2003 - 2008
Data Analysis

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slovakian
arthroplasty
register

Six Years of Slovakian Arthroplasty Register

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Foreword

Czechoslovakia is to be congratulated on introducing both total hip and total knee arthroplasty in the late 1960s and early 1970s despite the isolation and restrictions imposed by the USSR and „the Iron Curtain". The founding principles of Charnley were embraced at an early stage, and his low friction arthroplasty was introduced by Prof. Makai in 1972.

Early progress was hampered by lack of opportunity for „scientific cross-fertilisation", although there was a sound foundation of the practice of hip arthroplasty when Slovakia regained her autonomy.

It says much for the foresight of the orthopaedic community that Slovakia were amongst the forerunners to emulate their Scandinavian colleagues and establish a national implant registry in 2002. This is currently being validated against two other comprehensive national databases.

The registry provides important data reflecting national demographics - an ageing population - and will also identify changing trends in the millennium patient, with ever younger patients presenting for total hip replacement.

Assessment of the efficacy of the arthroplasty practice profile can only be accurately performed with robust data. Factors effecting the outcome will include the surgeon, the implant, the hospital, the approach etc. Multivariate analysis will enable the registry to determine whether a given prosthesis is effective.

It is gratifying that early data from the register confirms that the results of total hip arthroplasty in Slovakia are as good as anywhere in the world.

Healthcare economics - in the face of an economic downturn and increasing healthcare costs - dictate that any replacement arthroplasty should not only be effective, but also cost-effective. This will then constitute evidence based medicine. The Slovakian Arthroplasty Registry already goes a long way in producing the required data that will deliver this holy grail.

Dr. Libor Necas and the steering group of the SAR, together with all the participating surgeons, are to be congratulated on their initiative and perseverance in establishing a national joint registry that will monitor and improve the standards of arthroplasty surgery in Slovakia.

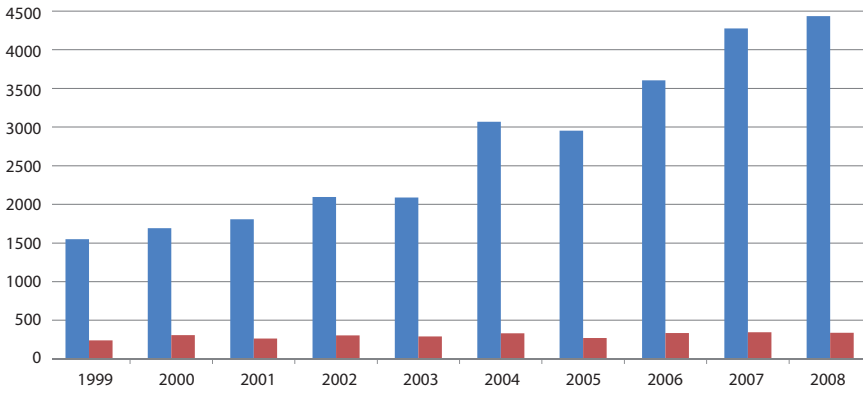
Prof. Ian Learmonth

Content

The History of the Arthroplasty in Slovak Republic

In the late 60s and 70s of the twentieth century, imported implants for the hip and knee joint were introduced, in addition to implants from Czechoslovakia. In 1972, thanks to Prof. František Makai, the Charnley low friction arthroplasty was also introduced. At the same time, in the Czech Republic, Poldi devised a cemented arthroplasty that was widely introduced in the Slovakian orthopaedic departments. In the 80s, a non-cemented arthroplasty by Walter-Motorlet was manufactured and introduced into clinical practice.
Thanks to all these events, the evolution of this new orthopedic procedure was well recognized throughout all departments in the late 90s. The following illustration charts the growth of these procedures for the hip joint in Slovakia.

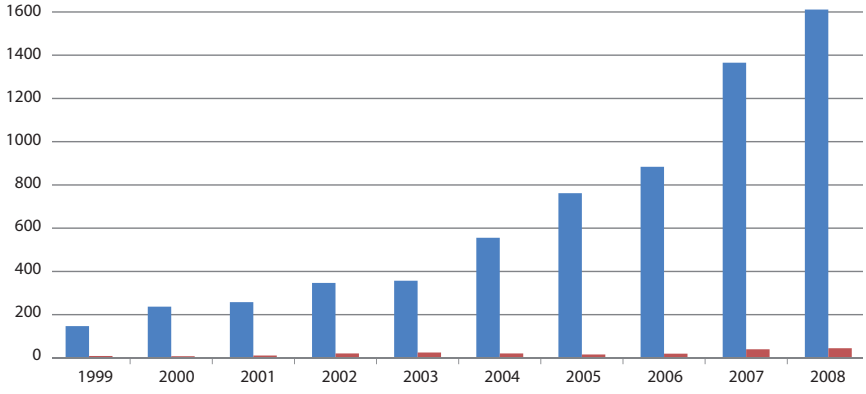
	Primary	Revision
1999	1,550	242
2000	1,693	307
2001	1,808	263
2002	2,095	304
2003	2,087	293
2004	3,068	333
2005	2,953	270
2006	3,602	336
2007	4,274	347
2008	4,435	339



Evolution of the hip join arthroplasty in Slovak republic *Table and figure No. 1*

Data from 1999 to 2002 – Chief Orthopedic Surgeon of the Ministry of the Health, data for the years 2003-2008 – SAR

	Primary	Revision
1999	147	9
2000	237	8
2001	258	11
2002	347	21
2003	357	25
2004	556	21
2005	762	16
2006	884	20
2007	1,365	40
2008	1,611	45

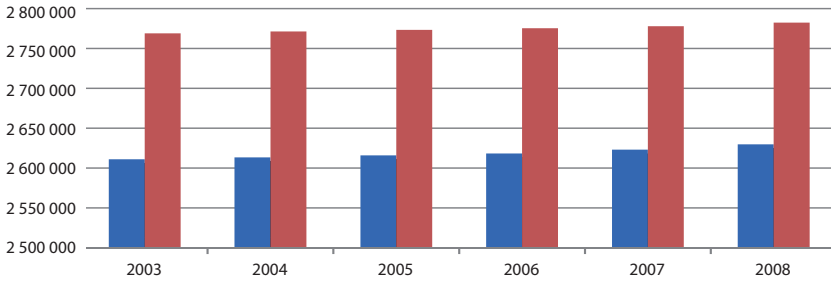


Evolution of the knee join arthroplasty in Slovak republic *Table and figure No. 2*

Data from 1999 to 2005 - Chief Orthopedic Surgeon of the Ministry of the Health, data for the years 2006-2008 - SAR

The demographic growth is driving the need of arthroplasty. We have used the prognosis until the 2025 to illustrate the aging of the Slovak population, as well as gender distribution. From these predictions it becomes clear that the male segment of the population will grow proportionately.

	Male	Female	Total
2003	2 611,124	2 768,929	5 380,053
2004	2 613,490	2 771,332	5 384,822
2005	2 615,872	2 773,308	5 389,180
2006	2 618,284	2 775,353	5 393,637
2007	2 623,127	2 777,871	5 400,998
2008	2 629,804	2 782,450	5 412,254

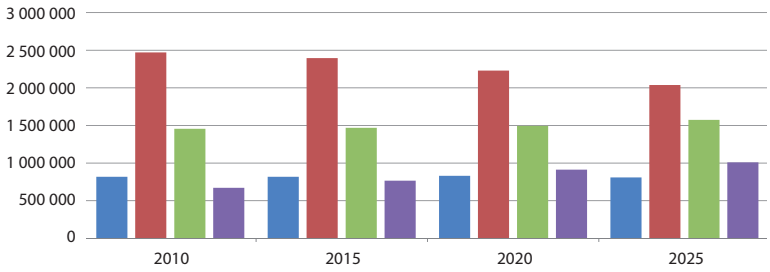


Number of inhabitants in Slovak republic until 31st December *Table and figure No. 3*

source: Statistical office of the Slovak republic

From the point of view of aging of the population, children between 0-14 years will decrease from 18 % in 2002 to 12, 6 % in 2025; at the opposite end of the age spectrum, the population over 65 years will increase from 11,6 % to 20 %. This fact will affect the demand for arthroplasties.

	2010	2015	2020	2025
0-14	819,267	818,551	832,184	810,664
15-44	2 471,089	2 395,612	2 230,819	2 039,605
45-64	1 457,676	1 469,989	1 495,531	1 576,225
65+	671,659	768,249	914,560	1 010,356



Prognosis of the population growth in Slovakia *Table and figure No. 4*

source: Statistical office of the Slovak republic

Slovakian Arthroplasty Register

Slovak Orthopedic and Traumatology Society (SOTS) decided in 2001 to follow the Scandinavian model and create a national implant registry. In 2002, the project became a reality and the SAR became a member of the new European Arthroplasty Register (EAR) and on 1st January 2003 the SAR was officially launched.
The seat of the SAR is Martin Faculty Hospital. The steering group of the registry has 7 members.

The SAR project involves all 38 departments performing arthroplasty in Slovakia, including Orthopedic and Traumatology departments.

Region	Orthopedics Departments	Traumatology Departments
Bratislava	Faculty Hospital Bratislava - I. Orthopaedic Traumatology Clinic	Faculty Hospital Bratislava - Traumatology Clinic
	Faculty Hospital Bratislava - II. Orthopaedic Traumatology Clinic	
	Sport & Endo Clinic - Clinica Orthopedica	
Trnava	Public Hospital Piešťany - Department of Orthopaedic	Faculty Hospital Trnava - Traumatology and Orthopaedic Depart.
	Public Hospital Skalica - Department of Orthopaedic and Traumatology	Public Hospital Galanta - Traumatology and Orthopaedic Depart.
		Public Hospital Dunajská Streda - Surgery Department
Trenčín	Faculty Hospital Trenčín - Department of Orthopaedic	Faculty Hospital Trenčín - Department of Traumatology
	Public Hospital P.Bystrica - Department of Orthopaedic	Public Hospital Partizánske - Surgery Department
	Public Hospital Bojnice - Department of Orthopaedic	
Nitra	Faculty Hospital Nové Zámky - Department of Orthopaedic	Faculty Hospital Nitra - Department of Traumatology and Orthopaedic
	Hospital Topoľčany - Department of Orthopaedic	Faculty Hospital Nové Zámky - Department of Traumatology
		Hospital Topoľčany - Department of Traumatology
Žilina	Public Hospital Žilina - Department of Orthopaedic	Public Hospital Žilina - Department of Traumatology
	Public Hospital D. Kubín - Department of Orthopaedic and Traumatology	Public Hospital Liptovský Mikuláš - Department of Orthopaedic and Traumatology
	Martin Faculty Hospital - Orthopaedic Traumatology Clinic	Central Military Hospital Ružomberok - Department of Orthopaedic and Traumatology
		Public Hospital Trstená - Surgery Department
Banská Bystrica	Faculty Hospital Banská Bystrica - Department of Orthopaedic	Faculty Hospital Banská Bystrica - Department of Traumatology
	Public Hospital Lučenec - Department of Orthopaedic and Traumatology	
Prešov	Faculty Hospital Prešov - Department of Orthopaedic	Hospital Poprad - Department of Traumatology and Orthopaedic
Košice	1st Private Hospital Košice-Šaca - Department of Orthopaedic	Faculty Hospital Košice - Traumatology Clinic
	Faculty Hospital Košice - Orthopaedic Traumatology Clinic	Public Hospital Michalovce - Traumatology Department
	Railways Hospital - Department of Orthopaedic	Public Hospital Rožňava - Traumatology Department
	Public Hospital Michalovce - Department of Orthopaedic	

Type of the departments according to region *Table No. 5*

Register Databases

The creation of the register databases is the most important single task. The SAR creates its data sets according to the Scandinavian model and uses the minimal data sets from EAR. Except the demographic data, we are focused on the same surgical parameters and implant identifications details. From 2003 to 2005 inclusive, we have used paper forms and mailing. During 2006, we introduced the on-line system with our own software. The refinement of the software is a continuous process. It is a client-server application and is available after log-in on the SAR page https://sar.mfn.sk, using the Gentoo Linux operating system.

Creation of the databases

To produce clear outcomes from the register, the data collection is the most critical issue. The quality of the data is essential. Until now, there are no quality control mechanisms, apart from the implant data. During 2009, we introduced the Implant Tracking System, which is based on the implants' bar codes. Every department is supplied with a scanner and, after completing the patient and surgical data, the implant data are scanned from the bar codes and sent to the central database, thereby automatically acquiring the implant data.
There are different types of the data quality control systems, but they are not compatible with implant registry software. It appears that data quality control is the weakest point of whole project, which is not solved, yet. For the implants we have created our own database with more than 30 000 bar codes. But still the essential part of the work is on the secretaries or people responsible for the data input.

Validisation of the databases

At the very beginning of this project, we had only two sources for the data – namely, questionnaire-based databases of the Chief Orthopedic Surgeon of the Ministry of Health and the main health insurance database. A third database now is the SAR database. We have cross-checked the SAR database with the database of the Chief Orthopedic Surgeon of the Ministry of Health and the correlation is over 95 %. We have also cross-checked the SAR database with the general health insurance database (VšZP), which covers more than two-thirds of the population of Slovakia, and 70 % of the SAR-registered arthroplasties appear in the insurance data and the correlation is also over 95 %.

	VšZP	SAR	%
130001 - THA Cemented	1,484	1,429	96.3
130002 - THA Hybrid	476	414	87
130003 - THA Non-cemented	718	741	103.2
130004 - Revision THA	191	258	135.1
Total	2,869	2,842	99.1

Cross-check of the databases of General health insurance company (VšZP) and SAR - 2006 *Table No. 6*

	VšZP	SAR	%
130001 - THA Cemented	1,375	1,448	105.3
130002 - THA Hybrid	566	478	84.5
130003 - THA Non-cemented	937	985	105.1
130004 - Revision THA	204	261	127.9
Total	3,082	3,172	102.9

Cross-check of the databases of General health insurance company (VšZP) and SAR - 2007 *Table No. 7*

Implants databases

Implants are divided into two groups according to the type of fixation – cemented and non-cemented implants. For THA there is still the possibility to combine implants from different manufacturers. Because of this we have to follow up individual components, rather than whole hip implants. This is not a problem related to TKA, because it is not possible to combine the implants from different systems different.
Until the end of 2008, the SAR database contained 31 non-cemented and 15 cemented acetabular components, totaling 46 acetabular cups. Femoral components are represented by 37 non-cemented stems and 30 cemented ones. In the SAR database there are 41 types of the knee implants as shown on Table No. 16.

Primary THA

Acetabular components non-cemented

During the observed period, 28 different types of acetabular components were used. The numbers of each type are shown in Table No. 8.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
2,299	DURALOC	DE PUY	0.70	16
1,568	NOVAE EVOLUTION	SERF	0.51	8
1,391	PINNACLE	DE PUY		0
1,020	TRILOGY	ZIMMER	0.20	2
867	BEZNOSKA (non-cement)	BEZNOSKA	1.15	10
627	L-CUP	BIOMET		0
529	PLASMACUP	AESCULAP	0.38	2
352	SF	BEZNOSKA	0.57	2
247	CLS SPOTORNO	ZIMMER	0.81	2
165	M-H-shell	BIOMET	0.60	1
134	DELTA	LIMA		0
115	ZWEYMULLER-ALLOCLASSIC CSF	ZIMMER	1.74	2
90	CENTRAMENT	AESCULAP	1.11	1
48	T.O.P.	LINK		0
46	ANA.NOVA	INTRAPLANT		0
44	BICON-PLUS	PLUS Endoprotetik		0
40	Y-AXIS II	SMITH & NEPHEW		0
39	ULTIMA UTC	DE PUY		0
34	RINGLOC - HIGH WALL	BIOMET		0
24	DURALOC OPTION	DE PUY	4.17	1
21	ASR	DE PUY		0
18	COPTOS	SERF	5.56	1
12	OCTOPUS	DE PUY	8.33	1
10	BS - revision	BEZNOSKA		0
5	TRILOGY AB - ceramic	ZIMMER		0
5	BEZNOSKA revision	BEZNOSKA		0
2	WM conical	WALTER MOTORLET	100.00	2
1	WM sferical	WALTER MOTORLET	100.00	1

Primary acetabular components non-cemented *Table No. 8*

Acetabular components cemented

15 different types of cemented acetabular components were used, as shown in Table No. 9.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
2,860	BEZNOSKA (cement)	BEZNOSKA	1.99	57
1,608	CHARNLEY	DE PUY	0.56	9
933	PE-CUP	AESCULAP	0.86	8
716	MULLER	BIOMET	0.28	2
355	ELITE PLUS	DE PUY	0.28	1
264	ULTIMA MK2	DE PUY	1.14	3
212	ZCA	ZIMMER		0
147	SF/A	BEZNOSKA		0
113	O2	BEZNOSKA	0.88	1
70	LUBINUS CLASSIC PLUS	LINK	1.43	1
59	MULLER	LIMA		0
38	ZWEYMULLER-ALLOCLASSIC	ZIMMER		0
4	BURCH-SCHNEIDER CAGE	ZIMMER		0
2	MULLER	SMITH & NEPHEW		0
1	MULLER LOW PROFILE	ZIMMER		0

Primary acetabular components cemented *Table No. 9*

Femoral components non-cemented

In the SAR database we have recorded 31 different types of non-cemented femoral components, as shown in Table No. 10.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
1,497	CORAIL	DE PUY	0.40	6
1,428	SAGITA EVOLUTION HA	SERF	0.28	4
1,089	AML	DE PUY	0.37	4
570	BIMETRIC (non-cement)	BIOMET		0
527	VERSYS	ZIMMER	0.38	2
362	SF	BEZNOSKA	0.55	2
209	BICONTACT	AESCULAP		0
168	CLS SPOTORNO	ZIMMER	0.60	1
163	PROXIMA	DE PUY		0
149	ZWEYMULLER-ALLOCLASSIC SL	ZIMMER		0
135	VERSYS FMT	ZIMMER	0.74	1
83	FIT	LIMA		0
46	ANA.NOVA MII	INTRAPLANT		0
43	SL-PLUS	PLUS Endoprotetik		0
42	LIBRA HA	SERF		0
37	BETA CONE	LINK		0
32	S-ROM	DE PUY		0
26	X-AXIS	SMITH & NEPHEW		0
23	LOGICA (non-cement)	LIMA		0
20	VERSYS FMMC	ZIMMER		0

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
17	SOLUTION	DE PUY	5.88	1
9	C.F.P.	LINK		0
8	SAM - FIT	LIMA		0
8	SF - revision	BEZNOSKA		0
8	SL (non-cement)	LIMA		0
7	ZMR	ZIMMER		0
5	RMD revision	BEZNOSKA		0
4	MP	LINK	25.00	1
3	METHA	AESCULAP		0
2	WM HA	WALTER MOTORLET	50.00	1
1	Y-AXIS	SMITH & NEPHEW		0

Primary femoral components non-cemented *Table No. 10*

Femoral components cemented

In the SAR database we have recorded 27 different types of cemented femoral stems, as shown in Table No. 11.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
3,709	BEZNOSKA	BEZNOSKA	1.16	43
2,519	BEZNOSKA CCEP	BEZNOSKA	0.28	7
1,718	CHARNLEY	DE PUY	0.93	16
1,322	CENTRAMENT	AESCULAP	0.45	6
989	BIMETRIC (cement)	BIOMET	0,91	9
633	C-STEM	DE PUY	0.16	1
422	AUSTIN-MOORE CCEP	BIOMET	0.47	2
594	CPT	ZIMMER		0
577	CSC	BEZNOSKA	0.69	4
340	ELITE PLUS	DE PUY	6.18	21
153	CHARNLEY MODULAR	DE PUY	2.61	4
131	SAGITA EVOLUTION	SERF	0.76	1
79	LUBINUS CLASSIC PLUS	LINK	1.27	1
68	ULTIMA-HOWSE II	DE PUY	7.35	5
68	CSC CCEP	BEZNOSKA		0
49	LOGICA (cement)	LIMA		0
26	SL (cement)	LIMA		0
23	FJORD	DE PUY		0
23	ASR	DE PUY		0
16	CL TRAUMA - CCEP	LIMA		0
14	Z-AXIS	SMITH & NEPHEW		0
11	BEZNOSKA - custom-made, tumor	BEZNOSKA		0
4	ULTIMA-STREIGHT STEM	DE PUY	25.00	1
3	LIBRA	SERF		0
2	AAP	AESCULAP		0
2	MS-30	ZIMMER		0
1	FRIENDLY	LIMA		0

Primary femoral components cemented *Table No. 11*

Revision THA

Acetabular components non-cemented

During the observed period, 24 different types of acetabular components were used. The numbers of each type are shown in Table No. 12.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
133	DURALOC	DE PUY	4.51	6
87	OCTOPUS	DE PUY	4.60	4
45	NOVAE EVOLUTION	SERF	4.44	2
44	TRILOGY	ZIMMER	9.09	4
35	PINNACLE	DE PUY		0
28	ZWEYMULLER-ALLOCLASSIC CSF	ZIMMER	7.14	2
25	CLS SPOTORNO	ZIMMER	4.00	1
21	BEZNOSKA (non-cement)	BEZNOSKA	4.76	1
19	COPTOS	SERF		0
13	L-CUP	BIOMET		0
11	ULTIMA UTC	DE PUY		0
6	M-H-shell	BIOMET		0
6	PLASMACUP	AESCULAP		0
6	TC - revision	BEZNOSKA		0
4	BICON-PLUS	PLUS Endoprotetik		0
4	BS - revision	BEZNOSKA		0
4	RSC - revision	BEZNOSKA		0
4	SF	BEZNOSKA		0
3	WM conical	WALTER MOTORLET	100.00	3
3	CENTRAMENT	AESCULAP		0
2	RINGLOC - HIGH WALL	BIOMET		0
1	DELTA	LIMA		0
1	WM oblong cup	WALTER MOTORLET		0
1	Y-AXIS II	SMITH & NEPHEW		0

Revision acetabular components non-cemented *Table No. 12*

Acetabular components cemented

13 different types of cemented acetabular components were used, as shown in Table No. 13.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
87	MULLER	BIOMET		0
64	ULTIMA MK2	DE PUY		0
39	CHARNLEY	DE PUY	7.69	3
38	LUBINUS CLASSIC PLUS	LINK	7.89	3
38	PE-CUP	AESCULAP		0
28	ELITE PLUS	DE PUY	7.14	2
13	O2	BEZNOSKA		0
12	ZWEYMULLER-ALLOCLASSIC	ZIMMER		0
9	SF/A	BEZNOSKA		0

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
5	BURCH-SCHNEIDER CAGE	ZIMMER		0
5	ZCA	ZIMMER		0
2	MULLER LOW PROFILE	ZIMMER		0
1	MULLER	SMITH & NEPHEW		0

Revision acetabular components cemented *Table No. 13*

Femoral components non-cemented

In the SAR database we have recorded 23 different types of non-cemented femoral components, as shown in Table No. 14.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
169	SOLUTION	DE PUY	2.37	4
93	MP	LINK	2.15	2
93	ZMR	ZIMMER	3.23	3
83	S-ROM	DE PUY		0
58	AML	DE PUY	1.72	1
25	RMD revision	BEZNOSKA	4.00	1
18	SAGITA EVOLUTION HA	SERF	5.56	1
15	VERSYS	ZIMMER	6.67	1
14	BIMETRIC (non-cement)	BIOMET		0
13	ZWEYMULLER-ALLOCLASSIC SL	ZIMMER	7.69	1
12	CORAIL	DE PUY		0
11	SF	BEZNOSKA		0
9	SF - revision	BEZNOSKA		0
6	VERSYS FMMC	ZIMMER	16.67	1
5	VERSYS FMT	ZIMMER	20.00	1
4	BICONTACT	AESCULAP		0
4	REVISION	LIMA		0
3	SL-PLUS	PLUS Endoprotetik		0
3	WM HA	WALTER MOTORLET	33.33	1
2	CLS SPOTORNO	ZIMMER		0
1	ASR	DE PUY		0
1	LIBRA HA	SERF		0
1	PROXIMA	DE PUY		0

Revision femoral components non-cemented *Table No. 14*

Femoral components cemented

In the SAR database we have recorded 20 different types of cemented femoral stems, as shown in Table No. 15.

