Fracture Management: Breaks for the FP to Fix

Deepak Patel, MD, FAAFP, FACSM

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A past FMX presenter, Dr. Patel practices family medicine and sports medicine in Aurora and Yorkville, Illinois, and is medical director for Rush Copley Sports Medicine. His specialty topics include musculoskeletal imaging, concussions, stress fractures, osteoarthritis, joint examinations, pediatric overuse injuries, knee pain, tendonitis/tendonopathy, fractures, and exercise recommendations, as well as evidence-based medicine. He is a fellow of the American College of Sports Medicine. Since Dr. Patel also practices family medicine, he is able to deliver effective presentations to help family physicians address sports medicine and musculoskeletal complaints. He serves as chair for the 2019 AAFP Musculoskeletal and Sports Care course. Dr. Patel has found that staying current with medical advances and evidence-based medicine is the most challenging aspect of family medicine.
Learning Objectives

1. Identify patients at high risk of fracture, and establish preventive care measures.

2. Assess injured bones or soft tissue to determine the stage and severity of the injury and the most effective mechanism of treatment.

3. Evaluate appropriate imaging modalities for patients with fractures that require diagnostic imaging evaluation.

4. Determine appropriate indications for fracture immobilization, providing adequate pain control as necessary.

5. Coordinate patient education, monitoring and follow-up care.

Associated Sessions

• (PBL) Fracture Management: Breaks for the FP to Fix
Audience Engagement System

Step 1

Step 2

Step 3

FMX
Overview

Fracture Diagnosis-Imaging

- X-ray preferred
- 3 views preferred (AP, LAT oblique)
- Fracture lucency seen on >1 view
- MRI an option if uncertain
Fracture Imaging- A.I.?

• Computer aided software algorhythm for distal radius fracture
• Algorhythm aided providers improved sensitivity, specificity, speed of detection


Fracture Imaging- Computed Tomography

• Enhanced visualization of fracture lines, loose bodies, bony comminution, position of fracture fragments (SORT:C)
• Consider for elbow anterior fat pad with normal x-ray (SORT:C)
• Evaluate healing or not (delayed union vs non-union) (SORT:C)
• Complex fractures (SORT:C)

Fracture Imaging - Ultrasound

<table>
<thead>
<tr>
<th>Fracture Type</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forearm ²,³</td>
<td>97.1%</td>
<td>95-100%</td>
</tr>
<tr>
<td>Peds Forearm ¹,³</td>
<td>99.5%</td>
<td>99.5%</td>
</tr>
<tr>
<td>Buckle Fracture ⁴</td>
<td>98.4%</td>
<td>95.3%</td>
</tr>
<tr>
<td>Upper Ext ⁵</td>
<td>95.3%</td>
<td>87.7%</td>
</tr>
<tr>
<td>Lower Ext. ⁵</td>
<td>98.6%</td>
<td>83%</td>
</tr>
</tbody>
</table>


Clavicle fractures

- Fall onto shoulder with arm adducted
- 4% of all fractures.
- 76% middle-third section

Clavicle fractures- figure 8 vs sling

Cochrane review: figure 8 vs sling
• 3 studies (296 pts)
• Little difference in shoulder function
• 1 study more pain w/ figure 8
• Equal fracture healing, adverse events, time to return (school / work activities)
• Larger study pending


Clavicle fractures- Surgical Referral

• Displacement >1 clavicle width should be plated to reduce risk of non union
• RCT (302 pts):
  • At 3 months: no diff. non-union
  • At 9 months: non-union in surgical lower (0.8%) vs (11%)
  • Surgery Pt satisfaction higher
• Cochrane: insufficient data on surgical vs conservative treatment

Boxers Fracture

- 5\textsuperscript{th} MC neck/head
- Punching hard object
- Volar displacement

Diagnosis

- Observe deformity (loss) of 5\textsuperscript{th} knuckle
- Tenderness
- Assess ROM/malrotation (see picture for normal)
- X-ray
AES Question 1

Boxers fracture needs reduction if angulation greater than?
A. 10 deg
B. 25 deg
C. 40 deg
D. 70 deg

Boxers fracture - Treatment

• Ulnar gutter/gauntlet splint
• Close follow up exam/x-ray in 2 wks
• Immobilize for 4-6 wks
• Non-displaced-cast 4-6 wks, then progressive ROM/ flexibility/ strengthening
• Malrotated, displaced and/or fragmented ➔ surgical referral
Boxers fracture-Treatment Soft wrap?

