



Osteoporosis

What *You* Should Know

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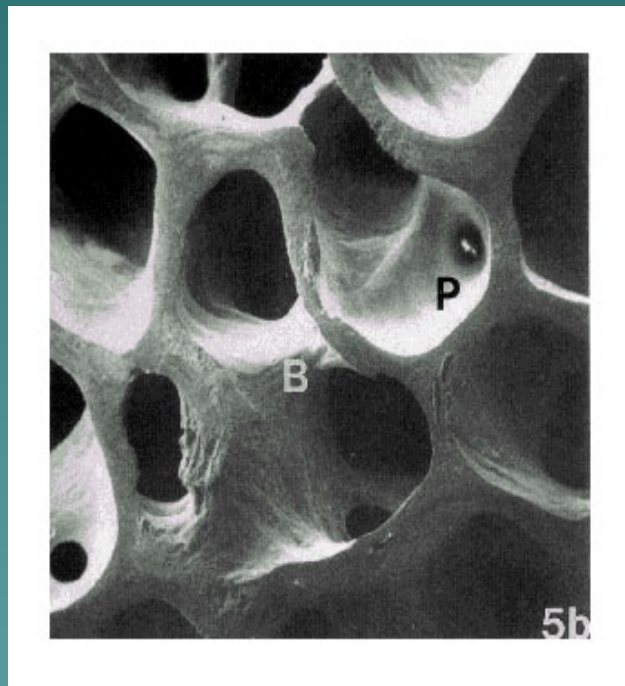
What is Osteoporosis?

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

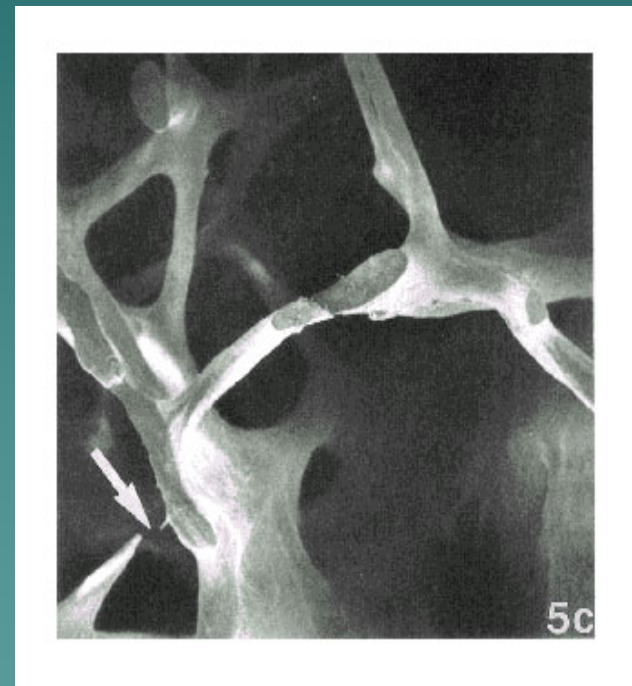
Weakened bone is at higher risk for fracture to occur from minimal stresses.

Normal & Osteoporotic Bone Architecture

Normal
Bone



Osteoporotic Bone



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Who Gets Osteoporosis?

ANYONE could be at risk for Osteoporosis

- ◆ Most people are identified after age 50
- ◆ Some diseases & conditions increase risk
- ◆ Even men & children are at risk

Risk Factors You *Can't* Change

- .Age
- .Gender (4/5 cases are female)
- .Postmenopausal status
- .Family history, race (Caucasian or Asian), Vit D genetics
- .Small frame (<127 lb = osteoporosis risk)
- .Hyperparathyroidism, RSD, cancer, organ replacement
- .Necessary medications (steroids, antiseizure, anticoagulants, synthroid, many chemotherapies, some diuretics)



Additional Risk Factors

Diseases that Are Often Treated with Glucocorticoid Medications*

Asthma

Bursitis

Crohn's Disease

Chronic Active

Hepatitis

Dermatitis (Severe)

Glaucoma

Lupus Erythematosus

Multiple Sclerosis

Osteoarthritis

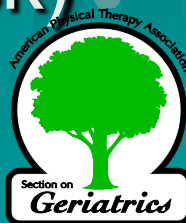
Psoriasis

Rheumatoid Arthritis

*Partial List

Risk Factors You *Can* Change

- Diet – inadequate calcium and vitamin D, too much or too little protein
- Some bone-damaging medications
- Unhealthy lifestyle choices
 - Alcohol (more than 2 drinks/day)
 - Smoking (any!)
- Too little exercise
- Under-eating (<127 lb = osteoporosis risk)





Bone Development

- ◆ Bones build mass beginning at birth and peak by age 20-30
- ◆ Bone growth is promoted by adequate intake of calcium, vitamin D, protein and exercise
- ◆ **BONE BEGINS TO LOSE MASS AFTER AGE 30!!**



