

The Danish Hip Arthroplasty Register

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ABSTRACT – In Denmark (5.3 mill. inhabitants), a national register for total hip replacements was established in January 1995. During the first 4 years, 18,222 primary total hip replacements (THR), 3,343 revisions and 6,071 follow-up examinations have been registered. During the same period, the incidence of primary THR per 100,000 inhabitants has increased from 72 in 1995 to 93 in 1998. The mean age at the primary replacement was 68 years, 59% were women and in 75% primary arthrosis was the diagnosis. An increasing use of uncemented implants has been observed both in primary THR and in revision. 64% of the primary THR were cemented and in revisions of both components, 49% were cemented. The reasons for revision were aseptic loosening in 63% of the cases followed by dislocation in 12% and deep infection in 11%.

When assessed by the Harris Hip Score, primary THR and revisions resulted in a considerable improvement in pain and function, with the best results after primary operation.

After 3 years, the prosthesis survival of all primary THR was approximately 97%. The lowest survival was observed in younger men with a hybrid prosthesis, usually uncemented cup and cemented stem.

In 1989, a group of Danish orthopedic surgeons, inspired by the Swedish National Hip Register, planned a register for total hip replacements (THR). Later, the Danish Orthopedic Society was involved in establishing the Danish Hip Arthroplasty Register (DHAR) but not until 1994, was an agreement reached between the National Board of Health and the Board of the Danish Counties about financing of the Danish medical data bases. On 1 January 1995, DHAR was established with the principal aim of registering and improving the results after THR in Denmark. Since then, all

Danish hospitals and some private clinics, where total hip replacements are performed, have participated.

Methods

DHAR is located in Aarhus University Hospital. A full-time secretary handles the practical work. The author runs the register besides working as an orthopedic surgeon. The register has a board of 3 orthopedic surgeons who are nominated by the Danish Orthopedic Society. The statistical analyses are performed by an external consultant.

From the start, all departments used registration forms for optical scanning. After 2 years, this was abandoned because of too many failures. Since 1997, the reporting departments have had the choice of either reporting on a registration form for each patient or forwarding the data on a disk. In 1998, the latter reporting was used by 21 of the 48 participating departments. At the central register, the secretary fits the data into the central database program. The departments report data about all primary THR and revisions.

The following preoperative data are registered: the civil registration number, the operated side, previous surgery on the same hip, diagnosis and function, according to Charnley (1979). In addition to these obligatory data, the departments can choose to register the clinical data, included in the Harris Hip Score (Harris 1969).

The peroperative data include: the surgeon's code number (which is not registered centrally), date of surgery, type of anesthesia, antibiotic prophylactic treatment, prophylaxis against ectopic bone formation, duration of surgery, surgical approach and trochanteric osteotomy, type of ace-

Table 1. Number of operations

Type of operation	1995		1996		1997		1998		Total	
	n	%	n	%	n	%	n	%	n	%
Primary THR	3778	83.7	4613	84.0	4888	84.6	4943	85.5	18222	84.5
Total hip revisions	736	16.3	877	16.0	889	15.4	841	14.5	3343	15.5
Total	4514	100.0	5490	100.0	5777	100.0	5784	100.0	21565	100.0

tabular component, fixation of the acetabular component, type of femoral component, fixation of the femoral component, type of cement, transplantation of bone to acetabulum and/or femur, material and diameter of the head of the prosthesis, peroperative complications. In case of revision, defined as exchange of a part or the whole implant or removal of the implant, information is also registered about indication, previous surgery, extent of revision and number of earlier revisions. By means of the civil registration number, the revision and the primary operation can be linked.

The following data are registered for the follow-up examination: the civil registration number, date of the latest surgery, date of follow-up, the operated side, postoperative complications, function according to Charnley, Harris Hip Score and the patient's own assessment of the result.

The secretary uses part of her time to correct failures. At the end of a year of registration, the departments are contacted in order to supplement incomplete data. This work has been given high priority and therefore the reported data are considered to be of good quality.

DHAR publishes an annual report, which is forwarded to the participating departments, the Danish Orthopedic Society, the National Board of Health and the county officials. Each department also receives a report about its own results. The national data are also reported at the annual autumn meeting of the Danish Orthopedic Society.

After the first 4 years (1995-1998), 18,222 primary THR, 3,343 revisions and 6,071 follow-up examinations were registered.

