Rehabilitation of Shoulder in the Overhead Thrower

Kevin E. Wilk, PT, DPT, FAPTA

Introduction

• Goals of presentation:
  1. Discuss rehab concepts in the thrower
  2. Describe several treatment strategies for the shoulder & elbow:
     - Post-Op Rehab Guidelines
     - Non-Op Rehab Approaches
     - ROM in the thrower
     - GIRD & TROM
     - Multi-phased approach to rehab
     - New exercises – insights
     - Return to throwing – different throwing plan

Recent advances in the treatment of the overhead athlete
The Thrower’s Shoulder

Treatment

- Non-operative rehabilitation is the first line of treatment. Mainstay of treatment!!
- Plays a key role in outcome
- Failed non-op treatment:
- Adjust your rehab program
- Common diagnosis:
  - Tendonitis
  - Biceps Pain
  - Internal impingement
  - Instability – SLAP lesions

Evaluate – Strategize – Implement – Assess – Adjustments

Glenoid Labral Lesions

Clinical Outcomes

Fedoriw, Linter et al: AJSM ’14

- Return to play after Rx of SLAP on professional baseball players:
  - Non-Op compared to Surgery
  - 119 consecutive patients retrospective review
  - 40% Pitchers return to play & 22% return to previous play with non-operative Rx
  - 48% Pitchers return to play & 7% return to previous level after SLAP repair
  - Position players: non-op (39% & 26%) SLAP repair (85% & 54%)

Elbow Injuries – Overhead Thrower

- Tremendous forces & stress
  - Acceleration phase: 64 Nm valgus stress
  - Increase stress with specific pitches (slider, split-finger)
  - Pitchers are bigger & stronger & able to generate
  - Tremendous torques generated

Better recognition of injuries

Rehabilitation Overhead Thrower

Rehabilitation Overview:

- Rehabilitation strategies for the overhead throwing athlete:
  - Stretching & flexibility
  - Activation drills
  - Restoring balance
  - Restore scapular position (posture)
  - Body restoration (core, hips & legs)
  - Plyometrics
  - Endurance
  - Gradual return to throwing

Evaluate – Strategize – Implement – Assess – Adjustments

UCL Pathomechanics

Maximum External Rotation

Elbow Varus Torque = 64 Nm (40#)

Fleisig GS: AJSM ’07
Medial Elbow Pathologies

**UCL Sprains**

- UCL is the main medial stabilizer of the elbow
- Anterior bundle is the primary structure involved in throwing

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Rehab UCL Repair Internal Brace

**Week 1:** Elbow brace at 90° locked 5-7 days
- Shoulder PROM & isometric exercises
- Scapular exercises, wrist PROM

**Week 2:** ROM Brace (30-110°)
- Continue shoulder exercises isotonics
- Initiate elbow & wrist exercises

**Week 3-4:**
- Thrower’s Ten Program
- Week 4-5 full PROM
**Week 5-6:**
- Advanced Thrower’s Ten Program

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Rehab UCL Repair Internal Brace

**Week 6:**
- Advanced Thrower’s Ten Program
- Plyometrics 2 hand drills

**Week 8:**
- Plyo 1 hand drills
- hitting week 10

**Week 11-16:**
- ITP Phase I (week 10-11)
- ITP Phase II (wk 14-15)

**Week 16+:**
- Return to play

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UCL Reconstruction
Rehab UCL Reconstruction

Overview – Rehab Phases

- Week 1: Posterior splint 90°
- Week 2: ROM brace 30-90°
- Week 3+: gradually increase elbow
  - Week 4: 10-125°
  - Week 5-6: 0-135°
- Perform shoulder PROM immediately post-op
- Wrist PROM immediately post-op

UCL RECONSTRUCTION REHAB

Return to Activity

- ITP (I): long toss – week 16
- ITP (II): mound - week 26
- Competitive throwing – 8-9 mos  (simulated game)
- RTP: 12-16 mos
- “Thrower’s Ten” program
  » Strengthening & Stretching

