

Can We Reduce the Epidemic of Elbow Injuries in Youth Throwers?

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As participation in youth sports continues to increase across the Nation, more adolescents are participating in Little League baseball in the United States than ever before.¹⁰ Accompanying this increased participation is an epidemic of upper extremity injuries in young throwers. Recent investigations have demonstrated that as many as 30% to 40% of 7- to 18-year-old baseball players experience elbow and shoulder pain during the baseball season.^{15,16} This is particularly important because a high percentage (46%) of injured adolescents report being encouraged to keep playing despite having arm pain.¹⁶

Initiating play at a participatory level likely contributes to early signs of overuse injuries. Demographic factors such as age, weight, and height also play a role in elbow injury, as do performance factors such as number of pitches thrown during a season and playing outside of the league.¹⁵ Increased year-long play and specialization have been identified as significant contributors to the high number of young throwers presenting with late sequelae of overuse injuries,²⁰ such as full-thickness ulnar collateral ligament (UCL) ruptures. A recent epidemiological assessment of UCL injuries in New York State demonstrated that the incidence of UCL reconstructions in patients 17 to 20 years old is rising significantly, greater than for any other age group.¹¹

Early detection of overuse injuries may be able to prevent further progression. Because throwers are told frequently to keep playing despite painful symptoms,¹⁶ the importance of early and complete evaluation of elbow pain in the young thrower is paramount. The assessment of elbow pain in young throwers should include analysis of level of play, extent of participation (including year-long play), a thorough history intake and physical examination, collection of appropriate patient-reported outcomes, and imaging as indicated. Education regarding the importance of adherence to rehabilitation protocols is crucial. The purpose of this Viewpoint was to discuss the impetus behind the youth thrower elbow injury epidemic and how to best evaluate these patients.

Youth Sports Specialization

Identification of the impetus driving this throwing injury epidemic is critical to

curb this concerning trend. It is likely that a confluence of factors, including intrinsic desire for success, participation in multiple leagues, and external pressure from parents and coaches, contributes to longitudinal overuse. Recently, early sports specialization has received enhanced coverage as a driver of youth overuse injuries. Young athletes who played a single sport for more than 9 months in a year and who had higher levels of weekly participation exhibited a 36% increase in risks associated with severe overuse injuries compared to healthy controls.¹³ The relative risk of injury was significantly higher in ultracompetitive regions known to produce high-level collegiate prospects.^{18,19}

As health care providers become increasingly aware of the epidemic of elbow injuries in young baseball players, accurate distribution of preventative information to the baseball community is necessary. This begins with expanding the role of clinicians from a focus on treatment to a focus on preventative education. Currently, half of high school baseball players and more than 25% of players, coaches, and media members answered that they believe that UCL reconstruction, also known as Tommy

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John surgery, was required to enhance the strength of healthy players' elbows.^{1,5} Physicians, physical therapists, and athletic trainers must eradicate these myths and counsel parents, players, and coaches regarding the risks of youth sports specialization.^{3,6} Additionally, assessment instruments validated in youth throwers should be used by all health care providers to screen for at-risk players and help to monitor recovery in injured players.²

When high-grade injuries to the UCL complex have occurred, and surgery is the selected option of the athlete and his or her care management team, referral to experienced, high-volume surgeons is critical to optimize these athletes' return-to-play prospects. Experience is necessary because UCL reconstruction is a complex operation with exceedingly low levels of incidence. Among Major League Baseball team physicians, only 6 surgeons stated that they perform 50 or more UCL reconstructions annually.⁷

Prevention

Addressing the increasing incidence of serious elbow injuries must begin with identifying causative factors and establishing evidence-based preventative measures. Significant research conducted over the past 20 years has attempted to isolate the causative factors of elbow overuse injuries in throwers. Despite these efforts, the numbers of both early- and late-stage overuse injuries continue to increase. Strict evidence-based guidelines must be instituted to best address this trend. Furthermore, enforcement of pitch counts for young players, the number of leagues players participate in, and the number of months of participation per year in a single sport is required.

Total-body conditioning, including hip, back, and lower extremity strengthening, may be able to help optimize a player's biomechanics to reduce strain on the upper extremity. Additionally, playing in a variety of sports to augment athletic dexterity, rather than engaging in early sports specialization, may protect these players while enhancing athleticism.

Last, stringent adherence to throwing rehabilitation protocols, including taking adequate time off from throwing and not accelerating the stage of rehabilitation, will aid secondary prevention of repeat injuries and exacerbations of existing injuries. Despite these advances, players who sustain severe injuries, such as full-thickness UCL ruptures and large osteochondral defects, should be referred to experienced surgeons to discuss operative management.

