CARTILAGE REPAIR
INTRODUCTION

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The conservative treatment of chondral lesions has been based for many years on similar criteria. The surgical treatment however is in constant evolution. The different techniques can be classified according to the goal that the surgeon wants to reach:

- Palliative (debridement and washing): degenerative tissue removal.
- Reparative (chondroabrasions, perforations and microfractures): cartilage fibrous tissue.
- Reconstructive (osteochondral graft OATS, autologous chondrocyte implantation ACI): restoration of the articular surface with hyaline or hyaline-like cartilage.

Before any preoperative planning, patient evaluation plays a pivotal role (anamnesis, clinical and instrumental evaluation). In the algorithm of any joint disease, the approach to cartilage lesions has to be addressed in secondary steps. Although it is a “noble” tissue, it has few intrinsic self-reparative potential. The correction of any joint malalignment, instability and meniscal lesion, that may have induced and/or determined the functional overload which in turn led to the chondral lesion, must be approached before any cartilage surgical treatment. The most appropriate treatment to improve pain, function and satisfy the patient’s needs, may be chosen only after comprehending the principles, indications and limits of any surgical technique.
Joint debridement is the oldest surgical treatment for symptomatic knees due to cartilage related problems. It was initially performed through a wide-open arthrotomy, but for the last 4 decades the arthroscopic approach has become a mainstay. It is always combined with a joint lavage. The rationale for this treatment is removal of the unstable cartilage flaps from the lesion, together with free-flowing cartilage debris from the joint. When a degenerated joint is targeted other soft-tissues, such as partial resection of degenerated menisci, resection of hypertrophic synovial folds, or osteophytes may be addressed simultaneously. As the joint debridement does not aim to restore the articular surface, it is a solely palliative procedure. Patients with predominant mechanical joint symptoms can expect substantial improvement of their knee function, while the reduction of intra-articular pain is less predictable. There are currently two well defined target patient populations for the joint debridement surgery: young active persons with small localized cartilage lesions who expect quick recovery, and elderly population with early stages of joint osteoarthritis in whom conservative management had failed.
Cartilage tissue is difficult to treat, therefore several surgical approaches have been proposed over the years to treat chondral or osteochondral lesions. Autologous chondrocyte implantation (ACI) was the first clinical application of cartilage regeneration and was first performed 25 years ago for the treatment of isolated chondral lesions in the knee. The positive results of this treatment have to be weighed against several problems, both from biological and surgical points of view. Therefore treatments using biomimetic scaffolds were developed in an attempt to fulfill the requirements of cartilage regeneration processes. These scaffolds had substantial differences regarding the materials chosen, natural or synthetic, and their physical forms, but all aimed at overcoming the problems related to previous procedures. Scaffolds are a temporary three-dimensional structure of biodegradable polymers for the in vitro growth of living cells, and some more recently developed scaffolds are biphasic products that enable even large chondral or osteochondral articular defects to be treated. The surgical procedure is different depending on the scaffold used: some scaffolds require a two step-procedure, others a one-step procedure. This review describes the treatment of chondral and osteochondral knee lesions by using these scaffolds and shows the results and limits of this scaffold-based repair approach for the healing of the articular surface.
In the last ten years, after various preclinical trials and the development of innovative implantation techniques, a great deal of studies have been performed, focusing on the most varied categories of patients. Second generation matrix-assisted autologous chondrocyte transplantation using the hyaluronan scaffold Hyalograft® C arose as a very promising technique among all the cartilage repair procedures.
Injuries to articular cartilage are one of the most challenging pathologies of musculoskeletal medicine due to the poor intrinsic healing capacities of damaged cartilage. Autologous Matrix Induced Chondrogenesis (AMIC) is an innovative treatment for localized full-thickness cartilage defects combining the well-known microfracturing with a collagen I/III scaffold. The current article reviews the treatment modalities utilized in cartilage repair procedures, focusing on the role of AMIC in clinical practice today and its way from “bench to bedside”.

NOVEL CARTILAGE REPAIR STRATEGIES – THE AMIC TECHNIQUE

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Platelet-rich Plasma (PRP) is widely used to promote tissue regeneration through the *in-situ* administration of a milieu of growth factors that may contribute to the healing process of tissues with a low healing potential and, among these, the treatment of cartilage pathology is gaining increasing interest. However, besides its wide clinical application, it is not clear how much the use of PRP is supported by real scientific evidence. This review analyses the available evidence about the use of PRP to treat cartilage lesions.

A search in the PubMed database was performed. Research criteria included: 1) papers in English, 2) papers on the clinical application of PRP for the treatment of cartilage degenerative pathology, 3) papers with a level of evidence of I to IV, and 4) papers reporting clinical results. Both conservative and surgical applications of PRP were considered for the review. Seventeen papers have been published mostly focusing on knee pathology, in particular as a conservative injective treatment. Osteochondral lesions of the talus have been the subject of 3 studies while 2 papers deal with applications in the hip via ultra-sound-guided injections. Overall clinical results were positive but the low quality of the papers combined with the great variability of procedures and PRP preparations make study comparison difficult and no conclusive indications can be drawn about the efficacy of PRP for the treatment of cartilage lesions.
Collagen Meniscus Implant. A Prospective Study with a Minimum 10 Years Follow-up

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Defects of meniscal tissue, even partial ones, can cause degenerative knee changes. Hence scaffolds for meniscus regeneration have been proposed for partial meniscal defects in order to save the meniscus. The CMI-menaflex (Ivy Sport Medicine) is a collagen scaffold of bovine origin. Stone proposed the use of this implant in 1992 and it has been available for clinical use in the medial meniscus since 2000. The aim of this study was the clinical and magnetic resonance imaging (MRI) evaluation at long-term follow-up of the effectiveness and safety of the CMI. Twenty-eight patients received a CMI implant between 2001 and 2002 and participated in our previous study of clinical and MRI at medium term. These patients were called again for another visit and MRI. Twenty-six patients were available for the 10-year follow-up. All the patients had a clinical evaluation with the Lysholm score and the Tegner activity scale before surgery and 2, 5, and 10 years after. An MRI examination was also performed after 2, 5 years and in 15 cases after 10 years. The Lysholm and Tegner score improved significantly 2 years after surgery and remained essentially unchanged in the controls at 5 and 10 years. At the MRI evaluation the complex CMI-meniscus appeared present, but often smaller than the native meniscus. The signal matured over time, but rarely was completely similar to a normal meniscus. The cartilage surface of the medial compartment did not show degenerative changes up to 5 years after surgery, at 10-years follow-up a slight progression of joint degenerative disease was observed. No adverse reactions to the implant were reported. The CMI generally induced a significant clinical improvement that is stable over time at 10-year follow-up. The MRI examination showed that the complex CMI-regenerated tissue was reduced in size during the first 2 years but remained unchanged at the following controls. A progressive maturation of the signal was observed over time. The appearance of the chondral surface was maintained or slightly degenerated 10 years after surgery in most cases.