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Objectives

- Understand the pathoanatomy of common and uncommon joint dislocations
- Understand the concepts of reduction techniques
- Awareness of the potential sequella of joint dislocations over time
Making the complex simple...

Complexity of Dislocations

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I’ve got a lot of years to live after baseball and I would like to live them with the complete use of my body.  

Sandy Koufax

Functional Stability

Essential joint mobility hinges on the balance of stability vs. force

- Stability
  - Dynamic
    - Muscular control of agonists & antagonists
  - Static
    - Ligamentous restraints with fixed points of range

- Force
  - Fins
  - Velocit
  - Acceleration
  - Deceleration
  - Acts of friction
  - Load on failure
Mechanical Failure

- Force exceeds capability of the joint to dissipate energy or to compensate by displacing load to another site
  - Something has to give, resulting in:
    - Subluxation
    - Dislocation
    - Fracture dislocation

Joint Dislocation

Injury severity range

- Sublime
  - Subtle injury may appear "minor" with athlete desiring an immediate return to play
- Gruesome
  - Major occurrence can be limb threatening with associated far-term consequences

Any Joint is Susceptible

- Number of joints in the body
  - Variable 250-350
    - 66 skull
    - 66 thorax
    - 76 spine & pelvis
    - 32 each upper limb
    - 31 each lower limb

- Types
  - Fibrous
    - Synarthrodial
  - Cartilaginous
    - Synchondroses or symphyses
  - Synovial
    - Diarthrosis
**Synovial Joint**
- **Hinge**
  - Flexion/extension
- **Pivot**
  - Rotation of one around the other
- **Ball & Socket**
  - Flexion/extension/adduction/abduction/internal & external rotation
- **Saddle**
  - Flexion/extension/adduction/abduction/abduction
- **Condyloid**
  - Flexion/extension/adduction/abduction/adduction
- **Gliding**
  - Gliding movements
- **Ellipsoid**
  - Similar to ball & socket, less motion

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**Epidemiology of Dislocations**
- **Gleno-humeral joint**
  - 45% of all dislocation visits to the ER
  - Anterior dislocation 96-98%
  - High recurrence rate associated with age, hyperlaxity and associated greater instability
    - *Gleno-humeral joint*:
      - Anterior dislocation 96-98%
      - High recurrence rate associated with age, hyperlaxity and associated greater instability

**Patello-femoral joint**
- 3% of knee injuries are acute traumatic patellar dislocations
- High re-dislocation rate: 15%
Epidemiology of Dislocations

- Elbow
  - 90% posterolateral dislocations

Epidemiology of Dislocations

- Wrist
  - Lunate and perilunate dislocations most common

Epidemiology of Dislocations

- Finger
  - Interphalangeal (IP), metacarpophalangeal (MCP)
    - Male incidence: 17.8/100,000 person years
    - Female incidence: 4.65/100,000 person years
    - Average age group: 15-19 years old

* - (name, year, title, etc.): Title. Description. Source.
Epidemiology of Dislocations

• Hip
  - Posterior 90%; anterior 10%
  - High impact: MVA's (sports, fall from height)
  - 93% associated injury to another body part

• Foot and ankle
  - Most common injury: ankle sprain involving anterior talofibular ligament (ATFL)
  - Tibio-talar joint
  - Lisfranc's Joint

Common Dislocations in Sports

• Shoulder
• Elbow
• Finger
• Hip
• Knee
• Patella
• Ankle
Shoulder Dislocations

- Most commonly dislocated joint
  - [Reference](https://journals.sagepub.com/doi/abs/10.1177/1941738117713780)

- Accounts for 54.9% of sports-related dislocations in High School athletes
  - [Reference](https://www.sciencedirect.com/science/article/pii/S0041139517300572)

- Majority are anterior inferior direction
  - [Reference](https://www.ncbi.nlm.nih.gov/pubmed/26265161)

- Anatomy
  - Large sphere on shallow socket
  - Capsuloligamentous restraints
  - Muscular forces of RC (CSS/IS/TMS/SIS)

