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DEXA Scan

A DEXA scan, also called DXA is an acronym for "Dual X-ray Absorptiometry". It is a quick, pain free, inexpensive scan that is extremely good at evaluating two medical conditions:

1. **Body composition analysis:** This scan provides you with an in-depth analysis of the main components of your body: Fat, muscle and bone. Most importantly, it tells you if you have healthy fat around the hips or unhealthy fat on the abdomen.
2. **DEXA bone density:** This is a scan of the lumbar spine, hip or forearm. It can diagnose osteopenia and osteoporosis.

Body mass index (BMI): The BMI is simply a number determined by calculating a person's body weight (Kg) divided by their height (M^2). Your BMI number will determine if you are diagnosed with having obesity. It also dictates whether or not your health insurance company will consider paying for medical treatment for obesity.

1. BMI less than 18.5: Underweight.
2. BMI 18.6-24.9: Normal weight.
3. BMI 25.0–29.9: Overweight.
4. BMI 27.0 with underlying medical condition such as insulin resistance, diabetes, hypertension, coronary artery disease, hyperlipidemia: This may allow you to qualify for insurance to pay for weight loss medications. Unfortunately, many insurance companies are restricting payments for weight loss medications for patients who are good candidates.
5. BMI 30: Obesity. This may allow you to qualify for insurance to pay for weight loss medications even if you do not have underlying medical conditions.
6. BMI 35: This may allow you to qualify for weight loss surgery.
7. BMI 40: Morbid obesity.

Limitations of the BMI: The BMI is still frequently used in the United States because it is so simple and inexpensive. However, it has major limitations in determining the health of the individual. For example, a very physically fit muscular man with very low body fat will have a BMI that may indicate that he is overweight or even obese. Remember, muscle weighs 3 times more than fat for the same volume. Alternatively, a physically unfit man with limited muscle who has a "beer gut" may have a normal BMI. A DXA scan is far better at evaluating a person to determine if they are healthy or unhealthy.

Obesity: In 1970, the average American man weighed 168 pounds and was 5' 9" tall. In 2020, the average American man remains 5' 9" tall but weighs 197 pounds with a 40" waist. In 1970, the average American female weighed 140 pounds and was 5' 4" tall. In 2020, the average American female remained 5' 4" tall but now weighs 170 pounds with a 38-1/2" waist. According to the Centers for Disease Control and Prevention (CDC) in 2020, 42% of all adults in the United States had obesity (BMI greater than 30) and an additional 31% were considered overweight (BMI 25-29.9). Fortunately, we now have new weight loss medications that should be able to finally significantly reduce obesity in America. Additionally, we also have DXA scans available that are extremely accurate in measuring body fat and more importantly, whether it is healthy or unhealthy fat.

Body fat percent: A DXA scan is the most accurate way to measure body fat. In 2023, the national average for whole body fat was 28% for men and 41% for women. Body fat percentage increases about 2% per decade, so an average 65 year old will have about 8% more body fat than a 25 year old. For those under age 50, body fat of over 25% for men and over 32% for women is considered the beginning of obesity.

Osteopenia/osteoporosis: Osteoporosis is a disease characterized by bone mass reduction that puts you at risk of fractures.

T-score: The diagnosis of osteopenia and osteoporosis is made by measuring your bone mineral density (BMD) and comparing it to the BMD of an average 30-year-old of the same ethnicity and gender as you.

Normal BMD is a T-score between -1 standard deviation (SD) and +1 standard deviation (SD). -1 SD means that 84% of 30-year-olds of your ethnicity and gender have a higher BMD than you. +1 SD means only 16% have a higher BMD than you.

Osteopenia is a T-score between -1 SD and -2.5 SD. The risk for bone fracture doubles with every SD below normal. So, a person with a T-score of -1 SD has double the risk of fracture compared to a person with a T-score of 0.

Osteoporosis is a T-score that is less than -2.5 SD. This means that about 99% of 30-year-olds of the same ethnicity and gender have a higher BMD than you.

Z-score: This score is measured the same as the T-score, except it compares it to people that are exactly your age, not a 30-year-old. This is a nice score to see for comparison purposes, but it does not dictate whether you have osteopenia or osteoporosis. If your Z-score is -1 SD, that means 84% of people of your age, ethnicity and gender have a higher BMD than you.