Results

5% of the registrations come from private clinics and hospitals, while the rest comes from public

hospitals. The number of operations has increased during the 4-year period and 16% are revisions (Table 1). All operations performed at public hospitals in Denmark have also been reported by the departments to the Statistical Department of the National Board of Health. The reports from public hospitals account in DHAR for 93% of the comparable registrations in the National Board of Health. Based on registrations in DHAR, the incidence of primary THR in Denmark per 100,000 inhabitants has increased from 72 in 1995 to 93 in 1998 (Figure 1).

At the time of primary THR, the mean age of the patients was 68 (13-98) years and 59% were women. The right hip was operated on in 53%. The commonest indication for primary THR was primary osteoarthritis (75%), followed by sequelae after proximal femoral fracture (11%). Rheumatoid arthritis accounted for approximately 3% (Table 2). 55% of the patients were classified

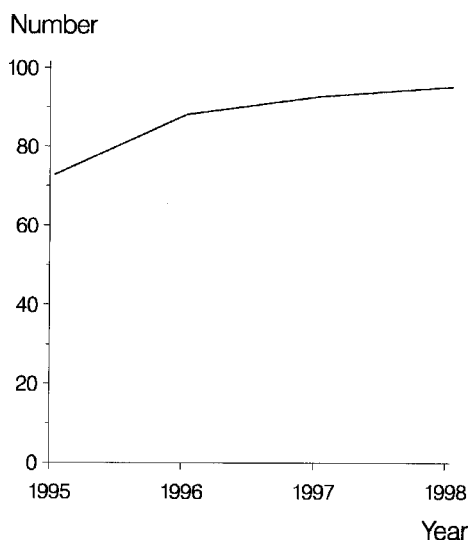


Figure 1. Incidence of primary THR in Denmark per 100,000 inhabitants per year.

Table 2. Diagnosis at primary THR

Diagnosis	Total	
	n	%
Primary arthrosis	13685	75.1
Acute femoral fracture	316	1.7
Sequelae after proximal femoral fracture	2019	11.1
Sequelae after acetabulum fracture	99	0.5
Sequelae after hip dislocation	54	0.3
Avascular necrosis	557	3.1
Rheumatoid arthritis	601	3.3
Other arthritis	158	0.9
Sequelae after childhood diseases	568	3.1
Missing	159	0.9
Total	18216	100.0

as Charnley group 1, 39% as group 2, and 6% as group 3. Four-fifths of all operations were performed in an operation theater with laminar air-flow and two-thirds with regional anesthesia. A posterior approach was used in 90%, a lateral in 9%, and an anterior in 1% of the operations. Trochanteric osteotomy was performed in less than 2%. The mean operation time for primary THR was 94 minutes. More than 99% of the patients received prophylactic parenteral antibiotic treatment as well as prophylaxis, with low molecular weight heparin. Prophylaxis against ectopic bone formation with NSAID was used in 19% of the operations. An antibiotic-containing bone cement was used in 42% of the cemented acetabular components and in 45% of the cemented femoral components.

During the 4 years of registration, there has been a decrease in the use of cemented primary THR and an increase in the use of uncemented and hybrid types (usually uncemented acetabular and cemented femoral components) (Table 3). Each department often uses a few different types of components but nationally 24 types of acetabular

Table 3. Primary THR-type of operations

Type of operation	1995		1996		1997		1998		Total	
	n	%	n	%	n	%	n	%	n	%
Cemented	2646	70.0	3254	70.6	3026	62.1	2745	55.7	11671	64.1
Uncemented	328	8.7	440	9.5	591	12.1	671	13.6	2030	11.2
Hybrid	804	21.3	919	19.9	1254	25.8	1514	30.7	4491	24.7
Total	3778	100.0	4613	100.0	4871	100.0	4930	100.0	18192	100.0

Table 4. Combinations of acetabular and femoral components at primary THR including at least 1,000 operations per combination 1995–1998

Acetabular component	Femoral component	n
Exeter	Exeter	3198
Lubinus	Lubinus	2521
Müller	Bimetric	1556
Charnley	Charnley	1484

components and 26 types of femoral stems have been used during this period. Usually a modular femoral component was used and 90% of the modular heads had a diameter of 28 mm. The 4 most frequently used combinations of acetabular and femoral components were all cemented (Table 4). Peroperative acetabular complications were registered in 2% and peroperative femoral complications in 2.4% of primary replacements.

In 63% of the revisions, aseptic loosening was the main indication followed by dislocation in 12% and deep infection in 11% (Table 5). In 42% of the revisions, both components were exchanged, in 51%, one or part of one component was exchanged, in 5%, the prosthesis was removed and in the remaining 2%, THR was performed after a temporary removal of the components. In 74%, it was the first revision and in 26%, the second revision or more. In revisions, uncemented designs have been used more often than in primary THR (Table 6). The mean operation time for a revision was 156 minutes.