Rehabilitation Biceps Pain

Clin Spts Med ’16

Classification of long head biceps brachii pain

- Tendinopathy
- Tenosynovitis
- Biomechanical dysfunction
- Capsule irritation
- Glenohumeral joint hypomobility
- Capsular involvement
- SLAP lesion
Partial Undersurface Infraspinatus Tear

Posterior Labral Detachment With “Peel-Back”

SLAP Lesion – Arthroscopic View
Overhead Throwing Athlete

Glenoid Labral Tears
SLAP Lesions

Type II Peel Back Lesion
» Three types of subclasses
IIA: Anterior type III
IIB: *posterior type II
IIC: combined anterior & posterior type II

Burkhart, Morgan: Arthroscopy ’98

The peel back mechanism
Type II SLAP lesions

Burkhart, Morgan: Arthroscopy ’98

How Do SLAP Lesions Occur?

Ball Release
Arm Cocking

Rehabilitation Following SLAP Surgery
Partial Undersurface Infraspinatus Tear

Posterior Labral Detachment With “Peel-Back”

Overhead Throwing Athlete

SLAP Lesion – Arthroscopic View

Rehabilitation Following SLAP Surgery

SLAP Repair 1999

SLAP Repair 2014

Biceps Tendon

Posterior Superior Labrum

Glenoid

Rehabilitation Following SLAP Repair

Overview

SLAP Lesion Repair

Rehab Guidelines

- Rehabilitation must match the surgery
  » Repair vs. Debridement
- Based on type of lesion
  » SLAP classification I thru IV (VIII)
- Based on severity of SLAP lesion
- Consider patient’s age
- Emphasis on dynamic stabilization
- Do not overstress healing tissue (excessive
  Microtrauma injury -
  *think dynamic stabilization !!!

- Concern is to control forces/loads on repaired labrum
- ER/IR motion usually Not a problem no excessive motion for 12 wks*
- Restoration of full arm elevation (flexion) sometimes difficult
- Determine extent of lesion*
  » Number of suture anchors used
  » Location of lesion
- Ensure dynamic stability is present

SLAP Repair

1999

Glenoid

Posterior Superior Labrum

Biceps Tendon

Rehabilitation Following
SLAP Repair

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  » Location of lesion
- Ensure dynamic stability is present
Rehabilitation Following SLAP Repair

**Precautions**
- Control forces for 6-8 weeks
- No overhead movements (above 90) for 3-4 weeks
- Need stable glenohumeral joint
- Emphasize dynamic joint stability
  - Minimize GH translation
- No isolated biceps 8 weeks
  - No heavy lifting

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Rehabilitation Following SLAP Repair

**Range of Motion Progression**
- Sling for 3-4 weeks
  - Sleep immobilizer 4 weeks
  - Shoulder immobilizer for protection

---

Rehabilitation Following SLAP Repair

**Precautions**
- No CKC exercise drills till 8 weeks post-operative
- No resisted movements above 90 degrees elevation for 8 weeks
- No heavy bench press, heavy lifting overhead till 3 months post-operative

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Rehabilitation Following SLAP Repair

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  - Shoulder immobilizer for protection

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Rehabilitation Following SLAP Repair

**Range of Motion Progression**
- Full ROM by week 6-9
  - ER to 90° by week 6-7
  - ER to 105° by week 7-8
  - ER to 115° at week 10-12
- Plyometrics week 8
  - 2 hand plyos week 8-10
  - 1 hand plyos week 12
- No CKC drills for 8-10 weeks
- Isolated biceps: initiate week 8
  - Light & progress

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  - Light & progress
Rehabilitation Following SLAP Repair
Muscular Training

- Isometrics immediately – *sub program!!*
- Active ROM week 3
- *Light* isotonics week 4-6
- No isolated biceps for 8 weeks
- No CKC exercises for 8 weeks
- Advanced strengthening wk 10-12
- Plyometrics week 12-14
- Interval throwing week 16 (toss)
- Interval mound throwing program 5-6mos
- Interval hitting program week 12-14

Rehabilitation Following SLAP Repair
Functional Activities

- *Initiate throwing program* week 16
  - ITP long toss: week 16
  - ITP mound program week 22-26
  - Competitive throwing: 7-9 months
  - Interval Golf week 14
- Athletes must continue ROM & strengthening program
- Return to sports:
  - *Overhead sports: 6-9 months*

