

# COMMON INJURIES AND REHABILITATION CONCEPTS IN THROWING ATHLETES



PHYSICAL THERAPY OF THE TRIAD

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## **BACKGROUND**

- 1991 Academic All-American at Auburn University, Drafted by Pittsburgh Pirates, Exercise Science/Sports Medicine Major
- 1991-92 1B-3B-C-P with Pirates Organization
- Master's of Physical Therapy at Medical College of Virginia
- Doctor of Physical Therapy at University of Montana
- Founded Physical Therapy of the Triad, Greensboro, NC in 2004
- Full time in PT Academics since 2014
- Member of ASSET—commitment to the prevention and treatment of throwing athletes
- No disclosures



## WHY ARE WE HERE?

- Too many throwing athletes getting injured—baseball/softball
- Most are avoidable—OVERUSE or REPETITIVE TRAUMA

## WHAT CAN WE DO ABOUT IT?

- **Educate**—athletes, parents, coaches, trainers, administrators
- **Identify**-- potential at-risk athletes: “pain + tenderness”
- **Encourage**—proper preparation, mechanics, recovery, rehab
- **Seek**—appropriate help—MDs, PTs, Coaches, Trainers, Analysts



## **OVERUSE INJURY**

### **Definition:**

*Microtraumatic damage to a bone, muscle or tendon that has been subjected to repetitive stress without sufficient time to heal or undergo the natural reparative process.*

## **STAGES**

1. Pain after activity
2. Pain DURING activity without restricting performance
3. Pain DURING activity that adversely affects performance
4. Chronic pain even at rest



## TREATMENT OF OVERUSE INJURIES

*“ARISE” by O’Donoghue, Allman, 1984*

- **A** = Analgesics and Anti-Inflammatories
- **R** = Rest (Relative) Why is this so hard?
  - Poor rehab experience/non-compliance
  - Pressure from parents, coaches, peers
  - Significance of the competition
- **I** = Ice
- **S** = Specific Stretching and Strengthening
- **E** = Evaluation by Health Care Professional



## COMMON INJURIES FOR THROWERS:

- Tendinitis/Tendinosis—rotator cuff, medial epicondylitis (wrist/forearm flexors, pronators), biceps long head
- UCL sprains/tears
- Degenerative changes of elbow (arthritis)
- Labral tears of shoulder
- Ulnar neuritis

Baseball injuries: 50+% UE (28% shoulder, 22% elbow)

Softball injuries: 33% UE (70% “Overuse”)



## WHY MORE INJURIES??

- Throwers are bigger, stronger
- Able to generate increased arm speed, torque, spin rates
- Begin pitching earlier
- More reps, less rest => Fatigue results in poor mechanics => Injury
- Different pitches?—very controversial





## COMPARISON: BASEBALL & SOFTBALL PITCHING

- Overhand throwing motion, late cocking stress
  - Shoulder Distraction force = 108% BW, anterior/superior GH forces
  - More established pitch limits, mandatory rest for select youth leagues--too much variance
  - Year round play, travel ball, “Showcase” events
  - College avg pitch count <120, 5-6 days rest
  - Pitching staff = up to half of roster (12-16)
- 
- 360 degree Windmill motion, late delivery stress
  - Shoulder Distraction 80% BW, elbow 70%
  - Similar incidence of injury, but lacks pitch limits
  - College average pitch count >170, rest varies
  - Pitching staff = usually 1-4 pitchers





## TYPICAL PRESENTATION

- Ages 10-18 (but trending younger) with recent growth spurt
- Pitchers, but also plays in field or catches when not pitching
- Muscle weakness (rotator cuff, scapular stabilizers, core, Kinetic chain)
- Too many breaking balls, split fingers
- No current training regimen
- Pain with strenuous throwing, usually late cocking phase
- Plays in several leagues (school/recreation) , travel teams, showcase events with poor communication



## TYPICAL PRESENTATION – continued

- Poor mechanics
  - Lack of balance point, under/over stride
  - Decreased elbow height
  - Opening of hips/placement of front foot
  - Glove side?
  - Decreased follow-through—using biceps to decel UE = pain



