Long term results after partial knee arthroplasty with the Oxford Knee.

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LIST OF PAPERS

I Oxford medial unicompartmental knee arthroplasty.
A survival analysis of an independent series
Svärd UCG, Price AJ.

J Bone Joint Surg (Br) 2001;83-B:191-197

II Oxford medial unicompartmental knee arthroplasty in patients younger and older than 60 years of age.
Price AJ, Dodd CAF, Svärd UCG, Murray DW

J Bone Joint Surg (Br) 2005;87-B:1488-1492

III Oxford medial unicompartmental arthroplasty for spontaneous osteonecrosis of the knee.
Langdown AL, Pandit H, Price AJ, Dodd CAF, Murray DW, Svärd UCG, Gibbons CL

Acta Orthopaedica 2005;76:688-692

IV Medial unicompartmental arthroplasty after failed high tibial osteotomy. Rees JL, Price AJ, Lynskey TG, Svärd UCG, Dodd CAF, Murray DW.

J Bone Joint Surg (Br) 2001;83-B:1034-1036

V Twenty year survival of the medial Oxford unicompartmental knee arthroplasty.
Svärd UCG, Price AJ

In manuscript

VI Revision of Oxford medial unicompartmental knee arthroplasty to total knee arthroplasty results of a multicentre study
Saldanha KAN, Keys GW, Svärd UCG, White SH, Rao C

The Knee 2007;14:275-279

ABBREVIATIONS AND DEFINITIONS

ACL	Anterior Cruciate Ligament
CRR	Cumulative revision rate
Etiology	The branch of medicine that deals with the causes of origins of disease
HSS score	Hospital for Special Surgery knee score. A scoring system evaluation of pain, mobility, range of motion and deforming of the knee giving 0-100 points. Results are reported as poor (<60 points), fair (60-69), good (70-84) or excellent (85-100).
HTO	High tibial osteotomy
Incidence	The extent or rate of occurrence, especially the number of new cases of a disease in a population over a period of time.
KSS score	Knee Society Score
OA	Osteoarthritis equivalent to arthrosis
OKS score	Oxford Knee Score. A scoring system based on a patient questionnaire with 12 questions each giving a maximum of 4 points. Total range; 0-48 points.
Outcome	The result or effect of a defined intervention.
Prevalence	The total number of cases of a disease in a given population at a specific time.
Revision arthroplasty	A reoperation during which prosthesis component(s) are either exchanged, removed or added.
ROM	Range of motion
SKAR	The Swedish Knee Arthroplasty Register
SONK	Spontaneous osteonecrosis of the knee
TKA	Total knee arthroplasty equivalent to TKR

TKR	Total knee replacement equivalent to TKA
UKA	Unicompartmental knee arthroplasty equivalent to UKR
UKR	Unicompartmental knee replacement equivalent to UKA
Validity	Degree to which a questionnaire instrument or test measures what it is intended to measure.
VAS	Visual Analogue Scale

ABSTRACT

Introduction

Osteoarthritis of the knee is one of the most common reasons for disability, especially in elderly people. Surgical treatment is still controversial. Unicompartmental knee arthroplasty, i.e. partial knee arthroplasty, using the Oxford Knee has been available since 1983.

The aims of the study were to compare the 10 years survival rate in the designers´ series, to determine the 10 year survival rate and clinical outcome in younger patients, to assess the outcome in patients with spontaneous osteonecrosis of the knee, to report the results in patients who were operated on earlier operated with high tibial osteotomy, to report long-term survival results more than 20 years after primary procedure and to assess the reconstruction requirements and early clinical outcome following revision of the Oxford Knee to total knee arthroplasty.

Methods and results

Patients in different age with painful focal antero-medial osteoarthritis stage I-III according to the Ahlbäck classification were operated on using unicompartmental arthroplasty with the Oxford Knee. Clinical and radiological assessments were performed preoperatively, as well as after 3 months, and 1, 6, 10, 15 and finally more than 20 years postoperatively. Hospital for Special Surgery score (HSS score 0-100) and Oxford Knee Score (OKS 0-48) were used to evaluate the outcome. The 10-years survival was found to be comparable to the designer's series. Accordingly, there was no obvious contraindication for the use of the Oxford Knee in younger patients. The clinical outcome and survival was similar in knees with primary osteonecrosis in terms of short- and medium-term results as in patients with osteoarthritis. A previous high tibial osteotomy should be considered to be a contraindication to the use of the Oxford Knee. The revision of the Oxford Knee is technically easier and the results superior to the revision of total knee replacement.

Conclusion

With correct indication and good surgical technique, the Oxford Knee partial arthroplasty can be considered a useful treatment in patients with antero-medial osteoarthritis of the knee.

INTRODUCTION

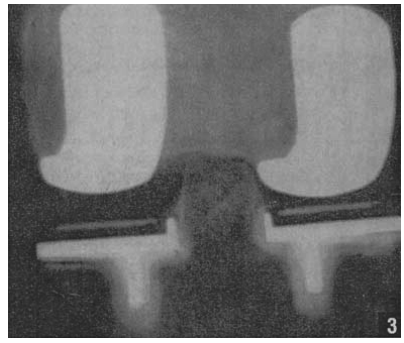
Osteoarthritis of the knee is one of the most common causes of painful disability in elderly people. Surgical treatment has been and is still a major challenge for the knee surgeon. The results after surgical treatment, especially knee replacement are of great importance, not only for the individual person, but for the whole society as well. One of the early problems was to study which materials were compatible with the human body. Dr Gluck in Vienna in 1880, more than 100 years ago, operated on three patients with knee replacement. He used hinges made of elephant bone. The short-term results were promising with good pain relief, but six months later he had to warn for this procedure. All three patients became infected and one of them ended up with amputation of the femur.

The Swedish orthopaedic surgeon Börje Walldius was considered to be a pioneer when he in the 1950's developed a more sophisticated hinge prosthesis using intra-medullary stems, both in the femur and the tibia. He claimed that the interface between the prosthesis and the bone (paraprosthesium) was similar to the parodontium around the teeth. Later on, during the 1960's, Sir John Charnley introduced the two-component bone cement for anchoring the prosthesis to the bone. This was a rigid fixation, which brought great success, but also left place for further development.

The natural history of osteoarthritis (OA) is not fully known so far. The surgical treatment was from the beginning concentrated to whole joint arthroplasty, i.e. exchange of two or three components of the knee. However, in some patients observations showed that the joint disease was located to only one compartment of the knee. Accordingly, it was encouraging to design unicompartmental knee replacement. The first modern designs were the *S:t Georg* (1969) and the *Marmor* (1972) knee hemi-prosthesis. Due to the configuration of the femoral condyles, the metal femoral component was made polycentric of, articulating on a flat polyethylene tibial component. Both components were then cemented to the bone. In the long-term, component wear and risk of osteolysis combined with subsidence may be suspected. Migration and loosening are the common reasons for revision of the prosthesis.

In 1974, the orthopaedic surgeon John Goodfellow and the engineer John O'Connor designed a new unicondylar prosthesis consisting of a spherical femoral component, a flat tibial component and a polyethylene mobile bearing, fully congruent was inserted between. This device allows a combination of flexion-extension, translation and rotation, which may resemble the normal kinematics of the knee (11).

This knee prosthesis was first used 1976 as a bicompartmental replacement; in the beginning often in patients with rheumatoid arthritis.



Bicompartmental replacement

The experience was that these patients often had a non-functioning anterior cruciate ligament (ACL), which led to changes in terms of the surgical indication (10). Since then, the indication for this type of hemi-arthroplasty has been limited to painful osteoarthritis, stage I-III according to Ahlbäck (1) in patients with functionally intact ACL, flexion deformity less than 15 degrees and correctable deformity also less than 15 degrees.

The alternative surgical treatment that must be considered in these patients is high tibial osteotomy (HTO). This method has mostly been reserved to young patients in the very early stages of the disease (3). The procedure demands long rehabilitaion and sometimes is correlated with surgical complications. The so-called survival, i.e. how long the favorable result lasts is also limited and revision surgery is difficult (16).

Total knee arthroplasty (TKA) also demands longer rehabilitation than hemi-arthroplasty or partial knee arthroplasty, often resulting in a limited range of motion. Although the TKA have repeatedly been shown to have long survival, the clinical outcome might be less favorable.

Taken as a whole, it is obvious that all surgical methods have been controversial over time in different countries and among different surgeons. In Sweden, for example a report from the Swedish Knee Arthroplasty Register (SKAR) warned Swedish orthopaedic surgeons not to use the Oxford Knee partial arthroplasty, due to the increased risk of complications. It therefore appears to be of major importance to report on the long-term results using this type of implant.

