Reading Hospital
School of Health Sciences
Medical Imaging Program

MI133: Clinical Seminar II

HAND and WRIST

Pathology & Image Analysis

1

Pathology

2

Rheumatoid Arthritis

Autoimmune disorder which appears primarily as a noninfectious, inflammatory arthritis of small joints of the hands and feet

- ***Causes***: Idiopathic
- ***Complications***: Inflammation throughout the body (lung, heart), crippling deformities
- ***Radiographic Appearance***:
  - Narrowing joints
  - Inflammation of joints
  - Bony erosions
- ***Subtractive Pathology*** - Decrease bone density
- ***Prognosis***: Depends on severity of symptoms
  - Without proper treatment, permanent joint damage may occur. However, early treatment with many of the newer medicines have decreased joint pain and damage

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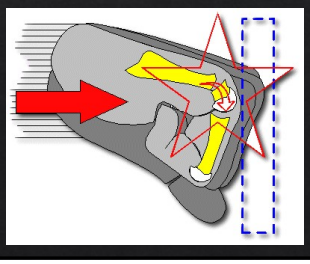
4

Boxer's Fracture

Transverse fracture of the neck of the 5th metacarpal with anterior angulation of the distal fragment

- ***Causes***: typically result of a blow struck with the fist
- ***Complications***: Can cause decreased grip strength or grasp abnormalities if left untreated
- ***Radiographic Appearance***:
  - Fracture lines with possible angulation of the metacarpal
  - No manual exposure factor change
- ***Treatment***:
  - Closed reduction and external fixation with a brace or splint
  - Open reduction with internal fixation (ORIF)



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Chip Fracture

** A fracture **type** found in the hand and foot*

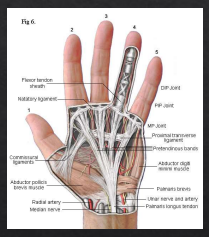
An isolated bone fragment --Not an avulsion fracture! It is not associated with the tendon and ligament

7

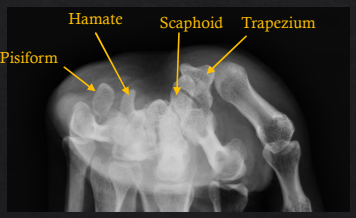
Carpal Tunnel Syndrome

Compression of the median nerve resulting in pain and weakness of the effected hand

- ***Causes***: Repetitive stress; trauma to carpal bones
- ***Complications***: CTS can reoccur even after treatment; Surgery may not completely alleviate symptoms
- ***Radiographic Appearance***: Diagnostic x-rays are used to rule out bony abnormalities that may compress the median nerve, such as fractures of the hook of hamate



- ***Technique***: No change in exposure factors usually required
- ***Prognosis***: Majority of patients recover completely; severe cases may cause permanent disability in the effected fingers



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Scaphoid (Navicular) Fracture

Most common carpal fracture

- ***Cause***: Trauma; typically from falling on outstretched hands
- ***Prognosis***: Longer than typical fracture healing time due to low vascularity of the carpals
- ***Complications***: Non-union if left untreated, leading to chronic pain and limited ROM; early onset of arthritis in the wrist
- ***Radiographic Appearance:*** Transverse fracture line mid-body of the scaphoid
- ***Technique***: No change in exposure factors usually required

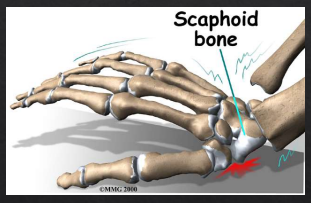

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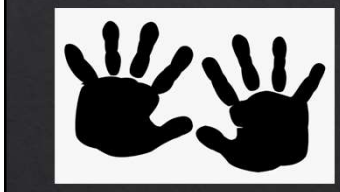
Image Analysis

EI Values

Acceptable 100-300

Direct

10



Hand

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Hand - PA

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest
- Anatomy from fingertips to distal radius and ulna
- No rotation of the hand:
  - Equal concavity of the metacarpal and phalangeal bodies on both sides
  - Equal amount of soft tissue on both sides of the phalanges
  - Fingernail, if visualized, in the center of each distal phalanx
  - Equal distance between the metacarpal heads
- Open MCP and interphalangeal (IP) joints, indicating that the hand is placed flat on the IR
- Bony trabecular detail and surrounding soft tissues

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13

14

C. PA

EI: 125

15

Hand - Oblique

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest
- Anatomy from fingertips to distal radius and ulna
- Digits separated slightly with no overlap of their soft tissues
- 45 degrees of rotation of anatomy
  - Decreasing amounts of separation between metacarpal bodies two through five, with the second and third having the greatest separation
  - Partial superimposition of the third, fourth, and fifth metacarpal bases and heads
- Open MCP joints
- Open IP joints, when digits are positioned parallel to IR
- Bony trabecular detail and surrounding soft tissues

