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REHABILITATION AFTER HIP FRACTURE IN THE ELDERLY

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Sixty-eight patients with hip fracture, mean age 79 years, from the city of Lund, were studied with special reference to functional and social rehabilitation at follow-up 1 year later. As compared with patients coming from institutions for permanent care, patients coming from their own homes had a significantly better prognosis in terms of survival, mobility and ability to cope with activities of daily living (ADL). However, patients returning home needed increased domestic help. Patients living with someone returned home sooner than those living alone. Although many of the patients who returned home could walk without support or with a walking-stick, more than one half did not go out shopping. More active measures, e.g. early home visits by a rehabilitation team, might give the patients more self-confidence and independence. Immediate weight-bearing did not appear to impair healing of the hip fracture or increase the risk of necrosis of the femoral head.

Key words: ADL; early ambulation; femoral neck fractures; fractures; hip fractures; rehabilitation

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The last two decades have witnessed noteworthy changes in the population of patients with hip fractures, i.e. femoral neck and trochanteric fractures of the femur. Both the prevalence and the incidence of hip fractures have increased (Alffram 1964, Hansen & Neidhardt 1970, Nilsson & Obrant 1978). Also the treatment of hip fractures has changed so that there is now a much greater emphasis on early postoperative mobilization and weight-bearing of the affected limb (Ceder et al., in press). During the period 1951–1970 the average stay in our hospital (Borgquist 1974) has dropped from 139 to 32 days for femoral neck fractures and from 125 to 26 days for trochanteric fractures.

Since 1970 uniform principles of treatment and rehabilitation have been applied in the management of hip fractures at the Department of Orthopaedic Surgery in Lund. Early operation, early postoperative mobilization and early weight-bearing of the affected limb is the rule. This paper reports a prospective investigation of the rehabilitation and the social situation of patients with hip fracture after institution of an active management programme.

PATIENTS AND METHODS

The clinical material consisted of 68 patients (11 men and 57 women), over the age of 50, all residents of the city of Lund (58,509 inhabitants), who had sustained a hip fracture in 1972 and had

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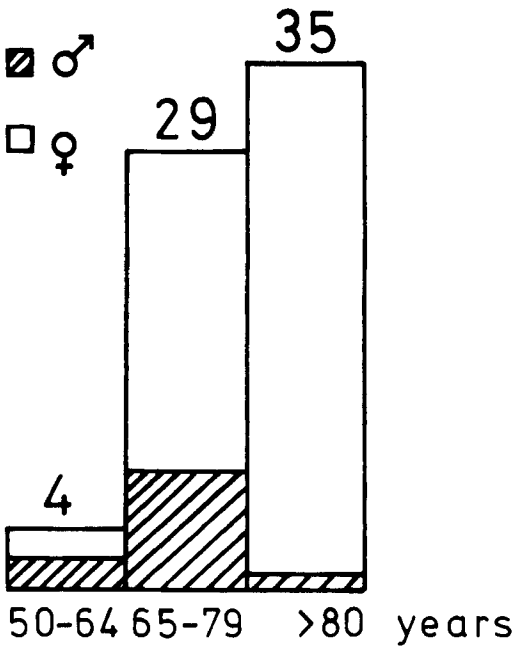

Figure 1. Age and sex distribution of patients with hip fracture.

been treated in the Department of Orthopaedic Surgery at the University Hospital of Lund. The mean age at the time of fracture was 79 years (Figure 1). Nineteen of the patients were married, 16 single, and 33 widows/widowers or divorced. There were 35 fractures of the femoral neck and 33 trochanteric fractures. Forty-eight patients came from their own homes and 20 from institutions (nine from old people's homes, seven from nursing homes and four from another hospital unit). The mean age in the former group was 78 years and in the latter 83 years.

