Monthly **CeraNews**

The Orthopaedic Landscape Information Newsletter, Issue 2 / 2018

Good long-term results with CoC in young patients

Third-generation alumina CoC bearings show good long-term clinical and radiographic results. **Lau et al.** retrospectively examined 126 primary THA in 108 patients with a mean age at implantation of 39.6 years. After an average follow-up of 12.1 years, the mean Oxford Hip Score was 39.8. Kaplan-Meier survivorship calculated at 10 years with revision for any cause as endpoint was 94.6%. There were no cases of osteolysis, detectable wear or squeaking.

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Ceramic with superior outcome in young patients

Latest generation ceramic-on-ceramic bearings (CoC) show encouraging mid-term results in young and highly active patients. **Lee et al.** conducted a prospective study on 252 patients (286 THA) with a mean age of 49.7 years. The primary diagnosis for most of them was osteonecrosis of the femoral head. With this indication, outcome normally is significantly poorer than with osteoarthritis. Clinical outcome scores (HHS, WOMAC, UCLA activity) improved significantly after surgery. The Kaplan-Meier survival rate, with revision for any reason as endpoint, was 99.4% at 6 years. The authors consider the mid-term survivorship of fourth-generation ceramic-on-ceramic bearings encouraging. Along with choosing the best implant solution they emphasize the importance of insert positioning.

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Superior results with ceramic in New Zealand

After adjustment for confounding factors, ceramic-on-ceramic bearings show superior results in the New Zealand registry when compared with other THA bearings. The data also confirm that the fracture rates of fourth-generation ceramics are lower than those of the third generation. **Sharplin et al.** analyzed 106,139 primary and 4,960 revision hip arthroplasties performed from January 1, 1999 to December 31, 2015. The authors name ceramic-on-crosslinked polyethylene (CoXPE) as the most promising option for young and active patients.

CoXPE bearings had the lowest revision rate, but when adjusted by age, gender, approach, fixation and surgical volumes, CoC resulted to be superior, followed by CoXPE. Acetabular loosening was the most common reason for revision (22.2%), followed by femoral loosening (16.7%). The lowest revision rate for femoral loosening was associated with CoC. Hard-on-hard bearings had a lower revision rate for dislocation than hard-on-soft combinations. Revision for infection was most common with metal-on-polyethylene (MoXPE) and least common with CoC.

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Dutch registry shows ceramic bearings on top

Bearings with ceramic components, both in hard-on-hard and hard-on-soft combinations show significantly better survival rates than those with metal components. The revision risk is lower by 13% to 19%. When large bearings are used, ceramic-on-ceramic offers the best survivorship. **Peters et al.** drew these conclusions from data of 209,912, primary THA recorded in the Dutch Arthroplasty Register (LROI) in 2007–2016 excluding metal-on-metal bearings.

The latest report from the Dutch Arthroplasty Register (LROI) confirmed a significantly lower risk of revision for bearings with ceramic and ceramicized-metal components than the standard MoP bearings after adjustment for confounding factors. When large-diameter bearings were used, CoC achieved the lowest revision rate among all bearings. For small femoral heads (22-28mm), statistically significant lower revision rates were found for CoP and CoXPE when compared with MoP. Revision rates in patients under 60 years were lower for ceramic bearings than for MoP.

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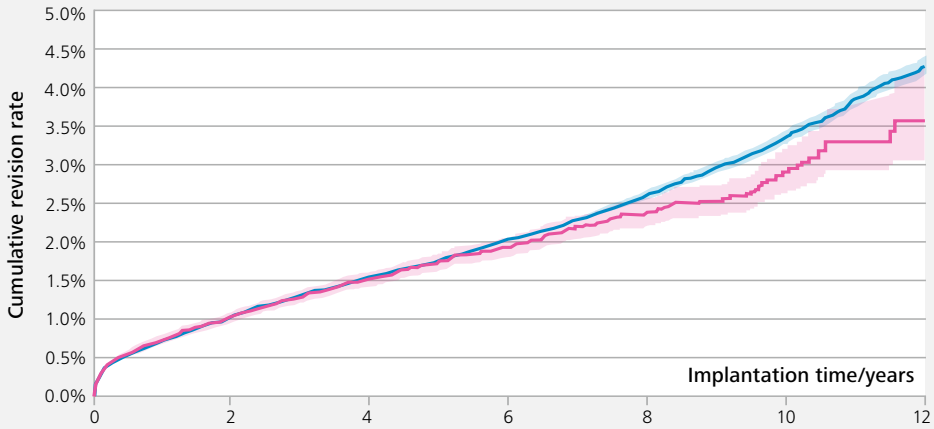
NJR 2017: CoP with BIOLOX®*delta* better than MoP

