

Sarcopenia and Osteoporosis: Two Factors Affecting Hip Fracture Mortality in the Elderly

Sarkopeni ve Osteoporoz: Yaşlılarda Kalça Kırığı Mortalitesini Etkileyen İki Faktör

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ABSTRACT

OBJECTIVE: Sarcopenia and osteoporosis the leading causes of hip fractures in elderly patients. This study aimed to evaluate the effects of sarcopenia related to psoas muscle index and osteoporosis obtained by T score on mortality in hip fracture patients.

MATERIALS AND METHODS: This retrospective cross-sectional study examined 236 patients after a hip fracture. The patients were sarcopenic and nonsarcopenic according to the psoas muscular index; According to the femoral neck T score in Dual Energy X-ray Absorptiometry, patients were grouped as low (<-2.5) and high (≥-2.5) and compared. Statistically significant variables associated with 30 days and one-year mortality were analyzed using logistic regression analysis.

RESULTS: Eighty-four (35.6%) patients were in the sarcopenia group, and 152 (64.4%) were in the non-sarcopenia group. Ninety-two (38.9%) patients were in the low group, and 152 (61.1%) were in the high group. In the sarcopenia and the low T score groups, the frequency of females, ≥65 years, comorbid disease, intensive care unit requirement, and complications rates were significantly higher. The survival rate was significantly lower ($p<0.05$). Female gender [odds ratio (OR): 2.97, 95% confidence interval (CI): 1.17-7.54], sarcopenia (OR: 3.65, 95% CI: 1.68-7.91), low T score (OR: 2.62, 95% CI: 1.23-5.62), intensive care unit requirement (OR: 2.32, 95% CI: 1.09-4.92) and presence of postoperative complications (OR: 2.89, 95% CI: 1.32-6.36) are significant risk factors for 1-month mortality; female gender (OR: 2.04, 95% CI: 1.06-3.94) and presence of sarcopenia (OR: 2.24, 95% CI: 1.22-4.09) are risk factors for 1-year mortality ($p<0.05$).

CONCLUSION: Detection of sarcopenia and osteoporosis in elderly patients at the early stage and correction of modifiable factors are of great importance in improving postoperative outcomes and reducing mortality.

Keywords: Hip fractures, sarcopenia, osteoporosis, postoperative outcomes, mortality

Öz

AMAÇ: Sarkopeni ve osteoporoz yaşlı hastalarda kalça kırıklarının önde gelen nedenleri arasındadır. Bu çalışmada kalça kırığı hastalarında, psoas kas indeksine bağlı sarkopeni ve T skoru ile elde edilen osteoporozun mortalite üzerine etkisinin değerlendirilmesi amaçlandı.

GEREÇ ve YÖNTEM: Bu retrospektif kesitsel çalışmada kalça kırığı sonrası 236 hasta incelendi. Hastalar psoas kas indeksine göre sarkopenik olan ve sarkopenik olmayan şeklinde; Dual-Energy X-ray Absorptiometry femur boynu T skoruna göre düşük (<-2,5) veya yüksek (≥-2,5) T skoru olarak gruplandırıldı ve karşılaştırıldı. Otuz günlük ve bir yıllık mortalite ile ilişkili istatistiksel olarak anlamlı değişkenler belirlendi ve lojistik regresyon analizi kullanılarak analiz edildi.

BULGULAR: Sarkopeni grubunda 84 (%35,6), sarkopeni olmayan grupta 152 (%64,4) hasta vardı. T skoru düşük grupta 92 (%38,9), yüksek grupta 152 (%61,1) hasta mevcuttu. Sarkopeni ve düşük T skor gruplarında ≥65 yaş, kadın cinsiyet, ek hastalık varlığı, cerrahi sonrası yoğun bakım ünitesi takibi ihtiyacı ve cerrahi sonrası cerrahi komplikasyon oranları anlamlı olarak daha yüksekti. Hem sarkopeni hem de T skoru düşük grupta sağkalım oranı anlamlı olarak daha düşüktü ($p<0,05$). Kadın cinsiyet [olasılık oranı (OO): 2,97, %95 güven aralığı (GA): 1,17-7,54], sarkopeni (OO: 3,65, %95 GA: 1,68-7,91), düşük T skoru (OR: 2,62, %95 GA: 1,23-5,62) ve cerrahi sonrası komplikasyon varlığı (OO: 2,89, %95 GA: 1,32-6,36) 30 günlük mortalite için bağımsız risk faktörleriyken; 1 yıllık mortalitede sadece kadın cinsiyet (OO: 2,04, %95 GA: 1,06-3,94) ve sarkopeni varlığı (OO: 2,24, %95 GA: 1,22-4,09) bağımsız risk faktörleri ($p<0,05$) olarak gözlemlendi.



