

Australian Orthopaedic Association National Joint Replacement Registry

2023 SUPPLEMENTARY REPORT

Metal/Metal Bearing Surface in Total Conventional Hip Arthroplasty



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**Metal/Metal Bearing Surface in Total Conventional
Hip Arthroplasty**

2023 Supplementary Report

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The Registry greatly appreciates the participation of all joint replacement patients throughout Australia. Their contribution allows ongoing improvements in arthroplasty outcomes to be achieved.

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Summary

This report provides information on total conventional hip replacement procedures performed with metal/metal bearing surfaces.

All hip replacement procedures recorded by the Registry from the commencement date to 31 December 2022 have been included in this report.

Summary data on the use of metal/metal bearings are provided, along with outcomes (revision rate, reason for revision and type of revision) according to patient and implant characteristics (e.g. head size, age and gender).

The use of metal/metal conventional hip replacements peaked between 2006 and 2008 (when over 3,000 were implanted each year) and then rapidly declined, with no metal/metal THRs implanted since 2016.

The revision rate for metal/metal THRs is higher than for other bearing surfaces, but the high revision rate is mainly restricted to prostheses with head sizes >32mm.

The most common reason for revision of a primary metal/metal hip replacement is metal related pathology, followed by loosening and infection.

Metal/Metal

OUTCOME

Since 2008, the Registry has identified metal/metal bearing surface as having a higher rate of revision compared to metal/polyethylene. In 2010, metal/metal bearing surfaces were identified as having a higher rate of revision compared to all other bearing surfaces. In the same year the Registry first identified the important relationship between head size and revision of metal/metal prostheses.

To further evaluate the effect of head size with metal/metal bearing surface, an analysis was undertaken comparing two head size groups ($\leq 32\text{mm}$ and $>32\text{mm}$). Head sizes $>32\text{mm}$ are associated with an increased rate of revision compared to $\leq 32\text{mm}$ head sizes (Table MM2).

DEMOGRAPHICS

Metal/metal bearing surface has been used in 22,107 primary total conventional hip replacements (Table MM1 and Figure MM1).

There have been 4,756 revisions of metal/metal primary total conventional hip replacement; 558 revisions with $\leq 32\text{mm}$ and 4,198 revisions with $>32\text{mm}$ head sizes. The majority of revisions with head sizes $>32\text{mm}$ involve the acetabular component only (57.9%) followed by revision of both the femoral and acetabular components (18.7%). For metal/metal with head sizes $\leq 32\text{mm}$, revision of the femoral component is most common (30.3%) followed by revisions of the acetabular component (25.1%) (Table MM3).

The main reasons for revision of $>32\text{mm}$ head sizes are metal related pathology (47.3%), loosening (17.7%), infection (11.5%) and lysis (7.2%). The main reasons for revision of $\leq 32\text{mm}$ head sizes are loosening (26.9%), prosthesis dislocation/instability (17.7%), fracture (15.8%) and infection (14.0%) (Table MM4 and Figure MM2).

The Registry continues to report a relationship between age and head size. The rate of revision for head sizes $>32\text{mm}$ is higher regardless of age. For head sizes $>32\text{mm}$, patients aged <65 years have a higher rate of revision than patients aged ≥ 65 years after 4 years (Table MM5 and Figure MM3).

For head sizes $>32\text{mm}$, both males and females have a higher rate of revision, with females having the highest rate. When head sizes $\leq 32\text{mm}$ are used, males have a lower rate of revision compared to females (Table MM6 and Figure MM4).

The differences in the reasons for revision between metal/metal and metal/polyethylene are more evident in metal/metal prostheses with $>32\text{mm}$ head sizes. Metal related pathology is largely confined to $>32\text{mm}$ head sizes. The cumulative incidence of metal related pathology at 15 years is 12.5% for head sizes $>32\text{mm}$ and 1.0% for head sizes $\leq 32\text{mm}$. The incidence of metal related pathology is potentially higher as it is possible that undiagnosed metal related pathology contributes to the increased rate of loosening and infection reported in metal/metal prostheses with larger head sizes (Figure MM5).

