

Continuum Total Conventional Hip Investigation

Note: This analysis compares the Continuum acetabular prosthesis with all other total conventional hip prostheses.

This prosthesis has been identified as having a significantly higher rate of revision. For a detailed explanation of the process used by the Registry that results in identification of prostheses that have a higher than anticipated rate of revision please refer to the Prostheses with Higher than Anticipated Rates of Revision chapter of the most recent AOANJRR Annual Report, <https://aoanjrr.sahmri.com/annual-reports-2023>.

Note: Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator. Procedures using prostheses with no recorded use in 2022 are excluded from the comparator.

TABLE 1

Revision Rate of Primary Total Conventional Hip Replacement

The revision rate of the Continuum total conventional hip prosthesis is compared to all other total conventional hip prostheses.

Table 1: Revision Rates of Primary Total Conventional Hip Replacement

Component	N Revised	N Total	Obs. Years	Revisions/100 Obs. Yrs (95% CI)
Continuum	623	13870	95437	0.65 (0.60, 0.71)
Other Total Conventional Hip	17071	485237	3028895	0.56 (0.56, 0.57)
TOTAL	17694	499107	3124331	0.57 (0.56, 0.57)

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 2

Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement

The yearly cumulative percent revision of the Continuum total conventional hip prosthesis is compared to all other total conventional hip prostheses.

Table 2: Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement

CPR	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs
Continuum	2.7 (2.4, 2.9)	3.2 (2.9, 3.5)	3.5 (3.2, 3.8)	3.7 (3.4, 4.0)	3.9 (3.6, 4.3)	4.2 (3.8, 4.5)	4.6 (4.2, 4.9)	4.8 (4.4, 5.2)
Other Total Conventional Hip	1.7 (1.7, 1.8)	2.2 (2.1, 2.2)	2.5 (2.5, 2.5)	2.8 (2.7, 2.8)	3.1 (3.0, 3.1)	3.3 (3.3, 3.4)	3.6 (3.6, 3.7)	3.9 (3.8, 4.0)

CPR	9 Yrs	10 Yrs	11 Yrs	12 Yrs	13 Yrs	14 Yrs	15 Yrs
Continuum	5.0 (4.6, 5.4)	5.2 (4.8, 5.7)	5.5 (5.0, 6.0)	5.8 (5.3, 6.4)	5.8 (5.3, 6.4)		
Other Total Conventional Hip	4.2 (4.2, 4.3)	4.6 (4.5, 4.6)	4.9 (4.8, 5.0)	5.3 (5.2, 5.4)	5.7 (5.6, 5.8)	6.1 (6.0, 6.2)	6.5 (6.4, 6.6)

CPR	16 Yrs	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs	22 Yrs
Continuum							
Other Total Conventional Hip	6.9 (6.8, 7.1)	7.3 (7.1, 7.4)	7.6 (7.4, 7.8)	8.2 (8.0, 8.5)	8.5 (8.2, 8.8)	8.9 (8.5, 9.3)	9.3 (8.8, 9.8)

