Introduction

- Goals of presentation:
  - Discuss rehabilitation concepts of the overhead thrower
  - HIT the HIGH POINTS
  - Describe several treatment strategies for the shoulder & elbow:
    - Specific rehab concepts
    - Pathology-specific
    - Multi-phased approach to rehab
    - New exercises – insights
    - Return to throwing

Recent advances in the treatment of the overhead athlete
Rehabilitation Overview:

- 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
**Thrower’s Shoulder**

**Key Points**

- Pitchers sustain injuries at the highest rate
  - 64% of all team injuries pitchers compared position players
  - 73% of all pitchers injuries are to their shoulder/elbow
- Specific risk factors increases injuries
  - Pitching when fatigued, or pitch too much (volume), improper throwing mechanics, 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

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**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

Tremendous stresses & velocities

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Overhead throwing motion

- Extraordinary demands on shoulder & elbow joint
  - Fastest human movement – 7,240 o/s
  - Late cocking to ball release 0.03sec

Tremendous forces generated

- Anterior displacement 0.5 x BW
- Distraction forces 1 x BW at ball release

Fleisig et al: *Am J Spis Med* ’95
Fleisig et al.: *J Biomech* ’99
Overhead throwing motion
- Moderate to high levels of muscular activity
  » 80-120% of MVIC during acceleration phase of pitch
  DiGiovine et al: JSES’92
Effective transfer of kinetic energy
- Over 60% of kinetic energy during pitch generated by legs
  Toyoshima et al: Biomech ’86

Introduction - Injuries
- Shoulder & elbow injuries are common in baseball – and appear to be increasing
- In MLB big league level:
  » 67% of all injuries to pitchers are to the upper extremity
  » Pitchers are 2.5x more likely to injury their UE than position players
  » Shoulder most commonly injured joint in pitchers
  » Shoulder joint 31% of all injuries to pitchers
  » Elbow joint 26% of all injuries to pitchers
  Posner et al: AJSM ‘12
  Wilk et al: AJSM ’11
  Conte et al: AJSM’01

- 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
  Conte et al: Am J Sppts Med ’01
- In youth baseball – 50% of players (9-14) complained of elbow or shoulder pain
  Lyman et al: Am J Sppts Med ’02
- UE 75% time lost college baseball players
Injuries in Baseball Players

Incidence of Injury

- Major League Baseball Injuries 1998-2012
- 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: 1.8:1 elbow to shoulder DL days
- 61% of all DL days are pitchers
  - relievers account for 31.5% of DL days
  - starters account for 29.7% of DL days

Elbow Injuries in Baseball

UCL Surgeries – Conte, Wilk, et al: AJSM ’15

- Surveyed all Minor League Baseball Players
- 4,052 respondents (2,145 pitchers)
- 29/30 teams responded
- 100% responses in 29 teams
- 331 players had UCLr (8%)
- Pitchers: 300/2145 (14%)
- Position players: 31/1907 (2%)
- Avg age at time of surgery 21

Elbow Injuries in Baseball

UCL Surgeries: Conte, Wilk, et al: AJSM ’15

- Surveyed all Major League Baseball Players
- 1,036 respondents
- 30/30 teams responded
- 100% responses in 30 teams
- 166 players had UCLr (16%)
- Pitchers: 25%
- Position players: 5%
- 49% UCLr received concomitant surgery
Rehabilitation Overhead Thrower

Rehabilitation Overview:

- Rehabilitation strategies for the overhead throwing athlete:
- Stretching & flexibility
- Activation drills
- Restoring balance
- Restore scapular position
- Plyometrics
- Endurance
- Gradual return to throwing

Evaluate – Strategize – Implement – Assess – Adjustments

Specific Rehabilitation Concepts

New Rehabilitation Concepts
Rehabilitation Programs for Throwers

- ROM/Flexibility Improvement
- IR
- Looseness
- Stabilization
- Tendinitis
- Reduce Pain/Inflammation
- Partial Thickness
- Tissue Regeneration/Strength
- Postural Adaptations
- Posture/Core
- Biomechanical Faults
- Correct Throw
Rehabilitation of Overhead Athlete

**Stabilization Program**
- Emphasize dynamic stabilization drills
  » Neuromuscular control
  » Rhythmic stabilization
  » Proprioception drills
  » Perturbation activities
- Muscular balance
  » ER/IR
  » ER/Deltoid
  » Scapular ratios
- Entire body awareness
  (core, hips)
- Core stabilization drills - tone

