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Association of surgery time and early curative effect for elderly patients with femoral neck fracture in China.

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Abstract

Introduction: This research is aimed to explore the effect of surgery time on early curative effect in elderly patients with femoral neck fracture.

Materials and method: 105 elderly patients with femoral neck fracture were divided into early surgery group (hospitalized for 6-18 days) and late surgery group (hospitalized for 8-26 days). Patients' general condition and postoperative situation were recorded in detail. The morbidity rate of complications was evaluated on patients during postoperative hospitalization. Harris hip scores and Activities of Daily Living (ADL) scores were assessed in order to observe the postoperative functional recovery of patients. The mortality rate of patients was also evaluated before surgery and at 3 month, 6 month and 12 month after surgery.

Results: The early surgery group had a shorter time of hospitalization and a lower morbidity rate of respiratory system disease than the late surgery group (t=-5.829, P=0.000). The Harris hip score and ADL score of the early surgery group were significantly higher than the late one in the six months after surgery (P<0.05). However, there was no obvious difference for Harris hip score and ADL score between the two groups after 12 months of surgery (P>0.05). The mortality rate had no significant difference between the two groups during hospitalization (χ^2=0.002, P=0.964).

Conclusion: The early surgery group had a better function recovery compared with the late surgery group, which indicates early surgery has a positive curative effect on patients with femoral neck fracture.

Keywords: Elderly patients, Femoral neck fracture, Surgery timing, Function recovery.

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Introduction

Femoral neck fracture, also known as hip fracture, is the most serious osteoporosis-related fracture in the elderly population, which frequently occurs as a common consequence of injuries [1]. The incidence of femoral neck fractures is increasing dramatically in recent years, especially in population aged over 70 years [2]. An elderly patient with femoral neck fracture has often suffered severe pain with inability to bear weight [3,4]. Moreover, femoral neck fracture is closely related to poor functional outcomes [5]. It has been reported that the mortality rate for femoral neck fracture is higher than others in elderly patients [6]. Clinically, aiming to decrease length of hospital stay and promote early activities, most scholars advocated that elderly patients with femoral neck fracture should take surgery as soon as possible in order to relieve the complications caused by lying in bed for a long time [7,8]. However, given that there were no researches demonstrating the association between early surgery and the curative effect, some researchers proposed that the bad curative effect of the late surgery patients might be caused by their worse condition of illness and internal system complications instead of the surgery timing. Leung et al. [9] held that early surgery could decrease the mortality rate of fragility hip fractures. However, other studies even found that early surgery may increase postoperative mortality in patients in adverse physical condition [10]. Besides, there have been reports that postponing surgery has a minor impact on postoperative mortality, but may increase the incidence of postoperative morbidity and complication [11,12]. It is also known that optical timing of surgery is of vital importance for the early curative effect of patients [13,14]. However, there has been no research on the effect of surgery time on curative effect in elderly patients in China.

The purpose of this study was to investigate whether the timing of surgery in hip fracture patients had an influence on the

function recovery of affected extremity and activities of daily living.

Materials and Method

Subjects

One hundred and five elderly patients with femoral neck fracture from the Department of Hip Damage of our hospital during June 2008 to December 2016 were included in this study. By the time point 48 h since they were hospitalized, the patients were divided into two groups: the early surgery group (41 cases including 14 males and 27 females, age 78.34 ± 5.06) and the late surgery group (64 cases including 27 males and 37 females, age 78.61 ± 5.36). The inclusion criteria were: age ≥ 65, single fracture with the X-ray fixing the fracture site, without pathological fracture and metabolic bone disease, hospitalized within 12 h since the injury, agreeing to take surgery. Our department has set up the evaluation group of femoral neck fracture and the surgery group. All patients were treated according to the protocols approved by the local ethics committee of Luoyang Orthopedic Hospital of Henan Province.

Preoperative examination

Preoperative testing of daily functions was performed by nurses. Being hospitalized, the patients were examined overall immediately. Their injury experience and internal system complications were recorded in detail. The internal diseases were sorted into four types: cardiovascular and cerebrovascular disease, hypertension, pulmonary disease and kidney disease. The patients' body functions were evaluated and recorded in Harris hip score and ADL (activities of daily living) score according to the dictation of the patients themselves and their family members.

Surgical procedure

According to the preoperative evaluation, we chose general anesthesia, combined spinal-epidural anesthesia or local infiltration anesthesia for the patients. The surgery projects contained hollow screw closed fixation and hip arthroplasty. Based on the different methods of surgery, patients lied on their side or back after anesthesia. Side body position requested the patients to lie on their healthy side with their hips and knees of the unaffected extremities flexed and their affected extremities straight on. Brackets were used to press their body from both sides in order to keep them perpendicular to the operating table. Supine body position requested the patients to keep their unaffected extremity straight and outward while their affected extremity flexed at the hips.

