Assessment of Peroperative Parameters Affecting Mortality in Geriatric Hip Fractures

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ABSTRACT

Objective: The aim of the present study was to evaluate the potential risk factors affecting mortality in geriatric patients undergoing surgical operations for hip fractures.

Methods: One-hundred and sixteen patients (46 males, 70 females; mean age, 77.6 years) who were older than 65 years and had been operated on for hip fractures and followed from the early postoperative period were included in the study. The patients underwent surgical treatment for a femoral neck, intertrochanteric fracture, and subtrochanteric fractures. Patients were evaluated in terms of age, surgical time, length of hospital stay, accompanying systemic diseases, and mobilization timing for risk factors affecting mortality.

Results: Twelve patients (2 male, 10 female) died of various medical diseases. Two (1.7%) patients died in the first month, 4 (3.4%) between the 1st and the 3rd month, 1 (0.9%) between the 3rd and the 6th month, and 5 (4.3%) between the 6th and 12th month. The causes of death in these patients were cardiopulmonary failure (n=7), pulmonary embolism, and old age. ASA scores of the group of non-survivor patients were significantly higher compared with the group of survivor patients in terms of age, the presence of 3 or more systemic diseases, the duration of hospital stay, and mobilization time. There was no significant correlation between the surgical procedure chosen and the mortality rate.

Conclusion: Geriatric patients for whom hip fracture surgery is planned should be evaluated together with their general health status before surgery. Advanced age and high ASA scores increase the risk of mortality. Early preparation of the patient for surgery will shorten the duration of hospital stay and time until surgery and consequently will reduce perioperative complications. In addition, early mobilization by selecting the appropriate surgery method for the fracture type and the patient is a significant factor in reducing mortality.

Keywords: Geriatric, hip fracture, mortality, risk factor, comorbidity

INTRODUCTION

Hip fracture is a common health problem that particularly affects the elderly, and with the increase in life expectancy, it is becoming the primary cause of mortality among geriatric patients (1, 2). Some studies have revealed that approximately 20% of females and 30% of males die within the first year of a hip fracture (1-4). Approximately 1.6 million of people worldwide develop a hip fracture every year, and this poses an important problem for public health. This number is predicted to increase up to 2.6 million in 2025 and 4.5 million in 2050 (5, 6).

About 70% of hip fractures in geriatric patients (older than 60 years old) are due to low-energy trauma (7). In a meta-analysis, mortality rates were found to be higher during the first 3 months after hip fracture, particularly among male patients (8). Mortality rates during hospitalization were reported to be between 4% and 12% (4, 9-11). Although many factors that can increase the risk of death have been defined, there is no consensus yet regarding those factors (10, 12, 13).

Knowing the factors that increase the risk of death will help us take precautions before and after surgery and intervene when necessary. The aim of this study was to evaluate the presence of comorbidity before surgery, surgical time, surgical method, length of hospital stay, postoperative mobilization, and reliability of the ASA (American Society of Anesthesiologists) classification in the determination of mortality risk in patients undergoing surgery for hip fracture.

METHODS

One-hundred and sixteen patients older than 65 years old, who had undergone surgery for hip fracture and followed up for at least 1 year, were included in the study. Forty patients (34.5%) had femoral neck fracture (FNF), 68 (58.6%) had intertrochanteric femoral fracture (ITFF), and 8 (6.9%) had subtrochanteric fracture (STF). Partial endoprosthesis (PEP) had been applied to 47 patients, with total hip replacement and osteosynthesis performed in 69 patients (Table 1).

Patients were taken to the clinic for surgical preparation after the first intervention in the emergency unit. At the beginning of hospitalization, skin traction was applied to the patients, and treatment with low-molecular-weight heparin (LMWH) was initiated. LMWH treatment was continued for 3 weeks after surgery and

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the patients were recommended to wear compression stockings. Patients were questioned for existing systemic diseases, and preoperative evaluations were performed by the relevant departments. Patients were operated after having been stabilized with preoperative medical interventions.

