

CoC can improve revision

Ceramic-on-ceramic bearings are possibly the best option for revision THA. For his study, **Wirtz** examined cumulative revision rates reported in several registers and clinical studies. In his presentation held at the 2016 AAOT Congress in Buenos Aires he pointed out that CoC bearings eliminate several revision causes, reduce the risk of re-infection and show superior results when compared to the alternatives.

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Noise in all bearings

In a study on noise emission from hip implants using a patient questionnaire, **Robinson et al.** found that this phenomenon is noted in hip implants with ceramic-on-ceramic as well as with metal-on-polyethylene bearings, although with different incidence. They concluded that noise apparently is an underreported phenomenon and recommend informing all patients of possible noise emission from their THA, irrespective of the bearing type.

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Dislocations reduced with CoC

The revision rates for late dislocation are significantly lower with ceramic-on-ceramic bearings than with other bearing couples, when the bearing diameter is larger than 28mm. **Pitto** presented his analysis of the New Zealand register data at the 2016 congress of the Japanese Hip Society. He found the best outcome with 32mm CoC bearings and hypothesised as reason the prevention of inflammatory reactions to polyethylene and metal particles leading to fluid expansion and capsule dissociation.

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• Steven Kurtz
• Rocco Pitto
• Robert Streicher

Is ceramic the most economical option?

When the costs of diagnosis and revision related to taper corrosion are taken into account, ceramic femoral heads can be more cost-effective than cobalt-chrome femoral heads. Regarding latest findings on these metal related issues, **Wyles et al.** calculated the overall financial burden. In their best-case scenario 0.875 % of all THA receive an adverse local tissue reaction (ALTR) work-up leading to revision in 0.11% of the patients. In the worst-case scenario, 3.5% of all THA patients receive an ALTR work-up and 1.75% are revised. They concluded that for the US health system “wholesale use (of ceramic femoral heads) in THAs may in fact provide the most economical option on a societal scale.”

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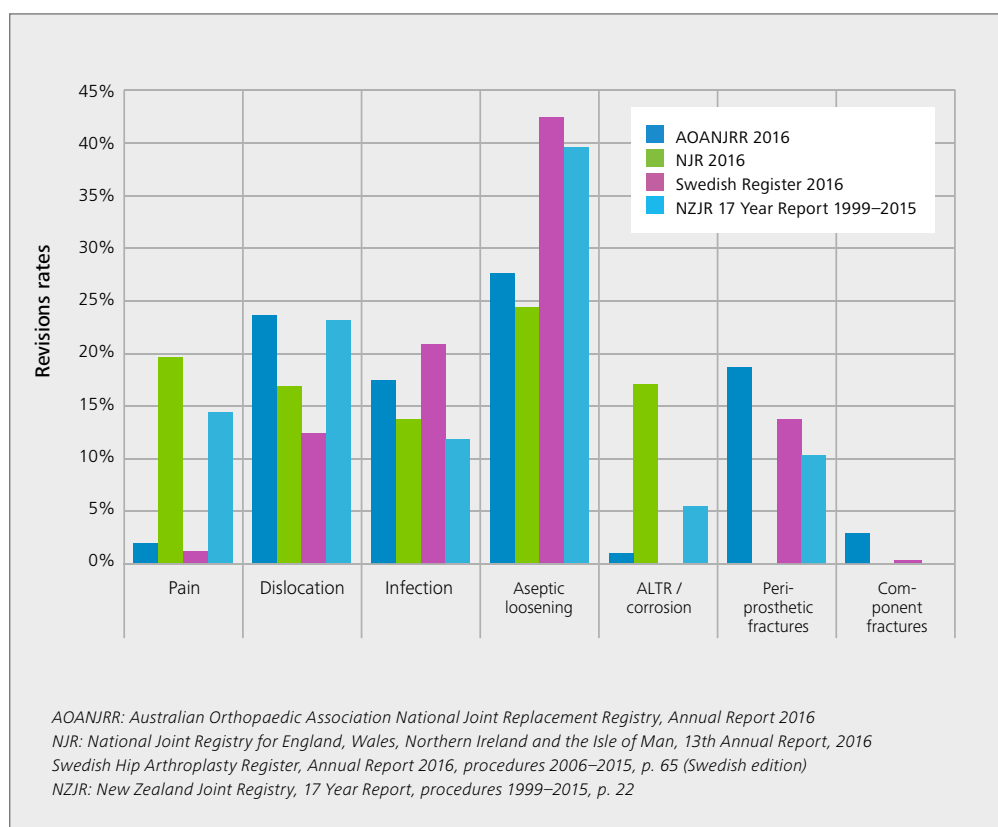
Medicare patients and THA bearing outcomes: Study insights

Elderly THA patients from the Medicare data base with CoP bearings show a reduced risk of dislocation, infection and mortality when compared to patients with MoP bearings. **Kurtz et al.** examined 315,784 US Medicare patients aged 65 years and older. They also found a trend towards reduced risk of revision with CoP in comparison to MoP bearings but the data did not reach statistical significance. When comparing patients with CoC and MoP bearings, there was no significant difference in risk of dislocation, revision, or mortality. However, there was a reduced risk of infection for patients with CoC bearings compared to MoP.

The Charlson comorbidity index was consistently one of the most important predictors for mortality, dislocation and revision as well as infection. Obesity was the most important risk factor for infection and the second most important factor for revision. The authors conclude that ceramic bearings are associated with lower risk of infection compared with MoP bearings.

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Reasons for revision in THA



Aseptic loosening, dislocation and infection are the three most common reasons for revision in THA.

Executive Summary

Issue January 2017

Title	Ceramic Femoral Heads for All Patients? An Argument for Cost Containment in Hip Surgery
Authors	Cody C. Wyles, Benjamin A. McArthur, Eric R. Wagner, Matthew T. Houdek, Jose H. Jimenez-Almonte, Robert T. Trousdale
Journal	Am J Orthopaedics 2016 September; 45(6):E362-E366
Level of Evidence	None given.
Summary	<p>Trunnionosis from modular connections of total hip arthroplasties (THA) is also an issue with metal-on-polyethylene (MoP) bearings, and can lead to increased complications such as painful THA or revisions (see also Monthly CeraNews 2_2016). The diagnosis and management of adverse local tissue reactions (ALTRs) is complex and cost-intensive. As ceramic femoral heads can mitigate this issue, a cost effectiveness model was developed by the authors.</p> <p>The cost estimation for an ALTR work-up was calculated following a published guideline (Kwon et al JBS 2014). Aspects of this were imaging (MRI, ultrasonography, radiography), serum and aspiration tests, and clinical appointments and procedures including revision. The costs for the tests were taken from in-house data. The authors created two models:</p> <ol style="list-style-type: none"> 1) additional cost for a ceramic femoral head and 2) cut-off value for cost effectiveness of a ceramic femoral head. Ceramic head prices were determined from 3 different practice sources for 2 different suppliers. The simulations were based on a previous finding that 7% of THA patients with MoP bearings present groin pain and that 12.5, 25 or 50% of these receive an ALTR work-up or are revised. <p>The cost for a single ALTR work-up was \$5,085 with MRI and \$2,402. Revision with 3-day stay costs \$53,320 without perioperative medications and devices. Ceramic head extra cost was between \$500 and \$1,500.</p> <p>The authors concluded that their model suggests that ceramic femoral heads could be more cost-effective than cobalt-chrome alloy femoral heads. In regards to ALTRs, ceramic femoral ball heads show a superior safety profile and wholesale use in THA may in fact provide the most economical option on a societal scale.</p>
Study Limitations	<p>Use of 7% as the incidence of painful conventional THA (self-reported)</p> <p>Based on only one clinical complication - trunnionosis</p> <p>Cost from one finance department at one institution</p> <p>Cost estimation only valid for the USA</p>
Key Messages	<p>Trunnionosis is a serious complication, also with MoP implants.</p> <p>Additional cost for a ceramic femoral head in the US was \$500 - \$1'500.</p> <p>Ceramic femoral heads could be more cost-effective than CoCr femoral heads based on avoidance of the consequences of metal release.</p>

Executive Summary

Issue January 2017

Title	Outcomes of Ceramic Bearings After Primary Total Hip Arthroplasty in the Medicare Population
Authors	Steven M. Kurtz, Edmund Lau, Doruk Baykal, Bryan D. Springer
Journal	J Arthroplasty. Published online, 2016. DOI: 10.1016/j.arth.2016.02.054.
Level of Evidence	None given.
Summary	<p>Kurtz et al analyze the outcome of total hip arthroplasty (THA) with ceramic-on-ceramic (CoC), ceramic-on-polyethylene (CoP) and metal-on-polyethylene (MoP) bearings for 315,784 US Medicare patients. They looked at periprosthetic joint infection (PJI), dislocation, revision, and death. Propensity scores were developed (used to treat large data sets of retrospective registry data, such as the Medicare claims administrative data) to adjust for selection bias in the choice of bearing couples. Most patients received MoP (74.7%), followed by CoP (22.3%) and CoC (3%) bearings. Patients were on average 74.3 years of age, with CoP and CoC used more often in the age group below 70 years (MoP 24.2%, CoP 40.3%, CoC 38.2% of patients). 62% were females, 94% were white, and 57% were without significant comorbidities.</p> <p>THA patients with CoP bearings exhibited a significantly reduced risk of dislocation ($p < 0.01$), infection ($p = 0.001$) and mortality ($p = 0.001$) compared to patients with MoP bearings. Additionally a trend towards reduced revision risk with CoP in comparison to MoP bearings ($p = 0.095$) was reported. The Charlson comorbidity index was consistently one of the most important predictors for mortality, dislocation, revision and infection. Obesity was the most important risk factor for infection and the second most important factor for revision.</p> <p>When comparing patients with CoC and MoP bearings, there was no significant difference in risk of dislocation, revision, or mortality. However, there was a significantly reduced risk of infection ($p = 0.01$).</p> <p>The authors conclude that their study results showed no significant difference in risk of revision at 8-9 years follow up for THAs with any bearing. However, after adjusting for selection bias and various other confounding factors, ceramic bearings exhibit an association with lower risk of infection compared with MoP bearings.</p>
Study Limitations	<p>Analysis is limited to THAs from the Medicare records including ICD-9-CM (reporting bearing material) classification and diagnosis codes. Codes recording accuracy was not tested.</p> <p>Study with only elderly patients, > 65 years</p> <p>Several relevant factors such as differences in material (PE/XPE; type of ceramic), bearing diameter are not reported in the Medicare records.</p> <p>36 mm CoC bearings, which have shown to reduce the risk of dislocation, were only available at the end of the study period.</p>
Key Messages	<p>Risk of infection was lower in patients with CoP and CoC bearings compared to patients with MoP bearings.</p> <p>Risk of mortality, dislocation, and infection was lower in patients with CoP bearings compared to MoP bearings.</p> <p>No significant difference in risk of overall revision rates between different bearing surfaces.</p> <p>Charlson comorbidity index was one of the most important risk factors for mortality, dislocation, revision and infection.</p>

