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Sideline Management of Fractures and Dislocations

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Disclosures

- No relevant disclosures or conflicts related to this topic

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Objectives

- Understand and apply basic principles of fracture and dislocation management to injuries sustained on the playing field
- Review immobilization techniques for common fractures
- Learn and apply reduction techniques for common dislocations
- Review appropriate triage for sideline injuries based upon severity

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FRACTURE BASICS

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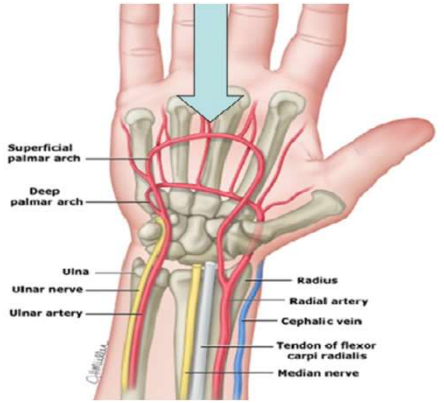
Initial Assessment

- Evaluate Limb - Stay Calm!
  - You are the captain of the sideline and initial assessment. Take control of the situation
- Assess the skin
  - Take off socks/shoes/jerseys to assess
  - If open fracture, +/- sterile irrigation and dress with sterile dressing. Remove any grass or debris
  - Saline soaked gauze dressing of choice
- Neurovascular assessment
  - Sensation and motor
  - Pulses

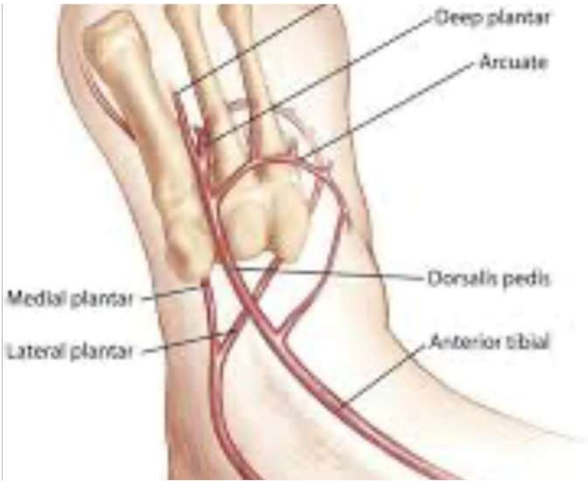
Neurovascular Exam

- Upper Extremity
  - Motor: AIN, PIN, ulnar
  - Sensation radial, ulnar, median
  - Radial pulse



Caption

- Lower extremity
  - Motor dorsiflexion, plantar flexion, great toe extension
  - Sensation superficial and deep peroneal, sural, saphenous, tibial
  - Dorsalis pedis and posterior tibial pulse



Caption

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Open Fractures

- Type I
  - < 1 cm, minimal contamination
- Type II
  - 1-10 cm, moderate muscle damage
- Type III (a/b/c)
  - high energy, will not see in athletics

Digit and Tibia most common

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Why is it important?

- If open, instruct EMS to start antibiotics during transport
  - Studies demonstrate earlier time to antibiotics decreases infection rate
  - > 3 hours out from injury increases infection
- Sterile dressing prevents further contamination of the wound
- **You may be the only one who assesses the skin and your report may drive the urgency of the athlete's care**

Immobilize and Stabilize

- Stabilize Extremity
  - Traction for long bones (make limb straight!)
  - Splint or brace as indicated
- Immobilization decreases pain, minimizes soft tissue trauma, and prevents clot disruption
- **Know your supplies!**

Transport and Triage

- Immediate triage to hospital or ER
  - Open fractures, neurovascular compromise
  - Femur/tibia fractures, hip dislocations
  - Dislocations that you cannot reduce, grossly displaced fractures
  - Ankle fracture that need reduction
- Less urgent, may follow up in orthopedic urgent care or with provider within the next few days
  - Closed clavicle fractures
  - Closed fractures of the digits
  - Questionable fractures without deformity

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OVERVIEW OF SPECIFIC INJURIES

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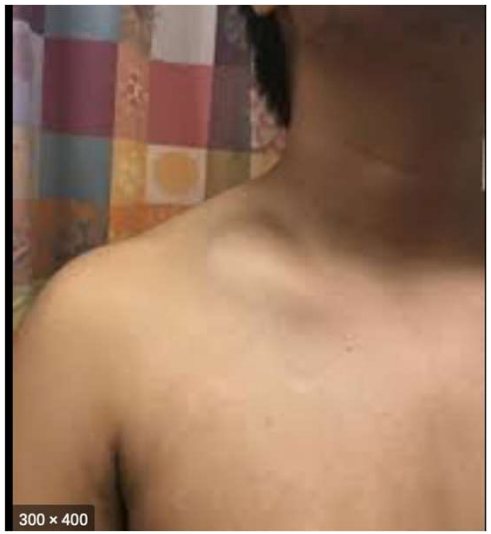
Injury Overview

- Upper Extremity
  - Clavicle fractures
  - Shoulder dislocations
  - Elbow dislocation
  - Forearm/wrist fractures
  - Finger fractures and dislocations
- Lower Extremity
  - Hip dislocations
  - Femur and tibia fractures
  - Knee dislocations
  - Patella dislocations
  - Ankle fractures and dislocations

Clavicle Fractures

- Mechanism of injury
  - Direct blow to the lateral shoulder
  - Direct blow to the top of the shoulder
- Common in contact sports
  - Football
  - Hockey
  - Lacrosse
- More common in males



