

**FUNCTIONAL OUTCOMES AFTER SURGICAL TREATMENT
OF PROXIMAL FEMUR FRACTURE IN ELDERLY PATIENTS**

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Summary

Objectives: To evaluate the functional outcomes of surgical treatment for proximal femoral fractures. **Subjects and methods:** This prospective study included 89 cases with proximal fractures of the femur in whom locking plate fixation, or bipolar head arthroplasty was performed between April 2020 and January 2021 at the Orthopedic and Trauma Center, Military Hospital 103. **Results:** The median age of all patients was 76.42 years (range, 60 - 93 years). The number of proximal femoral fractures that occurred in females (61.8%) was more than in males (38.2%), with $p < 0.001$. The average surgical delay was 6.39 ± 4.18 days. The mean hospital stay time was 10.58 ± 5.622 . There were (6.7%) deaths at the twelve-month follow-up, 14 (15.7%) with complications. The Barthel index score at 12 months was less than prior to fracture (90.42 vs. 98.49 points) ($p < 0.001$). The number of patients who have recovered from complications was less than those without complications (75% and 94%, respectively, $p < 0.001$). Recovery rate in the age groups 60 - 69 was reported as 98.6% and 71.61% over 90 years of age **Conclusion:** The Barthel index is a good tool to evaluate the physical recovery of pre-fracture condition and allows for the assessment of the functional recovery after one-year follow-up.

* *Keywords:* Hip fracture; Elderly patient; Barthel index.

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INTRODUCTION

Proximal femur fracture in elderly subjects is an important public health problem. According to the World Health Organization, the number of osteoporosis-related hip fractures worldwide is projected to triple over the next 50 years, from 1.7 million cases in 1990 to 6.3 million in 2050 [1]. Hip fractures are a major cause of mortality and disability in the elderly population. Post-fracture death rates ranged between 5% and 36.4% during the first year [2]. Such fractures are classified as trochanteric fractures and neck fractures in the AO/OTA classification, and osteoporosis-related proximal femur fractures in elderly patients are mostly trochanteric fractures (AO/OTA 31-A) and neck fractures (31-B). The incidence of proximal femur fracture increases with aging, and early surgical treatment and remobilization are recommended in the international clinical guidelines; however, conservative treatment based on traction is sometimes necessary for some patients when surgical treatment is not possible because of fragility, severity comorbidity. Older hip fracture patients are often characterized by various comorbidities and geriatric syndromes. In these patients, the preservation of independency and activities of daily living is of superior importance, and it is the goal of treatment to avoid a further functional

decline. Most of the published studies show results between 23% and 40% of previous physical condition recovery [2, 3].

Different evaluation scores have been used to assess the recovery of the physical condition previous to the fracture, the most common being the Katz index, Lawton and Brody scale, Downton scale, and Tinetti scale. Among the different scales, we consider the Barthel Index (BI) the most comprehensive tool to assess the physical condition previous to the fracture and its post-fracture evolution. We have used the original BI to assess the performance of activities of daily life (ADL) because, in our opinion, it is one of the most widely-used assessments of functional independence. The reason why we do not use the Harris hip score is that we consider the HHS to be appropriate for the assessment of the functional status of osteoarthritis of the hip. This study was conducted: *To report the functional outcomes of surgical treatment for proximal femoral fractures.*

SUBJECTS AND METHODS

1. Subjects

Eighty nine elderly patients with proximal femur fractures who underwent surgical treatment were enrolled in the study. All of these patients underwent

locking plate osteosynthesis or bipolar head arthroplasty at the Orthopedic and Trauma Center, Military Hospital 103, from April 2020 to January 2021.

** Inclusion criteria:*

- Patients aged 60 years and older.
- Patients underwent surgery for hip fracture.

** Exclusion criteria:*

- Pathological fractures.
- Polytraumatism.
- Periprosthetic fractures.

- Patients with malignant disease.

** Definition of variables:*

Data on age, sex, time period between trauma to surgery, type of trauma, length of hospital stay, mortality rate, Barthel index before and after the surgery, and complications were recorded for each patient.

** Evaluation methods:*

We evaluated the patients' functional status before the injury and 12 months after surgery using the Barthel index.

