Acta orthop. scand. *53*, 953–956, 1982

MOORE HEMI-ARTHROPLASTY WITH AND WITHOUT BONE CEMENT IN FEMORAL NECK FRACTURES

A Clinical Controlled Trial

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In a clinical, controlled trial 112 patients with fresh femoral neck fractures were allocated to two groups of treatment: 55 patients had a Moore hemi-arthroplasty cemented with methyl methacrylate and 57 patients a non-cemented prosthesis. 75 patients attended the follow-up study. At 6 weeks, 3 months, 6 months and 12 months after the operation the function of the hip was assessed according to Merle d'Aubigné. At 6 weeks, 3 months and 6 months after the operation the clinical results were significantly better among patients with cemented prosthesis, especially in relation to pain relief and gait function. It is concluded that fixation of the prosthesis with cement improves the clinical results, at least during the first 6 months following the operation.

Key words: arthroplasty; bone cement; femoral neck fractures; treatment

Accepted 8.v.82

Hemi-arthroplasty of the hip joint was introduced in 1940 (Moore & Bohlmann 1943) and has gained wide acceptance for the treatment of fresh femoral neck fractures in the elderly (Andersson & Nielsen 1972, Goodwin 1968, Hinchey & Day 1964, Jensen & Holstein 1975, Moore 1957, 1959).

Studies comparing different types of hemi-arthroplasties have been published to a limited extent (Andersson et al. 1964, Drinker & Murray 1979, Gossling & Hardy 1969, Sadr & Arden 1976, Salvati & Wilson 1973, Suman 1979), But none of these were designed as a clinical controlled trial.

The purpose of using bone cement for the primary anchoring of the prosthesis should be to avoid or postpone loosening of the prosthesis. This paper presents a clinical controlled trial comparing the results of cemented and non-cemented Moore hemi-arthroplasties with a follow-up period of 1 year in the treatment of femoral neck fractures.

PATIENTS AND METHODS

The patient series consisted of all patients admitted to Gentofte Hospital with a femoral neck fracture in the calendar year 1979. Patients over 70 years of age were elected for the clinical controlled trial, provided the fracture had been sustained within the past week and that they presented no orthopaedic or neurological disorders influencing gait function. Fifty seven patients were randomly allocated to treatment with a non-cemented standard Moore prosthesis, and 55 patients to a cemented Moore prosthesis of similar design, apart from the fenestrations of the femoral stem.

Operative procedure. The operations were performed as emergency procedures in conventional operation theatres without laminar air flow. The southern exposure and technique described by Moore (1959) was applied. Non-fenestrated prostheses were anchored with methyl methacrylate bone cement.

0001-6470/82/060953-04 $02.50/0

Clinical follow-up examinations were performed 6 weeks, 3 months, 6 months and 1 year postoperatively. The hip function was assessed according to pain, gait function and hip mobility on a 0–6 scale (d'Aubigné & Postel 1954). The highest score indicates the best hip function and the three scores were summarized on a 1–5 total index (poor, fair, medium, good, very good), giving a total description of the hip function. The patients were evaluated by the authors without knowledge of the type of prosthesis inserted.

A total of 37 patients were later excluded from the trial (Table 1). Of these, 22 patients died in the first 6 weeks postoperatively. The median age for the follow-up series was 76 years (range 62–95) and the male/female ratio was 0.33. Because of high age and general feeble condition not all patients participated in every stage of the follow-up examination (Table 2).

Radiological examination. The follow-up examination included AP and lateral roentgenograms of the hip. The roentgenograms were evaluated blindly without knowledge of the clinical results. The following were registered: periarticular calcification (any appearance of calcifications around the head of the prosthesis compared with the roentgenograms taken immediately postoperatively), osteolysis (along the prosthetic stem and cement) and settling (sinking of the prosthesis with resorption of the calcar) of the prosthesis.

Statistical methods. The Mann-Whitney rank sum test was applied for the comparison of hip scores and the chi-square test with Yates' correction for binomial observations.

RESULTS

The main observation in the clinical controlled trial was that the patients with cemented Moore arthroplasties had a superior hip function during the first 6 months postoperatively (Table 2).

After 6 weeks these patients had less pain ($P < 0.05$); but there was no significant difference in the hip mobility or gait function.

Table 1. Number of patients randomized and reasons for exclusion of the trial

	Group of patients	
	Uncemented	Cemented
Randomized	57	55
Reason for exclusion		
Dead before first follow-up	11	11
Wrong prosthesis inserted* for technical reasons	6	3
Transferred to other hospital	3	0
Refusal to cooperate	2	1
Follow-up	35	40

* No cementation because of anaesthiological problems. Insufficient fixation of a non-cemented prosthesis requiring cementation.

