OSTEOPOROSIS WORK-UP

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THE AMERICAN GERIATRICS SOCIETY
Geriatrics Health Professionals.
Leading change. Improving care for older adults.
Types of financial relationships and the companies with whom I have relationships are as follows:

• Consulting Fees:
  Amgen, Arthrocare, Biomimetics, D’Fine, Innovative Clinical Solutions, Kuros Biosurgery AG, Osteotech, Orthovita, Soteira, Zelos, Zimmer

• Speakers’ Bureaus:
  Eli Lilly, Novartis, Orthovita, Proctor & Gamble, Roche, Sonofi–Aventis
OSTEOPOROSIS

- Decreased bone mass
- Microarchitectural deterioration
- Altered quality (mineral, collagen)
- Fragility fracture
Low bone mass is the single most accurate predictor of increased fracture risk
## WORLD HEALTH ORGANIZATION CRITERIA

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>$-1\ SD$</td>
</tr>
<tr>
<td>Osteopenia</td>
<td>$-1\ SD$ to $-2.4\ SD$</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>$-2.5\ SD$</td>
</tr>
<tr>
<td>Severe osteoporosis</td>
<td>$-2.5\ SD$ and fracture</td>
</tr>
</tbody>
</table>
BIOCHEMICAL MARKERS

• Bone resorption
  ➢ Collagen breakdown products: n-telo and c-telo peptides, pyridinoline

• Bone formation
  ➢ Bone alkaline phosphatase
  ➢ Osteocalcin
OSTEOPOROSIS RISK FACTORS INDEPENDENT OF BONE MASS

• Low body weight (<127 pounds)
• Recent loss of body weight
• Personal history of fragility fracture
• Maternal history of fragility fracture
• Smoking
HIP FRACTURE RISK AND AGE

10-year hip fracture risk with \(-3\) SD DXA

<table>
<thead>
<tr>
<th>Age</th>
<th>Risk Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-year-old</td>
<td>2%–3%</td>
</tr>
<tr>
<td>80-year-old</td>
<td>16%–18%</td>
</tr>
</tbody>
</table>
FRAX® is a sophisticated risk assessment instrument, developed by the University of Sheffield in association with the World Health Organization. It uses risk factors in addition to DXA measurements for improved fracture risk estimation. It is a useful tool to aid clinical decision making about the use of pharmacologic therapies in patients with low bone mass. The International Osteoporosis Foundation supports the maintenance and development of FRAX®.
R/O MARROW-ETIOLOGY OSTEOPENIA

CBC/diff  
ESR  
Immunelectrophoresis

R/O Endocrine

Bone marrow

Multiple myeloma

Abnl 2%
Vertebral fracture
(kyphoplasty)

1/82 lymphoma
R/O ENDOCRINE-ETIOLOGY
OSTEOPENIA

- T3, T4
- TSH (IRMA)
- PTH
- Glucose
- Steroid HC

Hyperthyroidism
HPT
Type 1 diabetes
Cushing’s disease

Abnl
5%–15%

Normal

R/O Osteomalacia
Insulin is critical to bone health

Type 1 diabetes

→ low insulin
Iatrogenic thyroid increases turnover

CHECK TSH
Dermal

Inhaled

are steroids

steroids
R/O OSTEOMALACIA

↑ Alkaline phosphatase
↑ PTH
↓ Ca
↓ PO₄
↓ 25(OH) vitamin D

30%–70% hip fracture patients
40% primary total joint arthroplasty
- 45% elective surgery
- <32 ng/mL 25(OH) vitamin D
- Trauma
- Professional athletes
TOTAL HIP ARTHROPLASTY AT HSS

<20 ng/mL

↑ Walker

↓ Distance

on discharge
COMMON CAUSES OF OSTEOMALACIA

• Nutritional vitamin D deficiency
• Disorders of intestinal absorption of vitamin D (eg, sprue)
• Defects of vitamin D metabolism
• Renal osteodystrophy
• Renal tubular acidosis
• Hypophosphatemic (renal tubular)
Key

25 (OH) vitamin D

Calcium corrected for albumin
Vitamin D deficiency

A common occurrence in both high-energy and low-energy fractures
BONE TURNOVER (1 of 2)

High turnover

↑ Bone collagen breakdown products (NTX, CTX)

Low turnover

↓ Bone formation
  • Bone-specific alkaline phosphatase
  • Osteocalcin
  • BINP

↓ Bone resorption (NTX, CTX)
BONE TURNOVER (2 of 2)

High turnover

Onset of menopause — Rx: ↓ bone resorption

Low turnover

• Genetic
• Old age
• Chemotherapy
• Bisphosphonates

• Rx: Stop bisphosphonates
  Anabolic agent
METABOLIC BONE DISEASE WORK-UP FOR OSTEOPENIA

- Bone marrow CBC
- Sed rate
- Immunoelectrophoresis
- Endocrinopathy
  - Hyperthyroidism
  - Hyperparathyroidism
  - Cushing’s disease
  - Type 1 diabetes
- Osteomalacia
  - Calcium
  - Phos
  - Alkaline p-tase
  - PTH
  - 25 (OH) vitamin D
- Osteoporosis
  - High vs. low turnover NTX
THANK YOU FOR YOUR TIME!

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