

# MORTALITY AND FUNCTION AFTER SURGICALLY-TREATED HIP FRACTURE IN ADULTS YOUNGER THAN AGE 60

## MORTALIDADE E FUNÇÃO DEPOIS DE TRATAMENTO CIRÚRGICO DE FRATURA DE QUADRIL EM ADULTOS COM MENOS DE 60 ANOS

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### ABSTRACT

**Objective:** Hip fractures in young adults can cause poor functional capacity throughout life because of several complications. The purpose of this study was to prospectively evaluate 1-year mortality and functional outcomes for patients aged 60 years or younger with hip fracture. **Methods:** We prospectively obtained data for all consecutive patients aged 60 or younger with any type of hip fracture who were treated operatively between 2008 and 2014. After one year, patient outcomes were evaluated according to changes in pain severity, functional status (modified Barthel index), and mortality rate. **Results:** Of the total of 201 patients, 132 (65.7%) were men (mean age: 41.8 years) and 69 (34.3%) were women (mean age: 50.2 years) ( $p < 0.001$ ). Reduced pain severity was reported in 91.5% of the patients. The mean modified Barthel index was 22.3 in men and 18.6 in women ( $p < 0.001$ ). At the one-year follow-up, 39 cases (19.4%) were dependent on walking aids while only 17 patients (8.5%) used walking aids preoperatively ( $p < 0.001$ ). Seven patients (4 men and 3 women) died during the one-year follow-up period; 2 died in the hospital after surgery. **Conclusion:** Hip fractures in young adults have a low mortality rate, reduction in pain severity, and acceptable functional outcomes one year after surgery. **Level of Evidence II, Prospective Comparative Study.**

**Keywords:** Hip fractures. Morbidity. Mortality. Femoral neck fractures.

### RESUMO

**Objetivo:** As fraturas de quadril em adultos jovens podem ocasionar capacidade funcional insatisfatória durante toda a vida, devido a várias complicações. A finalidade deste estudo foi avaliar prospectivamente a mortalidade e os desfechos funcionais em um ano, em pacientes com 60 anos de idade ou menos com fratura de quadril. **Métodos:** Coletamos prospectivamente dados de todos os pacientes consecutivos com idade de 60 anos ou menos, com qualquer tipo de fratura de quadril, que foram tratadas por cirurgia entre 2008 e 2014. Depois de um ano, os desfechos dos pacientes foram avaliados de acordo com as mudanças da intensidade da dor, estado funcional (índice de Barthel modificado) e taxa de mortalidade. **Resultados:** Do total de 201 pacientes, 132 (65,7%) eram homens (média de idade: 41,8 anos) e 69 (34,3%) eram mulheres (média de idade: 50,2 anos) ( $p < 0,001$ ). A menor intensidade de dor foi relatada em 91,5% dos pacientes. A média do índice de Barthel modificado foi 22,3 em homens e 18,6 em mulheres ( $p < 0,001$ ). No acompanhamento de um ano, 39 pacientes (19,4%) dependiam de dispositivos auxiliares da marcha, enquanto apenas 17 pacientes (8,5%) usavam esses dispositivos no pré-operatório ( $p < 0,001$ ). Sete pacientes (4 homens e 3 mulheres) morreram durante o período de acompanhamento de um ano; dois morreram no hospital, depois da cirurgia. **Conclusão:** As fraturas de quadril em adultos jovens têm baixa taxa de mortalidade, redução da intensidade da dor e desfechos funcionais aceitáveis um ano depois da cirurgia. **Nível de Evidência II, Estudo Prospectivo Comparativo.**

**Descritores:** Fraturas do quadril. Morbidade. Mortalidade. Fraturas do colo femoral.

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### INTRODUCTION

Hip fracture is a major public health problem that has a significant financial impact on patients and health care systems.<sup>1,2</sup> The incidence of hip fracture varies by age and sex; it is more common

in older people. Hip fracture in elderly osteoporotic patients most often results from low-energy trauma such as falling down. On the other hand, high-energy trauma is the main mechanism of hip fracture in the young adult population.<sup>3-5</sup>

