



Hughston Health Alert



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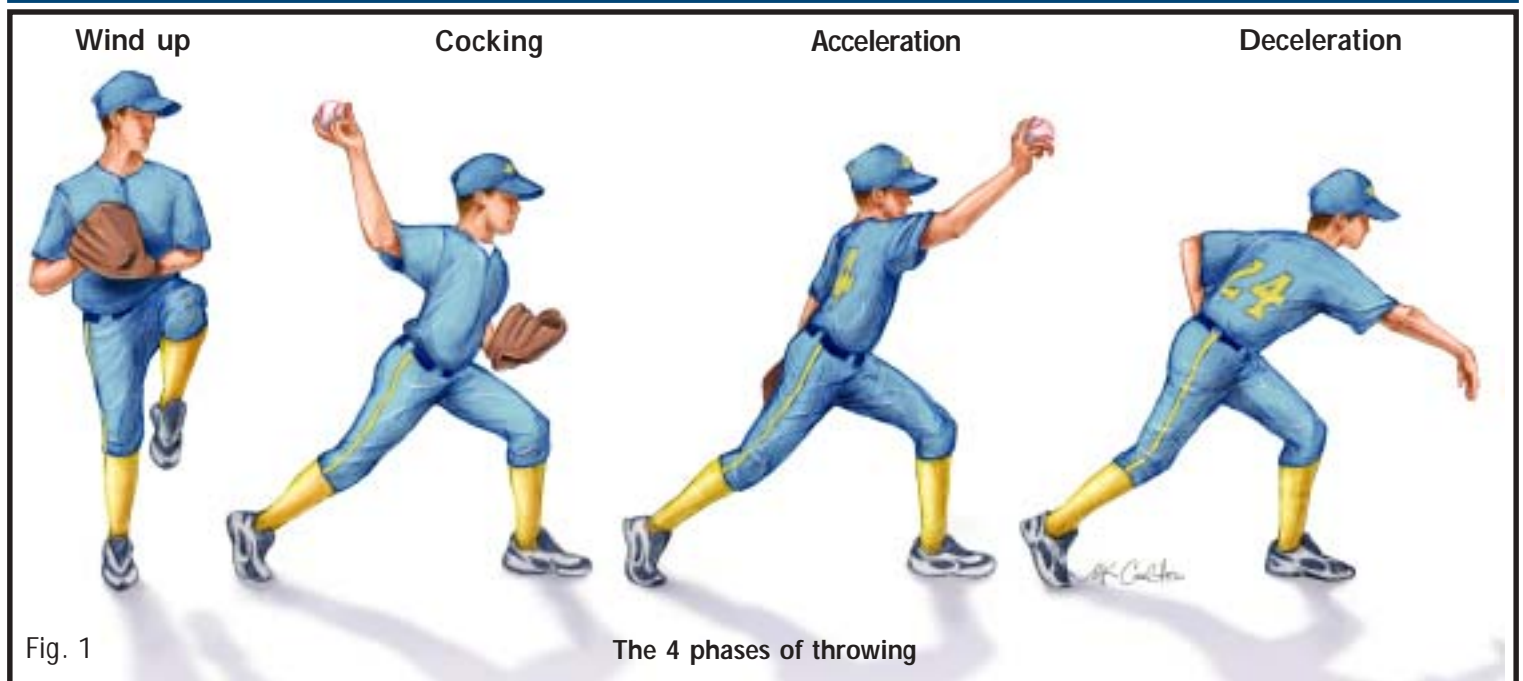


Fig. 1

The 4 phases of throwing

Baseball Players and their Shoulder Injuries

Shoulder pain is a common complaint among baseball players, especially pitchers, regardless of age or level of play. Pain experienced

