Parathyroid glands (3)

Dr. Zaynab Alourfi PhD

أ. م. د. زينب العرفي

يشكو مريض- ٧٨ سنة - من تعب واكتئاب، في سوابقه حادث وعائي دماغي ألزمه المنزل. مخبرياً وظائف الكلية طبيعية، الكالسيوم: ٨،٥ملغ/دل، الألبومين: ٣،٥ غ/دل، الفوسفور ٢،٥ (٢،٥ – ٤،٣ ملغ/دل)، هرمون جارات الدرق ١٤٥ بيكوغرام/مل.

- ما هو التشخيص الأرجح ولماذا؟

A. تخلخل عظام osteoporosis
B. تلين عظام osteomalacia
C. Paraneoplasticsyndrom
D. فرط نشاط جارات درق

- ما هو الاختبار المشخص مما يلي ولماذا؟

- 25-hydroxyvitaminD
- 1,25 hydroxivitamin D3
- Magnisum,
- Sestamibi scan
- Urinary calcium level in 24 h

سيدة ٧٢ سنة لديها ألم أسفل الظهر

Bone mineral density: Spine T score=-1.9, Z score= -2.1

ما هو التشخيص؟

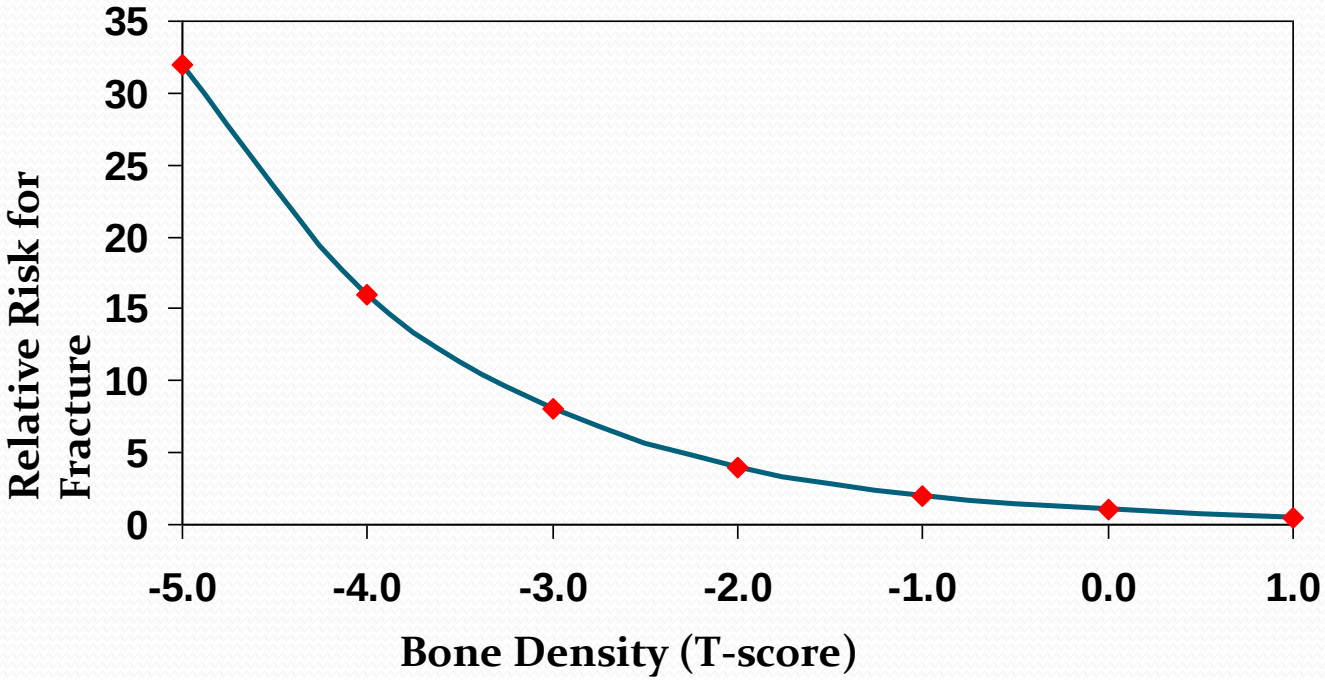
- تخلخل عظام
- تلين عظام
- طبيعية

World Health Organization Definition of Bone Mass-Dual-energy X-ray absoeptiometry (DEXA)	
Normal bone mass	T score > -1
Low bone mass	T score -1 to -2.5
Osteoporosis	T score < -2.5
Established osteoporosis	T score < -2.5 and one or more osteoporotic fractures

Bone Densitometry by Dual-energy X-ray Absorptiometry (DXA)

Why Should We Care?

