

*Questions
& Answers
about . . .*

**Knee
Problems**

*National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)
National Institutes of Health
Public Health Service • U.S. Department of Health and Human Services*

This booklet is not copyrighted. Readers are encouraged to duplicate and distribute as many copies as needed.

Additional copies of this booklet are available from

National Institute of Arthritis and Musculoskeletal
and Skin Diseases
NIAMS/National Institutes of Health
1 AMS Circle
Bethesda, MD 20892-3675

You can also find this booklet on the NIAMS Web site at
www.niams.nih.gov/hi/topics/kneeproblems/kneeqa.htm.

Table of Contents

What Do the Knees Do? How Do They Work?	1
What Causes Knee Problems?	2
Joint Basics	2
What Are the Parts of the Knee?	3
How Are Knee Problems Diagnosed?	6
Knee Injuries and Problems	8
Arthritis	8
Cartilage Injuries and Disorders	10
Injuries to the Meniscus	11
Ligament Injuries	15
Tendon Injuries and Disorders	17
Other Knee Injuries	21
What Kinds of Doctors Treat Knee Problems?	24
How Can People Prevent Knee Problems?	25
What Types of Exercise Are Most Suitable for Someone With Knee Arthritis?	26
Where Can People Find More Information About Knee Problems?	27

Information Box

Lateral View of the Knee 3

Knee problems commonly occur in young people and adults. This booklet contains general information about several knee problems. It includes descriptions and a diagram of the different parts of the knee. Individual sections of the booklet describe the symptoms, diagnosis, and treatment of specific types of knee injuries and conditions. Information on how to prevent these problems is also provided.

What Do the Knees Do? How Do They Work?

The knees provide stable support for the body and allow the legs to bend and straighten. Both flexibility and stability are needed for standing and for motions like walking, running, crouching, jumping, and turning.

Several kinds of supporting and moving parts, including bones, cartilage, muscles, ligaments, and tendons, help the knees do their job. Any of these parts can be involved in pain or dysfunction.

What Causes Knee Problems?

There are two general kinds of knee problems: mechanical and inflammatory.

Mechanical Knee Problems

Some knee problems result from injury, such as a direct blow or sudden movements that strain the knee beyond its normal range of movement. Other problems, such as osteoarthritis in the knee, result from wear and tear on its parts.

Inflammatory Knee Problems

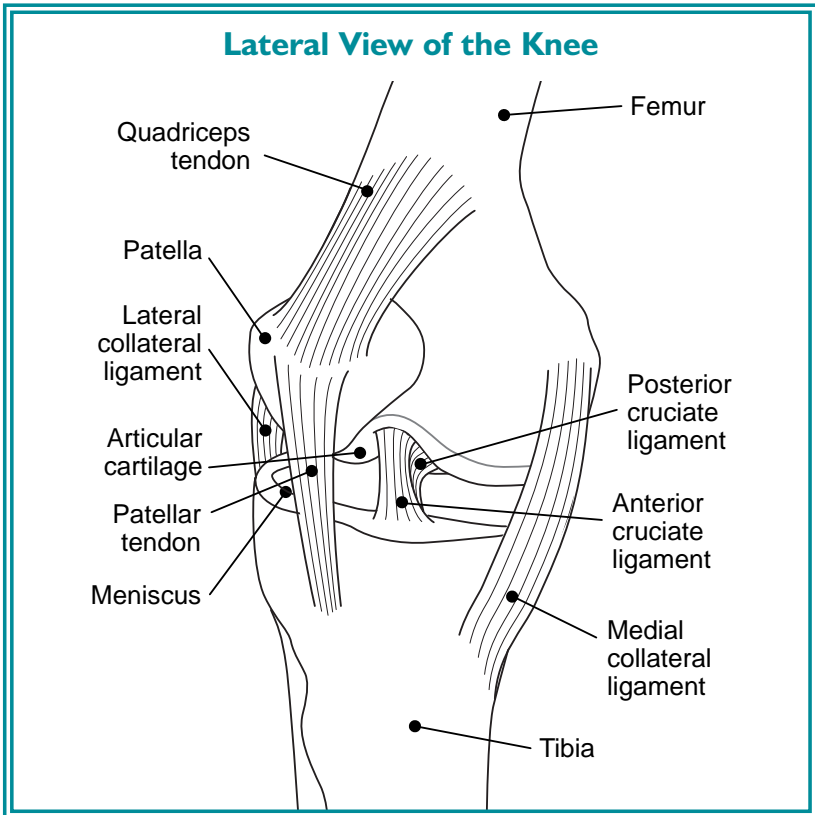
Inflammation that occurs in certain rheumatic diseases, such as rheumatoid arthritis and systemic lupus erythematosus, can damage the knee.

