Disclosures

- All Authors have no conflicts related to development of the CPG
- Funded by the Academy of Orthopaedic Physical Therapy & Academy of Sports Physical Therapy and by the APTA.

Objectives of Session

1. Explain the shoulder pain classification and methods used to categorize patients into shoulder CPG categories, specifically shoulder instability
2. Understand the evidence with regard to establishing a prognosis for patients with shoulder instability including pathoanatomic features as well as the limitation of evidence for the risk factors for operative versus non-operative treatment
3. Recognize current best practice and recent evidence supporting the physical therapy examination, treatment and outcome assessment in patients with shoulder pain related to shoulder instability and movement coordination deficits
4. Recognize the strengths and limitations in CPGs to define best practices that meet the needs of patients under most circumstances but do not replace the need for sound clinical decision making for individual patients

Outline

- Staged Algorithm for Rehabilitation of Shoulder Pain – (STAR) Shoulder Movement Diagnosis and Rehabilitation Classification Overview (Tim Uhl)
- Clinical Course: Typical outcomes of patients with instability including pathoanatomic diagnoses and other potential clinical factors that may impact prognosis of rehabilitation (Kyle Matsel)
- Diagnosis: Best evidence and clinical recommendations for examination procedures to identify patients with shoulder instability (Eric Hegedus)
- Intervention: Best evidence and clinical recommendations for physical therapy interventions including immobilization, exercise, neuromuscular retraining, and bracing (Amee Seitz)
- Outcome Assessment: What self-reported and performance based measures best capture patient rehabilitation treatment outcomes in patients with shoulder instability (Lori Michener)
- Questions

2013 First Shoulder Clinical Practice Guideline

- Shoulder Pain and Mobility Deficits: Adhesive Capsulitis
- Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association
4 Component Model with Tissue Irritability

Staged Approach for Rehabilitation Classification: Shoulder Disorders (STAR-Shoulder)

Pathoanatomic Diagnosis vs. Rehab Classification

Level 2 Pathoanatomic Dx
- Primary Tissue Pathology
- Stable over an episode of care
- Guides general Rx strategy
- Informs prognosis
- Surgical Decisions

Level 3 Rehabilitation Classification
- Irritability / Impairment
- Often changes over episode of care
- Guides specific rehab treatment
- Physical stress dosage
- Specific impairments
- May inform prognosis

Pathoanatomic Diagnosis based on specific physical examination (+/- imaging). Most diagnostic accuracy studies address this level. As examples, findings are listed for the three most common diagnoses only.

Pathoanatomic Diagnoses

Intervention Focus

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<tr>
<th>History and Exam</th>
<th>Tissue Irritability: Pain, Motion, Disability</th>
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<td>High Pain (7/10)</td>
<td>Max Physical Stress</td>
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<td>Pain before end ROM</td>
<td>High Disability</td>
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<td>GOM + PROM</td>
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<tr>
<td>High Stability</td>
<td>Excellent</td>
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<tr>
<td>GH + Abduction</td>
<td>Excellent</td>
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</tbody>
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Key positive findings:
- Impingement signs
- Painful arc
- Pain with isometric resistance
- Weakness
- Atrophy (tear)

Key negative findings:
- Significant loss of motion
- Instability signs

Key positive findings:
- Spontaneous progressive pain
- Loss of motion in multiple planes
- Pain at end-range

Key negative findings:
- Normal motion
- Age < 40

Key positive findings:
- Age usually < 40
- History of dislocation/subluxation
- Apprehension
- Generalized laxity

Key negative findings:
- No history of dislocation
- No apprehension
- GH arthritis
- Fractures
- AC joint
- Neural Entrapment
- Myofascial pain
- Post-op

Subacromial Pain Syndrome
Rotator Cuff Adhesive Capsulitis
Glenohumeral Instability
Other
Rehab Classification
- Tissue Irritability (guides intensity of physical stress)
- Impairments (guides specific intervention tactics)

**Impairment**
- **High Irritability**
  - Pain: Associated with local tissue injury
    - Modalities: Activity modification
    - Limited modality use
  - Pain: Associated with central sensitization
    - Modalities: Progressive exposure to activity
  - Limited passive mobility: Joint/muscle/neural ROM, stretching, manual therapy: Pain-free only, typically non-end range
    - Limited passive mobility: Comfortable end-range stretch, typically intermittent
    - Limited passive mobility: Tolerable stretch sensation at end range. Typically longer duration and frequency
  - Neuromuscular weakness: Associated with atrophy, disuse, deconditioning
    - Activity range of motion (AROM) within pain-free ranges
      - Light mobility
      - Moderate mobility to fatigue
      - High mobility to fatigue
    - Neuromuscular weakness: Associated with poor motor control or neural activation
      - AROM within pain-free ranges
      - Consider use of biofeedback, neuromuscular electric stimulation or other activation strategies
      - Basic movement training with emphasis on quality/precision according to motor learning principles
      - High demand movement training with emphasis on quality rather than resistance according to motor learning principles
  - Functional activity intolerance
    - Protect joint or tissue from end-range, encourage use of unaffected regions
    - Progressively engage in basic functional activity
    - Progressively engage in high demand functional activity
  - Poor patient understanding leading to inappropriate activity (or avoidance of activity)
    - Appropriate patient education