SONUÇ: İleri yaş hastalarda sarkopeni ve osteoporozun en erken dönemde saptanması ve değiştirilebilir faktörlerin düzeltilmesinin cerrahi sonrası sonuçların iyileştirilmesi ve mortalitenin azaltılmasında büyük önem taşımaktadır.

Anahtar Kelimeler: Kalça kırığı, sarkopeni, osteoporoz, psoas kas indeksi, mortalite

INTRODUCTION

Globally, hip fractures are among the most common musculoskeletal pathologies in the population over 65 (1). Hip fracture is a significant public health problem due to the increase in life expectancy in parallel with the developments in medicine, as well as high morbidity, disability, mortality, and health costs (2). One-year mortality rates reach up to 30% (3). In addition, while approximately half of the survivors lose their functional independence, one-third become entirely dependent (4). While hip fracture rates are decreasing in Western and developed countries, it is increasing in Turkey (5,6).

Most factors associated with functional recovery of elderly hip fractures are specific to the patient's baseline characteristics, including their biological, sociodemographic, or functional capacity (7). Among these factors, various factors affect postoperative recovery. Among the risk factors known as general opinion are advanced age, female gender, osteoporosis, and comorbid diseases (8). However, anemia, cognitive impairment, and Parkinson's disease are among the factors related to discharge (9). In addition, sarcopenia, which has been associated with physical disability and increased functional impairment in recent years and has been shown among the risk factors for falls, is of great importance in patients with hip fractures (10,11).

The term sarcopenia consists of the Greek words sarx (flesh) and penia (loss) (12). In recent years, interest in sarcopenia has increased considerably, and this increased interest is due to its association with adverse outcomes, including decreased ability to function in activities of daily living, mobility impairments, increased risk of falls, poor quality of life, and decreased life expectancy (13). In 2010, the European Working Group on Sarcopenia in Older People (EWGSOP) recommended low muscle mass and low muscle function for diagnosing sarcopenia (14). Although there are numerous studies on the relationship between sarcopenia and osteoporosis, there is insufficient data on the association of these two factors with postoperative complications and mortality in elderly patients with hip fractures.

Therefore, this study aims to evaluate the relationship between sarcopenia and osteoporosis in hip fracture in accordance with the clinicopathological data of patients and examine the effects of these two parameters on postoperative results. We hypothesize that the decrease in muscle mass and bone density with age and the sarcopenia that develops accordingly predispose to hip fracture and adversely affect the postoperative results.

MATERIAL & METHODS

Patient Selection

The data of patients operated on for traumatic hip fracture in Çankırı State Hospital, Clinic of Orthopedics and Traumatology between January 2018 and December 2022 were analyzed in a single-center cross-sectional retrospective study design. The study protocol was approved by the Karatekin University Ethical Committee (date: 06.11.2023, no: 9).

Patients who underwent surgery for hip fracture had preoperative abdominopelvic computed tomography, psoas muscle area measurement at lumbar vertebra level for sarcopenia assessment, and bone densitometry measurement in the preoperative period and had complete data included in the study.

Patients who underwent surgery for bone malignancy had a history of malignancy in any part of the body other than bone, did not have preoperative abdominopelvic computed tomography (CT), could not measure psoas area in CT, did not measure femur neck T score in bone densitometry and had missing data were excluded from the study.

Data Collecting

Demographic data of patients (age, gender), anthropometric measurements, preoperative abdominopelvic CT images, preoperative Charlson comorbidity index, American Society of Anesthesiologists score, preoperative femur-neck T score, psoas muscle index (PMI), fracture type, operation timing (emergency, elective), surgical technique, intensive care unit requirement, presence of postoperative complications,

length of hospital stay, and 30-day and one-year survival were recorded.

Study Design

The PMI score of the patients was calculated. According to the PMI cut-off value, the patients were grouped as sarcopenia and non-sarcopenia and compared. According to the femoral neck T score in Dual Energy X-ray Absorptiometry (DEXA), patients were grouped as low (<-2.5) and high (≥-2.5) and compared. Patients were grouped as dead and alive according to their postoperative survival status (30-days and one-year) and compared. Risk factors affecting overall survival were determined.