Executive Summary

Issue January 2017

Title	Noise characteristics in ceramic-on-ceramic vs. metal-on-polyethylene total hip arthroplasty: a comparative study
Authors	Patrick G. Robinson, Ian Anthony, Sudeep Kumar, Bryn Jones, Andrew Stark, Roland Ingram
Journal	Hip International 2016; 26 (5):492-497. DOI: 10.5301/hipint.5000383
Level of Evidence	None given.
Summary	<p>Robinson et al. sent a hip questionnaire (Ingram Squeaky Hip Score) and the Oxford Hip Score to 1,000 patients, of which 509 responded. Patient mean age was 63.7 years with a mean post OP follow up 33 months (6-156 months). 282 patients had ceramic-on-ceramic (CoC) and 227 metal-on-polyethylene (MoP) total hip arthroplasties (THA). In the CoC group 17% of the patients reported noise (55% clicking, 26% grinding, 19% squeaking, 17% crunching, 11% popping) compared to 8% in the MoP group (47% clicking, 21% squeaking, 16% crunching, 5% grinding, 5% popping), although the difference was not significant ($p=0.054$). Patients with noisy hips had an average of 5 points less in their OHS (Oxford Hip Score), however, the authors state that longer follow up is necessary to link noise to poorly functioning implants.</p> <p>In the CoC group 42% of noise affected patients frequently/all the time compared to 26% in the MoP group. Occasional noise was reported by 38% and 37%, respectively, and rare emission of noise in 19% and 37%, respectively. Movements causing noise were bending down and standing up, as well as taking the first few steps in both groups and squatting in the CoC group. Bending down and walking was reported to cause the loudest noise in both groups. Almost 30% of CoC and 15% of MoP patients complained of occasional pain during noise. When patients rated the effect of noise on their daily lives on a scale from 0-10 (0=no effect), the CoC group had a median score of 2 (range 0-8) and the MoP group had a median score of 1 (range 0-7). The authors found no relationship between noisy hips and BMI or femoral head size.</p> <p>According to the authors, noise from THA is an underreported phenomenon, which currently has been focused primarily on squeaking with CoC bearings. However, they found that it should also be considered a potential "complication" with MoP bearings. They conclude that patients should generally be forewarned of possible noise emission from their THA, irrespective of the bearing.</p>
Study Limitations	<p>Questionnaire based study, not validated</p> <p>Patient selection criteria not given</p> <p>61% of CoC implanted with THA components previously reported with high incidence of noise generation</p> <p>Short term study (CoC 2.5 years, MoP 3.3 years)</p> <p>Big age difference between CoC and MoP patients; age had a significant effect on noise reported</p>
Key Messages	<p>Noise is an underreported phenomenon of uncertain significance.</p> <p>Noise is a general issue in THA and not restricted to CoC bearings.</p> <p>Study reports squeaking even with MoP THA.</p> <p>Patients should be consented of possible noise emission irrespective of bearing surfaces.</p>

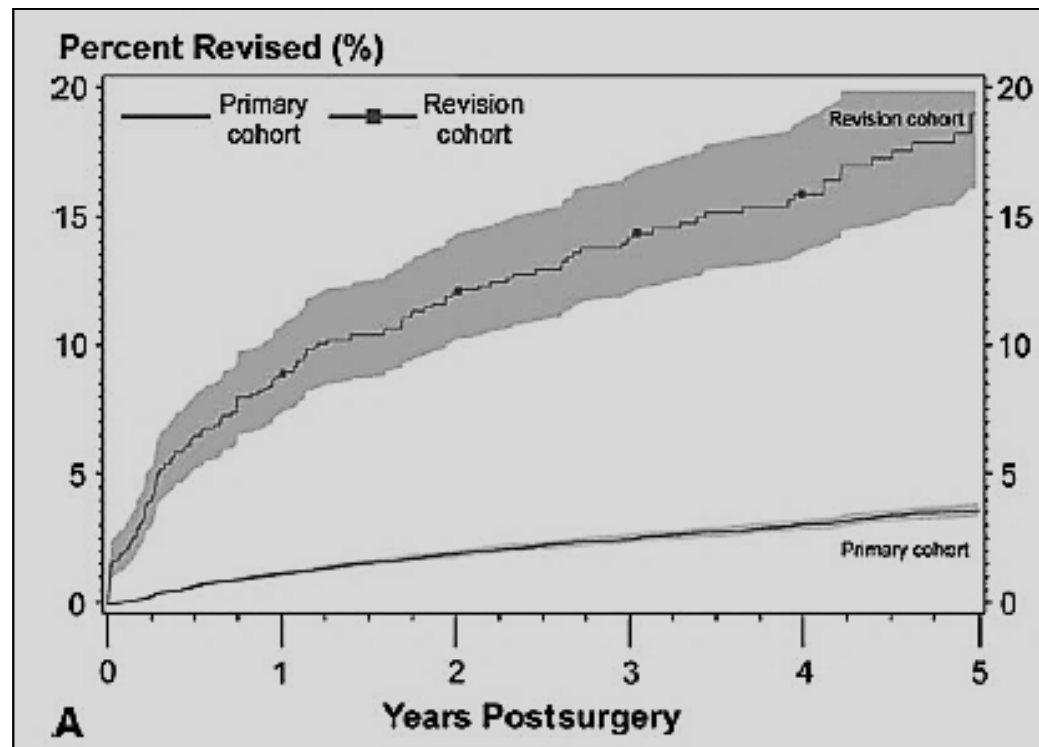
Ceramic-on-Ceramic in revision hip arthroplasty

Dieter C. Wirtz
Department of Orthopedics and Traumatology
University Hospital Bonn
Germany



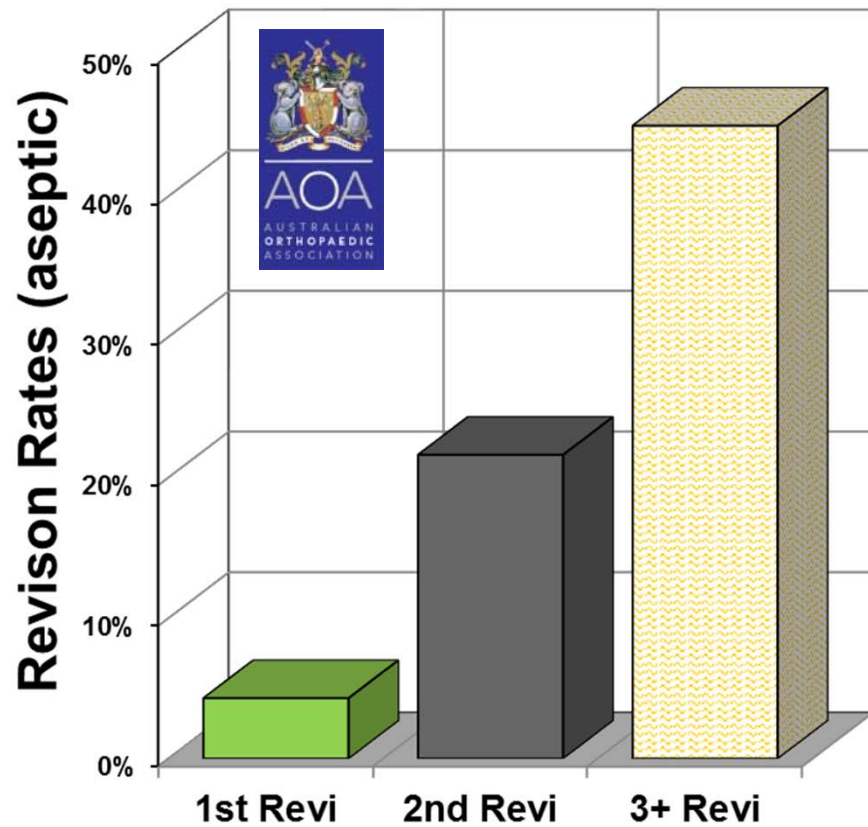
Risk of Subsequent Revision after Primary and Revision Total Joint Arthroplasty

Kevin L. Ong PhD, Edmund Lau MS,
Jeremy Suggs ScD, Steven M. Kurtz PhD,
Michael T. Manley FRSA, PhD