AIMS OF THESIS

I To compare the 10-year survival rate of the Oxford unicompartmental knee arthroplasty of the designers series of 144 knees (98% follow-up rate), with an independent series.

II To determine the 10-year survival and clinical outcome of the Oxford unicompartmental knee arthroplasty in patients younger than 60 years of age at the index operation, all with antero-medial osteoarthritis. Also to compare the results with those of patients over 60 years of age.

III To assess the outcome of medical unicompartmental knee arthroplasty (UKA) using the Oxford Knee prosthesis for end-stage focal spontaneous osteonecrosis of the knee (SONK).

IV To report the results of unicompartmental knee arthroplasty (UKA) with the Oxford knee after failed high tibial osteotomy (HTO) in patients with antero-medial osteoarthritis of the knee.

V To report the survival rates of the Oxford unicompartmental knee arthroplasty twenty years after the index procedure.

VI To assess the reconstruction requirements and early clinical outcome following the revision of the Oxford unicompartmental knee arthroplasty (UKA) to total knee arthroplasty (TKA).

STUDY I

Aim

The aim of this study was to compare the 10-year cumulative survival rate to the designers own series of 144 knees (17) with an independent series from a non-teaching hospital performed by three surgeons. Lewold and co-workers (13) reported from the Swedish Knee Arthroplasty Register (SKAR) a cumulative survival rate at six years of only 89%.

Results

Of the 124 knees included in the study, six were revised. Three revisions were done due to dislocation of the bearing, two because of aseptic loosening and one due to deep infection.

Table I. Medial unicompartmental procedures excluded from the study group

Time of review or revision (yr)	Reason for excusion	Outcome
0.8	Secondary osteoarthritis	Revised
2.9	Failed high tibial osteotomy	Revised
8.5	Psoriatic arthritis	Revised
8.1	Pigmented villonodular synovitis	Open reduction of dislocation
14.0	Failed high tibial osteotomy	Intact
11.9	Osteonecrosis	Intact

Table II. Details of the six revised arthroplasties

Time to revision (yr)	Indication for revision	Operative fieldings	Procedure	Outcome
0.3	Dislocation of bearing	Components firmly fixed	Bearing exchanged	Moderate
3.7	Dislocation of bearing	Components firmly fixed	Revised to TKR	Good
3.9	Dislocation of bearing	Components firmly fixed	Revised to TKR	Good
1.6	Pain	Loose femoral component, tibial component secure	Revised to TKR	Continued pain
5.7	Pain	Both components loose	Revised to TKR	Good
0.5	Clinical suspicion of infection	Infection confirmed	Revised to TKR	Good

The 10-year cumulative survival, with 94 knees still at risk was 95% (95% CI; 90.8-99.3). These values represent the “worst case” scenario, as no patient was lost to follow-up. The survival rate has remained the same, i.e. 95% up to the 16th year, but the confidence intervals are wider as the numbers at risk have decreased.

Table III. Details of the two reoperations

Time to reoperation (yr)	Reason for reoperation	Procedure	Findings	Outcome
1.3	Suspected loose body	Arthroscopy and arthrotomy	No loose body found. Components well fixed	Good
6.9	Meniscal dislocation	Closed reduction		Good

Table IV. Survival table for the Oxford knee

Year	Number of prostehses surviving	Number of knees withdrawn as success	Number of knees withdrawn due to death	Number of knees lost	Number of failures	Number at risk	Failure rate (%)	Survival rate (%)	Cumulative survival (%)	95% confidence interval *
1	124	0	0	0	2	124.0	1.6	98.4	98.4	2.2
2	122	0	1	0	1	121.5	0.8	99.2	97.6	2.7
3	120	0	0	0	0	120.0	0.0	100.0	97.6	2.7
4	120	0	4	0	2	118.0	1.7	98.3	95.9	3.5
5	114	0	4	0	0	112.0	0.0	100.0	95.9	3.6
6	110	0	1	0	1	109.5	0.9	99.1	95.0	4.0
7	108	0	4	0	0	106.0	0.0	100.0	95.0	4.0
8	104	0	2	0	0	103.0	0.0	100.0	95.0	4.1
9	102	0	5	0	0	99.5	0.0	100.0	95.0	4.2
10	97	0	7	0	0	93.5	0.0	100.0	95.0	4.3
11	90	17	10	0	0	76.5	0.0	100.0	95.0	4.7
12	63	12	2	0	0	56.0	0.0	100.0	95.0	5.5
13	49	18	1	0	0	39.5	0.0	100.0	95.0	6.6
14	30	13	2	0	0	22.5	0.0	100.0	95.0	8.7
15	15	7	1	0	0	11.0	0.0	100.0	95.0	12.5
16	7	7	0	0	0	3.5	0.0	100.0	95.0	22.2

* 95% confidence interval calculated using method of peto et al [8]

Conclusion

The survival rate of 95% is not significantly different (log-rank test; p=0.9) from the 97.7% reported by Murray and co-workers. These findings can be compared with the designers´ series as the inclusion criteria employed were the same. However, it is not possible to compare these values with the patients reported in the SKAR. It is probably that the criteria employed in the present study differed from those used by some of the surgeons whose cases were reported to the SKAR. Those patients were treated at 19 centers; probably with different indications and by surgeons with varying degree of training. The individual training might be of major importance, as the procedure is demanding for the surgeon. The selection of patients must also be strictly standardized.

The conclusion of this study is that the Oxford unicompartmental meniscal-bearing arthroplasty is a valid alternative to the treatment of osteoarthritis of the knee when correct indications are applied and appropriate surgical experience is available. The 10-year survival was high.

STUDY II

Aim

The aim of the study was to determine the 10-year survival and clinical outcome of the Oxford UKA in patients with antero-medical osteoarthritis who were less than 60 years of age at the index operation and further to compare the results with those of patients over 60 years of age.

Table I. Details of patient groups

	Number of knees	Number of patients	Men:women	Mean age in yrs (SD;range)
Oxford series [6,10]	144	114	53:61	70.5 (8.0; 34.6 to 90.6)
Skövde series [11]	420	333	136:197	69.8 (7.4; 50.7 to 94.5)
Combined series				
Total	564	447	189:258	70 (7.5; 34.6 to 94.5)
< 60 years old	52	44	15:29	56.4 (3.8; 34.6 to 59.6)
≥ 60 years old	512	403	174:229	71.4 (6.3; 60.1 to 94.5)

Results

The results show 20 revisions out of 512 knees in the older group and 4 in the younger groups of 52 knees.

Table II. Details of the revision procedures

Case	Age (yrs)	Time to revision (yrs)	Indication	Procedure
< 60 years of age group				
1	51.6	7.8	Arthritis in lateral compartment	Revision to TKA*
2	54.5	6.8	Loose femoral component	Revision to TKA
3	56.0	5.4	Fracture of meniscus	Open bearing-exchange
4	58.2	10.2	Arthritis in lateral compartment	Revision to TKA
< 60 years of age group				
1	60.5	4.6	Arthritis in lateral compartment	Revision to TKA
2	64.5	1.1	Arthritis in lateral compartment	Revision to TKA
3	65.6	4.3	Arthritis in lateral compartment	Revision to TKA
4	67.5	4.0	Arthritis in lateral compartment	Revision to TKA
5	69.7	1.4	Arthritis in lateral compartment	Revision to TKA
6	70.3	3.9	Arthritis in lateral compartment	Revision to TKA
7	74.6	4.5	Arthritis in lateral compartment	Revision to TKA
8	86.5	0.7	Arthritis in lateral compartment	Revision to TKA
9	64.4	5.6	Loose femoral and tibial components	Revision to TKA
10	68.6	5.8	Loose femoral and tibial components	Revision to TKA
11	65.7	10.0	Loose femoral component	Revision to TKA
12	81.7	1.6	Loose femoral component	Revision of femoral component
13	72.4	5.9	Bearing dislocation/loose femoral component	Revision to TKA
14	65.6	0.3	Bearing dislocation	Open bearing-exchange
15	66.1	3.7	Bearing dislocation	Revision to TKA
16	72.5	3.9	Bearing dislocation	Revision to TKA
17	67.4	1.2	Deep infection	Revision to TKA
18	68.6	0.5	Deep infection	Revision to TKA
19	75.4	2.2	Deep infection	Revision to TKA
20	67.3	12.5	Pain, unexplained at operation	Revision to TKA

* TKA, total knee arthroplasty

The 10-year survival for patients over 60 years of age was 96% and for those less than 60 years of age, the corresponding survival rate was 91%. The mean pre-operative HSS knee score for the younger patients was 52 points increasing to 94 points, ten years after surgery. For the older patients the corresponding values were 57 points compared with 86 points ten years after surgery.