Anthropometric Measurements

The patient's height (meters) and body weight (kilograms) were measured. Body mass index was calculated with the formula "body weight (kg)/height squared (m^2)". Data were obtained from the patient follow-up file.

Dual Energy X-ray Absorptiometry (DEXA) and Femur Neck T Score

DEXA uses a source that produces X-rays, a detector, and an interface with a computer system to display scanned areas of interest. The relevant, effective radiation doses are small ($1-7 \mu Sv$) (15). DXA is essential compared to other bone density methods because of its high accuracy, simplicity, usability, and relatively low cost and radiation exposure. In addition, unlike most other body composition methods designed to measure a single whole-body component, DEXA allows for quantifying multiple whole-body and regional components. Thanks to these advantages, it is widely used in bone density measurement in all body bones, vertebrae, and femur neck (16).

Psoas Muscular Index and Sarcopenia Detection

PMI was used to detect the presence of sarcopenia. In the preoperative abdominopelvic CT, bilateral psoas muscle area measurement was performed at the level of the L3 vertebra. PMI was calculated with the sum of the psoas area (right psoas area + left psoas area)/height squared (Figure 2). Studies with PMI sarcopenia cut-off values were taken as references. The cut-off value for PMI sarcopenia was ≤ 5.3 for men and ≤ 3.6 for women (17).

Statistical Analysis

The mean and standard deviation values were used in the data analysis while making the continuous data statistics. Frequency (n) and percentage (%) values were used to define categorical variables. Student's t-test was used to compare the means of two groups in continuous measurements. The chi-square test was used to evaluate the relationship between categorical variables. In order to evaluate the clinical status effectiveness on overall survival at the end of the postoperative 30-day and one-year, logistic regression analysis was performed with the statistically significant variables using backward and enter methods. The statistical significance level of the data was taken as $p < 0.05$. The data evaluation used www.e-picos.com New York software and MedCalc statistical package program.

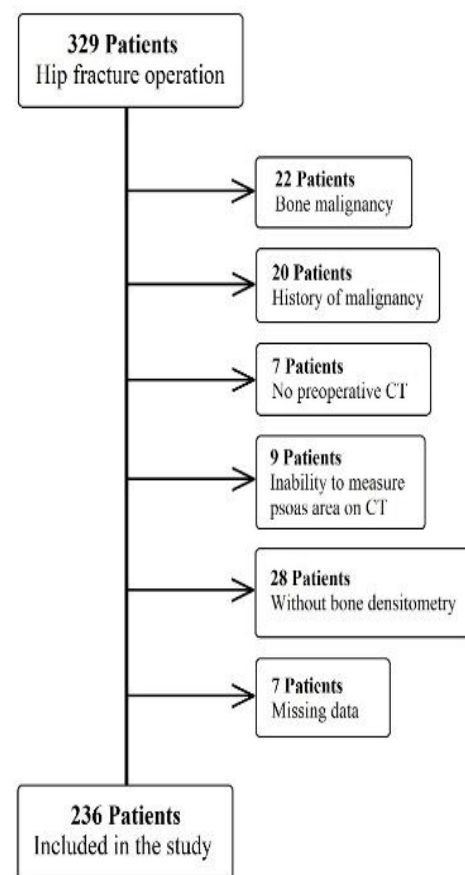


Figure 1. Flowchart-patients included and excluded from the study

CT: Computed tomography

RESULTS

During the study, 329 patients underwent hip joint surgery due to trauma in our clinic. In addition, 22 patients operated on for bone malignancy, 20 patients with a history of malignancy, seven patients without preoperative abdominopelvic CT, nine patients without psoas area measurement on CT, 28 patients without bone densitometry, and seven patients with missing data were excluded from the study (Figure 1).

