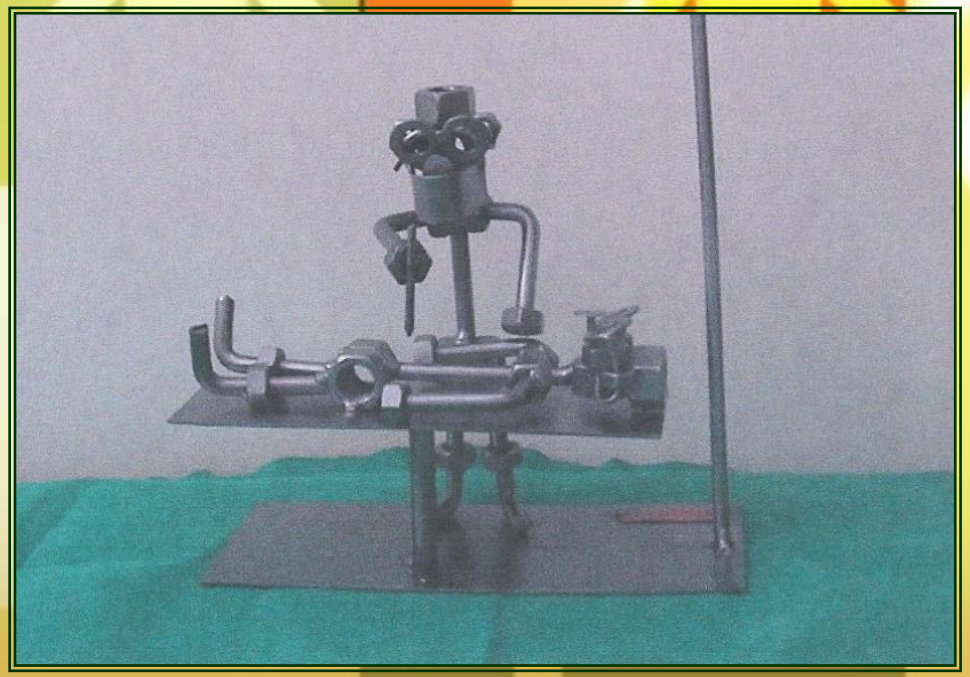
13 th BALKAN MEETING OF ATHLETIC INJURIES
DRAMA, MAY 2004



ARTHROINVEST

OSTEOCHONDRAL AUTOGENOUS TRANSFER GRAFTS FOR THE TREATMENT OF FULL THICKNESS ARTICULAR SURFACE DEFECTS. ARTHROSCOPIC TECHNIQUE

Dr K. VOUKALIS,Thessaloniki,Greece

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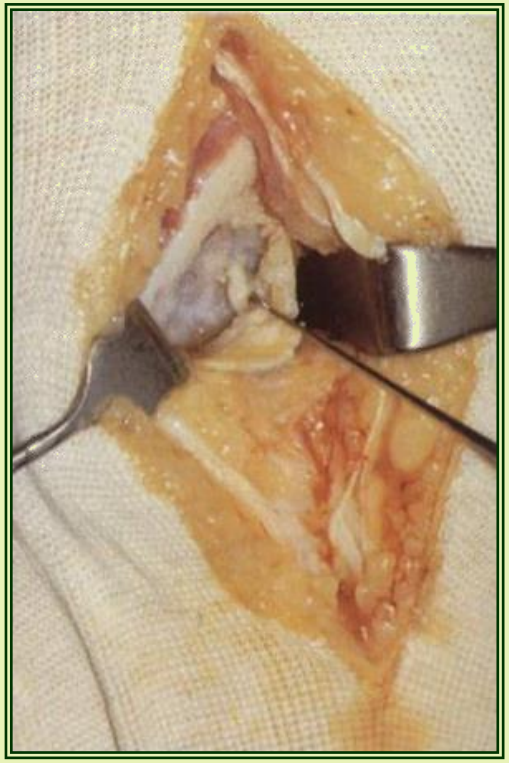
- **Articular cartilage,once injured,does not heal.**
- **This has been known for more than 200 years.**

Hunter W.Clin Orthop 1995 Aug;317



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Effort of nature to repair articular defects,

- **by cell proliferation and synthesis of new extracellular matrix.**

- **Unfortunately,the repaired articular cartilage generally fails to replicate the structure,composition,and function of normal hyaline articular carilage**

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- **The problem is compounded by the poor regenerative capacity of adult articular cartilage,and the commonly held belief that full-thickness chondral injuries eventually progress to osteoarthritis**

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The goal of our treatment is to restore the anatomy

- **Localised articular cartilage defects in weight-bearing joints are common,yet difficult to treat.OATS represents a method of autogenous osteochondral transplantation for the treatment of focal cartilaginous defects secondary to biomechanical chondropathy,traumatic chondral lesions and osteochondritis dissecans of the knee..**