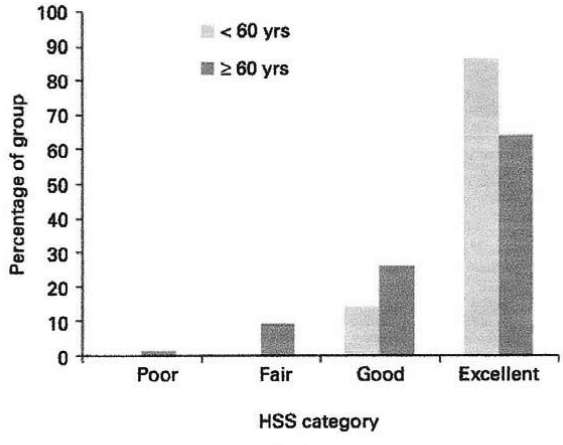


Fig. 1

Distribution of Hospital for Special Surgery (HSS) scores at follow-up of ten years.

The rage of motion was similar (109 degrees and 110 degrees respectively) from the beginning compared with 116 degrees and 111 degrees. Analysis of the radiographs showed no signs of loosening. One knee in the younger groups had early lateral osteoarthritis, but the remaining 19 had no evidence of progression of the disease.

Conclusion

Previous reports imply that the best candidates for UKA are older than 60 years of age and with low activity levels (12). We have previously showed excellent 10-year results in this age group (17,24). However, there is debate in terms of the use of UKA in younger patients with osteoarthritis. We found a 10-year survival rate of 91% and HSS-score of 94 points in patients less than 60 years of age.

This can be compared with 96% survival rate and a HSS-score of 86 points in patients over 60 years of age. The values are not statistically different, however. Pennington and co-workers (18) reported a 10-year survival rate of 92% in a series of Miller Galante UKAs.

In the present study, there was only one patient less than 50 years of age. Further studies will be required to determine if the ten-year survival rate of 91% will be maintained beyond 10 years. A wear rate of about only 0.02 mm/year using this device has been reported (2,19).

This suggests that the prosthesis will be protected more than one decade also in younger patients. One patient - 56 year old - required revision because of a fractured bearing that was 3.5 mm thick. It is probable that the thinnest bearing should be avoided in younger patients.

A stable thin radiolucency with sclerotic margins is probably physiological and is not a predictor of loosening. The radiographic study showed 55% radiolucency around the tibial component in 55% of the patients. This phenomenon has also been reported by Tibrewal and co-workers (27) in 96%.

HTO and TKA are two alternative treatments for unicompartmental disease in younger patients. The 10-year survival reported for high tibial osteotomies is generally worse than those after UKA and TKA. A series of TKA in patients less than 55 years with osteoarthritis showed a ten-year cumulative survival (all caused revision) of 90% and a mean postoperative HSS score of 92 points (4). The SKAR (26) reported a 10-year cumulative survival rate of about 90% after TKA.

The results of the present study suggest that the Oxford UKA can produce similar results as TKA in younger patients with knee osteoarthritis. It is also shown that reduced morbidity, improved kinematic function and rapid recovery after UKA can be expected, compared with TKA (8,20). There is also some evidence that Oxford UKA is easier to revise compared with TKA. This may be important for the younger patients who may require at least one revision in their lifetime. It is concluded that age under 60 is not a necessarily a contraindication to the use of the Oxford Knee in patients with antero-medial osteoarthritis of the knee.

STUDY III

Aim

The aim of the study was to assess the outcome in a two-centre study after Oxford unicompartmental knee arthroplasty in patients with SONK and compare it with the same procedure in patients with antero-medial osteoarthritis.

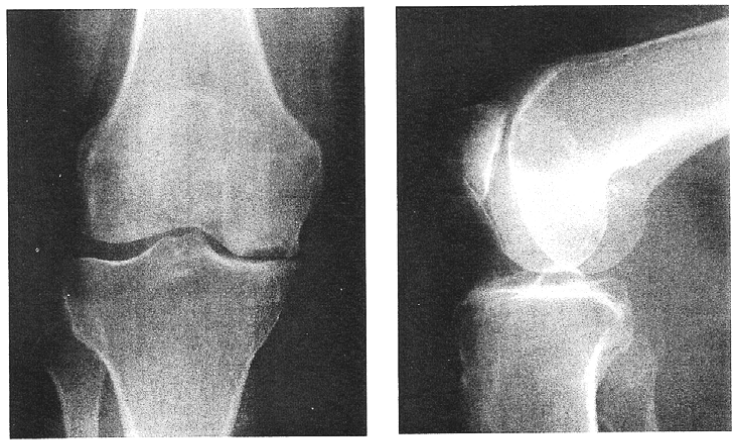


Figure 1. Plain anteroposterior and lateral radiographs showing focal osteonecrosis of the medial femoral condyle.

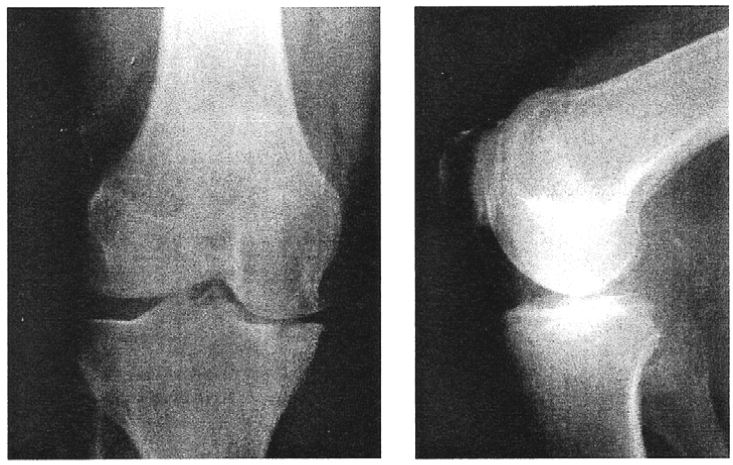


Figure 2. Plain anteroposterior and lateral radiographs showing focal osteonecrosis of the medial tibial plateau.

Results

Twenty-nine knees with osteonecrosis (1) were included and compared with a control group of 28 osteoarthritis knees. The groups were matched for age, sex, and time from surgery (within 3 months) as well as the center at which the surgery was performed. The two involved centers have earlier showed similar results when treating patients with antero-medial OA (17,24). The mean time follow-up was 5.2 years in the SONK group and 4.8 years in the control group.

There were no revisions in either group and no differences in terms of OKS scores (5).

Oxford Knee Score (OKS) (mean (SD))

	Preoperative OKS	Postoperative OKS
Osteoarthrosis	19 (4.9)	40 (6.2)
95% CI	17–21	38–42
Osteonecrosis	21 (7.4)	38 (6.2)
95% CI	18–24	35–41
P-value (Student T-test)	0.4 a	0.3 [a]
Difference between means	1.8	2.2
95% CI of difference between means	-1.6–5.2	-1.5–5.9

[a] Patients who had undergone bilateral procedures had only one knee score (the worst) included in the statistical analysis, but both scores are included in the descriptive statistics.

Conclusion

The number of patients with osteonecrosis is low, which is the reason why the number of patients in this study also was low. In statistical terms it is, however, sufficient with 24 patients in each group for 80% power. Survival analysis was impossible because of no failures. Specific technical considerations must be taken when balancing the knee with osteonecrosis. In conclusion use of the Oxford unicompartmental knee arthroplasty is reliable in the short- to medium-terms in patients with SONK, with results similar to those obtained in antero-medial osteoarthritis.

STUDY IV

Aim

The aim of this study was to report the results of unicompartmental knee arthroplasty (UKA) with the Oxford Knee after failed high tibial osteotomy (HTO) in patients with antero-medial osteoarthritis of the knee.

Results

To allow statistical analysis of this uncommon subgroup, a three-centre study was performed. There were 613 primary procedures and 18 were for a failed HTO.

Average time of failure was 4.1 years in the UKA group and 2.9 years in the HTO group. The ten-year survival for UKA after HTO was 66%, and 96% for the primary procedure.

