

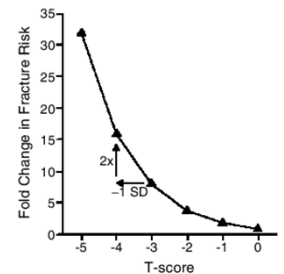
Osteoporosis Treatment for the Aging Athlete: Guidelines, Rationale and Misconceptions

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Assessing Fracture Risk – Bone Density

- T-Score = # standard deviations away from 30 year old healthy control
- One standard deviation T-Score correlates with approximately 2-fold increase in fracture risk.



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Assessing Fracture Risk – FRAX Calculation

Country: US (Caucasian) Name/ID: _____ About the risk factors

Questionnaire:

1. Age (between 40 and 90 years) or Date of Birth: _____
Age: _____ Yr: _____ Mo: _____ D: _____

2. Sex: ☐ Male ☒ Female

3. Weight (kg): _____

4. Height (cm): _____

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/cm²): _____ T-score: -2.5

GE-Lumbar: _____ T-score: -2.5

Clear Calculate

BMJ: 23.0
The ten year probability of fracture (%)

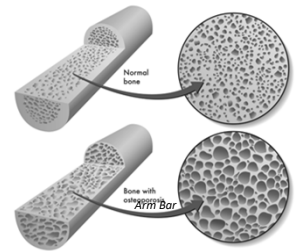
Major osteoporotic: 1.3
Hip Fracture: 2.8

If you have a TBS value, click here: [Adjust with TBS](#)

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Osteoporosis Defined

- **Fragility Fracture:** Any force less than or equivalent to a fall from standing height that results in a fracture.
- **T-Score ≤ -2.5 :** at the femoral neck, total femur and/or lumbar spine.
- “**Senile Osteoporosis**” due to age, genetics, menopause.



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Osteoporosis increases mortality

- One study estimates vertebral fractures increase the 5-year risk of mortality by 15%. [1]
- Another study found women with one or more fractures had a 1.23-fold increased age-adjusted mortality rate
- 5 or more vertebral fractures had a 2.3-fold increased age-adjusted mortality rate. [2]

1. Cooper C, Atkinson EJ, Jacobsen SJ, et al. Population-based study of survival after osteoporotic fractures. *Am J Epidemiol*. 1993 May 1;137(9):1001-6.
2. Kado DM, Browner WS, Palermo L, Nevitt MC, Genant HK, Cummings SR. Vertebral fractures and mortality in older women: a prospective study. *Study of Osteoporotic Fractures Research Group. Arch Intern Med*. 1999 Jun 14;159(11):1215-20.

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The aging athlete and sports related trauma

- Significant mental and physical benefit derived from sport
 - Not surprisingly
- Sport related injuries are increasing in prevalence among older patients

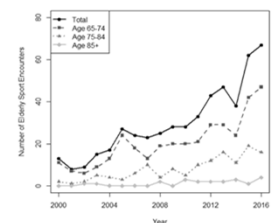


Fig. 1. Number of sport admissions over the study period, overall and by age group.

Kay, Annika B., et al. "Age is just a number: A look at "elderly" sport-related traumatic injuries at a level I trauma center." *The American Journal of Surgery* 217.6 (2019): 1121-1125.

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Indications for Advanced Pharmacologic Management Osteoporosis

AACE/ACE 2020 POSTMENOPAUSAL OSTEOPOROSIS TREATMENT ALGORITHM

Lumbar spine or femoral neck or total hip T-score of ≤ -2.5 , a history of fragility fracture, or high FRAX® fracture probability*

Evaluate for causes of secondary osteoporosis

Correct calcium/vitamin D deficiency and address causes of secondary osteoporosis

- Recommend pharmacologic therapy
- Education on lifestyle measures, fall prevention, benefits and risks of medications

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Bisphosphonates – first line therapy

