

# Doron Sher

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# Treatment of Knee Arthritis and Chondral Injuries

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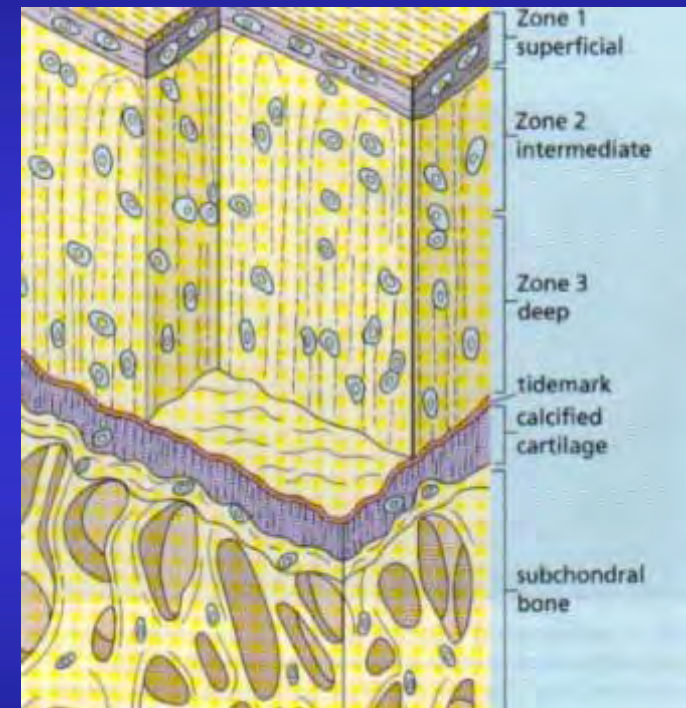
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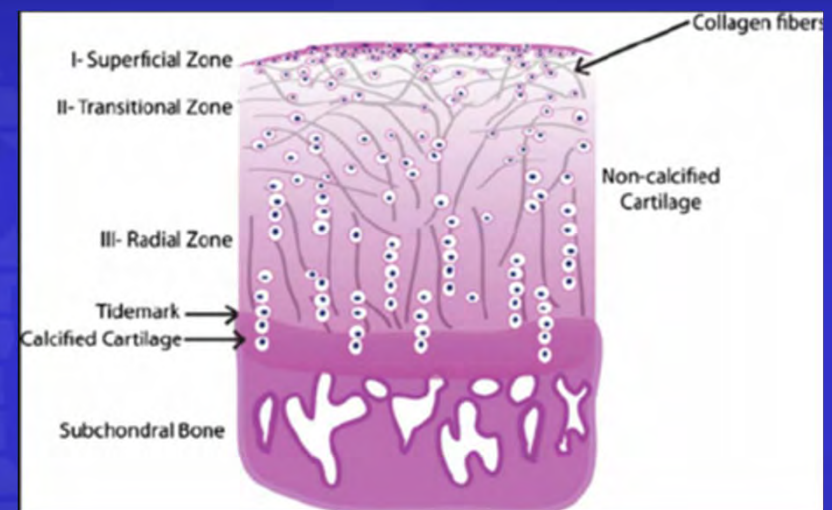
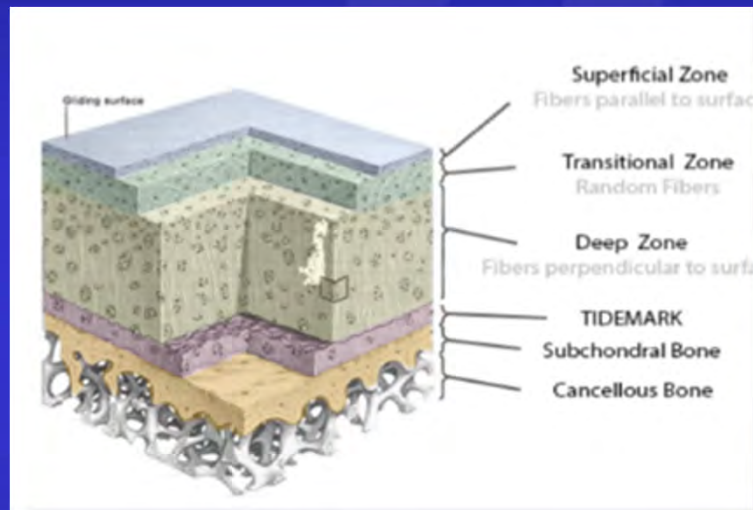
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# Cartilage

- Type II collagen
- Cross linked type IX collagen
- 80% water
- 20-40% dry weight of glycosaminoglycans
- Chondrocytes and a composite gel





Time-Dependent Processes in Stem Cell-Based Tissue  
Engineering of Articular Cartilage, Ivana Gadjanski & Kara  
Spiller &  
Gordana Vunjak-Novakovic, Stem Cell Rev and Rep

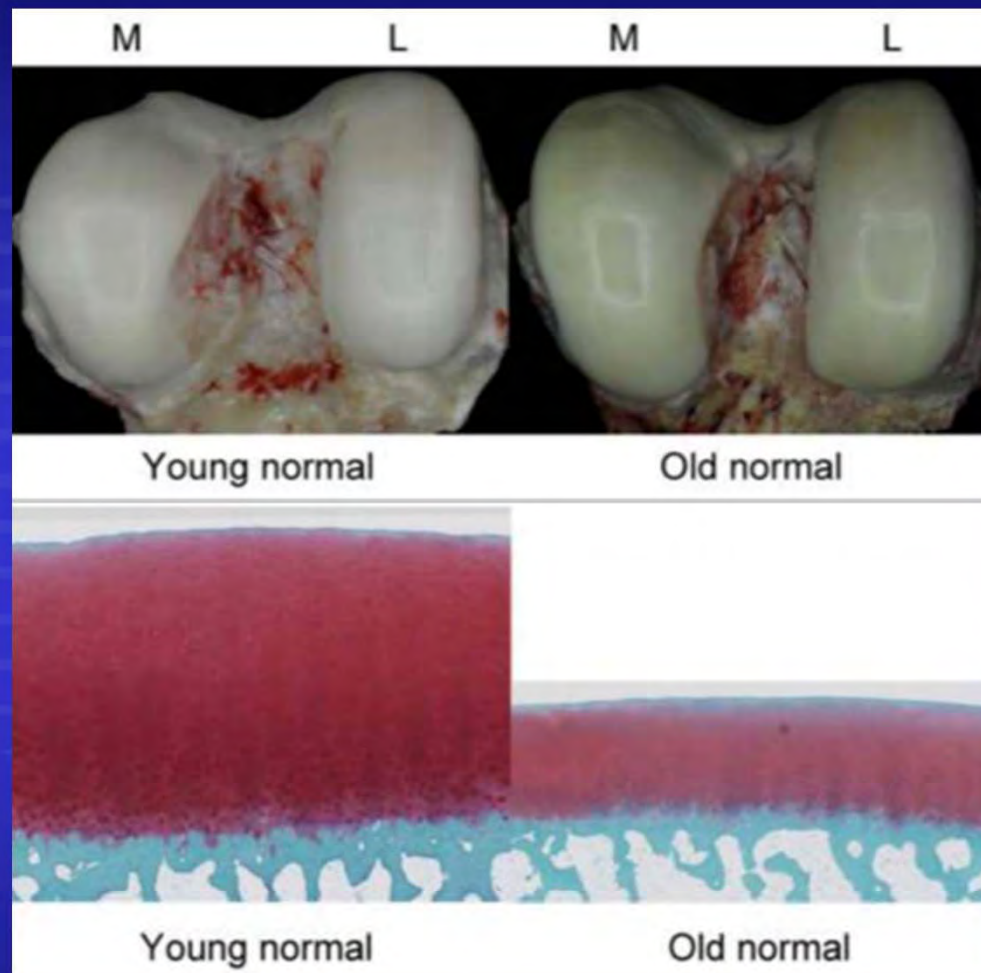
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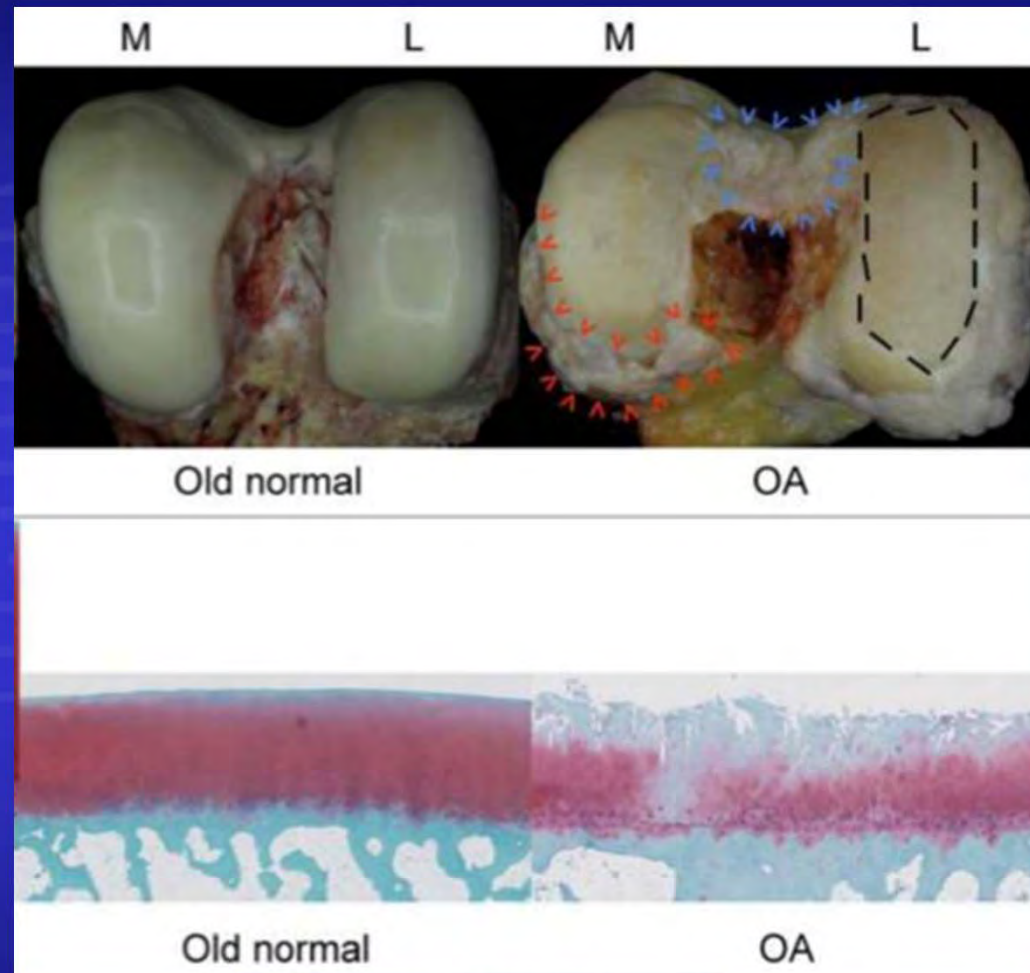
Effects of aging on articular cartilage homeostasis

