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Title: Surgical timing for proximal femur fractures is not affect early mortality: single center experience.

Short titile: Surgical timing for proximal femur fractures is not affect early mortality.

Abstract

Purpose: This study investigates the relationship between surgical timing and 30-day and 90-day mortality in geriatric patients with proximal femur fractures. It also evaluates other parameters potentially affecting mortality, addressing the ongoing debate in the literature about the ideal surgical timing for such fractures.

Patients and methods: A retrospective analysis of 181 patients aged 65 and older with femoral neck or intertrochanteric femur fractures was conducted. Data on demographics, comorbidities, fracture type, surgical timing, and mortality were collected. Patients were categorized into four groups based on surgery timing: within 24 hours, 24-48 hours, 48-72 hours, and after 72 hours. Statistical analyses included t-tests, Mann-Whitney U tests, Chi-square tests, and Bonferroni-corrected post hoc analyses. A significance level of $p<0.05$ was used.

Results: The overall 30-day and 90-day mortality rates were 3.86% and 11.04%, respectively. Surgical timing did not significantly affect 30-day and 90-day mortality. The highest 30-day mortality rate (6.7%) was observed in patients operated on within the first 24 hours, potentially due to rushed preoperative preparations. The group with the highest 90-day mortality rate (22%) consisted of patients undergoing surgery after 72 hours, likely influenced by comorbidities or anticoagulant use.

Conclusion: Surgical timing does not significantly affect mortality in proximal femur fractures, though the safest interval appears to be 24-72 hours. While early surgery can reduce complications related to immobilization, sufficient time for preoperative optimization is crucial. A balanced approach focusing on patient readiness rather than rigid timing guidelines ensures better outcomes.

Keywords: Hip fracture, surgical timing, mortality.

Makale başlığı: Proksimal femur kırıklarında cerrahi zamanlama erken mortaliteyi etkilemez: tek merkez deneyimi.

Öz

Amaç: Bu çalışmada, proksimal femur kırığı olan geriatri hastalarında cerrahi zamanlama ile 30 günlük ve 90 günlük mortalite arasındaki ilişkiyi araştırmak amaçlanmıştır. Ayrıca, literatürde bu tür kırıklar için ideal cerrahi zamanı konusundaki devam eden tartışmayı ele alarak, mortaliteyi potansiyel olarak etkileyebilecek diğer parametreler de değerlendirildi.

Hastalar ve yöntem: 65 yaş ve üzeri femoral boyun kırığı veya intertrokanterik femur kırığı olan 181 hastanın retrospektif analizi yapıldı. Demografik veriler, komorbiditeler, kırık tipi, cerrahi zamanı ve mortalite hakkında veriler toplandı. Hastalar, ameliyat zamanlamasına göre dört gruba ayrıldı: 24 saat içinde, 24-48 saat içinde, 48-72 saat içinde ve 72 saatten sonra. İstatistiksel analizler t-testleri, Mann-Whitney U testleri, Ki-kare testleri ve Bonferroni düzeltmeli post hoc analizlerini içeriyordu. $p<0.05$ anlamlılık düzeyi kullanıldı.

Bulgular: Toplam 30 günlük ve 90 günlük ölüm oranları sırasıyla %3,86 ve %11,04'tü. Cerrahi zamanı, 30 günlük ve 90 günlük mortaliteyi önemli ölçüde etkilemedi. En yüksek 30 günlük ölüm oranı (%6,7), ilk 24 saat içinde ameliyat edilen hastalarda gözlemlendi; bu durum, muhtemelen aceleci preoperatif hazırlıklardan kaynaklanıyor. En yüksek 90 günlük ölüm oranına sahip grup (%22), muhtemelen komorbiditeler veya antikoagülan kullanımı tarafından etkilenmiş olan 72 saatten sonra ameliyat olan hastalardan oluşuyordu.

Sonuç: Cerrahi zamanlama, proksimal femur kırıklarında mortaliteyi önemli ölçüde etkilemez, ancak en güvenli aralık 24-72 saat gibi görünmektedir. Erken cerrahi, immobilizasyonla ilgili komplikasyonları azaltabilirken, preoperatif optimizasyon için yeterli zaman kritik öneme sahiptir. Hasta hazırlığına odaklanan dengeli bir yaklaşım, katı zamanlama yönergeleri yerine daha iyi sonuçlar sağlar.