Joint Basics

The point at which two or more bones are connected is called a joint. In all joints, the bones are kept from grinding against each other by padding called cartilage. Bones are joined to bones by strong, elastic bands of tissue called ligaments. Tendons are tough cords of tissue that connect muscle to bone. Muscles work in opposing pairs to bend and straighten joints. While muscles are not technically part of a joint, they're important because strong muscles help support and protect joints.

What Are the Parts of the Knee?

Like any joint, the knee is composed of bones and cartilage, ligaments, tendons, and muscles (see the diagram).



Bones and Cartilage

The knee joint is the junction of three bones: the femur (thigh bone or upper leg bone), the tibia (shin bone or larger bone of the lower leg), and the patella (knee cap). The patella is 2 to 3 inches wide and 3 to 4 inches long. It sits

over the other bones at the front of the knee joint and slides when the leg moves. It protects the knee and gives leverage to muscles.

The ends of the three bones in the knee joint are covered with articular cartilage, a tough, elastic material that helps absorb shock and allows the knee joint to move smoothly. Separating the bones of the knee are pads of connective tissue. One pad is called a meniscus (muh-NISS-kus). The plural is menisci (muh-NISS-sky). The menisci are divided into two crescent-shaped discs positioned between the tibia and femur on the outer and inner sides of each knee. The two menisci in each knee act as shock absorbers, cushioning the lower part of the leg from the weight of the rest of the body as well as enhancing stability.

Muscles

There are two groups of muscles at the knee. The quadriceps muscle comprises four muscles on the front of the thigh that work to straighten the leg from a bent position. The hamstring muscles, which bend the leg at the knee, run along the back of the thigh from the hip to just below the knee. Keeping these muscles strong with exercises such as walking up stairs or riding a stationary bicycle helps support and protect the knee.

Tendons and Ligaments

The quadriceps tendon connects the quadriceps muscle to the patella and provides the power to extend the leg. Four ligaments connect the femur and tibia and give the joint strength and stability:

- The medial collateral ligament (MCL) provides stability to the inner (medial) part of the knee.
- The lateral collateral ligament (LCL) provides stability to the outer (lateral) part of the knee.
- The anterior cruciate ligament (ACL), in the center of the knee, limits rotation and the forward movement of the tibia.
- The posterior cruciate ligament (PCL), also in the center of the knee, limits backward movement of the tibia.

Other ligaments are part of the knee capsule, which is a protective, fiber-like structure that wraps around the knee joint. Inside the capsule, the joint is lined with a thin, soft tissue called synovium.

How Are Knee Problems Diagnosed?

Doctors use several methods to diagnose knee problems.

Medical history—The patient tells the doctor details about symptoms and about any injury, condition, or general health problem that might be causing the pain.

Physical examination—The doctor bends, straightens, rotates (turns), or presses on the knee to feel for injury and discover the limits of movement and the location of pain. The patient may be asked to stand, walk, or squat to help the doctor assess the knee's function.

Diagnostic tests—The doctor uses one or more tests to determine the nature of a knee problem.

- **X ray (radiography)**—An x-ray beam is passed through the knee to produce a two-dimensional picture of the bones.
- **Computerized axial tomography (CAT) scan**—X rays lasting a fraction of a second are passed through the knee at different angles, detected by a scanner, and analyzed by a computer. This produces a series of clear cross-sectional images (“slices”) of the knee tissues on a computer screen. CAT scan images show soft tissues such as ligaments or muscles more clearly than conventional x rays. The computer can combine individual images to give a three-dimensional view of the knee.

