Original Article

Change of Bone Mineral Density Measurement among Patients with Osteoporotic Fractures in Korean Population Using National Claim Database

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Background: Prior osteoporotic fractures are strongly associated with subsequent fractures. To prevent this, the diagnosis of osteoporosis following an osteoporotic fracture is important. The measurement of bone mineral density (BMD) is the first step in the diagnosis and management of osteoporosis. Therefore, this study aimed 1) to evaluate the rate of BMD measurement after osteoporotic fracture in the Korean population, and 2) to determine whether the rate of BMD measurement after osteoporotic fracture changed between 2005 and 2010. **Methods:** Using the database of the Health Insurance Review Assessment Service (HIRA), we identified patients with osteoporotic fractures (hip, spine, humerus, and wrist fractures) in 2005 and 2010. BMD examinations were evaluated by using procedure codes and medicines, exclusively approved for osteoporosis treatment. **Results:** During the study period, about half of all patients with osteoporotic fractures had BMD measurement. Between 2005 and 2010, the rate of BMD measurement significantly increased from 42.0% (65,556/156,190) to 53.9% (103,785/192,556) ($P < 0.001$). **Conclusions:** Our results showed that about half of all patients with osteoporotic fractures had BMD measurement, and that screening for osteoporosis in patients with osteoporotic fractures increased between 2005 and 2010.

Key Words: Osteoporotic fractures, Bone density, Absorptiometry, Photon

INTRODUCTION

Osteoporosis is a common health care concern in elderly populations that is characterized by compromised bone strength.[1,2] Osteoporosis results in osteoporotic fracture in hip, spine, humerus, and wrist.[3,4] The lifetime risk of these osteoporotic fractures is about 60% in Korean women.[5]

It is well-known that patients with an osteoporotic fracture have higher risk of a subsequent fracture than those with no previous fracture.[6,7] That is osteoporotic fracture offers physicians an important opportunity to initiate secondary prevention.[8,9] Thus, secondary prevention has been recommended by several guidelines for osteoporosis.

Bone mineral density (BMD) measurement is the first important step to investigate and manage patients with osteoporosis. There were few studies on the rate

of BMD measurement after osteoporotic fracture in Korea, and whether there was a change of rate of BMD measurement after fractures.

Therefore, our purpose was 1) to evaluate the rate of BMD measurement after osteoporotic fracture in Korean population, and 2) determine whether the rate of BMD measurement after osteoporotic fracture changed between 2005 and 2010 in Korea.

METHODS

1. Subjects

We used data from nationwide claims database of Health Insurance Review Assessment Service (HIRA). About 97% of the Korean populations are included in this national insurance system. Patients pay about 30% of total medical cost, and Korean governments reimburse the remaining 70% of medical cost to medical institute after the HIRA reviews all the medical claims data. The medical claims data include demographic information (age and gender), diagnoses using the International Classification of Disease, Tenth Revision (ICD-10) codes and procedures for diagnosis and treatment using codes in both of inpatients and outpatients care.

Thus, virtually all information about health care utilization is available from the HIRA database. Several epidemiologic studies have used this national claim database.[10-12] We analyzed patients aged over 50 years who were diagnosed with osteoporotic fracture by physician at 2005 and 2010.

2. Identification of patients with osteoporotic fractures

We identified patients with hip, spine, humerus and wrist fractures on 2005 and 2010. To identify patients with these fractures, we used the diagnostic codes using the ICD-10 (hip [S720 and S721], spine [M484, M485, S220, S221, and S320], humerus [S422 and S423] and wrist fractures [S525 and S526]) and the procedure codes according to each anatomic site.[13,14]

If an individual with fracture had more than one outpatient visits or admissions within the time period of six months, the cases were not counted as separate.[15,16]

Double recording was avoided by including only one record when a person had more than one record in the HIRA

database. If a patient had both spine and wrist fractures, only the first episode was counted.[17]

3. BMD examination rates

Data were obtained from the HIRA on patients who had experienced a hip, spine, humerus or wrist fracture and had undergone BMD examinations within 6 months before and after osteoporotic fractures.

The procedure codes (HC 341 to HC 344) for these examinations included dual energy X-ray absorptiometry (DXA) scans (single site, HC 341; multiple sites, HC 342), quantitative computed tomography scans (HC 343), and other methods, including ultrasound (HC 344).

