Mosaicplasty - How I do

5th Advanced Course on Knee Surgery

Gernot Felmet

ARTICO Sportclinic & Orthopedic Practice
Villingen-Schwenningen – Germany – Black Forest

Surgical Treatment Options

- Surgical débridement
- Marrow-stimulating procedures
- Autologous Chondrocyte Implantations
- Autologous Osteochondral Mosaicplasty




Hangody

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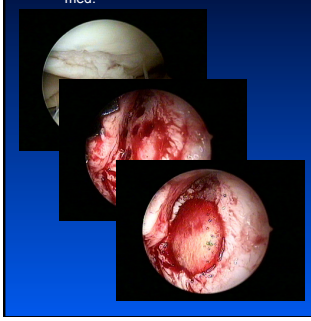
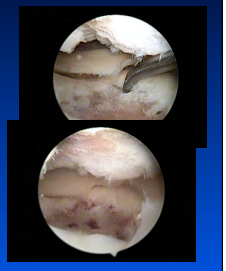
36 Y, M right Knee

med.



lat.



fibrin glue

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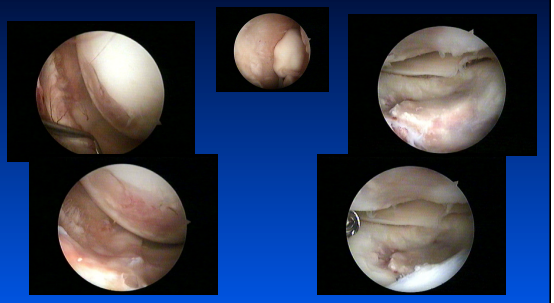
36 Y, M left Knee after 5 weeks revision – loose body



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Bone Morphogenetic Protein - BMP

Bone Marrow

Chondrogentic > Bone healing Osteogenetic

Age (closed growth zone)

Time (3 years)

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Orthopade. 2008 Sep;37(9):841-7.

Current treatment for cartilage damage in the patellofemoral joint.

[Article in German]

Steinwachs MR, Kreuz PC, Guhlke-Steinwachs U, Niemeyer P.

Source

Zentrum Orthobiologie und Knorpelregeneration, Schulthess-Klinik, Lengghalde 2, CH-8008 Zürich, Schweiz. matthias.steinwachs@kws.ch

Abstract

Joint cartilage damage in adults has practically no tendency to self healing. Symptomatic grade III/IV damage requires surgical treatment. There are special challenges involved in cartilage damage in the patellofemoral joint as the complicated biomechanics of the joint is often combined with dysplasia. All tissue regeneration measures are based on the recruitment of cells. The synovial cells available in the joint can be differentiated to fibrous cartilage under certain mechanical conditions; however, they cannot sufficiently fill in defects. Also the use of bone marrow cells for cartilage reconstruction only creates mechanically inferior fibrous cartilage (Pridie drillings, microfracture, AMIC). Presently only cultivated, autologous chondrocytes from the lab are available for a biomechanically high-quality reconstruction of the cartilage layer.The application of mesenchymal stem cells is a subject of extensive international research. However, the first experimental studies, **after initial formation of cartilage, disappointingly show significant ossification.** Essential conditions for a successful treatment of patellofemoral cartilage damage are the diagnosis of accompanying pathological conditions, selection of the right cartilage-regenerating procedure, sufficient removal of the basic pathological defect, and implementation of standardized rehabilitation.

PMID:
18719889

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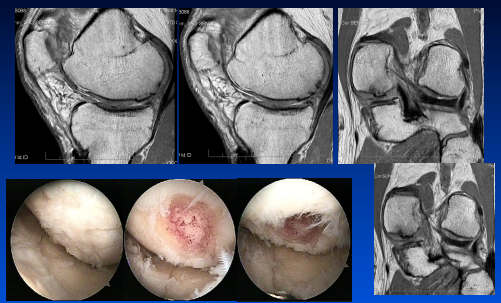
41y, M,
ACT 7 years ago
Pain medial compartment



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Surgical Treatment Options

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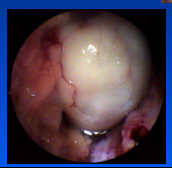
- Marrow-stimulating procedures
- Autologous Chondrocyte Implantations
- Autologous Osteochondral Mosaicplasty

Mega - OATS



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Am J Sports Med. **2010** Jun;38(6):1125-33. doi: 10.1177/0363546509360405. Epub 2010 Apr 1.

