

Factors Related to Mortality after Osteoporotic Hip Fracture Treatment at Chiang Mai University Hospital, Thailand, during 2006 and 2007

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Objective: To investigate the one-year mortality rate after osteoporotic hip fracture and to identify factors associated with that mortality rate.

Material and Method: A retrospective review of 275 osteoporotic patients who sustained a low-trauma hip fracture and were admitted in Chiang Mai University Hospital during January 1, 2006 to December 31, 2007 was accomplished. Eligibility criteria were defined as age over 50 years, fracture caused by a simple fall and not a pathological fracture caused by cancer or infection. Results of this one-year mortality rate study were compared to studies of hip fracture patient mortality in 1997 and the period 1998-2003.

Results: The average one-year mortality rate in 2006-2007 was 21.1%. Factors correlated with higher mortality were non-operative treatment, delayed surgical treatment, and absence of medical treatment for osteoporosis. The 2006-2007 mortality rate was slightly higher than for the 1997 and 1998-2003 periods.

Conclusion: The one-year mortality rate after osteoporotic hip fracture of 21.1% was approximately 9.3 times the mortality rate for the same age group in the general population, indicating that treatment of osteoporosis as a means of helping prevent hip fracture is very important for the individual, the family, and society as a whole.

Keywords: Osteoporosis, Hip fracture, Mortality, Delayed surgical treatment, Chiang Mai, Thailand

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Osteoporosis is characterized by a low bone mass, a deterioration of bone microarchitecture, and an increased risk of fragility fracture^(1,2). With osteoporosis, the risk of fragility fracture is increased throughout the body⁽³⁾. The mortality rate after a hip fracture for men and women age over 50 has been shown to be correlated with age, gender, mental attitude, underlying medical condition and unemployment status⁽⁴⁻¹⁰⁾. Verbeek et al⁽¹¹⁾ collected data on 192 patients and found that operating later than one day after the patient was admitted to hospital was correlated with increased incidence of complications after the operation and a longer period of recovery in the hospital, especially with patients age over 80 years and those who were ASA class 1 or 2. To reduce mortality after hip fractures, the operation should be conducted within 12 hours or in the first day if the

patient is sufficiently fit to undergo the procedure^(11,12). Phadungkiat et al collected information on 330 fractures of the hip joint in Chiang Mai Province during a twelve month period during of 1997^(13,14). That represents a rate of 151.2 incidents per 100,000 population according to one survey of hospital discharge records. Wongtriratnchai et al found that during the period 2006-2007 the rate of hip fractures in Chiang Mai Province had increased to 180.3 per 100,000 population⁽¹⁵⁾, an indication that the rate of hip fractures among the Thai population in Chiang Mai Province was increasing at 2 percent per year. The aging of the Thai population as a whole likely contributed to that increase. Chariyalertsak et al found that the mortality rate during hospitalization was 2.1%, while the survival rates at 3, 6, and 12 months were 91%, 88% and 83%, respectively. They found that mortality in hip fracture patients during the first year was as high as 17%. Factors associated with an increased mortality rate included male gender, age over 80 years, underlying medical conditions, inability to walk prior to the hip fracture, and receipt

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of non-operative treatment⁽¹⁶⁾. Vaseenon et al studied the mortality rate of patients with hip fractures due to osteoporosis at Chiang Mai University Hospital. Data was obtained for the period 1998-2003 on a total of 367 patients. They computed mortality rates over a period of 10 years (1997-2007) using Kaplan Meier Survival Analysis. It was found that mortality rates for 3, 6, 12, 24, 36, 60, 96, and 120 months were 10%, 14%, 18%, 27%, 32%, 45%, 55%, and 68%, respectively. Mortality during the first year averaged 18%, with males dying at a rate twice that of females (31% vs. 16%), eight times the rate for the general population. Factors found to be related to higher mortality rates included male gender, age over 70 years, and non-operative treatment of the fracture⁽¹⁷⁾. Because hip fractures due to osteoporosis in the elderly are an important risk factor for mortality and reduced in quality of life, the objective of this study is to determine the mortality rates of hip fractures due to osteoporosis and to investigate factors potentially affecting mortality including age, gender, type of fracture, surgical delay, underlying medical conditions, method of treatment, and receipt of medication for osteoporosis. The study also compares the one year mortality rate of individuals with hip fractures due to osteoporosis during the period 2006-2007 with the rates for the periods 1997 and 1998-2003^(16,17).