Table 1: Barthel index for the assessment of patient's functional status [10].

| | Task | With help | Independent |
|----|---|------------------|--------------------|
| 1 | Feeding | 5 | 10 |
| 2 | Moving from wheelchair to bed and back | 5 - 10 | 15 |
| 3 | Personal toilet use | 0 | 5 |
| 4 | Getting on/off the toilet | 0 | 10 |
| 5 | Self-bathing | 0 | 5 |
| 6 | Walking on a level surface (50 yards) | 10 | 15 |
| 6a | Propelling a wheelchair (50 yards) (do not score if the patient gets a score in item 6) | 0 | 5 |
| 7 | Ascending and descending stairs | 5 | 10 |
| 8 | Dressing and undressing | 5 | 10 |
| 9 | Bowels control | 5 | 10 |
| 10 | Controlling bladder | 5 | 10 |
| | Total (100 scores) | | |

A patient scoring 100 BI is continent, self-feeding, self-dressing himself, gets up out of bed and chairs, self-bathing, walks at least a block, and can ascend and descend stairs. A score of 0 is given in all of the above activities when the patient cannot meet the criteria as defined above.

Complications including:

Medical complications: Delirium, myocardial ischemia, deep venous thrombosis (DVT), pulmonary embolism, acute, chronic obstructive pulmonary disease, atelectasis, pneumonia, gastrointestinal bleeding, gastrointestinal perforation, urinary tract infections, acute kidney injuries, sepsis, and stroke.

Surgical complications: Deep infections, surgical site infection, dislocation, fracture of the femur, cut-out.

** Statistical analysis:*

Data were analyzed using the SPSS® software for windows®, version 16 (SPSS Inc., Chicago, IL, USA). Quantitative variables: Data presented as mean \pm variance, maximum, and minimum value. Qualitative variables:

Presented by frequency and ratio. For comparison of pre-operative and post-operative results in a single group, the paired T-test was used, and Spearman's correlation analysis for the Barthel index and correlating factors. A p-value of less than 0.05 was considered statistically significant.

** Research ethics:*

All patients' personal data were secured throughout the study in order to protect the anonymity of the patients. All patients gave their written and informed consent to enter the study.

RESULTS

1. Patient characteristics

The mean age group in the present study is 10.

The mean age group in the present study was 76.42 years (range, 60 - 93 years), and women were more popular than men (61.8% vs. 38.2%; $p < 0.001$). Bipolar hip arthroplasty was a popular treatment, including 55.17% of trochanteric fractures, 100% of neck fractures.

Table 2: Patient characteristics.

| Variables | | Value | p |
|---|-----------------------------|-----------------|---------|
| Median age: years (range) | | 76.42 (60 - 93) | |
| Gender: n (%) | | 89 (100) | |
| Men | | 34 (38,2) | < 0.001 |
| Women | | 55 (61,8) | |
| Trochanteric fracture | | 58 (65.2) | < 0.001 |
| Femoral neck fracture | | 31 (34.8) | |
| Locking plate | | 26 (29.2) | < 0.001 |
| Hemiarthroplasty | | 63 (70.8) | |
| Median presurgical days (range) | | 6.39 (0 - 22) | |
| Median hospitalization (range) | | 10.58 (6 - 39) | |
| Complication: n (%) | | 14 (15.7) | |
| | Delirium | 5 (5.62) | |
| | Failure heart | 1 (1.12) | |
| | Pneumonia | 6 (6.7) | |
| | Perforation of peptic ulcer | 1 (1.12) | |
| | Urinary tract infections | 1 (1.12) | |
| | Sepsis | 2 (2.24) | |
| | Deep infections | 2 (2.24) | |
| | Surgical site infection | 1 (1.12) | |
| Mortality: n (%) (12 months) | | 6 (6.7) | |
| Pre-fracture BI score: ($\bar{X} \pm SD$) | | 98.49 (6.397) | < 0.001 |
| Post-operative BI at 12 months: ($\bar{X} \pm SD$) | | 90.42 (17.912) | |

Concerning hospital stay before surgery, the mean value was 6.39 ± 4.18 , with a maximum of 22 and a minimum of 0 days. The median length of stay was

10.58 ± 5.622, with a maximum of 39 and a minimum of 6 days. The maximum days of hospitalization correspond to the patients with multiple complications at hospital admission. In terms of fracture type and surgical treatment, 65.2% of cases were trochanteric fractures, and 34.8% were intracapsular fractures. 29.2% of patients underwent locking plate osteosynthesis, 70.8% performed hemiarthroplasty. There were 6 (6.7%) deaths at the twelve-month follow-up, 14 (15.7%) with complications.

