Management of Distal Extremity Injuries in College Health
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Girl trips over her flip-flops and puts her hand out to catch herself
Distal Radius (Colles’) Fracture

- Most common upper extremity fracture
- FOOSH!
- Extremity often looks normal
  - Swelling may not develop immediately
  - Often no deformity
Distal Radius Fx - Evaluation

• Assess neuro-vascular status
  – Motor, sensory exam
  – Pulses, cap refill
  – Range of motion

• Obtain x-ray
  – What if you don’t have x-ray?
Distal Radius Fx – Management

- Refer to Ortho
  - within 3-5 days
- Reverse sugar tong splint is ideal
  - 2 planes of motion
- Volar splint and a sling in a pinch
Her flip-flop fanatic friend fell the same way
Scaphoid (Navicular) Fracture

- Most common carpal fracture
- FOOSH!
- Avascular necrosis risk
  - Blood supply enters at distal pole
- Pain, worse with grip
Scaphoid Fracture - Evaluation

- Compare wrists
  - May look normal
- **Snuff box tenderness**!
  - 90% sensitive for fx
  - Less specific (40%)
- Obtain x-ray...
  But don’t believe them!
Scaphoid Fracture - Management

• Thumb spica splint
• Reassess in 7-10 days
  – Re-check snuff box
  – Repeat x-rays
• Alternatively, MRI or CT
• Refer to Ortho if fracture is present or symptoms persist
Sophomore’s girlfriend broke up with him last night and he punched a wall
Boxer’s Fracture

- 5th Metacarpal neck fx
- Direct trauma to a clenched fist
  - I fought the wall and the wall won.
Boxer’s fracture - Evaluation

- Swelling of dorsum of hand
- Ecchymosis and Tenderness over 5th metacarpal head
- Assess rotational alignment
  - On exam
  - On x-ray
Boxer’s fracture - Management

• Ulnar gutter splint
• Refer to Ortho in 1 week
• Urgent referral
  – Open fracture
  – Neurovascular compromise
  – “pseudo-clawing”
  – Significant angulation
Freshman just got back from ski club trip over break and her thumb hurts.
Skier’s Thumb

• Ulnar Collateral Ligament Tear

• Forced abduction and hyperextension of 1st MCP joint

• Ski pole injuries most common cause
Skier’s Thumb - Evaluation
Skier’s Thumb - Evaluation

- Classic history
- Swelling of entire joint
- Tender at ulnar aspect
- Pain with extension or abduction
- Laxity of MCP joint
  - Compare to other thumb
Skier’s Thumb - Management

- Thumb spica splint
  - At least 6 weeks
- R.I.C.E.
- Ortho referral ASAP especially if...
  - Presence of fracture
  - Significant laxity of joint
- Early surgical repair has better outcomes
Wrestling with fraternity brother
PIP Volar Plate Injuries

- Mechanism: hyper-extension of joint
- “Swan Neck” deformity
  - PIP joint hyperextended by extensor tendons
Volar Plate Injuries

- Max tenderness at *volar* aspect of PIP joint
- Check flexion, extension and lateral stability
- Neurovascular assessment
- X-ray to rule out avulsion fracture
Volar Plate Injuries

- Block Splint at 30 degrees of flexion
  - Progressively extend over 2-4 weeks
  - Buddy taping for less severe strains
- Ortho referral
  - Presence of fracture
  - Unstable joint
6 weeks later his buddy comes in
Central Slip Extensor Injury

- Boutonniere Deformity
- PIP most commonly affected
- Mechanism = forced flexion of an extended PIP joint
- *Usually don’t present for 4-6 weeks
Central Extensor Slip Injury

- Max tenderness at **dorsal** aspect of PIP joint
- Can’t actively extend PIP joint
- X-ray to rule out dorsal avulsion fracture
Central Extensor Slip Injury

- Continuous splinting in full extension
  - 6-8 weeks
- Ortho Referral
  - Presence of fracture
  - Inability to passively extend PIP joint
  - Non-urgent
- What if you can’t tell?
Freshman tossing a baseball on the quad and "jams" his finger
Mallet Finger

- Avulsion of DIP extensor tendon
- Most common tendon injury in finger
- Pain, swelling, bruising
- *Inability to extend DIP – Flexed DIP at rest
Mallet Finger - Evaluation

• Isolate extensor tendon
  – Stabilize PIP joint
• No active extension
  – Passive extension intact
• Obtain x-ray to r/o avulsion fracture
Mallet Finger - Management

- **Continuous** splinting in *full extension*
  - Slight *hyper*-extension
  - 6-8 weeks

- Refer
  - Failed splinting
  - Presence of fracture
  - Distal phalanx subluxation
Junior playing flag football on the quad
Jersey Finger

- Flexor Digitorum Profundus (FDP) Tendon rupture
- Forced hyperextension of flexed DIP joint
- Ring finger = 75% of cases
Jersey Finger - Evaluation

- *Inability to **flex** DIP
- Again, isolate DIP
- X-ray to rule out fractures
Jersey Finger - Management

- Refer ALL cases to hand surgery ASAP*
  - Call Ortho/Hand that day
  - Requires surgical repair

