smith&nephew

POLAR3◇

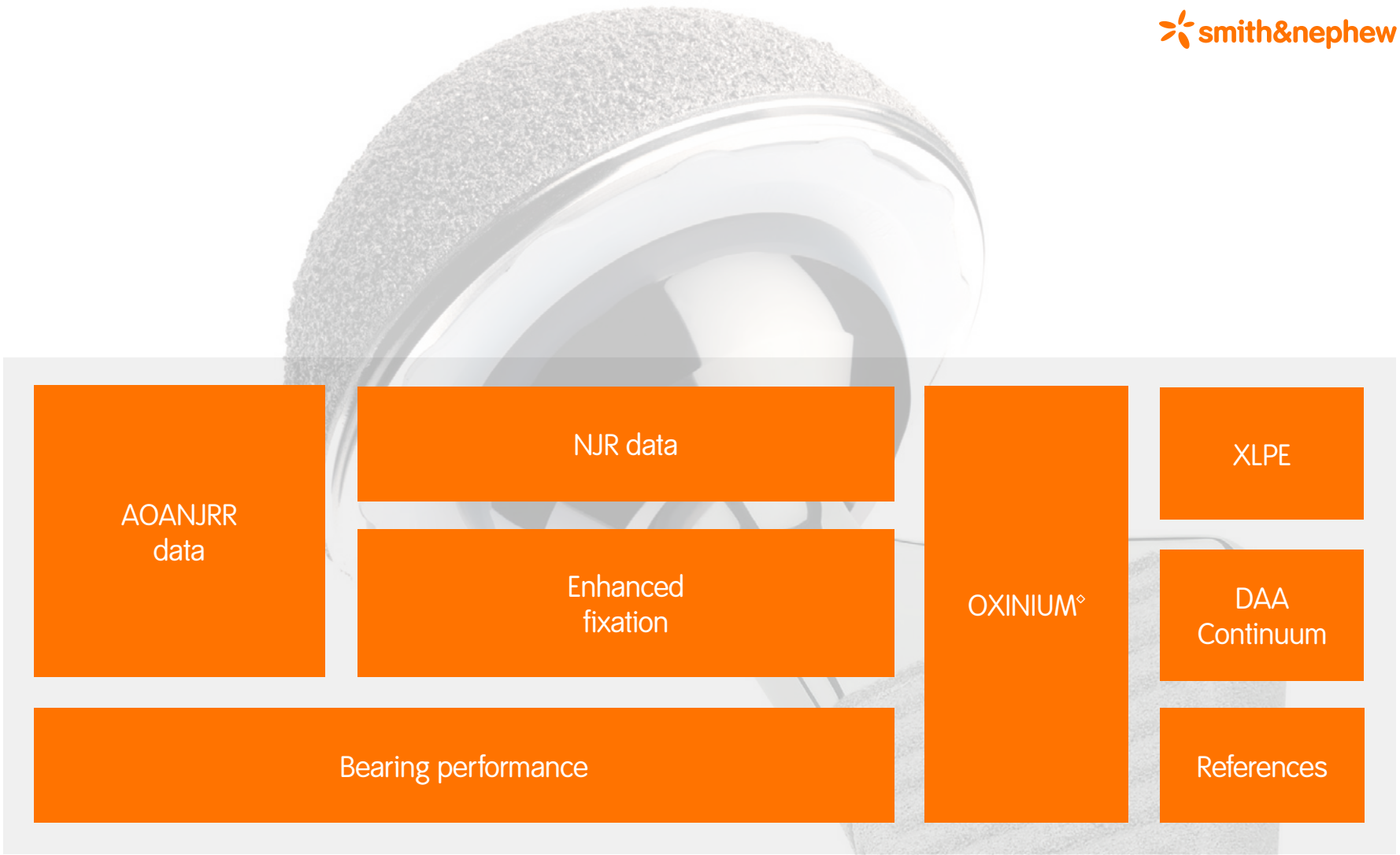
Total Hip Solution

Supporting healthcare professionals

Trusted technology. Trusted performance.

The POLAR3 Total Hip Solution, powered by Smith & Nephew's proprietary VERILAST◇ Technology, has the best survivorship figures of any total hip construct according to the world's largest national joint registry.* For outcomes that outperform and to get patients back to life's important moments – the solution is clear.

*National Joint Registry for England, Wales, Northern Ireland and the Isle of Man. http://www.njrcentre.org.uk. 15th Annual Report 2018 (Online) P68. Table 3.9 KM estimates of cumulative revision (95% CI) of primary hip replacement by fixation, and stem/cup brand.

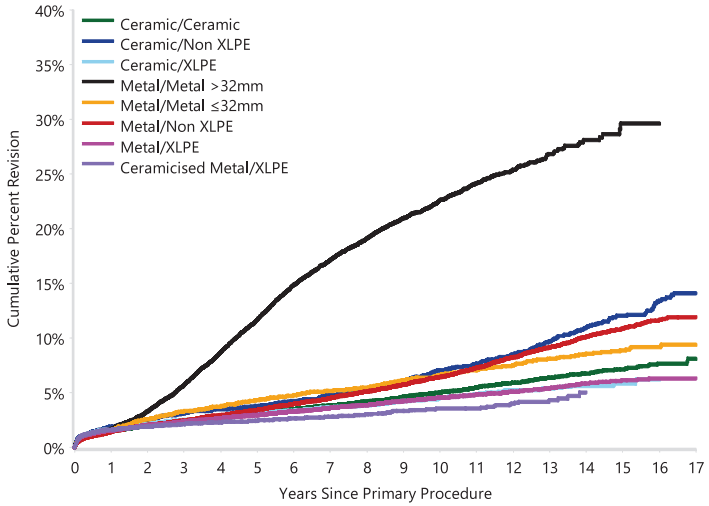

smith&nephew
AOANJRR data
NJR data
Enhanced fixation
Bearing performance
OXINIUM®
XLPE
DAA Continuum
References

VERILAST has the highest survivorship of all bearings in the AOANJRR[1]

96.5% survivorship at 10 years [Cumulative Percent Revision for Primary THR with primary diagnosis of OA 3.5 (3.2, 3.9)]

33% less likely to be revised vs. metal/XLPE [3 Mth + HR (adjusted for age and gender) = 0.67 (0.60, 0.76),p <0.001]

Figure HT27 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



HR - adjusted for age and gender

Ceramic/Ceramic vs Metal/XLPE
- Entire Period: HR=1.02 (0.98, 1.07),p=0.347

Ceramic/Non XLPE vs Metal/XLPE
- 0 - 3Mth: HR=1.08 (0.86, 1.36),p=0.520
- 3Mth - 2Yr: HR=1.44 (1.16, 1.78),p<0.001
- 2Yr+: HR=1.97 (1.75, 2.21),p<0.001

Ceramic/XLPE vs Metal/XLPE
- Entire Period: HR=1.01 (0.96, 1.07),p=0.665

Metal/Metal >32mm vs Metal/XLPE
- 0 - 2Wk: HR=1.30 (0.98, 1.73),p=0.068
- 2Wk - 1Mth: HR=0.49 (0.33, 0.72),p<0.001
- 1Mth - 3Mth: HR=0.86 (0.65, 1.14),p=0.298
- 3Mth - 9Mth: HR=1.13 (0.88, 1.45),p=0.345
- 9Mth - 1.5Yr: HR=2.63 (2.22, 3.12),p<0.001
- 1.5Yr - 2Yr: HR=4.26 (3.52, 5.17),p<0.001
- 2Yr - 2.5Yr: HR=6.00 (5.02, 7.16),p<0.001
- 2.5Yr - 6Yr: HR=9.61 (8.94, 10.33),p<0.001
- 6Yr - 6.5Yr: HR=8.40 (6.87, 10.26),p<0.001
- 6.5Yr - 8Yr: HR=7.96 (6.98, 9.06),p<0.001
- 8Yr - 9.5Yr: HR=5.30 (4.57, 6.15),p<0.001
- 9.5Yr+: HR=4.91 (4.26, 5.67),p<0.001

Metal/Metal ≤32mm vs Metal/XLPE
- Entire Period: HR=1.35 (1.21, 1.50),p<0.001

Metal/Non XLPE vs Metal/XLPE
- 0 - 1Mth: HR=0.75 (0.64, 0.88),p<0.001
- 1Mth - 6Mth: HR=0.94 (0.81, 1.09),p=0.381
- 6Mth - 1.5Yr: HR=1.42 (1.24, 1.62),p<0.001
- 1.5Yr - 2.5Yr: HR=1.15 (0.97, 1.37),p=0.114
- 2.5Yr - 6Yr: HR=1.60 (1.45, 1.77),p<0.001
- 6Yr - 11Yr: HR=1.95 (1.78, 2.14),p<0.001
- 11Yr+: HR=2.49 (2.19, 2.84),p<0.001

Ceramicised Metal/XLPE vs Metal/XLPE
- 0 - 3Mth: HR=1.10 (0.96, 1.27),p=0.150
- 3Mth+: HR=0.67 (0.60, 0.76),p<0.001

Comparing the rates of revision for these bearings, ceramicised metal/XLPE has the lowest rate of revision. As in previous years, the Registry urges caution in the interpretation of this result. This bearing is a single company product, used with a small number of femoral stem and acetabular component combinations. This may have a confounding effect on the outcome, making it unclear if the lower rate of revision is an effect of the bearing surface or reflects the limited combination of femoral and acetabular prostheses.[2]

POLARSTEM® / R3® is the best performing cementless hip combination in the UK[3]

ODEP 7A* POLARSTEM® cementless

Survivorship of 99.03% at 7 years (based on cumulative percentage of revision)

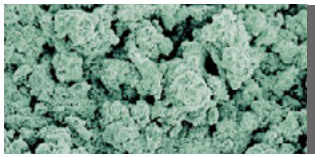
National Joint Registry www.njrcentre.org.uk Working for patients, driving forward quality

Stem / cup brand	n	Median (IQR) age at primary	Percentage (%) males	Cumulative percentage probability of revision (95% CI) at:					
				1 year	3 years	5 years	7 years	10 years	14 years
Uncemented									
Accolade™ / Trident™	26,073	66 (59-73)	44	0.95 (0.84-1.08)	1.91 (1.75-2.09)	2.61 (2.41-2.83)	3.13 (2.89-3.38)	4.46 (4.04-4.92)	5.24 (4.37-6.28)
Corail™ / Duraloc™ Cementless Cup	4,053	70 (64-75)	39	0.77 (0.54-1.09)	1.71 (1.35-2.16)	2.51 (2.07-3.06)	3.60 (3.05-4.25)	5.58 (4.83-6.43)	*9.69 (8.27-11.35)*
Corail / Pinnacle™	137,857	66 (59-73)	45	0.79 (0.75-0.84)	1.60 (1.53-1.67)	2.44 (2.34-2.53)	3.64 (3.50-3.77)	5.96 (5.72-6.22)	-
Corail / Trilogy™	3,030	68 (61-74)	40	0.65 (0.41-1.01)	1.15 (0.82-1.62)	1.65 (1.23-2.21)	2.23 (1.71-2.90)	3.45 (2.65-4.49)	*4.53 (3.24-6.32)*
Corail / ASR™ Resurfacing Cup	2,633	61 (54-67)	54	1.07 (0.74-1.54)	7.51 (6.56-8.59)	23.40 (21.81-25.09)	35.48 (33.64-37.38)	43.54 (41.57-45.57)	-
Corail Pinnacle / Gription™	6,089	67 (58-75)	40	1.00 (0.77-1.30)	1.77 (1.39-2.24)	2.21 (1.68-2.89)	2.97 (2.08-4.22)	-	-
Furlong HAC™ Stem / CSF™	17,173	69 (62-76)	40	1.06 (0.92-1.23)	1.76 (1.58-1.98)	2.15 (1.94-2.39)	*2.67 (2.43-2.94)*	*3.60 (3.30-3.94)*	*5.05 (4.47-5.71)*
Furlong HAC Stem / Furlong HAC CSF Plus	22,253	66 (59-73)	45	1.13 (1.00-1.28)	1.84 (1.66-2.03)	2.15 (1.95-2.36)	2.48 (2.26-2.74)	2.89 (2.31-3.61)	-
POLARSTEM® Cementless / R3® Cementless	**8,543**	**66 (58-73)**	**46**	**0.60 (0.45-0.79)**	**0.93 (0.73-1.19)**	**0.97 (0.75-1.24)**	**0.97 (0.75-1.24)**	-	-
SL-PLUS® Cementless Stem / EP-FIT® PLUS	5,402	66 (59-73)	43	1.24 (0.97-1.57)	2.61 (2.21-3.09)	3.78 (3.27-4.35)	*4.45 (3.89-5.08)*	*5.83 (5.14-6.62)*	-
SYNERGY® Cementless Stem / R3 Cementless	3,348	65 (57-71)	51	0.97 (0.69-1.37)	1.42 (1.05-1.91)	1.95 (1.45-2.64)	3.50 (2.40-5.09)	-	-
Taperloc™ Cementless Stem / Exceed ABT™	22,851	65 (58-72)	44	1.07 (0.94-1.21)	1.52 (1.36-1.70)	1.83 (1.65-2.04)	2.12 (1.90-2.37)	*2.16 (1.93-2.42)*	-
ANTHOLOGY® / R3 Cementless	4,042	63 (54-70)	42	1.13 (0.84-1.51)	1.60 (1.23-2.07)	2.30 (1.77-2.99)	3.57 (2.56-4.98)	-	-
Metafix™ Stem / Trinity™	4,403	64 (56-70)	46	0.80 (0.57-1.13)	1.44 (1.09-1.90)	1.80 (1.33-2.43)	1.80 (1.33-2.43)	-	-
M/L Taper™ Cementless / Continuum™	5,406	61 (53-68)	49	1.17 (0.92-1.50)	1.79 (1.45-2.20)	2.15 (1.74-2.64)	*2.31 (1.86-2.87)*	-	-
M/L Taper Cementless / Trilogy IT	3,748	64 (55-70)	51	1.00 (0.72-1.38)	2.27 (1.75-2.93)	2.27 (1.75-2.93)	-	-	-
Furlong Evolution™ Cementless / Furlong HAC CSF Plus	3,463	62 (52-70)	40	1.19 (0.87-1.63)	1.76 (1.31-2.35)	1.94 (1.45-2.61)	-	-	-
Accolade II™ / Trident™	3,731	65 (58-72)	46	0.53 (0.32-0.88)	0.97 (0.59-1.59)	4.88 (1.23-18.25)	-	-	-
Taperloc™ Complete Cementless Stem / Exceed ABT™	2,797	63 (56-70)	49	0.71 (0.46-1.12)	1.13 (0.76-1.68)	*1.48 (0.95-2.32)*	-	-	-

