



The Hearing Aid Podcasts



Episode 9.08

Osteoporosis and Resistance Training

Presented by: Iain Wilkinson, Jo Preston, Sarah-Jane Ryan, Sophie Norman

Faculty: Ananthi Puntis, Sarah Pope

Broadcast Date: 08/12/2020

Learning Outcomes

Knowledge

- To understand the role of different forms of exercise in the long term management of OP
- To understand the clinical reasoning involved in decision making around exercise prescription
- To understand the risk assessment involved in exercise prescription.

Skills

- To know how to assess people with OP and prescribe and progress appropriate exercise.

Attitudes

- To understand your role in empowering and enabling the person with osteoporosis to feel safe to exercise.

Definitions

Definition of Osteoporosis

"Osteoporosis is a disease characterised by low bone mass and structural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture."

[Osteoporosis: assessing the risk of fragility fracture. NICE Guideline 146. August 2012](#)

- Fragility fractures are fractures that result from mechanical forces that would not ordinarily result in fracture, known as low-level (or 'low energy') trauma.
- The World Health Organisation (WHO) has quantified this as forces equivalent to a fall from a standing height or less.

[Definition of fragility fracture from NICE Guideline 146, updated Feb 2017](#)

Main Discussion

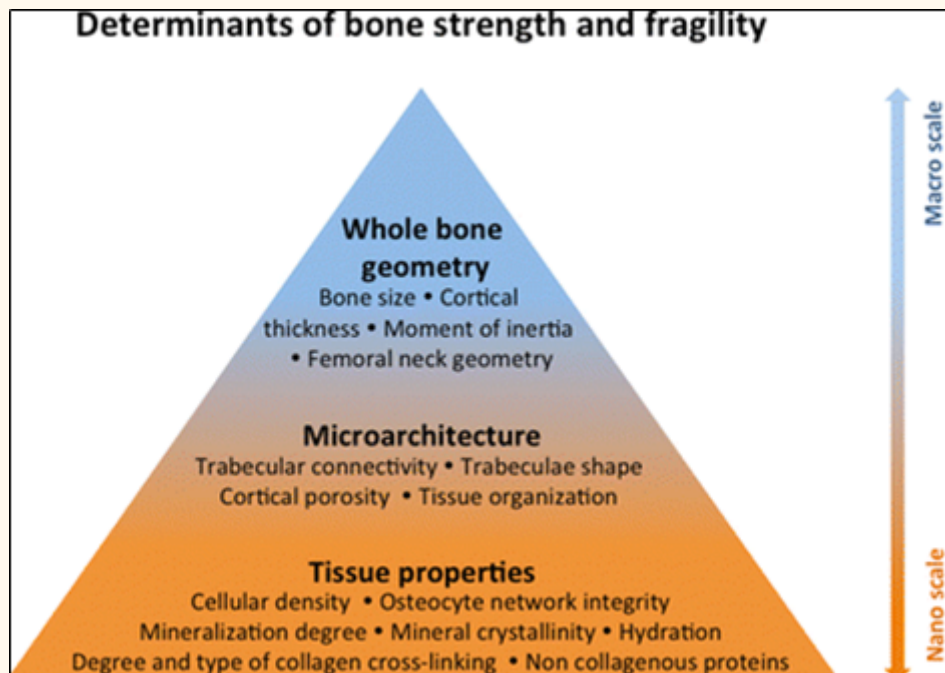
Previous episode for recommended for background listening;

<http://thehearingaidpodcasts.org.uk/episode-2-3-bone-health/>

Bone Density (and measuring bone strength)

- Bone strength is made up of several components including
 - Whole bone geometry
 - Bone microarchitecture
 - Degree of bone mineralisation
 - This is the only component of overall bone strength that we are able to measure/quantify. A DEXA scan does this, and assesses strength/bone mineral density as reflected by how much mineral (calcium and phosphate) is in part of your bone.
- A patient's bone density on a DEXA scan is compared to that of a healthy young adult to give a quantifiable result
 - This is calculated as a standard deviation (SD) and is reported as a T-score.
 - Standard deviation is a measure of variability based on an average or expected value.
 - A T-score of:
 - above -1 SD is normal

- between -1 and -2.5 SD shows bone loss and is defined as osteopenia
- below -2.5 shows bone loss and is defined as osteoporosis



[Fonseca, H, Moreira-Goncalves, D, Appell Coriolano, H-J & Duarte, JA \(2014\) Bone Quality: The determinants of BOne Strength and Fragility Sports Medicine 44:37-53 DOI 10.1007/s40279-013-0100-7](#)

Assessing fracture risk

There are 2 main online tools:

- FRAX
- QFracture

These tools take into account a variety of risk factors and provide a % 10 year fracture risk, which helps with assessment and clinical reasoning for a tailored intervention.

