Osteopenia and Osteoporosis:
Hormone Therapy is Superior for Prevention and Treatment

What Causes Osteopenia and Osteoporosis?

Our bones are made of living tissue. They are in a constant state of remodeling in order to repair ongoing damage, large or small, and to maintain optimal bone strength. Sex hormones play a key role in bone formation and remodeling. Cells that build bone (osteoblasts) and cells that resorb bone (osteoclasts) have both estrogen (E) and testosterone (T) receptors. However, the cells that direct the remodeling (osteocytes) have T receptors, not E receptors. As a result, when a woman's T production starts to decline (about age 40), bone density and strength begin to decline. Subsequently, with the menopausal transition around age 50, or with removal of the ovaries, the total loss of E means an even more rapid decline in bone formation, and by now the osteoclasts are outdoing the osteoblasts. Depending on the degree of peak bone mass and other factors, this can result in osteopenia (low bone density) or osteoporosis (severely low bone density with increase in fracture risk).

How Significant is Low Bone Density?

The impact of osteoporosis cannot be understated. The most dreaded consequence is fracture of the spine or hip – either can be extremely debilitating, even deadly. We are not accustomed to thinking of bone thinning being serious enough to kill a person, but statistics show that up to 25% of those with hip fracture after age 70 will die within one year due to complications of the fracture itself; and two-thirds of patients with hip fracture do not ever return to the level of function they enjoyed before the fracture; about half never walk comfortably again. In our 40's or early 50's, when we make the decision whether or not to use hormone replacement, it is critical to realize we are being given the opportunity to protect our quality of life for the long term, keeping us healthy and active for decades to come, and helping us avoid placement into a nursing home in later years.

What About Exercise and Vitamin Supplements to Maintain or Increase Bone Density?

It is commonly known that weight bearing exercise can improve bone density and strength, and this is a true for *premenopausal* women. However, exercise does nothing to improve bone density if the sex hormones E and T are depleted, as is the case for postmenopausal women not using hormone supplementation. Furthermore, we know that calcium and Vitamin D are crucial for strong bone formation in childhood and adolescence, but once bone maturity is reached, by age 20 to 25, calcium and/or Vitamin D neither prevent nor treat bone loss. In fact, the cause of osteoporosis is not related to calcium or mineral metabolism, so in adulthood, high intakes of calcium with or without Vitamin D will not affect development of osteoporosis, or its course. It may minimally increase bone mineral density (BMD), as detected with bone density testing, but these supplements will not improve bone resilience, or resistance to fracture.

Estrogen And Testosterone for Optimal Bone Health Throughout Life

Scientific research has shown that no therapy has surpassed hormone replacement in preventing postmenopausal osteoporosis, and reducing spine and hip fractures by 35% to 50%. Estrogen and Testosterone help maintain bone density by influencing bone remodeling, so as to keep bone building equal to or greater than bone absorption. While E has been shown to maintain bone density (meaning E has an *anti-resorptive* effect on bone), T has been found to have a greater effect on bone building than resorption, meaning T has an *anabolic* effect on bone.

Historically, E therapy had been the mainstay for prevention of bone loss in women. Unfortunately, after publication of the Women's Health Initiative (WHI) study in 2002, hormone therapy was all but abandoned, and pharmaceutical companies filled the gap with numerous non-hormonal medications. (The WHI study, its design flaws, faulty data interpretation, and biased reporting are covered more thoroughly in other Women's Wellness Center educational materials). Testosterone therapy has not been routinely recommended by most doctors due to failure of the medical community to fully recognize and investigate its benefits. Large studies, such as randomized controlled trials, are expensive, and often funded by the pharmaceutical industry. If a treatment is not patentable (meaning potentially hugely profitable), it will not be investigated. Bioidentical hormones are natural substances, and therefore not patentable. However, clinical studies do exist that have shown benefit of T therapy in significantly increasing bone density. These studies may be smaller than what big pharma can produce, but they do constitute a legitimate part of the body of scientific evidence.

In the discussion below, we consider Bioidentical E and T not as pharmaceutical agents, but as the natural agents they are – identical to the molecular structure of natural E and T found in the human body. Here, *Pharmaceutical Agents* refers to medications developed by the pharmaceutical industry as a substitute for the body's natural solution to bone maintenance. See page 3 for examples of currently marketed Pharmaceutical Agents.