Treatment

The detailed surgical and mobilization programme will be described in a separate article (Ceder et al., in press). An endeavour was made in each case to operate within 3 days after admission and to start mobilization with weight-bearing of the affected limb as early as the first postoperative day. Only three of the operated patients were not allowed immediate weight-bearing. Femoral neck fractures were operatively treated with insertion of a Rydell nail (Rydell 1964) in 21 cases, other types of nails in 6 cases and a hemi-prosthesis in 2 cases. For fixation of trochanteric fractures the Thornton nail and McLaughlin plate were used in 23 cases and Ender nails in 9 cases. Seven patients were not operated upon: two died shortly after arrival, three were poor risk patients and two had a stable fracture. These latter two patients were allowed weight-bearing.

Roentgen examination

Routine roentgen examination of the affected hip was done pre- and postoperatively, at 1–2 weeks, at 6 weeks, at 3 months, sometimes at 6 months and at follow-up 1 year postoperatively.

Review

About 12 months after sustaining their fractures, the patients were visited at home by a specially appointed physiotherapist. They were interviewed, according to a standardized questionnaire, regarding their social situation, mobility and ability to cope with activities of daily living (ADL). Fifty-one of the original 68 patients were reviewed. Sixteen patients had died and one was lost to follow-up examination.

The interview was followed by roentgen examination of the operated hip. Three of the 51 patients (two femoral neck fractures, one trochanteric fracture) could not be examined roentgenologically at follow-up. The former two were women, aged 93 and 86 years; one of them had no symptoms referable to the hip, but both required walking support. The third patient was in a nursing home after a stroke and was bedridden. Thus roentgen examination at review was carried out in 48 patients (21 femoral neck fractures and 27 trochanteric fractures).

The femoral neck fractures were operated upon according to Rydell in 14 patients, according to Thornton in two, according to Nyström in one, and in one with a nail and plate. One patient was not operated upon. One patient with Parkinsonism was primarily treated with insertion of a hemi-prosthesis. Another patient suffered from acute thyrotoxicosis and was treated in traction for 10 weeks. Owing to a displacement, she was then fitted with a hemi-prosthesis.

The trochanteric fractures were fixed with the Thornton nail and McLaughlin plate in 17 patients or with Ender nails in a further 9 patients. One patient was not operated upon.

The physiotherapist classified the patient's home as modern, semi-modern or old-fashioned. The home was classified as modern, if it had running hot and cold water, WC and shower or bath; as semi-modern, if it had no shower or bath; and old-fashioned, if it lacked an indoor WC and/or running water.

Mobility indoors was assigned a certain number of points as follows. Confinement to bed or wheel-

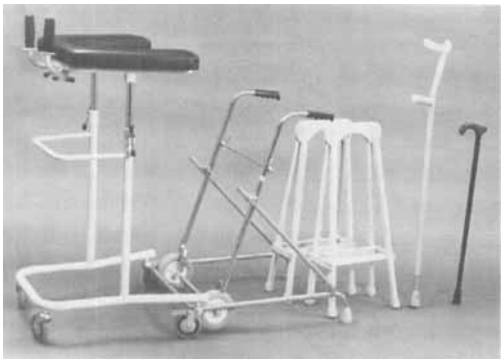

Figure 2. Walking aids used in rehabilitation of patients with hip fracture (from left to right): walking frame, rollator, quatraped, elbow crutch and walking-stick. The elbow crutch was seldom used by old patients.

chair or ability to walk only when strongly supported by another person scored 0 points, walking frame 2 points (Figure 2), rollator 3 points, quatraped 4 points, walking-stick 5 points, and ability to walk unaided 6 points.

Ability to manage ADL was judged with the aid of a simplified and abbreviated version of the standardized ADL-test (the Staff of the Benjamin Rose Hospital 1959, Katz et al. 1963, Carrol 1968). The patient's ability was assessed: eating one point, going to toilet one point, personal hygiene one point, and dressing and undressing one point. The patient who was able to manage independently and completely each activity was given the maximum score of 4 points.

