

# Mortality and the Factors Affecting Patients Over 65 Age with Unstable Intertrochanteric Fractures Treated with Proximal Femoral Nail

## Proksimal Femur Çivisi ile Tedavi Edilen 65 Yaş Üstü İnstabil İntertrokanterik Kırıklarda Mortalite ve Etki Eden Faktörler

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### ABSTRACT

**Objective:** We aimed to investigate the factors affecting postoperative mortality associated with intertrochanteric femoral fractures in patients age 65 and older who were treated with osteosynthesis with a proximal femoral nail (PFN).

**Materials and Methods:** Patients were categorized and examined according to age, gender, pre-operative American Society of Anesthesiologist (ASA) scores, time of surgery and type of anesthesia. Patients with more than two systemic additional diseases and an ASA of score 5 were not included in the study. Post-operative mortality results and the factors associated with mortality were investigated.

**Results:** Thirty-one patients (36.1%) were male and 55 (63.9%) were female. The mean age was 78.31 years and forty-eight of the patients were under 80 years old (55.8%) and 38 were over 80 years old (44.2%). According to the Jensen fracture classification, 35 (40.6%) of the patients were evaluated as type 3, 15 (17.4%) patients were type 4 and 36 (42%) patients were type 5. The ASA score was used for preoperative risk assessment. Thirty (34.8%) patients had an ASA score of 1-2, while 56 (65.2%) had an ASA score of 3-4. Patients were categorized as "3 days before" or "3 days after" according to the time of surgery, and the mean time to surgery was 3.7 days. The type of anesthesia was classified as general and regional with 65 patients (75.5%) operating under regional anesthesia and 21 patients (24.4%) under general anesthesia. After a mean follow-up of 18 months, the mortality rate was 20.9% (18/86). Mortality was significantly higher in patients over 80 years old (36.8% vs 8.3%, p=0.004).

**Conclusion:** Patients 80 years and older are at serious risk for mortality when they have unstable trochanteric fractures treated with PFN. These patients are at especially high risk for mortality within the first year and should be monitored closely.

**Keywords:** Intertrochanteric fractures, mortality, age, proximal femoral nail

### ÖZ

**Amaç:** Çalışmamızda proksimal femur çivisi (PFN) ile cerrahi tedavi yapılan 65 yaş üstü intertrokanterik femur kırıklarında post operatif dönemde mortalite sonuçlarını ve etki eden faktörleri araştırmayı amaçladık.

**Gereç ve Yöntemler:** Hastalar yaş, cinsiyet, preoperatif Amerikan Anestezistler Derneği (ASA) skoru, ameliyata alınma zamanı ve anestezi tipine göre kategorize edilerek incelendi. Çalışmaya ikiden fazla komorbidite yaratacak ek hastalığı olanlar ve ASA 5 hastalar dahil edilmedi. Postoperatif dönem mortalite sonuçları ile beraber mortaliteye etki eden faktör ilişkisi araştırıldı.

**Bulgular:** Hastaların 31'i (%36,1) erkek, 55'i (%63,9) kadındı. Ortalama yaş 78,31 olarak hesaplandı. Bunlardan 48'i 80 yaş ve altı (%55,8), 38'i 80 yaş üstü (%44,2) idi. Evans-Jensen kırık sınıflamasına göre hastalarda, 35 (%40,6) tip 3, 15 (%17,4) tip 4, 36 (%42) tip 5 mevcuttu. Preoperatif risk değerlendirmesi olarak ASA skoru kullanıldı ve 30 (%34,8) hasta ASA 1-2, 56 (%65,2) hasta ASA 3-4 olduğu görüldü. Hastalar operasyona alınma zamanına göre 3 gün ve öncesi ile 3 gün sonrası olmak üzere kategorize edildi ve ortalama ameliyata alınma zamanı 3,7 gün olarak ölçüldü. Anestezi tipi genel ve rejyonel olarak ikiye ayrılarak incelendi ve 65 hastanın (%75,5) rejyonel anestezi ve 21 hastanın (%24,4) genel anestezi aldığı görüldü. Ortalama 18 ay takip sonunda mortalite oranı %20,9 (18/86) olduğu görüldü. Seksen yaş üstü hastalarda mortalitenin 80 yaş ve altına göre belirgin olarak yüksek olduğu görüldü (%36,8-%8,3; p=0,004).

