

# Does Mobility of the Elderly with Hip Fractures Improve at One Year Following Surgery? A 5-year Prospective Survey

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## SUMMARY

**Background.** Hip fracture and its consequences are one of the major causes of morbidity and disability in the elderly. The purpose of this study was to collect epidemiologic data and assess the daily activities and walking ability of patients 3 months and 1 year following surgery because of a hip fracture.

**Material and methods.** We prospectively obtained data of all consecutive patients more than 50 years of age with any type of hip fracture from 2008 to 2013. After excluding pathologic fractures, hip fracture dislocations, non-surgically treated cases, and dead patients, functional status of the subjects at 3 months and 1 year after surgery was evaluated using a 10-degree scale of pain, modified Barthel index of daily activity, and independent walking ability.

**Results.** In total, 1015 cases were enrolled. Mean age was 75.6 year with a female to male ratio of 1.33. Left-sided hip fractures were seen in 51.7 % of cases. Intertrochanteric fractures were the most common type (72.1 %), followed by femoral neck (24.0 %) and subtrochanteric fractures (3.9 %). At both 3-month and 1-year follow-up visits, 562 subjects (317 women and 245 men) completed the questionnaires. Activities of daily living and independent walking ability were improved significantly at 1 year and the improvements were statistically superior to the results obtained at 3 months (p-value < 0.001 for both variables).

**Conclusion.** By continuing rehabilitation of elderly patients with surgically-treated hip fractures for one year, improvement in activities of life and walking independence can be expected even if they have a poor result after the first 3 months of rehabilitation.

**Key words:** Hip fracture, Morbidity, Osteoporosis, Rehabilitation, Elderly, Iran

## BACKGROUND

Hip fractures in the elderly and their associated complications are one of the major public health problems, causing a significant financial load on health-care systems in many countries [1,2]. Hip fractures are associated with functional impairment, reduced quality of life and higher mortality rates compared to the general population [3,4]. The risk of hip fractures in the people aged 50 years or more is principally related to a combination of osteoporosis and falls [5].

Distributions of hip fracture and related risk factors vary among different regions of the world. Incidence and other epidemiologic data regarding hip fractures in different parts of Iran have been well described [6-13]. By comparing the incidence rate of hip fractures in studies by Soveid et al. in 2005 and Maharlouei et al. in 2014, it becomes clear that hip fractures in this region have been increasing in recent years [6,7]. Moreover, increased life expectancy and consequent growth of an elderly population may result in higher incidence of hip fracture in the future. Prevention by activity modification, medical treatment, and screening of people at risk would be essential to reduce associated healthcare costs and increase the quality of life.

The final goal of patients with hip fractures is to regain independence in walking ability and performance of personal activities of daily living. Several studies have found that only one-half to one-third of patients after hip fractures are able to achieve the pre-fracture level of activity and return to the community [14, 15]. The lack of any article comparing 3-month to 1-year follow-up assessments of walking ability of patients after hip fracture surgery prompted us to conduct this research. The purpose of this prospective study was to obtain epidemiologic data on hip fractures and investigate locomotion and activities of daily living of patients who undergo surgery for hip fractures.

## MATERIAL AND METHODS

All consecutively admitted patients aged more than 50 years with hip fractures at Chamran University Hospital, the main orthopedic center in the south of Iran, from January 2008 to August 2013, were prospectively enrolled in this study. Exclusion criteria were patients with pathologic fractures, hip fracture dislocations, non-surgically treated cases, patients who died during the study's time frame, and patients who did not sign a written consent form to participate in the assessment.

Patient characteristics were obtained on arrival to the Center by patients filling a questionnaire includ-

ing demographic information, living situation (living in their own home or a nursing home), pre-fracture mobility status, any previous history of osteoporotic fracture and any positive history of hip fracture in his/her elderly first-degree relatives. The mechanism of fracture (a fall vs. an accident) was particularly documented. The side of the fracture, fracture type (i.e. pathologic fracture, femoral neck fracture, intertrochanteric fracture, and subtrochanteric fracture), and treatment method (i.e. total hip arthroplasty, bipolar versus unipolar hemiarthroplasty, reduction and fixation) were recorded by reviewing the operation notes of the patients.

Physiotherapy was started as soon as possible, preferably on the first day after surgery. The patient was encouraged to sit and change his or her position. Also, strengthening exercises for the trunk, arm, hip abductor, and quadriceps muscles in addition to limited motion of the hip and the knee joints were encouraged. Depending on the type and treatment of fracture, patients were usually helped to stand with full-weight bearing on the uninjured leg and partial-weight bearing on the injured leg with the assistance of their relatives and a walker or crutches. After ten days, walking exercises were started using a walker or crutches without the assistance of a person. The physiotherapy program was continued over several months, even for up to one year, until the patient could ambulate using a walking aid but without the assistance of relatives. Patients were occasionally referred to occupational therapists in order to learn how to carry out their daily activities.

