

Hip and Knee Arthroplasty: From Pre-Op to Post-Op Part 2

3:45pm – 5:15pm on Tuesday, June 13, 2023

Description:

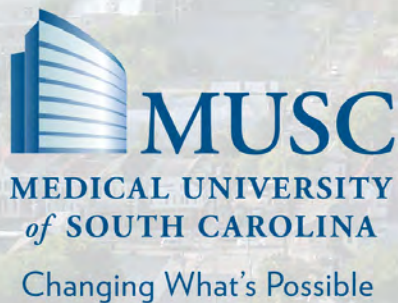
Although hip and knee replacement are among the most commonly performed orthopedic procedures and they have beneficial outcomes, achieving these outcomes requires diligent pre, intra, and post-op optimization and management. The following topics will be discussed in detail in this session (2/2):

- -- Intra-operative risk minimization, antibiotic prophylaxis, DVT prevention
- -- Inpatient or Outpatient?
- -- Pain management
- -- Therapy protocols

Learning Objectives:

- At the conclusion of this session, participants should be able to:
- Identify important considerations for surgical planning
- Discuss appropriate perioperative care in THA/TKA, including DVT prophylaxis and infection prophylaxis
- Review THA/TKA post-op protocols, including pain management and physical therapy





Hip and Knee Arthroplasty:
The Details in the OR and
Afterwards Make a Difference
Harry A. Demos, MD
Department of Orthopaedics and Rehabilitation

**I (and/or my co-authors) have
nothing to disclose.**

Goals and Objectives

At the conclusion of this session, participants should be able to:

- Identify important considerations for surgical planning
- Discuss appropriate perioperative care in THA/TKA, including DVT prophylaxis and infection prophylaxis
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“I am too young
(or old)
for a joint replacement”



J. A. - History

- 14 year old WM with hip pain
- Mild injury playing basketball 1 year prior. Played JV. Athletic.
- Now cannot walk without crutches
- Sedentary, embarrassed.
- Previously seen by 5 other orthopedists (pediatric and adult).
- PMH –
- Family history + for coagulopathy in grandmother



J. A. - Exam

- Pleasant, thin, healthy-appearing 14-year-old with a severe right antalgic limp.
- 1-1/2 cm leg length inequality with the right side being shorter.
- Flex up to about 90 degrees but has no internal rotation and gets exacerbation of his groin pain with external rotation past 45 degrees.
- Abduct 20 degrees.
- Pain in his hip with axial loading of his hip even without motion.





How would you advise him?

- Live with it
- Arthrodesis (Fusion)
- THA
 - › Conventional Metal on Polyethylene
 - › Ceramic on Polyethylene
 - › Ceramic on Ceramic
 - › Metal or Ceramic on Crosslinked Poly
 - › Metal on Metal
- Something else?

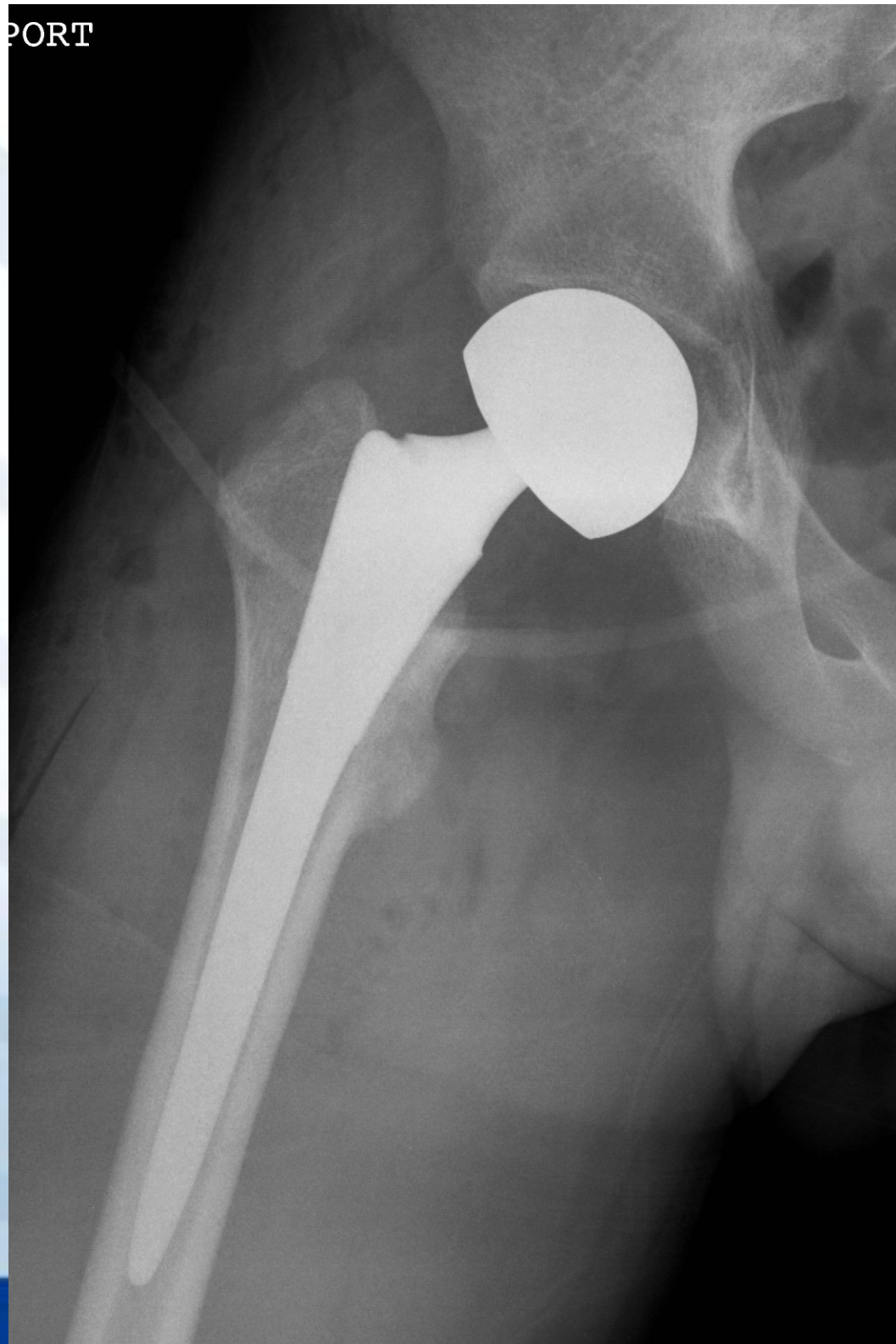


Pre-op Discussion

- We discussed the risks and benefits associated with hip arthroplasty and he does understand that this is a very controversial topic and very risky in somebody his age and that he most likely will require revision surgery in the future.
- He had already decided prior to coming here that he is ready to have this done, as did his family. They have researched this and would like to proceed with plans for a hip arthroplasty.
- We discussed the risks and benefits associated with total hip replacement versus hemiarthroplasty. Since he does have a normal acetabulum, I think a hemiarthroplasty may provide him a good durable long- lasting joint replacement without imposing a significant limitation of his activities.
- It would also leave future options for alternative bearings open as better options become available.
- I did explain to him that a hemiarthroplasty does have an increased incidence of groin pain and he is willing to accept this.



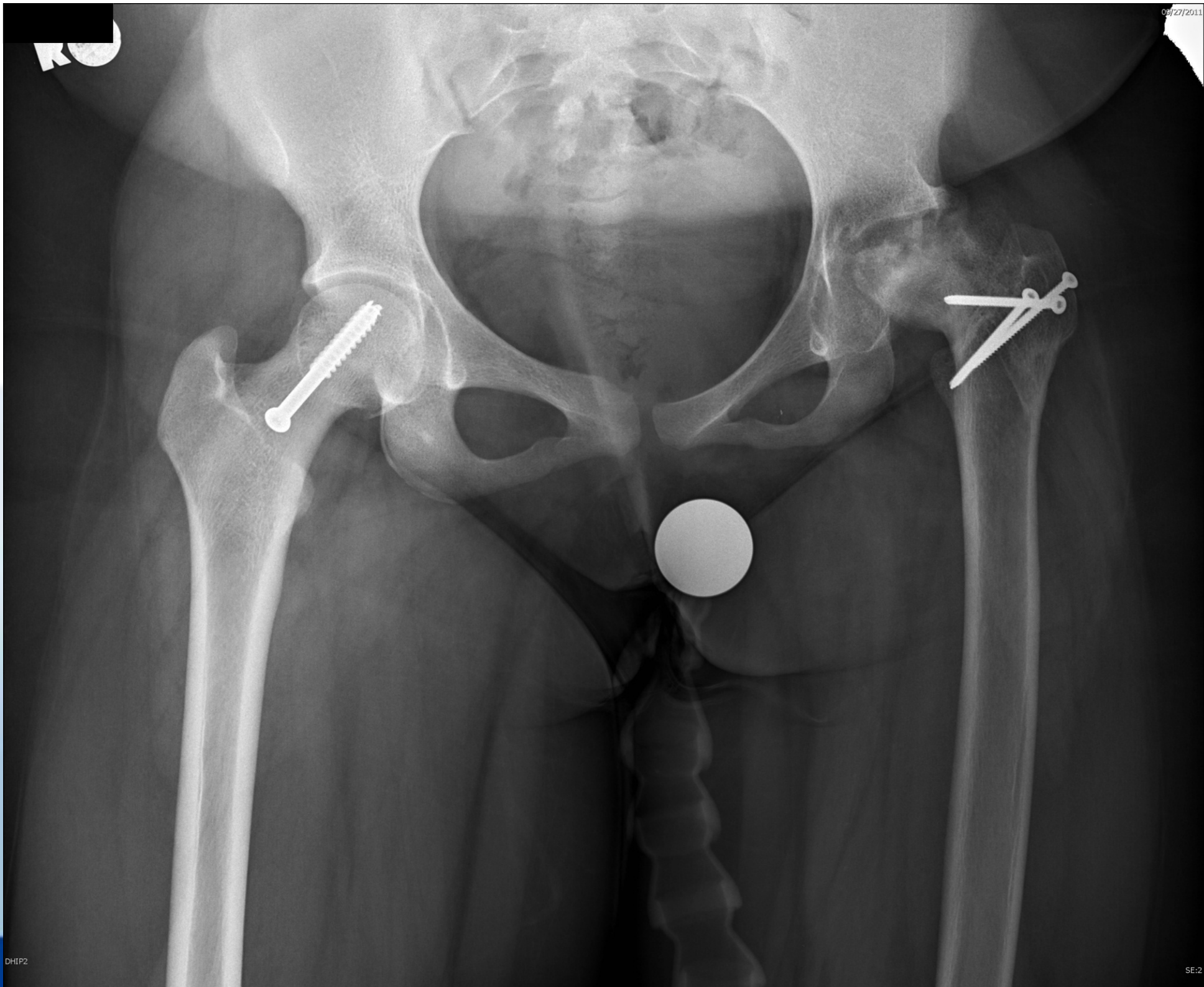
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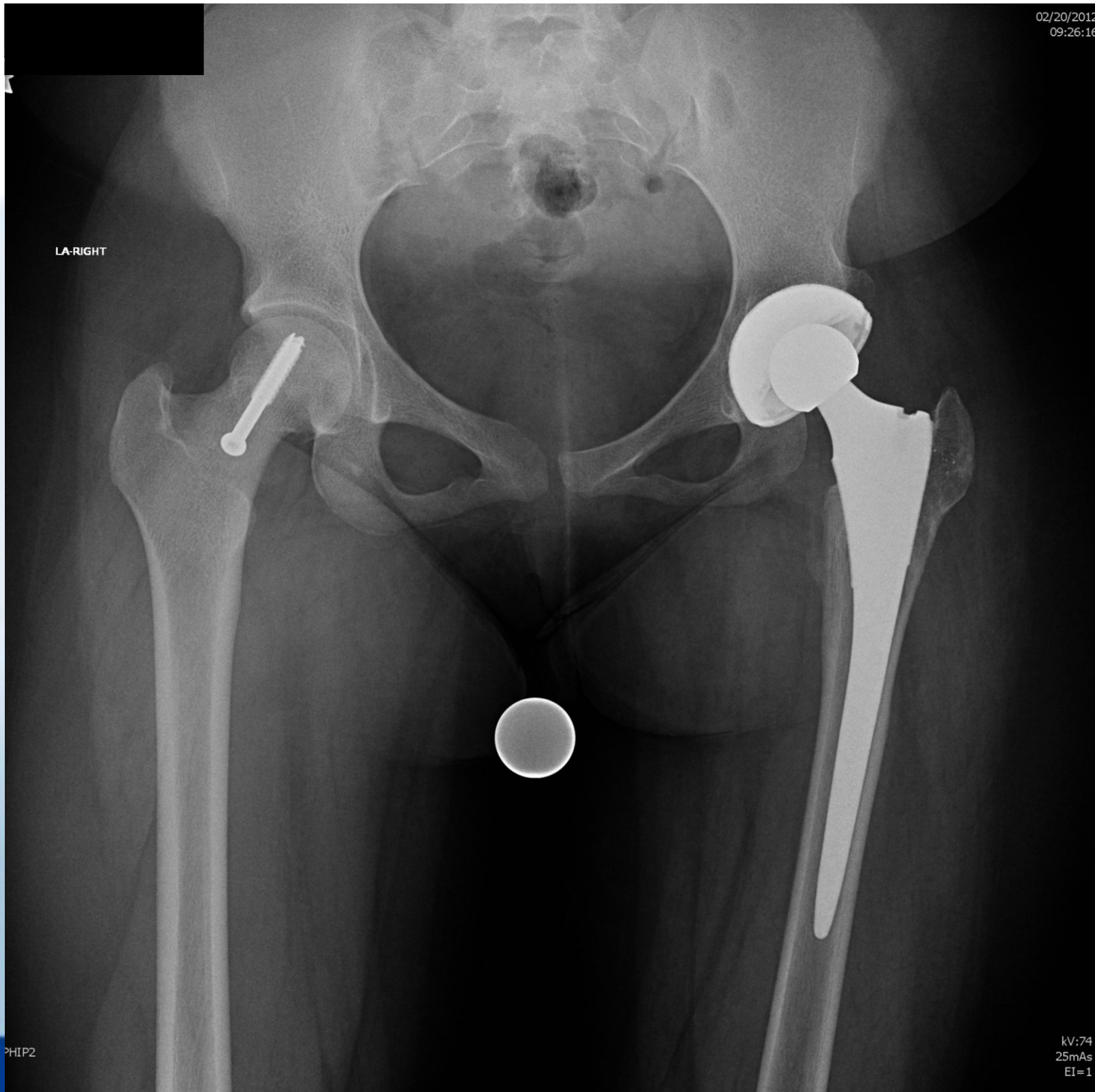
JORDAN, A.,
98714
157







LA-RIGHT







Age 8 – Septic Arthritis



Age 11

Age 13

Age 16



Age 17



Age 19



Life Expectancy



- People living and working longer
- Average life expectancy over 77
- By 2050, 86 (male) and 92 (female) expected
- 50 year old women expected to live to 82
- 65 year olds have nearly a 20 year average life expectancy

“I want the newest technology for my joint replacement”



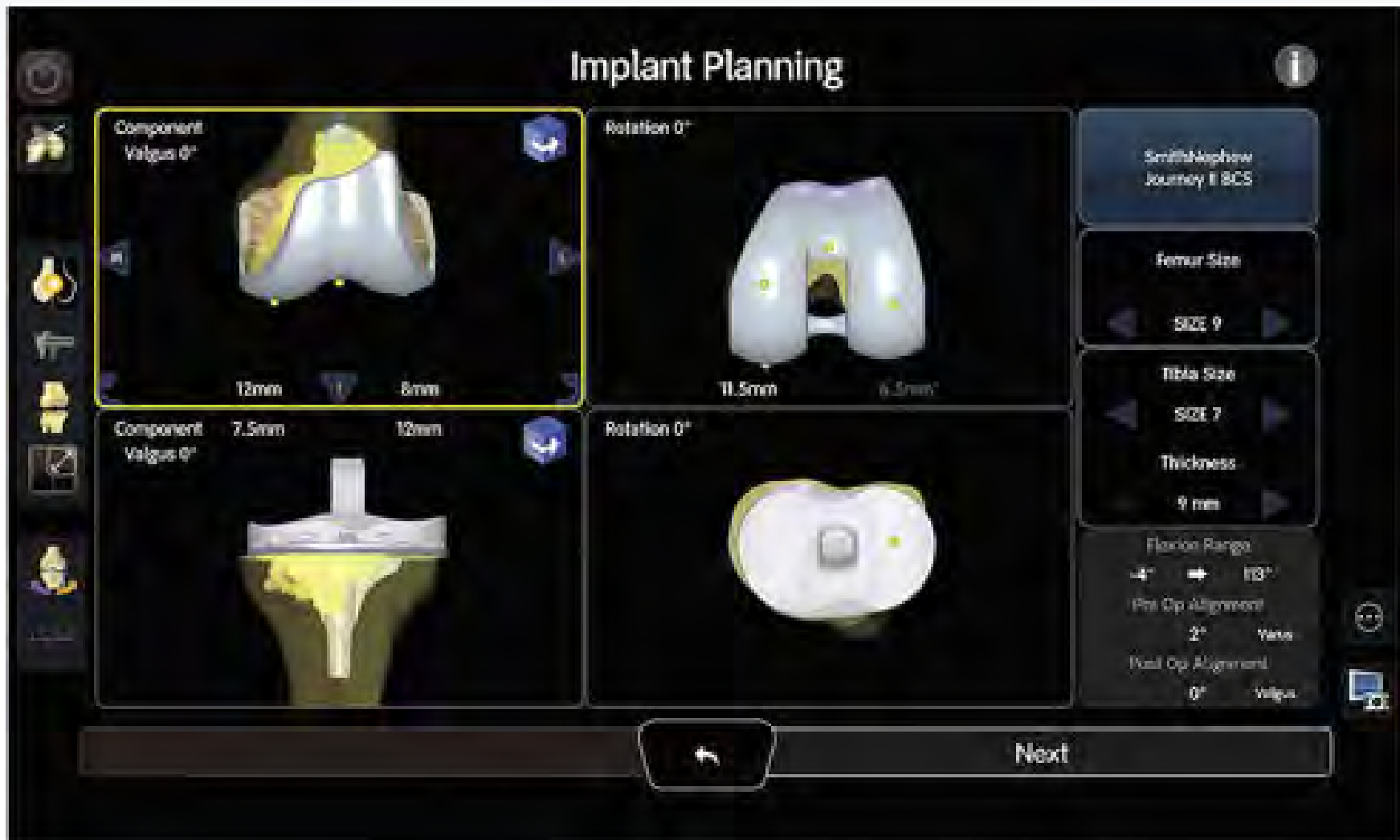
4/06 2007-346 © INKINCT Cartoons www.inkinct.com.au



Computer Assisted Surgery / Robotics



Computer Assisted Surgery / Robotics



Computer Assisted Surgery / Robotics

- Available from most manufacturers
- Image based and imageless systems available
- Allow planning based on mechanical axis (Hip, knee, and ankle center)
- Avoids canal instrumentation
- Allows sizing, balancing, alignment, and planning prior to making first bone cut
- High degree of accuracy
- Usually adds time
- Not smaller skin incision



Does Robotic-assisted TKA Result in Better Outcome Scores or Long-Term Survivorship Than Conventional TKA? A Randomized, Controlled Trial

Young-Hoo Kim MD, Sung-Hwan Yoon MD, Jang-Won Park MD

- Randomized trial compared robotic-assisted TKA to manual-alignment techniques
- 700 patients (750 knees) received robotic-assisted TKA and 706 patients (766 knees) received conventional TKA
- At >10 year f/u:
 - No difference in clinical or radiographic parameters
 - No difference in aseptic loosening
 - No difference in frequency of complications
- “Considering the additional time and expense associated with robotic-assisted TKA, we cannot recommend its widespread use.”



“Ask your doctor for the new type of knee that rotates as well as bends.”

