Endocrinology
Primary Care Update

OSTEOPOROSIS: Bad to the Bone
VITAMIN D: Our Favorite Hormone
CALCIUM & VITAMIN D CASES

MCE Conferences
Las Vegas, NV
May 27-29, 2011

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Definition of Osteoporosis

- Current National Institutes of Health definition: Osteoporosis is defined as a skeletal disorder characterized by compromised bone strength predisposing a person to increased risk of fracture\(^1\)

![Normal Vertebral Bodies](normal.jpg) ![Osteoporosis](osteoporosis.jpg)
HOW IS OSTEOPOROSIS DIAGNOSED?
Bone Mineral Density

Manufactures of DXA-Densitometers: Hologic, GE Healthcare/Lunar and Norland

DXA measures amount of x-ray absorbed by bone in the body

The more x-ray bone absorbs, the denser the bone; the less x-ray bone absorbs, the weaker

2 sources of x-ray allow the DXA to differentiate between bone and soft tissue. T-score reported

# WHO Diagnostic Categories for Osteoporosis

<table>
<thead>
<tr>
<th>Diagnostic Category</th>
<th>T-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>BMD representing a T-score $\geq -1.0$</td>
</tr>
<tr>
<td>Osteopenia (low bone mass)</td>
<td>BMD representing a T-score between $-1.0$ and $-2.5$</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>BMD representing a T-score $\leq -2.5$</td>
</tr>
<tr>
<td>Severe (established) osteoporosis</td>
<td>BMD representing a T-score $\leq -2.5$ and the presence of 1 or more fragility fractures</td>
</tr>
</tbody>
</table>
Not all equal T-scores are equal!

- 52 y/o man
  - Why was a DXA done?
    - DXA
    - LS T-score -0.4
    - Hip T-score -1.2
  - Fem neck Hip T-score -2.8
  - T12 compression fracture seen on VFA!

- TREAT with…??
  - Bisphosphonate or Teriparatide...

Fracture History?!
What more do you need to know?

Not all equal T-scores are created equally

ASK ABOUT...

FRACTURE HISTORY!!
Clinical Discussion

- 52 y/o man with tooth loss at 40y/o and past rib fracture from coughing!
  - DXA
  - LS T-score -0.4  
  - Hip T-score -1.2  
  - Fem neck Hip T-score -2.8
  - VFA with T12 compression

- ROS: weight gain, fatigue, decreased libido, H/As
- PMH: HTN, GERD, Asthma
- Meds: Lisinopril, Prilosec, Advair
Clinical Discussion

- 52 y/o man with tooth loss and fracture history
- 
  W/U:  
  - CBC, CMP nl
  - TSH 2.0 nl
  - Vit D 20 (goal >32)
  - PTH 40 nl
  - Total Testosterone 50 (LOW, nl 300-1000)
  - Prl 120 (HIGH, nl <25)  

  Dx: Testosterone Deficiency...

Lynn A. Kohlmeier, MD
Clinical Discussion

Osteoporosis

- 52 y/o man with tooth loss and fracture history
  - Vit D 20 (goal>32)
  - Total Testosterone 50 (LOW)
  - Prl 120 (HIGH), FSH 2 (Low)

- Vitamin D Insufficiency
- Testosterone Deficiency
- HyperProlactinemia
  - Not “Andropause”, FSH would be high

What is one of your next tests?
PITUITARY MRI
– Pituitary adenoma, Prolactinoma...
– Growth Hormone normal
– 24hr Ucortisol normal

NO ACROMEGALY
NO CUSHINGS

DOES HE NEED TRANSPHENOIDAL SURGERY?
Diagnosis

- **Prolactinoma** (pituitary macroadenoma - hyperprolactinemia)
- Testosterone deficiency
- Vitamin D insufficiency
- Osteoporosis with Fractures

Surgery **Not Likely** needed if he has no visual compromise or optic chiasm compression
Treatment

- **Parlodel** (bromocryptine) - to lower prolactin and likely shrinking macroadenoma

- **Vitamin D 2000IU qd** + Calcium 500mg BID

- **Bisphosphonate?** (Fosamax, Actonel, IV Reclast)

- **Forteo?**

  *(Boniva and Prolia not yet FDA-approved in men)*
Second Causes of Bone Loss...