Clinical experiences with **autologous osteochondral mosaicplasty** in an athletic population: a 17-year prospective multicenter study.

Hangody L, Dobos J, Baló E, Pánics G, Hangody LR, Berkes I.
Source

Uzsoki Hospital, Department of Orthopaedics, Mexikói strasse 62, Budapest, Hungary. hangody@t-online.hu
Abstract
BACKGROUND:

Several methods are used to treat focal chondral and osteochondral defects on the weightbearing surfaces of synovial joints. Autologous osteochondral grafting is 1 option used to replace hyaline cartilage in the defect.
HYPOTHESIS:

Mosaicplasty is effective in returning elite athletes to participation in sports.
STUDY DESIGN:

Case series; Level of evidence, 4.
METHODS:

In 3 institutes, 354 of 383 patients were followed from 2 to 17 years (average, 9.6 years). The results of mosaicplasty were prospectively evaluated at 6 weeks, 3 months, 6 months, and yearly with patient-reported outcomes measures and radiographs.
RESULTS:

Slight or moderate degenerative changes (Fairbank grade I or II) were detected preoperatively in 27% of the cases and in 36% of the cases at follow-up. Fairbank grade III changes were observed in 5 cases. An average radiographic deterioration of 0.32 on the Fairbank scale was detected (preoperative, 0.34; postoperative, 0.66). Good to excellent results were found in 91% of femoral mosaicplasties, 86% of tibial, and 74% of patellofemoral; 92% of talar mosaicplasties had similar results (Hannover ankle scoring system). Patellofemoral pain related to graft harvest was observed in 5% of cases. Second-look arthroscopies revealed good, congruent, gliding surfaces of the transplants and acceptable fibrocartilage coverage of donor sites in 16 patients and degenerative changes of the transplants in 5 cases. Histological evaluation revealed good graft incorporation in all 11 cases. Two infections and 3 deep venous thromboses occurred.
CONCLUSION:

Despite a higher rate of preoperative osteoarthritic changes in the athletic patients, clinical outcomes of mosaicplasty in this group demonstrated a success rate similar to that of less athletic patients. **Higher motivation resulted in better subjective evaluation**. Slight deterioration in results occurred during the 9.6-year follow-up; thus, autologous osteochondral **mosaicplasty may be a useful alternative for the treatment of 1.0- to 4.0-cm(2) focal chondral and osteochondral** lesions in competitive athletes.

PMID:
20360608
[PubMed - indexed for MEDLINE]

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J Bone Joint Surg Am. 2012 Jun 6;94(11):971-8. doi: 10.2106/JBJS.K.00815.

Activity levels are higher after osteochondral autograft transfer mosaicplasty than after microfracture for articular cartilage defects of the knee: a retrospective comparative study

Krych AJ, Harnly HW, Rodeo SA, Williams RJ 3rd.
Source

Hospital for Special Surgery, New York, NY, USA. krych.aaron@mayo.edu
Abstract
BACKGROUND:

There is limited information regarding direct comparisons of the outcome of osteochondral autograft transfer (OAT) mosaicplasty and microfracture for the treatment of isolated articular cartilage defects of the knee. The purpose of this retrospective comparative study was to compare the general health outcomes, knee function, and Marx Activity Rating Scale scores for patients treated with OAT or microfracture for symptomatic chondral defects of the femoral condyles or trochlea. We hypothesized that the patients in the two treatment groups would have similar clinical outcomes at intermediate-term follow-up.
METHODS:

Ninety-six patients with full-thickness cartilage defects of the femoral condyles or trochlea were treated with either **OAT mosaicplasty (n = 48) or microfracture (n = 48)**. The average age of the patients (thirty-two male and sixteen female in each group) at the time of surgery was 29.7 years in the OAT group and 32.5 years in the microfracture group. Patients were prospectively evaluated at baseline and at one, two, three, and **five years postoperatively** with use of validated clinical outcome measures including the Short Form-36 (SF-36) physical component, International Knee Documentation Committee (IKDC), Knee Outcome Survey activities of daily living, and Marx Activity Rating Scale instruments. Comparisons between outcomes before and after treatment or between outcomes after microfracture and mosaicplasty were made with use of two-tailed tests.
RESULTS:

