



BJI

BONE AND JOINT INSTITUTE

Unicompartmental Knee Arthroplasty

Brian Perkinson, MD
Orthopaedic Surgery, Hip and Knee Replacement



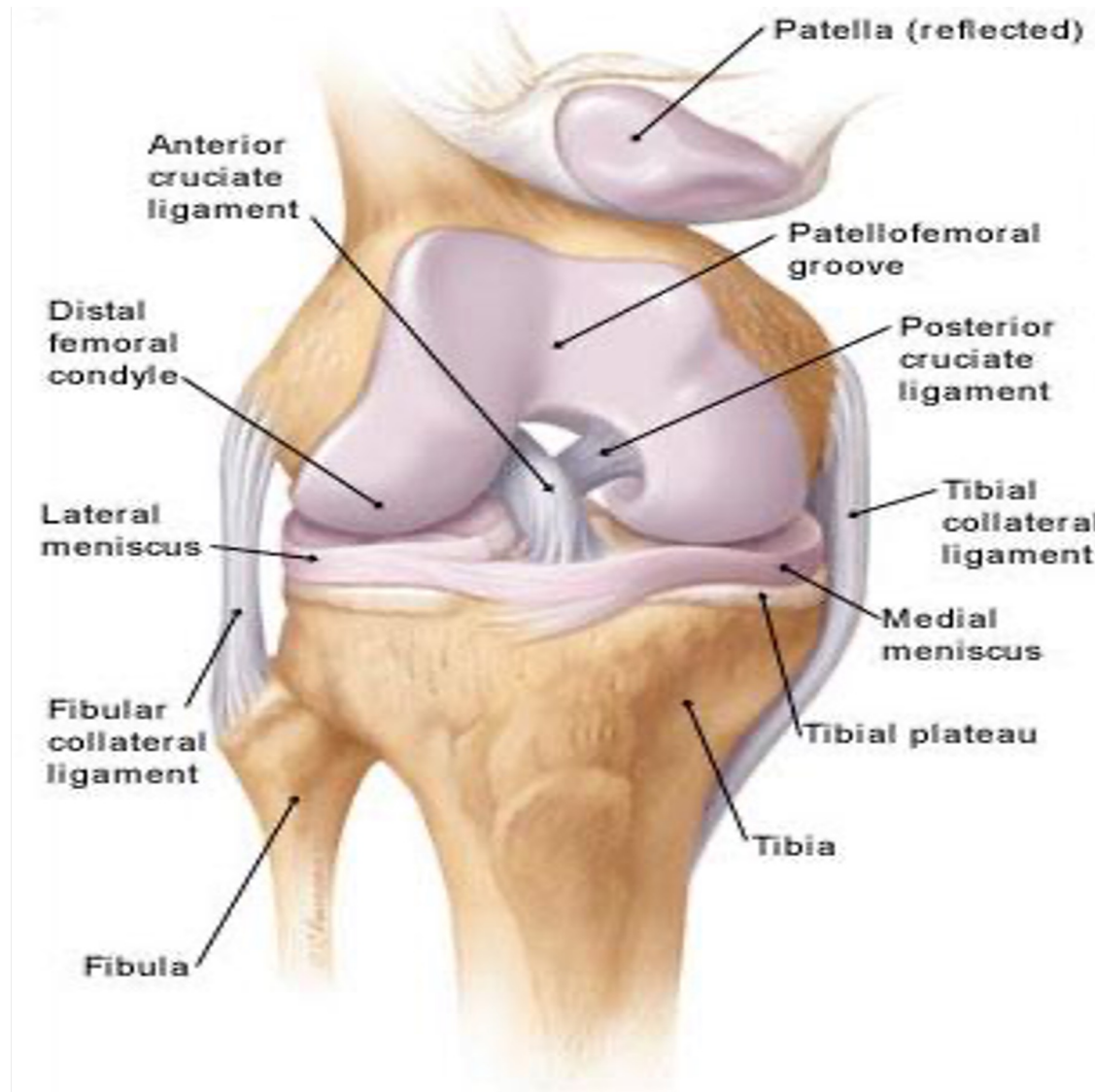
BONE AND JOINT
INSTITUTE

Disclosures

- ▶ Stryker Consultant
- ▶ Biased to partial knee replacements
- ▶ I LIKE ROBOTS
- ▶ I've never done a high tibial osteotomy