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
315	BEZNOSKA	BEZNOSKA	10.16	32
54	CHARNLEY	DE PUY	5.56	3
50	ELITE PLUS	DE PUY	4.00	2
46	BIMETRIC (cement)	BIOMET	2.17	1
32	SAGITA EVOLUTION	SERF		0

No. of Implantations	Name	Manufacturer	Revision Rate (%)	No. of Events
25	CENTRAMENT	AESCULAP		0
25	CSC	BEZNOSKA		0
15	LUBINUS CLASSIC PLUS	LINK	20.00	3
10	C-STEM	DE PUY		0
6	BEZNOSKA - custom-made, tumor.	BEZNOSKA		0
6	BEZNOSKA CCEP	BEZNOSKA		0
6	CPT	ZIMMER		0
2	CHARNLEY MODULAR	DE PUY		0
2	ULTIMA-HOWSE II	DE PUY		0
2	MULLER GERADSCHAFT	PETER BREHM		0
1	AUSTIN-MOORE CCEP	BIOMET		0
1	CSC CCEP	BEZNOSKA		0
1	ENDO-MODELL saddle	LINK		0
1	ULTIMA-STREIGHT STEM	DE PUY		0
1	Z-AXIS	SMITH & NEPHEW		0

Revision femoral components cemented *Table No. 15*

TKA

The SAR database contains 41 different types of knee replacement systems. There is no possibility to distinguish between the types of fixation used, because almost all manufacturers produce both cemented and non-cemented fixation under the same trademark. The introduction of the barcode scanner will solve this problem. Hitherto, the only criterion for registration has been the name of the product.

Name	Manufacturer
AGC - universal knee	BIOMET
AMK	DE PUY
BEZNOSKA - tumor	BEZNOSKA
CMS - hinge	BEZNOSKA
COLUMBUS	AESCULAP
E-MOTION	AESCULAP
ENDO-MODELL	LINK
EPP PIVOT	ENDOPLANT
GEMINI	LINK
LSC	DE PUY
MC2	C2F Implants
MULTIGEN PLUS - CCK	LIMA
MULTIGEN PLUS - CR	LIMA
MULTIGEN PLUS -H	LIMA
MULTIGEN PLUS - PS	LIMA
MULTIGEN PLUS BIOLOX DELTA	LIMA
NEX-GEN CR	ZIMMER
NEX-GEN LCCK	ZIMMER
NEX-GEN LPS	ZIMMER
NEX-GEN RHK	ZIMMER
PFC SIGMA	DE PUY

Name	Manufacturer
PFC SIGMA ALL POLY	DE PUY
PFC SIGMA REVISION	DE PUY
PFC SIGMA RP	DE PUY
PRESERVATION UNI	DE PUY
ROTASURF	SERF
SEARCH EVOLUTION	AESCULAP
SLED PROSTHESIS	LINK
SOLUTION EPP	ENDOPLANT
SVL	BEZNOSKA
SVL/RP	BEZNOSKA
SVR - revision	BEZNOSKA
SVS	BEZNOSKA
TMK - RP	BIOMET
UNI Oxford Knee	BIOMET
WM modular	WALTER MOTORLET
WM universal	WALTER MOTORLET

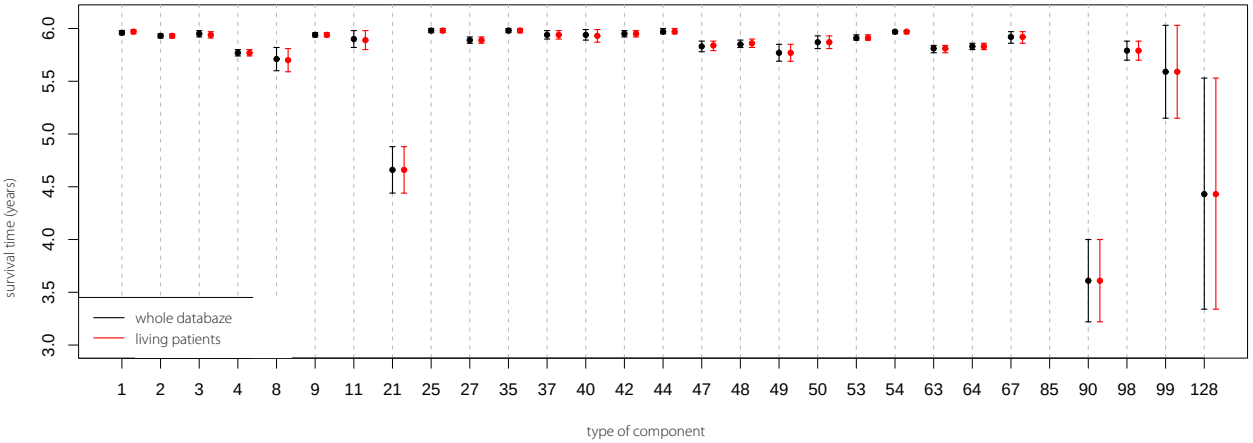
TKA implants *Table No. 16*

Statistical Methods

For a detailed explanation of the statistical methods used, see Appendix (page 53).

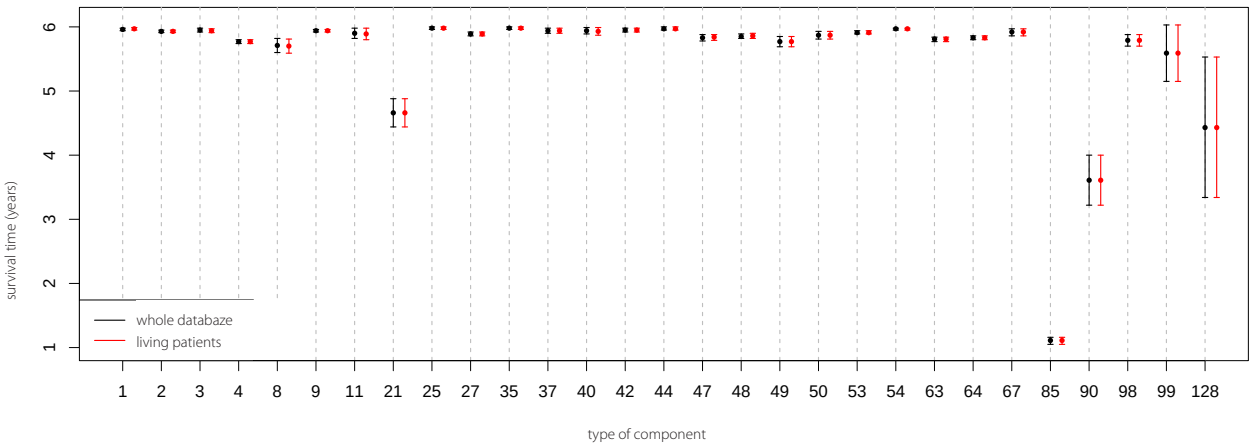
Analysis of THA Components in the Whole Database and Living Patients

In the SAR database of 37,368 primary components, 37,089 survived and 279 failed. In patients still living, 35,332 survived and 270 failed. In deceased patients, 1,757 had survived and 9 had failed.
In the SAR database of 2,514 revised components, 2,387 survived and 127 failed. In live patients, 2,278 components survived and 109 failed. In deceased patients, 121 components survived and 6 failed.
Approximate comparison of survival times of components for all patients and those who are alive is possible, based on mean survival times and 95% confidence intervals (CI). This method can be applied to compare only those components having at least one event in each group. For particular components, all CIs are overlapping (Figures No. 17, 18). This means that the difference between mean survival time of components in all patients and those who are alive is not statistically significant at the 5 % confidence level. Based on this finding, we have used the whole database (not taking death status into account) for the following calculations.



95 % confidence interval for mean survival times of primary components (whole database, living patients) *Figure No. 17*

RR and *SR* are calculated for whole sample and also for each primary and revised component. *RB* is calculated only for the whole sample. For primary components, *RR* = 279 / 37,368 × 100 = 0.7466, *SR* = 100 – *RR* = 95.2534 and *RB* = 279 / (24,949 + 2,514) = 0.0102, where 24,949 is the number of primary operations and 2,514 is the number of revisions. For a revised components, *RR* = 115 / 2,514 × 100 = 4.5744, *SR* = 100 – *RR* = 95.4256.
Having 37,368 primary components in the seven year period, total sum of component-times is 37,368 × 6 = 224,208 component-times. This can be interpreted as—224,208 components were at risk in one year. This number is used to calculate *incidence per component-time*, which is equal to number of revisions divided by total sum of component-times. Then 279 / 224,208 = 0.0012 ± 7.4499 × 10^{-05} (± standard error, 0.12 per 100 component-years), where 95 % CI is equal to (0.0011, 0.0014). This can be interpreted as—a speed with which first-time revisions occur.



95 % confidence interval for mean survival times of revised components (whole database, living patients) *Figure No. 18*

Having 2,514 revised components being at risk six years and total sum of component-times equal to 2514 × 6= 15,084 component-times, 15,084 revised components were at risk in one year and incidence per component-time is equal to the number of revisions divided by total sum of component-times. Then 115 / 15,084 = 0.0076 ± 1.7348 × 10^{-03} (0.76 per 100 component-years), where 95 % CI is (0.0042, 0.0110). This can be interpreted as—a speed with which there are second-time revisions likely to be occurred. This speed is 6.1267 times greater that for primary components.

For primary components, KM mean survival time (in years) is equal to 5.95 ± 0.00328 ($mean_{KM} \pm se(mean_{KM})$) and 95 % CI is (5.94, 5.96). For revised components, KM mean survival time is equal to 5.69 ± 0.0255 and 95 % CI is (5.64, 5.74).

Name	Producer	Type	Code	Frequency	No. of Events	RR	SR	$mean_{KM}$	$se(mean_{KM})$	LB95%CI	UB95%CI
CHARNLEY	DEPUY	acetabular	1	1,608	9	0.56	99.44	5.96	0.011	5.94	5.98
DURALOC	DEPUY	acetabular	2	2,299	16	0.70	99.30	5.93	0.010	5.91	5.95
CHARNLEY	DEPUY	femoral	3	1,718	16	0.93	99.07	5.95	0.014	5.92	5.98
CORAIL	DEPUY	femoral	4	1,497	6	0.40	99.60	5.77	0.017	5.74	5.80
ELITE PLUS	DEPUY	acetabular	6	355	1	0.28	99.72	5.91	0.035	5.84	5.98
DURALOC OPTION	DEPUY	acetabular	7	24	1	4.17	95.83	5.32	0.202	4.92	5.72
ELITE PLUS	DEPUY	femoral	8	340	21	6.18	93.82	5.71	0.056	5.60	5.82
AML	DEPUY	femoral	9	1,089	4	0.37	99.63	5.94	0.009	5.92	5.96
ULTIMA MK2	DEPUY	acetabular	11	264	3	1.14	98.86	5.90	0.042	5.82	5.98
ULTIMA UTC	DEPUY	acetabular	12	39	0	0.00	100.00	2.90	NA	NA	NA
C-STEM	DEPUY	femoral	13	633	1	0.16	99.84	4.86	0.009	4.84	4.88
S-ROM	DEPUY	femoral	14	32	0	0.00	100.00	5.83	NA	NA	NA
OCTOPUS	DEPUY	acetabular	16	12	1	8.33	91.67	5.50	0.305	4.90	6.00
ULTIMA-STRIGHT STEM	DEPUY	femoral	17	4	1	25.00	75.00	4.57	1.020	2.57	6.00
SOLUTION	DEPUY	femoral	18	17	1	5.88	94.12	5.84	0.027	5.79	5.89
ASR	DEPUY	acetabular	20	21	0	0.00	100.00	3.68	NA	NA	NA
ULTIMA-HOWSE II	DEPUY	femoral	21	68	5	7.35	92.65	4.66	0.110	4.44	4.88
ASR	DEPUY	femoral	22	21	0	0.00	100.00	3.68	NA	NA	NA
ZCA	ZIMMER	acetabular	24	212	0	0.00	100.00	5.96	NA	NA	NA
TRILOGY	ZIMMER	acetabular	25	1,020	2	0.20	99.80	5.98	0.008	5.96	6.00
CPT	ZIMMER	femoral	26	594	0	0.00	100.00	5.98	NA	NA	NA
VERSYS	ZIMMER	femoral	27	527	2	0.38	99.62	5.89	0.016	5.86	5.92
MULLER LOW PROFILE	ZIMMER	acetabular	29	1	0	0.00	100.00	1.71	NA	NA	NA
ZWEYMÜLLER-ALLOCLASSIC	ZIMMER	acetabular	30	38	0	0.00	100.00	5.89	NA	NA	NA
ZWEYMÜLLER-ALLOCLASSIC SL	ZIMMER	femoral	31	89	0	0.00	100.00	5.89	NA	NA	NA
ZMR	ZIMMER	femoral	33	7	0	0.00	100.00	2.64	NA	NA	NA
MÜLLER	BIOMET	acetabular	35	674	2	0.30	99.70	5.98	0.010	5.96	6.00
L-CUP	BIOMET	acetabular	36	627	0	0.00	100.00	5.98	NA	NA	NA
BIMETRIC (cement)	BIOMET	femoral	37	989	9	0.91	99.09	5.94	0.018	5.90	5.98
BIMETRIC (non-cement)	BIOMET	femoral	38	570	0	0.00	100.00	5.98	NA	NA	NA
AUSTIN-MOORE CCEP	BIOMET	femoral	40	422	2	0.47	99.53	5.94	0.026	5.89	5.99
NOVAE EVOLUTION	SERF	acetabular	42	1,568	8	0.51	99.49	5.95	0.016	5.92	5.98
SAGITA EVOLUTION	SERF	femoral	43	131	1	0.76	99.24	5.93	0.048	5.84	6.00
SAGITA EVOLUTION HA	SERF	femoral	44	1,428	4	0.28	99.72	5.97	0.014	5.95	6.00
COPTOS	SERF	acetabular	46	18	1	5.56	94.44	5.08	NA	NA	NA
BEZNOSKA (non-cement)	BEZNOSKA	acetabular	47	867	10	1.15	98.85	5.83	0.026	5.78	5.88
BEZNOSKA (cement)	BEZNOSKA	acetabular	48	2,860	57	1.99	98.01	5.85	0.019	5.82	5.89
CSC	BEZNOSKA	femoral	49	577	4	0.69	99.31	5.77	0.042	5.69	5.85
SF	BEZNOSKA	femoral	50	362	2	0.55	99.45	5.87	0.028	5.81	5.93
SF/A	BEZNOSKA	acetabular	52	147	0	0.00	100.00	5.79	NA	NA	NA
BEZNOSKA	BEZNOSKA	femoral	53	3,709	43	1.16	98.84	5.91	0.012	5.89	5.94
BEZNOSKA CCEP	BEZNOSKA	femoral	54	2,519	7	0.28	99.72	5.97	0.007	5.95	5.98
MÜLLER	SMITH+NEPHEW	acetabular	55	1	0	0.00	100.00	2.64	NA	NA	NA
Y-AXIS II	SMITH+NEPHEW	acetabular	56	40	0	0.00	100.00	5.94	NA	NA	NA
Z-AXIS	SMITH+NEPHEW	femoral	57	14	0	0.00	100.00	5.94	NA	NA	NA
Y-AXIS	SMITH+NEPHEW	femoral	58	1	0	0.00	100.00	4.61	NA	NA	NA
X-AXIS	SMITH+NEPHEW	femoral	61	26	0	0.00	100.00	5.81	NA	NA	NA
CENTRAMENT	AESCULAP	acetabular	62	90	1	1.11	98.89	4.43	0.049	4.33	4.52
PLASMACUP	AESCULAP	acetabular	63	529	2	0.38	99.62	5.81	0.018	5.77	5.84
CENTRAMENT	AESCULAP	femoral	64	1,322	6	0.45	99.55	5.83	0.016	5.80	5.86
BICONTACT	AESCULAP	femoral	65	209	0	0.00	100.00	4.72	NA	NA	NA
PE-CUP	AESCULAP	acetabular	67	933	8	0.86	99.14	5.92	0.027	5.86	5.97
BICON PLUS	PLUS ENDOPROTETIC	acetabular	68	44	0	0.00	100.00	5.93	NA	NA	NA
SL-PLUS	PLUS ENDOPROTETIC	femoral	69	43	0	0.00	100.00	5.93	NA	NA	NA
LUBINUS CLASSIC PLUS	LINK	acetabular	70	70	1	1.43	98.57	5.90	0.060	5.78	6.00
T.O.P.	LINK	acetabular	71	48	0	0.00	100.00	3.16	NA	NA	NA
LUBINUS CLASSIC PLUS	LINK	femoral	72	79	1	1.27	98.73	5.91	0.055	5.80	6.00
C.F.P.	LINK	femoral	73	9	0	0.00	100.00	3.16	NA	NA	NA
MP	LINK	femoral	76	4	1	25.00	75.00	3.12	0.240	2.65	3.59
BS	BEZNOSKA	acetabular	81	6	0	0.00	100.00	2.97	NA	NA	NA

