جامعة المستقبل
AL MUSTAQBAL UNIVERSITY

كلية العلوم

قسم الفيزياء الطبية

MedicalPhysics

Lecture: (1)

Subject: Bone Mineral Density Test * BMD

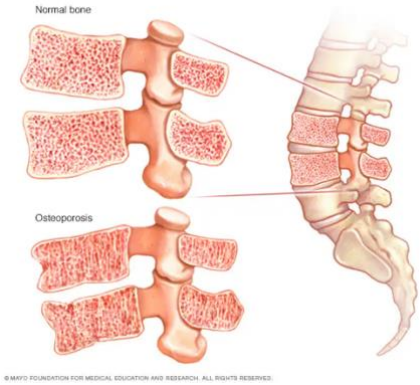
3dr Stage

Lecturer: 1..By..Afrah Hussein

Introduction

A bone density test ; determines whether you have osteoporosis, a condition where bones become weaker and more prone to fractures.

Bone density test: This test is used to measure the mineral content in the bones. The higher the bone density, the stronger the bones generally are, and the less likely they are to break. The test is performed using X-rays to measure the amount of calcium and other bone minerals in a section of the bone.
Bone density tests differ from bone scans, which require prior injections and are usually used to detect fractures, cancer, infections, and other bone abnormalities.



Why it is performed:

- Height loss
- Bone fractures
- Decrease in hormone levels
- Radiation exposure
- Previous spinal issues
- Long-term use of certain medications like steroids
- Osteoporotic fractures can sometimes occur from severe coughing or sneezing.

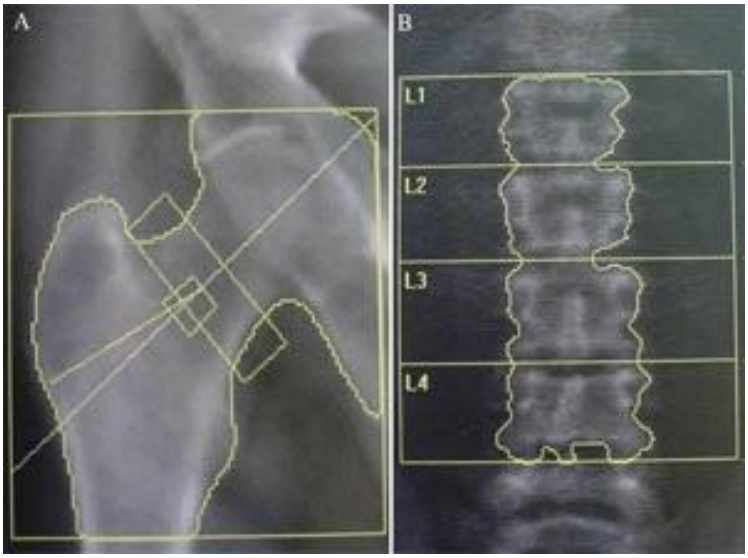
How to prepare for a bone density test:

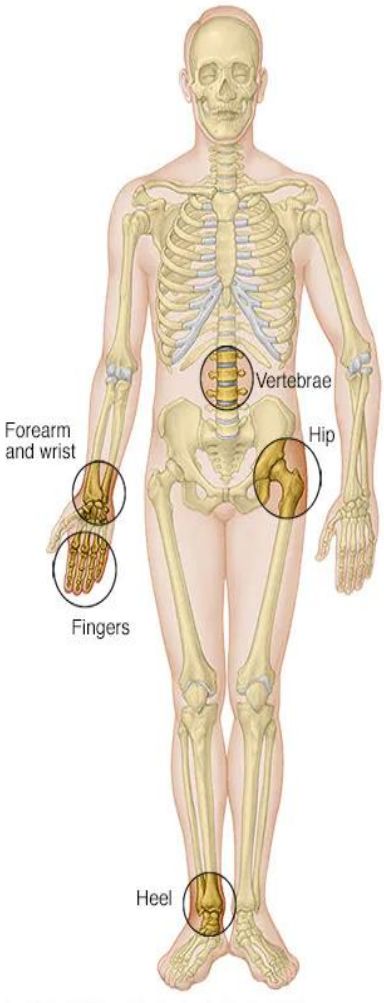
Bone density tests are quick, simple, and painless. Be sure to inform your doctor if you've recently had a barium exam or if you've taken an injection of contrast material for a CT scan or nuclear medicine test, as contrast materials can interfere with bone density tests.
and Avoid taking calcium supplements for at least 24 hours before your bone density test

