

Innovative Hip and Knee Treatments

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Disclosures

- I have no royalties, personal or family connections to technology or companies presented.

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Gunner – Alpha Dog



Knox – Goober



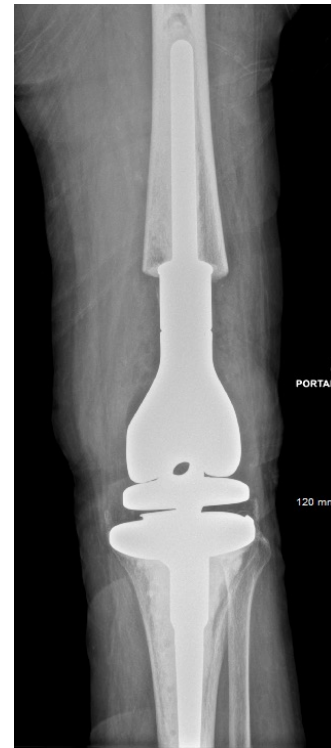


Erik C. Bowman, MD
*Orthopedic Surgeon Specializing
in Hip and Knee Reconstruction*

- University and Medical School at University of Tennessee
- Joint Reconstruction fellowship – Louisville, KY
 - Trained by Dr. Arthur Malkani - designer of Stryker Accolade, one of the highest consulted surgeons for Stryker and MAKO robotic surgery
 - 500+ cases in revision hip and knee surgery and MAKO
- Residency – Omaha, Nebraska
 - Trained by Dr. Kevin Garvin - 2019 president of the Hip Society
 - 18 months/60 months of training in joint reconstruction (20 weeks for most residency programs)

My Practice

- 80 % total joints
 - 25 % are revisions
 - 10 % of primary, uncomplicated Total Joints go home the day of surgery
- Offices
 - Boulder
 - Lafayette
 - Yuma



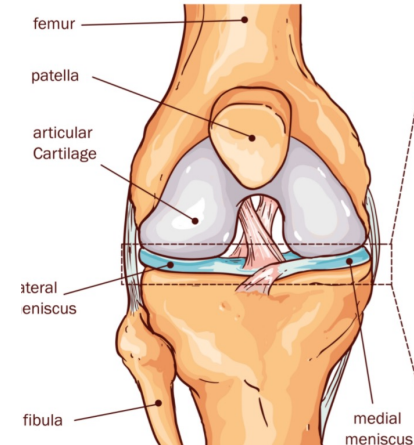
Lowest Complication Rate in Boulder



Boulder Centre
for Orthopedics

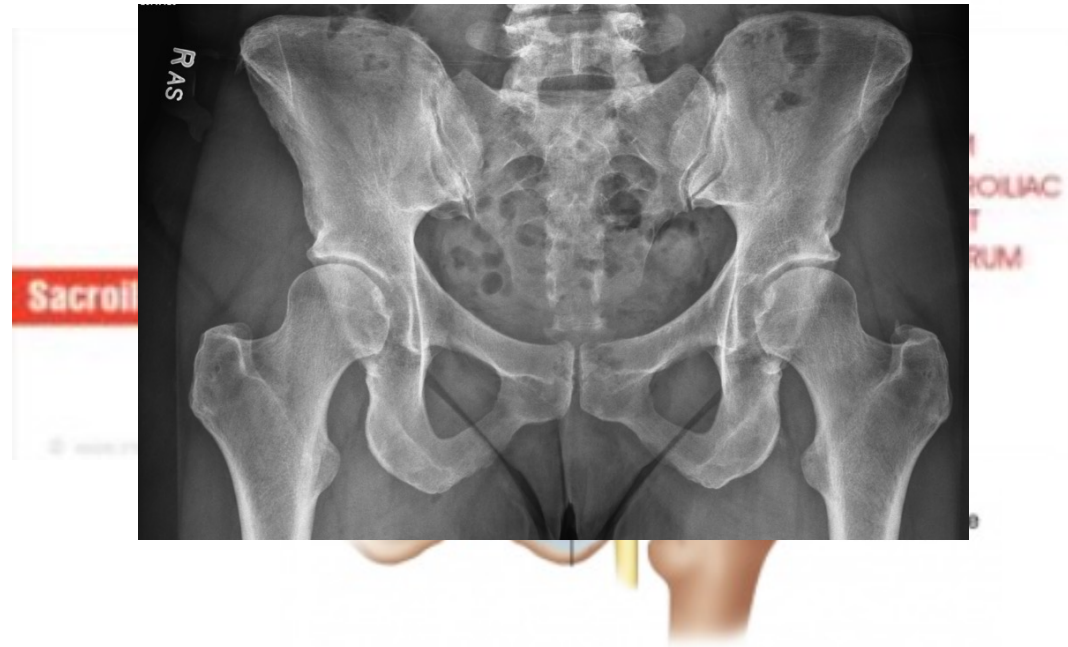
Knee Pain

- 3rd Most common cause of pain
- Acute
 - Meniscus tear
 - Ligament injury
 - Tendon injury
 - Bone bruising
- Chronic
 - Meniscus tear
 - Arthritis
 - Chronic tendinitis

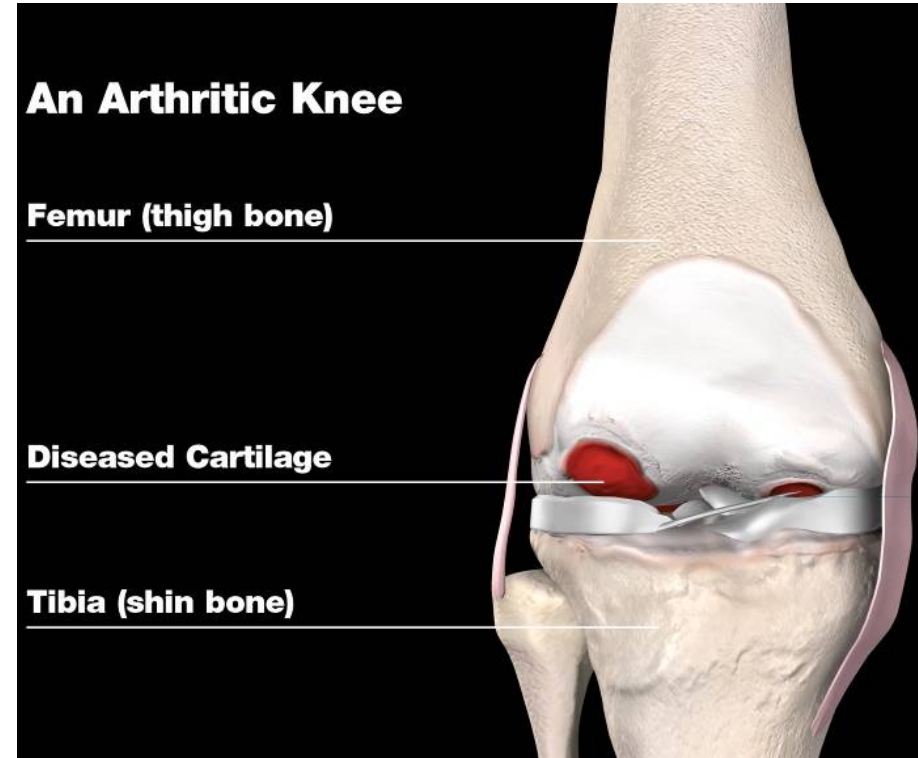
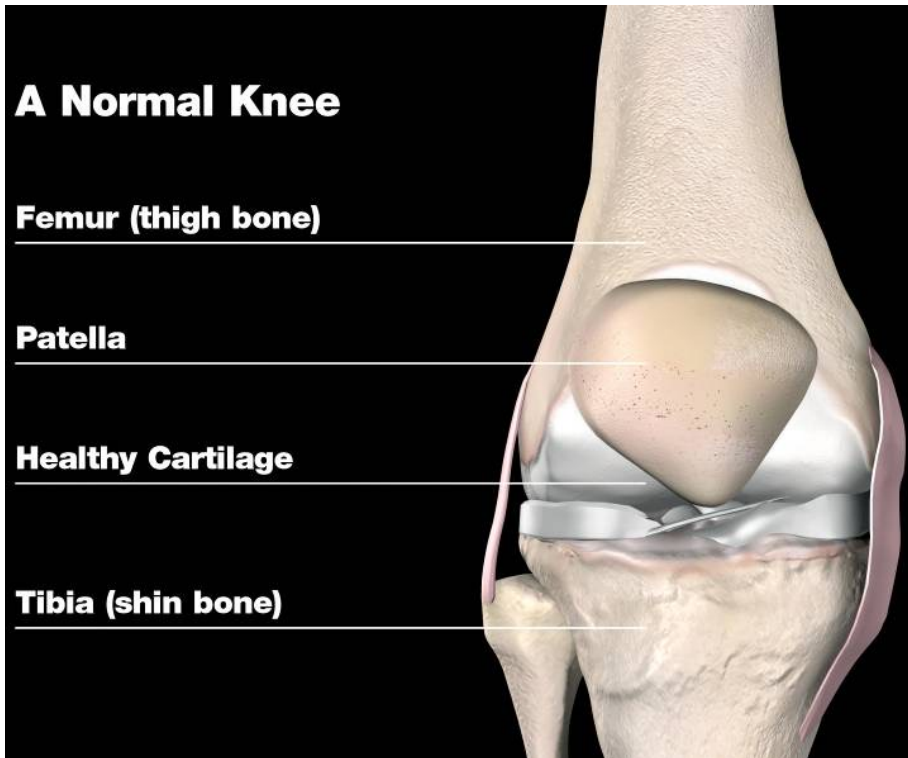


Hip Pain

- Location
 - Lateral (side)
 - Bursitis
 - Tendon tear
 - Buttocks
 - Sciatic nerve
 - Radiculopathy
 - Stenosis
 - Lower side back
 - SI joint
 - Groin
 - Arthritis
 - Labrum tear
 - Iliopsoas tendonitis/bursitis



What is Arthritis?



Osteoarthritis - Worn out articular cartilage

Inflammatory Arthritis - Systemic Process
ex: Rheumatoid, Psoriatic, etc.