- **Bone scan (radionuclide scanning)**—A very small amount of radioactive material is injected into the patient's bloodstream and detected by a scanner. This test detects blood flow to the bone and cell activity within the bone and can show abnormalities in these processes that may aid diagnosis.
- **Magnetic resonance imaging (MRI)**—Energy from a powerful magnet (rather than x rays) stimulates knee tissue to produce signals that are detected by a scanner and analyzed by a computer. This creates a series of cross-sectional images of a specific part of the knee. An MRI is particularly useful for detecting soft tissue damage or disease. Like a CAT scan, a computer is used to produce three-dimensional views of the knee during MRI.
- **Arthroscopy**—The doctor manipulates a small, lighted optic tube (arthroscope) that has been inserted into the joint through a small incision in the knee. Images of the inside of the knee joint are projected onto a television screen. While the arthroscope is inside the knee joint, removal of loose pieces of bone or cartilage or the repair of torn ligaments and menisci is also possible.
- **Biopsy**—The doctor removes tissue to examine under a microscope.

Knee Injuries and Problems

Arthritis

What Is Arthritis of the Knee?

Arthritis of the knee is most often osteoarthritis. In this disease, the cartilage in the joint gradually wears away. In rheumatoid arthritis, which can also affect the knees, the joint becomes inflamed and cartilage may be destroyed.* Arthritis not only affects joints; it can also affect supporting structures such as muscles, tendons, and ligaments.

Osteoarthritis may be caused by excess stress on the joint from deformity, repeated injury, or excess weight. It most often affects middle-aged and older people. A young person who develops osteoarthritis may have an inherited form of the disease or may have experienced continuous irritation from an unrepaired torn meniscus or other injury. Rheumatoid arthritis often affects people at an earlier age than osteoarthritis.

Signs and Diagnosis

Someone who has arthritis of the knee may experience pain, swelling, and a decrease in knee motion. A common symptom is morning stiffness that lessens as the person

* The National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse has separate publications on osteoarthritis, rheumatoid arthritis, and knee replacement. See the end of this booklet for contact information.

moves around. Sometimes the joint locks or clicks when the knee is bent and straightened, but these signs may occur in other knee disorders as well. The doctor may confirm the diagnosis by performing a physical examination and examining x rays, which typically show a loss of joint space. Blood tests may be helpful for diagnosing rheumatoid arthritis, but other tests may be needed too. Analyzing fluid from the knee joint may be helpful in diagnosing some kinds of arthritis. The doctor may use arthroscopy to directly see damage to cartilage, tendons, and ligaments and to confirm a diagnosis, but arthroscopy is usually done only if a repair procedure is to be performed.

Treatment

Most often osteoarthritis of the knee is treated with pain-reducing medicines, such as aspirin or acetaminophen (Tylenol*); nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen (Motrin, Nuprin, Advil); and exercises to restore joint movement and strengthen the knee. Losing excess weight can also help people with osteoarthritis.

Rheumatoid arthritis of the knee may require physical therapy and more powerful medications. In people with arthritis of the knee, a seriously damaged joint may need to be replaced with an artificial one. (A new procedure designed to stimulate the growth of cartilage by using a patient's own

* Brand names included in this booklet are provided as examples only, and their inclusion does not mean that these products are endorsed by the National Institutes of Health or any other Government agency. Also, if a particular brand name is not mentioned, this does not mean or imply that the product is unsatisfactory.

cartilage cells is being used experimentally to repair cartilage injuries at the end of the femur at the knee. It is not, however, a treatment for arthritis.)

Cartilage Injuries and Disorders

What Is Chondromalacia?

Chondromalacia (KON-dro-mah-LAY-she-ah), also called chondromalaciapatellae, refers to softening of the articular cartilage of the knee cap. This disorder occurs most often in young adults and can be caused by injury, overuse, parts out of alignment, or muscle weakness. Instead of gliding smoothly across the lower end of the thigh bone, the knee cap rubs against it, thereby roughening the cartilage underneath the knee cap. The damage may range from a slightly abnormal surface of the cartilage to a surface that has been worn away to the bone. Chondromalacia related to injury occurs when a blow to the knee cap tears off either a small piece of cartilage or a large fragment containing a piece of bone (osteochondral fracture).

