International Journal of Surgery 24 (2015) 101–104

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original research

# Hip fractures in patients older than 75 years old: Retrospective analysis for prognostic factors

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## HIGHLIGHTS

- Proximal femoral fractures are often seen in older patients.
- They are associated with high mortality.
- It is important to determine the factors that affect mortality especially in patients older than 75 to decrease the mortality rate.

## ARTICLE INFO

*Article history:*
Received 6 October 2015
Accepted 2 November 2015
Available online 10 November 2015

*Keywords:*
Proximal femoral fracture
Hip fracture
Affecting
Mortality
Factors
Over 75 years of age
Prognostic

## ABSTRACT

*Background:* Proximal femoral fractures are often seen in older patients and are associated with high mortality. Introduction to old age population is latening due to advancements in medical sciences and increasing life expectancy.
*Objectives:* The aim of the study was to evaluate factors affecting mortality in patients above 75 years of age who had been operated because of proximal femur fractures.
*Patients and methods:* Patients with age 75 and over who suffers from post-fall proximal femoral fracture who underwent surgery with one of following three methods (hemiarthroplasty, proximal femoral nail or total hip arthroplasty) were evaluated retrospectively. Effects on mortality were examined for factors such as type of surgery, type of anesthesia, preoperative ASA score (American Society of Anesthesiologists Score), need for intensive care, need for blood transfusion, operation waiting time and hospitalization duration. 115 patients who met inclusion criterion were included in the study out of 224 overall. 75 patients were women and 40 were males.
*Results:* Mortality rate after first year was found to be 40%. Patients over 85 years old had higher rates of mortality ($p = 0{,}0003$) than respectively younger patients (75–85). Sex was found to have no impact on mortality ($p = 0.5039$). There was no statistically significant difference in terms ASA score ($p = 0.1518$). Order of applied surgical methods with mortality risk rates was found to be total hip arthroplasty > hemiarthroplasty > proximal femoral nail ($p = 0.0003$). Type of anesthesia, the use of cement during arthroplasty, operation waiting time and hospitalization duration was not directly related with mortality rate (type of anesthesia $p = 0.63$, the use of cement during arthroplasty $p = 0.223$, operation waiting time $p = 0.5$ and hospitalization duration $p = 0.19$).
*Conclusions:* Age is the primary risk factor on first year mortality in patients older than 75 years old with hip fractures. Addition to older age, more need to blood transfusions, and arthroplasty are other risk factors for first year mortality. It should be kept in mind that after 75 years old first year mortality may be higher if the patient is treated with arthroplasty.
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## 1. Introduction

Femur fractures, with its increasing incidence among elderly, have been occurring increasingly due to lengthened life expectancy of humans all over the world. Only in United States of America, annual

*Abbreviations:* ASA, American Society of Anesthesiologists Score.

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http://dx.doi.org/10.1016/j.ijsu.2015.11.009
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**Table 1**
Gender distribution of patients according to age groups.

| Age | Women | Men | Total |
|---|---|---|---|
| 75–85 | 52 | 25 | 77 |
| >85 | 23 | 15 | 38 |
| Total | 75 | 40 | 115 |

reported number of cases is 350 000 [1]. Although most of the patients in this group survive at least one year, there are studies reporting high mortality rates in patients with proximal femoral fracture [2,3]. Many studies were conducted about hip fractures related mortality in patients above 65 years. Mortality rate after hip fracture in the first year varied between 26.9% and 35.7% in these studies [4,5]. However, factors affecting mortality in those studies are controversial. Those studies did not sufficiently analyze the relationship between mortality and factors such as type of surgery, type of anesthesia, ASA score (American Society of Anesthesiologists Score), gender, need for blood transfusion, time to operation, and hospitalization time.

Although elderly population was considered to be people older than 65 years in the present studies, introduction to old age population is latening due to advancements in medical sciences and increasing life expectancy. In the recent studies, elderly population deem to be accepted as 75 years and older; thus hip fractures mortality and effecting factors should be investigated in this age group [6].

In this study, factors affecting mortality and mortality after hip fracture were evaluated in patients above 75 years.

## 2. Patients and methods

In this retrospective study, geriatric patients who admitted to a tertiary health center between January 2009 and September 2013 with the complaint of proximal femoral fracture due to fall were evaluated. All patients underwent surgical operation by one of the 3 separate methods: proximal femoral nail, hemiarthroplasty, and total hip arthroplasty. Among the survived patients, those with at least 1-year follow up were included to the study. Exclusion criteria included pathological fractures, age below 75, fracture older than 1 week, and subtrochanteric fracture.

The data were recruited from hospital database and patient files. In addition, incomplete records were completed by telephone calls and outpatient clinic files.

Demographic data, surgery, anesthesia, preop ASA score (American Society of Anesthesiologists Score), need for intensive care, need for blood transfusion, time to operation, hospitalization, and time of death were recorded. The relationships between these parameters and mortality were analyzed.