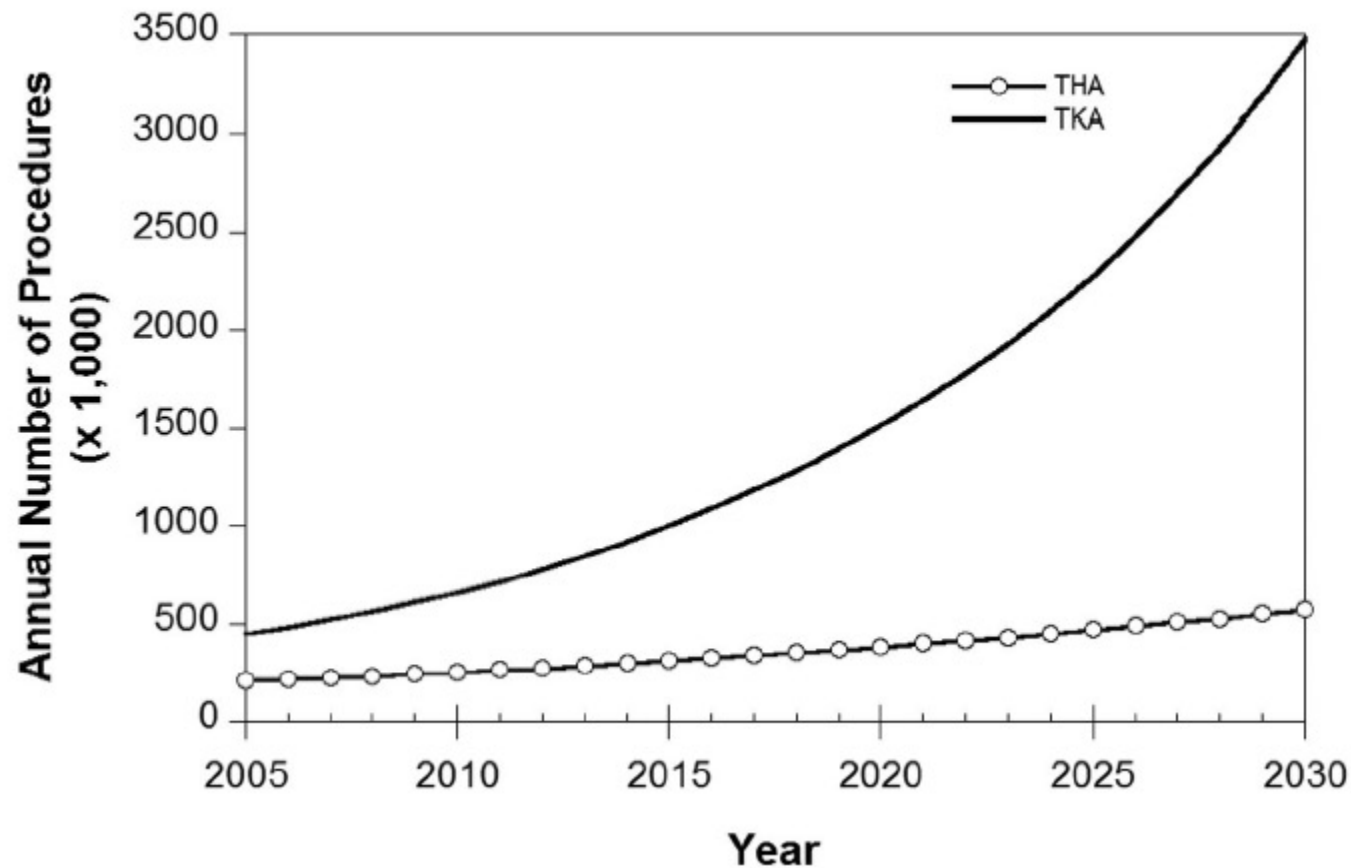


X-ray Showing Arthritis



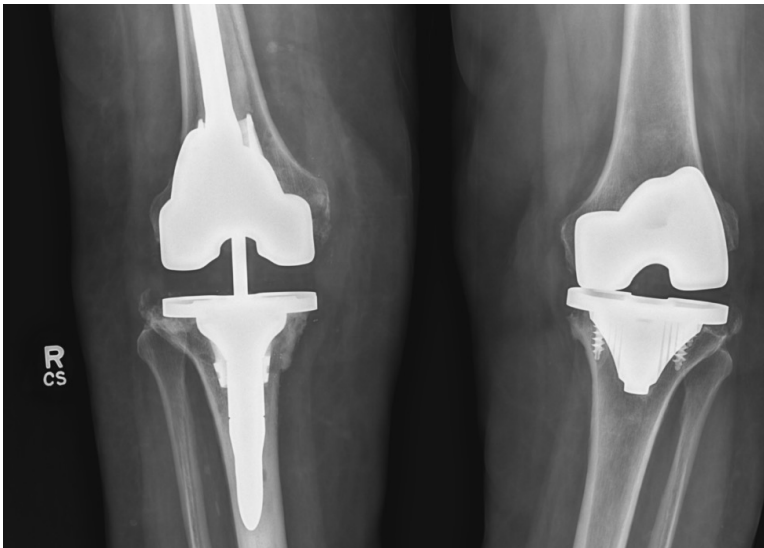


Primary Hip and Knee Replacement Projection 2005-2030



Joint Replacement

- Designed for the older, more sedentary patient
- <65 were not offered replacement
 - Replacement “wore out”



New Generation of Patients aka Coloradans

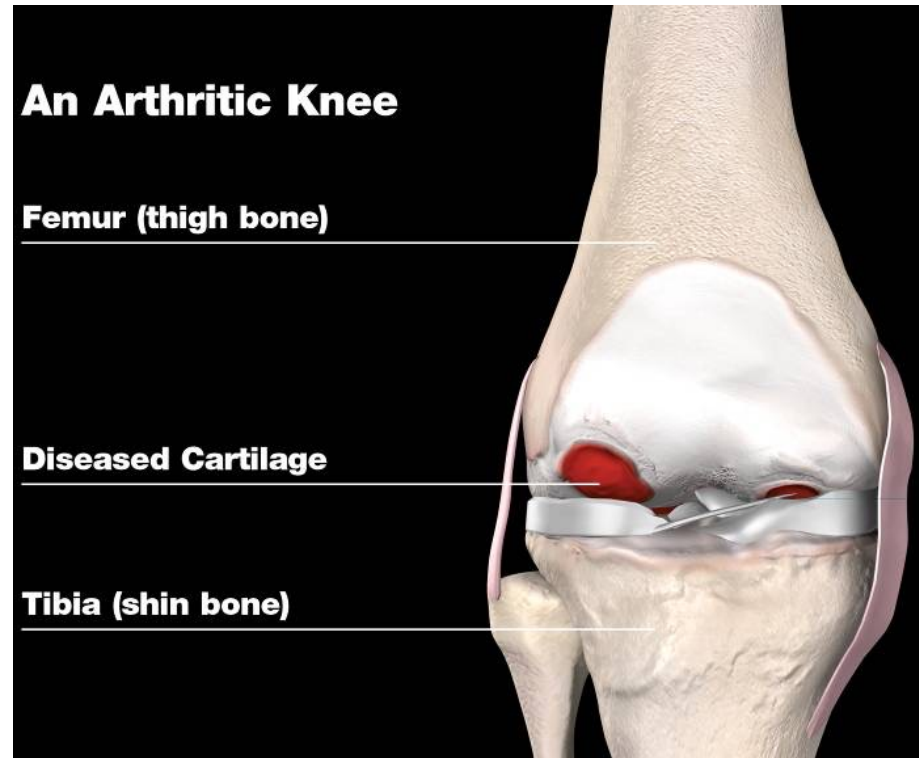
- Patients are older (>80) and younger (<55)
- Expectations are much higher
- Longevity?
 - Newer technology
 - 3D printed implants
 - Improved manufacturing



How Can I Avoid/Delay a Joint Replacement?

Treatment Options for Knee and Hip Pain

- Rest, ice, and heat applications
- Medications for inflammation and pain
- Lifestyle modification
- Physical therapy
- Joint fluid supplements
- Knee arthroscopy
- Total joint replacement



RICE and NSAIDs

- Rest, Ice, Compression, Elevation
- Tylenol
- Ibuprofen, Alleve, Celebrex
- Topical compounds – Voltaren, Pennsaid
- Glucosamine/Chondroitin
- Low inflammatory diet?



Activity Modification and Weight Loss

- Avoiding high impact activities, i.e., running, jumping
- Weight Loss: Goal BMI < 40
 - 20 lbs weight loss = 100-180 lbs less force on joints



Joint Injections

- Cortisone
 - Short and long
- Visco-supplementation
- Platelet rich plasma (PRP)
- Stem Cells



Cortisone

- Effective in the short term
- Decreases inflammation
- Pros
 - Cheap
 - One injection
- Cons
 - Toxic to cartilage
- Every 3-4 months



Visco-supplementation

- “Rooster comb” shot
- Hyaluronic acid
 - Substrate of cartilage
- Mimics cartilage
- Pros
 - Can last longer
 - Does not damage cartilage
- Cons
 - Expensive
 - Multiple injections



PRP: Platelet Rich Plasma

- Injections of concentrated blood products to enhance healing

**Not covered by insurance, expensive*



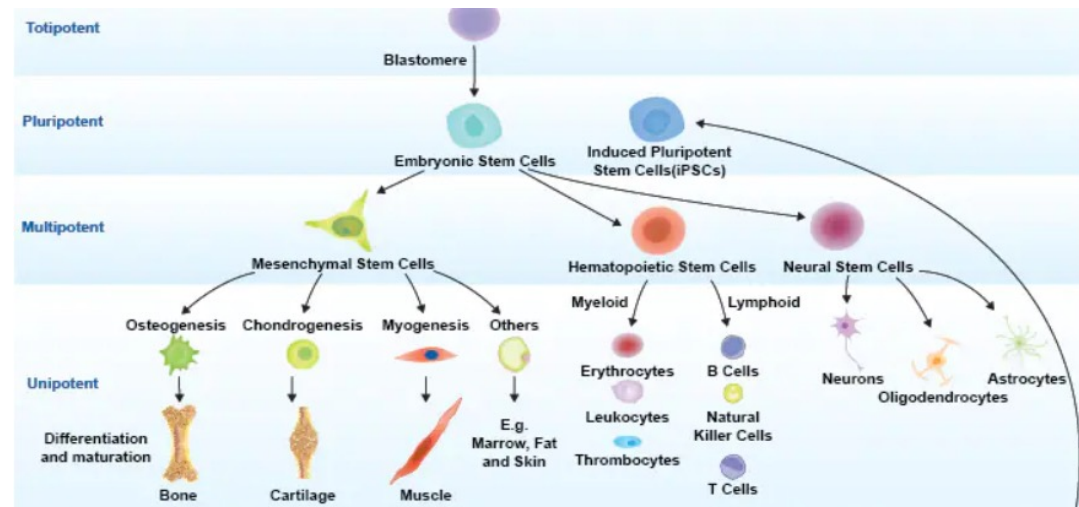
PRP: Platelet Rich Plasma

- Injections of concentrated blood products to enhance healing
- Cannot heal irreversible changes
- OOPC > \$600



Stem Cells

- Obtain stem cells, concentrate them and inject them into the joint to decrease inflammation and promote healing
- How do they know what to turn into?
- OOPC > \$5000



When is surgery right for me?