In order to determine if the higher revision rate of metal/metal prostheses with $>32\text{mm}$ head sizes is prosthesis specific, the Registry has analysed all prosthesis head/acetabular combinations that have a head size $>32\text{mm}$ and have >200 procedures. There are 13 combinations that meet these criteria. The cumulative percent revision ranges from 7.4% to 45.3% at 10 years. In comparison, there are 8 head/acetabular combinations that have head sizes $\leq 32\text{mm}$ and >50 procedures. The cumulative percent revision at 10 years ranges from 1.6% to 11.7% (Table MM7 and Table MM8).

Table MM1 Number of Revisions of Metal/Metal Primary Total Conventional Hip Replacement by Head Size and Year of Implant (All Diagnoses)

Year of Implant	≤32mm		>32mm	
	Number Revised	Total Number	Number Revised	Total Number
1999	0	7	6	12
2000	17	141	18	34
2001	57	662	41	113
2002	79	896	21	138
2003	60	653	62	421
2004	60	647	179	952
2005	72	643	457	1915
2006	46	493	791	2828
2007	42	471	896	3220
2008	38	419	969	3282
2009	33	311	536	2078
2010	21	184	181	955
2011	14	94	37	298
2012	9	77	2	34
2013	5	40	2	14
2014	5	51	0	5
2015	0	18	0	1
2016				
2017				
2018				
2019				
2020				
2021				
2022				
TOTAL	558	5807	4198	16300

Note: The number of revisions refers to the revisions of primaries undertaken in that year

Figure MM1 Metal/Metal Primary Total Conventional Hip Replacement by Head Size (All Diagnoses)

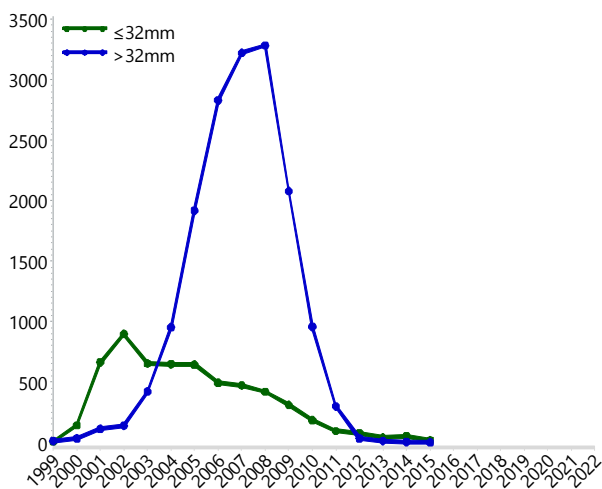


Table MM2 Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Head Size (All Diagnoses)

Type	Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Metal/Metal	≤32mm	558	5807	1.8 (1.5, 2.2)	3.5 (3.1, 4.0)	4.6 (4.1, 5.2)	7.1 (6.4, 7.8)	9.9 (9.1, 10.8)	12.1 (11.1, 13.2)
	>32mm	4198	16300	1.8 (1.6, 2.0)	5.6 (5.3, 6.0)	11.6 (11.1, 12.1)	22.5 (21.8, 23.1)	28.6 (27.8, 29.3)	32.9 (31.2, 34.7)
TOTAL		4756	22107						

Table MM3 Type of Revision of Metal/Metal Primary Total Conventional Hip Replacement by Head Size (All Diagnoses)

Type of Revision	Number	≤32mm		>32mm		
		% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Acetabular Component	140	2.4	25.1	2431	14.9	57.9
THR (Femoral/Acetabular)	82	1.4	14.7	784	4.8	18.7
Head/Insert	101	1.7	18.1	350	2.1	8.3
Femoral Component	169	2.9	30.3	312	1.9	7.4
Cement Spacer	21	0.4	3.8	162	1.0	3.9
Head Only	22	0.4	3.9	80	0.5	1.9
Head/Neck/Insert	8	0.1	1.4	37	0.2	0.9
Minor Components	9	0.2	1.6	23	0.1	0.5
Removal of Prostheses	3	0.1	0.5	7	0.0	0.2
Head/Neck	2	0.0	0.4	4	0.0	0.1
Bipolar Head and Femoral				2	0.0	0.0
Insert Only	1	0.0	0.2	2	0.0	0.0
Bipolar Only				1	0.0	0.0
Neck Only				1	0.0	0.0
Reinsertion of Components				1	0.0	0.0
Saddle				1	0.0	0.0
N Revision	558	9.6	100.0	4198	25.8	100.0
N Primary	5807			16300		

