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The Anatomy of Low Back Pain

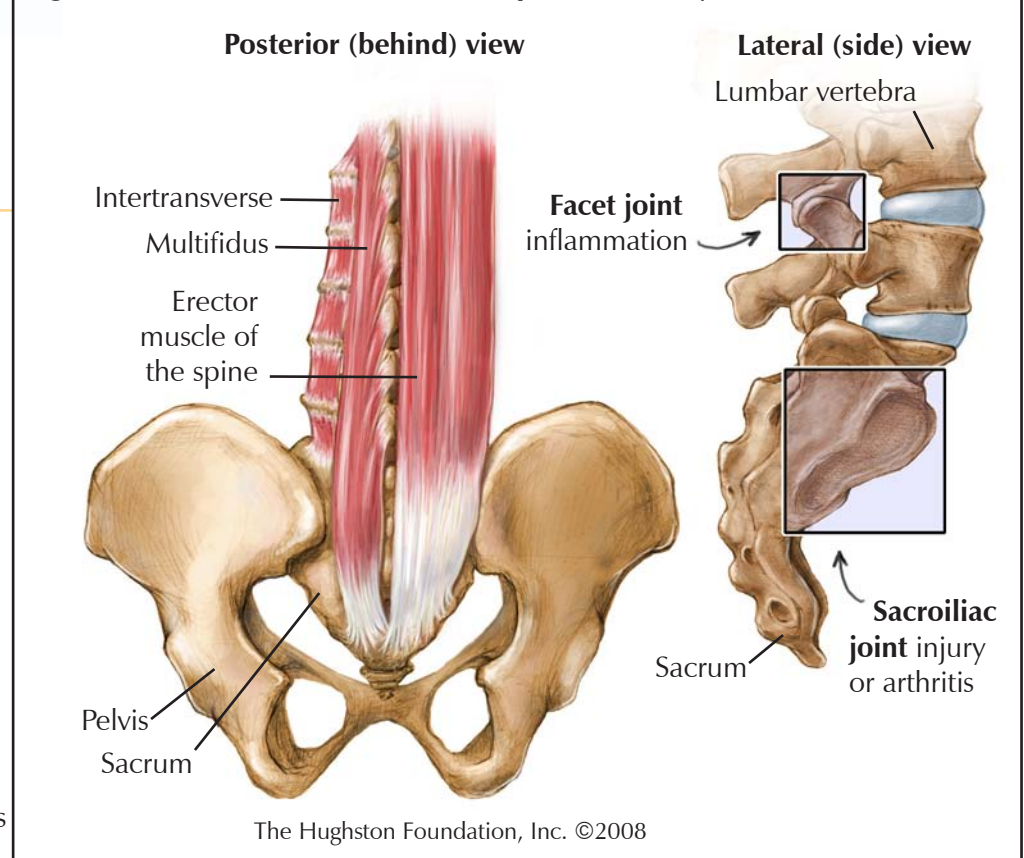
Low back pain affects 1 in 6 individuals. During his or her lifetime, 80% of adults will have an episode of low back pain requiring some form of medical treatment.¹ Americans spend at least \$50 billion each year on low back pain, the most common cause of job-related disability and a leading contributor to missed work.²

To successfully manage low back pain, your physician must accurately locate the source of the pain. Physicians find the source of low back pain by taking a thorough medical history, by examining the patient, and by analyzing diagnostic images. Often, patients with low back pain can be treated without surgery; however, patients with severe injuries or illness can require an operation.

Anatomy of the back

The back is a complex structure of bones and tissues covering the body's trunk from the neck to the pelvis (see page 3). The spinal column supports the upper body's weight and houses and protects the spinal cord, a delicate nervous system structure that carries nerve signals for body movement and conveys sensations. Vertebral bones are stacked on top of one another creating the spinal column. In the spaces between the vertebrae, spongy pads of cartilage called intervertebral discs allow for flexibility and act like shock absorbers during body movement. In adults, the spinal cord descends from the base of the brain to just below the rib cage. Small nerves or nerve roots enter and

Fig 1. Causes of Low Back Pain - Paraspinal muscle sprain or strain



emerge from the spinal cord through spaces between the vertebrae.

Starting from the top, the spine has 4 regions: the **cervical** spine, which consists of the 7 cervical, neck, vertebrae, C1 to C7; the **thoracic**, or upper back, consisting of 12 vertebrae, T1 to T12; the **lumbar** spine, or lower back, consists of 5 vertebrae, L1 to L5; and the sacral spine consists of 5 segments of the lower spine and the coccyx, which are fused together at the base of the spine.

