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Mortality and Prognostic Factors in Intertrochanteric Femur Fractures – Insights From Şanlıurfa

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Abstract

Background and Objective: Intertrochanteric femur fractures are severe injuries, particularly affecting the elderly population, and are associated with high morbidity and mortality. Early surgical intervention has been reported to reduce these risks, yet regional differences' influence on patient demographics and clinical management remains debatable.

Methods: A retrospective analysis was conducted on 305 patients treated for intertrochanteric femur fractures between 2015 and 2020 at Sanliurfa Mehmet Akif Inan Training and Research Hospital. Patients with a radiologically confirmed diagnosis of intertrochanteric femoral fracture, aged 50 years and older, with complete treatment records and follow-up data, were included. Demographic data (age, sex), clinical parameters (age at surgery, ASA score, comorbidities), time from hospital admission to surgery, and follow-up time and mortality status were meticulously collected from patient records.

Results: Mortality was observed in 36 patients. No significant differences in mortality were found between the sexes or in postoperative intensive care requirements. However, patients with higher ASA scores and multiple comorbidities exhibited a significantly increased risk of mortality (OR: 1.8, 95% CI: 1.2-2.6, p =0.004). Additionally, A longer time to surgery was observed in the mortality group (28.4 ± 8.3 hours vs. 20.6 ± 6.2 hours, p = 0.002); however, whether this delay itself contributed to mortality or reflected pre-existing medical instability requiring preoperative optimization could not be determined in this retrospective study.

Conclusions: This study highlights the importance of early surgical intervention and comprehensive risk assessment in reducing mortality in patients with intertrochanteric femoral fractures. The findings underscore the need for optimized clinical management strategies tailored to regional healthcare conditions to improve patient outcomes.

Keywords: Intertrochanteric Femur Fracture, Mortality, ASA Score, Comorbidities, Early Surgical İntervention

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İntertrokanterik Femur Kırıklarında Mortalite ve Prognostik Faktörler – Şanlıurfa'dan Yansımalar

Öz

Arka plan ve Amaç: İntertrokanterik femur kırıkları, özellikle yaşlı popülasyonu etkileyen ciddi yaralanmalardır ve yüksek morbidite ve mortalite ile ilişkilidir. Erken cerrahi müdahalenin bu riskleri azalttığı bildirilmiştir, ancak bölgesel farklılıkların hasta demografisi ve klinik yönetim üzerindeki etkisi tartışmaya açıktır.

Yöntemler: Şanlıurfa Mehmet Akif Inan Eğitim ve Araştırma Hastanesi'nde 2015-2020 yılları arasında intertrokanterik femur kırığı nedeniyle tedavi edilen 305 hasta üzerinde retrospektif bir analiz yürütülmüştür. Radyolojik olarak intertrokanterik femur kırığı tanısı doğrulanmış, 50 yaş ve üzeri, tam tedavi kayıtları ve takip verileri olan hastalar çalışmaya dahil edilmiştir. Demografik veriler (yaş, cinsiyet), klinik parametreler (ameliyat yaşı, ASA skoru, eşlik eden hastalıklar), hastaneye yatıştan ameliyata kadar geçen süre, takip süresi ve mortalite durumu hasta kayıtlarından titizlikle toplandı.

Bulgular: 36 hastada mortalite gözlendi. Cinsiyetler arasında veya postoperatif yoğun bakım gereksinimlerinde anlamlı bir mortalite farkı bulunmadı. Ancak, daha yüksek ASA skorları ve birden fazla eşlik eden hastalığı olan hastalarda mortalite riski önemli ölçüde artmıştır (OR: 1,8, %95 CI: 1,2-2,6, p = 0,004). Ek olarak, gecikmiş cerrahi müdahale daha kötü sonuçlarla ilişkilendirilmiştir, çünkü mortalite grubunda ameliyata kadar geçen ortalama süre önemli ölçüde daha uzundur (28,4 ± 8,3 saate karşı 20,6 ± 6,2 saat, p = 0,002).

