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Original article

Bilateral hip fractures

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Abstract

Background. In the past, patients admitted for hip fractures had often sustained a contralateral hip fracture. The incidence of bilateral hip fractures has been reported to be 5%–10%, and in the future the number of bilateral hip fractures is expected to increase with the increase of unilateral hip fractures. We believe that bilateral hip fractures can be efficiently prevented if a fracture on the other side could be predicted after unilateral hip fracture. Therefore, this retrospective study of 835 patients with hip fractures investigated the incidence, prognosis, and risk factors of bilateral hip fractures.

Methods. We examined 835 hip fractures retrospectively in Japan. Among them, we found 94 patients with bilateral noncontemporary hip fractures. We investigated age, sex, interval between the two fractures, type of fractures, cause, physical functioning, and complications. Differences between the unilateral fracture and bilateral fractures groups were analyzed statistically for age, sex, and complications using Student's *t* test and the chi-square test.

Results. In this study, the mean interval between two fractures was 4.28 years, and the second hip fracture occurred within 5 years in more than 70% of patients. The type of hip fracture was the same in 72.2% of bilateral hip fractures. No difference in age and sex was found between the unilateral and the bilateral groups. However, concerning complications, 22.1% of patients in the unilateral group and 34.8% in the bilateral group had dementia, the difference being significant.

Conclusions. These results revealed that the second hip fracture occurred within 5 years of the first in more than 70% of bilateral hip fracture patients and that dementia is a risk factor of bilateral hip fractures.

Introduction

In Japan, one of the most rapidly aging societies in the world, as the number of patients with osteoporosis has increased annually the incidence of hip fractures has been also increasing. Orimo et al. reported that 53000 hip fractures occurred in 1987, 76600 hip fractures in 1992, and 92400 hip fractures in 1997.[1]

In the past, patients admitted for hip fractures had often sustained a contralateral hip fracture. The incidence of bilateral hip fractures has been reported to be 5%–10%[2–7]; in future, the number of bilateral hip fractures is expected to increase with the increase of unilateral hip fractures.

The prognosis of unilateral hip fractures is poor; about 50% of patients require assistance in daily life, and the 1-year mortality rate is about 20%. In bilateral hip fractures, further decreases in the quality of daily life and survival can be predicted compared with unilateral fractures.

We believe that bilateral hip fractures can be efficiently prevented if a fracture on the other side could be predicted after unilateral hip fracture. Therefore, this retrospective study of 835 patients with hip fractures investigated the incidence, prognosis, and risk factors of bilateral hip fractures.

Subjects and methods

We examined the medical histories of 835 patients above the age of 60 who were treated for a hip fracture at six clinical centers in Mie, Japan, from January 1, 1996, to March 31, 1999. Patients with a fracture caused by high-energy trauma (traffic accident or falls from more than 1 m) and pathological fracture resulting from primary or metastatic tumor were excluded from our study. The patients consisted of 172 men and 663 women aged 60–103 years (mean, 80.0 years).

The following parameters were investigated: age, sex, interval between the two fractures, type of fracture, cause, physical functioning, and complications.

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The types of hip fractures in 72 patients of the bilateral group whose X-rays at the first fracture were available were classified as trochanteric or neck fractures. In addition, they were evaluated according to Evans' classification for trochanteric fractures and Garden's classification for neck fractures. Causes of fracture were classified into six categories: no trauma, falls from a chair or bed, falls from standing position, falls from a stairway, falls from less than 1 m or a bicycle, and unknown. Physical functioning was assessed using the following scoring system: walking without assistive devises (4), walking outside using assistive devises (3), walking inside but not outside (2), locomotion using a wheelchair (1), and bed confinement (0).

The following complicating diseases were traced using the patients' records: neurological diseases (cerebral bleeding, cerebral infarction, Parkinson's syndrome), eye diseases (cataract, glaucoma), cardiac diseases (myocardial infarction, angina pectoris, cardiac insufficiency, arrhythmia), respiratory diseases (pulmonary emphysema, asthma), dementia, hypertension, and diabetes mellitus. We judged the presence of dementia from symptoms such as amnesia, unrest, and wandering, which were described in the patient's records or were confirmed by the patient's family.

Differences between the unilateral fracture and bilateral fractures groups were analyzed statistically for age, sex, and complications using Student's *t* test and the chi-square test.