- RCT, 68 pts,
- 5th MC neck fx < 70 deg.
- Soft wrap + buddy taping vs reduction + cast
- 4 months, no difference: pain, appearance satisfaction, MCP mobility, grip strength
- Time off 11 days less with wrap
- Sys. Rev.: wrap=reduction + cast


Scaphoid fracture

- Fall onto out-stretched hand (FOOSH) injury
- Tender snuffbox sensitive (96%), not specific (39%) (SOR: A)
- Thumb compression: sensitive (82%), specific (58%) (SOR: A)

PHILLIPS, T.G., REIBACH, A.M., and SLOMIANY, W.P.; Diagnosis and Management of Scaphoid Fractures Am Fam Physician 2004;70:879-84


Tait, Mark; Bracey, John; Gaston, R. Acute Scaphoid Fractures: A Critical Analysis Review. JBJS Reviews. 4(9), September 27, 2016. DOI: 10.2106/JBJS.RVW.15.00073
AES Question 2

If you suspect scaphoid fracture with a negative initial x-ray. The most sensitive advanced imaging is?

A. Bone Scan  
B. CT  
C. MRI  
D. Ultrasound
Scaphoid fracture- imaging

- 3 view + scaphoid (navicular view) (SOR: C)
- Imaging: x-ray often negative initially (SOR: B)
- Bone scan = MRI (less cost-effective) (SOR: A)
- Any suspicion: thumb spica splint, repeat exam (tenderness), imaging in 10-14 days (SOR: C)
- ?immediate MRI/CT more cost effective (SOR:B)

PHILLIPS, T.G., REIBACH, A.M., and SLOMIANY, W.P.; Diagnosis and Management of Scaphoid Fractures Am Fam Physician 2004;70:879-84
Li, E., and Sanford, C.; What is the best imaging test for patients with suspected scaphoid fractures and normal plain radiographs? Evidence-Based Practice Vol. 20,(7) July 2017

Scaphoid Fracture Imaging

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>72%</td>
<td>99%</td>
</tr>
<tr>
<td>MRI</td>
<td>88%</td>
<td>100%</td>
</tr>
<tr>
<td>Bone Scan</td>
<td>99%</td>
<td>86%</td>
</tr>
</tbody>
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Scaphoid fracture- waist

Scaphoid Fracture-MRI
Scaphoid fracture- Treatment

- Non displaced fx:
  - Short arm cast w/o Thumb spica
    - Casting: 6-12 wks
    - Thumb spica stabilizes scaphoid
    - longer for proximal pole vs distal pole?

- Displaced fracture needs Ortho for ORIF


Tait, Mark; Bracey, John; Gaston, R. Acute Scaphoid Fractures: A Critical Analysis Review. JBJS Reviews. 4(9), September 27, 2016. DOI: 10.2106/JBJS.RVW.15.00073
Scaphoid non-union

Scaphoid non-union = OA
Ankle

AES Question 3

In regards to the “Ottawa Ankle Rules” which of the following is true?

A. Used for x-ray decision making for the toe injuries
B. X-ray required for any bone tenderness of the malleoli
C. X-ray required for patient only able to limp 3 steps after injury
D. X-ray required for tenderness of metatarsals
E. Not validated for use in children
Ottawa Ankle rules

An ankle x-ray only pain in the malleolar zone and 1 of these: (SORT: A)

• Bone tenderness at posterior edge (6 cm) or tip of lateral malleolus.
• Bone tenderness at posterior edge (6 cm) or tip of medial malleolus.
• Inability to bear weight both immediately and in Emergency Department (4 steps, limping is ok)

Patel, D., Chinta, S., “Which ankle injury scoring system is best for reducing the need for x-rays?” Evidence Based Practice; 2010; 13(1):5-6.