- Weekly oral pill (Alendronate) or annual infusion (Zoledronic acid)
- Inhibit osteoclasts and thus bone resorption.
- Increased risk of osteonecrosis of the jaw
- Increased risk of atypical femur fracture with prolonged treatment
- Risk esophagitis -> reflux / dysphagia
- Contraindicated in CKD (GFR < 35)

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Osteonecrosis of the Jaw

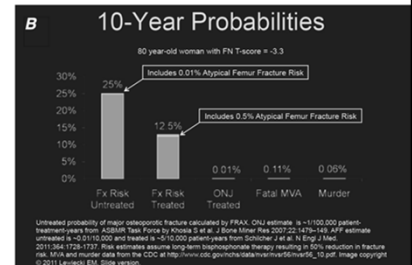
- ONJ is a rare condition where the bone of the lower or upper jaw becomes exposed and does not heal properly.
- Precipitating event required – injury, extraction, abscess.



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Osteonecrosis of the Jaw

- The incidence of ONJ is low ~1/100,000 patients per year [1]
- For patients already receiving therapy, no evidence discontinuing or interrupting treatment will change the outcome or reduce the risk of ONJ.



S.B. Woo, J.W. Hellstein, J.R. Kalmar Narrative review: bisphosphonates and osteonecrosis of the jaws Ann Intern Med., 144 (2006), pp. 753-761

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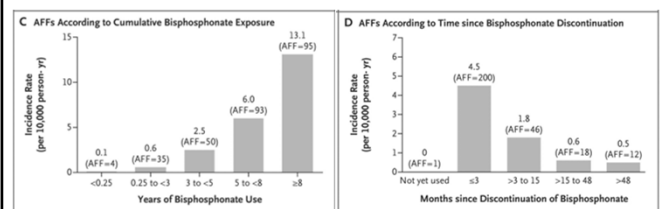
Atypical Femur Fracture

- Atypical femoral fractures are stress or insufficiency fractures occurring in the femoral shaft.
- “Chalk stick Fracture”
- AFF risk increased with long-term bisphosphonate therapy (> 5 years duration)



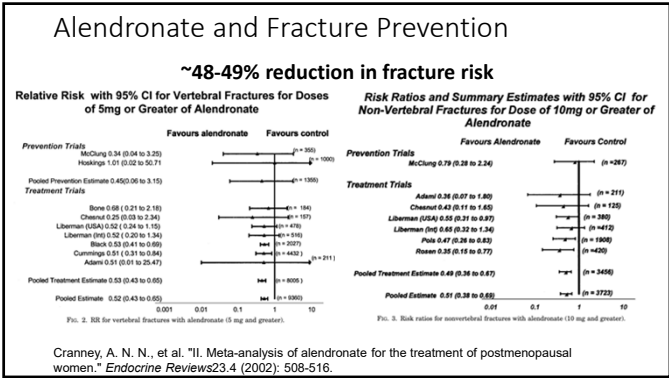
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Atypical femur Fx risk and treatment duration

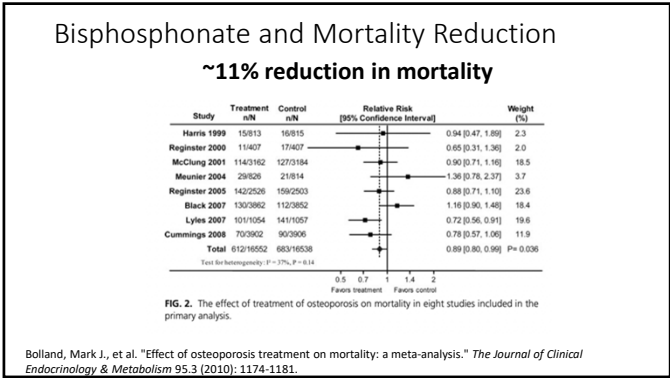


Black, Dennis M., et al. "Atypical femur fracture risk versus fragility fracture prevention with bisphosphonates." *New England Journal of Medicine* 383.8 (2020): 743-753.