Calcium and Bone

- ◆ Recommended daily calcium intake
 - Children and Young Adults
 - 1-10 years 800 mgs
 - 11-24 years 1,200 mgs
 - Adults 1,000 mgs
 - Pregnant and Lactating Women 1,200 mgs
 - Postmenopausal Women Not on ERT 1,500 mgs
 - Men over the age of 65 1,500 mgs

- ◆ Excess **salt displaces calcium**
 - Is added to almost all **canned foods!**
- ◆ High **phosphates leach calcium** from bone!
 - **Soda** – the worst culprit



Bone Nutrition - Beyond Calcium

◆ Vitamin D

- 400 – 800 units daily (Dawson-Hughes 1995)
- 30 minutes of sun to hands & face daily sufficient in sub-tropical latitudes but only the “sunny” 6 months in temperate latitudes

◆ Magnesium

- 400-600/day – allows calcification as a natural calcium chelator (Barzel US, 1995)
- Depleted by stress, physical exertion

◆ Protein Intake and Bone - moderation is the key

- No differences in bone density with MODERATE vegetarians vs MODERATE omnivores: 65-75 g/day (Marsh et al, 1980,1988)
- High amounts of protein intake (~200 g/day) associated with decreased bone density (Barzel 1998, Mazess et al 1974, 1997)
- Low protein diets (<50g/day) associated with decreased bone density (Chiu et al 1997)



Drug Options – FDA approved

- ◆ **Anti-resorptives (slow bone resorption)**
 - Calcium and vitamin D
 - Bisphosphonates (alendronate, risedronate, zoledronic acid, pamidronate)
 - Selective estrogen receptor modulators (raloxifene)
 - Calcitonin (Miacalcin)
 - Estrogen
 - ◆ risks with long term use outweigh benefits, may be safer with lower dosages
 - ◆ Always needs to be given with progesterone when uterus present
- ◆ **Anabolic (bone forming)**
 - Parathyroid hormone (Forteo)



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.



It's a Big Problem

- ◆ Osteoporosis affects more than 10 million people in the US
 - 8 million women
 - 2 million men (but they are catching up)
- ◆ 24 million others have low bone mass, called osteopenia
- ◆ Osteopenia is a precursor to osteoporosis



Why is It a Problem?

- ◆ Osteoporosis, by itself, is not a problem. It doesn't cause pain and you will not know you have it!
- ◆ The problem is that it makes bones very brittle and brittle bones can break easily.
- ◆ A broken bone is called a FRACTURE.



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
- ◆ Fracture care costs **\$3 BILLION** every year!



Fractures HURT

Fractures cause:

- ◆ Pain
- ◆ Limited mobility

Prolonged bedrest causes:

- ◆ Loss of strength
- ◆ Pneumonia
- ◆ Disability
- ◆ Death (20% of those with hip fractures die within one year, increased mortality with each vertebral 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** 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