"Secondary Osteoporosis"

Premature Ovarian Failure
OI
Porphyria
Low Ca
Homocystinuria
Immobilization
High Salt
Depo
Bulimia
IBD
Malabsorption
Anti-Convulsants
Chemotherapy
ETOH
Heparin
Chemotherapy
Mastocytosis
Liver failure
Marfan’s
Cystic Fibrosis
Immobilization
Smoking
Low Ca
High Salt
ETOH
Hi Vit A
Caffeine
Klinefelter’s
Bulimia
Anorexia
Low BMI
Falls
Celiac Sprue
Homocystinuria
Cystic Fibrosis
ESRD
Klinefelter’s
Immobilization
High Salt
Depo
Bulimia
IBD
Malabsorption
Anti-Convulsants
Chemotherapy
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Smoking
Low Ca
High Salt
ETOH
Hi Vit A
Caffeine
Klinefelter’s
Bulimia
Anorexia
Low BMI
Falls
Celiac Sprue
Secondary Causes of Bone Loss

Hypogonadal States
- Androgen insensitivity
- Hyperprolactinemia
- Testosterone deficiency
- Athletic amenorrhea
- Anorexia nervosa and bulimia
- Panhypopituitarism
- Premature ovarian failure
- Turner’s & Klinefelter’s

Endocrine Disorders
- Cushing’s syndrome
- Hyperparathyroidism
- Thyrotoxicosis
- Adrenal insufficiency
- Diabetes mellitus

Hematologic Disorders
- Hemophilia
- Multiple myeloma
- Systemic mastocytosis
- Leukemia and lymphomas
- Sickle cell disease
- Thalassemia

GI Disorders
- GI surgery
- Malabsorption
- Primary biliary cirrhosis
- Inflammatory bowel disease
- Celiac disease
- Pancreatic disease
- Gastric bypass

Miscellaneous Disorders
- Alcoholism
- Emphysema
- Amyloidosis
- End stage renal disease
- Muscular dystrophy
- Chronic metabolic acidosis
- Epilepsy

Medicines
- Anticoagulants (heparin)
- Barbiturates
- Parenteral nutrition
- Anticonvulsants
- Aromatase inhibitors
- Lithium
- Glucocorticoids (> 5 mg/d prednisone for > 3 mo)
- Cyclosporine A, tacrolimus
- Depo-medroxyprogesterone
- GnRH agonists
- Ca chemotherapeutic drugs
- Thiazolidinediones (TZDs)

Misc Disorders (cont’d)
- Post-transplant bone disease
- Congestive heart failure
- Idiopathic scoliosis
- Sarcoidosis
- Depression
- Multiple sclerosis
- Prior fracture as an adult

National Osteoporosis Foundation 2008
Secondary Osteoporosis

Laboratory Workup

According to the 2004 Surgeon General’s report:

“All patients with osteoporosis deserve at least a limited evaluation for secondary causes of bone loss.”


No Consensus on work-up

Basic laboratory testing

• CBC, CMP (Ca, PO₄, Alb, Cr, alk phos)
• 24-hour urine calcium, CrCl
• 25-OH vitamin D (Goal 32-40 ng/ml)

Additional tests

• ...TSH, PTH intact, Celiac/Sprue Abs (Anti-endomysial, Anti-TTG), SPEP-IEP, UPEP, 24 hour urine free cortisol, total & bioavailable testosterone in men (rarely serum tryptase, urinary histamine, iliac crest bone biopsy)


Clinical Discussion

- 37 y/o premenopausal woman
  - DXA
  - LS Z-score -2.4 and
  - Hip Z-score -1.8 compared to age-matched controls
- Medical Treatment...
  - Evaluate for secondary causes of bone loss
  - Request Z-scores and History...
    - SHx: smoking, ETOH, lactose intolerance
    - Anorexia@15y/o x 5yr
    - Depoprovera x 10yr
Clinical Discussion

- 37 y/o premenopausal woman
  - DXA
  - LS Z-score -2.4 and
  - Hip Z-score -1.8 compared to age-matched controls
- Multiple secondary causes of bone loss yet NO FRACTURE HISTORY!
- Follow with exercise and good lifestyle habits, confirming normal menses
- Rx when menopausal...
Clinical Discussion

