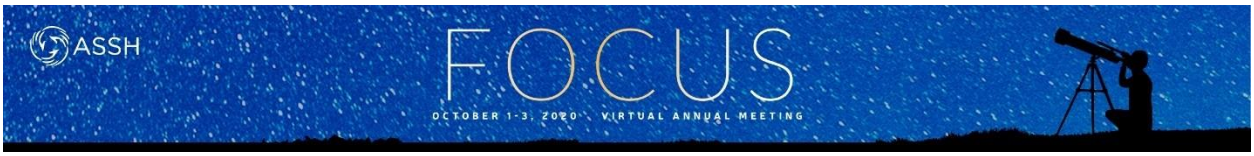

IC21-L: Management of Pediatric Hand and Finger Fractures

Moderator(s): Lindley B. Wall, MD

Faculty: Andrea S. Bauer, MD, Mary Claire Manske, MD, and Apurva S. Shah, MD, MBA

Session Handouts

Saturday, October 03, 2020

75TH VIRTUAL ANNUAL MEETING OF THE ASSH
OCTOBER 1-3, 2020

822 West Washington Blvd
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IC21-L
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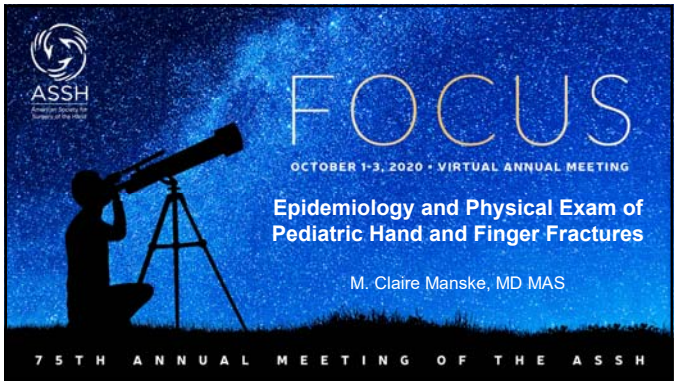
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OCTOBER 1-3, 2020 • VIRTUAL ANNUAL MEETING
Epidemiology and Physical Exam of Pediatric Hand and Finger Fractures
M. Claire Manske, MD MAS
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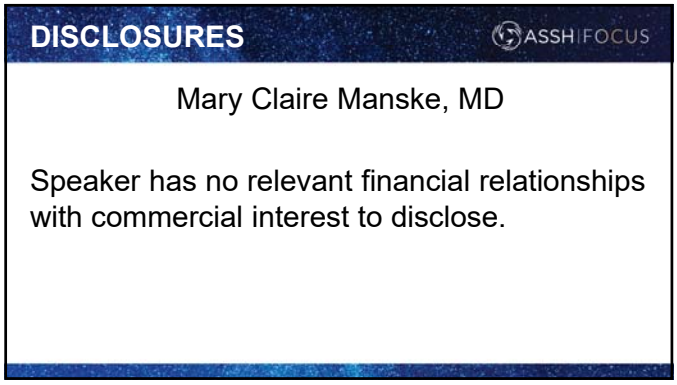
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Introduction

- Hand is the most commonly injured part of a child's body
  - -1/3 of all pediatric ER visits
  - -2/3 of all childhood fractures occur in the upper extremity
- Children's hands are vulnerable to injury
- Increasing incidence
- Most can be treated non-operatively
  - -Key is to recognize bad actors

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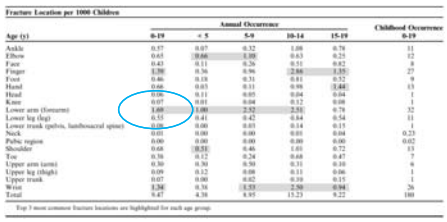
Epidemiology

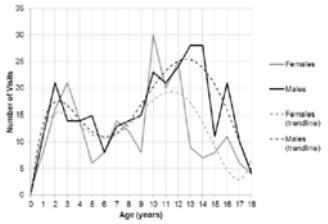
- Pediatric fractures presenting to the Emergency Department in the U.S.
  - Forearm
  - Finger
  - Wrist
  - Shoulder
  - Hand



Naranje et al J Pediatr Orthop, 2016

5

- Association of Hand Trauma with Age and Sex
- Bimodal: Toddlers and adolescents
- Toddlers:
  - -Soft tissue injuries
  - -Crush mechanism
  - -Household accidents
  - -Male = Female
- Adolescents
  - -Fractures
  - -Sports injuries
  - -Male > Female



Gibly et al J Child Orthop, 2018

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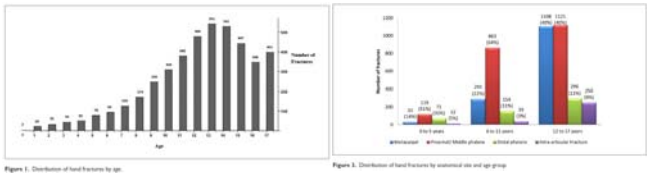
- Association between age and fracture

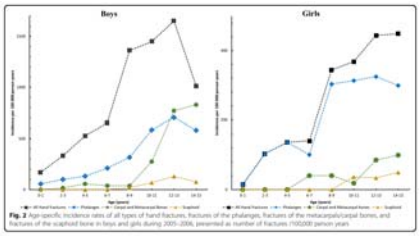


Kreutz-Rodrigues et al Hand, 2020

7

Epidemiology

- Hand fractures by sex and age



Lempesis et al J Orthop Surg Res, 2019

8

Epidemiology

- Fracture Location
- Border digits > Central digits
- Phalanges > Metacarpals > Carpus

