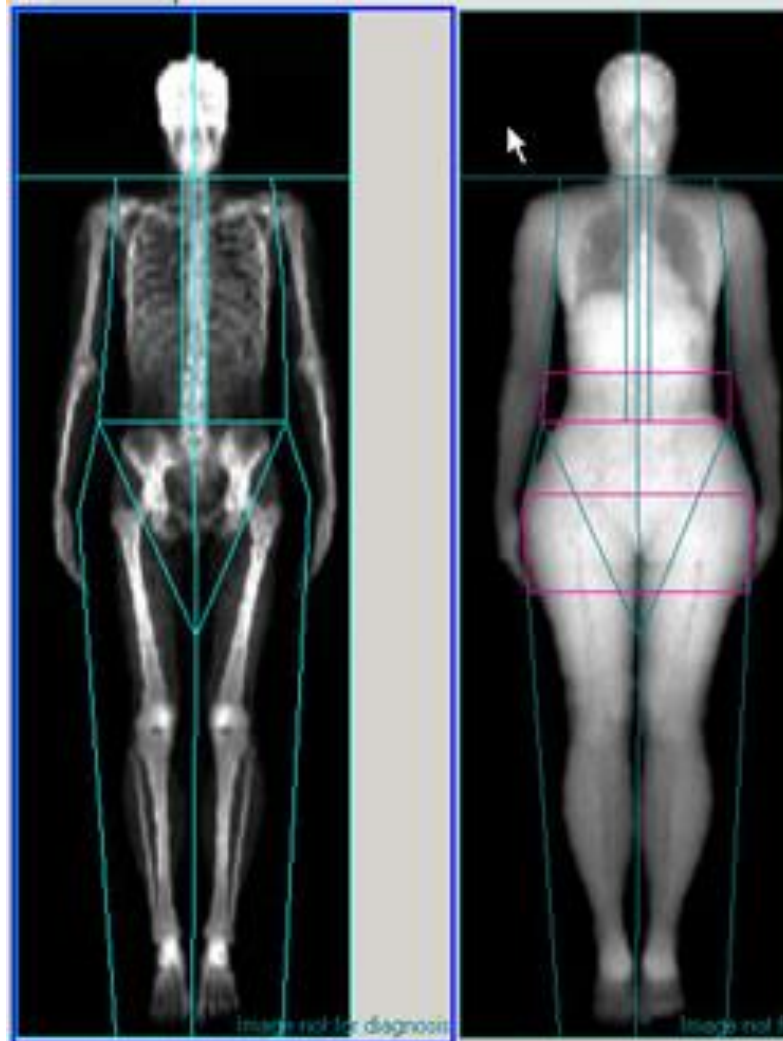


Role of DEXA in Determine Bone Mineral Density



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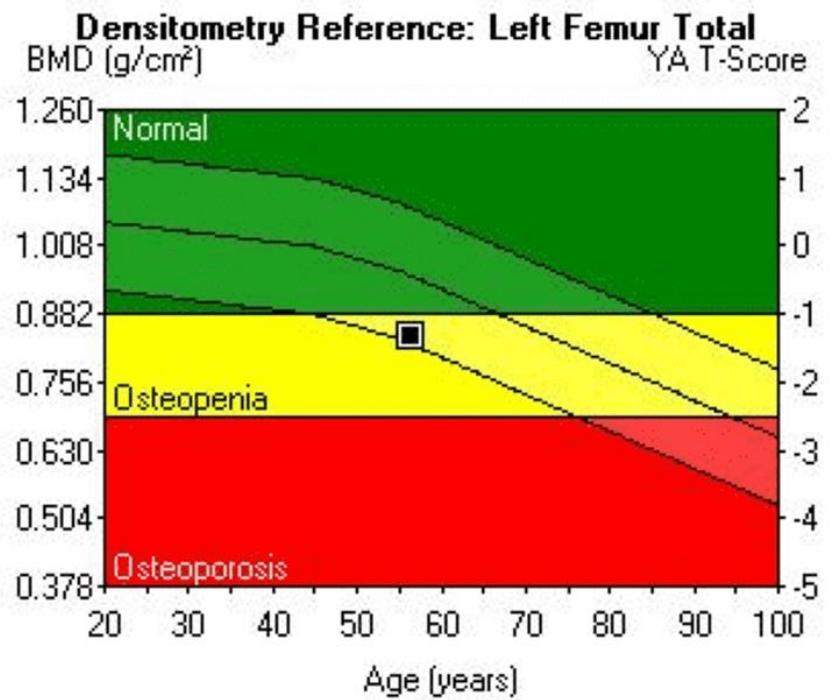
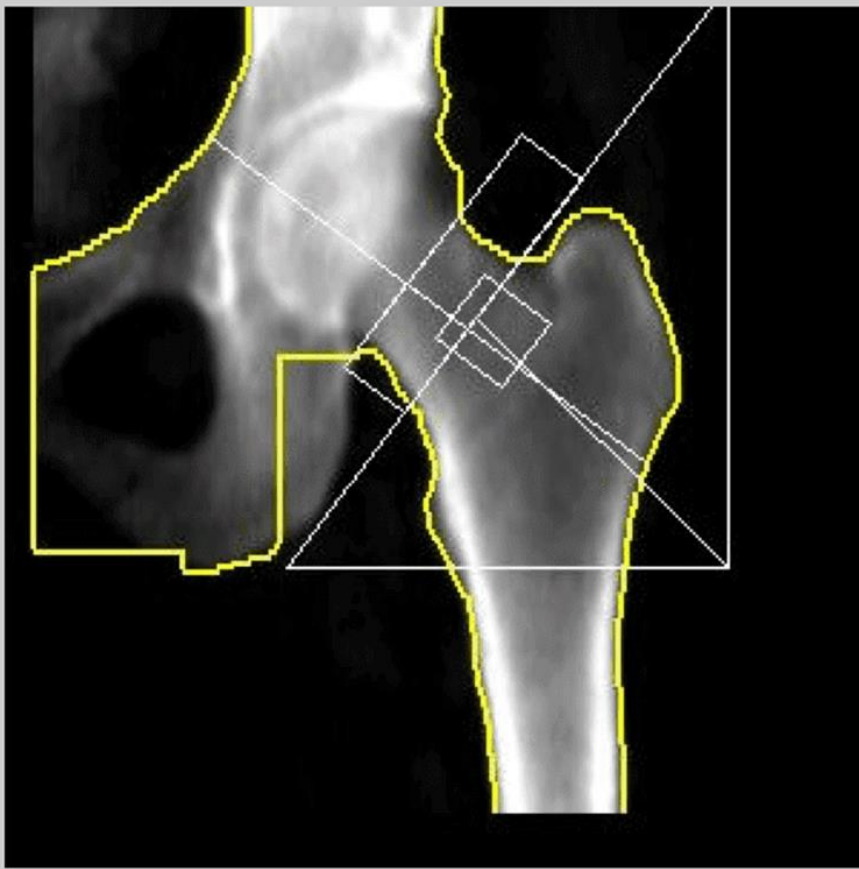
What is DEXA Scan?

- Dual energy x-ray absorption (DEXA) is a most effective technique used to measure Bone Mineral Density (BMD).
- It measures the density or thickness of bones and amount of calcium in specific area of bone.
- BMD is most often used to diagnose osteoporosis.
- Average bone mineral density = BMC / W

Where,

BMC = bone mineral content g/cm

W = width at the scanned line



What is Osteoporosis?

- Osteoporosis is a disease in which the density and quality of bones are reduced. It occurs when bone loss is so severe it causes bone to become porous, brittle and likely to break or fracture.
- Osteoporosis leads to weakness of the bones and increased risk of fracture of bones especially of the spine, hips and forearms. It is called the 'silent disease' as it does not produce symptoms until a fracture occurs after a minor accident or fall
- Internationally, at least one in three women and one in five men over the age of 50 will suffer a fracture caused by weak bones



Osteoporosis occurs when the bone breaks down faster than it can reform.