Thank You
- Next
- Discuss the evidence with regard to establishing a prognosis for patients with shoulder instability
- Classification
- Incidence
- Pathoanatomical features
- Clinical course
- Risk Factors

Clinical Practice Guidelines for Shoulder Instability
Prognosis
Kyle Matsel DPT, SCS, CSCS

Defining Shoulder Instability
- Numerous shoulder classifications exist but most are based on expert opinion and lack consistency and widespread acceptance
- Without established, validated, and well-defined diagnostic criteria for classifying shoulder instability, comparing studying and compiling data in a systematic manner is difficult
- Shoulder instability = discomfort and a feeling of looseness, slipping, or the shoulder "going out"
FEDS Classification System
- This classification system relies on history and the patient’s perception, however, a physical exam can be utilized to determine the direction of instability
  - Interobserver reliability: κ = 0.69 – 0.87
  - Interobserver reliability: κ = 0.44 – 0.7
  - Hettrich JSES 2019
- The categorical definitions prevent ambiguity in classification
  - 36 possible combinations
  - 6 categories are most meaningful
    - Solitary traumatic anterior dislocation (STAD) – 24.8%
    - Occasional traumatic anterior dislocation (OTAD) – 16.4%
    - Solitary traumatic anterior subluxation (STAS) – 8.4%
    - Frequent traumatic anterior subluxation (FTAS) – 7.6%
    - Frequent traumatic anterior dislocation (FTAD) – 8.1%
    - Occasional traumatic anterior subluxation (OTAS) – 6.8%

Incidence
- Shoulder instability has been classified by several different systems over the years incorporating mechanism, severity (subluxation vs dislocation), frequency, and direction of instability.
- The lack of consistent classification system creates a challenge to identify incidence rates for each category of instability.

Incidence – Primary Traumatic Anterior Dislocations
- Overall US incidence for traumatic shoulder instability = 0.24 per 1000 exposures (CI 0.21 – 0.27)
- The incidence of instability is greater in males over females and tends to be higher in individuals under 30 in high demand activities such as sport or military

Incidence – Primary Traumatic/Recurrent Posterior and Inferior Dislocations
- Rarely studies identify distinct direction of instability or frequency of occurrence
- United States Military Academy – Prospective cohort
  - 117/4141 total traumatic shoulder dislocations (2.8%)
  - 5/117 first time posterior subluxations (4.2%)
  - 6/117 recurrent posterior subluxations (5.2%)
  - 11/117 inferior instabilities (10%)
- This area has limited research and is a prime area for PT, ATC to perform epidemiological studies on this population

Pathoanatomical
What are the associated lesions with shoulder instabilities
Primary Traumatic Anterior Dislocation

- **Hill Sachs Lesions**
  - Hill Sachs lesions are common following traumatic anterior shoulder dislocation ranging from 13 – 90%
    - O’Brien Eur J Radiol. 2012 (LOE 3)
    - Simank Arch Orthop Trauma Surg. 2006 (LOE 3)
    - Taylor AJSM 1997 (LOE 2)
    - Widjaja ANZ J Surg. 2006 (LOE 4)
  - 76% (48/63) had an associated Hill Sachs lesion
    - Perron J Emerg Med. 2003 (LOE 4)

- **Rotator Cuff Lesions**
  - The probability of an associated rotator cuff tear following traumatic anterior dislocation appears to increase with age
    - 54% of the patients over the age of 40 have an associated cuff tear; the frequency increases with advancing age to 100% in patients over the age of 70.
    - O’Brien Eur J Radiol. 2012 (LOE 3)
    - Davy Injury 2002 (LOE 3)
    - Spatschil Arch Orthop Trauma Surg. 2006 (LOE 3)
    - Taylor AJSM 1997 (LOE 2)
    - Widjaja ANZ J Surg. 2006 (LOE 4)
  - Rotator cuff lesions with PRIMARY traumatic anterior dislocation ranges from 4 – 38%
    - Atef Int Orthop. 2016 (LOE 4)
    - Simank Arch Orthop Trauma Surg. 2006 (LOE 3)
    - Taylor AJSM 1997 (LOE 2)
  - Rotator cuff lesions can occur in addition to other pathologies
    - Rotator cuff tear with axillary nerve injury – 6%
    - Rotator cuff tear with Bankart lesion – 7.5%
    - Perron J Emerg Med. 2003 (LOE 4)

- **Nerve Lesions**
  - Axillary nerve lesions are most common following traumatic anterior dislocation
    - Axillary – 6 – 73%
      - Davy Injury 2002 (LOE 3)
      - Yeo Med J Malaysia. 2004 (LOE 3)
    - Ulnar – 10%
    - Radial – 1.4%
    - Musculocutaneous – <1%
    - Median – 3.8%
    - Robinson JBJS 2012 (LOE 2)

- **Greater Tuberosity Fracture**
  - The presence of greater tuberosity fractures following traumatic anterior shoulder dislocation is 15–16%
    - Simank Arch Orthop Trauma Surg. 2006 (LOE 2)
    - Perron J Emerg Med. 2003 (LOE 4)
    - Robinson JBJS 2013 (LOE 2)
Associated Lesions

