

Second Hip Fractures at Chiang Mai University Hospital

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Background: Hip fractures are a major public health problem. Patients who have suffered a hip fracture have an increased risk of a subsequent hip fracture. This study examines the incidence of second hip fractures and attempts to identify underlying risk factors.

Objective: To examine the incidence of second hip fractures in osteoporotic patients at Chiang Mai University Hospital and to identify risk factors related to second hip fractures.

Material and Method: A retrospective review was conducted of all low-energy mechanism hip fracture patients admitted during 2008 and 2009. Analysis of second hip fractures was conducted using survival analysis and logistic regression analysis.

Results: A total of 191 patients were observed for 391.68 person-years (mean 2.05 person-years per patient). Among that group, nine second hip fractures were identified, an overall incidence rate of 0.023 second fractures per person-year. Second hip fractures tended to occur within the first year following an initial hip fracture. There were no significant differences related to either gender or comorbid medical conditions. Logistic regression analysis revealed that increased risk of a second hip fracture was associated with age (highest between 80 to 89 years) and patients who were not treated for osteoporosis following their initial fracture.

Conclusion: The incidence of second hip fractures at Chiang Mai University Hospital was 0.023 per person-year. Careful follow-up of older patients, especially those over 80, and treatment of osteoporosis with bisphosphonate plus vitamin D and calcium supplements was correlated with a reduction in the incidence of second hip fractures.

Keywords: Incidence of hip fracture, Second hip fracture, Chiang Mai, Thailand

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Osteoporosis is associated with the risk of many types of fractures, the three most common sites being the hip, spine and wrist. Hip fractures are one of the most common types in osteoporotic patients in Thailand, with an incidence of 7.45 per 100,000 population in 1994⁽¹⁾. The incidence of hip fracture in Chiang Mai Province in 1997 reported by Phadungkiat et al was 151.2 per 100,000⁽²⁾ and there was increasing trend in 2006 as 181.0 per 100,000 reported by Wongtriratanachai et al⁽³⁾. The one- and ten-year mortality rates following the osteoporotic hip fracture in Chiang Mai reported by Vaseenon et al were 18% and 68% respectively and the median survival time was 6 years⁽⁴⁾. Elderly patients suffered from a decrease in quality of life⁽⁵⁾ and less than 5% were able to return to good condition⁽⁶⁾. They were also at risk of a second hip fracture.

After an initial hip fracture, osteoporotic patients are at increased risk of a second hip fracture, particularly in the first year following the initial fracture^(7,8). Seventy percent of second hip fractures occur within three years⁽⁸⁾.

There have been several studies related to second hip fractures. Chapurlat et al found that low bone mineral density was associated with second hip fractures⁽⁹⁾. Yamanashi et al reported that cognitive impairment and neurologic disease were related to second hip fractures, but that Singh index, bone mineral density (BMD), sex and age were not significantly associated with second fractures. The fall mechanism causing the injury and the type of fracture in the second hip fracture were found to be similar to that of the initial fracture⁽⁷⁾. Anghong et al, however, reported that a Singh index ≤ 3 was a risk factor, in addition to age over 85 and the presence of neurologic diseases⁽¹⁰⁾. Egan et al reported that older age, low bone mass and cognitive impairment increased the risk of second hip fracture, while treatment of osteoporosis reduced that risk⁽¹¹⁾. Mitani et al found that old age, dementia and chronic obstructive pulmonary disease (COPD)

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affected second hip fracture risk, but that sex was not a factor⁽¹²⁾. Bisphosphonates were reported to increase bone mass density and reduce the incidence of hip fracture⁽¹³⁻¹⁵⁾.

The incidence of second hip fractures in Chiang Mai Province between 1998 and 2003 was reported by Rojanasathien et al to be 2.5% in the first year following an initial hip fracture⁽¹⁶⁾. Mortality at 3, 6, 12 and 60 months following a hip fracture in Chiang Mai were reported to be 9, 12, 17 and 29%, respectively⁽¹⁷⁾.

The present study attempts to identify the incidence of and risk factors for a second hip fracture in patients who had suffered a previous hip fracture. Comparison is made with previous studies and it can refer to the efficacy of the treatment.

Material and Method

This is a descriptive study of data on femoral neck and intertrochanteric fractures treated at Chiang Mai University Hospital.

Inclusion criteria

1. Patients age over 60 years.
2. Femoral neck or intertrochanteric fracture from a low energy mechanism.
3. Admitted to Chiang Mai University Hospital between January 1, 2008 and December 31, 2009.