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- Champ L. Baker, Jr., MD

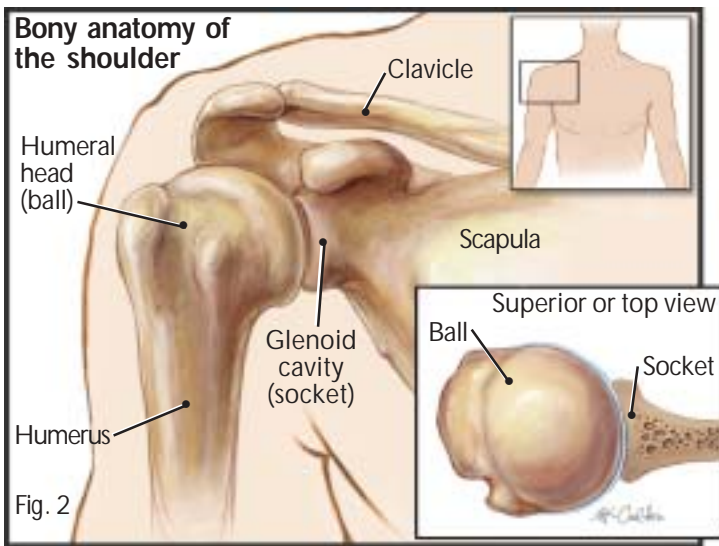
during the throwing motion results in an inability to throw with velocity, causing what is commonly referred to as “dead arm” syndrome. The cause of pain is most often injury to either the bones or the soft-tissue structures of the shoulder joint.

The 4 phases of throwing

To understand pain in the throwing shoulder, it is important to understand both the throwing mechanism and the anatomy of the shoulder joint. The act of throwing can be divided into 4 phases: (1) wind up, (2) cocking, (3) acceleration, and (4) deceleration (Fig. 1). Some add a fifth phase, follow-through. The unique anatomy of the shoulder joint allows a person to

generate velocity while throwing. The shoulder, like the hip, is a ball-and-socket joint (Fig. 2, pg. 2). However, unlike the hip where the ball fits tightly into the socket and is restricted, the shoulder ball (humeral head) fits loosely in the socket (glenoid) and is unrestricted, much like a golf ball on a tee. The farther one is able to bring the arm back into abduction (raised away from the side of the body) and external rotation, the faster the ball will go when released. This lack of restriction is a double-edged sword: it allows tremendous range of motion in the shoulder, making it possible to cock the arm back farther and throw with tremendous velocity. However, it also forces a reliance on relatively

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delicate balance of humeral head stability is thrown off, resulting in abnormal movement of the humeral head during throwing. This abnormal movement of the humeral head puts increased stress on the labrum and can lead to a tearing away of the labrum from the glenoid, the so-called SLAP (Superior Labrum

Anterior to Posterior) lesion, which is thought to be one of the major causes of pain in the thrower's shoulder (Fig. 4, pg. 3).

weak soft-tissue structures to maintain shoulder stability. These soft-tissue stabilizers feel the greatest stress during the throwing motion and are, therefore, the most frequently injured structures when this stress is applied repetitively.

The shoulder's soft-tissue stabilizers can be divided into two categories: *static* and *dynamic* (Fig. 3). The static stabilizers are the ligaments of the shoulder capsule and the labrum (the cartilage ring that surrounds the socket). The labrum is an important part of the thrower's shoulder anatomy because it serves as the attachment site for the capsular ligaments at the glenoid and it also deepens the socket to provide extra stability. The dynamic stabilizers, which include the rotator cuff muscles, are the muscle groups that surround the shoulder. These muscles contract at different times during the various stages of throwing. The static and dynamic stabilizers work together in a delicate balance to stabilize the humeral head in the glenoid during the act of throwing. When the soft tissue stabilizers become too loose or too tight, the

Shoulder pain

Shoulder pain can also come from the bones that make up the shoulder joint: the humerus (upper arm) and the scapula (shoulder blade), which includes the glenoid (socket) and attaches to the clavicle (collar bone). In young players whose growth plates are still open, shoulder pain is often the result of a fracture at the growth plate at the upper end of the humerus. This fracture, which results in a slight separation of the growth plate, is referred to as Little Leaguer's shoulder (Fig. 4, pg 3). The excessive

forces placed on the humeral head during the throwing motion cause a separation at the growth plate, a weak point in the bone. Bone pain in the shoulders of adult throwers is much less common and is usually the result of a pathologic process within the bone, such as a tumor.