Cox Proportional Hazards Model for revision risk ratio of BIOLOX®*delta*-on-polyethylene / metal-on-polyethylene



Adjustment	Hazard ratio (95% CI)	p-value
Unadjusted	0.97 (0.92–1.03)	0.295
Adjusted	0.78 (0.73–0.83)	<0.001

metal-on-polyethylene
95% confidence interval
BIOLOX®delta-on-polyethylene
95% confidence interval

Adjustment includes patient gender, age group and stem/cup fixation

Source: The data used for this analysis was obtained from the NJR Supplier Feedback System.Summary.Report.HP_Ceramtec_Delta on Poly vs Metal on Poly.09/01/2018.14:59; © 2018 Northgate Public Services (UK) Limited; Data on file.

MT-00241-1804-EN-01

Executive Summary

Issue 2 / 2018

Title	**Which is the best bearing surface for primary total hip replacement? A New Zealand Registry study**
Authors	Sharplin P., Wyatt M. C., Rothwell A., Frampton C., Hooper G.
Journal	Hip Int. 2017 Dec 1:0. doi: 10.5301/hipint.5000585.
Level of Evidence	Not indicated. Retrospective clinical study.
Summary	**Sharplin et al.** extracted from the New Zealand Registry (NZJR) the data of primary hip arthroplasty procedures (106,139) and 4,960 revisions (4.7 %) performed from January 1, 1999 and December 31, 2015 with the aim to identify the best performing bearing surface.
	The sixteen years outcomes of Metal-on-Polythylene (MoP; 35,647), Metal-on-Crosslinked Polyethylene (MoXPE; 31,579), Ceramic-on-Polythylene (CoP; 6,833), Ceramic-on-Crosslinked Polyethylene (CoXPE; 14,382), Ceramic-on-Ceramic (CoC; 11,235), Metal-on-Metal (MoM; 5,989) and Ceramic-on-Metal (CoM; 474) were analysed by calculating the Kaplan-Meier estimates and adjusting them with Cox-proportional hazards regression models by age at surgery, gender, surgical approach, surgeon volume, fixation and head size.
	The cementless implants were the most common used implants (39.1 %), followed by hybrid (38,6 %) and cemented fixations (22.3 %). In 64.0 % of the CoC cases the head size was equal or larger than 36 mm. The 28 mm head size was predominantly used with CoP (92.9 %) and MoP (85.7 %) bearing surfaces, whereas larger heads (≥32 mm) were preferred with CoXPE (70.4 %) and MoXPE (56.5 %). The posterior surgical approach was the most common (68.3 %) followed by the lateral (27.8 %). The patients in the ceramic group were almost a decade younger than the metal counterpart. The Hard-on-Hard combinations were preferred by high volume surgeons (≥ 100 procedures per year), whereas the Hard-on-Soft bearings were mostly used by surgeons performing between 25 and 49 procedures per year. The most common reasons for revisions were acetabular loosening (22.2 %) followed by femoral loosening (16.7 %). The lowest revision rate for acetabular loosening was associated with CoXPE and MoXPE and the lowest rate of revision for femoral loosening with CoC. All Hard-on-Hard bearings had a lower revision rate for dislocation when compared with Hard-on-Soft combinations. The revisions for infection were most common with MoXPE and least common with CoC. Of the 12 reported fractured ceramic heads 11 were 28 mm diameter heads. The fracture rate of ceramic heads larger than 28 mm resulted to be 0.005 %. In CoC bearings, 5 heads and 29 insert fractures (0.26 %) were reported. All the fractured ceramic liners fractured were from the third ceramic generation (BIOLOX®forte, CeramTec GmbH). 185 (23.2 %) of the MoM revisions were for adverse local reaction for metal debris. 18 (8.2 %) of the CoC revisions were due to noise-related issues.
	CoXPE bearing surfaces showed the lowest revision rate, but when the revision rate were adjusted by age, gender, approach, fixation and surgical volumes CoC resulted to be superior followed by CoXPE. However, when looking to the last 10 years and considering the 32 mm and 36 mm head sizes only, CoXPE resulted to be significantly superior than CoC solution. In the conclusion, the authors indicate the CoXPE as the most promising option for young and active patients undergoing primary THR.