Name	Producer	Type	Code	Frequency	No. of Events	RR	SR	$mean_{KM}$	$se(mean_{KM})$	LB95%CI	UB95%CI
WM spherical	WALTER MOTORLET	acetabular	83	1	1	100.00	0.00	NA	NA	NA	NA
WM conical	WALTER MOTORLET	acetabular	85	2	2	100.00	0.00	1.11	0.025	1.05	1.16
WM HA	WALTER MOTORLET	femoral	86	2	1	50.00	50.00	2.50	1.530	0.00	5.50
BURCH-SCHNEIDER CAGE	ZIMMER	acetabular	88	4	0	0.00	100.00	2.58	NA	NA	NA
TRILOGY AB - ceramic	ZIMMER	acetabular	89	5	0	0.00	100.00	2.66	NA	NA	NA
CLS SPOTORNO	ZIMMER	acetabular	90	247	2	0.81	99.19	3.61	0.198	3.22	4.00
PINNACLE	DEPUY	acetabular	91	1,391	0	0.00	100.00	3.63	NA	NA	NA
M-H-shell	BIOMET	acetabular	92	123	1	0.81	99.19	2.56	0.013	2.54	2.58
BEZNOSKA revision	BEZNOSKA	acetabular	93	5	0	0.00	100.00	2.45	NA	NA	NA
PROXIMA	DEPUY	femoral	94	163	0	0.00	100.00	2.89	NA	NA	NA
SF - revision	BEZNOSKA	femoral	95	2	0	0.00	100.00	1.66	NA	NA	NA
RMD revision	BEZNOSKA	femoral	96	1	0	0.00	100.00	2.24	NA	NA	NA
BETA CONE	LINK	femoral	97	37	0	0.00	100.00	3.09	NA	NA	NA
SF	BEZNOSKA	acetabular	98	352	2	0.57	99.43	5.79	0.045	5.70	5.88
ZWEYMÜLLER-ALLOCLASSIC CSF	ZIMMER	acetabular	99	115	2	1.74	98.26	5.59	0.225	5.15	6.00
O2	BEZNOSKA	acetabular	115	113	1	0.88	99.12	1.89	0.059	1.78	2.01
CSC CCEP	BEZNOSKA	femoral	116	68	0	0.00	100.00	1.80	NA	NA	NA
BEZNOSKA - custom-made., tumor.	BEZNOSKA	femoral	117	11	0	0.00	100.00	5.61	NA	NA	NA
BS - revision	BEZNOSKA	acetabular	118	2	0	0.00	100.00	1.84	NA	NA	NA
VERSYS FMT	ZIMMER	femoral	124	135	1	0.74	99.26	3.23	0.032	3.16	3.29
VERSYS FMMC	ZIMMER	femoral	125	20	0	0.00	100.00	1.79	NA	NA	NA
MS-30	ZIMMER	femoral	126	2	0	0.00	100.00	1.16	NA	NA	NA
CLS SPOTORNO	ZIMMER	femoral	127	168	1	0.60	99.40	1.60	0.009	1.58	1.62
CHARNLEY MODULAR	DEPUY	femoral	128	153	4	2.61	97.39	4.43	0.561	3.34	5.53
FJORD	DEPUY	femoral	129	23	0	0.00	100.00	1.92	NA	NA	NA
ASR	DEPUY	femoral	130	2	0	0.00	100.00	1.50	NA	NA	NA
AAP	AESCULAP	femoral	131	2	0	0.00	100.00	0.90	NA	NA	NA
METHA	AESCULAP	femoral	133	3	0	0.00	100.00	1.84	NA	NA	NA
RINGLOC - HIGH WALL	BIOMET	acetabular	134	34	0	0.00	100.00	1.65	NA	NA	NA
BS - revision	BEZNOSKA	acetabular	139	2	0	0.00	100.00	0.73	NA	NA	NA
M-H-shell	BIOMET	acetabular	141	42	0	0.00	100.00	1.88	NA	NA	NA
MULLER	BIOMET	acetabular	142	42	0	0.00	100.00	5.70	NA	NA	NA
MULLER	SMITH+NEPHEW	acetabular	143	1	0	0.00	100.00	0.65	NA	NA	NA
RMD revision	BEZNOSKA	femoral	145	4	1	25.00	75.00	4.91	NA	NA	NA
SF - revision	BEZNOSKA	femoral	147	6	0	0.00	100.00	0.91	NA	NA	NA
ZWEYMULLER-ALLOCLASICS SL	ZIMMER	femoral	153	60	0	0.00	100.00	1.15	NA	NA	NA
MULLER	LIMA	acetabular	154	59	0	0.00	100.00	0.75	NA	NA	NA
SL (cement)	LIMA	femoral	155	26	0	0.00	100.00	0.75	NA	NA	NA
LOGICA (cement)	LIMA	femoral	156	49	0	0.00	100.00	0.75	NA	NA	NA
CL TRAUMA - CCEP	LIMA	femoral	157	16	0	0.00	100.00	0.56	NA	NA	NA
FRIENDLY	LIMA	femoral	158	1	0	0.00	100.00	0.35	NA	NA	NA
DELTA	LIMA	acetabular	159	134	0	0.00	100.00	0.89	NA	NA	NA
FIT	LIMA	femoral	160	83	0	0.00	100.00	0.89	NA	NA	NA
SAM - FIT	LIMA	femoral	161	8	0	0.00	100.00	0.52	NA	NA	NA
SL (non-cement)	LIMA	femoral	162	8	0	0.00	100.00	0.69	NA	NA	NA
LOGICA (non-cement)	LIMA	femoral	163	23	0	0.00	100.00	0.70	NA	NA	NA
LIBRA	SERF	femoral	170	3	0	0.00	100.00	0.25	NA	NA	NA
LIBRA HA	SERF	femoral	171	42	0	0.00	100.00	1.26	NA	NA	NA
ANA. NOVA	INTRAPLANT	acetabular	173	46	0	0.00	100.00	0.94	NA	NA	NA
ANA. NOVA MII	INTRAPLANT	femoral	174	46	0	0.00	100.00	0.94	NA	NA	NA
NNC Titan	PETER BREHM	acetabular	180	1	0	0.00	100.00	2.15	NA	NA	NA
MULLER GERADSCHAFT	PETER BREHM	femoral	181	13	0	0.00	100.00	2.15	NA	NA	NA

Legend

- more than one event
- one event
- without event
- extremely large standard deviation

RR	revision rate in %
SR	survival rate in %
$mean_{KM}$	mean survival time in years
$se(mean_{KM})$	standard error
LB 95%CI	lower boundary of 95 % confidence interval
UB 95%CI	upper boundary of 95 % confidence interval

Basic characteristics of primary components *Table No. 19*

Name	Producer	Type	Code	Frequency	No. of Events	RR	SR	$mean_{KM}$	$se(mean_{KM})$	LB95%CI	UB95%CI
CHARNLEY	DEPUY	acetabular	1	39	3	7.69	92.31	5.37	0.213	4.95	5.79
DURALOC	DEPUY	acetabular	2	133	6	4.51	95.49	5.73	0.092	5.55	5.91
CHARNLEY	DEPUY	femoral	3	54	3	5.56	94.44	5.50	0.143	5.22	5.78
CORAIL	DEPUY	femoral	4	12	0	0.00	100.00	2.89	NA	NA	NA
ELITE PLUS	DEPUY	acetabular	6	28	2	7.14	92.86	5.37	0.347	4.69	6.00
ELITE PLUS	DEPUY	femoral	8	50	2	4.00	96.00	5.65	0.162	5.33	5.97
AML	DEPUY	femoral	9	58	1	1.72	98.28	5.84	0.103	5.64	6.00
ULTIMA MK2	DEPUY	acetabular	11	64	0	0.00	100.00	5.97	NA	NA	NA
ULTIMA UTC	DEPUY	acetabular	12	11	0	0.00	100.00	2.85	NA	NA	NA
C-STEM	DEPUY	femoral	13	10	0	0.00	100.00	2.94	NA	NA	NA
S-ROM	DEPUY	femoral	14	83	0	0.00	100.00	5.85	NA	NA	NA
OCTOPUS	DEPUY	acetabular	16	87	4	4.60	95.40	5.72	0.112	5.50	5.94
ULTIMA-STREIGHT STEM	DEPUY	femoral	17	1	0	0.00	100.00	5.46	NA	NA	NA
SOLUTION	DEPUY	femoral	18	169	4	2.37	97.63	5.80	0.070	5.66	5.94
ULTIMA-HOWSE II	DEPUY	femoral	21	2	0	0.00	100.00	4.57	NA	NA	NA
ASR	DEPUY	femoral	22	1	0	0.00	100.00	2.64	NA	NA	NA
ZCA	ZIMMER	acetabular	24	5	0	0.00	100.00	5.53	NA	NA	NA
TRILOGY	ZIMMER	acetabular	25	44	4	9.09	90.91	5.39	0.213	4.97	5.81
CPT	ZIMMER	femoral	26	6	0	0.00	100.00	3.95	NA	NA	NA
VERSYS	ZIMMER	femoral	27	15	1	6.67	93.33	4.57	0.250	4.08	5.06
MULLER LOW PROFILE	ZIMMER	acetabular	29	2	0	0.00	100.00	3.60	NA	NA	NA
ZWEYMULLER-ALLOCLASSIC	ZIMMER	acetabular	30	12	0	0.00	100.00	4.07	NA	NA	NA
ZWEYMÜLLER-ALLOCLASSIC SL	ZIMMER	femoral	31	11	1	9.09	90.91	4.57	0.436	3.72	5.42
ZMR	ZIMMER	femoral	33	93	3	3.23	96.77	5.63	0.112	5.41	5.85
MÜLLER	BIOMET	acetabular	35	80	0	0.00	100.00	5.94	NA	NA	NA
L-CUP	BIOMET	acetabular	36	13	0	0.00	100.00	5.93	NA	NA	NA
BIMETRIC (cement)	BIOMET	femoral	37	46	1	2.17	97.83	5.53	0.121	5.29	5.77
BIMETRIC (non-cement)	BIOMET	femoral	38	14	0	0.00	100.00	5.81	NA	NA	NA
AUSTIN-MOORE CCEP	BIOMET	femoral	40	1	0	0.00	100.00	3.85	NA	NA	NA
NOVAE EVOLUTION	SERF	acetabular	42	45	2	4.44	95.56	4.90	0.164	4.58	5.22
SAGITA EVOLUTION	SERF	femoral	43	32	0	0.00	100.00	5.14	NA	NA	NA
SAGITA EVOLUTION HA	SERF	femoral	44	18	1	5.56	94.44	4.57	0.308	3.97	5.17
COPTOS	SERF	acetabular	46	19	0	0.00	100.00	4.22	NA	NA	NA
BEZNOSKA (non-cement)	BEZNOSKA	acetabular	47	21	1	4.76	95.24	4.81	0.419	3.99	5.63
BEZNOSKA (cement)	BEZNOSKA	acetabular	48	423	26	6.15	93.85	5.57	0.071	5.43	5.71
CSC	BEZNOSKA	femoral	49	25	0	0.00	100.00	3.67	NA	NA	NA
SF	BEZNOSKA	femoral	50	11	0	0.00	100.00	5.87	NA	NA	NA
SF/A	BEZNOSKA	acetabular	52	9	0	0.00	100.00	5.28	NA	NA	NA
BEZNOSKA	BEZNOSKA	femoral	53	315	32	10.16	89.84	5.37	0.099	5.17	5.56
BEZNOSKA CCEP	BEZNOSKA	femoral	54	6	0	0.00	100.00	3.97	NA	NA	NA
Y-AXIS II	SMITH+NEPHEW	acetabular	56	1	0	0.00	100.00	5.54	NA	NA	NA
Z-AXIS	SMITH+NEPHEW	femoral	57	1	0	0.00	100.00	2.87	NA	NA	NA
CENTRAMENT	AESCULAP	acetabular	62	3	0	0.00	100.00	3.36	NA	NA	NA
PLASMACUP	AESCULAP	acetabular	63	6	0	0.00	100.00	0.90	NA	NA	NA
CENTRAMENT	AESCULAP	femoral	64	25	0	0.00	100.00	4.62	NA	NA	NA
BICONTACT	AESCULAP	femoral	65	4	0	0.00	100.00	3.61	NA	NA	NA
PE-CUP	AESCULAP	acetabular	67	38	0	0.00	100.00	5.56	NA	NA	NA
BICON PLUS	PLUS ENDOPROTETIC	acetabular	68	4	0	0.00	100.00	5.93	NA	NA	NA
SL-PLUS	PLUS ENDOPROTETIC	femoral	69	3	0	0.00	100.00	5.81	NA	NA	NA
LUBINUS CLASSIC PLUS	LINK	acetabular	70	38	3	7.89	92.11	5.54	0.229	5.09	5.99
LUBINUS CLASSIC PLUS	LINK	femoral	72	15	3	20.00	80.00	5.18	0.383	4.43	5.93
MP	LINK	femoral	76	93	2	2.15	97.85	5.85	0.087	5.68	6.00
ENDO-MODELL saddle	LINK	femoral	77	1	0	0.00	100.00	2.07	NA	NA	NA
WM oblong cup	WALTER MOTORLET	acetabular	84	1	0	0.00	100.00	1.61	NA	NA	NA
WM conical	WALTER MOTORLET	acetabular	85	3	3	100.00	0.00	1.21	0.043	1.13	1.29
WM HA	WALTER MOTORLET	femoral	86	3	1	33.33	66.67	3.74	1.075	1.63	5.85
BURCH-SCHNEIDER CAGE	ZIMMER	acetabular	88	5	0	0.00	100.00	0.96	NA	NA	NA
CLS SPOTORNO	ZIMMER	acetabular	90	25	1	4.00	96.00	2.46	0.097	2.27	2.65
PINNACLE	DEPUY	acetabular	91	35	0	0.00	100.00	2.33	NA	NA	NA
M-H-shell	BIOMET	acetabular	92	5	0	0.00	100.00	2.59	NA	NA	NA

Name	Producer	Type	Code	Frequency	No. of Events	RR	SR	$mean_{KM}$	$se(mean_{KM})$	LB95%CI	UB95%CI
BEZNOSKA revision	BEZNOSKA	acetabular	93	2	0	0.00	100.00	2.11	NA	NA	NA
PROXIMA	DEPUY	femoral	94	1	0	0.00	100.00	0.08	NA	NA	NA
SF - revision	BEZNOSKA	femoral	95	6	0	0.00	100.00	2.32	NA	NA	NA
RMD - revision	BEZNOSKA	femoral	96	17	1	5.88	94.12	2.43	0.107	2.22	2.64
SF	BEZNOSKA	acetabular	98	4	0	0.00	100.00	2.29	NA	NA	NA
ZWEYMÜLLER-ALLOCLASSIC CSF	ZIMMER	acetabular	99	28	2	7.14	92.86	5.36	0.282	4.80	5.91
O2	BEZNOSKA	acetabular	115	13	0	0.00	100.00	1.12	NA	NA	NA
CSC CCEP	BEZNOSKA	femoral	116	1	0	0.00	100.00	0.70	NA	NA	NA
BEZNOSKA - custom-made., tumor.	BEZNOSKA	femoral	117	6	0	0.00	100.00	0.96	NA	NA	NA
TC - revision	BEZNOSKA	acetabular	119	5	0	0.00	100.00	1.35	NA	NA	NA
RSC - revísion	BEZNOSKA	acetabular	120	1	0	0.00	100.00	1.70	NA	NA	NA
VERSYS FMT	ZIMMER	femoral	124	5	1	20.00	80.00	3.61	NA	NA	NA
VERSYS FMMC	ZIMMER	femoral	125	6	1	16.67	83.33	2.92	NA	NA	NA
CLS SPOTORNO	ZIMMER	femoral	127	2	0	0.00	100.00	1.34	NA	NA	NA
CHARNLEY MODULAR	DEPUY	femoral	128	2	0	0.00	100.00	1.06	NA	NA	NA
RINGLOC - HIGH WALL	BIOMET	acetabular	134	2	0	0.00	100.00	1.71	NA	NA	NA
BS - revision	BEZNOSKA	acetabular	139	2	0	0.00	100.00	0.62	NA	NA	NA
M-H-shell	BIOMET	acetabular	141	1	0	0.00	100.00	0.09	NA	NA	NA
MULLER	BIOMET	acetabular	142	7	0	0.00	100.00	1.31	NA	NA	NA
MULLER	SMITH+NEPHEW	acetabular	143	1	0	0.00	100.00	0.10	NA	NA	NA
RMD revision	BEZNOSKA	femoral	145	8	0	0.00	100.00	0.84	NA	NA	NA
RSC - revision	BEZNOSKA	acetabular	146	3	0	0.00	100.00	5.18	NA	NA	NA
SF - revision	BEZNOSKA	femoral	147	3	0	0.00	100.00	0.79	NA	NA	NA
TC - revision	BEZNOSKA	acetabular	149	1	0	0.00	100.00	0.53	NA	NA	NA
ZWEYMULLER-ALLOCLASICS SL	ZIMMER	femoral	153	2	0	0.00	100.00	4.64	NA	NA	NA
DELTA	LIMA	acetabular	159	1	0	0.00	100.00	0.16	NA	NA	NA
REVISION	LIMA	femoral	164	4	0	0.00	100.00	0.49	NA	NA	NA
LIBRA HA	SERF	femoral	171	1	0	0.00	100.00	0.06	NA	NA	NA
MULLER GERADSCHAFT	PETER BREHM	femoral	181	2	0	0.00	100.00	5.51	NA	NA	NA

Legend

- more than one event
- one event
- without event
- extremely large standard deviation

RR revision rate in %
SR survival rate in %
$mean_{KM}$ mean survival time in years
$se(mean_{KM})$ standard error
LB 95%CI lower boundary of 95 % confidence interval
UB 95%CI upper boundary of 95 % confidence interval

Basic characteristics of revised components *Table No. 20*

Analysis of the THA Components Survival

With THA there is possibility to combine the components from different manufacturers, in both primary and revision THAs. Because of this, we follow only individual components and not the whole arthroplasty assembly.

Primary Arthroplasty

The survival rate is calculated with the methodology mentioned in the Appendix. The main parameters are Revision Rate (RR) and Survival Rate (SR). We can create a chart only if two or more failures were reported.

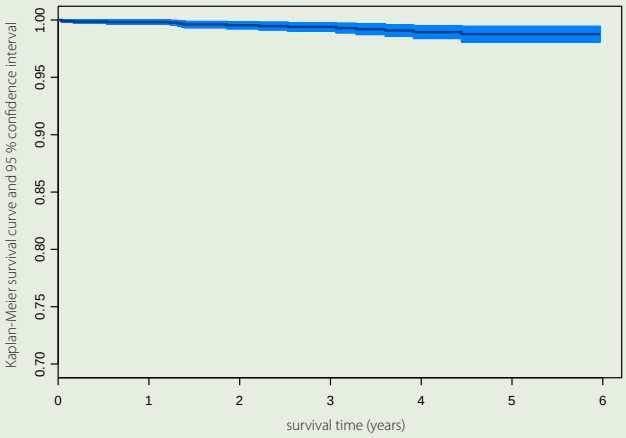
Acetabular components – non-cemented

DURALOC (DE PUY)

During the observed period we have recorded 2,299 component implantations and 16 failures, which represents a revision rate (RR) of 0.70 %.

Figure No. 21

Kaplan-Meier survival curve with 95 % confidence interval for primary component DURALOC

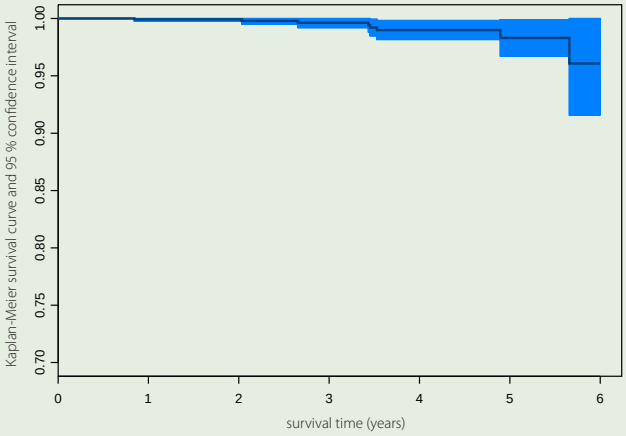


NOVAE EVOLUTION (SERF)

During the observed period we have recorded 1,568 component implantations and 8 failures, which represents a revision rate (RR) of 0.51 %.

Figure No. 22

Kaplan-Meier survival curve with 95 % confidence interval for primary component NOVAE EVOLUTION

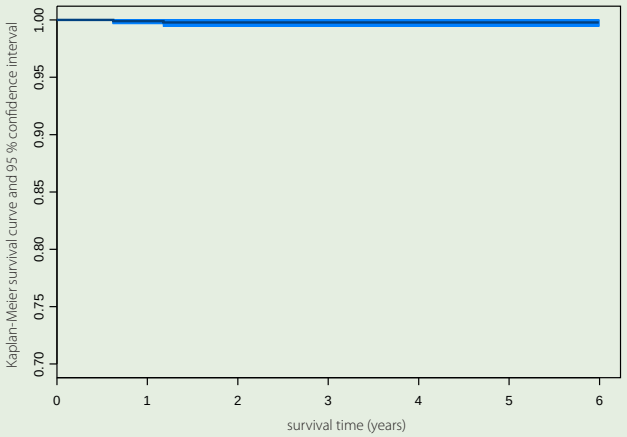


TRILOGY (ZIMMER)

During the observed period we have recorded 1,020 component implantations and 2 failures, which represents a revision rate (RR) of 0.20 %.