Postoperative follow-up

At three, six, or twelve months after surgery, the patients were followed by telephone or they returned to the hospital for a regular outpatient visit. By Harris hip score and ADL score system, the functional recovery of the affected extremities and ability of daily living were determined. The date of death was recorded if the patient had died.

Statistical analysis

Student's t-test or analysis of variance was conducted to determine statistically significant differences between groups by SPSS 17.0 (SPSS Inc., Chicago, IL, USA). All data were presented as mean ± SD. A P value<0.05 was considered statistically significant.

Results

General conditions and surgery conditions

There were 105 patients conforming to the standards of the research. They were divided into two groups: the early surgery group (41 cases, age 78.34 ± 5.06) and the late surgery group (64 cases, age 78.61 ± 5.36). There was no significant difference in age between the two groups (P=0.799). The early surgery group contained 14 males and 27 females while the late one contained 27 males and 37 females. There was no significant difference in gender (P=0.576). The comparison between two groups in internal system complication, preoperative Harris hip score and ADL score, methods of anesthesia, time of surgery and volume of hemorrhage showed no significant difference (P>0.05). These results indicated that the two groups had the same general conditions and surgery conditions (Tables 1 and 2).

Table 1. *Comparison of general conditions between the early surgery group and late surgery group.*

Items	The early surgery group (41 cases)	The late surgery group (64 cases)	χ2/t value	P value
Age (year)	78.34 ± 5.06	78.61 ± 5.36	-0.255	0.799
Gender (male %)	14 (34.15%)	27 (42.19%)	0.001	0.576
Cardiovascular and cerebrovascular disease (case)	11 (26.83%)	20 (31.25%)	0.502	0.525
Hypertension (case)	16 (39.02%)	28 (43.75%)	0.229	0.688
Pulmonary disease (case)	19 (46.34%)	29 (45.31%)	0.011	1
Kidney disease (case)	8 (19.51%)	12 (18.75%)	0.009	1

Harris hip score	62.63 ± 9.40	64.30 ± 9.20	1.26	0.211
ADL score	67.68 ± 10.96	65.55 ± 9.68	1.047	0.297

Table 2. *Comparison of the surgery conditions between the early surgery group and late surgery group.*

Items	The early surgery group	The late surgery group	χ^2 or t value	P value
General anesthesia	35 (85.37%)	51 (79.69%)	0.544	0.461
Epidural local infiltration anesthesia	6 (14.63%)	13 (20.31%)	0.544	0.461
Time of surgery (min)	99.12 ± 12.69	102.98 ± 13.82	-1.442	0.152
Volume of hemorrhage during surgery (ml)	167.75 ± 31.81	180.63 ± 40.65	-1.717	0.089
Internal fixation with hollow rivet	21 (51.22%)	42 (65.63%)	2.161	0.142
Prosthetic replacement	20 (48.78%)	22 (34.37%)	2.161	0.142

Complications during hospitalization

Patients of the early surgery group were hospitalized for 6-18 d with the average time 11.46 ± 2.60 d. Patients of the late surgery group were hospitalized for 8-26 d with the average time 15.95 ± 4.47 d. There was significant difference for the two groups (t=-5.829, P=0.000). There was no statistical significance in the morbidities of respiratory complications between the two groups (P=0.048). Apart from this, comparisons of other complications including cardiocerebral events, deep venous thrombosis and urinary system disease showed no obvious difference (P>0.05). These results indicated that timing of surgery for femoral neck fracture had no obvious effect on complications after surgery (Table 3).

Table 3. *Comparison of complications morbidity during postoperative hospitalization.*

Postoperative complications	The early surgery group (cases)	The late surgery group (cases)	χ^2 value	P value
Respiratory disease	9 (21.95%)	26 (40.63%)	3.921	0.048
Cardiocerebral events	3 (7.32%)	6 (9.38%)	0.135	0.713
Deep venous thrombosis	1 (2.44%)	3 (4.69%)	0.345	0.557
Urinary system disease	4 (9.76%)	7 (10.94%)	0.037	0.847

Postoperative recovery of function (Harris hip score and ADL score)

The patients' functional recovery of two groups at the 3th, 6th and 12th month after surgery was evaluated by Harris hip score and ADL score (Table 4). There was no significant difference in the preoperative scores (P>0.05). At the 3th and 6th month after surgery, Harris hip score and ADL score of the early surgery group were significantly higher than those of the late surgery group (P<0.05). At the 12th month, there was no obvious difference in Harris hip score and ADL score between the two groups (P>0.05). All these results demonstrated that, early surgery for femoral neck fracture could improve short-term functional recovery of affected extremity and ability of daily living, although it had little effect on the long-term functional recovery.