Sonuç: Bu çalışma, intertrokanterik femoral kırıkları olan hastalarda mortaliteyi azaltmada erken cerrahi müdahalenin ve kapsamlı risk değerlendirmesinin önemini vurgulamaktadır. Bulgular, hasta sonuçlarını iyileştirmek için bölgesel sağlık koşullarına göre uyarlanmış optimize edilmiş klinik yönetim stratejilerine olan ihtiyacı vurgulamaktadır.

Anahtar kelimeler: İntertrokanterik Femur Kırığı, Mortalite, ASA Skoru, Eşlik Eden Hastalıklar, Erken Cerrahi Müdahale.

INTRODUCTION

Intertrochanteric femur fractures (ITF) are among the most common lower extremity fractures that occur in the elderly after minor trauma due to osteoporosis and in younger patients after high-energy injuries[1]. The incidence of ITFs has increased significantly in recent years, especially in developing countries, due to increasing age[2]. Intertrochanteric femur fractures are severe injuries with a high risk of morbidity and mortality, particularly in the elderly. In the elderly population, such fractures, together with factors such as increased comorbidities, low bone density, and increased risk of falls, have a negative impact on patients' quality of life and place a significant burden on the healthcare system[1,2].

Among current treatment options, ITFs are usually treated with intramedullary fixation or extramedullary fixation[3,4]. However, since the failure rates of operations performed with dynamic hip screws providing extramedullary fixation in unstable ITFs are high, intramedullary fixation using a proximal femoral nail (PFN) is more frequently preferred. Biomechanical studies have shown that PFN provides better stability than dynamic hip screws due to its shorter lever arm[5]. In addition, PFN has advantages such as being suitable for a minimally invasive approach, easy application, short surgical time, full postoperative weight bearing, and low complication rate. Therefore, the preferred osteosynthesis method is PFN because it can provide stable fixation and early postoperative mobilization in ITF cases[6]. Especially in elderly patients diagnosed with osteoporosis, stable fixation and early mobilization after the treatment of proximal femur fractures significantly reduce morbidity and mortality rates and improve functional outcomes[5,7].

Complications that occur during PFN application are generally varus deformity, screw pullout, shortening of the femur, nonunion, secondary fracture, thigh pain, screw breakage, heterotopic ossification, and Z-effect or reverse Z-effect in double-headed delayed screw nails[5]. PFN designs with different features have been developed based on various needs in intertrochanteric fracture cases. These designs have multiple advantages over each other. Therefore, different designs have been compared with each other in many studies to determine the ideal PFN type in ITF cases.

Previous literature elaborated that early surgical intervention for intertrochanteric fractures has been reported to reduce mortality and complication rates. Still, the impact of regional differences in patient demographics, timing of surgery, and clinical management strategies on this rate is debated[3-5]. As the Sanliurfa region differs in socioeconomic structure and healthcare infrastructure, the treatment processes and outcomes of patients with intertrochanteric femoral fractures may vary from the averages reported in the national and international literature[6]. In this context, evaluating the effect of clinical and demographic parameters such as follow-up time, age, timing of surgery, and ASA score on mortality in our region is of great importance for clinical practice and health policy. Within the scope of this research, we aimed to elucidate the mortality rate of patients with intertrochanteric femoral fractures in the Sanliurfa region and to highlight the importance of early intervention and appropriate patient selection by examining the clinical and demographic parameters associated with this mortality. Thus, the results are expected to shed light on clinical practice and health system regulations.

METHOD

Study Design

This retrospective analysis included 305 patients treated for intertrochanteric femur fracture at Sanliurfa Mehmet Akif Inan Training and Research Hospital between 2015 and 2020. Patients with a radiologically confirmed diagnosis of intertrochanteric femoral fracture, aged 50 years and older, with complete treatment records and follow-up data, were included. In contrast, individuals with incomplete medical data, multifracture, pathological fracture history, and cancer history were excluded from the study. It is important to note that the exclusion of patients with a cancer history, while necessary to avoid confounding due to cancer-related mortality, may have led to an underestimation of the true mortality burden in this age group, given that malignancy is a common and clinically relevant comorbidity in the elderly population.