Marin Lotz<sup>a,\*</sup> and Richard F. Loeser<sup>b</sup>

*Bone*, 2012 Aug; 51(2): 241–248.

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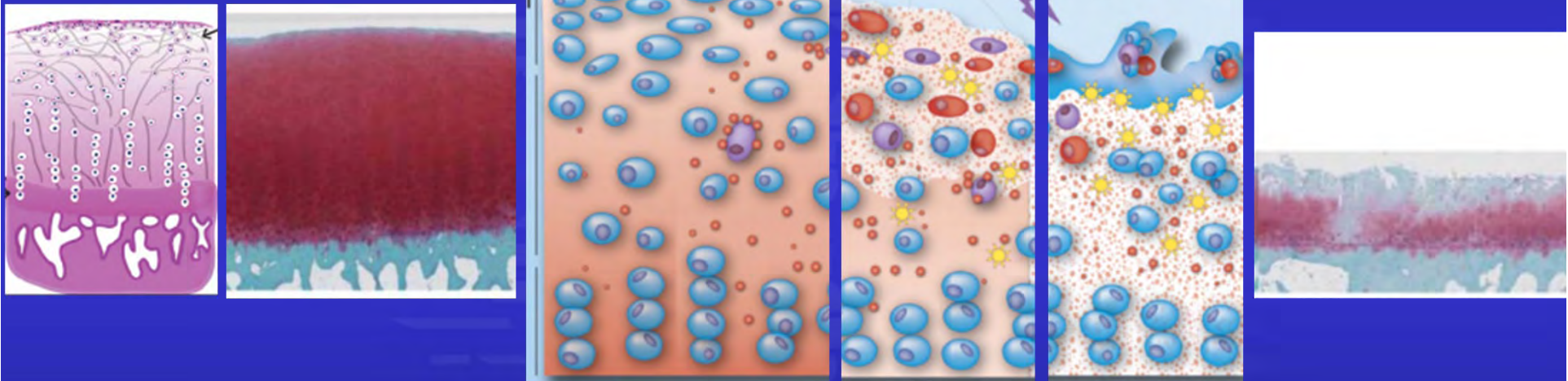


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# Arthritis - Damage to the joint lining surface



2010 April ; 5(2): 199-214

Joint aging and chondrocyte cell death  
Shawn P Grogan and Darryl D D'Lima

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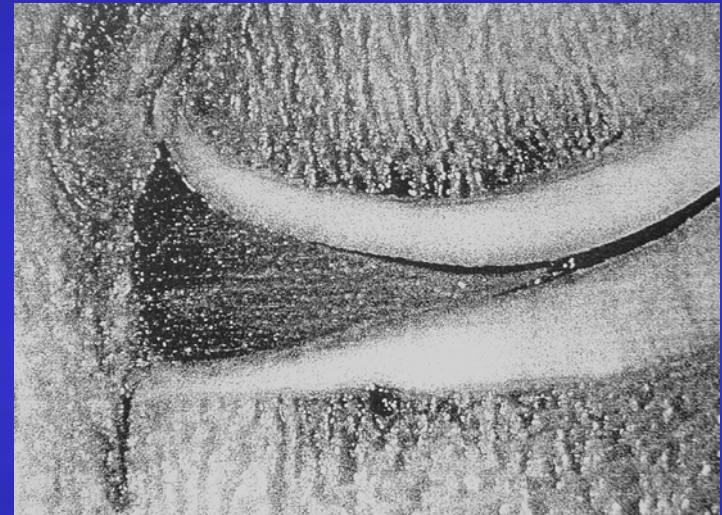
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# Articular Cartilage

- Load bearing
- Shock absorber
- Smooth movement
- Prevention of articular damage is the key



No proven method to date can  
reconstitute hyaline articular cartilage



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# Arthritis Disease progression

- Early OA often localised to 1 area
- Long standing OA pain more diffuse
- Can have acute change in a chronic knee



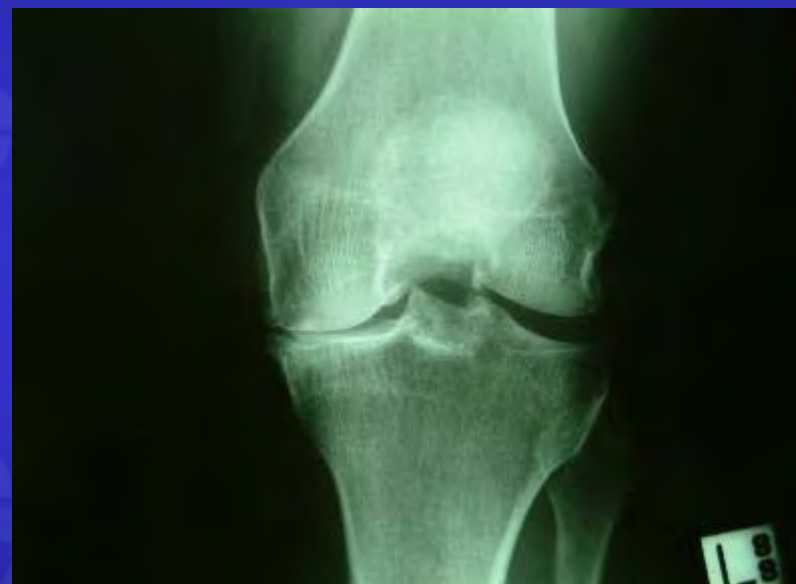
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# OA Knee

- Begins as mono-compartment disease in 70% of cases (higher in Asians)
- Can stay in one compartment for up to 20 years



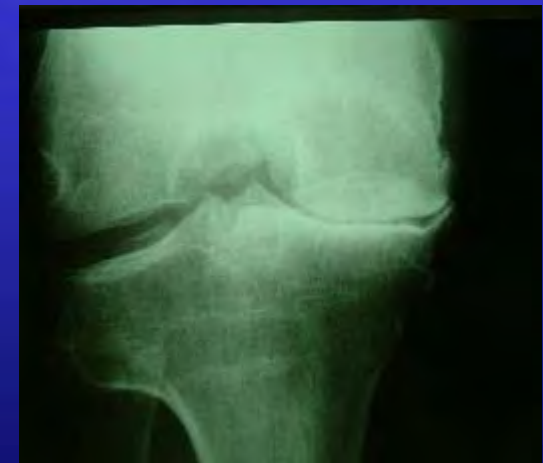
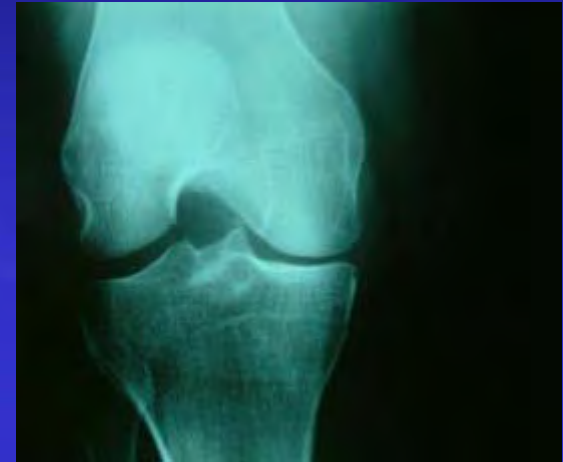
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# Pattern of Progression of OA

- Mono-compartment OA
- Intercondylar incarceration
- Rotatory subluxation
- Progressive ACL attenuation
- Bi and tri-compartment osteoarthritis



