Treating Knee Pain

Cartilage Restoration and Joint Resurfacing

offering solutions for patients of all ages

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Salt Lake City
2014

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Cartilage Restoration and Joint Resurfacing
A wide realm of treatment options…..

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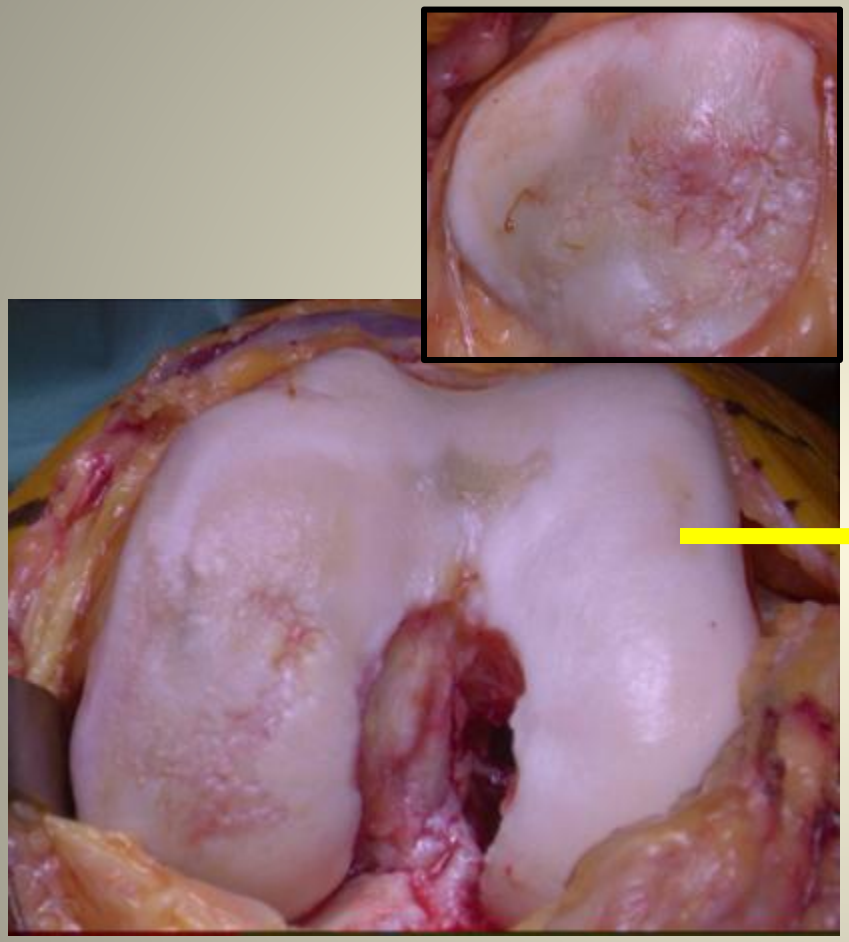

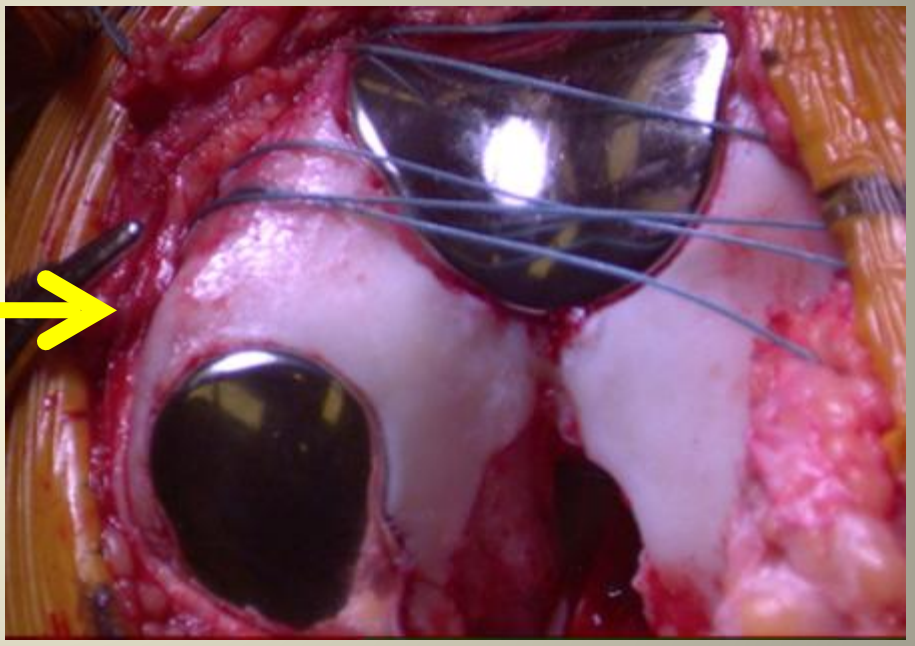

The problem:
29 y.o. mother of 3
Former elite skier

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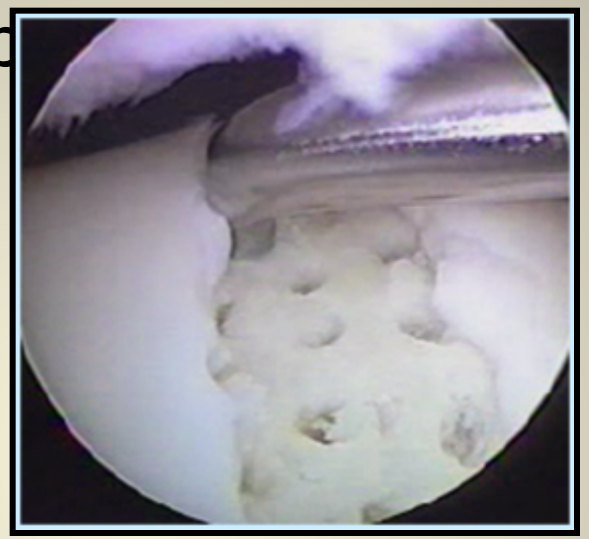
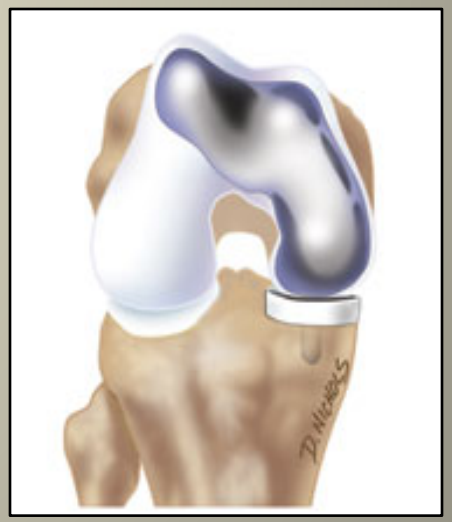
Cartilage Restoration and Joint Resurfacing Treatments:

...*THE BIG PICTURE*

- Debridement (clean up
- Marrow stimulation
- **Biological** Restoration
  - Biologic grafts
  - Biosynthetics
  - Scaffolds
  - Cellular therapy
- **Prosthetic** Resurfacing
  - Metals and Plastics
  - **Inlay** Arthroplasty
  - **Onlay** Arthroplasty
  - Kinematic Total Joint





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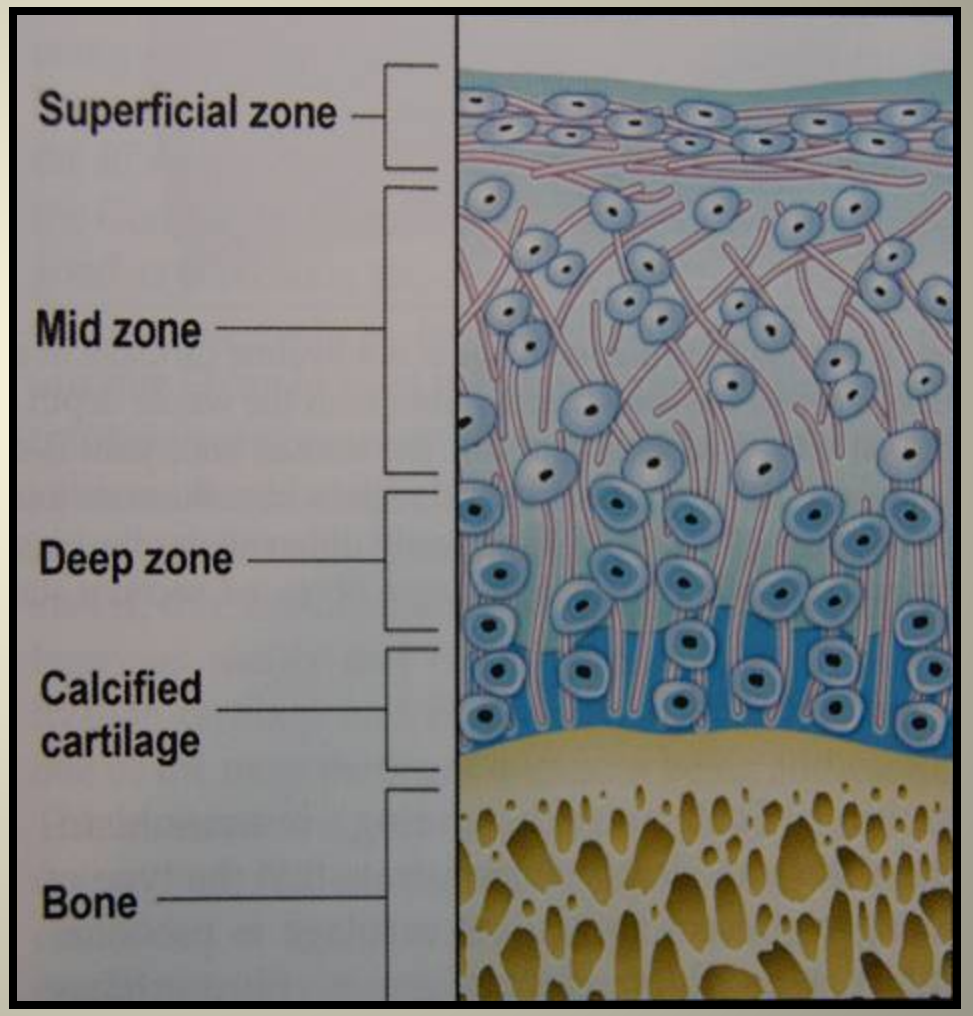
Goal of Cartilage Restoration …what's it *supposed* to look like



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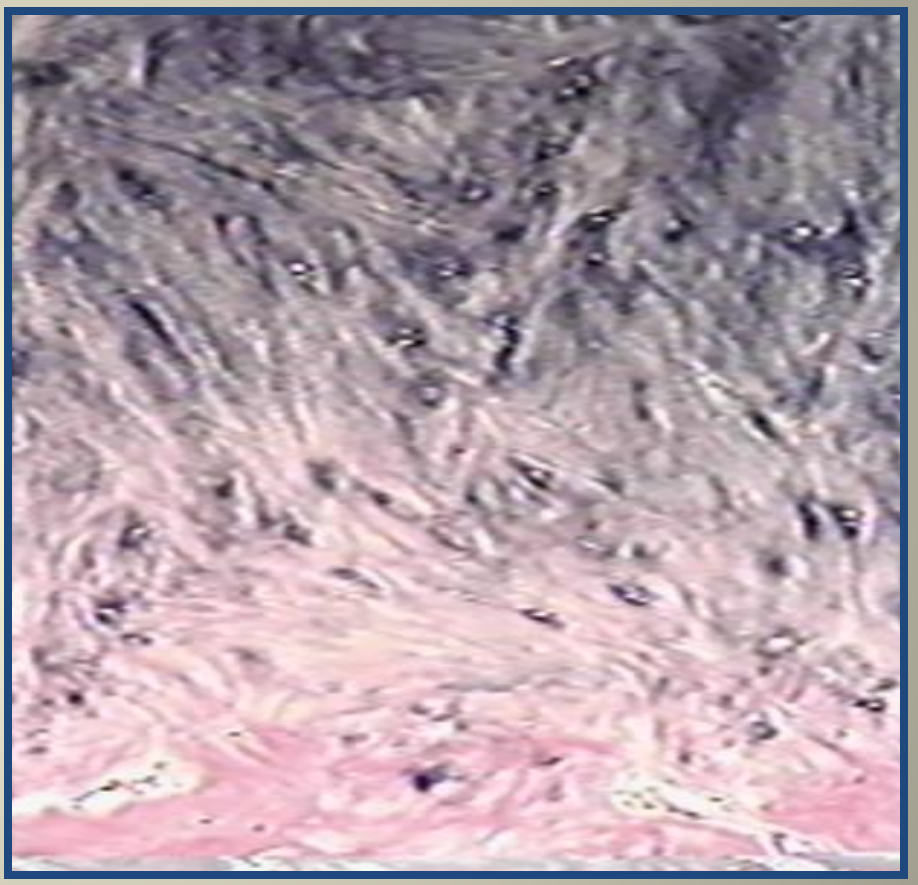
Marrow Stimulation

- Techniques
  - Drilling
  - Picking
  - Abrasion
  - **Microfracture**

- Marrow stimulation results:
  - Fibrocartilage
- Limited potential with increased age, injury chronicity
- Cheap, fast, easy
  - Short term efficacy seductive.



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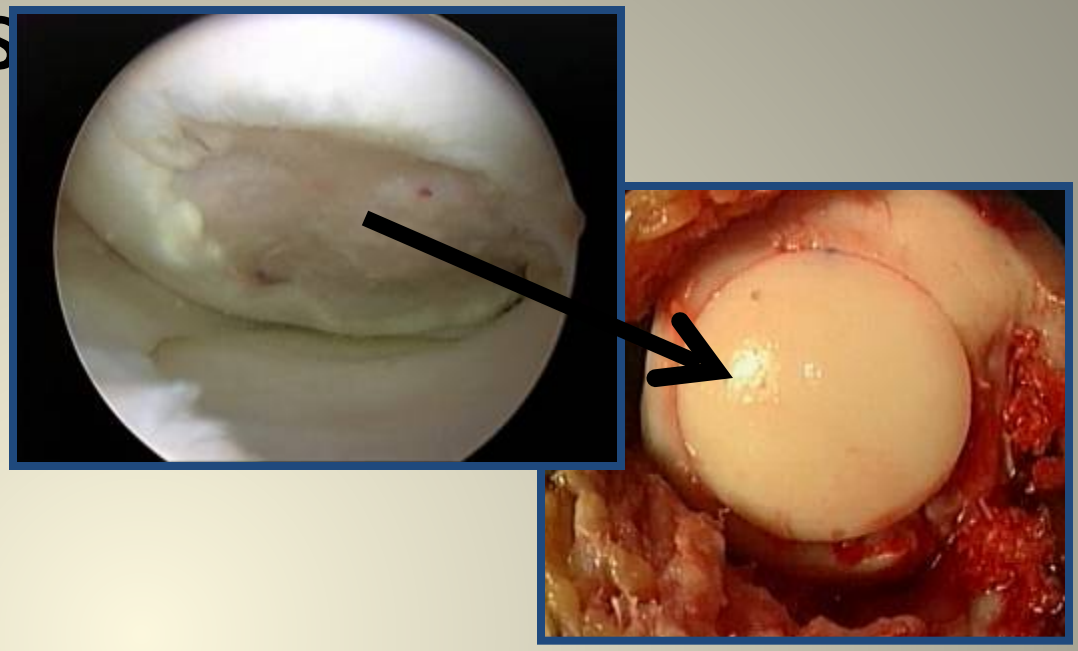
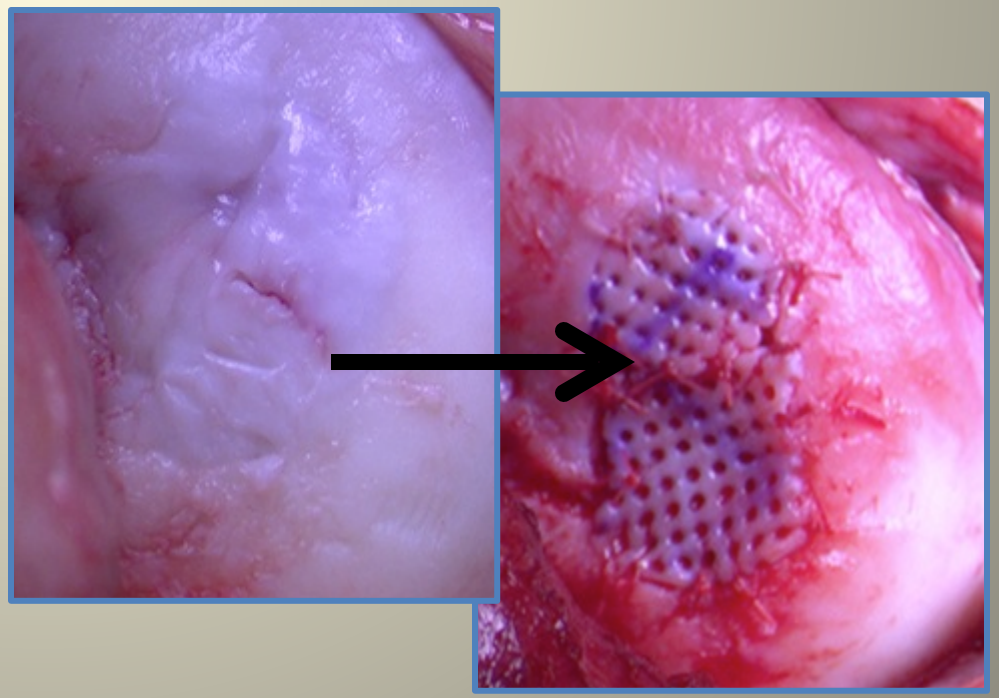
Biological Options

- Cell Therapy
- Osteochondral Grafts
  - Autogenous
    - Limited use
  - Allograft
  - Cryopreserved chondral graft
- Juvenile Cartilage Grafts
  - Minced grafts
- Biologically Active Scaffolds





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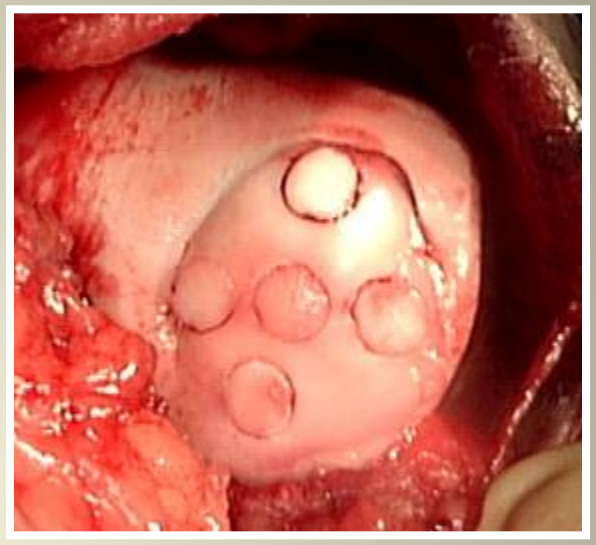
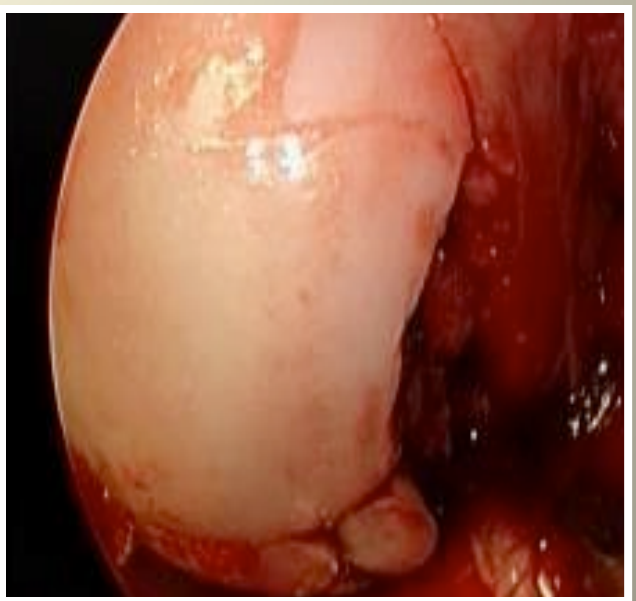
Bone and Cartilage Grafts

- Autograft (self donor)
  - No donor needed
  - Limited availability
  - Small lesions only
  - Repair Broken Cartilage
- Allograft (OCA)
  - Human Donor
  - Very effective
  - Young patients
  - Handle Bone loss
  - Larger lesions
    - Generally > 2 cm^2





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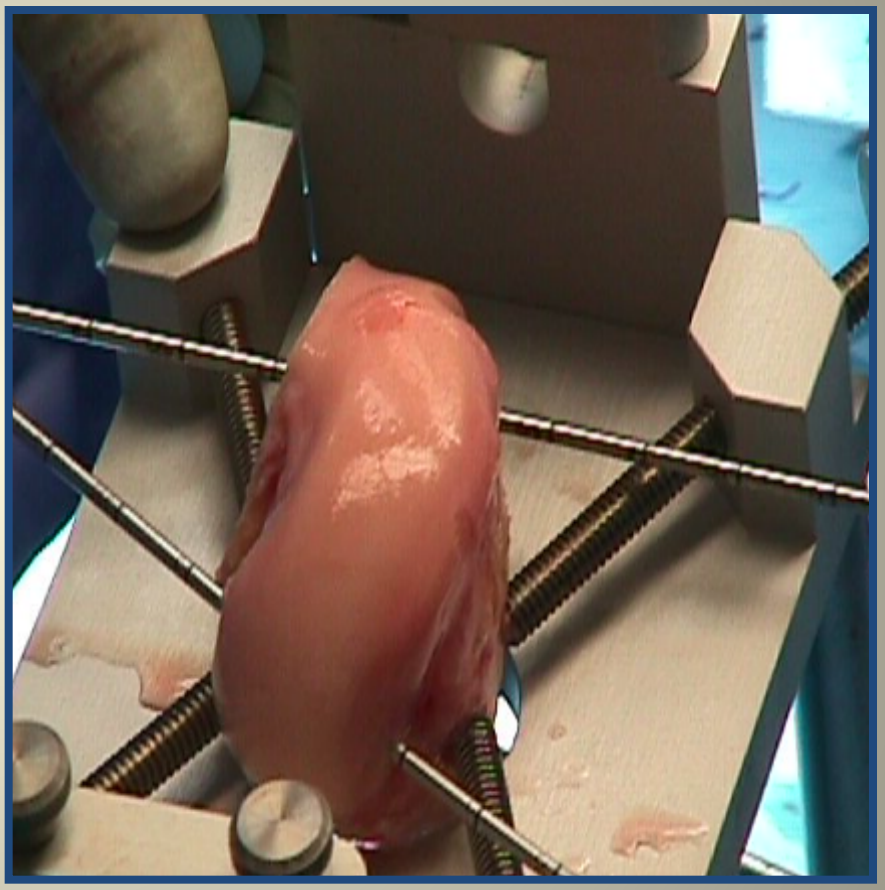
OCA– When is this done?

