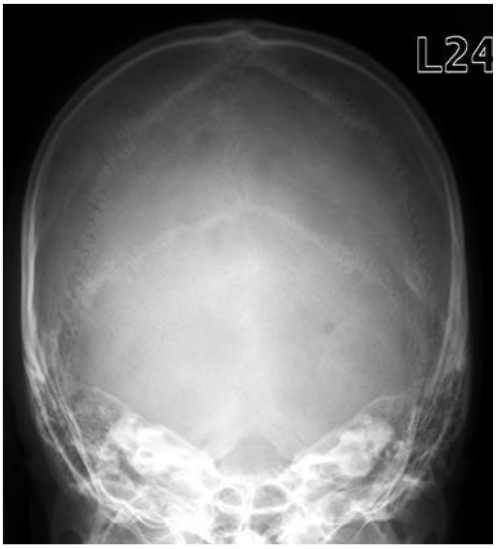
- **Lateral (72" SID)**
  - Entire sternum visible.
  - No evidence of rotation.
  - Taken on deep inspiration.

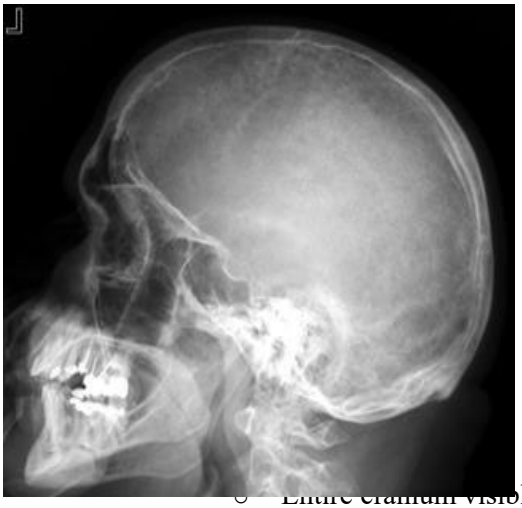
<u>Protocol</u>:

- Right Anterior Oblique (RAO)
- Lateral

Skull







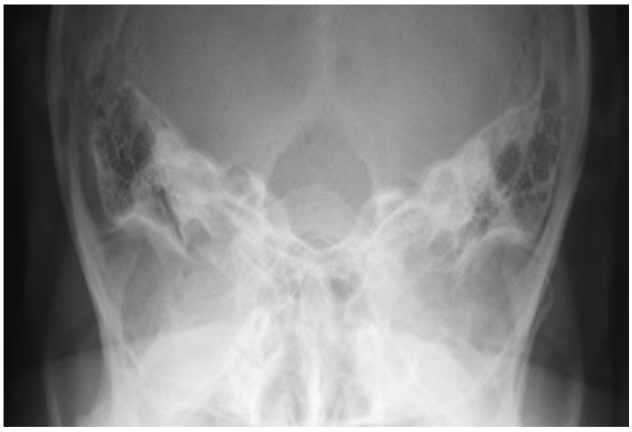
- PA
- Towne
- Lateral (Bilateral)

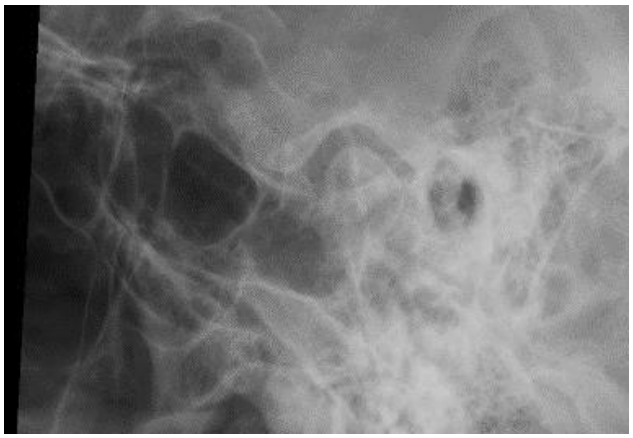
- Entire cranium visible.
- Petrous bones fill orbits.
- No evidence of head rotation visible.
- Midsagittal plane aligned to vertical center of image.

