Hughston Health Alert

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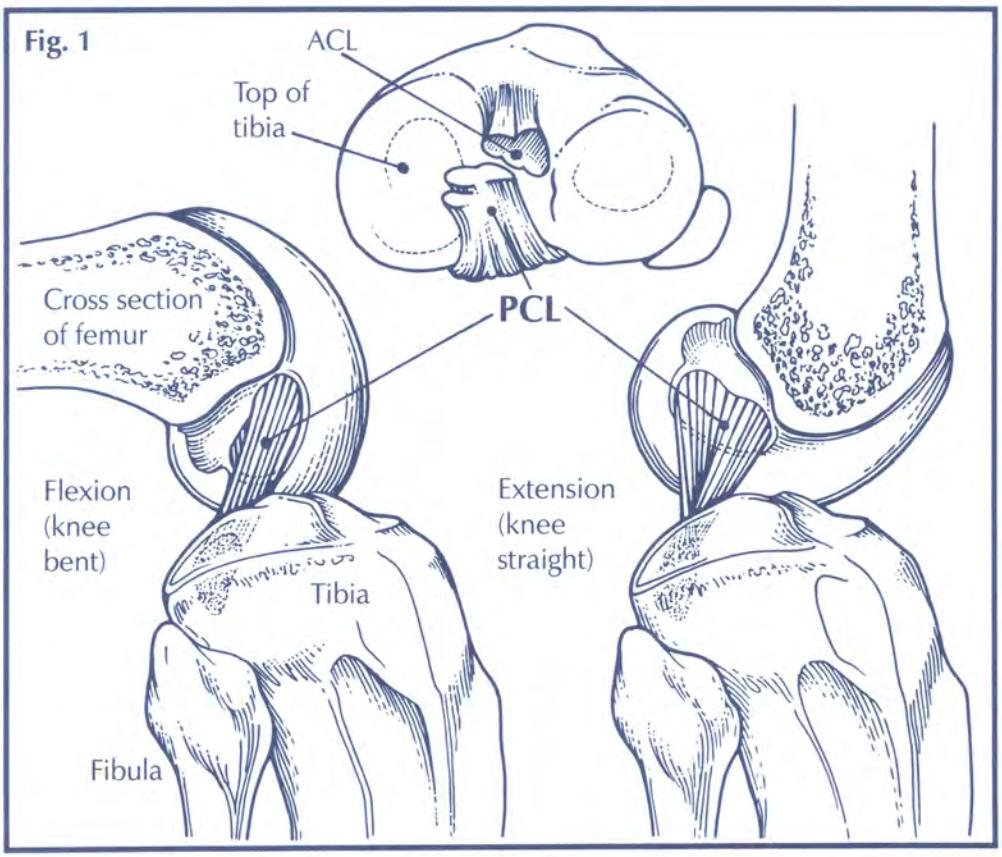
The Posterior Cruciate Ligament

In the last decade, orthopaedic surgeons have done much research to find out about anterior cruciate ligament (ACL) injuries of the knee so they can treat the problems better. Much less research has been done on the posterior cruciate ligament (PCL) because it is injured far less often than the ACL. In fact, orthopaedic knowledge and research of the PCL lags behind that of the ACL by about 10 years.

Your thigh bone (femur) and lower leg bones (tibia and fibula) meet in the knee joint and are held together by tissue called ligaments. In the middle of the knee are two ligaments called the anterior (front) cruciate ligament and the posterior (back) cruciate ligament (Fig. 1). The ACL prevents the femur from moving too far backward over the tibia. The PCL prevents the femur from moving too far forward over the tibia. The PCL is the knee's basic stabilizer and is almost twice as strong as the ACL. It provides a central axis about which the knee rotates.