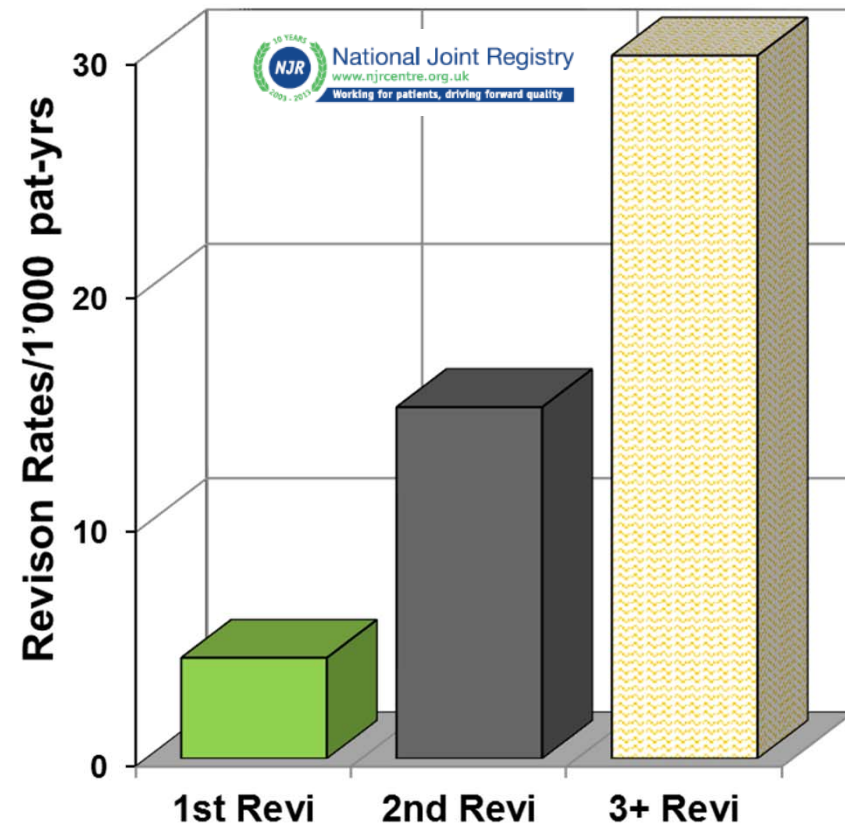


revisions at 10 years postoperative

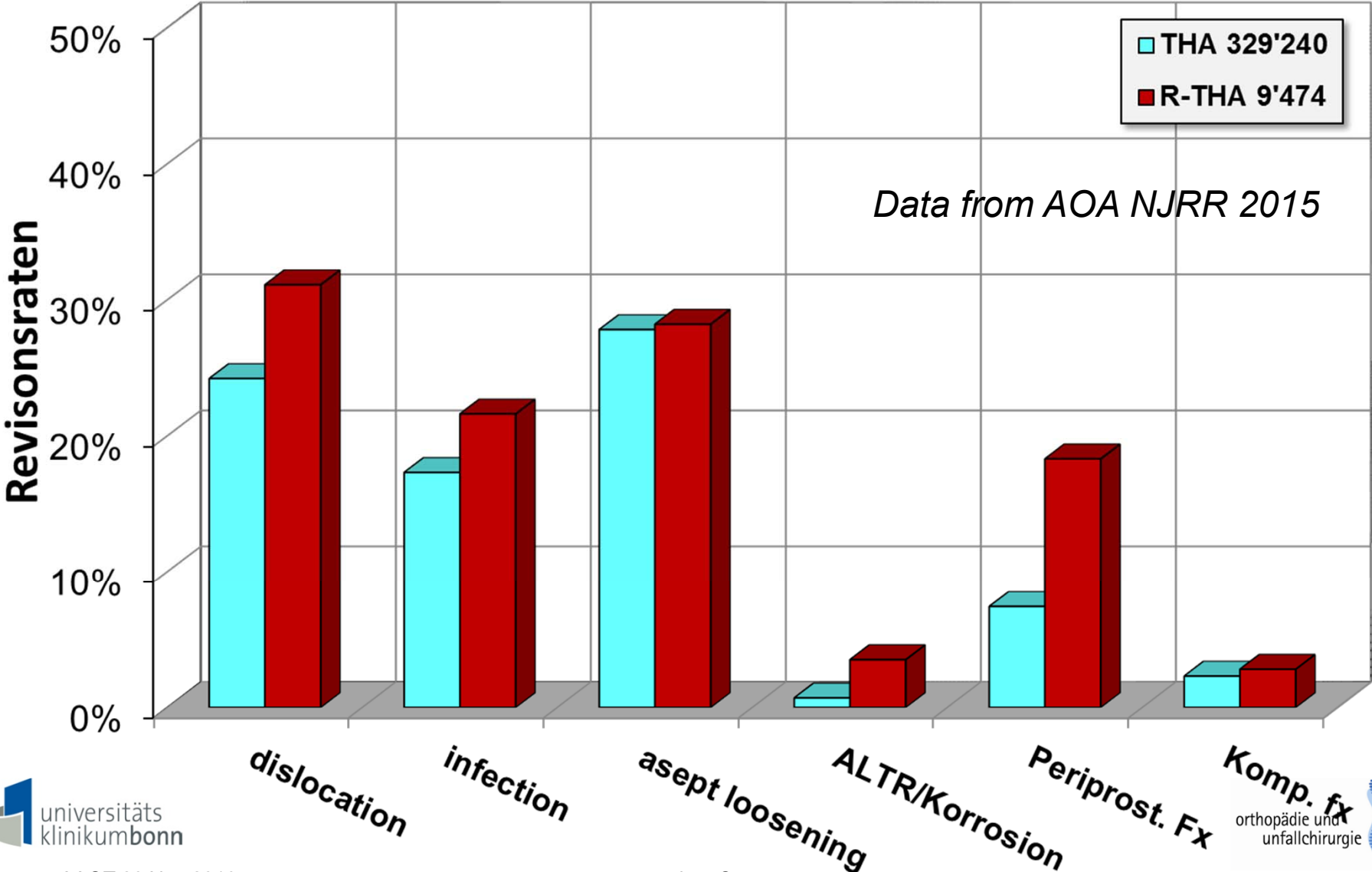
AOA NJRR 2015 – 327.151 THA
9.474 aseptic R-THA



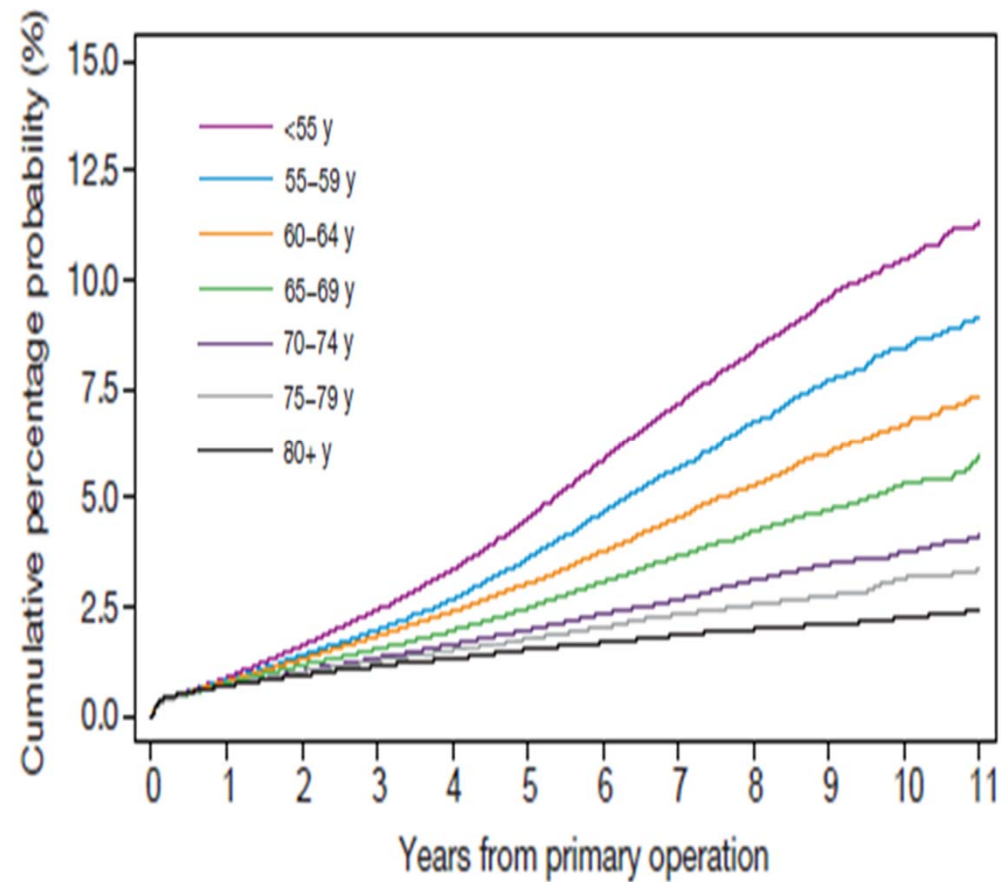
UK-NJR 2015 – 708.311 THA
79.859 aseptic R-THA



revision reasons THA & Re-THA






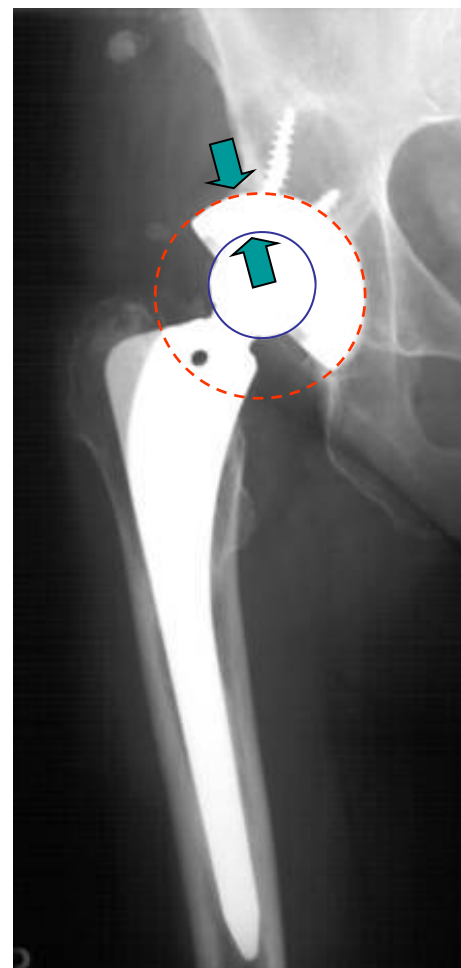
Dilemma – young patients are still young at time of 1th revision



UK NJR 2015

bearings in revision arthroplasty

linear wear [mm]			
	0.2 mm	0.1 mm	2 μ m
	PE- metall	PE- ceramic	ceramic- ceramic
	soft - hard	hard - hard	





Revision Arthroplasty

Outcomes of Ceramic Bearings After Revision Total Hip Arthroplasty in the Medicare Population

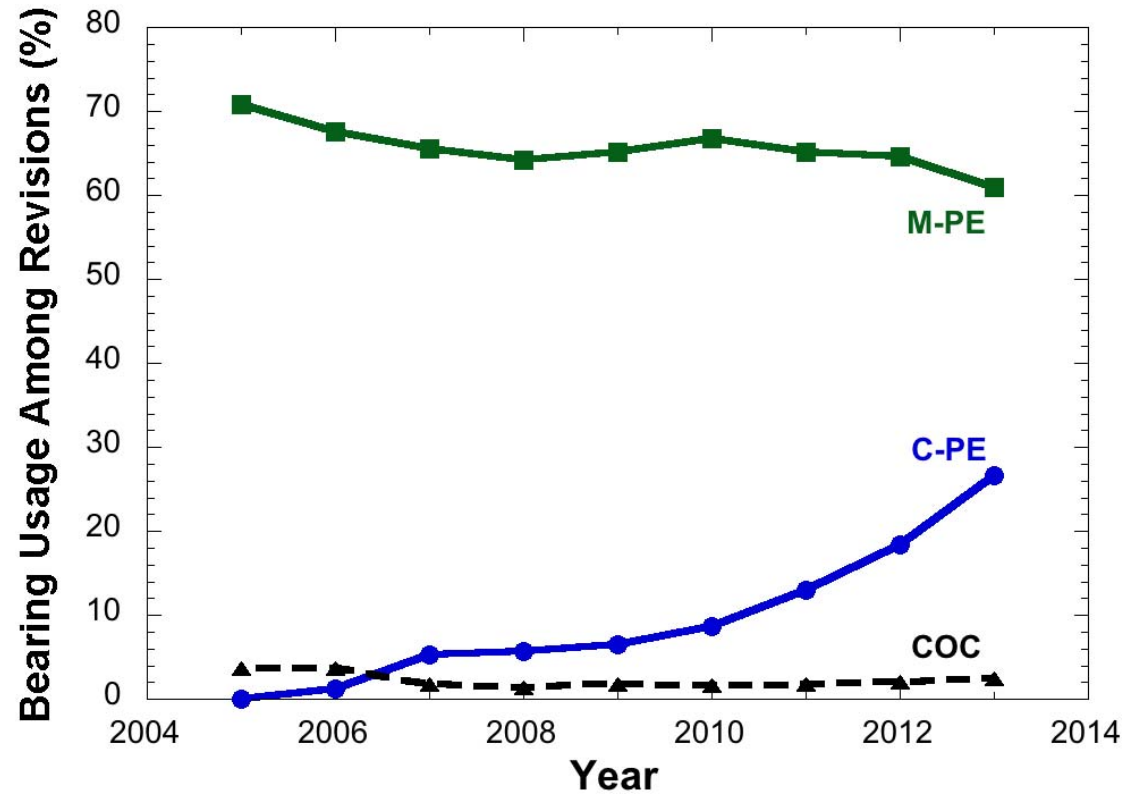
Steven M. Kurtz, PhD ^{a,*}, Edmund C. Lau, MS ^b, Doruk Baykal, PhD ^b, Bryan D. Springer, MD ^c

