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Risk factors affecting mortality and patient survival in patients above 60 years undergoing hemiarthroplasty due to hip fracture

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Abstract

The aim of this study was to retrospectively determine the risk factors affecting mortality and survival after partial prosthesis treatment of proximal femoral fractures in elderly patients. In this study, patients aged 60 years and over who underwent hemiarthroplasty with the diagnosis of proximal fracture of the femur between 2013 and 2016 were evaluated retrospectively. 94 patients (58 females and 36 males) were included in the study. Age, gender, fracture type and side, Garden and Evans Scores, Singh Index, ASA values, additional diseases, when they were operated after falling, stem type used, anesthesia methods, hospitalization periods, survivors Harris hip scores, UCLA scores, Barthel Index and VAS scores a total of 17 parameters were evaluated. When the fracture types of the cases were examined, it was seen that 58 patients had intertrochanteric and 36 patients had collum femoris fracture. The mean time from the day of fracture to operation was calculated as 5.61. Hypertension, diabetes, and coronary artery diseases were the most common diseases. Sixty-four out of 94 patients died, and 30 were still alive during our study. It was seen that 11 of the patients died in the first month, 11 of them died between 1-6 months postoperatively and 93% (n = 28) of the patients still alive were operated on in the first 5 days after fracture. Hip fractures are a serious cause of mortality and morbidity in the elderly. Physical and mental capacity of the patients before fracture is one of the most important predictors of postoperative mortality and morbidity. The main goal is to return patients to their daily lives in the shortest possible time. ASA values and comorbidities were found to be important in postoperative mortality.

Keywords: aged, comorbidity, hip fractures, mortality, osteoporosis, complications, prognosis, quality of life, risk factors

1. Introduction

Nowadays, hip fractures are frequently seen especially in the elderly patient group as a result of the increase in life expectancy and the increasing population. Hip fractures are an important orthopedic problem that may vary depending on the age of the patient, the severity of the trauma, and the displacement degree of the fracture, especially for the elderly population (1).

Conservative treatment is not preferred in the elderly population due to complications. Thanks to changes in the field of anesthesia and reanimation and new surgical techniques, hip fractures are treated surgically. The aim of surgical treatment is early movement. Surgical treatment options are internal fixation and arthroplasty. It has been reported that arthroplasty results after internal fixation are less successful than primary arthroplasty. Arthroplasty is preferred to reduce the possibility of reoperation and to return the patient to his pre-fracture condition early (2, 3).

The aim of this study is to examine the relationship between mortality, preoperative and postoperative medical conditions and vital factors in patients over 60 years of age who underwent hemiarthroplasty for hip fracture.

2. Materials and Methods

2.1. Patients

Patients aged 60 and over who were surgically treated at the Orthopedics and Traumatology Clinic of Süleyman Demirel University Medical Faculty Research and Practice Hospital between 2013 and 2016 with a diagnosis of hip fracture were screened through the hospital information system. A total of 173 patients were identified. 79 patients who did not have radiological imaging in the system and who could not be reached by phone were excluded from the study. Patients who had imaging and epicrisis information in the system but could not be reached by phone were scanned through the MERNIS (Central Population Management System) system and those whose date of death was determined were included in the study. 94 patients included in the study or their relatives were called by phone and information about the patients' preoperative and postoperative conditions was obtained. When evaluating 94 patients, age, gender, fracture type and side, Garden and Evans Scores, Singh indexes, ASA (American Society of Anesthesiologists) values, additional diseases, when they were operated after the fall, type of stem used, anesthesia methods, hospitalization times, survivors' Harris hip scores,

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UCLA (University of California at Los Angeles) scores, Barthel Index for daily activity evaluation and VAS (Visual Analog Scale for pain) scores, a total of 17 objective parameters were evaluated.

All of the survivors who were called by phone applied to our hospital voluntarily and were examined and scored. All of the patients were operated in the lateral decubitus position with a modified Gibson incision.

