Osteoporosis

WHO definition - bone mineral density 2.5 or more standard deviations below normal peak bone mass—that is, a T score –2.5.
Based on bone mineral density in the spine and proximal femur measured with dual energy x ray absorptiometry (DXA).

Burden of osteoporosis:

-120 hip #s per 100,000 population (UK)

- £ 25,000 cost to health service per hip # (UK).
- Mortality 25 % at 1 year & cumulative survival rates < 50% over age 75.
- only 60% survivors regain their premorbid walking ability.
- Unquantifiable pain and disability from all #s.

Risk factors for osteoporosis

Independent of bone mineral density

Age
Previous fragility fracture
Maternal history of hip fracture
Oral glucocorticoid therapy
Current smoking
Alcohol intake 3 units/day
Rheumatoid arthritis
Body mass index $\leq$ 19
Falls

Depending on bone mineral density

Untreated hypogonadism
Malabsorption
Endocrine disease ▲T4 ▲PTH
Chronic renal disease
Chronic liver disease
Chronic obstructive pulmonary disease
Immobility
Drugs (aromatase inhibitors, androgen deprivation therapy)

Medications that can cause/worsen low BMD
Alcohol (>2 drinks/d)
Anticonvulsants
Corticosteroids
Heparin
Lithium
Nicotine (ie, smoking)
Phenytoin
Thyroxine (if overreplaced or in suppressive dosage)

Assessment:

History; Falls ?
Fragility Fracture e.g colles
Loss of height e.g. vertebral #

Medication use e.g. steroids
Parity & age of menopause
Smoking Hx
Maternal # history
 Dietary ? coeliac ? vegan

Examination:

*Appearance: ?Thin ? kyphosis ?
 ? wrist deformity
 ? cushingoid
*Weight / Height
 BMI = weight(**Kg)**/height (**m**) ^{2}
* Clinical Thyroid Status

Laboratory: -FBC, ESR, U&E, LFTs
 - $Ca^{++}/PO_4^{=}$, Alk phos
 - TSH/T4, PTH, (Vit D?)
 - Tissue transGlutaminase (TTG)
 - Testosterone (male cases)
 - Myeloma screen (if multiple #s)
 - Bone markers
 Resorption e.g urinary NTX excretion
 formation: e.g. serum osteocalcin

Radiological:
 - Plain x-Ray thoraco-lumbar spine
 - Dual emission Xray absorption (DeXA)
 @ femoral neck
 @ lumbar spine
NB # lumbar vertebra can give false high T scores due to "compression effect" – must be compared with plain image.

Treatment

Non-pharmacological measures
Falls prevention to reduce fracture risk.

Lifestyle measures; adequate dietary calcium intake; exercise; stop smoking and avoid excess alcohol.

Pharmacological interventions

Calcium and vitamin D:
- Many older people have a real deficiency of Vitamin D
- should be prescribed with all other treatments for osteoporosis.
- also improves muscle strength and may help prevent falls.
- Where patients have significant renal disease 'activated' vitamin D needs to be used with careful monitoring of calcium.

Bisphosphonates
-Action: Inhibit bone resorption by osteoclast inhibition. Good evidence for reduction in Hip and Vertebral #.

Preparations: Daily /weekly Alendronate, Risedronate , monthly Ibandronate or ? yearly Zolendronic acid Generally well tolerated but may be associated with upper gastrointestinal side effects. Osteonecrosis of jaw is a rare but potentially serious side effect.

Strontium Ranelate

Action: dual effect "uncoupling"
     Inhibits resorption
      Promotes formation

Reduces vertebral and non-vertebral fractures in postmenopausal women with osteoporosis; an alternative front line option to bisphosphonate where these drugs are contraindicated (oesophageal disease) or are not tolerated. Adverse events are generally mild and include diarrhoea and headache.

Like Bisphoshponates not recommended in severe renal (GFR < 30 mls/min) .

Parathyroid hormone peptides

Action: 'Anabolic' stimulator of osteoblast formation.

Teriparatide (recombinant 1-34 parathyroid hormone), given as a subcutaneous daily injection (needs visual and dexterity skills if unaided) reduces vertebral and non-vertebral fractures in postmenopausal women with osteoporosis; reserved for patients with severe osteoporosis who are unable to tolerate or seem to be unresponsive to other treatments.
Ca^{++} needs monitoring.

* also can have an effective analgesia effect in cases of acute lumbar #.

Selective Estrogen Receptor Modulators (SERMS)
e.g *raloxifene* has been shown to reduce verterbral # by 40 % in post-menopausal women but its' benefit

in preventing long bone #s is not proven.

Hormone Replacement Therapy (HRT)
Improves bone mineral density and menopausal symptoms but has not been shown to prevent long bone fractures (#). **Concerns over cardiovascular risk and no longer recommended for osteoporosis treatment**

Radiological Treatments:

Verterbroplasty – 'cement' injection into 'collapsed' vertebra under radiological screening.

The procedure is often accompanied by **kyphoplasty** whereby inflatable bone tamps are introduced into the collapsed vertebra to elevate the end-plates before fixation. Can help reduce pain and restore vertebral height.

References

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