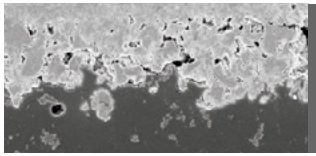
Blue italics indicate that fewer than 250 cases remained at risk at these time points.

POLAR3 offers enhanced fixation

The POLARSTEM® is a triple taper, self-locking stem designed to aid primary implant stability, possibly reducing the incidence of stem subsidence. The shortened stem aids implantation and may help prevent distal thigh pain. The POLARSTEM also incorporates a titanium plasma coating which provides a scaffold for bony ingrowth.[5]

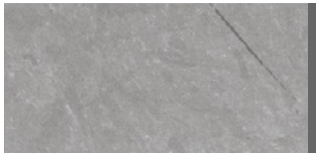


Hydroxyapatite (HA) on titanium plasma

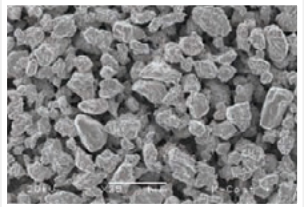


Titanium plasma coating

180µm



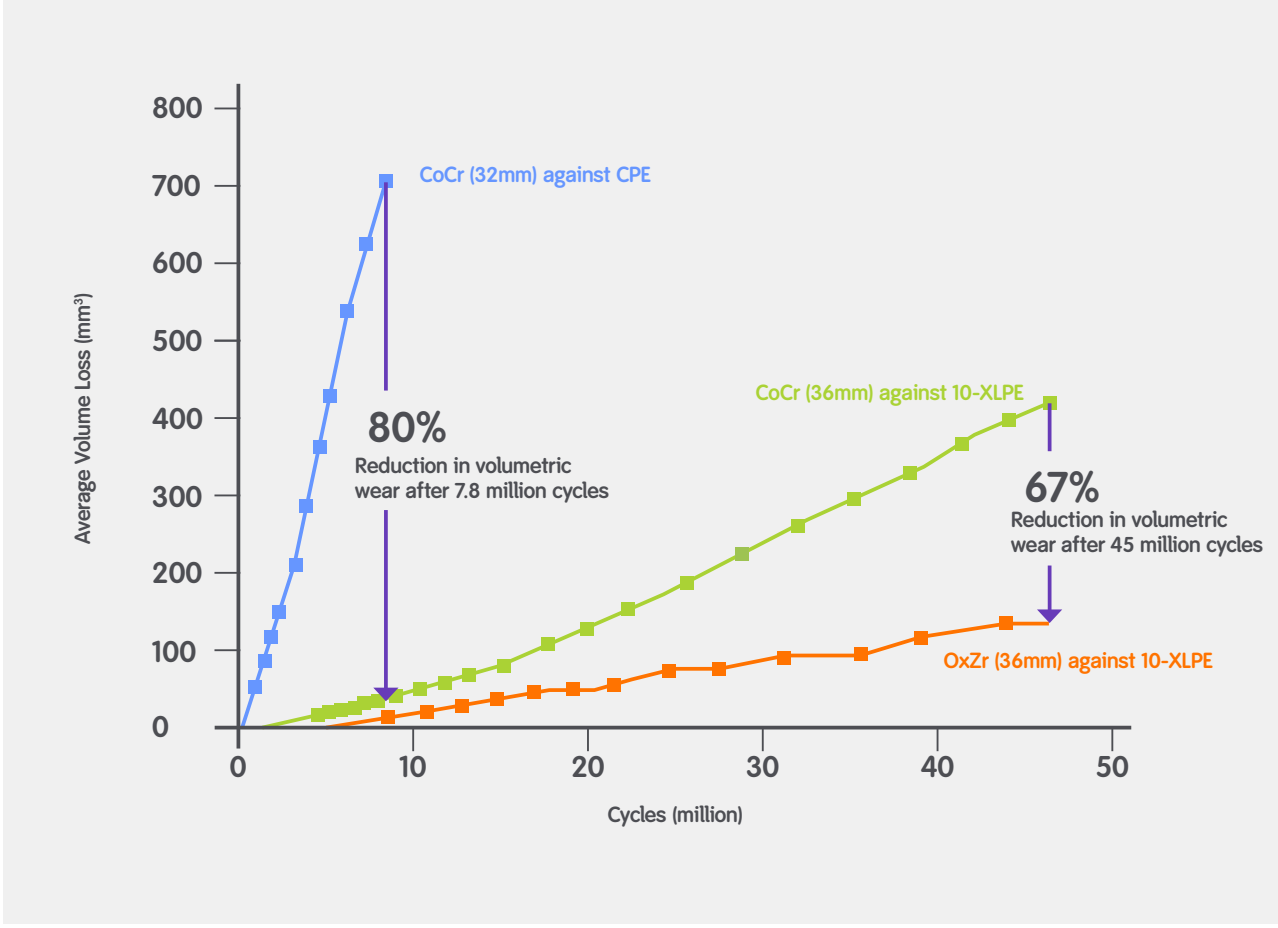
Pure titanium base material



The R3 benefits from STIKTITE® fixation. STIKTITE is composed of asymmetric titanium particles with a porosity of 60% that provides an enhanced scratch-fit and secondary fixation.[6]

VERILAST® provides low wear bearing performance

Cumulative volumetric wear comparison



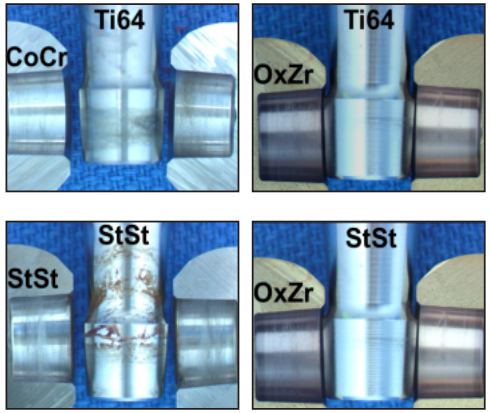
The volume of wear debris generated from a bearing depends on properties of both the femoral head and the acetabular liner.[7]

Various clinical and simulator studies have demonstrated that XLPE coupled with CoCr reduces wear debris generation when compared to CPE (conventional polyethylene), and that VERILAST reduces the wear volume even further.[7,8]

VERILAST® reduces taper corrosion

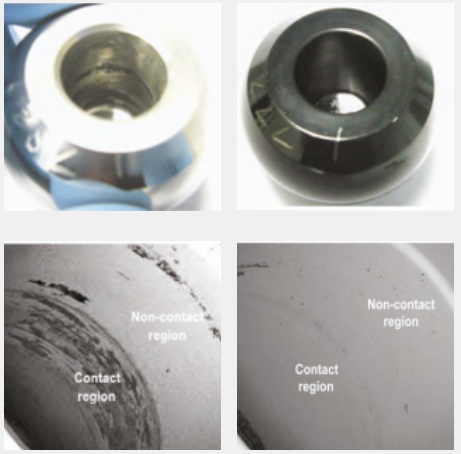
Mechanically assisted crevice corrosion at the taper neck junction is now widely acknowledged in THA with many known factors contributing to the phenomenon.[9]

OXINIUM® femoral heads have shown low levels of taper corrosion in both clinical retrievals and in laboratory studies.[10, 11, 12]



In a study simulating extreme crevice corrosion conditions, OXINIUM heads coupled with TiAlV and stainless steel (SS) stems showed the least chemical attack on either the head or the taper connection trunnion compared with SS/SS or CoCr/TiAlV.[10]

In a comparison of CoCrMo and OXINIUM femoral heads in a long-term hip simulator test (45 million cycles), corrosion features and depth of material loss on tapers were observed for CoCrMo heads, but largely absent from OXINIUM heads.[11]



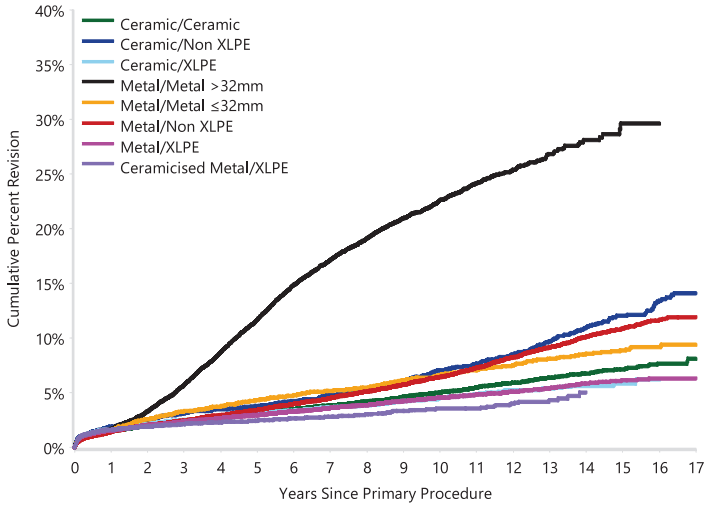
Retrieval analyses have also found that VERILAST® Technology shows reduced evidence of taper corrosion compared to CoCr.[12]

VERILAST has the highest survivorship of all bearings in the AOANJRR[1]

96.5% survivorship at 10 years [Cumulative Percent Revision for Primary THR with primary diagnosis of OA 3.5 (3.2, 3.9)]

33% less likely to be revised vs. metal/XLPE [3 Mth + HR (adjusted for age and gender) = 0.67 (0.60, 0.76),p <0.001]

Figure HT27 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)



HR - adjusted for age and gender
Ceramic/Ceramic vs Metal/XLPE
Entire Period: HR=1.02 (0.98, 1.07),p=0.347

Ceramic/Non XLPE vs Metal/XLPE
0 - 3Mth: HR=1.08 (0.86, 1.36),p=0.520
3Mth - 2Yr: HR=1.44 (1.16, 1.78),p<0.001
2Yr+: HR=1.97 (1.75, 2.21),p<0.001

Ceramic/XLPE vs Metal/XLPE
Entire Period: HR=1.01 (0.96, 1.07),p=0.665

Metal/Metal >32mm vs Metal/XLPE
0 - 2Wk: HR=1.30 (0.98, 1.73),p=0.068
2Wk - 1Mth: HR=0.49 (0.33, 0.72),p<0.001
1Mth - 3Mth: HR=0.86 (0.65, 1.14),p=0.298
3Mth - 9Mth: HR=1.13 (0.88, 1.45),p=0.345
9Mth - 1.5Yr: HR=2.63 (2.22, 3.12),p<0.001
1.5Yr - 2Yr: HR=4.26 (3.52, 5.17),p<0.001
2Yr - 2.5Yr: HR=6.00 (5.02, 7.16),p<0.001
2.5Yr - 6Yr: HR=9.61 (8.94, 10.33),p<0.001
6Yr - 6.5Yr: HR=8.40 (6.87, 10.26),p<0.001
6.5Yr - 8Yr: HR=7.96 (6.98, 9.06),p<0.001
8Yr - 9.5Yr: HR=5.30 (4.57, 6.15),p<0.001
9.5Yr+: HR=4.91 (4.26, 5.67),p<0.001

