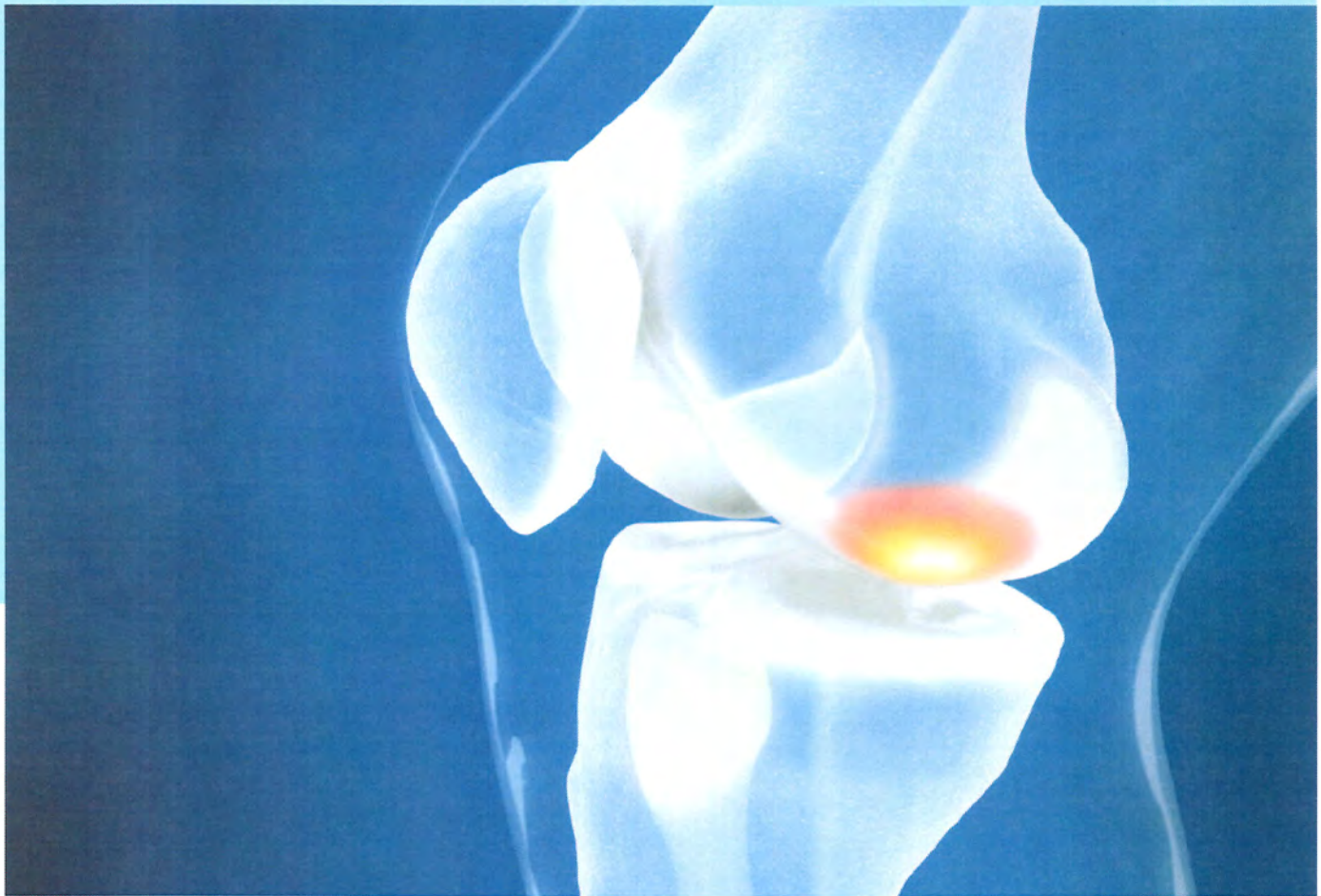


# BLICKPUNKT MEDIZIN

Zeitschrift für Orthopädie  
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## AMIC<sup>®</sup> versus ACT: Is there a difference in clinical outcome?

Lunch symposium within the framework of the 28<sup>th</sup> Congress  
of the German-Speaking Association of Arthroscopy (AGA)

Regensburg, 23<sup>rd</sup> September 2011

## AMIC® versus ACT: Is there a difference in clinical outcome?

At the AGA Congress in Regensburg, eminent experts reported their experience with biological surgical procedures in the treatment and repair of damaged articular cartilage. For the first time, the results of autologous matrix-induced chondrogenesis (AMIC®) and autologous chondrocyte transplantation (ACT/ACI) were compared not only in knee but also in foot and hip operations. Among others, these biological cartilage repair procedures should restore joint function and ameliorate pain, enabling a patient to return to his customary life style and previous level of activity. After ACT, AMIC® has also established itself as a valid technique for reaching this goal.