Figure No. 23

Kaplan-Meier survival curve with 95 % confidence interval for primary component TRILOGY

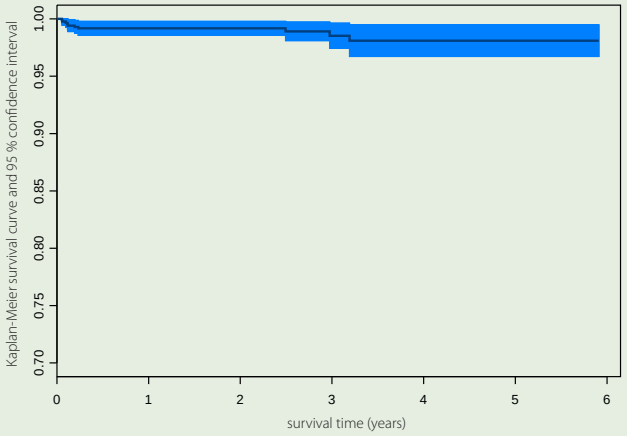


BEZNOSKA (non-cemented) (BEZNOSKA)

During the observed period we have recorded 867 component implantations and 10 failures, which represents a revision rate (RR) of 1.15 %.

Figure No. 24

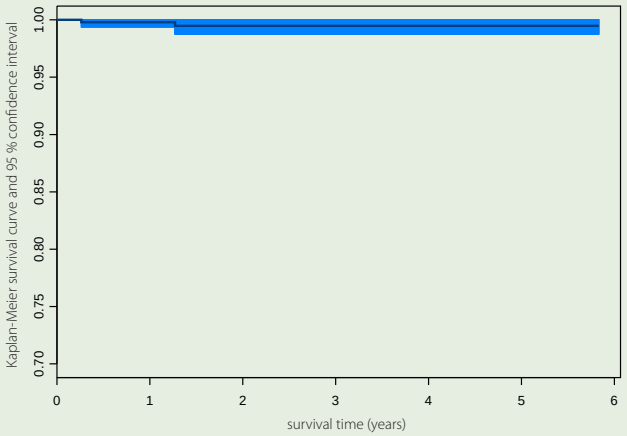
Kaplan-Meier survival curve with 95 % confidence interval for primary component BEZNOSKA (non-cemented)



PLASMACUP (AESCULAP)

During the observed period we have recorded 529 component implantations and 2 failures, which represents a revision rate (RR) of 0.38 %.

Figure No. 25
Kaplan-Meier survival curve with 95 % confidence interval for primary component PLASMACUP

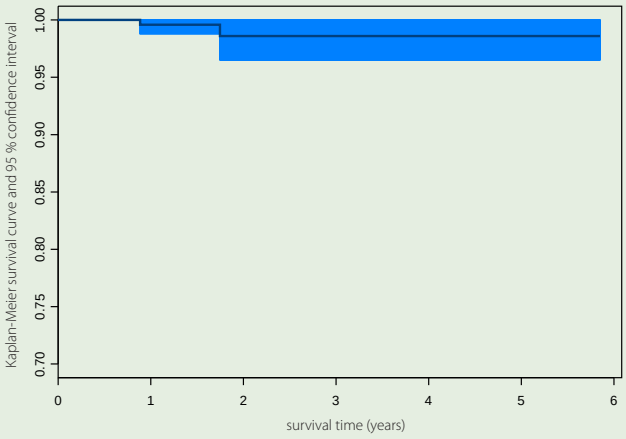


SF (BEZNOSKA)

During the observed period we have recorded 352 component implantations and 2 failures, which represents a revision rate (RR) of 0.57 %.

Figure No. 26

Kaplan-Meier survival curve with 95 % confidence interval for primary component SF

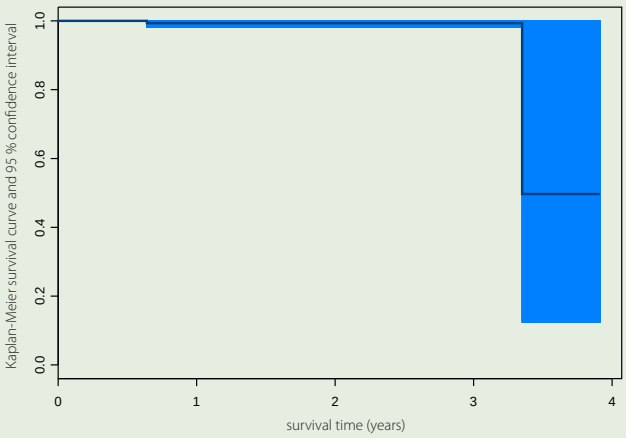


CLS SPOTORNO (ZIMMER)

During the observed period we have recorded 247 component implantations and 2 failures, which represents a revision rate (RR) of 0.81 %.

Figure No. 27

Kaplan-Meier survival curve with 95 % confidence interval for primary component CLS SPOTORNO

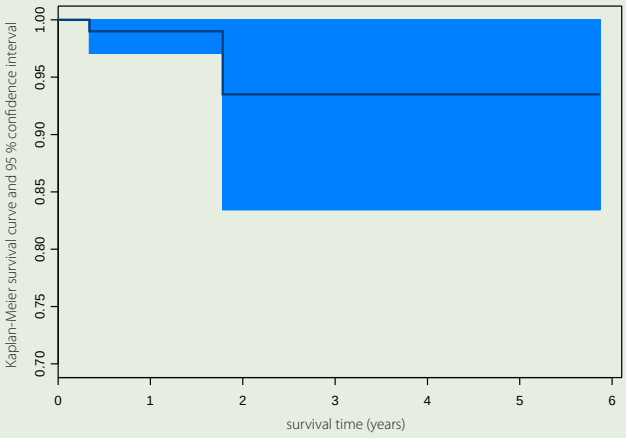


ZWEYMULLER-ALLOCLASSIC CSF (ZIMMER)

During the observed period we have recorded 115 component implantations and 2 failures, which represents a revision rate (RR) of 1.74 %.

Figure No. 28

Kaplan-Meier survival curve with 95 % confidence interval for primary component ZWEYMULLER-ALLOCLASSIC CSF

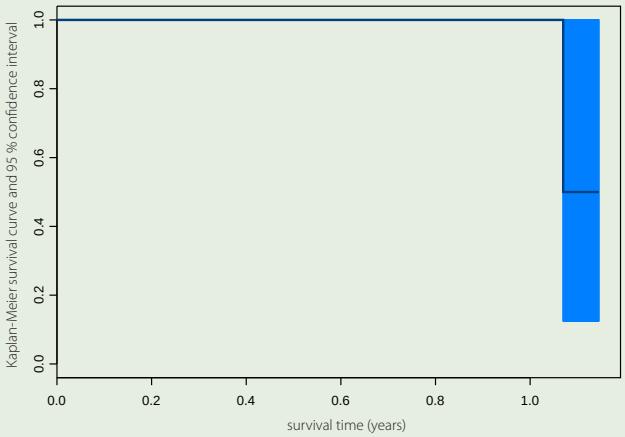


WM conical (WALTER MOTORLET)

During the observed period we have recorded 2 component implantations and 2 failures, which represents a revision rate (RR) of 100 %.

Figure No. 29

Kaplan-Meier survival curve with 95 % confidence interval for primary component WM conical



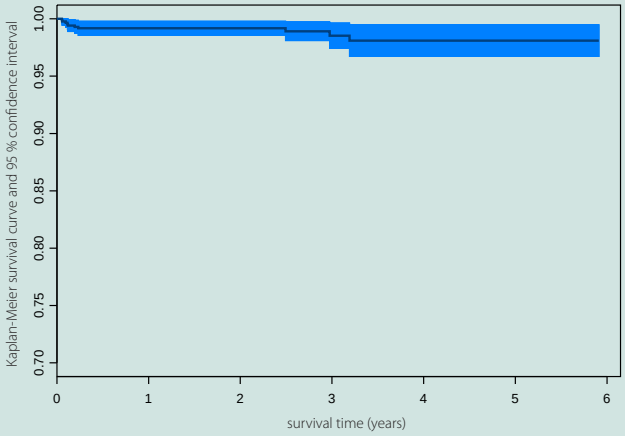
Acetabular components – cemented

BEZNOSKA (cement) (BEZNOSKA)

During the observed period we have recorded 2,860 component implantations and 57 failures, which represents a revision rate (RR) of 1.99 %.

Figure No. 30

Kaplan-Meier survival curve with 95 % confidence interval for primary component BEZNOSKA (cement)

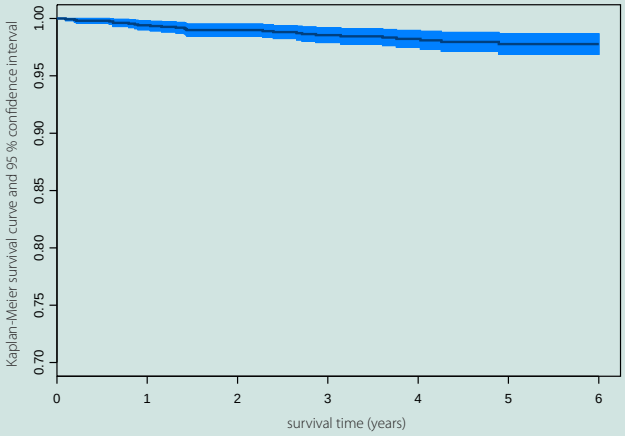


CHARNLEY (DE PUY)

During the observed period we have recorded 1,608 component implantations and 9 failures, which represents a revision rate (RR) of 0.56 %.

Figure No. 31

Kaplan-Meier survival curve with 95 % confidence interval for primary component CHARNLEY

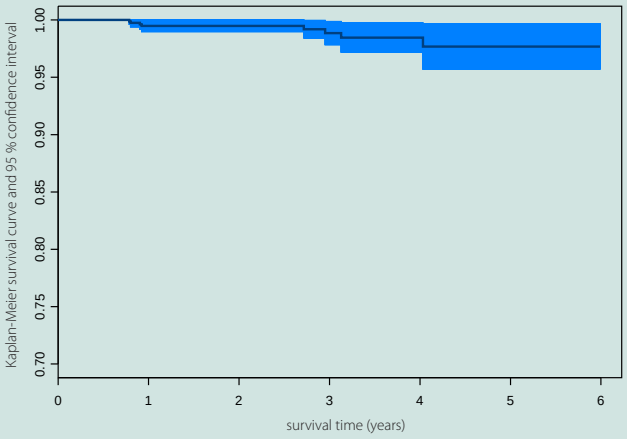


PE-CUP (AESCULAP)

During the observed period we have recorded 933 component implantations and 8 failures, which represents a revision rate (RR) of 0.86 %.

Figure No. 32

Kaplan-Meier survival curve with 95 % confidence interval for primary component PE-CUP

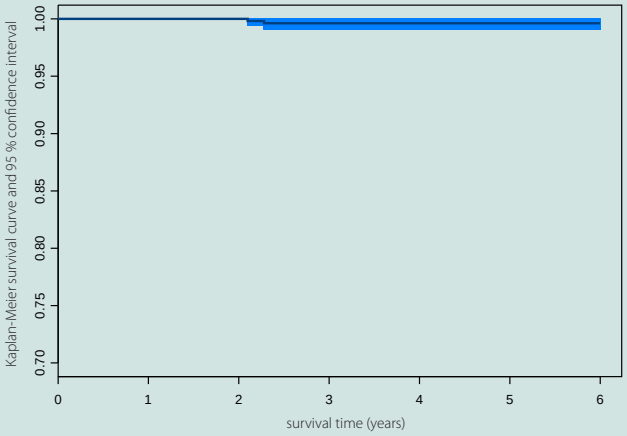


MULLER (BIOMET)

During the observed period we have recorded 716 component implantations and 2 failures, which represents a revision rate (RR) of 0.28 %.

Figure No. 33

Kaplan-Meier survival curve with 95 % confidence interval for primary component MULLER

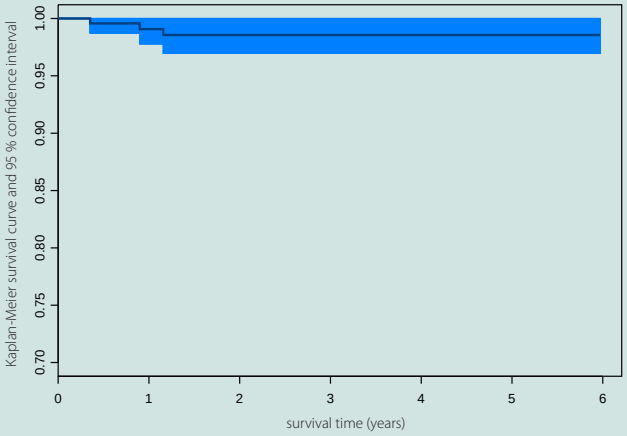


ULTIMA MK2

During the observed period we have recorded 264 component implantations and 3 failures, which represents a revision rate (RR) of 1.14 %.

Figure No. 34

Kaplan-Meier survival curve with 95 % confidence interval for primary component ULTIMA MK2



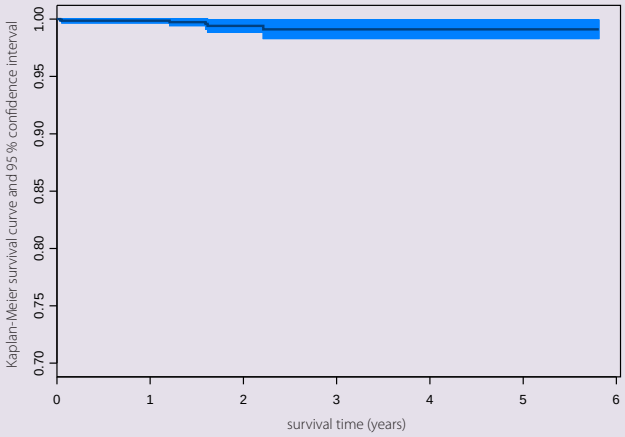
Femoral components – non-cemented

CORAIL (DE PUY)

During the observed period we have recorded 1,497 component implantations and 6 failures, which represents a revision rate (RR) of 0.40 %.

Figure No. 35

Kaplan-Meier survival curve with 95 % confidence interval for primary component CORAIL

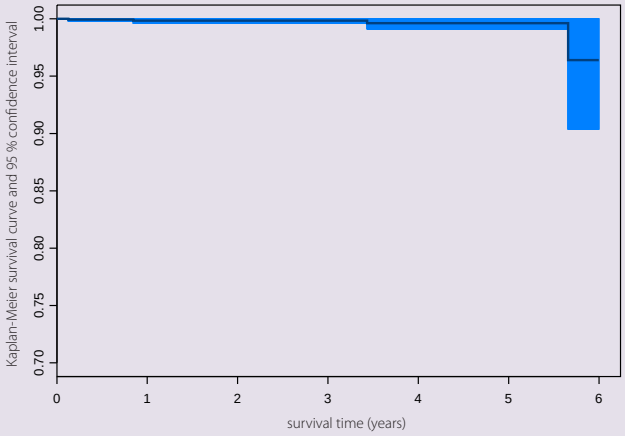


SAGITA EVOLUTION HA (SERF)

During the observed period we have recorded 1,428 component implantations and 4 failures, which represents a revision rate (RR) of 0.28 %.

Figure No. 36

Kaplan-Meier survival curve with 95 % confidence interval for primary component SAGITA EVOLUTION HA

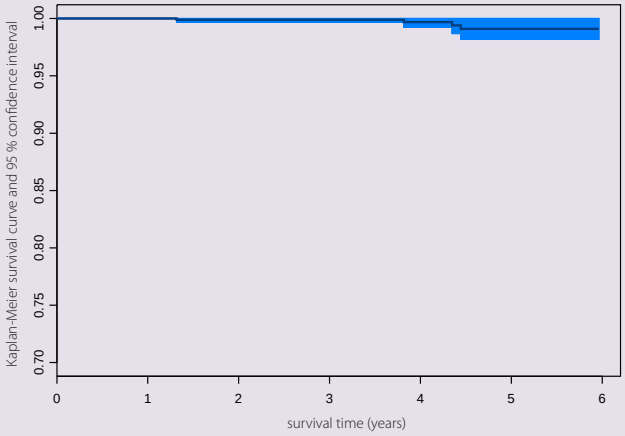


AML (DE PUY)

During the observed period we have recorded 1,089 component implantations and 4 failures, which represents a revision rate (RR) of 0.37 %.

Figure No. 37

Kaplan-Meier survival curve with 95 % confidence interval for primary component AML

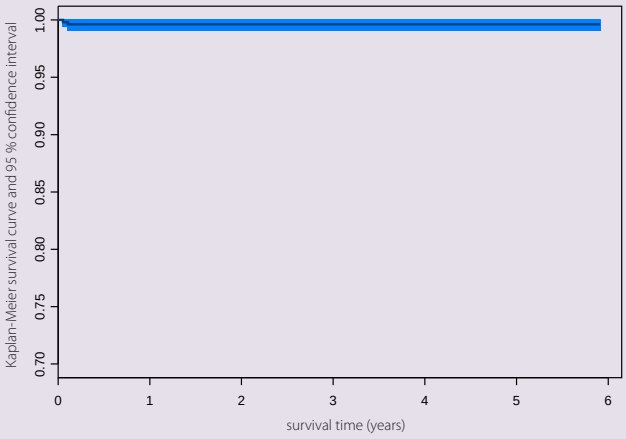


VERSYS (ZIMMER)

During the observed period we have recorded 527 component implantations and 2 failures, which represents a revision rate (RR) of 0.38 %.

Figure No. 38

Kaplan-Meier survival curve with 95 % confidence interval for primary component VERSYS

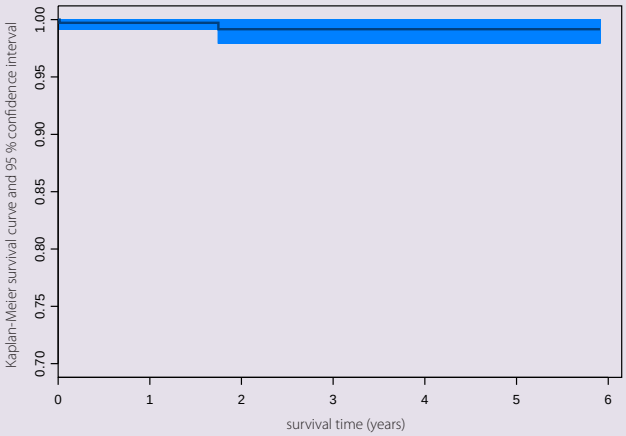


SF (BEZNOSKA)

During the observed period we have recorded 362 component implantations and 2 failures, which represents a revision rate (RR) of 0.55 %.

Figure No. 39

Kaplan-Meier survival curve with 95 % confidence interval for primary component SF



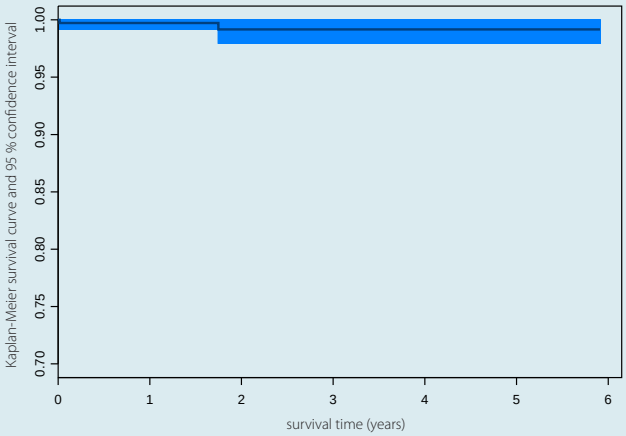
Femoral components – cemented

BEZNOSKA (BEZNOSKA)

During the observed period we have recorded 3,709 component implantations and 43 failures, which represents a revision rate (RR) of 1.16 %.

Figure No. 40

Kaplan-Meier survival curve with 95 % confidence interval for primary component BEZNOSKA

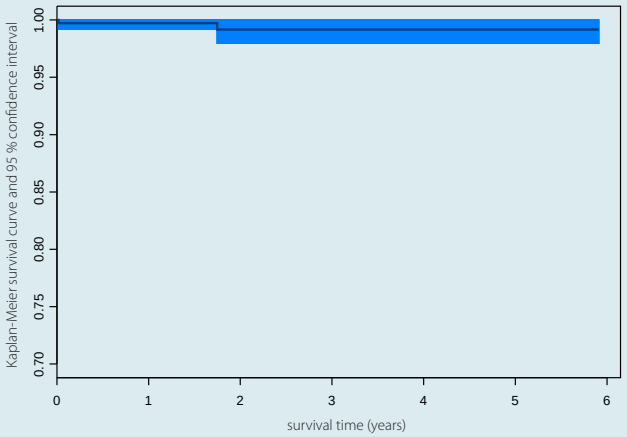


BEZNOSKA CCEP (BEZNOSKA)

During the observed period we have recorded 2,519 component implantations and 7 failures, which represents a revision rate (RR) of 0.28 %.

Figure No. 41

Kaplan-Meier survival curve with 95 % confidence interval for primary component BEZNOSKA CCEP

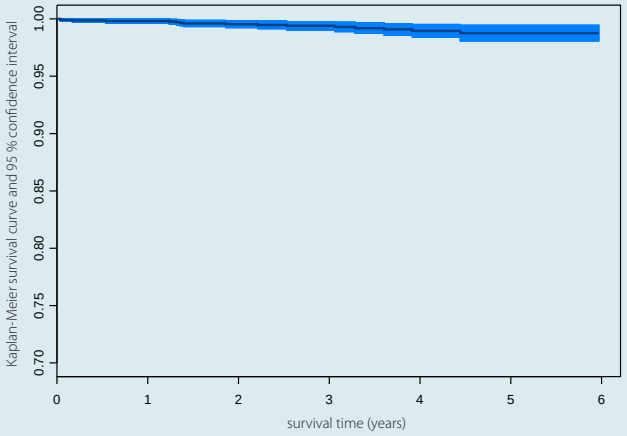


CHARNLEY (DE PUY)

During the observed period we have recorded 1,718 component implantations and 16 failures, which represents a revision rate (RR) of 0.93 %.

