

# Bone Up On Good Health

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## **What is Osteoporosis?**

“porous bones”

A condition in which the infrastructure of bone becomes thin and weakened.

Weakened bone is at higher risk for fracture to occur from minimal stresses.

## Who Gets Osteoporosis?

- ANYONE could be at risk for Osteoporosis
- The risk for osteoporosis depends on how much bone mass you attained between ages 20 and 30 and how fast you lose it.
- Most people are identified after age 50
- Some diseases & conditions increase risk
- Even men & children are at risk

## It's a Big Problem

- Osteoporosis affects more than 10 million people in the US
  - 8 million women
  - 2 million men
- Women over 50 are 50% more likely to have an osteoporotic fracture; men are 25% more likely
- Women tend to lose BMD (bone mineral density) earlier in life, and a 3-5 year acceleration of bone loss after menopause due to estrogen withdrawal
- 24 million others have low bone mass, called osteopenia
- Osteopenia is a precursor to osteoporosis

(National Osteoporosis Foundation, 2002)

## Risk Factors (genetic)

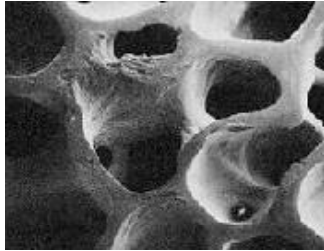
Certain people are more likely to develop this disease than others:

- Female
- Thin and/or small frame
- Advanced age
- Family history of osteoporosis
- Post menopause
- Caucasian or Asian

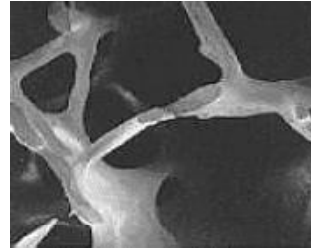
## Risk Factors (lifestyle)

- Anorexia nervosa or bulimia
- Diet low in calcium
- Use of certain medications
- Low testosterone levels in men
- Inactive lifestyle
- Cigarette smoking
- Excessive use of alcohol

# Osteoporosis

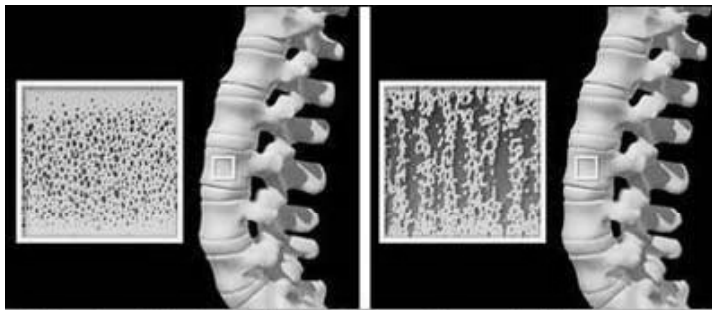


Normal Bone



Osteoporosis

# Osteoporosis in the Spine



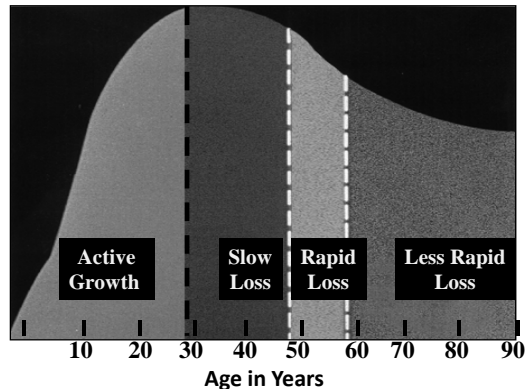
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## Bone Health

- Bones are living tissue, they provide structural support, protect vital organs and store calcium.
- Until age 30, we store and build bone effectively.
- As part of the aging process, bones begin to break down faster than they are formed.
- Accelerates after menopause. Estrogen is the hormone that protects against bone loss.

## Bone Development

- Bones build mass beginning at birth and peak by age 20-30
- **Peak bone mass is attained between 25 & 30 y/o**
  - 50% accrued during teen years
  - Declines by 1 – 1.5%/ year after peak
  - Declines by 3 – 5%/ year 1<sup>st</sup> 5 yr/ menopause



(National  
Osteoporosis  
Foundation, 2002)

## Fetal Bone Development



## Bone Strength

- Depends on: size and density
- New bone is made by breaking down and destroying old bone cells (osteoclasts), and remodeling/building new bone cells (osteoblasts)
- Determined by calcium, phosphorous, mineral and hormone levels

## Why Do Bones Weaken?

- Bones depend on calcium, other chemicals, and vitamins to keep them strong.
- Bones grow as a response to physical stress being put on them.
- The density (hardness) of bones requires a good diet, some sunlight, and exercise in order to stay strong and not break.

## Fracture Numbers

- Every year there are 1.5 million bone fractures in this country
  - 300,000 hip fractures
  - 700,000 vertebral fractures
  - 250,000 wrist fractures
- Women have a greater lifetime risk of sustaining a hip fracture than breast, ovarian , and uterine cancer combined
- Fracture care costs \$3 BILLION every year!

