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TREATMENT OF FRACTURES OF THE FEMORAL NECK BY PRIMARY ARTHROPLASTY

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A total of 163 patients with fracture of the neck of the femur in the acute stage were treated at the Orthopaedic Clinics of Härnösand and Östersund, between 1963 and 1970, by insertion of Moore's endoprosthesis. The patients were either above 70 years of age or were younger patients with debilitating diseases. The patients were followed up clinically for up to 9 years after operation, and 133 of them until death (average 3.4 years). The mortality within 6 weeks postoperatively was 9 per cent; other complications not producing late sequelae were seen in 8 per cent and complications producing late sequelae in 5 per cent. A good functional result was achieved in 95 per cent of those surviving the immediate postoperative course. A careful review of a sample of the patients showed that 77 per cent were without pain and 93 per cent could manage activities of daily living.

Key words: femoral neck fractures, surgery; arthroplasty; follow-up studies; hip joint; joint prosthesis; methods; postoperative complications; prognosis

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It was once widely believed that when Smith-Petersen (1931) published his method of reposition and nailing all the problems associated with the treatment of fracture of the femoral neck were solved. However, late complications, especially necrosis of the femoral head and pseudarthrosis, continued to appear. These fractures, so common in elderly patients, among whom late complications arise in up to 50 per cent of cases (Table 1), constitute a heavy burden on the community and on the hospital services.

Despite various technical modifications of the method, the use of different types of nails, and improved after-care, reposition and nailing have not resulted in any advance in the treatment of femoral neck fractures (Banks 1962).

Moore's self-locking endoprosthesis was devised in 1951. In the Departments of Orthopaedic Surgery at Härnösand and Östersund, this prosthesis has been used routinely since the beginning of the sixties as the primary treatment of fresh medial fractures of the femoral neck. Now that a fairly large series has accumulated an assessment has been made of the complications and late results of the method.

MATERIAL AND METHODS

Series I comprises 163 patients treated in the Departments of Orthopaedic Surgery at Härnö-

Table 1. Frequency of complications following nailing of femoral neck fractures.

Author		Pseudarthrosis + necrosis of the femoral head Per cent
Linton	1944	52
Spotoft	1944	54
Carlquist	1947	45
Odén	1947	40
Ibsen	1951	55
Slungaard et al.	1962	45

sand and Östersund. All have been examined at regular intervals for an average period of 3.4 years after operation, and the findings are shown in Table 2.

Series II comprises 30 patients from the above series still alive and examined by the author. In this series the average interval between operation and clinical review was 3.5 years.

The indications for treatment of recent fracture of the femoral neck with Moore's prosthesis were as follows: Age above 70 years, mental illness, blindness or rheumatic or other disabling conditions (Table 3). The anaesthetic time is also shown and compared with the anaesthetic time in reposition and nailing at the same hospitals. Moore's southern approach was used, the femoral neck being divided at an appropriate angle 1 cm above the lesser trochanter to avoid any leg length discrepancy. The operation differed from Moore's (1959) technique in one respect, viz., the capsule and the lateral rotators were sutured.

To start with the patients were kept in bed for a week after operation. Later, however, as more experience was gained, they got up the day after the operation, and appropriate physiotherapy, including walking exercises, was given. They were discharged from hospital as soon as they could manage activities of daily living—on average 4 weeks after operation (range 2–11 weeks).

Table 2. 163 patients with femoral neck fractures treated by primary Moore arthroplasty.

Age (years)	mean	78
	range	66–95
Sex	women	133
	men	30
Side	right	68
	left	95
Follow-up time (years)	mean	3.4
	range	2–9
Duration of anaesthesia * (minutes)	mean	96
	range	45–195

* For nailed patients 25–145 minutes. Mean 63.

Table 3. Indications for Moore prosthesis.

	No.
Debilitating diseases	25
Poor reduction	27
Old fractures	7
Age above 70	104
Total	163

RESULTS

Series I. Postoperative complications are shown in Table 4. The postoperative mortality includes all those who died within 6 weeks of the operation. Other complications are subdivided into those producing and those not producing late sequelae. Among the former, it was necessary to remove the prosthesis in seven patients. A total arthroplasty (McKee-Farrar) was performed in one patient.

Table 4. Postoperative complications (Primary series 163 cases).

		No.	Per cent
Mortality (6 weeks postoperatively)		15	9
Cardiac	7		
Pulmonary	5		
Cerebral	3		
Without late disability		17	10.4
Fracture during operation	6		
Thromboembolism	2		
Haematoma	7		
Wound rupture	2		
With late disability		8	5.4
Luxation	2 *		
Deep infection	5 *		
Unexplained pain	1 †		

* Salvage procedure: Girdlestone.
† Salvage procedure: McKee-Farrar.

Table 5. Total result. (Series I).

	No.	Per cent
Died	15	9
Complications wiht late sequelae	8	5.4
Good – otherwise healthy	110	85.6
– otherwise disabled	30	
Total	163	100

Table 6. Pain at review (Series II).

	No.	Per cent
Without pain	23	77
Intermittent mild pain	5	16
Intermittent moderate pain	2	7
	30	100

Although these secondary procedures gave relief, treatment with Moore's endoprosthesis was regarded as unsuccessful. Many patients were already bedridden or confined to a wheel-chair owing to other disabilities before the fracture. In these, function of the hip was regarded as good provided the joint was mobile and did not interfere with the care of the patient and provided the pre-fracture level of function was regained. The overall results are given in Table 5. No late complications occurred.

Series II. Of these 30 patients, 23 denied pain in the hip and seven complained of occasional postfunctional pain or pain on weightbearing (Table 6). All are old age pensioners, but many are still physically active (Table 7).

