Glenohumeral Instability

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G-H Instability: Introduction

- Glenohumeral stabilizers
- Traumatic glenohumeral dislocation
  - Anterior dislocation (95-98%)
  - Posterior dislocation
- Multidirectional shoulder instability (MDI)

G-H Instability: Introduction

- Laxity
  - the extent to which the humeral head can be translated on the glenoid
- Instability
  - an abnormal increase in glenohumeral translation that causes symptoms

- An asymptomatic shoulder that can be subluxed or dislocated is Laxity, not Instability!
Glenohumeral Stabilizers

- Static
  - Labrum
  - G-H ligaments
  - Adhesion-cohesion
  - Negative intra-articular pressure
  - Joint capsule

- Dynamic
  - Rotator cuff
  - Proprioceptive feedback of capsule
  - Scapular stabilizers
  - Deltoid
  - Biceps tendon

Glenohumeral Anatomy

Glenohumeral Static Stabilizers

- Labrum
  - Fibrous structure
  - Site of attachment for capsule, g-h ligaments, and biceps tendon
  - Increased contact area
  - Increases glenoid depth (50%)
  - “Chock block”
Glenohumeral Static Stabilizers

• GH Ligaments
  – IGHL (Inferior glenohumeral ligament complex)
    • Main stabilizer for inferior, anterior, and posterior translation at 90 degrees of abduction
    • ER tightens anterior band
    • IR tightens posterior band

• MGHL (Middle glenohumeral ligament)
  • Resists inferior and anterior translation at 45 degrees

• SGHL (Superior glenohumeral ligament)
  • Resists inferior and anterior translation in adduction

Glenohumeral Static Stabilizers

• Rotator Interval
  • Variably sized region between the Supraspinatus and Subscapularis
  • Associated with increased inferior (& ant/post) translation in MDI patients
Glenohumeral Static Stabilizers

- Adhesion-Cohesion forces
  - Synovial fluid and joint surfaces demonstrate stabilizing forces
- Negative intra-articular pressure
  - Kumar et al. *JBJS* 1985
    - “decompression” of joint due to lax capsule or RI defect

G-H Dynamic Stabilizers

- Rotator Cuff
  - Lippitt. *JBJS* 1993;
    - Concavity-compression
      - RTC compresses head into glenoid
      - Effect depends on intact labrum & amount of compressive force
      - RTC vital during MID-RANGE when capsule is lax

G-H Dynamic Stabilizers

- Proprioception of Capsule
  - Lephart *JSES* 1994 & Blasier *Orthop Rev* 1994 demonstrated proprioceptors in capsule modulate RTC forces
  - Alters concavity-compression stabilizing factor
G-H Dynamic Stabilizers

- Scapular Stabilizers
  - Levator Scapulae, Rhomboids, Trapezius, Serratus Anterior, Latissimus Dorsi function to position the glenoid perpendicular to humeral head to optimize compressive force
  - Rehab involves protraction, retraction, elevation, depression

G-H Instability: Radiological Evaluation

- AP, scapular lateral, axillary
- Stryker notch, internal rotation views for Hill-Sachs
- West point axillary
- CT Arthrogram or MRI for capsular volume & labral injury
GH Instability: Classification

• Frequency
  – acute, recurrent, fixed
• Degree
• Direction
  – anterior, posterior, inferior, bidirectional, multidirectional
• Volition: Involuntary or Voluntary
  – voluntary respond poorly to surgery!

GH Instability: Classification

• Etiology
  – Congenital
    • laxity in multiple joints
    • connective tissue disorders
  – Acquired
    • repetitive use in extremes of motion

Fig. 1 The patient with MDI often has hyperextension of the elbows.

GH Instability: Classification

<table>
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<tr>
<th>TUBS</th>
<th>AMRII</th>
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<tr>
<td>Traumatic</td>
<td>Atraumatic</td>
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<tr>
<td>Unidirectional</td>
<td>Multidirectional</td>
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<tr>
<td>Bankart lesion</td>
<td>Bilateral laxity</td>
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<td>Surgical repair</td>
<td>Rehabilitation</td>
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<td>Inferior shift</td>
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<td>Interval closure</td>
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Traumatic G-H Instability

- Diagnosis – evident with c/o instability
- Bankart Lesion
  - Taylor & Arciero, *AJSM 1997* found 97%
- Natural history
  - <20 y/o: 80-90% recur
  - 20-40 y/o: about 60%
  - >40 y/o: about 10%

