On-field Joint Dislocations & Management

Gary B. Fetzer, M.D.
TRIA Orthopaedic Center
Minneapolis, Minnesota
Disclosures

• No disclosures
Goals & Objectives

• Discuss current concepts in the acute management of joint dislocations
• Review the anatomy and pathophysiology of some common and uncommon joint dislocations
• Recognize common challenges and sideline management of common joint dislocations
Athletes et al.
Scope of Practice

• No ‘specific’ rules regarding acute treatment/reduction of joint dislocations

• May vary from state to state

• Certified ATs and team physicians should be aware of their local guidelines and regulations
ATHLETIC TRAINER SERVICES
EVALUATION AND TREATMENT PROTOCOL

SCOPE OF PRACTICE

"An athletic trainer shall:
(1) prevent, recognize, and evaluate athletic injuries; (2) give emergency care and first aid; (3) manage and treat athletic injuries; and (4) rehabilitate and physically recondition athletic injuries. The athletic trainer may use modalities such as cold, heat, light, sound, electricity, exercise, and mechanical devices for treatment and rehabilitation of athletic injuries to athletes in the primary employment site.” [MN Statute 148.7806 (a)]

"An athletic trainer may:
(1) Organize and administer an athletic training program including, but not limited to, educating and counseling athletes;
(2) Monitor the signs, symptoms, general behavior, and general physical response of an athlete to treatment and rehabilitation including, but not limited to, whether the signs, symptoms, reactions, behavior or general response show abnormal characteristics; and
(3) Make suggestions to the primary physician or other treating provider for a modification in the treatment and rehabilitation of an injured athlete based on the indicators in clause (2) [MN Statute 148.7806 (d)]"
Equipment Management

• MUST BE FAMILIAR WITH EQUIPMENT!!!

• FOR PROPER EVALUATION
  – Helmet/Facemask
  – Shoulder pads
  – Gloves
  – Lower extremity pads
  – Shoe wear
Musculoskeletal Fundamentals

Mechanism of Injury
Musculoskeletal Fundamentals

• Primary survey
• Secondary survey…
  – **Obvious deformities**
  – Palpation of extremities
  – Swelling
  – **Gross joint instability**
  – Open wounds/bleeding
  – Neurologic abnormalities
  – Vascular abnormalities
Acute Joint Dislocation

The Fundamentals

- Mechanism of injury
- Know your anatomy!!!!!!
- Be familiar with reduction techniques
- Know some common complications of specific dislocations/reductions
- Splinting and immobilization techniques
- Failed-reduction or post-reduction plan
Acute Joint Dislocation

*The Fundamentals*

- Most dislocations can be *acutely* reduced and stabilized

- Can athlete be moved off the field safely?
Acute Joint Dislocation

*The Fundamentals*

- **General rule for reductions:**
  Apply axial traction and reproduce the mechanism of injury then gently guide the joint back to congruity

- **Splint/sling to stabilize reductions and fractures**

- **If you reduce it.........XRAY it!!!!**
What constitutes a good reduction maneuver?

- It’s reduced
- ‘Gentle’
- Technically sound
- Minimal attempts
- Tolerated by athlete
Acute Joint Dislocation

*The Fundamentals*

Do what you are comfortable with!!!!!!!
Upper Extremity
Incidence of Shoulder Injuries

TABLE 1
Most Commonly Reported Shoulder Injuries

<table>
<thead>
<tr>
<th>Shoulder Injury</th>
<th>n</th>
<th>Shoulder Injuries, %</th>
<th>Injuries Requiring Surgery, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC separation</td>
<td>93</td>
<td>41.2</td>
<td>11.8</td>
</tr>
<tr>
<td>Anterior instability</td>
<td>46</td>
<td>20.9</td>
<td>76</td>
</tr>
<tr>
<td>RTC tendinitis</td>
<td>23</td>
<td>10.2</td>
<td>13</td>
</tr>
<tr>
<td>Clavicle fracture</td>
<td>10</td>
<td>4.4</td>
<td>0</td>
</tr>
<tr>
<td>Posterior instability</td>
<td>9</td>
<td>4</td>
<td>77.8</td>
</tr>
<tr>
<td>SLAP</td>
<td>5</td>
<td>2.2</td>
<td>40</td>
</tr>
<tr>
<td>RTC tear</td>
<td>4</td>
<td>1.8</td>
<td>100</td>
</tr>
<tr>
<td>SC separation</td>
<td>4</td>
<td>1.8</td>
<td>0</td>
</tr>
<tr>
<td>MDI</td>
<td>4</td>
<td>1.8</td>
<td>50</td>
</tr>
</tbody>
</table>

