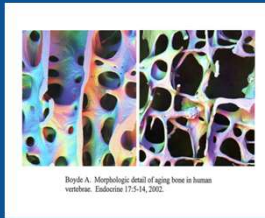


Bone Health & Cancer



Laura A. Graeff-Armas, MD, MS, PhD
Diabetes, Endocrinology & Metabolism

1

Background

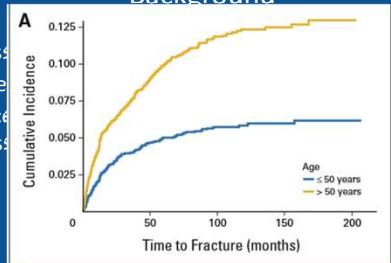
- Higher Fracture risk
- Across all cancers,
 - Higher fracture risk (HR 2.12) especially vertebrate
 - In 1st 1-5 years after diagnosis
 - Those who received chemo

JAMA Oncol 2023;9(1):79-87

2

Background

- Bone loss
- Usually e
- Incidence compress



Pundole et al. J Clin Onc 2015
Kendler et al. Osteoporosis International, Dec 2018

3

Risk factors

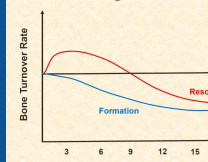
- “The usual suspects”
- +Steroids – 87% get “high dose” steroids
- Hypogonadism – premature menopause in women, hypogonadism in men- surgical, radiation or chemo induced
- High dose = ≥ 7.5 mg Prednisone equivalent daily

Pundole Arch Osteoporosis 2018

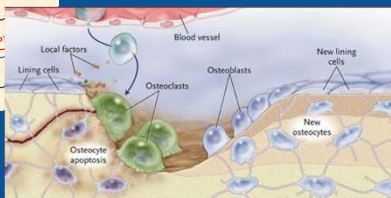
4

Mechanisms of steroids on Bone

Biphasic Effects of Glucocorticoids on Bone Remodeling



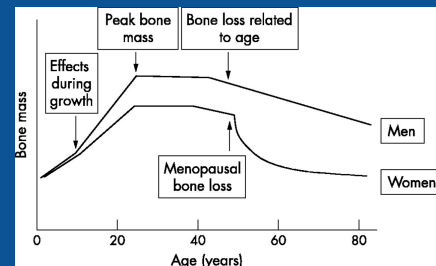
Increase Resorption
Decrease Formation
= BMD loss



Osteocyte Apoptosis

5

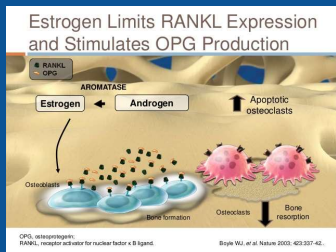
Age related alterations in bone mass in men and women.



E Dogan, and C Posaçi Postgrad Med J 2002;78:727-731

PMJ

6



7

Biol Blood Marrow Transplant 26 (2020) 1784–1802

ELSEVIER

Biology of Blood and Marrow Transplantation
journal homepage: www.bbmt.org

ASTCT
American Society for Transplantation and Cellular Therapy

Bone Health Management After Hematopoietic Cell Transplantation: An Expert Panel Opinion from the American Society for Transplantation and Cellular Therapy

Merav Bar^{1,2,*}, Susan M. Ott³, E. Michael Lewiecki^{3,4}, Kyriaki Sarafoglou^{5,6}, Joy Y. Wu⁷, Matthew J. Thompson⁸, Jonathan J. Vaux⁹, David R. Dean⁹, Kenneth G. Saag¹⁰, Shahrukh K. Hashmi¹¹, Yoshihiro Inamoto¹², Bhagirathbhai R. Dholaria¹³, Mohamed A. Kharfan-Dabaja¹⁴, Arnon Nagler¹⁵, Cesar Rodriguez¹⁶, Betty K. Hamilton¹⁷, Nina Shah¹⁸, Mary E.D. Flowers^{1,2}, Bipin N. Savani¹³, Paul A. Carpenter^{1,2}