Each tool incorporates a different number of risk factors and therefore have limitations; these tools do not consider certain risk factors e.g. medication affecting bone metabolism, if living in a care home (NICE Guideline 146). **It is, therefore, important to use these tools as one part of the whole patient picture/history.**

Accessed via <https://qfracture.org/> (07/12/2020)

Accessed via <https://www.sheffield.ac.uk/FRAX/tool.aspx?country=1> (07/12/2020)

Major risk factors:

High Risk

Prev fragility # / height loss
Age
Family History
Immobility ≥ 6 months

Co-morbidities

Inflammatory conditions eg. RA, HIV
Osteomalacia
Hyperthyroid / Hyperparathyroidism
Liver or Kidney Disease
Malabsorption

Low Androgens

Oestrogen / Testosterone deficiency
BMI ≤ 19

Medication

Glucocorticoids
Anticonvulsant Therapy
Anti-depressants
Alcohol 3+ units / day
Smoking

Which groups of patients should we be most alert to assessing for risk of fracture?

Mostly post-menopausal women and men over around 50

- $\frac{1}{3}$ women and $\frac{1}{12}$ men over 50 years have OP.
- 50% of women with OP over 50 will fracture
- 20% of men with OP over 50 will fracture
- Osteoporosis affects over 3 million people in the UK.
- More than 500,000 people receive hospital treatment for fragility fractures (bones that break after falling from standing height or less) every year as a result of osteoporosis.

Case study:

We could consider a (fictional) 65 year old female, Agatha, who enjoys running but recently fell and fractured her wrist. Due to the fracture, her GP referred her for a DEXA scan and she was found to have a T-score of -3.5 of the spine and -2.0 total hip. It was confirmed therefore that she has osteoporosis.

In addition to taking her potential medical treatment Agatha is worried about whether she should run again or not.

This highlights the fact that a large part of the therapy following a diagnosis of osteoporosis is centred around education and confidence building, so that fear of further falls and fractures doesn't hamper activity or impact quality of life.

- The aim of bone loading exercise is to reduce the rate of loss in bone strength.
- The aim of a holistic approach to exercise in this group is to reduce the risk of fracture and maintain quality of life, and need to be tailored to a patient's wishes, own and individual aims
- Bone strength and reduced fracture risk

Assessing people with osteoporosis:

- Take a subjective history including
 - Falls history
 - Current activity levels and type and if they are new to exercise
 - Comorbidities, Medications
 - Fracture hx including mechanism of any vertebral fractures
 - Other: T-scores, contraindications to exercise, readiness for change .
- Objective physical assessment:
 - Postural assessment, and postural endurance
 - Using for eg the tragus to wall measurement to assess severity of kyphosis
 - '1 repetition max' to assess a patient's strength and to guide intensity of exercises needed to stimulate an osteogenic response
 - 30 second sit to stand for muscle power and cardiovascular fitness
 - Active range of movement (AROM)
 - Muscle strength
 - Balance
 - Exercise prescription as part of assessment e.g. floor vs. standing exercise

Types of exercise to recommend:

To stimulate osteogenesis the bone cells need to detect high levels of stress and strain. This means bones need to be compressed and pulled to stimulate an osteogenic response.

To compress the bone = Weight bearing exercises

To stimulate the bone by pulling = Resistance exercises

The greater the load, the greater the effect on the bone. Therefore heavier weight or tougher exercise band means a higher load and a more positive effect on the bone.

Examples of Exercises targeting the key areas at risk of fragility fractures:

- Wrist: 4 point kneeling work for wrist and back extensors/core, press ups (or wall press ups if these needed to be modified for the individual you are working with)
- Spine: prone extension (lying face down and lifting breastbone off from the floor) with variety of progressions including adding weight on to the upper back, upper limb pulses with addition of upper limb weights, postural endurance in standing if there is the need to modify exercises (for eg if getting onto the floor is difficult).
- Hips: resistance work e.g. hip extension, abduction in standing using theraband, squats and lunges with the option to progress with the addition of weights, marching on the spot with stamping +/- weights, jogging/running.

Recommendations for strength training in osteoporosis:

- Lift heavier weights but complete fewer repetitions. It will have a greater effect on bone than a lower weight and more repetitions.
- Aim to lift a weight 8-12 times at most, with good posture. Decrease the load if it is too challenging and increase if easy. If 12 repetitions is easy, progress to heavier weight/greater resistance.
- Build up to 3 sets.
- The best exercise for bones needs to be novel and challenging, which is why progression is key.
- Exercises should be site-specific targeting key muscle groups surrounding the most common fracture sites.
- Pacing is important - take time to do the exercises properly and rest between sets - this will also help to avoid injury.