- 73 y/o postmenopausal woman
- PMH: PMR, HTN, TIA, Menopause at 50y/o
- ET x 5 yrs yet D/C’d after TIA
- No fx, No Fhx fx, non-smoker, wt 150 #
  - DXA
    - LS T-score -2.8
    - TH T-score -2.2
  - Fem neck Hip T-score -3.2
  - VFA with T12 compression
- Prednisone use x 5 years for PMR (5mg qd)
Clinical Discussion

- 73 y/o postmenopausal woman
  - DXA
    - LS T-score -2.8
    - Fem neck Hip T-score -3.2
- Prednisone x 5 years for PMR (5mg qd)
- Labs: 24hr UCa 48 (low), PTH 55 (high-nl), Vit D 13 (low), AlkPhos 212 (high)
- TSH, SPEP, CMP, CBC all nl
Clinical Discussion

- 73 y/o postmenopausal woman

Treatment:

- 2000iu D3 qd x 3 months... with an increase if vitamin D level not within goal >32ng/ml
- Bisphosphonate (BP)... Evista contraindicated w TIA hx
- Teriparatide (Forteo) considered once PTH normalized
- Denosumab (Prolia) *(not FDA approved for Steroid-induced OP)*

*Lynn A. Kohlmeier, MD*
Clinical Discussion

• 73 y/o man
  – DXA
  – LS T-score -2.8
  – TH T-score -2.2

• Prednisone use x 20 years for Asthma (10-20mg qd and high dose inhaled steroids)
  – Back Pain (3” ht loss), Total Testosterone 100 (low), Vit D 5ng/ml (very low)

• Treatment: Limit dose of glucocorticoids (GCs)
  Limit duration of GCs
First Clinical Use of Glucocorticoids - 1949
(STEROIDS)

First clinical use of glucocorticoids (GCs) in humans with rheumatoid arthritis by a Mayo Clinic team with dramatic benefit.


The Nobel Prize was Awarded to Dr Edward Kendall and Dr Philip Hench in 1950
Common Long-Term Uses of STEROIDS

- Dermatomyositis
- Polychondritis
- RS3PE
  - Wegener’s granulomatosis
  - Immune-mediated neuropathy
  - Behçet’s syndrome
  - Ulcerative colitis
- Rheumatoid arthritis
- Crohn’s disease
- Giant cell arteritis
- Polymyositis
- Systemic lupus
- Pseudotumor cerebri
- Hemolytic anemia
- Lymphoma
- Inflammatory lung diseases
- PMR
- Asthma

PMR = polymyalgia rheumatica; RS3PE = remitting seronegative symmetrical synovitis with pitting edema.

See Boxed Warning and Important Safety Information for FORTEO on slides 40–43.

See provided full Prescribing Information and Medication Guide for FORTEO.
Role of Osteocytes in Detecting Damage

- Osteocytes are osteoblasts that are left behind during the formation of new bone.¹

- Osteocytes become embedded in lacunae in the bone matrix and communicate with each other (and osteoblasts) via canaliculi.¹

Pathogenic mechanisms of GIO* include the following:

- ↓ osteoblastogenesis; ↑ osteoblast apoptosis
- ↓ osteoclastogenesis; transient ↑ in osteoclast survival
- ↓ osteocyte precursors; ↓ osteocyte function; ↑ osteocyte apoptosis

*GIO, Glucocorticoid Induced Osteoporosis
Patients on GCs Have an Increased Risk of Fracture, at Any BMD T-score\(^1\)*

At any given BMD T-score, the incidence of new vertebral fracture in postmenopausal women receiving GCs was increased when compared with nonusers of GCs.

*Data were obtained from postmenopausal women from the placebo arms of 2 randomized risedronate clinical trials (n=111).

BONES

Exercise
- Weight-bearing Impact
- Back Extension
- Vibration Plate

Estrogen in women
Testosterone in men

Calcium + Vitamin D
Exercise
- Weight-bearing Impact
- Back Extension
- Vibration Plate

Calcium + Vitamin D

MEDICAL THERAPY
- Bisphosphonates
- Denosumab

Reclast Zoledronic Acid

Prolia

BONES

Evista raloxifene HCl
What are the ‘Clinical Differences’ among Anti-Resorptive Agents: Bisphosphonates (oral and IV), SERM, ET/HT, Miacalcin and Denosumab?