## “TYPICAL” REHAB PROGRAM FOR TENDINOPATHY

- Decrease inflammation/pain with NSAIDs, Ice, modalities
- “Controlled rest”—eliminate or limit throwing
- Light Stretching/strengthening to increase bloodflow, increase healing
- Progress strengthening as tolerated to more dynamic activities, eccentrics
- Check throwing mechanics/technique
- Begin return to throwing program
- Usually 4-12 weeks in length



## **“TYPICAL” REHAB PROGRAM FOR UCL SPRAIN**

- No throwing for 2-4 months based on severity of injury
- Restrict motion/avoid end range stretch
- Begin strengthening program—wrist flexors/pronators/shoulder
- Return to Throwing program
- Average return to sport: 4-6 months

## **VERSUS.....**

## **“TYPICAL” REHAB PROGRAM AFTER UCL RECONSTRUCTION (TOMMY JOHN):**

- Initial rehab focusing on ROM, protecting graft site, bracing
- Full ROM at 4-6 weeks, begin light strengthening—similar to above
- Progress strengthening program to more dynamic/eccentrics
- Return to Throwing program (usually begins at 5-6 months post-op)
- Return to pre-injury level or above for MLB pitchers = 79-87%, but with decreased performance per statistics
- Average return to sport: 14-18 months

## TOP 10 REASONS THAT PITCHERS GET HURT ( Wilk, 2014)

Wilk: *“Loose enough to throw, but stable enough to prevent symptoms....”* (AJSM ‘02)

1. Total ROM/GIRD—Glenohumeral Internal Rotation Deficit
2. Scapular Position/weakness
3. Core Weakness
4. Pitching when fatigued: 8+months/year, 5x injury rate; with UE fatigue, 35x rate
5. Too many pitches/innings—200 game winners vs 200 HR's
6. Poor Mechanics
7. Weakness of Rotator Cuff
8. Poor Hip strength
9. Too many breaking balls, split fingers
10. Nutrition, genetics, recovery, supplements, biologics



## **FOUR “MUST HAVES” FOR ALL HEALTHY, STRONG THROWING ARMS**

1. Flexibility—full ROM with “some laxity but stable”
2. Strength—Rotator cuff + scapular stabilizers + core + hips
3. Endurance—same areas
4. Proper technique—emphasize follow-through



## MANUAL THERAPY TECHNIQUES/THERAPEUTIC EXERCISE RECOMMENDATIONS

- Soft tissue/Posterior Capsule Mobilization/Sleeper Stretch/SL Cross Body
- Upper Body Ergometer
- Dynamic Stabilization with NM control emphasis
- Blackburn's/Theraband exercises
- PNF D2 with theraband or manual resistance
- Seated press downs, UE stair climbing
- Advanced Thrower's Ten Exercises
- Plyoback, Ball vs. Wall, Body Blade
- Core/Hip Exercises—Monster walk, BOSU, Swiss Ball
- Return to Throwing Program



## EDUCATIONAL RESOURCES FOR ATHLETES, PARENTS, COACHES, ADMINISTRATORS

- [www.ASMI.org](http://www.ASMI.org)
- [www.mlb.com/pitch-smart/](http://www.mlb.com/pitch-smart/)
- [www.stopsportsinjuries.org/](http://www.stopsportsinjuries.org/)
- “Throw Like a Pro” App
- <http://www.youthpitching.com/armcare.html> TUFFCUFF Program
- <https://www.nytimes.com/2012/03/12/sports/baseball/debate-grows-over-how-to-protect-young-pitching-arms.html>
- ***Any Given Monday: Sports Injuries and How to Prevent Them for Athletes, Parents, and Coaches- Based on My Life in Sports Medicine***, by James Andrews, MD
- ***The Arm: Inside the Billion-Dollar Mystery of the Most Valuable Commodity in Sports***, by Jeff Passan





## **ASMI Position Statement for Adolescent Pitchers (2013):**

1. Watch and respond to signs of fatigue.
2. No overhead throwing of any kind for at least 2-3 months per year (4 months is preferred). No competitive baseball pitching for at least 4 months per year.
3. Do not pitch more than 100 innings in games in any calendar year.
4. Follow limits for pitch counts and days rest.
5. Avoid pitching on multiple teams with overlapping seasons.
6. Learn good throwing mechanics as soon as possible.
7. Avoid using radar guns.
8. A pitcher should not also be a catcher for his team. The pitcher-catcher combination results in many throws and may increase the risk of injury.
9. If a pitcher complains of pain in his elbow or shoulder, discontinue pitching until evaluated by a sports medicine physician. Inspire adolescent pitchers to have fun playing baseball and other sports. Participation and enjoyment of various physical activities will increase the player's athleticism and interest in sports.





