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The short term outcome of elderly patients with hip fractures

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Abstract A prospective outcome study was performed of 100 hip fracture patients at an urban medical center in the United States. After hospitalization 19% were discharged to a rehabilitation facility and 59% were discharged home. At a mean follow-up of 8 months, 81% of patients lived at home, compared to 89% who lived at home prior to the fracture. At follow-up 71% of the patients were able to walk outside with one cane or no aids at all, and 81% were able to perform basic activities of daily living. Half of all patients did not require any home assistance at follow-up. Ten patients had died at follow-up. The goal of operatively treating the patient with a hip fracture is fixation of the fracture with a return to the patient's pre-fracture functional ability. This study illustrates that patients with hip fractures can be effectively treated and discharged home or to a short-term rehabilitation facility with restoration of their pre-fracture functional status.

Résumé Une étude prospective sur le devenir de 100 patients présentant une fracture de la hanche a été faite dans un Centre Médical Urbain des USA. Après l'hospitalisation, 19% des patients sont allés en structure de rééducation et 59% ont regagné leur domicile. A un délai moyen de 8 mois, 81% des patients vivent à domicile alors qu'il y en avait 89% avant la fracture. Au délai d'observation, 71% des patients marchent à l'extérieur avec une canne ou sans aide et 81% sont capables des activités habituelles de la vie quotidienne. La moitié des patients n'ont besoin d'aucune assistance à domicile. 10 patients sont morts. Le but du traitement opératoire des patients présentant une fracture de la hanche est la fixation de la fracture pour permettre un retour au niveau de

fonction pré-traumatique. Cette étude confirma la possibilité d'un retour à l'état fonctionnel antérieur avec, après le traitement, un retour à domicile ou un court séjour en Centre de réadaptation.

Introduction

The morbidity and mortality associated with hip fractures remains a significant problem. Treatment of the orthopaedic injury and the subsequent care and rehabilitation of the patient places a heavy burden on the health care system. The majority of hip fracture patients are elderly with multiple concomitant medical problems. As the elderly population increases so too will the number of hip fractures and the cost of treating them [6].

Surgical management with early mobilization has become the treatment of choice for most hip fracture patients, with the goal of returning the patient to their pre-fracture functional ability [12,13]. Many studies have assessed pre-fracture functional status as it relates to post-operative ability. However, the majority of these studies have been retrospective analyses. In addition, there is no standardized functional outcome criteria, making comparative analysis difficult. In a recently published meta-analysis of displaced femoral neck fractures the authors commented that one of the major obstacles in comparing functional outcomes was the lack of standardized criteria [15]. Therefore, the objective of this project was to undertake a prospective outcome study using standardized criteria.

Materials and methods

This current study is based on the Swedish Multicenter Hip Fracture study. Standardized data collection forms were used at the time of initial presentation and at follow-up [17].

From November 1992 to June 1993, 100 consecutive patients admitted to the Fracture Service of The New York Hospital-Cornell Medical Center with an operative hip fracture were enrolled in this Institutional Review Board approved study. This ser-

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vice admits and treats patients from a large urban catchment area. Two of the senior authors (J.P.L. and C.M.C.) directly participated in over 95% of the surgeries. The average age of the study population was 76.5 years (range 65–100) and the median was 78 years old. Eighty-two of the patients were women and 18 were men.

At the time of the patient's hip fracture a standardized inpatient assessment was completed by the authors. Information entered on this form included patient demographics, fracture type, type of surgery, patient's place of residence, and the need for home help prior to the fracture. In addition, activities of daily living and ambulating ability both pre-fracture and 2 weeks post-fracture were recorded. Inclusion in this study did not alter patient treatment.

The hip fractures were classified into six categories: non-displaced femoral neck (Garden I-II), displaced femoral neck (Garden III-IV), basocervical, stable and unstable intertrochanteric, and subtrochanteric [7,8]. There were 45 femoral neck fractures, of which two-thirds were displaced fractures. There were 49 intertrochanteric fractures with 44 being stable fractures. The other 6 were evenly divided into basocervical and subtrochanteric fractures.