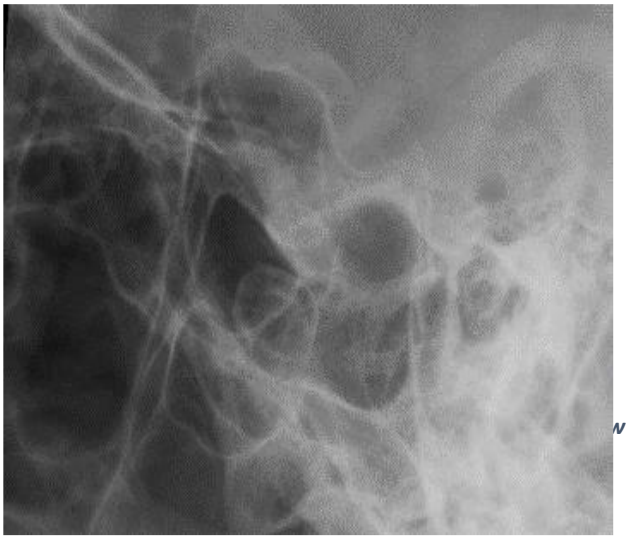
- **Towne**
  - Occipital bone, temporal and parietal bones visible.
  - Posterior clinoid processes visible within foramen magnum.
  - Entire petrous and mastoid areas visible bilaterally.
  - No evidence of head rotation visible.

- **Lateral (Bilateral)**
  - Entire cranium visible.
  - No evidence of head rotation visible.

T-M Joints







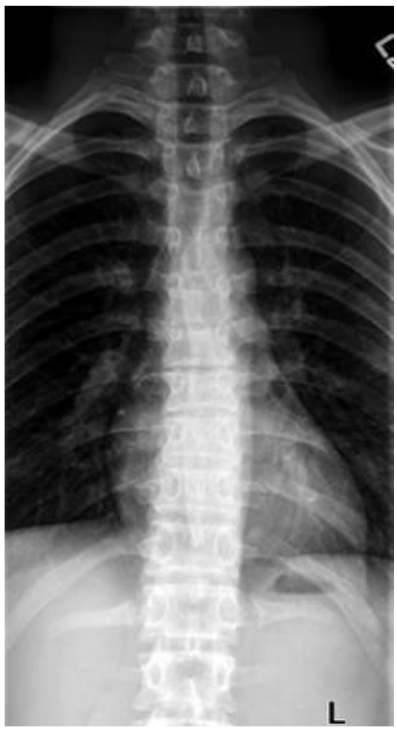
Protocol:

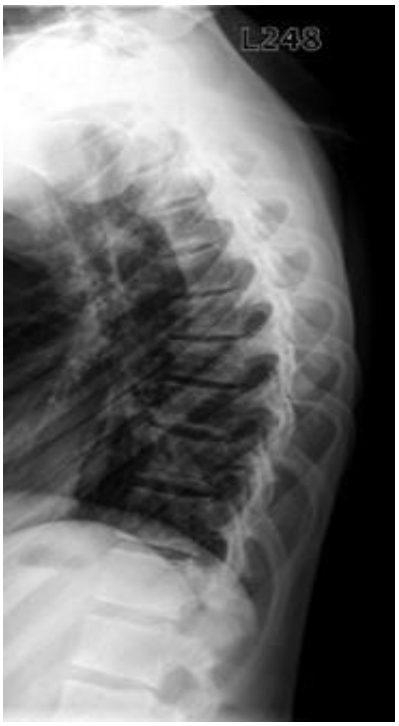
- Towne
- Bilateral Open Axial Transcranial
- Bilateral Closed Axial Transcranial