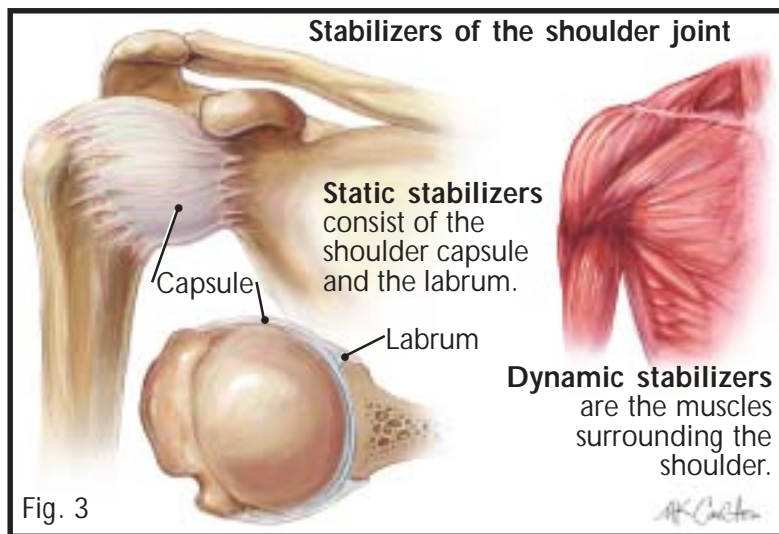
Diagnosis

Diagnosing the cause of pain in the throwing shoulder is challenging and begins with the patient's history. Was the onset of pain acute or chronic? How long has the pain been present? Which stage of the throwing motion causes pain? Where is the pain located? How long has the individual been playing baseball and at what position? Once these questions have been answered, a focused physical examination by a doctor will provide additional information. What the doctor finds during the examination suggests the type of injury that has occurred and helps to determine whether diagnostic imaging studies, such as x-rays or magnetic resonance imaging (MRI) are necessary. X-rays are obtained to look at the bony structures of the shoulder. Little Leaguer's shoulder appears on x-rays as a widening of the growth plate. If the injury involves soft tissue structures, as is most common, x-rays are often normal. In these patients, an

MRI may be obtained to look more closely at the soft-tissue structures of the shoulder. Unfortunately, MRI findings are also often normal in a painful shoulder.

Treatment

Treatment of shoulder pain in throwers is multifaceted, but the best treatment is early recognition and prevention of injury. As mentioned, pain is the earliest sign of

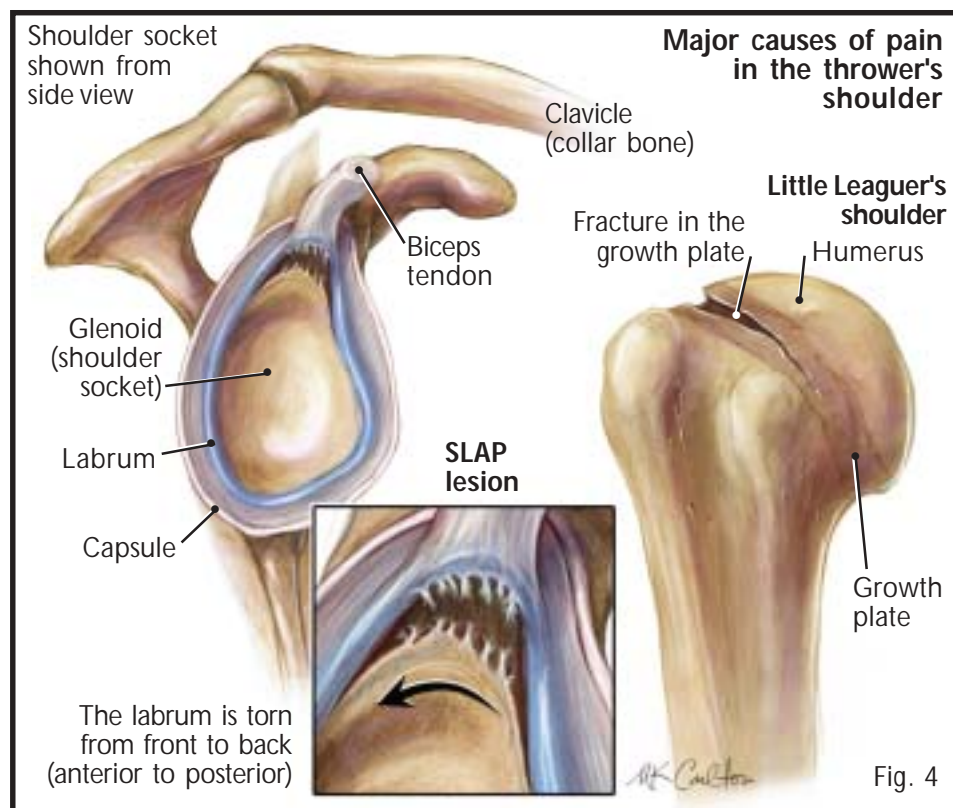


injury, so coaches should regularly question throwers regarding the presence of shoulder pain. Other signs that should be recognized by coaches are loss of velocity, stamina, and poor throwing mechanics. Avoiding high pitch counts, especially in younger players, and avoiding excessive numbers of breaking pitches (curve balls and sliders) have also been proven to decrease the chance of injury to the young throwing shoulder.¹