Table I. Details of the revised arthroplasties in the HTO group

Case	Time after primary operation (yr)	Reason for revision	Operative findings	Procedure and outcome
1	0.42	Persistent pain and effusion	Fluid not obviously infected	Two-stage revision: pain relieved and no infection confirmed
2	0.92	Persistent lateral pain and feeling of instability	Components not loose: 15° valgus deformity	Revision to TKR: pain relieved
3	2.93	Persistent pain	No obvious abnormality	Revision to TKR: pain relieved
4	4.58	Lateral compartment wear and pain	Lateral wear down to level of staples	Revision to TKR: pain relieved
5	5.7	Severe pain	Components not loose: marked lateral wear	Revision to TKR: pain relieved

Conclusion

The rate of revision for UKA performed due to failed HTO was approximately nine times higher than that for primary UKA. This difference is both statistically significant and clinically relevant. Moreover, the revision rate for UKA performed for failed HTO at a mean follow-up of 5.4 years was 28%. This does not compare favorably with TKR after failed HTO, in which the revision rate is lower (16).

If the deformity has already bean fully or partially corrected by an extra-articular procedure, like HTO, then any further change in alignment by an UKA might cause an overcorrection of the joint. This may result in a valgus alignment of the leg and increased loading of the lateral compartment.

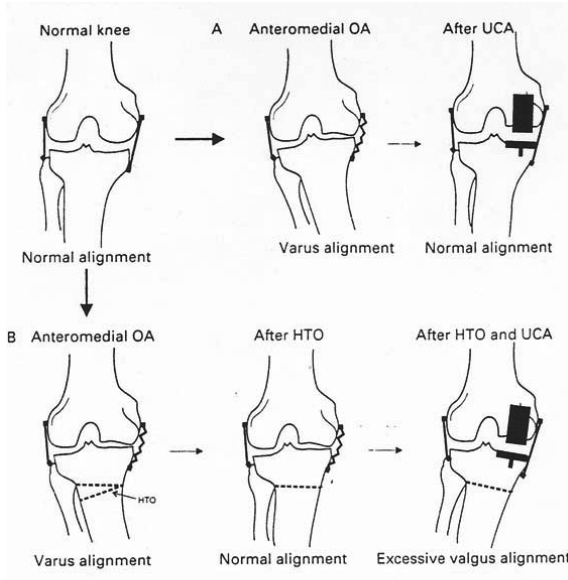


Fig. 1

Diagram showing the normal alignment of the knee, anteromedial osteoarthritis causing varus alignment and the effect of a UCA (A) and a previous HTO and UCA on alignment of the knee (B).

This is why it concluded that a previous HTO should be considered a contraindication to the use of an Oxford UKA. Knees in which symptoms recur after a previous HTO are most probably more effectively treated by a TKA, although it often is a technically more demanding surgical procedure.

STUDY V

Aim

The aim of this study was to establish the 20-year survival of the Oxford Knee prosthesis. We have previously reported 10- and 15-year survival of 95% and 94% with successful clinical results at 10 years (20).

Results

Between 1983 and 2004, 682 Oxford medial unicompartmental knee arthroplasties were performed at Skaraborg Hospital, Sweden. There have been 29 revision procedures. In 27 knees the revision was to a primary total knee replacement and in two, stemmed revision type prosthesis was required.

Number	Indication for primary operation	Phase	Time to further surgery	Cause for further surgery	Procedure	Implant
1	OA	3	0.2	Deep infection	Revision	AGC
2	OA	1	0.3	Primary dislocation	Open bearing exchange	6.5 to 5.5
3	ACL deficient	2	0.4	Primary dislocation	Open bearing exchange	4.5 to 5.5
4	OA	1	0.5	Deep infection	Revision	AGC
5	ACL deficient	1	0.5	Primary dislocation	Open bearing exchange	7.5 to 8.5
6	OA	2	0.7	Lateral arthrosis	Revision	AGC
7	OA	1	0.7	Unexplained pain	Revision	AGC
8	OA	3	0.9	Loose femoral component	Revision	PFC
9	OA	3	1.0	Deep infection	Revision	AGC
10	OA	3	1.0	Deep infection	Revision	AGC
11	OA	2	1.1	Lateral arthrosis	Revision	AGC
12	OA	3	1.2	Lateral arthrosis	Revision	AGC
13	OA	2	1.4	Lateral arthrosis	Revision	AGC
14	OA	1	1.6	Loose femoral compoent	Revision	Femoral component replaced
15	OA after HTO	2	1.7	Unexplained pain	Revision	Dual articular
16	OA	2	2.4	Deep infection	Revision	Dual articular
17	OA after HTO	1	2.9	Unexplained pain	Revision	AGC
18	OA	3	3.4	Primary dislocation	Open bearing exchange	4.5 to 5.5
19	OA	2	3.7	Primary dislocation	Revision	AGC
20	OA	1	3.9	Primary dislocation	Revision	AGC
21	OA	2	4.0	Lateral arthrosis	Revision	AGC
22	OA	2	4.5	Lateral arthrosis	Revision	AGC
23	OA	2	4.6	Lateral arthrosis	Revision	AGC
24	OA	2	5.2	Loose femoral component and secondary dislocation	Revision	Scan Knee
25	OA	2	5.4	Fracture of meniscus	Open bearing exchange	3.5 to 3.5
26	OA	2	5.6	Loose femoral and tibial components	Revision	Scan Knee
27	OA	1	5.7	Loose femoral an tibial components	Revision	AGC
28	OA	2	5.9	Loose femoral component and secondary dislocation	Revision	AGC
29	OA	2	6.8	Loose femoral component	Revision	AGC
30	OA	2	7.9	Lateral arthrosis	Revision	AGC
31	Psoriatic arthropathy	1	8.5	Loose femoral component	Revision	Scan Knee
32	OA	2	11.4	Lateral arthrosis	Revision	AGC
33	OA	2	13.5	Loose femoral component	Revision	PFC
34	OA	1	15.5	Lateral arthrosis	Revision	AGC

The indications for revision surgery were; lateral osteoarthritis (10), component loosening (9), infection (5), primary bearing dislocation (2), bearing fracture (1) and unexplained pain (3).

There were four cases of bearing dislocation and one of fractured bearing, which were all treated with re-operation and exchange of bearing. In the 9 knees, where loosening was the indication for re-operation, the majority (7/9) involved the femoral component alone, with 2/9 associated with secondary dislocation of the bearing. In 2 knees both femoral and tibial components were loose at surgery. Mean time to revision was 3.3 years, with only 3 revisions occurring after 10 years. Revision for infection and dislocation tended to occur within the first 2 years of implantation, whereas surgery for lateral osteoarthritis and loosening occurred later. The 10-year and 20-year survival rates were 94% and 91% respectively. Worst case scenario survival numbers were the same as no patients was lost to follow-up.

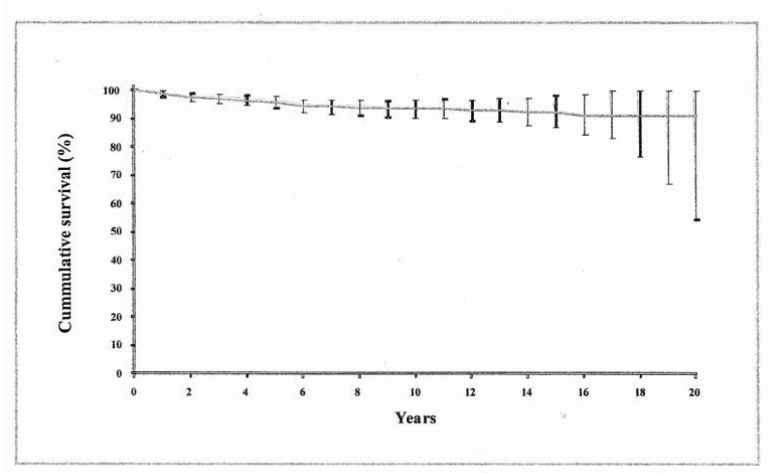


Figure 2

The mean age of patients at implantation was 70 years. According to the survival results, the Oxford Knee does not need to be considered a pre-total knee replacement and in many patients the surgery will prove to be a definitive treatment for antero-medial osteoarthritis of the knee. The requirements for revision surgery illustrates that the Oxford medial unicompartmental knee replacement is a bone sparing procedure. It is concluded that the Oxford medial unicompartmental knee arthroplasty can be considered a definitive and successful treatment for medial compartment osteoarthritis.

This suggests that the device is durable in the second decade after implantation; in other words, if the knee is functioning well at 10 years then survival to 20 years can be expected.

STUDY VI

Aim

The aim of this study was to determine the reconstruction requirements and clinical outcome following revision surgery from the Oxford Knee to TKR.

