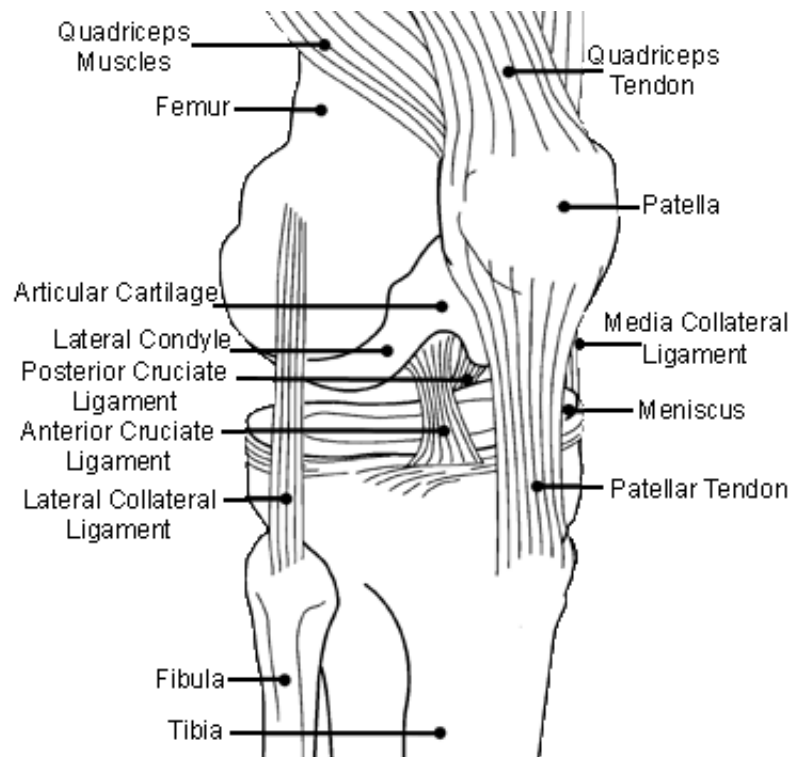


# Patella Problems

**Introduction** The patella, or kneecap, can be the reason your knee hurts if it fails to function properly. Over time, wear and tear underneath the patella can also lead to degeneration of the cartilage behind the patella and cause pain, weakness and swelling of the knee joint. There are several different problems that affect the patella - and the groove that it runs through as the knee is bent. These problems can affect people of all ages.

**Anatomy** The patella, or kneecap, is the moveable bone on the front of the knee. The patella is wrapped inside a large tendon that connects the large muscles on the front of the thigh, the quadriceps muscles, to the lower leg bone. This large tendon when combined with the patella, is called the quadriceps mechanism. The quadriceps mechanism is usually referred to as two separate tendons - the quadriceps tendon on top of the patella and the patellar tendon below the patella. The quadriceps mechanism allows you to straighten out the knee. The patella acts like a fulcrum to increase the force of the quadriceps muscle. The underside of the patella is covered with articular cartilage, the smooth covering of joint surfaces. This slippery surface helps the patella glide in a special groove of the thigh bone, or femur. Together the patella and the groove in the femur are called the patello-femoral mechanism.



#### Causes

Problems commonly develop when the patella suffers wear and tear. The underlying cartilage begins to degenerate, a condition sometimes referred to as chondromalacia patellae. Wear and tear can develop for several reasons. Degeneration may develop as part of the aging process causing generalized wear and tear--like putting a lot of miles on a car. The patello-femoral joint is usually affected as part of osteoarthritis of the knee.

One of the more common causes of knee pain is a problem in the way the patella moves through the patello-femoral groove as the knee moves. This situation can happen because of a muscle imbalance in the quadriceps muscles. Remember, the patella moves through the patello-femoral groove and is controlled mainly by the quadriceps muscles. If part of this muscle is weak for any reason a muscle imbalance can occur. When this happens the pull of the quadriceps muscle on patella may cause the patella to pull more to one side than the other. This causes more pressure on the articular cartilage on one side than the other. By viewing the knee joint on end, it's easy to see how this abnormal pull affects the patella. As it slides through the femoral groove, the patella shifts to the outside. This places more pressure on one side of the underlying cartilage than the other. In time this pressure can cause damage to the articular cartilage.

Another type of imbalance may exist due to differences in how the bones of the knee are shaped. These differences, or anatomic variations, are something people are born with. Some people are born with a greater than normal angle where the femur and the tibia come together at the knee joint. Women tend to have a

greater angle here than men. The patella sits at the center of this angle - where it sits in the femoral groove. When the quadriceps muscle contracts, the force tries to straighten this angle, pushing the patella to the outside of the knee. In cases where this angle is increased, the patella tends to shift outward with greater pressure. This leads to a similar problem as above. As the patella slides through the femoral groove, it shifts to the outside. This places more pressure on one side than the other, leading to damage to the underlying articular cartilage.

Finally, anatomic variations in the bones of the knee can occur where one side of the patello-femoral groove is smaller than normal. This creates a situation where the groove is too shallow, usually on the outside part of the knee. In people where the groove is too shallow, their patella may actually slip out of the groove, causing a patellar dislocation. This is not only painful when it occurs, but can damage the articular cartilage underneath the patella. If this occurs repeatedly, degeneration of the patello-femoral joint occurs fairly rapidly.

**Symptoms** Chondromalacia patellae exists when there is damage to the articular cartilage underneath the patella. This does not necessarily mean that the knee will be painful. Some people never have problems. Others experience vague pain in the knee which is difficult to localize. Pain may be felt along the inside edge of the patella, though this is not always the case. Typically, people who have patello-femoral problems experience pain when walking down stairs or down hills. Keeping the knee bent for long periods, as in sitting in the car or sitting in the movie theater, may cause pain. The knee may feel as if it gives out on occasion. This is thought to be a reflex response to the pain and not because there is any instability in the knee.

