OSTEOPROSIS TREATMENT

WITH NON-DRUG THERAPIES

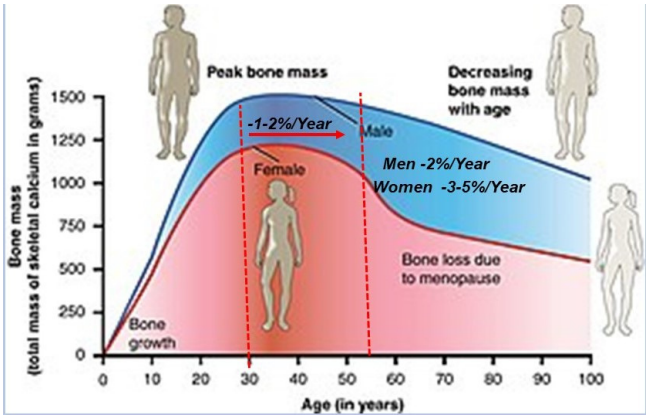
INTRODUCTION

Our population is aging and with that comes higher amounts of age-related diseases. Front and center in that is osteoporosis. Non-drug treatment efforts have centered around providing raw materials for bone including minerals like calcium, vitamins D and K2, and exercise. While these measures are needed as a part of a broader treatment program, they have only marginal effects as stand-alone therapy.

TREAMENT WITHOUT ADVERSE EFFECTS

The primary mechanism of bone loss in osteoporosis is a shift in the balance of activity between osteoclasts which remove bone, and osteoblasts which build new bone. These cells are balanced in activity in young, healthy adults. They work together to remove old bone with micro-damage and fill it back in with healthy bone. This process is called “bone remodeling”.

With age, osteoclasts tend to increase their activity while osteoblasts decrease in number and activity. The effect of this shift in balance is gradual bone loss. Surprising to many, this shift begins gradually at about age 40. Between 40 and 55 years bone density loss is a 1-2% per year representing a 15-30% loss over that 15 year interval. At about age 55 corresponding to hormonal decline, the loss accelerates to 2% per year in men and 3-5% in women.



Many drug therapies are available to modify the shift in activity of osteoclasts and osteoblasts to prevent further bone loss and to actually improve bone density. Unfortunately, these drugs are associated with adverse effects, some of which such as osteonecrosis of the jaw and transverse femoral fractures, are serious. Many patients will refuse these therapies based on the risk while others discontinue them because they have experienced an adverse outcome.

The shift in balance between osteoclasts and osteoblasts causing greater bone removal than repair involves several factors. Osteoclast are driven by inflammatory signaling and their activity can be increased by the greater levels inflammation that occur with age termed “inflammaging”. At the same time, the numbers of osteoblasts declines. Those cells only live from 12 to 100 days after which they need to be replaced by a specific stem cell in bone marrow called a mesenchymal stem cells (MSC).

During this same aging interval these bone marrow MSCs become fewer and are replaced with fat. This diminishes the replenishment of osteoblasts at the same time the osteoclasts are increasing in activity. The net effect is bone loss. So yes, the problem has several pieces all of which need to be addressed in a treatment program for optimal benefit.

KNOW WHERE WE ARE STARTING

Lab testing is a crucial part of determining an individualized treatment plan. Determining the unlying causes for inflammation is always the first step.

• Many patients will have a recent DEXA bone density scan. The level of disease helps us understand the intensity of recommended treatments discussed below. If the last DEXA is more than a year prior, a new one should be performed. We will also do a heel bone ultrasound density measurement. That T-score is correlated with the DEXA T-score. Heel density measurements can be repeated at shorter intervals such as 3-4 months to monitor progress as they do not involve radiation like the DEXA scan does.

• We will also order lab markers that show the degree of loss of bone matrix and tell us if matrix repair is increasing with treatment. Bone matrix is the collagen fiber network that houses bone cells and is where the bone minerals attach for strength much like rebar strengthens concrete. More discussion of bone matrix is below. Additional labs will be done to determine systemic inflammatory activity and blood vitamin D levels.

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75% of our immune activating tissue is in the digestive tract so it can be a major source of systemic inflammatory activation. If indicated by the initial exam, a gut microbiome test may be necessary. A shift in the microbiome from a population that helps us control inflammation to a population that drives inflammation is common with aging. This shift is called dysbiosis. Those who have had repeated doses of antibiotics are particularly susceptible to this. The results will guide a microbiome restoration program to reduce background systemic inflammation.

02

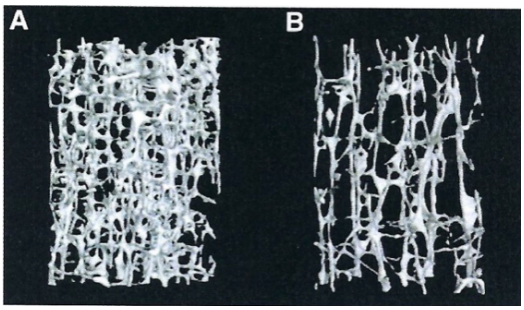
The second common driver of chronic inflammation and subsequent excessive osteoclast activation is “inflammaging”. This is a term immunologists use to refer to the buildup of old, non-functioning white blood cells that produce high amounts of chemicals called cytokines that generate inflammation. Almost every disease that becomes more prevalent with aging involves inflammation including osteoporosis. Once old white blood cells become “senescent” and can no longer replicate The should enter apoptosis or programed cell death to prevent becoming chronic inflammatory generators. Some senescent cells escape this process generating chronic inflammation. These cells can be reduced with supplementation of flavonoids such a quercetin and finestin that cause them to enter apoptosis.