Table 3: Association between age and functional outcome.

| Age group (years) | n | Mean BI 12 months post-operation/pre-fracture | $\bar{X} \pm SD$ | p |
|-------------------|----|---|------------------|-------|
| 60 - 69 | 25 | 0.9860 | 0.17649 | 0.016 |
| 70 - 79 | 20 | 0.8872 | 0.18628 | |
| 80 - 89 | 33 | 0.9203 | 0.13333 | |
| ≥ 90 | 5 | 0.7161 | 0.34254 | |
| Total | 83 | 0.9198 | 0.18423 | |

Overall, BI recovery at 12 months after surgery progressively decreased with age. Therefore, the age groups 60 - 69 had a 98.6% recovery rate. In contrast, the age group above 90 years only had a recovery rate of 71.61%. By analyzing BI, we witnessed a sharp fall prior to fracture compared to the 12-month post-operative score (90.42 vs. 98.49 points, $p < 0.001$).

Regarding BI recovery, depending on the different clinical complications, the mean of BI prior to fracture and 12 months after surgery were shown in table 3. Patients with complications had poorer BI recovery than patients with no complications (75% vs. 94%, $p < 0.001$).

Table 4: Association of complications with the functional outcome.

| Complication | n | Mean BI | Mean BI 12 months post-operation/pre-fracture | p |
|--------------|----|---------|---|---------|
| No | 73 | 93.36 | 0.75 | < 0.001 |
| yes | 10 | 69.0 | 0.94 | |

Table 5: Association of complications with the length of hospitalization.

| Complication | n | Length of stay in hospital (days) | $\bar{X} \pm SD$ | p |
|--------------|----|-----------------------------------|------------------|---------|
| No | 75 | 9.21 | 1.891 | < 0.001 |
| yes | 14 | 17.93 | 11.166 | |

Patients with complications had longer hospital stay than those without complications (17.93 vs. 9.21 days, $p < 0.001$). The maximum number of days spent in the hospital was 39 due to complications of pneumonia and sepsis.

DISCUSSION

89 patients enrolled in the present study had similar characteristics to other findings in patients with osteoporotic hip fractures in terms of sex, age, and fracture type. There were 55 females and 34 males (61.8% and 38.2%, respectively). Patients had a mean age of 76.42 years (60 - 93). 41 patients (46.1%) aged 80 and above (46.1%). Concerning fracture type, trochanteric fractures were predominant (65.2%) as compared to 34.8% of intracapsular fractures.

Regarding hospital stay before surgery, only 13.48% of patients were operated on within the first 48 hours after injury, 57.31% between 3 and 7 days, and 29.21% between 8 and 22 days. Surgical delay for hip fracture remains a matter of debate. Some reasons for the operative delay in the first 48 hours of admission include a high index of comorbidity, anemia,

prior antiplatelet therapy, and new oral anticoagulants with contraindication to regional anesthesia.

E.L.Goh et al. (2020) reported the incidence of complications recorded by 8,673 participants, 120 days, 278 out of 713 patients (39%) were directly related to the surgery, 88 (12%) were medical complications [9]. In our study, 14/89 patients (14%) had complications. The main complications were pneumonia in 6/89 cases (6.7%).

The death rate at final follow-up was 6.7%, in line with other published series [4]. E.L. This proportion in Goh et al.'s study (2020) on 8673 participants at 120 days post-operation was 12.2% [9]. Mortality is known to be markedly increased in people with multimorbidity and with severe cognitive impairment. The mortality rate appears to have increased in the past decade despite a marked improvement in care service.

Some studies have attempted to predict mortality in these patients. All estimations are based on some features of the patient, such as age, previous physical status, comorbidities, cognitive impairment, and post-operative complications [5]. We consider that it is very difficult to establish mortality rates in these patients who suffer multiple incidents throughout their clinical evolution.

In our study, the average BI score prior to fracture was 98.49, while in the hospital, the main goals of the rehabilitation care are early mobilization, such as sitting, standing, and walking with aids. This rehabilitation program continues after hospital discharge. BI was 90.42 (91.82%) at 12 months follow-up. Only 48.31% of cases recovered their functional status prior to fracture.

A striking difference was found in younger patients, who reached 100% of previous BI one year after fracture. Older patients suffered significant BI losses, consistent with different published papers [4, 6]. Studies on the recovery of the pre-fracture physical condition detect an evident decrease in the patient's ability to do activities of daily living, regardless of the scale used for its evaluation [2, 7]. The most important factor for physical condition recovery is the previous physical state

[5, 8]. Aging may hinder physical recovery: Elderly patients have longer recovery periods [5].

CONCLUSION

The elderly with a proximal femur fracture is vulnerable to high mortality and disability one year following the fracture and causing difficulties in recovering the previous physical condition. The Barthel index is a good tool to evaluate the recovery of pre-fracture physical condition and allows for the assessment of the functional recovery after a one-year follow-up concerning the activities of daily living.

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