- MOI
  - Forceful ABD & ER

- Load to failure
  - HII drives forward
  - Capsuloligamentous restraint
  - HII translation
  - Subluxation
  - Dislocation
Shoulder Dislocations

- Evaluation
  - Adducted “cradle” or “groop” position of arm
  - Feel humeral head anterior/inferior medial position
  - Feel clump or soft spot inferior to acromial arch
  - Check axillary nerve function

Shoulder Dislocations

- Injury
  - Labrum
  - Humeral Head
  - Glenoid
  - Articular cartilage
  - Ligamentous restraints
  - Neurovascular structures

Shoulder Dislocations

- Reduction technique
  - Traction/counter-traction
    - Longitudinal traction with progressive abduction while manipulating humeral head
  - Isocapton traction
  - Prone positioning with gentle traction
    - Modified Neer traction,Reset traction, C-arm fluoroscopy traction
  - Delayed reduction difficult because of muscular spasm
Shoulder Dislocations

- Long term sequelae
- Recurrent instability
- Osteoarthritic joint progression

Elbow Dislocations

- Second most commonly dislocated joint
  - Postero-lateral dislocation in 90%

Elbow Dislocations

- Anatomy
  - Unique trochoginglymus joint
    - Lunate point
    - Humeral articulation
    - Radial point
    - Humeroulnar articulation
    - Capsuloligamentous restraints
    - Muscular insertion points
  - MOI
    - Extension overload
Elbow Dislocations

- Load to failure
  - Extension
  - Hyperextension
  - Rotary instability
  - Joint disruption
- Progressive translation
  - Stable
  - Perched
  - Dislocation

Elbow Dislocations

- Evaluation
  - Exquisite pain
  - Obvious deformity
  - Skin dimpling
  - Neurovascular exam

Elbow Dislocations

- Injury
  - “Ring” of soft tissue restraints surrounding joint are disrupted
    - Lateral collateral ligament
    - Anterior capsule
    - Medial collateral ligament
  - Associated coronoid fx
  - Neurovascular structures
Elbow Dislocation

- Reduction technique
  - Can be difficult
    - Anatomy of joint
    - Muscular contraction
  - Degree of elbow flexion with traction to “jump” humerus over coronoid/olecranon into fossa
  - Two-person

Elbow Dislocations

- Long term sequela
  - Recurrent instability
  - “Contracture”
  - Osteoarthritic joint progression

Finger Dislocations

- Common, often “under-reported”
- 9% of all sports injuries
- Hand & wrist injuries commonly associated with finger injuries
- [Reference 1]
  - [Reference 2]
Finger Dislocations

- Anatomy
  - DIP
  - PIP
  - MCP

- MOI
  - Outstretched position, open-hand & grabbing techniques
  - Extension
  - Hyperextension
  - Axial load

Finger Dislocations

- DIP
  - Collesal ligaments
  - Dorsal to volar "U" to "V"
  - Central pivot
  - Volar plate

- PIP
  - Collateral ligaments
  - Dorsal or volar "H" to "U"
  - Central pivot
  - Volar plate

- MCP
  - Intrinsics-ligaments
  - Dorsal or volar "H" to "U"
  - Volar plate

Finger Dislocations

- Evaluation
  - Pain, deformity
  - Neurovascular exam
  - Often will reduce by athlete "grabbing" their own finger and pulling
**Finger Dislocations**

- Reduction technique
  - Distraction
  - Recreate deformity
  - Axial traction
  - Counter pressure
  - Reduce into alignment

**Finger Dislocations**

- DIP sequela
  - Swelling
  - Stiffness
  - Compromised ROM

**Finger Dislocations**

- PIP sequela
  - Swelling
  - Stiffness
  - Compromised ROM
  - Central slip injury
    - Boutonnière Deformity
  - Retinaculum & collateral ligament overpull
    - Swan Neck Deformity
Hip Dislocations