Posterior cruciate ligament injuries comprise between 3% and 20% of all knee ligament injuries. However, the true incidence of PCL injuries remains unknown. The most common cause of PCL injuries is athletic, motor vehicle, or industrial accidents. Most athletic PCL injuries occur during a fall on the flexed (bent) knee with the foot plantar flexed (the toes pointing down with the top of the foot in line with the front of the leg). The shin (tibia) strikes the ground first and is pushed backward (Fig. 2, pg. 2). In motor vehicle accidents, the dashboard can drive the shin backward on the flexed knee. Hyperflexion (bending too far) of the



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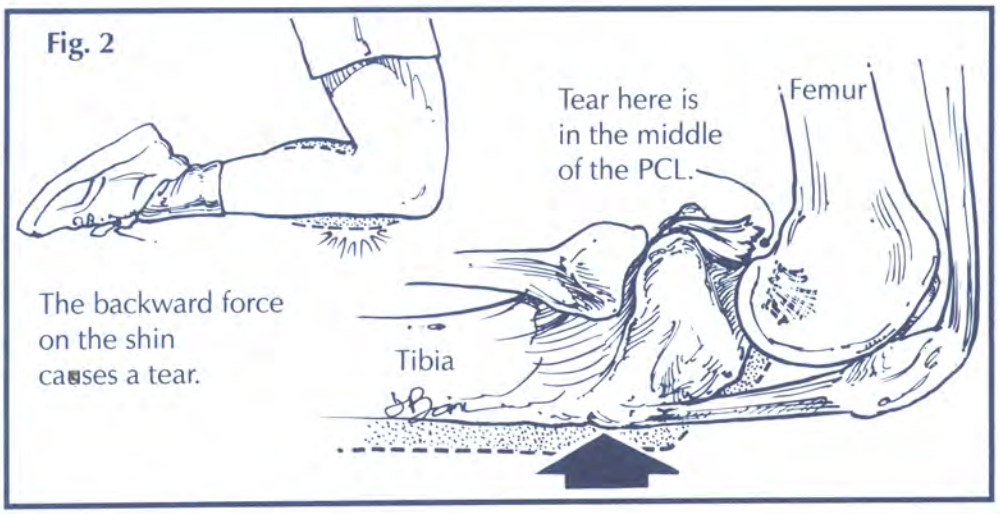

knee without a direct blow to the tibia can also cause an isolated PCL injury, which means no other ligaments are damaged. The PCL can be injured by other ways, but these injuries usually involve more ligaments, such as the ACL, medial and lateral collateral ligaments (located on either side of the knee), and the posterolateral corner (back outer side) of the knee.

Examination

The doctor examines your injured knee to find out if only the PCL is injured or if other ligaments are torn too. The type of injury dictates the type of treatment you need. Your doctor will move your knee in different directions to see how lax, or loose, it is.

The doctor can also do tests, such as magnetic resonance imaging (MRI), to help see what tissues are damaged in the knee, especially if you have injured more than one ligament and have much soft tissue damage.

Treatment

The treatment options are somewhat controversial among orthopaedists, but following are some general guidelines. If you have an acute (recent) PCL tear that does not cause much laxity, you will probably be treated with physical therapy that stresses aggressive rehabilitation of the quadriceps muscles, which are in the front of the thigh. Strong quadriceps muscles can take the place of the PCL to a certain extent, helping to prevent the femur from moving too far backward over the tibia.

If you have an acute PCL tear that causes significant laxity or if you have injured more than one ligament, you may need surgery to repair or reconstruct your PCL. Repairing a ligament means the torn fibers are reattached to each other (Fig. 3). The rich blood supply in the tissues around the ligament helps the PCL heal well if it is repaired soon after the injury.

If not enough fibers remain to repair the PCL or if the surgeon sees that the tissue has degenerated beyond repair, the PCL can be reconstructed. Reconstructing a ligament means the ligament is replaced with tissue from another part of your body or from a donor. Part of your patellar tendon (tissue that connects muscle to the patella) or hamstrings (muscles in the back of the thigh) can be used in the reconstruction. Or, donor tissue may be used instead.

Sometimes, a portion of bone is pulled off with the torn ligament. If the fragment is large enough, the bone is usually reattached. If the fragment is too small, it is discarded and the PCL is repaired or reconstructed.

All long-term PCL injuries are initially treated with an aggressive quadriceps rehabilitation program. Your doctor may consider reconstructing the PCL if the aggressive rehabilitation program fails, if there is significant laxity in your knee, or if degenerative changes in the knee joint can be seen on x-rays. Having an operation to treat a long-term PCL injury does not make your knee normal, but it may decrease your laxity somewhat.

