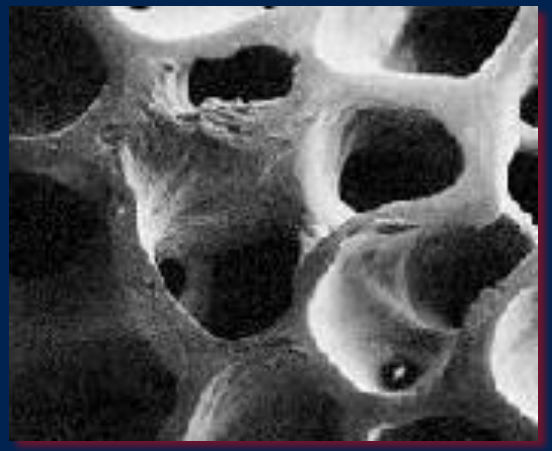
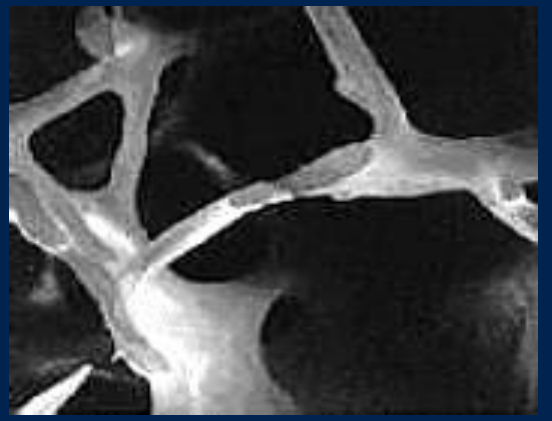
osteoporosis

characterised by reduced bone mineral density (BMD)

increased risk of fracture.





- In normal individuals, bone mass increases during skeletal growth to reach a peak between age 20-40 but falls thereafter.
- There is an accelerated phase of bone loss in women after the menopause.

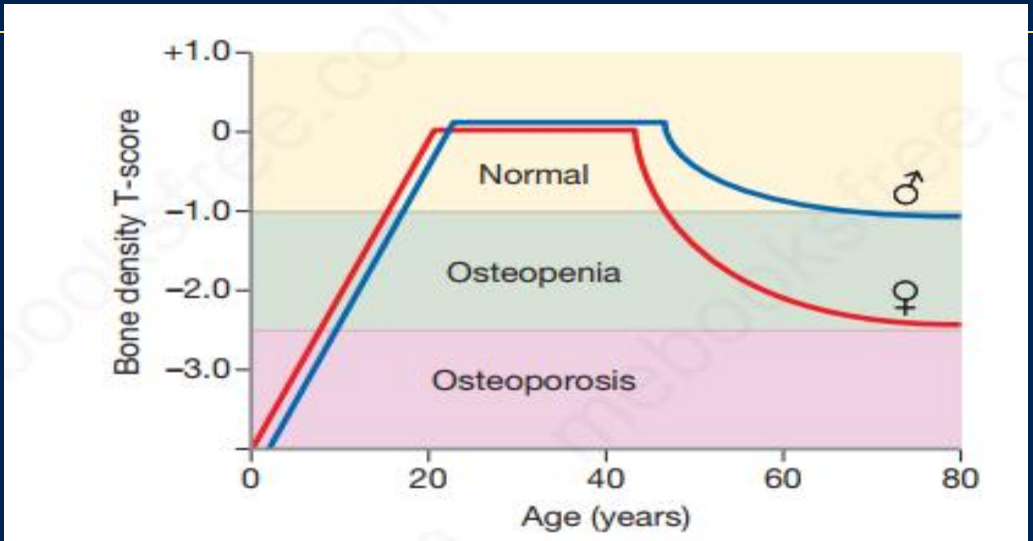


Fig. 24.56 **Changes in bone mass and microstructure with age.**
Changes in men (blue line) and women (red line).

Osteoporosis risk Factors**********

- Increasing age
- Female
- Family history and/or personal history of fractures as an adult
- Caucasian or Asian
- Normal or early menopause
- Inactive lifestyle
- Cigarette smoking
- Inadequate calcium intake.

