Here is the 2003 annual report, based on the content of the register as of October 1st 2003. There has been an increase in the primary operations reported, from 6,865 in 2001 to 7,785 in 2002. This report includes a historical overview of findings and describes our definitions and routines.

As in previous years, each surgical unit receives a list containing information on the arthroplasties reported in 2002. It is our hope that you will compare the list with locally available data and help us correct any errors found. To make this easier, we provide two lists, one sorted by ID and the other by date of operation.

The first and second parts of the report are general by nature and will be available for downloading from our website: www.ort.lu.se/knee/. They include information on implants reported in 2002 as well as analyses regarding the latest 10-year period. From 2004 each clinic will get a continuous online update on their reporting.

As before each unit also receives a diskette. It contains information regarding all the registered arthroplasties reported by that unit. If the patients have been revised later at another location, information regarding those revisions is also included.

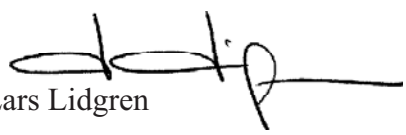
We find it appropriate to remind you that the Swedish Knee Arthroplasty Register is a prospective project and that revisions reported to the register are only entered if the primary operation has been reported previously. Thus, if a primary operation became known at a later time as it became a subject of a revision, neither the primary nor the revision will be entered into the database. Late reporting of primary procedures is only allowed in cases when all primaries performed during a time period are reported collectively.

The revision rate is still relatively high for many of the newer Unicompartmental models. The use of mini-incisions increased from 15 % in 1999 to 46 % in 2002. Unicompartmental implants, even without mini-incisions are sensitive to surgical routine. Infection is still a large problem that needs to be carefully followed up. New pharmacological treatments of rheumatoid arthritis have been introduced, and general thrombo-embolic prophylaxis has changed and probably affected the risk for postoperative bleeding and complications due to wound healing problems. The CRR for infection is 1,1 percent for arthrosis and 1,8 percent for rheumatoid arthritis. The result of an infection is still often amputation or arthrodesis. A group assigned by the Swedish Ortopaedic Association, with participants from the registry has developed algorithms for diagnosis and treatment of infected knee arthroplasties.

The Swedish knee arthroplasty register has received much international attention during the last year, and has been discussed in many editorials and review articles in major journals such as BMJ, JBJS. It will be represented in a register symposium at the AAOS.

We at the knee register center in Lund want to thank you for your cooperation during the last year and ask you to analyse and circulate the presented information.

Lund the 1st of november 2003
On behalf of the Swedish Knee Arthroplasty Register


Lars Lidgren


Kaj Knutson


Otto Robertsson

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## Definitions

***Revision*** is defined as a new operation in a previously resurfaced knee during which one or more of the components are exchanged, removed or added (incl. arthrodesis or amputation). This implies that soft tissue operations such as arthroscopy and lateral release are not considered revisions. The reason for this stringent definition is that some minor operations are not necessarily related to the primary surgery and thus cannot be considered a complication or failure.

All the Scandinavian registers do not use this stringent definition. For example the Finnish National Implant Register defines any re-operation as being a revision. However, in their reports, the additional operations account for only about 3 percent of the revision surgery.

***TKA*** (Total or Tricompartmental Knee Arthroplasty) is defined as a knee arthroplasty where the femoral component has a flange and thus all three compartments of the knee are affected. Even in cases where a patellar button is absent, the flange resurfaces half of the femoropatellar compartment and the arthroplasty is still considered to be a TKA.

***Bicompartmental arthroplasty*** (historical) uses two components, one on the femoral and one on the tibial side to resurface both the femorotibial compartments (medial and lateral) - but not the femoropatellar compartment. Thus, this implant has no femoral flange and is not meant to allow for resurfacing of the patella.

***UKA*** (Unicompartmental Knee Arthroplasty) implies an arthroplasty that separately resurfaces the medial or lateral femorotibial compartment. (med. UKA or lat. UKA). If 2 UKA implants are used to resurface both femorotibial compartments the arthroplasty it is named bilateral UKA.

***Patellar arthroplasty*** is used to resurface only the femoropatellar compartment. Even if this arthroplasty is unicompartmental by definition, it is accounted for separately.

***Hinged implants.*** As the name implies these implants only allow for flexion and extension through a fixed axis.

***Linked implants*** (Linked/Rotating hinge) have a mechanical coupling between the femoral and tibial component allowing for flexion and extension as well as for varying amount of rotation.

***Stabilized implants***. Even if the hinges and the linked implants are extremely stabilizing, the term stabilized implants is used for a group of prostheses that are a kind of TKA but use the form of the femoral and tibial component to restrict movement in valgus, varus and rotation. The posterior cruciate sacrificing type most often has an eminence in the middle part of the tibial polyethylene that can be contained by a box in the femoral component that lies between the medial and lateral sliding surfaces. By a camshaft-like property, the femoral component is forced to slide back during flexion, which simulates the effect of the posterior cruciate ligament. The fit between polyethylene and metal is such that it allows for some rotation. In so-called superstabilized implants the congruency has been increased by making the eminence larger with a total fit against the box of the femoral component thus, restricting the rotation and varus/valgus movement. Intermediary forms also occur. Stabilized implants are most often used for revision but also for the more difficult primary arthroplasties. The ordinary TKA can be made somewhat more stabilized by increasing the congruency between the sliding surfaces. In these instances there is a slight eminence of the polyethylene that fits against the femoral component. However, the term stabilized is only used for those implants that are more stabilized than usual by use the above mentioned camshaft construction.

## Filling in the Knee Register form

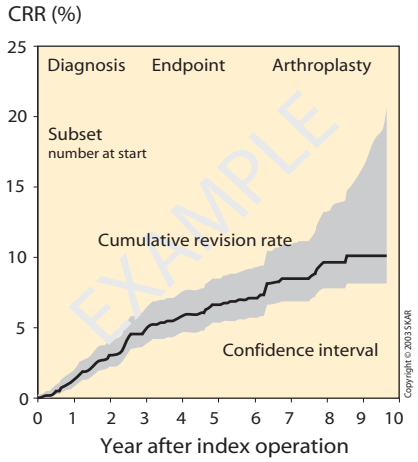
The Knee Register uses a form that it recommends to be filled in during the operation, (by a nurse or other attending personal). The implant-stickers (containing the Part No's and Lot No's) for all used implants are to be affixed to the form. Besides the ID of the patient, the date of operation, diagnosis, side operated, brand of cement and cementing of components has to be filled in. For UKA, information if mini arthrotomy was used must be specified. Information regarding the operating surgeon is voluntary. Forms are sent to Lund (once a month) where the data is computerized. In our opinion, this procedure has considerable advantages such as minimal workload for the participating units, the most certain information with the least chance of wrong coding. Furthermore, it allows the staff of the registry to check unknown Part No's during input.

## How the Knee Register compares implants

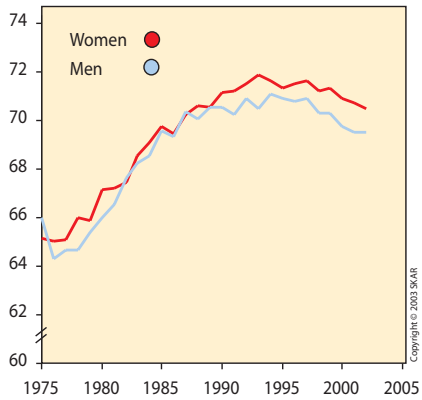
Survival analyses are used for graphical presentation of data using curves that show the Cumulative Revision Rate (CRR). They describe what percentage of the operated patients became revised with time. The calculation is based on the sum of all the revisions and expresses the rate as if none of the patients had died. Most often the time-axis shows a 10-year period. However, it has to be kept in mind that patients are continuously during this time. Thus, all the patients have not been followed for the whole period. This implies that if 1,000 patients were operated on each year (and nobody dies), a 10-year study would include 10,000 patients of which only 1,000 had been followed for more than 9 years. The last part of the curve (at the right) therefore expresses the long-term rate of revision for patients operated more than 9 years earlier. As the number of these patients is relatively small, the 95% confidence interval becomes large. When the number of patients at risk is small (at the right of the curve), each revision has a large effect (e.g. 50% are revised when 2 patients are left and one has a revision). For this reason the Register cuts the curves when less than 40 patients are left at risk.

A disadvantage of CRR curves is that they express the revision rate for a defined group of patients and do not allow for taking other factors into account (e.g. age and gender). It is possible to circumvent the problem by analyzing smaller groups of different gender and age. However, this unfortunately reduces the number of patients available for analysis, which in turn reduces the power of statistical conclusions.

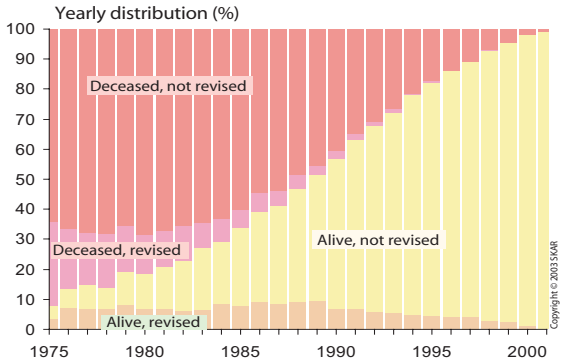
Cox regression allows for taking into account different factors that may vary within a group. The results cannot be shown as curves with confidence intervals, but are expressed as risk ratios between factors. If the factor is a category (e.g. an implant), one category is defined as a reference with a risk of 1 to which the other categories are compared. An implant with the risk 1.2 thus has 20% increased risk of becoming revised etc.. For numerical variables (e.g. mean age) the risk ratio relates to the change in risk if the variable increases by one unit (e.g. 1 year). When comparing groups where uneven distribution of factors can be expected (e.g. age in cemented vs. uncemented implants) the Cox regression is especially important..




*Example of a CRR curve.*



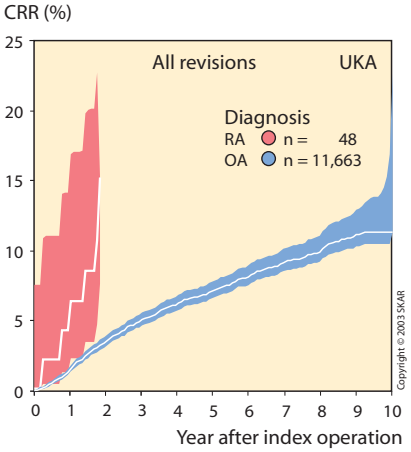

*The mean age of patients increased until 1995 when it started to decrease again. Therefore, when comparing the rate of revision in series of patients operated during different time periods, Cox regression or separate analyses for different age groups have to be performed.*




*Survival statistics are used to calculate how long an implant stays unrevised. As times goes by, the percentage of deceased patients increases (fig. left). During their lifetime these patients were at risk of becoming revised and the statistics allow them to supply information for that period of time. The probability for each revision that occurs is related to the number of unrevised patients alive with that particular follow-up time. All the probabilities are then added to produce the cumulative rate of revisions.*

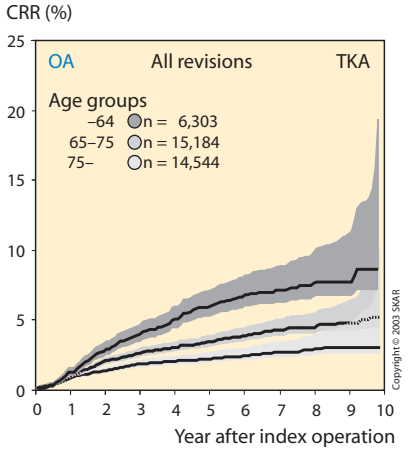
## Factors that influence the revision rate

***Primary disease*** – At an early stage it became evident that patients with different primary disease, e.g. rheumatoid arthritis (RA) and osteoarthritis (OA) followed a different postoperative course with differences in the revision rate. Therefore, the registry has always produced separate curves for these diagnoses. The differences in CRR between OA and RA that received unicompartmental knee arthroplasty (UKA) demonstrate the importance of this.




