Osteoporosis: Review of Updated Diagnosis and Treatment Guidelines
Charleston APRN Conference
February 22, 2019

Laura Boineau, MSN, APRN, FNP-BC
Department of Orthopaedics
Prisma Health-Upstate
Fracture Liaison Service and Osteoporosis/ Bone Health Program

Disclosures

• I am on the Bone Health Speaker Bureau for Amgen and Radius Health
• I have participated on a scientific advisory board for Radius Health
Bones: The Rodney Dangerfield of the Body

“Bones may not get as much respect as our hearts, brains and other vital organs, but without these rigid parts, we’d be nothing but a pile of goo.”  Erika Berg, PhD

Objectives

• Define “osteoporosis”
• Describe the different ways of diagnosing osteoporosis
• Understand and be able to utilize the AACE/ACE 2016 Treatment Algorithm to appropriately evaluate and treat osteoporosis
• Discuss the treatment options for osteoporosis: how they work, side effects, effectiveness, and proper selection

Basic Definition Osteoporosis

“porous bone”
Osteoporosis

• A skeletal disorder characterized by compromised bone strength predisposing to an increase risk of fracture
• Bone strength includes bone density and bone quality
• There are no symptoms of low bone mass unless a fracture occurs

Relevance of Architecture to Structural Strength

Normal quantity and architecture
Loss of quantity
Loss of architecture

- Architecture
- Turnover
- Mineralization
- Damage accumulation

Bone Strength = Bone Quality + Bone Density

aBMD = g/cm²
vBMD = g/cm²
Osteoporosis Definition: 
NIH Consensus Conference
A skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture
Bone strength = Bone density + Bone quality

So Why Is This Important?

<table>
<thead>
<tr>
<th>% of women and up to ¼ of men, over age 50, will break a bone due to osteoporosis</th>
<th>Over 1/3 of patient with a hip fracture HAD A PRIOR FRACTURE!</th>
<th>After a fracture, 4 out of 5 women over age 67 were not tested or treated for osteoporosis</th>
</tr>
</thead>
</table>
| Every year, of nearly 300,000 hip fractures patients: ¼ end up in nursing homes and ½ never regain previous function | 1 year mortality rates after hip fracture range from 12-37%. Worse in men, those with dementia and those of advanced age | Osteoporosis fractures will likely cost us $25 billion per year by 2025
50% of osteoporosis related repeat fractures can be prevented with appropriate treatments |

Osteoporosis Is A Major Medical Problem

Osteoporosis vs other diseases

Osteoporotic fractures in women: comparison with other diseases

Total incidence of osteoporosis related fractures vs. incidence of other diseases
3 Ways to Diagnose Osteoporosis

1. BMD

**WHO Classification of BMD**

<table>
<thead>
<tr>
<th>T-score</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>≥ 1.0</td>
</tr>
<tr>
<td>Osteopenia</td>
<td>1.0 - 2.5</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>&lt; 2.5</td>
</tr>
<tr>
<td>Severe Osteoporosis</td>
<td>≤ 2.5, if lower + Fracture</td>
</tr>
</tbody>
</table>

*Reference standards for substandard T-scores in Caucasian women NHANES III database.*
*Values based on a binomial distribution, 95% CI, or 95% CI, for diagnosis.*
*Values derived from BMD measurements or 20% prevalence of T and FRAX.*
*Other methods and cut-off values may not be used for diagnostic classifications.*


2. Fragility Fracture

**NBHA Position Statement:**
**Clinical Diagnosis of Osteoporosis**

In postmenopausal women and men age 50 years and older, osteoporosis may be diagnosed by...