Table 4. *Comparison of postoperative functional recovery between the early surgery group and late surgery group.*

Groups	Scoring system	The early surgery group	The late surgery group	t value	P value
Before surgery	Harris	62.63 ± 9.40	64.30 ± 9.20	1.26	0.211
	ADL	67.68 ± 10.96	65.55 ± 9.68	1.047	0.297
Three months after surgery	Harris	45.83 ± 8.69	41.45 ± 8.65	2.525	0.013
	ADL	42.44 ± 7.51	39.45 ± 5.35	2.211	0.031
Six months after surgery	Harris	50.66 ± 4.79	48.41 ± 4.72	2.37	0.02

	ADL	49.63 ± 7.53	46.64 ± 6.67	2.132	0.035
Twelve months after surgery	Harris	61.51 ± 8.36	60.30 ± 9.20	0.684	0.496
	ADL	64.63 ± 9.96	63.20 ± 8.52	0.786	0.434

The surgery time and mortality rate

During the hospitalization, 2 cases died in the early surgery group (4.88%) while 3 cases died in the later surgery group (4.69%). There was no significant difference (P=0.964). Moreover, the follow-up data revealed that earlier surgery didn't decrease the mortality (P>0.05) (Table 5). These results suggested that timing of surgery for femoral neck fracture had no effect on mortality after surgery.

Table 5. Comparison of mortality rate between the early surgery group and late surgery group.

Postoperative complications	The early surgery group (cases)	The late surgery group (cases)	χ^2 value	P value
During hospitalization	2 (4.88%)	3 (4.69%)	0.002	0.964
Three months after surgery	4 (9.76%)	7 (10.94%)	0.037	0.847
Six months after surgery	5 (12.20%)	9 (14.06%)	0.075	0.784
Twelve months after surgery	7 (17.07%)	12 (18.75%)	0.047	0.828

Discussion

Among elderly people, femoral neck fracture is a common injury which accounts for approximately 53% of hip fractures [15,16]. Moreover, being bedridden after injury contributes to the contracting of complications such as pneumonia, bedsore and phlebitis [17,18]. These increase the risk and difficulty degree of treatment. There have been reports that mortality of femoral neck fracture is higher than general fractures among elderly people [19]. In 1990s, Rogers et al. [20] reported that performing surgery within 72 h after the patients were hospitalized could remarkably decrease the mortality and infection rate in the five years after surgery. In addition, Bottle et al. [21] indicated that the postponement of surgery after injury could lead to the increasing mortality during hospitalization, which also support the early surgery. The idea that early surgery could reduce length of hospital stay, promote training and off-bed activities, and prevent postoperative complications had been unanimously approved by a number of colleagues [22,23]. According to the clinical outcome that early surgery could obviously reduce the postoperative complications and mortality [24]. However, another view is that sufficient evaluation and treatment of internal system disease should be carried out in order to decrease the risk of surgery and the mortality rate, which was based on the fact that the bad stress compensation ability of the elderly patients results in that they can't adjust their bodies to the general reaction or compensation caused by the injury in a short time [25]. Some researchers, through clinical observation, proposed that the poor prognosis of the late surgery group may be caused by patients' self-condition. Furthermore, advanced studies by Orosz et al. [26] discovered that early surgery couldn't reduce the morbidity of complications and the mortality. Therefore, Orosz et al. [26] presented that more evidences were needed to prove that early surgery could improve the functions of patients and reduce the mortality. Taking all the preoperative factors into account, Majumder et al. [27] announced that the individual difference and the selection bias of patients instead of the timing of surgery are the main factor of postoperative mortality.

In this study, we found that there was a significant difference in the average length of hospital stay between the early surgery group and the late surgery group. However, there were no obvious differences in other complications apart from respiratory complications, which may be due to the long hospital stay. Besides, there was no significant difference in the mortalities during hospitalization, at the 3th, 6th and 12th month after surgery. Therefore, we believe that the postoperative mortality has no significant association with the timing of surgery.

Inefficient functions of affected extremity and ability of daily living may increase the decay of the functions of major visceral organs and induce serious complications. Thus, function recovery of patients seems to be particularly important after the surgery for femoral neck fracture. Before surgery, the comparisons of Harris hip score and ADL score between two groups showed no differences. At the 3th and 6th month after surgery, the improvement of the early group is larger than the late group. However, at the 12th month, there was no significant difference between the two groups. We considered that, less length of hospital stay and taking functional training sooner than the late one, the early surgery group had an earlier recovery of muscular dystrophy, however, the distinction gradually decreased with the process of recovery training. As a result, the two groups had similar recovery at the 12th month.

In conclusion, early surgery on patients with femoral neck fracture improves the early curative effect including taking functional training sooner and shortening the length of hospital stay compared with the late surgery. However, there are some limitations in this research. Frist of all, few of participants were

included in this research; second, the follow-up time is short, so we need to continue to follow the information of patients.

Conflict of Interest

The authors declare that no conflicts of interest exist.

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