Pain reported by the patients at their 3-month and 1-year follow-up visits was evaluated using an 0 to 10 score, where 0 meant 'completely painless' and the severity gradually increased to score 10. We assumed the pain level in the patient with a hip fracture on arrival to be 10; therefore, the question asked at 3 months concerned change in pain severity in regard to 10. Moreover after one year, the pain score was administered once more and change in comparison to the result after 3 months was recorded. Pain was described as decreased, unchanged, and increased in tables.

Functional outcomes of the patients at the 3-month and 1-year follow-up were assessed by telephone interviews using a modified Barthel index of activities of daily living [16]. Five items (feeding, bathing, dressing, using the toilet and transfers) were scored as 0 if the patient was unable to carry out the activity, 1 if the patient needed help with the activity, and 2 if the patient could carry out the activity independently. The range of total scores for these five items was from 0 to 10, with a lower total score indicating more disability.

Locomotion of the patients at the 3-month and 1-year follow-up was classified as Independent and dependent on a cane, crutches, walker, wheelchair, or completely bed ridden.

Descriptive statistics were obtained using SPSS software version 18.0 for windows (SPSS Inc, Chicago, IL, USA). The frequency and percentage of the different variables were calculated. Further analyses were conducted as described below:

Comparison of modified Barthel Index of activity of the subjects at 1 year and at 3 months using the paired-samples t test.

Evaluation of locomotion of the subjects at the 3-month follow-up in comparison to pre-fracture status and at the 1-year follow-up in comparison to the 3-month follow-up using the Friedman Test. These analyses were performed after classifying locomotion of patients to independent, dependent on an instrument and bed ridden, which was recorded as 1, 2, and 3 respectively.

P-values of less than 0.05 were considered to be the significance threshold.

## RESULTS

Of the total of 1015 hip fractures in subjects with 50 years of age or older, the female to male ratio was 1.33 (581 women, 57.2 % and 434 men, 42.8 %). The mean age was 75.6 years, with the oldest patient of 109 years of age. Figure 1 shows the distribution of age and sex of the patients in 10-year intervals. Right-sided and left-sided hip fractures were found in 486 (47.9 %) and 525 (51.7 %) of the subjects, respectively. Also, four cases (0.4%) suffered from simultaneous bilateral hip fractures. Intertrochanteric fracture was the most common type (72.1%), followed by femoral neck fracture (24.0 %) and subtrochanteric fracture (3.9%). The most common procedure was reduction and fixation of the fracture (86.9%), followed by bipolar hemiarthroplasty (9.0%), unipolar hemiarthroplasty (3.0%), and total hip arthroplasty (1.1%). More than two-thirds of the procedures were performed under general anesthesia (72.8%). The distribution of hip fractures in our center was almost equal in different seasons of a year (spring: 25.4%, summer: 22.6%, fall: 26.6%, winter: 25.4%).

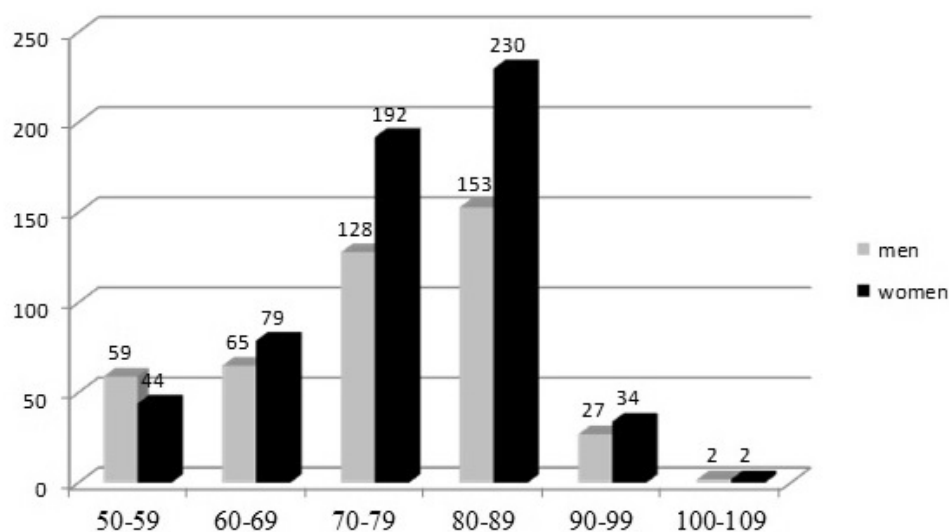


Fig. 1. Distribution of age and sex of patients in 10-year intervals

Tab. 1. Demographic data in patients participating in the survey on arrival to the hospital (by type of fracture)