*UKA is no longer used for patients with RA and during the period 1992-2001 48 RA patients got UKA. Even though the material is small the higher risk for revision is evident.*

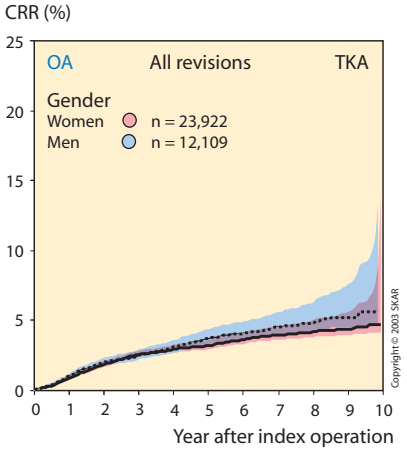
***Age*** – The effect that the age of the patients at the primary operation has on the CRR is illustrated by analyzing different age groups separately.

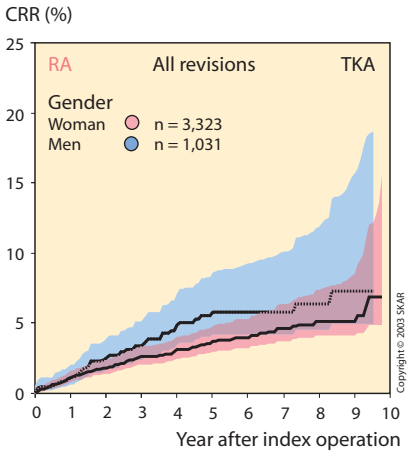



*The differences in CRR (1992–2001) between the 3 age groups <65, 65–75, >75 were significant for OA operated on with TKA and UKA but not for RA with TKA.*

When calculating CRR it would be reasonable to compare only similar age-groups. However, this method would reduce the size of the material and thus the statistical usefulness.

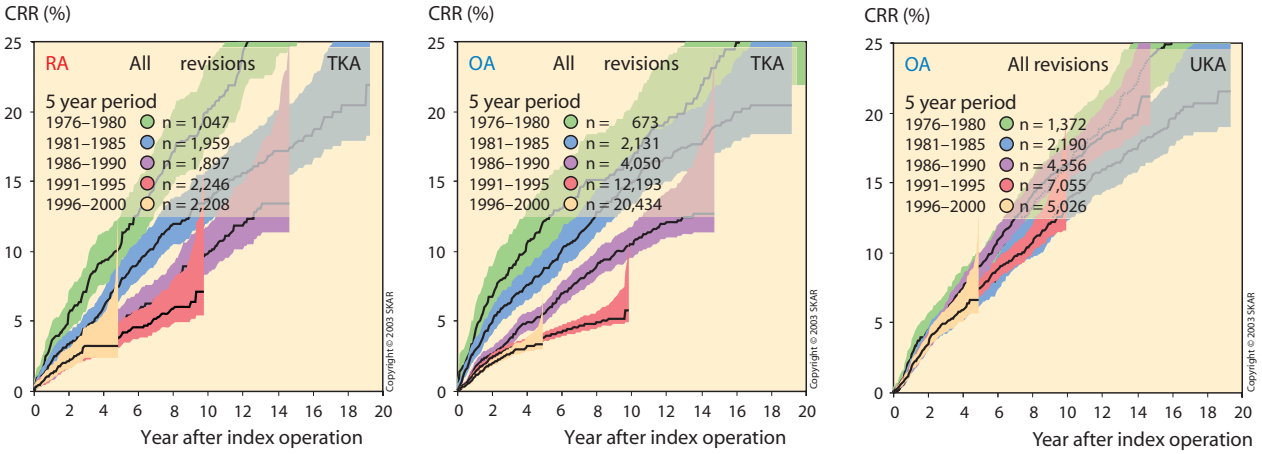
***Gender*** – In earlier analyses the registry has reported a difference in risk of revision between the sexes for patients with RA (men higher risk). For the period 1992-2001 (Cox regression) this difference has disappeared and there are no significant difference between the sexes for OA or RA.




*There were no significant difference in CRR (1992–2001) between the sexes, either for TKA or UKA with OA or RA.*

***Year of operation*** – Over the years the risk of revision has lessened for TKA. The reduction is not only to be explained by the increasing mean age at operation. Even if it can be explained partially by improved implants, reduction has also been seen for unchanged implants (Lewold, S et al. 1993). This indicates improvement in technique (cementing/seating) or in patient selection, which explains why comparison between implants must take into account the time-period they were inserted. Improvement with time has not been seen

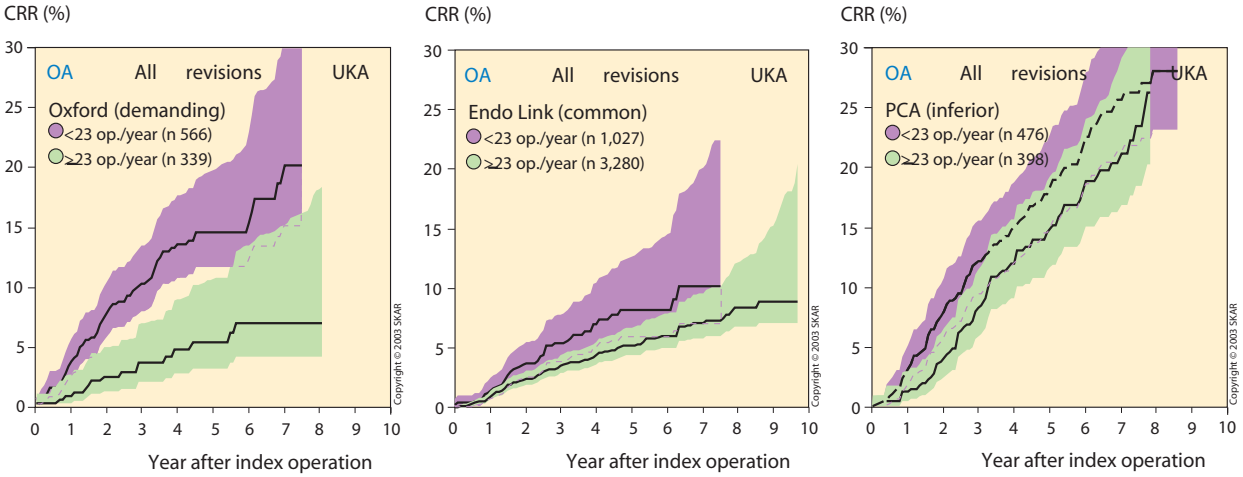



*Reduction in the revision rate with time was seen for TKA but not UKA when the time periods 1976–1980 (green), 1981–1985 (blue), 1986–1990 (violet), 1991–1995 (red) och 1996–2000 (orange) were compared.*

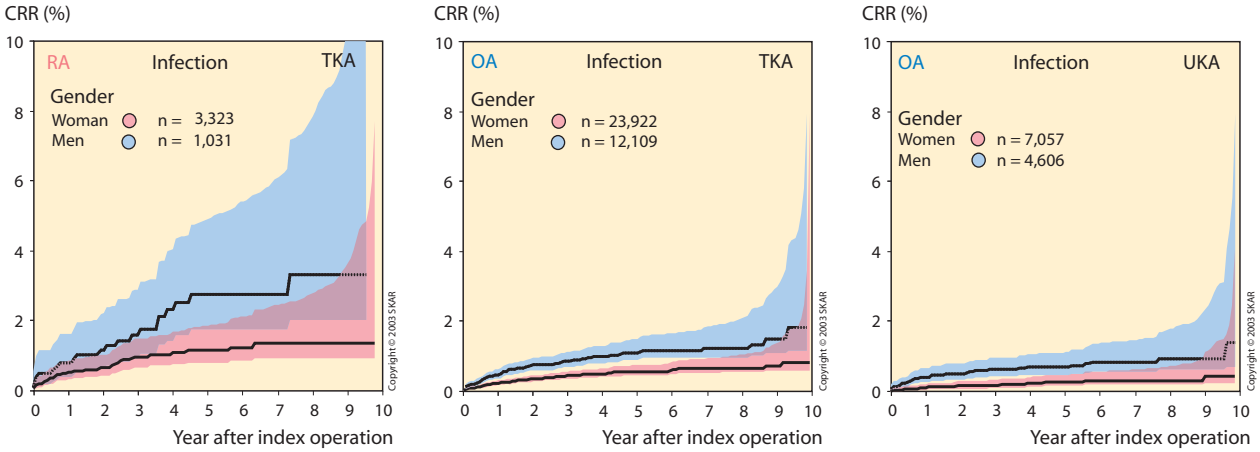
for the UKA, which probably is caused by some newer models that have shown inferior results. Furthermore, the number of UKA operations has lessened which maybe has reduced the surgical routine.

***Surgical routine*** – For the UKA implants we have shown that there is a relation between the number of operations performed in hospitals and their rate of revisions. Thus, a group of units that performed less than 23 operations/year had substantially more revisions than those that performed more. The Oxford implant with meniscal bearing was found to be especially sensitive to the surgical routine. The Swedish results for this implant have been quite different and worse than those published from large centers in England. This has lead the manufacturer to require that surgeons learn the operative technique before they can use the implant. It is very likely that the surgical routine can affect the results of other implant types such as the TKA.

***Type of implant*** – Hinges, linked and stabilized implants are mainly used for revisions or especially difficult primary cases. In uncomplicated primary cases TKA is used and if the disease is unicompartmental an UKA may do. For a proper comparison of TKA and UKA the results for patients with osteoarthritis are of interest. Although the UKA has been shown to have substantially higher CRR than TKA, the number of serious complications such as infection/arthrodesis/amputation is much less. If a primary UKA is revised to a TKA at a later time, the risk of re-revision is not significantly increased compared to the risk of revision if the patient had primarily been operated on with a TKA. As the




*The majority of orthopedic units performed relatively few UKA/year and there is a relation between the yearly number and the risk of later revision. For the 3 examined models (above) the effect of volume on CRR varied. The technically demanding Oxford implant was more affected than the most usual Link implant while the inferior PCA implant was not affected by volume at all.*

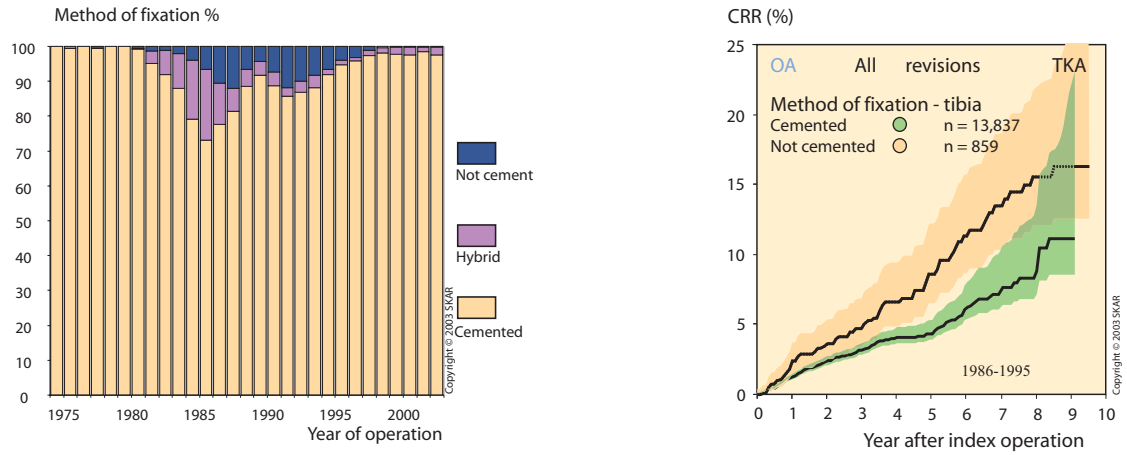



*Using revision because of infection as end-point the statistics shows that RA patients are more often affected (Risk Ratio 1.8) and that within each group men are more often stricken than women. The UKA with smaller components than the TKA are less affected.*

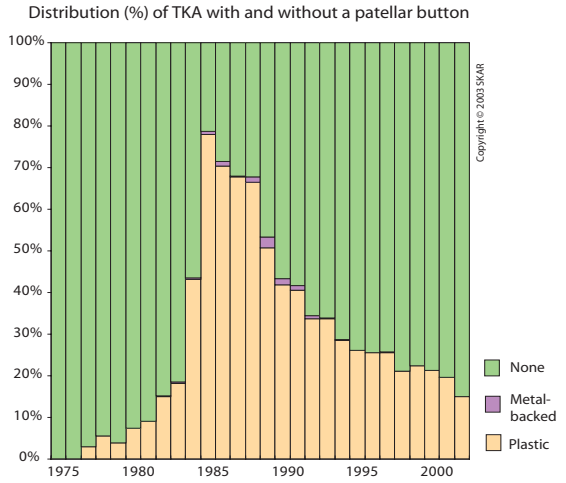
UKA implants are less expensive than the TKA, the increased number of revisions due to their use has not resulted in additional cost. When asked, patients with TKA and UKA seem equally satisfied with their knees. In summary we conclude that it cannot be considered wrong to use UKA implants for an unicompartmental disease.