Traumatic G-H Instability

- X-ray assures congruent joint
  - Need Axillary view
  - Look for Hill-Sachs, Glenoid bony Bankart
- MRI
  - To assess for Bankart, HAGL, and other lesions

Traumatic G-H Instability

- Post reduction immobilization traditionally in a sling
- Length & type of immobilization uncertain
  - *JSES 2003*: 30% recur in IR, 0% in ER
Traumatic G-H Instability

- Surgery recommended in young, active patient
- Arthroscopic labral (Bankart) repair
- Contraindications
  - Glenoid defect >25%
  - Large, engaging Hill Sachs
  - HAGL
  - Contact athletes (relative)

Arthroscopic Bankart Repair

Arthroscopic Bankart Repair
Arthroscopic Bankart Repair

Post-op Rehab

• Phase I: protection for 6 weeks
  – Pain control, retard atrophy, decrease inflammation
  – Gentle ROM avoiding excessive abduction, external rotation
  – Wound exercises, isometric flexion and extension
  – Wrist, elbow, hand exercises

Arthroscopic Bankart Repair

Post-op Rehab

• Phase II: 6-12 weeks post-op
  – Achieve full painless ROM
  – Active assisted ROM
  – Increase strength & neuromuscular control
  – Theraband & isotonic dumbbell
  – Scapulothoracic stabilizers

Arthroscopic Bankart Repair

Post-op Rehab

• Phase III: 12-20 weeks
  – Improve strength, power, endurance, neuromuscular control
  – Dynamic strengthening protocols, eccentric exercises, & functional movements
  – Prepare for return to sports
Arthroscopic Bankart Repair

Post-op Rehab
• Phase IV: 4-8 months P/O
  – Sport specific exercises
  – Return to activity
  – Must have full, painless ROM
  – No apprehension
  – Normal or near normal strength

Multidirectional Shoulder Instability (MDI)

• Recently described phenomenon
  – Neer & Foster 1980 provide “gold standard”
• Challenge to the standard
  – Arthroscopic repair

MDI: Pathophysiology

• INFERIOR CAPSULE
  – large, patulous
  – resists inferior translation as abduction increases to 90 degrees
• ROTATOR INTERVAL
  – defect, or attenuated tissue
  – stabilizer in adduction
MDI: Pathophysiology

- Patients with MDI commonly with bilateral shoulder laxity
- Must be other factors
  - Concavity-compression of RTC
  - Scapulothoracic muscles
  - Capsular proprioceptors
- Majority with MDI respond to physical therapy demonstrating importance of dynamic stabilizers

MDI: Pathophysiology

- Dynamic stabilizers crucial when passive restraints are lax
- Asymptomatic laxity may become symptomatic MDI if dynamic restraints overwhelmed by fatigue or trauma
- Self-perpetuating cycle ensues with neuromotor deconditioning

MDI: Diagnosis

- Based largely on history & physical exam
- Young adult in 3rd decade
- Bilateral about 15%
- Often no specific event, but ask about trauma
- Symptoms: PAIN, varying degrees of instability, & transient neurological deficits
- Pain often with normal functional activity
MDI: Diagnosis

- Seek positions & activities that reproduce symptoms
- Volitional nature of instability
- Frequency & force
- PHYSICAL EXAM
  - inspect for muscle atrophy & “squared” deltoid
  - cervical spine exam

MDI: Diagnosis - Physical Exam

- Glenohumeral ROM & scapulothoracic motion
- Muscle strength testing
- Brachial plexus and peripheral nerve exam
- Signs of generalized ligamentous laxity
- PROVOCATIVE TESTS
  - Sulcus sign to assess inferior stability

MDI: Diagnosis - Physical Exam

- Apprehension test followed by a relocation maneuver
- Load and shift test
- Push-pull test
- Jerk test
- Don’t forget the EUA!
  - Undisclosed pathology in relaxed patient
- Opposite shoulder
MDI: Diagnosis-Physical Exam

- The patient, the patient arm is abducted 90 degrees and internally rotated. The examiner exerts a downward force on the arm to plantarflex the shoulder. The elbow is hyperextensive. The examiner palpates the medial epicondyle of the humerus. The arm is then brought up to the starting position.

- The patient, the patient is supine and relaxed with the shoulder at the level of the chest. The examiner supports the arm in the abducted position. The examiner then exerts a downward force on the arm to plantarflex the shoulder. The elbow is hyperextensive. The examiner palpates the medial epicondyle of the humerus. The arm is then brought up to the starting position.