Overall, the state of the art in treatment of PCL injuries is evolving, and the specific treatment varies from person to person. Proper diagnosis, aggressive rehabilitation, and knowledge of the operative and nonoperative options are the keys to appropriate treatment of PCL injuries at this time.

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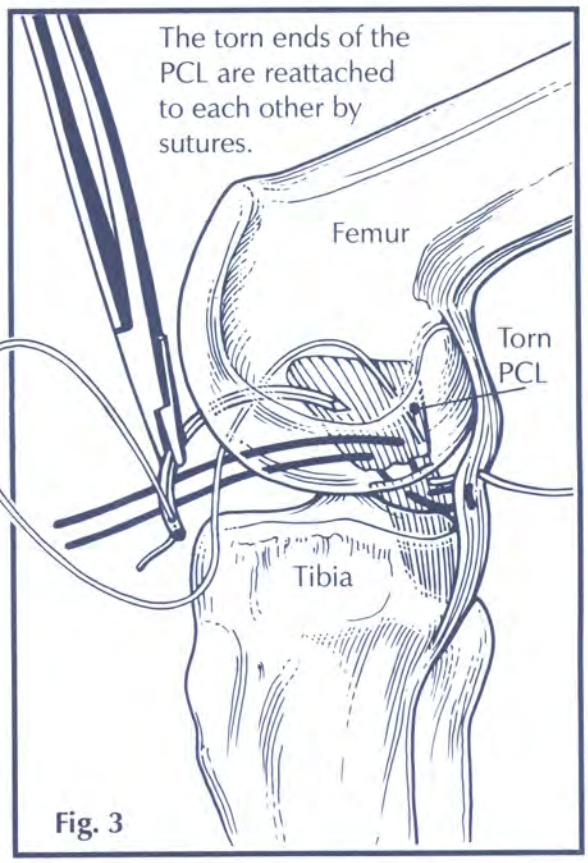

Fig. 3

Weight Training

Designing a Program for Children and Adolescents

Many young athletes want to increase their muscle strength and endurance as well as their cardiovascular fitness. Weight training is a form of exercise called resistance training that enables children and adolescents to build muscle strength. Starting a child or adolescent in a weight-training program is also a good opportunity to teach lifting principles and proper techniques.

Getting started

Athletes can begin a weight-training program at any age as long as they are mentally and emotionally mature enough. Youngsters must understand that rough play in the weight room can be dangerous to themselves and to others. When beginning a weight-training program, athletes should adhere to the following basic guidelines:

1. The athlete needs an annual physical examination and the doctor's permission to participate in a weight-training program. The doctor can recognize whether the athlete has any physical condition that may put him or her at risk for injury through program participation.

2. A knowledgeable adult supervises the weight-training activity and spots the lifter during bench presses.

3. An athletic trainer, physical therapist, or coach helps create a training program appropriate for the age and goals of the athlete and for the sport in which the athlete participates.

4. The athlete wears clothing that cannot be caught in the equipment and wears shoes with a firm toe box and nonskid soles.

5. The weight-training program includes at least 10 minutes of warm-up exercises, such as jogging and calisthenics, followed by stretching and concludes with at least 10 minutes of cool-down stretching.

6. Before starting the program, the athlete successfully completes a 4- to 6-week period of exercises including pushups, pullups, and situps. An adolescent who sticks with this exercise program will likely commit to a weight-training program. The athlete should continue to do these exercises throughout the weight-training program for general conditioning.

7. Flexibility and cardiovascular exercises are important for preventing injuries. The athlete should include some form of low-impact aerobic workout in the program.

Avoiding injury

Young people must be careful when lifting weights because their bones have not finished growing. Therefore, they risk damaging their growth plates, a layer of cartilage near the end of a bone where most of bone growth occurs. Trying to lift the heaviest weight can lead to a serious injury. For this reason, children and adolescents should not set bulking up as the goal of their weight-training program. They should tone their muscles using a low amount of weight and a high number of repetitions rather than lifting a heavy load one or two times. Only after they have passed through puberty should athletes begin to concentrate on adding muscle bulk. To prevent injury to growing bones, athletes should follow these guidelines for a weight-training program:

1. The routine should last no more than 30 minutes.

2. The program should include eight to 15 repetitions per set, two to three sets per exercise, and a maximum of 2 exercises per body part.

