

Adolescent Shoulder and Elbow Throwing Injuries

Interview with Christopher S. Ahmad, MD

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Injuries in young adolescent throwing athletes has recently become a major concern for parents, coaches, and the young athletes themselves. Dr. Ahmad is the Head Team Physician for the New York Yankees, a member of the Major League Baseball Team Physicians Association, and also serves as the Chief of Adolescent and Pediatric Sports Medicine. He has authored more than 100 articles and book chapters related to shoulder, elbow and sports medicine and has given greater than 100 lectures nationally and internationally. He is the author of the textbook *Minimally Invasive Shoulder and Elbow Surgery* and just released *Pediatric and Adolescent Sports Medicine*. Dr. Ahmad has received many awards for outstanding research in the field of sports medicine. He has ongoing research in the areas of biomechanics of the elbow, injury prevention and screening, and surgical techniques for Tommy John Surgery.

In the following, interview we ask Dr. Ahmad specific questions regarding shoulder and elbow injuries in young throwing athletes.

Question: *Why are so many young throwing athletes sustaining shoulder and elbow injuries?*

Ahmad: The training and performance demands on our young athletes have become more intense. Young athletes are attempting to play adult sports inside still-developing and skeletally maturing bodies. Increased throwing volume such as with year-round baseball, pitching for multiple teams during a season, pitching in show cases, and throwing at other positions such as catcher when not pitching, has coincided with the growing number of pitching-related injuries and surgery. In fact, young baseball players now have up to 50-70% chance of experiencing

elbow pain. Improper throwing mechanics are also common in these young athletes. The developing musculoskeletal system is vulnerable to injury especially at the areas where the bone grows called the physis. The throwing places incredible rotational force at the physis of the upper arm which can lead to chronic or acute stress injury to the physis. Throwing athletes also place significant demands on the ligaments and bone on the inside aspect of the elbow.

Question: Do young throwers develop shoulder adaptations to perform the pitching motion?

Ahmad: Yes, young throwers demonstrate adaptive changes to their throwing shoulder. These changes include increased external rotation with the arm in an elevated position and decreased internal rotation. We performed research that demonstrated that these changes develop during adolescence when the upper arm is undergoing rapid growth. In the uninjured thrower, the gain in external rotation is generally equaled by the loss in internal rotation, so the overall range of motion is maintained. In young throwers with shoulder or elbow pain, the loss of internal rotation is often pronounced and with a total arc of motion loss >20 degrees.

Question: Does pitching mechanics influence injuries?

Ahmad: In general, children without injury throw with mechanics similar to adults but with several differences. When comparing little league to college and professional pitchers, the younger little league pitchers generate slower trunk, hip rotation and shoulder external rotation velocities. In addition, their elbow may fall behind their body in the cocking phase and an overall poor synchronization of arm motion with body motion. These improper mechanics can lead to increased stress on the shoulder and elbow and create risk of injury.

Question: Does the type of pitches thrown affect injuries?

Ahmad: Different types of pitches can produce different torques on the shoulder and elbow. In adult pitchers, the fastball and slider produce the highest forces on the shoulder and elbow. The change-up is safer than either the curveball or the fastball. In children, throwing the splitter and slider increase the odds for developing elbow pain. Although controversial, research studies suggest that pitches other than the change-up exert significant torque on the elbow. Because little league players perceived as more talented tend to be the ones that pitch fastballs and curveballs, they may be at risk for injury, especially since these better players generally pitch more often and on multiple teams.

Question: How Does Muscular Strength or Muscle Imbalance Affect Pitching?

Ahmad: The younger thrower often presents with marked weakness of the entire shoulder girdle with the most significant deficits in the smaller muscles of the rotator cuff. Players with a history of shoulder or elbow pain demonstrate weaker external rotators. This weakness clearly becomes a bigger issue with increased velocity and throwing volume and can lead to increased impingement, overuse tendonitis or laxity due to poor control of the humeral head. Thus, a formal therapy program directed at strengthening the rotator cuff muscles under the guidance of a knowledgeable trainer or therapist is critical to restore muscular balance in the shoulder.

