Fractures of the Fingers Missed or Misdiagnosed on Poorly Positioned or Poorly Taken Radiographs: A Retrospective Study

Serdar Tuncer, MD, Neslihan Aksu, MD, Halil Dilek, MD, Turker Ozkan, MD, and Azmi Hamzaoglu, MD

報告者:PGY 顏逸凡

指導者: VS 吳亮廷

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Background

- Missed finger fracture: most common diagnostic error in ED
  - poor quality, bad position, incorrect dose, missed injury area, misreading, lack of view
- Diagnostic error: ordering a film – submitting a qualified film – reading a film

Methods

- Patients diagnosed with finger fracture
- Protocol: AP + pure LAT view, add oblique view if fracture presented
- Repeat film for transferred p’t due to poor position or quality
- Exclusion: lack of radiograph, missing clearly visible lesion, insignificant injury

Results

- 14 of 25 p’t with repeated radiograph found fracture — 8 male, 6 female, mean age:24, mean interval between medical facilities: 8.4 days
- Cause: sporting, crushing injury, fall, fight
- Referring reason: second opinion, severe pain, physician referral, slipped splint
- Error type: 7 missed, 7 misdiagnosed

Case	Sex	Age (yr)	Mechanism of Injury	Initial Diagnosis	Final Diagnosis	Diagnostic Error	Reason for Error
1	F	15	Sports injury (ball)	PIPJ dislocation R5	Reduced PIPJ dislocation, volar plate avulsion fracture	Missed	True lateral view missing
2	M	14	Sports injury (ball)	Finger sprain R2	PIPJ volar plate avulsion fracture	Missed	True lateral view missing
3	M	26	Sports injury	PIPJ dislocation R5	Reduced PIPJ dislocation, volar plate avulsion fracture	Missed	PIPJ not clear in true lateral
4	F	44	Fall	Soft tissue injury thumb R1	Distal phalanx fracture (radial collateral ligament avulsion fracture)	Missed	True AP view missing
5	F	14	Sports injury	Soft tissue injury R2	PIPJ volar plate avulsion fracture	Missed	True lateral view missing
6	M	14	Sports injury	Soft tissue injury L2	PIPJ volar plate avulsion fracture	Missed	True lateral view missing
7	M	13	Sports injury	Soft tissue injury R3	PIPJ volar plate avulsion fracture	Missed	True lateral view missing
8	F	25	Crush injury	Nondisplaced PP fracture R5	Angulated PP fracture	Misdiagnosed	True lateral view missing
9	F	32	Blow	Nondisplaced PP fracture R5	Angulated PP fracture	Misdiagnosed	Superimposition in lateral
10	F	42	Crush injury	Nondisplaced DP fracture R4	Mallet finger with DP fracture	Misdiagnosed	True lateral view missing
11	F	26	Crush injury	Nondisplaced DP fracture L4	Angulated DP fracture	Misdiagnosed	True lateral view missing
12	M	1	Crush injury	Nondisplaced PP fracture R3	Angulated PP fracture	Misdiagnosed	Superimposition in lateral
13	F	64	Fall	MPJ dislocation L5	Angulated PP fracture	Misdiagnosed	Superimposition in lateral
14	M	6	Crush injury	MP fracture R5	Angulated middle p fracture	Misdiagnosed	True lateral view missing

Results

- Most cause of error: lack of true LAT view of finger, lack of true AP view of thumb, superimposition of fingers in LAT view, poor film quality

- Mean follow-up: 6.8 months
- Early controlled active motion for rehab

Disscusion

- Sites with most missed fractures: ribs, periarticular region of phalanges, elbow (arm of hand in child)
- Rotation of finger (maybe due to injury) causing positioning error
- Collaboration of radiologist decrease reading error from 3% to 0.3%
- Oblique view: increase confidence of radiographic diagnosis

Discussion

- “One view is no view”
- Position of the thumb
- Proximal aspect of proximal phalanges in lateral view
- ABCs: adequacy, alignment, bone, cartilage, soft tissue
- Selection bias: visit history and transfer system
- Further: blinded study for evaluating efficacy of lateral and oblique view and error due to poor positioning

Conclusion & Take home message

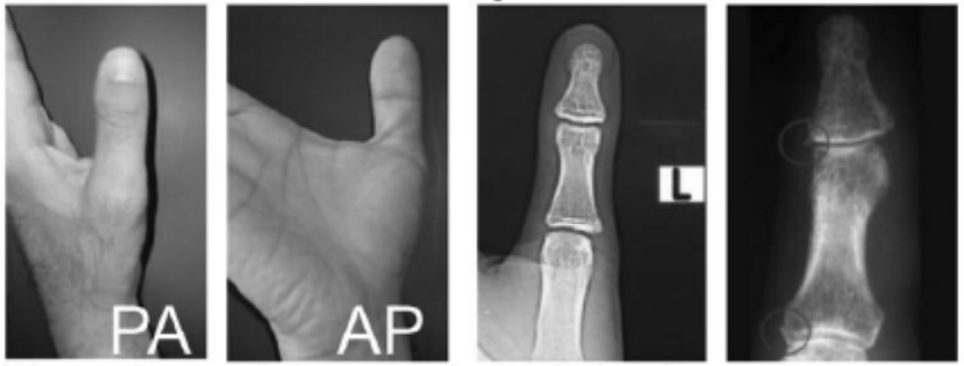
- Always obtain AP and LAT view and never substitute LAT view with oblique view
- Magnifying injury site helpful for detection
- True lateral view requires no superimpo-sition of fingers
- Never accept poor-quality or inadequate films and never rely on them for decisions
- Give clear and detail info on radiograph request
- Helpful to give example for better positioning