Table 7. Activities (Series II).

	No.
Heavy work	1
Household	22
Can manage daily activities	5
Hospital care	2
	30

Table 8. Activities of daily living (Series II).

	Yes	With some difficulty	No
Staircase	20	8	2
Stocking and shoes	23	5	2

The ability to climb a staircase and to put on stockings and shoes is shown in Table 8. Nine patients used no walking stick, 13 used one stick largely on the surgeon's recommendation, and eight needed two sticks.

Of the 163 patients 133 died during the follow-up period, death taking place 1 to 9 years (average 3.4 years) after operation. Figure 1 shows the expected duration of survival according to Swedish population statistics compared with the figures for these patients. The likelihood of an earlier death after fracture of the neck of femur is significantly increased ($P < 0.001$ and < 0.05 2 and 4 years after operation).

DISCUSSION

In these elderly patients, many in poor general condition (Alffram 1964), several factors contribute to the unfavourable prognosis of fractures of the femoral neck. The blood supply to the femoral head is very often reduced by atherosclerosis (Müssbichler 1970). Furthermore, the blood supply is reduced owing to the trauma (Müssbichler 1970). Preoperative investigations to assess the blood supply and consequently the prognosis have not been very rewarding (Hulth 1956, Johansson 1964, Müssbichler 1970). In many patients the femoral neck and head are osteoporotic and brittle. The head may therefore be dam-

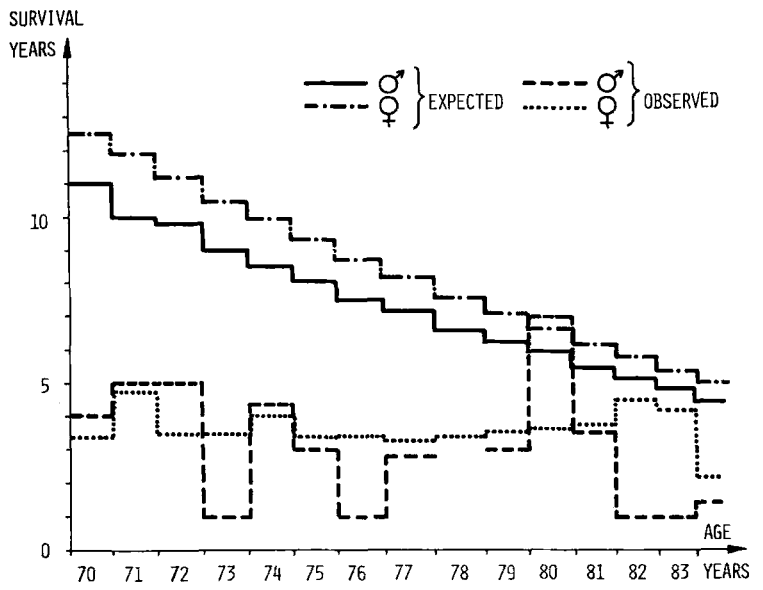

Figure 1. Expected and observed duration of survival.

aged by the trauma or by nailing (Böhler 1953). Sometimes the head is more or less an empty shell and very difficult to fix irrespective of the type or number of nails or screws because the tips of the fixing device have no grip inside the head. Also, several different means of fixation have given the same poor results (Table 1). Slipping of the nails is common, and the fixation of the nails by means of a plate to the lateral part of the femoral cortex often leads to penetration and destruction of the acetabulum by the nails (Barnes 1967) when resorption occurs in the fracture line and shortening of the neck takes place. The subtended angle of the fracture line can also create shear forces, making it difficult to maintain exact reduction (Pauwels 1935, Scheck 1965). In subcapital fractures the primary reduction is sometimes also difficult.

The result of nailing can be a long convalescence, limited mobility, and dependence on other people, or, alternatively, the care of an otherwise handicapped patient may be made still more difficult increasing the burden on hospital services. As Thorén (1975) points out, only 25 per cent of the patients were able to walk after nailing, and the burden on hospital staff increased in two-thirds of the patients. The present investigation shows that all patients regained their pre-fractural level of function. Furthermore, a second operation, such as arthroplasty, after failure of nailing may be risky, especially in an elderly patient. The usefulness of reposition and nailing of femoral-neck fractures in elderly patients is therefore open to question, and primary arthroplasty is recommended instead (Coventry 1959, Lunceford 1965, Riska 1971).

In young, otherwise healthy patients the femoral head ought not to be replaced by a prosthesis. It is not known where to set the age limit, because we do not yet know how long a prosthesis will continue to function without pain, but it could probably be set lower than in the present series. In this investigation patients had a shorter expectation of survival compared with the general population (Swedish Life Table). The reduction is probably not due to the arthroplasty *per se*, since aged patients treated by nailing (Fröysaker 1968) and aged patients

operated upon for inguinal hernia or gallstones also have a shorter expectation of life (Dahlin 1973) independent of the immediate postoperative mortality.

The total anaesthetic time may be taken as a rough measure of the surgical trauma. It is found (Table 2) that for nailing the anaesthetic time is two-thirds of that for arthroplasty. The difference is barely significant, and could be further reduced for arthroplasty. In arthroplasty it is possible to induce anaesthesia on the operating table, and the patient can even be aroused there, whereas in nailing anaesthesia must cover the time taken to place the patient on the traction table and be continued until he is back again in bed. The surgical magnitude of arthroplasty compared to nailing is also indicated by the fact that the postoperative mortality is the same (Fröysaker 1968) as are other postoperative complications such as infection, pneumonia, etc. (Banks 1962, Lunceford 1965, Fröysaker 1968, Riska 1971).

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