2.2. Statistical analysis

IBM SPSS Statistic 22.00 statistics program was used for statistical analysis. The compatibility of the quantitative data to normal distribution was examined with the Kolmogorov Smirnov test. T test and One Way ANOVA test were used for variables suitable for normal distribution. Mann Whitney U and Krusskal Walls tests were used for variables not suitable for normal distribution. Chi-square analysis was used for statistical comparisons for categorical variables, and descriptive statistics were shown as frequency (%). Linear regression analysis was used for correlation analysis and partial correlation test was used for correlation analysis.

3. Results

In our study, 58 of 94 patients were female (61.7%) and 36 were male (38.3%). The average age of the patients was 80.5 (± 6.85); the mean age of male patients was 78.6 (± 7.51) and the average age of the female was 81.7 (± 6.16). When the mean ages of both genders were compared, it was seen that the mean age of female patients was statistically significantly higher (p = 0.029) (Table 1).

Table 1. Demographic characteristics of the patients

	Male (n=36) (%38.3)	Female (n=58) (%61.7)	Total	P value
Mean Age	78.6 (±7.51)	81.7 (±6.16)	80.5 (±6.85)	0.029*
Fracture type/side	**Right**	**Left**	**Total**	**P value**
Collum femoris	23	13	36	0.248
Intertrochanteric	30	28	58	
Total	53	41	94	
Sex/Fracture type	**Intertrochanteric**	**Collum Femoris**	**Total**	**P value**
Male	23	13	36	0.731
Female	35	23	58	
Mean age	82.29 (±5.74)	77.69 (±7.58)	80.5 (±6.85)	0.003**

Evans Classification						
Intertrochanteric	**1**	**2**	**3**	**4**	**5**	**Total**
	6	13	6	15	18	**58**

Garden Classification					
Collum Femoris	**1**	**2**	**3**	**4**	**Total**
	-	3	11	22	**36**

Singh İndex							
	1	**2**	**3**	**4**	**5**	**P value**	**Total**
Intertrochanteric	8	22	21	7	0	0.220	58
Collum femoris	6	10	12	5	3		36

ASA Scores			
2	**3**	**4**	**Total**
52	30	12	94

Type of Anesthesia	
General	47
Spinal	47

Stem Type	
Straight	53
Calcar	41

* Mean age by sex Student T test (p=0.029)

** Relationship between fracture type and age Student's T test (p=0.003)

The average time elapsed from the day of the fracture to the operation day was calculated as 5.61 days (± 11.00). When the preoperative days and postoperative survival of the patients were examined, 93% (n = 28) of the patients who were still alive were operated in the first 5 days; when this situation was evaluated with the Chi-square test, it was found to be statistically significant (p = 0.018).

When the ASA scores of the patients were examined, it was seen that 52 patients (55.3%) had ASA 2, 30 patients (31.9%) had ASA 3, and 12 patients (12.8%) had ASA 4. When the mortality and survival times of the patients were examined with the ASA score, it was seen that both parameters had a statistically significant inverse correlation (p = 0.000).

When the anesthesia types of the patients in our study were examined, it was seen that 50% (n = 47) of them were operated under general anesthesia and 50% (n = 47) under spinal anesthesia. It was observed that the type of anesthesia administered did not have a statistically significant effect on survival time and mortality (p = 0.663).

Straight stem was used in 56.4% (n = 53) of the patients in our study, and calcar type stem was used in 43.6% (n = 41) of them. Cementless surgery was performed in 5 (5.3%) of the patients, and cemented technique was used in other patients. There was no statistically significant effect of stem type and cement status on mortality and morbidity of patients. (p = 0.212; p = 0.925)

When the comorbidities of the patients in our study were examined, when the presence of comorbidity and the postoperative and total hospitalization times of the patients were compared, the total length of stay and postoperative hospitalization time of the patients with comorbidities were significantly higher than those without any comorbidity. (p = 0.046; p = 0.030). Among the patients with comorbid diseases, 22 patients had 3 or more comorbidities, 18 patients had 2 different comorbidities, and 22 patients had one known comorbidity. As the number of comorbid diseases of the patients increased, a statistically significant decrease was observed in the survival time (p = 0.000) (Table 2).