Anahtar kelimeler: Kalça kırığı, cerrahi zamanlama, mortalite.

Introduction

One of the main causes of death and morbidity in the elderly population is hip fractures, which are widespread [1]. According to published research, 30-day death rates following hip fractures range from 8% to 13% [2]. In addition to mortality, hip fractures lead to pain, limited mobility, deformity, and a decrease in quality of life in both the early and late stages [3].

In studies related to surgical timing for proximal femur fractures, definitions of early and late surgery vary, but surgery performed within the first 24-48 hours after admission is often considered early surgery [4]. It is argued that early surgery reduces mortality and avoids complications such as pressure sores, thromboembolism, pneumonia, and urinary tract infections, which often occur secondarily to immobilization [5-7]. In addition, there are studies indicating that surgical timing does not affect mortality, but early surgery may be preferred to avoid potential perioperative complications [8-11].

In some countries, national guidelines have been published for the timing of surgery in hip fractures, and they are evaluating this as a quality indicator in healthcare service delivery [12, 13]. However, there are also authors who argue that early surgery cannot be used as an indicator of quality and that providing sufficient time for preoperative medical optimization for patients is safer [14].

Regarding the impact of surgical scheduling on mortality following hip fractures, there is disagreement in the researchs. In this study, the relationship between surgical timing and mortality rates at 30 days and 90 days was investigated. Additionally, other parameters that could affect mortality were also evaluated.

Materials and methods

Following the approval from the Scientific Research Evaluation and Ethics Committee of Ankara Etlik City Hospital (approval number: AEŞH-BADEK-2024-038, approval date: January 10, 2024), patients diagnosed with proximal femur fractures who applied to our hospital between October 2022 and December 2024 were retrospectively examined. Patients aged 65 and over, diagnosed with femoral neck fracture (FNF) and intertrochanteric femoral fracture (ITF) after falling from their own height, were included in the study. Patients younger than 65 years, polytrauma patients with accompanying fractures or other systemic injuries, and patients with pathological fractures were excluded from the study. When patients were evaluated according to these criteria, the study comprised a total of 181 patients. Data on patients' age, gender, comorbidities, use of oral anticoagulants, types of fractures, consultations requested during the preoperative preparation process, times of hospital admission and surgery, and types of surgeries performed (proximal femur nail, hemiarthroplasty, and total hip arthroplasty) were collected from our hospital's archive records. Patients were divided into 4 groups based on the timing of the surgical procedure: the first 24 hours, 24-48 hours, 48-72 hours, and after 72 hours. Again, the patients' death statuses were queried through the phone numbers registered in the archive, and the dates of death of the deceased were recorded.

The results of tests conducted on variables in the study were evaluated with a 95% confidence interval, and a *p*-value of <0.05 was considered significant. Kolmogorov-Smirnov test was applied for normality analysis of the data. To detect differences between numerical variables and groups, Independent Sample t-tests were conducted for variables where the normality condition was met, and Mann-Whitney U Test procedures were conducted for variables where the condition was not met. For the analysis of differences between groups for categorical variables, a non-parametric test, Chi-square Test, was applied. Post Hoc Analysis was conducted to determine which groups had significant differences in analyses involving more than two categorical groups. In this context, Adjusted Residual determination was made, and new *p*-values were determined with Bonferroni correction. Detection and interpretation of differences between groups were made based on these *p*-values.

Results

Among the 181 patients in the study, 71 (39.2%) were male and 110 (60.8%) were female. The mean age of the patients was determined to be 80.2. Femoral neck fractures occurred in 63 (34.8%) and intertrochanteric femur fractures in 118 (65.2%) of the patients. A total of 24 patients with femoral neck fractures performed hemiarthroplasty, 39 patients underwent total hip arthroplasty, and all patients with intertrochanteric femur fractures were treated with proximal femoral nailing.

Upon assessing the comorbidities of the patients, hypertension (116 patients), diabetes mellitus (68 patients), and coronary artery disease (42 patients) were identified as the most prevalent concomitant conditions. The most commonly requested preoperative consultations during surgical preparation were cardiology (173 patients), pulmonology (169 patients), and internal medicine (68 patients). Each patient requested an average of 2.74 preoperative consultations, and the average completion time for these consultations by the relevant departments, following the initial assessment by the anesthesiology department, was 84.6 minutes. Table 1 presents the comorbidities of the patients and the departments for which preoperative consultations were solicited.