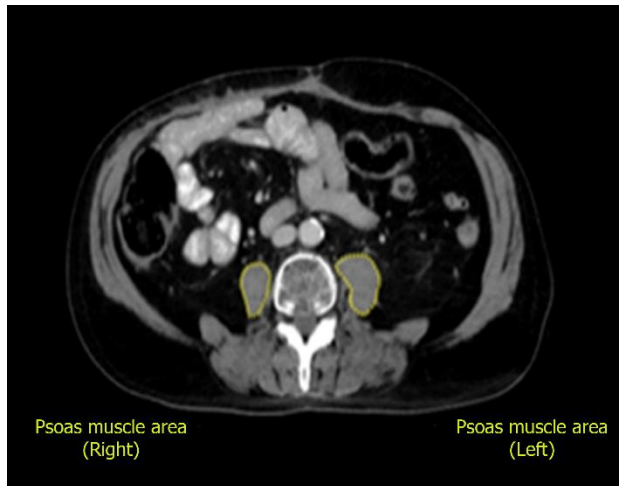


Figure 2. Calculation of psoas muscular index

Two hundred thirty-six patients were included in the study. Of the patients, 147 (62.3%) were female, and 89 (37.7%) were male. The mean age was 70.12 ± 10.24 years. The

patients' demographic, preoperative, and postoperative clinical data are summarized in Tables 1, 2.

Postoperative complications were evaluated separately as surgical and medical complications. In some patients, several complications were seen together. Postoperative surgical complications were sciatic nerve injury in two patients, dislocation in seven patients, surgical site infection in eight patients, and loosening in two patients. As postoperative medical complications, cardiovascular disease in 16 patients, thromboembolism in 4 patients, pulmonary infection in 8 patients, extra-pulmonary infections in 11 patients, and different complications in 17 patients.

The patients were divided into two groups sarcopenia and non-sarcopenia. According to the PMI cut-off values, 84 (35.6%) patients were in the sarcopenia group, and 152 (64.4%) were in the non-sarcopenia group. The mean age, CCI, and length of hospital stay were statistically significantly higher in the sarcopenia group than in the non-sarcopenia group, while the mean PMI was lower ($p < 0.05$). In addition, compared to the non-sarcopenia group, the frequency of females ≥ 65 years, comorbid disease, low T score, ICU requirement, postoperative complications, and surgical complications were significantly higher in the sarcopenia group.

Table 1. Preoperative demographic and clinical data of the groups according to PMI and T score

	All Patient (n=236)	Sarcopenia Group (n=84)	Non-Sarcopenia Group (n=152)	p value	Low T Score Group (n=92)	High T Score Group (n=144)	p Value
	x $\pm$ SD	x $\pm$ SD	x $\pm$ SD		x $\pm$ SD	x $\pm$ SD	
Age (year)	70.12 $\pm$ 10.24	72.12 $\pm$ 9.52	67.49 $\pm$ 8.91	<0.001	72.49 $\pm$ 8.17	69.91 $\pm$ 7.89	0.016
BMI (kg/m ²)	28.43 $\pm$ 5.62	27.89 $\pm$ 5.49	28.56 $\pm$ 4.41	0.308	28.11 $\pm$ 6.01	28.62 $\pm$ 4.56	0.461
CCI	10.12 $\pm$ 3.42	11.12 $\pm$ 3.72	8.47 $\pm$ 2.19	<0.001	13.01 $\pm$ 4.51	9.82 $\pm$ 3.37	<0.001
PMI							
Female	3.67 $\pm$ 0.72	3.11 $\pm$ 0.39	4.05 $\pm$ 0.61	<0.001	3.45 $\pm$ 0.61	3.82 $\pm$ 0.89	<0.001
Male	5.64 $\pm$ 1.08	5.07 $\pm$ 0.76	5.89 $\pm$ 0.84	<0.001	5.51 $\pm$ 0.99	5.69 $\pm$ 1.02	0.152
	n (%)	n (%)	n (%)		n (%)	n (%)	