3. The athlete should not work out more than 3 times each week. He or she must include one or two days of rest between workouts. This time allows the muscles to rest and recover from the strain put on them during weight training. Muscle soreness that occurs after a workout should be gone before the next workout.

4. Do not increase the amount of weight used by more than 5 pounds each week.

5. The dead lift, squat, military press, power clean, snatch, and clean and jerk should be avoided until the athlete has developed secondary sexual characteristics, including heavy facial hair for men and genitalia that is adult in size and shape for both men and women. These characteristics signal that the athlete has passed through the biggest "growth spurt," during which time the growth plates are more vulnerable to injury.

6. If possible, the athlete should use free weights rather than weight machines because most machines are sized for adult frames.

7. Do not limit the program to weight training. Resistance exercises can also be done with a partner, the athlete's own body weight, and a Thera-Band. Check with a physical therapist, athletic trainer, or coach to find out how to set up a program using these types of resistance exercises.

Following an appropriate fitness program that includes weight training as well as flexibility and cardiovascular exercises can help prepare a young athlete for sports participation.

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Living with Arthritis

Pain, swelling, and restricted motion of a joint often signal that you have arthritis. Arthritis is a chronic (long-term) disease in which a joint is inflamed. Some types of arthritis are osteoarthritis, rheumatoid arthritis, and gout. This disease can strike children and adults, and it slowly destroys your joints as it progresses over time. Learning to live with arthritis can be a very challenging undertaking; however, it is possible to remain active and to continue doing the things you enjoy by following these guidelines.

Participate in an exercise program created just for you.

In general, most people with arthritis can take part in some form of exercise. Make sure this exercise program is tailored for your specific needs by your doctor or physical therpist so you will not overuse and abuse the joints with arthritis. Overuse can lead to more pain, swelling, joint damage, loss of function, and loss of independence.

Respect your pain.

Pain is one of your body's signals that something is wrong. People with arthritis frequently have to modify their activities to prevent pain and further damage to the joints, but they should not eliminate activities completely. Taking breaks and avoiding stress on the arthritic joints are small changes you can make in your activity pattern that allow you to stay active while avoiding pain.

Become aware of your body's functions and positions.

When arthritis affects your arms and hands, avoid activities, such as opening jars and hand mixing, that involve a tight grip or too much pressure on the fingers and thumbs. Also avoid pinching, squeezing, or twisting motions. When your back, neck, hips, and knees are involved, concentrating on stretching and good posture is extremely important.

Control your weight.

Losing excess weight can help you reduce stress on weight-bearing joints, such as the hips, knees, back, and feet. For example, when you walk, each hip joint must support 1½ times your body weight. When you sit down or stand up or when you walk up and down stairs, each hip joint must support 3 to 4 times your body weight. Obviously, if you are overweight, reducing your overall weight reduces the stress on your hip joints and other weight-bearing joints.

Change your position frequently.

Pain and stiffness may increase in your joints or muscles if they are kept in the same position for a long period of time. To help decrease pain and stiffness, relax and stretch the muscles about the joint during various activities. For example, stand and move around periodically if you have been sitting for a long time. Or, sit and rest if you have been standing.

Use your strongest joints and muscles whenever possible.

By using these major joints and muscle groups, you can reduce stress on the smaller joints. Try opening a heavy door with the side of your arm or by leaning into it and using your body or hip instead of pushing the door with your arthritic hand. To reduce stress on an arthritic hip, knee, or ankle when using stairs, go up with your stronger leg first and come down using your weaker leg first.

Combine rest and activity.

The appropriate combination of rest and activity is important for people with arthritis. It is wise to learn to take short breaks and alternate heavy and light activities throughout the day and throughout the week. Again, it is better to regulate your activities than to stop them completely when you first develop arthritis.

Plan ahead.

Planning ahead for activities of daily living and other endeavors is extremely important. Eliminating activities that are not necessary, asking someone to assist you, and delegating some tasks to others are good ways to avoid activities that cause your symptoms. If you have problems with your hip, knee, ankle, or foot joints, you should sit to work whenever possible. In addition, using labor-saving items, such as jar openers (see figure below), raised toilet seats, and Velcro closures on clothing, can make tasks much easier and more efficient.

