FACTORS AFFECTING SURVIVAL OF PATIENTS WITH HIP FRACTURES

H. O. M. KUOKKANEN[1], O. L. KORKALA[2]

The preoperative findings of 111 patients after 117 fractures of the proximal femur were recorded retrospectively. Data on survival, present type of residence and ambulatory status were analyzed. After age and sex, the presence of dementia, renal insufficiancy and cardiac failure seemed to be the most important factors affecting the outcome. A full preoperative evaluation of patients with a proximal femoral fracture is needed to identify those at risk. This evaluation may help in the selection of the operative procedure.

Keywords : fracture ; hip ; prognostic factors.
Mots-clés : fracture ; hanche ; facteurs prognostiques.

INTRODUCTION

There is increasing interest in identifying factors that could predict the survival and morbidity of patients who sustain a fracture of the proximal femur. The mortality rate of such patients remains high, but the age of the patient alone does not reliably predict the survival. Preoperative cerebral dysfunction has been identified as a significant influence on survival in several reports (1, 6, 8). Male sex, presence of congestive cardiac failure, poor mobility before the fracture and an intertrochanteric location of the fracture may also affect the prognosis negatively (3, 5, 6, 7, 8, 10). Conlan (2) discovered that if the total lymphocyte count is below normal, patients are at increased risk of dying after proximal femoral fractures. Tilvis (9) investigated prospectively all of the patients admitted to a geriatric ward and found that factors that predicted death during the following 24 months were age over 80 years, diastolic blood pressure below 70 mm Hg, atrial fibrillation, usage of digitalis, diabetes, renal insufficiency and hyperkalemia.

In the present study preoperative data from patients with a fracture of the proximal femur were collected retrospectively. The data was tested statistically with respect to the postoperative prognosis of the patients and to the ambulatory status and type of residence during the follow-up period.

PATIENTS AND METHODS

The case records of 111 nonselected patients with 117 proximal femoral fractures admitted to the Lahti City hospital between October 1984 and November 1988 were examined. The female/male ratio was 83/34. The mean age was 78 years (range 48-92 years). There were 16 undisplaced (Garden I-II) and 50 displaced (Garden III-IV) intracapsular fractures, 3 basicervical, 29 stable and 12 comminuted pertrochanteric and 7 subtrochanteric fractures. Sixty-one fractures were operated on by using osteosynthesis and 51 of the femoral neck fractures by hemiarthroplasty. Two patients with nondisplaced femoral neck fractures were treated by primary mobilization without surgery.

The preoperative values of blood hemoglobin and serum creatinine concentrations, blood pressure and weight of the patient were recorded. The presence of atrial fibrillation, diabetes, dementia, usage of digitalis and type of residence were analyzed.

[1] Department of Orthopaedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland.
[2] Department of Surgery, Lahti City Hospital, Helsinki, Finland.
Correspondence and reprints : H. Kuokkanen, Kaarnatie 1 F 58, 00410 Helsinki, Finland.

The survival of all patients was checked using the national population register of Finland, and a questionnaire about present ambulatory status and type of residence was sent to all living patients.

For the statistical analysis the cases were divided into two categories : a) those who had died less than 24 months postoperatively (n = 49), and b) those who had survived 24 months or more postoperatively (n = 68).

The statistical analysis was carried out using a logistic regression model. The dependent variable was given a value of 1 in group b) and a value of 0 in group a). It became quite obvious that there is a correlation between some variables. To avoid colinearity the variables of the type of residence and the presence of dementia were not included in the same models (rank r = 0.65) (figs. 1, 2). The SAS program package, both CATMOD and LOGIST procedures (the latter supplied by Dr. Frank Harrell), was used. Only statistically significant and plausible models were selected. An important criterion was the share of correct predictions of the model. It was also carefully confirmed that the sensitivity rate was high (or to the contrary, the rate when the model predicts 1 while 0 is true was minimized).

The continuous variables were separately tested using the t-test (table I) and the qualitative or classified variables using the chi-square test (table II). The variables were also tested against the present walking ability and type of residence of living patients.

