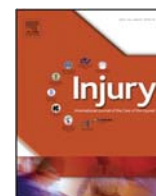




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Surgical delay as a risk factor for wound infection after a hip fracture

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KEY WORDS

Hip fracture
Complications
Mortality
Risk factors
Surgical delay
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Pneumonia
Urinary infection
Cardiac failure

ABSTRACT

Purpose: Analysis of significant risk factors for mortality and for medical and orthopaedic complications.
Patients and methods: Observational study of a prospective consecutive cohort of 697 patients diagnosed of hip fracture from December 2012 to December 2014. Average age was 85 ± 9 years and 520 were female (75%). Intracapsular fractures (308, 44%) were treated non-operatively, (19 patients), with cannulated screws (58) or with hip arthroplasty (228 bipolar, 3 total hip arthroplasty). Extracapsular fractures (389, 56%) were reduced and fixed with 375 trochanteric nails and 14 sliding-hip-screw-plates. Patients were controlled clinically and radiographically in outpatient clinic after 1, 3, 6 and 12 months. Bivariate analysis (Pearson, Mann-Whitney, Wilcoxon) was applied to study statistically significant relations, and Odds Ratio were calculated.
Results: Surgical delay reached 2.1 ± 2.2 days, 1.7 ± 1.9 in medically stable patients. Main reason for delay was anticoagulant/anti-platelet therapy. Immediate weight-bearing was begun for 72% of patients. Average time in-hospital was 12 ± 8 days and 63% returned to previous environment. Lost-to-follow-up reached 4% after 1 month and 8% after 6 months. After 1 year, 6% of previously-walking patients were unable to walk. Mortality reached 4% while in-hospital and 14% after 1 year, with older age as only significant risk factor ($p = 0.004$), OR = 1.9. Wound infection developed in 2.3% of the series, and surgical delay longer than 24 hours was a significant risk factor ($p = 0.023$), with an OR = 3.48 (1.1–10.8). Fixation failed in 7.9% of cannulated screws and 1.9% of trochanteric nails (1.1% cut-out, 0.8% nail fracture), while 2.7% of arthroplasty patients suffered a prosthesis dislocation and 1.3% a periprosthetic fracture. Pyelonephritis appeared in 6.7%, pneumonia in 6.3% and cardiac failure in 2.2% of patients; significant risk factors were previous comorbidity for pneumonia ($p = 0.007$) (OR = 2.7) and cardiac failure ($p = 0.007$) (OR = 9.7), as well as older age ($p = 0.006$) (OR = 2.2) for pneumonia.
Conclusions: Surgical delay longer than 24 hours has been an important risk factor for wound infection, a finding not previously described in literature. Older age is a significant risk factor for mortality and pneumonia, and previous comorbidity for cardiac failure and pneumonia.

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Introduction

As hip fracture is most frequent in old and/or frail and debilitated people, mortality and complications are very high [1–4], while functional results frequently are poor [5,6]. Many papers describe the high mortality [2,3,7,8], medical or general complications [1–3,5,7–10], and orthopaedic or surgical complications [5].

Most populations for these studies are extracted from national or regional databases, so the total number of patients is very high [4,11,12]. The problem with multicenter and national/regional studies [2–4,8,11–17] is that the reporting of complications may vary widely

according to the different locations [9], so some data may be under or over reported.

A large number of papers [2–4,7,8,11,14,16–22] explore the risk factors for mortality after a hip fracture (age, gender, surgical delay, previous comorbidity, anti-platelet therapy, dialysis, cardiac disease), many of them contributing contradictory results. An impressively higher number of publications [1–4,7,8,10–12,14,15,16–26] try to identify risk factors for medical complications (age, gender, ASA status, previous comorbidity, cognitive impairment, frailty, diabetes, stroke, nicotine abuse, bleeding, depression, surgical delay, analytical abnormalities, anti-platelet therapy, dialysis, obesity, cardiac disease, dehydration, hyperthyroidism). On the contrary, risk factors for orthopaedic or surgical complications are not frequently described [9,13], as is the case for poor functional results (complications, overweight, surgical delay) [5,6,14,27]. It is very important to know which risk factors are amenable to control or minimize [4,13,16] so as to improve final results in hip fracture management.

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Purpose

It has been the purpose of this paper to analyze statistically the significant risk factors for mortality and medical and orthopaedic complications in a single-center consecutive cohort of hip fracture patients.

Ethics

This study and all the work necessary to develop it comply with the principles laid down in the Declaration of Helsinki; Recommendations guiding physicians in biomedical research involving human subjects. Adopted by the 18th World Medical Assembly, Helsinki, Finland, June 1964, amended by the 29th World Medical Assembly, Tokyo, Japan, October 1975, the 35th World Medical Assembly, Venice, Italy, October 1983, and the 41st World Medical Assembly, Hong Kong, September 1989. This is an observational study of everyday clinical practice; according to national laws, approval by an Ethical Committee is not needed explicitly when informed consent is obtained for all patients and confidentiality is maintained along all the study. Previous to surgical treatment, oral and written informed consent was obtained from all patients (or from their families in case of cognitive impairment). Patients (or their families) also gave informed consent to include data in the database for the present study.