- 44 million Americans have osteoporosis or low bone mineral density (BMD)
- BMD is a good predictor of future fracture risk



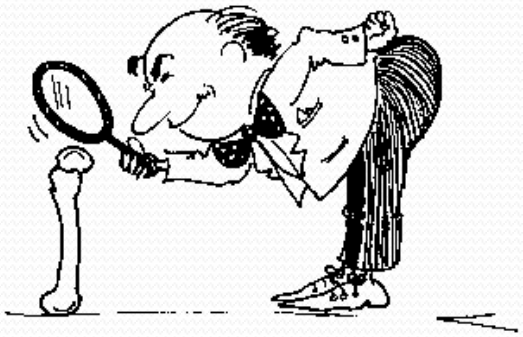
Fracture Risk Doubles With Every SD Decrease in BMD

- Fragility fractures are associated with increased morbidity and mortality
- **Treatments** are effective (**Fracture risk** can be **reduced** by about **50**%)

-Bradford R, DXA scanning to diagnose osteoporosis: Do you know what the results mean? Cleveland clinical journal of medicine volume70 number 4 April 2003
- Johnell O, Kanis JA, Oden A, et al. 2005 Predictive value of BMD for hip and other fractures. J Bone Miner Res 20(7): 1185e1194.
- www.ISCD.org

Bone Density Testing Is Done For Three Reasons

- To diagnose osteoporosis
- To predict fracture risk
- To monitor therapy

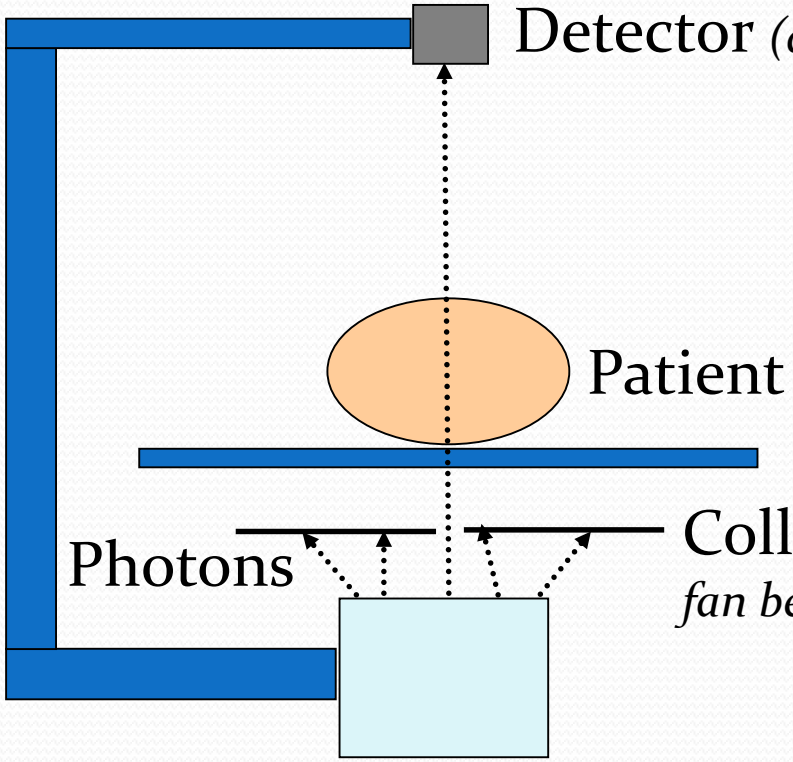


Bone Densitometry

- Non-invasive test for measurement of BMD
- Major technologies
  - Dual-energy X-ray Absorptiometry (DXA) (gold standard)
  - Quantitative Ultrasound (QUS)
  - Quantitative Computerized Tomography (QCT)
- Many manufacturers
- Numerous devices
- Different skeletal sites

DXA Technology

validated & widely accepted



Very low radiation to patient.