Kaplan LD et al. AJSM 33(8), 2005.
The Shoulder Girdle

- Coordinated relationship between 4 articulations
  - Sternoclavicular
  - Acromioclavicular
  - Glenohumeral
  - Scapulothoracic
Sternoclavicular Joint

• Only true articulation between axial skeleton and arm
• “Saddle’ bony articulation – unstable…
• Stability from capsule and ligamentous structures

Sternoclavicular Joint

• **Stabilization**
  – Interclavicular ligament
    • Restraint to superior migration
  – Capsular ligaments
    • Restraint to anterior/posterior motion
    • Posterior > anterior
  – Costoclavicular ligaments
    • Oblique orientation
    • 1st rib to inferior surface of clavicle
  – Intra-articular disc
    • Restraint medial displacement

SC Joint Sprains/Dislocation

- **Dislocations**
  - 1% of all shoulder injuries
  - Anterior >> Posterior
- **MOI:**
  - Anterior
    - Posterior force to anterolateral shoulder
  - Posterior
    - Direct blow to anteromedial clavicle
    - Anterior force to posterolateral shoulder

SC Joint Dislocations

- **Anterior**
  - Medical clavicle prominence
  - Pain with GH or SC motion

- **Posterior**
  - More painful
  - Manubrium prominence
    - Swelling may mask
  - Dyspnea, dysphagia, venous congestion, asymmetric pulses

Sternoclavicular Joint

Top view: anterior dislocation

posterior dislocation
SCJ Dislocation - So now what?

Important Considerations:
• Not done on the sideline or ATR
• Imaging
• Anterior dislocations
  – Reduction can be attempted
  – Technique:
    • Supine with roll of towels between shoulders
    • Posterior directed pressure to reduce
  – May not stay reduced………..
  – Figure of 8 or sling
SCJ Dislocation-Reduction

• OR!!!!!!

• Posterior
  – Abduction and extension of shoulder/arm with traction
  – ?towel clip
  – Thoracic surgery immediately available

Glenohumeral Joint

- Formed by humeral head and glenoid surface
- Large ROM at expense of stability
- Stability relies on **static** and **dynamic** restraints
Glenohumeral Joint

Anterior dislocation

Posterior dislocation
Anterior Dislocation

• Mech: abducted, ER arm

• PE:
  – fixed, slightly abducted and externally rotated
  – Acromion hollow posteriorly
  – Humeral head may be palpable in axilla or anteriorly
Posterior Dislocation

• Mech:
  – Fall on outstretched hand
  – Post-directed contact to anterior shoulder

• PE:
  – Posterior fullness may be appreciated
  – Arm usually adducted with internal rotation
  – Fixed

Posterior dislocation
Anterior Dislocation - *So now what?*

**Important Considerations:**

- Primary versus recurrent dislocation?
- Athlete status?
  - Neurovascular?
- Environment/location?
- Medical equipment and assistance?
Important Considerations:

- Use technique most familiar with
- Avoid multiple attempts
- Intra-articular lidocaine
- Post-reduction:
  - Re-check neurovascular status
  - Sling
- Follow-up:
  - Not reduced: ED
  - Reduced: Team physician
Ant GH Dislocation - Techniques

Systematic review failed to support any specific reduction technique.