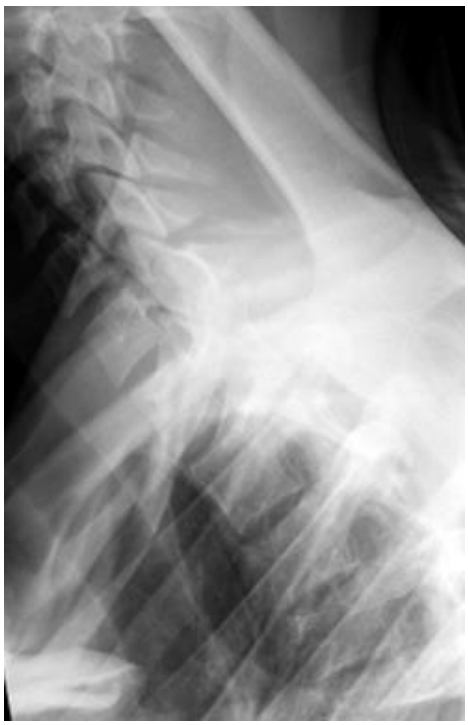
- **Towne**
  - Mandibular rami and condyles visible bilaterally.
  - No evidence of head rotation visible.

- **Bilateral Open and Closed Axial Transcranial (Schuller or Law Projection)**
  - Position of mandibular condyle in relation to fossa visible.
  - T-M joint in center of image.
  - "OPEN" and "CLOSED" annotation visible on appropriate image.

Thoracic Spine







- **AP**
  - Vertebrae C7 to L1 visible.
  - No evidence of rotation.
  - Spine aligned to vertical midline of image.

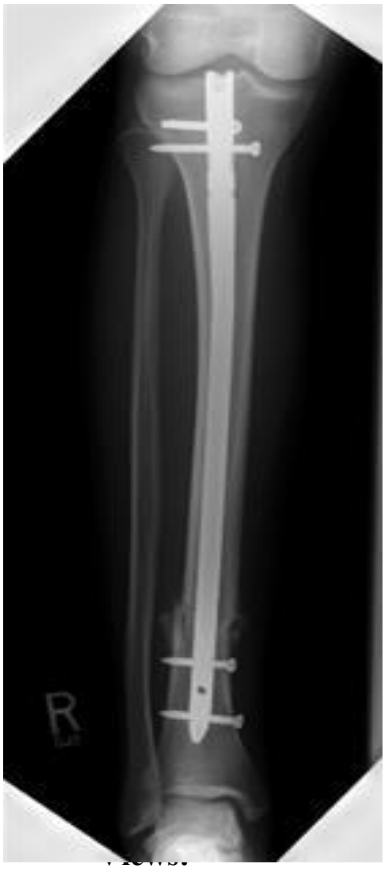
- **Lateral**
  - Uppermost thoracic vertebrae possible to L1 visible. Include
  - Swimmers if upper vertebrae are area of interest.
  - Lung markings blurred by shallow breathing.
  - No evidence of rotation.

- **Swimmers** (Done if requested or if anatomy of interest is C7-T3)
  - Air filled Pharynx and trachea visible.
  - Left arm is raised above head while right is positioned reaching to the floor with the shoulder relaxed.
  - No evidence of rotation.

Protocol:

- AP
- Lateral
- Swimmers (Done if requested or if anatomy of interest is C7-T3)

Tibia



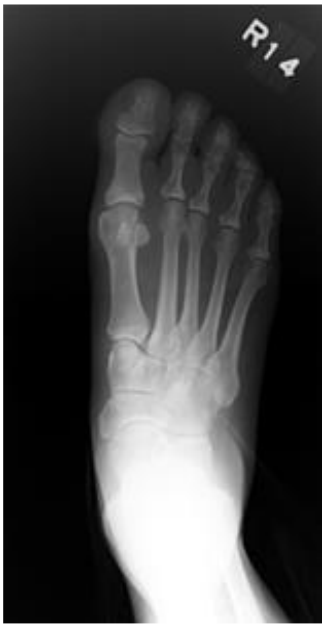

- **AP**
  - Both ankle and knee joints included on one image. Do second image if both joints are not present.
  - Ankle and knee joints in true AP position.

