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Risk Factors Affecting Postoperative Walking Ability Following Hip Fracture Surgery in the Elderly

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Abstract

Hip fractures are frequent in elderly people, and subsequent Activities of Daily Living (ADL) depend on whether practical walking ability is achieved postoperatively. The aim of this study was to examine the factors affecting postoperative walking ability following a hip fracture. A retrospective study of 95 patients (85 females, 10 males, mean age 77.4 ± 10.8 years) was conducted. All patients were operated in our hospital between 2007 and 2014. Information about age, sex, type of fracture, complications, surgical method, preoperative walking ability, preoperative ADL, dementia, osteoporosis treatment, and preoperative wait (days) was obtained from the patients' clinical records, and factors affecting postoperative walking ability were examined. On logistic regression analysis, age, bone and joint disease, and dementia were significant factors for failure to walk after hip fracture surgery.

Keywords: Age; Barthel index; Bone and joint disease; Cerebrovascular disease; Dementia; Walking ability; Hip fractures; Operation; Rehabilitation; Risk factors

Introduction

In an aging society, hip fracture is the most serious outcome of osteoporosis, and the number of hip fractures worldwide is expected to increase to 6.3 million in 2050 [1]. Recent studies have reported an increased incidence of hip fracture in Japan. Elderly patients with hip fractures often have more preoperative complications, and recovery of walking ability may be difficult postoperatively [2-6]. Although the incidence of hip fracture increases with age, and nonagenarians represent a population at high risk, few studies have focused on their potential to recover walking ability after hip fracture. The aim of this study was to describe the walking ability after hip fracture surgery affecting the risk factors for decreased walking ability. These factors can be used to improve discharge protocols and create appropriate rehabilitation programs.

Methods

Samples

A total of 95 patients (85 females, 10 males) admitted and operated for hip fracture, selecting patients using the same surgery instrument 65 years old or older in the same operator, and excluding patients who used a wheelchair before injury, and excludind unstable fracture type, from July 2007 through January, 2014; total 79 months was evaluated. Follow up duration was 12-65 months (mean; 33.5 ± 12.1months).

The fracture types were femoral neck fracture in 45 patients and trochanteric fracture in 50; the operative method was prosthetic replacement in 42, cylindrical pins in 3, and locking nails in 50.

All hip surgery was successful and the passage was good. Of Approval for this investigation was obtained from the institutional review board of Koishikawa Tokyo Hospital, and informed consent was provided by all patients who were included in the study.

Analysis

Postoperative walking ability was evaluated at discharge once by a medical doctor. The definition of the walking ability reacquisition rate was the ratio of patients that could walk with or without a walking aid.

Multidimensional assessment

Age, sex, type of fracture, co-morbidities (paralysis, cerebrovascular disorder, heart disorder, hypertension, respiratory disease, hepatic disorder, renal disease, diabetes mellitus, malignant tumor, digestive system disease, bone and joint disease (including spine, hip, knee disease; post operating, injury, and orthroarthritis), fracture treatment, preoperative walking ability, preoperative level of activities of daily living (Barthel index score) [7], presence of dementia, osteoporosis treatment, and preoperative wait days were evaluated [8,9]. In addition, we were seen about complication from before hospitalization, but 15 osteoporosis was treated from before hospitalization, but start treatment after hospitalization without performing it with 14. And cerebrovascular disease defined stroke, cardiac disease as angina, myocardial infarction, heart failure, arrhythmia and respiratory disease defined it as pneumonia, COPD, pulmonary emphysema, tuberculosis, lung cancer (Table 1). A diagnosis of dementia was made according to the Diagnostic and Statistical Manual of Mental Disorders, Third Edition-revised (DSM-III-R) [10].

The degree of dependence in walking and transferring ability was measured by means of the corresponding sub-items of the Barthel index score. Gait was independently classified into the following four functional levels (gait ability scoring system) graded from 1 to 4: grade 1, unaided walking; grade 2, use of a single support; grade 3, use of a double support or walker; and grade 4, no gait or bedridden [11,12].

A physician confirmed the preoperative walking ability level with the patient or family.

Rehabilitation training

In the case of locking nail and prosthetic replacement, postoperative rehabilitation started on the day after surgery and included load-bearing exercises depending on the side, wheelchair use, and pain

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Number of patients (n=95)	males, 10; females, 85
Age (years)	77.4 ± 10.8
Type of fracture (n)	
Femoral neck	45
Intertrochanteric	50
Type of surgical procedure (n)	
Cylindrical pins	3
Locking nail	50
Prosthetic replacement	42
Complications (n (%))	
Paralysis	4
Cerebrovascular disease	13
Cardiac disease	8
Hypertension	63
Respiratory disease	43
Liver disease	6
Renal disease	3
Diabetes mellitus	26
Malignancy	3
Gastrointestinal disease	5
Bone and joint disease	21
Gait ability (before hip fracture) (n)	
Grade 1	42
Grade 2	40
Grade 3	13
Grade 4	0
Barthel index total score before hip fracture	70.2 ± 25.1
Barthel index total score at discharge	65.8 ± 20.4
Dementia	27
Treatment of osteoporosis	29
Time between fracture and surgery, days (mean)	3-23 (9.3 ± 4.6)
Total length of stay, days (mean)	14-76 (41.5 ± 23.9)

Data are expressed as means ± standard deviation.