“Ask for the Get **Around** Knee™”

“Ask for the 30-year knee replacement”



Television commercials

“I want the same knee joint replacement as Mary Lou Retton.”



01/24/2006
12:13:08
01/24/2006
12:13:08



DEMOS, HARRY MD,
W 1.822 : L 2.275

general
LGM=2.30
DHIP2

“I want a metal on metal Birmingham Hip Resurfacing procedure and I’ve decided to go to India to have it done.”

[Home](#) > [Surgery abroad](#) > [India](#) > [Patient stories](#) > Hip resurfacing

Birmingham Hip Resurfacing operation in India

Mr. Henry Stevens is a professional polo umpire, horse trainer and polo manager who lives south of London. He had been suffering from severe pain and lack of mobility in his right hip, making it at times, impossible for him to "swing a leg" over a horse -- an obvious requirement for his profession.



Birmingham Hip Resurfacing Prosthesis

Through a series of x-rays, it was shown that his hip joint had deteriorated, yet the hip bone was "excellent" making him an ideal candidate for the "[Birmingham Hip Resurfacing](#)" operation. The NHS told him he would have to wait 12 to 18 months for the hip operation; private treatment costs were estimated at £10,000, whereas in India he had to pay just £4,000 with no waiting time.

Mr. Stevens contacted Wockhardt Hospitals in Mumbai, for his treatment in India. Wockhardt Hospitals operates a chain of super speciality hospitals, with international accreditation by [Joint Commission International](#).

Mr Stevens said:

"The main objective of our visit here was to get the best possible medical attention which means the best possible surgeon and the best possible nursing, physio-rehab and overall hospital care. The second requirement was to find the best medical services at a cost we could afford. Thirdly, we needed to schedule the procedure for a very specific time -- the time between the two polo seasons: October. All of the medical attention received has exceeded our expectations. Dr. Malhan is not only the skilled surgeon we knew he would be, but he instils in us total confidence and also has a personality (and a sense of humour) to delight. We are blessed with him."

ed by EasySite - EIBS Ltd

Patient story supplied by [Wockhardt Hospitals](#), Mumbai, India.

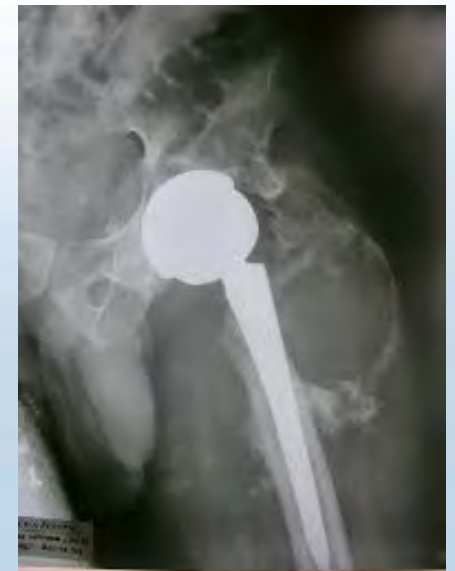
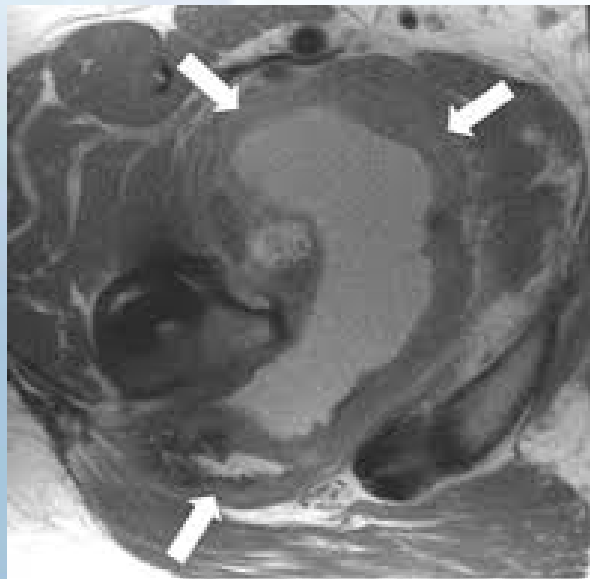
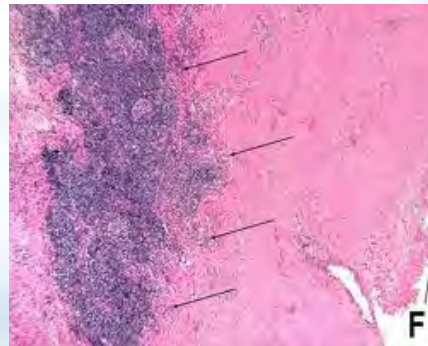
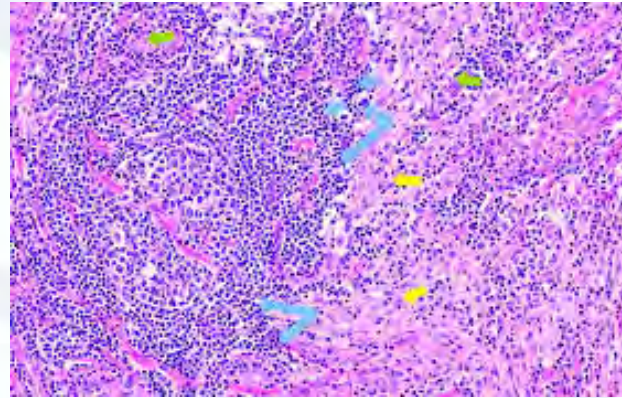


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With Warning, a Hip Device Is Withdrawn

By BARRY MEIER

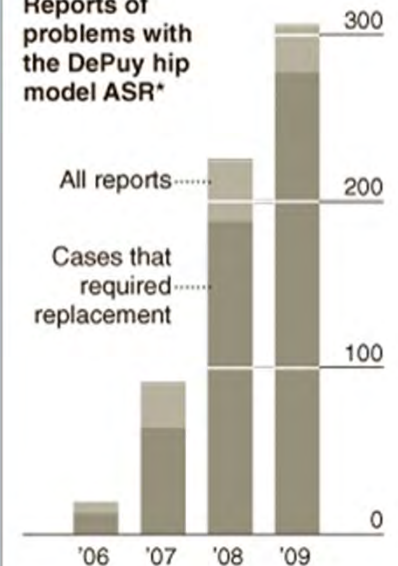
Published: March 9, 2010

A unit of [Johnson & Johnson](#), just months after saying it was phasing out an artificial hip implant because of slowing sales, has warned doctors that the device appears to have a high early failure rate in some patients.

Reported Problems

Between 2006 and 2009, reports of problems with the DePuy model ASR hip replacement device rose sharply. Of the problems reported in 2009, over 90 percent required replacement.

Reports of problems with the DePuy hip model ASR*



*Includes reports to F.D.A. of some cases outside the U.S.

Source: F.D.A.

The New York Times





Cobalt intoxication diagnosed with the help of Dr House

Kirsten Dahms, Yulia Shakova, Peter Heitland, Sabine Pankowitz, Juergen R Schaefer

Lancet 2014; 383: 574

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In May, 2012, a 55-year-old man was referred to our clinic for severe heart failure (New York Heart Association class IV). He had raised brain natriuretic peptide of 1053 ng/L (normal <55 ng/L) and his estimated ejection fraction by echocardiography was 25%. His medical history was mostly uneventful, apart from the fact that he had had both hips replaced by prostheses. Coronary artery disease had been excluded by heart catheterisation; cardiomyopathy was therefore regarded as the cause of heart failure. Additionally he was almost deaf and almost blind; furthermore he had fever of unknown origin, hypothyroidism, and reflux oesophagitis. His mediastinal lymph nodes as well as the lymph nodes at his left hip were enlarged. At this site he had had hip replacement surgery in November, 2010, when a metal-on-polyethylene prosthesis (head Zimmer CoCrMo Protasul, metal [Zimmer, Winterthur, Switzerland]; Inlay Aesculap NH 413 Chitralen PE [Aesculap, Tuttingen, Germany]) was implanted to replace a broken ceramic-on-ceramic hip prosthesis (implanted December, 2001; head Aesculap NK 561 Biolox forte, Inlay Aesculap NH 103 Plasmacup). All symptoms appeared within the past year before his admission to our centre. Searching for the cause combining these symptoms—and remembering an episode of the TV series “House” which we used for teaching medical students (series seven/episode 11)—we suspected cobalt intoxication as the most likely reason. We did radiography of the hip and measured cobalt and chromium. The radiograph showed a myostitis ossificans-like picture attributable to metal debris at the left-sided hip. The measurement of cobalt and chromium in the blood showed severe increase of these metals. In a heparin-blood sample the cobalt concentration was 15000 nmol/L (normal <15·3 nmol/L) and chromium was 942 nmol/L (normal <9·6 nmol/L). The cobalt

concentration in 24 h urine was 6140 nmol/L (normal <17 nmol/L) and chromium urine concentration was 52300 nmol/L (normal <11·5 nmol/L). We initiated 2,3-dimercaptopropane-1-sulfonate treatment and referred the patient to his former orthopaedic clinic, where he received a new left ceramic hip prosthesis, and subsequently—because of the severe heart failure—an implanted cardioverter-defibrillator. Most likely because of remaining ceramic particles, the metal head of the hip replacement was severely damaged (figure). Shortly after the hip replacement, the patient's plasma cobalt and chromium concentrations decreased, and the patient stabilised and recovered slightly. In July, 2013 (14 months after removal of the metal hip), heparin-blood concentration of cobalt was 1460 nmol/L and chromium was 365 nmol/L. Cardiac function improved to 40% and there were no new episodes of fever or signs of oesophagitis. However, the patient's hearing and vision recovered only slightly.

Cobalt intoxication has been a well known cause of cardiomyopathy for over 50 years; however, it has mostly been known in the context of so-called Quebec beer drinkers' cardiomyopathy and hard steel work-related exposure to cobalt.^{1,2} The stability of cobalt in combination with chromium and molybdenum (usually Co 70%, Cr 25%, Mo 5%) made this metal an excellent and stable compound in hip prosthetics. Numerous studies have investigated metal exposure due to metal hip arthroplasties.³ However, in certain situations—false placement, technical problems in metal-on-metal prostheses, and strikingly often after an off-label replacement of broken ceramic hips by metal parts—cobalt exposure to the patient from a hip prosthesis occurs. This cobalt intoxication is an increasingly recognised and life-threatening problem.⁴

Contributors

KD, YS, and JRS looked after the patient and wrote the report. SP and PH managed and measured the blood samples. All authors reviewed the text. Written consent by the patient to publish this report was obtained. JRS was supported by the Dr R Pohl Foundation.

References

- 1 Family Practice (House). [http://en.wikipedia.org/wiki/Family_Practice_\(House\)](http://en.wikipedia.org/wiki/Family_Practice_(House)) (accessed Oct 1, 2013).
- 2 Bonenfant J, Miller G, Roy PE. Quebec beer-drinkers' cardiomyopathy: pathological studies. *Can Med Assoc J* 1967; 97: 910–16.
- 3 Litina A, Olesz P, Groudaszewska K, et al. Exposure to cobalt in the production of cobalt and cobalt compounds and its effect on the human. *Occup Environ Med* 2004; 61: 877–85.
- 4 Janusz C, Jørgensen HL, Dams BR, Spørring SL, Lauritzen JB. Chromium and cobalt ion concentrations in blood and serum following various types of metal-on-metal hip arthroplasties: a literature overview. *Acta Orthop* 2013; 84: 229–36.
- 5 Gilbert CJ, Cheung A, Busany J, et al. Hip pain and heart failure: the missing link. *Circ J* 2013; 77: 639–42.



Figure. Metal hip prosthesis causing cobalt intoxication. Removed metal head with hole due to severe metal loss.

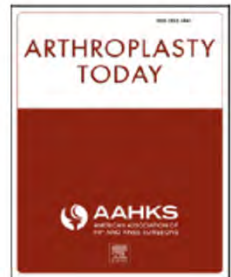


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Contents lists available at [ScienceDirect](#)

Arthroplasty Today

journal homepage: <http://www.arthroplastytoday.org/>



Case report

Cardiac transplant due to metal toxicity associated with hip arthroplasty

Sheldon Moniz, MBBS (UWA) ^{*}, Sean Hodgkinson, MBBS (UWA),
Piers Yates, MBBS (Hons), BSc (Hons), MRCS (Eng), FRCS (Tr & Orth), FRACS (Ortho), FAOrthA

Department of Orthopaedics, Fiona Stanley Hospital, Murdoch, Perth, WA, Australia

“I want the same type of joint replacement as Jack Nicklaus.”



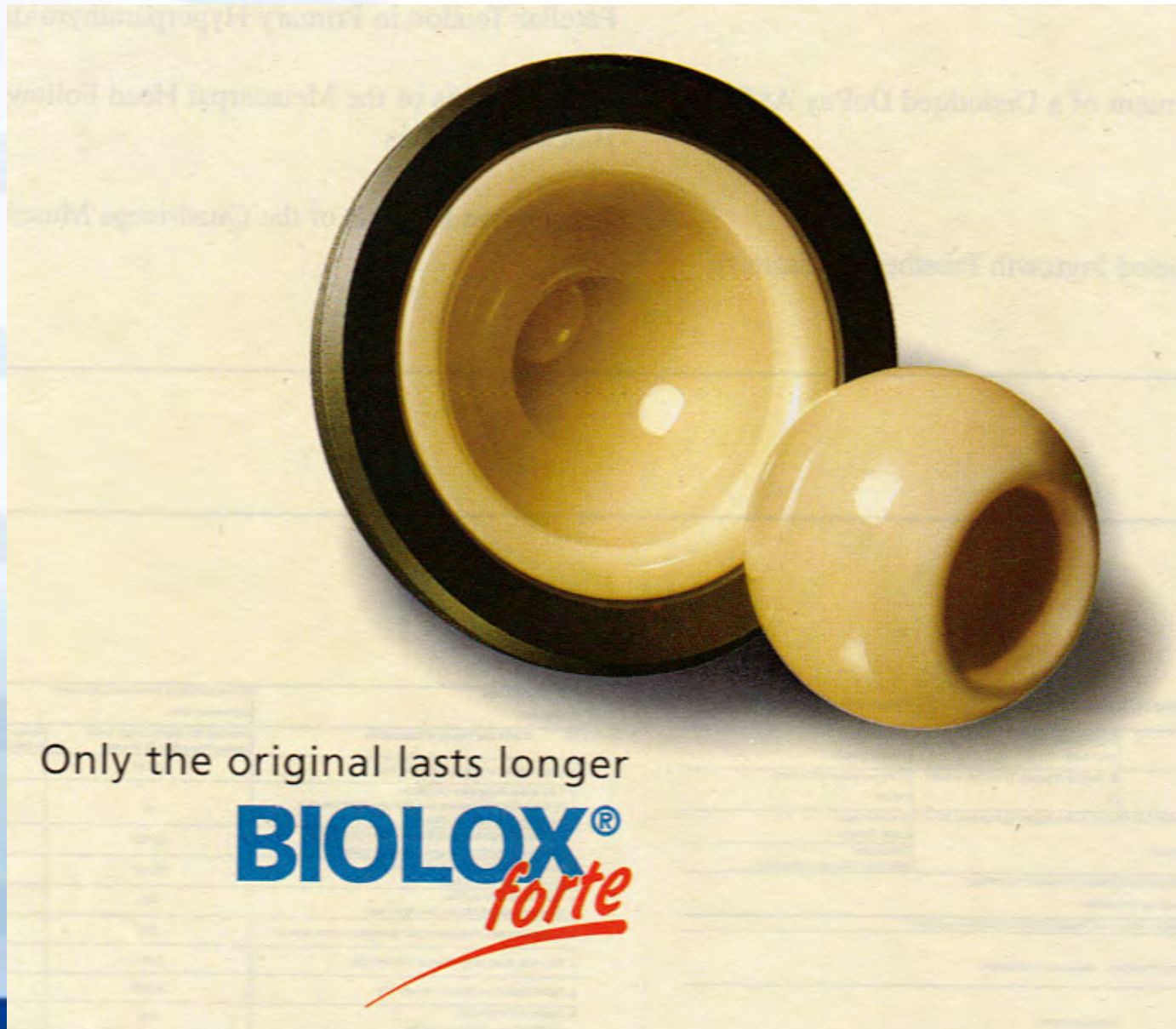
“I had my hip replaced to get back my life, not just for golf”

A handwritten signature in cursive script, which appears to be "Jack Nicklaus".

Jack Nicklaus



Ceramics



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Medical Device Recalls

Recall of Zirconia Ceramic Femoral Heads for Hip Implants

The FDA is announcing a voluntary recall of the unimplanted inventory of nine batches of zirconia ceramic femoral heads manufactured by a French manufacturer, Saint Gobain Advanced Ceramics Desmarquest (St. Gobain Desmarquest), and by U.S. manufacturers that have included these components in their hip prostheses. The component is the "ball" portion of the hip prosthesis that connects the femoral stem to the pelvis.

On Tuesday, August 14, 2001, St. Gobain Desmarquest recalled nine specific production batches of its zirconia ceramic femoral heads, which include some lots sold in the United States. As a result, most orthopedic companies have either recalled or are in the process of recalling zirconia ceramic femoral heads manufactured by the French company. The zirconia ceramic components are distributed worldwide by more than 51 companies. U.S. companies estimate that zirconia ceramic femoral heads are used in less than 6% of hip implant procedures in the United States. About 150,000 to 200,000 hip prostheses are implanted into U.S. patients each year.

This recall follows recent action by the French Agency for the Medical Safety of Health Products (AFSSAPS) and the United Kingdom Medical Devices Agency suspending sales of all St. Gobain Desmarquest-manufactured zirconia ceramic heads made after a manufacturing process change in 1998. A letter published by AFSSAPS cited the higher than expected fracture rate in some of the product produced by St. Gobain Desmarquest, with several possible reasons for the increased number of fractures.

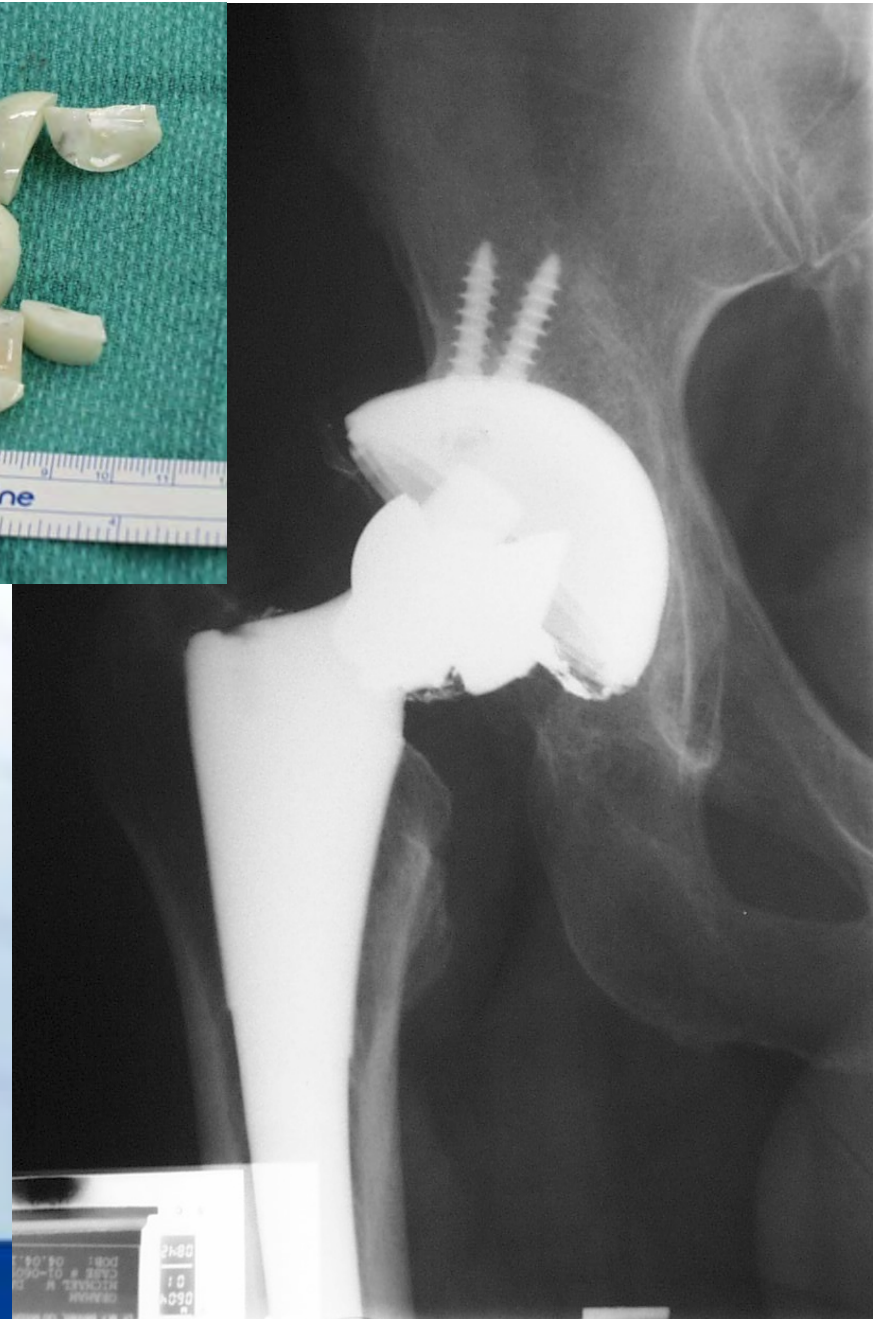
FDA is working with the U.S. industries, with Saint Gobain Desmarquest, and with the foreign regulatory agencies to help resolve this issue.