People who should undergo examination

1. Menopausal women, all women above 65 age or older and males over 70 age



4. Nutritional deficiency-rickets, rheumatoid arthritis

2. Lymphangiomatosis and low body weight



5. Kyphosis



3. Previous history of fracture



6. Long term steroid, hormonal therapy. Vit D, Calcium, Low estrogen level

DEXA Working Principal

- Photons are produced from low energy source.
- 2 X-ray beams with different energy peaks pass through the body.
- One peak absorbs by the soft tissue and other by the bone.
- Creates a 2D image.
- Soft tissue is subtracted from the total area, giving the bone mineral density.
- These measurements are then measured with the normal ranges matched for chronological age with the help of T-score and Z-Score

Preparing the patient for the examination

- Patient lie on his back on a couch and are asked to keep still while an x-ray detector (the 'scanner') comes over the area to be tested.
- An x-ray equipment is energised. The amount of x-rays that comes through the bone from the x-ray source is measured by a detector.
- This information is sent to a computer which calculates a score of the average density of the bone.
- A low score indicates that the bone is less dense than it should be, some material of the bone has been lost, and is more prone to fracture.
- The bones commonly scanned are the vertebrae (back bones) and hip. (These are the bones that most commonly fracture due to osteoporosis).
- The scan is painless and takes 15-20 minutes.



contraindications

(The patient who is prevented from being examined)



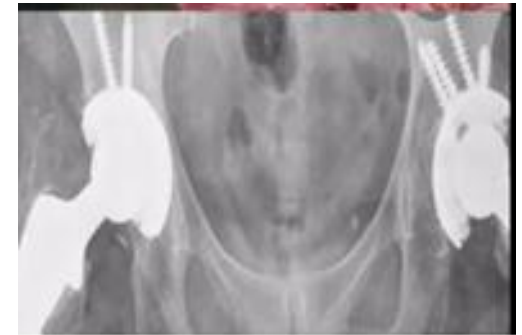
Pregnancy



Metal implant in the area



Weight about 120-130 kg



Bilateral hip replacement

Determine Bone Mineral Density (BMD)

1. T- score

Shows the amount of bone that is compared with a young adult of the same gender with peak bone mass.

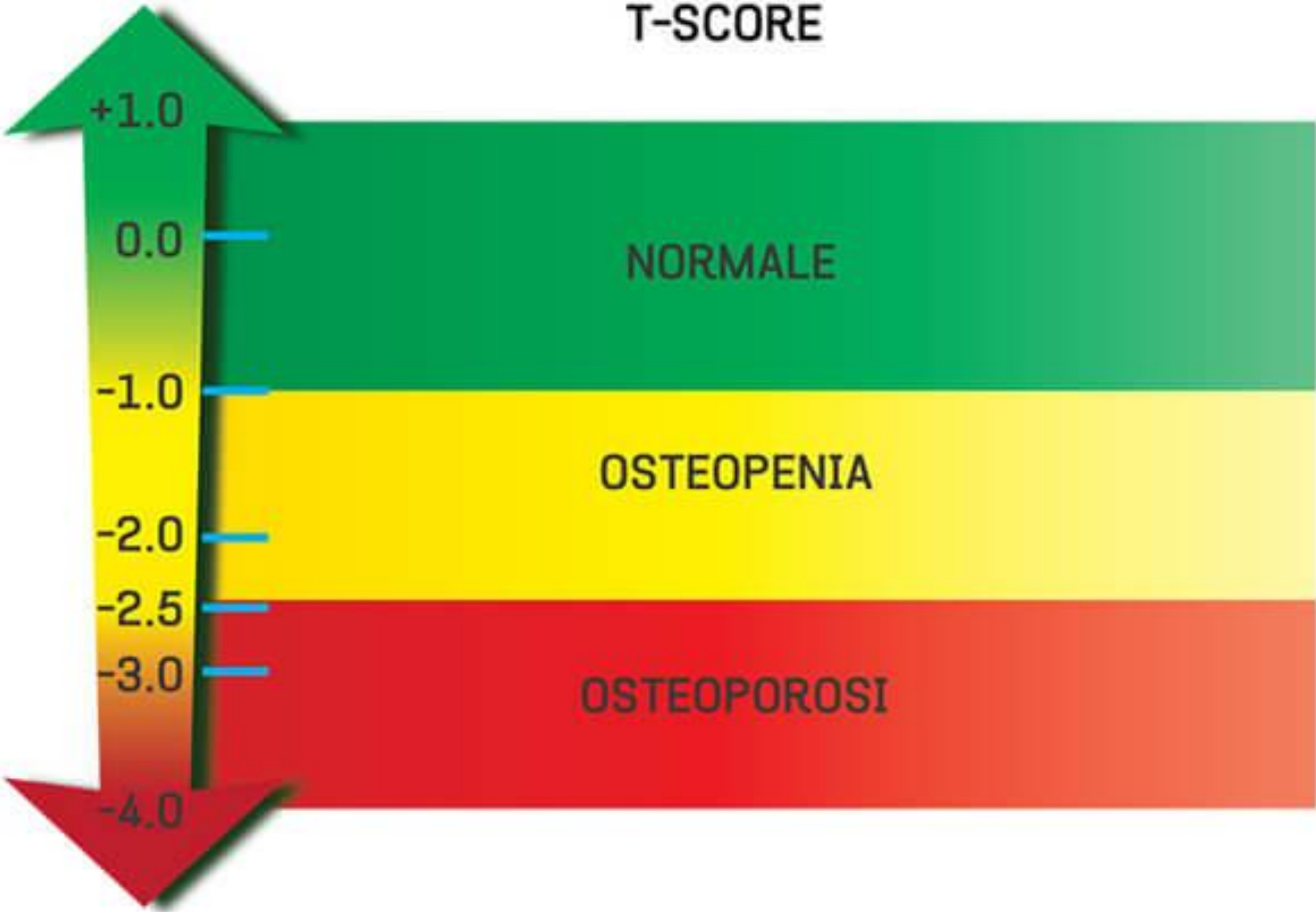
- A score above -1 is considered normal.
- A score between -1 and -2.5 is classified as osteopenia, the first stage of bone loss.
- A score below -2.5 is defined as osteoporosis.
- The T score is used to estimated your risk of developing fracture.

