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SURVIVAL ANALYSIS OF TOTAL HIP AND KNEE REPLACEMENT IN SLOVAKIA 2003–2011

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Slovakian Arthroplasty Register

Survival analysis of total hip and knee replacement in Slovakia 2003–2011

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Introduction

In 1979, when the Swedish Hip Arthroplasty Register - Svenska Höftprotesregistret – was founded, nobody foresaw how important such registers would become. The basic objective of arthroplasty registration was, and still remains, the improvement of the results of these types of surgery. In the short term, it is possible to follow particularly demographic data. Longer-term monitoring of patients after arthroplasty provides valuable information about the results in terms of the methods of implant fixation, the relative risk of revision surgery according to the type of implant, age group and many other important statistical data. The Slovakian Arthroplasty Register was one of the first national registers in Europe, which at the turn of the millennium started systematically to collect data about arthoplasties. Hereby, it is most appropriate sincerely to thank the current Head of the Dept. of Orthopaedics and Traumatology at University Hospital in Martin – Libor Nečas – who, together with his team, launched and maintained this register. Of course, thanks also need to go to all departments' heads and physicians of all departments who understood the importance of the national register and who are continuously involved in the systematic data collection. In 2009, we noticed significant progress in the flow of data from individual departments by the use of bar coding (Implant Tracking System). This enabled more rapid data transfer, and made the system more precise and efficient. The outcomes from the register over recent years show an increasing trend in the number of arthroplasties. Nowadays, at a time of economic restrictions and the perspective of new approvals of cheap implants, especially from Asia, the register helps us to answer the question whether the quality of the new implants is at the same level, or below those which we are using now. At the same time, we can clarify the question whether a few hundred Euros saving on the cost of the primary surgery does or does not result in an overpayment of thousands Euros due to the necessity for early revision surgery. In conclusion, let me state that it is a pleasure and an honour for me to provide you with the 2011 annual report of Slovakian Arthroplasty Register. It seems that the quality of treatment by joint replacement in Slovakia shows an increasing upward trend. Register data also enable us to compare our own results with results from other national registers. Current results show that the Slovakian departments captured all the modern trends in joint replacements and easily can be compared with foreign departments.

Andrey Švec
Chief Expert for Orthopaedics, Ministry of Health

The Slovakian Arthroplasty Register reached a total of 46,062 records by 31 December 2011. We have records of 35,290 THAs and 10,772 TKAs. The team of the SAR dedicated the majority of its time during this year to the validization of all registry databases. We were focused on the implementation of the Implant Tracking System, which has reached improvement in data collection 5.33 % compared to the previous year and accounted for 79.34 % of data submissions. This summary of the SAR's Annual Report for 2011 pays tribute to the collaboration of Slovakian Orthopaedic and Traumatology Society, and the Ministry of Health and Industry. In this report we have improved our statistical tools and this extract from the annual report seeks to present the most important parameters. In order to reduce the textual content, we present the results in graphics and tables. If we compare this report to the previous one, it is clear that we have improved data mining. The team of SAR hopes that this report will help orthopaedic surgeons and medical authorities to improve their knowledge about arthroplasty and could also contribute to improvement in the results of arthroplasty in Slovakia.

Libor Nečas
Head of the SAR

Summary

This survival analysis of Slovakian Arthroplasty Register (SAR) deals with all arthroplasty procedures performed in Slovakia from 1 January 2003 until 31 December 2011. Forty orthopaedic and traumatology departments performed 5,107 primary total hip arthroplasties (THA) and 433 revision total hip arthroplasties. In 2011, primary THA accounted for 92.18 % and revision THA for 7.82 % of all hip arthroplasties; the revision rate (RR) of all THAs reached 8.48 %, which represents a decrease of 0.73 % compared to 2010. The incidence of primary THA was 94.50 per 100,000 inhabitants and gender distribution was 59.19 % female and 40.81 % male. RR for the all arthroplasties performed after 1 January 2003 reached 2.27 %, with a mean survival time 8.75 years. Primary coxarthrosis was the reason for primary THA in 60.32 % of all cases. Femoral neck fracture accounted for 17.97 % and avascular necrosis of femoral head for 5.89 %. The most commonly used approach was anterolateral in 52.35 % of all cases, then the lateral approach in 30.82 %, and a posterior approach in 16.48 %. Total arthroplasty was used in 88.76 % and hemiarthroplasty in 10.45 % of all cases. 35.26 % of all implants were cemented, 51.16 % uncemented, and in 13.56 % a hybrid type of fixation was used. The four most commonly used brands of bone cement were distributed as follows: *SmartSet HV* – 33.45 %, *Palacos R* – 28.12 %, *Palacos R Gentamycin* – 14.03 %, and *SmartSet GHV* – 13.05 %. Third generation cementing techniques for femoral components was used in 38.69 % of all cemented implantations. In 2011, we have recorded 29 uncemented acetabular cups (UAC) and 12 cemented acetabular cups (CAC). The RR of UAC was 1.00 % and RR of CAC was 1.75 %. In femoral stems we recorded 41 uncemented femoral stems (UFS) and 28 cemented femoral stems (CFS). The RR of UFS was 0.95 % and RR of CFS was 1.75 %. In 2011 we recorded a decrease in revision THA by 25 cases compared to 2010. The revision database of SAR contains 3,195 protocols. We do not have detailed data about the primary THAs of 2,074 revisions. For deeper analysis we have used only 1,121 revision protocols. In 2011, 51.50 % of all revised implants were cemented, 30.48 % uncemented, and 18.01 % hybrids. After aseptic loosening of femoral and/or acetabular components, the third most commonly marked reason for revision is luxation of THA, with 149 cases. 30.42 % of all revisions were due to aseptic loosening of the femoral component, 24.19 % were due aseptic loosening of the acetabular component and 18.58 % due to luxation.

In 2011, we registered 2,679 primary total knee arthroplasties (TKA) and 116 revision TKAs. The incidence of primary THA was 49.57 per 100,000 inhabitants. The RR of TKAs reached 4.33 %, which is in 0.13 % less than in 2010. The RR of TKAs performed after 2006 was 1.80 %. The gender ratio was 67.53 % female to 32.47 % male. The main diagnosis for primary TKA is primary bicondylar degenerative joint disease (DJD) of the knee, which accounted for 89.95 %. The second most common diagnoses, posttraumatic DJD, reached a share of 2.87 %. A medial parapatellar approach was used in 77.64 % of all cases and a mid-vastus approach in 20.86 %. In 98.54 % of all TKAs bone cement was used for fixation of both components. The revision database contains 411 protocols, but 141 of the primary TKAs were performed before 2006 and only 270 revision protocols were used for deeper statistical analyses. From all revised patients, 61.2 % were females and 38.80 % males. Cemented fixation was used in 72.01 % of all patients, uncemented fixation in 3.65 %, and hybrid fixation has 0.73 %. Explantation was performed in 3.65 %, revision without complete data in 4.62 %, and conversion to a spacer in 15.33 %.

Statistical methods

Descriptive statistics of SAR data, implants and their components, are derived on the basis of a year-by-year break-down of the THA and TKA database into the following four groups, using nine time intervals in total, from 1 January 2003 to 31 December 2011:

1. alive and not revised,
2. alive and revised,
3. dead and not revised, and
4. dead and revised.

Tab. 1 Primary THA database break-down

© Slovakian Arthroplasty Register 2013

Year	Alive not revised	Alive revised	Dead not revised	Dead revised
2003	1740	131	246	3
2004	2532	118	432	4
2005	2502	102	366	6
2006	3107	94	390	3
2007	3884	96	275	2
2008	4205	88	117	1
2009	4597	75	95	0
2010	4846	58	66	2
2011	5070	19	18	0

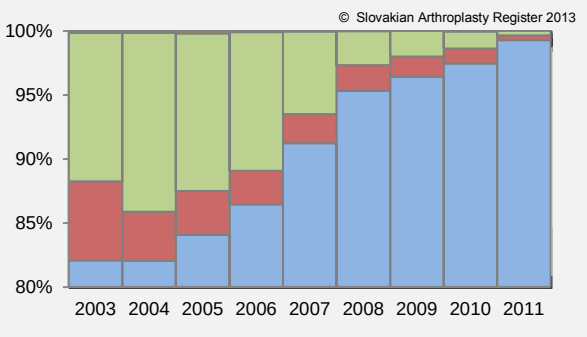

Chart 1 Primary THA database break-down

Survival analysis is used to describe the time to revision (failure), where the frequency of revisions increases with time.

Tab. 2 Revision THA database break-down

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Year	Alive not revised	Alive revised	Dead not revised	Dead revised
2003	220	37	32	4
2004	258	48	26	1
2005	214	32	23	1
2006	278	37	19	1
2007	300	36	12	0
2008	303	30	5	1
2009	347	38	1	0
2010	423	33	2	0
2011	415	18	0	0

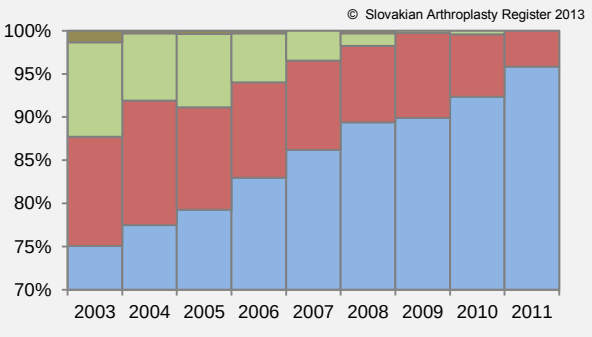

Chart 2 Revision THA database break-down

Therefore, the break-down of the primary THA database into four groups – alive and not revised, alive and revised, dead and not revised, and dead and revised, is important (table 1, chart 1). Table 2 and chart 2 show the break-down of revision THA database.

The same structure can also be seen for TKA (table 3, chart 3), where the differences between THA and TKA are due to the shorter TKA follow-up. Table 4 and chart 4 show results of the revision TKA database. We presume that both databases will follow the same trend in the next few years.

Considering the very low numbers of all deceased patients, 4.50 % only, this part of the database will not be analysed further.

Tab. 3 Primary TKA database break-down

© Slovakian Arthroplasty Register 2013

Year	Alive not revised	Alive revised	Dead not revised	Dead revised
2006	816	41	35	0
2007	1306	37	20	0
2008	1560	40	11	0
2009	1976	40	12	0
2010	2176	20	3	0
2011	2665	14	0	0

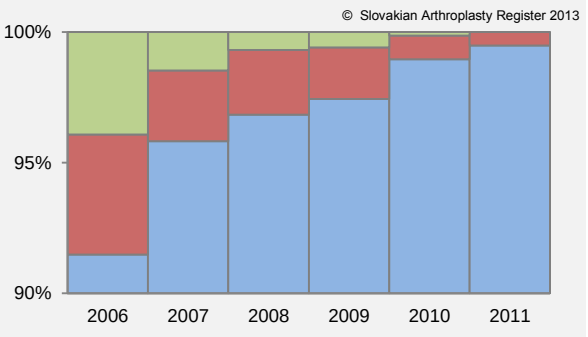

Chart 3 Primary TKA database break-down

Tab. 4 Revision TKA database break-down

© Slovakian Arthroplasty Register 2013

Year	Alive not revised	Alive revised	Dead not revised	Dead revised
2006	15	3	2	0
2007	32	10	0	0
2008	39	12	0	0
2009	60	24	0	0
2010	81	17	0	0
2011	107	9	0	0

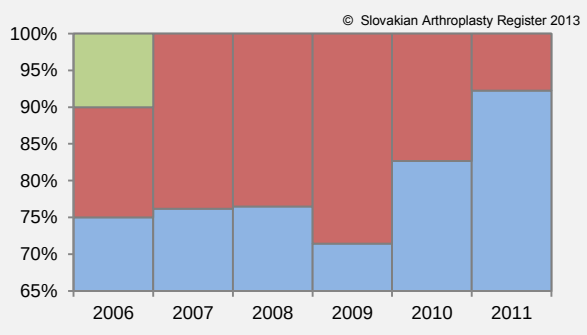

Chart 4 Revision TKA database break-down

The SAR database consists of the contributions of 40 departments – 12 performing THA and 31 both THA and TKA. The departments are characterised basically by the annual numbers of primary and revision THA and TKA performed. For any particular year (2003–2011), the frequencies of THA and TKA are recorded and compared with the databases of Ministry of Health of the Slovak Republic. Since 2009, an Implant Tracking System (ITS), based on Global Trade Item Number (GTIN) bar-codes and the Health Industry Business Communications Council (HIBCC) system, has been used to identify the implants. The database is divided into two sub-databases, THA and TKA, respectively, each of which is further divided into primary and revised sub-groups. Basic characteristics are summarized in frequency tables and bar plots as follows:

- implantation frequency,
- gender,
- age groups at five-year intervals (16 in total),
- diagnosis
- type of implant,
- surgical approach,
- antibiotic prophylaxis,
- type of fixation,
- brand of bone cement, and
- type of cementing technique.

In addition, for revision operations:

- type of fixation of revised implant,
- reasons for revision,
- revised components, and
- type of revision component

are recorded.

Basic survival/failure characteristics of primary implants and their components in the SAR database

Statistical analyses were performed with R software, as nine-year follow up from 1 January 2003 to 31 December 2011, with censored date equal to 31 December 2011. The basic characteristics of

1. Revision Rate (RR) and
2. Hazard Rate (HR)

are used to describe the failure and survival of implants/components. Of the above-mentioned basic characteristics, only the frequencies of failed and survived implants/components are used, but not the time to failure or censorship, which are necessary to describe implant/component survival completely. Therefore, in addition to (1) to (2),

3. mean survival time (in years),
4. 95% confidence interval (CI) of mean survival time characterized by its lower and upper bounds (LB and UB, respectively)

were also used. For the particular implant /component groups (primary and revision THA) and their combinations (primary THA), curves of cumulative risk with 95% confidence intervals derived from Kaplan-Meier survival curves (detailes is later) are used:

- for four most frequent acetabular components,
- for four most frequent femoral components,
- for four most frequent uncemented component combinations,
- for four most frequent cemented component combinations, and
- for four most frequent hybrid component combinations.

Testing of hypotheses about differences in mean time of survival between groups of primary and revised implants and their components in SAR database

Testing of hypotheses about differences in mean time of survival between stratified components of primary and revision THA (1 to 5) and implants of primary and revision THA (6 to 16), primary TKA (6 to 12, 14 to 16), and revision TKA (6 to 9, 10, 11, and 16) is performed as follows:

1. component type – acetabular and femoral,
2. interaction of the first order – component type (acetabular and femoral) vs type of fixation (uncemented and cemented),
3. interaction of the second order – gender vs component type and type of fixation,
4. generation of cemented techniques (1^{st}, 2^{nd}, and 3^{rd}),
5. interaction of the first order – gender vs generation of cemented techniques
6. gender – females and males,
7. age groups – less than or equal to 55 years [min,55], from 55 to 65 years (55,65], from 65 to 75 years (65,75], and more than 75 years (75,max],
8. type of the implant fixation (for both primary and revision THA, primary and revision TKA – uncemented, cemented, hybrids; additionally, for primary THA – reverse hybrid, cemented and uncemented hemiartroplasty),
9. diagnosis (7 types for THA and 5 types for TKA),
10. interaction of the first order – gender vs age groups,
11. interaction of the first order – gender vs type of fixation,
12. interaction of the first order – gender vs diagnosis,
13. interaction of the first order – age groups vs type of fixation,
14. interaction of the first order – age groups vs diagnosis,
15. interaction of the first order – type of fixation vs diagnosis, and
16. reasons for revision (17 types for THA and 18 for TKA).

The results are presented as

1) cumulative risk (*CR*) curves equivalent to Kaplan-Meier survival curves (*S*), where *CR(t)* equals to natural logarithm of *S(t)* multiplied by minus one at the time point *t* (the former represents component/implant failure and the latter component/implant survival);
2) p-values (to simplify the outputs, test statistics are omitted), using the following terminology
   A. significance, if *p*-value fails to the interval [0,0.05),
   B. marginal significance, if *p*-value fails to the interval [0.05,0.1).

Since a revision procedure is defined as any operation replacing any component, the *CR* curve is used to calculate the time from primary insertion to the first revision. A failure time is characterized by implementing both failed and censored implants into the calculation.

Results in 2011

By 31 December 2011 SAR had received in total 49,668 protocols, of which 38,485 were THA and 11,183 were TKA protocols.

Total Hip Arthroplasty

From 1 January 2011 till 31 December 2011 we had received 5,540 THA protocols, of which 5,107 were primary and 433 were revision procedures. The annual increase was 2.03 %. Table 5 and chart 5 show the annual increases in primary and revision THA.

Tab. 5 Number of THA and annual growth (%)

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Year	Primary THA	Annual growth	Revision THA	Annual growth
2003	2120		293	
2004	3086	45.57%	333	13.65%
2005	2976	-3.56%	270	-18.92%
2006	3594	20.77%	335	24.07%
2007	4257	18.45%	348	3.88%
2008	4411	3.62%	339	-2.59%
2009	4767	8.07%	386	13.86%
2010	4972	4.30%	458	18.65%
2011	5107	2.72%	433	-5.46%

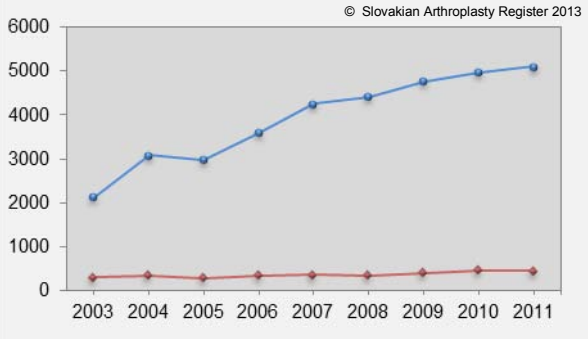

Chart 5 Number of primary and revision THA

The increase of primary THA procedures is not linked to revision THA and there is a slight decrease in revision procedures from 458 in 2010 to 433 in 2011.

Total Knee Arthroplasty

From both table 6 and chart 6, it is clear that the annual growth in TKA in 2011 was 21.68 %, compared to 2010.
The number of revision TKAs does not follow the trend of primary TKAs, as shown in chart 6 the increase in revision TKA was only 18.36 %.

Tab. 6 Number of TKA and annual growth (%)

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Year	Primary TKA	Annual growth	Revision TKA	Annual growth
2006	892		20	
2007	1363	52.80%	42	110.00%
2008	1611	18.20%	51	21.43%
2009	2028	25.88%	84	64.71%
2010	2199	8.43%	98	16.67%
2011	2679	21.83%	116	18.37%

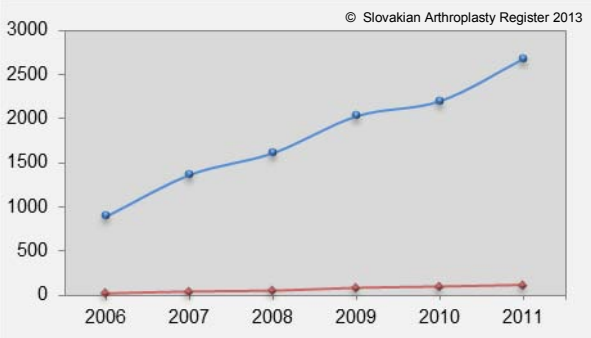

Chart 6 Number of primary and revision TKA

Demographic situation in Slovakia 2011

The number of inhabitants in Slovakia by 31 December, 2011 reached 5,404,322; according to chart 7 the population of the country has decreased.

Tab.7 Number of inhabitants in Slovakia 2003–2011

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Year	Male	Female	Total
2003	2611124	2768929	5380053
2004	2613490	2771332	5384822
2005	2615872	2773308	5389180
2006	2618284	2775353	5393637
2007	2623127	2777871	5400998
2008	2629804	2782450	5412254
2009	2636938	2787987	5424925
2010	2642240	2793033	5435273
2011	2631752	2772570	5404322

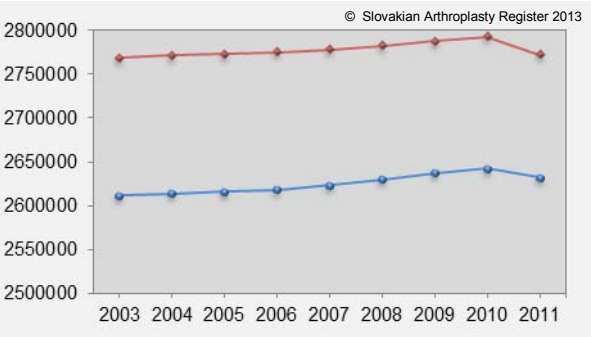

Chart 7 Number of inhabitants in Slovakia 2003–2011

Tab. 8 Ages of patients at the time of primary THA (interaction of gender and type of fixation; SD: standard deviation, Q1: first quartile, Q3: third quartile)

		Total number	Mean	95% CI for mean	SD	Min	Q1	Median	Q3	Max
Females										
	Uncemented	7577	55.27	55.19 to 55.34	10.46	9.00	49.00	55.00	62.00	89.00
	Cemented	7283	70.74	70.68 to 70.80	6.98	20.00	67.00	71.00	75.00	98.00
	Hybrids	2734	64.49	64.38 to 64.59	7.76	15.00	60.00	65.00	70.00	89.00
	Reverse hybrids	123	61.54	60.96 to 62.13	10.87	31.00	54.00	62.00	69.50	82.00
	Hemiarthropl. uncem.	175	80.30	79.87 to 80.73	8.39	35.00	77.00	81.00	85.00	95.00
	Hemiarthropl. cem.	3600	79.91	79.82 to 79.99	7.40	14.00	76.00	80.00	85.00	100.00
Females total		21492	66.05	66.00 to 66.10	12.49	9.00	58.00	67.00	75.00	100.00
Males										
	Uncemented	6697	55.45	55.38 to 55.53	9.77	15.00	50.00	56.00	62.00	85.00
	Cemented	3739	69.39	69.30 to 69.48	7.38	28.00	66.00	70.00	74.00	97.00
	Hybrids	1993	63.52	63.39 to 63.64	7.74	14.00	59.00	64.00	68.00	93.00
	Reverse hybrids	70	60.40	59.62 to 61.18	11.12	26.00	54.00	61.00	67.50	83.00
	Hemiarthropl. uncem.	83	74.19	73.49 to 74.90	10.67	48.00	70.00	76.00	82.00	97.00
	Hemiarthropl. cem.	1216	78.28	78.11 to 78.45	8.84	35.00	73.00	79.00	84.00	100.00
Males total		13798	62.54	62.49 to 62.60	11.74	14.00	55.00	63.00	71.00	100.00
Whole database										
	Uncemented	14274	55.35	55.30 to 55.41	10.14	9.00	50.00	56.00	62.00	89.00
	Cemented	11022	70.28	70.23 to 70.33	7.15	20.00	66.00	71.00	75.00	98.00
	Hybrids	4727	64.08	64.00 to 64.16	7.77	14.00	59.00	64.00	69.00	93.00
	Reverse hybrids	193	61.13	60.66 to 61.60	10.95	26.00	54.00	61.00	68.00	83.00
	Hemiarthropl. uncem.	258	78.33	77.96 to 78.71	9.60	35.00	76.00	80.00	84.00	97.00
	Hemiarthropl. cem.	4816	79.50	79.42 to 79.57	7.82	14.00	76.00	80.00	84.00	100.00
Whole database total		35290	64.68	64.64 to 64.72	12.32	9.00	56.00	66.00	74.00	100.00

Tab. 9 Ages of patients at the time of primary THA (interaction of gender and diagnosis; SD: standard deviation, Q1: first quartile, Q3: third quartile)

		Total number	Mean	95% CI for mean	SD	Min	Q1	Median	Q3	Max
Females										
	Primary coxarthrosis	11046	65.91	65.86 to 65.97	9.18	18.00	60.00	67.00	73.00	89.00
	Dysplastic coxarthrosis	3217	52.35	52.24 to 52.46	10.51	17.00	46.00	52.00	58.00	86.00
	Posttraumatic coxarthrosis	1398	71.69	71.50 to 71.88	12.74	15.00	64.25	75.00	81.00	98.00
	Avascular necrosis	817	63.26	63.02 to 63.49	11.71	15.00	56.00	65.00	72.00	86.00
	M. Perthes	19	47.63	46.08 to 49.18	11.86	25.00	40.50	48.00	55.00	71.00
	Rheumatoid arthritis	241	55.30	54.82 to 55.79	14.77	18.00	46.00	58.00	67.00	85.00
	Fracture of femoral neck	3791	76.20	76.09 to 76.30	10.26	17.00	71.00	78.00	83.00	100.00
Females total		20529	65.83	65.79 to 65.88	12.40	15.00	58.00	67.00	75.00	100.00
Males										
	Primary coxarthrosis	8593	63.05	62.99 to 63.11	9.21	24.00	57.00	63.00	70.00	93.00
	Dysplastic coxarthrosis	767	53.90	53.67 to 54.13	10.54	19.00	48.00	54.00	61.00	82.00
	Posttraumatic coxarthrosis	1015	61.16	60.93 to 61.40	14.81	15.00	52.00	61.00	72.00	97.00
	Avascular necrosis	1212	53.64	53.45 to 53.84	11.76	14.00	47.00	54.00	61.00	83.00
	M. Perthes	26	48.00	46.71 to 49.29	11.34	28.00	40.75	49.00	53.75	67.00
	Rheumatoid arthritis	95	52.81	52.05 to 53.57	14.28	15.00	43.00	54.00	64.00	79.00
	Fracture of femoral neck	1600	71.66	71.49 to 71.83	12.48	21.00	63.00	73.00	81.00	100.00
Males total		13308	62.45	62.40 to 62.51	11.57	14.00	55.00	63.00	70.00	100.00
Whole database										
	Primary coxarthrosis	19639	64.66	64.62 to 64.70	9.30	18.00	58.00	66.00	72.00	93.00
	Dysplastic coxarthrosis	3984	52.65	52.55 to 52.75	10.54	17.00	46.00	53.00	59.00	86.00
	Posttraumatic coxarthrosis	2413	67.26	67.11 to 67.41	14.60	15.00	57.00	70.00	79.00	98.00
	Avascular necrosis	2029	57.52	57.36 to 57.67	12.65	14.00	49.00	57.00	67.00	86.00
	M. Perthes	45	47.84	46.86 to 48.83	11.43	25.00	40.00	49.00	55.00	71.00
	Rheumatoid arthritis	336	54.60	54.19 to 55.01	14.66	15.00	46.00	57.00	66.00	85.00
	Fracture of femoral neck	5391	74.85	74.76 to 74.94	11.16	17.00	68.00	77.00	83.00	100.00
Whole database total		33837	64.51	64.47 to 64.54	12.19	14.00	56.00	65.00	73.00	100.00

Table 8 shows the mean age of patients at operation for primary THA, according to gender and type of fixation. From this table it is evident that the mean age of all groups is increasing slowly from 64.64 years in 2010 to 64.68 years in 2011. Table 9 shows the mean age of patients at operation according to diagnosis. For these descriptive statistics we were not able to use 1,453 protocols with the recorded diagnosis – "other causes". The mean age for the diagnosis primary coxarhrosis was 64.66 years, for dysplastic coxarthrosis it was 52.65 years. We received 45 protocols with the diagnosis of Perthes' disease and the mean age of these patients was 47.84 years.

Tab. 10 Ages of the patients at the time of revision THA (interaction of gender and type of fixation; SD: standard deviation, Q1: first quartile, Q3: third quartile)

		Total number	Mean	95% CI for mean	SD	Min	Q1	Median	Q3	Max
Females										
	Uncemented	519	61.03	60.75 to 61.32	10.90	16.00	54.00	62.00	69.00	89.00
	Cemented	694	71.07	70.85 to 71.28	8.37	33.00	67.00	72.00	77.00	91.00
	Hybrids	249	67.37	66.99 to 67.74	9.25	42.00	62.00	69.00	74.00	94.00
	Reverse hybrids	230	67.08	66.68 to 67.48	9.47	36.00	61.00	68.00	74.00	88.00
Females total		1883	66.91	66.76 to 67.05	10.49	16.00	60.00	68.00	75.00	94.00
Males										
	Uncemented	471	60.91	60.62 to 61.20	10.49	21.00	55.00	62.00	68.00	87.00
	Cemented	343	70.72	70.42 to 71.02	8.14	45.00	66.00	72.00	76.00	95.00
	Hybrids	185	67.79	67.33 to 68.25	10.11	18.00	62.00	69.00	75.00	86.00
	Reverse hybrids	162	67.41	66.96 to 67.85	8.33	42.00	63.00	70.00	73.00	82.00
Males total		1312	65.70	65.53 to 65.88	10.46	18.00	59.00	67.00	73.00	95.00
Whole database										
	Uncemented	990	60.97	60.77 to 61.18	10.70	16.00	55.00	62.00	68.00	89.00
	Cemented	1037	70.95	70.78 to 71.13	8.30	33.00	66.00	72.00	76.00	95.00
	Hybrids	434	67.55	67.25 to 67.84	9.62	18.00	62.00	69.00	74.00	94.00
	Reverse hybrids	392	67.22	66.92 to 67.51	9.01	36.00	61.75	68.00	74.00	88.00
Whole database total		3195	66.41	66.30 to 66.53	10.50	16.00	60.00	68.00	74.00	95.00

Table 10 shows the same parameters for the patients with revision THA. The mean age is 66.41 years, which is 1.73 years older than in the patients with primary THA.

Tab. 11 Ages of patients at the time of primary TKA (interaction of gender and type of fixation; SD: standard deviation, Q1: first quartile, Q3: third quartile)

		Total number	Mean	95% CI for mean	SD	Min	Q1	Median	Q3	Max
Females										
	Uncemented	50	59.46	58.34 to 60.58	16.21	14.00	57.00	64.00	68.00	81.00
	Cemented	7245	67.05	66.99 to 67.12	7.96	22.00	62.00	68.00	73.00	89.00
	Hybrids	17	61.65	60.37 to 62.92	7.21	47.00	56.00	64.00	68.00	69.00
	Reverse hybrids	27	57.96	56.80 to 59.12	9.44	26.00	54.00	59.00	64.50	73.00
Females total		7339	66.95	66.89 to 67.02	8.09	14.00	62.00	68.00	73.00	89.00
Males										
	Uncemented	50	55.48	54.47 to 56.49	13.25	18.00	51.00	57.50	60.75	80.00
	Cemented	3323	65.13	65.03 to 65.23	8.67	13.00	59.00	65.00	72.00	92.00
	Hybrids	19	55.95	54.33 to 57.56	12.89	16.00	52.00	56.00	64.00	76.00
	Reverse hybrids	43	56.23	55.20 to 57.27	11.95	13.00	52.00	58.00	63.00	74.00
Males total		3435	64.83	64.73 to 64.93	8.97	13.00	59.00	65.00	71.00	92.00
Whole database										
	Uncemented	100	57.47	56.71 to 58.23	14.87	14.00	52.00	60.00	67.00	81.00
	Cemented	10568	66.45	66.39 to 66.50	8.24	13.00	61.00	67.00	72.00	92.00
	Hybrids	36	58.64	57.56 to 59.71	10.84	16.00	53.00	59.50	66.25	76.00
	Reverse hybrids	70	56.90	56.12 to 57.68	11.01	13.00	52.00	58.00	64.00	74.00
Whole database total		10774	66.28	66.22 to 66.33	8.44	13.00	61.00	67.00	72.00	92.00

Tab. 12 Age of the patients at the time of primary TKA (interaction of gender and diagnosis; SD: standard deviation, Q1: first quartile, Q3: third quartile)

		Total number	Mean	95% CI for mean	SD	Min	Q1	Median	Q3	Max
Females										
	Primary monocondylar arthrosis	449	66.01	65.75 to 66.27	8.09	37.00	61.00	67.00	72.00	87.00
	Primary bicondylar arthrosis	6463	67.33	67.26 to 67.40	7.64	23.00	62.00	68.00	73.00	89.00
	Posttraumatic coxarthrosis	197	63.84	63.41 to 64.27	9.58	37.00	58.00	65.00	71.00	88.00
	Aseptic necrosis	24	70.42	69.33 to 71.50	7.38	56.00	65.75	71.50	76.25	84.00
	Rheumatoid arthritis	161	60.39	59.83 to 60.94	12.87	22.00	54.00	62.00	70.00	84.00
Females total		7294	67.01	66.95 to 67.08	7.97	22.00	62.00	68.00	73.00	89.00
Males										
	Primary monocondylar arthrosis	196	64.34	63.93 to 64.75	8.61	36.00	58.00	63.00	70.25	87.00
	Primary bicondylar arthrosis	2903	65.52	65.41 to 65.62	8.33	34.00	59.00	66.00	72.00	92.00
	Posttraumatic coxarthrosis	224	60.47	60.06 to 60.88	9.69	32.00	54.00	59.00	67.25	84.00
	Aseptic necrosis	11	66.82	64.82 to 68.82	11.48	39.00	66.00	72.00	73.00	78.00
	Rheumatoid arthritis	45	59.62	58.61 to 60.64	12.05	30.00	55.00	62.00	65.00	83.00
Males total		3379	65.04	64.94 to 65.14	8.62	30.00	59.00	65.00	71.00	92.00
Whole database										
	Primary monocondylar arthrosis	645	65.50	65.28 to 65.72	8.28	36.00	60.00	66.00	71.00	87.00
	Primary bicondylar arthrosis	9366	66.77	66.71 to 66.83	7.91	23.00	62.00	67.00	73.00	92.00
	Posttraumatic coxarthrosis	421	62.05	61.75 to 62.34	9.77	32.00	56.00	62.00	69.00	88.00
	Aseptic necrosis	35	69.29	68.30 to 70.27	8.86	39.00	66.00	72.00	74.00	84.00
	Rheumatoid arthritis	206	60.22	59.73 to 60.70	12.67	22.00	54.00	62.00	69.75	84.00
Whole database total		10673	66.39	66.33 to 66.44	8.23	22.00	61.00	67.00	72.00	92.00

Tab. 13 Ages of patients at the time of revision TKA (interaction of gender and type of fixation; SD: standard deviation, Q1: first quartile, Q3: third quartile)

		Total number	Mean	95% CI for mean	SD	Min	Q1	Median	Q3	Max
Females										
	Uncemented	12	59.17	56.72 to 61.62	18.73	27.00	55.00	66.50	70.50	77.00
	Cemented	173	66.76	66.32 to 67.19	8.55	37.00	61.00	67.00	72.00	85.00
	Hybrids	3	70.67	66.77 to 74.56	11.85	57.00	67.00	77.00	77.50	78.00
Females total		252	66.33	65.96 to 66.71	9.29	27.00	61.00	67.00	72.00	85.00
Males										
	Uncemented	3	61.33	55.53 to 67.13	26.27	31.00	53.50	76.00	76.50	77.00
	Cemented	123	63.76	63.21 to 64.30	9.60	14.00	59.50	64.00	70.00	82.00
	Hybrids	NA	NA	NA	NA	NA	NA	NA	NA	NA
Males total		159	64.21	63.73 to 64.70	9.59	14.00	60.00	65.00	70.00	83.00
Whole database										
	Uncemented	15	59.60	57.37 to 61.83	19.37	27.00	47.00	68.00	74.00	77.00
	Cemented	296	65.51	65.17 to 65.85	9.11	14.00	61.00	66.00	71.00	85.00
	Hybrids	3	70.67	66.77 to 74.56	11.85	57.00	67.00	77.00	77.50	78.00
Whole database total		411	65.51	65.22 to 65.81	9.45	14.00	61.00	67.00	72.00	85.00

Tables 11 and 12 show the same parameters for the patients with primary TKA. The mean age of all primary TKA patients is 66.28 years and the mean age of all revision TKA patients is 65.51 years. Compared to the primary TKA patients, the mean age of revised TKA patients is slightly smaller (by 0.77 years). Table 13 shows the mean age of patients with revision TKA and interaction of gender and type of fixation.

Departments

The following tables list the orthopaedic and trauma departments according to the number of arthroplasties performed per annum. Table 14 shows the ranking of departments according to the number of performed THA. Departments are divided into four groups. Table 15 shows the departments and number of TKAs performed. Compared to 2010, when only 8 departments performed more than 100 TKA, this year it was 12 departments.

Tab. 14 Departments according to the Nr. of performed THA

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Department	Primary THA	Revision THA	Total
Total Nr. 200 or more			
Bratislava – I.Orth.-traum.	406	77	483
Ružomberok – Traum.-orth.	454	25	479
B. Bystrica – Orth.	292	53	345
Martin – Orth.-traum.	258	60	318
Prešov – Orth.	270	32	302
Bratislava – II.Orth.-traum.	268	21	289
Košice – Orth.-traum.	214	17	231
Žilina – Orth.	195	9	204
Total Nr. 100 or more			
Nitra – Traum.-orth.	185	5	190
Poprad – Orth.	169	20	189
Michalovce – Orth.	175	10	185
N. Zámky – Orth.	179	2	181
Humenné – Orth.	147	2	149
Košice ŽZ – Orth.	137	10	147
Trenčín – Orth.	117	26	143
Košice – Šaca - Orth.	120	17	137
Topoľčany – Orth.	130	3	133
Trnava – Traum.-orth.	127	3	130
Skalica – Orth.	111	8	119
Bratislava – Traum.	99	11	110
Galanta – Traum.-orth.	103	1	104
Total Nr. 50 or more			
B. Bystrica – Traum.	92	3	95
Bojnice – Orth.-traum.	89	5	94
D. Streda – Orth.	91	1	92
Bratislava S & E – Orth.	86	0	86
D. Kubín – Orth.-traum.	80	4	84
N. Zámky – Traum.	80	4	84
Piešťany – Orth.	64	0	64
Lučenec – Orth.-traum.	63	0	63
Trenčín – Traum.	57	0	57
Žilina - Traum.	55	0	55
Total Nr. less than 50			
Košice – Traum.	43	3	46
P. Bystrica – Orth.	43	0	43
Michalovce – Traum.	33	0	33
Topoľčany – Traum.	27	1	28
L. Mikuláš – Traum.-orth.	27	0	27
Trstená – Traum.	13	0	13
Vranov n. Topľou - Traum.	5	0	5
Partizánske – Traum.	2	0	2
Bratislava DFNsP - Orth.	1	0	1

Tab. 15 Departments according to the Nr. of performed TKA

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Department	Primary TKA	Revision TKA	Total
Total Nr. 200 or more			
Ružomberok – Traum.-orth.	271	21	292
Prešov – Orth.	256	3	259
Bratislava – I.Orth.-traum.	215	23	238
Martin – Orth.-traum.	213	14	227
Total Nr. 100 or more			
B. Bystrica – Orth.	180	7	187
Bratislava – II.Orth.-traum.	169	8	177
Žilina – Orth.	124	4	128
Topoľčany – Orth.	126	1	127
Košice – Orth.-traum.	113	10	123
Nitra – Traum.-orth.	114	1	115
Košice – Šaca - Orth.	109	2	111
N. Zámky – Orth.	106	1	107
Total Nr. 50 or more			
Poprad – Orth.	92	7	99
Humenné - Orth.	88	0	88
Trenčín – Orth.	56	6	62
Bojnice – Orth.-traum.	57	0	57
Skalica – Orth.	54	3	57
Piešťany – Orth.	54	0	54
D. Streda – Orth.	49	1	50
Total Nr. less than 50			
Trnava – Traum.-orth.	42	0	42
Bratislava – Traum.	39	2	41
D. Kubín – Orth.-traum.	35	0	35
Bratislava S & E – Orth.	32	0	32
Košice ŽZ – Orth.	29	1	30
Košice – Traum.	15	0	15
Lučenec – Orth.-traum.	15	0	15
Michalovce – Orth.	13	0	13
Žilina - Traum.	6	0	6
B. Bystrica – Traum.	3	0	3
Bratislava DFNsP - Orth.	2	1	3
Galanta – Traum.-orth.	2	0	2

Table 16 presents departments according to region, type of hospital and speciality of the departments. The last four columns show the percentage participation of each department in the total numbers of primary and revision THA and TKA. The number of departments remained the same as in 2010 – forty. Charts 8–9 show the ranking of departments according to the numbers of primary and revision THAs. This year only 13 departments performed more than 10 revisions. Charts 10–11 show this ranking for primary and revision TKAs. In this segment, only four departments performed more than 10 revisions.

