

Knee Preservation

Injury or structural imperfections to the knee affect people of all ages, causing pain and problems that interfere with a person's ability to perform daily activities, from exercise to getting out of a chair and walking. Specifically, injuries to the articular cartilage of the knee have become increasingly common. The impact can be intense, creating disability that impairs work, leisure and sleep, and diminishes quality of life.

What is articular cartilage?

Articular cartilage is the protective outer layer covering the ends of bones within a joint. It dissipates stress to the bone beneath it and helps facilitate low-friction motion. Articular cartilage is often referred to as the chondral surface since chondrocytes are the cells that make up articular cartilage. When this layer of cartilage is injured it is referred to as a chondral defect and an osteochondral defect when the bone (subchondral bone) beneath the cartilage is injured as well. Injuries to articular cartilage of the knee are becoming increasingly common. Symptomatic defects are often associated with injuries to other structures of the knee and can result in significant pain and dysfunction. Articular cartilage lacks a blood supply which results in a poor healing potential and the inability to restore its structure following injury. Therefore, chondral defects have little potential to self-repair and spontaneously heal when left untreated.

How are these injuries managed?

The initial management for most articular cartilage injuries consists of rest, activity modification, anti-inflammatory medications, and physical therapy. Injections in the form of steroids, viscosupplementation (hyaluronic acid/gel), or orthobiologic agents may help decrease inflammation and improve symptoms in certain patients. A brace can be effective in cases when the cartilage damage is exposed to excessive forces as a result of malalignment. Patients who continue to be symptomatic despite conservative measures should be evaluated for possible surgical intervention.

What is knee joint preservation?

Restoration of the normal motion of the knee joint and functioning without replacement is achieved by different methods of joint care and is known as "knee joint preservation". The approach of preserving the knee joint helps orthopaedic surgeons to treat knee joint problems while retaining the natural structure of the affected joint. Techniques of knee joint preservation are used primarily in persons having defects in the articular cartilage of the knee.

Cartilage injury is a precursor to arthritic conditions and it may sometimes be manifested in the form of knee pain. The symptoms and severity of knee joint defects may vary from person to person. Traumatic injuries or age-related wear and tear often lead to damage of articular cartilage resulting in pain, stiffness and limited range of motion. Since articular cartilage cannot regenerate and has a limited capacity for healing, surgical interventions can be indicated to initiate to address the cartilage injury. Restoration of articular cartilage can diminish if not relieve a person of pain, can improve normal function and can even delay or prevent the onset of arthritis in the knee joint in certain cases.

