

**Projections**

Region	Basic projections	Additional / Modified projections
Hands	PA; Obl.	Lat.; Norgaard's
Thumb	AP; Lat.	PA
Fingers	PA; Lat.	
Wrist	PA; Lat.	Obls.
Scaphoid	PA; Lat.: Obls.; Elongated PA with ulnar deviation	
Lunate	PA with radial deviation	
Trapezium	PA obl. with ulnar deviation	
Triquetral	PA obl. with palmar-flexion	
Pisiform	AP obl.	
Carpal tunnel	Supero-inferior (Axial)	Infero-superior (Axial)
Forearm	AP; Lat.	PA
Elbow	AP; Lat.	Obls.
Ulnar groove	Supero-inferior (Axial)	
Humerus	AP; Lat.	
Shoulder	AP	Lat. (Y view); Axial; AP with 25° caudal tilting; Strykers'
Scapula	AP; Lat. (Y-view)	
Clavicle	AP	Infero-superior
Bicipital groove	Infero-superior	
ACJ (Acromio-clavicular joints)	AP with weight bearing	

1 Reasons of Examination

- 1.1 Trauma
- 1.2 Bone pain
- 1.3 Joint pain
- 1.4 Bone age
- 1.5 Foreign bodies
- 1.6 Limited range of movement

2 Equipment and Accessories

- 2.1 X-ray unit
- 2.2 Cassettes
- 2.3 Lead rubber sheet
- 2.4 Lead screen/shields
- 2.5 Soft pads
- 2.6 Sand bags
- 2.7 Bandages
- 2.8 Compression band

3 Pre-examination Considerations

- 3.1 Pathologic consideration
  - ? fracture; ? RA (rheumatoid arthritis); ? bone age; ? foreign bodies
- 3.2 Practical consideration
  - ? projections

4 Patient Preparation

- 4.1 Removal of any obstacles in the region of being examined
- 4.2 Get change if necessary

5 After Care

- 5.1 Return of the removed items
- 5.2 Ask to wait for film processing
- 5.3 Notice where to have the report



## **Radiographing Techniques**

### ***Hand***

#### PA

The patient is seated beside the couch with the forearm pronated and the elbow flexed.

The cassette is placed under the hand.

The fingers are extended and slightly apart, and the thumb is slightly flexed to bring the palm and fingers into close contact with the cassette.

Center: head of the 3<sup>rd</sup> metacarpal using a vertical beam

Collimation: the whole hand from tips of fingers to the wrist joint (distal ends of radius and ulna)

#### PA oblique

The patient is seated beside the couch.

The hand is externally rotated from pronated position to make the palm 45° with the cassette (i.e. the thumb side is raised away but with the 5<sup>th</sup> finger side still in contact with the cassette).

The fingers are slightly flexed and separated to avoid overlapping and rested on a soft pad for immobilisation.

Center: head of the 5<sup>th</sup> metacarpal using a vertical beam or

head of the 5<sup>th</sup> metacarpal first, then with tube tilting towards the radial side to the head of the 3<sup>rd</sup> metacarpal

Collimation: the whole hand from tips of fingers to the wrist joint (distal ends of radius and ulna)

### ***Look for foreign bodies in palm***

#### Lateral

The patient is seated beside the couch with the forearm flexed at elbow.

The palm is placed vertical with fingers overlapping each others.

The thumb is separated from the palm and rested on a soft pad for immobilisation.

Center: head of the 2<sup>nd</sup> metacarpal using a vertical beam

Collimation: the whole hand from tips of fingers to the wrist joint (distal ends of radius and ulna)

***For RA***

PA oblique with both hands (Norgaard's projection; ball catching view)

Both hands are placed palms up with internal (medial) rotation 35°.

The fingers and thumbs are slightly separated to avoid overlapping.

Center: between hands at the level of the 5<sup>th</sup> metacarpal using a vertical beam.

Collimation: the whole hand from tips of fingers to the wrist joint (distal ends of radius and ulna)

***Thumb***

**AP**

The patient is seated and turned away from the couch with the arm extended behind the patient.

The arm and hand is rotated internally (medially) until the posterior aspect of the thumb is in contact with the cassette

Sandbags can be placed over wrist and under the dorsum of the hand for immobilisation.

Center: 1<sup>st</sup> metacarpo-phalangeal joint using a vertical beam

Collimation: from the tip of the thumb to the wrist joint including the 1<sup>st</sup> metacarpal

**Lateral**

Same positioning as PA hands.

The palm is rotated internally (medially) until the posterior aspect of the thumb is vertical.