Tab. 16 Departments according to region, specialty and volume of joint replacements

Region	Type of hospital	Hospital	Department	Primary THA (%)	Revision THA (%)	Primary TKA (%)	Revision TKA (%)
Bratislava	**University**	**University Hospital Bratislava**	I.Orth.-traum.	7.95	17.78	8.03	19.83
			II.Orth.-traum.	5.25	4.85	6.31	6.90
			Traum.	1.94	2.54	1.46	1.72
	Faculty	**Children´s Faculty Hospital**	Orth.	0.02	0.00	0.07	0.86
	Private	**Sport & Endo Clinic**	Orth.	1.68	0.00	1.19	0.00
Trnava	**Faculty**	**Faculty Hospital Trnava**	Traum.-orth.	2.49	0.69	1.57	0.00
	Regional	**Public Hospital Piešťany**	Orth.	1.25	0.00	2.02	0.00
		Public Hospital Skalica	Orth.	2.17	1.85	2.02	2.59
		Public Hospital Galanta	Traum.-orth.	2.02	0.23	0.07	0.00
		Public Hospital Dunajská Streda	Orth.	1.78	0.23	1.83	0.86
Trenčín	**Faculty**	**Faculty Hospital Trenčín**	Orth.	2.29	6.00	2.09	5.17
			Traum.	1.12	0.00	0.00	0.00
	Regional	**Public Hospital Považská Bystrica**	Orth.	0.84	0.00	0.00	0.00
		Public Hospital Bojnice	Orth.-traum.	1.74	1.15	2.13	0.00
		Public Hospital Partizánske	Traum.	0.04	0.00	0.00	0.00
Nitra	**Faculty**	**Faculty Hospital Nitra**	Traum.-orth.	3.62	1.15	4.26	0.86
		Faculty Hospital Nové Zámky	Orth.	3.50	0.46	3.96	0.86
			Traum.	1.57	0.92	0.00	0.00
	Regional	**Hospital Topoľčany**	Orth.	2.55	0.69	4.70	0.86
			Traum.	0.53	0.23	0.00	0.00
Žilina	**University**	**University Hospital Martin**	Orth.-traum.	5.05	13.86	7.95	12.07
	Faculty	**Faculty Hospital Žilina**	Orth.	3.82	2.08	4.63	3.45
			Traum.	1.08	0.00	0.22	0.00
		Central Military Hospital Ružomberok	Traum.-orth.	8.89	5.77	10.12	18.10
	Regional	**Public Hospital Dolný Kubín**	Orth.-traum.	1.57	0.92	1.31	0.00
		Public Hospital Liptovský Mikuláš	Traum.-orth.	0.53	0.00	0.00	0.00
		Public Hospital Trstená	Traum.	0.25	0.00	0.00	0.00
B. Bystrica	**Faculty**	**Faculty Hospital Banská Bystrica**	Orth.	5.72	12.24	6.72	6.03
			Traum.	1.80	0.69	0.11	0.00
	Regional	**Public Hospital Lučenec**	Orth.-traum.	1.23	0.00	0.56	0.00
Prešov	**Faculty**	**Faculty Hospital Prešov**	Orth.	5.29	7.39	9.56	2.59
	Regional	**Hospital Poprad**	Orth.	3.31	4.62	3.43	6.03
		Public Hospital Humenné	Orth.	2.88	0.46	3.28	0.00
		Public Hospital Vranov n.Topľou	Traum.	0.10	0.00	0.00	0.00
Košice	**University**	**University Hospital Košice**	Orth.-traum.	4.19	3.93	4.22	8.62
			Traum.	0.84	0.69	0.56	0.00
	Regional	**Railways Hospital Košice**	Orth.	2.68	2.31	1.08	0.86
		Public Hospital Michalovce	Orth.	3.43	2.31	0.49	0.00
			Traum.	0.65	0.00	0.00	0.00
	Private	**1st. Private Hospital Košice-Šaca**	Orth.	2.35	3.93	4.07	1.72

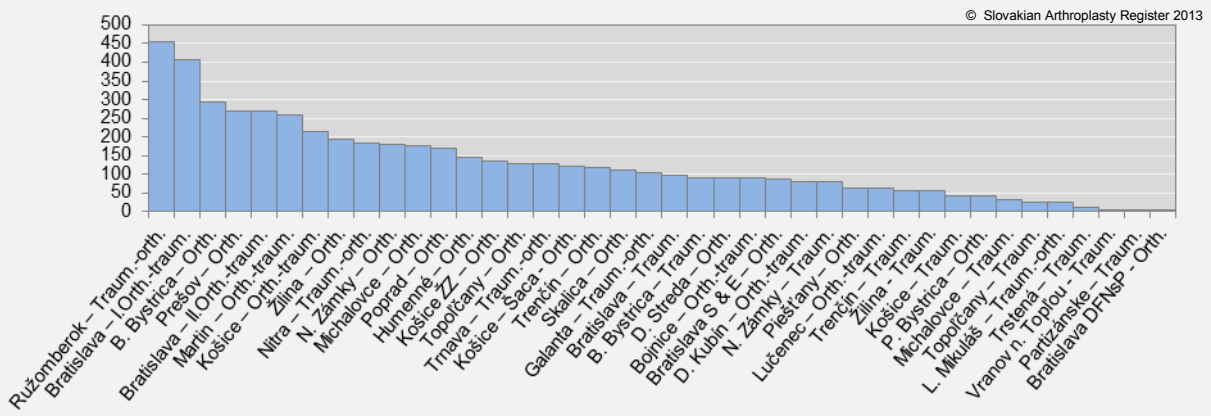

Chart 8 Departments according the volume of primary THA

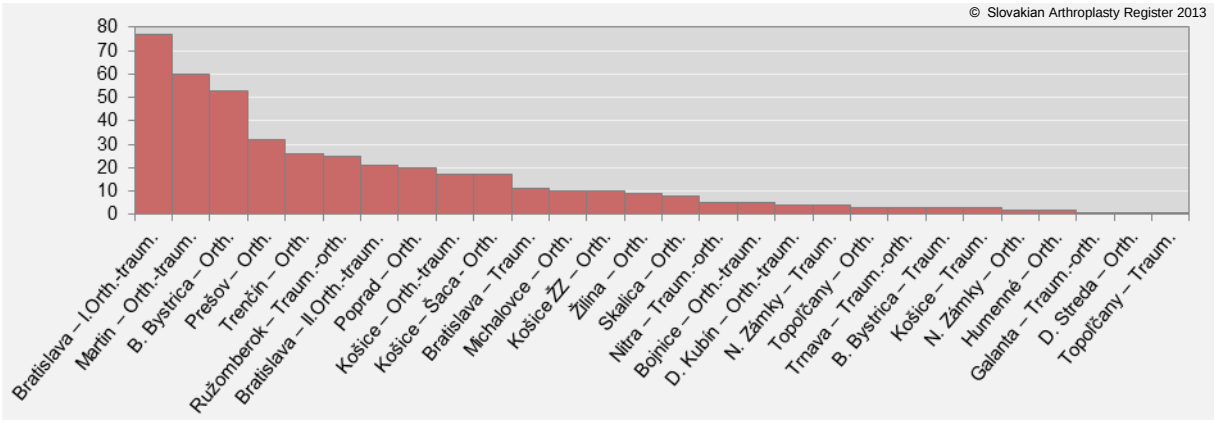

Chart 9 Departments according the volume of revision THA

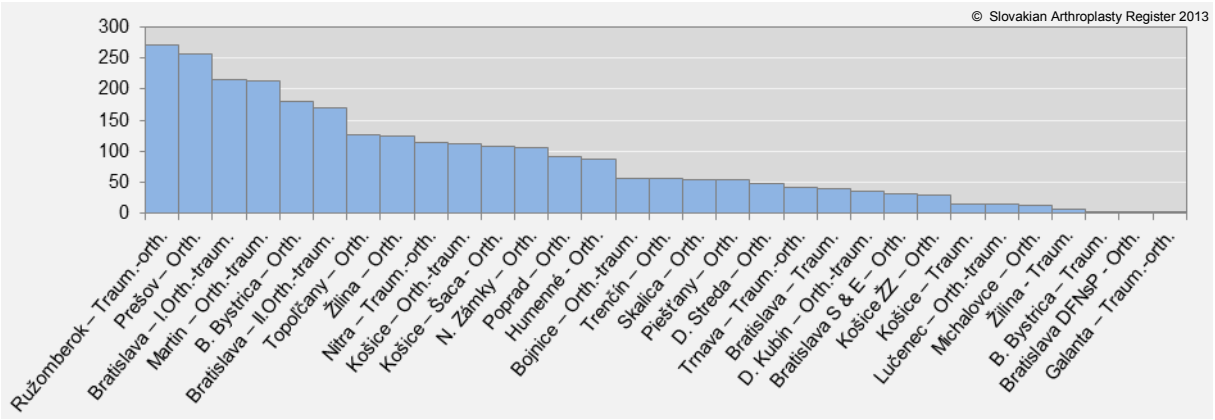

Chart 10 Departments according the volume of primary TKA

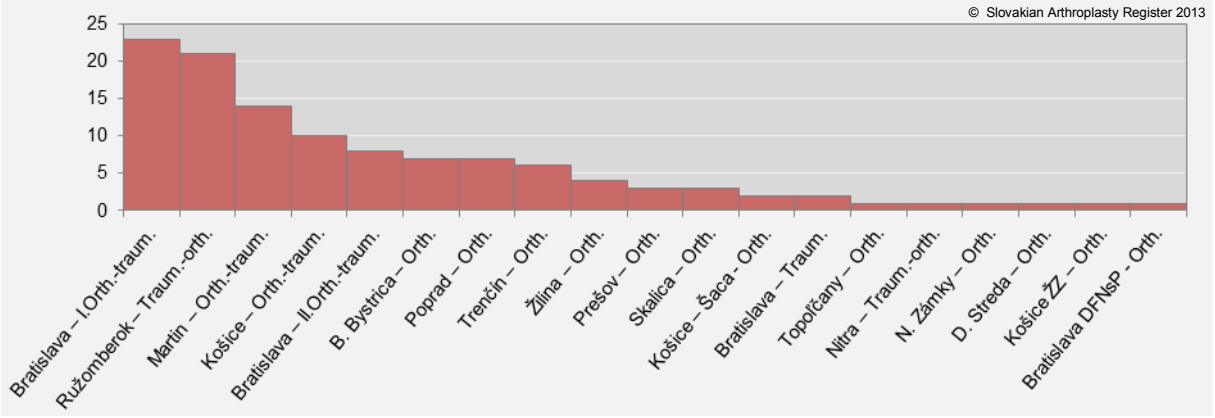

Chart 11 Departments according the volume of revision TKA

University and faculty departments have performed 66.43 % of all primary and 81.04 % of all revision total hip arthroplasties, as shown in table 17 and chart 12. For total knee arthroplasties the corresponding figures are 71.84 % of all primary and 87.06 % of all revisions – table 18 and chart 13.

Tab. 17 Volume of primary and revision THA according to the type of department

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Type of hospital	Primary THA (%)	Revision THA (%)
University	25.22	43.65
Faculty	41.21	37.39
Regional	29.55	15.00
Private	4.03	3.93

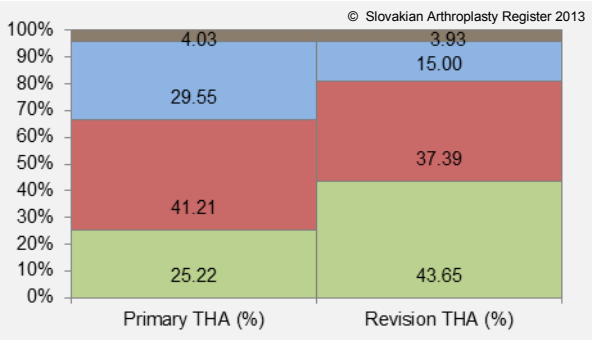

Chart 12 Volume of primary and revision THA according to the type of department

As it is clear from charts 12 and 13, majority of hip and knee revision arthroplasties were performed in university or faculty departments.

Tab. 18 Volume of primary and revision TKA according to the type of department

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Type of hospital	Primary TKA (%)	Revision TKA (%)
University	28.53	49.14
Faculty	43.31	37.92
Regional	22.92	11.20
Private	5.26	1.72

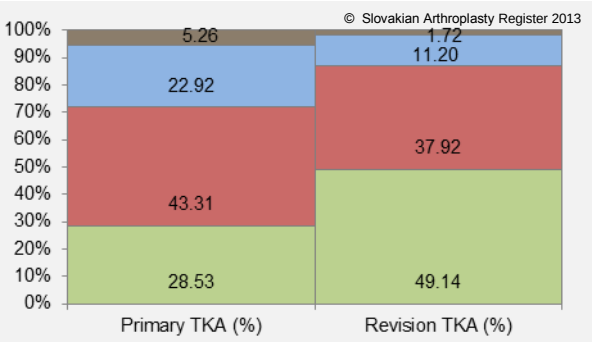

Chart 13 Volume of performed primary and revision THA according to the type of department

In 2010 we introduced a very sensitive parameter for arthroplasty – volume of performed revisions per department. To evaluate this figure precisely we have to consider the provenance of patients requiring revision. According to this, each department has two groups of patients. The first group comprises the revisions of a primary implantation performed in the same department. The second group comprises those referred revision patients, whose primary implantations had been performed in other departments. Among the departments which have performed more than 10 revisions, two have more than 80 % of revisions which have originated in other department. However, these departments were created after 2003 and have no prior history of performing arthroplasties. Only three departments have performed more than 40 % of revisions, whose primary implantation had been performed in other departments.

Tab. 19 Departments according the origin of THA revision

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Department	Own revision	Foreign revision	Total
Bratislava – I.Orth.-traum.	**65**	**12**	**77**
Martin – Orth.-traum.	**31**	**29**	**60**
B. Bystrica – Orth.	**37**	**16**	**53**
Prešov – Orth.	**20**	**12**	**32**
Trenčín – Orth.	**15**	**11**	**26**
Ružomberok – Traum.-orth.	**15**	**10**	**25**
Bratislava – II.Orth.-traum.	**3**	**18**	**21**
Poprad – Orth.	**19**	**1**	**20**
Košice – Orth.-traum.	**13**	**4**	**17**
Košice – Šaca – Orth.	**11**	**6**	**17**
Bratislava – Traum.	**7**	**4**	**11**
Košice ŽZ – Orth.	**2**	**8**	**10**
Michalovce – Orth.	**9**	**1**	**10**
Žilina – Orth.	9	0	9
Skalica – Orth.	6	2	8
Bojnice – Orth.-traum.	5	0	5
Nitra – Traum.-orth.	5	0	5
D. Kubín – Orth.-traum.	3	1	4
N. Zámky – Traum.	4	0	4
B. Bystrica – Traum.	3	0	3
Košice – Traum.	3	0	3
Topoľčany – Orth.	2	1	3
Trnava – Traum.-orth.	3	0	3
Humenné - Orth.	2	0	2
N. Zámky – Orth.	1	1	2
D. Streda – Orth.	1	0	1
Galanta – Traum.-orth.	1	0	1
Topoľčany – Traum.	1	0	1
Total	296	137	433

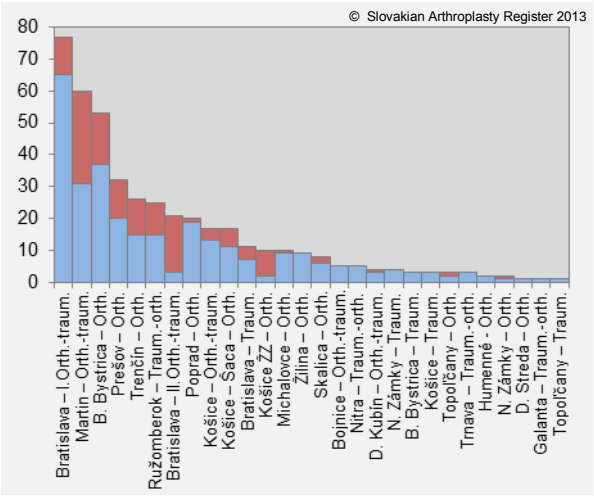

Chart 14 Departments according the origin of THA revision

For total knee arthroplasties the situation is different. TKA revisions were performed in fewer departments. Only four departments performed more than 10 revisions in the year. Table 20 and chart 15 show the figures for TKA.

Tab. 20 Departments according the origin of TKA revision

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Department	Own revision	Foreign revision	Total
Bratislava – I.Orth.-traum.	**19**	**4**	**23**
Ružomberok – Traum.-orth.	**19**	**2**	**21**
Martin – Orth.-traum.	**10**	**4**	**14**
Košice – Orth.-traum.	**9**	**1**	**10**
Bratislava – II.Orth.-traum.	2	6	8
B. Bystrica – Orth.	7	0	7
Poprad – Orth.	7	0	7
Trenčín – Orth.	6	0	6
Žilina – Orth.	4	0	4
Prešov – Orth.	3	0	3
Skalica – Orth.	3	0	3
Bratislava – Traum.	1	1	2
Košice – Šaca - Orth.	2	0	2
Bratislava DFNsP – Orth.	1	0	1
D. Streda – Orth.	1	0	1
Košice ŽZ – Orth.	1	0	1
N. Zámky – Orth.	1	0	1
Nitra – Traum.-orth.	1	0	1
Topoľčany – Orth.	1	0	1
Total	98	18	116

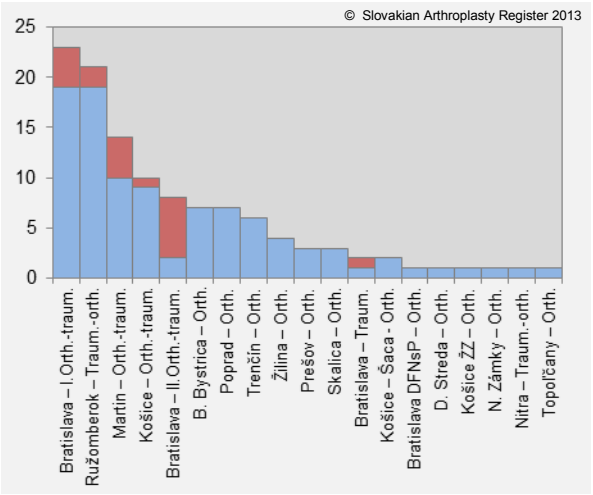

Chart 15 Departments according the origin of TKA revision

In 2010 we introduced another parameter for the register follow-up based on the hypothesis that the period of the year in which the arthroplasty procedure was performed could influence the survival of the implants. From the first two years of observation it became clear that the volume of the primary operation is not even throughout the year, but the volume of revision procedures is almost constant.

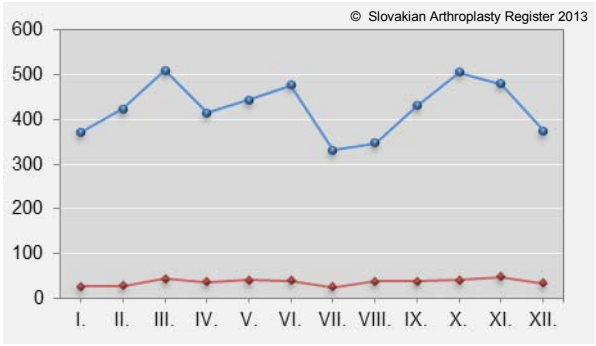

Chart 16 Volume of the performed THA during the year

There are three dips in primary THAs – first in January, second in July and the other in December. This corresponds to the results from 2010. The biggest volume of revisions was performed in November.

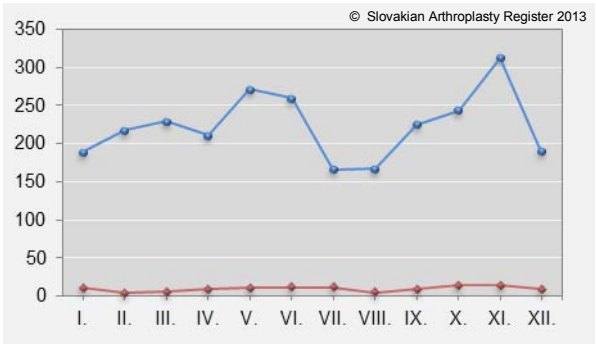

Chart 17 Volume of the TKAs performed during the year

Chart 17 shows the distribution of primary and revision TKAs for each month of the year. The shape of the plot is similar to that for THAs.

Implant Tracking System

Our Implant Tracking System (ITS) started in 1 January 2010. In 2011, 25.99 % of all components were recorded manually and 74.01 % with the use of bar-code scanners. The goal of this system was to improve recording of components. Table 21 shows this improvement, but some departments are still not using this system. We would like to achieve bar-code scanning of at least 95 % of all components within next two years.

Tab. 21 Bar-code scanning and ITS usage by department

Department	No. of surgeries	Manually	%	ITS	%
B. Bystrica – Orth.	532	151	28.38%	381	71.62%
B. Bystrica – Traum.	98	98	100.00%	0	0.00%
Bojnice – Orth.-traum.	151	8	5.30%	143	94.70%
Bratislava DFNsP - Orth.	4	0	0.00%	4	100.00%
Bratislava S & E – Orth.	118	1	0.85%	117	99.15%
Bratislava – I.Orth.-traum.	719	22	3.06%	697	96.94%
Bratislava – II.Orth.-traum.	467	213	45.61%	254	54.39%
Bratislava – Traum.	152	50	32.89%	102	67.11%
D. Kubín – Orth.-traum.	119	91	76.47%	28	23.53%
D. Streda – Orth.	142	140	98.59%	2	1.41%
Galanta – Traum.-orth.	106	17	16.04%	89	83.96%
Humenné – Orth.	237	0	0.00%	237	100.00%
Košice – Orth.-traum.	354	151	42.66%	203	57.34%
Košice – Traum.	61	7	11.48%	54	88.52%
Košice ŽZ – Orth.	178	4	2.25%	174	97.75%
Košice – Šaca - Orth.	247	100	40.49%	147	59.51%
L. Mikuláš – Traum.-orth.	27	0	0.00%	27	100.00%
Lučenec – Orth.-traum.	78	16	20.51%	62	79.49%
Martin – Orth.-traum.	545	17	3.12%	528	96.88%
Michalovce – Orth.	198	4	2.02%	194	97.98%
Michalovce – Traum.	33	0	0.00%	33	100.00%
N. Zámky – Orth.	288	65	22.57%	223	77.43%
N. Zámky – Traum.	84	10	11.90%	74	88.10%
Nitra – Traum.-orth.	305	294	96.39%	11	3.61%
P. Bystrica – Orth.	43	43	100.00%	0	0.00%
Partizánske – Traum.	2	0	0.00%	2	100.00%
Piešťany – Orth.	118	4	3.39%	114	96.61%
Poprad – Orth.	288	19	6.60%	269	93.40%
Prešov – Orth.	561	5	0.89%	556	99.11%
Ružomberok – Traum.-orth.	772	75	9.72%	697	90.28%
Skalica – Orth.	176	1	0.57%	175	99.43%
Topoľčany – Orth.	260	30	11.54%	230	88.46%
Topoľčany – Traum.	28	3	10.71%	25	89.29%
Trenčín – Orth.	205	16	7.80%	189	92.20%
Trenčín – Traum.	57	12	21.05%	45	78.95%
Trnava – Traum.-orth.	172	25	14.53%	147	85.47%
Trstená – Traum.	13	0	0.00%	13	100.00%
Vranov n. Topľou - Traum.	5	5	100.00%	0	0.00%
Žilina - Traum.	61	19	31.15%	42	68.85%
Žilina – Orth.	331	6	1.81%	325	98.19%
Total	8335	1722	20.66%	6613	79.34%

Primary Total Hip Arthroplasty

In 2011, we received THA data from 40 departments. These 40 departments performed 5,107 primary and 433 revision implantations.

Tab. 22 Number of primary and revision THAs

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Year	Primary THA	Annual growth	Revision THA	Annual growth
2003	2120		293	
2004	3086	45.57%	333	13.65%
2005	2976	-3.56%	270	-18.92%
2006	3594	20.77%	335	24.07%
2007	4257	18.45%	348	3.88%
2008	4411	3.62%	339	-2.59%
2009	4767	8.07%	386	13.86%
2010	4972	4.30%	458	18.65%
2011	5107	2.72%	433	-5.46%

In comparison with 2010, there was a 2.72 % increase in primary THAs. In 2011, primary THA accounted for 92.18 % and revision arthroplasty 7.82 % of all hip arthroplasties. Table 22 and chart 18 show the year-by-year evolution of these figures.

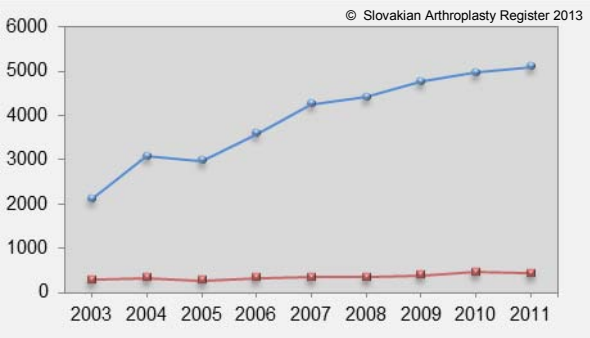

Chart 18 Number of primary and revision THAs

In 2011, the RR reached 8.48 %, which represents a decrease of 0.73 % compared to the previous year.

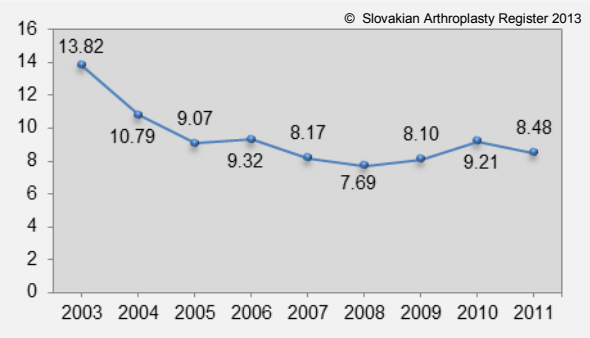

Chart 19 Primary THA – revision rate

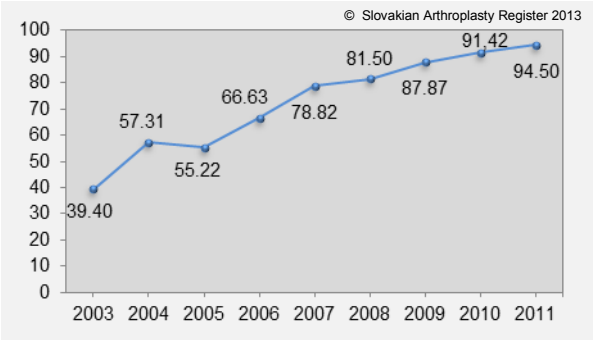

Chart 20 Primary THA – incidence per 100,000 inhabitants

In 2003, the incidence of primary THA was 39.40 per 100,000 inhabitants. In 2011, that value reached 94.50 per 100 000 inhabitants. The gender distribution in 2011 was 59.19 % female and 40.81 % male. The gender ratio is the same as in previous year. Table 23 and chart 21 show the numbers of primary THA according to gender.

Tab. 23 Primary THA – gender distribution

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Year	Female	Male
2003	1325	795
2004	1885	1201
2005	1808	1168
2006	2213	1381
2007	2631	1626
2008	2730	1681
2009	2892	1875
2010	2985	1987
2011	3023	2084

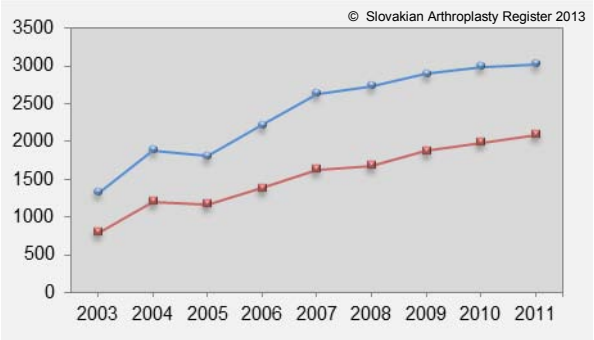

Chart 21 Primary THA – gender distribution

For the next observation, the whole database was divided according to the gender, age (4 groups) and type of implant fixation. Comparison of RR shows better results for the female gender. The lowest RR was observed in the age group over 75 years and in cemented hemiarthroplasty. The highest RR – 9.84, which is 4.33 times more than whole database, was observed in the group of reverse hybrids.

Tab. 24 Characteristics of primary THA (interaction of gender, age groups, and type of fixation)

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		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Gender							
	Females	21492	427	1.99	1.80 to 2.17	8.79	8.77 to 8.81
	Males	13798	375	2.72	2.45 to 2.99	8.69	8.66 to 8.72
Age groups							
	[min,55] yrs	8012	191	2.38	2.05 to 2.72	8.73	8.70 to 8.77
	(55,65] yrs	9558	259	2.71	2.38 to 3.04	8.70	8.66 to 8.74
	(65,75] yrs	10831	256	2.36	2.08 to 2.65	8.75	8.72 to 8.78
	(75,max] yrs	6889	96	1.39	1.12 to 1.67	8.85	8.82 to 8.88
Type of fixation							
	Uncemented	14274	250	1.75	1.54 to 1.97	8.76	8.73 to 8.79
	Cemented	11022	302	2.74	2.44 to 3.04	8.74	8.71 to 8.77
	Hybrids	4727	167	3.53	3.01 to 4.06	8.63	8.58 to 8.69
	Reverse hybrids	193	19	9.84	5.64 to 14.05	7.88	7.44 to 8.32
	Hemiarthropl. cem.	4816	61	1.27	0.95 to 1.58	8.84	8.81 to 8.88
	Hemiarthropl. uncem.	258	3	1.16	0.00 to 2.47	8.60	8.46 to 8.74
Whole database total		35290	802	2.27	2.12 to 2.43	8.75	8.73 to 8.77

For the first time in this survival analysis we have introduced cumulative risk as a new figure. Chart 22 shows the cumulative risk by gender. After the fourth year, the RR for males increases rapidly. Chart 23 shows the same parameter by age groups with lowest risk being in the group over 75 years. Chart 24 represents the cumulative risk (CR) curves by the type of fixation. The risk of revision for the reverse hybrids is significantly higher than in the other groups in the entire time range (increasing over time) and has lowest mean survival time, which is 7.88 yrs.

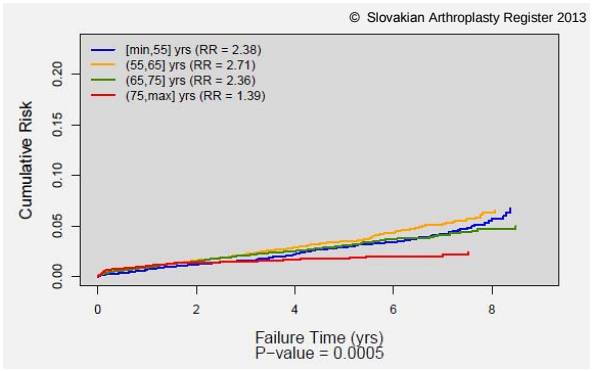

Chart 23 Cumulative risk of primary THA (age groups)

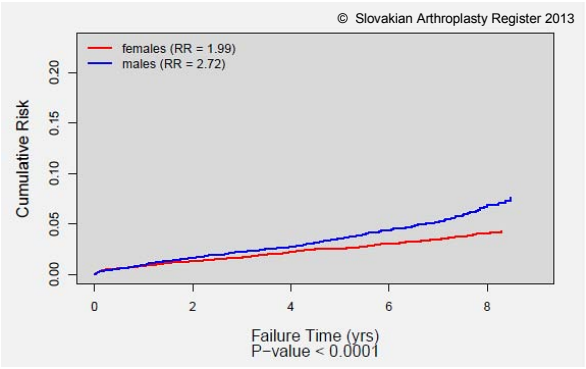

Chart 22 Cumulative risk of primary THA (gender)

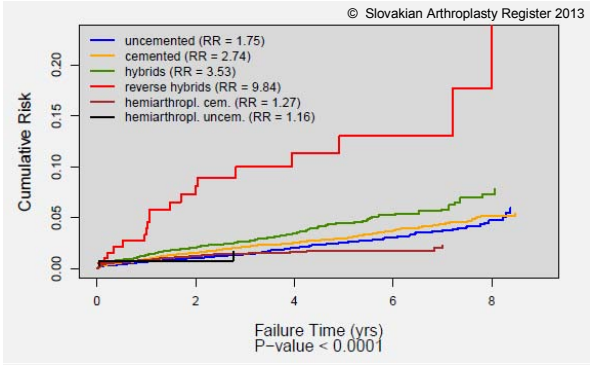

Chart 24 Cumulative risk of primary THA (type of fixation)

Interaction of gender and age groups is shown in table 25 and charts 25–26. RR for females is 1.99 compared to 2.72 RR for males. The lowest RR was in the male age group over 75 yrs.

Tab. 25 Characteristics of primary THA (interaction of gender and age groups)

	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females						
[min,55] yrs	4376	83	1.90	1.49 to 2.30	8.79	8.75 to 8.83
(55,65] yrs	5126	131	2.56	2.12 to 2.99	8.72	8.68 to 8.77
(65,75] yrs	6910	139	2.01	1.68 to 2.34	8.79	8.75 to 8.82
(75,max] yrs	5080	74	1.46	1.13 to 1.79	8.85	8.81 to 8.88
Females total	21492	427	1.99	1.80 to 2.17	8.79	8.77 to 8.81
Males						
[min,55] yrs	3636	108	2.97	2.42 to 3.52	8.66	8.60 to 8.72
(55,65] yrs	4432	128	2.89	2.40 to 3.38	8.67	8.62 to 8.73
(65,75] yrs	3921	117	2.98	2.45 to 3.52	8.68	8.62 to 8.74
(75,max] yrs	1809	22	1.22	0.71 to 1.72	8.82	8.74 to 8.89
Males total	13798	375	2.72	2.45 to 2.99	8.69	8.66 to 8.72
Whole database total	35290	802	2.27	2.12 to 2.43	8.75	8.73 to 8.77

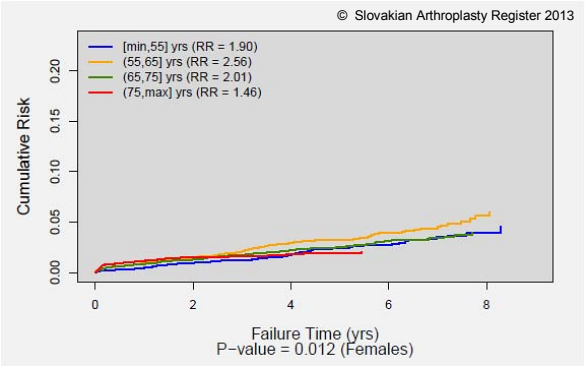

Chart 25 Cumulative risk of primary THA (females, age groups)

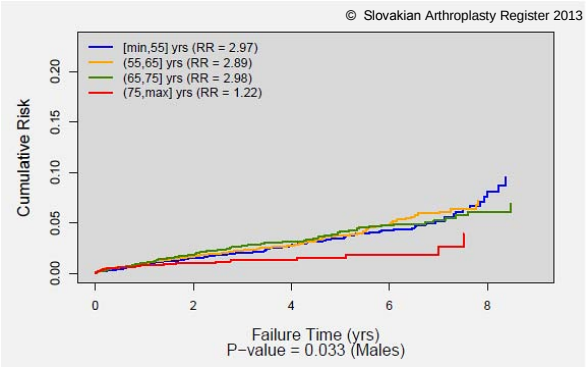

Chart 26 Cumulative risk of primary THA (males, age groups)

Age groups

Tab. 26 Primary THA – age groups

Year	<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	Not Ident.
2003	0	0	0	4	6	13	33	50	121	232	220	278	349	356	239	219	0
2004	0	1	2	6	15	24	56	98	208	364	390	403	468	484	294	273	0
2005	0	2	1	9	18	29	45	95	192	300	353	410	492	451	313	266	0
2006	0	2	3	7	16	50	72	155	272	413	450	553	569	490	303	238	1
2007	0	1	8	11	28	57	113	164	343	508	554	655	645	602	322	246	0
2008	0	7	7	17	30	68	100	222	397	547	620	713	650	547	291	195	0
2009	0	1	8	22	41	59	105	226	475	633	673	747	688	575	317	197	0
2010	1	4	11	19	41	71	146	227	485	707	705	779	709	570	333	163	1
2011	0	4	8	19	42	84	125	238	472	711	799	814	742	594	261	194	0

Table 26 shows the population divided into five-year age groups. This analysis indicates the trend of shifting THA towards younger age group during last few years. In 2011 in the age groups less than 25 years, only 12 implantations were recorded. We have recorded only three decreases among these age groups 40–44, 50–54 and 80–84. For our following analysis, we are using the database divided into only four age groups giving us the opportunity of their statistical comparison. Table 27 and chart 27 show this development. When we compare distribution of the age groups in 2003 and 2011, there is a decrease 4.17 % in the age group less than or

equal to 55 yrs but an increase of 5.13 % in group 55–65 yrs. There is a decrease of 2.24 % in the age group 65–75 and an increase of 1.87 % in the group over 75 yrs. Close inspection of chart 27 reveals two-year cycles with the dips in odd years for the age groups less than or equal to 55 yrs and 55–65 yrs. By contrast, in the age groups 65–75 and over 75 yrs, there are even year dips from 2009.

Tab. 27 Frequency of primary THA (age groups; in %)

Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	25.00	26.15	22.41	23.73	23.02	23.12	21.19	21.74	20.83
(55,65] yrs	24.91	25.86	25.00	26.43	26.26	26.59	27.19	28.50	30.04
(65,75] yrs	32.36	31.01	31.49	31.19	30.94	30.95	30.31	29.47	30.12
(75,max] yrs	17.74	16.98	21.10	18.64	19.78	19.34	21.31	20.29	19.01

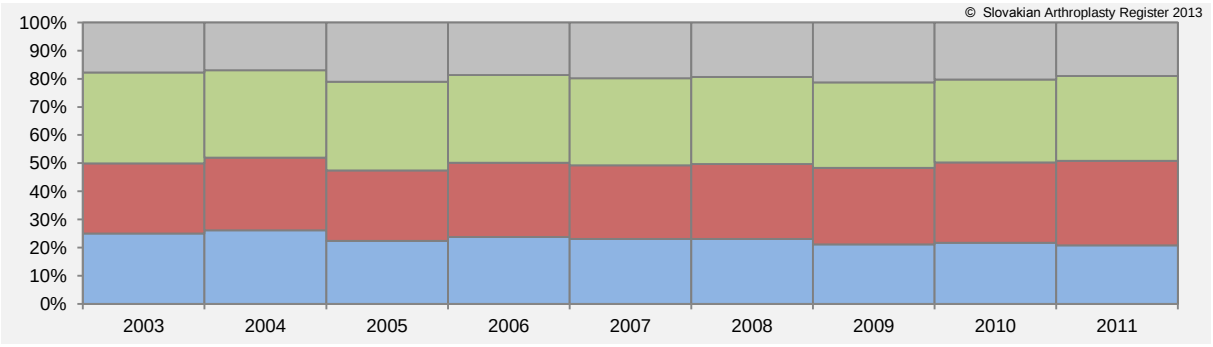

Chart 27 Frequency of primary THA (age groups; in %)

Tab. 28 Frequency of primary THA (females; age groups; in %)

Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	21.89	23.98	20.08	22.10	20.79	20.92	19.40	18.73	18.00
(55,65] yrs	23.92	22.49	21.40	23.36	22.58	23.33	24.72	24.66	26.43
(65,75] yrs	31.85	33.21	32.63	32.13	33.07	31.94	30.88	31.36	32.75
(75,max] yrs	22.34	20.32	25.88	22.41	23.57	23.81	25.00	25.26	22.83

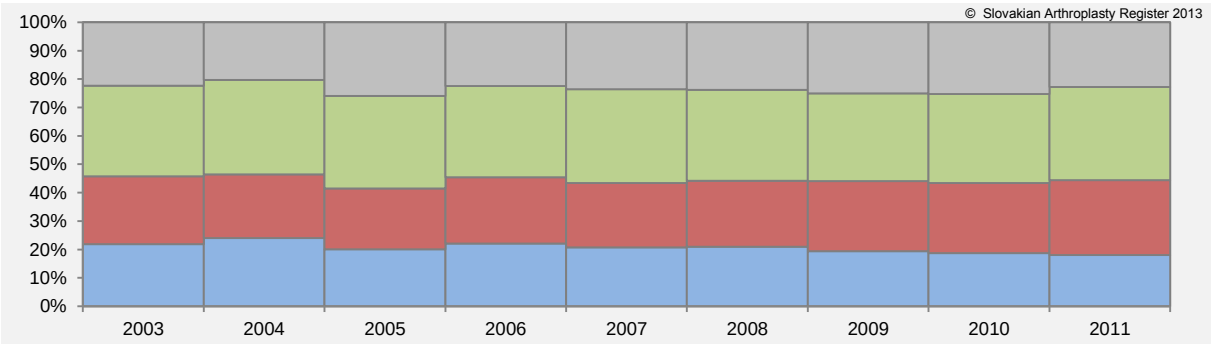

Chart 28 Frequency of primary THA (females; age groups; in %)

Tab. 29 Frequency of primary THA (males; age groups; in %)

Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	30.19	29.56	26.03	26.36	26.63	26.71	23.95	26.27	24.95
(55,65] yrs	26.54	31.14	30.57	31.35	32.23	31.89	30.99	34.27	35.27
(65,75] yrs	33.21	27.56	29.71	29.69	27.49	29.33	29.44	26.62	26.30
(75,max] yrs	10.06	11.74	13.70	12.60	13.65	12.08	15.63	12.83	13.48

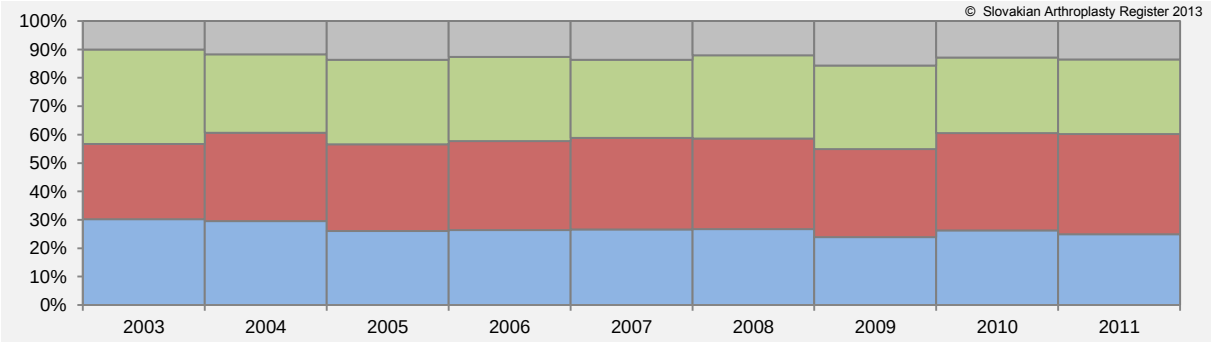

Chart 29 Frequency of primary THA (males; age groups; in %)

Table 28 and chart 28 show the results of this analysis for females and table 29 and chart 29 for males. For females in the age group less than equal to 55 yrs, there is a decrease from 21.89 % in 2003 to 18.00 % in 2011, and for males in the age group less than 55 we have recorded decrease from 30.19 % in 2003 to 24.95 % in 2011. The next analyses are the failures of the implants according to age groups. Table 30 and chart 30 show the distribution of failed implants in percentages, according to the four age groups.

Tab. 30 Frequency of failure of primary THA in a particular year (age groups; in %)

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Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	33.58	25.41	25.00	21.65	19.39	21.35	16.00	20.00	26.32
(55,65] yrs	29.85	40.98	27.78	39.18	28.57	34.83	24.00	30.00	31.58
(65,75] yrs	30.60	28.69	31.48	30.93	38.78	38.20	33.33	25.00	21.05
(75,max] yrs	5.97	4.92	15.74	8.25	13.27	5.62	26.67	25.00	21.05

Chart 30 Frequency of failure of primary THA in a particular year (age groups; in %)

Table 31 and chart 31 show these results for female patients and table 32 and chart 32 for male patients. From this chart, there are apparent differences in the percentages of failed THAs according to the four age groups. Due to the short observation period, the interpretation of these data is still difficult. For female patients in the age group less than or equal 55 yrs, we have found a clear decrease in failures from 2003 to 2009. In 2011 there was no record of revision in this age group. By contrast, the age group over 75 showed the significant increase in failures from 2009 to 2011. In 2011 we found 57.14 % of all revisions in this age group.

Tab. 31 Frequency of failure of primary THA in a particular year (females; age groups; in %)

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Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	32.81	23.81	22.81	19.51	14.93	14.58	9.09	13.89	0.00
(55,65] yrs	31.25	38.10	28.07	36.59	25.37	35.42	25.00	25.00	28.57
(65,75] yrs	29.69	31.75	28.07	29.27	46.27	39.58	27.27	25.00	14.29
(75,max] yrs	6.25	6.35	21.05	14.63	13.43	10.42	38.64	36.11	57.14

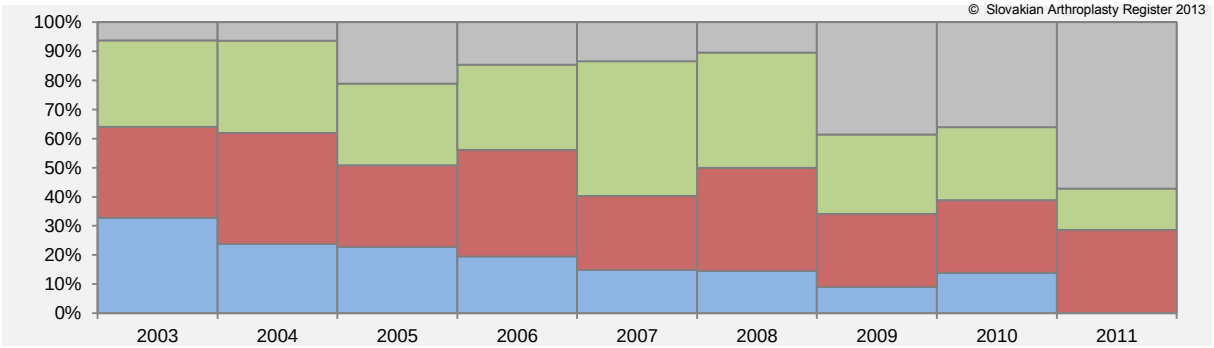

Chart 31 Frequency of failure of primary THA in a particular year (females; age groups; in %)

Tab. 32 Frequency of failure of primary THA in a particular year (males; age groups; in %)

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Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	34.29	27.12	27.45	23.21	29.03	29.27	25.81	29.17	41.67
(55,65] yrs	28.57	44.07	27.45	41.07	35.48	34.15	22.58	37.50	33.33
(65,75] yrs	31.43	25.42	35.29	32.14	22.58	36.59	41.94	25.00	25.00
(75,max] yrs	5.71	3.39	9.80	3.57	12.90	0.00	9.68	8.33	0.00

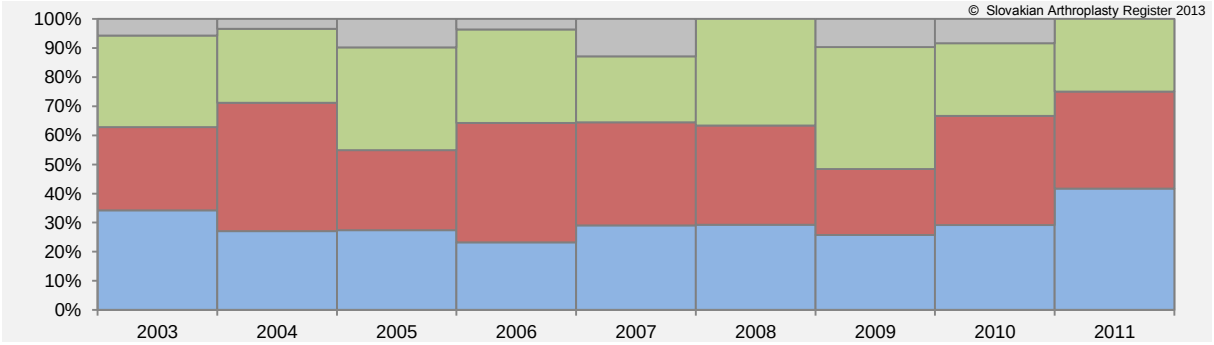

Chart 32 Frequency of failure of primary THA in a particular year (males; age groups; in %)

The last new analysis presents the failure rate of primary THA according to age group, which is not cumulative. We have recorded all failures in one month, three months and each consecutive year. Table 33 and chart 33 show the results in percentage for the whole database.