When it is right for YOU

- Pain is severely affecting activities
- Not responding to treatment
- Healthy
- Social factors



Modern Hip and Knee Replacements

- Since the 1960s and 1970s technology has improved longevity and function
- Recent problems
 - Polyethylene wear
 - Mechanical loosening of prostheses
 - Dislocation
 - Restoration of anatomy



Plastic Wear Solutions

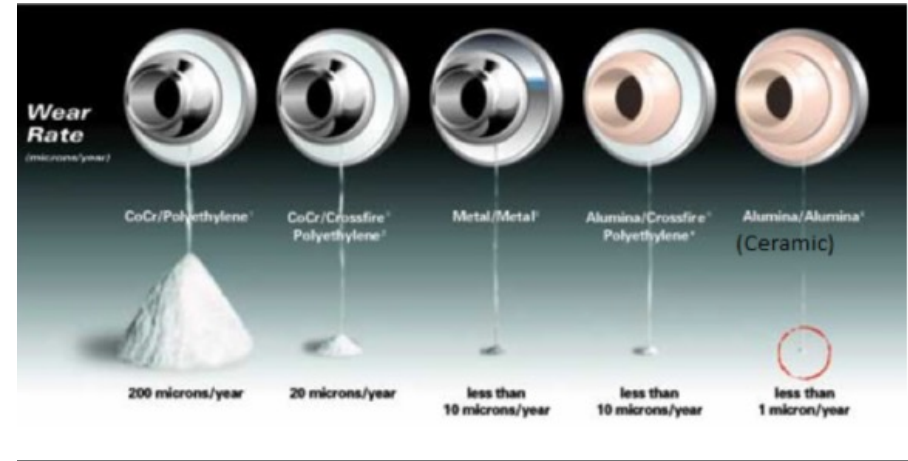
Conventional Metal Ball on Polyethylene

- Conventional plastic wear
 - Lead to severe osteolysis
 - Early revision



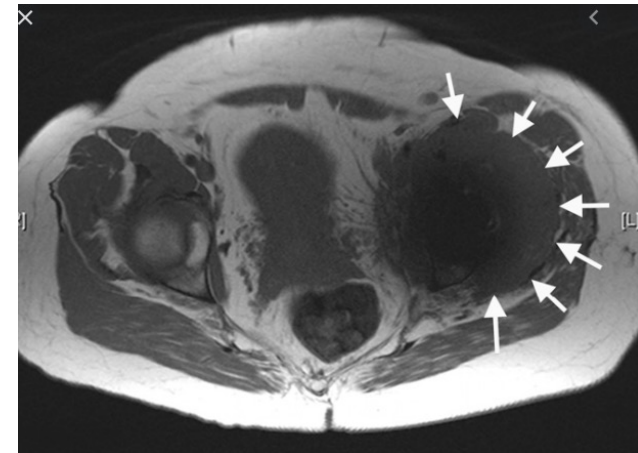
Conventional Metal Ball on Polyethylene

- Traditional solutions
 - thicker polyethylene
 - Smaller metal femoral heads
- Alternative bearing surfaces
 - Metal on metal
 - Ceramics on ceramic
 - Ceramic on poly



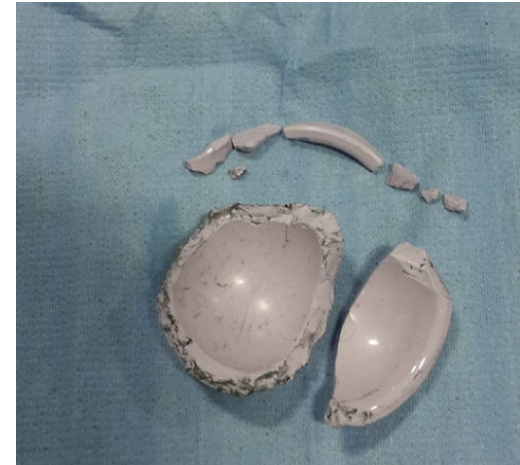
Metal on Metal Hip Replacement

- Popular in early 2000s
- 60 times less wear
- Early failure
 - Metallosis
 - pseudotumor
- Led to recall and lawsuits
- The Birmingham Hip resurfacing MoM has an excellent track record



Ceramic on Ceramic

- Exceptional wear but can be catastrophic
- Also can cause squeaking
- VIDEO



Technological Advances in Polyethylene

- Sterilization process
 - Oxidation caused accelerated wear
 - Sterilizing in inert gas
- Manufacturing process
 - Reactions to make polyethylene created free radicals
 - Free radical quenching processes
 - Annealing
 - Melting
 - Vitamin E
 - Cross-linking of branches



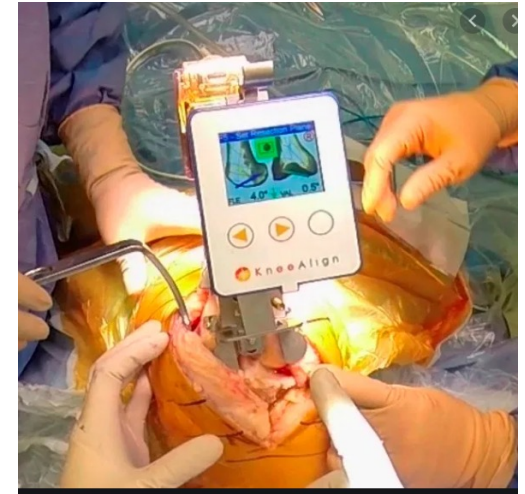
Modern Polyethylene

- Highly cross-linked +/- vitamin E
 - Studies show exceptional wear patterns
 - Approach metal bearing surface
- Limited to no osteolysis
- Allows for thinner plastic liner
 - Allows for larger femoral heads => less dislocation risk
- Longevity that could potentially last >25 years



Advanced Technology

- Computer Navigation
- Advanced robotics
- Sensor technology



Loosening Solutions

Hip Implant Fixation

- Traditional femoral implants were cemented
 - Still popular in Europe and Australia
 - Associated with early loosening
 - Highly dependent on technique
 - 4th generation techniques have comparable survival to cementless
- In the USA 90 % of femurs are fixed with cementless technology



Cementless Technology

- The bone is machined to fit the prosthesis
- Allows bone to grow on or into the metal
- Special coatings (e.g. hydroxyapatite) to augment growth



Knee Implant Fixation

- Cement is the gold standard
- Recently, renewed interest in cementless total knees
 - Improved design
 - 3D printed technology
 - Improved surgical technique
 - Highly dependent on perfect cuts
- Advantages of cementless
 - Theoretical longer survival
 - Quicker surgery



Hip Dislocation Solutions

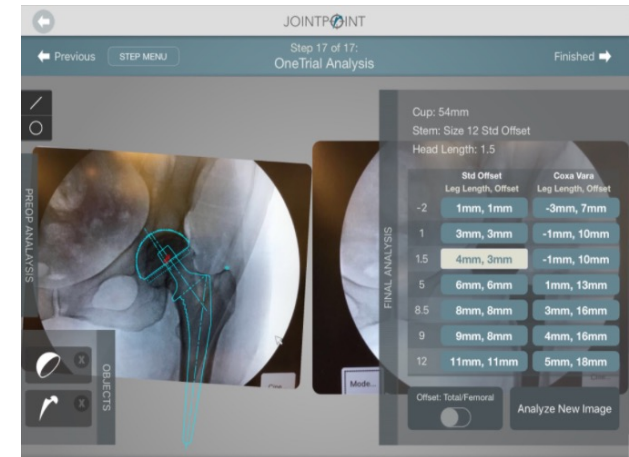
Dislocation

- #1 complication of Hip Replacement
 - Previous hip surgery
 - Soft tissue damage
 - Malalignment



Advancements in Technique

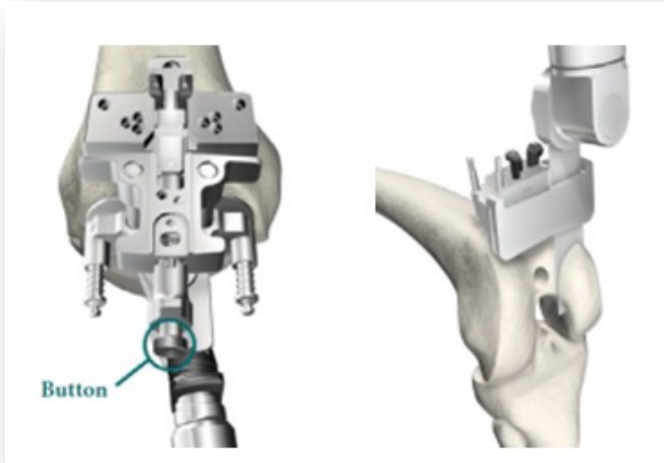
- Improved surgical techniques
 - Capsular repair
 - Respected soft tissue
- Advanced technology for placement of components
 - Xray guidance
 - Computer Navigation
 - Joint Point
 - Robotic-assisted technology
 - MAKO



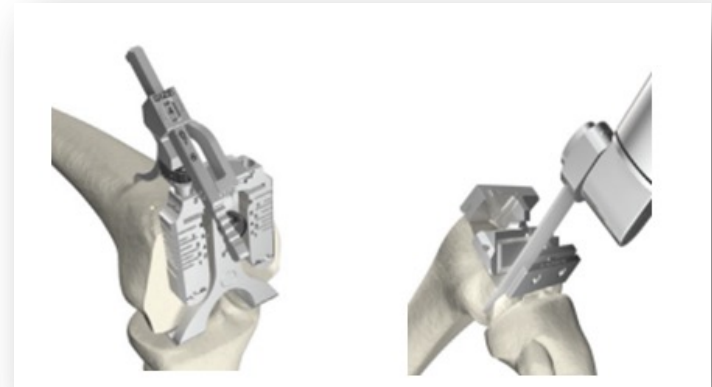
Restoration of Anatomy

- Traditional (Insall) Mechanical Alignment
 - Tibia cut 0°
 - Distal femur 5° valgus
 - Femur rotation 3° ER

