ORIGINAL ARTICLE

HIP FRACTURE: POST-OPERATIVE EVALUATION OF CLINICAL AND FUNCTIONAL OUTCOMES

Marcelo Teodoro Ezequiel Guerra[1], Thomas Alexandre Thober[2], André Vicente Bigolin[3], Marcos Paulo de Souza[4], Simone Echeveste[5].

ABSTRACT

Objective: To evaluate the clinical and functional outcomes from patients undergoing surgery to treat hip fractures, with regard to the ASA score and time spent waiting for definitive surgical treatment. Method: Over a one-year period, 154 patients with hip fractures, aged 65 years and over, underwent operations. Data on the preoperative ASA score and the time spent waiting for the operation were obtained. Two years after the operation, Zuckerman´s Functional Recovery Score (FRS) questionnaire was used to assess the patients' current functional capacity. Results: Mortality during the first postoperative year differed between patients with ASA 3 or 4 and those classified as ASA 1 or 2 (significant data; $p < 0.05$). Mortality up to the end of the second postoperative year was significantly higher ($p < 0.05$) in the ASA 3 or 4 group. The preoperative ASA score did not demonstrate any significant relationship with the patients' current functional capacity ($p > 0.05$). There was no significant difference between the group operated within 48 hours of admission and the group operated after 48 hours, in relation to mortality or current functional capacity ($p > 0.05$). The group aged 80 years and over showed significantly higher mortality ($p < 0.05$) than the group aged 65 to 79 years up to the end of the second postoperative year. Conclusion: The preoperative ASA score and an age of 80 years or over may be considered to be factors associated with higher mortality two years after hip fracture surgery. In isolation, time spent waiting for surgery was not significant.

Keywords – Hip Fractures; Postoperative Period; Health of the Elderly

INTRODUCTION

Hip fractures include intertrochanteric fractures and femoral neck fractures and constitute a major medical problem because of their high rates of morbidity and mortality. The incidence of hip fractures increases with age, doubling every 10 years after 50 years of age[1-5]. This increase is considerably greater among women after the menopause and among men after the age of 70 years[1-4,6-8]. In the United States, around 250,000 cases occur every year, with an annual cost of around 14 billion dollars. The general incidence of mortality during the first year after the fracture ranges from 10 to 30%[1,4-6,9,10]. Many factors have been correlated with increased risk of mortality after the operation and also influence the potential for long-term rehabilitation[11-20].

Preoperative assessment and postoperative follow-

1 – MSc in Medicine from UFRJ. Orthopedist and Coordinator of Orthopedics and Traumatology Module, ULBRA; Head of Orthopedics and Traumatology Service, ULBRA; Titular Member of SBOT and SBTO; International Affiliate of AAOS.
2 – Resident Physician in Orthopedics and Traumatology, Hospital Cristo Redentor, Porto Alegre, RS.
3 – Undergraduate Medical Student, ULBRA, Canoas, RS.
4 – Orthopedist and Member of the Orthopedic Trauma Group, ULBRA, Canoas, RS.
5 – MSc in Statistics and Professor of Statistics, ULBRA, Canoas, RS.

Work performed at the Lutheran University of Brazil (ULBRA), Canoas, RS.
Correspondence: Rua Nilo Peçanha, 450, apto. 901. Bairro Petrópolis CEP 90470-000 – Porto Alegre, RS.
E-mail: mguerraz@terra.com.br

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up for this group of patients is of fundamental importance for attaining the expected long-term clinical and functional results[21-23]. One of the assessment methods is the preoperative score of the American Society of Anesthesiologists (ASA), which has been proven to be an important predictor of mortality during the first postoperative year following a hip fracture[24-27]. Another method is the Functional Recovery Score (FRS) developed by Zuckerman in 1999, which has been shown to be reliable for assessing the post-fracture functional outcome[10,28].

The present study had the aim of assessing variables such as age, preoperative ASA score and time spent waiting for surgery, in relation to mortality and the functional outcome later on postoperatively, from hip fracture cases among patients aged 65 years and over.

MATERIALS AND METHODS

The patients underwent operations to treat hip fractures at Hospital Independência, in Porto Alegre, between January 2004 and December 2005. This study included all patients who were 65 years or over at the time of the surgery; who had suffered hip fractures (intertrochanteric or femoral neck fractures) of non-pathological origin; who presented any previous cognitive and functional state; and who had a proper clinical and surgical indication, independent of the surgical type and approach. Patients with subtrochanteric fractures and those who did not have any telephone number registered in the medical files for subsequent contact were excluded.