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Although several studies have dealt with the consequences and mortality of hip fractures in older people, only a few studies have reported the outcomes of hip fracture in the younger adult population.<sup>3,4,6-12</sup> Several complications of hip fracture such as osteonecrosis, nonunion, implant failure, and shortening can cause life-long poor functional capacity and impede the adult population from returning to pre-fracture levels of activity.<sup>4,6,10-14</sup> Moreover, the 1-year mortality rate for hip fracture is less than 10% in young patients, but it is approximately 20–30% in older patients.<sup>6,15</sup>

This prospective study presents epidemiologic data for young adults who were treated for hip fractures at our center and evaluates their 1-year mortality and functional outcomes.

## MATERIALS AND METHODS

After the study was approved by the institutional review board (Ortho-shiraz.Med.Rec.1390.2), we selected all patients 60 years or younger referred to our hospital with hip fracture between March 2008 and February 2014. Patients who died within the first day of admission, patients with pathologic fractures or hip fracture dislocations, and non-surgically treated cases were excluded. After the patients signed the terms of informed consent, a trained researcher interviewed each patient and extracted data from the medical records, surgical log, and discharge orders using a data-gathering form. We followed the patients by telephone for one year after discharge and asked about their functional status and potential mortalities.

Demographic data included age, sex, locomotion history of the patients prior to the fracture, and fracture risk factors such as body mass index (BMI), history of previous fracture, cigarette smoking, and comorbidities were recorded. Mechanism and type of fracture, surgical method, number of days from admission to surgery, and days from surgery to discharge were also recorded.

The main items used to measure patient outcome were pain severity and pain changes over time, functional status, and mortality rate. The functional status of the patients was measured using the modified Barthel index for activities of daily living, level of walking ability, sphincter control (bladder, bowel), and locomotion (walking with or without a walking aid or bedridden).<sup>16</sup> Activities of daily living were measured with five items for feeding, bathing, dressing, toilet use, and transfer. Each was scored as follows: 0=patient unable to perform, 1=patient required help to perform, 2=patient could perform independently. Total possible scores for these five items ranged from 0 to 10. Level of walking ability was measured with seven items including meal preparation, shopping, housework, watering the garden, washing clothes, taking medication, and transportation. The total possible score range was 0–14.

Descriptive statistics were analyzed using SPSS software version 18.0 for Windows (SPSS Inc, Chicago, IL, USA). Continuous variables are presented as mean values  $\pm$  standard deviation (SD). Categorical variables are presented as absolute numbers and percentages. The differences were considered statistically significant when *P* was less than 0.05 for all analyses.

## RESULT

Over the six-year study period, a total of 230 patients aged 60 years or less were treated surgically for hip fracture. Only 201 patients (87.3%) completed the survey with a one-year follow-up interview. Of these, 132 (65.7%) were men with a mean age ( $\pm$ SD) of 41.8 $\pm$ 13.1 years and 69 (34.3%) were women with a mean age of 50.2 $\pm$ 11.9 years (*p*<0.001). The mean length of hospital stay was 7.3 $\pm$ 3.3 days (injury to surgery interval: 3.4 $\pm$ 2.9 days, surgery to discharge interval: 3.8 $\pm$ 1.5 days). Other data are reported in Table 1.

As shown in Table 2, right and left hip fractures are equal in frequency. Intertrochanteric fractures were most common, followed by

femoral neck fractures and subtrochanteric fractures. Reduction and internal fixation was the most commonly used surgical management for hip fractures in our sample (96.5%). High-energy trauma including traffic accidents and falls from height caused 128 cases (63.7%). Most fractures occurred in the fall and winter seasons.

One-year mortality and functional outcome for patients are displayed in Table 3. Reduction in pain severity was reported in 91.5% of all participants. The mean modified Barthel index was 22.3 $\pm$ 3.9 in men and 18.6 $\pm$ 7.3 in women (*p*<0.001). More than 90% of patients had bladder and bowel control after surgery. At the one-year follow-up, 39 patients (19.4%) were dependent on walking aids while only 17 (8.5%) had used walking aids prior to surgery (*p* <0.001).