Drug and Disease Related

- **Endocrine disease:**
  Hypogonadism / Hyperparathyroidism / Hyperthyroidism / Cushing's syndrome
- **Inflammatory disease:**
  Inflammatory bowel disease / Ankylosing spondylitis / Rheumatoid arthritis
- **Drugs :**
  Corticosteroids /Thyroxine over-replacement /Anticonvulsants Heparin
- **Gastrointestinal disease :**
  Malabsorption / Chronic liver disease

Corticosteroid-induced osteoporosis

- related to dose and duration of therapy .
- osteoporosis is less likely to occur in patients who are receiving.

1. inhaled glucocorticoids
2. short-term courses of steroids.
3. prednisolone doses of less than 5 mg daily.

Clinical features

The clinical presentation of osteoporosis is with

- fragility fractures
- back pain.
- height loss and kyphosis.

****many patients are asymptomatic.

Osteoporotic fractures

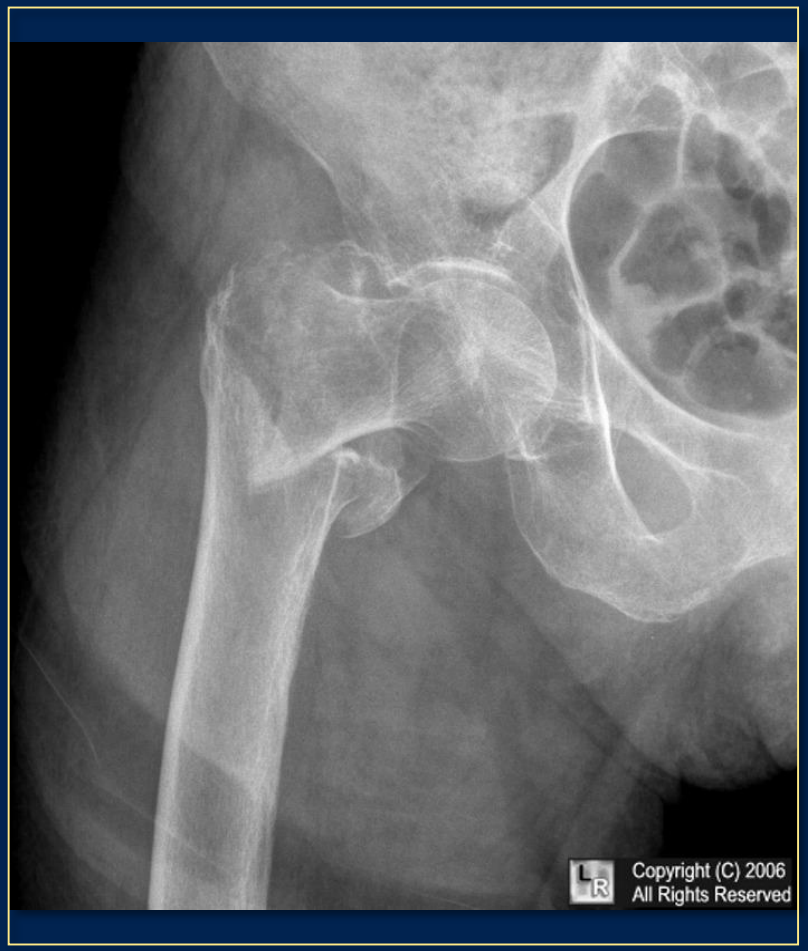
- Osteoporotic fractures can affect virtually any bone, but the most common sites are

1. the forearm (Colles fracture).
2. spine (vertebral fracture)
3. and femur (hip fracture)

Increase risk of

Cole's fracture

Hip fracture



diagnosis

- a history and Physical examination to identify predisposing causes .
- Routine biochemical and haematological screens should include serum calcium and phosphate, thyroid function tests, immunoglobulins and ESR.
- Additional investigations such as serum 25(OH)D and PTH measurement may be required if there is reason to suspect vitamin D deficiency or primary hyperparathyroidism.

How do we confirm diagnosis osteoporosis?