The mean time from hospital admission to surgery for the patients was found to be 51.4 hours. The 30-day mortality rate for all patients was found to be 3.86% (7/181). Further, the death rate after 90 days was discovered to be 11.04% (20/181). The relationship between all the investigated variables and mortality rates at 30 days and 90 days was examined (Table 2, Table 3).

The mean age of patients who survived the first 30 days was 79.9, whereas the mean age of patients who died was 86.4, indicating a significant correlation between age and 30-day mortality (*p*=0.05). No correlation was identified between age and mortality within the first 90 days. No significant correlation was identified between gender, the length of preoperative consultations, and fracture type and 30-day and 90-day death rates.

Upon evaluating the correlation between comorbidities and early death, it was noted that the individuals who suffered from diabetes mellitus, coronary artery disease, chronic obstructive pulmonary disease, or chronic renal failure had a 30-day death rate that was significantly higher as compared to the others, however the sole comorbidity associated with a considerably increased 90-day death rate was chronic obstructive pulmonary disease.

Patients were categorized based on the timing of surgical intervention: 90 patients underwent surgery within the first 24 hours post-admission, 24 patients within the 24-48 hour range, 26 patients within the 48-72 hour range, and 41 patients after the 72^{nd} hour. The timing of the surgical procedure was shown to have no impact on the first 30-day mortality. The evaluation of 90-day mortality revealed a borderline significance value (*p*=0.05). Post-hoc analysis and Bonferroni correction revealed that the time of the surgery did not influence the 90-day mortality rate.

Discussion

This study examined the impact of surgical scheduling on 30-day and 90-day mortality rates in proximal femur fractures among patients aged over 65 years. Furthermore, additional criteria that may influence early death were assessed. A Canadian study utilizing administrative management data revealed 30-day and 90-day mortality rates of 4.9% and 8.5%, respectively [5]. In the study conducted using data from the Danish fracture database, the 30-day and 90-day mortality rates were reported as 7.8% and 15.2%, respectively [7]. Our investigation revealed a total 30-day death rate of 3.9% and a total 90-day mortality rate of 11.04%, consistent with existing literature.

The literature lacks consensus on the impact of surgical timing on mortality. In high-patient-volume review and meta-analysis studies, some research indicates that early surgery decreases mortality, whereas other studies suggest no correlation between surgical time and death [5-11]. Various studies establish distinct time frames within which surgery must be conducted to be considered as early surgery. Studies established this limit at 24, 48, or 72 hours, assessing its influence on mortality and surgical complications [15-

17]. Consequently, rather of establishing one specific time limit in our study, we categorized our patients based on the 24-hour intervals of their surgical procedures and completed our analysis, revealing that the timing of the surgery did not influence the 30-day and 90-day death rates. Our analysis revealed that the group with the highest 30-day mortality rate comprised individuals who underwent surgical intervention during the first 24 hours (6.7%). Despite the approval from the appropriate departments indicating that all patients were prepared for surgery, there may have been undue rush during the preoperative preparation and the decision-making over the time of surgery. Nonetheless, the heterogeneous distribution of patients among the categories may render the acquired results false and misleading. Nevertheless, this rate cannot be deemed high when compared with the 30-day mortality rates reported in other studies within the literature [5, 7]. The group with the highest 90-day mortality rate was identified as those operated on 72 hours or later (22%). The elevated mortality rate in this group may be attributed to the presence of patients with significant comorbidities.