Which test is better for measuring bone mineral density, the DXA body composition analysis test or the DXA bone density test? The DXA body composition test will evaluate every bone in your body and give you specific breakdowns for bone mineral density for each arm, each rib cage, thoracic spine, lumbar spine, pelvis, both legs and the head. It will also give you an overall T-score and Z-score for all the bones in your body. This is great information to have, but only the DXA bone density test evaluating a hip, lumbar spine or forearm can accurately diagnose osteopenia or osteoporosis. Therefore, if you are at risk for osteoporosis and/or have a T-score less than -1 SD on your DXA body composition analysis, you should consider obtaining a DXA bone density test for definitive diagnosis.

DXA whole body composition analysis:

1. **Preparation:** Make sure you are well-hydrated but do not eat anything for at least 3 hours before the test. Do not take any calcium supplements 24 hours before the procedure.
2. **The procedure:** You need to remove all metal from your body (rings, piercings) and all clothing that contain any metal (bra, shoes). After measuring your height and weight, you will lie down on the table for a 6-minute scan.
3. **Post procedure:** Our technologist will require about 15 minutes to generate a very thorough report. If you have any concerns or questions, we recommend making an appointment with one of our specialists to thoroughly review your report and make recommendations to significantly improve your health. Consider repeating the DXA scan in about 6 months to track your progress.
4. **Report:** Your report consists of 2 pages. The first page that has a single noncolored image at the top left of the page is your bone density analysis. The second page with a colored and noncolored image along the top left is your fat and muscle analysis. We will now discuss the specifics of your report (you need to have these reports in front of you for this to make sense).

Whole body bone density: Total bone mass represents the weight of all your bones in your body measured in grams (interestingly, this is only about 7 pounds). It is shown on the report as bone mineral content (BMC). Bone mineral density (BMD) is simply the weight of your bones (BMC) divided by the area (g/cm^2).

The DXA results summary table will give you a breakdown of your bone mineral density (BMD) in all of your bones. The higher the number, the better. **You want your total BMD to be over 1.1 g/cm^2 for men and 1.0 g/cm^2 for women, and your T-score to be over -1.0.** Less than this indicates osteopenia. The BMD is usually highest in the spine, pelvis and legs, lower in the arms and lowest in the ribs. A long-distance runner may have higher BMD in their legs, pelvis and spine, but lower in the arms. Weightlifters should see higher BMD in their arms, legs, pelvis and spine. Normal is considered a T-score between -1 SD and +1 SD. T-scores and Z-scores over +1 SD indicate stronger than average bones. If your T-score is less than -1 SD, you are at risk for osteopenia/osteoporosis.

What is body composition? Your body weight is determined by:

1. Fat mass.
2. Fat-free mass (this is everything else—skin, organs, bones, blood, muscles, ligaments, tendons, water)

Body composition report: The colored image top left will show where you have fat (yellow), muscle and fat (orange), muscle (red) and bone (blue).

The yellow table bottom left shows fat mass (in grams) for every area of your body. It also reports how much fat you have in each area (% fat) and what percentile this is when compared to a person of your same gender who is in their 20s (YN), as well as to a person who is your age (AM).

The report is in grams (g). There are about 454 g in a pound. If you want to know how many pounds of fat you have, simply divide the reported number in grams by 454.

Total Body % Fat: See blue colored graph top right. The left side of this graft shows total body % fat. The right side of the graft shows the Z-score (which compares you to the average person of your same age and gender). The ⊕ sign on the chart is your specific age and your specific percent total body fat. If this sign is located in the top light blue area, you are fatter than average. If it is in the bottom dark blue area, you are less fat that average. If it is in the top white area, you are fatter or in the bottom white area you are less fat than 98% of all people your age and gender.

Body mass index (BMI): See colored graph middle right page. This was simply determined by your recorded height and weight and gives you your obesity classification. It is falsely elevated in a muscular person and falsely low in a non-muscular person with abdominal fat. **Your total body % fat is a much better predictor of health problems. Your visceral fat level is by far the best predictor of health problems.**

Adipose indices: See second to bottom right yellow table. This table provides the most important data in predicting potential health problems.

