

# Examining women's bones during menopause may help head off fractures

January 27 2017

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Credit: University of Michigan

Bone fragility has long been a worrisome condition affecting women as they age.

"It's been considered a silent disease," says Karl Jepsen, Ph.D., associate chair of research and professor of orthopaedic surgery at Michigan Medicine, noting, "One of the biggest challenges when you're looking at

age-related [bone](#) fragility is to identify people who will fracture."

Jepsen is the lead author on a new study, published in the *Journal of Bone and Mineral Research*, that examined the bone traits of 198 midlife women transitioning through menopause for 14 years. The goal: identifying women who will experience bone fragility well in advance of fracture.

"Current identification for bone fragility takes place when the patient is around 65 years of age," Jepsen explains. "We were hopeful that this study would give us an opportunity to identify those patients as early as 30 years before they fracture based on their bone traits. That means we would have an opportunity to intervene before the fracture happens, instead of after the fact."

Jepsen adds that understanding how bone structure and bone mass change during aging is not well understood on an individual basis.

"We hypothesized that age-related changes in bone traits also depend on external bone size, which is easily measured," he says. "This was based on work we had done in the past in young adults with stress fracture risks where we found individuals with narrow bones were at a higher risk of developing stress fractures."

## **Identifying subjects**

Jepsen and his colleagues from Michigan Medicine Department of Orthopaedic Surgery worked with Sioban Harlow, Ph.D., professor at the University of Michigan School of Public Health and director of the Center for Midlife Science, Carrie Karvonen-Gutierrez, Ph.D., M.P.H., assistant professor at the U-M SPH, and Jane Cauley, DRPH, at the University of Pittsburgh, who had access to a large cohort of women transitioning through menopause called the Study of Women's Health

Across the Nation.

The database had been following the subjects since 1996. Women who enrolled at that time had to be between 42 and 52 years of age, have an intact uterus and had at least one menstrual period in the previous three months. In addition, the subjects had approximately 14 annual study visits that included measurements, such as bone density scans, of their hip and spine.

## Analyzing X-ray images

The research team analyzed dual-energy X-ray absorptiometry images, which measure [bone mineral density](#), of the hip over the 14-year period to determine if changes were happening in each woman.

They found that over that time frame, women experienced different changes in [bone mineral](#) content and bone area within the hip, but similar changes in areal bone mineral density. In addition, the change in bone [mineral content](#) and bone area correlated negatively with baseline external size of the neck of the femur just below the ball of the hip joint.

"This means women showed similar changes in areal bone mineral density for different structural and biological reasons," Jepsen says.

"Essentially, we found that women with narrow femoral necks showed smaller changes in bone mineral content, but greater increases in bone area compared to women with wide femoral necks who showed greater losses in [bone mineral content](#), but didn't appear to be experiencing compensatory increases in bone area."

Jepsen adds that the results are not what he expected.

"Our results were opposite to all expectations of how we assumed this would work," Jepsen says. "Based on previous work, we assumed that

bone expansion acts to mechanically offset bone loss, but we found some women appeared to have hip bones that were increasing in strength during the menopausal transition while others seemed to be losing strength."

## Moving forward

"This study demonstrated for the first time that we can track bone changes happening individually in women during menopause," Jepsen says.

He hopes these results are a stepping point for additional research.

"With further research, our goal is to use simple bone traits to identify those women that may benefit from early intervention when it comes to bone fragility, instead of the current strategy, which treats individuals after they have lost appreciable bone mass and strength," he adds.

In addition, he notes this work further demonstrates the variability in each person's body.

"Bone is constantly remaking itself, but with age and menopause, considerable declines in bone strength can occur," Jepsen says. "This study helped us demonstrate how much that process can vary greatly among [women](#)."

**More information:** Karl J. Jepsen et al, Femoral Neck External Size but not aBMD Predicts Structural and Mass Changes for Women Transitioning through Menopause, *Journal of Bone and Mineral Research* (2017). [DOI: 10.1002/jbmr.3082](https://doi.org/10.1002/jbmr.3082)

Provided by University of Michigan

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