The knee may grind or a crunching sound may occur when squatting or when going up and down stairs. If there is a considerable amount of wear and tear, there may be a feeling of popping, or clicking, when the knee is bent. This results when the uneven surfaces of the underside of the patella and the femoral groove rub against one another. The knee may swell with heavy use and become stiff and tight. This is usually because of fluid accumulating inside the knee joint - sometimes called water on the knee. This is not unique to patella problems, but occurs whenever the knee becomes inflamed.

**Diagnosis** Diagnosis begins with a complete history of your knee problem followed by an examination of the knee, including the patella. X-

rays may be ordered on the initial visit to your doctor. An X-ray can help determine if the patella is properly aligned in the patello-femoral groove. Several X-rays taken with the knee bent at several different angles can help determine if the patella seems to be moving through the groove in the correct alignment. In the later stages, arthritis may be seen between the patella and femur. Diagnosing kneecap problems can be confusing. The symptoms can be easily confused with other knee problems, because the symptoms are often similar. In these cases, other tests, such as the MRI scan may be suggested. The MRI (Magnetic Resonance Imaging) machine uses magnetic waves rather than x-rays, to show the soft tissues of the body. With this machine, we are able to slice through the area we are interested in very clearly. Usually, this test is done to look for injuries, such as tears in the menisci or ligaments of the knee. Recent advances in the quality of the MRI scans has enabled doctors to actually see the articular cartilage on the scan, and see if there are abnormalities in the articular cartilage. This test does not require any needles or special dye, and is painless.

In some cases, arthroscopy may be used to make the definitive diagnosis - if there is a question about what is causing your knee problem. Arthroscopy is a type of an operation where a small fiberoptic TV camera is placed into the knee joint, allowing the orthopedic surgeon to look at the structures inside the knee joint directly. The arthroscope allows your doctor to actually look into the knee joint and see the condition of the articular cartilage on the back of your patella. The vast majority of patello-femoral problems are diagnosed without resorting to surgery, and arthroscopy is usually reserved to treat the problems identified by other means.

**Treatment** The Initial treatment for a patellar problem begins by decreasing the inflammation in the knee. Rest and anti-inflammatory medications, such as aspirin or ibuprofen, may be suggested by your physician. This can help decrease the pain and swelling.

Physical therapy can help in the early stages by decreasing pain and inflammation. Your physical therapist may suggest different modalities, such as ice massage or taping the patella to help reduce the pain initially. As the acute symptoms become controlled, your physical therapist can provide several treatment choices to help correct problems with flexibility, strength, alignment, and muscle balance in the knee.

If these measures fail to improve your condition surgery may be

indicated. Arthroscopy is sometimes useful in the treatment of patello-femoral problems of the knee. Looking directly at the articular cartilage surfaces of the patella and the patello-femoral groove is the most accurate way of determining how much wear and tear there is in these areas. Your physician can also watch as the patella moves through the groove, and may be able to decide whether or not the patella is tracking normally. If there are areas of articular cartilage damage behind the patella that are creating a rough surface, special tools can be used by the surgeon to smooth the surface and reduce your pain. This procedure is sometimes referred to as shaving the patella.

If your patella problems appear to be caused by a malalignment problem, a procedure called a lateral release may be suggested. This procedure is done to allow the patella to shift back to a more normal position and relieve pressure on the articular cartilage. In this operation, the tight ligaments on the outside (lateral side) of the patella are cut, or released, to allow the patella to slide more towards the center of the femoral groove. These ligaments eventually heal with scar tissue that fills in the gap created by the surgery, but they no longer pull the patella to the outside as strong as before the surgery. This helps to balance the quadriceps mechanism and equalize the pressure on the articular cartilage behind the patella. Looking at the end view of the knee shows how loosening these ligaments may relieve pressure on the articular cartilage. Once the ligaments are cut, the patella moves more into the center of the femoral groove, and tracks more in the center of the groove.

In some cases of severe malalignment, a lateral release alone may not be enough. If the malalignment is so bad that the patella dislocates repeatedly, then the operation will have to include a more involved re-alignment of the quadriceps mechanism. In addition to the lateral release, the tendons on the inside edge of the knee (the medial side) may have to be tightened as well. In very severe cases of malalignment, the attachment of the patellar tendon may also have to be moved. Remember that the patellar tendon attaches the patella to the lower leg bone (tibia) just below the knee. By moving the point where the patellar tendon attaches to the tibia, the direction that the patella moves through the patello-femoral groove can be changed as well. This is done surgically by removing the patellar tendon attachment - with a piece of bone still attached to the tendon. The piece of bone with the tendon attached is then reattached to the tibia about a half inch to the medial (towards the other knee) side and allowed to heal. Usually, the bone is reattached using screws or a metal staple. This is

called a Fulkerson osteotomy. Shifting the attachment of the patellar tendon medially also shifts the patella more medially. Once the surgery heals, the patella will hopefully track more within the center of the patellar groove, spreading the pressure equally on the articular cartilage.

A simple surgical procedure such as arthroscopy to shave the patella or a simple lateral release can usually be done as an outpatient. Your rehabilitation can begin almost immediately following surgery. If your problem requires the more involved surgical procedure where bone must be cut to allow moving the patellar tendon attachment, you may need to spend one or two nights in the hospital. Your rehabilitation may be slower to allow the bone to heal before too much strain can be put on the knee. A physical therapist will probably be contacted to help with your rehabilitation program.