Of the total, 7 patients (4 men and 3 women) died during the one-year follow-up period. The mean age of the dead patients was 51.4 $\pm$ 10.3 years. Fracture was the result of high-energy trauma in 5 patients. Intertrochanteric, subtrochanteric, and femoral neck fractures were seen in 4, 2, and 1 cases, respectively. The mean hospital stay was 10.5 $\pm$ 5.7 days. Two patients (28.5%) died in the hospital after surgery; 1 (14.2%) died within the first three months after hip fracture surgery and 4 patients (57.1%) died between 3 and 12 months after surgery.

**Table 1.** Baseline characteristics of patients with hip fracture.

General characteristic	No. (%) of men	No. (%) of women	Total
Age (Mean SD)	41.8 $\pm$ 13.1	50.2 $\pm$ 11.9	44.7 $\pm$ 13.3
Smoking	73 (55.3)	12 (17.4)	85 (42.3)
Body Mass Index (Mean SD)	22.5 $\pm$ 3.2	22.8 $\pm$ 3.8	22.6 $\pm$ 3.4
<b>Length of hospital stay (Mean SD)</b>			
Injury-surgery interval	3.5 $\pm$ 2.9	3.3 $\pm$ 2.9	3.4 $\pm$ 2.9
Surgery-discharge interval	3.9 $\pm$ 1.5	3.7 $\pm$ 1.4	3.8 $\pm$ 1.5
<b>Previous fracture</b>			
Hip fracture	4 (3.0)	2 (2.9)	6 (3.0)
Wrist fracture	3 (2.3)	1 (1.4)	4 (2.0)
Vertebra fracture	3 (2.3)	1 (1.4)	4 (2.0)
Other fracture	32 (24.2)	6 (8.7)	38 (18.9)
<b>Locomotion</b>			
Without walking aids	123 (93.2)	61 (88.4)	184 (91.5)
With walking aids	9 (6.8)	8 (11.4)	17 (8.5)
<b>Comorbidity</b>			
Hypertension	2 (1.5)	1 (1.4)	3 (1.5)
Diabetes mellitus	5 (3.8)	7 (10.1)	12 (6.0)
Heart disease	3 (2.3)	4 (5.8)	7 (3.5)
Cerebrovascular disease	0 (0.0)	2 (2.9)	2 (1.0)
Others	24 (18.2)	24 (34.8)	48 (23.9)

**Table 2.** Fracture characteristics among young adults.

Characteristics	No. (%) of men 132	No. (%) of women 69	Total
<b>Side of fracture</b>			
Left	69 (52.3)	30 (43.5)	99 (49.3)
Right	62 (47.0)	39 (56.5)	101 (50.2)
Bilateral	1 (0.8)	0 (0.0)	1 (0.5)
<b>Type of fracture</b>			
Intertrochanteric	78 (59.1)	27 (39.1)	105 (52.2)
Subtrochanteric	16 (12.1)	3 (4.3)	19 (9.5)
Femoral neck	38 (28.8)	39 (56.5)	77 (38.3)
<b>Mechanism of fracture</b>			
High-energy trauma	98 (74.2)	30 (43.6)	128 (63.7)
Low-energy trauma	34 (25.8)	39 (56.5)	73 (36.3)
<b>Method of fixation</b>			
Internal fixation	131 (99.2)	63 (91.3)	194 (96.5)
Arthroplasty	1 (0.8)	6 (8.7)	7 (3.5)
<b>Season of fracture</b>			
Spring	30 (22.7)	15 (21.7)	45 (22.4)
Summer	30 (22.7)	11 (15.9)	41 (20.4)
Fall	36 (27.3)	23 (33.3)	59 (29.4)
Winter	36 (27.3)	20 (29.0)	56 (27.9)