At the time of the latest follow-up, both groups demonstrated significant increases in SF-36 physical component, Knee Outcome Survey activities of daily living, and IKDC scores compared with baseline. These scores did not differ significantly between the two groups at any of the follow-up time points. However, the OAT group demonstrated a significantly greater improvement in the Marx Activity Rating Scale scores from baseline to the two-year ($p = 0.001$), three-year ($p = 0.03$), and **five-year ($p = 0.05$)** time points compared with the microfracture group.
CONCLUSIONS:

In the present retrospective comparative study, the hypothesis that patients treated with microfracture or OAT mosaicplasty for symptomatic articular cartilage defects of the femoral condyles or trochlea would have similar clinical outcomes at intermediate-term follow-up was affirmed for general health outcome and for knee function. However, patients treated with **OAT mosaicplasty maintained a superior level of athletic activity** compared with those treated with microfracture.
Comment in

Fibrocartilage following microfracture is not as robust as native articular cartilage: commentary on an article by Aaron J. Krych, MD, et al.: "Activity levels are higher after osteochondral autograft transfer mosaicplasty than after microfracture for articular cartilage defects of the knee: A retrospective comparative study". J Bone Joint Surg Am. 2012;

PMID:
22637203
[PubMed - indexed for MEDLINE]

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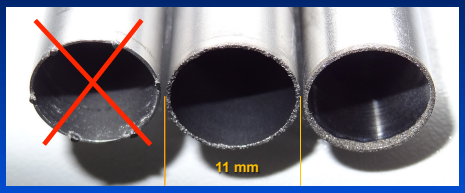
Technique:

Wet grinding system with diamond front (Draenert MedArtis > Storz)

MicroCrownCutter (ArticoSolutions, Germany)



CrownCutter | Micro CrownCutter | Diamond Cutter

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Wet grinding „Hollow Reamer“
12 to 17 mm

Extractor

Applikator and pusher

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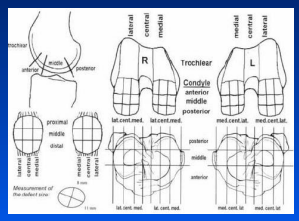

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Posterior approach

Anterior in max. flexion

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Anterior in max. flexion

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Anterior max flexed approach

Central

Lateral - Medial

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Medial Trochlea

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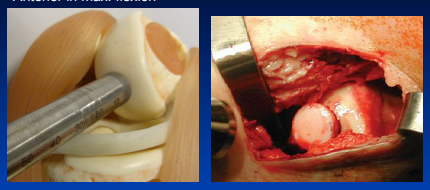
Anterior in max. flexion



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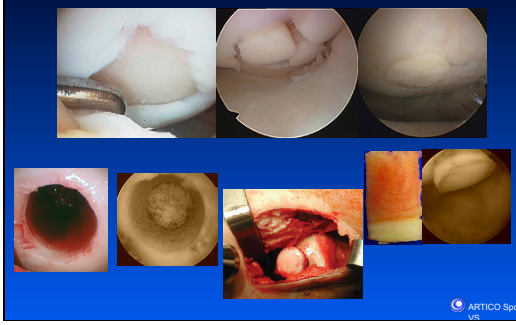
Autologous Osteochondral Mosaicplasty



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Defect up to 4 cm/2
Age up to 50 years

Med & lat. Kondyle

Harvest from med. Trochlea or posterior kondyle

In max. flexion - (frog position)

Donor Defect is filled with the „cartilage defect cylinder“ (15 mm)

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PRESS FIT

Autologous OsteoChondral Mosaicplasty > **MegaOATS** (ABC-D Technique)

25 y M - soccer player

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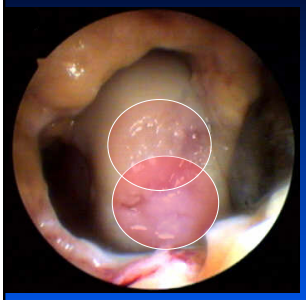
PRESS FIT

Autologous OsteoChondral Mosaicplasty > **MegaOATS** (ABC-D Technique)

25 y M - soccer player



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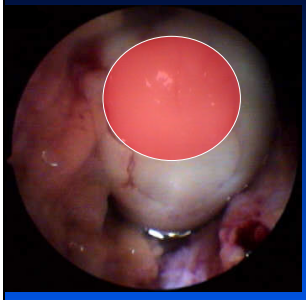
PRESS FIT

Autologous OsteoChondral Mosaicplasty > **MegaOATS** (ABC-D Technique)