Ottawa Ankle rules

• reduce the need for X-rays by 24-29%,
• when neg, fracture can be ruled out 99% of the time (SOR: A)

Patel, D., Chinta, S., “Which ankle injury scoring system is best for reducing the need for x-rays?” Evidence Based Practice; 2010; 13(1):5-6.
Lateral malleolus avulsion fractures

- Similar MOA as ankle sprain
- Crutches as needed
- Can be treated with ankle stirrup
- Return to sport/activity with bracing in 3-4 wks

Ankle fractures

- 212 pts Weber B distal fibular fracture
- RCT ankle stirrup, vs 6 wks casting, vs 3 wks casting
- No difference in healing
- 2 non-union in 3 wks cast

Foot Fractures

A foot x-ray if any: (SORT: A)

- Bone tenderness at based of the 5th MT
- Bone tenderness at Navicular
- Inability to bear weight both immediately and in Emergency (4 steps, limping is ok)

- Sens: 99.1%
- Spec: 43.4%

Ottawa Foot/Ankle Rules: 44-55-66PM

- 4 steps immediately
- 4 steps in office/ED
- 5th MT
- 5caphoid
- 6 cm Med Post Malleolus
- 6 cm Lat Post Malleolus

AES Question 4

The metatarsal fracture with the highest risk of non-union is?
A. 2nd metatarsal neck
B. 5th metatarsal shaft
C. 5th metatarsal proximally (base)
D. 5th metatarsal avulsion
Metatarsal fractures 5th avulsion

- Treatment same as 1-4 metatarsal fractures, except: may start ambulation as tolerated
- Short walking cast or boot for 4 wks
- Follow up every 2-3 wks
- Refer to Ortho: Displacement > 3 mm; step-off > 2 mm cuboid articular surface; > 60% MT-cuboid joint surface


Metatarsal fracture proximal 5th (Jones)

- Initial treatment: posterior mold, non weight bearing <1 wk
- Definitive treatment: short nonweight bearing cast or boot for 6-8 wks.
- Repeat imaging with healing = gradual weight bearing/activity
- No healing= repeat cast/boot for 4 wks

Jones Fracture

- Refer to Ortho: Displacement > 2 mm; nonunion at 12, athletes or persons with high activity level
- Consider surgical treatment


New Proximal 5th MT Classification

Common 3 zone classification

- 39 pts
- 31% displaced fx, 74% intra-articular fx, 41% fragmented
- Type I 59%, Type II 41%
- Treatment: stiff shoe, ace wrap (optional), full wt bearing as tol.
- Repeat xray at 6 wks only if symptoms
- Resumed work 17 +/- 12 days, sports 53 +/- 22 days
- None required surgery, no complications at 6 months

Prox. 5th MT Fracture Treatment?

- Meta analysis
- Functional: Ace wrap, boot, post op shoe
- Weight bearing as tolerated
- No significant difference

Janssen E, Rijpsma D., BET 1: Functional treatment is non-inferior to below the knee cast in adults with acute closed proximal fifth metatarsal fractures. Emergency Medicine Journal 2019;36:319-320


Prox. 5th MT Fracture Surgical Treatment?

- Athletes: consider surgical treatment?
- Operative 4.2x cost (Europe), better mental quality of life
- Conservative (casting) fewer complications (4.1% vs 12.9%)


Metatarsal fractures 1-4

- Initial treatment: posterior mold, non weight bearing <1 wk
- Definitive treatment: short walking cast or boot for 6 wks
- Follow up every 2-4 wks
- Refer to Ortho: Open, displaced (>3mm), angulated (>10 °) fractures; fracture-dislocations; intra-articular fractures


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Pediatric Fractures
Salter Harris Fracture classification

8 y/o buckle fracture
Buckle fracture- Ultrasound

• Sensitivity: 98.4%
• Specificity: 95.3%


AES Question 5

The best immobilization option for a distal radius buckle fracture is?

a) Ace wrap
b) Rigid splint
c) Wrist brace
d) Cast
Buckle fracture cast vs splint

- Short arm cast vs removable splint
- No difference in pain, healing
- Improved pt satisfaction for splint

- Cochrane: For distal forearm fractures- No useable conclusions


Buckle Fracture Rigid vs Nonrigid?