Metal/Metal ≤32mm vs Metal/XLPE
Entire Period: HR=1.35 (1.21, 1.50),p<0.001

Metal/Non XLPE vs Metal/XLPE
0 - 1Mth: HR=0.75 (0.64, 0.88),p<0.001
1Mth - 6Mth: HR=0.94 (0.81, 1.09),p=0.381
6Mth - 1.5Yr: HR=1.42 (1.24, 1.62),p<0.001
1.5Yr - 2.5Yr: HR=1.15 (0.97, 1.37),p=0.114
2.5Yr - 6Yr: HR=1.60 (1.45, 1.77),p<0.001
6Yr - 11Yr: HR=1.95 (1.78, 2.14),p<0.001
11Yr+: HR=2.49 (2.19, 2.84),p<0.001

Ceramicised Metal/XLPE vs Metal/XLPE
0 - 3Mth: HR=1.10 (0.96, 1.27),p=0.150
3Mth+: HR=0.67 (0.60, 0.76),p<0.001

Comparing the rates of revision for these bearings, ceramicised metal/XLPE has the lowest rate of revision. As in previous years, the Registry urges caution in the interpretation of this result. This bearing is a single company product, used with a small number of femoral stem and acetabular component combinations. This may have a confounding effect on the outcome, making it unclear if the lower rate of revision is an effect of the bearing surface or reflects the limited combination of femoral and acetabular prostheses.[2]

Data from other registries supports VERILAST superior survivorship

RIPO: Register for Orthopaedic Prosthetic Implantation, Emilia-Romagna, Italy[55]

- An analysis of 21,000 THAs from 68 orthopaedic units, performed between 2000 and 2015 with 10-year follow-up
- The survivorship of four different bearing types was compared: Ceramic/HXLPE (n=4,045), Metal/HXLPE (n=2,869), Ceramic/Ceramic (n=13,607) and oxidised zirconium (OXINIUM) on HXLPE (n=433)
- OXINIUM on HXLPE (VERILAST Technology) demonstrated the highest long-term survivorship of the bearing combinations considered at 10 years
- The authors concluded that these results were consistent with the AOANJRR

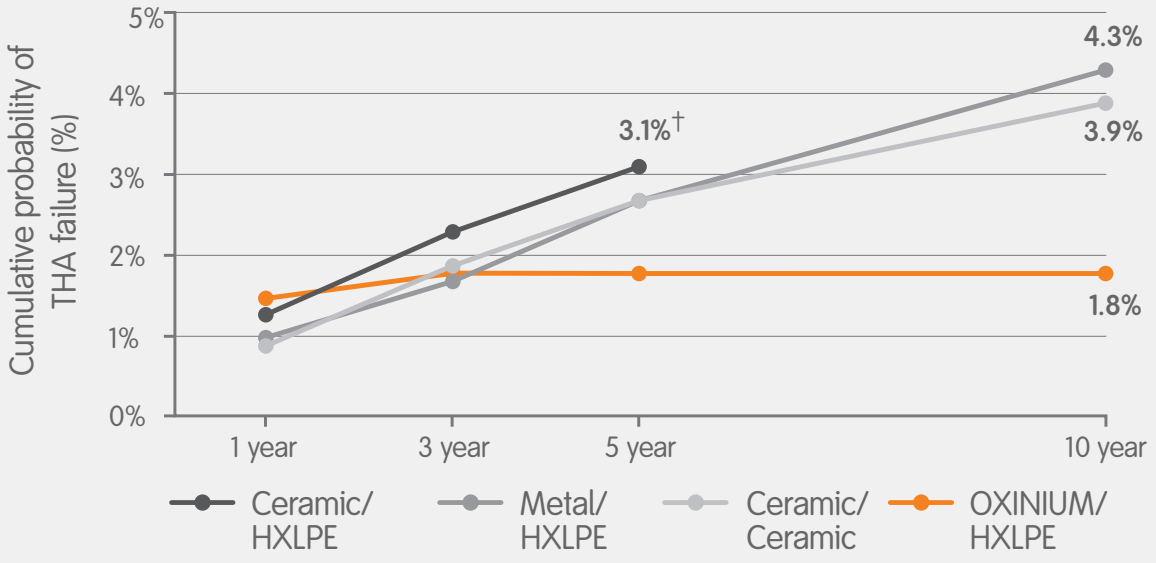


Figure. Revision risk by bearing type.
†Insufficient patient numbers at 10 years to estimate revision risk.

Data from other registries supports VERILAST superior survivorship

Dutch Arthroplasty Register (LROI)[56]

- An analysis of 209,912 primary THAs with non-metal-on-metal implants registered between 2007 and 2016 with a maximum 10-year follow-up
- The survivorship of the six most frequently employed bearing types was compared: Ceramic/Ceramic (n=17,625), Ceramic/Non XLPE (n=40,109), Ceramic/HXLPE (n=70,175), Metal/Non XLPE (n=37,351), Metal/HXLPE (n=32,867) and OXINIUM®/(HXL)PE† (n=11,785)
- OXINIUM/(HXL)PE† (VERILAST® Technology) demonstrated the highest mid- to long-term survivorship of all THA bearing types considered at 5 and 9 years
- The authors of the analysis concluded these results were consistent with those of other large registers such as the AOANJRR

Table Cumulative Incidence of THA revision: mean (95% CI)

Bearing Surface	N Revised	N Total	5 Yrs	9 Yrs
Ceramic/Ceramic	454	17625	2.8 (2.5, 3.0)	4.1 (3.4, 4.9)
Ceramic/Non XLPE	1186	40109	3.0 (2.8, 3.2)	4.0 (3.7, 4.3)
Ceramic/HXLPE	1649	70175	2.9 (2.7, 3.0)	4.0 (3.6, 4.4)
Metal/Non XLPE	1023	37351	2.7 (2.5, 2.9)	3.9 (3.6, 4.2)
Metal/HXLPE	890	32867	3.3 (3.1, 3.5)	4.2 (3.8, 4.6)
OXINIUM/(HXL)PE†	262	11785	2.5 (2.2, 2.8)	3.5 (3.0, 4.1)

†Due to small group sizes, OXINIUM on highly crosslinked (HXLPE) or standard polyethylene (Non XLPE) were analysed together.

OXINIUM®: Award-winning technology reducing wear and friction

OXINIUM is a hard, abrasion-resistant and wettable surface which helps to minimise wear and friction between the articulating surfaces in total hip replacement.[13, 14, 15, 16]

OXINIUM technology offers the low wear of a ceramic without the fracture risk and, the mechanical properties of a metal but with increased corrosion resistance.[10, 19]

OXINIUM is produced by heating an alloy of 97.5 weight % zirconium – 2.5 weight % niobium in air, so that the outer surface of the femoral head is transformed to form a 5 µm ceramic oxide – it is not a coating.[17, 18]

ASMA - EMAA 2005

Established in 1969, the Engineering Materials Achievement Award recognizes an outstanding achievement inmaterials or materials systems. In 2005 S&N were awarded this prestigious award for the development of Oxinium.

Smith & Nephew XLPE has demonstrated excellent clinical performance[51, 52]

Not all polys are the same[20-27]

If polys are not remelted then not all the free radicals are removed and there is an increased wear risk[20-27]

Smith & Nephew Hip XLPE manufacturing process:

- Ram-extruded GUR 1050 UHMWPE
- Crosslinked by gamma irradiation to 10 Mrad (100 kGy)
- Remelted to remove free radicals
- Machined into acetabular components
- Sterilised by ethylene oxide (EtO) gas[28]

The R3 XLPE liner sits flush to the rim, is fully contained within the R3 shell and maintains a minimum 5mm liner thickness in the loading zone.

AOANJRR XLPE analysis shows strong Smith & Nephew performance[54]

- 240,302 THAs performed for osteoporosis were analysed from the AOANJRR with up to 16 years follow-up.
- XLPE is associated with lower revision rates than CPE for THA.
- The rate of revision for XLPE is significantly lower than CPE from 9 months after THA onwards.
- Of the 10 most used cementless prostheses combinations with XLPE the four with the lowest revision rates at 7 years were all Smith & Nephew.

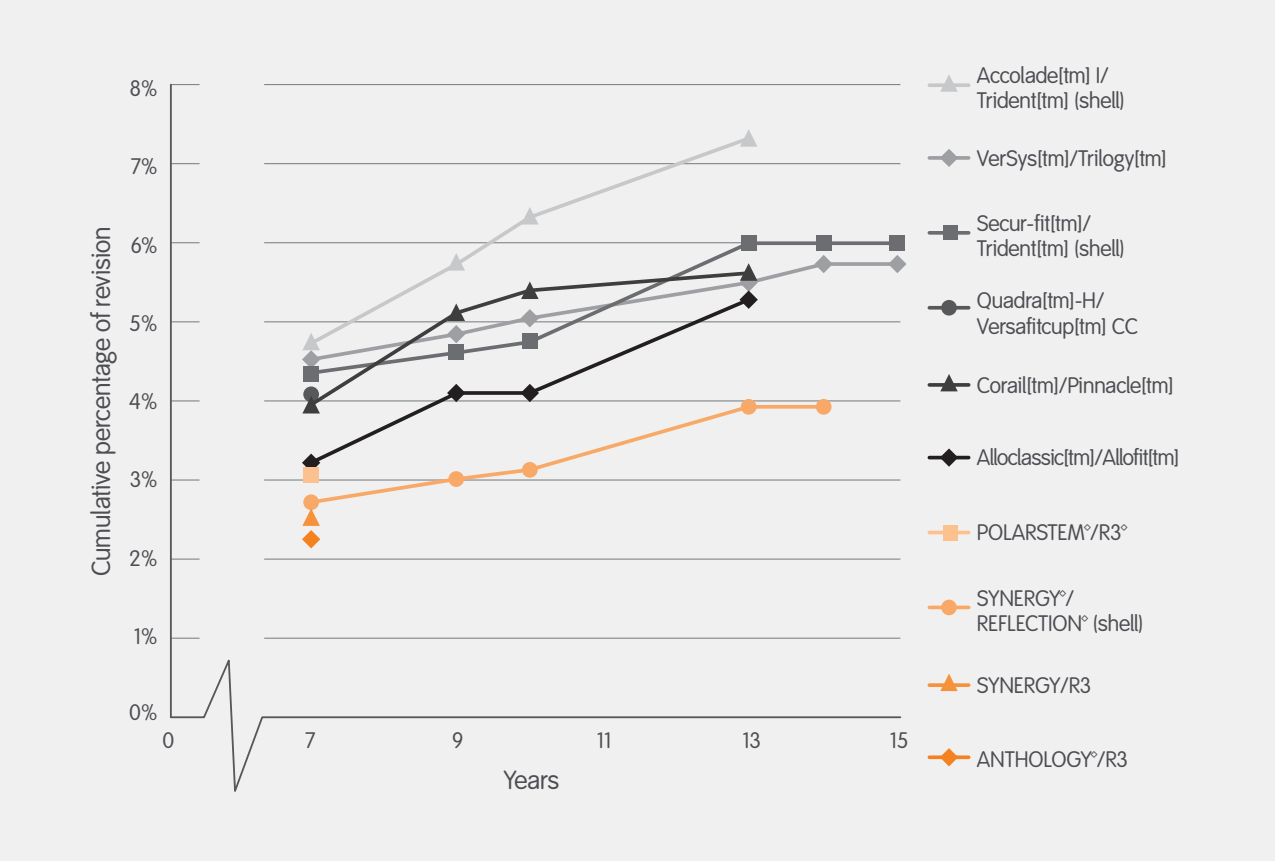


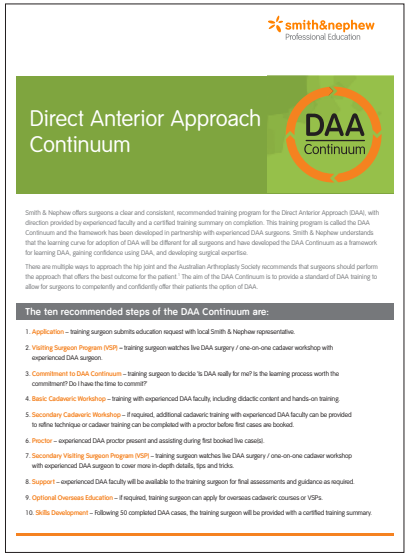
Figure. Cumulative revision rates by cementless prostheses with XLPE with a minimum 7-year follow-up.

Direct Anterior Approach Continuum

POLAR3 is ideal for the Direct Anterior Approach (DAA).

Instrumentation for POLAR3 is designed to allow surgeons to perform their preferred approach to the hip.

