

# Post-Menopausal Osteoporosis

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# 63 year old post-menopausal woman

- Fractured left shoulder (proximal humerus) at age 61 while walking her dog. Her first fracture
- **Menopause age 51**, No history of estrogen replacement therapy
- Bone Density T-score
  - Lumbar spine: - 2.8
  - Total hip: -2.4
  - Femoral neck of hip: -1.8
- No history of steroid therapy, **kidney stones**, cancer

# PMH / MEDS

- GERD
- Hypertension
- Insomnia
- Surgical History
  - Shoulder fracture repair
  - C-section
- Omeprazole 40 mg BID
- Amlodipine 5 mg daily
- Trazodone 50 mg bedtime
- Calcium with Vitamin D daily
- Multivitamin daily
- B Complex daily

## SH / FH / ROS

- Wine nightly, no tobacco/drugs
  - Lives with husband and dog
  - Active lifestyle
  - Yogurt every morning
- ROS
    - + back pain
    - + bloating
- Father had curved spine
    - No hip fracture
  - Mother died age 58 (breast cancer)

# Physical Exam

- BP 116/70 P 78 R 12 Pain 0 Weight 124 lbs Height 61.5 inches
- Gen: appears well
- EENT: no goiter, **stable dentition**
- CV: Reg
- Lungs CTA
- Abd: Soft, + BS
- MS: **no spine pain to palpation, no kyphosis**
- Skin: no bruising
- Psych: intelligent and conversational

# Bone Specific History / Exam Details

- Age of menopause
  - Premature is less than 45 yo (FRAX risk assessment)
- History of kidney stones
  - Hypercalciuria
- Daily dairy consumption
  - Calcium intake
- Proton Pump Inhibitor
  - Type of calcium supplement
- Parental history of HIP FRACTURE specifically
  - FRAX risk assessment
- Spine assessment on exam
  - Imaging workup
- Dental assessment on exam
  - Drug safety

# Diagnosis of Osteoporosis

- 1) Clinical Judgment: Fragility fractures, general frailty
- 2) Bone density
  - T-score less than -2.5 at spine, total hip, or femoral neck of hip
- 3) Fracture Risk Assessment Tool (FRAX) – Free calculator
  - 20.0 % or greater 10 year risk of any osteoporotic fracture
  - OR
  - 3.0 % or greater 10 year risk of hip fracture

# Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: **US (Caucasian)**

Name/ID: PRIMARY CARE REVIEW

[About the risk factors](#)

## Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth

Age:

63

Date of Birth:

Y:

M:

D:

2. Sex

Male

Female

3. Weight (kg)

56.3

4. Height (cm)

156.2

5. Previous Fracture

No  Yes

6. Parent Fractured Hip

No  Yes

7. Current Smoking

No  Yes

8. Glucocorticoids

No  Yes

9. Rheumatoid arthritis

No  Yes

10. Secondary osteoporosis

No  Yes

11. Alcohol 3 or more units/day

No  Yes

12. Femoral neck BMD (g/cm<sup>2</sup>)

T-Score

-1.8

Clear

Calculate

**BMI: 23.1**

The ten year probability of fracture (%)

**with BMD**

Major osteoporotic

**15**

Hip Fracture

**2.0**



## Weight Conversion

Pounds kg

124

Convert

## Height Conversion

Inches cm

61.5

Convert

**07721254**

Individuals with fracture risk  
assessed since 1st June 2011



# Diagnosis of Osteoporosis - YES

- 1) Clinical Judgment: Fragility fractures, general frailty
- 2) Bone density
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  - 20.0 % or greater 10 year risk of any osteoporotic fracture
  - OR
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# Clinical Pearl

- FRAX most useful in patients with osteopenia on bone density
  - T-score of -1.0 to -2.4 at spine, total hip, or femoral neck of hip
- Identifies patients with osteoporosis based on fracture risk
  - Parental history of hip fracture important data point
- Provides assurance that fracture risk is not elevated
  - Avoids over treatment
- Always calculate using the 'Caucasian' setting as FRAX underestimates fracture risk in Blacks, Asians, and Hispanics

# Osteoporosis Workup

- **Highly Recommended**
  - Complete Metabolic Panel (corrected calcium for low albumin)
    - Corrected Calcium =  $0.8 * (4 - \text{Albumin}) + \text{Measured Calcium}$
  - Phosphorus
    - Rare disorders of low phosphorus, osteomalacia
  - Vitamin D (25 – OH)
  - PTH (parathyroid level)
  - TSH
- **General recommendation**
  - Magnesium
  - CBC
  - Spine x-ray (abnormal exam finding)
  - 24 hour urine calcium (kidney stones = hypercalciuria?)
- **Not Recommended**
  - Bone turnover markers (NTX, CTX)
  - Vitamin D (1,25 – OH)