	Femoral Neck Fracture	Intertrochanteric Fracture	Subtrochanteric Fracture	
Number	170	478	26	
Age (year); mean ± SD	71.7 ± 11.5	75.3 ± 10.0	73.0 ± 10.4	
Female/Male ratio	1.61	1.24	0.85	
Positive history of previous osteoporotic fracture (percent)	9.4 %	11.2 %	19.2 %	
Positive history of previous hip fracture in first-degree family (percent)	4.1 %	9.2 %	11.5 %	
Mechanism	Fall	154 (91.6 %)	416 (87.0 %)	20 (76.9 %)
	Other trauma	16 (9.4 %)	62 (13.0 %)	6 (23.1 %)

SD: Standard Deviation

Tab. 2. Results of 3-month and 1-year follow-up examinations by type of fracture

	3-month follow-up			1-year follow-up		
	Femoral neck fracture	Intertrochanteric fracture	Subtrochanteric fracture	Femoral neck fracture	Intertrochanteric fracture	Subtrochanteric fracture
Number	170	478	26	137	405	20
Pain						
Decreased	146 (85.9 %)	433 (90.6 %)	23 (88.5 %)	115 (84.0 %)	347 (85.5 %)	16 (80.0 %)
Unchanged	13 (7.6 %)	14 (2.9 %)	3 (11.5 %)	11 (8.0 %)	41 (10.1 %)	3 (15.0 %)
Increased	11 (6.5 %)	31 (6.5 %)	0 (0.0 %)	11 (8.0 %)	18 (4.4 %)	1 (5.0 %)
Barthel index of activity (mean ± SD)	6.62 ± 3.40	7.16 ± 5.68	7.00 ± 3.09	7.78 ± 3.40	7.83 ± 4.85	7.75 ± 3.05
Locomotion						
Independent	31 (18.2 %)	78 (16.3 %)	3 (11.5 %)	50 (36.6 %)	134 (33.0 %)	5 (25.0 %)
With cane	28 (16.5 %)	114 (23.8 %)	5 (19.2 %)	35 (25.5 %)	99 (24.4 %)	6 (30.0 %)
With crutches	13 (7.6 %)	22 (4.6 %)	3 (11.5 %)	11 (8.0 %)	17 (4.2 %)	2 (10.0 %)
With walker	74 (43.5 %)	201 (42.1 %)	10 (38.5 %)	24 (17.5 %)	103 (25.3 %)	2 (10.0 %)
With wheelchair	2 (1.2 %)	8 (1.7 %)	4 (15.5 %)	2 (1.5 %)	4 (1.0 %)	3 (15.0 %)
Bed ridden	22 (13.0 %)	55 (11.5 %)	1 (3.8 %)	15 (10.9 %)	49 (12.1 %)	2 (10.0 %)

Tab. 3. Means of locomotion of patients and p-values by type of hip fracture

	Pre-fracture status	3-month follow-up	1-year follow-up	P-value
Femoral neck fracture	<b>1.44</b>	<b>2.39</b>	<b>2.17</b>	<b>&lt;0.001</b>
Intertrochanteric fracture	<b>1.43</b>	<b>2.40</b>	<b>2.16</b>	<b>&lt;0.001</b>
Subtrochanteric fracture	<b>1.65</b>	<b>2.18</b>	<b>2.18</b>	<b>0.017</b>

Among the 1015 patients, 674 subjects (292 male, 382 female) agreed to participate in the survey and replied to the questionnaire on admission and three months after surgery. Most of the patients lived with their families (639 cases; 94.8%). A total of 517 patients (76.7%) were able to walk independently at pre-fracture time. Only one patient with an intertrochanteric fracture was bed-ridden and 156 patients (23.1%) used an aid for walking before fracture. The characteristics of different fractures are reported in Table 1.

After excluding bilateral hip fracture subjects and the non-ambulatory patient, there were 562 cases including 317 women and 245 men who responded to phone contact one year after surgery. Most cases lived with their families (94.5%). Data collected at the 3-month and 1-year follow-up visits from patients with different fracture types are shown in Table 2. After analysis of the modified Barthel index scores of patients who completed the questionnaire at both the 3-month and one-year follow-up visits, it was determined that for all types of hip fracture, this variable increased significantly from 6.84 to 7.70; p-value <0.001. Moreover, analysis of the modified Barthel index of activity for different types of hip fracture revealed a statistically significant difference between femoral neck fracture (p-value=0.001 for 137 cases) and intertrochanteric fracture (p-value <0.001 for 405 cases), but for the 20 patients with subtrochanteric fractures, no difference was found (p-value of 0.201).