Figure No. 42

Kaplan-Meier survival curve with 95 % confidence interval for primary component CHARNLEY

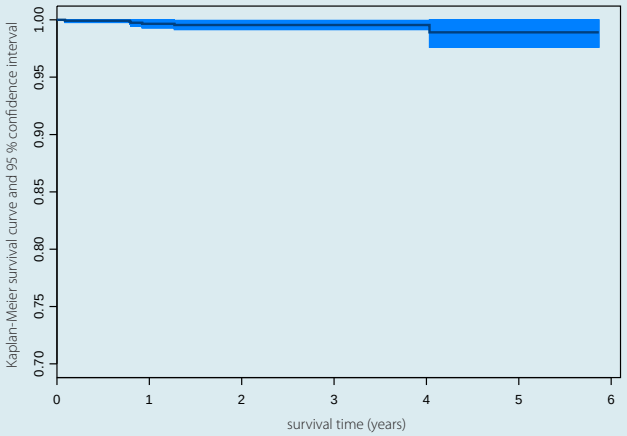


CENTRAMENT (AESCULAP)

During the observed period we have recorded 1,322 component implantations and 6 failures, which represents a revision rate (RR) of 0,45 %.

Figure No. 43

Kaplan-Meier survival curve with 95 % confidence interval for primary component CENTRAMENT

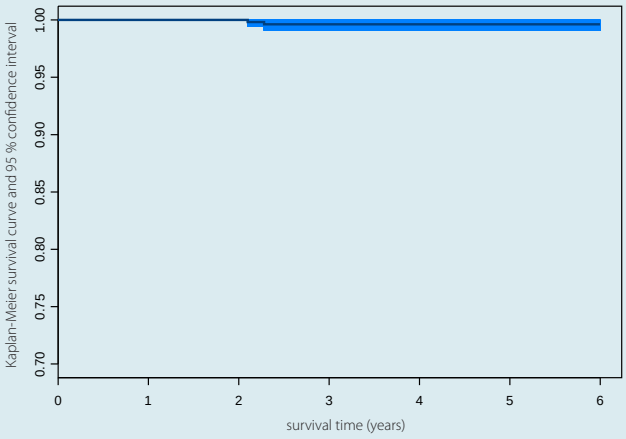


BIMETRIC (cement) (BIOMET)

During the observed period we have recorded 989 component implantations and 9 failures, which represents a revision rate (RR) of 0.91 %.

Figure No. 44

Kaplan-Meier survival curve with 95 % confidence interval for primary component BIMETRIC (cement)

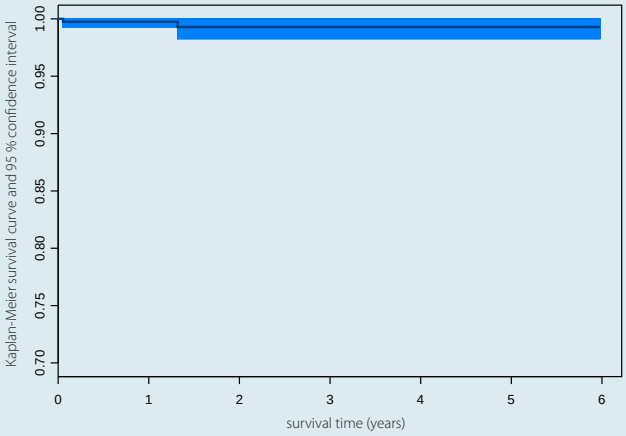


AUSTIN-MOORE CCEP (BIOMET)

During the observed period we have recorded 422 component implantations and 2 failures, which represents a revision rate (RR) of 0.47 %.

Figure No. 45

Kaplan-Meier survival curve with 95 % confidence interval for primary component AUSTIN-MOORE CCEP

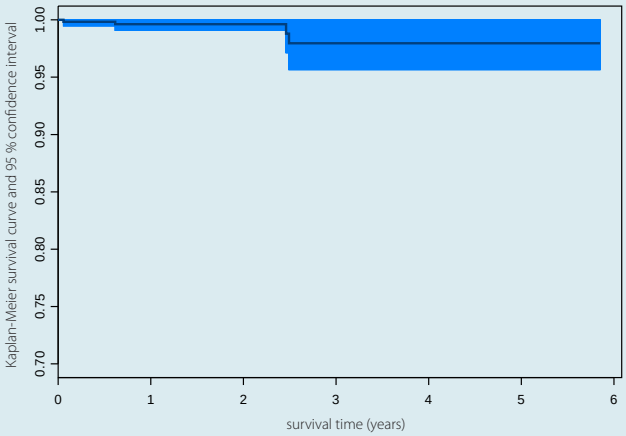


CSC (BEZNOSKA)

During the observed period we have recorded 577 component implantations and 4 failures, which represents a revision rate (RR) of 0.69 %.

Figure No. 46

Kaplan-Meier survival curve with 95 % confidence interval for primary component CSC

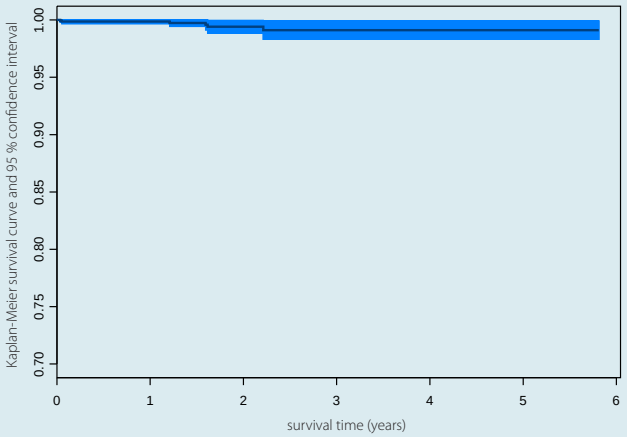


ELITE PLUS (DE PUY)

During the observed period we have recorded 340 component implantations and 21 failures, which represents a revision rate (RR) of 6.18 %.

Figure No. 47

Kaplan-Meier survival curve with 95 % confidence interval for primary component ELITE PLUS

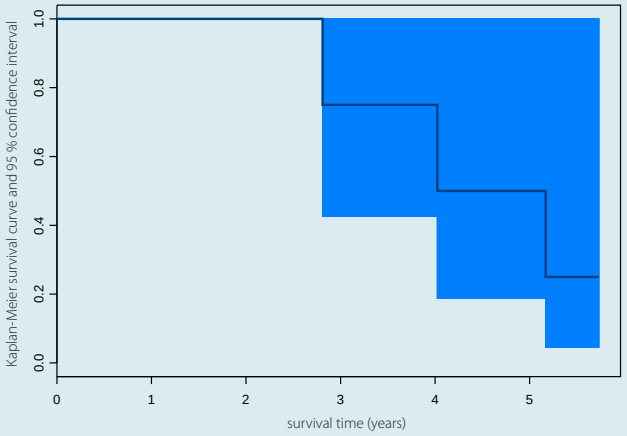


CHARNLEY MODULAR (DE PUY)

During the observed period we have recorded 153 component implantations and 4 failures, which represents a revision rate (RR) of 2.61 %.

Figure No. 48

Kaplan-Meier survival curve with 95 % confidence interval for primary component CHARNLEY MODULAR

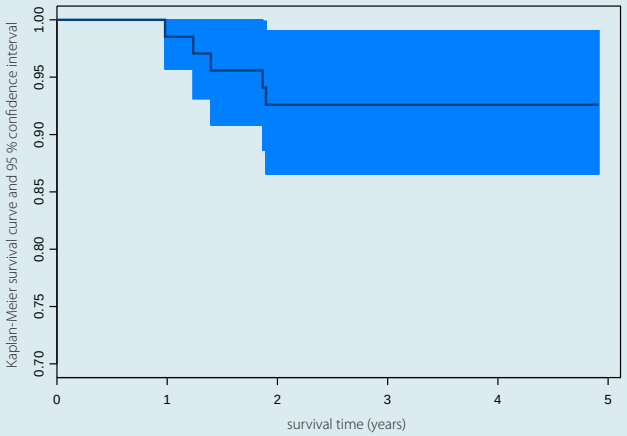


ULTIMA-HOWSE II (DE PUY)

During the observed period we have recorded 68 component implantations and 5 failures, which represents a revision rate (RR) of 7.35 %.

Figure No. 49

Kaplan-Meier survival curve with 95 % confidence interval for primary component ULTIMA-HOWSE II



Revision Arthroplasty

Survival rates of the components in revision arthroplasty (one revision procedure after the primary) and re-revision (one or more revision after the first revision) are significantly lower and the revision rate is higher. Therefore, we consider these parameters separately.

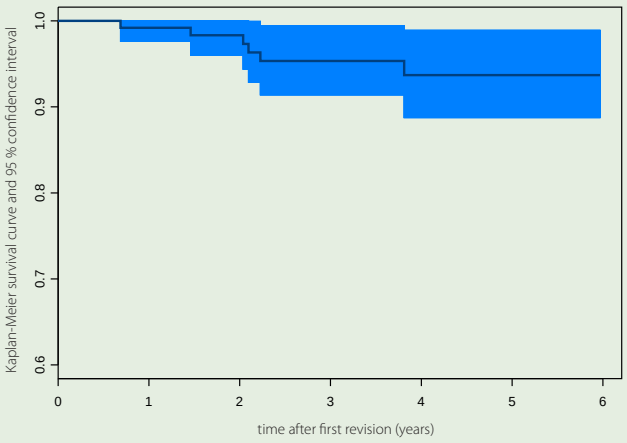
Acetabular components – non-cemented

DURALOC (DE PUY)

During the observed period we have recorded 136 component implantations and 6 failures, which represents a revision rate (RR) of 4.51 %.

Figure No. 50

Kaplan-Meier survival curve with 95% confidence interval for revised component DURALOC

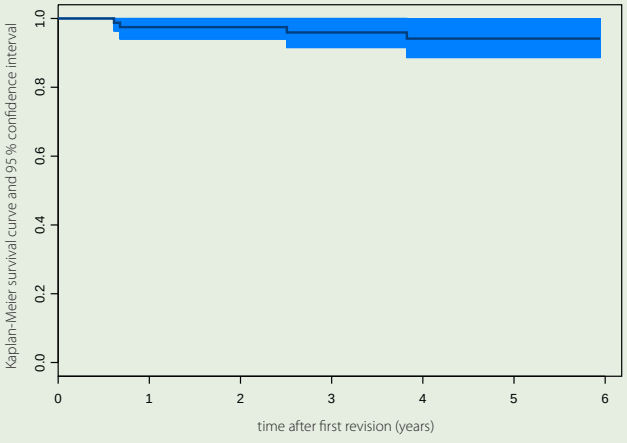


OCTOPUS (DE PUY)

During the observed period we have recorded 87 component implantations and 4 failures, which represents a revision rate (RR) of 4.60 %.

Figure No. 51

Kaplan-Meier survival curve with 95% confidence interval for revised component OCTOPUS

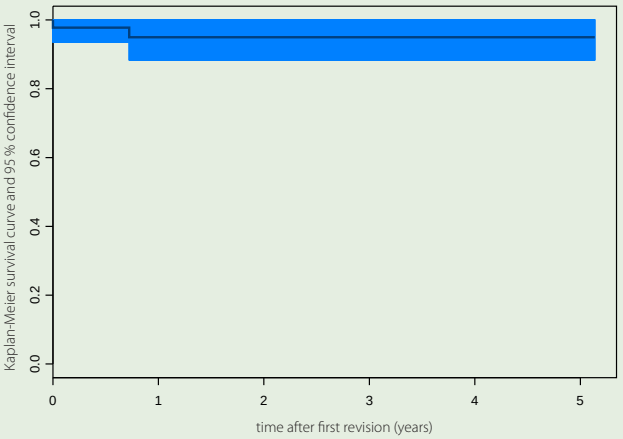


NOVAE EVOLUTION (SERF)

During the observed period we have recorded 45 component implantations and 2 failures, which represents a revision rate (RR) of 4.44 %.

Figure No. 52

Kaplan-Meier survival curve with 95% confidence interval for revised component NOVAE EVOLUTION

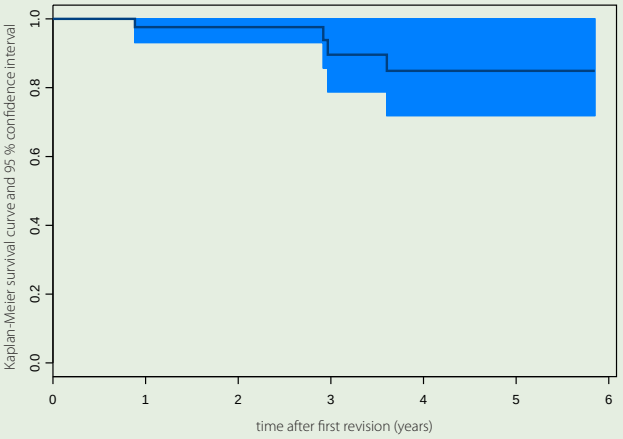


TRILOGY (ZIMMER)

During the observed period we have recorded 44 component implantations and 4 failures, which represents a revision rate (RR) of 9.09 %.

Figure No. 53

Kaplan-Meier survival curve with 95% confidence interval for revised component TRILOGY

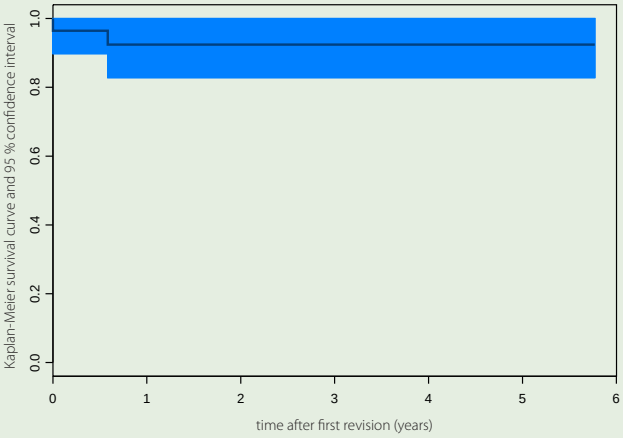


ZWEYMULLER-ALLOCLASSIC CSF (ZIMMER)

During the observed period we have recorded 28 component implantations and 2 failures, which represents a revision rate (RR) of 7.14 %.

Figure No. 54

Kaplan-Meier survival curve with 95% confidence interval for revised component ZWEYMULLER-ALLOCLASSIC CSF

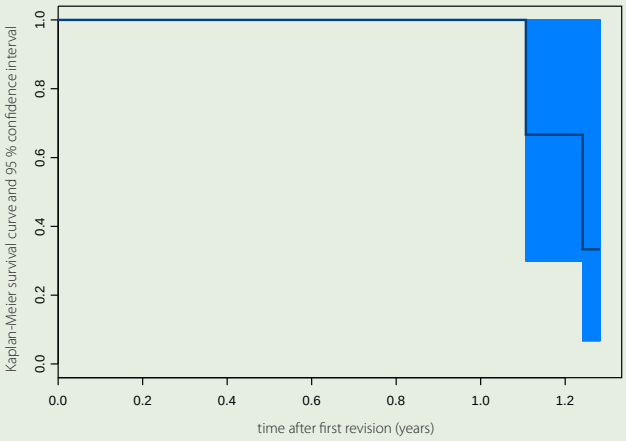


WM conical (WALTER MOTORLET)

During the observed period we have recorded 3 component implantations and 3 failures, which represents a revision rate (RR) of 100 %.

Figure No. 55

Kaplan-Meier survival curve with 95% confidence interval for revised component WM conical



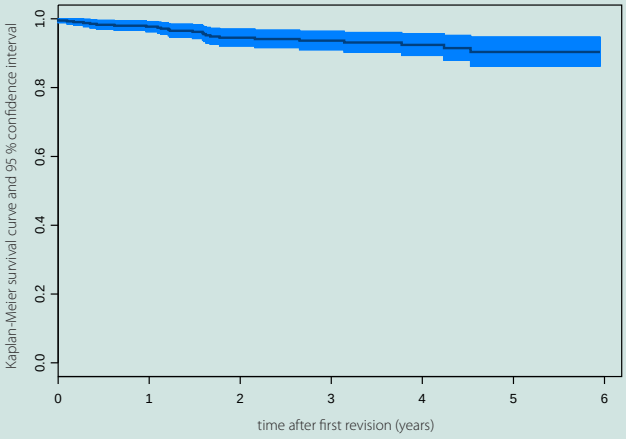
Acetabular components – cemented

BEZNOSKA (cement) BEZNOSKA

During the observed period we have recorded 423 component implantations and 26 failures, which represents a revision rate (RR) of 6.15 %.

Figure No. 56

Kaplan-Meier survival curve with 95% confidence interval for revised component BEZNOSKA (cement)

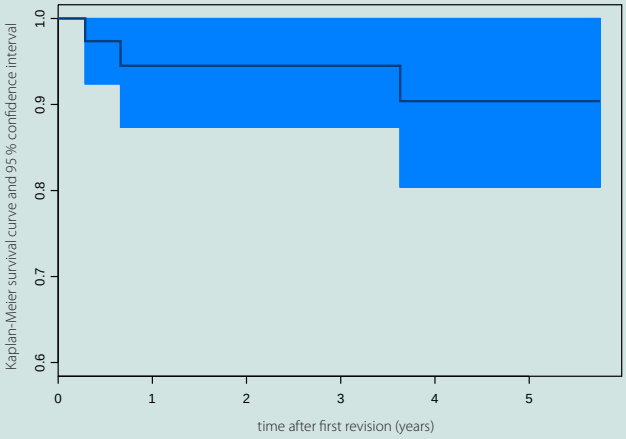


CHARNLEY (DE PUY)

During the observed period we have recorded 39 component implantations and 3 failures, which represents a revision rate (RR) of 7.69 %.

Figure No. 57

Kaplan-Meier survival curve with 95% confidence interval for revised component CHARNLEY

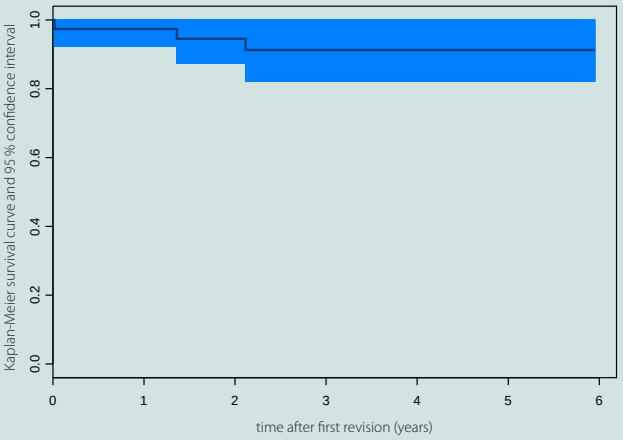


LUBINUS CLASSIC PLUS (LINK)

During the observed period we have recorded 38 component implantations and 3 failures, which represents a revision rate (RR) of 7.89 %.

Figure No. 58

Kaplan-Meier survival curve with 95% confidence interval for revised component LUBINUS CLASSIC PLUS

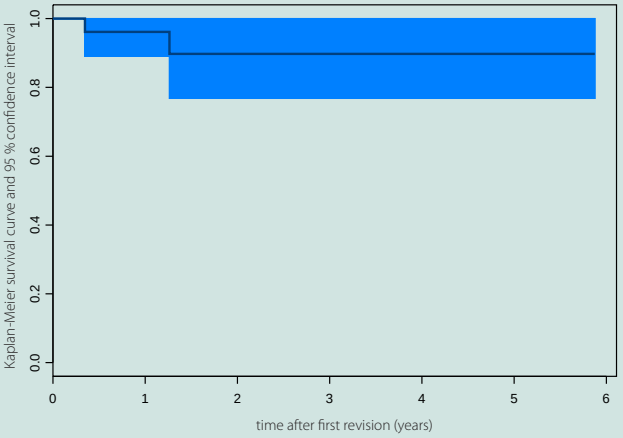


ELITE PLUS (DE PUY)

During the observed period we have recorded 28 component implantations and 2 failures, which represents a revision rate (RR) of 7.14 %.

