The Athlete with the Unstable Shoulder: Hypermobility versus Traumatic Instability

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Disclosures

- No relevant disclosures
Definitions

• **Laxity**
  – A degree of translation in the glenohumeral joint which falls in the physiologic range and is asymptomatic

• **Instability**
  – Translation in the glenohumeral joint which causes pain, subluxation or dislocation of the shoulder
Glenohumeral Joint Anatomy

High degree of bony congruity

Very little bony congruity
## Stabilizers of the Glenohumeral Joint

<table>
<thead>
<tr>
<th>Dynamic Stabilizers</th>
<th>Static Stabilizers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotator cuff</td>
<td>Labrum</td>
</tr>
<tr>
<td>Joint compression</td>
<td>Articular Anatomy</td>
</tr>
<tr>
<td>Steering</td>
<td>Capsuloligamentous structures</td>
</tr>
<tr>
<td>Dynamization of GHL</td>
<td>Negative pressure</td>
</tr>
<tr>
<td>Periscapular muscles</td>
<td>Joint fluid adhesion</td>
</tr>
<tr>
<td>Scapulothoracic motion</td>
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</tbody>
</table>
Ligamentous Support of the Glenohumeral Joint

- **Origin:**
  - Anterior Band 2-4 o’clock
  - Posterior Band 7-9 o’clock

- **External Rotation:**
  - Anterior Band Fans

- **Internal Rotation:**
  - Posterior Band Fans
Anterior Shoulder Dislocations

- Forceful abduction and external rotation
  - Tearing of anterior-inferior labrum/capsule
    - Bankart lesion
  - Potential bony injury at anterior-inferior glenoid rim
  - Injury to Humeral Head
    - Impaction fracture at posterolateral humeral head
    - Hill-Sachs lesion
Exam Tests

- Range of motion
- Instability tests
  - Farber et al *JBJS* 2006
    - Apprehension:
      - Sensitivity 72%
      - Specificity 96%
    - Relocation:
      - Sensitivity 81%
      - Specificity 92%
Exam Tests

- Load & Shift
  - Stabilize scapula
  - Assess A & P translation
    - Grade
      - 1+: to rim
      - 2+: over rim with spontaneous reduction
      - 3+: over rim & locked
  - Compare to contralateral side
  - Assess for pain, crepitus, palpable click, & instability
  - Perform seated or supine
Exam Tests

- **Sulcus sign**
  - Downward traction on the arm with the patient seated
  - Positive sulcus suggests multidirectional instability or inferior involvement
Multidirectional Instability

- History of bilateral dislocations
  - Dislocations in other joints
  - Hypermobile joints
  - 2+ or greater sulcus
  - Anterior and posterior instability
- Beighton score can be useful
Case #1: My Shoulder Dislocated…

- 35 yo M who was snowboarding, injured his left shoulder in a fall:
  - Reduced on the mountain 3 days ago
  - Pain has been improving since then
  - No other injuries
  - No prior history of shoulder dislocations or other shoulder problems

- What should we do?
  - Surgery now – make him stable!
  - Recover range of motion then plan for surgery in 6-8 weeks
  - Rehabilitation, monitor, and counsel on risks of re-dislocation
Primary anterior dislocation of the shoulder: long-term prognosis at the age of 40 years or younger

Lennart Hovelius¹ · Hans Rahme²

- Long-term follow up on patient cohort from Sweden with first-time anterior shoulder dislocation

- Risk factors for recurrent instability:
  - **Younger patient age = higher risk**
  - Male sex = higher risk

- First-time dislocation can be managed non-operatively though with risk of recurrent instability

- 2/3 of patients have shoulder arthritis at 25 years after injury
Pooled recurrence rate of 21%

Risk factors for recurrence:

- Male sex
- Age < 20 years
- Greater tuberosity fracture protective of recurrent instability

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A  Age (≤ 20 years old vs. > 20 years old)

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>log(Odds Ratio)</th>
<th>SE</th>
<th>Weight</th>
<th>Odds Ratio</th>
<th>IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>McLaughlin 1950(a)</td>
<td>2.9704</td>
<td>0.8527</td>
<td>16.3%</td>
<td>19.50 ([3.67, 103.72])</td>
<td></td>
</tr>
<tr>
<td>Rowe 1960(a)</td>
<td>3.563</td>
<td>0.6086</td>
<td>25.3%</td>
<td>35.27 ([10.70, 116.26])</td>
<td></td>
</tr>
<tr>
<td>Simonet 1984(a)</td>
<td>2.0181</td>
<td>0.4607</td>
<td>33.4%</td>
<td>7.52 ([1.05, 58.16])</td>
<td></td>
</tr>
<tr>
<td>te Slaa 2004(a)</td>
<td>1.0474</td>
<td>0.6142</td>
<td>25.0%</td>
<td>2.67 ([1.02, 7.36])</td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>100.0%</td>
<td>12.76 ([5.77, 28.23])</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: \(I^2 = 0.28; \chi^2 = 5.25, df = 3 (P = 0.15); I^2 = 43%\)