Tab. 33 Probability of failure of primary THA until certain time point (age groups; not cumulative; in %)

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Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
[min,55] yrs	14.85	7.46	24.59	23.61	19.61	32.53	33.33	22.00	38.24	40.74	60.00
(55,65] yrs	27.72	26.87	28.69	32.64	35.29	36.14	31.82	40.00	38.24	33.33	20.00
(65,75] yrs	29.70	35.82	31.97	32.64	41.18	26.51	31.82	34.00	20.59	22.22	20.00
(75,max] yrs	27.72	29.85	14.75	11.11	3.92	4.82	3.03	4.00	2.94	3.70	0.00

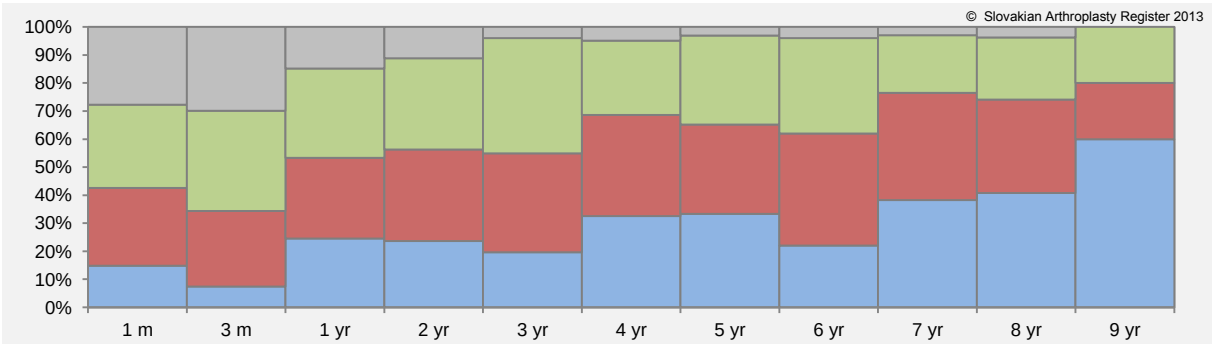

Chart 33 Probability of failure of primary THA until certain time point (age groups; not cumulative; in %)

Table 34 and chart 34 show the same results for females and table 35 and chart 35 show results for males. This analysis shows the increased probability of failure of the implants in the age group less or equal than 55 yrs and a decrease in failures in the age group over 75 yrs. In the ninth year we have recorded revisions in 60 % for the age group less than or equal 55 yrs, but no revision in the age group over 75.

Tab. 34 Probability of failure of primary THA until certain time point (females; age groups; not cumulative; in %)

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Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
[min,55] yrs	10.77	4.76	14.52	23.68	14.29	26.42	48.15	12.50	43.75	20.00	50.00
(55,65] yrs	21.54	21.43	32.26	28.95	38.78	39.62	18.52	37.50	31.25	50.00	50.00
(65,75] yrs	32.31	35.71	30.65	30.26	42.86	26.42	29.63	45.83	25.00	30.00	0.00
(75,max] yrs	35.38	38.10	22.58	17.11	4.08	7.55	3.70	4.17	0.00	0.00	0.00

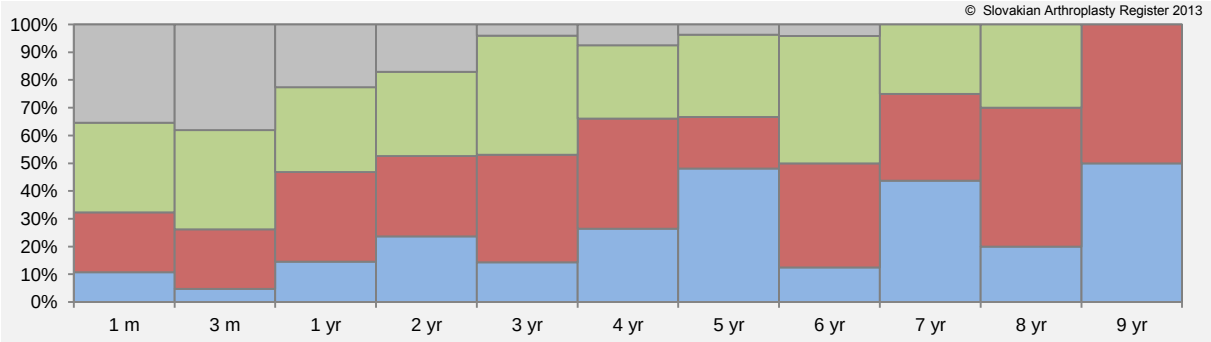

Chart 34 Probability of failure of primary THA until certain time point (females; age groups; not cumulative; in %)

Tab. 35 Probability of failure of primary THA until certain time point (males; age groups; not cumulative; in %)

© Slovakian Arthroplasty Register 2013

Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
[min,55] yrs	22.22	12.00	35.00	23.53	24.53	43.33	23.08	30.77	33.33	52.94	66.67
(55,65] yrs	38.89	36.00	25.00	36.76	32.08	30.00	41.03	42.31	44.44	23.53	0.00
(65,75] yrs	25.00	36.00	33.33	35.29	39.62	26.67	33.33	23.08	16.67	17.65	33.33
(75,max] yrs	13.89	16.00	6.67	4.41	3.77	0.00	2.56	3.85	5.56	5.88	0.00

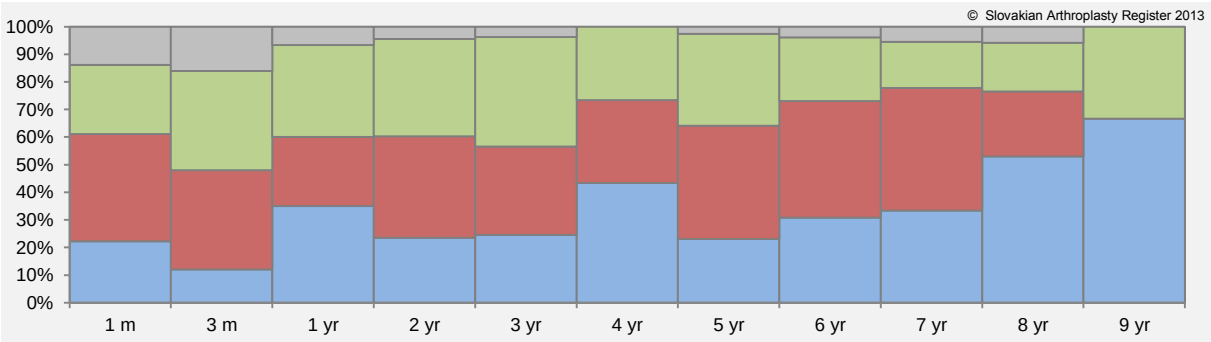

Chart 35 Probability of failure of primary THA until certain time point (males; age groups; not cumulative; in %)

Diagnoses

Tab. 36 Primary THA – diagnoses

Year	Primary Coxarthrosis	Dysplastic Coxarthrosis	Posttraumatic Coxarthrosis	Aseptic Necrosis	M.Perthes	Rheumatoid Arthritis	Fracture of Femoral Neck	Other Causes
2003	1135	209	274	134	1	25	28	291
2004	1600	359	498	201	3	40	15	352
2005	1487	298	557	207	6	32	46	322
2006	1969	432	169	241	1	31	680	54
2007	2396	490	183	221	5	38	874	35
2008	2364	557	224	259	11	56	881	43
2009	2736	552	176	223	6	39	970	56
2010	2871	566	178	242	4	40	979	92
2011	3081	521	154	301	8	35	918	89

Tab. 37 Characteristics of primary THA (diagnoses)

		Total numbers	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Diagnoses							
	Primary coxarthr.	19639	373	1.90	1.71 to 2.09	8.79	8.77 to 8.81
	Dysplastic coxarthr.	3984	71	1.78	1.37 to 2.19	8.79	8.75 to 8.84
	Posttraum. coxarthr.	2413	50	2.07	1.50 to 2.64	8.80	8.74 to 8.85
	Avascular necrosis	2029	43	2.12	1.49 to 2.75	8.76	8.70 to 8.83
	M. Perthes	45	2	4.44	0.00 to 10.47	8.26	7.73 to 8.78
	Rheumatoid arthritis	336	10	2.98	1.16 to 4.79	8.70	8.52 to 8.87
	Fracture of fem.	5391	91	1.69	1.34 to 2.03	8.69	8.63 to 8.75
Whole database				2.27	2.12 to 2.43	8.75	8.73 to 8.77

In 2011, primary coxarthrosis was still the main indication for THA. Compared to 2010, when primary coxarthrosis was the indication for THA in 57.70 % off all indications, in the current year it was 60.32 %. Between 2010 and 2011, a minor decrease, from 11.38 % to 10.20 %, for dysplastic coxarthrosis was recorded. For femoral neck fracture, the decrease was similar from 19.69 % to 17.97 %. Only one increase was recorded, namely avascular necrosis from 4.86 % in 2010 to 5.89 % in 2011.

Tab. 38 Characteristics of primary THA (interaction of gender and diagnoses)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females							
	Primary coxarthr.	11046	172	1.56	1.33 to 1.79	8.83	8.81 to 8.86
	Dysplastic coxarthr.	3217	55	1.71	1.26 to 2.16	8.81	8.76 to 8.86
	Posttraum. coxarthr.	1398	19	1.36	0.75 to 1.97	8.87	8.81 to 8.93
	Avascular necrosis	817	21	2.57	1.49 to 3.66	8.68	8.57 to 8.78
	M. Perthes	19	0	0.00	NA	7.68	NA
	Rheumatoid arthritis	241	5	2.07	0.28 to 3.87	8.72	8.55 to 8.88
	Fracture of fem. neck	3791	60	1.58	1.19 to 1.98	8.70	8.66 to 8.74
Females total		21492	427	1.99	1.80 to 2.17	8.79	8.77 to 8.81
Males							
	Primary coxarthr.	8593	201	2.34	2.02 to 2.66	8.73	8.70 to 8.77
	Dysplastic coxarthr.	767	16	2.09	1.07 to 3.10	8.64	8.50 to 8.77
	Posttraum. coxarthr.	1015	31	3.05	2.00 to 4.11	8.69	8.59 to 8.79
	Avascular necrosis	1212	22	1.82	1.06 to 2.57	8.79	8.71 to 8.87
	M. Perthes	26	2	7.69	0.00 to 17.93	7.96	7.05 to 8.87
	Rheumatoid arthritis	95	5	5.26	0.77 to 9.75	8.44	7.98 to 8.90
	Fracture of fem. neck	1600	31	1.94	1.26 to 2.61	8.60	8.42 to 8.77
Males total		13798	375	2.72	2.45 to 2.99	8.69	8.66 to 8.72
Whole database total		35290	802	2.27	2.12 to 2.43	8.75	8.73 to 8.77

From the table 37 it is clear that the RR of all diagnosis except Perthes' disease was within interval 1.69–2.98. There were only 45 protocols with the diagnosis of Perthes' disease with 2 revisions and the RR therefore reached 4.44.

Tab 39 Characteristics of primary THA (interaction of age groups and diagnoses)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
[min,55] yrs							
	Primary coxarthr.	3284	65	1.98	1.50 to 2.46	8.75	8.70 to 8.81
	Dysplastic coxarthr.	2524	41	1.62	1.13 to 2.12	8.81	8.76 to 8.86
	Posttraum. coxarthr.	520	14	2.69	1.30 to 4.08	8.70	8.58 to 8.83
	Avascular necrosis	892	14	1.57	0.75 to 2.39	8.82	8.74 to 8.90
	M. Perthes	35	1	2.86	0.00 to 8.38	8.40	7.92 to 8.87
	Rheumatoid arthritis	152	4	2.63	0.09 to 5.18	8.65	8.41 to 8.90
	Fracture of fem. neck	342	11	3.22	1.35 to 5.09	7.29	7.04 to 7.53
[min,55] yrs total		8012	191	2.38	2.05 to 2.72	8.73	8.70 to 8.77
(55,65] yrs							
	Primary coxarthr.	6447	130	2.02	1.67 to 2.36	8.77	8.73 to 8.81
	Dysplastic coxarthr.	1005	23	2.29	1.36 to 3.21	8.71	8.62 to 8.81
	Posttraum. coxarthr.	472	21	4.45	2.59 to 6.31	8.59	8.42 to 8.76
	Avascular necrosis	550	10	1.82	0.70 to 2.93	8.71	8.60 to 8.82
	M. Perthes	8	1	12.50	0.00 to 35.42	6.74	5.06 to 8.43
	Rheumatoid arthritis	98	4	4.08	0.16 to 8.00	8.50	8.14 to 8.87
	Fracture of fem. neck	724	19	2.62	1.46 to 3.79	8.22	8.10 to 8.35
(55,65] yrs total		9558	259	2.71	2.38 to 3.04	8.70	8.66 to 8.74
(65,75] yrs							
	Primary coxarthr.	7682	144	1.87	1.57 to 2.18	8.80	8.77 to 8.83
	Dysplastic coxarthr.	378	7	1.85	0.49 to 3.21	8.76	8.61 to 8.91
	Posttraum. coxarthr.	588	10	1.70	0.66 to 2.75	8.84	8.75 to 8.94
	Avascular necrosis	426	15	3.52	1.77 to 5.27	8.61	8.43 to 8.78
	M. Perthes	2	0	0.00	NA	3.27	NA
	Rheumatoid arthritis	72	2	2.78	0.00 to 6.57	8.74	8.42 to 9.07
	Fracture of fem. neck	1296	25	1.93	1.18 to 2.68	8.47	8.39 to 8.55
(65,75] yrs total		10831	256	2.36	2.08 to 2.65	8.75	8.72 to 8.78
(75,max] yrs							
	Primary coxarthr.	2226	34	1.53	1.02 to 2.04	8.83	8.77 to 8.89
	Dysplastic coxarthr.	77	0	0.00	NA	7.03	NA
	Posttraum. coxarthr.	833	5	0.60	0.08 to 1.12	8.91	8.85 to 8.97
	Avascular necrosis	161	4	2.48	0.08 to 4.89	8.63	8.40 to 8.86
	M. Perthes	NA	NA	NA	NA	NA	NA
	Rheumatoid arthritis	14	0	0.00	NA	7.24	NA
	Fracture of fem. neck	3029	36	1.19	0.80 to 1.57	8.77	8.73 to 8.82
(75,max] yrs total		6889	96	1.39	1.12 to 1.67	8.85	8.82 to 8.88
Whole database total		35290	802	2.27	2.12 to 2.43	8.75	8.73 to 8.77

Surgical approaches

Tab. 40 Primary THA – surgical approaches

Year	Anterior	Ante-rolat.	Lateral	Poster.	T-tomy	MIS	Not Ident.
2003	2	821	942	337	0	0	18
2004	13	1297	1173	579	0	4	20
2005	20	1381	896	635	0	24	20
2006	8	1560	1315	679	4	9	19
2007	10	1856	1545	815	4	11	16
2008	5	2120	1436	829	3	2	16
2009	6	2151	1749	850	2	1	8
2010	5	2617	1433	910	5	2	0
2011	10	2674	1574	842	3	4	0

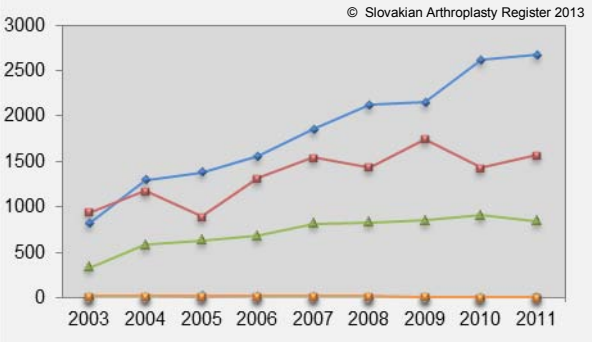

Chart 36 Primary THA – surgical approaches

In 2011, the most commonly used approach was anterolateral, in 52.35 % of all cases, then the lateral approach in 30.82 % and the posterior approach in 16.48 %. Trochanterotomy with a minimally invasive approach was used only in 0.35 % of all cases. Table 40 and chart 36 shows the types of surgical approaches used.

Types of implants used

In the THA database, there are three basic groups of implants: total arthroplasty, bipolar hemiarthroplasty and hemiarthroplasty. In 2011, total arthroplasty was used in 88.76 %, which is an increase of 1.98 % compared to 2010. The frequency of bipolar hemiarthroplasty remained under 1 % and in 2011 a decrease in its use from 12.44 % in 2010 to 10.45 % was recorded.

Tab. 41 Primary THA – types of implant

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Year	Total arthroplasty	Bipolar hemiarth.	Hemiarth.
2003	1786	4	330
2004	2580	10	496
2005	2425	14	537
2006	3061	13	517
2007	3641	20	596
2008	3784	18	609
2009	4089	22	656
2010	4315	38	619
2011	4533	40	534

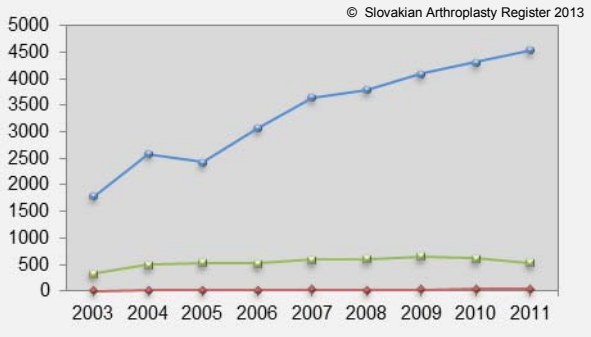

Chart 37 Primary THA – types of implant

Types of the fixation

For the anchoring of the implants, three types of fixation are distinguished: cemented, uncemented and hybrid fixations. In 2011, the distribution of fixation was as follows: 35.26 % cemented, 51.16 % uncemented, and 13.56 % hybrid fixation. Comparing 2011 to the previous year, only hybrid fixation increased in 2011 from 11.66 % to 13.56 %. Back in 2003 (comparing with 2011), the distribution was 63.99 % cemented, 23.07 % uncemented and 12.93 % hybrid fixation. Significant change has occurred only between cemented and uncemented groups. Table 42 and chart 38 show the records for the types of the fixation.

Tab. 42 Primary THA – types of fixation

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Year	Cement	Uncement	Hybrid
2003	1373	472	275
2004	1820	900	366
2005	1625	826	525
2006	1847	1163	584
2007	1938	1639	680
2008	1750	2002	659
2009	1870	2339	558
2010	1814	2578	580
2011	1801	2613	693

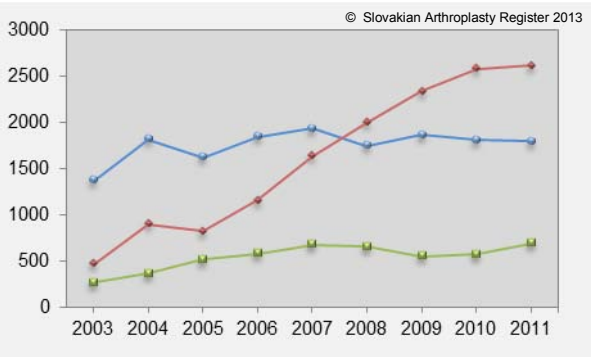

Chart 38 Primary THA – types of fixation

The next table shows the interaction of gender and type of fixation. For this observation, the hemiarthroplasty was selected to be compared to total arthroplasty. The RR for females with cemented hemiarthroplasty was only 0.57 %, and the mean survival time 8.67 years. Similar results were observed in the group of uncemented hemiarthroplasties where RR was 1.22 % and the mean survival time 8.85 years. The worst results were observed in the female group with reverse hybrids, in which the RR was 6.50 % and mean survival time 8.26 years. In males, reverse hy-

brids suffered a RR of 15.71 % and survival time was 7.19 years, which is the worst in the whole database. In 2010, by comparison, the RR of males with reverse hybrids was 8.20 %. Chart 39 shows the cumulative risks of implants in interaction with type of fixation. Charts 40–41 show the cumulative risks of implants in interaction with gender and type of fixation. The results of reverse hybrids are inferior to the other groups of implants. The RR of reverse hybrids was 9.84 %, compared to 3.53 % of standard hybrids.

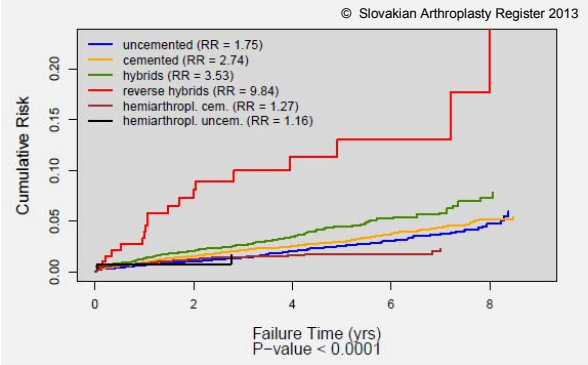

Chart 39 Cumulative risk of primary THA (type of fixation)

Tab. 43 Characteristics of primary THA (interaction of gender and type of fixation)

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		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females							
	Uncemented	7577	117	1.54	1.27 to 1.82	8.78	8.74 to 8.81
	Cemented	7283	169	2.32	1.97 to 2.67	8.78	8.75 to 8.81
	Hybrids	2734	88	3.22	2.56 to 3.88	8.66	8.59 to 8.73
	Reverse hybrids	123	8	6.50	2.15 to 10.86	8.26	7.82 to 8.70
	Hemiarthropl. cem.	3600	44	1.22	0.86 to 1.58	8.85	8.81 to 8.89
	Hemiarthropl. uncem.	175	1	0.57	0.00 to 1.69	8.67	8.57 to 8.77
Females total		21492	427	1.99	1.80 to 2.17	8.79	8.77 to 8.81
Males							
	Uncemented	6697	133	1.99	1.65 to 2.32	8.72	8.68 to 8.77
	Cemented	3739	133	3.56	2.96 to 4.15	8.66	8.61 to 8.72
	Hybrids	1993	79	3.96	3.11 to 4.82	8.58	8.50 to 8.67
	Reverse hybrids	70	11	15.71	7.19 to 24.24	7.19	6.37 to 8.00
	Hemiarthropl. cem.	1216	17	1.40	0.74 to 2.06	8.80	8.71 to 8.89
	Hemiarthropl. uncem.	83	2	2.41	0.00 to 5.71	7.18	6.82 to 7.54
Males total		13798	375	2.72	2.45 to 2.99	8.69	8.66 to 8.72
Whole database total		35290	802	2.27	2.12 to 2.43	8.75	8.73 to 8.77

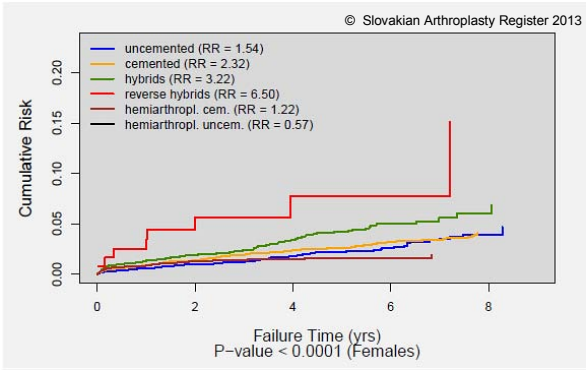

Chart 40 Cumulative risk of primary THA (females, type of fixation)

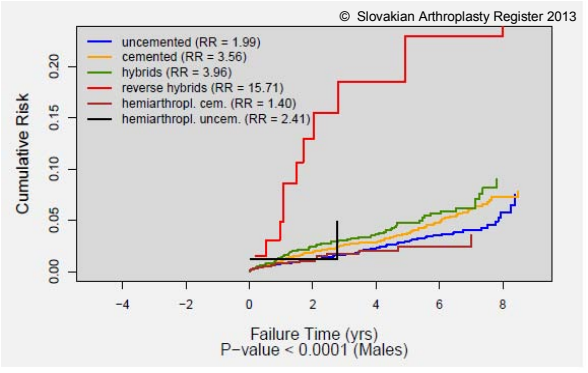

Chart 41 Cumulative risk of primary THA (males, type of fixation)

Table 44 shows the interaction of type of fixation with diagnoses. For uncemented fixations, a RR of 3.03 % was recorded for posttraumatic coxarthrosis and 3.56 % for fractures of the femoral neck. The lowest RR in cemented fixations was recorded for a diagnosis of fracture of the femoral neck – 1.64 %. In total, reverse hybrids bore the worst RR – 9.84 %. The RR in cemented THA for posttraumatic coxarthrosis was 21.43 %.

Tab 44 Characteristics of primary THA (interaction of type of fixation and diagnosis)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Uncemented							
	Primary coxarthr.	8312	105	1.26	1.02 to 1.50	8.79	8.76 to 8.83
	Dysplastic coxarthr.	3145	46	1.46	1.04 to 1.88	8.80	8.75 to 8.85
	Posttraum. coxarthr.	660	20	3.03	1.72 to 4.34	8.60	8.47 to 8.74
	Avascular necrosis	1162	11	0.95	0.39 to 1.50	8.88	8.82 to 8.94
	M. Perthes	35	1	2.86	0.00 to 8.38	7.63	7.20 to 8.06
	Rheumatoid arthritis	184	4	2.17	0.07 to 4.28	8.64	8.41 to 8.88
	Fracture of fem. neck	533	19	3.56	1.99 to 5.14	6.17	6.00 to 6.34
Uncemented total		14274	250	1.75	1.54 to 1.97	8.76	8.73 to 8.79
Cemented							
	Primary coxarthr.	8156	186	2.28	1.96 to 2.60	8.78	8.75 to 8.82
	Dysplastic coxarthr.	383	10	2.61	1.01 to 4.21	8.73	8.59 to 8.88
	Posttraum. coxarthr.	571	14	2.45	1.18 to 3.72	8.79	8.68 to 8.90
	Avascular necrosis	557	20	3.59	2.05 to 5.14	8.65	8.52 to 8.78
	M. Perthes	4	0	0.00	NA	8.64	NA
	Rheumatoid arthritis	104	3	2.88	0.00 to 6.10	8.73	8.46 to 9.01
	Fracture of fem. neck	855	14	1.64	0.79 to 2.49	8.51	8.42 to 8.60
Cemented total		11022	302	2.74	2.44 to 3.04	8.74	8.71 to 8.77
Hybrids							
	Primary coxarthr.	3047	78	2.56	2.00 to 3.12	8.71	8.65 to 8.77
	Dysplastic coxarthr.	416	13	3.12	1.45 to 4.80	8.73	8.59 to 8.86
	Posttraum. coxarthr.	256	9	3.52	1.26 to 5.77	8.70	8.52 to 8.89
	Avascular necrosis	286	11	3.85	1.62 to 6.07	8.53	8.34 to 8.73
	M. Perthes	4	0	0.00	NA	7.68	NA
	Rheumatoid arthritis	44	3	6.82	0.00 to 14.27	7.73	7.11 to 8.35
	Fracture of fem. neck	527	19	3.61	2.01 to 5.20	7.35	7.21 to 7.48
Hybrids total		4727	167	3.53	3.01 to 4.06	8.63	8.58 to 8.69
Reverse hybrids							
	Primary coxarthr.	92	4	4.35	0.18 to 8.51	8.42	7.95 to 8.89
	Dysplastic coxarthr.	37	2	5.41	0.00 to 12.69	7.49	7.01 to 7.96
	Posttraum. coxarthr.	14	3	21.43	0.00 to 42.92	6.20	4.70 to 7.69
	Avascular necrosis	16	1	6.25	0.00 to 18.11	7.99	7.99 to 7.99
	M. Perthes	2	1	50.00	0.00 to 119.30	4.25	1.18 to 7.33
	Rheumatoid arthritis	1	0	0.00	NA	7.83	NA
	Fracture of fem. neck	12	1	8.33	0.00 to 23.97	5.18	3.66 to 6.70
Reverse hybrids total		193	19	9.84	5.64 to 14.05	7.88	7.44 to 8.32
Hemiarthropl. cem.							
	Primary coxarthr.	24	0	0.00	NA	6.82	NA
	Dysplastic coxarthr.	3	0	0.00	NA	5.32	NA
	Posttraum. coxarthr.	884	4	0.45	0.01 to 0.89	8.93	8.88 to 8.98
	Avascular necrosis	7	0	0.00	NA	8.60	NA
	M. Perthes	NA	NA	NA	NA	NA	NA
	Rheumatoid arthritis	2	0	0.00	NA	3.61	NA
	Fracture of fem. neck	3252	36	1.11	0.75 to 1.47	8.78	8.74 to 8.82
Hemiarthropl. cem. total		4816	61	1.27	0.95 to 1.58	8.84	8.81 to 8.88
Hemiarthropl. uncem.							
	Primary coxarthr.	8	0	0.00	0.00 to 0.00	4.80	4.80 to 4.80
	Dysplastic coxarthr.	NA	NA	NA	NA	NA	NA
	Posttraum. coxarthr.	28	0	0.00	NA	8.54	NA
	Avascular necrosis	1	0	0.00	NA	0.80	NA
	M. Perthes	NA	NA	NA	NA	NA	NA
	Rheumatoid arthritis	1	0	0.00	NA	8.72	NA
	Fracture of fem. neck	212	2	0.94	0.00 to 2.24	5.03	4.96 to 5.09
Hemiarthropl. uncem. total		258	3	1.16	0.00 to 2.47	8.60	8.46 to 8.74
Whole database total		35290	802	2.27	2.12 to 2.43	8.75	8.73 to 8.77

Bone cements and cementing techniques

Tab. 45 Primary THA – brands of bone cement

Year	Biomet Plus	CMW	CMW-G	Copal	Hi-Fatique G	Osteobond	Palacos LV genta	Palacos R	Palacos R genta	Palamed	Palamed - G	Refobacin Plus	Refobacin Revision	Simplex	Simplex ABC	SmartSet GHV	SmartSet HV	Synicem 1	Synicem G
2003	0	1633	162	1	0	79	1	527	44	215	10	0	0	0	0	0	11	0	0
2004	0	1556	104	0	0	33	2	878	79	324	41	0	0	0	0	30	456	0	0
2005	2	340	53	0	0	18	1	1112	147	95	119	0	0	0	0	198	1144	0	0
2006	2	227	2	0	0	16	2	1619	96	115	65	0	0	0	0	289	1314	0	0
2007	0	372	5	0	0	29	8	1587	133	144	37	0	0	0	0	239	1430	0	0
2008	0	272	9	0	0	19	14	1326	245	128	11	5	0	0	0	411	1140	0	0
2009	35	313	18	13	0	6	13	1127	482	0	0	112	3	0	30	428	1076	1	0
2010	73	213	16	18	2	0	0	1042	686	0	0	41	1	2	118	324	1000	42	1
2011	73	156	29	21	2	9	3	1056	527	0	0	48	0	12	35	490	1256	31	6

As table 45 shows, in the 2011, 88.67 % of the brands used were shared as follows: *SmartSet HV* 33.45 %, *Palacos R* 28.12 %, *Palacos R Gentamycin* 14.03 %, and *SmartSet GHV* 13.05 %. Increase in the 3rd generation of cementing techniques was recorded. In 2010, we recorded 2,394 protocols and the ratio of cementing techniques used was as table 46, which shows: 21.30 % 1st generation, 41.93 % 2nd, and 35.25 % 3rd generation cementing techniques. In 2011, we recorded 2,494 protocols and 3rd generation cementing techniques increased to 38.69 %.

Tab. 46 Primary THA – cementing techniques

Year	1st gen.	2nd gen.	3rd gen.	Not Ident.
2003	1069	465	100	14
2004	1114	904	146	22
2005	820	1078	229	23
2006	530	1360	517	24
2007	662	1272	659	25
2008	592	1175	625	17
2009	594	1011	783	40
2010	510	1004	844	36
2011	526	982	965	21

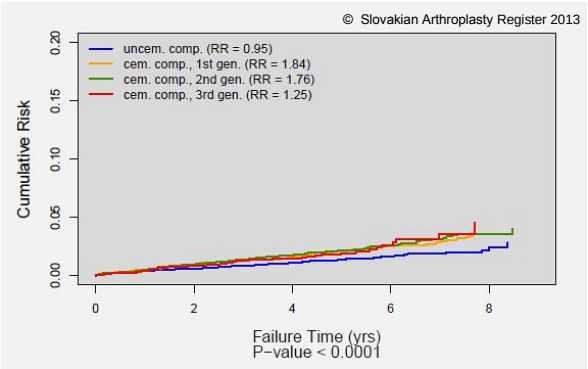

Chart 42 Cumulative risk of primary THA (cementing techniques of femoral components)

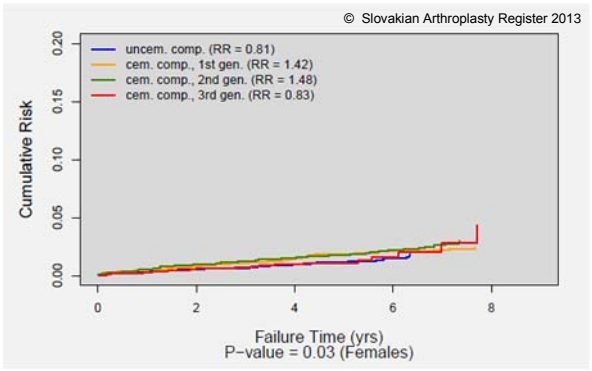

Chart 43 Cumulative risk of primary THA (females; cementing techniques of femoral components)

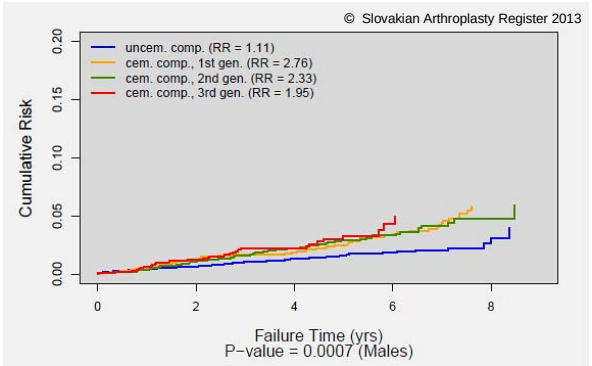

Chart 44 Cumulative risk of primary THA (males; cementing techniques of femoral components)

Chart 42 shows the cumulative risks for revision of the femoral component in interaction with cementing techniques. The RR of 3rd generation techniques is the lowest at 1.25 %in the whole database The RR for uncemented femoral components in 2011 was 0.95 %. Charts 43–44 show this analysis for female and male patients.

Tab. 47 Characteristics of primary THA (cementing techniques of femoral components)

Cem. technique		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
	1st generation	6416	118	1.84	1.51 to 2.17	8.83	8.80 to 8.86
	2nd generation	9247	163	1.76	1.49 to 2.03	8.82	8.79 to 8.85
	3rd generation	4868	61	1.25	0.94 to 1.57	8.81	8.76 to 8.86
Fem. component cemented		20560	360	1.75	1.57 to 1.93	8.82	8.80 to 8.84

During the period 2003–2011 we recorded 20,560 cemented femoral components (CFS). Table 47 shows the generation of cementing techniques related to RR. The 3rd generation has the lowest RR of 1.25 %. Table 48 shows the cumulative RR and number of failures for each generation of cementing technique. Table 49 shows these results for females and table 50 for males.

Tab. 48 Cumulative characteristics of primary THA (cementing techniques of femoral components)

Cementing technique		2003	2004	2005	2006	2007	2008	2009	2010	2011
1st generation	Total number	1069	2183	3003	3533	4194	4786	5380	5890	6416
	Nr. of failures	2	6	15	25	44	67	85	107	118
	RR	**0.19**	**0.27**	**0.50**	**0.71**	**1.05**	**1.40**	**1.58**	**1.82**	**1.84**
2nd generation	Total number	462	1366	2443	3803	5075	6250	7261	8266	9247
	Nr. of failures	1	8	27	43	68	81	103	141	163
	RR	**0.22**	**0.59**	**1.11**	**1.13**	**1.34**	**1.30**	**1.42**	**1.71**	**1.76**
3rd generation	Total number	101	247	476	993	1652	2277	3060	3902	4868
	Nr. of failures	0	4	5	7	13	24	40	53	61
	RR	**0.00**	**1.62**	**1.05**	**0.70**	**0.79**	**1.05**	**1.31**	**1.36**	**1.25**

Tab. 49 Cumulative characteristics of primary THA (females; cementing techniques of femoral components)

Cementing technique		2003	2004	2005	2006	2007	2008	2009	2010	2011
1st generation	Total number	717	1454	1985	2356	2835	3269	3694	4063	4426
	Nr. of failures	0	3	9	13	26	39	48	58	63
	RR	**0.00**	**0.21**	**0.45**	**0.55**	**0.92**	**1.19**	**1.30**	**1.43**	**1.42**
2nd generation	Total number	287	863	1557	2445	3280	4087	4773	5488	6154
	Nr. of failures	0	3	13	22	40	47	56	81	91
	RR	**0.00**	**0.35**	**0.83**	**0.90**	**1.22**	**1.15**	**1.17**	**1.48**	**1.48**
3rd generation	Total number	61	151	291	599	1015	1403	1884	2409	3022
	Nr. of failures	0	2	3	5	7	12	16	21	25
	RR	**0.00**	**1.32**	**1.03**	**0.83**	**0.69**	**0.86**	**0.85**	**0.87**	**0.83**

Tab. 50 Cumulative characteristics of primary THA (males; cementing techniques of femoral components)

Cementing technique		2003	2004	2005	2006	2007	2008	2009	2010	2011
1st generation	Total number	352	729	1018	1177	1359	1517	1686	1827	1990
	Nr. of failures	2	3	6	12	18	28	37	49	55
	RR	**0.57**	**0.41**	**0.59**	**1.02**	**1.32**	**1.85**	**2.19**	**2.68**	**2.76**
2nd generation	Total number	175	503	886	1358	1795	2163	2488	2778	3093
	Nr. of failures	1	5	14	21	28	34	47	60	72
	RR	**0.57**	**0.99**	**1.58**	**1.55**	**1.56**	**1.57**	**1.89**	**2.16**	**2.33**
3rd generation	Total number	40	96	185	394	637	874	1176	1493	1846
	Nr. of failures	0	2	2	2	6	12	24	32	36
	RR	**0.00**	**2.08**	**1.08**	**0.51**	**0.94**	**1.37**	**2.04**	**2.14**	**1.95**

Analyses were performed looking at cementing techniques and cumulative risk of revision of this component until certain time point. We have observed the components at one month, three months and every year after primary surgery. Table 51 shows these results for the whole database, table 52 shows these results for females and table 53 for males.

Tab. 51 Characteristics of failure of primary THA until certain time point (cementing technique of femoral components)

Cementing technique		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
1st generation	Nr. of failures	8	7	14	22	14	11	15	12	7	8	NA
	Cumulative risk (%)	**0.127**	**0.243**	**0.495**	**0.941**	**1.264**	**1.574**	**2.059**	**2.528**	**2.892**	**3.484**	**NA**
	95% LB	0.038	0.118	0.308	0.667	0.931	1.188	1.587	1.975	2.261	2.675	NA
	95% UB	0.217	0.367	0.681	1.215	1.596	1.960	2.531	3.082	3.523	4.294	NA
2nd generation	Nr. of failures	11	9	22	36	23	21	16	11	9	4	1
	Cumulative risk (%)	**0.120**	**0.220**	**0.489**	**0.977**	**1.346**	**1.757**	**2.170**	**2.595**	**3.165**	**3.577**	**4.019**
	95% LB	0.048	0.122	0.336	0.745	1.063	1.408	1.747	2.074	2.461	2.742	2.816
	95% UB	0.191	0.318	0.641	1.209	1.630	2.105	2.594	3.116	3.868	4.412	5.221
3rd generation	Nr. of failures	4	2	11	16	11	3	6	4	3	1	NA
	Cumulative risk (%)	**0.082**	**0.125**	**0.389**	**0.845**	**1.292**	**1.446**	**1.925**	**2.616**	**3.593**	**4.532**	**4.532**
	95% LB	0.001	0.024	0.194	0.516	0.851	0.966	1.210	1.539	1.641	1.849	NA
	95% UB	0.164	0.226	0.585	1.174	1.733	1.925	2.640	3.692	5.545	7.214	NA

Tab. 52 Characteristics of failure of primary THA until certain time point (females; cementing technique of femoral components)

Cementing technique		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
1st generation	Nr. of failures	7	5	7	11	8	9	9	4	1	2	NA
	Cumulative risk (%)	**0.162**	**0.281**	**0.463**	**0.788**	**1.059**	**1.426**	**1.844**	**2.080**	**2.159**	**2.385**	**NA**
	95% LB	0.041	0.120	0.249	0.491	0.697	0.980	1.316	1.501	1.559	1.682	NA
	95% UB	0.283	0.441	0.678	1.085	1.421	1.871	2.373	2.659	2.759	3.088	NA
2nd generation	Nr. of failures	7	8	15	20	11	11	6	7	4	2	NA
	Cumulative risk (%)	**0.114**	**0.248**	**0.523**	**0.930**	**1.199**	**1.532**	**1.770**	**2.195**	**2.617**	**2.942**	**NA**
	95% LB	0.029	0.121	0.330	0.654	0.873	1.135	1.315	1.602	1.848	2.029	NA
	95% UB	0.200	0.376	0.716	1.207	1.524	1.928	2.225	2.787	3.386	3.855	NA
3rd generation	Nr. of failures	1	2	4	7	2	3	1	2	2	1	NA
	Cumulative risk (%)	**0.033**	**0.102**	**0.251**	**0.582**	**0.715**	**0.964**	**1.073**	**1.564**	**2.770**	**4.320**	**NA**
	95% LB	0.000	0.000	0.051	0.235	0.318	0.464	0.529	0.648	0.403	0.468	NA
	95% UB	0.098	0.219	0.452	0.929	1.112	1.464	1.618	2.481	5.137	8.172	NA

Tab. 53 Characteristics of failure of primary THA until certain time point (males; cementing technique of femoral components)

Cementing technique		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
1st generation	Nr. of failures	1	2	7	11	6	2	6	8	6	6	NA
	Cumulative risk (%)	**0.051**	**0.158**	**0.565**	**1.282**	**1.721**	**1.908**	**2.527**	**3.475**	**4.414**	**5.793**	**NA**
	95% LB	0.000	0.000	0.206	0.700	1.025	1.164	1.615	2.319	2.976	3.824	NA
	95% UB	0.152	0.337	0.924	1.864	2.416	2.652	3.438	4.630	5.852	7.762	NA
2nd generation	Nr. of failures	4	1	7	16	12	10	10	4	5	2	1
	Cumulative risk (%)	**0.130**	**0.163**	**0.420**	**1.065**	**1.629**	**2.184**	**2.918**	**3.342**	**4.168**	**4.749**	**5.947**
	95% LB	0.001	0.019	0.177	0.648	1.091	1.523	2.066	2.387	2.913	3.237	3.155
	95% UB	0.259	0.308	0.664	1.482	2.167	2.845	3.771	4.297	5.424	6.261	8.739
3rd generation	Nr. of failures	3	NA	7	9	9	NA	5	2	1	NA	NA
	Cumulative risk (%)	**0.163**	**NA**	**0.614**	**1.276**	**2.233**	**NA**	**3.305**	**4.327**	**4.946**	**NA**	**NA**
	95% LB	0.000	NA	0.219	0.644	1.288	NA	1.743	2.798	2.479	NA	NA
	95% UB	0.349	NA	1.009	1.908	3.177	NA	4.866	7.093	7.413	NA	NA

Antibiotic prophylaxis in primary THA

Tab. 54 Primary THA – antibiotic prophylaxis in 2011 (brands, numbers)

Brand	Vulmizolin	Axetine	Bitamon	Climicin	Kefzol	Xorim	Ciphin	Lendacin	Unasyn	Zinacef	Dalacin	Abactal	Cefuroxim	Amoxiklav	Augmentin	Cefazolin	Cefizox	Vankomycin	Cefotaxim	Amoxycilin	Ciprinol	Claforan	Edicin	Gentamycin	Zinat	Ampicilin	Clacid
	2875	880	541	198	97	88	82	57	56	38	37	31	22	19	17	15	10	10	4	2	2	2	2	2	2	1	1

Table 54 presents antibiotic prophylaxis in 2011. The mostly used antibiotic was *Vulmizolin* with 2,875 records followed by *Axetine* and *Bitamon*. Compared to 2010, the only change is 3rd place for *Bitamon* instead *Unasyn*. The antibiotic prophylaxis was not used only in 16 cases.

Components and their combinations

In comparison to 2010, there was no increase the number of different brands of acetabular components (AC) used. There were reductions of one uncemented and two cemented brands. Each of thirteen ACs accounted for less than 1 % and all 13 together represent only 3.72 % from all AC. Table 55 shows UACs.

Tab. 55 Uncemented acetabular cups

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Name	n	%
PINNACLE	815	25.27%
DELTA - PF	455	14.11%
DURALOC	360	11.16%
SF	327	10.14%
NOVAE EVOLUTION	262	8.12%
PLASMACUP	257	7.97%
SUNFIT TH	149	4.62%
CLS SPOTORNO	147	4.56%
M-H-shell	77	2.39%
DELTA - FINS	58	1.80%
TRILOGY	51	1.58%
ZWEYMULLER-ALLOCLASSIC CSF	39	1.21%
ANA.NOVA	38	1.18%
TRIDENT HEMISPHERICAL SOLID	37	1.15%
T.O.P.	33	1.02%
BEZNOSKA (uncement)	29	0.90%
NOVAE E TH	28	0.87%
DELTA - TT	24	0.74%
TRIDENT HEMISPHERICAL CLUSTER	10	0.31%
DELTA - ONE - TT	8	0.25%
DELTA - ST - C	5	0.16%
COPTOS	3	0.09%
PLASMACUP DC	3	0.09%
RINGLOC - 10 st	3	0.09%
RINGLOC - STANDARD	3	0.09%
RINGLOC - HIGH WALL	1	0.03%
TC - revision	1	0.03%
TRILOGY IT	1	0.03%
DURALOC OPTION	1	0.03%
Acetabular uncemented	3225	100.00%

Tab. 56 Cemented acetabular cups

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Name	n	%
O2	469	36.87%
PE-CUP	214	16.82%
BEZNOSKA (cement)	175	13.76%
ELITE PLUS	108	8.49%
TRILOC	91	7.15%
MULLER	80	6.29%
MUELLER	52	4.09%
CHARNLEY	29	2.28%
EXETER Contemporary Cup	27	2.12%
ZCA	25	1.97%
MARATHON	1	0.08%
NOVAE STICK	1	0.08%
Acetabular cemented	1272	100.00%

Table 56 shows CACs. From all CACs, only two brands accounted for less than 1 %.