# Osteoporosis Treatment - Calcium

- A vital component of care!
- **Total daily MINIMUM = 800 mg from all sources combined**
  - Dairy plus supplements
  - Maximum intake = 2000 mg
- Assume 250 mg of calcium for every serving of dairy
  - Soy, almond, and coconut milk must say FORTIFIED on the package
- Leafy green vegetables are a potential source of calcium
  - Collard Greens: 250 mg / cup
  - Turnip greens: 200 mg / cup
  - Kale / Bok Choy: 150 mg / cup
  - Spinach contains oxalate which will impede absorption of calcium
  - All other greens contain < 150 mg / cup (broccoli, okra, swiss chard, peas)

# Osteoporosis Treatment - Calcium

- Supplement to a level of 800 mg daily if required with tablets/caplets/chews/liquid/powder
- **Will not cause a heart attack**
- Calcium carbonate – most common form
  - **1 serving = 1 tablet** will provide 500-600 mg calcium
  - Take with food
- Calcium Citrate – enhanced absorption over calcium carbonate
  - **1 serving = 2 tablets** will provide 500 mg calcium
- Jarrows Bone Up™, Osteoblend™ are acceptable
  - Large serving size (3-6 tablets) to provide 500-800 mg calcium

# Clinical Pearl

- **Our patient on proton pump inhibitor therapy (over 40 mg daily)**
- Reduces absorption of calcium carbonate
  - H2 blockers (ranitidine, famotidine) not a concern
- Confirm her supplement and switch to Calcium Citrate based regimen
  - Citracal™ is my personal favorite
- Other conditions to consider calcium citrate
  - Post gastric bypass
  - Crohns or Inflammatory bowel disease
  - Gluten intolerance

# Osteoporosis Treatment – Vitamin D

- Goal Vitamin D (25 – OH) level
  - Optimal: 30 – 80 ng/ml (no difference between 34 and 68 ng/ml)
  - 20 ng/ml is absolute minimum
- 4000 IU (international units) daily from all supplement sources is safe and effective
- Add on 50,000 IU prescription dose weekly for 8 weeks to boost very low baseline levels (< 15 ng/ml)
- Check level after 6-8 weeks of repletion
- 6000 – 8000 IU daily are needed for some patients
  - No toxicity until over 100 ng/ml

# Clinical Pearl

- Vitamin D3 (cholecalciferol) is the standard vitamin D supplement
  - Human/animal form
- Vitamin D2 (ergocalciferol) is plant based form
  - Same mechanism of action as D3 but shorter half-life
    - Vegan preferred
  - Prescription 50,000 IU capsule is Vitamin D2 – short term use
- **Some labs report out Vitamin D3 (25-OH) and Vitamin D2 (25-OH) values**
  - **This is absurd, the total value (D3 (25-OH) + D2 (25-OH)) is what matters**



# Osteoporosis Treatment - Exercise

- Best weight bearing exercise program:
- Oregon State University Better Bones and Balance Program
  - \$15.00 workout DVD
  - <https://extension.oregonstate.edu/bbb/better-bones-balancer-store#dvd>

# Our Patient

- Ca 8.8 mg/dl Phos 2.8 mg/dl Cr 0.6 mg/dl
- Vitamin D (25 – OH) : 24 ng/ml
- PTH 82 pg/ml
- TSH Normal
  
- Stop calcium carbonate
- Start calcium citrate 500 mg daily (2 tablets daily)
- Start Vitamin D3 2000 unit capsule daily
- Maintain MVI and Yogurt intake
- Provide DVD order form
  
- **CALCIUM, VITAMIN D, WEIGHT BEARING EXERCISE ARE THE FOUNDATIONS OF BONE HEALTH**
  - Ensure that all three elements are addressed in your patient prior to medical therapy

# Osteoporosis Treatment – Medications

## Bisphosphonates

- Bisphosphonates enter bone matrix and inhibits osteoclast cells (bone eating cells)
  - Known as ANTI-RESORPTIVES
- **1) Alendronate 70 mg tablet by mouth once weekly**
  - Generic for Fosamax™
  - No role for Actonel™ (risedronate) nor Boniva™ (ibandronate)
- Empty stomach, water only, no lying down for 30 minutes
  - Complex rules and GI side effects main barrier to usage
- Reduces spine, hip, and other fractures (humerus, radius, rib etc..)
- A first line agent

