Innovative Treatments for Painful Hips and Knees

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My Training
- Undergrad- Carroll College- Helena, MT
- Medical School- University of Washington
- Residency- University of New Mexico
- Fellowship in Joint Replacement-
- Coon Joint Replacement Institute St. Helena, CA
- * First Surgeon with Fellowship training specifically in Robotic Joint Replacement

Medical License: CO and MT

Disclosures: Consultant for Stryker Robotics

Boulder County Fair circa 1989ish
About my practice...

- Focus on minimally invasive surgical techniques combined with advanced technology
- 99% of cases done under spinal anesthesia
- Avg LOS: TKA 1.1 days, THA 1.5 days
- 91% of patients discharged to home with outpatient PT

New Name, New Place

What is Arthritis?
Osteoarthritis - Worn out articular cartilage

Inflammatory Arthritis - Systemic Process
ex: Rheumatoid, Psoriatic, etc.
Other Causes of “Hip Pain”

- Bursitis: Lateral/Side pain. Worse when you lay on that side
- Back pain: Can radiate down to hip and cause hip pain symptoms
- Hernia: Abdominal opening causing pain in the groin

Primary Hip and Knee Replacement Projection 2005-2030

New Generation of Patients

Patients are getting both younger and older. They have different expectations.
- Want to maintain their quality of life and active lifestyles

Patients are often better informed today.
- Internet allows access to more information
- BUT BEWARE THE INTERNET (and Stem Cells)

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

AAOS Guidelines
RICE and NSAIDs

Rest, Ice, Compression, Elevation
Ibuprofen, Aleve, Tylenol, Celebrex
Topical compounds
Glucosamine

Activity Modification and Weight Loss

Avoiding high impact activities, i.e., running, jumping
Weight Loss: Goal BMI<40

Joint Injections

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

Visco-supplementation

“Chicken Shots”- Hyaluronic acid injections
*Covered by most insurance in knees but not hips
PRP: Platelet Rich Plasma
Injections of concentrated blood products to enhance healing
*Not covered by insurance, expensive

The Promise of Stem Cells
Obtain stem cells, concentrate them and inject them into the joint to decrease inflammation and promote healing.
*Not covered by insurance, very expensive

My Future?

Stem Cell Results:
Knee Society Assessment Score

- TKA
  - Pre op: 48
  - Post op: 80

- BMAC
  - Pre op: 69.08
  - Post op: 82.44

Mean Harris Hip Score

- THA Preop (101): 56
  - THA Postop (24): 94

- BMAC Preop (28): 68.75
  - Post BMAC (18): 82.89

Stem Cells = Snake Oil?

STEM CELLS?
Consequences of Delaying Surgery

- Surgery is a difficult decision
  - Duke Study: 88% pts decline Joint Replacement
- OA is a degenerative disease
- Better outcomes are reported in patients who had a total joint operation earlier in the disease process\(^1\)
- At 2 years post-operation, patients who chose surgery earlier in disease process vs. those who waited\(^1\)
  - Had improved function
  - Had reduced pain


New Opportunities in Arthroplasty

- Improvements in hip and knee replacement materials
  - Success rates >90% \(^1\)
- Partial vs. total knee replacements
- Minimally invasive procedure techniques
- New designs


What is Makoplasty?

Computer Navigated, Robotic Arm Assisted
Early Arthritis

- Damage and pain isolated to one compartment of the knee, usually medial or lateral.

Early Arthritis

- Can also be isolated to the patella femoral joint.

Early Arthritis

- Damage and pain isolated to one compartment of the knee, usually medial or lateral.

Mid-stage Arthritis

- Occurs in 2 of the 3 compartments of the knee, most commonly the medial and patella femoral.
**Mid-stage Arthritis**

- Occurs in 2 of the 3 compartments of the knee, most commonly the medial and patella femoral.

**Makoplasty Procedure**

- The patient must have the correct indications for the procedure.
- A CT scan is then performed to make a 3D model of the patient’s knee.

**Robotic process (cont.)**

- Then a pin is placed into the distal femur and proximal tibia for placement of tracking device.
- Center of hip is then found.
Surgical Technique

- Anatomic landmarks on the femur and tibia are used to calculate the position of the knee in space.
- This information is then combined with CT and pre-op plan.

Surgical Technique (cont.)

- After obtaining anatomic landmarks, evaluation of coronal and sagittal alignment, flexion and extension laxity and ROM can be measured.
- Infinitely personalized process.

Bone Preparation

- Done through a minimal incision to allow for less tissue damage.
Surgical Technique (cont.)