Bone Mineral Density Test (BMD Test)

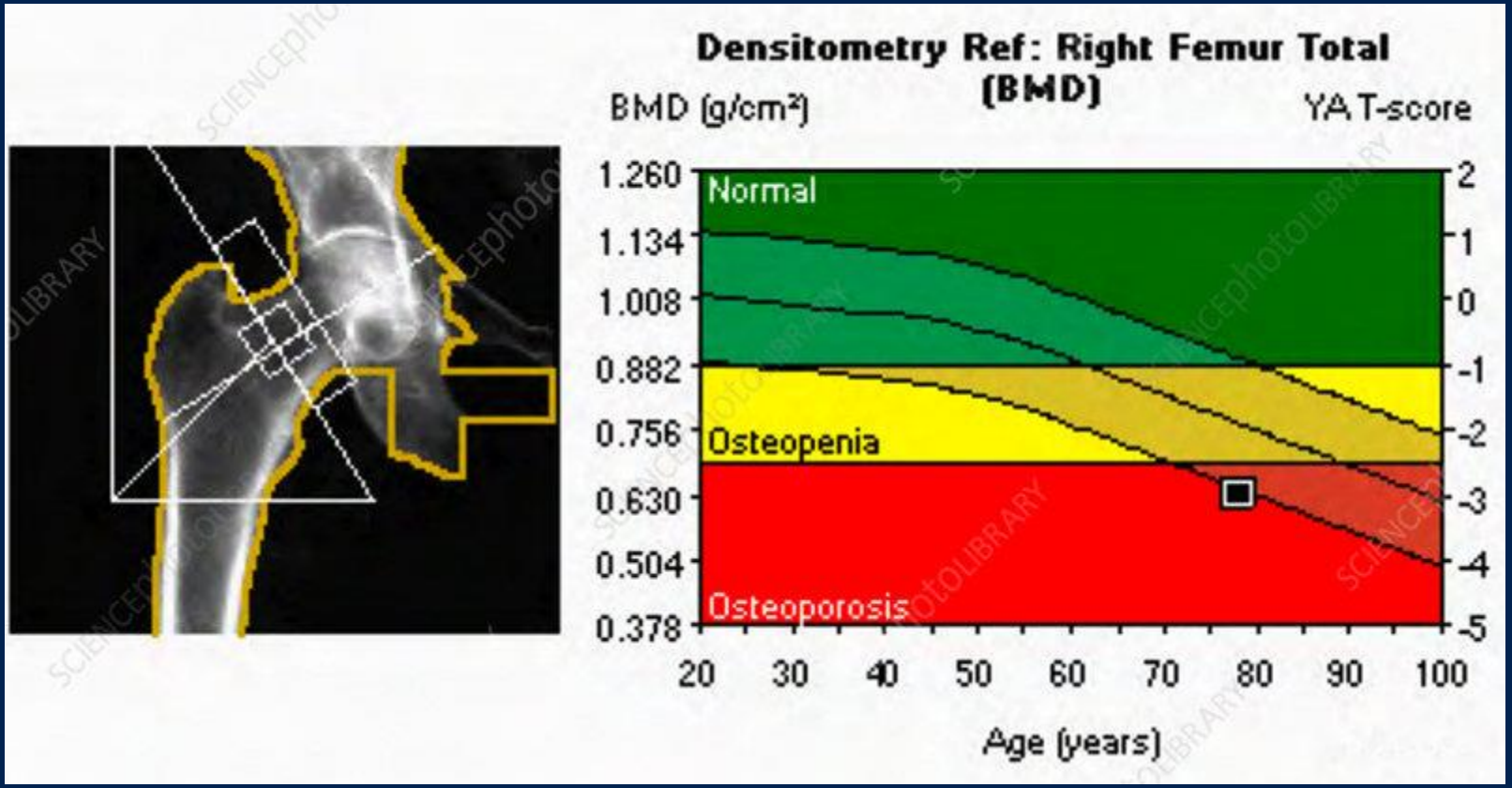
- **Measures bone density at various sites**
- **Helps determine risk for fractures**

