

# Diagnosis and Treatment of Osteoporosis Following Hip Fracture in Chiang Mai University Hospital

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**Background:** Osteoporosis is defined as a skeletal disorder characterized by compromised bone strength predisposing a person to an increased risk of fracture. Hip fracture is the common and serious consequence of osteoporosis. To improve bone quality and prevent new fracture, osteoporosis should be treated while the patient was admitted with hip fracture problem. Several medications have been proven to be effective. Objectives of the present study were to determine the adequacy of diagnosis and treatment of osteoporosis in hip fracture patients.

**Material and Method:** A retrospective study of all low energy trauma hip fracture patients, between 1998 and 2003 at the age of 50 years old or more. The National Osteoporosis Foundation guideline was used to identify adequacy of diagnosis and treatment of osteoporosis in this group of patients. Age, sex, admitted diagnosis, mechanism of injury, admission medication, treatment procedures, discharge medication, BMD investigation were analysed.

**Results:** The percentage of calcium supplementation for the discharged patients in 1998 to 2003 was 0%, 10.5%, 33.3%, 32.7%, 39.3% and 43.0% respectively. The percentage of combination of calcium and vitamin D supplementation for the discharged patients was 0%, 8.8%, 21.1%, 12.7%, 24.6% and 37.5% respectively. Bisphosphonate was ordered in 9 and calcitonin in 20 patients. 7% of patients were diagnosed as osteoporosis. The quantity of osteoporosis was confirmed by DXA measurement in only one patient.

**Conclusions:** In the past 6 years, most of the hip fracture patients were underdiagnosed and undertreated for osteoporosis. There was also a good trend for better treatment.

**Keywords:** Hip fracture, Diagnosis, Treatment

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Osteoporosis, mostly found in the elderly, is the disease characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and increased susceptibility to fracture<sup>(1-3)</sup>. Osteoporosis is frequently found as 13-18% in women more than 50 years old and 3-6% in men<sup>(4)</sup>.

The World Health Organization (WHO) has assigned the osteoporosis diagnostic criteria by using the bone mineral density (BMD) examined by the dual energy x-ray absorptiometry (DXA). The decreasing of BMD for more than 2.5 standard deviations of young adults means value will be diagnosed as osteoporosis.

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To be diagnosed as osteopenia if the BMD is between less than or equal to -1 and -2.5 of the young adult mean value. To be diagnosed as normal bone mass if the BMD is higher than -1 of young adult mean value<sup>(5)</sup>.

Osteoporosis is risky to any bone fracture. The 3 main fractural sites which are clinically significant and commonly found are the hip, spine and wrist. In the USA, women more than 50 years old have a 16% more risk of hip fracture, more than the risk of breast cancer which is 11%. The death rate of hip fracture patients is 20 % in the first year after discovering the fracture<sup>(6,7)</sup>. It has been found that the fracture caused by osteoporosis is related to 7 times of increasing death rate<sup>(8)</sup>.

Moreover, the medical expense of the hip fracture caused by osteoporosis is as high as 3 times the treatment expense without any fracture<sup>(9)</sup>.

The patients who have experienced hip fracture from osteoporosis will be at more risk of other fractures in the future<sup>(10)</sup>. The high risk women include those in the elderly age group, have a history of osteoporotic fracture, take anticoagulants, have long-acting benzodiazepines, drink coffee, consume less calcium, smoke, do not exercise, or are very slim with a body mass index lower than 19. According to the present study, if one has 5 or more of these factors, the rate of hip fracture from the osteoporosis would increase to 27 of 1000 female population per year. Otherwise, if one has less than 2 factors, the rate would be only 1.1 of a 1000 female population per year<sup>(11)</sup>. Besides, the patient who had a history of osteoporotic hip fracture before is the main group to have a 38 % risk of contralateral hip fracture<sup>(12)</sup>.

In Thailand, according to the study of Sompant Phadungkiat et al, the occurrence of hip fracture has been highly found as 151.2 of a 100,000 population from a hospital discharge survey and 185.2 per a 100,000 population from the community survey<sup>(13)</sup>.

The mortality rate of the osteoporotic hip fracture patient was increased from 4.7 of 1,000 populations to 5 of 1,000 populations and would grow up to 7 times<sup>(14)</sup>.

The study of Suwat Chariyalersak et al in Thailand, suggested that the mortality rate after hip fracture is as high as 17% in the first year<sup>(15)</sup>.

The international osteoporosis foundation reported, in America and Europe, cost of osteoporotic hip fracture treatment in one year, was 27,000 million U.S. dollars (> 1 million-million Baht) In Thailand, the study of Paiboon Suriyawongpaisan, showed the hospital cost of treatment was about one third of the national income per capita.

