**PRINCIPLES OF SHOULDER INSTABILITY REHABILITATION**

J. GREGORY BENNETT, PT, DSc, MS
Excel Physical Therapy
Marymount University

PROBLEM:

• INHERENTLY UNSTABLE JOINT COUPLED WITH EXCESSIVE DEMANDS

SOLUTION:

• DUAL INTERPLAY OF STATIC AND DYNAMIC STABILIZERS TO PROVIDE STABILITY AND MOBILITY

Anatomy

- Stability: ball & socket = compression in concavity effect
- Bone: big head – small cup = unstable
- Menisci: labrum = ↑ depth of cup by 20%
- Ligaments: glenohumeral & capsule
- Muscles: rotator cuff & biceps = holds ball in cup
- Primary Movers: Deltoid, Pec. major & Lat. Dorsy = subluxing forces
- Dynamic: proprioceptive feedback

COMPLEX INTERACTION

- JOINTS
- MUSCLE
- SPINE
- NEUROVASCULAR

Bony Anatomy

Anterior
Anatomy

- Glenohumeral joint
  - "Ball and socket" vs. "Golf ball and tee"
  - Very mobile
  - Price: instability
  - 45% of all dislocations
  - Joint stability depends on multiple factors

- Passive stability
  - Joint conformity
  - Glenoid labrum (50%)
  - Joint capsule
  - Ligaments
  - Bony restraints

- Muscles
  - Deltoid
  - Trapezius *
  - Rhomboids *
  - Levator scapulae *
  - Rotator cuff
  - Teres major
  - Biceps
  - Pectoralis muscles *
  - Serratus anterior *

* Scapular stabilizers

JOINT FORCES

- COPRESSION=JOINT STABILITY
- SHEAR/TRACTION=JOINT INSTABILITY

CAPSULOLIGAMENTOUS COMPLEX

- Superior ligaments
- Middle ligaments
- Inferior ligaments
- Post G-H ligaments
- Labrum

STATIC RERAINTS

- AIGHL-anterior inferior subluxation
- MGHL-anterior & ER limitation
- SGHL-anterior
- POST CAPSULAR-IR & anterior
**Dynamic Restraints**
- Supraspinatus
- Infraspinatus
- Teres Minor
- Subscapularis

**Force Couple**
- The rotator cuff, acting in concert, stabilizes the humerus and limits superior migration.

**Shoulder Forces**
- **Glenohumeral Motion**
- **Scapular Motion**
- **Rotator Cuff**

**Cuff Action**

**Joint Conformity**
- Ligaments
- Labrum
- Capsule
- Bony Restraint

**Labrum/capsule**
EVALUATION IS KEY
- Degree and type of instability
- Inflammation
- Associated pathology
- Muscular strength, endurance
- Biomechanical activity analysis
- Posture
- Emotional state

HISTORY: Symptoms
- Trauma-reduce
- Looseness/catching
- Dead arm syndrome
- “Feels like it pops out”
- Pain

HISTORY: Pain
- May be only symptom in athletes
- Poor indicator of location
- Manifests as impingement

EXAMINATION
- Compare
- Correlate

Range of Motion
- Forward flexion: 160 - 180°
- Extension: 40 - 60°
- Abduction: 180°
- Adduction: 45°
- Internal rotation: 60 - 90°
- External rotation: 80 - 90°

ARTHROKINEMATICS
OSTEOKINEMATICS
- In the shoulder (convex on concave surfaces), these motions occur in opposite directions. (Abduction stresses the inferior capsule).
Control exceeds strength in importance!

Strength Testing
- External rotation
  - Tests RTC muscles that ER the shoulder
    - Infraspinatus
    - Teres minor
  - Arms at the sides
  - Elbows flexed to 90 degrees
  - Externally rotates arms against resistance

Strength Testing
- Internal rotation
  - Tests RTC muscle that IR the shoulder
    - Subscapularis
  - Arms at the sides
  - Elbows flexed to 90 degrees
  - Internally rotates arms against resistance
  - Subscapularis Lift-Off Test
  - Other techniques

Strength Testing
- Supraspinatus
  - "Empty can" test
  - Jobe’s Test
  - Tests Supraspinatus
  - Attempt to isolate from deltoid
  - Positioned sitting
  - Arms straight out
  - Elbows locked straight
  - Thumbs down
  - Arm at 30 degrees (in scapular plane)
  - Attempts to elevate arms against resistance