Material and Method

This is a retrospective study of patients aged 50 years or over, residents of Chiang Mai Province, who had a fractured hip due to osteoporosis treated at Chiang Mai University Hospital during the two years period 1 January 2006 through 31 December 2007.

Data was obtained from medical records of both in-patients and out-patients, excluding those with fractures due to a severe accident such as falling from a high position, traffic accidents, or pathology of the hip area such as bone tumors or other bone diseases. Information obtained included first and last name, age, gender, medical evaluation, mechanism of the hip fracture, whether the patient had received calcium, vitamin D supplements, or antiresorptive agents during fracture treatment, underlying medical conditions, method of treatment, and surgical delay. Identification of death and date of death were obtained through telephone interviews and from the Ministry of the Interior data base. Statistics used in the analysis included t-test and Chi-square using $p < 0.05$ as the standard for statistical significance. The Kaplan-Meier test was used to estimate survival rates. The log-rank

test was used to compare mortality rates between categories of associated factors. The Cox proportional hazard model was used to determine the association between potential associated factors and mortality.

Results

Data was obtained for a total of 275 patients including 76 males (27.6%) and 199 females (72.4%) (Table 1). The average age was 77.06 years (77.9 years for males, 76.8 years for females). There were 2.6 times as many hip fractures due to osteoporosis in females as in males. The group with the most hip fractures due to osteoporosis was patients age 70 to 80 years. The majority (85.4%) of hip fracture patients were age 70 or older (Fig. 1).

Table 1. Demographic data of osteoporotic hip fracture patients (2006-2007)

| Characteristic | Number (%) |
|----------------------------|------------|
| Age (years) | |
| <70 | 40 (14.6) |
| 70-80 | 40 (50.9) |
| >80 | 195 (34.5) |
| Gender | |
| Male | 76 (27.6) |
| Female | 199 (72.4) |
| Co-morbidities | |
| Yes | 222 (80.7) |
| No | 53 (19.3) |
| Location of fracture | |
| Femoral neck | 94 (34.2) |
| Intertrochanter | 181 (65.8) |
| Type of treatment | |
| Operative | 203 (73.8) |
| Non-operative | 72 (26.2) |
| Type of operation | |
| Fixation | 135 (66.5) |
| Arthroplasty | 68 (32.5) |
| Osteoporotic drugs | |
| Yes | 167 (60.7) |
| No | 108 (39.3) |
| Type of osteoporotic drugs | |
| Calcium | 22 (13.2) |
| Calcium + vitamin D | 117 (70.0) |
| Antiresorptive agents | 28 (16.8) |
| Surgical delay period | |
| ≤1 week | 79 (38.9) |
| >1 week | 124 (61.1) |
| Mortality status | |
| Dead | 58 (21.1) |
| Alive | 217 (78.9) |

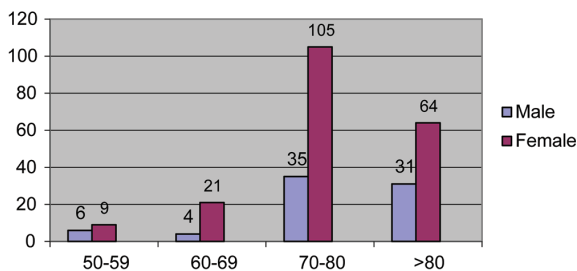


Fig. 1 Number of hip fractures in Chiang Mai University Hospital by age group and gender during 2006-2007.

