LONG-TERM CLINICAL RESULTS OF CEMENTED REVISION OF PRIMARY CEMENTED TOTAL HIP ARTHROPLASTIES

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Seventy-six patients who had undergone revision of a cemented total hip replacement were reviewed with an average follow-up of almost ten years.The average age at primary total hip replacement (PTHR) was 63.3 years.The average time between primary total hip replacement and revision was 62.5 months.
Revision surgery was performed without using special techniques such as acetabulum reconstruction or femoral bone grafting.
We evaluated patients pre- and postoperatively using the Merle d'Aubigné-Postel(M d'A) hip score. Clinically we observed an improvement of the hip score after total hip revision, particularly regarding pain.
Thirty hips required a second,and six a third revision.
If re-revision is used as an end-point, our results are unsatisfactory, as we had a cumulative failure rate of 54% after 12 years.This is mainly due to not using special techniques adapted to revision situations.

Key words :total hip replacement ; cemented revision.
Mots-clés :prothèse totale de hanche ;cimentée,reprise.

INTRODUCTION

After more than three decades of experience with total hip arthroplasty (6), mechanical failure has emerged as the most significant and prevalent long-term problem.

The failure rate as a result of infection has diminished slowly and now ranges from 0.4% to 3.5% (13,20), whereas the failure rate due to aseptic loosening is growing with longer follow-up and ranges from 1.1% to 29% (27, 28).

Earlier studies (4, 12, 14, 15, 16, 19, 21) have documented the technical difficulties associated with revision surgery and the decreased predictability of the results after revision arthroplasty .

The purpose of this study was to assess the clinical results according to the Merle d'Aubigné hip-score (18) as modified by Charnley (7) of cemented revision total hip arthroplasties carried out at a tertiary referral center and followed-up between 1975 and 1985.

MATERIALS AND METHODS

During the period 1971-1985, 100 hip revisions were performed in our department.

In 21 cases an uncemented prosthesis had been used,primarily or as a revision prosthesis. We decided to exclude these from our study.Three patients were excluded because data were incomplete or untraceable. Altogether there remained 69 patients with 76 hips.This group consisted of 56 women and 13 men; 32 left and 44 right hips. The mean age at primary total hip replacement (PTHR) was 63.3 years (range : 17 to 83 years). In 55 hips,the PTHR had been performed in our department, and 21 hips had been treated primarily elsewhere.

The mean age at revision was 68.6 years; 62.5 months after PTHR(range: 7 to 153 months).

The original diagnosis was osteoarthritis in 55 cases, rheumatoid arthritis in 12 cases, congenital hip dislocation in 5 and fractures in 4. The reasons for revisions are listed in table I.

The various types of revised and implanted prostheses are listed in table II.

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Table I. — Indications for first revision (n=76)

— 42 aseptic loosenings of cup and stem
— 14 stem loosenings
— 8 cup loosenings
— 3 recurrent dislocations
— 2 stem fractures
— 7 infections(9%).

In the Seventies the McKee prosthesis was usually implanted ; in the Eighties we used mainly the Stanmore prosthesis. Of the seven hips with deep infection (infection rate 9%), two were subjected to a so-called two-stage revision (reimplantion after 12 and 25 months),one of these ultimately requiring a Girdlestone procedure.In one case we performed an irrigation-drainage system ; the stem and cup were well fixed.Three had positive post-operative tissue cultures and were treated with antibiotics.

In all cases parenteral antibiotics were given for at least six weeks,followed by oral antibiotics for up to six months. Since 1976 total hip surgery has been carried out in a laminar flow operating room.

An anterolateral Watson-Jones approach was used in 59 hips, 41 with trochanteric osteotomy; a lateral McFarland approach was used in 17 hips. In the latest years multiple biopsies for cultures were routinely taken at operation . The intramedullary cement of the femur was removed with a Slooff extraction set (25).