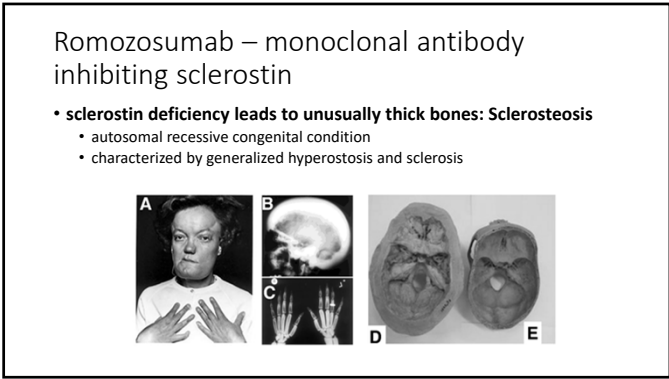
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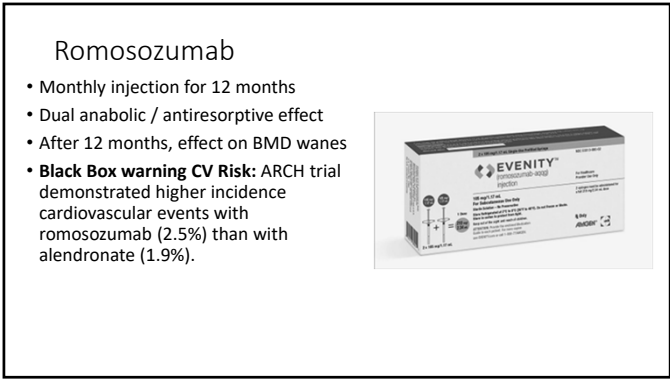
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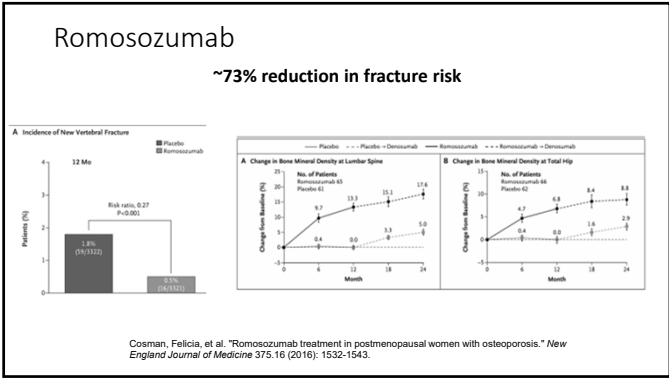
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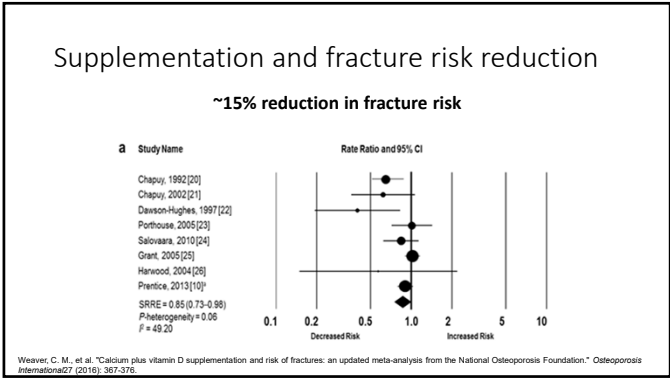
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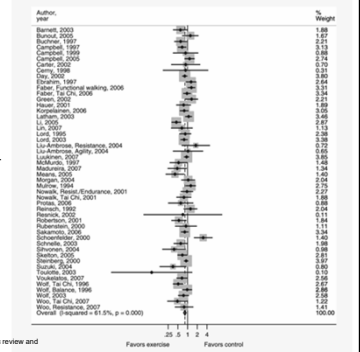
“Overtraining” Osteoporosis - Supplements