The ultimate goal of treatment for shoulder pain is to return the player to the field in a safe and timely manner, with a restored ability to throw with speed and accuracy. Initial treatment consists of resting the arm, thereby avoiding the activity that causes or increases the pain. In the case of Little Leaguer's shoulder, an average of 3 months of rest with a gradual return to throwing is recommended, provided the athlete has no shoulder symptoms.² If the problem is thought to be with the soft tissue stabilizers, a physical therapy program that focuses on stretching and strengthening the ligaments and muscles of the shoulder is undertaken as the mainstay of treatment. Most shoulder problems in throwers can be treated effectively with physical therapy. Achieving and maintaining range of motion in the shoulder, especially internal and external rotation, while strengthening the muscles around the shoulder at the same time is the mark of a good physical therapy program.

Surgery

When rest and physical therapy are unsuccessful in treating shoulder pain or if an injury is discovered on MRI, surgical treatment may be needed. As many as 90% of all throwers with symptoms of tightness of the shoulder capsule respond to a physical therapy program of stretching.³ The 10% who do not respond tend to be older players who are pitching at a highly



competitive level. It is unusual for compliant high school and college pitchers to be unresponsive to a stretching and strengthening program. In the small group of throwers who do not improve with nonoperative treatment, arthroscopic or open surgery may be needed, depending on the location of the shoulder problem. These procedures include labral repair (stitching the cartilage ring back to the bone of the socket), posterior capsular release (cutting into the shoulder capsule to decrease tightness of the posterior, or back, portion of the capsule), and anterior capsular plication (tightening the anterior, or front, portion of the shoulder capsule to reduce looseness).

The diagnosis and treatment of shoulder pain in baseball players can be a challenging undertaking. Early recognition of a problem is an important responsibility of coaches and parents. Once a problem is recognized, diagnosis and treatment should be sought from a physician. Beginning with the history, physical

examination, and findings from imaging studies, a working diagnosis can often be made and a treatment plan determined. Rest and physical therapy are the mainstays of treatment, with surgery reserved for those who do not improve with nonoperative treatment. Surgery is directed at repairing the injury and restoring the normal shoulder anatomy.

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Overuse Injuries

Common problems for young baseball players

Skeletally immature (growing) athletes are susceptible to unique elbow injuries that occur as a result of repetitive throwing. These pediatric elbow injuries are common and are often caused by stressing the joint too much, too frequently, or with poor technique. Injury can occur to the growing bone and to articular cartilage, as well as to the muscles, tendons, and nerves.

The weak link in a skeletally immature bone is the growth plate, or growth center (Fig. 1), that part of the bone where growth occurs and, consequently, a frequent site of chronic overuse injury. Injury to the growth center can cause pain, deformity, or shortening. The term Little League elbow, somewhat generalized and overused, is applied to many different types of elbow injuries and diagnoses.