SPECIAL TESTS
- Sulcus
- Apprehension
- Load/Shift
- Relocation
- Fulcrum
- Drawer
- Crank

Instability: Sulcus Sign
- Inferior instability
- Arm relaxed in neutral position
- Arm pulled downward at wrist
- Positive test is a visible sulcus at infra-acromial area
  - Compare to contralateral side
Instability: Apprehension Test

- Anterior instability
- Shoulder abducted to 90°
- Slight stress to humeral head directed in anterior direction
- While externally rotating shoulder
- Positive test is apprehension due to feeling of instability or impending dislocation
  - Beware of false positives

Instability: Relocation Test

- Anterior instability
- After a positive apprehension
- Apply posteriorly directed force over externally rotated humeral head
- Positive test is relief of apprehension
- Anterior release test
Glenoid Labral Tear
- Tear in glenoid labrum
- Usually due to instability
- SLAP Tear (Superior Labrum Anterior to Posterior)
  - Fall on outstretched hand or shoulder
  - Rotator cuff tendinosis or tears
- Bankart Lesion
  - Anterior-inferior labral tear
  - Anterior shoulder dislocation / subluxation

O'Brien's Active Compression Test
- Labral, AC, or biceps pathology
- Arm flexed to 90°
- Arm cross-arm adducted 10-15°
- Elbow extended
- Max pronation
- Resist downward force
- Positive test if painful
  - Beware location of pain
    - AC
    - Biceps
    - Internal +/- click

O'Brien's Active Compression Test
- For labral pathology
  - Repeat testing with
    - Max supination
  - Should be pain free

Labral Tear: Crank Test
- Abduct arm to 90-120°
- Stabilize shoulder
- Elbow secured with one hand
- Axially load with ER / IR at shoulder
- Positive test: audible or painful click / catch / grind

Shoulder Separation
- Perhaps the most common traumatic injury to an athlete's shoulder is known as a shoulder separation.
- Occurs at the acromio-clavicular joint (A/C joint).
- Must be differentiated from the glenohumeral joint
Shoulder Separation

**Causes**
An A/C separation occurs when you land on your shoulder with your arm at its side or you are hit from the side.
- Land on the “point of the shoulder”
- A hockey player being checked into the boards is a common scenario.

**Symptoms**
- Ache with overhead and cross-body activity
- Popping and clicking
- Rotator cuff tendonitis
- Trouble sleeping

**Types**
- **Type I**
  - A sprain (without a complete tear) of either of the ligaments holding the joint together.
- **Type II**
  - A tear of the acromioclavicular ligament.
- **Type III**
  - A tear of the acromioclavicular and coracoclavicular ligaments.
- **Type IV**
  - Both ligaments are torn, and the clavicle is pushed forward and sideways into soft tissue.

Gleno-Humeral Dislocation

**DEGREE of INSTABILITY**
- Subluxation
- Dislocation, self reduction
- Dislocation
- Separation*
Labral Tear/Bankart Lesion

- Seen at tips of red arrows

Gleno-Humeral Dislocation

- Initially, exquisite pain until joint is reduced
- Paresthesias or numbness in hand and arm
- Sense of instability or apprehension
- Weakness if rotator cuff is torn or stretched

DEGREES OF INSTABILITY

- Subluxation: Symptomatic translation
- Dislocation: Complete separation of joint surfaces
- Apprehension: Fear of Dislocation

DIRECTION

- Anterior
- Posterior
- Multidirectional

MECHANISM

- Traumatic
- Atraumatic
- Voluntary
- Involuntary

Instability allows humeral migration...

Impingement
Impingement is the secondary diagnosis

CLASSIFICATION

AMBRI - VS - TUBS

- Atraumatic
- Multidirectional
- Bilateral
- Rehab, usually effective
- Inferior capsule shift key

- Traumatic
- Unidirectional
- Bankhart
- Surgery

Traumatic and Atraumatic: Not Mutually Exclusive

AMBRI INSTABILITY

- ATramatic
- Multidirectional
- Bilateral
- Rehabilitation effective
- Inferior capsule shift

A.M.B.R.I.