Clothing and personal items:

comfortable clothing and avoid wearing clothes with zippers, belts, or buttons. Remove all metal objects from your pockets, such as keys, money clips, or coins. In some facilities, you may be asked to wear a medical gown.

Bone density tests are usually conducted on bones most likely to break due to osteoporosis, including:
- The lower spine bones (lumbar vertebrae)
- The narrow neck of the hip bone (femur) near the hip joint
- Forearm bones





Devices used

If the bone density test is done in a hospital, This test is conducted using a central DXA machine to diagnose osteoporosis. DXA stands for (Dual Energy X-ray Absorptiometry), The DEXA Scanner is a device that produces two X-ray beams: one with high energy and the other with low energy. The device measures the amount of X-rays that pass through the bone from each beam, which varies depending on the thickness of the bone. Based on the difference between the two beams, your doctor can measure the patient's bone density.

which measures bone density in the lower back or hip area.

How the procedure is done:

it will be performed using a device where you lie on a padded table while a mechanical arm passes over your body. The amount of X-ray radiation exposure is minimal, much less than that emitted during a chest X-ray. The test typically takes between 10 and 30 minutes.
A small portable device can measure the bone density in the peripheral areas of your skeletal system, such as your fingers, wrist, or heel. These devices are called peripheral devices and are commonly used at health fairs.
Bone density varies across different parts of your body, so the measurement taken from the heel is not an accurate indicator of fracture risk compared to measurements from the spine or hip. Therefore, if your test result from a peripheral device is positive, your doctor may recommend a follow-up scan of your spine or hip to confirm the diagnosis.

Results:

BMD Bone mineral density test results

Your bone density test results are reported in two scores: the T-score and the Z-score.

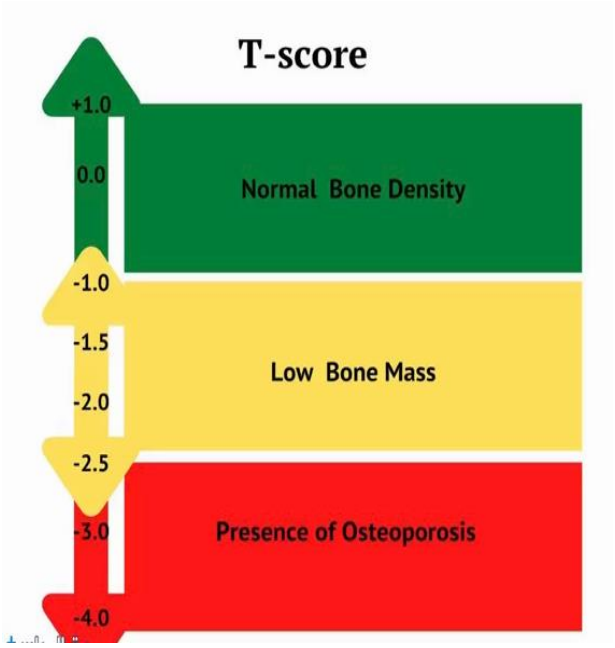
Z_Score : **Standard Deviation:**

The Z-score is the number of standard deviations above or below what is typically expected for a person of your age, gender, weight, race, and ethnic background. If your Z-score is significantly higher or lower than average, additional tests may be required to determine the cause of this issue.