Most patients had surgery on the day following admission. The majority of non-displaced femoral neck fractures were treated with multiple cannulated screws. The majority of displaced femoral neck fractures were treated with a cemented bipolar hemiarthroplasty. All patients with femoral neck fractures were allowed to weight-bear as tolerated post-operatively. The majority of intertrochanteric fractures were treated with a sliding screw and side plate. On the first postoperative day these patients were instructed to be full weight-bearing, provided they were medically stable.

Follow-up information was recorded on an additional standardized assessment form completed by telephone questionnaire. Since many of the elderly hip fracture patients have dementia or other cognitive deficits, family members or home help and other supportive staff acted as proxies to provide follow-up information. Information on the follow-up form included the patient's discharge status, residence status, when they lived alone, required any home help, had pain with ambulation, and need for pain medication. In addition, their general ambulating ability and walking aid requirements were assessed, as was their ability to perform activities of daily living.

Results

Inpatient assessment

Eighty-nine percent of patients were admitted from their own home, while 10% were admitted from a nursing home. Eighty-five percent of all patients were able to execute activities of daily living prior to the fracture, while only 40% were able to do so at 2 weeks after their injury. Patients' walking ability is illustrated in Table 1. The majority were able to walk alone outside prior to the fracture.

Of the 100 patients, 78% did not require any walking aids prior to the fracture. At 2 weeks after the injury, all patients either used some form of walking aid or did not walk. The distribution of assistive devices used both pre- and post-fracture is demonstrated in Table 2. Of the 100 patients, 70% did not require any home help prior to the fracture.

Fifty-nine percent of all patients were discharged to their own home. Nineteen percent were discharged to a short-term, geriatric-rehabilitation center, while 18% were discharged to a nursing home. The 2 that died in the hospital prior to discharge died on post-operative days 7 and 41, both of pneumonia.

Table 1 Patients walking ability at time of fracture and at follow-up

	Pre-fracture (%)	Follow-up (%)
Outside/alone	73	53
Outside/accompanied	7	17
Inside only	17	23
Non-ambulator	3	7

Table 2 Assistive devices used prior to fracture, at 2 weeks post-fracture and at follow-up

	Pre-fracture (%)	2 weeks post-fracture (%)	Follow-up (%)
None	78	0	45
Cane	12	10	26
Walker	7	74	21
Wheelchair	3	16	8

Follow-up assessment

At an mean follow-up time of 8 months (range 4–27 months), 99 of the 100 patients were reached, while 1 was lost to follow-up. Of the 99 patients, 10 had died and thus were not included in the analysis of post-operative functional ability. The median age of the 10 patients who had died, including the 2 who died prior to discharge, was 92.5 years. Of these, 6 were women and 4 were men.

Of the 89 patients alive at follow-up, 81% were living at home, while 19% were living in a nursing home. Of the 78 living patients who were admitted initially from their own home, 90% had returned home at follow-up (Fig. 1). All of those who had not returned home were currently living in a nursing home.

Functional parameters similar to those assessed while the patient was hospitalized were determined at follow-up. The majority were able to regain their ability to walk outside (Table 1).

With regards to the walking aids used by the patients at follow-up, 45% did not require any walking aids. Twenty-six percent required any combination of canes and quad canes, and 21% used a walker. Eight percent said they required a wheelchair (Table 2). Fifty-six percent of the patients stated that they could not walk equally well at follow-up as compared to prior to the fracture and added that the hip continued to give them problems. Twenty-six percent said they could walk equally well at follow-up, while 18% said that they were not able to walk equally well, but for reasons other than the hip. Other reasons included motor deficits secondary to strokes, problems with balance, cardiovascular disease, and pulmonary problems. Eight percent of patients reported significant pain at the operated hip, requiring analgesics. Forty-three percent reported minimal pain not requiring analgesics, while 49% reported no pain. Eighty-one percent of the 89 patients were able to do the basic activities of daily living at follow-up (Fig. 2).