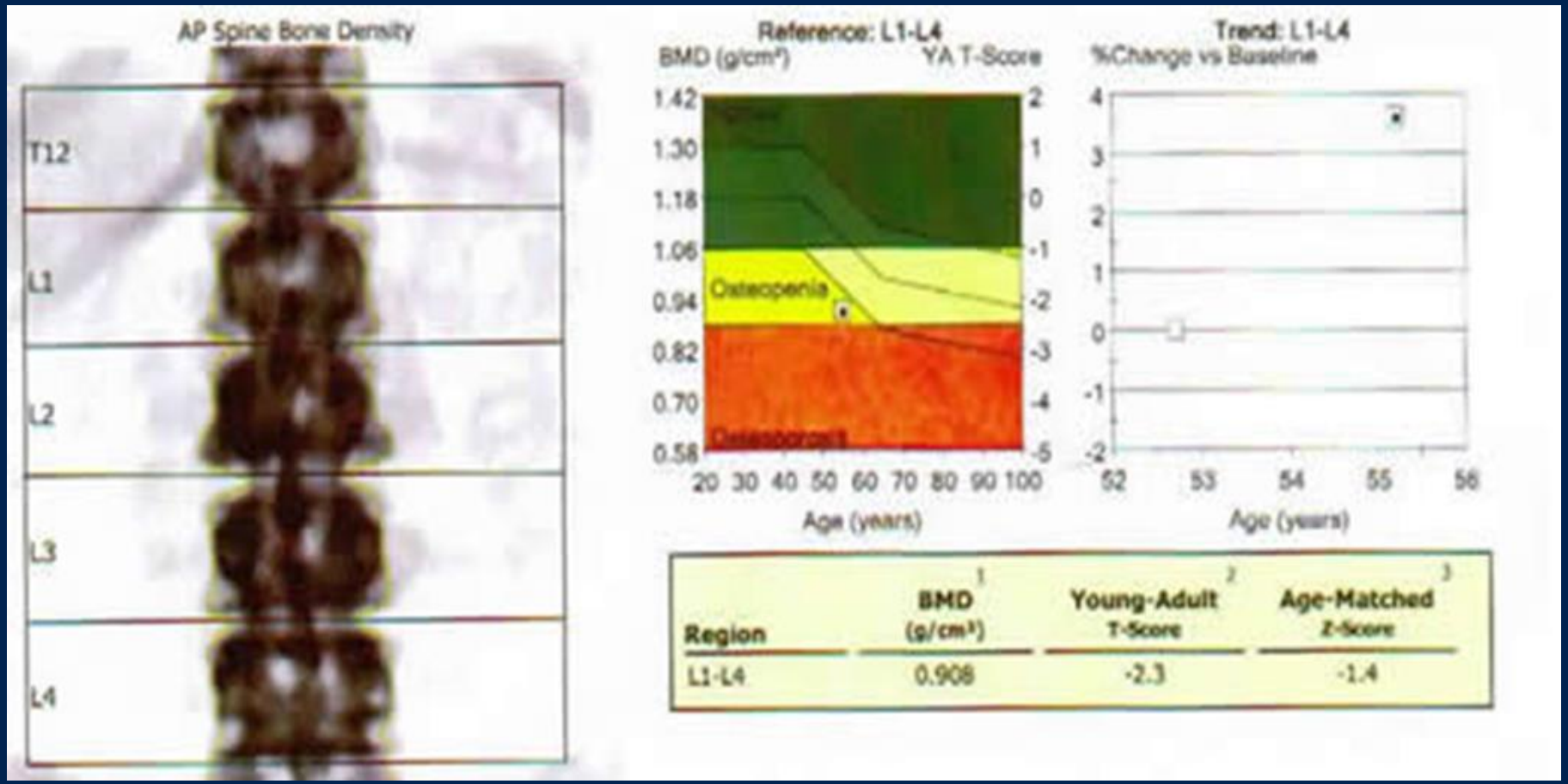
What does a T-Score mean?

	T-score
Normal	Greater than –1.0
Osteopenia (low bone mass)	Between – 1.0 to – 2.5
Osteoporosis	Less than or equal to – 2.5

Bone mass T-score: The standard deviation in a patient's bone mineral density (BMD) compared with the peak bone mass in a young adult of the same gender