^a Exponent, Inc, Philadelphia, Pennsylvania

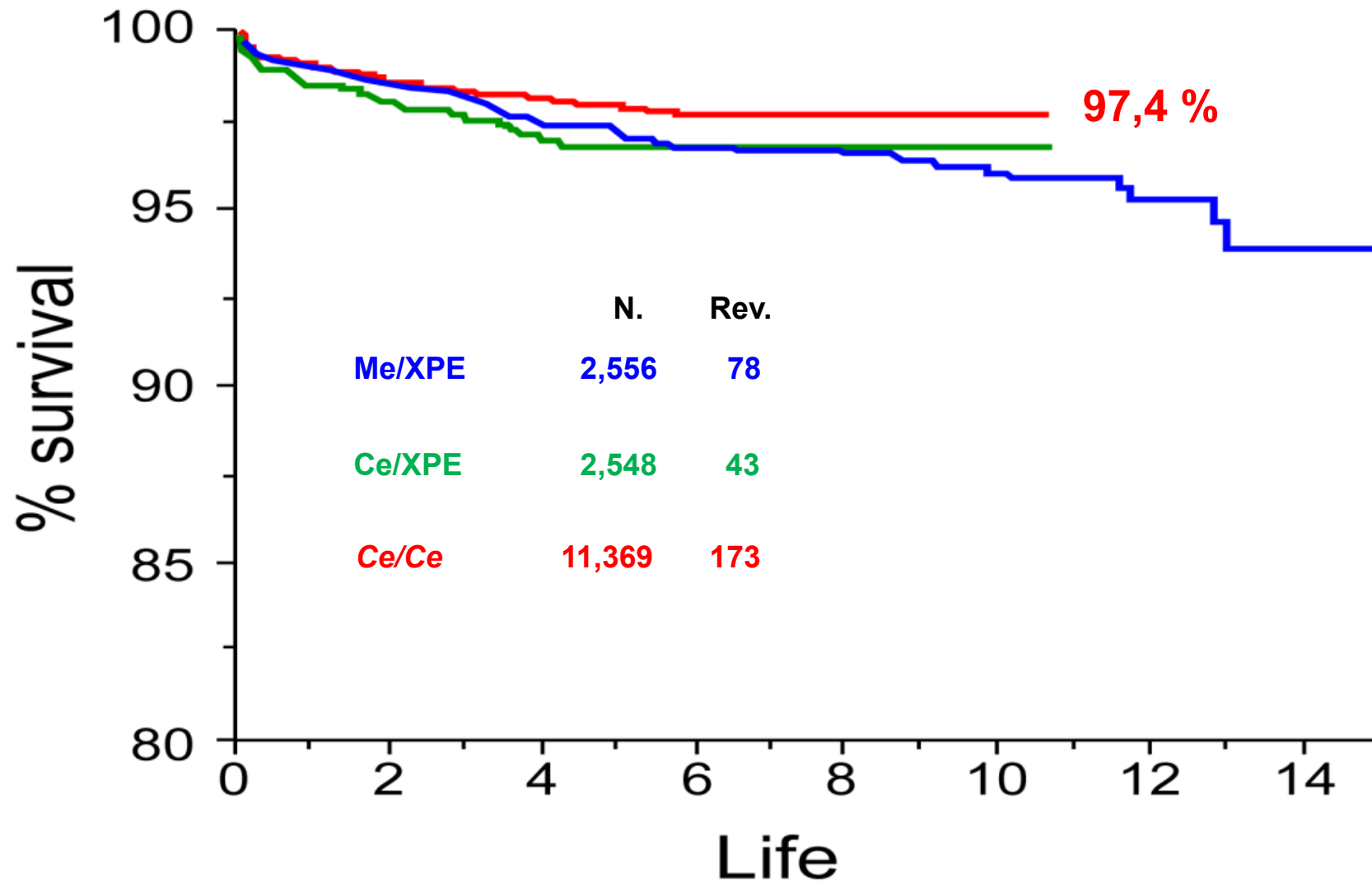
^b Exponent, Inc, Menlo Park, California

^c OrthoCarolina Hip and Knee Center, Charlotte, North Carolina

US-Medicare population
between 2005 and 2013.
n= 31.809
age > 65 yr
*Note: CoC limited
availability in US (FDA)*



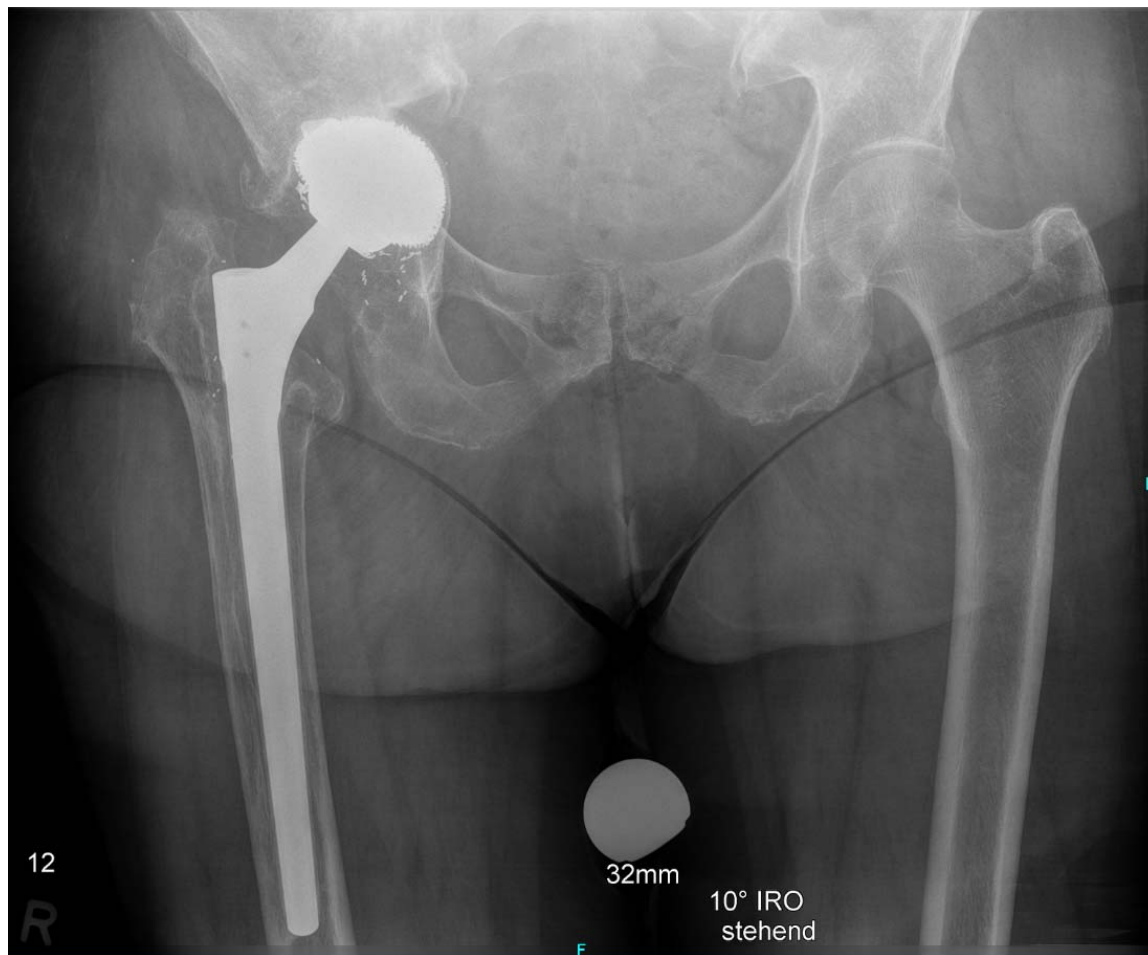
Revision rate THA (only osteoarthritis)



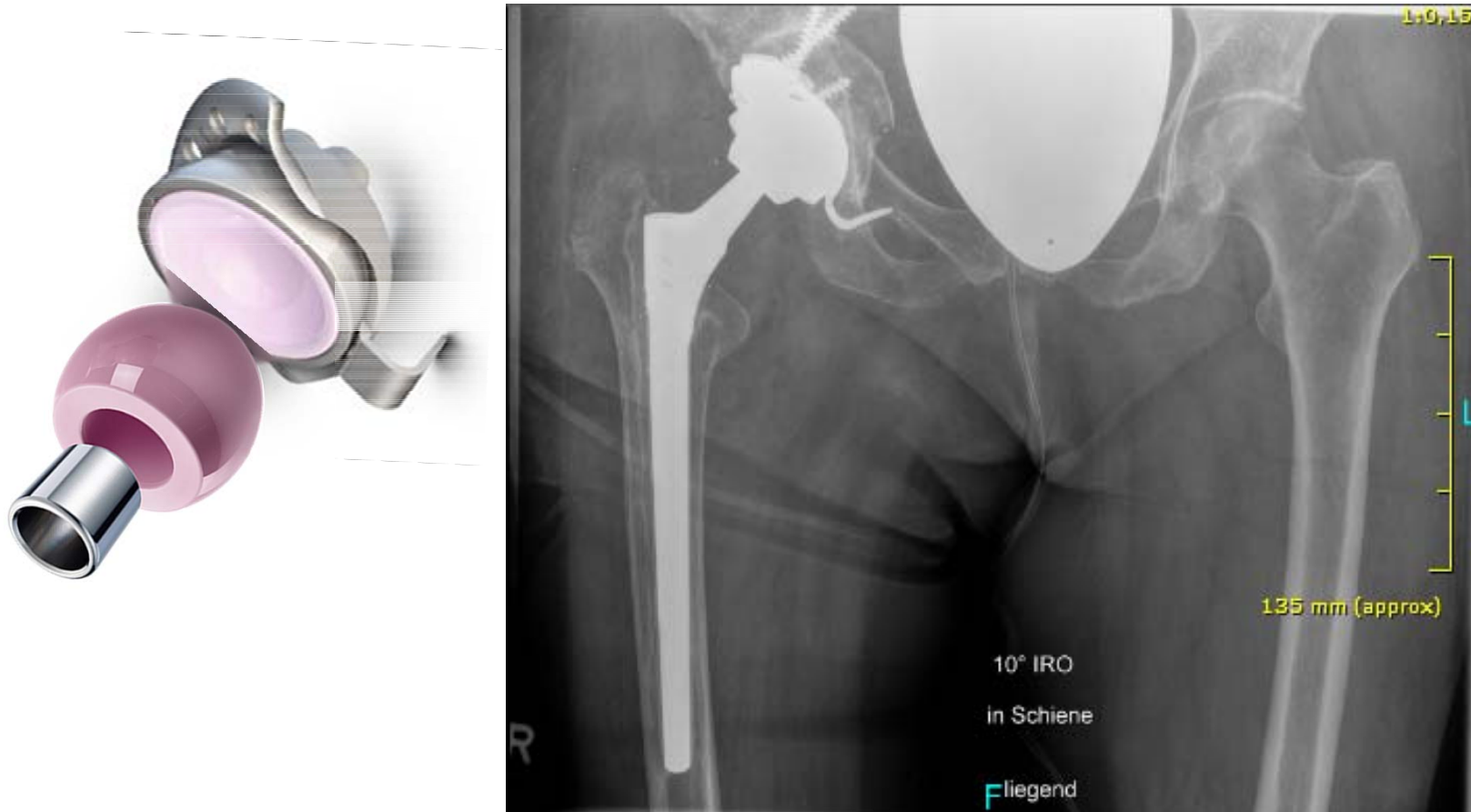
T.R., f., 73 ys.