Data Collection

Demographic data (age, sex), clinical parameters (age at surgery, ASA score, comorbidities), time from hospital admission to surgery, and follow-up time and mortality status were meticulously collected from patient records.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Harran University has granted ethics committee approval with protocol number HRU/25.11.12, and informed consent has been obtained from all participants.

Statistical Analysis

Patient data collected within the scope of the study were analyzed with the IBM Statistical Package for the Social Sciences (SPSS) for Windows 29.0 (IBM Corp., Armonk, NY) package program. Frequency and percentage for categorical data and mean and standard deviation for continuous data were given as descriptive values. For comparisons between groups, the "Independent Sample T-test was used for two groups, and the "Pearson Chi-Square Test" was used to determine differences in follow-up time and age at the surgery between the death and survival groups. Relationships between mortality status and categorical variables such as sex, presence of control radiograph failure, and need for postoperative intensive care were evaluated using the chi-squared and Fisher's exact test when appropriate.

Survival rates at 12, 36, and 60 months were calculated using the Kaplan-Meier method and presented with confidence intervals for survival analysis. In addition, Cox regression analysis was used to assess the effect of variables such as sex on survival, with hazard ratios (HRs) and 95% confidence intervals. The results were considered statistically significant when the p-value was less than 0.05.

RESULTS

A total of 305 patients were analyzed in this retrospective study. The mean age of the participants was 77.0±10.5 years; 62% (n=189) of them were female, and 38% (n=116) were male. The ASA score I–II was 60% (n=183), ASA III–IV 40% (n=122). The comorbidities were hypertension 55% (n=168), diabetes mellitus 40% (n=122), and cardiovascular disease 30% (n=91) . Analyses of demographic and clinical parameters showed significant differences between the patient groups (Table 1). When analyzed by sex, 14 deaths occurred in the male group (n=116) and 22 in the female group (n=189), but this difference was not statistically significant by the χ^2 test (χ^2 = 0.0127, p =0.910). Mortality was observed in 36/305 patients.

Table I: Baseline demographic data of the patients

Demographic and Clinical data	Value (%)
Total number of patients	305
Mean age (± SD) year	77.0 ± 10.5 year
Gender – Female	189 (62%)
Gender – Male	116 (38%)
ASA Score I–II	183 (60%)
ASA Score III–IV	122 (40%)
Hypertension	168 (55%)
Diabetes Mellitus	122 (40%)
Cardiovascular disease	91 (30%)
Mortality ratio	36 (11.8%)

When other clinical classifications were analyzed, there was no significant difference in mortality rates between the seven patients in the fail group and the 298 patients in the normal union group on control radiographs (χ^2 = 0.959, p =0.327). There was no difference in mortality between patients who went to intensive care after surgery (n=161) and patients who were followed up on the ward after surgery (n=144) (χ^2 =0.504, p =0.478). However, when the distribution of intertrochanteric fractures with failure was analyzed by sex, a significant difference was found between the male and female groups (χ^2 =4.40, p =0.036; Fisher's exact test, p =0.047). When comparing the distribution of ICUs and wards by gender, no significant difference was observed (χ^2 =0.0848, p =0.771).

As expected in any survival analysis, the observed follow-up duration was shorter in the mortality group (30.33 ± 11.3 months) compared to the survival group (46.2 ± 15.8 months), as death inherently terminates follow-up (Table 3). This difference reflects the natural censoring structure of the data and should be

interpreted as a descriptive characteristic rather than an independent prognostic factor. Accordingly, follow-up duration was not included as a predictor in the survival model.