RESULTS

Fifty-one patients were still alive at the end of the study. The average follow-up time for living patients was 40 months (range 24-96 months). Four patients died during the first postoperative month, 14 within 3 months, 25 within 6 months, 37 within 12 months, 46 within 18 months and 49 within 24 months postoperatively.

The most important factor predicting patient survival was age (table I). Dementia and residence in a geriatric ward at the time of injury also had significant negative effects on the outcome. The use of digitalis and the presence of renal insufficiency were significantly more common in patients who died early (table II). In the logistic regression analysis male sex also seemed to reduce the survival over 24 months.

Table I. — Testing of the continuous variables by t-test
Group I = patients who survived 24 months or were still living at the end of the study
Group II = patients who died in less than 24 months postoperatively
SD = standard deviation

	Group 1 mean (SD)	Group 2 mean (SD)	p
Age (years, men)	69.9 (8.4)	80.1 (4.6)	0.0001
Age (years, women)	77.5 (9.5)	82.5 (5.0)	0.0025
Weight (kg)	61.8 (12.2)	60.1 (12.6)	0.5169
B-hemoglobin (g/l)	130.4 (15.7)	127.7 (20.3)	0.4388

The weight of the patient, the hemoglobin concentration, the presence of diabetes and the type of fracture did not affect the prognosis.

Analysis of the data from living patients showed that older patients and those who use digitalis ended up in an institutional ward significantly more often than the others. Patients using digitalis were significantly more likely to need walking aids. One-fifth of the patients who lived at home at the time of the accident were transferred to an institutional ward during the follow-up. The number of survivors was, however, too small for further statistical conclusions.

DISCUSSION

Age and sex alone do not seem to be very good predictors of survival after proximal femoral fracture. Indeed, otherwise healthy 85-year-old patients are likely to survive 24 months or more after the operation, while patients with dementia and renal insufficiency at the age of 45 years do not have a better prognosis (fig. 1). Our results support the views of Miller (8), Ions (6) and Clayer and Bauze (1) that dementia is an important factor in reducing the life expectancy of patients with proximal femoral fractures.

Renal insufficiency was found to be significant prognostic factor by Tilvis (9) and Eiskjaer and Ostgard (4). This is supported by our study.

Diabetes and the type of the fracture did not affect the outcome in our series.

Unlike Tilvis (9) we found that patients with a low diastolic blood pressure did rather better

Table II. — Test of association between the resulting variable and various qualitative or classified variables by chi-square test

	Group 1 (number of cases)	Group 2 (number of cases)	X^2	df	p
Dementia			21.958	1	0.000
Yes	4	20			
No	64	28			
Type of residence			24.632	2	0.000
Home	56	23			
Home for the aged	11	10			
Hospital	1	16			
Creatinine more than 150 µmol/l			7.057	1	0.008
Yes	3	10			
No	64	38			
Digitalis			4.439	1	0.035
Yes	12	17			
No	56	32			
Atrial fibrillation			1.077	1	0.299
Yes	9	10			
No	59	39			
Sex			0.528	4	0.467
Male	18	16			
Female	50	33			
Diastolic RR less than 70 mmHg			0.430	1	0.512
Yes	17	10			
No	48	38			
Diabetes			0.000	1	0.983
Yes	11	8			
No	57	41			

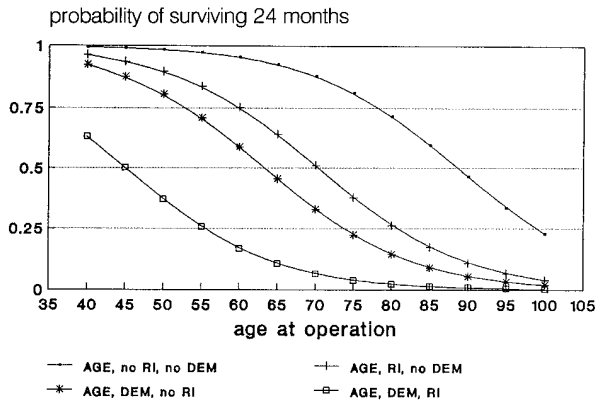

Fig. 1. — Prediction for survival according to the patient's age and illness (RI = renal insufficiency, DEM = dementia).