Causes of low back pain

Low back pain can be caused by injury or disease such as arthritis. Lumbar strain (stretching or tearing a muscle or tendon) or sprain (stretching or tearing a ligament) can cause injury to the facet joints or paraspinal muscles (muscles adjacent to spinal column) (Fig. 1). This type of injury can be self-limiting; however, it can be treated with ice, heat, stretching exercises, anti-inflammatory medications, and muscle relaxants. Physical therapy or

manual, or manipulative, therapy can help with recovery, as well.

Back pain that radiates into the lower extremities can be referred pain from the facet joints or sacroiliac joint or from an irritated or compressed nerve caused by a disc herniation or spinal stenosis (narrowing of the spinal canal that houses the spinal cord and nerve roots). Often, patients with moderate symptoms from nerve compression improve with medications, physical therapy, or spinal injections. However, surgery can be necessary if a patient's level of pain cannot be managed by nonoperative treatment or if the nerve damage continues.

Diagnostic tools

Magnetic resonance imaging (MRI, a scan that shows the bones, muscles, tendons, and ligaments) and computed tomography (CT, a scan using special x-ray equipment to show bones, organs, and soft tissue) have revolutionized the ability to show the anatomy of the spine. Congenital (at birth) abnormalities, fractures, tumors, infection, disc herniations (a bulging or protruding disc), degenerative (wear and tear) changes, and nerve compression can be displayed with these advanced imaging techniques.

Preventing low back pain

Several proactive measures can reduce the risk of low back pain. Although, some back problems are hereditary, these preventive measures can be helpful in preventing common causes of low back pain.

- Quit smoking. Smokers have a higher incidence of low back pain due to chronic coughing and the harmful and toxic agents in smoke that increase disc degeneration.
- Diet sensibly. Obesity hastens disc degeneration and makes rehabilitation more difficult. Weight reduction programs should be initiated by a professional. Avoid crash dieting.
- Exercise regularly. A 30-minute walk each day is

as good as an "apple a day," to keep the doctor away. Advanced exercise programs should be supervised by a professional and structured to the individual's particular needs. Some moderate-level low back exercises are shown below (Fig. 2).

- Reduce osteoporosis. Menopausal women should have periodic bone density evaluations to identify those who are at risk for osteoporosis. It is much easier to treat this problem early rather than later after it develops. Osteoporotic spine or pelvic fractures are more common in the aging population.

- Avoid habit-forming drugs. Many doctors with good intentions prescribe narcotic medications for back pain that can be treated by other methods. These medications can become habit forming if taken on a regular basis.

- Avoid work-related back pain. Learn proper body mechanics for physically demanding jobs. Even with sedentary jobs, ergonomic workstations, chairs with a lumbar support, and a safety conscious employer are essential to reduce work-related low back pain.

- Have an annual check up. All adults should have an annual wellness physical examination by their primary care physician. Detecting and treating abnormal conditions and disease can prevent chronic back pain.

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Fig. 2

Exercise 1: Standing Extension with Lateral Bending


① **Starting position-** place hands in small of back and lean backwards.



② While leaning backwards, lean to the right, hold briefly, then return to starting position.

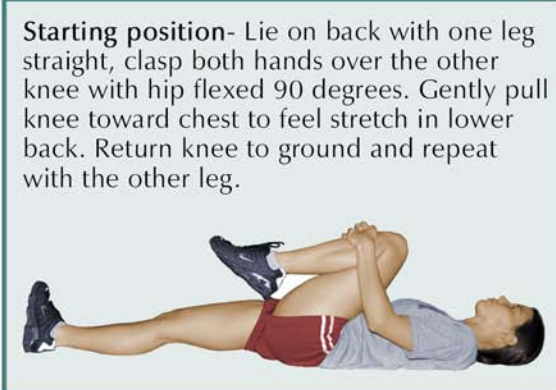


③ While leaning backwards, lean to the left, hold briefly, then return to starting position.