Exclusion criteria

1. Femoral neck or intertrochanteric fractures which were the results of a high energy mechanism such as fall from a height or a traffic accident.
2. Fractures resulting from primary bone tumor or bone metastasis.
3. Patients who were followed-up for less than one year.

Osteoporosis treatment after initial hip fracture

Patients with hip fractures received bisphosphonate regularly after their fracture. Compliance was at least 80% in the first year following the fracture as documented by medical records and interviews with relatives.

Statistical analysis

Data was analyzed with the statistical software package STATA (version 10.0) using survival analysis for second hip fractures and log rank test for the risk factors and logistic regression analysis for all of

the risk factors. The *p*-value less than 0.05 were considered statistically significant.

Results

Of 452 patients treated for hip fracture, 191 met the inclusion criteria. They had been observed after their fracture for a total of 391.68 person-years (mean 2.05 person-years per patient). Among that group, nine second hip fractures occurred. The overall incidence was 0.023 fractures per person-year. Five of the nine second hip fractures occurred within one year of the initial fracture. Eight of the nine were contralateral hip fractures and one was an ipsilateral hip fracture. Estimated fracture-free survival time as shown in the following:

Of the 191 patients in the study, 136 were female and 55 were male. The nine second hip fracture patients were all female, and sex was not statistically significant (Table 1).

Of the 191 patients, in 108 cases the initial hip fracture was on the left side, and 83 cases on the right side. Among the second hip fractures, four were on left side and five on the right, but the side of the fracture was not statistically significant (Table 1).

Of the 191 patients, there 118 initial hip fractures at the intertrochanter of the femur and 73 cases at the neck of the femur. Among the second hip fractures, five cases were intertrochanter and

Table 1. Risk factors and *p*-value

Risk factors	Group details	<i>p</i> -value
Sex	Male, female	0.0670
Side	Right, left	0.4558
Site	Intertrochanter, neck of femur	0.8708
Age group	60-69, 70-79, 80-89, ≥90 years	0.1587
Type of treatment	Conservative, internal fixation, arthroplasty	0.6778
Hypertension	With, without	0.2499
DM	With, without	0.8595
CKD	With, without	0.2164
Alzheimer's	With, without	0.0890
Parkinson's	With, without	0.7430
COPD	With, without	0.3133
IHD	With, without	0.9453
CVA	With, without	0.3936
Hypothyroidism	With, without	0.0861

DM = diabetes mellitus; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease; IHD = ischemic heart disease; CVA = cerebrovascular accident

four cases were neck fractures; differences in site of the fracture were not statistically significant (Table 1).

The 191 patients in the study were divided into four age groups: 1) 60-69 years (40 patients), 2) 70-79 years (78 patients), 3) 80-89 years (5 patients) and 4) ≥ 90 years (1 patient). Of the second hip fractures, one was in group 1, two in group 2, five in group 3 and one in group 4. There was no statistically significant difference among groups (Table 1).

The 191 patients in this study received one of three types of treatment: conservative (21 cases), fixation (111 cases) or arthroplasty (59 cases). Of the second hip fractures, six were treated by fixation and three were treated by arthroplasty; none received conservative treatment. This distribution of treatments was not statistically significant (Table 1).

There were nine comorbidities before the initial hip fracture among the 191 patients in the study: HT, DM, CKD, Alzheimer's, Parkinson's, COPD, IHD, CVA and hypothyroidism. There were no statistically significant correlations between comorbidities and incidence of initial hip fractures (Table 1).

The 191 patients in the study received one of three types of osteoporosis treatment after an initial hip fracture: both bisphosphonate and supplements (calcium and vitamin D), supplements only and neither bisphosphonate and supplement. The relationship between second hip fracture and type of osteoporosis treatment was statistically significant (Table 2, Fig. 2).

All factors included in this study (sex, side, site, age, type of treatment, comorbidities and osteoporosis treatment) were analyzed by logistic regression. Two factors were found to be related to the occurrence of a second hip fracture: age 80-89 at the time of the initial hip fracture and osteoporosis treatment with both bisphosphonate and supplements (Table 3).

