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ORIGINAL RESEARCH

Analysis of the Surgical Outcomes in Elderly Patients with Hip Fractures Combined with Hemiplegia

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Objective: This study aimed to investigate the surgical outcomes in elderly (age ≥65) patients with hip fractures combined with hemiplegia and compare them with the surgical outcomes in elderly patients with hip fractures but no hemiplegia.

Methods: A total of 761 elderly patients with hip fractures who were treated between January 2013 and December 2019 were enrolled in this study using a retrospective study design. The patients were divided into two groups: a hemiplegia group (77 cases, 10.1%) and a non-hemiplegia group (684 cases, 89.9%). Length of hospital stay, postoperative complications, 30-day and one-year mortalities, and one-year functional status were compared between the two groups.

Results: The average length of hospital stay in the hemiplegia group (13.51 ± 10.17 days) was longer than in the non-hemiplegia group (12.60 ± 7.83 days), but the difference was not statistically significant (P = 0.354). The incidence of postoperative complications in patients with hemiplegia (28.6%, 22/77) was higher than in patients without hemiplegia (15.4%, 105/684), and the difference was statistically significant (P = 0.003). The 30-day and one-year mortalities in the hemiplegia group were higher than in the non-hemiplegia group (30 days after surgery: 10.4%, 8/77 vs 4.5%, 31/684; one year after surgery: 29.9%, 23/77 vs 15.2%, 104/684), and the difference was statistically significant (30 days after surgery: P = 0.027; one year after surgery: P = 0.001). One year after surgery, the average activity of daily living score was 56.02 ± 9.63 in the hemiplegia group and 76.89 ± 8.40 in the non-hemiplegia group, and the difference was statistically significant (P = 0.000).

Conclusion: Hemiplegia can increase the incidence of postoperative complications and 30-day and one-year mortalities in patients with hip fractures.

Keywords: hip fracture, hemiplegia, curative effect, elderly patients, comorbidity, recovery, complications

Introduction

Hip fracture is the most serious type of osteoporotic fracture, with high mortality and disability rates.[1] It is estimated that there were approximately 1.26 million hip fractures worldwide in 1990, and this is predicted to increase to 2.5 million by 2025 and 4.5 million by 2050.[2] Complex comorbidities are the leading cause of death in elderly people with hip fractures.[3] However, different comorbidities[4] have varying impacts on the body, and a poor prognosis may be improved if adequate measures are taken in advance for comorbidities that greatly impact the diagnosis.

The term "stroke" refers to a cerebrovascular accident that often occurs in older adults, and it can be ischemic or hemorrhagic. Stroke is the leading cause of limb hemiplegia.[5] Patients with hemiplegia have mobility difficulties and slow responses, and they are prone to osteoporosis. Furthermore, the risk of hip fracture is 2–4 times higher in patients with hemiplegia than in healthy people.[6] However, whether hemiplegia increases the incidence of postoperative adverse hip fracture events has not been clearly determined. This study therefore aimed to investigate the surgical outcomes in elderly patients with hip fractures combined with hemiplegia and compare them with the surgical outcomes in elderly patients with hip fractures but without hemiplegia.

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Data and Methods

Inclusion and Exclusion Criteria

Inclusion criteria: (1) patient aged ≥65 years; (2) hip fracture; (3) low-energy injury; (4) surgical treatment; (5) follow-up for at least one year.

Exclusion criteria: (1) patient aged <65 years; (2) multiple injuries; (3) pathological fractures; (4) endangered patients (The American Society of Anesthesiologists (ASA) grade V); (5) high-energy injuries; (6) multiple fractures; (7) conservative treatment; (8) refusal to follow up; (9) incomplete data.

General Data

Elderly patients with hip fractures who were treated between January 2013 and December 2019 were included as the study subjects using a retrospective study design. A total of 761 eligible patients with hip fractures were included. The group consisted of 247 male patients and 514 female patients, with an average age of 81.23 ± 6.60 years. There were 451 cases of intertrochanteric fracture and 310 cases of femoral neck fracture. The preoperative comorbidities mainly included hypertension, coronary heart disease, arrhythmia, cardiac insufficiency, diabetes, dementia, stroke, and renal insufficiency.

Preoperative Preparation and Surgical Methods

After admission, the patients underwent examination and surgical treatment as soon as possible. Treatment plans were undertaken according to the type of fracture: femoral neck fractures (Garden I and II) with insignificant displacement were fixed with cannulated screws, and femoral neck fractures with obvious displacement (Garden III and IV) underwent arthroplasty. Stable intertrochanteric fractures (A1, A2.1) were treated with extramedullary fixation, while unstable intertrochanteric fractures (A2.2, A2.3, A3) were treated with intramedullary fixation. Specialist physicians were responsible for postoperative rehabilitation treatment, with different rehabilitation function training plans being adopted according to the fracture locations and treatment plans.

Follow-Up

After discharge, the patients were followed up by a rehabilitation therapist or nurse. The follow-up personnel did not participate in other elements of the study. The patients were followed up mainly by telephone or outpatient service at 30 days and one year after surgery. The follow-up contents included 30-day and one-year mortalities and 1-year activity of daily living (ADL) scores.