Table 2. Comorbid diseases

Hypertension	37 (39.4%)
Diabetes	23 (24.5%)
Coronary Artery Disease	21 (22.3%)
Osteoporosis	2 (2.1%)
Chronic Kidney Disease	6 (6.4%)
Asthma & COPD	7 (7.4%)
Alzheimer	7 (7.4%)
Thyroid Disease	5 (5.3%)
Arrhythmia	4 (4.3%)
Cerebrovascular Disease	4 (4.3%)
Malignancy	6 (6.4%)
Hematological Diseases	3 (3.2%)

COPD: Chronic obstructive pulmonary disease

Coronary artery diseases (p = 0.001) and Alzheimer's disease (0.007) were found to have a statistically significant effect on the duration of survival in the regression analysis examining the relationship between the survival times and comorbidities.

Among the cases, in the postoperative period, infection occurred in 1 patient, periprosthetic fracture in 1 patient, and dislocation in 3 patients. When the effects of these three parameters on mortality and survival were examined, it was seen that there was no significant effect.

It was observed that 64 of 94 patients examined in our study died and 30 patients were still alive. It was observed that 11 of the patients who died in the first postoperative month, and 1 of these patients died at home after discharge, and 10 died at the hospital without being discharged. It was also seen that 11 patients who died between 1-6 months postoperatively. 5 of these patients are in the hospital after 1 month of hospitalization; It was seen that 6 of them died outside the hospital. 4 patients between 6-12 months; 15 patients between 12-24 months; It was observed that 23 patients died between 24-60 months (Table 3).

Table 3. Death time and survival of patients

	Number of patients
Death In the 1st Month Postoperatively	11 (11.7%)
Death between 1-6 Months	11 (11.7%)
Death between 6-12 Months	4 (4.3%)
Death between 12-24 Months	15 (16%)
Death between 24-60 Months	23 (24.5%)
Survivors	30 (31.9%)
Total	94

Comparing the average age of the patients who died and those who are still alive in our study, the average age of the patients who died was found to be statistically significantly higher. (p = 0.004) (Table 4).

Table 4. Relation of mean ages with mortality

	Number of Patients	Mean Age	Standard Deviation
Deceased Patients	64	81.91	6.361
Alive	30	77.60	7.040

The results of daily quality of life and activity scores applied on patients who are still alive during our study are given below as a table (Table 5).

Table 5. Activity and quality of life scores of surviving patients

	Poor	Fair	Good	Excellent	Total
UCLA	0	4	4	22	30
HARRIS	0	5	3	22	30

BARTHEL INDEX		
Very Dependent	**Partially Dependent**	**Minimally Dependent**
1	5	24

VISUAL PAIN SCALE (VPS)										
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0	19	7	4	0	0	0	0	0	0	0

The effects of comorbid diseases on postoperative daily life quality and activity scores were examined. It was observed that coronary artery diseases (p = 0.000) and respiratory system diseases had the most statistically significant effect on UCLA (p=0.018). Coronary artery diseases (p=0.000), diabetes (p=0.032) and respiratory system diseases (p=0.034) also had the most statistically significant effect on Harris scoring. It was observed that coronary artery diseases (p = 0.001) and diabetes had the most statistically significant effect on Visual Pain Scoring (VAS) (p=0.034). It was observed that coronary artery diseases (p=0.000), diabetes (p=0.012) and respiratory system diseases (p=0.014) negatively affected the statistically most significant effect on the Barthel index. As can be seen from these data, it is striking that coronary artery diseases, diabetes and chronic diseases of the respiratory system are the most common comorbid conditions that cause the most deterioration in the quality of life of patients in the postoperative period. It was also observed that as the comorbidity of comorbid diseases in the patients increased, the Barthel index scores decreased in a statistically significant way. (p=0.027)

4. Discussion

Hip fractures are a common health problem affecting especially the elderly population all over the world and become one of the leading causes of death in elderly people as the life expectancy increases. With advanced age, the risk of falling increases due to systemic diseases, decreased physical capacity, posture and gait disorders, and multiple and unbalanced fractures may occur in the upper end of the femur due to their osteoporosis (4).