03

It is also important to supply the nutritional factors that help the body regulate inflammation. These include phenolics like curcumin, ginger and boswellia as well as omega-3 fatty acids. While these factors are present in a diverse whole food diet, they are greatly reduced in the modern process food diet. As the body ages and has greater inflammation needing management, increased amounts of the helpful phenols can be given in herbal extracts.

STIMULATING BONE FORMATION

Once the underlying issues that are driving the inflammation have been addressed, the next step is to rebuild the bone matrix. This matrix is a woven network of collagen fibers which house the bone cells and hold hydroxyapatite which is the main mineral in bone. The left half of the diagram shows normal bone collagen matrix. The image on the right is osteoporotic bone matrix which is considerably thinned.



Treatment	Description
Rebuild Bone Collagen	The first step is to provide the material to rebuild bone collagen. This requires very small collagen peptides of only 4-5 amino acids. They must also contain the amino acids glycine and proline which are basic to bone matrix allowing collagen fibers to link together. While there are many collagen supplements available, only these specific peptides have a high affinity to bone matrix. In a clinical trial of supplementation with these specific peptides, improvement in BMD at 4 years increased 5-8%.
BMP Supplements	Osteoblast cells must be replenished by mesenchymal stem cells in bone marrow migrating to the weakened bone and differentiating into osteoblasts. This process is stimulated by the existing bone matrix releasing bone morphogenic proteins (BMPs) which are a “homing” signal to the stem cells about where to migrate for bone formation. BMPs are available as a dietary supplement which can be used to augment systemic bone regeneration.
PEMF Therapy	The use of therapies that deliver specific types of energy to bone are proving to be strong, effective treatments. The most effective energy therapy is PEMF therapy (pulsed electromagnetic frequency). PEMF triggers bone cell receptors which activate bone cell regenerative pathways involved in bone cell differentiation and activation. (SEE NEXT PAGE)

PEMF THERAPY: A BREAKTHROUGH IN BONE REGENERATION

The most effective energy therapy for bone regeneration is PEMF therapy (pulsed electromagnetic frequency). PEMF triggers bone cell receptors which activate bone cell regenerative pathways involved in bone cell differentiation and activation. These same regenerative pathways are activated by estrogen and this signal is lost with estrogen decline resulting in the acceleration of bone loss with menopause. Re-establishing the regenerative cell signal can be safely “bio-hacked” with PEMF and laser therapy.

PEMF therapy also is anti-inflammatory reducing osteoclastic bone removal slowing bone loss while stimulating bone building. It is an ideal therapy as it increases MSC replication and migration, it increases osteoblast replication and inhibits osteoclast activity generating positive bone gain

Studies of the commonly used drug therapies for osteoporosis have found that they can increase bone density from 8-13% in the spine over 3 years and 5-10% in the hip. The trials using PEMF therapy have shown increases in bone mineral density of 39% and 37% in the lumbar spine and hip respectively. No adverse effects occurred in these trials which is a unique benefit associated with PEMF therapy.

Trial	Intervention	% Change BMD
Ebid et al	PEMF + Exercise	+26% Spine
Liu et al	PEMF	+37% Hip
Abdelaal et al	PEMF	+39% Spine

Interestingly, the trail by Abdelaal et al compared the changes in BMD with PEMF to a control group receiving no therapy and a third group receiving laser therapy. BMD decreased a further 0.79% in the control group over the 3-month interval while that in the laser therapy group increased 17%. Laser therapy is the best option for those who have an implanted electrical device such as a pacemaker which prevents the use of PEMF.

NEXT STEPS

Where do you go from here? Sustainable, low-risk non-drug therapy is a healthy option.

It is important in a complex, chronic disease such as osteoporosis that has several causative parts to use a comprehensive treatment program that addresses as many as possible. It is also a chronic, progressive disease which tends to march on with more age. Most if not all of drug therapies tend to be for life. A non-drug program is similar. Treatment involves a 3-4-month intensive treatment program which is followed by an ongoing infrequent therapy session, typically monthly.
Healthy aging requires more effort than was needed simply to be young and not sick. However, working at it pays high dividends.

01

Initial Exam and Individualized testing

Contact us to schedule an appointment to get started assessing your individual treatment needs.

02

Address Underlying Causes of Inflammation

Make necessary lifestyle and supplemental changes to slow the chronic progression of osteoporosis.

03

Bone Regeneration Therapy

Using PEMF Therapy when indicated, increase bone mineral density and slow bone loss.

According to Aristotle, 'the whole is greater than the sum of its parts"

ACKNOWLEDGEMENTS

1. Ebid et al. Long-term effect of full-body pulsed electromagnetic field and exercise protocol in the treatment of men with osteopenia or osteoporosis: A randomized placebo-controlled trial. F1000Res, 2021;10:649.
2. Liu et al. Pulsed Electromagnetic Field Affects the Development of Postmenopausal Osteoporotic Women with Vertebral Fractures. Biomed Res Int, 2021:2021:4650057.
3. Abdelaal et al. effect of pulsed electomagnetic therapy versus low-level laser therapy on bone mineral density in the elderly with primary osteoporosis: a randomized, controlled trial. Bull Fac Phys Ther, 2019;22:34-39

To schedule an appointment, call the number below or visit our website for more information.

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