- ◆ 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

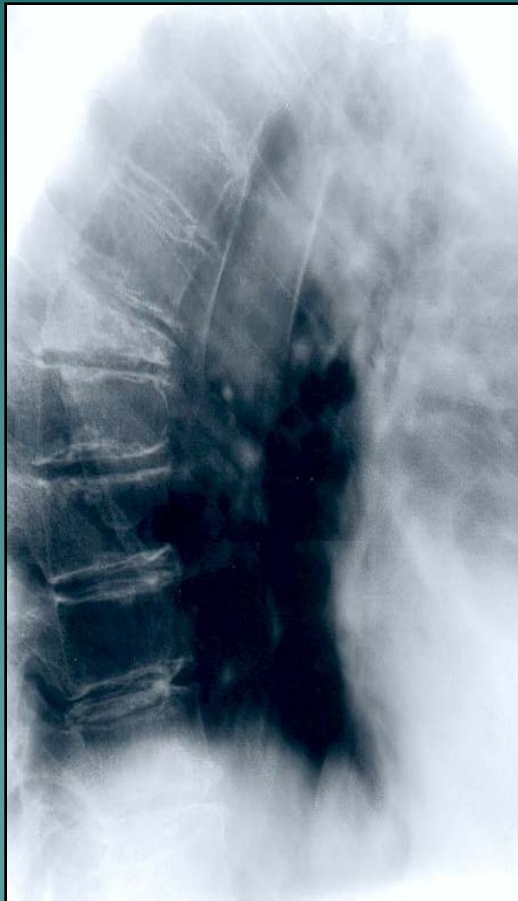


Studies on Exercise

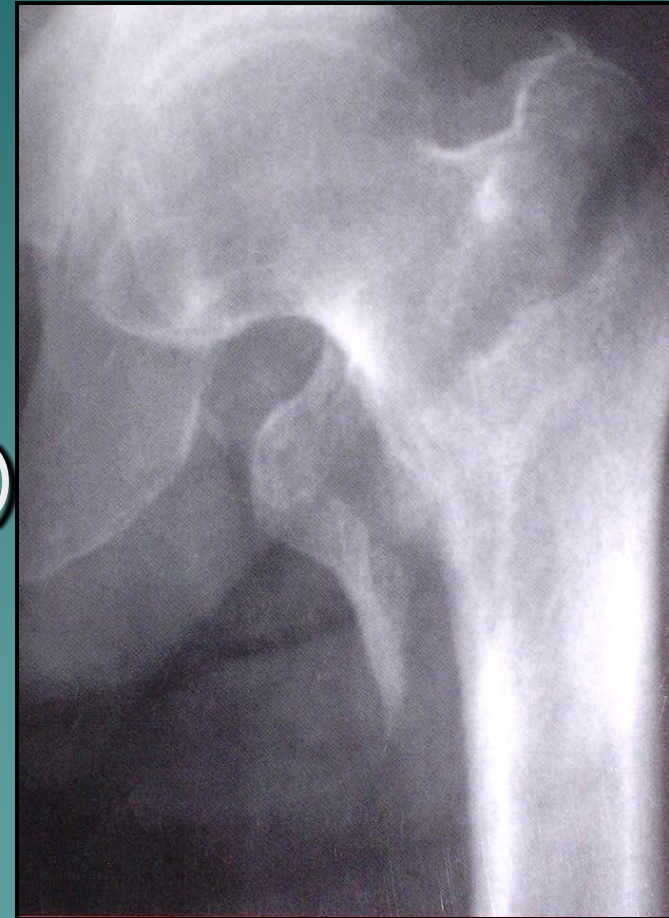
- ◆ Appropriate exercise may slow the rate of bone loss
- ◆ Sedentary lifestyles and immobility lower bone density
- ◆ Effects of exercise are improved when combined with proper nutrition and medication

Determinants of Osteoporotic Fracture

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



Vertebral Fracture

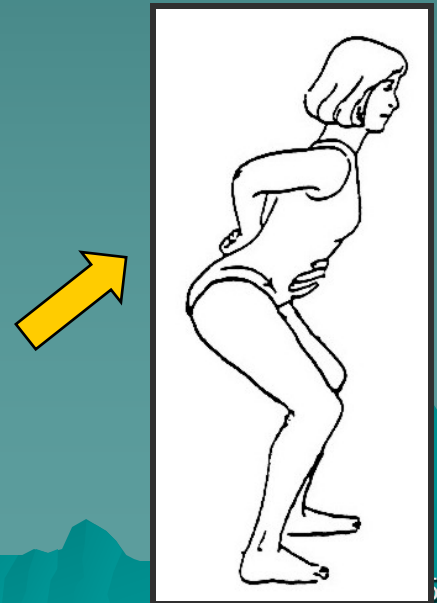
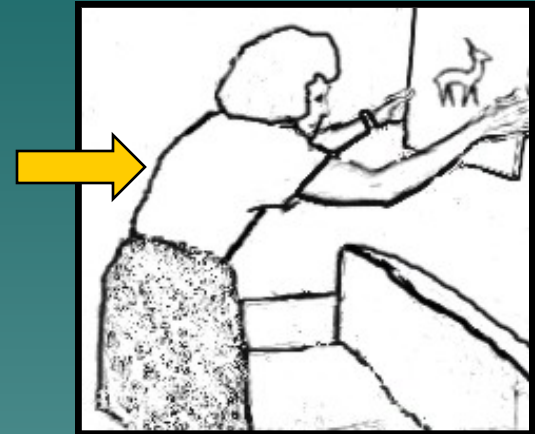


Hip Fracture 24



Fracture Force Risks During Bending and Lifting

- ◆ Compression loads imposed on the L3 motion segment (lower back) by 30° of trunk flexion
 - 1800 N with arms at chest
 - 2610 N with arms in front, holding 2 kg in each hand (Schultz et al 1982)
- ◆ 300 to 1200 N enough to fracture an osteoporotic vertebra (Edmondston et al 1997)
- ◆ Practical Application - **bend and lift in everyday life with the trunk in relative neutral!**

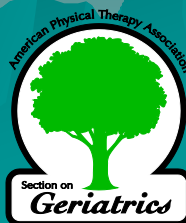


Exercise and Vertebral Fractures

(for women with a previous fracture)

<u>Type of Exercise</u>	<u>New Fractures</u>
◆ Spinal Extension (Back arches/lifts)	◆ 16%
◆ Spinal Flexion (Crunches)	◆ 89%
◆ Combined Flexion and Extension	◆ 53%
◆ No exercise	◆ 67%

◆ Sinaki and Mikkelsen, 1994





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
- ◆ Avoid activities or positions that move the body into bent (flexed) postures



Prevention of Bone Loss and Minimizing Fracture Risk

- ◆ **Healthy lifestyle choices**
 - Exercise
 - Nutrition
- ◆ **Early treatment**
 - Screening
 - Individualized therapies
- ◆ **Physical Therapy**
 - Resistive weight bearing exercise
 - Correct body mechanics
 - Balance interventions
 - Treat mechanical pain & dysfunction

See a Physical Therapist
for More Details!



Find Out More About Osteoporosis

Web sites for up to date information:

www.geriatricspt.org/clients/resources.cfm

www.nof.org

www.surgeongeneral/library/bonehealth

www.osteoporosis.org

www.fore.org

