Bone Health After Cancer

If you have received or are actively receiving certain cancer therapies you may be at an increased risk of developing osteoporosis. Osteoporosis and osteopenia (the precursor to osteoporosis) are medical terms for decreases in bone density, or a "thinning" or weakening of the bones. This increases the risk of fracture (breakage) of the bones. It most often affects the hips, spine, and wrists, and is the cause of 2 million broken bones a year in the United States. Cancer survivors at risk for osteoporosis should learn more to take steps to prevent it and have appropriate screening.

Our bones provide support and structure for our body, as well as storage for essential nutrients. Your bones are continually being damaged and repaired by a complex system involving osteoclasts, which are cells that break down old bone, and osteoblasts, which are cells that form new bone. The body maintains a delicate balance between the breakdown of old or damaged bone, and the formation of new bone, to maintain bone strength. The hormones estrogen, testosterone, and parathyroid hormone play critical roles in regulating bone remodeling. In osteoporosis, more bone is being destroyed than is being formed, leading to weakened bones.

Who is at risk?

- Women who have premature (early) menopause or decreased estrogen production due to cancer therapy (i.e. women taking hormonal therapy, such as aromatase inhibitors or leuprolide, or menopause induced by surgery, chemotherapy, or radiation). Of note, tamoxifen increases the risk of osteoporosis in premenopausal women, but can actually increase bone density in menopausal women, thereby decreasing the chance of osteoporosis.
- Men who have decreased testosterone production. This is a common concern for men treated with androgen deprivation therapy (ADT) or orchiectomy (surgery to remove testicles) for prostate cancer.
- Treatment with some chemotherapy medications, radiation to the brain or weight-bearing bones (spine, hips, legs), or allogeneic stem cell or bone marrow transplant.
- Survivors of childhood cancers.
- Long-term use of corticosteroids (dexamethasone and prednisone, greater than 5 mg per day for 2 months or more).
- Patients who have had their stomachs surgically removed (gastrectomy).

There are additional risk factors that are not specific to having cancer, including smoking, consuming excessive alcohol, leading an inactive lifestyle, being petite and thin, having a diet low in calcium and vitamin D, and missing menstrual periods. Osteoporosis is more common in women (80% women, 20% men), those with a family history, Caucasians and those of Asian or Latino descent, although all races have some risk. You can learn more about other risk factors by visiting the National Osteoporosis Foundation.

How is osteoporosis detected?

Screening for osteoporosis is done with a bone mineral density (BMD) test. A DEXA scan is the most commonly used test. The National Osteoporosis Foundation recommends that women should have the test at age 65 and men at age 70 when no risk factors are present. They recommend screening for younger individuals with risk factors. The test is also used to monitor the bone health of people with osteopenia or osteoporosis.

Experts recommend screening for all patients with cancer who are at increased risk because of their age or the treatments they received. Cancer survivors should discuss their specific risks and need for screening with their healthcare team. Risk can be evaluated using the FRAX® tool, which was developed by the World Health Organization to evaluate the risk of fracture in people.
What can I do to protect my bone health?

While you may not be able to change your family and health history, there are some steps you can take to protect your bones.

- Get 1000-1200 mg of calcium a day – ideally in your diet (see more below).
- Take 800-1000 IU of vitamin D3 daily.
- Do not smoke or drink excessive alcohol (no more than 2 drinks per day).
- Watch your caffeine intake - studies have shown large amounts of caffeine increase the risk of fractures (broken bones). Drink milk instead!
- Get your weight-bearing exercise and strength/resistance training! This strengthens bones and muscles (learn more below).
- Have appropriate bone health screening.

Dietary Tips

Calcium

Our bodies cannot produce calcium, so we must be sure to get enough in our diet to support healthy bones. You should aim to get 1000-1200 mg of calcium per day. It is best to get calcium in a balanced diet, including 4-8 servings of calcium-rich foods a day.

Dairy foods, such as milk, yogurt, and cheese, are highest in calcium. Canned fish (sardines and salmon with bones), dark, green vegetables, such as broccoli, kale, and collard greens, contain calcium as well. Some foods are fortified with calcium, but read the labels to get an idea of just how much they contain. Calcium-fortified orange juice is one good source.

Spinach and rhubarb contain calcium, but also contain large amounts of oxalate and phytate, which prevent the body from absorbing their calcium. However, they do not interfere with the absorption of calcium from other foods. Other good sources of calcium include almonds, sunflower seeds, apricots, and figs. A dietitian can provide more guidance in choosing calcium-rich foods.

If you cannot take in the recommended amount of calcium in foods, take calcium supplements. Your body does not absorb calcium supplements well, so spread the dose out by taking 1 tablet multiple times a day. If you take Synthroid (thyroid hormone), separate it from calcium doses by at least 4 hours.

Vitamin D

Vitamin D is often called the "sunshine vitamin" because our skin converts ultraviolet rays from the sun into vitamin D. In general, 10-15 minutes of sun exposure on the hands, arms and face creates the needed amount. However, it is difficult to measure how much vitamin D you are getting by this method and the amount can vary by season or location. In addition, avoiding the sun and using sunscreen limit how much UV exposure we get.

Very few foods contain vitamin D naturally; these include certain fish (salmon, tuna, mackerel) and fish liver oils, while egg yolks and beef liver contain small amounts. Many foods are fortified with vitamin D, read the nutrition labels to know how much. Milk is often fortified with vitamin D, but keep in mind that foods made with milk (cheese, ice cream) are not.

Vitamin D is available in two forms, D2 and D3. Supplements typically contain D3. Research has found that both are beneficial for bone health. A cup of fortified milk contains about 100 international units (IU) of vitamin D. A multivitamin contains 400 IU and some calcium supplements also include vitamin D. You should aim for 800-1000 IU per day. Your care provider may check your Vitamin D blood levels to see if you should take a supplement.

Reading Food Labels

Food labels can be hard to understand, but the Food and Drug Administration (FDA) has approved a new "Nutrition Facts" label on food products that is easier to read. Food manufacturers are just starting to use this new label, so you may see the old labels still being used. On the old label, the content of calcium was listed as a percentage of the recommended daily amount (RDA or Daily Value). How many people actually know the Daily Value of a given nutrient? The new labels require manufacturers to list the actual amount of calcium, vitamin D, iron, and potassium, in addition to the Daily Value of these foods.
This change will make it easier to determine how much calcium and vitamin D you are getting in packaged foods.

**Medical Therapy**

If your healthcare team determines that you have osteoporosis or osteopenia, they may recommend medications to prevent it from getting worse. The main category of medication used to treat osteoporosis is called antiresorptive medications, which work by slowing the rate of bone breakdown. While breakdown is slowed, the formation of bone occurs at the same speed, which may allow bone density to improve. Antiresorptive medications include bisphosphonates (such as alendronate, zoledronic acid, etc.), raloxifene (a selective estrogen receptor modifier or SERM), and calcitonin. PTH (teriparatide) is a type of parathyroid hormone, which increases the rate of bone formation, allowing bones to strengthen, but is much less commonly used because of significant side effects. If you are taking a bisphosphonate, be sure to talk to your care provider if you have dental work planned, as you may need to temporarily stop this medication.

Each of the medications has some risk of side effects and may not be appropriate for every patient. Discuss your medical options for treating osteoporosis with your healthcare team.

**Resources**

- National Osteoporosis Foundation
- International Osteoporosis Foundation
- WHO FRAX® tool (for estimating the risk of developing a bone fracture)

Resources about calcium and vitamin D and diet:

- NIH - Calcium Fact Sheet
- NIH – Vitamin D Fact Sheet
- FDA information about food labels

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