Symptoms and Diagnosis

The most frequent symptom is a dull pain around or under the knee cap that worsens when walking down stairs or hills. A person may also feel pain when climbing stairs or when the knee bears weight as it straightens. The disorder is common in runners and is also seen in skiers, cyclists, and soccer players. A patient's description of symptoms and a followup

x ray usually help the doctor make a diagnosis. Although arthroscopy can confirm the diagnosis, it's not performed unless the condition requires extensive treatment.

Treatment

Many doctors recommend that patients with chondromalacia perform low-impact exercises that strengthen muscles, particularly the inner part of the quadriceps, without injuring joints. Swimming, riding a stationary bicycle, and using a cross-country ski machine are acceptable as long as the knee doesn't bend more than 90 degrees. Electrical stimulation may also be used to strengthen the muscles. If these treatments don't improve the condition, the doctor may perform arthroscopic surgery to smooth the surface of the cartilage and "wash out" the cartilage fragments that cause the joint to catch during bending and straightening. In more severe cases, surgery may be necessary to correct the angle of the knee cap and relieve friction with the cartilage or to reposition parts that are out of alignment.

Injuries to the Meniscus

What Causes Injuries to the Meniscus?

The meniscus is easily injured by the force of rotating the knee while bearing weight. A partial or total tear may occur when a person quickly twists or rotates the upper leg while the foot stays still (for example, when dribbling a basketball around an opponent or turning to hit a tennis ball). If the tear is tiny, the meniscus stays connected to the front and

back of the knee; if the tear is large, the meniscus may be left hanging by a thread of cartilage. The seriousness of a tear depends on its location and extent.

Symptoms

Generally, when people injure a meniscus, they feel some pain, particularly when the knee is straightened. If the pain is mild, the person may continue moving. Severe pain may occur if a fragment of the meniscus catches between the femur and the tibia. Swelling may occur soon after injury if blood vessels are disrupted, or swelling may occur several hours later if the joint fills with fluid produced by the joint lining (synovium) as a result of inflammation. If the synovium is injured, it may become inflamed and produce fluid to protect itself. This makes the knee swell. Sometimes, an injury that occurred in the past but was not treated becomes painful months or years later, particularly if the knee is injured a second time. After any injury, the knee may click, lock, or feel weak. Although symptoms of meniscal injury may disappear on their own, they frequently persist or return and require treatment.

Diagnosis

In addition to listening to the patient's description of the onset of pain and swelling, the doctor may perform a physical examination and take x rays of the knee. The examination may include a test in which the doctor bends the leg, then rotates the leg outward and inward while extending it.

Pain or an audible click suggests a meniscal tear. An MRI may be recommended to confirm the diagnosis. Occasionally, the doctor may use arthroscopy to help diagnose and treat a meniscal tear.

Treatment

If the tear is minor and the pain and other symptoms go away, the doctor may recommend a muscle-strengthening program. Exercises for meniscal problems are best started with guidance from a doctor and physical therapist or exercise therapist. The therapist will make sure that the patient does the exercises properly and without risking new or repeat injury. The following exercises after injury to the meniscus are designed to build up the quadriceps and hamstring muscles and increase flexibility and strength.

- Warming up the joint by riding a stationary bicycle, then straightening and raising the leg (but not straightening it too much).
- Extending the leg while sitting (a weight may be worn on the ankle for this exercise).
- Raising the leg while lying on the stomach.
- Exercising in a pool (walking as fast as possible in chest-deep water, performing small flutter kicks while holding onto the side of the pool, and raising each leg to 90 degrees in chest-deep water while pressing the back against the side of the pool).

If the tear is more extensive, the doctor may perform arthroscopic or open surgery to see the extent of injury and to repair the tear. The doctor can sew the meniscus back in place if the patient is relatively young, if the injury is in an area with a good blood supply, and if the ligaments are intact. Most young athletes are able to return to active sports after meniscus repair.

