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ORIGINAL RESEARCH

Predictors of Long-Term Mortality in Older People With Hip Fracture

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Abstract

Objectives: To determine 1-year mortality and predisposing factors in older people who had surgery after a hip fracture.

Design: Prospective cohort study.

Setting: Public acute hospital, trauma service.

Participants: Patients (N=281) aged ≥65 years who were admitted to the hospital with a hip fracture from January 2009 to January 2010, and followed up for 1 year thereafter.

Interventions: Not applicable.

Main Outcome Measures: Cumulative survival probability up to 1 year from surgery was calculated by means of Kaplan-Meier charts, and Cox regression models were performed to analyze the factors associated with mortality. Data were collected from medical charts and by interviews. Health status was evaluated using the American Society of Anesthesiologists rating, prefracture functional level with the FIM, and cognitive status with the Pfeiffer score.

Results: The 1-year mortality for the 281 patients who were followed up was 21% (95% confidence interval [CI], 16.1%−25.9%). A non−weight-bearing status was associated with increased mortality in unadjusted analyses (hazard ratio [HR]=1.99; 95% CI, 1.16−3.43), but 5 other factors were identified when entered into the multiple Cox regression model: age (HR=1.05; 95% CI, 1−1.09), male sex (HR=2.92; 95% CI, 1.58−5.39), low health status (HR=2.8; 95% CI, 1.29−6.09), low prefracture function (HR=.98; 95% CI, .97−.99), and change of residence (HR=3.21; 95% CI, 1.43−7.17).

Conclusions: The overall 1-year mortality rate was 21%. Change of residence is the only potentially modifiable risk factor, independent of the following other traditional risk factors that were found: age, sex, health status, and prefracture functional level. Furthermore, 2 to 4 weeks of non−weight-bearing status, which is considered modifiable, is also associated with increased mortality rates in unadjusted analyses.

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Unless there are improvements in the prevention and treatment of hip fractures, their incidence is expected to rise as the world's population grows increasingly older.[1] Hip fractures are one of the most important public health burdens among the elderly because of their high incidence and outcomes such as a poor recovery of the functional level.[1-3] The main consequences of a hip fracture are an increased likelihood of morbidity, disability, and mortality.[4,5]

The increased risk of death after hip fracture has been amply shown in the literature,[6-8] with 1-year mortality ranging from 8.4% in a Swedish study[7] to 36% in a U.S. study.[9] Whether these differences between countries are due to patient demographics or to the diversity of treatment methods is not yet known.[10]

While many researchers have studied mortality after hip fracture, some studies have certain weaknesses such as a short

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follow-up covering mainly in-hospital mortality[2,3,11,12] up to just 30 days after hip fracture,[13] a retrospective design,[4,14] or the adjusted analysis of a limited number of predisposing factors[15] mainly related to comorbidities.

Furthermore, there is no consensus about the effect of certain factors on the increase of 1-year mortality in the literature.[4,16-19] The influence of some factors such as advanced age,[2-4,11,16,20,21] male sex,[3,8,10,21-23] the presence of concomitant illness,[2,4,11,12,24] poor health status,[16] poor prefracture functional status,[9,20] and dementia[4,9] on the increase of 1-year mortality has been extensively investigated. However, there are additional risk factors that need to be studied in greater depth, including the type of fracture,[22,25] place of residence,[16,26] and weight-bearing (WB) status after surgery.

The knowledge of these potentially modifiable risk factors among patients with hip fracture may help to identify those who would benefit from new treatment models that have demonstrated a capacity to reduce mortality rates for this frail patient group. The aims of this study were, therefore, to determine the 1-year mortality rate of older people with hip fracture and to evaluate the influence of WB status and change of residence on this 1-year mortality.

Methods

Participants

We performed a prospective cohort study of patients with an acute hip fracture admitted consecutively at a traumatology service in southern Spain (Department of Orthopedic Surgery and Traumatology, Neurotraumatologic Hospital of Jaén) between January 2009 and January 2010. The hospital covers a population of around 350,000 inhabitants. The patients included met the selection criteria of being ≥65 years, having surgery for an acute hip fracture, and agreeing to participate in the study and signing an informed consent form. For patients with cognitive impairment, the closest relative or caregiver signed the informed consent. The ethics committee of the hospital approved the study.