Kaplan-Meier survival analysis showed that the 12-, 36- and 60-month survival rates were 98.36%, 94.75%, and 93.75%, respectively (Table 2). When subgrouped by sex, the 12-, 36- and 60-month survival rates were 98.28%, 93.10%, and 92.24% in the male group and 98.41%, 95.76%, and 94.68% in the female group (Figure 1). Median survival in both sexes could not be determined because it was over 50% during the follow-up period. Cox regression analysis analyzed the effect of sex on survival; the risk ratio calculated for female patients was 1.02 (95% CI: 0.52-2.00, p =0.952), indicating that sex had no independent effect on survival.

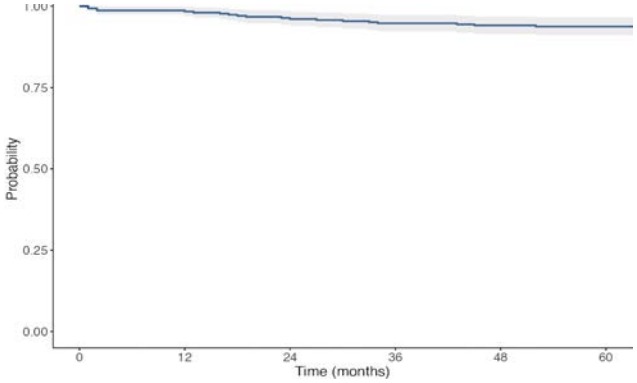

Figure 1: Kaplan–Meier survival curve for patients with intertrochanteric femur fractures.

Table II: Kaplan-Meier Survival Analysis

Time (months)	Survival Rate (%)	95% Confidence Interval (%)
12	98.36	96.9 – 99.80
36	94.75	92.3 – 97.29
60	93.75	91.1 – 96.51

Table III: Descriptive Characteristics and Surgical Timing by Mortality Status

Variable	Group	Mean ± SD	Range	t-value	p-value
Follow-up Duration (months)	Mortality	30.33 ± 11.3	25–60		
	Survival	46.2 ± 15.8	27–60		
Age at Surgery (years)	Mortality	78.1± 11.3	48–97	0.949	0.343
	Survival	76.3 ± 10.2	46–108		
Time to Surgery (hours)	Mortality	28.4± 8.3	1–120	-3.587	0.002
	Survival	20.6 ± 6.2	1-36		

†Follow-up duration is shorter in the mortality group as a consequence of event-driven censoring, not as an independent predictor of mortality.

When mortality events were stratified by timing, 2 patients (0.7%) died during the in-hospital postoperative period prior to discharge, and a total of 5 patients (1.6%) died within the first 30 postoperative days. The remaining 31 deaths (10.2%) occurred beyond 30 days of surgery, representing late mortality. Accordingly, the majority of deaths in this cohort (86%) were late events occurring during long-term follow-up rather than in the acute perioperative period.

Out of 305 patients, a distribution of 60% (n=183) in the ASA I-II group and 40% (n=122) in the ASA III-IV group was observed. The mortality rate was 20% in the ASA III-IV group and 7% in the ASA I-II group (Table 4). In addition, approximately 55% of patients had hypertension, 40% had diabetes, and 30% had cardiovascular disease. Multiple logistic regression analysis showed that one or more comorbidities significantly increased the mortality risk; OR: 1.8 (95% CI: 1.2-2.6, p =0.004) (Table 5). These results suggest that ASA score and comorbidity status significantly impact patient prognosis in managing intertrochanteric femoral fractures.

Table IV: ASA Score and Mortality Scores of the study group

ASA Score	Number of Patients (n)	Mortality (n, %)
ASA I–II	183	13 (7.1%)
ASA III–IV	122	23 (18.9%)
Total	**305**	**36 (11.8%)**

Table V: Comorbidity Distribution and Associated Findings

Comorbidity	Prevalence (n, %)	Association with Mortality (OR, p-value)
Hypertension	168 (55%)	–
Diabetes Mellitus	122 (40%)	–
Cardiovascular Disease	91 (30%)	–
Any Comorbidity	–	1.8 (95% CI: 1.2–2.6, p = 0.004)