- Degree of bone turnover suppression
- Differences in uptake and diffusion in trabecular and cortical bone
- Tolerability
- Compliance
- Speed of onset of effect...’ON’
- Speed of reversal of effect...’OFF’

Adapted from slides complimentary of Michael R. McClung, MD with permission
Do these Differences Explain Fracture Efficacy or Result in Possible Clinical Consequences?

- ’OFF’ differences...and therefore: Long-term Safety and Efficacy?

- FRACTURE REDUCTION EFFICACY... shown in trials and confirmed with FDA-indications!
  - Types/Sites of Anti-Fracture Effects: Vertebral vs. Hip vs. Non-Vertebral
### Available Agents for Osteoporosis

*No head-to-head trials comparing fracture outcomes*

<table>
<thead>
<tr>
<th>Antiresorptive Agents (Bisphosphonates)</th>
<th>Documented Fracture Reduction</th>
<th>DOSING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spine</td>
<td>Nonvertebral</td>
</tr>
<tr>
<td><strong>Alendronate</strong>¹ <strong>FOSAMAX</strong></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Ibandronate</strong>² <strong>BONIVA</strong></td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td><strong>Risedronate</strong>³,⁴ <strong>ACTONEL</strong></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Zoledronic acid</strong>⁵ <strong>RECLAST</strong></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Other Antiresorptive Agents (Hormones)

- Calcitonin
- Raloxifene

Anabolic Agent (PTH Hormone)

- Teriparatide
# Available Agents for Osteoporosis

**No head-to-head trials comparing fracture outcomes**

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<tr>
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<tr>
<td></td>
<td>Spine</td>
<td>Nonvert</td>
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</table>

## Other Antiresorptive Agents

<table>
<thead>
<tr>
<th></th>
<th>Spine</th>
<th>Nonvert</th>
<th>Hip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcitonin 6</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>MIACALCIN</strong></td>
<td></td>
<td></td>
<td>Daily intranasal spray alternating nostrils</td>
</tr>
<tr>
<td>Raloxifene 7</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>SERM  EVISTA</strong></td>
<td></td>
<td></td>
<td>Daily oral anytime of day no waiting</td>
</tr>
<tr>
<td>Denosumab 9</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>RANKL PROLIA</strong></td>
<td></td>
<td></td>
<td>Subcutaneous injection q 6 months</td>
</tr>
</tbody>
</table>

## Anabolic Agent

<table>
<thead>
<tr>
<th></th>
<th>Spine</th>
<th>Nonvert</th>
<th>Hip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teriparatide 8</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td><strong>FORTEO (PTH)</strong></td>
<td></td>
<td></td>
<td>Daily subcutaneous injection</td>
</tr>
</tbody>
</table>

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Raloxifene (Evista)

- Reduces bone resorption or turnover
  - 60 mg oral daily
  - 30% ↓ in biochemical marker Approved for both prevention and treatment
- 2-3% BMD increases at hip & spine @ 3yrs
  - Decreased incidence of vertebral fractures (30-50%) in women w pre-existing vertebral fractures or low bone mass
  - No effect on nonvertebral or hip fractures observed
- Adverse effects:
  - Hot flashes, venous thrombosis, leg cramps
- **Extra-skeletal effects:**
  - Reduction in invasive breast cancer

Bisphosphonates

- Alendronate - Fosamax
- Risedronate - Actonel
- Ibandronate - Boniva
- Zoledronic Acid - Reclast

- Reduce bone resorption or turnover
  - Increased bone density in the spine by 5-8% and at the hip by 3-6% after 3 years
  - Reduced vertebral fractures by 40-70%
  - Risedronate and Zoledronic acid reduced nonvertebral fractures (25-40%), and hip fractures (40-60%) in subanalysis in women with osteoporosis as did Alendronate
Bisphosphononates

- "Class warning" upper gastrointestinal sx (no increase in UGI complaints in randomized trials)
- "Class warning" regarding infrequent bone, joint, and/or muscle pain
  - FDA Medwatch warning released Jan 08 – severe and sometimes incapacitating musculoskeletal pain
  - Pain may occur within days, months, or years after starting a bisphosphonate; consider temporary or permanent drug discontinuation
- "Class warning" regarding jaw osteonecrosis (ONJ)
  - ONJ is very uncommon (1/100,000) in patients taking BPs in osteoporosis doses...no causal relationship...
  - But in 'chemo-therapeutic BP' doses for metastatic cancer there is a 0.6-2% risk of ONJ and a dose-response curve does exist
- Influenza-like symptoms may occur after first monthly oral dose or IV injection
“Class warning” regarding ‘possible risk of atypical sub-trochanteric femur fractures’ (Oct 13, 2010)