<table>
<thead>
<tr>
<th>Method</th>
<th>Type</th>
<th>Patient Position</th>
<th>Description</th>
<th>Success Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hippocratic</td>
<td>Traction</td>
<td>Supine</td>
<td>Longitudinal traction to arm with foot in axilla</td>
<td>NR</td>
</tr>
<tr>
<td>Traction-countertraction</td>
<td>Traction</td>
<td>Supine</td>
<td>Longitudinal traction to arm with counter traction applied via sheet around chest wall</td>
<td>NR</td>
</tr>
<tr>
<td>Chair</td>
<td>Traction</td>
<td>Sitting to standing</td>
<td>With the arm held in place, patient applies traction by standing up from a seated position.</td>
<td>73–97\textsuperscript{23,24}</td>
</tr>
<tr>
<td>Kocher</td>
<td>Levering</td>
<td>Supine or sitting</td>
<td>Elbow flexed to 90°, adduction, external rotation, and forward flexion of shoulder</td>
<td>81–100\textsuperscript{25,26}</td>
</tr>
<tr>
<td>Stimson</td>
<td>Traction</td>
<td>Prone</td>
<td>Arm hangs over edge of stretcher and downward traction applied with weights</td>
<td>NR</td>
</tr>
<tr>
<td>Milch</td>
<td>Combination</td>
<td>Supine or sitting</td>
<td>Humeral head stabilized, arm fully abducted, traction applied then humeral head pushed over glenoid rim</td>
<td>70–100\textsuperscript{27,29}</td>
</tr>
<tr>
<td>External rotation</td>
<td>Levering</td>
<td>Supine or sitting</td>
<td>Arm adducted then passively externally rotated</td>
<td>78–90\textsuperscript{30–33}</td>
</tr>
<tr>
<td>Spaso</td>
<td>Traction</td>
<td>Supine</td>
<td>Scapula stabilized against stretcher and upward traction and external rotation applied</td>
<td>68–86\textsuperscript{34-36}</td>
</tr>
<tr>
<td>Eskimo</td>
<td>Traction</td>
<td>Lateral decubitus</td>
<td>Upward traction applied to abducted arm and torso lifted off floor</td>
<td>NR</td>
</tr>
<tr>
<td>Scapular manipulation</td>
<td>Combination</td>
<td>Prone</td>
<td>Stimson technique + manual internal rotation and medialization of scapula</td>
<td>79–96\textsuperscript{37-38}</td>
</tr>
<tr>
<td>FARES</td>
<td>Traction + oscillation</td>
<td>Supine</td>
<td>Arm adducted, vertical oscillating movement, gradual abduction with gentle traction</td>
<td>88–95\textsuperscript{26,33}</td>
</tr>
</tbody>
</table>

FARES = fast, reliable, and safe; NR = not reported

Youm T. JAAOS 22(12), 2014.
Posterior Dislocation-Field Reduction?

- Usually more difficult

- Reduction:
  - FF 90 degrees, adduction, IR
  - Gentle pressure on posterior HH

- ?sedation and/or muscle relaxant
The Elbow – Bony Anatomy

1. Medial Epicondyle
2. Lateral Epicondyle
3. Trochlea
4. Capitellum
5. Olecranon Fossa
The Elbow – Capsular/Ligamentous Anatomy
Elbow (Ulnohumeral) Dislocation

- Epidemiology
- Recurrent dislocations rare
- *Kenter K et al. JSES 9, 2000.*
  - 5 year NFL study - 16 elbow dislocations

**NFL 1996-2005**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Diagnosis</th>
<th>No. of Reported Injuries</th>
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<tr>
<td>1</td>
<td>Wrist sprain</td>
<td>160</td>
</tr>
<tr>
<td>2</td>
<td>Elbow hyperextension sprain</td>
<td>114</td>
</tr>
<tr>
<td>3</td>
<td>Forearm fracture</td>
<td>84</td>
</tr>
<tr>
<td>4</td>
<td>Medial/lateral elbow sprain</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>Elbow contusion</td>
<td>56</td>
</tr>
<tr>
<td>6</td>
<td>Elbow dislocation/subluxation</td>
<td>44</td>
</tr>
<tr>
<td>7</td>
<td>Wrist fracture</td>
<td>43</td>
</tr>
<tr>
<td>8</td>
<td>Triceps strain/avulsion</td>
<td>38</td>
</tr>
<tr>
<td>9</td>
<td>Elbow loose body formation</td>
<td>36</td>
</tr>
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<td>10</td>
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<td>24</td>
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*Carlisle et al. AJSM 36(10), 2008.*
Elbow (Ulnohumeral) Dislocation

• **Mechanism**
  – Posterolateral Rotatory (90%)
  – Hyperextension

• **LCL Complex Injury**
  – UCL often injured
Elbow Dislocation - So now what?