- Larger defects
- Deeper defects
- Bone loss
- Patellofemoral
- Younger Patients
- Osteochondritis
- Otherwise healthy joint



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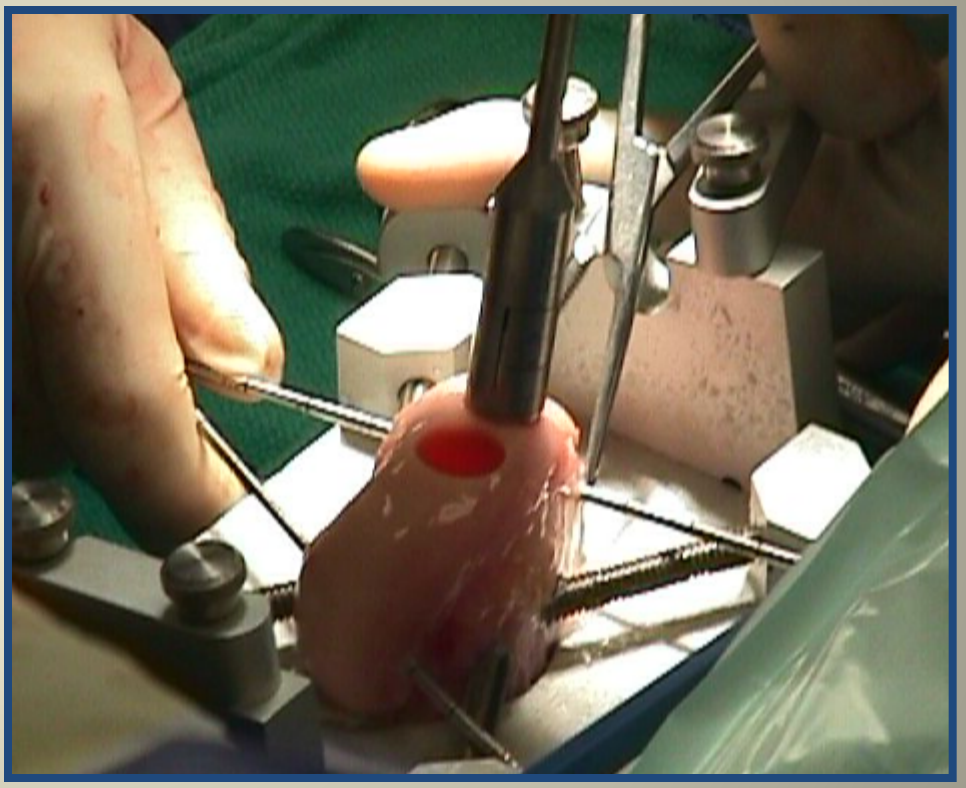
OCA donor tissue

- Fresh Stored (< 30 days)
- Germ Surveillance
- Donor Testing/Screening
- Limited Availability
- From specific tissue bank(s)
- Expensive
- No game day decisions
- No anti-rejection drugs



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OCA- Procedure

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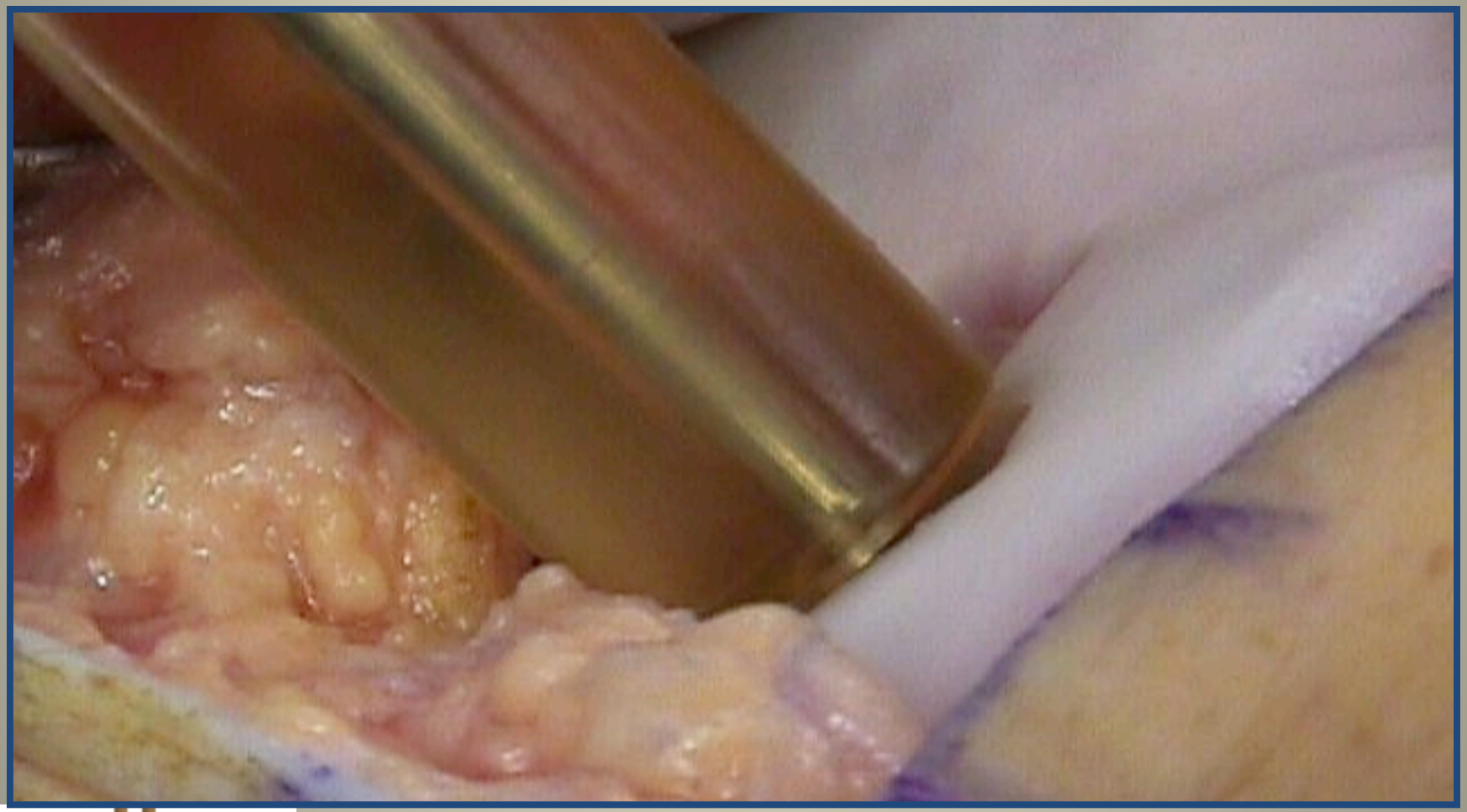
OCA- Procedure



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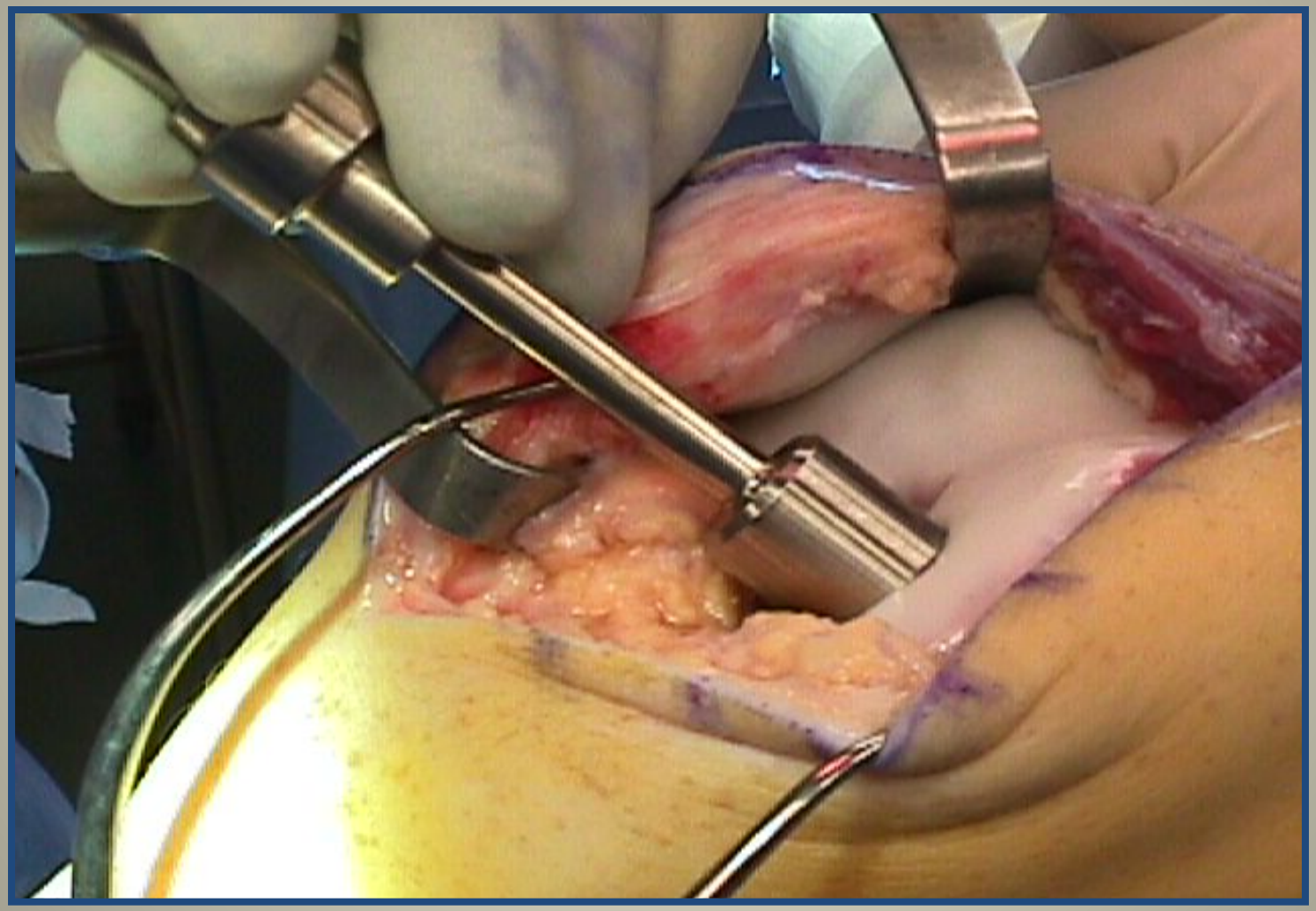

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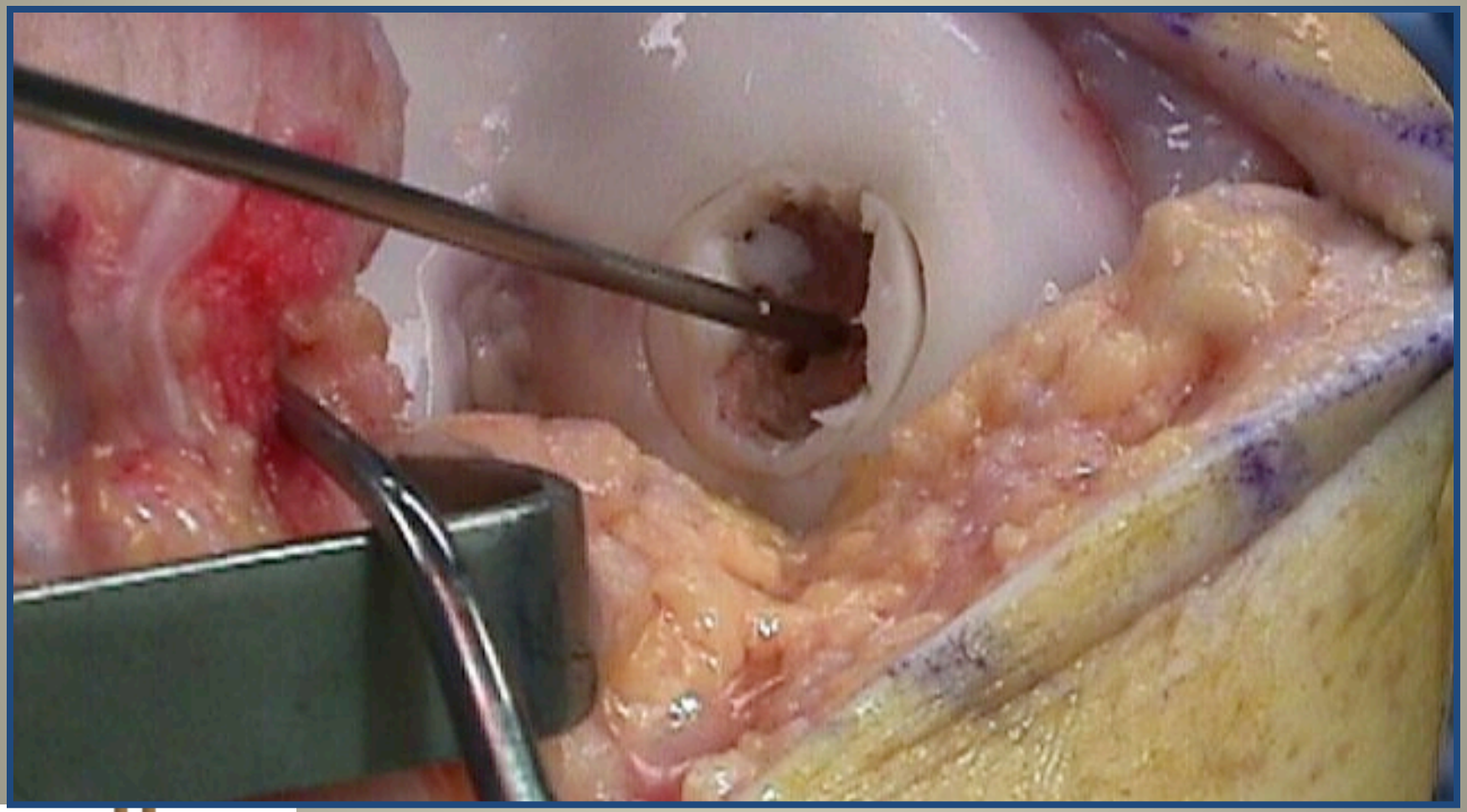

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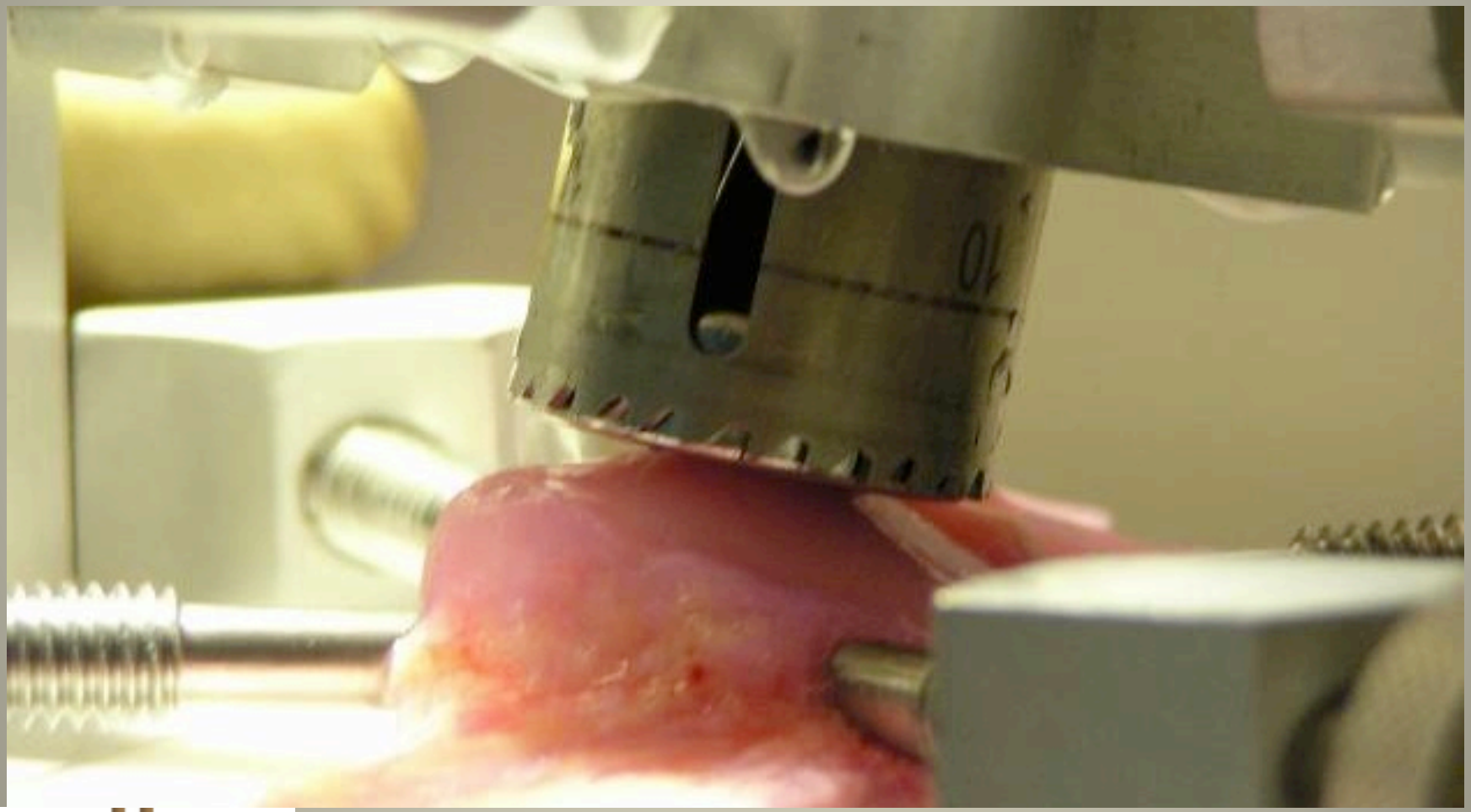

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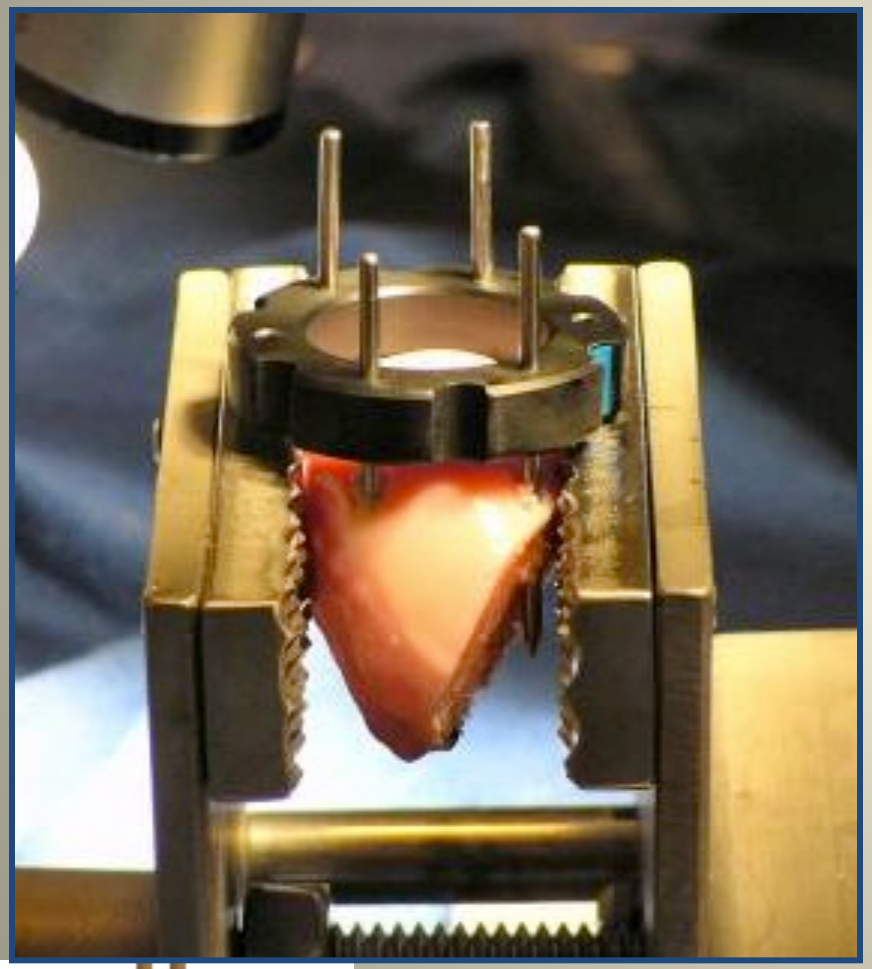