- Pediatric patients (age 11-18) with anterior shoulder dislocations
  - Plain radiography identified a lower incidence of fractures than those reported from adult studies.
  - 3% associated fractures
  - 4% associated Hill Sachs lesions
    - Reid Pediatr Emerg Care 2013 (LOE 4)

Primary Traumatic Anterior Subluxation

- In younger individuals age 18-24 who had a first time, traumatic subluxation event results in a high rate of labral and Hill Sachs lesions.
  - Labral Bankart
    - 74% (20/27) had an associated labral Bankart
      - Owens JBJS 2010 (LOE 2)
  - Bony Bankart
    - 22% (6/27) had an associated labral Bankart
      - Owens JBJS 2010 (LOE 2)
  - Hill Sachs Lesion
    - 93% (25/27) had an associated Hill Sachs lesion
      - Owens JBJS 2010 (LOE 2)

Recurrent Traumatic Anterior Subluxation

- Younger individuals (18-35) who present with recurrent traumatic anterior subluxations appear to be at greater risk for labral Bankart lesions compared to other bony pathologies
  - Shin Arthroscopy 2016 (LOE 4)
  - Labral Bankart lesion
    - 39% (11/28) had an associated labral Bankart lesion
  - Isolated rotator cuff tear
    - 3.5% (1/28) had an associated rotator cuff lesion
  - Bony Bankart lesion
    - 2% (6/28) had an associated bony Bankart lesion
  - Glenoid chondral injury
    - 7% (2/28) had erosion of the glenoid
  - Hill Sachs
    - 2% (6/28) had an associated Hill Sachs defect
Recurrent Traumatic Anterior Dislocation

- Labral Bankart
  - Labral Bankart lesions are common following recurrent traumatic anterior dislocation ranging from 45% - 97%
  - 87% (103/119) associated labral Bankart or Alspah lesions
  - Yiannakopoulos Arthroscopy 2007 (LOE 4)
  - 91% (58/64) had an associated labral Bankart lesion
    - Shin Arthroscopy 2016 (LOE 4)

- SLAP Lesions – 20% (21/104)
  - Yiannakopoulos Arthroscopy 2007 (LOE 4)

- Hill Sachs lesion
  - The presence of a Hill Sachs lesion following a recurrent traumatic anterior dislocation is high ranging from 80% - 93%.
  - 93% (97/104) had an associated Hill Sachs lesion
    - Yiannakopoulos Arthroscopy 2007 (LOE 4)
  - 80% (67/84) had an associated Hill Sachs lesion
    - Shin Arthroscopy 2016 (LOE 4)

Recurrent Traumatic Anterior Dislocation

- The correlation between labral Bankart and Hill Sachs showed that if one of the lesions was identified, the chance of the other being present was more than 2.5 times as likely (OR = 2.67 (0.83-8.61)).
  - P=0.10
  - 79% of those with a labral Bankart lesion also had a Hill Sachs lesion
  - 81% of those with a Hill Sachs lesion also had a labral Bankart lesion
  - Widjaja ANZ J Surg. 2006 (LOE 4)

Recurrent Traumatic Anterior Dislocation

- Glenoid bone loss seen in 48% (55/114)
  - 13% (15/114) had critical glenoid bone loss.
  - Average age of patients with no glenoid bone loss was 14.7 years (range 6.5-18.1)
  - Average age of 15.6 years (11.4-18) male can expect more glenoid bone loss than females - Male to female ratio 6:1
    - Ellis J Pediatr Orthop. 2017 (LOE 3)

Recurrent Traumatic Anterior Dislocation

- Bony Bankart lesion
  - The presence of a bony Bankart lesion following a recurrent traumatic anterior dislocation ranges from 10.5% - 72%
  - 10.5% (11/104) had an associated bony Bankart lesion
    - Yiannakopoulos Arthroscopy 2007 (LOE 4)
  - 29% (24/84) had an associated bony Bankart lesion
    - Shin Arthroscopy 2016 (LOE 4)
  - 72% (33/46) had an associated bony Bankart lesion
    - Widjaja ANZ J Surg. 2006

Recurrent Traumatic Anterior Dislocation

- Rotator cuff lesion
  - Associated rotator cuff lesions ranges from 4.7% - 11.5%
    - 11.5% (12/104) had an associated rotator cuff lesion
    - Yiannakopoulos Arthroscopy 2007 (LOE 4)
    - 4.7% (8/174) had an associated rotator cuff lesion
      - Shin Arthroscopy 2016 (LOE 4)

- Nerve Lesions (age 16-86)
  - 1.3% (1/75) associated neurepaxia of the axillary and radial nerve
  - 4% (3/75) associated neurepaxia of only the axillary nerve
    - Gumina Chir Organi Mov. 2005 (LOE 2)

Primary and Recurrent Inferior Dislocations

- Rotator cuff lesions (ages 14-78)
  - 6.3% (19/303) had an associated rotator cuff lesion
    - Primary inferior dislocations 20% (22/110) were more commonly to have associated rotator cuff lesion than recurrent inferior dislocations 15% (27/182)
      - Spatschil Arch Orthop Trauma Surg. 2006 (LOE 2)

- Hill Sachs Lesion (ages 14-78)
  - 80.5% (344/423) had an associated Hill Sachs lesion
    - Primary inferior dislocations made up 57% (45/81) of the Hill Sachs lesions whereas recurrent inferior dislocations made up 94%
  - Recurrent inferior dislocations = more associated Hill Sachs lesions compared to primary events
    - Spatschil Arch Orthop Trauma Surg. 2006 (LOE 2)

- MGHL, IGHL, and Hill Sachs lesions were all more common in recurrent inferior dislocations
  - Spatschil Arch Orthop Trauma Surg. 2006 (LOE 2)
• Associated, secondary intra-articular lesions are more frequent in patients with chronic compared with acute shoulder instability, probably as a result of the repeated dislocation or subluxation episodes.