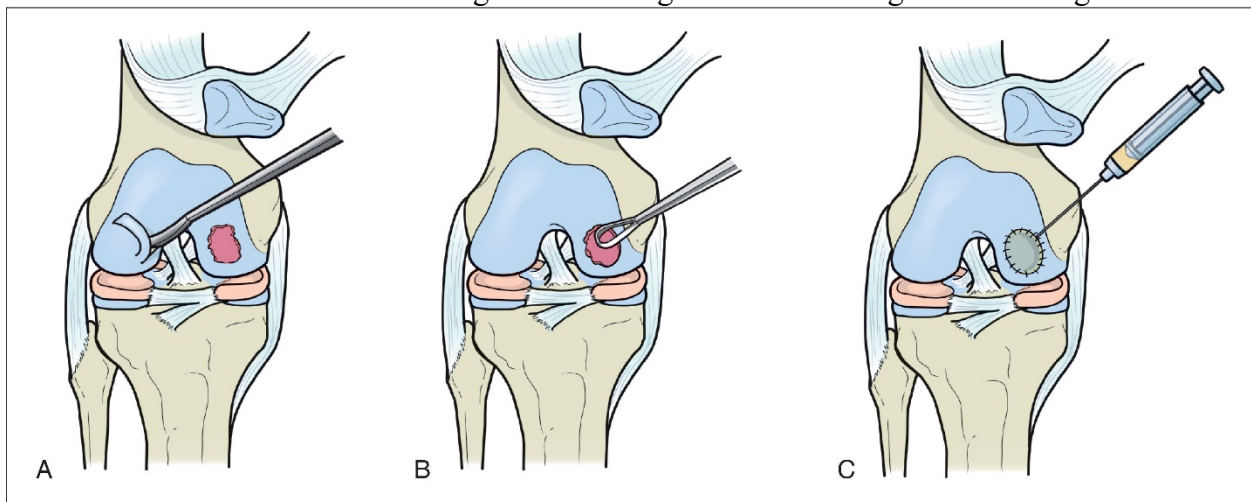
Treatment

Dr. Brian J Chilelli of The Cincinnati Sports Medicine and Orthopaedic Center - Mercy Health promotes a cutting-edge approach to knee joint preservation, and pathways in research and education that set a new standard in personalized orthopaedic care for patients in and beyond the Cincinnati area. Patients have access to state-of-the-art arthroscopic and open surgical techniques and cartilage technologies, as well as non-surgical rehabilitation protocols and emerging treatments to regain full function, including orthobiologics, cartilage restoration, meniscus transplantation and osteotomy techniques. Recognizing the need to better define optimum care models for young, active individuals, Dr. Chilelli provides evidence-based non-arthroplasty treatment options for knee pain, delaying progression of end-stage arthritis, and returning individuals to functional wellness. Bolstering promising, active research while strengthening education for future leaders in the field, Dr. Chilelli also works to advance understanding of joint preservation, sports medicine, and orthopaedic wellness – ultimately, securing his position as the region’s premier joint preservation surgeon.

Dr. Chilelli is currently enrolling patients with symptomatic cartilage injuries who have failed non-operative management into a cartilage repair surgery outcome study in order to document patient progress and success with the procedures. The following are the procedures that patients are being enrolled to receive:

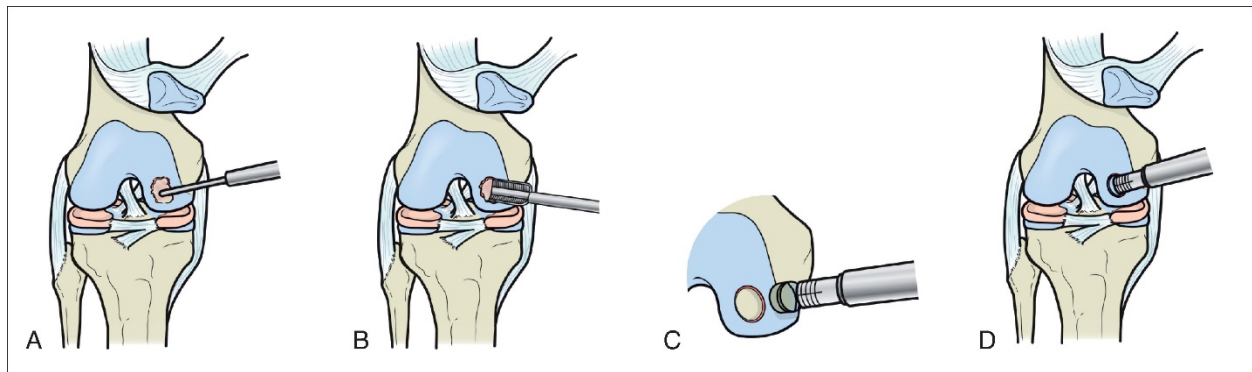
Autologous minced cartilage implantation

The technique involves preparing the lesion in order to remove the damaged cartilage. This can be done minimally invasive with an arthroscope (scope with a small camera) or through a small incision. Autologous cartilage is then harvested from a non-weight-bearing part of the knee and minced. The minced cartilage is then placed within the prepared area and held in place with a biologic adhesive followed by being covered by a collagen membrane that is sutured to surrounding cartilage. PRP (platelet rich plasma) and BMAC (bone marrow aspirate concentrate) are often added to the minced cartilage to enhance growth and healing of the cartilage.



Osteochondral Allograft Transplantation

This technique involves taking small amounts of bone and cartilage from a cadaver knee of similar size and shape to the patient being treated. The cadaver specimens are carefully evaluated and tested to ensure safety. For the procedure, A small incision is made and the damaged cartilage is removed from the patient. The size and shape of the defect is determined, and it is prepared using the appropriate equipment. The area of the knee from which the cadaver grafting material will be taken will be selected based on the size and shape of the injured area. A harvesting chisel is used to remove the tissue, which is then inserted into the prepared area of the patient. The transplanted bone and cartilage will then heal and integrate within the patient's knee.