If the patient is elderly or the tear is in an area with a poor blood supply, the doctor may cut off a small portion of the meniscus to even the surface. In some cases, the doctor removes the entire meniscus. However, osteoarthritis is more likely to develop in the knee if the meniscus is removed. Medical researchers are investigating a procedure called an allograft, in which the surgeon replaces the meniscus with one from a cadaver. A grafted meniscus is fragile and will shrink and tear easily. Researchers have also attempted to replace a meniscus with an artificial one, but this procedure is even less successful than an allograft.

Recovery after surgical repair takes several weeks, and post-operative activity is slightly more restricted than when the meniscus is removed. Nevertheless, putting weight on the joint actually fosters recovery. Regardless of the form of surgery, rehabilitation usually includes walking, bending the legs, and doing exercises that stretch and build up leg muscles. The best results of treatment for meniscal injury are obtained in people who do not show articular cartilage changes and who have an intact ACL.

Ligament Injuries

What Are the Causes of Anterior and Posterior Cruciate Ligament Injuries?

Injury to the cruciate ligaments is sometimes referred to as a “sprain.”* The ACL is most often stretched or torn (or both) by a sudden twisting motion (for example, when the feet are planted one way and the knees are turned another).

The PCL is most often injured by a direct impact, such as in an automobile accident or football tackle.

Symptoms and Diagnosis

Injury to a cruciate ligament may not cause pain. Rather, the person may hear a popping sound, and the leg may buckle when he or she tries to stand on it. The doctor may perform several tests to see whether the parts of the knee stay in proper position when pressure is applied in different directions. A thorough examination is essential. An MRI is very accurate in detecting a complete tear, but arthroscopy may be the only reliable means of detecting a partial one.

Treatment

For an incomplete tear, the doctor may recommend that the patient begin an exercise program to strengthen surrounding

* The National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse has a separate publication on sprains and strains. See the end of this booklet for contact information.

muscles. The doctor may also prescribe a brace to protect the knee during activity. For a completely torn ACL in an active athlete and motivated person, the doctor is likely to recommend surgery. The surgeon may reattach the torn ends of the ligament or reconstruct the torn ligament by using a piece (graft) of healthy ligament from the patient (autograft) or from a cadaver (allograft). Although synthetic ligaments have been tried in experiments, the results have not been as good as with human tissue. One of the most important elements in a patient's successful recovery after cruciate ligament surgery is a 4- to 6-month exercise and rehabilitation program that may involve using special exercise equipment at a rehabilitation or sports center. Successful surgery and rehabilitation will allow the patient to return to a normal lifestyle.

What Is the Most Common Cause of Medial and Lateral Collateral Ligament Injuries?

The MCL is more easily injured than the LCL. The cause is most often a blow to the outer side of the knee that stretches and tears the ligament on the inner side of the knee. Such blows frequently occur in contact sports like football or hockey.

Symptoms and Diagnosis

When injury to the MCL occurs, a person may feel a pop and the knee may buckle sideways. Pain and swelling are common. A thorough examination is needed to determine the kind and extent of the injury. To diagnose a collateral ligament injury, the doctor exerts pressure on the side of the knee

to determine the degree of pain and the looseness of the joint. An MRI is helpful in diagnosing injuries to these ligaments.

Treatment

Most sprains of the collateral ligaments will heal if the patient follows a prescribed exercise program. In addition to exercise, the doctor may recommend ice packs to reduce pain and swelling and a small sleeve-type brace to protect and stabilize the knee. A sprain may take 2 to 4 weeks to heal. A severely sprained or torn collateral ligament may be accompanied by a torn ACL, which usually requires surgical repair.

Tendon Injuries and Disorders

What Causes Tendinitis and Ruptured Tendons?

Knee tendon injuries range from tendinitis (inflammation of a tendon) to a ruptured (torn) tendon. If a person overuses a tendon during certain activities such as dancing, cycling, or running, the tendon stretches like a worn-out rubber band and becomes inflamed. Also, trying to break a fall may cause the quadriceps muscles to contract and tear the quadriceps tendon above the patella or the patellar tendon below the patella. This type of injury is most likely to happen in older people whose tendons tend to be weaker. Tendinitis of the patellar tendon is sometimes called jumper's knee because in sports that require jumping, such as basketball, the muscle contraction and force of hitting the ground

after a jump strain the tendon. After repeated stress, the tendon may become inflamed or tear.