Intravenous antibiotic prophylaxis was initiated 30 min before surgery. Antibiotic prophylaxis was applied postoperatively for 1 day, and first-generation cephalosporin was preferred. A day after the surgery, patients were allowed to sit on their beds. On the second postoperative day, after having the wound treated by aspirative drainage, patients with good general health status were allowed to stand up. Patients undergoing PEP were allowed to walk on their operated leg, as long as they were able to bear the pain. Patients who underwent osteosynthesis were able to stand up on the second postoperative day. Partial weight-bearing was initiated after 3–4 weeks depending on the condition of the fracture, presence of excessive osteoporosis, and implant that had been used. Patients who suffered a walking dysfunction before the surgery (such as a previous stroke) and whose general health condition did not allow them to stand and walk continued to sit on their beds at certain intervals. For all other patients, non-weight-bearing walking was encouraged. Patients were discharged from the hospital when their postoperative wound healing and general medical condition were stable.

The preoperative ASA scores of the patients were obtained from hospital records and were used for risk scoring. Patients were evaluated in terms of factors that can affect mortality, including age, surgical time, length of hospital stay, accompanying systemic diseases, ASA scores, and postoperative mobilization.

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was not received because our study was retrospective and no consent was sought from patients. Likewise, informed consent forms from patients were not obtained either as no additional procedure was performed on patients and data were obtained from patient files.

Statistical Analysis

Data obtained were analyzed using the SPSS 13.0 (Statistical Package for the Social Sciences Inc.; Chicago, IL, USA) software. The Mann–Whitney U test was used for comparing the rates among the groups. A p value of <0.05 was considered statistically significant.

RESULTS

Of the 116 patients included in the study, 46 (39.6%) were males and 70 (60.4%) were females. It was found that 12 (10.3%) of the 116 patients who underwent surgery died for various reasons after the 1-year follow-up period. Two (1.7%) of 52 patients in the age group of 65–74 years and 10 (8.6%) of 54 patients in the age group of 75 years and above died during the first 12 months. Two (1.7%) patients were males and 10 (8.6%) patients were females. It was observed that 2 patients (1.7%) died in the first month, 4 patients (3.4%) between the first and third month, one patient (0.9%) between the third and sixth month, and 5 patients (4.3%) between the sixth and twelfth month. Among the non-surviving patients, 7 patients (6%) received internal fracture treatment, and 5 patients (4.3%) underwent partial arthroplasty. The most common cause of death among patients was found to be cardiopulmonary insufficiency (7 patients, 58.3%). On the other hand, it was verbally stated that the cause of death was dementia and embolism in 5 patients.

Table 1. Demographic data of patients

	Non-surviving	Surviving	Total
Male	2	44	46
Female	10	60	70
Age (Mean)	86 (67–95)	75.4 (65–99)	77.6 (65–99)
Surgical time (day)	5.5 (2–10)	4.5 (2–15)	4.9 (2–15)
Duration of hospital stay (day)	13.8 (6–24)	9.9 (3–45)	10.3 (3–45)
ASA score	2.6 (1–3)	1.6 (1–3)	1.9 (1–4)
Number of comorbid diseases			
0	0	34	34
1	3	38	41
2	5	21	26
3≤	4	11	15

The overall mean age was 77.6 years (range 65–99 years). For non-surviving patients, mean age was 86 years (range 67–95 years) and 75.4 years (range 60–99 years) for surviving patients (Table 2). The difference was found to be statistically significant ($p<0.05$).

The patients were evaluated for hypertension, diabetes mellitus, chronic heart failure, chronic pulmonary disease, renal diseases, and cerebrovascular diseases. While the number of patients with 3 and more comorbidities was 36 (39.1%) in the group of surviving patients, it was 6 (60%) in the non-surviving group. There was a statistically significant difference between the two groups ($p<0.05$). It was observed that the risk of mortality increased in parallel with accompanying comorbidities.

The ASA scoring system was used for evaluating preoperative risks in patients. While the mean preoperative ASA score was 1.6 (range 1–3) in surviving patients, it was 2.6 (range 2−3) in non-surviving patients and the difference was statistically significant ($p<0.05$).

Length of hospital stay and surgical time were compared in surviving and non-surviving patients. The mean surgical time was 4.5 (range 1–16) days in the surviving group and 5.5 (range 2–12) days in the non-surviving group ($p>0.05$). In terms of hospitalization, the mean length of hospital stay was 9.9 (range 3–21) days in the surviving group and 13.8 (range 8–26) days in the non-surviving group. The difference was found to be statistically significant ($p<0.05$). It was observed that a delayed stabilization of patients increased mortality.