- 3-4 servings of dairy or 1-2 Ca/D3 tablets adequate supplementation for most
 - Tailor amount with labs – PTH/Ca/D25
- Excess can cause harm
 - Constipation
 - Hypervitaminosis D
 - Milk Alkali Syndrome
 - Lighter Wallet

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Exercise and fracture risk reduction

- ~10% reduction in fracture risk [2]
- ~17% reduction fall risk
 - Balance exercises seem to be superior to other forms of exercise
- ~2% increase bone density [1]



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“Overtraining” Osteoporosis

- Guideline: Walking 30-40 minutes per session, plus back and posture exercises for a few minutes, 3-4 days per week [1]
- Many factors affect participation in sport
 - Personal interests, social circle, venue accessibility and cost, physical limitations
- Recidivism among intensive “bone” exercise program participants
- Perpetuate false narrative osteoporosis secondary to not “training hard enough”



1. AACE/ACE Postmenopausal Osteoporosis CPG, Endocr Pract. 2016;22(Suppl 4)

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The aging athlete and sport selection

- Consider counseling the aging athlete to choose sports which carry low risk of injury.
- This may be a challenging conversation with patients who are passionate about their sport.

Table 3
Mechanism of injury in sport patients.

Mechanism	N (%)
Ski	187 (36%)
Offroad Vehicle	108 (21%)
Animal/horse riding	83 (16%)
Bicycle	86 (16%)
Fall while running/hiking	42 (8%)
Team/ball Sports	14 (3%)
Other	6 (1%)

Kay, Annika B., et al. “Age is just a number: A look at “elderly” sport-related traumatic injuries at a level I trauma center.” *The American Journal of Surgery* 217.6 (2019): 1121-1125.

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Osteoporosis of Immobilization

- Space travel is associated with 6.2% reduction in bone density after 78 days of flight time. [1]
- Immobilization due to spinal cord injury is associated with 2–4% bone loss per month during the first year. [2]



1. Stavrichuk, Mariya, et al. “A systematic review and meta-analysis of bone loss in space travelers.” *npj Microgravity* 6.1 (2020): 13.
2. Wilmett E, Ismail AA, Hellebrandt D, Bergmann P (1995) Longitudinal study of the bone mineral content and of soft tissue composition after spinal cord section. *Paraplegia* 33:674-677.

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Exercise PLUS alendronate?

“...at the distal tibia the mean increase of 3.6% (0.3–7.1%) in the section modulus (that is, bone strength) and 3.7% (0.1–7.3%) increase in the ratio of cortical bone to total bone area were statistically significant in the exercise group compared to the non-exercise group, indicating exercise-induced thickening of the bone cortex.”

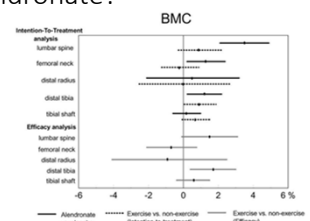


Fig. 2. Means and 95% confidence intervals of the group differences (%) in the bone mineral content (BMC) between the alendronate groups (black lines) and between the exercise groups (dotted lines for ITT analysis and grey lines for efficacy analysis).

Uusi-Rasi, K., et al. “Effect of alendronate and exercise on bone and physical performance of postmenopausal women: a randomized controlled trial.” *Bone* 33.1 (2003): 132-143.

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Opinions from an Endocrinologist / Jiu jitsoka

- Encourage sports / nutrition in which patients find joy
 - 1-2 Ca/D25 tablets or 3-4 servings dairy daily
 - Perhaps avoid high-risk sports such as alpine skiing and horse back riding
- Literature does not support exercising nor supplementing away osteoporosis
 - *Numerous other benefits, which should be emphasized*
 - *Risk of "Overtraining" osteoporosis*
- Osteoporosis medications are safe, well-tolerated and highly efficacious
 - May work synergistically with sport

Treatment can save lives!