Table MM4 Revision Diagnosis of Metal/Metal Primary Total Conventional Hip Replacement by Head Size (All Diagnoses)

Revision Diagnosis	Number	≤32mm		>32mm		
		% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Metal Related Pathology	60	1.0	10.8	1984	12.2	47.3
Loosening	150	2.6	26.9	745	4.6	17.7
Infection	78	1.3	14.0	484	3.0	11.5
Lysis	33	0.6	5.9	301	1.8	7.2
Fracture	88	1.5	15.8	226	1.4	5.4
Prosthesis Dislocation/Instability	99	1.7	17.7	141	0.9	3.4
Pain	13	0.2	2.3	128	0.8	3.0
Implant Breakage Stem	5	0.1	0.9	56	0.3	1.3
Leg Length Discrepancy	7	0.1	1.3	21	0.1	0.5
Wear Acetabulum				19	0.1	0.5
Implant Breakage Acetabular	5	0.1	0.9	16	0.1	0.4
Incorrect Sizing	5	0.1	0.9	12	0.1	0.3
Malposition	4	0.1	0.7	11	0.1	0.3
Tumour				10	0.1	0.2
Synovitis	1	0.0	0.2	4	0.0	0.1
Implant Breakage Acetabular Insert	1	0.0	0.2	3	0.0	0.1
Osteonecrosis				3	0.0	0.1
Wear Acetabular Insert	3	0.1	0.5	2	0.0	0.0
Heterotopic Bone				1	0.0	0.0
Implant Breakage Head				1	0.0	0.0
Other	6	0.1	1.1	30	0.2	0.7
N Revision	558	9.6	100.0	4198	25.8	100.0
N Primary	5807			16300		

Figure MM2 Cumulative Incidence Revision Diagnosis of Metal/Metal Primary Total Conventional Hip Replacement by Head Size (All Diagnoses)

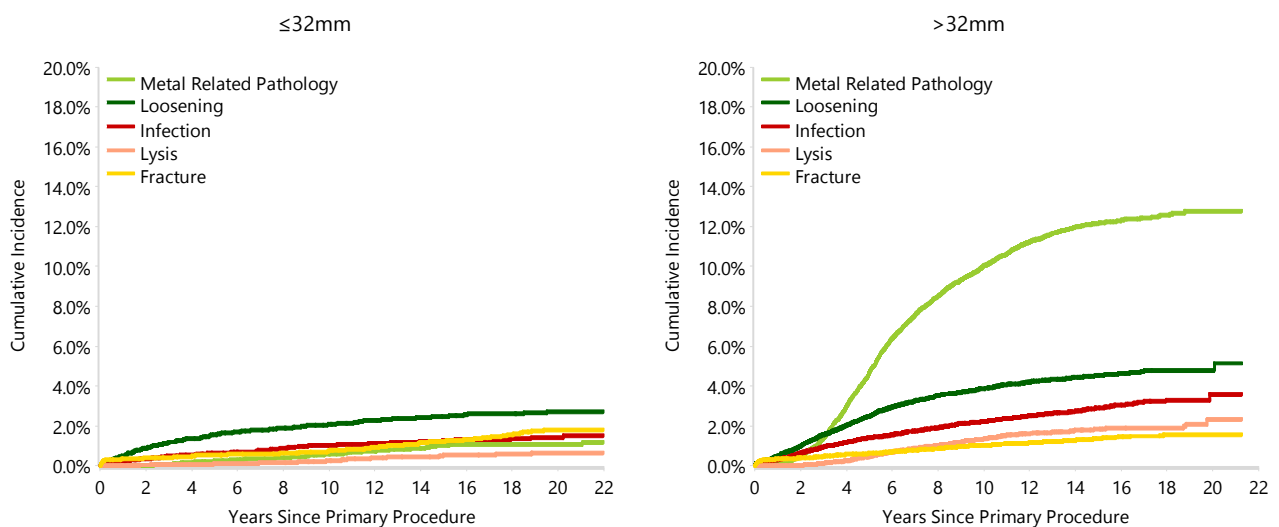
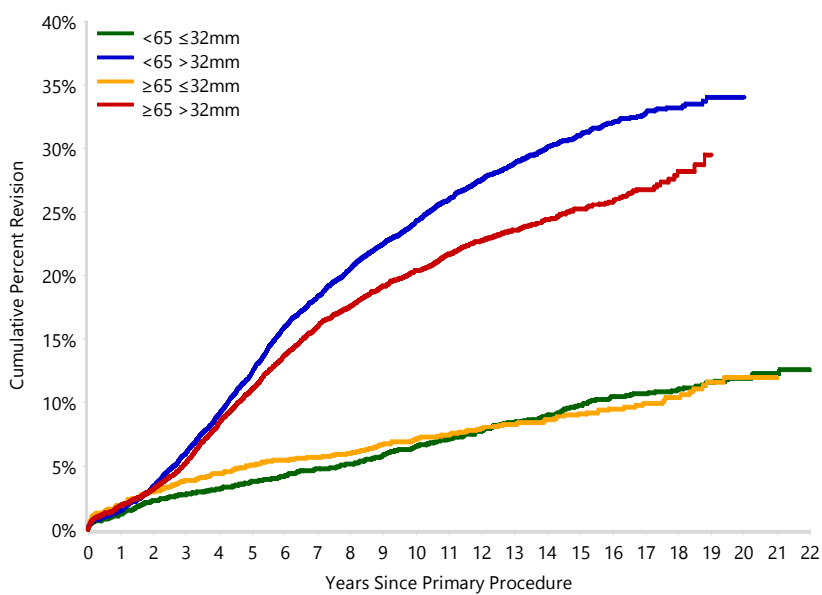


