Glenohumeral instability

“A condition in which unwanted translation of the humeral head on the glenoid compromises the comfort and function of the shoulder”

(Matsen et al 1991 cited by Hill et al. 2008)
Classification

- **Frequency**
  - Acute
  - Recurrent
  - Chronic (fixed dislocation)

- **Cause**
  - Traumatic event (macrotrauma)
  - Atraumatic event (voluntary, involuntary)
  - Microtrauma
  - Congenital condition
  - Neuromuscular condition (cerebral palsy, seizures)

- Direction of instability not as relevant as whether structural, non-structural or both in management
Glenohumeral joint stability

Stability of the shoulder complex relies upon both active and passive mechanisms.

- Static
- Dynamic
Static stabilisers

- Articular anatomy
- Glenoid labrum
- Intra-articular negative pressure
- Capsule
- Ligaments
- Rotator cuff
Articular anatomy

- Humeral head – only 25–30% covered by glenoid
- Convex head: Concave glenoid – Stability provided by compressing to surfaces together
- Hyaline cartilage thickened centrally on humeral head and peripherally on glenoid
- Glenoid orientation retroverted approx 7 degrees superior and anterior – helps to prevent anterior translation of humeral head.
- Glenoid fossa is pear shaped, therefore an increased depth in the superior–inferior direction compared to anterior inferior.
Clinical significance

Stability may be compromised by damage to bony components

- Eg. Glenoid fracture or bony Bankart
- Mal union of surgical neck fractures affect glenoid retroversion
- Hillsachs lesion (if exceeds 50% of articular surface)
- Congenital hypoplasia of glenoid
Glenoid labrum

- Triangular fibrocartilage increases articulating surface area of glenoid and deepens glenoid by 50%
- Sucking effect
- Superior labrum is loosely attached and very mobile – provides attachment for long head biceps and superior and middle gleno–humeral ligaments
- Inferior labrum is firm and resistant to deformation
- Prevents slide of the humeral head down the glenoid
Negative intra-articular pressure (IAP)

- IAP in GHJ creates vacuum effect

- Conditions resulting in increased joint volume (e.g. Capsular defects, labral lesions) will affect joint seal, resulting in increased translation of humeral head
Capsular–ligamentous complex

- Lax inferomedially
- Blended with the cuff
- Presence of mechanoreceptors
Capsular laxity

- Increased translation can cause microtrauma to the static restraints
- Decreased proprioception
- Altered muscle activation patterns
- Less fatigue resistance
- Injury risk

Myers 2006
Hubscher 2000
### Capsular ligaments

<table>
<thead>
<tr>
<th>Ligament</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHL &amp; SGHL</td>
<td>Inferior and ER Posterior translation</td>
</tr>
<tr>
<td>MGHL</td>
<td>Anterior and inferior translation</td>
</tr>
<tr>
<td>IGHL – anterior band</td>
<td>Anterior translation</td>
</tr>
<tr>
<td>IGHL – anterior and posterior band</td>
<td>Inferior translation</td>
</tr>
<tr>
<td>IGHL – posterior band</td>
<td>Posterior translation</td>
</tr>
<tr>
<td>Posterior capsule</td>
<td>Posterior translation</td>
</tr>
</tbody>
</table>
Dynamic Stability

- Rotator cuff and deltoid
- Long head biceps (LHB)
- Scapula rotators

- Contraction of muscles centralises humeral head into the glenoid by providing compressive forces
- Tension developed by cuff tendons and deltoid squeezes the humeral head preventing anterior and posterior displacement
- Contraction also causes CLC to tauten and therefore assist stabilisation by static restraints
Rotator cuff & Deltoid

Supraspinatus
- Active throughout most arm movements
- Provides strong compressive force to help keep humeral head snug in glenoid in abduction and overhead

Subscapularis
- Main muscle preventing anterior humeral head displacement
- Also counteracts the upward pull of deltoid (with infraspin and TM)
**Inferior RC**

**Infraspinatus**
- Has oblique and horizontal fibres
- Oblique fibres depress humeral head against upward pull of SS and D

**Teres minor**
- Externally rotates and depresses humeral head

Deficiency in IRC can lead to 8mm increased translation of humeral head on initiation of abd, and 61% superiorly (impingement of SS)
Shoulder Instability

- A pathological increase in translatory movements that interferes with joint function and/or produces pain