The Overhead Thrower
Introduction

- Highly skilled athlete
- Requires flexibility, muscle strength, coordination, synchronicity & *NM* efficiency
- Proper throwing mechanics
- Proper training program

Injuries Are Common to the Throwers Shoulder & Elbow

- Shoulder & elbow injuries are common in baseball – and appear to be increasing
- In professional baseball:
  - 28% of all injuries occur to the shoulder joint
  - 22% of all injuries occur to elbow joint
- Length of injury time is increasing – days on the disabled list days
  - Conte et al: *Am J Spts Med ’01*
  - Lyman et al: *Am J Spts Med ’02*
  - UE 75% time lost college baseball players

What’s New Thrower’s Shoulder
New Rehab Concepts

- GIRD assessment
- Assessment of humeral retroversion
- ROM & association with injuries
- Stretching techniques
- Thrower’s Ten Program
- Advanced Thrower’s Ten Program
- Lower Trapezius activation
- Serratus anterior activation
- Planking
- Shoulder & Hips/Core activation
- Endurance
- Weighted Ball Throwing
- BFR
Thrower’s Shoulder
Key Points
- Pitchers sustain injuries at the highest rate
- 64% of all team injuries pitchers compared to position players
- >75% of all pitchers injuries are to their shoulder/elbow
- Specific risk factors increases injuries
- Pitching when fatigued, or pitch too much (volume), improper throwing mechanisms, or max effort - all increase injury risk
- GIRD & GERI is predominantly due to boney adaptations
- ~83% boney & ~17% due to soft tissue
- Maintaining motion in throwing shoulder when healthy isn’t difficult
- Specific exercises & stretches are important – maintain!

Injuries in Baseball Players
Incidence of Injury
- DL Days:
  - 72% of all DL days are due to shoulder &or elbow injuries
  - 1998-2007: 2:1 shoulder to elbow DL days
  - 2007 to now: 1.9:1 elbow to shoulder DL days
- 61% of all DL days are pitchers
- relievers account for 32.5 % of DL days
- starters account for 30.7% of DL days

The Overhead Thrower
Introduction
- Overhead throwing motion
  - Extraordinary demands on shoulder & elbow joint
    - Fastest human movement – 7,220 o/s
    - Youth: 6382°/s  High School: 6545°/s
    - Late cocking to ball release 0.03 sec.
- Tremendous forces generated
  - Anterior displacement 0.5 x BW
  - Distraction forces 1 x BW at ball release
- Fleisig et al: Am J Spts Med ’95

Specific Rehabilitation Concepts
Wilk - Rehabilitation Throwing Shoulder
SPTS Team Concept Meeting 2017, Las Vegas, NV

### Rehabilitation Programs for Throwers

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROM/Flexibility Improvement</td>
<td>IR/Horz Add, Stabilization</td>
</tr>
<tr>
<td>Laxity</td>
<td>Stabilization</td>
</tr>
<tr>
<td>Tendinitis</td>
<td>Reduce Pain/Inflammation</td>
</tr>
<tr>
<td>Partial Thickness</td>
<td>Tissue Regeneration, Stabilization</td>
</tr>
<tr>
<td>Postural Adaptations</td>
<td>Core/Stabilization</td>
</tr>
<tr>
<td>Biomechanical Faults</td>
<td>Correct Throw</td>
</tr>
</tbody>
</table>

### Rehabilitation of Overhead Athlete

#### Motion Imbalance Program
- Improve IR ROM
- Restore total rotational ROM balance

**Capsular Restriction**
- Supine Horizontal Adduct Stretch
- Sleeper’s stretch
- Joint mobilization

**Musculotendinous**
- Treatment based on assessment

#### Postural Correction Program
- Improve soft tissue flexibility
- Pectoralis minor/maj stretches
- Strengthen Rhomboids/ Trapezius
- Neuromuscular control drills
- Scapular T spine -Pelvis Link
- Proprioception of scapular
- Scapular shirt

#### Kinetic Chain Effect
- Assess & treat deficiencies in the entire kinetic chain
- GH, ST, Core, Hips, Legs
- Pelvic girdle ➔ Shoulder girdle
- Hip abduction, ER, Extension
- ND & D Hip PROM
- Core position & stabilization

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Wilk_kevin
Rehabilitation of Overhead Athlete

Correct Biomechanics Program

- Is athlete able to get into proper body position – to perform task
- Adequate/ proper ROM
- Body awareness – proprioception

Break it down into components
- analyze each phase of the throw
- proper body position?