# Pitch Smart.

A series of practical, age-appropriate guidelines to help parents, players and coaches avoid overuse injuries and foster long, healthy careers for youth pitchers.



## Pitch Smart Guidelines



USA Baseball and MLB team up to help young players reduce arm injuries by providing a comprehensive resource for safe pitching practices.

Baseball is a safe game to play at all ages, but research





# Preventing Softball Injuries



Softball injuries in young athletes are on the rise and nearly as frequent as baseball injuries, but they generally result in less time lost to competition. These injuries most commonly involve the back, shoulder, forearm, wrist, and hand. Pitchers are not more prone to injury than position players; catchers and infielders have similar injury rates. However, pitcher injuries differ from position player injuries because pitchers use a windmill motion that places unique demands on the back, neck, shoulder, forearm, and wrist.

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### Prevent Injuries

- Sport Specific
- Injury Specific
- Athletes
- Parents
- Coaches
- Healthcare Providers

## WHAT ARE THE MOST COMMON OVERUSE INJURIES IN SOFTBALL?

For pitchers, the most common overuse injuries are shoulder tendinitis (inflammation of the tendon), back or neck pain, and elbow, forearm, and wrist tendinitis. For catchers, back and knee problems in addition to overhead throwing shoulder



## **“THROW LIKE A PRO”--Baseball throwing injury prevention app released by Dr. James Andrews and Dr. Kevin Wilk**

- Designed to help young baseball players prevent injuries and safely participate in sports. The purpose of this app is to provide information about safe participation that keeps players out of the operating room.
- Includes an overview of baseball throwing injuries, statistics, and general guidelines for prevention. The app then divides recommendations into Pre-Season and In-Season sections.
- In Pre-Season, videos are included that demonstrate how to perform 5 different stretching exercises, with instructions to complete them daily.
- “Throwers Ten” which includes videos of 20 more exercises that should be performed with 10 repetitions, 3-4 times/week.
- Advice for a throwing progression with a module that talks the player through the distance and number of throws to build up.
- The In-Season module includes a warm up with stretching (same videos), a thrower’s ten band workout (more videos), a throwing warm up and a pitching warm up.
- Pitch-count tool which can be modified for the patient’s age, rest days, and maximum pitches desired (and advised).
- Overall, the app has a very high production quality and includes important information from leading surgeons in the field of throwing injuries. They estimate a 60% reduction in throwing injuries if used properly.



## THINGS TO DISCUSS

- Proper Warm-up?
- When do you start throwing breaking pitches?
- What do I do if I am hurting?
- Exercises/Training?
- Long toss?
- Weighted ball training?
- Use of PRP/Biologics?



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# The Use of Posterior Glide Mobilization and Sleeper Stretch on Glenohumeral Internal Rotation Deficit (GIRD) in an Adolescent Baseball Pitcher

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# Glenohumeral Internal Rotation Deficit (GIRD)

- ▶ Primarily in overhead throwing athletes
- ▶ “Adaptive Pathology” phenomenon where ER ROM increases, IR decreases in dominate UE with retention of total rotation ROM compared to non-throwing shoulder



# Causes of GIRD?

- ▶ Posterior-inferior capsule contracture (Burkhart, Morgan, Kibler, 2003)
- ▶ Humeral retroversion (Kurokawa, et al, 2017)
- ▶ Thixotropy of the posterior shoulder soft tissue (Meister, 2000; Bailey, et al, 2015)