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

Rehabilitation of Overhead Athlete

**Postural Correction Program**
- Improve soft tissue flexibility
- Pectoralis minor stretches
- Strengthen Rhomboids/ Trapezius
- Neuromuscular control drills
- Scapular ↔ Pelvis Link
- Proprioception of scapular
- Scapular shirt
Rehabilitation of Overhead Athlete

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

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

Rehabilitation of Overhead Athlete

Reduce Inflammation Program

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

Determine cause of onset
Rehabilitation of Overhead Athlete

Tissue Regeneration Program

- Rotator Cuff Partial Thickness Tears
- Tendonosis - Tendinopathy
- Restore musculotendinous flexibility
- Promote collagen synthesis & organization:
  - ↑ blood flow – heat, ultrasound, etc
  - Cold laser
  - Eccentric loading of muscle
  - Higher loads
  - Nutrition, PRP, Stem Cell

The Thrower’s Shoulder

Scapular – Anterior
Tilted & Protracted

Hyperlaxity

Hypomobility

Poor Posture
Weak Core

Usually Presents with numerous contributing factors

Internal Impingement

Introduction

- Occurs during abduction & excessive external rotation
- Late cocking during pitching
- Supraspinatus / Infraspinatus rubs on the posterosuperior glenoid rim & labrum
- Results in fraying of cuff & glenoid labrum – inflammation

Andrews: Tech Orthop ‘88
Walch: JSES ‘91
Jobe et al: JSES ‘93
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
    ✓ Thrower’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 Overhead Athlete
Rehabilitation Programs

• Diminish inflammation & pain
• Improve dynamic stabilization
• Re-establish proper ROM & flexibility
• Correct posture & scapulae position
• Promote core control
• Correct throwing mechanics
• Tissue regeneration
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

- Iontophoresis
- Hybresis

The Action-Patch

Anderson et al: Physical Therapy 83(2) 2003
Iontophoresis Application

• By 2001, 1440 US patents & 5600 articles incorporating the term "iontophoresis"

• Factors affecting iontophoresis:
  » Current flow & depot formation
  » forms in the first 2mm layer
  » skin (epidermis)
  » Tissue penetration – through diffusion
  » Deeper tissue penetration

Iontophoresis Hybresis

Hybresis Treatment Modes

1. Injuries & Healing
2. Relief of Pain
3. Management of edema
4. 1 minute
5. 3 minutes

Iontophoresis

IOMED

"Really... Reason to Recover"
Rehabilitation of the Thrower’s Shoulder
Soft Tissue Mobilization Techniques

Loss of IR Due to Several Factors:

1. Osseous adaptations
2. Scapular posture – anterior tilt
3. Posterior muscular tightness
4. Shoulder fatigue
5. Posterior capsular thickness/thickness

Osseous Adaptation and Range of Motion at the Glenohumeral Joint in Professional Baseball Pitchers

From Fellowship Orthopedic Arkansas, Arkansas, Arkansas Sports Medicine Institute, Birmingham, Alabama, Tampa Bay Devil Rays Biomedical Cts, Tampa Bay, Florida, and University of Florida Shands Clinic, Gainesville, Florida
Crockett, Gross, Wilk, et al: AJSM ’02

- 25 professional baseball pitchers
- Compared to 25 subjects (never played baseball)
- Assessed laxity, ROM and CT scan
- Average ROM
  - Throwers: ER 129º, IR 61º
  - Non-throwers: ER 119º, IR 7º
- Total motion: NS side-to-side
- Laxity: NS side-to-side

CT scan: humeral retroversion:
- Throwing side: 40º
- Non-throwing side: 20º

Control group (NT): 22º = bilateral

Humeral Retroversion Throwers

Bilateral Differences – 34 studies

Reagan, Meister, Horodyshki, Wilk, et al: AJSM ’02 (10°)
Osbahr, Cannon, Speer: AJSM ’02 (10°)
Chart, Litchfield, et al: JOSPT ’07 (10.6°)
Pieper: AJSM ’98 (9.4° up to 29°, painful grp less retrov)
Whiteley et al: JOSPT ’09 (Ultrasound 11.9°)
Hibberd et al: AJSM ’14 (Ultrasound - age dependent)
Myers et al: AJSM ’12 (validation study – ultrasound)
Myers et al: Sports Health ’11 (injury related – college age)
Tokish et al: J Spts Sci Med ’08 (radiographs) (11.2°)