Exercise 2: Single Knee to Chest

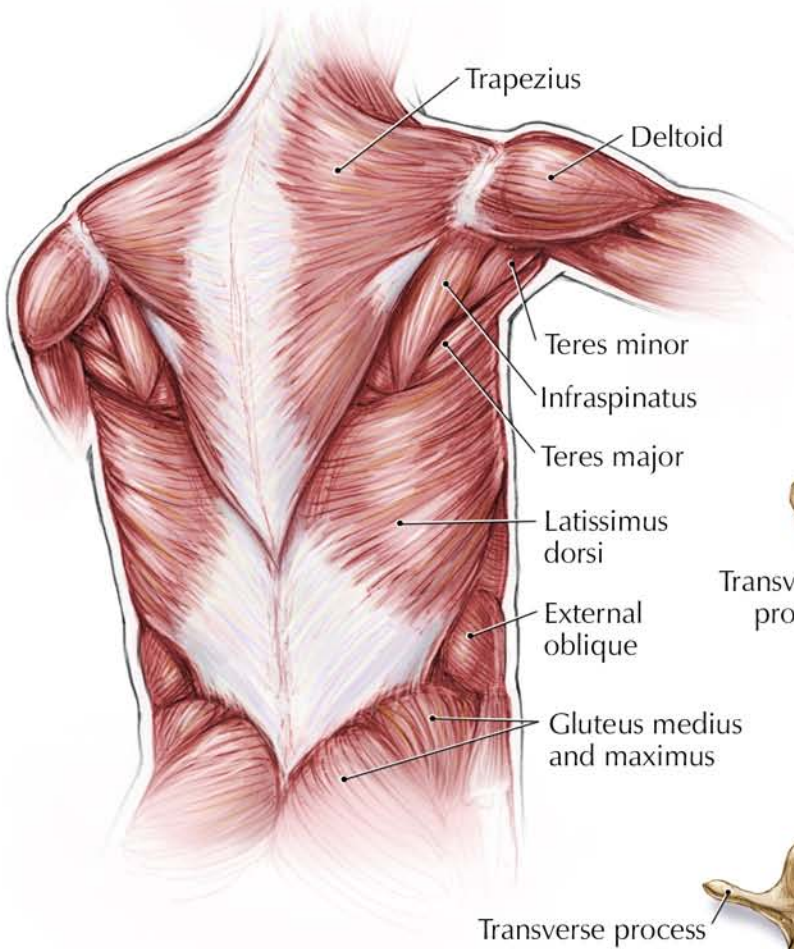
Starting position- Lie on back with one leg straight, clasp both hands over the other knee with hip flexed 90 degrees. Gently pull knee toward chest to feel stretch in lower back. Return knee to ground and repeat with the other leg.



