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Early surgery within 2 days for hip fracture is not reliable as healthcare quality indicator

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ABSTRACT

Purpose: To analyze prospectively the influence of the timing of surgery on morbidity and mortality, and to assess whether the early surgery within 2 days admission may be a reliably healthcare quality indicator.

Methods: Prospective observational study of 628 patients age 60 or older who had been co-managed between surgeons and internists. Based on the literature, many potential factors influencing outcomes were collected to control confounding regard to surgery delay, complications and mortality. Multivariate logistic regression and Cox regression models were used to assess effects on the delay and mortality, respectively.

Results: Mean Charlson index was 2.3, and 284 patients had at least 3 comorbidities. Mean timing of surgery was 3.6 days (range 0–20). 418 patients were fit for surgery, of which 180 underwent surgery within 2 days. Delay for surgery more than 2 days was significantly associated with ASA >2, Charlson >2 and anticoagulant therapy. Medical complications were not significantly associated with delayed surgery more than 2 days. Mortality rate was 0.9% in-hospital, 3.4 at 1 month, 7.0% at 3 months, and 13.6% at 12 months. There were no significant differences in in-hospital, 3-month or 1-year mortality between patients operated within 2 days and those operated at 3–4 days, but delayed more than 4 days was associated with higher 1-year mortality. Likewise, patients readmitted within 30 days had higher in-hospital mortality. Excluding unfit for surgery patients at admission, there was no significant difference in 3-month or 1-year mortality between patients operated within 2 days and those with delayed surgery.

Conclusions: Delaying surgery up to 4 days was not associated with higher morbidity or mortality rates. We recommend concentrating more on preoperative optimizing the condition of patient with sufficient medical treatment rather than being bound by a universal timing of surgery.

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Introduction

Hip fractures are an important medical and social problem because of the high incidence in elderly population. There is a high consensus that surgery is the treatment of choice for these patients to reduce postinjury mortality and provide effective functional results for the remaining years of life [1]. The prognostic factors reported in the literature are very varied [2], and the timing of surgery has been described as a main factor with influence on postoperative morbidity and mortality. Several studies and systematic reviews have reported that early surgery within 48 h after admission was associated with lower postoperative morbidity and mortality [1,3,4]. On this basis, current guidelines [5,6] recommend early surgery within 2 days after admission. Likewise, some hospitals and health administrators [7,8], including our country [9], have set the hip fracture surgery within 2 days as a reliable indicator of quality of healthcare. However, although hip fracture in elderly and prognostic factors have been widely studied, the suitable time to surgery is still a controversial topic, and the association between this time and postoperative complications or mortality appears to be unclear. This is probably because there are limited available quality evidences and the results are conflicting [1].

The most studies were retrospective and they did not take account those patients who were unfit for surgery at the time of admission and failed to adjust confounding factors such as

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coexisting comorbidities. Thus, these studies could be susceptible to selection bias and this could lead to an overestimating the risk of death associated with delayed surgery. There are few prospective studies [10–15] but they had different objectives and varied study time periods. On the other hand, recent studies [9,16] found that morbidity increased but the mortality rate did not when surgery was delayed more than 2 days. Likewise, other studies [2] reported that delay of surgery had no impact on mortality when this was adjusted in terms of other risk factors such as comorbidities. On the contrary, precipitous surgery may increase the risk of postoperative complications [11,13] because delaying surgery may be necessary to stabilize patients with significant comorbidities. Thus, our hypothesis was that delayed surgery may not be a result of poor healthcare quality but rather to optimize preoperatively clinical conditions of those patients with severe comorbidities.

The objectives of this study were to analyze prospectively the influence of the timing of surgery on morbidity and mortality at one year, and to assess whether the early surgery within 2 days after admission may be reliably used as an indicator of medical care quality.

Material and methods

A prospective observational study was designed to evaluate prognostic after hip fracture in elderly, which was approved by our institutional ethics committee and informed consent was required. All consecutive patients with hip fractures admitted at our hospital between January 2012 and December 2014 were potentially eligible. The only inclusion criterion was age 60 years or older. The exclusion criteria were concurrent major injuries or nonsurgical treatment (ASA-V, decision to palliative care, bed or wheelchair bound, or patients admitted with acute medical comorbidity that led to death before surgery could be performed). In patients who had sequential hip fracture within the study period the first fracture was excluded.