### Knee

Dr. Sven Anders, Bad Abbach, compared the two surgical procedures in the treatment of chondral and osteochondral lesions of the knee.

He reported on 83 patients with chondral (83%) and osteochondral (17%) lesions of the knee which were treated with matrix-induced autologous chondrocyte implantation (MACI®) (age range: 13–51; mean age: 30.2; BMI: 25.0; me-

dian defect size: 4.2 (1.8–7.8) cm<sup>2</sup>). Anders compared these with 37 patients with chondral (70%) and osteochondral (30%) lesions which were treated with microfracturing and additional defect covering with cell-free, porcine collagen-I/III-matrix (Chondro-Gide®), i.e., with the AMIC procedure (age range: 17–52; mean age: 35; BMI: 26.4; median defect size: 3.7 (1–10,8) cm<sup>2</sup>).

The clinical results assessed on the basis of the Lysholm score remained stable

during the course of treatment. There were statistically significant differences only after 3 months and these were in favour of the AMIC group (Fig. 1). The marked improvement in knee function and pain experience was comparable in both groups (Fig. 2).

In his summary of results, Anders said that cartilage defects in the knee can be treated adequately with ACT as also with AMIC. The results presented show that in the clinical course, the cell-based matrix ACT offers no advantages over the autologous stem-cell based ("cell-free") AMIC technique, but with AMIC, there is no need for a 2-stage procedure involving time-consuming and cost-intensive cell culture process.

According to Anders, the indications for AMIC in the knee are single or multifocal defects (ICRS III–IV). The preconditions for performing AMIC are intact surrounding cartilage, vital subchondral bones, defect size of 2–10 cm<sup>2</sup> and a patient age of about 50 years. Contraindications, according to Anders, are: flat arthrotic lesions, ligament instability, axial deviation as well as systemic diseases such as rheumatoid arthritis, haemophilia or storage disorders. Anders warned: "No cartilage treatment without the indicated axial correction and/or ligament stabilisation".

Anders concluded that AMIC is a cost-effective ad hoc procedure which enables

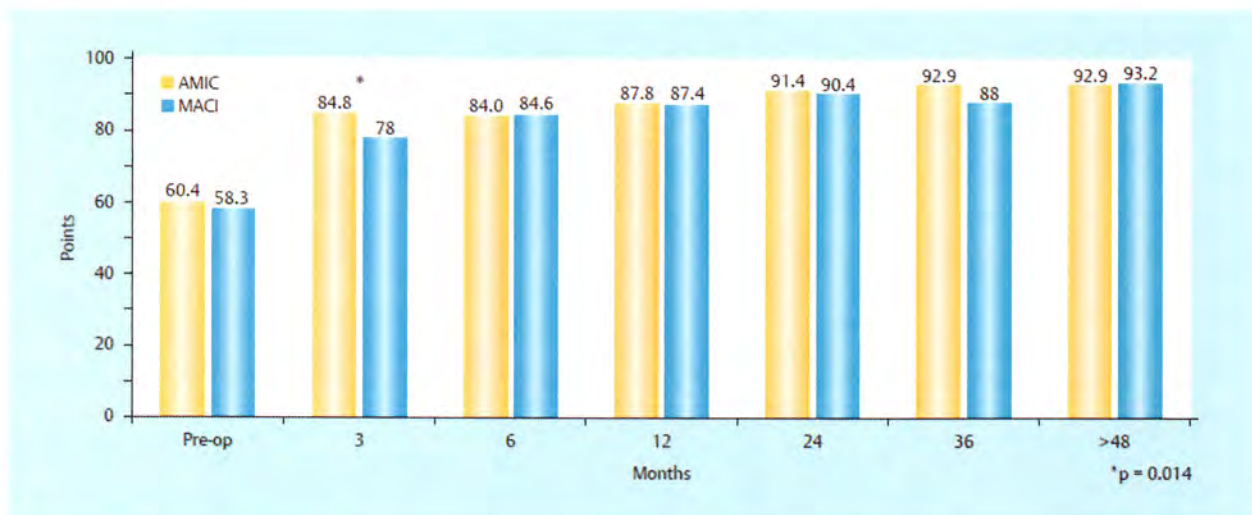


Abb. 1 Postoperative course assessed with the Lysholm score; modified according to [1].