Question: What is Little Leaguer's Elbow?

Ahmad: Although the term “little league elbow” has recently become a catchphrase for any elbow injury in a young baseball player, classically, it refers to a stress injury to the medial elbow in the skeletally immature throwing. In these younger athletes, the growing bone is

preferentially injured over the ligaments. Patients will complain of a gradually increasing onset of medial elbow pain and stiffness when throwing. Physical exam will elicit tenderness over the medial elbow. X-rays often reveal irregular ossification of the medial humeral growth centers.

Question: How can overuse injuries be treated?

Ahmad: Our goal for the thrower who presents with shoulder or elbow pain is to develop a straight forward rehabilitation program. The first phase is to improve muscular strength and endurance. Resistance is initially light with an emphasis on form. Volume is progressively increased. Once adequate endurance is obtained, the rehabilitation program focuses on strength and speed. It is important to train muscles to respond and contract at a speed that is consistent with performance speed. Recovery of shoulder internal rotation if lost with posteroinferior capsular stretching programs is also important.

Question: Are young pitchers at risk for Tommy John Surgery?

Ahmad: Ulnar collateral ligament (UCL) injuries are increasing in young throwers. Children who are still growing are more likely injure the growth area of the elbow but older adolescents are more likely to present with a UCL tear. Some young athletes have avulsion injuries where the ligament stays intact but pulls off a piece of bone.

Question: How does a sports medicine physician know the ligament has been injured?

Ahmad: Athletes with UCL injuries complain of pain during the acceleration phase of throwing. Pitchers often describe losing “zip” on the ball. The patient may remember a single episode of “giving way” of the medial elbow. Physical exam will demonstrate point tenderness at the

medial elbow and pain and instability or pain with valgus stress testing. If the UCL is injured, the athlete will experience pain in the arc of 80° to 120°. Plain radiographs will rarely show stigmata of UCL injuries. MRI arthrography where dye is injected into the elbow has been reported to be 97% sensitive in detecting UCL injury.

Question: What is the treatment for elbow ligament injury in a young patient?

Ahmad: Initial treatment involves rest, NSAIDs and physical therapy for 6 weeks with gradual progression of activity. Non-operative treatment should focus on restoration of hip, core, shoulder, and elbow strength. Proper pitching mechanics with a progressive throwing program is instituted. A new injection therapy can also be considered which enhances healing and is called platelet rich plasma.

Question: What is platelet rich plasma?

Ahmad: Platelet rich plasma is a treatment that uses a small amount of peripheral blood obtained from an injured patient. The blood is placed in a centrifuge machine to separate and concentrate the natural and important healing agents from the rest of the blood. The platelet rich plasma is then injected over the injured ligament to stimulate healing. I have used this technique in numerous young pitchers with success that has allowed surgery to be avoided.

Question: What are the results of Tommy John Surgery in young throwers?

Ahmad: Tommy John Surgery can be very effective for returning injured throwers back to the mound. The recovery is difficult however and often requires a full year before the athlete can return to competition.

Question: What final message can you give to athletes, coaches, and parents regarding throwing injuries?

Ahmad: Elbow pain in young athletes warrants special attention. Treating physicians must be knowledgeable of the developing elbow anatomy, sport-specific dangers and, particularly in throwing athletes, careful evaluation of mechanics and training and performance volume. In order to mitigate elbow injuries in pediatric and adolescent athletes, guidelines to reduce overuse injuries should be applied and enforced as much as possible.

1. Throwing should not be painful. Pain with throwing should always be evaluated by a physician.
2. Pitch counts per game and per season should be respected.
3. Pitchers should pitch for one team per season
4. Pitchers should not alternate with catching when not pitching.
5. Year round pitching should be avoided.
6. Showcases should be discouraged if they interfere with rest
7. Breaking pitches should be avoided until skeletal maturity