Table 1
Indications for revision

Indications	Number of patients
Progression of osteoarthritis to lateral compartment	13
Loosening of femoral component	10
Loosening of tibial component	2
Loosening of both femoral and tibial components	2
Dislocation of bearing	4
Unexplained pain	4
Patellofemoral symptoms	1

Table 2

Intraoperative findings and details of revision surgery

Result	Numbers
Intraoperative findings	
Average thickness of the original Oxford	5.5 mm (range 3.5 to 9.5)
Polyethylene bearing	
ACL	
Intact	34 knees
Deficient	2 knees
MCL	
Intact	28 knees
Deficient	8 knees
Degenerative change in lateral compartment	
Normal or mild change	23 knees
Moderate or severe change	13 knees
Revision surgery	
Revision prostheses	
Standard TKR prostheses	28 knees
Constrained prostheses with intramedullary stems	6 knees
Semi-constrained prostheses	2 knees
Mean thickness of tibial component (tibial tray + polyethylene insert)	13.7 mm (range 8 to 20)
Reconstruction for bone loss	
Reconstruction for bone loss not required	30 knees
Metal wedges	
Femur	1 knee
Tibia	1 knee
Cement augmentation for contained defects	
Femur	2 knees
Tibia	None
Bone graft for contained defects	
Femur	None
Tibia	2 knees

Results

This three-centre study includes 36 revisions. The mean time interval between primary surgery and revision was 5 years. The mean operating time was 113 minutes.

All the revision were cemented TKRs, six being constrained, two semi-constrained, and 28 standard TKRs. Six required intra-medullary stems in both femur and tibia, whereas the remaining 30 were revised without any intra-medullary stems. Patella resurfacing was performed in five patients.

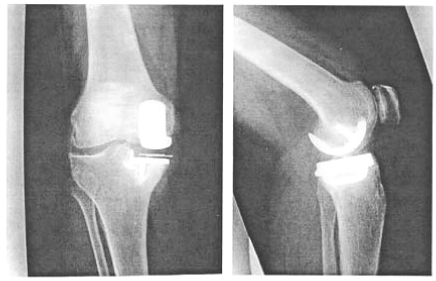


Fig. 1. One-year postoperative anteroposterior and lateral radiographs of Oxford UKR showing loosening of tibial component.

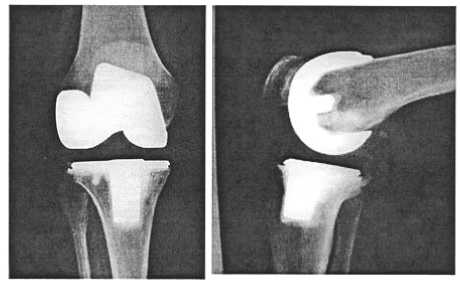


Fig. 2. Anteroposterior and lateral radiographs of knee in Fig. 1 after revision to a standard AGC Total Knee Replacement.

In 30 knees reconstruction of bone loss was not required. Metal augmentation for bone loss was necessary in two knees. Cement was used to fill out femoral defects in two knees and bone grafts from revision cuts were used to fill out tibial defects in two patients. Mean thickness of the tibial component of the revision prosthesis was 13.7mm (range 8-20mm). Complications included superficial wound infection in five knees, all of which responded to antibiotic treatment, transient peroneal nerve paresis in two patients and deep venous thrombosis in one patient. Three knees required further reoperations after the revision surgery.

Fig. 3. Six-year postoperative anteroposterior and lateral radiographs of Oxford UKR with significant varus.

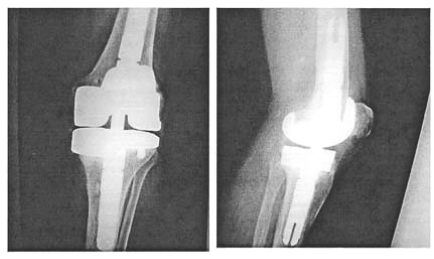


Fig. 4. Anteroposterior and lateral radiographs of knee in Fig. 3 after revision to a constrained, stemmed Total Knee Replacement with wedge augmentation of medial tibia.

One loose tibial component was changed after 9 months. One loose femoral component was changed after 28 months. Another standard total knee replacement was changed to a stemmed prosthesis after two years because of pain and instability.

Conclusion

Because of small amount of bone resected at the primary procedure it was possible to use standard total knee prosthesis for the revision in 28 of 36 patients.

In six knees, it was necessary to fill out bone defects with cement or bone grafts. Taken as a whole, a total of 70% of the patients had good or excellent results in terms of the HSS score and 60% when the functional score was considered. Poor results following total condylar revisions have previously been reported (6,21,22,23).

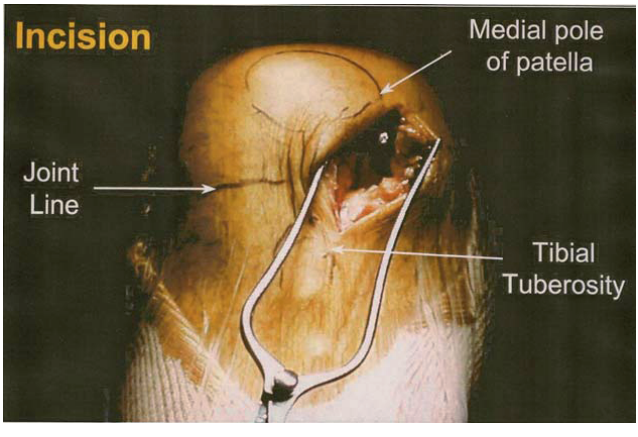
The follow-up is only 24 months. Long-term results require follow-up. It has been estimated that only 25% of revisions for failed primary TKR can be revised using standard unconstrained knee replacements (21).

In conclusion, the findings are comparable with the report from the Oxford Group (15). Revision of the Oxford knee is technically easier and the results are superior to revision of TKR.

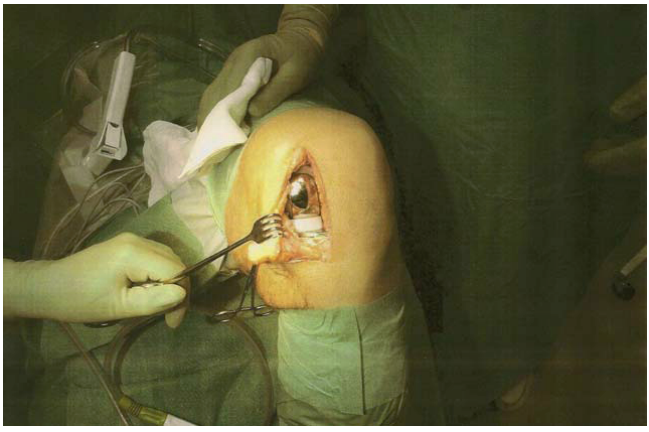
SURGICAL TECHNIQUE

The design of the Oxford Knee has been almost the same over time with only small modifications since it was introduced in 1976 (Phase I).

The instrumentation has been up-dated twice. The first instrument update was done to be able to balance the ligaments (Phase II) and the second to make the procedure minimally invasive without injury to the exterior mechanism (Phase III). The procedure is performed either in general or spinal anesthesia. The antero-medial incision is 7-8 cm long.



The medial compartment is exposed through the antero-medial incision. First, the tibial plateau is cut, while the medial collateral ligament is protected. An intra-medullary femoral rod is used to guide the femoral instrumentation. Thereafter, the posterior femoral condyle is cut, and the femoral condyle is milled using a spherical cutter until the ligaments are balanced. The two metal components are cemented with bone cement. This is always done in two stages. Finally, the fully congruous polyethylene bearing of appropriate thickness is applied.



Local anesthetics are infiltrated to ensure less pain, draining for 24 hours is used and an epidural catheter is inserted in the knee joint for pain relief. Routine wound closure follows. Systemic antibiotics for one day and prophylaxis against deep venous thrombosis for two weeks are routinely used. The patients are allowed full weight-bearing from the first day.

METHODS

Patients

	Study I Knees	Study II Knees	Study III Knees	Study IV Knees	Study V Knees	Study VI Knees
N Men Women	124 49 54	564 189 258	SONK 29 6 23	631 Ratio I 1.24	682 Ratio I 1.2	36 19 17
Age Mean Range	69.6 50.7-85.7	70 34.6-94.5	73 43-88	69,9 34.6-90.6	69.7 48-94	71 57-86
N Men Woman			OA 28			
Age Mean Range			71 46-85			

CLINICAL AND RADIOLOGICAL FOLLOW UP

Preoperative assessments were performed with clinical and radiographic investigations. Pain, mobility, range of motion and deformity of the knee were evaluated. The findings were documented in a specially designed protocol (Appendix I) and the HSS-scoring was done with points 0-100. The ratings are poor (<60), fair (60-69), good (70-84) and excellent (85-100). (Appendix II).

