

High-Resolution CT Accurately Assesses Bone Microarchitecture

BY JEFF EVANS
Senior Writer

BETHESDA, MD. — High-resolution peripheral quantitative CT appears to be a promising technology for identifying osteoporosis-related changes in bone microarchitecture, according to the results of a prospective study.

Data from the noninvasive technique suggest that the imaging procedure will provide new insight into the degradation of bone mineral architecture that occurs in osteoporosis, Stéphanie Boutroy, Ph.D., said at a meeting on bone quality.

Dr. Boutroy of France's National Institute of Health and Medical Research, Lyon, described her findings from an investigation of the scanning technique in 108 healthy premenopausal women (aged 19-45 years), 109 osteopenic, postmenopausal women (aged 52-88 years), and 33 osteoporotic, postmenopausal women (aged 61-84 years). The women were classified as osteopenic or osteoporotic based on bone mineral density (BMD) measures taken by dual x-ray absorptiometry of the femoral neck or spine.

Initially, eight healthy women underwent three separate scanning sessions within 1 month to determine the short-term reproducibility of the density and architecture parameters of the scanning protocol. Between the three sessions, trabecular and cortical volumetric BMD measurements varied by only 0.5%-1.3% in each of those eight patients. Similarly, trabecular architecture

values varied by 0.9%-3.1% for each patient between sessions.

When Dr. Boutroy examined the relationship between volumetric BMD and architectural parameters, she found that total density, as expected, was strongly correlated to both trabecular and cortical density. Trabecular and cortical density were strongly correlated to trabecular architecture and cortical thickness, respectively.

At the distal radius, osteoporotic women had significantly lower total volumetric BMD and cortical thickness compared with osteopenic women. Likewise, osteoporotic women also had comparatively lower trabecular density, number, thickness, and separation. No differences could be found in cortical density or the distribution of trabeculae between the two groups, Dr. Boutroy said at the meeting, sponsored by the National

Institute of Arthritis and Musculoskeletal and Skin Diseases and the American Society for Bone and Mineral Research.

At the tibia, osteoporotic women had significantly lower measurements on all parameters (total volumetric BMD, cortical and trabecular density, and trabecular number, thickness, and separation) than osteopenic women. In addition, the osteopenic women had significantly lower values on all parameters compared with healthy, premenopausal women.

Dr. Boutroy has no financial interest in the companies that manufacture high-resolution peripheral quantitative CT devices. ■

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Transdermal Technique Checks Bone Quality

BETHESDA, MD. — Among the many novel technologies cropping up to help analyze bone quality non-invasively, near-infrared spectroscopy may eventually prove to be quite useful, according to results from a preliminary study.

In an investigation that involved mice as subjects, the near-infrared spectroscopy technique has been shown to detect differences in mineralization of those with and without a mutation that models type III osteogenesis imperfecta, Guiyang Li, Ph.D., reported at a meeting on bone quality.

Dual x-ray absorptiometry scans are limited in that they cannot obtain "information on molecular structure of bone and its primary components—hydroxyapatite mineral and collagen," explained Dr. Li, of the musculoskeletal imaging and spectroscopy laboratory at the Hospital for Special Surgery in New York.

Near-infrared spectroscopy can penetrate millimeters to centimeters through the skin—farther than its close cousin, mid-infrared spectroscopy, which can only penetrate about 10 µm into skin, Dr. Li noted.

Mid-infrared spectroscopy has stronger absorbance bands than near infrared.

The relatively low intensity of near infrared absorbance necessitates the use of special modeling methods to analyze the resulting spectrum, he explained at the meeting, which was sponsored by the National Institute of Arthritis and Musculoskeletal and Skin Diseases. The meeting was cosponsored by the American Society for Bone and Mineral Research.

—Jeff Evans

Hip Replacement Beats Hip Fracture Surgery in Outcomes

BY HEIDI SPLETE
Senior Writer

WASHINGTON — Elective hip replacement and hip fracture repair may be roughly equivalent in terms of their degree of invasiveness, but there is often a world of difference between the outcomes these procedures help patients achieve, Joseph Zuckerman, M.D., observed at an international symposium sponsored by the National Osteoporosis Foundation.

Even among patients of the same age, those who undergo elective hip replacement surgery are far more likely to have favorable outcomes compared with those who undergo hip fracture repair.

And while both groups have a history of long-standing chronic disease, osteoporosis patients with fractures often present with complex medical, surgical, and psychological issues that involve challenges well beyond mending the fracture itself.

In fact, "in many ways the surgical treatment we provide is less challenging than the medical and psychosocial problems associated with the disease," he said. Ultimately, it's these other issues that determine a patient's ability to achieve their pre-fracture level of function and independence, said the chairman of the department of orthopedic surgery at the New York University-Hospital for Joint Diseases in New York City.

"Hip and knee replacements are among

the most successful operations in medicine in general," he said. "You can assure patients with a 90-95% certainty that they will have a successful result."

By comparison, the literature suggests that 50%-65% of hip fracture patients will regain their previous levels of ambulation, 10%-15% become home ambulators, and up to 20% will become nonambulatory.



This patient suffered a reverse obliquity fracture, an uncommon fracture pattern.

In his own series of 366 hip fracture patients aged 65 and older, Dr. Zuckerman reported that following surgery, 41% regained their prefracture ambulation. However, the degree of improvement was often minor. In addition, 12% became home ambulators, and 8% became non-ambulatory.

In general, the infection rate among hip fracture patients ranges from 2% to 15%,



An intramedullary hip screw was highly appropriate for this fracture pattern.

compared with a less than 1% infection rate among hip replacements performed electively.

Likewise, when dislocations occur in approximately 1%-10% of hip fracture patients vs. 1%-3% of hip replacement patients, they tend to be due to circumstances that cause the dislocation to reoccur and necessitate additional surgery.

The poor bone quality among hip fracture patients means they're more likely to have bone fragments that complicate the repair. Newer surgical techniques, however, have helped minimized such complications, compared with 20 years ago, he observed.

Fixation failures, usually due to inferior bone quality or poor surgical technique, occur in 12%-20% of hip fracture patients, and reoperations are often needed. By comparison, fewer than 1% of hip replacement patients experience fixation failure.

Similarly, healing complications can occur in 5%-35% of hip fracture patients, compared with fewer than 1% of hip replacement patients.

Overall, mortality rates in the elderly population following a hip fracture can be as high as 40%, compared with a mortality of less than 1% during the year following a hip replacement.

Dr. Zuckerman had no financial relationships to disclose. ■

PHOTOS COURTESY DR. JOSEPH ZUCKERMAN