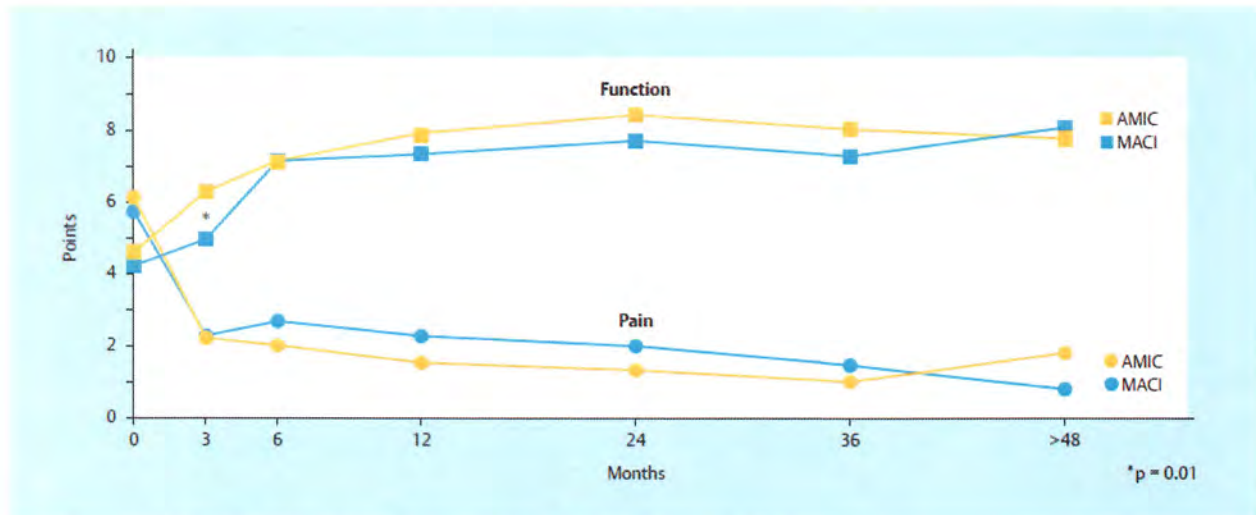


Abb. 2 Postoperative course evaluated by VAS (function and pain); modified according to [1].

also stabilisation, axial correction and patellar centring on one side. Thus, AMIC is suitable as a minimally invasive biological primary or secondary procedure. Possibility for therapeutic withdrawal strategies remains open.

### Talus

Prof. Markus Walther, Munich, addressed the differences between ACT and AMIC in the treatment of osteochondral lesions of the talus.

He pointed out that there was sparse clinical data on these 2 therapy procedures for this indication. Literature search on ACT in the knee showed that in 80–90% of the cases, good AOFAS scores were reached, independently of the specific ACT product that was used. Walther, however, drew attention to the fact that the pain factor was given an inflated position in the AOFAS score and pain amelioration alone had an above-average positive influence on the score. He emphasized the point, “A score of 85 in the AOFAS does not represent a normal ankle”.

Walther, furthermore, drew attention to problems with ACT reported in the literature: no cell growth in about 20% [2], hypertrophic transplant with impingement [3, 4], with failure of the transplant to establish itself [3] as well as arthrofibrosis and delamination [4].

Summarising, Walther concluded that ACT, while an effective pain treatment, does not enable production of hyaline cartilage. Altogether, there is not enough long-term experience with ACT, ACT is very costly and in addition, the costs of this procedure are not reimbursed by the DRG. In his lecture, the speaker presented his results on 57 talus operations with AMIC. These were good or very good in 54 cases; in 3 patients revision surgery was necessary (1 failure after osteotomy and 2 with hypertrophic tissue with impingement).

In conclusion, Walther explained: “Of course, there are no robust data on treating osteochondral defects of the talus with ACT, but there is also no evidence of

a significantly poorer clinical outcome after AMIC compared to ACT”. The main advantages of AMIC are, according to Walther, that “it is available at all times and is cheaper by a factor of 10 than ACT”. And he sees the following advantages of AMIC as verified by basic science research: the “super clot” is stabilised, proliferation and chondrogenesis of the mesenchymal stem cells are promoted, fibrin glue supports cell differentiation and additionally, the ankle is traumatised only minimally.

### Hip

Chondropathies of the acetabulum and the femoral head are, according to Dr.