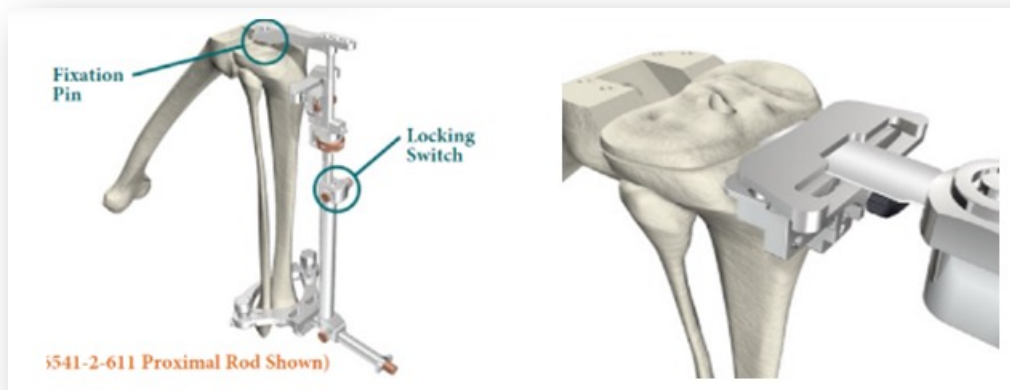
Variability of manual instrumentation



Placement of the IM rod



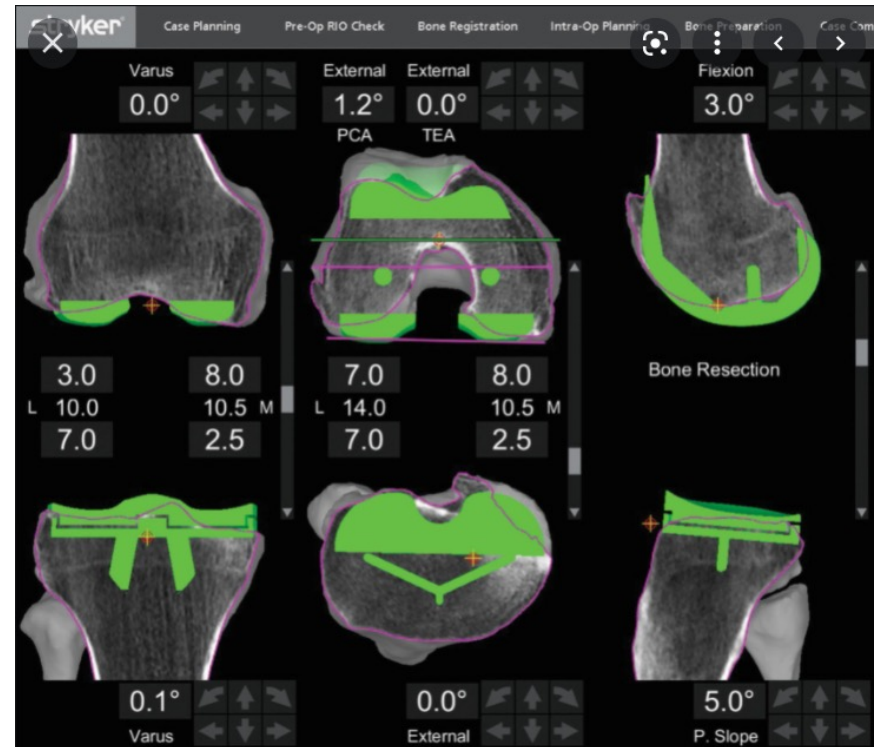
Alignment of cutting guides



Placement of extramedullary guides sawblade excursion and toggle

Restoration of Anatomy

- Kinematic alignment
 - Ability to restore native anatomy



What is Mako?