A low Z-score (below —2.0) is a warning sign that you have less bone mass or that you are losing bone more rapidly than expected for someone of your age.

****T-score:**

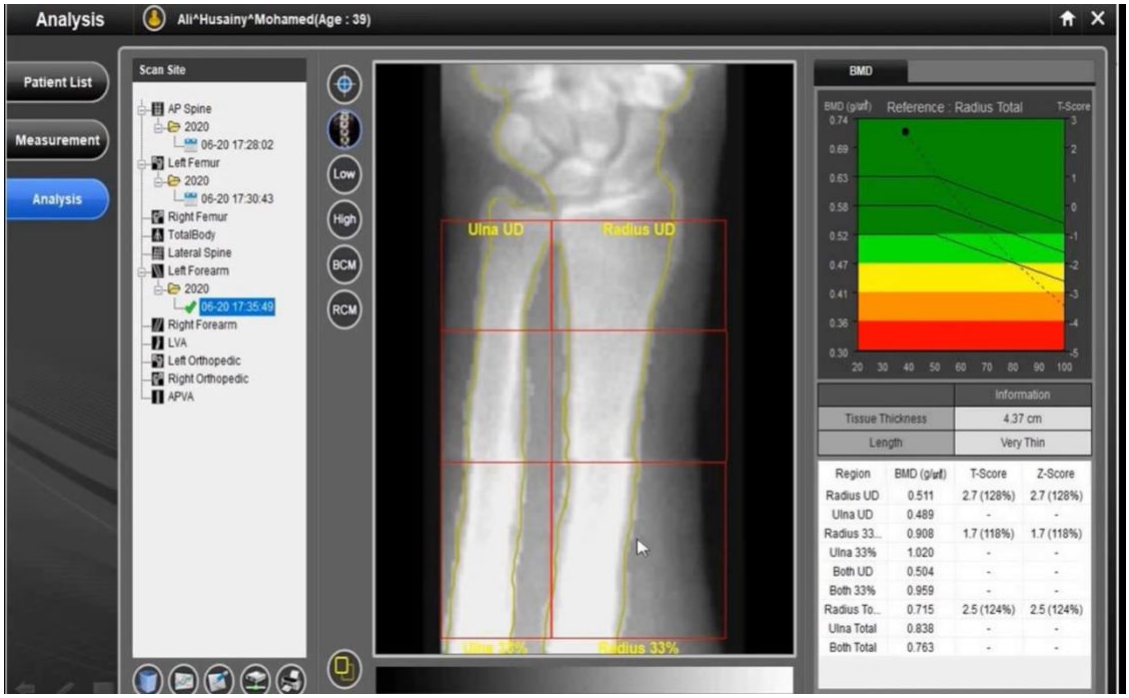
The T-score represents your bone density compared to what is typically expected in healthy adults of your gender. It also indicates the number of units, called standard deviations, by which your bone density is above or below the average.