Arthritis can be painful and frustrating, but by exercising, resting, and listening to your body, you can remain active. Contact the Arthritis Foundation (800/933-7023) for more information on living with arthritis.

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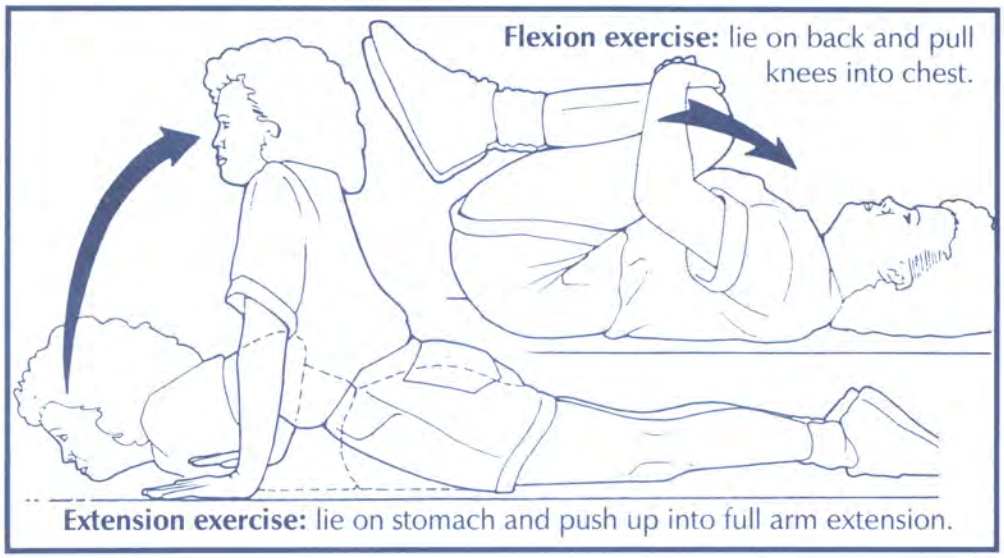
Low Back Pain

New Guidelines for Treatment

Everyone will have low back pain at some point in their life. Many medical professionals consider it a part of being human. The treatment can be costly, and prevention, diagnosis, and treatment options are numerous. The Agency for Health Care Policy and Research (AHCPR), created as a branch of the United States Public Health Service in 1989, recently released guidelines for the treatment of acute low back pain. The guidelines are aimed at decreasing the cost of treatment and streamlining the prevention, diagnosis, and management of low back pain.

In many ways the treatment of back pain today is similar to what you would expect if you were treated for a sore throat 100 years ago. Treatments for a sore throat in 1896 varied from one doctor to another; you might take garlic, herbs, poultices, or various tonics. In 1996, treatments for low back pain vary, and any number of treatments may be prescribed for you, including over-the-counter and prescription pain killers, muscle relaxers, anti-inflammatory medications (such as aspirin and ibuprofen), antidepressants, acupuncture, massage, manipulation by chiropractors or physical therapists, and various exercise regimens. There are "pain clinics," "back schools," specialized garments, and even the famous special chairs that Judge Ito and the defense and prosecution lawyers used at the O.J. Simpson trial! The choices can be as confusing to medical professionals as they are to the public.

The AHCPR guidelines suggest using activity-intensive treatments, such as exercise, instead of expensive medical testing for people who do not have serious medical problems. Passive treatments, such as bed rest, hot packs, massage, ultrasound, and electrical treatments, are not used.



Diagnosing your low back pain

Your doctor will examine you to see if your problem needs to be treated with surgery. Most people do not need surgery to treat their pain. In fact, surgical treatment only works for people who meet strict criteria. If you do not need surgery, your doctor will counsel you about the best program that will enable you to return to your normal activities. By following this program, you should improve from week to week, and nearly all problems should completely resolve within 6 weeks. When appropriate, the doctor refers you to a physical therapist to further evaluate and manage the problem.

An appropriately trained physical therapist can differentiate a muscle strain from a more serious injury to the joints of the spine. Back pain that lasts for more than 2 weeks is usually the result of an injury to one or more of the joints of the spine.