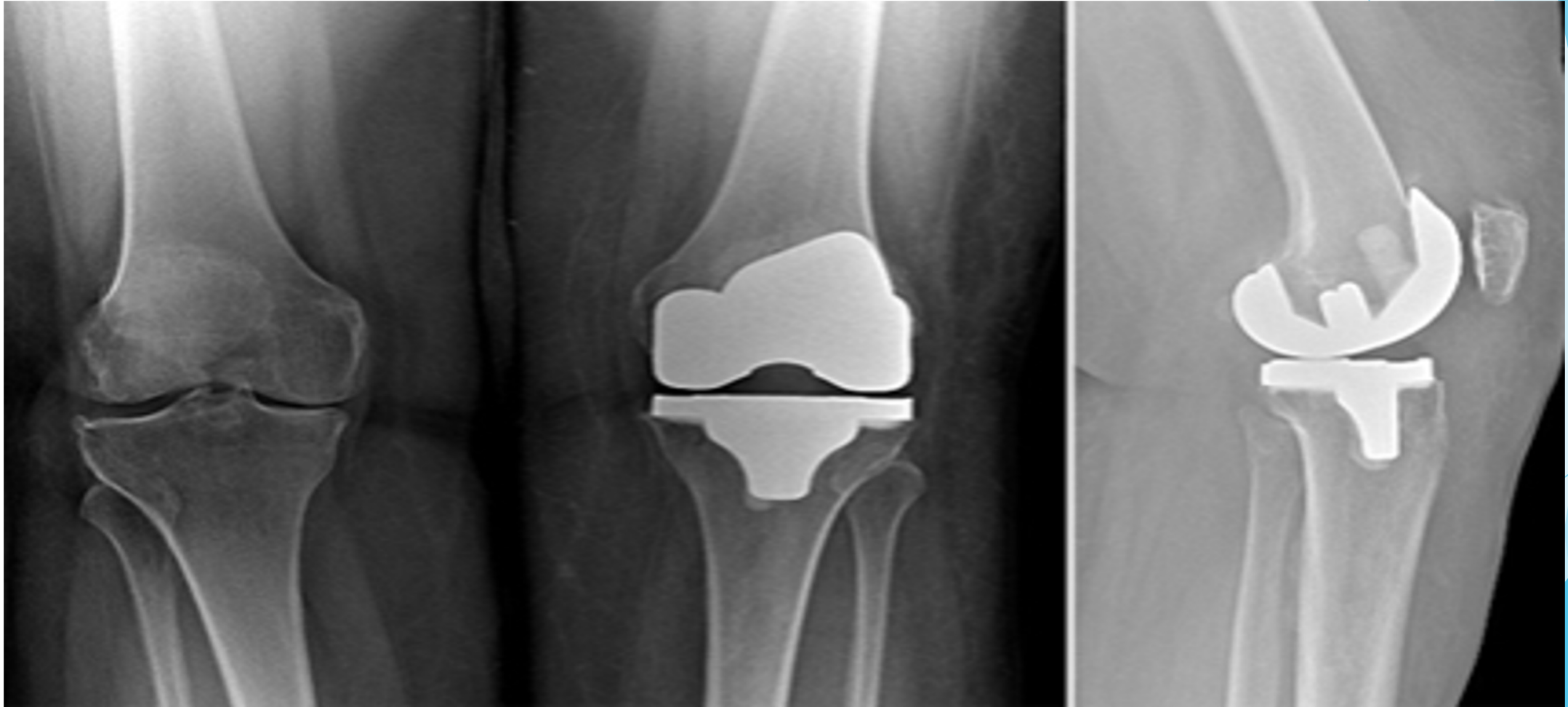
Anatomy of the Knee



Radiograph Osteoarthritis



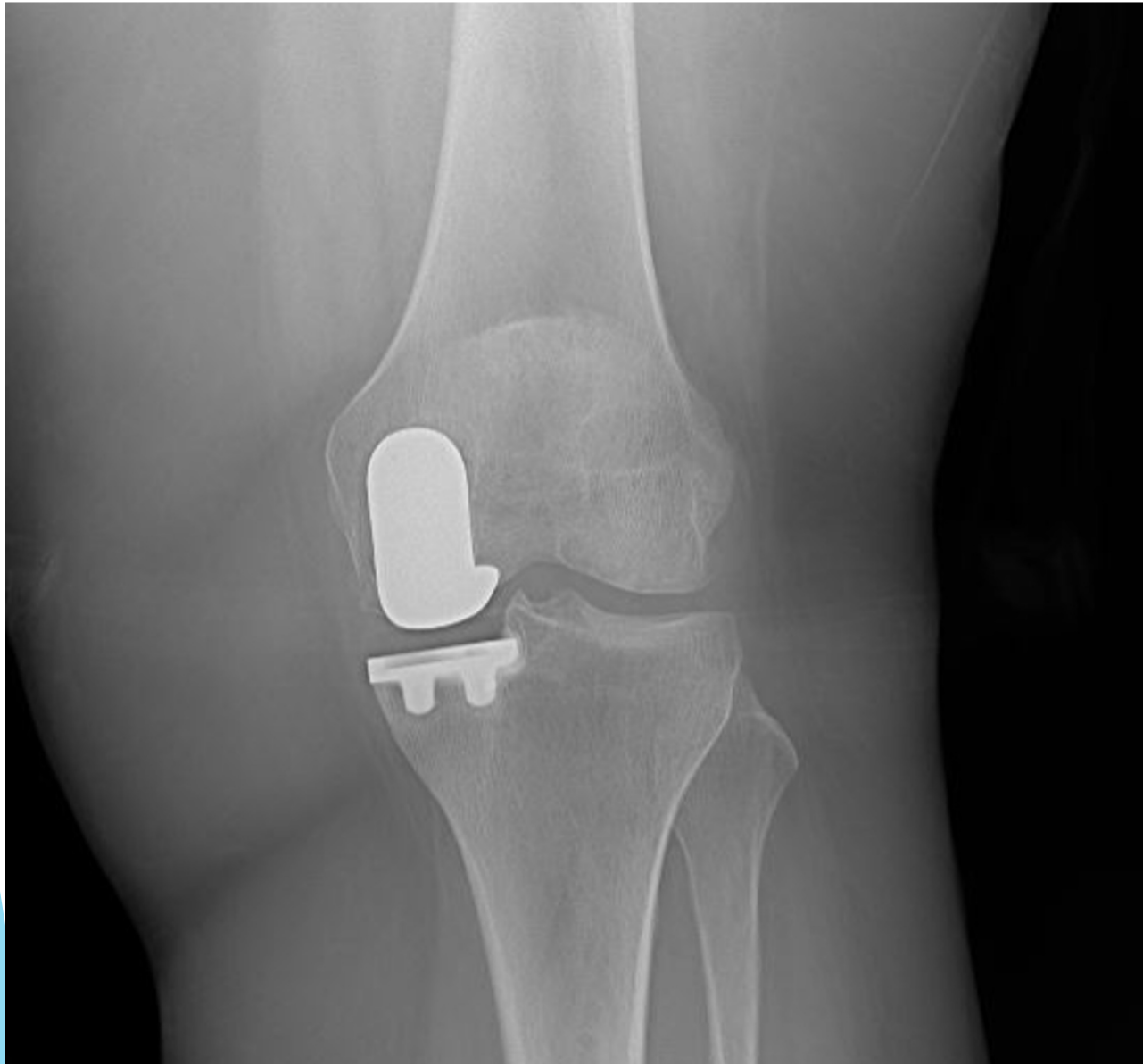
Total knee replacement



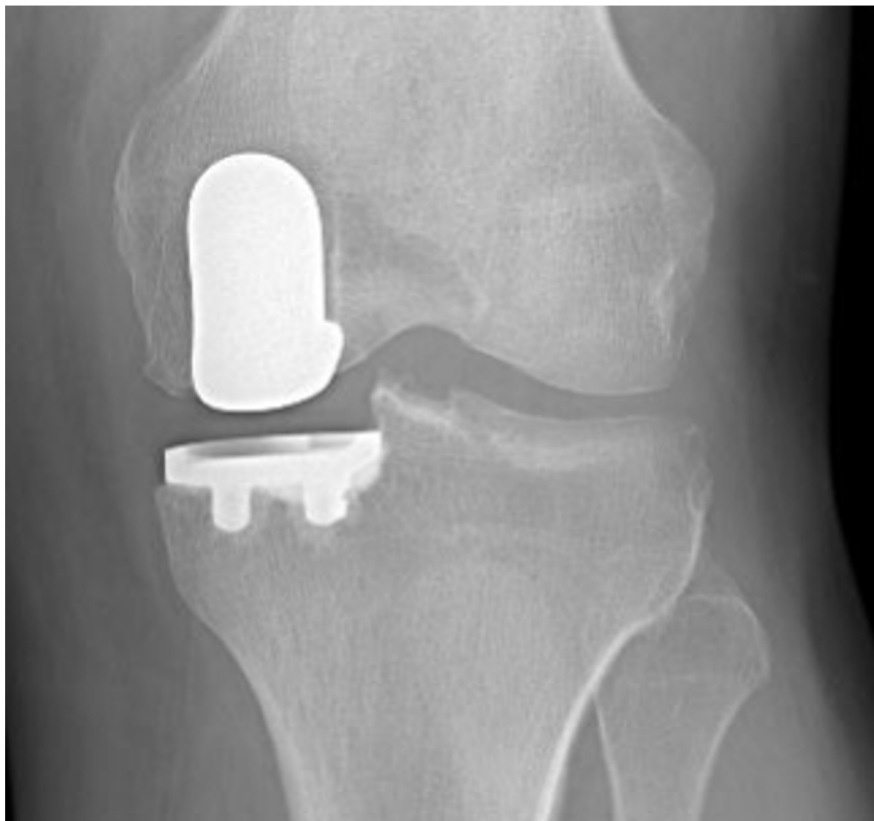
What are the components?



What is a Partial Knee Replacement?



Partial vs Total



VS



Classic Indications for Partial Knee Replacement (Kozinn & Scott 1989)

1. Non-inflammatory arthritis
2. Arthritis in one compartment of knee
3. No patellofemoral arthritis
4. Age greater than 60
5. Low demand activity
6. < 80kg (180 lbs)
7. No resting pain
8. Flexion greater than 90 degrees
9. Flexion contracture < 5 degrees
10. Angular deformity of < 15 degrees that is passively correctable
11. Ligaments intact (ACL/PCL)

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4.3% of knee arthroplasty candidates met this clinical standard

Ritter et al.

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11. ~~Ligaments intact (ACL/PCL)~~

Expanding Indications for Partial Knee Replacement

1. One compartment disease
2. Functional motion of knee
3. Angular deformity of < 15 degrees that is passively correctable
4. No **SEVERE** patellofemoral arthritis

VARIABLES to consider...

- ▶ Inflammatory arthritis (meniscal chondrocalcinosis)
- ▶ Severe obesity (BMI >35)
- ▶ Bone quality
- ▶ Conundrum of the 60's
- ▶ Negative Lachman's exam - ACL functionally intact

PreOp Stress Xrays

Medial Compression



Medial Stress



Evolving Criteria for UKA...



Contents lists available at [ScienceDirect](#)

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org



Primary Arthroplasty

Evidence-Based Indications for Mobile-Bearing Unicompartamental Knee Arthroplasty in a Consecutive Cohort of Thousand Knees



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Cathy Jenkins, MSc ^b, Stephen J. Mellon, PhD ^a, Christopher A.F. Dodd, FRCS ^b,
David W. Murray, FRCS (Orth), MD ^{a,b}

^a Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Botnar Research Centre, Oxford, UK

^b Nuffield Orthopaedic Centre, Oxford University Hospitals NHS Foundation Trust, Oxford, UK

Evolving Criteria for UKA...

- ▶ Analyzed a prospective series of 1,000 consecutive medial UKA's
- ▶ Review demonstrated that 68% of UKA's failed Kozinn & Scott's traditional criteria (contraindication group)
- ▶ Pain and function scores equivalent at 10yrs for contraindication and ideal groups
- ▶ No difference in 15yr survival score in patients under or over 60yo
- ▶ Equivalent functional outcomes found regardless of patellofemoral OA

Demographics

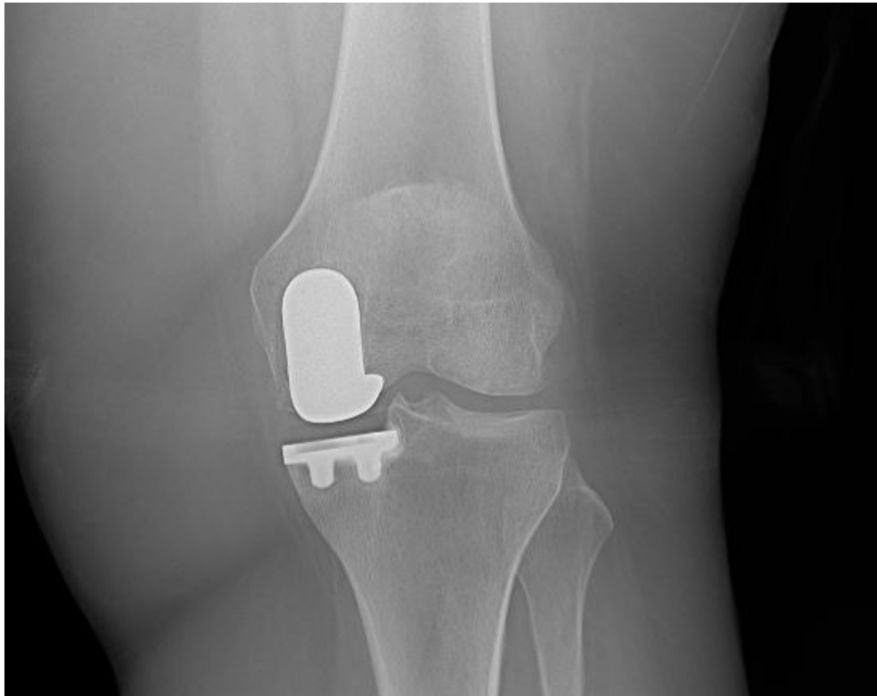
- ▶ **TKA's estimated to increase 673% by 2030** (Kurtz et al., AAOS 2006)
- ▶ Approximately 620,000 total knee replacement surgeries performed annually in the U.S.
- ▶ 4,000,000 people over the age of 50 in U.S. live with a total knee replacement
- ▶ Historically, less than 10% of patients with arthritis of the knee are candidates for partial knee replacement

The numbers are growing...

- ▶ Aging “baby boomer” population
- ▶ Increasing life expectancy
- ▶ Decreasing age of utilization of surgery
- ▶ Increasing Obesity?
- ▶ **TKA's estimated to increase 673% by 2030**

Types of UKA's

Medial 90%

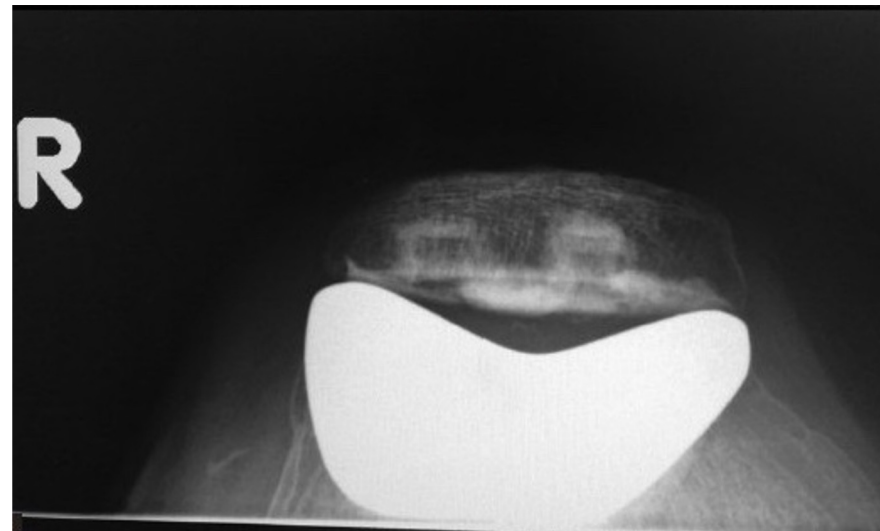
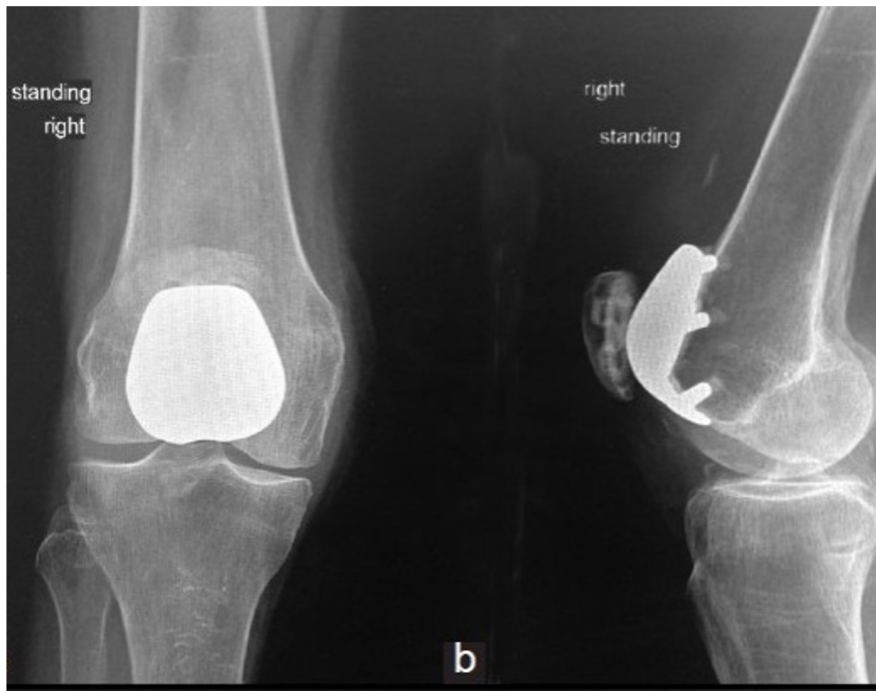


Lateral 10%



Types of UKA's

RARE “elusive”
Patellofemoral



Mobile-bearing vs Fixed-bearing UKA



► Preference for FIXED bearing:

1. Surgical technique similar to TKA
2. Remove failure mode of bearing dislocation
3. Easier ligament balancing
4. Decrease risk of over-correction of mechanical axis
5. Ignore ACL

Potential Benefits of Partial Knee Replacement

- ▶ 2/3 of normal joint retained
- ▶ “More normal” knee
- ▶ Less invasive procedure
- ▶ Early functional recovery⁴
- ▶ Greater range of motion, less stiffness¹
- ▶ Preferred to total knee²
- ▶ Less blood loss¹
- ▶ Lower 5 year complication rate⁶
 - ▶ 11% for totals and 4.3% for partial
- ▶ Lower rate of infection³
- ▶ Outpatient surgery

1. Rougraff et al 1991, 2.Cobb et al 1990, 3.Knutson et al 1990, 4. Laurencin et al 1991, 5. Willis-Owen et al 2009, Arno et al 2011, Pandit et al 2011 6. Brown et al. JOA 2012