The National Osteoporosis Foundation (NOF) of USA has established the proper medical

treatment for hip fracture from osteoporosis as shown in Table 1<sup>(16,17)</sup>.

Since hip fracture from osteoporosis in the elderly is an important risk factor of increasing mortality rate, worsening the quality of life as well as the possibility of increasing the incidence of contralateral hip fracture, any patient who has this kind of disease and comes to the hospital should be properly diagnosed and treated. The present study, therefore, aimed to determine the adequacy of diagnosis and treatment of osteoporosis in hip fracture patients in Chiang Mai University Hospital over the past 6 years.

### Material and Method

A retrospective study of all patients with hip fracture caused by osteoporosis in Chiang Mai University Hospital from 1998 to 2003 was carried out from the medical records collected.

### Inclusion Criteria

1. Male and female patients with hip fracture at either femoral neck or intertrochanteric locations who were admitted to Chiang Mai University Hospital from the 1<sup>st</sup> of January 1998 to the 31<sup>st</sup> of December, 2003.

2. Fracture caused by a simple fall
3. The age of 50 years old or more
4. Singh's index in 3 or less
5. Follow up time at least 6 months

### Criteria of Exclusion

1. Secondary osteoporosis
2. Died during the first hospitalization
3. Experienced a severe accident such as a traffic accident or a fall from a height
4. Fractures caused by cancer (pathologic fracture)

The methodology of the present study was to

**Table 1.** The medical treatment for osteoporosis after bone fractures<sup>(16,17)</sup>

1. All patients presenting with a low-energy hip fracture should be considered as having primary or secondary osteoporosis.
2. All patients should be placed on 800 IU of vitamin D and 1200 to 1500 mg of elemental calcium (preferably calcium citrate) daily.
3. Before discharge, all patients should be started on alendronate (70 mg per week), risedronate (30 mg per week), or pamidronate (30 mg administered intravenously every three months). Pamidronate is the agent of choice if the patient has a history of gastrointestinal dysfunction.
4. Within six weeks after discharge, all patients should undergo a dual-energy X-ray absorptiometry scan and a metabolic workup to rule out secondary causes of osteoporosis.

collect the diagnosis data, accidental process, treatment with or without operation, pharmacological treatment taken during and after the treatment, the BMD results during treatment and 6 weeks after discharge.

### Results

According to the data, in 1998, the average age of the patients was 73.18 years old, which was 34 females (85%) whereas in 1999 the average age was 73.54 years old including 48 females, which can be estimated as 84.2%. In the next year, 2000, the patient average age was 75.60 years old, consisting of 45 females calculated as 78.5%. In the years 2001 and 2002, the patient average age was 74.62 and 74.95 years old respectively. There were 40 and 55 females or 72.7% and 90.2% of the overall patients, in sequence. Then, in 2003, the average patient age was 75.39 years old and included 104 females which can be calculated as 81.3%. In conclusion, the average age of the 398 patients, according to the present study, was 74.76 years old. There were 326 females (81.9%) with the average age of 74.5 years old, whereas the average age of male patients was 75.8 years old (Table 2, Chart 1).

In the present study, there were 319 patients treated by operation. Most of the operations were internal fixation which was carried out on 200 patients, estimated as 50.2 percent. The other operation was Arthroplasty which was carried out on 119 patients calculated as 30 percent, whereas the remaining 79 patients were non-operated patients, calculated as 19.8 percent (Chart 2).

### The positions of hip fracture

According to the data of 398 patients, 130 of them had femoral neck, 65 per each side, calculated as 50 percent. The other 268 patients had intertrochanteric fracture, 150 on the left side (56 percent) and 118 on the right side (44 percent).

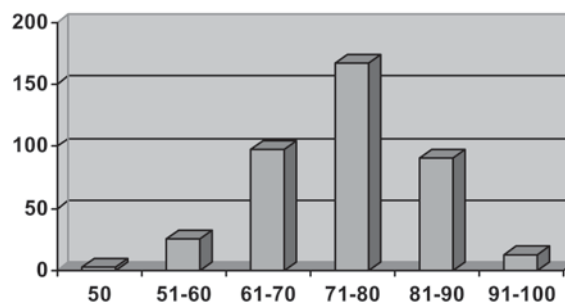


Chart 1. The chart shows the number of patients in different age groups

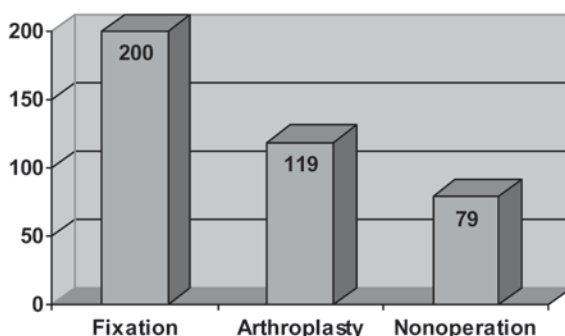


Chart 2. The chart shows the number of patients in the three groups of treatment

### The diagnosis of osteoporosis

From the medical records, after reviewing all hospital discharge summaries and OPD cards, 28 patients were diagnosed as osteoporosis (7%)