Lempesis et al J Orthop Surg Res, 2019

9

Epidemiology

- Pediatric hand fractures commonly referred to a hand specialist
  - -32% - 100%

Common reasons for referral
- -fracture displacement
- -loss of joint congruity
- -fracture instability

- Injury may not be as billed
  - ~10% incorrect diagnosis/misdiagnosis rate
  - -misinterpretation of physis/epiphysis, multiple fractures, inadequate/wrong x-rays

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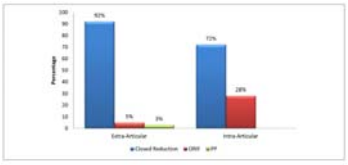
Epidemiology

- Surgical intervention in 2-10%
- Most extra-articular fractures treated with closed reduction ± internal fixation
- Intra-articular fractures more likely treated with open reduction, internal stabilization



Kreutz-Rodrigues et al Hand, 2020

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Physical Examination

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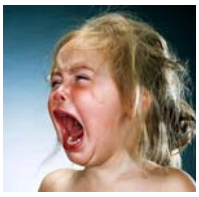
Physical Examination

Examining a child's injured hand can be difficult



- Can't communicate what's wrong
- Can't answer difficult questions
- Won't follow commands
- Afraid/anxious/in pain

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Physical Examination

Comprehensive Assessment
- Skin: abrasions, lacerations, threatened skin
- Bones and joint: alignment/deformity, tenderness, motion
- Neurovascular status: sensation, strength, perfusion

My Approach
- Inspection
- Active tasks/Cooperation
- Passive
- Things that may hurt

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Physical Examination

General tips
- Have someone else be the bad cop
- Engage parents to help
- Tell the kid what you are going to do
- Demonstrate on yourself, parent, or child's other hand
- Save things that hurt until the end

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Physical Examination

Other tips

- Child Development
  - -Stranger anxiety
  - -How to ask questions
  - -Make exam a game
- Pick your battles
- Distraction techniques/Child Life

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Physical Examination

Inspection

- Swelling
- Ecchymosis
- Skin lesions
- Clinical alignment/deformity
- Digital cascade
- Compare to contralateral hand

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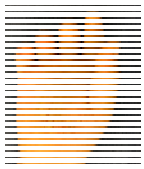
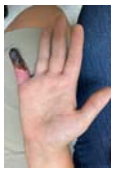
Physical Examination

Inspection

- Neurovascular status
- Sensory denervation
  - -dry skin/loss of sweat patterns
- Color, turgor, temperature
  - -pale, flat, cool: arterial disruption
  - -purple, dusky, congested: venous congestion





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Physical Examination

Active Participation

- Use stickers or a small toy
- evaluate motion
- Watch the child play
- Spy on them while taking a history




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Physical Examination

Active Cooperation

- Use simple commands, goal oriented tasks
- Fun tasks
- Tell child only have to do it one time. “1…2…3…Go”



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Physical Examination

Passive examination

- Explain to child what you are going to do
- Tenodesis to assess cascade of fingers
- Wrinkle test to assess sensory nerves



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- Things that may hurt

- Explain what you are going to do
- Give choices if appropriate
- Distraction techniques/Child Life

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Summary

- Pediatric hand and finger injuries are common
  -adolescents: sports injuries, fractures
  -toddlers: household injuries, soft tissue injuries

- Often non-operative treatment is appropriate

- Tips for physical exam
  -earn child's trust
  -toys/stickers
  -explain in terms they can understand

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Thanks and Good Luck!

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Metacarpal Fractures in Children

Andrea S. Bauer, MD
Assistant Professor of Orthopaedic Surgery
Boston Children's Hospital

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Epidemiology

- 30% of pediatric hand fractures
- Most common hand fracture in 13- to 16-year-olds
- Classify and treat by location:
  - Head
  - Neck
  - Shaft
  - Base

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Metacarpal head fractures

Often missed
- Don't be afraid to get advanced imaging

Open reduction & pinning / headless screws

Can lead to AVN
- Follow long term

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Metacarpal head fractures



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Metacarpal head fractures




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Metacarpal neck fractures

- Common teenage injury
  - Sports
  - Punching
- Acceptable angulation
  - 10/20/30/40 (index-small fingers)
  - Some studies quote up to 70 degrees "acceptable" for small metacarpal neck
- Why is it unacceptable?
  - Extensor lag
  - Prominence in the palm

Jahss maneuver for closed reduction (more on this later)

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Metacarpal shaft fractures

- Central rays stabilized by intermetacarpal ligaments
  - Generally can be treated nonoperatively (mitten cast)
- Acceptable angulation is HALF that of neck fractures
- Rotational malalignment is common – check tenodesis!

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Indications for surgery – neck & shaft fxs

- If you can't get "acceptable alignment"
  - Rotation is never acceptable
- Open fractures
- Multiple fractures

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Surgical options - neck & shaft fxs

Lots of options in kids

- Lag screws alone
- Plate & screws
- IM nail/screw
- Multiple pin configurations

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Metacarpal base fractures

- Rare in truly "pediatric" patients
- Perhaps higher chance of nonoperative management?

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Does Closed Reduction and Immobilization of Pediatric Metacarpal Fractures Result in an Improvement in Fracture Angulation ?