Clavicle Fractures

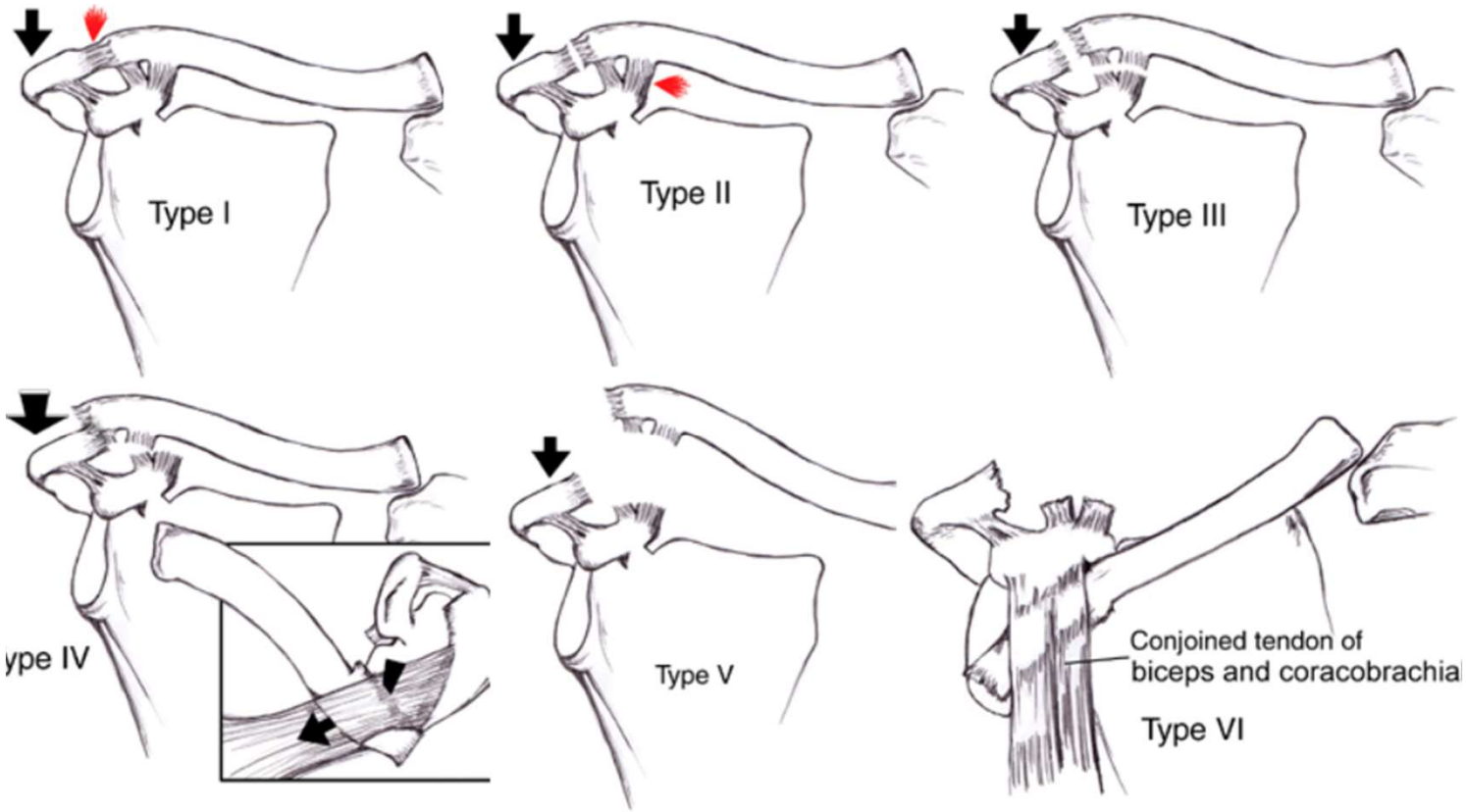
- History - Felt a pop/crack on impact, gross deformity
- Midshaft clavicles fractures are the most common
- Evaluation
  - SKIN (evaluate for tenting - more urgent)
  - Remove shoulder pads for assessment
  - Neurovascular

- Sideline Treatment
  - Sling immobilization
  - No return to play
- Triage
  - Clinic/xrays in the next day

Caption

Related: Shoulder Separation

- Same treatment/assessment as clavicle fracture
- Treatment - Sling, may return to play if no deformity, non urgent evaluations