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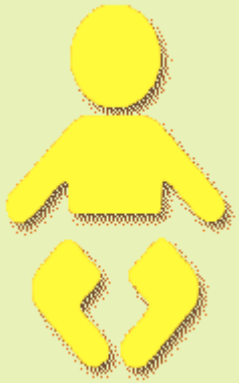
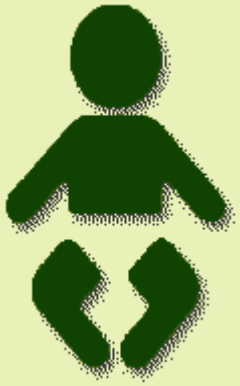
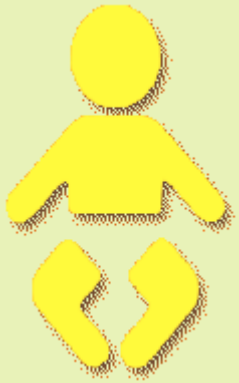
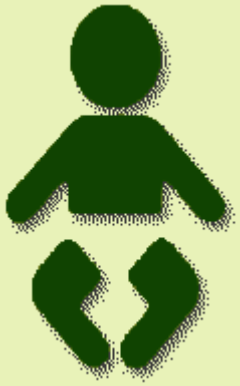
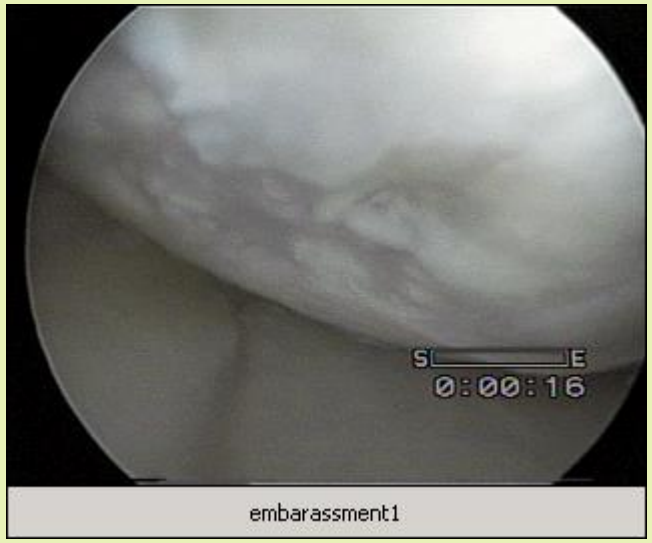




- **Embarrassment during arthroscopic surgery finding full thickness articular surface defect and not be prepared to deal with it.**
- **Shaving is like pumping up a flat tyre.**
- **If you have a hammer in your hand all things look like nails. Marrow stimulation techniques (microfractures) aim to provide repair tissue of fibrocartilage that has inferior mechanical properties to hyaline cartilage**







embarassment1

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embarassment3

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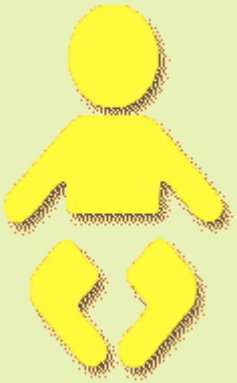

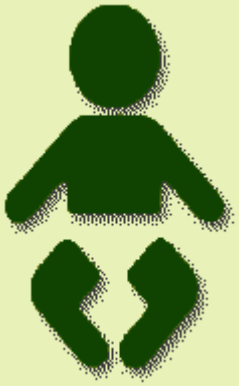

embarassment5

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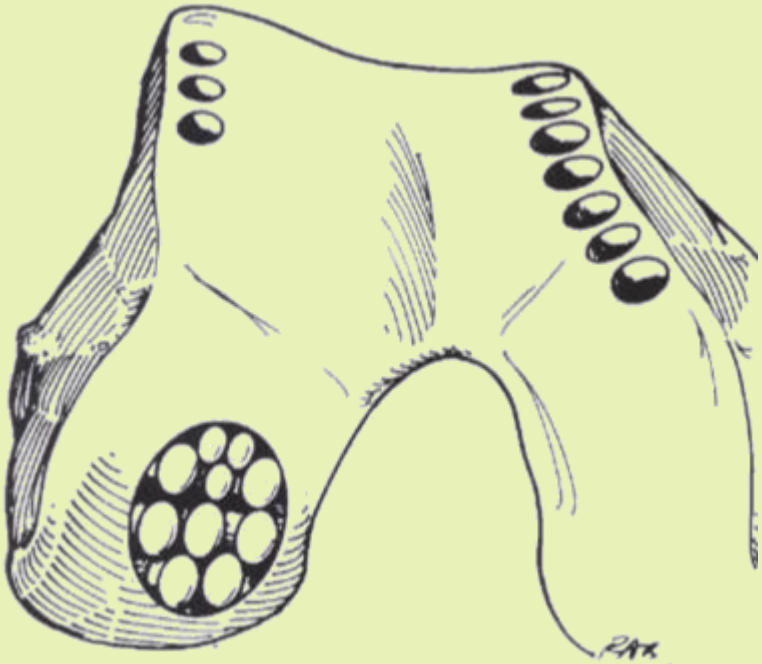
ARTHROINVEST

OATS technique or how to treat chondral defects in WB articular joint surface ?

- transfer of cylindrical osteochondral plugs
- transplant >10 mm optimal
- fixation in press-fit technique



- **The OATS procedure represents an effective means to treat full thickness symptomatic articular defects.**
- **Treatment method is determined by lesion size,location,geometry and graft availability.**

OATS indications

- focal chondral defects in WB zone.
- OCD.
- focal osteonecrosis.

OATS contraindications

- generalised arthrosis
- age over 60 yrs
- open epiphysis
- size over 30 mm in diameter.

- **The OATS procedure can generally be performed arthroscopically for lesions of the femoral condyles when the effect is close to the intercondylar notch and does not exceed 2cm in diameter**

OATS advantages

- arthroscopic technique
- reliability of bone union
- high survival rate of chondrocytes
- no disease transmission
- treatment of different joints
- low cost