The estimates of parameters for the model (standard errors in parenthesis) :

constant : 9.486 (2.833), age : – 0.107 (0.035), renal insufficiency : – 1.955 (0.760), dementia : – 2.707 (0.707). n : 114, rho bar square : 0.290, -2L(o) : 155.2, -2L(p) : 110.1.

Share of correct predictions : 77.2%, sensitivity 87.9%, specificity = 62.5%.

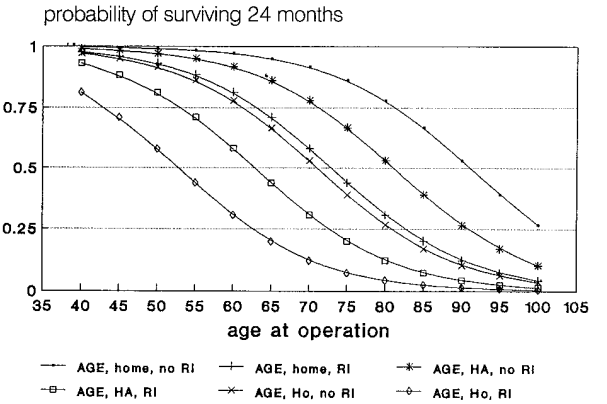

Fig. 2. — A prediction for survival according to the patient's age, illness and preinjury residence for women (RI = renal insufficiency, Ho = hospital, HA = home for the aged).

The estimates of the parameters for the model in fig. 2 (the standard error in parenthesis) :

constant : 11.536 (3.150), age : – 0.114 (0.039), sex (male) : – 1.042 (0.573), renal insufficiency : – 2.079 (0.778), residence : – 1.145 (0.350). n : 115, rho bar square : 0.279, -2L(o) : 156.9, -2L(p) : 113.1.

Share of correct predictions : 73.9%, sensitivity 83.3%, specificity : 61.2%.

than the others in this series. This difference was, however, not statistically significant.

It is suggested that patients with proximal femoral fractures should be evaluated preoperatively to estimate the risk of early death. Besides the age and sex, particular attention should be paid to the presence of dementia, renal insufficiency and cardiac failure. Further investigation is needed to create a practical useful scoring system for everyday use to quantify the risk. That would help in the selection between hemiarthroplasty and internal fixation for patients with dislocated femoral neck fractures. Such a scoring system might also be useful in identifying which patients would benefit from intensive postoperative rehabilitation.

CONCLUSION

In addition to age and sex, we have found that dementia, renal insufficiency and cardiac failure are also significant factors in predicting survival of patients with hip fractures.

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SAMENVATTING

H. O. M. KUOKKANEN en O. L. KORKALA. Bepalende faktoren voor de overleving na heupfraktuur.

De preoperatieve gegevens van 111 patiënten, met 117 frakturen van het proximaal uiteinde van het femur, werden restrospectief ontleed. De gegevens betreffende de overleving, de domiciliatie en de funktionele recuperatie, werden geanalyseerd. Na leeftijd en sex, zijn de volgende faktoren beslissend : eventuele dementie, nierinsufficiëntie en cardiale decompensatie. Een volledige preoperatieve evaluatie van de patiënten met een fraktuur van het proximaal uiteinde van het femur is onontbeerlijk om dit risico te evalueren. Deze evaluatie is dienstig bij de selectie van de patiënten en bij de keuze van de operatietechniek.

RÉSUMÉ

H. O. M. KUOKKANEN et O. L. KORKALA. Facteurs de survie chez les malades présentant une fracture de hanche.

Les auteurs ont analysé les données pré-opératoires de 111 patients, présentant 117 fractures de l'extrémité supérieure du fémur.

Les données concernant la survie, le lieu de résidence et le résultat fonctionnel sont passés en revue. Les plus importants facteurs qui influencent le résultat final sont, après l'âge et le sexe, un éventuel état démentiel, une insuffisance rénale et une insuffisance cardiaque. Une évaluation pré-opératoire complète des patients présentant une fracture de l'extrémité supérieure du fémur permet d'évaluer ce risque. Cette évaluation sera utile dans la sélection des cas chirurgicaux et dans le choix de la technique.