Radiographs with antero-posterior (A-P) and lateral views in the standing position with slight flexion in the knee were used in all patients. The radiographs were evaluated according to the Ahlbäck's classification. Standardized follow-up using the same questionnaire (Appendix III) was performed after three months, one year, six years and ten years postoperatively, with HSS-scoring. The final follow-ups were after 15 years and 20 years postoperatively, with HSS-scoring, as well as OKS-scoring (0-48 points), (Appendix IV).

DISCUSSION

Osteoarthritis (OA) is one of the most common causes of painful disability in elderly people. It is ten times more common than rheumatoid arthritis. Four out of ten retired people have pain in their joints. Almost all joints in the human body can be affected, but OA in the knee causes most problems for the individual, the health care system and the society. Although osteoarthritis in the knee is more common than OA in the hip, twice as many hip arthroplasties are performed. Today more than 15 000 arthroplasties are performed annually in Sweden. The natural history of OA is not fully known. Progression of OA is slow and it is difficult to identify those individuals on beforehand, whose symptoms will require surgical treatment. In fact, most patients never need operation (14). Symptoms of OA in the knee are pain on activity, stiffness, swelling with effusion, limited range of motion and deformity leading to decreased function and disability. The diagnosis is verified by radiographic examination. It is important that the radiographs are correctly taken. To evaluate the Ahlbäck stages, the patient stands with the knees in slight flexion. In order to measure the Hip Knee Ankle (HKA) angle, long radiographs are needed. A more sophisticated method to study the medial or lateral compartments is to use screened stressed radiographs (9). The classic signs of OA are narrow joint space, bone attrition with subchondral cysts, osteophytes and translation. One problem is that often there is only limited correlation between radiological findings and symptoms.

Non-surgical treatment of osteoarthritis in the knee includes adjusted activity level, physiotherapy, medication and local injections (e.g. corticosteroids) either alone or in combination. Adjusted activity is more or less normal over time in elderly and retired people. Physiotherapy can effectively treat pain and reduced muscle function with strength, mobility and balance exercises. Prevention of deformity especially flexion deformity is also of major importance. Acupuncture and TNS can also be used to reduce pain. Sometimes crutches and knee braces can be useful. An analgesic, such as paracetamol often in combination with NSAID is the standard medication. Local injections with corticosteroids will augment the anti-inflammatory effect. In short or long periods, non-surgical treatment may be sufficient and many people never need surgery. Discussion about surgery starts first when the symptoms progress.

Arthroscopic debridement and shaving has only temporary effect and is usually not indicated in patients with knee OA.

High tibial osteotomy can be a realistic alternative in young patients, especially in the early stages (3). The procedure can have severe complications and the rehabilitation is long and demanding. The survival is limited and revision to arthroplasty is technically more difficult compared with UKA (16).

Total knee arthroplasty has been the standard procedure, most often used in the elderly and with wide indications. It allows a more limited range of motion, however. The rehabilitation is longer with a risk of worse functional outcome. Long-term survival up to 98% has been reported (12).

There is still debate as to the role of unicompartmental knee replacement in the treatment of osteoarthritis. When considering the results of large population based joint registers it is clear that the results of unicompartmental knee replacement are inferior to total knee replacement when long-term survival is calculated. Some surgeons describe the unicompartmental knee replacement as a pre-total knee replacement procedure, which buys patients time before proceeding to a total knee replacement. The debate is currently still ongoing.

This body of this work presents two papers dealing with the long-term survival of Oxford medial unicompartmental replacement. Ten-year survival was shown to be 94% and 20-year survival 92% (25). These results are encouraging with survival at a higher rate than that reported in the Swedish knee arthroplasty register; SKAR (24). The Register has identified that surgeons who undertake this operation regularly are likely to achieve better results than those who perform lower number of operations. The success achieved in these series is likely to relate, in part, to the experience of the surgeons undertaking the procedure.

The most common cause of failure in the entire series was progression of arthritis into the lateral compartment. Despite being the commonest, it is still an infrequent problem, however. Previous literature has suggested that this mode of failure relates to overcorrection at the time of surgery (7).

The long-term study highlights the failure due to polyethylene wear. One patient underwent revision for a fractured bearing, which may well have been associated with polyethylene wear. However, then there were no other direct instances of this mode of failure. This would suggest the design aim of a fully congruous mobile bearing, which increases the surface contact area and therefore decreases contact stress is a successful design against polyethylene wear. The clinical data would support the previous studies, which have shown that the linear penetration into bearings from the Oxford prosthesis occurs at a rate around 0.02mm/year, an order of magnitude less than that seen with a fixed bearing device (2).

Bearing dislocation proved to be an extremely uncommon complication. The original publication by Lewold and co-workers (14) had suggested that the mobile bearing device has a significant risk of dislocation when compared with a fixed bearing device. The results of this study confirm that bearing dislocation in the medial compartment is an uncommon occurrence.

A striking feature of the 20-year results is the relatively low number of revisions occurring in the second decade. Historically, this would be the time period of concern for failure of the

unicompartmental knee replacement. It is encouraging that this design is able to last for a long period of time in those patients. Moreover, for many patients who undergo unicompartmental knee replacement the procedure is the only knee surgery needed. In these patients, unicompartmental knee replacement can certainly be described as the definitive treatment for knee arthritis rather than a pre-total knee replacement.

Comparisons between unicompartmental and total knee replacements are difficult. There are a number of confounding features, which make comparison of survival figures difficult to interpret. The threshold for revision for a unicompartmental knee replacement is lower than that for a total knee replacement. The surgeon is faced with a potentially more straightforward operation to revise a unicompartmental knee to a total knee replacement as opposed to undertaking more complicated revision knee replacement, where a primary knee replacement has been done first. This bias leads to a greater proportion of unicompartmental knee replacements being revised, at least when compared with total knee replacements. In addition, care must be taken to understand the indications for revision. Patients may undergo revision of a unicompartmental knee replacement to a total where the indication is pain. The same level of pain in a patient with a total knee replacement may not result in the patient being offered a complicated revision procedure.

Despite the issues raised above, there is some benefit in comparing total to unicompartmental knee replacement, as both interventions can be used to treat the same disease.

There are several series of total knee replacements, which have very good survival rates. The vast majority of total condylar devices have been reported in series in the literature with survival above 95% at 10 years. There are fewer reports for total knee replacements at 20 years, but those that do exist suggest that the 20-year survival remains over 90%. The results of the Oxford unicompartmental knee replacement reported in this body of work show 10- and 20-year survival comparable to that achieved by total knee replacement. Another surgical alternative, which can be used instead of joint replacement, is high tibial osteotomy (HTO). This has historically been a popular choice for treating medial unicompartmental osteoarthritis of the knee. Published series show survival of approximately 70% at 10 years, which is inferior to that reported for both unicompartmental and total knee replacement. High tibial osteotomy does have a role, particularly in treating younger patients with partial thickness disease. Unfortunately there are no direct comparisons of unicompartmental knee replacement versus high tibial osteotomy in randomized controlled trials. It must be noted that this comparison is based on historical results of high tibial osteotomy, which have mainly been a closing wedge on the lateral side. Contemporary practice has shifted towards an opening wedge osteotomy using rigid fixation, with the aim of reducing failure rate due to non-union.

It is clear that high tibial osteotomy, unicompartmental knee replacement and total knee replacement can all be effective means of treating osteoarthritis of the knee. The results from this body of work suggest that unicompartmental knee replacement offers reliable long-term success in treating antero-medial osteoarthritis of the knee. It compares favorably to both total knee replacement and high tibial osteotomy and should be considered a definitive treatment for antero-medial osteoarthritis of the knee.

There are number of features of the cohort studies in this work that require discussion. The rates of lost to follow-up are very low, adding to the robustness of the reported outcomes. It has been clearly shown that loss to follow-up matters when survival is being calculated and the fewer patients that remain lost to follow-up, the better for the overall validity of the study. Another feature is that these reports represent the entire experience of the surgeons involved with unicompartmental knee replacement. The series therefore includes the learning curve of all surgeons involved, but still manages to have a good survival rate at 10- and 20 years.

There are very few series of joint replacements reported which include the entire output of a single department. The results are therefore more likely to represent the true outcome of the unicompartmental knee replacement. Another striking feature of these series is the use of very similar indications for surgery. As the 25-year period has passed, there have only been very slight modifications of the indication for surgery. All patients reported had medial compartmental disease in the pattern, which is described as antero-medial osteoarthritis. This type of disease is usually associated with an intact anterior cruciate ligament and retained posterior cartilage at the back of the medial side of the knee joint. The retained cartilage allows the medial collateral ligament to regain its full length when the knee is flexed falling into varus only in full extension when the bony erosions are in contact.