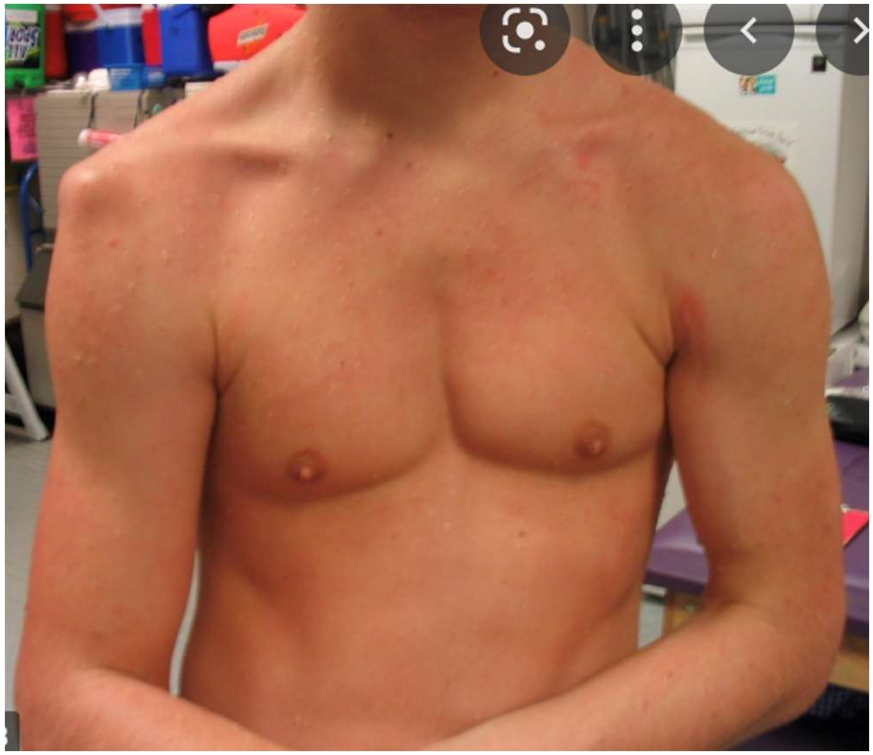
Shoulder Dislocations

- Mechanism
  - Anterior directed force on the arm in maximal abduction and external rotation
- Risk factors for dislocation
  - Contact or overhead athlete
  - Male > Female
  - Age under 21 years old
- Sports
  - Football
  - Hockey
  - Rugby
  - Basketball
  - Lacrosse

Caption

Shoulder Dislocations

- Physical Exam
  - Arm Dangling
  - Sulcus sign/dangling arm
  - Neurovascular status
- Prompt diagnosis is important
- On field reduction is indicated
  - Multiple techniques
  - Must do in first few minutes



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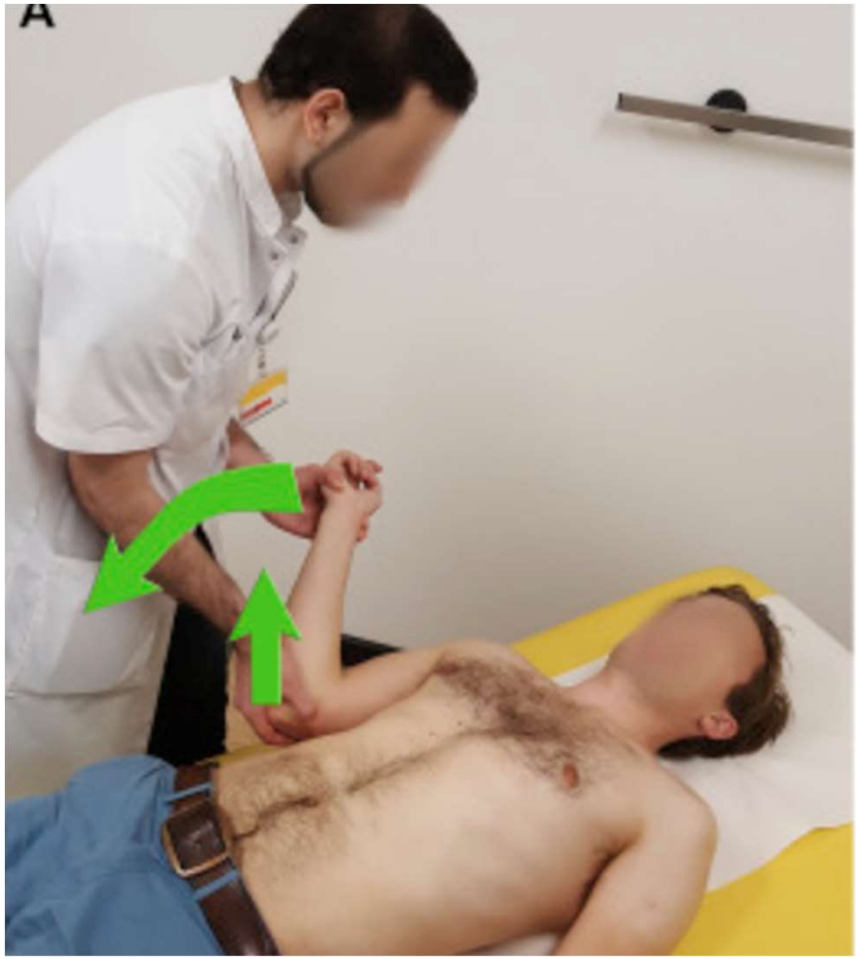
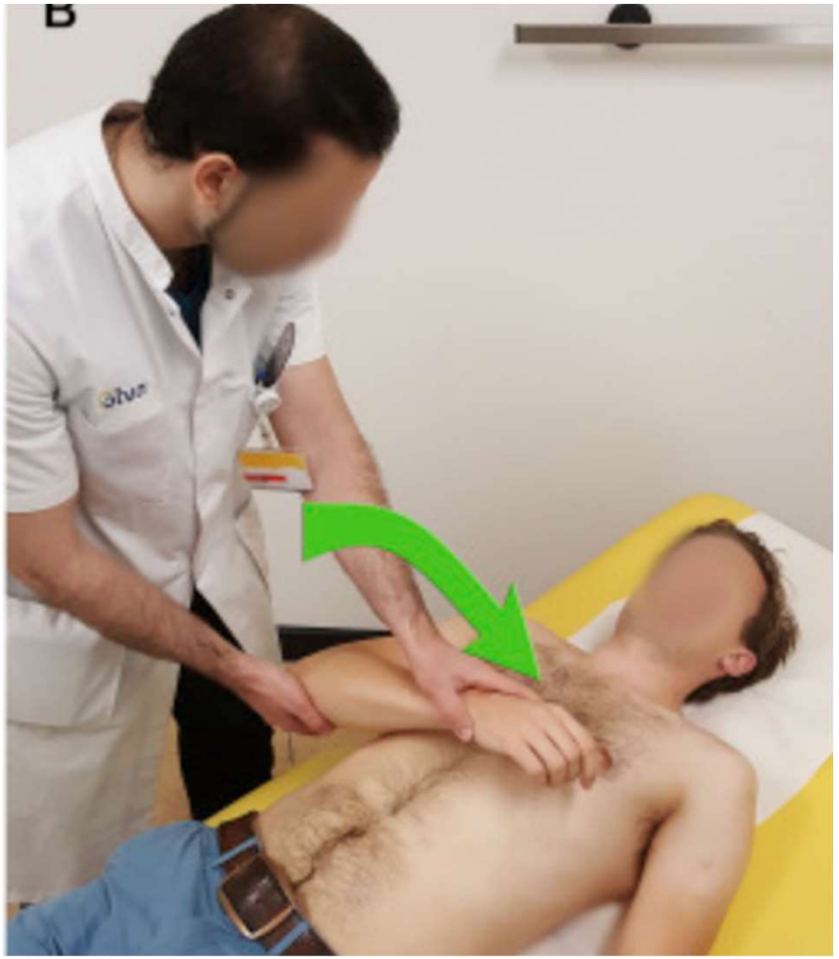
Reduction Technique

