Supplementary article data

Increased risk of revision of cementless stemmed total hip arthroplasty with metal-on-metal bearings

Data from the Nordic Arthroplasty Register Association

Claus VARNUM[1,2,3], Alma B PEDERSEN[4], Keijo MÄKELÄ[5], Antti ESKELINEN[6], Leif Ivar HAVELIN[7,8], Ove FURNES[7,8], Johan KÄRRHOLM[9,10], Göran GARELLICK[9,10], and Søren OVERGAARD[2,3]

[1] Department of Orthopaedic Surgery, Section for Hip and Knee Replacement, Vejle Hospital, Vejle; [2] Clinical Institute, University of Southern Denmark, Odense; [3] Department of Orthopaedic Surgery and Traumatology, Odense University Hospital, Odense; [4] Department of Clinical Epidemiology, Aarhus University Hospital, Aarhus, Denmark; [5] Department of Orthopaedics and Traumatology, Turku University Hospital, Turku; [6] Coxa Hospital for Joint Replacement, Tampere, Finland; [7] The Norwegian Arthroplasty Register, Department of Orthopedic Surgery, Haukeland University Hospital, Bergen; [8] Department of Clinical Medicine, Faculty of Medicine and Dentistry, University of Bergen, Bergen, Norway; [9] Swedish Hip Arthroplasty Register; [10] Institute of Clinical Sciences, Department of Orthopaedics, Sahlgrenska University Hospital, Gothenburg, Sweden.
Correspondence: clausvarnum@gmail.com
Submitted 2014-08-20. Accepted 2015-01-06.

Table 2. Crude and adjusted relative risk (RR) of revision for any reason, with 95% confidence intervals (CIs), in total hip arthroplasty (THA) with metal-on-metal (MoM) and metal-on-polyethylene (MoP) bearings. MoP bearings were considered the "standard" for THAs

	Patients at the beginning of the year (n)	Revisions performed within the year (%)	Crude RR (95% CI)	Adjusted RR (95% CI)
At 1-year follow-up (0–1 year postoperatively)				
MoM	11,567	198 (1.7)	0.81 (0.68–0.95)	0.83 (0.70–1.00)
MoP	21,111	448 (2.1)	1 (ref.)	1 (ref.)
At 2-year follow-up (1–2 years postoperatively)				
MoM	11,295	91 (0.8)	0.92 (0.80–1.06)	0.94 (0.81–1.09)
MoP	20,495	123 (0.6)	1 (ref.)	1 (ref.)
At 3-year follow-up (2–3 years postoperatively)				
MoM	9,640	66 (0.7)	1.01 (0.89–1.15)	1.02 (0.89–1.18)
MoP	15,653	72 (0.5)	1 (ref.)	1 (ref.)
At 4-year follow-up (3–4 years postoperatively)				
MoM	7,251	44 (0.6)	1.09 (0.96–1.23)	1.10 (0.96–1.26)
MoP	11,976	45 (0.4)	1 (ref.)	1 (ref.)
At 5-year follow-up (4–5 years postoperatively)				
MoM	4,638	49 (1.1)	1.32 (1.17–1.50)	1.37 (1.19–1.57)
MoP	9,137	22 (0.2)	1 (ref.)	1 (ref.)
At 6-year follow-up (5–6 years postoperatively)				
MoM	2,466	18 (0.7)	1.44 (1.27–1.63)	1.49 (1.30–1.71)
MoP	6,811	19 (0.3)	1 (ref.)	1 (ref.)

