

Bisphosphonates & The Femur... What Should I Do?

Trauma 101: Fracture Care for the Community
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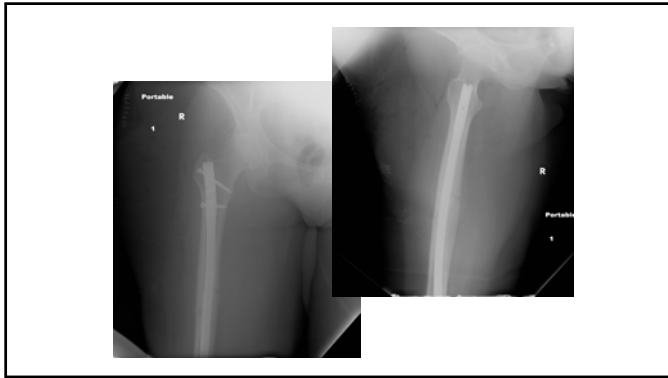
Disclosures

- No financial disclosures
- Reviewer: *Journal of Orthopaedic Trauma*

The Problem

61 yo F
Turned on carpet at home
PMHx: Osteoporosis
Meds: Alendronate





Bisphosphonates

- What is the Problem?
- Relatively new phenomenon
- Potentially becoming larger
- Recognition = Prevention
- Epidemiologic Problem
 - Osteoporosis & Fractures
 - Resultant increased death, morbidity, cost, effects on independence & quality of life
- Epidemiologic Solution
 - Bisphosphonates
 - Alendronate (Fosamax), Residronate (Actonel), Ibandronate (Boniva), Zoledronate (Reclast)

Bisphosphonates

- Alendronate...How it works
 - Target...Osteoclasts
 - Binds to inorganic component of bone
 - Bound alendronate released during resorption
 - Endocytosed by osteoclasts
 - Inhibits mevalonate pathway for cholesterol synthesis
 - Induced osteoclast apoptosis
 - Result...Increased BMD
- Nitrogen containing: inhibit farnesyl pyrophosphate synthase → inhibits prenylation = loss of resorptive capacity
- Non-nitrogen containing: produce toxic analogs of ATP

Bisphosphonates

- Increased BMD...but at what cost?
- Decreased bone resorption, remodeling, microdamage repair, mechanical integrity, etc.
 - Allen et al. *Bone* 2010
 - Mashiba et al *Bone* 2001
 - Odvina et al *J Clin Endocrinol Metab* 2005
 - Mashiba et al *J Bone Miner Metab* 2005
 - Burr et al *J Bone Miner Res* 1997
 - Cao et al *J Bone Miner Res* 2002
- **Femoral Insufficiency Fracture?**

Low Energy Femur Fractures Associated with Alendronate Use



from Baniffy et al CORR 2011

Bisphosphonates and the Femur

- A growing problem
 - Pubmed Search
 - "bisphosphonate femur" = 1779 citations
 - "bisphosphonate femur fracture" = 1786 citations



Isaacs et al CORR 2010

Bisphosphonates and the Femur

- Nevaizer et al. *J Orthop Trauma* 2008
 - 70 low-energy femur fractures
 - 36% treated with Alendronate
 - 76% demonstrated characteristic fracture pattern



Bisphosphonates and the Femur

- Nevaizer et al.
 - Only 1 patient *not* on alendronate showed this same pattern (dx multiple myeloma)
 - Fracture pattern & duration of alendronate use: 6.9 yrs vs 2.5 yrs

Bisphosphonates and the Femur



From Goh et al CDRR 2007

- Goh et al. *JBJS Br* 2007
- 13 low-energy subtrochanteric fractures
 - 9 on alendronate (mean 4.2yrs)
 - 5 with prodromal pain
 - 3 with contralateral stress reaction

Bisphosphonates and the Femur

- Kweck et al. *Injury* 2008
 - 17 low-energy fractures, mean age 66
 - Alendronate 4.8 yrs average
 - Classical x-ray findings
 - Cortical thickening lateral ST area
 - Transverse fracture with medial cortical spike
 - 53% with **contralateral** stress reaction
 - 76% with **prodromal** pain

Bisphosphonates and the Femur

- Isaacs et al. *CORR* 2010
 - 100 low-energy fractures
 - 21 pre-bisphosphonate era (1995-97)
 - None "insufficiency-type"
 - 79 post-bisphosphonate intro (2007-09)
 - 41 on alendronate
 - 71% **prodromal** pain
 - 44% **bilateral**
 - **Bisphosphonates correlated with fxs (P<0.0001)**
 - Length of treatment: **7 years vs. 3 years**

Bisphosphonates and the Femur

- 72 year-old female with lateral thigh pain on weight bearing. On Alendronate for last 5 years.

What should I do?



• What is the likelihood of a nonoperatively treated bisphosphonate-associated femoral stress fracture progressing to completion and in what time period?

Bisphosphonates and the Femur

- Banffy et al. *CORR* 2011
- 34 patients with 40 fractures
- Average bisphosphonate use 6.4 years
- 70% (28/40) completed, displaced fractures treated with IMN

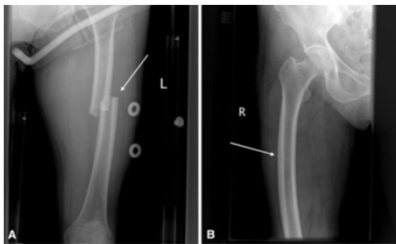
Bisphosphonates and the Femur

- Banffy et al. *CORR* 2011
- 6 of 12 nondisplaced stress fractures treated with prophylactic IMN
- 6 of 12 treated non-operatively
 - PWB with assist device

Bisphosphonates and the Femur

- Banffy et al. *CORR* 2011
 - 6 nonoperative fractures
 - Time to fracture completion...10 months (3-18)
 - 1 stress fracture did not complete after 1 year
 - Hospital stay
 - Prophylactic IMN... **3.7 days** (100% union)
 - IMN acute fracture... **6 days** (96% union)
 - IMN acute fracture after previous non-op management... **6 days** (100% union)
- *Union can be "delayed" up to a year

71 year-old fall from standing after 6 years of bisphosphonate therapy
Left femur? No problem
Right femur?



HANES et al. *CORR* 2010

Bisphosphonates and the Femur

- Clear evidence: The use of bisphosphonates reduces fractures in osteoporotic patients (T<-2.5)
- Fracture risks are significantly greater in patients taking bisphosphonates for greater than 5 years
- Current evidence shows NO benefit for bisphosphonate therapy beyond 5 years
 - Some advocate shorter duration and 2-3 year "holidays"
- Some evidence to support rPTH (Forteo) administration during post-op period to augment healing

Bisphosphonates and the Femur: What should we do?

1. Treat the broken femur (IMN of choice)
2. Counsel patient on potential delayed healing
3. ALWAYS EVALUATE THE CONTRALATERAL SIDE AND CONSIDER PROPHYLACTIC FIXATION
4. Engage your endocrine colleagues and primary providers for help in management

Bisphosphonates and the Femur

Thanks Very Much & Good Luck

Questions, Comments...

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