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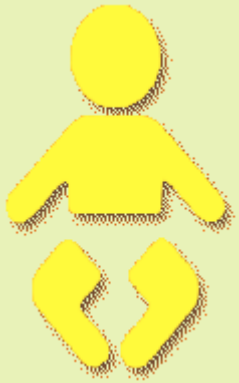
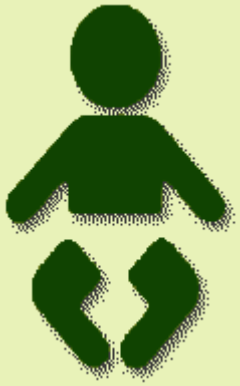
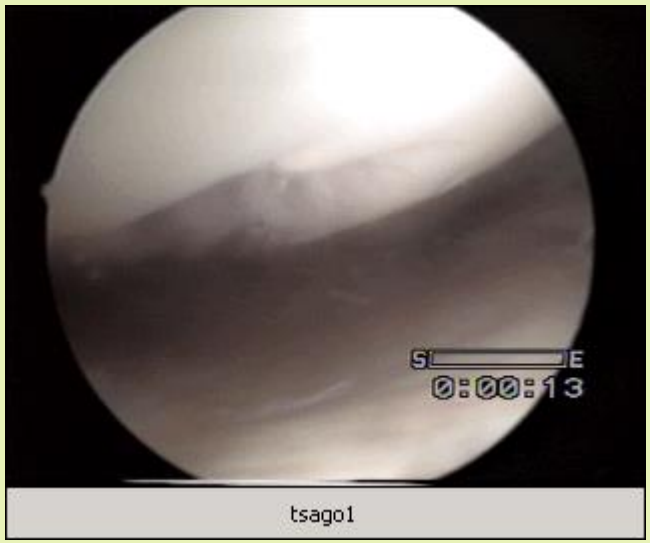
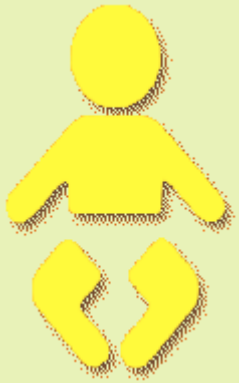


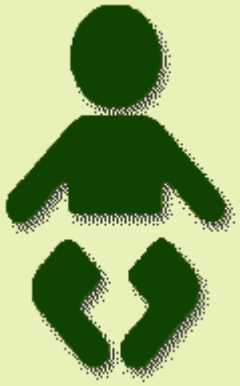


- **OATS is currently the only surgical cartilage repair technique that provides and retains hyaline articular surface.The technique is in clinical use since 1992**

- **The ideal chondral lesion is a relative small,10 to 20 mm in diameter,full thickness chondral defect.Frequent lesion in the WB area of the medial femoral condyle in the ACL deficient knee.**







tsago3

tsago4

tsago5

tsago6

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CHONDRAL_LESION7

CHONDRAL_LESION8

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- **Injuries of the articular cartilage that do not penetrate the subchondral bone do not heal spontaneously.**

- **Injuries that penetrate the subchondral bone undergo repair through the formation of fibrocartilage,instead of the normal hyaline cartilage.**

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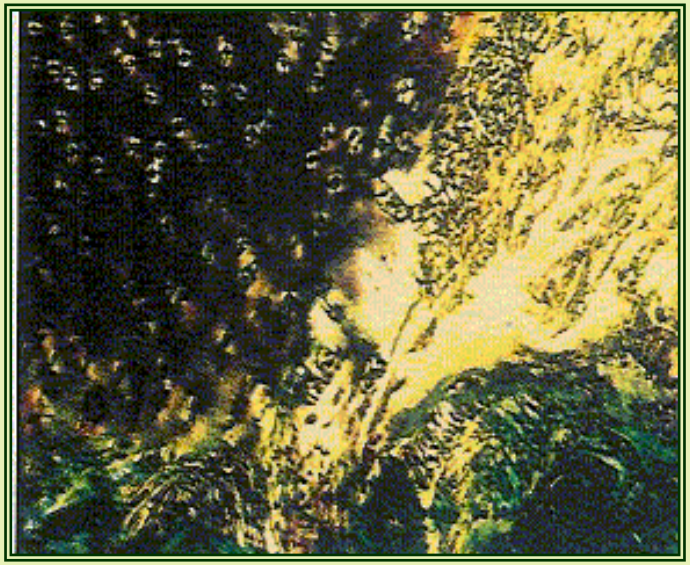
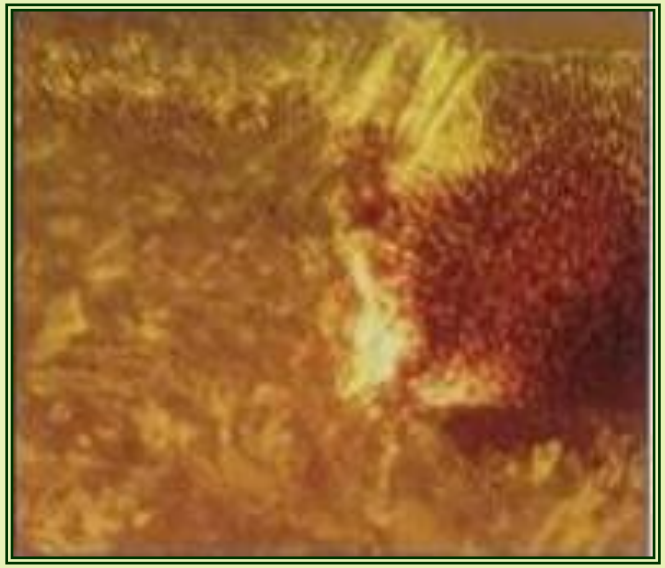
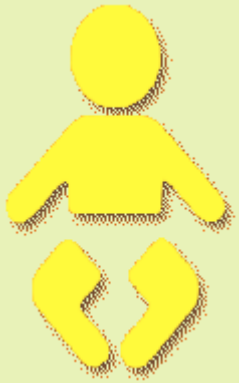
- **Healthy Hyaline Cartilage Covering the Defect Site.**
- **The slides illustrate the survival of healthy hyaline cartilage in the transplanted area.Studies indicate that the transplanted area consists of 60-80% hyaline cartilage and 20-40% fibrocartilage from the cancellous bed of the defect..**