**Table 3.** One-year mortality and functional outcome for patients with hip fractures.

	No. (%) of men	No. (%) of women	Total
<b>Pain</b>			
Decreased	126 (95.5)	58 (84.1)	184 (91.5)
Unchanged	1 (0.8)	5 (7.2)	6 (3.0)
Increased	1 (0.8)	3 (4.3)	4 (2.0)
Modified Barthel index of activity (Mean SD)	22.3 ± 3.9	18.6 ± 7.3	21.0 ± 5.5
Bladder control	125 (94.7)	61 (88.4)	186 (92.5)
Bowel control	126 (95.5)	62 (89.9)	188 (93.5)
<b>Locomotion</b>			
Without walking aids	111 (84.1)	44 (63.8)	155 (77.1)
With walking aids	17 (12.9)	22 (31.9)	39 (19.4)
<b>Mortality</b>			
Alive	128 (97.0)	66 (95.7)	194 (96.5)
Dead	4 (3.0)	3 (4.3)	7 (3.5)

## DISCUSSION

Morbidity and mortality among elderly patients after hip fracture have been well described in the literature.<sup>17,18</sup> In young adults, prolonged morbidity after hip fracture as a major public health concern requires significant attention to reduce the economic burden on society. The morbidities are the result of complications such as nonunion, malunion, implant failure, femoral shortening, osteonecrosis, arthritis, and stiffness of joint motions.<sup>7,19,20</sup> To the best of our knowledge, many studies in the literature describe complications of surgically-treated hip fractures (especially femoral neck type) in young adults, but limited research has been carried out on functional outcomes.<sup>11</sup> In this study we showed that pain levels were reduced, activities of daily living increased, and patients were able to move about unaided after one year in most cases. The survival rate for hip fracture among young adults exceeds 90%. Duckworth et al.<sup>21</sup> reported a mortality rate of 2.6% and complications of about 32% in adults <60 years with surgically-treated hip fracture. Additionally, in a study of mortality and complication-free

rates following hip fractures in patients aged 20–40 years, Lin et al.<sup>6</sup> reported 10-year survival rates of 93.3%, 91.8%, and 94.5% for all hip fracture cases, patients with trochanteric fracture, and patients with femoral neck fracture, respectively. The complication-free rate after one year was 86.8%. Overall, these results were similar to our findings. In our study, all dead patients had important comorbidities (e.g. renal failure). This result is in line with recent reports showing a higher risk of mortality and complications in young adults with a higher number of comorbidities.<sup>6</sup> Intertrochanteric fracture was the most prevalent fracture type, not only among all the hip fractures but also in the dead patients. This result is consistent with studies that reported a higher mortality rate for trochanteric fractures in both young and elderly patients.<sup>6,22</sup>

In this present study, hip fractures occurred more frequently in men than women. The mean age of hip fracture in men was about 42 years, significantly lower than the mean age in women who underwent surgery for hip fractures. High-energy trauma was seen to be the main cause of hip fracture in young men, but low-energy trauma (like simple falls) were more common in older women due to osteoporosis. These results are in line with other studies evaluating the incidence and rate of hip fractures in young adult patients.<sup>6,20</sup> We found a higher mortality rate and increased morbidity measures such as pain and quality of life after surgically-treated hip fractures in women in comparison to men. We hypothesize that the higher mean age of the women included in this study could explain this finding. This survey has several limitations, principally the small sample size. Furthermore, subjects with hip fracture were followed by telephone for one year. It is obvious that some morbidity measures require patient visits and radiographic evaluations for longer follow-up periods. Consequently, caution should be used in extrapolating our results.

## CONCLUSION

Hip fractures in young adults have a low mortality rate, reduction in pain severity, and acceptable functional outcomes one year after surgery.

**AUTHORS' CONTRIBUTIONS:** Each author made significant individual contributions to this manuscript. BP (0000-0002-6118-8938)\*, MJE (0000-0001-6598-0968)\*, and ARV (0000-0002-6118-8938)\* designed the study and directed the research. ARV and ZK (0000-0003-0431-179X)\* followed patients and gathered clinical data. BP and HM (0000-0002-8998-1209)\* evaluated the data for the statistical analysis. MJE, ARV, and HM performed the literature search, reviewed the manuscript, and contributed to the intellectual concept of the study. All authors participated in drafting the article, critically reviewed the manuscript, and approved the final manuscript as submitted. \*ORCID (Open Researcher and Contributor ID).

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