- Voluntary or involuntary
- General laxity
- Rehabilitation Candidate
- Posture Related
- Gender Bias

ATRAUMATIC Signs/Symptoms

- General hypermobility
- Mild to Moderate inflammation
- General Weakness
- Poor Posture
- Anxious
AMBRI

- 80% satisfactory with rehab (Rockwood)
- Avg. 75% satisfactory with Rehab

TUBS INSTABILITY

- Traumatic
- Unidirectional
- Bankhart lesion
- Surgery frequent

TUBS

- 99% recurrence if <20yoa at initial trauma (AusSm)
- >20yoa 17% recurrence (Yoneda)
- >20yoa 25% recurrence (Aronen)
- D/L x2..poor non-surgery results

T.U.B.S.

- Traumatic
- Usually anterior direction
- Surgery (Bankart Lesion)

Conservative Treatment

Rowe – JBJS, 1957

- 324 young patient with ant. dislocations
- 94% had recurrence if < 20 years old
- 62% had recurrence if < 30 years old
- 14% had recurrence if > 40 years old

Burkhead & Rockwood (text book)

- 40 patients with acute dislocation & vigorous rehabilitation
- Only 16% had good or excellent result (1 in 6)

Deny & Drew – Injury, November 2002

- 21% of all patients presenting with shoulder dislocation had previous dislocation in 1 year
- 43% in patients 15-22 years had re-dislocations

Non operative treatment of shoulder dislocation in young athletes


80% recurrence rate
Non operative treatment ?? acceptable
Traumatic D/L
- 20% posterior
- 80% anterior
- ? MDI

Principles of Rehabilitation

EARLY CONTRAINDICATIONS
- Early overhead resistive exercise
- Early combined External Rotation & Abduction
- Aggressive Anterior or Inferior mobilization of Humerus

P.T. System Adjustments
- Atraumatic-
  - General Hypermobility
- Microtraumatic-
  - 15-35 Year Old overhead use
- Traumatic-
  - Single initial episode

ATRAUMATIC Signs/Symptoms
- General hypermobility
- Mild to Moderate inflammation
- General Weakness
- Poor Posture
- Anxious

ATRAUMATIC Treatment
- Heat or Ice, Meds
- Exercise
- Posture/Positioning
- Counseling
- Duration 2-4 weeks
### MICROTRAUMA

**Signs/Symptoms**
- Overhead athlete
- 15-35 years old
- Associated pathology
- Overuse Syndrome
- Muscle imbalance
- Faulty Biomechanics
- Impatient

**Treatment**
- Ice, electrical stimulation, Rest, NSAID
- Scapular & Rotator Cuff Strength and endurance, Flexibility
- Biomechanical adjustments
- Functional progression
- Duration 4 to 8 weeks

### TRAUMATIC

**Single episode (rehab effective)**

**VS.**

**Recurrent (rehab questionable)**

**Treatment**
- Immobilization 3 to 4 weeks
- Rehab-Similar to Post-Op
- Duration 10-12 weeks

### INCREASE STRENGTH

**Initial Strength sequence**
- Anterior Muscles
- Rotators
- Scapular
- Posterior Muscles

**Strength mode progression**
- Isometric
- Manual
- Isokinetic
- Isotonic
INCREASE STRENGTH
Muscle Isolation & Synergy
- Deltoids
- Rotator Cuff
- Scapular muscles
- Core
- Triceps/ Biceps

SCAPULA EXERCISE
- Shrugs
- Rowing
- Push-ups
- Serratus

OTHER EXERCISE
- Shrug
- Rowing
- Push-ups
- Serratus

EMPTY CAN?
- Which is More Useful, the "Full Can Test" or the "Empty Can Test," in Detecting the Torn Supraspinatus Tendon?
- Muscle weakness should be interpreted as indicative of supraspinatus tendon tear.
- Both tests are equivalent in terms of accuracy, but considering pain provocation, the full can test may be more beneficial in the clinical setting

SUPRASPINATUS ISOLATION
(Jobe)
- 90° abduction
- 30° Horizontal Adduction
- Full internal rotation (creates impingement above 90 degrees)

Posterior Instability Rehabilitation
- Slower than anterior
  "Less success
  "Less Familiarity
- Rehabilitation concepts with anterior instability are valid.
- Avoid Closed Chain
**Multidirectional Instability Rehabilitation**
- Slowest of all Rehab programs
- Emphasize isometrics
- Caution with long lever arm

