

**THOMAS JEFFERSON UNIVERSITY HOSPITAL
DEPARTMENT OF RADIOLOGY**

**TECHNICAL
DIAGNOSTIC AND PEDIATRIC
PROTOCOLS AND PROCEDURES**

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INTRODUCTION TO RADIOGRAPHIC & FLUOROSCOPIC PROCEDURES
(POSITIONS AND ROUTINES)

The "routine views" are intended as a guide. The technologist is expected to consider each patient's general physical condition and clinical history. If the technologist feels the routines should be compromised, he/she must consult with a radiologist or technical supervisor. The reason for the compromise, the radiologist's or technical supervisor's name must be recorded in the Comment Section of Imagecast.

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ROUTINE RADIOGRAPHIC POSITIONS

AOI = Area of Interest

Documentation of patient complaint, specify on request

(i.e. X-Ray: LT hand; Trauma: 2 wks ago;

Pain: 2nd Metacarpal; Area: Distal MP joint space)

***ALL SKULL EXAMS SHOULD BE APPROVED THROUGH A BONE RADIOLOGIST**

I. Headwork

A. Skull

1. PA
2. AP Towne
3. Base
4. Rt. lateral
5. Lt. lateral

B. Mandible

1. PA
2. Both obliques
3. Towne
4. Lateral of affected side

C. T.M. Joints

1. Rt. lateral - open and close mouth
2. Lt. lateral - open and close mouth
3. Base and Townes views (include only for fracture or dislocation)

D. Sinuses

1. PA
2. Waters with mouth open (modified Waters)
3. Base
4. Lateral

E. Facial Bones

1. PA
2. Waters
3. Exaggerated Waters
4. Base
5. Lateral face

F. Mastoids

1. AP
2. Base
3. Transorbital
4. Laws
5. Stenvers

G. Optic Foramen

1. Rt. and Lt. Rheese

H. Orbits

1. See facial bones
2. Rheese view

I. Nasal Bones

1. Right and Left Lateral
2. Waters

J. Zygomatic Arches

1. See facial bones
2. Mays view

K. Foreign Body of Eye (MRI) -

Clean cassettes with AGFA screen cleaner prior to exposure

1. PA Caldwell 23° caudal angulation
2. Waters
3. Lateral

II. Spine

A. Cervical 10x12 portrait (never do flexion and extension views until lateral is checked by radiologist)

1. AP
2. RPO _____
3. LPO
4. Lateral
5. In cases of trauma, cross table lateral is done first and shown to a radiologist. Then proceed with what he/she orders. Views possibly needed for trauma:
 - a. Odontoid
 - b. Flexion and extension (not done until lateral is shown to radiologist)
 - c. Trauma obliques-requested by ER physicians as needed

B. Thoracic 14x17 portrait

1. AP
2. Lateral

C. Lumbar

1. AP (14 x 17 - full abdomen)
2. RPO 14x17 portrait
3. LPO 14x17 portrait
4. Lateral 14x17 portrait
5. Lateral L5-S1 spot 10x12 portrait

D. Sacrum 10x12 portrait

1. AP
2. Lateral

E. Coccyx 10x12 portrait

1. AP
2. Lateral

F. S.I. Joints

1. AP pelvis 14x17 landscape
2. RPO 10x12 portrait
3. LPO 10x12 portrait

G. Pelvis 14x17 landscape

1. AP

H. Hip

1. AP pelvis 14x17 landscape
2. AP hip 10x12 portrait
3. Lateral hip 10x12 portrait-in cases of trauma or possible fracture do shoot through lateral

III. Upper Extremities - Despite what views are requested, it is departmental policy that both obliques be done on all trauma extremities (i.e. hand, finger, wrist, elbow, toes, knees, feet and ankles). Then an AP and lateral is obtained.