**Sonuç:** Seksen yaş üstünün PFN ile tedavi edilen instabil trokanterik kırıklarda mortalite için ciddi risk faktörü olduğunu düşünüyoruz. Ayrıca bu hastaların ilk 1 yıl içinde mortalite açısından risk altında olduğunu ve yakın takip edilmesi gerektiği kanaatindeyiz.

**Anahtar kelimeler:** Intertrokanterik kırıklar, mortalite, yaş, proksimal femur çivisi

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## INTRODUCTION

Trochanteric femoral fractures are the most commonly treated orthopedic injuries. They frequently occur in the elderly because of low-energy trauma and in young people following high-energy trauma, and approximately half of these injuries are unstable fractures (1). Physicians experience challenges related to the prevention, treatment, and functional recovery of trochanteric fractures. These difficulties include mortality, morbidity, and high costs, which are increasing in unstable and displaced intertrochanteric fractures (2). Mortality increases during the first year after a hip fracture occurs. While mortality rates have been reported to range between 15% to 25% in women over 70 years of age, hip fractures are estimated to lead to an additional nine deaths per 100 patients (3,4).

High mortality and morbidity rates were reported following conservative treatment for intertrochanteric fractures. Thus, treatment with conservative methods has been abandoned except for special cases. Horowitz et al. reported a mortality rate of 34.6% when patients were treated with traction and 17.5% when patients underwent internal fixation for intertrochanteric fractures. Surgical treatment and early weight-bearing exercises are accepted as the standard approach for the treatment of intertrochanteric fractures. Rigid internal fixation methods are therefore considered to be the first choice in surgical treatment (5).

The aim of this study was to examine the mortality rates and factors affecting mortality in 86 patients over 65 years of age suffering from unstable intertrochanteric femoral fractures following surgical treatment with proximal femoral nail (PFN).

## MATERIAL AND METHODS

We retrospectively examined 86 patients over 65 years of age with unstable intertrochanteric femoral fractures, who underwent surgical osteosynthesis in our hospital between 2013 and 2016 (Figure 1a-c). Patients excluded from study included those who were under 65 years of age, were bedridden before suffering the fracture, had pathological fractures, and experienced more than two diseases that would cause co-morbidities, a non-fall trauma, stable fractures according to the Jensen fracture classification, and additional fractures other than intertrochanteric femoral fractures. The patients surgically treated with any implants other than the antirotator nail of the Turkish Spinal Trauma (TST) Company or the proximal nail with

compression (APFN, TST Medical Instruments Ind. Trade Co. Ltd., İstanbul, Turkey) were also excluded from the study.

All patients were contacted using their medical records. If the patient was not alive, the time of death after surgery was recorded. For the analysis, patients were categorized as "patients aged 80 years and older" and "patients over 80 years old."

The operative risk score of the American Society of Anesthesiologists (ASA) was determined for each patient according to the preoperative evaluation of the anesthesiologist, and the patients were classified into one of two ASA classification groups: low (class 1 or 2) or high (class 3 or 4). Timing in relation to the surgery was categorized as "3 days and before" or "3 days after." Patients were also categorized according to gender (female or male) and preferred type of anesthesia (regional or general).

Since our study was a retrospective folder scan study, no additional medical treatment was performed on the patients.

## Statistical Analysis

Data were presented as means, standard deviations, and percentages. Categorical data were analyzed using the chi-square test. The analyses were performed using IBM-SPSS 20 program (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). The level of significance was accepted as  $p < 0.05$  in all tests.

## RESULTS

We identified 102 potential participants for our study, but only 86 could be contacted. Thirty-one (36.1%) of the patients were male and 55 (63.9%) were female. The mean age was 78.31 years (male: 78.12 years; female: 78.41 years). The mean follow-up period was 18 months (1-36 months). According to the Jensen classification (6), 35 (40.6%) patients were type 3, 15 (17.4%) patients were type 4, and 36 (42%) patients were type 5. Stable type 1 and type 2 fractures were not included in the study. Forty-six (53.4%) patients had undergone right hip surgery and 40 (46.6%) patients had left hip surgery.