The orthopedic industry is working with various regulatory agencies around the world to determine whether and to what extent there are any performance issues with other production batches of zirconia heads manufactured by St. Gobain Desmarquest. The U.S. companies that are recalling the St. Gobain Desmarquest components are:

- Apex Surgical, LLC (Lakeville, Mass.)
- Biomet, Inc. (Warsaw, Ind.)

Ceramics – Disadvantages

- Fractures
 - Risk with modern components $<0.05\%$
- Difficulty in designing taper locks
- Rigid
 - Direct transmission of energy to bone
- Expensive
- Noise – Squeaking hips (10-20%)



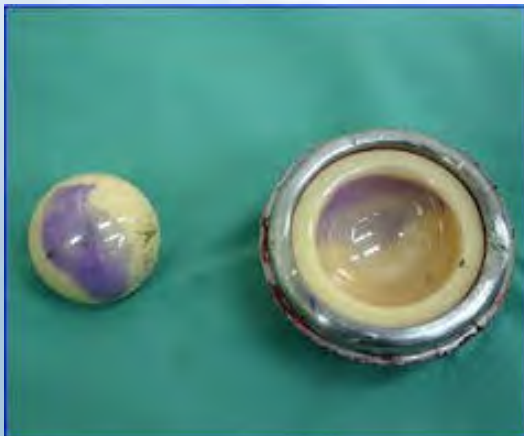
Squeaking Ceramics

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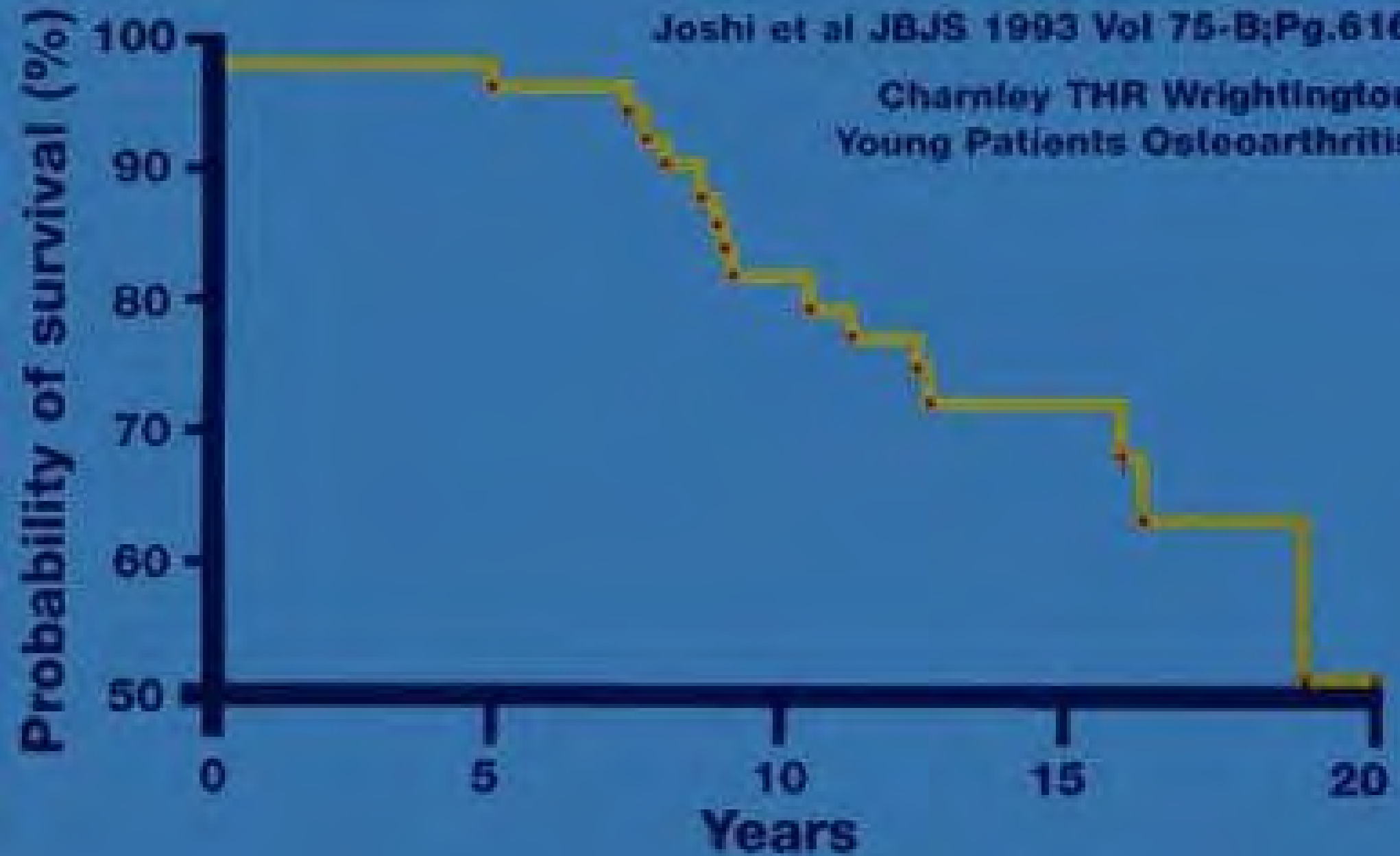
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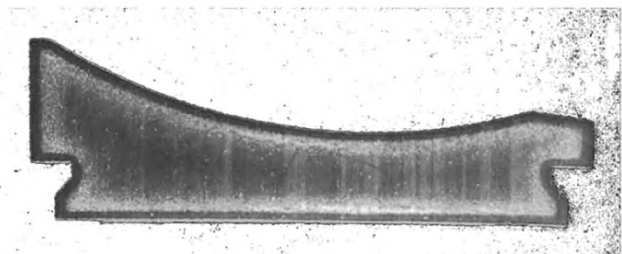
“Joint replacements wear out after 10 years”



Joshi et al JBJS 1993 Vol 75-B;Pg.616

Charnley THR Wrightington
Young Patients Osteoarthritis





Bearing History

- 1880's – soft tissue interposition
- 1894 – ivory
- 1920's – mold arthroplasty
- 1930's – metal –metal
- 1950's – Teflon
- 1962 – high density polyethylene
the standard for the next 50+ years



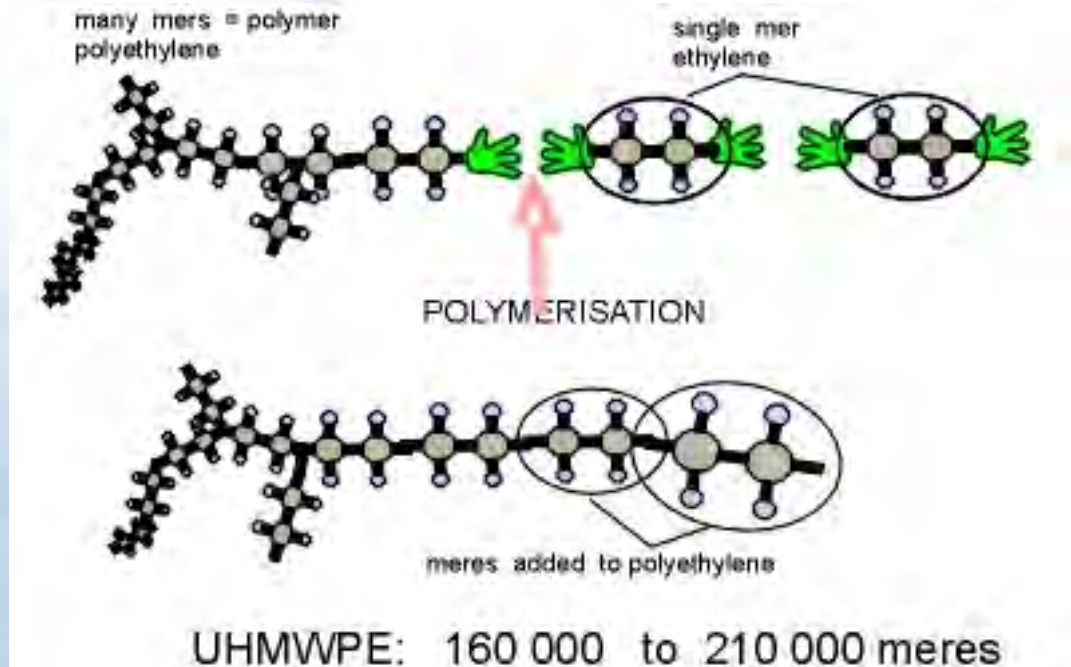
Sir John Charnley

Polyethylene – What is it?

- Polymer of ethylene molecules C_2H_4
- Fine powder consolidated at elevated temp or pressure



- Ram extrusion
- Molding followed by machining
- Direct molding into final shape



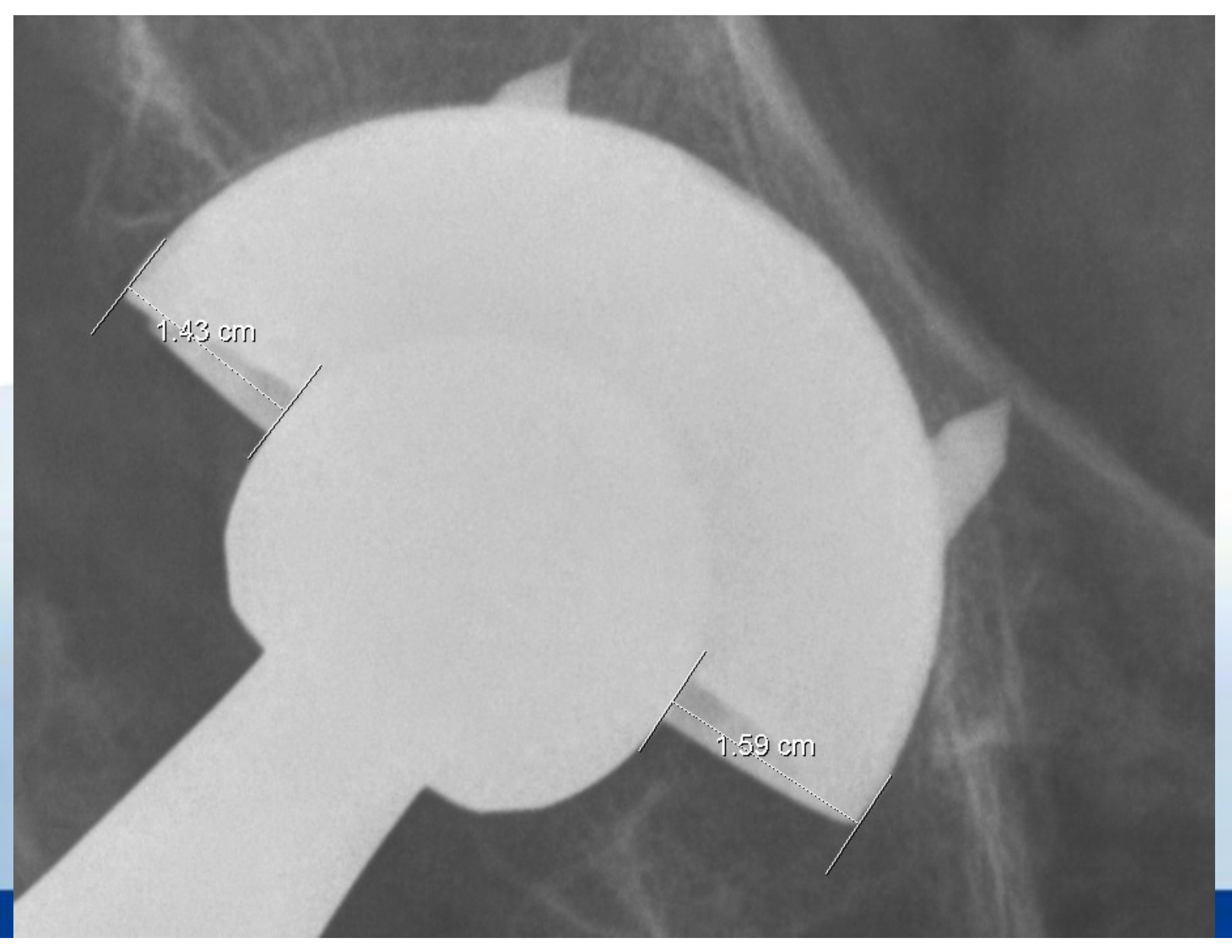
Advantages of Poly

- Abrasion resistance
- Impact strength
- Shock absorption
- Low coefficient of friction
- Chemical inertness
- Resistance to stress cracking
- Inexpensive

The Problem with Poly

- Wear debris
 - Abrasive and adhesive wear
 - 75 to 250 microns linear wear / year
 - 500 billion particles / year
 - 500,000 particles / step
 - Submicron particles
 - 85% < 1 micron
 - 4% > 2 microns





1.43 cm

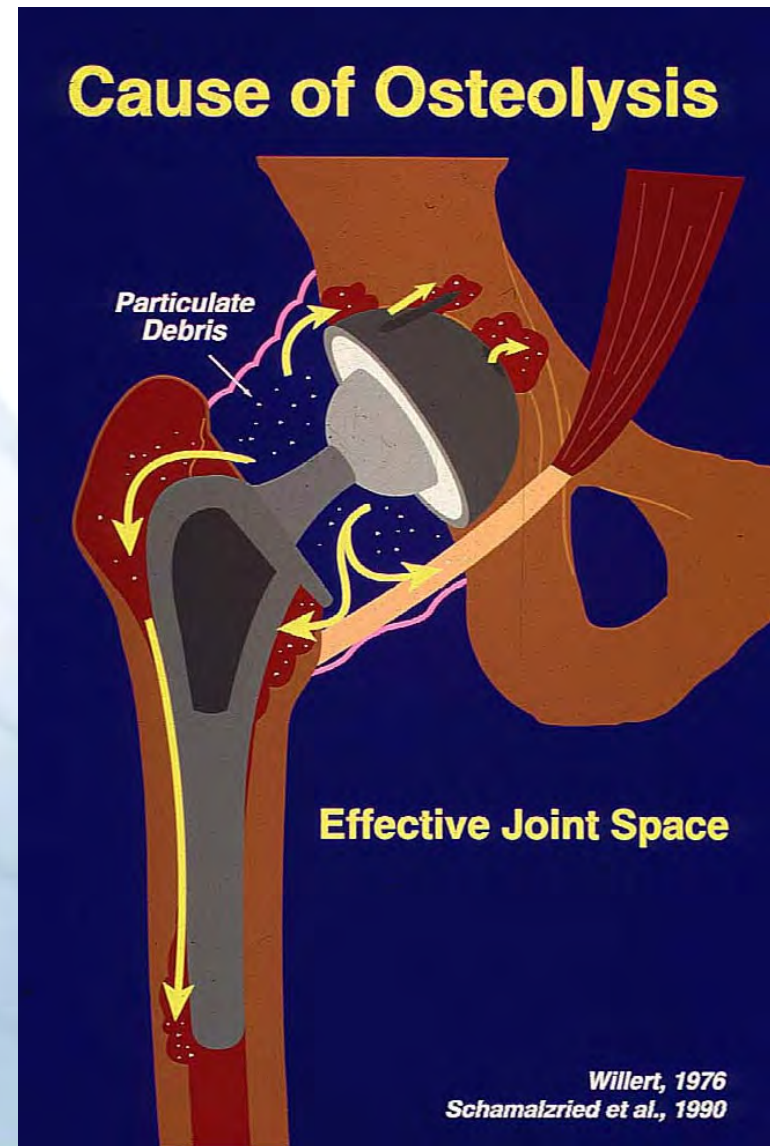
1.59 cm

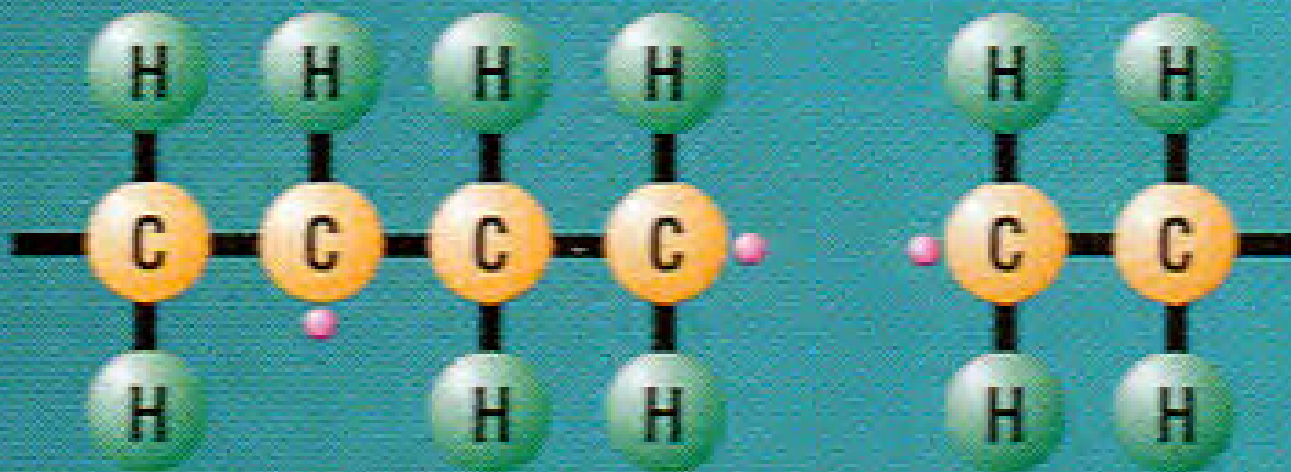
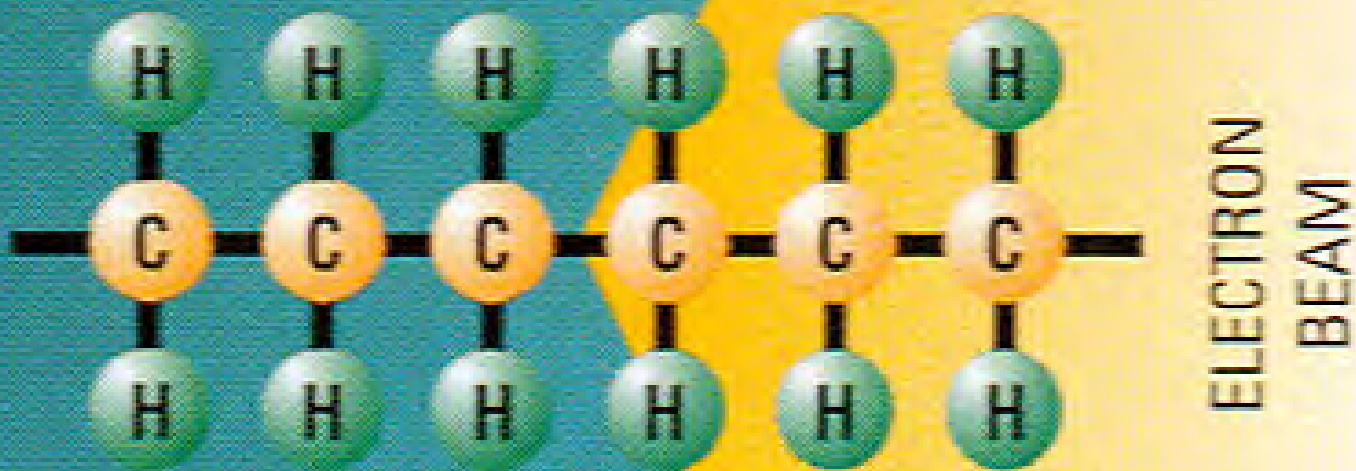
The biggest long term problem in THA is polyethylene wear and the resultant osteolysis.

