Osteopenia and Osteoporosis

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Osteoporosis means porous bone. It is characterized by bone mass reduction and a deterioration of the bony architecture. This results in fractures most commonly in the spine, hip and wrist.

Epidemiology: The highest level of bone mass a person will ever obtain occurs between adolescence and age 35. This is called the peak bone mass. Both men and women will then lose 0.25% to 1% bone mass annually for the rest of their life. The exception is when a woman starts menopause. She will then lose 3% to 5% bone mass per year for 5-7 years unless she aggressively treats this with hormones and medications.

There are 2 million fractures per year in the United States related to osteoporosis. One third of all women over 65 years old will have a vertebral fracture. Caucasian women have a 40% lifetime risk of having an osteoporosis related fracture. Women over age 50 have 4 times the rate of osteoporosis compared to men. Female osteoporotic fractures occur 5-10 years earlier than with men. A Caucasian/Asian woman who weighs less than 130 pounds is almost guaranteed to develop osteoporosis when she reaches her 80's unless aggressively treated. The mortality rate is very high following an osteoporotic fracture of the hip; 8-9% of people die within 30 days and 25-30% die within one year.

Non-modifiable risk factors:

1. Caucasian or Asian
2. Female
3. Loss of ovarian function/estrogen depletion (menopause), testosterone deficiency
4. Advanced age
5. Diminished peak bone mass at skeletal maturity – eating disorders, elite lean athletes
6. Family history
7. History of fracture as adult

Modifiable risk factors:

1. Malnutrition
2. Smoking
3. Excessive alcohol intake
4. Excess caffeine intake
5. Inactivity/immobilization
6. Exercise-induced amenorrhea
7. Low body mass index typically less than 20

Decreased Risk: Obesity

Medical conditions that can cause osteoporosis: Hyperparathyroidism, hyperthyroidism, renal disease, diabetes, rheumatoid arthritis, alcoholism, malignancy, poor nutrition, immobility, menopause, low testosterone.

Medications that can cause osteoporosis: Steroids, heparin, anticonvulsants, lithium, loop diuretics.

Workup for osteoporosis:

1. **Dual x-ray absorptiometry (DEXA) bone density study:** This is a measure of your bone mineral density at the spine and hip. It should be done every 2 years after menopause or in high risk men. Your T score compares you to a 30-year-old person with your gender and ethnicity. The T score is listed as either normal, osteopenia (early bone loss) or osteoporosis (severe bone loss). The Z-score compares you to a person your age.
2. **N-telopeptide/creatine ratio (NTx):** This measures how much bone resorption you have. If you have more bone resorption than bone formation, you will develop osteoporosis. This should be done at the onset of menopause and then every 3-6 months if needed to track your progress. You want your urine NTx level to be less than 30.
3. **Blood work** such as a complete blood count, metabolic profile, calcium, vitamin D, and hormones including testosterone, estrogen, thyroid, DHEA and parathyroid.

Prevention of osteoporosis: The recommended treatment in the United States to prevent osteoporosis – calcium, vitamin D, diet, exercise, stop smoking, limit alcohol – is woefully inadequate for those at risk. These treatments are effective for men and premenopausal women. Unfortunately, they will not prevent osteoporosis in postmenopausal females. Biphosphonates can slow down the bone loss but they are not used until after the woman already has osteoporosis – which is obviously too late. To prevent osteoporosis in at risk women (see risk factors), hormone replacement therapy should be started as soon as possible after she loses ovarian function. Unfortunately, many physicians are still reluctant to start estrogen and progesterone in postmenopausal women because a specific type progesterone, Provera, has been shown to have a very slight increased risk of causing breast cancer, stroke and heart attacks. If a postmenopausal woman takes estrogen (Premarin or estradiol) and progesterone (but not Provera), studies reveal a significant decrease in breast cancer, strokes and heart attacks.

Treatment of osteoporosis:

1. **Hormones: Hormones are by far the most effective treatment for the prevention of osteoporosis. They should be started as soon as menopause starts and continued for the rest of the woman's life.** If a woman stops taking estrogen, her osteoporosis will quickly return within 6 years. **Estrogen** replacement can reduce fractures by about 50%, and slightly increase bone density over several years. Estrogen is frequently given with **progesterone.** Patients with active estrogen sensitive cancer (breast, uterus, ovary) or blood clots should not take estrogen. In addition, women can also apply topical **testosterone** to further improve osteoporosis. In men, testosterone replacement is the primary treatment of osteoporosis. **NP thyroid** and **DHEA** are other hormones that can also help prevent osteoporosis.
2. **Biphosphonates (e.g. Fosamax, Boniva, Reclast)**: Unfortunately, biphosphonates are not typically recommended until the person has already developed osteoporosis which is obviously too late. These medications do slow down bone loss, but do not improve bone growth. They have been shown to decrease spine fracture rates but not hip fracture rates.
3. **Calcium and vitamin D:** Can improve bone density but do not improve bone resilience. Therefore, they are not very helpful in preventing fractures. Take vitamin D 1000-5000 IUs per day to get your vitamin D blood level to 50-100.
4. **Exercise:** Exercise can improve bone strength and resistance to fracture in premenopausal women. However, it does not improve strength or resistance to fracture in postmenopausal women who are not on hormone replacement therapy.
5. **Calcitonin:** This hormone prevents bone breakdown and can prevent bone loss but has not been shown to prevent fractures.
6. **Forteo:** This is a form of parathyroid hormone that stimulates new bone formation. It reduces fractures but its effectiveness decreases after 2 years.
7. **Selective estrogen receptor modulators (SERMs):** For postmenopausal women unable to take estrogen. It has been shown to decrease vertebral fractures but not hip fractures.

Good book to read: *Estrogen Matters* by Avrum Bluming, M.D. and Carol Tavris, Ph.D.