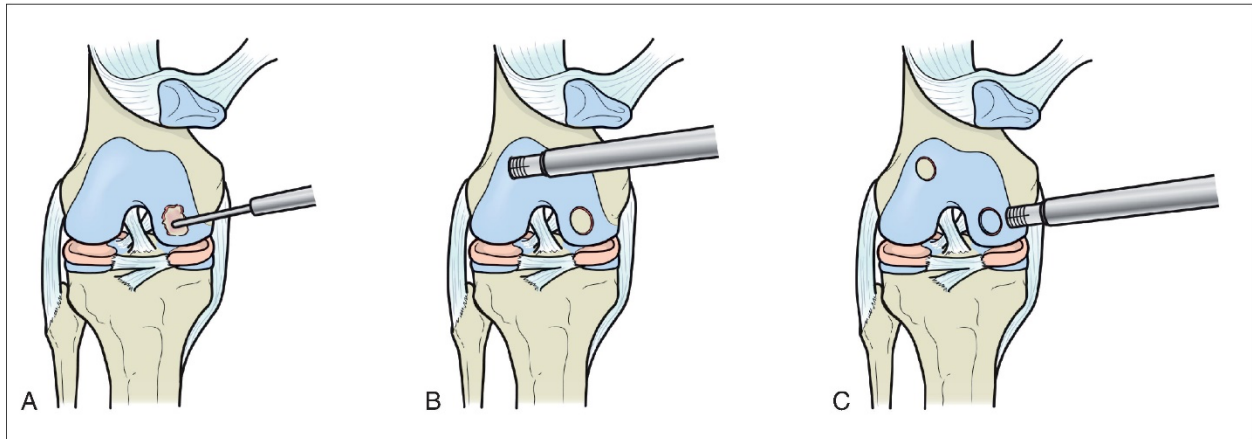
Matrix-Induced Autologous Chondrocyte Implantation (MACI)

MACI is a two-stage procedure. In the first stage, a knee scope is performed to evaluate the size and location of the defect. If the surgeon determines that MACI is appropriate, a sample of cartilage is taken from a non-weight-bearing part of the knee. This sample tissue then is sent to a lab, where cells are removed and expanded over 4 to 6 weeks through a special procedure. The second stage involves implanting the expanded cells back into the area of the defect.

Osteochondral Autograft Transfer (OAT)

This technique involves harvesting one or multiple osteochondral cylinders (mosaicplasty) from minimal weight-bearing portions of the femur and transferring them to defects in higher weight-bearing areas. It can be performed arthroscopically, open or mini-open; the latter being increasingly recognized as a useful compromise of minimal morbidity and better precision. Most commonly a knee scope is performed followed by a small incision. The size and shape of the damaged cartilage (defect) is determined and it is prepared using proprietary equipment. The appropriate donor site is selected based on size and contour of the recipient defect.

Recommended femoral donor sites include the intercondylar notch region or trochlea, which are low weight bearing areas of the knee. A cartilage and bone cylinder is taken from this area of the knee using a special harvesting chisel. The graft is subsequently inserted into the prepared recipient tunnel utilizing press-fit technique, similar to placing a cork into a bottle. The transferred bone and cartilage will then heal and integrate within the patient's knee.



Other Treatment options:

Meniscus repair/transplantation

The meniscus is “C” shaped structure that sits between the tibia and femur. It functions as a shock-absorber to protect the articular cartilage. The articular cartilage is the smooth surface at the ends of the femur and tibia inside the joint. The meniscus can be damaged and torn in acute trauma or gradually wear out as a result of degeneration. Meniscus tears can be repaired with sutures in order to preserve the structures function. Some meniscus tears are unable to be repaired and have to be “cleaned up” by surgically removing the torn pieces. If patients continue to have pain as a result of missing portions of their meniscus then meniscus transplant surgery can be considered. Rehabilitation following meniscus repair and transplantation surgery consists of crutches for 3-6 weeks and a brace for 6 weeks. Return to full athletic activity and sports usually occurs between 4-6 months following meniscus repair.

Osteotomy

Normal alignment of the knee is when the forces through the knee joint are evenly distributed. Occasionally people can develop malalignment. This can be congenital, degenerative, or due to trauma. If the malalignment causes or contributes to pain, realignment surgery can be performed in the form of an osteotomy procedure. In this procedure the malaligned bone is cut, realigned, and secured with a plate. The most common osteotomy procedures of the knee include the femur, tibia, or tibial tubercle. Healing occurs over 6-12 weeks requiring crutches over that time.