Table MM5 Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Age and Head Size (Primary Diagnosis OA)

Age	Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<65		2573	10348	1.5 (1.2, 1.7)	5.2 (4.8, 5.7)	10.1 (9.6, 10.8)	19.7 (18.9, 20.5)	25.5 (24.6, 26.4)	28.0 (27.0, 29.1)
	≤32mm	275	2698	1.3 (0.9, 1.8)	2.8 (2.3, 3.5)	3.8 (3.2, 4.6)	6.5 (5.7, 7.6)	9.8 (8.7, 11.0)	11.9 (10.6, 13.4)
	>32mm	2298	7650	1.5 (1.3, 1.8)	6.1 (5.6, 6.6)	12.4 (11.7, 13.1)	24.3 (23.3, 25.3)	31.0 (30.0, 32.1)	34.0 (32.6, 35.5)
≥65		1665	9219	1.9 (1.7, 2.2)	4.9 (4.5, 5.4)	9.4 (8.9, 10.1)	16.8 (16.0, 17.6)	20.9 (20.0, 21.8)	24.2 (22.8, 25.8)
	≤32mm	207	2445	1.9 (1.5, 2.6)	3.9 (3.2, 4.7)	5.1 (4.3, 6.0)	7.1 (6.1, 8.2)	9.1 (7.9, 10.4)	12.0 (10.2, 14.0)
	>32mm	1458	6774	1.9 (1.6, 2.3)	5.3 (4.8, 5.9)	11.0 (10.3, 11.8)	20.4 (19.4, 21.4)	25.2 (24.1, 26.4)	
TOTAL		4238	19567						

Figure MM3 Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Age and Head Size (Primary Diagnosis OA)



HR - adjusted for gender

<65 ≤32mm vs <65 >32mm

- 0 - 2Wk: HR=0.59 (0.25, 1.37), p=0.218
- 2Wk - 2Yr: HR=0.64 (0.48, 0.85), p=0.002
- 2Yr - 5Yr: HR=0.16 (0.12, 0.22), p<0.001
- 5Yr - 5.5Yr: HR=0.05 (0.02, 0.16), p<0.001
- 5.5Yr - 6Yr: HR=0.16 (0.08, 0.32), p<0.001
- 6Yr - 6.5Yr: HR=0.25 (0.13, 0.48), p<0.001
- 6.5Yr - 7.5Yr: HR=0.08 (0.04, 0.18), p<0.001
- 7.5Yr+: HR=0.34 (0.29, 0.41), p<0.001

<65 ≤32mm vs ≥65 ≤32mm

- 0 - 5.5Yr: HR=0.72 (0.56, 0.94), p=0.013
- 5.5Yr+: HR=1.46 (1.12, 1.91), p=0.005