- Rare injury pattern in sports
- Extremely important to recognize
- Require emergent identification and transport to a facility for proper treatment


Hip Dislocations

- Anatomy
  - Centraled ball & socket
  - Deepened by labrum
  - Significant muscle layers

- MOI
  - High energy impact with hip & knee flexed
  - Posterior displacement from anterior to posterior directed force

Hip Dislocations

- Load to failure
  - Hip in flexed position
  - Anterior = posterior force
  - Capsulolabral failure
  - Posterior acetabular fx
  - Dislocation posteriorly often “locked” over posterior rim of acetabulum
Hip Dislocations

- Evaluation
  - Hip held in flexed and internally rotated position
  - Affected leg appears shorter than contralateral side
  - Painful limited ROM especially any attempt to externally rotate leg

- Injury
  - Capsulolabral tear
  - Posterior acetabular rim fx
  - Femoral head shear fx (Pijlin)
  - Sciatic nerve injury
  - Vascular supply to femoral head

- Reduction technique
  - Supine position, knee flexed to 90
  - Axial traction on leg
  - Downward counter pressure on posterior ASIS
  - Gradual traction to reduce femoral head over acetabular rim into acetabulum
  - Appropriate facility and sedation
Hip Dislocations

- Long term sequela
  - Avascular necrosis (AVN) of femoral head
    - AVN varies variable reports, ranging from 10-30%
  - Osteoarthritic progression

Knee Dislocations

- Uncommon in sports
- Extremely significant injury
- High association with popliteal artery injury (20%-40%) and peroneal nerve injury

Knee Dislocations

- Anatomy
  - Femoral & tibial articulation
  - Ligaments (ACL, PCL, MCL, LCL)
  - Popliteal artery trifurcation posterior
  - Peroneal nerve lateral

- MOI
  - Fixed foot position with anterior-to-posterior directed force
  - Land on extended knee with off-balance rotational axial load
Knee Dislocations

• Load to failure
  • Posterior force on tibia/axial load rotation of tibia under femur
  • Ligament failure
  • Subluxation
  • Dislocation

Knee Dislocations

• Evaluation
  • Mal-aligned/angular deformity of knee
  • Extreme pain
  • Neurovascular compromise

Knee Dislocations

• Injury
  • Multiple ligament failure
  • Meniscus/cartilage injury
  • Posterolateral corner injury
  • Fracture
  • Popliteal artery
  • Peroneal nerve
Knee Dislocations

- Reduction technique

  - Traction with anterior/posterior/medial/lateral translation depending on direction of dislocation
  - Reduce to extension
  - Neurovascular exam prev and post-reduction

Knee Dislocations

- Warrants urgent evaluation to document vascular status

  - CT angiography
  - Vascular consult/serial vascular examination
  - MRI

- Determine soft tissue/ligament injury

Knee Dislocations

- Short term sequela

  - Vascular status of extremity: potentially limb threatening
  - Nerve injury: sensory paresthesias, motor weakness (footdrop)

- Long term sequela

  - Vascular compromise: amputation
  - Nerve injury: motor/sensory changes
  - Knee instability
Knee Dislocations

- Injury can auto-reduce

  • High index of suspicion if there is multi-planar instability or exam, or if neurovascular compromise is noted on the "reduced" knee

Patella Dislocations

- Patella is the largest sesamoid bone

  • Unique anatomy/attachments
    - Quadriceps
    - Patellar tendon
    - Medial & lateral retinacula
    - Medial patellofemoral ligament (MPFL)

Patella Dislocations

- Anatomy
  - Note: MPFL

- MOI
  - Acceleration/deceleration with foot planted and change of direction
  - Direct contact to medial or lateral side of knee
Patella Dislocations

• Load to failure
  • Foot plant
  • Quadriceps contraction loads knee (vector force)
  • Twist/rotation/contact
  • Lateral dislocation (most common)