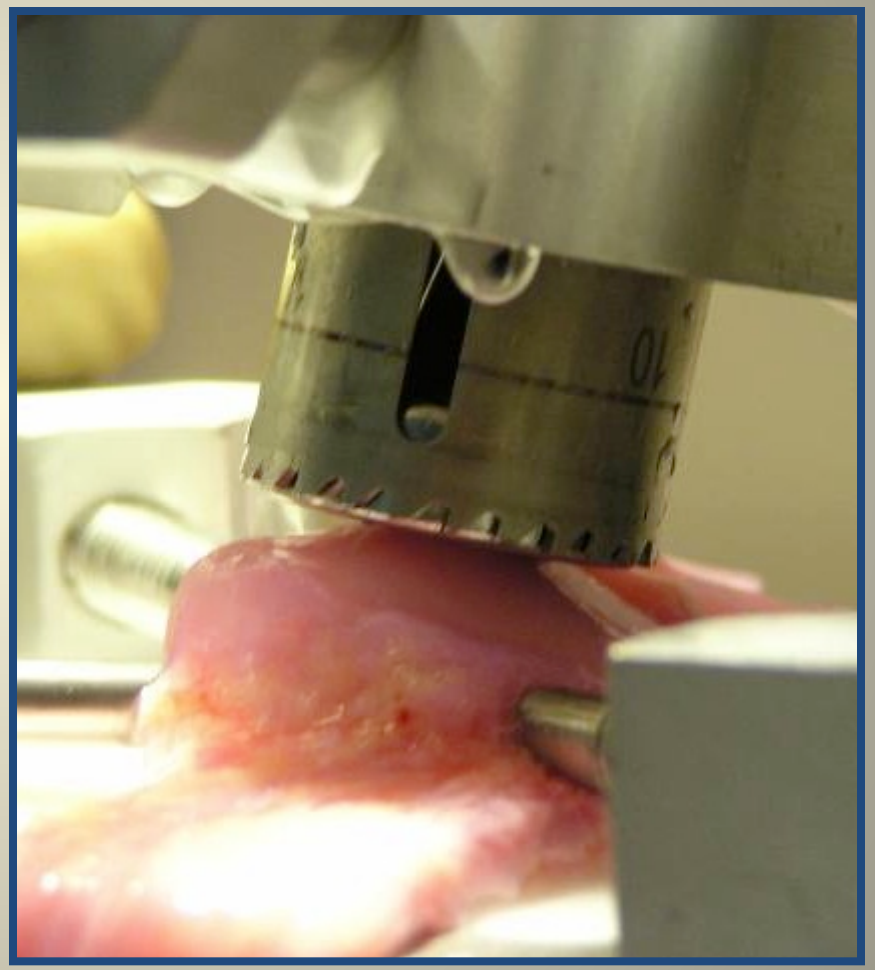

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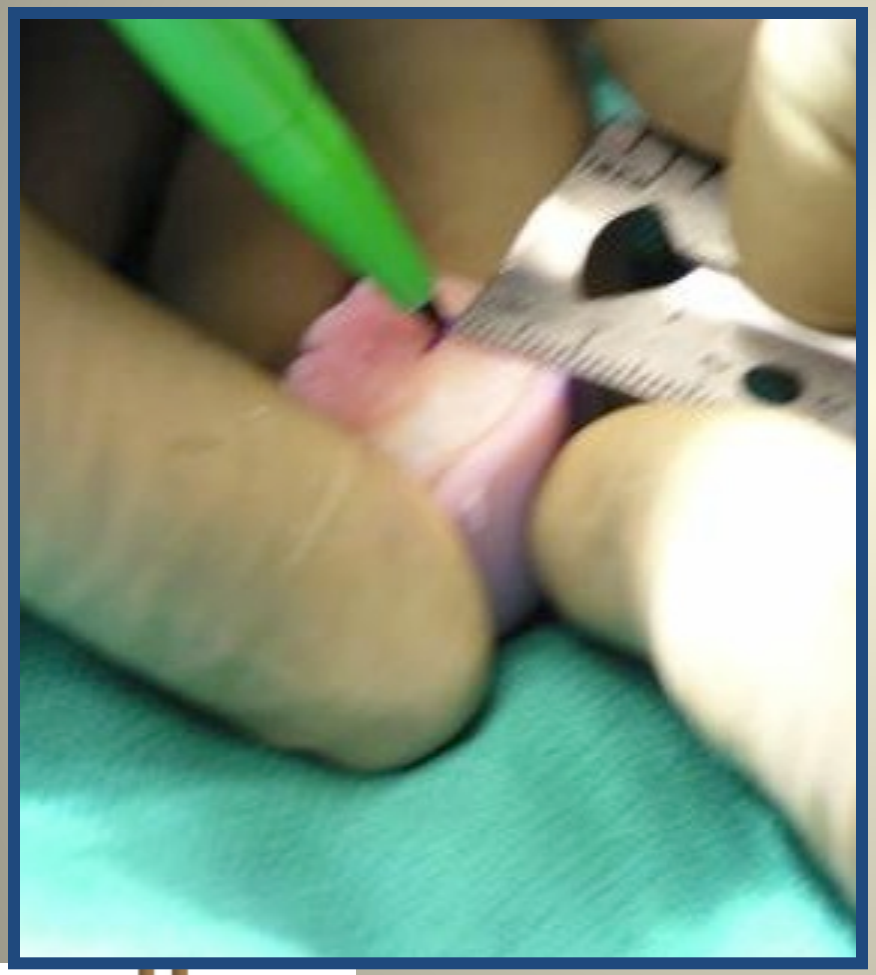

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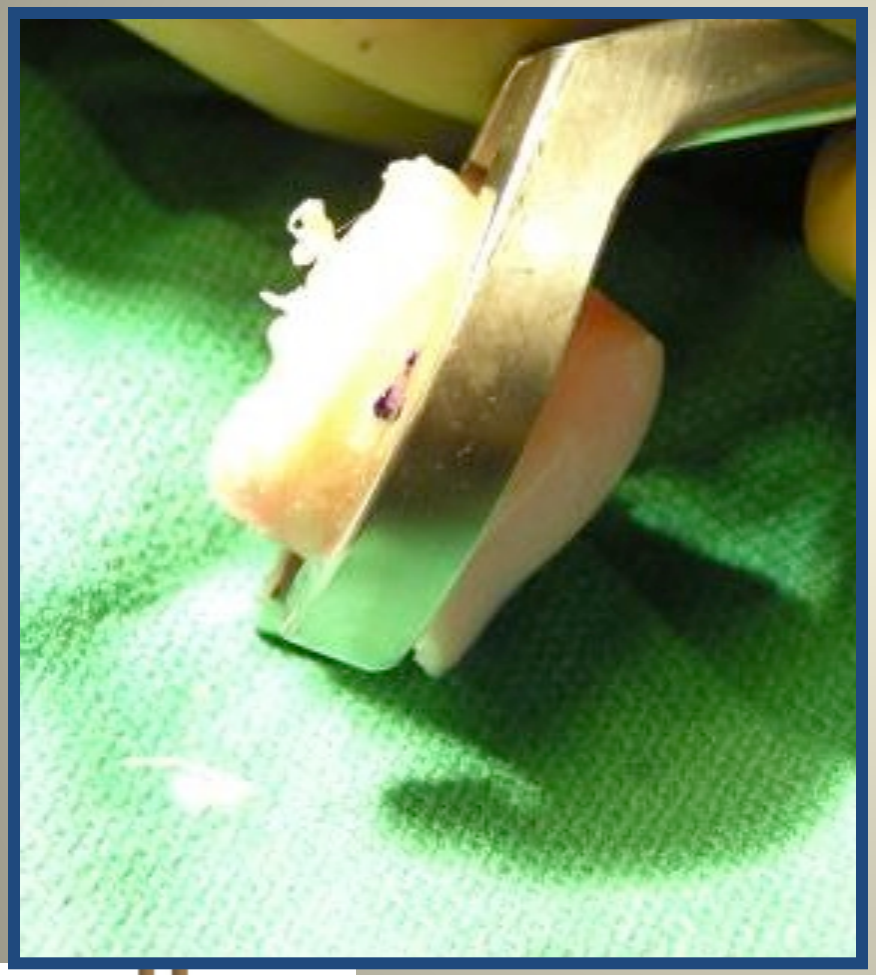
OCA- Procedure



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OCA- Procedure

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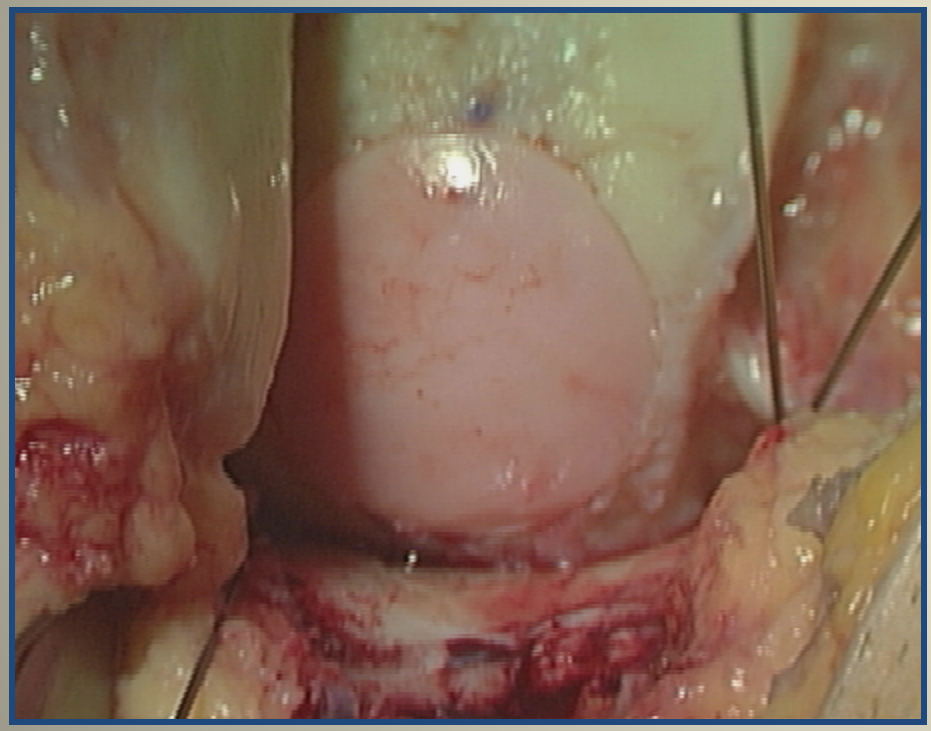

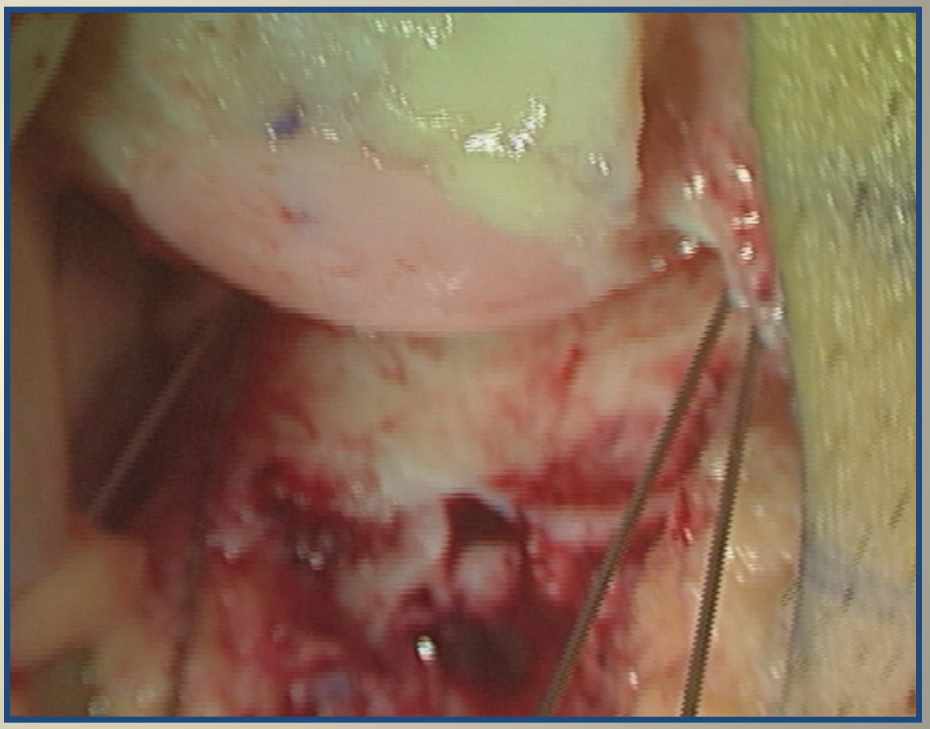

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OCA- Procedure

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What if biologics will not or cannot work?
…too large, no longer “young”, obese, smoking,
……..Or just plain worn out

Prosthetics - Joint Resurfacing

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Biologic or Prosthetic Resurfacing ????

Key decision making point

- Multifactoral decision
  - **Lesion/Cartilage nearby**
  - Patient Factors
  - Age (biological)
  - Comorbidities
  - Joint Status
  - Resources

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Decision Making – Bio vs. Prosthetic Joint Shape

- Biologic Solutions are less likely to work in joint which has lost shape or is "crooked"

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Transitional thinking from biologics to prosthetics

- Once planning progresses to resurfacing need conceptual framework

1. Inlay
2. Onlay
3. Total Joint

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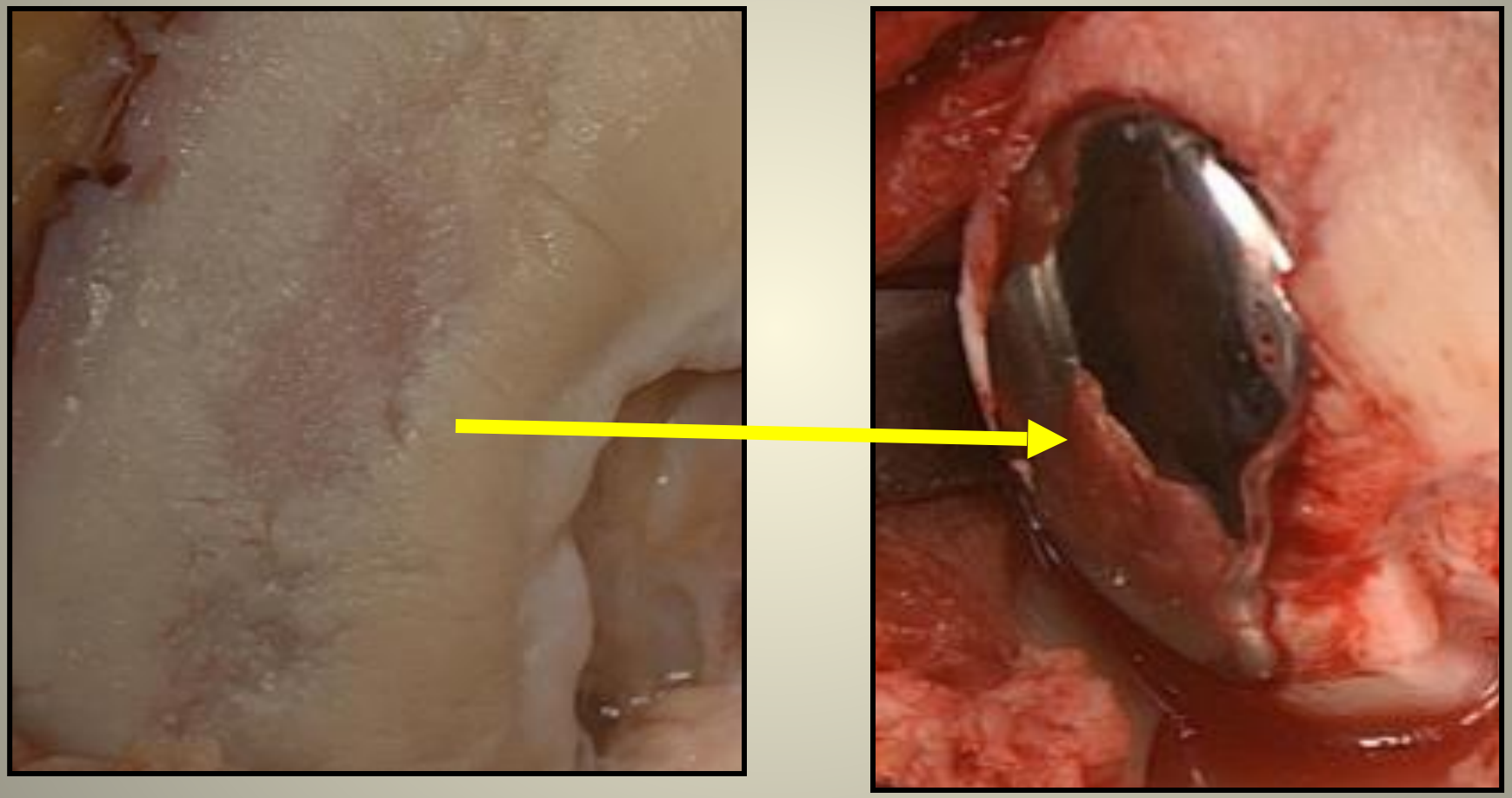
Inlay Joint Resurfacing



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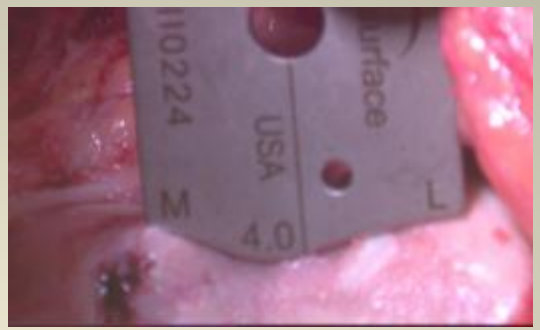
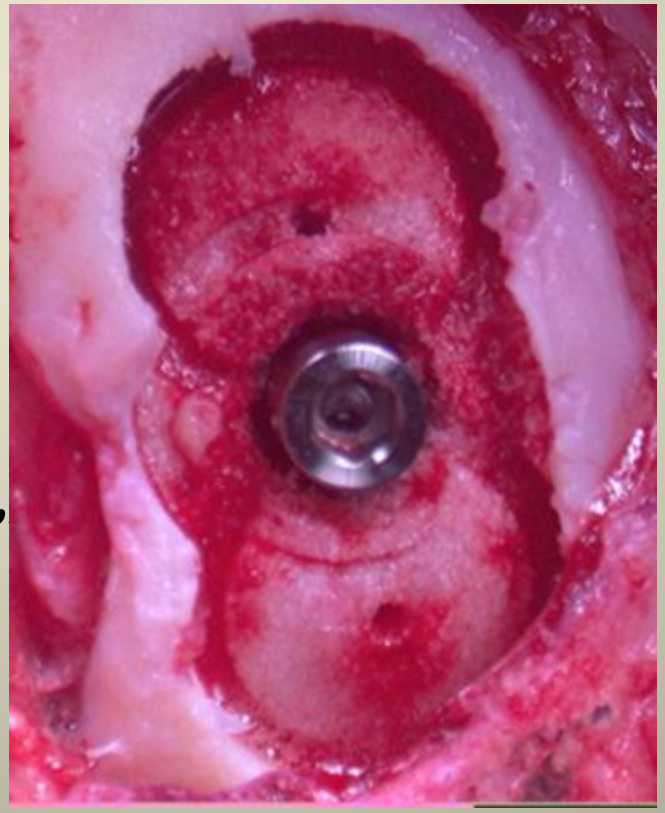
Inlay Resurfacing

- Accommodates different shapes and sizes
- Intraoperative surface mapping
- Preserves anatomy, minimal bone resection
- Ways to think about Inlay:
  - “filling a cavity”
  - “new tiles on the floor”
  - “patching a tire”





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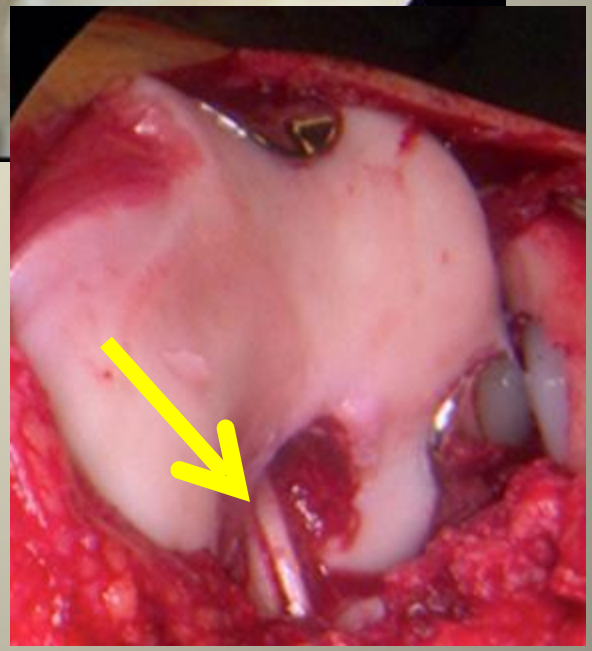
Inlay Resurfacing: Anatomical Reconstruction

- Accommodate complicated curvatures
- Minimally invasive procedure allows for other reconstructions at same time
- Inlay Arthroplasty is stable
- Accounts for different sizes and shapes of persons and joints



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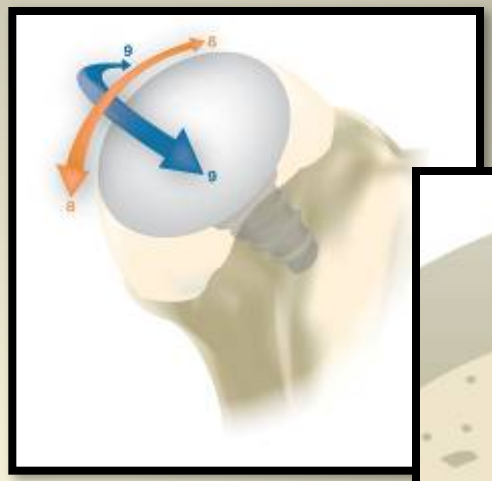
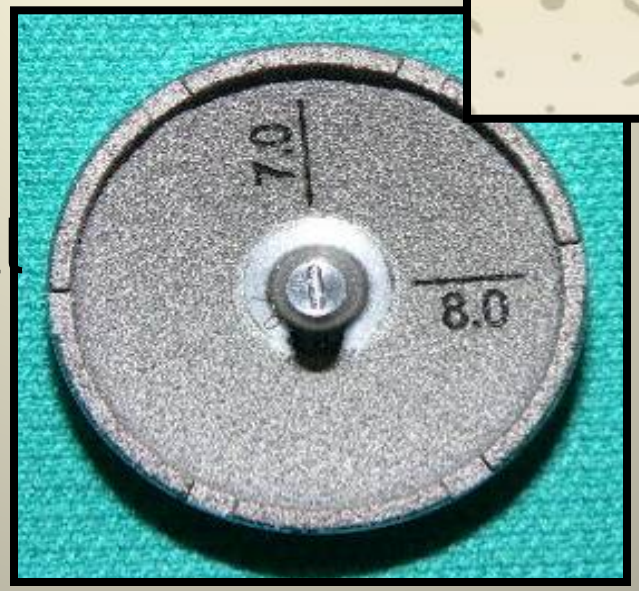
Inlay – Contoured Articular Prosthesis