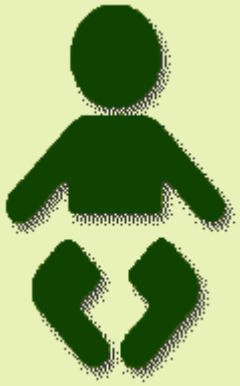


- **Fibrocartilage is made to resist tension forces,whereas the hyaline cartilage is made to resist compression forces to enable smooth articulation,and to withstand long-term variable cyclic load and shearing forces.**

Classification of Chondral Damage according to Outerbridge classification system

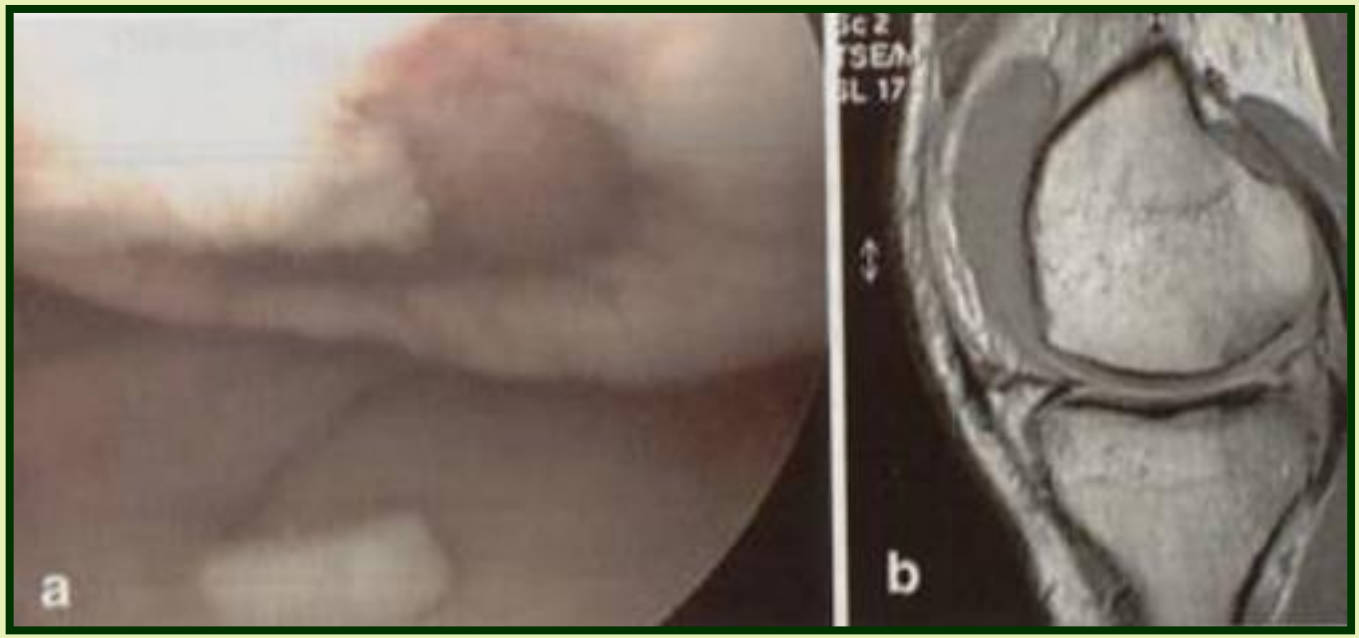


- **GRADE 0 = normal articular cartilage**
- **GRADE I = softening and swelling of the cartilage**
- **GRADE II = early fissuring that does not reach the subchondral , Size <0.5 in.**
- **GRADE III = fissuring reaches the subchondral bone,which is not exposed, Size >0.5 in.**
- **GRADE IV =the subchondral bone is exposed.**

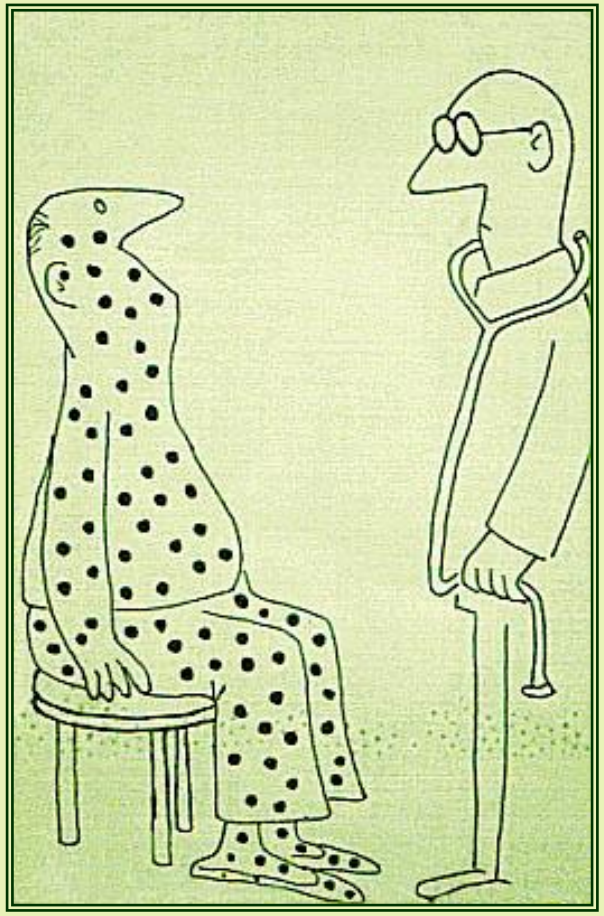


In October 1997 the International Cartilage Repair Society (ICRS) was founded in Switzerland.

