

# DXA Scans Enhance Weight-Loss Motivation

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TAMPA — 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 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 up to 6 feet 5 inches in height.

Individuals who have undergone body fat assessment by another method may be reluctant to accept the DXA results: The percentage of 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 mea-

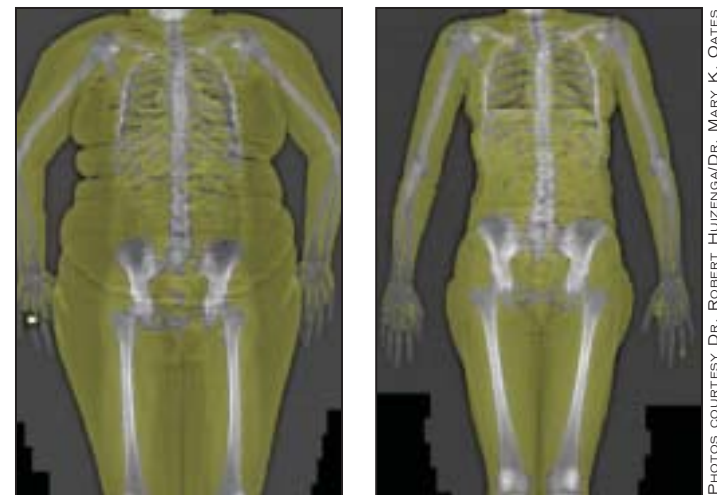
suring fat, we are measuring muscle, we are measuring bone,” said Dr. Oates, a medical consultant to GE Healthcare Lunar. “The other methods are just estimating from body density.”

To demonstrate the usefulness of DXA in monitoring body composition changes, Dr. Oates offered to work with the producers of “The Biggest Loser,” an NBC television reality show in which morbidly obese contestants compete to lose weight through aggressive diet and exercise. DXA provided a graphic visual image of the weight loss and changes in percent body fat of the contestants.

DXA scans can be a powerful motivational tool for patients in weight-loss programs. One advantage of DXA in monitoring weight loss is illustrated by the case of a contestant whose apparent fat loss was greater than the 30-pound weight loss indicated by the scales.

DXA results showed that he had gained 16.5 pounds of muscle. “Muscle weighs more than fat,” Dr. Oates said. “We now can see the breakdown of total weight loss.” The contestant eventually went from 39% body fat to 5.8% body fat.

**Unlike indirect body composition tests such as calipers and dunk tanks, DXA directly measures fat mass, lean mass, and bone mineral content.**



DXA scans show a 105-kg woman with 53% total body fat before aggressive diet and exercise program (left) and after the program at 57 kg, with 18% total body fat (right).

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

## Study Meant to Test Drug Effect

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[with hypertension]. If a patient has a DTI abnormality and even mild hypertension, it makes me more aggressive in the degree of blood pressure reduction that I try to achieve,” Dr. Solomon said in an interview. Most Doppler echocardiography units made during about the past 5 years are able to assess DTI. The most robust measure of DTI to gauge heart relaxation is E’ (E prime), the measure of the heart’s early relaxation velocity.



**‘If we had more hypertrophied and more fibrotic patients, we may have seen a bigger effect.’**

DR. SOLOMON

The study that Dr. Solomon reported at the meeting was designed to test whether blood pressure reduction using the angiotensin receptor blocker valsartan was especially effective for improving E’, compared with other antihypertensive drugs in patients with hypertension and an impaired relaxation velocity.

The underlying hypothesis was that a drug that reduces activation of the renin-angiotensin-aldosterone system (RAAS) would be more effective than other anti-

hypertensive medications for reducing left ventricular hypertrophy and fibrosis and thereby improving diastolic function. The Valsartan in Diastolic Dysfunction study was sponsored by Novartis, which markets valsartan (Diovan). Dr. Solomon is a consultant to and has received honoraria from Novartis.

The study involved 384 patients aged 45 or older with stage 1 or 2 hypertension who also showed diastolic dysfunction based on their lateral E’ measure. The average E’ reading for all patients in the study was 7.5 cm/sec, substantially below the normal level for age (see box, right).

The middle-aged patients in the study had an average E’ level that was comparable to that of a 76-year-old person with no history of hypertension, Dr. Solomon said. Their average blood pressure at entry was about 144/86 mm Hg, and their average left ventricular ejection fraction was about 57%. About 4% of the partici-

pants had left ventricular hypertrophy.

The patients were randomized to two different antihypertensive regimens. One group received as its primary drug 320 mg/day of valsartan, followed by other, non-RAAS-affecting drugs as needed to reach a goal blood pressure of less than 135/80 mm Hg.

The second group of patients had the same goal blood pressure but did not receive any drugs that affect the RAAS. Alternative agents were used in this order: a diuretic,  $\beta$ -blocker, calcium channel blocker, and  $\alpha$ -blocker. Patients in the control group received significantly more antihypertensive medications, especially diuretics and calcium channel blockers.

After 9 months of treatment, the average blood pressure was 129/78 mm Hg in the patients treated with valsartan, and an average of 134/82 in the patients who did not get an RAAS-active drug.

Follow-up DTI data were available for 341 patients. The study’s primary end point was an improvement in the E’ measure, which rose by an average of 0.60 cm/sec in patients treated with valsartan and by an average of 0.44 cm/sec in the control patients. The difference between average improvements in the two groups was not statistically significant. But E’ was significantly improved over baseline levels in both treatment groups, indicating that

lowering blood pressure improves diastolic function.

The two groups did show a significant difference in two secondary efficacy measures also made using DTI. Both the isovolumic relaxation time and the systolic contraction velocity showed improvements that were significantly greater in the valsartan group, compared with the control patients, Dr. Solomon said.

“I think that if we had more hypertrophied and more fibrotic patients, we may have seen a bigger effect” from RAAS treatment, Dr. Solomon said. “Over the next several years, we’ll see many more studies that look at patients with normal ejection fraction and diastolic dysfunction,” he predicted.

### Normal Heart Relaxation Velocity

Age (years)	E’
45-55	≥10 cm/sec
56-65	≥9 cm/sec
66-75	≥8 cm/sec

Note: Patients with an E’ that is below these age-specific levels have diastolic dysfunction.

Source: Dr. Solomon