The vast majority of patients will not have a large fixed flexion deformity in this pattern of disease. In addition the varus deformity must be correctible indicating no fixed shortening of the medial collateral ligament. In previous studies the designers have shown that loss of the Anterior Cruciate Ligament reduces the longevity of the device with loosening of the components being the usual mode of failure (10).

The indications were evolving when the reported series in this thesis were starting. It can therefore be noted that two patients had an absent Anterior Cruciate Ligament, which would now be considered a contraindication. In addition, two patients underwent surgery where it was an inflammatory component to the arthritis (pigmented villonodular synovitis and psoriatic arthropathy), which both would now be considered as contraindications.

The second, third and fourth studies presented in this thesis deal with important aspects concerning specific indications for the Oxford unicompartmental knee replacement. The study of patients under the age of 60 clearly shows that although there was a decreased 10-

year survival rate compared with patients over the age of 60, that a survival of over 90% is achievable. In other words, this represents an excellent treatment option for this younger age group. Kozinn and Scott (12) published a set of indications for unicompartmental knee replacement suggesting that the procedure should be avoided in patients under the age of 60 and the results of the study reported in this thesis challenge that point of view with evidence to suggest that a younger age should not be considered a contraindication to the procedure. The slightly higher revision rate compared with the older age group may well represent increased activity and functional demand put upon the prosthesis in the younger patient.

The third study examines the use of the Oxford medial unicompartmental knee replacement to treat osteonecrosis. Spontaneous osteonecrosis of the knee (SONK) is a well recognized diagnosis and produces similar symptoms to that seen with osteoarthritis. There is surprisingly little literature relating to the outcome of unicompartmental knee replacement in this group of patients. The condition is much less common than osteoarthritis and hence the need for a combined multi-centre study to identify enough patients to make a comparison between patients with osteoarthritis and osteonecrosis. The results presented suggest the device can be used successfully to treat osteonecrosis and this should not be considered a contraindication to the procedure.

The fourth study examines the results of Oxford unicompartmental knee replacement after high tibial osteotomy. At the beginning of the series reported in this thesis previous high tibial osteotomy was not a contraindication to proceeding to partial knee replacement. However, the results of the studies presented clearly show inferior survival for unicompartmental knee replacement performed in a patient who has previously undergone high tibial osteotomy. The mode of failure probably relates to problems created with attempting to address an intra-articular problem with an extra-articular correction.

Another important issue must be brought up when considering indications used for the Oxford unicompartmental knee replacement in this series. The state of the patello-femoral joint was not used as a contraindication to unicompartmental knee replacement. Historical and more contemporary data from surgeons in Oxford now clearly show that the state of the patello-femoral joint has no influence on the outcome of the surgery, unless there is severe grooving and loss of bone on the lateral facet of the patella.

In addition, the presence of chondrocalcinosis is not considered in this series to be a contraindication for surgery. Although this type of pathology has been considered to have an inflammatory component by some authors, clinical data suggests that it has no bearing on the outcome of mobile unicompartmental knee replacement. In a true inflammatory arthropathy, such as rheumatoid arthritis, the results have been shown to be less good when this type of prosthesis is used to treat unicompartmental knee affection. They are therefore accepted contraindications to this type of surgery. In this series, two patients underwent

unicompartmental knee arthroplasty early in the series for this type of indication, one with psoriatic arthropathy and the other with pigmented villonodular synovitis. Both subsequently failed and all the related inflammatory arthropathies are now considered as contraindications to this type of replacement.

The final study in this series relates to the revision of unicompartmental knee replacement when failure occurs. This is a multi-centre study and the modes of failure in different centers are similar. The development of lateral osteoarthritis is the most common cause of failure although it still occurs infrequently. Dislocation occurs at around half a percent and revision due to loosening is very rare. The most interesting clinical aspect of the paper is the fact that the vast majority of patients undergoing revision for Oxford unicompartmental knee replacement undergo a primary total knee replacement procedure rather than a stemmed revision total knee procedure. This is based around the fact that the initial unicompartmental knee replacement is bone sparing and that the failure mechanisms rarely involve any significant bone loss. This is an important point and highlights the difficulties of comparing unicompartmental knee replacements and total knee replacements. The comparison of a revision unicompartmental knee replacement to a revision total must be made in the light of the revision prosthesis procedure having an inferior clinical outcome. It is also important to remember at this point the fact that the vast majority of patients undergoing an Oxford unicompartmental knee replacement no revision procedure is required and that the joint replacement appears to procedure a solution for their arthritic problem which is definitive.

In summary, this thesis presents data suggesting that the survival results of unicompartmental knee replacement using the Oxford system are encouraging with over 90% survival rate at 20 years. It has been highlighted that the indications in terms of patients' selection in using the Oxford unicompartmental knee replacement are extremely important. Several contraindications which are used by other centers are not necessary but the indications which are built around the knowledge of the pathoanatomy of antero-medial osteoarthritis are extremely important. The replacements durability may in many ways be due to its low wear rate and suggest that the designers original design concepts have been borne out in clinical practice.

CLINICAL RECOMMENDATIONS

This study shows good or excellent long-term clinical and survival results with the Oxford knee both in patients with antero-medial osteoarthritis and osteonecrosis. Age is not a contraindication. The revision procedure if needed is easy and results superior to the revision of TKA. However, the Oxford Knee replacement is not recommended as a revision procedure after failed high tibial osteotomy. Patient selection is very important with narrow and strict indication. Surgical technique is also of great importance.

There are some limitations, such as that this study deals only with one single knee replacement. Randomization was not a part of this study. Gender analysis has not been done. The majority of operations have been performed by one surgeon, but 3 other experienced surgeons have contributed. Objective assessment has been done with patient-related questions according to a standardized questionnaire (Appendix IV)

CONCLUSION

Osteoarthritis of the knee is one of the most common reasons for disability especially in elderly people. Non-operative treatment, including physical training, medication and injections is often sufficient and no surgery is needed. If non-surgical treatment is not successful, surgical procedures will be discussed. In this thesis the advantages and also some disadvantages with unicompartmental Oxford Knee arthroplasty have been shown. Correct indications and good surgical technique results in low morbidity, rapid recovery, good function and long survival with possibility to easy revision procedure. In conclusion, the Oxford Knee arthroplasty can be a valid treatment alternative and in several patients a definitive treatment of osteoarthritis in the knee.

ABSTRACT IN SWEDISH

Bakgrund och syfte

Artros i knäleden är en av de vanligaste orsakerna till handikapp, särskilt hos äldre personer. Val av kirurgisk behandling har varit omdiskuterat. Ledersättning av inre ledkammaren med Oxford-protesen har använts sedan 1983. Syftet med denna studie var att jämföra 10-årsöverlevnaden av protesen med motsvarande serie av de som ursprungligen beskrev protesen, att bestämma 10-årsöverlevnad och kliniska resultat hos yngre patienter, att bedöma resultat hos patienter med spontan osteonekros (SONK), att rapportera resultat hos patienter som tidigare opererats med hög tibia osteotomi, att rapportera långtidsresultat hos patienter opererade för 20 år sedan samt bedöma rekonstruktionsbehov och tidiga resultat efter utbytesplastik från Oxford till total protes.

Material, Metoder och Resultat

Patienter i olika åldrar med smärtsam artros i inre ledkammaren grad I-III enligt Ahlbäcks klassifikation opererades med enkammarprotes enligt Oxford.

Kliniska och röntgenologiska bedömningar gjordes före operation, efter 3 månader, 1, 6, 10, 15 år och slutligen mer än 20 år efter operation. För bedömning av kliniska resultat har Hospital for Special Surgery score (HSS) 0-100 poäng och Oxford Knee Score (OKS) 0-48 poäng också använts.

10-årsöverlevnaden visade sig vara jämförbar med designers (de som ursprungligen beskrev protesen) serie. Resultaten visade att det inte är kontraindicerat att använda Oxfordprotesen hos yngre patienter.

Knäleder med osteonekros (SONK) uppvisade samma kort- och medellångt resultat som knäleder med artros. Patienter, som tidigare opererats med hög tibia osteotomi bör ej reopereras med användning av Oxford-protesen, utan hög tibia osteotomi bör betraktas som kontraindikation. Utbytesplastik av Oxfordprotes är tekniskt lättare och resultaten bättre än vid revision av total protes.

Konklusion

Med korrekt indikation och noggrann kirurgisk teknik är ledersättning av inre ledkammaren med Oxfordprotes att anse som en definitiv behandling av artros i knäleden.

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Bild & Media with Catrin Olofsson and Peter Johansson helping me with illustrations and slides.

The more than 1000 patients operated on with the Oxford knee.