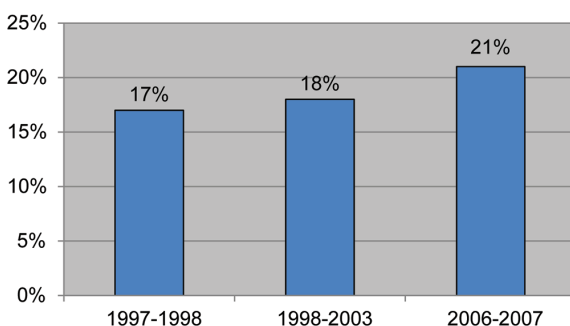


Fig. 2 Comparison of one-year mortality after hip fracture in Chiang Mai during different time periods.

The most frequent locations of fractures were the intertrochanteric region (181 patients or 65.8%) and the femoral neck (94 patients or 34.2%). Most often the circumstances surrounding the fracture involved falling while standing or walking in which the hip contacted the ground (simple fall). In addition to hip fractures, associated injuries were found including distal radius and proximal humerus fractures. Most patients also had one or more underlying medical conditions (222 individuals or 80.7%).

Most of the patients (203 or 78.8%) were treated operatively and were divided into two large groups. The first group included those receiving internal fixation such as dynamic hip screw fixation, condylar blade plate, intramedullary nailing, proximal femoral nailing, or screw fixation. The second group included patients receiving arthroplasty such as Austin Moore endoprosthesis and bipolar endoprosthesis. A total of 135 patients (66.5%) were treated by internal fixation, while 68 patients (33.5%) received arthroplasty. Seventy-two individuals (26.2%) were treated non-operatively.

One hundred sixty-seven patients (60.7%) were given osteoporosis medication, while 108 patients (39.3%) did not receive medication while they were

in-patients at the hospital or during the first three months after discharge from the hospital (Table 2). The most common medication was calcium with vitamin D (117 individuals or 70.0%). Only 28 individuals (16.8%) of those receiving medication were given antiresorptive drugs.

The average surgical delay period was nine days (range 3 days to 14 weeks). It was found that most of the patients (124 individuals or 61.1%) were operated on more than one week subsequent to the hip fracture.

A total of 58 individuals (21.1%) died within one year of their hip fracture (Table 3). Of that total, 16 (21.1%) were male and 42 (21.1%) were female (Fig. 2).

Table 2. Mortality rate of osteoporotic hip fracture patients by associated factors

| Characteristic | Number of deaths | Total | p-value |
|----------------------------|------------------|-------|---------|
| Age (years) | | | |
| <70 | 6 | 40 | 0.0758 |
| 70-80 | 25 | 140 | |
| >80 | 27 | 95 | |
| Gender | | | |
| Male | 16 | 76 | 0.8635 |
| Female | 42 | 199 | |
| Co-morbidities | | | |
| Yes | 51 | 222 | 0.1467 |
| No | 7 | 53 | |
| Location of fracture | | | |
| Femoral neck | 18 | 94 | 0.4708 |
| Intertrochanter | 40 | 181 | |
| Type of treatment | | | |
| Operative | 28 | 203 | 0.0000* |
| Non-operative | 30 | 72 | |
| Type of operation | | | |
| Fixation | 17 | 135 | 0.4513 |
| Arthroplasty | 11 | 68 | |
| Osteoporotic drugs | | | |
| Yes | 27 | 167 | 0.0125* |
| No | 31 | 108 | |
| Type of osteoporotic drugs | | | |
| Calcium | 5 | 22 | 0.4780 |
| Calcium + vitamin D | 17 | 117 | |
| Antiresorptive agents | 5 | 28 | |
| Surgical delay period | | | |
| ≤1 week | 4 | 79 | 0.0047* |
| >1 week | 24 | 124 | |

* Statistically significant

Factors statistically significantly correlated with higher mortality rates include non-operative treatment ($p = 0.000$), surgical delay period in excess of one week ($p = 0.004$), and non-receipt of medication for osteoporosis ($p = 0.012$). Factors found to be not statistically significantly correlated with higher mortality rates include age, gender, underlying diseases, the location of the fracture, and the type of operation performed (Table 3).