Medial elbow injuries

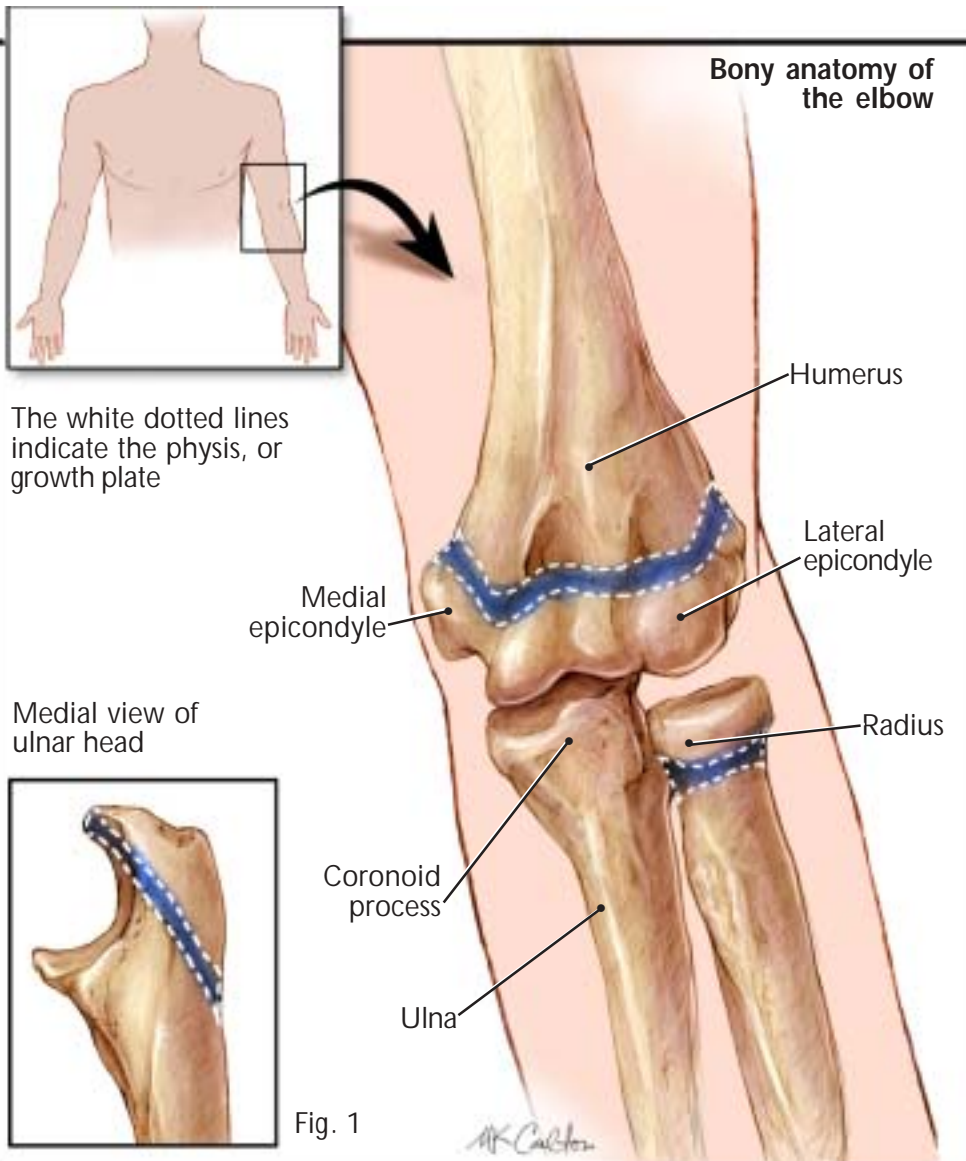
The medial (inside) aspect of the elbow is subjected to tremendous force in baseball (Fig. 2, pg. 5). During the throwing motion, tension develops over the medial aspect of the elbow, often causing pain and injury. The

growth plate on the medial side can experience a spectrum of injuries, ranging from stress fractures to complete fracture with avulsion (the tearing away of a part of bone from its attachment point) and displacement of the bone. Young throwers often experience decreased throwing performance, usually followed by pain and swelling of the elbow and an inability to completely straighten the joint. In addition, the patient may experience tenderness on the inside of the elbow. Symptoms may be exacerbated by continued throwing. X-rays can reveal widening of the growth plate or complete avulsion with separation. Because every child is at his or her own unique stage in growth and development, x-rays of the uninvolved elbow should always be obtained for comparison.

Conservative treatment for medial elbow growth plate injuries includes rest, immobilization, and reconditioning with a gradual return to throwing. Surgery may be necessary for significantly displaced bone fragments.

Osteochondritis dissecans

Repetitive throwing causes compressive forces on the lateral (outside) aspect of the elbow, which, over time, may compromise the blood supply to the articular cartilage and underlying bone. Known as osteochondritis dissecans, this condition is usually seen in 10- to 14-year-old patients. The patient typically complains of pain on the outside of the elbow. Loss of motion, particularly when the elbow is being extended, is also common. Swelling and locking of the joint may also occur. X-rays will usually show the area in question and can assist in the diagnosis. Conservative treatment, to include cessation of sports, immobilization, maintenance and regaining of range of motion, is indicated if the involved segment of bone remains in its normal location