BPO-allergy

medial + superomedial acetabular defect, stem taper not damaged

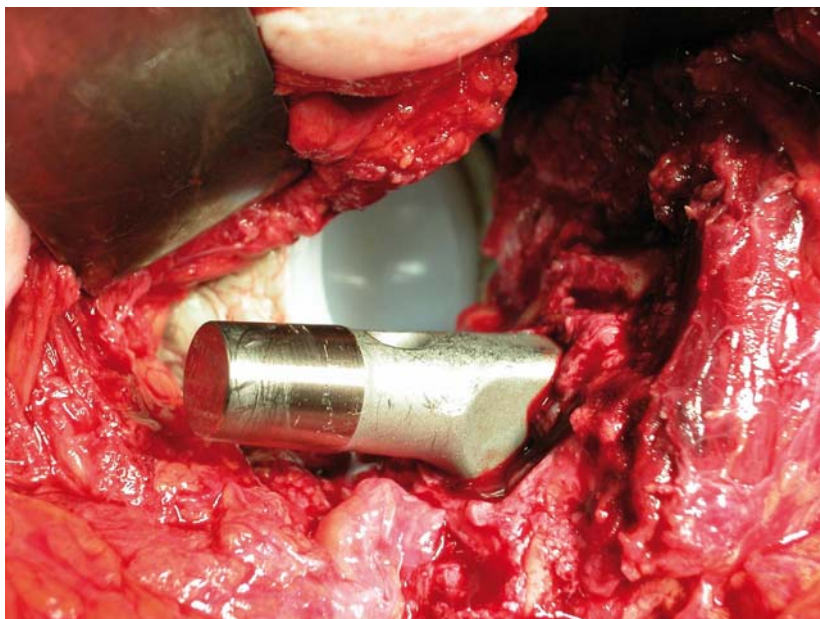


Cementless acetabular reconstruction with C-o-C, sleeved ceramic head

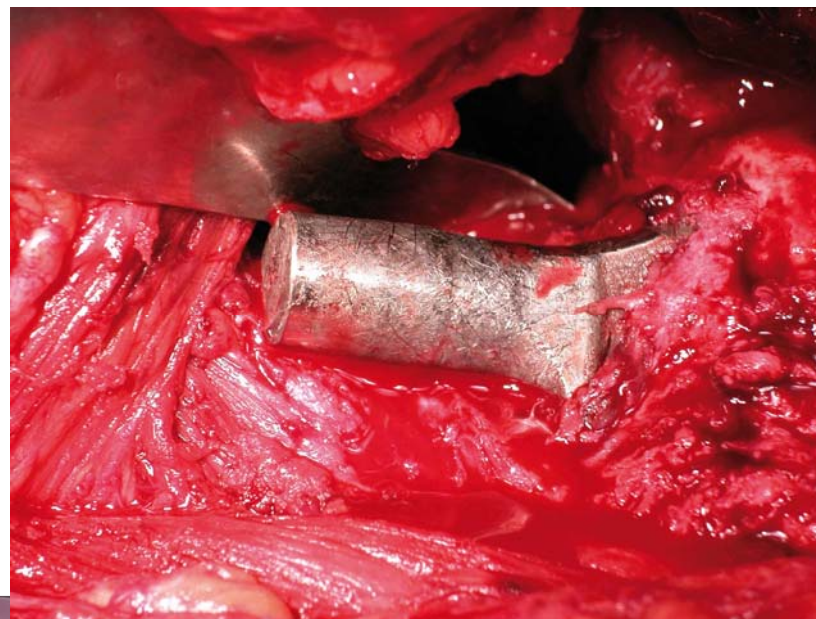


Use of sleeved ceramic heads

minor damage on stem taper
light scratches < 0.25 mm



major damage on stem taper
heavily scratched, broad truncations



BIOLOX®OPTION
can be used



BIOLOX®OPTION
must not be used

adapter sleeves for BIOLOX[®]OPTION - literature

“large ceramic heads ...with a metal adapter sleeve have no effect on corrosion of modular taper connections”

*Fretting Corrosion and Trunnion Wear — Is it also a Problem for Sleeved Ceramic Heads?
Preuss R, Haeussler KL, Flohr M, Streicher, RM. Seminars in Arthroplasty 2012; 4: 251-6*

“the use of the Biolox[®]OPTION system in revision hip arthroplasty demonstrates little damage to either the titanium adapter sleeve or the ceramic head”

*Performance of Biolox Delta Ceramic Bearings with Titanium Adapter Sleeves in Revision Hip Arthroplasty: A Retrieval Analysis.
Figgie M. Jr., Elpers, Padgett D. Abstract ORS 2015*

“fretting corrosion in sleeved ceramic heads showed lower levels than observed in prior studies of tapers in CoCr femoral heads. None of the sleeves in this study had severe corrosion of the internal sleeve surface”

*Fretting and Corrosion Damage in Taper Adapter Sleeves for Ceramic Heads: A Retrieval Study.
MacDonald DW, Chen A, Lee GC, Klein GR, Mont MA, Kurtz SM. Submitted to JoA August 2016*

ceramic-inlays in cup revision



CombiCup R- Link



MRSC - Brehm

K.A., f., 64ys.

2.- Re-THA, BPO+Nickel allergy



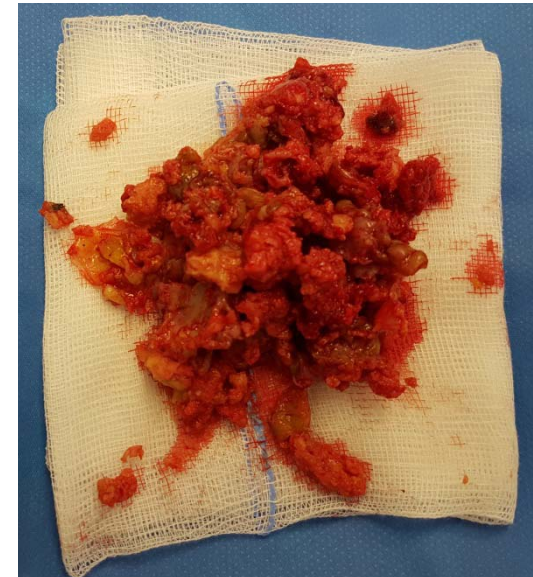
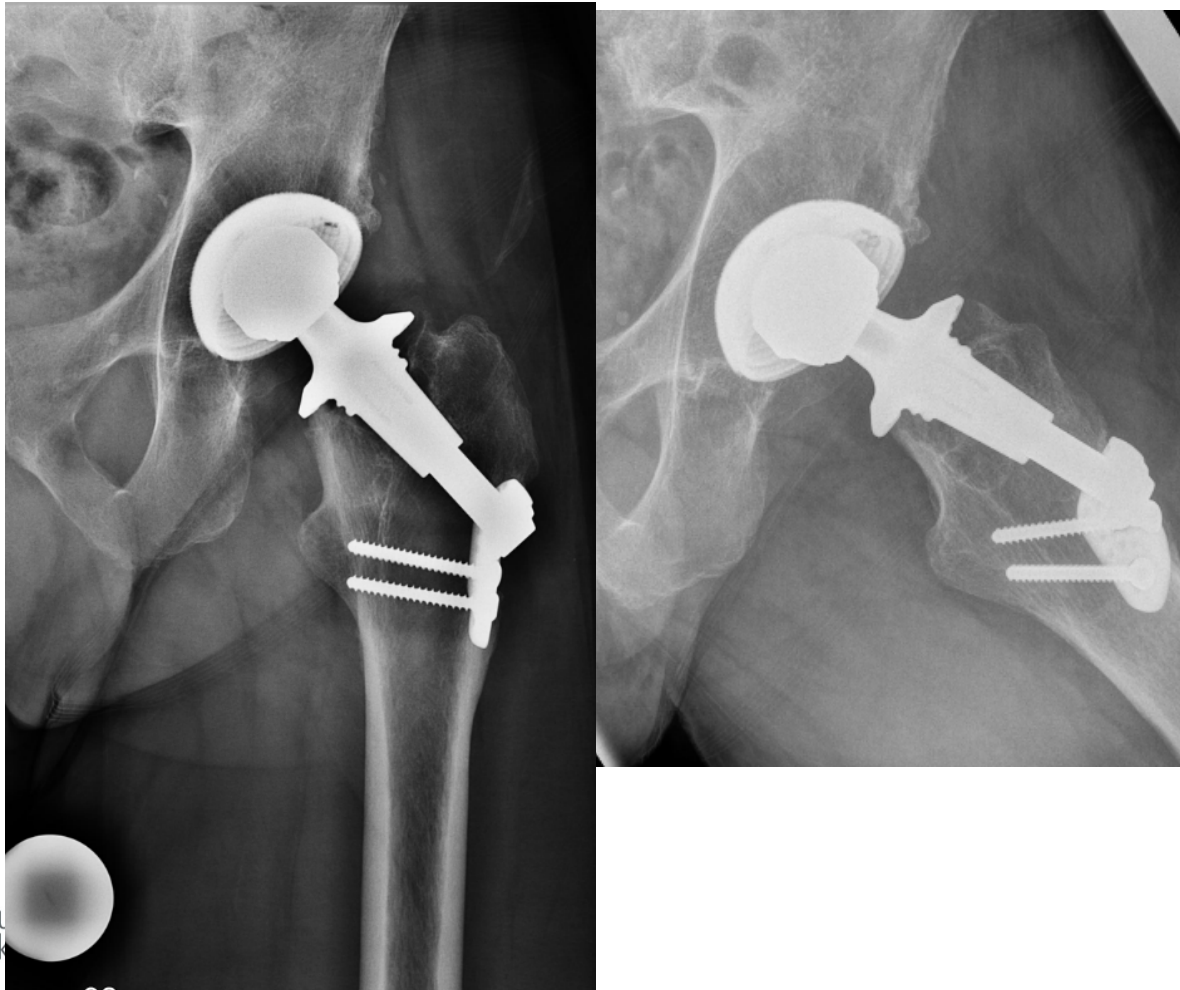
CombiCup R [Link]



20°

B.H., m., 62 ys.