<65 >32mm vs ≥65 >32mm

- 0 - 4Yr: HR=1.11 (0.99, 1.24), p=0.064
- 4Yr+: HR=1.37 (1.26, 1.48), p<0.001

≥65 ≤32mm vs ≥65 >32mm

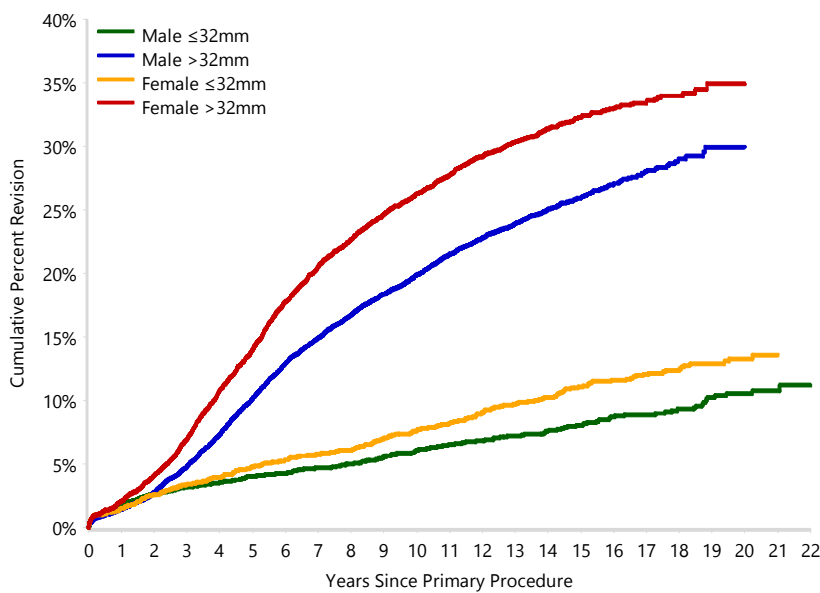
- 0 - 2Yr: HR=0.95 (0.74, 1.21), p=0.662
- 2Yr - 3Yr: HR=0.39 (0.26, 0.57), p<0.001
- 3Yr - 4Yr: HR=0.18 (0.12, 0.25), p<0.001
- 4Yr - 5.5Yr: HR=0.22 (0.16, 0.30), p<0.001
- 5.5Yr - 6Yr: HR=0.10 (0.05, 0.21), p<0.001
- 6Yr - 6.5Yr: HR=0.19 (0.11, 0.35), p<0.001
- 6.5Yr - 7Yr: HR=0.08 (0.03, 0.19), p<0.001
- 7Yr+: HR=0.31 (0.24, 0.40), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
<65	≤32mm	2698	2655	2578	2520	2287	1690	594
	>32mm	7650	7511	7098	6542	5424	2667	76
≥65	≤32mm	2445	2366	2262	2134	1667	961	193
	>32mm	6774	6552	6118	5439	3882	1498	24

Table MM6 Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Gender and Head Size (Primary Diagnosis OA)

Gender	Head Size	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male		2188	11059	1.5 (1.3, 1.7)	4.4 (4.1, 4.8)	8.7 (8.2, 9.2)	16.6 (15.9, 17.3)	21.6 (20.8, 22.5)	24.8 (23.7, 26.0)
	≤32mm	216	2673	1.7 (1.2, 2.2)	3.2 (2.6, 4.0)	4.0 (3.4, 4.9)	6.1 (5.2, 7.1)	8.1 (7.0, 9.3)	10.5 (9.2, 12.1)
	>32mm	1972	8386	1.4 (1.2, 1.7)	4.8 (4.4, 5.3)	10.1 (9.5, 10.8)	19.9 (19.0, 20.8)	25.9 (24.9, 27.0)	30.0 (28.2, 31.7)
Female		2050	8508	1.9 (1.6, 2.2)	5.9 (5.4, 6.5)	11.3 (10.7, 12.0)	20.8 (19.9, 21.7)	26.1 (25.1, 27.1)	28.3 (27.1, 29.6)
	≤32mm	266	2470	1.5 (1.1, 2.1)	3.4 (2.8, 4.2)	4.8 (4.0, 5.7)	7.6 (6.6, 8.8)	11.1 (9.8, 12.5)	13.3 (11.8, 15.0)
	>32mm	1784	6038	2.1 (1.7, 2.5)	7.0 (6.3, 7.6)	14.0 (13.1, 14.9)	26.3 (25.1, 27.4)	32.3 (31.0, 33.6)	34.9 (33.2, 36.7)
TOTAL		4238	19567						

