Bone Health in Cancer Survivors

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Without bones
Functions of the skeleton

- Protect internal organs
- Transmit noise
- Mineral storage
- Support to generate negative pressure for breathing
- Locomotion
- Niche for marrow stem cells
- Glucose metabolism (secrete osteocalcin)
- Phosphate metabolism (secrete FGF23)
- Buffer in acidosis
Causes of osteoporosis

- Genetic diseases
- Neurologic disease
- Parathyroid disease
- Cystic fibrosis
- Diabetes
- Hepatic disease
- Hypogonadism
- Muscle disease
- Lupus, rheumatoid arthritis
- Metabolic acidosis
- Chronic inflammation
- Weight loss
- Depression
- Hyperthyroidism
- COPD, smoking
- Malabsorption, malnutrition
- Cushings syndrome
- Renal disease
- Marrow disease
- Medications (prednisone)
- Toxins, alcohol, radiation
- Hemochromatosis
- Low vitamin D
- Bedrest
Risks in cancer survivors

Osteoporosis is very common, with many risk factors. Cancer survivors may have particular increases in risk.

- Medications can be harmful to bone cells
- Sex hormones may be lowered
- Weight loss may occur
- Patients are too tired to get exercise
- Radiation can damage bone cells/stem cells
- Other diseases may be more common
Fractures during aromatase inhibition

Followup 2 – 5 years

Saad, J Clin Oncol, 2008
Osteoporosis in breast cancer survivors

Results explained by lower hormone use in Breast cancer survivors

Chen, Z
Cancer 2005
Fracture risk in men with history of prostate cancer (case-control study from Denmark)

Men who have had prostate cancer have about twice as many fractures as men who did not have cancer.

Gender: Men & Osteoporosis

Under-diagnosed

Unrecognized

Under-reported

Inadequately researched
"It’s too late for me to do anything about osteoporosis."
Ca  

Vitamin D  

Prevent E  

Good nutrition F  

Stop G  

Exercise S
Calcium recommendations

Daily intake of 1000 to 1200 mg/day
Best from food instead of pills

Yogurt: 300   Latte: 300   Kale: 200   Almonds: 100

Ordinary diet gives about 200mg/day of calcium from low-calcium foods
Cheese 200
Tofu: 250
OJ + Calcium 300
Bok Choy: 100
Sweet potato: 90

Ordinary diet gives about 200mg/day of calcium from low-calcium foods
Food labels for calcium

100% = 1000 mg

so 25% = 250 mg
Don’t take too much calcium

It can deposit in blood vessels

Or result in kidney stones

Netto, Radiol Bras 2013
Calcium supplements

Only if necessary if diet less than 1000
Take with food.
Cut large pills in half

Cost per 1000mg
13¢ 14¢ 17¢ 26¢ 29¢

Calcium per pill
300 600 500 500 315

These reliable brands are equally effective
Calcium supplements in gut
Protein is good for bone health

• Bones are 50% protein and 50% minerals
• Proteins are the building blocks that are necessary for the bone
• Recommendations of about 60-90 grams/day
• Dairy, poultry, fish, eggs, meat, quinoa
• Combinations of plant proteins (rice + beans)
Who’s going to break her hip?
Body Mass Index

n = 60,000 men and women

DeLaet, Osteoporosis Int 2005
Osteoporosis Diet for low BMI
Vitamin D

• Vitamin D: good for bones
  – Cholecalciferol (D₃) a little better than ergocalciferol (D₂)
  600 IU/day younger than 70
  800 IU/day older than 70

• Normal level in the blood: 20 to 50 ng/ml
• (some labs still say 30 – 100)
Vitamin D levels in surfers

Binkley 2007
Vitamin D: Fact vs Fiction

Fact: Too little vitamin D is bad for you because you can not absorb calcium.

Fiction: High doses of vitamin D are good for the bones.

Fact: Low vitamin D is associated with higher mortality rate.

Fiction: High vitamin D will lower mortality.
Vitamin D: Fact vs Fiction

Fact: Cancer cells grown in tissue culture will stop growing if vitamin D is added.

Fiction: High doses of vitamin D can prevent or treat cancer in humans.

Fact: Vitamin D can help cells fight TB.

Fiction: High vitamin D will prevent infections.
Vitamin D: Fact vs Fiction

Fact: High doses of vitamin D increase the cells that resorb bone. Studies of high doses have shown more fractures or bone loss.

Fiction: High doses of vitamin D are good for bones.

Fact: Vitamin D is lower in African Americans.

Fiction: African Americans need more supplements of vitamin D.
Vitamin D

Fact: Many patients, especially older than 70 years old, have low vitamin D levels, and recommended doses of vitamin D (800 IU/day) will prevent hip fractures.

Wishful thinking: Higher doses of vitamin D will make them young again.
Tai-chi helps reduce falls

• Best to do weight-training exercises AND resistance-training exercises
Exercise in breast cancer survivors

N = 106 enrolled
67 completed

Winters-Stone, Breast Cancer Res, 2011
RCT of exercise in postmenopausal women with past breast cancer

% change in BMD

N = 223, all subjects also received risedronate
Duration 24 months

Waltman Osteoporosis Int, 2010
Prevent Falls!

FALLING CAN BE DEADLY

Please stay on the trail
1. Have handrails and plenty of light in all stairways.
2. Wear shoes that give good support and have non-slip soles.
3. Don’t use stepstools. Keep items you need within easy reach.
4. Maintain a clear path to the bathroom.
5. Remove all small rugs. They can make you trip.
6. Make sure your walkways are wide enough.
7. Remove things that you may trip over from stairs and places where you walk.
8. Move phone and electrical cords away from walkways and open areas.
9. Make sure that all areas are well lit. Use bright light bulbs.
10. Be aware that some medications, including over-the-counter medicines, can make you dizzy or sleepy. Talk with a healthcare professional about what is best for you.
11. Get your vision checked. Annual vision checks can help eliminate bone-breaking falls.
12. Use non-slip mats in the bathtub or shower. Have grab bars put in next to your toilet and in the bathtub or shower.
Alcohol

n = 16,971 men and women

Kanis, Osteoporosis Int 2005
Medical treatment for bone disease in cancer survivors

Estrogens: In perimenopausal or premenopausal hypogonadal women without hx of estrogen-related cancer

Testosterone: In hypogonadal men without hx of hormone-related cancers.

Raloxifene: In postmenopausal women who have not had tamoxifen (not studied in breast cancer survivors)

Bisphosphonates: Long-term effects still not defined with or without cancer history. Proven fracture efficacy in first 5 years.

Teriparatide: Not indicated for most patients with cancer history.

Denosumab: New medication, long-term effects uncertain, marked suppression of bone formation. May be helpful for limited use such as with aromatase inhibitors. Not recommended for myeloma.

Calcitonin: Safe and gentle but not as effective.
Bisphosphonates and fracture prevention in breast cancer trials

Valachis, Gynedol Onc, 2010