extended PE + ME-granuloma
superomedial + craniolateral defect

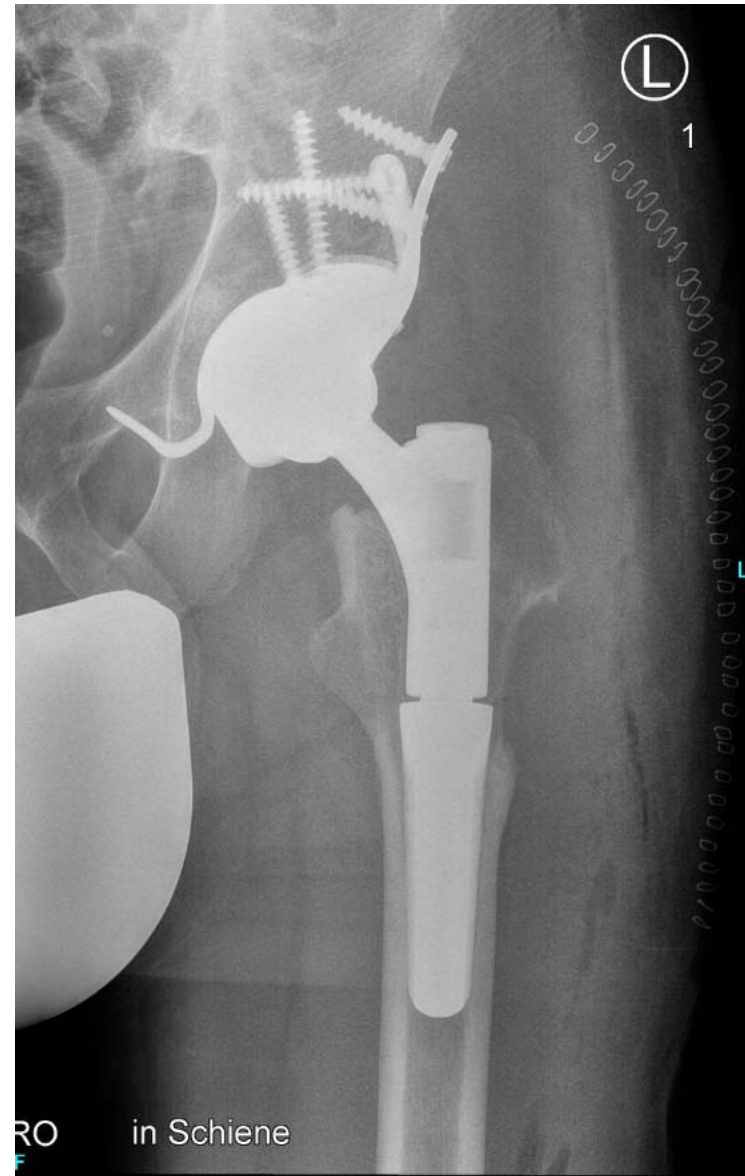


AAOT 28 Nov 2016

symposium Ceramtec



„augment-and-modular cage“
MRSC [Brehm]



Why ceramic in hip revision ?

aseptic loosening, young patient

The Journal of Arthroplasty Vol. 28 No. 1 2013

Revision Total Hip Arthroplasty Using an Alumina-On-Alumina Bearing Surface in Patients With Osteolysis

Jeong Joon Yoo, MD,* Pil Whan Yoon, MD,† Young-Kyun Lee, MD,‡
Kyung-Hoi Koo, MD,* Kang Sup Yoon, MD,* and Hee Joong Kim, MD*§

n=64
age 47 yr [24-72 yr]
follow-up mean 9.8 yr
survival rate 97%
dislocation 3

Osteolysis or Loosening of Any Implant or Reoperation for Any Reason

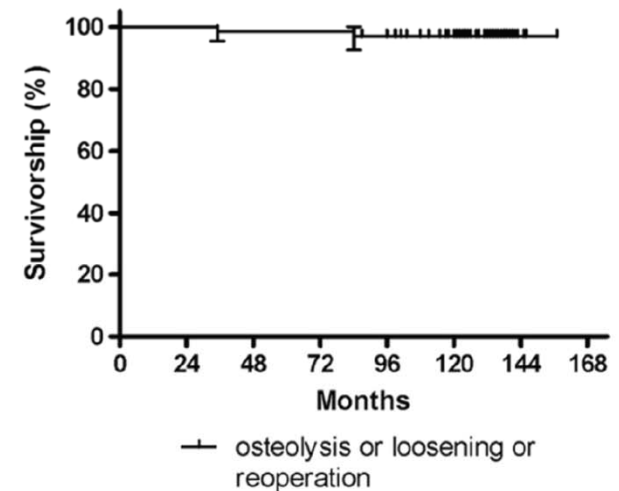


Fig. 4. Kaplan-Meier curve, with any reoperation or radiographic evidence of osteolysis or loosening as the end point. The tick marks indicate censored data. The I bars indicate the 95% CIs.

G.R., f., 64ys.

2. Re-THA, aseptic cup loosening, multiple dislocations (head 28mm)



Why ceramic in hip revision ?

dislocation

Clin Orthop Relat Res 2013
DOI 10.1007/s11999-013-2857-2

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SYMPOSIUM: 2012 INTERNATIONAL HIP SOCIETY PROCEEDINGS

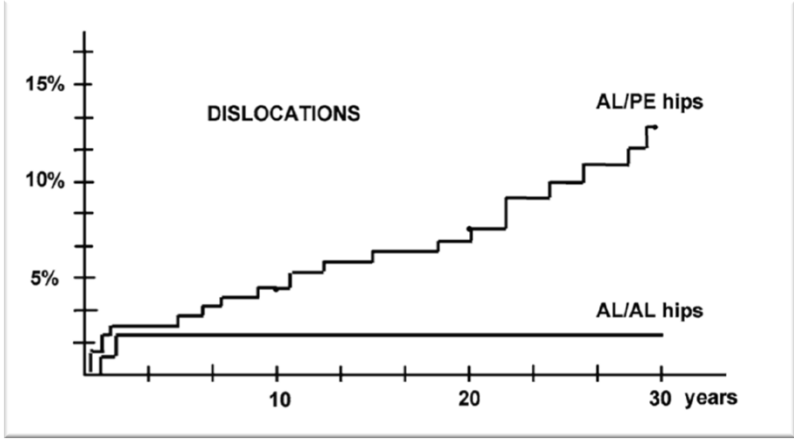
Ceramic-on-ceramic Bearing Decreases the Cumulative Long-term Risk of Dislocation

Philippe Hernigou MD, Yasuhiro Homma MD,
Olivier Pidet MD, Isaac Guissou MD,
Jacques Hernigou MD

Table 1. Dislocations in AL/AL and AL/PE hips

Dislocation	AL/AL hips (n = 126)	AL/PE hips (n = 126)	p value
Early first time < 2 years	2 (1.6%)	2 (1.6%)	0.82
Late first time > 2 years	0 (0%)	14 (11%)	< 0.001
Recurrent	2 (1.6%)	15 (12%)	0.01
Cumulative number	4 (3.2%)	31 (25%)	< 0.001

Values are expressed as number of dislocations with percentage in parentheses. For recurrent dislocations, the first time was not counted; AL/AL = alumina-on-alumina; AL/PE = alumina-on-polyethylene.



“...he reasons may be related to observed differences in the periarticular muscles (fat atrophy or not) ...”



Revision Arthroplasty

Outcomes of Ceramic Bearings After Revision Total Hip Arthroplasty in the Medicare Population

Steven M. Kurtz, PhD ^{a,*}, Edmund C. Lau, MS ^b, Doruk Baykal, PhD ^b, Bryan D. Springer, MD ^c

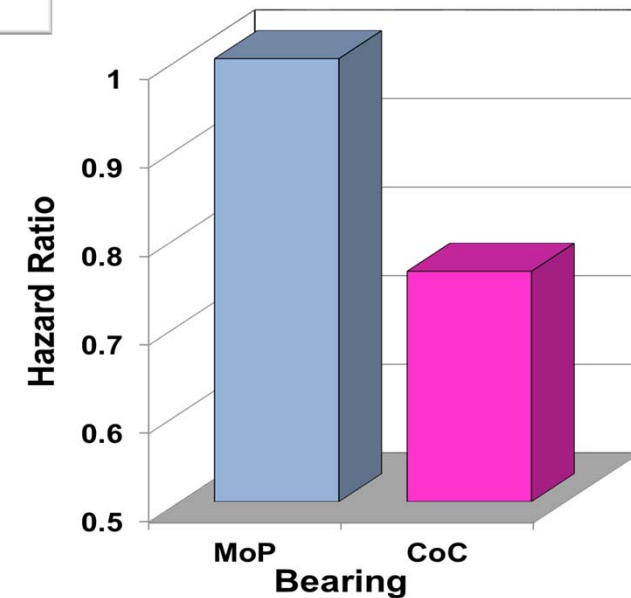
^a Exponent, Inc, Philadelphia, Pennsylvania

^b Exponent, Inc, Menlo Park, California

^c OrthoCarolina Hip and Knee Center, Charlotte, North Carolina

US-Medicare Register 2005 - 2013

- 31'809 Revisions-THA
- adjusted for patient-, hospital- und surgeon risk-factors; Cox-Regression
- Ce/Ce significant better
 - HR = 0,76; $p=0,04$ im Vergleich zu Me/PE



A.M., m., 59ys

Girdlesone-situation 6 mo after explantation
MRSA, Proprii acnes



Why ceramic in hip revision ?

Periprosthetic joint infections

Clin Orthop Relat Res
DOI 10.1007/s11999-016-4916-y

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SYMPOSIUM: 2015 INTERNATIONAL HIP SOCIETY PROCEEDINGS

Periprosthetic Joint Infection in Hip Arthroplasty: Is There an Association Between Infection and Bearing Surface Type?

Rocco P. Pitto MD, PhD, Laurent Sedel MD

NZJR
n= 84.894
age 68 yr (SD 11 yr)
follow-up 9yr (1-15)

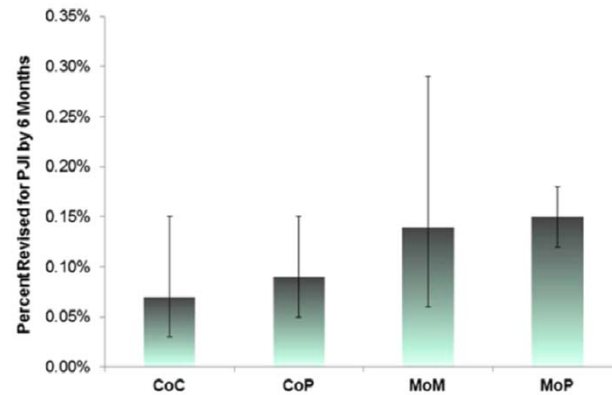


Fig. 1 This figure shows the percent of revision with CIs for PJI within 6 months after the index procedure by bearing surface.