- Classification of unstable shoulder
  - Many systems
    - Differentiate between structural damage (e.g., caused by trauma) and atraumatic (unbalanced muscle recruitment)
    - However, in reality, may be a combination of factors
  - Aims to identify suitability for surgery
Triangle (Bayley 2002) with 3 poles representing extreme types of instability

- In reality instabilities fall within triangle – combination of structural and neurological system disturbances

- Instability should be classified as due to muscle patterning disorder until proven otherwise
Type I Traumatic structural

- Significant trauma
- Usually Bankarts lesion
- Usually unilateral laxity
- No abnormal muscle patterning
Type II  Atraumatic structural

- No trauma
- Structural damage to articular surface
- Capsular dysfunction
- No abnormal muscle patterning
- Not uncommonly bilateral
Type III Muscle patterning
Non structural

- No trauma
- No structural damage
- Capsular dysfunction
- Abnormal patterning
- Often bilateral
Type I – true TUBS

Traumatic UniDirectional Bankart lesion treated with Surgery

- Most common
- Affects 2% of general population
- Average age early 20’s
- 85–95% anterior
- 75% during sport in Abd/ER
- Posterior dislocation occurs in flexion and IR
Type II True AMBRI

- Atraumatic Multidirectional Bilateral treated with Rehabilitation and if surgery is required an Inferior capsular shift

- Generalised ligamentous laxity (40–70%)
- Proprioceptive deficit
- Lax capsule and/or poor collagen structure
- Poor scapula stabilisers
- Dysfunction rotator cuff
- Often microtrauma/change in sport/activity or over use superimposed on already lax capsule = symptoms
Type III Non structural

- Abnormal sequencing of shoulder musculature
- No structural lesion
- Often present with odd movt patterns
- Surgery likely to fail
- Management – regain normal neuromuscular control and sequencing
Other structural lesions

Bankart – most common sustained in traumatic dislocation

1) ALPSA lesion (Anterior Labral Periosteal Sleeve Avulsion)
   Displaced bankart tear, where labrum has displaced around glenoid neck. High risk of recurrent instability

2) HAGL tear (Humeral Avulsion of Glenohumeral Ligament)

3) Bony Bankart
   Fragment of bone breaks off with Bankart tear
Other structural lesions

4) Hill–Sachs lesion – impaction of humeral head against glenoid rim during dislocation = posterolateral hum head #

5) SLAP – Superior Labrum Anterior Posterior tear in top of labrum

6) Rotator cuff tears
Young pts more likely to have extensive labral avulsions but significantly less likely to have RC tears following traumatic dislocations (Antonio et al 2007)
Posterior shoulder instability

- Less common than anterior
- Mechanism = fall onto fixed elbow/sh in flex +IR
- Possible history minor trauma/repetitive microtrauma
- Usually associated with capsular laxity and/or muscle patterning abnormalities
- C/O posterior shoulder joint pain (often worse with shoulder loaded in flex/IR)
History

- **Type I instability (traumatic dislocation)**
  - clear mechanism of injury for first time dislocation
  - normally require A&E joint reduction

- **Type II** – 84% with true voluntary instability present with no history of pain

- **Type II&III** – Most patients with atraumatic instability tend to be <25 years

- Overhead sports (throwing/swimming) predispose
## Shoulder instability

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Feeling of shoulder slippage with pain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insecurity when doing specific activities</td>
</tr>
<tr>
<td></td>
<td>No history of injury</td>
</tr>
<tr>
<td>Observation</td>
<td>Normal / Predisposing factors: Posture,</td>
</tr>
<tr>
<td></td>
<td>Poor jt position sense</td>
</tr>
<tr>
<td>Active ROM</td>
<td>Normal ROM Pain possible</td>
</tr>
<tr>
<td>Passive</td>
<td>Normal ROM Pain possible at extreme</td>
</tr>
<tr>
<td>Resisted isometric</td>
<td>Normal in test position May be weak in</td>
</tr>
<tr>
<td></td>
<td>provocative</td>
</tr>
<tr>
<td>Tests</td>
<td>Load and shift +ve</td>
</tr>
</tbody>
</table>
# Traumatic anterior dislocation