Table 2. Final control findings of patients and statistical comparison

	Non-surviving	Surviving	Total
Age	86 (67–95)	75.4 (60–99)	0.001
Surgical time (day)	5.5 (2–12)	4.5 (1–16)	0.349
Hospitalization (day)	13.8 (8–26)	9.9 (3–21)	0.034
ASA score	2.6 (2–3)	1.6 (1–3)	0.003
3≤ comorbid disease	4/12 (33.3%)	11/104 (10.6%)	0.044
Immobilized patient	8/12	12/104	<0.001

The patients were compared in terms of postoperative early mobilization. The number of mobilized patients was 94 (90.4%) in the surviving group and 5 (41.6%) in the non-surviving group. The difference was statistically significant (p<0.005).

DISCUSSION

Hip fractures seen in geriatric patients is the most serious consequence of osteoporosis, and it has been reported that the mortality rate increases in the first year following the incident (14-17). Although various factors are thought to be responsible for increased mortality, no consensus has yet been reached.

Hip fractures are skeletal system injuries that are commonly seen among the elderly population and are accompanied by high mortality and morbidity rates. It is stated that mortality rates are between 5.9% and 50% in geriatric patients operated for osteoporotic hip fracture (18-21). In the literature, there are some studies reporting the mortality rate after hip fracture and various risk factors that affect it. Although no statistically significant difference was found when comparing mortality rates according to the region of the hip that is broken and the surgical technique, it was observed that trochanteric fractures occurring in advanced-age patients are accompanied by high mortality (1, 6, 14).

In our study, when we evaluated mortality rates, we found that the number of patients undergoing internal fixation due to trochanteric fracture (7/5), but no statistically significant difference was observed.

Intraoperative and postoperative mortality rates vary in patients undergoing surgical treatment after hip fracture. Brossa Torruella et al. (22) found the mortality rate to be 40% in patients with hip fracture and 16.5% in the control group. They also found that 3-year mortality rates were associated with heart failure, neoplasia, and dementia. In the study of McLeod et al. (23), the 1-year mortality rate was reported to be 24.9% in geriatric patients operated for hip fracture. In the same study, it was observed that mortality rates were associated with age, sex, general health status, and place of residence, whereas the effects of surgical time, surgical method, and anesthesia type on mortality were found to be low. Rogmark et al. (15) stated in their study that patients mostly died in the first 4 months after surgery. In our study, mortality rate was found to be 9.8% and most patients (5/10–50%) died in the first 3 months following surgery, which is consistent with the literature. In the first month after surgery, patients cannot avoid being confined to bed all the time and accordingly, complications such as deep venous thrombosis and pulmonary embolism occur during this period.

Deep venous thrombosis (DVT) prophylaxis decreases postoperative mortality rates, but it does not provide an appropriate solution (17). Particularly, geriatric patients that have been confined to bed for a long time have an increased risk of DVT and pulmonary embolism (16). In our study, it was verbally stated that patients died of cardiopulmonary diseases more frequently, and two patients were suspected of suffering embolism. This suggests that thromboembolism can develop in parallel with increased time until surgery, which can increase the mortality rate associated with cardiovascular insufficiency and pulmonary embolism. Improvements in physical treatment and care services at home, and follow-up and rehabilitation of geriatric patients with high postoperative risk in a clinical setting can be effective in decreasing mortality rates.

The effect of increasing preparation time for surgery on the mortality risk is controversial. In the literature, there are studies reporting that it decreases or increases mortality in patients operated within the first 24 h (14, 16, 24). The ones who defend early surgery suggest that complications such as DVT and urinary system infections will decrease as the time of being confined to bed decreases. Besides, Sexson and Lehner (25) specified that if the general health condition of a patient was inappropriate for immediate surgery, it would be better to operate after stabilization of the general health condition. In our series, because the number of patients operated within 24 h was limited, such an evaluation was not possible. Operating patients having a good general health status within the first 24 h decreases the risk of thromboembolism and thus mortality rates. In addition, it was observed that the time elapsed during surgical preparation was close among patients, and it was found in the comparison between surviving and non-surviving patients that this time had no significant effect on mortality (p>0.05).