Table 2. Observed and expected incidence of second fractures by type of osteoporosis treatment after a hip fracture ($p = 0.0011$)

Osteoporosis treatment	Events observed	Events expected
Bisphosphonate + supplement (calcium, vitamin D)	0	4.80
Supplement (calcium, vitamin D)	9	3.62
No medication	0	0.58
Total	9	9.00

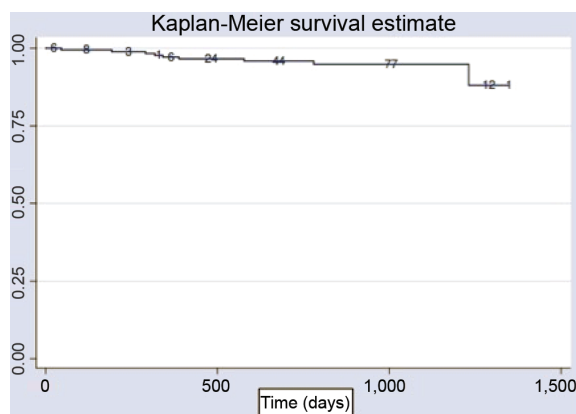


Fig. 1 Estimated fracture-free survival time.

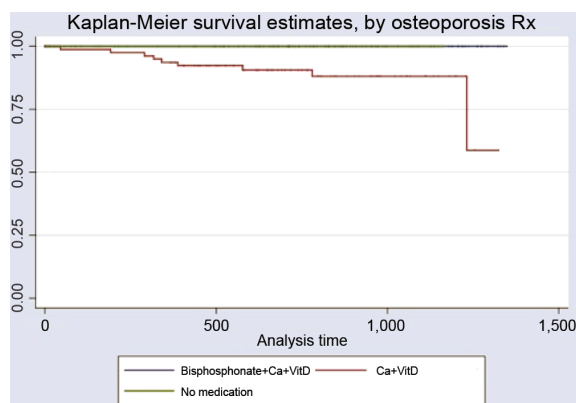


Fig. 2 Estimated fracture-free survival times by type of osteoporosis treatment after an initial hip fracture.

Discussion

Osteoporotic hip fractures are a major health problem because they decrease the quality of life of individuals and require the services of health care teams⁽⁵⁾. The number of osteoporotic hip fractures is increasing^(1,2). Second osteoporotic hip fractures are a particularly serious problem, so identifying risk factors can help physicians and patients protect against a second fracture.

The incidence of second hip fractures at Chiang Mai University Hospital at 0.023 per person-year is comparable to the rate in Japan of 0.029 reported by Yamanashi et al. Similarly, both this study and the Yamanashi et al's study found most second hip fractures occurred within one year of the initial fracture⁽⁷⁾.

Studies by Yamanashi et al⁽⁷⁾, Chapurlat et al⁽⁹⁾ and Anghong et al⁽¹⁰⁾ all found that sex was not correlated with second hip fractures, just as in this study (although the incidence of initial hip fractures was higher in females in this study). Cummings, however,

Table 3. Correlation of factors with second hip fracture

Factors	Hazard ratio	Standard error	z	$p> z $	95% confidence interval	
Sex	2.23e+15	8.90e+21	0.00	1.000	0	-
Side	0.9299669	0.870382	-0.08	0.938	0.1485266	5.822785
Site	6.273963	8.163596	1.41	0.158	0.4897451	80.37369
Type of Rx	0.5717625	0.6104946	-0.52	0.601	0.0705265	4.635311
Osteoporosis Rx	29.11462	32.7687	3.00	0.003	3.206846	264.3286
HT	0.0225003	0.037087	-2.30	0.021	0.0008895	0.5691347
DM	8.198556	11.22596	1.54	0.124	0.5600421	120.0201
CKD	2.61e+14	9.02e+20	0.00	1.000	0	-
Alzheimer	0.8429992	1.280673	-0.11	0.910	0.0429233	16.55623
Parkinson	4.94e+14	-	-	-	-	-
COPD	3.25e+14	1.23e+21	0.00	1.000	0	-
IHD	4.2026	5.88978	1.02	0.306	0.2695209	65.53053
CVA	1.09e+14	-	-	-	-	-
Hypothyroidism	0.2068012	0.2520349	-1.29	0.196	0.0189744	2.253917
Age	5.484014	3.390702	2.75	0.006	1.63234	18.42411

Rx = recipe/treatment; HT = hypertension; DM = diabetes mellitus; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease; IHD = ischemic heart disease; CVA = cerebrovascular accident

reported that female gender was a risk factor for a hip fracture⁽¹⁸⁾.

Studies by Kettler et al⁽¹⁹⁾, Egan et al⁽¹¹⁾, and Mitani et al⁽¹²⁾ all noted that dementia and cognitive impairment were correlated with the incidence of a second hip fracture, while this study found that comorbidities were not significant. That difference could be due to the low number of patients with either dementia or cognitive impairment in our study.