Important Considerations:

• Timing and/or associated fracture?

• Athlete (patient) status?
  – Neurovascular?

• Assistance?

Elbow Dislocation - So now what?

**Reduction pearls:**

- Correction of medial or lateral deformity, then axial forearm traction

- Wrap fingers around olecranon to bring distal and anterior

- Check stability, NV, ROM

- Splint (will need post-reduction rads)
  - Elbow at 90 degrees
  - Forearm position – pronation if needed
Elbow (Ulnohumeral) Dislocation

• Muscle relaxation/sedation may be required
• Neurovascular checks are key
• Follow-up radiographs are important to document concentric reduction
  – 25-50% dislocations are associated with fracture (radial head most common)
Wrist/Hand/Finger Dislocations
Wrist/Hand/Finger Dislocations

Figure 2. Injuries to the hand, first ray, and fingers, by category, in the National Football League, 1996-2005.
# Wrist/Hand/Finger Dislocations

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<td>24</td>
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*Carlisle et al. AJSM 36(10), 2008.*
Wrist/Hand/Finger - Evaluation

• History
  – MECHANISM!!!

• Physical examination
  – Wrist or finger deformity - obvious
  – Wrist pain and/or swelling
Wrist/Carpal Dislocations

- Radiocarpal Dislocations
  - Doral >> Volar
  - Rare

Ilyas AM, Mudgal CS. JAAOS 16(11), 2008.
Wrist/Carpal Dislocations

- Lunate/Perilunate Dislocation
Wrist Dislocations – So now what?

**Important Considerations:**

- Gross deformity will be obvious
- Careful neurovascular examination
- Reduction Pearls
  - Distal traction
  - Splint
- Radiographs will be key!
- Refer to team MD or ED
PIP Dislocations

Dorsal dislocations:
• Volar Plate Rupture (MP)
  – Common

Volar dislocations:
• Central slip disruptions (MP)
  – RARE
  – Can be difficult to reduce
  – Boutonniere deformity!!

www.Eatonhand.com
Dorsal PIP Dislocations

• Mech: Hyperextension +/- axial load

• Reduction Pearls:
  – Hyperextension, ? traction, thumb pressure on MP base, flexion
  – Test collateral stability
  – Splint/Coban/buddy tape
  – ?Digital block
  – Refer to team MD
Volar PIP Dislocations

- **Mech:** Axial load with volar directed force

- **Reduction Pearls:**
  - Hyperflexion, ? traction, thumb pressure on MP base, then extension
  - Test collateral stability
  - Splint in extension, DIP free
  - Digital block
  - Refer to team MD or hand specialist
Hip/Pelvis

• Hip dislocation is rare (collision sports)
  – Hip subluxation??
  – NFL: 9 subluxation/dislocations over 10-yr period*

**Table 1. Patient Demographics**

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Age (yr)</th>
<th>Sport</th>
<th>Time to Relocation (hr)</th>
<th>Time from Injury to Arthroscopy (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18</td>
<td>Biking</td>
<td>2</td>
<td>218</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>Rugby</td>
<td>12</td>
<td>131</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>Football</td>
<td>5</td>
<td>122</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>Football</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
<td>Dancing</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>Football</td>
<td>6</td>
<td>92</td>
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<tr>
<td>7</td>
<td>30</td>
<td>Football</td>
<td>4</td>
<td>0</td>
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<tr>
<td>8</td>
<td>16</td>
<td>Track</td>
<td>0</td>
<td>198</td>
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<tr>
<td>9</td>
<td>18</td>
<td>Basketball</td>
<td>2</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>17</td>
<td>Biking</td>
<td>4</td>
<td>63</td>
</tr>
<tr>
<td>11</td>
<td>22</td>
<td>Football</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>12</td>
<td>20</td>
<td>Biking</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>13</td>
<td>32</td>
<td>Skiing</td>
<td>2</td>
<td>138</td>
</tr>
<tr>
<td>14</td>
<td>46</td>
<td>Hockey</td>
<td>4</td>
<td>556</td>
</tr>
</tbody>
</table>