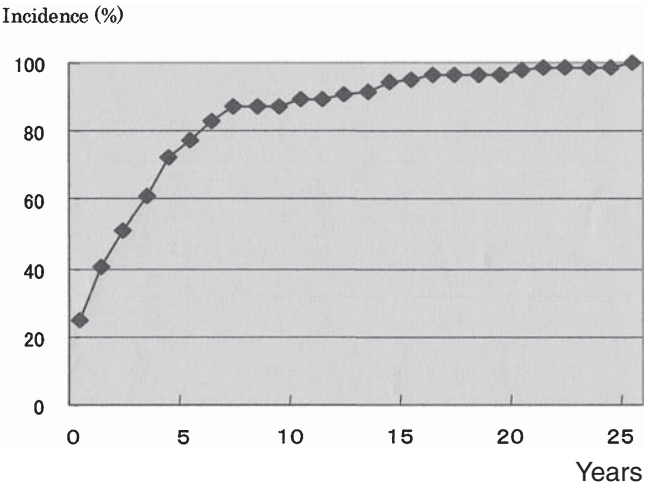

Fig. 1. Interval between the two fractures

Table 1. Complications of the unilateral and bilateral group

	Unilateral group	Bilateral group	
Dementia	22.1%	34.8%	$P = 0.008$
Respiratory disease	1.8%	3.8%	$P = 0.100$
Hypertension	28.4%	20.5%	$P = 0.117$
Cardiac disease	19.8%	26.1%	$P = 0.170$
Neurological disease	21.2%	17.0%	$P = 0.364$
Eye disease	12.3%	10.2%	$P = 0.466$
Diabetes mellitus	10.5%	9.1%	$P = 0.677$

* Analyzed statistically with the chi-square test

Results

Among the 835 patients, 94 patients (11.3%) had had bilateral hip fractures. In the bilateral group, the interval between the two fractures ranged from 4 days to 24 years (mean, 4.28 years). The second fracture occurred within 3 years in 51.2% of patients and within 5 years in 71.2% (Fig. 1).

The fracture types were evaluated in 72 patients with bilateral fractures for whom X-ray examination was possible. The fracture type was the same for both fractures in 52 (72.2%) of the 72 patients, being trochanteric fractures in 40 and neck fractures in 12. Moreover, Evans and Garden classification revealed that the fracture types were symmetrical in 22 (30.6%) of the 72 patients (Fig. 2).

The mean age in the unilateral group was 79.6 years (731 patients, 153 men and 588 women) and 79.0 years in the bilateral group (94 patients, 19 men and 75 women) at the time of the first fracture. There was no significant difference between the two groups. However, the mean age in the bilateral fractures group at the time of second fracture was 83.3 years, being significantly older than the mean age of the unilateral fracture group ($P < 0.0001$). The ratio of men to women did not vary significantly between the unilateral (153/588) and bilateral (19/75) groups.

More than 65% of the causes consisted of falls from a standing position in both groups. In the bilateral group, falls from a chair or bed were observed in 5.9% of patients for the first fracture and in 22.7% for the second fracture, showing a more than threefold increase (Fig. 3).

A decrease by more than 2 grades between physical functioning before fracture and that after discharge occurred in 14.7% of the unilateral group and in 71.7% of the bilateral group; i.e., physical functioning markedly decreased in the latter group.

Analysis of complications revealed that significantly fewer patients had dementia in the unilateral group (22.1%) than the bilateral group (34.8%) ($P = 0.0082$). However, the incidence of neurological diseases was not significantly different between the two groups (21.2% in the unilateral group and 17.0% in the bilateral fractures group) ($P = 0.44$). No significant differences were found in the incidence of other diseases between the two groups (Table 1).

	Evans classification					Garden classification			
Second / First	Type I Group 1	Group 2	Group 3	Group 4	Type II	I	II	III	IV
Type I Group 1	●●●	●●●							●
Group 2	●●●	●●●●● ●●	●●●●		●			●	●●●
Group 3	●●	●●	●●●●●		●		●	●	●●●●
Group 4			●●●	●●	●		●		●●
Type II		●		●	●				
I						●●		●	
II			●			●		●●	
III			●			●			●●
IV		●	●●	●				●	●●

