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Perspective Article

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The determinants of fracture in men

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Abstract

Osteoporosis represents an increasingly important clinical and public health problem among older men. Estimates indicated that 1-2 million (3-6%) men aged 50 years and over in the United States have osteoporosis and 8-13 million (28-47%) have osteopenia. The lifetime risk of suffering a hip, spine or forearm fracture for a 50-year-old man is 13%, similar to the risk for prostate cancer. The number of osteoporotic fractures in men is expected to increase dramatically due to aging of the population and secular increases in fracture rates. Identification of men who are at greatest risk of osteoporosis and the risk factors, which predispose men to fracture, are essential so that preventive steps can be taken. Data on risk factors are emerging but many questions remain. Men may fracture at a higher bone mineral density (BMD) level than women. However, estimates of volumetric BMD, which correct in part for gender differences in bone size, and risk of fracture, may actually show similar relationships in men and women. Fracture rates are similar in older African American women and Caucasian men. Improved understanding of ethnic differences in fracture could identify potential reasons for gender differences. Family history and genetic factors are also important risk factors for fractures but the specific candidate genes are not known and whether gender modifies the effects of these genetic polymorphisms on BMD and the risk of fracture is also not known. In general, lifestyle factors and anthropometric measurements show similar relationships with fractures in men and women although few comprehensive prospective studies have been conducted. Current data will be reviewed on the relationships between markers of skeletal health, genetic polymorphisms, lifestyle and anthropometric factors and fracture.

Keywords: Osteoporosis, Fracture, Gender, Ethnicity, Bone Mineral Density

Introduction

Osteoporosis is an important health problem among older men. It is estimated that the lifetime risk of experiencing an osteoporotic fracture in men over the age of 50 is 13%[1], similar to the lifetime risk of developing prostate cancer[2]. The lifetime risk of hip fracture in older white men (6%) is similar to the lifetime risk of hip fracture in older African American women[3]. The number of osteoporotic fractures in older men will increase largely because of dramatic changes in the demographies of aging. The older population is growing rapidly and the aging of the "baby boomers" born between 1946 and 1964 will accelerate this growth. Men comprise 42% of the population age 65 and older and 30% of the population age 85 and older. Gender differences in life expectancy narrows with age. Life expectancy for men at age 65 is 15.9 years and at age 85, 5.5 years compared to 19.2 and 6.6 years for women[4]. There were 0.5 million hip fractures in men in 1990 and this number will increase to 1.2 million by 2025[5]. Men account for about 20% of the direct costs of osteoporosis in the United States[6].

Fractures have a major public health impact in men. Mortality after osteoporotic fractures may be greater in men than women[7]. The gender differences in the excess mortality among men increases with age[8].

The gender ratio of hip fracture varies geographically and by ethnic group[9]. The gender ratio of hip fracture is 1.5 among US blacks compared to 2.9 among US whites. Hip fracture rates are similar in African American women and Caucasian US men. The prevalence of vertebral fracture is also similar in both groups. Trabecular and cortical BMD is similar in white men and African American women, but there are no ethnic differences in vertebral cross-sectional areas[10]. These observations raise the possibility that efforts to understand ethnic differences in women could actually improve our understanding of gender differences in fracture risk.

Few prospective studies have been done to identify risk factors for fractures in men. The cohort studies were, in general, not specifically designed to look at fractures, so

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many of the important skeletal and other determinants were not measured. In general, the number of fractures has been small, limiting the statistical power.

It is currently unknown whether the same diagnostic criteria for osteoporosis applies to both men and women. A more stringent criteria might be appropriate for men because men have a lower risk of fracture[11].

In a Finnish study of 75 and 80-year-old men and women, at a given BMD level, the risk of fracture was equivalent in men and women[12]. However, this study relied on calcaneal BMD and axial BMD, in particular hip BMD, may be a stronger predictor of the clinically important hip and spine fractures[13]. In addition, at the extremes of the distribution of BMD, there was no overlap in BMD in men and women.

Selby and colleagues recently reported that gender-specific t-scores of –2.5 were appropriate in identifying both men and women with a fracture[14]. The t-score associated with a 50% prevalence of vertebral fractures was –2.77 in women and –2.60 in men. However, there was some suggestion that the cumulative percent of men with a vertebral fracture occurred at higher BMD levels in men, but the study had very limited power to detect a difference in men and women. The results of this study were based on only 13 men with a prevalent fracture, all of whom were referred for possible inclusion in an osteoporosis treatment study.

To further explore the relationship between areal and volumetric BMD and prevalent vertebral fractures in men and women, we performed several cross-sectional studies. Although limited to only prevalent fractures, areal BMD was about 1/3 standard deviation lower among men and women with a vertebral fracture compared with men and women without a vertebral fracture. A 0.10 g/cm^2 decrease in areal BMD was associated with a 30 to 40% increased odds of having a fracture in men and a 60 to 70% increased odds in women. The cumulative proportion of men and women with a fracture across the range of areal BMD differed by gender: 38% of women with a vertebral fracture had a total hip BMD >0.7 g/cm^2 compared with 80% of men.

On the other hand, estimated volumetric BMD was similar in Caucasian men and women with a fracture. The cumulative proportion of men and women with a fracture across the range of estimated volumetric BMD was similar in both genders.

Our data suggest that men who have a vertebral fracture have higher areal BMD but not volumetric BMD than women with a fracture. Nevertheless, prospective studies are needed to confirm these findings.

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