Very little scatter radiation to technologist

The spine and the hip are chosen for a number of reasons:

- Easily accessible sites.
- They are direct load bearing sites that are the first to respond to changes in bone density.
- They are the most common sites for osteoporotic fractures.

Indications for Bone Mineral Density (BMD) Testing (Official Positions of the international society for clinical densitometry (ISCD) as updated in August 2013)

1. Women aged 65 and older, Men aged 70 and older
2. Post-menopausal women age < 65 (**Men < 70 years**) if they have a risk factor for low bone mass such as:
   - **Low body weight**
   - **Prior fracture**
   - **High risk medication use**
   - **Disease or condition associated with bone loss.**

3. Women during the menopausal transition with clinical risk factors for fracture.
4. Women discontinuing estrogen therapy
5. Adults with a fragility fracture.
6. Adults with a disease or condition associated with low bone mass or bone loss.
7. Adults taking medications associated with low bone mass or bone loss.
8. Anyone being considered for pharmacologic therapy.
9. Anyone being treated, to monitor treatment effect.
10. Anyone not receiving therapy in whom evidence of bone loss would lead to treatment.

Which Skeletal Sites Should Be Measured?

Every Patient	Some Patients

• Spine
  • L1-L4
• Hip
  • Total Hip
  • Femoral Neck
	• Forearm (33%radius, 1/3 radius)
	  • If hip or spine cannot be measured
	  • Hyperparathyroidism
	  • Very obese

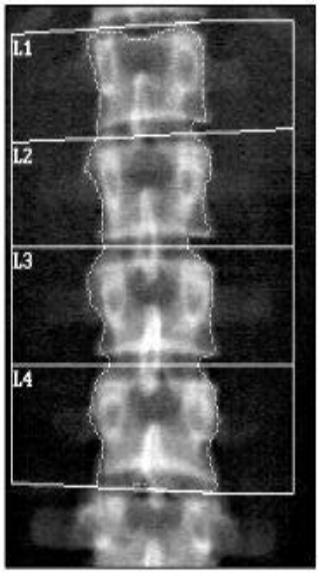
Use lowest T-score of these skeletal sites

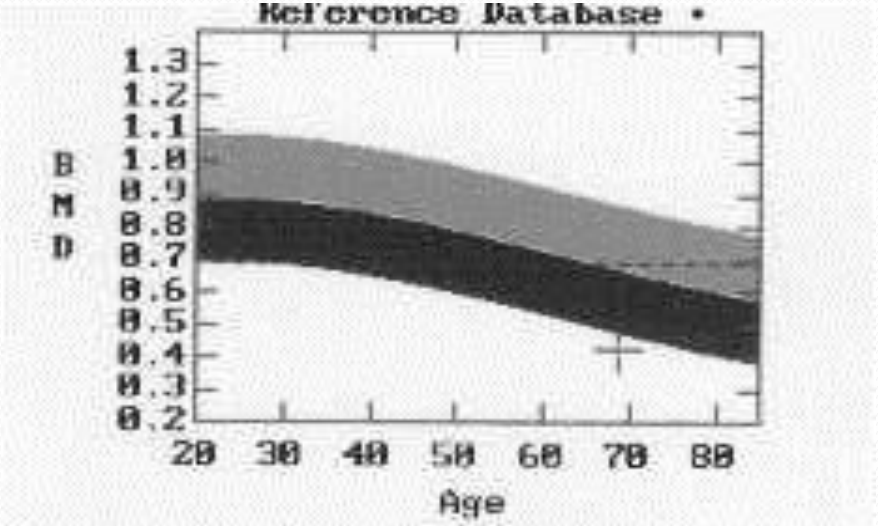
Peripheral BMD Testing

Portable devices that determine BMD at wrist, fingers, or heel.