The survival of the prostheses after primary THR has been assessed by the Kaplan-Meier method. After 3 years, the survival was approximately 97% in the whole material (Figure 2). The longest survival was observed in elderly women and the shortest in younger men (Figure 3). When the type of replacement was taken into consider-

Table 5. Indication for total hip revision

Reason for revision	1995		1996		1997		1998		Total	
	n	%	n	%	n	%	n	%	n	%
Aseptic loosening	446	60.6	558	63.6	594	66.8	520	61.8	2118	63.4
Osteolysis without loosening	15	2.0	18	2.0	6	0.7	12	1.4	51	1.5
Deep infection	77	10.5	90	10.3	90	10.1	94	11.2	351	10.5
Femoral fracture	34	4.6	41	4.7	20	2.3	22	2.6	117	3.5
Dislocation	86	11.7	83	9.5	107	12.0	110	13.1	386	11.5
Implant failure	34	4.6	38	4.3	42	4.7	46	5.5	160	4.8
Pain	0	0.0	4	0.5	12	1.4	15	1.8	31	0.9
Missing	44	6.0	45	5.1	18	2.0	22	2.6	129	3.9
Total	736	100.0	877	100.0	889	100.0	841	100.0	3343	100.0

Table 6. Revisions – type of operations ^a

Type of operation	1995		1996		1997		1998		Total	
	n	%	n	%	n	%	n	%	n	%
Cemented	191	58.2	216	52.9	185	48.7	125	35.0	717	48.7
Uncemented	70	21.4	102	25.0	109	28.7	118	33.1	399	27.1
Hybrid	67	20.4	90	22.1	86	22.6	114	31.9	357	24.2
Total	328	100.0	408	100.0	380	100.0	357	100.0	1473	100.0

^a Only revisions where both components were exchanged

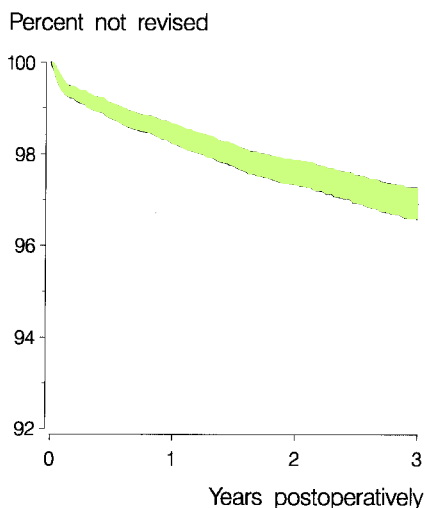


Figure 2. Prosthesis survival in primary THR.

ation, the longest survival was found in elderly women with a cemented prosthesis and the shortest in younger men with a hybrid prosthesis (Figure 4).

In primary THR, the total Harris hip score increased from 43 preoperatively to 89 at follow-up

and in revisions from 44 to 83. The Harris Pain Score improved considerably after both primary THR and total hip revision, best after primary THR (Table 7). The patients were asked about their assessment of the operation results and reported a high degree of satisfaction after both operation types, best after primary THR (Table 8).

Discussion

DHAR was organized on about the same principles as the hip registers in Sweden (started 1979) (Herberts and Malchau 2000), Norway (started 1987) (Havelin et al. 2000), and Finland (started 1980) (Paavolainen et al. 1991).

The present incidence of primary total hip arthroplasties (93 per 100,000 inhabitants in 1998) is presumably too low because of underreporting, indicated by a higher reporting of similar operations from public hospitals to the National Board of Health. The low number of operations in 1995 may be due to a long hospital strike in that year. Overgaard et al. (1992) reported an incidence of