### FEDS Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Labral Bankart</th>
<th>Rotator Cuff</th>
<th>Bony Bankart</th>
<th>Nerve Lesion</th>
<th>Great Tuberosity Fracture</th>
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### Risk Factors

#### Primary Traumatic Anterior Dislocation/Subluxation – Age Children

- **Age**
  - 92.9% (79/85) of children aged 14 years and older experienced an instability event following first time anterior dislocation
  - 40.4% (21/52) of children aged 13 years or younger experience recurrent instability
  - Children aged 14-18 years are 24.14 times (OR = 24.14, CI95 3.71 to 156.99) more likely to experience recurrence compared to those <13 years of age (OR = 24.14, CI95 3.71 to 156.99)
  - Olds BJSM 2016 (LOE 1)

- **Sex**
  - Males - 83.4% (57/66) had at least one recurrent episode of shoulder instability
  - Females – 51.6% (16/31) had at least one recurrent episode of shoulder instability
  - Male children are 3.44 times (OR=3.44, CI9 0.98 to 12.06) more likely to experience a recurrence
  - Olds BJSM 2016 (LOE 1)

#### Primary Traumatic Anterior Dislocation/Subluxation – Age < Children

- **Mechanism of primary shoulder dislocation**
  - Primary mechanism due to sports
  - 85.2% (36/42) had a recurrent episode of shoulder instability
  - Primary mechanics not due to sports
  - 70% (35/50) experienced a recurrent episode of shoulder instability
  - Children were 2.85 times (OR=2.85, CI95 0.64 to 12.62) more likely to experience recurrence when the primary mechanism was sports compared to non-sports
  - Olds BJSM 2016 (LOE 1)
Primary Traumatic Anterior Dislocation/Subluxation – Age < Children

- Open/closed proximal humeral physis
  - Open physis – 61.1% (39/59) had at least one recurrent episode of shoulder instability
  - Closed physis – 94.1% (16/17) had at least one recurrent episode of shoulder instability
  - Children with a closed physis are 14 times (OR=14.0, CI95 1.46 to 134.25) more likely to experience recurrent instability compared to those with open physis
    - Olds BJSM 2016 (LOE 1)

- Hill Sachs lesion
  - 100% (13/13) of subjects with a Hill Sachs lesion had at least one recurrent episode of shoulder instability
  - 72% (13/18) of subjects without a Hill Sachs lesion had at least one recurrent episode of shoulder instability
  - Individuals under the age of 18 years with a Hill Sachs lesion were 17.18 times (OR=17.18, CI95 0.76 to 390.92) more likely to experience recurrence
    - Olds BJSM 2016 (LOE 1)

Primary Traumatic Anterior Dislocation/Subluxation – Age < Children

- Hill Sachs lesion
  - 100% (13/13) of subjects with a Hill Sachs lesion had at least one recurrent episode of shoulder instability
  - 72% (13/18) of subjects without a Hill Sachs lesion had at least one recurrent episode of shoulder instability
  - Individuals under the age of 18 years with a Hill Sachs lesion were 17.18 times (OR=17.18, CI95 0.76 to 390.92) more likely to experience recurrence
    - Olds BJSM 2016 (LOE 1)

Primary Traumatic Anterior Dislocation/Subluxation – Adults

- Age
  - < 40 years of age had a 44% increased risk for an recurrence of instability compared to those > 40 years (11%)
  - Individuals who are < 40 years of age are 13.46 times (OR=13.46, CI95 (5.25 to 34.49) more likely to have a recurrent instability compared to those > 40 years
    - Olds BJSM 2015 (LOE 1)

Primary Traumatic Anterior Dislocation/Subluxation – Adults

- Sex
  - Men are 3.18 times (OR=3.18, CI (1.28 to 7.89) more likely to have a recurrent instability compared women
    - Olds BJSM 2015 (LOE 1)

Primary Traumatic Anterior Dislocation/Subluxation – Adults

- Greater Tuberosity Fractures
  - Individuals with a greater tuberosity fracture were over 7 times less likely to have a recurrence (OR=0.13 CI 0.06 to 0.36)
    - Olds BJSM 2013 (LOE 1)

Primary Traumatic Anterior Dislocation/Subluxation – Adults

- Hyperlaxity
  - Individuals with hyperlaxity are 2.68 times (OR=2.68, CI (1.33 to 5.39) more likely to have a recurrent instability compared to those who don’t.
    - Olds BJSM 2013 (LOE 1)

Primary Traumatic Posterior Dislocation

- Glenoid retroversion
  - Increased (glenoid) retroversion was associated with increased risk for posterior instability
  - HR= 1.17 CI 1.03 to 1.34 for every 1 degree of increased retroversion there was a 17% increased risk of posterior shoulder instability.
    - Owens AJSM 2013 (LOE 2)