# OA

- Increases with age
- Activity level NOT related to arthritis incidence
- 25% pts 45-64 yrs
- 85% pts >65 yrs have premature arthrosis of the knee (as seen on xray)



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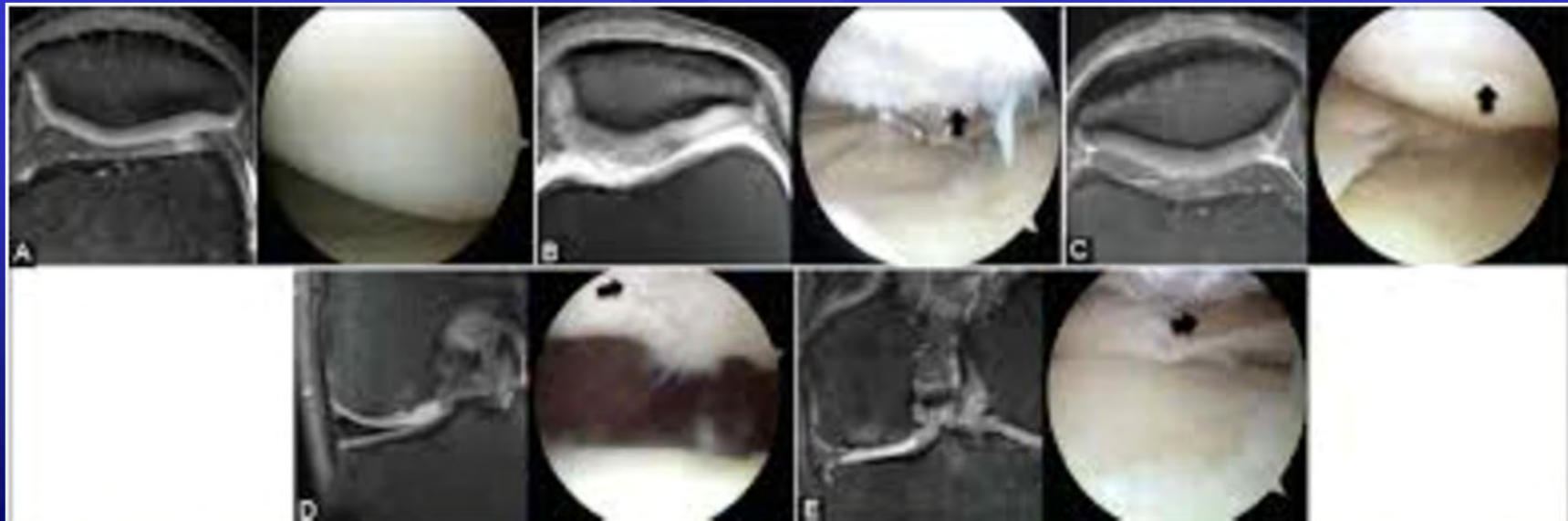
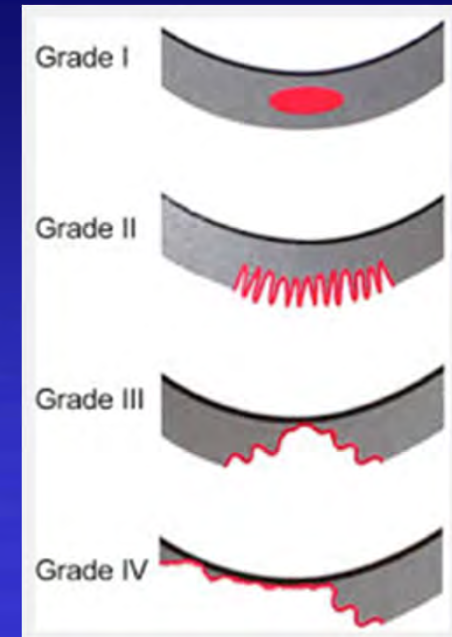
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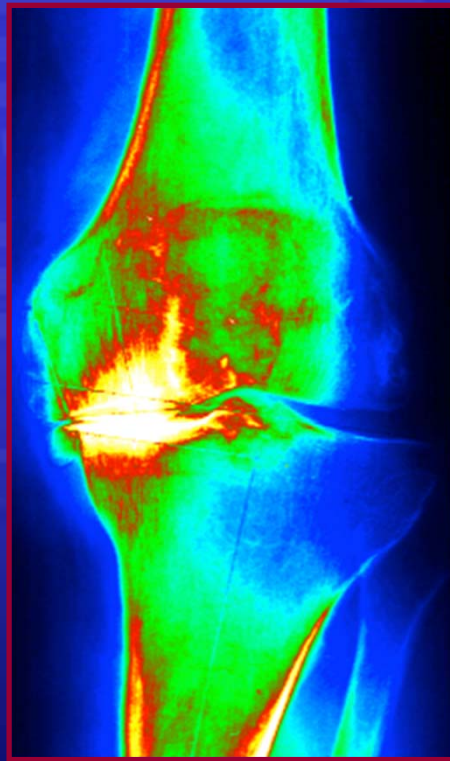
# Outerbridge Classification

- 1- softening of cartilage
- 2- fibrillation superficial
- 3- fibrillation down to subchondral bone
- 4- exposed bone



# Osteoarthritis

- What is the source of the pain?



Arthritic pain is largely due to increased stress on the unprotected bone

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# Traumatic Chondral Lesions

- Very common
- Difficult to treat
- Present to physio before and often after arthroscopy because of ongoing pain

Can we stop isolated chondral lesions progressing to arthritis?



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# Who Gets Them?

- Anterior cruciate ligament injuries
- Direct blows
- Patella dislocation

Gradual wear and tear damage occurs with increasing age and usually not suitable for grafting



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# Surgical Treatment

- Arthroscopy
  - Debridement
  - Microfracture
  - Mosaicplasty
  - Fresh Allograft
  - CarGel
- Osteotomy
- Arthroplasty
  - Uni
  - Total



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# Debridement of OA

- 70% success rates
- Always try non-surgical first
- Success rate the same for delayed treatment



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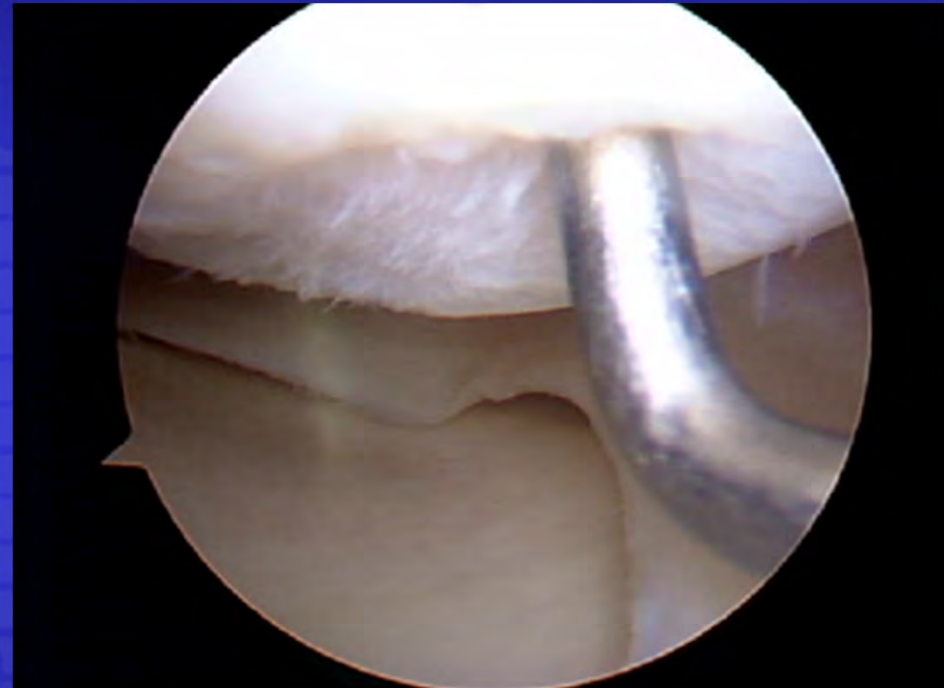
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# Debridement



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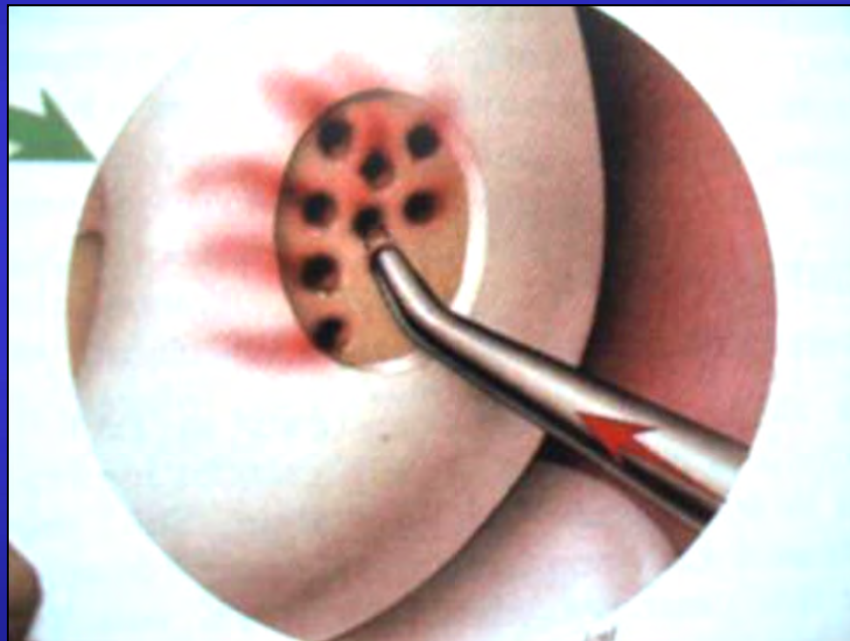