The ASA classification is used for the evaluation of how preoperative systemic diseases affect the general condition of a patient (26, 27). Although the ASA classification is a subjective evaluation system, it has been shown to be useful as a mortality risk indicator in many studies (28-30). It is a known fact that as comorbid diseases increase, mortality also increases (27, 31). In parallel with advanced age, mortality increases with ASA score (29). On the other hand, it is possible to decrease the postoperative mortality and morbidity rates during the follow-up period and treatment even in patients with an ASA score of 3 and above (25). In our study, the mean ASA score was significantly higher in the non-surviving group than in the surviving group. This shows that the ASA classification system is useful for determining postoperative mortality risk in patients with hip fracture.

It has been revealed that mortality rate is significantly higher in patients having dementia and Alzheimer, which lead to cognitive and communicative deficits, than in patients with normal cognitive function (22-26, 28). In our study, it was mostly observed that postoperative mobilization was not achieved in patients who did not cooperate due to cognitive dysfunction, and these patients were more likely to being confined to bed. Considering the positive effect of postoperative mobilization on mortality, it can be suggested that as mobilization is delayed, an increase in the rates of complications and mortality is inevitable. Consistently with the literature, a significant difference was found between postoperative mobilization and mortality in our study, and it was revealed once again that early mobilization is vital for decreasing mortality.

CONCLUSION

In the examination of studies in which postoperative mortality rates are evaluated in patients with hip fracture, it was observed that different results have been reported according to various parameters. The common result of all studies is that preoperative medical health status is an important factor in the prediction of postoperative mortality. For decreasing high mortality rates, patients with hip fracture should be evaluated considering their general health conditions before surgery. Medical problems should be solved and stabilized as soon as possible and the duration of hospitalization and surgical time should be reduced. In addition, early mobilization after choosing a surgical method appropriate for the type of fracture and the presence of risk is an important factor that decreases mortality.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects", (amended in October 2013).

Informed Consent: As the study design was retrospective and no further invasive or noninvasive action apart from evaluating their current files were carried on fort he patients, no informed consent was obtained.