Data relating to the patients' names, date and type of surgery and the surgeon responsible were gathered. Age, telephone number (including numbers for close family members or caregivers responsible for the patients), length of time from admission until performing the surgery and the preoperative ASA assessment score reported by the anesthetist in charge were obtained from the medical files.

The Functional Recovery Score questionnaire was applied on a single occasion (June 2007), i.e. more than one and a half years after the surgery, to all the patients whom it was possible to contact by telephone (mean of two years and two months after the surgery, ranging from one year and six months to three years and five months). Close family members or caregivers responsible for the patients also answered the questionnaire in cases in which direct contact with the patient was not possible. These informants were also asked about the cause and date of any cases of death.

For the purposes of the statistical analysis, and in conformity with previous studies[9,27-29], the patients were divided into groups according to the factors to be analyzed. In relation to the preoperative ASA score, we stratified the patients as ASA 1 or 2 and ASA 3 or 4. In relation to the time spent waiting for surgery, we stratified them into a group operated within 48 hours of admission and another group operated more than 48 hours after admission. We also divided the patients according to age groups: one consisting of patients aged 65 to 79 years and the other for patients aged 80 years or over. In relation to the functional result, we stratified the patients into FRS 80 to 100, 60 to 79 and less than 60. The statistical analysis was performed using the non-parametric Mann-Whitney test, with a 5% significance level, to investigate whether there were any significant differences between the groups in relation to mortality during the first or second year after the operation, and in relation to the current functional capacity measured using FRS. The analyses were performed with the aid of the SPSS software, version 10.

RESULTS

Over the two-year study period, 207 patients underwent operations. Fifty-three did not present the criteria for inclusion, and 154 patients remained eligible. Out of these, only 79 patients participated in the study. Seventy-five patients were lost from the study because they could not be contacted by telephone. The participants' mean age was 78.6 years (range: 65 to 93 years). There were 41 patients (51.9%) between 65 and 79 years of age and 38 (48.1%) aged 80 years or over. Sixty patients (75.9%) were female and 19 (24.1%) were male. Among the women, five died during the first postoperative year and seven in the second year. Among the men, four died during the first postoperative year and two in the second year. There were 18 deaths in total (22.8%), of which nine were in the first year and nine in the second year after the operation. The causes of death were mainly respiratory complications, stroke and acute myocardial infarction.

The group with preoperative ASA score 1 or 2 contained 43 patients (54.4%). Of these, three died during the first year after the operation and three in the second year. The group with score 3 or 4 contained 36 patients (45.6%). Of these, six died during the first year and six in the second year. The data on the patients are presented in Table 1. The group that underwent the operation within 48 hours of admission contained 32 patients (40.5%). Of these, two died during the first year after the operation and four in the second year. The group operated more than 48 hours after admission contained 47 patients (59.5%). Of these, seven died during the first year and five in the second year.

In relation to the patients' current functional capacity, the FRS measured on average two years after the surgery was as follows: score 80 to 100, 30 patients (38%); score 60 to 79, 10 (12.7%); and score less than 60, 21 (26.6%). The group that was dependent in relation to at least one basic activity of daily living (BADL) contained 28 patients (45.9%), while the remainder were independent in all activities. The group that was dependent in relation to at least two instrumental activities of daily living (IADL) contained 33 patients (54.1%), while the remainder were either dependent in relation to just one activity or independent in all activities. Twenty-one patients (34.4%) presented full independence for walking, both at home and outside. Twenty patients (32.8%) required support for walking outside (walking stick, walking frame or accompanying person). Twelve patients (19.7%) were only able to walk inside their homes and eight patients (13.1%) were non-walkers.

Table 1 – Profile of the patients assessed in the study, regarding the variables evaluated (n = 79).