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# MICROFRACTURE



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# Microfracture

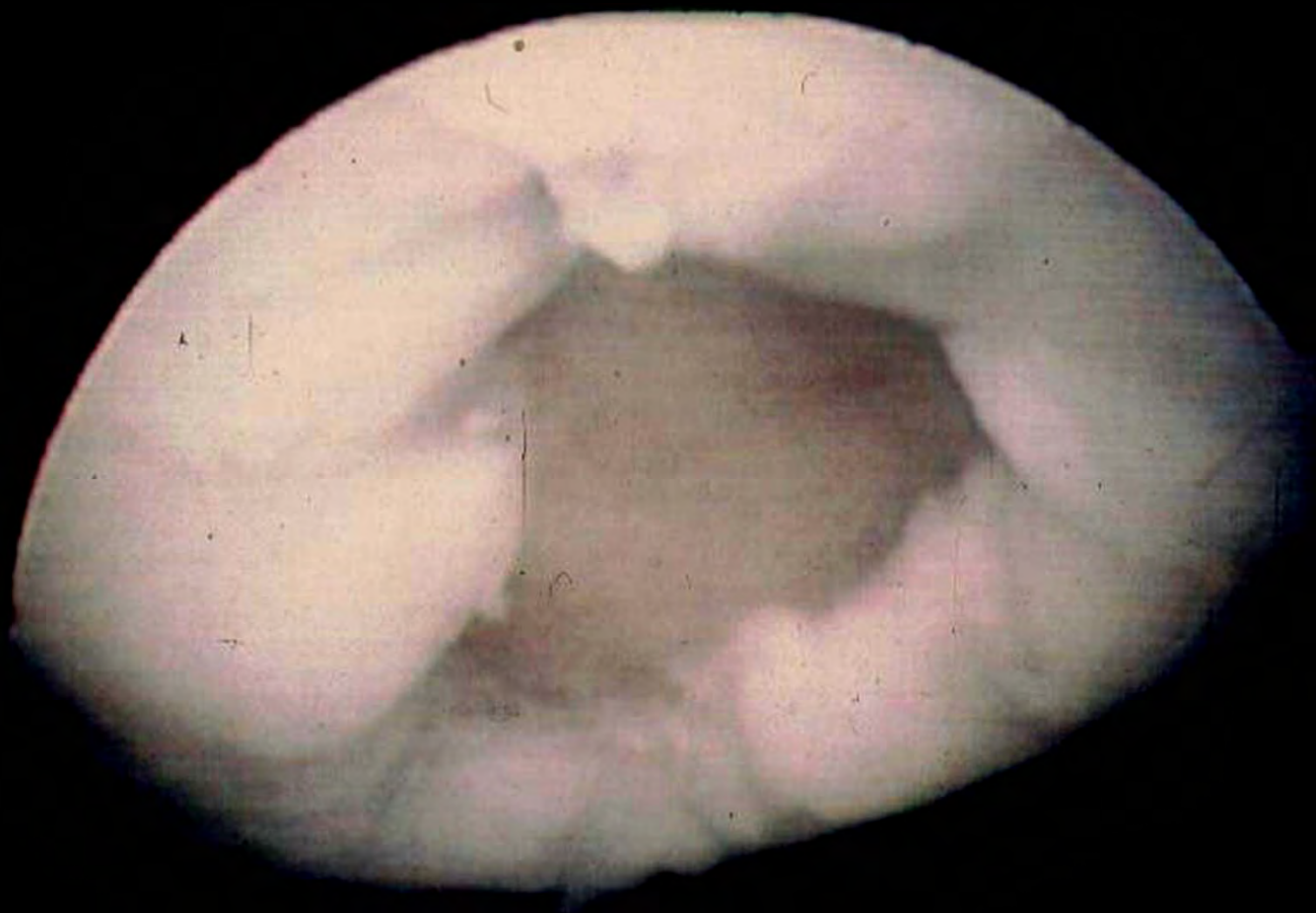
- Hematoma fills the defect
  - Reparative fibrocartilage forms
    - joint surface contour partially restored
    - improved symptoms
    - delays need for reconstructive surgery
- Perforations promote blood clot adhesion