In some countries, national guidelines exist for the timing of surgery in hip fractures, and performing the surgery within the time frame specified in the guidelines is considered a quality indicator in healthcare delivery. In the latest 2021 update of the American Academy of Orthopaedic Surgeons (AAOS) guidelines for the management of hip fractures in older adults, it is recommended that surgery be performed within the first 48 hours [13]. In the latest guidelines updated in 2023 in the United Kingdom, it is recommended that patients diagnosed with a hip fracture undergo surgery on the day of admission or, at the latest, the following day [12]. The Association of Anaesthetists of Great Britain and Ireland has defined <8 hemoglobin, electrolyte imbalance, uncontrolled diabetes, arrhythmia, heart failure, pneumonia, and coagulopathy as acceptable reasons for delaying surgery after a hip fracture [18]. Although there is no consensus report and guidelines in our country, the approach we apply in our clinic is to operate on patients as early as possible to avoid potential perioperative complications, provided they are physiologically stable, ready for surgery, and their preoperative preparations are completed. In parallel, we found that approximately half of the patients who participated in our research (90/181) underwent surgery within the first 24 hours. The most significant reason for the delay in surgery for patients operated on 72 hours and later was determined to be the use of oral anticoagulants. All 32 patients in our research who used oral anticoagulants underwent surgery 72 hours or later. In a recent study involving 1803 patients, it was shown that the most common medical factor leading to surgical delays was the use of oral anticoagulants [19]. Another important reason for the delay in surgery could be that the patients in this group are uncontrolled in terms of comorbid diseases, and more time is spent to achieve their physiological stabilization. In another study investigating the relationship between surgical timing and mortality, it was reported that the proportion of patients with a high number of comorbidities was higher in the group that underwent delayed surgery compared to the group that underwent early surgery [20].

Due to potential ethical issues, it is inherently difficult to plan this study prospectively, but its main limitations are its design as a retrospective study and the lack of a large patient population. Additionally, the failure to examine whether mortality developed due to surgical complications or comorbidities can also be identified as a limitation.

In summary, there is no agreement regarding the optimal surgical timing for proximal femur fractures, which have seen a steadily increasing incidence over the years and have become a significant cause of mortality, especially in the aging population. Based on the results of our research, there is no effect of surgical timing on mortality rates; however, although not statistically significant, the safest interval for surgery appears to be between 24-72 hours. Performing surgery hastily and early just to adhere to a rule is as dangerous as planning it too late, which increases the risk of complications arising from the fracture itself or secondary to immobilization. The safest way to determine the timing of surgery is to ensure that the patient has enough time for preoperative medical optimization and to perform the surgery at the earliest moment the patient is ready for surgery.

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Conflict of interest: No conflict of interest was declared by the authors.

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Table 1. Patients' comorbidities and preoperative consultations

Comorbidities	n (%)	Preoperative Consultations	n (%)
Hypertension	116 (64.1)	Cardiology	173 (95.5)
Diabetes Mellitus	68 (37.5)	Pulmonology	169 (93.3)
Coronary Artery Disease	42 (23.2)	Internal Medicine	68 (37.5)
Stroke	18 (9.9)	Neurology	54 (29.8)
Alzheimer	18 (9.9)	Psychiatry	9 (4.9)
Chronic Obstructive Pulmonary Disease	15 (8.2)	Neurosurgery	8 (4.4)
Parkinson's Disease	11 (6)	Thoracic Surgery	5 (2.7)
Heart failure	8 (4.4)	Endocrinology	4 (2.2)
Thyroid Dysfunction	5 (2.7)	Nephrology	3 (1.6)
Chronic Renal Failure	4 (2.2)	General Surgery	3 (1.6)

Table 2. Relationship between variables and 30-day mortality

		30-day mortality			
		Survived	**Death**	**Total**	***p***
Age (Mean±SD)		79.9±8.54	86.4±8.58	80.24±8.61	**0.05* (t=-1.953)**
Preoperative Consultation Time (Mean±SD)		85.7±67.5	56.7±32.5	84.6±66.72	0.085 (u=375.00)
		Survived	**Death**	**Total**	***p***
Gender n (%)	**Female**	105 (95.4)	5 (4.6)	110 (100)	0.706¥
	Male	69 (97.1)	2 (2.9)	71 (100)	
Fracture Type n (%)	**FNF**	61 (96.8)	2 (3.2)	63 (100)	0.636 (v=0.000)
	ITF	113 (95.7)	5 (4.3)	118 (100)	
Comorbidities n (%)	**HT**	113 (97.4)	5 (2.6)	116 (100)	0.134 (v=0.000)
	DM	61 (89.7)	6 (10.3)	68 (100)	**0.046¥***
	CAD	38 (90.4)	4 (9.6)	42 (100)	**0.05¥***
	Stroke	18 (100)	0 (0)	18 (100)	0.398¥
	Alzheimer	17 (94.4)	1 (5.6)	18 (100)	0.534¥
	COPD	13 (86.6)	2 (13.4)	15 (100)	**0.047* (v=3.942)**
	Parkinson's Disease	11 (100)	0 (0)	11 (100)	0.416¥
	HF	6 (75)	2 (25)	8 (100)	**0.032¥***
	TD	5 (100)	0 (0)	5 (100)	0.142¥
	CRF	4 (100)	0 (0)	4 (100)	0.096¥
Surgical Timing n (%)	**<24 h**	84 (93.3)	6 (6.7)	90 (100)	0.211 (v=4.512)
	24-48 h	24 (100)	0 (0)	24 (100)	
	48-72 h	25 (96.2)	1 (3.8)	26 (100)	
	>72 h	41 (100)	0 (0)	41 (100)	
Total Mortality n (%)		174 (96.14)	7 (3.86)	181 (100)	

