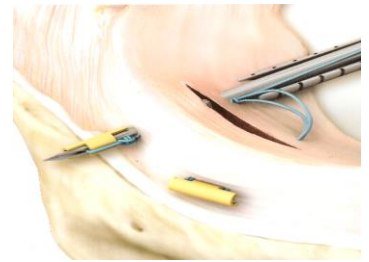


Cartilage Injuries

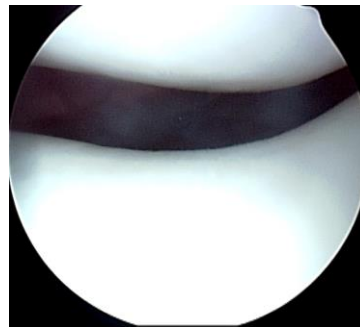
Marc S. Fineberg MD



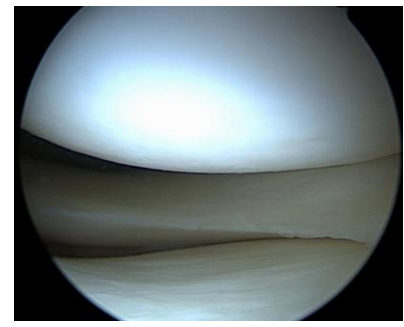
There are two types of cartilage in the knee. Articular cartilage is the thin, glistening lining on the end of the bone which allows for normal, smooth joint motion. Breakdown of the articular cartilage leads to arthritis and knee pain. There are two meniscus cartilage structures (medial and lateral) located between the thigh bone (femur) and shin bone (tibia) which serve as joint shock absorbers. The menisci conform the rounded end of the femur to the relatively flat surface of the tibia. Resecting portions of the meniscus dramatically increases the contact pressure on the articular cartilage. Ligaments stabilize the knee joint and protect the articular and meniscus cartilage from twisting and translational forces.

Patients with cartilage injuries typically present with symptoms that include pain, swelling, giving way and catching in the knee joint. Each knee should be evaluated for overall alignment and stability. An x-ray and MRI may also be helpful in diagnosing the cartilage injury.

Injuries to the **meniscus** may require arthroscopic surgery. The goal is to preserve as much viable meniscus as possible to prevent progressive knee degeneration. The torn section of the meniscus is usually removed. The procedure takes thirty to forty five minutes and is performed on an outpatient basis.



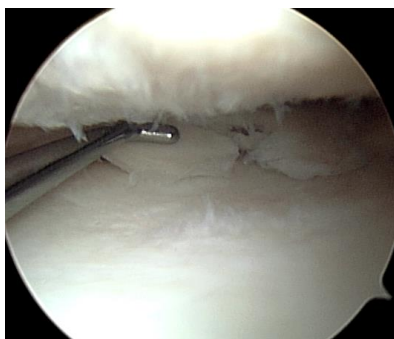
normal patellofemoral
articular cartilage



normal tibiofemoral
articular cartilage
and meniscus

Patients are able to bear weight immediately but the knee can remain sore and stiff for several weeks. Complete recovery may be limited by the degree of articular cartilage degeneration.

A very small and specific subset of tears can be repaired instead of removed. Meniscus repair surgery usually requires six weeks on crutches with limited weight bearing. Return to sports usually takes at least three months.



Complex radial tear of the meniscus
with early degenerative changes



Displaced bucket handle meniscus tear



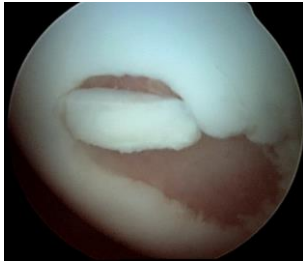
Repaired bucket handle meniscus tear

Treatment of the symptoms from **articular cartilage** injuries is based on the underlying cause of the injury and the patient's needs and activity level. Conservative approaches include activity modification, weight control and rehabilitation. Anti-inflammatory medications may also be used to decrease joint inflammation and pain. Glucosamine and Chondroitin Sulfate supplements are vitamin pills for knee cartilage and may be effective for some patients. Cortisone injections can provide arthritic pain relief in carefully selected patients. Viscosupplementation involves "knee lubricant" injections which can provide relief of variable degrees and duration.

