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Editorial

Osteoporosis Prevention and the Orthopaedic Surgeon: When Fracture Care is Not Enough

Osteoporosis — which threatens the health and independence of the elderly, especially postmenopausal women — is now on the radar screen of the general public and health-care providers. "Milk mustache" commercials are ubiquitous. Virtually every women's magazine as well as periodicals for senior citizens feature stories about investing in one's "bone bank."

These concerns are well founded. A woman's risk for a fracture about the hip is equal to her combined risk for breast, uterine, and ovarian cancer, and the morbidity and mortality associated with fractures about the hip are staggering[1,4]. The mortality rate in the first year after a fracture about the hip has been shown to increase considerably compared with the expected rate, depending on the age of the patient at the time of the fracture, the gender of the patient, and the presence of comorbidities[7]. Using a population-based model of the impact of osteoporosis over a lifetime, Chrischilles et al.[3] estimated that 10 percent of postmenopausal white women older than fifty years of age who sustain a fracture about the hip become permanently functionally dependent in activities of daily living and 19 percent need long-term nursing-home care. In a sample of seventy-five patients who were sent for rehabilitation training after a fracture about the hip, Jette et al.[6] found that twenty-two (29 percent) died and less than a third of the survivors returned to baseline functional status. Although the risk of fracture in men is lower, it is certainly not inconsequential, and men are more likely to die after a fracture about the hip. In many studies, the risk of fracture in men parallels that in women; it simply occurs five to ten years later[11].

Medical editors, writers, and scientists are making a Herculean effort to educate health-care providers about the prevention, diagnosis, and treatment of this potentially life-threatening condition that often robs patients of their independence. We applaud the decision to publish the Current Concepts Review of techniques for measuring bone density by Mirsky and Einhorn[8]. Bone mass is the single most important indicator of osteoporosis. This, in turn, is a strong predictor of the risk of a fragility fracture and the possible need for intervention with respect to diet, exercise, medication, or a combination of these. Thorough and timely, the article provides an excellent reference for *The Journal*'s readers.

Advertisements and articles in the medical and lay press, however, do not necessarily translate into behaviors to prevent osteoporosis. A recent telephone survey[9] of 543 women who were forty-five years of age or older, by the National Osteoporosis Foundation, documented the current gap between awareness of the disease and changes in behavior. The survey revealed that, although almost all (97 percent) of the women who were interviewed were aware of osteoporosis, most were unclear about what should be done to prevent the disease. The women who were most at risk for osteoporosis were no more likely to take action to prevent the disease than were the women who were less at risk. The respondents believed that exercise was more important than diet in the prevention of osteoporosis, even though both are essential. The gravity of the findings of this survey is underscored by reports of low consumption of calcium by all Americans. Thus, if behaviors are not changed, the harsh reality is that, given our aging population, we can expect the number of fragility fractures to rise notably.

Improvements in orthopaedic hardware and technology make the technical aspects of fracture care relatively routine. Historically, orthopaedic surgeons have readily treated fragility fractures, but they have rarely followed through and initiated care and treatment of the porous skeleton. In these times of outcome analysis, fixation of

fractures is not enough. We must strive to prevent fractures rather than treating them once they occur.

We believe that the orthopaedic surgeon, as the recognized expert on bone injury and disease, has a unique opportunity to initiate strategies for the prevention, diagnosis, and treatment of osteoporosis. In the past, this was easier said than done. Orthopaedic surgeons, like most clinicians, were not instructed, during their training, in the care of patients who have osteoporosis; the literature offered a maze of conflicting protocols; and the cost of diagnostic workups was frequently not reimbursed by insurance companies. However, three recent events have made this task substantially easier for orthopaedic surgeons.

First, the National Osteoporosis Foundation recently published the *Physician's Guide to Prevention and Treatment of Osteoporosis*[10]. This comprehensive evidence-based guide provides detailed algorithms for the evaluation and management of patients. The guide reflects the experience of treating white postmenopausal women because most research has focused on this population. However, it provides an intellectual framework for the assessment of other populations.

Second, in the past, access to bone-density analysis was limited by the availability of machines, cost, and physician awareness. However, the prices of the machines are falling rapidly, and payment for bone-density evaluations has now been guaranteed for certain Medicare beneficiaries who are at risk. The Balanced Budget Act of 1997[5], effective July 1, 1998, includes a section entitled "Standardization of Medicare Coverage of Bone Mass Measurement." It states that Medicare will pay for bone-density technologies approved by the Food and Drug Administration for people in any one of five diagnostic categories: (1) estrogen-deficient women who are at clinical risk for osteoporosis, (2) patients who have vertebral abnormalities (such as a fracture of the spine as shown on a radiograph), (3) patients who are receiving long-term glucocorticoid therapy, (4) patients who have primary hyperparathyroidism, and (5) patients who are being monitored to assess the response to, or the efficacy of, an approved drug for osteoporosis. In addition, Medicare will pay for a follow-up measurement every two years. It will cover the measurement of bone mass more frequently under special circumstances, such as when a patient is receiving long-term glucocorticoid therapy (for more than three months), or to allow confirmatory baseline measurements of bone mass "to permit monitoring of beneficiaries in the future if the initial test was performed with a technique that is different from the proposed monitoring method."