- Traction with counter traction

Reduction Technique

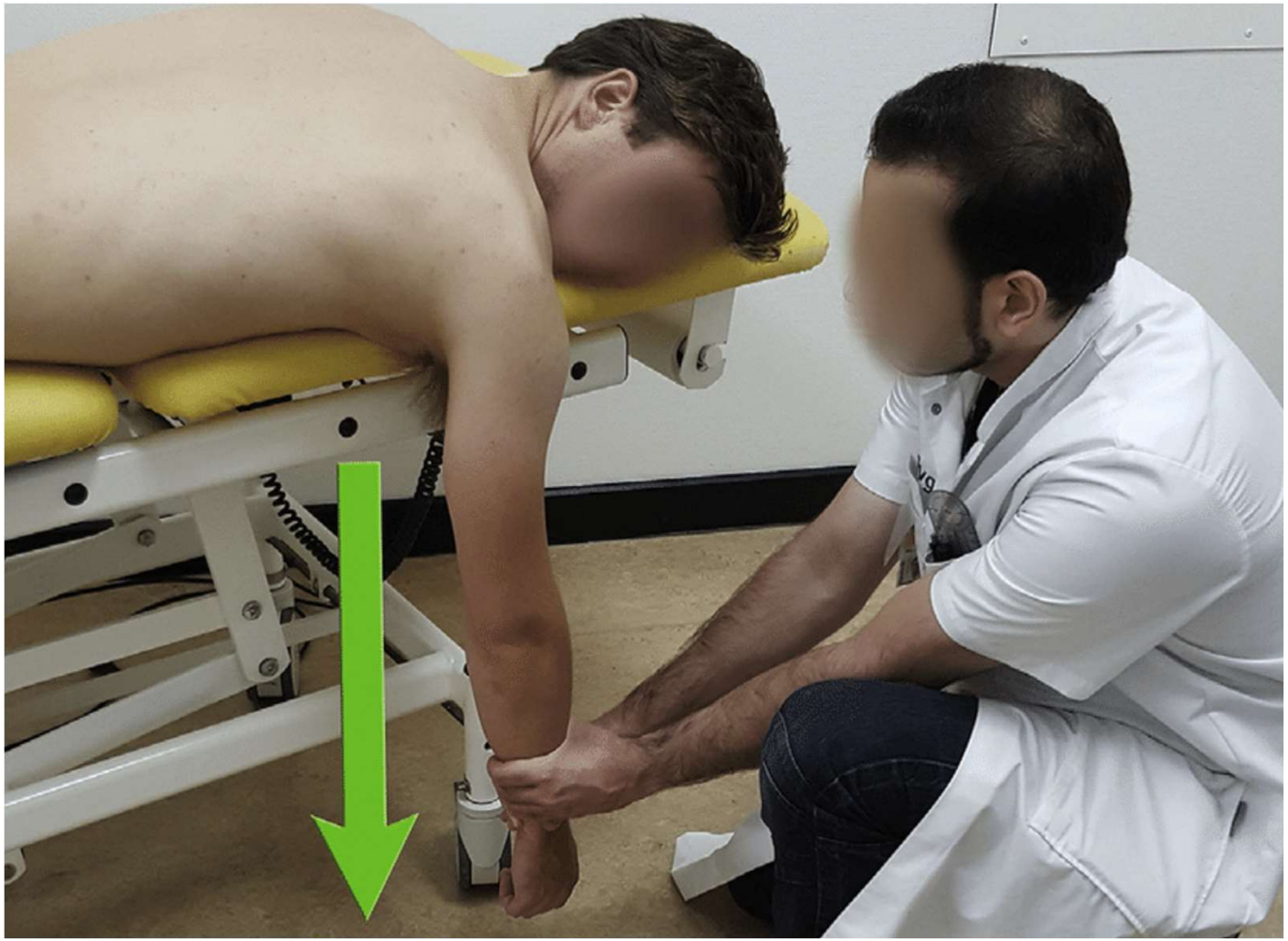
- Traction with gentle internal and external rotation





Reduction Technique

- Prone arm hang, use weights if able!