A standardized protocol for co-management of these patients between orthopaedic surgeons and a specific team of internists was used at our hospital from admission to discharge, as we had previously published [17]. At the admission, routine evaluation included hip and chest radiographs, electrocardiography, laboratory analysis, and assessment by surgeon and internist. When required, both preoperative stabilization and suitability of previous medical treatments were performed. Surgery was delayed when the patient required acute medical evaluation, treatment or optimization because of anticoagulation treatment. The surgery was not delayed by treatment with 100 mg acetylsalicylic acid. All patients were examined before surgery by an anaesthesiologist who assessed the surgical risk using the American Society of Anaesthesiologists score [18].

Surgical protocol

All surgeries were performed in an operating room with laminar flow, under spinal anaesthesia. The surgical procedures were based on fracture type conform to established protocol. Trochanteric fractures were treated with sliding hip screw or trochanteric nail depending on the fracture line, undisplaced cervical with screws, and displaced with hemiarthroplasty or total hip arthroplasty (if younger than 70, and adequate functional and mental preinjury status). Postoperative rehabilitation was carried out with assistance of a physiotherapist, and usually began within 24 h after surgery with mobilization out of bed to a chair and progression to ambulation with walker. All patients received antibiotic prophylaxis for 24 h (started 1 h prior to skin incision) and thromboembolic prophylaxis with low-molecular-weight heparin for 30 days.

Evaluations

After discharge, routine postoperative visits were at 1, 3, 6 and 12 months, unless death had occurred before. Routine hip radiographs were made in each visit. If the patient did not return for examination, telephone contact with patient or their families was performed.

Preinjury data were collected at admission, including physical function, mobility, cognitive status and information about concomitant comorbidities. Moreover, medical records were reviewed to collect information on comorbidities and previous treatments. Our centre is a district public hospital and its administration database is linked to all primary healthcare centres, remaining hospitals of our community, and the national mortality register. Data from these different sources could be combined using the unique personal identification number of each citizen, and it is possible to construct the complete medical history for each patient and to identify admission in other outside hospitals.

Based on the literature, many potential factors influencing outcomes were collected in order to control for confounding. These factors included gender, age, day of admission (for this study, weekend was Friday to Sunday), fracture type (trochanteric or cervical), prior residence and at discharge (own home or nursing home). Comorbidity at the time of admission was assessed by the Charlson index [19]. The American Society of Anaesthesiology (ASA) [18] score was also recorded. Mental status at the time of admission was measured by the Hodkinson's [20] abbreviated mental test 0–10 score, where 6 or less suggested dementia. Pre and postoperative physical function was measured by the Katz index [21] for 6 activities of daily living (ADL), where partial dependence was defined as the ability to do 4 or 5 activities without assistance, and total dependence as the ability to do 3 activities or fewer without assistance. Ability to walk before and after injury was classified as independent or with one cane, with walker, and wheelchair or bed. Perioperative factors included surgical procedure (internal fixation or hip prosthesis) and medical or surgical complications.

Time to surgery was defined as the difference between the admission date and operation date.

This time was treated in various ways, such as continuous variable, categorized into 3 groups (within 2 days, 3–4 days, and more than 4 days), and similar to the existing literature was also dichotomized (within 2 days was considered early surgery, and more than 2 days delayed surgery). Reasons for the surgical delay were classified as medical (e.g., waiting acute medical optimization, abnormal international normalized ratio – INR) or nonmedical (e.g., operating room, equipment or staff not available). Hospital readmissions for any reason and mortality data were also collected. In-hospital mortality was defined as death occurring during the index hospital stay for hip fracture.

Statistical analysis

We carried out all statistical analyses using IBM-SPSS software. Normality was tested using Kolmogorov–Smirnov test. For univariate analysis, Student's *t*, Mann–Whitney *U* or ANOVA tests were used for continuous variables, and chi-square or Mantel–Haenszel tests for categorical variables. Pearson's coefficient was used for correlation analysis between continuous variables. To identify factors associated with delay of surgery more than 2 days, a backward multivariate logistic regression model was used including all relevant independent variables in univariate analyses ($p < 0.1$). The Cox proportional hazards multiple regression models were used for adjusting covariates on the likelihood of mortality. In multivariate analysis, adjusted risks (OR: odds ratio, HR: hazard ratio) were presented with 95% confidence intervals (CI).

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