The main finding of this study is that mortality is multifactorial rather than a single factor. When we classify these factors as changeable and unchangeable, we can say that age and comorbidities are patient-dependent and unchangeable factors, and the time until the operation and postoperative rehabilitation are changeable risk factors.

Of the 94 patients in our study, 58 were female (61.7%) and 36 were male (38.3%). Among the reasons for this high rate in women, they are less active, lack of estrogen after menopause, and the inability to replace them, and related to these, osteoporosis is more effective. Another reason for the increase in this ratio may be the dominance of women in the elderly population (5, 6). In a study conducted by NN Wazir et al. In 2006, the rate of women was 62.4% (7); In the study conducted by Anderson, 83% (8); in Seçkin's study, it was found to be 68% (9). The findings of our study were found to be in line with the literature. The average age of the patients was 80.5 (± 6.85); The mean age of the male patients was 78.6 (± 7.51) and the average age of the female gender was calculated as 81.7 (± 6.16). When the mean ages of both sexes were compared, it was observed that the mean age of female patients was statistically significantly higher and that female patients were numerically higher. In the study conducted by Bekerom et al. In 2010, the mean age of 115 patients who underwent THA (total hip arthroplasty) was found to be 82 years, and the average age of patients who underwent BHA (bipoplar hip arthroplasty) was 80 years (10). Somashekar et al. compared the UHA (unipolar hip arthroplasty) and BHA, and the mean age of the patients who underwent UHA was 75.7 years, and the patients who underwent BHA were found to be 67.3 years (11).

In the literature, there are studies reporting different opinions on whether the time until surgery increases mortality. Zuckerman et al. and Sexson and Lehner reported that mortality increased when the time between fracture and surgery increased, while Kenzora et al reported that the mortality rates in patients operated on the first day were significantly higher than those operated between the 2nd and 5th days in their studies (12-14).

In order to prevent this, they recommended taking precautions against the general condition disorder at the first admission of the patients and performing a surgical intervention with the necessary support. On the other hand, Şener et al. found that high comorbidities, prolonged fracture time and the time to surgery, worsening postoperative walking capacity and advanced age significantly increased mortality (15). As a result, they emphasized that accompanying comorbid factors, walking capacity and operative time should be considered in the treatment and rehabilitation planning of such patients. Doruk et al. it was emphasized that the mortality of patients who were not operated in the first 5 days was higher (16). Öztürk et al. in their study, it was shown that the operation time was not related to mortality (17). In the cases in our study, the mean time from the day of fracture to the operation day was calculated as 5.61 (±11.00). When the number of preoperative days and postoperative survival of the patients were examined, 93% of the patients who were still alive were operated in the first 5 days; When this situation was evaluated with the Chi-square test, it was found to be statistically significant. ($p=0.018$) It can be said that the operation of patients within the first 5 days after fracture has a positive effect on survival.

The ASA physical condition scale is often used to classify the preoperative general condition of patients with hip fractures. ASA I defines patients who do not have systemic disease other than surgical pathology, while ASA V defines patients who do not have a life expectancy of more than 24 hours regardless of the operation. Studies have shown that the higher the ASA class, the higher the risk of death in the long term. Hamlet et al. Found that the 3-year mortality rate (23%) of ASA I and II patients was significantly lower than the ASA III, IV, and V patients (39%) (18). Studies were examined in terms of ASA class distribution of patients who underwent arthroplasty. Nelson et al. reported that 47% of the patients were in ASA II and 50% were in ASA III in their partial arthroplasty series including 70 patients (19). In the study conducted by Hedbeck et al, in which UHA and BHA applications were compared, it was stated that the majority of patients in both the UHA (48%) and the BHA (50%) groups were ASA class II (20). Atay et al. reported that the preparation period for the operation was prolonged in patients with a high ASA score in their study on patients over the age of 60 who underwent arthroplasty due to hip fracture. After a 1-year follow-up, they found that the mortality rate was higher in patients with a high ASA score at the time of fracture and a long time until the operation (1). When the ASA scores of the patients in our study were examined, it was seen that 52 patients (55.3%) were ASA II, 30 patients (31.9%) were ASA III, and 12 (12.8%) were ASA IV. When the mortality and survival times of the patients were examined with the ASA score, it was seen that both parameters had a statistically significant inverse correlation.