The mean time to surgery was 28.4±8.3 hours (range: 1-120 hours) in the mortality group and 20.6±6.2 hours (range: 1-36 hours) in the survival group. According to the independent samples t-test results, there was a significant difference between the two groups; the mean difference was -8 hours (t = 3.587, p =0.002). While the time to surgery was significantly longer in the mortality group, this association should be interpreted with caution. Patients with greater medical instability or higher comorbidity burden may have required longer preoperative optimization, resulting in delayed surgery. Therefore, whether the delay itself independently contributed to mortality, or whether it was a consequence of the patient's pre-existing clinical condition, cannot be established from this retrospective dataset.

DISCUSSION

Intertrochanteric fractures are common fractures in elderly patients over the age of 65 due to low-energy injuries. They are among the most common fractures seen in elderly patients due to osteoporosis. As global life expectancy continues to rise, the incidence of intertrochanteric fractures has increased proportionally, now accounting for approximately 8–10% of the overall fracture burden. Surgical intervention has been firmly established as the standard of care, with evidence demonstrating significant reductions in both mortality and functional impairment compared to conservative management. Successful treatment of these fractures depends on patient-related factors such as the patient's general condition, comorbidities, walking capacity before the fracture, osteoporosis level, and patient expectations, as well as surgical parameters such as the type of fracture, early surgery, quality of reduction, and surgeon experience[8]. However, although proximal femoral nail (PFN) fixation was the predominant surgical method in our cohort, the specific implant design used (e.g., PFNA, InterTAN, Gamma nail) and individual surgeon experience were not systematically recorded or analyzed. This represents a notable limitation, as implant-specific biomechanical characteristics and surgical learning curves have been shown to independently influence fixation failure rates and clinical outcomes. Wu et al. demonstrated that PFN design-related factors, including tip-apex distance and nail-shaft angle, were significant predictors of internal fixation failure in intertrochanteric fractures[5]. Similarly, the comparative performance of different cephalomedullary nail designs remains an active area of investigation, with no single implant demonstrating universal superiority[3,4,8]. Future studies from our institution should prospectively record implant design and surgeon volume to allow for more granular subgroup analyses. In a study by Niu et al.[9], 68% of surgeons preferred cephalomedullary nails, 19% used sliding hip plates, and 13% used nails and plates equally.

Many randomized and non-randomized clinical studies and meta-analyses, including these studies, have been published in the last 10 years. Meta-analyses have shown that the surgical time is shorter with internal fixation than with arthroplasty. A Cochrane meta-

analysis by Parker and Handoll[10] 2006 reported that the surgical time favored proximal hip pinning in a single study. In their meta-analysis of five studies in 2017, Nie et al.[11] showed that the duration of internal fixation was shorter. In a meta-analysis by Ju et al.[12] in 2019, it was determined that the surgical time was shorter in the intramedullary nailing group in 13 studies. Still, the difference with arthroplasty was not found to be statistically significant. In 2020, Kumar et al.[13] reported that the surgical time was shorter with proximal hip pinning in their meta-analysis of seven randomized clinical trials. Although meta-analyses have shown that blood loss is less in internal fixation and especially in the proximal hip pin, Ju et al.[12], in their meta-analysis published in 2019, evaluated 11 studies examining the amount of transfusion and showed that although blood loss was less in the internal fixation group, when the results of three studies reporting the amount of transfusion were combined, there was no difference between the amount of transfusion in both groups. The literature has widely emphasized the importance of early surgical intervention and effective patient management in reducing mortality in patients with intertrochanteric femoral fractures. In our study, the mean time to surgery was significantly longer in deceased patients (28.4 vs. 20.6 hours, p = 0.002). While this is consistent with the broader literature supporting early surgical intervention, the causal direction of this association warrants careful interpretation. In a retrospective cohort, patients who are medically less stable—due to higher ASA scores or greater comorbidity burden—may require extended preoperative medical optimization, inherently delaying surgery. Consequently, poor preoperative status may act as a common cause of both surgical delay and subsequent mortality, representing a classic confounding relationship. Prospective studies incorporating multivariable adjustment for preoperative clinical status would be required to disentangle the independent effect of surgical timing from that of baseline medical condition.