Key further points; Osteoporosis is a long term condition so the therapy for it needs to reflect that - for eg by starting slow and progressively building up in intensity to allow it to be a sustainable intervention. The treatment must also be individualised to encourage long term compliance, and to be effective long term the exercises have to get progressively harder.

Key Research Supporting Current Practice:

The ROS consensus statement was developed in recognition that the evidence for exercise in osteoporosis is limited: lack of clinical primary outcomes (fracture) and rely on proxy measures e.g BMD. Lack of data relating to men and older frailer people.

[Royal Osteoporosis Society: Strong, Steady and Straight, December 2018](#)

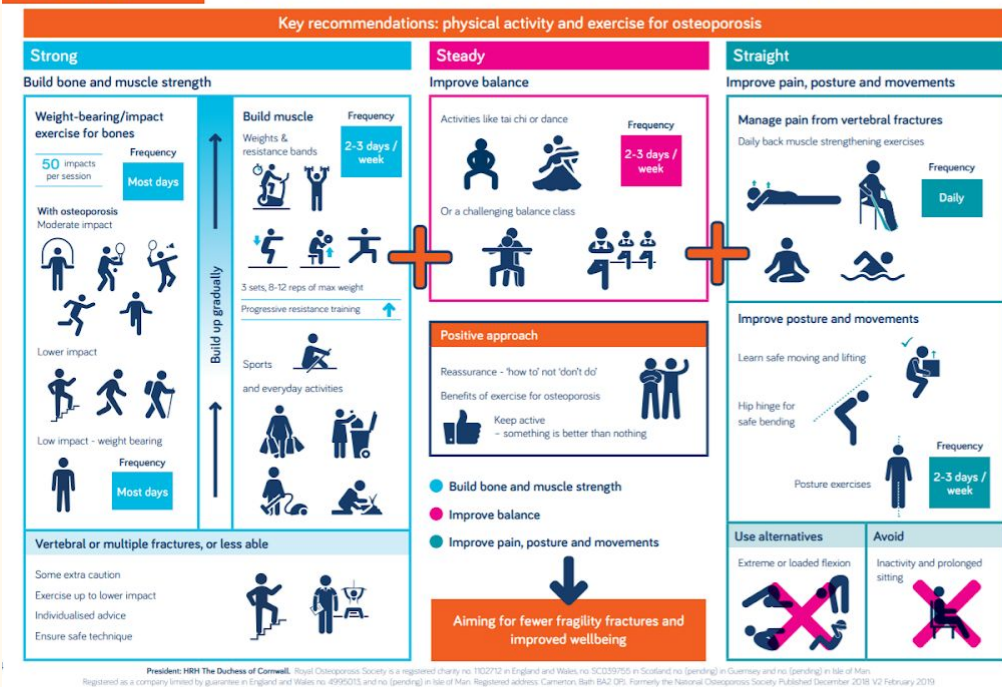
Executive summary of this report:

- Physical activity and exercise have an important role in therapy for osteoporosis..
- People with osteoporosis should be encouraged to do more rather than less...positive and encouraging approach...'how to' messages rather than 'don't do'.
- Evidence indicates that physical activity and exercise is not associated with significant harm, including vertebral fracture.
- HCPs should avoid restricting activity and exercise unnecessarily according to BMD
- People with painful vertebral fractures need clear and prompt guidance.

[High Intensity Resistance and Impact Training Improve Bone Mineral Density and Physical Function in Postmenopausal Women with Osteopenia and Osteoporosis: The LIFTMOR Randomised Controlled Trial](#)

Previous episode for further listening

<http://thehearingaidpodcasts.org.uk/8-07-safe-exercise-2/>



<https://theros.org.uk/media/005h1l53/ros-strong-steady-straight-quick-guide-february-2019.pdf>

The LIFTMOR RCT demonstrated:

- Superiority of supervised high intensity resistance and impact training (HiRIT, >80% 1RM) compared with home based low intensity (<60% 1RM) in terms of improving BMD at clinically relevant sites (lumbar spine and femoral neck BMD, femoral neck cortical thickness);
- Improved functional performance of outcome measurements relevant to falls (timed up and go, functional reach, 5 times sit to stand and leg strength) in postmenopausal women with low to very low bone mass (T-score range -1 to -3.9) for femoral neck and spine was noted.
 - Sample: 101 women aged 65± 5 years; healthy volunteers with no previous musculoskeletal issues.
 - Experimental group(n=49): 8 month, twice weekly, 30 min supervised HiRIT program.
 - Control (n=52): 8 month, twice weekly, 30 min home-based, low intensity (10-15 reps at <60% 1 RM) exercise program designed to improve balance and mobility.