Discussion

Data for the period 1997 and the period 1998 through 2003 reflect one-year mortality rates in patients with hip fractures of 17% and 18%, respectively^(16,17) (Fig. 2). The long-term mortality study during period 1998 through 2003 demonstrated 7.9 times higher mortality rate than that of corresponding Thai general population. This study showed the one-year mortality rates in patients with hip fractures during the period

2006 through 2007 was 21.1%, 9.3 times higher than the rate for the general population of Thailand of the same age. The ageing of the Thai population as a whole likely contributed to this increased mortality. In this study, 39.3% of the patients did not receive osteoporosis medication while recovering in the hospital or after discharge from the hospital, and only 16.8% received medication to reduce bone resorption. However, that data indicates an improvement over the 1998-2003 study which found that 54% of patients did not receive any osteoporosis medication during fracture treatment and that only 6% received medication to reduce bone resorption.

The present study looked at factors potentially related to the mortality rate of patients with hip fractures due to osteoporosis. Those factors included age; gender; clinical evaluation; receipt of calcium, vitamin D supplements, and antiresorptive agents; underlying diseases and surgical delay period. There was a significant difference in mortality rate between the group that received surgical treatment and the group that was treated non-surgically, but there were no statistically significant differences related to the specific operative procedure employed.

One of the factors identified by this study as affecting mortality rates of patients with a hip fracture due to osteoporosis is whether or not the patient received medication for osteoporosis during fracture treatment. Previous studies have found that receipt of antiresorptive drugs during fracture treatment was statistically significantly correlated with a lower mortality rate^(18,19). The present study found similar results: the mortality rate in patients who received osteoporosis medication during fracture treatment was lower than in the group that did not receive medication ($p = 0.012$). No differences were found, however, among patients receiving different medications, e.g., calcium, vitamin D supplements, and antiresorptive agents. In addition, no statistically significant differences were found in mortality rates related to gender or underlying diseases.

Studies conducted in other countries of the relationship between surgical delay period and mortality rates of patients found statistically significant reductions in mortality with earlier surgery⁽¹²⁾. Similarly, the present study found that delaying surgery more than one week significantly increased the mortality rate. Many factors encountered at Chiang Mai University Hospital, e.g., patients delaying coming to the hospital for treatment, patients with several underlying diseases, evaluations conducted by different

Table 3. Factors associated with mortality in osteoporotic hip fracture patients: Cox proportional hazard model

| Associated factors | Hazard ratio (95% CI) | p-value |
|-----------------------|-----------------------|---------|
| Gender | | |
| Male | 1 | |
| Female | 0.95 (0.53-1.69) | 0.864 |
| Age (years) | | |
| 70-80 | 1 | |
| <70 | 0.81 (0.33-1.99) | 0.66 |
| >80 | 1.72 (0.99-2.98) | 0.042* |
| Co-morbidities | | |
| Yes | 1 | |
| No | 1.78 (0.80-3.92) | 0.152 |
| Location of fracture | | |
| Femoral neck | 1 | |
| Intertrochanter | 1.23 (0.69-2.17) | 0.472 |
| Type of treatment | | |
| Non-operative | 1 | |
| Operative | 0.27 (0.16-0.46) | 0.000* |
| Type of operation | | |
| Fixation | 1 | |
| Arthroplasty | 1.33 (0.62-2.85) | 0.453 |
| Osteoporotic drugs | | |
| No | 1 | |
| Yes | 0.52 (0.30-0.87) | 0.014* |
| Surgical delay period | | |
| >1 week | 1 | |
| ≤1 week | 0.24 (0.084-0.70) | 0.009* |

* Statistically significant

hospital departments, a limited number of operating theaters, and the inability to perform hip fracture operations outside of normal business hours, resulted in delays in operating on patients. Some 61.1% of patients were found to have waited more than one week for an operation. The most rapid operations were accomplished within three days; the longest hospital-related delay was 14 weeks.

Conclusion

The one-year mortality rate of patients with a broken hip resulting from osteoporosis in Chiang Mai University Hospital was 21.1%, which was 9.3 times higher than that of the general population of the same age group and gender. The mortality rate from hip fractures increased slightly compared to 1997 and 1998-2003. Factors correlated with increased mortality rates included non-operative treatment, delaying treatment more than one week, and not receiving osteoporosis medication. Thus it is essential that every patient with a broken hip due to osteoporosis receive operative treatment in the shortest time possible consistent with safety and that they also receive osteoporosis medication as part of that treatment.