WHO criteria for DEXA diagnosis of osteoporosis

Classification	Score
Normal	BMD within 1 SD of the reference mean , T-score -1.0 or higher
Low bone mass or <u>osteopaenia</u>	BMD between 1 and 2.5 SD of the reference mean, T-score between -1.0 and -2.5
Osteoporosis	BMD more than 2.5 SD of the reference mean , T-score -2.5 or lower



Range of T-Score



Determine Bone Mineral Density (BMD)

2. Z- score

- Shows the amount of bone, compared with other people in same age group of the same size, height and gender.
- Z score mainly to determine risk of having a fracture.
- A low Z score below -2.0 is a warning sign of low bone mass than expected people of same age of 30-year-old man/woman.
- $Z \text{ score} = T\text{-score} - \text{Reference } T\text{-score}$
- Small changes may normally be observed between scans due to differences in positioning and usually are not significant.

DXA Results Summary:

Region	Area (cm ²)	BMC (g)	BMD (g/cm ²)	T - score	PR (%)	Z - score	AM (%)
L1	12.97	10.55	0.814	-1.0	88	-0.9	89
L2	14.64	13.96	0.954	-0.7	93	-0.6	94
L3	16.00	16.92	1.058	-0.2	98	-0.2	98
L4	18.05	18.31	1.015	-0.9	91	-0.8	92
Total	61.65	59.74	0.969	-0.7	93	-0.6	93

Total BMD CV 1.0%

WHO Classification: Normal

Fracture Risk: Not Increased

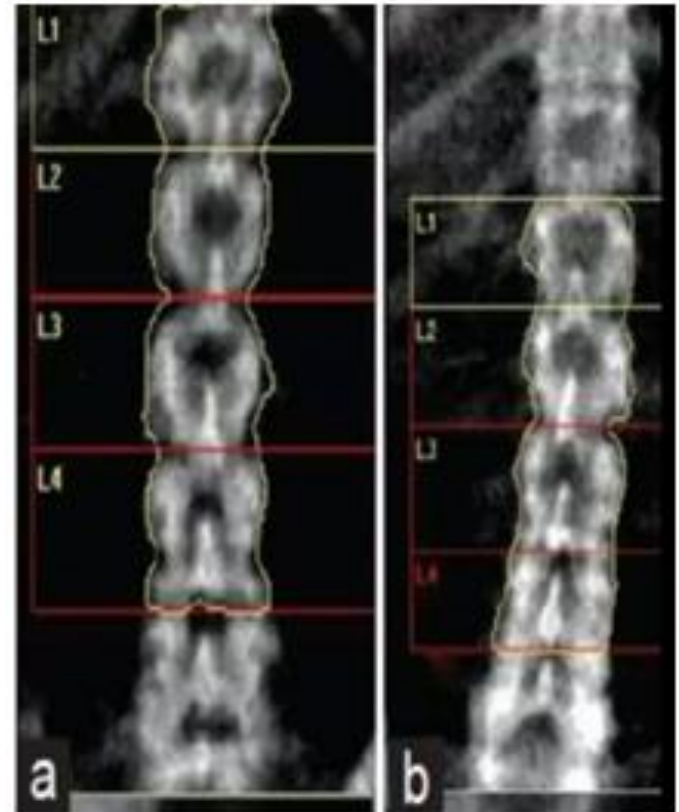
How is the procedure performed?