Biomechanical assessment

Motion Analysis Study ➔ Coach

Reduce Inflammation Program

- Reduce Pain &/or Inflammation
  - Tendinitis program
  - Anti-inflammatory treatment
  - NSAIDs, Laser, Iontophoresis
  - Restore tendon health
  - Flexibility (light program)
  - Strengthening program

Determine cause of onset

The Thrower’s Shoulder

Overview

- Excessive Motion especially External Rotation
- Requires stability
- Inherent hyper-laxity
- Allows tremendous mobility

Fine line:
Too loose & just right !!!

Rehabilitation of Overhead Athlete

Tissue Regeneration Program

- Rotator Cuff Partial Thickness Tears
  - Tendonosis - Tendinopathy
  - Restore musculotendinous flexibility
  - Promote collagen synthesis & organization:
    - Blood flow – laser, heat, etc
    - Eccentric loading of muscle
    - Higher reps (15/20 reps)
    - BFR
    - Nutrition - protein

Internal Impingement
Proposed Mechanism

Normal
GIRD
Hyperlaxity

Rotator Cuff Weakness / Fatigue
Scapula/ Posture
Mechanics

The Thrower’s Shoulder

Hypomobility
Hyperlaxity
Scapular – Anterior Tilted & Protracted
Poor Posture
Weak Core

Usually Presents with numerous contributing factors

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The Thrower’s Shoulder

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Weak Core

Usually Presents with numerous contributing factors
• 31 asymptomatic professional baseball pitchers tested at onset spring training
• MRI of glenohumeral joint
  - 28/31 (90%) abnormal glenoid labrum
  - 27/31 (87%) abnormal rotator cuff appearance
• 12/31 (39%) humeral head changes
• All pitchers were pain-free at time of study
• All MRI scans assessed by radiologist

Rehabilitation Guidelines

- Youth – Adolescent
  - Weak hips/core
  - Posterior chain weakness
  - Scapular weakness
  - ER weakness
  - Fatigue easily-endurance
  - Pitching biomechanics

- Elite Professional
  - Fine tune the shoulder
  - Calm inflamed tissue
  - Correct imbalances
  - Small corrections = big
  - Find the “issue/lesion”
  - Train power transfer

Andrews, Wilk, Reed et al: Spring Trn ’00

Shoulder Imaging & Clinical Rx

- **BARF**
  - Blind Application of Radiographic Findings
- **VOMIT**
  - Victim of Modern Imaging Technology

Rx the Patient - Not the MRI
Prevention of Arm Injuries
5 Specific Categories

- Pitch Counts:
  - Innings, Games, Year, …
- Rest:
  - Per week, end of year rest, no year round pitch
- Endurance:
  - Prevent fatigue, don’t pitch when tired
- Conditioning:
  - Proper ROM, strength, dynamic stability
- NM control & Coordination
  - Proprioception & neuromuscular drills

MLB Pitchers ≥ 200 Wins

Youth Baseball Player
Risk Factors for Injury

Rehabilitation of the Thrower
Rehabilitation – 4 Phases Program

- Phase I: Acute Phase:
- Phase II: Subacute Phase:
- Phase III: Advanced Phase:
- Phase IV: Return to Activity Phase:
Rehabilitation of the Thrower
Rehabilitation – 4 Phases Program

• Phase I: Acute Phase:
  ✓ Normalize motion
  ✓ Decrease inflammation & pain
  ✓ Normalize muscular ratios
  ✓ Activation of specific muscles
  ✓ Establish Scapular base (posture)

