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. Osteoporotic fractures occur 5-10 years earlier in women than in 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. Thin body frame – less than 6" wrist circumference in women and 6-1/2" in men.
5. Advanced age.
6. Diminished peak bone mass at skeletal maturity – eating disorders, elite lean athletes.
7. Family history.
8. 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, multiple myeloma.

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

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/creatinine 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 effective for most men and premenopausal women. Unfortunately, for those most commonly at risk – thin, white/Asian postmenopausal females – these treatments will not prevent osteoporosis. To prevent osteoporosis in at risk women (see risk factors), consider hormone replacement therapy as soon as possible after she loses ovarian function.

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. **Bisphosphonates:** This includes **oral medications such as Fosamax, Boniva and Actonel** or an **annual IV infusion called Reclast**. 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. They do have a lot of GI side effects, can cause degeneration of the jawbone and are usually discontinued after 5 years.
3. **Antibody drugs:**
   a. **Denosumab (Prolia)** slows the process of bone breakdown and helps maintain bone density. This is injected subcutaneously every six months.
   b. **Romosozumaab (Evenity) is the only medication available that builds new bone and slows bone loss.** It is approved for post-menopausal women that have high risk of fracture. It is injected subcutaneously once a month for 12 months and then is usually followed by receiving a Prolia injection every six months forever. It is very expensive and cannot be given if a person has had a stroke or heart attack within the previous year.
4. **Hormone related medications**:
   a. **Calcitonin** is a hormone that prevents bone breakdown and can prevent bone loss but has not been shown to prevent fractures.
   b. **Parathyroid hormone such as Forteo and Tymlos** stimulates new bone formation and can reduce fractures but its effectiveness decreases after about two years.
   c. **Selective estrogen receptor modulators (SERMS) include raloxifene (Evista)** is used for postmenopausal women who are unable to take estrogen. It has been shown to decrease vertebral fractures but not hip fractures.
5. **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.
6. **Lifestyle factors: Weightbearing exercise, good nutrients, no tobacco and limiting alcohol can all be beneficial.**