Check for updates

8

Table 2
Indications for Starting Pharmacologic Bone Protective Treatment in Adults

Patients who have not received glucocorticoids for late acute/chronic GVHD	
<ul style="list-style-type: none"> History of fragility fractures after age 50 years Postmenopausal women and men aged ≥ 50 years with femoral neck, total hip, or lumbar spine T-score ≤ -2.5. Patients age 40–80 years with T-score between -1.0 and -2.5 and FRAX[®] 10-year probability for major osteoporotic fracture¹ $\geq 20\%$ or 10-year risk of hip fracture $\geq 3\%$. 	
Patients who received glucocorticoids for late acute/chronic GVHD	
Adults age ≥ 40 years	Adults age < 40 years
<ul style="list-style-type: none"> History of fragility fractures Men aged ≥ 50 years and postmenopausal women with femoral neck, total hip, or lumbar spine T-score ≤ -2.5 FRAX[®] (glucocorticoid-adjusted¹) 10-year probability of major osteoporotic fracture¹ $\geq 10\%$ FRAX[®] (glucocorticoid-adjusted¹) 10-year probability of hip fracture $> 1\%$ 	<ul style="list-style-type: none"> History of fragility fractures Hip or lumbar spine Z-score < -3.0 or rapid bone loss ($\geq 10\%$ at the hip or lumbar spine over 1 year) AND Continuing glucocorticoids treatment at a prednisone dose of ≥ 7.5 mg/day or equivalent for ≥ 6 months
Adults age ≥ 30 years who received very high-dose glucocorticoids Initial prednisone dose of ≥ 30 mg/day (or equivalent glucocorticoid exposure) and a cumulative annual dose of > 5 gm – consider pharmacologic bone protective treatment.	

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FRAX[™] WHO Fracture Risk Assessment Tool

HOME CALCULATION TOOL PAPER CHARTS FAQ REFERENCES Select a Language

Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: **USA (American)** Name: **ID** About the risk factors

Questionnaire:

- Age (between 40–90 years) or Date of birth: 10. Secondary osteoporosis: ☐ No ☐ Yes
- Sex: ☐ Male ☐ Female 11. Alcohol 3 more units per day: ☐ No ☐ Yes
- Weight (kg): 12. Femoral neck BMD: Select
- Height (cm): 13. Previous fracture: ☐ No ☐ Yes
- Parent fracture hip: ☐ No ☐ Yes
- Current smoking: ☐ No ☐ Yes
- Glucocorticoids: ☐ No ☐ Yes
- Rheumatoid arthritis: ☐ No ☐ Yes

Weight Conversion: 160 lb 72.6 kg

Height Conversion: 5'6" 167.6 cm

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Chart review of 47 UNMC patients s/p BMT

Table 2
Indications for Starting Pharmacologic Bone Protective Treatment in Adults

Patients who have not received glucocorticoids for late acute/chronic GVHD	
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17 who didn't meet any criteria for Rx
1 who didn't meet criteria for Rx
1 who didn't meet criteria for Rx

11

Journal of Bone Oncology 7 (2017) 1–12

Contents lists available at ScienceDirect

Journal of Bone Oncology

journal homepage: www.elsevier.com/locate/jbo

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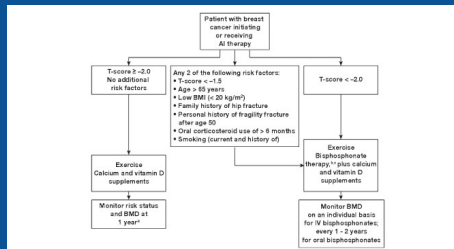
Review Article

Management of Aromatase Inhibitor-Associated Bone Loss (AIBL) in postmenopausal women with hormone sensitive breast cancer: Joint position statement of the IOF, CABS, ECTS, IEG, ESCEO, IMS, and SIOG

CrossMark

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• Who to Treat?



