



## Functional Outcomes and Quality of Life in Elderly Patients Following Intertrochanteric Femur Fracture: A One-Year Follow-Up Study

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### ABSTRACT

**Objectives:** Intertrochanteric femur fractures are prevalent injuries among the elderly, significantly affecting their quality of life (QOL) and functional status. This study aimed to evaluate functional outcomes and QOL in elderly patients one year after sustaining an intertrochanteric femur fracture.

**Methods:** This retrospective observational study was conducted at Shahid Beheshti Hospital in Kashan, Iran. The functional status and QOL of 79 elderly patients with intertrochanteric femur fractures, who were at least one year post-injury were assessed between February 2020 to February 2021.

Data were collected from patient's records, which included sociodemographic and clinical information at the time of admission. Functional status was evaluated using the Barthel Index, and QOL was assessed using the shortened form of the SF-36 questionnaire.

**Results:** The study population comprised 60.8% women, with a mean age of 79.81±7.07 years. The mean of the Barthel index score was 11.49±2.22, indicating that participants achieved approximately 60% of the maximum functional score. The mean overall QOL score was 50.59±9.54, suggesting that patients attained approximately 51% of the maximum QOL score. A final linear regression model indicated that increased age was significantly associated with declines in both functional abilities ( $R^2=0.53$ ,  $p<0.001$ ) and QOL ( $R^2=0.39$ ,  $p<0.001$ ). Additionally, patients who received physiotherapy demonstrated significantly better functional outcomes than those who did not.

**Conclusion:** This study highlighted the significant impact of intertrochanteric femur fractures on the functional status and QOL of older adults. The findings emphasized the critical role of rehabilitation services, such as physiotherapy, in improving patient outcomes. Further research is warranted to explore the influence of comorbidities and optimize interventions for this vulnerable population.

**Keywords:** Function, Quality of life, Intertrochanteric, Fracture, Elderly.

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## Introduction

Femoral fractures are common injuries, particularly among aging populations, and their incidence is expected to rise as global populations continue to age. By 2050, the number of femoral fractures worldwide is estimated to reach 6.26 million, with 6.69% occurring in the Middle East [1]. Intertrochanteric fractures, which are extracapsular fractures occurring between the greater and lesser trochanter, are especially prevalent among the elderly [2]. Several risk factors contribute to the occurrence of intertrochanteric fractures, including advanced age, alcohol consumption, a history of hip fractures, physical inactivity, Alzheimer's disease, and osteoporosis [3]. These fractures impose a significant financial burden on healthcare systems. In the United States alone, they account for approximately \$2.63 billion annually, representing 44% of the total cost of femoral fractures [4, 5]. The economic impact is influenced by factors such as the duration of hospital stays, timing of surgeries, availability of specialized geriatric orthopedic units, and access to rehabilitation services post-hospitalization [4, 5]. Beyond financial costs, intertrochanteric fractures are associated with significant health risks, including an increased likelihood of future fractures, higher mortality rates, and complications such as impaired mobility and reduced quality of life (QOL) compared to the general population [6]. The one-year mortality rate for these fractures ranged from 23% to 34% [7], and nearly half of affected patients became dependent on others for daily activities, with 25% requiring long-term care [8].

Given that mobility is critical to maintaining QOL after such injuries, understanding postoperative complications and functional outcomes is essential for improving patient outcomes [2]. Despite the significant impact of intertrochanteric fractures, limited research has assessed the functional status and QOL in Iranian patients following these injuries. This study aimed to address this gap by evaluating functional outcomes and QOL in elderly patients one year after sustaining an intertrochanteric femur fracture.

## Materials and Methods

This retrospective observational study evaluated the functional outcomes and QOL of elderly patients with intertrochanteric fractures at Shahid Beheshti Hospital in Kashan, Iran, one year after their injuries. The study was conducted between February 2020 and February 2021.

A list of 79 patients with intertrochanteric fractures was retrieved via census from the Hospital Information System (HIS) unit of Shahid Beheshti Hospital. Required data included sex, age, residence, underlying diseases, phone number, trauma mechanism, type of treatment, duration

of hospitalization, physiotherapy or rehabilitation interventions during hospitalization, treatment-related complications, and mortality. Additionally, QOL and functional status were assessed through telephone interviews using the SF-36 questionnaire and the Barthel index.

Inclusion criteria encompassed patients aged 65 years and older with intertrochanteric fractures who were able to respond. Exclusion criteria included incomplete patient records with inaccessible information, patients referred to other treatment centers, and those unresponsive to phone calls (maximum of two attempts).

Necessary data were collected from patient files, the shortened SF-36 questionnaire, and the Barthel questionnaire.