Bioidentical Hormone Therapy is Superior to Drug Therapy for Healthy Aging of Bones

Unpleasant side effects, plus concern of long term risk of Pharmaceutical Agents results in up to 70% noncompliance. Side effects and long term risk are significant, and can include GI Symptoms (nausea, heartburn, indigestion, esophageal erosion or ulcer), musculoskeletal pain, joint pain, leg cramps, dizziness, and headache. See page 3 for agent-specific side effects and limitations.

Perhaps the most significant advantage of hormone therapy over the Pharmaceutical Agents listed below is that hormone therapy can be used indefinitely, so the benefit is ongoing throughout life. In the case of Pharmaceutical Agents, there are often limits to duration of use. For some, the time limit is 3-5 years, because there are known risks of long-term use, such as atypical femur fracture, osteonecrosis of the jaw, and esophageal cancer. For others, use is limited to 2 years due to research of the drug not having been of long enough duration to assure long-term safety, and osteosarcoma has developed in rats treated with high doses.

What happens when you cease taking a Pharmaceutical Agent for bone protection? The same thing that would happen if you cease taking hormone therapy – bone remodeling ceases being stable or positive and starts being resorptive (negative). To keep bone remodeling on the positive side, or at least stable, the agent must be used for life. As soon as the agent is discontinued, bone resorption begins to surpass bone formation, and over a few years, bone fragility is the result. For this reason alone, HT should be the natural choice for maintaining healthy strong bones as we age – and it's safe to use for as long as we age!

Besides bioidentical hormone therapy being the optimal choice for bone health, there are many other benefits to continuation of hormone therapy throughout life. Advantages include maintenance of brain health, heart health, and metabolic health, not to mention enjoying vitality and emotional well being as the years go by.

ANTI-RESORPTIVE PHARMACEUTICAL AGENTS

BISPHOSPHONATES

Risedronate (Actonel) – oral daily
Alendronate (Fosamax) – oral daily
Ibandronate (Boniva) – monthly or q 3 month IV dosing
Zoledronic Acid (Reclast) – monthly injection

- Mechanism of action: inhibits osteoclast resorption of bone.
- Take first thing in A.M. with full glass water, remain upright for 30-60 minutes to reduce GI side effects.
- Side effects: heartburn, indigestion, esophogeal erosion, esophageal ulcer, musculoskeletal pain.
- Risks: Long-term use associated with atypical low-impact femur fractures, osteonecrosis of the jaw (ONJ), and esophageal cancer. Some data shows cardiovascular risk may be increased, though controversial.
- Because bisphonates will accumulate in the bone and continue to be released for months to years, it is recommended that a drug holiday is taken after 3-5 years of therapy.

SERM's (Selecitve Estrogen Receptor Modulators)

Raloxifene (Evista) – oral daily
Bazodoxifene + CEE 45mg (Duavee)

- Mechanism of action: inhibits osteoclast resorption of bone.
- Side effects/Risks: vaginal bleeding, hot flashes, hypertriglyceridemia, venous thromboembolism (VTE, including deep vein thrombosis and pulmonary embolism), stroke, cardiovascular disease, leg cramps, peripheral edema.

DENOSUMAB (Prolia) – SQ Injection q 6 months

- It is a fully human monoclonal antibody that inhibits RANKL to decrease bone resorption (breakdown). RANKL is a cell membrane protein required for formation and function of osteoclasts (cells that cause bone resorption).
- Side effects: flatulence, serious infections, dermatological reactions, musculoskeletal pain, hypercholesterolemia, hypocalcemia.
- Risks: Long-term use associated with atypical low-impact femur fractures, ONJ, and esophageal cancer.

ANABOLIC PHARMACEUTICAL AGENTS

PARATHYROID HORMONE ANALOGS

Teriparatide (Forteo), daily injection, $4,000/mo
Abaloparatide (Tymlos), daily injection, $2,000/mo

- Mechanism of Action: Mimics the physiological actions of Parathyroid Hormone in stimulating new bone formation on the surface of bone by stimulating osteoblastic activity.
- Side effects include nausea, dizziness, headache, joint pain, muscle cramps, hypercalcemia.
- Two-year limit for use, due to osteosarcoma in rats treated with high dose.
- Treatment for 2 years, follow immediately with an anti-resorptive agent to maintain bone density.

References

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