- Geometry based on patient's native anatomy
- Intraoperative joint mapping
- Account for complex asymmetrical geometry
- Extension of biological resurfacing





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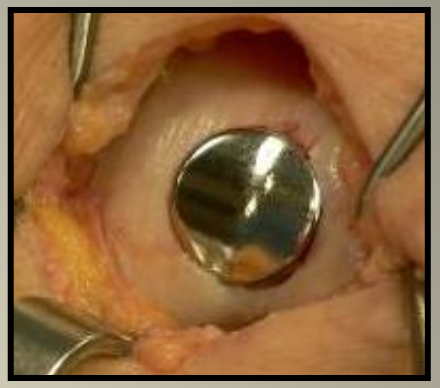
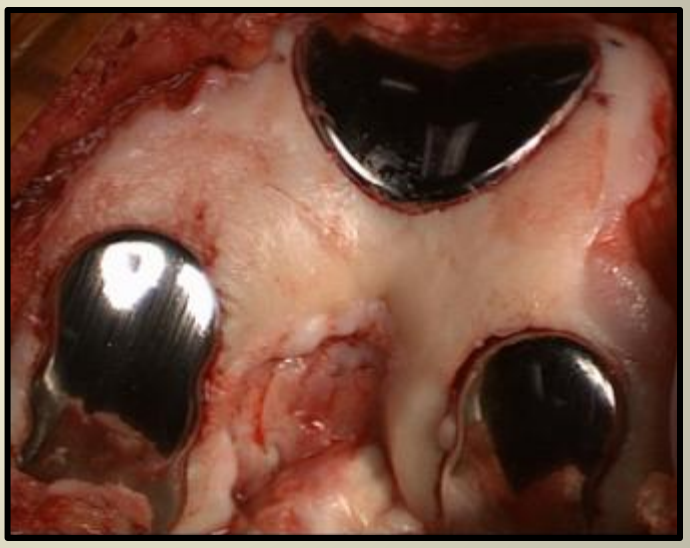
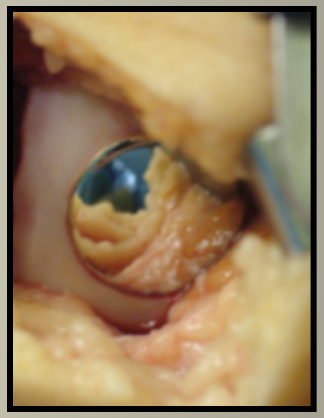
Inlay-
Platform Technology

- Multiple Joints
- Multiple sizes and shapes
- Metallic Inlay in conjunction with stud or set-screw
- Poly (special plastic) Technology uses cement in socket







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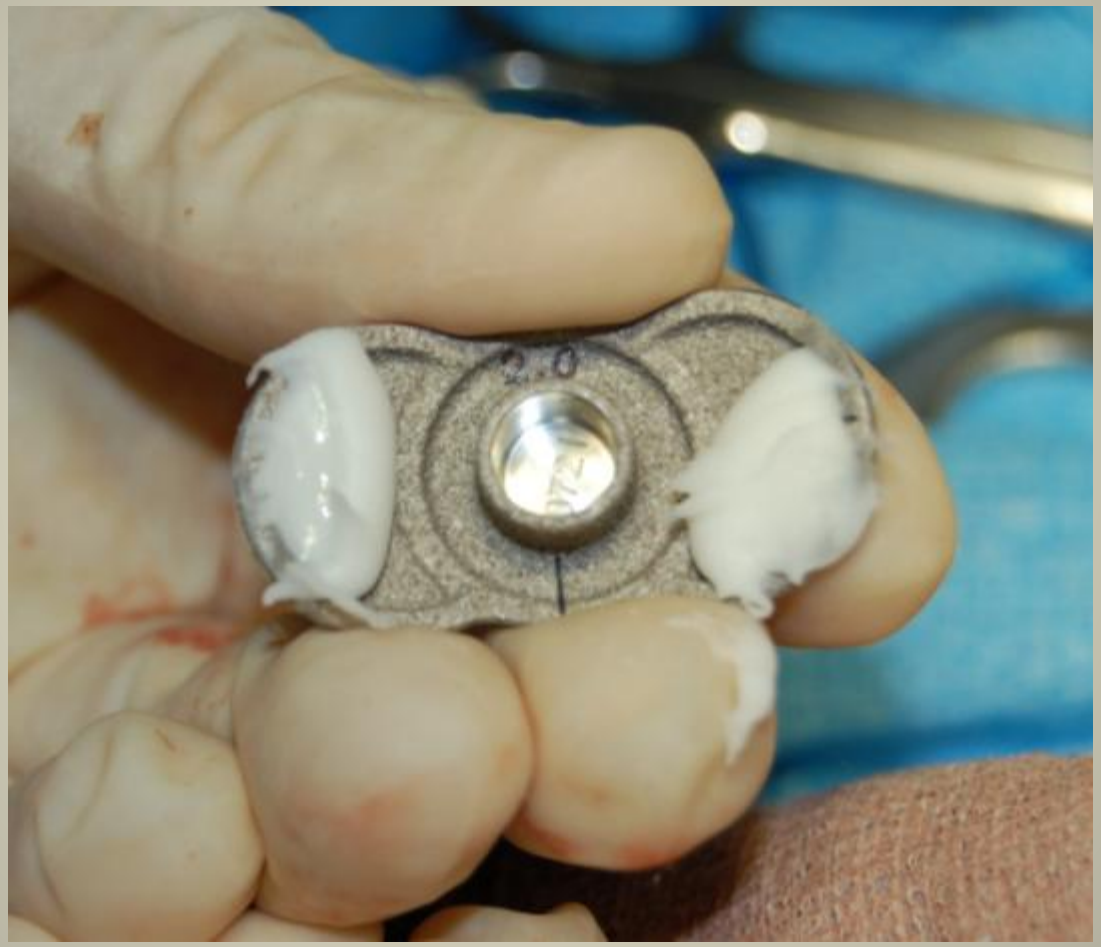
These implants are cemented in place



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Patellofemoral (knee cap joint)
Inlay Resurfacing

- Trochlea alone **or** Bipolar
- Traditional prostheses limited success and rarely used
- Inlay device allows for realignment easily, as no overstuffing
- Inlay device can handle very advanced PF DJD and morphologic variability

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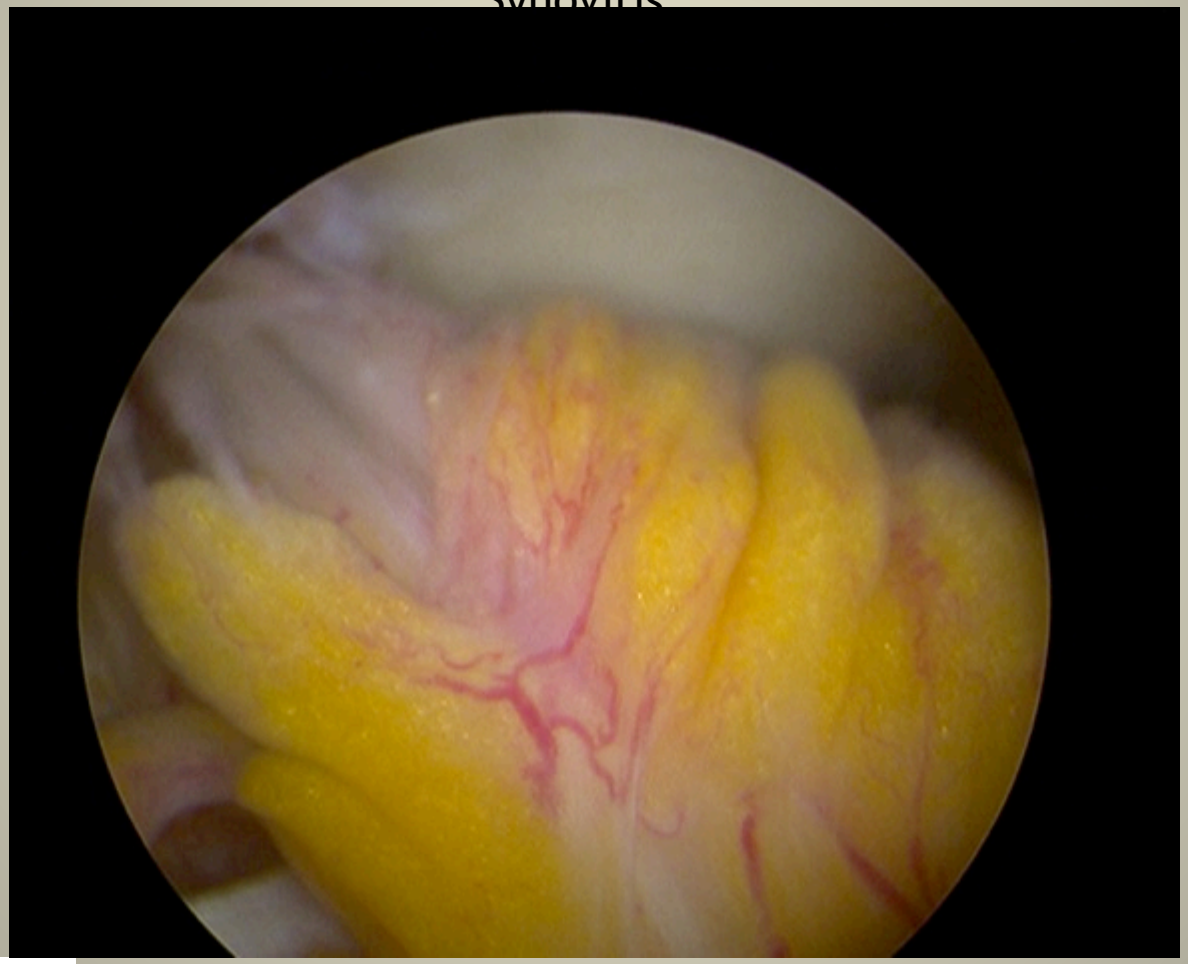
47 year old woman
mainly anterior knee pain and swelling

Synovitis



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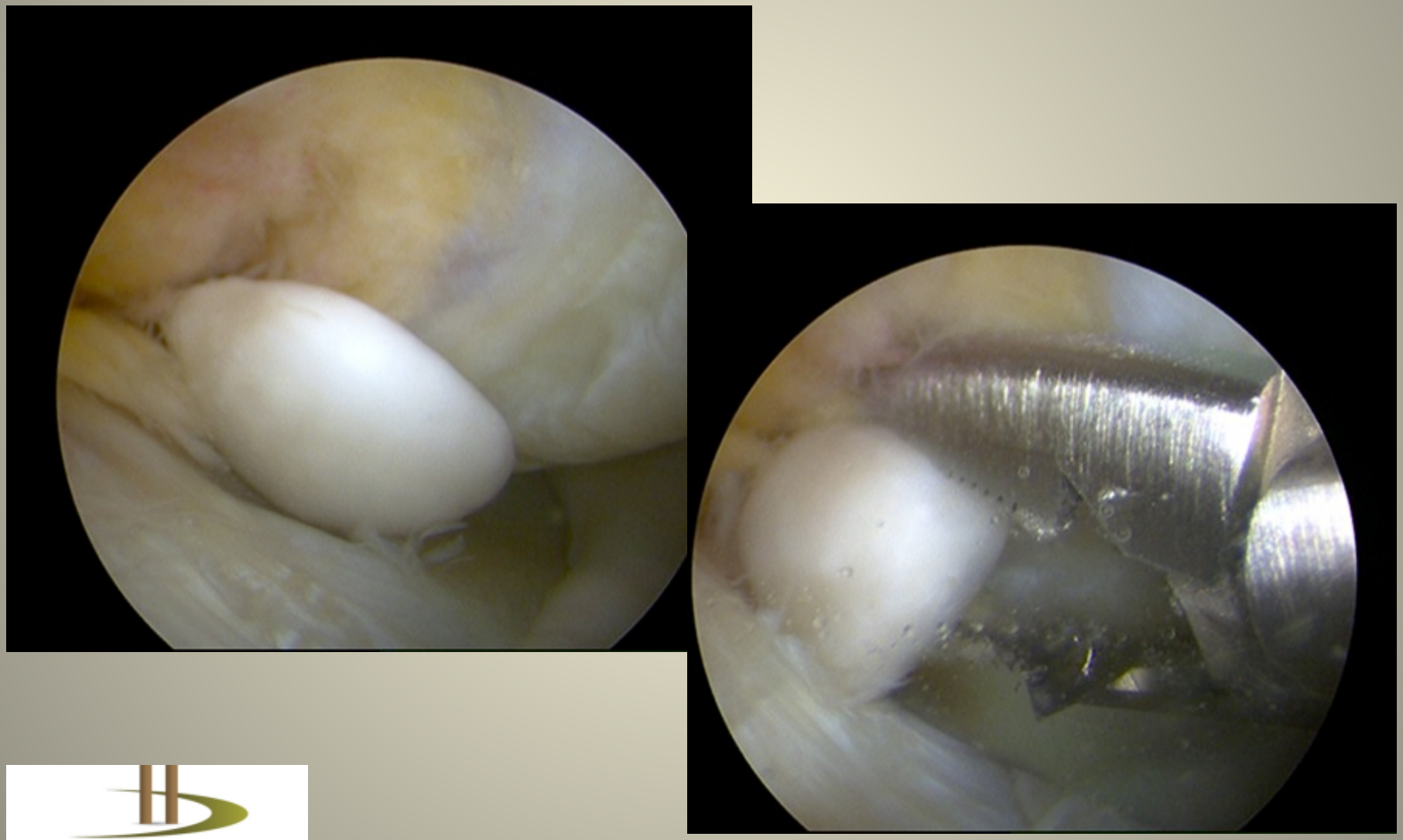
Loose Body (removal)



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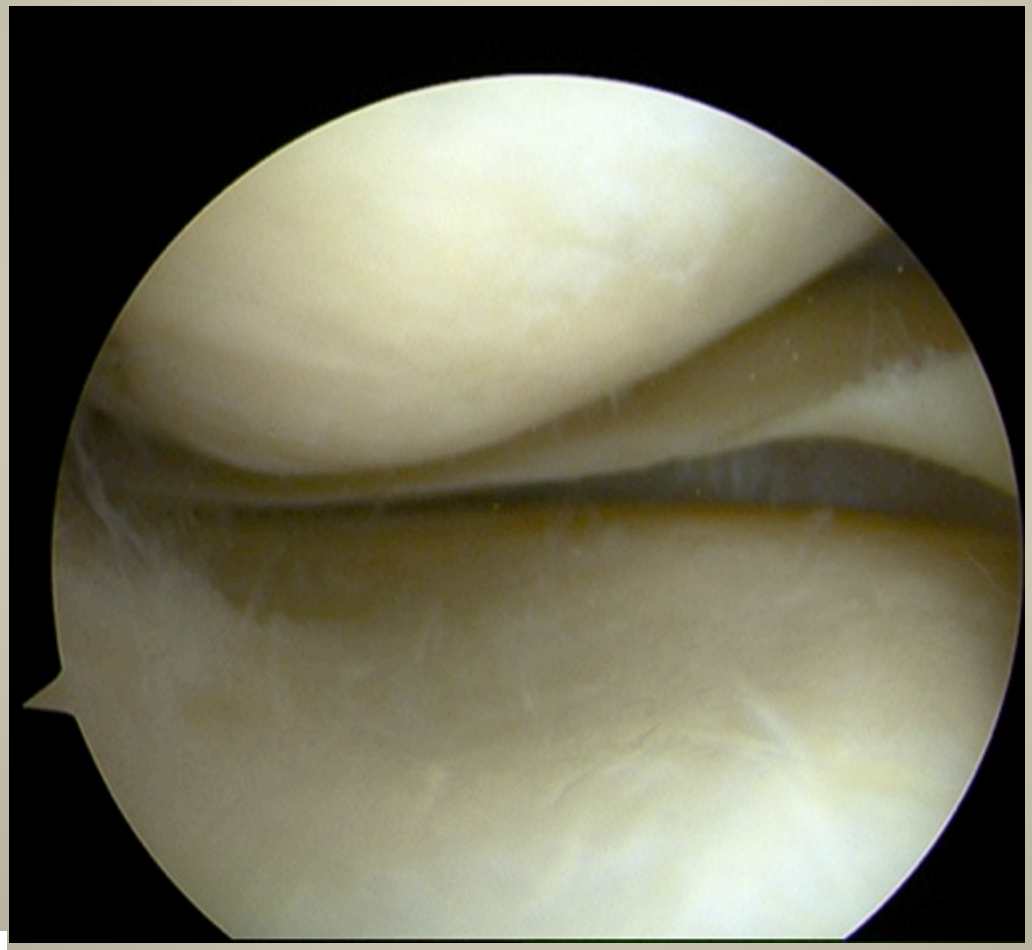
Normal, healthy medial knee



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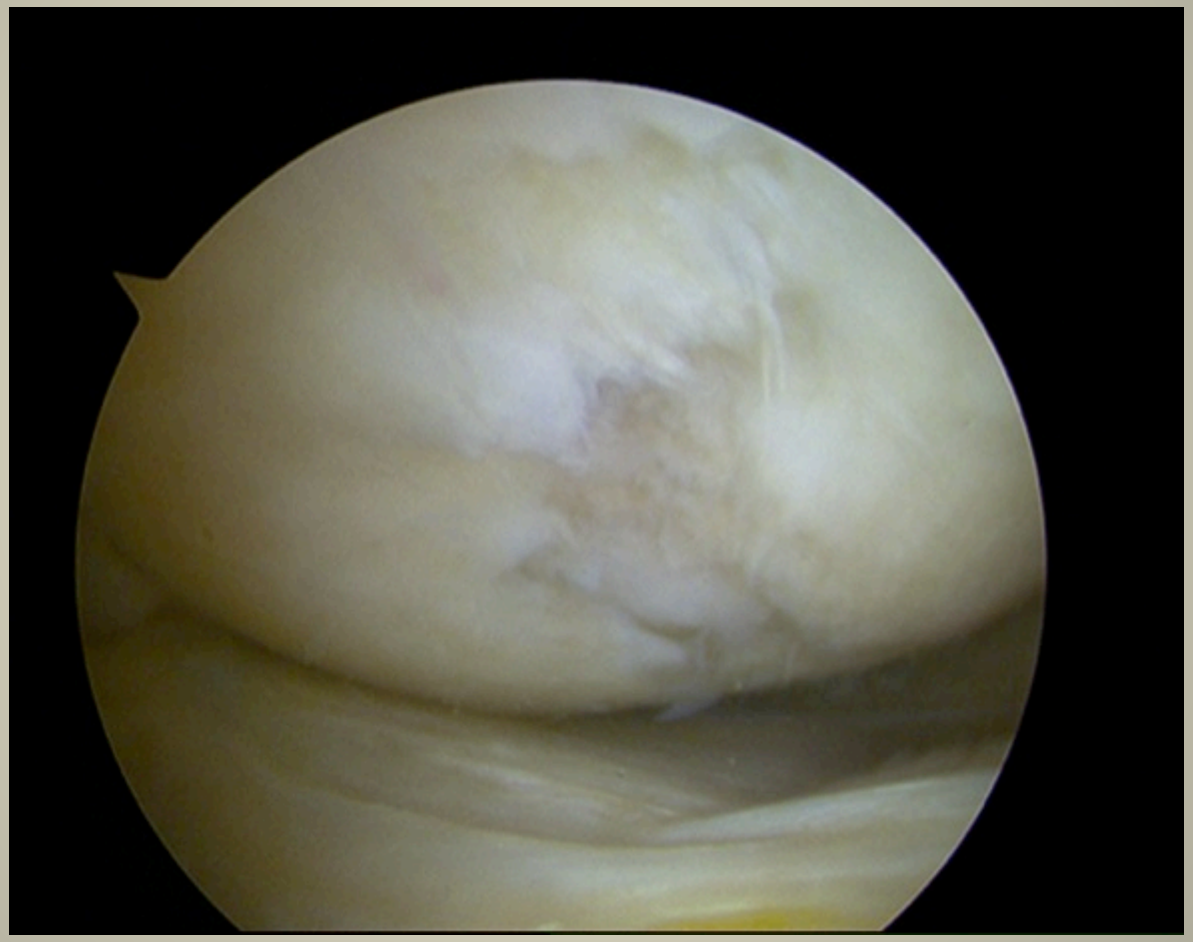
Lateral knee- cartilage damage