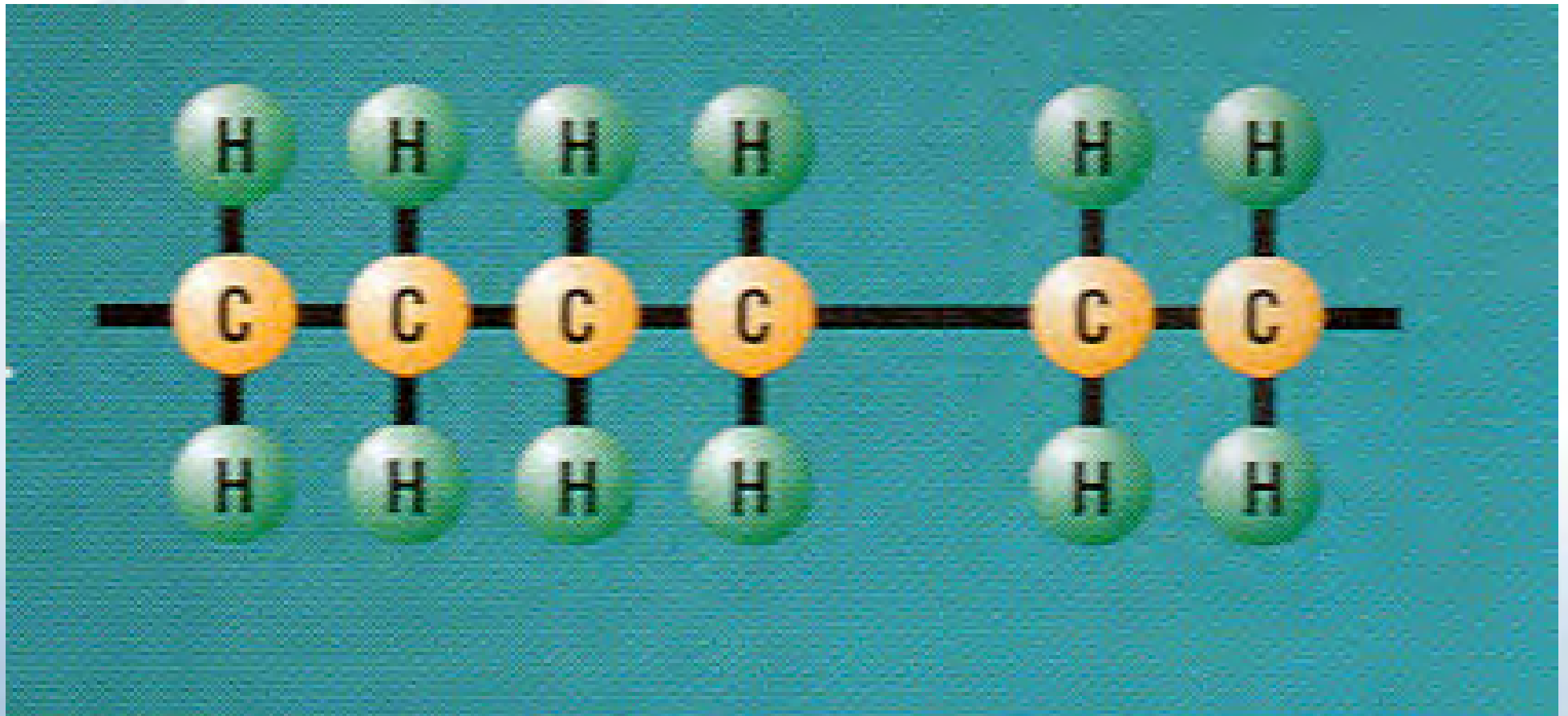


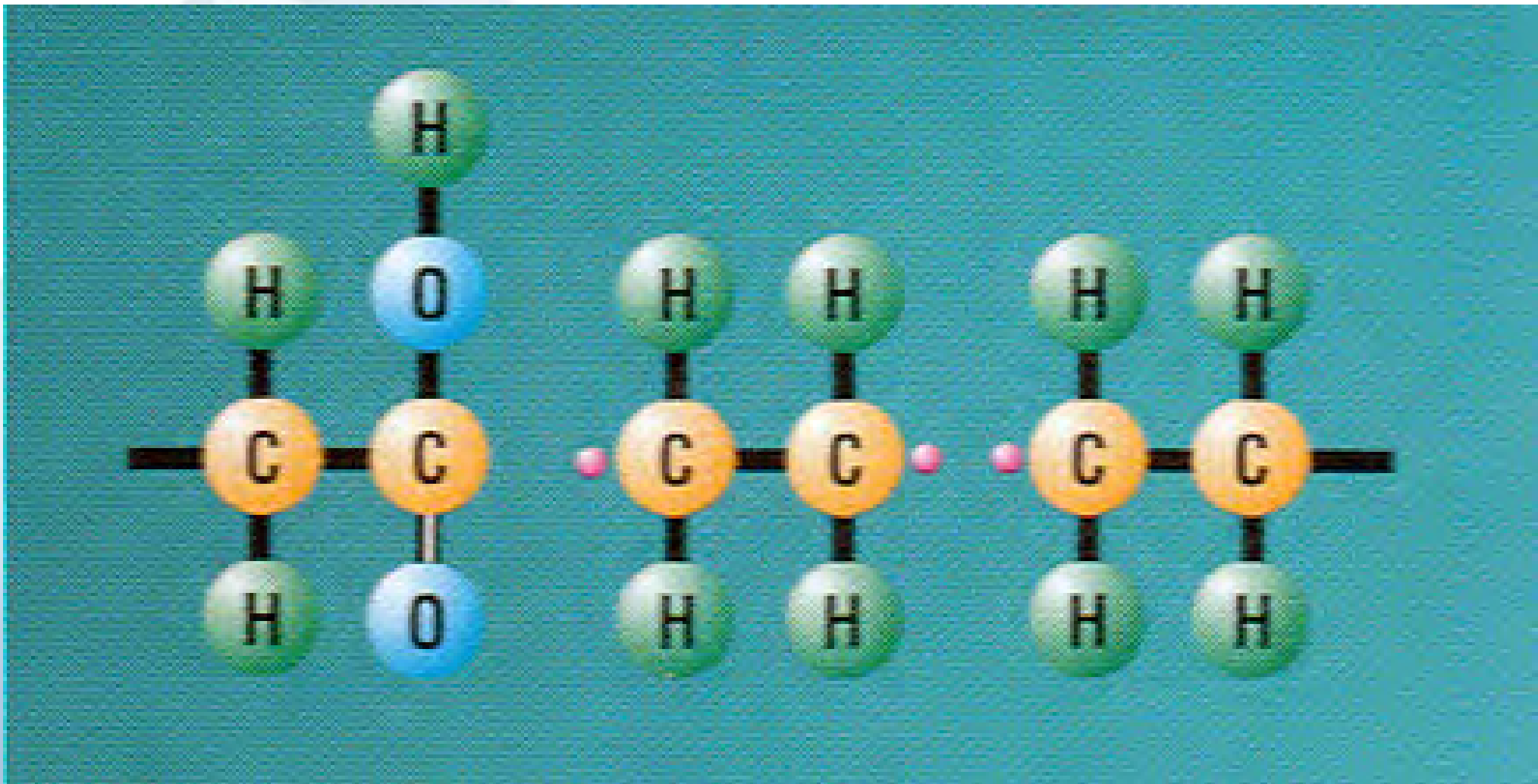
Attempts to Correct This

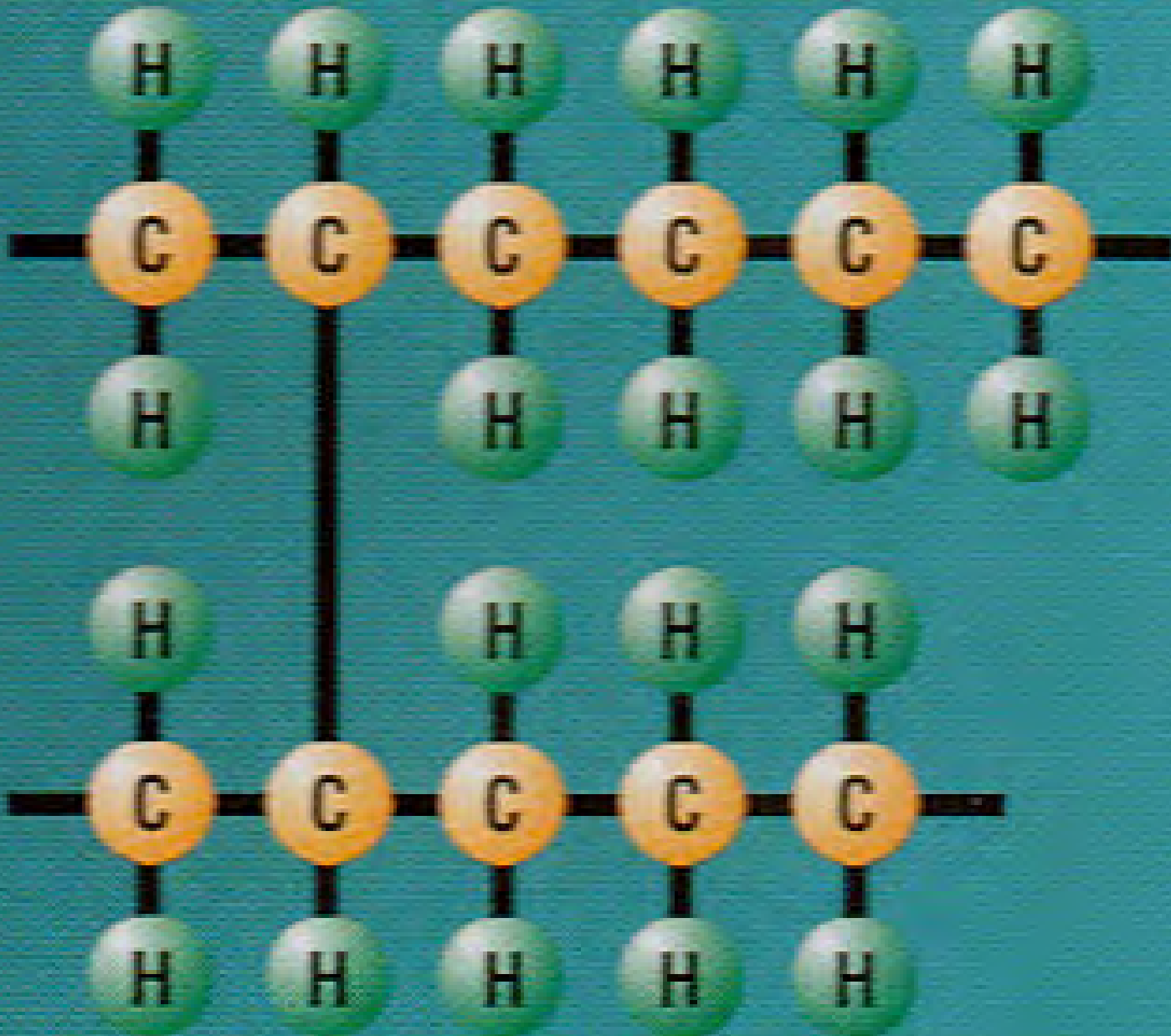
- Avoid thin poly
- Avoid modularity or make connections stable
- Polished backside surfaces
- Avoid screw holes
- Avoid impingement
- Decrease effective joint space
- Avoid poly











Crosslinked Polyethylene

- Radiation causes free radicals
 - May combine with oxygen - Oxidation
 - Polymer chains break
 - Crystalline structure disturbed
 - Mechanical properties deteriorate
 - May combine with each other - Cross linking
- Heating (annealing) helps to reduce oxidation
 - 150 degrees C for 16 hours
 - Outer layer of oxidized material removed

Crosslinked Polyethylene

- Prevents surface deformation
- Increases wear resistance
- Reduces sensitivity to abrasion

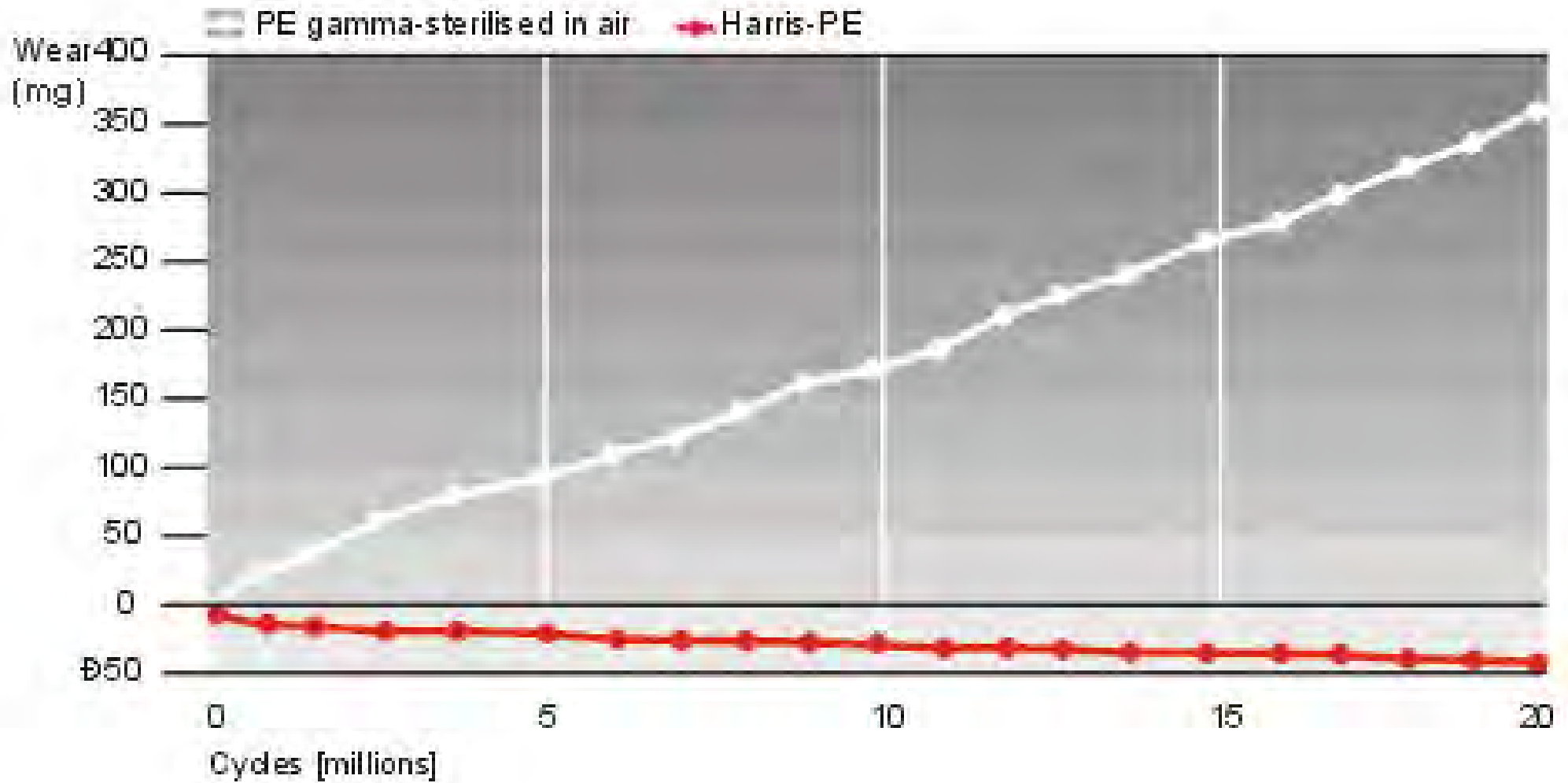


Crosslinked Poly - Advantages

- Minimal wear in lab simulations
- No significant change in material properties
- Allows for use of larger heads
 - Reduced dislocation rates
 - Reduced need for skirts
 - Improved ROM



Hip simulator test



THE OTTO AUFRANC AWARD

Highly Cross-linked Polyethylene in Total Hip Arthroplasty

Randomized Evaluation of Penetration Rate in Cemented and Uncemented Sockets Using Radiostereometric Analysis

Georgios Digas, MD, PhD; Johan Kärrholm, MD, PhD; Jonas Thanner, MD, PhD; Henrik Malchau, MD, PhD; and Peter Herberts, MD, PhD

- Prospective, randomized
- Bilateral hips –
 - N = 32 (Longevity & Conventional)
- Unilateral hips
 - N= 62 (all poly cups- Durasul or conventional)

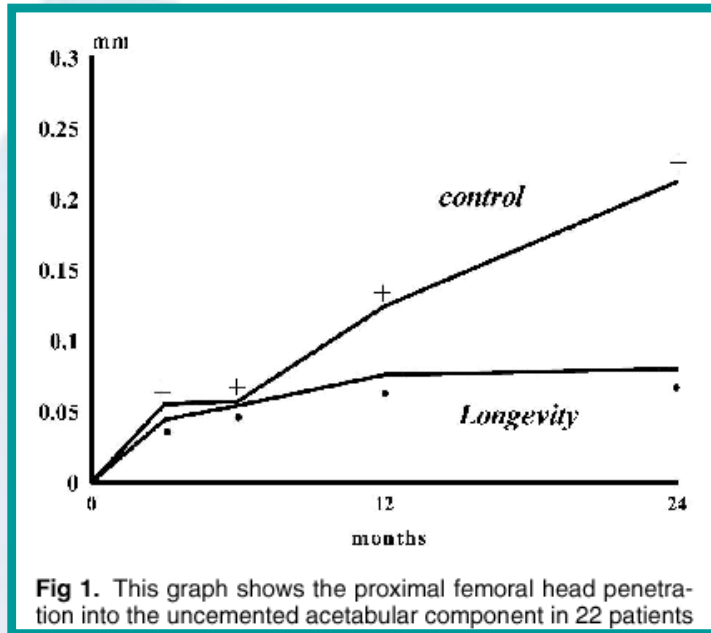
Radiostereometry: Tantalum markers implanted into acetabulum and liner at time of surgery