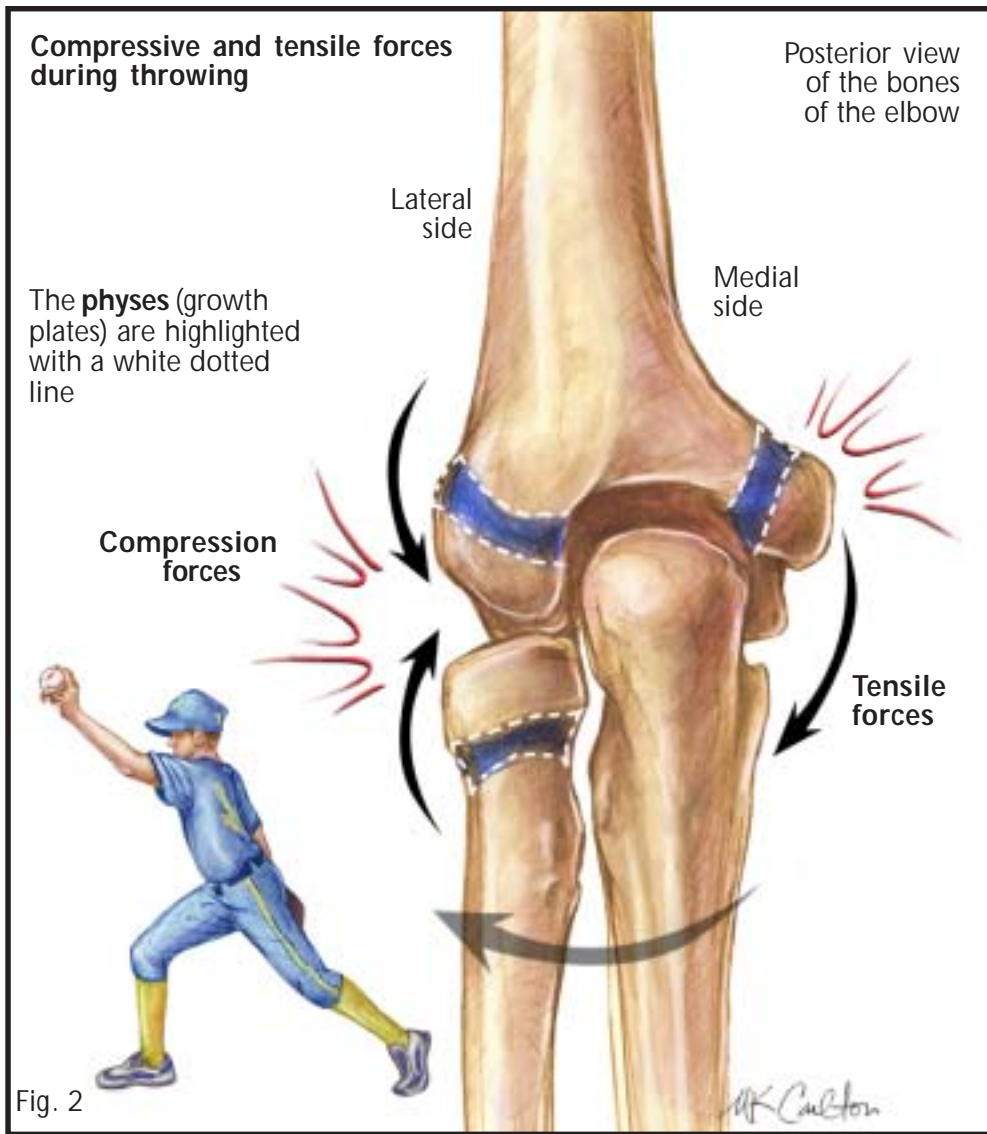


Fig. 2

the elbow against force. X-rays show changes, particularly a widening or fragmentation of the growth center (Fig. 3). Treatment consists of immobilization until the pain and tenderness have resolved. If, however, the fracture fragment has shifted away from the bone, surgery may be required to replace it.

Prevention is the key to protecting young, throwing athletes. Educating the athlete as well as coaches and parents is critical. Proper training with respect to technique and limiting the number of pitches per week should be encouraged.

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Further Reading:

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DeSalva E, Williams J, Fidelly P, Holsten M, Urledge M. Pediatric throwing injuries about the elbow. The American Journal of Orthopaedics. 1998;(Feb): 90-96.

and there are no other signs of loose particles within the joint. Surgery, however, may be indicated if (1) loose particles exist within the joint, (2) the involved bone segment has separated, or (3) conservative treatment has failed. Most patients can expect a full return to activity.

