

TEN-YEAR FOLLOW-UP OF MÜLLER HIP REPLACEMENTS

OLAV REIKERÅS

Kronprinsesse Märthas Institutt, Oslo, Norway

During 1969-72 138 total hip replacements were performed according to the technique of Müller. The mean age of the patients at operation was 65.4 years. The results were analysed 9-12 years after the operation. Deep infection occurred in two cases necessitating removal of the prosthesis. Eighteen per cent (25/138) were reoperated on because of mechanical failure, the prosthesis was exchanged in 20 of them. Radiological signs of loosening of either component were found in a further 17 patients; only two had symptoms. The total loosening rate was thus 33 per cent (42/138). Twenty-six patients with 31 operated hips died during the observation period. In all of these the aim of the operation was achieved. The remaining cases were evaluated for the long-term results of total hip replacement. These were found to be satisfactory in all of but two cases with symptoms of mechanical failure. Loosening of the femoral stem was associated with varus position, while no relationship was found between loosening of the acetabular cup and the degree of inclination.

Key words: arthroplasty; hip; surgery

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Since 1969 we have used the Müller prosthesis in total hip replacement (THR). Our short-term results, reported in a previous paper (Reikerås & Rugtveit 1978) have been satisfactory and in agreement with those of other authors.

It is generally accepted that the results of THR deteriorate with time. The purpose of the present study was to review all patients operated on in 1969-72 with a minimum follow-up of 9 years.

PATIENTS AND METHODS

During 1969-72 116 patients with osteoarthritis were treated with total hip replacement according to the technique described by Müller (1970). Because 22 patients were operated on bilaterally, a total of 138 hips are included in the study. The sex and age distribution of the patients is shown in Figure 1. The mean age of the patients was 65.4 years (range 41-79 years).

The operations were performed in a conventional operating theatre as the first operation of the day, mostly on the day after admission to the hospital.

Prophylactic antibiotics were not given. The patients were mobilized on the second post-operative day. They were advised to use elbow crutches for 3 months after the operation.

This clinical material was evaluated an average of 10.2 years after the operation (range 9-12 years). Information about the patients who died during the observation period were obtained from their medical records and their families. Cases who had been reoperated on because of complications of the THR were analysed and controlled clinically and radiologically.

The remaining cases were investigated for the long-term results. Three patients were unable to attend the follow-up examination but relevant information was obtained by a questionnaire. The others were examined clinically and radiologically.

The degree of pain, hip mobility and walking ability were rated on a numerical scale according to the method of d'Aubigné & Postel (1954) as modified by Charnley (1972). Grade 1 denotes disability and grade 6 indicates normal findings. The result was judged to be excellent when the sum of the three evaluations was 15-18, good when it was 11-14, fair when it was 7-10, and poor when it was 3-6.

In the evaluation of X-rays special attention was paid to migration of the prosthetic components, diagnosed

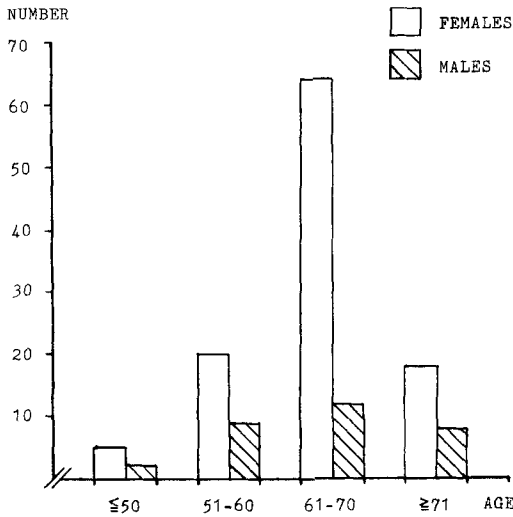


Figure 1. Sex and age distribution in 138 total hip replacements. The numbers include data for both operations in patients operated bilaterally.

when a change in position of at least 3 mm could be measured on the radiograms. Migration was related to the position of the prosthetic components in the antero-posterior view. The acetabular cup inclination was measured by a goniometer. The position of the femoral stem was classified as neutral if the tip of the stem was in the midaxis of the femur and as varus or valgus if the tip was respectively lateral or medial to the midaxis of the femur.

RESULTS

The clinical results following 138 total hip replacements 9–12 years later is shown in Table 1. Postoperative deep infection occurred in one case and late infection appeared 1½ years after the operation in another. *Staphylococcus aureus* were cultivated in both cases, and the prostheses were removed.

Twenty-five cases were reoperated on for mechanical failure 1–10 years after the primary operation. The femoral stem failed in 14 cases, the acetabular cup in two cases and both the stem and the cup in nine cases. As demonstrated in Table 1 the rate of mechanical failure was greater in the males than in the females. The prosthesis was removed in five cases while reinsertion was performed in 20 cases. The observation period of these secondary prostheses has been too short to form any conclusions with regard to long-term

Table 1. Results at reviewing 138 total hip replacements 9–12 years after the operation

	Females		Males		Total	
	n	%	n	%	n	%
Reoperated						
Infection	1	0.9	1	3.2	2	1.4
Mechanical failure	16	15.0	9	29.0	25	18.1
Dead	20	18.7	11	35.5	31	22.5
Remaining	70	65.4	10	32.2	80	58.0
Total	107	100.0	31	99.9	138	100.0

results. So far, however, the results are encouraging.