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

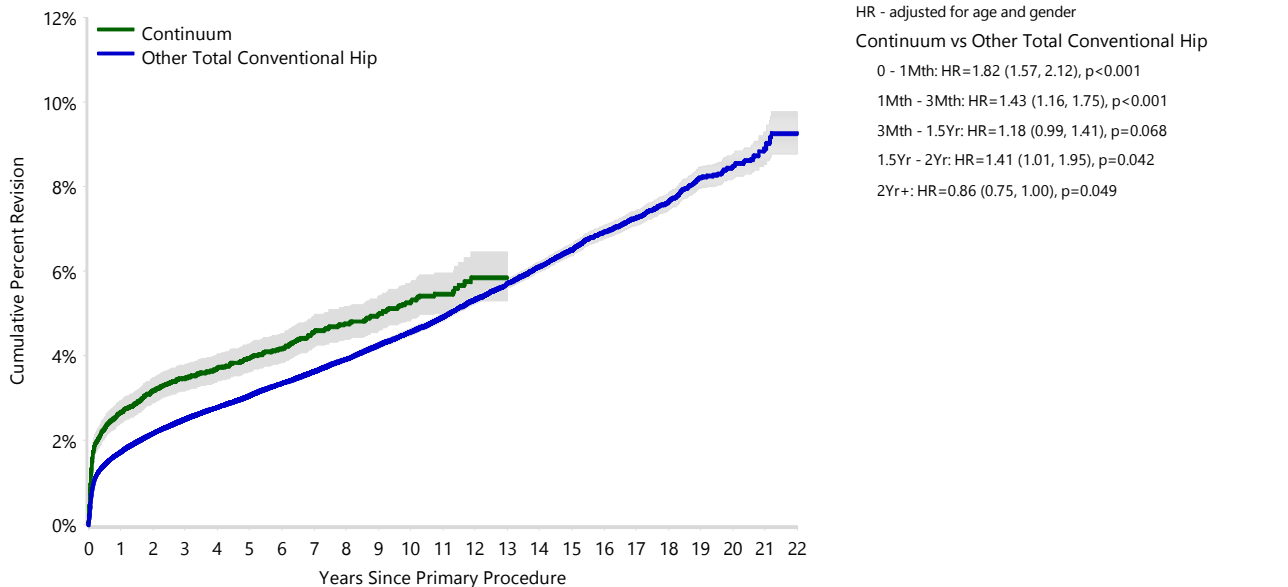
FIGURE 1

Yearly Cumulative Percent Revision of Primary Total Conventional Hip Replacement

The yearly cumulative percent revision of the Continuum total conventional hip prosthesis is compared to all other total conventional hip prostheses. In addition, hazard ratios are reported.

Hazard ratios are reported for specific time periods during which the hazard ratio is constant. This is done to enable more specific and valid comparisons of the risk of revision over time. The pattern of variation in risk has important implications with respect to the underlying reasons for any difference.

Figure 1: Cumulative Percent Revision of Primary Total Conventional Hip Replacement



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	7 Yrs	8 Yrs	9 Yrs	10 Yrs	11 Yrs
Continuum	13870	13183	12653	11939	10911	9614	8219	6854	5504	4145	2871	1816
Other Total Conventional Hip	485237	429125	380799	336933	293287	252783	215104	180264	149020	123350	101725	82991

Number at Risk	12 Yrs	13 Yrs	14 Yrs	15 Yrs	16 Yrs	17 Yrs	18 Yrs	19 Yrs	20 Yrs	21 Yrs	22 Yrs
Continuum	889	121	0	0	0	0	0	0	0	0	0
Other Total Conventional Hip	66439	51960	39538	29740	22330	16535	11402	7013	3737	1435	252

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 3**Primary Diagnosis for Revised Primary Total Conventional Hip Replacement**

This table identifies the diagnosis of the primary procedure which was subsequently revised. This information is provided as there is a variation on outcome depending on the primary diagnosis. It is therefore important when considering the reasons for a higher than anticipated rate of revision that there is identification of the primary diagnosis. This information should be compared to the primary diagnosis for the revisions of all other total conventional hip prostheses.

Table 3: Primary Diagnosis for Revised Primary Total Conventional Hip Replacement

Primary Diagnosis	Continuum		Other Total Conventional Hip	
	Number	Percent	Number	Percent
Osteoarthritis	519	83.3	14133	82.8
Fractured Neck Of Femur	46	7.4	1255	7.4
Osteonecrosis	25	4.0	777	4.6
Developmental Dysplasia	15	2.4	266	1.6
Rheumatoid Arthritis	6	1.0	182	1.1
Failed Internal Fixation	5	0.8	144	0.8
Tumour	2	0.3	144	0.8
Other Inflammatory Arthritis	2	0.3	97	0.6
Fracture/Dislocation	2	0.3	44	0.3
Arthrodesis Takedown			16	0.1
Other	1	0.2	13	0.1
TOTAL	623	100.0	17071	100.0

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 4

Reasons for Revision

This is reported in two ways: a percentage of primary procedures revised and as a percentage of all revision procedures.

% Primaries Revised: This shows the proportional contribution of each revision diagnosis as a percentage of the total number of primary procedures. This percentage can be used to approximate the risk of being revised for that diagnosis. Differing percentages between groups, with the same distribution of follow up time, may identify problems of concern.

% Revisions: The number of revisions for each diagnosis is expressed as a percentage of the total number of revisions. This shows the distribution of reasons for revision within a group but cannot be used as a comparison between groups.