Stella J. Lee MD, Hannah Merrison, Kathryn A. Williams MS,
Carley B. Vuillermin MBBS MPH, Andrea S. Bauer MD

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Retrospective Cohort Study

- Level 1 Pediatric Trauma Center
  - Emergency Department and Clinic
- Patients treated Jan 2011 – Sept 2016
  - Closed reduction and immobilization
  - 2nd to 5th Metacarpal Neck and Shaft Fractures
- 18 years and younger
- Exclusion criteria
  - Open fractures
  - Multiple metacarpal fractures
  - Reduction performed at outside facility
  - Missing or inadequate post-reduction radiographs

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Lateral Fracture Angulation

Medullary canal method
- Leung et al, JHS 2002
- Validated with inter- and intra-rater testing

Time points
- Immediate
- Initial follow up (2-14d)
- Healed (21-35d)

Clinically significant improvement = 10 degrees

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Study Cohort

91 Patients
Average age 15years
- Range 9-18y
- 92% Male

Metacarpal skeletal maturity
- Physis open 48%

Anatomic location
- 5th metacarpal 87%
- Neck 2/3rds

Mechanism
- Punch 64%
- Sports 23%
- Fall 4%

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Lateral Angulation Measurements

Time Point	Angle (sd)	Range
Initial Injury	40.7 (10.7)	7-66
Early Follow up (2-14d)	33.2 (9.6)	3-56
Healed (21-35d)	35.3 (11)	-3 - 57

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Lateral Angulation Difference from Pre-reduction

Time Point	Angle (sd)	p-value Mean ≠ 0	p-value Equivalence Test
Immediate	8.3 (10.2)	<0.001	0.123
Early Follow up (2-14d)	8.9 (10.2)	<0.001	0.198
Healed (21-35d)	5.8 (12.4)	<0.001	0.003

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Subgroup Analyses

Open vs Closed physes
Neck vs Shaft
Extension vs intrinsic-plus position

No significant mean differences for all difference levels p>0.05

Fracture angulation greater than or less than 50 degrees

Injury angle >=50 has significantly higher mean reductions than Injury angle <50 for all difference levels

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Conclusions

Retrospective study

Modest improvements in lateral fracture angulation

Closed reduction of pediatric metacarpal fractures results in a clinically insignificant improvement in lateral fracture angulation

Maybe limited utility in the treatment of fractures with angulation greater than 50 degrees

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Summary

- Metacarpal fractures are common in teenagers
- Most can be treated nonoperatively

- Pitfalls to watch for:
  - Metacarpal head fractures → get advanced imaging and follow long term
  - Always check tenodesis → no rotation is acceptable, even in a kid
  - Although we can accept a lot of angulation in 5th MC neck, the same rules do not apply for more radial MCs or for shaft fxs
  - Consider whether a closed reduction is "worth it" – if you wouldn't operate anyway, maybe skip it?

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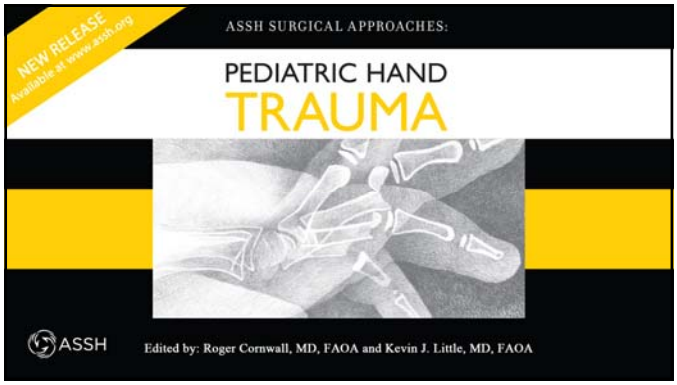
NEW RELEASE
Available at www.a5sh.org
ASSH SURGICAL APPROACHES:
PEDIATRIC HAND
TRAUMA
ASSH
Edited by: Roger Cornwall, MD, FAOA and Kevin J. Little, MD, FAOA

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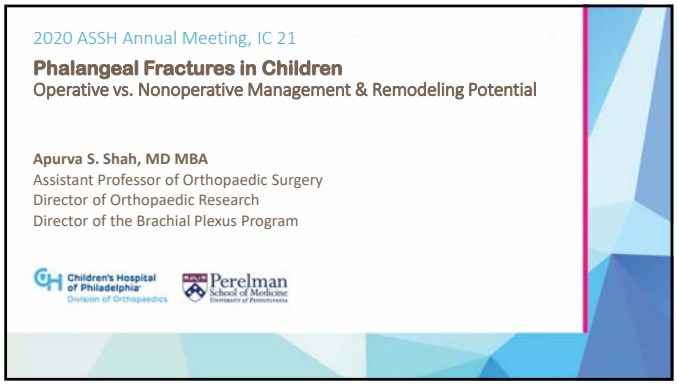
2020 ASSH Annual Meeting, IC 21
Phalangeal Fractures in Children
Operative vs. Nonoperative Management & Remodeling Potential
Apurva S. Shah, MD MBA
Assistant Professor of Orthopaedic Surgery
Director of Orthopaedic Research
Director of the Brachial Plexus Program
Children's Hospital of Philadelphia
Division of Orthopaedics
Perelman School of Medicine

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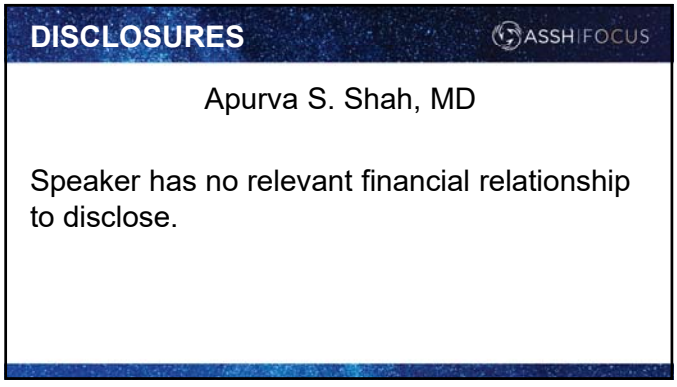
DISCLOSURES
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Apurva S. Shah, MD
Speaker has no relevant financial relationship to disclose.