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Post Reduction

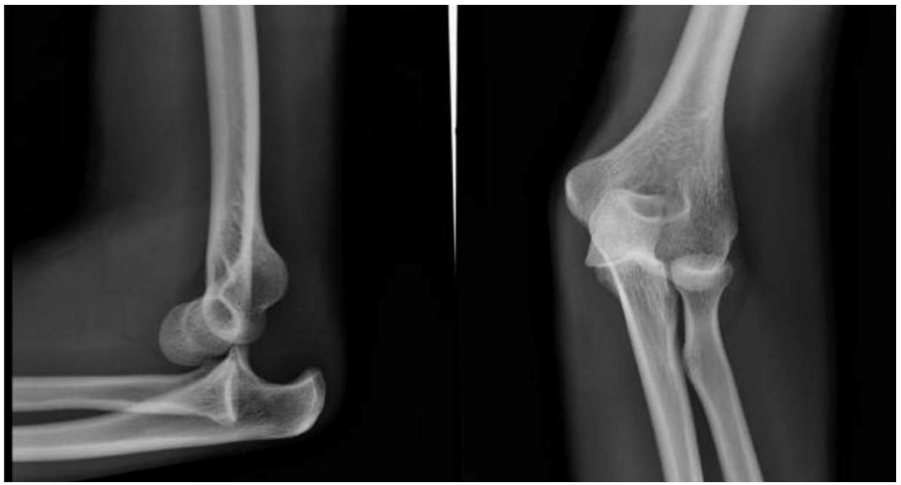
- Now that the shoulders reduced…what should I do?
- First time dislocations
  - Typically there is more swelling, pain, and dysfunction in first time dislocations
  - Lean towards no return to play
  - Triage: sling, follow up non urgently with provider
- Chronic dislocations
  - Typically there is less pain and swelling
  - May consider return to play pending sideline exam
  - Sulley brace if possible

Irreducible Shoulder

- After ~5 minutes of attempts, if unable to reduce shoulder should discontinue attempts
  - Muscles tighten, pain increases, and likelihood if overcoming these factors is low
- Patient must go to the ED (private vehicle is appropriate)
  - Keep patient NPO as may require conscious sedation
  - Sling for comfort

Elbow Dislocation

- Mechanism: Fall on outstretched hand with axial load, supination, and valgus force
- Common in patient ages 10-20 years old
- Second most common major joint dislocation after the shoulder
- Sports
  - Soccer
  - Lacrosse
  - Basketball
  - Football



Caption

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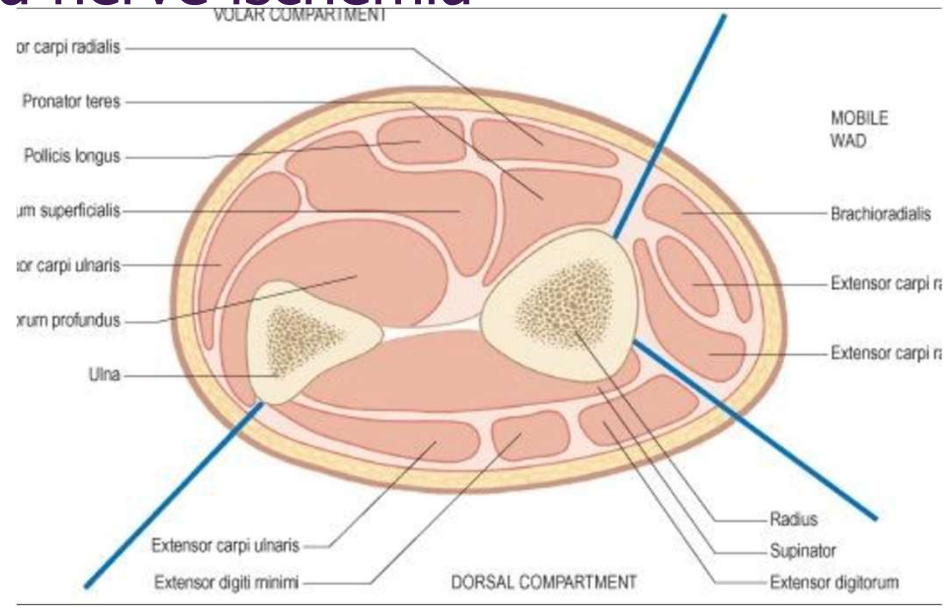
- Physical exam
  - Higher association with neurovascular injury, close attention pre/post reduction
  - ~15% have an associated ipsilateral forearm fracture so examine the distal limb
  - Will see olecranon prominence posteriorly

Caption

Compartment Syndrome Risk

- What is compartment syndrome?
  - Rise in the pressures within the fascial compartments, can cause muscle and nerve ischemia

- Clinical diagnosis 5 Ps
  - Pain
  - Palor
  - Paresthesias
  - Pulseleness
  - Poikolothermia



Caption

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Reduction Technique

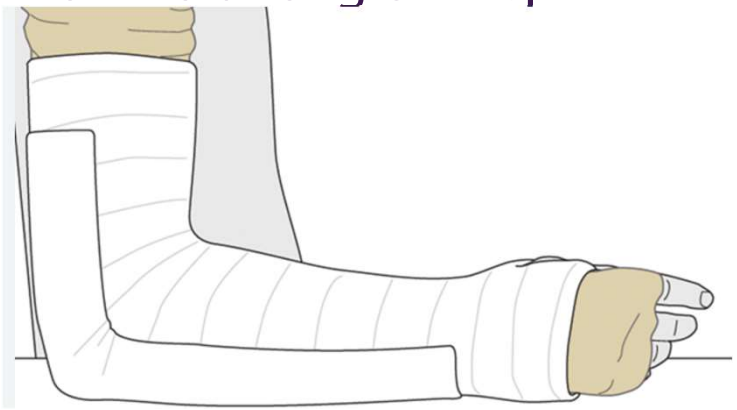
Elbow Dislocation

How to Reduce a Dislocated Elbow

FIFA | MEDICAL NETWORK

Immobilization

- Post reduction, place in a posterior mold long arm splint with arm in 90 degrees of flexion