25 y M - soccer player



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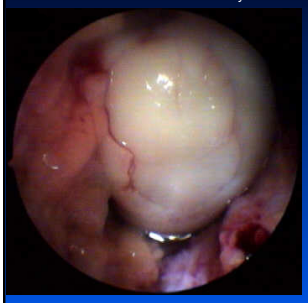
PRESS FIT

Autologous OsteoChondral Mosaicplasty > **MegaOATS** (ABC-D Technique)

25 y M - soccer player



14 mm

Dorsal med. Kondyle

Trochlea

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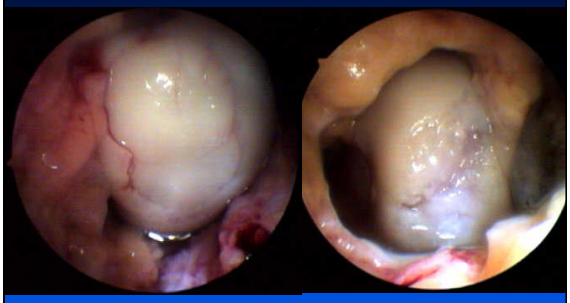
PRESS FIT

Autologous OsteoChondral Mosaicplasty > **MegaOATS** (ABC-D Technique)

25 y M - soccer player



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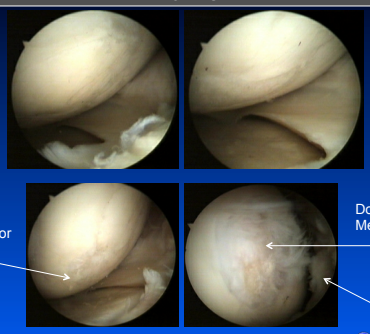
PRESS FIT

Autologous OsteoChondral Mosaicplasty > **MegaOATS** (ABC-D Technique)

5 Y FU



Donor: Med. posterior kondyle

Donor: Med. Trochlea

Resected plica

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J Orthop Sports Phys Ther. 2006 Oct;36(10):815-27.

Rehabilitation of articular lesions in the athlete's knee.

Wilk KE, Briem K, Reinold MM, Devine KM, Dugas J, Andrews JR.
Source

Benchmark Medical Inc, Malvern, PA, USA. KWilkpt@hotmail.com
Abstract

Articular cartilage lesions of the knee joint are common in patients of varying ages. Some articular cartilage lesions are focal lesions located on one aspect of the tibiofemoral or patellofemoral joint. Other lesions can be extremely large or involve multiple compartments of the knee joint and these are often referred to as osteoarthritis. There are numerous potential causes for the development of articular cartilage lesions: joint injury (trauma), biomechanics, genetics, activities, and biochemistry. Numerous factors also contribute to symptomatic episodes resulting from lesions to the articular cartilage: activities (sports and work),

- joint alignment, joint laxity,
- muscular weakness, genetics,
- dietary intake, and body mass index.

Athletes appear to be more susceptible to developing articular cartilage lesions than other individuals. This is especially true with specific sports and subsequent to specific types of knee injuries. Injuries to the anterior cruciate ligament and/or meniscI may increase the risk of developing an articular cartilage lesion. The treatment for an athletic patient with articular cartilage lesions is often difficult and met with limited success. In this article we will discuss several types of knee articular cartilage injuries such as focal lesions, advanced full-thickness lesions, and bone bruises. We will also discuss the risk factors for developing full-thickness articular cartilage lesions and osteoarthritis, and describe the clinical evaluation and nonoperative treatment strategies for these types of lesions in athletes.

PMID:
17063841
[PubMed - indexed for MEDLINE]

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Rehabilitation
> Osteochondral integration

- Week 1-3 = non-weight bearing
- Week 4-6 = 25% Weight bearing
- 0-6 Weeks = brace (rotation –stability)

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OATS – Mega OATS

Disadvantage:

1. Diff. thickness of cartilage
2. Steps in the congruency
3. Chondral cut remains

Advantage:

1. Hyalin cartilage – „Original“
2. Mega OATS > better congruency
3. Early weight bearing
4. Return to sports
5. Donordefects filled by the „defect“ cylinder
6. Less donorsite morbidity

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Rate for return to sports is higher:

- younger athletes
- more competitive athletes
- preoperative duration of symptoms of less than 1 year

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Back to the biological original

Cartilage is not to restore

>>> than by Cartilage

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EFOST

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Thank You !

Instruction by

EFOST

European Federation of National Associations of Orthopedic Sports Traumatology

www.efost.org

www.artico-klinik.de

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