- After finalizing operative plan, a high speed burr is used to make the femoral and tibial cuts.
- The haptic feedback increases and will not allow you to go outside of the planned resection.

Clinical benefits

Pre-op

Post-op

Makoplasty

- Less invasive
- Accurate
- Reproducible
- Bone conserving
Mako Total Knee

Total Knee Joint Replacement

- End surface of femur replaced with metal
- End surface of tibia replaced with metal
- Plastic liner is inserted between femur and tibia
- Patella is resurfaced with plastic

A Normal Knee

- Femur (thigh bone)
- Patella
- Healthy Cartilage
- Tibia (shin bone)

An Arthritic Knee

- Femur (thigh bone)
- Diseased Cartilage
- Tibia (shin bone)
**A Replaced Knee**

- Femur (thigh bone)
- Artificial Knee Implant
- Tibia (shin bone)

**Variability of manual instrumentation**

- Placement of the IM rod
- Alignment of cutting guides
- Placement of extramedullary guides: sawblade excursion and toggle
Bigger opportunity to move the needle

Overall patient satisfaction
"satisfied" or "very satisfied" WOMAC score

Survivorship

81%
99%

Mako Total Knee workflow

Pre-op planning
Array placement
Bone registration

Ligament balancing assessment
Intra-op plan adjustments
Bone resection

Preop Planning

Dynamic pre-resection balancing
Early Clinical results

Minimally Invasive TKA

- Provide early and exceptional analgesia
- Low trauma surgery
- Early discharge and rapid rehab

Prevent the Bad Effects

- Pre-emptive analgesia
  - Celebrex
  - Spinal Anesthetic
- Pre-emptive anti nausea
  - Pepcid

Operative Management

- SPINAL anesthetic
- IV sedation
- Capsular injection
Post-Operative Management

- Early ROM with PT
- Ambulation same day

Post-Operative Management

- Gait training POD1
- Stairs and PT instruction
- Possible outpatient

Update on Hip Arthroplasty

The Very Important Bearing Surface

- The bearing affects
  - Performance
  - Flexibility
  - Durability
  - Longevity

- Options for bearings in hip replacements
  - Ceramic-on-ceramic
  - Metal-on-plastic
  - Metal-on-metal
  - Ceramic-on-plastic

The bearing surface: The two parts that glide together throughout motion

Femoral head and acetabular insert in hips
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
Why I Do The Direct Anterior Approach?

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

Special Equipment

Retractors

Lighting

Arch table
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 replacement

Potential Benefits of MIS with Direct Anterior Approach
- Decreased hospital stay and quicker rehabilitation
- Smaller incision and reduced muscle disruption may allow patients a shorter recovery time and less scarring
- Potential for less blood loss, less time in surgery, and reduced post-operative pain
- Risk of dislocation reduced
- May allow for a more natural return to function and activity

Advantages of Direct Anterior
- MIS approach is better for patients
- No Hip precautions
- Improved control over component position

The Use of Technology in Hip Replacement
Why Navigation?

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

rTHA vs. mTHA: Multicenter Study

MGH, University of Wisconsin, HSS (Malchau, Padgett, Dounchis, Illgen, Marchand)

- Manual THA: N=1883
  - 47% inside target zone
- Robotic THA: N=119
  - 96% inside target zone
  - 95% within 4 degrees of plan

rTHA vs mTHA: Single Surgeon Data

A Matched-Pair Study - Dr. Domb – Hinsdale, IL CORR 2013

- rTHA (N=50) vs. mTHA (N=50), X-ray analysis (HAS)
- rTHA vs. mTHA - 100% vs. 80% in Lewinnek “Safe Zone”
Technique with Technology

Surgical goals of hip replacement
• Pain relief
• Restoration of function/lifestyle
• Optimize patient outcomes
• Economics

DA THA

• Provide early and exceptional analgesia
• Low trauma surgery
• Early discharge and rapid rehab

Prevent the Bad Effects

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Operative Management

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Post-Operative Management

- Gait training POD1
- Stairs and PT instruction
- Ideally same day ambulation

Summary

- rTHA more accurate than mTHA- multiple studies
- Improved accuracy with rTHA correlated with improved clinical outcomes at 1 year
  - Lower dislocation rate
  - Less LLD
  - Less blood loss
  - Excellent PROM
    - Better HHS and UCLA activity scores than mTHA
- Robotic assisted THA:
  - Longer OR time than mTHA, no infections
  - Cost benefit analysis requires further study

10,000 Miles in 18 mos after THA

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
Current Limitations

• Elective Surgery is on hold until 4/26.
• Plan to reopen elective cases, joint replacement, as soon as we safely can.

Questions?

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