

National Utilization of Calcium Supplements in Patients with Osteoporotic Hip Fracture in Korea

Sang-Hwan Kim¹, Young-Bong Ko², Young-Kyun Lee¹, Seok-Woo Hong¹, Hyung-Jin Choi³, Yong-Chan Ha², Chan-Soo Shin⁴

¹Department of Orthopaedic Surgery, Seoul National University Bundang Hospital, Seongnam;

²Department of Orthopaedic Surgery, Chung-Ang University College of Medicine, Seoul;

³Division of Endocrinology, Department of Internal Medicine, Chungbuk National University College of Medicine, Cheongju;

⁴Division of Endocrinology and Metabolism, Department of Internal Medicine, Seoul National University College of Medicine, Seoul, Korea

Corresponding author

Young-Kyun Lee

Department of Orthopaedic Surgery, Seoul National University Bundang Hospital, 166 Gumi-ro, Bundang-gu, Seongnam 463-707, Korea

Tel : +82-31-787-7204

Fax : +82-31-787-4056

E-mail : ykleemd@gmail.com

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Sang-Hwan Kim and Young-Bong Ko equally contributed to this work, and should be considered co-first authors.

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Background: Calcium is prescribed worldwide for patients diagnosed with osteoporosis. However, the national utilization of calcium and compliance with calcium is unclear in Korea. Our purpose is to evaluate Korea's national utilization of calcium and compliance with calcium in patients with osteoporotic hip fracture from 2007 to 2010 using data from the Health Insurance Review and Assessment (HIRA) Service. **Methods:** From 2007 to 2011, osteoporotic hip fractures were identified using the International Classification of Diseases, 10th revision (ICD-10) and procedure code form from the nationwide database of the Health Insurance Review and Assessment Service. Compliant users of calcium were defined as the patients' medication possession ratio of 80 or more. We analyzed the compliance of calcium according to age and gender. **Results:** Among 85,228 patients with hip fracture, 20,800 patients (24.4%) received a prescription of a calcium supplement. Among them, only 1,692 patients (8.1%) were identified as compliant users of calcium. The proportion of compliant users was higher in women than men in all age groups. The proportion of compliant users decreased with age in women. **Conclusions:** In Korea, the national utilization of calcium was low and compliance with calcium was unsatisfactory even in patients with osteoporotic hip fracture.

Key Words: Calcium, Compliance, Hip fractures, Osteoporosis, Osteoporotic fractures

INTRODUCTION

Osteoporotic hip fractures have become an increasing health concern among the elderly,[1,2] and are associated with excess mortality, decreased mobility, and impaired activity of daily living.[3-5] Patients with osteoporotic hip fracture can be at risk of a subsequent osteoporotic fracture.[6,7] Therefore, several guidelines have been recommended for the treatment of osteoporosis in patients with osteoporotic hip fracture.[8-10] Strategies for treatment of osteoporosis have been recommended to include comprehensive education for life-style modification, supplementation of calcium and vitamin D, and anti-osteoporosis drugs.[8-10]

However, recent practice and research have focused on anti-osteoporosis drugs, such as anti-resorptive and bone-formation agents.[11,12] In particular, bisphosphonate has been the most commonly administered anti-osteoporosis drug in

real practice.[13,14] This phenomenon can also be found in Korea. In fact, the full effect of bisphosphonate for treatment of osteoporosis depends on the sufficient use of calcium.[15-18] Moreover, compliant use of calcium was associated with a reduced risk of osteoporotic fracture.[19, 20]

Although compliance with bisphosphonate has been well reported in literature,[6,7,21] there has been a lack of study on compliance with calcium supplementation. Moreover, no study has yet reported Korea's national utilization of calcium after diagnosis of osteoporotic hip fracture.

The purpose of this study is to investigate Korea's national utilization of calcium and compliance with calcium in patients with osteoporotic hip fracture from 2007 to 2010 using data from the Health Insurance Review and Assessment (HIRA) Service.

METHODS

This study was a retrospective review of the nationwide claims database of HIRA, which was established by the Korean government. The HIRA database has covered over 99% of the Korean population since 2007. The database, which includes data on diagnoses (as determined by the International Classification of Diseases, 10th revision [ICD-10]), procedures, prescription records and demographic information, has been used on several occasions for epidemiological studies.[1,5,7,22-24]

Our inclusion criteria comprised of osteoporotic hip fractures (femoral neck fractures or intertrochanteric fractures) from 2007 to 2011. Hip fractures require hospitalization and surgical intervention, and are recorded prospectively nationwide using ICD-10 codes. To identify osteoporotic hip fractures, the selected ICD-10 codes and a minimum cut-off value of 50 years were used.[1,5] Hip fracture was defined in femoral neck fractures (ICD-10 S720) or intertrochanteric fractures (ICD-10 S721) requiring hospitalization. In addition, we limited the cohort to those patients who performed one of the following seven procedures: open reduction of fractured extremity-femur, closed pinning-femur, external fixation-pelvis/femur, closed reduction of fractured extremity-pelvis/femur, bone traction, skin traction or hemiarthroplasty-hip.[1,5]

Patients could not be censored for loss to follow-up or death, because information regarding death was not avail-

able in the database. To avoid any bias, only patients who had one or more medical records after 1 year from their index date were included, thereby ensuring no loss to follow-up and survival of patients up to that time.