In most hips an intramedullary bone plug and a cement-gun were used for retrograde packing of the femoral canal with cement.

Radiopaque PMMA-cement and prophylactic parenteral antibiotics have been used since 1973.
After trochanteric osteotomy,fixation was established by the use of Dutchman's hooks (10, 24).

All of the 76 hips were evaluated pre-and postoperatively using the hip scoring system developed by Merle d'Aubigné and Postel (18) for pain, walking ability and range of motion. Each category can score zero to six points; zero is a poor and six an excellent result.The maximum score is 18.

The patients were seen in the outpatient department by the authors and other members of the staff of the orthopedic department.A radiograph was routinely taken at each visit to the outpatient department. Those patients (3 hips) who had a re-revision elsewhere were assessed by their local orthopedic surgeon. If patients died after a period of non-documentation in the outpatient department, the family physician was contacted for details of premortem hip status.

Table II. — Implants used at primary THR and at first revision.

Type	Revised Prosthesis	Implanted Prosthesis
McKee - Farrar	48	9
McKee - Arden	17	26
McKee - Brunswik	2	10
Charnley - Müller	5	6
Stanmore	0	9
Müller	1	0
CAD - Harris	1	2
Minneapolis	2	13
Gunston Pieron	0	1
Total	76	76

Table III. — Merle d'Aubigné score

	preop. n=76	postop. total 116 months n=46	postop. alive 139 months n=20	postop. dead 93.5 months n=26
Total score	8.4	11.3	10.7	11.8
Pain	1.8	4.1	3.7	4.2
Walking	2.1	2.8	2.5	3.3
Motion	4.5	4.4	4.5	4.3

RESULTS

Complications after revision

Of the 76 hips which had undergone revision arthroplasty, 30 required a second revision and another 3 patients (3 hips) are awaiting a second revision. Four of these 30 hips were infected,and were treated by Girdlestone excision arthroplasty.

Six hips required a third revision, two of these ultimately requiring a Girdlestone.

Only one patient who had a first revision because of infection needed a second revision. Unfortunately he died three months postoperatively, from urosepsis and pneumonia.An intraoperative femoral shaft fracture occurred in four hips. Two patients had ipsilateral femoral nerve neurapraxia, both with total recovery. One patient suffered a complete ipsilateral sciatic nerve palsy.

Severe ectopic bone formation was observed in four hips. According to the classification of

Brooker *et al.* (3), three hips could be classified grade III and one hip grade IV.

Dislocation after revision was seen in two of the 76 revisions, both without recurrence after three weeks of immobilisation in abduction.

The 46 hips which underwent only one revision had an average follow-up of 116 months. Twenty-four patients (26 hips) died after a mean follow-up of 93.5 months (range 28-218).

The remaining 20 patients (20 hips) are still alive with a mean follow-up of 139.7 months(range 105-230).

Our Merle d'Aubigné scores are listed in table III. These scores include three patients (3 hips) who are awaiting a second revision because of symptomatic aseptic loosening (after 141, 145 and 158 months).

One patient with symptomatic loosening (after 105 months) has refused a second revision. Only one patient showed signs of asymptomatic roentgenologic loosening (after 125 months).

Twenty-eight patients (30 hips) had a second revision after an average period of 70 months (range 3-141). The reasons for a second revision are listed in table IV.

Table IV. — Indications for second revision (n=30)

— 19 cup and stem loosenings	— 1 conversion
— 2 cup loosenings	— 1 femur fracture
— 2 stem loosenings	— 1 severe pain
— 4 infections	

Six out of 30 hips needed a third revision. Of the remaining 24 hips with an average follow-up of 81 months,ten patients (10 hips) died after a mean follow-up of 75 months(range 3-143 months). Fourteen patients (14 hips) are still alive with a mean follow-up of 86 months (range 20-208). The Merle d'Aubigné scores for the second revisions are listed in table V.