Treatment

A physical therapist with specialized manual therapy skills can isolate and treat joint injuries in the spine. When the joint problem has been successfully treated, strengthening exercises are incorporated into the treatment program. Although you may be in excellent physical condition, your low back may be weak. Your physical therapist can show you special exercises to strengthen your low back muscles (see figure above). Many nerve and disc injuries get better as you exercise. Doing stretches and other exercises for your low back as soon as possible can promote healing of nerve and disc injuries.

Unfortunately, some people do not get better with exercise, but exercising your low back is better than not exercising at all. Moving your back prevents muscle atrophy (withering) and joint stiffness.

Treatment for low back pain varies depending on whether the problem is related to muscles, joints, nerves, or discs. To get the appropriate treatment for your low back pain, the first step is to see your doctor, who will make sure the problem is musculoskeletal and not pain referred from a problem with an internal organ, such as the kidneys. Together, your doctor and physical therapist can treat your pain appropriately using the activity-intensive treatment suggested by the AHCPR guidelines.

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Problems That Can Occur During Fracture Healing

Fractures, or broken bones, are common injuries that orthopaedists treat. The healing process is generally the same for all fractures; through a series of stages, new bone forms and fills in the fractured area. If the fracture is severe, problems that slow the healing process can occur.

How does a fracture heal?

Stage 1: Inflammation

Bleeding from the fractured bone and surrounding tissue causes the fractured area to swell. This stage begins the day you fracture the bone and lasts about 2 to 3 weeks.

Stage 2: Soft callus

Between 2 and 3 weeks after the injury, the pain and swelling will decrease. At this point, the site of the fracture stiffens and new bone begins to form (see figure). The new bone cannot be seen on x-rays. This stage usually lasts until 4 to 8 weeks after the injury.

Stage 3: Hard callus

Between 4 and 8 weeks, the new bone begins to bridge the fracture. This bony bridge can be seen on x-rays. By 8 to 12 weeks after the injury, new bone has filled the fracture.

Stage 4: Bone remodeling

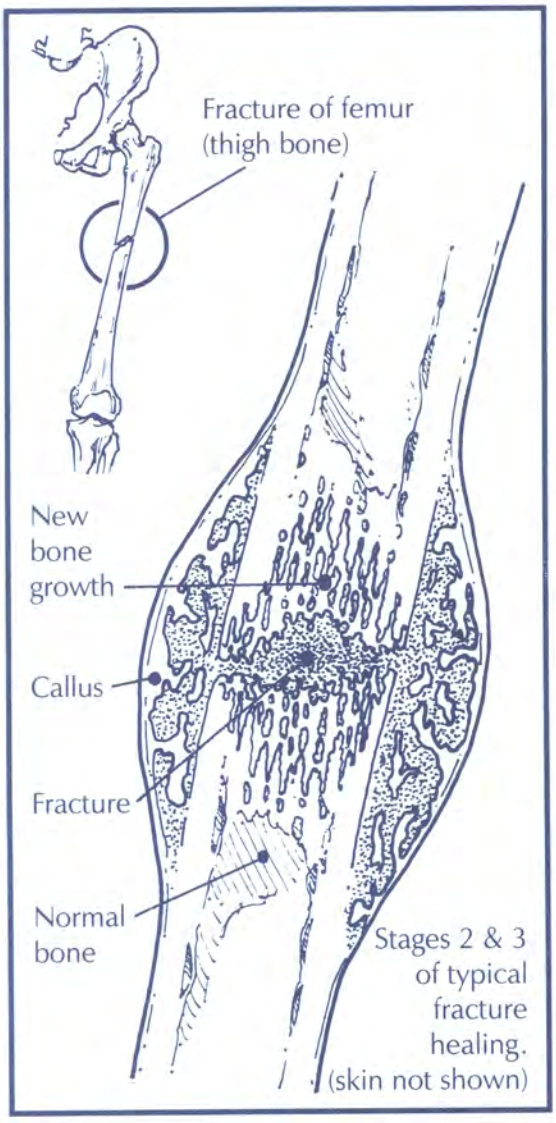
Beginning about 8 to 12 weeks after the injury, the fracture site remodels itself, correcting any deformities that may remain as a result of the injury. This final stage of fracture healing can last up to several years.

The rate of healing and the ability to remodel a fractured bone vary tremendously for each person and depend on your age, your health, the kind of fracture, and the bone involved. For example, children are able to heal and remodel their fractures much faster than adults.