Nakase, et al: AJSM ’16 (Ultrasound) (14°)
Itami, et al: AJSM ’16 (CT scan) (16°)
Noonan : AJSM ’16 (Ultrasound) (15°)
Saka et al: OJSM ’15 (CT scan) (10°)
Hibberd et al: AJSM ’14 (Ultrasound) (16°)
Oyama et al: Clin Biomech’13 (US) (12-14°)
Wyland et al: AJSM ’12 (Ultrasound) (13°)
Myers et al: AJSM ’12 (ultrasound) (13°)
Myers et al: Sports Health ’11 (US) (15°)
Polster et al: AJSM ’13 (CT scan) (10.9°)
Influence of age on GIRD, humeral retrotorsion, retrotorsion adjusted GIRD & TROM on healthy baseball players
- 52 youth aged (6-10 yrs of age)
- 52 junior high school (11-13 yrs)
- 70 junior varsity (14-15 yrs)
- 113 Varsity (16-18 yrs)
- GIRD & retrotorsion increased with age while retrotorsion adjusted GIRD & TROM remained unchanged –
- GIRD is primarily attributed to retrotorsion & not due to soft tissue tightness

Noonan, Shanley, Bailey, et al: AJSM ’16
- Humeral torsion risk factor for shoulder/elbow injuries in professional baseball pitchers
- Relationship between GIRD & retortorsion
- 222 pitchers assessed in spring training
- IR, ER & TROM, retrotorsion assessment (US)
- GIRD = 15° ≥, TROM 10° ≥
- 60 pitchers exhibited GIRD (27%)
- GIRD pitchers exhibited greater retrotorsion (19°) compared to Non-GIRD (12°)
- IR was affected retrotorsion but not ER

Ultrasound Retroversion Corrected ROM
Why is the humeral retroversion of throwing athletes greater in dominant shoulders than in nondominant shoulders?

Kishimoto Tanaka, MD, *T* JG, KIC, MD, *S* Hoshikurii Kimigawa, MD, Masekiyo Yoshida, MD, Y.
Ishikawa, Sato, MD, *S* Masaaki Seki, MD, *S* Tsuyoshi Kurosaka, MD, *S* Shinya Koshigoe, MD, and
Takuya Mihara, MD, *K* Akira and *S* Yutaka, *J* Japan

Assess the angle, the humeral retroversion. The humeral retroversion is defined as the degree of posterior translation of the shoulder joint center relative to the lower end of the humerus. The normal range is 0 to 10 degrees, with a value of 15 degrees or more considered abnormal. We used the method of determining the humeral retroversion, as in the following paragraphs. Visual inspection of the humeral retroversion angle was performed in the supine position with the shoulder in neutral rotation and abduction. The humeral retroversion angle was then measured with a goniometer. The normal range of humeral retroversion is 8 to 10 degrees.

ASSESS DON'T ASSUME!!

Treat the clinical findings.
ASSESS DON'T ASSUME!!

Treat the clinical finding

ASSESS DON'T ASSUME!!

Treat the clinical finding

Total Rotational Motion Concept (TRM)
ER + IR = Total Motion
“Envelope of Motion”

Wilk AJSM ’02
Total Rotational Motion is equal bilaterally (within ±5 degrees)

Throwing Shoulder

Non-Throwing Shoulder

Rehabilitation of Overhead Athlete

Rehabilitation Programs

• Diminish inflammation & pain
• Improve dynamic stabilization
• Re-establish proper ROM & flexibility
• Correct posture & scapulae position
• Promote core control
• Correct throwing mechanics
• Tissue regeneration
Sleeper’s Stretch with a Lift*

Modified Sleeper’s Stretch

Modified Sleeper Stretch
Modified Sidelying Cross Body 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 adduction
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

Lintner, Mayol, Uzodinma, Jones, Labossiere: AJSM ‘07
- 85 professional pitchers enrolled in study
- Divided into 2 groups:
  » Group I: pitchers in stretch program 3 yrs or >
  » Group II: pitchers with < 3yrs in stretch program
- Pitchers with 3 yrs or more in stretch program exhibited greater IR ROM (74 vs 54 degrees) & greater TROM 217 vs 194 degrees

Corner Stretch – Pect Minor
Rehabilitation of the Thrower’s Shoulder

**ROM & Stretching**

- **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,...)