In the central DXA examination, which measures bone density of the hip and spine, the patient lies on a padded table. An x-ray generator is located below the patient and an imaging device, or detector, is positioned above.



Procedures of Spine examination

- To assess the spine, the patient's legs are supported on a padded box to flatten the pelvis and lower (lumbar) spine.
- The detector is slowly passed over the area, generating images on a computer monitor.



Sample of Results of examination

Name: Express Scans, 2
 Patient ID:
 DOB: August 24, 1944

Sex: Female
 Ethnicity: White

Height: 65.0 in
 Weight: 150.0 lb
 Age: 61

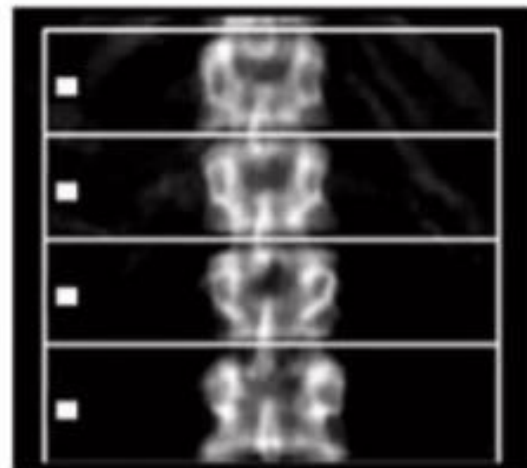


Image not for diagnostic use
 k = 1.128, 40 = 48.0
 118 x 339

Scan Information:

Scan Date: November 12, 2005 ID: A11120501
 Scan Type: x Lumbar Spine
 Analysis: November 12, 2005 09:48 Version 12.4
 Lumbar Spine

Operator:
 Model: Discovery C (S/N 81202)
 Comment:



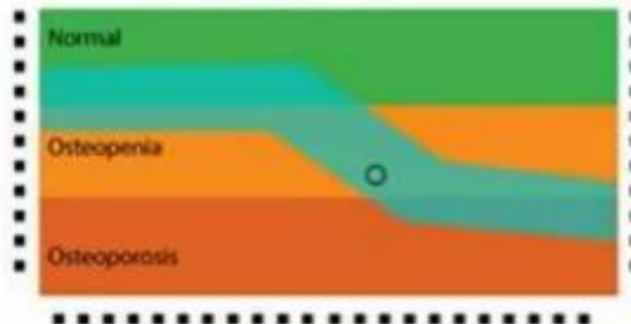
DXA Results Summary:

Region	Area (cm ²)	BMC (g)	BMD (g/cm ³)	T-score	PR (%)	Z-score	AM (%)
L1	14.41	14.44	1.002	0.7	108	2.0	129
L2	15.27	16.23	1.069	0.4	104	1.8	123
L3	16.99	19.69	1.159	0.7	107	2.2	127
L4	18.74	21.27	1.135	0.2	102	1.8	121
L1-L2	29.68	30.77	1.037	0.5	106	1.9	126
L1,L2	31.41	34.13	1.087	0.7	107	2.1	127
L1,L4	33.15	35.71	1.077	0.4	104	1.9	123
L2-L3	32.26	36.01	1.116	0.5	106	2.0	125
L2,L4	34.01	37.59	1.105	0.3	102	1.8	122
L3-L4	35.73	40.95	1.146	0.4	104	2.0	124
L1-L3	46.68	50.46	1.081	0.6	106	2.0	126
L1-L2,L4	48.42	52.03	1.075	0.4	104	1.8	123
L1,L3-L4	50.14	55.40	1.105	0.5	105	2.0	125
L2-L4	51.09	57.28	1.123	0.4	104	1.9	123
L1-L4	65.41	71.72	1.096	0.4	105	1.9	124