Problems

Fractures heal without problems in most people. However, when they occur, fracture problems are almost always a result of a severe injury.

Compartment syndrome:
Severe swelling after a fracture can put so much pressure on the blood vessels that not enough blood can get to the muscles around the fracture. The decreased blood supply can cause the muscles around the fracture to die, which can lead to long-term disability. Compartment syndrome usually occurs only after a severe injury.



Neurovascular injury:
Some fractures are so severe that the arteries and nerves around the injury site are damaged.

Infection:
Open fractures can become infected when the jagged bone ends are exposed to the air where they have torn through the skin.

Post-traumatic arthritis:
Fractures that extend into the joints (intra-articular fractures) or fractures that cause the bones to meet at an abnormal angle in the joint can cause premature arthritis of a joint.

Growth abnormalities:
A fracture in the open physis, or growth plate, in a child, can cause many problems. Two of these problems are premature partial or complete closure of the physis. This means that one side of a bone or the whole bone stops growing before it naturally would. If one side of a bone stops growing before the other side, the bone will grow at an abnormal angle. If the whole bone, such as a thigh bone, stops growing prematurely, it will be shorter than the other thigh bone, making one leg shorter than the other.

Delayed union:
A fracture that takes longer to heal than expected is a delayed union.

Nonunion:
A fracture that fails to heal in a reasonable amount of time is called a nonunion.

Malunion:
A fracture that does not heal in a normal alignment is called a malunion.

These problems and complications do not often occur. When they do occur, orthopaedists have methods for managing them.

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Skier's Thumb

Thumb injuries commonly occur during sports participation and other activities. Because the thumb enables you to grip, pinch, and do other important hand functions, injuring it can be extremely disabling. One of the most commonly occurring thumb injuries is damage to the ligaments, the tissue that connects the bones. This injury is called skier's thumb because it frequently occurs when you fall on your hand while holding a ski pole.

The two bones that meet in the knuckle joint of the thumb (metacarpophalangeal joint) are held together and supported by ligaments. The ulnar collateral ligament, which is one of these supportive ligaments, is located on the inner side of the thumb. When high stress is placed on the knuckle joint, the thumb is forced away from the palm and index finger (Fig. 1). If this stress is greater than the ulnar collateral ligament can tolerate, the ligament stretches, then tears slightly, and eventually tears completely (Fig. 2). The stretching and tearing may occur in the middle of the ligament or where the tissue inserts into bone. Occasionally, a small piece of bone is pulled off with the ligament. When injured, the ulnar collateral ligament and other ligaments cannot support the thumb bones. The bones cannot move together normally in the joint, and the thumb is weakened. For example, you may notice that your thumb is weak when you try to pinch with the index finger and thumb.