Caption

- Reassess remainder of limb post reduction, including concomitant injuries and neurovascular status
- Up to 40% of elbow dislocations are associated with fractures around the elbow
  - **Given this and compartment syndrome risk, it is my opinion that all elbow dislocations should NOT return to play and should be evaluated in the ED or by a provider same day or within 24 hours**

Forearm and Wrist Fractures

- This is by far the most common pediatric fracture (<18 years old) and estimated to account for 40% of all pediatric fracture
- Mechanism is fall on outstretched hand
- Will see more often in the junior high and younger high school populations, much less common in skeletally mature patients
- Sports
  - Football
  - Soccer
  - Lacrosse
  - Basketball

Forearm and Wrist fracture

- Physical Exam
  - Angulation of the mid shaft forearm
  - These have a higher incidence of open fracture even at low energy
    - Often Type I open fracture (poke hole)
    - **EASILY MISSED**
  - 10-15% of ipsilateral elbow injury, examine the proximal limb as well

Caption

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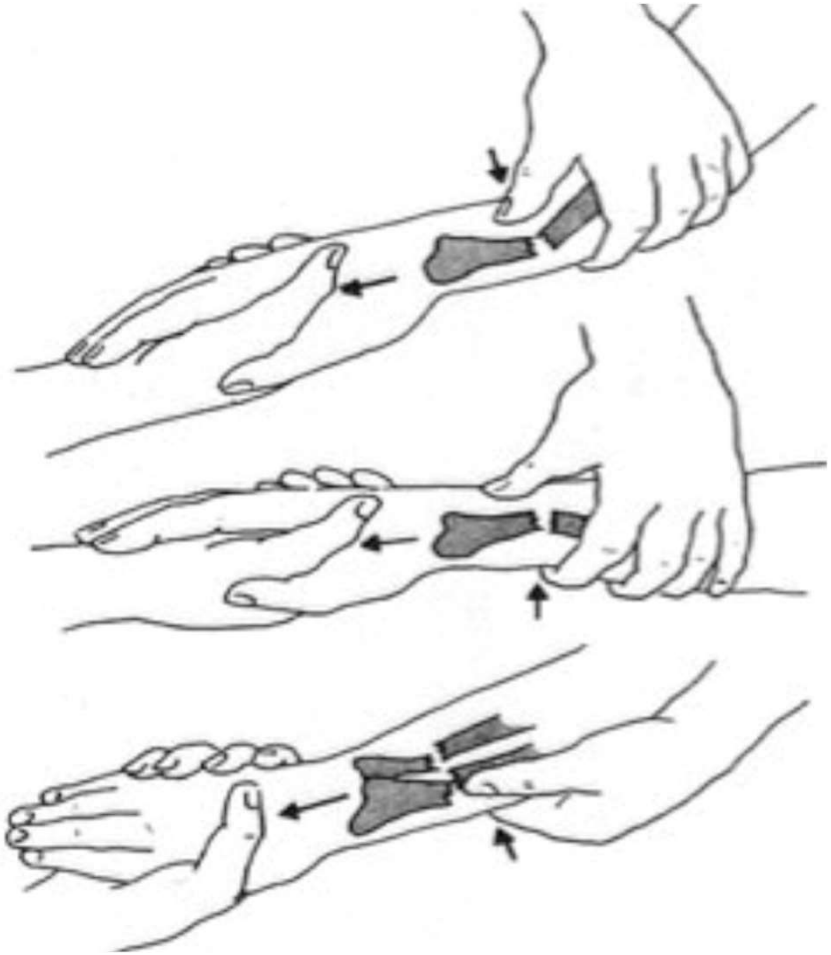
Reduction Technique

- Recreate deformity, pull traction, then flexion
- May perform per your comfort level, but only would recommend one try on the field



Caption

Splinting

- Recommended splint is a sugartong splint
- Elbow bent to 90 degrees, splint should extend from the palmar crease to the dorsal hand

Caption

Triage

- This should all be sent to the ED for xrays immediately.
- Often times formal reduction with sedation is needed
- Instruct athlete and family to remain NPO given sedation needs

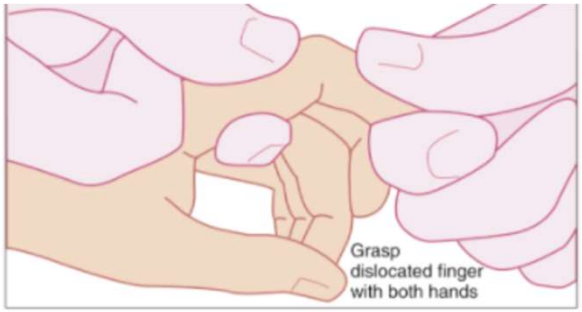
Finger fractures/dislocations

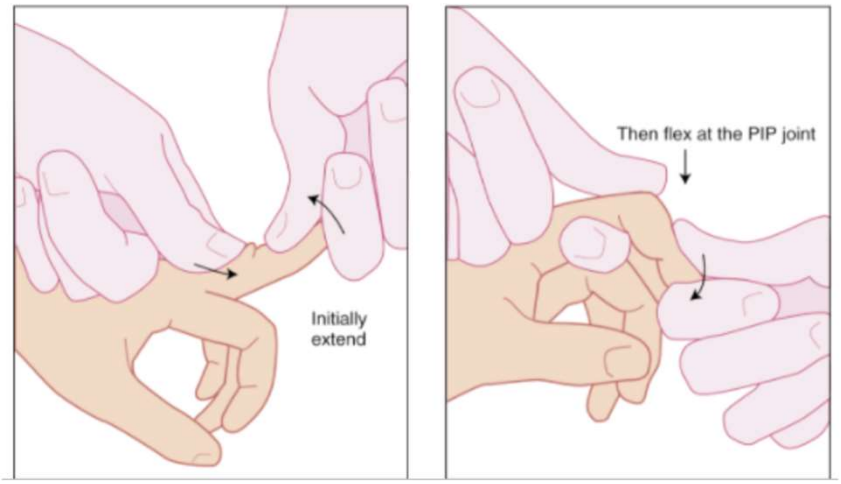
- These come in a wide variety of patterns, so treatment needs to be tailored to the digit/injury
- Splint/immobilization types should be tailored to the digit involved
- Assessment:
  - High association with open fracture, so evaluate for wounds. Open fractures should be evaluated in ED
  - Closed fractures/dislocation can often be managed on the field

