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Knee Anatomy

While there are four bones that come together at the knee, only the femur (thigh bone) and the tibia (shin bone) form the joint itself. The head of the fibula (strut bone on the outside of the leg) provides some stability, and the patella (kneecap) helps with joint and muscle function. Movement and weight-bearing occur where the ends of the femur called the femoral condyles match up with the top flat surfaces of the tibia (tibial plateaus).

There are two major muscle groups that are balanced and allow movement of the knee joint. When the quadriceps muscles on the front of the thigh contract, the knee extends or straightens. The hamstring muscles on the back of the thigh flex or bend the knee when they contract. The muscles cross the knee joint and are attached to the tibia by tendons. The quadriceps tendon is a little special, in that it contains the patella within it. The patella allows the quadriceps muscle/tendon unit to work more efficiently. This tendon is renamed the patellar tendon in the area below the kneecap to its attachment to the tibia.

The stability of the knee joint is maintained by four ligaments, thick bands of tissue that stabilize the joint. The medial collateral ligament (MCL) and lateral collateral ligament (LCL) are on the sides of the knee and prevent the joint from sliding sideways. The anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) form an "X" on the inside of the knee and prevent the knee from sliding back and forth. These limitations on knee movement allow the knee to concentrate the forces of the muscles on flexion and extension.

Inside the knee, there are two shock-absorbing pieces of cartilage called menisci (singular meniscus) that sit on the top surface of the tibia. The menisci allow the femoral condyle to move on the tibial surface without friction, preventing the bones from rubbing on each other. Without the menisci, the friction of bone on bone would cause inflammation, or arthritis.

Bursas surround the knee joint and are fluid-filled sacs that cushion the knee during its range of motion. In the front of the knee, there is a bursa between the skin and the kneecap called the prepatellar bursa and another above the kneecap called the suprapatellar bursa (supra=above).

Each part of the anatomy needs to function properly for the knee to work. Acute injury or trauma as well as chronic overuse both cause inflammation and its accompanying symptoms of pain, swelling, redness, and warmth.

Types and Causes of Knee Injuries

While direct blows to the knee will occur, the knee is more susceptible to twisting or stretching injuries, taking the joint through a greater range of motion than it can tolerate.

If the knee is stressed from a specific direction, then the ligament trying to hold it in place against that force can tear. Ligament stretching or tears are called sprains. These sprains are graded as first, second, or third degree based upon how much damage has occurred. Grade-one

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sprains stretch the ligament but don't tear the fibers; grade-two sprains partially tear the fibers, but the ligament remains intact; and grade-three tears completely disrupt the ligament.

Twisting injuries to the knee put stress on the cartilage or meniscus and can pinch it between the tibial surface and the edges of the femoral condyle, causing tears.

Injuries of the muscles and tendons surrounding the knee are caused by acute hyperflexion or hyperextension of the knee or by overuse. These injuries are called strains. Strains are graded similarly to sprains, with first-degree strains stretching muscle or tendon fibers but not tearing them, second-degree strains partially tearing the muscle tendon unit, and third-degree strains completely tearing it.

There can be inflammation of the bursas (known as bursitis) of the knee that can occur because of direct blows or chronic use and abuse.

Acute knee injuries fall into two groups; those where there is almost immediate swelling in the joint associated with the inability to bend the knee and bear weight, and those in which there is discomfort and perhaps localized pain to one side of the knee, but with minimal swelling and minimal effects on walking.

Knee Injury Symptoms and Signs

Acute knee injuries can cause pain and swelling with difficulty bending the knee and weight-bearing. If the swelling occurs immediately, it may suggest a ligament tear or fracture. If the swelling arises over a period of many hours, meniscal or cartilage injuries may be the cause. However, injuries to the knee may involve more than one structure and the symptoms may not present classically.

Longer-term symptoms that point to knee problems will include pain and swelling in addition to other complaints. Inflammation in the joint may be caused by even minor activity. Swelling may be intermittent, brought on by activity, and may gradually resolve as the inflammation decreases.

Pain, too, may come and go and may not occur right away with activity but might be delayed as the inflammation develops. Pain can also be felt with specific activities. Pain while climbing stairs is a symptom of meniscus injury, where the cartilage is being pinched in the joint as it narrows with bending. Pain with walking down stairs suggests patellar pain, where the kneecap is being forced onto the femur.

Giving way, or a feeling of instability of the knee, or, popping or grinding in the knee is associated with cartilage or meniscus tears. "Locking" is the term used when the knee joint refuses to completely straighten, and this is almost always due to torn cartilage. In this situation, the torn piece of cartilage folds upon itself and doesn't allow the knee to extend.

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Knee Pain

Common conditions and treatment information

Knee pain is an extremely common complaint, and there are many common causes. It is important to make an accurate diagnosis of the cause of your symptoms so that appropriate treatment can be directed at the cause. If you have knee pain, some common causes include:

Arthritis
Arthritis is among the most common causes of knee pain, and there are many treatments available.

Ligament Injuries
Ligament injuries commonly occur during athletic activities and can cause discomfort and instability.