Symptoms and Diagnosis

People with tendinitis often have tenderness at the point where the patellar tendon meets the bone. In addition, they may feel pain during running, hurried walking, or jumping. A complete rupture of the quadriceps or patellar tendon is not only painful, but also makes it difficult for a person to bend, extend, or lift the leg against gravity. If there is not much swelling, the doctor will be able to feel a defect in the tendon near the tear during a physical examination. An x ray will show that the patella is lower than normal in a quadriceps tendon tear and higher than normal in a patellar tendon tear. The doctor may use an MRI to confirm a partial or total tear.

Treatment

Initially, the doctor may ask a patient with tendinitis to rest, elevate, and apply ice to the knee and to take medicines such as aspirin or ibuprofen to relieve pain and decrease inflammation and swelling. If the quadriceps or patellar tendon is completely ruptured, a surgeon will reattach the ends. After surgery, the patient will wear a cast for 3 to 6 weeks and use crutches. For a partial tear, the doctor might apply a cast without performing surgery.

Rehabilitating a partial or complete tear of a tendon requires an exercise program that is similar to but less vigorous than that prescribed for ligament injuries. The goals of exercise are to restore the ability to bend and straighten the knee and to strengthen the leg to prevent repeat injury. A rehabilitation program may last 6 months, although the patient can return to many activities before then.

What Causes Osgood-Schlatter Disease?

Osgood-Schlatter disease is caused by repetitive stress or tension on part of the growth area of the upper tibia (the apophysis). It is characterized by inflammation of the patellar tendon and surrounding soft tissues at the point where the tendon attaches to the tibia. The disease may also be associated with an injury in which the tendon is stretched so much that it tears away from the tibia and takes a fragment of bone with it. The disease most commonly affects active young people, particularly boys between the ages of 10 and 15, who play games or sports that include frequent running and jumping.

Symptoms and Diagnosis

People with this disease experience pain just below the knee joint that usually worsens with activity and is relieved by rest. A bony bump that is particularly painful when pressed may appear on the upper edge of the tibia (below the knee cap). Usually, the motion of the knee is not affected. Pain

may last a few months and may recur until the child's growth is completed.

Osgood-Schlatter disease is most often diagnosed by the symptoms. An x ray may be normal, or show an injury, or, more typically, show that the growth area is in fragments.

Treatment

Usually, the disease resolves without treatment. Applying ice to the knee when pain begins helps relieve inflammation and is sometimes used along with stretching and strengthening exercises. The doctor may advise the patient to limit participation in vigorous sports. Children who wish to continue moderate or less stressful sports activities may need to wear knee pads for protection and apply ice to the knee after activity. If there is a great deal of pain, sports activities may be limited until discomfort becomes tolerable.

What Causes Iliotibial Band Syndrome?

This is an overuse condition in which inflammation results when a band of a tendon rubs over the outer bone (lateral condyle) of the knee. Although iliotibial band syndrome may be caused by direct injury to the knee, it is most often caused by the stress of long-term overuse, such as sometimes occurs in sports training.

Symptoms and Diagnosis

A person with this syndrome feels an ache or burning sensation at the side of the knee during activity. Pain may be localized at the side of the knee or radiate up the side of the thigh. A person may also feel a snap when the knee is bent and then straightened. Swelling is usually absent and knee motion is normal. The diagnosis of this disorder is typically based on the symptoms, such as pain at the outer bone, and exclusion of other conditions with similar symptoms.

Treatment

Usually, iliotibial band syndrome disappears if the person reduces activity and performs stretching exercises followed by muscle-strengthening exercises. In rare cases when the syndrome doesn't disappear, surgery may be necessary to split the tendon so it isn't stretched too tightly over the bone.

Other Knee Injuries

What Is Osteochondritis Dissecans?