Reduction Technique

- Dislocations tend to be dorsal
- Same principles as forearm fractures
  - Extend first (recreate deformity)
  - Traction
  - Flexion

- I recommend trying reduction and may return to play with immobilization if successful (sport dependent)





Splint types

Thumb Spica

Ulnar gutter

Buddy Tape

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Triage

- Return to play is variable and dependent on athletes comfort as well as sport and position
- Closed fractures without gross deformity and comfortable in immobilization may consider return to play
- When in doubt, keep athlete out and triage for non urgent evaluation with hand specialist in the next few days
- Remember to appropriately pad any splints prior to return to play for safety

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THAT'S A WRAP ON THE UPPER EXTREMITY… ONTO THE LOWER EXTREMITY

Hip Dislocations

- Very rare, often occurs in younger kids (< 10 years old) but can occur in teenagers as well
- Mechanism is typically an axial load on a flexed knee, but can occur in lower energy if there's underlying dysplasia
- Posterior dislocation most common
- Recognize
  - Hip held in flexion and internal rotation
  - Shortened limb

Caption

Triage Immediately

Caption

- **Do not attempt reduction on the field!**
  - Reduction must be attempted with anesthesia
  - Reduction without anesthesia has a high risk of femoral neck fracture and will not be successful
- Recognize and transfer via EMS to nearest hospital
- Time to reduction is crucial
  - **AVN risk associated with dislocation for longer than 6 hours**
  - Devastating complication in a young patient

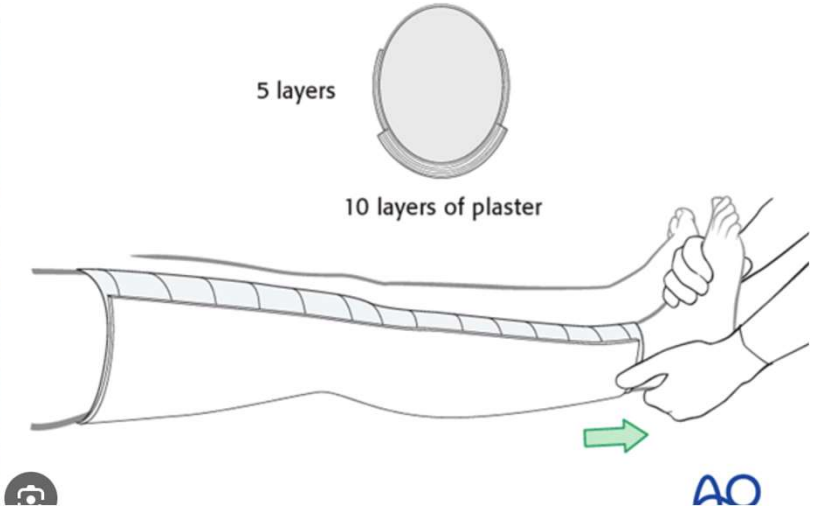
Femur and Tibia Fractures

Caption

- Long bone fractures of the lower extremity tend to be higher energy, blunt trauma
- Typically seen in contact sports only, such as football, rugby, lacrosse, hockey
- Assessment
  - Gross deformity of the thigh or shin
  - Assess for poke hole open fractures, particularly in tibia
  - Remember to check neurovascular status

Immobilization

- **Traction** is best for long bone fractures, but no formal reduction is performed
- Tibia or femur fractures should be pulled straight and immobilized in long leg splint
- Vacuum splints most effective if available



Caption

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Triage

- All femur and tibia fractures will require surgery within the next 24 hours
- Triage immediately via EMS to nearest **trauma center or pediatric hospital**
- Keep patient NPO
- Remember to assess for open fractures for tibia

Knee Dislocations

- Extremely rare but can be limb threatening!
- Mechanism often involves higher energy, such as direct impact with a helmet to the knee of planted foot. In rare occasions can be noncontact as well
- Knee often will reduce spontaneously or with minimal manipulation, and therefore you need to have a high suspicion based on injury mechanism!

Caption

Knee Dislocation

- Assessment
  - Need to be very thorough with vascular assessment
  - Feel for DP and PT pulses, compare symmetry to the other side
  - Feel for bruit behind the knee
  - **Peroneal nerve palsy is common (25% of knee dislocations) which can point toward an occult dislocation**
  - 60% are associated with fractures, often of the tibia plateau