• Phase II: Subacute Phase:
  ✓ Continue stretching program
  ✓ Isotonic strengthening program
  ✓ Scapular & Glenohumeral joint
  ✓ Throwing’s Ten Program
  ✓ Core & Leg program

• Phase III: Advanced Phase:
  ✓ Advanced isotonic program
  ✓ Strength, power, & endurance
  ✓ Advanced thrower’s ten program
  ✓ Plyometrics
  ✓ Continue stretching & ROM program

• Phase IV: Return to Activity Phase:
  ✓ Advanced thrower’s ten program
  ✓ Adjust the program when throwing
  ✓ Plyometrics
  ✓ Interval throwing program (ITP)
  ✓ Light stretching program (maintain)

Rehabilitation of the Thrower
Rehabilitation – Keys to Treatment

✓ Active Rest – not total rest
  Abstain from throwing (2 – 8 weeks)
✓ Stretch – normalize motion (esp IR)
✓ Strengthen ER, scapular muscles
✓ Enhance dynamic stabilization
  mid-range progressing toward end-range
✓ Gradual return to throwing
✓ Return to competitive throwing

Rehabilitation of the Thrower
Diminish Pain & Inflammation

• Rest – from throwing
• Stretch /motion - tolerance
• Exercise at tolerance level
• Modalities
  ✓ Laser
  ✓ Iontophoresis
  ✓ Injection
  ✓ Hybresis
  ✓ Heat or ice ???

Rehabilitation of the Thrower’s Shoulder
Diminish Pain & Inflammation & DOMS

• Stretching Techniques
Sleeper’s Stretch
Modified Sleeper’s Stretch

McClure et al: JOSPT ‘07

- Randomized controlled comparison for stretching posterior shoulder tightness
- 30 subjects with 10 deg loss of IR compared contralateral side
- Compared sleeper stretch (n=15) to cross body (n=15) to control group (n=24)
- Stretches 5 reps for 30 sec for 4 weeks
- Significant improvement in IR in cross body group (20°) compared to control (6°)
- Sleeper stretch (12°) no sign increase in IR compared to control

Moore, Laudner, McLoda et al: JOSPT ‘11

- 61 Division I baseball players randomized into 1 of 3 groups:
  - muscle energy technique for horz abd
  - muscle energy technique for ER
  - control
- A single application of MET for the shldr horz abd provided immediate gain in IR & horizontal abduction

Modified Side-Lying Cross Body Stretch

Laudner, Sipes, Wilson: J Athl Trn ‘08

- Effects of sleeper stretch during a season
- 33 Division I baseball players were evaluated (15 pitchers, 18 position players)
- ROM assessed pre & post season
- 3 stretches of 30 sec stretch
- Stretching produced an increase in IR ROM – however not stat sign
Wilk, Macrina, Fleisig, et al: AJSM ‘15

- 8 year GIRD study – 1 professional team
- N=505 Pitcher/ Seasons (n=296 pitchers)
- Correlation of spring training shoulder ROM to DL days & surgery (shoulder)
  - GIRD did not correlate (p=0.862)
  - TROM did correlate (p=<0.05)
  - >ER was protective
  - 77 shoulder injuries
  - Players who had surgery spent 3x more time on DL getting well, 208.5 days on DL

Corner Stretch – Pect Minor

Rehabilitation of the Thrower’s Shoulder

- Can you stretch too much ??
  - Stretch into ER ROM?
  - PROM vs Stretching
  - Stretch into IR?
  - Too much ??

What about the TROM concept?
**ROM & Stretching**

*My Thoughts:*

- **Stretching & ROM on healthy players:**
  - Stretch to maintain healthy ROM
  - Hold stretch for 30 sec, 3-4 stretches to maintain
  - Dynamic stretching prior to throwing

- **Stretching & ROM on players with injury:**
  - Stretch to improve motion to desired ROM
  - Consider TROM & GIRD
  - Balance the GH joint PROM
  - Stretch for 30 sec but more stretches, more times per day
  - Determine cause of loss of motion (capsule, muscle, …)