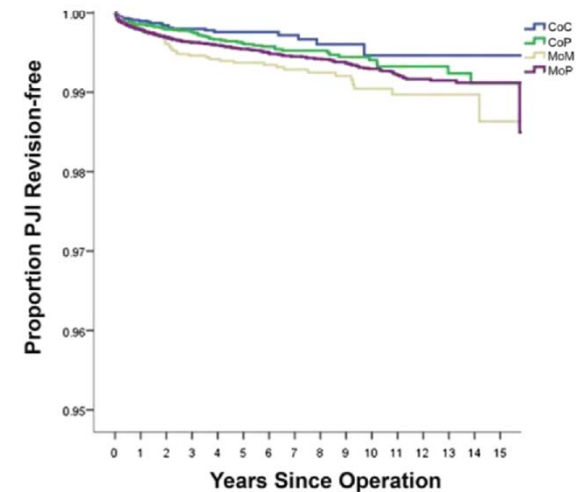
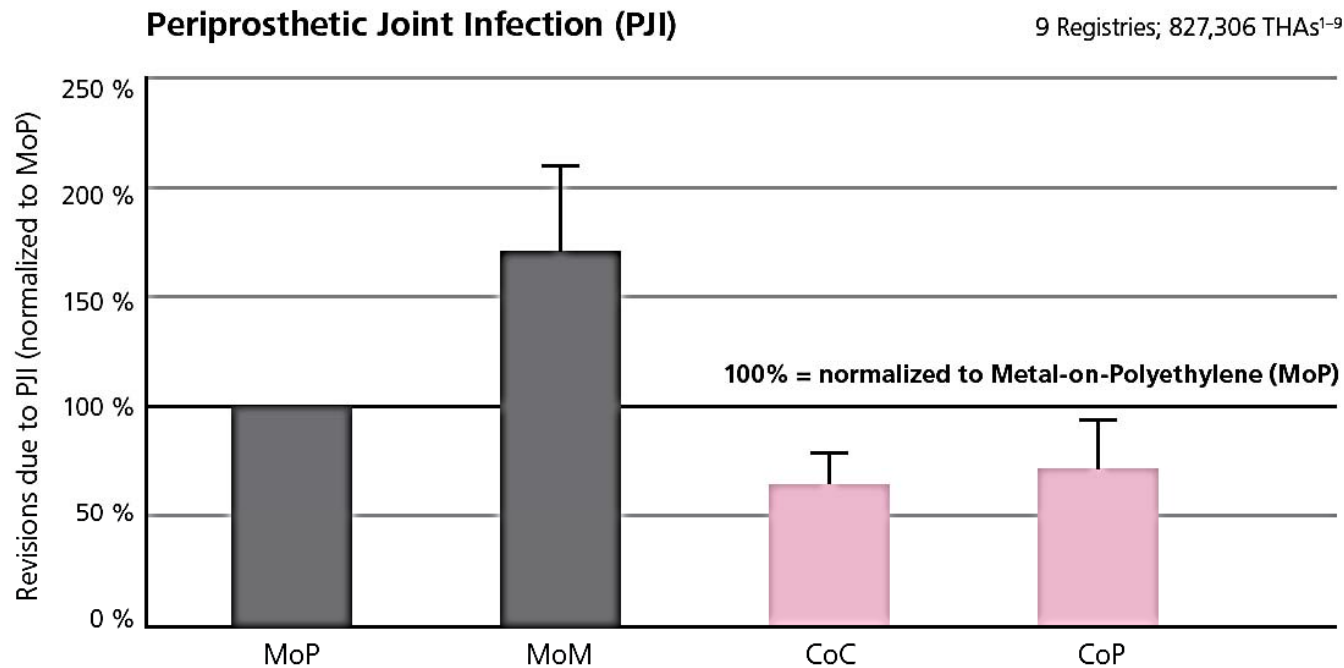


Fig. 2 The Kaplan-Meier survival analysis shows the proportion of revision-free THAs for PJI by bearing surface. The median observation period in this patient population (84,894 THAs) was 9 years (range, 1–15 years).

Why ceramic in hip revision ?

Periprosthetic joint infection



1. Bozic KJ, Ong K, Lau E, Kurtz SM, Vail P, Rubash H. Risk of Complication and Revision Total Hip Arthroplasty Among Medicare Patients with Different Bearing Surfaces. CORR 2010;468;2357-2362
2. Trebse R, Levasic V, Kovac S. Prosthetic Joint Infections and bearings. Hip International 2014;24(5), 533
3. Alijanipour P, Restrepo C, Smith L, Parvizi J, Malkani A. Periprosthetic joint infection: Could Bearing Surface Play a Role? Presentation 45th Annual Meeting Eastern Orthopaedic Association 2014
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8. Graves SE, Lorimer M, Bragdon C, Muratoglu O, Malchau H. Reduced risk of revision for infection when a ceramic bearing surface is used. Abstract ISTA 2015
9. Pitto RP, Sedel L. Periprosthetic Joint Infection in Hip Arthroplasty: Is There an Association Between Infection and Bearing Surface Type? Clin Orthop Relat Res 2016;DOI 10.1007/s1999-016-4916-y

Streicher R, unpublished data Ceramtec

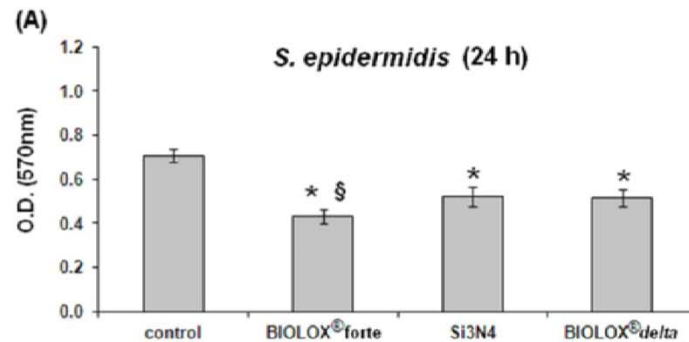
Bioceramic materials show reduced pathological biofilm formation

Corrado PICONI^{1,a}, Andrei C. IONESCU^{2,b}, Andrea COCHIS^{3,4,c},
 Erica IASI^{4,d}, Eugenio BRAMBILLA^{2,e} and Lia RIMONDINI^{3,4,f*}

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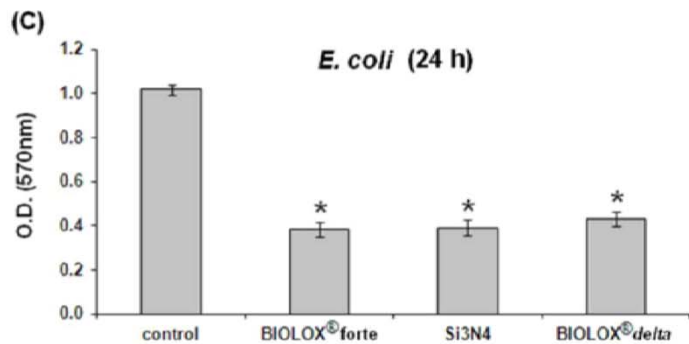
² Department of Medical, Surgical and Dental Sciences, Università di Milano, 20121 Milan (MI), Italy

³ Consorzio Interuniversitario per la Scienza e Tecnologia dei Materiali (INSTM), Via G. Giusti 2, 50121 Firenze (FI), Italy



(B) *S. epidermidis*

Specimen	% Inhibition (vs control)
BIOLOX [®] forte	38.6 ± 3.3
Si3N4	25.9 ± 4.5
BIOLOX [®] delta	26.8 ± 3.9



(D) *E. coli*

Specimen	% Inhibition (vs control)
BIOLOX [®] forte	62.3 ± 3.5
Si3N4	61.5 ± 3.8
BIOLOX [®] delta	57.5 ± 3.2

K.M., f., 63 ys.,

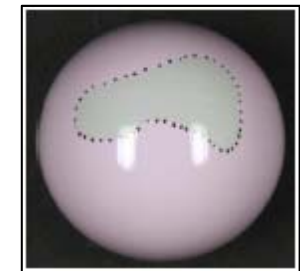
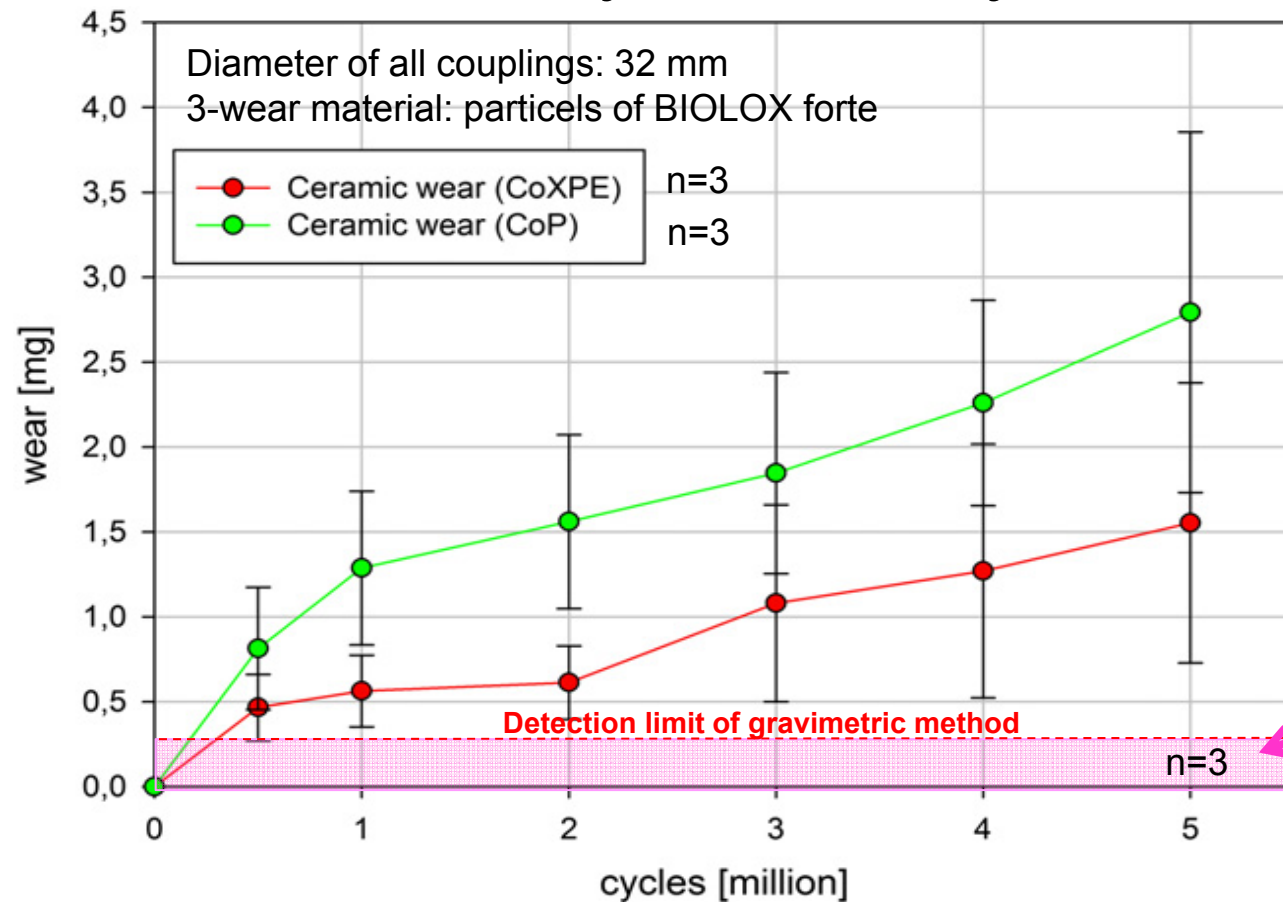
ME-ME resurfacing with aseptic cup loosening 4 ys. postop
revision with CE-CE + cementless stem + 36 head



Why ceramic in hip revision ?

ALRT - „wear disease“

3-body wear-study



KE-KE
Deltakeramik

B.M., f., 55 ys.

rim fracture of the ceramic inlay with multiple ceramic particles within the soft-tissues



preop



postop

Why ceramic in hip revision ?