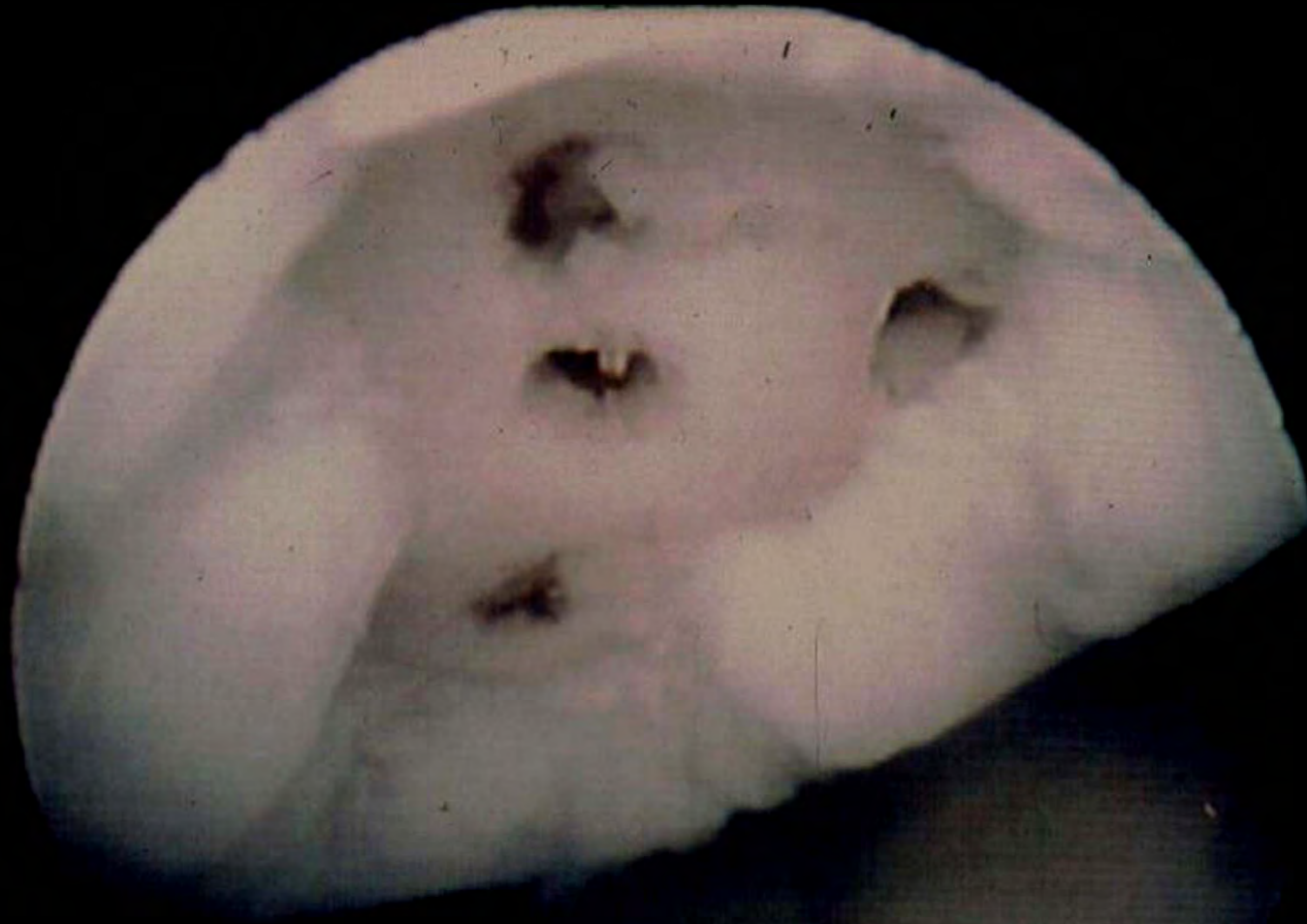


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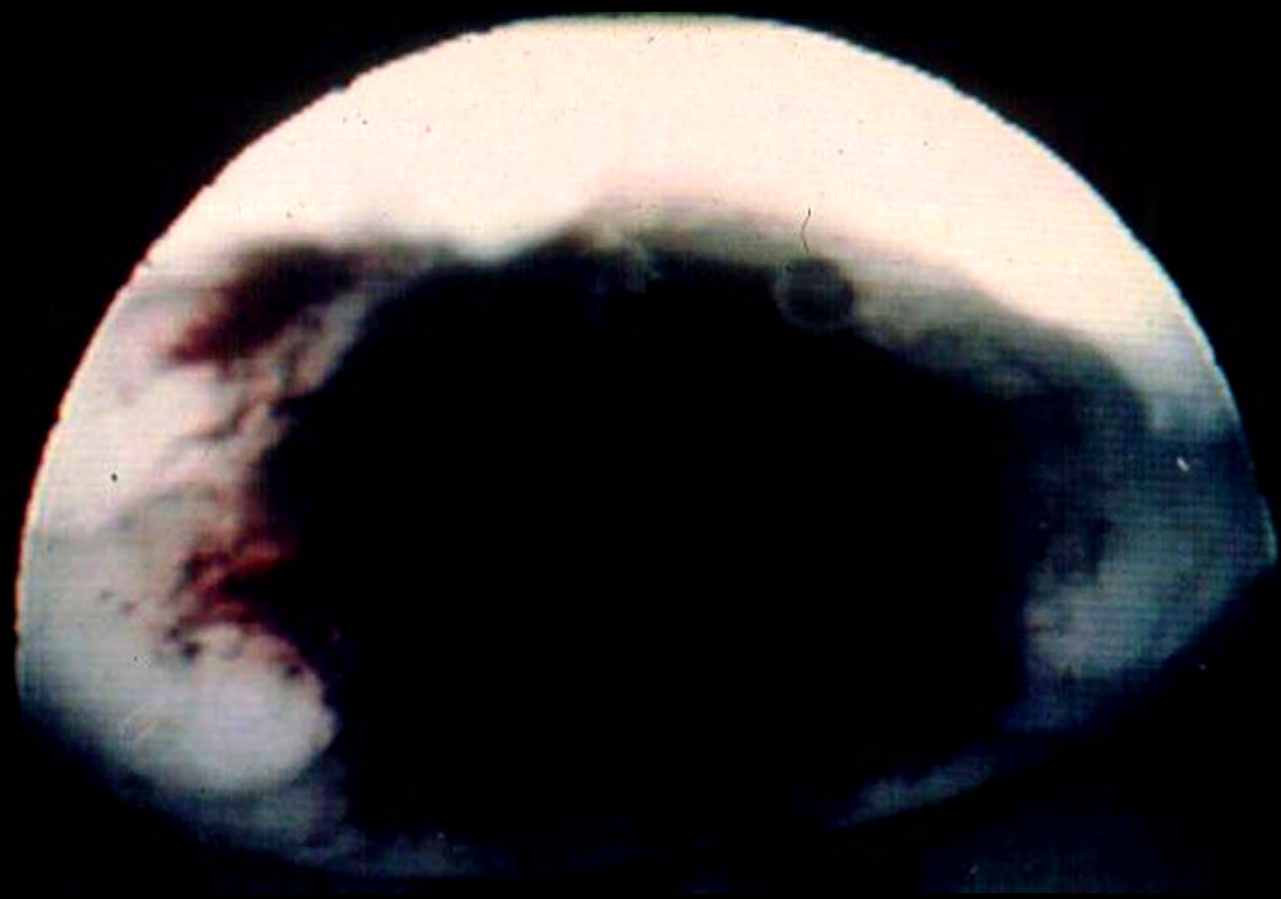
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# Microfracture - Results

- Male
  - Small lesion
  - Femur
- } Good
- Type of Rehab probably makes a difference
  - Deteriorates after 2-5 years



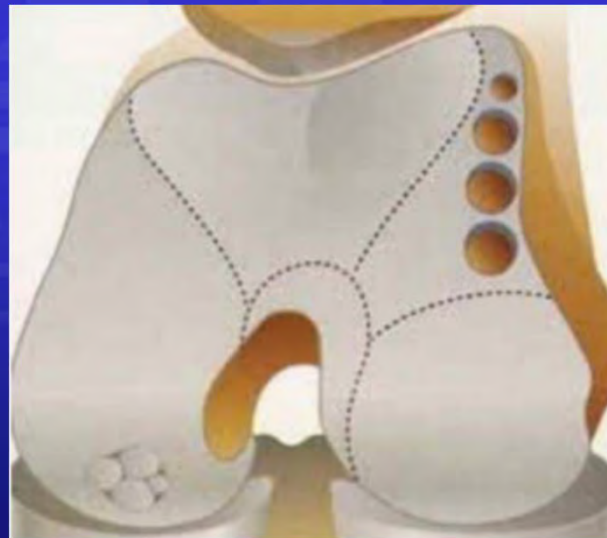
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# Mosaicplasty

- Take cartilage from one part of the knee and put it in another



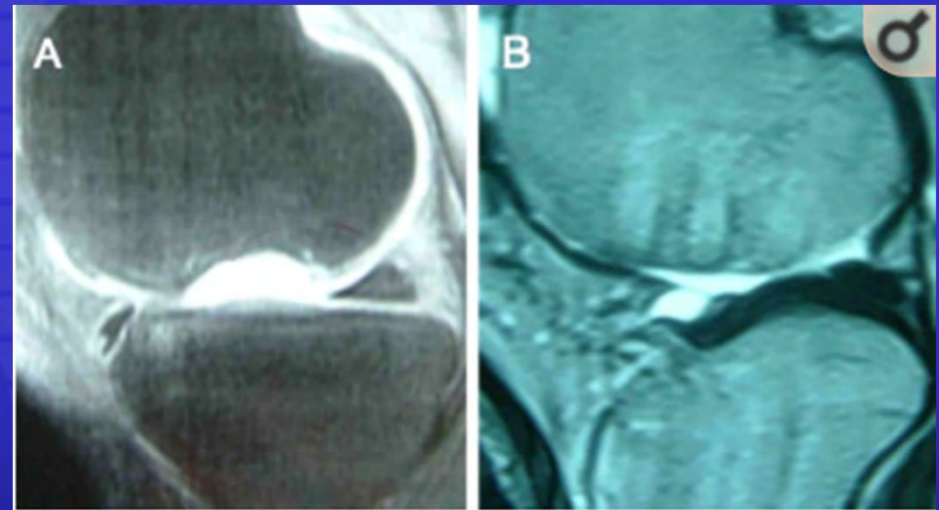
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# Mosaicplasty – Failure Rate

- 40% (long term conversion to TKR)
  - > 40 yrs
  - Female
  - Defects >3 cm<sup>2</sup>
- 12.5%
  - <40yrs
  - Male
  - <3cm<sup>2</sup>



# Fresh Allograft

- Difficult to do in Australia

But what do you do when:



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# Loss of subchondral plate

- Structural defect
- Often large lesions
  - Too big for OATS autograft
- Often young patients
- Almost always significant symptoms with ADL's



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# Osteochondral Allograft

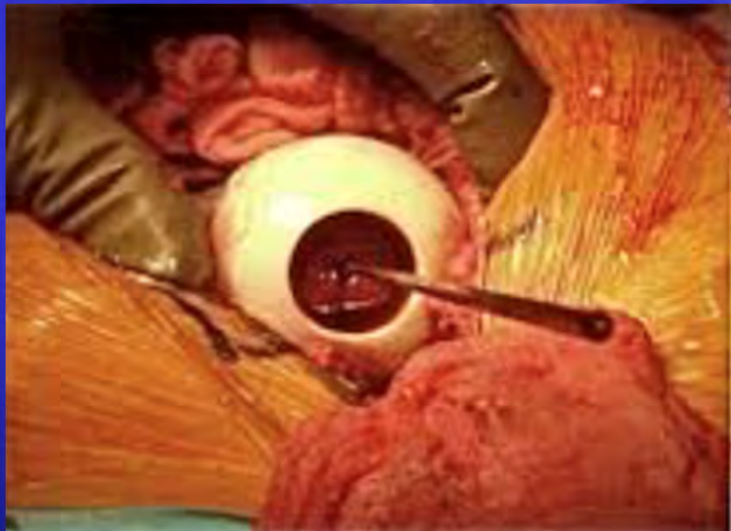
- Must be FRESH
- Radiation destroys chondral cartilage
- Concerns about disease transmission
- No blood supply
  - Nutrients from synovial fluid
- Failure rate quite high



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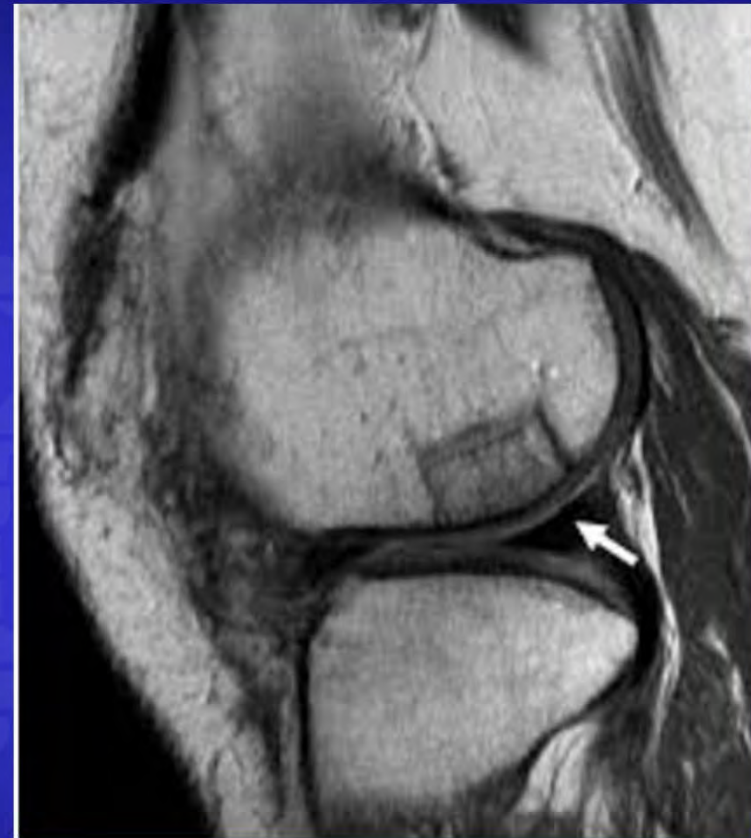
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# Prognosis