***Use of cement*** – We have previously found that cement free insertion of the tibial component is associated with an increased risk of revision. This is in agreement with the results of the Finnish implant register that has found substantially increased risk of revision for uncemented implants. For the period 1991–2000 we do not observe significant differences any longer. However, only in 2,5% of the cases was the tibial component uncemented.

***Patellar button in TKA*** – Estimating how the use of a patellar button affects the revision rate is complex. The use of a patellar button varies with the brand of TKA used, while simultaneously its use has lessened over the years. Hitherto, when the TKA implants are analyzed together, we have not found the use of patellar button to influence the revision rate. However, when comparing different time-periods one finds that during the eighties, when patellar buttons were used in half of the cases, its use had a negative effect. In the nineties, during which patellar buttons were used in one quarter of TKA, the effect has started to change to the advantage of the button. If only the most commonly used TKA is analyzed (AGC) we find that the CRR is considerably lower when a button is used. This finding in combination with the previous finding that patients that receive a patellar button are more satisfied with their knee (at least early on) implies that a patellar button could be




*Evaluation of method of fixation today is difficult since most of the implants are being cemented. The analysis of the period 1986-1995 for relatively modern TKA with uncemented tibial component shows significant higher CRR then for TKA with cemented tibial component.*



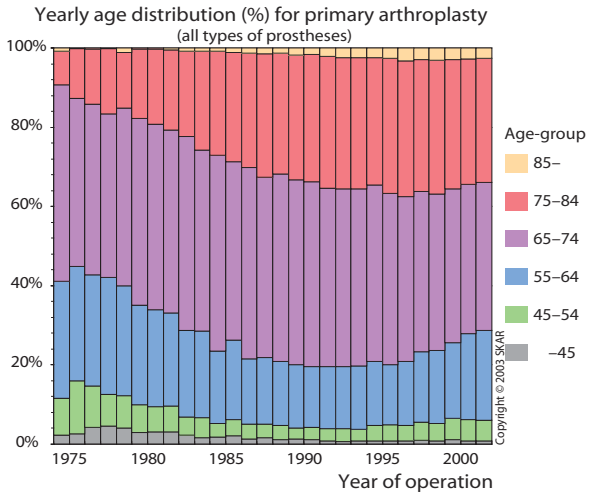

inserted more often - at least for the elderly.

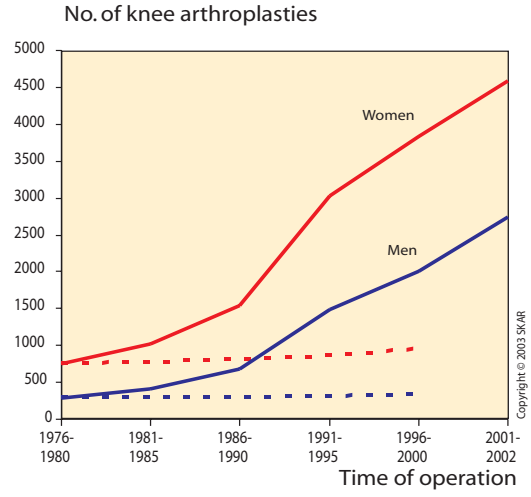
***Implant model (brand)*** – The model is the factor that generates most interest and most often is related to the result after knee arthroplasty. As can be suspected from what has been said, the results are not only affected by the model or design of the prosthesis. In Sweden the most commonly used implants have also been those with the lowest CRR. This can be due to a good design but also due to the surgical routine as the same implant is often used. However, some models have had considerably worse results than others. Of the newer brands the Miller-Galante can be mentioned but the use of that implant has now ceased. Regarding the UKA it seems that most the newer implants have not improved survivorship over the older ones.

## Mean age, age distribution and future incidens

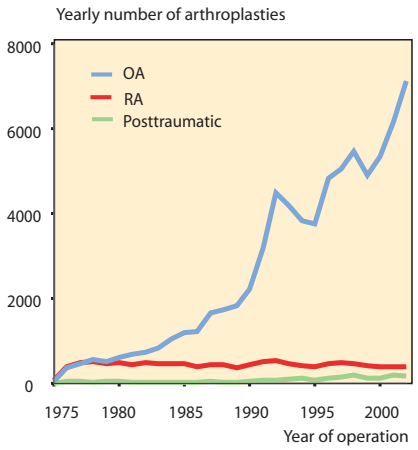
The mean age at the primary operation steadily increased from approx. 65 years in 1975 to approx. 72 years in 1994. (Fig. Page 3). Since then the mean age has not increased but rather shown the tendency of decreasing. The main reason for the rise in mean age has been that older age groups have been offered surgery. However, since 1994 the relative number of patients less than 55 years has again increased.

In a article published in *Acta Orthopaedica Scandinavica* (2000; 71: 376-380) it was demonstrated how the number of operations had increased substantially more than could be explained by ageing of the population. Further, it was found that the expected changes in the age distribution would increase the demand for knee arthroplasty by 36% by 2030. At the same time it was argued that the incidence of operations still was rising, why the actual demand would be considerably higher. The article that was based on data until 1998 predicted that provided that the incidence was unchanged (as it was in 1996-1997), the number of arthroplasties in year 2015 would be 6,754. The presently reported 7,785 arthroplasties indicates that the incidence is still on the rise.

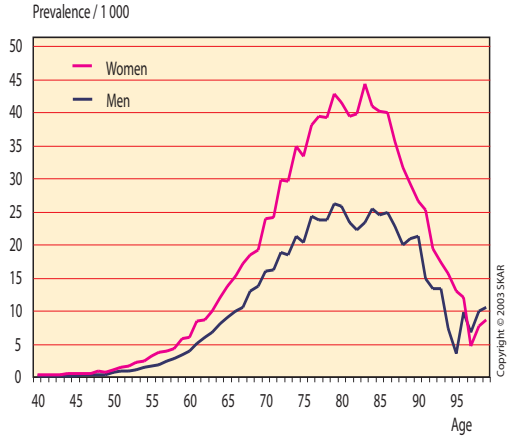



*Knee arthroplasties / year in the marked time-periods. A solid line shows the observed number of operations while a dotted line shows the number to be expected if the increase only had been caused by changes in the age-distribution.*




*Yearly number of kneearthroplasties for respective diagnosis*




*Prevalence of patients with knee arthroplasty in 2000*

As the figure above shows, the increase in the number of knee arthroplasties began at the beginning of the eighties. The increase has mainly depended on a increase of operation due to arthrosis, while the rhumathoid arthritis has decreased slightly, and the posttraumatic cases slightly increased. The reason for this can only be speculated about.

In the beginning of the seventies knee arthroplasty was a relatively unusual operation offered to a few patients with severe joint disorder. The succesful operations made knee arthroplasty more popular, and the technique spread to several hospitals and surgeons. This, in combination with better anesthetics made it possible to offer knee arthroplasties to patients with lesser degree of joint disorder and to older patients. The substantial increase of operations results in more and more patients within the society with operated knees. The figure above is showing the prevalence of knee arthroplasty, i.e. the number of patients per 1000 people who has a knee prosthesis in different age groups. For both men and women the prevalence peaks around 80 years of age. The decrease after 85 years of age is probably a sign that this group is provided below its actual need (in case the patients do not pass away due to the arthroplasty). Thus, there are signs of a ”steady state” among the elderly within a few years. Further increases will occur through shifts in indications and treatment of younger patients.

## The knee register mailout for patients in 2003

During the spring, 35,000 patients operated with knee arthroplasty between 1996 and 2002 were sent a questionaire from the register. The questionaire included Oxford12, SF12 and Euroqol health questionaires, questions about satisfaction, re-operations and infections. Input of the answers are being processed.

An aging population makes joint diseases a growing problem. Approximately 25% of the elder population have symtomatic knee arthrosis. It is therefore important that the effects of treatment for knee arthrosis are evaluated to make a foundation for comparison between different procedures.

The use of questionaires with consequent evaluation might be able to replace certain routines for patients visiting hospitals and thus lead to savings for the health care.

The aim of the project is 1) to develop the register to include measures of patient satisfaction and health related quality of live, 2) to give new information for compilation, analysis and accounts to be used for new groups such as health care purchasers and commissioners, patients and the general public, 3) to validate the contents in the register according to revisions since this is the major measurement of failure for the register.

# Type of operation and implans in 2002

7,785 primary prosthesis reported in 2002, by type and region

| TYPE | Stockholm Gotland | Uppsala Örebro | Southeast | South | West | North |
|---|---|---|---|---|---|---|
| Hinges | 0 | 0 | 0 | 0 | 0 | 0 |
| Linked | 0 | 9 | 1 | 3 | 1 | 2 |
| TKA | 1,440 | 1,379 | 799 | 1,290 | 1,266 | 680 |
| UKA medial | 169 | 256 | 69 | 215 | 163 | 23 |
| UKA lateral | 3 | 3 | 1 | 2 | 1 | 1 |
| Patella | 4 | 1 | 3 | | | 1 |
| TOTAL | 1,616 | 1,648 | 873 | 1,510 | 1,431 | 707 |

Implants for primary TKA in 2002

| | Number | Percent |
|---|---|---|
| PFC Sigma | 2,169 | 31,6 |
| AGC | 1,563 | 22,8 |
| F/S MIII | 896 | 13,1 |
| NexGen | 866 | 12,6 |
| Duracon | 859 | 12,5 |
| Kinemax | 218 | 3,2 |
| Scan | 106 | 1,5 |
| Profix | 65 | 0,9 |
| LCS | 42 | 0,6 |
| Natural II | 13 | 0,2 |
| Other | 57 | 0,8 |
| Total : | 6,854 | 100 |

Implants for primary UKA in 2002

| | Number | Percent |
|---|---|---|
| Link Uni | 419 | 46,2 |
| Miller Galante Uni | 307 | 33,9 |
| Oxford Uni | 82 | 9,1 |
| Genesis | 50 | 5,5 |
| EIUS | 17 | 1,9 |
| PFC-Uni | 13 | 1,4 |
| Other | 18 | 2,0 |
| Total : | 906 | 100 |

Compared with 2001, the number of reported primary arthroplasties has increased from 6,865 to 7,785 or by 13%. All units have reported to the register and although some additional corrections may occur later, they are only expected to cause minor changes in the operations reported.

Use of TKA increased again by 16% between 2001 and 2002. PFC Sigma is the mostly used implant in Sweden while AGC has decreased its marketshare.

The use of UKA decreased by 4% between 2001 and 2002, but the order of popularity for the implants is unchanged. As before the 3 most commonly used implants account for a 90 percent marketshare. One new implant, EIUS, has been introduced since 2001.