1. *A "normal" peripheral test does not necessarily mean that the patient does not have osteoporosis.*
2. *WHO criteria do not apply to peripheral BMD testing.*

DXA computational software





BMD(Neck[L]) = 0.420 g/cm^2

Region	BMD	T		Z	
Neck	0.420	-4.74 (22.0)	42%	-2.53	62%
Troch	0.398	-3.60 (30.0)	55%	-2.06	68%
Inter	0.688	-3.28 (29.0)	60%	-1.73	74%
TOTAL	0.588	-3.23 (28.0)	60%	-1.63	75%
Ward's	0.300	-4.51 (28.0)	38%	-1.46	65%

Images are not used for diagnosis

The Key Information On The Report

T Score:

Standard deviations from the young reference mean value

Female, white, age 20-29 years (National Health and Nutrition Examination Survey III (NHANES III) database)

Z-Score:

Standard deviations from the mean of age matched subject (same ethnic background).

Area: The surface area of the area being scanned.

BMD: Bone Mineral Density

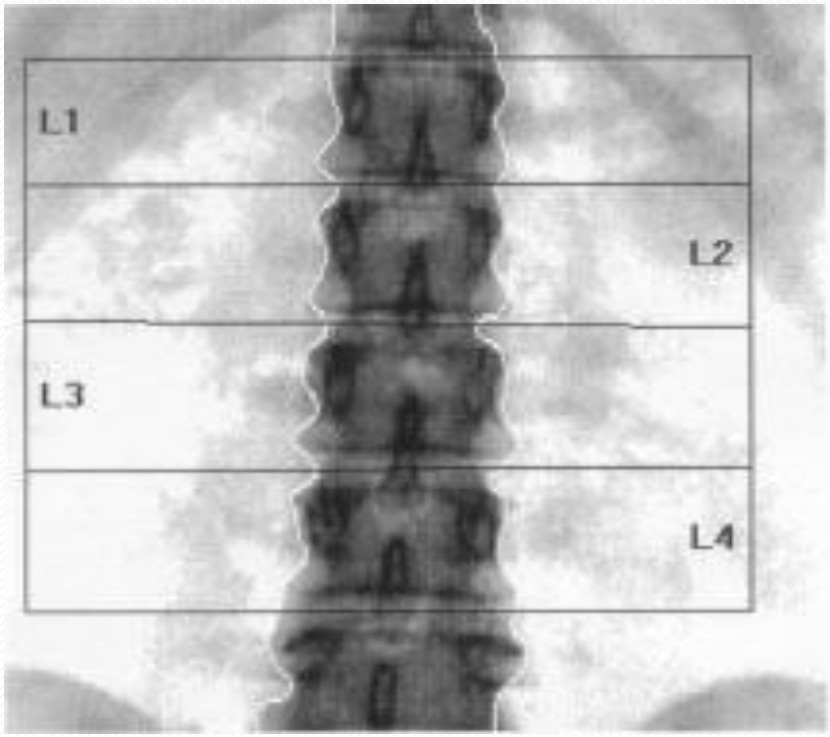
(grams per cm squared.) This is an aerial density as opposed to volumetric due to the fact that the scan is a 2 dimensional scan only.

