



Orthopaedic surgery

CARTILAGE

Beside the ligamentous system the hyaline cartilage, which covers the articulating bony surfaces of the joint, is the most important component of any joint. Cartilage has no blood supply and its nutrition is given by synovial fluid. Intact cartilage surfaces are essential for a normal function of every joint. There are various causes for damages to the cartilage like fractures, joint instabilities, meniscal lesions or overuse injuries. Symptoms depend on the diameter and depth as well as the location of the lesion. Initially symptoms appear only while using the joint whereas later on permanent pain may develop. Over the years cartilage damage increases and may lead to complete deterioration of the joint. There may be chronic swelling and limited range of movement. This means, the joint has developed osteoarthritis. Treatment depends on the dimension and localization of the lesions and of the age of the patient as well. The potential for regeneration of the cartilage is rather high in juvenile patients but decreases with time. There are different therapeutical approaches for every individual situation.

Conservative treatment

An exact anamnesis and the clinical examination usually lead to a precise diagnosis already. X-rays are always needed to evaluate the joint space and the mechanical axis (x-rays in monopodal stance). In difficult cases magnetic resonance imaging (MRI) may be needed. The main goal of every treatment is pain release and improvement of joint function. At early stages of joint diseases the therapy of choice is conservative, i.e. physiotherapy, physical treatment like cryo-therapy or heat (fango e.g.) and local medication (Voltaren, Celebrex or similar non steroidal anti-inflammatory drugs) Foot support and modification of shoes are also part of the treatment. Some patients may benefit from injections of hyaluronic acid which may have a positive influence on the cartilage metabolism. Activities like bicycling and swimming are always commendable. For obese patients diet is essential. Unfortunately for the majority of patients conservative treatment alone is not sufficient and operative arthroscopy is needed. This is enabling the physician to put a precise diagnosis of the joint surfaces, both menisci and cruciate ligaments. Pathological lesion like torn menisci, ruptures of the

cartilage and changes of the synovium can be treated at the same occasion. Unstable parts of damaged cartilage can be resected and smoothed whereas areas with naked subchondral bone can be abraded or treated by multiple perforations (see microfracturing). The choice of the procedure depends on the individual situation of the patient and the pathological findings.

Joint debridement

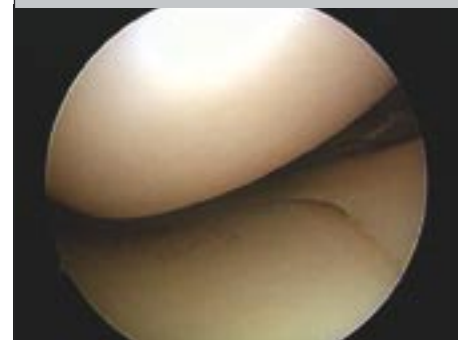
This means operative treatment by arthroscopy with resection of unstable parts of the cartilage, smoothing of surfaces and joint lavage with cleaning of the joint from debris. In general there are good early results whereas the long lasting effect will not protect the joint from further degeneration.

Microfracture technique

Cartilage defects with naked subchondral bone are treated by microfracturing, i.e. that the bone is perforated with a special instrument and multiple small little holes are made. Through these holes pluripotent cells are emerging which will create fibrous cartilage. With this technique even larger defects can be treated.



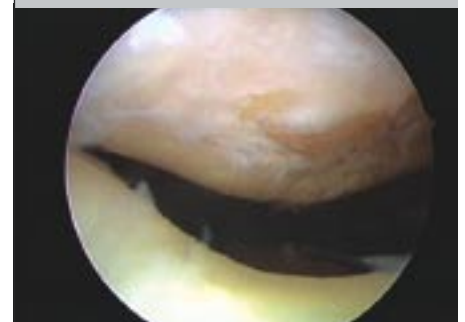
intact cartilage surfaces left knee



arthroscopic view on intact cartilage and medial meniscus



damaged cartilage surface



severe cartilage damage at the patella



Orthopaedic surgery



CARTILAGE

Abrasion Arthroplasty

In cases of very large defects with bare bone (osteoarthritis) the eburnated bone is abraded with the help of powered instruments, which enables the bone to build up a layer of fibrous cartilage. For the regeneration of this fibrous cartilage the protection of the joint from weight bearing for at least 8 to 10 weeks and daily continuous passive motion for the same period of time is essential. Though abrasionarthroplasty may be helpful in numerous cases it cannot always avoid the need for total joint replacement on the long run.