My mother, who made it possible for me to become an orthopaedic surgeon.

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APPENDICES

Appendix I

PROTOKOLL FÖR UPPFÖLJNING AV OXFORD-PLASTIKER **preoperativ**

Nr: .....

Namn: .....

Födelse nr: .....

Ålder: .....

Vikt: .....

Längd: .....

Yrke: .....

Vilovärk: **Ingen** .....
Lätt .....
Medel .....
Svår .....
VAS .....

Rörelse- och/eller belastningssmärta: **Ingen** .....
Lätt .....
Medel .....
Svår .....
VAS .....

Gångstöd: .....

Maximal gångsträcka: .....

Trappgång: **Kan ej** .....
Med stöd .....
Utan stöd .....

Annan sjukdom som påverkar gångförmågan: .....

.....

Övriga sjukdomar: .....

Exteriör felställning: **varus** 0 ..... 0-5 ..... >5 .....
valgus 0 ..... 0-5 ..... >5 .....

Smärta i femuropatellarleden: **Ingen** .....
Lätt .....
Medel .....
Svår .....
VAS .....

Rörelseomfång: .....

Instabilitet: **Ingen** .....
Lätt (0-5) .....
Medel (5-15) .....
Svår (>15) .....

Röntgen: .....

Diagnos: .....

Tidigare behandling: **Operation:** .....

Medicinering: .....

Fysikalisk behandling: .....

Undersökningsdatum: ..... **Läkare:** .....

Appendix II

Undersökningsdatum **HSS** **Patientbricka**

			Höger knä	Vänster knä
Smärta:	**Ingen smärta någonsin:**	**30 p**		
30 p	**Ingen gångsmärta:**	**15 p**		
	Lätt gångsmärta:	**10 p**		
	Svår gångsmärta:	**0 p**		
	Ingen vilovärk:	**10 p**		
	Måttlig vilovärk:	**5 p**		
	Svår vilovärk:	**0 p**		
Funktion:	**Obegränsad gång och stående:**	**12 p**		
22 p	**Gångsträcka 2 – 4 km:**	**10 p**		
	Gångsträcka 0,5 – 2 km:	**8 p**		
	Gångsträcka < 0,5 km:	**4 p**		
	Kan ej gå:	**0 p**		
	Trappgång u a:	**5 p**		
	Trappgång med stöd:	**2 p**		
	Resa sig ur stol u a:	**5 p**		
	Resa sig ur stol med stöd:	**2 p**		
Rörlighet:	**1 p för varje 8 grader**			
Max 18 p				
Muskelstyrka:	**Kan ej bryta quadriceps:**	**10 p**		
10 p	**Kan bryta quadriceps:**	**8 p**		
	Aktiv rörlighet mot benets tyngd:	**4 p**		
	Ingen rörlighet:	**0 p**		
Felställning:	**Ingen felställning:**	**10 p**		
10 p	**< 5 gr felställning:**	**8 p**		
	5 – 10 gr felställning:	**5 p**		
	> 10 gr felställning:	**0 p**		
Stabilitet:	**Full stabilitet:**	**10 p**		
10 p	**0 – 5 gr instabil:**	**8 p**		
	6 – 15 gr instabil:	**5 p**		
	> 16 gr instabil:	**0 p**		
Poängavdrag:	**Använder käpp:**	**-1 p**		
	Använder 1 krycka:	**-2 p**		
	Använder 2 kryckor:	**-3p**		
Extensionsdefekt:	**5 gr:**	**-2 p**		
	10gr:	**-3 p**		
	15 gr:	**-5 p**		
Varus valgus:	**5 gr valgus/varus**	**-1p**		
Excellent	**85 – 100 p**	**Summa:**		
Good	**70 – 84 p**			
Fair	**60 – 69 p**			
Poor	**< 60 p**			

Appendix III

PROTOKOLL FÖR UPPFÖLJNING AV OXFORD-PLASTIKER **3 månader**

Nr: .....

Namn: .....

Födelse nr: .....

Vilovärk: **Ingen** .....
Lätt .....
Medel .....
Svår .....
VAS .....

Rörelse- och/eller belastningssmärta: **Ingen** .....
Lätt .....
Medel .....
Svår .....
VAS .....

Gångstöd: .....

Maximal gångsträcka: .....

Trappgång: **Kan ej** .....
Med stöd .....
Utan stöd .....

Annan sjukdom som påverkar gångförmågan: .....

.....

Exteriör felställning: **varus** 0 ..... 0-5 ..... >5 .....
valgus 0 ..... 0-5 ..... >5 .....

Smärta i femuropatellarleden : ..... **VAS** .....

Rörelseomfång: .....

Instabilitet: **Ingen** .....
Lätt (0-5) .....
Medel (5-15) .....
Svår (>15) .....

Röntgen: .....

Komplikationer: .....

Nöjd: ..... **Tveksam:** ..... **Missnöjd:** .....

Undersökningsdatum: .....

Läkare: .....

Appendix IV:1

Patient No ☐☐☐☐☐☐

Problem med ditt knä

Under de senaste fyra veckorna … Markera en ruta för varje fråga

Under de senaste fyra veckorna …

1 Hur skulle Du beskriva den smärta Du vanligtvis har i Ditt knä?

Ingen	Mycket lindrig	Lindrig	Måttlig	Svår
☐	☐	☐	☐	☐

Under de senaste fyra veckorna …

2 Har Du haft några problem med att tvätta Dig och torka Dig (hela kroppen) på grund av Ditt knä?

Inga problem alls	Mycket lite problem	Måttliga problem	Mycket stora problem	Omöjligt att göra
☐	☐	☐	☐	☐

Under de senaste fyra veckorna …

3 Har Du haft något problem med att komma in i eller ut ur bil eller med att använda offentligt transportmedel (vilket Du nu tenderar att använda) på grund av Ditt knä?

Inga problem alls	Mycket lite problem	Måttliga problem	Mycket stora problem	Omöjligt att göra
☐	☐	☐	☐	☐

Under de senaste fyra veckorna …

4 Hur länge har Du kunnat promenera innan smärtan i Ditt knä blivit svår? (Med eller utan käpp)?

Ingen smärta/ > 30 min	16 till 30 min	5 till 15 min	Endast runt huset	Inte alls - svår smärta direkt vid promenad
☐	☐	☐	☐	☐

Under de senaste fyra veckorna …

5 Efter en måltid (sittande till bords), hur smärtsamt har det varit för Dig att resa Dig upp från stolen på grund av Ditt knä?

Inte smärtsamt alls	Lätt smärtsamt	Måttlig smärtsamt	Väldigt smärtsamt	Outhärdligt
☐	☐	☐	☐	☐

Under de senaste fyra veckorna …

6 Har Du haltat då Du promenerat på grund av Ditt knä?

Sällan / aldrig	Ibland eller endast i början	Ofta och inte bara i början	Merparten av tiden	Hela tiden
☐	☐	☐	☐	☐

Appendix IV:2

Problem med ditt knä

Under de senaste fyra veckorna ... Markera en ruta för varje fråga

Under de senaste fyra veckorna ...

7 Kan Du sätta dig ner på huk och komma upp igen efteråt?

Ja, lätt	Med viss svårighet	Med måttlig svårighet	Med mycket stor svårighet	Nej, omöjligt
☐	☐	☐	☐	☐

Under de senaste fyra veckorna ...

8 Har Du besvärats av smärta i Ditt knä då Du legat till sängs på natten?

Inga nätter	Bara 1 eller 2 nätter	Vissa nätter	De flesta nätter	Varje natt
☐	☐	☐	☐	☐

Under de senaste fyra veckorna ...

9 I vilken grad har smärta i Ditt knä påverkat Ditt vanliga arbete (inklusive hushållsarbete)?

Inte alls	Lite grann	Måttligt	I hög grad	Fullständigt
☐	☐	☐	☐	☐

Under de senaste fyra veckorna ...

10 Har det känts som om Ditt knä plötsligt skulle "vika sig" eller svika Dig?

Sällan / aldrig	Ibland eller bara i början	Ofta och inte bara i början	Merparten av tiden	Hela tiden
☐	☐	☐	☐	☐

Under de senaste fyra veckorna ...

11 Kan Du handla det som behövs till hushållet på egen hand?

Ja, lätt	Med viss svårighet	Med måttlig svårighet	Med mycket stor svårighet	Nej, omöjligt
☐	☐	☐	☐	☐

Under de senaste fyra veckorna ...

12 Kan Du gå nerför en trappa?

Ja, lätt	Med viss svårighet	Med måttlig svårighet	Med mycket stor svårighet	Nej, omöjligt
☐	☐	☐	☐	☐