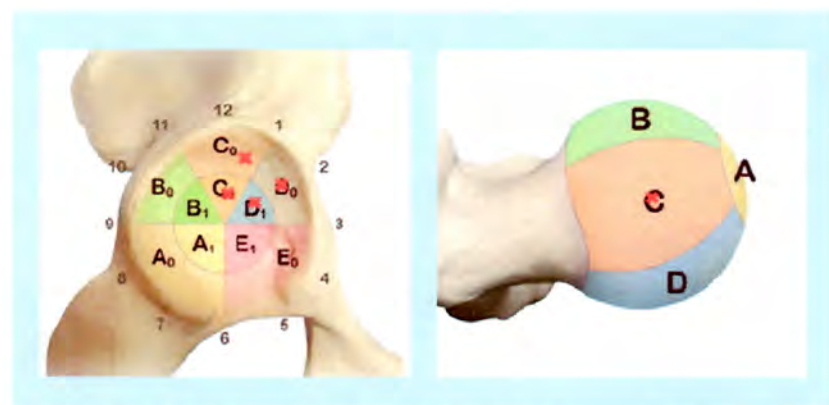


Abb. 3 The most frequent cartilage defects are localised at the anterosuperior acetabulum (left) and the superior segment of the femoral head (right); modified according to [5].

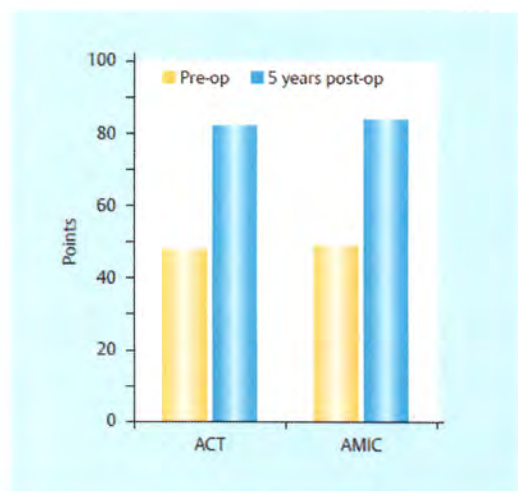


Abb. 4 Results 5 years after ACT (n = 109) and AMIC (n = 128) measured with the Harris Hip Score; modified according to [5].

Andreas Fontana, Mailand (Italy), a frequent cause of pain and functional limitations. With an incidence of 92%, they are the consequences of a femoroacetabular impingement (FAI). Their surgical treatment should, according to Fontana, not only correct the bone deformities causing them, but also address any cartilage defect present.

With the help of a schematic representation, the speaker explained the different localizations of cartilage defects of the acetabulum and the femoral head (Fig. 3). Most frequently, these appear at the anterosuperior acetabulum and at the superior segment of the femoral head.

### The AMIC procedure

The AMIC® procedure is based on microfracturing, combined with application of a bilayer matrix of porcine collagen type I/III (Chondro-Gide®).

The so-called „super clot“ emerging after microfracturing contains all the building blocks needed for cartilage repair (e. g., precursor cells, mesenchymal stem cells [MSC], cytokines and growth factors).

The „super clot“ is stabilised and protected by the application of the Chondro-Gide® matrix. With its dense cell-occlusive surface, the compact layer prevents the migration of mesenchymal cells into intra-articular space and offers mechanical protection and at the same time improved gliding. The porous layer consists of loose collagen fibres that encourage cell proliferation and extra-cellular matrix deposition. The structure of Chondro-Gide® ensures high tensile strength so that it can be fixed in place with fibrin glue or sutures.

In his lecture, Fontana revealed the differing results of treating cartilage lesions of the hip with ACT and AMIC. Since 2000, a total of 109 patients were treated in his clinic with matrix-ACT and 128 patients with AMIC. Age, sex, grade and site of pathological lesions in the 2 groups were comparable.

The median preoperative Harris hip score (HHS) was 48 in patients treated with ACT and 48.7 in AMIC-treated patients. Postoperative Harris hip scores achieved by both the procedures are shown in Figure 4. They were comparable after 5 years (ACT = 82.9; AMIC = 84.5) and showed no significant difference.

The main disadvantages of ACT, according to Fontana, are the 2-stage procedure, additional work in logistic and planning, possible errors in chondrocyte culture as also post-operative pain lasting for 1–3 months.

For Fontana, the advantages of AMIC are the one-stage surgery that can be well planned without the additional logistic work usually involved, the clear cost-benefit as against other therapy procedures and not least, the efficacy of this innovative method.

### Conclusion

All speakers at the AGA satellite symposium underlined the increasing importance of AMIC as an alternative procedure for cartilage regeneration in lesions of the hip, knee and talus. Easy to plan one-stage procedure, considerable cost-efficiency and proven efficacy emerged as the special advantages of AMIC.

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