Editorial

Osteoarthritis and Bone Mineral Density: What Is the Relation and Why Does It Matter?

Thirty years have passed since Foss and Byers published their report confirming observations made by orthopedic surgeons on the relative absence of osteoarthritic changes in excised femoral heads from patients who had had hip fracture[1]. Their findings of higher percentages of hip fractures among those with the lowest bone density (measured at the metacarpal bone) and abnormally high bone density among patients with osteoarthritis (OA) were intriguing[1]. This apparent inverse relation between OA and osteoporosis led to important speculations on the pathogenesis of these 2 conditions, spurring several investigators to further explore the relationship between OA and bone mineral density (BMD). The relation between these 2 common, age related disorders is relevant not only for our understanding of the pathogenesis of these conditions, but also for the development of appropriate management for both OA and osteoporosis, especially if treatment for one could theoretically increase the risk for the other. Thirty years later, however, we have come to learn that the relationship between the OA and BMD is actually much more complex and even more intriguing.

Among several cross sectional epidemiologic studies an association has been seen between higher BMD and either hip or knee OA, primarily in women[2-4]. Unfortunately, relatively few studies have been performed in men. Speculation has been that weight-bearing activities, which are beneficial to the attainment and preservation of peak bone mass, also increase the risk of damage to articular cartilage leading to OA in lower extremity joints. Another explanation offered has been that high body mass index, which is associated with higher BMD, confers a detrimental biomechanical load to weight-bearing joints, thus leading to OA. However, growth factors and other hormones that affect bone metabolism may also play a role.

The association between lower extremity OA and BMD, however, becomes more complex when results from longitudinal studies are considered. Studying women from the Framingham cohort, Zhang, *et al* found that higher BMD at the hip was associated with prevalent as well as incident knee OA in older women[5]. On the other hand, among women with established knee OA, high BMD decreased the risk of progression of disease in the knee over the followup period[5]. Similarly, women who gained BMD over the followup were at higher risk of incident knee OA, but a lower risk of progression of established knee OA[5]. Others describe similar findings on the association between BMD and progression of knee OA, although results did not reach statistical significance[6].

Examining men and women from the Rotterdam Study, Burger, *et al* found that radiographic OA of the hip was associated with a higher rate of bone loss at the femoral neck over a 2 year followup, and appeared to be independent of lower limb disability[7]. In women only, similar higher rates of bone loss were seen with radiographic OA of the knee[7].

In contrast to studies of lower extremity OA, cross sectional studies examining OA of the hand and BMD have not shown findings as consistent[8–11]. Some have shown higher BMD among those with hand OA, others failed to see an association. And yet in a longitudinal study of women with hand OA[12], Sowers, *et al* described findings very similar to what others have seen in longitudinal studies of lower extremity OA. They showed that women who later developed hand OA were more likely to have higher baseline bone mass than women who did not develop OA, but that these women had a greater likelihood of bone loss over time[13].

In this issue of the *Journal,* Schneider, *et al*[13] examine the association between symptomatic hand OA and BMD in a community dwelling, ambulatory population of men and women over the age of 50. They found women with clinically diagnosed hand OA had significantly lower BMD at the hip. There was no consistent significant association between hand OA and BMD among men. The authors conclude that osteoporosis should not be overlooked in women with hand OA.

The findings by Schneider, *et al* raise important questions regarding the relation between OA and osteoporosis. Is the apparent inverse relation only seen in weight-bearing joints? Do those with hand OA represent another spectrum of disease, being more genetically influenced? Is there a sex difference in the relation between OA and BMD? Do sex hormones play a role in this difference?

Before considering these issues, however, it is important to examine the methodology used by Schneider, *et al* in their

See BMD and clinical hand OA in elderly men and women, *page 1467*

Personal non-commercial use only. The Journal of Rheumatology Copyright © 2002. All rights reserved.

Downloaded on September 15, 2026 from www.jrheum.org

study and how that may influence findings. First, the authors examine hand OA diagnosed clinically using the American College of Rheumatology criteria[14], and not by radiographs. As they point out, radiographic OA of the hand is much more prevalent. In trying to understand the pathogenesis of OA and osteoporosis, however, is it better to examine radiographic OA or clinical OA of the hand? Or should both be used? Should it matter? If their findings in women are correct, does symptomatic OA of the hand represent women who have had OA of the hand for longer and therefore be representative of those women who have been experiencing greater bone loss? How does the BMD of women with asymptomatic hand OA compare?

An important advantage of the study by Schneider, *et al* is that men were also examined. It is interesting that results were somewhat different between men and women. Given that there is a relative paucity of data on men, does that mean that men perhaps have a different relationship between OA and osteoporosis than women?