Caption

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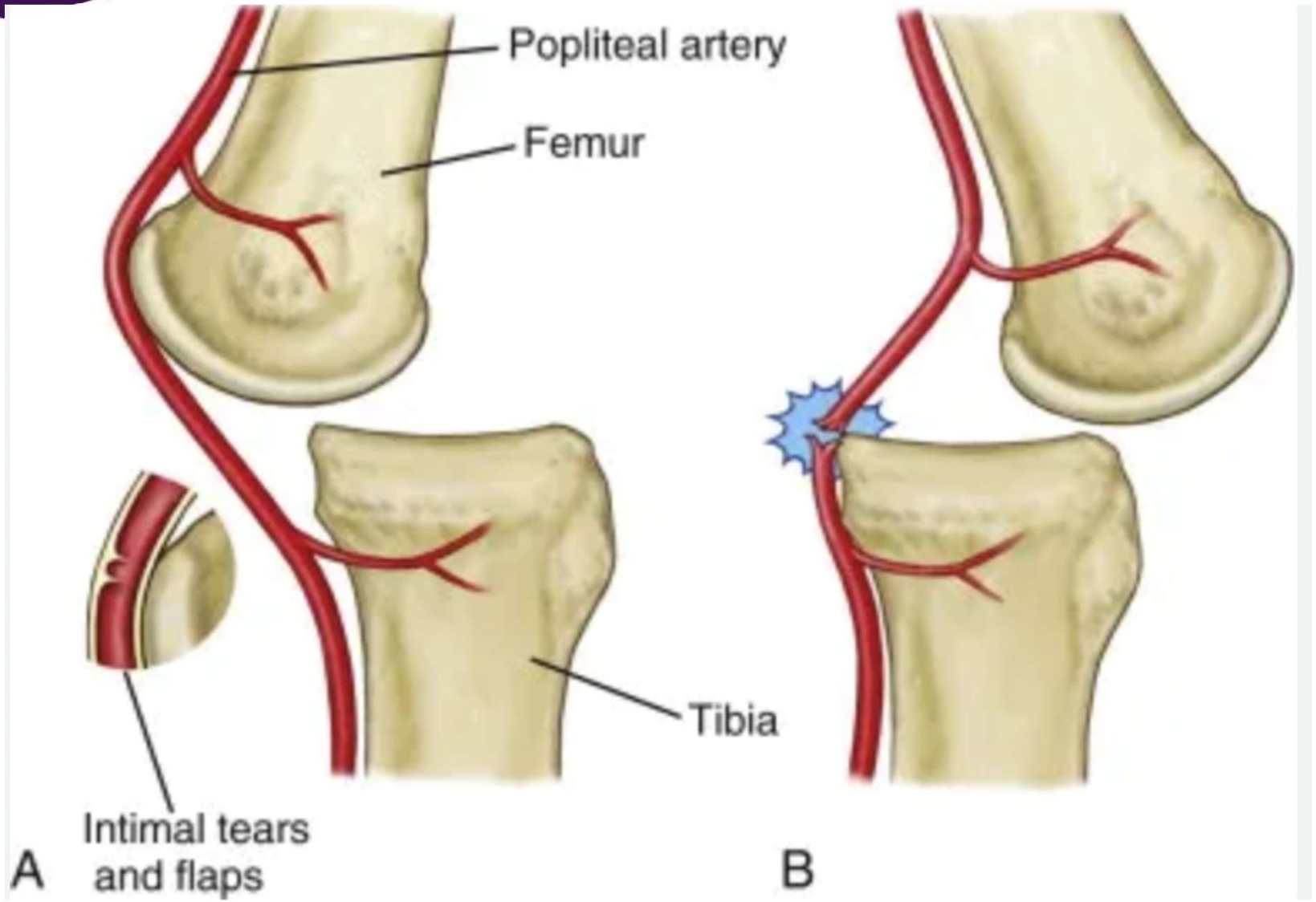
Vascular Assessment



Caption

Reduction

- In my opinion, reduction should be attempted **immediately** on the field
- **TRACTION**
- Pull tibia anteriorly for posterior dislocations
- Push tibia posteriorly for anterior dislocation
- Often the knee will spontaneously reduce in transit, rarely require formal reduction in the emergency room
- Immobilize in long leg splint or vacuum splint, similar to tibia/femur fractures

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Reduction Technique

Triage

- Transport via EMS immediately to closes **level 1 trauma center**
- Keep NPO

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Patella Dislocation

- Patella dislocations are nearly always lateral and occur with a noncontact twisting mechanism. Rarely due to direct blow
- Anatomic parameters and genetic factors predispose patients to dislocations (ligamentous laxity, patella alta, femoral ante version, external tibial torsion)
- Most common in teenagers and early 20s

Caption

Reduction Techniques

- Push patella medially while extending the knee

Triage

- Immobilize in a knee immobilizer and crutches
- As long as patella is reduced on the field, no need to send to the ER
- May follow up within the next week with orthopedic surgeon for further evaluation

- If unable to reduce on the field, transport to the ED. May transport in personal vehicle depending on patient's comfort

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Ankle Fractures

- Ankle fractures are very common and are most often a rotation, twisting injury. Often are noncontact, but can be associated with a direct blow to a planted foot
- Most often in males between ages of 15-24
- 2% are open fractures, most commonly poke holes over the medial malleolus

Caption

Ankle fracture assessment

- Assessment
  - Skin for open fractures
  - Neurovascular status
  - Gross deformity/displacement. If there is significant displacement, consider a reduction on the field
  - Distinguish from a sprain due to tenderness over the malleoli, inability to weight bear

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Reduction

- Reduction is indicated only if there is gross deformity and associated dislocation
- My preferred method
  - Flex the knee
  - Gentle traction, then rotate the foot and lift the heel
  - Use the big toe as a reference, should point upward in line with patella
  - Have assistant hold the leg while you splint
- Recommend one quick reduction maneuver then short leg splint

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Reduction

Splinting and Triage

ecommend short leg splint with side slaps

y deciphering between sprain, walking boot is

bearing

p in the next few days with orthopedic surgeon

ed to be sent to ER same day

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TIME TO WRAP UP…

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Summary and Final Thoughts

- Stay calm, take control, and assess the skin and neurovascular status
- Perform reductions for dislocations as you feel comfortable
- Know your supplies and splint options. Apply immobilization for fractures as appropriate
- Triage according to injury severity

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QUESTIONS?