### *SF-36 Questionnaire*

The SF-36 questionnaire assesses QOL across two dimensions: physical and mental health. The physical health dimensions included physical functioning (10 questions), physical role (4 questions), bodily pain (2 questions), and general health (5 questions). The mental health dimensions include vitality (4 questions), social functioning (2 questions), emotional role (3 questions), and mental health (5 questions). The questionnaire also included one item where individuals rated their health over the past month, totaling 36 questions [9]. This questionnaire offered a comprehensive assessment of an individual's health status across eight dimensions. Scores in each section were calculated based on responses, with lower scores indicating poorer health and higher scores indicating better health. The overall score ranged from 0 to 100, with higher scores reflecting better QOL. The validity and reliability of SF-36 were established in various studies, including those by Jenkinson and Maslin [10, 11]. In this study, the reliability of the SF-36 was confirmed with a Cronbach's alpha of 90.3%, and its structural validity was well-documented [12].

### *Barthel Index*

The Barthel questionnaire, developed by Mahoney and Barthel (1965), is a widely used tool for assessing functional independence due to its simplicity, sensitivity, accuracy, and ease of use [13]. This tool consists of 10 questions with a scoring system of 0-5-10-15. The Persian version of the Barthel Index was translated and validated by Ghorani in 2000, with a reported reliability of 0.99 and a validity of 0.99 [14?]. This index assessed 10 functional skills: Eating, Bathing, Grooming, Dressing, Bowel control, Bladder control, toileting, Transferring (moving between sitting and standing), Mobility (on level surfaces), and Stair climbing, and scored them based on function levels. Each skill was scored based on the level of independence, with a maximum total score of 100 indicating complete independence and a score of zero indicating complete dependence. Scores were

categorized as follows: (0-20 indicated complete dependence, 20-60 indicated severe dependence, 61-90 indicated moderate dependence, 91-99 indicated partial dependence, and 100 indicated independence [15]. For scoring: mobility and transfer (wheelchair) status each have a maximum of 15 points. Activities such as going up and down stairs, using the toilet, controlling urination, eating, and dressing each had a maximum of 10 points, while personal hygiene and bathing each had a maximum of 5 points. The Barthel Index is a globally recognized and standard tool that has been widely used in numerous similar studies, making it a valid criterion for assessing functionality in this study [13, 15].

#### Data Extraction

Information was extracted from hospital records, including initial hospitalization records and any subsequent visits due to complications. Data encompassed demographic details (age, sex, residence), type of treatment (surgical or non-surgical), trauma mechanism, and underlying diseases.

#### Statistical Analysis

Data were analyzed using SPSS software, version

26. Descriptive statistics, including mean and standard deviation, were used for quantitative variables, while frequency and percentage were employed for qualitative variables. The normality of the data was assessed using both the Kolmogorov-Smirnov and Shapiro-Wilk tests.

Independent t-tests, Chi-square tests, correlation, and ANOVA (Analysis of Variance) were used to assess the relationship between independent variables, functional outcomes, and QOL. Univariate and multivariate analyses were performed to model the relationship between patients' QOL and functional status with independent variables.  $P < 0.05$  was considered statistically significant.

#### Results

In this study, we analyzed 79 elderly patients with intertrochanteric femoral fractures who were at least one year post-injury. The findings revealed that 60.8% of the patients were women, with a mean age of  $79.81 \pm 7.07$  years. Most patients reported a moderate income level (44.4%), and hypertension was the most prevalent underlying condition, affecting 30.4% of the participants. The mean duration of hospitalization was  $5.28 \pm 3.15$  days. Among the

**Table 1.** Demographic and Clinic Characteristics of the Patients Included in This Study

Variables		N	(%)
Gender	Male	31	39.2
	Female	48	60.8
Age	Means±SD (Minimum-maximum) 79.81±7.07(65-99)		
Living area	City	67	84.8
	Village	12	15.2
Income	(Low)	25	34.7
	(Average)	32	44.4
	(High)	15	20.8
Smoking		9	11.4
Underlying diseases	Diabetes	14	17.7
	High blood pressure	24	30.4
	Cardiovascular diseases	9	11.4
	High blood fat	9	11.4
	Hyperplasia	5	6.3
	Gastrointestinal ulcer	1	1.3
Ability to walk before the injury		73	92.4
The severity of the injury mechanism	Low	67	84.8
	High	12	15.2
Type of treatment	Surgery	54	68.4
	Non-surgical	25	31.6
Elapsed time from injury to surgery (days)	Means±SD (Minimum-maximum) 1.50±0.64 (1-3)		
Duration of hospital stay (days)	Means±SD (Minimum-maximum) 5.28±3.15 (1-18)		
Physiotherapy		32	40.5
Physiotherapy place	Inside the hospital	19	59.4
	Outside the hospital	10	31.3
	Both	3	9.4
Wound infection		5	6.3
Delayed union of the bone		16	20.3
Pressure ulcers		8	10.1

patients, 40.5% received physiotherapy, while 10.1% developed pressure ulcers. A significant proportion of patients reported being able to walk prior to their injury (92.4%), and nearly 85% experienced a low-severity mechanism of injury. Surgery was the preferred treatment for approximately 70% of the patients. Additionally, five patients (6.3%) reported experiencing wound infections, and 16 patients (20.3%) indicated a delayed union of their

fractures (Table 1). The mean Barthel index score was 11.49±2.22, indicating that participants achieved approximately 60% of the maximum function score (20 points).