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Hand Fractures

Most commonly injured part of child

Crush injury to fingertip most common hand injury in toddlers & young children (46% doors & windows)

Yorlets et al Hand 2017

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Treatment

Vast majority → Nonoperative

Operative treatment

- Malrotation or deviation
- Unstable fractures
- Displaced phalangeal neck fractures
- Unicondylar fractures
- Displaced intraarticular fractures
- Seymour fractures

*Most Salter-Harris II proximal phalanx fractures need closed reduction without pinning

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Finger Proximal Phalanx

Can be difficult to visualize on radiographs

Often Salter-Harris II, but can be juxtaphyseal

Will remodel in young children

Can be treated with closed reduction, taping and casting

Percutaneous pinning acceptable option if residual deviation or central digit

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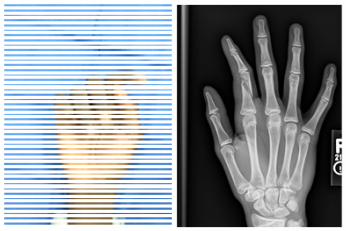
Phalangeal Shaft Fracture

Often unstable and generally require operative treatment

- Younger children → Closed reduction and pinning
- Older children → Treat similar to adults



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Phalanx Shaft Fracture

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Phalangeal Neck Fracture

Fracture extends and translates dorsally

Common toddler crush injury

Distal fragment may appear small (unossified)

Displaced fractures result in loss of IP flexion

- Loss of subcondylar fossa
- May remodel a little even in older patients

Cornwall & Waters JHS 2004

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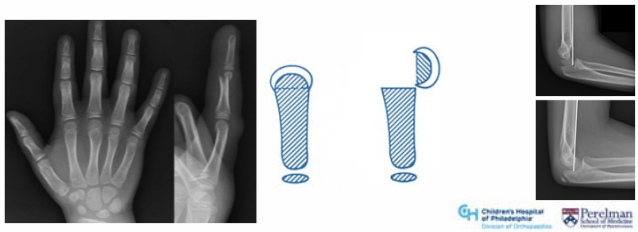
Phalangeal Neck Fracture

Radiographs

- True lateral required to assess the amount of dorsal displacement
- Fragment appears small due to cartilaginous articular surface in young child



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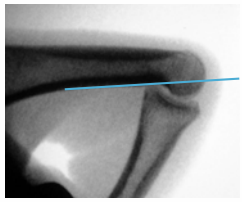
Phalangeal Neck Fracture

Treatment

- Near anatomic reduction to restore the subchondral recess and deep flexion



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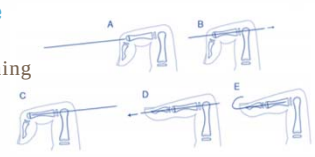
Phalangeal Neck Fracture

Treatment

- Timely closed reduction & pinning
  Karl & Strauch JPO 2012
- Full recovery of ROM expected



- Impending malunions can be treated with intrafocal pin osteoclasis
- ORIF should be avoided, need to preserve vascularity through collateral ligament (high risk of AVN)

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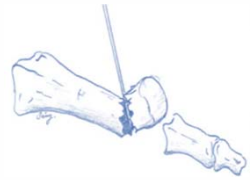
Phalangeal Neck Fracture

Subacute: use intrafocal pin to lever reduction

Chronic: subcondylar fossa reconstruction

Simmons JHS 1987



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Phalangeal Neck Remodeling

5 yo boy with middle finger proximal phalangeal neck fracture

Cornwall & Waters JHS 2004

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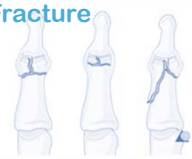
Phalangeal Inter-condylar Fracture

Diagnosis

- Often present late as "jammed fingers"
- Double shadow appearance at condyle
- Rotational deformity often present
- True orthogonal films required



Treatment

- Nondisplaced fractures can be treated closed
- Displaced fractures require timely closed reduction and pinning with minimum 2 pins per fragment if possible
- ORIF with great care to preserve vascularity, since high risk of AVN with open treatment (preserve collaterals for blood supply)

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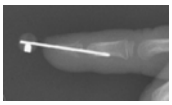
Mallet Equivalent Injury

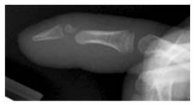
Salter-Harris III or IV injury

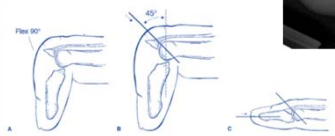
Most can be splinted continuously x 6 weeks

Irreducible need to be reduced (preferably closed)

- Extension block pinning (Hofmeister et al JHS 2003)
  - Mean ROM 4-77° flexion
- Re-establish extensor tension
- Restore joint congruity







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Phalanx Fractures

Beware of the Seymour fracture!

