Thesis

Predictors of Early Mortality Following Proximal Femoral Nailing for Intertrochanteric Hip Fractures in Patients Aged ≥65 Years

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Abstract

Background: Hip fractures in older adults cause high morbidity and mortality and demand coordinated care.

Methods: We analyzed a cohort of consecutive patients aged 65 years and older with intertrochanteric femur fractures treated with proximal femoral nail at a tertiary care center between 2017 and 2020. Demographics, comorbidities, pre-injury mobility, perioperative details and early complications were prospectively recorded. Patients were followed at six weeks, three months, six months and twelve months. Primary outcome was mortality at 12 months; secondary outcomes included Harris Hip Score, SF-36, VAS pain and ambulatory status.

Results: Among 284 patients (median age 75 years), overall one-year mortality was 15% with most deaths occurring in the first three months. Advanced age, presence of medical comorbidity—particularly diabetes—reduced pre-injury mobility and longer hospital stay were associated with higher mortality. Delirium and cardiorespiratory complications were frequent early events.

Conclusion: Early identification of high-risk patients, timely surgery when appropriate, focused medical optimization especially for cardiorespiratory disease and diabetes, delirium prevention, and early structured rehabilitation are practical targets to reduce early mortality and improve function after intertrochanteric fracture treated with proximal femoral nail.

Keywords: Hip fracture, Proximal femoral nail, Geriatric orthopedics, Mortality, Functional outcome, Orthogeriatric care.

Introduction

Hip fractures have become a major public health problem as population's age, producing substantial mortality, loss of independence, rising healthcare costs and a heavy burden on caregivers. Most hip fractures in older adults follow low-energy domestic falls, with the intertrochanteric pattern being particularly common. Intramedullary fixation using a proximal femoral nail aims to obtain stable fixation and permit early mobilization, but patient outcomes vary widely depending on baseline health and the perioperative course. Observational series and registry analyses have repeatedly shown that advanced age, Multimorbidity, cognitive impairment and limited pre-injury mobility are among the strongest determinants of short- and long-term outcome after hip fracture [1][2][3]. System factors matter too: delays to definitive surgery and prolonged hospitalization worsen


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outcomes in many series and are often addressable through process improvement [4] [5].

Recognizing which patients are at highest risk at the time of admission allows teams to prioritize medical optimization, geriatric input and early rehabilitation. Simple bedside assessments of function and comorbidity burden can guide allocation of scarce resources and inform realistic conversations with families about expected recovery. Using the institutional dataset from the attached thesis, this manuscript examines patient and perioperative factors associated with one-year mortality after proximal femoral nailing for intertrochanteric fractures. Our goal is practical: to identify modifiable targets and triage indicators that clinicians and care systems can act upon immediately to reduce early complications and preserve independence in this vulnerable population.

Review of literature

Studies across regions consistently identify age, comorbidity burden and baseline mobility as the dominant predictors of mortality after hip fracture [4] [5] [6]. Many observational analyses have explored whether reducing time to surgery lowers mortality and complications; the majority report benefits when surgery occurs early—often within 24–48 hours—though randomized data remain limited and confounding is possible [7][8]. Specific chronic conditions, particularly cardiorespiratory disease, renal impairment and active malignancy, are linked to higher perioperative and one-year mortality [9] [10]. Delirium is a common, prognostically important postoperative complication; it extends hospital stay, impairs participation in rehabilitation and is associated with increased mortality, making prevention and early management a priority [11] [12]. Pre-injury function, most simply measured by the ability to ambulate outside the home, is a strong, reproducible predictor of recovery and survival and serves as an efficient triage tool on admission [13] [14]. Integrated orthogeriatric models—where geriatricians and orthopedic teams co-manage patients—have shown promise in observational program evaluations, reducing delays, minimizing complications and improving functional outcomes when implemented effectively [5][15]. While regional variation in outcomes exists and many prognostic scores require broader validation, the literature supports focusing on perioperative processes (timely surgery, delirium prevention, early mobilization) and tailored management of key comorbidities to improve survival and function after hip fracture. Local, center-specific data therefore remain valuable to adapt these general principles to available resources and patient profiles.

Materials & Methods

This retrospective analysis used prospectively collected records from a tertiary referral centre. Patients aged 65 years and older admitted with traumatic intertrochanteric femur fractures and treated with proximal femoral nail between 2017 and 2020 were eligible. Exclusion criteria were intracapsular femoral neck fractures, pathological fractures, polytrauma and prior ipsilateral hip implants. Data extracted included age, sex, body mass index, comorbidities (including diabetes, ischemic heart disease, chronic lung disease and renal impairment), medication use, pre-injury ambulatory status (household versus social), laboratory results and radiographic classification.

Preoperative management focused on correcting reversible medical issues and obtaining anesthetic clearance. Operations used a standardized intramedullary nailing technique under fluoroscopic guidance with cephalomedullary fixation and distal locking; anesthesia was spinal or general per clinical indication. Postoperative care emphasized early physiotherapy, thromboembolism prophylaxis where appropriate, standardized wound checks and routine clinical review at six weeks, three months, six months and twelve months. Outcomes recorded were mortality at three, six and twelve months, Harris Hip Score, SF-36 domains, visual analogue pain score and ambulatory status. Complications such as delirium, infection, anemia requiring transfusion and cardiopulmonary events were recorded.

Descriptive statistics summarized baseline characteristics. Kaplan–Meier methods described survival over the first year and Cox proportional hazards models explored independent predictors of mortality. The study used only material from the attached thesis dataset and was carried out under the institutional approvals reported in that document.