- **KNEELAND in 1997 published that cartilage has proven exceedingly difficult to evaluate accurately with MRI.**
- **Carefull arthroscopic visual inspection and probing are still the most helpful diagnostic tool.**
- **FRIEMERT, ESSKA journal, Jan 2004: “Based on our results, and after evaluation of the literature, MRI is not able at present to replace arthroscopy for the diagnosis of cartilage damage of the knee joint”.**



Attempts to address the problem



This ranges from no treatment (supervised neglect),treatment with chondroprotective agents (glucosamine,chondroitin sulfate,hyaluronic acid),lavage,debridement and curettage,abrasion arthroplasty,bone marrow stimulating techniques (subchondral drilling,microfracture),refixation of chondral fragments,carbon fiber resurfacing,autogenous bone grafting,allograft and autograft osteochondral transplantation,periosteal transplantation,periochondreal transplantaion,implantation of autologous cultured chondrocytes,and induction of cartilage repair with growth hormones.

Some efforts were true medical efforts to solve the problem,some others were forced from the "BUSINESS OF SCIENCE."

Clinical experience of OATS

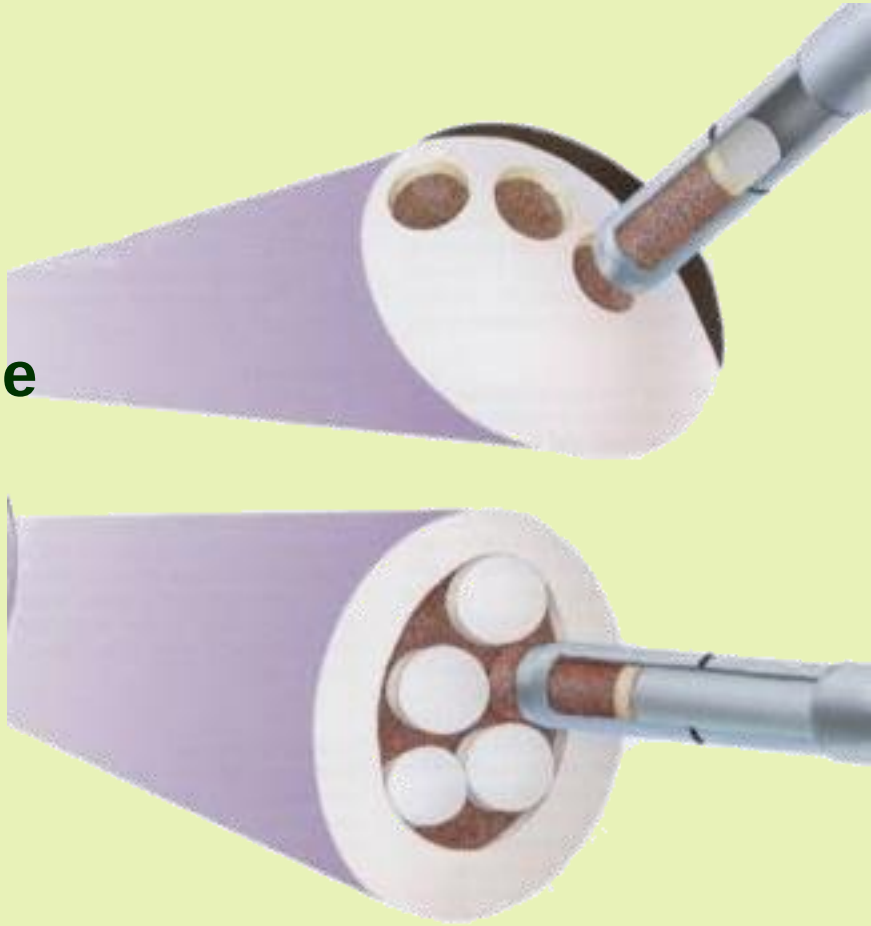
1952 Wilson and Jacobs published the first results of OATS(open technique).

1993 Matsusue published the first arthroscopic OATS.

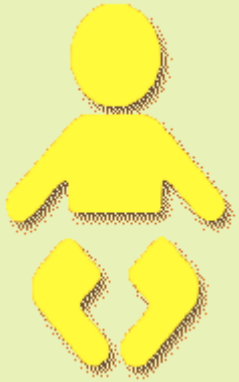
Osteochondral autograft transplantation

PROS

- **single stage/arthroscopic**
- **cost effective/feasible**
- **autogenous whole tissue graft**
- **hyaline viability**
- **quicker recovery**

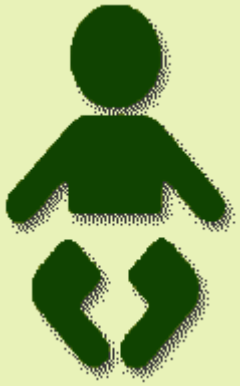


Osteochondral autograft transplantation



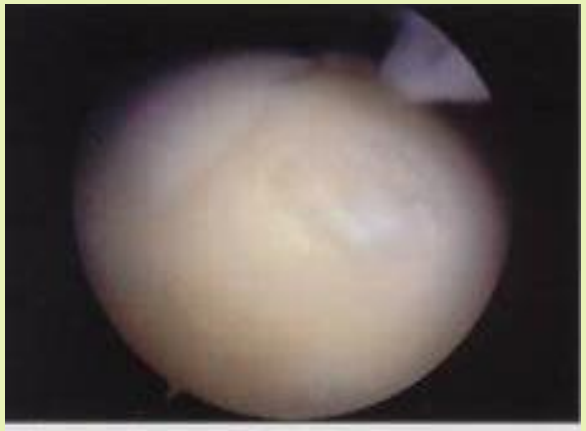
CONS

- technically demanding
- “rob Peter to pay Paul”/donor sites?
- limited donor sites
- effect of impacting plugs
- imprecise contouring
- interfill tissue is fibrous?