United Kingdom Registry Adverse Outcomes of UKA vs TKA

- ▶ 25K UKA's matched to 75K TKA by propensity scores
- ▶ TKA adverse outcomes
 - ▶ Mortality
 - ▶ VTE, MI, Stroke
 - ▶ Readmission rate
 - ▶ LOS
- ▶ *“If 100 patients receiving TKA's were to receive UKA's instead, there would be 1 less mortality, but 3 more operations in the first 4 years after surgery.”*

Disadvantages of Partial Knee Replacement

- ▶ Revision rate is HIGHER?
- ▶ Total knee lasts 20 years, 85% of the time
- ▶ Partial knee lasts 15 years, 80% of the time

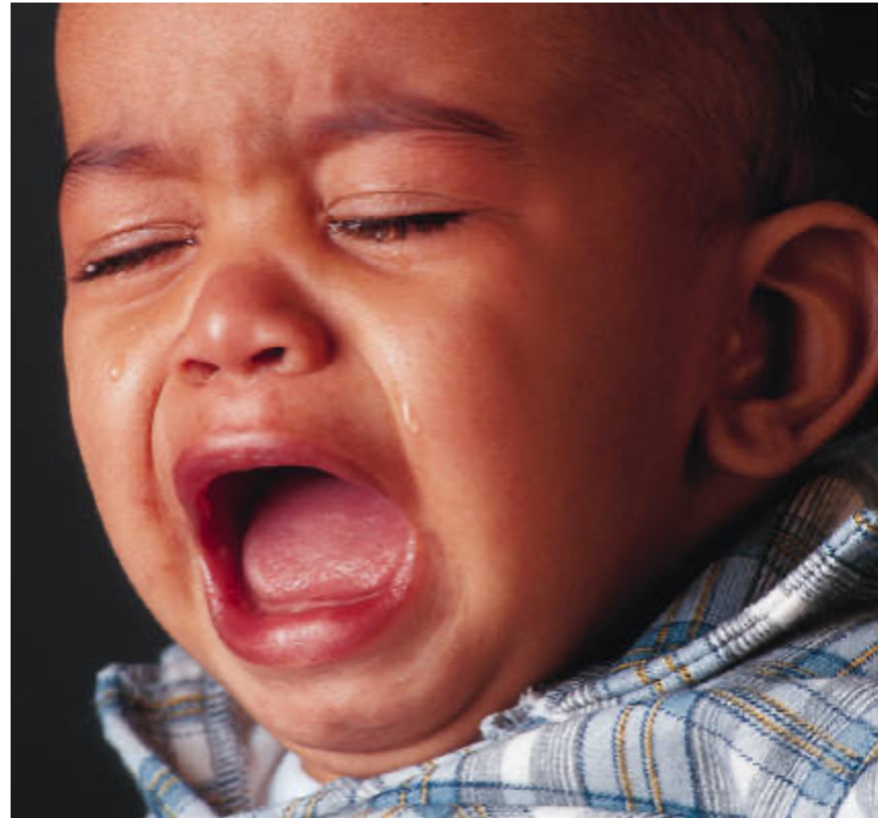
Painful TKA Surgeon's Zen

- ▶ No infection
- ▶ Well-fixed, well-aligned
- ▶ Implant track record good
- ▶ No flexion instability
- ▶ Adequate Range of motion
- ▶ No soft tissue issues - patellar clunk or popliteus catching



Painful UKA Surgeon's Nightmare

- ▶ No infection
- ▶ Well-fixed, well-aligned
- ▶ Implant track record good
- ▶ No flexion instability
- ▶ Adequate Range of motion
- ▶ No soft tissue issues



Surgeon Bias for Revisions

- ▶ Surgeons are...
- ▶ *Hesitant to revise a painful TKA without know cause*

- ▶ But...
- ▶ *Quick to revise a painful UKA without know cause*

Revision for Unexplained Pain in UKA vs TKA

- ▶ NJR of England and Wales review of 402,714 knee arthroplasties from 2003-2010 (JBJS)
- ▶ 366,965 TKA (91%), 35,749 UKA (9%)
- ▶ Revised at max of 8-yrs
- ▶ Revision for Unexplained Pain **UKA 23%, TKA 9%**
- ▶ 5-yr revision rate for unexplained pain, 1.6% for UKA and 0.2% TKA (8x higher)

Advantages of Robotic Assisted UKA

- ▶ Restoration of native knee biomechanics
- ▶ Accurate implant positioning
- ▶ Reproducible leg alignment (mechanical axis)
- ▶ Improved soft tissue balancing



Midterm Survivorship of Robotic-assisted Medial UKA

▶ Prospective, multicenter study to determine:

1. Midterm survivorship

- ▶ 97% Survivorship @ 5.7 yrs
- ▶ Mean time to revision 2.27 yrs
- ▶ 432 knees, 13 failures = 11 revisions to TKA, 2 UKA component revisions

2. Modes of failures

- ▶ Most common failure mode - 7/13 aseptic loosening of tibia

3. Satisfaction

- ▶ 91% satisfied or very satisfied

Survivorship and Patient Satisfaction Rates of Robotic-Assisted Unicompartmental Knee Arthroplasty: A 10-Year Follow-Up Study

Rushabh M. Vakharia, M.D.^{1,2}, Tsun Yee Law, M.D., M.B.A.¹, Martin W. Roche, M.D.²

¹ = Maimonides Medical Center, Department of Orthopaedic Surgery, Brooklyn, NY; ² = Holy Cross Hospital, Orthopaedic Research Institute, Ft. Lauderdale, FL

- ▶ 98% 10-yr survivorship with robotic-assisted medial UKA's
- ▶ Patient Satisfaction rates 97%
 - ▶ 81% Very Satisfied
 - ▶ 16% Satisfied
- ▶ 2 Revisions
 - ▶ Advance of lateral compartment OA at 5yr
 - ▶ Poly exchanged for Infection at 5 weeks post Op

Revision of Partial Knee

- ▶ Partial knee arthroplasty can be converted to a total knee arthroplasty with outcomes comparable to a primary total knee replacement
 - ▶ If performed by joint specialist
 - ▶ If no severe bone loss

Partial knee replacement

- ▶ *“Am I a candidate for partial knee replacement?”*
- ▶ 1/3 of patients are potentially candidates
- ▶ Must go to a surgeon who performs high volume partial knee replacement

Partial knee replacement

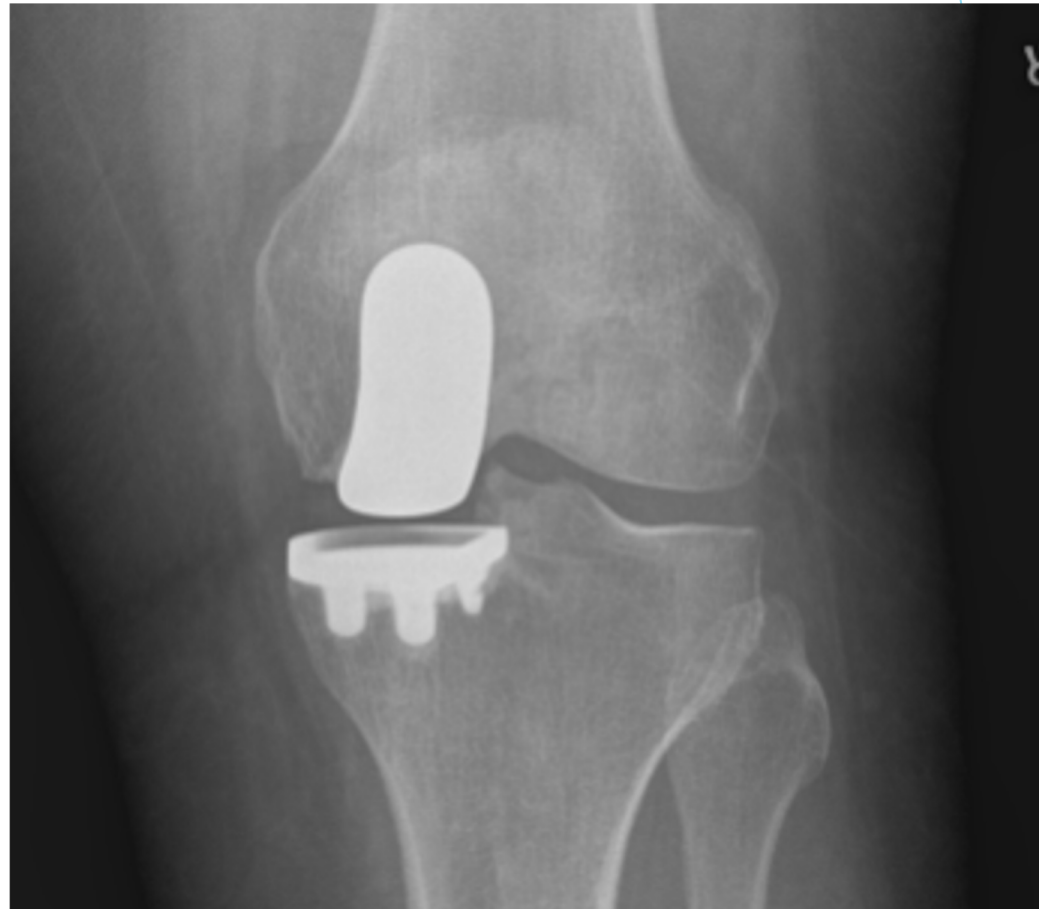
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Partial Knee Replacement – Case Studies

