Ceramic-on-Ceramic in revision hip arthroplasty

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Risk of Subsequent Revision after Primary and Revision Total Joint Arthroplasty

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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

Data from AOA NJRR 2015

- THA 329'240
- R-THA 9'474

Revisionsraten

- dislocation
- infection
- asept loosening
- ALTR/Korrosion
- Periprost. Fx
- Komp. fx

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AAOT 28 Nov 2016
symposium Ceramtec
Dilemma – young patients are still young at time of 1th revision
bearings in revision arthroplasty

linear wear [mm]

- PE-metall: 0.2 mm
- PE-ceramic: 0.1 mm
- ceramic-ceramic: 2 µm

soft - hard  hard - hard
n= 31,809 
age > 65 yr 
Note: CoC limited availability in US (FDA)
Revision rate THA (only osteoarthritis)

- Me/XPE: 2,556, Rev. 78
- Ce/XPE: 2,548, Rev. 43
- Ce/Ce: 11,369, Rev. 173

% survival over Life

97.4%
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”


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


“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. Sumitted 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
„augment-and-modular cage“
MRSC [Brehm]
Why ceramic in hip revision?
aseptic loosening, young patient

n=64
age 47 yr [24-72 yr]
follow-up mean 9.8 yr
survival rate 97%
dislocation 3
G.R., f., 64ys.

2. Re-THA, aseptic cup loosening, multiple dislocations (head 28mm)
Why ceramic in hip revision?

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

<table>
<thead>
<tr>
<th>Dislocation</th>
<th>AL/AL hips (n = 126)</th>
<th>AL/PE hips (n = 126)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early first time &lt; 2 years</td>
<td>2 (1.6%)</td>
<td>2 (1.6%)</td>
<td>0.82</td>
</tr>
<tr>
<td>Late first time &gt; 2 years</td>
<td>0 (0%)</td>
<td>14 (11%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Recurrent</td>
<td>2 (1.6%)</td>
<td>15 (12%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Cumulative number</td>
<td>4 (3.2%)</td>
<td>31 (25%)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

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.

“...the reasons may be related to observed differences in the periarticular muscles (fat atrophy or not) ...”
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, Propioni acnes
Why ceramic in hip revision?

Periprosthetic joint infections

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

Periprosthetic Joint Infection (PJI)

9 Registries, 827,306 THAs


Streicher R, unpublished data Ceramtec
Bioceramic materials show reduced pathological biofilm formation

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(A) S. epidermidis (24 h)

(B) S. epidermidis

<table>
<thead>
<tr>
<th>Specimen</th>
<th>% Inhibition (vs control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOLOX⁶ forte</td>
<td>38.6 ± 3.3</td>
</tr>
<tr>
<td>SI2N4</td>
<td>25.9 ± 4.5</td>
</tr>
<tr>
<td>BIOLOX⁶ delta</td>
<td>26.8 ± 3.9</td>
</tr>
</tbody>
</table>

(C) E. coli (24 h)

(D) E. coli

<table>
<thead>
<tr>
<th>Specimen</th>
<th>% Inhibition (vs control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOLOX⁶ forte</td>
<td>62.3 ± 3.5</td>
</tr>
<tr>
<td>SI2N4</td>
<td>61.5 ± 3.8</td>
</tr>
<tr>
<td>BIOLOX⁶ delta</td>
<td>57.3 ± 3.2</td>
</tr>
</tbody>
</table>
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

Diameter of all couplings: 32 mm
3-wear material: particels of BIOLOX forte

- Ceramic wear (CoXPE) n=3
- Ceramic wear (CoP) n=3

Detection limit of gravimetric method

Porporati, Laborstudie Endolab, ISTA 2014

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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

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