Smith & Nephew supports surgeons interested in learning DAA through the Direct Anterior Approach Continuum.


smith&nephew
Professional Education

Direct Anterior Approach Continuum

DAA Continuum

Smith & Nephew offers surgeons a clear and consistent, recommended training program for the Direct Anterior Approach (DAA), with direction provided by experienced faculty and a certified training summary on completion. This training program is called the DAA Continuum and the framework has been developed in partnership with experienced DAA surgeons. Smith & Nephew understands that the learning curve for adoption of DAA will be different for all surgeons and have developed the DAA Continuum as a framework for learning DAA, gaining confidence using DAA, and developing surgical expertise.

There are multiple ways to approach the hip joint and the Australian Arthroplasty Society recommends that surgeons should perform the approach that offers the best outcome for the patient.* The aim of the DAA Continuum is to provide a standard of DAA training to allow for surgeons to competently and confidently offer their patients the option of DAA.

The ten recommended steps of the DAA Continuum are:

1. Application – training surgeon submits education request with local Smith & Nephew representative.
2. Visiting Surgeon Program (VSP) – training surgeon watches live DAA surgery / one-on-one cadaver workshop with experienced DAA surgeon.
3. Commitment to DAA Continuum – training surgeon to decide 'is DAA really for me? Is the learning process worth the commitment? Do I have the time to commit?'
4. Basic Cadaveric Workshop – training with experienced DAA faculty, including didactic content and hands-on training.
5. Secondary Cadaveric Workshop – if required, additional cadaveric training with experienced DAA faculty can be provided to refine technique or cadaver training can be completed with a proctor before first cases are booked.
6. Proctor – experienced DAA proctor present and assisting during first booked live case(s).
7. Secondary Visiting Surgeon Program (VSP) – training surgeon watches live DAA surgery / one-on-one cadaver workshop with experienced DAA surgeon to cover more in-depth details, tips and tricks.
8. Support – experienced DAA faculty will be available to the training surgeon for final assessments and guidance as required.
9. Optional Overseas Education – if required, training surgeon can apply for overseas cadaveric courses or VSPs.
10. Skills Development – Following 50 completed DAA cases, the training surgeon will be provided with a certified training summary.

Different versions of broach handles for every surgical approach.

References

1. Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). Hip, Knee & Shoulder Arthroplasty: 2018 Annual Report. Adelaide: AOA, 2018. P. 158 Figure HT27. Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA).
2. Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). Hip, Knee & Shoulder Arthroplasty: 2018 Annual Report. Adelaide: AOA, 2018. P. 157.
3. National Joint Registry for England, Wales, Northern Ireland and the Isle of Man. http://www.njrcentre.org.uk. 15th Annual Report 2018 (Online) P68. Table 3.9 KM estimates of cumulative revision (95% CI) of primary hip replacement by fixation, and stem/cup brand.
4. http://odep.org.uk/products.aspx
5. http://www.smith-nephew.com/education/resources/video/2014/january/polarstem-design-rationale-and-mid-term-clinical-results/
6. Bourne, RB, McCalden, RW, Naude, D, Cherron, KDJ, Yuan, X, Holdsworth, DW. The next generation of acetabular shell design and bearing surfaces. Supplement to Orthopaedics Innovation in Total Hip Arthroplasty, pp. 92-96, December 2008.
7. Parikh, A; Hill, P; Pawar, V; Sprague, J, "Long-term Simulator Wear Performance of an Advanced Bearing Technology for THA", Trans. ORS, 2013, Poster 1028.
8. S. S. Jassim, S. Patel, N. Wardle, J. Tahmassebi, R. Middleton, D.L. Shardlow, A. Stephen, J. Hutchinson, F.S. Haddad Five-Year Comparison of Wear Using Oxidised Zirconium and Cobalt-Chrome Femoral Heads in Total Hip Arthroplasty: A Multicentre Randomised Controlled Trial Bone Joint J 97-B (7), 883-889. 7 2015.
9. Gilbert MACC
10. Pawar, V., Jones, B., Sprague, J., Salehi, A., and Hunter, G., "Acidic fretting tests of oxidized Zr-2.5Nb, CoCr and SS modular heads", Medical Device Materials II, M. Helmus and D. Medlin (eds.), ASM International, Materials Park, OH, 2005, pp. 403-408.
11. Li C, Parikh A, Sprague J, Pawar V., "Mechanically Assisted Crevice Corrosion on CoCrMo Heads after Long-term Hip Simulator Wear Testing", Trans 61st ORS, 2015, Poster#0270.
12. J. Cartner , P. Aldinger, C. Li, D. Collins Characterization of Femoral Head Taper Corrosion Features Using a 22-Year Retrieval Database HSS J 13 (1), 35-41. 2016 Aug 12.
13. N.P. Sheth, P. Lementowski, G. Hunter, and J.P. Garino, "Clinical applications of oxidized zirconium", J. Surg. Orthop. Adv., 17 (1), 2008, pp. 17-26.
14. Long, M., Hunter, G., and Blau, P.J., "Scratch test evaluations of CoCrMo, Ti-6Al-4V, and zirconia", 6th World Biomaterials Cong. Trans., Society For Biomaterials, Minneapolis, MN, 2000, p. 1533.
15. Hunter, G., and Long, M., "Abrasive wear of oxidized Zr-2.5Nb, CoCrMo, and Ti-6Al-4V against bone cement", 6th World Biomaterials Cong. Trans., Society For Biomaterials, Minneapolis, MN, 2000, p. 835.
16. Davidson, J.A., Mishra, A.K., and Poggie, R.A., "Friction and UHMWPE wear of cobalt alloy, zirconia, titanium nitride, and amorphous diamond-like carbon implant bearing surfaces", 4th World Biomaterials Cong. Trans., European Society for Biomaterials, Berlin, FRG, 1992, p. 278.
17. M. Spector, M.D. Ries, R.B. Bourne, W.S. Sauer, M. Long, and G. Hunter, "Wear performance of ultra-high molecular weight polyethylene on oxidized zirconium total knee femoral components", J. Bone Joint Surg., 83-A (S2), 2001, pp. 80-86.
18. Hunter, G., Dickinson, J., Herb, B., and Graham, R., "Creation of oxidized zirconium orthopaedic implants", Titanium, Niobium, Zirconium, and Tantalum for Medical and Surgical Applications, ASTM STP 1471, L.D. Zardiackas, M.J. Kraay, and H.L. Freese (eds.), American Society for Testing and Materials, West Conshohocken, PA, 2006, pp. 16-29. (I am not sure if there is language around fracture risk in this paper)
19. Sprague, J., Aldinger, P., Tsai, S., Hunter, G., Thomas, R., and Salehi, A., "Mechanical Behavior of Zirconia, Alumina, and Oxidized Zirconium Modular Heads," ISTA 2003 Volume 2, International Society for Technology in Arthroplasty, S. Brown, I. C. Clarke, and A. Gustafson, Eds., Birmingham, AL, 2004, pp. 31–36
20. Chen et al., J Orthop Res, 2016;34(5):845-851
21. "Pinnacle Hip Solutions: Design Rationale," DePuy Orthopaedics, 2013, EO-129 (Rev 1)
22. S.M. Kurtz, "Compendium of HXLPEs," in UHMWPE Biomaterials Handbook, S. M. Kurtz, Eds., Amsterdam: Elsevier, 2009
23. Muratoglu et al., Orthop Res Soc, Orlando, FL, Mar 12-15, 2000, 0566
24. "Vivacit-E vitamin E highly crosslinked polyethylene long-term performance for high demand patients," Zimmer, Inc., 2012, 97-7255-181-00 1209-H01
25. Mimnaugh et al., Orthop Res Soc, Orlando, FL, Mar 5-8, 2016, 0403
26. Suhardi et al., Orthop Res Soc, New Orleans, LA, Mar 15-18, 2014, 1137
27. Kop et al., Orthop Res Soc, Orlando, FL, Mar 5-8, 2016, 0194
28. S&N specification
29. Australian Orthopaedic Association National Joint Replacement Registry Annual Report(AOANJRR). Hip, Knee & Shoulder Arthroplasty: 2018 Annual Report. Adelaide: AOA, 2018. P. 157 Table HT30 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA).
30. Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). Hip, Knee & Shoulder Arthroplasty: 2016 Annual Report. Adelaide: AOA, 2016. P. 30 Figure YH9 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cementless Fixation in Patients Aged <55 Years by Bearing Surface (Primary Diagnosis OA).
31. P. Lee and A. Evans, "Early failure of the Polarstem total hip arthroplasty - can the Australian NJR tell us the full story?," J Arthroplasty, vol. 29, no. 3, pp. 609-11, 2014.
32. I. Nizam, "The bikini hip replacement - surgical technique preserving vessels and deep soft tissues in direct anterior approach hip replacement," J Orthop Res Physiother, vol. 1, no. 2, p. 100007, 2015.
33. G.K. Karidakis, T. Karachalios Oxidized Zirconium Head on Crosslinked Polyethylene Liner in Total Hip Arthroplasty: A 7- To 12-Year in Vivo Comparative Wear Study Clin Orthop Relat Res 473 (12), 3836-3845. 2015 Aug 20.
34. A. Fiquet and D. Noyer, ""Polarsystem" dual mobility hip prosthesis and "minimally invasive surgery" (MIS)," Interact Surg, vol. 1, pp. 51-5, 2006.
35. 'Corail Hip System; Product rationale and surgical technique' DePuy Orthopaedics CA#DPEM/ORT /1112/0330(1) 9066-35-025 Issued: 12/13
36. Summary.Report.HP_Cup_Reflection Cementless_Onlabel.16/05/2016.16:05
37. Heiner AD and Brown TD, "Frictional coefficients of a new bone ingrowth structure", Trans. ORS, p. 1623, 2007.
38. Zhang Y, Ahn PB, Fitzpatrick DC, Heiner AD, Poggie RA, and Brown TD, "Interfacial frictional behavior: cancellous bone, cortical bone, and a novel porous tantalum biomaterial, J. of Musculoskeletal Research, 3(4): 245-251, 1999.
40. Berry DJ, von Knoch M, Schleck CD, Harmsen WS. Effect of femoral head diameter and operative approach on risk of dislocation after primary total hip arthroplasty. J Bone Joint Surg Am. 2005 Nov; 87(11):2456–2463.
41. Barrack RL, Butler RA, Laster DR, Andrews P. Stem design and dislocation after revision total hip arthroplasty: clinical results and computer modeling. J Arthroplasty. 2001 Dec; 16(8 Suppl 1):8–12.
42. Barrack RL. Dislocation after total hip arthroplasty: implant design and orientation. J Am Acad Orthop Surg. 2003 Mar-Apr; 11(2):89–99.
43. Barrack RL, Lavernia C, Ries M, Thornberry R, Tozakoglou E. Virtual reality computer animation of the effect of component position and design on stability after total hip arthroplasty. Orthop Clin North Am. 2001 Oct; 32(4):569–577, vii.
44. Veenesh Selvaratnam, Vishwanath Shetty and Vishal Sahni. Subsidence in Collarless Corail Hip Replacement. The Open Orthopaedics Journal, 2015, Volume 9.
45. Valérie Malfroy Camine, Hannes A. Rüdiger et al. THE EFFECT OF A COLLAR ON CEMENTLESS FEMORAL STEMS PRIMARY STABILITY: AN EXPERIMENTAL CADAVERIC STUDY. 22nd Congress of the European Society of Biomechanics, July 10 - 13, 2016, Lyon, France.
46. Mark I. Froimson, Jonathan Garino et al. Minimum 10-year Results of a Tapered, Titanium Hydroxyapatite-Coated Hip Stem: An Independent Review. The Journal of Arthroplasty Vol. 22 No. 1 January 2007.
47. 47. Munnan Al-Najjim, Usman Khattak et al. Differences in subsidence rate between alternative designs of a commonly used uncemented femoral stem. Journal of Orthopaedics 13 (2016) 322–326.
48. 48. Medacta International Quadra® Leaflet, ref: 99.14HSC.11US.
49. 49. Pinnacle Product Rationale. 9068-81-050 version 7 Issued: 05/13.
50. A. Chitre et al. Complications of total hip arthroplasty: periprosthetic fractures of the acetabulum. Curr Rev Musculoskelet Med (2013) 6:357–363
51. Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). Hip, Knee & Shoulder Arthroplasty: 2017 Annual Report. Adelaide: AOA, 2017 P. 118 Figure HT30 Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Prosthesis Type and Polyethylene Type (Primary Diagnosis OA).
52. Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). Hip, Knee & Shoulder Arthroplasty: 2017 Annual Report. Adelaide: AOA, 2017 P. 120 Figures HT34 & HT35 Cumulative Percent Revision of Reflection Primary Total Conventional Hip Replacement by Polyethylene Type (Primary Diagnosis OA).
53. de Groot, K. HA coatings for implants in surgery. / In High Tech Ceramics, pp. 381-386. Edited by P. Vincencinni. Amsterdam, Elsevier Science, 1987.
54. de Steiger R, Lorimer M, Graves SE. Cross-linked polyethylene for total hip arthroplasty markedly reduces revision surgery at 16 years. J Bone Joint Surg Am. 2018:100;1281–1281.
55. Atrey A, Ancarani C, Fitch D, Bordini B. Impact of bearing couple on long-term component survivorship for primary cementless total hip replacement in a large arthroplasty registry. Poster presented at: Canadian Orthopedic Association; June 20–23, 2018; Victoria, British Columbia, Canada.
56. Peters RM, Van Steenbergen LN, Stevens M, Rijk PC, Bulstra SK, Zijlstra WP. The effect of bearing type on the outcome of total hip arthroplasty. Acta Orthop. 2018;89:163–169.
57. National Joint Registry for England, Wales and Northern Ireland. Implant Summary Report for POLARSTEM, dated 20 November 2018.
58. Anakwe RE, Jenkins PJ, Moran M. Predicting dissatisfaction after total hip arthroplasty: A study of 850 patients. J Arthroplasty. 2011;26:209-213.
59. National Joint Registry for England, Wales and Northern Ireland. Implant Summary Report for R3, dated 18 November 2018.

smith&nephew

POLAR3◇

Total Hip Solution

Supporting healthcare professionals

Trusted technology. Trusted performance.