- T-score ≤ -2.5 at the LS, TH, or FN
- Low trauma fracture regardless of BMD
- T-score between -1.0 and -2.5 with low trauma vertebral, proximal humerus, pelvic or some distal forearm fractures
- FRAX MOF risk ≥ 20% or HF risk ≥ 3%

*NBHA Position Statement: Clinical Diagnosis of Osteoporosis* 2013

3. What is a low-trauma fracture?

- No consensus
  - Common clinical definition is fracture due to fall from a standing position or equivalent
  - Clinical trials may include all fractures other than face, skull, fingers, and toes
  - Fractures associated with low BMD that increased in incidence with age (Kans et al., 2001)
- Maybe it doesn’t matter
  - Low BMD contributes similarly to risk of high- and low-trauma fractures
  - High- and low-trauma fractures contribute similarly to risk of future fractures
3 Ways to Diagnose Osteoporosis

3. High risk for fracture by FRAX

NBHA Position Statement: Clinical Diagnosis of Osteoporosis

In postmenopausal women and men age 50 years and older, osteoporosis may be diagnosed by...

- T-score ≤ -2.5 at the LS, TH, or FN
- Low trauma hip fracture regardless of BMD
- T-score between -1.0 and -2.5 with low trauma vertebral, proximal humerus, pelvis or some distal forearm fractures
- FRAX MOF risk ≥ 20% or HF risk ≥ 3%
Ultimate Goal of Diagnosing and Treating Osteoporosis

**Prevent fractures!!!**

Causes of Secondary Low Bone Mass

![Sunset Image](image-url)

Some Secondary Causes Of Osteoporosis In Adults

<table>
<thead>
<tr>
<th>Endocrine Disease or Metabolic Causes</th>
<th>Bone Resorption</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1 Hyperparathyroidism Acromegaly</td>
<td>Excess Hormones</td>
<td>Osteoporosis, Hyperparathyroidism</td>
</tr>
<tr>
<td>Type 2 Hyperparathyroidism</td>
<td>Excess Hormones</td>
<td>Osteoporosis, Hyperparathyroidism</td>
</tr>
<tr>
<td>Excess Hormones</td>
<td>Excess Hormones</td>
<td>Osteoporosis, Hyperparathyroidism</td>
</tr>
<tr>
<td>Excess Hormones</td>
<td>Excess Hormones</td>
<td>Osteoporosis, Hyperparathyroidism</td>
</tr>
<tr>
<td>Excess Hormones</td>
<td>Excess Hormones</td>
<td>Osteoporosis, Hyperparathyroidism</td>
</tr>
</tbody>
</table>

Adapted from AACE Guidelines on Osteoporosis
Workup for Causes of Secondary Low Bone Mass

- History and Exam
- Labs in all patients
  * Comprehensive metabolic panel
  * CBC w/ diff
  * Total Vitamin D
  * PTH
  * Magnesium
  * Phosphorous
  * TSH w/ reflex Free T4

Workup for Secondary Causes of Low Bone Mass

- Labs based on clinical evaluation
  * PTHrP
  * 24 hour urine for calcium and creatinine
  * SPEP/ IFE/ UPEP
  * Celiac antibodies
  * Free and total testosterone
  * Bone turnover markers (CTX, NTX, P1NP)
High Risk for Fracture

- Older age
- Prior fractures
- Very low T score
- Low muscle mass
- Glucocorticoids
Treatment
Current Medications for Osteoporosis

<table>
<thead>
<tr>
<th>Drug</th>
<th>Prevent</th>
<th>Tx</th>
<th>Prevent</th>
<th>Tx</th>
<th>Tx</th>
<th>Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estrogen</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcitonin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alendronate (Fosamax, generic)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Risedronate (Actonel, Atelvia, generic)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Ibandronate (Boniva, generic)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Zoledronic Acid (Reclast, generic)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Denosumab (Prolia)</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Raloxifene (Evista, generic)</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Calcitonin (Miacalcin, Forcal)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Estrogen (various)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

USA Osteoporosis Medications

<table>
<thead>
<tr>
<th>Drug</th>
<th>PMO*</th>
<th>GIO**</th>
<th>Men with OP***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estrogen</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Calcitonin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alendronate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Risedronate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ibandronate</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Zoledronic Acid</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Raloxifene</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Denosumab</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Teriparatide</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Abaloparatide</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Anti-resorptives