Patella Dislocations

• Evaluation
  • Knee held in flexion
  • Extreme pain
  • Patella located lateral to anterior knee
  • Heard or felt a “pop”
  • Hemarthrosis
  • Common spontaneous auto-reduction

Patella Dislocations

• Injury
  • MPFL tear
  • Medial retinacular disruption
  • Patellar shear fx
  • Patellar articular facet damage (chondral injury; loose body)
Patella Dislocations

- Reduction technique
- Medially directed force with knee in extension

Patella Dislocations

- Long term sequelae
  - Recurrent instability
    - Subluxation/dislocation
  - Patellofemoral joint osteoarthritic progression

Ankle Dislocations

- Sprains: common; 45% of athletic injuries
- Dislocations: uncommon
Ankle Dislocations

- **Anatomy**
  - Tibia-Fibula-Talus articulation
  - Meniscus
  - Ligament stability
    - ATFL, CFL, deltoid

- **MOI**
  - Foot plantar, rotation, contact

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Ankle Dislocations

- **Load to failure**
  - Axial load
  - Force translation
  - Rotation
  - Ligament disruption
    - +/– fx
    - Dislocation

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Ankle Dislocations

- **Evaluation**

  - Obvious deformity with malalignment and possible rotation or displacement of foot relative to tibia
Ankle Dislocations

- Injury
  - Direction of dislocation determines structures that can be damaged
    - Ligaments
  - High association with fibula and/or medial malleolus fx

Ankle Dislocations

- Reduction technique
  - Firm grasp of heel in conjunction with stabilizing lower tibia
  - Retrace direction of injury with traction, attempting to reduce ankle under tibia
  - May be unstable if associated fx
  - May not be reducible on the field

Ankle Dislocations

- Long term sequelae
  - Instability
  - Progressive osteoarthritic change
Complex Dislocations

My 2 cents...

• Dislocations are usually obvious

• Sometimes they aren’t
  • Subtleties
    • Something just doesn’t seem right
  • Nuances
    • Mechanism of injury

Complex Dislocations

Awareness & Diligence

• Lunate/Perilunate wrist injury

• Luxatio Erecta of the shoulder

Lunate/Perilunate Injury

• MOI: Progressive rotatory instability with extension and axial load
• Limited ROM
• Vague pain in wrist
• ? Deformity
• Neurovascular compromise
  • Median nerve (carpal tunnel)
Lunate/Perilunate injury

- Mayfield classification
- X-ray evaluation

Lunate/Perilunate Injury

- Reduction (urgent)
  - ER
  - Local sedation
  - Distraction and/or rotation
  - Palmar pressure on lunate to rotate back into carpus

- Plan of care
  - Associated injuries
  - Scaphoid fracture ORIF
  - Supplemental pins to stabilize associated ligamentous instability

Luxatio Erecta

- MOI: Forced hyper-abduction in traumatic fall
- Significant pain
- Limited ROM
  - “Touch Down” sign
- Unable to reduce in the field (do not attempt)
- Nerve/vascular compromise
  - Axillary nerve palsy
Luxatio Erecta

- X-ray evaluation
- Conscious sedation in ER for reduction

Luxatio Erecta

- Long-term sequelae
  - Axillary nerve palsy
    - Decreased sensation lateral upper arm
    - Motor weakness

Complexity of Dislocations

There is nothing "routine" about joint dislocation & reduction

- Risk
  - Attempt at reducing dislocation may cause undue pain or complicate the injury
  - Understand the anatomy
  - Limited sideline imaging options and anesthesia

- Reward
  - Reduce pain
  - Minimize potential neurovascular compromise
  - Improve post-injury care
Comfort Zone
• Understand what “Scope of Practice” means
• No specific “rules” regarding acute treatment and/or reduction of joint dislocation
• ATCs and MDs should be aware of local guidelines and regulations (variations may exist from state to state)

Simplicity of Dislocations
• Comfort level is gained by
  • Understanding the anatomy
  • Knowledge of reduction techniques
  • Experience
• When in doubt
  • Stabilize
  • Splint
  • Send

Thank You