Ceramic fracture



Hip International / Vol. 12 no. 1, 2002 / pp. 37-42 © Wichtig Editore, 2002

Case report

Massive wear in a CoCrMo head following the fracture of an alumina head

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Third-Generation Ceramic-on-Ceramic Bearing Surfaces in Revision Total Hip Arthroplasty

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indications of C-o-C in Re-THA

- revision because of aseptic loosening in young patients (<70ys)
=> avoiding PE-wear / osteolysis
- revision because of dislocation with small heads
=> “upgrade” to larger head diameter (36 / 40)
- revision because of periprosthetic joint infection
=> reducing risk of re-infection
- revision because of ALTR in case of MoM
=> stops effect and eliminates the risk of re-occurrence
- revision because of ceramic fracture
=> best and safest option



ceramic on ceramic is an (the) option in revision hip arthroplasty

Ceramic Bearings and Revision Risk for Late Dislocation



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Disclosure

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CeramTec



Introduction

- **Dislocation is a major complication after THA and constitutes a prominent reason for revision surgery**
- **Multiple studies have focused on risk factors for late dislocation, but bearing surface has not been extensively studied**
- **Currently there is conflicting evidence about bearing surfaces and dislocation rates**



Introduction

The incidence of dislocation is highest in the first year after arthroplasty, and then continues at a constant rate over the life of the implant

- **Early (<1yr) versus late dislocation (>1yr):**
 - **Early: patient and surgical factors**
 - **Late: biological factors**



Objective

- **To determine whether the bearing surface is a risk factor for late revision due to dislocation in primary THA**



Methods

NZ Arthroplasty Registry:

- Since 1999
- 100,315 primary THJRs (16-year Report)
- Dislocation most common cause for revision (26.5%)



Methods

Exclusion criteria:

- Resurfacing arthroplasty**
- Revision arthroplasty**
- Primary endpoint was revision for late dislocation (late defined as >1 year postOP)**

Material and Methods

- **73,386 THRs fulfilling inclusion:**
 - **73,386 hips ≥ 1 year postOP**
 - **65,387 hips ≥ 2 years postOP**
 - **42,086 hips ≥ 5 years postOP**
 - **12,967 hips ≥ 10 years postOP**
- **Mean age 68.9 years**
- **Mean 10-year Follow-up**
- **53.2% female**
- **88% OA**

Material and Methods

- **Surgical Approach:**
 - **Posterior 65.3%**
 - **Lateral 28.3%**
 - **Anterior 4.2% (other 2.2%)**

- **Bearing surfaces:**
 - **MoP 53,331**
 - **CoP 14,093**
 - **CoC 8,177**
 - **MoM 5,910**
 - **CoM 461**

Results

- **3130 (4.3%) hips revised for any cause**
 - **Rate of 0.7/100 component / years**
- **836 (1.1%) revised for dislocation**
 - **Rate of 0.19/100 component / years**
- **470 (0.65%) revised for dislocation >1 year**
 - **Rate of 0.11/100 component / years**

Multivariate Analysis

CoC HR versus

– CoP

(HR 2.10; 95% CI 1.12 – 3.94, p=0.021)

– MoP

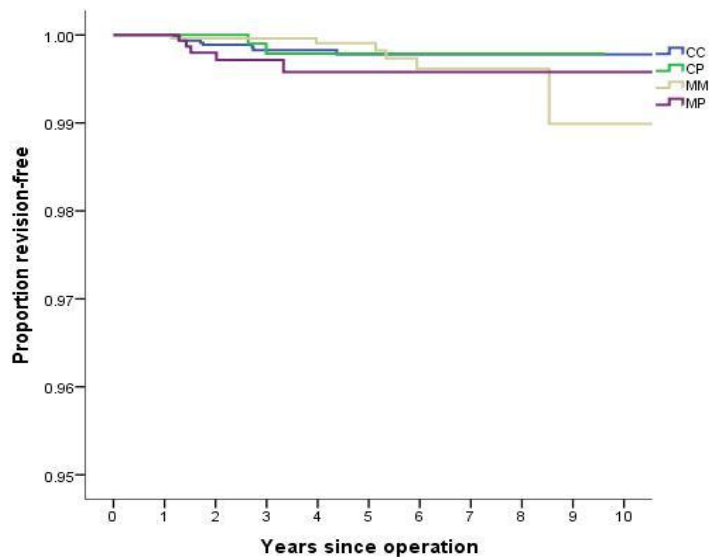
(HR 1.76; 95% CI 0.94 – 3.28, p=0.075)

Adjusted for age, gender, head size, surgical approach

Results

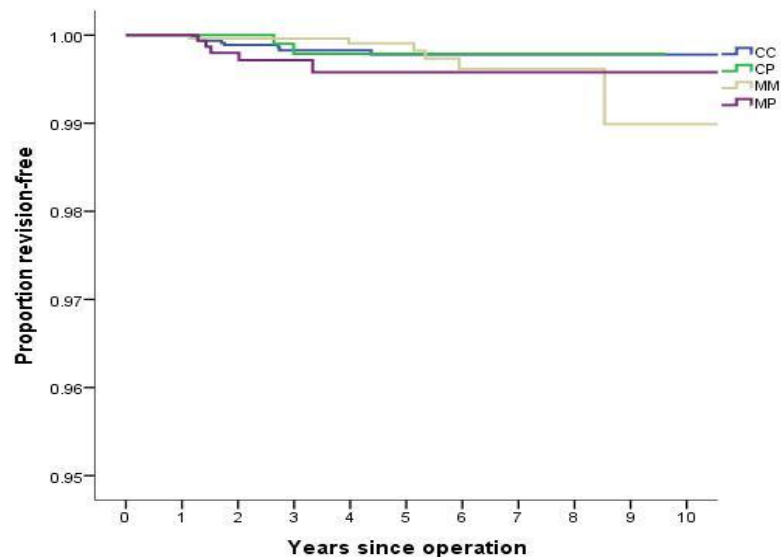
- **There were statistically significant lower rates of revision for dislocation in all age groups with >28mm CoC bearings than:**
 - **MoM (HR = 0.36; 95% CI 0.20 – 0.67, p= 0.004)**
 - **CoP (HR = 0.51; 95% CI 0.30 – 0.89, p= 0.018)**
 - **MoP (HR = 0.55; 95% CI 0.33 – 0.93, p= 0.027)**

Revision for dislocation after 1 year

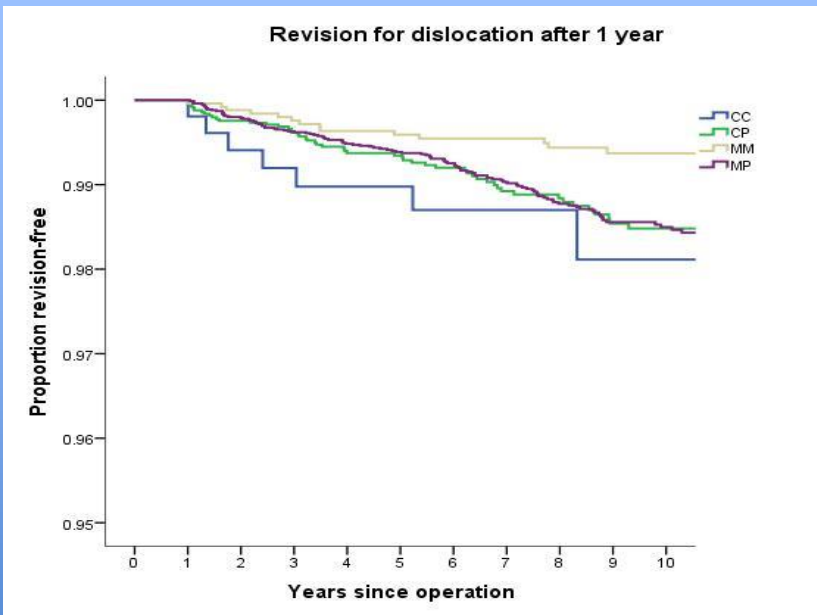


Head size >28mm and age <65 years

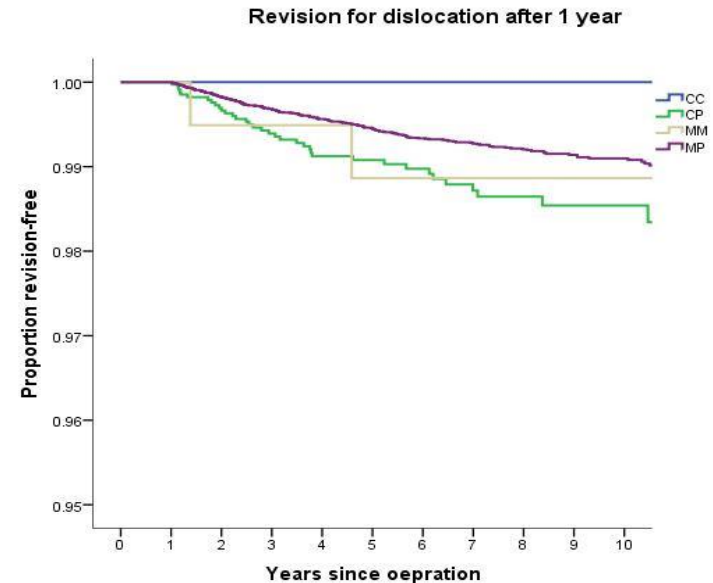
Revision for dislocation after 1 year



Head size >28mm and age ≥ 65 years



Head size ≤ 28 mm and age < 65 years



Head size ≤ 28 mm and age ≥ 65 years

There were more revisions in CoC than MoM THAs in younger patients and smaller head size (< 65 years, 28 mm) (HR 0.29; 95% CI 0.12–0.71; $p = 0.014$)

Discussion

- **This 10-year Registry analysis shows low rates of revision for late dislocation with CoC THRs**
- **Confirms Australian Registry finding regarding the increased risk of revision for late dislocation in patients younger than 65 yrs with 28mm CoC**
- **Confirms findings of previous paper showing low rates of late dislocation with 32mm CoC**

***Sexton SA et al.:* CoC and risk of revision due to dislocation after THA. JBJS 91B: 1448-53, 2009**

***Hernigou P et al.:* CoC Decreases the Long-term Risk of Dislocation. CORR 471:3875-82, 2013**

Discussion

- **Late dislocations may be influenced by biological factors:**
 - **analysis of tissue reaction to ceramics has shown small numbers of macrophages, few foreign body type giant cells and occasional lymphocytes**
 - **polyethylene implants promote extensive foreign body type inflammatory changes**

*Esposito C. et al.: Periprosthetic Tissues from CoC THAs.
J Arthroplasty 2013;28:860-6*

Discussion

Late dislocations may be influenced by biological factors like *Pathology of the Pseudo-Capsule*:

- MoP pseudocapsules exhibit significantly higher levels of inflammatory markers than CoC**
- inflammatory reaction to polyethylene and metal wear particles results in fluid expansion and capsule dissociation**

***Sedel L. et al.:* Prostaglandin levels in peri-THA tissues.
Arch Orthop Trauma Surg 1992;111:255-8**

Message to Take Home

Ceramic Bearings:

- Low rates of revision for late dislocation
- Best outcome with 32mm bearing surfaces