For statistical analysis the chi-square test was used.

RESULTS

Mortality

One quarter (16/68) of the patients had died 1 year after the fracture. Nine patients died from cardiovascular diseases (Table 1). The mortality rate among patients who came from their own homes was only 15 per cent (7/48) compared with 45 per cent (9/20) of those institutionalized at the time of fracture (Table 2). This difference is almost significant ($P < 0.05$).

Institutional care after discharge from hospital

Four of the 48 patients who lived at home before the fracture died in the Orthopaedic Department, 18 were discharged to institutions and the remaining 26 went directly home (Table 2). Eight of the 18 patients

Table 1. Time of death, cause of death, age and sex

Patient no.	Time of death* (days after fracture)	Diagnosis	Age	Sex
1	2	Pulmonary embolism†	76	M
2	4	Ruptured aortic aneurysm†	82	F
3	7	Aspiration pneumonia†	87	F
4	10	Myocardial infarction†	83	F
5	25	Chronic pyelonephritis with uraemia†	82	F
6	43	Cardiac incompensation	91	F
7	53	Pleuromesothelioma†	78	M
8	55	Metastasing breast carcinoma	83	F
9	74	Bronchopneumonia	72	M
10	102	Pleuropneumonia	95	F
11	166	Cardiac incompensation	91	F
12	174	Cerebral haemorrhage	93	F
13	174	Cardiac incompensation	87	F
14	210	Chronic lymphatic leukaemia	78	M
15	264	Myocardial infarction†	83	F
16	362	Cardiac incompensation	85	F

* Patients numbers 1–6 died in the Orthopaedic Department
† Diagnosis from autopsy

eventually returned home after they had received an average of 55 days of care with 1.1 admissions each in different institutions after the discharge from the Orthopaedic Department. This can be compared with 26 days of institutional care with 0.4 admissions each for the 26 patients who initially returned home. Seven of the 18 patients became permanent residents in institutions with an average of 264 days of care and three had died at follow-up after having spent an average of 109 days in institutions.

Patients living at home

Patients living alone or with someone. Of the 19 patients (mean age 76 years) living with someone before the fracture, 16 could return directly home from the hospital, whereas of the 29 (mean age 79 years) who were living alone before the fracture, only 10 could go directly home. Patients living with someone could thus more often return directly home. The difference between the groups in this respect is significant ($P < 0.01$).

Communal home help. The need for home help successively increased (Table 3). Before the fracture 10 of the 34 patients, who had returned home at follow-up, had home help and after 1 year 21 of these patients were receiving such help. This difference is almost significant ($P < 0.05$). This is essentially due to the fact that more of the patients living with someone received home help at follow-up than before the fracture. Thirteen of the 34 patients had no communal home help after 1 year, but 6 were helped by relatives or employed private help and only 7 patients had no help at all.

Patients' homes at the 1 year review. Of the 34 who resided at home, 20 were living in a flat, 7 in their own houses, and 7 in flats for pensioners. Twenty-five of the homes were modern with toilet and bath and 9 semi-modern with no bath. None was old-fashioned. Thirty of the 34 patients had to climb at least three steps.

Since all the patients lived in the city of Lund, a good general service was available

Table 2. Accommodation before fracture, after discharge from hospital and 1 year later

	From own home ($n=48$)		From institution ($n=20$)	
	At discharge	At 1 year	At discharge	At 1 year
Own home	26	34	1	1
Old people's home	5	3	4	3
Nursing home	6	4	9	7
Other hospital unit	3	–	3	–
Rehabilitation centre	4	–	1	–
Dead	4	7	2	9

Table 3. Recipients of communal home help before fracture, at time of discharge from hospital and 1 year later (patients who returned home)

	Before fracture		At discharge		After 1 year	
	Alone	Living with someone	Alone	Living with someone	Alone	Living with someone
With home help	8	2	6	6	11	10
Without home help	10	14	4	10	7	6
Total	18	16	10	16	18	16

and only three patients were more than 1 kilometer from the nearest post office, bank, grocer's or bus stop. But even when there was less than 1 kilometer to the nearest shop, more than half (18/31) of the patients could not avail themselves of this service because of orthopaedic and/or other medical or social causes. Six of these patients used a quatraped and the remaining 12 used a walking-stick or needed no support.