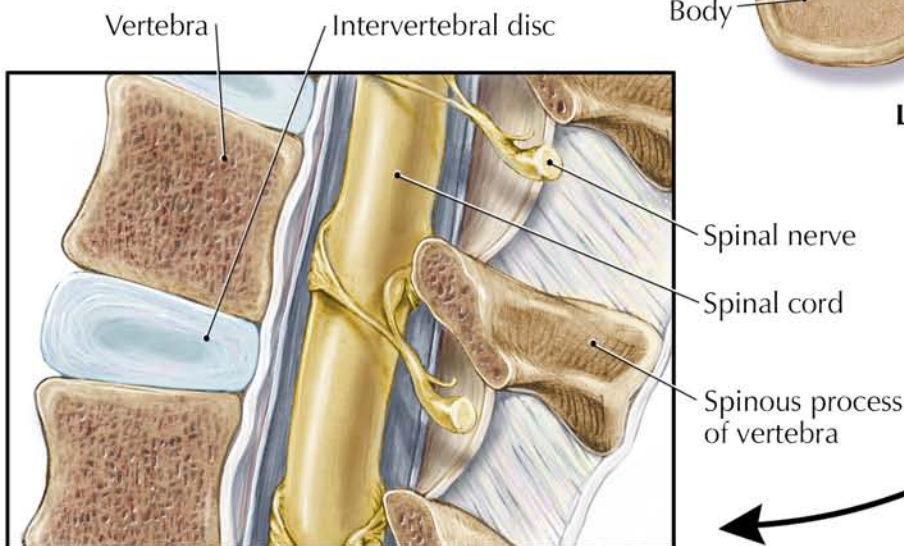
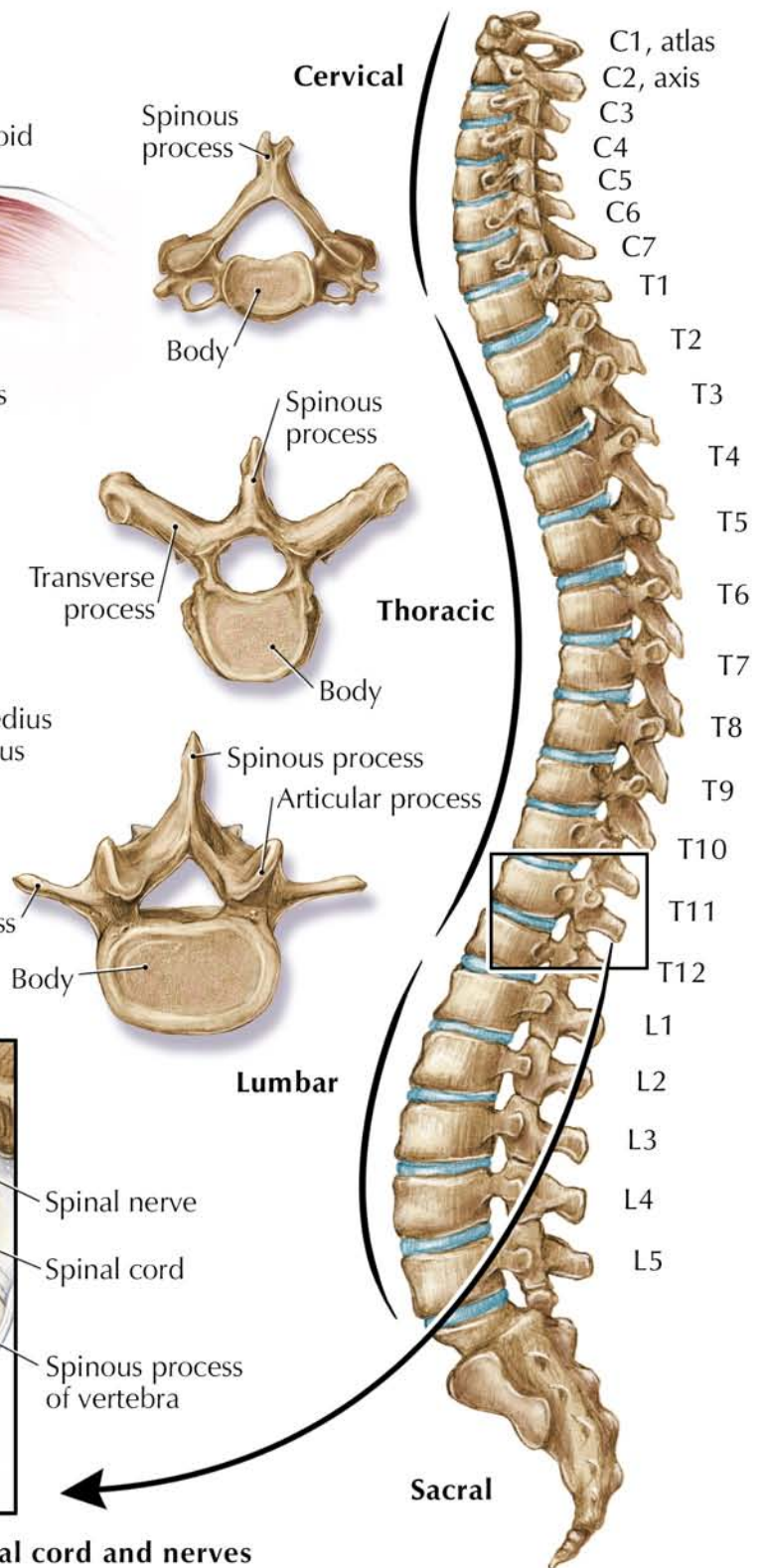
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BACK to the basics: ANATOMY OF THE BACK