Data on the duration and number of prescription of calcium supplements was analyzed. In this study, the type of calcium supplements was not distinguished. In addition, compliance with calcium was evaluated during the 12 months after hip fracture by using the medication possession ratio (MPR). MPR was defined as the sum of days supplied with calcium supplements divided by the length of follow-up (365 days in each period). Patients with an MPR of more than 80% were defined as compliant users of calcium.[25-27] Among the remaining patients with calcium prescriptions, those with an MPR of less than 80% were defined as non-compliant users.

To determine the compliance with calcium, patients were divided into 5-year age groups and dichotomized by gender. We used descriptive statistics for presenting the national utilization of calcium supplement and compliance with calcium. De-identified information was used in this study. Statistics analysis was performed using SPSS for windows, version 16 (SPSS Inc., Chicago, IL, USA). This study was approved by the HIRA institutional review boards.

RESULTS

In total, 85,228 patients (24,113 men and 61,115 women) were identified as patients with osteoporotic hip fracture from 2007 to 2010. Among those aged 50 years or older, the crude overall incidence of hip fracture was 160.3 per 100,000 persons during the study periods, and the gender-specific incidence was 98.2 per 100,000 person years for men and 213.5 per 100,000 person years for women. Of the 85,228 patients with hip fracture, calcium supplement was administered in 20,800 patients (24.4%). Women were more prescribed with calcium than men; also, the proportion of patients with calcium prescription increased in women from 2007 to 2010 (Fig. 1). Of the 20,800 patients prescribed with calcium supplementation, only 1,692 patients (8.1%) were identified as compliant users of calcium (Table 1). The proportion of compliant users was higher in women than men in all age groups. Further, in women, the proportion of compliant users decreased with age (Fig. 2).

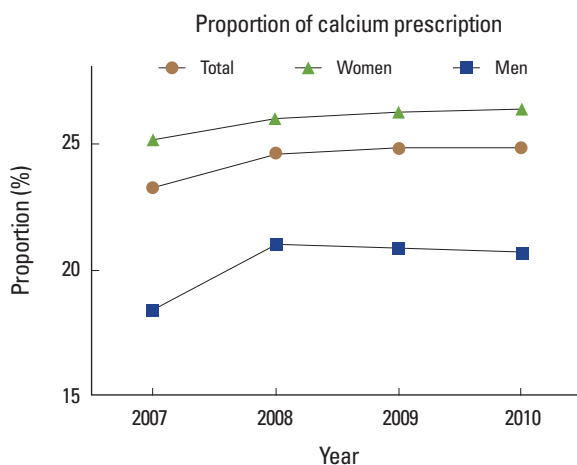


Fig. 1. Proportion of patients with calcium prescription after hip fracture from 2007 to 2010.

Table 1. Compliance with Calcium Supplements according to Age and Gender

	Compliant user			Non-compliant user		
	Men	Women	Total	Men	Women	Total
Age						
50-54	11	38	49	190	243	433
55-59	14	55	69	239	306	545
60-64	17	87	104	364	651	1,015
65-69	41	193	234	668	1,511	2,179
70-74	62	294	356	1,019	2,675	3,694
75-79	50	363	413	919	3,339	4,258
80 over	55	412	467	1,251	5,733	6,984
Total	250	1,442	1,692	4,650	14,458	19,108
Year						
2007	43	262		930	3,142	
2008	61	335	1,692	1,173	3,461	19,108
2009	59	390		1,241	3,698	
2010	87	455		1,306	4,157	