Of the 224 patients operated between January 2009 and September 2013 because of proximal femoral fracture, 109 patients who can not be reached or who had pathologic fractures or had missing data were excluded from the study. Of the included patients, 66 had proximal femoral nail, 40 had hemiarthroplasty, and 9 had total hip arthroplasty. Of the 115 patients, 75 were females and 40 were males. [See Table 1 and 2] The mean age of female and male patients was 84.2 and 82.7 years, respectively. [See Table 3]. The mean duration of follow-up period was 18 months.

Survival analysis was made by Kaplan–Meier method. In order to evaluate the relationship of recorded parameters and mortality, cox regression model was used. Statistical analyses were conducted by MedCalc software. Mortality and survival analyses were based on the first date of hip surgery. Statistically significance level was adjusted to 0.05. Written informed consent was obtained from all participants in the study.

## 3. Results

46 of 115 patients who were included in the study were found to die within the first one year. 15.21% of the first year deaths were found to occur in the first month. 63.04% of the first year deaths were found to occur between 1 and 6 months, 21.73% were found to occur after 6 months.

When factors affecting mortality were examined, it was seen that the type of surgery was related to mortality ($p = 0.0003$). [See Table 4].

In proximal femoral nail group, mortality rate by the end of the first year was 24.24%, whereas it was 66.66% in the total hip arthroplasty group, and 60% in the hemiarthroplasty group. [See Table 5].

In patients treated with proximal femoral nail, the first-year mortality rate was significantly lower compared to patients treated with arthroplasty ($p = 0.0003$).

The use of cement during arthroplasty was determined to have no significant effect on mortality ($p = 0.223$).

Mortality rate was found to be significantly higher in patients who should be monitored in the intensive care unit postoperatively ($p = 0.002$).

When the patients were divided into two groups of above and less than 85 years old, analyzes show mortality was relatively higher in patients older than 85 compared to patients between 75 and 85 years old ($p = 0.02$). [See Table 4].

When examining the effects of sex on mortality, it was found to have no impact on mortality ($p = 0.5039$). The mortality rate in the first year was 38.66% in women, while was 42.5% in men.

**Table 2**
Patients included in the study and distribution of the patients according to the type of surgery.

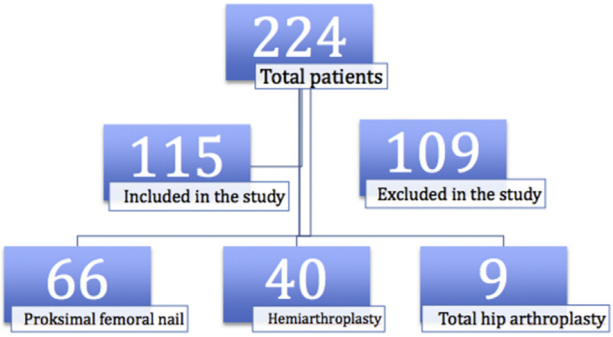


**Table 3**
The characteristics of the groups when patients were grouped according to the type surgery.

| | Proksimal femoral nail | | Hemiarthroplasty | | Total hip arthroplasty | |
|---|---|---|---|---|---|---|
| | Men | Women | Men | Women | Men | Women |
| Number of patients | 22 | 44 | 13 | 27 | 6 | 3 |
| Mean age | 82.86 | 83.5 | 81.92 | 86.07 | 84.66 | 81.33 |
| ASA Score | 2.9 | 2.5 | 3.4 | 3.2 | 2.3 | 2.2 |
| Blood transfusion | 0.9 | 0.8 | 2.1 | 2.2 | 3 | 2.9 |

**Table 4**
The effect of patient factors on mortality among patients with hip fractures treated surgically.

| Correlated with mortality | Not correlated with mortality |
|---|---|
| Type of surgery (p = 0.0003) | Type of anesthesia (general-spinal)(p = 0.63) |
| Age ≥ 85 (p = 0.02) | Operation waiting time (before 5 days and after) (p = 0.5) |
| | Total time of hospitalization (before 10 days and after) (p = 0.19) |
| Blood transfusions ≥ 2 units (p = 0.03) | ASA score≥ 3 (p = 0.1518) |
| | Sementing or not sementing (p = 0.223) |

Preoperative status and additional comorbidities were assessed with ASA score. Patients were divided into two groups depending on ASA score whether 3 or above and under 3. While in patients with ASA score 3 or above first year mortality rate 41.6%, it was 37.2% in patients with ASA score was under 3.

According to this rates, there was no statistically significant difference in terms ASA score (p = 0.1518). [See Table 4].

When assessing impact of blood transfusion peroperatively and postoperatively on mortality, mortality was higher in patients who needed 2 or more blood transfusions (p = 0.006). On the other hand, type of anesthesia (general-spinal) (p = 0.63), time to operation (before and after 5 days) (p = 0.5), and total time of hospitalization were not significant factors affecting mortality (less or more than 10 days) (p = 0.19).