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**Rehabilitation of Overhead Athlete**

*Rehabilitation Programs*

- Diminish inflammation & pain
- Improve dynamic stabilization
- Re-establish proper ROM & flexibility
- Correct posture & scapulae position
- Promote core control
- Correct throwing mechanics
- Tissue regeneration
Rehabilitation of Overhead Athlete

Re-establish Static/Dynamic Stability
- Static stabilization
  - Hold stationary position
  - Low level control drill
- Dynamic stabilization
  - Ability to move through space
  - Then stabilize
  - Moderate level control drill

It's all about capturing/controlling HH

Rhythmic Stabilization ER/IR

Restoration of Proprioception
- Awareness of joint position
- Eyes open & closed
- Performed static/dynamically
- Levels of proprioception
  - Progression through stages

Apprehension to Controlled Apprehension
Rehabilitation of Overhead Athlete

Rehabilitation Programs

- Diminish inflammation & pain
- Improve dynamic stabilization
- Re-establish proper ROM & flexibility
- Strengthening program
- Promote core control
- Correct throwing mechanics
- Tissue regeneration
**Rehabilitation of the Thrower’s Shoulder**

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

**Enhancing Activation of Posterior Cuff**

**Thrower’s Ten Program**
Thrower’s Ten Program

D2 PNF Flexion

Standing Full Can

Tubing ER/IR

Lateral Raises

Thrower’s Ten Program

Sidelying ER

Prone Full Can

Prone Horz Abduct

Prone Row into ER

Thrower’s Ten Program

Prone rowing

Elbow Flex/Ext

Push-Ups

Sup/Pron & Wrist Flex/Ext

www.asmi.org
Rehabilitation of the Thrower’s Shoulder
Rehabilitation Concepts

• Improve proprioception and
  Neuromuscular control

Mid-Range
• Progress gradually to fast
  speed movements
• Enhance end range dynamic
  stabilization
  » Improve proprioception
  » Co-contraction rotator cuff
  » Centralize humeral head

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
Scapular Muscle Training

**Alternating day schedule:**
- Isotonic table exercises days: strength
- Stability ball – NM benefits, core, legs, bilateral
### Lower Trapezius Exercises

**Kibler et al: AJSM ’08**

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Lower</th>
<th>Middle</th>
<th>Upper</th>
<th><em>SA</em></th>
<th><em>AD</em></th>
<th><em>LD</em></th>
<th><em>MD</em></th>
<th><em>BD</em></th>
<th><em>LT</em></th>
<th><em>RT</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upper trapezius</strong></td>
<td>8.1 (5.9)</td>
<td>10.4 (8.3)</td>
<td>21.8 (15.7)</td>
<td>31.0 (14.7)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Lower trapezius</strong></td>
<td>19.4 (26.0)</td>
<td>15.4 (11.6)</td>
<td>30.5 (19.2)</td>
<td>37.0 (20.0)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Serratus anterior</strong></td>
<td>22.6 (18.9)</td>
<td>20.2 (20.9)</td>
<td>30.5 (25.4)</td>
<td>29.0 (18.6)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Anterior deltid</strong></td>
<td>4.6 (2.4)</td>
<td>16.4 (15.3)</td>
<td>5.5 (6.0)</td>
<td>7.4 (5.5)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Posterior deltid</strong></td>
<td>8.6 (0.6)</td>
<td>42.4 (25.2)</td>
<td>15.2 (19.6)</td>
<td>14.6 (5.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Between muscles</strong></td>
<td>6A ≤ 7A, AD, FD</td>
<td>PD = UT, LE, AD</td>
<td>UT = LT ≥ 8A</td>
<td>UT ≥ LT ≥ AD</td>
<td>SA = UT, LE</td>
<td>PD = AD</td>
<td>UF = LF ≤ FD</td>
<td>SA = UT, LE</td>
<td>PD = AD</td>
<td>UF = LF ≤ FD</td>
</tr>
</tbody>
</table>

*Data are given in means (standard deviations): EOG = electromyography; RL, rehabilitation; SA, serratus anterior; UT, upper trapezius; AD, anterior deltid; PD, posterior deltid; LE, lower trapezius.*
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
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
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

Rehabilitation of the Thrower’s Shoulder

Functional Drills

- Stretching & ROM
- Thrower’s ten program
- Plyometric drills
- Interval throwing program:
  - long toss
  - interval mound throwing
  - Gradual return to competition
Throwers’ Shoulder