DOI 10.3109/17453674.2015.1023132

Table 3. Median follow-up and revision rate for different designs of acetabular components in cementless metal-on-metal (MoM) total hip arthroplasty (THA). Crude and adjusted relative risk (RR) of revision for any reason at 6-year follow-up with 95% confidence intervals (CIs), compared to metal-on-polyethylene (MoP) bearings

	n = 32,678 (%)	Median follow-up (IQR)	Any revision (n)	Risk time, years	Revision rate per 100 years (95% CI)	Crude RR (95% CI)	Adjusted RR (95% CI)
Brands of acetabular components in MoM THAs compared to acetabular components in MoP THAs							
All MoP acetabular components	21,111 (65)	3.4 (2.0–5.8)	766	84,404	0.91 (0.85–0.97)	1 (ref.)	1 (ref.)
Recap	5,384 (16)	3.3 (2.3–4.5)	152	18,172	0.84 (0.71–0.98)	0.91 (0.78–1.07)	0.96 (0.81–1.15)
M2a	2,652 (8)	4.7 (3.0–6.0)	103	11,671	0.88 (0.73–1.07)	1.13 (0.86–1.48)	1.20 (0.91–1.58)
Pinnacle	925 (3)	2.9 (2.0–3.9)	31	2,779	1.12 (0.78–1.59)	1.19 (0.88–1.62)	1.20 (0.86–1.66)
ASR	759 (2)	3.9 (2.8–4.7)	100	2,872	3.48 (2.86–4.24)	5.89 (4.72–7.34)	6.38 (4.99–8.15)
Birmingham	521 (2)	4.0 (2.9–5.0)	15	2,093	0.72 (0.43–1.19)	1.23 (0.70–2.17)	1.34 (0.73–2.45)
Durom	497 (2)	3.2 (1.8–5.0)	18	1,692	1.06 (0.67–1.69)	1.50 (0.91–2.47)	1.50 (0.88–2.57)
Conserve Plus	478 (1)	3.3 (2.7–4.0)	25	1,555	1.61 (1.09–2.38)	1.83 (1.25–2.67)	1.70 (1.14–2.54)
Others	351 (1)	3.6 (2.8–4.6)	26	1,368	1.90 (1.29–2.79)	2.41 (1.57–3.70)	2.38 (1.45–3.92)
Combinations of brands of acetabular and femoral components in MoM THAs compared to MoP THAs							
All MoP THAs	21,111 (65)	3.4 (2.0–5.8)	766	84,404	0.91 (0.85–0.97)	1 (ref.)	1 (ref.)
Recap/Bi-Metric	4,990 (15)	3.2 (2.2–4.4)	138	16,652	0.83 (0.70–0.98)	0.90 (0.76–1.06)	0.96 (0.80–1.15)
M2a/Bi-Metric	2,407 (7)	4.8 (3.0–6.1)	95	10,683	0.89 (0.73–1.09)	1.16 (0.87–1.53)	1.25 (0.93–1.67)
Pinnacle/Corail	910 (3)	2.9 (2.0–3.9)	31	2,723	1.14 (0.80–1.62)	1.21 (0.89–1.65)	1.25 (0.90–1.74)
Conserve Plus/Profemur	418 (1)	3.2 (2.7–3.9)	18	1,315	1.37 (0.86–2.17)	1.53 (1.00–2.33)	1.47 (0.95–2.27)
ASR/Summit	401 (1)	3.9 (2.8–4.8)	56	1,540	3.64 (2.80–4.72)	6.35 (4.74–8.49)	7.27 (5.18–10.2)
Birmingham/Synergy	369 (1)	4.2 (3.4–5.1)	10	1,566	0.64 (0.34–1.19)	1.07 (0.51–2.24)	1.26 (0.56–2.84)
ASR/Corail	307 (1)	3.7 (2.7–4.5)	35	1,117	3.13 (2.25–4.36)	5.00 (3.54–7.07)	5.17 (3.53–7.56)
Others	1,765 (6)	3.7 (2.5–4.9)	87	6,606	1.32 (1.07–1.63)	1.77 (1.39–2.26)	1.75 (1.29–2.36)