Figure MM4 Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement by Gender and Head Size (Primary Diagnosis OA)



HR - adjusted for age

Male ≤32mm vs Male >32mm

0 - 2Yr: HR=0.91 (0.70, 1.17), p=0.439
 2Yr - 5Yr: HR=0.18 (0.13, 0.25), p<0.001
 5Yr - 6Yr: HR=0.08 (0.03, 0.17), p<0.001
 6Yr - 7.5Yr: HR=0.15 (0.08, 0.26), p<0.001
 7.5Yr - 8.5Yr: HR=0.27 (0.15, 0.48), p<0.001
 8.5Yr - 11.5Yr: HR=0.29 (0.20, 0.42), p<0.001
 11.5Yr - 12Yr: HR=0.07 (0.01, 0.51), p=0.008
 12Yr+: HR=0.42 (0.31, 0.57), p<0.001

Male ≤32mm vs Female ≤32mm

Entire Period: HR=0.75 (0.63, 0.90), p=0.001

Male >32mm vs Female >32mm

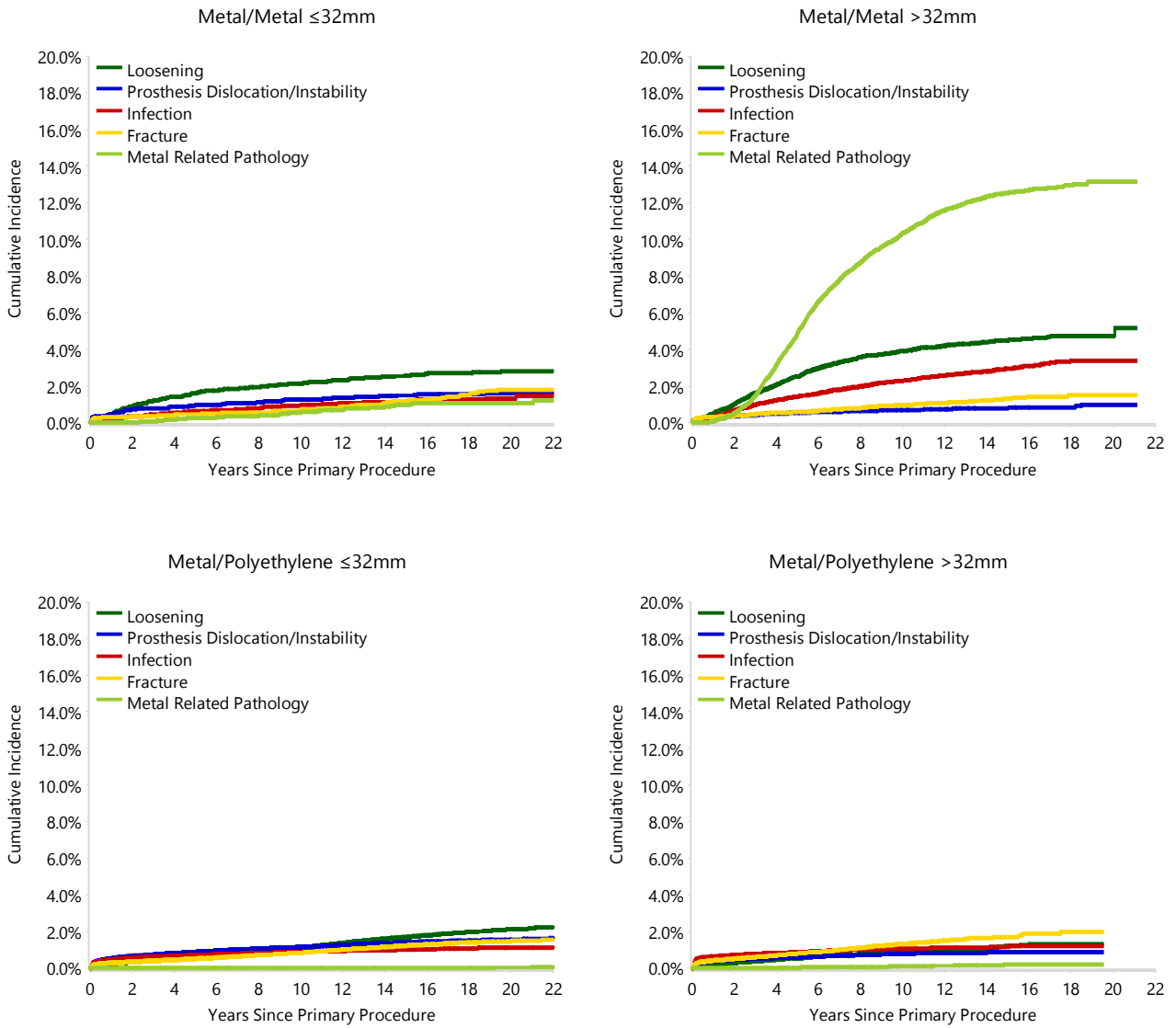
Entire Period: HR=0.74 (0.69, 0.79), p<0.001