The pharmacological treatment included Calcium, Vitamin D, and antiresorptive agent

In 1998, there were as many as 90 percent of patients who did not get osteoporosis medicines. Then it decreased to 53 percent in 2003. This led to the conclusion that osteoporosis treatment had increased each year.

Table 2. Demographic data during 1998 to 2003

Year	Number	Age	Sex	
			Male	Female
1998	40	73.18	6	34
1999	57	73.54	9	48
2000	57	75.60	12	45
2001	55	74.62	15	40
2002	61	74.95	6	55
2003	128	75.39	24	104
Total	398	74.76	72	326

From 1998 to 2003, the ratio of patients taking the osteoporosis medicines increased, for instance, calcium from 7.5 percent to 46.1 percent, vitamin D from 7.5 percent to 40.6 percent, bisphosphonate which was given from 2001 to 2003, increasing from 1.8 percent to 2.3 percent, and calcitonin from 2.5 percent to 21.1 percent. Besides, these groups of medicines were increasingly given to patients after discharge every year (Chart 3, 4).

From 1998 to 2003, the number of patients who received calcium, or vitamin D increased from 5.0 percent to 39.8 percent respectively. The use of combination with calcium, vitamin D and calcitonin increased from 2.5% to 21.1%, whereas the combination of calcium, vitamin D along with bisphosphonate, began in 2002-2003, increased from 1.6% to 2.3%. Moreover, after hospitalization, the amounts of these groups of medicine taking were yearly increased as well (Chart 5, 6).

**The contralateral hip fracture**

After the 6-year retrospective study of 398 patients, 15 of them were readmitted with hip fracture, calculated as 3.8 percent of overall patients. The con-

tralateral hip fracture was the other side fracture of 8 patients (53%) and the same side fracture of 7 patients. From the present study, there were 10 patients who had a fracture within the first year, which can be estimated as 67% of the readmitted patients and 2.5 % of overall patients.

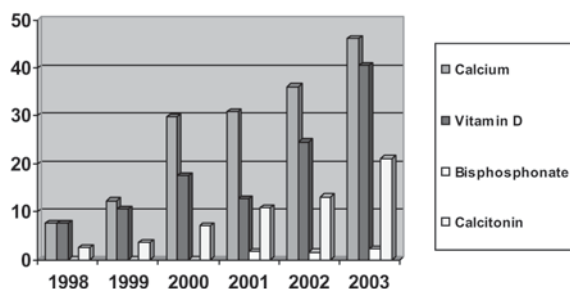
Another 14 patients readmitted within 2 years counted as 93 percent of the readmission patients and 3.5% of overall patients. From 15 patients, there were 9 who were not treated by any medicine during admission and after the discharge.

**The BMD measurement**

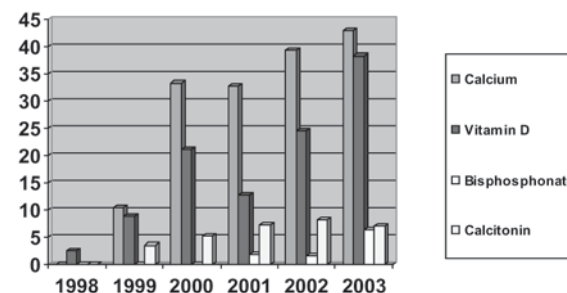
After collecting the data of the patients from the hospital admission until 6 weeks after discharge, there was only 1 patient (0.03 percent of overall patients) who had the BMD examination.

