



Orthopedic Pitfalls in Emergency Medicine

Many emergency department visits occur due to orthopedic injuries. The lecturer will emphasize the mechanism of injury and the recognition of pertinent physical findings in the diagnosis of subtle orthopedic injuries that may result in long-term problems. Common errors in the early management of various injuries will be identified, and appropriate treatment is outlined.

- Identify the clinical features and radiographic findings of fractures and dislocations.
- Explain the emergency department management of fractures and dislocations and their potential complications.
- Identify associated injuries that may occur with fractures and dislocations.

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FACULTY

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ORTHOPEDIC PITFALLS IN EMERGENCY MEDICINE

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A. OBJECTIVES

1. Describe the rules to avoid missed orthopedic injury.
2. Review the important historical, physical exam and radiographic findings in subtle and frequently missed orthopedic injuries
3. Elaborate on the emergency department treatment and follow up care of these injuries
4. Identify associated injuries that may occur

Head Introduction

A. GENERAL PRINCIPALS

Rules to Avoid Pitfalls

- ◆ Fx of a member of a set of paired bones implies a Fx of the other bone or dislocation on a common joint
 - Monteggia
 - Galeazzi
- ◆ Bony Rings and Arches Fx at more than one point
 - Ankle
 - Vertebrae
 - Pelvis
- ◆ Small Avulsion Fx at or near a joint may indicate instability
 - Gamekeeper's (Skier's) Thumb
 - Mallet Finger
 - Segond Fx
 - Tibial Eminence
 - Glenoid Rim (Bankart)
- ◆ Intra-articular Fx a potential for joint instability
 - Bennet's
 - Rolando's
 - Barton's
 - Malleolar Fx's
- ◆ Fx's localized to an articular surface may cause chronic joint injury
 - Osteochondral Fx (Loose Body)
- ◆ In multiple trauma the majority of missed injuries are Orthopedic
- ◆ Pediatric Fx's: Not just little adults
 - Salter Harris Class (Type II)

B. RADIOGRAPHS

- ◆ Proper views
 - AP, LAT, Obliques
 - ? Comparison views
- ◆ Special views
 - Shoulder: True AP, Axillary
 - Wrist: Scaphoid, Obliques
 - Metacarpals, Metatarsals, Tibial Plateau: Obliques
- ◆ Do not accept technically poor films
- ◆ Evidence of fractures/dislocations
 - Direct vs. indirect evidence
 - Direct-fracture lines
 - Cortical irregularities, angulation
 - Indirect
 - Loss of symmetry, fat pads, fat planes

C. COMPLICATIONS OF ORTHOPEDIC INJURIES

- ◆ Hemorrhagic shock (pelvic, femur fxs)
- ◆ Neurovascular compromise
- ◆ Fat Embolism (1%)
- ◆ Compartment syndrome
- ◆ Infection

D. ORTHOPEDIC CONSULTATION

- ◆ Immediate: True emergency
- ◆ Eventual: ER vs. Admit
- ◆ Referral: Days, weeks

E. MEDICAL LEGAL CONSIDERATIONS

- ◆ Charting:
 - PE
 - X-ray
 - RX
 - Orthopedic follow-up
 - Missed x-rays
- ◆ Discuss Rx, FU and rehab

UPPER EXTREMITY INJURIES**A. SHOULDER DISLOCATIONS**

- ◆ Types
 - Anterior: 90%
 - **Posterior: frequently missed**
 - Other
- ◆ Mechanism (MOI)
 - Posterior: trauma, seizures, electrical injury
- ◆ X-Rays
 - AP (Thorax): empty glenoid sign, rim sign, trough line
 - AP (True): overlap
 - Scapular (Y): post displaced HH
 - Axillary
 - CT, MRI: Complex Dislocations/Fractures

- ◆ RX: Reduction: expeditious and atraumatic
 - Traction/Countertraction
 - Scapular manipulation
 - Stimson (hanging weights)
 - Hennepin's (Liedelmeyer 1977)
 - Sno-Bird (Weston 1995)
 - Others
- ◆ RX: Causes of failure
 - Inadequate anesthesia
 - Poor body positioning (mechanics)
- ◆ Complications
 - Unsuccessful reduction
 - Assoc Fxs: Glenoid Rim, GT, LT
 - Head-splitting
 - Rotator cuff tears
 - NV injury
 - Recurrence

B. ROTATOR CUFF TEARS

- ◆ Often missed
- ◆ MOI
 - Frequently accompany shoulder dislocations and shoulder 'contusions'
- ◆ PE
 - Pain, weakness, limited ROM
- ◆ X-Rays
 - Fracture/Dislocation
 - Normal
- ◆ RX
 - Sling
 - Ice
 - NSAID's
 - Follow-up
- ◆ Complications
 - Missed injury, partial vs. full thickness tear