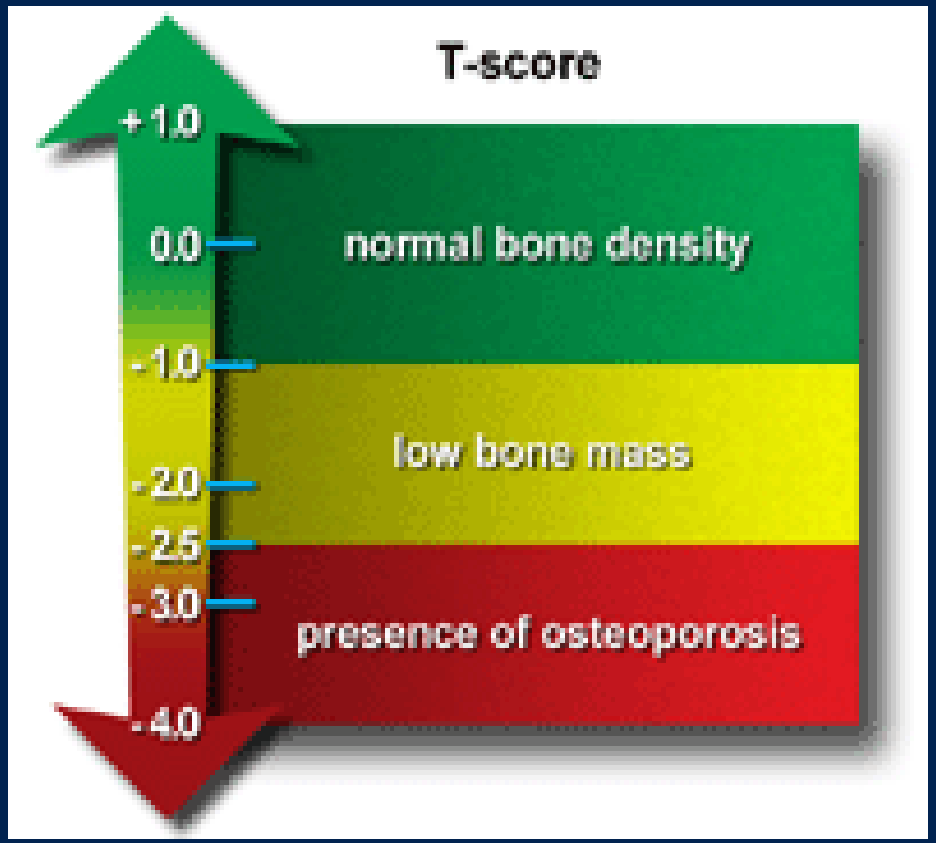
- **DEXA (dual energy x-ray absorptiometry)**
  - **Gold standard**
  - **Measures hip, and spine**
  - **Compares bone density to that of a young adult (T-score)**




AP Spine Bone Density
T12
L1
L2
L3
L4
Reference: L1-L4
BMD (g/cm²)
YA T-Score
1.42
1.30
1.18
1.06
0.94
0.82
0.70
0.58
2
1
0
-1
-2
-3
-4
-5
Osteopenia
Osteoporosis
20 30 40 50 60 70 80 90 100
Age (years)
Trend: L1-L4
%Change vs Baseline
4
3
2
1
0
-1
-2
52 53 54 55 56
Age (years)
Region
BMD [1] (g/cm²)
Young-Adult [2] T-Score
Age-Matched [3] Z-Score
L1-L4
0.908
-2.3
-1.4