- **Bisphosphonates**
  - * Alendronate (Fosamax)* - 70 mg for osteoporosis or 35 mg weekly for osteopenia
  - * Risedronate (Actonel)* - once monthly and once weekly delayed release (Atelvia)
  - * Ibandronate (Boniva)* - once a month oral and IV once every 3 months
  - * Zoledronic acid (Reclast)* - once a year IV for osteoporosis and once every 2 years for osteopenia
Bisphosphonates

- Classified as anti-resorptive medications
- Bind to hydroxyapatite crystals in bone inhibiting crystal dissolution, aggregation and formation
- Inhibit resorption of bone and lead to small increases in bone density and reduced fracture risk
- Alendronate, risdroronate, ibandronate, and zoledronic acid are approved for use in osteoporosis

Oral Bisphosphonate Administration

- Oral bisphosphonates must be taken carefully to avoid side effects
- Patients must:
  - Take this medication when they arise in the morning with 8 ounces of water. They are to take nothing else by mouth (food, drink, other medications) for at least 1/2 hour
  - Atelia may be taken after meals
  - Remain upright for at least 1/2 hour (1-hour with ibandronate)

Bisphosphonate Comparisons

<table>
<thead>
<tr>
<th>Bisphosphonate</th>
<th>Osteoporotic Fracture</th>
<th>GIOP</th>
<th>Male Osteoporosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alendronate</td>
<td>Hip</td>
<td>Treatment</td>
<td>Treatment</td>
</tr>
<tr>
<td>Weekly 70 mg</td>
<td>Vertebral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risetronate</td>
<td>Vertebral</td>
<td>Treatment</td>
<td>Treatment</td>
</tr>
<tr>
<td>150 mg monthly</td>
<td>Non-vertebral</td>
<td>Prevention</td>
<td>35 mg q wk</td>
</tr>
<tr>
<td>Ibandronate</td>
<td>Vertebral</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>150 mg/mo or 3 mg</td>
<td>Vertebral</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>NQ every 3 months</td>
<td>Non-vertebral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoledronic acid</td>
<td>Hip, vertebral</td>
<td>Treatment</td>
<td>Treatment</td>
</tr>
<tr>
<td>5 mg IV yearly</td>
<td>Non-vertebral</td>
<td>Prevention</td>
<td></td>
</tr>
</tbody>
</table>
Considerations for Choosing a Bisphosphonate

• Fracture reduction
• Adherence issues
• Taking with food (Atelvia – risedronate)
• GI Tolerance of oral dosing
• Acute phase reactions from intravenous dosing

Commonly Asked Questions About Bisphosphonates

• Should we stop bisphosphonates after prescribing them for a period of years?
• What about osteonecrosis of the jaw?
• What about atypical fractures due to bisphosphonates?

Long Term Studies with Bisphosphonates

• Considerable lack of consensus as to how long to treat patients with bisphosphonates
  - Bisphosphonates deposited in bone lead to reservoir of drug that may have effects for months and years
• Stopping alendronate after 10 yrs of treatment at a dose of 10 mg daily
  - Amount of alendronate released from bone over the next several months or years would be equivalent to taking one fourth of the usual dose (2.5 mg daily or 7.5 mg once a month)
Example of an Algorithm to Manage Women on Long Term Bisphosphonates

Atypical Femoral Fractures in Bisphosphonate Users

Locations of Femur Fractures

Subtrochanteric fractures

Subtrochanteric & femoral shaft fractures - 7% to 10% of all hip/femoral shaft fractures
**Epidemiology of Atypical Femoral Fractures**

- Incidence of subtrochanteric fractures is very low
- Highest incidence reported (Schlicher NEJM 2011)
  - 5.5/10,000 pt-year for ever use
  - 1.9/10,000 for <1 to 1.9 years of use
  - 5.4/10,000 for >2.0 years
- Compare with the overall incidence of hip fracture (103 per 10,000 person-years) (Kelly 2010)

---

**Risk Factors - Atypical Femur Fractures**

- Long duration of BP use (> 5 yrs)
- Younger age
- Asian race
- Low vitamin D levels
- Multiple antiresorptive drugs
- Glucocorticoids
- Diabetes
- Rheumatoid arthritis