Donor site

- **Follow up arthroscopic studies demonstrate that the donor site fills with cancellous bone and fibrocartilage.**
  At 1 year the donor site is filled with fibrocartilage ,which is usually level with the surrounding cartilage.



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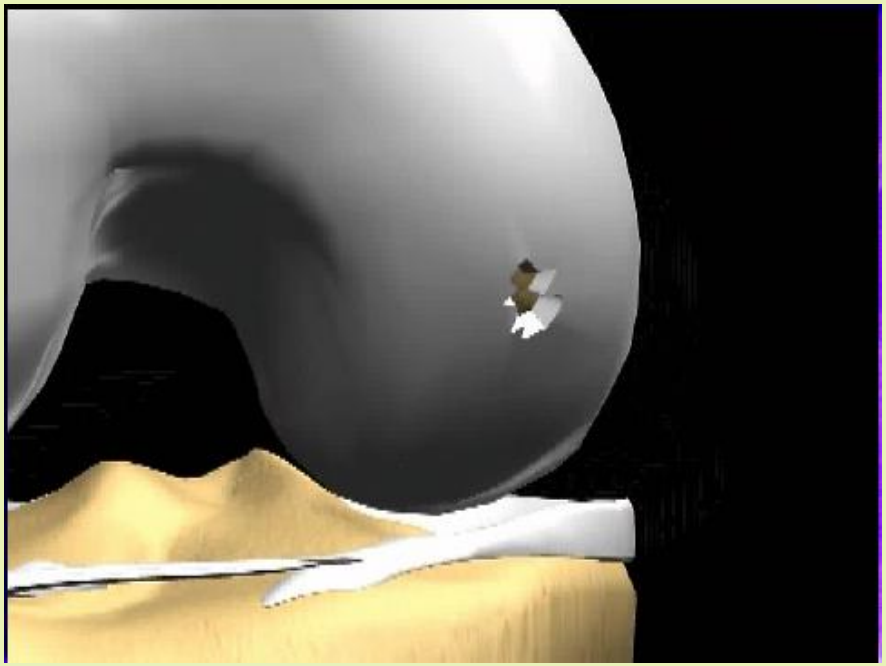
OATS arthroscopic technique step by step

Step 1: Selection of Donor site

- Potential donor site along the outer edge of the lateral femoral condyle,above the sulcus terminalis.
- Alternative donor site superolateral margin of the intercondylar notch.



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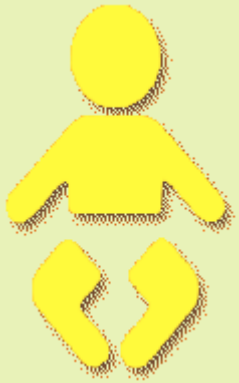
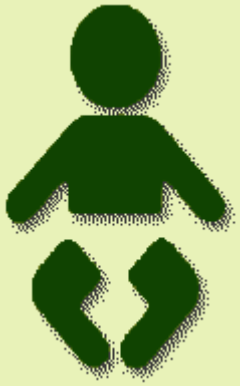
OATS arthroscopic technique step by step



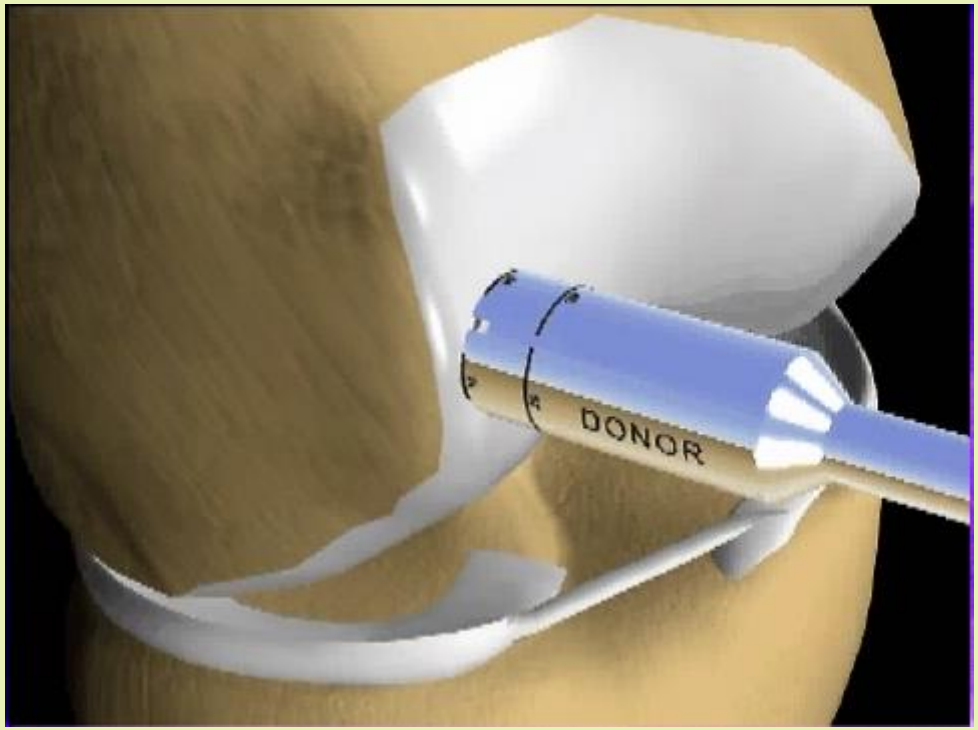
Step 2: Chondral Defect Size

Determination and Surgical Planning.