Grouping

The patients were divided into two groups—a hemiplegia group and a non-hemiplegia group—according to whether they were complicated with limb hemiplegia at admission. Hemiplegia referred to a history of hypertensive intracerebral hemorrhage or cerebral embolism and a quadriceps femoris muscle strength lower than grade III on the hemiplegic side.

Observation Indexes

Postoperative complications, length of hospital stay, 30-day and one-year mortalities, and postoperative ADL scores were compared between the two groups. The postoperative complications primarily included pulmonary infections, cardiac insufficiency, acute myocardial infarction, and gastrointestinal bleeding. Postoperative function was assessed by ADL score, the assessment of which included the ability to dress, eat, bathe, use the toilet, and move, reflecting the most basic living abilities of people in a family (or medical institution) and in the community, with a total of 100 points.

Statistical Analysis

The SPSS 21.0 software was used for statistical analysis. Measurement data were expressed as mean ± standard deviation ($\bar{x} \pm SD$) and compared using a two-sample independent *t*-test. Count data were expressed as a percentage and compared using a χ^2 test. $P < 0.05$ was considered statistically significant.

Results

General Data

There were 77 patients in the hemiplegia group (10.1%), among which 68 (88.3%) had hemiplegia of an ipsilateral fracture of a limb. There were 29 male patients and 48 female patients in this group, with an average age of 78.40 ± 6.43 years. The average admission–operation interval was 3.80 ± 1.72 days, and the average ADL score before injury was 58.51 ± 10.64.

There were 684 patients in the non-hemiplegia group, including 218 male patients and 466 female patients, with an average age of 81.53 ± 6.53 years. The average admission–operation interval was 4.12 ± 2.38 days, and the average ADL score before injury was 77.48 ± 8.28.

Compared with the non-hemiplegia group, the hemiplegia group were younger and had a higher prevalence rate of hypertension and lower pre-injury ADL scores. The differences between the two groups were statistically significant. A comparison of the general data of the two groups is presented in Table 1.

Postoperative Complications

Postoperative complications occurred in 28.6% (22/77) of the patients in the hemiplegia group and 15.4% (105/684) of those in the non-hemiplegia group, and the difference between the two groups was statistically significant ($\chi^2 = 8.700$, $P = 0.003$, Table 2).

Table 1 Comparison of General Data Between the Hemiplegia and Non Hemiplegia Groups

Item	Hemiplegia Group	Non Hemiplegia Group	Test Statistics	P
Age	78.40±6.43	81.53±6.53	3.992	0.000
Gender (male)	29(37.7%)	218(31.9%)	1.041	0.308
Fracture type (femoral intertrochanteric fracture)	44(57.1%)	407(59.5%)	0.160	0.689
Comorbidity				
Hypertension	60(77.9%)	394(57.6%)	11.873	0.001
Coronary heart disease	18(23.4%)	176(25.8%)	0.208	0.648
Arrhythmia	6(7.8%)	77(11.3%)	0.862	0.353
Dementia	5(6.5%)	56(8.2%)	0.269	0.604
Pulmonary infection	11(14.3%)	97(14.2%)	0.001	0.980
COPD	5(6.5%)	80(11.7%)	1.888	0.169
Diabetes mellitus	24(31.2%)	182(26.6%)	0.716	0.397
Renal dysfunction	2(2.6%)	40(5.8%)	1.402	0.236
Number of comorbidities (≥ 4)	13(16.9%)	95(13.9%)	0.510	0.475
Pre injury ADL score	58.51±10.64	77.48±8.28	18.463	0.000
Admission-operation interval (d)	3.80±1.72	4.12±2.38	1.130	0.259
Anesthesia method				
Regional anesthesia	44(57.1%)	466(68.2%)	3.888	0.051
General anesthesia	33(42.9%)	217(31.8%)		
Operation mode			6.315	0.097
Intramedullary screw	32(41.6%)	350(51.2%)		
DHS	12(15.6%)	53(7.7%)		
Arthroplasty	21(27.3%)	176(25.7%)		
Cannulated screw	12(15.6%)	105(15.4%)		

Abbreviation: COPD, chronic obstructive pulmonary disease.

Table 2 Surgical Outcomes of the Patients Enrolled

Item	Hemiplegia Group	Non Hemiplegia Group	P value
Postoperative complications (n)	28.6%	15.4%	P = 0.003
Hospital stays (day)	13.51±10.17	12.60 ± 7.83	P = 0.354
Postoperative ADL score			
1-year	56.02 ± 9.63	76.89 ± 8.40	P = 0.000
Mortality (%)			
30-day	10.4%	4.5%	P=0.027
1-year	29.9%	15.2%	P=0.001

Abbreviation: ADL, activity of daily living.

Length of Hospital Stay

The average length of hospital stay was 13.51 ± 10.17 days in the hemiplegia group and 12.60 ± 7.83 days in the non-hemiplegia group. The difference between the two groups was not statistically significant (t = −0.928, P = 0.354, Table 2).