Autologous transplantation (Mosaik plasty)

Mosaik plasty means that one or more cylinders with cartilage and subchondral bone are taken out from areas of the joint which are barely loaded. These cylinders are then precisely implanted in the area of the defect. This procedure is only indicated in cases of isolated defects with intact surrounding cartilage in younger patients.

Autologous chondrocyte transplantation (ACT)

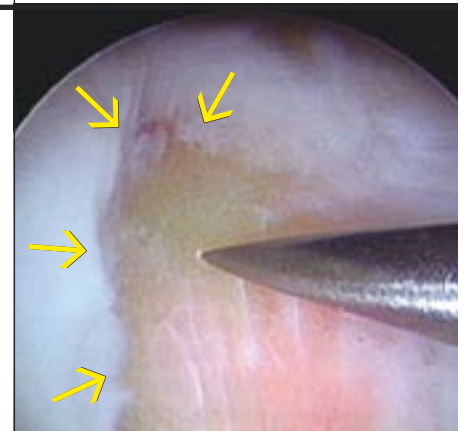
This new procedure may be indicated in cases with isolated defects and intact surrounding cartilage. It requires two interventions: At the first step, small pieces of cartilage are harvested by an arthroscopical approach. Then these pieces are cultivated in a laboratory over a couple of weeks. Then in a second operation, these cultivated cells are implanted into the defect area and covered by a periosteal flap from the tibia. Over a period of 6 to 8 weeks, the cells form a new regenerative cartilage which appears to be quite similar to the original hyaline cartilage. If the limits of indication are well respected this procedure

is very recommendable. Unfortunately it is very costly and most insurances are not covering the costs up to now.

The mentioned options for treatment – also called “bioprosthesis” – will only lead to a partial regeneration of the joint surface. A complete restoration of the original hyaline cartilage is not possible yet. It is also very important to treat accompanying pathologies like chronic instabilities and axial malalignment for example. These cases need ligament reconstruction or/and corrective osteotomies respectively in addition to the treatment of cartilage.

Rehabilitation

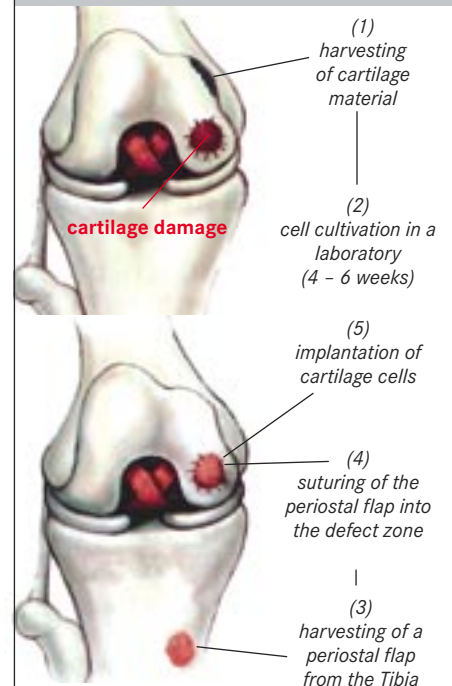
After reconstructive interventions of the joint surfaces, partial weight bearing between 8 to 12 weeks is mandatory because this is the time needed for stable cartilage healing. During this period the patient goes through a thorough physiotherapy program and continuous passive motion on a motor device is applied 3 to 4 times daily (30 minutes each time). Bicycling and aquajogging are also most helpful.



debridement of defect zone and microfracturing of subchondral bone



principle of cartilage-bone-transplantation
 • harvesting of cartilage-bone-cylinders (yellow)
 • implantation in defect zone (red)



principle of autologous chondrocyte transplantation (ACT)