Osteoporosis

Unit: Understanding medical conditions for exercise referral

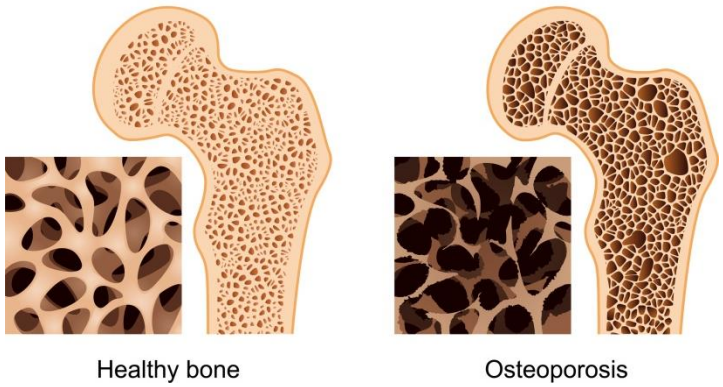
Osteoporosis

Characterised by:

- progressive deterioration of bone tissue
- low bone mass
- bone fragility
- an increased risk of fracture

Fractures can occur at any site, classical sites are the:

- hip (proximal femur)
- wrist (distal radius)
- thoracic and lumbar spine



Classification

May be classified as:

- **Primary type 1**
  - postmenopausal osteoporosis.
  - most common in women after menopause
- **Primary type 2**
  - senile osteoporosis.
  - occurs after age 75
  - is seen in both females and males at a ratio of 2:1
- **Secondary osteoporosis**
  - may arise at any age
  - affects men and women equally
  - results from chronic predisposing medical problems or disease
  - prolonged use of medications, such as glucocorticoids.

Prevalence

In the UK

- 1 in 2 women and 1 in 5 men will suffer a fracture after the age of 50
- Around 76,000 hip fractures occur each year in the UK (**National Hip Fracture Database Annual Report 2018)**
- Worldwide
- an osteoporotic fracture is estimated to occur every 3 seconds
- a vertebral fracture every 22 seconds
- estimated to affect 200 million women globally

Cost to the nation

- Annual cost in the UK of treating osteoporotic fractures
  - £1.7 billion +
- The cost of treating all osteoporotic fractures in postmenopausal women
  - predicted to increase to more than £2 billion by 2020
- Hip fracture patients
  - 50% no longer able to live independently
  - 20% die within 6 months

Pathology

The underlying mechanism in all cases of osteoporosis is:

- an imbalance between bone resorption and bone deposition
- resorption exceeds deposition

The three main mechanisms by which osteoporosis develops are:

1. inadequate peak bone mass (the skeleton develops insufficient mass and strength during growth)
2. excessive bone resorption
3. inadequate formation of new bone during remodelling

Presentation

- Develops slowly over several years without any visible signs or symptoms
- After a certain amount of bone loss, the following may occur:
  - bone fracture after a minor injury such as a fall (fragility fracture)
  - loss of height, persistent back pain and a stooping (bent forward) posture

Risk factors

- Gender
- Older age
- Ethnicity
- Family history
- Physical inactivity
- Low BMI and low body weight
- Low oestrogen levels in women
- Low sex hormones
- Smoking and alcohol

Part two

ACCEPTED TREATMENTS

Pharmacological intervention

- Several medications
- Generally classified as anti-resorptive or bone anabolic agents
- Analgesics and anti-inflammatory drugs may be prescribed for pain relief associated with fractures

Common medications

- Bisphosphonates
- Strontium ranelate
- Selective Oestrogen Receptor Modulators
- Parathyroid hormone peptide drugs
- Calcitonin
- Hormone Replacement Therapy (HRT)

Side effects may include

Bisphosphonates, Strontium ranelate, Calcitonin

- nausea, diarrhoea

Selective Oestrogen Receptor Modulators

- risk of thrombo-embolic disease in those at high risk.

Parathyroid hormone peptide drugs

- dizziness, tachycardia

Hormone Replacement Therapy (HRT)

- Breast pain and swelling, swelling of the legs and feet
- rapid weight gain
- risk of breast cancer, thrombo-embolic disease, heart disease/ stroke.

Lifestyle interventions

Lifestyle prevention aims to address modifiable risk factors:

- smoking cessation
- reduced alcohol intake
- diet sufficient in calcium and vitamin D
  - at-risk patients may require additional supplementation
- activity

Part three

EXERCISE GUIDELINES AND CONSIDERATIONS

Rationale for exercise

- Force of muscles pulling against bones stimulates bone building process

- Any exercise that places force on a bone will strengthen that bone
  - regular resistance exercises
  - Weight-bearing exercise

- Exercise may help:
  - build and maintain bone density
  - stimulate bone formation
  - help retention of calcium in the bones that are bearing the load

Exercise recommendations

Mode of exercise	FIT principles
Aerobic	• 40%-70% maximum heart rate • 30-60 mins per session, 3-5 days per week • Emphasize progression of intensity and duration
Resistance	• 75% 1RM, 2-3 sets of 8-12 reps, 2-3 days/week • 20-40 mins per session • Emphasis on hip/knee/back extensors, lower abdominals, and ankle dorsiflexors • Emphasise progression of intensity as tolerated (higher loads, fewer reps)
Functional training	• 3-5 days/week • Focus on quality of movement • Increase duration/intensity as required (as quality improves)
Flexibility	• 5-7 days/week. Perform before/after aerobic/strength exercises • Static stretches hold for 10-30 secs as tolerated • Active/dynamic stretching also OK, providing no limitations in mobility
Neuromuscular	• 2-3x/week, or incorporated within a general exercise programme

Exercise considerations

- A well-balanced programme
- Both aerobic and resistance training exercises for individuals with low bone mass and osteoporosis
- Consider progression of condition
- May need to signpost to specialist level 4 falls prevention

Other considerations

- Include specific functional exercises
  - improve balance and co-ordination
  - modification of activities of daily living (ADL)
- Target potential fracture sites
  - wrist, spine and hip
  - bone adaptation through exercise is site-specific
- Include weight-bearing exercises
  - upper body, trunk and lower body
  - particularly the extensor muscle groups
- If weight-bearing exercise is not possible
  - Chair-based or water-based alternatives
  - non/partial weight-bearing, so less effective at building bone density

Other considerations

Activities that may increase falls and fracture risk for higher risk include:

- Choreography (e.g. crossing legs)
- High impact
- Regular flexion exercises (crunches or sit-ups)
  - may increase the risk of vertebral fractures in individuals with established osteoporosis
- Prone and supine lying positions
- Movements of the neck
  - avoid rolling the neck backwards

Source: National Osteoporosis Society

Comorbidities

- Consider
  - Any change in risk stratification?
  - Effects of medications
  - Exercise recommendations for other conditions
  - Further adaptations and modifications?