Superficial muscles of the back

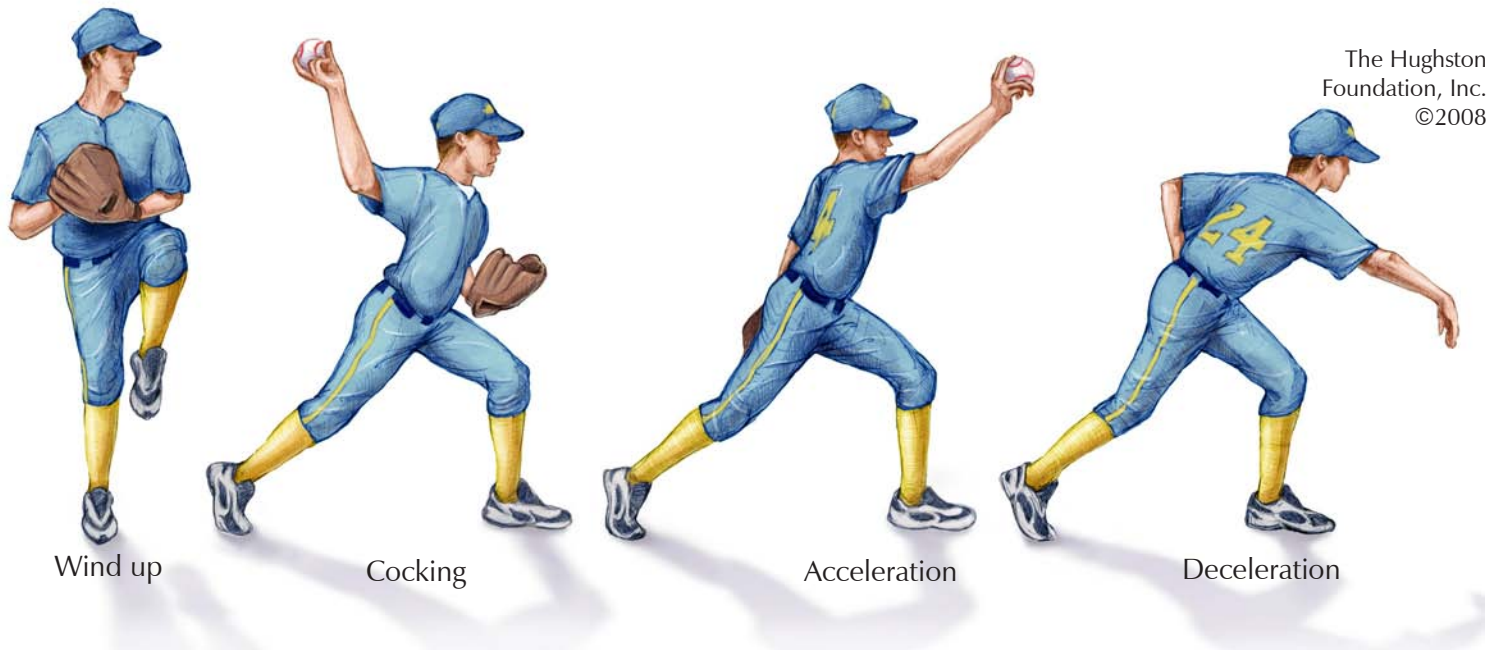


The spine and the vertebrae



Cross section of T11 vertebra showing the spinal cord and nerves

Fig 1. The 4 phases of throwing



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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 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

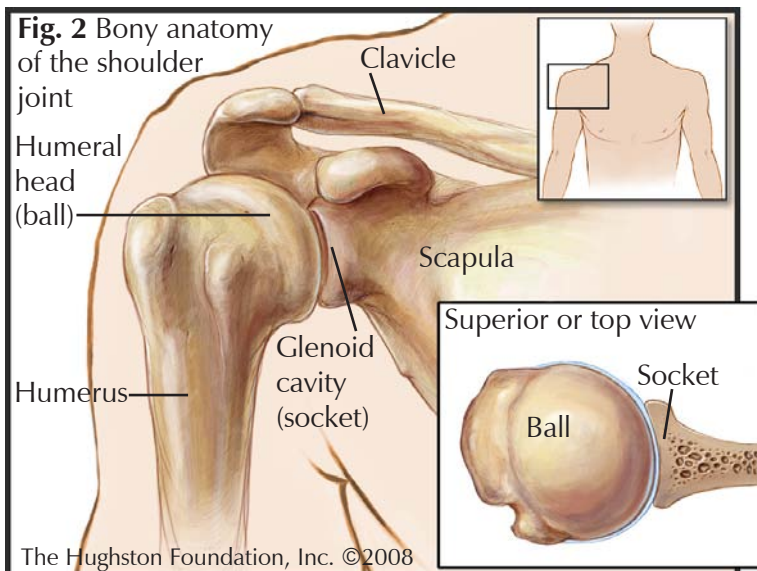
To understand pain in the throwing shoulder, it is important to understand both the throwing mechanism and the anatomy of the shoulder joint. The act of throwing can be divided into 4 phases: (1) wind up, (2) cocking, (3) acceleration, and (4) deceleration (Fig. 1). Some add a fifth phase, follow-through. 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). 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 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 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. 6).