The mean overall QOL score was 50.59±9.54, indicating that patients achieved approximately 51% of the maximum QOL score (100 points) (Table 2).

Based on the results of the univariate analysis, variables such as sex, living area, income, diabetes,

**Table 2.** The means of functioning and QOL score

Variables	Means±SD (Minimum-maximum)	
Barthel Index	11.49±2.22 (7-17)	
QOL	Physical functioning	23.61±14.23 (0-70)
	Role limitations attributed to physical problems	49.05±36.78 (0-100)
	Role limitations attributed to emotional problems	58.23±35.59(0-100)
	Energy/Fatigue	49.18±10.20(15-70)
	Emotional health (Well-Being)	54.23±15.30 (12-88)
	Social functioning	61.87±17.09 (25-100)
	Pain	62.45±15.94(22.2-100)
	Overall health	46.14±14.74 (15-80)
	Total score	50.59±9.54 (34.3 -76.2)

**Table 3.** The univariate regression analysis between demographic information, underlying diseases, type of treatment, and hospitalization records, and Barthel and QOL indices

Variables	Barthel Index Means±SD	P value	QOL Means±SD	P value	
Gender	Male	11.68±2.24	0.55	50.0±10.45	0.66
	Female	11.37±2.23		50.97±9.00	
Age	R=-0.71	<0.001	R=-0.62	<0.001	
Living area	City	11.51±2.31	0.89	51.07±9.48	0.29
	Rural	11.42±1.73		47.90±9.84	
Income	Low	11.80±2.51	0.68	50.06±10.37	0.46
	Average	11.31±2.15		49.68±8.36	
	High	11.73±1.94		53.25±10.07	
Diabetes	Yes	11.28±2.01	0.72	48.09±7.67	0.28
	No	11.51±2.29		51.51±9.94	
Blood pressure	Yes	11.42±2.00	0.84	47.13±8.94	0.03
	No	11.53±2.33		52.10±9.48	
Cardiovascular diseases	Yes	11.00±1.80	0.48	52.06±11.15	0.62
	No	11.56±2.27		50.40±9.39	
Ability to walk before the injury	Yes	11.67±2.15	0.01	50.74±9.53	0.62
	No	9.33±2.16		48.76±10.39	
The severity of the injury mechanism	Low	11.33±2.26	0.11	50.65±9.10	0.90
	High	12.42±1.78		50.27±12.17	
Type of treatment	Surgery	11.54±2.06	0.80	50.62±10.20	0.97
	Non-surgical	11.40±2.58		50.54±8.12	
Elapsed time from injury to surgery (days)	R= -0.12	0.37	R= -0.06	0.62	
Duration of hospital stay (days)	R= -0.064	0.57	R= 0.07	0.50	
Physiotherapy	Yes	11.97±1.77	0.09	50.65±8.79	0.87
	No	11.17±2.45		50.55±10.11	
Physiotherapy place	Inside the hospital	11.89±1.41	0.87	49.76±8.77	0.60
	Outside the hospital	12.20±2.39		52.98±9.00	
	Both	11.67±2.08		48.51±10.05	
Wound infection	Yes	12.20±0.83	0.46	52.30±7.84	0.68
	No	11.44±2.28		50.48±9.68	
Delayed union of the bone	Yes	11.25±2.08	0.62	48.22±7.23	0.26
	No	11.55±2.27		51.19±10.00	
Pressure ulcers	Yes	10.37±2.32	0.13	47.38±7.66	0.31
	No	11.62±2.19		50.95±9.71	



blood pressure, cardiovascular diseases, type of treatment, elapsed time from injury to surgery, duration of hospital stay, physiotherapy location, wound infection, delayed bone union, and pressure ulcers were not significantly associated with the physical function of the subjects ( $p>0.05$ ).

Similarly, variables such as sex, living area, income, diabetes, cardiovascular diseases, type of treatment, ability to walk before the injury, severity of the injury mechanism, physiotherapy, elapsed time from injury to surgery, duration of hospital stay, physiotherapy location, wound infection, delayed union of the bone, and pressure ulcers were not significantly associated with QOL ( $p>0.05$ ). Only age and blood pressure demonstrated a significant relationship with QOL ( $p<0.05$ ). Additionally, age, ability to walk before the injury, severity of the injury mechanism, physiotherapy, and pressure ulcers were significantly associated with physical function ( $p<0.05$ ). These variables were subsequently included in the final model (Table 3).