Test for overall effect: \(Z = 6.28 (P < 0.00001)\)

B  Age (≤ 30 years old vs. > 30 years old)

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>log(Odds Ratio)</th>
<th>SE</th>
<th>Weight</th>
<th>Odds Ratio</th>
<th>IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoenen 1998(b)</td>
<td>3.007</td>
<td>0.4464</td>
<td>13.4%</td>
<td>20.23 ([8.43, 48.52])</td>
<td></td>
</tr>
<tr>
<td>Hovelius 2008(c)</td>
<td>1.698</td>
<td>0.3171</td>
<td>16.8%</td>
<td>5.46 ([2.93, 10.17])</td>
<td></td>
</tr>
<tr>
<td>Kralinger 2002(d)</td>
<td>1.1417</td>
<td>0.3658</td>
<td>15.5%</td>
<td>3.13 ([1.53, 6.42])</td>
<td></td>
</tr>
<tr>
<td>Leroux 2013(e)</td>
<td>1.408</td>
<td>0.0384</td>
<td>22.6%</td>
<td>4.09 ([1.79, 9.41])</td>
<td></td>
</tr>
<tr>
<td>Lill 2001(f)</td>
<td>3.1209</td>
<td>0.5812</td>
<td>10.4%</td>
<td>22.67 ([7.26, 70.81])</td>
<td></td>
</tr>
<tr>
<td>Sachs 2007(g)</td>
<td>1.6089</td>
<td>0.4216</td>
<td>14.0%</td>
<td>5.00 ([2.19, 11.42])</td>
<td></td>
</tr>
<tr>
<td>Salomonsson 2010(h)</td>
<td>2.3026</td>
<td>0.7746</td>
<td>7.3%</td>
<td>10.00 ([2.19, 45.64])</td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>100.0%</td>
<td>6.69 ([4.07, 11.02])</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: \(I^2 = 0.28; \chi^2 = 24.06, df = 6 (P = 0.00005); I^2 = 75%\)

Test for overall effect: \(Z = 7.48 (P < 0.00001)\)

C  Age (≤ 40 years old vs. > 40 years old)

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>log(Odds Ratio)</th>
<th>SE</th>
<th>Weight</th>
<th>Odds Ratio</th>
<th>IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>McLaughlin 1950(a)</td>
<td>-1.1281</td>
<td>0.6178</td>
<td>16.5%</td>
<td>0.04 ([0.01, 0.16])</td>
<td></td>
</tr>
<tr>
<td>Rowe 1960(a)</td>
<td>-3.2995</td>
<td>0.3074</td>
<td>40.8%</td>
<td>0.04 ([0.02, 0.07])</td>
<td></td>
</tr>
<tr>
<td>Sachs 2007(a)</td>
<td>-1.9562</td>
<td>0.5675</td>
<td>19.6%</td>
<td>0.14 ([0.05, 0.43])</td>
<td></td>
</tr>
<tr>
<td>Simonet 1984(a)</td>
<td>-3.7423</td>
<td>1.0385</td>
<td>7.2%</td>
<td>0.02 ([0.00, 0.18])</td>
<td></td>
</tr>
<tr>
<td>te Slaa 2004(a)</td>
<td>-2.5047</td>
<td>0.653</td>
<td>15.9%</td>
<td>0.08 ([0.02, 0.32])</td>
<td></td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>100.0%</td>
<td>0.05 ([0.03, 0.10])</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: \(I^2 = 0.12; \chi^2 = 5.46, df = 4 (P = 0.24); I^2 = 27%\)

Test for overall effect: \(Z = 9.93 (P < 0.00001)\)
Case #1: Continued…

- Completes ~6 weeks of PT and shoulder feels great
- Returns to normal activity
- However…
  - Six months later
  - Dislocated should when swimming
  - Successfully reduced
- Best treatment at this point?
Surgical Stabilization

- Arthroscopic stabilization
  - Labral and capsular repair with suture anchors
- Remplissage for Hill-Sachs lesions
- Outcomes
What are Our Surgical Options?