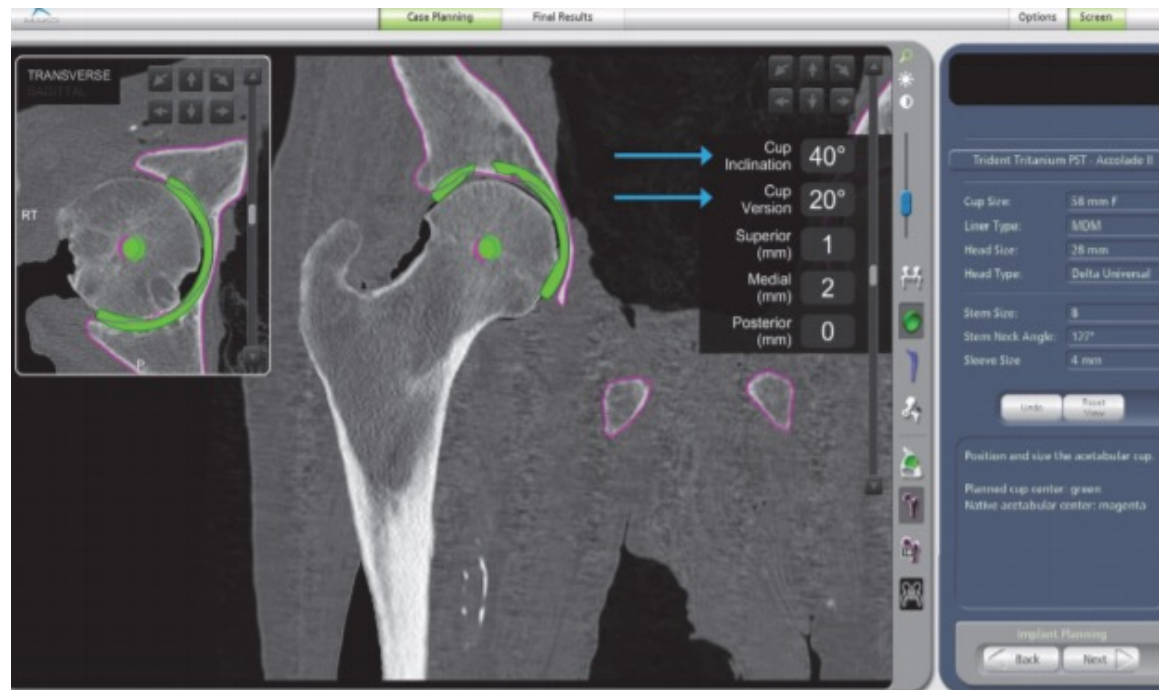


Computer Navigated, Robotic Arm Assisted



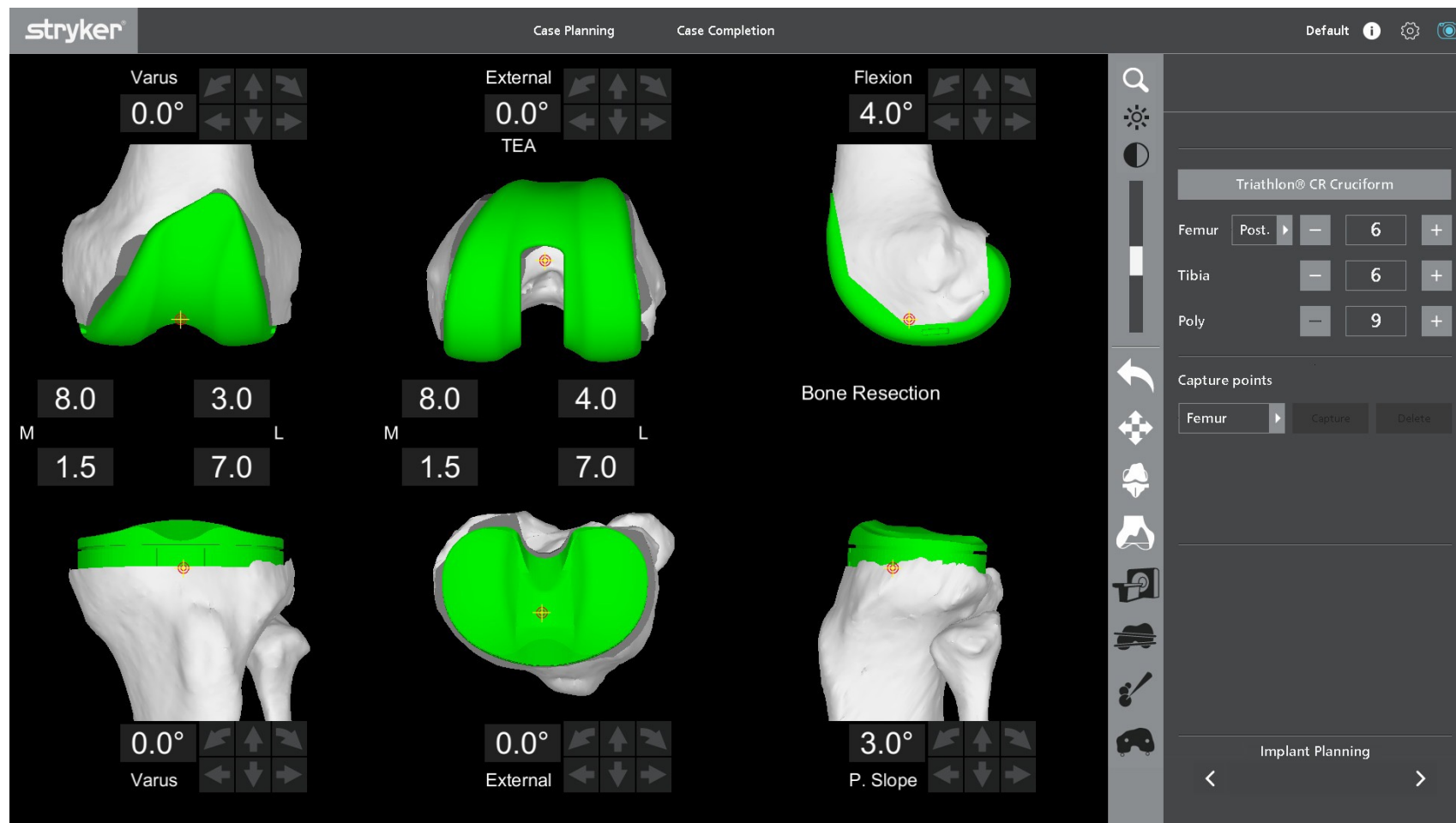
Makoplasty Procedure

- Requires CT scan for both hip and Knee applications



MAKO Total Knee

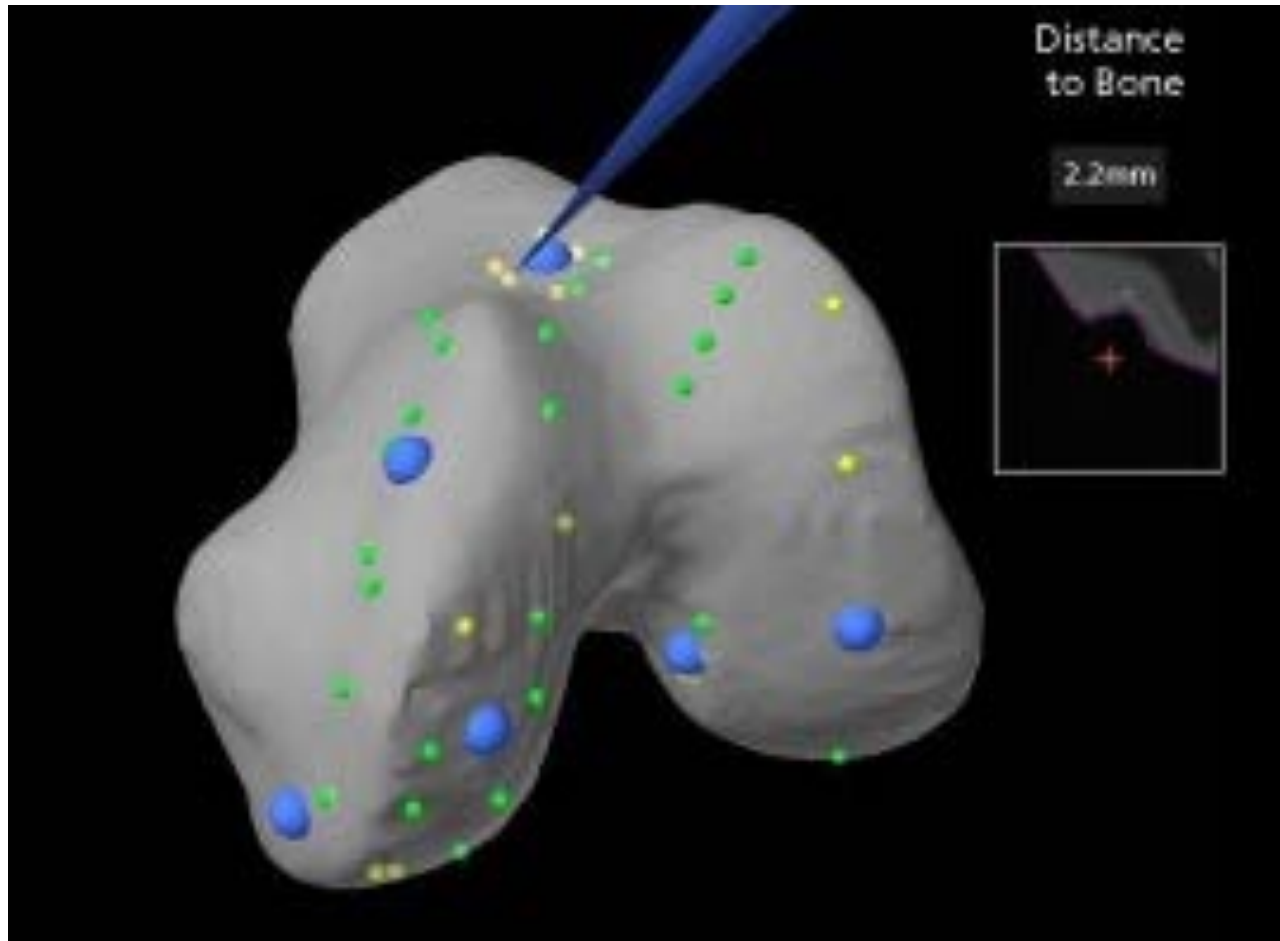
Preop Planning



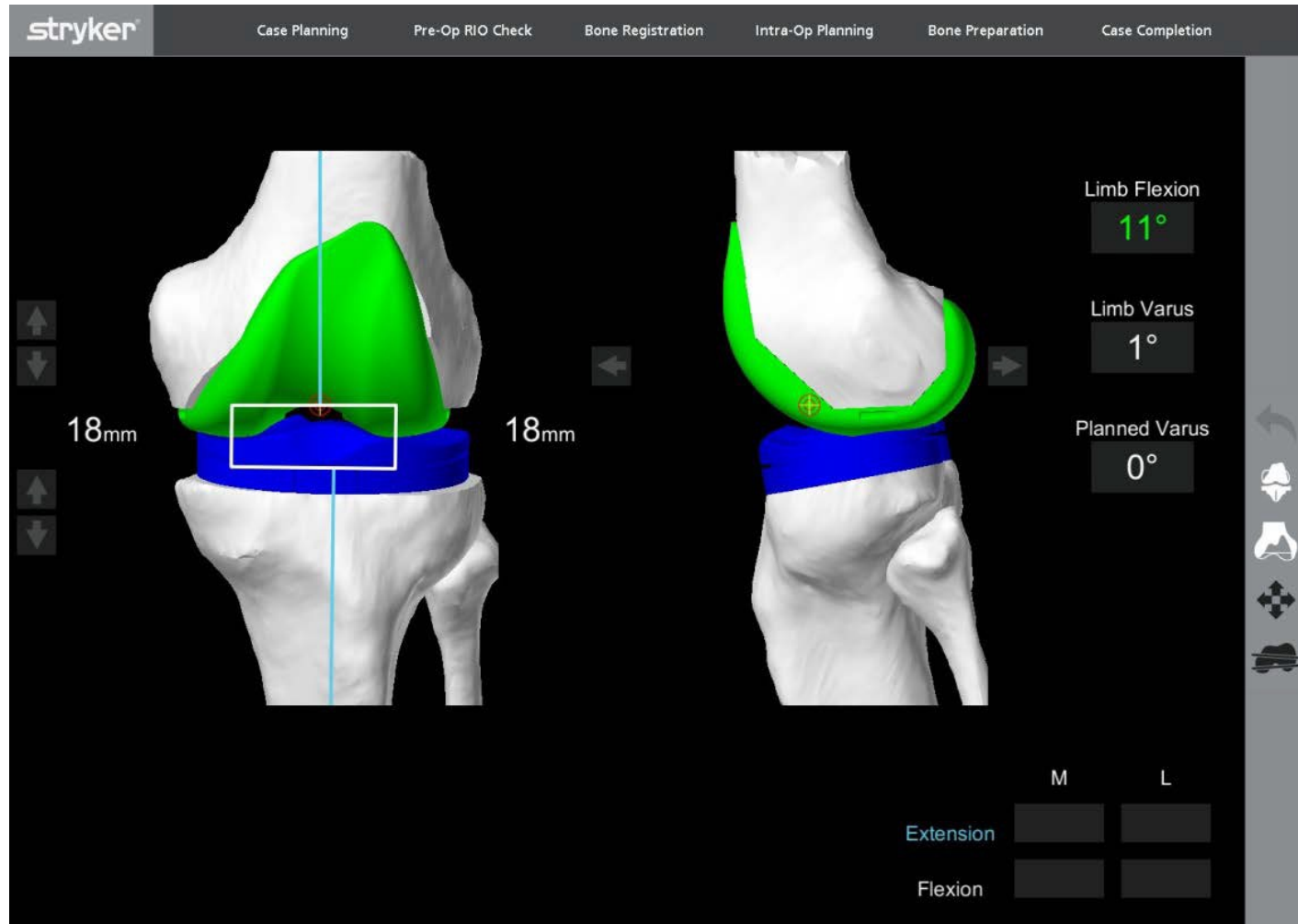
Array Placement



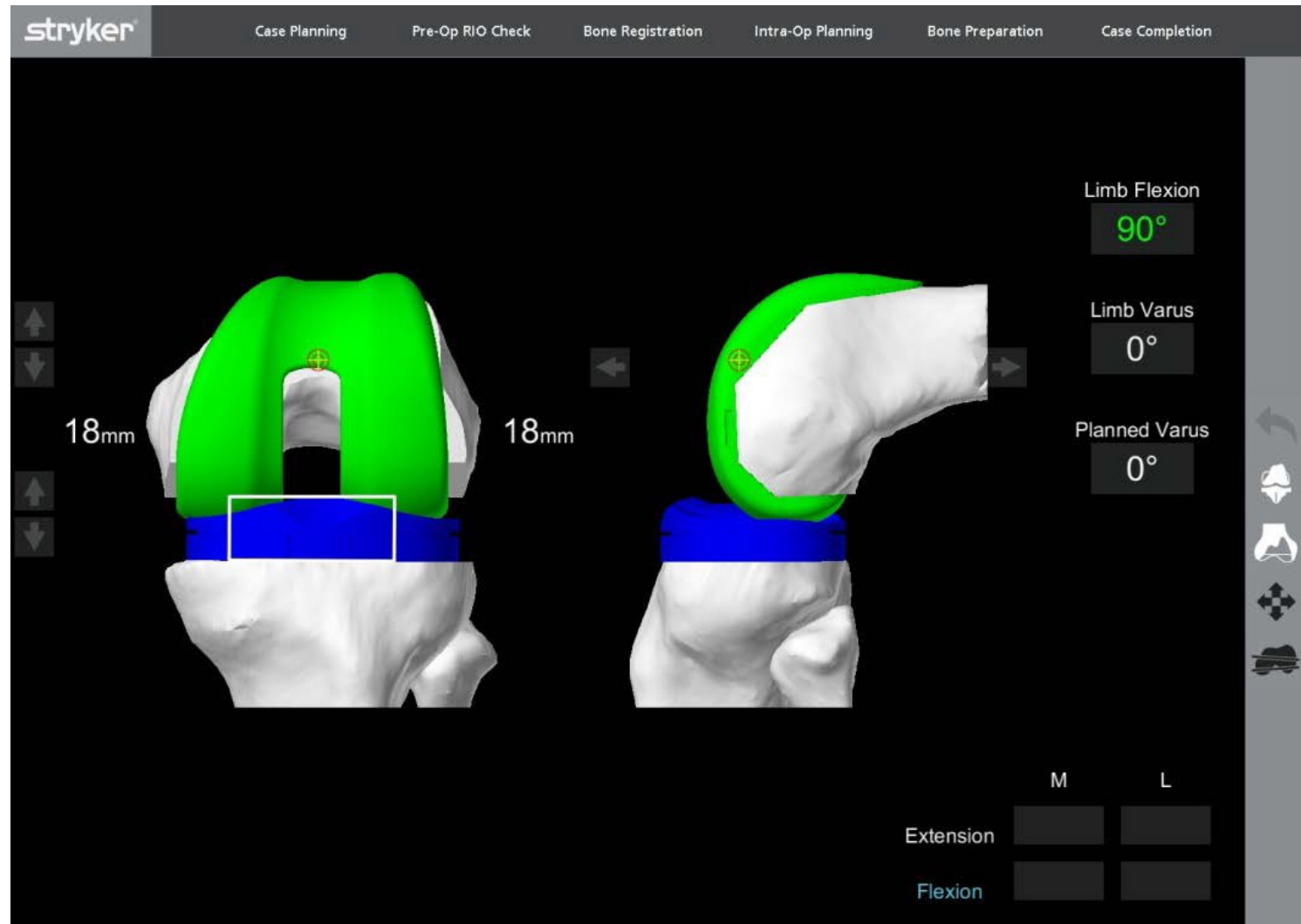
CT guided bone registration



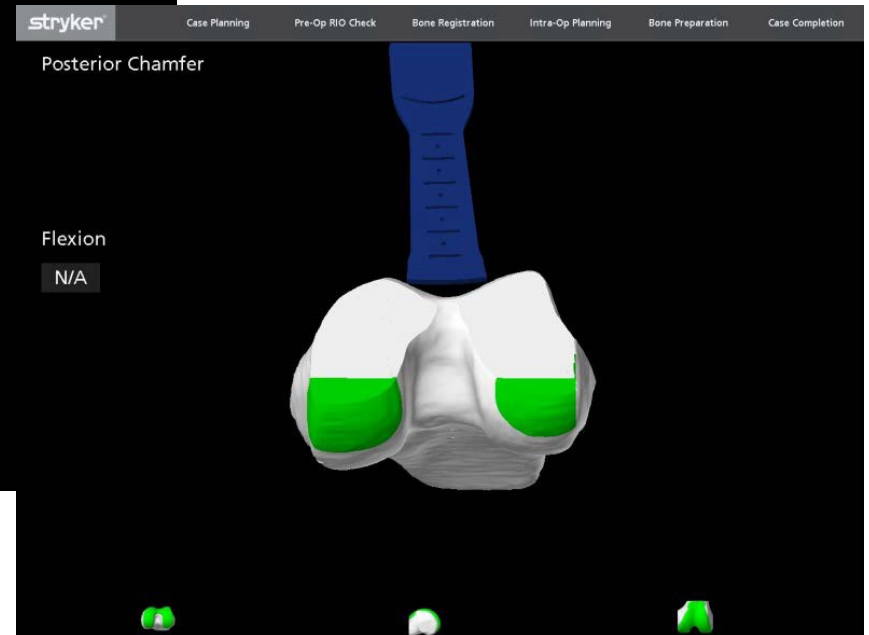
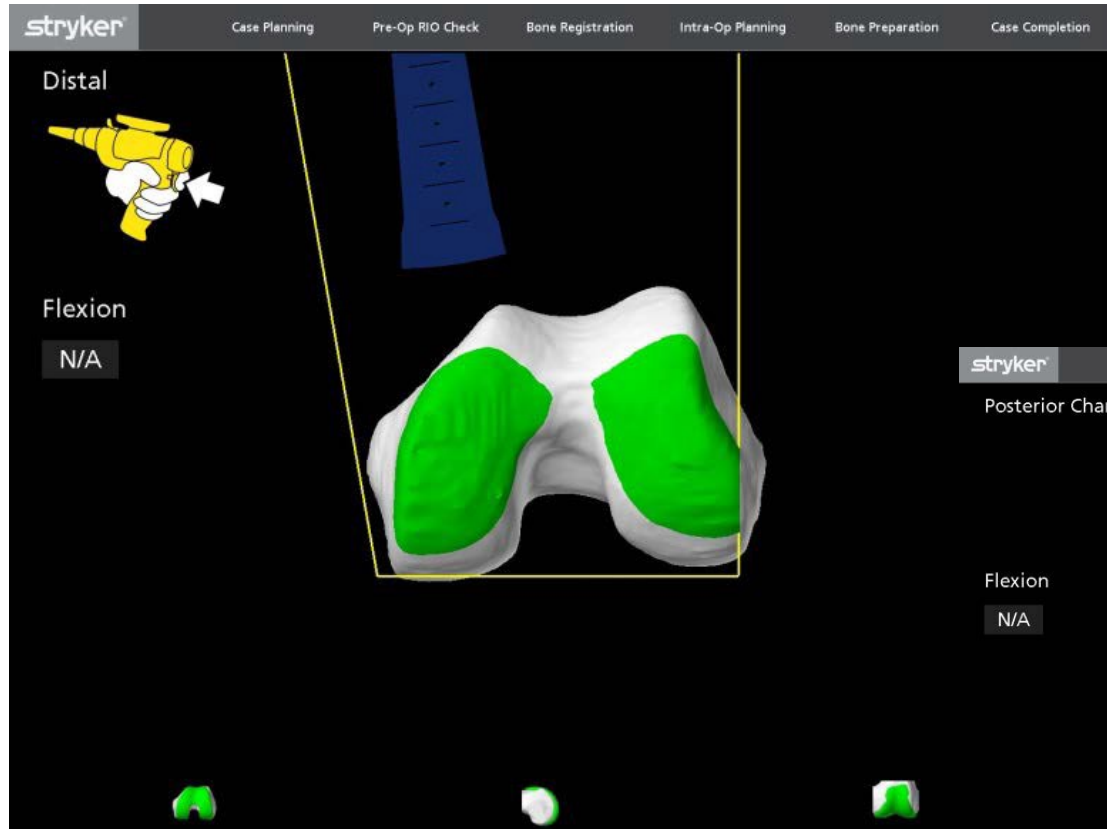
Dynamic pre-resection balancing



Joint Balancing



Distal Femur and Posterior Chamfer



stryker

Case Planning

Pre-Op RIO Check

Bone Registration

Intra-Op Planning