When hospital stays were examined, the meta-analysis conducted by Parker and Handoll10 showed that the hospital stay of internal fixation patients was shorter. In contrast, similar hospital stays were found in Nie and Ju's meta-analysis[11,12]. Due to six randomized clinical trials, Kumar et al.[13] stated that the hospital stay was shorter in the proximal femoral nail group.

Complications of the treatment methods of intertrochanteric fractures can be evaluated in several groups. Mechanical complications (implant failure, prosthesis loosening), periprosthetic fractures, and infection are the main complications evaluated in meta-analyses. In their review conducted in 2015, Jiang et al.[14] reported no difference between arthroplasty and internal fixation in the rates of mechanical complications, implant failure, periprosthetic fractures, and deep infection. When implant-related complications were evaluated, Nie et al.'s[11] meta-analysis found fewer complications in the arthroplasty group. Yoo et al.'s[15] meta-analysis revealed that the arthroplasty group had fewer complication rates in medical condition-related or implant-related complications. In the 2019 Ju et al.[12] meta-analysis, arthroplasty was advantageous in both mechanical and postoperative complications. In Kumar et al.'s[13] analysis, no difference was found between implant failure and infection rates. When implant-related complications were evaluated, it is crucial to consider that the studies' follow-up periods were short-medium term. Late complications after arthroplasty (chondrolysis, loosening, infection) were not considered in these studies.

According to treatment methods, there was no difference in mortality rates between Jiang et al. and Yoo et al. Analyses[14,15]. However, the meta-analyses of Nie et al.[11] and Kumar et al.[13] revealed that internal fixation and intracanal

nailing had lower mortality rates. Our study evaluated the clinical course, mortality, and survival of 305 patients with intertrochanteric femoral fractures. The results generally agreed with those reported in the literature, and significant differences were found between the mortality and survival groups, particularly in terms of follow-up time[16,17]. The fact that the follow-up period was significantly shorter in the mortality group (30.33 ± 11.3 months; 937.17±344.9 days) than in the survival group (46.2±15.8 months; 1423.3 ± 481.7 days) reveals a determining factor in the clinical status of the patients and their response to treatment. The fact that there was no significant difference in age at surgery between the two groups suggests that age alone may not be sufficient to explain mortality.

The stratification of mortality by timing further contextualized our findings within the existing literature. The in-hospital postoperative mortality rate of 0.7% and the 30-day mortality rate of 1.6% observed in our cohort are notably lower than figures reported in several comparable series. Hao et al.[18] reported a one-year mortality rate of approximately 14–20% in elderly patients with femoral intertrochanteric fractures treated at a Chinese tertiary center, while Cui et al.[19] documented excess mortality persisting up to five years following surgical treatment in patients aged 50 and older—findings that underscore the long-term prognostic burden of this injury. Lu et al.[16] similarly identified that long-term mortality at three years was strongly influenced by preoperative comorbidity burden, a finding consistent with our own results demonstrating significantly higher mortality in ASA III–IV patients and those with multiple comorbidities. Nasab et al.[17] reported that quality of life and mortality outcomes in patients over 60 were substantially determined by pre-fracture functional status rather than surgical variables alone. Taken together, the predominance of late deaths (86%) in our series aligns with this body of evidence, suggesting that the long-term mortality risk in intertrochanteric fracture patients is driven primarily by progressive comorbidity accumulation, functional decline, and loss of ambulatory capacity—rather than acute perioperative complications. The relatively low in-hospital and 30-day mortality rates in our cohort may reflect the effect of timely surgical intervention and perioperative management; however, given the retrospective design and the confounding factors discussed above, causal inference remains limited.