The third revision in these 6 hips was performed after a mean interval of 77 months (range 9-135 months). All patients (6) are still alive,with a mean follow-up of 37 months (range 11-96) ; two have been treated by a Girdlestone procedure for infection. There were two loosenings of the cup and stem and two loosenings of the stem alone. The Merle d'Aubigné scores for the third revisions are listed in table VI. The average time in months between primary total hip replacement and the first,second and third revision are listed in table VII. For the survival analysis according to Carr *et al.* (5) see fig. 1. (Cumulative estimate of survival percentage).

Table V. — Merle d'Aubigné scores

	preop. n=30	postop. total 81 months n=24	postop. alive 86 months n=14	postop. died 75 months n=10
total score	8.2	11.1	10.6	13.1
pain	1.9	4.2	4.2	4.8
walking	2.3	2.9	2.8	3.2
motion	4.0	4.0	3.6	5.1

Table VI. — Merle d'Aubigné score

	preop. n=6	postop. 37 months n=6
total score	8.2	11.1
pain	1.9	4.2
walking	2.3	2.9
motion	4.0	4.0

Table VII. — Time intervals between successive revisions (in months)

	PTHR→rev.	1st.→2nd rev	2nd rev.→3rd rev
one revision	69.9		
two revisions	55.4	67.6	
three revisions	39.2	79.1	77

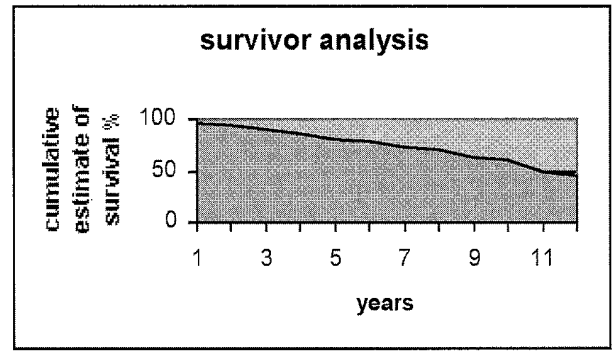

Fig. 1. — Survival analysis of cemented revision of primary cemented total hip arthroplasties

DISCUSSION

Pellici *et al.* (21) reported in a series of 99 hips a second revision rate of 19% after a follow-up of 8 years; 29% had mechanical loosening.Callaghan *et al.* (4) in a study of 139 hips found a second revision rate of 8.6% after a follow-up of 3.6 years,with a mechanical loosening rate of 15%. Kavanagh *et al.* (14) reported second revisions in 9% of 162 hips after a mean follow-up of 4.5 years. Twenty-one percent had symptomatic loosening and 45% asymptomatic loosening.

Marti *et al.* (19) reported in their study a second revision rate of 10% and a mechanical loosening rate of 45%, after 9 years follow-up. Strömberg *et al* (26) re-revised 32 hips (15%)of their group of 204 hips. They observed altogether a radiographical loosening or re-revision in 107 hips(52%),after a mean follow- up of 7 years.

In all these reports (2, 22, 23) there is a discrepancy between the observed mechanical clinical loosenings and the number of re-revisions.They all have a high percentage of asymptomatic loosening.Their follow-up varies between 3 and 9 years.

In our study we found a cumulative failure rate using revision as an endpoint of 40% after 10 years, and 54% at 12 years.

If we add in our 5 failed cases who were loose but not re-revised our scores for "failure" are 40% after 10 years and 58% after 12 years.Reviewing the xrays revealed only one patient with asymptomatic loosening among those not re-revised.

Comparing our re-revision rate with other reports, one should keep in mind that in our study there were no more patients at risk because of mechanical or clinical loosening. Especially those reports with a short follow-up will achieve a worse re-revision rate because of high numbers of patients at risk.