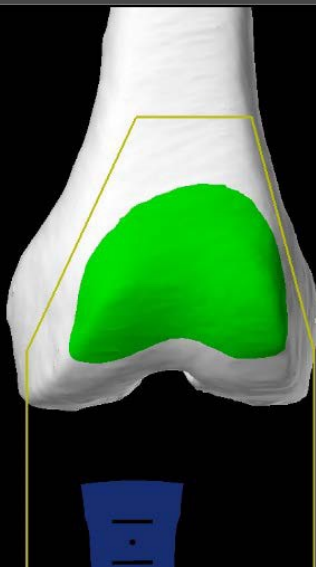
Bone Preparation

Anterior



Flexion

101.5°



stryker

Case Planning

Pre-Op RIO Check

Bone Registration

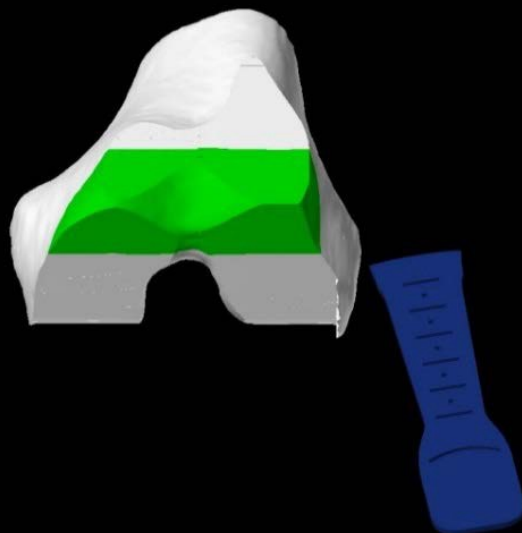
Intra-Op Planning

Bone Preparation

Anterior Chamfer

Flexion

N/A



stryker

Case Planning

Pre-Op RIO Check

Bone Registration

Intra-Op Planning

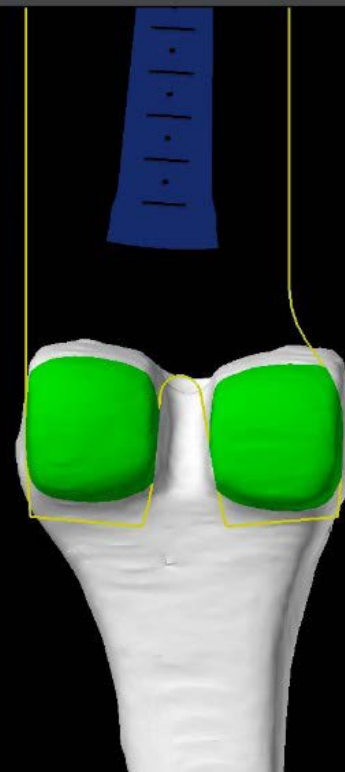
Bone Preparation

Posterior



Flexion

101.0°

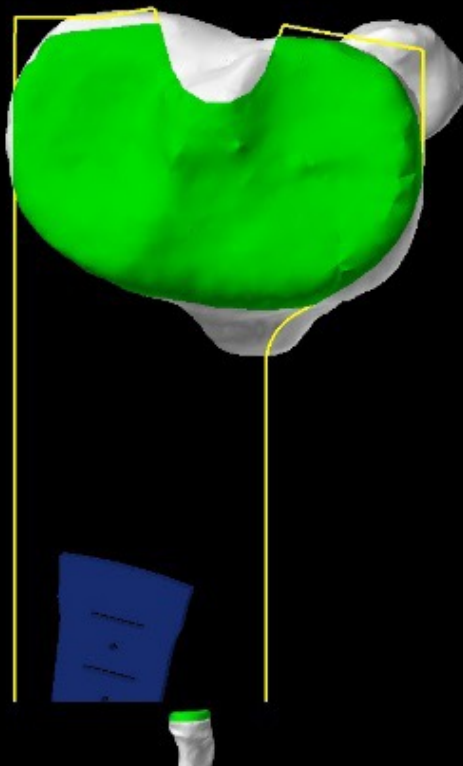


Tibia



Flexion

101.0°



Side	Left
Femur	3
Tibia	3 x 9mm
Tool	Straight Saw, Standard
Mode	Approach



1: Tibia

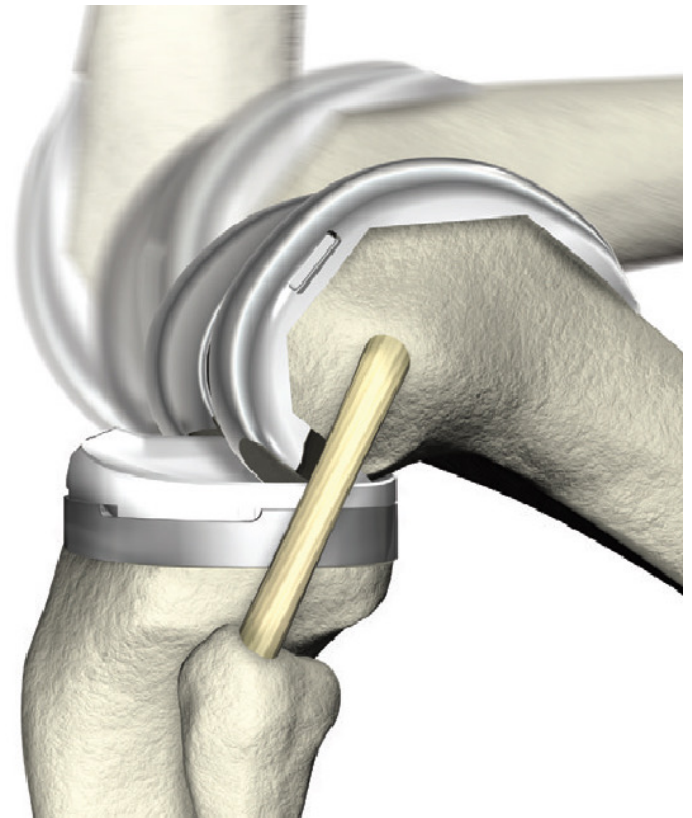


Hold the trigger to start alignment.