Twenty-six patients including 31 THR died from unrelated causes 1–8 years after the operation. Relatively more males than females died during the follow-up period (Table 1). The available information indicates that primary results were satisfactory in all these cases.

In the remaining 80 hips the long-term results were evaluated. The mean grade of pain, hip mobility and walking ability before the operation and at follow-up is shown in Table 2. The grading of results into excellent, good, fair and poor is demonstrated in Table 3. Only two patients were not satisfied with the operations; migration of the prosthesis was radiologically confirmed in both.

Most of the patients were dependent on crutches before THR, while most of them managed very well without crutches at follow-up (Table 4).

The X-rays showed calcar resorption in six cases but in none of these did the stem seem to have loosened.

Migration of one or both parts of the prosthesis was diagnosed in 17 out of 77 cases. The migration ranged from 3–15 mm. Only two of these had clinical symptoms of mechanical failure, and

Table 2. Average grading (range 1–6) of pain, hip mobility and walking ability preoperatively and at follow-up in 77 total hip replacements

	Preoperatively Grading	At follow-up Grading
Pain	1.9	5.4
Hip mobility	2.6	4.5
Walking ability	2.1	4.8

Table 3. Hip condition preoperatively and at follow-up in 77 total hip replacements according to objective assessment

	Preoperatively		At follow-up	
	n	%	n	%
Excellent	—	—	45	58.4
Good	—	—	26	33.8
Fair	38	49.4	6	7.8
Poor	39	50.6	—	—
Total	77	100.0	77	100.0

none of them showed signs of late infection. Thus, of the primary case material, 33 per cent (42/138) showed signs of loosening. Table 5 reflects a strong relationship between loosening and varus position of the stem.

The inclination of the acetabular cup in the antero-posterior view was 43 degrees on the average with a standard deviation of 9 degrees. No relationship was revealed between loosening and inclination of the acetabular cup.

DISCUSSION

In the literature the frequency of infection after THR varies from about 1 to 10 per cent (Benson & Hughes 1975). It has been shown that antibiotic prophylaxis can reduce the frequency of both early and late infections (Erikson et al. 1973, Carlson et al. 1977, Olsson et al. 1979). In the present study the rate of infection was small, and no tendency to increase with time was observed. Even though some infections may remain undiagnosed because of inadequate bacteriological

Table 4. Use of crutches preoperatively and at follow-up in 80 total hip replacements

	Preoperatively		At follow-up	
	n	%	n	%
No crutches	9	11.3	57	71.3
1 crutch	47	58.8	19	23.8
2 crutches	24	30.0	4	5.0
Total	80	100.1	80	100.0

Table 5. Loosening (mechanical failure and migration) of the femoral stem in relation to the position in 102 total hip replacements

Position	Loosening		No loosening		Total	
	n	%	n	%	n	%
Varus	17	45.9	15	23.1	32	31.4
Neutral	13	35.1	24	36.9	37	36.2
Valgus	7	18.9	26	40.0	33	32.4
Total	37	99.9	65	100.0	102	100.0

technique, we consider aseptic operative technique and strict operative routines to be the best prophylaxis. This view is in accordance with that of other authors (Brady et al. 1975, Collins & Steinhaus 1976).

The important long-term problem following all types of THR is mechanical failure. In the present series 18 per cent (25/138) required reoperation because of mechanical failure during the observation period. In most of these cases the prosthesis was exchanged.

In addition radiological signs of loosening were found in 17 cases. Only two patients, however, had any symptoms. This observation is in accordance with previous reports *investigations* dance with previous reports (Charnley & Cupic 1973, Beckenbaugh & Ilstrup 1978, Salvati et al. 1981). Revision surgery may become necessary in the future, but in some of the cases the prosthesis has probably settled into a new and stable position. Thus, the total loosening rate was 33 per cent (42/138) of the primary case material.

Mechanical failure has been reported to be associated with the prosthetic design (Mossing & Madsen 1980) and operative technique (Galante et al. 1975, Nolan et al. 1975, Bocco et al. 1977, Coudane et al. 1980). Varus position and insufficient medial support of the proximal part of the femoral stem have been reported to be factors predisposing to loosening. In this study a strong correlation was found between mechanical failure and varus position of the stem.

Calcar resorption was observed in six cases of a well-positioned stem with no signs of loosening. This would indicate that mechanical forces are not transmitted to a great extent through the cal-

car region in cases of a properly positioned stem, and that the proximal medial support of the cement is not of great significance.

The rate of mechanical failure of the prosthesis was a greater problem in the male than in the female patients. A possible explanation may be the larger dimension of the medullary cavity which necessitates a thick layer of cement around the prosthesis with a subsequent mechanical disadvantage.

In the present series satisfactory clinical results were achieved in about 80 per cent of cases (109/138). Compared to a previous study (Reikerås & Rugtveit 1978) results did not seem to deteriorate with time in those cases with a stable prosthesis.

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Correspondence to: Olav Reikerås, Regionsykehuset, 9012 Tromsø, Norway.