Table 1: Baseline data at admission.

from surgery. Walking with a walker in parallel bars was started 1-2 weeks after surgery, and Activities of Daily Living (ADL) exercises were started 2-3 weeks after surgery. A physician confirmed that the patients actually received the standard rehabilitation protocol by reviewing the medical records.

Because two of three patients who underwent cylindrical pins had osteoporosis, and pin might do cut out, as for three days after surgery, we began rehabilitation in bed side, and wheelchair ride started from 4days after surgery. In load bearing, it was one case four weeks one case, three weeks one to have started from one week after surgery. At the beginning of rehabilitation training, the goal, as well as each exercise, was explained. When patients required a rest, a brief interruption was allowed.

Analysis

Univariate and multivariate analyses were conducted to identify factors significantly related to walk acquisition. Independent variables were age, type of fracture, type of surgical procedure, and complications, and the dependent variable was postoperative walking ability.

A value of $p<0.05$ was considered significant. The Bonferroni correction was used to adjust for multiple comparisons. All variables were included multivariate analysis. All analyses were performed using SPSS version 10.0 (SPSS Inc., Tokyo, Japan).

Results

After surgery, 51.2% of patients were discharged home (Length of stay in our hospital: mean 45.1 ± 12.3days), 38.9% were discharged to nursing facilities (Length of stay in our hospital: mean 14.0 ± 2.2days) and 9.9% were discharged to hospitals (Length of stay in our hospital: mean 42.8 ± 8.1days). When there was no dementia, home discharge was dominant (65.2%), and for patients with dementia, the percentage of home discharges was low (35.7%, p=0.007). In the type of surgical procedure, there was not the home discharge case in the case of the cylindrical pins. It took it more than 4 weeks until full weight gait came to be possible as this reason in the case of cylindrical pins, and it was though that we required longer-term rehabilitation. There was not the fatal case during hospitalization.

In the type of fracture, 38 cases were able to walk in the intertrochanteric type, and 37 cases were able to walk in the femoral neck type, there were not the significant difference (p=0.01).

Patients that Barthel index score has it or less 50 points required support to live. The mean Barthel index score before hip fracture was 70.2 ± 25.2 points; of the total patients, 75% had a score >50 points, and 25% had a score ≤ 49 points. The mean score on the Barthel index scale at discharge was 65.8 ± 20.4 points; of the total patients, 60% had a score >50 points, and 40% had a score ≤ 49 points.

A total of 75 (78.9%) patients became able to walk with an assistive device, including a cane walker. There was not the significant difference by characteristic by characteristic patients about a period to surgery (p=0.51) and a surgical methods (p=0.30).

The ratio that was available for a walk was 58.3% (p=0.005 on logistic regression analysis) for the group with bone and joint disease, 55.6% (p=0.04 on logistic regression analysis) for the group with dementia, and 65.0% (p=0.005 on logistic regression analysis) for the group with cerebrovascular disease.

On univariate analysis, age, cerebrovascular disorder, bone and joint disease, preoperative ADL, and dementia were found to be significant factors; Furthermore, as a result of having gone multiple regression analysis in all factors, cerebrovascular disease, preoperative ADL, bone and joint disease, and dementia were found to be significant factors (Tables 2 and 3).

Discussion

Hip fracture is one of the most common fractures in elderly people [6,8], and it affects their prognosis and postoperative ADL. Various postoperative complications can occur, and acquisition of walking ability can be a problem [5]. Various factors are involved in postoperative gait ability following a hip fracture, including gait ability before the injury, age, fracture type, muscular strength, and dementia [13-22].

On multivariate analysis in the present study, age, spine, hip, knee disease and dementia were significantly related to postoperative walking ability. Basic rehabilitation training and use of a walking aid were difficult in elderly people, and patients with cognitive dysfunction had an increased risk of falls, thus resulting in the need for assistance with walking. Elderly patients often had concomitant osteoarthritis of the spine, lumbar vertebral compression fractures, gonarthrosis, and pain and instability of osteoarthritic knees, causing difficulty in rehabilitation.