*Philippon MJ. Arthroscopy 25(2), 2009.*
Hip Dislocations

• Is a stable joint!!!!
  – Congruent bony anatomy
  – Strong capsular and ligamentous restraints
  – Muscles

Hip Dislocations

• Mechanism…
  – 85% are posterior
  – Fall on flexed, adducted hip
  – Held in flexion, adduction, and internally rotated

Hip Dislocations – So now what?

**Reduction considerations:**

- Can be difficult to reduce
- Anesthesia and analgesia
- Should not be done on the field?
- Rule out associated fracture
  - Posterior wall
  - Femoral neck
- EMS and transport

*Photo: Courtesy of EB Medicine*
Knee Dislocations

• Uncommon
• Can be devastating injuries
• Usually result of high-energy trauma, but are seen in sports
• Be aware of the spontaneously reduced ones!!!
Knee Dislocations

Important Considerations:

• Direction of dislocation?
  – Anterior most common
  – Posterolateral!!!
• Neurovascular exam!!!!!
• Be aware of spontaneous reduced one
Knee Dislocations

Important Considerations:

• Reduction:
  – Malreduced ones
  – Neurovascular compromise

• Post-reduction:
  – Check stability??
  – Neurovascular checks
  – Splint

• Refer to ED
Patellar Dislocations

• Common injury
• Typically .......... lateral instability

**Mechanism:**
  – Non-contact, body rotation around a planted foot
  – Direct contact

• Stability
  – Bony architecture
  – MPFL et al.
Patellar Dislocations

• Can dislocate and relocate spontaneously (lateral)

• Classic appearance:
  – Flexed knee
  – Fullness laterally
  – Prominent medial femoral condyle

Patellar Dislocations

• Reduction
  – Extended knee with medially directed pressure on patella.

• Post-reduction:
  – Neurovascular status
  – Knee immobilizer
  – Referral to team physician or ED
Patellar dislocations

• Common associated injuries:
  – Chondral injuries
  – Osteochondral fractures
Tibiotalar dislocations

• Dislocation of tibiotalar joint without bony injury is RARE
• Stability
  – Bony anatomy of ankle
  – Talar anatomy is also important
• Sideline reduction may be easier if associated fracture
  – May have to hold reduction during splinting
Tibiotalar – bony stability

Anterior View

- Tibia
- Medial Malleolus
- Talus
- Fibula
- Lateral Talar Process
Tibiotalar – ligament stability

Lateral Ligaments

- Posterior Tibiofibular
- Calcaneofibular
- Lateral Talocalcaneal

Interosseous Membrane
- Anterior Tibiofibular
- Anterior Talofibular
Tibiotalar – ligament stability

Deltoid Ligament

Anterior Tibiotalar (Deep)

Tibial Navicular (Superficial)

Posterior Tibiotalar (Superficial)

Tibiocalcaneal (Superficial)
Tibiotalar Dislocations

- Clinical presentation
  - Obvious deformity
  - Significant pain
  - Check neurovascular status
Tibiotalar dislocations

Important Considerations:

• Reduce to relax stress on NV structures

• Isolated dislocations may need sedation or general anesthesia

• Splint/immobilize and refer/transport
Conclusions

• Be prepared!!!!!!
• **Mechanism of Injury** is key
• Know your anatomy
• Avoid multiple attempts
• Stay within your comfort zone
• Understand your ‘scope of practice’ within your state
• Splint and refer if necessary………