1. **Total body % fat:** The current United States national average is 41% for women and 28% for men. Unfortunately, 73% of Americans are overweight or obese. You want your total body % fat to be **less than 25 for men and less than 32 for women.** Numbers greater than this, indicates the beginning of obesity. The percentile on the right side of the table compares you to people of your gender who are in their 20s (YN), and for your specific age (AM). You want your percentile to be low. For example, a 30th percentile means that you have less total body fat than 70% of people.
2. **Fat Mass/Height^2 (kg/m^2):** This is also called the **fat mass index (FMI)**. It is a more accurate measure of obesity than the body mass index (BMI) because it calculates the amount of fat you have relative to height instead of the total weight (which contains muscle) relative to height as is done with a BMI. The higher this number the more fat you have. **A normal level is between 2.7 to 5.5 for men and 4.5 to 8.2 for women.**

3. **Android/gynoid ratio:** This describes where your fat is stored. This is determined mainly by your genetics and hormones. Android refers to having most of the fat around the stomach. Gynoid refers to having most of the fat around the hips. The number is derived by simply dividing the % fat in the android region (waist) by the % fat in the gynoid region (hips). The yellow body composition results table (bottom left) gives you your specific % fat for the android and gynoid regions. From a health risk standpoint, **ideal values are less than 0.8 for women and less than 1.0 for men.** If your number is higher than this, you are at risk of having unhealthy visceral fat.
4. **% Fat Trunk/%Fat Legs and Trunk/Limb Fat Mass Ratio:** These numbers simply report where you store your fat -- your trunk versus your limbs. Men tend to store more fat in their trunk and are more likely to have a score over 1. Women tend to store fat in their legs and are more likely to have a score less than 1.
5. **Visceral fat:** The visceral fat indices are extremely important in determining your health risk. Visceral fat is the fat that sits inside the abdominal cavity and around the organs. It is not the fat you can pinch. **Visceral fat is very dangerous** because it releases proteins that contribute to inflammation, atherosclerosis, hyperlipidemia, high blood pressure, etc. **Visceral fat is associated with everything bad that prematurely kills humans. Visceral fat is significantly higher in men than women.** Women have about 30% more fat than men in every area of the body except for abdominal fat, which is almost **twice is high in men as in women. Visceral fat increases significantly with age** in both men and women. An average 65-year-old will have about 3 times as much visceral fat as an average 25-year-old.
6. **Est VAT Mass (g):** This is how many grams of visceral fat you have. **For women, this should be less than 700 g if under 40, or under 800 g if over 40. For men, this should be less than 1000 g if under 40, or under 1200 g if over 40. Anything over this is associated with everything bad.** Obviously, you want this number to be as low as possible. Unfortunately, the table does not give you a percentile comparing you to other people. However, we do have tables available that will give your percentile based on age and gender. For example, a 45-year-old male with 254 g of visceral fat would be at the 15th percentile, and with 1684 g would be at the 85th percentile. A 45-year-old female with 73 g would be at the 15th percentile and with 890 g would be at 85th percentile. To determine how many pounds of visceral fat you have, simply divide the number of grams by 454.
7. **Est VAT Volume (cm^2):** This is the volume of your visceral fat. It should be slightly higher than your Est VAT Mass (g).
8. **Est VAT Area (cm^2):** This is the area of your visceral fat. **For women, this should be less than 75 cm^2 if under 40 or under 100 cm^2 if over 40. For men, this should be less than 100 cm^2 if under 40, or under 125 cm^2 if over 40. Anything over 160 cm^2 is considered very dangerous.**

Lean Indices: See bottom right yellow table. This table provides data on arm and leg size relative to height. Lean mass is everything that is not fat. In the arms and legs, this is primarily muscle, but also bone, joints, connective tissue, blood, edema, etc. For most people, our muscles start to shrink in our late 30s and significantly shrink in our late 60s. Unlike fat, which increases significantly from age 20 to age 60, the lean indices do not significantly decrease during this timeframe. This is because the small amount of muscle that is lost is replaced with enlarged joints, swelling, etc. People who are "big boned" with naturally large calves and forearms generally have higher numbers for the lean indices.

1. **Lean/Height^2 (kg/m^2):** This is the amount of lean mass you have relative to your height. The higher the number, the more muscle you have. This should be **over 14.5 for females and over 17.5 for males.** If on the low end, and certainly if lower than this, you should be lifting weights.
2. **Appen. Lean/Height^2 (kg/m^2):** This is the amount of lean mass in the arms and legs relative to height. This should **be over 5.5 for women and 7.0 for men.** If lower than this, you are at risk for sarcopenia (low muscle mass) and frailty.