Gender							
Female	147 (62.3)	62 (73.8)	85 (55.9)	0.007	69 (75)	78 (54.2)	<0.001
Male	89 (37.7)	22 (26.2)	67 (44.1)		23 (25)	66 (45.8)	
Age Group							
<65	45 (19.1)	10 (11.9)	35 (23.1)	0.037	11 (11.9)	34 (23.6)	0.026
≥65	191 (80.9)	74 (88.1)	117 (76.9)		81 (88.1)	110 (76.4)	
Comorbid Disease							
Yes	201 (85.2)	78 (84.8)	123 (80.9)	0.013	78 (84.8)	123 (85.4)	0.894
No	35 (14.8)	6 (15.2)	29 (19.1)		14 (15.2)	21 (14.6)	
ASA							
I	12 (5.1)	2 (2.4)	10 (6.6)	0.125	6 (6.5)	6 (4.2)	0.153
II	37 (15.7)	10 (11.9)	27 (17.8)		8 (8.7)	29 (20.2)	
III	138 (58.5)	50 (59.5)	88 (57.9)		56 (60.9)	82 (56.9)	
IV	40 (16.9)	16 (19.1)	24 (15.8)		17 (18.5)	23 (15.9)	
V	9 (3.8)	6 (7.1)	3 (1.9)		5 (5.4)	4 (2.8)	
Presence of Sarcopenia							
Sarcopenia	84 (35.6)	84 (100)		-	43 (46.7)	41 (28.5)	0.004
Non-sarcopenia	152 (64.4)		152 (100)		49 (53.3)	103 (71.5)	
T-score							
Low	92 (38.9)	48 (57.1)	44 (28.9)	<0.001	92 (100)	-	
High	144 (61.1)	36 (42.9)	108 (71.1)		-	144 (100)	
Fracture Type							
Femoral Neck	127 (53.8)	40 (47.6)	87 (57.2)	0.156	43 (46.7)	84 (58.3)	0.081
Intertrochanteric	109 (46.2)	44 (52.4)	65 (42.8)		49 (53.3)	60 (41.7)	

ASA: American Society of Anesthesiologists, BMI: body mass index, CCI: Charlson comorbidity index, PMI: psoas muscle index

Table 2. Postoperative clinical data of the groups according to PMI and T score

	All Patient (n=236)	Sarcopenia group (n=84)	Non-Sarcopenia Group (n=152)	p Value	Low Group (n=92)	High Group (n=144)	p Value
	x ± SD	x ± SD	x ± SD		x ± SD	x ± SD	
Length of Hospital Stay (Days)	12.57±5.91	14.56±5.21	11.47±4.88	<0.001	13.99±5.51	11.63±5.02	<0.001

	n (%)	n (%)	n (%)		n (%)	n (%)	
Operation Timing							
Emergent	217 (91.2)	74 (88.1)	143 (94.1)	0.106	84 (91.3)	133 (92.4)	0.771
Elective	19 (8.8)	10 (11.9)	9 (5.9)		8 (8.7)	11 (7.6)	
Operation Technique							
Internal Fixation	112 (47.5)	39 (46.4)	73 (48.0)	0.511	46 (50.0)	66 (45.8)	0.216
Hemiarthroplasty	86 (36.4)	34 (40.5)	52 (34.2)		36 (39.1)	50 (34.7)	
Total Hip Replacement	38 (16.1)	11 (13.1)	27 (17.8)		10 (10.9)	28 (19.5)	
ICU Requirement							
Yes	84 (35.6)	39 (46.4)	45 (29.6)	0.010	35 (38.1)	49 (34.0)	0.530
No	152 (64.4)	45 (53.6)	107 (70.4)		57 (61.9)	95 (66.0)	
Postoperative Complication							
Yes	52 (22.1)	25 (29.8)	27 (17.8)	0.033	28 (19.4)	24 (16.7)	0.013
No	184 (77.9)	59 (70.2)	125 (82.2)		64 (80.6)	120 (83.3)	
Postoperative Surgical Complication							
Yes	10 (4.2)	7 (8.3)	3 (1.9)	0.020	7 (7.6)	3 (2.1)	0.040
No	226 (95.8)	77 (91.7)	149 (98.1)		85 (92.4)	141 (97.9)	
Postoperative Medical Complication							
Yes	50 (21.2)	18 (21.4)	32 (21.1)	0.946	19 (20.7)	31 (21.5)	0.872
No	186 (78.8)	66 (78.6)	120 (78.9)		73 (79.3)	113 (78.5)	
30-day Mortality	32 (13.5)	18 (21.4)	14 (9.2)	0.009	16 (17.4)	16 (11.1)	0.149
1-year Mortality	58 (24.6)	29 (34.5)	29 (19.1)	0.008	25 (27.2)	33 (22.9)	0.022

PMI: psoas muscle index, ICU: intensive care unit

The frequency of survival (30 days and one year) was significantly lower ($p<0.05$). There was no significant difference between the sarcopenia and non-sarcopenia groups in terms of other parameters ($p>0.05$) (Table 1, 2). According to the femoral neck T score, the patients were

divided into low and high groups. Ninety-two (38.9%) patients were in the Low group, and 152 (61.1%) were in the high group. The mean age, CCI, and length of hospital stay were statistically significantly higher in the low group than in the high group, while the mean PMI was lower ($p<0.05$).