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Feeling of insecurity in specific positions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recurrent episodes of apprehension</td>
</tr>
<tr>
<td>Observation</td>
<td>Normal (if reduced)</td>
</tr>
<tr>
<td></td>
<td>Rounding of deltoid caused by anterior dislocation</td>
</tr>
<tr>
<td>Active ROM</td>
<td>Apprehension, decreased Abd and LR</td>
</tr>
<tr>
<td>Passive</td>
<td>Muscle guarding and decreased ROM in app position</td>
</tr>
<tr>
<td>Resisted isometric</td>
<td>Pain abduction and lat rot</td>
</tr>
<tr>
<td>Tests</td>
<td>Apprehension +ve Relocation +ve</td>
</tr>
</tbody>
</table>
Investigations

- X-ray – no value

- CT-scan – useful where there is instability secondary to glenoid dysplasia or traumatic fractures to assess bone architecture

- CT arthrography – identify labral tears and ligamentous laxity

- MRI – used more than CT. Effective to identify associated cuff damage, less useful for labral.
Arthroscopy – only way to accurately assess structural damage
Physical examination

- Examine both shoulders
- Cervical spine
- Generalized ligamentous laxity
Shoulder Instability Tests

- Lack of evidence for diagnostic accuracy of tests

- Apprehension, relocation and anterior release testss all appear to be diagnostic of anterior instability

- Biceps load II test appears diagnostic for SLAP lesions

  (Hegedus 2008 – Systematic review of shoulder tests)
Laxity tests

- Demonstrate the degree of translation at the GHJ (Hill et al 2008)
- Not reproduce symptoms
- Starting position of humeral head is important
- Inter and intra examiner error
- Differing interpretation of end feel
- Differing force applied to joint
# LAXITY TESTS

<table>
<thead>
<tr>
<th>TEST</th>
<th>TESTING</th>
<th>+ve LAXITY</th>
<th>PATIENT POSITION</th>
<th>HUMERAL HEAD ROTATION</th>
<th>RELIABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Load and Shift</strong></td>
<td>0-60° - superior GHL, CHL, RI</td>
<td>Mild :0-1cm</td>
<td>Sitting or supine</td>
<td>Neutral</td>
<td>Optimal reliability in 0° for post instability</td>
</tr>
<tr>
<td></td>
<td>60-90° - mid GHL</td>
<td>Mod: 1-2cm</td>
<td></td>
<td></td>
<td>Good reliability in 90 degrees for anterior instability</td>
</tr>
<tr>
<td></td>
<td>90°+ - inf GHL</td>
<td>Severe: &gt;2cm</td>
<td></td>
<td></td>
<td>McFarkand: oversensitive in diagnosing instability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Margery: Translation tests unreliable in conscious patients</td>
</tr>
<tr>
<td><strong>Anterior</strong></td>
<td>Anterior instability</td>
<td>Absence of a force loading the humeral head</td>
<td>Supine</td>
<td>80-120° abd 0-120° flex 0-30°ER Humeral head ant pressure</td>
<td></td>
</tr>
<tr>
<td><strong>Drawer Test</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>Posterior</strong></td>
<td>Posterior capsule and Labrum</td>
<td>Posterior translation and apprehension</td>
<td>Supine</td>
<td>80-120° abd 20-30° scap MR 90° elb flex Humeral head post pressure</td>
<td></td>
</tr>
<tr>
<td><strong>Drawer Test</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Sulcus</strong></td>
<td>MDI</td>
<td>Lateral acromion edge depression on gentle traction</td>
<td>Standing and sitting</td>
<td>Neutral</td>
<td>Unknown reliability</td>
</tr>
<tr>
<td><strong>Test</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Load and shift

- Translation of humeral head on glenoid
- Sitting or supine
- One hand over shoulder and scapula to stabilise the girdle
- Other hand grasps humerus
- Humerus loaded into glenoid and then translated anteriorly and posteriorly
- Can be assessed in neutral and varying degrees of abduction
Sulcus test

- Multidirectional instability
- Commonly complain of pain in midrange
- Pt stands/sits, arm by side
- Grasp forearm and pull inferiorly
- Increase in depression between acromion and humeral head
- Can be done in symptomatic positions
Provocation tests

- Test the ability of the shoulder to resist challenges to stability in positions where ligaments are normally under tension and therefore exacerbate symptoms of clinical instability i.e. Pain, apprehension, loss of function and joint clicking/popping

- Unable to differentiate between static and dynamic aetiology

- Lo et al (2004) found the Surprise test was the single most accurate test (Sensitivity 63–89% and Specificity 98–92%)
## Provocation tests