- Smaller Lesions Do Better
- Femoral Condyle
  - Better than Tibial
    - Better Than Patella
- Kissing Lesions Don't Do As Well
- Not For Arthritis



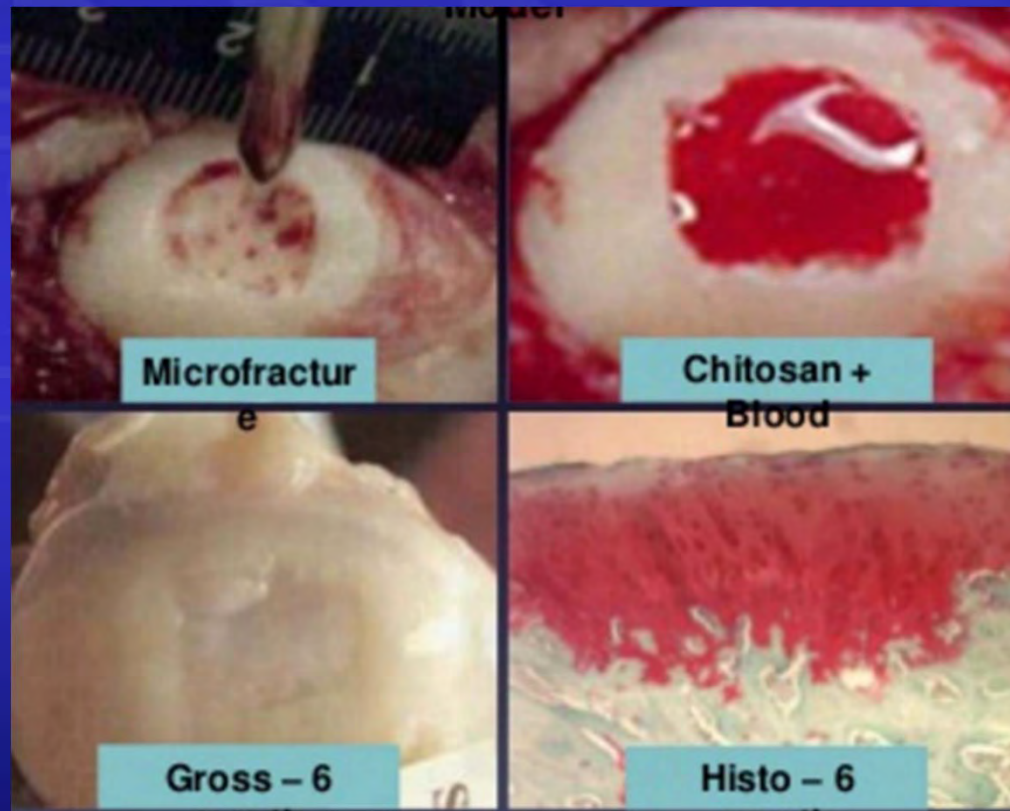
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# CarGel



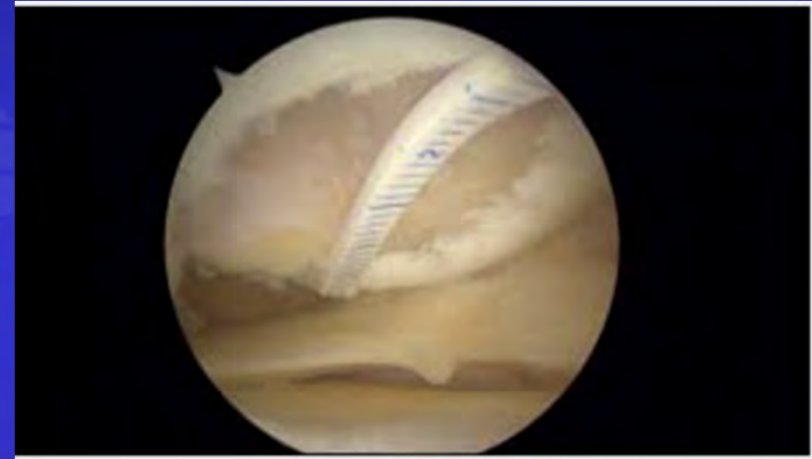
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# Indications For Surgery

- Young Patient
- Contained Lesion
- Stable Knee
- Not Overweight
- Motivated For Rehabilitation
- Subchondral Plate Intact



# Treatment

- Conventional treatments do not restore articular cartilage to its normal state
- Healing tissue is fibrocartilage which does not have the normal mechanical properties of articular cartilage



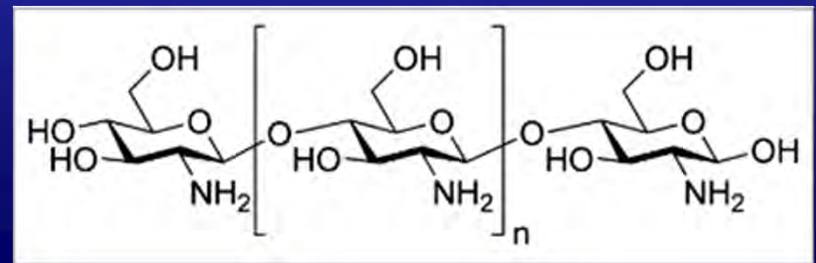
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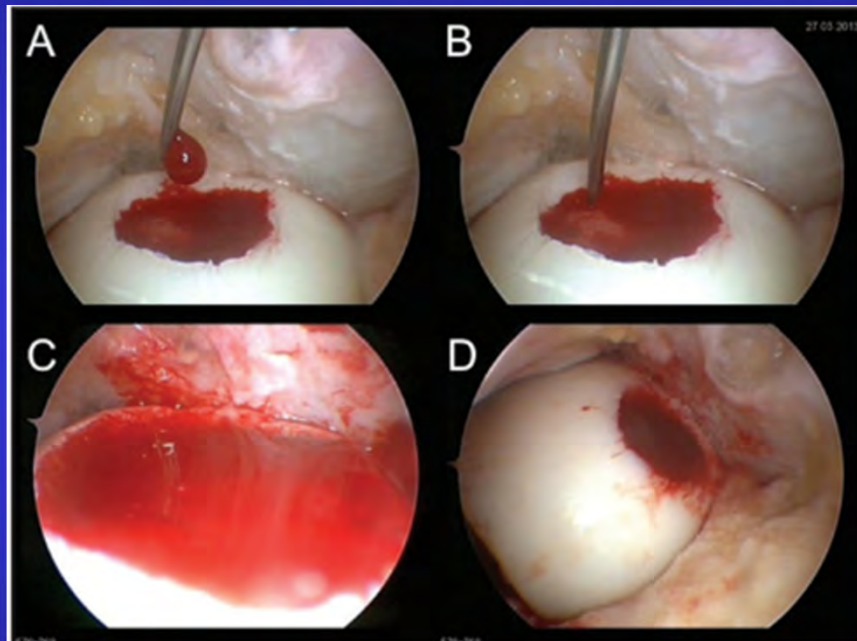
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# CarGel

- Chitosan based scaffold
  - Mixed with blood (shrimp exoskeleton)
  - Placed on defect after microfracture
  - Needs 15 minutes to set
- 
- Physically stabilize the clot that forms
  - Guide and enhance marrow-derived repair





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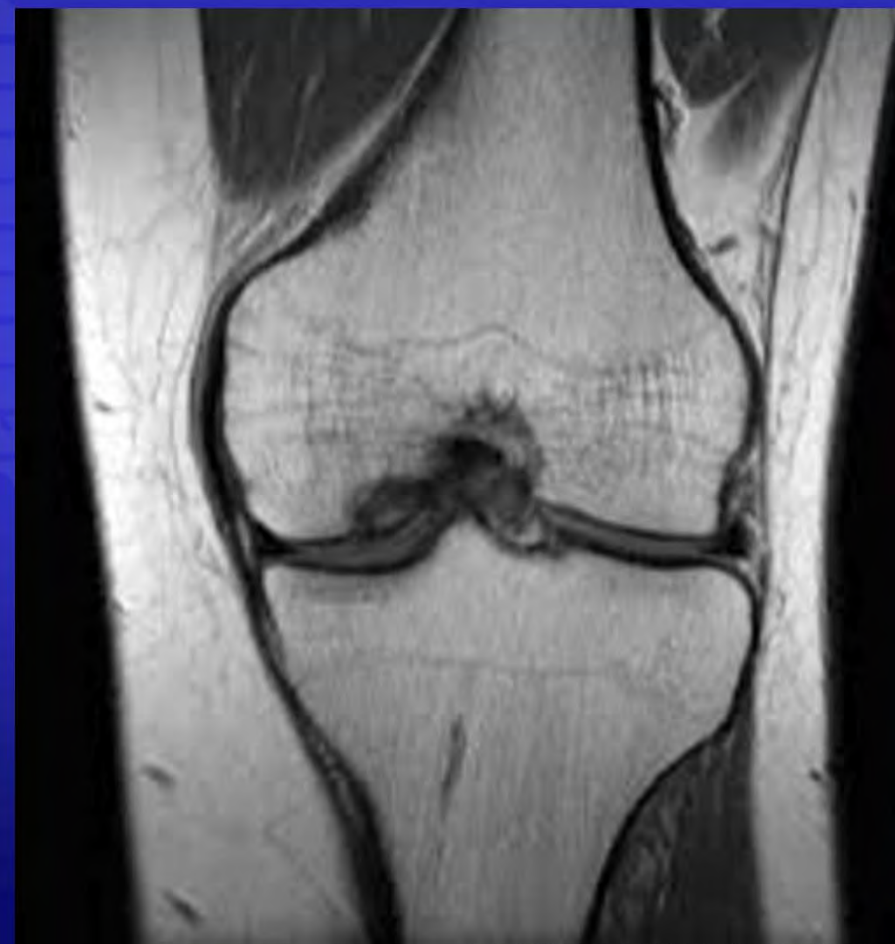