Table 4: Primary Total Conventional Hip Replacement - Reason for Revision (Follow-up Limited to 13.3 Years)

Revision Diagnosis	Number	Continuum		Other Total Conventional Hip		
		% Primaries Revised	% Revisions	Number	% Primaries Revised	% Revisions
Infection	110	0.8	17.7	3866	0.8	23.5
Prosthesis Dislocation/Instability	234	1.7	37.6	3785	0.8	23.0
Fracture	129	0.9	20.7	3581	0.7	21.8
Loosening	67	0.5	10.8	3308	0.7	20.1
Pain	15	0.1	2.4	292	0.1	1.8
Leg Length Discrepancy	15	0.1	2.4	264	0.1	1.6
Malposition	17	0.1	2.7	230	0.0	1.4
Lysis	6	0.0	1.0	156	0.0	0.9
Implant Breakage Stem	3	0.0	0.5	153	0.0	0.9
Implant Breakage Acetabular Insert	5	0.0	0.8	114	0.0	0.7
Incorrect Sizing	7	0.1	1.1	100	0.0	0.6
Wear Acetabular Insert	1	0.0	0.2	72	0.0	0.4
Implant Breakage Acetabular	1	0.0	0.2	68	0.0	0.4
Metal Related Pathology	4	0.0	0.6	65	0.0	0.4
Wear Head	2	0.0	0.3	43	0.0	0.3
Tumour	1	0.0	0.2	40	0.0	0.2
Implant Breakage Head				28	0.0	0.2
Heterotopic Bone	1	0.0	0.2	25	0.0	0.2
Wear Acetabulum				8	0.0	0.0
Progression Of Disease				2	0.0	0.0
Osteonecrosis				1	0.0	0.0
Synovitis				1	0.0	0.0
Other	5	0.0	0.8	253	0.1	1.5
N Revision	623	4.5	100.0	16455	3.4	100.0
N Primary	13870			485237		

Note: This table is restricted to revisions within 13.3 years for all groups to allow a time-matched comparison of revisions.

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

FIGURE 2

Cumulative Incidence Revision Diagnosis of Primary Total Conventional Hip Replacement

This figure details the cumulative incidence of the most common reasons for revision. The five most common reasons for revision are included as long as each of these reasons account for more than 10 procedures or at least 5% of all revisions for the Continuum total conventional hip prosthesis. A comparative graph is provided of the cumulative incidence for the same reasons for revisions for all other total conventional hip prostheses.

Figure 2: Cumulative Incidence Revision Diagnosis for Primary Total Conventional Hip Replacement

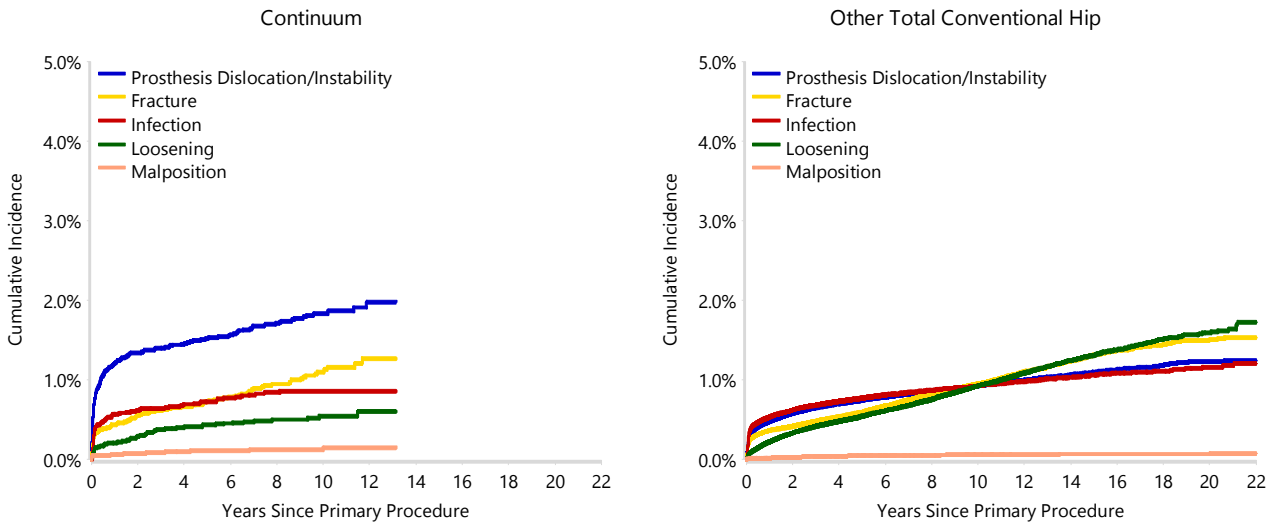


TABLE 5

Type of Revision Performed for Primary Total Conventional Hip Replacement

This analysis identifies the components used in the revision of the Continuum total conventional hip prosthesis and compares it to the components used in the revision of all other total conventional hip prostheses.