Total BMD CV: 1.0%

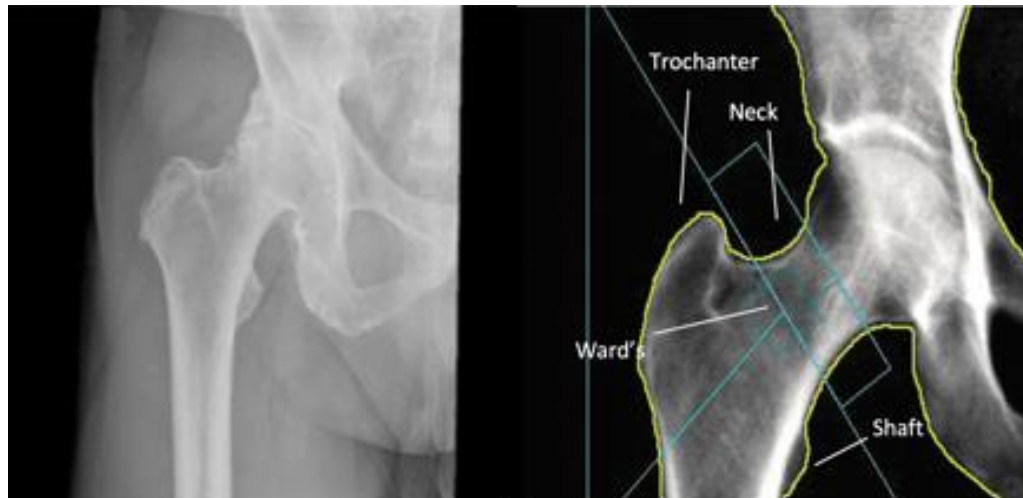
HOLOGIC®

Reference Lumbar Spine L1-L4



Procedures of Hip examination

- To assess the hip, the patient's foot is placed in a brace that rotates the hip inward.
- The detector is slowly passed over the area, generating images on a computer monitor.



Sample of Results of examination

Telephone: 2872-1205

E-Mail: activhp@hku.hk

Fax: 2817-1974

Name: XYZ
Patient ID:
DOB: July 1, 19XX

Sex: Male

Ethnicity: HK

Height: 168.0 cm

Weight: XXX kg

Age: XX

Referring Physician:



Scan Information:

Scan Date: April 23, 201X ID: A0423190A

Scan Type: f Left Hip

Analysis: April 23, 201X12:25 Version 13.6.0.5

Hip

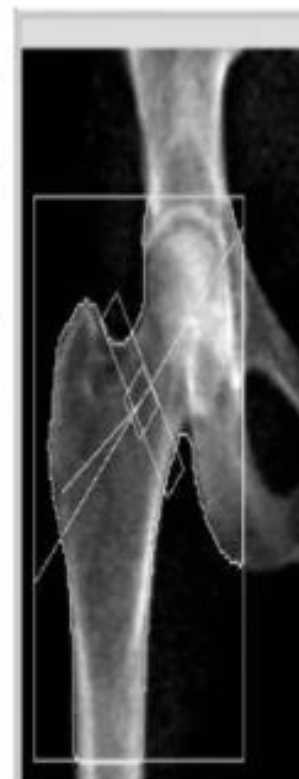
Operator: CW

Model: Horizon A (S/N 301169M)

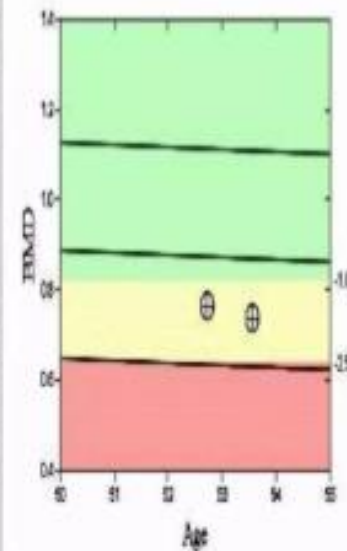
Comment:

