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Delay to surgery does not affect survival following osteoporotic femoral fractures

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ABSTRACT

Aims: Fragility femoral fractures occur in a similar group of patients to hip fractures but they are not routinely managed along standardised guidelines. This study looked specifically at whether delay to surgery has an impact on mortality and morbidity.
Patients and methods: An international, multi-centre retrospective review was carried including all patients over 60 years with fragility femoral fractures, including most periprosthetic fractures, between December 2008–2014.
Results: 243 patients met the inclusion criteria with mean follow-up 25 months. 197 (81%) were female with mean age 81 years. Median time to surgery was 2 days; 39% were operated on <24 h, 23% 24–48 h, and 37% at >48 h. 3- and 12-month mortality were 14% (95% CI: 9–18%) and 26% (20–31%) respectively. On Kaplan-Meier plotting, relationships were apparent between survival and sex, and ASA grade, but not delay to surgery or fracture type.
Conclusion: Fragility femoral fractures have equivalent mortality to hip fractures but we found no link between delay to surgery and mortality. We believe it is safe to delay surgery, within reason, whilst their acute and chronic medical problems are optimised. We believe this information will help develop guidelines similar to hip fracture pathways.

Introduction

Fragility fractures are a major health problem with global numbers of hip fractures being reported as 1.3 million in 1990 and projected to reach 21 million by 2050 [1]. In general, femoral fractures occur in a bimodal distribution—young patients with high-energy fractures or elderly patients with low-energy injuries [2–4] with 85% of these fractures occurring in patients over 50 years of age. Fragility femoral fractures are approximately ten times less common than hip fractures [3] but their incidence remains likely to increase at a similar rate to NOF fractures due to the ageing population. This will present a significant burden on health care provision in the future.

Given that hip fractures are the commonest cause of injury related death, it is unsurprising that so many guidelines for the management of these fractures exist [5–7]. These guidelines, and the Best Practice Tariff, have created a standardised approach to the management of these fractures which has reduced 30-day mortality to 8.2% [7]. One of the key recommendations is that hip fracture patients should be operated on within 36 h from diagnosis to improve the clinical outcome and minimise mortality [5,8].

Non-NOF femoral fractures femoral fractures in the elderly are also recognized as a difficult problem [2,9,10] that have a high twelve-month mortality [9,11,12]. Like hip-fracture patients they often have significant medical comorbidities that do influence the ultimate success and functional outcome achieved [13] but they are currently not managed in this standardised way according to national guidelines. There has been a call for further research into these fractures in order to create guidelines with the aim of improving outcomes [14].

The aim of this study is to determine the mortality and morbidity of non-NOF femoral fractures in patients over 60 years and to assess whether delay to surgery has an impact on this. This study was classified as a clinical audit as the aim was to look at outcomes of routine care and therefore was not subject to research

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ethics committee approval. However, local audit committee approval was provided by all trusts.

Methodology

This was an international multi-centre retrospective cohort study conducted between December 2008 and December 2014. Waikato Hospital, New Zealand and The Royal Sussex County Hospital (RSCH), UK are busy level 1 trauma centres, and Worthing Hospital, UK is a district general hospital.

Inclusion criteria were: age over 60-years and admission with a low-energy femoral fracture, excluding NOF and subtrochanteric fractures. Exclusion criteria were pathological fracture, high-energy mechanism and periprosthetic fracture with loose components requiring revision arthroplasty. The rationale for this is that these patients require subspecialty surgeons to perform their operations and in most centres the personnel is not available on a daily basis. However, periprosthetic fractures with stable implants, suitable for open reduction and internal fixation, are often managed by general orthopaedic surgeons and therefore were included in this group. There is a growing burden of periprosthetic injuries and we felt it would be useful to include this group in the analysis [15].

Plain anteroposterior and lateral radiographs were assessed by the lead author and classified according to either the AO-OTA system [16] or the Vancouver classification, for periprosthetic fractures [17]. Chart review was also conducted and information collected on a standardised spreadsheet. Medical and surgical complications were also recorded.

Statistical analysis was performed in R version 3.2.2 (R Core Team, 2015) (R Core Team, 2015). Descriptive analyses were performed using quantiles, arithmetic means and medians for continuous data, and absolute and proportional frequencies for categorical data.