The POLAR3 Total Hip Solution, powered by Smith & Nephew's proprietary VERILAST◇ Technology, has the best survivorship figures of any total hip construct according to the world's largest national joint registry.* For outcomes that outperform and to get patients back to life's important moments – the solution is clear.

*National Joint Registry for England, Wales, Northern Ireland and the Isle of Man. http://www.njrcentre.org.uk. 15th Annual Report 2018 (Online) P68. Table 3.9 KM estimates of cumulative revision (95% CI) of primary hip replacement by fixation, and stem/cup brand.

VERILAST has the highest survivorship of all bearings in the AOANJRR[29]

TABLE HT30 **Cumulative Percent Revision of Primary Total Conventional Hip Replacement by Bearing Surface (Primary Diagnosis OA)**

Bearing Surface	N Revised	N Total	1 year	3 years	5 years	10 years	15 years	16 years
Ceramic/Ceramic	3130	84474	1.5 (1.4, 1.6)	2.4 (2.3, 2.5)	3.1 (3.0, 3.2)	5.0 (4.8, 5.2)	7.2 (6.8, 7.5)	7.6 (7.2, 8.1)
Ceramic/Non XLPE	483	6793	1.9 (1.6, 2.3)	3.2 (2.7, 3.6)	3.8 (3.3, 4.3)	7.1 (6.4, 7.9)	12.1 (10.9, 13.3)	13.4 (12.1, 14.9)
Ceramic/XLPE	1631	61666	1.7 (1.6, 1.8)	2.5 (2.4, 2.6)	3.1 (2.9, 3.3)	4.5 (4.2, 4.8)	5.8 (5.2, 6.5)	6.2 (5.3, 7.3)
Ceramic/Metal	20	299	1.7 (0.7, 4.0)	3.7 (2.1, 6.6)	4.4 (2.6, 7.4)			
Metal/Metal > 32mm	3119	14421	1.7 (1.5, 1.9)	5.7 (5.3, 6.1)	11.7 (11.2, 12.2)	22.6 (21.9, 23.4)	29.6 (27.7, 31.6)	29.6 (27.7, 31.6)
Metal/Metal ≤ 32mm	373	5146	1.6 (1.3, 2.0)	3.3 (2.9, 3.8)	4.4 (3.8, 5.0)	6.6 (5.9, 7.4)	8.9 (8.0, 9.9)	9.2 (8.2, 10.2)
Metal/Non XLPE	2497	34837	1.4 (1.3, 1.5)	2.5 (2.3, 2.6)	3.4 (3.3, 3.7)	6.4 (6.1, 6.7)	10.9 (10.4, 11.3)	11.7 (11.2, 12.2)
Metal/XLPE	4577	143028	1.6 (1.5, 1.6)	2.4 (2.3, 2.4)	3.0 (2.9, 3.1)	4.5 (4.4, 4.7)	6.1 (5.8, 6.5)	6.3 (5.9, 6.7)
Ceramicised Metal/Non XLPE	40	293	1.7 (0.7, 4.1)	3.8 (2.1, 6.8)	4.2 (2.4, 7.3)	12.7 (9.1, 17.7)		
Ceramicised Metal/XLPE	517	20327	1.6 (1.5, 1.8)	2.2 (2.0, 2.4)	2.5 (2.2, 2.7)	3.5 (3.2, 3.9)		
TOTAL	**16387**	**371284**						

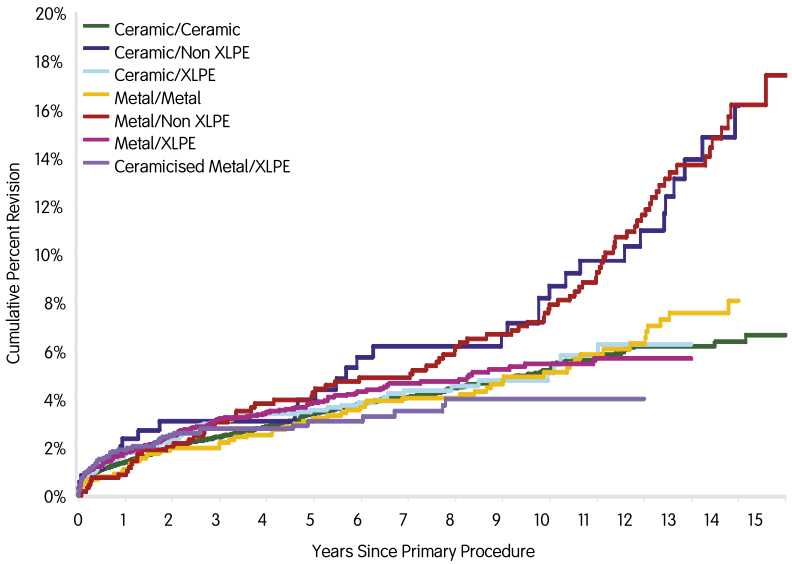
Note: Excludes 200 procedures with unknown bearing surface, one procedure with ceramicised metal/ceramic bearing surface and eight procedures with metal/ceramic bearing surface.

VERILAST is a good choice for younger patients[30]

VERILAST has the highest survivorship of all bearings for patients under 55 in the AOANJRR[30]

Detailed Analysis

FIGURE YH9 Cumulative Percent Revision of Primary Total Conventional Hip Replacement with Cementless Fixation in Patients Aged <55 Years by Bearing Surface (Primary Diagnosis OA)



HR –adjusted for age and gender	
Ceramic/Ceramic vs Metal/XLPE	Entire Period: HR=0.89 (0.75, 1.07),p=0.228
Ceramic/Non XLPE vs Metal/XLPE	Entire Period: HR=1.84 (1.25, 2.69),p=0.001
Ceramic/XLPE vs Metal/XLPE	Entire Period: HR=0.99 (0.78, 1.25),p=0.920
Metal/Metal vs Metal/XLPE	0 - 3 Yr: HR=0.76 (0.47, 1.21),p=0.242
	3Yr+: HR=1.25 (0.85, 1.82),p=0.252
Metal/Non XLPE vs Metal/XLPE	0 - 3Mth: HR=0.45 (0.14, 1.42),p=0.174
	3Mth - 1.5Yr: HR=1.37 (0.72, 2.63),p=0.339
	1.5Yr - 3Yr: HR=1.31 (0.63, 2.71),p=0.464
	3Yr - 5.5Yr: HR=1.59 (0.85, 2.99),p=0.149
	5.5Yr - 7Yr: HR=0.29 (0.04, 2.11),p=0.221
	7Yr - 9Yr: HR=2.86 (1.44, 5.66),p=0.002
	9Yr+: HR=4.00 (2.62, 6.10),p=<0.001
Ceramicised Metal/XLPE vs Metal/XLPE	Entire Period: HR=0.84 (0.61, 1.17),p=0.301
Ceramic/XLPE vs Ceramic/Ceramic	Entire Period: HR=1.11 (0.91, 1.36),p=0.311
Ceramicised Metal/XLPE vs Ceramic/Ceramic	Entire Period: HR=0.95 (0.70, 1.27),p=0.710
Ceramicised Metal/XLPE vs Ceramic/XLPE	Entire Period: HR=0.85 (0.61, 1.19),p=0.346

Comparing the cumulative revision rates for these bearings, ceramicised metal/XLPE has the lowest rate of revision. As in previous years, the Registry urges caution in the interpretation of this result. This bearing is a single company product used with a small number of femoral stem and acetabular component combinations. This may have a confounding effect on the outcome, making it unclear if the lower rate of revision is an effect of the bearing surface or reflects the limited combination of femoral and acetabular prostheses.[2]

Clinical Study Survival Data

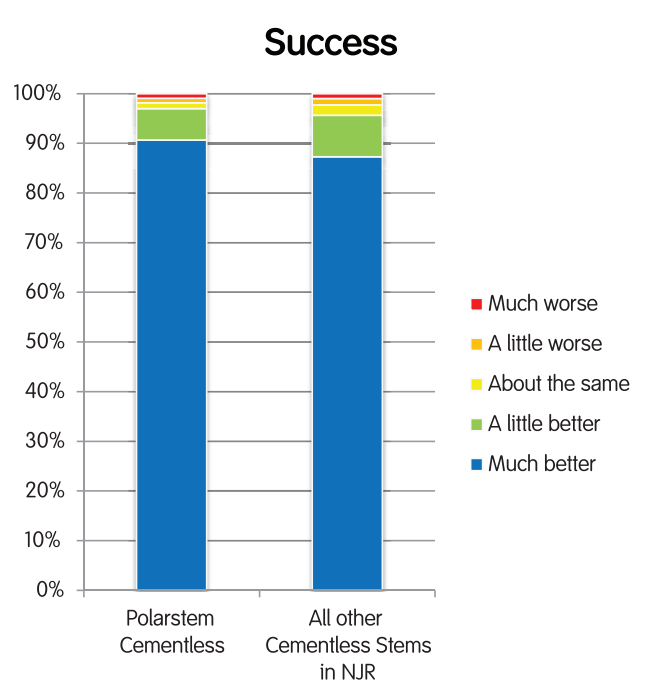
Low revision rates have been published for a variety of studies involving POLARSTEM, VERILAST & R3[8,31-34]

Study	Femoral comp.	Acetabular comp.	Total number of hips	Number of revisions	Follow-up period	Total cumulative revisions	Revision rate
Lee & Evans (2014)#[31]	Polarstem®	R3®	646	2	3 years	0.3% #	0.1%/year #
Nizam (2015)[32]	Polarstem	R3	100	1	17.2 months	1%	0.7%/year
Jassim et al (2015)[8]	Synergy®	Reflection®	122	1	5 years	0.008%	0.16%/year
Karidakis & Karachalios (2015)[33]	Synergy	Reflection	97	3	9 years	3%	0.34%/year
Fiquet & Noyer (2006)[34]	Polarstem	Polarcup®	600	2	3 years	0.33%	0.11%/year

= Note, 188 hips out of 646 used VERILAST and data not separated.

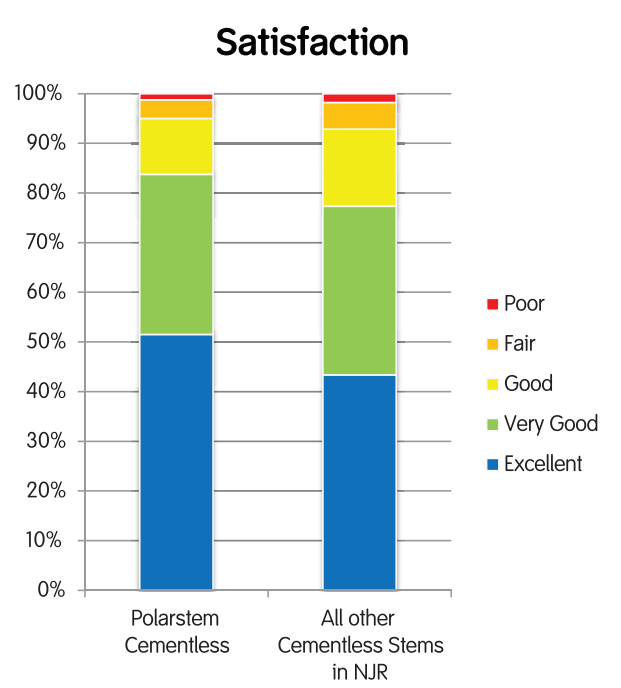
POLARSTEM patients have higher satisfaction than all other cementless stems patients[57]

Answer to 6-months general health question:
Overall, how are your problems now, compared to before your operation?