A. Finger (identify affected finger with arrow)

1. PA hand
2. Oblique (both obliques if trauma)
3. Lateral of affected digit

- B. Hand
 - 1. PA
 - 2. Oblique (both obliques if trauma)
 - 3. Lateral

- C. Wrist
 - 1. PA with hand flat on cassette
 - 2. Oblique (both obliques if trauma)
 - 3. Lateral
 - 4. Navicular view (if indicated on request or ordered by radiologist)

- D. Forearm
 - 1. AP
 - 2. Oblique -- only if requested
 - 3. Lateral

- E. Elbow
 - 1. AP
 - 2. Lateral
 - 3. Obliques (if trauma)
 - 4. Radial head view (if trauma)

- F. Humerus 14x17 lengthwise
 - 1. AP - internal and external rotation
 - 2. For trauma:
 - a. AP - neutral
 - b. Transthoracic lateral - 10x12 lengthwise

- G. Shoulder
 - 1. (Trauma)
 - a. AP internal rotation (15° caudad)
 - b. AP external rotation (15° caudad)
 - c. Axillary
 - d. Y view

 - 2. (Non-Trauma)
 - a. AP internal rotation (15° caudad)
 - b. AP external rotation (15° caudad)
 - c. Y view

IV. Lower Extremities

A. Toes

1. AP forefoot (identify affected toe)
2. Oblique toe (both obliques if trauma)
3. Lateral toe

B. Foot

1. AP
2. Obliques (both obliques if trauma)
3. Lateral

C. Calcaneus

1. Axial
2. Lateral

D. Ankle

1. AP
2. 45° medial oblique (both obliques if trauma)
3. Lateral
4. 15° medial oblique (mortise view for trauma)

E. Knees (AP erect of affected knee only unless ordered as bilateral, 14x17 landscape – if patient can bear weight)

Table Bucky:

1. Lateral 10x12 portrait
2. Tunnel 10x12 portrait

For Trauma:

3. Both obliques 10x12 portrait
4. Axial – 10x12 portrait if possible when indicated for patella

ATTN: When long bones and both joints are required, the joint views should be done separately (all views)

F. Tibia 14x17 portrait

1. AP
2. Lateral

G. Femur (include both joints)

1. AP 14x17 portrait
2. Lateral 14x17 portrait

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V. Thorax

A. Chest (routine) 14x17 portrait or landscape

1. PA / Lateral

B. Ribs

1. PA chest - erect 14x17 portrait or landscape
2. Lateral chest - erect 14x17 portrait
3. AP supine overpenetrated chest 14x17 portrait
4. Oblique of affected area

Pain

Right Anterior
Left Anterior
Right Posterior
Left Posterior

Oblique

LAO center on side that is up
RAO center on side that is up
RPO on center side that is down
LPO on center side that is down

NOTE: Lead Bee-Bee is placed on affected side

C. A.C. Joints

1. Stress AP (both sides) 15° cephalad with weights
2. Non stress AP (both sides) 15° cephalad without weights

D. Clavicles 10x12 landscape

1. AP
2. AP - 30° cephalad

E. Sternum 10x12 portrait

1. RAO
2. Lateral

F. Sternoclavicular Joints

1. Obliques
2. Lateral
3. AP serendipity view 40° cephalad

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G. Scapula 10x12 portrait

1. AP
2. Lateral

VI. Abdomen 14x17 Portrait

A. Obstruction Series

1. PA/AP and lateral chest
2. AP supine
3. PA prone if possible
4. Left lateral decubitus abdomen (no right lateral decub)

(Abdominal pain, free air, distention, nausea, vomiting per Dr. S. Karasick)

B. If only an abdomen is ordered for the aforementioned reasons, perform supine and left lateral decubitus views and have a radiologist review them before sending the patient.

C. *KUB stones and constipation only

VII. Survey Studies

A. Skeletal Survey

1. PA and lateral chest 14x17 portrait
2. Lateral skull 10x12 landscape
3. Lateral C-spine 10x12 portrait
4. AP and lateral L-spine 14x17 portrait
5. AP and lateral T-spine 14x17 portrait
6. AP pelvis 14x17 landscapes

B. Hyperparathyroid Survey/Renal Bone Survey

1. PA hands (separate exposures) 10x12 landscape
2. AP pelvis 14x17 landscape
3. Lateral T&L-spine 14x17 portrait
4. Lateral skull 10x12 landscape
5. AP both clavicles (done separately) 10x12 landscape