- Physeal fracture
- Open (nail avulsed)

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Phalanx Fractures

Beware of the Seymour fracture!

- Physeal fracture
- Open (Nail avulsed)
- Torn nailbed interposed

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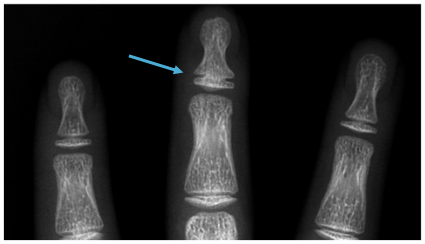
Phalanx Fractures

Beware of the Seymour fracture!

Through debridement to avoid osteomyelitis, deformity, growth arrest



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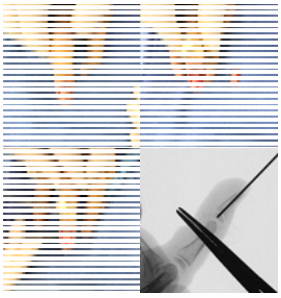
Seymour Fracture



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Take Home Points

1. Management influenced by remodeling potential
2. Most phalangeal fractures treated non-operatively, but beware of minimally displaced phalangeal neck fractures
3. Seymour fractures need early I&D

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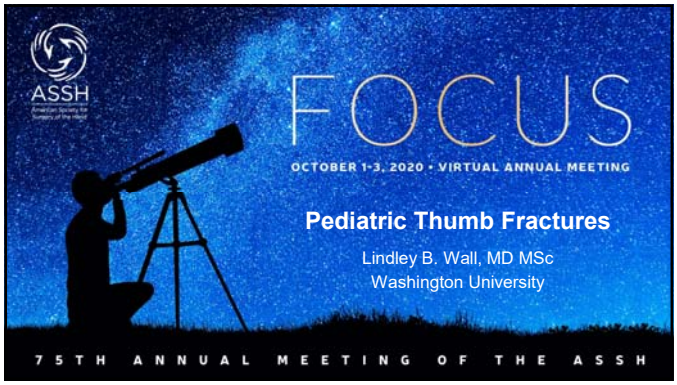

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Objectives

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- Understand unique thumb anatomy
- Discuss fractures of the thumb ray
- Discuss treatment for thumb fractures
- Post-op protocol

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Background

- Young
  - Exploring the surrounding world
- Adolescences
  - Sports/Recreational activities
  - Thumb ray is exposed and used for grip

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Anatomy

- Similar to a finger without a metacarpal
  - Physis is located proximally in distal, middle/proximal phalanx, and metacarpal
  - Pseudoepiphysis* – distal and does not grow
  - Double epiphysis – active growth plates proximal and distal
- Contralateral images if questionable

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Anatomy

- Tendon insertions
  - Determine fracture displacement
- Extensor Pollicis Longus – inserts onto the epiphysis of the distal phalanx
- Abductor Pollicis Longus – Epiphysis and metaphysis of the metacarpal
- Adductor Pollicis – Proximal phalanx and extensor tendon through the adductor aponeurosis
- FPL – inserts into the metadiaphyseal region of the distal phalanx
- FPB – inserts into the metadiaphyseal region of the proximal phalanx

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Anatomy

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- Collateral ligaments
- MPJ collaterals insert into the epiphyseal region of the proximal phalanx
  - → SHIII injuries
- In comparison - PIPJ collaterals insert into the metadiaphyseal region
  - → SHII injuries base of proximal phalanx

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Xray imaging

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- True lateral of thumb
  - Pronate hand 15-35 degrees
- Remember pseudoepiphysis
- Sesamoids
- Compare to contralateral side if needed

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Distal Phalanx

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- Similar to lesser digits
- Alignment and angulation – CRPP
- Low threshold to pin across IPJ
- * Beware the Seymour – can happen in thumb also

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Proximal Phalanx

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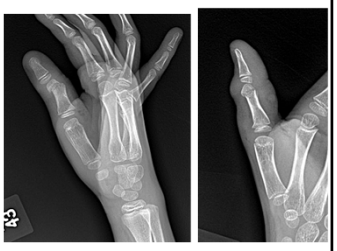
- **Condylar fractures**
  - Need anatomic alignment
  - Low threshold for open reduction
- **Subcondylar fractures**
  - Limited stability – hard to hold in cast
  - Non-displaced watch closely
  - Displaced - reduce and pin stabilization



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Proximal Phalanx

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- **Base Fracture**
  - Salter Harris II Or juxtaphyseal
- Don't treat based on xrays
- Mild angulation tolerated
- Confirm with family*

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Proximal Phalanx

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- **Base Fracture**
- Increased angulation
  - Closed reduction and pinning

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Proximal Phalanx

- **Salter Harris III Base fx - Ulnar Avulsion**
- Skier/Gamekeeper's thumb
- Equivalent to Adult UCL injury/avulsion.
- >11yo
- Need anatomic alignment – fix if displaced (>1.5mm or rotated)
- Fragment larger and more palmar in size than seen radiographically
- Open reduction and pin/screw fixation

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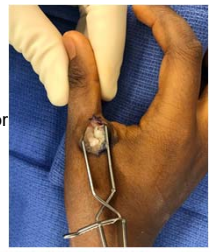
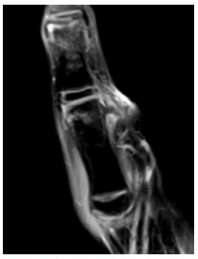
Proximal Phalanx

- Ligament avulsions can happen in kids…
- 11yo Male
- Curvilinear ulnar incision
- Repair with suture anchor or bones tunnels.