Before



After

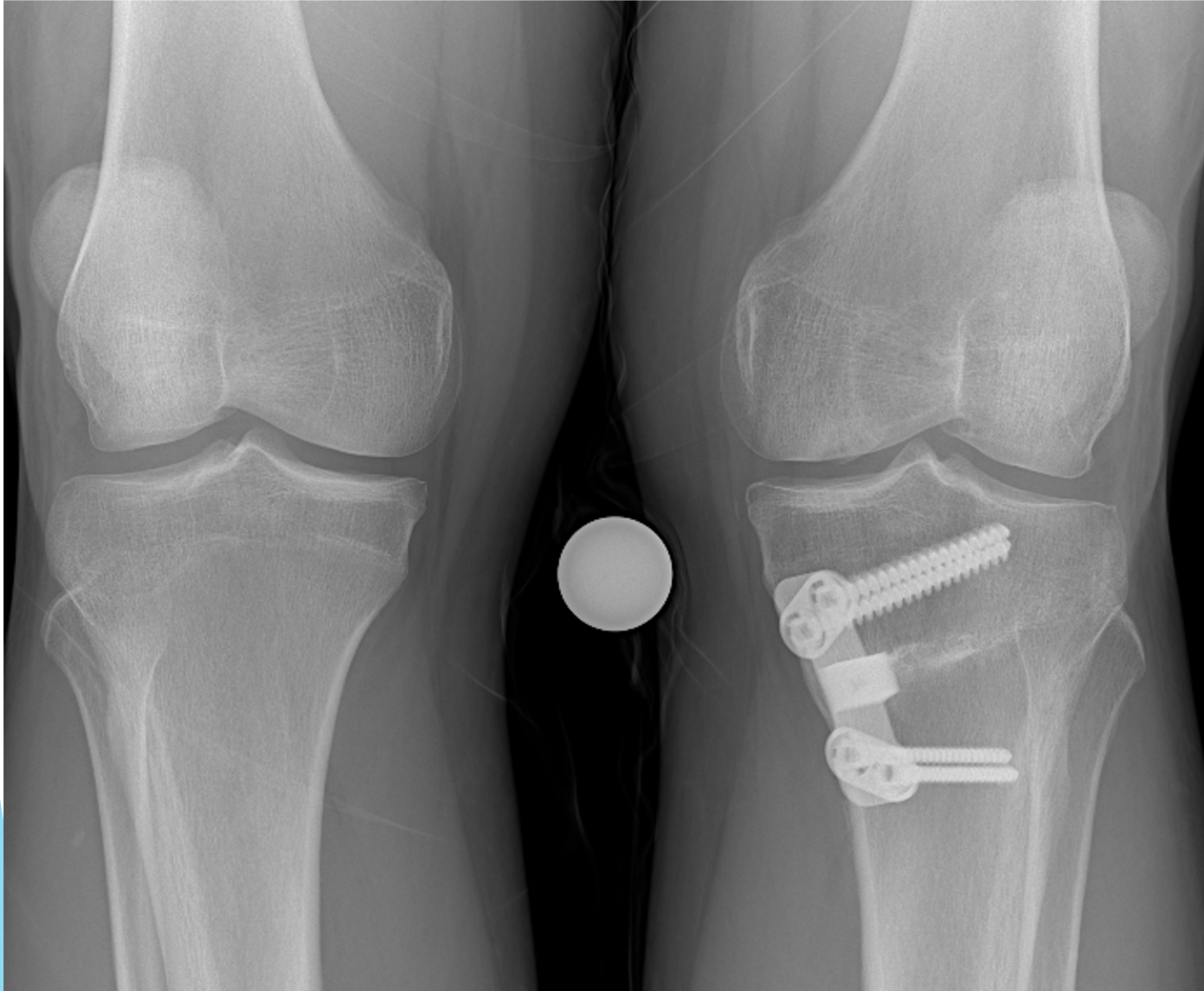


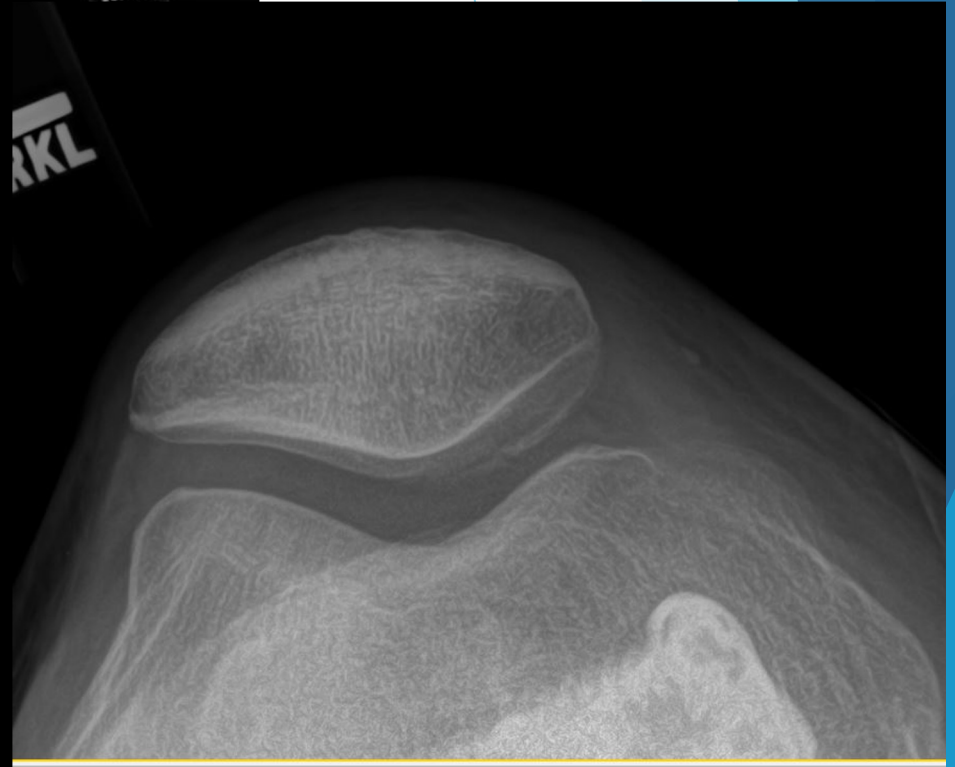
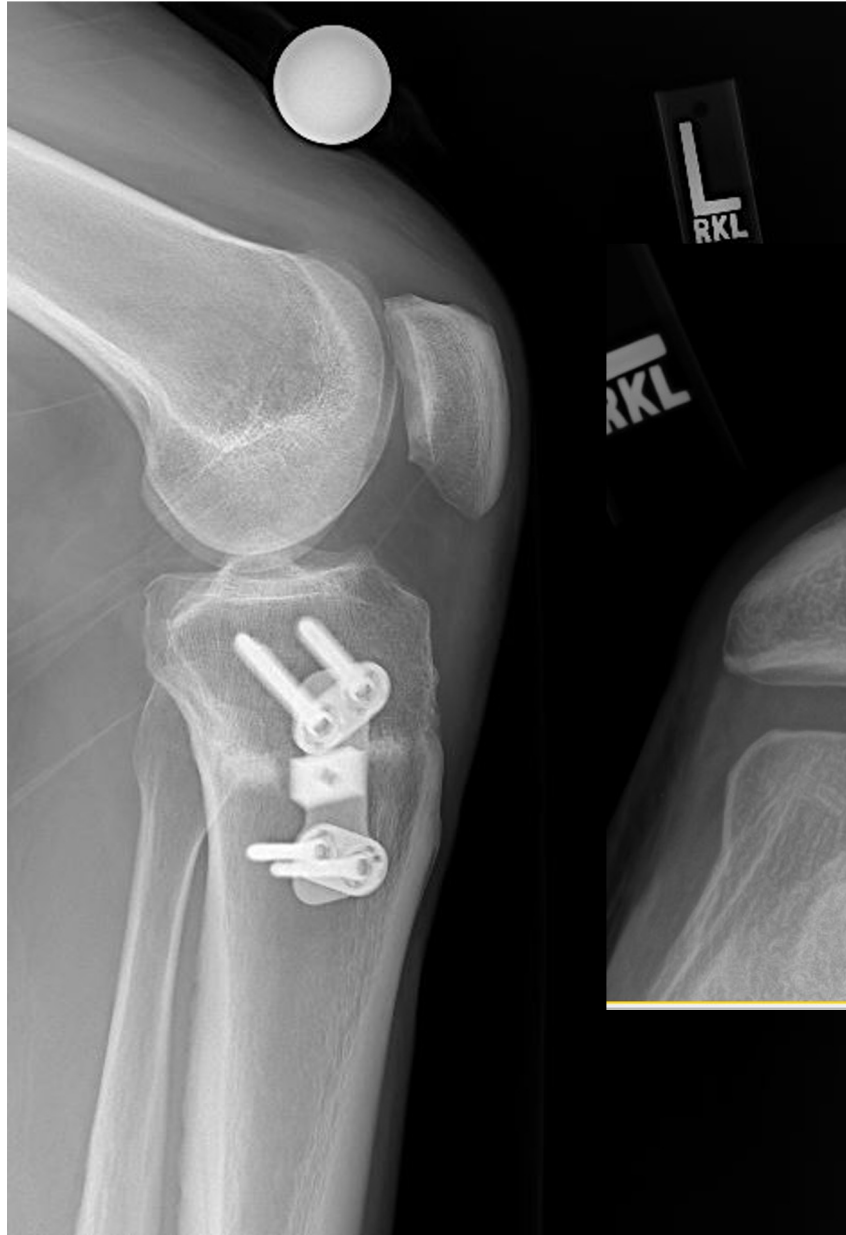
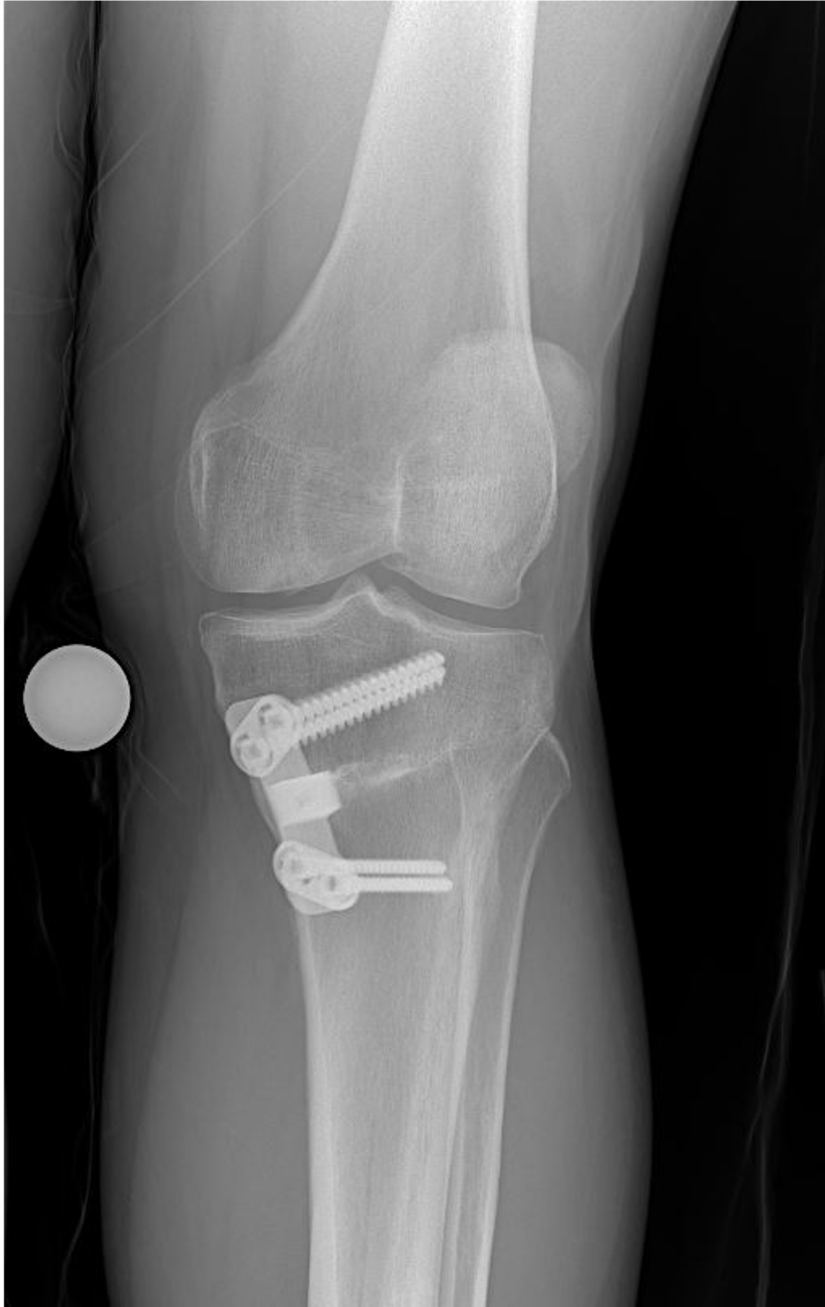
CASE 2 - 35yoM post traumatic MFC fx