## 4. Discussion

Many previous studies reported that the mortality within the first year after proximal femoral fracture was increased [1–5]. In literature, mortality rate varied between 26.9% and 35.7% in the studies evaluating patients older than 65 years old. In this study with the population older than 75 years old the first year mortality rate is significantly higher with 40%. If the study population is separated to two groups, younger and older than 85 years old, it is observed that the mortality in patients older than 85 years old is even higher. This finding indicates that age is a independent risk factor for mortality after hip fracture and supported in the literature [2,3].

Rogmark and colleagues identified age as an important risk factor, nevertheless they reported that mortality remained comparable in different surgical interventions. On the contrary in this study, mortality rate was significantly different in different surgery groups. The lowest mortality rate was observed in the proximal femoral nailing, which was followed by hemiarthroplasty and total hip arthroplasty. Interestingly, the mortality rate in the hemiarthroplasty group was lower than total hip arthroplasty although the patients treated with total hip arthroplasty had less comorbidities and lower ASA scores. The higher mortality rate in total hip arthroplasty group may be explained by longer surgery time, more blood loss and more need for blood transfusions in that group of patients. The studies of Parker and Bhandari supports that the mortality rates after osteosynthesis of hip fractures is lower than arthroplasty [13,14].

**Table 5**
Postoperative mortality within the first year according to the type surgery.

| Proksimal femoral nail | Hemiarthroplasty | Total hip arthroplasty |
|---|---|---|
| % 24.24 | % 60 | % 66.66 |

ASA classification is commonly used to determine the preoperative comorbidities and risk factors [7,15]. Although in the literature higher ASA scores are related with higher mortality rates after hip fracture [8,9,16], in this study the mortality rates in patients with ASA 3-4 was not to be found higher than patients with ASA 1-2. That strengthens the thesis that the age is an important risk independent of ASA and comorbidities.

The effect of time to operation on mortality is still on debate. In literature, there are some studies that suggests lower mortality rates in patients operated within the first 24 h. These studies also stated that increased duration of immobilization may reduce complications such as deep vein thrombosis and urinary system infection [1,3,10]. In this study, the number of patients operated within the first 24 h was very limited to make any analysis. Thus, we could not draw any conclusions about this issue. Nevertheless, we compared patients operated within the first 5 days and later, there is no difference in terms of mortality.

Few studies, evaluating patients older than 65, reported increased mortality in male gender during the first year after surgery and accompanying comorbidities were suggested as the main reason [11,12]. However in this study there is no difference between male and female patients in terms of mortality. It can be explained with the older population (older than 75) in this study. Beyond the age of 75 the particular differences of genders decrease.

In terms of anesthesia method, there was no significant difference of one-year mortality between regional anesthesia and general anesthesia. Certainly, preference in the method of anesthesia was based on the condition of a patient and presence of comorbidities. Therefore, it is not surprising that regional anesthesia and general anesthesia patient groups were not homogenous in terms of comorbidities. Thus, adequate anesthesia method taking comorbidities into consideration would not affect early period mortality.

The study has several limitations. First of all, the retrospective nature of the study makes the study prone to misinterpretations. The proximal femur fractures are not classified separately as intra-articular and extra-articular fractures and this makes it impossible to comment on the mortality in different hip fractures. Many patients are excluded from the study due to several reasons because of the lack of the follow-up and lack of the achieve data. Another limitation of the study was about the small number of patients in total arthroplasty group (n:9) compared to others.

## 5. Conclusions

In conclusion, this study shows that age is the primary risk factor on first year mortality in patients older than 75 with hip fractures. Especially age older than 85 is an independent risk factor for mortality. Addition to older age, more need to blood transfusions and

arthroplasty are other risk factors for first year mortality. Gender, ASA Classification, time to surgery, sementing or not sementing, type of anesthesia may not be related with mortality after hip fractures. According to these findings, it should be kept in mind that after 75 years old first year mortality may be higher if the patient is treated with arthroplasty.

## Competing interests

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this article.

## Ethical approval

Istanbul University, Clinical Research Ethics Committee Reference Number: 71306642/050-01-04/145.

## Sources of funding

We did not receive any support.

## Authors' contributions

Gökhan Karademir, Yücel Bilgin and Mehmet I Buget were responsible for the study conception and design. Mehmet Demirel performed data collection and Gökhan Karademir, Yucel Bilgin, Ali Erşen prepared the first draft of the manuscript. Gökhan Polat revised the study draft. Gökhan Karademir did the data analysis, made critical revisions to the paper for important intellectual content and supervised the study.

## Conflicts of interest

All of the authors, their immediate family, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

## Guarantor

Gökhan Karademir and Yücel Bilgin accept full responsibility for the work as a guarantor.

## Acknowledgment

The authors wish to thank Msc. Mustafa Necip Polatcan because of his special contribution and Istanbul medical faculty members of the department of orthopedics and traumatology.

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