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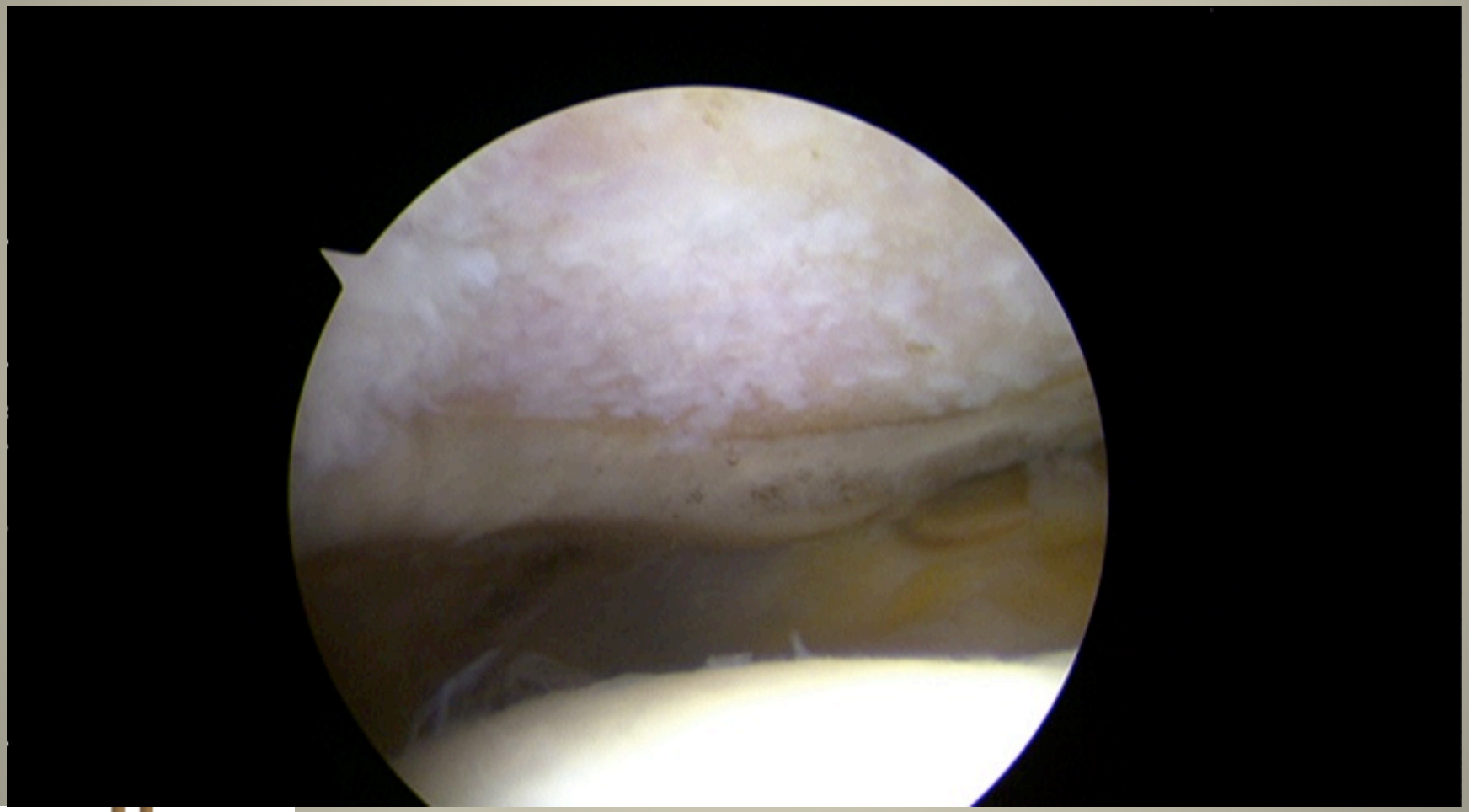
Patella (knee cap) – no cartilage



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Patella malaligned, off to side

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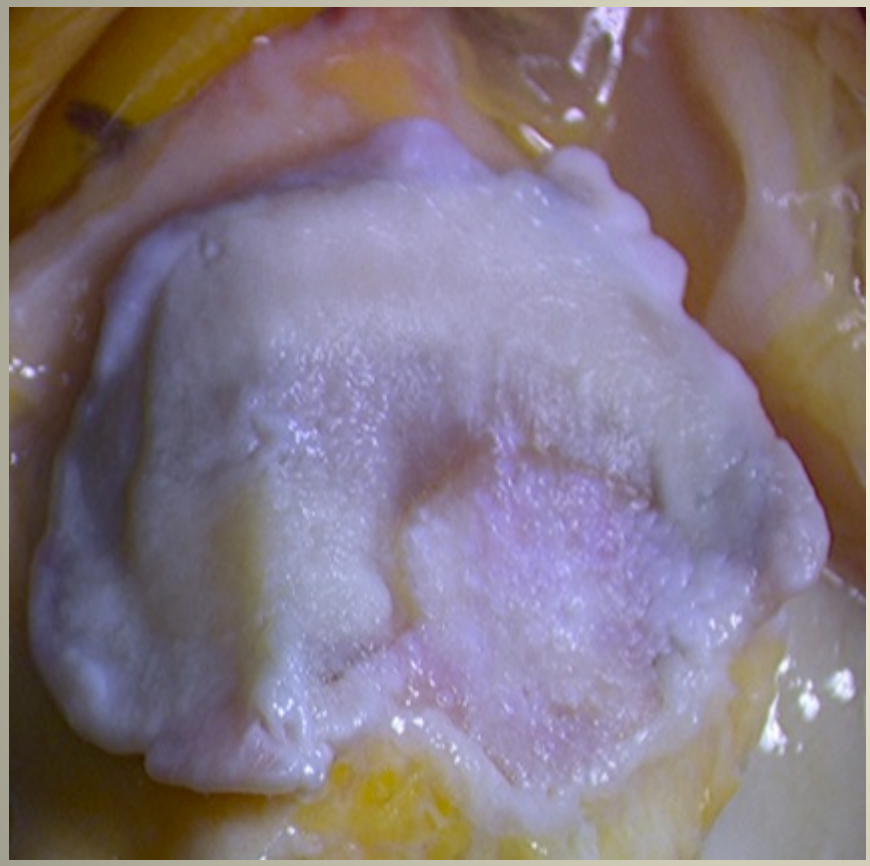
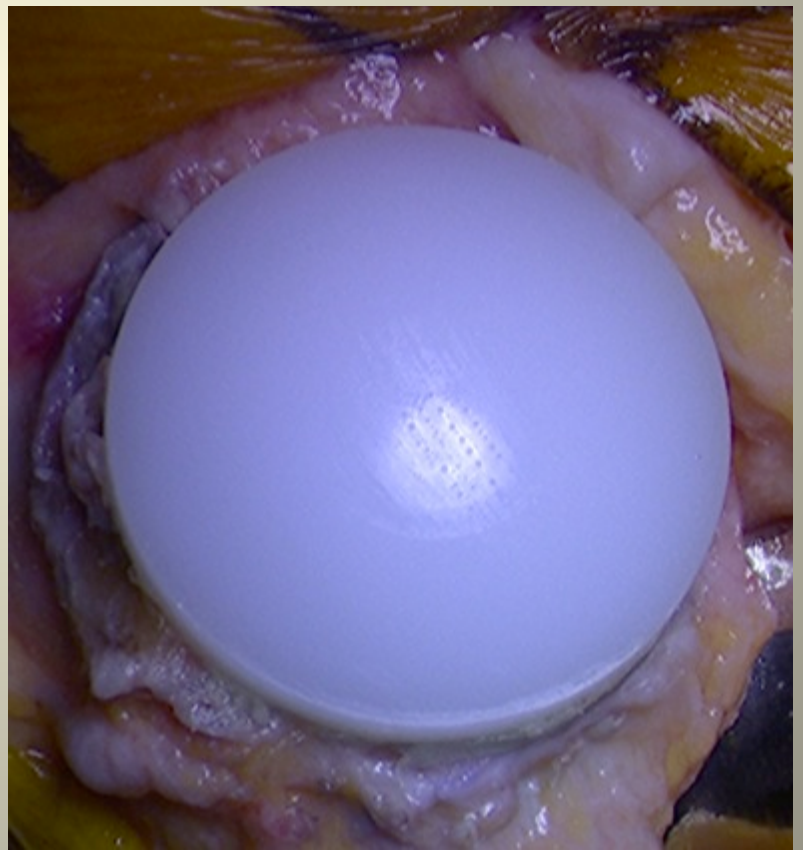
Patella (open) before and after





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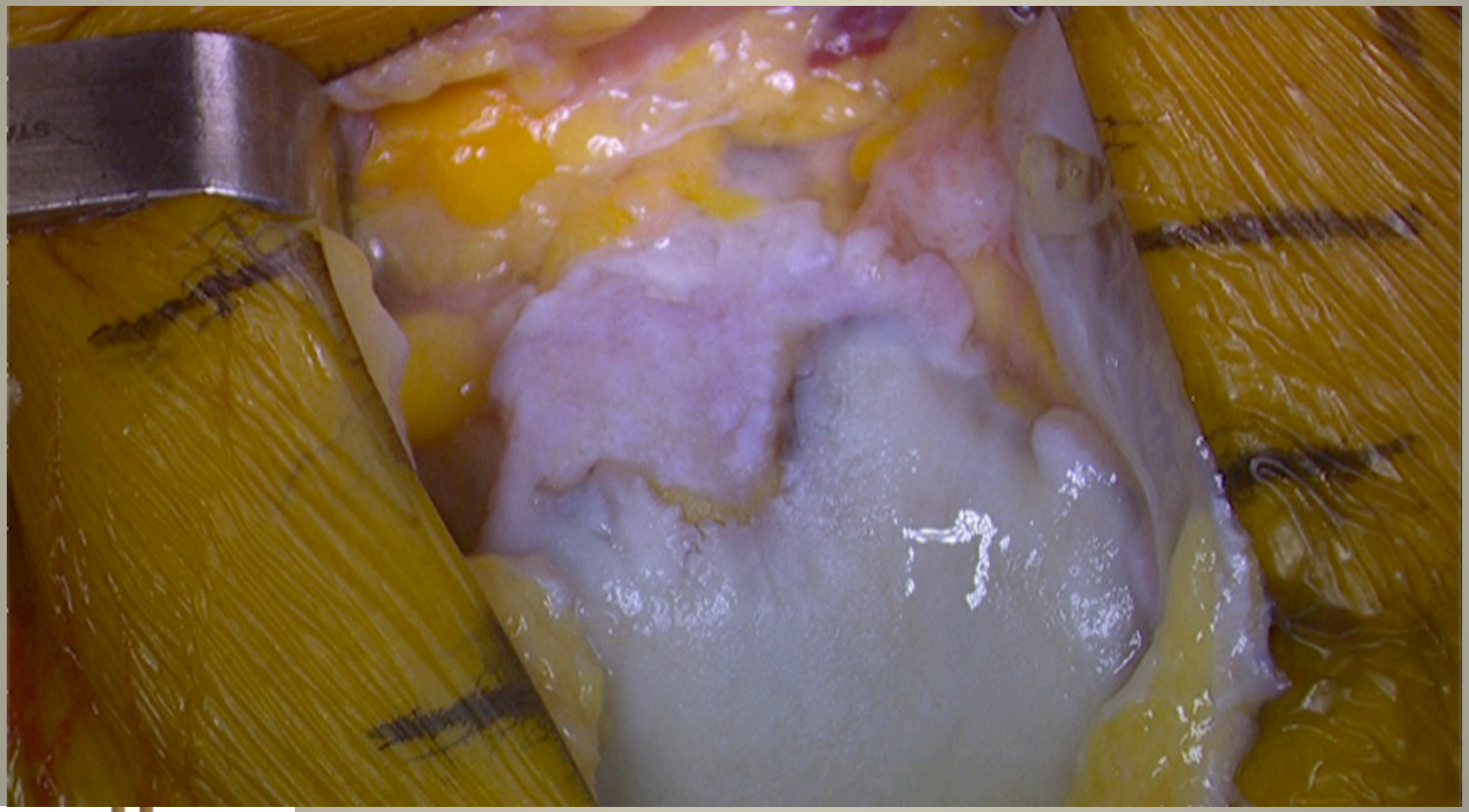
Femoral Trochlea, no cartilage and shallow



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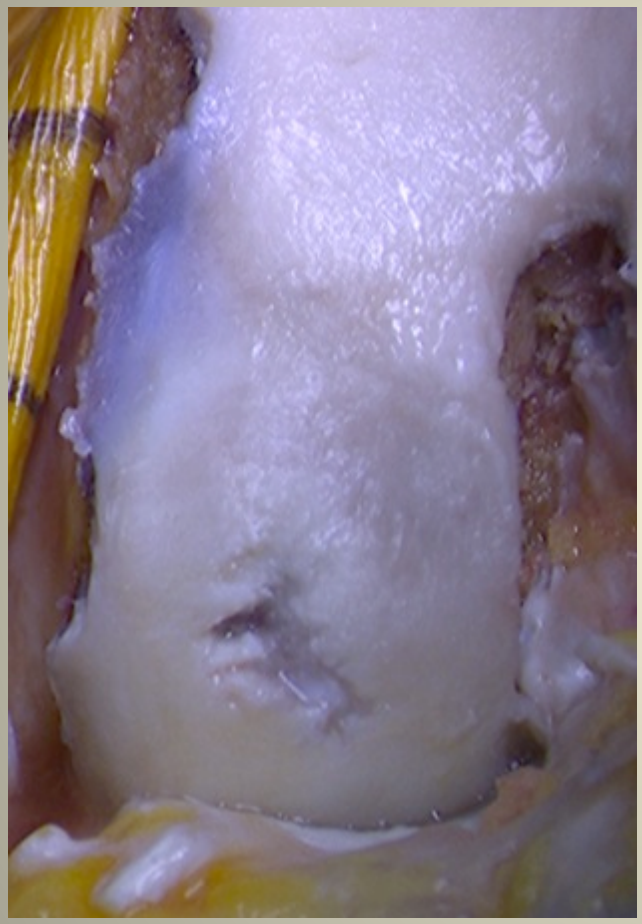
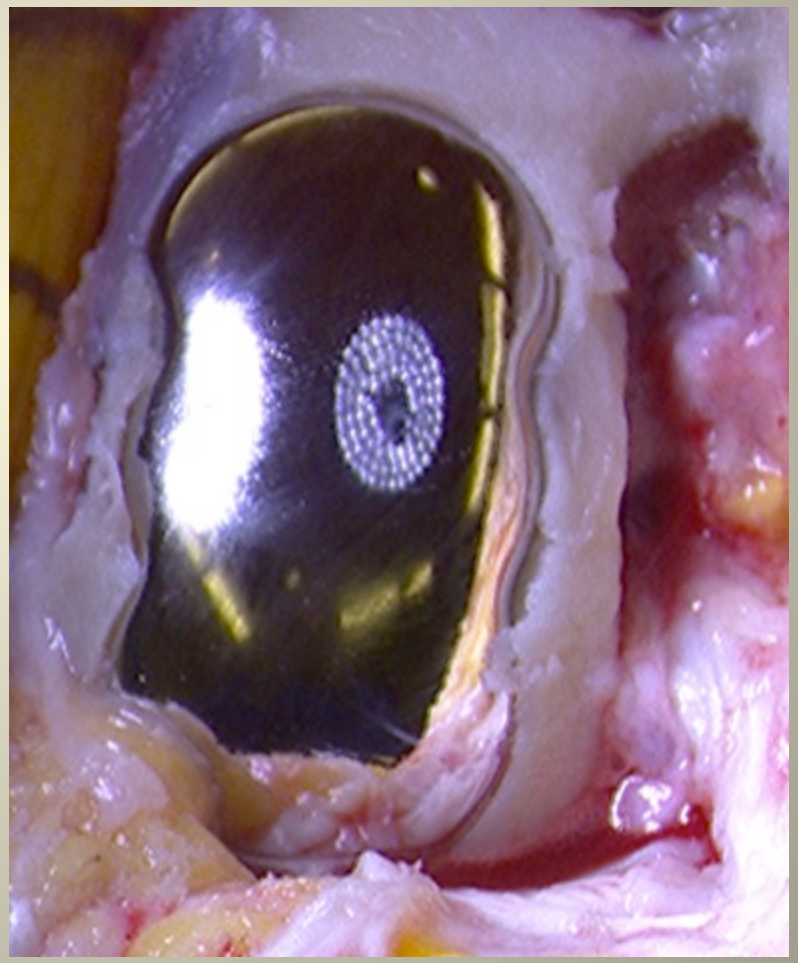
Lateral Femur, before and after- **Inlay**





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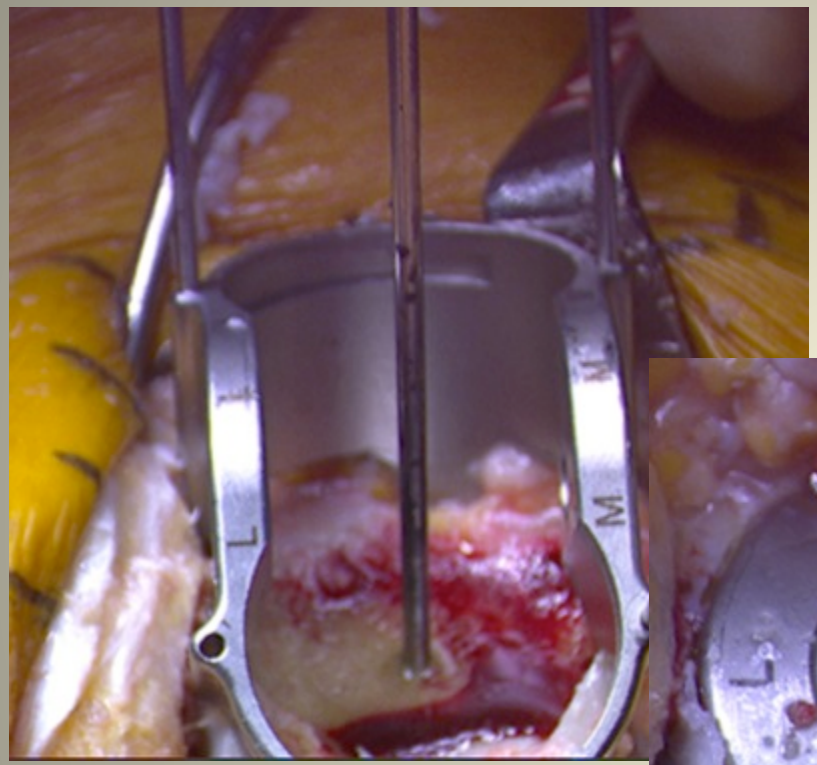
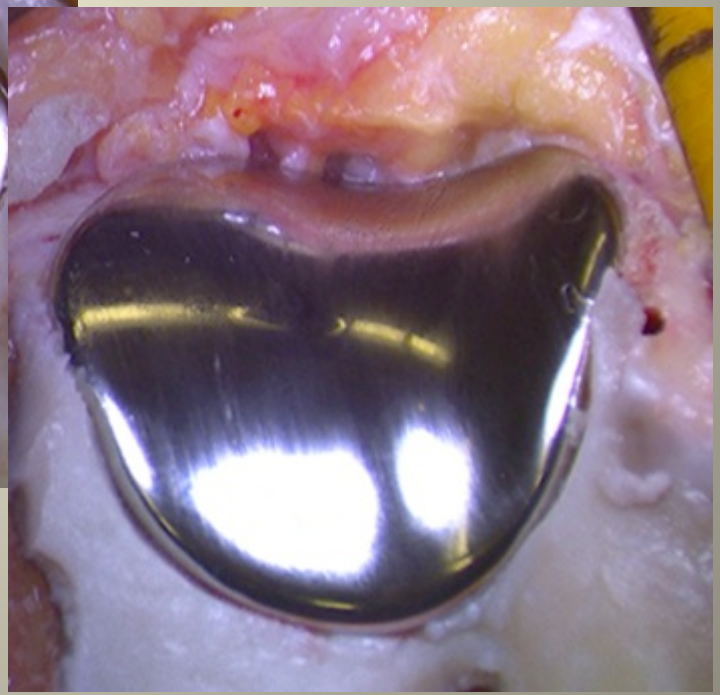
Preparing the Femoral Trochlea





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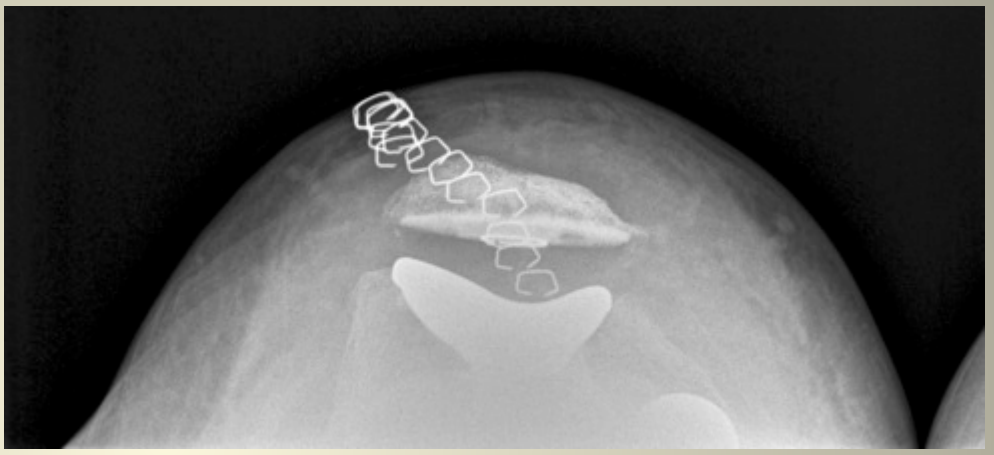
Radiographs