The 3 most common implants for primary TKA in each region in 2002

| | Model 1 | n | Model 2 | n | Model 3 | n | Others |
|---|---|---|---|---|---|---|---|
| Stockholm / Gotland | PFC S | 922 | Duracon | 215 | NexGen | 124 | 179 |
| Uppsala / Örebro | F/S MIII | 423 | AGC | 319 | NexGen | 313 | 324 |
| Southeast | PFC S | 289 | NexGen | 274 | AGC | 229 | 7 |
| South | PFC S | 535 | Duracon | 354 | AGC | 290 | 111 |
| West | AGC | 378 | F/S MIII | 352 | Duracon | 212 | 324 |
| North | AGC | 340 | PFC S | 142 | Duracon | 75 | 123 |

The 3 most common implants for primary UKA in each region in 2002

| | Model 1 | n | Model 2 | n | Model 3 | n | Others |
|---|---|---|---|---|---|---|---|
| Stockholm / Gotland | Miller Gal. | 152 | Oxford | 9 | Link | 8 | 3 |
| Uppsala / Örebro | Link | 206 | Genesis | 25 | Miller Gal. | 16 | 12 |
| Southeast | Link | 26 | Genesis | 24 | Miller Gal. | 13 | 7 |
| South | Link | 140 | Oxford | 34 | Miller Gal. | 15 | 28 |
| West | Miller Gal. | 109 | Oxford | 34 | Link | 21 | |
| North | Link | 18 | Oxford | 4 | Miller Gal. | 2 | |

# Bone cement and incision in 2002

Use of bone cement in 2002

| | Primary TKA | | Primary UKA | |
|---|---|---|---|---|
| All components cemented | 6,177 | | 906 | |
| Only the patellarbutton without cement | 556 | | | |
| The femur- and tibial components without cement (1 with cem pat) | 98 | | | |
| Only the femur component without cement | 5 | | | |
| Only the tibial component without cement | 5 | | | |
| The femur component and patellar button without cement | 0 | | | |
| The femur-, tibia- and patellar components without cement | 0 | | | |
| Information missing | 13 | | | |
| Total | 6,854 | | 906 | |
| | Number | Percent | Number | Percent |
| Palacos/Gentamycin | 5,355 | 79,2 | 742 | 81,9 |
| Refobacin-Palacos R | 1,199 | 17,7 | 138 | 15,2 |
| Palacos | 157 | 2,3 | 20 | 2,2 |
| Simplex | 28 | 0,4 | 4 | 0,4 |
| CMW Genta | 11 | 0,2 | 0 | 0,0 |
| Copal | 5 | 0,1 | 0 | 0,0 |
| Palamed G40 | 1 | 0,0 | 0 | 0,0 |
| Information missing | 1 | 0,0 | 2 | 0,2 |
| Total | 6,757 | 100 | 906 | 100 |
| All implanted part without cement | 97 | | 0 | |
| Grand Total | 6,854 | | 906 | |

NB Handwriting the type of the cement on the report may be a source of error.

The units are encouraged to use the sticker that comes with the cement package.

## Type of bone cement.

In Sweden, the use of bone cement is the most common method for fixing the implants in bone. During 2002 approximately 1,4% of all TKA were completely without cement. Cement was used in all UKA. Palacos bone cement continues to be the dominating type of cement being used in 99% of the cemented prosthesis. Only 3% of the cemented implants were implanted without having antibiotics in the cement.

We want to remind the operative units to report the type of bone cement used, using the stickers that normally are to be found in the cement packages.

## Mini-incision

For UKA we have since 1999 registered whether the implant was inserted by a standard arthrotomy or by the new type of mini-arthrotomy.

Our definition of mini-incision implies that the surgeon gains access to the knee joint by the use of a very small arthrotomy without needing to dislocate/evert the patella. The procedure has been claimed to be less traumatic surgery, quicker rehabilitation and shorter hospital stay.

Minimally invasive technique seems to be gaining popularity. Thus it has increased from being used in 15% of the UKA implanted in 1999 to 46% in 2002.

Even though the material is still small and has not been followed longterm, there are indications showing that the mini-incision increases the revision rate. If that is due to the learning curve and whether the results will improve in the future can only be speculated on. However, as the UKA has been shown to be sensitive to surgical routine without a mini-incision, it is conceivable that the new operating procedure may further deteriorate the long-term results.

The type of incision for 906 UKA in 2002

| | Incision | | |
|---|---|---|---|
| | Standard | Mini | No info |
| Link Uni | 324 | 92 | 3 |
| Miller Galante Uni | 84 | 221 | 2 |
| Oxford Uni | 0 | 80 | 2 |
| Genesis | 34 | 3 | 13 |
| EIUS | 2 | 15 | 0 |
| PFC-Uni | 13 | 0 | 0 |
| Duracon Uni | 9 | 0 | 0 |
| Other | 8 | 0 | 0 |
| Unknown implant | 0 | 1 | 0 |

# Use of patellar button in 2002

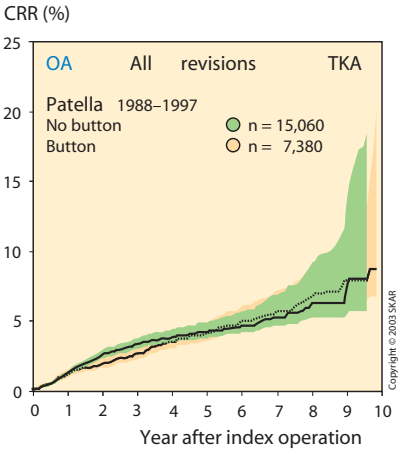
## Patellar button for TKA in 2002

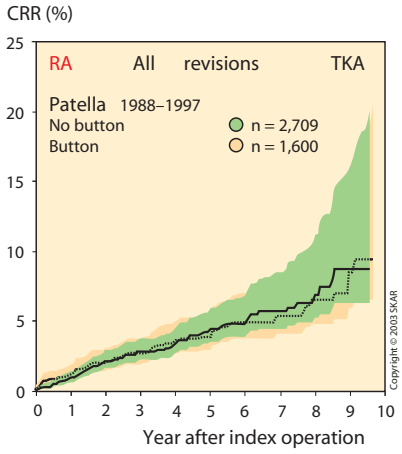
The use of patellar button is heavily dependent on the implant model used. Thus, those using Freeman-Samuelson implants most often inserted a button during the primary operation while those using LCS (New Jersey) and Scan Knee seldomly did.

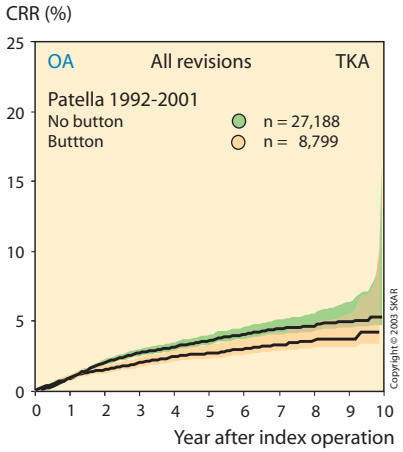
In previous analyses (1988–1997) we found no difference in CRR dependent on the use of patellar button. However, as mentioned in the last report, there has been a tendency for a change to the advantage of the patellar button. During the present time period we found a lower CRR when a patellar button was used. If only AGC implants were analyzed, the difference became still more evident.

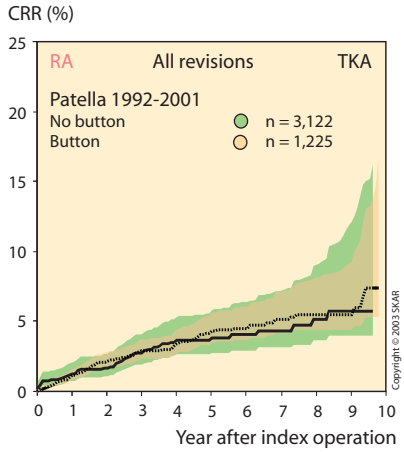
## Use of patellar button for primary TKA in 2002

| | No patellar button | % | Patellar button | % |
|---|---|---|---|---|
| PFC | 2,020 | 93,1 | 149 | 6,9 |
| AGC | 1,433 | 91,7 | 130 | 8,3 |
| Freeman/Samuelsson | 288 | 32,1 | 608 | 67,9 |
| NexGen | 843 | 97,3 | 23 | 2,7 |
| Duracon | 798 | 92,9 | 61 | 7,1 |
| Kinemax | 186 | 85,3 | 32 | 14,7 |
| Scan Knee | 106 | 100,0 | 0 | 0,0 |
| Profix | 55 | 84,6 | 10 | 15,4 |
| New Jersey (LCS) | 42 | 100,0 | 0 | 0,0 |
| Other | 60 | 85,7 | 10 | 14,3 |
| Total | 5,831 | 85,1 | 1,023 | 14,9 |




*The general CRR during the analyzed period 1988-1997 was not affected by whether or not a patellar button was used in TKA. However, during the current 10-year period the CRR is lower for TKA with patellar button. The need for secondary patellar additions has to be weighted against the frequency of loosening of the patellar buttons.*

# Implants and revisions during 1992–2001

Operations performed early during the analyzed period have a relatively large influence on the cumulative revision rate. Subsequently this has the largest impact on the older models.

To be able to account for the reasonably long-term results of relatively modern types of implant types, the register usually uses the latest 10-year period that is available for analysis.

Implants for primary TKA in 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 14,017 | 33,1 |
| PFC Sigma | 4,091 | 9,7 |
| PFC | 2,839 | 6,7 |
| F/S MIII | 5,541 | 13,1 |
| F/S unspec | 319 | 0,8 |
| Duracon | 4,203 | 9,9 |
| Kinemax | 3,333 | 7,9 |
| Scan | 2,730 | 6,5 |
| NexGen | 1,464 | 3,5 |
| Miller Galante2 | 1,089 | 2,6 |
| Miller Galante unspec | 343 | 0,8 |
| AMK | 640 | 1,5 |
| LCS | 484 | 1,1 |
| Profix | 256 | 0,6 |
| Axiom | 139 | 0,3 |
| PCA-Mod | 125 | 0,3 |
| PCA unspec | 17 | 0,0 |
| Synatomic | 119 | 0,3 |
| Osteonics | 64 | 0,2 |
| Rotaglide | 63 | 0,1 |
| Tricon | 62 | 0,1 |
| Nuffield | 37 | 0,1 |
| Genesis | 31 | 0,1 |
| Other | 295 | 0,7 |
| Total : | 42,301 | 100 |

Implants for primary UKA in 1992–2001

| | Number | Percent |
|---|---|---|
| Link-Endo | 4,819 | 39,7 |
| Link-St,Georg | 370 | 3,0 |
| Marmor / Richards | 1,631 | 13,4 |
| Miller Galante | 1,500 | 12,4 |
| Brigham | 923 | 7,6 |
| Oxford | 694 | 5,7 |
| Duracon | 693 | 5,7 |
| PFC | 611 | 5,0 |
| Genesis | 328 | 2,7 |
| Allegretto | 313 | 2,6 |
| Repicci (AARS) | 212 | 1,7 |
| Other | 41 | 0,3 |
| Total | 12,135 | 100 |

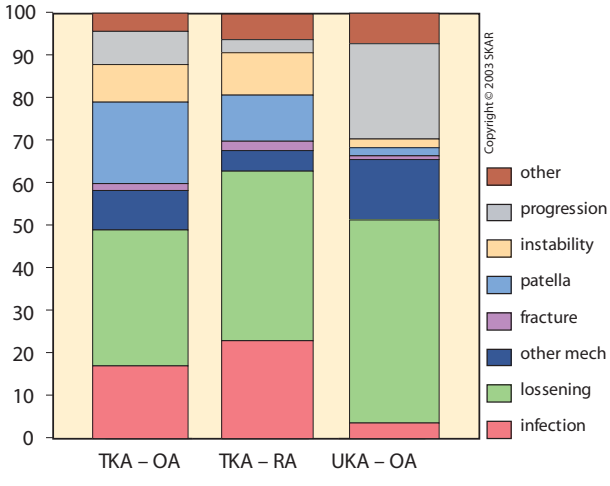
Linked implants (primary) in 1992–2001

| | Number | Percent |
|---|---|---|
| Endo rotation | 119 | 71,3 |
| Kotz | 33 | 19,8 |
| St. Georg rotation | 12 | 7,2 |
| Other | 3 | 1,8 |
| Total | 167 | 100 |

## Revisions during 1992–2001

1,392 revisions of TKA´s for OA, 394 of TKA for RA and 1,615 revisions of UKA for OA were performed durng the 10-year period. The indications for the revisions are shown in the diagram. Note that the index-operations may have been performed before the accounted 10-year period. Loosening remains the dominant reason for revision. ”Progression” in TKA mainly reflects revisions performed for femoropatellar arthrosis/arthritis. ”Patella” includes all kind of problems with the patella in patients that had their primaries inserted with or without a patellar button. Please note that the distrubution of the causes for revision does not have to reflect the risk of these complications, which preferably are evaluated by CRR.

