Osteoporosis: Are your bones at risk of fracturing?

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What is Osteoporosis?

- Osteoporosis causes bones to lose density, become weak, and fracture easily.
- Osteoporosis affects the entire skeleton.
- Osteoporosis predicts fracture risk.
Why Do We Care About Osteoporosis?

• Osteoporosis is **common**
• Osteoporosis is **serious**
• Osteoporosis is **easy to diagnose**
• Good treatments are available
Impact of Osteoporosis

• 40% of women over 50 will suffer an osteoporosis-related fracture in their lifetimes.

• Each year, the risk of suffering a fracture from osteoporosis is greater than the combined risk of suffering a heart attack, stroke, or breast cancer in women.
Who is at Risk for Developing Osteoporosis?

• Post-menopausal women; increasing age
• Caucasian or Asian
• Small body stature
• Family history (especially hip fracture in a parent)
• Personal history of fractures as an adult (non-traumatic)
• Inactive lifestyle
• Cigarette smoking
• Alcohol use (≥3 drinks/day)
• Inadequate calcium intake
• Rheumatoid arthritis
• Medications: prednisone, breast cancer treatment, seizure medications, progesterone birth control
What is Meant by a Fragility Fracture?

A fracture sustained from a fall from a standing height or less
Or a Fracture Sustained with a Fall from Which a Fracture Ought Not be Expected

21 yo woman

62 yo woman

Google Images, 2016
Facts about Fractures

• Most osteoporotic fractures occur in the spine, hip, and wrist

• 2/3 of spine fractures are painless

• Fractures lead to disability, decreased quality of life and increased mortality
  • 20-25% increased mortality as early as one year after a hip fracture. [5-8x ↑ in the first 3 months]
Fragility Fractures

81 yo W
Left hip fx

62 yo W
Wrist fx

85 yo M
L1 Vert fx

71 yo W
Humerus fx
Societal Impact of fractures

• Two million osteoporotic fractures occur each year

• Cost for all fractures
  • $17 billion in direct medical costs (2005)
    • 17x cost of congestive heart failure (CHF)
  • Projected $25 billion (2025)

Fractures Lead to Fractures

• 1 in 5 patients with a fragility fracture will sustain a 2nd fracture in the next 5 years (2x greater risk)
  • 1 in 10 patients with a hip fracture will have a repeat hip fracture within 5 years

• Risk highest 2-4 years post fracture

• Risk remains high for 10 years post-fracture

Fracture probability is age- and gender-specific

Adapted from Kanis et al., Osteoporos Int. 2000
How to Detect Osteoporosis

• DXA (dual-energy x-ray absorptiometry)
  • Gold standard
  • Measures hip and spine (sometimes forearm)
  • Compares bone mineral density to that of a young adult (T-score)

• Peripheral measures (ankle, hand, finger)
  • A screening tool
  • Indicate possible risk of future fracture
  • Do not confirm the presence of osteoporosis
  • Not approved to make the diagnosis
Diagnosis: Bone Densitometry
Who Should Get a Baseline Bone Density Test?

• All women 65 years old or older
• All women with a history of a fragility fracture
• Postmenopausal women with at least one risk factor
• Adults with a disease or medication history associated with bone loss
  • Prednisone
  • Breast cancer medications
  • Seizure medications
  • Progesterone birth control
Interpretation: T-score is key

- The most clinically relevant value on the bone density report

- The T-score compares the bone density of the patient to that of peak bone density (approximately age 30)
The T-Score

• Bone density compared to that of a healthy young adult

• World Health Organization (WHO) defined
  ➢ Normal: $> -1.0$
  ➢ Osteopenia: $-1.0$ to $-2.5$
  ➢ Osteoporosis: $-2.5$ or lower

• The lower the T-score, the higher the risk of fracture
Fracture Risk Doubles With Every Standard Deviation Decrease in Bone Density
What About Osteopenia

• 50% of post-menopausal women age > 50 who fracture have osteopenia
  • T-score between -1.0 and -2.5