Female ≤32mm vs Female >32mm

0 - 2Yr: HR=0.71 (0.57, 0.89), p=0.003
 2Yr - 2.5Yr: HR=0.35 (0.23, 0.53), p<0.001
 2.5Yr - 3Yr: HR=0.22 (0.15, 0.34), p<0.001
 3Yr - 6.5Yr: HR=0.15 (0.12, 0.19), p<0.001
 6.5Yr - 7.5Yr: HR=0.08 (0.05, 0.16), p<0.001
 7.5Yr - 8Yr: HR=0.31 (0.21, 0.45), p<0.001
 8Yr - 9.5Yr: HR=0.32 (0.25, 0.41), p<0.001
 9.5Yr - 11.5Yr: HR=0.35 (0.28, 0.45), p<0.001
 11.5Yr+: HR=0.43 (0.35, 0.55), p<0.001

Number at Risk		0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Male	≤32mm	2673	2603	2498	2403	2019	1351	452
	>32mm	8386	8189	7737	7075	5596	2431	52
Female	≤32mm	2470	2418	2342	2251	1935	1300	335
	>32mm	6038	5874	5479	4906	3710	1734	48

Figure MM5 Cumulative Incidence Revision Diagnosis of Metal/Metal and Metal/Polyethylene Primary Total Conventional Hip Replacement by Head Size (Primary Diagnosis OA)



Note: Metal/Polyethylene includes both non cross-linked and cross-linked polyethylene

Table MM7 Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement using Head Size ≤32mm by Head and Acetabular Surface (Primary Diagnosis OA)

Head Surface	Acetabular Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
Articul/Eze	PINNACLE	14	105	1.0 (0.1, 6.6)	3.8 (1.5, 9.9)	4.8 (2.0, 11.2)	8.0 (4.1, 15.4)	13.2 (7.7, 22.2)	
Metamys	CBF Cup	9	84	0.0 (0.0, 0.0)	2.4 (0.6, 9.3)	3.6 (1.2, 10.8)	6.1 (2.6, 14.0)	10.4 (5.3, 19.8)	12.1 (6.4, 22.1)
Metasul	Armor	19	312	0.6 (0.2, 2.5)	1.6 (0.7, 3.8)	1.9 (0.9, 4.3)	2.7 (1.3, 5.3)	5.5 (3.3, 9.0)	7.5 (4.8, 11.6)
	Metasul	362	4014	1.6 (1.2, 2.0)	3.3 (2.8, 3.9)	4.5 (3.9, 5.2)	6.9 (6.1, 7.7)	9.4 (8.5, 10.4)	11.6 (10.4, 12.9)
S-Rom	S-Rom	4	129	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	1.6 (0.4, 6.2)	2.5 (0.8, 7.4)	3.4 (1.3, 8.9)
Stanmore	Ringloc	15	90	1.1 (0.2, 7.6)	4.5 (1.7, 11.5)	4.5 (1.7, 11.5)	10.4 (5.6, 19.1)	13.1 (7.4, 22.4)	17.8 (10.9, 28.5)
Taperloc	M2a	4	54	0.0 (0.0, 0.0)	1.9 (0.3, 12.4)	3.7 (0.9, 14.0)	5.7 (1.9, 16.6)	7.8 (3.0, 19.4)	7.8 (3.0, 19.4)
Transcend	Lineage	12	96	5.2 (2.2, 12.1)	6.4 (2.9, 13.6)	7.5 (3.6, 15.1)	8.7 (4.4, 16.6)	15.0 (8.7, 25.3)	15.0 (8.7, 25.3)
Other (31)		43	259	3.5 (1.8, 6.6)	5.8 (3.6, 9.5)	7.0 (4.5, 10.9)	11.7 (8.3, 16.4)	16.0 (11.9, 21.4)	21.8 (15.9, 29.5)
TOTAL		482	5143						