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Thumb Metacarpal Base

- **Extra-articular**
- Volar flexion, apex dorsal
- Can laterally displace
- 30 degrees angulation***
- Clinical appearance and age
-
- Often shaft displacement
- Periosteum entrapped and makes reduction difficult
- Heal reliably

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Thumb Metacarpal Base

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- **Intra-articular/Bennet**
  - Displaced proximal and dorsal
- Need congruent joint
- Attempt closed reduction
  - Traction, abd head, pronation
- Low threshold for open reduction
  - Volar approach
- Pins or screw fixation
  - Pin across CMC if needed

Hand Clinics 2006

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Post-op/Fracture healing

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- Cast or pins for 4 weeks
- Protective ROM and custom hand-based brace for 3 weeks
- Brace for few additional weeks for sports if needed
- *UCL avulsion*
  - Thumb MPJ taping for sports after brace for 3 weeks

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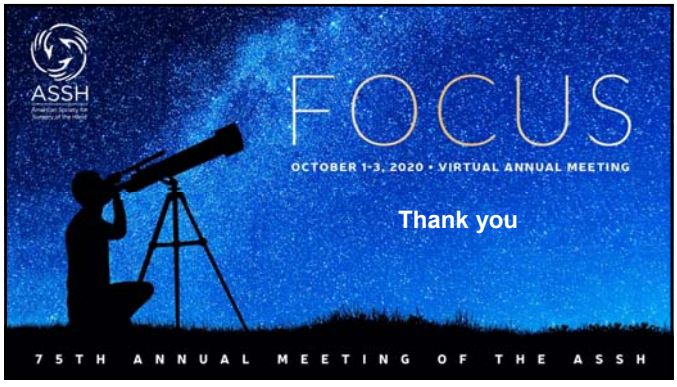

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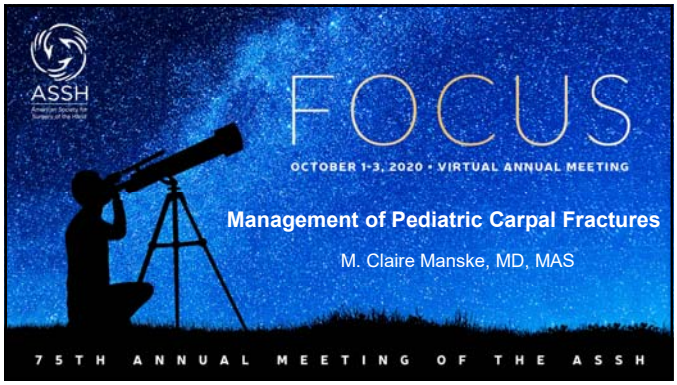

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DISCLOSURES

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Mary Claire Manske, MD

Speaker has no relevant financial relationships with commercial interest to disclose.

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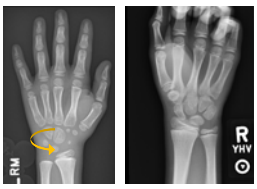
Pediatric Carpal fractures

- Uncommon injuries
- Adolescents >> Children
  - -Carpal ossification
  - -Mechanism of injury
- Most common are scaphoid >>capitate>>other carpal bones



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Scaphoid Fractures

Pediatric Scaphoid Fractures

- 11/100,000 per year
- ~3% pediatric hand/wrist fracture
- Concomitant injury

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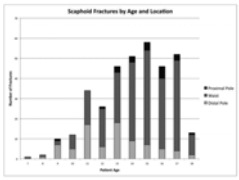
Scaphoid Fractures

Pediatric Scaphoid Fractures

- Adolescent injury
  - -ossific nucleus 5 yo, ossified 13-18 yo
  - -rare in children < 10 yo
- Changing fracture patterns
  - -distal pole (historical)
  - -waist and proximal pole (current)



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Scaphoid Fractures

Pediatric Scaphoid Fractures

- Occult
- Acute
- Nonunion

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Scaphoid Fractures

Occult Scaphoid Fractures

- Clinical evidence of fracture on initial evaluation
  - -tenderness of anatomic snuffbox—not specific
  - -x-rays negative for fracture
- 30% clinically suspected scaphoid fractures
- Clinical signs associated with occult scaphoid fracture
  - - tenderness of distal tubercle volarly
  - - axial compression of thumb
  - - pain with radial deviation, wrist ROM
  - - pain with active wrist ROM

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Scaphoid Fractures

Occult Scaphoid Fractures

Diagnosis
- X-rays 2 weeks post injury vs MRI

Treatment
- Immobilization until radiographic union or clinically asymptomatic
- ~4-6 weeks

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Scaphoid Fractures

Acute Scaphoid Fractures

- ≤6 weeks from injury
- Fall on hyperextended, pronated wrist
- Changing fracture patterns
  - - increasing incidence waist and proximal pole fx
- Mechanism of injury changing
  - -increased sports participation
  - -extreme sports
  - -increasing BMI

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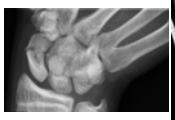
Scaphoid Fractures

Acute Scaphoid Fractures



- Clinical exam
  - -anatomic snuffbox, distal tubercle, axial grind
  - -scaphoid Watson shift test
  - -wrist, digit, forearm ROM
- X-rays: PA, lateral, ulnar deviation/navicular view
- CT scan: if needed
  - -evaluate displacement, assess carpal alignment, plan surgical approach
- Treatment determined by fracture location and displacement