Figure No. 59

Kaplan-Meier survival curve with 95% confidence interval for revised component ELITE PLUS



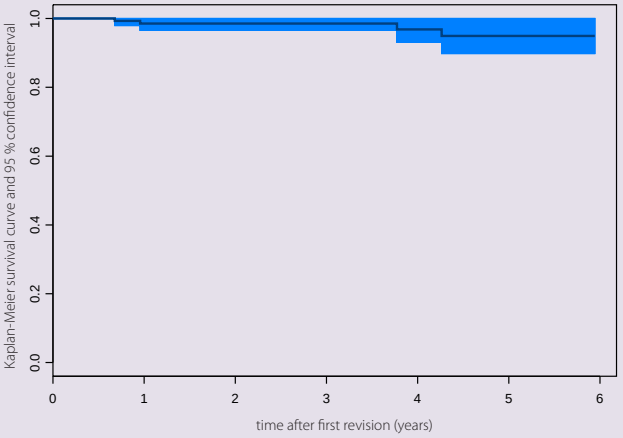
Femoral components – non-cemented

SOLUTION (DE PUY)

During the observed period we have recorded 169 component implantations and 4 failures, which represents a revision rate (RR) of 2.37 %.

Figure No. 60

Kaplan-Meier survival curve with 95% confidence interval for revised component SOLUTION

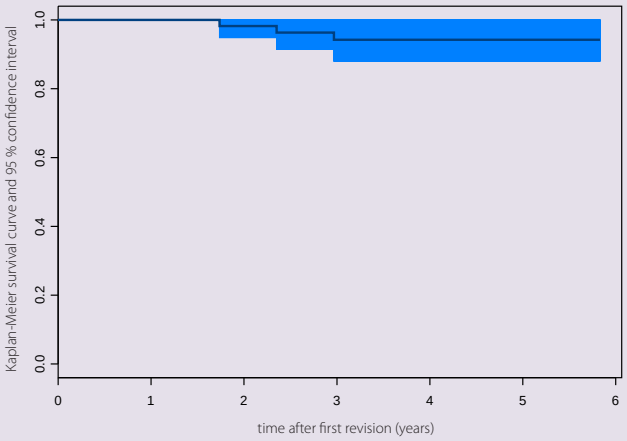


ZMR (ZIMMER)

During the observed period we have recorded 93 component implantations and 3 failures, which represents a revision rate (RR) of 3.23 %.

Figure No. 61

Kaplan-Meier survival curve with 95% confidence interval for revised component ZMR

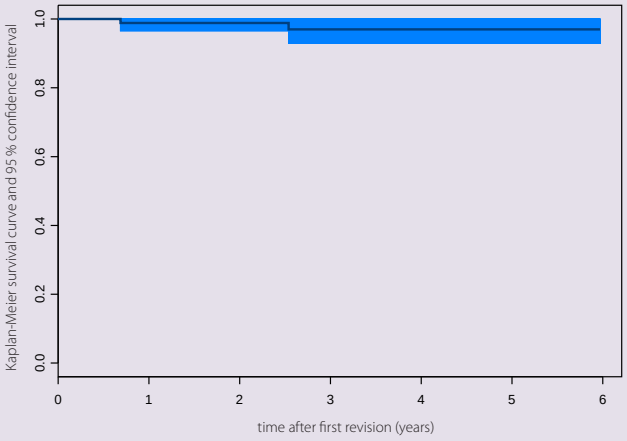


MP (LINK)

During the observed period we have recorded 93 component implantations and 2 failures, which represents a revision rate (RR) of 2.15 %.

Figure No. 62

Kaplan-Meier survival curve with 95% confidence interval for revised component MP



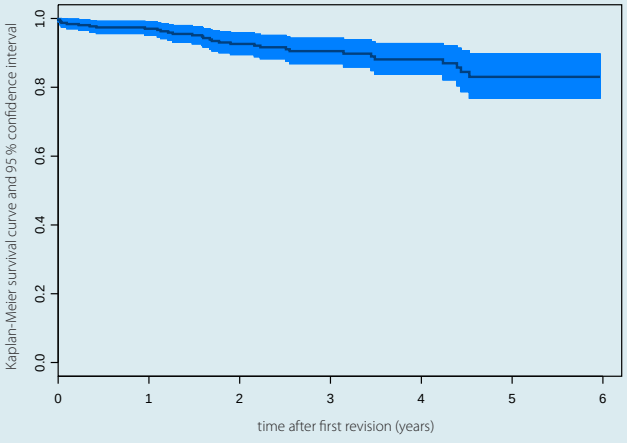
Femoral components – cemented

BEZNOSKA (BEZNOSKA)

During the observed period we have recorded 315 component implantations and 32 failures, which represents a revision rate (RR) of 10.16 %.

Figure No. 63

Kaplan-Meier survival curve with 95% confidence interval for revised component BEZNOSKA

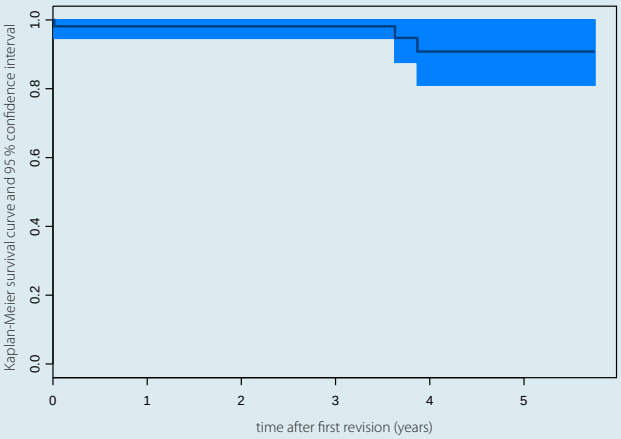


CHARNLEY (DE PUY)

During the observed period we have recorded 54 component implantations and 3 failures, which represents a revision rate (RR) of 5.56 %.

Figure No. 64

Kaplan-Meier survival curve with 95% confidence interval for revised component CHARNLEY

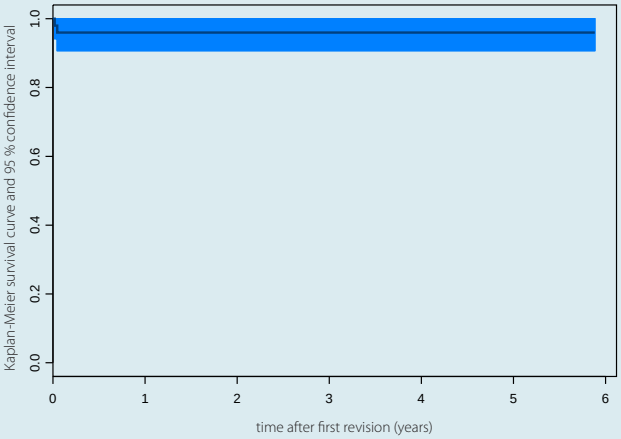


ELITE PLUS (DE PUY)

During the observed period we have recorded 50 component implantations and 2 failures, which represents a revision rate (RR) of 4.00 %.

Figure No. 65

Kaplan-Meier survival curve with 95% confidence interval for revised component ELITE PLUS

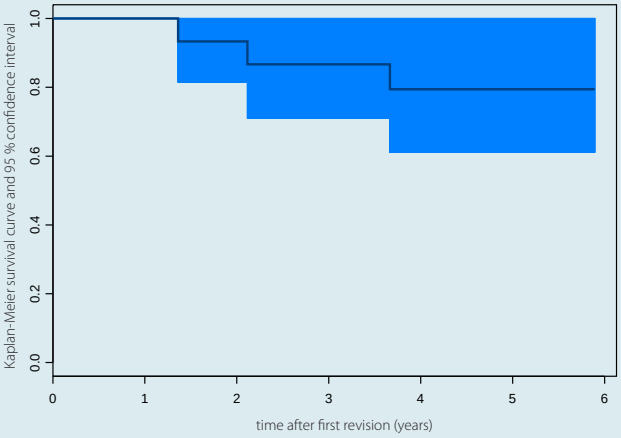


LUBINUS CLASSIC PLUS (LINK)

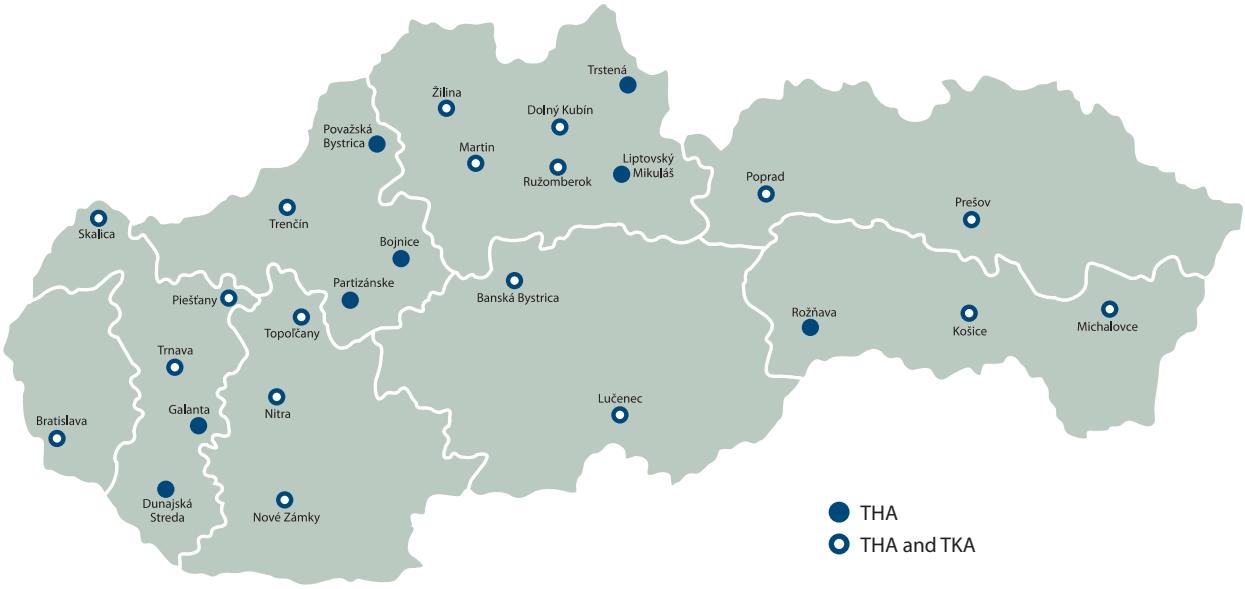
During the observed period we have recorded 15 component implantations and 3 failures, which represents a revision rate (RR) of 20.00 %.

Figure No. 66

Kaplan-Meier survival curve with 95% confidence interval for revised component LUBINUS CLASSIC PLUS



Arthroplasty of the Hip and the Knee in the Slovak Republic in 2003-2008

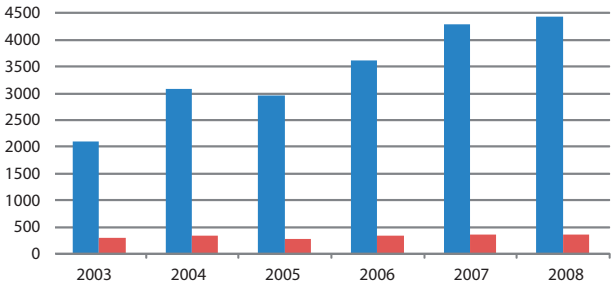


Geographical distribution of the departments performing hip and knee arthroplasty in Slovakia *Map*

Primary THA

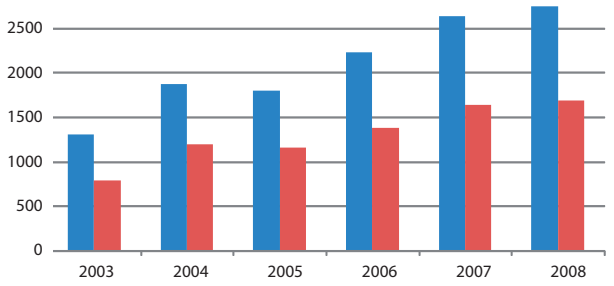
As seen in Figure No. 67, there is continuous growth in the rates of primary implantations. In the period of the 6 observed years, the growth was 112 %, but the growth in revisions is lower.

	Primary	Revision	Total
2003	2,087	293	2,380
2004	3,068	333	3,401
2005	2,953	270	3,223
2006	3,602	336	3,938
2007	4,274	347	4,621
2008	4,431	340	4,771
Total	20,415	1,919	22,334



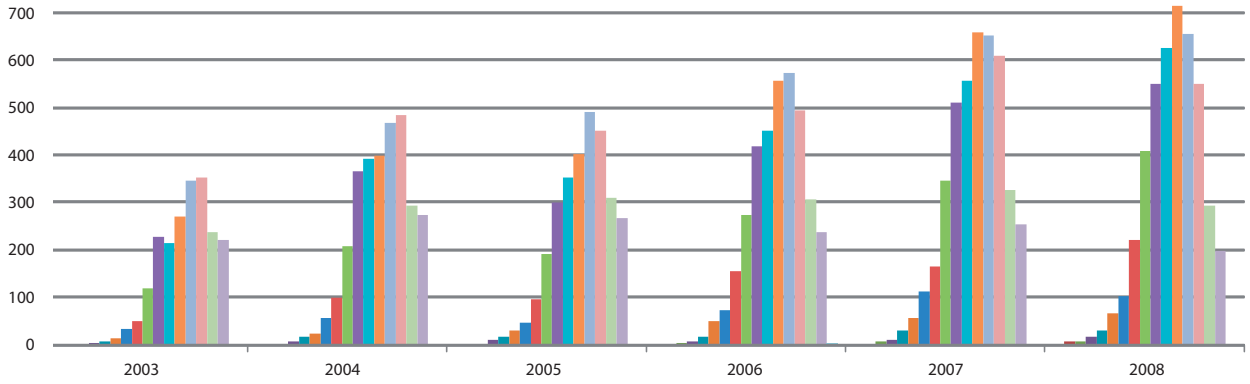
Number of primary and revision THA *Table and figure No. 67*

	Female	Male	Total
2003	1,306	781	2,087
2004	1,873	1,195	3,068
2005	1,793	1,160	2,953
2006	2,221	1,381	3,602
2007	2,635	1,639	4,274
2008	2,744	1,687	4,431
Total	12,572	7,843	20,415



Primary THA - Gender distribution *Table and figure No. 68*

	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85 +	Not Id.	Total
2003	0	0	4	6	13	33	48	119	227	214	270	345	352	237	219	0	2,087
2004	0	2	6	15	24	56	97	206	363	390	398	464	481	293	273	0	3,068
2005	2	1	9	18	29	45	94	191	298	352	401	490	448	308	267	0	2,953
2006	2	3	7	16	49	72	155	272	416	450	554	569	492	306	236	3	3,602
2007	1	9	11	29	56	113	163	344	508	553	655	648	607	326	251	0	4,274
2008	7	7	17	31	66	101	221	405	549	623	712	654	549	293	196	0	4,431
Total	12	22	54	115	237	420	778	1,537	2,361	2,582	2,990	3,170	2,929	1,763	1,442	3	20,415

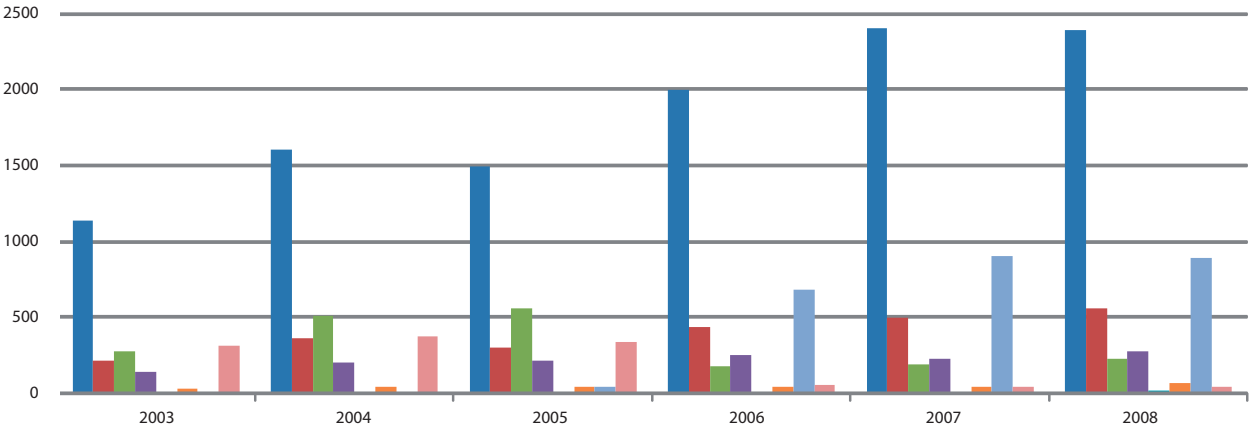


Primary THA - Age groups *Table and figure No. 69*

In the observed period there is growth in the age groups 15-19 years and 20-24 years: at the beginning of the follow-up period there was no implantation in these groups and into the 2008 there were 7 implantations. The trends are more clear in the age groups 30-34 years and 35-39 years.

Figure No. 70 presents the diagnosis as indications for arthroplasty.

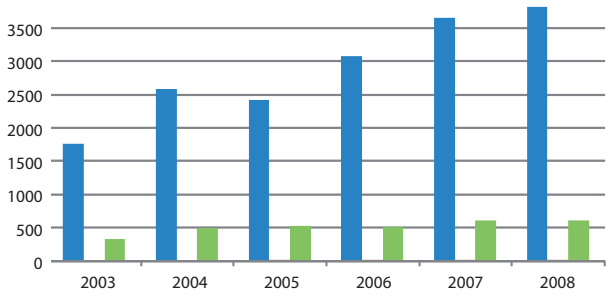
	Primary Coxarthrosis	Dysplastic Coxarthrosis	Posttraumatic Coxarthrosis	Aseptic Necrosis	M. Perthes	Rheumatoid Arthritis	Fracture of Femoral Neck	Other Causes	Total
2003	1,134	209	274	134	1	25	0	310	2,087
2004	1,601	359	498	201	3	40	1	365	3,068
2005	1,487	298	557	207	6	32	36	329	2,953
2006	1,986	434	169	243	1	32	682	54	3,602
2007	2,402	490	186	223	5	38	895	35	4,274
2008	2,386	556	225	266	11	57	887	43	4,431
Total	10,996	2,346	1,909	1,274	27	224	2,501	1,136	20,415



Primray THA - Diagnosis *Table and figure No. 70*

The number of hemiarthroplasties is almost constant.

	THA	Bipolar Hemiarth.	Hemiarth.	Total
2003	1,753	4	330	2,087
2004	2,566	10	492	3,068
2005	2,408	15	530	2,953
2006	3,069	13	516	3,598
2007	3,647	20	607	4,274
2008	3,805	19	607	4,431
Total	17,248	81	3,082	20,411

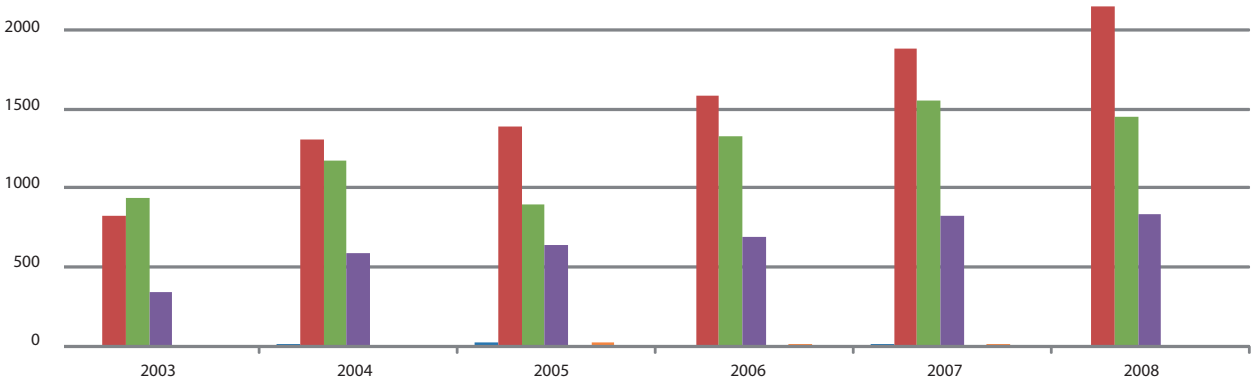


Primary THA - Type of THA

Table and figure No. 71

The anterolateral approach is widely used. Minimally invasive approaches, on the other hand, were performed rarely.

	Anterior	Anterolateral	Lateral	Posterolateral	Trochanterotomy	MIS	Not Idetificated	Total
2003	2	815	936	334	0	0	0	2,087
2004	12	1,299	1,173	579	0	4	1	3,068
2005	20	1,380	894	635	0	24	0	2,953
2006	7	1,574	1,322	683	4	9	2	3,601
2007	10	1,878	1,549	822	4	11	0	4,274
2008	4	2,145	1,444	833	3	2	0	4,431
Total	55	9,091	7,318	3,886	11	50	3	20,414

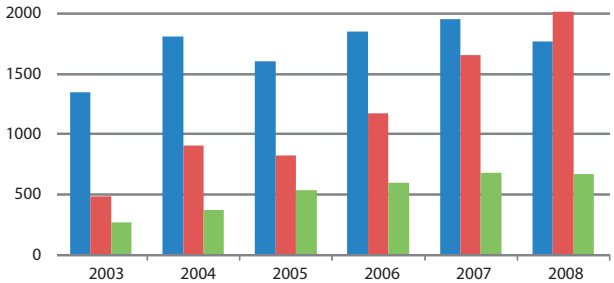


Primary THA - Surgical approach

Table and figure No. 72

There is a tendency to prefer non-cemented and hybrid types of fixation (with cemented stem and non-cemented socket, reverse hybrids are not popular.