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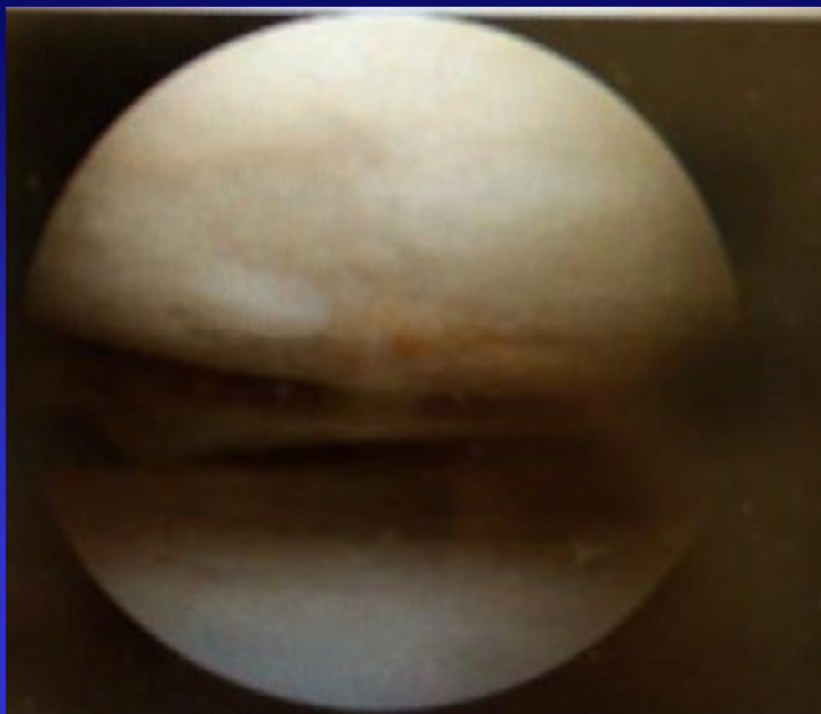
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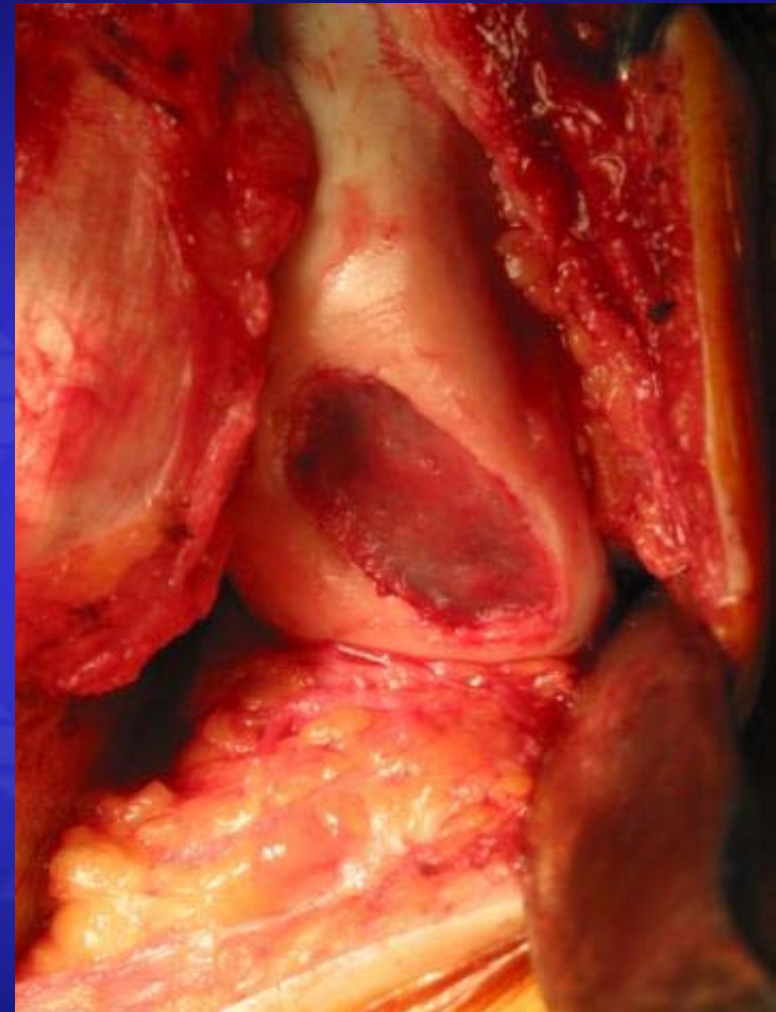
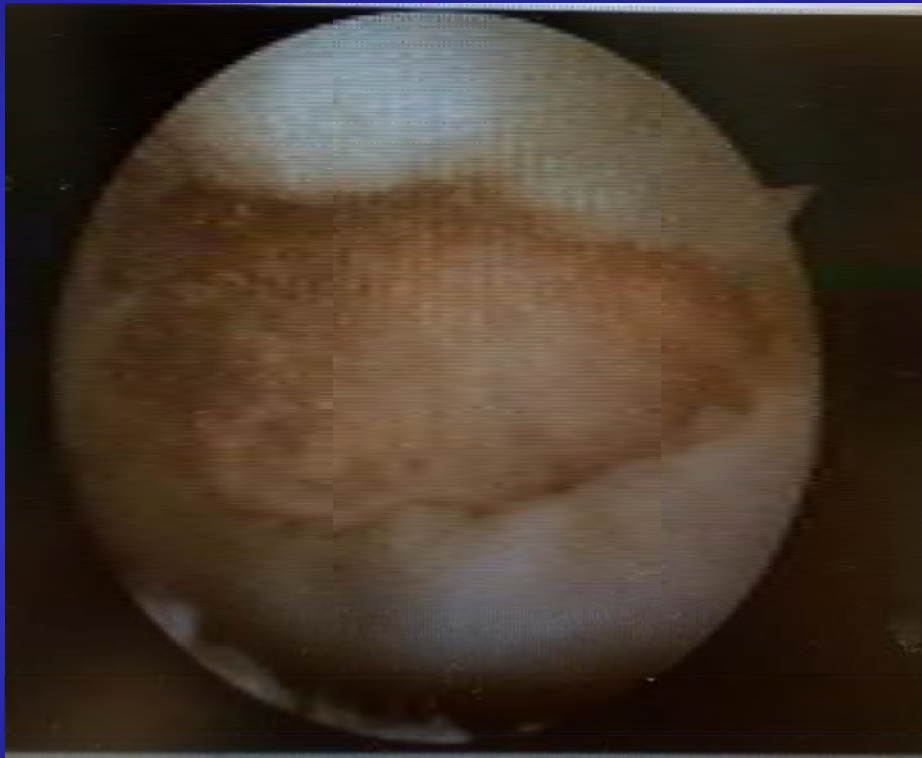
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# Rehabilitation Variable After Chondral Surgery

- Site of lesion
  - Femoral condyle different from patella
- Size
  - Larger more conservative
- Surgery
  - Contained can be more aggressive
- Talk to the surgeon



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## Protection Phase (0-6 WEEKS)

- Allow incorporation of implant
- Promote chondrocyte activity
- Prevent adhesions
- Prevent loss of muscle strength



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## WEEK 0-3

- Brace straight 24 hours after surgery
- CPM can help for some
- NWB depending on site
- Isometric quads exercises
- Ice, local treatment modalities



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# WEEK 3-6

- PWB depending on site of lesion
- Exercises
  - Closed chain
  - Hydrotherapy
  - Gentle bike riding



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## Loading Phase (WEEK 6-12)

Controlled loading and pressure gives the knee the necessary stimulus to promote hyaline cartilage regeneration and restore normal joint function



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# WEEKS 6-12

- Full ROM
- Graduated FWB
- Wean off crutches
- Exercises
  - Resisted cycling
  - Closed chain resisted quads
  - Walking
  - Hydro
  - Gentle proprioceptive exercises



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# 3-6 MONTHS

- Strengthening exercises
- Avoid impact loading (No jogging/jumping)
- ?? Resisted exercises
- ?? Start jogging at 6 months
- ?? Sport 6-12 months



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# WORK

- Sedentary Work 2 Weeks With Crutches
- Standing Work 6 Weeks
- Physical Work 3-6 Months