Primary Traumatic Posterior Dislocation

- Strength
  - Increased external rotation strength in adduction (HR =1.06, CI95 1.01 to 1.12) and at 45 degrees of abduction (HR=1.07, CI95 1.01 to 1.13) was associated with those who had a posterior dislocation
  - Increased internal rotation strength in adduction (HR= 1.05 CI95 1.00 to 1.11) was associated with those who had a posterior dislocation
    - Owens AJSM 2013 (LOE 2)
Outcomes for Primary Traumatic Anterior Instabilities

• Level 1 and 2 limited information on Patient self-reported function (n = 22 articles)
  • Rowe Scores in RCT
    • 1 year follow up 12/30 good to excellent (>70)
    • Wound et al., 2014 (LOE 2)
    • 2 year follow up 7/15 good to excellent (>70)
    • Wound et al., 2014 (LOE 2)
  • Most recovery occurs in 1st year
  • Repeated follows ups with prospective cohort non-operative care in teenagers
    • Siggi et al., J Ped Ortho (LOE 3)

Outcomes for Primary Traumatic Anterior Instabilities

• 79 mos F/U following Non-op management(n=15) vs. surgical care (n=16) (33/original 40)
  • ASES 93.5 vs 94.7%
  • DASH 94 vs. 96%
  • WOSI 75 vs. 86%
  • 7 of the traditional group went to surgery but due to intention to treat analysis were kept in the non-operative group
    • Kilkey et al., Arthroscopy 2005 (LOE 2)

Outcomes of Inferior/MDI Instabilities

• One pre – post cohort study of 46 patients over 2 month window
  • Pre Rowe Score 52 (17) vs Post Rowe Score 75 (14)
  • Increased strength 25 -33%
  • Ide et al., JSES 2003 (LOE 2)

Outcomes of Inferior/MDI Instabilities

• 46 month F/U of MDI Involuntary and Voluntary Subluxations
  • Involuntary 28/33 Good to Excellent on Rowe score (>70)
  • Rowe & D’Hooiser JSES 2004 (LOE 3)

• 44 month F/U of 59 MDI patients of which 62 shoulders not received surgery
  • Rowe Score 50 (20) Constant score 76 (16)
  • 38/62 satisfied with shoulder following exercise
    • Aus et al., Mayo Clin Proc 80

Outcomes of Inferior/MDI Instabilities

• 46 month F/U of Posterior Involuntary and Voluntary Subluxations
  • Involuntary 8/8 Good to Excellent on Rowe score (>70)
  • Rowe & Rockwood JBJS 1992 (LOE 4)

• No other studies used PRO to describe outcomes

Outcome Summary

• Patients self-report level of function improves
• Patient with level of self-report of function rarely recovers to 90% or greater from rehabilitation
Thank You

- Up next... Diagnosis of shoulder instability

Diagnosis

Clinical examination to identify patients with shoulder instability

ERIC HEGEDUS, PT, PhD, DPT, OCS, CSCS

History

V- Expert Opinion

- Trauma
- Congenital
- Overuse

Tests & Measures - Motion Testing

- Motion testing
  - AROM may be painful
  - PROM may be excessive with reports of apprehension at end range
  - Accessory motions likely show greater excursion and maybe subluxation

V- Expert Opinion

Tests & Measures - Muscle Testing

- Muscle testing
  - Often no issue as MMT
  - Performance tests may show decreased function, pain, apprehension

V- Expert Opinion

Tests & Measures - Palpation

- Palpation is often unremarkable
- Unique tests as follows

V- Expert Opinion
Unique Tests
Anterior Instability
Level II - Lesser Quality Diagnostic Studies
Grade- A

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<td></td>
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<td>High</td>
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<td>Low</td>
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</table>

GRADE A

GRADE A

GRADE B

GRADE A
Load and Shift LR+ = 7

Pathology  | Lead Author  | LR+  | LR-  | Risk of Bias from QUADAS 2
--- | --- | --- | --- | ---
Anterior Instability | Van Kampen | 0.32 | Low

GRADE B

Hyperabduction Test LR+ = 6

Pathology  | Lead Author  | LR+  | LR-  | Risk of Bias from QUADAS 2
--- | --- | --- | --- | ---
Anterior Instability | Van Kampen | 0.37 | Low

GRADE B

Unique Tests

Posterior Instability

II- 1 Lesser Quality Diagnostic Study

Hyperabduction Test LR+ = 6

Pathology  | Lead Author  | LR+  | LR-  | Risk of Bias from QUADAS 2
--- | --- | --- | --- | ---
Inferior Instability | Gage | NA | NA

GRADE E - Cadaver study

Posterior Apprehension Test LR+= 19

* Shoot a photo

Pathology  | Lead Author  | LR+  | LR-  | Risk of Bias from QUADAS 2
--- | --- | --- | --- | ---
Posterior Instability | Jia | 0.82 | High

GRADE C

Unique Tests

Inferior Instability

Level V- Expert Opinion
Unique Tests
Multidirectional Instability

V- Expert Opinion

In My Opinion- Grade F
- Beighton index 5/9 or greater
- Almost always congenital
- Comparisons to opposite shoulder largely meaningless
- Best tests for anterior, inferior, and posterior instability to rule in