- **The size of the lesion is measured by using a range of appropriate sizers.**
- **The appropriately sized donor graft harvester is indroduced perpendicularly to donor articular cartilage area.**
- **It is very important to insert the harvester at 90 degrees taking care not to change the angle or rotate the tube harvester during impaction.**
- **Depth of graft 15 mm.**



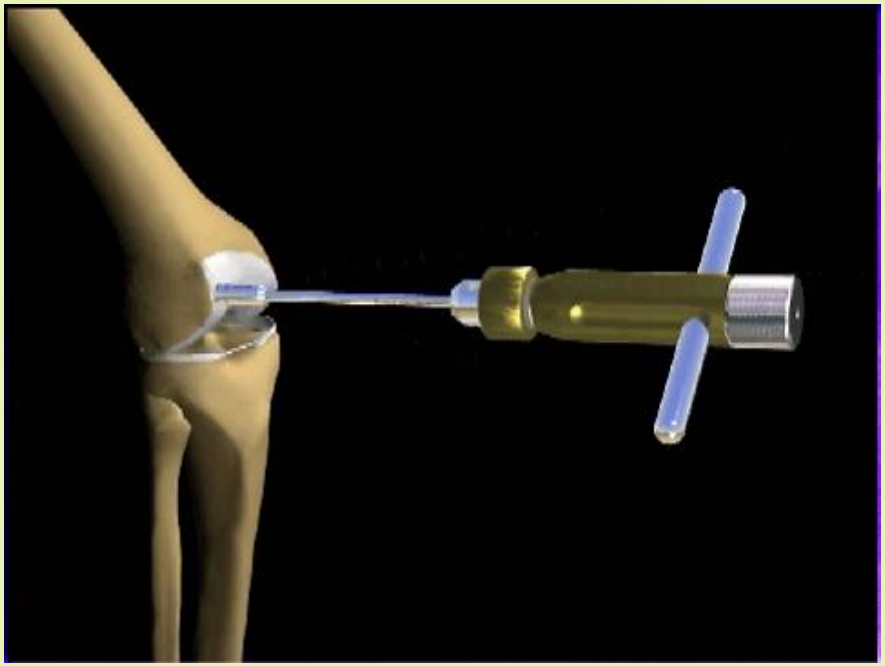
Step 2: Chondral Defect Size



OATS arthroscopic technique step by step

Step 3: Donor Core Harvesting

- **By rotating the driver/extractor 90 degrees clockwise and counterclockwise remove the harvester.**



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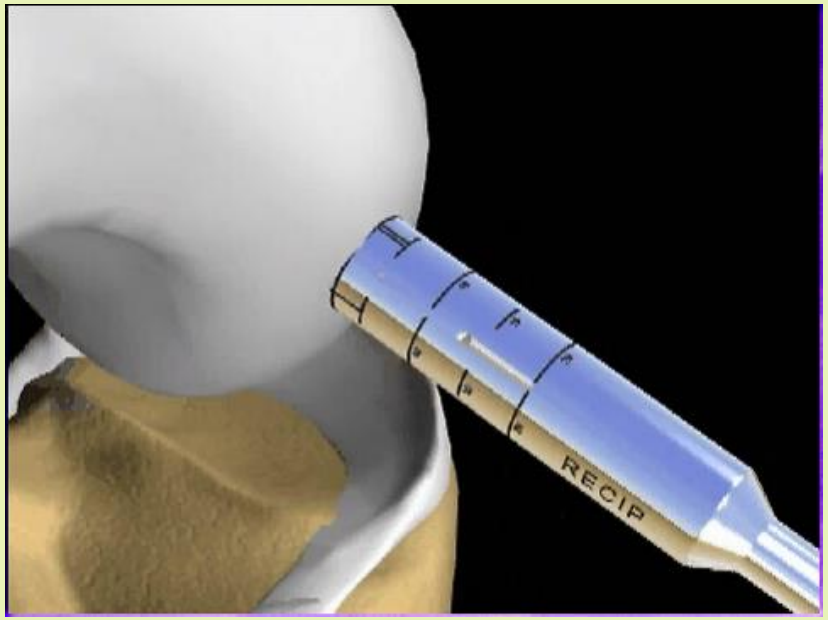
OATS arthroscopic technique step by step

Step 4 : Recipient Socket Creation

- Tubular Harvester versus Drilling.
- Drilling as opposed to manual punch technique,causes significant greater chondrocyte death.



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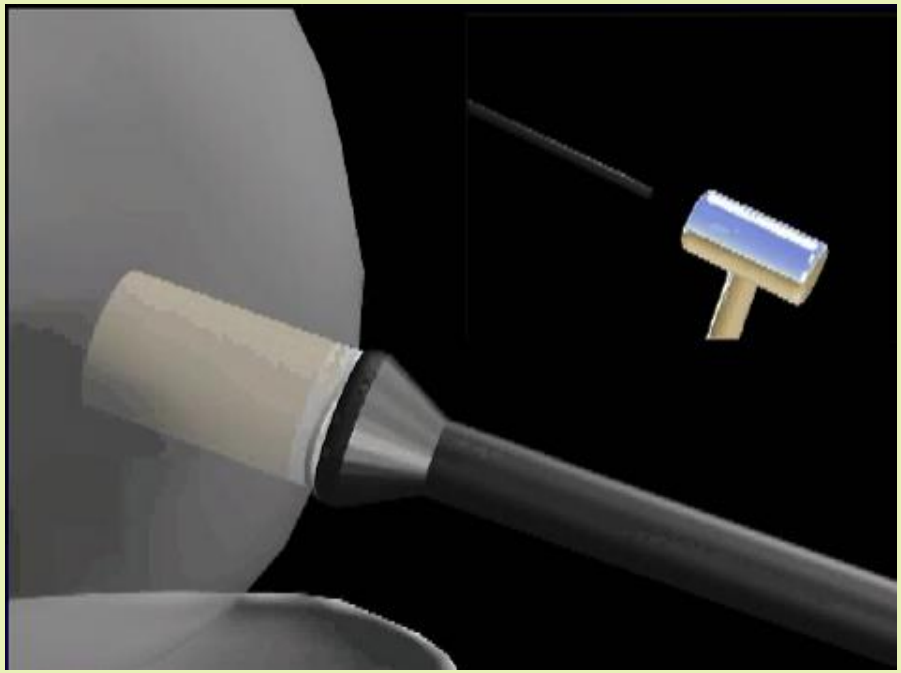
OATS arthroscopic technique step by step

Step 5: Final Donor Seating

- The introducer is designed to advance the graft so that 1 mm of the graft will be exposed.The final taping of the graft is done by the flat surface of a sizer 1 mm larger than the diameter of the graft.