Chi-squared p-value for difference: <0.001

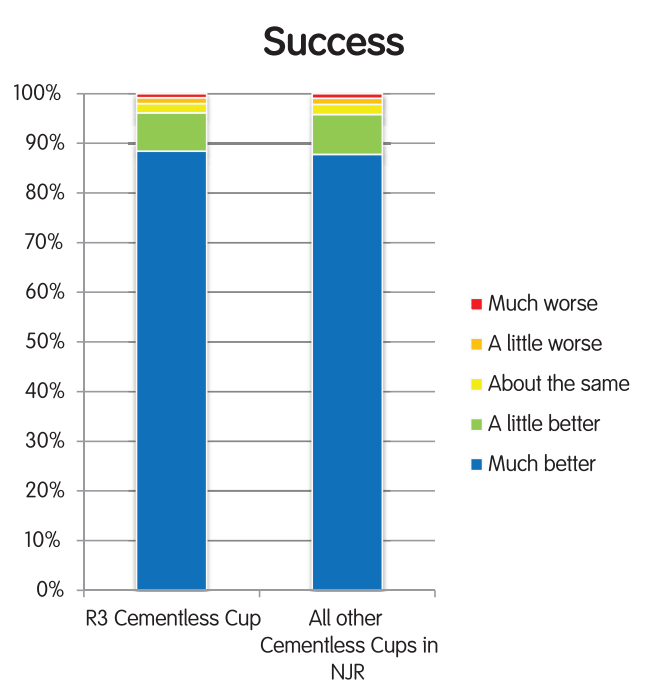
Answer to 6-months general health question:
How would you describe the results of your operation?



Chi-squared p-value for difference: <0.001

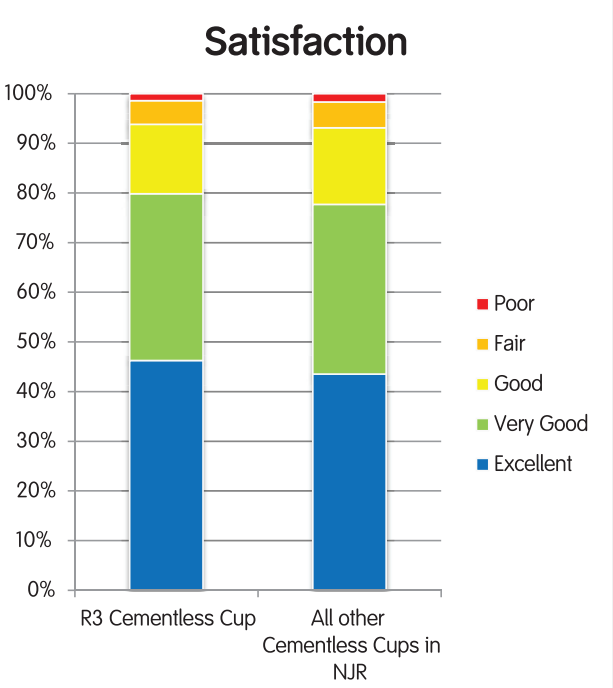
R3 patients have higher satisfaction than all other cementless cup patients [59]

Answer to 6-months general health question:
Overall, how are your problems now, compared to before your operation?



Chi-squared p-value for difference: 0.580

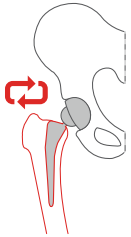
Answer to 6-months general health question:
How would you describe the results of your operation?



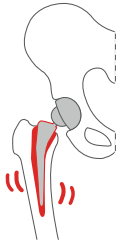
Chi-squared p-value for difference: <0.001

POLARSTEM & R3 demonstrate reduced risks in UKNJR Implant Summary Reports

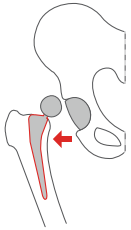
At 8 years, compared to class average (all bearing types), POLARSTEM demonstrated:



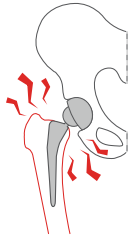
46% reduction in femoral revisions – all reasons ($p<0.001$)[57]



61% reduction in stem aseptic loosening ($p<0.01$)[57]



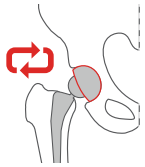
36% reduction in dislocation/ subluxation ($p<0.05$)[57]



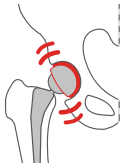
55% reduction in revisions caused by pain ($p<0.01$)[57]

A reduction in pain has been shown to correlate with increased patient satisfaction[58]

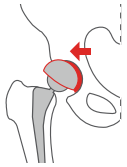
At 8 years, compared to class average (all bearing types), R3 demonstrated:



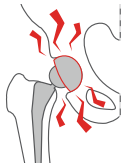
55% reduction in acetabular revisions ($p<0.001$)[59]



77% reduction in aseptic loosening – socket ($p<0.001$)[59]



44% reduction in socket malalignment ($p<0.05$)[59]



67% reduction in revisions caused by pain ($p<0.001$)[59]

POLARSTEM® has very strong 7 year evidence[4]

Developed by the Groupe GILES, the POLARSTEM was designed to support osseo-integration of the stem and to prevent subsidence and distal femoral pain.[5]

First clinical use: 2002

ODEP rating: 7A*[4]

Implantations to date: >250,000

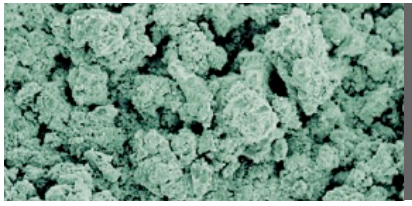
Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

POLARSTEM offers enhanced fixation

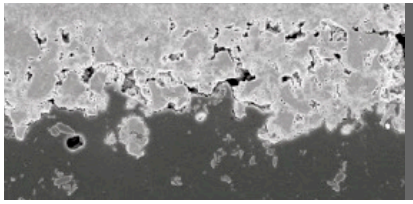
Unlike other fully HA coated stems, the POLARSTEM® design benefits from the surface roughness of Titanium Plasma spray, covered with an HA coating.[17]

The main purpose of this plasma spray is to encourage osseo-integration of the stem.

Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility



Hydroxyapatite (HA) on titanium plasma



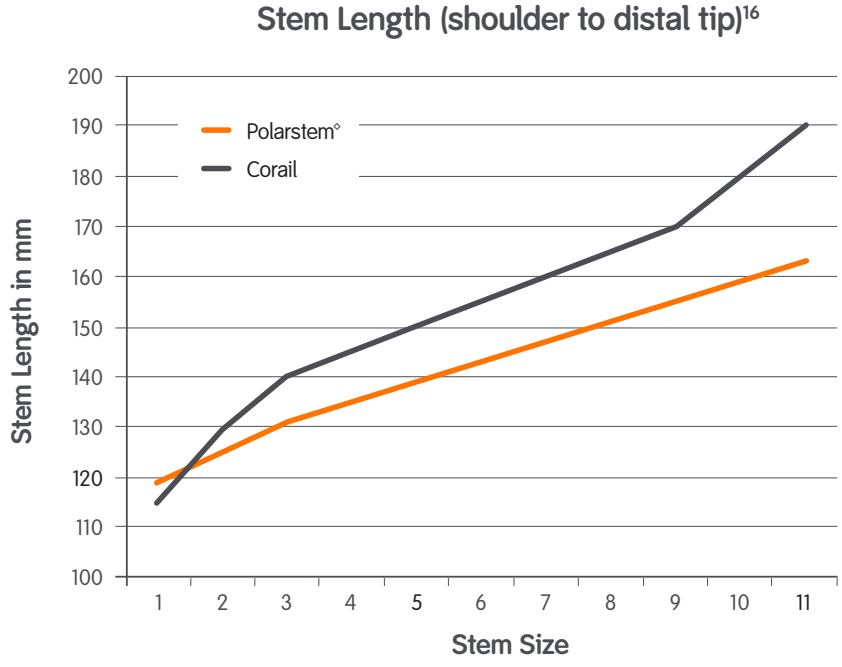
Titanium plasma coating

Pure titanium base material

180µm

POLARSTEM: Designed to provide excellent primary stability and reduced thigh pain[5]

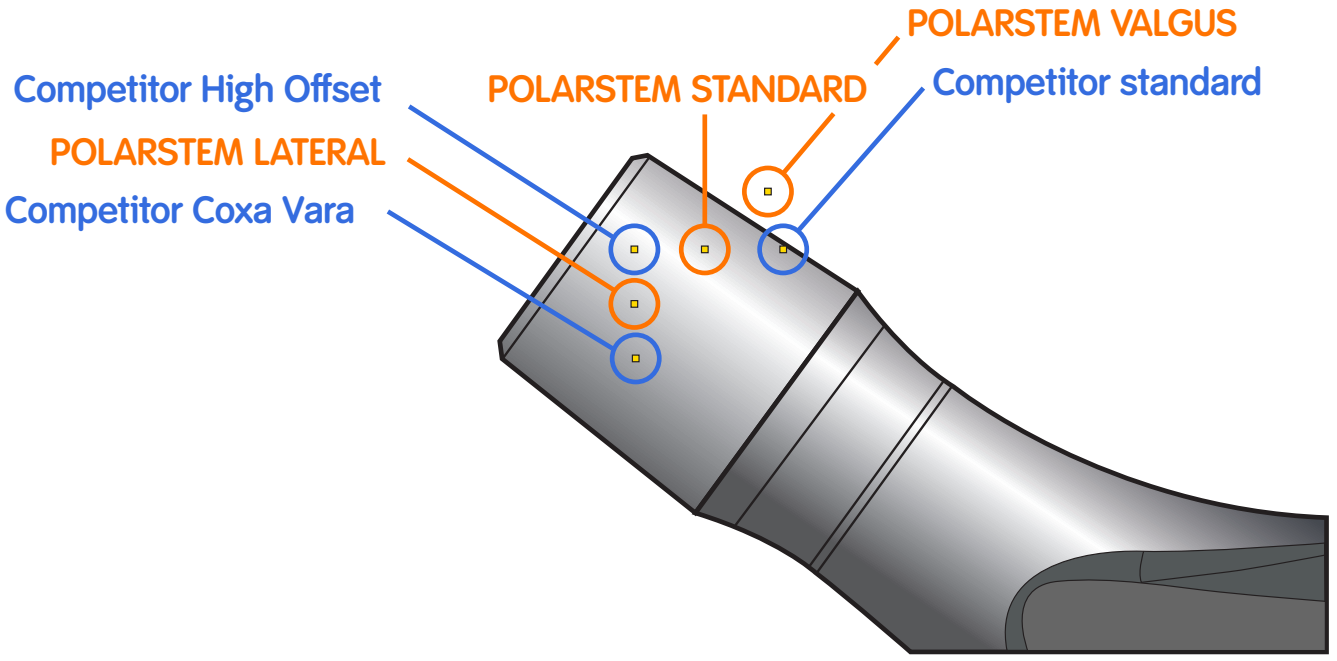
- Thickened proximal area to help reduce the risk of subsidence.[5]
- Shorter stem length than other fully HA coated stems to help reduce the risk of distal thigh pain.[17]
- Thin distal area with a narrow tip, aiding implantation.[5]



Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

POLARSTEM offsets ensure a good anatomic match

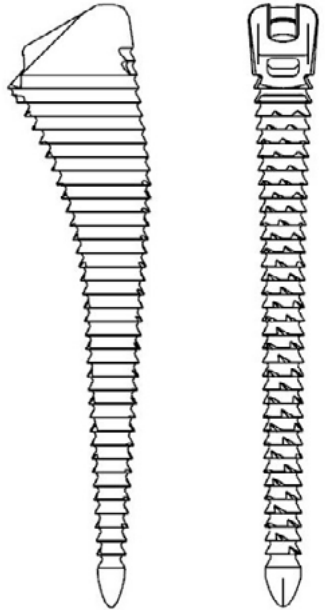
The cementless POLARSTEM® range includes 13 standard, 11 lateral and 8 valgus stems, providing a wide choice of anatomical head centre restoration options.