In our study we found that 9% of the first revisions were caused by infection. This result is in accordance with other studies such as those of Pellici *et al.* (21) with a rate of 5.5%, Callaghan *et al.* (4)with a rate of 3.4% and Ahnfelt *et al.* (1) with a rate of 11%.Hunter *et al.* (12) found in their study an alarming rate of 32% of first revisions for septic loosening.

According to table VI,patients who eventually underwent three revisions had their first revision earlier than those who had one or two revisions, and patients with two revisions had their first revision earlier than those who had only one revision. There was no difference in age at primary THR, weight,original diagnosis or infection between the groups who had one, two or three revisions.

Clinically we observed an improvement in the hip score after total hip revision, in particular regarding pain. We recorded an improvement for pain from 1.8 preoperatively to 4.2 postoperatively after a mean follow-up of almost 10 years. Even second and third revisions produced an improved score for pain (from 1.9 to 4.2). Other series also report a (very) satisfied population of postrevision patients. Kavanagh *et al.* (14) reported 56% were satisfied after a mean follow-up of 4.5 years, Marti *et al.* (19) had 92% patients very satisfied after a mean follow-up of 8.9 years, Lord *et al.* (17) reported 73% good or excellent results after 5 years follow-up, and Kershaw *et al.* (16) reported mild or absent pain in 83% of their patients after a mean follow-up of 6 years.

In our study revision surgery was performed by nonspecialists and without a special technique.It seems that hip specialists achieve better long term results.We therefore advise that revision surgery should be performed by specialist hip surgeons.

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SAMENVATTING

C.H. DIEKERHOF, L.F.W. BARNAART, P.M. ROZING. Klinische lange termijnresultaten van gecementeerde revisies van primair gecementeerde totale heup arthroplastieken.

We hebben een groep van zesenzeventig patiënten onderzocht die een revisie operatie hebben ondergaan van hun gecementeerde totale heup.
De gemiddelde leeftijd ten tijde van de implantatie was 63,3 jaar. De gemiddelde tijd tot de eerste revisie was 62,5 maand.
De revisie operatie werd zonder een speciale techniek uitgevoerd in de zin van een acetabulum reconstructie of een femur schacht bone-grafting.
De patiënten werden pre-en postoperatief gescoord volgens de Merle-d'Aubigne-Postel heupscore. Klinisch zagen we een duidelijke verbetering in de heupscore en in het bijzonder ten aanzien van de pijn.
Dertig heupen behoefden een tweede, zes een derde revisie. Als we re-revisie als eindpunt gebruiken, hadden wij tegenvallende resultaten met een cumulatieve failure rate van 54% na 12 jaar. Dit resultaat wordt voornamelijk bepaald door dat we in de beginjaren geen speciale revisietechniek gebruikten.

RÉSUMÉ

C.H. DIEKERHOF, L.F.W. BARNAART, P.M. ROZING. Résultats cliniques à long terme après reprise par prothèse cimentée de prothèses totales de hanche cimentées.

Les auteurs ont revu, avec un suivi moyen proche de 10 ans, 76 patients qui avaient subi une reprise de prothèse totale de hanche cimentée par une autre prothèse cimentée.
L'âge moyen lors de l'arthroplastie primaire était de 63,3 ans. Le délai moyen entre l'arthroplastie primaire et la reprise était de 62,5 mois.

La reprise chirurgicale a été réalisée sans recourir à des techniques particulières telles qu'une reconstruction acétabulaire ou une greffe au niveau fémoral. Les patients ont été évalués avant et après les interventions sur base du score de Merle d'Aubigné-Postel. Les reprises ont permis une amélioration du score clinique, en particulier concernant la douleur.
Trente-six hanches ont nécessité une deuxième reprise, et 6 en ont subi une troisième. Si l'on prend comme critère la reprise itérative, les résultats sont médiocres, puisque l'on note un taux d'échec cumulé de 54% à 12 ans. La raison principale en est vraisemblablement l'utilisation d'une technique de routine inadaptée dans ce contexte de reprise chirurgicale.