Mortality at 3 and 12 months was calculated with 95% confidence intervals. Potential contributing factors to mortality were evaluated firstly with Kaplan-Meier curves and the log-rank test for categorical independent variables. Multivariate analysis using Cox Proportional Hazards regression was performed to identify significant contributions simultaneously, with model optimisation using a backwards selection on AIC procedure.

Complication rates were described using absolute frequencies and incidence. Relationships between rates of specific complications and potentially-influencing factors (such as age, ASA, fracture type, delay to surgery and surgical technique) were analysed using Pearson's Chi-squared tests (with continuity correction where required), student's *t*-tests or Wilcoxan rank-sum tests according to determination of normality using the Shapiro-Wilk test.

A 0.05 level of significance was used throughout.

Results

Patient demographics

Data from 243 patients admitted between December 2008 and October 2014 were included in the study. 13 patients had incomplete radiographs and were excluded from analysis, except for survival. 197 (81%) were female with a mean age of 81 years (range 60–103 years). Median length of stay was 17 days (range 2–155 days); median time to surgery was 2 days; 39% of patients were operated on within 24 h, 23% between 24 and 48 h, and 37% at >48 h [Table 1]. 40 (17%) patients had diaphyseal (AO 32-A/B/C) fractures; 80 (35%) had distal femoral (AO 33-A/B/C) fractures; 38 (16.5%) had periprosthetic THR fractures; and 72 (31.5%) had periprosthetic TKR fractures [Table 6].

Table 1
Demographics & descriptive statistics.

		n (%)/mean (SD)
Hospital	Worthing	90 (37%)
	Waikato	52 (21%)
	Royal Sussex County	101 (42%)
Age (years)		82.2 (9.1)
Female sex		196 (81%)
ASA	1	3 (1.2%)
	2	56 (23%)
	3	130 (53.5%)
	4	32 (13.2%)
	5	1 (0.4%)
Time to surgery (hours)	<24	95 (39%)
	24–48	57 (23%)
	>48	91 (37%)
Length of stay (days)		25.1 (25)

Mortality & survival analysis

Mean follow-up time was 25 months during which 102 deaths were recorded. Overall 3- and 12-month mortality were 14% (95% CI: 9–18%) and 26% (20–31%) respectively [Fig. 1]. On Kaplan-Meier plotting, relationships were apparent between survival and sex, hospital and ASA grade, but not delay to surgery or fracture site [Fig. 2]. The relationship between survival and hospital and ASA grade achieved statistical significance on log-rank testing ($p = 0.017$ and $p < 0.001$ respectively). The optimised Cox Proportional Hazards regression model retained sex, age, ASA grade and length of stay, the latter of which did not achieve statistical significance. Odds ratios for the retained variables are shown in Table 2.

Complications

Surgical complications data were retrieved from all patients, while complete medical complications data were retrieved from 142 patients attending the three hospitals. Medical and surgical complications occurred in 39% (95% CI: 31–47%) and 39.9% (31.9–48.0%) of patients respectively [Table 3]/[Fig. 1].

Although Kaplan-Meier plotting was suggestive of relationships between survival and LRTI, UTI and delirium [Fig. 4], only LRTI

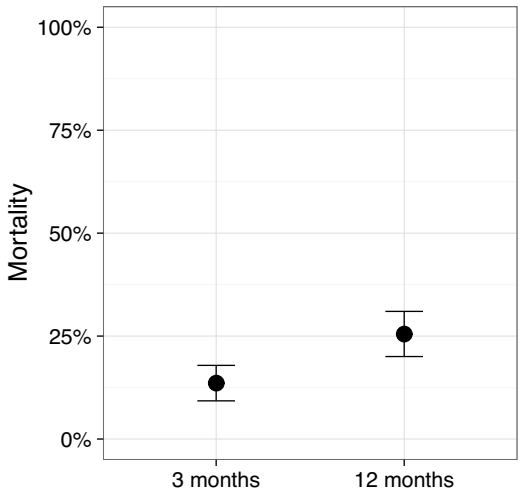

Fig. 1. Mortality.