C. SUPRACONDYLAR FRACTURES

- ◆ Children 6-10 years
- ◆ Types:
 - 1 - Undisplaced

- 2 - Displaced (intact post cortex)
- 3 - Displaced (oblique fx line)
- 4 - Open

◆ MOI

- Fall, hyperextension

◆ PE

- Tender
- Swollen
- Limited ROM

◆ X-Rays

- AP: transverse fx line
- Lat: ant humeral capitellar line
- Ant, post fat pad

◆ RX

- Type 1: Non-displaced: long arm splint in flexion, dc vs. admit?
- Type 2: Minimally displaced: reduction, splint, admit
- Type 3: Displaced: reduction, splint, admit
- Type 4: Open: OR

◆ Complications

- **Neurovascular injury (5-10%)**
 - Median nerve and brachial artery (PL)
 - Radial nerve (PM)
 - Ulnar nerve
 - Volkmann's ischemic contracture

D. RADIAL HEAD FRACTURES

◆ Types:

- 1 - **Undisplaced**
- 2 - Marginal fx
- 3 - Comminuted
- 4 - Fx/Disl

◆ MOI

- Fall on outstretched hand

◆ PE

- Tender RH
- Pain on supination/pronation

◆ X-rays

- Fat pad sign
- Fracture line(s)

◆ RX

- Sling

- Early immobilization
- ORIF

E. MONTEGGIA FRACTURE

- ◆ 1814: Fracture ulnar with radial head dislocation
- ◆ Types 1-4 named for direction of radial head dissociation
- ◆ The radius dislocates to accommodate the shortened ulnar
- ◆ MOI
 - Direct blow vs. forced pronation
- ◆ PE
 - Pain, swelling
- ◆ X-rays
 - AP: proximal ulnar fracture
 - LAT: radiocapitellar line
 - **Radial head dislocation missed 30% time**
- ◆ RX
 - Reduction of the radial head most important
 - Long arm splint in flexion
- ◆ Complications
 - Post interosseous nerve injury

F. GALEAZZI FRACTURE

- ◆ 1934: Fracture of the distal radius with DRUJ dislocation
- ◆ Distal equivalent of the Monteggia fx
- ◆ **DRUJ dislocation almost always missed**
- ◆ MOI
 - Fall with forced pronation
- ◆ PE
 - Pain, swelling DRUJ joint
- ◆ X-rays
 - AP: Fracture of the distal radius, DRUJ disruption, proximal migration of radius
 - LAT: Lack of DRUJ overlap
- ◆ RX
 - Closed reduction: long arm splint in flexion and supination
 - ORIF

G. WRIST INJURIES

- ◆ Carpal fractures
 - Scaphoid (navicular): most common
 - Triquetral: 2nd most common
- ◆ Carpal dislocations
 - Lunate and Peri-lunate
- ◆ Carpal instability
 - Scapho-lunate dissociation

1. SCAPHOID FRACTURES

- ◆ Location
 - Waist: 60%
 - Distal: 10%
 - Proximal: 30%
- ◆ MOI
 - Fall on an outstretched wrist
- ◆ PE
 - Tender snuffbox
- ◆ X-Rays
 - PA
 - Lat
 - Scaphoid views
- ◆ RX
 - X-ray
 - Thumb spica sugar-tong splint
 - **Clinical Fxs**
 - 15% + on F/U
 - Re-Xray vs. Bone scan, CT, MRI
 - Definitive Rx
 - 6-12 weeks, surgery if displaced or athlete
 - ORIF
 - Displaced
 - Oblique
 - Proximal
- ◆ Complications
 - Non-union, avascular necrosis

2. LUNATE AND PERI-LUNATE DISLOCATIONS

- ◆ MOI
 - Fall
- ◆ PE

- Volar tenderness and swelling
- ◆ X-Ray
 - Lat: radial carpal metacarpal line
 - PA: articular clear space disrupted
- ◆ RX
 - Reduction and splint
- ◆ Complications
 - Avascular necrosis
 - Degenerative arthritis

3. SCAPHO-LUNATE DISSOCIATION

- ◆ Ligamentous injury to SL articulation
- ◆ **Often missed and misdiagnosed**
- ◆ MOI
 - Fall
- ◆ PE
 - Tender and swollen (acute)
 - Pain and clicking (chronic)
- ◆ X-Ray
 - PA: widening scapho-lunate junction (> 2mm): 'Terry Thomas' sign
 - 'Signet ring' sign
- ◆ RX
 - Thumb spica
 - > 4mm widening: ORIF
- ◆ Complications
 - Instability
 - Chronic pain and clicking
 - Avascular necrosis

H. SKIER'S THUMB

- ◆ Campbell - 1955
- ◆ Ulnar Collateral Ligament (UCL) Injury
 - First MCP joint
 - Grade I-III
 - Stener lesion (50% GIII)
- ◆ MOI
 - Fall on abducted thumb (valgus stress)
- ◆ PE
 - Tender, swollen MCP joint