Longevity

1 yr – 0.08 vs 0.08 mm

>1yr- 0.12 vs 0.21 mm

$p < 0.005$

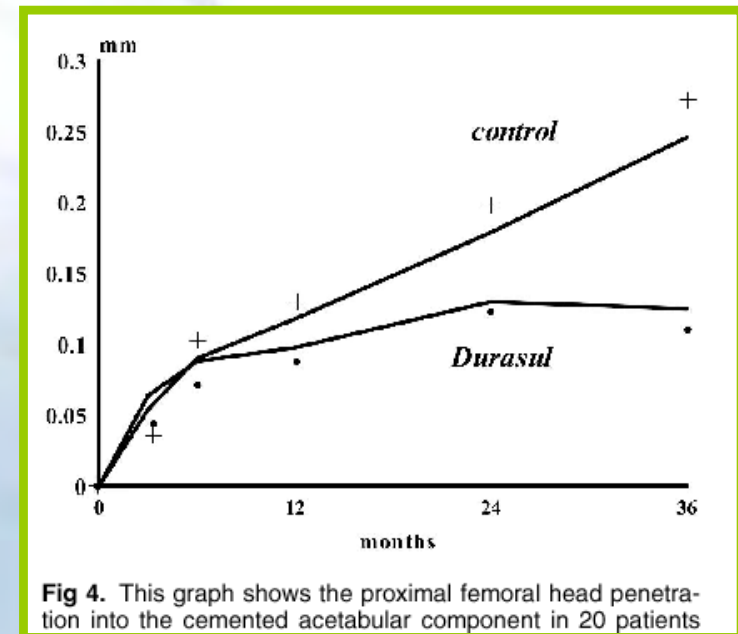


Durasul

1 yr – 0.09 vs 0.13 mm

>1yr- 0.13 vs 0.25 mm

$p < 0.002$



Continued Improved Wear with an Annealed Highly Cross-linked Polyethylene

**William N. Capello MD, James A. D'Antonio MD,
Rama Ramakrishnan MS, Marybeth Naughton BS**

- Clin Orthop Relat Res (2011) 469:825–830
- 42 hips at 8.6 years
- 0.031 mm linear wear per year for XLPE versus 0.141 mm for conventional (78% reduction)
- No osteolysis in XLPE versus 50% in conventional
- No mechanical failure

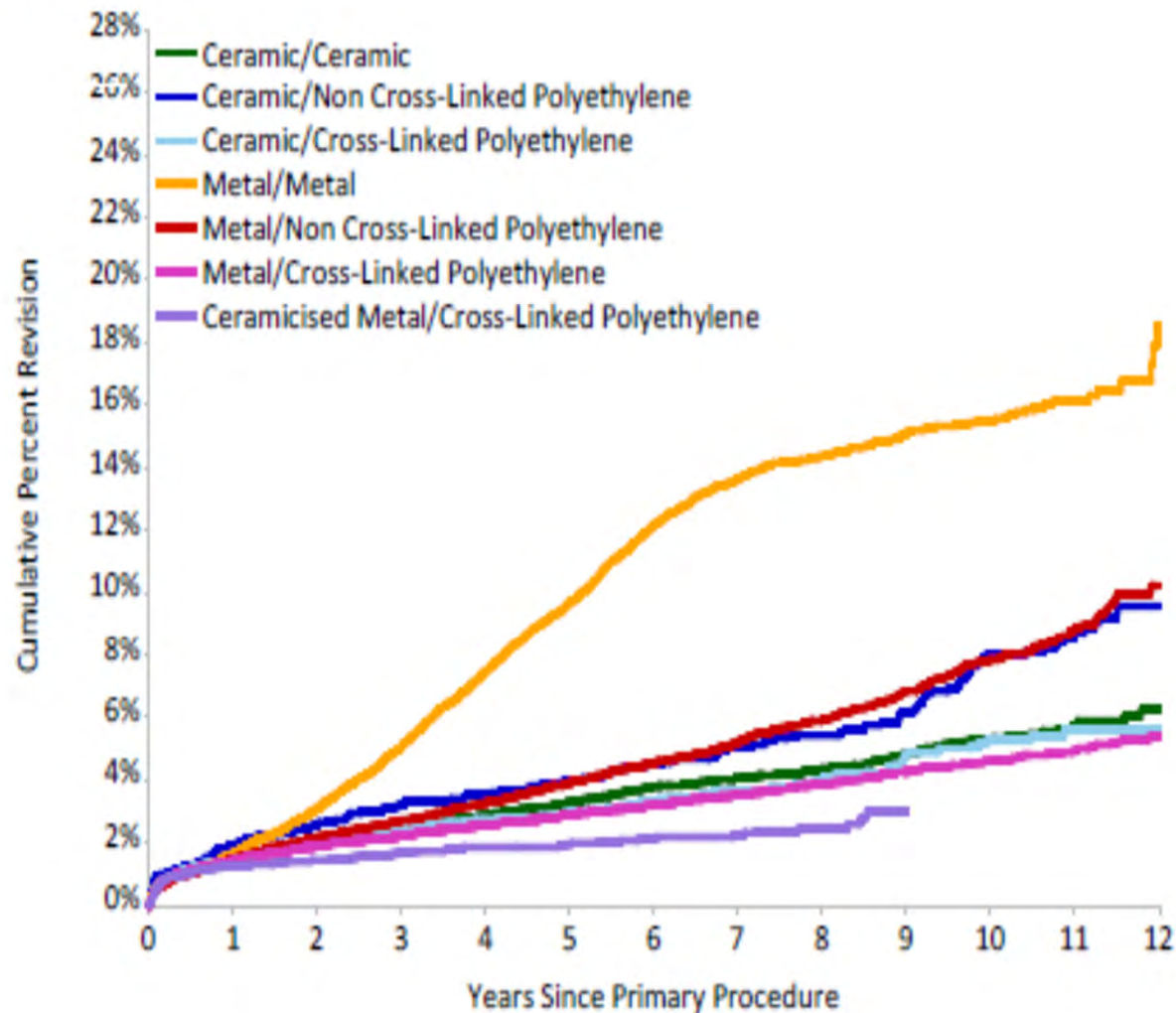
MUSC Experience

- Over the past 20+ years, >99% of our THA's have been either ceramic or metal on XPLE.
- >90% of primaries are cementless, proximally porous coated stems with porous cups.
- No revisions for any bearing surface related issue (wear, osteolysis, bearing failure)
- Minimal wear on follow-up x-rays
- Our implant of choice for all hip replacement patients



Australian Registry 2013 Report

Figure HT25: Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



Joint Commission Health Care Organization

Organization ID: 6584-Medical University of South Carolina Medical Center 169 Ashley Avenue Charleston, SC
29425

Certification Activity- 60-day Evidence of Standards Compliance

DSC-Advanced Total Hip and Knee Replacement DSSE.01 EP 1
Likelihood: Low Scope: WideSpread

Standard Text: The program involves patients in making decisions about managing their disease or condition.

EP Text: The program involves patients in decisions about their care, treatment, and services.

Finding(s): 1) Observed in Record Review at MUSC Medical Center - Main University Hospital (169 Ashley Avenue, Charleston, SC) site . The program did not involve patients in decisions about their care, treatment, and services as seen in chart review in which there was no discussion of the implant rationale and alternatives. The importance of involving the patient in the decision making process was discussed with the program coordinator and they voiced understanding.

Assigning Accountability

The Medical Director Joint Replacement is ultimately responsible for all corrective actions and ongoing compliance associated with this element of performance.

Correcting Non - Compliance

Q. All corrective actions identified below must be completed prior to submission

Documentation of discussion between surgeon and patient that includes type of procedure, cemented vs. non-cemented, and bearing surface will be incorporated into the surgeon's note at the time that surgery is discussed.

Q. All corrective actions described above were completed by Jun 01, 2023

Ensuring Sustained Compliance

Q. Describe how the organization will identify issues of non-compliance in a timely manner and monitor/audit the effectiveness of the corrective action put in place to ensure it is working and sustained. Example: auditing medical records, conducting observations, coding changes in systems, etc.

Will perform 10 audits per QAPI bi-monthly to determine compliance with documentation of surgeon's note.

Q. Indicate how often the auditing/monitoring will occur (e.g. daily, weekly, monthly).

Note:

- To ensure sustained compliance, monitoring should be ongoing periodically and not stop after a period of time.
- We encourage organizations to be aggressive in setting 100% compliance goals and monitoring to achieve 100% compliance.

Bi-monthly to achieve 100% compliance



Pre-op (Holding)

- **Nursing check in**
 - Review consent, confirm site
 - SCD for non-operative leg
 - Chlorhexidine wipes
 - Clip surgical site
 - Betadine to surgical site
 - IV and initiate Vancomycin, if needed
 - Blood, meds, other orders
 - Empty bladder before going to OR
- **Anesthesia team**
 - Review consent
 - Discuss anesthesia plan
 - Peripheral nerve blocks
 - Confirm Vanco, if needed
- **Surgical team**
 - Review consent
 - Mark surgical site
 - Discuss surgery and answer questions
 - Discuss discharge plan
 - Confirm all of above as being done



Operative Considerations

Prophylactic antibiotics

Infection prevention

Blood management

Surgical approaches



OR Prevention of Infection - Disclaimer

There is little Level 1 evidence to support many of the things we do in the operating room to prevent infections.

There is too little time to begin to cover all of the literature on this topic.

A consistent, logical, thoughtful approach seems to have the highest impact on establishing culture and improving outcomes.



OR Order of Operations

- No sterile equipment opened prior to patient arrival
- Circulator writes Name, MRN, DOB, Procedure, Antibiotic timing on White Board
- Patient brought to OR by anesthesia team
 - Hair covering, masks for all personnel. Shirts tucked, Boots (?)
 - No outside jackets
- Transfer to OR table
 - Stretcher and all linens out of room
- Administration of anesthetic
 - Surgical team reviews radiographs, templates, history, equipment
- Position bed, establish barrier between anesthesia and surgical site (sheet) before opening any equipment
- Scrub and circulator / facilitator begin opening equipment
- Surgical team (MDs, PAs) prepares patient
 - Positioning, lights, leg suspension, tourniquet, Blue U drape, Pre-prep
- Antibiotics during pre-prep



OR Order of Operations

- Time out
 - Circulator reviews consent
 - Introductions
 - Surgeon discusses case
 - Surgical plan, time, EBL, needed equipment and blood products, specimens, drains, recovery / discharge plan, anything unusual
 - Anesthesia concerns
 - Scrub tech concerns
- Surgical team scrubs while OR nurses continue opening equipment
- Sterile gloves for prep (no gowns for person applying prep)
- Hoods – fan off until gloves on
- Down and top sheets, stockinette, drape, impervious skin covering, change gloves, mark, suction/cautery/pulse lavage.
- No forced air warmers until all drapes on
- Operate!
- Change gloves every hour and before implants
- No change of personnel unless absolutely necessary
- Chlorhexidine irrigation and saline pulse lavage
- Chlorhexidine prep at final skin closure
- Impervious dressing



Pathogenesis of O.R. Infections

Skin

Airborne Sources / instruments / gloves

Hematogenous

Most common organisms

- › Staph Aureus and Staph Epidermidis
- › Enterococcus, Streptococcus, GNR's

Glycocalyx biofilms on orthopaedic implants allow non-pathologic organisms to lead to infection

Development of infection depends on virulence of organism, load of contamination, host factors, and local environment.



Host or systemic factors

Systemic antibiotics

MRSA / MSSA isolation and decolonization

Glucose control

Nutritional support

Body temperature

Oxygenation

Shaving / Clipping

Prepping / Draping / Skin isolation



Prophylactic Antibiotics - History

History

- Conflicting data prior to mid 1970's
- "Prophylactic" antibiotics typically given hours or days after surgery
- 1961 – Burke reported that adequate tissue levels at time of inoculation prevented infection in Guinea pigs
- Bowers, JBJS 1973
 - Canine model showed high cephaloridine levels in hematoma if given 30 minutes prior to surgery with no infection
 - Starting administration 6 hours post-op could not achieve bacterial sterility
 - Starting after 24 hours were universally infected
- Pavel, JBJS 1974
 - Prospective, placebo-controlled study of 1591 clean operations using pre and intra-op cephaloridine
 - Decreased infection risk from 5% to 2.8%
- Charnley – 7% in 1960 to 0.5% in 1970 without antibiotics



Prophylactic Antibiotics

JBJS CCR 2009 – Meehan, et al

- ⦿ Given to prevent surgical infection when infection is not believed to be present, but risk is present.
- ⦿ Goal is to achieve serum and tissue levels that exceed the MIC for organisms likely to be encountered during the operation.
- ⦿ Augments hosts immune system by increasing the amount of contamination required to cause infection



Prophylactic Antibiotics - Timing

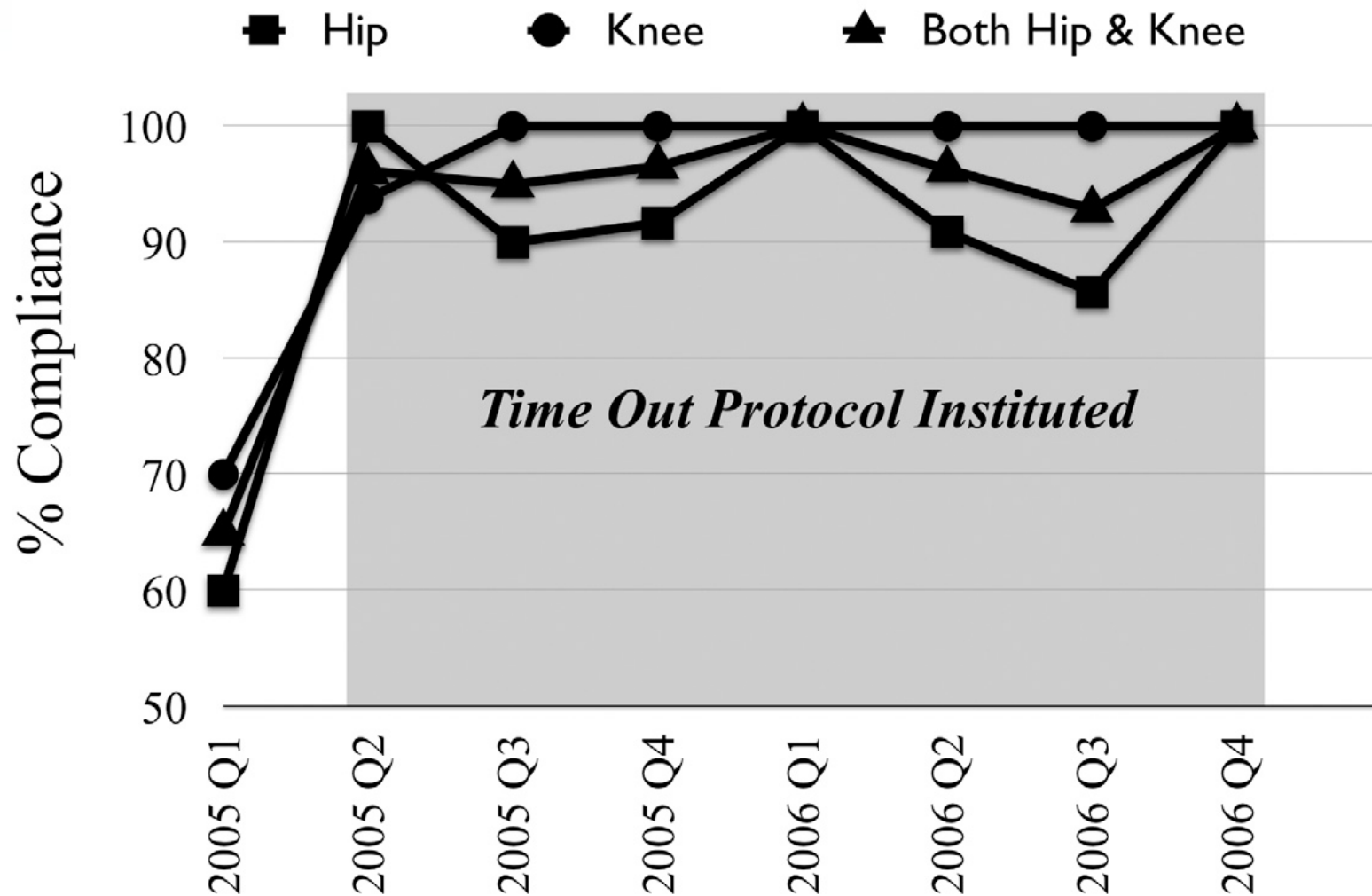
- Within 60 minutes prior to incision
- Peak levels reached within 20 minutes of administration
- Vancomycin can start up 2 hours prior
- Additional dose if procedure exceeds half-life of antibiotic or substantial blood loss.
- AAOS Recommendations

TABLE I Recommendations by the American Academy of Orthopaedic Surgeons for Repeat Doses of Antibiotics⁶²	
Antibiotic	Frequency of Administration
Cefazolin	Every 2-5 hours
Cefuroxime	Every 3-4 hours
Clindamycin	Every 3-6 hours
Vancomycin	Every 6-12 hours



Ensuring Appropriate Timing of Antimicrobial Prophylaxis

By Andrew D. Rosenberg, MD, Daniel Wambold, MD, Linede Kraemer, RN, MA, CNOR, Maureen Begley-Keyes, BS, RN, CPHRM, CPHQ, Scott L. Zuckerman, Neeraj Singh, BA, Max M. Cohen, MD, and Michele V. Bennett, RN, MA, ONC



Prophylactic Antibiotics - Choice

◎ Choice should cover most common organisms

- PCN, Cephalosporins, vancomycin, aminoglycosides are bactericidal
- Clindamycin is bacteriostatic
- Cefazolin or cefuroxime for sensitive staph.
- Vancomycin or clindamycin for allergic patients.
 - Cross reactivity between PCN and cephalosporins historically 10%.
 - Current anaphylaxis to cephalosporins estimated between 0.0001% and 0.1%



Prophylactic Antibiotics - Choice

Cefazolin

- › Has been antibiotic of choice for 3 decades
- › Excellent distribution profiles in bone, muscle, synovium, and hematoma
- › Rapid MIC levels in tissue
- › Rare anaphylactic reactions
- › 2 grams for adults < 120 Kg;
3 grams if > 120 Kg



Prophylactic Antibiotics – Choice

⦿ Vancomycin

- Reaches high concentrations in tissue within minutes
- 5-13% Red man syndrome with rapid infusion
- 15 mg/Kg for normal renal function
- Useful for
 - Known colonization with resistant organism
 - Facilities with recent outbreaks of MRSA
 - Anaphylaxis to Penicillin or Cephalosporins
 - May be warranted in high risk patients
- Risks
 - Development of VRE colonization
 - <1% ototoxicity or nephrotoxicity
 - Hypersensitivity, neutropenia, drug fever - rare



Prophylactic Antibiotics – AAOS Position – June 2004

⦿ Antibiotic selection

- Cefazolin or cefuroxime
- Reserve clindamycin or vancomycin for confirmed beta-lactam allergies, MRSA colonization, or outbreaks

⦿ Timing and dosage

- Within 1 hour of start time, 2 hours for vanc.
- Completely infused before tourniquet inflation
- 2 grams cefazolin for patients > 80 Kg
- Redose during surgery as needed

⦿ Duration

- Discontinue within 24 hours of the end of surgery
- Antibiotics not proven to be beneficial for retained catheters or drains



Pre-operative Screening for MRSA

Allows modification of choice of antibiotics for MRSA colonized patients

Role of nasal mupirocin remains unclear

Successful in Netherlands

- › 0.78% Staph isolates are MRSA

Unreported MUSC data suggests decreased MRSA infection rates in pre-screened patients



Real life at MUSC

MRSA screening and decolonization

Cefazolin 2 or 3 grams at time of “time-out” – After positioning, immediately before handwashing.

Re-dose at 3-4 hours.

Vancomycin 15mg/kg started in holding and completed prior to beginning of procedure for MRSA+ or severe allergy.

Antibiotics stopped within 24 hours (except revisions with pending cultures)

Order example:

- › Cefazolin 2 Gram IV x 3 doses – begin on (DOS) at (time) – 6 hours after last dose in OR (time). Must complete before (time, date) – 24 hours after end of surgery (time).



Hypothermia

Rationale:

- › Core temperatures outside the normal range pose a risk in all patients undergoing surgery.
- › According to the Clinical Guidelines for the Prevention of Unplanned Perioperative Hypothermia by the American Society of PeriAnesthesia Nurses (ASPAN, 2001), published research has correlated impaired wound healing, adverse cardiac events, altered drug metabolism, and coagulopathies with unplanned perioperative hypothermia.
- › Kurtz, et al (1996), found that incidence of culture-positive surgical site infections among those with mild perioperative hypothermia was three times higher than the normothermic perioperative patients. In this study, mild perioperative hypothermia was associated with delayed wound closure and prolonged hospitalization.
- › Mahoney and Odom (1999), demonstrated that hypothermia is associated with a significant increase in adverse outcomes, including an increased incidence of infections. The authors also concluded that hypothermia is associated with an increased chance of blood products administration, myocardial infarction, and mechanical ventilation. These adverse outcomes resulted in prolonged hospital stays and increased healthcare expenditures.