Fig. 1 Residence at time of fracture, 2 weeks post-fracture and at follow-up

Fig. 2 Percentage of patients able to perform activities of daily living prior to fracture, 2 weeks post-fracture and at follow-up

The data obtained from both inpatient and follow-up forms were analyzed with respect to fracture type: femoral neck compared to intertrochanteric fractures. The mean length of hospitalization for the femoral neck group was 13.5 days, and for the intertrochanteric group it was 17 days.

Discussion

The Swedish Multicenter Hip Fracture Registry, which prospectively follows hip fracture patients in Sweden by encoding information on standardized forms at the time of admission and at follow-up, was first developed in 1988. Since its inception, it has enrolled over 30,000 hip fracture cases [17]. These standardized forms have also been used in the Netherlands in a similar study, and information obtained from the forms has enabled comparisons to be made concerning the treatment and rehabilitation of hip fracture patients across geographical borders [2]. These standardized forms provide information con-

cerning demographics and the functional assessment of the patient. All of the basic data registered in this type of study permits the possibility of refined analyses.

Emphasis concerning hip fractures has shifted from treatment of the fracture per se towards treatment of the patient with regards to their pre-fracture independence and mobility. The majority of patients enrolled in our study were able to achieve their pre-fracture independence. In addition, the majority of patients were discharged directly home. By discharging the patient to the community, even if home health aide is required for assistance, the patient is kept out of the nursing home, costs are controlled, and the patient regains some semblance of autonomy.

In addition to the costs of rehabilitation is the cost of hospitalization, which is directly related to the length of stay [5]. The average length of stay varies ranging from 10 to 37 days depending on the age of the patient and the type of fracture.[2–5,9–11,14,16,17] In our study, the median length of stay was 15.5 days for all 100 patients, 13.5 days for the femoral neck group, and 17 days for the intertrochanteric fracture group.

As mentioned, the goal of operative treatment of the hip fracture patient is fixation of the fracture with a return to the patient's pre-fracture functional abilities. This study employs walking ability, walking aids used, and the ability to perform simple activities of daily living to assess the patient's functional status. The majority of our patients said they could walk outside prior to their fracture. The ability to walk outside decreased somewhat on follow-up as did the number of those who could walk outside. This may reflect the pain in the operated hip. In addition, since a hip fracture is a traumatic injury, many patients may feel a loss of balance or unsteadiness when they walk outside on uneven surfaces.

The use of walking aids is another useful measure of a patient's functional status. Prior to the fracture, 78% of all patients did not require any walking aids. However, at 2 weeks after the fracture all of the patients used some form of walking aid. At follow-up, many patients returned to their pre-fracture status, but the majority still required aids. This is in contrast to a study that reports no difference in walking aids used prior to fracture and at 4 months follow-up.[2] However, our results are more encouraging than others who report that only 50–60% of patients will regain their pre-fracture ambulatory status [12,13]. As with the patient's walking ability, pain and unsteadiness may account for the increase in the number of walking aids used after the fracture.

Functional status, independence, and quality of life can be assessed by the ability of a patient to perform activities of daily living. Activities of daily living can be divided into two categories: basic activities and instrumental activities. Basic activities of daily living include feeding, dressing, and toileting. Instrumental activities of daily living include food shopping, banking, laundry, and housework [12,13]. Our study assesses the ability to perform basic activities of daily living so that the patient's minimum level of function can be determined. Our re-

sults show that, despite a decrease in walking ability, the ability to perform activities of daily living is largely intact at follow-up.

One of the limitations of the current study is that the patients' co-morbid medical conditions were not considered. Therefore, a complete analysis of factors associated with hip fracture mortality could not be performed. In addition, since the average follow-up in this study was 8 months after the fracture, the follow-up mortality of 10% cannot be directly compared to 1 year mortality figures. Nor can it be directly compared to those figures from the Swedish Hip Registry because their follow-up was at 4 months for all patients. However, the mortality is at the lower end of those reported. This may be related to the relatively well functioning patient population just prior to fracture: 89% of the patients lived in their own home, 70% did not require any home help, 78 could walk without aids, and 85% were able to perform basic activities of daily living.