• How do we determine which patients with osteopenia are at increased risk for fracture?
  • FRAX score
Fracture probability is *age-* and *BMD-*specific

Adapted from Kanis et al., Osteoporos Int. 2001
Accumulation of risk factors increases fracture probability

At age 65 years, BMI = 24 kg/m², US Caucasian

10-year fracture probability (%)
(Hip, clinical spine, humerus, forearm)

Men

Women

BMD T-score

No Clinical Factors
Prior Fracture
+ Glucocorticoids
+ Family History
Using the FRAX® Tool to Help Determine Fracture Risk in Treatment-Naïve Patients With Low Bone Mass

- FRAX is a tool to help determine 10-year fracture risk in treatment-naïve patients with low bone mass
- Takes into account BMD and specific risk factors
- Identifies the high-risk patients who could benefit from treatment
- NOF recommends intervention at following 10-year fracture risk thresholds¹:
  - Osteoporotic fracture: ≥20%
  - Hip fracture: ≥3%
- Clinical judgment remains the critical element

Would you prescribe treatment for this patient?

Management

• Exercise
• Modification of environment for safety
• Medications
Management

- Exercise
- Modification of environment for safety
- Medications
Weight-bearing Exercise

Consult your doctor first
Role of Exercise in Prevention and Treatment

- Decreased risk of falling
- Improved bone mass and strength
- Enhanced muscle strength
- Improved balance, better posture
- Increased flexibility of soft tissues
- Improved cardiovascular fitness
- Improved depression
Management

- Exercise
- Modification of environment for safety
- Medications
Management

• Exercise
• **Modification of environment for safety**
• Medications
Fall Prevention In The Home

- Use handrails on stairs, bathroom
- Keep rooms free of clutter
- Keep floors clean but not slippery
- Wear supportive, low-heeled shoes. Don’t walk in socks; floppy slippers
- Use 100 watt bulbs in all rooms
- Install ceiling lighting in bedrooms
- Use rubber mat in shower/tub
  - Keep a flashlight at bedside
  - Check posture in mirror often
Management

• Exercise
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Management

- Exercise
- Modification of environment for safety
- Medications
What are the medication treatment options?

- **Calcium + Vitamin D**

- **Daily**
  - Estrogen
  - Raloxifene
  - Teriparatide
  - Abaloparatide

- **Weekly**
  - Alendronate
  - Risedronate

- **Monthly**
  - Risedronate
  - Ibandronate

- **Quarterly**
  - Ibandronate IV

- **Twice yearly**
  - Denosumab

- **Yearly**
  - Zoledronic acid
How Much Calcium is Enough?

• Varies for age
  • 1,200-1,500 mg every day after age 50
• From diet or supplement or both
  • It is ideal to obtain calcium from diet as much as possible

Good Sources of Calcium

• Milk-300 mg/glass (includes soy and almond)
• Yogurt-400 mg/cup
• Broccoli-180 mg/cup
• Sardines-370 mg/3 oz
How Much Vitamin D?

• 800-1000 IU every day
• From fortified foods or supplements or both
• Higher doses if Vitamin D deficient

Good sources of Vitamin D

• Milk (100 IU per glass)
• Multivitamins (most have 400 IU)
• Over the counter vitamin D tablets
Medications Available for Treating Post-Menopausal Osteoporosis

• Tablets
  • Calcium and Vitamin D supplementation
  • Estrogen
  • Raloxifene (Evista®)
  • Alendronate (Fosamax®)
  • Risedronate (Actonel®)
  • Ibandronate (Boniva®)

• Intravenous yearly
  • Zoledronic Acid (Reclast®)

• Subcutaneous injection
  • Teriparatide (Forteo®) daily
  • Abaloparatide (Tymlos®) daily
  • Denosumab (Prolia®) twice yearly
Concerns about Medication-Related Adverse Events

• Bisphosphonates (alendronate, zoledronic acid)
  • Esophageal discomfort
  • Osteonecrosis of the jaw
  • Thigh bone fractures

• Anabolic agents (teriparatide, abaloparatide)
  • Black box warning
  • Leg cramps
  • Dizziness