Diagnosis and Classification- Summary
- Diagnosis of specific shoulder pathology is not easy
- In other areas of the body where diagnosis is also challenging, classification systems are developed
- Many classification systems have been developed for the shoulder and are based often on etiology (ex: trauma) and direction (ex: anterior)
  - Recent classification systems have added frequency and severity
- No classification system has the requisite proven psychometric properties (ex: validity)

Diagnosis and Classification- Summary
- Traumatic instability is often suspected from patient history and confirmed by imaging
- Non-traumatic instability is more difficult but there are physical examination tests that can help
- Research on physical examination tests is primarily focused on anterior instability and secondarily on posterior instability while inferior and multidirectional instability are largely ignored

Other Considerations
Traumatic Dislocation & Hypermobility

Trauma
- X-ray for bony lesions
- MRI for soft tissue lesions
- MR arthrography for labral tear
Hypermobility Syndrome – Beighton Score

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<th>The ability to:</th>
<th>Right</th>
<th>Yes/No</th>
<th>Left</th>
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<td>Passively extend the 5th MCP to &gt; 90 degrees</td>
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<tr>
<td>Passively oppose the thumb to the (ulnar) forearm</td>
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<td>1</td>
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<tr>
<td>Elbow hyperextension of &gt; 10 degrees</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Knee hyperextension of &gt; 10 degrees</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hands flat on floor without bending knees</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total Possible Score = 9</td>
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</table>

Note: 5/9 + HMS

Marfan Syndrome- 2010 Nosology

- *Points for systemic score
- Wrist AND thumb sign = 3 (wrist OR thumb sign = 1)
- Pectoral muscle asymmetry = 2 (pectoral muscle or chest asymmetry = 1)
- Mild facial flattening = 2 (flat nose sign = 1)
- Scoliosis = 2
- Dural ectasia = 2
- Reduced upper segment/lower segment ratio AND increased arm/height AND no severe scoliosis = 1
- Skin striae = 1
- Myopia > 3 diopters = 1
- Mitral valve prolapse = 1

Ehlers Danlos Syndrome

- Requires genetic testing

Thank You

- Up next... Intervention:
  - Physical therapy interventions including
    - Immobilization
    - Exercise
    - Motor control/neuromuscular retraining
    - Bracing

Intervention

Evidence Based Recommendations for Treatment of Patients with Shoulder Instability

Anee L. Seitz, PT, PhD, DPT, OCS

1. Immobilization (following Dislocation)
   - Duration
   - Position

2. Exercise
   - Strengthening
   - Motor Control/Neuromuscular Retraining

3. Bracing for return to high demand activity/sport
Interventions Immobilization Duration & Position

- 1 week vs 3-4 weeks duration
- ER vs IR position

Population
- 1st Time Anterior Dislocation

Level of Evidence... Careful review

- No level I/II studies on duration of immobilization

- Excluded Hovelius 1983: allocation to group at 6/27 centers was based on date of shoulder dislocation. At 21/27 centers treatment was given according to customary practice- Not randomized/quasi (prospective observational study)

- Excluded Kiviluto 1980: of 99 patients, 53 immobilized for 1 week and 46 for 3 weeks. No indication of method of allocation. No response from study authors.

- Robinson 2006 was not included it is a prospective cohort examining factors associated with recurrent instability. No formal statistics were conducted to compare recurrence as it related to duration of immobilization. Level I prognosis but not level I intervention study

Results: Recurrence

Pooled meta-analysis

Patients younger <30 yo rate of recurrence:
41% (40/97) in patients immobilized for one week or less
37% (34/93) in patients immobilized for three weeks or longer
(p = 0.52). Bottom line………

Guideline Recommendation:

Immobilization Duration

- No randomized clinical trials (Level I/II evidence) for duration of immobilization
- High risk of bias or confounding in currently published observational study results

C There is no harm in immobilizing a patient for 1 week instead of 3 weeks following a first time anterior dislocation

Immobilization: Position

What is best position to immobilize shoulder s/p traumatic dislocation?

- Ilori et al ...
  - MRI study 19 patients
  - ER vs IR position
  - No significant difference in posterior displacement of the labrum was found

- Miller et al 2004 Hart 2005
  - Cadaveric and arthroscopic observations supports ER optimal healing position that approximates labrum in vivo
Randomized Trials Immobilization Position

- **Itoi 2007**
  - N=198 participants
  - 3 weeks immobilization
  - Randomized IR vs ER (10°)

- **Liavaag 2011**
  - N=51 participants
  - 3 weeks immobilization
  - Randomized IR vs ER (15°)

- **Taskoparan 2010 (level 2)**
  - N=188 participants
  - 3 week immobilization
  - Randomized IR vs ER (10°)

- **Finestone 2009**
  - N=33 participants
  - 4 weeks immobilization
  - Randomized IR vs ER (15°-20°)

N= 470 total; 371 (79%) males

Quality Assessment: Bias Risk High & Overall “low” grading

Hanchard 2014
- N= 6 Randomized Trials Immobilization Position (Level 1-2 evidence)

Whelan 2014
- N=60 participants
- 4 weeks immobilization
- Randomized IR vs ER (10°)