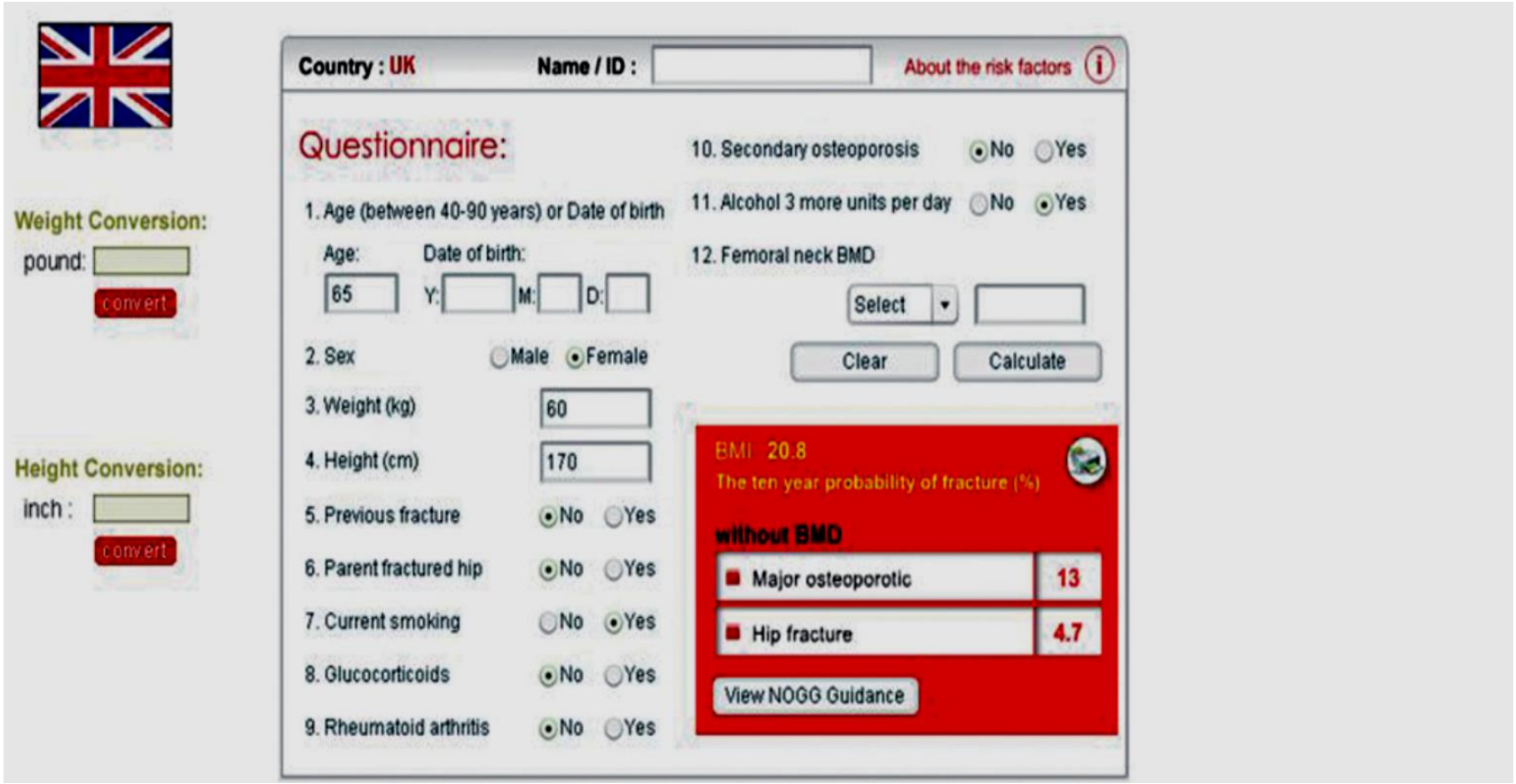
'T-scores' and 'Z-scores'.

- DXA machines give results as 'T-scores' and 'Z-scores'.
- The T-score measures by how many standard deviations the patient's BMD value differs from that of a young healthy control.
- the Z-score measures by how many standard deviations the BMD deviates from that of an aged-matched control).
- Osteoporosis is diagnosed when the T-score value falls to -2.5 or below .
- T-score values that lie between -1.0 and -2.5 are defined as being in the osteopenic range).
- Values of BMD above -1.0 are regarded as normal.


T-score
+1.0
0.0
-1.0
-2.0
-2.5
-3.0
-4.0
normal bone density
low bone mass
presence of osteoporosis

managment

The FRAX(fracture risk assessment score) tool for the assessment of an individual ' s 10 - year probability of fracture



Education

- Maintain bone mass
  - Good nutrition
  - Adequate calcium and Vitamin D
  - Encourage weight bearing exercise
  - Avoid smoking

What Osteoporosis Risk Factors Are Unchangeable?unmodifyable?

- Gender (female)
- Menopausal status
- Family history of fracture
- Caucasian or Asian ancestry
- Small and/or thin frame
- History of fracture

What Osteoporosis Risk Factors Are Changeable?

- Lack of exercise
- Lack of calcium and vitamin D
- Smoking
- Excessive alcohol use

Weight Bearing Exercise

- **Exercise that forces your body to support your full weight.**
- **20-30 minutes at least three times a week**
- ***Examples***
  – Walking– Climbing stairs – Jogging

Prevent Falls

- Maintain good lighting
- Have vision checked
- Use sturdy step-stools
- Do not carry heavy things
- Keep clutter off stairs and floors
- Get rid of loose rugs and furniture
- Wear shoes with low heels and non-skid soles
- Rise slowly from sitting to standing
- Use walking help if needed (cane, walker)

How Much Calcium is Enough?