Bone Preparation



Total Knee Joint Replacement



After Surgery

- “Happy Knee”
- 5 Accomplishments before Discharge
 - No medical problems
 - Pain
 - Walk 100 ft
 - Go up and downstairs
 - Out of bed, off a toilet and into a car

MAKO Anterior Total Hip

What is the 'Direct Anterior Approach'?

- The direct anterior approach is a minimally invasive hip replacement technique that allows the surgeon good access to the hip without detaching any muscles or tendons.

Traditional vs. Direct Anterior Approach

Traditional Hip Replacement

- 8-12 inch incision
- Surgical approach - side (lateral) or back (posterior)
- Disturbance of the joint and connecting tissues

MIS with Direct Anterior Approach

- 4-5 inch incision
- Surgical approach – front (anterior)
- Muscles or tendons not detached

Typical Precautions: Traditional vs. Direct Anterior

Traditional Hip Replacement

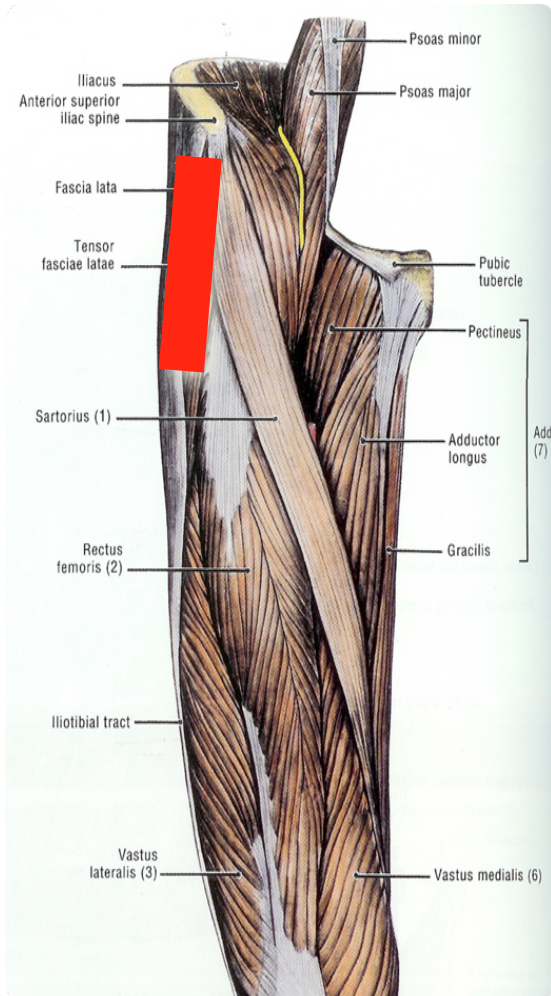
- Do not cross legs
- Do not bend hip more than a right angle
- Do not turn feet excessively inward or outward
- Use a pillow between your legs when sleeping

Direct Anterior Approach

- Under doctor's supervision, may be immediately allowed to move their hips
- May potentially avoid restrictions associated with traditional hip replacement¹

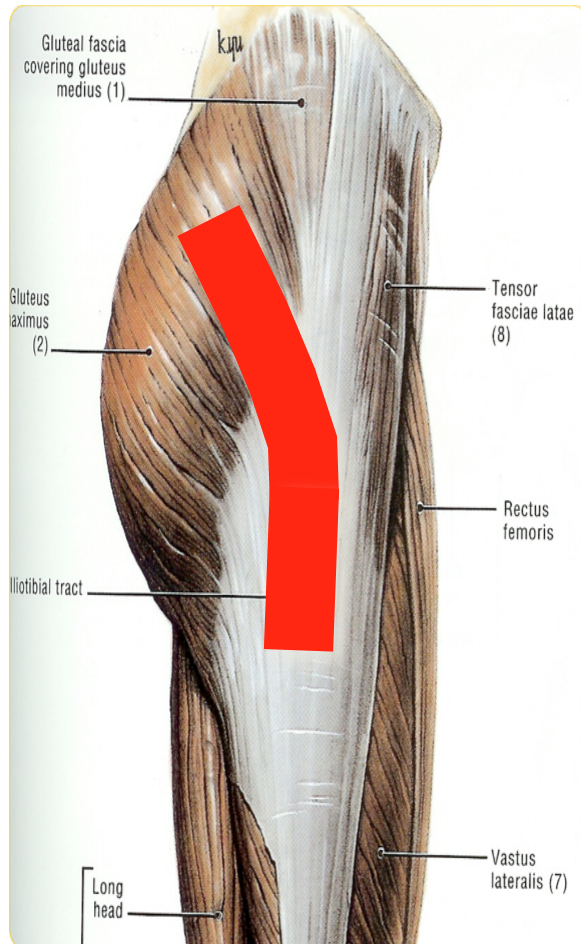
1. <http://www.anteriorhip.org/anterior-hip-replacement.html> accessed Nov 2010.

Why Direct Anterior?



- Hip closer to the front of the body
- Surgical anatomy
- Doesn't detach any major muscles
- Minimal risk to nerves
- Truly MIS

Why Direct Anterior?



- Less pain
- Quicker restoration of function
- Shorter hospital stay
- Probably more economical

Direct Anterior Hip Replacement



Why?

- Ideal soft tissue interval
- Ease of patient position
- Simple socket instrumentation

Direct Anterior Hip Replacement



Why Not?

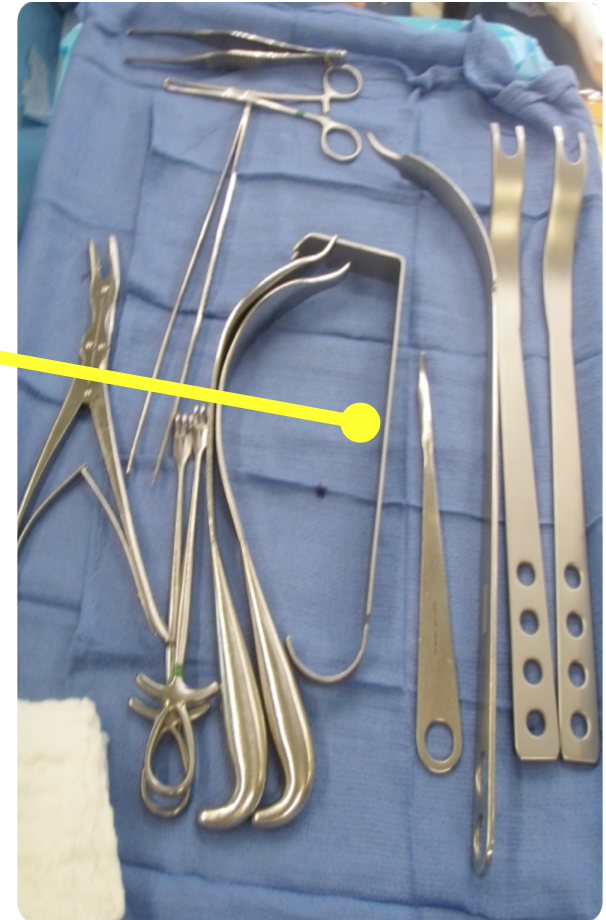
- Unfamiliar territory
- Femoral exposure is difficult
- Specialized equipment

How it's done

Special Instruments



Retractors

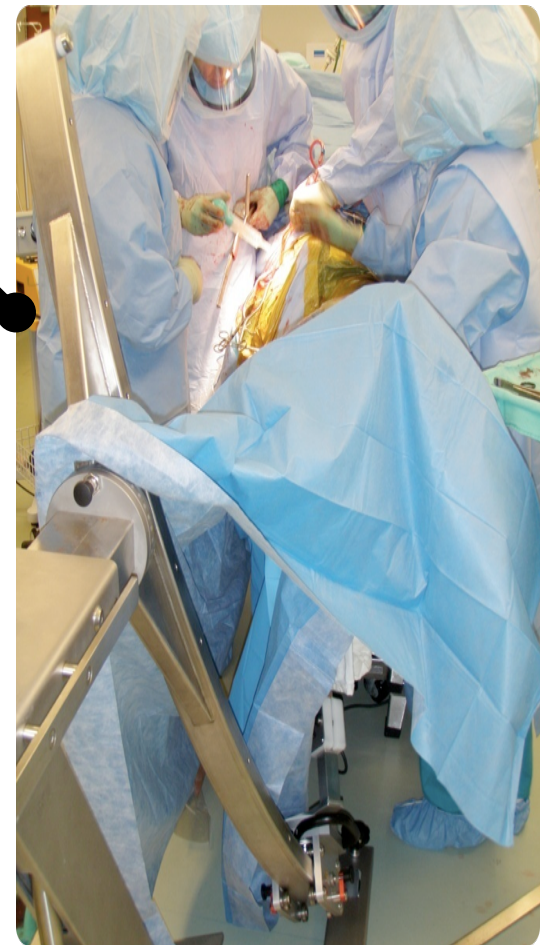


Special Equipment

Lighting



Arch table



Potential Benefits of MIS with Direct Anterior Approach

- Decreased hospital stay and quicker rehabilitation.²
- Smaller incision and reduced muscle disruption may allow patients a shorter recovery time and less scarring.¹
- Potential for less blood loss, less time in surgery, and reduced post-operative pain.^{1,3,4}
- Risk of dislocation reduced. ²
- May allow for a more natural return to function and activity.^{1, 3}

1. Wenz, J, Gurkan, I., Jibodh, S., "Mini-Incision Total Hip Arthroplasty: A Comparative Assessment of Peri-operative Outcomes," Orthopedics Magazine, 2002.