In the low group, compared to the high group, the frequency of females ≥ 65 years, sarcopenia, postoperative complications, and surgical complications was significantly higher. In addition, the postoperative 30-day survival rate was significantly lower ($p < 0.05$). There was no significant difference between the low and high groups in terms of other parameters ($p > 0.05$) (Tables 1, 2).

Patients were divided into two groups, alive and dead, according to their postoperative 30-day and one-year survival. In the postoperative 30-day mortality evaluation, 204 (86.5%) patients were alive, and 32 (13.5%) were dead. Women, sarcopenia, low T score, ICU requirement, and postoperative complications were significantly higher in the dead than in the alive group ($p < 0.05$). However, there was no significant difference between the groups in terms of 30-day survival in terms of other parameters ($p > 0.05$) (Table 3).

In the postoperative 1-year mortality evaluation, 178 (75.4%) patients were alive, and 58 (24.6%) were dead. The frequency of women and sarcopenia was significantly higher in the dead group than in the alive group ($p = 0.032$, $p = 0.008$, respectively). There was no significant difference between the groups in terms of one-year survival in terms of other parameters ($p > 0.05$) (Table 3).

For postoperative one-month mortality, female gender [odds ratio (OR): 2.97, 95% confidence interval (CI): 1.17-7.54] and sarcopenia (OR: 3.65, 95% CI: 1.68-7.91), low T score (OR: 2.62, 95% CI: 1.23-5.62), ICU requirement (OR: 2.32, 95% CI: 1.09-4.92) and presence of postoperative complications (OR: 2.89%, 95% CI: 1.32-6.36) were significant risk factors ($p < 0.05$). For postoperative one-year mortality, female gender (OR: 2.04, 95% CI: 1.06-3.94) and presence of sarcopenia (OR: 2.24, 95% CI: 1.22-4.09) was a significant risk factor ($p < 0.05$) (Table 4).

DISCUSSION

In the current study, patients who were operated on for hip fractures were examined, and 1-month and 30-day mortality and postoperative complications were compared between the groups according to sarcopenia due to PMI and osteoporosis status obtained according to the T score of the patients.

While 1-year mortality was seen in 58 (24.6%) patients, 1-month mortality was observed in 32 (13.56%) patients. In multivariate analysis, the sarcopenic group and female gender due to PMI were necessary for 1-year and 30-day mortality; low T score, ICU requirement, and postoperative complications are among the factors affecting 30-day mortality.

Table 3. Comparison of groups according to postoperative survival (30-day and one-year)

	All Patient (n=236)	30-day Mortality (n=32)	p Value	One-year Mortality (n=58)	p Value
	n (%)	n (%)		n (%)	
Gender					
Female	147 (62.3)	26 (81.3)	0.020	43 (74.1)	0.032
Male	89 (37.7)	6 (18.7)		15 (25.9)	
Age Group					
<65	45 (19.1)	6 (18.7)	0.664	45 (77.6)	0.717
≥ 65	191 (80.9)	26 (81.3)		13 (22.4)	
Comorbid Disease					
Yes	201 (85.2)	27 (84.4)	0.892	52 (89.7)	0.268
No	35 (14.8)	5 (15.6)		6 (10.3)	
PMI					
Sarcopenia	84 (35.6)	20 (62.5)	0.001	29 (50)	0.008
Non-Sarcopenia	152 (64.4)	12 (37.5)		29 (50)	
T score					
Low	92 (38.9)	19 (59.4)	0.011	25 (43.1)	0.459
High	144 (61.1)	13 (40.5)		33 (56.9)	

Table 4. Multivariate analysis of the effect of clinical data on postoperative 30-day and one-year mortality status

	Odds Ratio	95% Confidence Interval	p Value
<i>For 30-Day Mortality</i>			
Gender (Female)	2.97	1.17-7.54	<0.05
PMI (Sarcopenia)	3.65	1.68-7.91	<0.05
T score (Low)	2.62	1.23-5.62	<0.05
ICU (Yes)	2.32	1.09-4.92	<0.05
Postoperative Complication (Yes)	2.89	1.32-6.36	<0.05
<i>For One-Year Mortality</i>			
Gender (Female)	2.04	1.06-3.94	<0.05
PMI (Sarcopenia)	2.24	1.22-4.09	<0.05

PMI: Psoas muscle index, ICU: Intensive care unit, odds ratio, $p < 0.05$

The term sarcopenia was first described by Rosenberg et al. (18) in 1989 as a degenerative loss in skeletal muscle mass and strength. After understanding the pathophysiology of sarcopenia in line with the studies conducted in recent years, its importance is increasing day by day due to its effect on the aging society and its close relationship with the clinical results of the disease. It is known that a sarcopenic state is associated with impaired cardiopulmonary performance, weakened cognitive functions, greater risk of falling, and thus fracture risk, physical disability, and death (19,20). In addition, the hospital cost of patients with sarcopenia in hospitalized patients is 5-fold higher than those without sarcopenia (21).