- **Arthroscopic Stabilization**
  - Current gold-standard
  - Capsule/labral injuries
  - No/minimal glenoid bone loss

- **Open Stabilization/Capsular Shift**
  - Prior gold-standard but less common
  - Failed arthroscopic stabilization
  - Capsular shift for greater laxity

- **Treatment of Hill-Sachs Lesion**
  - Remplissage for most
  - Can consider humeral head allograft

- **Bony Augmentation of Glenoid**
  - Critical bone loss: >20-25%
  - Latarjet coracoid transfer
    - Iliac crest
    - Distal tibia allograft
Relative to first-time dislocators, patients with recurrent dislocations have:

- More anterior glenoid erosion
- More labral/periosteal sleeve avulsion
- Higher failure rates after stabilization
- Lower patient-reported satisfaction
Case #2

- 19 yo M, plays linebacker at Division 1 college
  - 2nd game of the season – dislocated his right shoulder while making a tackle
  - Felt a pop, immediate pain, and deformity noted by ATC
  - Reduced on the sideline shortly after dislocation
  - No prior history of shoulder instability or shoulder injury
Treatment Plan

How should we treat him?
1. Rehabilitation for ROM/strengthening, allow return to play when recovered
2. Sling for 2-3 weeks, then begin rehab program
3. Call your orthopedic surgeon – we need to operate!

”When will I be back?”
1. Next week
2. 3-4 weeks
3. End of season if you’re lucky
4. Plan for a medical redshirt, see you next year
Return to Play and Recurrent Instability After In-Season Anterior Shoulder Instability

A Prospective Multicenter Study

MAJ Jonathan F. Dickens,†† MD, LTC Brett D. Owens,†† MD, Kenneth L. Cameron,† PhD, MPH, ATC, MAJ Kelly Kilcoyne,‡† MD, LTC C. Dain Allred,‡ MD, COL Steven J. Svoboda,†† MD, LTC Robert Sullivan,‡ MD, Col (Ret) John M. Tokish,†† MD, Karen Y. Peck,‡ MEd, ATC, and CDR John-Paul Rue,* MD

Investigation performed at the United States Naval Academy, Annapolis, Maryland, USA; the United States Military Academy, West Point, New York, USA; and the United States Air Force Academy, Colorado Springs, Colorado, USA

- 45 in-season contact intercollegiate athletes with in-season shoulder dislocation
- 73% of athletes returned to sport at median of **5 days**
  - 27% completed the season without recurrent instability
  - 64% had recurrent dislocation or subluxation
- Time of return to sport is inversely correlated with Simple Shoulder Test at time of initial injury

### TABLE 3
Estimated Time to Return to Sport Based on the SST at the Time of Injury

<table>
<thead>
<tr>
<th>SST Score</th>
<th>Time to Return to Play, d</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>80</td>
<td>5</td>
</tr>
<tr>
<td>60</td>
<td>7</td>
</tr>
<tr>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>20</td>
<td>12</td>
</tr>
</tbody>
</table>

*The Simple Shoulder Test (SST) is a 12-question test administered at the time of injury. Estimated values for return to play were calculated using the following formula: time loss = (SST score) \times (-0.117) + 14.04.
Case 2 Continued

- Successfully finishes the year without further instability events
- Exit physical exam:
  - Full range of motion
  - Full strength
  - + mild apprehension and relocation
- Treatment at this point:
  - Off-season strengthening program, plan to play next year?
  - Surgical stabilization now, start rehab program, play next year?
39 intercollegiate contact athletes

10 chose non-operative treatment
  • 4 played the next season without recurrence (40%)

29 chose surgical treatment
  • 26 played the next season without recurrence (90%)
  • 9/20 had stabilization after first dislocation
  • 20/29 continued playing and had recurrent instability
  • No difference in outcomes between these groups
Case #3: My Shoulders Pop Out All the Time

- 16 yo M with bilateral shoulder instability
  - Left shoulder started popping out ~2 years ago, no specific inciting event
  - Right shoulder started popping out ~1 year ago
  - Shoulders dislocate multiple times each day – very painful
  - Currently home schooled as school cannot manage dislocations

- Exam:
  - Shoulders dislocate posteriorly with active range of motion
Diagnosing Multidirectional Instability

- Positive sulcus sign combined with anterior or posterior dislocations
- Increased Beighton score
- Bilateral involvement
- Absence of clear traumatic onset
Treatment Options for MDI

- Rehabilitation program is primary treatment
  - Scapular stabilization exercises
  - Cuff strengthening
  - Proprioception focus
  - Prolonged rehabilitation program
- Surgical treatment is capsular shift
Conclusions

- Glenohumeral joint is inherently unstable and requires dynamic stabilizers to allow for stable functional joint.

- Age and sex contribute to likelihood of recurrent instability.
  - May consider stabilization for first-time dislocation in young patient.

- Special considerations for elite-level athletes.
  - In-season injury can return to play.
  - Discussion regarding off-season stabilization.

- Recurrent instability = intra-articular damage.

- Multidirectional instability is challenging entity.
  - Treated best with focused rehabilitation program.