Center: 1<sup>st</sup> metacarpo-phalangeal joint using a vertical beam

Collimation: from the tip of the thumb to the wrist joint including the 1<sup>st</sup> metacarpal

***Base of the 1<sup>st</sup> metacarpal***

**PA**

Same positioning as PA oblique hand.

The palm is further rotated until the posterior aspect of the thumb is parallel to the cassette.

The thumb is rested on a soft pad for immobilisation.

Center: 1<sup>st</sup> metacarpo-phalangeal joint using a vertical beam

Collimation: from the tip of the thumb to the wrist joint including the 1<sup>st</sup> metacarpal

## ***Fingers***

### **PA**

Same positioning as PA hand.

Center: head of the proximal phalanx of the finger being examined using a vertical beam

Collimation: from the tip of the finger being examined to the upper third of the corresponding metacarpal. Neighbouring fingers should also be included for identification.

### **Lateral of 4<sup>th</sup> and 5<sup>th</sup> fingers**

Same positioning as PA oblique hand.

4<sup>th</sup> and 5<sup>th</sup> fingers are extended and the other fingers are flexed into the palm and held by the thumb.

The hand is further rotated until the posterior aspect of the 5<sup>th</sup> finger is vertical.

The 4<sup>th</sup> finger is slightly flexed to avoid overlapping.

Center: head of the proximal phalanx of the finger being examined using a vertical beam

Collimation: from the tip of the finger being examined to the upper third of the corresponding metacarpal.

### **Lateral of 2<sup>nd</sup> and 3<sup>rd</sup> fingers**

4<sup>th</sup> and 5<sup>th</sup> fingers are flexed into the palm and held by the thumb.

The arm is internal (medial) rotated until the fingers are in lateral.

2<sup>nd</sup> finger is slightly flexed to avoid overlapping.

Center: head of the proximal phalanx of the finger being examined using a vertical beam

Collimation: from the tip of the finger being examined to the upper third of the corresponding metacarpal.

## ***Wrist***

### **PA**

Forearm and hand pronated with elbow flexed.

The wrist and hand relaxed with a claw like flexion of fingers.

Radial and ulnar styloid processes should be equidistant to the cassette.

Center: midway between the radial and ulnar styloid processes

Collimation: from half of the metacarpals to the distal end of the forearm

Lateral

Forearm in lateral position with the elbow flexed.

The palm of the hand is placed facing the patient's truck.

An additional backward tilting of the forearm is required to bring the radial styloid process and ulnar styloid process superimposed.

Center: the radial styloid process

Collimation: from half of the metacarpals to the distal end of the forearm

***For demonstration of carpal bones***

PA oblique

Same positioning as PA wrist.

The wrist is laterally (externally) rotated 45°.

Center: the ulnar styloid process

Collimation: from half of the metacarpals to the distal end of the forearm

AP oblique

The hand and wrist are supinated.

The wrist is then medially (internally) rotated 45°.

Center: the ulnar styloid process

Collimation: from half of the metacarpals to the distal end of the forearm

***Scaphoid***

PA; Lateral; Obliques

Same as describe as wrist

Elongated PA with ulnar deviation

Same as positioning as PA wrist, but the hand is adducted as far as possible.

Center: midway between the two processes with 35° cranial tube tilting

Collimation: carpal region

***Lunate***

PA with radial deviation

Same positioning as PA wrist, but with radial deviation

Center: midway between the two processes using a vertical beam

Collimation: carpal region

***Trapezium***

PA oblique with ulnar deviation

Same positioning as PA oblique wrist, but with ulnar deviation.

Center: base of the 1<sup>st</sup> metacarpal using a vertical beam

Collimation: carpal region

***Triquetral***

PA oblique with palmar-flexion

Same positioning as PA oblique wrist, but with 60° rotation and with palmar-flexed through 45°.

Center: the triquetral using a vertical beam

Collimation: carpal region

***Pisiform***

AP oblique

Same as AP oblique wrist.

***Carpal tunnel***

Supero-inferior

The patient stands with the back to the couch.

The patient puts the palm of the hand onto the cassette, with the fingers over the edge of the cassette and the couch.

The wrist is fully flexed but the palm remains on the cassette.

Center: mid-carpal region using a vertical beam

Collimation: carpal region

Infero-superior

The patient is seated, the pronated hand and forearm are extended onto the couch.

The arm is rested on the the cassette.

Using a bandage, the fingers are held in the fully dorsi-flexed position.

Center: mid-carpal region using a vertical beam

Collimation: carpal region

**Forearm**

AP

The arm is extended and supinated.