In alignment with the current literature[18,19], this study investigated the prognostic significance of ASA classification and comorbidity profiles. The observed disparity in mortality rates—7.1% in the ASA I–II cohort versus 18.9% in the ASA III–IV group (Table III)—underscores the critical necessity of meticulous preoperative risk stratification and individualized patient optimization prior to surgical intervention. Furthermore, the presence of systemic comorbidities, including hypertension, diabetes mellitus, and cardiovascular disease, was significantly associated with an increased mortality risk, as demonstrated by an odds ratio of 1.8 (95% CI: 1.2–2.6, p = 0.004) (Table IV). These findings reinforce the clinical consensus that prognosis following intertrochanteric fracture surgery is dictated not solely by the orthopedic injury itself, but by the patient's overall physiological reserve and systemic health status[20,21].

The title of this study references Sanliurfa specifically, as the regional context of this southeastern Turkish province carries distinct sociodemographic and healthcare infrastructure characteristics that may have meaningfully influenced our findings. Sanliurfa is among the provinces with the highest rates of socioeconomic disadvantage in Turkey, with a younger overall population structure yet a higher burden of metabolic comorbidities—

particularly diabetes mellitus and hypertension—compared to national averages, consistent with the high comorbidity prevalence observed in our cohort (diabetes: 40%, hypertension: 55%). Nutritional deficiencies, including vitamin D insufficiency associated with limited sun exposure among women who predominantly remain indoors due to cultural practices, may contribute to accelerated osteoporosis and increased fracture risk in this population. Additionally, the regional healthcare infrastructure—including limited access to subspecialty preoperative optimization services such as cardiology, endocrinology, and haematology—may have contributed to the prolonged time to surgery observed in higher-risk patients in our cohort, compounding the confounding relationship between surgical delay and mortality discussed above. Seasonal variation in fall-related injuries, commonly observed in agricultural populations during harvest periods, and the distance of rural patients from tertiary care centers may also have affected the timing of hospital presentation and admission-to-surgery intervals. Whilst these regional factors could not be formally quantified in this retrospective dataset, they provide essential clinical context for interpreting our results and highlight the importance of region-specific health policy interventions—such as community-based fall prevention programs, nutritional supplementation strategies, and streamlined preoperative assessment pathways—in reducing morbidity and mortality from intertrochanteric fractures in southeastern Turkey.

Limitations

This study has several limitations that should be considered when interpreting the results. First, the retrospective design is a major methodological constraint; incomplete medical records or non-standardized clinical practices across the study period may have introduced selection bias and information bias, potentially affecting the accuracy of the reported outcomes. Second, the data were collected from a single tertiary center in the Sanliurfa region, which may not fully represent the broader regional or national patient population. Differences in patient demographics, referral patterns, and local healthcare infrastructure may limit the generalizability of our findings. Third, several potential confounders—including nutritional status, cognitive function, ambulatory capacity, and social support—were not systematically recorded and could not be adjusted for in the analysis. Fourth, the exclusion of patients with a cancer history, although intended to control for cancer-related confounding, represents a notable limitation. Malignancy is a frequent comorbidity among elderly patients and is independently associated with increased perioperative mortality. Its exclusion may have resulted in an underestimation of comorbidity burden and mortality risk in our study population, limiting the applicability of our findings to the broader geriatric population with intertrochanteric fractures. Future prospective, multicenter studies with standardized data collection protocols are warranted to validate and extend these findings.

CONCLUSION

In conclusion, this study demonstrates the importance of early intervention, comprehensive risk assessment, and effective patient management in patients with intertrochanteric femoral fractures. In line with studies in the literature, our results suggest that preoperative risk factors significantly impact mortality. These findings should guide the development of patient management strategies and the efficient use of resources in clinical practice. Future prospective, multicenter investigations incorporating regional demographic variables, implant-specific data, and standardized mortality classification will be essential for developing evidence-based,

regionally tailored management strategies for intertrochanteric femoral fractures.

Ethics Committee Approval: All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Harran University has granted ethics committee approval with protocol number HRU/25.11.12, and informed consent has been obtained from all participants.

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