The results of the analysis of variance (ANOVA) test indicated that the model fit for patients' function ( $F=45.210$ ,  $p<0.001$ ) and QOL ( $F=49.538$ ,  $p<0.001$ ) was both acceptable and significant. Both age and receipt of physiotherapy significantly affected patients' function ( $p<0.05$ ). Specifically, as patients' age increased, their functional ability decreased significantly ( $B=-0.22$ ,  $p<0.001$ ). Additionally, patients who received physiotherapy demonstrated significantly better function than those who did not ( $B=0.76$ ,  $R=0.53$ ,  $p=0.03$ ) (Table 4).

Furthermore, the final linear regression model indicated that as patients' age increased, their QOL significantly declined ( $B=-0.84$ ,  $R=0.39$ ,  $p<0.001$ ). The adjusted coefficient of determination values showed that the two variables (age and physiotherapy) were able to explain 53% of the changes in patients' functional outcomes, while the age variable alone explained nearly 40% of the changes in patient's QOL (Table 4).

## Discussion

Intertrochanteric femur fractures are among the most common fractures involving the hip and femoral neck [16]. This study examined the function outcomes and QOL of elderly patients with these fractures one year post-injury.

The mean overall QOL score was  $50.59\pm 9.54$ , and the mean functional score, as measured by the Barthel's index, was  $11.49\pm 2.22$ . While other studies in Iran reported lower mean QOL scores than the

present research [2, 17], the mean functional score aligned with findings from related studies [18, 19].

Age is a critical factor influencing QOL and functional outcomes. The results of this study indicated that as age increased, both function and QOL declined, likely due to inadequate physical fitness and deficiencies in essential minerals among older adults [2, 20-22]. Poor function was also directly associated with higher mortality rates [23, 24], underscoring the importance of addressing functional decline in this population.

In the study by Jia-bao *et al.*, patients receiving physiotherapy exhibited better functional outcomes, supporting the findings of the present study. Improved lower limb muscle strength through physiotherapy significantly enhanced patient function [20]. Individualized and periodic rehabilitation following surgery is essential for restoring function in the affected limb, effectively reducing pain, and lowering mortality rates [25, 26]. Furthermore, effective rehabilitation improved patients' capacity for self-care and independence in daily activities, ultimately leading to a better QOL for elderly patients with fractures [21].

In accordance with the present study, other research also identified a significant relationship between the Barthel Index and walking ability [27, 28].

Considering that less than half of all hip fracture patients regain their pre-injury functional status, many require long-term, intensive rehabilitation post-surgery. Notably, only 40% of these patients regain their pre-injury ambulatory function, which might be attributed to factors related to the postoperative care system or physiotherapy [18]. Another notable finding of this study was the relationship between blood pressure and QOL, a connection that has also been identified in the research conducted by Ramazani *et al.* [29]. It is important to note that the association between high blood pressure and a decline in QOL has been well-established in the literature [30], highlighting the need to manage comorbidities in elderly patients with fractures.

One limitation of this study was the potential presence of comorbidities, osteoporosis, and other physical injuries resulting from trauma, which were not accounted for in this study, and might affect the findings. These factors, such as abdominal or chest trauma, might have contributed to declines in QOL and functional outcomes. Therefore, further investigation should concern with injuries to other body organs as potential confounding variables to provide a more comprehensive understanding of patient outcomes.

**Table 4.** The multivariate regression analysis between age and physiotherapy, and Barthel and quality of life indices A Stepwise multiple linear regression)

	Variables	Coefficient	SE	Adjusted R-square	P value
Barthel Index	Age	-0.22	0.02	0.53	<0.001
	Physiotherapy	0.76	0.34		
QOL	Age	-0.84	0.12	0.39	<0.001

One of the strengths of the present study was its focus on the impact of intertrochanteric fractures on the function and QOL of elderly patients over a one-year period. This longitudinal approach facilitated the identification of specific needs and challenges faced by this age group. Moreover, the findings enhanced the generalizability of the results to similar populations and provide valuable insights for improving treatment methods and social support for these patients.

The findings of this study highlighted the significant impact of age on the decline in function and QOL among elderly patients. Identifying individuals at greater risk could lead to more targeted treatments and effective rehabilitation programs. Physiotherapy, as one of the effective therapeutic approaches, not only improved functional outcomes but also enhanced QOL and promoted overall health. Therefore, integrating physiotherapy into treatment programs could be a key strategy for managing the conditions of elderly patients and optimizing their clinical outcomes.

## Declaration

**Ethical Approvals:** This study was approved by the Ethics Committee of Kashan University of Medical Sciences (ethical code IR.KAUMS.MEDNT.

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