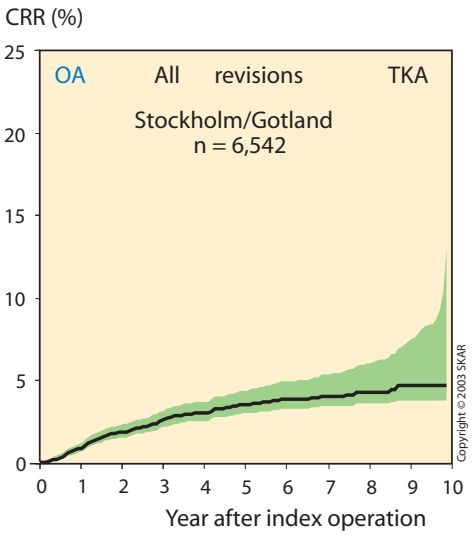
Distribution (%) of reasons for revisions 1992–2001



# TKA implants for osteoarthrosis in the regions 1992–2001

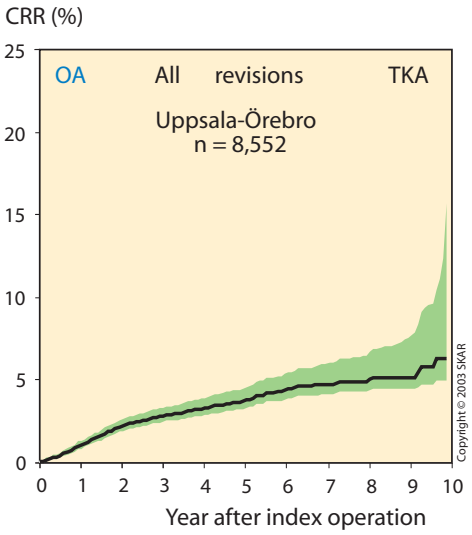
Stockholm + Gotland
Implants for primary TKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 2,342 | 35,8 |
| PFC Sigma | 1,821 | 27,8 |
| PFC | 399 | 6,1 |
| Kinemax | 778 | 11,9 |
| Duracon | 750 | 11,5 |
| F/S MIII | 192 | 2,9 |
| F/S unspec | 15 | 0,2 |
| NexGen | 121 | 1,8 |
| AMK | 66 | 1,0 |
| Genesis | 14 | 0,2 |
| Rotaglide | 10 | 0,2 |
| LCS | 10 | 0,2 |
| Other | 24 | 0,4 |
| Total | 6,542 | 100 |



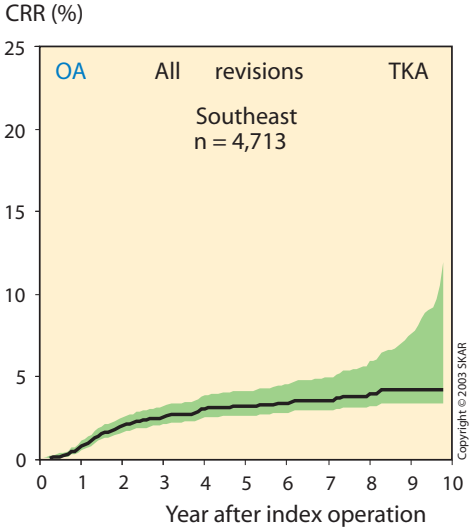

Uppsala-Örebro
Implants for primary TKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| F/S MIII | 2,526 | 29,5 |
| F/S unspec | 43 | 0,5 |
| AGC | 2,258 | 26,4 |
| Kinemax | 1,976 | 23,1 |
| Miller Galante2 | 368 | 4,3 |
| Miller Galante unspec | 64 | 0,7 |
| NexGen | 421 | 4,9 |
| Scan | 329 | 3,8 |
| AMK | 310 | 3,6 |
| PFC Sigma | 85 | 1,0 |
| PFC | 78 | 0,9 |
| Tricon | 12 | 0,1 |
| PCA-Mod | 12 | 0,1 |
| PCA | 12 | 0,1 |
| Other | 58 | 0,7 |
| Total | 8,552 | 100 |



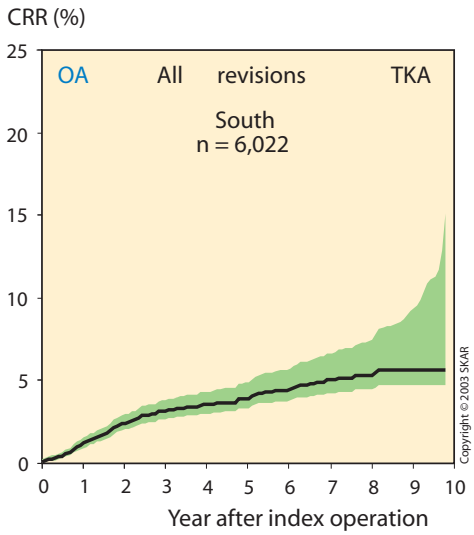

Southeast
Implants for primary TKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 2,000 | 42,4 |
| NexGen | 712 | 15,1 |
| PFC | 496 | 10,5 |
| PFC Sigma | 463 | 9,8 |
| Miller Galante2 | 394 | 8,4 |
| Miller Galante unspec | 126 | 2,7 |
| Duracon | 343 | 7,3 |
| Scan | 49 | 1,0 |
| Kinemax | 45 | 1,0 |
| PCA-Mod | 33 | 0,7 |
| F/S MIII | 10 | 0,2 |
| Other | 42 | 0,9 |
| Total | 4,713 | 100 |



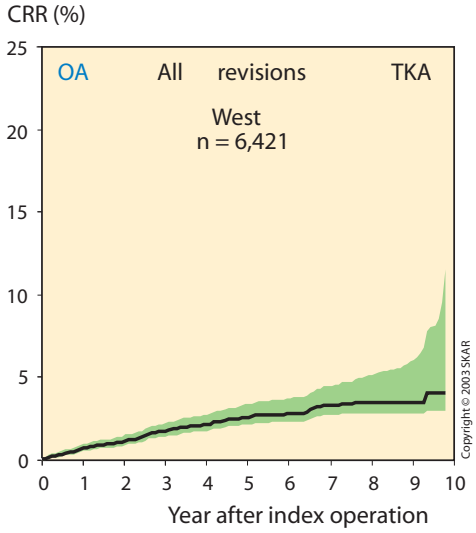
South
Implants for primary TKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| Duracon | 1,676 | 27,8 |
| AGC | 1,244 | 20,7 |
| Scan | 1,086 | 18,0 |
| PFC | 874 | 14,5 |
| PFC Sigma | 658 | 10,9 |
| Synatomic | 81 | 1,3 |
| Axiom | 63 | 1,0 |
| Osteonics | 63 | 1,0 |
| F/S MIII | 61 | 1,0 |
| LCS | 48 | 0,8 |
| Rotaglide | 47 | 0,8 |
| Nuffield | 37 | 0,6 |
| PCA-Mod | 24 | 0,4 |
| AMK | 13 | 0,2 |
| Other | 47 | 0,8 |
| Total | 6,022 | 100 |



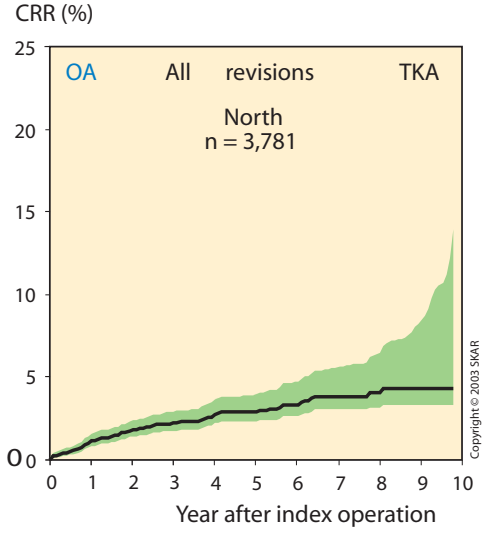

West
Implants for primary TKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 3,135 | 48,8 |
| F/S MIII | 1,677 | 26,1 |
| F/S unspec | 186 | 2,9 |
| Duracon | 459 | 7,1 |
| Scan | 437 | 6,8 |
| PFC Sigma | 165 | 2,6 |
| PFC | 33 | 0,5 |
| AMK | 114 | 1,8 |
| Axiom | 72 | 1,1 |
| Miller Galante2 | 46 | 0,7 |
| Miller Galante unspec | 25 | 0,4 |
| NexGen | 45 | 0,7 |
| Other | 27 | 0,4 |
| Total | 6,421 | 100 |




North
Implants for primary TKA in OA 1992–2001

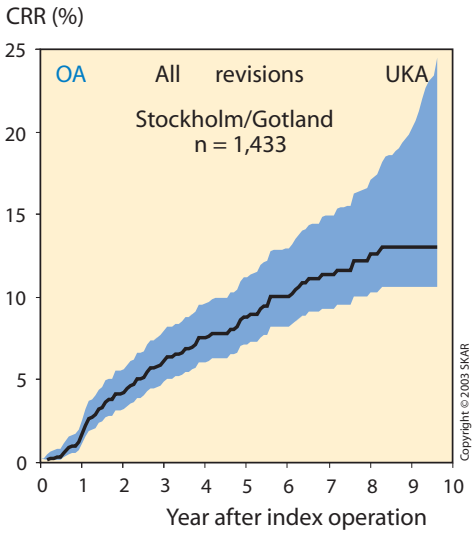
| | Number | Percent |
|---|---|---|
| AGC | 1,297 | 34,3 |
| PFC | 461 | 12,2 |
| PFC Sigma | 355 | 9,4 |
| Duracon | 488 | 12,9 |
| LCS | 341 | 9,0 |
| Profix | 190 | 5,0 |
| Scan | 147 | 3,9 |
| F/S MIII | 143 | 3,8 |
| Miller Galante2 | 89 | 2,4 |
| Miller Galante unspec | 49 | 1,3 |
| Kinemax | 59 | 1,6 |
| AMK | 42 | 1,1 |
| Tricon | 37 | 1,0 |
| PCA-Mod | 25 | 0,7 |
| Synatomic | 17 | 0,4 |
| Other | 45 | 1,2 |
| Total | 3,785 | 100 |



# UKA implants for primary osteoarhrosis in the regions 1992–2001

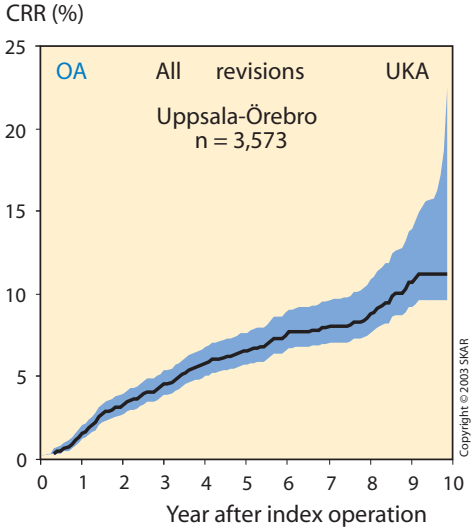
Stockholm + Gotland
Implants for primary UKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| Brigham | 573 | 40,0 |
| Miller Galante | 555 | 38,7 |
| Oxford | 90 | 6,3 |
| Link | 80 | 5,6 |
| Genesis | 57 | 4,0 |
| Allegretto | 27 | 1,9 |
| Repicci (AARS) | 20 | 1,4 |
| Duracon | 13 | 0,9 |
| PFC | 13 | 0,9 |
| Other | 5 | 0,3 |
| Total | 1,433 | 100 |