Avulsion and stress fractures

The posterior (back) aspect of the elbow is also subjected to significantly increased forces during throwing and, like the medial side of the elbow, can experience injuries ranging from stress fractures to avulsion fractures. The patient may experience pain in the back of the elbow as well as increased discomfort when attempting to extend



Fig. 3

Rehabilitation of Common Shoulder and Elbow Injuries

Shoulder and elbow injuries occur frequently in the throwing athlete, particularly in baseball players from Little League to high school level. Of course, for both the short- and long-term, injury prevention is in the athlete's best interest; however, when injuries do occur, rehabilitation is critical to full recovery.

Shoulder instability is one of the most common conditions in the throwing athlete and is usually the result of an imbalance that exists when the structures in the front of the shoulder are too loose and the structures in the back of the shoulder are too tight. This imbalance often

occurs in combination with weakness of the rotator cuff and scapula (shoulder blade) muscles. Players complain of pain in the front or back of the shoulder, which is the result of an unstable ball and socket joint that actually allows too much movement of the joint during the throwing motion.

Treatment of shoulder instability requires rest from throwing to allow inflammation within the shoulder to subside. The treatment also includes a series of exercises to increase the strength of the muscles that stabilize the shoulder and to increase the flexibility of tissues that are too tight. Proper strengthening of the shoulder muscles usually requires the athlete to perform a 4 to 6 week exercise program prescribed and monitored by a physical therapist. Exercises progress from basic strengthening

exercises that isolate specific muscles (Fig. 1) to sport-specific exercises that require the coordination of several different muscle groups (Fig. 2). All muscle groups around the shoulder must work well together to allow the athlete to perform at his or her highest level while decreasing the risk of further injury.

Specific exercises are undertaken to strengthen the muscles that stabilize and position both the scapula and the ball and socket of the shoulder joint. Careful attention is also given to exercises that strengthen the athlete's "core" (legs and trunk) (Fig. 3, pg. 7), which is the source of power during the throwing motion. A strong core can take pressure off both the shoulder and

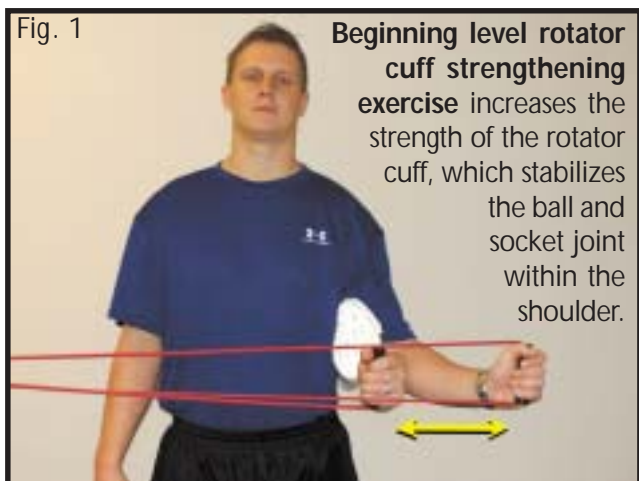
elbow, thereby decreasing the risk of injury to these areas.

A gradual return to throwing is encouraged once the athlete is stronger and pain-free. Throwing begins at a distance of about 30 feet and slowly progresses to longer tosses within a 2 to 4 week period. This progress is based on how much throwing the athlete can tolerate without pain. Once a pain-free throwing program has been completed, the physician and therapist determine whether to allow the athlete to return to play. However, even after returning to sport, the athlete should continue a strengthening and flexibility program to prevent further injury.

Physal injuries (injuries to the growth plate) are common in the shoulders and elbows of young throwers. Children have areas within each of their bones called growth plates from which the bones grow bigger and longer. An injury to a child's growth plate usually occurs because the athlete throws too frequently or has poor throwing mechanics. Although less common than shoulder instability, an injury to a child's growth plate can be severe.

Rehabilitation of a growth-plate injury requires the athlete to discontinue all throwing for at least 2 to 3 weeks. During this time, the athlete's arm is usually immobilized in a sling to prevent unwanted arm movement. Following this period, the athlete undergoes a therapy program focused on increasing both range of motion and strength. In the case of elbow injuries, the core and shoulder as well as the elbow are addressed during the athlete's rehabilitation. A gradual return to throwing follows, with an emphasis on both proper throwing mechanics and frequency of throwing.

The rehabilitation of throwing injuries can be difficult and requires



Core stabilization: Working with a medicine ball and feet off the floor strengthens the abdominal muscles. Strong abdominal and lower extremity muscles are needed to throw with improved velocity and prevent injury to the upper extremity.