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REFERENCES

1. Cauley JA, Thompson DE, Ensrud KC, Scott JC, Black D. Risk of mortality following clinical fractures. Osteoporos Int 2000; 11: 556-61. [CrossRef]
2. Center JR, Nguyen TV, Schneider D, Sambrook PN, Eisman JA. Mortality after all major types of osteoporotic fracture in men and women: an observational study. Lancet 1999; 353: 878-82. [CrossRef]
3. Nguyen ND, Eisman JA, Center JR, Nguyen TV. Risk factors for fracture in nonosteoporotic men and women. J Clin Endocrinol Metab 2007; 92: 955-62. [CrossRef]
4. Jiang HX, Majumdar SR, Dick DA, Moreau M, Raso J, Otto DD, et al. Development and initial validation of a risk score for predicting in-hospital and 1-year mortality in patients with hip fractures. J Bone Miner Res 2005; 20: 494-500. [CrossRef]
5. Gullberg B, Johnell O, Kanis JA. World-wide projections for hip fracture. Osteoporos Int 1997; 7: 407-13. [CrossRef]
6. Johnell O, Kanis JA. An estimate of the worldwide prevalence, mortality and disability associated with hip fracture. Osteoporos Int 2004; 15: 897-902. [CrossRef]
7. Bergström U, Björnstig U, Stenlund H, Jonsson H, Svensson O. Fracture mechanisms and fracture pattern in men and women aged 50 years and older: a study of a 12-years population-based register, Umea, Sweden. Osteoporos Int, 2008; 19: 1267-73. [CrossRef]
8. Haentjens P, Magaziner J, Colon-Emeric CS, Vanderschueren D, Milisen K, Velkeniers B, et al. Meta-analysis: excess mortality after hip fracture among older women and men. Ann Intern Med 2010; 152: 380-90. [CrossRef]
9. Clague JE, Craddock E, Andrew G, Horan MA, Pendleton N. Predictors of outcome following hip fracture. Admission time predicts length of stay and in-hospital mortality. Injury 2002; 33: 1-6. [CrossRef]
10. Katelaris AG, Cumming RG. Health status before and mortality after hip fracture. Am J Public Health 1996; 86: 557-60. [CrossRef]
11. Poor G, Atkinson EJ, O'Fallon WM, Melton III LJ. Predictors of hip fractures in elderly men. J Bone Miner Res 1995; 10: 1900-7. [CrossRef]
12. Kanis JA, Oden A, Johnell O, De Laet C, Jonsson B, Oglesby AK. The components of excess mortality after hip fracture. Bone 2003; 32: 468-73. [CrossRef]
13. Magaziner J, Lydick E, Hawkes W, Fox KM, Zimmerman SI, Epstein RS, et al. Excess mortality attributable to hip fracture in white women aged 70 years and older. Am J Public Health 1997; 87: 1630-6. [CrossRef]
14. Kenzora JE, McCarthy RE, Lowell JD, Sledge CB. Hip fracture mortality. Clin Orthop Relat Res 1984; 186: 45-56. [CrossRef]
15. Rogmark C, Carlsson A, Johnell O, Sernbo I. Primary hemiarthroplasty in old patients with displaced femoral neck fracture: a 1-year follow-up of 103 patients aged 80 years or more. Acta Orthop Scand 2002; 73: 605-10. [CrossRef]
16. Casaletto JA, Gatt R. Post-operative mortality related to waiting time for hip fracture surgery. Injury 2004; 35: 114-20. [CrossRef]
17. Fisher AA, Davis MW, Rubenach SE, Sivakumaran S, Smith PN, Budge MM. Outcomes for older patients with hip fractures: the impact of orthopedic and geriatric medicine cocare. J Orthop Trauma 2006; 20: 172-80. [CrossRef]
18. Vidan M, Serra JA, Moreno C, Riquelme G, Ortiz J. Efficacy of a comprehensive geriatric intervention in older patients hospitalized for hip fracture: a randomized, controlled trial. J Am Geriatr Soc 2005; 53: 1476-82. [CrossRef]
19. Wehren LE, Magaziner J. Hip fracture: risk factors and outcomes. Curr Osteoporos Rep 2003; 1: 78-85. [CrossRef]
20. Abrahamsen B, Van Staa T, Ariely R, Olson M, Cooper C. Excess mortality following hip fracture: a systematic epidemiological review. Osteoporos Int 2009; 20: 1633-50. [CrossRef]
21. Pande I, Scott DL, O'Neill TW, Pritchard C, Woolf AD, Davis MJ. Quality of life, morbidity, and mortality after low trauma hip fracture in men. Ann Rheum Dis 2006; 65: 87-92. [CrossRef]
22. Brossa Torruella A, Tobias Ferrer J, Zorrilla Ribeiro J, Lopez Borras E, Alabart Teixido A, Belmonte Garridof M. Mortality after hip fracture: a three year follow-up study. Med Clin 2005; 124: 53-4. [CrossRef]

23. McLeod K, Brodie MP, Fahey PP, Gray RA. Long-term survival of surgically treated hip fracture in an Australian regional hospital. Anaesth Intensive Care 2005; 33: 749-55.
24. Cannada L, Schmidt A. The effect of surgical timing on elderly hip fracture patient outcomes. An updated systematic review and meta-analysis. Bone Joint Evidence 2011; 1: 1-15.
25. Sexson SB, Lehner JT. Factors affecting hip fracture mortality. J Orthop Trauma 1987; 1: 298-305. [CrossRef]
26. Owens WD, Felts JA, Spitznagel EL Jr. ASA physical status classifications: a study of consistency of ratings. Anesthesiology 1978; 49: 239-43. [CrossRef]
27. Fleisher LA. Risk of anesthesia. In: Miller RD, editor. Miller's anesthesia. Vol 1, 6th ed. USA: Elsevier; 2005. p. 893-925.
28. White BL, Fisher WD, Laurin CA. Rate of mortality for elderly patients after fracture of the hip in the 1980's. J Bone Joint Surg Am 1987; 69: 1335-40. [CrossRef]
29. Cohen MM, Duncan PG, Tate RB. Does anesthesia contribute to operative mortality? JAMA 1988; 260: 2859-63. [CrossRef]
30. Pedersen T, Eliasen K, Henriksen E. A prospective study of mortality associated with anesthesia and surgery: risk indicators of mortality in hospital. Acta Anaesthesiol Scand 1990; 34: 176-82. [CrossRef]
31. Shah SN, Wainess RM, Karunakar MA. Hemiarthroplasty for femoral neck fracture in the elderly. Surgeon and hospital volume-related outcomes. J Arthroplasty 2005; 20: 503-8. [CrossRef]