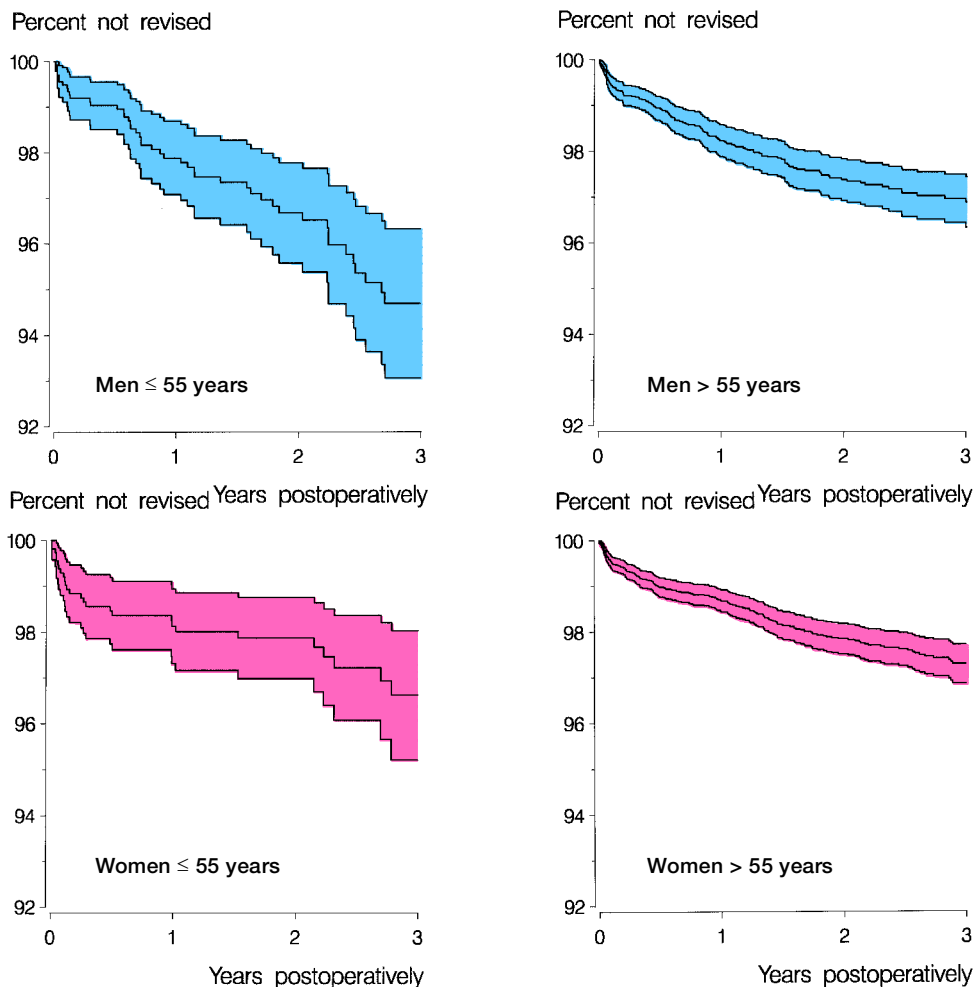


Figure 3. Prosthesis survival in primary THR according to age and sex.

82/100,000 inhabitants/year during 1981–91 in a Danish county. Havelin et al. (2000) reported a frequency of 120 THR/100,000 inhabitants/year. In Sweden, it has been calculated that the incidence per 100,000 inhabitants/year should be 130, in order to meet the need (Herberts and Malchau 2000).

At surgery for primary THR, the mean age of the patients was 68 years in Denmark, 69 years in Norway and 70 years in Sweden (Havelin et al. 2000, Herberts and Malchau 2000). As in Sweden, the indication for primary THR was primary osteoarthritis in 75% of the patients.

In Denmark, uncemented devices have been used oftener than in Sweden, where 93% of the hip arthroplasties are cemented (Herberts and Malchau 2000). This may be one of the reasons

for a lower revision rate in Sweden than in Denmark, since a higher revision rate has been reported after the first generations of uncemented designs (Malchau et al. 1993, Havelin et al. 1995, Puolakka et al. 1999, Revald et al. 1999). Another reason for a lower revision rate in Sweden might be a positive effect on the surgical quality after many active years' use of the national hip register (Herberts and Malchau 2000).

A prosthesis survival below 94% after 3 years in young men operated on with a hybrid prosthesis gives rise to concern and must be further analyzed.

As the data in DHAR increases, there will also in the years to come be a basis for a more detailed identification of risk factors in primary total hip replacements and revisions. However, already to-