FNF: Femoral neck fracture, ITF: Intertrochanteric femur fracture, HT: Hypertension, DM: Diabetes mellitus, CAD: Coronary artery disease, COPD: Chronic Obstructive Pulmonary Disease, HF: Heart failure, TD: Thyroid Dysfunction CRF: Chronic renal failure

t: Independent Samples Test, u: Mann Whitney U Test, v: Pearson Chi-Square test

¥Chi-Square Test – Fisher Exact p value

Table 3. Relationship between variables and 90-day mortality

		90-day mortality				
		Survived	**Death**	**Total**	***p***	
Age (Mean±SD)		80.09±8.76	81.4±7.38	80.24±8.61	0.508 (t=-0.663)	
Preoperative Consultation Time (Mean±SD)		83.24±63.25	95.5±91.3	84.6±66.72	0.121 (u=1267.00)	
		Survived	**Death**	**Total**	***p***	
Gender n (%)	Female	100 (90.9)	10 (9,1)	110 (100)	0.295 (v=1.095)	
	Male	61 (85.9)	10 (14.1)	71 (100)		
Fracture Type n (%)	FNF	56 (88.8)	7 (11,2)	63 (100)	0.491 (v=0.000)	
	ITF	105 (88.9)	13 (11.1)	118 (100)		
Comorbidities n (%)	HT	103 (88.7)	13 (11.3)	116 (100)	0.315 (v=0.001)	
	DM	61 (89.7)	6 (10.3)	68 (100)	0.061 (v=0.549)	
	CAD	35 (83.3)	7 (16.7)	42 (100)	0.243[¥]	
	Stroke	17 (94.4)	1 (5,6)	18 (100)	0.437[¥]	
	Alzheimer	16 (88.8)	2 (11.2)	18 (100)	0.704[¥]	
	COPD	10 (66.6)	5 (33.4)	15 (100)	**0.014[¥]***	
	Parkinson's Disease	10 (90.9)	1 (9.1)	11 (100)	0.368[¥]	
	HF	6 (75)	2 (25)	8 (100)	0.547[¥]	
	TD	5 (100)	0 (0)	5 (100)	0.287[¥]	
	CRF	4 (100)	0 (0)	4 (100)	0.155[¥]	
Surgical Timing n (%)	<24 h	81 (90)	9 (10)	90 (100)	**0.05*** (v=7.588)	0.68[§]
	24-48 h	23 (95.8)	1 (4.2)	24 (100)		0.23[§]
	48-72 h	25 (96.2)	1 (3.8)	26 (100)		0.19[§]
	>72 h	32 (78)	9 (22)	41 (100)		0.012[§]
Total Mortality n (%)		161 (88.96)	20 (11.04)	181 (100)		

FNF: Femoral neck fracture, ITF: Intertrochanteric femur fracture, HT: Hypertension, DM: Diabetes mellitus, CAD: Coronary artery disease, COPD: Chronic Obstructive Pulmonary Disease, HF: Heart failure, TD: Thyroid Dysfunction CRF: Chronic renal failure

t: Independent Samples Test, u: Mann Whitney U Test, v: Pearson Chi-Square test

[¥]*Chi-Square Test – Fisher Exact p value*

[§]*Post Hoc Analysis was conducted to determine which surgical timing groups had significant differences and new p-value were determined with Bonferroni correction as 0.008. Posthoc analysis revealed no difference between surgical timing groups.*

Sibar K, Emet A, Akgun E, Tepedelenlioglu HE, Erdogan Y, Yurdakul T, Firat A. Surgical timing for proximal femur fractures is not affect early mortality: single center experience. Pam Med J 2025;18:…-…

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