C. Joint Survey

1. Both PA hands and wrists (separate exposures) 10x12 landscape
2. Both AP knees (separate exposures) 10x12 landscape
3. Both AP shoulders (separate exposures) 10x12 landscape
4. Both AP elbows (separate exposures) 10x12 landscape
5. Both lateral ankles (separate exposures) 10x12 landscape
6. AP pelvis 14x17 landscape

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TECHNICAL
PEDIATRIC PROTOCOLS & PROCEDURES

Revised 11/09/10

**Thomas Jefferson University Hospital
Department of Radiology**

PEDIATRIC ROUTINES

CHEST

- A. Routine
 - 1. PA or AP – do erect when possible
 - 2. Lateral

- B. Positioning
 - 1. (0-4 mos) supine AP and left lateral with sandbags
 - 2. (4-10 mos) supine AP and x-table lateral on brat board
 - 3. (10 mos-4 yrs) AP and lateral erect with film holder at end of table
 - 4. (4-8 yrs) AP and lateral erect with adjustable film holder (hangs on wall buck)
 - 5. (9 and up) PA/lateral erect in bucky

- C. Additional films
 - 1. Decubs (Air-Fluid Levels)
 - 2. Obliques (25° for pneumonia, 45° and 60° for heart)
 - 3. Erect (pneumothorax)
 - 4. Lordotic (supine, angle 30° cephalad)

SOFT TISSUE NECK

- A. Routine
 - 1. Lateral only

- B. Positioning
 - 1. Erect if possible with head and neck extended
 - 2. Have patient “sniff” during exposure, if age appropriate
 - 3. If patient moves too much for erect, do x-table lateral on brat board with sandbag or rolled sheet under shoulders so that head falls back to extend neck

- C. Additional films
 - 1. AP (if ordered by radiologist)

ABDOMEN

1. Constipation – Flate plate only
2. Abdominal Pain – Flate plate and erect
3. Obstruction – PA/AP erect chest x-ray, supine and erect – Abdomen (decubitus if erect cannot be obtained).
4. AP and Prone Abdomen – nausea/vomiting

C-SPINE

- A. Routine
 1. AP and lateral (non-trauma)
 2. Open mouth (trauma and torticollis)
- B. Positioning
 1. Sitting or standing for older children
 2. Supine and cross-table lateral on brat board for toddlers
- C. Additional views
 1. Obliques
 2. Flexion and extension – after neutral lateral is cleared by radiologist

THORACIC SPINE

- A. Routine
 1. AP and lateral
- B. Positioning
 1. Same immobilization techniques as with CXR, but try to collimate

LUMBAR SPINE

- A. Routine
 1. AP and lateral
 1. Obliques on all patients with history of spondylolisthesis
- B. Positioning
 1. AP – center just above crest, keep cones open, shield as possible
 2. Lateral – center just above crest, collimate
 3. Use same immobilization techniques as a CXR

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- C. Additional views (only if requested by radiologist)
1. Obliques
 2. L5-S1 spot
 3. Flexion/extension

SCOLIOTICS

- A. Routine
1. PA erect
 2. Lat erect
- B. Positioning
1. Use 2-3 FLFS AGFA cassettes, ID tag down in 14x36 bucky; include from tip of ear to ASIS; attach filter onto collimator so that it covers cephalad ½ of light field
 2. You may shield from ASIS down
 3. Ask patient if he/she wears "lifts" in his/her shoes; if so films, must be done without shoes
 4. For PA erect: first stand patient AP to adjust shield to height of ASIS then turn patient PA
 5. For lateral; turn patient to left lateral, fold arms in front of patient with elbows raised, chin up and shield from ASIS down
 6. Cassettes must be placed in same digitizer when being processed
- C. Additional views
1. Lateral - must be done if patient is "new" or hasn't had scoliotic films for several years (or if ordered by ortho)
 2. Supine bending views: place patient supine; have patient bend laterally, keeping both shoulders on table so that right shoulder leans toward right hip then left shoulder leans toward left hip; include from sternal notch to ASIS; usually fits on 14x17 cassette