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MT-00234-1806-EN-02

Executive Summary

Issue 2 / 2018

Study limitations	Not all confounding factors as the BMI and the activity level have been accounted in the analysis.
	All-cause revision has been identified as marker for a successful primary THR.
	The different groups of implants have not been identified.
Key Messages	**CoC were after adjustment the superior bearing, when considering the whole period of analysis.**
	CoXPE resulted to be the significantly superior bearing when considering the last ten years of the period of analysis and the 32mm and 36mm sizes only.
	The revision for dislocation with ceramic bearings (CoC and CoXPE) is significantly lower when compared with the other bearing options.
	The revision for periprosthetic infection with CoC is significantly lower when compared with the other bearings.
	The registry confirms lower ceramic fracture rates with the fourth ceramic generation than with third ceramic generation.

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MT-00234-1806-EN-02

Executive Summary

Issue 02 / 2018

Title	**The effect of bearing type on the outcome of total hip arthroplasty Analysis of 209,912 primary total hip arthroplasties registered in the Dutch Arthroplasty Register**
Authors	Peters I. M., Van Steenbergen L. N., Stevens M., Paul C Rijk P. C., Bulstra S.K., Zijlstra W. P.
Journal	Acta Orthopaedica 2017; 88 (x): x–x DOI: 10.1080/17453674.2017.1405669
Level of Evidence	Level III (Retrospective comparative study)
Summary	The authors extracted from the Dutch Arthroplasty Register (LROI) the nationwide data of all patients (209,912) that underwent primary THA with a non-Metal-on-Metal bearing (MoM; 5,359) in the Netherlands from 2007 to 2016. The objective of the study was to calculate the revision rates of THAs by bearing type: Metal-on-Polyethylene (MoP; 37,351), Metal-on-Cross Linked Polyethyene (MoXPE; 32,867), Ceramic-on-Polyethylene (CoP; 40,109), Ceramic-on-Cross Linked Polyethyene (CoXPE; 70,175), Ceramic-on-Ceramic (CoC; 17,625), Oxidized Zirconium-on-Polyethyene (OxZroP), Oxidized Zirconium-on-Cross Linked Polyethyene (OxZroXPE). Patients with unknown implant components or patients with at least one of the components were not registered have been excluded (11,836).
	For the purpose, multivariable Cox proportional hazard regression ratios (HRs) adjusted for age, sex, ASA score, diagnosis, previous operation to the affected hip joint, fixation technique, femoral head diameter, surgical approach, and period of surgery, were used. MoP was set as reference bearing. OxZroP and OxZroXPE were merged (11,785), because of the small sample size. The revision rate by bearing type of a sub-group of 34,204 patients with less than 60 years was also calculated.
	CoXPE, CoC and OxZroXPE in patients younger than 60 years were found to be statistically significantly better than MoP. The analysis showed that CoXPE, CoC and OxZroXPE lower risk of revision compared to MoP. CoP and CoXPE had statistically significant lower revision rate in comparison with MoP when 22-28 mm ball heads were considered. CoC showed a statistical lower HR compared to MoXPE (0.7 Vs. 1.0) with large ball heads (i.e. 36mm). The overall risk of revision with 22-28mm heads was 18 % higher than 32mm heads and that of 36 mm heads 11% higher when compared to 32 mm heads.
	In conclusion, CoXPE, CoC and OxZroXPE bearings offered significantly better survival rates in mid-term compared with MoP according to the Dutch Arthroplasty Register data-set analysis.
Study Limitations	The study has limited follow-up with a mean follow-up of 3.9 years and a maximum of 9.9 years.
	The national registry studies are based on observational data and therefore cannot infer causality.
	The data limit the ability to comment on the effect of THA components, which may be an unknown confounder.
Key Messages	**Bearings with ceramic components, both in hard-on-hard and hard-on-soft are showing a significant better survival when compared with metal bearings.**
	Ceramic-on-ceramic offers the best survivorship, when large bearings (i.e. 36mm) are used.