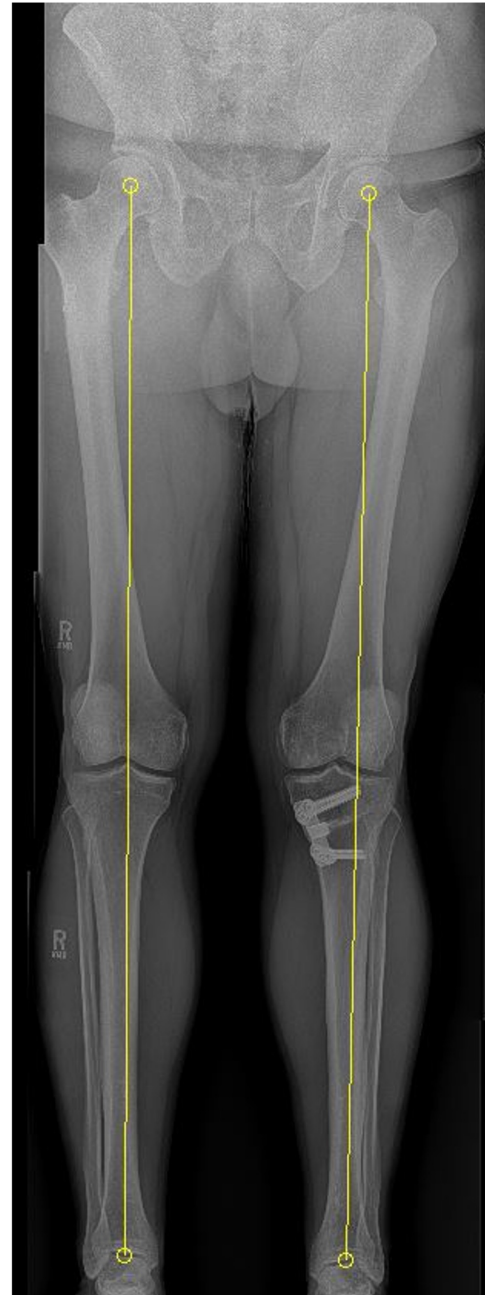


CASE 3 - 27yo MS/P HTO & MFC OATS

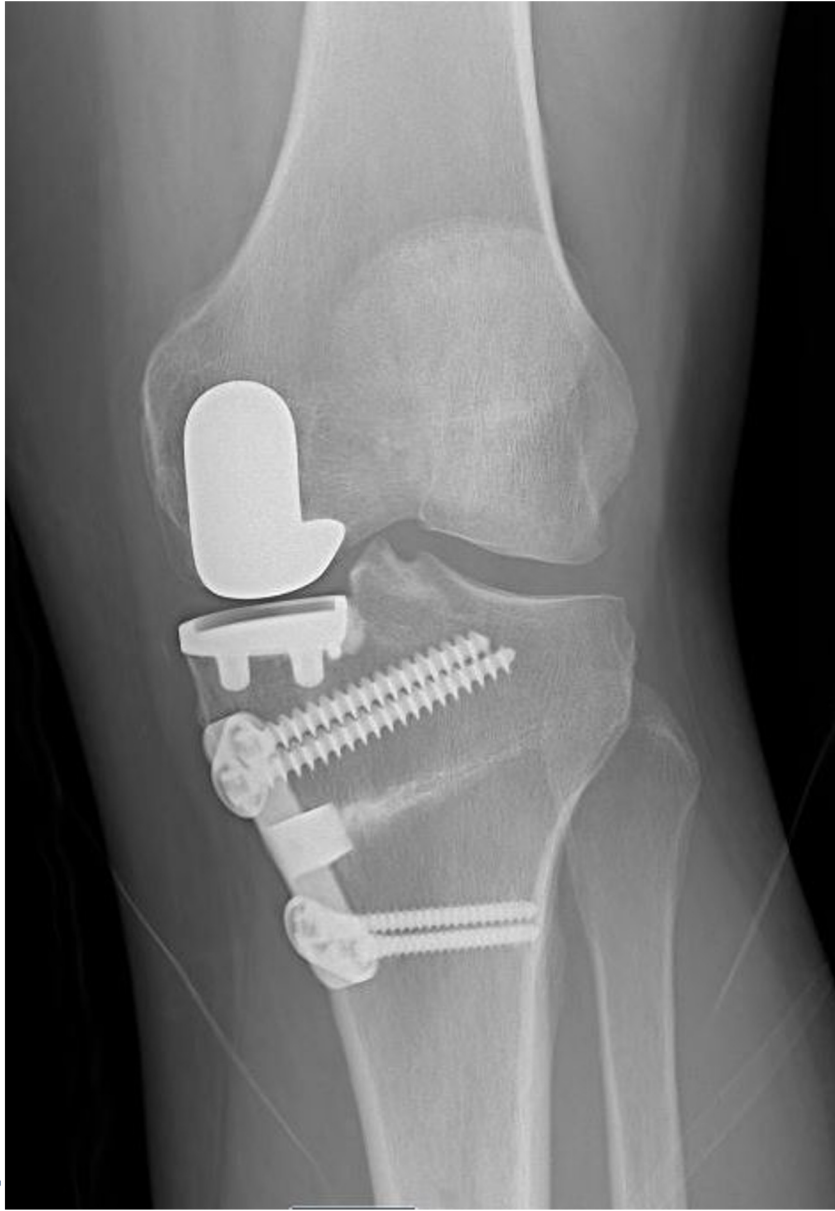




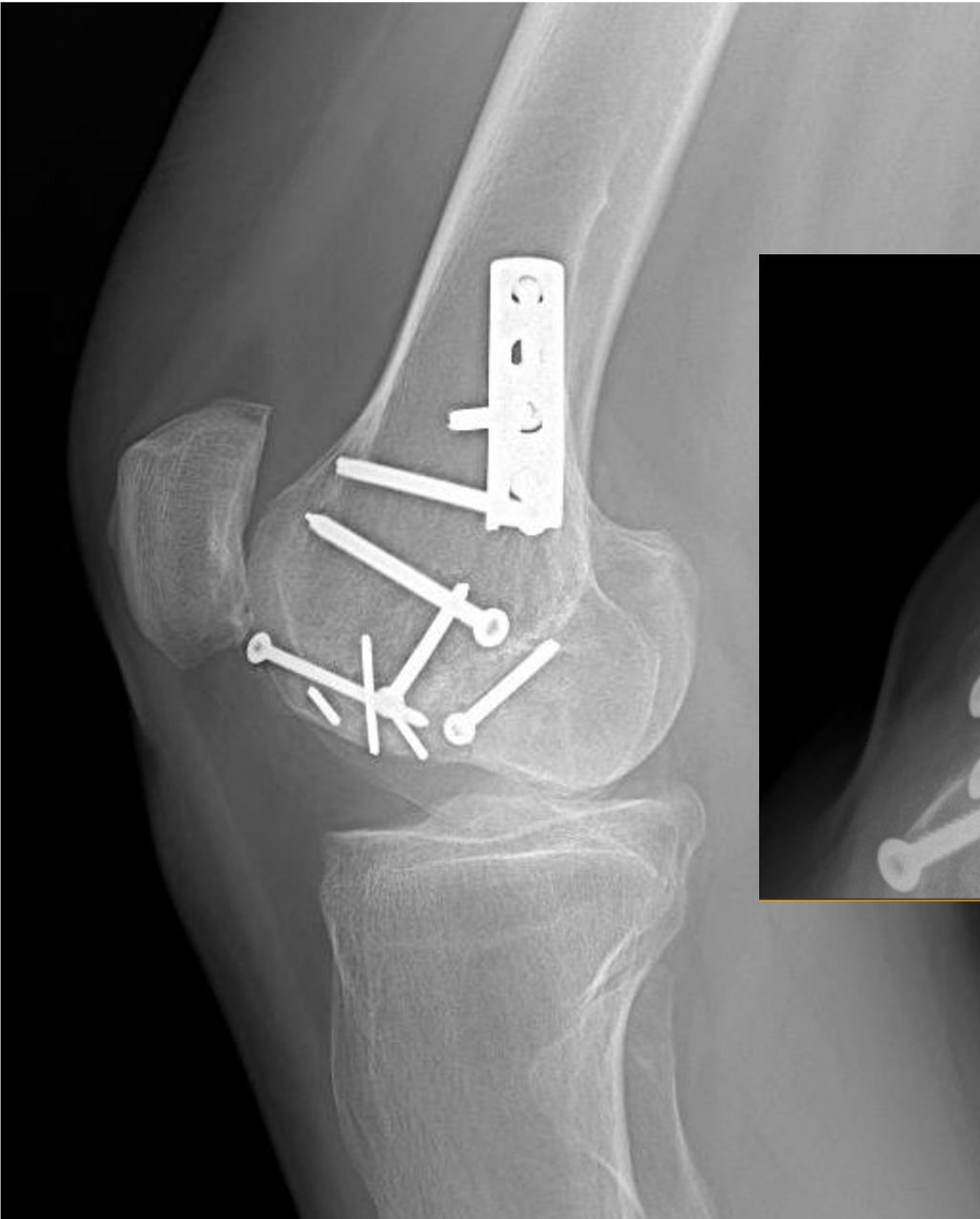
VALGUS Inducing HTO







CASE 4 - 42yoM s/p ORIF intrarticular distal femur fx





MAKOplasty®

Partial Knee Replacement

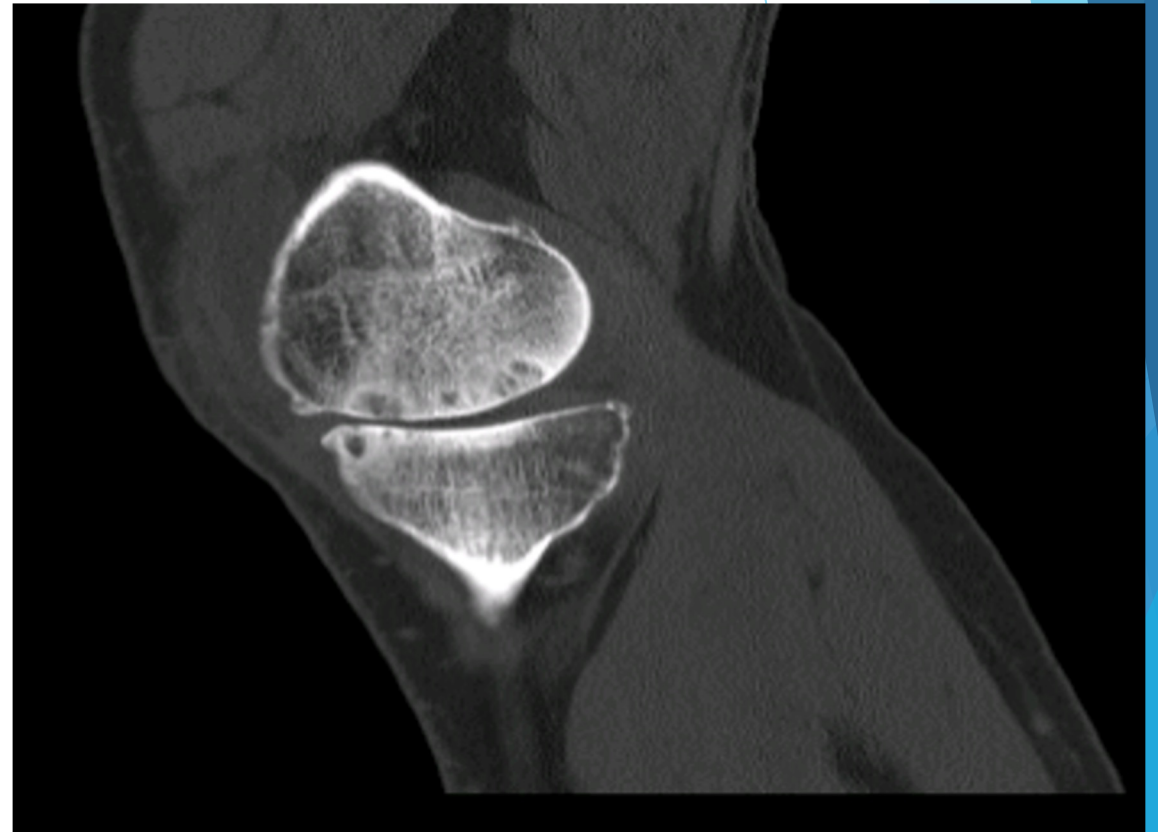
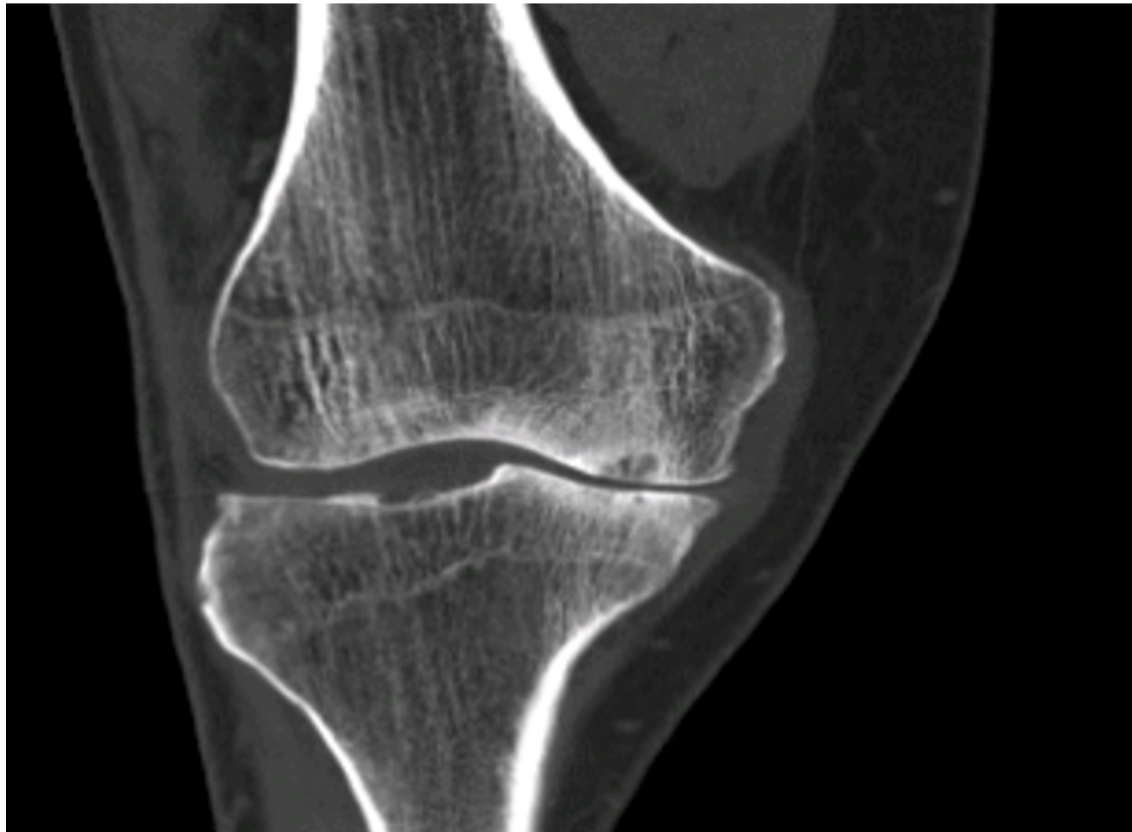
Brian T. Perkinson, M.D.