- ◆ X-Ray
 - Negative vs. avulsion fracture
- ◆ RX
 - Thumb spica vs. glove cast
 - ORIF
 - complete tears (Stener lesion)
 - large intra-articular fractures
- ◆ Complications
 - Instability

LOWER EXTREMITY INJURIES

A. HIP DISLOCATION

- ◆ Types
 - **Posterior - 90%**
 - Anterior
 - Central
- ◆ MOI
 - Dashboard dislocation
- ◆ PE
 - Post: adducted, internal rotation
 - Ant: abducted, external rotation
- ◆ X-Ray
 - AP, LAT
 - CT: associated fractures
- ◆ RX
 - Reduction: ASAP
 - Closed
 - Stimson
 - Allis
 - Whistler (JEM, 99)
- ◆ Complications
 - **Avascular necrosis**
 - Missed fractures
 - Neurovascular injury
 - Irreducible
 - Aseptic necrosis

B. SLIPPED CAPITAL FEMORAL EPIPHYSIS

- ◆ Adolescent males, bilateral 33%
- ◆ MOI
 - Atraumatic (minimally traumatic)

- ◆ PE
 - Painful limp
- ◆ X-ray
 - AP, Frog leg, bilateral
 - Femoral head-neck relationship
- ◆ RX
 - Non-weight bearing
 - ORIF
- ◆ Complications
 - Avascular necrosis

C. KNEE INJURIES

- ◆ 1.5 Million knee injuries ED year
- ◆ Fracture rate: 6-8%
- ◆ **The absence of a fracture does not rule out serious injury**
- ◆ MOI
 - Contact vs. non-contact
- ◆ PE
 - ROM, tenderness, specific tests
 - **Effusion (traumatic hemarthrosis) is a predictor of serious injury**
- ◆ Traumatic Hemarthrosis: Differential
 - Fractures
 - Fem Condylar
 - Tibial plateau
 - Patella
 - Tibial spine
 - Lat tibial (Segond)
 - OC fractures
 - Dislocations
 - Patella, knee
 - Non-osseous injures
 - Ligamentous
 - Meniscal
 - Bone bruise
- ◆ X-Rays
 - ? Clinical criteria for ordering
 - AP, LAT, Obliques, Sunrise
- ◆ RX
 - Diagnosis dependent

- Knee immobilization vs. long leg splint
- ? Aspiration
- Close follow-up

- ◆ Complications
 - Missed injuries
 - ACL
 - PCL
 - MCL
 - Meniscus
 - OC fractures

D. KNEE DISLOCATION

- ◆ Types
 - **Anterior, posterior: most common**, medial, lateral, rotatory, occult
- ◆ MOI
 - High vs. low velocity
- ◆ PE
 - Spectrum of instability
- ◆ X-ray
 - AP, LAT
- ◆ RX
 - Reduction (before x-ray), splint, admit
 - ORIF
 - Early vs. late
 - Absent pulse - OR
 - Intact pulse - Angiography, US
- ◆ Complications
 - Neurovascular injury
 - Poor ROM, arthrofibrosis

E. ANKLE INJURY

- ◆ 5 Million ankle injuries a year
- ◆ 15% fractures
- ◆ **Occult injuries**
 - Occult fractures (1-2%)
 - Tib-fib diastasis
 - Maisonneuve injury
- ◆ MOI

- Inversion (85-90%)
- Eversion (more serious)
- ◆ PE
 - ? STS, tenderness, anterior drawer
- ◆ X-rays
 - Clinical criteria (Ottawa)
 - AP, LAT (tear drop sign: effusion)
 - Mortise (articular space)
 - CT, MRI
- ◆ RX
 - Sprains
 - Protected and Early Mobilization
 - Fracture
 - Short leg splint
 - ORIF
 - Open fractures
 - Fracture/Dislocation
 - Bi/Trimalleolar
 - Maisonneuve
 - Mortise disruption
- ◆ Complications
 - Occult fractures
 - Instability
 - Synostosis
 - Peroneal tendon subluxation

F. FOOT INJURIES

- ◆ Often accompany ankle injuries
- ◆ Types
 - 5th Metatarsal base fracture
 - Jones's fracture vs. tuberosity avulsion
 - **Lisfranc's fracture/dislocation (missed 20-40%)**
- ◆ MOI
 - Inversion
 - Direct blow vs. forceful plantar flexion
- ◆ PE
 - Tenderness at the 5th metatarsal base
 - Tender, swollen dorsal mid foot
- ◆ X-Rays
 - AP, LAT: avulsion tuberosity vs. transverse fracture base
- ◆ RX
 - Jones's fracture: short leg splint, non-weight bearing (?ORIF)

- Tuberosity fracture: protected mobilization
- LisFranc: short leg splint (ORIF)
- ◆ Complications
 - Non-union
 - Chronic pain

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