Osteochondritis dissecans results from a loss of the blood supply to an area of bone underneath a joint surface and usually involves the knee. The affected bone and its covering of cartilage gradually loosen and cause pain. This problem usually arises spontaneously in an active adolescent or young adult. It may be due to a slight blockage of a small artery or to an unrecognized injury or tiny fracture that

damages the overlying cartilage. A person with this condition may eventually develop osteoarthritis.

Lack of a blood supply can cause bone to break down (avascular necrosis).* The involvement of several joints or the appearance of osteochondritis dissecans in several family members may indicate that the disorder is inherited.

Symptoms and Diagnosis

If normal healing doesn't occur, cartilage separates from the diseased bone and a fragment breaks loose into the knee joint, causing weakness, sharp pain, and locking of the joint. An x ray, MRI, or arthroscopy can determine the condition of the cartilage and can be used to diagnose osteochondritis dissecans.

Treatment

If cartilage fragments have not broken loose, a surgeon may fix them in place with pins or screws that are sunk into the cartilage to stimulate a new blood supply.

If fragments are loose, the surgeon may scrape down the cavity to reach fresh bone and add a bone graft and fix the fragments in position. Fragments that cannot be mended are removed, and the cavity is drilled or scraped to stimulate new

* The National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse has a separate publication on avascular necrosis. See the end of this booklet for contact information.

cartilage growth. Research is being done to assess the use of cartilage cell and other tissue transplants to treat this disorder.

What Is Plica Syndrome?

Plica (PLI-kah) syndrome occurs when plicae (bands of synovial tissue) are irritated by overuse or injury. Synovial plicae are the remains of tissue pouches found in the early stages of fetal development.

As the fetus develops, these pouches normally combine to form one large synovial cavity. If this process is incomplete, plicae remain as four folds or bands of synovial tissue within the knee. Injury, chronic overuse, or inflammatory conditions are associated with this syndrome.

Symptoms and Diagnosis

People with this syndrome are likely to experience pain and swelling, a clicking sensation, and locking and weakness of the knee. Because the symptoms are similar to those of some other knee problems, plica syndrome is often misdiagnosed. Diagnosis usually depends on excluding other conditions that cause similar symptoms.

Treatment

The goal of treatment is to reduce inflammation of the synovium and thickening of the plicae. The doctor usually prescribes medicine such as ibuprofen to reduce inflammation.

The patient is also advised to reduce activity, apply ice and an elastic bandage to the knee, and do strengthening exercises. A cortisone injection into the plica folds helps about half of those treated. If treatment fails to relieve symptoms within 3 months, the doctor may recommend arthroscopic or open surgery to remove the plicae.

What Kinds of Doctors Treat Knee Problems?

Extensive injuries and diseases of the knees are usually treated by an orthopaedic surgeon, a doctor who has been trained in the nonsurgical and surgical treatment of bones, joints, and soft tissues such as ligaments, tendons, and muscles. Patients seeking nonsurgical treatment of arthritis of the knee may also consult a rheumatologist (a doctor specializing in the diagnosis and treatment of arthritis and related disorders).

How Can People Prevent Knee Problems?

Some knee problems, such as those resulting from an accident, can't be foreseen or prevented. However, a person can prevent many knee problems by following these suggestions:

- Before exercising or participating in sports, warm up by walking or riding a stationary bicycle, then do stretches. Stretching the muscles in the front of the thigh (quadriceps) and back of the thigh (hamstrings) reduces tension on the tendons and relieves pressure on the knee during activity.
- Strengthen the leg muscles by doing specific exercises (for example, by walking up stairs or hills, or by riding a stationary bicycle). A supervised workout with weights is another way to strengthen the leg muscles that support the knee.
- Avoid sudden changes in the intensity of exercise. Increase the force or duration of activity gradually.
- Wear shoes that both fit properly and are in good condition to help maintain balance and leg alignment when walking or running. Knee problems can be caused by flat feet or overpronated feet (feet that roll inward). People can often reduce some of these problems by wearing special shoe inserts (orthotics). Maintain a healthy weight to reduce stress on the knee. Obesity increases the risk of degenerative (wearing) conditions such as osteoarthritis of the knee.