- Acute care
  - Splint with DIP and PIP joint in slight flexion.
Sophomore slams the tip of her finger in her car door
Distal phalanx (tuft) fracture

- Half of all hand fractures
- Middle finger most commonly involved
- Mechanism = direct blow
Distal Phalanx fracture - evaluation

- Pain, swelling, ecchymosis
- Tuft vs. Distal Phalanx
- Neuro-vascular status
  - Capillary refill
  - 2-point discrimination
- X-ray to evaluate intra-articular fracture and displacement
Distal phalanx (tuft) fracture

- Splint with DIP in extension for 3-4 weeks
- Referral to ortho/hand
  - Immediately
    - open fx, severe crush injury, neuro compromise
  - Within 3-4 days
    - Tendon dysfunction
    - Nerve dysfunction
    - Intraarticular (> 30%) or displaced
Nail bed Injury - Subungual Hematoma

- Distal phalanx fracture more likely if hematoma involves > 50% of nail bed
- Evaluate eponychial fold for disruption or deformity
Nail bed injuries - Trephination

- Indications
  - Acute (< 48 hours)
  - Painful
- Electrocautery
  - 18-gauge needle
  - Heated paperclip
- No antibiotics
- Soapy soaks for 2 days
What if her finger looked like this?
Proximal/Middle phalanx fracture

- Pain, swelling, ecchymosis
- Neuro-vascular status
  - Capillary refill
  - 2-point discrimination
- X-ray to evaluate intra-articular fracture and displacement
Proximal/Middle phalanx fracture - Management

- Stable, non-displaced
  - Buddy taping 4-6 weeks
  - Dorsal or volar splint for added protection and pain control

- Referral to Ortho/Hand
  - Comminuted, rotational, intraarticular, displaced, angulated or unstable
Guy walks in from soccer practice with his finger looking like this!
PIP dislocation - evaluation

- Most common = dorsal
  - Lateral fairly common
  - Volar rarely
- Pain, swelling, impaired range of motion and deformity
- X-ray to assess for associated fracture
PIP dislocation - Management

• Reduction
  – Pre/post x-rays*
  – Gentle traction, then flexion
  – Dorsal splint in flexion
    • Buddy tape after 3-5 days

• Prompt Referral
  – Irreducible
  – unstable
  – Tendon rupture
  – *Volar* dislocation
Junior playing basketball twists his ankle coming down from a rebound.
Ankle Sprains

- Lateral sprains most common
- Medial injuries usually result in fractures
- Syndesmotic ("high") sprains predict poor outcomes
Ankle Sprains

• Anterior Drawer Test
  – Assess ATF ligament

• Talar Tilt Test
  – Assess CF ligament

• Squeeze Test
  – Assess syndesmotic structures
To X-Ray or Not: Ottowa Rules

- Pain over malleolus and/or midfoot **AND**
- Tenderness over malleolus and/or midfoot **OR**
- Inability to bear weight immediately and at visit
Ankle Sprain – Management

• Functional Treatment*
  I. Start PRICE protocol within 24 hours
  II. Strength and ROM exercises in 48-72 hours
  III. Endurance and balance training
Ankle fractures

- 60-70% malleolar
  - Lateral most common and most stable
- 15-20% bi-malleolar
- 7-12% tri-malleolar
- Isolated medial malleolar fx are rare and unstable
  - Treat like bi- or tri-malleolar
Ankle fracture - Management

- Small, non-displaced avulsion fractures
  - Like ankle sprain
- Isolated Malleolar fx
  - Stirrup splint
    - At 90 degrees (neutral position)
    - Non weight-bearing
  - Ortho follow-up in 3-5 days
What if he has pain here?
5th Metatarsal Styloid Aulsion fracture

- Most common fracture of lower extremity
- Mechanism identical to lateral ankle sprain
  - Inversion while foot is plantar flexed
- Walking possible but painful
5th Metatarsal Styloid Avulsion fracture

- Swelling, ecchymosis
- Ottawa rules!
- Beware a Jones fracture
  - Same mechanism
  - Different management
  - Different prognosis
5th Metatarsal Styloid Avulsion fracture

- Conservative Management
- Weight-bearing as tolerated
- Post-op shoe +/- elastic wrap
- Usually resolves in 3-6 weeks
Junior on ski club trip who tried snowboarding this time.
Snowboarder’s fracture

- Lateral Process of Talus
- Exact mechanism unknown
  - Axial loading + external rotation, dorsiflexion and inversion
- Soft snowboarding boots contribute
Snowboarder’s fracture

- Lateral Process of Talus fracture
- Have a high index of suspicion
- Hard to pick up on exam and on x-ray
  - Looks a lot like ankle sprain
Snowboarder’s fracture

- Best treatment not really known
- Non weight-bearing
- Refer to ortho
- Err on the side of caution
A grad student playing racquetball thought he got with the ball
Achilles Tendon Rupture

- Feels sudden “pop” or “being kicked”
- Weekend warriors in late 20’s, 30’s
- Medications
  - Fluoroquinolones
  - Steroids
- Missed 25% of time
Thompson Test