Third, the Current Concepts Review by Mirsky and Einhorn[8] provides a thorough overview of the types of bone-density testing that are available and explains how the test results are associated with the risk of fracture.

These three items represent a major step forward in the prevention and identification of osteoporosis as well as in the care of patients who have osteoporosis. However, there are numerous issues that still need to be addressed.

Although the various methods of determining bone density appear to be capable of identifying a population at risk for low-energy fracture, not all of the methods are alike. The tests vary with regard to the information that they provide, and it is essential to recognize the strengths and weaknesses of each. On the basis of its precision and cost, and the amount of radiation to which the patient is exposed, dual-energy x-ray absorptiometry is currently believed to be the so-called gold standard of bone-density testing[12]. However, the machines that are necessary for this test are not universally available and are expensive, so other studies are frequently used. Many of the other techniques involve the evaluation of peripheral bone sites, such as the wrist or the heel, but it is well known that site-specific analysis best determines the risk of fracture at that site. Thus, although the findings of a wrist single-bone determination are associated with fractures about the hip, this association is considerably weaker than that of the findings of dual-energy x-ray absorptiometry of the proximal part of the femur. Also, most methods for testing the density of peripheral bones measure cortical bone, which is notably less active metabolically than trabecular bone. Because cortical bone is slow to demonstrate a therapeutic benefit from drug intervention, the analysis of this bone is less helpful for long-term monitoring of the patient. Ultrasound is quicker, is less expensive, and requires no radiographic exposure and therefore is an excellent technique for screening large populations. However, ultrasound measurements have only a 73 percent association ($p < 0.001$) with the findings of dual-energy x-ray absorptiometry[14]. Thus, ultrasound measures other attributes of bone. Patients who are receiving anti-osteoporotic agents have only limited changes on ultrasound, yet they have major accretion of bone on dual-energy x-ray absorptiometry.

Although quantitative computed tomography scans work best when performed by experts, precision decreases sharply when they are carried out by teams that do not use dedicated bone quantitative computed tomography. In addition, there is a twentyfold increase in the dose of radiation to which the patient is exposed compared with that associated with dual-energy x-ray absorptiometry. As a result of these issues, most treating physicians use dual-energy x-ray absorptiometry for the long-term management of patients[2,8].

The interpretation of the results of dual-energy x-ray absorptiometry is not always straightforward[2,8,13]. Accurate testing of bone density with dual-energy x-ray absorptiometry requires the identification of potential artifacts that may interfere with the analysis. A previous operation on the spine can either increase or decrease the value for the bone density. Osteoarthrotic spurs artificially increase bone density. Vertebral crush fractures collapse to the

point of reestablishing normal bone density. The bone density of the spine can appear normal in patients who have compression fractures. Thus, it is essential to analyze the hip preferentially in patients who have spinal artifacts or to eliminate the vertebral segments in question from the analysis. Physicians cannot simply read the summary of a dual-energy x-ray absorptiometry analysis; they must request the computer readout so that they can directly evaluate the sites of interest. In other words, thorough training in the appropriate ordering and interpretation of these studies is essential.

The issue of access to diagnostic testing and treatment after diagnosis has not been fully resolved. If we are to advocate the management of patients before they sustain a fracture and need an operation, we must recognize that the insurance company that has authorized payment for testing bone density (Medicare) does not pay for the medications to prevent the disease from progressing to the point of fracture or other morbidities. In addition, strategies for prevention and treatment such as hormone replacement therapy are much more effective when they are initiated at menopause. Thus, the best time for the first bone-density test is at the onset of menopause, but menopause usually occurs many years before a patient is eligible for Medicare. Moreover, many health-care insurers do not yet pay for bone-density testing, which makes it more difficult for perimenopausal women to make informed choices.

Perhaps most important, the current data permit consensus recommendations only for white postmenopausal women who have a high risk of fracture[1,8]. Many questions remain about what to do for men and for women who fall outside these parameters. Diagnosis alone is not enough. A great deal of additional research is needed to identify the most appropriate lifestyle and medical interventions that prevent bones from becoming truly osteoporotic.

Longevity, in and of itself, may be good. Far better, however, is an advanced age that is free from pain and offers the highest possible degree of independence. Orthopaedic surgeons know firsthand the dreadful consequences of osteoporosis. Our unique expertise carries with it a particular responsibility. It is up to us not just to repair fractures but to be certain that diagnostic studies for osteoporosis are performed and that effective preventative measures and treatment are initiated. Bone-density measurement must not be seen as a generator of revenue or as an end unto itself but rather as an important part of a total program of prevention, diagnosis, and treatment of osteoporosis. We must use our special expertise to argue for broader access to diagnostic testing for osteoporosis as well as for treatment for all men and women who need it. Most important, we need to push for increased funding for osteoporosis research so that we are sure that the diagnostic and treatment strategies that we recommend are the most suitable for each patient. The appropriate care of patients who have osteoporosis will guide them toward a vigorous and independent old age.

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