- FDA Labeling Change and Medication Guide
  - “FDA is continuing to evaluate data about safety and effectiveness of bisphosphonates when used long-term for osteoporosis treatment.” according to Dr Kweder, deputy director, Office of New Drugs at FDA
  - Will Not apply to bisphosphonates used for Paget’s disease or Hypercalcemia of Malignancy
  - “Patients taking bisphosphonates for osteoporosis should NOT STOP using the medication unless told to do so by their health care professional. New thigh or groin pain should be reported. www.fda.gov/Medwatch 800-332-1088
ASBMR Task Force Report on Atypical Fractures, Sept 2010

• Reviewed 310 cases of “atypical femur fractures” and found 94% had taken bisphosphonates, most >5 years
• Emphasized that these type of fractures represent <1% of hip and thigh fractures overall

• Nevertheless concerned that there may be a relationship between these fractures and long-term bisphosphonate use and, even though the risk is low, to make certain that people know the warning signs

• Long-term use of osteoporosis medication associated with increased risk of atypical fractures A total of 205,466 women treated with a bisphosphonate met inclusion criteria, and 716 women were identified who sustained a subtrochanteric or femoral shaft fracture following initiation of bisphosphonate (BP) therapy, including 411 women with a subtrochanteric fracture and 305 women with a femoral shaft fracture. Cases were matched to 3,580 controls. Among 52,595 women with at least 5 years of BP therapy, a subtrochanteric or femoral shaft fracture occurred in 71 (0.13%) during the subsequent year and 117 (0.22 percent) within 2yrs.

JAMA 2011;305[8]783-789


Slide compliments of and adapted with permission from Robin K. Dore M.D.
Atypical Fractures are ‘ATYPICAL’

- There has been a theoretical concern that “oversuppression” of bone remodeling could impair the repair of microdamage—and increase the risk of atypical fractures...yet no association proven
  - fractures are often of femoral diaphysis and bilateral
  - transverse rather than spiral fracture
  - often on other drugs, especially steroids or estrogen
  - many with early signs of stress reaction or fracture, ‘beaks’ on imaging and prodromal aching thigh pain

2011 JAMA results ‘should not deter clinicians and patients from using bisphosphonates in appropriate patients’ the authors conclude. ‘Our study confirms the known benefits of bisphosphonate treatment for typical osteoporotic fracture, and evidence suggests that BP therapies are underused in individuals at high risk of fracture despite their established efficacy.’


Slide compliments of and adapted with permission from Robin K. Dore M.D.
Denosumab (Prolia)

- Human monoclonal antibody to RANKL
  - Specific for the skeleton
- Few adverse effects:
  - Skin reactions such as rashes, dermatitis, eczema were significantly more common in Prolia-treated women
- SQ injection q 6 mos
- Relatively expensive
  - ~ $850/sq injection

**Currently indicated for the treatment of women at high risk of fracture**

- Skeletal effects
  - Improvement of BMD, 9% @ spine and 5% @ hip over 3 yrs
  - Reduction in vertebral fracture risk (61%, 71%, 68% RRR @ 1, 2, 3 yrs respectively)
  - Reduction in non-vertebral fracture risk (20% RRR)
  - Reduction in hip fracture (40% RRR)

Cummings SR et al NEJM 2009; 361:756-65
RANK Ligand Is an Essential Mediator of Osteoclast Activity

1. Osteoblasts express RANKL
2. RANKL binds to RANK
3. Differentiated osteoclasts are formed
4. RANKL mediates osteoclast formation, function, and survival

In premenopausal women, estrogen regulates RANKL expression.