**Discussion**

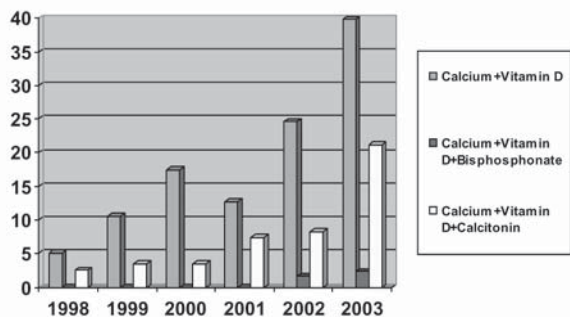
Osteoporosis is a disease which might show no symptoms of the decreasing bone mass which progressively is at risk of fracture. The patients with osteoporosis after hip fracture, which is severe osteo-



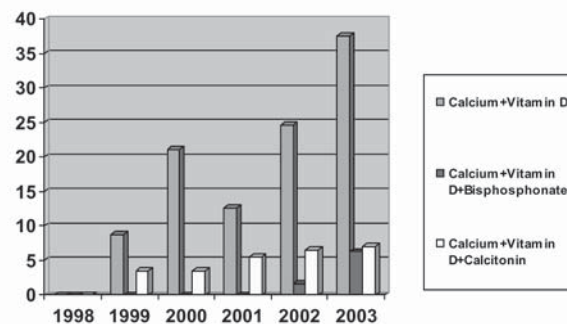
**Chart 3.** The chart shows the percentage of patients who received calcium, vitamin D, bisphosphonate, or calcitonin during admission



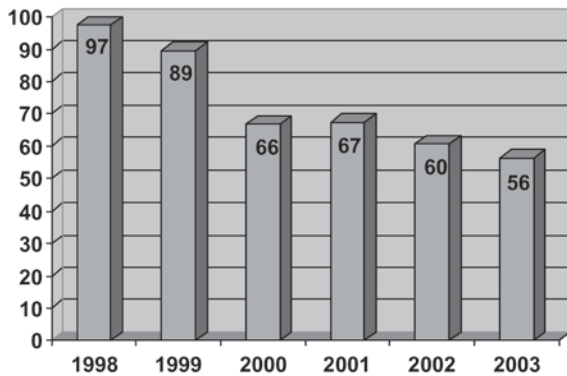
**Chart 4.** The chart demonstrates percentage of the patients who received calcium, vitamin D, Bisphosphonate, or calcitonin after discharge



**Chart 5.** The chart illustrates the percentage of patients taking the combination of medicine during admission



**Chart 6.** The chart demonstrates the percentage of patients taking the combination of medicine after discharge



**Chart 7.** The chart demonstrates the percentage of patients who didn't get any pharmacological treatment

porosis, are frequently found<sup>(1)</sup>. Therefore, this disease is vitally crucial for the diagnosis and medical treatment. The aims of the osteoporosis fracture treatment are to allow the normal life style of the patient and to prevent a future fracture caused by osteoporosis, in order to decrease its incidence<sup>(2)</sup>.

According to previous studies, there were many hip fractured patients of osteoporosis who did not take osteoporosis medicines. Abbasi et al investigated patients with hip fracture in a geriatric nursing home in America and found that there were as much as 84 percent who had not been diagnosed as osteopenia or osteoporosis and had been taking no treatment or prevention<sup>(3)</sup>.

Gardner et al<sup>(4)</sup> in a study in America in 2002, by getting random samples of 288 patients older than 65 years old who had hip fractures from osteoporosis, 83.3 percent of the patients had not been treated by any osteoporosis medicines. Another 3 percent were treated with calcium, 6.7 percents with calcitriol, 1.8 percent with Ergocalciferol, 2.2 percents with hormone replacement therapy and the remaining 3 percent with Bisphosphonate.

The study of Alexander A. Fisher et al<sup>(5)</sup> at Geriatric Medicine, Canberra Hospital, Australia in 2003 suggested that there were 52.8 percent of the patients who had taken osteoporosis medicines after discharge, and only half of them had received triple therapy (calcium carbonate 1,200 mg/ay, ergocalciferol 1,000 unit/day and alendronate 70 mg/week).

According to the present study there was only 1 patient who had BMD examination, which can be calculated as 0.03 percent. This suggested the lack of diagnosis and follow-up treatment plan, which should be improved by further promotion.

From the study of 398 patients, it was found that the number of patients who had been treated by medicines had increased from 10 percent to 47 percent from 1998 to 2003. It is indicated that the incidence of fracture caused by osteoporosis is high and increases every year. People still lack information and misunderstand the disease, health professionals are unable to give proper care thoroughly and lack serious care of osteoporosis. As high as 93 % of osteoporotic hip fracture patients were not recorded as having osteoporosis

According to the data, there was 8 percent of calcium-only medication, which was found mainly during 1998-2001. Then it decreased after the achievement of knowledge about the combination of calcium with other medicines.