- Nonrigid:
  - soft cast,
  - splint,
  - ace bandage,
  - Slab

- nonrigid better clinical efficacy, functional recovery, cost, complication

- Preferred by patients

Buckle fracture: follow up?

- Splint for 2-3 wks
  - PCP ok
- Resume activity if asymptomatic for 2 wks
- Usually resume by 4-6 wks
- Follow up if unable to resume by 6 wks
- Choosing wisely: no follow up xray at 4 wks if asymptomatic


Choosing wisely. American Academy of Pediatrics – Section on Orthopaedics and the Pediatric Orthopaedic Society of North America

Ottawa Ankle Rules evidence in children

- > 5 y/o
- Sens: 97.5%
- Spec: 21%
- Ankle x-ray reduction: 16-32%
- If neg, 90% NO fracture


Low risk Ankle fractures

- Avulsion distal fibula
- Salter I
- Salter II
- Lateral Talus

Boutis K et al. Pediatrics. 2007

Low risk fractures: post mold, stirrup, cast?

- Post mold = stirrup for return to play.
- Brace superior to cast in return to function, patient preference, cost
- Cochrane: Low quality evidence to support stirrup.

Boutis K et al. Pediatrics. 2007
Minimal distal fibular fractures management

- No ED consultation of ortho required
- Posterior mold, stirrup brace, ace wrap preferred
- Determine immobilization, return to sports clinically (4-6 wks)
- Follow up with PCP, sports med/ortho 1 week


Peds low risk ankle fx brace vs cast

- Cochrane
- Limited evidence
- Faster recovery at 4 wks in peds low-risk ankle fractures in brace vs cast

Meds/Supplements for fracture

- **Nsaids:** no harms or risk of non-union (SOR: B)
- **Opioids** have some negative correlation on healing (SOR: B)
- **Alcohol** no difference (SOR: C)
- **Vit C.** doesn’t prevent CRPS (SOR: B)


Richards, Christopher J. et al. The Effect of Opioids, Alcohol, and Nonsteroidal Anti-inflammatory Drugs on Fracture Union Orthopedic Clinics , Vol 48 (4), 433 – 443


Analgesics for Peds fracture-

- **Ibuprofen>** acetaminophen or codeine
- **Ibuprofen=** acetaminophen + codeine
- **No harm on healing with NSAIDS in peds** (SOR: B)
- **No benefit to morphine** but great risk (SOR: B)

Korownyk, C., Young, J., Allan, M., Optimal pain relief for pediatric MSK injury  Canadian Family Physician Jun 2015, 61 (6) e276;

Treatment of fractures-US or shockwave

- Cochrane:
  - Low-intensity ultrasound (LIPUS), high-intensity focused ultrasound (HIFUS), & extracorporeal shockwave therapies (ECSW)
  - 12 studies, 648 fractures
  - Potential benefit of ultrasound, but insufficient evidence for routine use (SOR: A)


Fracture non-union tx- bone stimulators

- Cochrane:
  - 4 RCT, 125 participants, delayed union or non-union of long bone treated w/ electromagnetic fields
  - No reduction in pain
  - May offer some benefit but insufficient evidence for regular use (SOR: A)
  - Meta-Analysis: mod. Quality evidence on pain, reduced non-union by 35%,


Practice Recommendations

• Minimally displaced clavicle fractures can be treated with sling vs figure of 8 brace (SOR: A)
• Splint suspected scaphoid fractures in a thumb spica and repeat imaging after 10-14 days (SOR: C)
• Lateral ankle avulsion and low risk pediatric lateral malleolus fractures can be splinted with an ankle stirrup (SOR: B)
• Radial buckle fractures can be treated with ace wrap or splint and return to activities after 2-3 wks if improved (SOR: B)

References

• Korownyk, C., Young, J., Allan, M., Optimal pain relief for pediatric MSK injury. Canadian Family Physician Jun 2015, 61 (6) e276;
References

- Tait, Mark; Bracey, John; Gaston, R. Acute Scaphoid Fractures: A Critical Analysis Review. JBJS Reviews. 4(9), September 27, 2016. DOI: 10.2106/JBJS.RVW.15.00073
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References


Thanks!

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Questions