	Cement	Non-cement	Hybrid	Total
2003	1,342	482	263	2,087
2004	1,800	901	366	3,067
2005	1,603	821	529	2,953
2006	1,840	1,166	593	3,599
2007	1,950	1,645	679	4,274
2008	1,761	2,005	665	4,431
Total	10,296	7,020	3,095	20,411

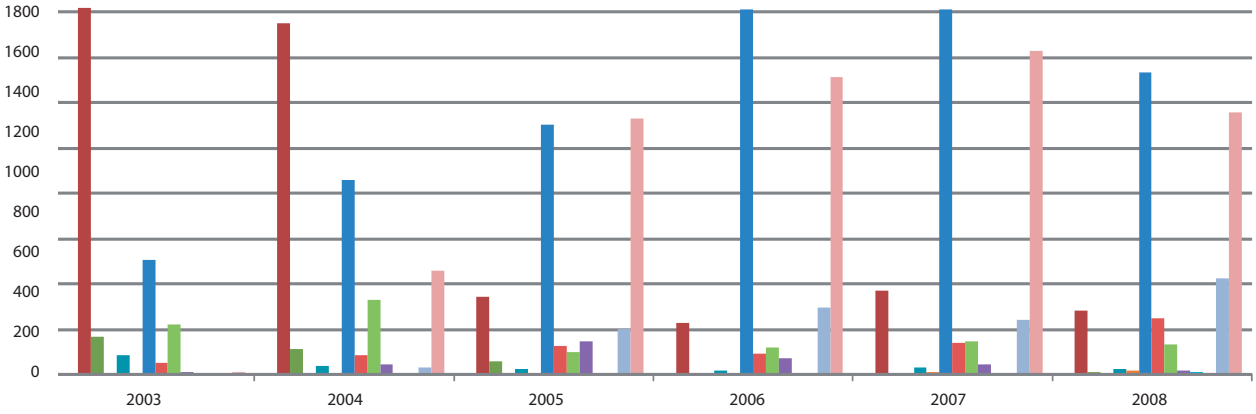


Primary THA - Type of fixation

Table and figure No. 73

Figure No. 74 shows the types of bone cement used. The increase in number of antibiotic-loaded bone cements is demonstrated.

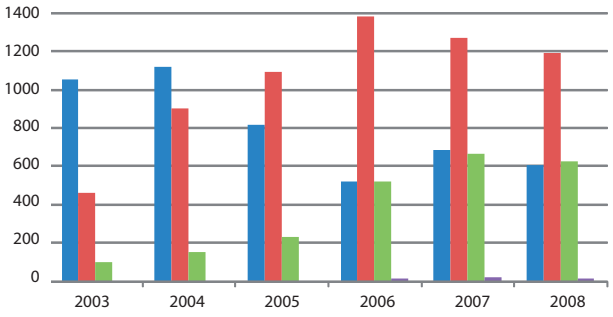
	Biomet Plus	CMW	CMW-G	Copal	Osteo-bond	Palacos LV genta	Palacos R	Palacos R genta	Palamed	Palamed - G	Refobacin Plus	Refobacin Revision	SmartSet GHV	SmartSet HV	Total
2003	0	1,614	162	0	80	0	500	45	214	10	0	0	0	7	2,632
2004	0	1,547	108	0	35	2	858	80	329	41	0	0	30	454	3,484
2005	0	337	53	0	19	0	1,099	123	98	145	0	0	200	1,130	3,204
2006	0	225	2	0	14	2	1,613	91	117	67	0	0	290	1,308	3,729
2007	0	369	5	0	30	9	1,613	135	146	39	0	0	238	1,425	4,009
2008	0	277	9	0	19	16	1,331	243	129	13	4	0	418	1,153	3,612
Total	0	4,369	339	0	197	29	7,014	717	1,033	315	4	0	1,176	5,477	20,670



Primary THA - Type of bone cement *Table and figure No. 74*

Modern cementing techniques were used in 25 % of all cases.

	1st Gen.	2nd Gen.	3rd Gen.	Not Identif.	Total
2003	1,047	456	101	1	1,605
2004	1,117	900	148	1	2,166
2005	813	1,086	230	3	2,132
2006	521	1,378	519	15	2,433
2007	680	1,268	663	18	2,629
2008	602	1,186	624	14	2,426
Total	4,780	6,274	2,285	52	13,391



Primary THA - Cementing techniques *Table and figure No. 75*

The most frequently used implants are in Table No. 76.

2003				
	Acetabular Component	Number	Femoral Component	Number
Cement	Charnley	501	Charnley	500
Non-cement	Duraloc	226	AML	213
Hybrid	Duraloc	84	Bimetric (cement)	59

2004				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	531	Beznoska	554
Non-cement	Duraloc	306	AML	245
Hybrid	Duraloc	127	Beznoska	94

2005				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	419	Beznoska CCEP	457
Non-cement	Novae Evolution	225	Sagita Evolution HA	225
Hybrid	Beznoska (non-cement)	155	Beznoska	162

2006				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	592	Beznoska	557
Non-cement	Duraloc	322	Corail	252
Hybrid	Duraloc	138	Beznoska	211

2007				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	630	Beznoska	523
Non-cement	Pinnacle	440	Corail	489
Hybrid	Duraloc	159	Beznoska	201

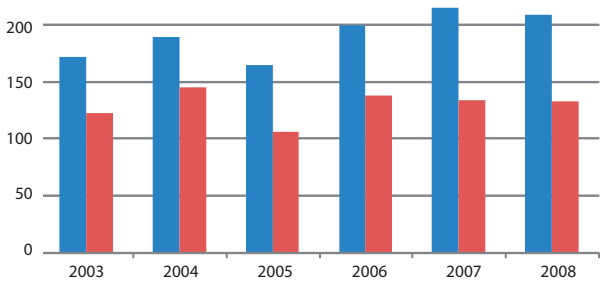
2008				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	436	Beznoska CCEP	446
Non-cement	Pinnacle	617	Corail	583
Hybrid	Duraloc	132	Beznoska	175

Primary THA - The most frequently used implants *Table No. 76*

Revision THA

Figure No. 67 (page 38) shows almost no growth in the number of revisions. Women are revised more often.

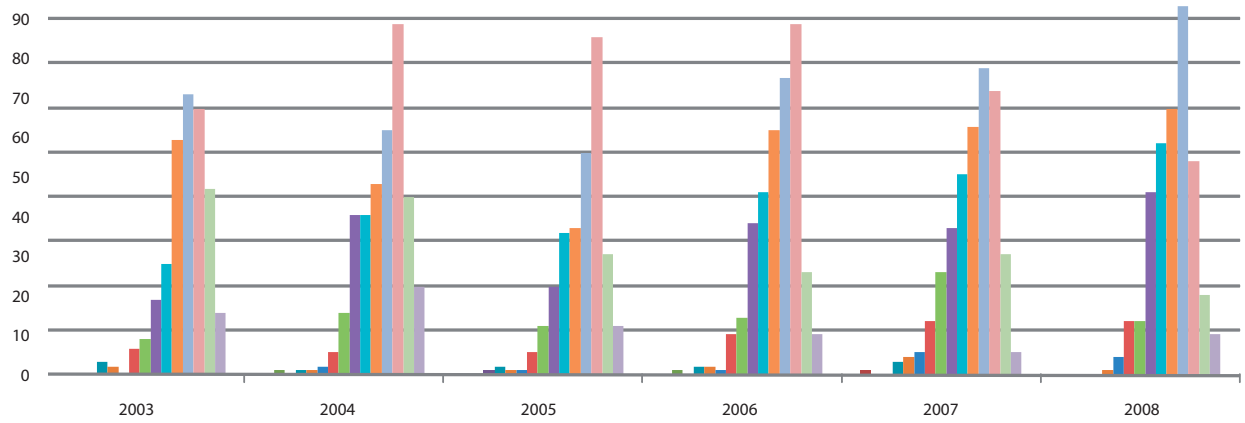
	Female	Male	Total
2003	171	122	293
2004	189	144	333
2005	164	106	270
2006	199	137	336
2007	214	133	347
2008	208	132	340
Total	1,145	774	1,919



Revision THA - Gender distribution *Table and figure No. 77*

The most frequently patients are in the age range 60-80 years.

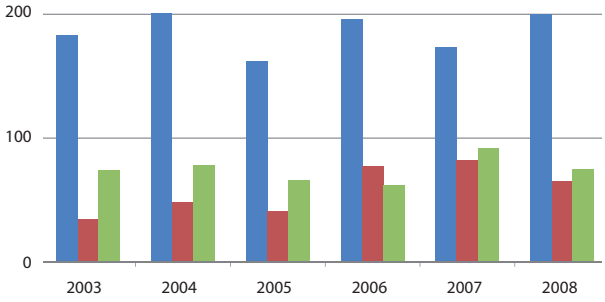
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85 +	Total
2003	0	0	0	3	2	0	6	8	17	25	53	63	60	42	14	293
2004	0	1	0	1	1	2	5	14	36	36	43	55	79	40	20	333
2005	0	0	1	2	1	1	5	11	20	32	33	50	76	27	11	270
2006	0	1	0	2	2	1	9	13	34	41	55	67	79	23	9	336
2007	1	0	0	3	4	5	12	23	33	45	56	69	64	27	5	347
2008	0	0	0	0	1	4	12	12	41	52	60	83	48	18	9	340
Total	1	2	1	11	11	13	49	81	181	231	300	387	406	177	68	1,919



Revision THA - Age groups *Table and figure No. 78*

Cemented primary THAs are revised more often than other type of fixation.

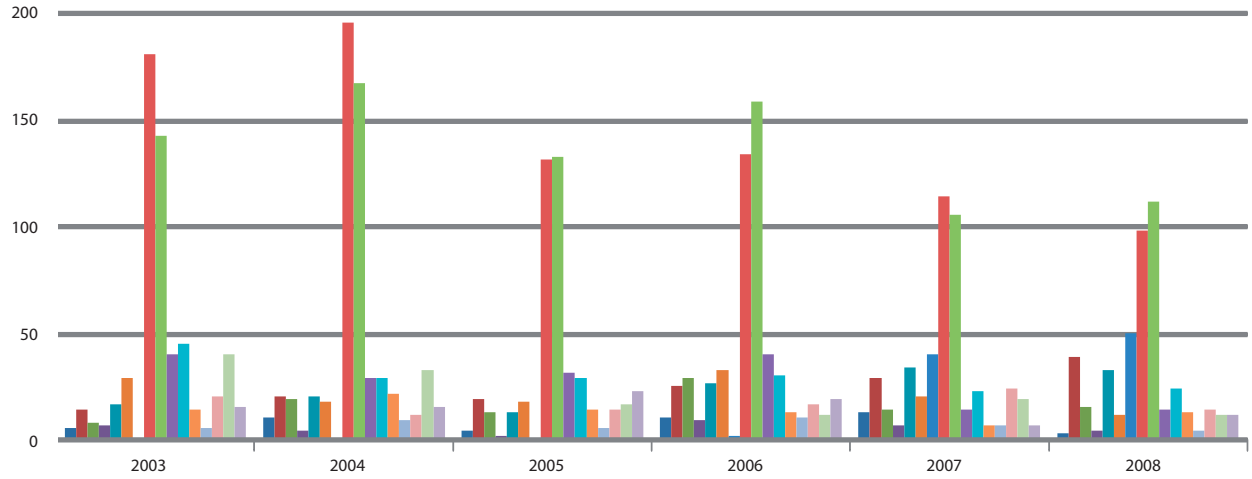
	Cement	Non-cement	Hybrid	Not Identif.	Total
2003	183	34	74	2	293
2004	201	48	78	6	333
2005	162	41	66	1	270
2006	196	77	62	1	336
2007	173	82	92	0	347
2008	200	65	75	0	340
Total	1,115	347	447	10	1,919



Revision THA - Type of fixation of primary THA *Table and figure No. 79*

Loosening of the acetabular component is the main reason for revision.

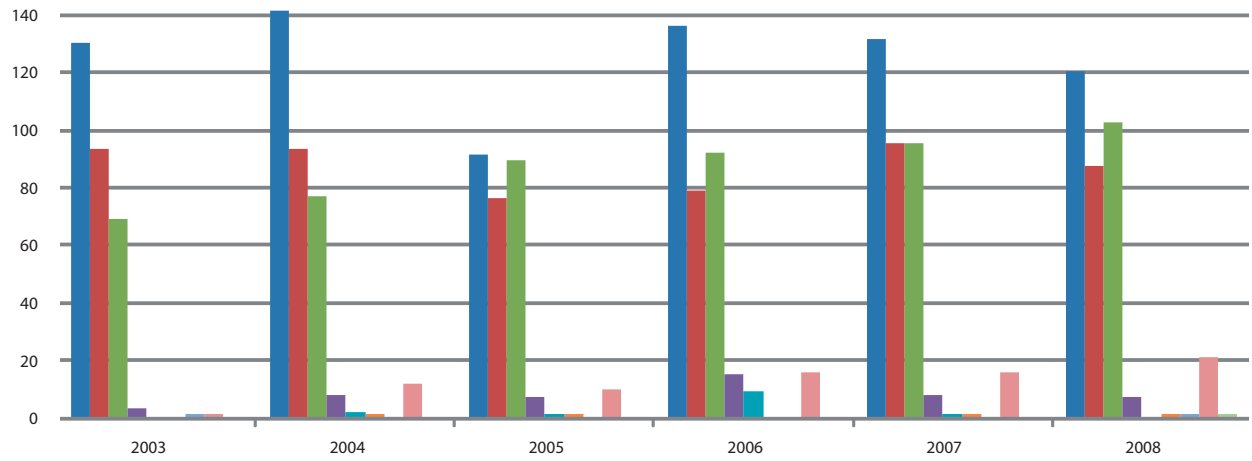
	Paraarticular Osifications	Luxation	Polyethylene Wear	Early Infection	Chronic Infection	Acetabulary Protrusis	Aseptic Loosening of Both Components	Aseptic Loosening of Acetab. Component	Aseptic Loosening of Femoral Component	Osteolysis of Acetabulum	Osteolysis of Femur	Big Bone Defect of Acetabulum	Big Bone Defect of Femur	Periprosthesis Fracture	Fracture of Implant	Other	Total
2003	5	14	8	6	16	28	0	181	142	39	45	14	5	20	39	15	577
2004	10	20	18	3	20	17	0	196	167	29	28	21	9	11	32	15	596
2005	4	19	12	1	12	17	0	131	133	31	28	14	5	13	16	22	458
2006	10	25	28	8	26	32	1	134	159	40	30	12	10	16	11	18	560
2007	12	28	14	6	34	20	39	114	105	13	22	6	6	24	18	6	467
2008	3	38	15	4	32	11	49	98	111	13	23	12	4	13	11	11	448
Total	44	144	95	28	140	125	89	854	817	165	176	79	39	97	127	87	3,106



Revision THA - Reason for revision *Table and figure No. 80*

Figure No. 81 represents the part of the implant requiring revision. There is an increase in the number of explantations, probably due to the large defects.

	Whole System	Acetab. Component	Femor. Component	Head	Inlay	Total Replace-ment of Bipolar CCEP	Osteosynthesis	Girdlestone	Other	Total
2003	130	93	69	3	0	0	1	1	0	297
2004	141	93	77	8	2	1	0	12	0	334
2005	91	76	89	7	1	1	0	10	0	275
2006	136	79	92	15	9	0	0	16	0	347
2007	131	95	95	8	1	1	0	16	0	347
2008	120	87	102	7	0	1	1	21	1	340
Total	749	523	524	48	13	4	2	76	1	1,940



Revision THA - Revised parts of implant *Table and figure No. 81*

The most revised systems are shown in Table No. 82 and the most used revision systems in Table No. 83.

2003				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	119	Beznoska	121
Non-cement	other	16	other	12
Hybrid	other	31	other	34

2004				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	130	Beznoska	126
Non-cement	other	13	other	14
Hybrid	other	44	other	42

2005				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	94	Beznoska	89
Non-cement	other	11	other	12
Hybrid	other	35	other	30

2006				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	88	Beznoska	96
Non-cement	other	31	other	24
Hybrid	other	21	other	20

2007				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	102	Beznoska	97
Non-cement	other	20	other	20
Hybrid	other	28	other	28

2008				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	96	Beznoska	97
Non-cement	Duraloc	12	Corail	12
Hybrid	other	28	other	30

Revision THA - The most revised THA in relation to type of fixation *Table No. 82*

2003				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	58	Beznoska	42
Non-cement	Octopus	28	Solution	41
Hybrid	Novae Evolution	4	Sagita Evolution	4

2004				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	85	Beznoska	51
Non-cement	Duraloc	26	ZMR	29
Hybrid	Muller Novae Evolution	7 7	MP	12

2005				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	47	Beznoska	29
Non-cement	Duraloc	19	ZMR	18
Hybrid	Lubinus Classic Plus Novae Evolution	7 7	MP	12

2006				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	59	Beznoska	51
Non-cement	Duraloc	15	Solution	21
Hybrid	Novae Evolution	5	Beznoska	13

2007				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	64	Beznoska	38
Non-cement	Duraloc	16	Solution	31
Hybrid	Beznoska (cement)	6	Beznoska	9

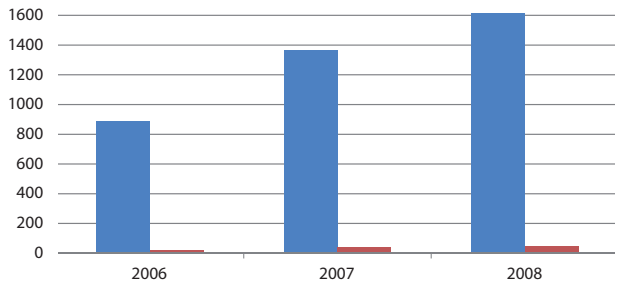
2008				
	Acetabular Component	Number	Femoral Component	Number
Cement	Beznoska (cement)	63	Beznoska	30
Non-cement	Pinnacle	14	Solution	37
Hybrid	Beznoska (cement)	5	Beznoska	5

Revision THA - The most used revision THA *Table No. 83*

Primary TKA

We launched the SAR for knee implants in January 2006. During the observed period we have recorded a growth of 82 % within two years.

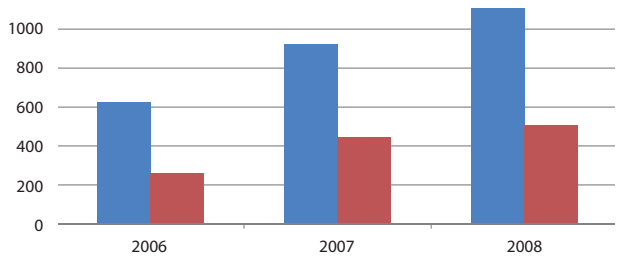
	Primary	Revision	Total
2006	885	20	905
2007	1,365	40	1,405
2008	1,610	49	1,659
Total	3,860	109	3,969



Number of primary and revision TKA *Table and figure No. 84*

TKA was performed more often in women and the gender ratio has remained constant.

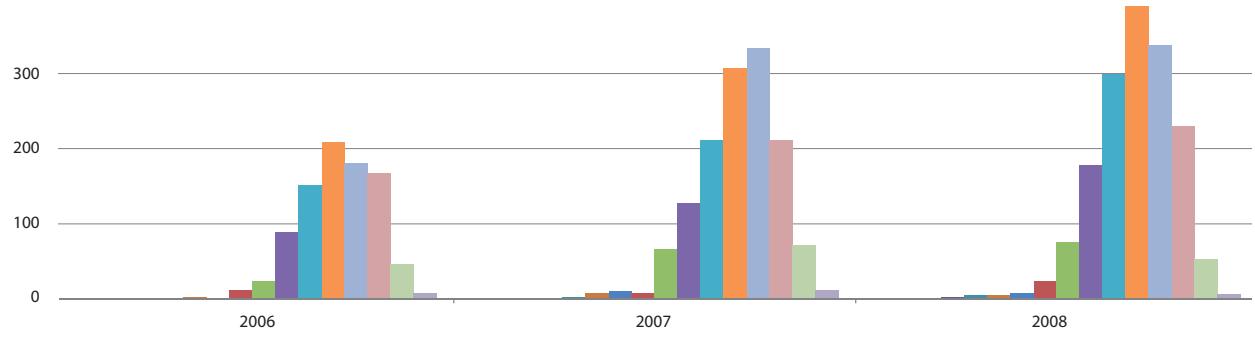
	Female	Male	Total
2006	624	261	885
2007	923	442	1,365
2008	1,106	504	1,610
Total	2,653	1,207	3,860



Primary TKA - Gender distribution *Table and figure No. 85*

There is a tendency to implant TKAs in the younger age groups.