---

**Osteonecrosis of the Jaw**
Osteonecrosis of the Jaw

- Known risk factors for ONJ include:
  - Diagnosis of cancer
  - Concomitant therapies (e.g., chemotherapy, radiotherapy, and corticosteroids)
  - Poor oral hygiene
  - Smoking
  - Co-morbid disorders (e.g., pre-existing dental disease, anemia, coagulopathy, and infection)
- The mechanism by which ONJ occurs is currently uncertain

Conclusions

- Bisphosphonates reduce osteoporotic fractures but data supporting the extent of fracture reduction varies across agents
- Serious side effects are much less common than the fragility fractures that are prevented by taking bisphosphonates
  - Patient follow up needs to include surveillance for signs of impending atypical femur fracture
- Length of treatment needs to be individualized according to response during the first 3-5 yrs of therapy and overall fracture risk at that time

Bisphosphonates Summary

- Available as a generic
- Variety of dosing options (oral and IV)
- Poor compliance with oral dosing
- Has osteopenia and osteoporosis dosages
- Dose modifications needed for decreased kidney function or may be contraindicated with creat. clearance <35 ml/ min
Antiresorptive

- **Raloxifene** (Evista): SERM
  - SERM: selective estrogen receptor modulator, named in an era where use of estrogens for chronic therapy was common
  - “Ideal” SERM: estrogen agonist in skeleton and cardiovascular system; estrogen antagonist in breast and uterus
  - Phase 2 trial:
    - Modest reduction in biochemical markers of bone turnover, increase in BMD
    - Approx. 10% reduction in LDL cholesterol
    - No evidence of endometrial stimulation

Draper 1996; JBMR

---

Raloxifene: Treatment of Osteoporosis

Safety:
- Hot Flashes
- Leg Cramps
- Venous Thromboembolic Disease
- Breast cancer: decreased risk
- Overall Mortality: no increase

Efficacy:
- Vertebral fracture reduction: 30% to 50%
- No evidence of non-vertebral fracture reduction including no support for hip fracture benefit

Ettinger 1999 JAMA

---

Antiresorptive

- **Estrogen**
Antiresorptive

- Denosumab (Prolia)
  - Is a RANK-Ligand inhibitor

Rank-Ligand is required for the activation, function and survival of osteoclasts and therefore bone resorption
Denosumab

- Denosumab is a fully human IgG2 antibody that very specifically binds to and inactivates RANK ligand.
- Denosumab has been available since 2010 and is widely used for the treatment of postmenopausal osteoporosis at high risk for fracture.
- Also approved for osteoporosis in men and in men and women receiving hormone deprivation therapy for prostate and breast cancer at high risk for fracture.
- The effects of denosumab treatment have now been evaluated through the final year of the FREEDOM Extension Study, representing up to 10 years of continued denosumab treatment.

Effects of Denosumab

- Maintains trabecular architecture
- Increases cortical mass and thickness
- Decrease cortical porosity
- Increases bone strength in hip and spine
- Rapidly reversible – rapid loss of fracture protection
- Increases BMD progressively out to 10 years
- Increases BMD when switched from bisphosphonate
- Effective after and with teriparatide
- Fracture risk reduction is persistent or improving
  - 21.7% in lumbar spine; 9.2% at total hip
Denosumab: Safety and Tolerability

- Overall, no increased risk of adverse events or serious adverse events in clinical trials
- Increased incidence of: skin rash (3% vs 1.7%), cellulitis (12/3808 vs 1/3805) No progression with time
- No renal or cardiovascular effects noted
- Very rare cases of AFF and ONJ

Summary

- Denosumab treatment for up to 10 years was associated with:
  - persistent reduction of bone turnover
  - continued increases in BMD without therapeutic plateau
  - low incidence of new vertebral and non-vertebral (including hip) fx
  - no evidence of resistance to therapy
  - no new adverse events with long-term therapy
- No justification for a “drug holiday”