RLO at MUSC

Forced air warmers

Temp monitors

Pre-warm OR

Warm blankets / cover patients

Ongoing battle between Anesthesia and scrubbed personnel



Surgical Issues – Hair Removal

- ⦿ Increased risk of infection if shaving done the night before surgery
- ⦿ Clippers reduce post-operative infection rates over shaving
- ⦿ No difference in hair removal versus no hair removal.
- ⦿ Tanner J, Woodings D, Moncaster K. Preoperative hair removal to reduce surgical site infection. Cochrane Database Syst Rev. 2006;2:CD004122.



Surgical Issues – Skin Prep.

Chlorhexidine gluconate and iodophors both disrupt bacterial cell membranes, but chlorhexidine is more long-lasting.

Iodophors can be inactivated by blood or serum proteins.

Alcohol germicidal, but no residual activity.

No difference in efficacy in some studies, conflicting in others

“The current literature strongly suggests that chlorhexidine gluconate is superior to povidone-iodine for preoperative antisepsis for patients.” Fletcher, 2007

“Skin preparation solution is an important factor in the prevention of surgical-site infections. Iodophor-based compounds may be superior to chlorhexidine for this purpose in general surgery patients.” Swenson, 2009



Surgical Issues – Occlusive Drapes

No conclusive evidence of benefit

Geelhoed GW, Sharpe K, Simon GL. A comparative study of surgical skin preparation methods. *Surg Gynecol Obstet*. 1983;157:265-8.

Ritter MA, Campbell ED. Retrospective evaluation of an iodophor incorporated antimicrobial plastic adhesive wound drape. *Clin Orthop Relat Res*. 1988;228:307-8.

Jacobson C, Osmon DR, Hanssen A, Trousdale RT, Pagnano MW, Pyrek J, Berbari E, Naessens J. Prevention of wound contamination using DuraPrep solution plus Ioban 2 drapes. *Clin Orthop Relat Res*. 2005;439:32-7.



RLO at MUSC

Chlorhexidine shower at home

Pre-prep done in holding (Betadine)

If needed, clippers used in OR

Chlorhexidine/Alcohol pre-prep at time of “time-out”

Chlorhexidine/Alcohol entire extremity by scrubbed, gloved, ungowned surgeon

Start at surgical site and work outward

“No touch” skin technique

Iodine impregnated occlusive drape to seal skin and cloth drape together.



Airborne bacteria

Room traffic / doors

Blocks in Holding

Open equipment

Shedding

- › Outside scrubs
- › Body exhaust
- › Boots
- › Beards and hair

Airflow

UV lights

OR time

Scheduling / Turnover cleaning





Intraoperative bacterial contamination in operations for joint replacement

N. Davis, A. Curry, A. K. Gambhir, H. Panigrahi, C. R. C. Walker, E. G. L. Wilkins, M. A. Worsley, P. R. Kay

From the Bone Infection Group, University of Manchester, North Manchester General Hospital, Manchester, England

- Samples from 100 primary THA and TKA
- 63% overall contamination rate
 - 11.4% suction tips
 - 14.5% light handles
 - 9.4% skin blades
 - 3.2% inside blades
 - 28.7% prep gloves – “Over-gloves should be used during the preparation and changed before application of an adhesive plastic drape.”
 - 17% surgical gowns
 - 10% fascia suture needles – “implying that these cases are deeply contaminated”
- 76% Coag negative staph.
- Only 1 deep infection – not with contaminating organism

Surgical Issues – OR Environment

Decreased circulating CFUs and incidence of infection with:

- › Laminar Flow – 90% reduction
- › UV light
- › High-volume air exchange
- › Eliminating open doors / traffic
- › Synthetic gowns
- › Eliminating open implants > 2 hours
- › Reducing OR time

Ears and beards shed most bacteria

Men shed more than women



Surgical Issues – Room Traffic

Positive correlations with

- › Number of residents present
- › Proximity of door to OR equipment
- › Number of times door opened
- › Laterality of TKA's (proximity to door)



Body Exhaust Suits

Mostly personal protection

Variable data

Not sterile

- › CORR 469:11, 2011
- › 22% + culture at time 0
- › 47% + at end of procedure
- › 43% CNS, S. Aureus, and MRSA
- › “change gloves if the PPS is touched or adjusted during the procedure.”



RLO at MUSC

Blocks done in holding

Vertical laminar flow rooms with high exchange and HEPA filters

No UV lights

No forced air warmers until after fully draped

Body exhaust suits, tucked in tops, boot covers, synthetic gowns, covered hair and beards

All traffic from sterile corridor (minimize)

Instruments not opened before patient arrival

Keep traffic away from sterile areas!



Instrument contamination

Wrapping / containerization

Flash sterilization

Skin knife

Wash basin

Light handles

Double and re-gloving



Surgical Issues – Flash Sterilization

Should be used only for dropped instruments or emergency situations

Avoidance requires accurate posting, timely delivery of loaner sets, adequate on hand supplies, and minimal set contamination (wrap holes, filter issues, bioburden)



Splash Basins

J of Infection 52:231-232, 2006

21 TJA cases, laminar flow, 24h abx.

Cultured 100ml fluid from basin at end of case.

5 (23.8%) positive cultures

- › CNS, Pseudomonas, Neisseria, etc.

No clinical infections

“This study emphasizes that the orthopaedic community should stop using the splash basin since it increases the risk of wound contamination. We suggest that the surgical instruments should be left on the main instrument trolley until the end of surgery. It also underlines the importance of adhering to rigorous protocol in theatre management and the need for continued vigilance in the prevention of implant related infection.”



RLO at MUSC

Struggled with SPD issues for years

- › Worse with off-site processing
- › High incidence of contaminated trays (noticed before use)
- › Education, improved wrapping, containerization, padded corners

No wash basins

Skin knife

Double glove and change after draping, before implants, and hourly



Host contamination

Pulse lavage

Antibiotic cement

Antibiotic suture

Systemic antibiotics



Pulse lavage

Hargrove, et al. J Hosp Infection, 2006

356 Hemiarthroplasties with 2L NS washout

Jug / syringe – 15.6% infection (5.2% deep)

Pulse lavage – 5.6% infection (1.8% deep)

“The use of pulse lavage has never been shown to reduce infection rates in total joint replacement. The quoted infection rate for total hip replacements is 0.5–1.5%. If the use of pulse lavage reduced a quoted 1% infection rate to 0.5%, a prospective study of over 30,000 hips would be necessary to prove its success.”



Antibiotic Cement

Negligible reduction in fatigue strength

Costs about \$300 more per batch than plain

Numerous studies support use in high-risk population and revisions

Chiu JBJS 2009

- › Vancomycin cement for 183 revision TKA without “clean-air”
- › 7% in plain cement versus 0% in ALBC (P=0.013)

FDA-approved for revision after infection

Questionable benefit in routine primaries

Gandhi, et al JOA 2009

- › 1625 patients with primary TKA
 - › 2.2% ABLC vs. 3.1% Plain (not sig)

Jiranek WA, et al JBJS 2006.

- › Would require reduction in rate of infection from 1.5% to 0.3% to be cost effective.
- › An increase in usage in the US to 50% would cost \$117 Million



RLO at MUSC

Pulse lavage with bacitracin and polymyxin saline (not for all MD's)

Betadine irrigation

Irrisept (Chlorhexadine)

Antibiotic cement in high-risk TKA's



Surgical Issues - Drains

Higher incidence of retrograde bacterial contamination with conduit drains versus suction drains.

High incidence of contamination beyond 24 hours

No difference in infection rates

More bruising & wound drainage w/o drains, but more transfusions with

No clear advantage in using drains in TJA



Perioperative Issues – Urinary Catheters

UTI's are most frequent nosocomial infections

0.5 – 20% risk of UTI with single catheterization

8 – 30% transient bacteremia with catheterization

Urinary retention common in TJA patients

Up to 48 hours is equivalent to intermittent catheterization

26% of patients develop UTI after 48 hours of catheterization

JBJS 1976 Donovan, et al

- › 359 retrospective and 100 prospective patients on cephalosporin
- › 8X more likely to develop UTI if catheter present
- › Most caused by Pseudomonas or Enterobacter
- › 1 had acute hematogenous infection of TJA from UTI



RLO at MUSC

Foley (if used) removed POD 1

Drain for some TKA's, removed within 24 hours

Staples for most wounds

Impervious Aquacel dressing

Dressing change POD7



**I don't want a transfusion.
I want my relative to give
blood for me.
I want to predonate my
own blood.**



ABLA

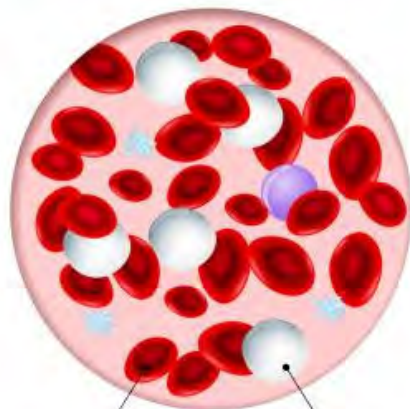
..... stands for

Acute Blood Loss Anemia



Abbreviations.com

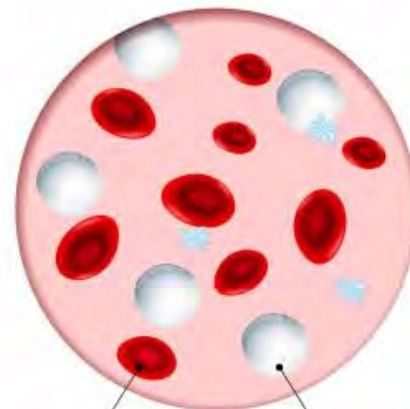
Normal



Red blood cell

White blood cell

Anemia



Red blood cell

White blood cell



Risks of Blood Transfusions

JAAOS 2002 Keating and Meding

Viral infection

- › HIV 1:1,000,000
- › HBV 1:100,000
- › HCV 1:500 to 1:5,000
- › HTLV I and II 1:200,000
- › CMV and bacterial contamination Varies; 1:2,500

Transfusion reaction

- › Fatal hemolytic reaction <1:600,000
- › Nonfatal hemolytic reaction 1:6,000
- › Fever or urticaria 1:100
- › Allergic reaction 1:100
- › Graft-versus-host disease Rare

Alloimmunization Common

Immunosuppression

- › Infection Increased after surgery
- › Cancer Inconclusive



Blood Transfusions and Postoperative Infections in Patients Undergoing Elective Surgery

Surgical Infections 2006;7:S33-35

Transfusion was single most powerful risk factor for infection in 2809 colorectal resections (OR=5.3 to 6.2)

Primary THA and TKA have 12x risk of infection if allogeneic transfusion

Explored evidence behind WBC mediated immunosuppression, free serum iron, storage time, metalloproteinase-1.



Intraoperative Hemostasis

Acute Normovolemic Hemodilution

Tourniquet

Hypotensive Anesthesia

Regional anesthesia

Avoidance of hypothermia

Blood salvage / Cell Saver

Good hemostatic technique

Bipolar Sealer (Aquamantys)

Topical hemostatic agents

Intravenous antifibrinolytics



Tranexamic and Aminocarpoic Acid

Lysine analogues

Inhibit binding of lysine residues on fibrin to plasmin or plasminogen

Prevent fibrinolysis (more significant with tourniquet)

Inhibit clot breakdown

Do not affect coagulation



INDICATIONS AND USAGE

- › CYKLOKAPRON Injection is indicated in patients with **hemophilia** for short-term use (two to eight days) to reduce or prevent hemorrhage and reduce the need for replacement therapy during and following **tooth extraction**.

CONTRAINDICATIONS CYKLOKAPRON

- › Injection is contraindicated:
 - › 1. In patients with acquired defective **color vision**, since this prohibits measuring one endpoint that should be followed as a measure of toxicity (see WARNINGS).
 - › 2. In patients with **subarachnoid hemorrhage**. Anecdotal experience indicates that cerebral edema and cerebral infarction may be caused by CYKLOKAPRON in such patients.
 - › 3. In patients with **active intravascular clotting**.
 - › 4. In patients with **hypersensitivity** to tranexamic acid or any of the ingredients.



MUSC Tranexamic Acid Protocol

- All Primary and Revision THA, TKA, TSA
- 20mg/Kg IV TXA with maximum of 2g
- All patients except thromboembolic disease within 6 months
- THA and TSA – Administer before scrubbing
- TKA administer when inserting implants, or before tourniquet deflation





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Primary Arthroplasty

Process Improvement Project Using Tranexamic Acid Is Cost-Effective in Reducing Blood Loss and Transfusions After Total Hip and Total Knee Arthroplasty



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ABSTRACT

Background: Tranexamic acid (TXA) has been associated with decreased blood loss and transfusion after total hip arthroplasty (THA) and total knee arthroplasty (TKA). The purpose of this study was to examine both transfusion utilization and the economic impact of a Process Improvement Project implementing TXA for THA and TKA.

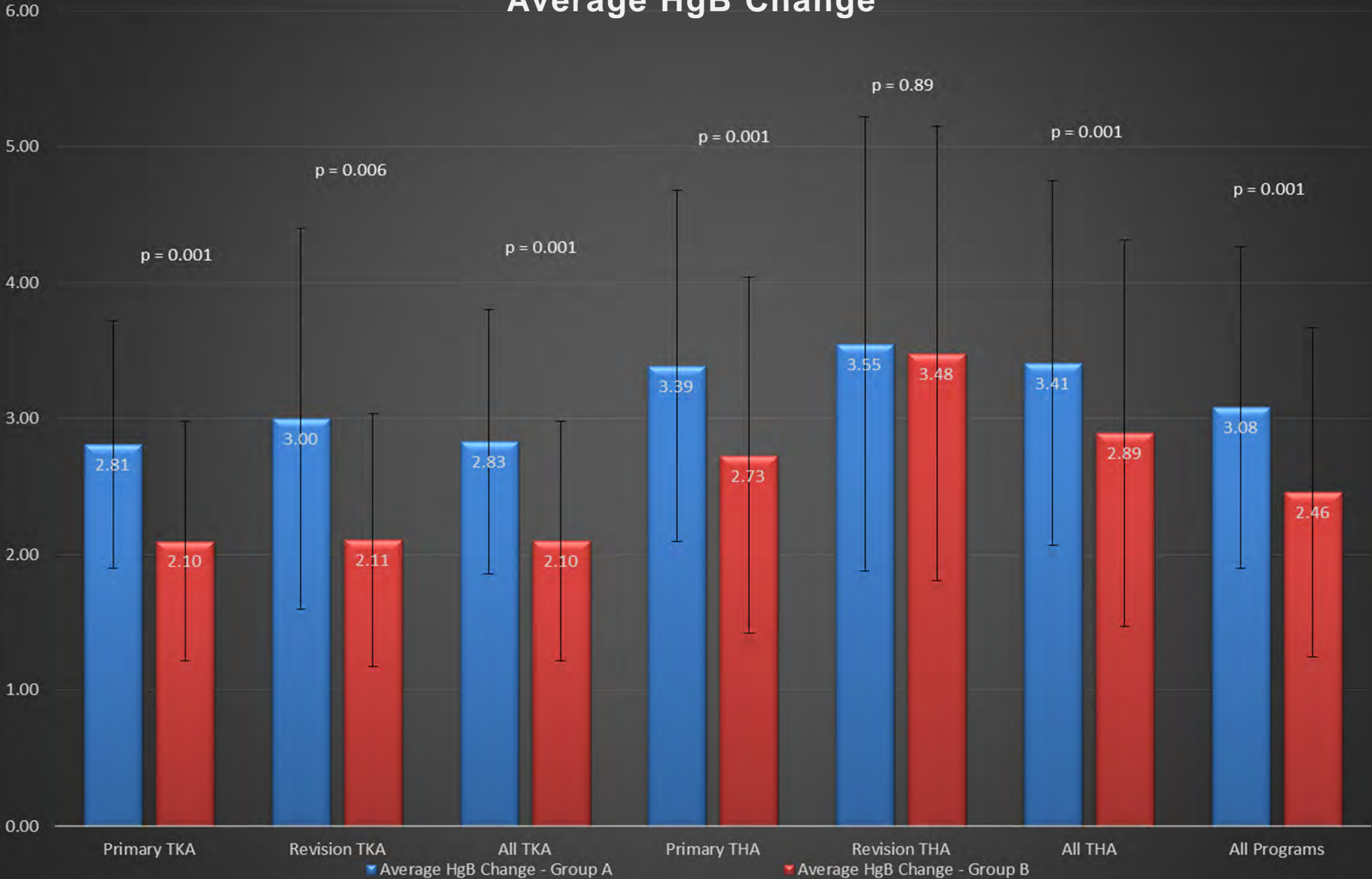
Methods: After standardization of TXA administration in THA and TKA patients, retrospective data were compared from 12 consecutive months before (group A, n = 336 procedures) and after (group B, n = 436 procedures) project initiation.

Results: TXA administration increased with project implementation (group A = 3.57%, group B = 86.01%) and was associated with reductions in perioperative hemoglobin decrement (20.2%), patients transfused (45%), and number of units transfused per patient (61.9%). Cost savings were notable per patient (\$128) and annually program wide (\$55,884) with the primary THA subgroup contributing the most to the savings. No increase in adverse effects was observed.

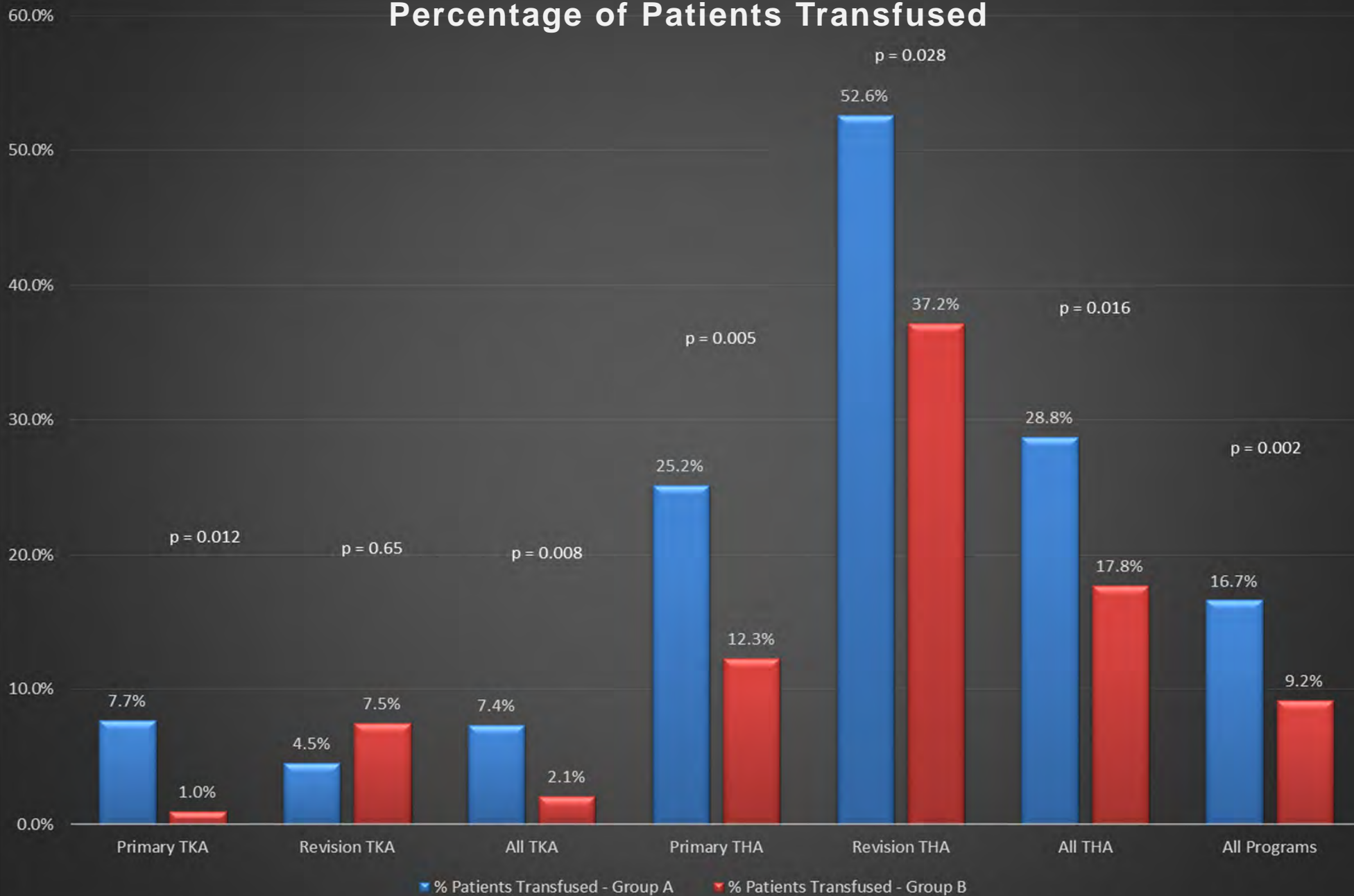
Conclusion: Standardized administration of TXA is an effective and economically favorable blood-reduction strategy for patients undergoing elective THA or TKA. Although reduction in transfusions with TXA may be greater after TKA, the economic and clinical impact of transfusion reduction is more substantial in THA patients.



