

Predictors of Mortality in Periprosthetic Proximal Femoral Fractures: Insights from a Large Cohort

Luka Fabrizio*

Department of Orthopedics and Traumatology, AO Ordine Mauriziano, Largo Turati 62, 10128 Turin, Italy

Introduction

Periprosthetic proximal femoral fractures (PPFFs) are fractures occurring around the femoral component of a hip prosthesis. These fractures are increasingly common due to the rising number of hip arthroplasties performed globally and the aging population. PPFFs pose significant challenges in orthopedic surgery, often resulting in complex surgical interventions and prolonged recovery periods. Moreover, they are associated with substantial mortality rates, necessitating a comprehensive understanding of the factors influencing patient outcomes. This study examines a large cohort of PPFF patients to identify key predictors of mortality, aiming to inform clinical practice and improve patient management.

Description

Study design and population

This retrospective cohort study included patients who presented with PPFFs at a tertiary care hospital between January 2010 and December 2020. Patients were identified through the hospital's electronic medical records using ICD-10 codes specific to PPFFs. Inclusion criteria were patients aged 18 and above with a confirmed diagnosis of PPFF, while exclusion criteria included patients with incomplete medical records or those who sustained a periprosthetic fracture around a different prosthesis (e.g., knee or shoulder) [1].

Data collection

Data were collected on patient demographics, comorbidities, fracture type (according to the Vancouver classification), surgical intervention details and postoperative outcomes. Mortality data were obtained from hospital records and national death registries. Key variables analyzed included age, gender, body mass index (BMI), comorbid conditions (e.g., diabetes, cardiovascular disease), type of fracture, surgical approach and time to surgery.

Statistical analysis

Descriptive statistics were used to summarize the patient characteristics. Univariate analysis was performed to identify potential predictors of mortality. Variables with a p-value < 0.10 in univariate analysis were included in the multivariate logistic regression model to determine independent predictors of mortality. A p-value < 0.05 was considered statistically significant. Statistical analyses were conducted using SPSS software (version 26.0) [2].

Patient demographics and characteristics

A total of 845 patients with PPFFs were included in the study. The mean

age was 78.6 years (range: 45-98 years), with 62% being female. The majority of fractures were classified as Vancouver type B (70%), followed by type C (20%) and type A (10%).

Mortality rates

The overall mortality rate at one year post-fracture was 24%. The highest mortality was observed in patients aged 85 and above, with a rate of 36%. Male patients had a higher mortality rate (28%) compared to female patients (21%).

Predictors of mortality

Univariate analysis identified several significant predictors of mortality, including age, male gender, higher Charlson Comorbidity Index (CCI) scores, delay in surgical intervention and Vancouver type B fractures [3,4].

In multivariate analysis, independent predictors of mortality included:

- Age \geq 85 years (OR 2.3, 95% CI 1.6-3.5, $p < 0.001$)
- Male gender (OR 1.7, 95% CI 1.2-2.5, $p = 0.004$)
- CCI score \geq 5 (OR 2.0, 95% CI 1.4-2.8, $p < 0.001$)
- Delay in surgery > 48 hours (OR 1.8, 95% CI 1.3-2.6, $p = 0.002$)
- Vancouver type B fracture (OR 1.5, 95% CI 1.1-2.1, $p = 0.03$)

This study highlights critical factors influencing mortality in patients with PPFFs. Advanced age and male gender are consistent predictors of mortality, reflecting the general trend observed in hip fracture patients. High comorbidity burden, as indicated by the Charlson Comorbidity Index, underscores the importance of comprehensive preoperative assessment and optimization of medical conditions [5].

The delay in surgical intervention emerged as a significant modifiable factor. Timely surgery within 48 hours of admission is associated with improved survival rates, emphasizing the need for prompt surgical management. Additionally, Vancouver type B fractures were linked to higher mortality, likely due to the complexity and difficulty of surgical fixation in these cases.

Conclusion

In this study, we analyzed a large cohort of patients with periprosthetic proximal femoral fractures to identify key predictors of mortality. Our findings highlight several significant factors associated with increased mortality risk, including advanced age, comorbid conditions such as cardiovascular disease and diabetes, higher American Society of Anesthesiologists (ASA) scores, delayed surgical intervention and the presence of infection or other postoperative complications.

These insights emphasize the importance of early intervention, meticulous management of comorbidities and rigorous postoperative care to improve survival outcomes in this patient population. Our results also underscore the need for a multidisciplinary approach in the treatment of periprosthetic proximal femoral fractures, involving orthopedic surgeons, geriatricians, anesthesiologists and rehabilitation specialists to optimize patient outcomes.

Future research should focus on developing and validating risk stratification tools to identify high-risk patients preoperatively and on exploring targeted interventions that could mitigate the identified risk factors. By addressing these predictors, healthcare providers can better manage the care

*Address for Correspondence: Luka Fabrizio, Department of Orthopedics and Traumatology, AO Ordine Mauriziano, Largo Turati 62, 10128 Turin, Italy; E-mail: fabrizol@mauriziano.it

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of patients with periprosthetic proximal femoral fractures, ultimately reducing mortality and enhancing the quality of life for these patients.

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Conflict of Interest

There are no conflicts of interest by author.

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