(National Osteoporosis Foundation, 2002)

## Fractures HURT

Fractures cause:

- Pain
- Limited mobility
  - Prolonged bed rest causes:
    - Loss of strength
    - Pneumonia
- Disability
- Death
  - 20% of those with hip fractures die within one year
  - Increased mortality with each vertebral fracture

(National Osteoporosis Foundation, 2002)

## Most Common Fracture Sites:

- Postural fractures:
  - Spine
  - Hip
- Limb fractures:
  - Wrist

## Posture differences in the older adult?

- In elders, when mobility becomes limited, forces acting on the joints produced by gravity are no longer efficacious .
- Osteoporosis can cause compression fractures in spinal column
- These fractures lead to:
  - Increased thoracic kyphosis
  - Decreased lumbar lordosis
  - Posterior pelvic tilt
  - Forward head, rounded shoulders
  - Flexed hips and knees
  - Tight gastronemius/soleus

## Determinants of Osteoporotic Fracture



Vertebral Fracture

- Number of osteoporosis risk factors
- Forward bending (trunk flexion)
- Poor balance, or accidents resulting in falls



Hip Fracture

## How Do I Know if I Have It?

- There are many types of screening tests available in the community. Many use a finger or a foot to estimate possible risk.
- The gold standard (the absolute test) for determining the amount of bone density an individual has is a DEXA test. It is like an X-ray without the radiation.
- You lie on a table and a scanner passes over you. A computer determines how much bone you have by the information read by the scanner.

## What's a T-score?

- The amount of bone you have is determined by how much has been lost since childhood, assuming you had lots of calcium and activity at that time
- A T-score is a statistical number which says whether you are above or below "normal"
- T-scores are such numbers as -1.4 or -3.0 or even +1.0 sometimes.

## T-scores

- Normal T-scores range from +1 to -1
- Osteopenia T-scores  
-1.0 to -2.5
- Osteoporosis T-score  
less than -2.5 (up to -6.0)

## What Should I Do First?

There are 3 major things you can do

1. Talk to your doctor about a Bone Density Test
2. Talk to a physical therapist or exercise physiologist about your activity level and an exercise program to combat osteoporosis
3. Talk to a dietician to make sure your diet is providing your bones with enough calcium and is balanced correctly

## What If I Already Have Osteoporosis?

- Talk to your physician and pharmacist about medications available to help you
- Make sure your diet includes enough calcium, not too much caffeine or alcohol, and adequate, but not excessive, protein.
- Spend at least 30 minutes/day in sunlight and/or eat foods which are fortified with Vitamin D
- and.....



## See a Physical Therapist/PT, EP

- PTs are able to develop an exercise program for you that will be appropriate for your condition
- PTs will evaluate your posture, your strength, your range of motion, your balance, and your general endurance status
- PTs will develop a balanced program which should help keep you fit as well as safe
- PTs can answer your questions or refer you to others who will

## Studies on Exercise

- Appropriate exercise may slow the rate of bone loss
- Sedentary lifestyles and immobility lower bone density
- Effects of exercise are improved when combined with proper nutrition and medication

## Exercise Effect on Bone – Works only when “Regular”

- Postmenopausal women exercised 3 times per week for 9 months
- Stair-climbing for ~ 30 minutes each session
- Spinal bone density ↑ 4% in exercisers
- Spinal bone density ↓ to baseline within 9 months for those who stopped exercising

(Dalsky 1988)

## Resistance Training Increases Bone Density Best

- **Landmark study** (Nelson & Fiaterone 1994)
  - Sedentary 50-70 y/o postmenopausal women
  - Resistance training 2 X/wk on 5 machines for 1 year
  - Significant bone density increases in spine, hip, total body
- **Many other studies validate, including:**
  - Cussler EC 2003
  - Kerr D 2001
  - Kelley GA 2001

## Principles of Exercise for People with Lowered Bone Mass

- Posture is critical in all activities
- Weight bearing is important
  - Walking, Dancing, Stair climbing
- Resistance exercise is the best way to strengthen bone & muscle groups
- Balance exercise to decrease fall risk
- Avoid activities or positions that move the body into bent (flexed) postures

## Eclectic Treatment Focus Essential

- Frailty Injury Cooperative Interventions Trial Analysis revealed that a year after the intervention:
  - Fall rate decreased **10%** in those who did **strength** exercises only
  - Fall rate decreased by **17%** in those who received **“balance” exercises** only
  - Fall rate decreased by **31%** in those who did **both plus the Tai Chi**.

(Wolfson L et al: Balance and strength training in older adults: intervention gains and Tai Chi maintenance. 1996)

- **Those who increase all balance scores show a 60% reduction in fall risk.**

(Tinetti ME et al: A multifactorial intervention to reduce the risk of falling among elderly people living in the community. 1994)

## Prevention of Bone Loss and Minimizing Fracture Risk

- **Healthy lifestyle choices**
  - Exercise (including weight-bearing cardio/aerobic activities, weight training, and balance training)
  - Nutrition
- **Early treatment**
  - Screening
  - Individualized therapies
- **Physical Therapy**
  - Resistive weight bearing exercise
  - Correct body mechanics
  - Balance interventions
  - Treat mechanical pain & dysfunction

## Strength Training

- Strengthen the bones in the arms and front of your spinal column:

- Free weights
- Weight machines
- Resistance bands
- Water exercise



## Weight Bearing Aerobic Activities

Slows mineral loss directly on the bones of:

- Legs
- Hips
- Lower spine



## Stability and Balance Exercises

- Help your muscles work together to decrease your chance of falling:

- Balance class
- Tai Chi
- Yoga



## Exercises to AVOID!

- High-impact:
  - Jumping
  - Running
  - Jogging
- Exercises in which you bend forward and twist your waist:
  - Toe touches
  - Sit-ups



## What's Next?

- We need to educate young women and teenagers about the risk of osteoporosis.

Great resources: Web sites for up to date information:

[www.geriatricspt.org/clients/resources.cfm](http://www.geriatricspt.org/clients/resources.cfm)

[www.nof.org](http://www.nof.org)

[www.surgeongeneral/library/bonehealth](http://www.surgeongeneral/library/bonehealth)

[www.osteoporosis.org](http://www.osteoporosis.org)

[www.fore.org](http://www.fore.org)