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# Osteotomy



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# Realignment Osteotomy

- Unicompartmental arthritis
- Ligamentous deficiency
- Chondral transplantation



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# Realignment Osteotomy

- Tibial/femoral
- Medial/lateral
- Opening/closing wedge
- Flexion/deflexion
- Combined ligamentous reconstruction



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# Biomechanical Basis of Osteotomy

Transfer weight bearing forces from the arthritic portion of the knee to a healthier location in the knee joint to increase the lifespan of the knee

- Realigns the weight bearing forces
- Unloads the worn out joint surface



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# Goals of Realignment Osteotomy

- Pain relief
- Functional improvement
- Permit heavy demands
- Buy time before arthroplasty



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# Goals of Realignment Osteotomy

- Pain relief
- Functional improvement
- Permit heavy demands
- **Buy time before arthroplasty**



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# Osteotomy is different nowadays

- Intervene earlier
  - Smaller angular corrections
- Combined Procedures
  - ACL, PCL, Cartilage work



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# Contra-indications

- Diffuse knee pain
- Patellofemoral pain as primary complaint
- Moderate/severe instability
- Diffuse arthrosis
- Inflammatory disease
- Unrealistic patient expectations



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# Relative Contra-indications

- Age > 60 yrs
- ROM < 90°
- Obesity (1.3x)
- Severe arthrosis
- Tibiofemoral subluxation (1 cm)



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# Results

- 80% still good at 5 years
- 60% still good at 10 years
- The operation is expected to fail
- It buys time for the patient to be active before their TKR



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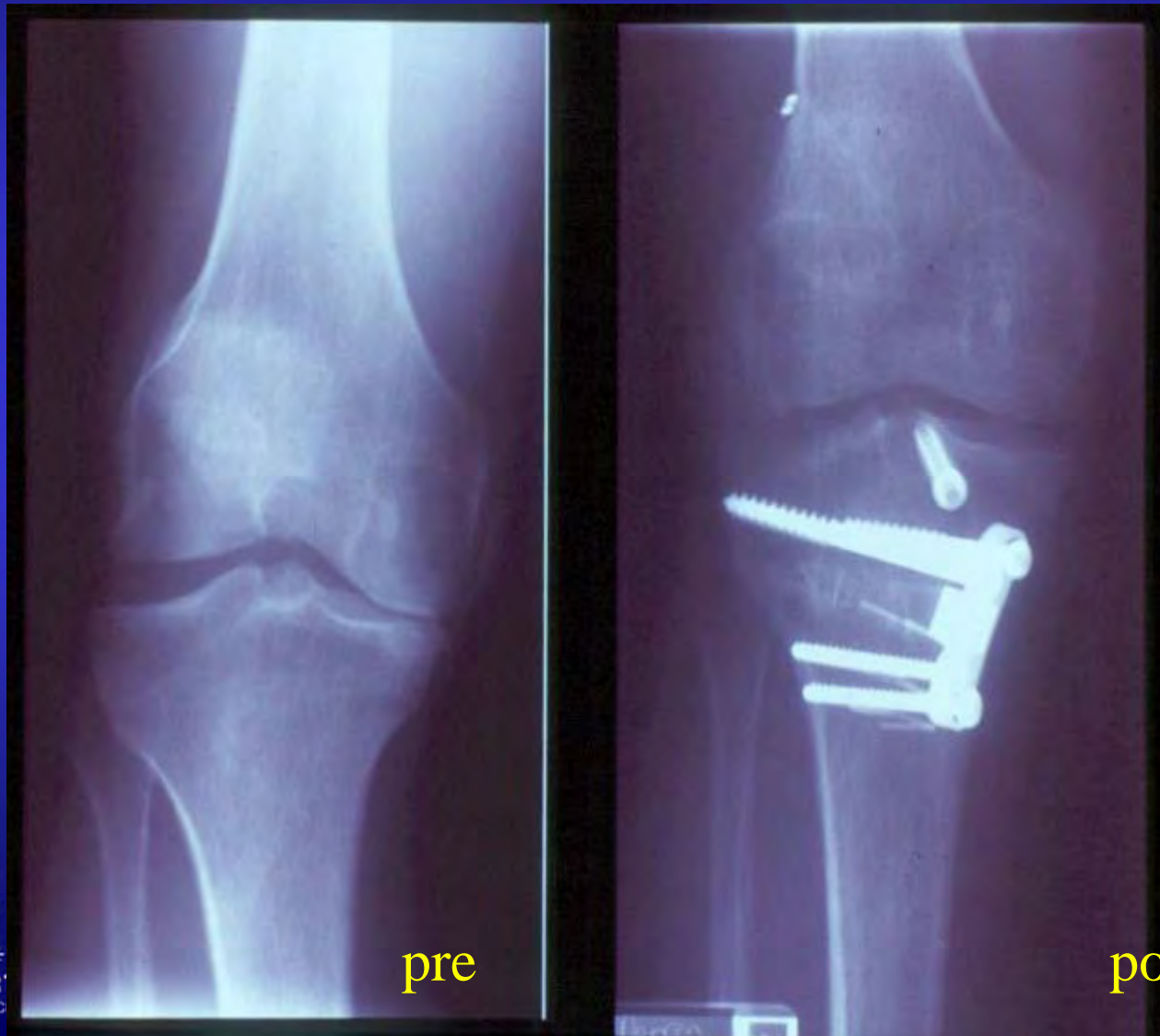


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# Medial Opening Wedge HTO



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# Post-Operative Management

- Hinged brace
- Full range of motion
- Touch → protected weight-bearing
  - over 3 months



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# Post-Operative Management

## Return to:

- ADL
  - 3 - 4 months
- Work (standing)
  - 4 - 6 months
- Sports
  - 4 - 6 months



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# Realignment Osteotomy

- Active population / increasing longevity
- Current indications narrow
- Patient selection
- Accurate surgical technique
- Combines well with cartilage surgery



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But there are problems:

- Poor relief of symptoms?
- Technical failures are common (under correction / over correction, loss of fixation etc.
- High complication rate?
- Results unpredictable

? Poor results when revised to TKR



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(wound healing, patellar contractures, altered joint line etc.)

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# HTO vs TKR



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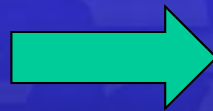
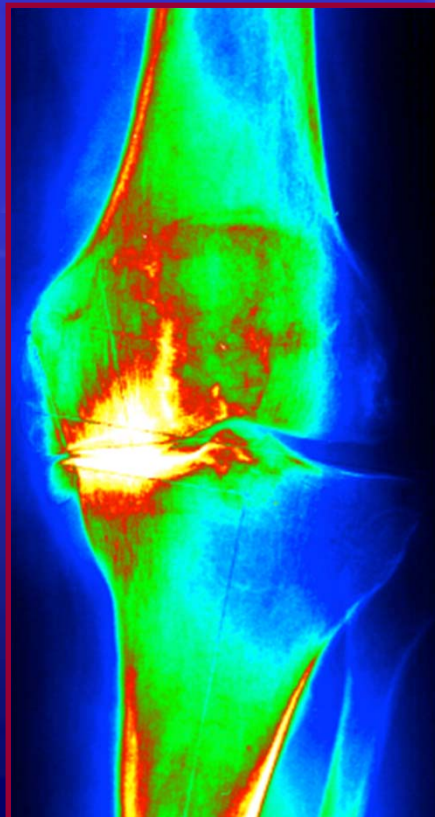
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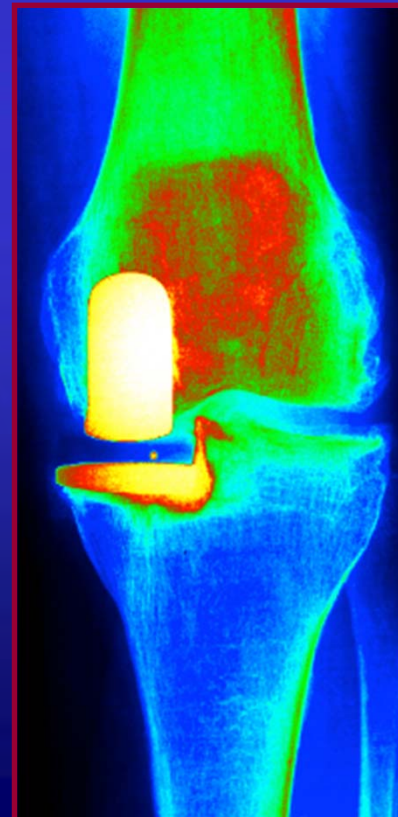
# Arthroplasty

- Protects the bone from increased stress and therefore relieves pain

OA



UKR



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# Resurfacing



The pathology is treated and the normal tissues are left alone

# Unicondylar resurfacing allows a better range of motion than TKR



# TKR

## Good, but not without problems:

- Incomplete pain relief
- Loss of motion
- Loss of function
- Activity restriction
- Difficult revisions
- Wear problems
- Altered joint mechanics



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# TKR Complications



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# TKR alters joint mechanics

- De-functions cruciate ligaments
- Alters patellofemoral mechanics
- Changes retinacular tension
- Crowds flexion space
- Decreases knee stability
- Alters femoral rollback



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# Final Decision Making

- Patient expectations
  - gender, cosmesis
- Surgeon capabilities
- Potential complications
- Rehab & immobilization
- Durability of procedure



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# Summary

Arthroscopy

Debridement

Microfracture

Grafting

HTO

Arthroplasty

Uni

Total



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