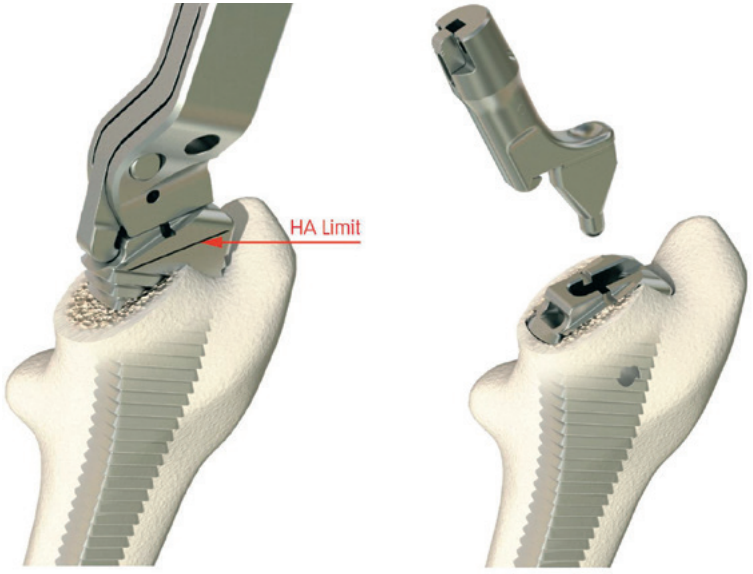


Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

POLARSTEM instrumentation aids surgical workflow

A variety of easy to use quick connect broach handles aid the surgical workflow of the POLARSTEM.



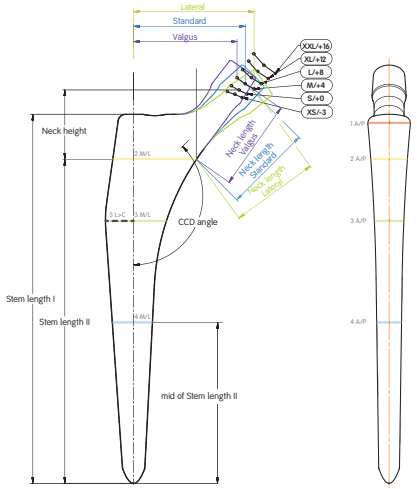


POLARSTEM broaches have female connections which allow the surgeon to prepare acetabulum or femur first.

POLARSTEM broaches have bone cutting teeth medially and laterally, and impaction teeth anteriorly and posteriorly, to provide stable self-locking of the implant.

Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

Specifications



Neck Offset (mm) Valgus Standard Lateral

Size	XS/-3			S/+0			M/+4			L/+8			XL/+12			XXL/+16		
01					37.2			40.0			42.8			45.7			48.5	
0	34.2	35.3		35.9	37.4		38.2	40.2		40.5	43.0		42.8	45.9		45.1	48.7	
1	35.0	37.9	40.8	36.7	40.0	43.2	39.0	42.8	46.4	41.3	45.6	49.7	43.6	48.4	52.9	45.9	51.3	56.1
2	35.7	38.5	41.5	37.3	40.6	43.8	39.6	43.4	47.0	41.9	46.2	50.3	44.2	49.1	53.5	46.5	51.9	56.7
3	36.5	39.3	42.3	38.1	41.4	44.6	40.4	44.2	47.8	42.7	47.0	51.1	45.0	49.9	54.3	47.3	52.7	57.5
4	37.1	40.0	42.9	38.8	42.0	45.3	41.1	44.9	48.5	43.4	47.7	51.7	45.7	50.5	55.0	48.0	53.3	58.2
5	37.7	40.6	43.5	39.4	42.6	45.9	41.7	45.5	49.1	44.0	48.3	52.3	46.3	51.1	55.6	48.6	54.0	58.8
6	38.3	41.2	44.1	40.0	43.3	46.5	42.3	46.1	49.7	44.6	48.9	53.0	46.9	51.7	56.2	49.2	54.6	59.4
7	39.0	41.8	44.7	40.6	43.9	47.1	42.9	46.7	50.3	45.2	49.5	53.6	47.5	52.3	56.8	49.8	55.2	60.0
8		42.3	45.3		44.4	47.6		47.2	50.8		50.0	54.1		52.9	57.3		55.7	60.5
9		43.0	46.0		45.1	48.3		47.9	51.6		50.8	54.8		53.6	58.0		56.4	61.3
10		43.7	46.6		45.7	48.9		48.5	52.2		51.4	55.4		54.2	58.6		57.0	61.9
11		44.3	47.2		46.3	49.5		49.1	52.8		52.0	56.0		54.8	59.3		57.6	62.5

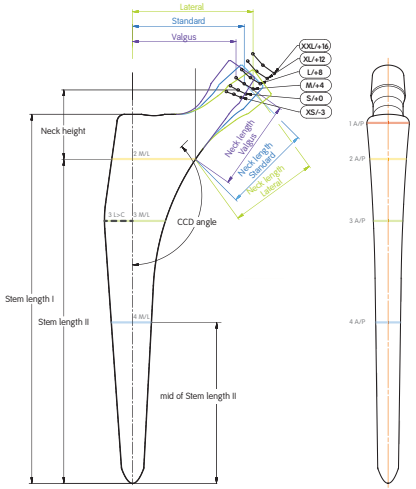
Neck Length (mm) Valgus Standard Lateral

Size	XS/-3			S/+0			M/+4			L/+8			XL/+12			XXL/+16		
01					29.9			33.9			37.9			41.9			45.9	
0	29.9	27.0		32.8	29.9		36.8	33.9		40.8	37.9		44.8	41.9		48.8	45.9	
1-7	29.9	29.5	29.5	32.8	32.4	32.4	36.8	36.4	36.4	40.8	40.4	40.4	44.8	44.4	44.4	48.8	48.4	48.4
8-11		29.5	29.5		32.4	32.4		36.4	36.4		40.4	40.4		44.4	44.4		48.4	48.4

Neck Height (mm) Valgus Standard Lateral

Size	XS/-3			S/+0			M/+4			L/+8			XL/+12			XXL/+16		
01					26.4			29.3			32.1			34.9			37.8	
0	27.6	24.4		30.0	26.4		33.3	29.3		36.5	32.1		39.8	34.9		43.1	37.8	
1-7	27.6	26.2	24.7	30.0	28.2	26.4	33.3	31.0	28.8	36.5	33.9	31.2	39.8	36.7	33.5	43.1	39.5	35.9
8-11		26.2	24.7		28.2	26.4		31.0	28.8		33.9	31.2		36.7	33.5		39.5	35.9

Specifications



Dimensions

			Shoulder	Resection Level		Lateral Flair Peak			Mid level of stem	
Size	Stem length I	Stem length II	1 A/P	2 M/L	2 A/P	3 L > C	3 M/L	3 A/P	4 M/L	4 A/P
01	119.5	101.5	14.2	25.6	11.9	6.8	16.7	9.5	10.0	8.1
0	125.5	107.5	14.7	27.2	12.5	8.0	18.2	10.1	10.8	8.6
1	131.5	113.5	15.2	28.7	13.0	8.7	19.7	10.7	11.9	9.1
2	135.5	117.5	15.7	30.2	13.5	9.6	21.2	11.2	13.1	9.6
3	139.5	121.5	16.4	31.5	14.2	10.2	22.2	11.9	14.4	10.4
4	143.5	125.5	16.9	32.7	14.6	10.9	23.4	12.1	15.5	10.4
5	147.5	129.5	17.5	33.9	15.1	11.5	24.5	12.3	16.6	10.4
6	151.5	133.5	18.0	35.1	15.5	12.2	25.6	12.5	17.6	10.4
7	155.5	137.5	18.4	36.2	15.9	12.8	26.6	12.6	18.6	10.4
8	159.5	141.5	18.8	36.5	16.2	13.4	26.7	12.6	19.7	10.4
9	163.5	145.5	19.3	37.3	16.9	13.9	28.1	13.6	20.7	11.6
10	167.5	149.5	19.7	37.9	17.3	14.3	29.2	13.8	21.8	11.7
11	171.5	153.5	20.1	38.5	17.6	15.2	30.7	14.4	22.8	11.7

Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

Collarless options

Standard	Lateral	Valgus
Sizes 01 – 11	Sizes 1 – 11	Sizes 0 – 7
CCD 135°	CCD 126°	CCD 145°

Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

Collared options

Standard	Lateral
Sizes 01 – 11	Sizes 1 – 11
CCD 135°	CCD 126°

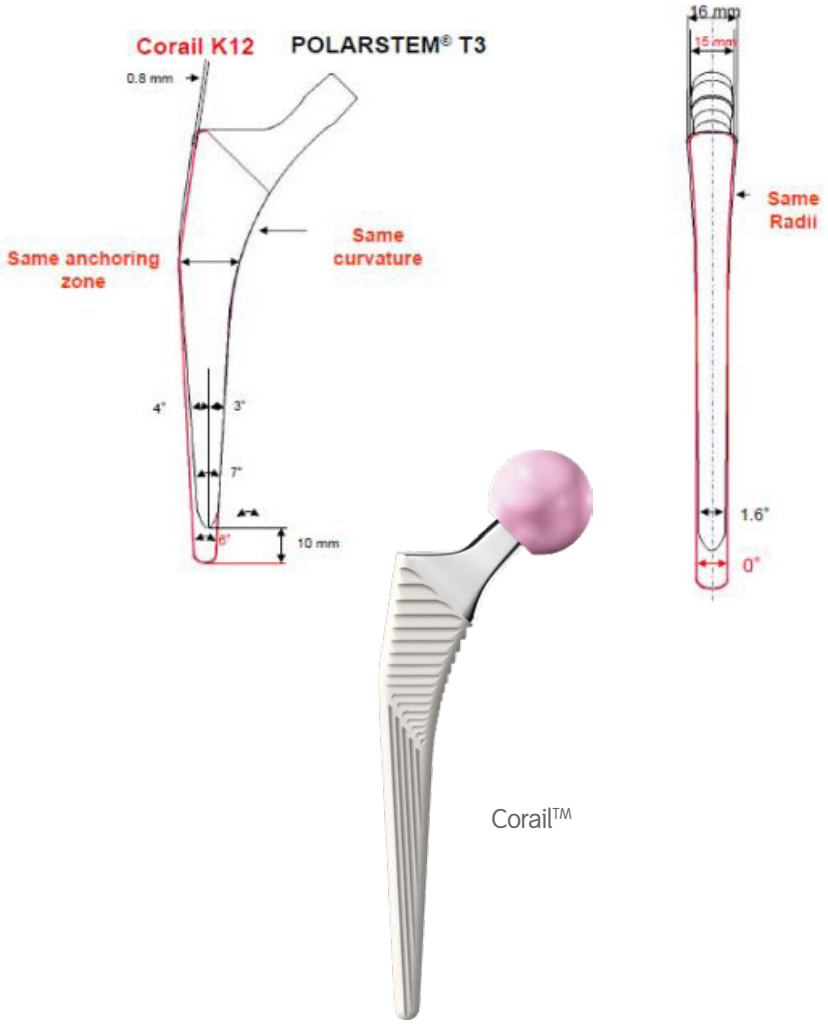
Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

POLARSTEM vs. Corail™

Multiple clinical papers report on subsidence seen with Corail[44-47] with significant, early subsidence reported in as high as 69% of patients and up to 26mm.[44]

The POLARSTEM triple taper, larger proximal body, HA coating on Ti-Plasma, proximal grooves and broach design all help reduce the risk of subsidence.

POLARSTEM is also 1cm shorter than Corail with a narrower distal cross-section to avoid distal contact with cortical bone, providing easy insertion and reduced risk of thigh pain.



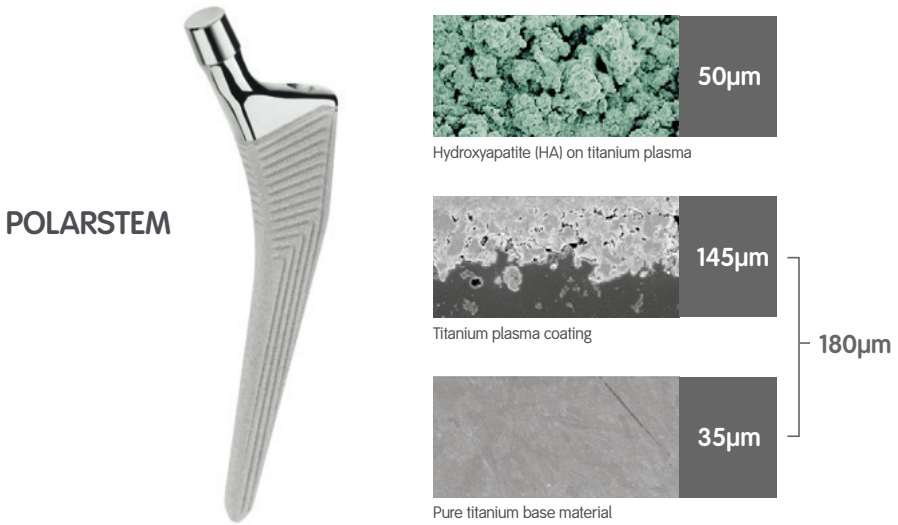
Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility

POLARSTEM vs. Quadra-H™

Quadra-H has an 80µm HA coating on the whole shaft applied after superficial sand-blasting (4µm-7µm).[48] This means that when the HA is absorbed, there is only minimal porosity of the sand-blasted shaft to support in-growth of bone.[53]

The POLARSTEM layered coating prevents HA from shedding from the surface and 145µm Ti-Plasma spray creates a thicker and more porous area for secondary anchorage to provide improved long-term fixation.[31]

Fixation
Geometry
Offset
Instrumentation
Specifications
Collarless options
Collared options
vs. Corail™
vs. Quadra-H™
Compatibility



Quadra-H is a trademark of Medacta.