The reason this analysis is undertaken is to identify whether there is one or more components which are being replaced that differ from the components replaced for revisions of all other total conventional hip prostheses i.e. is there a difference in the type of revision undertaken for the Continuum total conventional hip prosthesis compared to all other total conventional hip prostheses.

Table 5: Primary Total Conventional Hip Replacement - Type of Revision (Follow-up Limited to 13.3 Years)

Type of Revision	Continuum		Other Total Conventional Hip	
	Number	Percent	Number	Percent
Femoral Component	187	30.0	5403	32.8
Acetabular Component	102	16.4	3095	18.8
THR (Femoral/Acetabular)	46	7.4	1874	11.4
Cement Spacer	21	3.4	596	3.6
Removal of Prostheses	1	0.2	91	0.6
Reinsertion of Components	1	0.2	26	0.2
Total Femoral			6	0.0
Bipolar Head and Femoral			5	0.0
Saddle			1	0.0
N Major	358	57.5	11097	67.4
Head/Insert	183	29.4	4071	24.7
Head Only	33	5.3	822	5.0
Minor Components	7	1.1	285	1.7
Insert Only	5	0.8	176	1.1
Head/Neck/Insert	23	3.7		
Head/Neck	11	1.8	1	0.0
Neck Only	3	0.5		
Bipolar Only			2	0.0
Cement Only			1	0.0
N Minor	265	42.5	5358	32.6
TOTAL	623	100.0	16455	100.0

Note: This table is restricted to revisions within 13.3 years for all groups to allow a time-matched comparison of revisions.

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 6

Revision Rates of Continuum Primary Total Conventional Hip Replacement by Fixation

This analysis is provided as some prostheses have more than one fixation option. Additionally there are prostheses where an alternative to the recommended approach to fixation was used e.g. a cementless prosthesis that has been cemented or vice-versa.

Table 6: Revised Number of Continuum Primary Total Conventional Hip Replacement by Fixation

Fixation	N Revised	N Total
Cemented	0	21
Cementless	399	9050
Hybrid (Femur Cemented)	222	4781
Reverse Hybrid (Femur Cementless)	2	18
TOTAL	623	13870

TABLE 7

Revision Rates of Continuum Primary Total Conventional Hip Replacement by Bearing Surface

This analysis is provided as some prostheses are combined with a variety of bearing surfaces. All bearing surfaces used with this prosthesis are listed.

Table 7: Revised Number of Continuum Primary Total Conventional Hip Replacement by Bearing Surface

Bearing Surface	N Revised	N Total
Ceramic/Ceramic	96	2253
Ceramic/Non XLPE	0	1
Ceramic/XLPE	136	3491
Ceramic/XLPE + Antioxidant	17	594
Metal/Metal	9	117
Metal/XLPE	350	6959
Metal/XLPE + Antioxidant	12	434
Ceramicised Metal/XLPE	3	16
Ceramicised Metal/XLPE + Antioxidant	0	1
Unknown	0	4
TOTAL	623	13870

TABLE 8**Revision Rates of Continuum Primary Total Conventional Hip Replacement by Approach**

This analysis is provided as some prostheses are used with a variety of surgical approaches. All surgical approaches used with this prosthesis are listed.

Table 8: Revised Number of Continuum Primary Total Conventional Hip Replacement by Approach

Approach	N Revised	N Total
Anterior	17	601
Lateral	87	1876
Posterior	155	4080
TOTAL	259	6557

Note: Excludes 7313 procedures with no approach recorded

TABLE 9

Revision Rates of Primary Total Conventional Hip Replacement by State

This enables a state by state variation to be identified for the Continuum total conventional hip prosthesis and provides the comparative data for each of the states for all other total conventional hip prostheses.

The purpose of this analysis is to determine if the higher than anticipated rate of revision has widespread distribution between states. If there is widespread distribution then the reason for the higher than anticipated rate of revision is unlikely to be surgeon specific. If the prosthesis has been used in only a small number of states it is not possible to distinguish if the higher than anticipated rate of revision is related to the prosthesis, surgeon, technique or patient.

