Christopher Born, MD, FAAOS, FACS
Intrepid Heroes Professor
Department of Orthopaedic Surgery
The Alpert School of Medicine
Chief, Orthopaedic Trauma
Rhode Island Hospital

Consultant: Stryker, IlluminOss, Biointraface
Stock Ownership: IlluminOss, Biointraface
Board: Fdn. for Orthopaedic Trauma

>10 million Americans have osteoporosis
>33 million have low hip bone density
Fragility fractures
  > 1 in 2 Females ≥50yo
  > 1 in 5 Males ≥50yo
>432K hospital admissions
>180K nursing home admissions

**Osteoporosis Diagnosis**

- **DEXA**
  - BMD testing F≥65 and M≥70
  - Re-test Q 2yrs if on therapy
- **Pharmacologic RX:**
  - T-scores ≤ -2.5 at femoral neck/spine
  - -1 to -2.5 if additional Risk Factors
    - Postmenopausal females
    - Males ≥ 50yo

**Risk Assessment Tools**

- WHO Fracture Risk Assessment Tool (FRAX™)
- FORE Fracture Risk Calculator (FRC)

Both allow estimated risk of hip fracture alone or hip/wrist/humerus/spine
Both express risk as 10 year percentage

**FDA-approved Pharmacologic Options**

- Bisphosphonates
  - alendronate, ibandronate (Boniva), risendronate (Actonel), zoledronic acid (Reclast)
- Calcitonin
- Estrogen/and/or hormone replacement therapy
- Parathyroid hormone (e.g. teriparatide)
- Estrogen agonist/antagonist (e.g. raloxifene)
Supplements

- Females ≥ 50yo
  - 1,200 mg Ca+
  - 800-1000 units Vit D
- WB exercise 3-5 X/WK for 30 min

Bisphosphonates

- Alendronate released 1995
  - Inhibit osteoclast function
  - Promote osteoclast apoptosis
- Reduction in Fragility Fractures*
  - Hip 51%
  - Distal Radius 44%
  - Vertebral 46%


Bisphosphonate Length of Treatment

- Alendronate >5yrs no greater protective advantage*
  - Long biologic half-life (10 years)
- Risedronate 1 year
- Zoledronic acid 3 years

"Timing and length of drug holidays should be based on the biocharacteristics of each unique bisphosphonate***

- BRONJ

Atypical Femur Fractures

- Controversy over relationship
  - ASBMR Task force “limited evidence”*
- Several reports => 2-113 per 100,000 patient years
- Overall incidence is low in the osteoporotic population but number increases with prolonged bisphosphonate therapy


Definition

- A distinct fracture type
- Subtrochanteric and shaft
- Atraumatic or low energy trauma
- Excludes high energy, femoral neck, intertrochanteric with subtrochanteric extension

Major Characteristics

- Originates at lateral cortex substantially transverse
- Low-energy or no trauma
- Complete fractures => both cortices Incomplete => lateral cortex only
- Non or minimally comminuted
- Medial spike or “beak”
  - Periosteal or endosteal thickening

4 of 5 to make the diagnosis

Pathophysiology

- Femoral geometry
  - Lateral cortex ↑ tensile loading
- Stress related failure
  - Bone resorption reduced
  - Poor remodeling potential
  - Microdamage to lateral cortex
  - Bisphosphonate accumulation impedes intracortical repair
    ➞ further propagation of stress fx

Diagnosis

="Complete"
- Four of Five major criteria
- 70% have prodromal pain
  ➞ Pain in contralateral leg?
  ➞ On chronic Bisphosphonate therapy?

="Incomplete"
- Thigh/Groin pain!
- May have X-ray evidence of lateral stress fx
  - NB: Athletic/military stress fractures medial cortex
- If not... and on bisphosphonates
  ➞ MRI for linear fx line or stress reaction
  - T1 and/or STIR
Diagnosis

- “Incomplete” (unable to obtain MRI)
  - DEXA
    - Compare to pre-fracture DEXA
    - Lateral cortical changes
    - 73% detection rate
  - Bone scintigraphy
    - Mild uptake
    - Endosteal thickening of lateral femoral diaphysis

Treatment

- Stop bisphosphonate therapy
  - Rate of contralateral fx >50% if continued over 3 years
  - <20% if discontinued
- Begin vitamin D and Ca+ supplementation
- Consider teriparatide (Forteo™)
  - Inconclusive evidence
  - Promotes Ca+ absorption
  - Stimulates osteoblasts

- Intramedullary nailing
  - Slow to heal
  - Higher rates of intra-op fracture, malunion, nonunion, implant failure, periprosthetic fracture
  - 10% revision rate
- Evaluate contralateral femur
  - X-ray
  - Pain vs no pain
  - Fx line vs no fx line
  - Observation vs prophylactic nailing
Prophylactic Nailing

2yrs No Pain

3mo No Pain No Surgery Observe

No Pain
3 Weeks Rehab => Pain
Summary

- Association between bisphosphonates and atypical femur fractures
- Increases with prolonged therapy
- Typical X-ray appearance
- Questions to consider
- Surgical and medical management
- Bisphosphonates remain first line RX for osteoporosis, but....

Roy K. Aaron, MD