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Executive Summary

Issue 02 / 2018

Title	**3rd generation ceramic-on-ceramic cementless total hip arthroplasty: a minimum 10-year follow-up study**
Authors	Yeong J. Lau, Shashank Sarmah, Johan D. Witt
Journal	Hip Int. 2017 Jul 29:0. doi: 10.5301/hipint.5000541. [Epub ahead of print]
Level of Evidence	None given. Retrospective analysis.
Summary	**Lau et al.** analyzed their own cementless THA patient cohort with 3rd generation alumina CoC bearings. The aim of the retrospective study was to evaluate the long-term performances of alumina CoC bearings with a particular attention to hip function and noise. 126 primary THA were performed in 108 patients. The mean age at implantation was 39.6 years. The average follow-up was 12.1 years. Clinical and radiographic outcomes were reviewed. The Oxford Hip Questionnaire was completed by all patients investigated. Kaplan-Meier survivorship calculated at 10 years with revision for any cause as endpoint resulted to be 94.6 %. The mean Oxford Hip Score was 39.8 out of 48. There were no cases of osteolysis, detectable wear or squeaking. 1 patient was revised for early stem subsidence, 1 for deep infection, 2 for recurrent dislocation, 1 for ceramic head fracture with the revision only of the bearing, 1 for progressive radiolucency, probably due to the resorption of the HA-layer on the acetabular cup. The authors concluded suggesting this articulation for younger patients due to the good preservation of bone quality with no osteolysis.
Study Limitations	Retrospective analysis of THA with CoC bearings without control group
Key Messages	**THA with CoC bearings show good clinical and radiographic results in the long term.**
	There was no squeaking, osteolysis or detectable wear.
Commentary	3rd generation CoC (BIOLOX®*forte*) bearings confirm the good long-term (> 10 years) clinical outcomes and show good preservation of bone quality without squeaking, osteolysis or wear

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Executive Summary

Issue 02 / 2018

Title	**Mid-term results of the BIOLOX®*delta* ceramic-on-ceramic total hip arthroplasty**
Authors	Lee, Y. K., Y. C. Ha, J. I. Yoo, W. L. Jo, K. C. Kim and K. H. Koo
Journal	Bone Joint J 2017; 99-b(6): 741-748.
Level of Evidence	None given. Prospective study.
Summary	**Lee et al.** conducted a prospective study to evaluate the mid-term results of a specific THA system (DePuy; Corail, Pinnacle) with BIOLOX®*delta* CoC bearings. Only patients with at least 5 years of follow-up were included in the analysis. The cohort consisted of 252 patients (286 THA) with a mean age of 49.7 years. Primary diagnosis was mostly osteonecrosis. A 32 mm bearing was used in 247 hips (86 %) and 36mm in 39 hips (14 %). The mean follow-up was 5.5 years. Clinical outcome scores (HHS, WOMAC, UCLA activity) improved significantly post-op. Only 21 patients reported thigh pain, however, without limitations to their activity level or requiring medication. Radiological assessment showed evidence of bone ingrowth for all THA components, no measurable wear and no evidence of osteolysis. Kaplan-Meier survival rate, with revision for any reason as endpoint, was 99.4 % at 6 years. Three patients needed revision surgery; one for periprosthetic fracture, one for infection, and one for fracture of a malseated (tilted) ceramic liner which was revised with a new ceramic head and a highly crosslinked PE liner. There was no fracture of a ceramic ball head during the study period. 34 patients reported noise from their hip implant: grinding (20 hips), non-reproducible squeaking (7), snapping (3), clicking (2), cracking and popping (1 each). Neither pain nor functional limitations were associated with noise. According to the authors' conclusions, the mid-term survivorship of 4th generation ceramic-on-ceramic bearing surfaces is encouraging. However, insert malseating might be a concern.
Study Limitations	Study without control group
	The main primary diagnosis for THA in Korea is osteonecrosis which is not common in western countries.
	Only one THA system used
	Mid-term follow up
Key Messages	**The CoC solution with BIOLOX®*delta* shows encouraging mid-term outcome in highly active and young patients diagnosed with osteonecrosis, normally showing lower survival rates than in patients with osteoarthritis.**
	There was no ceramic head fracture and one liner fracture due to malseating.
	Ceramic-liner malseating is a frequent cause of ceramic-liner fracture.
	11.9 % of patients reported noise generated from their THA
	2.5 % of patients reported non-reproducible squeaking

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