With respect to the mortality rates, it was found that 18 (20.9%) of 86 patients died, including 16 (88.8%) within the first year and two (11.2%) after 1 year. Thirty-eight (44.8%) patients were over 80 years old, and 48 patients (55.2%) were 80 years old or younger. Considering the

mortality-age relation, being over 80 years old constituted a significant risk factor compared to being younger than 80 years old (36.8%-8.3%,  $p=0.004$ ). Furthermore, 19.3% (6/31) of the male patients and 24.6% (12/55) of the female patients died. However, there was no statistically significant difference in terms of mortality ( $p=0.81$ ).

The average time before or after surgery was 3.7 days (1-15). Patients were divided into groups designated "operated 3 days after" or "operated 3 days before" according to the timing of the surgery (Table 1). The number of patients was 43 in both groups. There was no significant difference in terms of mortality rates between the two groups (11.6% vs. 30.2%;  $p=0.593$ ).

Patients were assessed according to the ASA scores during the preoperative period, and ASA 5 patients were excluded from the study. Thirty patients (34.8%) were ASA 1-2, and 56 patients (65.2%) were ASA 3-4 (Table 1). While the mortality rate was 10% (3/30) for ASA 1-2 patients, it was 26.78% (15/56) for ASA 3-4 patients. Although, there was no statistical difference between them ( $p=0.104$ ), it was remarkable that 83.3% (15/18) of the patients who died were ASA 3-4.

While 65 (75.5%) patients were operated on under regional anesthesia, general anesthesia was used in 21 (24.4%) patients (Table 1). Although mortality rates were lower in

patients operated on under regional anesthesia, there was no statistically significant difference (RA: 18.4%, GA: 28.5,  $p=0.378$ ).

## DISCUSSION

Intertrochanteric femoral fractures are often observed during the 6<sup>th</sup> and 8<sup>th</sup> decades of life, and they are associated with morbidity, a decrease in daily functions, and mortality in elderly patients (3). Although mortality rates range from 15-30%, femoral fractures in particular result in an increase in deaths within 1 year after the fracture occurs (3,4,7). Mortality, morbidity, and high costs are increasing in unstable and displaced intertrochanteric fractures (2). As higher mortality and morbidity rates have been reported following conservative treatment of intertrochanteric fractures, surgical treatment and early weight-exercises bearing are regarded as the standard approach (8). Intramedullary implants are preferred because of their biomechanical advantages for surgical treatment of instable trochanteric fractures, and many studies have reported satisfactory results after the use of such implants (9). In our study, we retrospectively evaluated 86 patients over 65 years of age with unstable trochanteric fractures, who were operated on with PFN. Mortality rates and factors affecting mortality during the post-operative period were evaluated.

**Table 1:** Analysis of risk factors affecting mortality

Risk factors	Death		Mortality rate	p value
	No	Yes	%	
<b>Age (years)</b>				0.004
≤80	44	4	8.3%	-
>80	24	14	36.8%	-
<b>Type of anesthesia</b>				0.378
Regional	53	12	18.4%	-
General	15	6	28.5%	-
<b>Time of operation (days)</b>				0.0593
≤3	38	5	11.6%	-
>3	30	13	30.2%	-
<b>ASA classification</b>				0.104
ASA 1-2	27	3	10%	-
ASA 3-4	41	15	26.7%	-
<b>Gender</b>				0.810
Female	43	12	21.8%	-
Male	25	6	19.3%	-

ASA: American Society of Anesthesiologist

According to the literature, intertrochanteric fractures are two times more common in females than males (8). Our study consisted of 31 (36.1%) male and 55 (63.9%) female patients. Considering the mortality rates, it was found that there was no significant difference between male and female patients (male: 24.6%, female: 19.3%,  $p=0.81$ ).