The high average age of the patients who were operated on for femoral neck fractures causes the frequent occurrence of accompanying chronic diseases. In the study of Salvakçı, 14.4% of patients with femoral neck fracture who underwent hip arthroplasty had diabetes, 16.9% had coronary artery disease, 20.3% had hypertension, 1.7% had arrhythmia, and 2.4% had atrial fibrillation. reported that 10% had COPD,

3.38% had chronic renal failure and 3.38% had chronic hepatitis (21). In the study of Şener et al., which included 280 patients, hypertension (n: 48) and diabetes (n: 20) were found to be the most common accompanying chronic diseases (22). In the study of Çopuroğlu et al., which included 180 patients with femoral neck fracture, 22 (12.2%) patients had hypertension, 10 (5.5%) cancer, 7 (3.9%) heart disease, 6 (3.5%) patients have identified diabetes (23). When the additional diseases of the patients in our study were examined, 39.4% patients had hypertension, 24.5% patients had diabetes, 22.3% patients had coronary artery disease, 6.4% patients had chronic kidney failure, 7.4% patients had chronic lung diseases, 7.4% patient's Alzheimer's, 5.3% patient's thyroid disease, 4.3% patient's rhythm disorders, 4.3% patient's cerebrovascular disease, 6.4% patient's history of malignancy, 3.2% patient's history of hematological disease, 2.1% patient's known He had a history of osteoporosis and vitamin D deficiency. 34% of the patients did not have a history of any disease. Among the patients with comorbidity, 22 patients had 3 or more comorbidities, 18 patients had 2 different comorbidities and 22 patients had only one known comorbidity. When the presence of comorbidity and the postoperative and total hospitalization times of the patients were compared, the total length of hospital stay and the postoperative length of stay in patients with comorbidity were significantly higher than those without comorbidity (p=0.046; p=0.030). As the number of additional diseases of the patients increased, a statistically significant decrease was observed in the survival time (p=0.000). When we examined the relationship between the survival time of the patients and their comorbidities, it was seen that the most effective factors were coronary artery diseases (p=0.001) and Alzheimer's disease (p=0.007).

Many factors play a role in the success of the functional outcome of patients after surgery. Patients with hip fractures should be mobilized as soon as possible and returned to their daily activities as soon as possible. During our study, questionnaires evaluating quality of daily life and activity scoring were applied to patients who were still alive. It was examined how much the comorbidities of the patients could affect the postoperative quality of life and activity scoring. Coronary artery diseases (p=0.000) and respiratory system diseases (p=0.018) had the most statistically significant effects on the UCLA score; Coronary artery diseases (p=0.000), diabetes (p=0.032) and respiratory system diseases (p=0.034) had the most statistically significant effects on Harris scoring; Coronary artery diseases (p=0.001) and diabetes(p=0.034) had the most statistically significant effect on Visual Pain Scoring (VPS); It was observed that coronary artery diseases (p=0.000), diabetes (p=0.012) and respiratory system diseases (p=0.014) had the most statistically significant effect on the Barthel index. As it can be understood from these data, it is observed that the comorbid conditions that most cause deterioration in the quality of life of patients in the postoperative period are coronary artery diseases, diabetes and chronic diseases of the respiratory system, respectively. As the comorbidities of the patients increased, it was observed that the Barthel index scores decreased statistically significantly (p=0.027). When we look at the literature, it has been shown in many studies in parallel with our study that the presence of additional diseases before the fracture and the ambulatory status before the fracture cause postoperative morbidity and negatively affect rehabilitation (23-26).

