

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

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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.) |

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) | 1.53 (1.01–2.47) | 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 | | | | | | Total |
|---------------|-----------------------|------------|----------|------------|------------|------------|--------|
| | ≤ 37 | 38–39 | 40–43 | 44–47 | 48–51 | ≥ 52 | |
| 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 | MoP | p-value |
|---------------------------------|-------------|-------------|---------|
| | n = 470 (%) | n = 766 (%) | |
| 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 |