Age		
65 to 79 years	41	51.90%
80 years or over	38	48.10%
Sex		
Female	60	75.90%
Male	19	24.10%
ASA score		
1 or 2	43	54.40%
3 or 4	36	45.60%
Time spent waiting for surgery		
More than 48 h	47	59.50%
Less than 48 h	32	40.50%
Death		
No	61	77.20%
In first year after the operation	9	11.40%
In second year after the operation	9	11.40%
Current functional capacity		
Basic activities of daily living (BADL)		
Dependent in at least one	28	45.90%
Independent in all	33	54.10%
Instrumental activities of daily living (IADL)		
Dependent in at least two	33	54.10%
Dependent in just one or none	28	45.90%
Walking capacity		
Full independence	21	34.40%
Walking with support: walking stick, walking frame or accompanying person	20	32.80%
Walking only at home	12	19.70%
Non-walker	8	13.10%

The group aged 80 years or over presented higher mortality ($p < 0.05$) than did the group aged 65 to 79 years, up to the end of the second year after the operation. From evaluation only on the mortality during the first year after the operation, no difference was found between the groups ($p > 0.05$). Furthermore, no difference was found in relation to the current functional capacity, between the age groups ($p > 0.05$). The number of deaths among the men was proportionally greater than among the women, but the difference was not statistically significant ($p > 0.05$). In relation to current functional capacity, there was no difference between the men and women ($p > 0.05$). The mortality up to the end of the second year after the operation was greater in the ASA 3 or 4 group ($p < 0.05$) than it was in the ASA 1 or 2 group. The mortality in the first year after the operation alone was not greater in the ASA 3 or 4 group than in the ASA 1 or 2 group ($p > 0.05$). The preoperative ASA score did not show any significant relationship ($p > 0.05$) with the current functional result among the patients. The group operated less than 48 hours after admission and the group operated more than 48 hours after admission did not differ in relation to mortality and current functional capacity ($p > 0.05$).

DISCUSSION

The major bias in our study, which compromised the data analysis, was the sample size. Practically half of the patients could not be contacted by telephone. Thus, it was not possible to confirm the findings of other studies. The study was also retrospective, such that in some cases, we had to calculate the ASA score. The questionnaire was applied by means of telephone contact, which is a debatable method even though its reliability has already been demonstrated by Zuckerman *et al*[10,28] and Petrella et al(30).

The preoperative assessment score of the American Society of Anesthesiologists (ASA) has been proven to be an important predictor of mortality during the first year after operations to treat hip fractures[24-27]. It has been used almost universally for more than 30 years, and represents an attempt to standardize the clinical assessment and estimate the perioperative risk[31,32]. In our study, six patients in the ASA 3 or 4 group and three in the ASA 1 or 2 group died during the first year after the operation. The difference between the deaths was not statistically significant. However, in the study by Michel *et al*[27], it was shown that the group that presented ASA 3 or 4 had a risk of death in the first year after the operation that was almost nine times greater than in the group with ASA 1 or 2 ($p < 0.001$), especially in the first three months after the fracture or the surgery. In the present study, there was no significant relationship between the preoperative ASA score and the long-term functional recovery. Among the nine patients in our study who died during the first year, four died during the first three months after the operation. Dzupa *et al*[26] found that there were high risks of mortality in relation to male sex, age over 80 years and ASA 4, particularly during the first three months after the operation. Likewise, Hasegawa *et al*[25] demonstrated that ASA scores 3 or 4, along with another four factors (gender, advanced age, dementia and patient institutionalization), were closely related to higher risk of mortality during the postoperative period resulting from hip fractures. Richmond et al(33) also reported that among the patients who were less than 85 years of age, those classified as ASA 3 or 4 had significantly excessive mortality ($p < 0.05$) during the two-year follow-up after the fracture. In the study by Zuckerman *et al*[10,28], 69 patients (11.6%) died during the first year after the operation. In Japan, Nakano[9] found a mortality rate of 10% in the first year after the operation ($n = 10{,}992$). In our study, the value was very close to what was found in these studies (11.2%). Zuckerman *et al*[10,28] demonstrated that patients with a preoperative ASA score of 3 or 4 had a lower FRS prior to the fracture than did those with ASA 1 or 2 ($p < 0.001$). In our study, we found an apparently much greater number of patients with better current functional capacity who presented an ASA score of 1 or 2 ($n = 22$). However, from the statistical analysis, this difference was not significant.