Tab. 57 Uncemented femoral stems

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Name	n	%
CORAIL	779	29.85%
FIT	262	10.04%
SF	200	7.66%
SAGITA EVOLUTION HA	200	7.66%
BICONTACT	182	6.97%
LOGICA (uncement)	149	5.71%
CLS SPOTORNO	130	4.98%
BIMETRIC (uncement)	93	3.56%
PROXIMA	93	3.56%
LIBRA HA	70	2.68%
TRI-LOCK BPS	54	2.07%
S-ROM	37	1.42%
C.F.P.	35	1.34%
ZWEYMULLER-ALLOCLASICS SL	35	1.34%
ABGII V40	31	1.19%
TRIO modular (uncement)	27	1.03%
TRIO (uncement)	26	1.00%
AUSTIN-MOORE CCEP (uncement)	25	0.96%
COLLO - MIS	24	0.92%
VERSYS FMT	24	0.92%
SAM - FIT	22	0.84%
SOLITÄR	22	0.84%
SL (uncement)	16	0.61%
METHA	12	0.46%
ANA.NOVA MII	11	0.42%
MODULUS	11	0.42%
C 2	6	0.23%
ANA.NOVA MII double stem couted	5	0.19%
BETA CONE	4	0.15%
VERSYS FMMC	4	0.15%
ZMR	4	0.15%
H - MAX S	3	0.11%
REVISION	3	0.11%
AML	2	0.08%
H - MAX M	2	0.08%
SAGITTA EVL R	2	0.08%
REEF	1	0.04%
RMD revision	1	0.04%
SF - revision	1	0.04%
SL-PLUS	1	0.04%
WM HA	1	0.04%
Femoral uncemented	2610	100.00%

In femoral components (FC), we have recorded an increase in UFS from 37 brands in 2010 to 41 in 2011: CFS increased from 25 brands to 28. The 17 most popular UFSs represent a share of 92.07 % and the remaining 24 UFSs represent only 7.93 %. From CFS, nine brands each represent a share of under 1 % and all 9 together

Tab. 58 Cemented femoral stems

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Name	n	%
BEZNOSKA	519	21.02%
BEZNOSKA hemiarthroplasty	391	15.84%
CSC	225	9.11%
SAGITA EVOLUTION	162	6.56%
TRILLIANCE	128	5.18%
CENTRAMENT	124	5.02%
CHARNLEY	117	4.74%
CORAIL (cement)	92	3.73%
BIMETRIC (cement)	79	3.20%
LOGICA (cement)	74	3.00%
C-STEM AMT	67	2.71%
AUTOBLOQAUATE	66	2.67%
TRIO (cement)	64	2.59%
CSC hemiarthroplasty	61	2.47%
C-STEM	49	1.98%
CPT	48	1.94%
SL (cement)	46	1.86%
EXETER V40	42	1.70%
AUSTIN-MOORE hemiarthropl. (cement)	37	1.50%
AAP	20	0.81%
CL TRAUMA - hemiarthropl.	18	0.73%
CHARNLEY MODULAR	13	0.53%
LIBRA	13	0.53%
Revision stem (cement)	4	0.16%
MS-30	4	0.16%
ELITE PLUS	3	0.12%
BEZNOSKA - custom-made, tumor.	2	0.08%
REVISION - LR	1	0.04%
Femoral cemented	2469	100.00%

represent only 3.16 %; remaining 19 brands are over 1 %, represents all together 96.84 %.

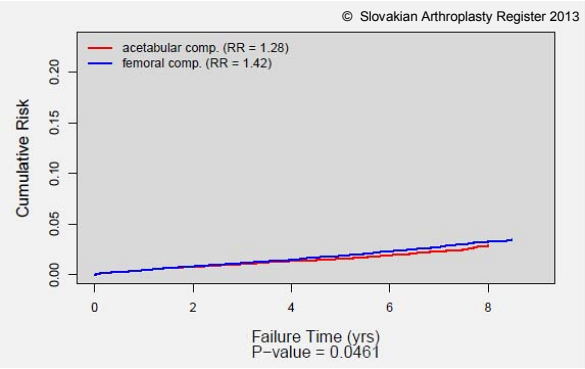

Chart 45 Cumulative risk of primary THA (component type)

Chart 45 shows the cumulative risks of acetabular and femoral components. Until the fourth year from the operation, there is no difference, but after this time point ACs with a RR of 1.28 % are performing better than FCs with a RR of 1.42 %. Chart 46 shows an analysis of the components according to the type of fixation and reveals that uncemented components are surviving better than cemented, with a RR of 1.00 % for the UACs and 0.95 % for the UFSs.

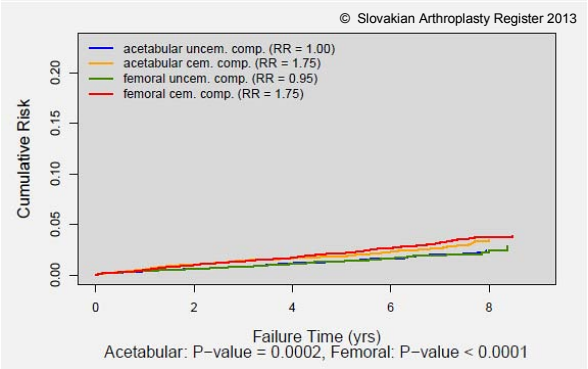

Chart 46 Cumulative risk of primary THA (interaction of component type and fixation)

Charts 47–48 show the results of components according to the type of fixation in interaction with the gender.

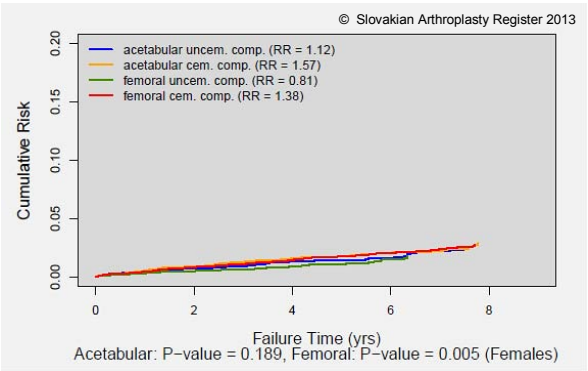

Chart 47 Cumulative risk of primary THA (females; interaction of component type and fixation)

According to chart 47, in females the type of fixation of the components does not affect the RR as much as in males. In males, uncemented components performed significantly better than cemented components.

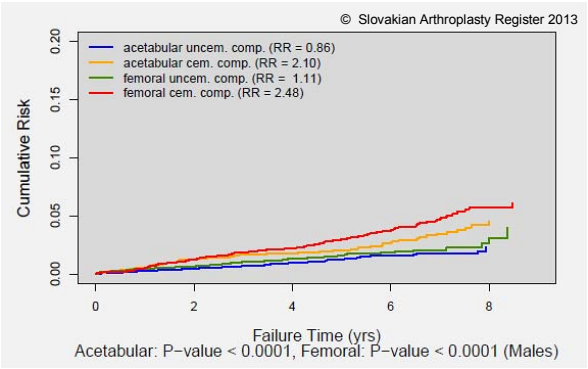

Chart 48 Cumulative risk of primary THA (males; interaction of component type and fixation)

Acetabular components

During the observed period 2003–2011, we recorded a total number 18,999 ACs, of which only 47 were uncemented. Only 7 brands have each reached more than 1,000 applications. These 7 brands comprise the 75.84 % share of all ACs. In 16 brands we recorded less than 10 applications each during this observed period. Table 59 and 60 shows the results of UACs and CACs.

Tab. 59 Characteristics of primary THA (acetabular, uncemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
PINNACLE	3608	11	0.30	0.12 to 0.48	6.43	6.18 to 6.68
DURALOC	3293	28	0.85	0.54 to 1.16	8.89	8.87 to 8.92
NOVAE EVOLUTION	2796	19	0.68	0.38 to 0.98	8.92	8.88 to 8.95
SF	1266	8	0.63	0.20 to 1.07	8.76	8.70 to 8.82
PLASMACUP	1249	17	1.36	0.72 to 2.00	8.68	8.60 to 8.76
TRILOGY	1159	10	0.86	0.33 to 1.40	8.93	8.88 to 8.97
BEZNOSKA (uncem)	1039	27	2.60	1.63 to 3.57	8.69	8.61 to 8.77
DELTA - PF	791	3	0.38	0.00 to 0.81	2.79	2.77 to 2.80
CLS SPOTORNO	712	5	0.70	0.09 to 1.32	6.85	6.78 to 6.91
L-CUP	641	7	1.09	0.29 to 1.90	8.91	8.87 to 8.96
DELTA	585	3	0.51	0.00 to 1.09	3.88	3.86 to 3.89
M-H-shell	359	1	0.28	0.00 to 0.82	8.22	8.17 to 8.27
ZWEYMULLER-ALLOCLASSIC CSF	295	16	5.42	2.84 to 8.01	7.36	6.76 to 7.95
ANA.NOVA	184	0	0.00	NA	3.94	NA
SUNFIT TH	149	0	0.00	NA	0.90	NA
T.O.P.	117	1	0.85	0.00 to 2.52	6.10	5.97 to 6.22
DELTA - FINS	108	1	0.93	0.00 to 2.73	3.92	3.83 to 4.00
TRIDENT HEMISPHERICAL SOLID	74	0	0.00	NA	2.10	NA
COPTOS	51	1	1.96	0.00 to 5.77	7.57	7.05 to 8.08
RINGLOC - HIGH WALL	45	0	0.00	NA	4.65	NA
DELTA - TT	44	1	2.27	0.00 to 6.68	3.33	3.18 to 3.48
BICON-PLUS	43	1	2.33	0.00 to 6.83	8.81	9.00 to 9.04
Y-AXIS II	39	0	0.00	NA	8.94	NA
TRIDENT HEMISPHERICAL CLUSTER	34	0	0.00	NA	1.87	NA
NOVAE E TH	28	0	0.00	NA	0.65	NA
DURALOC OPTION	26	1	3.85	0.00 to 11.24	8.23	7.66 to 8.79
OCTOPUS	23	5	21.74	4.88 to 38.60	6.85	5.45 to 8.24
ASR	20	1	5.00	0.00 to 14.55	6.37	5.79 to 6.96
DELTA - ST - C	14	0	0.00	NA	1.83	NA
DELTA - ONE - TT	9	0	0.00	NA	2.60	NA
ULTIMA UTC	7	0	0.00	NA	6.24	NA
TC - revision	6	0	0.00	NA	2.56	NA
TRILOGY AB - ceramic	6	0	0.00	NA	5.66	NA
BS - revision	5	0	0.00	NA	6.95	NA
WM oval	5	0	0.00	NA	1.72	NA
RINGLOC - 10 st	3	0	0.00	NA	0.90	NA
RINGLOC - STANDARD	3	0	0.00	NA	0.52	NA
PLASMACUP DC	3	0	0.00	NA	0.64	NA
NNC - Titan	3	0	0.00	NA	5.55	NA
ACETABULAR PLATES	2	0	0.00	NA	1.61	NA
CENTRAMENT	2	1	50.00	0.00 to 119.30	3.00	0.00 to 7.04
CERAFIT Cup	1	0	0.00	NA	0.39	NA
TRILOGY IT	1	0	0.00	NA	0.91	NA
WM conical	1	1	100.00	NA	4.02	NA
RSC - revision	1	0	0.00	NA	2.80	NA
Acetabular uncemented	**18999**	**190**	**1.00**	**0.86 to 1.14**	**8.88**	**8.86 to 8.90**
All acetabular	**30214**	**386**	**1.28**	**1.15 to 1.40**	**8.86**	**8.85 to 8.88**
Whole database total	**65499**	**886**	**1.35**	**1.26 to 1.44**	**8.85**	**8.84 to 8.86**

Tab. 60 Characteristics of primary THA (acetabular, cemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
BEZNOSKA (cem)	3852	104	2.70	2.19 to 3.21	8.75	8.70 to 8.79
CHARNLEY	1886	22	1.17	0.68 to 1.65	8.91	8.87 to 8.95
PE-CUP	1545	29	1.88	1.20 to 2.55	8.80	8.74 to 8.87
O2	1006	3	0.30	0.00 to 0.64	4.92	4.88 to 4.97
MULLER	837	9	1.08	0.38 to 1.77	8.91	8.85 to 8.97
ELITE PLUS	661	3	0.45	0.00 to 0.97	8.90	8.85 to 8.95
ULTIMA MK2	351	7	1.99	0.53 to 3.46	8.81	8.69 to 8.93
ZCA	288	2	0.69	0.00 to 1.65	8.89	8.80 to 8.99
MUELLER	281	0	0.00	NA	3.75	NA
EXETER Contemporary Cup	139	1	0.72	0.00 to 2.12	5.03	4.91 to 5.15
TRILOC	105	0	0.00	NA	1.97	NA
EXETER Duration Cup	85	0	0.00	NA	3.21	NA
LUBINUS CLASSIC PLUS	69	1	1.45	0.00 to 4.27	8.79	9.00 to 9.03
BURCH-SCHNEIDER CAGE	7	1	14.29	0.00 to 40.21	6.17	4.35 to 8.00
MULLER LOW PROFILE	5	2	40.00	0.00 to 82.94	6.60	9.00 to 9.05
MARATHON	4	0	0.00	NA	5.88	NA
NOVAE STICK	2	0	0.00	NA	2.95	NA
OSTEAL PE Cup	1	0	0.00	NA	0.45	NA
Acetabular Cemented	**11215**	**196**	**1.75**	**1.51 to 1.99**	**8.83**	**8.81 to 8.86**
All acetabular	**30214**	**386**	**1.28**	**1.15 to 1.40**	**8.86**	**8.85 to 8.88**
Whole database total	**65499**	**886**	**1.35**	**1.26 to 1.44**	**8.85**	**8.84 to 8.86**

During the observed period, 18 brands of CAC were recorded. Four brands have more than 1,000 applications each, comprising together a share of 73.90 %. Regardless of the fixation type, charts 49 to 52 show the cumulative risks of revision of the most commonly used AC.

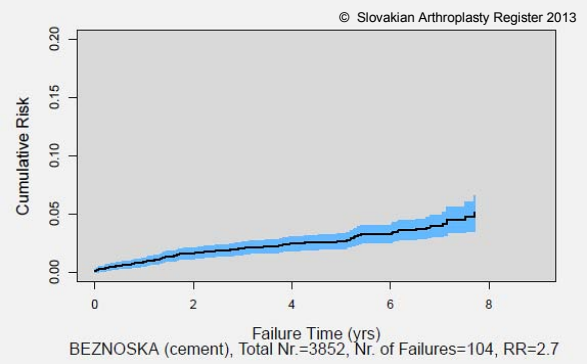

Chart 49 Cumulative risk of primary THA, acet. comp. BEZNOSKA (cement)

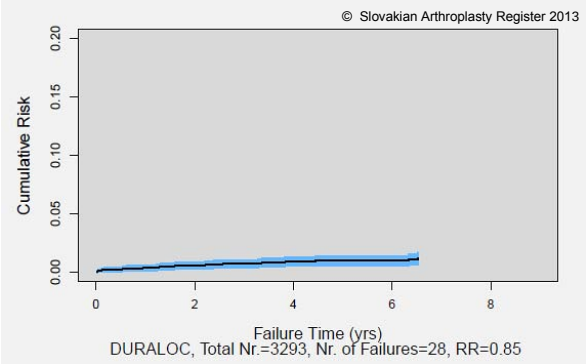

Chart 51 Cumulative risk of primary THA, acet. comp. DURALOC

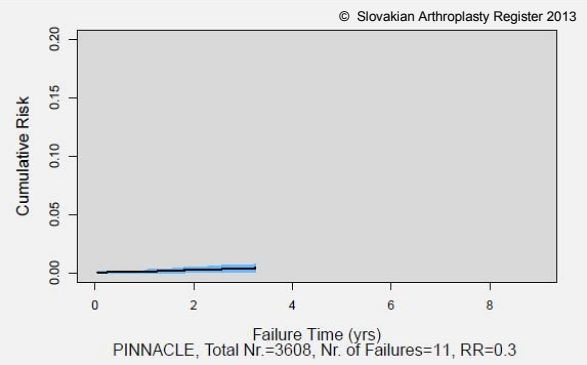

Chart 50 Cumulative risk of primary THA, acet. comp. PINNACLE

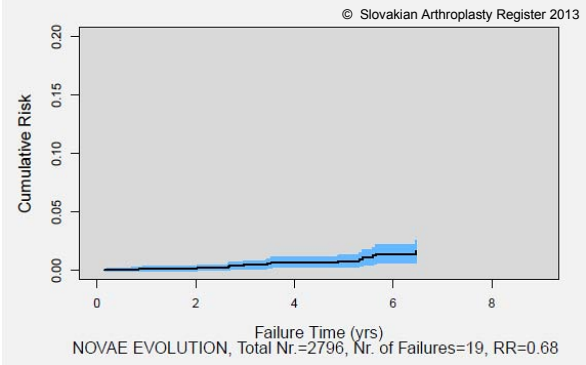

Chart 52 Cumulative risk of primary THA, acet. comp. NOVAE EVOLUTION

Femoral components

Tab. 61 Characteristics of primary THA (femoral, uncemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
CORAIL	3527	28	0.79	0.50 to 1.09	8.70	8.64 to 8.75
SAGITA EVOLUTION HA	2179	8	0.37	0.11 to 0.62	8.96	8.94 to 8.99
AML	1226	13	1.06	0.49 to 1.63	8.89	8.85 to 8.93
SF	1031	11	1.07	0.44 to 1.69	8.78	8.70 to 8.86
BIMETRIC (uncem)	834	6	0.72	0.15 to 1.29	8.91	8.86 to 8.97
BICONTACT	790	3	0.38	0.00 to 0.81	7.66	7.57 to 7.74
FIT	779	7	0.90	0.24 to 1.56	3.92	3.90 to 3.95
CLS SPOTORNO	572	1	0.17	0.00 to 0.52	4.60	4.58 to 4.62
LIBRA HA	513	4	0.78	0.02 to 1.54	5.84	4.79 to 6.88
VERSYS	512	4	0.78	0.02 to 1.54	8.84	8.77 to 8.91
PROXIMA	478	0	0.00	NA	5.89	NA
LOGICA (uncem)	402	2	0.50	0.00 to 1.19	5.06	5.03 to 5.10
ZWEYMULLER-ALLOCLASICS SL	281	4	1.42	0.04 to 2.81	8.82	8.67 to 8.96
VERSYS FMT	208	6	2.88	0.61 to 5.16	6.15	5.97 to 6.32
AUSTIN-MOORE hemiarthropl. (uncem)	194	1	0.52	0.00 to 1.52	8.48	8.37 to 8.59
ANA.NOVA MII	149	0	0.00	NA	3.94	NA
S-ROM	116	1	0.86	0.00 to 2.54	8.58	9.00 to 9.06
ABGII V40	77	1	1.30	0.00 to 3.83	2.07	2.02 to 2.12
TRI-LOCK BPS	72	0	0.00	NA	1.24	NA
SL (uncem)	70	2	2.86	0.00 to 6.76	3.59	3.44 to 3.73
BETA CONE	67	2	2.99	0.00 to 7.06	5.41	5.22 to 5.60
C.F.P.	56	0	0.00	NA	6.16	NA
SAM - FIT	55	0	0.00	NA	3.52	NA
SL-PLUS	44	0	0.00	NA	8.93	NA
COLLO - MIS	37	0	0.00	NA	1.53	NA
TRIO (uncem)	32	1	3.12	0.00 to 9.15	3.50	NA
METHA	32	0	0.00	NA	4.84	NA
VERSYS FMMC	32	1	3.12	0.00 to 9.15	7.61	7.17 to 8.04
TRIO modular (uncem)	31	0	0.00	NA	1.11	NA
X-AXIS	25	0	0.00	NA	8.81	NA
SOLUTION	25	2	8.00	0.00 to 18.63	8.15	9.00 to 9.04
SOLITÄR	22	0	0.00	NA	0.54	NA
MODULUS	19	0	0.00	NA	1.50	NA
ANA.NOVA MII double stem couted	15	0	0.00	NA	2.14	NA
ZMR	14	3	21.43	0.00 to 42.92	4.79	3.97 to 5.61
RMD revision	10	1	10.00	0.00 to 28.59	4.91	NA
ASR	10	2	20.00	0.00 to 44.79	6.47	5.25 to 7.70
REVISION	8	0	0.00	NA	2.94	NA
SF - revision	7	0	0.00	NA	5.81	NA
H - MAX S	6	0	0.00	NA	1.62	NA
C 2	6	0	0.00	NA	0.07	NA
MP	6	2	33.33	0.00 to 71.05	6.68	9.00 to 9.03
H - MAX M	5	0	0.00	NA	1.83	NA
SAGITTA EVL R	3	0	0.00	NA	1.12	NA
ANTEGA	3	1	33.33	0.00 to 86.68	1.89	0.41 to 3.36
WM HA	3	0	0.00	NA	5.19	NA
CERAFIT Standard	2	0	0.00	NA	0.39	NA
SL-TWIN	2	0	0.00	NA	2.56	NA
REEF	1	0	0.00	NA	0.93	NA
ANA.NOVA NANOS	1	0	0.00	NA	2.39	NA
Y-AXIS	1	0	0.00	NA	7.61	NA
Femoral Uncemented	**14725**	**140**	**0.95**	**0.79 to 1.11**	**8.88**	**8.86 to 8.90**
All femoral	**35285**	**500**	**1.42**	**1.29 to 1.54**	**8.84**	**8.83 to 8.86**
Whole database total	**65499**	**886**	**1.35**	**1.26 to 1.44**	**8.85**	**8.84 to 8.86**

During the period 2003–2011, we recorded 14,725 UFS applications. Only four brands had each more than 1,000 applications with combined share of 54.07 %. Fourteen brands had less than 10 applications each. Table 61 shows the results of these components.

Tab. 62 Characteristics of primary THA (femoral, cemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
BEZNOSKA	5271	104	1.97	1.60 to 2.35	8.80	8.77 to 8.84
BEZNOSKA hemiarthropl.	3843	40	1.04	0.72 to 1.36	8.87	8.83 to 8.91
CHARNLEY	2183	47	2.15	1.54 to 2.76	8.84	8.79 to 8.88
CENTRAMENT	1700	24	1.41	0.85 to 1.97	8.74	8.69 to 8.79
CSC	1201	17	1.42	0.75 to 2.08	8.70	8.62 to 8.77
BIMETRIC (cem)	1184	23	1.94	1.16 to 2.73	8.84	8.78 to 8.91
C-STEM	1007	8	0.79	0.25 to 1.34	7.78	7.72 to 7.84
CPT	762	8	1.05	0.33 to 1.77	8.89	8.83 to 8.95
AUSTIN-MOORE hemiarthropl.	356	5	1.40	0.18 to 2.63	8.83	8.69 to 8.96
ELITE PLUS	355	33	9.30	6.28 to 12.32	8.39	8.20 to 8.59
SAGITA EVOLUTION	343	4	1.17	0.03 to 2.30	8.77	8.56 to 8.98
LOGICA (cem)	330	1	0.30	0.00 to 0.90	3.74	3.72 to 3.76
EXETER V40	273	2	0.73	0.00 to 1.74	8.58	8.36 to 8.79
CHARNLEY MODULAR	255	5	1.96	0.26 to 3.66	5.38	5.00 to 5.77
CSC hemiarthropl.	229	5	2.18	0.29 to 4.08	6.86	6.72 to 7.00
TRILLIANCE	217	1	0.46	0.00 to 1.36	3.24	3.19 to 3.29
SL (cem)	154	2	1.30	0.00 to 3.09	3.70	3.64 to 3.77
CORAIL (cem)	95	0	0.00	NA	1.23	NA
LUBINUS CLASSIC PLUS	79	2	2.53	0.00 to 6.00	8.77	8.58 to 8.96
AUTOBLOQAUATE	77	0	0.00	NA	1.37	NA
CL TRAUMA - hemiarthropl.	69	0	0.00	NA	3.56	NA
ULTIMA-HOWSE II	69	8	11.59	4.04 to 19.15	7.16	6.66 to 7.66
C-STEM AMT	67	1	1.49	0.00 to 4.40	0.89	0.87 to 0.92
AUSTIN-MOORE hemiarthropl. (cem)	67	1	1.49	0.00 to 4.40	5.13	2.27 to 8.00
TRIO (cem)	66	0	0.00	NA	1.38	NA
FJORD	56	0	0.00	NA	5.51	NA
BEZNOSKA - custom-made, tumor.	50	2	4.00	0.00 to 9.43	8.09	7.41 to 8.77
AAP	45	1	2.22	0.00 to 6.53	3.62	3.17 to 4.07
MULLER GERADSCHAFT	21	3	14.29	0.00 to 29.25	6.00	5.27 to 6.72
LIBRA	19	0	0.00	NA	2.45	NA
ASR	14	1	7.14	0.00 to 20.63	6.31	5.62 to 7.01
Z-AXIS	14	0	0.00	NA	8.94	NA
MS-30	7	0	0.00	NA	5.49	NA
REVISION STEM (cem)	6	0	0.00	NA	2.35	NA
ULTIMA-STREIGHT STEM	6	2	33.33	0.00 to 71.05	6.48	9.00 to 9.08
FRIENDLY	4	0	0.00	NA	3.35	NA
REVISION - LR	2	0	0.00	NA	1.12	NA
OSTEAL Standard	1	0	0.00	NA	0.45	NA
Femoral Cemented	**20560**	**360**	**1.75**	**1.57 to 1.93**	**8.82**	**8.80 to 8.84**
All femoral	**35285**	**500**	**1.42**	**1.29 to 1.54**	**8.84**	**8.83 to 8.86**
Whole database total	**65499**	**886**	**1.35**	**1.26 to 1.44**	**8.85**	**8.84 to 8.86**

Table 62 shows the results for CFSs. In the observed period, we recorded 38 brands, with total number of 20,560 applications. Seven brands had more than 1,000 applications each, comprising a share of 79.71 % and only 6 brands of CFSs had less than 10 applications each. Charts 53 to 56 show the cumulative risks of revision of the four most commonly used femoral components, regardless of the fixation type. In terms of the number of applications, only one uncemented stem is in this group of charts. Cemented hemiarthroplasty reached a total number of 3,843 with a RR of 1.04 %.

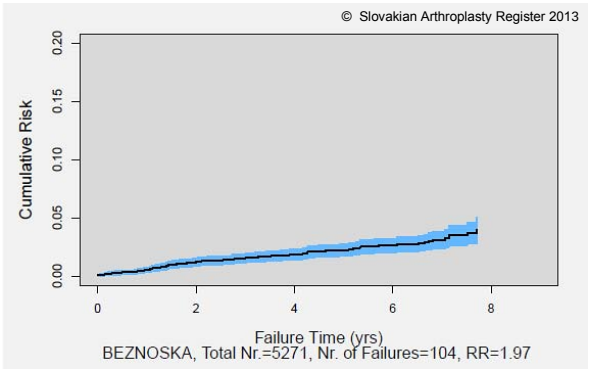

Chart 53 Cumulative risk of primary THA, fem. comp. BEZNOSKA

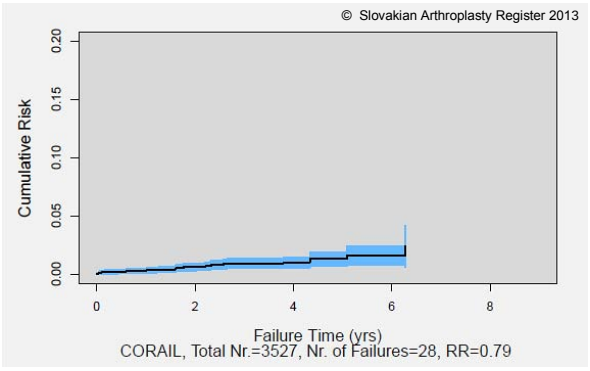

Chart 55 Cumulative risk of primary THA, fem. comp. CORAIL

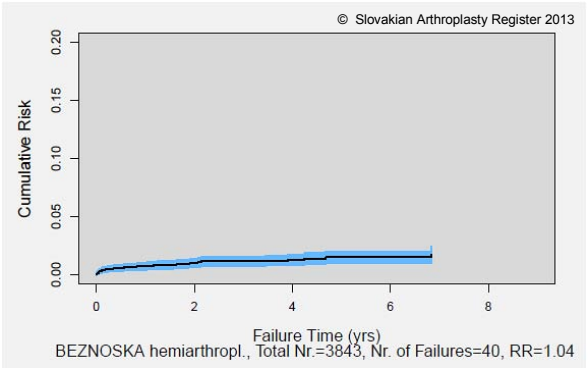

Chart 54 Cumulative risk of primary THA, fem. comp. BEZNOSKA hemiarthropl.

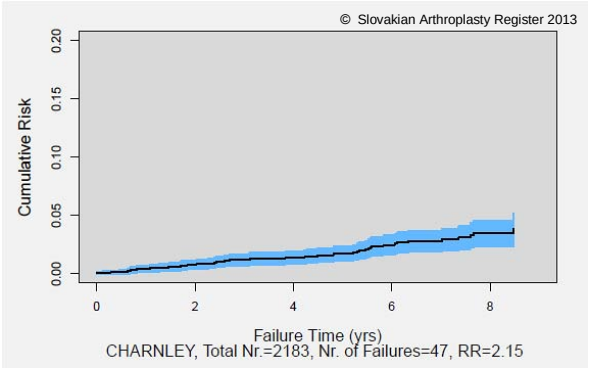

Chart 56 Cumulative risk of primary THA, fem. comp. CHARNLEY

Tab. 63 Characteristics of primary THA (acetabular and femoral components)

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Component type		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Acetabular		30214	386	1.28	1.15 to 1.40	8.86	8.85 to 8.88
	Uncemented	18999	190	1.00	0.86 to 1.14	8.88	8.86 to 8.90
	Cemented	11215	196	1.75	1.51 to 1.99	8.83	8.81 to 8.86
Femoral		35285	500	1.42	1.29 to 1.54	8.84	8.83 to 8.86
	Uncemented	14725	140	0.95	0.79 to 1.11	8.88	8.86 to 8.90
	Cemented	20560	360	1.75	1.57 to 1.93	8.82	8.80 to 8.84
Whole database total		65499	886	1.35	1.26 to 1.44	8.85	8.84 to 8.86

Tab. 64 Cumulative characteristics of primary THA (acetabular and femoral components)

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Component type		2003	2004	2005	2006	2007	2008	2009	2010	2011
Acetabular										
Uncemented	Total number	735	1971	3289	5002	7250	9845	12663	15748	18999
	Nr. of failures	1	3	15	33	62	92	127	168	190
	RR	**0.14**	**0.15**	**0.46**	**0.66**	**0.86**	**0.93**	**1.00**	**1.07**	**1.00**
Cemented	Total number	1050	2396	3501	4850	6242	7433	8704	9934	11215
	Nr. of failures	3	15	30	44	70	108	131	166	196
	RR	**0.29**	**0.63**	**0.86**	**0.91**	**1.12**	**1.45**	**1.51**	**1.67**	**1.75**
Femoral										
Uncemented	Total number	483	1402	2243	3428	5084	7103	9479	12091	14725
	Nr. of failures	0	3	8	23	38	65	87	123	140
	RR	**0.00**	**0.21**	**0.36**	**0.67**	**0.75**	**0.92**	**0.92**	**1.02**	**0.95**
Cemented	Total number	1637	3805	5937	8345	10944	13336	15727	18087	20560
	Nr. of failures	3	18	49	79	129	181	239	319	360
	RR	**0.18**	**0.47**	**0.83**	**0.95**	**1.18**	**1.36**	**1.52**	**1.76**	**1.75**

Table 63 shows an analysis of RR and mean survival time for acetabular and femoral components during the period 2003 to 2011, with 65,499 components. Table 64 shows the cumulative results of components year by year. Table 65 shows the cumulative risks of revision until certain time points for the whole database.

Tab. 65 Characteristics of failure of primary THA until certain time point (acetabular and femoral components)

Component type		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
Acetabular	Nr. of failures	32	30	67	74	56	43	22	27	19	16	NA
	Cumulative risk (%)	**0.106**	**0.209**	**0.457**	**0.770**	**1.070**	**1.363**	**1.563**	**1.914**	**2.280**	**2.907**	**NA**
	95% LB	0.069	0.156	0.374	0.655	0.924	1.186	1.360	1.654	1.949	2.313	NA
	95% UB	0.144	0.261	0.539	0.886	1.216	1.541	1.765	2.174	2.612	3.502	NA
Uncemented	Nr. of failures	17	20	32	32	24	29	12	10	10	4	NA
	Cumulative risk (%)	**0.090**	**0.198**	**0.388**	**0.611**	**0.827**	**1.174**	**1.380**	**1.626**	**2.014**	**2.397**	**NA**
	95% LB	0.047	0.134	0.292	0.481	0.663	0.952	1.120	1.314	1.587	1.713	NA
	95% UB	0.133	0.263	0.483	0.741	0.991	1.397	1.641	1.938	2.442	3.082	NA
Cemented	Nr. of failures	15	10	35	42	32	14	10	17	9	12	NA
	Cumulative risk (%)	**0.134**	**0.226**	**0.571**	**1.026**	**1.447**	**1.669**	**1.862**	**2.321**	**2.664**	**3.496**	**NA**
	95% LB	0.066	0.137	0.421	0.812	1.180	1.373	1.536	1.904	2.169	2.601	NA
	95% UB	0.203	0.316	0.720	1.240	1.714	1.965	2.189	2.738	3.160	4.391	NA
Femoral	Nr. of failures	43	30	76	99	70	53	49	37	25	16	2
	Cumulative risk (%)	**0.123**	**0.211**	**0.457**	**0.829**	**1.157**	**1.479**	**1.872**	**2.311**	**2.759**	**3.275**	**3.472**
	95% LB	0.086	0.162	0.380	0.716	1.013	1.304	1.651	2.031	2.399	2.705	2.833
	95% UB	0.160	0.260	0.534	0.942	1.300	1.654	2.093	2.592	3.118	3.844	4.110
Uncemented	Nr. of failures	19	11	26	19	21	17	10	8	5	3	1
	Cumulative risk (%)	**0.130**	**0.207**	**0.406**	**0.581**	**0.837**	**1.128**	**1.372**	**1.675**	**1.943**	**2.422**	**2.850**
	95% LB	0.071	0.132	0.294	0.440	0.645	0.878	1.060	1.281	1.475	1.535	1.629
	95% UB	0.189	0.282	0.518	0.723	1.028	1.379	1.683	2.070	2.411	3.309	4.071
Cemented	Nr. of failures	24	19	50	80	49	36	39	29	20	13	1
	Cumulative risk (%)	**0.118**	**0.214**	**0.493**	**0.999**	**1.373**	**1.714**	**2.184**	**2.684**	**3.210**	**3.759**	**3.893**
	95% LB	0.070	0.149	0.389	0.837	1.173	1.477	1.887	2.314	2.740	3.142	3.223
	95% UB	0.165	0.279	0.598	1.160	1.573	1.951	2.480	3.054	3.680	4.376	4.563

Component combinations

Due to the standardised diameters of the articulating heads, THA offers the possibility of combinations either with recommended components by the same manufacturer or with components from other manufacturers. These combinations are, from the legal point of view, off-label use of components and the surgeon is thereby creating completely new implant. The use of such a combination is not recommended by any manufacturer. These combinations are highlighted in blue in the following tables.

Combinations of uncemented components

Tab. 66 Characteristics of primary components combinations (uncemented THA)

Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Novae Evolution	Sagita Evolution HA	2049	18	0.88	15	0.73	8	0.39
Pinnacle	Corail	1988	12	0.60	6	0.30	11	0.55
Duraloc	Corail	1355	19	1.40	10	0.74	14	1.03
Plasmacup	Bicontact	769	10	1.30	8	1.04	3	0.39
Duraloc	AML	759	14	1.84	9	1.19	9	1.19
SF	SF	732	8	1.09	7	0.96	5	0.68
CLS Spotorno	CLS Spotorno	539	1	0.19	0	0.00	1	0.19
Trilogy	Versys	491	3	0.61	1	0.20	3	0.61
Novae Evolution	Libra HA	480	4	0.83	2	0.42	3	0.62
Pinnacle	Proxima	470	2	0.43	2	0.43	0	0.00
L-Cup	Bimetric (uncem)	421	6	1.43	5	1.19	4	0.95
Pinnacle	AML	415	4	0.96	2	0.48	3	0.72
Delta - PF	Fit	365	6	1.64	0	0.00	6	1.64
Delta	Fit	317	0	0.00	0	0.00	0	0.00
M-H-shell	Bimetric (uncem)	278	2	0.72	1	0.36	1	0.36
Zweymuller Alloclassic CSF	Zweymuller Alloclassic SL	259	12	4.63	12	4.63	3	1.16
Beznoska (uncem)	SF	248	8	3.23	4	1.61	5	2.02
Delta - PF	Logica (uncem)	235	1	0.43	0	0.00	1	0.43
Trilogy	Versys FMT	190	5	2.63	3	1.58	5	2.63
Ana.Nova	Ana.Nova MII	141	0	0.00	0	0.00	0	0.00
Delta	Logica (uncem)	135	2	1.48	2	1.48	0	0.00
Pinnacle	Tri-lock BPS	68	0	0.00	0	0.00	0	0.00
Pinnacle	S-ROM	68	0	0.00	0	0.00	0	0.00
CLS Spotorno	***Corail***	67	2	2.99	2	2.99	0	0.00
Delta - Fins	Fit	67	1	1.49	1	1.49	1	1.49
Sunfit TH	Sagita Evolution HA	66	0	0.00	0	0.00	0	0.00
T.O.P	Beta Cone	63	2	3.17	1	1.59	2	3.17

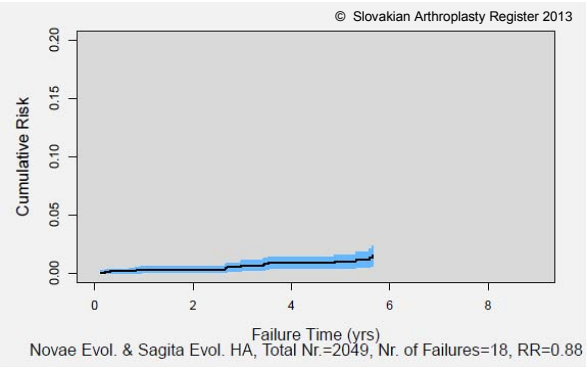

Chart 57 Cumulative risk of primary THA, acet. comp. Novae Evolution and fem. comp. Sagita Evolution HA

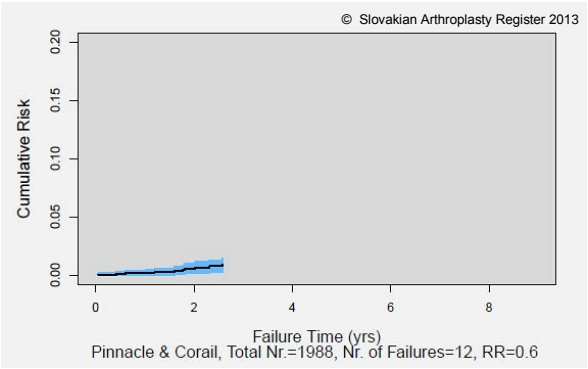

Chart 58 Cumulative risk of primary THA, acet. comp. Pinnacle and fem. comp. Corail

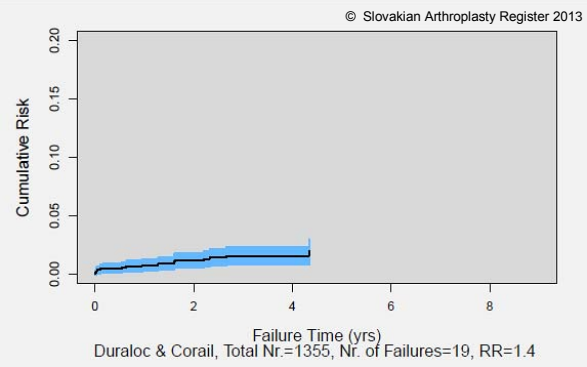

Chart 59 Cumulative risk of primary THA, acet. comp. Duraloc and fem. comp. Corail

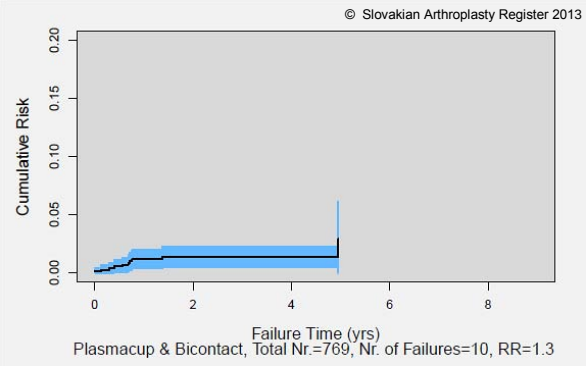

Chart 60 Cumulative risk of primary THA, acet. comp. Plasmacup and fem. comp. Bicontact

Table 66 shows the combinations of uncemented components with one component from a different manufacturer. Charts 57 to 60 show the cumulative risk of revision for the commonest UAC/UFS combinations.

Combinations of cemented components

Tab. 67 Characteristics of primary components combinations (cemented THA)

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Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Beznoska (cem)	Beznoska	3196	111	3.47	91	2.85	74	2.32
Charnley	Charnley	1857	43	2.32	18	0.97	39	2.10
Cup	Centrament	1299	28	2.16	24	1.85	17	1.31
Muller	Bimetric (cem)	694	15	2.16	8	1.15	11	1.59
O2	Beznoska	437	2	0.46	1	0.23	1	0.23
O2	CSC	432	3	0.69	1	0.23	3	0.69
Beznoska (cem)	CSC	418	6	1.44	2	0.48	5	1.20
Elite Plus	Charnley	274	1	0.36	0	0.00	1	0.36
ZCA	CPT	273	2	0.73	2	0.73	1	0.37
Mueller	Logica (cem)	225	0	0.00	0	0.00	0	0.00
Elite Plus	Charnley Modular	198	1	0.51	1	0.51	1	0.51
Ultima MK2	C-Stem	183	4	2.19	3	1.64	2	1.09
PE-Cup	Trilliance	165	3	1.82	3	1.82	1	0.61
Exeter Contemporary Cup	Exeter V40	139	2	1.44	1	0.72	2	1.44
Muller	***Beznoska***	90	1	1.11	1	1.11	1	1.11
Elite Plus	Elite Plus	81	4	4.94	0	0.00	4	4.94
Exeter Duration Cup	Exeter V40	76	0	0.00	0	0.00	0	0.00
Beznoska (cem)	***C-Stem***	71	0	0.00	0	0.00	0	0.00
Triloc	Autobloqauate	67	0	0.00	0	0.00	0	0.00
Lubinus Classic Plus	Lubinus Classic Plus	65	0	0.00	0	0.00	0	0.00
O2	Trio (cem)	57	0	0.00	0	0.00	0	0.00
Elite Plus	C-Stem	55	0	0.00	0	0.00	0	0.00
Ultima MK2	Elite Plus	55	3	5.45	2	3.64	2	3.64

Table 67 shows the combination of cemented components, including two combinations not recommended by the manufacturer, with a higher RR in one CFS of 5.45 %. With RR of 4.94 %, this CFS failed also in another combination recommended by manufacturer. Charts 61 to 64 show the cumulative risks of revision of the commonest combination of CAC/CFS used. Table 65 shows hybrid combinations of UAC/CFS. All RRs equal to or higher than 5.00 % are in orange and RR equal to or higher than 10.00 % are in red.