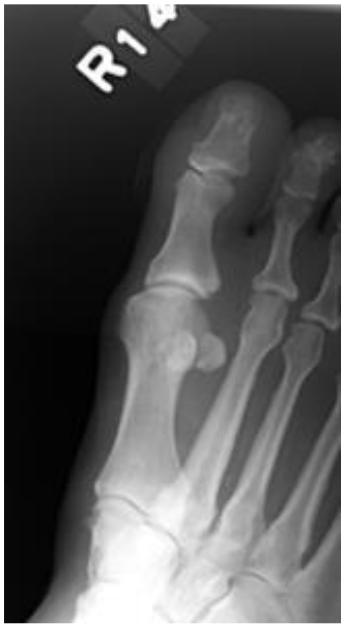
- **Lateral**
  - Both ankle and knee joints included on one image. Do second image if both joints are not present.
  - Ankle and knee joints in lateral position with knee joint flexed.

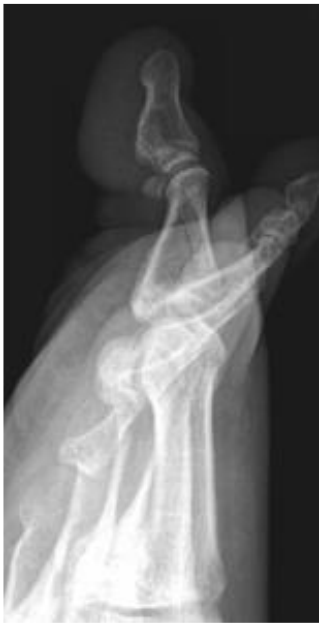
Protocol:

- AP
- Lateral

Toe







- **AP Foot**
  - Metatarsal-phalangeal joint spaces open
  - Overlapping of metatarsals only at proximal ends
  - Cuneiforms, cuboid and navicular visible
  - Foot aligned with vertical center of image with toes uppermost
  - "STANDING" annotation visible (if applicable)

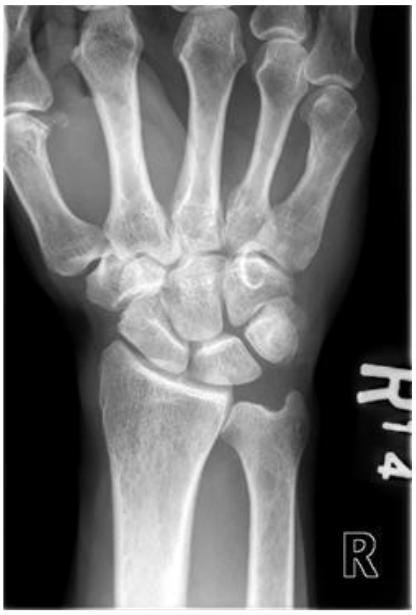
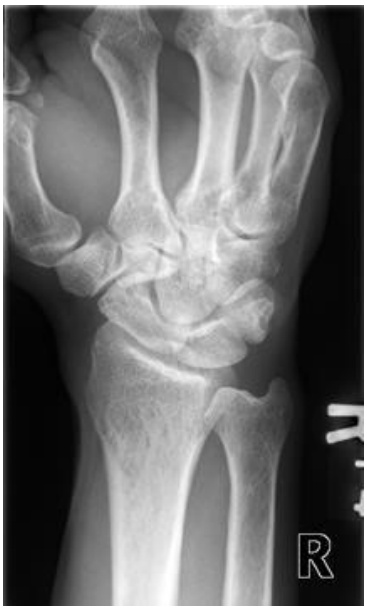
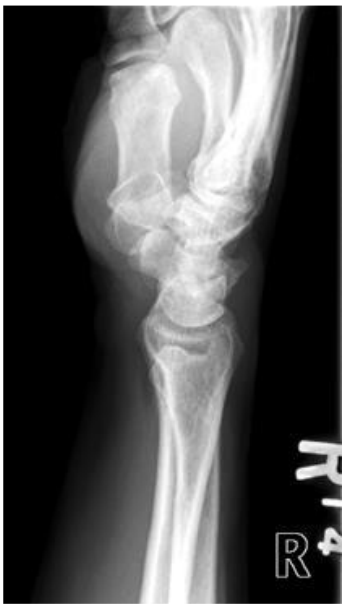
- **Oblique**
  - Joint spaces open
  - Majority of adjacent metatarsal visible
  - Distal phalanx uppermost in image