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Scaphoid Fractures

Non-Operative Treatment

Injury x-rays

4 weeks casting

- Indications
  - -non-displaced distal pole and waist fractures
  - -proximal pole fractures?
- Cast immobilization
  - -Long arm cast vs Short arm cast vs thumb spica
  - -immobilization time proximal pole > waist > distal pole
  - -up to 3 months for proximal pole
  - -x-rays q 4-6 weeks, CT at 3 months if no radiographic healing or symptomatic
- Outcomes
  - -90-99% union rates in **non-displaced** fractures treated with **prompt** immobilization

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Scaphoid Fractures

Operative treatment

- Indications
  - -displaced fractures
  - -consider for proximal pole fractures
- Open vs percutaneous reduction and internal fixation
- Dorsal vs Volar approach
- Bone grafting (distal radius, iliac crest)

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Scaphoid Fractures

Operative treatment

- Post-operative care
  - -short arm thumb spica cast
  - -q 6 week x-rays, CT scan at 3 months
  - -consider bone stimulator if <50% bony bridging on CT scan at 3 months
- Outcomes
  - -95% union following surgery
  - -increased time to union: open physes, displaced fx, screw type, bone graft needed

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Scaphoid Fractures

Scaphoid Nonunion

- <1% nonunion of acute fx with prompt management
- Referral centers: 1/3 of pediatric scaphoid fractures present as nonunions
- Factors associated with nonunion
  - -displacement
  - -proximal pole
  - -chronicity
  - -delayed treatment >4 weeks
- Chronic fracture (>6 weeks old) less likely to heal with casting alone
  - -23% union rate
  - -chronic displaced proximal pole and waist <2%
- Natural history of pediatric scaphoid nonunions is not well understood

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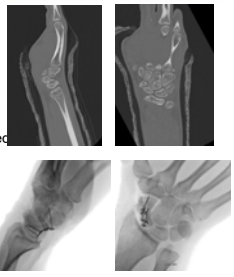
Scaphoid Fractures

Scaphoid Nonunion

- X-rays and CT scan
- Treatment is surgical
  - -open reduction (dorsal or volar approach)
  - -bone autograft (distal radius, iliac crest) vs vascularized
  - -internal fixation—compression screw/plate
- Outcomes
  - -High union rates(>90%) with or without grafting
  - -improved ROM and strength
  - -complication rate low: iliac crest donor site pain, infec



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Summary

- Pediatric carpal injuries are uncommon, scaphoid most frequent
- Adolescent injury, adult fracture patterns
- Non-displaced, acute scaphoid fracture usually do well with **prompt** non-operative management
- Consider operative management for proximal pole, displaced fractures, or >6 weeks old

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Selected References

Ahmed et al. The pediatric fracture of the scaphoid is patients aged 13 years and under: an epidemiologic study. J Pediatr Orthop, 2014

Evenski et al. Clinically suspected scaphoid fractures in children. J Pediatr Orthop, 2009

Fabre et al. Fractures and Nonunions of the carpal scaphoid in children Acta Orthop Belg, 2001

Gholson et al. Scaphoid fractures in children and adolescents: contemporary injury patterns and factors influencing time to union. J Bone Joint Surg, 2011

Goddard N. Carpal fractures in Children. Clin Orthop Rel Res, 2005

Goodall et al. Problematic pediatric hand and wrist fractures. J Bone Joint Surg Reviews, 2016

Jauregui et al. Operative management for pediatric and adolescent scaphoid nonunions: a metaanalysis. J Pediatr Orthop, 2019

Parvizi et al. Combining the clinical signs improves diagnosis of scaphoid fractures. A prospective study with follow-up. J Hand Surg Br 1998

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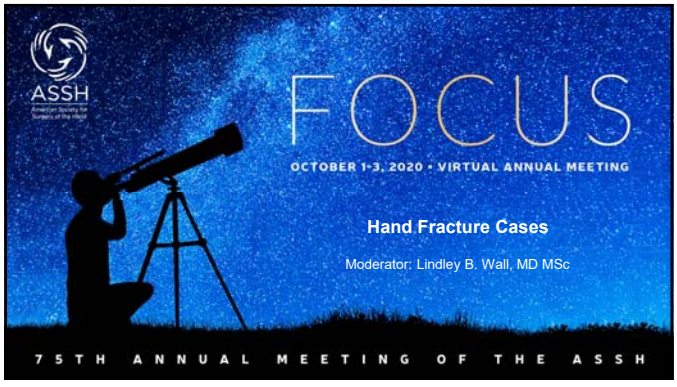

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DISCLOSURES

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Lindley B. Wall, MD

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Case 1

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- 13yo F sustained Right small finger injury when sliding into base playing softball. 1 week ago.

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Approach?

- CR and casting, buddy tape
- Operative fixation
- Open versus closed
- Fixation technique

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Post-op protocol?

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Case 2

- 12yo M with a ring finger injury 5 months ago. Continued deformity and mild pain intermittently.