Note: Only prostheses with >50 procedures have been listed

Table MM8 Cumulative Percent Revision of Metal/Metal Primary Total Conventional Hip Replacement using Head Size >32mm by Head and Acetabular Surface (Primary Diagnosis OA)

Head Surface	Acetabular Surface	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	20 Yrs
ASR	ASR	1885	3982	1.8 (1.4, 2.2)	9.8 (8.9, 10.7)	24.9 (23.5, 26.2)	45.3 (43.7, 46.9)	51.7 (50.1, 53.4)	
Articul/Eze	PINNACLE	216	1627	1.9 (1.3, 2.6)	3.0 (2.3, 4.0)	4.9 (3.9, 6.1)	10.6 (9.1, 12.2)	14.3 (12.5, 16.3)	
BHR	BHR	424	2223	1.0 (0.7, 1.5)	3.3 (2.6, 4.1)	6.2 (5.2, 7.3)	14.6 (13.1, 16.2)	21.6 (19.7, 23.6)	
	R3	142	535	2.3 (1.3, 3.9)	7.4 (5.5, 10.0)	11.7 (9.2, 14.8)	21.7 (18.4, 25.6)		
BMHR	BHR	42	279	1.8 (0.7, 4.3)	3.9 (2.2, 7.0)	5.7 (3.6, 9.2)	12.5 (9.1, 17.0)		
Bionik	Bionik	99	377	3.7 (2.2, 6.2)	8.1 (5.8, 11.4)	15.3 (11.9, 19.4)	25.3 (21.0, 30.3)	30.3 (25.5, 35.9)	
Icon	Icon	96	341	2.4 (1.2, 4.7)	7.2 (4.9, 10.6)	12.5 (9.4, 16.6)	24.3 (19.9, 29.5)	32.3 (27.1, 38.2)	
M2a	M2a	119	780	1.8 (1.1, 3.0)	4.3 (3.1, 5.9)	6.5 (5.0, 8.5)	11.4 (9.3, 13.9)	15.9 (13.4, 18.9)	
M2a Magnum	Recap	102	924	1.5 (0.9, 2.6)	2.5 (1.7, 3.8)	4.3 (3.2, 5.9)	8.5 (6.8, 10.5)	12.1 (10.0, 14.6)	
Metasul	Durom	187	1100	1.2 (0.7, 2.0)	3.9 (2.9, 5.2)	5.6 (4.4, 7.2)	13.3 (11.4, 15.6)	18.3 (15.9, 20.9)	
Mitch TRH	Mitch TRH	150	648	1.7 (0.9, 3.0)	5.1 (3.7, 7.1)	8.5 (6.6, 10.9)	16.2 (13.5, 19.4)	26.9 (23.1, 31.0)	
Optimom	Cormet	130	702	1.4 (0.8, 2.6)	3.6 (2.4, 5.3)	5.1 (3.7, 7.0)	13.1 (10.7, 15.9)	21.3 (18.0, 25.2)	
S-Rom	PINNACLE	28	284	2.1 (1.0, 4.6)	3.5 (1.9, 6.5)	3.9 (2.2, 6.9)	7.4 (4.9, 11.3)	9.6 (6.6, 13.9)	
Other (23)		136	622	2.6 (1.6, 4.2)	6.4 (4.7, 8.6)	9.6 (7.5, 12.2)	16.4 (13.6, 19.7)	23.5 (20.0, 27.6)	28.9 (24.1, 34.4)
TOTAL		3756	14424						

Note: Only prostheses with >200 procedures have been listed

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