Table 9: Revised Number of Primary Total Conventional Hip Replacement by State

Component	State	N Revised	N Total
Continuum	NSW	238	6269
	VIC	137	2167
	QLD	87	2601
	WA	71	1065
	SA	28	466
	TAS	8	362
	ACT/NT	54	940
Other Total Conventional Hip	NSW	4569	140269
	VIC	4278	127174
	QLD	3392	85445
	WA	2348	58173
	SA	1601	45237
	TAS	399	16235
	ACT/NT	484	12704
TOTAL		17694	499107

Note: Prostheses no longer used in 2022 are excluded from the comparator. Procedures using metal/metal prostheses with head size larger than 32mm are excluded from the comparator.

TABLE 10**Number of Revisions of Continuum Primary Total Conventional Hip Replacement by Year of Implant**

This analysis details the number of prostheses reported each year to the Registry for the Continuum total conventional hip prosthesis. It also provides the subsequent number of revisions of the primaries reported in that year.

Primary procedures performed in later years have had less follow up time therefore the number revised is expected to be less than the number revised in earlier years. For example, a primary procedure performed in 2022 has a maximum of one year to be revised, whereas a primary procedure performed in 2020 has a maximum of three years to be revised.

Table 10: Number of Revisions of Continuum Primary Total Conventional Hip Replacement by Year of Implant

Year of Implant	Number Revised	Total Number
2009	9	175
2010	68	1117
2011	72	1245
2012	57	1331
2013	81	1504
2014	62	1492
2015	62	1359
2016	56	1327
2017	43	1293
2018	47	1197
2019	31	850
2020	21	513
2021	10	289
2022	4	178
TOTAL	623	13870

TABLE 11

Revision Rates of Continuum Primary Total Conventional Hip Replacement by Catalogue Number Range

Many prostheses have a number of catalogue ranges. The catalogue range is specific to particular design features; more than one catalogue range usually indicates a minor difference in design in a particular Continuum prosthesis.

This analysis has been undertaken to determine if the revision rate varies according to the catalogue number range.

Model	Catalogue Range	Catalogue Description	Cement	Material	Fixation
Acetabular					
Continuum	00875704000-00875708000	CONTINUUM ACETABULAR SYSTEM TRABECULAR METAL SHELL WITH UNI-HOLE POROUS	NO	METAL	HIGHLY POROUS
Continuum	00875704002-00875708002	CONTINUUM ACETABULAR SYSTEM TRABECULAR METAL SHELL WITH MULTI HOLES POROUS	NO	METAL	HIGHLY POROUS
Continuum	00875704401-00875708001	CONTINUUM ACETABULAR SYSTEM TRABECULAR METAL SHELL WITH CLUSTER HOLES POROUS	NO	METAL	HIGHLY POROUS

Table 11: Revised Number of Continuum Primary Total Conventional Hip Replacement by Catalogue Number Range

Acetabular Range	N Revised	N Total
00875704000-00875708000	43	941
00875704002-00875708002	16	201
00875704401-00875708001	564	12728
TOTAL	623	13870

TABLE 12

Revision Rates of Continuum Primary Total Conventional Hip Replacement by Component

A prosthesis may be combined with multiple components. This analysis has been undertaken to determine if the revision rate varies according to the component with which it is combined.

Table 12: Revised Number of Continuum Primary Total Conventional Hip Replacement by Femoral Stem Component

Femoral Stem Component	N Revised	N Total
Absolut	3	76
Accolade I	0	1
Accolade II	0	1
AcuMatch M-Series	0	3
Alloclassic	22	343
Anatomic II	7	246
Anthology	0	2
Apex	0	1
Arcos	1	18
Avenir	68	1819
C-Stem AMT	1	1
CLS	7	158
CORAIL	3	66
CPCS	0	13
CPT	186	3407
Echelon	0	3
Echo	0	1
Epoch	0	3
Exeter V40	8	241
KAR	0	1
M/L Taper	68	1694
ML Taper Kinectiv	106	2246
MS 30	20	987
MasterLoc	0	1
Mayo	0	7
Metafix	1	2
Mets	1	2
Natural Hip	0	18
Omnifit	1	7
Paragon	0	1
Polarstem	1	4
Profemur XM	0	1
Quadra-C	0	1
Quadra-H	1	5
Revitan	0	2
S-Rom	3	31
SL-Plus	1	2
Secur-Fit	2	39
Segmental System	0	7
Short Exeter V40	0	3
Sirius	0	22

Femoral Stem Component	N Revised	N Total
Spectron EF	0	1
Synergy	1	4
Taper Fit	0	2
Taperloc	19	792
Taperloc Microplasty	18	584
Trabecular Metal	53	701
VerSys	10	147
VerSys Heritage	0	1
Wagner	8	78
ZMR	3	74
TOTAL	623	13870