Table 4. Stratified analyses with crude and adjusted relative risk (RR) of revision for any reason with 95% confidence intervals (CIs) at 6-year follow-up among total hip arthroplasties (THAs) with metal-on-metal (MoM) bearings

	n = 11,567 (%)	Any revision (n)	Crude RR (95% CI)	Adjusted RR (95% CI)
Brands of acetabular components in MoM THAs. As Recap was the most prevalent, it was used as reference				
Recap	5,384 (47)	152	1 (ref.)	1 (ref.)
M2a	2,652 (23)	103	1.24 (0.94–1.66)	1.82 (0.97–3.43)
Pinnacle	925 (8)	31	1.31 (0.94–1.82)	1.41 (0.60–3.32)
ASR	759 (7)	100	6.45 (5.03–8.28)	6.73 (4.95–9.14)
Birmingham	521 (4)	15	1.35 (0.76–2.41)	1.43 (0.73–2.81)
Durom	497 (4)	18	1.65 (0.99–2.75)	1.57 (0.83–2.95)
Conserve Plus	478 (4)	25	2.00 (1.35–2.97)	1.77 (1.07–2.92)
Others	351 (3)	26	2.64 (1.70–4.11)	2.57 (1.37–4.81)
Combination of brands of acetabular and femoral components in MoM THAs. The combination Recap/Bi-Metric was the most prevalent and was therefore used as reference				
Recap/Bi-Metric	4,990 (43)	138	1 (ref.)	1 (ref.)
M2a/Bi-Metric	2,407 (21)	95	1.29 (0.95–1.76)	2.11 (1.14–3.89)
Pinnacle/Corail	910 (8)	31	1.35 (0.97–1.88)	1.44 (0.49–4.22)
Conserve Plus/Profemur	418 (4)	18	1.71 (1.10–2.65)	1.57 (0.92–2.70)
ASR/Summit	401 (3)	56	7.09 (5.17–9.72)	8.15 (5.06–13.1)
Birmingham/Synergy	369 (3)	10	1.19 (0.56–2.53)	1.36 (0.53–3.51)
ASR/Corail	307 (3)	35	5.59 (3.88–8.06)	5.24 (3.39–8.09)
Others	1,765 (15)	87	1.98 (1.51–2.60)	1.95 (1.22–3.10)

Table 5. Distribution of femoral head size for different designs of acetabular components. Values are numbers of patients and percentages (%) within each acetabular component

	Femoral head size, mm						
	≤ 37	38–39	40–43	44–47	48–51	≥ 52	Total
Recap	23 (0)	24 (0)	268 (5)	1,487 (28)	2,116 (40)	1,466 (27)	5,384
M2a	22 (1)	2,283 (86)	3 (0)	76 (3)	150 (6)	118 (4)	2,652
Pinnacle	695 (75)	1 (0)	196 (21)	25 (3)	6 (1)	2 (0)	925
ASR	14 (2)	3 (0)	37 (5)	298 (39)	258 (34)	149 (20)	759
Birmingham	3 (1)	1 (0)	63 (12)	184 (35)	179 (34)	91 (18)	521
Durom	17 (3)	3 (1)	46 (9)	156 (31)	172 (35)	103 (21)	497
Conserve Plus	4 (1)	0 (0)	50 (10)	146 (31)	184 (38)	94 (20)	478
Others	171 (49)	2 (1)	16 (5)	59 (17)	59 (16)	44 (12)	351
Total	949 (8)	2,317 (20)	679 (6)	2,431 (21)	3,124 (27)	2,067 (18)	11,567

Table 7. Main indications for total hip arthroplasty (THA) revisions. For each type of THA bearing, the number and percentage (%) of the total number of THAs for each specific cause of revision is given. Bearings included metal-on-metal (MoM) and metal-on-polyethylene (MoP)

	MoM n = 470 (%)	MoP n = 766 (%)	p-value
Aseptic loosening	218 (1.9)	121 (0.6)	< 0.001
Deep infection	66 (0.6)	127 (0.6)	0.7
Periprosthetic femoral fracture	57 (0.5)	122 (0.6)	0.3
Dislocation	39 (0.3)	276 (1.3)	< 0.001
Pain only	19 (0.2)	28 (0.1)	0.5
Other	71 (0.6)	92 (0.4)	0.03