The wrist and elbow should be in AP. (check wrist is AP in that the radial and ulnar styloid processes are equidistance)

Center: the midline of the forearm, midway between the elbow and wrist joints using a vertical beam

Collimation: from carpal bones to distal end of the humerus

Lateral

The arm is flexed and rotated so that the medial aspect of the arm rests on the couch.

The arm is raised (by raising the couch or padding up the cassette) to the level of shoulder to make the elbow in lateral position.

The wrist is adjusted to lateral by checking the two styloid processes are superimposed.

Center: the midline of the forearm, midway between the elbow and wrist joints using a vertical beam

Collimation: from carpal bones to distal end of the humerus

**For fracture; POP**

PA

Same position as PA wrist, but the elbow is in lateral position.

Center: the midline of the forearm, midway between the elbow and wrist joints using a vertical beam

Collimation: from carpal bones to distal end of the humerus



***Elbow***

AP

Same positioning as AP forearm.

Center: the midline of the forearm, 2.5cm distal to the midpoint of two epicondyles of the humerus using a vertical beam

Collimation: from proximal end of forearm to distal end of humerus

Lateral

Same position as lateral forearm.

Center: lateral epicondyle using a vertical beam

Collimation: from proximal end of forearm to distal end of humerus

Obliques

Same positioning as AP elbow.

The arm is internally rotated and externally rotated 25°.

Center: the head of radius using a vertical beam

Collimation: from proximal end of forearm to distal end of humerus

***Ulnar groove***

Axial

The patient is seated with the back to the couch.

The elbow is projected backwards with the elbow flexed to 45° with the forearm resting on the cassette.

Or

The patient is seated facing the couch.

The arm is flexed and the humerus is resting on the cassette.

Center: just above the level of the humeral epicondyles using a vertical beam

Collimation: proximal end of forearm

***Humerus***

AP

The patient faces the tube.

The arm is abducted slightly from the trunk and the palm is supinated.

The patient is slightly rotated in order to make the shoulder and the elbow are in contact to the cassette.

Exposed on arrested respiration.

Center: midway between shoulder and elbow joints using a “straight” beam

Collimation: from shoulder joint to proximal end of forearm

Lateral

From AP position, the patient is rotated facing the cassette.

Rotate the patient so that the lateral aspect of the humerus and shoulder are in contact to the cassette.

The elbow is flexed and the arm is abducted slightly to clear it from the chest wall.

Center: midway between shoulder and elbow joints using a “straight” beam

Collimation: from shoulder joint to proximal end of forearm

***Shoulder***

AP

The patient is faced the tube.

The patient is rotated 30° to the side under examination.

The whole arm is rotated so that it is in AP.

The head should be turned away from the shoulder.

Exposed in arrested respiration.

Center: coracoid process of the scapula using a “straight” beam

Collimation: the whole clavicle and the proximal third of the humerus

Axial

The patient is seated at the end of the couch

The patient leans over the cassette with the shoulder directly above the cassette.

The forearm is pronated onto the couch

Center: head of humerus through the acromion using a vertical beam

Collimation: from neck of scapula to the proximal third of the humerus

***For frozen shoulder***

AP with 25° caudal tilting

Same positioning as AP shoulder except that the central ray is 25° caudal angulation.

Collimation: from acromion process to the humeral head

***For recurrent dislocation***

Strykers' view

The patient lies supine on the couch.

The arm of the affected side is fully extended and the elbow is flexed to allow the hand to rest on the patient's head.

Center: to the coracoid process using a 10° cranial tube angulation

Collimation: humeral head region

***Scapula***

AP

Same as AP shoulder.

Lateral ("Y" view)

Same positioning as lateral humerus.

Palpate the borders of the scapula and make any minor adjustments to the position of the patient to ensure a lateral scapula.

Center: to the vertebral border of the scapula at the level of the 4<sup>th</sup> thoracic vertebra

Collimation: from the clavicle to the inferior angle of the scapula

***Clavicle***

AP

Same positioning as AP shoulder.

Fine adjustments to the patient's position so that the long axis of the clavicle is parallel to that of the cassette.

Center: middle of the clavicle

Collimation: from ACJ to sterno-clavicular joint

Infero-superior

Same as AP clavicle except that the tube is 45° cranially titled

***Bicipital groove***

Supero-inferior

The patient lies supine on the couch.

The arm is extended and supinated alongside the body.

Center: tangentially to the anterior surface of the humerus, with the beam making an angle of 10° to the shaft of the humerus

Collimation: humeral head region

***Acromio-clavicular joints***

AP with weight bearing (erect)

The patient is faced the tube with both hands are holding on “equal weights”.

Two 24 X 18 cm cassettes are placed just behind the shoulders of the patients (or a 18 X 43 cm cassette instead).

Center: midway at the level of the ACJs