

OSTEOPOROSIS AND CANCER

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Questions

- How does cancer therapy increase the risk of bone loss and fractures?
- How do steroids used in cancer treatment affect bone?
- How can cancer patients reduce their risk of bone loss and fractures?

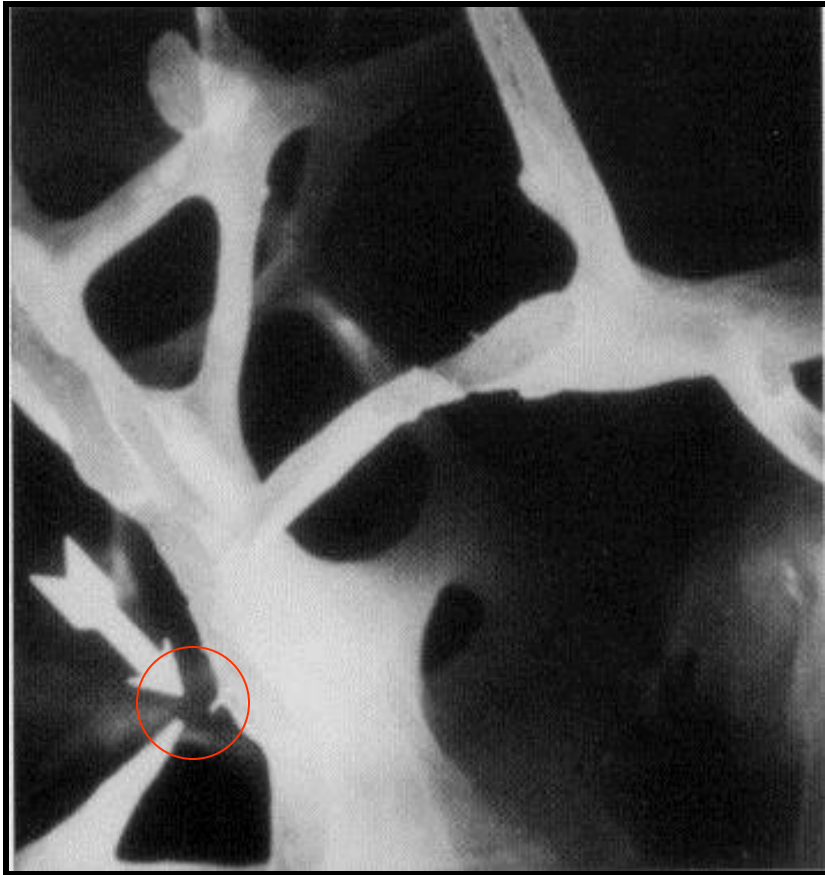
Healthy Bone



Bone is living tissue, which is constantly being broken down and rebuilt, a process called remodeling

Like skin, hair and nails, bone is renewed

Osteoporotic Bone



The loss of living bone tissue makes bones fragile and more likely to fracture

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Cancer & Bone Loss

- Most cancers can have adverse effects on the skeleton
- Bone loss is caused by the effects of
 - cancer cells
 - cancer therapy
- Bone loss in people with cancer is
 - Significantly higher than in the general population
 - generally more rapid and severe than postmenopausal or age-related bone loss

Cancer and Bone Loss

- Some cancers may cause bone loss
- Some cancer therapies lower estrogen and testosterone levels
- Cancer treatment may cause early menopause/hypogonadism

What are the Common Causes Bone Loss with Cancer Therapy?

- Chemotherapy
- Surgery (ovaries/testes)
- Hormonal therapy
- Radiation
- Corticosteroid use
- Deconditioning

Diseases where Bone Loss is Common

- Breast cancer
- Prostate cancer

Breast Cancer

Premenopausal women

- High risk of ovarian failure (menopause) with chemotherapy
- Women who receive chemotherapy enter menopause an average of 10 years earlier
- Tamoxifen may result in bone loss in premenopausal women

Breast Cancer

Postmenopausal Women

- Increased risk for osteoporosis and fractures compared to cancer-free women
- Tamoxifen is protective against bone loss

Breast Cancer

Aromatase Inhibitors (anastrozole, letrozole, exemestane)

- Suppress estrogen levels
- Decrease cancer recurrence and improve disease-free survival
- Cause significant bone loss
- Increase the risk of fractures