SCANOGRAM

- A. Routine
1. AP bilateral hip joints on 14x17 crosswise - Bucky
 2. AP bilateral knees on 14x17 crosswise - Bucky
 3. AP bilateral ankles on 14x17 crosswise - Bucky.
- B. Positioning
1. Tape lead ruler to center of tabletop
 2. Assist patient onto table, patient being careful not to dislodge ruler
 3. Be sure ruler is under patient's hips, knees, & ankle and along patient's midline

4. Tape feet together
5. IMPORTANT: Don't move FFD, ruler or patient between exposures; tube and bucky may be slid longitudinally to reach from hips to ankles but don't let patient move himself/herself
6. Always shoot bilaterally in each exposure

SHOULDER

- A. Routine
 1. AP – internal/external
- B. Positioning
 1. Hands and legs sandbagged down or, if necessary, use brat board with affected arm unrestrained; then use compression band to restrain affected arm
- C. Additional views
 1. Lordotic – angle 30° cephalad , center 1" below shoulder
 2. Y - view

CLAVICLE

- A. Routine
 1. AP - 0° angulation
 2. Axial - 30° cephalad
- B. Positioning
 - 1.. Place small roll under shoulders to lift chin out of way
 2. Sandbag or brat board with arms at baby's sides
 3. Newborns may be wrapped in a blanket with arms down; for infants, use head clamps to keep mandible away from clavicle
 4. Do tabletop when possible

EXTREMITIES

- A. General Information
 1. AP and lateral (include both obliques for trauma)

HUMERUS

- A. Routine
 1. AP
 2. Lateral

- B. Positioning
 - 1. AP arm extended – sandbag forearm or use compression band
 - 2. Lateral – flex elbow, put arm across body

ELBOW

- A. Routine
 - 1. AP
 - 2. Lateral
 - 3. Both obliques for trauma
- B. Positioning
 - 1. AP – arm extended – sandbag forearm or use compression band
 - 2. Lateral – flex elbow 90° - keep wrist and hand lateral
- C. Additional Views
 - 1. Radial Head – modified AP elbow; rotate humerus laterally and wrist internally
 - 2. Axial – elbow flexed, true lateral, and angle 45° toward shoulder

FOREARM

- A. Routine
 - 1. AP
 - 2. Lateral
- B. Positioning
 - 1. AP – extend elbow – use compression band as needed
 - 2. Lateral – flex elbow 90° - keep hand/wrist lateral; if being done supine on an infant or toddler under compression band, bring hand above head but still keep hand lateral by pointing thumb toward table

HAND AND WRIST

- A. Routine
 - 1. PA/AP
 - 2. Lateral
 - 3. Oblique for trauma
- B. Positioning
 - 1. PA – use compression band over hand/wrist as needed; keep fingers extended (even on newborns); sandbag forearm as needed
 - 2. Lateral – use sponges under compression and to keep baby's hand true lateral
- C. Additional views

1. Navicular – wrist in ulnar flexion, angle 20° toward elbow

BONE AGE

- A. Routine
 1. 12 mos old and up – left hand/wrist – PA only
 2. Under 12 mos old – left upper extremity (shoulder- >fingertip) left lower extremity (hip- >toe)
- B. Positioning
 1. Keep fingers extended (even on newborns)

LOWER EXTREMITIES

PELVIS

- A. Routine
 1. AP
- B. Positioning
 1. Remove diaper
 2. Sandbag arms
 3. compression band over pelvis
 4. Invert feet and sandbag feet

HIPS

- A. Routine
 1. AP pelvis
 2. Frog Lateral
 3. For above always do bilateral, even if only one side is ordered
- B. Positioning
 1. AP – see “pelvis” above
 2. Lateral – flex knees so that soles of feet touch, compression band over knees
- C. Additional views
 1. Roll lateral – oblique patient 45°, center over affected hip
 2. Bridgeman lateral – use grid on older patients
- D. Shielding
 1. When doing patient’s first exam of hip/pelvis, one view should be completely

unshielded; all subsequent/follow-up hip films should be shielded for all views

KNEE

- A. Routine
 - 1. AP and lateral
 - 2. Obliques for trauma
- B. Positioning
 - 1.. AP – extend knee, compression band over knee
 - 2. Lateral – patient lying on affected side, flex knee 15°
- C. Additional views
 - 1. Tunnel
 - 2. Tangential patella – patient prone, flex knee 90°, tube angled 20° cephalad