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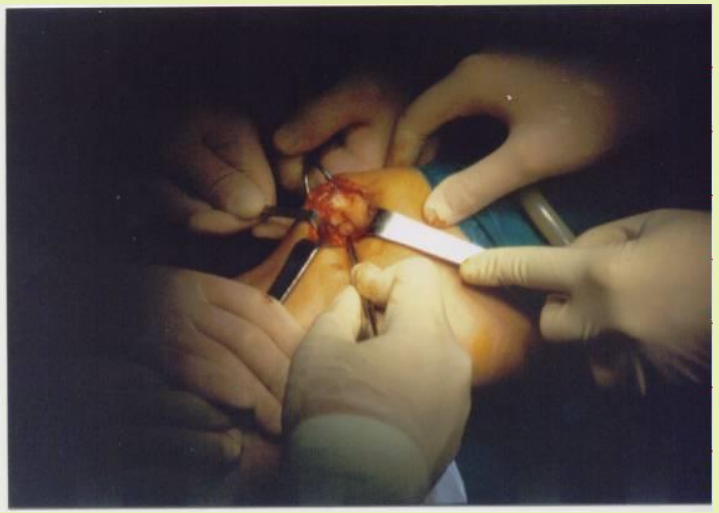
- All our cases were treated arthroscopically except one.
- A 17 yrs old boy who had an arthroscopy performed elsewhere 6/12 ago with no clinical success.
- The reason we did this case with a mini- open technique was that the large defect was on the medial aspect of the patellar articular susface.
- It was impossible to achieve perpendicular axis to the defect area.



- During the year 2003 we had 11 cases. 5 of them had an arthroscopy performed elsewere with no clinical improvement.
- The main symptoms were walking and night pain.
- The pain probably occurs because of the stimulation of the nerve ending of the subchondral bone.The procedure gave immediate relief from night pain.

Case of OA

- What is the first think it comes to our mind when you see this kind of lesion in a 65 yrs old patient?
- Do a TKR.
- Is it the only solution?
- Having in mind that you can always do a TKR later if things go wrong,try OATS first.

papas3

papas4

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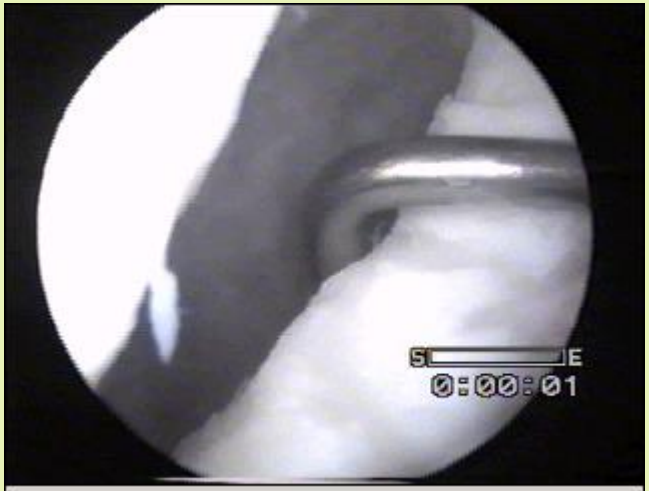
Surprise case

- Osteofracture.
- Be prepared because things are not always as shown in the MRI.
- 17 yr old boy with the following arthroscopic finding.In this huge fragment we did the only wise thing to do , fixing the fragment back with absorbable pins.



SURPRISE1

SURPRISE2

SURPRISE3

SURPRISE4

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Normal case

- **Mother of a doctor ,6/12 post arthroscopy with a lot of pain. OATS with excellent result.**

post arthroscopy3

post arthroscopy6

post arthroscopy7

post arthroscopy8

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Salvage case

- Any suggestions to solve the problem?.
- implantation of periosteal and autologous cultered chondrocytes?
- transplantation of posterior femoral condyle?(Imhoff,Cologne ‘03)

SALVAGE3

SALVAGE4

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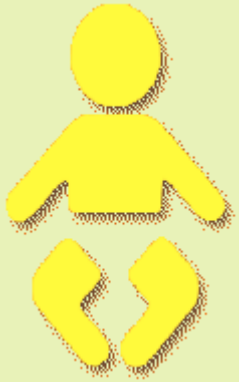
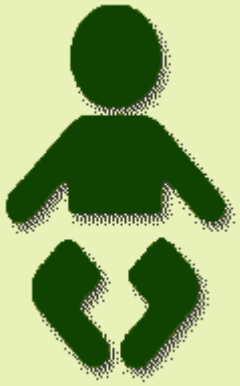
OATS technique in other joints



- **in elbow (Panner's disease)**
- **in OCD of Talar Dome**
- **in Hill-Sachs defect of Recurrent Dislocation of Shoulder**



The highlights for the future are:

- **tissue engineering**
- **gene therapy**
- **autologous protein production**

Conclusion

- Symptomatic full-thickness chondral lesions in the knee pose a difficult management issue for orthopaedists and patients.
- The results has shown that this technique can restore an articular surface.
- The long- term follow up has shown that the transplantation of osteochondral autologous grafts can be effective for the treatment of focal defects of articular cartilage in selected patients.

Thank You!