MDI: Non-operative Treatment

- Educate patient about dynamic stabilizers
- May need brief immobilization, NSAIDS, mild analgesic, or subacromial injection initially
- Physical Therapy
  - strengthen RTC, scapular stabilizers, deltoid
  - retrain glenohumeral joint proprioceptors
  - Minimum 4 months, followed by maintenance
- Burkhead and Rockwood (JBJS 1992)
  - satisfactory results in 29 of 33 (88%)
MDI: Inferior Capsular Shift

• Neer & Foster *JBJS 1980*
  – unidirectional procedures fail in MDI because they are incomplete
  – asymmetrically tighten joint causing fixed subluxation to opposite side leading to arthritis
  – must *globally* tension capsule while reinforcing it on side of greatest instability

MDI: Inferior Capsular Shift

• Neer & Foster *JBJS 1980*
  – anterior approach in 18, posterior in 15 patients
  – second anterior approach used if Bankart found while doing shift through posterior approach

MDI: Inferior Capsular Shift

• Anterior Approach
  – beach-chair position
  – 7-8 cm axillary skin incision
  – deltopectoral approach
  – subscapularis detached off humerus, separated from capsule
  – capsule incised from humerus
MDI: Inferior Capsular Shift

• Anterior Approach
  – arm adducted & externally rotated to protect axillary n.
  – horizontal “T” limb between inferior & middle GHL
  – inspect joint for Bankart or other pathology

• Anterior Approach
  – minimum 20 degrees ER, 10 degrees FF, 30 degrees AB
  – inferior flap brought superior, superior to inferior
  – rotator interval closed
  – immobilization for 6 weeks post-operatively

• Posterior Approach
  – lateral decubitus
  – oblique, 10 cm incision angles 40-60 degrees from scapular spine
  – deltoid split along fibers
  – infraspinatus incised 1 cm medial to greater tuberosity
MDI: Inferior Capsular Shift

- Posterior Approach
  - capsule incised 1 cm medial to humeral insertion
  - horizontal limb so junction of flap at middle of glenoid
  - superior flap brought inferior, inferior to superior
  - immobilized for 6 weeks

MDI: Arthroscopic Suture Technique

- Why arthroscopic?
  - possibility to identify & treat concomitant disease
  - lower morbidity and reduce pain
  - decrease surgical time
  - improve cosmesis
  - easier post-operative recovery
  - outpatient surgery to lower costs
  - less scar so less loss of external rotation (throwers)

MDI: Arthroscopic Suture Technique

- Why NOT arthroscopic?
  - is a glenoid based shift, unlike open humeral based shift potentially limiting extent of shift
  - unable to thicken and overlap tissue as is done with open technique
MDI: Arthroscopic Suture Technique

• Ideal patient for arthroscopic stabilization
  – non-contact athlete, throwing athlete, and sedentary patient

• Contraindication to arthroscopic repair
  – contact athlete, heavy laborers, non-throwing athletes
  – large Hill-Sachs or reverse Hill-Sachs lesion
  – glenoid dysplasia

MDI: Arthroscopic Suture Technique

• Suture anchor techniques
• Purse string techniques
• Anchors placed globally both anteriorly and posteriorly
• Large inferior shift of patulous capsule
• Must close rotator interval & immobilize

MDI: Arthroscopic Suture Technique

• McIntyre et al (Arthroscopy 1997)
  – 18 of 19 good or excellent results at average 34 months
• Treacy et al (J Shoulder Elbow Surg 1999)
  – 21 of 25 (88%) stable at average 60 months (range, 36-80 months)
• Gartsman et al (Arthroscopy 2001)
  – 44 of 47 (94%) good/excellent at average 35 months
MDI

• Rehab
  – Immobilize!
  – Similar rehabilitation as traumatic instability, but may progress motion slower
  – DYNAMIC STABILIZERS
    • RTC
    • SCAPULA MOTION and POSITION

G-H Stability Rehabilitation

• Principles
  – Shoulder functions as link in chain of sequentially activated segments
  – Chain starts with ground reaction force initiated by legs
  – 54% of force & 51% kinetic energy from legs, hip, trunk
G-H Stability Rehabilitation

• Principles
  - Link breakage at any level disrupts activation sequences & decreases forces transmitted to shoulder and hand
  - Restoration of the normal patterns throughout the entire linkage system required for normal shoulder function

Glenohumeral Instability

Questions?