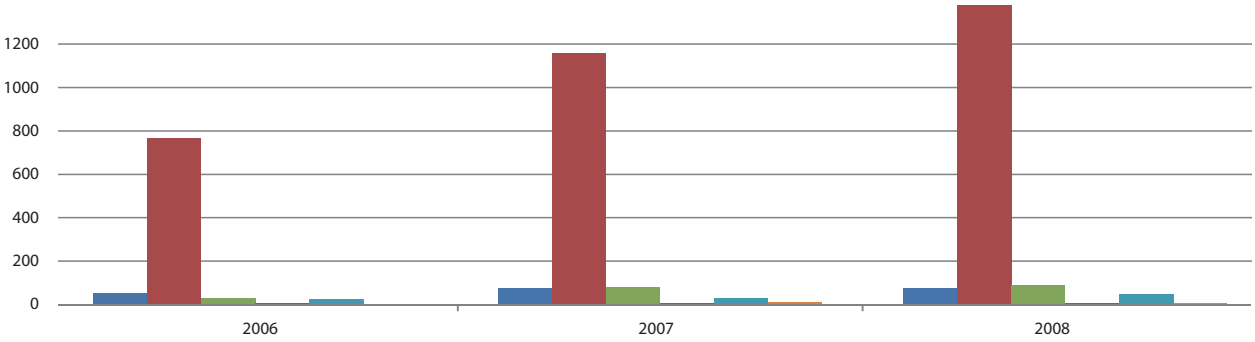
	- 15	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85 +	Total
2006	0	0	0	0	0	2	1	11	24	88	151	208	180	167	46	7	885
2007	0	1	0	0	2	7	10	7	66	127	211	307	334	211	71	11	1,365
2008	1	1	1	2	5	5	7	23	75	178	298	389	338	229	52	6	1,610
Total	1	2	1	2	7	14	18	41	165	393	660	904	852	607	169	24	3,860



Primary TKA - Age groups *Table and figure No. 86*

The main indication has been primary bicondylar arthritis.

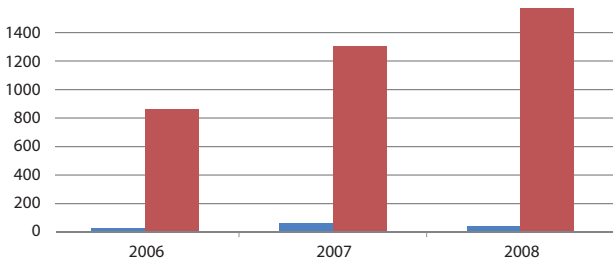
	Primary Monocon-dylar Arthrosis	Primary Bicondy-lar Arthrosis	Posttraumatic Arthrosis	Aseptic Necrosis	Rheumatoid Arthritis	Other	Total
2006	52	770	29	5	26	3	885
2007	78	1,158	80	7	30	12	1,365
2008	77	1,377	90	8	49	9	1,610
Total	207	3,305	199	20	105	24	3,860



Primary TKA - Diagnosis *Table and figure No. 87*

In only 3.4 % was unicondylar knee replacement used.

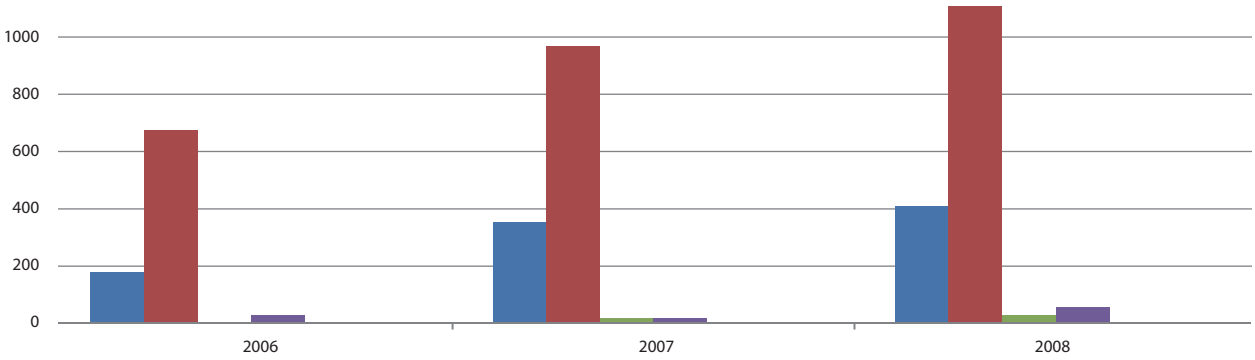
	Unicondylar	Bicondylar	Total
2006	26	859	885
2007	60	1,305	1,365
2008	40	1,570	1,610
Total	126	3,734	3,860



Primary TKA - Type of TKA *Table and figure No. 88*

Medial parapatellar and mid-vastus approaches are the mostly used.

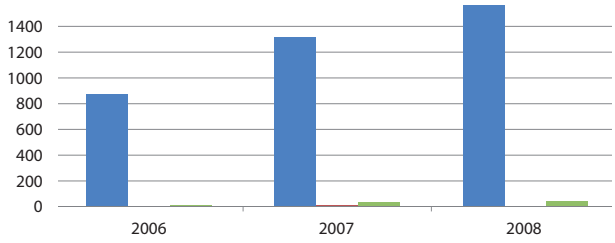
	Mid-vastus	Medial Parapatellar	Lateral Parapatellar	Subvastus	Tubercle Osteotomy	Other	Total
2006	178	674	4	28	1	0	885
2007	353	970	18	20	3	1	1,365
2008	411	1,109	30	56	0	4	1,610
Total	942	2,753	52	104	4	5	3,860



Primary TKA - Surgical approach *Table and figure No. 89*

Only 0.5 % cases were non-cemented and in 2.2 % hybrid type of fixation was used.

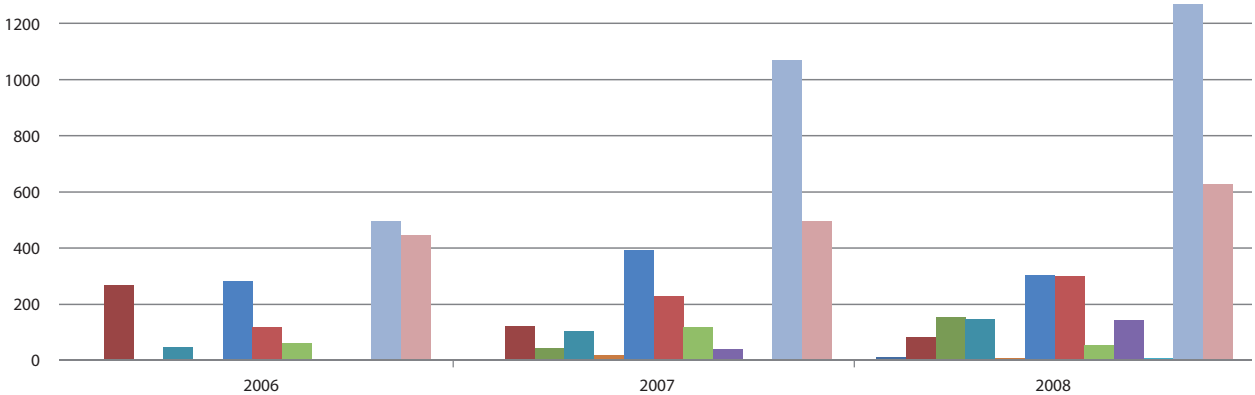
	Cement	Non-cement	Hybrid	Total
2006	871	4	10	885
2007	1,320	10	35	1,365
2008	1,564	5	41	1,610
Total	3,755	19	86	3,860



Primary TKA - Type of fixation *Table and figure No. 90*

Antibiotic-loaded cements predominate.

	Biomet Plus	CMW	CMW-G	Osteo-bond	Palacos LV genta	Palacos R	Palacos R genta	Palamed	Palamed - G	Refoba-cin Plus	SmartSet GHV	SmartSet HV	Total
2006	0	269	2	48	0	283	119	62	3	0	497	447	1,730
2007	0	124	46	105	19	394	229	118	41	0	1,068	495	2,639
2008	12	84	156	147	8	305	302	55	145	8	1,268	630	3,120
Total	12	477	204	300	27	982	650	235	189	8	2,833	1,572	7,489



Primary TKA - Type of bone cement *Table and figure No. 91*

Table No. 92 presents the most commonly used types of implants.

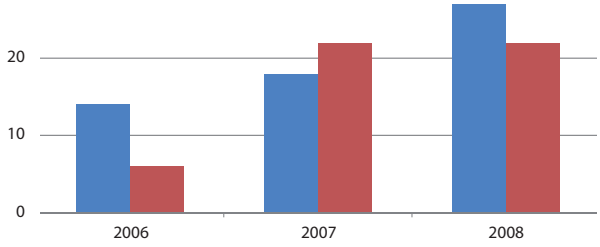
	2006		2007		2008	
Cement	PFC Sigma	268	PFC Sigma	513	PFC Sigma	690
Non-cement	Rotasurf	2	AMK	4	Rotasurf	3
Hybrid	AGC - universal knee	6	AGC - universal knee	20	AGC - universal knee	21

Primary TKA - The most frequently used implants *Table No. 92*

Revision TKA

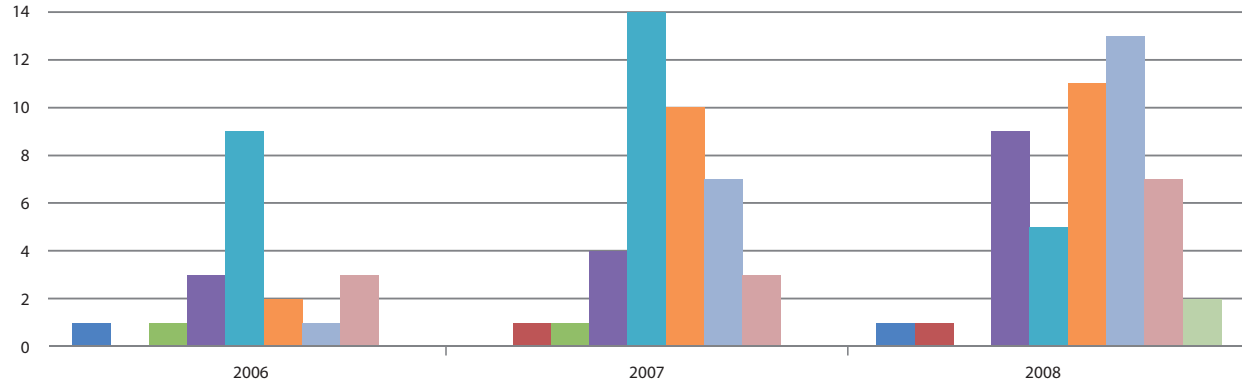
During the period of observation we have recorded 109 revisions: Figures No. 93, 94, 95 and 96 show the gender distribution, age groups, reasons of revision and the type of fixation of primary TKA. The most common reasons for revision are early infection, late infection and the aseptic loosening. Table No. 98. presents the most revised implants and the Table No. 99 the most commonly used revision systems.

	Female	Male	Total
2006	14	6	20
2007	18	22	40
2008	27	22	49
Total	59	50	109



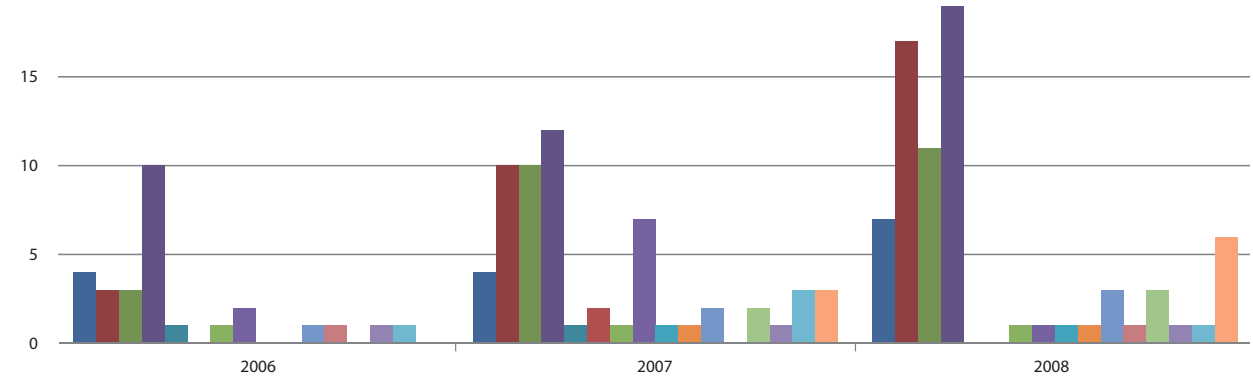
Revision TKA - Gender distribution *Table and figure No. 93*

	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Total
2006	1	0	1	3	9	2	1	3	0	20
2007	0	1	1	4	14	10	7	3	0	40
2008	1	1	0	9	5	11	13	7	2	49
Total	2	2	2	16	28	23	21	13	2	109



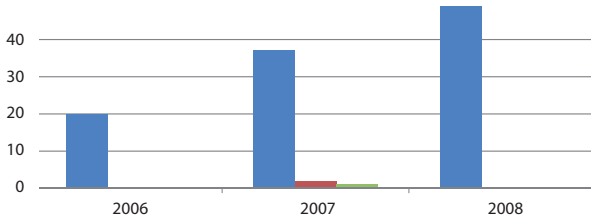
Revision TKA - Age groups *Table and figure No. 94*

	Early Infection	Chronic Infection	Aseptic Loosening of Femoral Component	Aseptic Loosening of Tibial Component	Aseptic Loosening of Patellar Component	Patellar Pain	Periprosthesis Fracture	Colateral Ligaments Instability	Instability of PCL	Luxation	Polyethylene Wear	Fracture of Implant	Stifness	Malposition	Knee Pain without Loosening	Other	Total
2006	4	3	3	10	1	0	1	2	0	0	1	1	0	1	1	0	28
2007	4	10	10	12	1	2	1	7	1	1	2	0	2	1	3	3	60
2008	7	17	11	19	0	0	1	1	1	1	3	1	3	1	1	6	73
Total	15	30	24	41	2	2	3	10	2	2	6	2	5	3	5	9	161



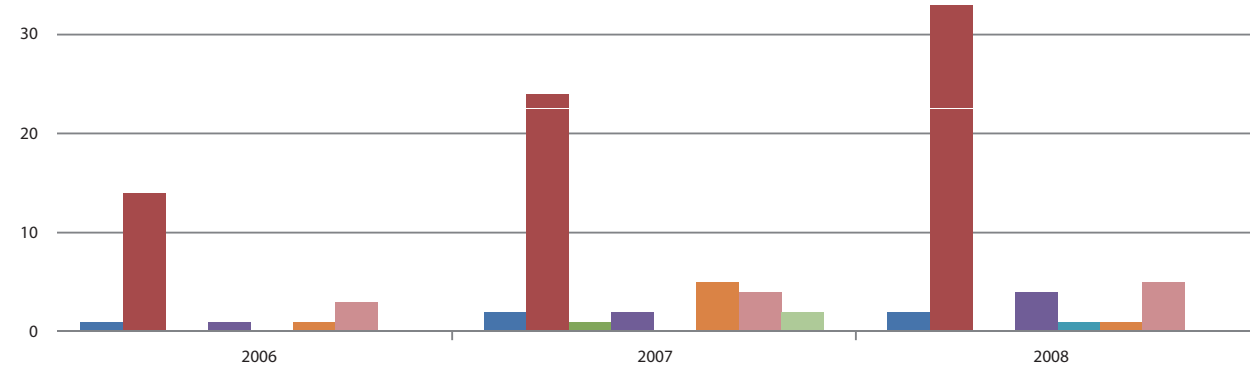
Revision TKA - Reason of revision *Table and figure No. 95*

	Cement	Non-cement	Hybrid	Total
2006	20	0	0	20
2007	37	2	1	40
2008	49	0	0	49
Total	106	2	1	109



Revision TKA - Type of fixation of primary TKA *Table and figure No. 96*

	Revision	Whole System	Femoral Component	Tibial Component	Patella	Inlay	Explantation	Other	Total
2006	1	14	0	1	0	1	3	0	20
2007	2	24	1	2	0	5	4	2	40
2008	2	33	0	4	1	1	5	0	46
Total	5	71	1	7	1	7	12	2	106



Revision TKA - Revised parts of implants *Table and figure No. 97*

	2006		2007		2008	
Cement	PFC Sigma	3	PFC Sigma	16	PFC Sigma	12
	AGC - universal knee	3				
	Sled Prosthesis	3				
Non-cement		0	Rotasurf	1		0
			Endo-Modell	1		
Hybrid		0	UNI Oxford Knee	1	PFC Sigma	2

Revision TKA - The most revised TKA in relation to type of fixation *Table No. 98*

	2006		2007		2008	
Cement	PFC Sigma	3	PFC Sigma	9	PFC Sigma Revision	8
	Search Evolution	3				
Non-cement		0		0		0
Hybrid		0		0		0

Revision TKA - The most used revision TKA *Table No. 99*

Conclusion

We have presented the results from Slovakian Arthroplasty Register in its first six years of existence. The next annual report should be published at the end of 2010 and will have a different format. We are going to focus on the age groups and the implants types and on the revision and survival rates. Slovakia belongs to the countries of the EU, where the demand for arthroplasties is still growing. The main task for the SAR is to publish accurate outcome figures in relation to these procedures and to help orthopedic surgeons to be guided by the results. These analyses can only be published with the help of all those taking part in this project and we should like to extend our gratitude to them all.

Appendix
Statistical Methods

Statistical analysis was performed using R software (R Development Core Team 2008) as six-year follow up (from January 1, 2003 to December 31, 2008, start-to-end date interval).

For both primary and revision femoral and acetabular components, basic statistical characteristics are calculated (Kärrholm a kol. 2006) for individual Slovakian sites in 8 regions over the 6 year interval (2003-2008), and summarized to tables and bar plots as follows:

1. number of primary and revision arthroplasties,
2. number of primary arthroplastyies for females and males,
3. diagnoses for primary arthroplasties of hip joint,
4. types of primary hip joint arthroplasties,
5. surgical approaches for primary hip joint arthroplasty,
6. type of primary hip joint arthroplasty based on fixation,
7. type of bone cement for arthroplasty,
8. cement technique for arthroplasty,
9. reason for revision arthroplasty,
10. number of revision arthroplasty for females and males, and
11. number and type of components revised in failed primary arthroplasty.

Additional tables consist of

1. tables of component types for each individual site, based on fixation type,
2. tables of revised components based on fixation type, and
3. tables of revision systems used.

Other component characteristics (Table No. 19 and 20, page 18-21, in %)

1. Revision Rate (*RR*) - rate of revision surgery at a defined follow-up period - number of revisions divided by total number of primary arthroplasties included in the evaluation sample × 100
2. Survival Rate (*SR*) - rate of survived components at a defined follow up period - number of survived components divided by total number of primary arthroplasties included in the sample × 100, $SR = 100 - RR$
3. Revision Burden (*RB*) - ratio between primary and revision surgery - number of revisions in a time period divided by the number of all arthroplasties (primary and revision) in the same period.

In epidemiology, person-time (here *component-time*) is used to estimate the actual *time-at-risk* that all persons contributed to a study. If the time unit is one year then the person-years (here *component-years*) is used to express time-at-risk-in our case six years. Summing up all component-years, we get *total time-at-risk*, which is the amount of components with follow up time equal to component-time unit (year). *Incidence* (incidence rate) is the frequency with which new revisions appear in particular time interval. *Crude (specific)* incidence is the ratio of number of new revisions divided by total time-at-risk throughout the follow up period of six years. This mean metric contains information about mean number of revisions per component-time unit in the risk (Zvárová et al. 2003, modified).

Survival analysis of components

In survival analysis, survival time is *right-censored*, which means that at the time of observation (end-date), the relevant event (first or second arthroplasty here) had not yet occurred. Thus, the total length of time (in years) between start-date and the event is not known. Censored times form only partial information about

the event but this is the only information available. Then, maximal time to event, or censoring time, is six years.
Based on right-censored data, we calculated mean survival time ($mean_{KM}$), standard error ($se(mean_{KM})$) and 95 % confidence interval (CI) characterized by lower and upper boundary (LB and UB, respectively). It is important to say, that mean survival time and mean time to event are not the same quantities – the latter is not taking censoring into account. The characteristics mentioned above are calculated based on *Kaplan-Meier (KM) product-limit estimator of survival function* (Therneau and Grambsch 2000). The estimate of survival curve plots the probability of survival as a function of time (here in years). The estimated curve is non-increasing step function with jumps in observed event times.
If a horizontal line drawn at 50 % survival crosses the KM curve, we can calculate the median survival time (Tableman et al. 2000). For any component, the median survival time does not exist. If $se(meanr_{KM})$ is equal to zero, then number of events is also equal to zero (all components survived until the end-date) and $mean_{KM}$ is calculated only for censored data. In figures, only survival functions with 95 % confidence interval (CI) of the components with more than one event are plotted. If LB is greater than zero and UB less than one, CI is symmetrical about KM estimate of survival curve. If LB is less than zero, LB has to be substituted by zero. If UB is greater than one, UB has to be substituted by one. In these cases, CI is not symmetric. The same is applicable to 95 % CI of KM mean survival time-if LB is less than zero, LB has to be substituted by zero; if UB is greater than six, UB has to be substituted by six.

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