**INCREASE STRENGTH**

**Strengthening Concepts**
- Sub-Maximal To Maximal
- Invulnerable Mid Range to full functional arc
- Overload not overwhelm
- Specificity

**INCREASE STRENGTH**

**Ultimate Strength Importance**
- Scapular Muscles
- Rotator Cuff Muscles
- Posterior Muscles
- Anterior Muscles

**POST-OPERATIVE REHABILITATION**

**UNDERSTANDING SURGERY**
- BANKART (Re-attach Labrum)
- LATARJET......
- BRISTOW (Coracoid Transfer)
- CASPARI (AIGHL)
- MAGNUSON-STACK (Advancement)
- PUTTI-PLATT (Overlapping)
- NEER CAPSULAR SHIFT (Repair)
CAPSULORRAPHY

- Create redundancy
- "reefing"
- "pants over vest"

THERMAL CAPSULORRAPHY

- "Thermal capsular shrinkage, radiofrequency thermal shrinkage, and thermal capsular shift"
- Causes the length of the collagen to shrink but does weaken the collagen
- How well does this procedure work?

Arthroscopic Thermal Shrinkage of Lax Shoulder Joint

Latarjet Procedure

- Transfer of the coracoid with its attached muscles to the deficient area over the front of the glenoid. This replaces the missing bone and the transferred muscle also acts as an additional muscular strut preventing further dislocations.

BRISTOW PROCEDURE

- Transfer of coracoid process
- Transfer conjoined tendon (pec minor & brachioradialis)
- Anterior bony block
Latarjet Procedure
Triple Effect

- Described by Patte:
  1) Increase or restore the glenoid contact surface area;
  2) Conjoint tendon stabilizes the joint when the arm is abducted and externally rotated, by reinforcing the inferior subscapularis and anteroinferior capsule;
  3) Repair of the capsule.

Rehabilitation Considerations

- Early postoperative therapy must protect the subscapularis and the development bone graft of the coracoid process. The therapy takes around 6-8 weeks and the biceps and coracobrachialis tendons be protected during this time. Therefore, aggressive shoulder extension and external rotation stretching is not advocated in the immediate postoperative period. Overhead motion should be gradual allowing the anterior structures to heal.

Phase I – Immediate Post Surgical Phase (Weeks 1-6)

- No active range of motion
- No excessive ER stretching (stop at end feel)
- Sling at all times, shower with arm in adducted position
- No lifting, pushing, pulling
- 100 deg FF, 30 deg ER, 20-30 deg abduction

Phase II – Intermediate Phase/ROM (approximately Week 6-9)

- Obtain AROM
- Discontinue sling by week 4-5
- Start light waist level activities
- Must have most PROM and good mechanics
- No pushing, pulling, lifting
- No excessive ER or stretching

Early Phase II (approximately week 6):

- Motion (FF to tolerance, ER to 45 with 30 deg abduction, IR to 45 with 30 deg abduction)
- Mobilize glenohumeral joint if decreased ROM. Only mobilize in directions of limited motion, address scapulothoracic and trunk mobility limitations as well.
- Start post capsule stretching

Late Phase II (approximately Week 9):

- Continue ROM
- FF, IR, abduction to tolerance
- ER progression, may progress once >35 deg ER at 0-40 abduction
- Strengthen scapular retractors and upward rotators
- Initiate balanced AROM program
- Low dynamic position first
Phase III – Strengthening Phase (approximately Week 10 – Week 15)

Goals:
- Improve strength, endurance, neuromuscular control
- Avoid aggressive overhead activities/strengthening
- Avoid contact sports/activities
- No strengthening until near full ROM

Precautions:
- Avoid aggressive overhead activities/strengthening
- Avoid contact sports/activities
- No strengthening until near full ROM

Phase IV – Overhead Activities Phase / Return to activity phase (approximately Week 16-20)

Goals:
- Return to full work and recreational activities
- Avoid stressing anterior capsular structures
- “Always see your elbows” exercises (avoid bench, dips, lat pulls behind shoulders)
- No throwing or overhead activities until cleared by MD

Precautions:
- Avoid stressing anterior capsular structures
- “Always see your elbows” exercises (avoid bench, dips, lat pulls behind shoulders)
- No throwing or overhead activities until cleared by MD