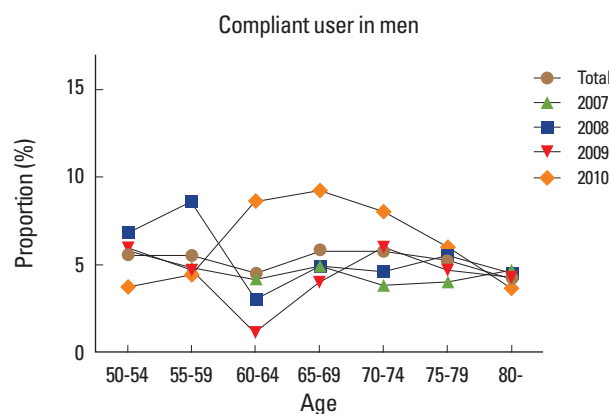
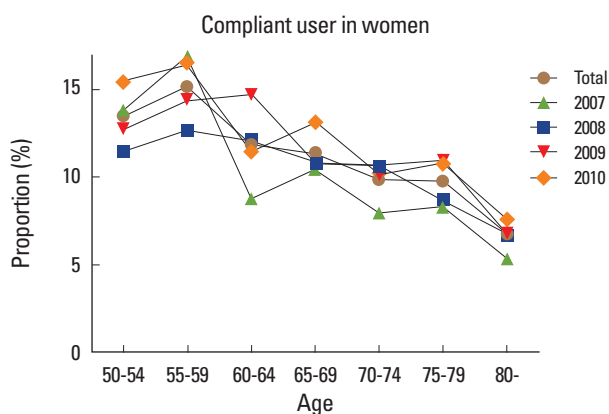


Fig. 2. Proportion of compliant user (medication possession ratio [MPR] ≥ 80) of calcium according to age.

DISCUSSION

In this nationwide study, we evaluated the proportion of prescription for calcium supplements after osteoporotic hip fracture. We also analyzed compliance with calcium in patients with hip fractures from 2007 to 2010 in Korea. During the study period, calcium supplement was administered in 24.4% of the patients after being diagnosed with osteoporotic hip fracture; however, only about 8% of the patients with the prescription were compliant users of calcium. Although women demonstrated a higher proportion of compliant users than men in all age groups, the proportion of compliant users decreased with age in women.

A previous epidemiologic study using the HIRA database reported that bisphosphonate was administered in 58% of

patients with osteoporotic hip fracture during the similar study periods (from 2007 to 2011).[7] However, in this study, in terms of calcium supplement, only 24.4% of the patients received a calcium prescription after being diagnosed with hip fracture.

Among several strategies for treatment of osteoporosis, anti-resorptive agents, such as bisphosphonate and selective estrogen receptor modulator, have been widely used in elderly patients.[11-14] This dominant use of anti-resorptive agents may have led both physicians and patients to overlook the role of calcium supplement as an essential component of osteoporosis treatment.[11,28] However, in order to treat osteoporosis as well as to prevent osteoporotic fracture, calcium supplement should be recommended with anti-osteoporotic drugs.[8-10,28,29]

Particularly in Korea, the contemporary reimbursement guideline for anti-osteoporosis drugs requires that patients had a T-score of less than -2.5 after the annual examination of bone mineral density.[7] Consequently, in Korea, calcium supplementation should be considered as the primary strategy after osteoporotic hip fracture.[16] However, our study revealed that in Korea, only a quarter of patients with hip fractures received calcium prescription.

The proportion of compliant users of bisphosphonate was about 7% in the previous study,[7] and the proportion of compliant users of calcium was approximately 8% in this study.

There are several possible reasons for such low compliance with calcium, such as bisphosphonate. Patient factors, including poor awareness on calcium for osteoporosis, have been presented to be important.[30-32] Generally, women have been known to have higher awareness and more treatment for osteoporosis compared to men.[32] In this study, the proportion of compliant users were higher in women. This might be due to physicians' indifference and ignorance about the necessity of calcium in osteoporosis management. However, the proportion of patients with calcium prescription increased in women from 2007 to 2010. Drug-related factors, including gastrointestinal discomfort and constipation, should also be considered.[33]

This present study has an advantage of a large sample size from a nationwide database; however, there are several limitations. First, we could not exclude fractures due to high-energy trauma, because the study design is based on an ICD-10 coding system. However, we used additional criterion of "aged 50 years or more," as elsewhere.[1,5,7,24] Second, we did not distinguish the type and dose of calcium. The compliance with calcium supplement could be influenced by the type of calcium.[34] Third, we could not compare the clinical results between compliant and non-compliant users, because only de-identified data were available from HIRA.

In spite of these limitations, our study demonstrated that in Korea, the national utilization of calcium was low from 2007 to 2010 and further, compliance with calcium was unsatisfactory even in patients with osteoporotic hip fractures. Considering that calcium supplementation is essential to the treatment of osteoporosis, further efforts should be taken in order to increase the compliance of cal-

cium, particularly in patients with osteoporotic hip fracture.

CONFLICT OF INTEREST

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Young-Kyun Lee and Yong-Chan Ha designed the study. Hyung-Jin Choi, Seok-Woo Hong, and Chan-Soo Shin gathered the data. Young-Bong Ko and Sang-Hwan Kim analyzed it, and wrote the initial draft. All authors ensured the accuracy of data and manuscript.

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