The effect of the timing before and after surgery on mortality remains controversial. In the elderly, it is a generally accepted standard to observe patients preoperatively for 12-24 hours and perform the surgery after the medical condition is corrected (7,8). Zuckerman reported that over 3 days of delay before surgery doubled the likelihood of mortality during the first year (10). McGuire et al. reported that mortality changed by 15% between fixations performed before and after 2 days (11). Despite studies reporting that delaying surgery for more than 2 days increased mortality during the first year, no correlation between waiting time and postoperative mortality was reported in more recent publications (12,13). According to the results of a retrospective study involving patients aged 60, the time before the surgery had no effect on the mortality of patients whose medical conditions were corrected, and it was concluded that the treatment of medical co-morbidities was an advantage (14). In our study, the average time until surgery was 3.7 (1-15) days. All the patients underwent surgery after stabilizing their medical conditions. Patients were evaluated at  $\leq 3$  days and  $>3$  days from the time of surgery. The number of patients was equal in both groups, and there was no significant difference in terms of mortality (11.6% vs. 30.2%,  $p=0.593$ ).

In a 2-year prospective study of 1.944 patients with hip fractures, mortality was significantly higher in patients with ASA scores of 3-4 (15), and in a retrospective review, ASA 3-4 patients aged between 65 and 84 years had a higher mortality rate after a hip fracture occurred (16). In our study, patients were evaluated according to the ASA classification and those with an ASA score of 5 were excluded. Thirty (34.8%) patients scored as ASA 1-2, and 56 (65.2%) were ASA 3-4. Although there was no significant relationship between the two groups in terms of mortality, 83.3% (15/18) of the patients who died had an ASA score of 3-4.

In a study involving 9.525 patients, O'Hara et al. did not find any difference in the mortality rates of patients who were operated on under general or spinal anesthesia (17). In another study comparing regional and general anesthesia,

postoperative mortality and complication rates were found to be significantly higher in general anesthesia patients (18). In our study, 65 (75.5%) patients were operated on under regional anesthesia and 21 (24.4%) under general anesthesia. While the mortality rate was 28.5% in the general anesthesia patients, it was 18.4% in regional anesthesia patients. There was no significant relationship between anesthesia type and mortality ( $p=0.378$ ).

The majority of intertrochanteric fractures occur after the age of 70 (8,19). In a study involving 217 patients with hip fractures, Lin et al. identified trochanteric fractures and being over 80 years of age as risk factors for mortality (20). In another study of 143.595 retrospectively evaluated patients with hip fractures, Wang et al. found that mortality rates increased significantly within the first year in patients over age 80 (21). In our study, the mean age of 86 patients over 65 years of age was 78.31 years (65-102 years). Patients were evaluated as  $<80$  years and  $\geq 80$  years. While the mortality rate of 48 patients aged 80 years old and less was 8.3% (4/48), it was 36.8% (14/38) in 38 patients over age 80, which was statistically significant ( $p=0.004$ ). This suggests that 80 years of age is a serious risk factor for mortality in patients with unstable trochanteric fractures.

Mortality rates in intertrochanteric fractures range from 15-30% (8.21) and they most often occur within the first year (21-24). Moran et al. observed 9% mortality rates during the first month, 19% within the first 3 months, and 30% within the first year (24). Davidson et al. observed a mortality rate of 26% within 1 year after a hip fracture occurred (25). In our study, a mortality rate of 86 patients with a mean follow-up of 18 months was 20.9% (18/86). Furthermore, 77.8% (14/18) of the patients died within the first year ( $p=0.007$ ), and this was consistent with the literature.

## CONCLUSION

Being over the age of 80 is a serious risk factor for mortality in patients with unstable trochanteric fractures after treatment with a PFN. These patients are also at a higher risk of mortality within the first year and should be monitored closely.

**Ethics Committee Approval:** Since this study is based on non-invasive and retrospective clinical research, ethics committee approval could not be taken, however, administrative leave letter related to study was taken from the hospital.

**Informed Consent:** Is not taken as no personal data of any patient was used.

### Authorship Contributions

Surgical and Medical Practices: Ö.C., F.D., Concept: Ö.C., N.D., Design: H.H.C., Ö.C., Data Collection or Processing: Ö.C., N.D., Literature Search: Ö.C., N.D., Writing: Ö.C., N.D., F.D.

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