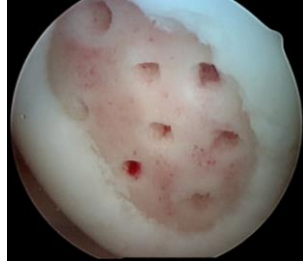


Diffuse grade 4 degenerative disease (exposed bone)

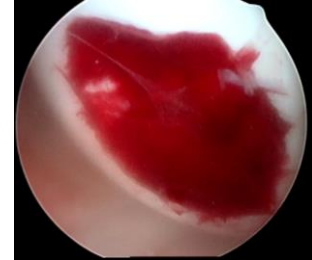
Articular cartilage restoration procedures are indicated for focal (isolated) injuries much like a "pothole" in the road. Most patients are between the ages of 15 and 50. A knee which is stable and has normal alignment is a prerequisite for these procedures. The particular technique depends on the size of the injury. Smaller areas of cartilage damage can be treated by poking holes ("microfractures") in the underlying bone with a type of "ice pick" instrument. This results in the formation of a "scar cartilage" called fibrocartilage. Fibrocartilage is less durable than normal articular cartilage.



traumatic focal full thickness cartilage defect



microfracture procedure



blood clot will turn into fibrocartilage

When there are larger defects in the articular surface, other techniques may be recommended. An osteochondral autograft transplant (OAT) procedure is analogous to a "hair-plug" transfer. A small cylindrical section of cartilage and bone is transferred from one area of the knee into the defect. Treating larger lesions is limited by the number and size of available donor plugs. Recreating the normal, smooth cartilage surface remains a technical challenge.

For larger defects with bone and cartilage loss, an allograft (cadaver) implant of bone and cartilage may be transplanted into the defect. Fresh osteochondral allograft transplantation may be indicated in cases of osteochondritis dissecans (OCD), avascular necrosis (AVN), posttraumatic arthritis, or previous failed cartilage procedures. Widespread use is limited by tissue availability and cost. Allografts have unique issues revolving around tissue banking and safety.

Autologous chondrocyte implantation (ACI) is another option and involves a two-staged procedure. The patient has an arthroscopic cartilage biopsy. The cells are then replicated in a lab and then reimplanted through an open incision. The cartilage cells are injected under a patch of periosteum (bone lining) which is sutured circumferentially to the intact cartilage border. This technique can recreate complex knee contours such as the trochlear groove for the patella (kneecap). However, the rehabilitation is slow and the procedure is expensive and labor intensive. Periosteal patch overgrowth or delamination can compromise the results and lead to additional surgery.

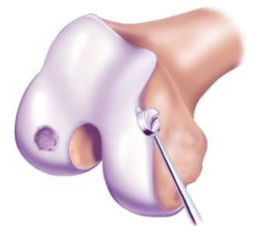
Allograft meniscus transplant is another form of cartilage restoration. It is reserved for patients who have had previous meniscus surgery which resulted in a near complete removal of the meniscus. Patients typically present with pain and swelling. A meniscus transplant may delay the progression to arthritis. Minimal joint space narrowing (arthritis) on x-ray is a prerequisite for this procedure.

When there is global involvement of the entire articular surface (entire road worn), the only option may be an osteotomy or joint replacement. An osteotomy (cut in bone) can improve the alignment of bow-legged or knock-kneed patients to unload the diseased side of the knee. An osteotomy may be required in conjunction with a cartilage restoration procedure. Another option for arthritis on one side of the knee is a unicompartmental (one-sided) replacement with metal and plastic.

Arthritis of both sides of the knee usually necessitates a total knee replacement. Surgeons can use the aid of a computer to improve the accuracy of the procedure for perfectly placed components. Total knee arthroplasty is a very successful procedure for eliminating knee pain.



OAT



**ACI:
2 steps**