OPG = osteoprotegerin.
Prolia™ (denosumab) Inhibits Osteoclast Formation, Function, and Survival

1. Prolia™ binds to and inhibits RANKL
2. Prolia™ prevents RANKL from binding to RANK
3. Prolia™ inhibits osteoclast formation
4. Prolia™ inhibits osteoclast function and survival

Mechanism of action representations are for illustrative purposes only and are not meant to imply any clinical efficacy.
Teriparatide (Forteo)

- Recombinant human parathyroid hormone – rhPTH(1-34)
- Few adverse effects; black box warning regarding the risk of osteosarcoma
- Need for daily sq injection
- Use not FDA-approved beyond 2 years
- Expensive
  - ~$700-1000/mo

Skeletal effects
- Improvement of 9-12% in BMD of the spine and 3% in BMD of the hip
- Reduction in vertebral fracture risk
- Reduction in nonvertebral fracture risk
- Specific for the skeleton

Currently indicated for the treatment of women and men at high risk of fracture and Steroid-induced Osteoporosis

Secondary Causes of Bone Loss may develop after treatment is initiated and a ‘second’ evaluation therefore indicated.

If there is an insignificant change in BMD, less than the DXA least significant change value (LSC), in the absence of a new fracture, there is no rationale for changing therapies or ‘secondary evaluation’.

A significant decrease in BMD on therapy (>LSC) should prompt both an evaluation for secondary causes of bone loss and possible change in treatment, considering...

- Failure to adhere to therapy should be associated with a ‘normal’ increased rate of bone loss. Ask about compliance!
Anti-Resorptive Agents are Mainstay of Treatment

- **Bisphosphonates (BPs)** are most commonly used:
  - Alendronate po generic and non-generic po weekly
  - Risedronate po weekly or monthly before breakfast, or weekly after breakfast (Atelvia approved 2011)
  - Ibandronate po monthly, pts need to WAIT 60 min after tablet to eat or drink, not 30 min like other po BPs, or Ibandronate IV over 30 sec q 3 months
  - Zoledronic Acid IV over 15 minutes yearly

- **Denosumab** a human monoclonal antibody to RANKL is given by sq injection twice a year

- **Calcitonin** is a nasal spray daily

- **SERM**, Selective Estrogen Receptor Modulator
  - Raloxifene po daily
Safety of BPs and Denosumab (Label warnings)

- Osteonecrosis of the jaw (ONJ) is very uncommon in patients on osteoporosis doses of BP or Denosumab, and no causal relationship shown. A risk of 1 in 100,000 to 180,000 patient years has been speculated for BPs. All BPs (including pamidronate) now have a Box warning regarding ONJ.

- ‘Chemo-therapeutic’ BP doses for metastatic cancer do have a 0.6-2% risk of ONJ, in a dose-response manner. ‘Chemo-therapeutic’ Denosumab FDA-approved 11/2010 for solid tumor metastatic cancer (Xgeva) and ONJ seen

- FLU-like reaction in patients on IV BPs reduced with tylenol and hydration yet can still be significant after the first infusion (zolundronic acid > ibandronate), yet <5% with subsequent infusions. Not reported with Denosumab.
Safety of BPs and Denosumab (Label warnings) con’t

- **Atypical Femur Fractures** questioned as a consequence of ‘long-term’ BP use, no causal relationship or association proven. No case reports or discussion with Denosumab

Safety of BPs and Denosumab (Without Label warnings)

- **Myalgias** reported in post-marketing data with BPs and appear to be causal (IV > po) yet uncommon, yet were not significant in trials aside from with Zoledronic acid
- **Myalgias** not reported with Denosumab
- **Atrial Fibrillation** reported in post-marketing data with BPs yet not conclusive
- **Esophageal cancer** reported in post-marketing data with BPs yet not conclusive
Anabolic Agent

- Teriparatide, PTH hormone
  - sq injection qd for 2 years

Safety of Teriparatide

Compliance of Osteoporotic Medical Therapy Reduces Fractures!

- Efficacy dependents on significant reduction of fractures which differ between medications
- Data regarding long-term use...5, 10, 15, 20 years... are limited
- Providers and patients may want to discuss a "Drug Holiday" when they have been on ‘long-term’ therapy...
  Remember there is NO Fracture Efficacy Off Medical Therapy ASK...WHAT IS FRACTURE RISK?
STRIDES FOR STRONG BONES
MEDICAL LAKE, SPOKANE, WASHINGTON
AUGUST 2011

SALLY FIELD TALKS ABOUT OSTEOPOOROSIS
AT THE GARDEN SHOW IN SEATTLE, WA

WALK A WOC FOR OSTEOPOOROSIS, SEATTLE, WA OCT 2009
FOR YOUR ATTENTION!

THANK YOU FOR YOUR ATTENTION!

www.SpokaneOsteoporosis.com