**Daily Routine**

**Alternating Day Schedule**
Heavy work days & light work days
Volume & intensity of exercise

**Heavy Volume Days:**
- Exercise
- Throw
- Exercise

**Light Volume Days:**
Light exercise, neuromuscular drills, physioball, stretch, core, scapulae, & techniques to recovery

Rehab Overhead Thrower

**Functional Drills**

**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

**Long Toss Program**
- Suggested application
  » Gradually increase distance
  » 120 – 150 feet ???
- Advantages
  » Arm strengthening
  » Flexibility (get loose)
- Disadvantages:
  » Ball release point
  » Differences in mechanics

Is Throwing Longer Better ??
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

Interval Throwing Program
Mound Throwing

- Rate of progression
  50% - 75% - 100%
- What does that mean?
  ✓ 50% is really 75%
  ✓ 75% is really 90%
  Fleisig et al: ASMI '98

- Fastballs → Breaking balls

Partial Tear Classification

Articular

Bursal

Ellman 1987
Partial Thickness Tear (Articular)

- T2: Fluid Signal extending into black tendon
- Partial Thickness Undersurface Tear

Rehab of Partial Rotator Cuff Tears

Critical Factors

• Depth of cuff lesion:
  » Small: 15% or less
  » Moderate: 15–40%
  » Significant: 40% or greater

• Location of lesion:
  » Involved muscles
    • supraspinatus, infraspinatus, ??
  » PASTA &/or PAINT Lesions

Rehab of Partial Rotator Cuff Tears

Classification

Partial Thickness tears
Small tears:  15% or less
Moderate size: 15 – 40%
Significant tears: 40% or greater
50% or greater

Treatment Based on Classification Determines Rate of Rehabilitation
Rehab of Partial Thickness Rotator Cuff Tears

Rehabilitation Concepts

- Restore musculotendinous flexibility
- Promote collagen synthesis & organization:
  - ↑ blood flow – heat, ultrasound, etc
  - Eccentric loading of muscle
  - Submax higher reps
  - Nutrition

Tissue Regeneration

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
Rehab of Partial Rotator Cuff Tears

Throwing Progression

- Interval Throwing Program
- Progress gradually to ITP when appropriate
- Specific criteria
  - Small tears: wk 12-14
  - Moderate tears: wk 16-18
  - Significant tears: wk 18-20
- Variable timeframes

Gradually Progress to Mound Throwing
Rehab Overhead Athlete

Return to Play Criteria

- Full sport specific non painful ROM
- Strength which meets the criteria
- Excellent stability and no painful special tests
- Demonstrates proper throwing mechanics
- Successfully has completed rehab program
- Appropriate rehab progression completed
- Satisfactory functional scoring

An Objective Criteria is Important

Assess Muscular Strength

Biodex - Isokinetics

- ER / IR ratios
  - 72 - 76%
- ER / ABD ratios
  - 68 - 73%
- Torque / BW ratios
  - ER 18 - 23%
  - IR 26 - 32%
- Bilateral comparison
  - ER 95-100%; IR 115%

Wilk et al: AJSM ’93
Wilk et al: AJSM ’95

Return to Play Criteria

Appropriate Rehab Progress

- Plyometrics
  - painfree 1 hand throwing
- Dynamic stabilization drills
  - RS drills at 90/90 (P/F)
  - prone ball drops
Return to Play Criteria

Ball Drop Test

- Dynamic stabilization tests
  - Prone ball drops
    - 30 sec test
    - prone on plinth
    - number of releases/catches
    - compare Dom to Non Dom
    - score: %
    - Goal: 90%>
    - Expectation: 110%>

Return to Play Criteria

Single Leg Squat

- Single leg squat test
  - Floor or 8 in step
    - 10 reps on each leg
    - assess depth
    - assess valgus/varus
    - assess lateral trunk movt.
    - assess trunk flexion
    - looking for symmetrical motion with no pain &/or dysfunction

Return to Play Criteria

Appropriate Rehab Progression

- Subjective Shoulder Questionnaire & Scoring System
Overuse Tendonitis

Overview

“Too much . . . too soon”

“Increased demands due to improper mechanics”

Thrower’s Ten Program

- D2 PNF Flexion
- Standing Full Can
- Tubing ER/IR
- Lateral Raises

www.asmi.org
Advanced Throwers Ten Program

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