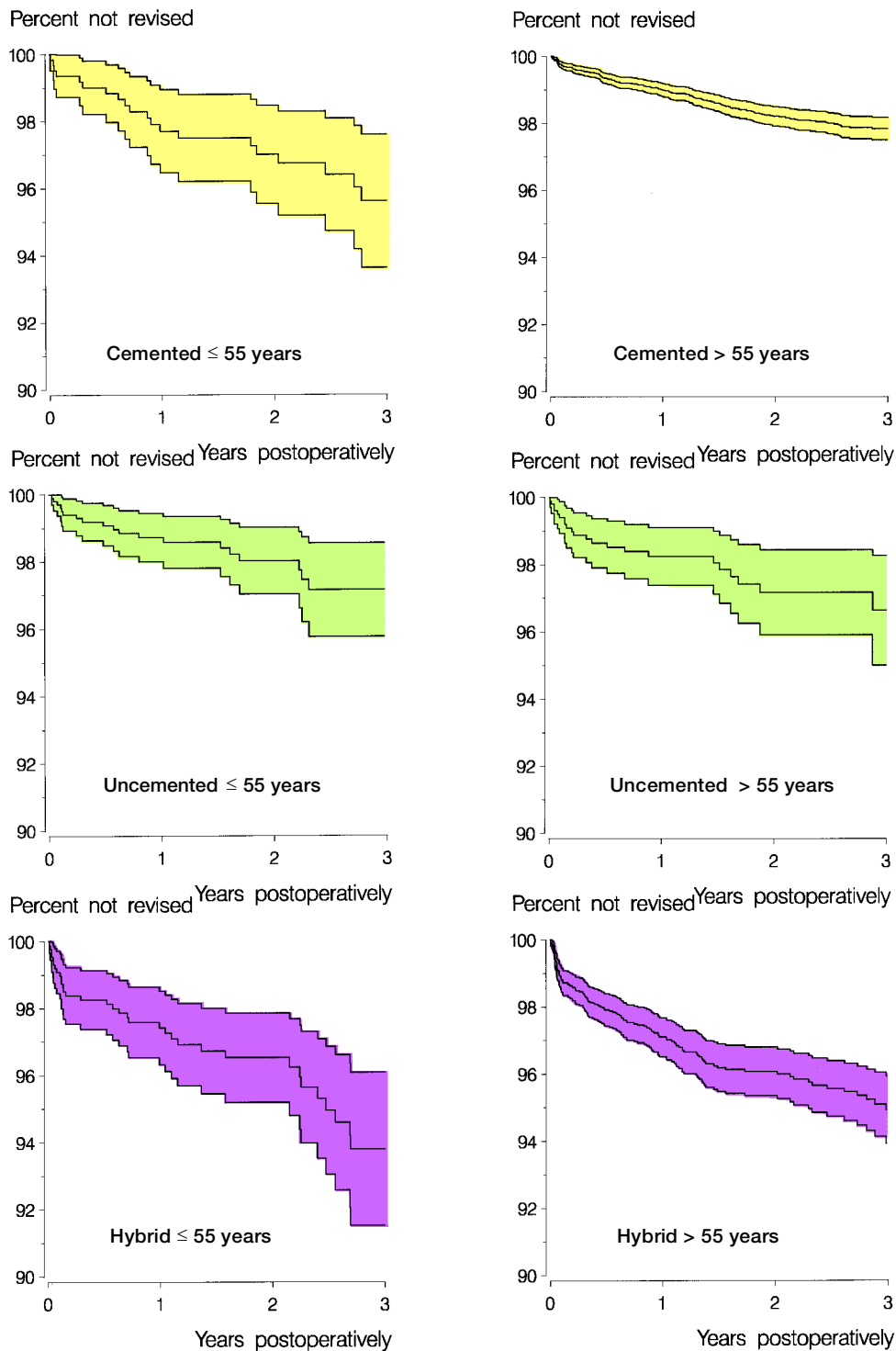


Figure 4. Prosthesis survival in primary THR according to age and type of implant.

Table 7. Harris pain score ^a

Pain	Primary total hip		Total hip revision		Total	
	n	%	n	%	n	%
None	3399	72.0	523	57.7	3922	69.7
Ignores	873	18.5	184	20.3	1057	18.8
Mild	257	5.4	106	11.7	363	6.5
Moderate	150	3.2	71	7.8	221	3.9
Marked	37	0.8	21	2.3	58	1.0
Disabled	3	0.1	2	0.2	5	0.1
Total	4719	100.0	907	100.0	5626	100.0

^a Follow-up period > 6 monthsTable 8. Patient assessment of the operation result ^a

Patient satisfaction	Primary total hip		Total hip revision		Total	
	n	%	n	%	n	%
Very satisfied	3671	72.1	542	55.3	4213	69.4
Satisfied	1073	21.1	283	28.8	1356	22.3
Not quite satisfied	292	5.7	122	12.4	414	6.8
Dissatisfied	54	1.1	34	3.5	88	1.5
Total	5090	100.0	981	100.0	6071	100.00

^a Follow-up period > 6 months

day the reporting departments can compare their results with the national figures and, possibly, change procedures to improve their results.

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