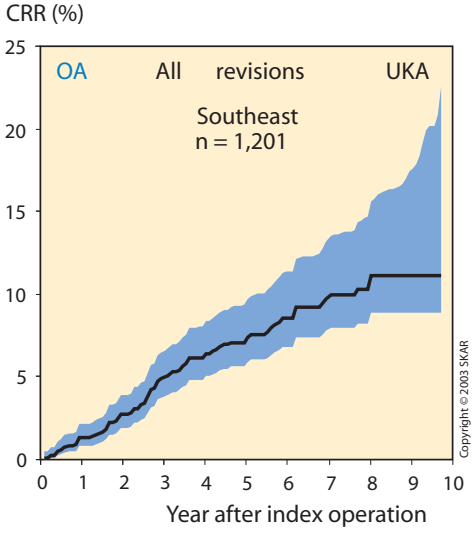

Uppsala-Örebro
Implants for primary UKA in OA 1992–2001

| | Antal | Procent |
|---|---|---|
| Link | 1,951 | 54,6 |
| Marmor | 748 | 20,9 |
| PFC | 280 | 7,8 |
| St, Georg | 237 | 6,6 |
| Duracon | 99 | 2,8 |
| Genesis | 98 | 2,7 |
| Oxford | 50 | 1,4 |
| Brigham | 31 | 0,9 |
| Miller Galante | 30 | 0,8 |
| Allegretto | 24 | 0,7 |
| PCA | 21 | 0,6 |
| Other | 5 | 0,1 |
| Total | 3,574 | 100 |



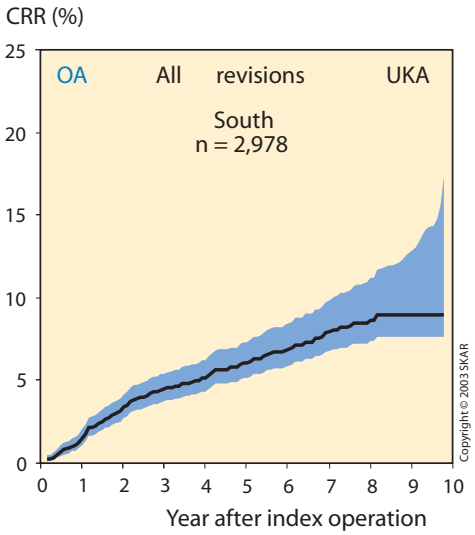

Southeast
Implants for primary UKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| Link | 296 | 24,6 |
| Marmor | 262 | 21,8 |
| Brigham | 174 | 14,5 |
| Duracon | 154 | 12,8 |
| Genesis | 110 | 9,2 |
| Allegretto | 64 | 5,3 |
| PFC | 63 | 5,2 |
| Miller Galante | 45 | 3,7 |
| Oxford | 24 | 2,0 |
| Other | 9 | 0,7 |
| Total | 1,201 | 100 |



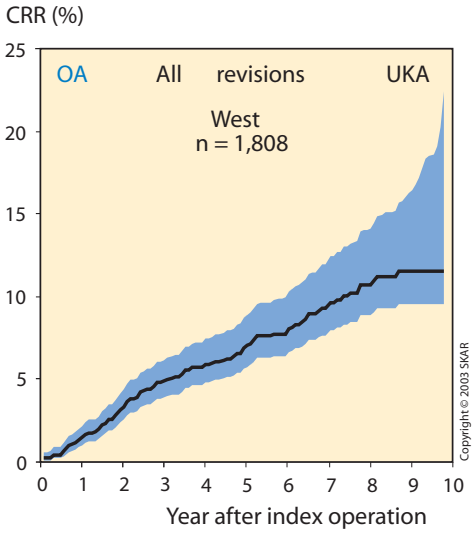
South
Implants for primary UKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| Link | 1,387 | 46,6 |
| Marmor | 439 | 14,7 |
| Duracon | 269 | 9,0 |
| PFC | 195 | 6,5 |
| Miller Galante | 141 | 4,7 |
| Allegretto | 118 | 4,0 |
| Repicci (AARS) | 109 | 3,7 |
| Brigham | 107 | 3,6 |
| Oxford | 94 | 3,2 |
| St, Georg | 61 | 2,0 |
| Genesis | 54 | 1,8 |
| Other | 5 | 0,2 |
| Total | 2,979 | 100 |



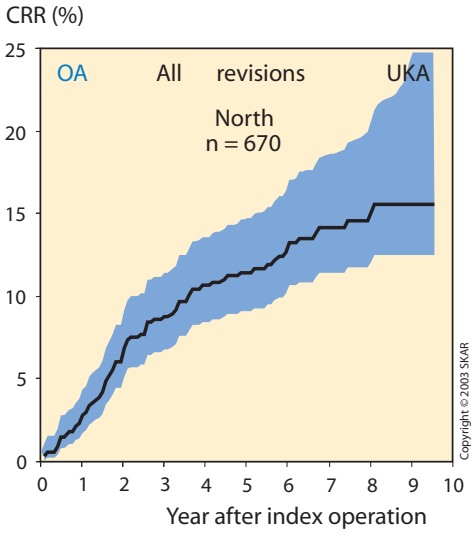

West
Implants for primary UKA in OA 1992–2001

| | Number | Percent |
|---|---|---|
| Miller Galante | 604 | 33,4 |
| Link | 506 | 28,0 |
| Oxford | 333 | 18,4 |
| Duracon | 109 | 6,0 |
| Marmor | 99 | 5,5 |
| Repicci (AARS) | 75 | 4,1 |
| Allegretto | 69 | 3,8 |
| St, Georg | 12 | 0,7 |
| Other | 1 | 0,1 |
| Total | 1,808 | 100 |




North
Implants for primary UKA in OA 1992–2001

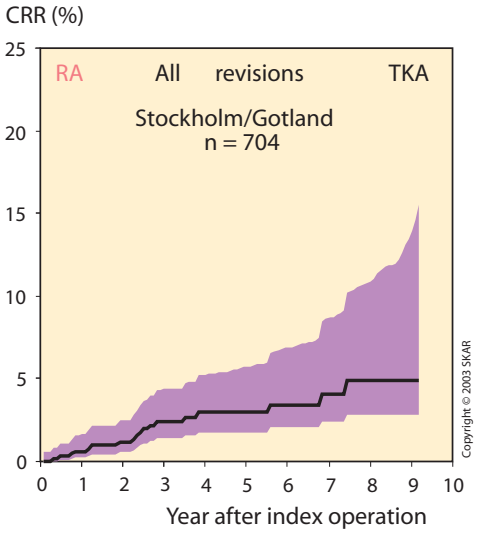
| | Number | Percent |
|---|---|---|
| Link | 413 | 61,6 |
| Oxford | 71 | 10,6 |
| Miller Galante | 61 | 9,1 |
| St, Georg | 53 | 7,9 |
| Marmor | 30 | 4,5 |
| PFC | 27 | 4,0 |
| Duracon | 15 | 2,2 |
| Other | 0 | 0,0 |
| Total | 670 | 100 |



# TKA Implants for RA in the regions 1992–2001

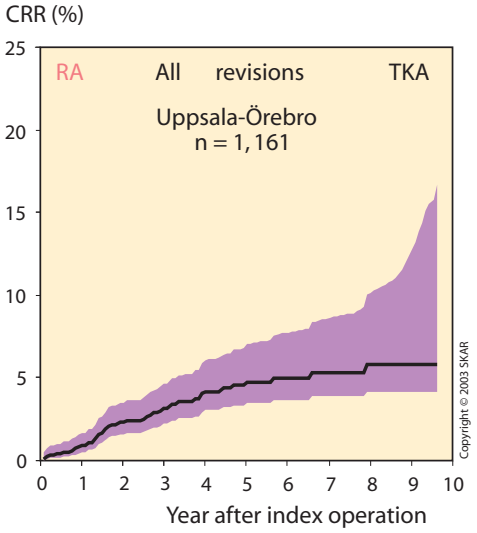
Stockholm + Gotland
Implants for primary TKA in RA 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 280 | 39,8 |
| PFC Sigma | 156 | 22,2 |
| PFC | 41 | 5,8 |
| Duracon | 100 | 14,2 |
| Kinemax | 83 | 11,8 |
| F/S MIII | 29 | 4,1 |
| F/S unspec | 8 | 1,1 |
| Other | 7 | 1,0 |
| Total | 704 | 100 |



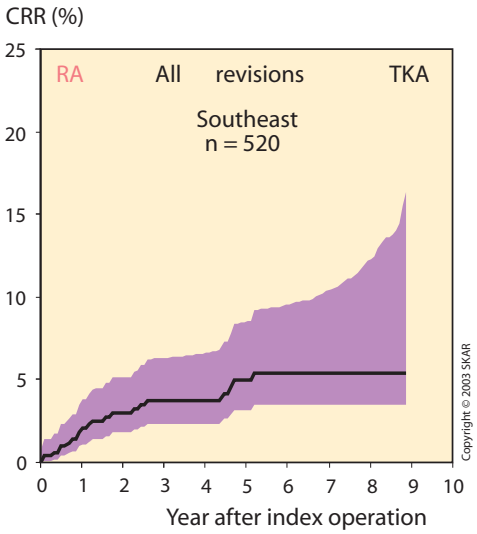

Uppsala-Örebro
Implants for primary TKA in RA 1992–2001

| | Number | Percent |
|---|---|---|
| F/S MIII | 364 | 31,4 |
| F/S unspec | 14 | 1,2 |
| Kinemax | 263 | 22,7 |
| AGC | 228 | 19,6 |
| Scan | 141 | 12,1 |
| Miller Galante2 | 61 | 5,3 |
| Miller Galante unspec | 25 | 2,2 |
| NexGen | 16 | 1,4 |
| AMK | 13 | 1,1 |
| PFC | 12 | 1,0 |
| PFC Sigma | 6 | 0,5 |
| Other | 18 | 1,6 |
| Total | 1 161 | 100 |



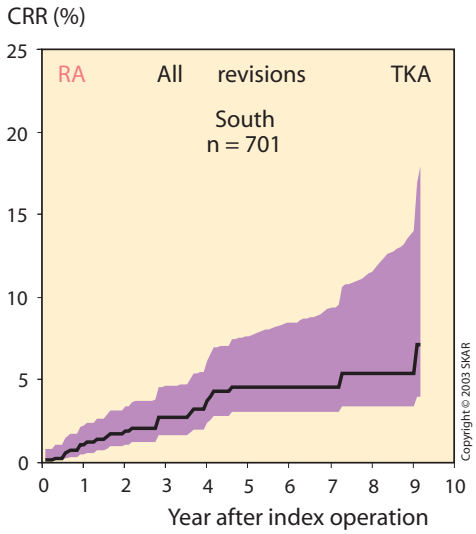

Southeast
Implants for primary TKA in RA 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 217 | 41,7 |
| NexGen | 81 | 15,6 |
| PFC | 78 | 15,0 |
| PFC Sigma | 34 | 6,5 |
| Miller Galante2 | 35 | 6,7 |
| Miller Galante unspec | 23 | 4,4 |
| Duracon | 30 | 5,8 |
| Scan | 9 | 1,7 |
| Other | 13 | 2,5 |
| Total | 520 | 100 |



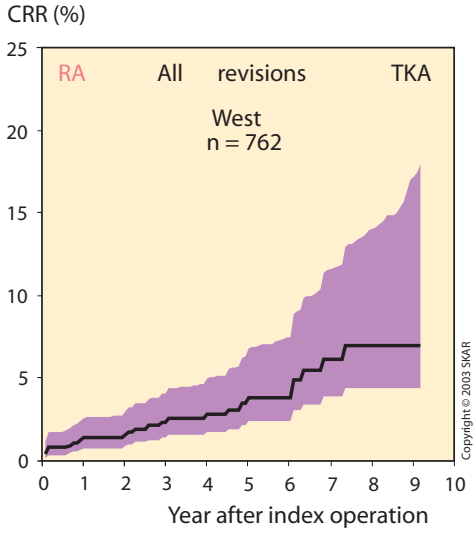
South
Implants for primy TKA in RA 1992–2001

| | Number | Percent |
|---|---|---|
| Scan | 285 | 40.7 |
| PFC | 130 | 18.5 |
| PFC Sigma | 62 | 8.8 |
| AGC | 110 | 15.7 |
| Duracon | 72 | 10.3 |
| Synatomic | 21 | 3.0 |
| Other | 21 | 3.0 |
| Total | 701 | 100 |