Denosumab Summary

- Powerful anti-resorptive
- Subq injection every 6 months
- No “drug holiday”
- Make sure calcium level is WNL
- May use in CKD but monitor calcium and phosphorous closely

Anabolics

• Anabolic agents increase bone mass
  1. Teriparatide (Forteo)
     - Recombinant human PTH(1-34)
  2. Abaloparatide (Tymlos)
     - (PTHrP 1-34)

PTH and PTHrP analogs stimulate bone formation and activate bone remodeling. Increases in bone formation occur more quickly than bone resorption, leading to an increase in bone mineral density (BMD)

Anabolics

• Patient selection:
  - Have severe osteoporosis and are at high risk for fracture (T-score of -3.5 or below even in the absence of fractures; T-score of -2.5 or below plus a fragility fracture)
  - Have osteoporosis and are unable to tolerate bisphosphonates or who have relative contraindications to oral bisphosphonates (achalasia, scleroderma esophagus, esophageal strictures)
  - Fail other osteoporosis therapies (fracture and/or loss of BMD in spite of compliance with therapy)


## Teriparatide

- **Approved for treatment of postmenopausal osteoporosis in women at high risk for fracture**
- **Approved to increase bone mass in men with primary or hypogonadal osteoporosis who are at high risk for fracture**
- **Approved for treatment of glucocorticoid induced osteoporosis (GIO) in men and women**


- Bone formation occurs soon after PTH is administered because osteoblast formation is increased, which results in an increase in bone turnover and formation
- Important to dose 24 hours apart
- It is “good” bone, structurally similar to bone from younger individuals
- Once daily subq injection
- Pen device needs to stay refrigerated


## Side effects (Most common, slightly more than placebo)

- Hypercalcemia
- Dizziness
- Leg cramps
- Hypercalcuria (Mild)


Teriparatide

- Black box warning for osteosarcoma
- 2 year lifetime limit
- However, it seems to be a rat problem
- Of more than 1 million people treated with teriparatide worldwide, there have been 3 reported cases of osteosarcoma


Abaloparatide

- Approved for treatment of postmenopausal osteoporosis in women at high risk for fracture
- Increases spine and hip BMD and reduces the risk of vertebral and nonvertebral fractures
- Once a day subq injection


Abaloparatide

- Black box warning for osteosarcoma
- 2 year lifetime limit
- Once the pen is started, it does NOT have to stay in the refrigerator
Anabolic Summary

- Build bone and improve bone quality and architecture
- 2 year lifetime limit of use
- Must be followed by an anti-resorptive or benefits lost
- Seems to help with fracture healing (small studies, not FDA approved for fracture healing)


Anabolic Summary

- Contraindicated in primary or secondary hyperparathyroidism and conditions that cause hypercalcemia
- In an ideal world, I would use an anabolic agent first line for most everyone with osteoporosis and low bone mass with fractures followed by an antiresorptive

Duration of Therapy

- For oral bisphosphonates, consider a “bisphosphonate holiday” after 5 years of stability in lower-risk or moderate risk patients
- For oral bisphosphonates, consider a “bisphosphonate holiday” after 6-10 years of stability in higher-risk patients
- For IV zoledronic acid, consider a “bisphosphonate holiday” after 3 annual doses in lower/ moderate-risk patients and after 6 annual doses in higher risk
Duration of Therapy

- Teriparatide and Abaloparatide for 2 years and must be followed with an anti-resorptive
- Anabolic or raloxifene may be used during the “bisphosphonate holiday” period for higher-risk patients
- A drug “holiday” is not recommended with denosumab

When is the bisphosphonate holiday over?

- FRACTURE!!!!!
- BMD decline
- Rise in bone turnover markers may be a signal that the holiday is over, but does not apply to those with low marker’s prior to treatment
Treating to Target

• What is your goal in treating high blood pressure? High cholesterol or high blood sugar? Why?
• What is your goal in treating osteoporosis? Why?

Treating to Target

• Ultimate goals of osteoporosis therapy
  - Prevent fractures and their complications
• What are osteoporosis treatment targets?
  - Is there any evidence to support treatment targets?
• How would having treatment targets affect treatment decisions?
  - How will this ultimately benefit patients?