Heidari 2014
- N= 102 participants
- 3 week immobilization
- Randomized IR vs ER (10°)

Pooled DATA
- N= 632 total patients; 517 (82%) males
- Mean age= 30 years

Summary Evidence Immobilization Position

- **Recurrence (2yr f/u) 6 studies**
  - No significant difference between positions in low and high risk groups

- **Patient Reported Outcomes**
  - WOSI lower is better (3 studies)
  - Mean WOSI 83 (ER) vs. 89 (IR)
  - No significant difference between groups

- **Return Pre-Injury Activities (Itoi 2007 & Liavaag 2011)**
  - No significant difference (p>0.05)

- **Adherence**
  - 5 studies
  - No significant difference in self-reported adherence (p>0.05)

Recommendation Immobilization: Position

- Evidence for superiority of immobilization in ER over traditional sling in IR is lacking

There is no justification for change in current clinical practice

Interventions

1. Immobilization (following Dislocation)
   - Duration
   - Position
   - Terminology for population not consistent

2. Exercise
   - Strengthening
   - Anterior Dislocation (traumatic / atraumatic)
   - Motor Control/ Neuromuscular Retraining

3. Bracing for return to high demand activity/sport
4 Randomized Trials Surgery vs Non-surgical 1st anterior dislocation

Bottoni et al. 2002
- N=24 male active military
- Mean age 22yrs
- 4 weeks immobilization + rehabilitation vs Bankart repair
- Wintzell et al. 1999
- N=30 male active military
- Mean age 24 years
- 1 week immobilization + normal use vs Arthroscopic lavage
- Kirkley et al. 1999
- N=40 participants (35 males)
- Mean age 22yrs
- 3 week immobilization + rehabilitation vs Bankart repair
- Sandow et al. (abstract only)
- N=39 26 year old
- 4 weeks immobilization + Rehabilitation vs Bankart repair

Rehabilitation Protocol
Bottoni et al.
1. 4 weeks sling immobilization, limited active ROM and "some exercises" under physiotherapist supervision;
2. 4 weeks of progressive passive motion exercises followed by active-assisted ROM exercises without resistance
3. 4 weeks of progressively greater resistance exercises
4. Return to full active duty, contact sports and activities requiring over-head or heavy lifting restricted until 4 months

Kirkley et al.
1. 3 Weeks immobilization, then both groups had the same staged (4 to 6 weeks; 7 to 8 weeks; 9 to 12 weeks) rehabilitation protocol of progressive exercises, including easing of the restrictions in ER ROM
2. 3 month for return to non-contact or non-overhead sports;
3. 4 months for contact sports

Wintzell et al.
1. 1 week immobilization + normal use

Which is the most effective treatment for instability, surgery vs rehabilitation?

Randomized trials compare surgical intervention to non-surgical management:
- Bottoni et al. 2002* 24 males in military
- Kirkley et al. 1999* 40 patients
- Wintzell et al. 1999* lavage vs no rehab
- Sandow et al 1996* abstract only

• Limited evidence supporting primary surgery for young adults, usually male, engaged in high demand physical activities following their 1st acute traumatic shoulder dislocation
• There is no evidence for other patient groups

Summary Evidence: Surgery vs. PT for 1st Dislocation
• First time only dislocation: Rehab vs Bankart
• 2 published randomized trials - 1999
• 59/64 total patients males, 24 military population
• Mean age 22 years
• Greater likelihood of recurrence with rehab (64% recurrence vs. 33%)
• Both are successful at improving patient rated outcomes and return to activity
• The rehabilitation program in these studies (strengthening initiated at 8 weeks) is not current evidence-based standard of care
• Immobilization time (3-4 weeks versus shorter duration) is not standard of care for non-operative treatment of acute shoulder dislocation

Results: Recurrence Dislocation 2yr f/u

Surgery first in high demand patient?
• A key area of controversy
• Limited evidence with 2 randomized control trials recruited the population at highest risk of recurrence Level 2
• Shoulder instability also occurred in the surgical treatment group- pooled data 6/28 =21% (versus rehabilitation 43%)
• Only 50% of patients with recurrence in the conservative treatment group chose subsequent surgery
Guideline Recommendation: Progressive Exercise

Moderate evidence

Following first time dislocation PT consisting of graded exercise improves pain, function, and allows for return to activity

• GAP: More aggressive non-operative treatment rehabilitation program → neuromuscular control / strengthening started ≤ one week with is warranted (Prior recommendation Grade C)
• GAP: proprioception and motor control exercises

Interventions

1. Immobilization (following Dislocation)
   • Duration
   • Position
   • Atraumatic/Multidirectional Instability

2. Exercise
   • Strengthening
   • Motor Control/ Neuromuscular Retraining

3. Bracing for return to high demand activity/sport

Exercise-based management versus surgery for multidirectional instability of the glenohumeral joint: a systematic review

Sathi A-Matha, Talia Rizvi, Jon I-Hoel, Andrew Kolber, Jyr Motton

4 studies: No RCTs, 2 retrospective cohorts, 2 pre/post cohorts

Low quality evidence exercise better than surgery
   • Satisfaction
   • Self-report outcome measures
   • Shoulder kinematics
   • Likelihood return to sport