Mortality

The 30-day and one-year mortalities were 10.4% (8/77) and 29.9% (23/77) in the hemiplegia group, respectively, and 4.5% (31/684) and 15.2% (104/684) in the non-hemiplegia group, respectively, and the differences between the two groups were statistically significant (χ^2 = 4.884, P = 0.027; χ^2 = 10.706, P = 0.001, Table 2).

Postoperative Function

One year after surgery, the average ADL score was 56.02 ± 9.63 in the hemiplegia group and 76.89 ± 8.40 in the non-hemiplegia group, and the difference between the two groups was statistically significant (t =17.229, P = 0.000).

Discussion

This study found that the average length of hospital stay in the hemiplegia group was longer than in the non-hemiplegia group, although the difference was not statistically significant. The incidence of postoperative complications, 30-day and one-year mortalities, and postoperative ADL score in patients with hemiplegia were significantly different from those in patients without hemiplegia.

Several previous studies have identified[3,7] comorbidity as being the leading cause of death in elderly patients with hip fractures. Understanding the impact of comorbidity on the prognosis of hip fractures can therefore give an early warning and enhance clinical work. Stroke is a common cerebrovascular disease in China, usually occurring in middle-aged and elderly adults. Varying degrees of dysfunction occur in 70% of patients after stroke, manifesting as limb hemiplegia.[8] Hemiplegia and hip fractures are risk factors for each other.[9,10] One meta-analysis[11] found that hemiplegia can promote or aggravate osteoporosis, weaken muscle strength, and reduce activity. The same meta-analysis found that the overall incidence of postoperative hip fracture was 4.87%, and the odds ratio was as high as 1.54. It has also been found that patients with hip fractures are more prone to cerebrovascular accidents under stress, such as pain and bed rest. Kang et al[12] reported that 4.1% of patients with hip fractures had a stroke after surgery, with an odds ratio of 1.55. However, the impact of hemiplegia on the postoperative outcomes of patients with hip fractures currently remains unclear.

The present study found that, compared with patients without hemiplegia, patients with hemiplegia were significantly younger and had a significantly higher rate of hypertension. Patients with hemiplegia are often complicated by various medical diseases and have poor mobility; furthermore, compared with healthy patients, they are more vulnerable and have a shorter life span. Therefore, the average age of patients with hemiplegia is younger than that of patients without hemiplegia. Hypertension is a risk factor for stroke, and the present study found that hypertension in patients with hemiplegia was much higher than in patients without it.

Patients with hemiplegia also have poor physical condition and low resistance to diseases. They are therefore more prone to various complications,[13] as confirmed by the present study. This study also reported that, although patients with hemiplegia had a longer hospital stay than patients without it, the difference between the two groups was not statistically significant. The reason for this may be that the hospital in which the study was conducted adopted the concept of rapid rehabilitation. Since the hospital established its Department of Gerontology in 2012 according to the characteristics of hip fractures in elderly patients, a series of measures, including multidisciplinary diagnoses, treatments before injuries, full analgesia, early surgical intervention, and the whole-process participation of rehabilitation doctors, have been formulated to accelerate rehabilitation and shorten hospital stays.

The present study also reported that the 30-day and one-year mortalities in patients with hemiplegia were higher than those in patients without it. This finding differs from that of David et al,[14] who found that proximal femoral fractures with hemiplegia are not related to high mortality. However, the number of patients with stroke in the two studies differed greatly, which may have accounted for the difference in mortality rates.

The functional recovery of elderly patients with hip fractures is poor, and less than half of them return to their pre-injury state. Patients with hemiplegia are often complicated with affective disorders and communication difficulties and cannot effectively cooperate with rehabilitation exercises. The present study reported that the ADL scores of patients with hemiplegia one year after surgery were significantly lower than those of patients without hemiplegia. However, in the assessment of functional recovery, there was no significant difference between the hemiplegia and non-hemiplegia groups in the proportion of patients returning to a pre-injury functional state. There may be two causes for the slight difference between the two groups in rate of functional recovery. First, after the geriatric orthopedic project was carried out in the hospital, rehabilitation doctors participated in the whole treatment, focusing on patients with limb hemiplegia. Second, most patients with hemiplegia have fractures on the hemiplegic side of their bodies, and although it has a certain impact on postoperative walking function, the overall impact is limited.

The present study had some limitations. First, it was a single-center, retrospective study, which cannot rule out selective bias. Second, there was a large difference in the number of patients in each of the two groups, which may have led to systematic errors. Last, the study only analyzed the risk of death 30 days and one year after surgery, but the high incidence of postoperative mortality associated with hip fractures can last up to 20 years after injury.

Conclusion

The incidence of hip fractures is high in patients with hemiplegia, and these patients have a higher incidence of perioperative complications and postoperative mortality than patients without hemiplegia. For such patients, therefore, early intervention is needed. Treatment measures should include multidisciplinary treatments and early intervention by rehabilitation physicians.

Ethics Approval

This study was conducted with approval from the Ethics Committee of Air Force characteristic Medical Center (2020061002). This study was conducted in accordance with the declaration of Helsinki. This study was retrospective and did not require written informed consent. Patient data were kept confidential in this study.

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Disclosure

The authors declare that they have no competing interests.

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