In relation to the time spent waiting for the operation, Hamlet *et al*[34] demonstrated that patients operated within the first 24 hours after admission had lower mortality than did those operated more than 24 hours after admission, independent of the preoperative ASA score. In the same way, Casaletto and Gatt[20] showed that the one-year survival was better when the patients were clinically ready for the surgery and were operated on the same day on which they were admitted. This survival advantage was greater among the patients over the age of 80 years. McGuire *et al*[35] also found that a delay in implementing surgery of two days or more significantly increased the one-month mortality. However, in more recent studies like the one by Bergeron *et al*[29], it was shown that the delay in implementing surgery was unrelated to adverse results when the surgery was delayed in order to enable treatment for comorbidities. Delayed surgery has been associated with longer hospital stays. In the same way, McLeod *et al*[36] demonstrated that factors that were unrelated to the patient and to the process, including delayed surgery, type of surgery and type of anesthesia, had minimal impact on the one-year mortality. No main determinant for the length of hospital stay was identified. The state of health was the main determinant for delays in implementing surgery. Moreover, Williams and Jester[37] showed that there was no relationship between delayed surgery and postoperative mortality ($p < 0.05$) after controlling for all other independent variables. According to their study, cognitive dysfunction and reduced mobility before the fracture were good prognostic indicators of higher mortality during the first year after the operation. In our study, surgery delayed for more than 48 hours did not show any relationship with higher mortality during the first year after the operation, or with current functional capacity ($p > 0.05$).

The vast majority of instruments for post-fracture hip assessment are limited to patients' general state of health and wellbeing[38-40]. They are generally complex and difficult to apply to elderly people. They basically emphasize pain relief: a symptom that normally is not present before the hip fracture occurs. Moreover, the results assessed are commonly based on what health insurance plans consider to be most important: fracture consolidation, alignment and infection[28]. The FRS of Zuckerman *et al*[10,28] is a questionnaire that can be applied both in outpatient consultations and by telephone. It consists of 11 questions relating to activities of daily living: four relating to independence in basic activities, six relating to instrumental activities and one relating to mobility. Pre-fracture scores using the FRS have demonstrated that the score presents predictive value for mortality, institutionalization of patients and rehospitalization during the first year after the fracture. In the study by Zuckerman *et al*[10,28], which validated the FRS, all the patients were identified after the occurrence of the hip fracture, on admission, and were prospectively followed up. Data on functional capacity prior to the fracture were gathered at the time of admission. During the follow-up, information was obtained three, six and twelve months after the surgery, by means of direct interviews with the patient, always using the FRS questionnaire.

Our study did not have predictive value like that of Zuckerman *et al*[10,28], because the questionnaire on functional recovery was applied on a single occasion (around two years after the surgery), without the possibility of making comparisons with the pre-fracture functional capacity and hence no possibility of evaluating the degree of patients' recovery. This means that the values presented by this study represented (in percentages) the patients' current functional capacity. For example, the FRS value of 63.7 our study signifies that currently, this patient presents 63.7% of the maximum functional capacity.

Zuckerman *et al*[10,28] stratified their patients into five groups, based on assessments of the pre-fracture state, as follows: scores of 90 to 100: 67% of the patients; scores of 80 to 89: 14%; scores of 70 to 79: 6%; scores of 60 to 69: 3.7%; and scores of less than 60: 8.3%. Our study showed sizes that were very different to those of the study by Zuckerman *et al*[10,28], for the groups with scores of 90 to 100: 25% of the patients; and with scores less than 60: 25%. This impaired comparisons between the findings.

In the study by Zuckerman *et al*[10,28], the FRS was significantly lower three months after the fracture, compared with the pre-fracture state ($p < 0.001$). There was a significant increase in the score between three and six months ($p < 0.001$) and between six and 12 months ($p < 0.001$). These findings were compatible with previous findings in the literature(41,42). They demonstrated that hip fractures resulted in a functional loss of around 20%, compared with the pre-fracture state, during the first year in relation to a control group. The scores of 90 to 100 and 80 to 89 showed a parallel pattern of recovery of the functional capacity prior to the fracture, with 82 and 77%, respectively. The group that presented the lowest pre-fracture score (FRS < 60) recovered practically 100% of its functional capacity. The groups with medium pre-fracture scores (60 to 69 and 70 to 79) were the ones that recovered least of the functional capacity prior to the fracture. This identified them as groups that were at risk and that they would probably have greater need for intervention than the other groups.

CONCLUSION

Thus, we can conclude that age of 80 years or over and preoperative ASA score 3 or 4 can be considered to be risk factors for predicting mortality within two years after an operation to treat a hip fracture. The ASA score along does not have any relationship with long-term functional capacity. The time spent waiting for the operation does not have any relationship with mortality during the first year after the operation, or with long-term functional capacity.

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