- **Anterior Cruciate Ligament (ACL) Injury**
  The anterior cruciate ligament (also called the ACL) is one of four ligaments that are critical to the stability of the knee joint. A ligament is made of tough fibrous material and functions to control excessive motion by limiting joint mobility. Of the four major ligaments of the knee, the ACL injury is the most common.

- **Posterior Cruciate Ligament (PCL) Injury**
  The posterior cruciate ligament, or PCL, is one of four ligaments important to the stability of the knee joint. The PCL is the ligament that prevents the tibia (shinbone) from sliding too far backwards.

- **Medial Collateral Ligament (MCL) Injury**
  The medial collateral ligament is also is one of four ligaments that are critical to the stability of the knee joint. It spans the distance from the end of the femur (thigh bone) to the top of the tibia (shin bone) and is on the inside of the knee joint.

Cartilage Injuries | Meniscal Tear
Cartilage tears are seen in young and old patients alike, and are also an extremely common cause of knee pain.

Patellar Tendonitis
Tendonitis around the joint is most commonly of the patellar tendon, the large tendon over the front of the knee. Tendonitis is an inflammation or swelling of this tendon.

Chondromalacia Patella
Chondromalacia causes knee pain under the kneecap and is due to softening of the cartilage. It is most common in younger patients (15-35 years old).

Dislocating Kneecap
A dislocating kneecap causes acute symptoms during the dislocation, but can also lead to chronic knee pain.

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Baker's Cyst
A Baker's cyst is swelling in the back of the joint, and is usually a sign of another underlying problem such as a meniscus tear.

Bursitis
The most common bursa affected around the joint is just above the kneecap. This is most common in people who kneel for work, such as gardeners or carpetlayers. Bursitis is an inflammation or swelling of the bursa.

Plica Syndrome
Plica syndrome is an uncommon cause of knee pain, and can be difficult to diagnose. The diagnosis is usually made at the time of arthroscopy.

Osgood-Schlatter Disease
Osgood-Schlatter disease is a condition seen in adolescents and is due to irritation of the growth plate just at the front of the joint.

Gout
Gout is an uncommon cause of knee pain. However, in patients who have a diagnosis of gout, it must be considered as a cause for new onset knee pain.

When do you need to call your doctor about your knee pain?

If you are unsure of the cause of your symptoms, or if you do not know the specific treatment recommendations for your condition, you should seek medical attention. Treatment of knee pain must be directed at the specific cause of your problem. Some signs that you should be seen by a doctor include:

- Inability to walk comfortably on the affected side
- Injury that causes deformity around the joint
- Knee pain that occurs at night or while resting
- Knee pain that persists beyond a few days
- Locking (inability to bend) the knee
- Swelling of the joint or the calf area
- Signs of an infection, including fever, redness, warmth
- Any other unusual symptoms

What are the best treatments for knee pain?

Treatment depends entirely on the cause of the problem. Therefore, it is of utmost importance that you understand the cause of your symptoms before embarking on a treatment program

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and should seek medical advice before beginning any treatment plan.

Some common treatments for knee pain are listed here. Not all of these treatments are appropriate for every condition, but they may be applied in your situation.

Rest & Activity Modification
The first treatment for many common conditions that cause wrist pain is to rest the joint, and allow the acute inflammation to subside. It is important, however, to use caution when resting the joint, because prolonged immobilization can cause a stiff joint. Adjusting your activities so as not to irritate the joint can help prevent worsening of knee pain. Your Rehabilitation Provider will assist in adjusting your work activities and negotiate the provision of suitable duties with the Employer.

Ice and Heat Application
Ice packs and heat pads are among the most commonly used treatments for knee pain. So which one is the right one to use, ice or heat? And how long should the ice or heat treatments last? Read on for more information about ice and heat treatment.

Stretching
Stretching the muscles and tendons that surround the joint can help with some causes of knee pain. A good routine should be established, and following some specific suggestions will help you on your way.

Physical Therapy
Physical therapy is an important aspect of treatment of almost all orthopedic conditions. Physical therapists use different modalities to increase strength, regain mobility, and help return patients to their pre-injury level of activity.

Anti-Inflammatory Medication
Non steroidal anti-inflammatory medications, commonly referred to as NSAIDs, are some of the most commonly prescribed medications, especially for patients with knee pain caused by problems such as arthritis, bursitis, and tendonitis.

Cortisone injections
Cortisone is a powerful medication that treats inflammation, and inflammation is a common problem in patients with knee pain. Discuss with your doctor the possible benefits of a cortisone injection for your condition.

Vocational Rehabilitation
This should begin as soon as possible after the injury. The Rehabilitation Provider will assist to identify suitable duties with the employer and in consultation with the treating medical provider, the injured worker, their supervisor and any other key person. The Rehabilitation Provider will prepare a return to work plan of action with the aim being a gradual and safe return to normal work duties. This plan will always include considerations directed by the Medical Provider and may include identifying any other requirements or services needed particularly if seated duties are required.