Fig. 3

time away from one's sport. Therefore, it is in the athlete's best interest to prevent injuries from occurring. A physician, therapist, or athletic trainer can provide additional information about the prevention and rehabilitation of common baseball injuries.

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Throwing Guidelines for Young Pitchers

Baseball!!! One of America's favorite pastimes has become increasingly popular with young athletes. Once played as a springtime sport, baseball is now played year-round in some locations by athletes of all ages. This increase in popularity and the amount of time spent throwing has caused the number of injuries related to the sport to rise at an alarming rate. For example, one study in an orthopaedic journal found that the number of elbow surgeries performed between 1998 and 2001 represented more than a 100% increase compared with the number of elbow surgeries performed

between 1994 and 1997. The reason is clear. More time is spent playing with less time spent on conditioning and controlling the number of pitches and types of pitches thrown.

The demands on young pitchers are increasing, and the types of pitches allowed are more difficult than in the past. Recently, Atlanta Braves orthopedic surgeon Joe Chandler polled more than 70 professional pitchers and 100 Little League coaches. The pitchers were asked about their own experiences as young players and what they would recommend if their child were a pitcher in youth baseball today. Although the coaches agreed on

restricting a young pitcher's number of innings per week and number of pitches per game, only 63% of them actually counted pitches. With an increased number of injuries occurring in younger pitchers, it is clear that guidelines must be established and then followed by both coaches and parents with attention to the following risk factors:

1. Curveballs and sliders thrown at too early an age.
2. Abuse (too many innings/pitch counts too high).
3. Year-round baseball without enough rest.
4. Poor throwing mechanics.
5. Poor practice or conditioning habits.

Based on the experience of medical professionals and on Chandler's survey of professional pitchers and Little League coaches, we also recommend specific ages at which young pitchers should begin throwing various types of pitches (see Figure below).

By following these guidelines, young baseball pitchers can spend more time enjoying their sport and less time recuperating from overuse injuries.

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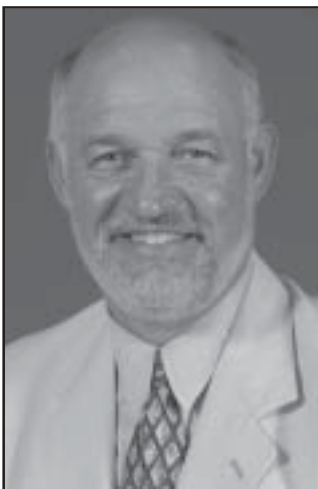
Recommendations to avoid overuse injuries

Earliest throwing age		
	curveballs	14.5
	sliders	17
	change-ups	11
Pitch restrictions		
Age	# of throws	
8-10	50 per game	
11-14	75 per game	
15-18	90-100 per game	
Inning restrictions		
Age	Innings	
12 or younger	6 per week	
13-18	10 per week	

Champ L. Baker, Jr., MD, received his undergraduate and medical degrees at Louisiana State University. He completed his residency through Letterman Army Medical Center and Shriners Hospital for Crippled Children, and then he completed his sports medicine fellowship at The Hughston Clinic.

Certified by the American Board of Orthopaedic Surgery, he holds memberships in professional societies, such as the American Shoulder and Elbow Society, the American Orthopaedic Society for Sports Medicine, the American Orthopaedic Association, and the Arthroscopy Association of North America. Dr. Baker has written and published numerous scientific articles. He has served on the editorial board of the American Journal of Sports Medicine and the Journal of the Southern Orthopaedic Association. He is currently president of the Southern Orthopaedic Association and is Past President of the Georgia Orthopaedic Society. Dr. Baker is the team physician and serves on the Board of Trustees for Columbus State University.

Dr. Baker and his wife, Sue Anne, have three adult children. During his free time, he enjoys playing golf. Dr. Baker's specialties include arthroscopic surgery and sports medicine.



The *Hughston Health Alert* is a quarterly publication of the Hughston Sports Medicine Foundation, Inc. The Foundation's mission is to help people of all ages attain the highest possible standards of musculoskeletal health, fitness, and athletic prowess. Information in the *Hughston Health Alert* reflects the experience and training of physicians at The Hughston Clinic, PC, of physical therapists and athletic trainers at Hughston Rehabilitation, of physicians who trained as residents and fellows under the auspices of the Hughston Sports Medicine Foundation, Inc., and of research scientists and other professional staff at the Foundation. The information in the *Hughston Health Alert* is intended to supplement the advice of your personal physician and should not be relied on for the treatment of an individual's specific medical problems.

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