- **Complete Rupture**
  - *Abnormal* Thompson
  - Can’t stand on toes

- **Partial Rupture**
  - *Normal* Thompson
  - +/- Palpable defect
  - Plantar flexion intact
  - Patient can walk
  - Tendon is not painful
Achilles Tendon Rupture

- X-rays not helpful
- Prompt ortho referral
- Non weight-bearing
- Aircast or posterior splint for comfort
  - Slight plantar flexion
Sophomore joined the bowling team and dropped a ball on her foot.
Metatarsal Fracture

• Mechanism = direct blow or twisting

• Edema, ecchymosis, pain, point tenderness

• Neurovascular exam
  – Pain, pallor, paresthesia, pulselessness

• Lisfranc joint*
Metatarsal Fracture - Management

- **R.I.C.E.**
- Posterior splint
- Non weight-bearing
- Ortho F/U in 3-5 days
  - Immediate for open fracture and/or neuro-vascular compromise
Her friend tried to help her home and stubbed her toe... in flip-flops
Toe Fractures

- Stubbing or direct blow
- Pain, edema, deformity, ecchymosis
Toe Fractures - Management

- Buddy taping
- Postop shoe prn pain
- R.I.C.E.
- Follow-up in 1-2 weeks
Toe Fracture – Referral?

1st toe fractures
- Fracture with dislocation
- Displaced intra-articular fx
- Intra-articular fx > 25% of joint space
- Unstable displaced fx

Lesser toe fractures
- Rarely
- Displaced intra-articular fx
- Irreducible fractures
- Open fractures
- Unstable displaced fractures
Basic Principles of splinting

• 1 joint above and below
• Clean, repair, and dress skin before application
• Clothing considerations
• Neurovascular status pre and post application
• R.I.C.E.
• Position of Function
• Pad between digits and bony prominences
### Positions of Function for Splints

<table>
<thead>
<tr>
<th>Splint</th>
<th>Position</th>
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</thead>
<tbody>
<tr>
<td>Volar</td>
<td>Neutral forearm (thumb up), wrist slightly extended</td>
</tr>
<tr>
<td>Ulnar gutter</td>
<td>Neutral forearm, wrist at 20 degrees extension, MCP at 50 degrees flexion, PIP in slight flexion (10 degrees), DIP in extension</td>
</tr>
<tr>
<td>Thumb spica</td>
<td>Forearm neutral, wrist at 25 degrees extension, allowing thumb-index finger opposition and alignment of the thumb and forearm (“Can of Soda” position)</td>
</tr>
<tr>
<td>Finger</td>
<td>Finger in slight flexion</td>
</tr>
<tr>
<td>Sugar Tong</td>
<td>Elbow at 90 degrees flexion, neutral flexion, neutral wrist</td>
</tr>
<tr>
<td>Ankle posterior/stirrup</td>
<td>Ankle at 90 degrees</td>
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# Upper Extremity Splints

<table>
<thead>
<tr>
<th>SPLINT</th>
<th>INDICATION</th>
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<tbody>
<tr>
<td>Volar splint</td>
<td>Wrist fractures or sprains, fractures of 2nd to 5th metacarpals, soft tissue injuries of the hand</td>
</tr>
<tr>
<td>Reverse sugar tong splint</td>
<td>Wrist and distal forearm fractures</td>
</tr>
<tr>
<td>Ulnar gutter splint</td>
<td>5th metacarpal (Boxer’s) fractures</td>
</tr>
<tr>
<td>Thumb spica splint</td>
<td>Scaphoid fractures, fractures of 1st (thumb) metacarpal, ulnar collateral ligament (Skier’s thumb) injuries</td>
</tr>
<tr>
<td>Volar finger splint</td>
<td>Fractures of distal phalanges and interphalangeal joints</td>
</tr>
<tr>
<td>Buddy taping</td>
<td>Finger phalanx fractures, finger dislocations (post-reduction)</td>
</tr>
</tbody>
</table>
# Lower Extremity Splints

<table>
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<tr>
<th>SPLINT</th>
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</thead>
<tbody>
<tr>
<td>Posterior splint</td>
<td>Ankle, tarsal, and metatarsal fractures, severe sprains</td>
</tr>
<tr>
<td>Stirrup splint</td>
<td>Ankle fractures</td>
</tr>
<tr>
<td>Buddy taping</td>
<td>Toe phalanx fractures</td>
</tr>
<tr>
<td>Elastic wrap/AirCast</td>
<td>Ankle sprains</td>
</tr>
<tr>
<td>Crutches</td>
<td>As needed for pain with soft tissue injuries and until ortho follow-up for fractures requiring non weight-bearing</td>
</tr>
<tr>
<td>Postoperative shoe</td>
<td>5th metatarsal styloid avulsion fractures, 1st toe fractures and lesser toe fx prn pain</td>
</tr>
</tbody>
</table>
Take Home Points

• WHEN IN DOUBT, SPLINT IT!

• ALWAYS REMEMBER THE 5 P’s!
  – pallor, pain, paresthesia, pulselessness, and paralysis

• DON’T LET THE X-RAY GET IN YOUR WAY
Management of Distal Extremity Injuries in College Health

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