Although Anghong et al⁽¹⁰⁾ and this study used different age groupings (over 85 vs. 80-90, respectively), both found older age to be correlated with initial hip fractures.

Conclusion

Risk of a second osteoporotic hip fracture is higher in elderly patients, although treatment with bisphosphonate and supplements can reduce that risk, avoiding quality of life effects and reducing the economic impact of medical care. The site of the fracture (intertrochanteric or femoral neck) and type of treatment (conservative, fixation or arthroplasty) of an initial hip fracture is not significantly correlated with the risk of a second hip fracture.

What is already known on this topic?

There were many paper in European and US country about the risk factor in a primary hip fracture,

but for the second hip fracture there was a few especially for Thailand. The incidence trend of hip fracture now in Thailand is increase and these can increase the rate of second hip fracture also, the risk factor which made the rate of second hip fracture should be known and prevented.

What this study adds?

We can identify incidence and risk factor for a second hip fracture in Thai patients who had suffered a previous hip fracture. The risk factor which can be controlled and prevented will reduce the incidence of second hip fracture in Thailand.

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Potential conflicts of interest

None.

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การศึกษาการเกิดซ้ำของภาวะกระดูกสะโพกหักในผู้ป่วยกระดูกพรุนของโรงพยาบาลมหาวิทยาลัยราชภัฏวชิรเวศน์

ประสิทธิ์ วงศ์วีรรัตนชัย, ศิริพงศ์ เชี่ยวชาญธนกิจ, ธนวัฒน์ วะสินนท์, สัตยา โรจนเสถียร, ธนินนิตย์ สิริพันธ์

ภูมิหลัง: ภาวะกระดูกสะโพกหักจากภาวะกระดูกพรุนทำให้คุณภาพชีวิตหลังกระดูกหักลดลง ผู้ป่วยดังกล่าวมีโอกาสเกิดกระดูกสะโพกหักซ้ำได้สูงซึ่งทำให้เกิดปัญหาต่อผู้ป่วยและสังคมมากขึ้น

วัตถุประสงค์: เพื่อหาอุบัติการณ์ของการเกิดกระดูกสะโพกหักซ้ำในผู้ป่วยกระดูกพรุนของโรงพยาบาลมหาวิทยาลัยราชภัฏวชิรเวศน์ และหาปัจจัยเสี่ยงที่มีผลต่อการเกิดกระดูกหักซ้ำ

วัสดุและวิธีการ: เป็นการศึกษาเชิงพรรณนาโดยเก็บข้อมูลจากเวชระเบียนของผู้ป่วย *low-energy hip fracture* ที่เข้ารับการรักษาในโรงพยาบาลมหาวิทยาลัยราชภัฏวชิรเวศน์ ระหว่าง เดือนมกราคม พ.ศ. 2551 ถึง ธันวาคม พ.ศ. 2552 เพื่อหาอุบัติการณ์และนำข้อมูล เช่น อายุ เพศ โรคประจำตัวมาวิเคราะห์ทางสถิติ โดยใช้วิธี *survival analysis* และ *logistic regression*

ผลการศึกษา: ผู้ป่วย 191 ราย (ผู้หญิง 136 ราย ผู้ชาย 55 ราย) เกิดกระดูกสะโพกหักซ้ำ 9 ราย คิดเป็นอุบัติการณ์เท่ากับ 0.023 รายต่อปี โดยส่วนมากเกิดขึ้นภายใน 1 ปี หลังกระดูกสะโพกหัก และพบว่าอายุระหว่าง 80 ถึง 89 ปี กับการรักษากระดูกพรุนด้วยยา *bisphosphonate* มีผลต่อการเกิดกระดูกสะโพกหักซ้ำ ขณะที่ เพศ ตำแหน่งของการเกิดกระดูกสะโพกหัก ชนิดของการผ่าตัด และโรคประจำตัวต่างๆ ไม่มีผลต่อการเกิดกระดูกสะโพกหักซ้ำ

สรุป: อุบัติการณ์การเกิดกระดูกสะโพกหักซ้ำในโรงพยาบาลมหาวิทยาลัยราชภัฏวชิรเวศน์ เท่ากับ 0.023 รายต่อปี และผู้ป่วยที่มีอายุระหว่าง 80 ปี ถึง 89 ปี ที่เกิดกระดูกสะโพกหักครั้งแรกและไม่ได้รับการรักษาภาวะกระดูกพรุน เป็นปัจจัยเสี่ยงต่อการเกิดกระดูกสะโพกหักซ้ำ