1,500 mg every day after age 50

Good Sources of Calcium

- **Milk-300 mg/glass (4 glasses per day)**
- **Yogurt-400 mg/cup (3 cups per day)**
- **Broccoli-172 mg/cup (7+ cups per day)**

Sources of Calcium

FOOD	SERVING SIZE	CALCIUM(mg)
MILK - WHOLE	**1 GLASS (190ML)**	225
MILK - SEMI-SKIMMED	**1 GLASS (190ML)**	231
MILK - SKIMMED	**1 GLASS (190ML)**	236
YOGHURT	**1 POT (150g)**	225
CHEDDAR CHEESE	**S MALL PIECE (30g)**	216
COTTEGE CHEESE	**2 TABLESPOONS**	58
ICE-CREAM	**2 SCOOPS**	156
SARD DIINES (with bones)	**2 CANNED**	230
ORANGE	**1 MEDIUM**	75
WHITE BREAD	**2 SLICES**	72
BAKED BEANS	**3 TABLESPOONS**	64

How Much Vitamin D Should I Get?

- 800 IU every day
- From fortified foods or supplements or both

<u>Good sources of Vitamin D</u>

- Milk (100 IU per glass)
- Supplements with calcium (most have 400 IU)

Table. Pharmacological Therapies for Osteoporosis

Agent	Route and Frequency of Administration	BMD Response		Fracture Risk Reduction in Postmenopausal Osteoporosis		
		Spine	Hip	Spine	Hip	Nonvertebral
Alendronate	PO, daily or weekly	+++	++	+	+	+
Ibandronate	PO, daily or monthly; IV infusion, q3mo	+++	++	+		
Risedronate	PO, daily or weekly	+++	++	+	+	+
Zoledronic acid	IV, yearly	+++	++	+	+	+
Calcitonin	Intranasal spray, daily			+		
Estrogen/hormone replacement	PO, daily; transdermal patch, twice weekly	+++	++	+	+	+
Raloxifene	PO, daily	++	+	+		
Teriparatide	SC injection, daily	++++	+	+		+

BMD, bone mineral density; +, modest response; ++, moderate response; +++, good response; ++++, very good response.

Alendronate (Fosamax), Risedronate (Actonel) inhibit osteoclast function ******

Estrogen Replacement Therapy (ERT)

- **Indication: prevent and treat osteoporosis**
  Mechanism: Decreases osteoclast activity
  - **Increased risk of thromboembolic events and IHD**
  - **Possible increased risk of breast cancer**

Selective Estrogen Receptor Modulators (SERMs)

- Indication: Treatment and prevention of osteoporosis
- Mechanism: Decreases bone resorption
- Dose: Raloxifene (Evista) 60mg qd
  - Increased risk of thromboembolic events
  - Doesn’t treat post-menopausal sx
  - May increase hot flashes.

- **Calcitonin:** approved for Rx .

- **Recombinant human parathyroid hormone** peptide1–34 (teriparatide) and recombinant human parathyroid hormone 1–84 are anabolic agents that stimulate bone formation

- **Denosumab** is a fully human monoclonal antibody to RANKL. It is administered as a single subcutaneous injection every 6 months. Denosumab is an antiresorptive

Name the abnormality?
Mention diagnostic test?
Outline non pharmacological rx?
Three therapeutic intervention?



Paget’s Disease (Osteitis Deformans)

- Paget's disease is a chronic bone disorder.
- Excess of bone destruction & unorganized bone formation and repair.
- The etiology is unknown
- Usually affects the axial skeleton, vertebrae and skull, the pelvis, tibia, femur are the other common sites of disease.
- Most persons are asymptomatic.

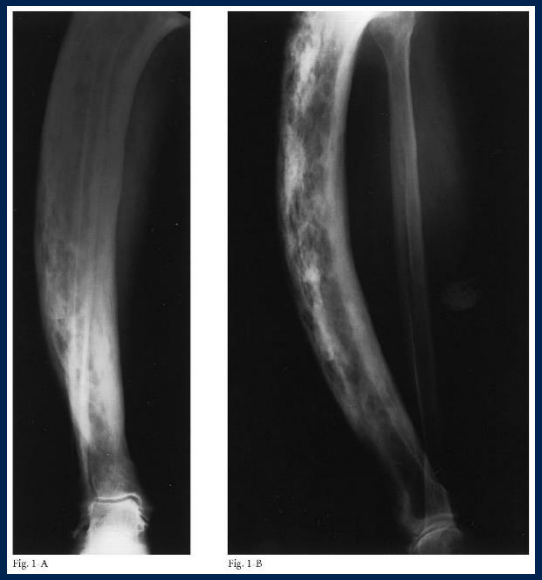
Pagets disease

Paget's Disease (Osteitis Deformans)

- Vascularity is increased in affected portions of the skeleton.
- Deformities & bony enlargement often occur. Bowing of the limbs & spinal curvature in persons with advanced disease.
- Bone pain- is the most common symptom. Involved bones may feel warm because of increased vascularity.
- Skull pain is usually accompanied with headache, warmth, tenderness & enlargement of the head.