BANKART LESION
- Labral tear
- Fix or debride
- Usually anterior

PUTTI-PLATT MAGNUSSEN-STACK
- Subscapularis transfer
- Lose ER
- Ineffective for sports

SLAP LESION
- Superior
- Labrum
- Anterior to
- Posterior

HILL-SACHS LESION
- Eburnated bone
- 2° to instability
- Chondroplasty
ARThROSCOPIC SHOULDER STABILIZATION REHABILITATION

J. GREGORY BENNETT, PT, DSc, MS

Less trauma
• Faster rehabilitation
• ROM preserved
• NOT a license for aggression

PHASED REHABILITATION
Sequential and overlapping

GOALS
Sequential and overlapping

General Goals
✓ Communication essential
✓ Progressive/regressive
✓ Based on tissue healing
✓ CAUTION with weights with inferior instability

General Goals
• Control inflammation
• Re-establish ROM
• Strengthen
• Functional progression
SEQUENTAIL GOALS OF REHAB

- "Normal" passive and then active R.O.M.
- Synchrony of motion & neuromuscular control
- ↑ Endurance then strength
- Functional progression

GENERAL TIME FRAME

IMMOBILIZATION -
3-6 WEEKS IN SLING

FULL R.O.M. -
12-16 weeks

FULL STRENGTH -
16-18 weeks

RETURN TO HIGH DEMAND -
4-6 month with caution

PURPOSE OF EXERCISE

- Facilitate Healing
- Regain Motion
- ↑ strength/endurance
- ↑ Neuromuscular Control
- Improve function

Phase I

- Tissue approximation
- Healing
- Preserve ROM

IMMEDIATE REHABILITATION

- Isometrics for shoulder girdle
- Uninvolved joints to tolerance

Phase I

1. Sling 0-3wks
2. Pendulum exercises 1wk
3. Gentle isometrics 1wk
4. Active-assistive exercise 3-4wks
5. Dynamic exercise 4-6wks
Early Goals (1-6 weeks)
- Protect surgery
- Facilitate healing
- Begin to regain motion
- Neuromuscular control

Range of Motion Sequence
- Passive
- Active-Assistive
- Active-strength

PHASE II
- Increase ROM
- Neuro-muscular control
- Strength

1. Progressive Exercise 4-5wks
2. Endurance (high rep) 4-5wks
   Strength (higher wt) 6wks
3. Aggressive ROM 6wks

INTERMEDIATE GOALS (6-12weeks)
REGAIN FUNCTIONAL R.O.M.
30°External Rotation=9weeks
60°External Rotation=12weeks
80°-90°External Rotation=10weeks

INTERMEDIATE GOALS (6-12weeks)
REGAIN FUNCTIONAL R.O.M.
120° Flexion=8 weeks
150° Flexion=10 weeks
180° Flexion=12-14 weeks
INTERMEDIATE GOALS (6-12 weeks)

- Regain flexion first then horizontal abduction
- External rotation initially at side, then abduction
- Combined external rotation & abduction last.

PHASE III

- Increased intensity and specificity of exercise
- Functional progression

PHASE IV-DISCHARGE

10-16 weeks

- Maintenance exercised
- Counseling

Next Steps

1. Vigorous ROM as needed 8wks+
2. Vigorous strengthening 8-10wks+ incorporated isokinetics
3. Advanced neuromuscular exercise closed chain if desired 10wks+
4. Functional progression

ADVANCED REHAB (12-16 weeks)

- Strengthening & Endurance
- Neuromuscular Techniques
- Functional Progression

DISCHARGE

- MAINTENCE- Exercise Program
- COUNSELING- Activities
- Equipment
- Position
IMPROVE NEUROMUSCULAR CONTROL
- COMPRESSION
- PNF
- KINESTHETIC AWARENESS
- FEEDBACK
- VARIOUS MOTOR/SENSORY TECHNIQUES

POSTERIOR INSTABILITY
- Generally slower
- Exercise modified- "reversed"
  1. avoid IR; Horiz. Add
  2. avoid WB ex.

MULTIDIRECTIONAL INSTABILITY
- Slowest of all-long immobility
- Emphasis isom, ex, mid-range activity
- Non wt. loading prevents tractioning (hands on-not wts, on ex.)

THANK YOU!