In addition, patients who administrated with at least one of the exclusive medicines approved for osteoporosis treatment were also considered as patients who were measured with BMD, because the medicines for osteoporosis was available only after BMD measurement during study period in Korea. These medications included bisphosphonates (alendronate, etidronate, pamidronate, risedronate, zoledronate), selective estrogen receptor modulator (raloxifene), and calcitonin. Estrogen replacement therapy, calcium and vitamin D supplements were not included because they had another indication such as osteopenia.

The rates of BMD examinations were estimated within 6 months before and after osteoporotic fractures. Significance of differences was determined with use of a χ^2 test. Statistical analyses were performed using SAS for windows, version 9.4 (SAS Inc., Cary, NC, USA).

RESULTS

The 156,190 patients with osteoporotic fractures were identified in 2005, and 192,556 in 2010, respectively. Between 2005 and 2010, the rate of BMD measurement significantly increased from 42.0% to 53.9% ($P<0.001$) (Table 1).

The rate of BMD measurement dramatically increased from 19.7% to 37.9% in men, while the rate of BMD measurement changed from 48.3 to 57.9 % in women (Fig. 1).

Table 1. Comparison of the rate of BMD measurement by χ^2 test

	2005	2010	P-value
Non-BMD (%)	90,634 (58.0)	88,771 (46.1)	<0.001
BMD (%)	65,556 (42.0)	103,785 (53.9)	

BMD, bone mineral density.

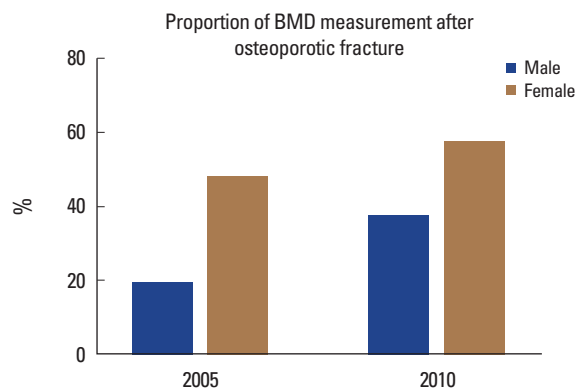Proportion of BMD measurement after osteoporotic fracture

Fig. 1. Change of proportion of bone mineral density (BMD) measurement according to gender.

The percentage of women who received a bone density examination was significantly higher for those of men in both 2005 and 2010.

DISCUSSION

The present study demonstrates that the rate of BMD measurement after osteoporotic fractures was around 50%, and significantly increased between 2005 and 2010, especially in men.

Many studies have indicated that BMD measurement following an osteoporotic fracture was performed in less than 15% of patients with osteoporotic fracture.[18,19]

The rate of BMD measurement after fracture seems to be unsatisfactory in Korea. It might be the reason the limitation of Korean health-care reimbursement system during the study period. The reimbursement system has allowed the screening of osteoporosis in patients just after fracture since 2015. It might suppress the clinical inertia for initiation of a required action such as screening of osteoporosis in patients with fracture before 2015.

However, the rate of BMD measurement increased between 2005 and 2010, which is sure to be positive direction for health care. There are some possible explanations on our results.

First, physician's awareness on osteoporosis might increase, although we could not evaluate the level of physician's awareness on osteoporosis. Some studies showed that the increase of awareness in physicians lead to increase of screening of osteoporosis in patients with fracture.[20,21] Second, patients' awareness on osteoporosis might increase as well.

The strength of this study is that we evaluated the rate

of osteoporosis screening in patients with osteoporotic fractures in a large, population-based national cohort.

There were limitations in this study. First, we included patients who had undergone BMD examinations within 6 months 'before' as well as 'after' osteoporotic fractures, because the obtained dataset from HIRA could not be distinguished between before and after osteoporotic fractures. Although it might result in bias, BMD measurement is mostly taken after osteoporotic fractures.

Second, we could not perform comprehensive analyses to define the factors associated with low rate of BMD measurement after fracture, because we could not access to individual records of subjects. Further studies are necessary to identify the risk factors of low investigation of osteoporosis in these patients.

Despite these limitations, this study would be helpful in terms of understanding current practice patterns after fracture in Korea. Our results showed that about a half of patients with osteoporotic fractures had BMD measurement, and the rate of screening for osteoporosis increased between 2005 and 2010.

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