Although a total of 281 patients with hip fracture fulfilled the inclusion criteria, 6 died within 24 hours after surgery (sociodemographic or clinical data of these patients were not recorded), leaving 275 patients for final analysis. Figure 1 shows the flow chart of patients.

Measures and follow-up

Data were obtained from medical records and interviews with the patients and their relatives or caregivers. Clinical data regarding the surgery risk/health status before surgery, comorbidity, type of hip fracture (intracapsular [cervical] or extracapsular [inter- or subtrochanteric]), type of surgery (hemiarthroplasty, dynamic hip screw with plate or intramedullar hip screw), WB status within 2 to 4 weeks postsurgery (full WB as tolerated 48h after surgery vs non−weight-bearing [NWB], decided by the orthopedic surgeon), medical or surgical complications after surgery, time from admission to surgery, and length of hospital stay were taken from the medical record. Sociodemographic data recorded during the interview included weight and height (body mass index), cognitive status, prefracture functional level, and residential status after discharge, the latter coded as follows: (1) continue living on their own or with relatives; (2) continue living in a nursing home; and (3) change of residence after the hip fracture. A more detailed description of the methodology can be found in a previously published article by our research group.[27]

The first interview took place at the hospital after surgery, where patients were asked about their prefracture functional level, sociodemographic data, psychiatric symptoms, and cognitive status. The same interviewer conducted the last interview by phone 1 year after surgery.

In the case of patients who died during the follow-up period, the days to death from surgery date were obtained from the interview with the relatives and checked from the patient's medical records.

Cognitive status was assessed using the Pfeiffer Scale,[28] and it was categorized as light or no cognitive impairment (0−4) to severe cognitive impairment (5−10). The prefracture functional level was measured by the FIM.[29,30] It has 6 categories with a total of 18 items. Each item is scored from 1 to 7 based on the level of independence, where 1 represents total dependence and 7 indicates complete independence. The FIM score was dichotomized into an "independent" level (91−126, indicating scores of 6 or 7 for each item) and a need for some kind of personal "assistance" (18−90, representing scores between 1 and 5 for each item). The FIM has been well validated for patients during hip fracture rehabilitation.[29]

Surgery risk/health status was assessed using the American Society of Anesthesiologists rating,[31] which was categorized as high health status (1−2) and low health status (3−5). The Charlson Comorbidity Index[32] was used to assess comorbidity. The Goldberg Depression and Anxiety Scale[33] was used to assess psychiatric symptoms. Medical/surgical complications were categorized in 1 dichotomy variable, including any of the following complications: nosocomial infection, pressure ulcer, delirium, or resurgery.

Statistical analysis

Absolute and relative frequencies for categorical variables and mean with SD for quantitative variables were calculated. For nonnormally distributed data, median and percentiles 25 to 75 were used. To compare proportions of those alive and dead within 1 year, the chi-square test and percentiles 25 to 75 were used, as appropriate. Correspondingly, the Student *t* test was used for comparing normally distributed variables among the living and dead, while for nonnormal variables the Mann-Whitney test was performed.

We used Kaplan-Meier survival analysis to calculate the cumulative survival probability up to 1 year after surgery. The log-rank test was used to evaluate differences among Kaplan-Meier charts. Cox regression models (unadjusted and adjusted) were performed to analyze the factors associated with mortality. The selection of covariables was done using statistic and epidemiologic criteria. We used the information from previous studies and a directed acyclic graph to identify confusing factors, intermediate factors in the causal pathway, and collider factors.[34] The reference categories were: women, high health status (American Society of Anesthesiologists score, 1−2), allowed WB, and continue living with relatives or in own home. Age (years) and the prefracture functional level were entered as continuous variables. Adjusted hazard ratios (HRs) and 95% confidence intervals (CIs) were calculated.

List of abbreviations:

CI	**confidence interval**
HR	**hazard ratio**
NWB	**non−weight-bearing**
WB	**weight-bearing**