ANALYSIS OF REVERSE HYBRID TOTAL HIP REPLACEMENT USING THE CORAIL® FEMORAL COMPONENT IN THE NATIONAL JOINT REGISTRY FOR ENGLAND, WALES, NORTHERN IRELAND AND THE ISLE OF MAN

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Introduction

National joint registries provide valuable and generalizable information on the revision rates / survivorship of newer and older implants alike. Typically they include large cohorts with contributions from all surgeons, irrespective of experience level. The National Joint Registry for England, Wales, Northern Ireland and the Isle of Man (NJR) has been in operation since 2003 and in that time has collected data on over 890,000 total hip replacements. A reverse hybrid total hip replacement (THR) uses a cemented all-polyethylene acetabular cup and uncemented femoral stem. Up to the end of 2016, reverse hybrid THR accounted for 22,552 procedures on the NJR, with a steady uptake in adoption from just 0.6% in 2003 to 2.5% in 2016.[1]

Lindalen et al[2] analysed 3,963 reverse hybrid THRs recorded on the Norwegian Arthroplasty Registry in a ten year period between 2000 and 2009. In this cohort there were 3,553 (89.7%) implantations of the CORAIL stem with six different cemented cup systems. The results were then compared with those from the 10 most common cemented implant combinations over the same follow-up period. The authors found no statistical difference in implant survivorship at 5 and 7 years between the reverse hybrid group and the cemented combinations. This was also the case in patients younger than 60 when the survivorship analysis was adjusted for age. In a study based on data from the New Zealand Joint Registry, Hooper et al[3] compared the patient time incidence rates (PTIR) across four fixation types. The reverse hybrid cohort demonstrated similar or lower revision rates as compared to cemented, cementless or standard hybrid fixation, although the cohort size was far smaller than the other groups. McNally et al[4] studied survival of the Furlong HA coated femoral stem in combination with a cemented polyethylene cup at 10-11 years and found survivorship of 99% for the stem and 95% for the cup. The AOA NJRR does not report results for reverse hybrid procedures as a class.

The purpose of this analysis is to examine the results of the CORAIL femoral implant when used in reverse hybrid THR. In addition to the publicly available UK NJR reports, data is also available from a Supplier Feedback dataset, downloaded by DePuy Synthes from the UK NJR on 10th April 2018.[5] This additional information provides detailed data on all CORAIL implantations included on the registry. The focus of this commentary is the combination of CORAIL stems with either the ELITE PLUS™ or MARATHON® XLPE all-polyethylene cemented acetabular cups. Sub-analysis has been performed on different head materials and sizes.

Results

In total the dataset records 6,636 cases in which a CORAIL stem has been implanted with an ELITE PLUS cemented cup, and 11,869 cases in which a MARATHON XLPE cemented cup has been used.

The follow up for the ELITE PLUS group extends to 12 years and the PTIR for this group is 0.32 (95% CI 0.27, 0.38). In the MARATHON XLPE group the maximum follow up is 9 years and the PTIR is 0.31 (95% CI 0.26, 0.37). The system allows for multiple reasons for revision to be entered. These are tabulated below in Table 1 and the cumulative incidence rates of the most prevalent reasons for revision have been plotted in Figure 2 for each cup group.

Kaplan-Meier analysis was undertaken to estimate the cumulative revision rate (CRR) with an end point of revision of any component for any cause. Table 2 includes the cumulative revision rate estimates for the overall cohorts, plus the estimates for the different head materials. The cohort sizes are such that reliable estimates are not possible for all the head size/material combinations.

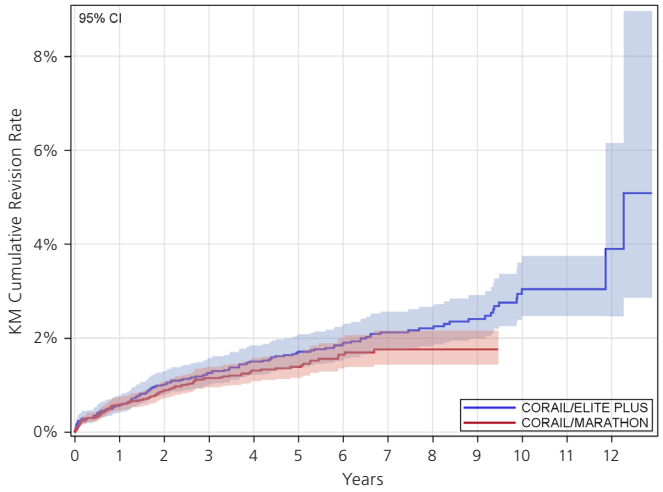

Figure 1: CORAIL Reverse Hybrid THR: Cumulative revision rates split by Cemented Cup (2018 NJR).

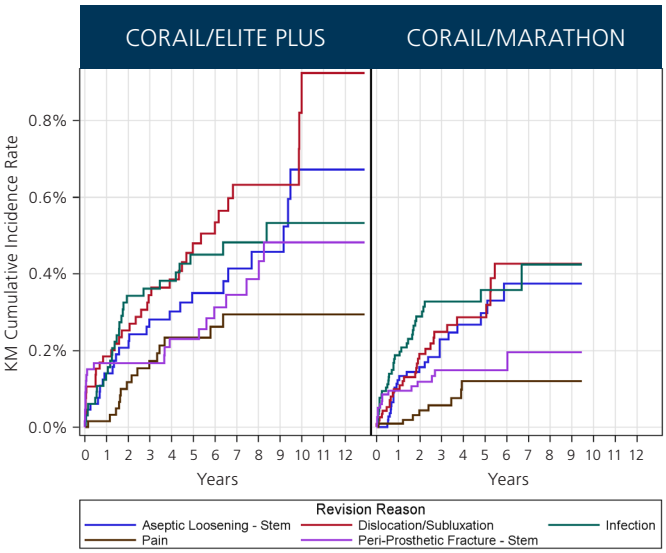

Figure 2: CORAIL Reverse Hybrid THR: Cumulative incidence rate of revision reasons split by Cemented Cup (2018 NJR).