Thirty-three of the 34 patients at home were pensioners; three of these had retired earlier than normal. A 50-year-old woman worked half-time, having completely recovered from the fracture.

Mobility and ADL

Of the 51 patients reviewed, 17 used some walking support even before the fracture. Of the 34 patients living at home at the 1-year follow-up, 6 used a quatraped, 17 a walking-stick and 11 walked unaided. Of the six patients living in old people's home, two used a rollator, two a quatraped and two a walking-stick. Of the 11 patients in nursing home, six were bedridden, two used a walking frame, one a quatraped, one a walking-stick and one no support at all. Thus, a total of only 12 patients walked unaided.

At the ADL-test, the majority of patients (28/34) living at home scored the maximal 4 points, a few (5/34), 3 points, and only one, 2 points. Half of the patients in old people's homes scored the maximum number of points. Of those in nursing homes, the majority (10/11) scored 0 or 1 point. The mobility test showed a similar distribution with the mean close to a maximum of 6 points for patients at home and less than 2 points for patients in a nursing home (Table 4).

Roentgen examination at review

Femoral neck fractures. Three of the 19 patients were reoperated upon and fitted with a prosthesis within 1 year of the fracture due to secondary displacement of the fracture in two cases and necrosis of the femoral head in one.

Six of the patients had *necrosis of the femoral head* during the follow-up year. Five of them had not been reoperated. Three of the five patients had no symptoms referable to the hip and locomotion was satisfactory, whereas one had pain but no functional impairment. The fifth patient had both pain and a deteriorated hip function. A replacement of the femoral head was later performed.

Six femoral neck fractures had *not healed* 1 year after the operation. Three of these belonged to the group with necrosis of the femoral head described above. The remaining patients had in two cases minor discomfort and one also had functional impairment.

Trochanteric fractures. In three of the 27 patients, the result of the operation after 1 year was unsatisfactory as evaluated by

Table 4. Mobility and ADL-test scores for patients living at home, in old people's homes and in nursing homes at follow-up 1 year after hip fracture

Accommodation	Number	Mean score	
		Mobility (max. 6 points)	ADL (max. 4 points)
Own home	34	5.1 (range 4–6)	3.8 (range 2–4)
Old people's home	6	4 (range 3–5)	3 (range 1–4)
Nursing home	11	1.7 (range 0–6)	0.6 (range 0–2)

roentgen examination. One fracture had not completely healed since the osteosynthesis material had loosened, resulting in a varus position; this patient had no symptoms and the function of the hip was not impaired. In an 86-year-old woman the fracture was compressed, the nail having penetrated into the joint. The patient was bedridden before the fracture as well as 1 year after the operation. One patient was reoperated on because of fracture of the osteosynthesis material. In spite of this, the fracture healed in a varus position without the patient having either pain or functional impairment.

DISCUSSION

Mortality

Sixteen of the 68 patients had died within 1 year after the hip fracture, 13 of them within the first 6 months. This figure agrees well with the increased mortality within the first 3 to 6 months after hip fracture in other series (Fitts et al. 1959, Alffram 1964, Hansen & Neidhardt 1970). It is noteworthy that patients coming from their own homes have a better prognosis.