The present results differ partially from those of previous studies. The rate of postoperative walking was low in the present study (78.9%) compared to the 84.5% with a single or double support reported by Torpilliesi et al [22]. Such differences can be related to the fact that Torpilliesi [22] excluded patients affected by spine, hip, knee disease

	Able to walk	Unable to walk or bedridden	Univariate analysis	Logistic regression analysis
Number of patients (n=95)	Male, 6 Female, 69	Male, 4 Female, 16	n.s.	n.s.
Age (years)	76.8 ± 5.9	77.9 ± 5.2	<0.001	n.s.
Type of Fracture (n(%))				
Femoral neck	37 (39.0%)	8(8.4%)	n.s.	n.s.
Intertrochanteric	38(40.0%)	12 (12.6%)	n.s.	n.s.
Type of surgical procedure (n (%))				
Cylindrical pins	0	3(3.2%)	n.s.	n.s.
Locking nail	38 (40.0%)	12 (12.6%)	n.s.	n.s.
Prosthetic replacement	37 (38.9%)	5 (5.2%)	n.s.	n.s.
Complications				
Paralysis	4	3	n.a.	n.a.
Cerebrovascular disease	13	7	<0.001	0.005
Cardiac disease	8	9	n.s.	n.s.
Hypertension	63	15	n.s.	n.s.
Respiratory disease	43	10	n.s.	n.s.
Liver disease	6	0	n.s.	n.s.
Renal disease	3	1	n.s.	n.s.
Diabetes mellitus	26	8	n.s.	n.s.
Malignancy	0	0	n.s.	n.s.
Gastrointestinal disease	5	2	n.s.	n.s.
Spine, hip, knee disease	21	15	<0.001	0.005
Gait ability (before hip fracture)				
Grade 1	50	1	0.015	<0.001
Grade 2	15	4	<0.001	<0.001
Grade 3	10	15	n.s.	n.s.
Grade 4	—	—	—	—
Barthel index total score before hip fracture (0-100)	75.4 ± 13.9	45.7 ± 18.8	<0.005	<0.005
Barthel index total score at discharge (0-100)	58.5 ± 20.1	12.8 ± 11.3	<0.005	<0.005
Dementia	15 (20%)	12 (60%)	<0.001	0.04
Treatment of osteoporosis (n)	35	7	n.s.	n.s.
Time between fracture and surgery (days)	8.5 ± 3.1	7.6 ± 3.4	n.s.	n.s.
Total length of stay (days)	34.1 ± 20.7	20.6 ± 18.4	n.s.	n.s.

Data are expressed as means ± standard deviation. n.s., not significant.

Table 2: Clinical and functional characteristics of 95 patients after rehabilitation following hip fracture surgery.

and cerebrovascular disease. Furthermore, 63% was able to recover unaided or aided walking in the study of Tarazona [9] et al. These results were lower than the results of the present study, but their mean length of stay was short (8.9 ± 4.3 days). Tarazona [9] et al. reported an ambulatory rate at 1 month after a discharge of 77.4%, which is similar to the present results. About 78% was able to walk unaided or aided walk after surgery when they could walk before hip fracture.

In the present cases, the group it was possible for a walk for 20.6 ± 18.4 days for the length of stay of the group where it was not possible for a walk for an average of 34.1 ± 20.7 days presented with the tendency that had a long length of stay for the length of stay of the group there was a walk.

	Adjusted Odds Ratio	95%PI	P
Barthel index	1.21	1.04 to 2.78	0.21
Age	0.20	0.01 to 0.05	0.07
Spine, hip, knee disease	0.01	0.001 to 4.23	2.3
Dementia	0.001	0.18 to 3.11	0.021

Table 3: Multivariate logistic regressions of potential predictors on ability to walk at discharge.

Furthermore, the percentage of patients who left the hospital to be discharged home was 35.7% in the dementia group, fewer than the 65.2% in the group without dementia.

It was later found that the patients with dementia entered a nursing facility after discharge. Among the groups that regained walking ability, the average time before walking was 5.8 weeks. It was an average of 2 months until the patient could walk after surgery.

Dementia and the type of bone and joint disease are different types of factors, and, in the future, it will be necessary to evaluate walking ability reacquisition by level and perform appropriate rehabilitation, use the appropriate means of transport for patients who cannot become independent, and provide instruction for home care support.

Conclusions

In conclusion, factors that affect postoperative walking ability in hip fracture patients were identified. Preoperative factors significantly associated with postoperative walk ability reacquisition were age, bone and joint disease, and dementia. In the future, it will be necessary to examine the types of dementia and bone and joint diseases, to evaluate walking function by level, and to set an appropriate rehabilitation goal for such patients early.

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Statement of responsibility and author contributions: All authors made significant contributions to the design of the study, the analysis and interpretation of data, and the drafting of the manuscript. Specifically, TN, AO conceived and designed the study, performed the literature search, analyzed and interpreted the data, and drafted and revised the manuscript; AO performed the technical surgeries. All authors had full access to all data (including statistical reports and tables) in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. In addition, all authors provided final approval of the version to be published.

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Conflicts of interest

None declared.

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