OSTEOPOROSIS
Risk Factors and Screening

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Objectives

• Review bone loss facts and prevalence of osteoporosis
• Discuss risk factors of osteoporosis and fracture prevention modalities
• Overview of BMD screening machines
• Review patient counseling tips
• Case presentation

Bone Facts

• Normal bone physiology
  – Resorption / formation
• Major bone types
  – Trabecular/ cortical bones
• Bone Loss: 4th-5th decade of life
  – Trabecular bone loss > cortical bone loss
  – Female lose 50% trabecular and 35% cortical bone in a lifetime
  – Male loses about 30% trabecular bone and 20% cortical bone in a lifetime
Prevalence of Osteoporosis

- Affects nearly 10 million individuals
  - 80% are females
- Results in 1.3 million fractures annually
- 1/5 women and 1/8 men over 50 years old have risk of fractures
  - hip, vertebral, and wrist
- Estimated fracture related expenditure
  - $13.8 billion annually
  - $38 million daily

Risk Factors of Osteoporosis

(Non-modifiable)

- Female gender
- Advanced age (postmenopause or > 65y.o.)
- Body size (thin and small)
- Ethnicity
  - Caucasians and Asian are highest risk
  - African American and Latino are lower risk
- Family history
- History of fracture

Risk Factors of Osteoporosis

(Modifiable)

- Dietary issues
  - Calcium/ vitamin D
  - Alcohol use
  - Anorexia nervosa and bulimia
- Lifestyle issues: exercise, cigarette smoking
- Medications/health problems
  - Glucocorticoids (asthma)
  - Anticonvulsants (seizures)
  - Thyroid hormones (hypothyroidism)
  - Excessive aluminum-containing antacids (GI problems)
Fracture Prevention

- Early detection
  - BMD Screening
- Lifestyle modification
  - Dietary supplementation
  - Weight bearing exercise
  - Fall prevention
- Medications
  - SERM’s: raloxifene (60mg qd)
  - Alendronate (5mg qd or 35mg weekly)
  - Risedronate (5mg qd or 35 mg weekly)
  - Discontinuation/ dose reduction of certain medications

BMD Screening

- Bone mineral density (G/cm^2)
- T-Score
  - BMD compared to those of normal young adults of the same gender, expressed in Standard Deviation (SD)
  - 1 SD equals to 10%-12% difference in bone density
  - Fracture risk increases approximately 1.5-2.5 times for every 1 SD below those of normal young adult
- Z-Score
  - BMD compared to those of same age cohorts

Osteoporosis Defined by WHO

- Normal:
  - BMD within 1 SD of a young normal adult (T-score between +1 and -1)
- Osteopenia (low bone mass):
  - BMD between 1 and 2.5 SD below that of a young normal adult (T-score between –1 and –2.5)
- Osteoporosis (increased fracture risk):
  - BMD is 2.5 SD or more below that of a young normal adult (T-score below –2.5)
BMD Screening

- Cortical (radius) vs. trabecular (calcaneus) BMD measurement
- X-ray Absorptiometry
  - SXA (125I) vs. DXA (125I and 57CO)
  - Accuracy- relates to fracture risk
  - Precision- relates to rate of bone loss
- Wet vs. dry methods
  - Wet- use of water to correct for soft tissue irregularities
- Ultrasound densitometer

Osteoanalyzer (Norland Corp)

- SXA 125I
  - Wet method
- Heel (os calcis) bone
- Examination time 4 minutes
- Accuracy/precision error <5%
- Radiation dose
  - 10 times less than standard chest x-ray
  - 12 scans at 3mm path intervals
  - BMD indicate relative fracture risk (T-Score)

PIXI (Lunar Corp)

- DXA
  - Dry method
- Heel (os calcis) and forearm
- Accuracy and precision error <1.5
  - 0.2 mm image resolution
- Examination time 5 seconds
- Fully automatic
  - visible image of measured region
  - Graphic report
Ultrasound Densitometry

- Portable units - heel bone measurement
  - Other common sites are tibia and patella
- Uses gel (Norland) or warm water (Lunar)
- Reports T-Score and Z-Score (Stiffness Index)
- Measures bone fragility and structure to predict fracture risk
- Fully automatic, measures acoustic energy
- Measurement time: up to 2 minutes

Counseling Tips 1

- Prescreening, obtain
  - Consent
  - Background information
- During Screening
  - Specific counseling based on information obtained
- Post Screening
  - Explanation of report
  - Follow-up/ monitor/ advise

Counseling Tips 2

- Ask about:
  - Family history of osteoporosis
  - Lifestyle: dietary, exercise, social habits
  - Medical and medication history
  - Fall/ fracture history
- Advise/ recommendations:
  - Lifestyle modifications when appropriate
  - Medical/ medication related issues
  - Fall prevention tips
  - Referrals