FEMUR OR TIB/FIB

- A. Routine
 - 1. AP and lateral
- B. Positioning
 - 1. AP – extend knee, use compression band, sandbags and brat board as needed
 - 2. Lateral – turn patient on affected side, bring unaffected leg up in front, collimate and shield as much as possible
- C. Additional views
 - 1. Standing legs – for Blount's disease or rickets

ANKLE

- A. Routine
 - 1. AP and lateral
 - 2. Obliques for trauma
- B. Positioning
 - 1. AP – extended knee, dorsi-flex foot, compression band over knee as necessary, have parent hold foot dorsi-flexed
 - 2. Lateral – turn patient on affected side, use compression band as needed

FOOT

- A. Routine
 - 1. AP and lateral
 - 2. Internal oblique for trauma

- B. Positioning
 - 1. AP – flex knees, place feet under compression band
 - 2. Lateral – same as above but with foot lateral

- C. Additional views
1. Calcaneus – point toes up – angle 45° cephalad
 2. Harris view of calcaneus – have patient stand on cassette; flex knees, angle 25° toward the heel

SURVEYS

- A. Long bone survey
1. AP of bilateral lower extremities (hip- >toes single exposure if infant)
 2. AP of bilateral upper extremities (shoulder - ? fingertips – separate exposures)
 3. Done for congenital syphilis, rickets, anemia, leukemia
- B. Skeletal survey
1. AP and lateral skull
 2. AP and lateral of entire spine (T- and L-spine may be combined for each view but C- spine must be separate exposures); don't collimate for AP T- or L-spine to include ribs and abdomen
 3. AP of bilateral upper extremities (separate exposures)
 4. AP of bilateral lower extremities (single exposure if infant)
 5. AP of bilateral feet (if not visualized on AP of lower extremities)
 6. Done for suspected child abuse or congenital abnormalities
- C. Rickets survey
1. AP bilateral legs – standing if possible
 2. PA bilateral wrists – separate exposure
- D. Lead poisoning
1. AP abdomen (to R/O lead chips)
 2. AP – bilateral knees
 3. PA – bilateral wrists

SKULL

- A. Routine
1. AP or PA
 2. Towne's - 30° caudad
 3. Both laterals
- B. Positioning
1. AP and Towne's – mummy wrap child, strap onto brat board; place head clamps on each side of head; place compression band over face and head clamps.
(It looks like torture but if patient is able to cry he can breathe!)

2. Laterals – remove head clamps; rotate brat board by placing a sandbag under the board in the area of the patient’s arm or chest; this helps the patient to be able to turn his/her head true lateral; place sponge under head; hold head lateral while tightening compression band
3. Don’t attempt to turn head true lateral while body is true AP!

SINUSES

- A. Routine
 1. AP/PA
 2. Water’s / reverse Water’s
 3. Lateral
- B. Positioning
 1. AP/PA – see “skull” for immobilization method, center at nasion
 2. Water’s /reverse Water’s – place sandbag behind child’s shoulders to extend neck and raise chin; angle cephalad as needed if neck is not extended enough by sandbag; center at acanthion
 3. Lateral – see “skull” for immobilization method; center at outer canthus

NASAL BONES

- A. Routine
 1. Water’s / reverse Water’s
 2. Both laterals
- B. Positioning
 1. Water’s / reverse Water’s – see “sinuses” for immobilization method
 2. lateral – (non-grid, finger technique) use for compression band and sponge – see “lateral skull” for immobilization method

MANDIBLE

- A. Routine
 1. PA – no angulation – use brat board, head clamps, and compression band as needed
 2. Both lateral obliques – place patient supine with sandbag behind shoulders to allow head/neck to extend back; turn head almost lateral; place film non-grid under mandible; angle cephalad as needed (depending on how far head/neck is extended) so that both halves of mandible are not superimposed