Prostate Cancer

Androgen deprivation therapy (ADT) (Lupron, Zoladex)

- Lowers testosterone levels
- Increases survival in advanced prostate cancer
- Causes significant bone loss – greatest in the first year
- Increases the risk of fractures
- Sarcopenia (loss of muscle mass and strength) is also common

Medications used to Prevent/Reduce Bone Loss

- Studies in patients receiving therapy for breast and prostate cancer have shown benefits using
 - Oral and intravenous bisphosphonates
 - Denosumab
- Benefits include
 - Improved BMD
 - Increased time to first skeletal event
 - Fracture reduction

Multiple Myeloma

- Bone lesions and generalized bone loss common in multiple myeloma
- Fracture rates are up to 16 times that of the general population in the year prior to diagnosis
- Bisphosphonates are commonly used in the treatment protocols, and help to reduce fractures

Bone Marrow Transplant

- Bone marrow transplant is used for many blood-related cancers
- Bone loss and increased risk of fracture is seen post bone marrow transplant

Radiation

- Radiation is used to shrink/kill cancer cells
- May be used to reduce bone pain
- Bones treated with radiation tend to break easily
- The risk for fracture increases with
 - Higher radiation doses
 - Pre-existing osteoporosis

Radiation

- Research on the effect of radiation on bone is limited
- There appears to be both a decrease in bone density and bone quality
- There is an increase in bone resorption (loss) and a decrease in new bone formation
- Due to the effect of radiation on bone cells and blood vessel walls

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Corticosteroids

- In cancer, steroids are used
 - as part of treatment protocols
 - to manage side effects of treatment (nausea, pain)
- Often given for extended periods of time
- Steroids have many side effects
 - Elevated blood sugars
 - Weight gain
 - Bone loss and fractures

Corticosteroids

- Almost 50% of people on long-term, high dose corticosteroid therapy will have bone loss, and more than 15% will fracture in the first year of therapy
- Risk factors for fracture include
 - Age > 65
 - Use for more than 3 months
 - Family history of osteoporosis
 - Low calcium intake

Steroids & Bone Loss

- Corticosteroids cause bone loss through a number of mechanisms including
 - ↓ bone formation
 - ↑ bone resorption
 - ↓ calcium absorbed in the intestine
 - ↑ calcium lost in the urine
 - ↓ production of estrogen and testosterone

Steroids & Fracture Risk

- Impact on bone depends on total dose and duration of therapy
- Affects bone quality
- Risk of fracture not always related to change in bone density
- Steroids cause muscle weakness, increasing the risk for falls
- Most osteoporosis therapies reduce the risk of steroid-induced bone loss and fracture

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Prevention

- Osteoporosis may not be detected in cancer patients until a fracture occurs, so cancer patients need preventative strategies:
 - Fracture risk assessment +/- bone densitometry
 - Guidance on lifestyle changes

Reducing the Risk of Bone Loss

- Lifestyle factors
 - Diet
 - Exercise
- Fall prevention
- ? Medication

Fracture Risk Assessment

- Your doctor can assess your fracture risk using information about your
 - medical history
 - risk factors for osteoporosis
 - fracture history
- A bone density test may then be ordered so that your 10-year fracture risk can be determined using a fracture risk calculator such as CAROC or FRAX

Lifestyle

- Maintain a healthy body weight
- Avoid excessive alcohol and caffeine
- Smoking cessation

Diet & Supplements

- **Calcium**

- as much as possible from food sources
- Age 19-50: 1000 mg
- Age 50+: 1200 mg

- **Vitamin D**

- Age 19-50: 400-1000 IU
- Age 50+: 800-2000 IU

- **Protein**

- adequate intake to maintain muscle strength and body weight

Exercise

- Regular exercise can help
 - improve strength and mobility
 - prevent falls
 - protect the spine
 - slow the rate of bone loss
- An exercise programme should include
 - muscle strengthening
 - balance training
 - weight bearing
- Always consider safety

Reducing Falls

- Fall risk is increased
 - deconditioning
 - pain medications
 - sedatives
- To help prevent falls
 - be aware of your environment
 - maintain a healthy diet
 - exercise safely

What about Medication?

- The potential benefit of medication to prevent bone loss/treat osteoporosis depends on your risk for fractures
- Once you have had a fracture risk assessment, a decision can be made on the use of bone-specific medication

THANK YOU!