BMC: Bone Mineral Content = Area * BMD

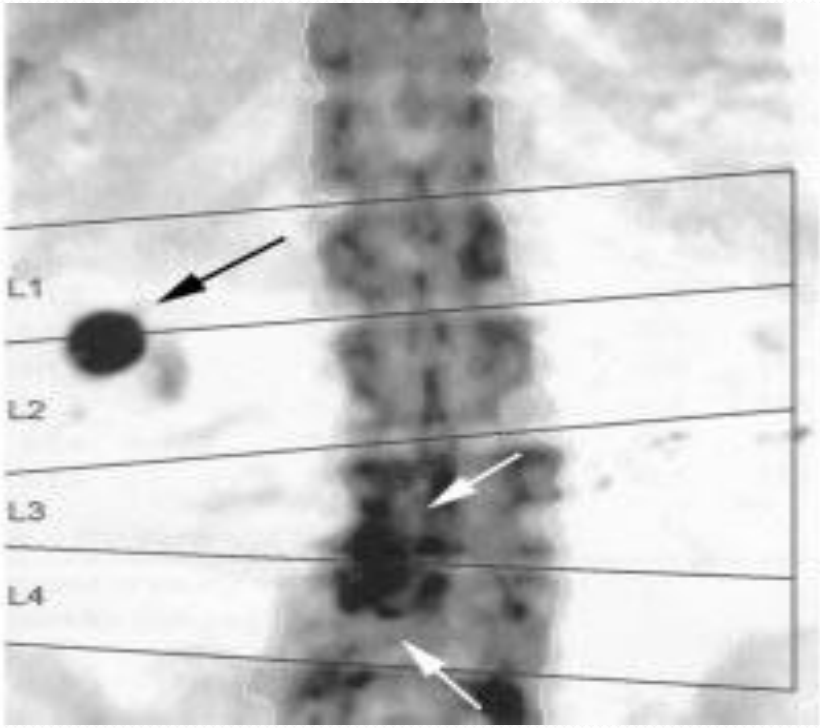
(grams) the weight of bone for the area being scanned.

DXA of the lumbar spine:

Good scan



“Problem” scans



BRADFORD R, DXA scanning to diagnose osteoporosis: Do you know what the results mean? Cleveland clinical journal of medicine volume70 number 4 April 2003

BMD Reporting in Females in Postmenopause and in Males Age 50 and older

- The WHO international reference standard for osteoporosis diagnosis is a T-score of -2.5 or less at the femoral neck.

BMD Reporting in Females Prior to Menopause and in Males Younger Than Age 50

- **Z-scores, not T-scores**, are preferred. This is particularly important in children.
- A Z-score of -2.0 or lower is defined as "below the expected range for age".
- Osteoporosis cannot be diagnosed in men under age 50 on the basis of BMD alone.
- The WHO diagnostic criteria may be applied to women in the menopausal transition.

WHO Diagnostic Classification

Classification	T-score
Normal	-1.0 or greater
Osteopenia	Between -1.0 and -2.5
Osteoporosis	-2.5 or less
Severe Osteoporosis	-2.5 or less and fragility fracture

The term “osteopenia” is retained, but “low bone mass” or “low bone density” is preferred..

Using T-scores vs. Z-scores

T-scores

- WHO diagnositic classification in **postmenopausal women and men age 50 and older**
- WHO classification with T-score cannot be applied to healthy premenopausal women, men under age 50, and children

Z-scores

- For use in reporting BMD in healthy **premenopausal women, men under age 50, and children**
- Z-score -2.0 or less is defined as “below the expected range for age”
- Z-score above -2.0 is “within the expected range for age”

Why Do Serial BMD Testing?

- To determine if treatment is needed
- To monitor response to therapy

When Should Repeat BMD Testing Be Done?

- Intervals between BMD testing should be determined according to each patient's clinical status
  - Consider **one year** after initiation or change of therapy
  - **Longer** intervals once therapeutic effect is established
  - **Shorter** intervals when rapid bone loss is expected

Never Compare T-scores

Always Compare BMD

BMD Values From Different Manufacturers Are Not Comparable

- Different dual energy methods
- Different calibration
- Different detectors
- Different edge detection software
- Different regions of interest

Dual-energy x-ray absorptiometry (DXA)

- “provides useful information about osteoporosis and fracture risk that, combined with other risk factors for osteoporosis, helps guide therapy. However, DXA is **operator-dependent**, making it imperative to refer patients to sites where the operators are experienced in this technology”.

Bradford R, DXA scanning to diagnose osteoporosis: Do you know what the results mean? Cleveland clinic journal of medicine Volume 70 number 4 April 2003 P353 -360

- The **FRAX®** algorithms give the **10-year probability of fracture**. The output is a 10-year probability of hip fracture and the 10-year probability of a major osteoporotic fracture (clinical spine, forearm, hip or shoulder fracture).


شكراً
لإصغائكم