Orthopaedic Surgery, Adult Reconstruction of the Hip and Knee

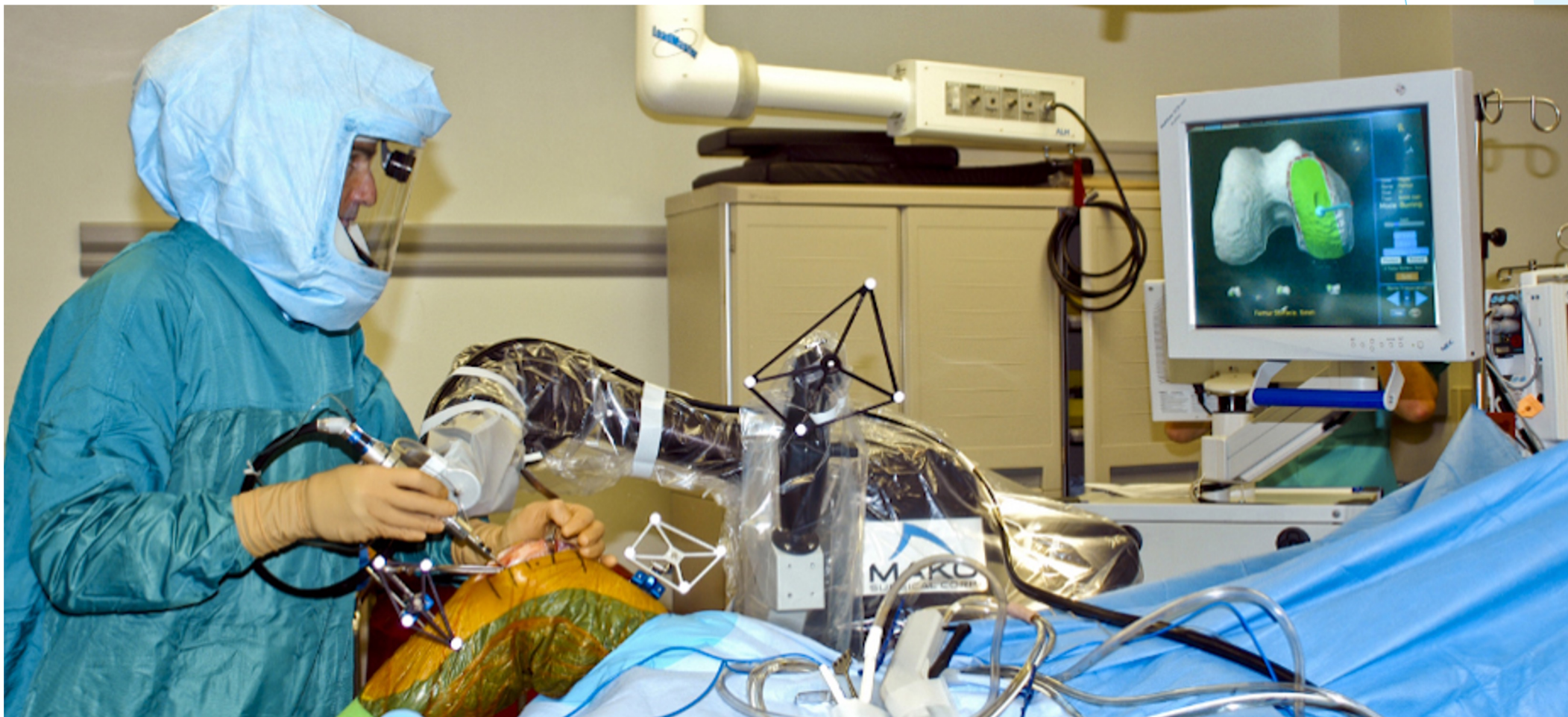
Bone & Joint Institute of Tennessee



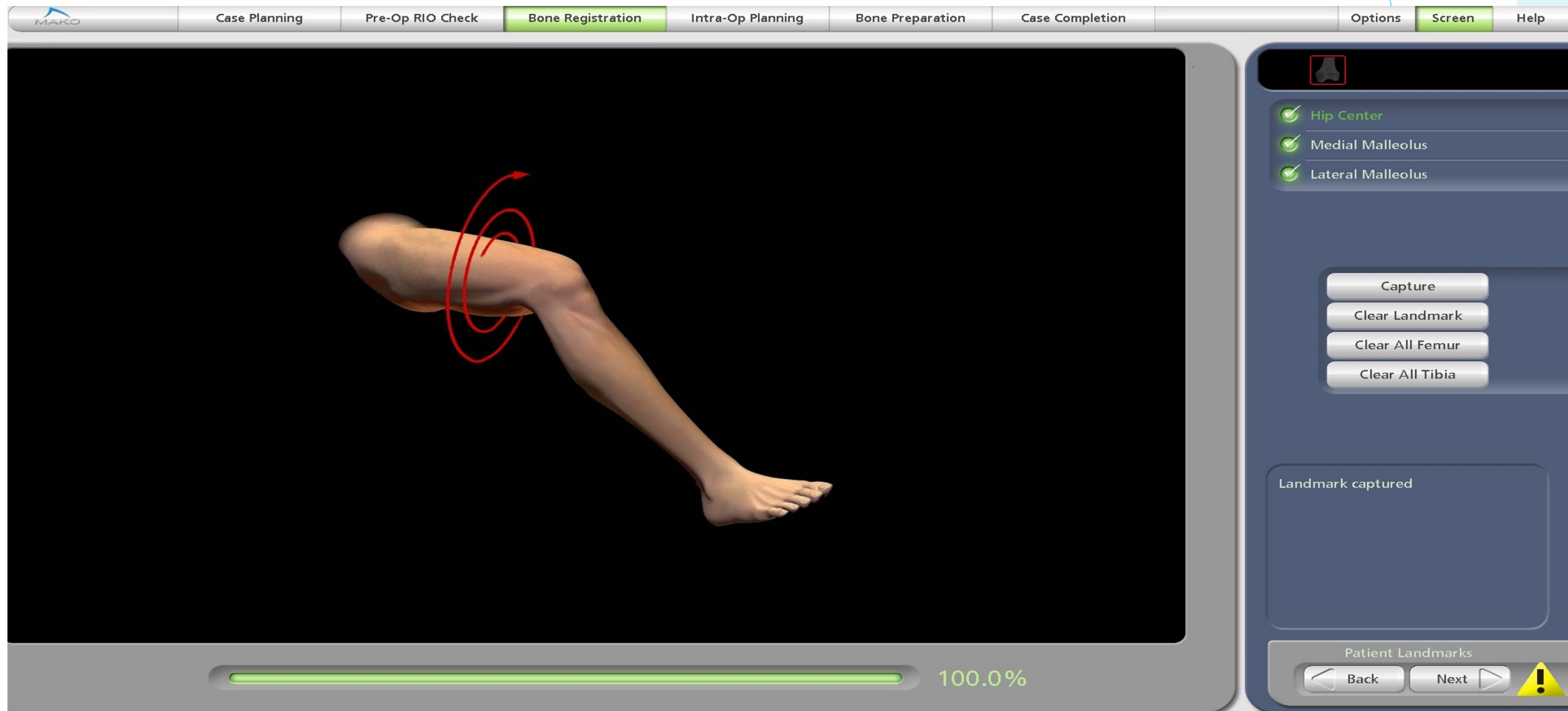
CT Scan of Osteoarthritis



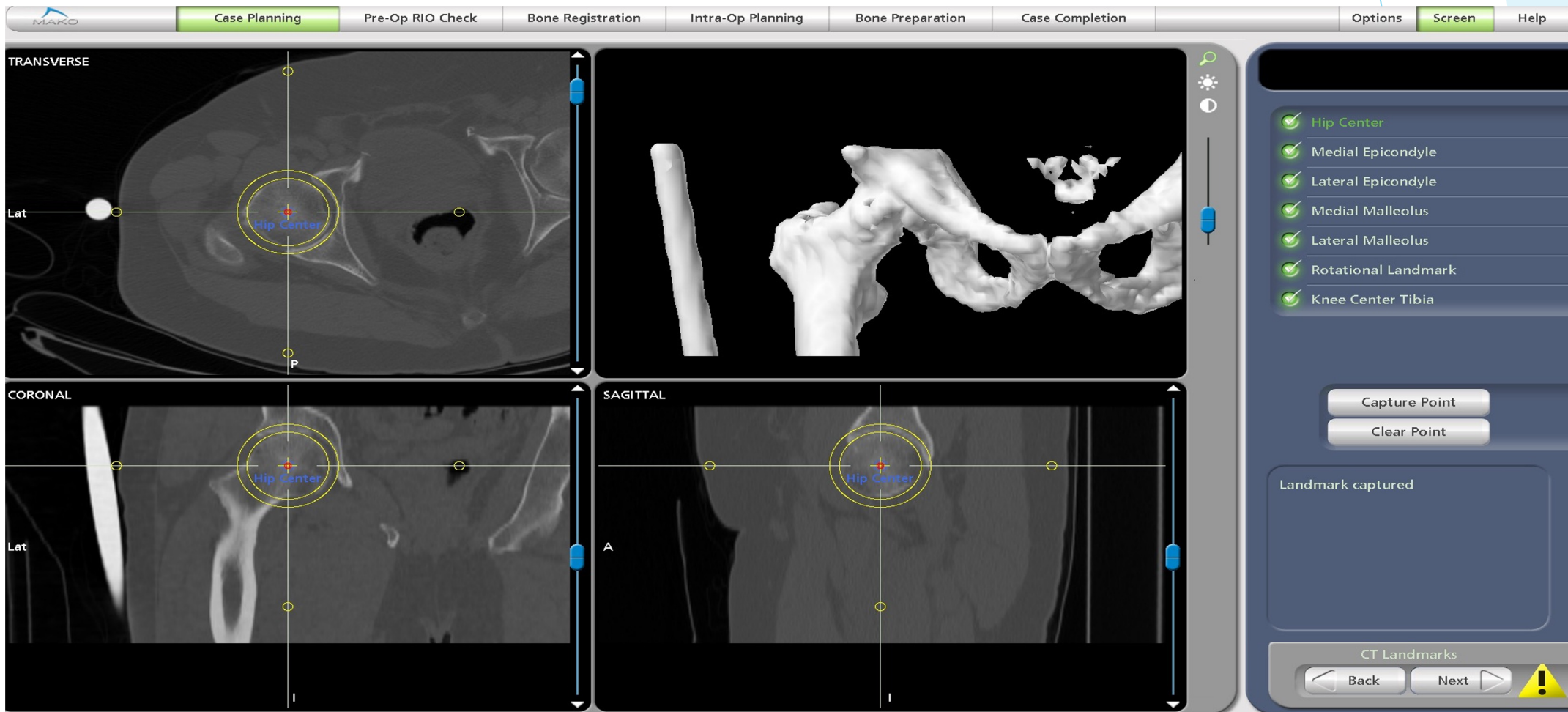
Operating Room Setup



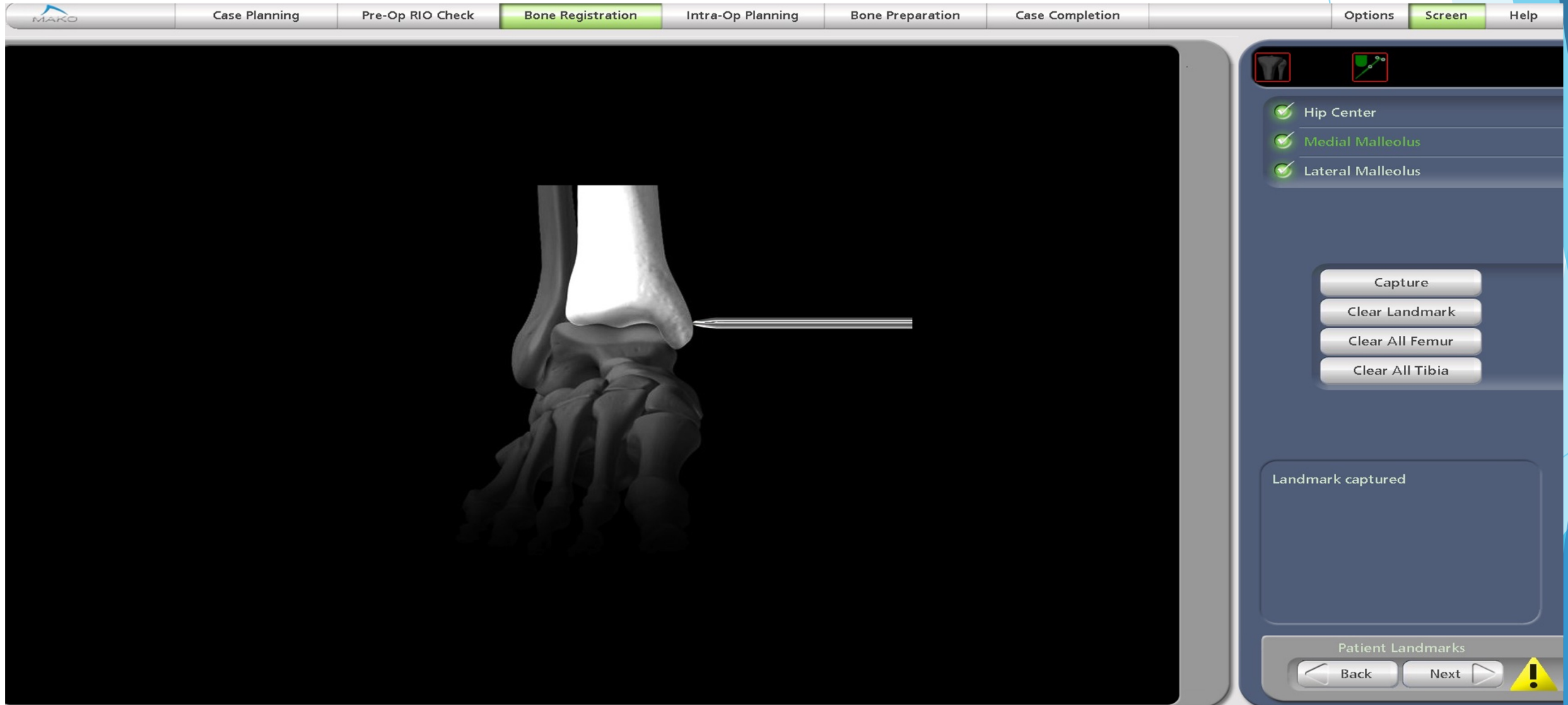
MAKO® Partial knee replacement



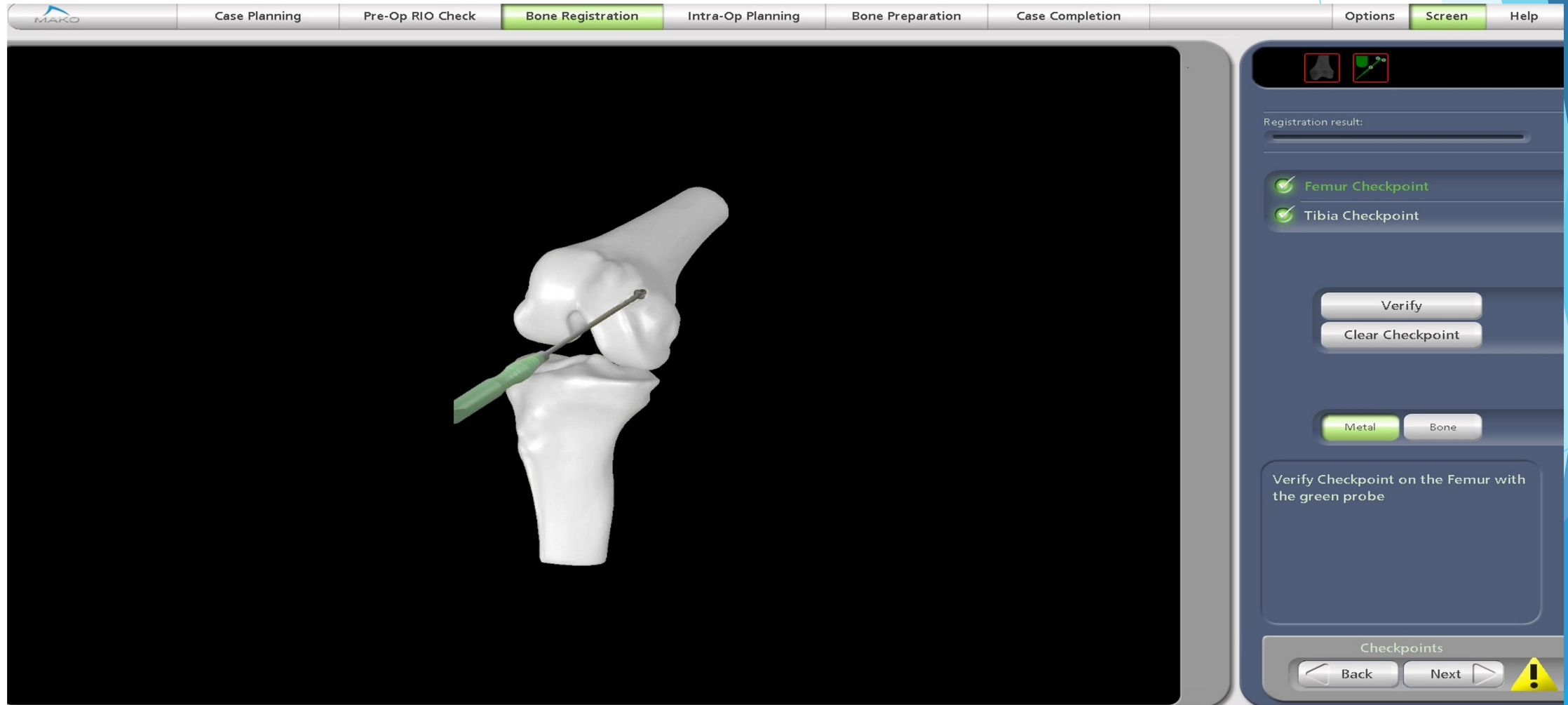
MAKO® Partial knee replacement



MAKO® Partial knee replacement



MAKO® Partial knee replacement



MAKO® Partial knee replacement

The screenshot displays the MAKO software interface for partial knee replacement case planning. The interface is divided into several sections:

- Navigation Bar:** Includes tabs for Case Planning (active), Pre-Op RIO Check, Bone Registration, Intra-Op Planning, Bone Preparation, Case Completion, Options, Screen, and Help.
- TRANSVERSE View:** Shows a CT scan of the knee joint with a pink outline of the femur and tibia. Landmarks are marked with yellow circles and labeled: Lateral Epicondyle and Medial Epicondyle. A white sphere is visible on the lateral side.
- CORONAL View:** Shows a CT scan of the knee joint with a pink outline of the femur and tibia. A landmark is marked with a yellow circle and labeled: Medial Epicondyle.
- SAGITTAL View:** Shows a CT scan of the knee joint with a pink outline of the femur and tibia. A landmark is marked with a yellow circle and labeled: Medial Epicondyle.
- 3D Model View:** Shows a 3D model of the knee joint with a blue dot on the medial epicondyle.
- Landmark List:** A list of landmarks with green checkmarks indicating they have been captured:
 - Hip Center
 - Medial Epicondyle
 - Lateral Epicondyle
 - Medial Malleolus
 - Lateral Malleolus
 - Rotational Landmark
 - Knee Center Tibia
- Buttons:** Capture Point, Clear Point, Back, Next, and a warning icon.

MAKO® Partial knee replacement

MAKO

Case Planning Pre-Op RIO Check **Bone Registration** Intra-Op Planning Bone Preparation Case Completion Options **Screen** Help

Distance to Bone

N/A

Femur

Tibia

Capture

Clear Last Point

Clear All Points

Verify

Touch the probe to the bone surface at each location identified by the large, blue spheres. Click 'Verify' to check registration accuracy at each location.