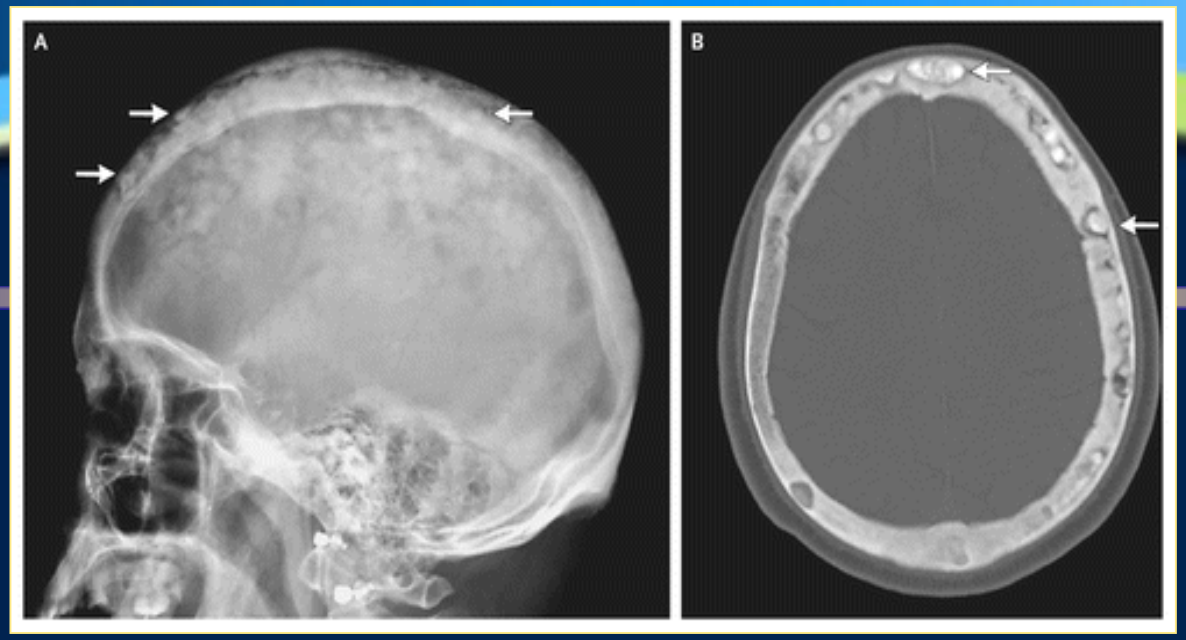
Paget's Disease (Osteitis Deformans

- Alkaline phosphatase levels- markedly elevated as the result of osteoblast activity.
- Pathologic fractures.
- High output heart failure.
- Increse risk of bone tumors.
- neural decompression nerve deafness.
- Radiograph reveals radiolucent areas in the bone, typical of increased bone resorption. Deformities & fractures may also be present.



Goals of the treatment- Paget's Disease (Osteitis Deformans)

- suppress osteoclastic activity by . Bisphosphonates & calcitonin are used to decrease bone pain and relieve neural decompression.
- Use of analgesics & NSAIDs. Assistive devices, including cane, walker.
- Surgery for # and deformity.



A 63-year-old man presented with a long-standing history of sinusitis and 3 weeks of frontal headache. The physical examination was unremarkable. The alkaline phosphatase level was elevated at 434 IU per liter (upper limit of the normal range, 129). The serum calcium level was within normal limits. Radiography of the skull (Panel A) showed thickening of the outer and inner tables of the cranial bones, widening of the diploë, and a “cotton wool” appearance caused by irregular areas of sclerosis (arrows). Computed tomography of the skull (Panel B) confirmed bony expansion, cortical bone thickening, and irregular areas of sclerosis (arrows). These imaging findings reflect the mixed osteolytic and osteoblastic phases of Paget's disease, resulting in accelerated bone turnover with bone deposition and expansion. The patient was treated with alendronate, which resulted in improvement in frontal headache.

thank
you