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Approach

- Non-operative
- Surgical Treatment?
  - Approach
  - Considerations
  - Fixation

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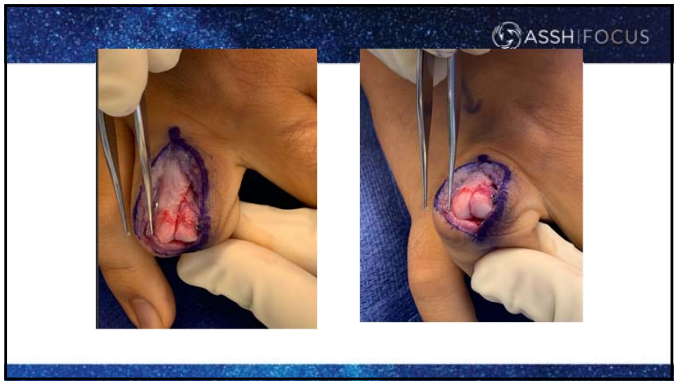

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Case 3

- 17yo Female presents with finger pain and swelling after “jamming” it 2 weeks ago.

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Approach

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- Indications?
- Splinting?
- Surgical approach?

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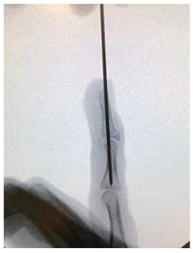

Post-op protocol?

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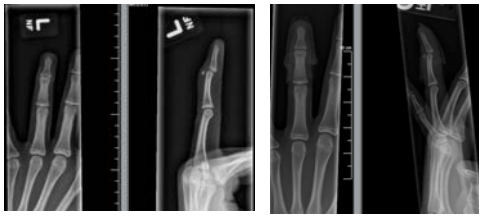
Another mallet: 5 weeks out



In splint

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Case 4

- 8yo male sustained traumatic injury to ring finger while playing football 3 days ago. Seen at Urgent Care and then followed up for care.

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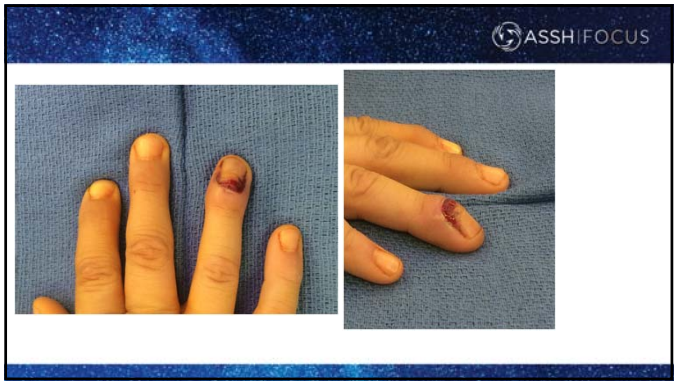

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Approach

- 3 days out…
- Timing:
  - Elective vs Immediate
  - Surgical Approach

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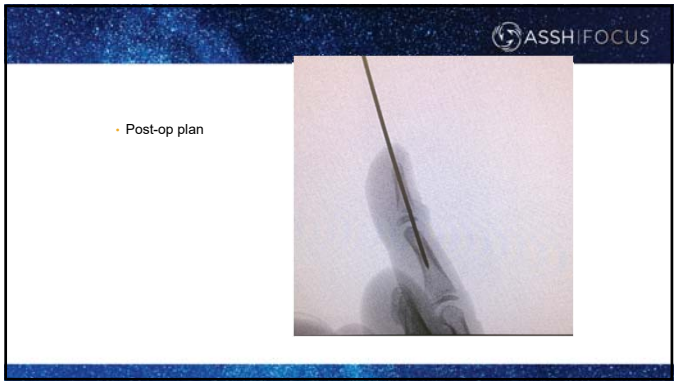

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Case 5

- 14-year-old male who presented with an injury to his right thumb which occurred while playing football when he tried to catch the ball.

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Approach

- Indications for operative fixation
  - Size?
  - Rotation?
  - Displacement amount?
- Fixation technique
  - Closed vs Open?
- Pins or screws

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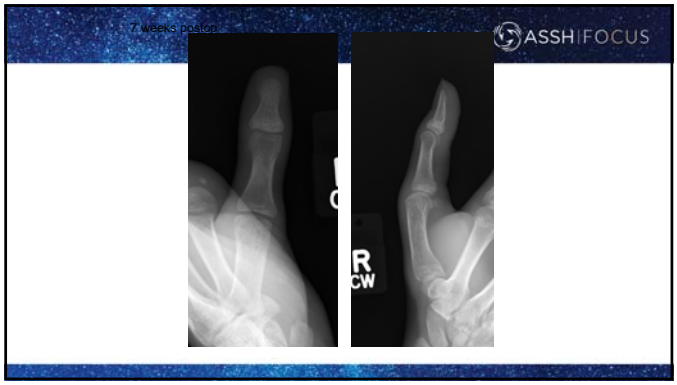
7 weeks postop
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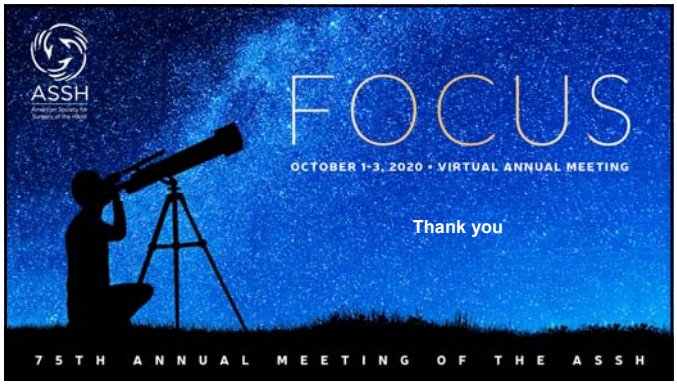
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Thank you
75TH ANNUAL MEETING OF THE ASSH

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