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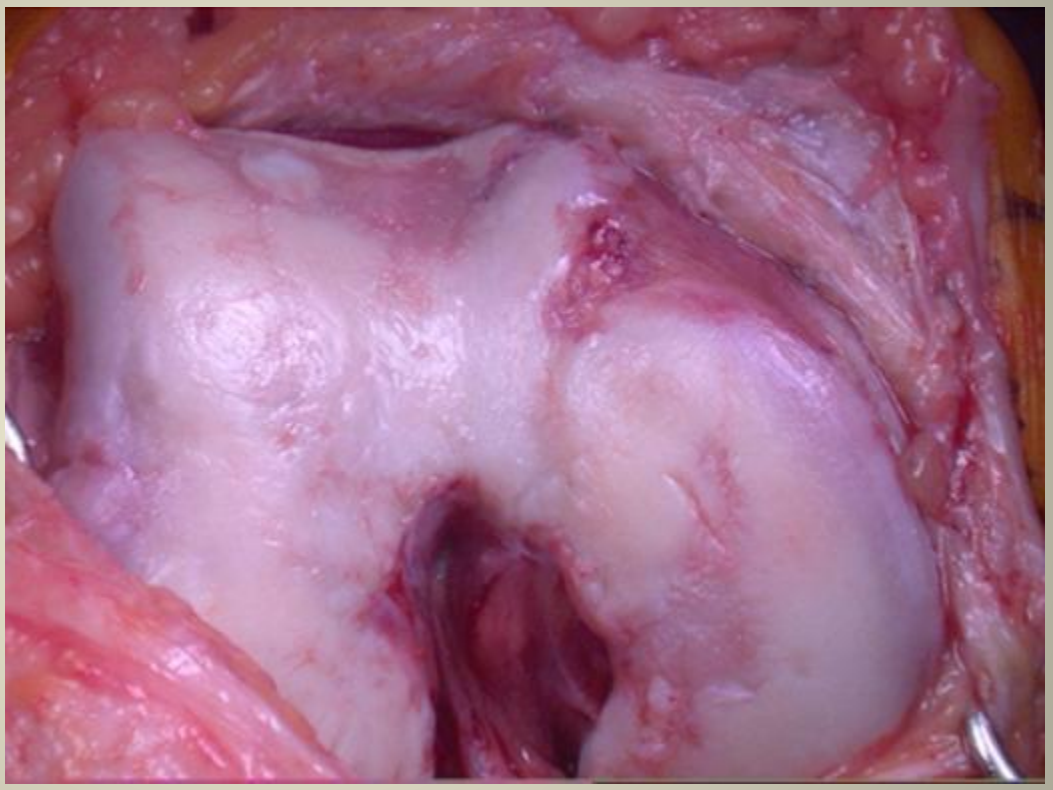
32 year old female rancher

- Neutral alignment
- Told she needed a TKA
- Healthy, ideal body weight



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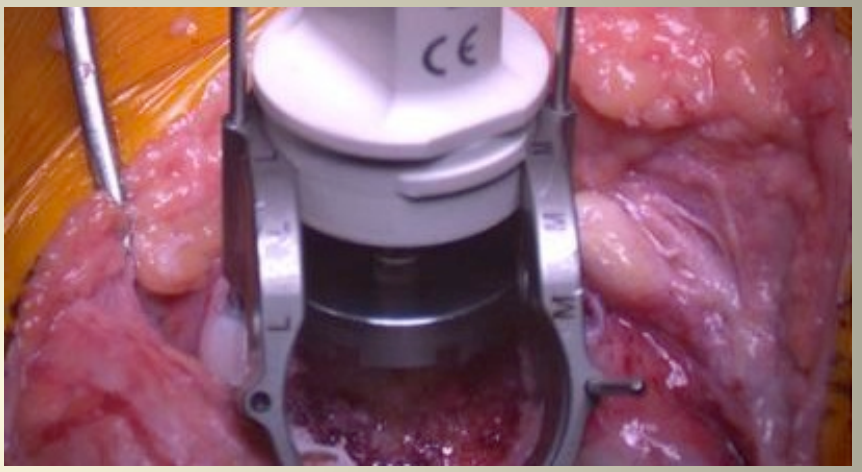
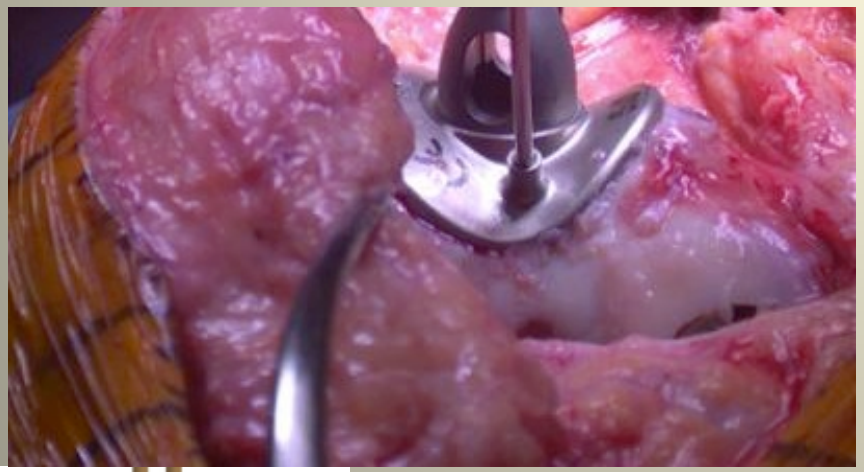
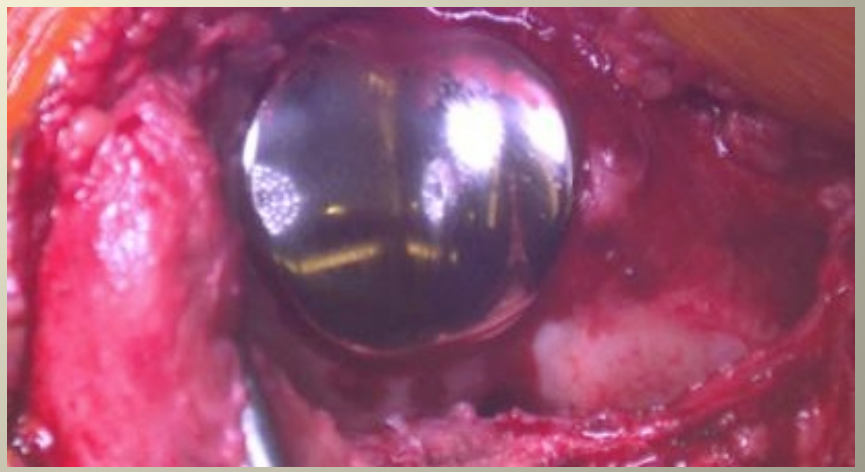
PFJ







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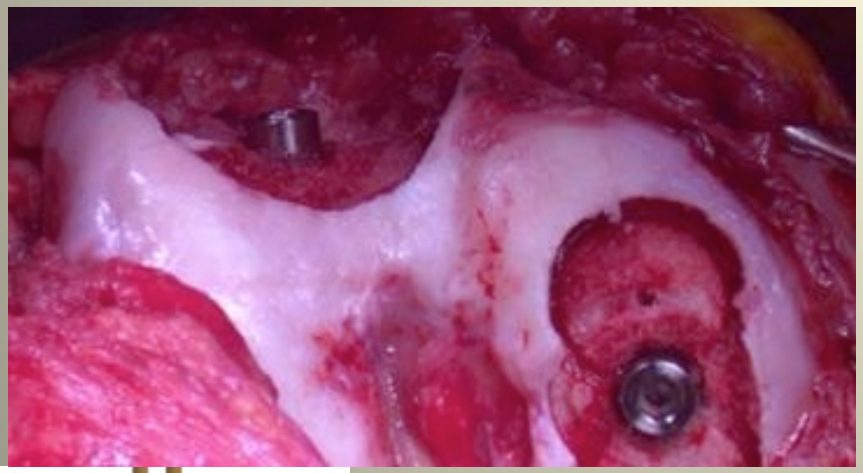
MFC



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Resurfacing & Alignment

- Must know alignment, potentially correct or accommodate with resurfacing
- Must have long leg standing films available
- Inlay does not restore joint height
- Onlay can offer more joint height restoration

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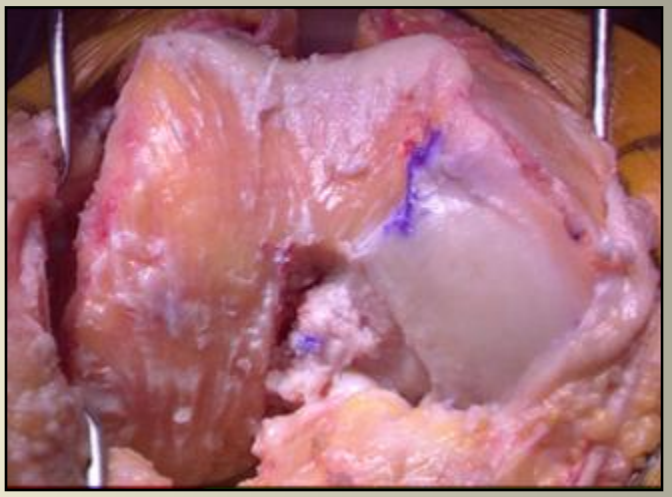
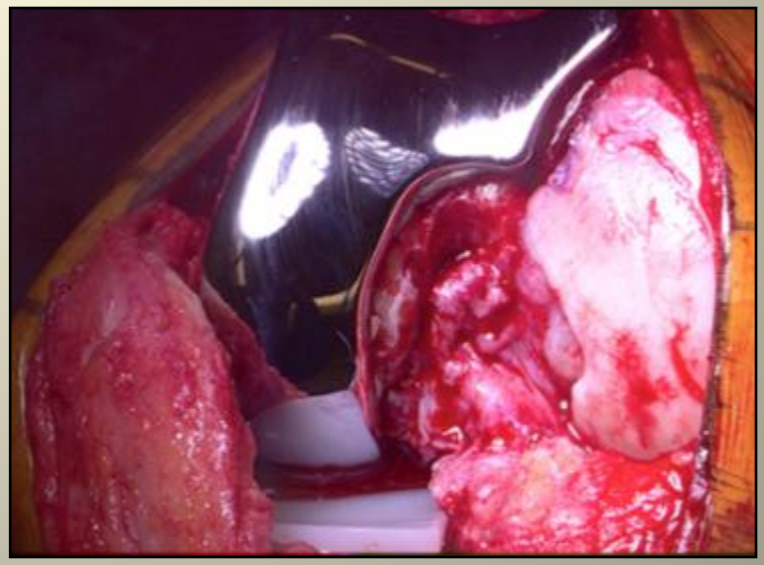
Onlay Resurfacing Arthroplasty

- Onlay optimizes fit of implant to bone
- Onlay minimizes bone resection
- Onlay accounts for alignment and patient specific anatomy using pre-op data acquisition (CT scan)





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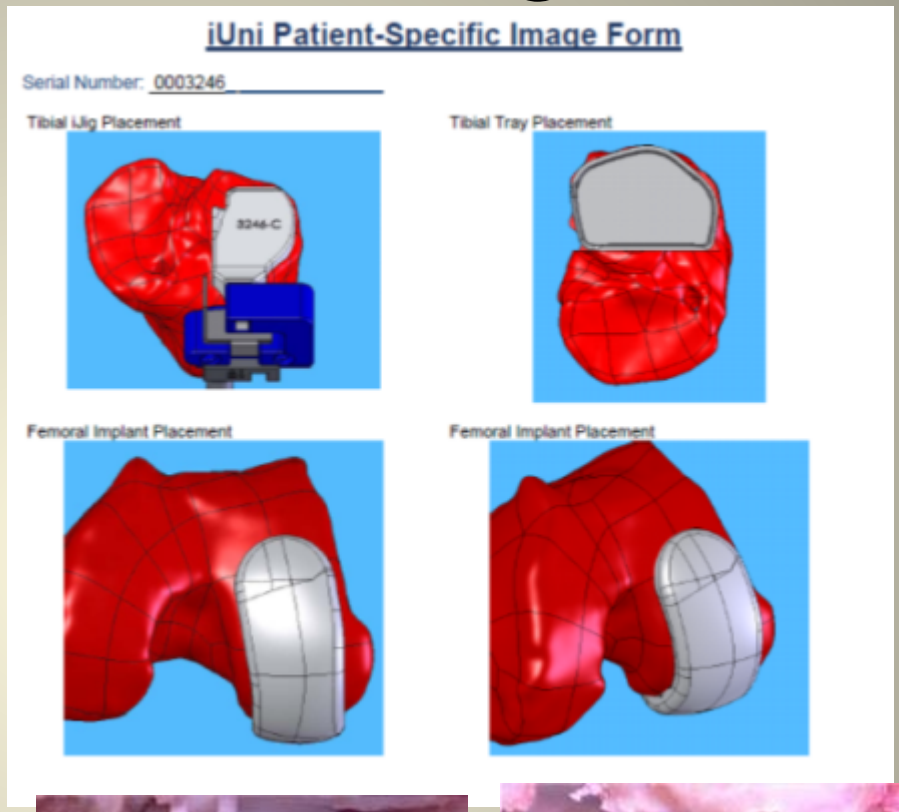
Onlay Resurfacing

- Very little bone cut off
- Implants custom made from CT scan
- More accurate fit may increase longevity
- Accommodate morphologic variability, “odd sizes and shapes”



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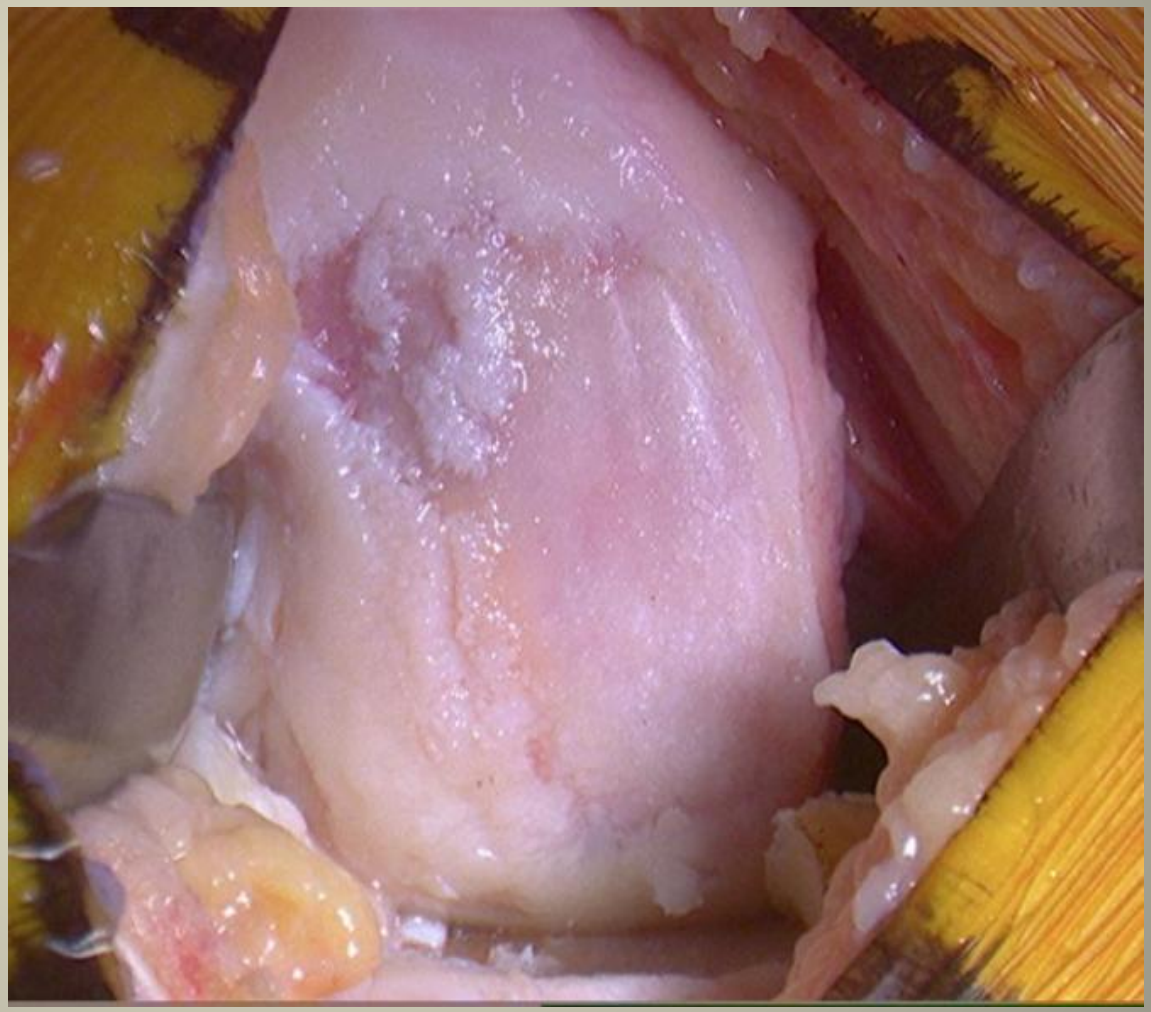
58 year old male - Onlay



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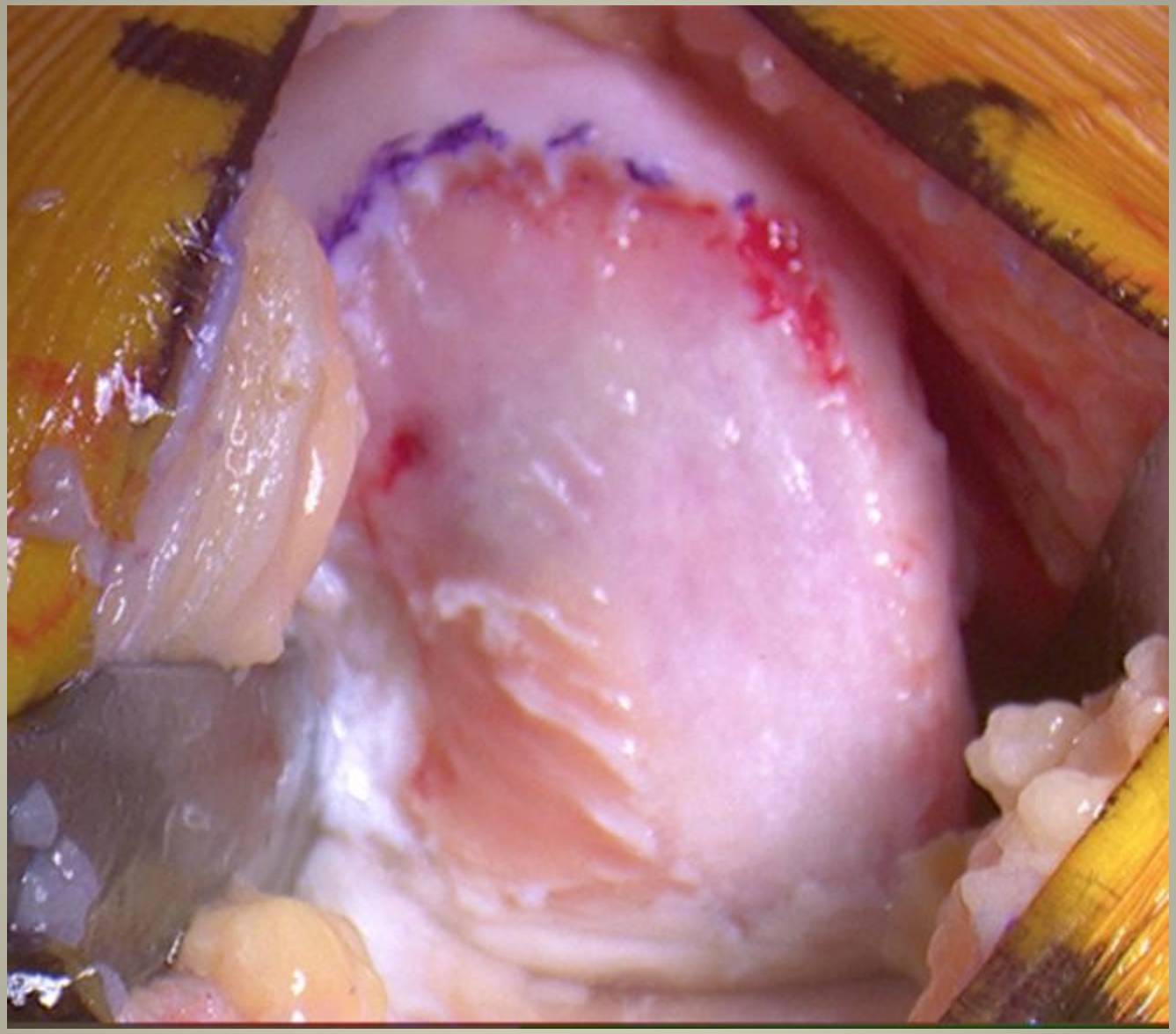

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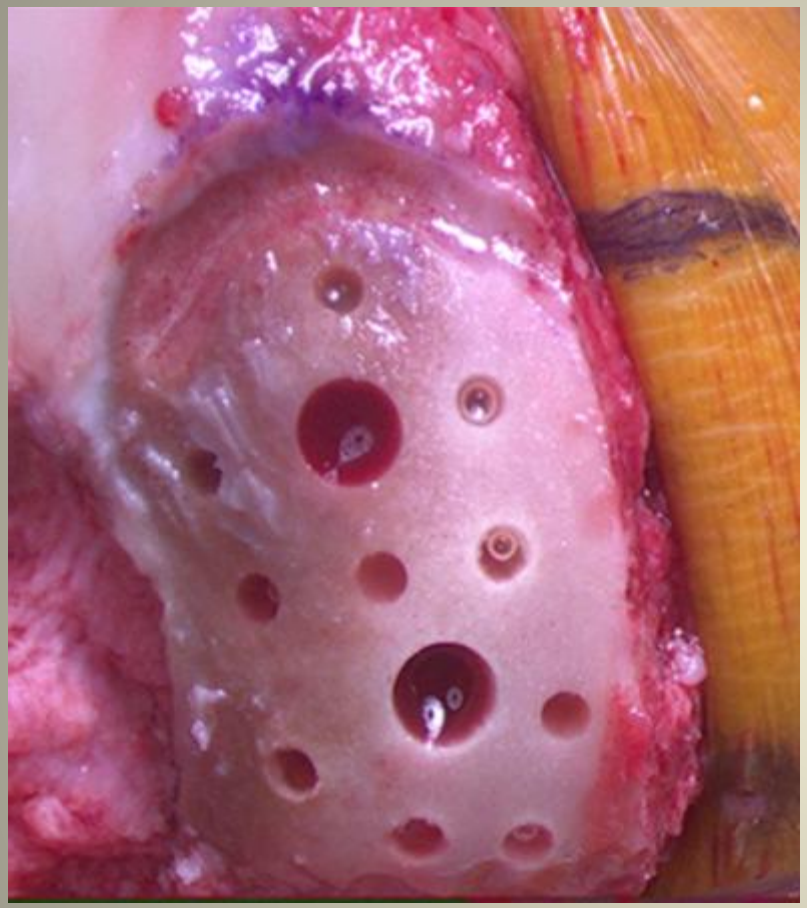