# Why is GIRD significant?

- ▶ Two different studies from Wilk, et al (2009, 2011): greater potential for injury to throwing shoulders with GIRD
  - ▶ Internal Impingement (Myers, et al 2006)
  - ▶ Rotator Cuff Pathology, Scapular Dyskinesis, GH Instability, Capsular Restrictions (Cools, et al, 2008)
  - ▶ SLAP Lesions (Grossman, et al, 2005)
  - ▶ Elbow Valgus Instability (Thomas, et al, 2010)

# GIRD—The Impact

- ▶ Magnified by speed and repetition
- ▶ Especially in competitive youth sports
- ▶ Year round effort
- ▶ Greater specialization
- ▶ Under-educated parents, coaches, trainers
- ▶ Most dramatic decline of total rotation:  
between ages 13-14 (Meister, et al, 2005)

# GIRD—The Impact



# Case Description

- ▶ 15 year old male HS baseball RH pitcher
- ▶ Quit all other sports to concentrate on baseball
- ▶ No previous arm trouble/injury or significant PMH
- ▶ His mother observed him “wincing in pain” pitching 2 weeks prior
- ▶ HS ATC recommended ice, NSAIDs, one week of rest
- ▶ Returned to pitching, felt similar pain (3/10 at rest, 10/10 at release)
- ▶ Referred to Ortho, diagnosed with impingement, GIRD
- ▶ No throwing x 4 weeks, prescribed Meloxicam, refer to PT

# Initial Clinical Impression

- ▶ Both patient and Mother VERY eager for him to return for beginning of Varsity baseball season (2 weeks)
- ▶ No lack of motivation—need to monitor premature return
- ▶ Penn Shoulder Score = 70%
- ▶ Given history and pain patterns, significant issues with throwing shoulder



# Examination

- ▶ Poor posture with slight scapular dyskinesis/protraction
- ▶ Limited AROM in all planes due to pain
- ▶ PROM Right elevation full, ER = 90 (p! limiting), IR = 45 (firm end feel)
- ▶ PROM Left ER = 95, IR = 72.....GIRD
- ▶ MMT: Right shoulder 4/5 throughout except ER 3/5 painful. Left 5/5
- ▶ Special tests: + Neer/Hawkins-Kennedy, - Drop Arm/Lift off
- ▶ Palpation: Tenderness at greater tuberosity

# Physical Therapy Goals/Plan

- ▶ PT Diagnosis: RC tendinopathy, subacromial tissue irritation
- ▶ LTG: Return to competitive pitching in 8 weeks
- ▶ Plan: 2x/week x 6 weeks initially
  1. Therapeutic Exercise/Home Exercise Program
  2. Manual Therapy
  3. Patient & Family Education
  4. Modalities as needed
  5. Return to Throwing Program

# Interventions: Visits 1-2

- ▶ Education: healing, A&P of throwing shoulder, “if it hurts, STOP!”
- ▶ Therapeutic Exercise: increase blood flow, encourage healing/ROM
- ▶ Modalities: Game Ready
- ▶ Manual Therapy:
  1. Joint Distraction
  2. PROM
  3. Massage
  4. Posterior GH glides



# Interventions—Visits 3-8

- ▶ Pain/tenderness greatly reduced
- ▶ Sleeper Stretch: adjusted, if painful



- ▶ PRE's for rotator cuff/scapular stabilizers introduced and progressed
- ▶ Plyometrics, PNF, core/rotational work—preparing for return to throwing

# Outcomes

- ▶ Fully independent and compliant with home exercises
- ▶ Full and pain-free AROM
- ▶ Improved PROM with GIRD eliminated (76 degrees)
- ▶ MMT 5/5 throughout right UE
- ▶ 100% on Penn Shoulder Score
- ▶ Discharge from PT, all goals met

3 months later:

1. Completed flat ground and off mound return to throwing program
2. Increased velocity by 7 mph—most importantly, PAIN FREE

# Conclusions

- ▶ Manual therapy + Therapeutic Exercise = favorable outcomes
- ▶ Posterior Glides and Sleeper Stretch should be considered
- ▶ More studies involving young throwers
- ▶ Prevent overuse: pitch counts, controlled rest, be an “athlete”
- ▶ Educate players, families, coaches, clinicians, administrators

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# Questions, Comments, Suggestions

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