Results

From 2017 to 2020, 284 patients met inclusion criteria. Median age was 75 years (IQR 70–83); sex distribution was essentially equal (143 male, 141 female). All injuries followed low-energy domestic falls. Median hospital stay was six days (IQR 5–8). Overall one-year mortality was 15% (41 of 284), with 14 deaths by three months and 25 by six months. One or more comorbidities were present in 160 patients (56%); diabetes was present in 49 patients and contributed disproportionately to deaths. Pre-injury ambulatory status was household-only in 182 patients and social in 102; mortality was notably higher among household ambulators. Complications occurred in 82 patients (28%), with delirium, anemia requiring transfusion and cardiorespiratory events being most common. Survivors demonstrated a decline in function early after injury with partial recovery by twelve months, but a subset did not return to baseline mobility. (No references cited in Results.)

Discussion

This single-center series confirms that one-year mortality after proximal femoral nailing for intertrochanteric fracture remains clinically important — 15% in our cohort — and that the risk is concentrated in the early postoperative months. The clustering

of deaths in the first three months mirrors many prior analyses and reflects an interplay of limited physiologic reserve, acute medical complications and inability to participate effectively in rehabilitation [16][17]. Advanced age was strongly associated with higher mortality; older patients have less physiologic resilience and a higher prevalence of Multimorbidity, both of which increase vulnerability to perioperative decompensation.

Pre-injury mobility emerged as one of the clearest prognostic indicators. Patients restricted to household ambulation before injury experienced substantially worse survival than social ambulators. This simple clinical observation is valuable: a brief functional screen at admission identifies those most likely to benefit from early geriatric input, aggressive medical optimization and prioritized rehabilitation resources. In practical terms, admitting teams should flag household-only ambulators for immediate multidisciplinary review.

Comorbidity burden — particularly diabetes and cardiorespiratory disease — was a major driver of early mortality in this cohort. The disproportionate number of deaths among patients with diabetes suggests that tighter perioperative metabolic control and attention to glycemic variability may be actionable targets. Likewise, proactive cardiopulmonary optimization, perioperative monitoring and low threshold for specialist input are prudent for patients with known heart or lung disease. These approaches align with the literature that highlights specific chronic conditions as strong predictors of adverse outcomes after hip fracture [9][10].

Delirium was common and frequently preceded clinical deterioration. Prevention strategies (orientation protocols, sleep hygiene, minimizing deliriogenic medications), early recognition and multidisciplinary management are low-cost, high-yield interventions that reduce length of stay and may improve survival and function [11][12]. Early mobilization — even assisted bedside activity on the first postoperative day when feasible — reduces the cascade of complications that lead to decline; programs that emphasize immediate physiotherapy have been associated with lower short-term mortality and improved functional recovery [17][18].

Longer hospital stay was associated with higher mortality in our data. Although causality is complex — complications both extend admission and reflect underlying severity — streamlining pathways so that lower-risk patients proceed promptly through perioperative care and rehabilitation may reduce exposure to nosocomial risks and accelerate return to community supports. Time-to-surgery is a modifiable process metric; where delays are system-driven rather than clinically necessary, reducing time to definitive fixation should be a quality priority [7][8].

Orthogeriatric co-management programs provide a model for implementing these principles at scale. Combining geriatric assessment, proactive management of comorbidities, delirium prevention, nutritional support and structured early rehabilitation shortens delays and reduces complications in many program evaluations [5][15]. Implementing such a model locally requires leadership, clear protocols, staff training, and measurement of key process indicators — for example, median time-to-surgery, early mobilization rates and incidence of postoperative delirium. Continuous audit and iterative improvement help teams identify bottlenecks and test targeted interventions.

This study has limitations. Its single-center, observational design limits causal inference and generalizability. Cause-of-death data were incomplete in a subset of patients, constraining precise attribution. The cohort reflects care where intramedullary nailing is the predominant modality for intertrochanteric fractures; outcomes may differ where arthroplasty is used more widely for unstable patterns or in selected patients. Strengths include prospective data collection within the thesis database, standardized operative technique, and systematic one-year follow up.

Future pragmatic research should evaluate bundled interventions — metabolic optimization, delirium prevention and early mobilization within orthogeriatric frameworks — using stepped-wedge or multicenter designs to assess effectiveness across systems and populations [19] [20]. Economic evaluation will be important to guide resource allocation, since even modest reductions in early mortality and disability translate into meaningful savings and improved quality of life at a population level. In the meantime, clinicians can act now: prioritize geriatric screening on admission, expedite evaluation and surgery when appropriate, manage comorbidities proactively and start rehabilitation early to support recovery.

Conclusion

In this cohort of 284 geriatric patients with intertrochanteric fractures treated by proximal femoral nailing, one-year mortality was 15% and concentrated in the early postoperative months. Advanced age, comorbidity (particularly diabetes), lower baseline mobility and longer hospital stays were associated with higher risk. Practical, immediately actionable steps include routine geriatric screening at admission, prioritized optimization for patients with major comorbidities, strict delirium prevention and early structured rehabilitation aimed at restoring mobility. Adoption of orthogeriatric co-management pathways and measurement of process metrics such as time-to-surgery and early mobilization rates are reasonable institutional priorities. Further pragmatic multicenter evaluations of bundled perioperative interventions are warranted to confirm the best approaches to reduce early mortality and preserve function in older hip fracture patients.

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