Fig. 2. Classification of the type of bilateral fractures

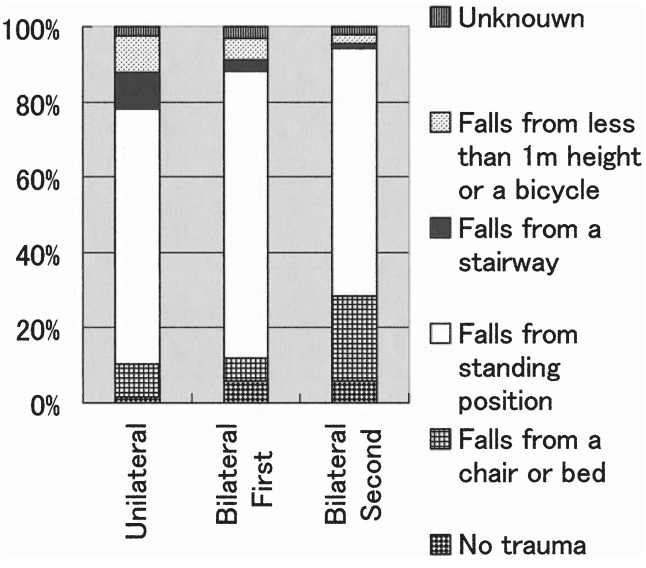

Fig. 3. Causes of hip fractures

Discussion

The incidence of bilateral hip fractures has been reported to be 5.4%–10.6%.[2–7] In the present study, we noted 94 bilateral hip fractures (11.3%) of 835 hip fractures, which is slightly higher than the previously reported incidence. The mean interval between the first and second fractures is about 3–7 years in recent reports[2,4,6–8] and was 4.3 years in the present study. Dretakis et al. reported that half of the second hip fractures occurred within 24 months of the first and 75% occurred with 48 months.[5]. Similarly, in the present study, 51.2% of second fractures occurred within 3 years and 71.2% occurred within 5 years of the first fracture, indicating a tendency for the second hip fracture to occur sooner rather than later.

Most previous reports have emphasized the symmetry between the first and second hip fractures, showing 64%–83% symmetry between fractures. In the present study, when the fracture types were classified as trochanteric or neck, the type was identical in 72.2% of the bilateral hip fractures. In addition, evaluation according to the Evans and Garden classifications showed symmetrical fracture types in 30.6% of bilateral hip fractures. The reason for this phenomenon is not clear; however, Ferris et al. suggested a positive correlation between trochanteric fracture patterns and a short neck (4.5 cm); longer necks (5.4 cm) were associated with subcapital fractures or osteoarthritis.[9] These findings suggest that the existence of endogenous factors might determine the type of hip fracture.

Evaluation of the cause of injury in the bilateral group revealed that the incidence of falling from a chair or bed at the second fracture was threefold greater than that at the first fracture and that the number of patients

who had fallen from a standing position, from a stairway, or from less than 1 m or a bicycle at the second fracture decreased. This finding indicates that activities of daily life might have declined after the first hip fracture.

Physical functioning decreased by more than 2 grades in 14.7% of the unilateral group and 71.7% of the bilateral group, showing a marked decrease in the latter. Decreased physical functionality would have markedly affected survival. Boston reported that the 3-month mortality following a second fracture was 30% compared with 13% following a first fracture.[3] Thus, prevention of a second hip fracture following the first is important, and the characteristics of bilateral hip fractures need to be further evaluated. First, patients after the first hip fracture should be treated for osteoporosis and be prevented from a second trauma such as a fall. The patient with osteoporosis should be treated with drugs such as estrogen, alendronate, or risedronate. The present studies reported that these drugs reduced the risk of hip fracture among elderly women with osteoporosis.[10–12]

Rodaro et al. reported the most common causes of both bilateral and monolateral fractures were either a moderate trauma or a fall on domestic premises.[13] Thus, the patient's place of residence needs to be repaired or modified; that is, uneven thresholds and doorsills must be made flat, for example, and handrails must be installed on the walls to help prevent a second fall. Furthermore, rehabilitation such as training to walk and extension of lower limb muscles is very important to avoid a second fall, and hip protectors should be worn to prevent a second hip fracture in case the patient does fall.

Finally, Chiu et al. reported that concomitant neurological diseases such as previous stroke or parkinsonism occurred more frequently in patients with sequential fractures of both hips.[14] However, in the present study, no significant difference in incidence of neurological diseases was observed between the two groups. On the other hand, the bilateral group contained statistically significantly more dementia cases than the unilateral group. Dementia would induce wandering and restlessness, which could increase falls due to carelessness, resulting in a second hip fracture. Thus, dementia may be one of the risk factors for bilateral hip fractures. This is the first report to document such an association.

Conclusion

This study revealed that the second hip fracture occurred within 5 years of the first in more than 70% of bilateral hip fracture patients, and that dementia is a risk factor of bilateral hip fractures. Thus, patients within 5 years after unilateral hip fracture or with dementia and hip fracture should be carefully followed. Accordingly, they must be treated for osteoporosis with drugs, be prevented from a second trauma by modifications to their home and by rehabilitation, and wear hip protectors to avoid a bilateral hip fracture.

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