What Types of Exercise Are Most Suitable for Someone With Knee Arthritis?

Three types of exercise are best for people with arthritis:

- **Range-of-motion** exercises help maintain normal joint movement and relieve stiffness. This type of exercise helps maintain or increase flexibility.
- **Strengthening** exercises help keep or increase muscle strength. Strong muscles help support and protect joints affected by arthritis.
- **Aerobic or endurance** exercises improve function of the heart and circulation and help control weight. Weight control can be important to people who have arthritis because extra weight puts pressure on many joints. Some studies show that aerobic exercise can reduce inflammation in some joints.

Where Can People Find More Information About Knee Problems?

- **National Arthritis and Musculoskeletal and Skin Diseases (NIAMS)**

National Institutes of Health

1 AMS Circle

Bethesda, MD 20892-3675

Phone: 301-495-4484 or

877-22-NIAMS (226-4267) (free of charge)

TTY: 301-565-2966

Fax: 301-718-6366

E-mail: NIAMSInfo@mail.nih.gov

www.niams.nih.gov

NIAMS provides information about various forms of arthritis and rheumatic disease and bone, muscle, joint, and skin diseases. It distributes patient and professional education materials and refers people to other sources of information. Additional information and updates can also be found on the NIAMS Web site.

- **American Academy of Orthopaedic Surgeons**
P.O. Box 2058
Des Plaines, IL 60017
Phone: 800-824-BONE (2663) (free of charge)
www.aaos.org

The academy provides education and practice management services for orthopaedic surgeons and allied health professionals. It also serves as an advocate for improved patient care and informs the public about the science of orthopaedics. The orthopaedist's scope of practice includes disorders of the body's bones, joints, ligaments, muscles, and tendons. For a single copy of an AAOS brochure, send a self-addressed stamped envelope to the address above or visit the AAOS Web site.

- **American College of Rheumatology**
1800 Century Place, Suite 250
Atlanta, GA 30329
Phone: 404-633-3777
Fax: 404-633-1870
www.rheumatology.org

This national professional organization can provide referrals to rheumatologists and allied health professionals, such as physical therapists. One-page fact sheets are available on various forms of arthritis. Lists of specialists by geographic area and fact sheets are also available on this Web site.

- **American Physical Therapy Association**

1111 N. Fairfax Street

Alexandria, VA 22314

Phone: 800–999–APTA (2782) (free of charge)

www.apta.org

The association publishes a free brochure titled “Taking Care of the Knees.”

- **Arthritis Foundation**

1330 West Peachtree Street

Atlanta, GA 30309

Phone: 404–872–7100 or 800–283–7800 (free of charge)

or call your local chapter (listed in the local telephone directory)

www.arthritis.org

The foundation has several free brochures about coping with arthritis, taking nonsteroid and steroid medicines, and exercise. A free brochure on protecting your joints is titled “Using Your Joints Wisely.” The foundation also can provide addresses and phone numbers for local chapters and physician and clinic referrals.

Acknowledgments

The NIAMS gratefully acknowledges the assistance of Barbara Mittleman, M.D., and James Panagis, M.D., M.P.H., NIAMS, NIH; John H. Klippel, M.D., Arthritis Foundation, Atlanta, Georgia; Frank A. Pettrone, M.D., Arlington/Vienna, Virginia; and W. Norman Scott, M.D., Beth Israel Medical Center, New York, New York, in the preparation and review of this booklet.



The mission of the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), a part of the Department of Health and Human Services' National Institutes of Health (NIH), is to support research into the causes, treatment, and prevention of arthritis and musculoskeletal and skin diseases, the training of basic and clinical scientists to carry out this research, and the dissemination of information on research progress in these diseases. The National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse is a public service sponsored by the NIAMS that provides health information and information sources. Additional information can be found on the NIAMS Web site at www.niams.nih.gov.



U.S. Department of Health and Human Services
Public Health Service
National Institutes of Health
National Institute of Arthritis and
Musculoskeletal and Skin Diseases

NIH Publication No. 01-4912
May 2001