The combination with calcium and vitamin D, which can help to reduce the fracture rate<sup>(6)</sup>, was 16.8 percent found in the present study. This kind of treatment has been found to increase gradually from 1999 to 2003, from 1 in 20 of the patients to 1 in 3 patients.

In the present study, 5 percent of the treatment used calcium, vitamin D combined with calcitonin. This number increased from 2 patients (3.5%) in 1999 to 9 patients (7 %) in 2003.

Due to the treatment guideline reported by Michael J. Gardner et al<sup>(15,16)</sup> (Table 1), there was treatment using calcium, vitamin D combined with bisphosphonate, which began in 2002. In 2002, there was only 1 patient who had been treated by such a method which could be calculated as 1.6 percent, whereas in 2003, 8 patients were found, calculated as 6.3 percent.

Compared with the treatment of hip fracture following osteoporosis, reported by the National Osteoporosis Foundation (NOF) in America, the treatment at Chiang Mai University Hospital was undertreated. To illustrate, in Chiang Mai University Hospital, only 4.2 percent of patients have been treated by calcium, vitamin D and an antiresorptive agent. In 2003, the BMD examination was only 0.03 percent of overall patients found. This may suggest the reason of readmission of the patient with hip fracture caused by osteoporosis.

Calcium is the medicine which has been used the most regularly in osteoporosis treatment. Its main compound is calcium carbonate which is well-absorbed. Generally, the calcium intake, from milk or fish, in the elderly is insufficient. The calcium used in osteoporosis treatment can slow down the decrease of bone mass in the elderly and the rate of bone fracture following osteoporosis<sup>(7)</sup>. The National Institutes of Health (NIH) suggested 1,500 mg of calcium per day<sup>(8)</sup>.



Vitamin D helps to absorb calcium from food intake and rearranging bone element. In the elderly, vitamin D level would decrease according to the rare sun exposure, the less-produced vitamin D of the skin and the decrease of vitamin D intake. These may cause the reduction of bone mass and the risk of fracture<sup>(9)</sup>. The National Institute of Health (NIH) suggested 700 IU of vitamin D per day combined with calcium in order to reduce the reduction of hip and spine bone mass which may cause osteoporosis fracture<sup>(10)</sup>.

Bisphosphonates such as alendronate are selective osteoclast inhibitors which help to prevent the bone mass reduction. Treated by bisphosphonates for one year, the rate of fracture could be reduced almost 50 percent<sup>(11)</sup>. The important side-effect is esophagitis which could be found in 5-8 percent.

Calcitonin is bone preserving effect hormone used for osteoporosis treatment to reduce the fracture rate and stop pain<sup>(12, 13)</sup>.

The tendency of patients with osteoporosis fracture has rapidly increased according to the rise of treatment which led to improper care. This might be the reason for readmission of patients with hip fracture caused by osteoporosis. It is partly because the health professionals do not completely understand the proper treatment. Further study of factors related to the improper medication and care for the patients is therefore suggested.

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## การรักษาโรคกระดูกพรุนในผู้ป่วยกระดูกตะโพกหัก ของโรงพยาบาลมหาราชนครเชียงใหม่

ศัตยา โรจนเสถียร, ศิริพงษ์ เชี่ยวชาญธนกิจ, ธนวัฒน์ วะสินนท์

การศึกษาข้อมูลผู้ป่วยกระดูกตะโพกหักในโรงพยาบาลมหาราชนครเชียงใหม่ ที่มีอายุ 50 ปี ขึ้นไป พบว่าในปี พ.ศ. 2541-2546 ผู้ป่วยได้รับเฉพาะแคลเซียมเป็นจำนวนร้อยละ 0, 10, 33.3, 32.7, 39.3 และ 43.0 ตามลำดับ ได้รับแคลเซียมร่วมกับวิตามินดีร้อยละ 0, 8.8, 21.1, 12.7, 24.6 และ 37.5 ตามลำดับ มีการสั่งยาลดการสลายกระดูก Bisphosphonate เพียง 9 ราย และ Calcitonin เพียง 20 ราย ได้รับการวินิจฉัยโรคกระดูกพรุนร้อยละ 7 และเพียง 1 รายเท่านั้นได้รับการตรวจวัดมวลกระดูก

**สรุป** ในปัจจุบันการรักษาโรคกระดูกพรุนในผู้ป่วยกระดูกตะโพกหัก ด้วยแคลเซียม วิตามินดี ยาลดการสลายกระดูก และได้รับการวินิจฉัยโรคกระดูกพรุนมีจำนวนน้อยมาก แต่อย่างไรก็ตามพบว่า การรักษาด้วยแคลเซียม และวิตามินดีมีแนวโน้มที่ดีขึ้น