High-intensity exercise did not cause vertebral fractures and improves thoracic kyphosis in postmenopausal women with low to very low bone mass: the LIFTMOR trial (Jan 2019) Watson et al.
<https://pubmed.ncbi.nlm.nih.gov/30612163/>

Group interventions with an evidence base:

Nordic Walking:

This is facilitated often through community based organisations (Nordic walking UK) to deliver walking based exercise referral and physical activity promotion projects in the community.

They work with local authorities, trusts and charities etc to set up and deliver a safe and sustainable programme. They also provide and advise on insurance, equipment, health screening, risk assessment and participation reporting.

https://nordicwalking.co.uk/?page=activity_promotion&c=46

A successful example of this is the group set up at ST GEORGE'S UNIVERSITY HOSPITAL LONDON:

Initially the team worked to develop a project for the Integrated Falls service in 2014 but this soon expanded into other Departments and to date they have trained circa 40 physios to use poles within the neuro, mental health and community outreach programmes. The focus is on empowering patients to lead their peers too.

2 studies have shown benefit from this intervention:

- 1) Patients ≥ 70 years old were assigned to either a Nordic walking group (n=8) or general exercise group (n=10), and participated in 3 x 1 hour sessions per week for 12 weeks.

In conclusion, Nordic walking was more effective than general exercise (building muscle and balance). Therefore, we suggest that Nordic walking may be an attractive option for significant functional improvement in frail people over 70 years old.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4563288/>

- 2) Over 12 weeks - 45 women age 63-79 with osteopenia / osteoporosis were studied..

Overall, short-term Nordic walking training induced positive changes in knee muscle strength and functional performance in women with low bone mass.

This finding could be applied in clinical practice for intervention programs in women with osteopenia and osteoporosis.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5137931/>

More research can be found at :

<https://britishnordicwalking.org.uk/pages/nordic-walking-research>

Zumba Gold is another example of a community based exercise programme beneficial in falls and fracture prevention:

- For active older adults who are looking for a modified zumba (dance) class that introduces an easy to follow Zumba choreography that focuses on balance, ROM and coordination, Zumba gold can provide this. There is a cardiovascular, muscle strength, flexibility and balance effect.
- 12 week intervention programme with three 40 minute sessions of Zumba. DXA measured bone mineral content (BMC) and areal bone mineral density (aBMD) at total body less head (TBLH), LX spine and right hip.
- They concluded that regular practice of zumba and aqua gym might reduce the progressive deterioration of bone mass in inactive middle aged women.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6358983/>

These types of exercise classes and groups reflect the key aims and incentives of the 'Hate Exercise, Love Activity' campaign from the Chartered Physiotherapy Society. They promote empowerment and a sense of ownership over the intervention from the patient's perspective, and the community aspect of the groups can provide real motivation and reduce the element of fear that can often surround new exercise and activity.

<https://www.csp.org.uk/public-patient/keeping-active-and-healthy/love-activity-hate-exercise-campaign>

Curriculum Mapping

NHS Knowledge Skills Framework

- HWB1 Level 1
- HWB6 Level 1
- HWB7 Level 1

Foundation Programme

- 1.2 Patient centred care
- 1.4 self-directed learning
- 3.10 Recognises, assesses and managed patients with long term conditions

Internal Medicine Stage 1

- Rheumatology

- Metabolic bone disease
- Osteoporosis
- Public health and health promotion
 - Exercise
 - Mental health
- Geriatric medicine
 - Deterioration in mobility
 - Falls
 - Fragility fractures
 - Movement disorders
 - Osteoporosis

GPVTS

- Managing complex and long-term care
 - Enable people living with long-term conditions to improve their health
- Caring for the whole person and wider community
 - Support people through individual experiences of health, illness and recovery

Geriatric Medicine Specialty Training

- 11. Managing long-term conditions and promoting patient self-care
- 16. Health promotion and public health
- 21. Evidence and guidelines
- 29. Diagnosis and management of chronic disease and disability
- 30. Rehabilitation and multidisciplinary team working
- 35. Falls
- 41. Orthogeriatrics
- 47. Orthogeriatrics and bone health

Physician Associate Matrix of Conditions

- Musculoskeletal and orthopaedics
 - Fractures
 - Kyphosis/Scoliosis
- Rheumatological conditions
 - Osteoporosis/Osteomalacia