The acute care of the fracture occurs early in the hospital course and the remainder of the hospital stay typically involves simple rehabilitation. Ideally, the patient could be discharged to home with services or to a geriatric-rehabilitation center within a week after the fracture. Although these patients might not require acute hospital care, the majority will require some form of assistance. This can be provided cost-effectively by several community rehabilitation options. One group in England has established a system by which appropriate patients are discharged early with flexible support services ranging from hospital level nursing initially to an intensive home help service. With this outpatient system the English group decreased their length of stay to 9 days [16]. However, many elderly hip fracture patients have coexisting medical problems requiring prolonged post-operative hospital stays. The oldest patients are the ones with the longest length of stay [4,5,17]. To help reduce the costs of hip fracture treatment the hospital must implement a system by which hip fracture patients are identified with regards to age, coexisting medical problems, and pre-fracture function. The further use of this registry, in the United States and abroad, will contribute to the understanding of hip fracture treatment and functional outcomes.

References

1. Bannister GC, Gibson AGF, Ackroyd CE, Newman JH. (1990) The fixation and prognosis of trochanteric fractures: A randomized prospective controlled trial. *Clin Orthop* 254:242-246
2. Berglund-Roden M, Swierstra WA, Wingstrand H, Thorgren KG. (1994) Prospective comparison of hip fracture treatment: 856 cases followed for four months in the Netherlands and Sweden. *Acta Orthop Scand* 65:287-294
3. Borgquist L, Lidelow G, Thorgren KG. (1991) Costs of hip fracture: rehabilitation of 180 patients in primary care. *Acta Orthop Scand* 62:39-48
4. Ceder L, Thorgren KG, Wallden B (1980) Prognostic indicators and early home rehabilitation in elderly patients with hip fractures. *Clin Orthop* 152:173-184
5. Cox MA, Bowie R, Horne G. (1993) Hip fractures: An increasing health care cost. *J Orthop Trauma* 7:52-57
6. Cummings SR, Rubin SM, Black D (1990) The future of hip fractures in the United States: numbers, costs, and potential effects of postmenopausal estrogen. *Clin Orthop* 252:163-166
7. Evans EM. (1949) The treatment of trochanteric fractures of the femur. *J Bone Joint Surg Br* 31:190-203
8. Garden RS (1961) Low-angle fixation in fractures of the femoral neck. *J Bone Joint Surg Br* 43:647-663
9. Jensen JS (1981) Hip fractures: epidemiology and mortality. *Acta Orthop Scand* 188 [Suppl 1]:11-16
10. Jensen JS, Tondevold E (1979) Mortality after hip fractures. *Acta Orthop Scand* 50:161-167
11. Kenzora JE, McCarty RE, Lowell JD, Sledge CB (1984) Hip fracture mortality: relation to age, treatment, preoperative illness, time of surgery, and complications. *Clin Orthop* 186:45-56
12. Koval KJ, Zuckerman JD (1994a) Hip fractures I: Overview and evaluation and treatment of femoral neck fractures. *J Am Acad Orthop Surg* 2:141-149
13. Koval KJ, Zuckerman JD (1994b) Hip fractures II: evaluation and treatment of intertrochanteric fractures. *J Am Acad Orthop Surg* 2:150-156
14. Larsson S, Friberg S, Hansson LI (1990) Trochanteric fractures: mobility, complications, and mortality in 607 cases treated with the sliding screw technique. *Clin Orthop* 260:232-241
15. Lu-Yao GL, Keller RB, Littenberg B, Wennberg JE. (1994) Outcomes after displaced fractures of the femoral neck: A meta-analysis of one hundred and six published reports. *J Bone Joint Surg Am* 76:15-25
16. Parker MJ, Pryor GA, Myles JW (1991) Early discharge after hip fracture: Prospective three year study of 645 patients. *Acta Orthop Scand* 62:563-566
17. Thorgren KG, Berglund-Roden M, Wingstrand H (1994) The Swedish multicenter hip fracture study: Influence of age. *Acta Orthop Scand* 65 [Suppl 260]:31-35