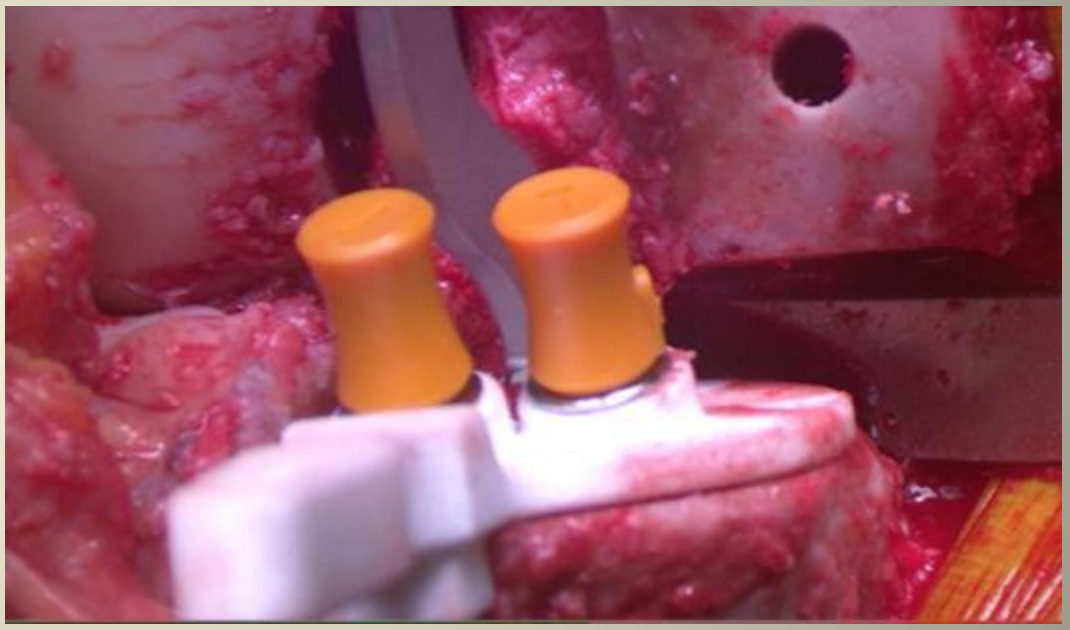

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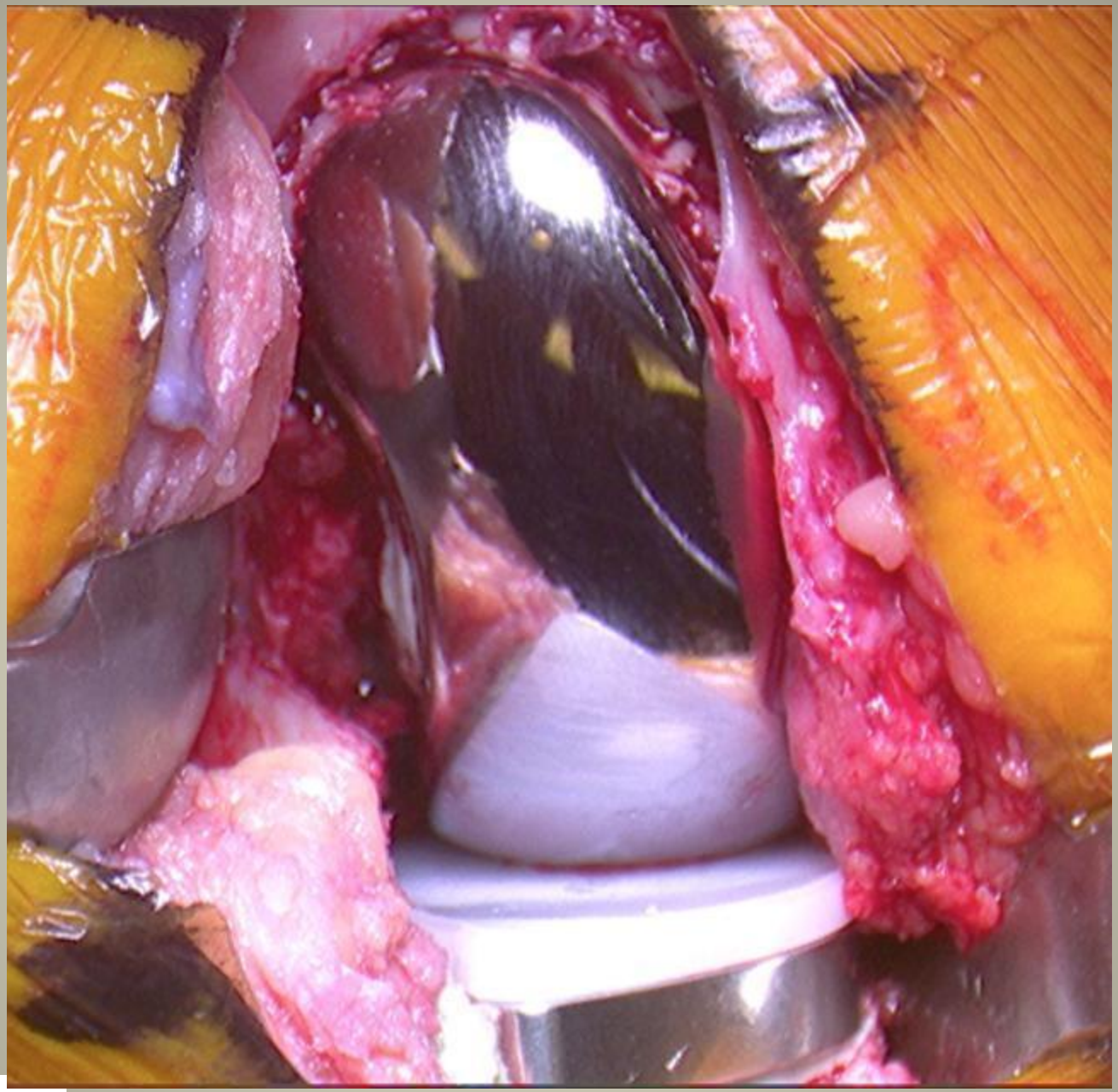

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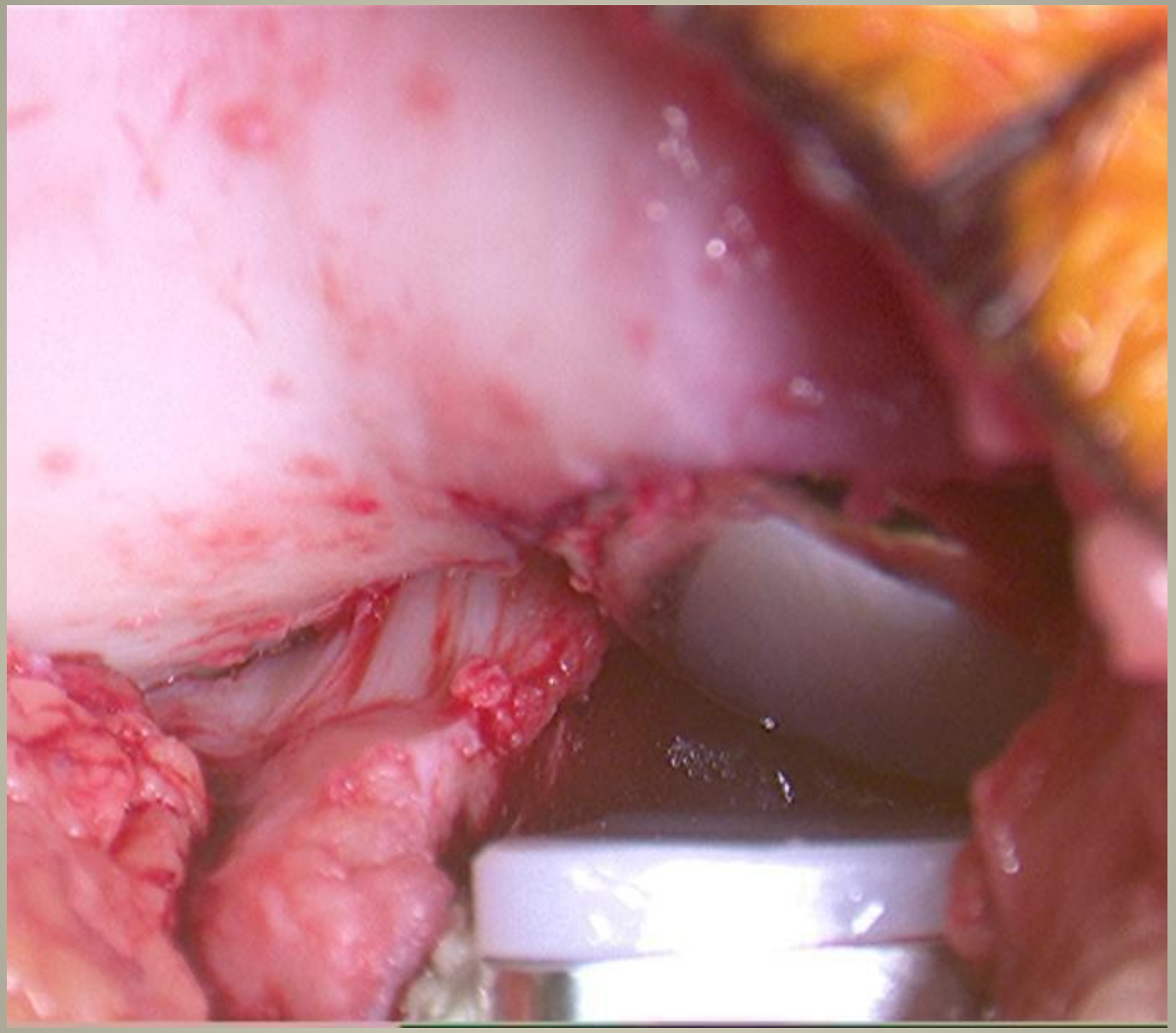

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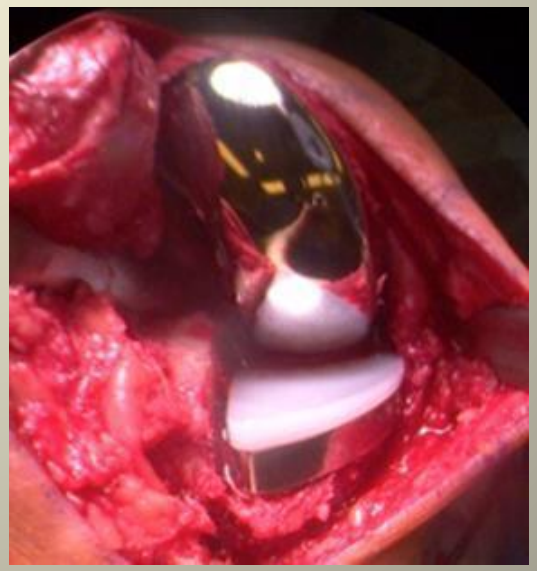
Biologic Treatment - Injured Worker

Prosthetic Inlay and Onlay Resurfacing Procedures

- Outpatient or one night stay
- Full WB immediately
- Full ROM immediately
- Appropriate for “younger” patients and high demand boomers



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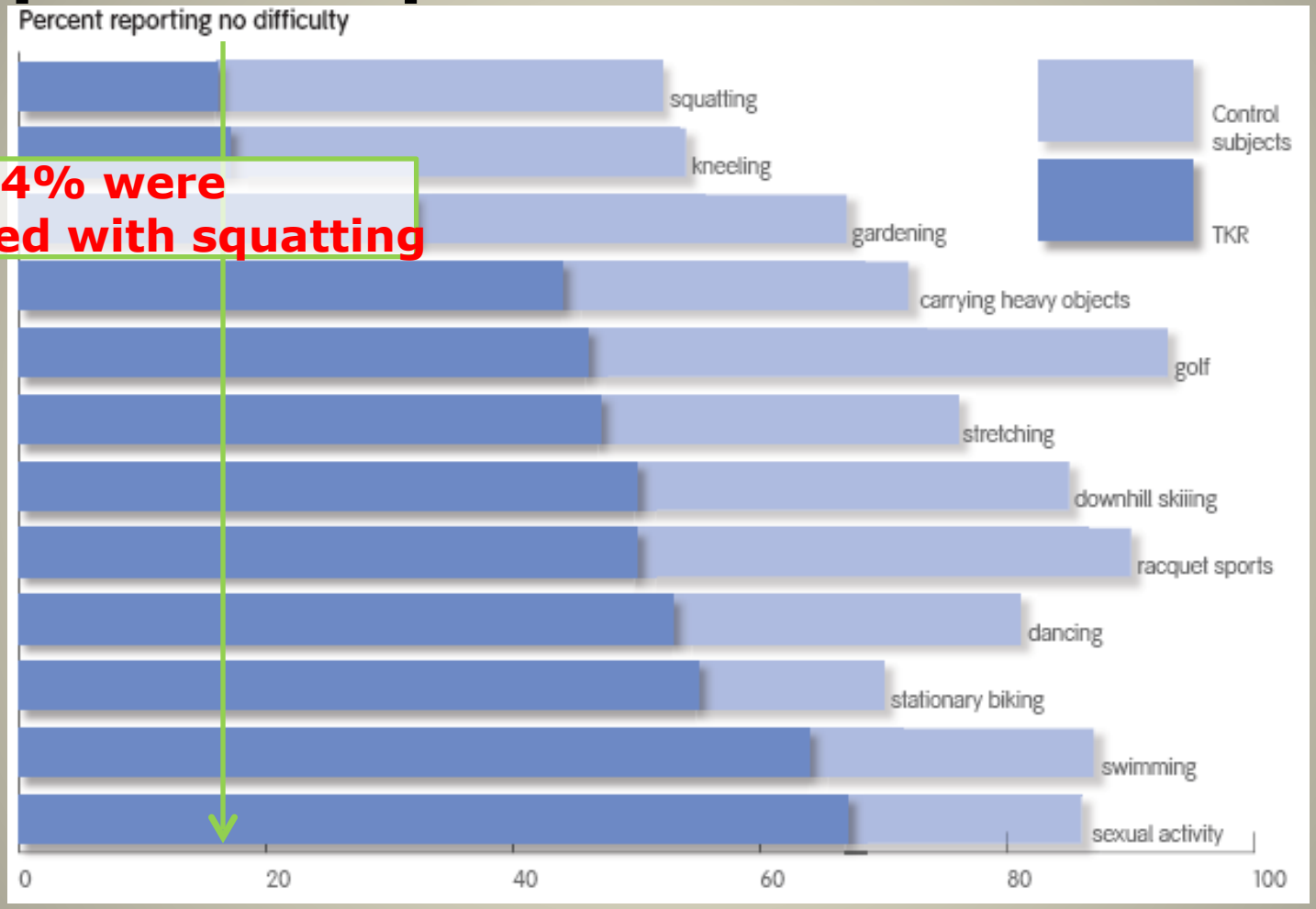
Total Knee Replacement
Explore Your Journey

Historical "standard" TKA doesn't meet patient expectations



Only 14% were satisfied with squatting

- 2 Arms (TKA v Normal Knee) appx 500 patients total
- Age and Gender matched arms

Clin Orthop Relat Res. 2005 Feb;431:157-165: Noble PC, Gordon MJ … Mathis KB

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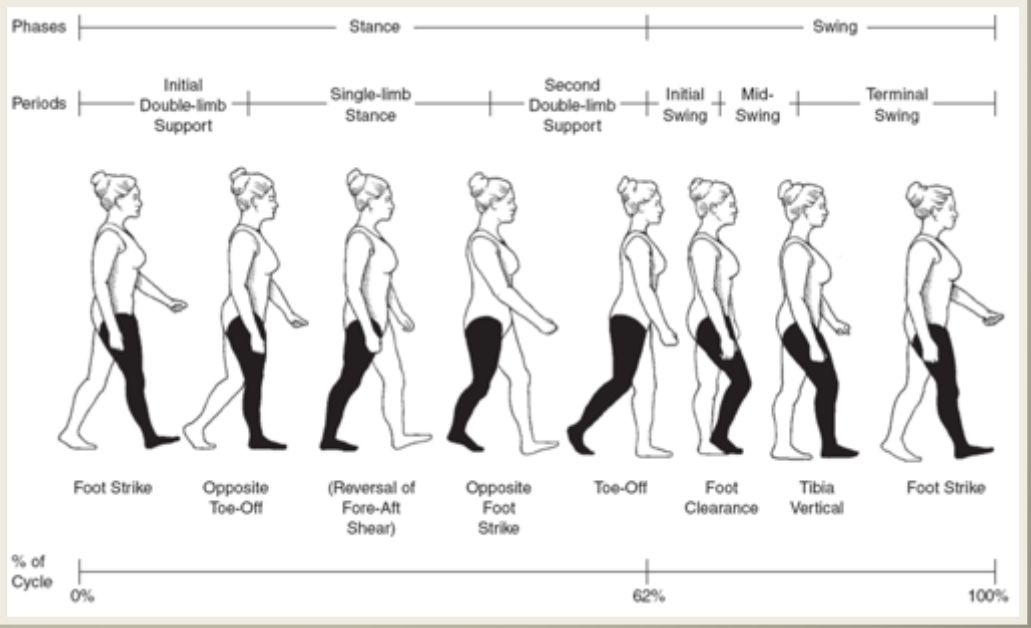
Does gait alter after traditional TKA?

- Velocity ↓
- Stride length ↓
- Mid-stance knee flexion (quad avoidance gait)
- ↓ Max knee flexion during stance and swing phases

Dorr, CORR 1988
Kramers, JOA 1997
Saari, Acta Orthop 2005
Andriacchi, JBJS-A 1982



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What the NORMAL knee does?

0° (Full Extension)

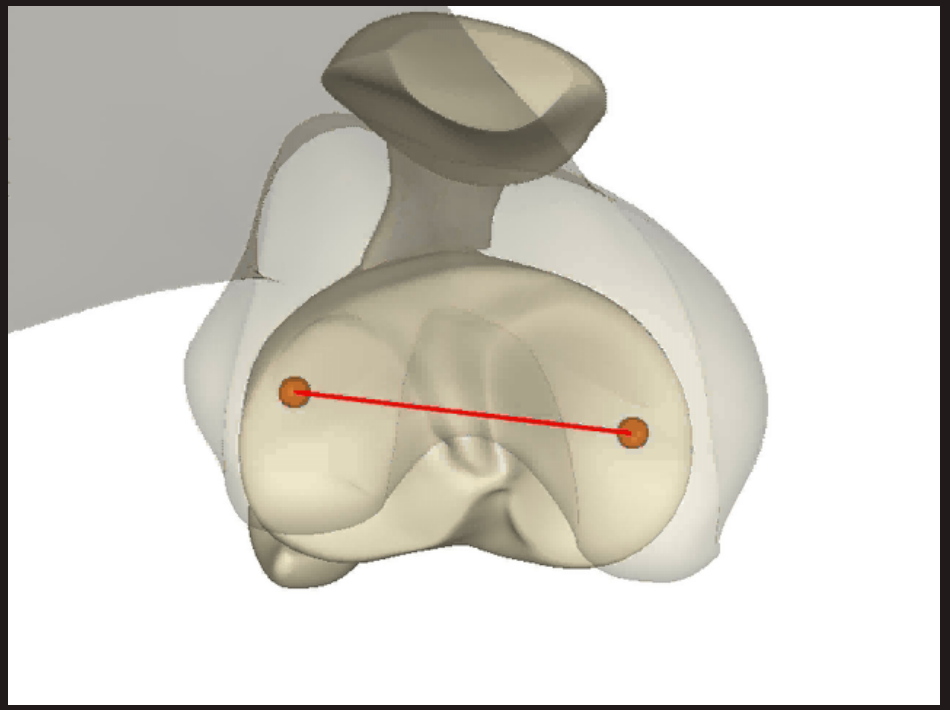
- Screw-home (5° femoral internal axial rotation)
- No posterior femoral overhang

1-90° (Mid Flexion)

- Medial pivot (rollback + femoral external axial rotation)
- Q-angle minimized (quad mechanism straight line)

90-155° (Full Flexion)

- Posterior femoral translation
- Axial rotation retained



Johal P, et al. "Tibio-femoral movement in the living knee". J Biomech. 38(2): 269-76. 2005.