Accommodation

Four fifths of the surviving patients coming from their own homes returned home within 1 year (Table 2). Three of the four surviving patients from old people's homes returned there. All five survivors from nursing homes were in their institution after 1 year. The only patient who required less care at discharge from the hospital than before the fracture came from another hospital unit where he had been investigated for myeloma; he was first discharged to his home but later admitted to the hospital for cytostatic treatment. During the first year after discharge from the Orthopaedic Department the patients successively required less institutional care. This applied in particular to patients who came from their own homes, eight of whom were first referred to an institution but afterwards returned home. Only seven of the survivors among those who came from their own homes required permanent institutional care. However, several of these patients probably needed institutional care even before the fracture.

Patients living at home

Patients living with someone were more often able to return directly home after discharge from the Orthopaedic Department than patients living alone. The former were on average 3 years younger than the latter. However, also the urge to return home was probably stronger for those who had somebody waiting for them, making the first few weeks after the home-coming easier (Thomas & Stevens 1974).

The proportion of patients who required home help at follow-up was greater than before the fracture (Table 3). This increase occurred gradually during the follow-up year, most strikingly for patients living with someone. One year after the fracture there was no difference between the two groups regarding the proportion of patients requiring home help. This might perhaps be explained by the assumption that the other partner could not, with the passage of time, manage the increased burden of domestic work. It was also possible that some latent need for care before the fracture became more obvious after discharge from hospital. Eight persons living alone before the fracture were transferred to an institution after discharge from hospital but eventually returned home.

Mobility and ADL status

The above unrecognized need for care might also be reflected in the mobility and the ADL-test. The mobility and ADL scores (Table 4) show that some of the patients living at home clearly had a lower score than several of those living in institutions. These patients could continue to live at home due to the help given by a partner, relatives or home

help. Patients living alone before the fracture found it more difficult after the discharge from the hospital to return home because of lack of help at home.

Roentgen examination at follow-up

Femoral neck fractures. The active mobilization programme with immediate weight-bearing in this series did not seem to increase the rate of non-union and/or necrosis of the femoral head. Of the 19 femoral neck fractures where immediate weight-bearing was allowed, necrosis of the femoral head developed in six. In an earlier material of 91 patients (Ståhl 1957), also from this department, the incidence of necrosis 1 year after the accident was 36 per cent in spite of the fact that weight-bearing was not allowed until after 4 months. Other workers (Dahlgren 1959, Frangakis 1966 and Öhman et al. 1969) found necrosis of the femoral head in about 40–50 per cent within 1.5 to 5 years. Nieminen (1975) did not find that early weight-bearing (after 2 weeks) resulted in more non-union and necrosis of the femoral head than late weight-bearing (after 12 weeks), which corroborated the findings of Bonnin & Cashman (1963).

Six of the 19 fractures had not healed but three of these also had necrosis of the femoral head. In a large material, Barnes et al. (1976) found that at least 22 per cent of the fractures in women and 16 per cent in men had not healed within 1 year. Ståhl (1957) reported non-union in 16 per cent.

Trochanteric fractures. Roentgen examination revealed few complications. This agreed well with earlier publications. Ring (1963) and Ainsworth (1971) reported no noteworthy complications after immediate weight-bearing. Alffram (1961) found no correlation between walking ability and the anatomy of the healed fracture and claimed that rehabilitation was dependent almost entirely on factors other than the actual fracture. Other workers (Laros & Moore 1974, Laros 1975, Jensen & Michaelsen 1975) reported a higher frequency of complications in the form of varus dislocation and penetration by the nail, but, like earlier investigators, they did not consider these complications to be of major clinical significance.

CONCLUSIONS

This investigation emphasizes the difference in survival, mobility and ability to cope with ADL between patients coming from their own homes and institutions. To be living with someone is a good prognostic factor for early return home. There were no obvious reasons to explain why the need for home help increased during the follow-up year and why more than one half of the patients did not do their own shopping. Studies in progress (Ceder et al., unpublished) suggest that there should be home visits by nurses, physiotherapists or occupational therapists very early after discharge from the Orthopaedic Department to encourage rehabilitation. In this way the patients might become more self-confident and independent.

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