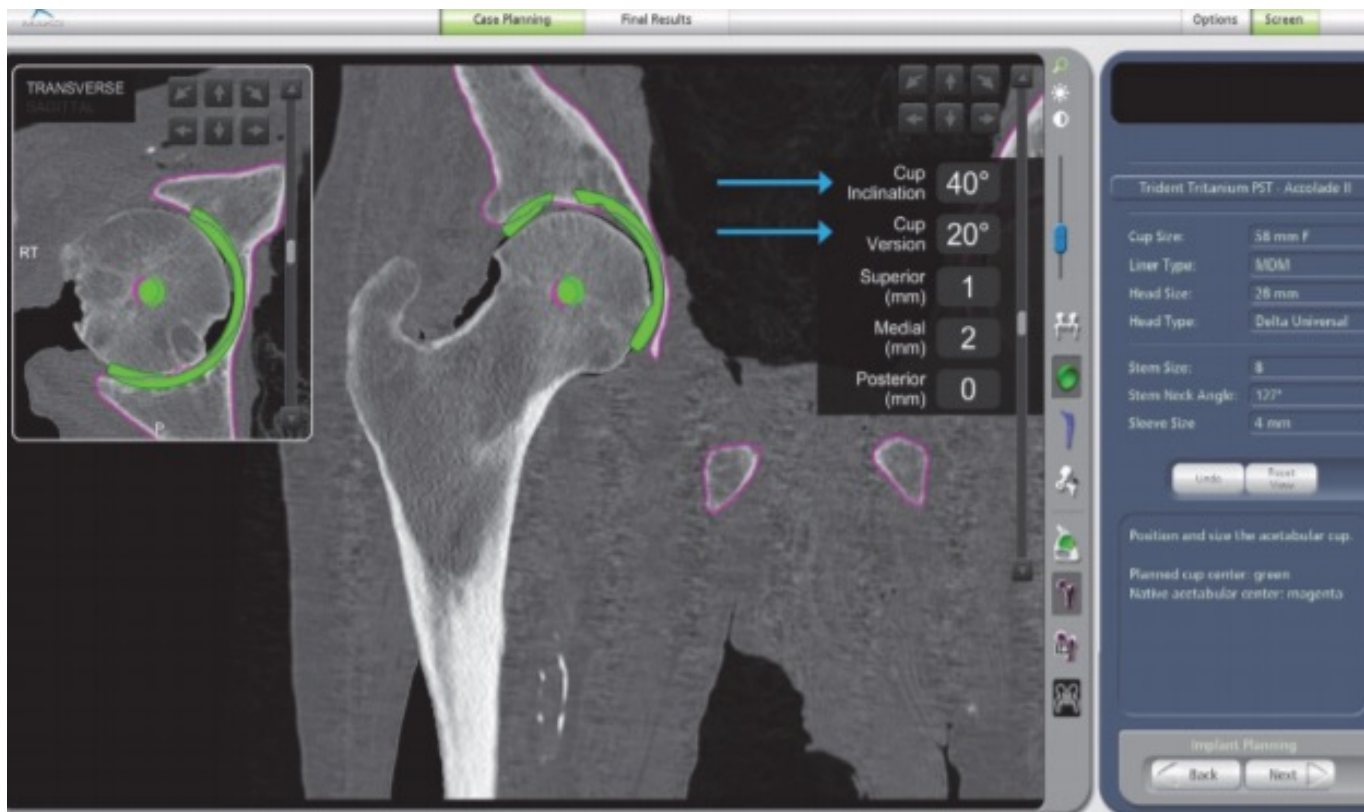
2. www.anteriorhip.org/anterior-hip-replacement.html accessed Nov 2010.

3. Keggi, Kristaps, I., "Total Hip Arthroplasty Through a Minimally Invasive Anterior Surgical Approach," JBJS, Vol. 85-A. 2003.

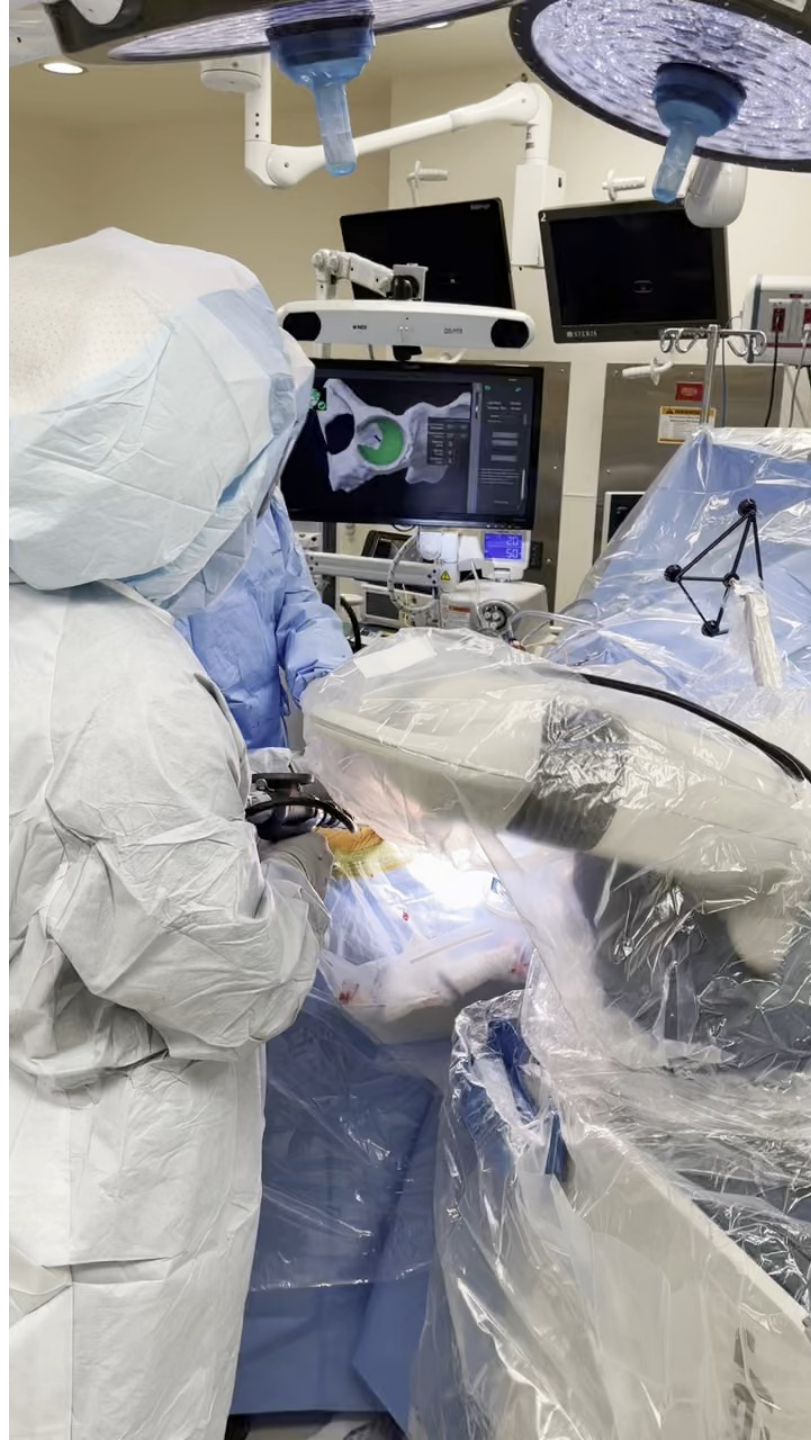
4. Baerga-Varela, L., Malanga, G.A., "Rehabilitation after Minimally Invasive Surgery." Hozack, W., Krismer, M., Nogler, M., Bonutti, P., Rachbauer, F., Schaffer, J., Donnelly, W., ed. Minimally Invasive Total Joint Arthroplasty. New York, NY: Springer-Verlag; 2004: 2-5.

MAKO Robotics Anterior Hip

PreOp Planning











Why MAKO?

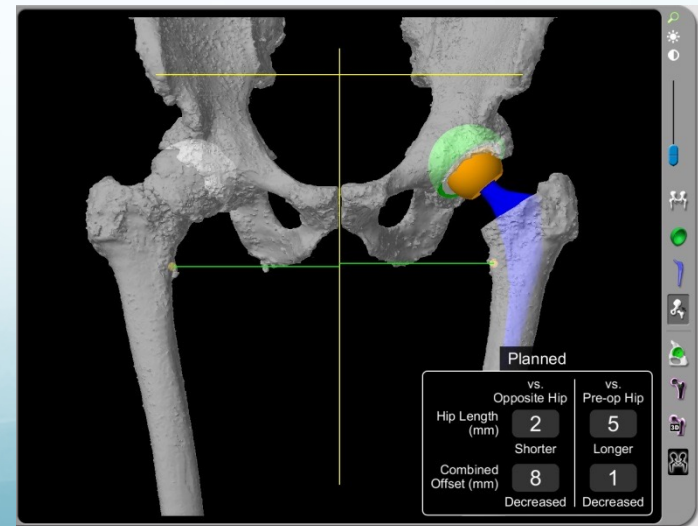
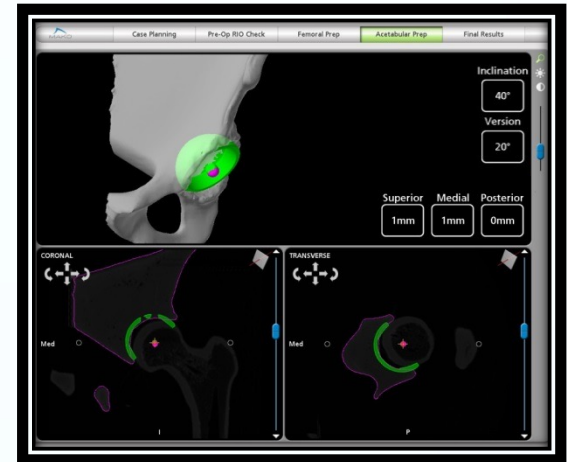
- Increased level of precision
- Confidence in component position
- Recovery room film is too late for changes
- Optimize surgical results

rTHA- Better Plan

mTHA- Plain x-ray



rTHA- 3D CT



Risks of Surgery

Including but not limited to:

- Bleeding
- Infection
- Damage to nerves and vessels
- Blood clots (DVT)
- Blood clots in lungs (PE)

And rare things like:

- Stroke
- Heart attack and
- Death

Summary

- Hip and knee pain has many etiologies
- Arthritis can be treated without surgery
- If surgery is indicated, hip and knee replacement are excellent options
- Technology and techniques have evolved substantially
- MAKOplasty provides superior advantages to conventional techniques

Questions?