Overall Accuracy: 0.24 mm

Bone Registration

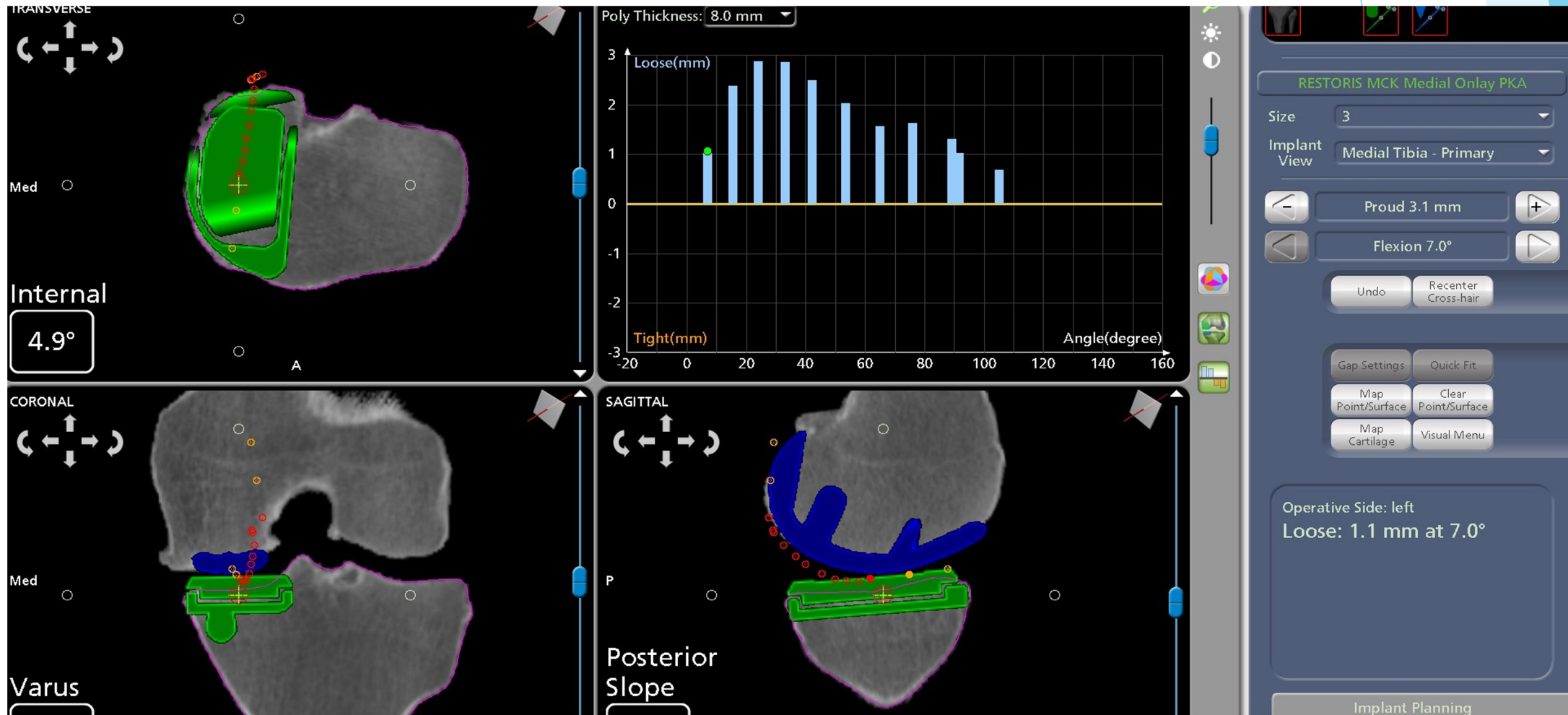
Back Next !

100.0%

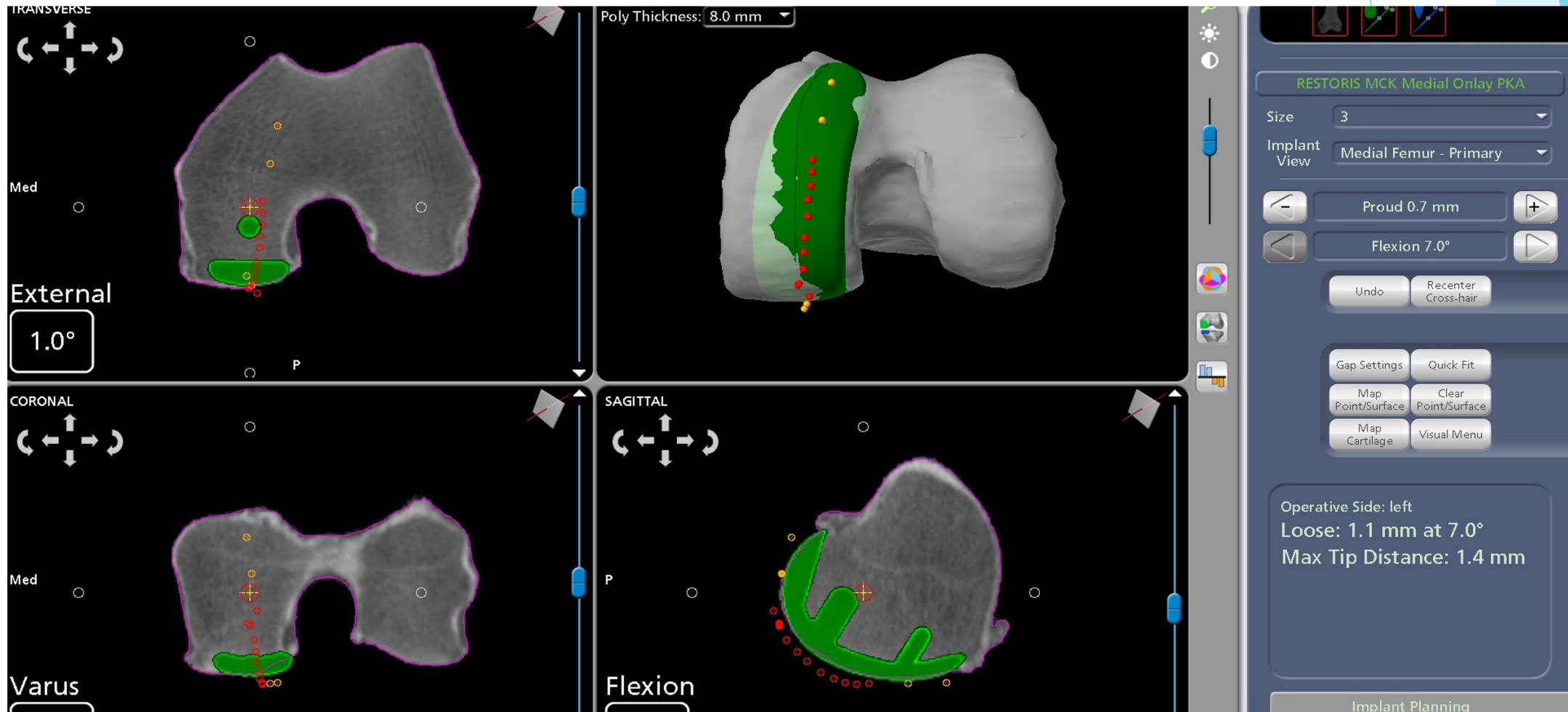
MAKO® Partial knee replacement

The screenshot displays the MAKO software interface during the Bone Registration phase. The top navigation bar includes tabs for Case Planning, Pre-Op RIO Check, Bone Registration (highlighted), Intra-Op Planning, Bone Preparation, Case Completion, Options, Screen, and Help. The main display area shows a 3D model of a bone with several registration points (green, yellow, and white spheres). To the right of the model, the text "Distance to Bone" is displayed above a box containing "N/A". Below this is a small inset image showing a cross-section of the bone with a red crosshair. The right-hand control panel features buttons for "Femur" and "Tibia" (both with checkmarks), "Capture", "Clear Last Point", "Clear All Points", and "Verify". A text box at the bottom right of the control panel provides instructions: "Touch the probe to the bone surface at each location identified by the large, blue spheres. Click 'Verify' to check registration accuracy at each location. Overall Accuracy: 0.26 mm". At the bottom of the interface, a green progress bar is shown next to the text "100.0%".

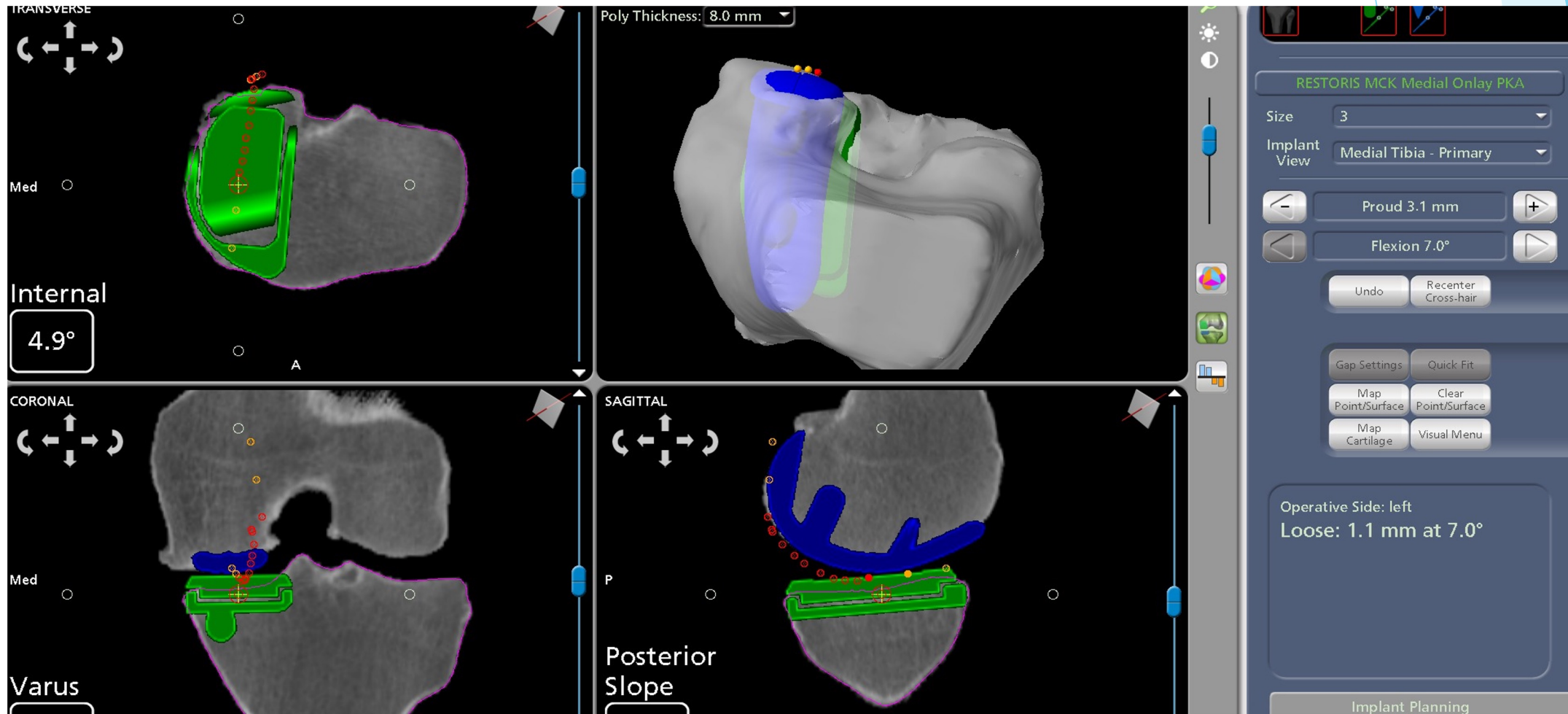
MAKO® Partial knee replacement



MAKO® Partial knee replacement



MAKO® Partial knee replacement



MAKO® Partial knee replacement

The screenshot displays the MAKO Intra-Op Planning software interface. At the top, a navigation menu includes: Case Planning, Pre-Op RIO Check, Bone Registration, **Intra-Op Planning**, Bone Preparation, Case Completion, Options, **Screen**, and Help.

The central 3D view shows a knee joint model with a blue femoral component and a green tibial component. A yellow vertical line and a cyan horizontal line indicate the alignment axes. To the right of the 3D view, the following alignment parameters are displayed:

- Flexion: 103.5°
- Varus: 1.0°
- External Rotation: 1.5°

The right-hand control panel contains the following elements:

- Buttons: Capture, Delete, Live, Review.
- Navigation: Pose 8 (with left and right arrows).
- Joint Balancing section: Back, Next, and a warning icon.

A text box in the lower right of the control panel reads: "MAKO Surgical recommends that you follow standard surgical practice and take at least 4 poses - full extension, full flexion, and two angles in between."

Partial Knee Replacement

Before



After







10:12

Thursday, January 23



BONE AND JOINT
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