Both treatments improve pain, function, and activity participation

Comparison of 2 Exercise Rehabilitation Programs for Multidirectional Instability of the Glenohumeral Joint

Rockwood Program, 1992

Warby S, et al

“Motor Control + Strengthening” program

Scapular motor control + GH joint strengthening- 4 phases

Watson et al. Shoulder & Elbow 2017

• Greater improvements in motor control /strengthening program (Watson)
  • WOSI total score 12 weeks and 24 (>MCID) weeks (difference 11-12%)
  • Melbourne Instability Shoulder Score at 24 weeks (15% difference)

• Not included in rehabilitation program
  • Proprioceptive training: joint repositioning activities
  • Closed chain exercises
  • Kinetics Chain/ trunk/ core/ UE strengthening

Comparison of 2 Exercise Rehabilitation Programs for Multidirectional Instability of the Glenohumeral Joint

Rockwood Program, 1992

Knee Push-Up

Wall Push-Up

All exercises 5 repetitions with a 5-10 s hold at the end range of motion.
Guideline Recommendation: Motor Control + Strengthening

In patients with multi-directional instability, clinicians should consider progressive motor control and strengthening exercises to improve pain, function, and abduction ROM.

- GAP: More aggressive non-operative treatment rehabilitation program → neuromuscular control / strengthening started ≤ one week with is warranted (Prior recommendation Grade C)

Interventions

1. Immobilization (following Dislocation)
   - Duration
   - Position

2. Exercise
   - Strengthening
   - Motor Control/Neuromuscular Retraining

3. Bracing for return to high demand activity/sport

Bracing for return to sport/high demand activity following dislocation/subluxation

- 5 studies including patients ages 17-31 years
  - 4 prospective patient studies
  - 1 prospective case series
  - 2 retrospective studies
  - 3 cross-sectional studies (joint reposition sense with/without brace)

All subjects were managed non-operatively and treated with a brace during return to activity or sport.

- Bracing allowed for early RTS, 10 to 40 days, but recurrence rate is higher with an earlier return:
  - 76% with 5 days RTS (n=61)
  - 58% with 11-5 days RTS (n=66)
  - 18% with 60 days RTS (n=46).

- 50% of athletes (n=27/54) RTS without pain within 40 days; 10 had recurrence (37%)

- Joint reposition sense improves with use of brace near end range (10 degrees from full) shoulder external rotation.

Risk of Bias

- GAP: no comparative studies have been conducted examining the use of a brace for return to sport or high demand activity although the risk of recurrence increases with earlier return.

Guideline Recommendation: Rehabilitation + Bracing for Return to Activity/Sport

In patients who experienced a dislocation/subluxation, clinicians may consider recommending a brace for return to sport or high demand activity.

- GAP: no comparative studies have been conducted examining the use of a brace for return to sport activities

Thank You

- Up next: Examination:
  - Key impairments
  - Self-reported outcome tools
Examination

Evidence Based Recommendations for Examination of Patients with Shoulder Instability

Lori A Michener, PT, PhD, ATC, SCS

Examination

- Examination - Impairments
  - Deficits related to prognosis and risk factors
  - Functional requirements
- Examination – Outcomes Measures - Patient-Reported
  - Disease-Specific, Shoulder-Specific, and Patient-Specific Measures
  - Anchoring the scores

Examination: Impairments

Muscle Performance - Strength
- ER, IR, Elevation (abduction, scaption, flexion)
- Methods: MMT
  - 0 – 5 grades; limited reliability and validity
  - Alternative: 3 grades: markedly reduced, reduced, or normal
    Reliable (Wainner, 2003)
- Used to determine impairments
- Limited ability to assess change over time

Grade: B

Muscle Performance - Strength
- ER, IR, Elevation (abduction, scaption, flexion)
- Methods: HHD or Isokinetic
- Used to determine impairments
- Reliable in athletes, patients, & healthy
- Improved ability to assess change over time
- Isokinetic – concentric and eccentric

Grade: B

Range of Motion
- ER, IR, Elevation
- Methods: goniometer, inclinometer - bubble, digital, smartphone
  - Used to determine impairments
  - Reliability for all
  - Good ability to assess change over time
- Methods: IR by vertebral level
  - Limited reliability
- Additional: horizontal add or low flexion
  - Posterior shoulder tightness
  - Inclinometer as above

Grade: B

Additional Measures
- 1. Joint Position Sense
- 2. Pain Pressure
- 3. Scapular position and motion
- 4. Pectoralis minor length
- Limited evidence for clinical utility

Grade: C/ D
Examination: Patient-reported Outcome Measures

**Disease Specific Measures**
- Western Ontario Shoulder Instability Index (WOSI)
- Oxford Shoulder Instability (OSSI)

**Shoulder Specific Measures**
- ASES
- PENN
- DASH

Grade: B
QuickDASH

Examination: Patient-reported Outcome Measures

- Patient-Specific Measure
  - Patient Specific Functional Scale (PSFS) Grade C

Feeling Good Rather Than Feeling Better Matters More to Patients

- Feeling good – Patient Acceptable Symptom State (PASS)
  - PASS: "Taking into account your level of pain and also your functional impairment, if you were to remain for the next few months as you are today, would you consider that your current state is satisfactory?" *Yes* or *No*

- Feeling better – clinically important change (MCID)

Thank You....

Questions?