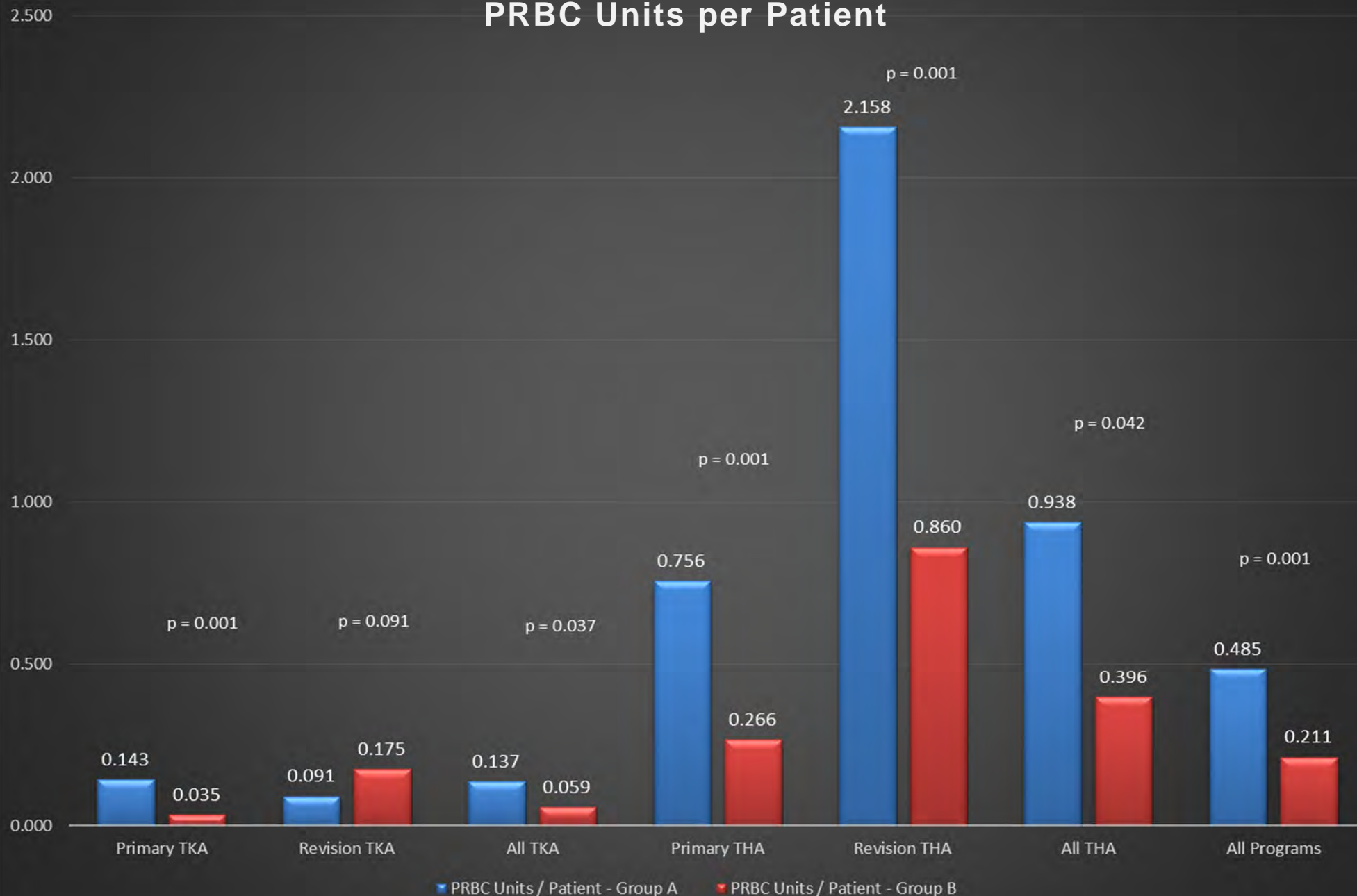
Average HgB Change

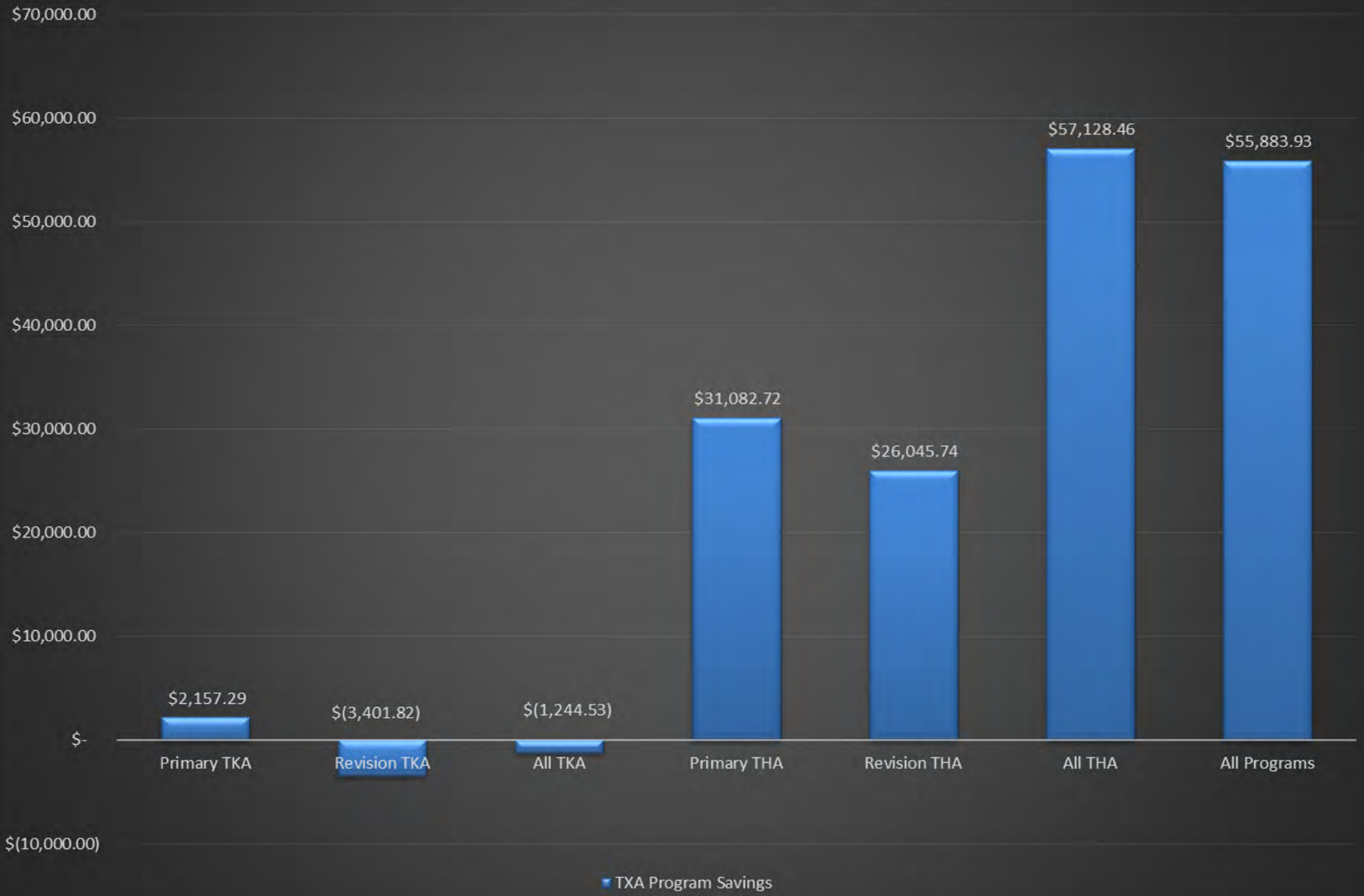


Percentage of Patients Transfused



PRBC Units per Patient





TXA Protocol Summary

- A multidisciplinary Process Improvement Project with a standardized approach to using tranexamic acid resulted in greatly increased the use of this blood management strategy.
- This resulted in significantly decreased blood loss and need for transfusion in total joint patients.
- 72% reduction of transfusions in TKA patients
- Largest cost savings in THA patients
- There were no resultant significant increases in complications or readmissions.
- Patients receiving TXA prior to the protocol had a higher complication rate than those receiving TXA after the protocol (16.67% vs. 3.2%; $p=0.014$).
- Value was created by both increasing Quality and decreasing Costs with a program cost savings of \$55,884.
- Creates further opportunities for cost savings (decreased pre-op crossmatching, decreased blood draws, etc).



TXA Protocol Summary

- Safety of IV TXA article



I want
minimally invasive
joint surgery



“My friend had an arthroscopic knee replacement and went home the same day. He only missed one day from work.”



Knee Replacement Surgery - Minimally Invasive Total Knee Replacement Surgery Patients Go Home Same Day - Microsoft Internet Explorer

Address: <http://www.dentalplans.com/articles/Minimally%20Invasive%20Total/>

Knee Replacement Surgery

Minimally Invasive Total Knee Replacement Surgery Patients Go Home Same Day

Updated: 1/26/2006 10:04:43 AM

[Print Article](#) [Email Article](#)

Orthopedic surgeons at Rush University Medical Center found that 96 percent of patients who had minimally invasive total knee replacement surgery were able to go home the same day, without complications—many walking out unassisted or with a cane. These results were published in the October issue of the Journal of Arthroplasty.

Lead author surgeon Dr. Richard A. Berger says it's not just the surgeon's skills and techniques that help patients avoid a hospital stay.

"It's a comprehensive management approach that helps the patient avoid an overnight stay. It's optimal sequencing and timing of interventions by the nursing, physical therapy, anesthesia surgical team; it's a team approach of equally weighted preoperative, intraoperative, and postoperative care."

The MIS Quad-Spring total knee procedure is performed through one small three- to four-inch incision instead of a large, eight- to 12-inch incision. This approach has the potential for dramatically reducing pain by sparing muscles and tendons that historically have been cut during standard TKA surgery. "Using new tools and minimally invasive surgical techniques, we avoid cutting through the quadriceps tendon and muscles and replace the damaged knee through a three- to four-inch incision, rather than the standard eight- to 12-inch incision down the front of the knee," says Berger.

First, the patients meet with the surgeon to evaluate whether the patient would be appropriate for the minimally invasive knee replacement. Next, patients who will receive a minimally invasive knee replacement meet with the physical therapist and nurse prior to surgery. "They attend a class led by with a nurse where potential surgical complications and postoperative care are discussed. Patients spend an hour learning about the surgery, asking questions about pain, recovery and surgery. We reassure patients that their pain will be controlled, that they will be carefully monitored for the occurrence of complications or delayed recovery due to early discharge, and explain how will be able to move around independently after surgery.

After class with the nurse, patients have a physical therapy session for instruction in gait training with crutches and a cane. An internist also evaluates the patients. Lastly, the hospital discharge planner calls the patient at home before surgery to make sure arrangements have been made to have someone take the patient home after surgery."

The 50 study patients (20 female, 30 males) in the study had surgery between August 2003 and August 2004. The average age was 68 years old, average weight of 203 lbs. with a body mass index of 29.2. Forty-eight of the patients had osteoarthritis. Each patient was the first surgical case of the day.

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[BirminghamHipResurfacing.com](#)

Arthritis knee
Find resources to help you talk to your doctor about arthritis pain.
CELEBREX.com

Knee Replacement
the new, amazing Oxford implant or total replacement, Houston, Texas
DrLiker.com

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[Veterans Are Sicker Than Civilian Patien...](#)

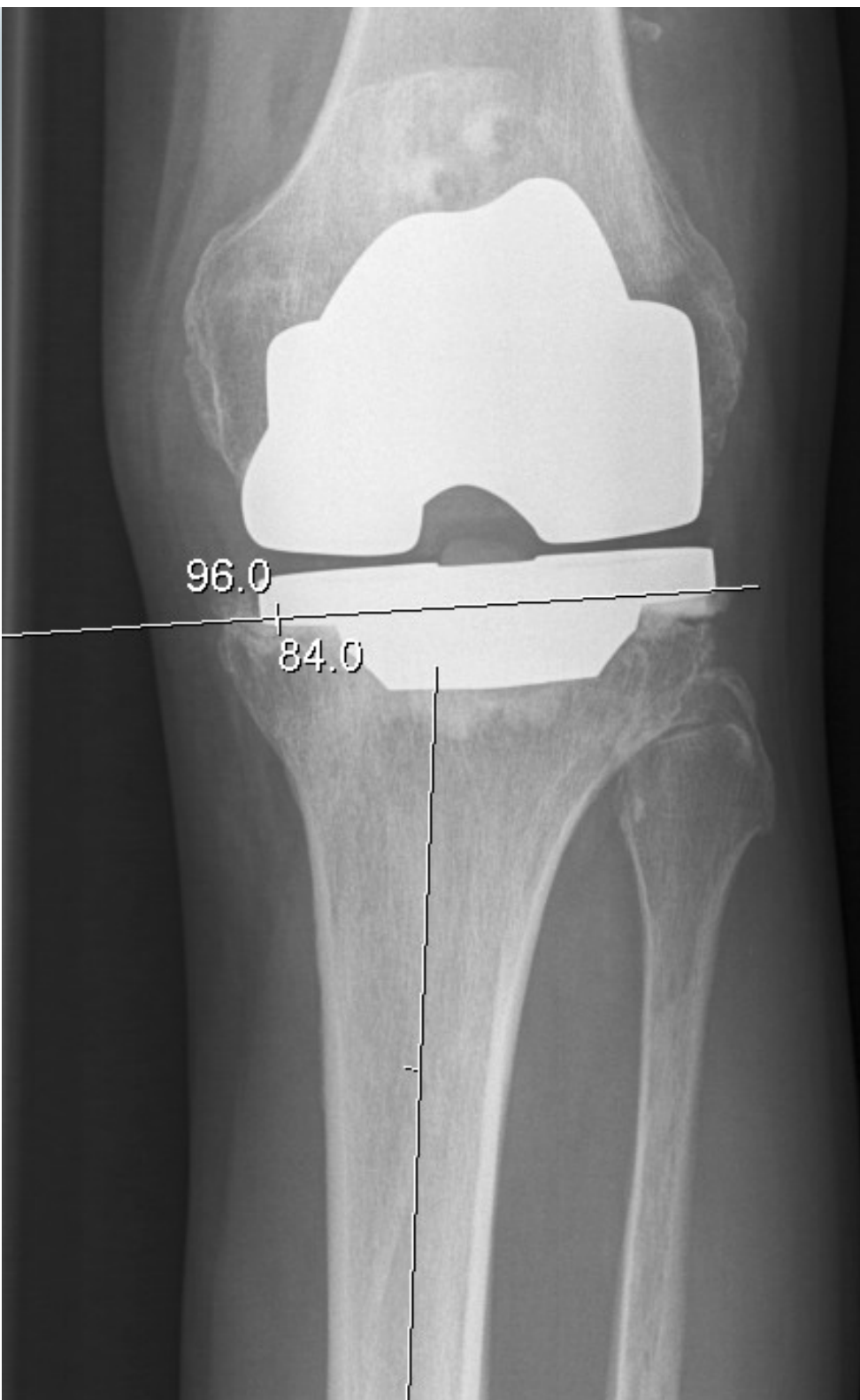
“outpatient total knee replacement through arthroscopy was safe with no short-term readmission or complications related to early discharge. New clinical guidelines, including improvements in anesthetic techniques, postoperative pain management, and rehabilitation protocols, will make performing outpatient total knee arthroscopy a realistic goal.”



Minimally Invasive Surgery

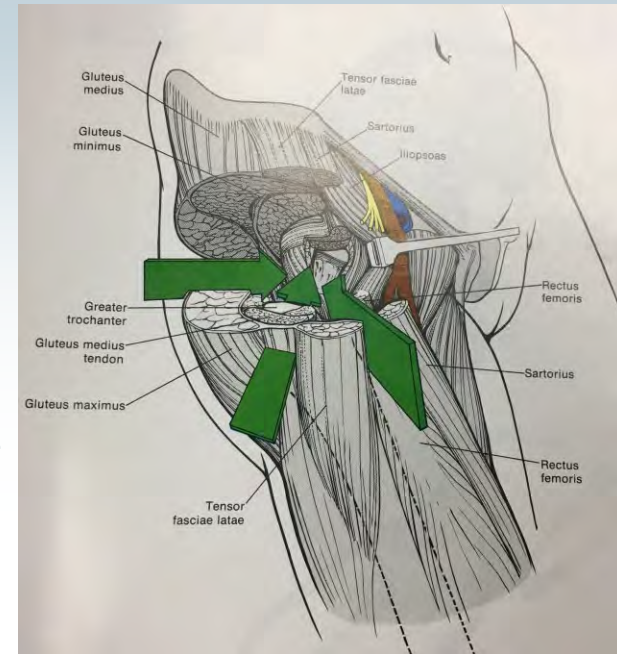
- A smaller skin incision does not mean the surgery is less invasive.
- Benefits mostly cosmetic.
- Possibly a slightly decreased recovery time.
- Higher risk of complications for some techniques.
- Do the operation, using proven techniques, through the smallest possible incision that allows proper placement of the implants and the best long term outcome.