---

**Rehabilitation of the Thrower**

*Rehabilitation – 4 Phases Program*

- **Phase I: Acute Phase:**
  - Normalize motion
  - Decrease inflammation & pain
  - Normalize muscular ratios
  - Activation of specific muscles
  - Establish Scapular base

- **Phase II: Subacute Phase:**
  - Continue stretching program
  - Isotonic strengthening program
  - Scapular & Glenohumeral joint
  - Fine tune muscular ratios
  - Core & Leg program

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**Enhancing Activation of Posterior Cuff**

**Dynamic Stabilization & Activation of Rotator Cuff**

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**Rehabilitation of the Thrower’s Shoulder**

*Rehabilitation*

- **Emphasize dynamic stabilization**
- ER & scapular muscle strengthening
  - ER / IR ratio (70 – 75%)
  - Scapular retractors / protractors

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**Thrower’s Ten Program**
Rehabilitation of the Thrower’s Shoulder

- **Rehabilitation Concepts**

  - Improve proprioception and Neuromuscular control
  - **Mid-Range → End-Range**
    - Progress gradually to fast speed movements
    - Enhance end range dynamic stabilization
      - Improve proprioception
      - Co-contraction rotator cuff
      - Centralize humeral head

**Thrower’s Ten Program**

- D2 PNF Flexion
- Standing Full Can
- Lateral Raises
- Tubing ER/IR
- **www.asmi.org**

- Sidelying ER
- Prone Full Can
- Prone Horz Abduct
- Prone Row into ER
- **www.asmi.org**

- Prone rowing
- Elbow Flex/Ext
- Sup/Pron & Wrist Flex/Ext
- Push-Ups
- **www.asmi.org**
Scapular Muscle Training

**Alternating day schedule:**
- Isotonic table exercises days-
  - Goal: strengthen/hypertrophy
  - traditional exercises
  - progress with dumbbells
  - neuromuscular drills
- Stability Ball days-
  - Goal: NM control & dynamic stab
  - Isotonic exercises on stability ball
  - NM control drills
  - Core, hips & legs

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### Lower Trapezius Exercises

Kibler et al: AJSM ‘08

**TABLE 2**
Average Amplitude EMO Activity AR Subject (M ± SD) by Exercise

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Inferior Gluteal</th>
<th>Low Row</th>
<th>Latsverter</th>
<th>Hubby</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper trapezius</td>
<td>10.6 (8.4)</td>
<td>10.4 (8.4)</td>
<td>21.9 (19.7)</td>
<td>21.4 (18.7)</td>
</tr>
<tr>
<td>Lower trapezius</td>
<td>10.6 (8.4)</td>
<td>10.4 (8.4)</td>
<td>21.9 (19.7)</td>
<td>21.4 (18.7)</td>
</tr>
<tr>
<td>Nerveus anterior</td>
<td>19.4 (18.6)</td>
<td>20.8 (18.5)</td>
<td>21.5 (22.4)</td>
<td>20.8 (18.5)</td>
</tr>
<tr>
<td>Nerveus posterior</td>
<td>19.4 (18.6)</td>
<td>20.8 (18.5)</td>
<td>21.5 (22.4)</td>
<td>20.8 (18.5)</td>
</tr>
<tr>
<td>Posterior deltoid</td>
<td>10.0 (10.0)</td>
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*Data are given in means (standard deviations): EMO, electromyography; RL, ribbon; LM, latsverter; SA, semitendinosus anterior; UT, upper trapezius; AD, anterior deltoid; PD, posterior deltoid; LT, lower trapezius*
Reverse Wall Slides

Scapular neuromuscular control drills
Bilateral Extremity Exercises

Rehabilitation of the Thrower’s Shoulder
Progress Strengthening Program

- Emphasize muscular balance
- Manual resistance drills
- Rhythmic stabilization drills @ end range
- Isotonic strengthening
- Trunk and leg training
  Core tone & stabilization

Hot Topics Shoulder Rehab
What You Need to Know

BFR Procedure:
- Blood Flow Restriction
- Designed to enhance muscle return
- Muscle hypertrophy
- Hypoxic environment
- Intramuscular anabolic signaling
- Proliferation stem cell release
- Results in greater muscle hypertrophy
Serratus Anterior Drills/Exercises