Clinical Assessment

When an adolescent experiences an injury, a thorough examination of the elbow is critical. The crux of the assessment of the youth thrower with elbow pain remains a thorough history intake and physical examination. A holistic approach incorporating the observations of parents and coaches can assist clinicians with gaining a complete clinical picture. Suspicion for severe overuse injury should be raised for highly specialized, single-sport athletes. Throwers with early symptoms of an overuse injury will often endorse subtle changes in velocity, accuracy, and delivery,¹⁴ whereas later-stage pathology may preclude them from throwing altogether. The timing and location of the pain and overall symptomatology, in addition to provocative movements, can help guide the physician down established diagnostic algorithms.²³

Physical examination should begin with inspection and comparison to the contralateral extremity. Following a standardized physical exam of the upper extremity, thrower-specific diagnostic maneuvers must be performed. In addition to assessing for physeal injuries and rotator cuff-related shoulder pain, the elbow requires careful examination, given its anatomic complexity. Specifically, the integrity of the UCL must be determined to differentiate partial- or full-thickness rupture. Appropriate use of special tests, such as the moving valgus test, or milking test, may provide clinical insight on the condition of the UCL. This test has exhibited 100% sensitivity and 75%

specificity in 21 athletes with varied ages (range, 16-56 years) in the diagnosis of UCL damage.¹⁷

Patient-Reported Outcomes

Patient-reported outcomes have become prevalent in the clinical assessment of musculoskeletal injuries. While the Kerlan-Jobe Orthopaedic Clinic shoulder and elbow score is often used for throwers of all ages, the instrument was designed for and validated in an adult population. The instrument utilizes some items that make it suboptimal for pediatric evaluation, such as an item asking about the player's relationship with agents. Instead, assessors should consider the use of the recently published Youth Throwing Score,² which was generated for and validated in youth baseball players. Written for young athletes (third-grade reading level) and rapidly completed, this instrument can be administered in the clinician's office, after practice, or at home.

Imaging

Clinicians should utilize imaging conservatively. One study reported that more than 80% of young baseball players demonstrated elbow radiographic abnormalities at preseason evaluation, the majority of whom were asymptomatic.¹² Additional prospective investigations have demonstrated that abnormalities at routine preseason magnetic resonance imaging examinations are found in 35% to 48% of young baseball players, with abnormalities more often found in those players who receive private coaching and who play year round.^{21,22}

Patients with persistent pain who have failed a thorough nonsurgical rehabilitation approach, including a graded return to throwing,²⁴ and who have additional specific examination findings, such as a positive valgus or moving valgus stress test, are candidates for advanced imaging. After imaging, the authors assert that the patient's symptoms and clinical presentation must be carefully integrated in evaluating radiological results. Positive

imaging findings in the setting of painless play should not be treated operatively.

Treatment Options

When speaking with adolescents, discussion of the diagnosis and treatment recommendations requires great care and the inclusion of the parents. Patients and parents alike are often taken aback by even the idea of “shutting down” a player by stopping all throwing for an extended period, or by receiving surgery as an avenue to allow for recovery. These discussions must be conducted gradually to avoid alienating the thrower or parent. Nonoperative treatment must be taken seriously in young athletes, as increasing evidence suggests its potential for success. Intrasubstance damage is rare in young athletes, and partial UCL ruptures can be treated successfully using nonsurgical treatment, even in the majority (84%) of Major League Baseball players.⁸

In addition to the physiologic health of young athletes, mental health must be closely evaluated. Specialized athletes often possess high athletic identities and may suffer significant psychosocial trauma after receiving the recommendation that they not play. Psychology research in athletes with anterior cruciate ligament injuries has demonstrated that special attention should be given to the impact the diagnosis has on the patient, as sadness and even depression may impact the player immediately and the player’s chance of returning to play at a high level in the future.^{4,9} Referral to experienced physical therapists during recovery and referral to sports psychologists for patients who are not coping well assist in both close monitoring and empathic counseling.

With or without surgery, many overuse injuries require players to take a hiatus from throwing before entering an organized throwing rehabilitation protocol. While players and parents are often eager to advance to the next phase of recovery, pre-emptively engaging in activity prior to full healing of an injury

carries the inherent risk of further progression of the injury. While returning a young athlete to play is important, overly aggressive rehabilitation progression risks exacerbating a sprain, which may be treated nonoperatively, into a rupture, which may require operative procedures. Thoroughly educating patients, parents, and coaches regarding the importance of adherence is crucial to optimizing the chances for a successful recovery, regardless of surgical intervention.

Further Research

Despite persistent, multidisciplinary efforts, one third to one half of youth baseball players experience elbow and shoulder pain in a given season. Prospective studies contrasting differing pitch-count protocols can assist with providing evidence-based guidelines for players and coaches to follow. Additionally, specialization studies with longer follow-up would help provide physicians more detailed information to educate parents and players regarding the risks of playing a single sport at an early age.

Key Points

- The crux of reducing an emerging prevalence of youth elbow injuries will be in implementing effective, evidence-based preventative measures.
- When initially evaluating the youth thrower, assessing the level of specialization and year-round play should raise suspicion for serious overuse injury.
- Validated patient-reported outcomes, such as the Youth Throwing Score, should supplement clinical evaluation and help monitor recovery.
- Advanced imaging should be reserved for players with significant physical exam findings, such as a positive moving valgus stress test, due to the high rate of incidental findings.
- Nonsurgical treatment, including relative rest, and graduated return to play often allow for successful return to play in athletes with partial UCL ruptures. ●

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