Points

- Osteoporosis is a common problem and occurs in post-menopausal women, elderly individuals and those on steroids

- It is characterized mainly by the presence of low bone mass

- Bone densitometry techniques can quantify this low bone mass, DXA being the gold standard

- A T-score of less than 2.5 is considered suggestive of osteoporosis

Osteoporosis

Osteoporosis is defined as a "systemic skeletal disease, characterized by low bone mass and microarchitectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture."

This definition has two components:

1.Qualitative bone abnormality; this currently is difficult to analyze

2.Quantitative bone loss; this can be analyzed using bone densitometry techniques

Osteoporosis is important because the presence of low bone mass directly correlates with an increased risk of fracture. The common fractures that occur are vertebral body, femoral neck and distal radius (Colles'). Vertebral body and femoral neck fractures are extremely disabling and survival rates after femoral neck fractures are poor.

Osteoporosis can be controlled and even reversed with appropriate medication (Ca, vitamin D, bisphosphonates, etc.) and life-style changes (diet, exercise). However, the aggressiveness of treatment often depends on the extent of osteoporosis and the presence of concomitant risk factors. The extent of bone loss is best diagnosed using bone densitometry techniques.

Osteoporosis is extremely common in the following populations:

1.Post-menopausal women

2.Patients on steroids

3.Patients with metabolic bone diseases

The diagnosis of osteoporosis can be done by the following means

1.Plain radiographs - insensitive. Osteoporosis is only diagnosable after approximately 40% of bone loss.

2.Bone densitometry techniques

a.Single photon absorptiometry (SPA) no longer available

b.Quantitative CT (QCT) suffers from lack of standardization

c.Ultrasound has advantages of being cheap, quick and portable, but suffers from lack of sensitivity and specificity

d.Dual X-ray absorptiometry (DXA) the gold standard (Fig. 1).

Fig. 1

Fig 1 : A typical DXA scanner

*The online version is up at **http://www.jankharia.com/innerspaces/current.htm***

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DXA

This technique uses two X-ray beams that pass almost simultaneously through bone. The difference in attenuation between the two beams gives us the bone density in gms/sq cm. The DXA scan is usually performed in the spine (Fig. 2), both hips and both wrists.

These bone densities are then plotted against a normal database, to give us the standard deviation from normal, i.e. the T-score (Fig. 2), which is the bone density of the patient compared to young, healthy adults of the same sex.

For post-menopausal women, the T-score values are classified as follows

1 to 0	Normal
0 to -1	Normal
-1 to -2.5	Ostopenia
less than -2.5 (eg.: -3.0, -4.5, etc)	Osteoporosis

The T-scores help in the planning of treatment protocols and in estimating the fracture risk (Fig. 3). Comparison of T-scores on follow-up DXA scans, helps in determining response to therapeutic measures.

DXA scans can also be used to measure the body fat composition and the lean mass, which helps in nutritional planning and control.
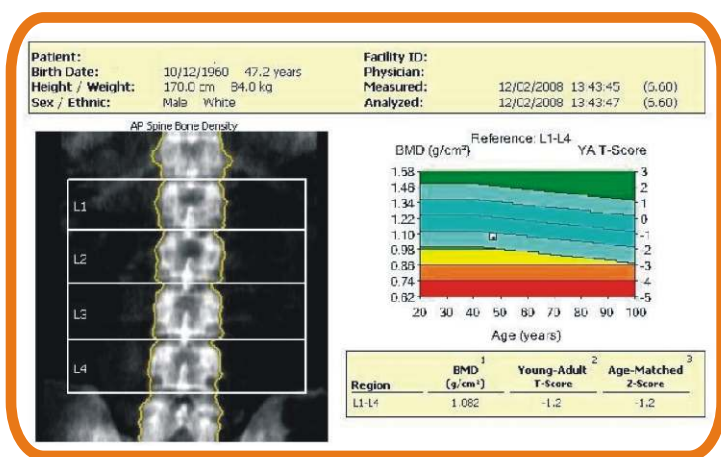

Fig. 2

Fig 2 : DXA of the spine. The bone densities from L1 to L4 are calculated and then summated. The average bone density in gms/sq. cm. is then plotted against a normal database to give the T-score
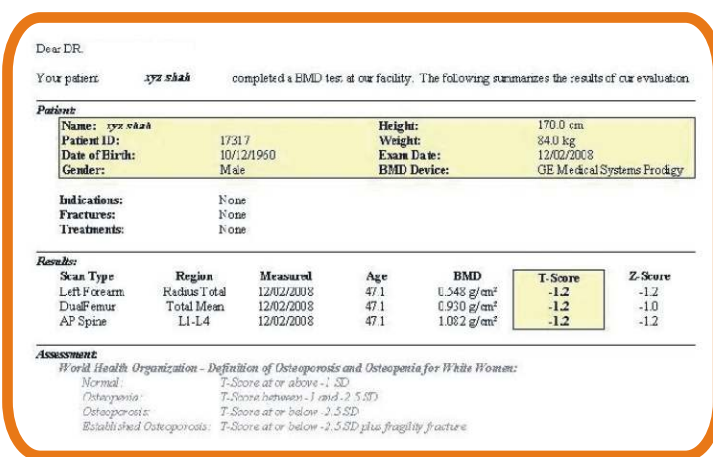

Fig. 3

Fig 3 : Typical report. The bone densities of L1 to L4, both femoral necks and the left distal radius are computed, along with the T-scores and an estimation of fracture risk is made.

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