Summary

The National Joint Registry results for the combinations of CORAIL stems with both ELITE PLUS and MARATHON cups compare favourably within the class of reverse hybrid THR as reported on the NJR.[6] The 9-year cumulative revision rate for the CORAIL/MARATHON combination from the Supplier Feedback dataset is 1.76% (95% CI 1.43, 2.16%) and the 10-year cumulative revision rate for the CORAIL/ELITE Plus combination is 3.04% (95%CI 2.47, 3.75%). From the NJR Annual Report the cumulative revision rate for all reverse hybrid THR is 2.55% (95%CI 2.28, 2.85%) at 7 years and 4.00% (95%CI 3.36, 4.76%) at 10 years.

Conclusion

The proponents of reverse hybrid THR claim that the approach is advantageous as it removes the challenges of femoral cementing technique and saves operating time.[7] These advantages can be combined with the excellent long-term results of all-polyethylene cemented cups to provide a long-term solution with excellent survivorship over the mid to long-term.[2,4] The introduction of moderately cross-linked polyethylene may further improve the results of the cemented all-polyethylene cups due to a reduction in wear.[8,9] Cumulative revision rate estimates have been calculated from the NJR dataset on the combination of the CORAIL femoral stem with both the ELITE PLUS and the MARATHON cemented cups. The revision rate estimates of the CORAIL femoral stem with both the ELITE PLUS and the MARATHON cemented cups are low, and compare favourably to the overall class of reverse hybrid THR from the NJR.[6]

Reason	CORAIL/ELITE PLUS N= 6636		CORAIL/MARATHON N= 11869	
	Number	Rate	Number	Rate
Dislocation/Subluxation	35	0.53%	29	0.24%
Infection	28	0.42%	35	0.29%
Aseptic Loosening - Stem	26	0.39%	26	0.22%
Peri-Prosthetic Fracture - Stem	21	0.32%	16	0.13%
Pain	15	0.23%	8	0.07%
Aseptic Loosening - Socket	14	0.21%	7	0.06%
Malalignment - Stem	7	0.11%	8	0.07%
Wear of Acetabular Component	6	0.09%	2	0.02%
Other	4	0.06%	9	0.08%
Malalignment - Socket	3	0.05%	3	0.03%
Peri-Prosthetic Fracture - Socket	3	0.05%	1	0.01%
Lysis - Stem	2	0.03%	2	0.02%
Adverse Soft Tissue Reaction to Particulate Debris	2	0.03%	2	0.02%
Lysis - Socket	1	0.02%	4	0.03%
Dissociation of Liner	1	0.02%	3	0.03%
Head/Socket Mismatch - Socket	1	0.02%	1	0.01%
Head/Socket Mismatch MDS2	1	0.02%	–	–
Implant Fracture - Stem	1	0.02%	–	–

Table 1: CORAIL Reverse Hybrid THR: Revision reasons split by Cemented Cup (2018 NJR).

Group	1 Year	3 Years	5 Years	7 Years	10 Years
CORAIL/ELITE PLUS n = 6636	0.57% (0.41, 0.79%) n = 6163	1.26% (1.01, 1.57%) n = 5161	1.71% (1.40, 2.09%) n = 3992	2.12% (1.76, 2.57%) n = 2756	3.04% (2.47, 3.75%) n = 937
CORAIL/ELITE PLUS Metal Heads n = 4546	0.61% (0.42, 0.88%) n = 4209	1.11% (0.84, 1.48%) n = 3470	1.57% (1.22, 2.02%) n = 2599	2.00% (1.57, 2.55%) n = 1704	3.22% (2.45, 4.24%) n = 578
CORAIL/ELITE PLUS Ceramic Heads n = 2044	0.50% (0.27, 0.93%) n = 1909	1.55% (1.08, 2.22%) n = 1648	2.01% (1.45, 2.77%) n = 1351	2.40% (1.77, 3.27%) n = 1015	2.72% (1.98, 3.72%) n = 348
CORAIL/MARATHON n = 11869	0.59% (0.46, 0.75%) n = 9995	1.15% (0.95, 1.39%) n = 6059	1.39% (1.15, 1.67%) n = 3137	1.76% (1.43, 2.16%) n = 1262	n/a
CORAIL/MARATHON Metal Heads n = 8113	0.62% (0.46, 0.82%) n = 6698	1.15% (0.91, 1.45%) n = 4027	1.36% (1.08, 1.71%) n = 2114	1.69% (1.33, 2.16%) n = 874	n/a
CORAIL/MARATHON Ceramic Heads n = 3724	0.53% (0.34, 0.83%) n = 3268	1.16% (0.83, 1.61%) n = 2009	1.46% (1.06, 2.01%) n = 1001	1.71% (1.22, 2.40%) n = 374	n/a

Table 2: CORAIL Reverse Hybrid THR: Cumulative revision rate estimates split by Cemented Cup and head material (2018 NJR). (95% CI), N with later follow up.[5]

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