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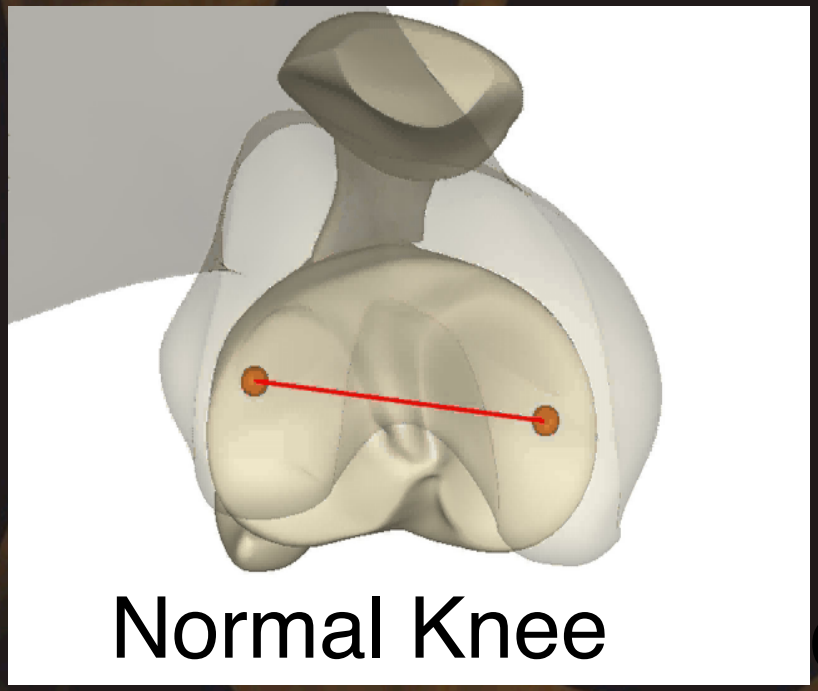
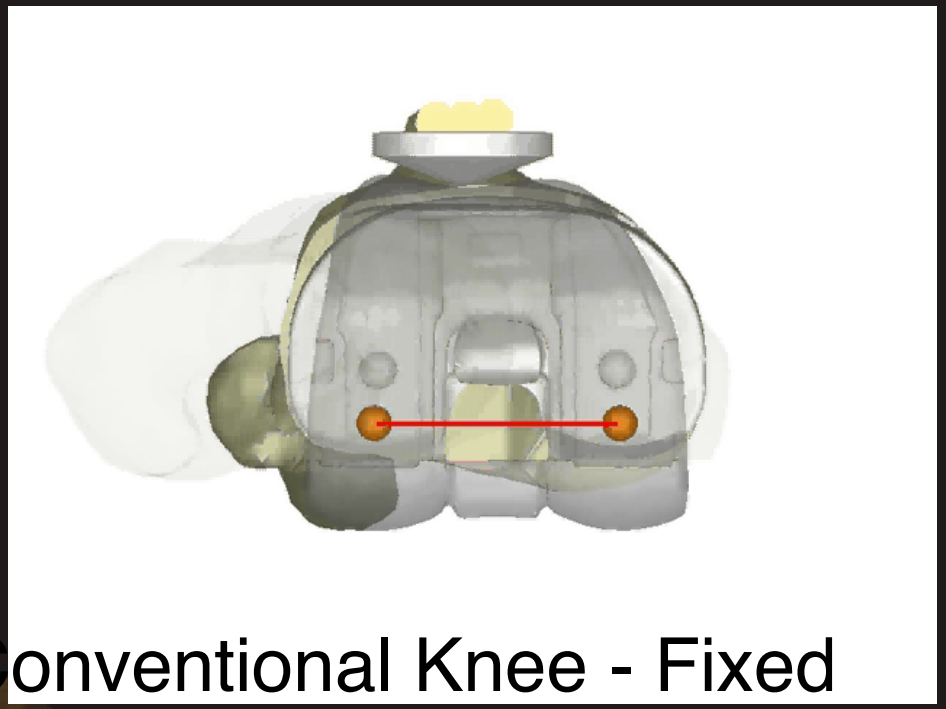
Conventional TKA limitations

Non-anatomic (abnormal) motion

- Paradoxical motion (anterior sliding)
- Lateral pivoting



Normal Knee



Conventional Knee - Fixed

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JOURNEY™ II BCS: **Function**

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Stability

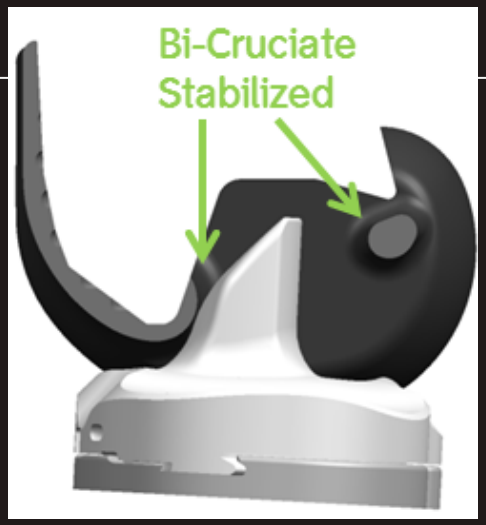
- Lachman study shows 76% restoration of normal A-P stability (Brink)

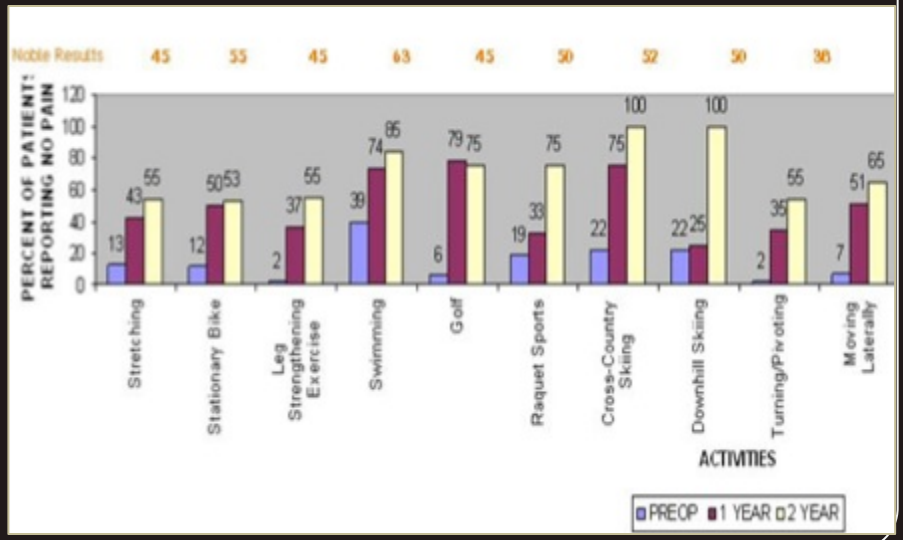
Strength

- EMG study shows recovery of normal extensor/flexor muscle groups (Catani/Lester)

Satisfaction

- Noble questionnaire highlights key improvements of patient satisfaction





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JOURNEY™ II TKA: **Motion**

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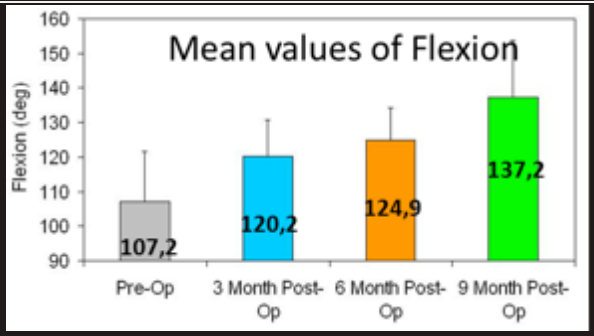
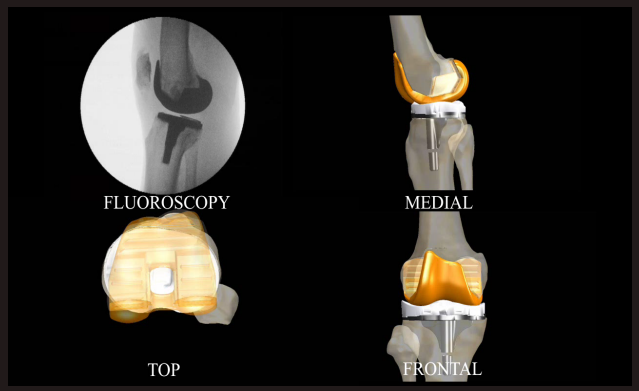
Deep Flexion:

- Average flexion mid-130 degrees



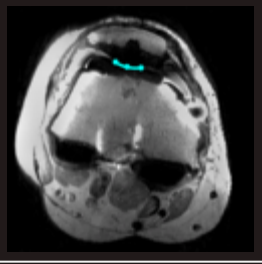
Kinematics:

- FDA Claim for Normal Motion (Only System)
- Femoro-Tibial Kinematic studies show normal rollback and rotation



Patello-Femoral Kinematics:

- Patello-Femoral Kinematic study display normal PF contact, shift, and tilt (Ries)



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JOURNEY™ II BCS: **Durability**

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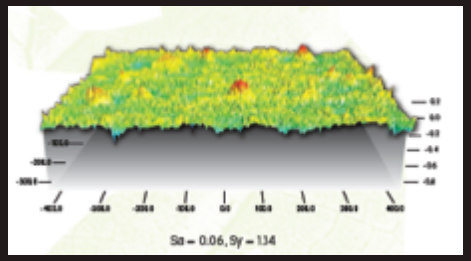
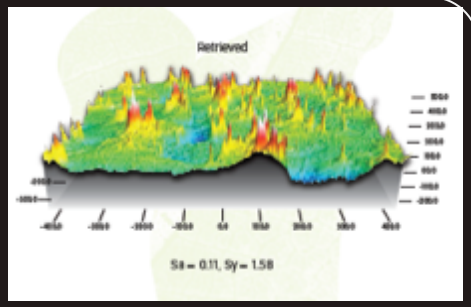
Wear:

- 83% less surface roughness (OXINIUM™)
- Industry leading bearing couple (VERILAST™)





Metal Sensitivity:

- Zirconium is a nearly inert material that has not reported to induce immune reactions

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PHYSIOLOGICAL MATCHING™

Restoring anatomy and motion

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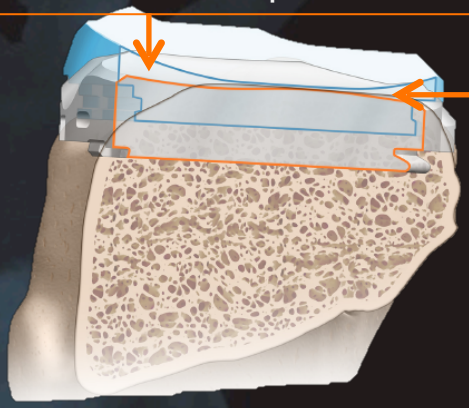
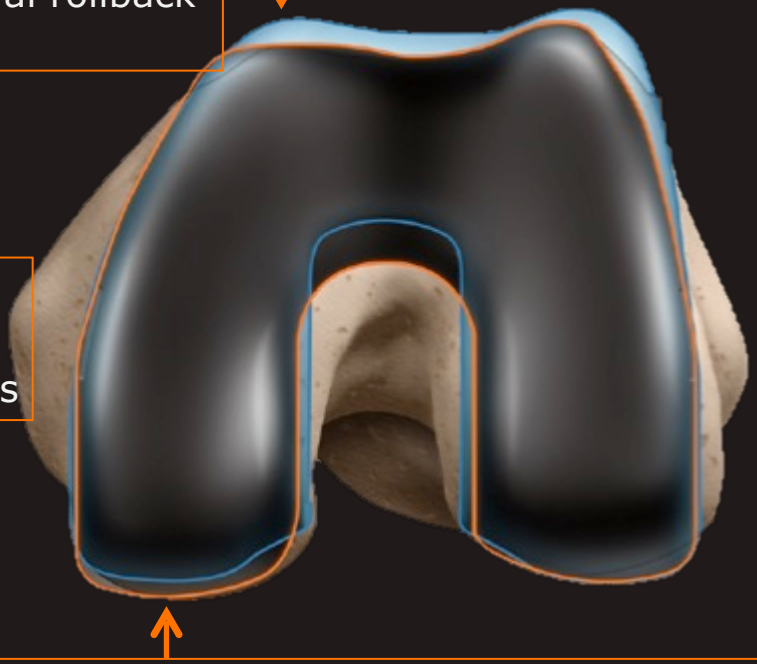
Lateral:
Smaller anterior lip allows screw-home

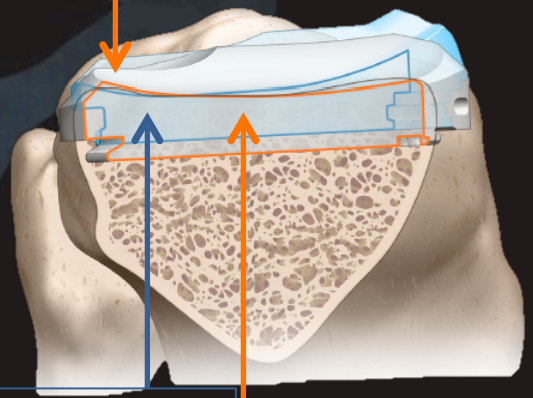


Normal convexity provides anatomic lateral femoral rollback and external rotation

Femur:
Anatomic, asymmetric flange prevents overstuffing the patello-femoral compa



Medial:
Prominent posterior medial lip provides Stability and promotes normal kinematics



Restores anatomic 3° distal and posterior femo line providing more normal ligament strain and Patello-femoral tracking

Conventional A/P sulcus

Normal A/P sulcus position prevents paradoxical motion

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Conventional TK

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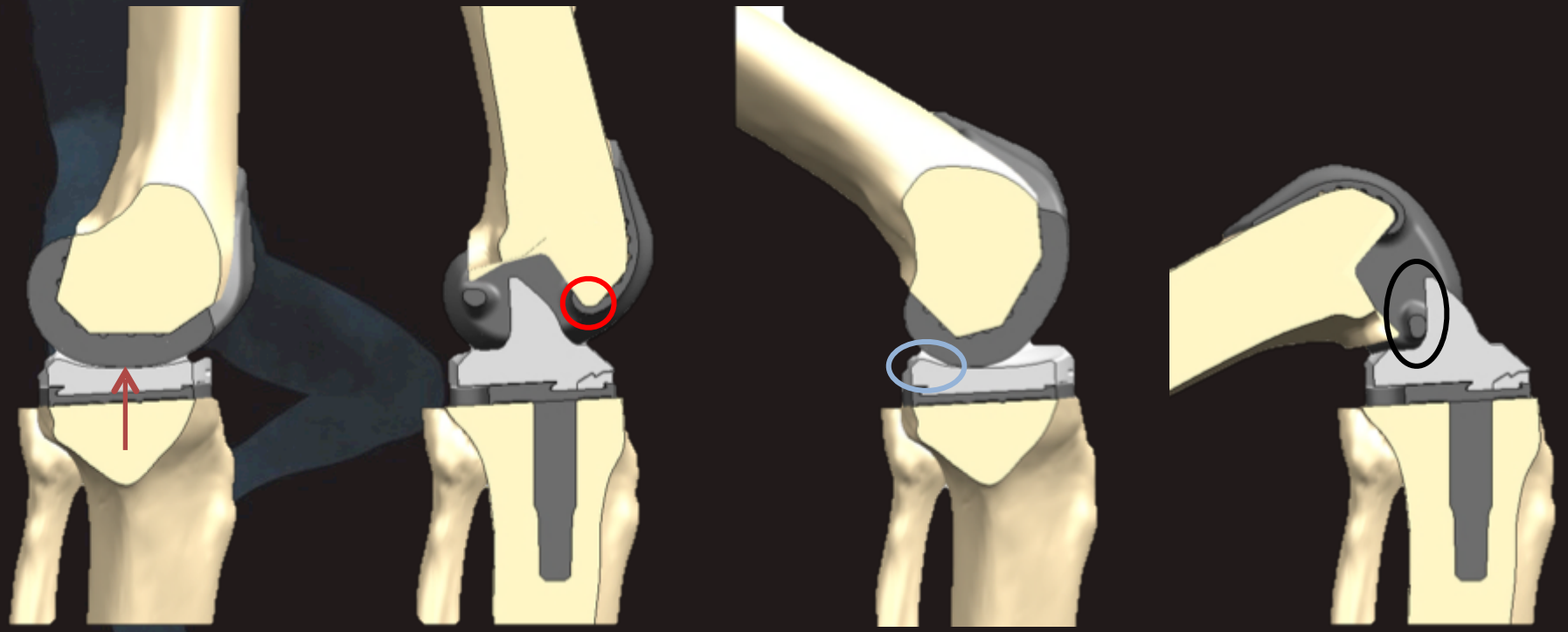
PHYSIOLOGICAL MATCHING™:

Stability Throughout a Range of Motion

0° → 0° - 20° → 20° - 60° → 60° - 155°



Mid-line Sulcus

Anterior Cam

Posterior Medial Lip/Horn

Posterior Cam

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Updating Traditional TKA with Visionair

- Yield precise data about bone shape , size and alignment
- Alignment, sizing and intended corrections can be precisely calculated preoperatively
- This digital information can be used to plan, create cutting guides and manufacture implants
- Increases precision
- Increases efficiency by: decreasing OR time, instruments, and inventory
- May lessen or obviate the need for intraoperative navigation systems
- **Saves time and money while potentially making outcomes more predictable and ultimately better.**

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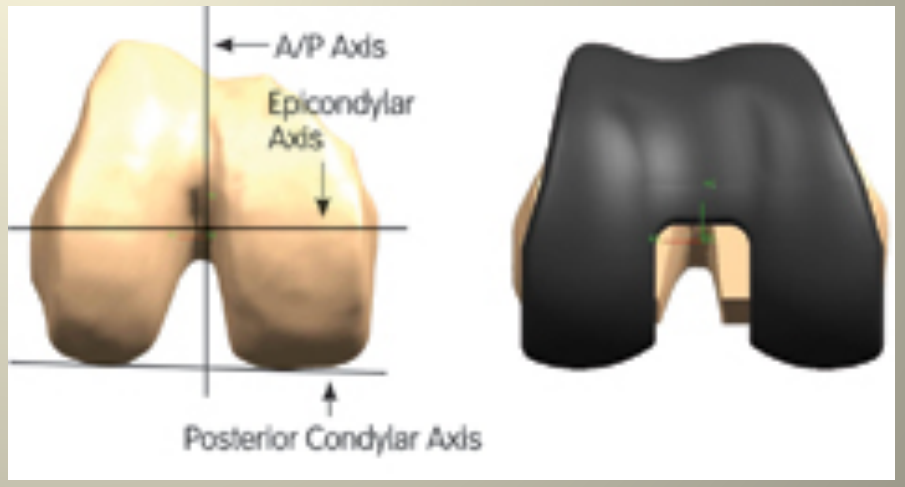
Updating Traditional TKA- VISIONAIR

- Pre-op templated cutting guides/blocks
- Avoid/minimize intraoperative intra and extra medullary alignment guides
- These traditional guides can be used as “double-check”



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Summary

- **Cartilage Restoration (biologics)**
  - For younger patients with the joint maintained
- **Inlay Resurfacing**
  - For joints that are not collapsed, but biologics won't work
- **Onlay Resurfacing**
  - For joints with loss of height in 1 or 2 compartments
- **Kinematic Total Joint**
  - For 2 or 3 compartment cartilage loss, motion loss and instability

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Closing thoughts…..Cartilage Restoration and Joint Resurfacing

- Custom solutions for each individual
- Retain future options – as much as possible
  - Resurfacing may be a bridging procedure
- Maximize Outcomes
  - Equal, or better than traditional treatments
- Offering additional options to patients that may previously have had few alternatives

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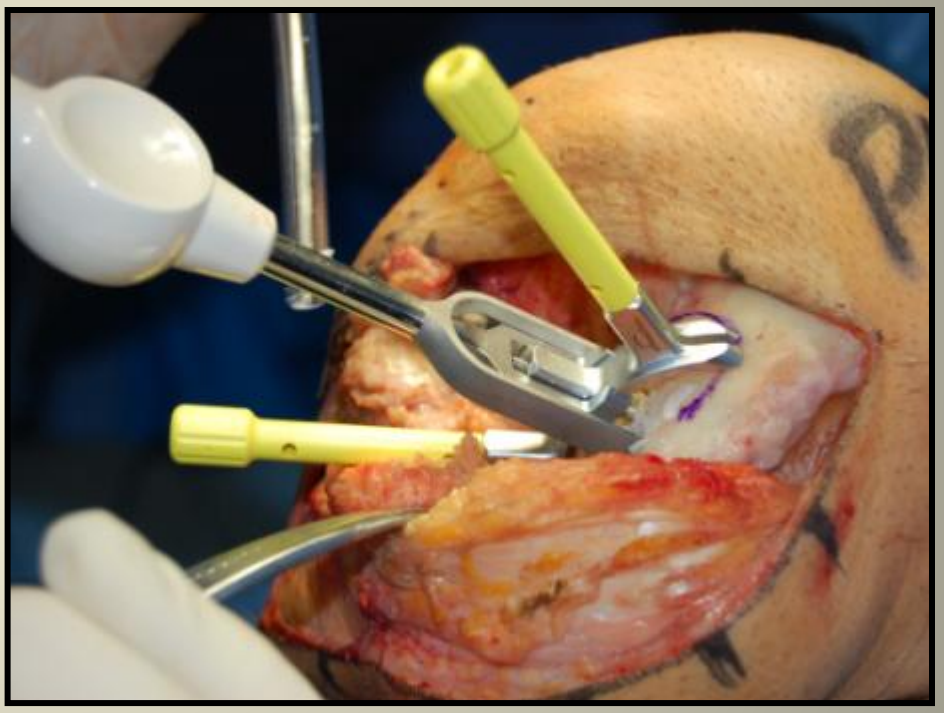
Future Trends

- "Geographic" , biologic , or large area contoured resurfacing for damaged joints
- Combining biologics with prosthetics
- Enhanced biomaterials for resurfacing implants, nanotechnology
- Decreasing the time and costs associated with patient specific implants and instruments
- Both patient demand and cost containment will drive the need for more precise, less invasive joint resurfacing



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Thank You

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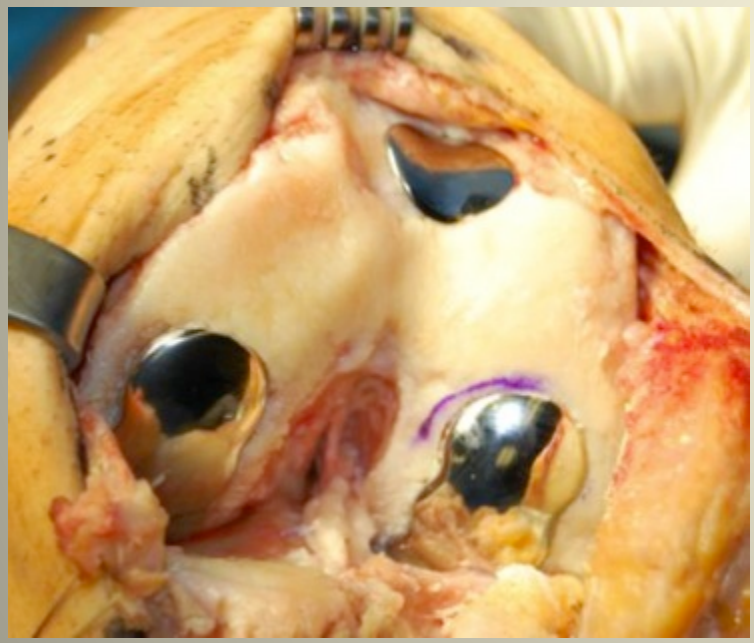

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