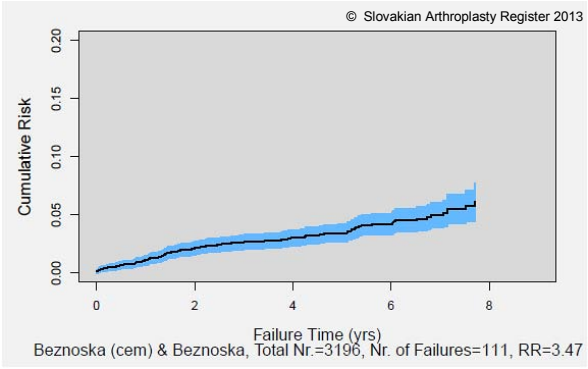

Chart 61 Cumulative risk of primary THA, acet. comp. Beznoska (cem) and fem. comp. Beznoska

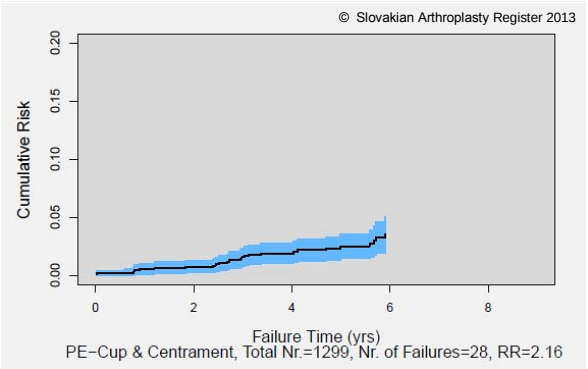

Chart 63 Cumulative risk of primary THA, acet. comp. PE-Cup and fem. comp. Centrament

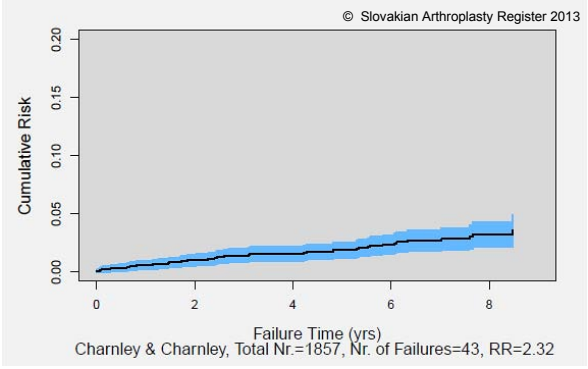

Chart 62 Cumulative risk of primary THA, acet. comp. Charnley and fem. comp. Charnley

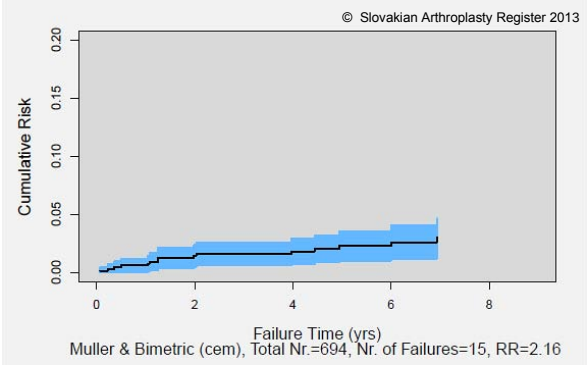

Chart 64 Cumulative risk of primary THA, acet. comp. Muller and fem. comp. Bimetric (cem)

Hybrid components

Tab. 68 Characteristics of primary components combinations (hybrids)

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Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Beznoska (uncem)	Beznoska	459	18	3.92	15	3.27	6	1.31
Plasmacup	Centrament	357	10	2.80	8	2.24	6	1.68
Duraloc	C-Stem	353	5	1.42	1	0.28	5	1.42
Trilogy	CPT	348	6	1.72	2	0.57	6	1.72
SF	Beznoska	325	9	2.77	1	0.31	8	2.46
Duraloc	***Beznoska***	319	4	1.25	1	0.31	3	0.94
Pinnacle	C-Stem	290	1	0.34	1	0.34	0	0.00
Novae Evolution	Sagita Evolution	236	5	2.12	2	0.85	3	1.27
Duraloc	Elite Plus	194	25	12.89	2	1.03	25	12.89
L-Cup	Bimetric (cem)	177	4	2.26	1	0.56	4	2.26
Beznoska (uncem)	CSC	152	6	3.95	3	1.97	5	3.29
Beznoska (uncem)	***Bimetric (cem)***	132	3	2.27	3	2.27	1	0.76
SF	CSC	120	0	0.00	0	0.00	0	0.00
M-H-shell	Bimetric (cem)	74	0	0.00	0	0.00	0	0.00
Duraloc	***CPT***	66	0	0.00	0	0.00	0	0.00
Sunfit TH	Sagita Evolution	66	0	0.00	0	0.00	0	0.00
Pinnacle	Corail (cem)	66	0	0.00	0	0.00	0	0.00
Duraloc	Ultima-Howse II	53	8	15.09	2	3.77	8	15.09
Pinnacle	***Beznoska***	53	0	0.00	0	0.00	0	0.00

During the observation period we have recorded 3,840 implants with hybrid type of fixation and only 73 implants with reverse hybrid type of fixation. Table 68 shows the results of UACs combined with CFSs. Charts 65–68 show CR of four mostly used hybrid combinations in the database. Table 69 presents results of implants with reverse type of fixation.

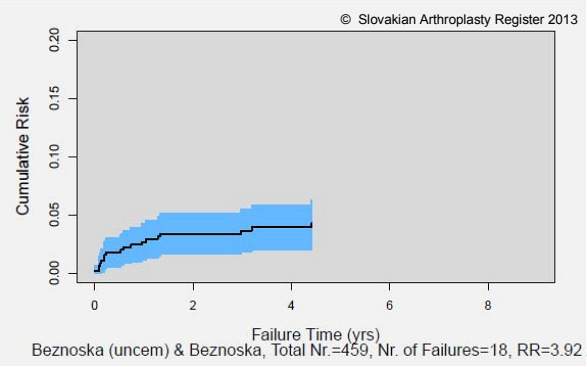

Chart 65 Cumulative risk of primary THA, acet. comp. Beznoska (uncem) and fem. comp. Beznoska

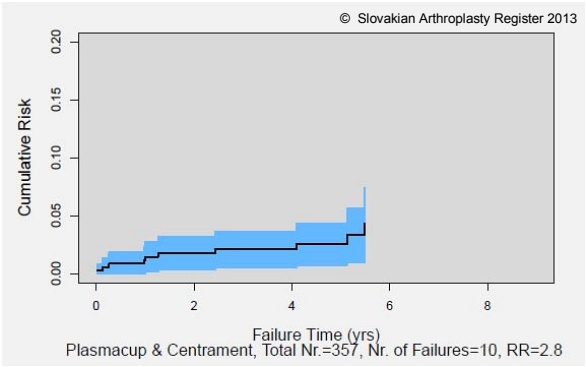

Chart 66 Cumulative risk of primary THA, acet. comp. Plasmacup and fem. comp. Centrament

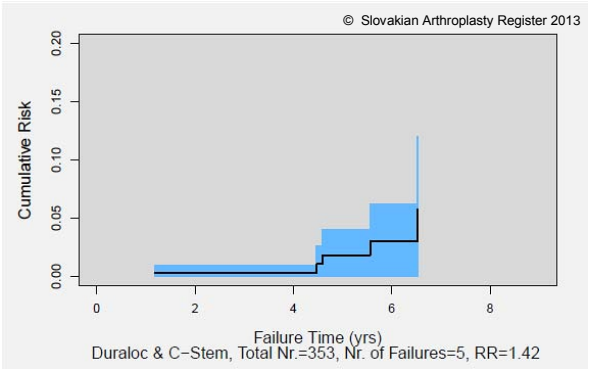

Chart 67 Cumulative risk of primary THA, acet. comp. Duraloc and fem. comp. C-Stem

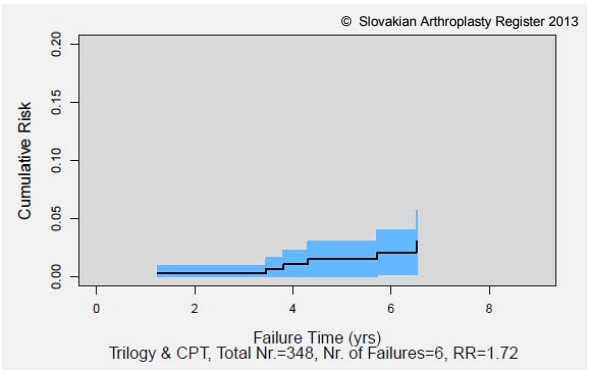

Chart 68 Cumulative risk of primary THA, acet. comp. Trilogy and fem. comp. CPT

Reverse hybrid components

Tab. 69 Characteristics of primary components combinations (reverse hybrids)

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Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Beznoska (cem)	SF	20	1	5.00	1	5.00	0	0.00
Muller	Bimetric (uncem)	19	0	0.00	0	0.00	0	0.00
PE-Cup	Bicontact	12	0	0.00	0	0.00	0	0.00
Elite Plus	AML	12	0	0.00	0	0.00	0	0.00
Beznoska (cem)	***Corail***	10	1	10.00	0	0.00	1	10.00

Revision Total Hip Arthroplasty

In 2011 we recorded a decrease in revision THA by 25 cases. Chart 69 shows evolution of RR during the observed period 2003–2011.

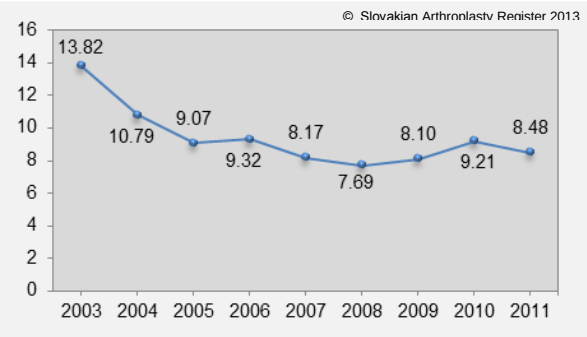

Chart 69 Revision THA – revision rate

Tab. 70 Structure of revision database

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	Total	Censored	Failured
1st revision	803	720	83
2nd revision	276	241	35
3rd revision	35	31	4
4th revision	4	4	0
Missed primary operation	3	0	3
Primary THA before 2003	2074	1882	192
Total	3195	2878	317

The revision database contains in total 3,195 protocols. The majority of them had the primary THA performed before the start of the register – prior to 1 January 2003. We do not have detailed data about the primary THAs of 2,074 revisions. We know only that 192 of these revisions failed. The rest of the database is divided according to the number of revisions performed, as table 70 shows. In this report we will analyse only first revisions. This part of database comprises 803 protocols. The gender ratio is shown in table 71 and chart 70. We have recorded a decrease in females from 58.73 % in 2010 to 56.35 % in 2011.

Tab. 71 Revision THA – gender distribution

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Year	Female	Male
2003	171	122
2004	189	144
2005	164	106
2006	198	137
2007	214	134
2008	208	131
2009	226	160
2010	269	189
2011	244	189

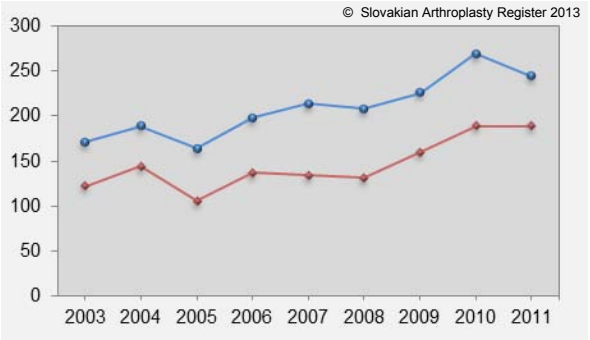

Chart 70 Revision THA – gender distribution

Types of fixation of primary THA

From 2008, there was observed an increase in the numbers of revisions of primary uncemented implants and a decrease of the numbers of revisions of cemented implants. Table 72 and chart 71 show the evolution of revised primary implants according to the type of fixation.

Tab. 72 Revision THA – types of fixation of primary implants

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Year	Cement	Uncement	Hybrid	Not Ident.
2003	184	34	74	1
2004	204	47	78	4
2005	162	41	66	1
2006	196	73	66	0
2007	175	82	91	0
2008	199	63	77	0
2009	196	112	78	0
2010	243	130	85	0
2011	223	132	78	0

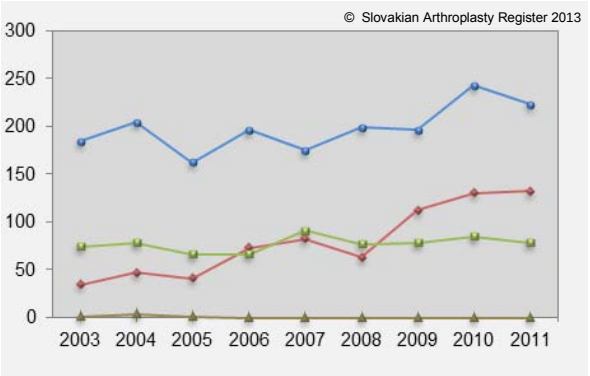

Chart 71 Revision THA – types of primary fixation

In 2011, 51.50 % of all revised implants were cemented, 30.48 % uncemented and 18.01 % hybrids; in 2010, 52.95 % of all revised implants were primarily cemented, 28.67 % uncemented, and 18.38 % were hybrids.

Age groups

In the age group less than 55 years, an increase of revision THAs from 12.6 % in 2010 to 15.11 % in 2011 was observed. Also in the age group 55–65 years, a 26.32 % increase, compared to 23.64 % in 2010, was observed. 40.21 % of patients in the age group 65–75 years and 18.34 % in the age group over 75 were revised. Table 73 shows the age groups according the methodology of Statistical Office of the Slovak Republic. Table 74 shows the four age groups and the interaction of gender. The number of failures represents the number of re-revisions, which means that of 3,195 revision THAs 317 were revised again THAs. Table 75 shows the interaction of gender, age groups and type of fixation of revision THA.

Tab. 73 Revision THA – age groups

Year	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
2003	0	0	0	3	2	0	6	8	17	25	53	63	60	42	14
2004	0	1	0	1	1	2	5	14	36	36	43	55	79	40	20
2005	0	0	1	2	1	1	5	11	20	32	33	51	75	27	11
2006	0	1	0	2	2	1	9	13	33	41	55	67	79	23	9
2007	1	0	0	3	4	5	11	23	33	45	57	69	64	28	5
2008	0	0	0	0	1	4	12	12	41	52	60	83	47	18	9
2009	0	0	0	0	5	5	12	33	58	48	76	58	64	19	8
2010	0	0	2	3	1	5	17	30	46	62	87	94	65	37	9
2011	0	0	1	4	3	9	8	27	54	69	53	101	67	29	8

Tab. 74 Characteristics of revision THA (interaction of gender and age groups)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females							
	[min,55] yrs	277	37	13.36	9.35 to 17.36	7.79	7.44 to 8.14
	(55,65] yrs	469	45	9.59	6.93 to 12.26	7.99	7.73 to 8.25
	(65,75] yrs	756	60	7.94	6.01 to 9.86	8.21	8.03 to 8.39
	(75,max] yrs	381	21	5.51	3.22 to 7.80	8.34	8.12 to 8.56
Females total		1883	163	8.66	7.39 to 9.93	8.13	8.01 to 8.25
Males							
	[min,55] yrs	206	22	10.68	6.46 to 14.90	7.84	7.44 to 8.25
	(55,65] yrs	372	42	11.29	8.07 to 14.51	7.81	7.51 to 8.11
	(65,75] yrs	529	77	14.56	11.55 to 17.56	7.56	7.27 to 7.84
	(75,max] yrs	205	13	6.34	3.01 to 9.68	8.26	7.90 to 8.62
Males total		1312	154	11.74	10.00 to 13.48	7.81	7.64 to 7.98
Whole database total		3195	317	9.92	8.89 to 10.96	8.00	7.90 to 8.10

Tab. 75 Characteristics of revision THA (interaction of gender, age groups, and type of fixation)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Gender							
	Females	1883	163	8.66	7.39 to 9.93	8.13	8.01 to 8.25
	Males	1312	154	11.74	10.00 to 13.48	7.81	7.64 to 7.98
Age groups							
	[min,55] yrs	483	59	12.22	9.29 to 15.14	7.82	7.56 to 8.09
	(55,65] yrs	841	87	10.34	8.29 to 12.40	7.93	7.73 to 8.13
	(65,75] yrs	1285	137	10.66	8.97 to 12.35	7.96	7.80 to 8.12
	(75,max] yrs	586	34	5.80	3.91 to 7.69	8.36	8.16 to 8.55
Type of fixation							
	Uncemented	990	88	8.89	7.12 to 10.66	8.08	7.91 to 8.26
	Cemented	1037	113	10.9	9.00 to 12.79	7.98	7.82 to 8.15
	Hybrids	434	36	8.29	5.70 to 10.89	8.08	7.83 to 8.33
	Reverse hybrids	392	18	4.59	2.52 to 6.66	8.39	8.18 to 8.59
Whole database total		3195	317	9.92	8.89 to 10.96	8.00	7.90 to 8.10

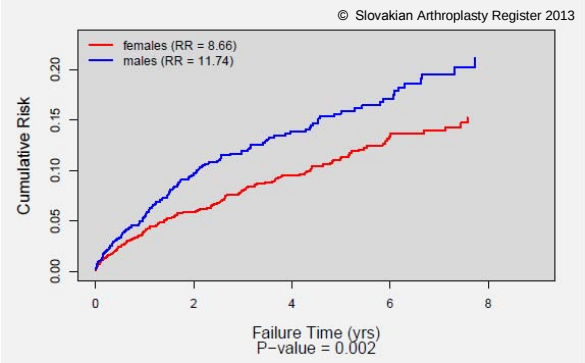

Chart 72 Cumulative risk of revision THA (gender)

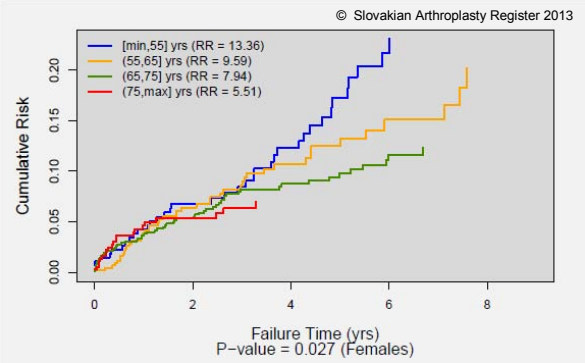

Chart 74 Cumulative risk of revision THA (females, age group)

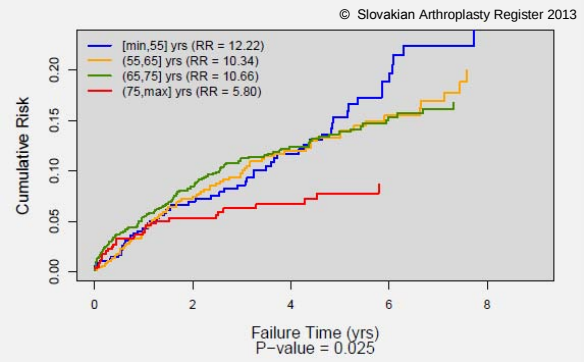

Chart 73 Cumulative risk of revision THA (age groups)

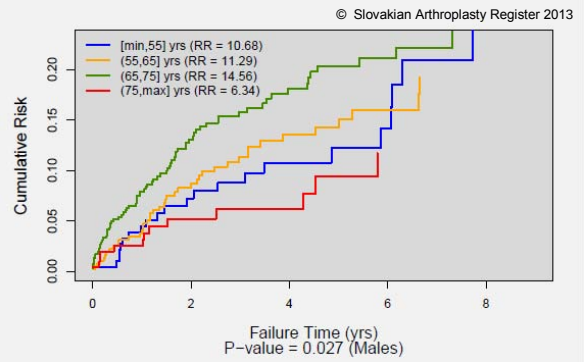

Chart 75 Cumulative risk of revision THA (males, age groups)

Tab. 76 Frequency of revision THA (age groups; in %)

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Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	14.68	19.52	14.44	14.33	19.54	12.09	15.28	13.32	13.63
(55,65] yrs	28.67	23.72	24.44	26.57	24.71	29.20	27.46	24.45	27.71
(65,75] yrs	42.32	39.64	44.07	43.28	41.38	42.18	35.75	40.39	35.80
(75,max] yrs	14.33	17.12	17.04	15.82	14.37	16.52	21.50	21.83	22.86

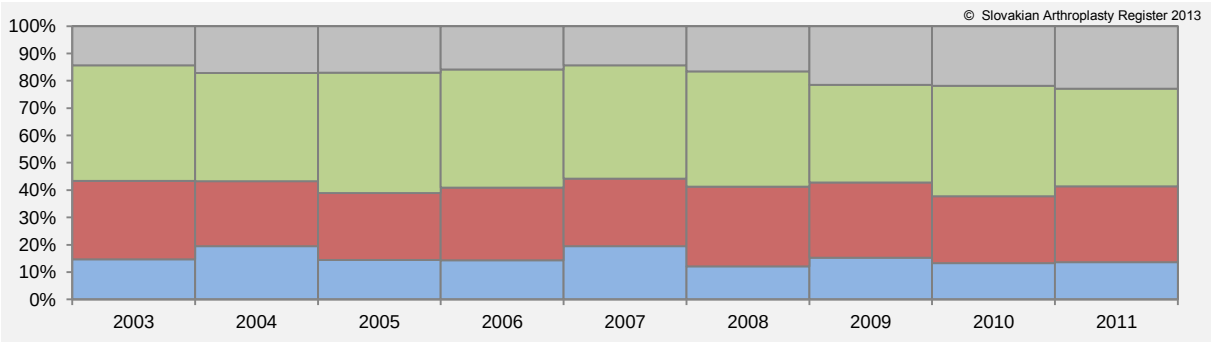

Chart 76 Frequency of revision THA (age groups; in %)

Tab. 77 Frequency of revision THA (females; age groups; in %)

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Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	12.87	23.28	15.85	14.65	19.63	11.54	14.60	12.27	9.84
(55,65] yrs	28.07	18.52	20.12	23.23	24.30	26.92	27.43	24.54	29.10
(65,75] yrs	44.44	37.04	48.78	42.42	41.59	43.27	35.84	37.17	35.25
(75,max] yrs	14.62	21.16	15.24	19.70	14.49	18.27	22.12	26.02	25.82

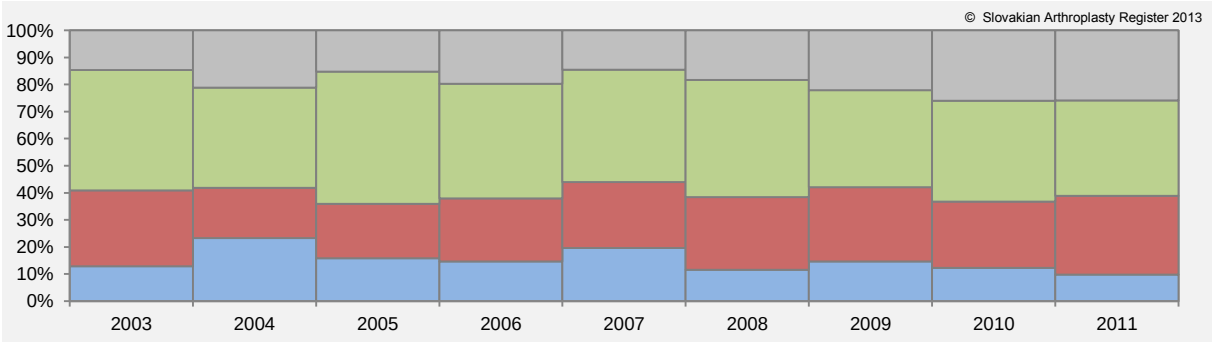

Chart 77 Frequency of revision THA (females; age groups; in %)

Tab. 78 Frequency of revision THA (males; age groups; in %)

© Slovakian Arthroplasty Register 2013

Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	17.21	14.58	12.26	13.87	19.40	12.98	16.25	14.81	18.52
(55,65] yrs	29.51	30.56	31.13	31.39	25.37	32.82	27.50	24.34	25.93
(65,75] yrs	39.34	43.06	36.79	44.53	41.04	40.46	35.63	44.97	36.51
(75,max] yrs	13.93	11.81	19.81	10.22	14.18	13.74	20.63	15.87	19.05

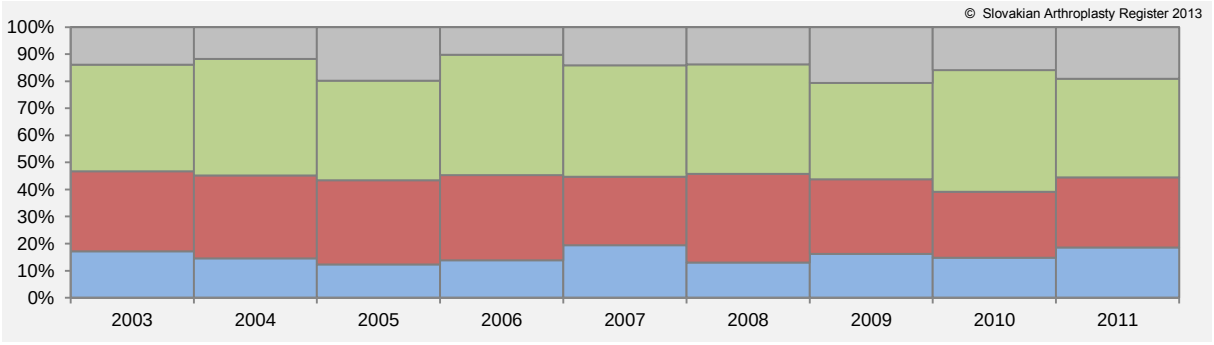

Chart 78 Frequency of revision THA (males; age groups; in %)

Charts 72–75 show the cumulative risk of re-revision according to the age group and gender. The higher risk of revision of revision THA is among males (chart 72) and the age group less than 55 years (chart 73). In females the highest risk was in the age group less than 55 years (chart 74) and in the male age group 65–75 years (chart 75). Table 76 and chart 76 show the percentage participation of age groups in the revision THA. There is a trend for increasing numbers of revision in the age group 65–75 years, from 41.46 % in 2003 to 61.11 % in 2011. The next two tables and charts show these results for females and for males. The following analysis is the percentage probability of failure of revision THA according to the age groups Table 79 and chart 79 show results for the whole database, tables 80–81 and charts 80–81 show these results for females and males. In 2011, the probability of failure of revision THA was highest in the age group 65–75 years, at 61.11 %. In males, the probability of failure was 87.50 %. There was no risk of failure in the age group less than 55 years. The final analysis (tables 82–84 and charts 82–84) shows this probability until a certain time point with one, three month and every year. This analysis is not cumulative.

Tab. 79 Probability of revision THA (age groups; in %)

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Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	21.95	28.57	27.27	13.16	19.44	9.68	15.79	18.18	0.00
(55,65] yrs	34.15	28.57	33.33	23.68	25.00	25.81	31.58	15.15	27.78
(65,75] yrs	41.46	32.65	36.36	55.26	52.78	45.16	31.58	45.45	61.11
(75,max] yrs	2.44	10.20	3.03	7.89	2.78	19.35	21.05	21.21	11.11

Chart 79 Probability of revision THA (age groups; in %)

Tab. 80 Probability of revision THA (females; age groups; in %)

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Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	29.41	34.48	41.18	23.53	21.74	6.25	14.29	15.38	0.00
(55,65] yrs	29.41	27.59	35.29	29.41	21.74	25.00	28.57	15.38	40.00
(65,75] yrs	41.18	24.14	23.53	41.18	56.52	43.75	33.33	30.77	40.00
(75,max] yrs	0.00	13.79	0.00	5.88	0.00	25.00	23.81	38.46	20.00

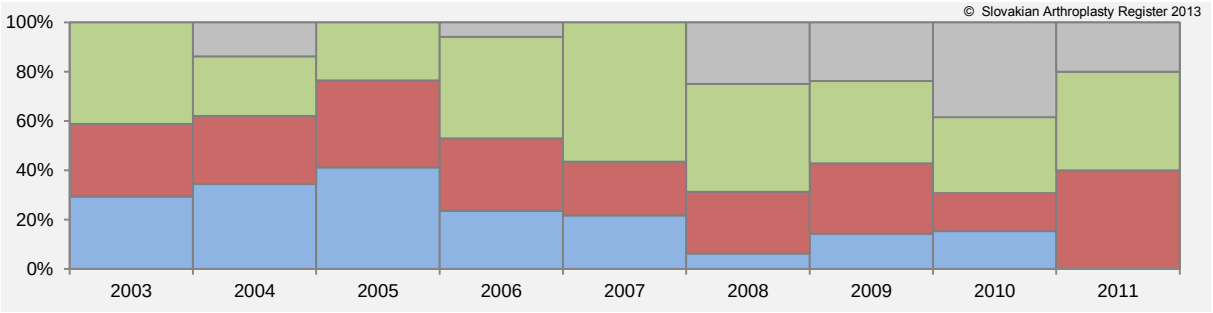

Chart 80 Probability of revision THA (females; age groups; in %)

Tab. 81 Probability of revision THA (males; age groups; in %)

© Slovakian Arthroplasty Register 2013

Age groups	2003	2004	2005	2006	2007	2008	2009	2010	2011
[min,55] yrs	16.67	20.00	12.50	4.76	15.38	13.33	17.65	20.00	0.00
(55,65] yrs	37.50	30.00	31.25	19.05	30.77	26.67	35.29	15.00	12.50
(65,75] yrs	41.67	45.00	50.00	66.67	46.15	46.67	29.41	55.00	87.50
(75,max] yrs	4.17	5.00	6.25	9.52	7.69	13.33	17.65	10.00	0.00

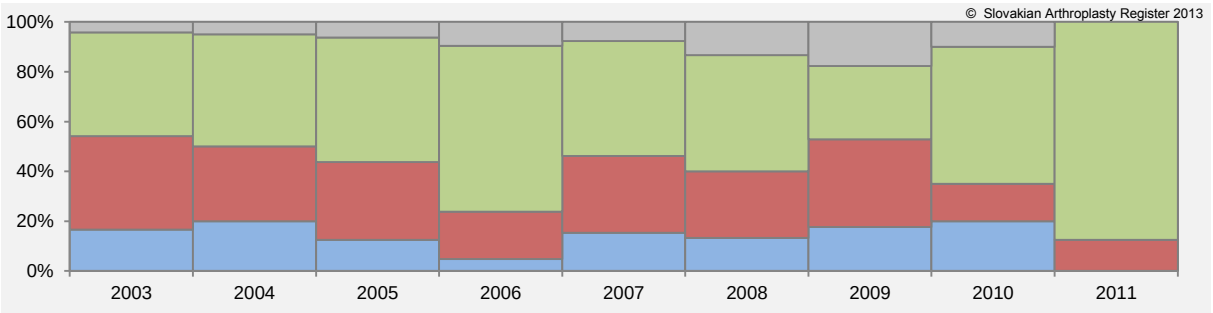

Chart 81 Probability of revision THA (males; age groups; in %)

Tab. 82 Probability of failure of revision THA until certain time point (age groups; not cumulative)

Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
[min,55] yrs	12.50	3.13	20.29	14.71	11.90	32.00	35.00	31.25	50.00	20.00	NA
(55,65] yrs	12.50	15.63	28.99	33.82	28.57	36.00	20.00	31.25	25.00	60.00	NA
(65,75] yrs	59.38	56.25	39.13	42.65	52.38	28.00	35.00	31.25	25.00	20.00	NA
(75,max] yrs	15.63	25.00	11.59	8.82	7.14	4.00	10.00	6.25	0.00	0.00	NA

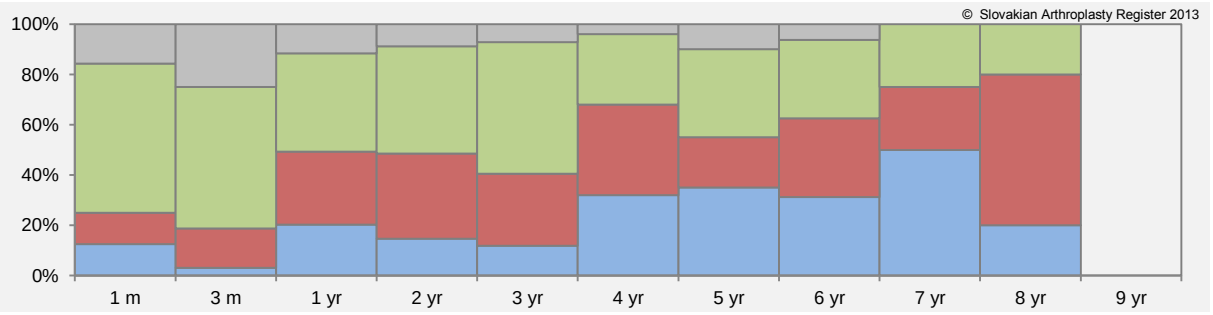

Chart 82 Probability of failure of revision THA until certain time point (age groups; not cumulative)

Tab. 83 Probability of failure of revision THA until certain time point (females; age groups; not cumulative)

Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
[min,55] yrs	16.67	7.69	18.42	22.22	12.00	42.86	50.00	36.36	50.00	0.00	NA
(55,65] yrs	5.56	7.69	36.84	33.33	24.00	35.71	25.00	27.27	0.00	100.00	NA
(65,75] yrs	55.56	46.15	26.32	37.04	56.00	14.29	25.00	36.36	50.00	0.00	NA
(75,max] yrs	22.22	38.46	18.42	7.41	8.00	7.14	0.00	0.00	0.00	0.00	NA

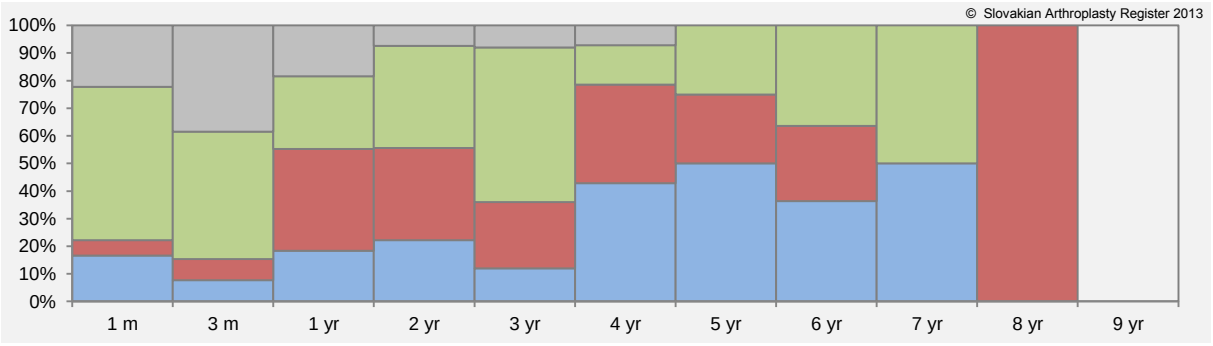

Chart 83 Probability of failure of revision THA until certain time point (females; age groups; not cumulative)

Tab. 84 Probability of failure of revision THA until certain time point (males; age groups; not cumulative)

Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
[min,55] yrs	7.14	0.00	22.58	9.76	11.76	18.18	12.50	20.00	50.00	50.00	NA
(55,65] yrs	21.43	21.05	19.35	34.15	35.29	36.36	12.50	40.00	33.33	0.00	NA
(65,75] yrs	64.29	63.16	54.84	46.34	47.06	45.45	50.00	20.00	16.67	50.00	NA
(75,max] yrs	7.14	15.79	3.23	9.76	5.88	0.00	25.00	20.00	0.00	0.00	NA

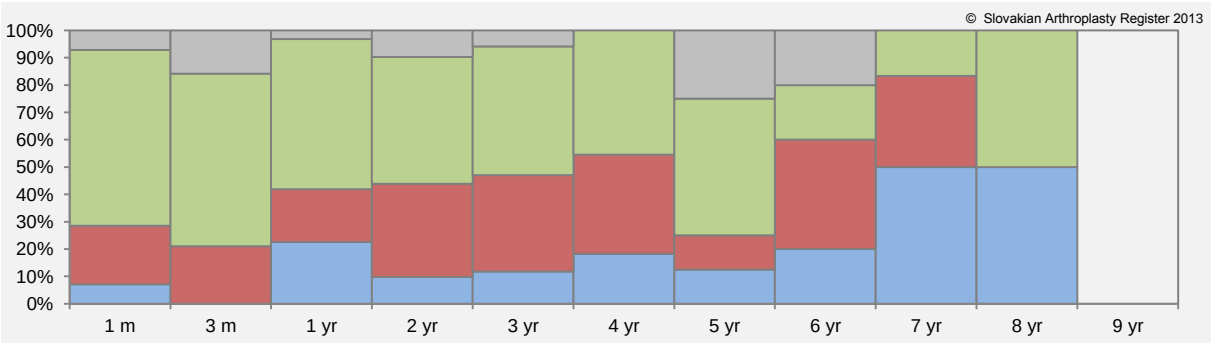

Chart 84 Probability of failure of revision THA until certain time point (males; age groups; not cumulative)

Reasons for the revision

Tab. 85 Revision THA – reasons for revision

Year	Paraarticular Osifications	Luxation	Polyethylene Wear	Early Infection	Chronic Infection	Acetabulary Protrusis	Aseptic Loos. of Both Components	Aseptic Loos. of Acet. Component	Aseptic Loos. of Fem. Component	Osteolysis of Acetabulum	Osteolysis of Femur	Big Bone Defect of Acetabulum	Big Bone Defect of Femur	Periprosthesis Fracture	Fracture of Implant	Spacer to THA	Girdlestone to THA	Other
2003	5	14	8	6	16	28	6	175	136	39	45	14	5	20	39	0	1	15
2004	10	20	18	3	20	17	2	194	165	29	28	21	9	11	32	0	1	15
2005	4	19	12	1	12	17	6	124	126	31	28	14	5	13	16	0	1	22
2006	10	25	28	8	26	32	13	122	147	40	30	12	10	16	11	0	3	11
2007	12	28	14	6	34	20	40	113	105	13	22	6	6	24	18	0	1	5
2008	3	38	15	4	32	11	51	95	109	13	23	12	4	13	11	0	2	10
2009	4	38	28	3	30	22	52	108	133	13	14	13	5	12	19	0	1	13
2010	11	56	21	4	35	27	58	113	108	15	12	12	2	35	17	9	3	19
2011	10	46	29	8	47	19	51	100	108	15	14	19	7	32	15	11	5	7

Table 85 shows all reasons for revision according to the protocol. Analyses of the reasons for revisions are complicated, with the multiple-choice in the revision protocol, which means that each revision THA could potentially have more than one reason for revision. Therefore, the total number of reasons for revision does not correspond to the total number of performed revision THAs. In the table are displayed all 3,195 revision THAs. For deeper analysis we can use only 1,121 revisions with primary operation from the observed period 2003–2011. Table 86 shows the frequency of these reasons. From this table is clear that after aseptic loosening of femoral and acetabular components, the third mostly marked reason for revision is luxation. 30.42 % of all revisions were due to aseptic loosening of the femoral component, 24.19 % were due to aseptic loosening of the acetabular component and 18.58 % due to luxation. Chronic infection was the reason for revision in 11.22 % and early infection in 2.87 % of 802 cases. Table 87 shows the same characteristics of re-revision THA. The frequency of septic loosening of the acetabular component was 22.71 %, aseptic loosening of femoral component was 21.77 %, chronic infection 18.30 % and luxation 17.98 %.

Tab. 86 Characteristics of revision THA (reasons for revision)

		Nr. of events	RR	95% CI for RR	Mean survival	95% CI for mean
Reason for revision						
	Paraarticular osifications	16	2.00	1.03 to 2.96	8.08	7.89 to 8.28
	Luxation	149	18.58	15.89 to 21.27	6.63	6.36 to 6.91
	Polyethylene wear	25	3.12	1.91 to 4.32	7.80	7.56 to 8.05
	Early infection	23	2.87	1.71 to 4.02	8.12	7.98 to 8.27
	Chronic infection	90	11.22	9.04 to 13.41	6.84	6.54 to 7.15
	Acetabulary protrusis	24	2.99	1.81 to 4.17	7.98	7.77 to 8.19
	Asept. loosening of acet. comp.	194	24.19	21.23 to 27.15	5.52	5.23 to 5.82
	Asept. loosening of fem. comp.	244	30.42	27.24 to 33.61	5.00	4.72 to 5.28
	Osteolysis of acetabulum	24	2.99	1.81 to 4.17	8.05	7.87 to 8.22
	Osteolysis of femur	27	3.37	2.12 to 4.61	7.94	7.74 to 8.15
	Big bone defect of acet.	6	0.75	0.15 to 1.34	8.37	8.28 to 8.46
	Big bone defect of femur	7	0.87	0.23 to 1.52	8.35	8.24 to 8.45
	Periprosthesis fracture	55	6.86	5.11 to 8.61	7.50	7.25 to 7.76
	Fracture of implant	17	2.12	1.12 to 3.12	8.18	8.04 to 8.32
	Asept. loosening of both comp.	45	5.61	4.02 to 7.20	7.48	7.20 to 7.76
	Spacer to THA	5	0.62	0.08 to 1.17	8.39	8.31 to 8.47
	Girdlestone to THA	1	0.12	0.00 to 0.37	8.40	8.27 to 8.54
Whole database			2.27	2.12 to 2.43	8.75	8.73 to 8.77

Tab. 87 Characteristics of re-revision THA (reasons for revision)

		Nr. of events	RR	95% CI for RR	Mean survival	95% CI for mean
Reason for revision						
	Paraarticular osifications	7	2.21	0.59 to 3.83	7.34	7.02 to 7.66
	Luxation	57	17.98	13.75 to 22.21	5.99	5.58 to 6.40
	Polyethylene wear	9	2.84	1.01 to 4.67	7.13	6.71 to 7.54
	Early infection	6	1.89	0.39 to 3.39	7.54	7.40 to 7.69
	Chronic infection	58	18.30	14.04 to 22.55	5.63	5.17 to 6.09
	Acetabulary protrusis	12	3.79	1.68 to 5.89	6.87	6.46 to 7.29
	Asept. loosening of acet. comp.	72	22.71	18.10 to 27.33	4.99	4.52 to 5.45
	Asept. loosening of fem. comp.	69	21.77	17.22 to 26.31	4.96	4.49 to 5.43
	Osteolysis of acetabulum	12	3.79	1.68 to 5.89	7.17	6.84 to 7.51
	Osteolysis of femur	13	4.10	1.92 to 6.28	7.10	6.76 to 7.44
	Big bone defect of acet.	9	2.84	1.01 to 4.67	7.24	6.92 to 7.57
	Big bone defect of femur	5	1.58	0.21 to 2.95	7.55	7.39 to 7.70
	Periprosthesis fracture	15	4.73	2.39 to 7.07	7.11	6.77 to 7.44
	Fracture of implant	11	3.47	1.46 to 5.48	6.97	6.55 to 7.39
	Asept. loosening of both comp.	23	7.26	4.40 to 10.11	6.43	5.94 to 6.91
	Spacer to THA	13	4.10	1.92 to 6.28	7.31	7.09 to 7.53
	Girdlestone to THA	12	3.79	1.68 to 5.89	7.29	7.04 to 7.54
Whole database			9.92	8.89 to 10.96	8.00	7.90 to 8.10

Revised components of implants

Tab. 88 Revision THA – revised components of implants

Year	Soft Tissue Revision	Whole System	Acetabular Component	Femoral Component	Head	Inlay	Total Replacement of Bipolar Hemiarthropl.	Osteosynthesis	Girdlestone	Spacer	Other
2003	0	130	93	69	3	0	0	1	1	0	0
2004	0	141	93	77	8	2	1	0	12	0	0
2005	0	91	76	89	7	1	1	0	10	0	0
2006	0	135	80	92	14	7	0	0	16	0	0
2007	0	131	95	96	8	1	1	0	16	0	0
2008	0	120	86	102	7	0	1	1	21	0	1
2009	0	149	77	111	17	3	1	1	19	5	3
2010	0	165	94	124	31	4	1	1	23	17	0
2011	16	142	89	103	39	3	0	3	22	16	1

The revision protocol has eleven options for revised components. Soft tissue revision was introduced for the first time in January 2011. In comparison to 2010, when the whole implant combination was revised in 35.86 %, during 2011 complete revision was performed in 32.71 %. The acetabular component was revised in 20.50 % and the femoral component in 23.73 %, compared to 26.95 % in 2010. We have observed an increased number of head revisions from 6.73 % in 2010 to 8.98 % in 2011 (table 88).

Revision implants and components

The revision database contains 3,195 records of revision THA implants. These are revision implants used after 1 January 2003. We don't have complete data from the primary protocols about 2,074 revision procedures. 32.45 % of these revision implants were cemented, 30.98 % were uncemented, 13.58 % were hybrids and 12.26 % were reverse hybrids. Table 89 shows the characteristics of the revision THAs – interaction of gender and type of fixation of revision implants.