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). 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 multi-faceted,

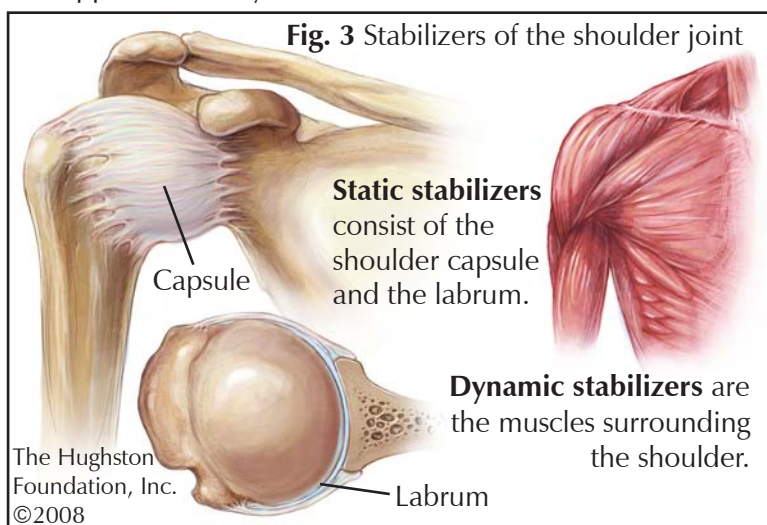
but the best treatment is early recognition and prevention of injury. As mentioned, pain is the earliest sign of injury, so coaches should regularly question throwers regarding the presence of shoulder pain. Other signs that should be recognized by coaches are loss of velocity, stamina, and poor throwing 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. 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



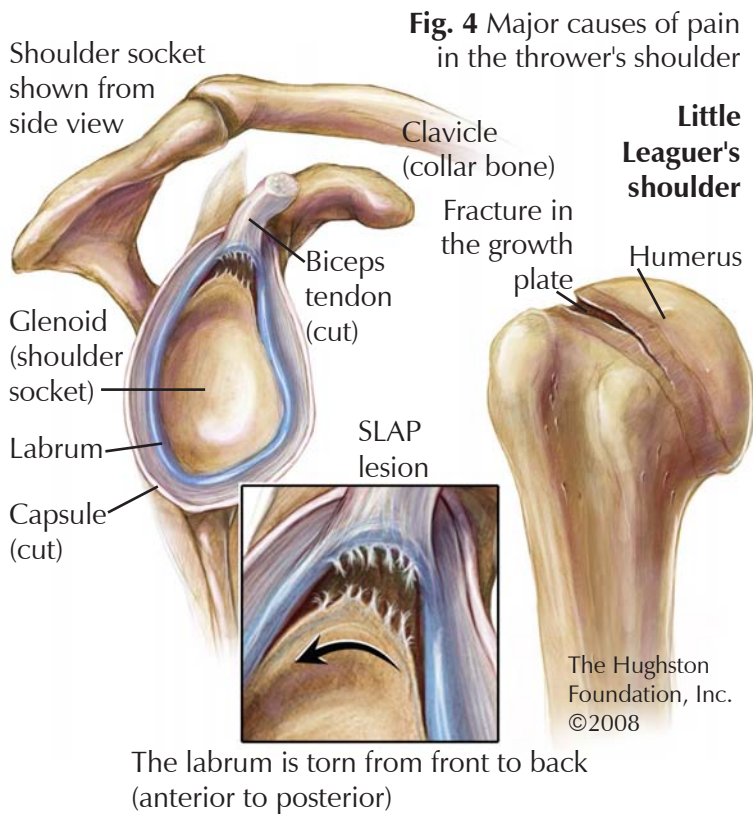


Fig. 4 Major causes of pain in the thrower's shoulder

Knee Injuries in Basketball

THE SPRAINS AND STRAINS OF THE GAME

Basketball is an exciting, fast-moving sport. Unfortunately, what makes the game exciting to watch and exhilarating to play also makes it a high-risk sport for knee injuries. Running with sudden stops, cutting side to side, jumping, and pivoting can injure your knee. Although there are risks of knee injury, it's still a great game, so before you jump in, you should know the risks and what you can do to prevent injury.

