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.
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 (anastrazole, 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
  • Densosumab

• 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!