<table>
<thead>
<tr>
<th>TEST</th>
<th>+’VE TEST</th>
<th>PATIENT POSITION</th>
<th>HUMERAL HEAD ROTATION</th>
<th>SENSITIVITY: SPECIFICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprehension Test</td>
<td>Apprehension without dislocation Joint pain</td>
<td>Sitting and supine</td>
<td>90° abd IR to ER</td>
<td></td>
</tr>
<tr>
<td>Relocation Test</td>
<td>Fowlers sign (reduced symptoms)</td>
<td>Supine</td>
<td>90° abd ER Post stress</td>
<td>68%:100% in 90° abd with 90° abd ER (Guanche and Jones 2003)</td>
</tr>
<tr>
<td>Release/surprise Test</td>
<td>Re-initiation of apprehension +/- (P)</td>
<td>Supine</td>
<td>90° abd, ER +/- post stress</td>
<td>64-92%: 89-99% 93% 87% (Gross and Distefano 1997)</td>
</tr>
</tbody>
</table>
Apprehension (crank) test

- Primarily test for traumatic instability problems
- Relocation part used to differentiate between instability and impingement.
- Abduct arm to 90 and laterally rotate shoulder slowly.
- +ve test = pt looks or feels apprehensive or resists further motion (apprehension > pain)
- Sensation may resemble what it felt like when shoulder dislocated
Relocation test (Jobe’s)

- Apprehension test
- Apply posterior translation (AP) to HOH
- Will often lose apprehension, pain and ↑ROM LR
- Test +ve is pain decreases during test (even if there was no apprehension)
- If symptoms ↓, diagnosis is instability, dislocation or impingement
Release/Surprise Test

- The arm is released in the newly acquired range
- +ve test = pain and forward translation of humeral head
- Pain may be caused by anterior shoulder instability, labral lesion or bicipital tendinosis.
- Most commonly anterior instability

- Should be done with care, particularly with recurrent dislocations – release some LR
# Labral Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Testing</th>
<th>+ve Sign</th>
<th>Patient Position</th>
<th>Humeral Head Rotation</th>
<th>Sensitivity: Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active compression/ O’Briens Test</strong></td>
<td>General labral lesion</td>
<td>Increased (P) ‘inside’ the joint and reduced pain with ER</td>
<td>Sitting/standing</td>
<td>90° flex 10° add full IR with resistance ER with resistance</td>
<td>54-100%;31-98.5% (47% sensitivity for SLAP) 50-100% (O’Brien 1998, Stetson 2002, Guanche 2003)</td>
</tr>
<tr>
<td><strong>Crank</strong></td>
<td>General labral lesion</td>
<td>Increased (P) +/- ‘click’</td>
<td>Sitting/supine</td>
<td>160 degrees scaption Axial load Add rot</td>
<td>46-91%;56-100% 61-90% 94% (Liu 1996, Milmori 1999, Stetson 2002)</td>
</tr>
<tr>
<td><strong>Bicep Load Test 1</strong></td>
<td>General labral lesion</td>
<td>Increased (P) with resisted elbow flex</td>
<td>Supine/sitting</td>
<td>90° abd Full ER Resist elbow flex</td>
<td>90.9%;90% 83% 98% (Kim 1999)</td>
</tr>
<tr>
<td><strong>Bicep Load Test 2</strong></td>
<td>Isolated labral tear</td>
<td>Increased (P) on resisted elbow flex</td>
<td>Supine/sitting</td>
<td>120° abd Full ER Resist elbow flex</td>
<td>89.7%;96.9% 92.1% 95.5% (Kim 2001)</td>
</tr>
<tr>
<td>Test</td>
<td>Description</td>
<td>Position</td>
<td>Movement</td>
<td></td>
<td></td>
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<tr>
<td>Biceps tension</td>
<td>SLAP</td>
<td>Standing</td>
<td>Flex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression-rotation</td>
<td>SLAP, ‘catch’, ‘snap’ felt at the joint line</td>
<td>Supine</td>
<td>90 degrees abd, circumduction and rotation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clunk</td>
<td>General labral lesion</td>
<td>Standing and sitting</td>
<td>Ext to Flex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior Slide</td>
<td>AS general labral lesion, Ant GHJ (P), +/- pop or click</td>
<td>Sitting and standing</td>
<td>Hands on hips with thumbs facing post</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speeds Test</td>
<td>Biceps tendinitis, Bicep tendon (P)</td>
<td>Standing</td>
<td>Resisted Flex</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Management

....... Dave Burton
References

- Labriola, J (2005) Stability & Instability of the glenohumeral joint: The role of shoulder muscles JSES