The largest joint in the body, the knee, is made up of the lower end of the femur (thighbone) and the upper end of the tibia, or shinbone. The patella, or kneecap, slides in a groove at the end of the femur. Ligaments at the end of the femur and tibia connect the bones and help stabilize and support the knee (Fig. 1). Tendons connect the muscles to the bones, and the cartilage inside the joint helps to cushion and absorb shock to the joint and to give stability to the knee.

A sprain or strain can occur when there is a direct blow to the knee or when there is a sudden, stressful movement that affects the knee. A sprain or strain can also develop from overuse of the joint or when you place too much stress on the knee for a long period of time. Often, with a sprain or strain the tissues become irritated, causing pain and swelling.

Sprains

A sprain is a stretch or tear of a ligament. More serious sprains involve complete tears of one or more of the knee ligaments. A common knee sprain involves the anterior cruciate ligament (ACL) (Fig. 1). Changing direction rapidly or stopping abruptly while running can cause the twisting motion that tears the ACL.

If you sprain your knee, you may hear a popping or snapping sound at the time of injury. Afterward, pain seems to come from within the knee, especially with movement. You will not be able to bear weight on that leg, and you can experience swelling and fluid behind the kneecap. You may also hesitate to place weight on the knee because it feels loose or unstable.

Strains

Strains are defined as a partially or completely torn muscle or tendon. With knee strains, you may feel symptoms similar to a sprain and may see bruising around the injured area.

Patellar tendinitis, or jumper's knee, is a common strain that usually results from overuse. Jumper's knee is an inflammatory condition that causes pain in the front of the knee. The extensor mechanism, which includes the quadriceps muscle and patellar tendon, connects the patella (kneecap) to the femur (thighbone) and the tibia (shinbone) (Fig. 2). Patellar tendinitis begins as inflammation 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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patellar tendon where it attaches to the patella. It can worsen by continual tearing or from degeneration of the tendon.

Treatment

You should rest your knee at the first sign of a sprain or strain. Immediately after injury, apply the RICE (rest, ice, compression and elevation) method. You should rest your knee as much as possible, apply ice packs for a couple of days to bring down the swelling, use compression, such as an ACE bandage, and elevate the leg on a pillow. For inflammation and pain, your doctor may prescribe anti-inflammatory medications such as aspirin or ibuprofen.

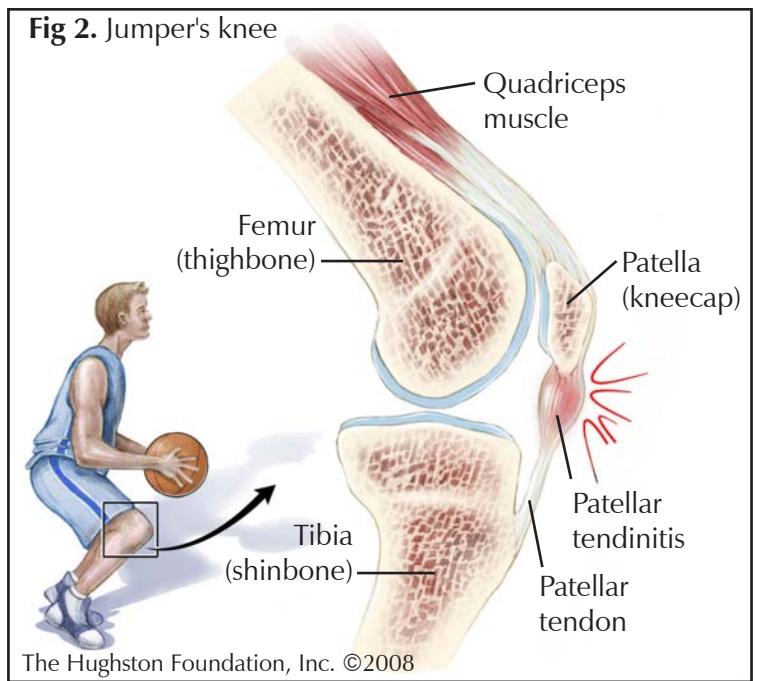
Treatment for knee injuries, such as severe sprains or strains (where a ligament or tendon is more seriously stretched or torn), may involve using a knee splint, immobilizer, or cast, and using crutches for a few weeks or months.

Depending on the injury, your doctor may suggest rehabilitation for your knee injury. Working with a physical therapist, you will do specific exercises designed to take your knee through its range of motion to prevent stiffness and scarring as your knee heals. You may also need to do regular exercises to strengthen the muscles surrounding the knee.