Multiple chronic diseases that occur in advanced ages can lead to deterioration of general health status. Therefore, patients with hip fractures are more likely to die in the first year after fracture than their peers. In studies, the 1-year mortality rate of patients with femoral neck fractures varies between 14% and 36% (14, 24, 27). Death is basically; it may depend on many factors such as age, gender, chronic diseases, waiting time for surgery, type of anesthesia, and type of treatment (13, 24, 28, 29). This high rate of mortality is related to the preoperative general condition of the patient rather than the surgical intervention (30). It was observed that 64 of the 94 patients examined in our study died and 30 patients were still alive. It was observed that 11 of these patients died in the first month postoperatively, 1 of these patients died at home after discharge, and 10 of them died in the hospital before being discharged. It was reported that 11 patients died between 1-6 months postoperatively. 5 of these patients are in the hospital after a 1-month hospitalization period; It was seen that 6 of them died outside the hospital. It was observed that 4 patients died between 6-12 months; 15 patients died between 12-24 months; 23 patients died between 24-60 months. When the characteristics of the patients who died in the first month were examined; the mean age was calculated as 83.36 (±7.18) and no significant difference was observed between the other groups in terms of mean age (p=0.079). When the mean age of the patients who died and those who are still alive in our study were compared, the mean age of the patients who died was found to be statistically significantly higher (p=0.004). When examined in terms of ASA scores, a significant difference was observed between the patients who died in the first month and the patients in the other group (p=0.001). This was caused by the statistical difference between the ASA scores of patients who died between 24-60 months of age and are still alive and those who died in the first 1 month. Patients who died in this first month were more likely to have comorbidities than patients who lived longer (p=0.000). When the coronary artery disease (CAD) of deceased patients and surviving patients was compared, the frequency of CAD was found to be significantly higher in deceased patients (p=0.006). There was no significant difference between the groups in terms of other additional diseases of the patients in our study. There was no significant difference between the other groups in terms of fracture types of patients who died in the first month (p=0.788). When the number of preoperative days and postoperative survival were examined, 93% of the patients who were still alive were

operated in the first 5 days; when this situation was evaluated with the Chi-square test, it was found to be statistically significant (p=0.018). However, no statistically significant difference was found between the duration of the operation and mortality of the patients who died in the first month.

Fractures of the upper end of the femur are a serious trauma with mortal and morbid consequences for elderly patients. The prolongation of life expectancy has led to an increase in the number of geriatric patients, and accordingly, the incidence of femoral neck fracture has increased. The incidence of hip fractures due to osteoporosis increases with advancing age. Femoral neck fractures are more common in the elderly and women.

Waiting time for surgery negatively affects survival and functional results. Hemorrhage at the fracture line and metabolic effects of secreted cytokines should be eliminated. For this reason, surgery should be rushed and medical preparations should be completed as soon as possible.

The higher the preoperative ASA scores of the patients, the higher the risk of postoperative death.

Partial hip prosthesis is an appropriate treatment for patients with a low life expectancy, who have already received various treatments due to comorbidities, and whose general condition is very poor, who are admitted to the hospital due to femoral upper end fracture, in order to be able to stand up in a short time and to minimize the failure rate.

In the light of all this information, mortality after hip fractures is multifactorial and some of these are risk factors that cannot be changed. At this point, the surgeon should know the modifiable risk factors well and manage the process accordingly. Informing the patients and their relatives about the possible results of the operation in the preoperative period in line with this information and obtaining written consent is important in order to prevent the medicolegal problems that the physicians have been exposed to recently.

Conflict of interest

The authors declare that they have no conflict of interest regarding the publication of this article.

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None to declare.

Ethical Approval

This study is approved by Süleyman Demirel Medical Faculty Local Ethics Committee on 21.05.2019 with the approval number of 175.

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