Tab. 89 Characteristics of revision THA (interaction of gender and type of fixation)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females							
	Uncemented	519	42	8.09	5.75 to 10.44	8.17	7.94 to 8.40
	Cemented	694	59	8.5	6.43 to 10.58	8.2	8.02 to 8.38
	Hybrids	249	23	9.24	5.64 to 12.83	7.99	7.64 to 8.33
	Reverse hybrids	230	6	2.61	0.55 to 4.67	8.57	8.35 to 8.79
Females total		1883	163	8.66	7.39 to 9.93	8.13	8.01 to 8.25
Males							
	Uncemented	471	46	9.77	7.09 to 12.45	7.98	7.71 to 8.24
	Cemented	343	54	15.74	11.89 to 19.60	7.49	7.13 to 7.84
	Hybrids	185	13	7.03	3.34 to 10.71	8.14	7.79 to 8.49
	Reverse hybrids	162	12	7.41	3.37 to 11.44	8.07	7.69 to 8.46
Males total		1312	154	11.74	10.00 to 13.48	7.81	7.64 to 7.98
Whole database							
	Uncemented	990	88	8.89	7.12 to 10.66	8.08	7.91 to 8.26
	Cemented	1037	113	10.9	9.00 to 12.79	7.98	7.82 to 8.15
	Hybrids	434	36	8.29	5.70 to 10.89	8.08	7.83 to 8.33
	Reverse hybrids	392	18	4.59	2.52 to 6.66	8.39	8.18 to 8.59
Whole database total		3195	317	9.92	8.89 to 10.96	8.00	7.90 to 8.10

Table 90 presents the mean age of patients at the time of revision operation and the type of revision implant fixation. Uncemented fixation was used for the youngest group of patients with a mean age 60.97 years. The cemented type of fixation was used in patients with a mean age 70.95 years. The mean age of patients who had hybrid or reverse hybrid fixation was 67.55 years, and 67.22 years respectively. Chart 85 shows the cumulative risk of revision THA for whole revision database, according to the type of fixation. The lowest risk represents the group of reverse hybrids with RR 4.59 %. The next two charts show the cumulative risk of revision in females and in males.

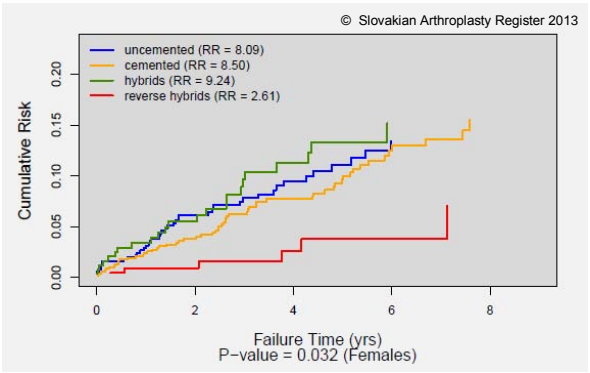

Chart 86 Cumulative risk of revision THA (females, type of fixation)

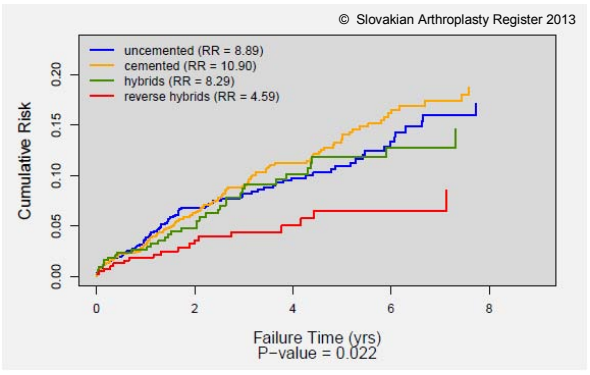

Chart 85 Cumulative risk of revision THA (type of fixation)

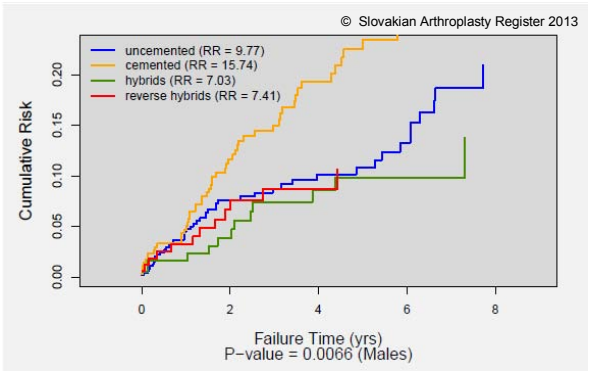

Chart 87 Cumulative risk of revision THA (males, type of fixation)

Tab. 90 Ages of the patients at the time of revision THA (interaction of gender and type of fixation; SD: standard deviation, Q1: first quartile, Q3: third quartile)

		Total number	Mean	95% CI for mean	SD	Min	Q1	Median	Q3	Max
Females										
	Uncemented	519	61.03	60.75 to 61.32	10.90	16.00	54.00	62.00	69.00	89.00
	Cemented	694	71.07	70.85 to 71.28	8.37	33.00	67.00	72.00	77.00	91.00
	Hybrids	249	67.37	66.99 to 67.74	9.25	42.00	62.00	69.00	74.00	94.00
	Reverse hybrids	230	67.08	66.68 to 67.48	9.47	36.00	61.00	68.00	74.00	88.00
Females total		1883	66.91	66.76 to 67.05	10.49	16.00	60.00	68.00	75.00	94.00
Males										
	Uncemented	471	60.91	60.62 to 61.20	10.49	21.00	55.00	62.00	68.00	87.00
	Cemented	343	70.72	70.42 to 71.02	8.14	45.00	66.00	72.00	76.00	95.00
	Hybrids	185	67.79	67.33 to 68.25	10.11	18.00	62.00	69.00	75.00	86.00
	Reverse hybrids	162	67.41	66.96 to 67.85	8.33	42.00	63.00	70.00	73.00	82.00
Males total		1312	65.70	65.53 to 65.88	10.46	18.00	59.00	67.00	73.00	95.00
Whole database										
	Uncemented	990	60.97	60.77 to 61.18	10.70	16.00	55.00	62.00	68.00	89.00
	Cemented	1037	70.95	70.78 to 71.13	8.30	33.00	66.00	72.00	76.00	95.00
	Hybrids	434	67.55	67.25 to 67.84	9.62	18.00	62.00	69.00	74.00	94.00
	Reverse hybrids	392	67.22	66.92 to 67.51	9.01	36.00	61.75	68.00	74.00	88.00
Whole database total		3195	66.41	66.30 to 66.53	10.50	16.00	60.00	68.00	74.00	95.00

Tab. 91 Characteristics of revision THA (acetabular and femoral components)

Component type		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Acetabular total		2857	155	5.43	4.59 to 6.26	8.44	8.36 to 8.52
	Uncemented	1426	71	4.98	3.85 to 6.11	8.47	8.36 to 8.59
	Cemented	1431	84	5.87	4.65 to 7.09	8.41	8.30 to 8.53
Femoral total		2877	165	5.74	4.89 to 6.58	8.41	8.33 to 8.50
	Uncemented	1393	61	4.38	3.30 to 5.45	8.52	8.42 to 8.63
	Cemented	1484	104	7.01	5.71 to 8.31	8.32	8.20 to 8.44
Whole database total		5734	320	5.58	4.99 to 6.17	8.43	8.37 to 8.49

Table 91 presents re-revision of components in 320 failures from 5,734 revision components. Revision of cemented femoral components has the highest RR at 7.01 %, in contrast to uncemented revision femoral components with the lowest RR – 4.38 %. Chart 88 shows the cumulative risks of failure and compares acetabular and femoral components. Chart 89 presents the cumulative risks of revision according to the component and the type of fixation. Charts 90–91 show cumulative risks of component in interaction with gender.

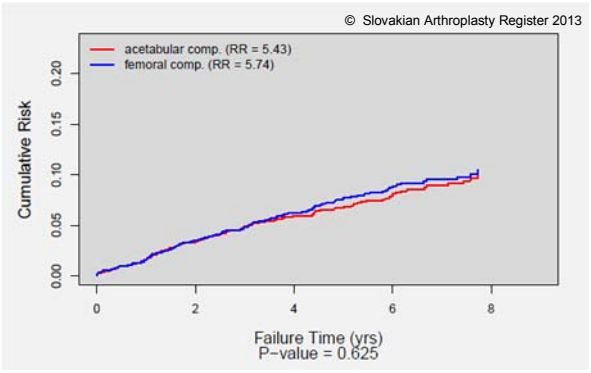

Chart 88 Cumulative risk of revision THA (component type)

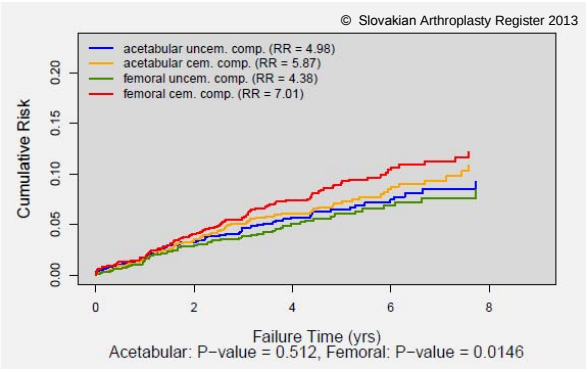

Chart 89 Cumulative risk of revision THA (interaction of component type and fixation)

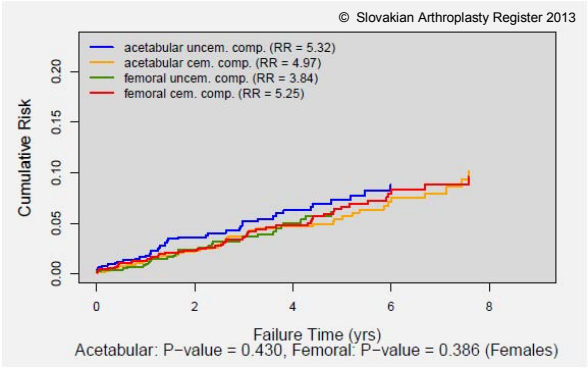

Chart 90 Cumulative risk of revision THA (females; interaction of component type and fixation)

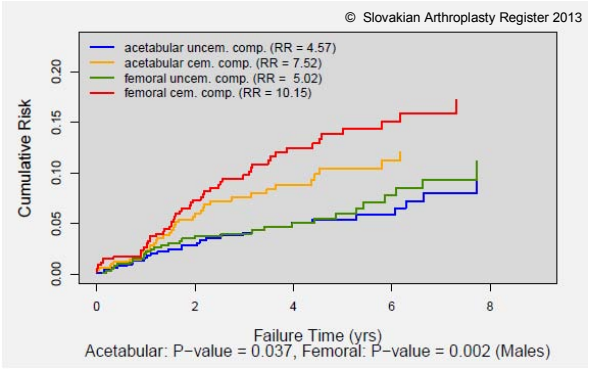

Chart 91 Cumulative risk of revision THA (males; interaction of component type and fixation)

Table 92 presents the cumulative RR of revision THA according to the component type and fixation method. Table 93 and 94 show these characteristics for females and males. The highest cumulative RR was observed in the male database for cemented femoral components – 10.15 % and the lowest was observed in female database for uncemented femoral stems with 3.84 %.

Tab. 92 Cumulative characteristics of revision THA (acetabular and femoral components)

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Component type		2003	2004	2005	2006	2007	2008	2009	2010	2011
Acetabular										
Uncemented	Total number	126	270	388	534	704	848	1015	1220	1426
	No. of failures	0	2	9	17	34	46	55	63	71
	RR	**0.00**	**0.74**	**2.32**	**3.18**	**4.83**	**5.42**	**5.42**	**5.16**	**4.98**
Cemented	Total number	162	330	462	620	771	937	1110	1286	1431
	No. of failures	1	7	13	21	28	33	46	72	84
	RR	**0.62**	**2.12**	**2.81**	**3.39**	**3.63**	**3.52**	**4.14**	**5.60**	**5.87**
Femoral										
Uncemented	Total number	114	251	363	485	655	814	1003	1200	1393
	Nr. of failures	0	2	5	10	29	36	44	55	61
	RR	**0.00**	**0.80**	**1.38**	**2.06**	**4.43**	**4.42**	**4.39**	**4.58**	**4.38**
Cemented	Total number	177	353	498	683	836	988	1140	1326	1484
	Nr. of failures	2	8	18	26	34	46	69	92	104
	RR	**1.13**	**2.27**	**3.61**	**3.81**	**4.07**	**4.66**	**6.05**	**6.94**	**7.01**

Tab. 93 Cumulative characteristics of revision THA (females; acetabular and femoral components)

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Component type		2003	2004	2005	2006	2007	2008	2009	2010	2011
Acetabular										
Uncemented	Total number	62	136	196	275	374	457	544	660	770
	Nr. of failures	0	1	6	9	20	26	32	35	41
	RR	**0.00**	**0.74**	**3.06**	**3.27**	**5.35**	**5.69**	**5.88**	**5.30**	**5.32**
Cemented	Total number	106	211	299	404	504	614	727	843	926
	Nr. of failures	0	2	5	9	12	14	19	38	46
	RR	**0.00**	**0.95**	**1.67**	**2.23**	**2.38**	**2.28**	**2.61**	**4.51**	**4.97**
Femoral										
Uncemented	Total number	55	129	191	252	349	439	541	653	755
	Nr. of failures	0	1	3	5	16	20	23	25	29
	RR	**0.00**	**0.78**	**1.57**	**1.98**	**4.58**	**4.56**	**4.25**	**3.83**	**3.84**
Cemented	Total number	115	220	312	436	540	644	741	861	952
	Nr. of failures	0	1	5	7	10	16	28	42	50
	RR	**0.00**	**0.45**	**1.60**	**1.61**	**1.85**	**2.48**	**3.78**	**4.88**	**5.25**

Tab. 94 Cumulative characteristics of revision THA (males; acetabular and femoral components)

Component type		2003	2004	2005	2006	2007	2008	2009	2010	2011
Acetabular										
Uncemented	Total number	64	134	192	259	330	391	471	560	656
	Nr. of failures	0	1	3	8	14	20	23	28	30
	RR	**0.00**	**0.75**	**1.56**	**3.09**	**4.24**	**5.12**	**4.88**	**5.00**	**4.57**
Cemented	Total number	56	119	163	216	267	323	383	443	505
	Nr. of failures	1	5	8	12	16	19	27	34	38
	RR	**1.79**	**4.20**	**4.91**	**5.56**	**5.99**	**5.88**	**7.05**	**7.67**	**7.52**
Femoral										
Uncemented	Total number	59	122	172	233	306	375	462	547	638
	Nr. of failures	0	1	2	5	13	16	21	30	32
	RR	**0.00**	**0.82**	**1.16**	**2.15**	**4.25**	**4.27**	**4.55**	**5.48**	**5.02**
Cemented	Total number	62	133	186	247	296	344	399	465	532
	Nr. of failures	2	7	13	19	24	30	41	50	54
	RR	**3.23**	**5.26**	**6.99**	**7.69**	**8.11**	**8.72**	**10.28**	**10.75**	**10.15**

Table 95 show cumulative risk of re-revision THA in one month, three month and yearly intervals and table 96–97 present these characteristics for females and males.

Tab. 95 Characteristics of failure of revision THA until certain time point (acetabular and femoral components)

Component type		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
Acetabular	**Nr. of failures**	9	5	23	36	26	14	7	9	6	4	NA
	Cumulative risk (%)	**0.346**	**0.543**	**1.515**	**3.231**	**4.772**	**5.783**	**6.432**	**7.563**	**8.544**	**9.683**	**NA**
	95% LB	0.118	0.255	1.004	2.412	3.720	4.572	5.114	5.990	6.731	7.416	NA
	95% UB	0.574	0.831	2.025	4.050	5.825	6.995	7.750	9.136	10.357	11.949	NA
Uncemented	**Nr. of failures**	6	3	10	17	12	7	3	3	3	1	NA
	Cumulative risk (%)	**0.464**	**0.704**	**1.572**	**3.229**	**4.745**	**5.829**	**6.416**	**7.227**	**8.281**	**9.008**	**NA**
	95% LB	0.089	0.238	0.835	2.087	3.266	4.106	4.551	5.086	5.752	6.105	NA
	95% UB	0.839	1.170	2.308	4.371	6.224	7.552	8.281	9.369	10.809	11.911	NA
Cemented	**Nr. of failures**	3	2	13	19	14	7	4	6	3	3	NA
	Cumulative risk (%)	**0.229**	**0.384**	**1.457**	**3.224**	**4.790**	**5.733**	**6.440**	**7.859**	**8.769**	**10.268**	**NA**
	95% LB	0.000	0.046	0.753	2.087	3.355	4.100	4.646	5.638	6.254	7.088	NA
	95% UB	0.489	0.723	2.160	4.361	6.224	7.365	8.234	10.079	11.284	13.447	NA
Femoral	**Nr. of failures**	11	5	19	42	22	21	15	9	5	3	NA
	Cumulative risk (%)	**0.420**	**0.615**	**1.416**	**3.416**	**4.705**	**6.209**	**7.591**	**8.720**	**9.536**	**10.441**	**NA**
	95% LB	0.170	0.310	0.929	2.574	3.671	4.942	6.093	7.000	7.629	8.195	NA
	95% UB	0.670	0.920	1.902	4.258	5.738	7.475	9.088	10.441	11.443	12.686	NA
Uncemented	**Nr. of failures**	2	2	9	16	7	8	5	3	2	1	NA
	Cumulative risk (%)	**0.160**	**0.324**	**1.129**	**2.751**	**3.651**	**4.973**	**6.029**	**6.912**	**7.682**	**8.472**	**NA**
	95% LB	0.000	0.006	0.490	1.645	2.319	3.296	4.057	4.655	5.142	5.497	NA
	95% UB	0.383	0.642	1.767	3.857	4.984	6.651	8.002	9.169	10.221	11.447	NA
Cemented	**Nr. of failures**	9	3	10	26	15	13	10	6	3	2	NA
	Cumulative risk (%)	**0.655**	**0.879**	**1.676**	**4.007**	**5.627**	**7.291**	**8.911**	**10.225**	**11.074**	**12.067**	**NA**
	95% LB	0.223	0.376	0.953	2.769	4.094	5.455	6.755	7.754	8.365	8.971	NA
	95% UB	1.087	1.382	2.400	5.246	7.161	9.128	11.067	12.695	13.783	15.162	NA

Tab. 96 Characteristics of failure of revision THA until certain time point (females; acetabular and femoral components)

Component type		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
Acetabular	Nr. of failures	5	4	11	19	17	9	4	7	2	3	NA
	Cumulative risk (%)	**0.321**	**0.583**	**1.351**	**2.829**	**4.485**	**5.532**	**6.140**	**7.580**	**8.125**	**9.445**	**NA**
	95% LB	0.038	0.198	0.737	1.878	3.200	4.045	4.524	5.536	5.913	6.653	NA
	95% UB	0.604	0.969	1.966	3.780	5.770	7.019	7.757	9.624	10.338	12.236	NA
Uncemented	Nr. of failures	5	2	3	12	7	4	2	2	NA	NA	NA
	Cumulative risk (%)	**0.715**	**1.011**	**1.485**	**3.619**	**5.279**	**6.433**	**7.173**	**8.267**	**NA**	**NA**	**NA**
	95% LB	0.080	0.251	0.540	1.990	3.190	4.024	4.531	5.135	NA	NA	NA
	95% UB	1.349	1.770	2.431	5.248	7.367	8.841	9.816	11.398	NA	NA	NA
Cemented	Nr. of failures	0	2	8	7	10	5	2	5	2	3	NA
	Cumulative risk (%)	**0.000**	**0.236**	**1.234**	**2.203**	**3.856**	**4.828**	**5.347**	**7.030**	**7.927**	**NA**	**NA**
	95% LB	0.000	0.000	0.437	1.098	2.313	3.016	3.384	4.414	4.966	6.003	NA
	95% UB	0.000	0.566	2.030	3.307	5.400	6.640	7.311	9.646	10.887	14.242	NA
Femoral	Nr. of failures	6	2	8	17	14	11	10	4	2	1	NA
	Cumulative risk (%)	**0.382**	**0.513**	**1.066**	**2.375**	**3.703**	**4.964**	**6.438**	**7.273**	**7.811**	**8.300**	**NA**
	95% LB	0.074	0.154	0.527	1.509	2.547	3.549	4.672	5.287	5.656	5.941	NA
	95% UB	0.690	0.871	1.605	3.241	4.859	6.379	8.205	9.258	9.966	10.659	NA
Uncemented	Nr. of failures	2	1	2	9	6	5	3	NA	NA	NA	NA
	Cumulative risk (%)	**0.291**	**0.439**	**0.767**	**2.399**	**3.789**	**5.296**	**6.415**	**NA**	**NA**	**NA**	**NA**
	95% LB	0.000	0.000	0.085	1.066	1.966	2.996	3.701	NA	NA	NA	NA
	95% UB	0.695	0.935	1.448	3.731	5.611	7.596	9.129	NA	NA	NA	NA
Cemented	Nr. of failures	4	1	6	8	8	6	7	4	2	1	NA
	Cumulative risk (%)	**0.453**	**0.570**	**1.295**	**2.365**	**3.652**	**4.764**	**6.436**	**7.762**	**8.628**	**9.419**	**NA**
	95% LB	0.006	0.068	0.515	1.247	2.173	2.998	4.182	5.075	5.624	6.038	NA
	95% UB	0.900	1.073	2.075	3.483	5.130	6.530	8.689	10.448	11.633	12.800	NA

Tab. 97 Characteristics of failure of revision THA until certain time point (males; acetabular and femoral components)

Component type		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
Acetabular	Nr. of failures	4	1	12	17	9	5	3	2	4	1	NA
	Cumulative risk (%)	**0.384**	**0.482**	**1.765**	**3.858**	**5.213**	**6.167**	**6.883**	**7.530**	**9.175**	**10.072**	**NA**
	95% LB	0.005	0.057	0.877	2.413	3.449	4.172	4.722	5.163	6.166	6.587	NA
	95% UB	0.762	0.907	2.653	5.304	6.977	8.162	9.044	9.897	12.185	13.557	NA
Uncemented	Nr. of failures	1	1	7	5	5	3	1	1	3	1	NA
	Cumulative risk (%)	**0.168**	**0.342**	**1.674**	**2.762**	**4.101**	**5.111**	**5.522**	**6.050**	**8.203**	**9.730**	**NA**
	95% LB	0.000	0.000	0.520	1.212	2.059	2.714	2.993	3.317	4.312	4.821	NA
	95% UB	0.499	0.816	2.829	4.313	6.144	7.509	8.051	8.782	12.095	14.640	NA
Cemented	Nr. of failures	3	3	5	12	4	2	2	1	1	NA	NA
	Cumulative risk (%)	**0.666**	**0.666**	**1.881**	**5.281**	**6.656**	**7.544**	**8.671**	**9.501**	**10.431**	**NA**	**NA**
	95% LB	0.000	0.000	0.317	2.554	3.559	4.183	4.951	5.441	5.981	NA	NA
	95% UB	1.423	1.736	3.445	8.007	9.753	10.906	12.391	13.561	14.882	NA	NA
Femoral	Nr. of failures	5	3	11	25	8	10	5	5	3	2	NA
	Cumulative risk (%)	**0.476**	**0.768**	**1.952**	**5.050**	**6.276**	**8.185**	**9.421**	**11.029**	**12.287**	**13.881**	**NA**
	95% LB	0.057	0.234	1.038	3.385	4.355	5.847	6.807	7.965	8.828	9.545	NA
	95% UB	0.895	1.302	2.866	6.714	8.197	10.523	12.036	14.092	15.745	18.217	NA
Uncemented	Nr. of failures	0	1	7	7	1	3	2	3	2	1	NA
	Cumulative risk (%)	**0.000**	**0.183**	**1.578**	**3.191**	**3.482**	**4.580**	**5.556**	**7.490**	**9.198**	**10.938**	**NA**
	95% LB	0.000	0.000	0.419	1.423	1.624	2.264	2.835	3.851	4.731	5.319	NA
	95% UB	0.000	0.541	2.737	4.958	5.339	6.896	8.277	11.129	13.665	16.557	NA
Cemented	Nr. of failures	5	2	4	18	7	7	3	2	1	1	NA
	Cumulative risk (%)	**1.019**	**1.436**	**2.381**	**7.214**	**9.524**	**12.355**	**13.872**	**15.165**	**15.962**	**17.380**	**NA**
	95% LB	0.119	0.364	0.941	4.236	5.974	8.108	9.274	10.135	10.695	11.425	NA
	95% UB	1.920	2.508	3.820	10.193	13.074	16.602	18.471	20.195	21.229	23.336	NA

Tab. 98 Characteristics of revision THA (cementing techniques of femoral components)

Cem. technique		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
	1st generation	342	29	8.48	5.53 to 11.43	8.27	8.03 to 8.51
	2nd generation	540	42	7.78	5.52 to 10.04	8.14	7.92 to 8.36
	3rd generation	226	9	3.98	1.43 to 6.53	8.34	8.08 to 8.61
Fem. component cemented		1484	104	7.01	5.71 to 8.31	8.32	8.20 to 8.44

Table 98 presents the results of 1,484 cemented revision femoral components in interaction with type of cementing techniques used. The best results with RR of 3.98 % were achieved with 3rd generation cementing techniques. RR of 1st and 2nd generation techniques are similar – 8.48 % and 7.78 % respectively. Charts 92–94 show the results of cemented revision femoral components in total, for females and males.

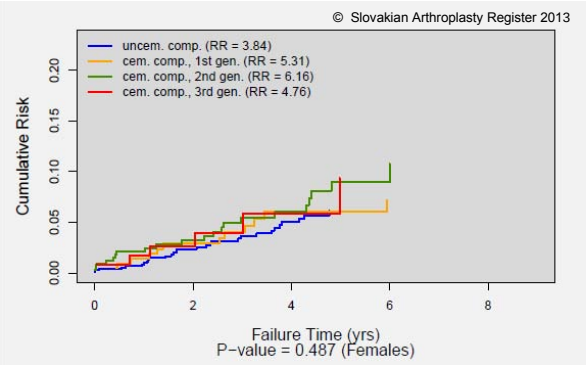

Chart 93 Cumulative risk of revision THA (females; cementing techniques of femoral components)

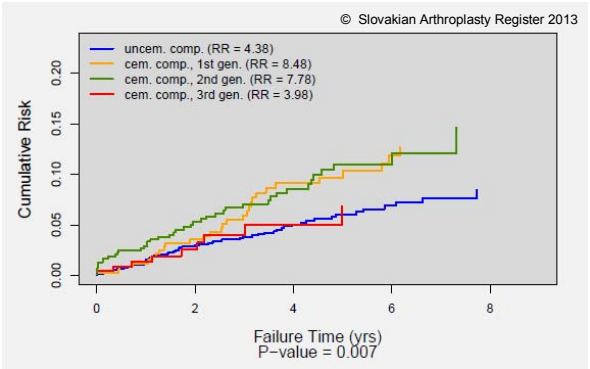

Chart 92 Cumulative risk of revision THA (cementing techniques of femoral components)

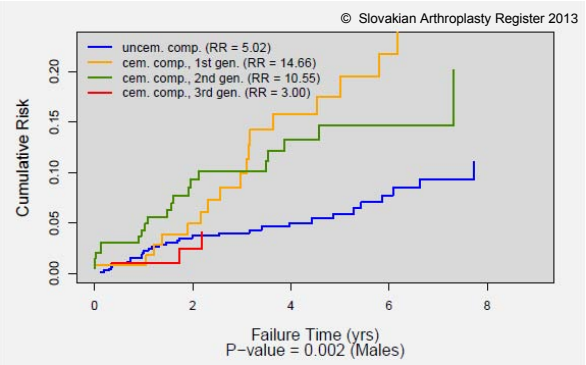

Chart 94 Cumulative risk of revision THA (males; cementing techniques of femoral components)

Tab. 99 Cumulative characteristics of revision THA (cementing techniques of femoral components)

Cementing technique		2003	2004	2005	2006	2007	2008	2009	2010	2011
1st generation	Total number	79	135	160	195	230	256	292	321	342
	Nr. of failures	1	3	5	8	10	14	19	26	29
	RR	**1.27**	**2.22**	**3.12**	**4.10**	**4.35**	**5.47**	**6.51**	**8.10**	**8.48**
2nd generation	Total number	22	66	121	211	280	356	403	480	540
	Nr. of failures	0	3	7	10	14	19	26	37	42
	RR	**0.00**	**4.55**	**5.79**	**4.74**	**5.00**	**5.34**	**6.45**	**7.71**	**7.78**
3rd generation	Total number	1	9	28	63	84	108	149	196	226
	Nr. of failures	0	0	0	1	3	4	8	8	9
	RR	**0.00**	**0.00**	**0.00**	**1.59**	**3.57**	**3.70**	**5.37**	**4.08**	**3.98**

Cumulative RR of cemented revision stems are shown in table 99. The third generation cementing techniques compare favourably with 2nd and 1st generations. Tables 100–101 present these characteristics for females and males. Tables 102–104 show the cumulative risks of re-revision THA until certain time points.

Tab. 100 Cumulative characteristics of revision THA (females; cementing techniques of femoral components)

Cementing technique		2003	2004	2005	2006	2007	2008	2009	2010	2011
1st generation	Total number	46	84	97	125	150	172	195	214	226
	Nr. of failures	0	1	2	2	2	4	7	11	12
	RR	**0.00**	**1.19**	**2.06**	**1.60**	**1.33**	**2.33**	**3.59**	**5.14**	**5.31**
2nd generation	Total number	11	32	68	124	172	229	258	307	341
	Nr. of failures	0	0	2	3	5	8	11	17	21
	RR	**0.00**	**0.00**	**2.94**	**2.42**	**2.91**	**3.49**	**4.26**	**5.54**	**6.16**
3rd generation	Total number	1	5	15	33	44	57	82	110	126
	Nr. of failures	0	0	0	1	2	2	5	5	6
	RR	**0.00**	**0.00**	**0.00**	**3.03**	**4.55**	**3.51**	**6.10**	**4.55**	**4.76**

Tab. 101 Cumulative characteristics of revision THA (males; cementing techniques of femoral components)

Cementing technique		2003	2004	2005	2006	2007	2008	2009	2010	2011
1st generation	Total number	33	51	63	70	80	84	97	107	116
	Nr. of failures	1	2	3	6	8	10	12	15	17
	RR	**3.03**	**3.92**	**4.76**	**8.57**	**10.00**	**11.90**	**12.37**	**14.02**	**14.66**
2nd generation	Total number	11	34	53	87	108	127	145	173	199
	Nr. of failures	0	3	5	7	9	11	15	20	21
	RR	**0.00**	**8.82**	**9.43**	**8.05**	**8.33**	**8.66**	**10.34**	**11.56**	**10.55**
3rd generation	Total number	0	4	13	30	40	51	67	86	100
	Nr. of failures	0	0	0	0	1	2	3	3	3
	RR	**NA**	**0.00**	**0.00**	**0.00**	**2.50**	**3.92**	**4.48**	**3.49**	**3.00**

Tab. 102 Characteristics of failure of revision THA until certain time point (cementing technique of femoral components)

Cementing technique		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
1st generation	**Nr. of failures**	1	1	3	7	5	7	1	3	1	NA	NA
	Cumulative risk (%)	**0.310**	**0.310**	**1.290**	**3.772**	**5.829**	**9.121**	**9.694**	**11.906**	**12.736**	**NA**	**NA**
	95% LB	0.000	0.000	0.000	1.323	2.691	5.020	5.442	6.855	7.430	NA	NA
	95% UB	0.918	1.170	2.707	6.222	8.967	13.221	13.945	16.957	18.042	NA	NA
2nd generation	**Nr. of failures**	7	2	4	9	6	4	5	5	1	NA	NA
	Cumulative risk (%)	**1.388**	**1.799**	**2.687**	**4.921**	**6.770**	**8.351**	**10.847**	**10.847**	**11.952**	**NA**	**NA**
	95% LB	0.346	0.609	1.194	2.703	4.041	5.156	6.801	6.100	6.734	NA	NA
	95% UB	2.430	2.990	4.180	7.139	9.499	11.545	14.894	15.595	17.171	NA	NA
3rd generation	**Nr. of failures**	1	1	2	2	2	2	1	NA	NA	NA	NA
	Cumulative risk (%)	**0.494**	**0.494**	**1.548**	**2.881**	**4.488**	**4.488**	**6.323**	**NA**	**NA**	**NA**	**NA**
	95% LB	0.000	0.000	0.000	0.000	0.805	0.150	0.688	NA	NA	NA	NA
	95% UB	1.462	1.863	3.589	5.766	8.172	8.826	11.958	NA	NA	NA	NA

Tab. 103 Characteristics of failure of revision THA until certain time point (females; cementing technique of femoral components)

Cementing technique		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
1st generation	**Nr. of failures**	0	0	3	3	2	3	3	1	NA	NA	NA
	Cumulative risk (%)	**0.000**	**0.000**	**1.446**	**2.986**	**4.170**	**6.184**	**6.184**	**7.367**	**NA**	**NA**	**NA**
	95% LB	0.000	0.000	0.000	0.538	1.212	2.375	1.682	2.303	NA	NA	NA
	95% UB	0.000	0.000	3.114	5.434	7.127	9.992	10.685	12.431	NA	NA	NA
2nd generation	**Nr. of failures**	3	1	2	3	5	1	4	4	1	NA	NA
	Cumulative risk (%)	**0.931**	**1.253**	**1.913**	**3.018**	**5.329**	**5.930**	**8.919**	**8.919**	**10.788**	**NA**	**NA**
	95% LB	0.000	0.017	0.374	0.981	2.357	2.733	4.245	3.134	3.941	NA	NA
	95% UB	1.994	2.489	3.453	5.055	8.301	9.127	13.592	14.704	17.635	NA	NA
3rd generation	**Nr. of failures**	1	1	1	1	1	NA	NA	NA	NA	NA	NA
	Cumulative risk (%)	**0.897**	**0.897**	**1.902**	**2.995**	**4.434**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
	95% LB	0.000	0.000	0.000	0.000	0.000	NA	NA	NA	NA	NA	NA
	95% UB	2.655	3.383	5.074	6.822	9.188	NA	NA	NA	NA	NA	NA

Tab. 104 Characteristics of failure of revision THA until certain time point (males; cementing technique of femoral components)

Cementing technique		1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr	7 yr	8 yr	9 yr
1st generation	Nr. of failures	1	1	1	4	3	4	1	2	1	NA	NA
	Cumulative risk (%)	**0.957**	**0.957**	**0.957**	**5.474**	**9.505**	**15.712**	**17.581**	**22.096**	**24.565**	**NA**	**NA**
	95% LB	0.000	0.000	0.000	0.000	1.755	5.573	6.800	9.370	10.950	NA	NA
	95% UB	2.833	3.609	4.206	11.303	17.254	25.850	28.361	34.822	38.180	NA	NA
2nd generation	Nr. of failures	4	1	2	6	1	3	1	NA	NA	NA	NA
	Cumulative risk (%)	**2.198**	**2.771**	**4.109**	**8.661**	**9.550**	**13.037**	**14.541**	**NA**	**NA**	**NA**	**NA**
	95% LB	0.008	0.310	1.016	3.405	4.013	6.076	6.982	NA	NA	NA	NA
	95% UB	4.388	5.232	7.202	13.918	15.088	19.998	22.100	NA	NA	NA	NA
3nd generation	Nr. of failures	0	0	1	1	1	NA	NA	NA	NA	NA	NA
	Cumulative risk (%)	**0.000**	**0.000**	**1.130**	**2.756**	**4.591**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
	95% LB	0.000	0.000	0.000	0.000	0.000	NA	NA	NA	NA	NA	NA
	95% UB	0.000	0.000	3.345	6.637	9.882	NA	NA	NA	NA	NA	NA

Revision components and their combinations

Tab. 105 Characteristics of revision THA (acetabular, uncemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
DURALOC	289	15	5.19	2.63 to 7.75	8.54	8.32 to 8.75
OCTOPUS	104	7	6.73	1.92 to 11.55	8.43	8.07 to 8.80
PINNACLE	92	2	2.17	0.00 to 5.15	5.20	5.03 to 5.37
CLS SPOTORNO	83	3	3.61	0.00 to 7.63	5.34	5.09 to 5.59
NOVAE EVOLUTION	72	3	4.17	0.00 to 8.78	7.80	7.44 to 8.17
TRILOGY	63	4	6.35	0.33 to 12.37	8.36	7.90 to 8.82
DELTA - TT	52	0	0.00	NA	1.91	NA
ZWEYMULLER-ALLOCLASSIC CSF	51	4	7.84	0.46 to 15.22	5.90	5.48 to 6.32
COPTOS	48	0	0.00	NA	6.88	NA
BEZNOSKA (uncem)	46	5	10.87	1.87 to 19.86	7.39	6.40 to 8.39
SF	37	0	0.00	NA	5.59	NA
L-CUP	29	0	0.00	NA	8.93	NA
PLASMACUP	28	0	0.00	NA	7.68	NA
WM oval	26	0	0.00	NA	4.61	NA
DELTA - PF	14	1	7.14	0.00 to 20.63	1.58	1.46 to 1.71
M-H-shell	14	0	0.00	NA	5.69	NA
TC - revision	13	0	0.00	NA	4.35	NA
DELTA	10	0	0.00	NA	3.16	NA
DELTA - FINS	7	0	0.00	NA	2.76	NA
BS - revision	7	0	0.00	NA	6.95	NA
WM conical	6	2	33.33	0.00 to 71.05	5.85	9.00 to 9.20
BICON-PLUS	6	1	16.67	0.00 to 46.49	8.02	9.00 to 9.61
RSC - revision	5	0	0.00	NA	3.75	NA
ULTIMA UTC	5	0	0.00	NA	5.28	NA
RINGLOC - HIGH WALL	3	0	0.00	NA	4.71	NA
T.O.P.	3	0	0.00	NA	2.13	NA
ASR	3	0	0.00	NA	5.68	NA
ACETABULAR PLATES	2	0	0.00	NA	1.10	NA
ANA.NOVA	2	0	0.00	NA	2.04	NA
COPTOS TH	1	0	0.00	NA	0.16	NA
TRIDENT HEMISPHERICAL SOLID	1	0	0.00	NA	0.08	NA
WM sferical	1	0	0.00	NA	1.90	NA
BEZNOSKA revision	1	0	0.00	NA	4.82	NA
CENTRAMENT	1	0	0.00	NA	7.47	NA
Y-AXIS II	1	0	0.00	NA	8.54	NA
DURALOC OPTION	1	0	0.00	NA	5.64	NA
Uncemented	**1298**	**65**	**5.01**	**3.82 to 6.19**	**8.48**	**8.36 to 8.60**
All acetabular	**2610**	**139**	**5.33**	**4.46 to 6.19**	**8.46**	**8.38 to 8.54**
Whole database total	**5239**	**291**	**5.55**	**4.93 to 6.17**	**8.44**	**8.38 to 8.50**

During the observed period 2003–2011 we have registered 1,298 UACs used in revision. DURALOC acetabular component was used in 22.26 % of all uncemented revision cases, with RR of 5.19 % and mean survival time 8.54 years. Table 105 shows the results of UACs.

Tab. 106 Characteristics of revision THA (acetabular, cemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
BEZNOSKA (cem)	714	60	8.40	6.37 to 10.44	8.20	8.02 to 8.38
O2	123	3	2.44	0.00 to 5.17	3.98	3.81 to 4.14
CHARNLEY	110	8	7.27	2.42 to 12.13	8.14	7.72 to 8.56
MULLER	110	1	0.91	0.00 to 2.68	8.86	9.00 to 9.01
ULTIMA MK2	90	0	0.00	NA	8.97	NA
PE-CUP	68	0	0.00	NA	8.56	NA
ELITE PLUS	58	3	5.17	0.00 to 10.87	8.40	7.89 to 8.92
LUBINUS CLASSIC PLUS	39	4	10.26	0.73 to 19.78	8.08	7.33 to 8.84
BURCH-SCHNEIDER CAGE	16	0	0.00	NA	5.69	NA
EXETER Contemporary Cup	13	0	0.00	NA	3.88	NA
MUELLER	12	0	0.00	NA	2.70	NA
MULLER LOW PROFILE	9	0	0.00	NA	6.60	NA
ZCA	6	0	0.00	NA	8.53	NA
ZWEYMÜLLER-ALLOCLASSIC	5	0	0.00	NA	7.30	NA
TRILOC	1	0	0.00	NA	0.08	NA
EXETER Duration Cup	1	0	0.00	NA	1.26	NA
SF/A	1	0	0.00	NA	5.53	NA
Cemented	**1312**	**74**	**5.64**	**4.39 to 6.89**	**8.45**	**8.33 to 8.56**
All acetabular	**2610**	**139**	**5.33**	**4.46 to 6.19**	**8.46**	**8.38 to 8.54**
Whole database total	**5239**	**291**	**5.55**	**4.93 to 6.17**	**8.44**	**8.38 to 8.50**

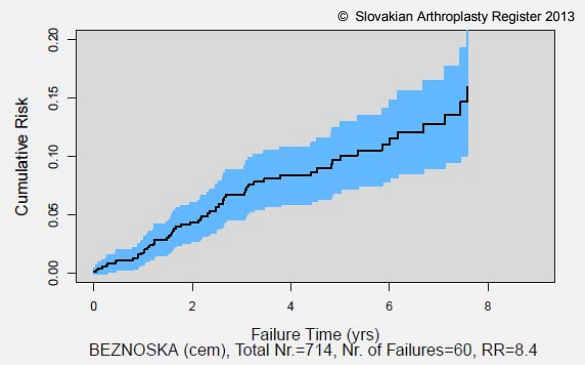

Chart 95 Cumulative risk of revision THA, acetabular component BEZNOSKA (cem)

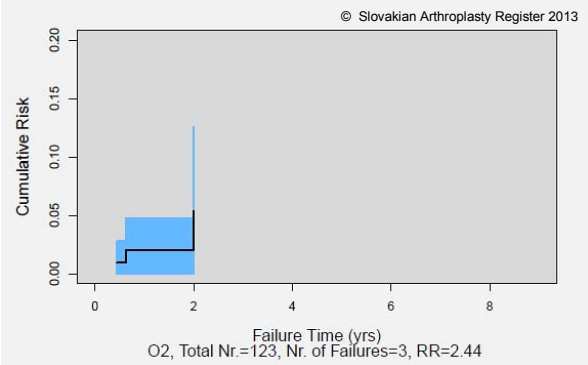

Chart 97 Cumulative risk of revision THA, acetabular component O2

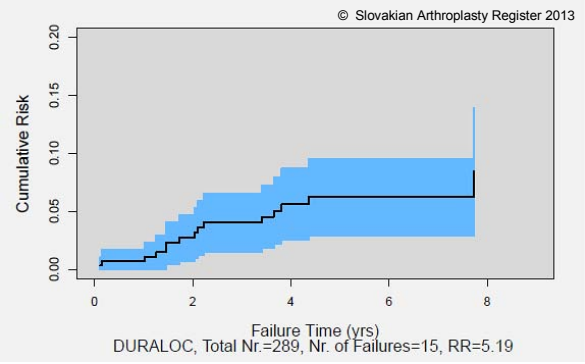

Chart 96 Cumulative risk of revision THA, acetabular component DURALOC

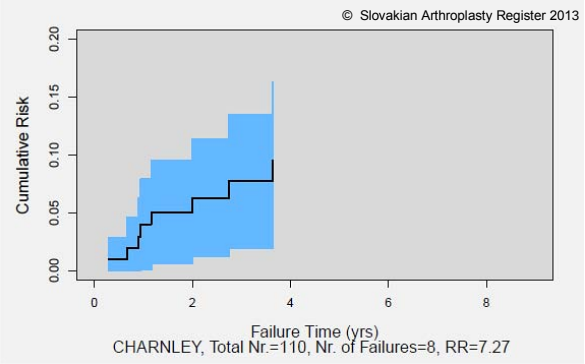

Chart 98 Cumulative risk of revision THA, acetabular component CHARNLEY

Table 106 shows 17 CACs used in revisions. The most-used cemented cup was BEZNOSKA (cem) with 54.42 % of all applications and with RR of 8.40 %. Charts 95–98 show cumulative risks of revision of the four most-used ACs in revision surgery, regardless of the type of fixation.