Injury prevention

To prevent knee injuries, always wear appropriate protective equipment during practices and competition. Kneepads and shinguards will help to protect your knee from injury. You'll also want to make sure you wear supportive shoes that are in good condition and are appropriate for the basketball court.

During workouts, always warm-up and cool down, and



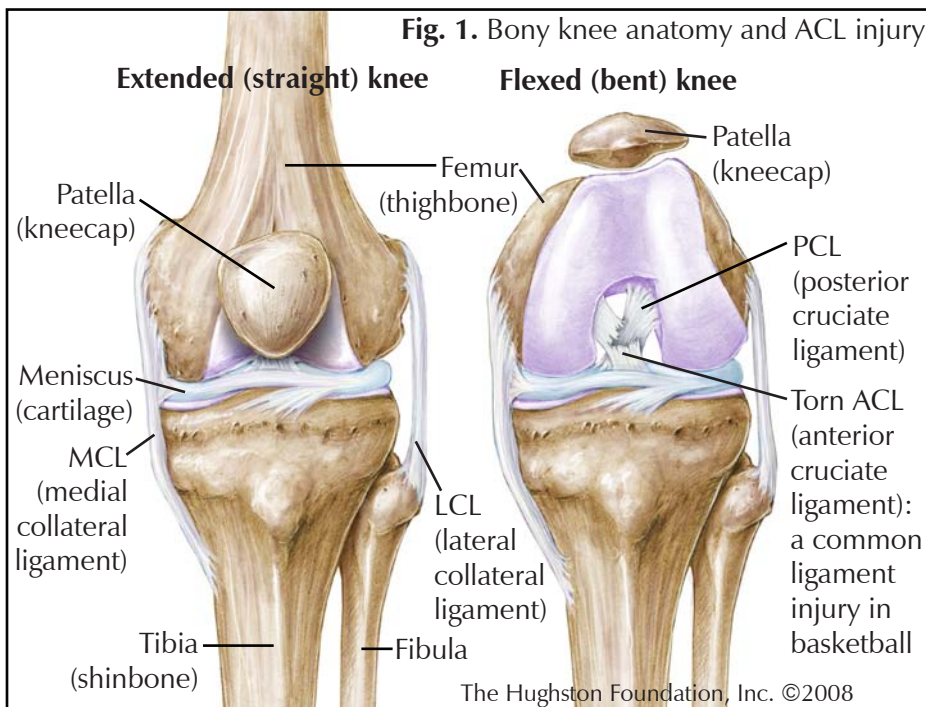
remember to increase your training intensity slowly. You might try weight lifting to strengthen your muscles and use stretching exercises to improve your flexibility because strong flexible muscles help support and protect joints. Warm-up with jumping jacks, a stationary bike, or running or walking in place for 3 to 5 minutes. Then slowly and gently stretch, holding each stretch for 30 seconds. After an intense workout, practice, or competition, slow down your heartbeat and stretch your muscles again to cool down. Do not suddenly increase the intensity or duration of your workout because it can lead to an overuse injury. If you play only one sport, maintain coordination and balance by training year-round even if it's at a lower intensity than during your competitive season.

The way you move can also help to prevent knee injuries. When you jump, bend your knees when you land to take pressure off the ACL. When you cut laterally or pivot, crouch at the hip and bend your knees to reduce your chance of ligament injury.

Never play through the pain of a sprain or strain. A minor injury can become a more serious injury that requires surgery if left untreated. A minor sprain or strain may keep you off the basketball court for a few weeks, but a major injury may keep you out of the game the entire season. Always see your doctor at the first sign of knee injury. You'll be glad you did.

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Expanding Dr. Hughston's Vision

Built in 2006, The Jack Hughston Memorial Hospital is a beautiful 110,000 square-foot facility. All of our patient rooms are spacious and private, and equipped with a 27-inch flat screen television. Only minutes separate The Hughston Clinic and the Jack Hughston Memorial Hospital; but, our electronic medical records system links the two instantly. Wireless Internet throughout, a dining hall with outdoor terrace, and floor-to-ceiling windows are all designed to make our patients and their families feel welcome. Additionally, our outpatient services, paper-free admissions process, and digital x-rays reduce tension, save time, and enhance our stress-free atmosphere. We offer all the high-tech equipment, professional staff, and the specialists you have come to expect from Hughston. Patients, of course, will receive world-class orthopaedic care, but the Jack Hughston Memorial Hospital

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