13

www.impactjournals.com/oncotarget/ Oncotarget, 2017, Vol. 8, (No. 43), pp: 75646-75663

Review

The prevention of fragility fractures in patients with non-metastatic prostate cancer: a position statement by the international osteoporosis foundation

Luisella Cianferotti¹, Francesco Bertoldo², Marco Carini³, John A. Kanis⁴, Alberto Lapini⁵, Nicola Longo⁶, Giuseppe Martorana⁶, Vincenzo Mirone⁵, Jean-Yves Reginster⁷, Rene Rizzoli⁸ and Maria Luisa Brandi¹

14

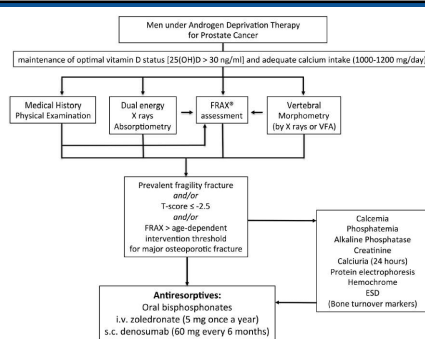


Figure 3: IOF's algorithm for the management of non-metastatic bone disease in prostate cancer patients receiving ADT (modified from ref. 16).

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Calcium

- 2011 Institute of Medicine report indicated that daily intake of **1,200 mg** of calcium (vitamin D) for women ages 51 to 70 had a clear net benefit in fracture prevention (15-30%)⁶.
- Recommend dietary Ca^{2+} , keep supplements <1000 mg/day
- All osteoporosis meds were tested with Calcium as co-therapy

Institute of Medicine 2011 DRI's for calcium and vitamin D. The National Academies Press.

16

Vitamin D

- 25(OH)D Goal 30-50 ng/ml (**40**)
- Dosing Rule of thumb:
 - 1000 IU vitamin D_3 increases 25(OH)D by 10
- Can use Bolus dosing
 - 50,000 weekly for 8-12 weeks
 - Or 5,000 daily for 8-12 weeks

If they are really low <10-15 without obvious cause, check other reasons celiac

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So what can you do?

- DEXA (bone density test)
- Fracture risk score FRAX®
- Get adequate protein, calcium and vitamin D
- Move – exercise of any kind
- Discuss fracture risk with your dr.

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Bisphosphonates

- Oldest class of bone antiresorptives
- Generic alendronate and ibandronate available
 - Oral (**Alendronate**, **Risedronate**, **Ibandronate**)
 - MUST take fasting and wait 30-60 minutes
 - Contraindicated – esophageal disease, GI malabsorption, can't sit upright
 - IV (**Ibandronate**, **Zoledronate**)
 - Acute phase reaction – 45 minutes for 1st dose
 - Kidney disease contraindicated
- Stop osteoclasts, preserve osteoblasts

Ibandronate not FDA approved in men

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- Denosumab RANKL Ab
- Can cause hypocalcemia (hypophosphatemia) if vitamin D and calcium deficiency not fixed, CKD
- **No drug holiday**
- Have to be given on time
- No residual protection, increases rates fracture after stopping

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Medication induced Osteonecrosis

American Association of Oral and Maxillofacial Surgeons' Position Paper on Medication-Related Osteonecrosis of the Jaws—2022 Update

Salvatore L. Ruggiero, DMD, MD,¹ Thomas B. Dodson, DMD, MPH,¹
Tara Aghaloo, DDS, MD, PhD,² Eric R. Carlson, DMD, MD, EAG,²
Brent B. Ward, DDS, MD,³ and Deepak Kademani, DMD, MD⁴

"Patients with osteoporosis, osteopenia, and other metabolic bone diseases benefit from antiresorptive therapy by significantly reducing the risk of fragility fractures and other skeletal related events."

J Oral Maxillofac Surg 80:920-943, 2022

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