16

D. Oblique

EI: 200

17

E. Oblique

EI: 155

18

F. Oblique

EI: 200

19

Hand - Lateral

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest
- Anatomy from fingertips to distal radius and ulna
- Extended digits
- Hand in a true lateral position
  - Superimposed phalanges (individually seen on fan lateral)
  - Superimposed metacarpals
  - Superimposed distal radius and ulna
- Thumb free of motion and superimposition
- Bony trabecular detail and surrounding soft tissues

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G. Lateral

EI: 220

21

H. Lateral

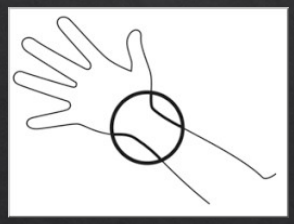
EI: 240

22

I. Lateral

EI: 270

23



Wrist

24

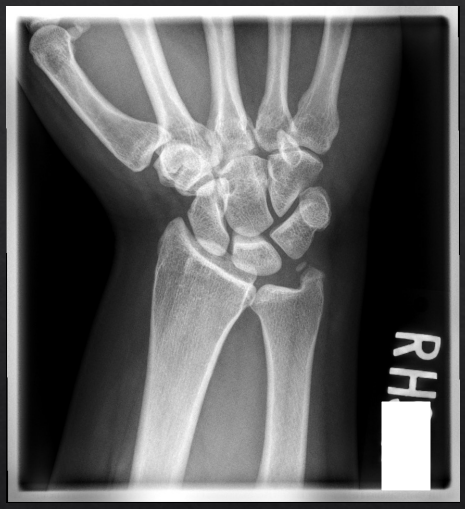
Wrist - PA

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest
- Distal radius and ulna, carpals, and proximal half of metacarpals
- No excessive flexion of digits to overlap and obscure metacarpals
- No rotation in carpals, metacarpals, radius, and ulna
- Bony trabecular detail and surrounding soft tissues
- Open radioulnar joint space ***(Merrill's only)***

25

J. PA

EI: 285



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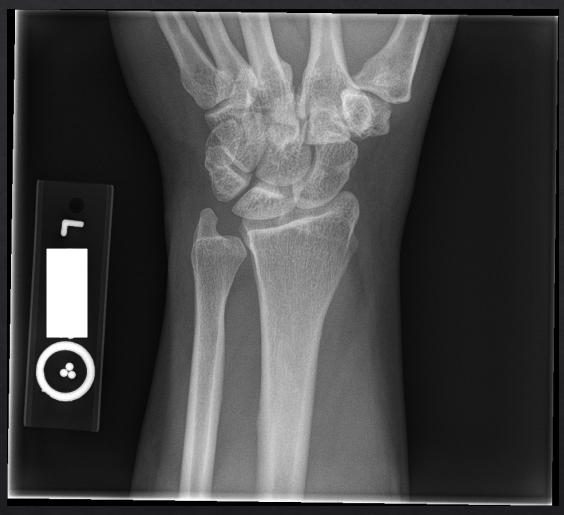
K. PA

EI: 128

27

L. Lateral

EI: 181



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Wrist - Oblique

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest
- Distal radius and ulna, carpals and proximal half of metacarpals
- 45 degree rotation of anatomy:
  - Slight interosseous space between the third, fourth and fifth metacarpal bodies
  - Slight overlap of the distal radius and ulna
- Carpals on lateral side of wrist
- Trapezium and distal half of the scaphoid without superimposition
- Open trapeziotrapezoid and scaphotrapezial joint space
- Bony trabecular detail and surrounding soft tissues

29

30

M. Oblique

EI: 100

31

N. Oblique

EI:100

32

O. Oblique

EI: 120

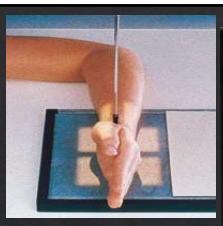
33

P. Oblique

EI: 100

34

Wrist - Lateral



- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest
- Distal radius, and ulna, carpals, and proximal half of metacarpals
- Superimposed distal radius and ulna
- Superimposed metacarpals
- Bony trabecular detail and surrounding soft tissues

35

36

Q. Lateral

EI: 100

37

R. Lateral

EI: 294

38

S. Lateral

EI: 200

39

T. Lateral

EI: 200

40

Wrist – Ulnar Deviation (Navicular/Scaphoid)

9 years of age and older

- Evidence of proper collimation and presence of side marker placed clear of anatomy of interest
- Scaphoid with adjacent articulations open
- No rotation of wrist
- Maximum ulnar deviation, as revealed by the angle formed between longitudinal axis of the ulna and the longitudinal axis of the 5th metacarpal
- Bony trabecular detail and surrounding soft tissues
- Distal radius and ulna carpals, and proximal half of metacarpals **(Merrill's only)**

Merrill's states CR angulation of 10 to 15 proximally or distally required for clear delineation; RH protocol is 30°

41

U. Lateral

EI: 200

42

V. Lateral

EI: 100

43

W. Lateral

EI: 200

44