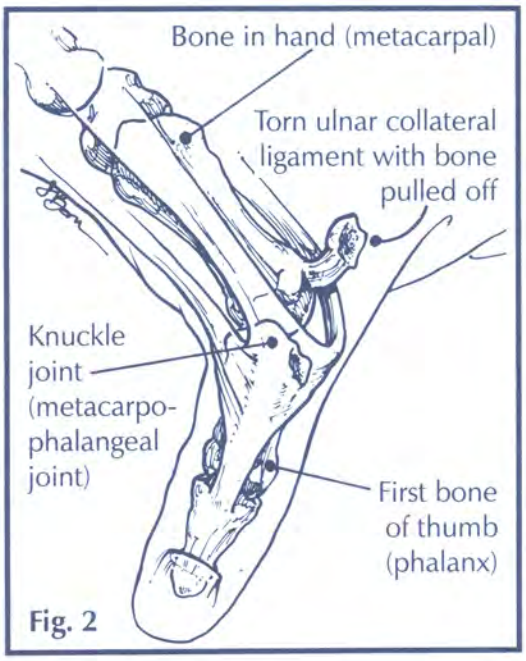

Fig. 2

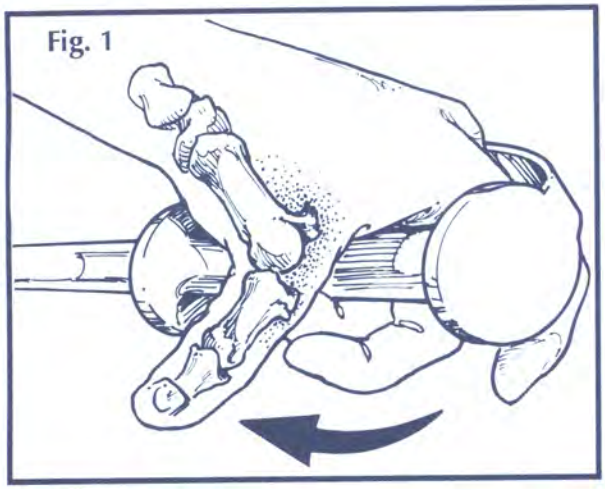
Fig. 1

You should immobilize, elevate, and ice your thumb immediately after it is injured to reduce swelling and to protect it, and you should have a doctor treat the injury as soon as possible. A thorough physical examination of your thumb is the most important step in correctly diagnosing skier's thumb. The doctor will evaluate your symptoms, take x-rays of your thumb, and compare the injured with the uninjured thumb.

The most common symptom is pain directly over the injured joint and ligament. Other symptoms include joint instability and swelling, tenderness, and, occasionally, bruising over the injured joint and ligament. The doctor takes x-rays to see if a small portion of bone was pulled off as the ligament was injured. Special x-rays called stress views may be taken. A stress view is an x-ray taken while a force (often similar to the force of the injury) is applied to the thumb. By comparing the injured with the uninjured thumb, the doctor can often determine if the ligament is injured and to what degree it is injured.

Treatment

Treatment depends on the type of injury to the ligament. If the ligament is strained (stretched or partially torn), your thumb may be immobilized in a cast for 4 to 6 weeks. You may also wear a splint for up to 8 weeks after the cast is removed to protect your thumb when you participate in sports.

If the ligament is completely torn or a small piece of bone has been pulled off with the ligament, you may need surgery. Surgery to treat skier's thumb is often an outpatient procedure, so you do not have to stay overnight in the hospital. A small incision is made directly over the joint and the ligament is repaired. After surgery, the thumb will be immobilized in a cast for 2 to 6 weeks. As with a sprained ligament, you will wear a splint for 8 weeks after the cast is removed to protect your thumb when you participate in sports.

If you have a skier's thumb injury that is not correctly diagnosed and treated immediately, long-term problems can develop. Symptoms include pain, swelling, and thumb instability, as well as a weak pinch. If the injury causes a significant problem, reconstructive surgery can be performed. The doctor takes tissue from another part of your body and uses it in place of your torn ulnar collateral ligament. The results of reconstructive surgery, however, are not as good as repairing the ligament early after the injury. Therefore, it is very important to have your thumb treated by your doctor as soon as possible after you injure it.

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Ask the Doctor

Q What is erythropoietin and how does it reduce the risks of blood transfusions?

A During major orthopaedic surgery, such as a total joint replacement, patients often lose much blood, and they need blood transfusions after surgery. Although the blood supply today is very safe, it nonetheless has been associated with some health problems. Therefore, many patients participate in a program called autologous predeposit: they give blood before they have surgery. This blood is stored, and if they lose too much blood during surgery, the patients can receive a transfusion of their own blood. Autologous predeposit can be hindered by problems scheduling the predeposits, the short shelf life of fresh blood (about 8 weeks), and the development of anemia (low red blood cell count) because of frequent donations. Erythropoietin, a drug currently under investigation at The Hughston Clinic, increases the bone marrow's production of red blood cells and raises the patient's hematocrit (red blood cell count). Patients are given this drug up to 3 weeks before their surgery, building their hematocrit and minimizing the chance they will need a transfusion after surgery. Early results from studies with this drug are very promising; minimal side effects and a significant reduction in blood transfusions have been reported. In the future, erythropoietin may become a standard way to reduce the need for blood transfusions and to reduce patients' concerns about blood loss during surgery.

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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, P.C., of physical therapists and trainers at Rehabilitation Services of Columbus, Inc., 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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Health Hints

● Don't overdo it when trying to make the lifestyle changes included on your New Year's resolution list, such as beginning an exercise program and reducing dietary fat. You can successfully improve your lifestyle by working on one change at a time.

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