• Denosumab (Prolia®)
  • Eczema
  • Osteonecrosis of the jaw
  • Atypical thigh bone fractures
Concerns about Medication-Related Adverse Events

- Bisphosphonates
  - Esophageal discomfort
  - Osteonecrosis of the jaw
  - Atypical femoral fractures
Osteonecrosis of the Jaw

• Woo and colleagues, May 2006
  • Review of published literature
  • 368 cases of osteonecrosis of the jaw
  • Treated predominantly for metastatic disease and hypercalcemia of malignancy
    • Breast, prostate, lung, renal cell cancer, multiple myeloma
  • Majority received high dose IV bisphosphonate

Osteonecrosis of the Jaw

• Risk factors
  • Intravenous bisphosphonates
  • Dosage used (up to 12x dosage used for osteoporosis)
  • History of dental trauma or surgery
    • Includes dentures
  • History of dental infection

Osteonecrosis of the Jaw

• Recommendations
  • Complete all dental invasive work prior to or within 1-2 months of initiating IV bisphosphonate treatment
  • Once on IV bisphosphonates maintain good dental care
    • If already on treatment then seek conservative procedure management
    • Appropriate timing of dosing and procedures if possible
  • If ONJ develops treat conservatively
    • Antibiotics, oral rinses

Atypical Femoral Fractures

- Fragility of thigh bone (femur)
- Association determined (but not causal) with long term bisphosphonate use
- Important to consider how long a course of therapy should be
  - Studies show benefit with 3-6 years of treatment (depends on which medication)
    - Alendronate (Fosamax) 5 years
    - Zoledronic acid (Reclast) 3 or 6 years
  - Some patients at very high risk warrant a longer treatment course
Medication Adverse Events

Begging the Question

Who should receive a drug holiday?
When should the holiday begin?
How long should it last?
Consider Drug Holiday
The Drug Holiday: Following a Sufficient Treatment Course

• Many patients take a drug holiday
  • Bone turnover can resume
  • Awareness of fracture risk prevention
  • Careful monitoring for ongoing bone loss
  • Continue calcium and vitamin D intake
How Long is the Holiday?
The Drug Holiday: What is the Duration?

- Taking into account
  - Patient age
  - Risk factors
  - History of fracture
  - Other medical illnesses

1-2 years OR 3-4 years
Drug Holiday Considerations

Individualize the decision with each patient

Reconsider this regularly
Concerns about Medication-Related Adverse Events

• Anabolic agents (teriparatide, abaloparatide)
  • Black box warning
  • Leg cramps
  • Dizziness 2 year treatment limit

• Denosumab (Prolia®)
  • Eczema Safe for 10 years
  • Osteonecrosis of the jaw
  • Atypical femoral fractures
Benefits Outweigh Risk

Benefits

Timing and Therapy Duration

Risks
Fracture Prevention: Primary

- Preventing the first fracture
  - Appropriate screening (DXA scan)
  - Risk assessment
  - Utilization of the FRAX tool
  - Risk factor modification
    - Falls assessment
  - Treatment regimen
    - Ensuring correct administration
    - Ensuring compliance
    - Determining plan for therapy duration
Fracture Prevention: Secondary

- Treatment of osteoporosis after a fragility fracture is sustained
  - Appropriate screening (DXA scan)
  - Risk assessment
  - Utilization of the FRAX
  - Risk factor modification
    - Falls assessment
  - Treatment regimen
    - Initiating treatment
    - Ensuring correct administration
    - Determining plan for therapy duration

IN ADDITION TO REDUCING FRACTURE RATES, BISPHOSPHONATES DECREASE MORTALITY RATES
The Osteoporosis Challenge

• To educate all patients on measures to maintain good bone health
• To identify patients at high risk for osteoporosis
• To use bone densitometry to detect low bone density **BEFORE** a fracture occurs
• To educate patients about treatment options taking into account the risks and benefits
• To use risk factor reduction, medications and exercise to treat patients for osteoporosis
• Consider appropriate duration of therapy
Questions?