There may be a more simple explanation for these overall findings. In examining the results of this study, it is important to note that both women and men diagnosed with clinical hand OA were much older than those who were not diagnosed with clinical hand OA. In women, the mean age for those diagnosed with hand OA was 78.7 years (range 69.3–86.9) compared to 67.8 years (range 64.1–71.5) for women without a diagnosis of clinical hand OA. Although BMD results were adjusted for age, there was very little overlap in age range between the 2 groups, so a residual confounding effect of age on BMD results may explain why women with clinical hand OA had lower BMD. Men with clinical hand OA were also older than men without clincal hand OA (78.7 vs 70.3 yrs), but there was no overlap in age range between the 2 groups. One would expect the older men to have a lower BMD than the younger men. The fact that they still had higher BMD despite being 8 years older is relevant. Although the higher BMD results for men with clinical hand OA did not reach statistical significance, it may be related to the fact that the number of men with classified disease was small (46 vs 652 men without clinical hand OA).

Nevertheless, the conclusions reached by Schneider, *et al* are relevant for clinicians. Osteoporosis should not be overlooked in women or men regardless of whether they carry a diagnosis of OA, be it in their hand or lower extremity. Some studies have reported no difference in osteoporotic fractures between subjects with and those without OA of the lower extremity[15,16]. Lower limb disability related to OA may actually increase the risk of falls and thereby increase the risk for fracture. Further, even though many have shown an inverse relation between OA and osteoporosis, it does not mean that the 2 conditions are mutually exclusive. The presence of OA in a joint should not exclude the diagnosis of osteoporosis in a patient.

Longitudinal studies have shown that the relationship between OA and BMD is much more complex than was first recognized from cross sectional studies. If we are to design effective management strategies for OA and osteoporosis, it is necessary that we better understand the pathogenesis of these conditions and how they relate to each other.

SHREYASEE AMIN, MDCM, FRCPC, MPH,
Assistant Professor of Medicine,
Division of Rheumatology,
Mayo Clinic,
200 First Street SW, Rochester, Minnesota 55905, USA.

REFERENCES

1. Foss MVL, Byers PD. Bone density, osteoarthrosis of the hip and fracture of the upper end of the femur. Ann Rheum Dis 1972;31:259-64.
2. Cooper C, Cook P, Osmond C, Fisher L, Cawley M. Osteoarthritis of the hip and osteoporosis of the proximal femur. Ann Rheum Dis 1991;50:540-2.
3. Hannan MT, Anderson JJ, Zhang Y, Levy D, Felson DT. Bone mineral density and knee osteoarthritis in elderly men and women. Arthritis Rheum 1993;36:1671-80.
4. Nevitt M, Lane N, Scott J, et al. Radiographic osteoarthritis of the hip and bone mineral density. Arthritis Rheum 1995;38:907-16.
5. Zhang Y, Hannan MT, Chaisson CE, et al. Bone mineral density and risk of incident and progressive radiographic knee osteoarthritis in women: the Framingham Study. J Rheumatol 2000;27:1032-7.
6. Hart DJ, Cronin C, Daniels M, Worthy T, Doyle DV, Spector TD. The relationship of bone density and fracture to incident and progressive radiographic osteoarthritis of the knee: the Chingford Study. Arthritis Rheum 2002;46:92-9.
7. Burger H, van Daele PLA, Odding E, et al. Association of radiographically evident osteoarthritis with higher bone mineral density and increased bone loss with age: the Rotterdam Study. Arthritis Rheum 1996;39:81-6.
8. Hochberg M, Lethbridge-Cejku M, Scott W, Plato C, Tobin J. Appendicular bone mass and osteoarthritis of the hands in women: Data from the Baltimore Longitudinal Study of Aging. J Rheumatol 1994;21:1532-6.
9. Marcelli C, Favier F, Kotzki P, Ferrazzi V, Picot M, Simon L. The relationship between osteoarthritis of the hands, bone mineral density, and osteoporotic fractures in elderly women. Osteoporosis Int 1995;5:382-8.
10. Belmonte-Serrano MA, Bloch A, Lane NE, Michel BE, Fries JF. The relationship between spinal and peripheral osteoarthritis and bone density measurements. J Rheumatol 1993;20:1005-13.
11. Hart D, Mootoosamy I, Doyle D, Spector T. The relationship between osteoarthritis and osteoporosis in the general population: the Chingford Study. Ann Rheum Dis 1994;53:158-62.
12. Sowers M, Zobel D, Weissfeld L, Hawthorne VM, Carman W. Progression of osteoarthritis of the hand and metacarpal bone loss. A twenty-year followup of incident cases. Arthritis Rheum 1991;34:36-42.
13. Schneider DL, Barrett-Connor E, Morton DJ, Weisman MH. Bone mineral density and clinical hand osteoarthritis in elderly men and women: The Rancho Bernardo Study. J Rheumatol 2002;29: 1467-72.
14. Altman R, Alarcon G, Appelrouth D, et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hand. Arthritis Rheum 1990;33:1601-10.
15. Arden NK, Nevitt MC, Lane NE, et al. Osteoarthritis and risk of falls, rates of bone loss, and osteoporotic fractures. Arthritis Rheum 1999;42:1378-85.
16. Jones G, Nguyen T, Sambrook PN, Lord SR, Kelly PJ, Eisman JA. Osteoarthritis, bone density, postural stability and osteoporotic fractures: a population-based study. J Rheumatol 1995;22:921-5.

Personal non-commercial use only. The Journal of Rheumatology Copyright © 2002. All rights reserved.

Downloaded on September 15, 2026 from www.jrheum.org