Limitations of the study

The group studied included only patients who had sought treatment at Chiang Mai University Hospital; data was not obtained for the entire province of Chiang Mai or other hospitals in Chiang Mai Province. This study classified the underlying disease status of patients into those with an underlying disease and those without; information was not obtained on the number of diseases in each patient or the severity of those diseases.

What is already known on this topic?

Mortality rate after osteoporotic hip fracture is higher in patients who got non-operative treatment, worldwide and also in Thailand.

One randomized controlled trial in USA; Horizon PFT, demonstrated that treatment of osteoporosis in post-hip fracture patients can reduce all causes mortality.

What this study adds?

Delayed surgical treatment more than one week in Thai population significantly increased risk of mortality.

Treatment of osteoporosis in post-hip fracture Thai patients can significantly reduced mortality.

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Potential conflicts of interest

None.

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อัตราการตายของผู้ป่วยกระดูกสะโพกหักจากโรคกระดูกพรุนในโรงพยาบาลมหาราชนครเชียงใหม่ ระหว่าง พ.ศ. 2549 ถึง 2550

รัฐศาสตร์ นายศรี, ธนินนิตย์ ลีรพันธ์, กสิสิน กลั่นกลิ่น, ศิริพงษ์ เขียวชาญธนกิจ, ศิริชัย ลือวิฑูรเวชกิจ, สัตยา โรจนเสถียร

วัตถุประสงค์: เพื่อศึกษาหาอัตราการตายภายในระยะเวลา 1 ปี หลังจากสะโพกหัก และปัจจัยที่มีผลต่ออัตราการตาย

วัสดุและวิธีการ: ทำการศึกษาแบบย้อนหลังในผู้ป่วยกระดูกสะโพกหักที่เข้ารับการรักษาในโรงพยาบาล มหาราชนครเชียงใหม่ ระหว่างวันที่ 1 มกราคม พ.ศ. 2549 ถึง 31 ธันวาคม พ.ศ. 2550 โดยกลุ่มผู้ป่วยในการศึกษานี้มีอายุเท่ากับหรือมากกว่า 50 ปี สาเหตุของกระดูกสะโพกหักไม่ได้เกิดจากอุบัติเหตุที่รุนแรงและไม่ได้มีสาเหตุจากพยาธิสภาพของกระดูก ทำการศึกษาหาอัตราการตายภายในระยะเวลา 1 ปี และปัจจัยที่มีผลต่อการตาย และเปรียบเทียบกับรายงานผู้ป่วยกระดูกสะโพกหักจากโรคกระดูกพรุนในจังหวัดเชียงใหม่ ในช่วง พ.ศ. 2540 และ พ.ศ. 2541 ถึง 2546

ผลการศึกษา: พบผู้ป่วย 275 ราย เพศชาย 76 ราย (ร้อยละ 27.63) เพศหญิง 199 ราย (ร้อยละ 72.36) อัตราส่วนเพศชายต่อเพศหญิงเท่ากับ 1:2.61 พบอัตราการเสียชีวิตภายในระยะเวลา 1 ปี เฉลี่ยร้อยละ 21.1 โดยปัจจัยที่มีผลต่อการเสียชีวิตสูงขึ้นคือการรักษาด้วยวิธีไม่ผ่าตัด การรอผ่าตัดนานกว่า 1 สัปดาห์ และการไม่ได้รับยารักษาโรคกระดูกพรุน เมื่อเปรียบเทียบกับอัตราการตายจากการศึกษาในช่วง พ.ศ. 2540 และ พ.ศ. 2541 ถึง 2546 พบว่ามีค่าสูงขึ้น

สรุป: อัตราตายภายใน 1 ปี หลังจากสะโพกหักมีปริมาณสูงถึงร้อยละ 21 ซึ่งสูงกว่าอัตราการตายจากการศึกษาในอดีต การป้องกันมิให้กระดูกพรุนและกระดูกสะโพกหักจึงมีประโยชน์อย่างสูงยิ่งต่อประชาชน ครอบครัว สังคม และประเทศชาติ