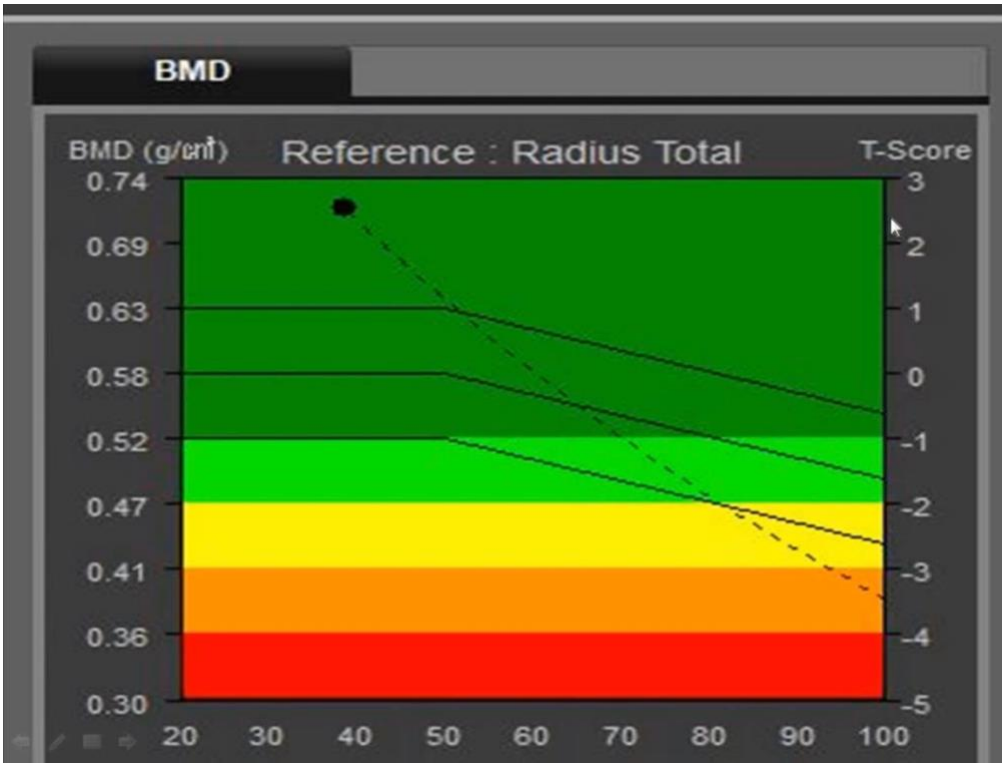


World Health Organization diagnostic classification for osteoporosis

Classification	T-score
Normal	−1.0 or higher
Low bone mass (osteopenia)	Between −1.0 and −2.5
Osteoporosis	−2.5 or lower
Severe osteoporosis	−2.5 or lower and personal history of fragility fracture

Adapted from World Health Organization. 1994.[7]


Analysis
Ali^Husainy^Mohamed(Age : 39)
Patient List
Measurement
Analysis
Scan Site
AP Spine
2020
06-20 17:28:02
Left Femur
2020
06-20 17:30:43
Right Femur
TotalBody
Lateral Spine
Left Forearm
2020
06-20 17:35:49
Right Forearm
LVA
Left Orthopedic
Right Orthopedic
APVA
Low
High
BCM
RCM
Ulna UD
Radius UD
Ulna 33%
Radius 33%
BMD
BMD (g/cm²)
Reference : Radius Total
T-Score
Information
Tissue Thickness
4.37 cm
Length
Very Thin
Region
BMD (g/cm²)
T-Score
Z-Score
Radius UD
0.511
2.7 (128%)
2.7 (128%)
Ulna UD
0.489
Radius 33...
0.908
1.7 (118%)
1.7 (118%)
Ulna 33%
1.020
Both UD
0.504
Both 33%
0.959
Radius To...
0.715
2.5 (124%)
2.5 (124%)
Ulna Total
0.838
Both Total
0.763


BMD
BMD (g/cm²)
Reference : Radius Total
T-Score
0.74
0.69
0.63
0.58
0.52
0.47
0.41
0.36
0.30
3
2
1
0
-1
-2
-3
-4
-5
20
30
40
50
60
70
80
90
100

What does the DEXA scanner use to measure bone density?
A) Sound waves
B) Magnetic fields
C) Dual X-ray beams
D) Radioactive tracers

Answer: ?

What might a low T-score indicate?
A) Strong bones
B) Weakened bones or osteoporosis
C) Normal bone density
D) Fracture healing

Answer: ?

How long does a typical bone density test take?
A) 5 minutes
B) 10 to 30 minutes
C) 1 hour
D) 2 hours

Answer: ?

Which part of the body is typically NOT measured in a standard bone density test?
A) Hip
B) Wrist
C) Finger
D) Skull

Answer: ?

What should you avoid wearing during a bone density test?
A) Comfortable, loose clothing
B) Clothes with zippers or buttons
C) Cotton garments
D) Clothes with bright colors

Answer: ?