Tab. 107 Characteristics of revision THA (femoral, uncemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
SOLUTION	230	9	3.91	1.41 to 6.42	8.59	8.36 to 8.81
ZMR	135	4	2.96	0.10 to 5.82	8.52	8.23 to 8.82
S-ROM	132	1	0.76	0.00 to 2.24	8.78	8.65 to 8.91
MP	106	7	6.60	1.88 to 11.33	8.47	8.11 to 8.83
REVISION	101	1	0.99	0.00 to 2.92	3.45	3.37 to 3.53
AML	92	4	4.35	0.18 to 8.51	8.58	8.23 to 8.93
RMD revision	87	1	1.15	0.00 to 3.39	5.46	5.31 to 5.62
SAGITA EVOLUTION HA	58	2	3.45	0.00 to 8.14	7.57	7.13 to 8.01
SF	49	1	2.04	0.00 to 6.00	8.7	9.00 to 9.04
ZWEYMULLER-ALLOCLASICS SL	43	2	4.65	0.00 to 10.95	6.48	6.00 to 6.96
BICONTACT	38	0	0.00	NA	6.61	NA
CORAIL	33	2	6.06	0.00 to 14.20	5.95	5.44 to 6.47
BIMETRIC (uncem)	28	1	3.57	0.00 to 10.45	8.53	9.00 to 9.07
WM HA	22	1	4.55	0.00 to 13.25	8.26	7.54 to 8.98
SF - revizny	20	0	0.00	NA	5.32	NA
VERSYS	15	1	6.67	0.00 to 19.29	7.37	6.50 to 8.24
CLS SPOTORNO	9	0	0.00	NA	4.34	NA
VERSYS FMMC	9	1	11.11	0.00 to 31.64	4.04	3.70 to 4.37
SL-PLUS	9	1	11.11	0.00 to 31.64	7.87	9.00 to 9.61
LIBRA HA	7	1	14.29	0.00 to 40.21	2.55	1.68 to 3.42
LOGICA (uncem)	6	0	0.00	NA	2.85	NA
VERSYS FMT	5	1	20.00	0.00 to 55.06	3.97	3.76 to 4.17
REEF	3	0	0.00	NA	0.66	NA
SAM - FIT	3	0	0.00	NA	1.03	NA
PROXIMA	3	0	0.00	NA	2.14	NA
ASR	2	0	0.00	NA	5.64	NA
SAGITTA EVL R	1	0	0.00	NA	5.08	NA
TRI-LOCK BPS	1	0	0.00	NA	0.51	NA
TRIO modular (uncem)	1	0	0.00	NA	0.55	NA
TRIO (uncem)	1	0	0.00	NA	0.18	NA
MODULUS	1	0	0.00	NA	1.32	NA
SL (uncem)	1	0	0.00	NA	2.14	NA
C.F.P.	1	0	0.00	NA	6.93	NA
Uncemented	**1249**	**55**	**4.40**	**3.27 to 5.54**	**8.53**	**8.42 to 8.64**
All femoral	**2629**	**152**	**5.78**	**4.89 to 6.67**	**8.42**	**8.34 to 8.50**
Whole database total	**5239**	**291**	**5.55**	**4.93 to 6.17**	**8.44**	**8.38 to 8.50**

Table 107 show 33 UFSs used in revision surgery. We have records of 1,249 such stems. Five of them have reached more than 100 applications, with a 56.36 % share. Seventeen of them have less than ten implantations during the observed period. Table 108 shows results of 27 CFSs Only the BEZNOSKA cemented stem has reached more than 100 implantations and has 60.50 % share, with a RR of 7.90 %. Fourteen stems were implanted less than ten each, with a total 3.55 % share. The RR of this whole database reached 5.55 %. Charts 99–102 show cumulative risks of revision of the four most-used stems, regardless of the type of fixation.

Tab. 108 Characteristics of revision THA (femoral, cemented components)

Component name	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
BEZNOSKA	835	66	7.90	6.07 to 9.73	8.27	8.11 to 8.43
CHARNLEY	80	7	8.75	2.56 to 14.94	8.07	7.58 to 8.55
ELITE PLUS	78	6	7.69	1.78 to 13.61	8.22	7.71 to 8.73
BIMETRIC (cem)	72	2	2.78	0.00 to 6.57	8.41	8.08 to 8.75
CSC	59	2	3.39	0.00 to 8.01	6.41	6.06 to 6.76
CENTRAMENT	52	1	1.92	0.00 to 5.66	7.26	7.01 to 7.51
SAGITA EVOLUTION	52	0	0.00	NA	8.14	NA
EXETER V40	24	0	0.00	NA	7.98	NA
BEZNOSKA - custom-made, tumor.	24	2	8.33	0.00 to 19.39	6.86	5.96 to 7.76
C-STEM	20	1	5.00	0.00 to 14.55	5.67	5.16 to 6.18
LUBINUS CLASSIC PLUS	17	6	35.29	12.58 to 58.01	6.89	5.50 to 8.29
CPT	14	0	0.00	NA	6.95	NA
BEZNOSKA hemiarthropl.	13	0	0.00	NA	6.97	NA
LOGICA (cem)	8	0	0.00	NA	2.85	NA
TRILLIANCE	7	0	0.00	NA	1.99	NA
MULLER GERADSCHAFT	5	2	40.00	0.00 to 82.94	5.15	4.10 to 6.20
CHARNLEY MODULAR	5	1	20.00	0.00 to 55.06	2.73	0.88 to 4.57
ULTIMA-STREIGHT STEM	5	0	0.00	NA	8.46	NA
SL (cem)	4	0	0.00	NA	2.17	NA
C-STEM AMT	3	0	0.00	NA	0.62	NA
ULTIMA-HOWSE II	3	1	33.33	0.00 to 86.68	6.50	4.79 to 8.21
CORAIL (cem)	2	0	0.00	NA	0.81	NA
FJORD	2	0	0.00	NA	1.88	NA
CSC hemiarthropl.	2	0	0.00	NA	3.70	NA
LIBRA	1	0	0.00	NA	0.63	NA
ENDO-MODELL saddle	1	0	0.00	NA	5.07	NA
AUSTIN-MOORE hemiarthropl.	1	0	0.00	NA	6.85	NA
Cemented	**1380**	**97**	**7.03**	**5.68 to 8.38**	**8.32**	**8.20 to 8.45**
All femoral	**2629**	**152**	**5.78**	**4.89 to 6.67**	**8.42**	**8.34 to 8.50**
Whole database total	**5239**	**291**	**5.55**	**4.93 to 6.17**	**8.44**	**8.38 to 8.50**

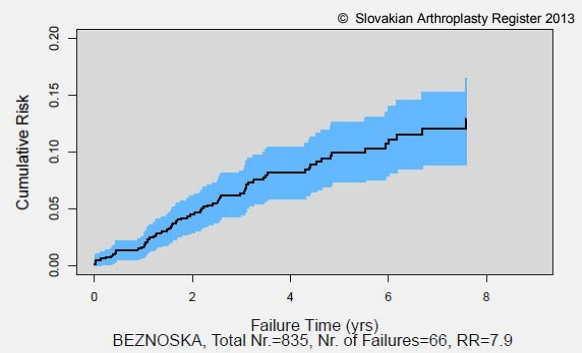

Chart 99 Cumulative risk of revision THA, femoral component BEZNOSKA

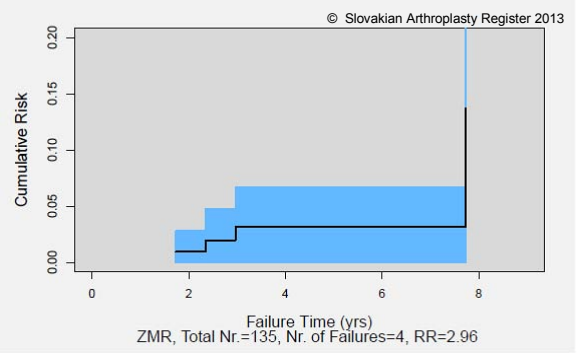

Chart 101 Cumulative risk of revision THA, femoral component ZMR

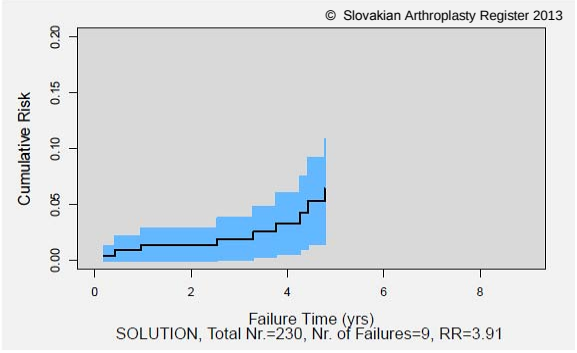

Chart 100 Cumulative risk of revision THA, femoral component SOLUTION

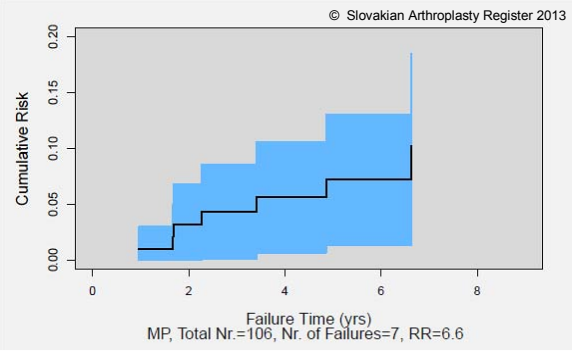

Chart 102 Cumulative risk of revision THA, femoral component MP

Tables 109–112 show the results of component combinations. Table 109 shows 38 combinations of uncemented components. Only the combination DURALOC/SOLUTION reached more than 50 implantations during observed time period, with a 13.43 % share. Table 110 shows 20 combinations of cemented components. BEZNOSKA (cem)/BEZNOSKA reached 467 implantations, with a 53.0 % share. Table 111 shows 15 hybrid combinations and table 112 shows 20 reverse hybrid combinations.

Tab. 109 Characteristics of revision THA – component combinations (uncemented)

Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Duraloc	Solution	68	2	2.94	0	0.00	2	2.94
Octopus	Solution	34	2	5.88	2	5.88	2	5.88
Duraloc	***MP***	31	5	16.13	1	3.23	4	12.90
Duraloc	AML	29	2	6.90	0	0.00	2	6.90
Coptos	Sagita Evolution HA	25	0	0.00	0	0.00	0	0.00
Novae Evolution	Sagita Evolution HA	23	1	4.35	1	4.35	1	4.35
Delta - TT	Revision	20	0	0.00	0	0.00	0	0.00
Trilogy	ZMR	19	1	5.26	1	5.26	1	5.26
Pinnacle	Solution	17	0	0.00	0	0.00	0	0.00
Duraloc	S-ROM	16	0	0.00	0	0.00	0	0.00
Pinnacle	S-ROM	16	1	6.25	1	6.25	0	0.00
Zweymuller Alloclassic CSF	Zweymuller Alloclassic SL	15	1	6.67	1	6.67	1	6.67
Duraloc	***ZMR***	14	1	7.14	1	7.14	1	7.14
SF	SF	11	0	0.00	0	0.00	0	0.00
Pinnacle	***RMD revision***	10	0	0.00	0	0.00	0	0.00
Pinnacle	AML	10	0	0.00	0	0.00	0	0.00
Zweymuller Alloclassic CSF	ZMR	9	1	11.11	1	11.11	0	0.00
Duraloc	Corail	9	1	11.11	0	0.00	1	11.11
SF	RMD revision	8	0	0.00	0	0.00	0	0.00
WM oval	***RMD revision***	8	0	0.00	0	0.00	0	0.00
Pinnacle	Corail	8	1	12.50	1	12.50	1	12.50
CLS Spotorno	CLS Spotorno	8	0	0.00	0	0.00	0	0.00
Zweymuller Alloclassic CSF	***Solution***	8	1	12.50	1	12.50	0	0.00
Duraloc	***Revision***	8	1	12.50	1	12.50	1	12.50
CLS Spotorno	ZMR	7	1	14.29	1	14.29	1	14.29
Octopus	S-ROM	7	2	28.57	2	28.57	1	14.29
Octopus	AML	7	0	0.00	0	0.00	0	0.00
Novae Evolution	Libra HA	7	1	14.29	1	14.29	1	14.29
Plasmacup	Bicontact	6	0	0.00	0	0.00	0	0.00
L-Cup	***S-ROM***	6	0	0.00	0	0.00	0	0.00
Duraloc	***RMD revision***	6	0	0.00	0	0.00	0	0.00
Delta	Revision	6	0	0.00	0	0.00	0	0.00
CLS Spotorno	***AML***	5	1	20.00	1	20.00	0	0.00
CLS Spotorno	***Solution***	5	0	0.00	0	0.00	0	0.00
WM oval	***Solution***	5	1	20.00	0	0.00	1	20.00
Beznoska (uncem)	SF	5	1	20.00	1	20.00	0	0.00
Trilogy	Versys	5	1	20.00	0	0.00	1	20.00
PF	Revision	5	0	0.00	0	0.00	0	0.00

Tab. 110 Characteristics of revision THA – components combinations (cemented)

Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Beznoska (cem)	Beznoska	467	70	14.99	52	11.13	50	10.71
Charnley	Charnley	57	5	8.77	3	5.26	4	7.02
Ultima MK2	***Beznoska***	55	0	0.00	0	0.00	0	0.00
O2	Beznoska	39	2	5.13	2	5.13	1	2.56
Muller	Bimetric (cem)	39	0	0.00	0	0.00	0	0.00
Muller	***Beznoska***	34	1	2.94	1	2.94	1	2.94
Beznoska (cem)	Revision stem (cem)	22	0	0.00	0	0.00	0	0.00
Beznoska (cem)	CSC	21	1	4.76	1	4.76	1	4.76
O2	CSC	21	0	0.00	0	0.00	0	0.00
PE-Cup	***Beznoska***	21	1	4.76	0	0.00	1	4.76
PE-Cup	Centrament	20	0	0.00	0	0.00	0	0.00
Elite Plus	Elite Plus	17	2	11.76	0	0.00	2	11.76
Beznoska (cem)	Beznoska - custom-made, tumor.	13	2	15.38	2	15.38	0	0.00
Lubinus Classic Plus	Lubinus Classic Plus	11	3	27.27	2	18.18	3	27.27
Exeter Contemporary Cup	Exeter V40	11	0	0.00	0	0.00	0	0.00
Elite Plus	***Beznoska***	9	3	33.33	3	33.33	3	33.33
Beznoska (cem)	***Bimetric (cem)***	8	1	12.50	1	12.50	1	12.50
Beznoska (cem)	***Centrament***	6	1	16.67	1	16.67	0	0.00
Ultima MK2	C-Stem	5	1	20.00	0	0.00	1	20.00
Elite Plus	Charnley	5	0	0.00	0	0.00	0	0.00

Tab. 111 Characteristics of revision THA – components combinations (hybrids)

Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Novae Evolution	Sagita Evolution	31	0	0.00	0	0.00	0	0.00
Duraloc	***Beznoska***	27	6	22.22	5	18.52	3	11.11
CLS Spotorno	***Beznoska***	25	0	0.00	0	0.00	0	0.00
Octopus	***Beznoska***	23	1	4.35	1	4.35	1	4.35
Beznoska (uncem)	Beznoska	20	5	25.00	4	20.00	3	15.00
Zweymuller Alloclassic CSF	***Beznoska***	14	1	7.14	1	7.14	1	7.14
Coptos	Sagita Evolution	13	0	0.00	0	0.00	0	0.00
Duraloc	Charnley	12	3	25.00	1	8.33	3	25.00
SF	Beznoska	10	0	0.00	0	0.00	0	0.00
WM oval	***Beznoska***	8	0	0.00	0	0.00	0	0.00
Pinnacle	Beznoska	8	0	0.00	0	0.00	0	0.00
Plasmacup	Centrament	7	1	14.29	0	0.00	1	14.29
Duraloc	Elite Plus	7	2	28.57	1	14.29	2	28.57
Trilogy	***Beznoska***	6	0	0.00	0	0.00	0	0.00
Plasmacup	***Beznoska***	5	0	0.00	0	0.00	0	0.00

Tab. 112 Characteristics of revision THA – components combinations (reverse hybrids)

Component name		Implants			Acetabular		Femoral	
Acetabular	Femoral	Total number	Nr. of failures	RR	Nr. of failures	RR	Nr. of failures	RR
Lubinus Classic Plus	MP	23	1	4.35	1	4.35	0	0.00
Beznoska (cem)	***ZMR***	21	0	0.00	0	0.00	0	0.00
Beznoska (cem)	***Solution***	20	1	5.00	1	5.00	1	5.00
Muller	***MP***	13	0	0.00	0	0.00	0	0.00
Beznoska (cem)	***S-ROM***	11	0	0.00	0	0.00	0	0.00
Beznoska (cem)	SF	10	0	0.00	0	0.00	0	0.00
Beznoska (cem)	RMD revision	10	1	10.00	1	10.00	0	0.00
Charnley	S-ROM	10	2	20.00	2	20.00	0	0.00
Beznoska (cem)	***AML***	9	1	11.11	1	11.11	0	0.00
Charnley	Solution	9	0	0.00	0	0.00	0	0.00
Beznoska (cem)	***Zweymuller Alloclassic SL***	9	0	0.00	0	0.00	0	0.00
Charnley	***RMD revision***	9	1	11.11	1	11.11	1	11.11
PE-Cup	Bicontact	7	0	0.00	0	0.00	0	0.00
O2	RMD revision	7	0	0.00	0	0.00	0	0.00
Muller	Bimetric (uncem)	7	0	0.00	0	0.00	0	0.00
Charnley	***Revision***	7	0	0.00	0	0.00	0	0.00
Beznoska (cem)	***WM HA***	6	0	0.00	0	0.00	0	0.00
O2	***Bicontact***	6	0	0.00	0	0.00	0	0.00
Beznoska (cem)	SF revision	5	0	0.00	0	0.00	0	0.00
O2	***Revision***	5	0	0.00	0	0.00	0	0.00

Antibiotic prophylaxis in revision THA

Tab. 113 Revision THA – antibiotic prophylaxis in 2011 (brands, numbers)

Brand	Vulmizolin	Edicin	Axetine	Bitamon	Climicin	Ciphin	Unasyn	Cefotaxim	Dalacin	Abactal	Fortun	Oxacilín	Vankomycin	Amoxiklav	Cefobid	Ciprinol	Gentamycin	Kefzol	Xorim	Zinacef
	221	56	54	28	21	16	7	4	4	3	2	2	2	1	1	1	1	1	1	1

In 2011, antibiotic prophylaxis was used in 98.61 % of all revision THAs. Table 113 shows the brands and the number of cases when antibiotic prophylaxis was used. *Vulmizolin* was the most-used brand, administered in 51.75 % of all revision THAs.

Primary Total Knee Arthroplasty

The TKA register was officially launched on the 1 January 2006. In 2011 we received TKA data from 31 departments. These 31 departments performed 2,679 primary TKAs and 116 revision TKAs. During the observation period 2006–2011 we have received a total of 10,772 primary and 411 revision TKA protocols.

Tab. 114 Number of primary and revision TKAs

Year	Primary TKA	Annual growth	Revision TKA	Annual growth
2006	892		20	
2007	1363	52.80%	42	110.00%
2008	1611	18.20%	51	21.43%
2009	2028	25.88%	84	64.71%
2010	2199	8.43%	98	16.67%
2011	2679	21.83%	116	18.37%

We are using the same statistical methods as for the THA. Table 114 and chart 103 show development of the data for primary and revision TKAs. In 2011 three times more primary TKAs were performed than in 2006 and 5.8 times more revisions than in 2006.

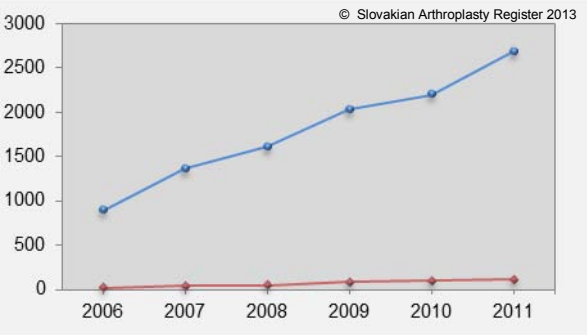

Chart 103 Number of primary and revision TKAs

In 2011 the RR reached 4.33 %, which is 0.13 % less than in 2010, but the tendency for RR is growing.

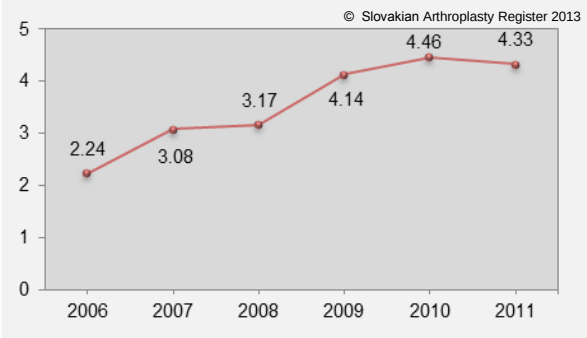

Chart 104 Primary TKA – revision rate

For this analysis, all failed TKAs were used, but our statistical methodology does not permit the inclusion of revisions before the start of TKA registry and therefore the RR in the chapter on revision TKA, which uses the whole database for deeper statistical analysis, is 1.80 %. Chart 105 shows the evolution of TKA incidence from 2006 to 2011. For primary TKA the growth of incidence reached 49.57 per 100.000 inhabitants in 2011, which is almost three times that in 2006, when it was 16.54. Table 115 and chart 106 show gender distribution of patients with primary TKA. There is no significant alteration in the gender ratio and in 2011 it was 67.53 % females to 32.47 % males for primary TKA. In 2006 the gender ratio was 70.29 % females to 29.70 % males.

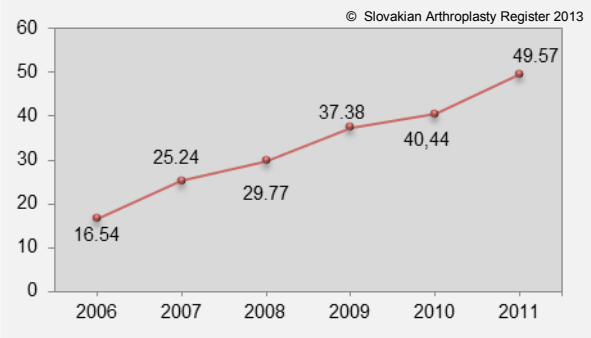

Chart 105 Primary TKA – incidence per 100,000 inhabitants

Tab. 115 Primary TKA – gender distribution

Year	Female	Male
2006	627	265
2007	921	442
2008	1107	504
2009	1393	635
2010	1481	718
2011	1809	870

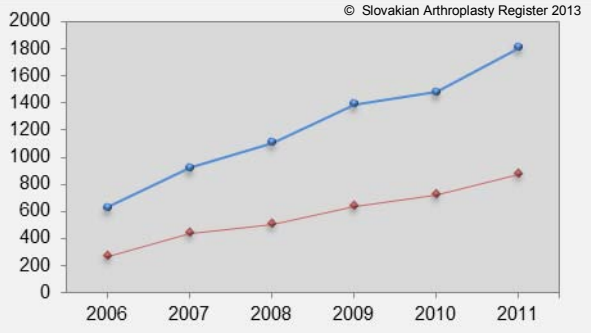

Chart 106 Primary TKA – gender distribution

Age groups

Table 116 show the interaction of gender and age groups. In females only 8.20 % of patients were in the age group less than 55 years, in males it was 13.82 %. The age group 65–75 years represents 46.69 % in females and 36.71 % in males. The highest RR was recorded in males in the age group less than 55 years and reached 2.74 %. In females in the same age group the RR was 2.66 %.

Tab.116 Characteristics of primary TKA (interaction of gender and age groups)

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	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females						
[min,55] yrs	602	16	2.66	1.37 to 3.94	5.77	5.68 to 5.85
(55,65] yrs	2268	48	2.12	1.52 to 2.71	5.83	5.78 to 5.87
(65,75] yrs	3441	55	1.60	1.18 to 2.02	5.87	5.84 to 5.89
(75,max] yrs	1028	5	0.49	0.06 to 0.91	5.94	5.91 to 5.97
Females total	7339	124	1.69	1.39 to 1.98	5.86	5.84 to 5.88
Males						
[min,55] yrs	475	13	2.74	1.27 to 4.20	5.76	5.66 to 5.86
(55,65] yrs	1293	29	2.24	1.44 to 3.05	5.79	5.74 to 5.85
(65,75] yrs	1261	25	1.98	1.21 to 2.75	5.79	5.74 to 5.85
(75,max] yrs	406	3	0.74	0.00 to 1.57	5.92	5.87 to 5.98
Males total	3435	70	2.04	1.57 to 2.51	5.83	5.80 to 5.86
Whole database total	10774	194	1.80	1.55 to 2.05	5.85	5.84 to 5.87

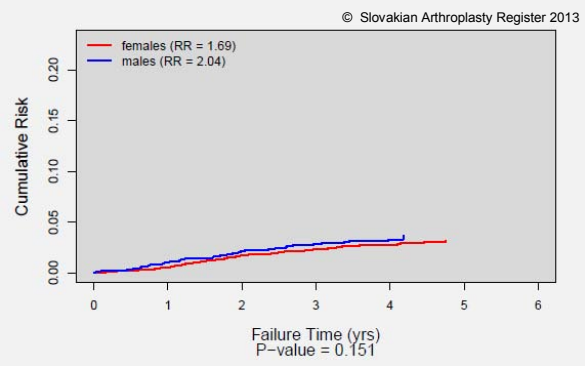

Chart 107 Cumulative risk of prim. TKA (gender)

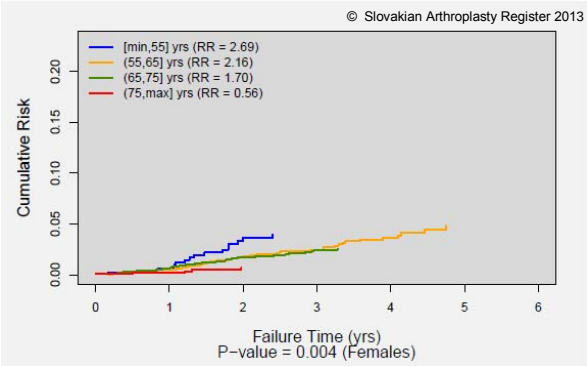

Chart 109 Cumulative risk of prim. TKA (females, age groups)

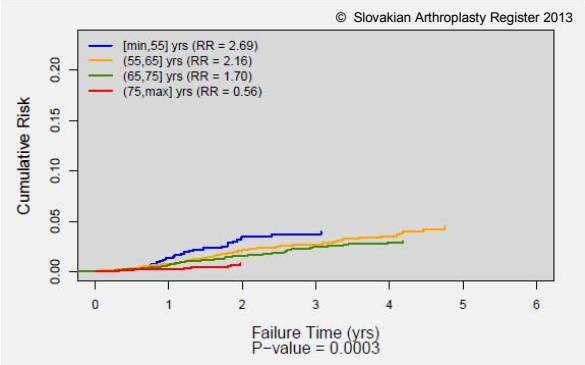

Chart 108 Cumulative risk of prim. TKA (age groups)

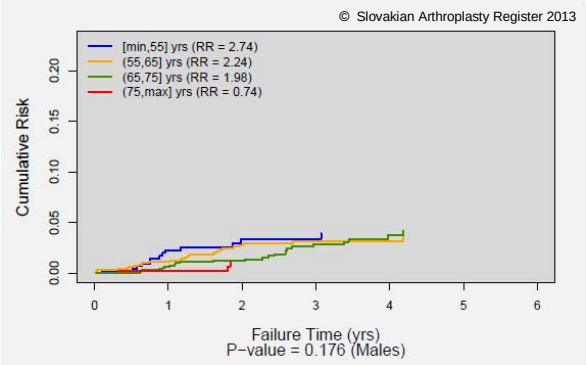

Chart 110 Cumulative risk of prim. TKA (males, age groups)

Table 117 shows the age groups of patients with primary TKA according to the methodology of the national Statistical Office. In this year, for the first time in the history of the SAR we have recorded at least one TKA in every age group. For the age group less than 55 years we have recorded a decrease from 9.11 % in 2010 to 7.87 % in 2011. For the age group 55–65 years the share only decreased from 32.66 % in 2010 to 32.58 % in 2011.

Tab. 117 Primary TKA – age groups

Year	<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
2006	0	0	0	0	0	2	1	11	24	93	152	207	184	167	46	7
2007	0	1	0	0	2	7	10	8	65	128	212	305	333	211	70	11
2008	1	1	1	2	5	5	7	23	74	179	297	391	339	228	52	6
2009	0	0	3	1	2	4	11	29	124	272	357	539	359	273	43	11
2010	1	2	0	5	0	9	7	38	139	281	437	511	426	282	55	6
2011	1	1	1	3	3	4	10	41	147	344	529	624	571	334	59	7

The age group 65–75 years rose from 42.58 % in 2010 to 44.60 % in 2011. The most significant decrease compared to 2006 was observed in the age group more than 75 years, from 24.66 % to 14.93 %. Table 118 and chart 111 show probabilities of primary TKA in the different age groups.

Tab. 118 Frequency of primary TKA (age groups; in %)

Age groups	2006	2007	2008	2009	2010	2011
[min,55] yrs	10.99	11.59	9.99	9.62	10.14	9.03
(55,65] yrs	34.75	30.37	33.19	32.69	33.79	33.45
(65,75] yrs	43.61	46.00	44.79	42.95	41.84	43.75
(75,max] yrs	10.65	12.03	12.03	14.74	14.23	13.77

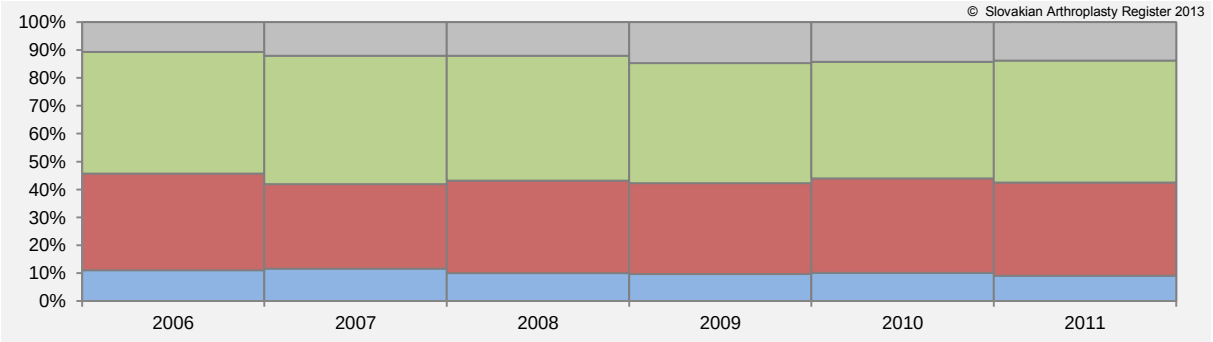

Chart 111 Frequency of primary TKA (age groups; in %)

Table 119 and chart 112 show these analyses for females. The probability of primary TKA in the age group less than 55 years has a tendency to decrease. Table 120 and chart 113 show this analysis for males.

Tab. 119 Frequency of primary TKA (females; age groups; in %)

Age groups	2006	2007	2008	2009	2010	2011
[min,55] yrs	8.93	9.23	8.03	8.33	8.37	7.30
(55,65] yrs	33.49	29.64	31.59	30.94	30.86	30.24
(65,75] yrs	46.89	48.43	48.38	46.09	44.97	47.37
(75,max] yrs	10.69	12.70	12.00	14.64	15.80	15.09

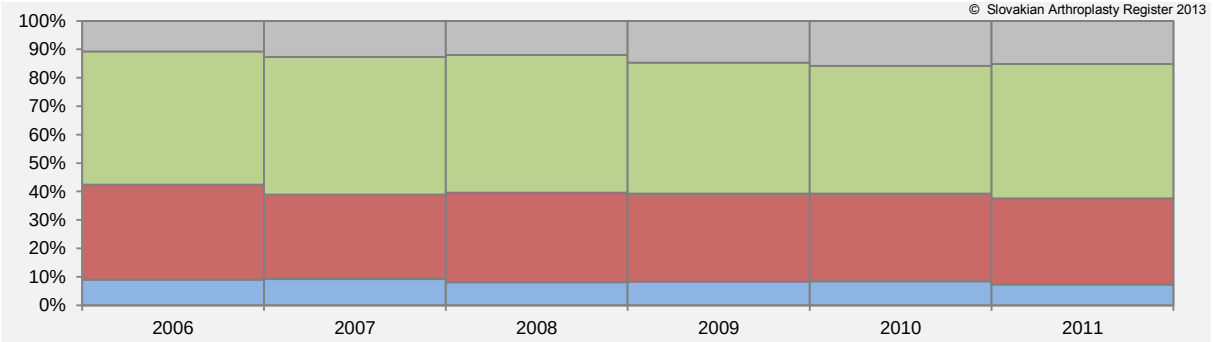

Chart 112 Frequency of primary TKA (females; age groups; in %)

Tab. 120 Frequency of primary TKA (males; age groups; in %)

Age groups	2006	2007	2008	2009	2010	2011
[min,55] yrs	15.85	16.52	14.29	12.44	13.79	12.64
(55,65] yrs	37.74	31.90	36.71	36.54	39.83	40.11
(65,75] yrs	35.85	40.95	36.90	36.06	35.38	36.21
(75,max] yrs	10.57	10.63	12.10	14.96	11.00	11.03

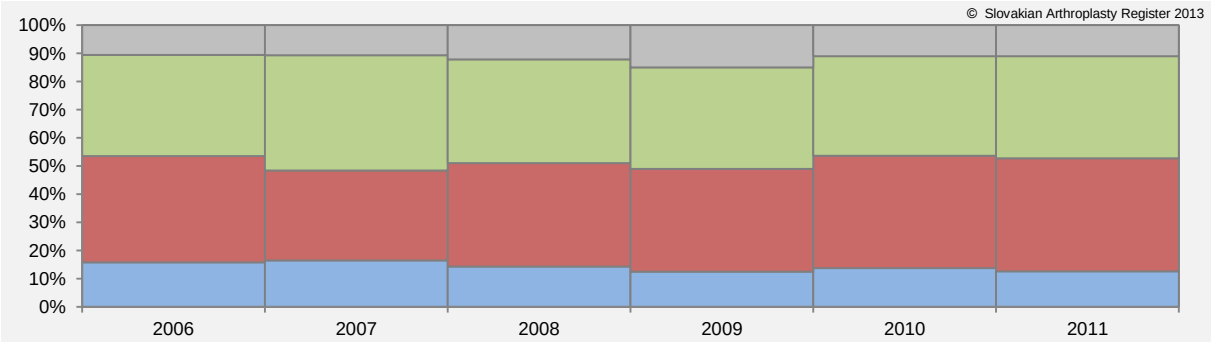

Chart 113 Frequency of primary TKA (males; age groups; in %)

The next analysis reported is the probability of failure of primary TKA for the whole database – table 121 and chart 114, for females – table 122 and chart 115 and for males – table 123 and chart 116.

Tab. 121 Frequency of failure of primary TKA in a particular year (age groups; in %)

Age groups	2006	2007	2008	2009	2010	2011
[min,55] yrs	12.20	8.11	24.39	12.50	20.00	14.29
(55,65] yrs	48.78	32.43	46.34	32.50	25.00	57.14
(65,75] yrs	39.02	56.76	26.83	45.00	50.00	21.43
(75,max] yrs	0.00	2.70	2.44	10.00	5.00	7.14

Chart 114 Frequency of failure of primary TKA in a particular year (age groups; in %)

Tab. 122 Frequency of failure of primary TKA in a particular year (females; age groups; in %)

Age groups	2006	2007	2008	2009	2010	2011
[min,55] yrs	6.67	4.55	28.00	13.79	11.11	11.11
(55,65] yrs	50.00	36.36	40.00	31.03	11.11	55.56
(65,75] yrs	43.33	54.55	32.00	44.83	77.78	22.22
(75,max] yrs	0.00	4.55	0.00	10.34	0.00	11.11

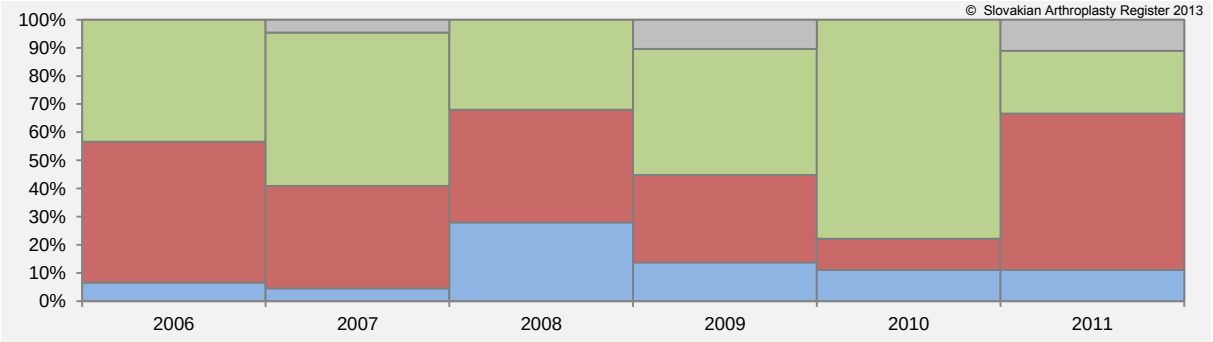

Chart 115 Frequency of failure of primary TKA in a particular year (females; age groups; in %)

Tab. 123 Frequency of failure of primary TKA in a particular year (males; age groups; in %)

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Age groups	2006	2007	2008	2009	2010	2011
[min,55] yrs	27.27	13.33	18.75	9.09	27.27	20.00
(55,65] yrs	45.45	26.67	56.25	36.36	36.36	60.00
(65,75] yrs	27.27	60.00	18.75	45.45	27.27	20.00
(75,max] yrs	0.00	0.00	6.25	9.09	9.09	0.00

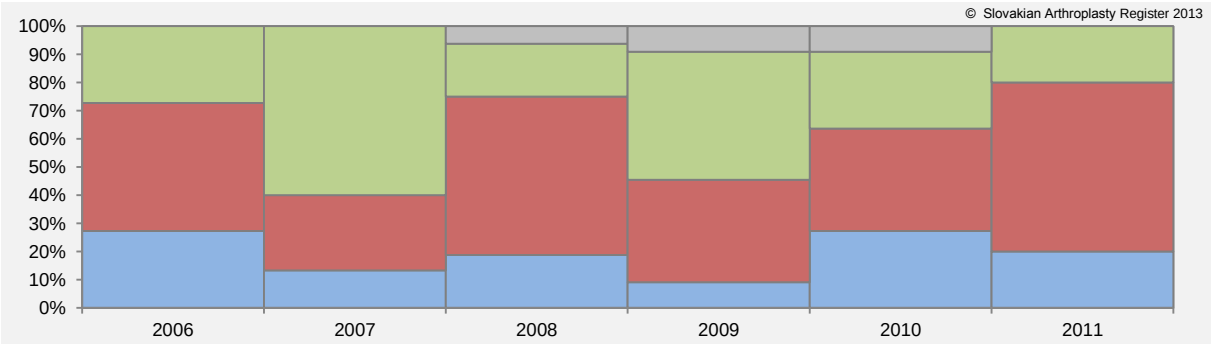

Chart 116 Frequency of failure of primary TKA in a particular year (males; age groups; in %)

The last new analysis is the failure rate in primary TKA according to the age groups, which is not cumulative. We have recorded all failures at one month, three month and twelve months for each year. Table 124 and chart 117 shows the results in percentages for the whole database, table 125 and chart 118 for females and table 126 and chart 119 for males.

Tab. 124 Probability of failure of primary TKA until certain time point (age groups; not cumulative; in %)

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Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr
[min,55] yrs	3.03	10.00	8.67	8.55	8.42	9.82	12.80	8.05
(55,65] yrs	21.21	25.71	35.29	35.15	30.16	34.04	26.40	35.57
(65,75] yrs	66.67	54.29	38.39	41.57	47.01	44.91	48.40	43.62
(75,max] yrs	9.09	10.00	17.65	14.73	14.40	11.23	12.40	12.75

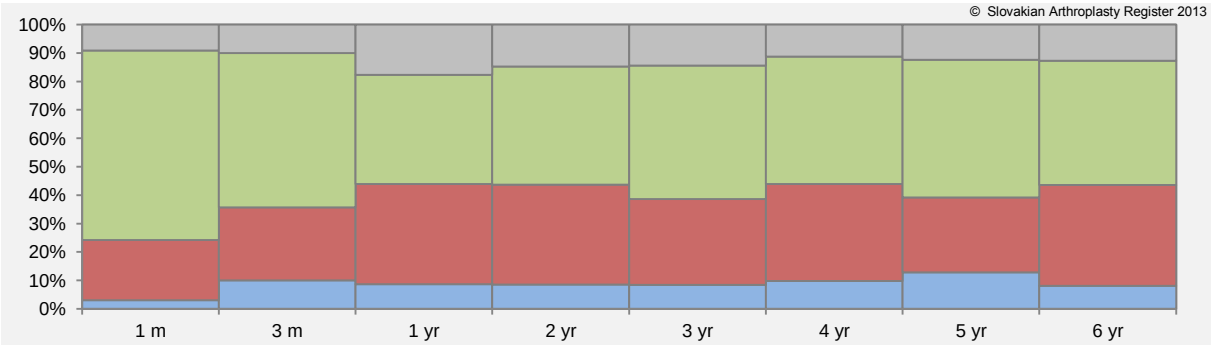

Chart 117 Probability of failure of primary TKA until certain time point (age groups; not cumulative; in %)

Tab. 125 Probability of failure of primary TKA until certain time point (females; age groups; not cumulative; in %)

Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr
[min,55] yrs	0.00	10.98	9.60	12.06	7.76	8.88	11.11	8.43
(55,65] yrs	18.75	26.83	34.34	29.96	28.77	33.73	30.07	38.55
(65,75] yrs	75.00	51.22	39.39	40.08	50.23	44.38	46.41	39.76
(75,max] yrs	6.25	10.98	16.67	17.90	13.24	13.02	12.42	13.25

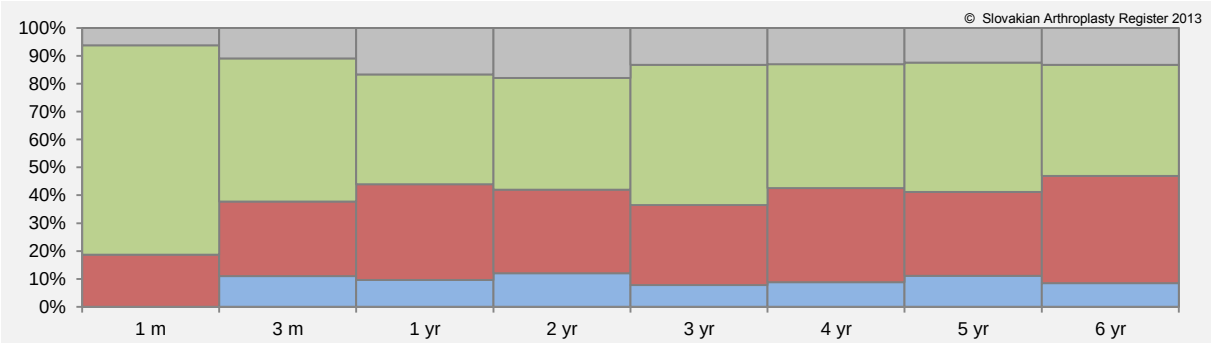

Chart 118 Probability of failure of primary TKA until certain time point (females; age groups; not cumulative; in %)

Tab. 126 Probability of failure of primary TKA until certain time point (males; age groups; not cumulative; in %)

Age groups	1 m	3 m	1 yr	2 yr	3 yr	4 yr	5 yr	6 yr
[min,55] yrs	5.88	8.62	7.20	3.05	9.40	11.21	15.46	7.58
(55,65] yrs	23.53	24.14	36.80	43.29	32.21	34.48	20.62	31.82
(65,75] yrs	58.82	58.62	36.80	43.90	42.28	45.69	51.55	48.48
(75,max] yrs	11.76	8.62	19.20	9.76	16.11	8.62	12.37	12.12

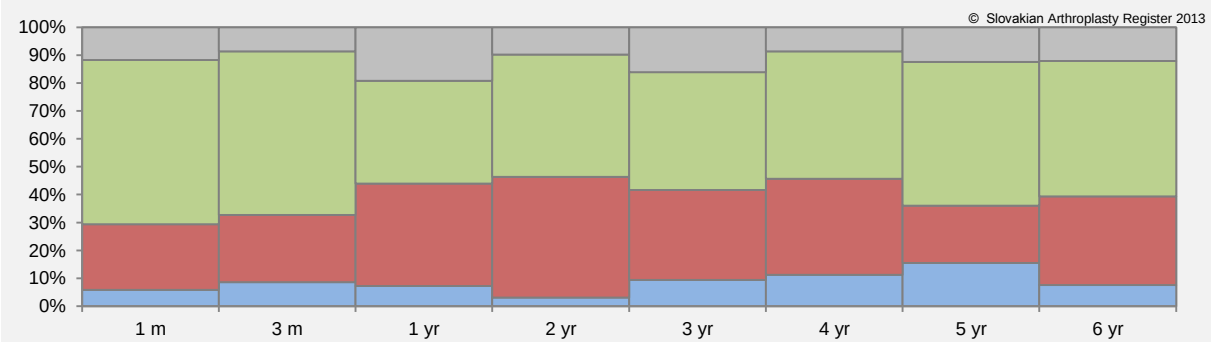

Chart 119 Probability of failure of primary TKA until certain time point (males; age groups; not cumulative; in %)

Diagnoses

Tab. 127 Primary TKA – indicative diagnoses

Year	Primary Monocondylar Arthrosis	Primary Bicondylar Arthrosis	Posttraumatic Arthrosis	Aseptic Necrosis	Rheumatoid Arthritis	Other
2006	52	762	29	5	26	3
2007	76	1 152	80	7	30	12
2008	77	1 374	91	8	49	9
2009	116	1 788	71	7	33	8
2010	190	1 880	73	4	31	20
2011	133	2410	77	4	37	18

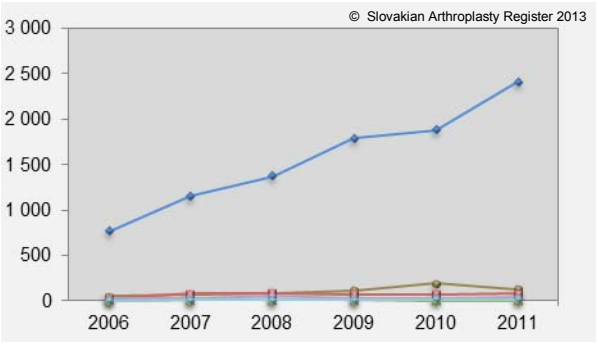

Chart. 120 Primary TKA – indicative diagnoses

The main diagnosis recorded as the reason for primary TKA in 2011 was still primary bicondylar DJD of the knee. The primary bicondylar DJD accounted for a share of 89.95 % in 2011. In comparison to the 2010, there was a significant shift, this diagnosis accounting for 93.62 % in 2010. The second most common diagnosis, post-traumatic DJD, reached a share of 2.87 %. Table 128 shows the distribution of diagnoses in the whole database.