Treating to Target

• Sequential monotherapy can be used to attain and maintain treatment targets
• There are optimal sequences that may provide greater effects on fracture reduction and BMD
• Can achieve treatment targets in many patients, especially with anabolic agents
• Might allow for shorter anti-resorptive treatment duration, decrease consequences of long term use
Potential Treatment Targets for Osteoporosis

1. Remain fracture free (first or recurrent) for 5 years
2. Attain BMD T-scores above osteoporosis range
3. Reduce fracture probabilities to below treatment indications (FRAX scores)

Treatment Goal: Fracture Free

- With a recent fracture, getting through the early “high risk” period should be the target
- A fracture during treatment resets the 5 year clock
  - Fracture more important than BMD
  - May need to change type of treatment
- Actual duration of “fracture free target” target could vary based on age, number and location of fractures and underlying diseases

Treatment Goal: BMD T-score >2.5

- Second target is BMD above level where treatment is indicated
  - Target BMD should be a level higher than >2.5
How Would Treatment Targets Affect Treatment Decisions?

- Selection of initial treatment
- Treatment sequences

Treatment Targets Affect Selection

- For patients at highest risk (e.g. those with recent fractures, low T-score < -3.0)
  - Need rapid reduction in fracture risk
  - Need rapid BMD improvement
  - Anabolic agents optimal in these patients

Anabolic Agents Provide Rapid Fracture Reduction

- Over median of 19 months, Teriparatide
  - Reduced vertebral fracture by 65% and nonvertebral by 35%

- Over 18 months, Abaloparatide
  - Reduced vertebral fracture by 86% and nonvertebral by 43%
Treatment Targets Affect Selection of Initial Treatment and Treatment Sequence

- To achieve BMD goal, especially with T-Score < -3.0
  - Best initial treatment still an anabolic
    - Rapid increases in BMD
  - Treatment sequence is important

Cosman F et al. Treatment Sequence Matters. JBMR 2017

4 Year Sequential Treatment with Teriparatide and Denosumab

Green: Combination Teriparatide + Denosumab for 2 yrs followed by Denosumab for 2 yrs
Red: Denosumab for 2 yrs followed by Teriparatide for 2 yrs
Blue: Teriparatide for 2 yrs followed by Denosumab for 2 yrs


ACTIVE Extend BMD at 25 months

Percent change from ACTIVE Baseline

Placbo/Alendronate
Abaloparatide-SC/Alendronate

Cosman, F. Mayo Clinic Proceedings 2017
Treatment Target Will Affect Treatment Cessation Decisions

• If treatment target is achieved and the last agent is a bisphosphonate
  — Effect on BMD and bone remodeling resolve slowly
  • Can stop treatment temporarily (Bisphosphonate holiday)
• If treatment target is achieved and the last agent is not a bisphosphonate
  — BMD rapidly declines after treatment is stopped
  • Continue treatment indefinitely
  • Use short term bisphosphonate to maintain BMD and allow temporary medication “holiday”

Treatment Target Conclusions

• Decide what your target is and discuss it with your patient
• Choose your treatment plan with care to maximize benefits of pharmacologic agents and minimize side effects and long term consequences
• Consider the sequence of monotherapy

Key Takeaway Points

1) Osteoporosis is more than “thin” bone
2) Diagnosis and treatment of osteoporosis is to prevent fractures and the poor outcomes associated with fractures (loss of life, loss of independence, pain, cost)
3) Think beyond the “T” score
4) Remember bisphosphonate holiday NOT drug holiday
Key Takeaway Points

5) It’s a holiday, NOT a retirement
6) Consider fracture or loss of bone mass on therapy as a treatment failure and strongly consider changing treatment
7) There is no one size fits all treatment plan
8) Workup for secondary causes, don’t just assume it’s postmenopausal or age-related osteoporosis
9) Discuss realistic benefits and risks

Questions???

Thank you!

- lboineau@ghs.org
- 864-455-1339