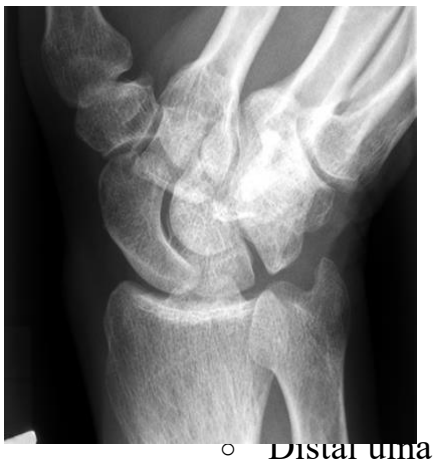
- **Lateral**
  - Toes separated to prevent superimposition
  - Metatarsal-phalangeal joint visible
  - Joint spaces open
  - Distal phalanx uppermost in image

Protocol:

- AP Foot
- Oblique of affected toe
- Lateral of affected toe

Wrist



- **PA**
  - Distal ulna and radius and proximal 2/3 of
  - metacarpals visible.
  - 3rd metacarpal in alignment with long axis of radius.
  - No rotation of wrist evident.
  - Ulna/radius and metacarpals aligned to vertical center of image with metacarpals uppermost.

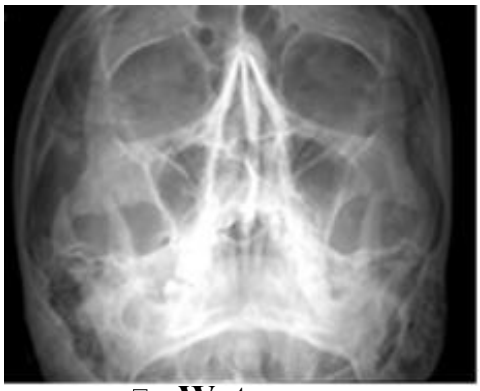
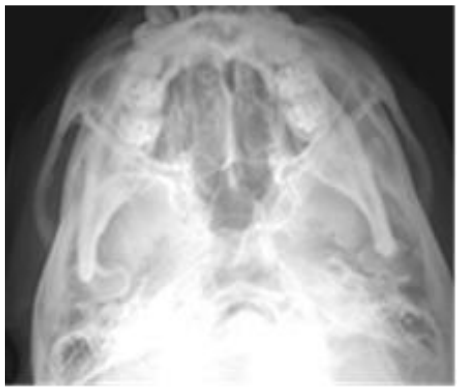
  - Distal ulna and radius and the proximal 2/3 of the
  - Metacarpals visible.
  - 3rd metacarpal in alignment with long axis of radius.
  - Navicular well demonstrated.
  - Ulna/radius and metacarpals aligned to vertical center of image with metacarpals uppermost.
- **Lateral**
  - Distal ulna and radius and the proximal 2/3 of
  - metacarpals visible.
  - Shafts of distal ulna/radius superimposed.

- 2nd to 5th metacarpals superimposed.
- 2nd to 5th metacarpals in alignment with long axis of radius.
- Anterior pisiform edge midline between anterior surfaces of navicular and capitate.
- Ulna/radius and metacarpals aligned to vertical center of image with metacarpals uppermost.

Protocol:

- PA
- Oblique
- Lateral
- Navicular (Only if new trauma/scaphoid hardware present)
  - **Navicular (Only if new trauma/scaphoid hardware present/if requested)**
    - Distal ulna/radius, proximal metacarpals and all of carpals visible.
    - Wrist in ulnar deviation (away from radius).
    - Navicular well demonstrated with minimal superimposition by adjacent bones.
    - Metacarpals uppermost.

Zygomatic Arches

- **Waters**
  - Entire frontal and maxillary sinuses, margin of both orbits and zygomatic arches visible.
  - Petrous ridges projected immediately below maxillary sinuses.
  - No evidence of head rotation visible.
  - Nasal spine aligned to vertical center of image.

- **SMV**
  - Zygomatic arches visible.
  - No evidence of head rotation visible.
  - Symphysis menti uppermost and aligned to vertical center of mage.