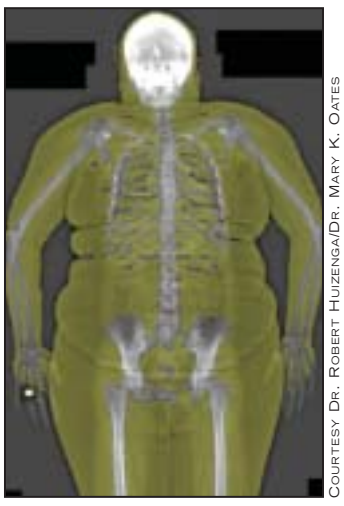

COURTESY DR. ROBERT HUIZENGA/DR. MARY K. OATES

Unlike dunk tanks, DXA directly measures fat mass, lean mass, and bone mineral content. This 105-kg white female was shown to have 53% total body fat before undergoing an aggressive diet and exercise program.

DXA Offers Window on Fat, Muscle

BY BARBARA J. RUTLEDGE
Contributing Writer

TAMPA, FLA. — Dual-energy x-ray absorptiometry is an excellent method to measure and monitor body composition changes in obese patients undergoing weight loss and to assess body composition in athletes, Dr. Mary K. Oates reported at the annual meeting of the International Society for Clinical Densitometry.

Although this application is not reimbursable by medical insurance, many patients concerned about fitness and weight loss are willing to pay out of pocket to have a direct measurement of their percent lean mass and percent fat, said Dr. Oates, who is board-certified in physical medicine and rehabilitation and has private clinics in Santa Maria and Pismo Beach, Calif.

Unlike other methods for assessing body composition, dual-energy x-ray absorptiometry (DXA) "can give you regional values, not just total body fat," she said. "Olympic athletes and professional athletes want to know, How much muscle do I have in my leg? How much muscle did my injured quarterback lose in his throwing arm after his injury?" DXA also provides a dramatic total body image of the skeleton and soft tissue.

DXA is being used by the Green Bay Packers pro football team and at the U.S. Olympic Training Center in Colorado Springs, Colo. to provide benchmarks for performance enhancement, she said.

Most methods that have been widely used to estimate body composition are indirect. Epidemiology studies usually rely on measurement of waist and hip circumferences and calculation of waist:hip ratio, as well as body mass index. Determination of BMI is often used to define obesity, although BMI does not account for percent body fat. A nonobese, muscular individual may have a BMI score in the obese range.

Digital scales use bioelectrical impedance analysis to estimate percent body fat. Another indirect method that is widely used in health clubs is skin-fold measurement, in which calipers measure the skin at the back of the upper arms or the stomach ("pinch test"). Calculation of total body fat is based on the assumption that the amount of subcutaneous fat is proportional to the total body fat. "It is assumed that about one-third of the total fat is located subcutaneously, but we all know that it varies with sex, age, ethnicity, and individual fat distribution," Dr. Oates said.

The "dunk tank" has traditionally been considered the most accurate way to determine body composition, although it is technically difficult for the subject to perform. The Bod Pod is similar to the "dunk tank" but is based on air displacement, rather than water displacement.

In contrast, DXA directly measures fat mass, lean mass, and bone mineral content, and calculates the percentages of fat mass and lean mass. One limitation of DXA is the inability to measure the fat or lean composition of pixels that contain bone, although composition can be estimated from the adjacent pixels.

Different DXA machines have various limits on patient thickness and weight, and most models can't accommodate obese patients who weigh 300 pounds or more, so it's necessary to do a right-sided scan, then double the results to get whole-body estimates, Dr. Oates said. The new Lunar iDXA by GE has a larger table size and weight capacity that allows direct full-body measurement of patients up to 450 pounds and 6'5".

Individuals who have undergone body fat assessment by another method may be reluctant to accept the DXA results: The percent fat may generally be a little higher with DXA than with other methods. "I think that's because we are really measuring three compartments—we are measuring fat, we are measuring muscle, we are measuring bone," said Dr. Oates, a medical consultant to GE Healthcare Lunar. "The other methods are just estimating from body density." ■