

## Does bone size affect bone strength?

Ahlgberg HG, Johnell O, Turner CH, Rannevik G, Karlsson MK. Bone loss and bone size after menopause. *N Engl J Med*. 2003;349:327-334.

**OBJECTIVE** To determine whether a strength index that accounts for both bone density and bone size might better predict the risk of fracture than bone mineral density (BMD) alone.

**METHODS AND RESULTS** For this prospective investigation, researchers recruited 241 white women, all 48 years of age. Analysis was based on the 108 women who were followed through age 67, the study's endpoint.

For the duration of the trial, participants' right and left forearms were regularly evaluated via single photon absorptiometry for bone mineral content and BMD. From these scans, investigators calculated periosteal diameter, medullary diameter, and cortical thickness of the distal radius. Serum estradiol levels were also regularly assessed.

Researchers found that, annually, medullary diameter increased by 1.1% and periosteal diameter rose by 0.7%. BMD, however, decreased an average of 1.9% each year. The net result was a 0.7% annual decrease in the strength index, which accounted for both bone mass and skeletal structure.

Postmenopausal serum estradiol was related inversely to periosteal diameter and directly to BMD.

**WHO MAY BE AFFECTED BY THESE FINDINGS?**

Women at risk for osteoporosis.

**EXPERT COMMENTARY** We know that BMD correlates well with fracture risk. However, bone architecture—not assessed by BMD

studies—also plays a role in bone strength.

Indeed, a recent trial on risedronate use noted a probable relationship between early changes in bone resorption and reduced fracture risk.<sup>1</sup> Risedronate reduces the risk of vertebral fracture within the first year of therapy, but some believe this effect occurs too rapidly to be solely attributable to BMD changes, which are maximum by the third year. The implication is that bone-strength factors beyond BMD are at work.

**Clinical relevance of bone size.** Few would argue the need to treat all patients with documented osteoporosis (World Health Organization definition: a T-score of -2.5 or less); however, from a public health perspective it is not cost-effective to treat all women with low bone mass/osteopenia—even though there is an increased incidence of fractures among these patients. Thus, a strength index such as that described in this article would—if effective—help further stratify postmenopausal women with low bone mass into low, medium, and high risk for future fractures.

**Flaws in study's bone size measurements.** In this timely study by Ahlgberg et al, the authors theorize that the observed postmenopausal increase in periosteal apposition and size partially preserves bone strength—but this hypothesis has not been proven. With the crude images rendered by large pixels, it is impossible to note true bone size; furthermore, no evidence exists to confirm that we can actually measure bone size with single photon densitometry. In addition, the authors here evaluated the distal third of the forearm; ultradistal forearm measurements would have yielded a more accurate assess-

ment since these correlate better with Colle's fractures of the wrist/forearm.

It is anticipated that, in the future, quantitative computed tomography scanning with ultrathin slices will allow clinicians to assess bone architecture in a way that will allow for more accurate bone-strength measurements.

**The authors theorize that the observed postmenopausal increase in periosteal apposition and size preserves bone strength—but this has not been proven.**

**BOTTOM LINE** Correctly classifying women into the appropriate bone-risk category is even more critical in this post-Women's Health Initiative era. Many women who are stopping hormone therapy may still be at risk for losing bone mass; others who already have low bone mass may not have been offered other bone therapies. The current study is important only for raising the issue of the relationship of bone strength to future fracture risk.

Dual-energy bone densitometry—a valuable tool for diagnosing osteoporosis, assessing a patient's fracture risk, and following the effects of bone treatments—remains the standard of care.

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## The economics of an elective cesarean delivery policy

Bost BW. Cesarean delivery on demand: what will it cost? *Am J Obstet Gynecol.* 2003;188:1418-1423.

**OBJECTIVE** To determine the true cost differences between vaginal delivery and elective cesarean and to assess the economic impact of a "cesarean on demand" policy.

**METHODS AND RESULTS** Using data on direct costs (those that can be directly attributed to the care of mother and neonate) from a community-based hospital over a 12-month period, the author calculated the average per-patient costs of both vaginal delivery and elective cesarean.

He found that, compared with elective cesarean delivery (\$918), multiparous vaginal delivery costs 7.1% less (\$853) but nulliparous vaginal delivery costs 5.9% more (\$972), on average.

**WHO MAY BE AFFECTED BY THESE FINDINGS?** Women who would prefer cesarean delivery, payers of health-care costs (including patients), health plans, and society.

**EXPERT COMMENTARY** For 2 decades the merits and drawbacks of elective cesarean delivery have been debated in the medical literature.<sup>1</sup> This practice is seen in Brazil, Chile, and Taiwan, among other countries, where physicians seem to encourage delivery by cesarean section.<sup>2</sup> In the United States, no formal guidelines exist. However, with approximately 4 million births per year, this country needs a clear policy concerning elective cesarean that considers

- risks and benefits,
- effects on the provision of care, and
- costs to patients and society.

It is this last item that the current study examines.

**Other costs must be considered.** Dr. Bost's analysis of the short-term direct costs of attempted vaginal and elective cesarean delivery finds little difference between the 2 modes of delivery. The strength of this study

is its use of estimated costs from supplies, labor, and amortization of equipment. However, the author does not consider any of the indirect costs, the expenditures related to rare but expensive complications, and, notably, future costs these patients might incur in later pregnancies or subsequent medical care.

Health-care expenditures accounted for 13% of the gross domestic product in the United States for 2002 (\$1.3 trillion),<sup>3</sup> and are projected to outstrip the economy's growth at even higher rates during the next few decades.<sup>4</sup> Thus, when considering a new policy regarding clinical care, cost is clearly a crucial factor—but it is not the only issue for us to weigh.

**Evidence sparse on clinical outcomes.** In a recent commentary, Minkoff and Chervenak<sup>5</sup> support “a physician’s decision to accede to an informed patient’s request for [elective cesarean] delivery.” The authors discuss the risks and benefits of elective cesarean to both mother and fetus. These include protecting the pelvic floor, a slightly reduced rate of neonatal complications at term, and increased risks to the mother from surgery and anesthesia. They advise that these data should be used to counsel patients considering elective cesarean, but concede that there is no overwhelming evidence on either side to guide a clear decision.

**The issue of consent.** There also is the concern of how well women can be counseled regarding complications. It is unclear whether patients are able to truly understand<sup>6</sup> and incorporate<sup>7</sup> small risks of rare complications into the decision-making process. Certainly, psychologists, economists, and sociologists have found that there are many ways in which individuals are unable to make well-informed decisions based on the proper use of probabilities; these limitations have been designated as “bounded rationality.”<sup>8</sup> This observation raises the issue of patient autonomy versus paternalism.

While we as clinicians endeavor to consistently achieve informed consent by educating patients about the range of possible outcomes, bounded rationality may prevent us from always reaching this goal. Further, many clinical situations call for shared decision-making between patients, families, and physicians. Thus, we must exercise at least some paternalism in order to optimize the medical care we provide to our patients. This balance is particularly relevant when establishing practice standards, guidelines, and other such policies.

**BOTTOM LINE** This investigation found a slightly increasing trend in the short-term direct costs of successful vaginal delivery (least costly), cesarean delivery, and unsuccessful attempted vaginal delivery (most costly). However, indirect, long-term costs may have larger variation, and clinical outcomes also must be considered. Both require further examination in prospective studies. ■

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