DXA Results Summary:

Region	Area (cm ²)	BMC (g)	BMD (g/cm ²)	T-score	Z-score
Neck	5.85	4.39	0.750	-1.3	-1.2
Total	39.91	36.01	0.902	-0.9	-0.8



Total



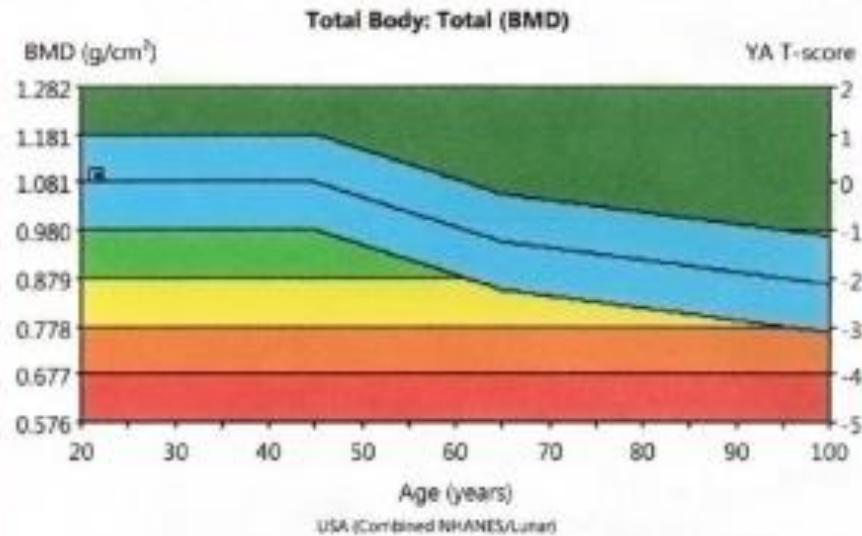
Report for Region: Hip

92 x 116

1000 47 x 10

T-score vs. White Female, Z-score vs. White Female, Same Site BMD/CSP

Sample of Results of the whole body examination

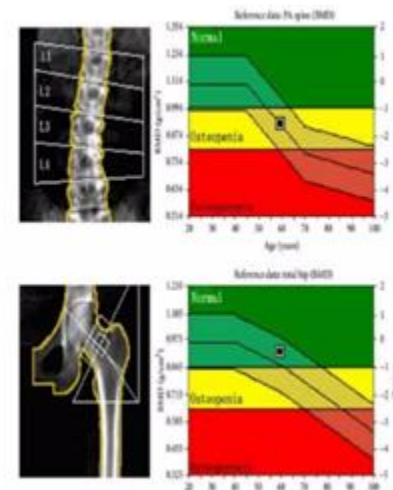


Densitometry: USA (Combined NHANES/Lunar) (Enhanced Analysis)

Region	BMD (g/cm ³)	YA T-score	AM Z-score
Head	2.223	-	-
Arms	0.830	-	-
Legs	1.057	-	-
Trunk	0.880	-	-
Ribs	0.708	-	-
Spine	0.971	-	-
Pelvis	0.970	-	-
Total	1.096	0.2	0.2

What is the benefits of DEXA

- Quick and noninvasive procedure
- Non anesthesia required
- The most accurate method available for the diagnosis of osteoporosis
- Accurately measures the fracture risk less radiation exposure almost 0.001 mSv.



Limitations of a DEXA Scan?

- A DEXA test cannot predict who will experience a fracture but can provide indications of relative risk.
- Despite its effectiveness as a method of measuring bone density, DEXA is of limited use in people with a spinal surgery. The presence of vertebral compression fractures or osteoarthritis may interfere with the accuracy of the test; in such instances, CT scans may be more useful.
- A test done on a peripheral location, such as the wrist, may help predict the risk of fracture in the spine or hip. But because bone mass tends to vary from one location to the other, measuring the wrist is not as accurate as measuring the spine or hip.

To prevent Osteoporosis



1. It is advice to intake sufficient calcium and vitamin.



2. Regular exercise



3. Sun exposure.



4. Reduce consumption of soft drinks (such as Pepsi - Cola)

*Thank you
for
Listening*