CLX ER Spiral
CLX ER Spiral

CLX ER Double Bands: ER & Retract

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Ball on Wall Stabilization Drills
Push Ups on Rocker Board RS

Rehabilitation of the Thrower’s Shoulder
Rehab- Advanced Phase

- Utilize plyometric training as transition
  » Two hand drills → one hand drills
- Gradual return to throwing
- Monitor throwing mechanics
Plyometrics with Dynamic Stabilization

Rehabilitation of the Thrower’s Shoulder

Exercise & Training Programs

• Thrower’s ten Program
  ✔ 2% increase in throwing velocity in adolescent baseball players (11-15 yrs) isotonic program for 4 weeks

  Escamilla: J Strength Cond ’10

• Plyometrics:
  ✔ 2% increase (PLY), Throwers 10 (1.7%) in throwing velocity in adolescent baseball players (14-17 yrs) plyometric program 6 wk

  Escamilla: J Strength Cond Res ’12
Rehab Overhead Thrower

Interval Throwing Program

- How far should a player throw ???
- Pitcher vs position player
  - Should pitchers throw further than 120 ft ???
  - From 120 feet – progress to off the mound program
  - Normalize biomechanics

Interval Throwing Program

- Rate of progression
  - 50% - 75% - 100%
- What does that mean ?
  - 50% is really 75%
  - 75% is really 90%

- Fastballs – Breaking balls

Interval Throwing Program

Long Toss Program

- Suggested ITP:
  - Gradually increase distance
  - 120 –150 feet ??? Or further ?
- Advantages
  - Arm strengthening
  - Flexibility (get loose)
  - Strength it out “get long”
- Disadvantages:
  - Ball release point
  - Differences in mechanics
  - Increased arm stress

Is Throwing Longer Better ??

Interval Throwing Program

Mound Throwing

- Rate of progression
- Fastballs – Breaking balls

Sub-Max Throwing

Fleisig, Bolt, Fortenbaugh, Wilk: JOSPT ’11

- 17 healthy college pitchers
- Biomechanical analysis of long & short throwing
- Threw 18.4m, 37m, 55m & maximal distance on a line
- Shoulder line was horizontal for mound distance but gradually went uphill as distance increased
  - Maximal throwing distance resulted in more ER, more Elb Flexion, more shoulder IR torque & more varus elbow torque
- Trunk tilt gradually increased with distance

Throwers’ Shoulder Injuries

- Fatigue

Effects of shoulder fatigue:
  - Leads to injuries - little league pitchers
  - Lyman, Fleisig, Andrews: AJSM ’02
  - Olsen, Fleisig, Andrews: AJSM ’06
  - Increase superior migration humeral head
  - Wickiewicz, Otis, Warren: JSES ’91
  - Fatigue effects performance & mechanics
  - Murray, Cook, Werner, Hawkins: AJSM ’01
  - Proprioception diminishes by 78%
  - Carpenter: AJSM ’98
  - Scapular position changes
  - Macrina, Wilk, Reinold: APTA CSM ’06
Weighted Ball Programs – Plyoball 1#

Boost Your Fastball With This Weighted Baseball Workout!

Rehab Overhead Throwing Athlete
Weighted Ball Programs

- Popular form of training
- Proposed to increase throwing velocity
- Program utilizes weighted baseballs
- 4-8 week program prior season
- Been using plyoball throws since ’86
  Wilk, Gambetta, et al: JOSPT ’93
- Literature review:
  DeRenne: Athlete J ’85
  DeRenne: J Appl Sppt Sci B ’90
  Escamilla et al: Sport Health ’00
  Fleisig et al: JSIH ’16

Rehab Overhead Throwing Athlete
Weighted Ball Programs
Rehab Thrower’s
Key Points

- Recognition of pathology
  differential diagnosis
- Establish cause - treat cause
- Improve posterior flexibility IR & Horz Adduction (IR) *
  STRETCH & Normalize
- Establish muscular balance
- Scapular muscular strength
- Enhance proprioception & NM
  Gradual return to throwing

Thank You!