# Osteoporosis Treatment – Medications

## Bisphosphonates

- 2) Reclast™ (zoledronic acid) 5 mg infusion
- Once yearly
- 100% adherence, no gastrointestinal side effects
  - inexpensive
- Excellent fracture prevention
- Post infusion reaction 1 – 5 days post therapy
  - Flu like symptoms
  - Acetaminophen, hydration, rest

# Our patient

- Use of high dose proton pump inhibitor ( > 40 mg daily)
  - Concern for ulcers, Barrett's esophagus, esophageal strictures
- Would avoid oral bisphosphonate (alendronate)
- Recommend IV zoledronic acid

# Clinical Pearl

- Mild GERD not contraindication to oral alendronate
  - Safe to try for 4-8 weeks to assess GI side effects
- Caution patients on post infusion reaction to zoledronic acid infusion
- Ensure normal calcium levels and calcium intake
- Ensure normal vitamin D (25 – OH) level and vitamin D intake
- **Minimum GFR for bisphosphonates: 40 ml/min**
  - **Calculate via Cockcroft-Gault equation**
    - Accounts for weight, gender, age, and creatinine (MDRD does not account for weight)
    - Women less than 100 lbs will have low GFR despite normal creatinine

# Osteoporosis Treatment – Medications

## Prolia™ (denosumab)

- Inhibits osteoclast signaling (only agent with this mechanism of action)
  - Classified as an anti-resorptive, like bisphosphonates
- **60 mg subcutaneous injection every 6 months**
  - **Must be in health care setting, not for patient self injection**
- Superb spine, hip, and other fracture prevention
  - Similar to Reclast™ (zoledronic acid)
- Alternative for those with adverse reaction to bisphosphonates
  - Myalgias, infusion reaction
- Minimum GFR is 30 ml/min (excellent choice for CKD)
- Expensive, requires insurance pre-authorization
- Ensure adequate calcium and vitamin D intake

# Osteonecrosis of the Jaw - ONJ (bisphosphonates and denosumab)

- Very rare: 1 in 10,000 patient-years
  - Fear of this adverse event not sufficient to avoid osteoporosis therapy
- **Precautions**
  - Poor dentition (you will know it when you see it)
  - History of radiation therapy to jaw/mouth
  - No regular dental care (unless full dentures)
  - Planned dental extraction or root canal
- Dental clearance not required
- No lab tests nor imaging available to predict, monitor for ONJ



# Surveillance / Monitoring of Therapy

- Bone density after 1 year of therapy
  - Same or improved values
    - No declines over 5 %
- Routine labs not required

# Duration of Therapy

- Alendronate: Not to exceed 5 years of continuous therapy
- Zoledronic acid: Not to exceed 3 years of continuous therapy
- Prolonged bisphosphonate exposure increases risk of atypical mid-femur shaft fractures
  - 1/1000 risk after 8 years of therapy
- Can restart therapy after 2 year drug holiday
- Denosumab: Safety data up to 10 years (20 injections) continuously
  - Therapy cessation associated with accelerated bone loss

# Summary

- Calcium, Vitamin D, and weight bearing exercise are the foundations of bone health
  - Must be present for medical therapy to succeed
- Use calcium supplements to *supplement* to 800 mg of calcium daily
- Calculate FRAX score for patients with osteopenia
- Alendronate PO, zoledronic acid IV, and denosumab SQ are the primary osteoporosis agents
- Bisphosphonates (alendronate/zoledronic) have duration limits
- ONJ is a rare adverse effect
- Anabolic agents require attention to black box warning

## 2<sup>nd</sup> Line Therapeutic Options

- **Evista™ (raloxifene)** : Selective estrogen receptor modulator (SERM)
- **60 mg tablet daily**
  - No regard to food or medications
- Prevents spine fractures
  - No hip fracture prevention data
- Reduces risk of breast cancer
  - Our patient with family history of breast cancer
    - If used for this indication, can be combined with other osteoporosis agents
- Risk of blood clots similar to estrogen
  - No uterine bleeding (progesterone not needed)

## 2<sup>nd</sup> Line Therapeutic Options

- Estrogen replacement (HRT)
- Prevents fractures
  - Breast and clot related side effects
- Should be used in conjunction with relief of menopausal symptoms
  - Should not be used solely for bone health
- Can be used in combination with any osteoporosis agent
  - Except raloxifene
- Rapid declines in bone mass occur after cessation