Using the Friedman test for evaluating changes in locomotion of all 562 subjects with different types of

hip fractures, a significant difference was noted after 3 months and one year (P-value <0.001). Increase in mean locomotion scores from the pre-fracture status of 1.44 to 2.39 at 3-month follow-up showed reduction in independent motion. At one year post fracture, the mean of 2.16, being less than the 3-month score, indicated a reduction in the use of assistive devices for mobility. Subgroup analyses for each hip fracture type showed similar results with the exception of subtrochanteric fractures (Table 3).

## DISCUSSION

Considering similarities in race, culture, and life style, it is more rational to compare demographic and epidemiologic data of the present study with previous studies from different regions of Iran. Our study shows a significant increase in the rate of hip fractures in the seventh and eighth decades of life. It is similar to what has been reported by Moayyeri et al [10]. The incidence of hip fractures in females was higher than in males older than 60 years of age but it was reversed below 60 years of age. Although the female to male ratio of hip fractures was greater than 1 in our study and in other studies performed in Iran [9,11,12], but it was lower than in other parts of the world [17,18]. The female to male ratio was below 1 in the subtrochanteric fracture group, as in the study by Maharlouei et al [7].

It has been stated that intertrochanteric fractures are associated with osteoporosis to a greater extent than femoral neck fractures [19]; hence more elderly

patients, especially women, experience intertrochanteric fractures as compared to femoral neck fractures [6,7, 20]. However, a study by Lee et al. showed the contrary findings of 67.2% femoral neck fractures versus 32.8% intertrochanteric fractures in Singapore [21].

Interestingly, the distribution of hip fractures in different seasons of the year was almost equal in the current study. This is contrary to other studies, which described increased incidence of hip fractures in the winter season [8,11,17]. A probable cause is the moderate climate of Shiraz without very cold and heavy snow in winters; therefore, the incidence of falls among the elderly in the winter and other seasons is similar in this region.

A previous osteoporotic fracture is a major risk factor for a new fracture and subsequent increase in morbidity and mortality [19, 22]. Our study showed more patients with previous osteoporotic fractures in cases of intertrochanteric fractures (32.2%) as compared to femoral neck (27.6 %) or subtrochanteric types (19.2 %).

Patients with a hip fracture suffer from high morbidity and disability especially in independent walking. The prevention of disability relies on good support, fine rehabilitation programs and careful home care services. In-hospital mobilization immediately after surgery should be followed by regular out-patient rehabilitation provided by concerned family members and friends for a long time, even up to one year. One reason for improvement in activities of daily living and independent walking ability at 1 year in the present study is that most of our patients lived with their families (94.5%). Most Iranians do not keep their old family members in care institutions, particularly after an injury. Therefore, culture of the region is an important factor in the quality of life of elderly people with hip fractures, as previously mentioned by others [23]. Also, it is routine in our hospital to begin physiotherapy and ambulation on the first post-operative day, an important point in the rehabilitation of hip fracture patients [24], and continue it progressively even for several months. Another important reason behind the finding of an acceptable level of function and mobility at one year in our patients was the pre-fracture ability to walk independently of more

than 75% of the patients. Basic activities of the patients were reported as an important determinant of outcome in hip fracture [25]. Our results on improvement in activities of daily living and walking ability at 1 year compared to 3 months after operation are similar to those from a study by Valaviciene et al [23]. They concluded that four months were not an adequate period for hip fracture patients to regain their pre-fracture mobility. In another study of cognitive-impaired patients, walking independence could be maintained at 1 year [26]. In contrast to the previously described studies, Ariza-Vega et al. [27] reported that most functional recovery of patients following hip fracture surgery happens within the first three months.

It should be mentioned that a non-significant improvement at 1-year follow-up in comparison to 3-month follow-up in patients with subtrochanteric fractures might be due to the low number of cases (20 patients) in our study.

By continuing rehabilitation and support of elderly patients treated surgically for hip fractures for one year, significant improvement can be expected in activities of life and walking independence. Therefore, the finding of little improvement over a short period following surgery should not discourage the patients into thinking that they would remain dependent for the rest of their lives. Continuing rehabilitation programs and physiotherapy sessions for at least one year after surgery is strongly suggested and may result in better functional outcomes in a majority of patients with hip fractures.

## CONCLUSION

By continuing rehabilitation of elderly patients with surgically-treated hip fractures for one year, improvement in activities of life and walking independence can be expected even if they have a poor result after the first 3 months of rehabilitation.

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