1 : ANTEROPOSTERIOR (AP)

AP view for fingers excluding the thumb

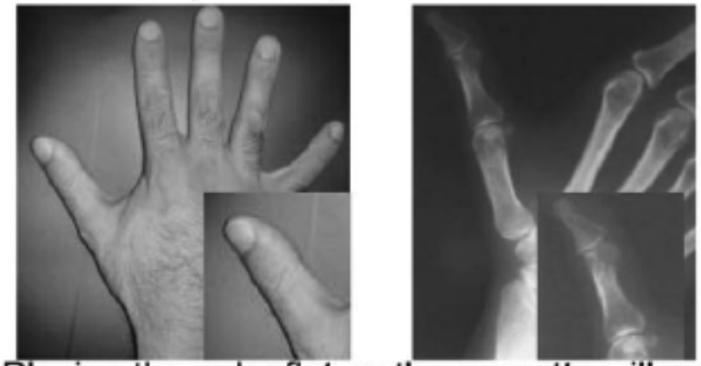
Place the hand flat for hand and finger AP.
Injury site can be zoomed if possible

AP view for X ray of the thumb



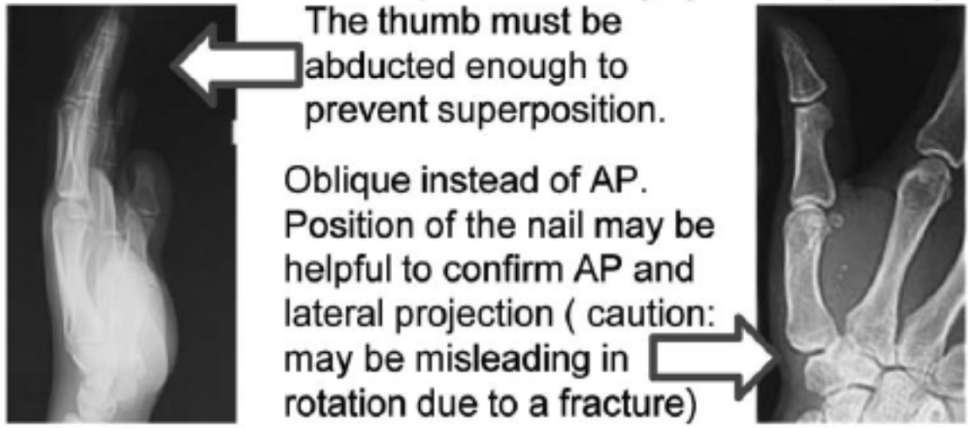
Either anteroposterior or posteroanterior view is acceptable.
Notice the position of the hand for thumb PA and AP

Important points in AP view



Placing the palm flat on the cassette will result in an oblique view for thumb, and not AP.

Possible causes of poor AP X rays(Unacceptable)



The thumb must be abducted enough to prevent superposition.

Oblique instead of AP.
Position of the nail may be helpful to confirm AP and lateral projection (caution: may be misleading in rotation due to a fracture)

2 : LATERAL

Lateral view for fingers excluding the thumb

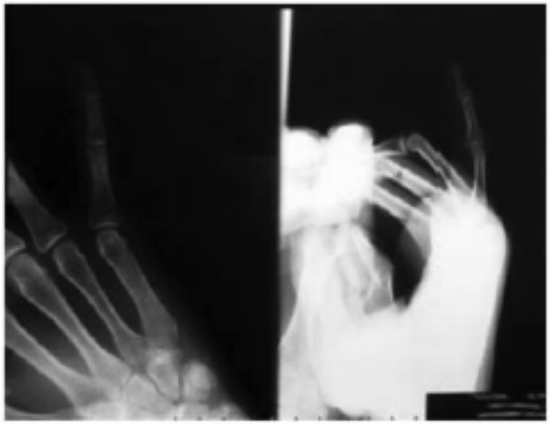
Extension of the finger is necessary for a complete lateral view. Check avulsions

Lateral view for X ray of the thumb

For a good lateral view of the thumb, the hand should either be pronated or the fingers slightly flexed. The nail can be used as a guide to confirm that the thumb is in lateral position /caution: may be misleading in rotation deformity due to a fracture)

Possible causes of poor lateral X rays (Unacceptable)

An oblique position of the hand without true lateral digit X ray will lead to missed fractures



Correct position, however inadequate detail leading to missed avulsion fracture

3: OBLIQUE (OPTIONAL)

To observe the proximal aspect of the proximal phalanx without superposition or to gain more information on the fracture

Thanks for Listening !!