Table 2. Number of patients with maximal score according to the hip assessment by Merle d'Aubigné

	Time after operation							
	6 weeks		3 months		6 months		12 months	
–/+ cement	–	+	–	+	–	+	–	+
Total number	21	30	22	29	25	28	25	33
Pain	10 *	21	12	22	10 *	21	13	23
Mobility	10	17	10	18	16	22	18	25
Gait function	5	8	5 *	13	5 *	12	10	14
Total score	4	9	5 *	13	5 **	14	12	14

* $P < 0.05$, ** $P < 0.01$ by comparing the uncemented and cemented group with a Mann-Whitney test.

After 3 months and 6 months the total hip index was significantly higher for patients with cemented hemi-arthroplasties, due mainly to less pain and better gait function. About 70–75 per cent of patients with cemented hemi-arthroplasties were free from pain throughout the entire observation period, as compared to 40–55 per cent with non-cemented Moore arthroplasties. The difference between the two groups was significant during the first six postoperative months.

The gait function was normal for twice as many patients with cemented as compared with non-cemented hemi-arthroplasties after 3 months and 6 months, but after 1 year about 40 per cent of all patients had normal gait function.

Superficial infection was encountered in one patient in each group and one cemented prosthesis had to be removed because of deep infection.

The occurrence of periarticular calcifications increased with observation time for both groups and after 1 year calcifications were observed among one third of the patients (Table 3). No significant difference was found between the groups and there was no relationship between the total hip index and calcifications.

Settling of the prosthesis was recorded among 36 per cent (14/40) of patients with non-cemented hemi-arthroplasties 1 year after the operation, but not among patients with the cemented hemi-arthroplasties. Settling was, however, not related to the total hip index ($P > 0.9$).

Osteolysis along the femoral stem was observed in two patients with non-cemented hemi-arthroplasties. One had a total hip index of 1 and the other of 3 points. Among cemented hemi-arthroplasties osteolysis was encountered in four patients, including the patient with deep infection. The total hip index was between 4 and 5 points for the remaining three patients.

Table 3. Patients (per cent) with periarticular calcification

Time after operation	Group of patients	
	Uncemented	Cemented
6 weeks	6 (1/18)	16 (3/19)
3 months	23 (5/22)	46 (9/22)
6 months	32 (8/25)	41 (11/27)
12 months	35 (8/23)	38 (11/29)

All P-values $\geqq 0.05$ comparing the two groups with a χ^2-test.

DISCUSSION

The follow-up examination was blind, as the examiner had no knowledge of the type of prosthesis inserted. Due to the high age of patients their own knowledge of the type of prosthesis can hardly have biased the results significantly. The trial is consequently considered as double blinded.

The radiological description was performed without knowledge of the clinical results, but the type of prosthesis could naturally be determined from the roentgenograms and might thus constitute a minor bias.

The improved gait function and especially the lack of pain following cementation of the prosthesis is considered to be caused by better primary anchorage. A high number of settlings in the non-cemented group indicates lack of rigid fixation of the femoral stem. Although no relationship between settling and poor total hip index was found in the non-cemented group this might be due to the limited number of patients available for stratification. A relationship between osteolysis and clinical results has been shown previously (Jensen & Holstein 1975).

Periarticular calcifications appear to have no clinical implication. The calcifications are observed after 3 months and are encountered irrespective of the use of bone cement. Loosening of the prosthesis as cause of periarticular calcification can thus not be proven. The high incidence of periarticular calcifications may be explained by a registration of the slightest changes in the soft tissues.

A number of papers recommend internal fixation routinely for the treatment of femoral neck fractures, irrespective of age and fracture type. A controlled trial concerning the choice of osteosynthesis method has been published recently (Frandsen & Andersen 1981). Controlled trials and comparative studies evaluating

hemi-arthroplasty in relation to internal fixation have recommended internal fixation (Bracey 1977, Hunter 1974, Søreide et al. 1979). For future controlled trials of this type cementation of the femoral head prosthesis should be chosen, as the present investigation demonstrates superior clinical results postoperatively when bone cement is used for primary anchorage of the prosthesis. As the life span for feeble elderly patients with femoral neck fractures is limited, cementation is recommended, if a hemi-arthroplasty is performed.

This study does not concern differences in the long-term results and before choosing the type of prosthesis one should consider the problems of revision of a cemented hip-arthroplasty.

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