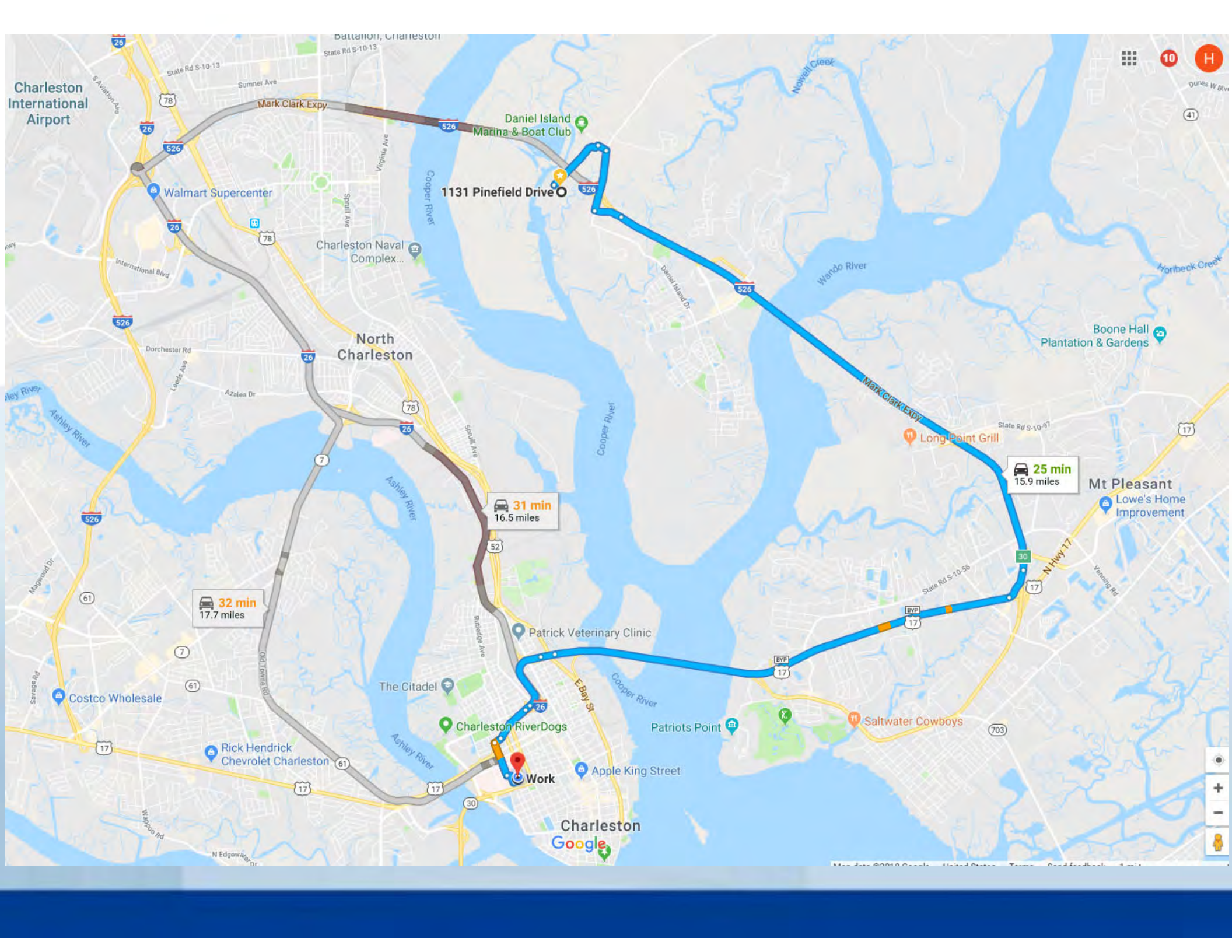




Hip Approaches

- **Posterolateral**
 - Common, well-known, good femoral exposure
 - Highest dislocation rate (posterior)
- **Direct lateral (transgluteal)**
 - Lowest dislocation rate, good acetabular exposure
 - Highest rate of abductor dysfunction
- **Direct anterior**
 - Internervous plane (Sartorius and Tensor), marketable, Good acetabular exposure.
 - Difficult femoral exposure, long learning curve, specialized table / flouro, complications





32 min
17.7 miles

31 min
16.5 miles

25 min
15.9 miles

Charleston
Google

Map data ©2018 Google, United States, Terms, Send feedback, 1 mi

Post Operative Management

Optimal Length of Stay

Pain Management

DVT Prevention

Physical Therapy

Expectation Management



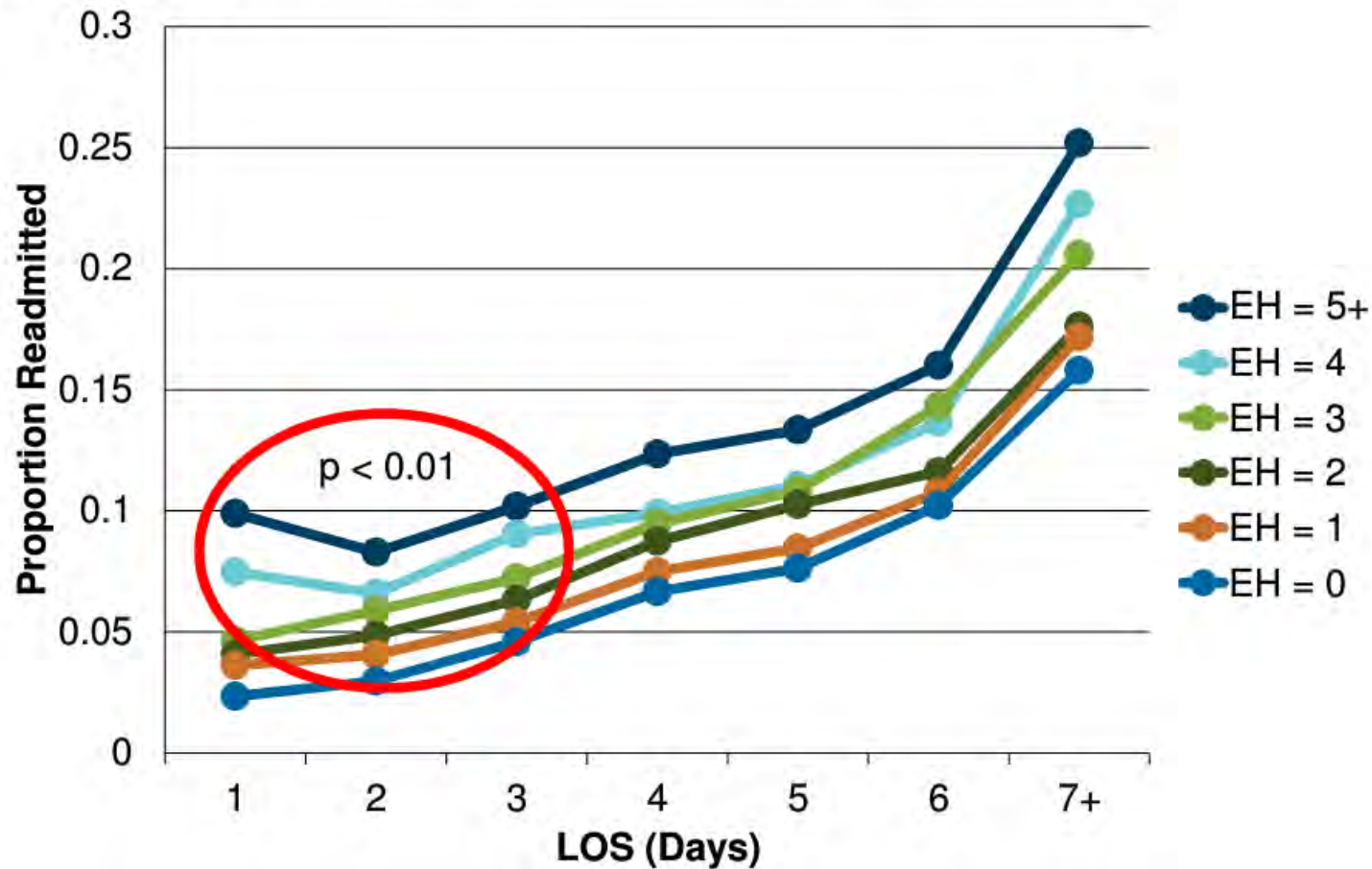
Optimal Length of Stay Following Total Joint Arthroplasty to Reduce Readmission Rates

Patricia A. Kirkland¹, William R. Barfield¹, Harry A. Demos¹, Vincent D. Pellegrini, Jr.¹, Jacob M. Drew²

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Figure 2. Chance of Readmission for Specific EH and LOS



Same Day Discharge Hip, Knee, Shoulder Arthroplasty Patient Selection Pre-op Clinic Guidelines

- All Patients must go through Pre-op Clinic and Pre- op Optimization Protocol :
 - Patient meets accepted Pre-op Risk Stratification (may include Outpatient Arthroplasty Risk Assessment/OARA Score)
 - assessed in outpatient clinic by surgeon at time of discussion with patient
 - assessed in pre-op TJR clinic
 - Patient meets pre-op optimization parameters: no smoking, adequate nutrition, etc.
- These patients will be screened to participate in the PePPER Trial, unless otherwise indicated by surgeon (Hip/Knee)
- Patient agrees to discharge to home, per discussion with surgeon
- Verified home support for the first few post-op days
- Patient must ambulate independently without use of an assistive device
- Local patients only: Patient must live within 1-1.5 hour travel time to home at discharge
- Patient must have DME arranged Pre- Admission
- Home Health services will be set up to start morning of POD 1 (day after discharge) as needed
 - Physical Therapy- establish goals, exercises per protocols, wound check, home safety
 - For patients identified as able to start with outpatient PT, this will be arranged as requested



Same Day Discharge Hip, Knee, Shoulder Arthroplasty Patient Selection Pre-op Clinic Guidelines

Medical Exclusions

- No age limit if patient medically healthy, motivated, caregiver home support
- ASA 3 classification- if poorly controlled underlying condition
- Bleeding disorders
- Pre-op Hemoglobin less than 12
- Poorly controlled /severe cardiac or pulmonary comorbidities (i.e.: heart failure, history of MI within 1 year, dysrhythmia, CHF, CAD, COPD, hx respiratory failure)
- CKD- consider function
 - IF CKD 3a mild to moderate w/ GFR 55-60 may be appropriate for SDD
- Cirrhosis
- Uncontrolled DM Type I or Type II
- OSA w/ history of poor compliance
- BMI >40 should be considered if otherwise healthy
- Chronic opioid use
- Functional neurologic impairments
- Dependent functional status
- Reduced Pre-op cognitive capacity, history of post op delirium
- Urologic medical history/History urinary retention
- History of inadequate pain control



Top Focus For Improvement: Increasing Same Day Discharge (SDD) Joint Replacements

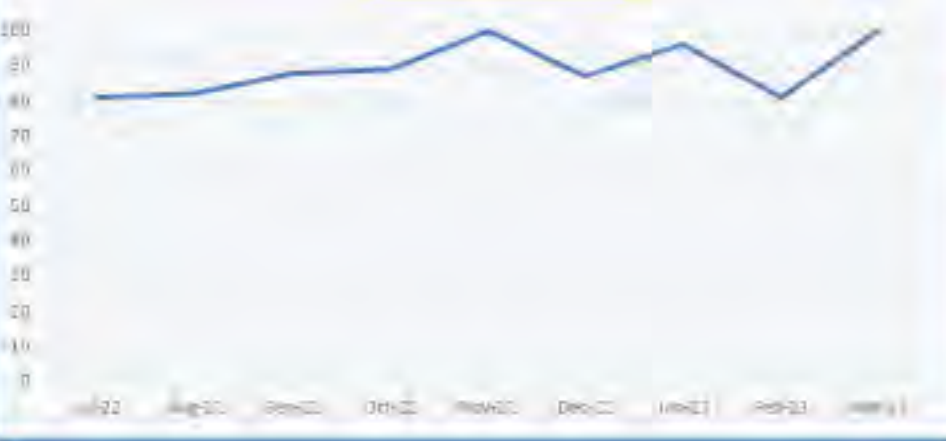
Goal = 90

Same Day Discharge- PDSA

Jan 2021- Dec 2022 % Sched DOS Successful



Jul 2022 - Mar 2023



- Shift SDD to "Short Stay" PACU
- Educ. Nsg PACU
- Schedule PT in PACU
- Early Mobility
- PACU Nsg
- Equipment
- Anesthesia Reviews w/fail trends
- IDT rounds

- Selection Criteria
- Anesthesia Protocols
- Discharge Criteria
- Team Education
- Explore space
- Surgery Center Site visit
- Outreach to Peers
- Attend ACPM - OVBC



- Successful SDD patients: excellent outcomes. Post Discharge call logs-"why was I moved to a hospital room for 45 minutes"
- TJR Inpatient Unit Negative Impact: throughput, resource planning, reimbursement, observation beds, Leading reasons for SDD failure rates 50-60%: sensorimotor deficit, post-op hypotension, nausea, pain.
- First & Second cases best

- Transfer Post PACU to TJR Unit 10 E
- Schedule selected patients
- Pre-op Pt/Coach Education
- Therapy & Nursing DOS Ambulation
- Expedited Pathways



Home, Not “Rehab”

Subacute rehab associated with

Higher costs

Lower patient satisfaction

Decreased mobilization

Slower recovery

Higher readmission and complication rates

Worse Patient Reported Outcomes

Reserved for patients with no support system who do not meet PT goals for functional independence

Make sure they understand that it is a “nursing home”.



Pain Management

Spinal Anesthesia

Regional Nerve Blocks

- Adductor canal for TKA

- Lumbar plexus for THA

Cryotherapy

Multi-modal pain management

- NSAIDS (Celecoxib) 400mg in holding, 200mg BID (except CRI)

- Acetaminophen 650mg QID (except liver disease)

- Gabapentin 300mg TID (start in holding) if < 80 years old

- Oxycodone / Hydrocodone / Tramadol PRN

- Rarely use IV Opioids

Local blocks

- Bupivacane, Epinephrine, Clonidine, Morphine, Ketorolac,

- Corticosteroids

Opioid reduction (Rx #30-40) Most are finished or on Tramadol by 2 weeks



DVT Prevention

Historical DVT rate 40-50% with 3-6% Fatal PE

Symptomatic DVT: 0.5% of THA, 1% TKA

Symptomatic PE: 0.14% of THA, 0.27% of TKA

Mostly after discharge

Prophylaxis is Standard of Care

- Mechanical (SCD, Foot Pumps)

 - Compliance dependent

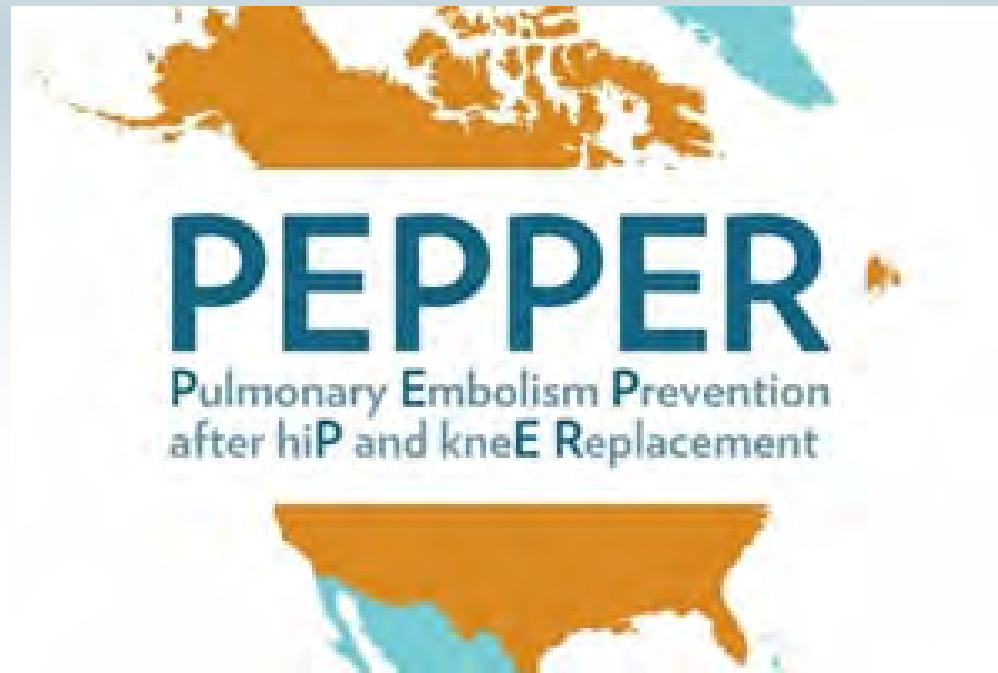
- Warfarin – Anti Vitamin K (Factors II, VII, IX, X)

- Aspirin – Anti-platelet, anti-inflammatory

- Heparinoids (LMWH) – Anti-III Binding

- Anti Xa (Rivaroxaban), Anti IIa (Dabigatran)





PE Prevention after hiP and kneE Replacement

PCORI Multicenter Clinical Trial of 25,000 patients at 25 centers

Aspirin / Warfarin / Rivaroxaban for 28 days

Clinical endpoint: Mortality, VTE, bleeding, reoperation, functional outcomes

No differences so far....

Mortality 16/7000 (0.23%)



PT Protocols

Same day ambulation

Bed exercises

Independent OOB and ambulation, stairs prior to D/C

WBAT with walker → cane by 2 weeks

Limited home PT

Transition to outpatient PT ASAP (TKA)

Limited hip precautions (THA)

- Pillow between legs

- No extremes of rotation

- No abduction against gravity



ISCR (ERAS) Core Process Measures

Jan 2022

	Facility	ISCR
	#(%)	#(%)
Evidence of Advanced Care Planning	NA	426(46.81%)
Use of Regional Anesthesia	19(100.00%)	552(62.87%)
Tranexamic Acid (TXA) Use	19(100.00%)	655(71.98%)
Multi-modal Pain Management	18(94.74%)	702(77.14%)
Medical DVT Prophylaxis Cont'd 28 Days Postop	19(100.00%)	583(58.18%)
First Postop Mobilization	12(63.16%)	599(81.28%)
Foley Removal	19(100.00%)	873(95.93%)
Weight Bearing as Tolerated POD#1	14(73.68%)	786(86.47%)



Expectation Management



“My left joint replacement
will be exactly like my
right joint replacement
(or vise versa)”



ORIGNAL



LEFT SYMMETRY



RIGHT SYMMETRY



“A knee replacement will
make my knee
normal again”



Residual Pain after TKA

- 75-80% of patients are satisfied or very satisfied with their TKA
- Very few report that their knee is “normal”
 - Unlike THA patients
- Residual pain, stiffness, swelling are most common complaints
- Some report “stiffness”, despite excellent ROM
- Expectation management is critical



**“It doesn’t matter
where I have
my surgery”**



MUSC
Joint Replacement Program

Restoring the Motion of Life



Changing What's Possible | [MUSC.edu](https://www.musc.edu)



Total Joint Program

Dedicated team – Surgeons, Anesthesiologists, PA / NPs, Nurses, Therapists, Case workers, Hospitalists, Managers, Administrators, etc.

Joint class / workup process

Standardization of orders and processes

Pain management - multimodal





"I am grateful to MUSC and the orthopaedic team approach for my care during my joint replacement surgery. My job as a radiation therapist is very important to me. Before I had my right hip replaced, I got to the point where I almost could not work because I was on pain medications every two hour Today, I am totally pain free, and people are shocked to learn that I have had a joint replaced, because I have no limp, swelling or any other outward signs. My thanks goes out to a great team for a great job!"

– M. C., 53, radiation therapist



“I will never be able
to do the things
I like if I have a
joint replacement”



















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WEDNESDAY, OCTOBER 18, 2006 10:07 AM

Lowcountry appeal gets high marks

TENNIS

BY JAMES BECK

The Post and Courier

Charleston's tennis appeal continues to grow. Tennis Magazine is the latest to put the area in a different league from most others.

In its November/December issue, the world's most popular tennis magazine (600,000 circulation) rates Charleston as one of the best six places in the United States for tennis players to retire.

"When the magazine took into account the climate, number of courts, cultural opportunities, and real estate options, six residential/recreational communities came out on top," the magazine reported.

Why Charleston?

"Few small cities in America capture the imagination quite like Charleston. Southern charm, elegant homes, historic sites, and of course, its location, at a confluence of rivers and inlets, tidal creeks and marshes, makes it the setting for a lazy life. For tennis players it probably helps that two of Tennis' (Magazine) top 10 resorts are just across the water - Kiawah Island (28 courts) and Wild Dunes (18 courts) . . ."

Charleston isn't alone along the South Carolina coast. Hilton Head Island also is among of the best six places for tennis players to retire. The other four best places are: Charlottesville, Va., La Quinta, Calif., Palm Coast, Fla., and Scottsdale, Ariz.

Weiland U.S. champ

That's right. Charleston has another national champion.

Jeanette Weiland won her third national title of the year by teaming with Angie Ray of Phoenix to capture the women's 75 doubles title in the National Hard Court Championships in Folsom, Calif.

The same two players also won the National Clay Courts and the National Indoors. They were third in the National Grass Courts. Weiland and Ray are the No. 1 women's 75 doubles team in the nation.

Weiland has been a member of the Family Circle Tennis Center since the Daniel Island complex opened six years ago.

A long game

Summary

What matters most

- › Patient motivation
- › Surgeon experience
- › Implants and bearings
- › Hospital volume
- › Pain management
- › Appropriate prevention and management of complications
- › Rehab / return to function

What matters less

- › Patient age
- › Consumer advertising
- › Smaller incisions
- › Computer navigation and robotics (?)
- › Rapid discharge (?)