Compatibility

Combinations listed in the matrix may not be approved in all individual markets or geographies. The information contained in this matrix does not supersede the instructions for use (Package insert) in force in the markets where the products are being used. Please refer to your local Smith & Nephew representative to confirm the approval status in your country or region if you have questions about how Smith & Nephew products can be used.

Combination is approved by Smith & Nephew

Combination is not approved by Smith & Nephew

Combination is under consideration

	Ball Head Ø	Neck Length					POLARSTEM Cementless		POLARSTEM Collared	
							Size 01	Other sizes	Size 01	Other sizes
OXINIUM®	D22		S / +0	M / +4	L / +8	XL / +12		✓	✓	✓	✓
	D26		S / +0	M / +4	L / +8	XL / +12					
	D28 to D36	XS / -3						✓		✓
	D28 to D36		S / +0	M / +4			✓	✓	✓	✓
	D28 to D36				L / +8		✓	✓	✓	✓
	D28					XL / +12	✓	✓	✓	✓
	D28							XXL / +16	✓		✓
	D32 and D36					XL / +12	✓	✓	✓	✓
	D32							XXL / +16			
	D40 and D44#	XS / -4					✓	✓	✓	✓
	D40 and D44#		S / +0	M / +4	L / +8		✓	✓	✓	✓
CoCrMo	D22		S / +0	M / +4	L / +8	XL / +12	✓	✓	✓	✓
	D26		S / +0	M / +4	L / +8	XL / +12					
	D28 to D36	XS / -3						✓		✓
	D28 to D36		S / +0	M / +4			✓	✓	✓	✓
	D28 to D36				L / +8		✓	✓	✓	✓
	D28					XL / +12	✓	✓	✓	✓
	D28							XXL / +16		✓	✓
	D32 and D36					XL / +12	✓	✓	✓	✓
	D32							XXL / +16		✓	✓
	D40 and D44#	XS / -4									
	D40 and D44#		S / +0	M / +4	L / +8		✓	✓	✓	✓
	D22			M	L		✓	✓	✓	✓
	D28 and D32		S	M	L		✓	✓	✓	✓
	D28 and D32					XL	✓	✓	✓	✓
	D28 and D32							XXL	✓	✓	✓
BIOLOX® Delta	D32 and D36		S / +0	M / +4	L / +8		✓	✓	✓	✓
	D36					XL / +12	✓	✓	✓	✓
	D40		S / +0	M / +4	L / +8		✓	✓	✓	✓
	D28 to D36		S	M	L		✓	✓	✓	✓
	D32 and D36					XL	✓	✓	✓	✓
BIOLOX® Option*	D28 to D36		S	M	L		✓	✓	✓	✓
	D28 to D36					XL	✓	✓	✓	✓

#40mm and 44mm heads include Ti-sleeves. This matrix is only applicable for Smith & Nephew Femoral Ball Heads and Stems as well as third-party products (identified by *) covered in this document. *Biolox Option (Revision THA) Femoral Ball Heads are products of CeramTec GmbH and compatible with Smith & Nephew stems in respect to this matrix. This product is only available for sale in the EU. This compatibility matrix can only be accessed online via Smith & Nephew's website http://www.smith-nephew.com/compatibilitymatrix. It is the responsibility of the user to consult the Smith & Nephew website to ensure the currency of compatibility information.

R3® has very strong 10 year evidence[4]

The R3 was developed from the highly successful REFLECTION® acetabular cup system, the first to address backside wear through a highly polished inner surface.[36]

First clinical use: 2007

ODEP rating: 10A*[4]

Implantations to date: > 1,200,000

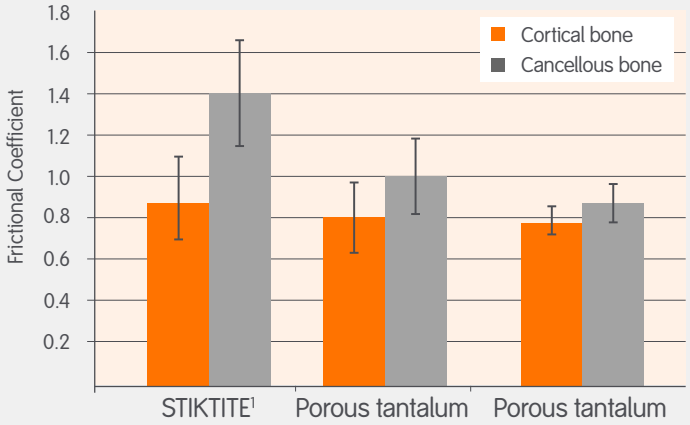
Fixation
XLPE
Poly Thickness
Options
vs. Pinnacle™
vs. Versafitcup CC™

R3 offers enhanced fixation

R3 benefits from STIKTITE fixation.

An advanced ingrowth material composed of asymmetric titanium particles that provides enhanced scratch-fit against cancellous and cortical bone.[37, 38]

Higher friction compared to porous tantalum[45] → Superior scratch fit = Superior initial fixation



Cross-section of the STIKTITE coating (Porosity 60% Pore Size – 200 µm)

Cross-section of a traditional porous coating (Porosity 30% Pore Size – 250 µm)

The asymmetric titanium structure has an average pore size of 200µm and a porosity of 60% encouraging bone ingrowth and secondary fixation.[37]

Fixation
XLPE
Poly Thickness
Options
vs. Pinnacle™
vs. Versafitcup CC™

R3 XLPE liners help increase ROM

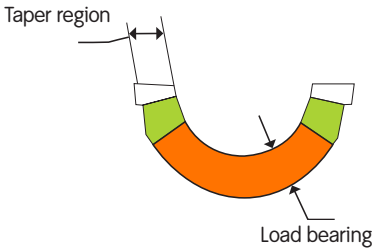
All R3® bearings sit flush with the rim of the shell, which increases the range of motion (ROM) and reduces the opportunity for impingement postoperatively.[40, 41, 42, 43]

The flush liner also provides intraoperative tactile feedback that it has seated within the shell.

Fixation
XLPE
Poly Thickness
Options
vs. Pinnacle™
vs. Versafitcup CC™

R3 XLPE liner thickness maintained throughout range

The XLPE liner maintains a minimum 5mm liner thickness in the load bearing zone.



Fixation
XLPE
Poly Thickness
Options
vs. Pinnacle™
vs. Versafitcup CC™

Shell OD	Poly OD	Poly Thickness Taper Region mm	Poly Thickness Load-Bearing Region mm
40	22	5.5	6.1
42	22	6.5	7.1
44	22	7.5	8.1
46	28	5.4	6.1
48	28	6.4	7.1
48	32	4.3	5.1
50	28	7.3	8.1
50	32	5.3	6.1
52	28	8.3	9.1
52	32	6.3	7.1
52	36	4.3	5.1
54	28	9.3	10.1
54	32	7.3	8.1
54	36	5.3	6.1
56	28	10.3	11.1
56	32	8.3	9.1
56	36	6.3	7.1
56	40	4.6	5.0
58	28	11.3	12.1
58	32	9.3	10.1
58	36	7.3	8.1
58	40	4.3	6.0

Shell OD	Poly OD	Poly Thickness Taper Region mm	Poly Thickness Load-Bearing Region mm
60	28	12.3	13.1
60	32	10.3	11.1
60	36	8.3	9.1
60	40	6.5	7.0
60	44	4.3	5.0
62	32	11.3	12.1
62	36	9.3	10.1
62	40	7.5	8.0
62	44	5.3	6.0
64	36	10.3	11.1
64	40	8.4	9.0
64	44	6.4	7.0
66-70	36	11.3	12.1
66-70	40	9.3	10.0
66-70	44	7.2	8.0
72-74	36	13.8	14.0
72-74	40	11.8	12.0
72-74	44	9.8	10.0
76-80	36	15.8	16.0
76-80	40	13.8	14.0
76-80	44	11.8	12.0

R3 Options

- No Hole Shells 40 – 68mm
- Three Hole Shells 40 – 68mm
- Multi Hole Shells 48 – 80mm

XLPE Liners in:

0 degree and 20 degrees including 4mm lateralised options

R3 XLPE liner offering chart

	XLPE					
Cup	22	28	32	36	40	44
40	•					
42	•					
44	•					
46		•				
48		•	•			
50		•	•			
52		•	•	•		
54		•	•	•		
56		•	•	•	•	
58		•	•	•	•	
60		•	•	•	•	•
62			•	•	•	•
64				•	•	•
66				•	•	•
68				•	•	•
70				•	•	•
72				•	•	•
74				•	•	•
76				•	•	•
78				•	•	•
80				•	•	•

Fixation
XLPE
Poly Thickness
Options
vs. Pinnacle™
vs. Versafitcup CC™

R3 vs. Pinnacle™

Pinnacle cups are hemispherical offering Gription® porous coating for poor bone quality (introduced in 2009 with irregular particles to increase CoF to 1.15, pore size 300µm, 60% porosity) or standard Porocoat® porous coating (pure titanium sintered metal beads, pore size 250µm, 30% porosity, 0.75 CoF).[49]

STIKTITE coating has a higher CoF (1.4) than Porocoat or Gription for a greater 'scratch fit' and this results in a more simple technique with reaming size for size.

RSA data shows that STIKTITE coating has improved initial and long-term fixation versus traditional porous coatings.[6]

Average STIKTITE pore size is 200µm with a range of 100-500µm for optimal bone ingrowth and the sintered 3D asymmetric coating has 60% porosity, similar to Gription.

Fixation
XLPE
Poly Thickness
Options
vs. Pinnacle™
vs. Versafitcup CC™

Range of motion

R3

	22mm	28mm	32mm	36mm
0°	140°	150°	154°	157°
20°	132°	134°	136°	138°
Ceramic	–	–	154°	156°

Pinnacle™

		Neutral	+4 Neutral	+4 10° Face-Changing	Lipped
Polyethylene	28mm	132°	132°	132°	119° / 104°
Polyethylene	32mm	139°	139°	139°	130° / 113°
Polyethylene	36mm	140°	140°	140°	–
Metal	28mm	146°	–	–	–
Metal	36mm	151°	–	–	–
Ceramic	28mm	135°	–	–	–
Ceramic	36mm	153°	–	–	–

R3 vs. Versafitcup CC™

Versafitcup CC shells are elliptical, which can make them difficult to impact into high-density bone. This may result in inadequate seating and increased risk of component malpositioning or acetabular fracture.[50]

There are no Versafitcup lateralised liners available and there are no anti-rotation tabs on the poly, which means reduced rotational stability.

R3 XLPE liners are available in lateralised as well as hooded versions.

There are 12 anti-rotational tabs on R3 XLPE liners for excellent rotational stability and reduced risk of spin-out.

Fixation
XLPE
Poly Thickness
Options
vs. Pinnacle™
vs. Versafitcup CC™

Polyethylene comparison chart[19-27]

Material	GUR Resin	Total Dose (Mrad)	Source	Thermal Treatment	Sterilization	Free Radicals	Oxidation Potential
S&N 10-XLPE	RE1050	10	Gamma	Re-melt	EtO	No	Low
DePuy Altrx	CM1020	7.5	Gamma	Re-melt	Gas Plasma	No	Low
Zimmer Durasul*	CM1050	9.5	E-beam	Re-melt	EtO	No	Low
Zimmer Longevity	CM1050	10	E-beam	Re-melt	Gas Plasma	No	Low
Zimmer Vivacit-E	CM1020 + Vitamin E	10	E-beam	None	EtO	Unknown	Low
Biomet E-Poly/E1	IMB1050	10+3	Gamma	Sub-melt + Vitamin E	Gamma-Inert	Yes	Low
Stryker X3	CM1020	3x3=9	Gamma	Sub-melt	Gas Plasma	Yes	High

smith&nephew

Supporting healthcare
professionals for over 150 years

Smith & Nephew Pty Ltd
Australia
T +61 2 9857 3999 **F** +61 2 9857 3900
www.smith-nephew.com/australia

Customer Service
T 13 13 60 **F** 1800 671 000

Smith & Nephew Ltd
New Zealand
T +64 9 820 2840 **F** +64 9 820 2841
www.smith-nephew.com/new-zealand

Customer Service
T 0800 657 799 (Surgical) **T** 0800 807 663 (Wound)

SN14294 (01/19)