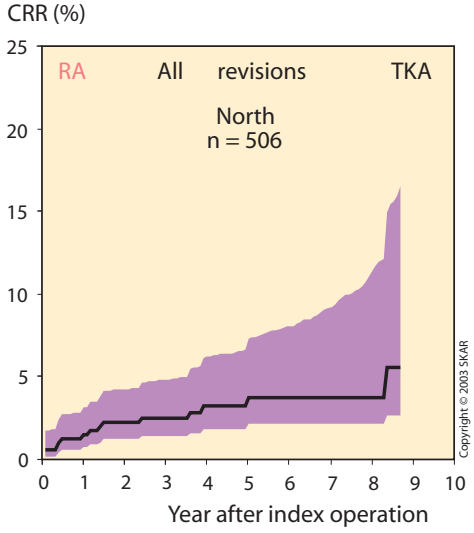

West
Implants for primy TKA in RA 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 295 | 38.7 |
| F/S MIII | 274 | 35.9 |
| F/S unspec | 44 | 5.8 |
| Scan | 92 | 12.1 |
| Duracon | 28 | 3.7 |
| AMK | 20 | 2.6 |
| Other | 10 | 1.3 |
| Total | 763 | 100 |




North
Implants for primy TKA in RA 1992–2001

| | Number | Percent |
|---|---|---|
| AGC | 113 | 22.3 |
| Duracon | 110 | 21.7 |
| PFC | 94 | 18.6 |
| PFC Sigma | 44 | 8.7 |
| LCS | 33 | 6.5 |
| Miller Galante2 | 29 | 5.7 |
| Miller Galante unspec | 7 | 1.4 |
| Profix | 19 | 3.8 |
| Scan | 13 | 2.6 |
| Tricon | 10 | 2.0 |
| Other | 34 | 6.7 |
| Total | 506 | 100 |



The registry usually uses the last 10-year period for analysis to present the results of relatively modern implant types that have a reasonable long-term follow-up. It has to be noted that brands marked as unspecified usually consist of a mix of older and newer variants but where the reporting unit has not delivered a specified description. For some older unspecified brands this has resulted in improvement of results compared to prior analysis. The cause is probably that fewer implants of the older variants are becoming included in the analysis.

The risk of becoming revised is only one of the many ways how differences between implants can be measured. Although not accounted for here, the type of the revision should also be considered. For example, the observed revision rate will increase when the use of patellar button is deliberately avoided (see page 11) in favour of a secondary resurfacing of the patella, when needed.

On the following pages are CRR curves for TKA and UKA implants used for OA. As the table below shows, there are no significant differences for the models when used in RA, subsequetly no curves are disclosed.

For OA TKA has the increased number of operations led to that the former small diffrences observed, now has become significant and where some popular prosthesis now has a lower risk of revision than the reference AGC.

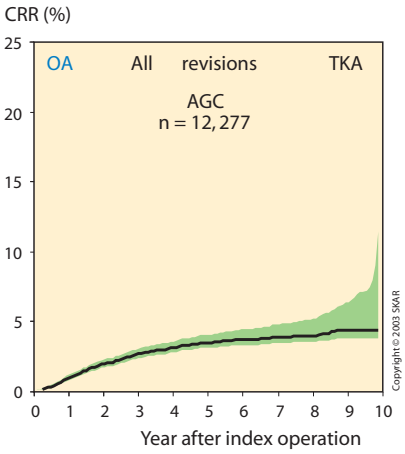
Presently we cannot evaluate the effect of mini-incision on the results of UKA. However, it is noteworthy that the implants most often used with mini-incision have a bigger CRR than the most commonly used Endo-Link. As even this implant is now becoming used with mini-incision the qustion may be answered later.

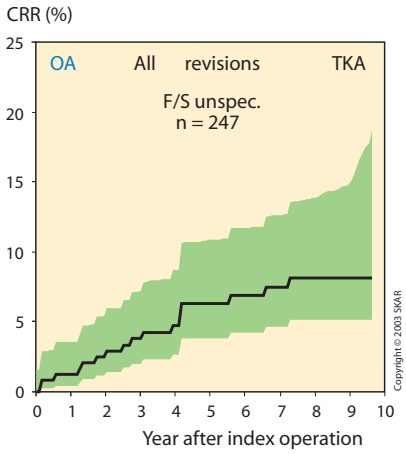
95% confidense interval for risk ratios for becoming revised. Cox regression is used to adjust for gender, age and year of operation.

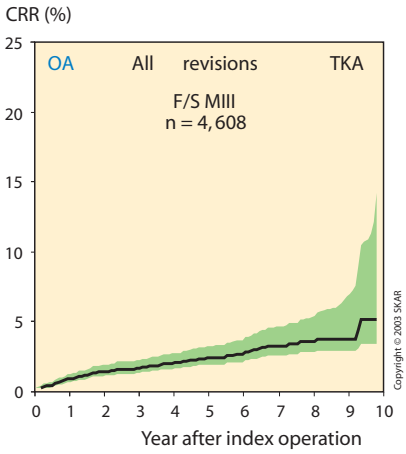
| | OA / TKA n | 95% CI | | RA / TKA n | 95% CI | | OA / UKA n | 95% CI |
|---|---|---|---|---|---|---|---|---|
| AGC | 12 227 | REF | AGC | 1242 | REF | Link–Uni | 4 631 | REF |
| PFC Sigma | 3 547 | 0,55–1,18 | PFC Sigma | 302 | 0,07–1,31 | Marmor/Richards | 1 581 | 1,33–1,97 |
| PFC | 2 339 | 1,02–1,60 | PFC | 355 | 0,43–1,44 | Miller Galante | 1 436 | 1,05–1,86 |
| F/S MIII | 4 608 | 0,59–0,95 | F/S MIII | 672 | 0,49–1,33 | Brigham | 885 | 0,88–1,51 |
| F/S unspec | 247 | 1,03–2,76 | F/S unspec | 66 | 0,41–3,29 | Oxford | 662 | 0,99–1,81 |
| Duracon | 3 718 | 0,57–0,96 | Duracon | 342 | 0,29–1,30 | Duracon | 659 | 0,93–1,73 |
| Kinemax | 2 867 | 0,89–1,40 | Kinemax | 355 | 0,61–1,85 | PFC | 578 | 1,47–2,64 |
| Scan | 2 049 | 1,01–1,65 | Scan | 540 | 0,37–1,15 | St,Georg | 367 | 0,33–0,95 |
| NexGen | 1 299 | 0,05–0,49 | NexGen | 98 | 0,20–3,50 | Genesis | 319 | 0,51–1,85 |
| Miller Galante II | 898 | 0,85–1,69 | Miller Galante II | 127 | 0,44–2,41 | Allegretto | 302 | 1,03–2,24 |
| Miller G, unspec | 265 | 1,44–3,29 | Miller G, unspec | 56 | 0,50–3,98 | Repicci (AARS) | 204 | 1,18–2,77 |
| AMK | 552 | 1,06–2,47 | – | | | PCA | 23 | 1,38–8,18 |
| LCS | 405 | 0,65–1,96 | LCS | 35 | 0,11–5,60 | – | | |
| Profix | 190 | 0,12–2,00 | – | | | – | | |
| Axiom | 139 | 0,66–3,30 | – | | | – | | |
| PCA–Mod | 103 | 1,01–3,84 | PCA–Mod | 16 | 0,13–7,15 | – | | |
| Synatomic | 98 | 0,58–2,93 | – | | | – | | |
| Other | 430 | 0,65–1,78 | Other | 65 | 0,41–4,24 | Other | 15 | 0,55–8,88 |
| Gender | | 0,83–1,08 | Gender | | 0,50–1,03 | Gender | | 0,90–1,19 |
| Age | | 0,95–0,97 | Age | | 0,98–1,01 | Age | | 0,95–0,96 |
| Year of operation | | 0,95–0,99 | Year of operation | | 0,96–1,12 | Year of operation | | 0,93–1,01 |

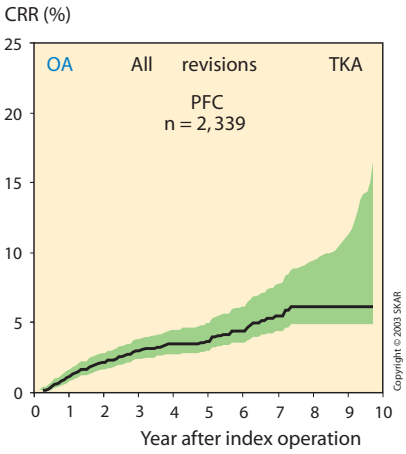
Significant difference with higher risk ratio
Significant difference with lower risk ratio

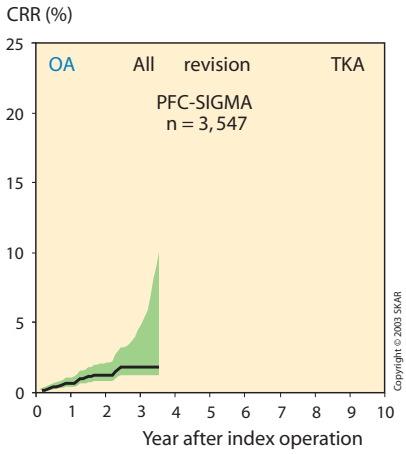
# CRR for commonly used TKA implants in OA during 1992–2001