Patients and methods

Design

Observational study of a prospective consecutive cohort of all patients diagnosed of hip fracture.

Inclusion criteria

- Hip fracture patients
- Diagnosed in the Emergency Department of a University General Hospital
- Diagnosed from December 12th, 2012, until December 30th, 2014
- Patients were included in "Multiple comorbidity" subgroup when they were previously diagnosed of 3 or more pathologic conditions.

Surgical treatment

Previous to surgical treatment, oral and written informed consent was obtained from all patients. In those cases of cognitive impairment we obtained informed consent from their families. Most frequent reason for preoperative delay was the use of anticoagulants (acenocumarol) or anti-platelet medication (both were retired and substituted by enoxaparin with different dosages according to patient comorbidity). According to protocols in use along the years studied, clopidogrel should be retired 5 days before surgery, aspirin 300 mg for 3 days before surgery, INR should be lower than 1.3 in acenocumarol patients, and patients receiving aspirin 100 or 150 mg could be operated immediately. Among the intracapsular fracture patients, 58 patients were treated by closed reduction and fixation with cannulated screws (Smith-Nephew, UK), 3 were treated with a total hip arthroplasty (Furlong-HAP, JRI, London, UK) while 228 were implanted with a JRI Furlong (JRI, London, UK) bipolar cemented hemiarthroplasty; 19 patients were treated conservatively without surgery. The extracapsular fractures were reduced and fixed with a trochanteric nail (Affixus, Biomet Trauma, Warsaw, Indiana, USA) in 375 cases and with a sliding-hip screw-plate (HipLOC, Biomet, South Wales, UK) in 14 patients.

Postoperative care

All patients were controlled daily while in-hospital by the surgeon and by a specialist in Internal Medicine specially dedicated to the Traumatology ward. All of them received pre and postoperative DVT prophylaxis until 6 weeks after fracture/surgery according to protocols recommended by the national orthopaedic society (enoxaparin 40 mg or bemiparine 35 mg, subcutaneous, once a day unless other treatment were needed because of comorbidity). Antibiotic prophylaxis was administered to all operated patients (cefazolin 2 g intravenously preoperatively and 3 postoperative doses every 8 h). Suction drains were used for hemiarthroplasty surgery and retired 24 hours after surgery. Pre or intraoperative urinary catheter was not used routinely; it was used postoperatively only in those cases needed because of postoperative urinary retention. Patients remained in bed for 24 hours after surgery, and then were seated. Partial weight bearing with the aid of walker/crutches was authorized on an individual basis according to the criteria of each responsible surgeon (taking into consideration the anatomy of the fracture, the stability obtained in the surgery, and the immediate postoperative radiographic control). Walking rehabilitation was begun in authorized cases 48 hours after surgery, while the other patients began on the 4th postoperative week. Postoperative medical and orthopaedic/surgical complications were controlled while in-hospital and registered prospectively for this study.

Follow-up

Patients were controlled clinically and radiographically in Hospital outpatient clinic after 1, 3, 6 and 12 months post-fracture. When patients did not come to these reviews their clinical evolution was followed by means of the regional electronic net interconnecting all regional hospitals (27 public hospitals attending a population of 7,000,000 habitants) and General Physician offices. This secondary procedure of follow-up contained enough information about if the patient was alive, if he/she was being followed in other center by the same or other process, or was too ill to come to our outpatient clinic. All medical and orthopaedic/surgical complications that appeared while patient was out-hospital were registered prospectively for this study.

Statistical analysis

Descriptive statistics: Central (mean, median, mode) and dispersion measures were used for quantitative variables, while central measures were applied for qualitative variables.

Statistical analysis: Bivariate analysis (Pearson, Mann-Whitney, Wilcoxon) were applied to study the relation between apparently independent variables (age, previous multiple comorbidity, surgical delay) with controlled results (medical complications, orthopaedic complications). Level of significance was established in 0.05% ($p = 0.05$)

Odds ratio (OR) were additionally calculated in those cases with statistically significant relation, establishing confidence interval in 95% (95% CI).

Results

Epidemiology

The cohort was formed by 697 patients, that is, an approximate prevalence of 121 hip fractures per year and 1000 inhabitants. Average age was 84.7 ± 8.9 (26–104) years, and 520 were female (74.6%); this represents a 3:1 proportion of female:male patients. An intracapsular fracture was present in 308 (44.2%) and an extracapsular one in 389 (55.8%).

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