Tab. 128 Characteristics of primary TKA (diagnoses)

		Total numbers	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Diagnoses							
	Primary monocond. arthrosis	645	20	3.10	1.76 to 4.44	5.74	5.65 to 5.83
	Primary bicondylar arthrosis	9366	127	1.36	1.12 to 1.59	5.88	5.87 to 5.90
	Posttraumatic coxarthrosis	421	12	2.85	1.26 to 4.44	5.66	5.57 to 5.76
	Aseptic necrosis	35	0	0.00	NA	5.89	NA
	Rheumatoid arthritis	206	3	1.46	0.00 to 3.09	5.80	5.69 to 5.90
Whole database				1.80	1.55 to 2.05	5.85	5.84 to 5.87

Table 129 shows the interaction between age groups and diagnoses. The highest RR was recorded in the age group less than 55 years – 2.69 %. The RR is decreasing with the age of the patients. The lowest RR of 0.56 % was recorded in the age group over 75 years. The RR of whole database is 1.80 %.

Tab. 129 Characteristics of primary TKA (interaction of age groups and diagnosis)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
[min,55] yrs							
	Primary monocond. arthrosis	73	2	2.74	0.00 to 6.48	5.53	5.30 to 5.77
	Primary bicondylar arthrosis	800	17	2.12	1.13 to 3.12	5.80	5.73 to 5.86
	Posttraumatic coxarthrosis	102	5	4.90	0.71 to 9.09	5.44	5.20 to 5.68
	Aseptic necrosis	2	0	0.00	NA	5.89	NA
	Rheumatoid arthritis	61	0	0.00	NA	5.78	NA
[min,55] yrs total		1077	29	2.69	1.73 to 3.66	5.76	5.70 to 5.83
(55,65] yrs							
	Primary monocond. arthrosis	243	10	4.12	1.62 to 6.61	5.67	5.50 to 5.84
	Primary bicondylar arthrosis	3054	47	1.54	1.10 to 1.98	5.87	5.84 to 5.90
	Posttraumatic coxarthrosis	156	4	2.56	0.08 to 5.04	5.68	5.53 to 5.83
	Aseptic necrosis	6	0	0.00	NA	5.57	NA
	Rheumatoid arthritis	70	1	1.43	0.00 to 4.21	5.74	5.46 to 6.02
(55,65] yrs total		3561	77	2.16	1.68 to 2.64	5.82	5.79 to 5.86
(65,75] yrs							
	Primary monocond. arthrosis	242	7	2.89	0.78 to 5.00	5.67	5.52 to 5.81
	Primary bicondylar arthrosis	4226	56	1.33	0.98 to 1.67	5.88	5.86 to 5.91
	Posttraumatic coxarthrosis	131	3	2.29	0.00 to 4.85	5.30	5.17 to 5.43
	Aseptic necrosis	19	0	0.00	NA	5.88	NA
	Rheumatoid arthritis	56	2	3.57	0.00 to 8.43	5.69	5.42 to 5.95
(65,75] yrs total		4702	80	1.70	1.33 to 2.07	5.86	5.83 to 5.88
(75,max] yrs							
	Primary monocond. arthrosis	87	1	1.15	0.00 to 3.39	5.88	5.74 to 6.03
	Primary bicondylar arthrosis	1286	7	0.54	0.14 to 0.95	5.94	5.91 to 5.97
	Posttraumatic coxarthrosis	32	0	0.00	NA	5.63	NA
	Aseptic necrosis	8	0	0.00	NA	4.17	NA
	Rheumatoid arthritis	19	0	0.00	NA	5.78	NA
(75,max] yrs total		1434	8	0.56	0.17 to 0.94	5.94	5.91 to 5.96
Whole database total		10774	194	1.80	1.55 to 2.05	5.85	5.84 to 5.87

Table 130 shows these data for females and for males. The RR for primary monocondylar arthrosis in females is 4.23 %, which is 2.3 times more than the mean RR of whole database!

Tab. 130 Characteristics of primary TKA (interaction of gender and diagnoses)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females							
	Primary monocond. arthrosis	449	19	4.23	2.37 to 6.09	5.67	5.54 to 5.79
	Primary bicondylar arthrosis	6463	78	1.21	0.94 to 1.47	5.90	5.88 to 5.91
	Posttraumatic coxarthrosis	197	6	3.05	0.65 to 5.45	5.66	5.52 to 5.80
	Aseptic necrosis	24	0	0.00	NA	5.57	NA
	Rheumatoid arthritis	161	3	1.86	0.00 to 3.95	5.77	5.64 to 5.91
Females total		7339	124	1.69	1.39 to 1.98	5.86	5.84 to 5.88
Males							
	Primary monocond. arthrosis	196	1	0.51	0.00 to 1.51	5.83	5.77 to 5.89
	Primary bicondylar arthrosis	2903	49	1.69	1.22 to 2.16	5.85	5.82 to 5.89
	Posttraumatic coxarthrosis	224	6	2.68	0.56 to 4.79	5.45	5.33 to 5.58
	Aseptic necrosis	11	0	0.00	NA	5.89	NA
	Rheumatoid arthritis	45	0	0.00	NA	5.70	NA
Males total		3435	70	2.04	1.57 to 2.51	5.83	5.80 to 5.86
Whole database total		10774	194	1.80	1.55 to 2.05	5.85	5.84 to 5.87

Surgical approaches

Tab. 131 Primary TKA – surgical approaches

Year	Mid-vastus	Medial Parapatellar	Lateral Parapatellar	Subvastus	Tubercle Osteotomy	Other	Not. Ident.
2006	195	668	4	9	1	0	15
2007	364	964	18	7	3	1	6
2008	444	1105	30	25	0	4	3
2009	492	1489	19	12	0	11	5
2010	521	1633	28	14	1	1	1
2011	559	2080	22	14	2	2	0

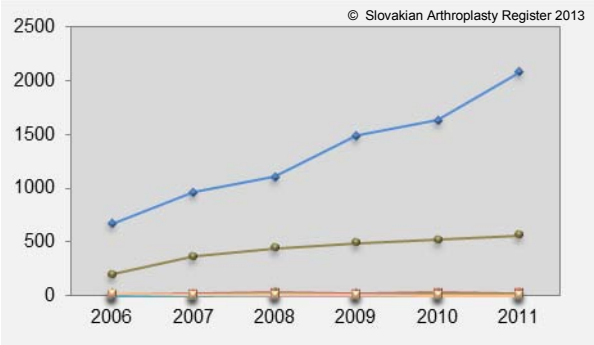

Chart 121 Primary TKA – surgical approaches

Two approaches, medial parapatellar and mid-vastus, were predominant in 2011. Medial parapatellar increased from 74.26 % in 2010 to 77.64 % in 2011, in contrast to the mid-vastus approach, which decreased from 23.69 % to 20.86 %. The lateral parapatellar approach was used in only 22 cases (0.82 %). The two mostly used approaches reached a combined share of 98.5 %. Table 131 and chart 121 present all approaches used for primary TKA.

Types of implants used

Tab. 132 Primary TKA – types of implants used

Year	Unicondylar	Bicondylar
2006	29	863
2007	59	1304
2008	41	1570
2009	35	1993
2010	60	2139
2011	29	2650

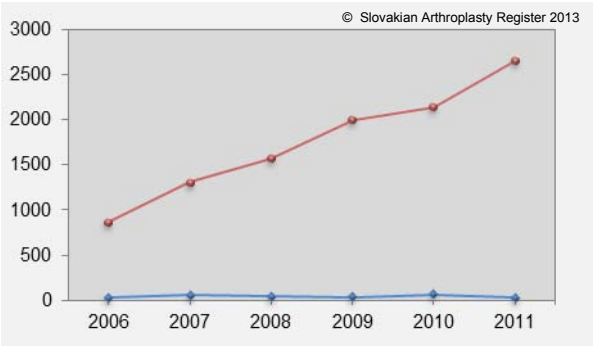

Chart 122 Primary TKA – types of implants used

Table 132 and chart 122 shows the types of implants used. The commonest were bicondylar implants, used in 2011 in 98.91 % of cases, compared to 97.27 % of cases in 2010. Hemiarthroplasty was used in 29 cases – 1.08 %.

Types of the fixation

Tab. 133 Primary TKA – types of the fixation

Year	Cement	Uncement	Hybrid
2006	888	4	0
2007	1351	10	2
2008	1573	6	32
2009	1980	18	30
2010	2134	30	35
2011	2640	32	7

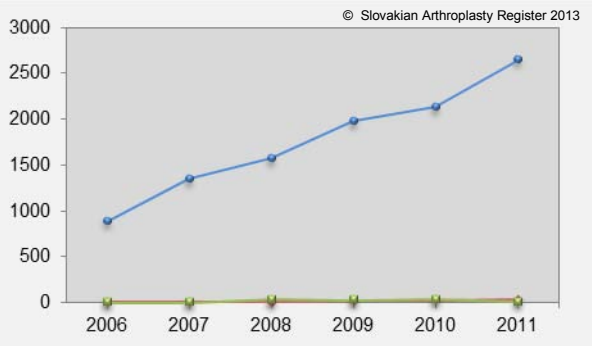

Chart 123 Primary TKA – types of the fixation

In 98.54 % of all TKAs, bone cement was used for fixation of both components. This represents a slight increase compared with 2010 when cement fixation was used in 97.04 %.

There has been a small decrease in uncemented fixations from 1.36 % in 2010 to 1.19 % in 2011.

There was a significant decrease in hybrid fixations from 1.59 % to 0.26 %.

Tab. 134 Characteristics of primary TKA (interaction of gender and type of fixation)

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	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females						
Uncemented	50	3	6.00	0.00 to 12.58	5.25	4.68 to 5.83
Cemented	7245	121	1.67	1.38 to 1.97	5.86	5.84 to 5.88
Hybrids	17	0	0.00	NA	3.84	NA
Reverse hybrids	27	0	0.00	NA	4.60	NA
Females total	7339	124	1.69	1.39 to 1.98	5.86	5.84 to 5.88
Males						
Uncemented	50	1	2.00	0.00 to 5.88	5.66	5.39 to 5.93
Cemented	3323	68	2.05	1.56 to 2.53	5.83	5.80 to 5.86
Hybrids	19	0	0.00	NA	3.85	NA
Reverse hybrids	43	1	2.33	0.00 to 6.83	4.13	3.96 to 4.30
Males total	3435	70	2.04	1.57 to 2.51	5.83	5.80 to 5.86
Whole database total	10774	194	1.80	1.55 to 2.05	5.85	5.84 to 5.87

Table 134 shows the interaction between gender and type of fixation. In females uncemented TKAs have a significantly higher RR than all other types of fixation. With a RR of 6.0 %, this group is 3.3 times higher than the whole database. Table 135 shows the interaction between gender, age groups and types of fixation. The highest RR of 4.0 % was in uncemented TKAs.

Tab. 135 Characteristics of primary TKA (gender, age groups, and type of fixation)

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	Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Gender						
Females	7339	124	1.69	1.39 to 1.98	5.86	5.84 to 5.88
Males	3435	70	2.04	1.57 to 2.51	5.83	5.80 to 5.86
Age groups						
[min,55] yrs	1077	29	2.69	1.73 to 3.66	5.76	5.70 to 5.83
(55,65] yrs	3561	77	2.16	1.68 to 2.64	5.82	5.79 to 5.86
(65,75] yrs	4702	80	1.70	1.33 to 2.07	5.86	5.83 to 5.88
(75,max] yrs	1434	8	0.56	0.17 to 0.94	5.94	5.91 to 5.96
Type of fixation						
Uncemented	100	4	4.00	0.16 to 7.84	5.46	5.14 to 5.78
Cemented	10568	189	1.79	1.54 to 2.04	5.85	5.84 to 5.87
Hybrids	36	0	0.00	NA	3.85	NA
Reverse hybrids	70	1	1.43	0.00 to 4.21	4.54	4.43 to 4.65
Whole database total	10774	194	1.80	1.55 to 2.05	5.85	5.84 to 5.87

Tab. 136 Characteristics of primary TKA (interaction of type of fixation and diagnosis)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Uncemented							
	Primary monocond. arthrosis	3	0	0.00	NA	2.77	NA
	Primary bicondylar arthrosis	66	3	4.55	0.00 to 9.57	5.45	5.08 to 5.83
	Posttraumatic coxarthrosis	16	0	0.00	NA	3.76	NA
	Aseptic necrosis	1	0	0.00	NA	2.60	NA
	Rheumatoid arthritis	1	0	0.00	NA	1.35	NA
Uncemented total		100	4	4.00	0.16 to 7.84	5.46	5.14 to 5.78
Cemented							
	Primary monocond. arthrosis	639	20	3.13	1.78 to 4.48	5.74	5.65 to 5.83
	Primary bicondylar arthrosis	9218	123	1.33	1.10 to 1.57	5.89	5.87 to 5.90
	Posttraumatic coxarthrosis	392	12	3.06	1.36 to 4.77	5.66	5.56 to 5.76
	Aseptic necrosis	34	0	0.00	NA	5.89	NA
	Rheumatoid arthritis	202	3	1.49	0.00 to 3.15	5.80	5.69 to 5.90
Cemented total		10568	189	1.79	1.54 to 2.04	5.85	5.84 to 5.87
Hybrids							
	Primary monocond. arthrosis	2	0	0.00	NA	1.89	NA
	Primary bicondylar arthrosis	30	0	0.00	NA	3.85	NA
	Posttraumatic coxarthrosis	2	0	0.00	NA	2.06	NA
	Aseptic necrosis	NA	NA	NA	NA	NA	NA
	Rheumatoid arthritis	1	0	0.00	NA	1.91	NA
Hybrids total		36	0	0.00	0.00 to 0.00	3.85	3.85 to 3.85
Reverse hybrids							
	Primary monocond. arthrosis	1	0	0.00	NA	1.26	NA
	Primary bicondylar arthrosis	52	1	1.92	0.00 to 5.66	4.52	4.37 to 4.67
	Posttraumatic coxarthrosis	11	0	0.00	NA	3.60	NA
	Aseptic necrosis	NA	NA	NA	NA	NA	NA
	Rheumatoid arthritis	2	0	0.00	NA	3.29	NA
Reverse hybrids total		70	1	1.43	0.00 to 4.21	4.54	4.43 to 4.65
Whole database total		10774	194	1.80	1.55 to 2.05	5.85	5.84 to 5.87

Brands of implants

In the primary TKA database the major problem of implant identification is the name of implant. Knee implants cannot be in mixed combinations as can hip joint implants. Under the same implant name you can find cruciate retaining (CR), posterior stabilised (PS) and sometimes even condylar constrained (CCK) variants of the same implant. To increase the complexity, the tibial component could be fixed or mobile. With the SAR inventory of the knee implants, which was completed during 2010, we have tried to sort all TKAs brands with possible different designs and types of tibial components. In table 137 we present all knee implants sorted according to manufacturer, brand, design and type of fixation. In the table 138 all implants are ranked according to the number of components used in 2011. Some manufacturers introduced implant systems with many different design variants, but almost identical brand names. Therefore, table 139 shows these systems and shares of these systems. From 2006, the *PFC Sigma* (*DePuy*) dominated the Slovakian market and in 2011 this implant accounted for 33.33 % of all TKAs used. As table 139 shows, the share of the *PFC Sigma* system was 34.9 %. From these figures, it is clear that the SAR inventory does not solve the problem of precise implant identification. The problem of *PFC Sigma* was poor identification of CR and PS design. By contrast, *Nex-Gen* and *Multigen Plus* systems have good design identification. The only solution is bar-code identification and ITS. In 2011 nineteen brands each have more than ten implantations accounting for 96.94 % of all implants used and sixteen brands with a total of only 82 applications accounted for only 3.06 %. Knee systems represented 67 % of all used TKAs. Due to short observation period and poor implant identification before the introduction of ITS, we must wait at least four more years to perform deeper statistical analyses of TKAs.

Tab. 137 Primary TKA – implants according to the manufacturers, brand, design, and type of fixation

	Implantat	Cemented	Hybrid	Uncemented	Revision	Other
Lima	Multigen Plus Biolox Delta Multigen Plus - CR-Fix Multigen Plus - CR-Rot Multigen Plus - PS-Fix Multigen Plus - PS-Rot Multigen Plus - CCK Multigen Plus - H	CR PS CR-ROT PS-ROT	CR PS CR-ROT PS-ROT	CR PS CR-ROT PS-ROT	CCK Hinged	Ceramic-CR, ALL-Poly
Zimmer	Nex-Gen CR Nex-Gen PS Nex-Gen LCCK Nex Gen RHK Nex Gen Segmental	CR PS PS-ROT	CR PS PS-ROT		CCK Hinged Segmental	Gender CR Gender PS High Flex CR High Flex PS
DePuy	AMK PFC Sigma PFC Sigma RP PFC Sigma ALL Poly PFC Sigma Revision MBT/C3 Sigma Revision Stab. Plus Preservation-Uni LCS S-ROM Noil Hinged Knee	CR PS PS-ROT PS-High Flex	CR PS PS-ROT PS-High Flex	CR PS PS-ROT PS-High Flex	CCK Hinged	All-poly tibia High Flex
Biomet	AGC TMK - rot. Uni Oxford ROCC Vanguard - min. invasive surgery Dual articular 2000 - revision	CR PS ROT	CR			
Serf	Rotasurf C2F Implants Lexa - rekonstruction MC3 - revision	CR-ROT	CR-ROT	CR-ROT	Hinged	
Beznoska	SVL SVL/RP SVS SVR - revision CMS UKR	CR PS CR-ROT PS-ROT			CCK Hinged Individual-R Individual-Tumor	
Aesculap	Search Evolution Columbus E-Motion EnDuro Mebio	CR PS CR-ROT PS-ROT	CR PS CR-ROT PS-ROT	CR PS CR-ROT PS-ROT	CCK Hinged	
W-Link	Endo-Modell Sled Prosthesis Gemini	CR PS CR-ROT	CR PS CR-ROT	CR PS CR-ROT	CCK Hinged Individual-R Individual-Tumor	
W-M - Medin	WM Universal WM modular Medin Ortopaedic	CR,PS				
Stryker	Scorpio NRG Scorpio TS					
Endoplant	EPP Pivot Solution EPP	CR PS CR-ROT PS-ROT				
Ceraver		PS PS-ROT				
Mathys	Balansys	CR				

Tab. 138 Primary TKA – ranking of the implants

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Name	n	%
PFC SIGMA	893	33.33%
COLUMBUS	381	14.22%
NEX-GEN CR	215	8.03%
NEX-GEN LPS	194	7.24%
MULTIGEN PLUS - CR - fix.	178	6.64%
MC2	155	5.79%
AGC - universal knee	135	5.04%
SVL	105	3.92%
SCORPIO NRG	53	1.98%
SVL/RP	50	1.87%
NEX-GEN LPS FLEX	43	1.61%
E-MOTION	37	1.38%
MULTIGEN PLUS - PS - fix.	34	1.27%
LSC	32	1.19%
SOLUTION EPP	27	1.01%
PFC SIGMA RP	21	0.78%
UNI Oxford-hemiarthroplasty	17	0.63%
NEX-GEN LCCK	16	0.60%
SLED PROSTHESIS	11	0.41%
PFC SIGMA ALL POLY	9	0.34%
PFC SIGMA REVISION STAB PLUS	8	0.30%
MULTIGEN PLUS - CR - rot.	7	0.26%
GEMINI	5	0.19%
MULTIGEN PLUS BIOLOX DELTA	5	0.19%
ENDO-MODELL	6	0.22%
PFC SIGMA REVISION MBT/TC3	4	0.15%
CMS - hinge	3	0.11%
ROCC	3	0.11%
AMK	2	0.07%
SVS	2	0.07%
S-ROM NOIL HINGE KNEE	2	0.07%
MULTIGEN PLUS - CCK	1	0.04%
SVR - revision	1	0.04%
ROTASURF	1	0.04%
Others	23	0.86%
Total	2679	100.00%

Tab. 139 Primary TKA – implant systems

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System	n	%
PFC Sigma System		
PFC SIGMA	893	33.33%
PFC SIGMA RP	21	0.78%
PFC SIGMA ALL POLY	9	0.34%
PFC SIGMA REVISION STAB PLUS	8	0.30%
PFC SIGMA REVISION MBT/TC3	4	0.15%
PFC Sigma System total	**935**	**34.90%**
Nex-Gen System		
NEX-GEN CR	215	8.03%
NEX-GEN LPS	194	7.24%
NEX-GEN LPS FLEX	43	1.61%
NEX-GEN LCCK	16	0.60%
Nex-Gen System total	**468**	**17.47%**
Multigen Plus System		
MULTIGEN PLUS - CR - fix.	178	6.64%
MULTIGEN PLUS - PS - fix.	34	1.27%
MULTIGEN PLUS - CR - rot.	7	0.26%
MULTIGEN PLUS BIOLOX DELTA	5	0.19%
MULTIGEN PLUS - CCK	1	0.04%
Multigen Plus System total	**225**	**8.40%**
SVL System		
SVL	105	3.92%
SVL/RP	50	1.87%
SVS	2	0.07%
SVR - revision	1	0.04%
SVL System total	**158**	**5.90%**
Others	892	33.30%
Total	2679	**100.00%**

Antibiotic prophylaxis in primary TKA

Table 140 shows antibiotic prophylaxis. In 2011, antibiotic prophylaxis was used in 99.85 % of primary TKAs. *Vulmizolin* was the most-used brand of antibiotic and was used in 57.86 % of all cases.

Tab. 140 Primary TKA - antibiotic prophylaxis in 2011 (brands, numbers)

© Slovakian Arthroplasty Register 2013

Brand	Vulmizolin	Axetine	Bitamon	Climicin	Xorim	Unasyn	Zinacef	Dalacin	Abactal	Ciphin	Lendacin	Amoxiklav	Cefuroxim	Augmentin	Cefazolin	Edicin	Kefzol	Vankomycin	Amoxycilin	Cefotaxim	Ciprinol	Oxacilín
	1548	522	325	93	47	22	21	18	17	15	12	10	9	4	2	2	2	2	1	1	1	1

Revision Total Knee Arthroplasty

In 2011, of the 31 Slovakian units performing primary TKA, only 20 units performed at least one revision TKA, and only four units performed more than 10 revision TKAs. These four units performed 57.75 % of all TKA revisions. The RR of all primary TKAs (all TKAs before and after 2006 included) reached a 2011 value 4.33 %. Chart 124 shows the evolution of the RR.

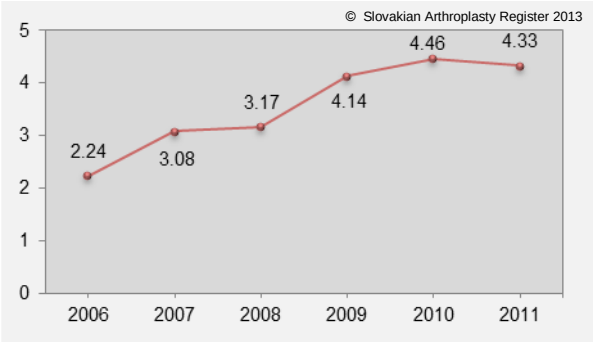

Chart 124 Revision TKA – revision rate

Tab. 141 Structure of revision database

© Slovakian Arthroplasty Register 2013

	Total	Censored	Failured
1st revision	195	138	57
2nd revision	68	61	7
3rd revision	7	7	0
Primary TKA before 2006	141	130	11
Total	411	336	75

Table 141 shows the structure of the TKA revision database, with the numbers of revisions and of failures.

In this chapter we shall deal only with first revisions. RR of revision TKAs in the observed period, from 1 January 2006 until 31 December 2011, reached 18.25 %. The gender distribution of revised TKA patients is different from that for THA. In 2011, females accounted for 61.2 % of all revised TKA patients. Males accounted 38.8 %. Table 142 and chart 125 show the gender distribution. During the whole period of observation 61.31 % of all revised patients were female and 38.60 % were male.

Tab. 142 Revision TKA – gender distribution

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Year	Female	Male
2006	14	6
2007	18	24
2008	29	22
2009	51	33
2010	69	29
2011	71	45

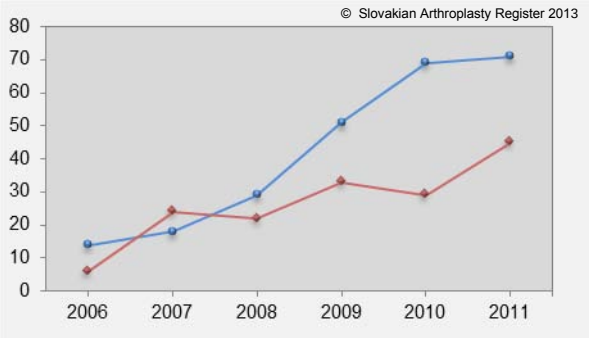

Chart 125 Revision TKA – gender distribution

Types of fixation of revised TKA

Tab. 143 Revision TKA – structure of the database according to gender and type of fixation

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	Total	Female	Male
Uncemented	15	12	3
Cemented	296	173	123
Hybrids	3	3	0
Explantation	15	10	5
Spacer	63	46	17
No data	19	8	11
Total	411	252	159

Revision database contained 411 records. Table 143 shows the structure of this database according to gender and type of fixation. Explantation of implants, conversion to spacer and revisions without complete data are excluded from deeper analyses.

Explantation accounted for 3.65 %, a spacer 15.33 % and revision without complete data 4.62 %. Cemented fixation for revision TKAs was used in 72.01 % of all patients, uncemented fixation was used in 3.65 %, and hybrid type of fixation in 0.73 %.

Tab. 144 Revision TKA – types of fixation of primary TKAs

© Slovakian Arthroplasty Register 2013

Year	Cement	Uncement	Hybrid
2006	20	0	0
2007	39	2	1
2008	49	2	0
2009	82	2	0
2010	90	6	2
2011	110	6	0

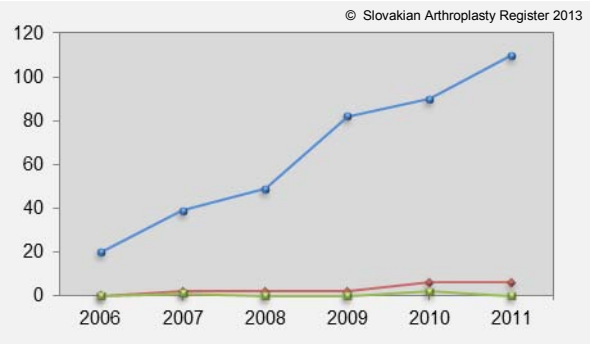

Chart 126 Revision TKA – types of fixation of primary TKAs

94.83 % of all revisions were performed on cemented primary TKAs and 5.17 % on uncemented TKAs in 2011. No hybrid type of fixation was revised during this year. Table 144 and chart 126 show types of fixation of revised primary TKAs. Table 145 shows interaction of gender and type of fixation of revision implants.

Tab. 145 Characteristics of revision TKA (interaction of gender and type of fixation)

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		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females							
	Uncemented	12	0	0.00	NA	0.98	NA
	Cemented	173	13	7.51	3.59 to 11.44	5.41	5.13 to 5.69
	Hybrids	3	0	0.00	NA	1.78	NA
	Explantation	10	NA	NA	NA	NA	NA
	Spacer	46	NA	NA	NA	NA	NA
	No data	8	NA	NA	NA	NA	NA
Females total		252	45	17.86	13.13 to 22.59	4.69	4.37 to 5.02
Males							
	Uncemented	3	0	0.00	NA	0.86	NA
	Cemented	123	16	13.01	7.06 to 18.95	5.06	4.65 to 5.47
	Hybrids	0	0	NA	NA	NA	NA
	Explantation	5	NA	NA	NA	NA	NA
	Spacer	17	NA	NA	NA	NA	NA
	No data	11	NA	NA	NA	NA	NA
Males total		159	30	18.87	12.79 to 24.95	4.65	4.23 to 5.06
Whole database total		411	75	18.25	14.51 to 21.98	4.68	4.42 to 4.94

Age groups

In 2011, the age group less than 55 years constituted 11.2 % of all revised TKA patients. The age group 55–64 years represented 29.31 %, the age group 65–75 years 43.96 %, and over 75 years accounted for 15.51 % of all revised patients. The situation for the whole database is as follows: the age group less than 55 years – 9.97 %, the age group 55–65 years accounted for 36.73 %, the age group 65–75 years for 39.9 %, and the age group over 75 years accounted for 13.38 %. Table 147 presents the age group distribution.

Tab. 146 Characteristics of revision TKA (interaction of gender and age groups)

© Slovakian Arthroplasty Register 2013

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Females							
	[min,55] yrs	22	4	18.18	2.06 to 34.30	4.29	3.20 to 5.38
	(55,65] yrs	81	14	17.28	9.05 to 25.52	4.71	4.17 to 5.26
	(65,75] yrs	113	24	21.24	13.70 to 28.78	4.46	3.95 to 4.97
	(75,max] yrs	36	3	8.33	0.00 to 17.36	5.13	4.55 to 5.71
Females total		252	45	17.86	13.13 to 22.59	4.69	4.37 to 5.02
Males							
	[min,55] yrs	19	3	15.79	0.00 to 32.19	4.95	3.98 to 5.92
	(55,65] yrs	70	14	20.00	10.63 to 29.37	4.65	4.08 to 5.22
	(65,75] yrs	51	11	21.57	10.28 to 32.86	3.74	3.12 to 4.37
	(75,max] yrs	19	2	10.53	0.00 to 24.33	4.24	3.41 to 5.08
Males total		159	30	18.87	12.79 to 24.95	4.65	4.23 to 5.06
Whole database total		411	75	18.25	14.51 to 21.98	4.68	4.42 to 4.94

Tab. 147 Revision TKA – age groups

Year	<15	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
2006	0	0	0	0	1	0	1	3	9	2	1	3	0
2007	0	0	0	0	0	1	1	4	14	10	8	4	0
2008	0	0	0	0	1	1	0	9	5	12	12	9	2
2009	0	0	0	1	0	3	4	10	20	18	16	11	1
2010	0	0	1	0	0	3	2	12	24	28	11	13	4
2011	1	3	1	0	1	1	6	7	27	29	22	12	6

Table 148 shows the interaction of gender, age groups and type of fixation of revision TKA implants. The highest RR of 21.34 %.was recorded in the age group 65–75 years.

Tab. 148 Characteristics of revision TKA (gender, age groups, and type of fixation)

		Total number	Nr. of failures	RR	95% CI for RR	Mean survival	95% CI for mean
Gender							
	Females	252	45	17.86	13.13 to 22.59	4.69	4.37 to 5.02
	Males	159	30	18.87	12.79 to 24.95	4.65	4.23 to 5.06
Age groups							
	[min,55] yrs	41	7	17.07	5.56 to 28.59	4.71	3.91 to 5.51
	(55,65] yrs	151	28	18.54	12.34 to 24.74	4.68	4.28 to 5.07
	(65,75] yrs	164	35	21.34	15.07 to 27.61	4.44	4.01 to 4.87
	(75,max] yrs	55	5	9.09	1.49 to 16.69	5.05	4.55 to 5.56
Type of fixation							
	Uncemented	15	0	0.00	NA	0.96	NA
	Cemented	296	29	9.80	6.41 to 13.18	5.26	5.02 to 5.51
	Hybrids	3	0	0.00	NA	1.78	NA
	Explantation	15	NA	NA	NA	NA	NA
	Spacer	63	NA	NA	NA	NA	NA
	No data	19	NA	NA	NA	NA	NA
Whole database total		411	75	18.25	14.51 to 21.98	4.68	4.42 to 4.94

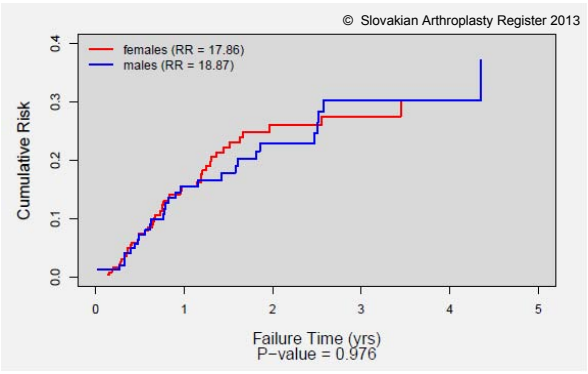

Chart 127 Cumulative risk of rev. TKA (gender)

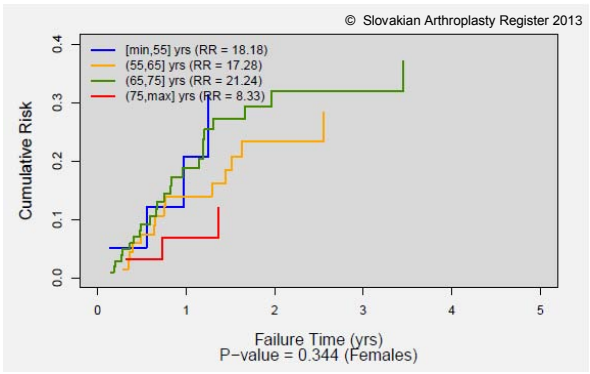

Chart 129 Cumulative risk of rev. TKA (females, age groups)

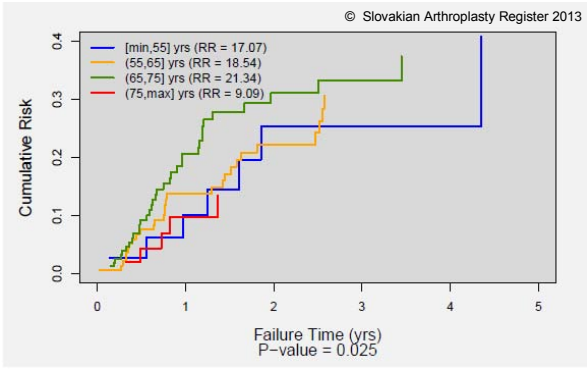

Chart 128 Cumulative risk of rev. TKA (age groups)

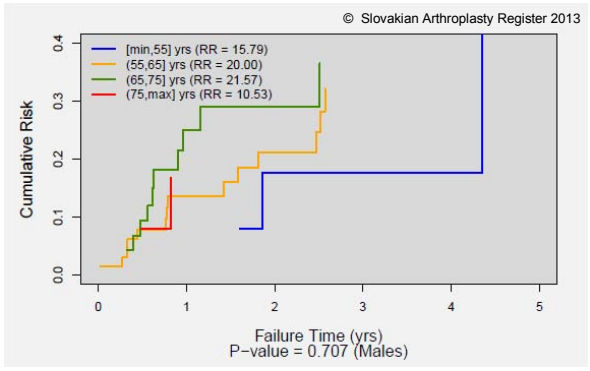

Chart 130 Cumulative risk of rev. TKA (males, age groups)

Males reached a RR of 18.87 %, females 17.86 %, and the mean RR for both genders was 18.25 % with mean survival of 4.68 %. Chart 127 shows the cumulative risk of revision according to the gender, with no difference between genders until the first year of survival. Chart 128 presents cumulative risk of revision according to age groups: charts 129–130 present this analysis for gender and age groups. The highest RR of 21.34 % was recorded in the age group 65–75 years and the lowest one of 9.09 % in the age group over 75 years.

Reasons for the revision

The most common reason for revision in 2011 was chronic infection, constituting 22.22 % of all diagnoses. Acute infection was the reason for revision in 7.63 % and knee pain without loosening was the reason for revision in 6.94 % of all cases. Aseptic tibial loosening at 14.58 % and aseptic femoral loosening at 12.50 % are the second and third most common reasons for revision. Table 149 shows all the reasons for revision and comparison with previous years.

Tab. 149 Revision TKA – reasons for revision

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Year	Early Infection	Chronic Infection	Aseptic Loosening of Femoral Component	Aseptic Loosening of Tibial Component	Aseptic Loosening of Patellar Component	Patellar Luxation	Patellar Pain	Periprosthesis Fracture	Colateral Ligaments Instability	Instability of PCL	Luxation	Polyethylene Wear	Fracture of Implant	Stifness	Malposition	Knee Pain Without Loosening	Spacer to TKA	Other
2006	4	3	3	10	1	0	0	1	2	0	0	1	1	0	1	1	0	0
2007	4	12	10	12	1	0	2	1	7	1	1	2	0	2	1	3	1	3
2008	6	17	11	19	0	0	0	1	1	1	1	3	1	3	1	1	1	5
2009	7	28	22	30	1	0	0	0	3	2	1	3	4	1	1	2	2	4
2010	3	34	20	26	0	0	4	1	2	1	0	3	5	1	1	3	21	4
2011	11	32	18	21	0	2	3	3	5	1	3	4	1	6	5	10	15	4

Revised components of implants

Tab. 150 Revision TKA – revised components of implants

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Year	Soft Tissue Revision	Whole System	Femoral Component	Tibial Component	Patella	Inlay	Explantation	Spacer	Other
2006	1	14	0	1	0	1	2	1	0
2007	2	24	1	2	0	5	4	2	2
2008	3	33	0	4	1	1	5	4	0
2009	0	51	1	5	0	4	2	19	0
2010	2	65	2	4	1	6	0	17	1
2011	14	56	6	4	3	10	2	20	1

In 2011, the revision protocol had nine options. The whole system was revised in 48.27 % of all revisions. In 12.06 % of all cases only the soft tissues were revised, spacer was used in 17.24 % and the inlay was revised in 8.62 % of all cases. Table 150 compares revised components year by year. In 2011 we observed an increased number of revisions due to soft-tissue problems. During the time period 2006–2010, we recorded only eight revisions, in 2011 it was 14 revisions.

Antibiotic prophylaxis in revision TKA

Tab. 151 Revision TKA – antibiotic prophylaxis in 2011 (brands, numbers)

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Brand	Vulmizolin	Edicin	Bitamon	Climicin	Axetine	Cefotaxim	Ciphin	Augmentin	Ciprinol	Lendacin	Vankomycin	Xorim	Zinacef	Zinat
	39	19	18	15	10	2	2	1	1	1	1	1	1	1

In 2011, antibiotic prophylaxis was used in 96.55 % of revision TKAs. *Vulmizolin* was the most-commonly used brand of antibiotic and was administered in 33.62 % of all revision TKAs. Table 151 shows antibiotic prophylaxis in 2011 according to the brands and the numbers of cases in which they were used.

Glossary

AC – acetabular component

Arthroplasty – surgical exchange of all, or part, of any joint of the human body with an artificial joint replacement

Bipolar hemiarthroplasty – partial hip joint replacement, with head-neck articulation

CAC – cemented acetabular cup

CCK (condylar constrained knee) – total knee joint replacement with range of motion constrained

Censoring time – time point when the follow-up is terminated (here 31 December 2011); implant/component would be censored if it did not fail by this time point

CFS – cemented femoral stem

CI – confidence interval with lower bound (LB) and upper bound (UB)

Cohort – group having one, or more, similar attributes, and monitored during the study period

Component – part of a multipart implant

CR – cumulative risk

CR implant (cruciate-retaining) – total knee joint replacement allowing retention of the posterior cruciate ligament

Crude (specific) incidence (implant-time, or component-time incidence) – the ratio of the number of new revisions divided by total time-at-risk (sum of all component-years/implant-years) throughout the follow-up period

Cumulative revision rate (CRR) – rate of revised implants/components divided by total number of implants/components × 100

Demographic analysis – methods of observing and interpreting the state and movement of a population

Demographic characteristics – numerical characteristics of the state and movement of a population

DJD – degenerative joint disease

Empirical survival function – rate of surviving implants/components and total number of implants/components, where censored observations are calculated as failures

Expected value (mean) – weighted arithmetic average of all possible values of a random variable; its estimate is called the arithmetic average and is calculated from a random sample

F – female

FC – femoral component

Hazard Rate (HR) – of the revision rate (RR) of any component, component combination, or group of components and RR of a reference group, where the reference group is always the group hierarchically superior to it, e.g. for acetabular and femoral components, the whole database

Hemiartroplasty – partial joint replacement

Hinge implant – total knee joint replacement with a constrained hinge articulation

Implant – any surgically implanted device

Implant-year, or component-year – time interval when implant/component had been at risk (of revision); it is the number of days from primary operation to the first revision, death, or termination of the study, divided by 365.25

Incidence THA/TKA – the frequency of primary THA/TKA per 100,000 inhabitants, in which new revisions appear within a particular time period

Kaplan-Meier survival curve – non-increasing step function of probability of survival, with jumps in observed event times; its length is positively correlated with the length of time-intervals to failure, or censorship

M – male

Median survival – the time at which half of the implants/components fail

Mean age – weighted arithmetic average of number of years that a random sample survived up to a time point

Mean survival – generalised mean for censored data; the volume under the K-M survival curve (q.v.) calculated using survived, censored and failed observations

Monocondylar knee replacement – hemiarthroplasty of the knee joint.

Null hypothesis – the statement in the form of a hypothesis about the equality of an unknown parameter and some constant, the validity of which is tested statistically; in this study, the parameter is the difference between the expected (mean) survival times of two groups, and the constant is zero; we are testing if the difference of expected survival times is equal to zero

P-value – minimal significance level at which the null hypothesis can be rejected; if p-value is smaller than the significance level, then the null hypothesis is rejected; a smaller p-value refers to a greater evidence about null hypothesis rejection

Population – is a set of organisms in which any pair of members can breed together. This implies that all members belong to the same species.

Population prognosis – a scientific calculation of how many people, in which age and gender structure, will be living in a country, or in a town, at some point in the future

Probability of survival – empirical probability of survival at time *t,* adjusted for censoring; ratio of survived implants/components at time *t* and the number of implants/components at risk in an infinitely small time period before time *t*, where the number of survived implants/components at time *t* is equal to the difference between the number of implants/components at risk within an infinitely small time period before time *t* and the number of failed implants/components in an infinitely small time period before time *t*

Prevalence – see **Revision Rate**

Primary implantation – first surgical procedure when a total or partial artroplasty is implanted

PS implant (posterior stabilised) – total knee joint replacement with sacrifice of the posterior cruciate ligament PCL

Q1 – first quartile

Q3 – third quartile

Rate – is a ratio that compares two quantities of different units within a time period.

Revision Rate (RR) – rate of revision surgery within a defined follow-up period – number of revisions divided by total number of primary arthroplasties included in the evaluation sample × 100

Revision surgery of soft tissue – any surgery after the primary implantation where only soft tissues are revised

SD – standard deviation

SAR – Slovakian Arthroplasty Register

Significance level – the probability, fixed ahead of testing of statistical hypotheses; upper boundary of null hypothesis rejection (e.g., equal to 0.05, or 0.1)

SOTS – Slovakian Orthopaedic and Traumatology Society

Standardisation – technique of adjustment for confounding variables, e.g., age, gender, etc.

Testing of statistical hypotheses – testing of the validity of a null hypothesis, whether this hypothesis is rejected, or not. If the null hypothesis is not rejected, there is not enough statistical evidence in the data for rejection

THA – total hip arthroplasty

TKA – total knee arthroplasty

Total implant-time, or component-time – sum of all implant-times, or component-times (implant-years, or component-years) characterising total follow-up time; the number of implants /components with a follow-up time equal to one year (the unit of implant-years, or component-years)

UAC – uncemented acetabular cup

UFS – uncemented femoral stem

95% CI for mean survival time – expected value of mean survival time of implant/component group falling within this interval with 95% confidence

95% CI for K-M survival curve – expected K-M curve of implant/component group fails to this interval with 95% confidence