In the current study, sarcopenia was detected in 84 (35.59%) of 236 patients who were operated for hip fracture. In patients with sarcopenia, 30-day, and 1-year mortality rates were observed in 18 (21.4%) and 29 (34.5%) patients, respectively. In addition, while 30-day mortality increased 3.65 times in the sarcopenic group, it was found that 1-year mortality increased 2.24 times. A recent study involving 913 people aged 63-67, similar to ours, showed that low muscle mass increased the risk of fracture 2-fold for three years (22). Similarly, another study reported that the EWGSOP definition of sarcopenia fracture risk was higher than the patient group without sarcopenia (heart rate: 0.94, 95% CI: 0.54-1.64) (23).

In this study, most patients with hip fractures were female. In addition, female patients have a higher prevalence of sarcopenia than male patients. However, contrary to the current study, it has been shown in various studies that the

male gender is a risk factor for increased hip fracture mortality. Low grip strength and muscle mass are more common in male patients with hip fractures than in females (24,25). However, in a study of 322 male and 435 female patients, the effect of sarcopenia on fractures in various parts of the body differed between men and women. In this study, sarcopenia was seen more in women with vertebral and hip fractures; sarcopenia is more common in men with ankle and hip fractures (26).

In the current study, 92 (38.9%) patients were in the low group according to the femoral neck T score. In the low group, the incidence of females ≥ 65 years of age, sarcopenia, postoperative complications, and surgical complications was significant. Similarly, a study involving 2,261 patients showed that lower T scores were directly related to a 1-year risk of hip fractures (27).

Studies show that both conditions are seen in similar populations when we evaluate the relationship between sarcopenia and osteoporosis in advanced age. A mechanical relationship exists between muscle and bone in sarcopenic individuals (28). The relationship between muscles and bones has been revealed more clearly with DEXA and cross-sectional imaging methods (29). While DEXA studies show positive relationships between muscle condition and bone mass and density, cross-sectional imaging methods have additionally shown that bone size and strength are associated with muscle size and, to a lesser extent, muscle strength (30). This study also has several limitations. First, the study was designed as a single center and retrospective.

Sarcopenin was performed only according to radiological measurements according to PMI, and functional parameters such as EWGSOP or ISarcoPRM criteria were not used. In addition, sarcopenia cut-off values were determined in accordance with the current literature data. Despite these limitations, the study also has strengths. Our study is the only study evaluating the effects of sarcopenia and osteoporosis on postoperative outcomes in hip fracture patients in the Turkish population.

CONCLUSION

In conclusion, sarcopenia and osteoporosis are age-related decreases in the amount of muscle and bone, respectively. Both are among the factors that cause disability, falls, and hip fractures in the elderly and directly affect the postoperative results. The incidence of sarcopenia and low T score is high in female patients over 65 and in patients with adverse postoperative outcomes. Therefore, especially in geriatric patients, the detection of these two conditions in the earliest period to be detected and the correction of the factors that can be corrected are crucial both in increasing the quality of life of the patients and in dealing with the development of adverse traumatic events and the resulting situations with less damage.

Ethic: The study protocol was approved by the Karatekin University Ethical Committee (date: 06.11.2023, no: 9).

Etik: Çalışma protokolü Karatekin Üniversitesi Etik Kurulu tarafından onaylandı (tarih: 06.11.2023, sayı: 9).

Yazar katkı durumu; Çalışmanın konsepti; MBU, OA, dizaynı; MBU, Literatür taraması; YE, MBU, verilerin toplanması ve işlenmesi; UD, OA, istatistik; OA, YUY, yazım aşaması; MBU, YUY, YP

Author contribution status; The concept of the study; MBU, OA, design; MBU, literature review; YE, MBU, collecting and processing data; UD, OA, statistics; OA, YUY, writing phase; MBU, YUY, YP

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