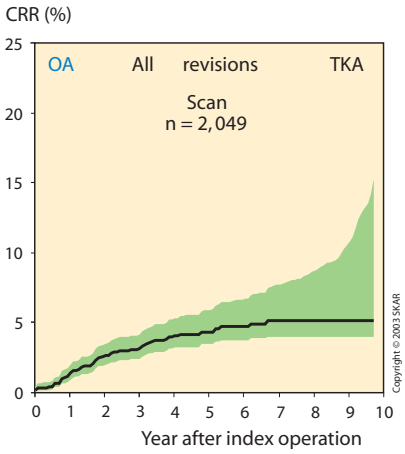


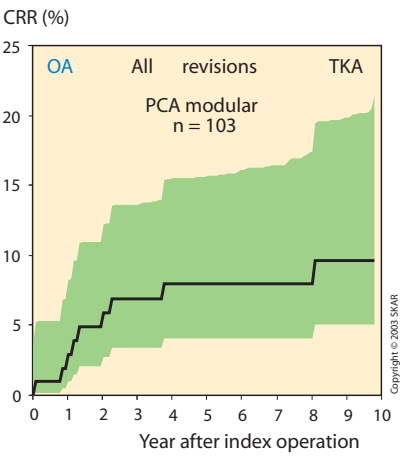



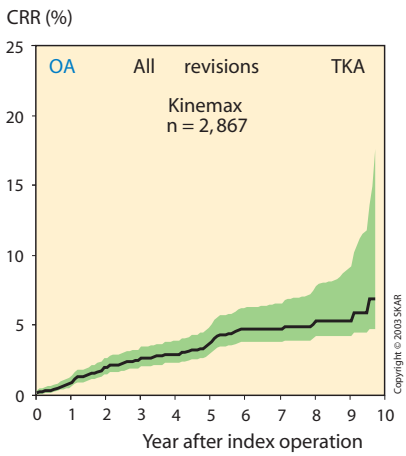



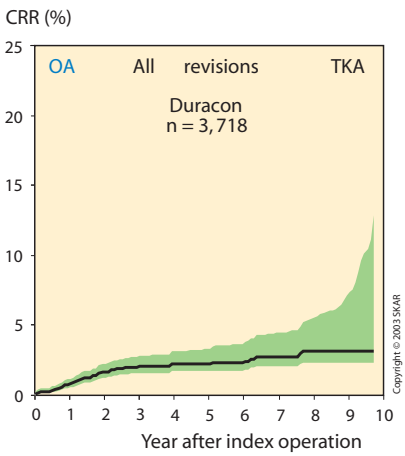



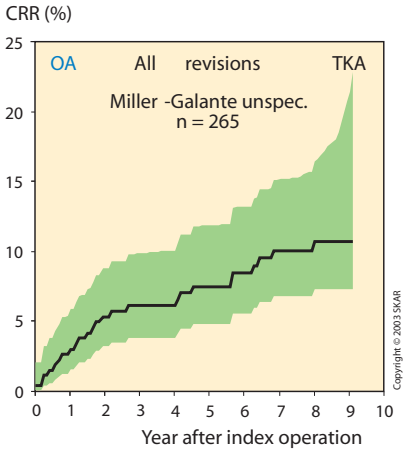




CRR (%)
OA All revisions TKA
Miller -Galante unspec.
n = 265
Year after index operation
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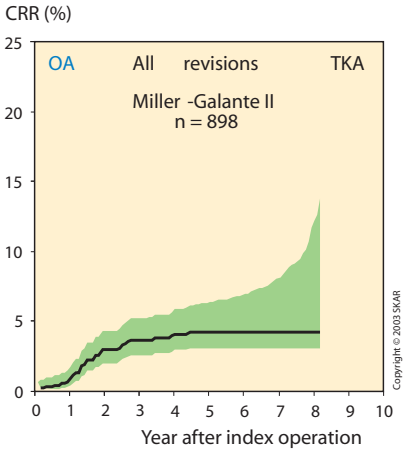
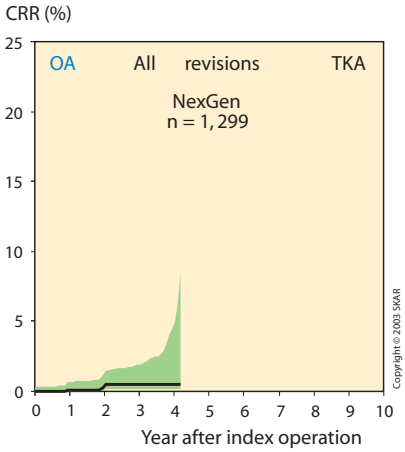

CRR (%)
OA All revisions TKA
Miller -Galante II
n = 898
Year after index operation
Copyright © 2003 SKAR


CRR (%)
OA All revisions TKA
NexGen
n = 1,299
Year after index operation
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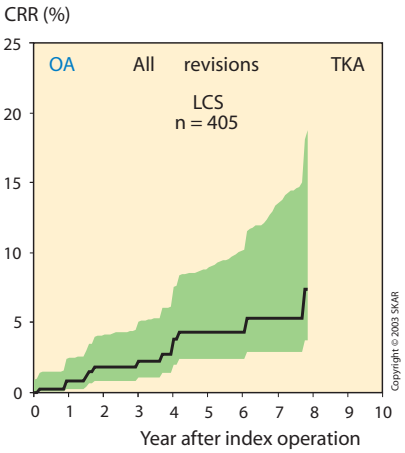
CRR (%)
OA All revisions TKA
LCS
n = 405
Year after index operation
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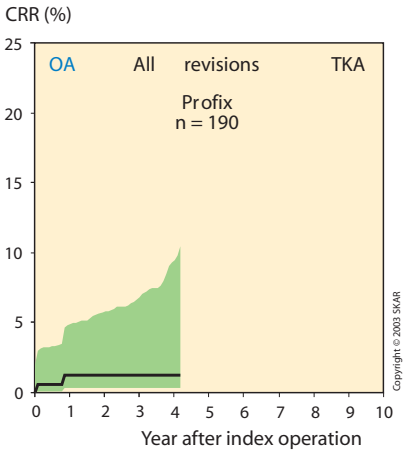
CRR (%)
OA All revisions TKA
Profix
n = 190
Year after index operation
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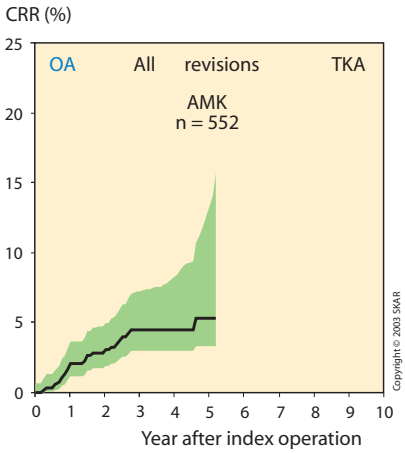
CRR (%)
OA All revisions TKA
AMK
n = 552
Year after index operation
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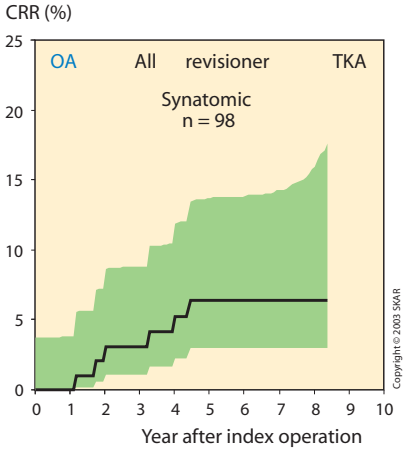
CRR (%)
OA All revisioner TKA
Synatomic
n = 98
Year after index operation
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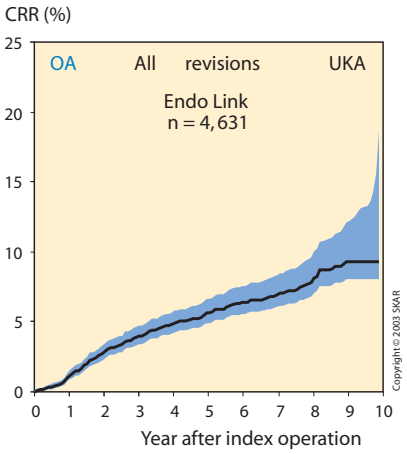
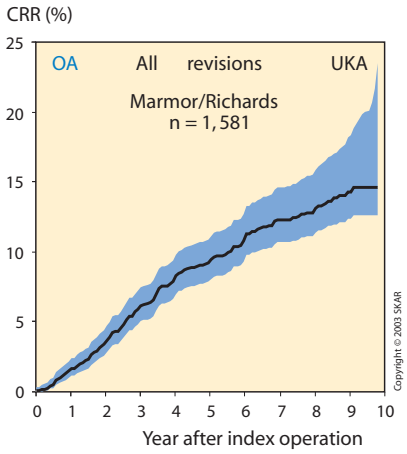
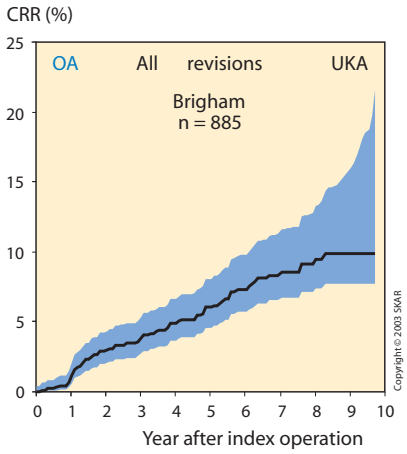
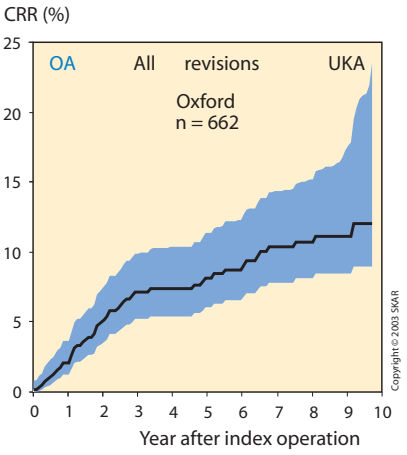
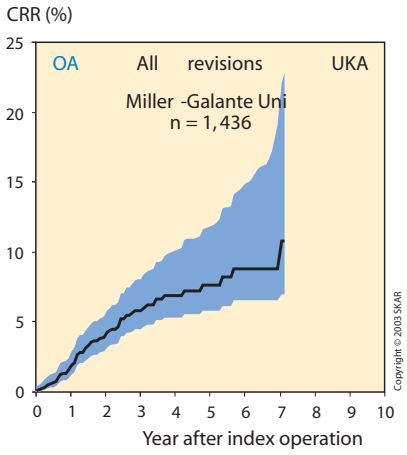
# CRR for commonly used UKA implants in OA during 1992–2001

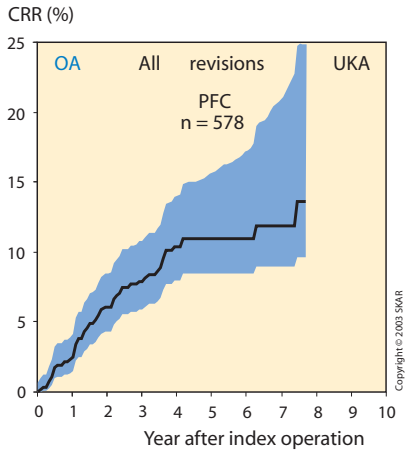


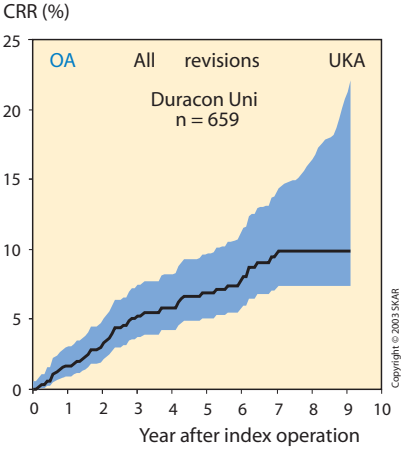



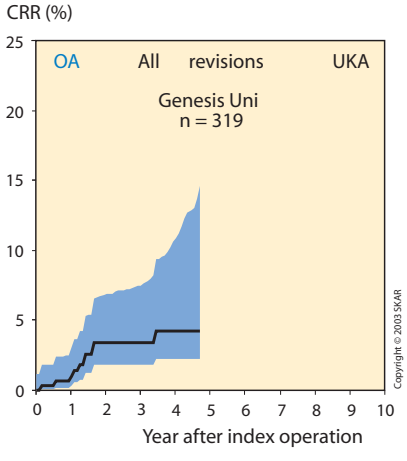



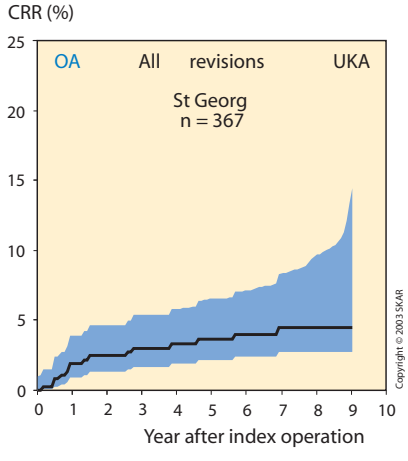



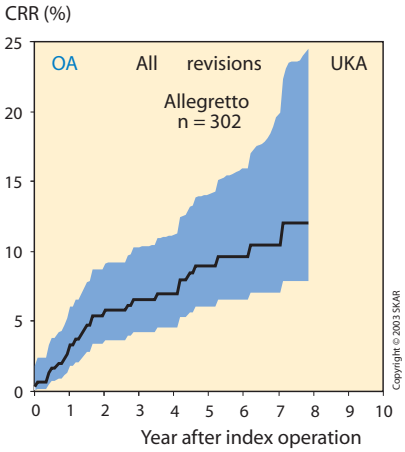



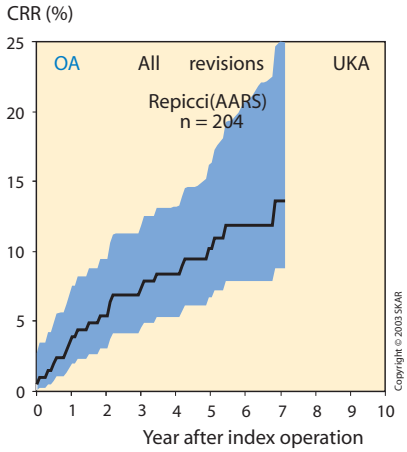



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